APPENDIX A

NOP, Initial Study, and Comment Letters

APPENDIX A.1

Notice of Preparation

Los Angeles County
Department of Regional Planning

Planning for the Challenges Ahead

Amy J. Bodek, AICP
Director of Regional Planning

Dennis Slavin
Chief Deputy Director,
Regional Planning

ORIGINAL FILED

AUG 05 2019

LOS ANGELES, COUNTY CLERK

NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT AND PUBLIC SCOPING MEETING

DATE: August 5, 2019

TO: State Clearinghouse, Responsible Agencies, Trustee Agencies, Organizations and Interested Parties

SUBJECT: Notice of Preparation of a Draft Environmental Impact Report in Compliance with Title 14, section 15082(a) of the California Code of Regulations

The County of Los Angeles (County) is the lead agency pursuant to the California Environmental Quality Act (CEQA) and intends to prepare an Environmental Impact Report (EIR) for the proposed Project identified below. The County has prepared this Notice of Preparation (NOP) to provide Responsible Agencies and other interested parties with information describing the Project and to identify its potential environmental effects pursuant to State requirements.

AGENCIES: The County requests your agency's views on the scope and content of the environmental information relevant to your agency's statutory responsibilities in connection with the proposed Project, in accordance with Title 14, section 15082(b) of the California Code of Regulations. Your agency will need to use the EIR prepared by the County when considering any permits that your agency must issue, or other approval for the Project.

ORGANIZATIONS AND INTERESTED PARTIES: The County requests your comments and concerns regarding the environmental issues associated with construction and operation of the proposed Project.

PROJECT & PERMIT(S): Sterling Ranch Residential Project/Project No. 03-250-(5)/Vesting Tentative Parcel Map No. 060257/Conditional Use Permit No. 03-250/ / Oak Tree Permit No. 200700007 /Environmental Assessment No. 03-250.

PROJECT APPLICANT: Sterling Gateway, LP

PROJECT LOCATION: 29053 Coolidge Avenue, Val Verde, CA 91384 APN: 3271-004-012, 3271-004-013, and 3271-005-032

PROJECT DESCRIPTION: To create 222 detached single-family residential lots on 57.9 acres, a passive pocket park on 0.2 acre, a passive park with a tot lot, shade structure and tables on 3.4 acres, and 21,000 square feet of commercial uses with 71 parking spaces on 2.5 acres, five undisturbed open space lots on 21 acres, six landscaped open space HOA lots on 0.1 acre, three access strip lots on 0.2 acre, three infiltration basin lots and six debris basin lots on 8.8 acres, a pump station lot on 0.1 acre, and 19.7 acres of public right-of-way and private and future streets within Zone R-1 on 113.9 acres.

Sterling Gateway, LP proposes the Sterling Ranch Estates Residential Project (Project), a 113.9-acre residential community (See **Figure 1: Site Plan Sheet A**). Of the proposed 222 residential lots, 91 residential lots would be 7,000 square feet to 10,000 square feet in size and 131 residential lots would be greater than 10,000 square feet in size, for an average of 11,364 square feet, consistent with Castaic Area Community Standards District (CSD) development standards. The Project also would include five open space lots on 21 acres, six landscaped/open space HOA lots on 0.1 acre, three access strip lots at Trevylon Street (20' emergency access), Rainbow Drive (20' emergency access) and Lexington Drive (26' project access) on 0.2 acre, three infiltration basins and six debris basins on 8.8 acres, a pump station on 0.1 acre, and public streets and private and future streets for the community on 19.7 acres (See **Figure 2: Site Plan Sheet B**).

The Project would provide a private trail, the Sterling Horn Memorial Trail, ten feet in width along the southern portion of the Project site. The private trail would connect with the County's Del Valle Trail outside the Project site as identified in the County's Regional Trail Plan. The Project also would dedicate a twenty-foot wide, multiuse trail easement to the County for the Del Valle Trail, located off-site, on a third party's property. The off-site trail would be a variable-width (five-foot to eight-foot wide), natural soil surface trail within a twenty-foot dedication. An easement for the off-site grading from the adjacent owner has been obtained for this work, including the agreement to dedicate easements to the County upon request.

The off-site improvements consist of the following: a portion of Del Valle Road from the easterly Project boundary to approximately 772-feet east of the Project boundary within the adjacent property; the off-site construction of a mainline sewer from the Project site to Hasley Canyon Road within Del Valle Road; the upsizing of the existing water line within Hasley Canyon Road; and the dedication of off-site permanent open space on 37.9 acres. The Project also involves the construction of a one-million-gallon water tank, located on approximately 1.4 acres of disturbed land, at an elevation of 1575 feet, approximately 2.2 miles westerly from the Project site, and in the vicinity of the existing Cuyama water tank site.

The proposed uses and densities are consistent with the existing General Plan, the Area Plan land use designations, zoning, and CSD development standards. The Project includes requests for approval of a vesting tentative tract map to create 249 lots, a conditional use permit (CUP) for development within a Hillside Management Area, the grading of more than 100,000 cubic yards of earth and construction and maintenance of a water tank, and an oak tree permit. While the Project would have one mass grading plan and storm drain plan for the entire Project site, the Project could be constructed in up to six phases, with the commercial portion constructed during

Phase 5. The Los Angeles County Waterworks District No. 36 would provide water to the Project, the Los Angeles County Sewer Maintenance Division would operate the pump station, and the Los Angeles County Sanitation District would provide wastewater treatment collection and treatment.

The Project's system of public streets would access Del Valle Road. The extension of Chiquito Canyon Road (as Sterling Parkway) would provide access to the Project site and would include four new intersections with local roadways constructed within the Project site.

The Project site is primarily undeveloped, with the exception of one single-family residential structure, unimproved hiking trails and dirt roads. The Project would demolish and remove the existing on-site residential structure, which is located off Hunstock Street and Coolidge Avenue (proposed Sterling Parkway).

The Project would require an Oak Tree Permit (OTP No. 200700007) to remove two jurisdictional oak trees. The two trees are located at the corner of Hunstock Street and what is currently Coolidge Avenue.

POTENTIAL ENVIRONMENTAL EFFECTS OF THE PROJECT

Based on a preliminary review of the proposed Project consistent with section 15060 of the CEQA Guidelines, the County has determined that an EIR should be prepared for this proposed Project. In addition, consistent with section 15082 of the CEQA Guidelines, the County has identified the following probable environmental effects of the Project, which will be addressed in the EIR for this project:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Geology / Soils
- Greenhouse Gas Emissions
- Hazards/Hazardous Materials
- Hydrology / Water Quality
- Noise
- Public Services
- Recreation
- Transportation / Traffic
- Tribal Cultural Resources

- Utilities / Services Systems
- Wildfire

The County has determined that there is not a likelihood of potentially significant effects related to the following environmental topics:

- Agricultural and Forestry Resources
- Energy
- Land Use / Planning
- Mineral Resources
- Population / Housing

The EIR will include information on the reasons why these effects were determined not to be significant and are therefore not addressed in detail in the EIR.

NOTICE OF SCOPING MEETING: The County will conduct a public scoping meeting for the purpose of soliciting oral and written comments from interested parties as to the appropriate scope and content of the EIR.

All interested parties are invited to attend the scoping meeting to assist in identifying issues to be addressed in the EIR. The scoping meetings will include a brief presentation of the Project to be addressed in the EIR and will provide attendees with an opportunity to provide input to the scope of the EIR. The Scoping Meeting will be held on Thursday August 29, 2019 at 6:30 PM at the following location:

Live Oak Elementary
27715 Saddleridge Way
Castaic, CA 91384

Translation in other languages can be made available at the meeting upon request. Please submit translation requests at least seven business days in advance of each scheduled meeting to sdjones@planning.lacounty.gov.

PUBLIC REVIEW PERIOD: The County has determined to make this NOP available for public review and comment pursuant to Title 14, section 15082(b) of the California Code of Regulations. The comment period for the NOP begins on Monday, August 5, 2019 and ends on Thursday, September 5, 2019.

Any comments provided should identify specific topics of environmental concern and your reason for suggesting the study of these topics in the EIR.

Please direct all written comments to the following address:

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012
Tel: 213-974-6433
Fax: (213) 626-0434
sdjones@planning.lacounty.gov

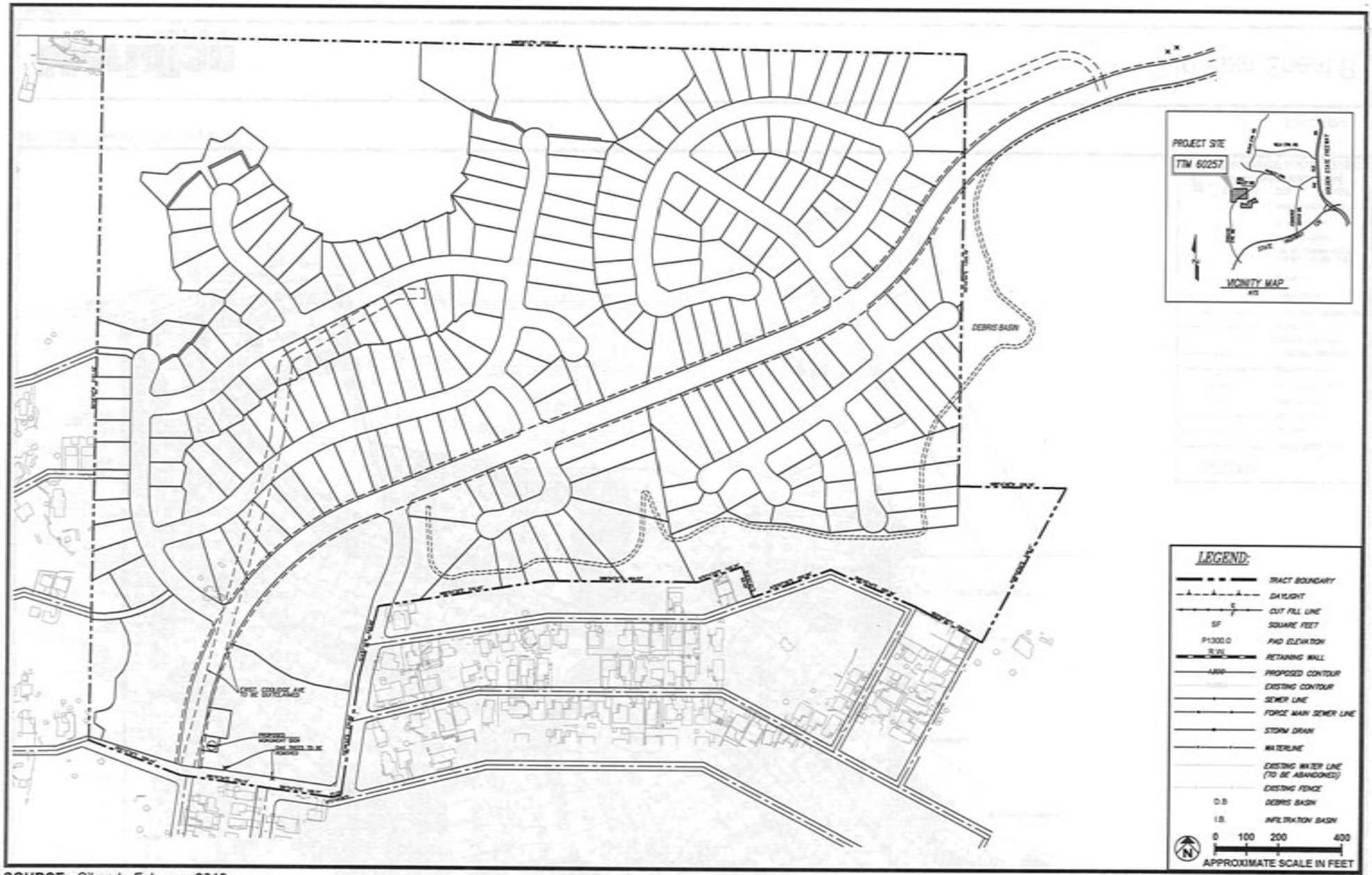
All written responses will be included as Appendices in the Draft EIR and their contents considered in accordance with State and County environmental guidelines.

DOCUMENT AVAILABILITY: The NOP and Initial Study are available for public review during regular business hours at the Los Angeles County Department of Regional Planning address listed above and the following locations:

- Castaic Library, 27971 Sloan Canyon Road, Castaic, CA 91384
- Stevenson Ranch, 25950 The Old Road, Stevenson Ranch, CA 91381

The public is also encouraged to visit the Department of Regional Planning's website to review the initial study at http://planning.lacounty.gov/case/view/03-250.

Thank you for your participation in the environmental review of this project.



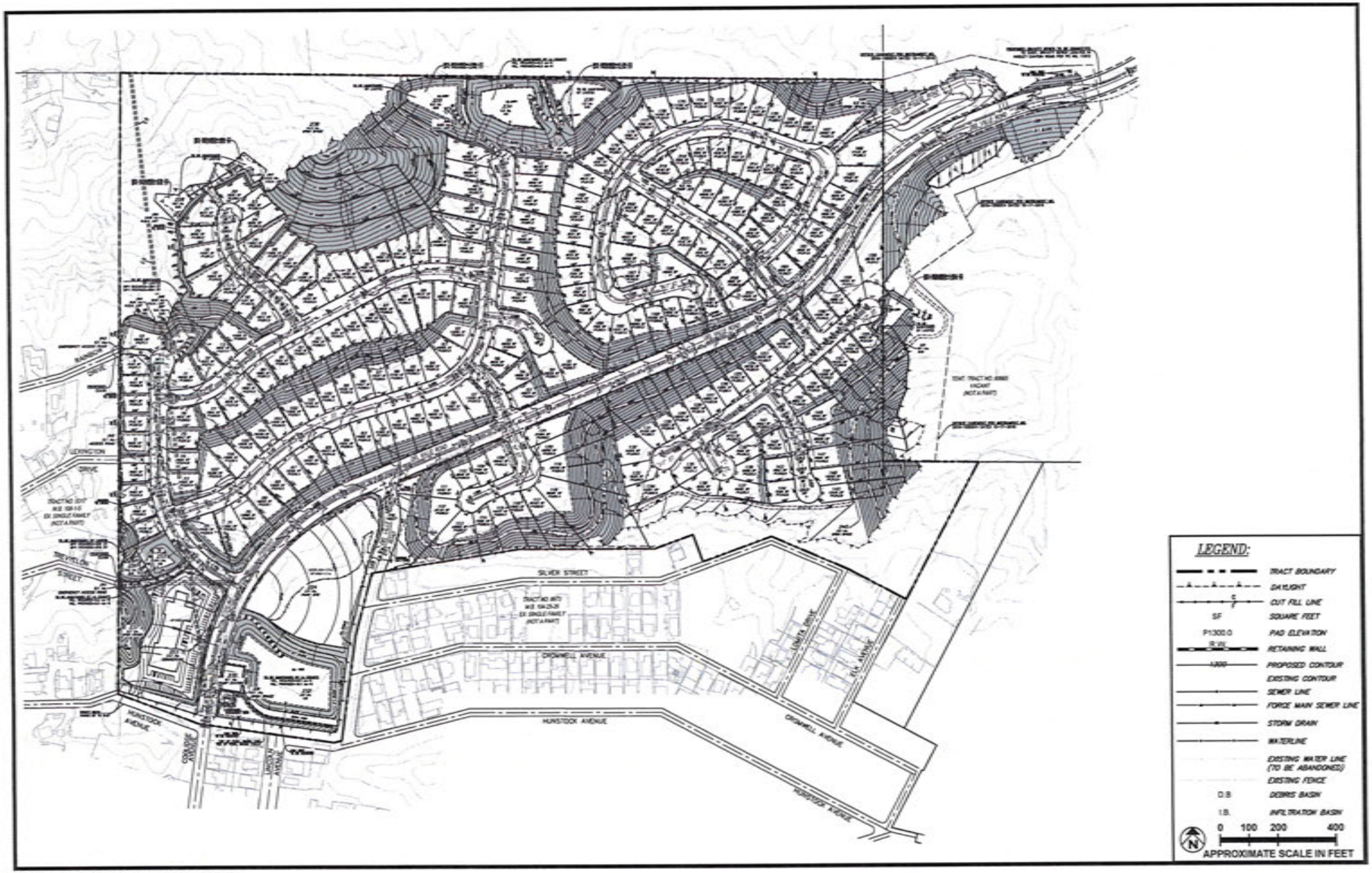
SOURCE: Sikand - February 2019

FIGURE 1

Meridian Consultants

Site Plan Sheet A

185-001-18



SOURCE: Sikand - February 2019

FIGURE **2**

Meridian Consultants

Site Plan Sheet B

185-001-18

APPENDIX A.2

Initial Study

Initial Study

Sterling Ranch Residential Project

Prepared for:

Los Angeles County, Department of Regional Planning
320 West Temple Street
Los Angeles, CA 90012

Prepared by:

Westlake Village Office
920 Hampshire Road, Suite A5
Westlake Village, CA 91361

Meridian Consultants

Los Angeles Office
706 S. Hill Street, 11th Floor
Los Angeles, CA 90014

August 2019

Table of Contents

Section		Page
Environmental Checklist Form		1
Environmental Factors Potentially Affected		10
Evaluation of Environmental Impacts		11
1	Aesthetics	12
2	Agricultural / Forest	15
3	Air Quality	17
4	Biological Resources	19
5	Cultural Resources	22
6	Energy	24
7	Geology and Soils	25
8	Greenhouse Gas Emissions	28
9	Hazards and Hazardous Materials	29
10	Hydrology and Water Quality	32
11	Land Use and Planning	35
12	Mineral Resources	38
13	Noise	39
14	Population and Housing	40
15	Public Services	41
16	Recreation	43
17	Transportation	44
18	Tribal Cultural Resources	45
19	Utilities and Service Systems	46
20	Wildfire	48
21	Mandatory Findings of Significance	50

List of Figures

Figure		Page
1	Regional Location Map	2
2	Project Site	3
3a	Site Plan Sheet A	4
3b	Site Plan Sheet B	5
3c	Site Plan Sheet C	6

Environmental Checklist Form (Initial Study)

County of Los Angeles, Department of Regional Planning

Project title: Sterling Ranch Residential Project/Project No. 03-250-(5)/Vesting Tentative Tract Map No. 060257/Parcel Map No. 82320/ Conditional Use Permit No. 03-250/ Oak Tree Permit No. 200700007/Environmental Assessment No. 03-250.

Lead agency name and address: Los Angeles County, Department of Regional Planning, 320 West Temple Street, Los Angeles, CA 90012

Contact Person and phone number: Steven Jones (213) 974-6433

Project sponsor's name and address:
Sterling Gateway LP
c/o Hunt Williams
5018 E. Meadows Drive, Park City, Utah 84098
Phone: (435) 901-3488

Project location: 29053 Coolidge Avenue (existing, proposed Sterling Parkway), Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032
USGS Quad: Val Verde. Refer to Figure 1, Regional Location Map and Figure 2, Project Site.

Gross Acreage: 151.8 acres (113.9 acres on site and 37.9 acres off-site open space)

General plan designation: H2- Residential 2 (0-2 dwelling units/acre), H5 – Residential 5 (0-5 dwelling units/acre) and CG-General Commercial, off-site – RL5 (0.2 dwelling units/acre)

Community/Area wide Plan designation: Santa Clarita Valley Area Plan, One Valley One Vision (OVOV) (2012), HM - Hillside Management, and U1 -Urban Residential

Zoning: R-1 (Single Family Residence) and C-2 (Neighborhood Commercial)
In addition to the zoning designation, indicate which Community Standards District the property is located within: Castaic Area Community Standards District (CSD), Area 4, Val Verde Area.

Description of project: Sterling Gateway, LP proposes the Sterling Ranch Estates Residential Project (Project), a 113.9-acre residential community consisting of 222 detached single-family residential lots on 57.9 acres, a passive pocket park on 0.2 acres, a passive park with a tot lot, shade structure and tables on 3.4 acres, and 21,000 square feet of commercial uses with 71 parking spaces on 2.5 acres (refer to Figure 3a, 3b, and 3c, Site Plan Sheets). Of the 222 residential lots, 91 lots would be 7,000 square feet to 10,000 square feet in size and 131 lots would be greater than 10,000 square feet in size, for an average of 11,364 square feet, consistent with CSD development standards. The Project also would include five open spaces lots on 21 acres, six landscaped/open space HOA lots on 0.1 acres, three access strip lots at Trevylon Street (20' emergency access), Rainbow Drive (20' emergency access) and Lexington Drive (26' project access) on 0.2 acres, three infiltration basins and six debris basins on 8.8 acres, a pump station on 0.1 acres, and streets for the community on 19.7 acres.

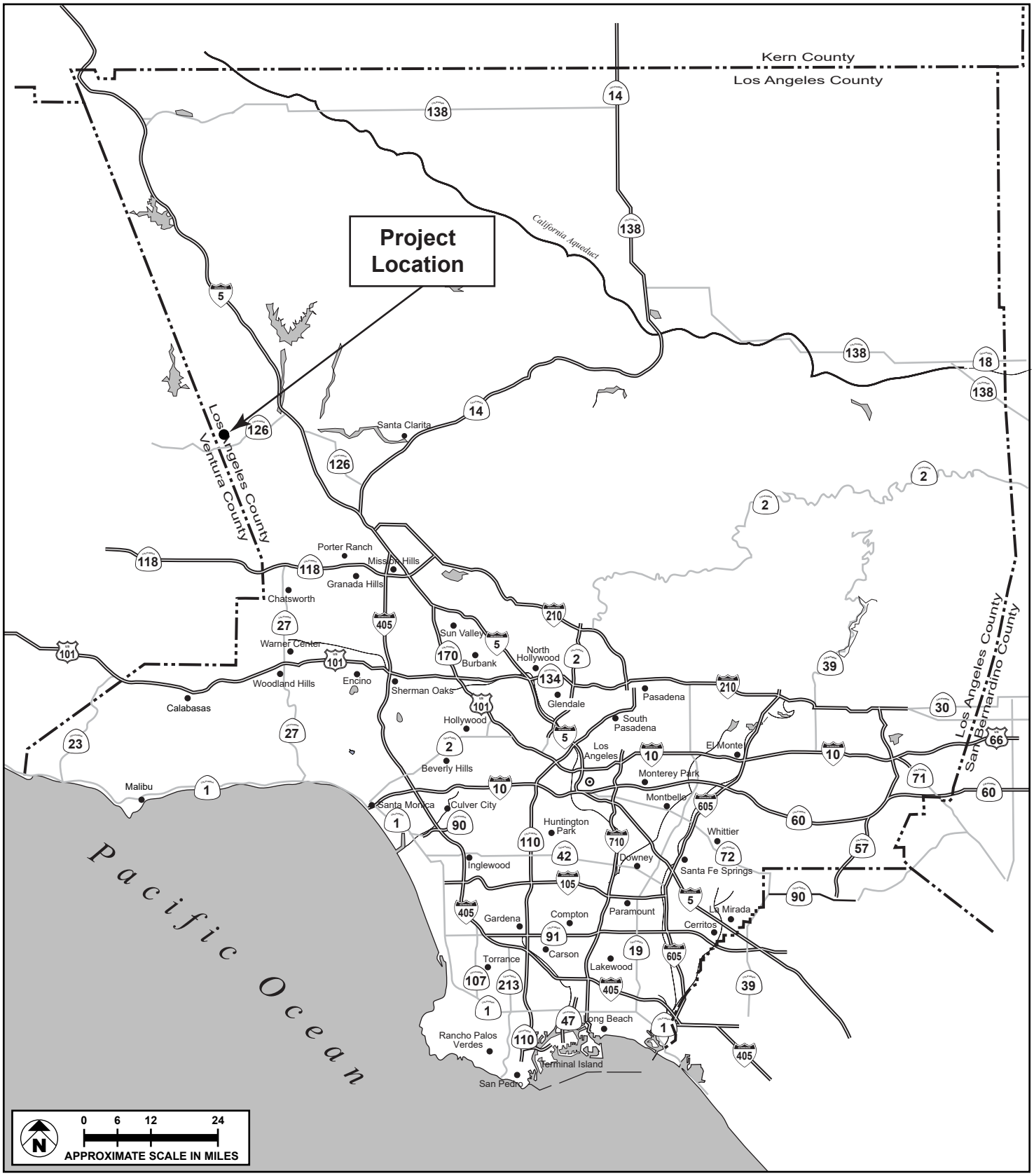
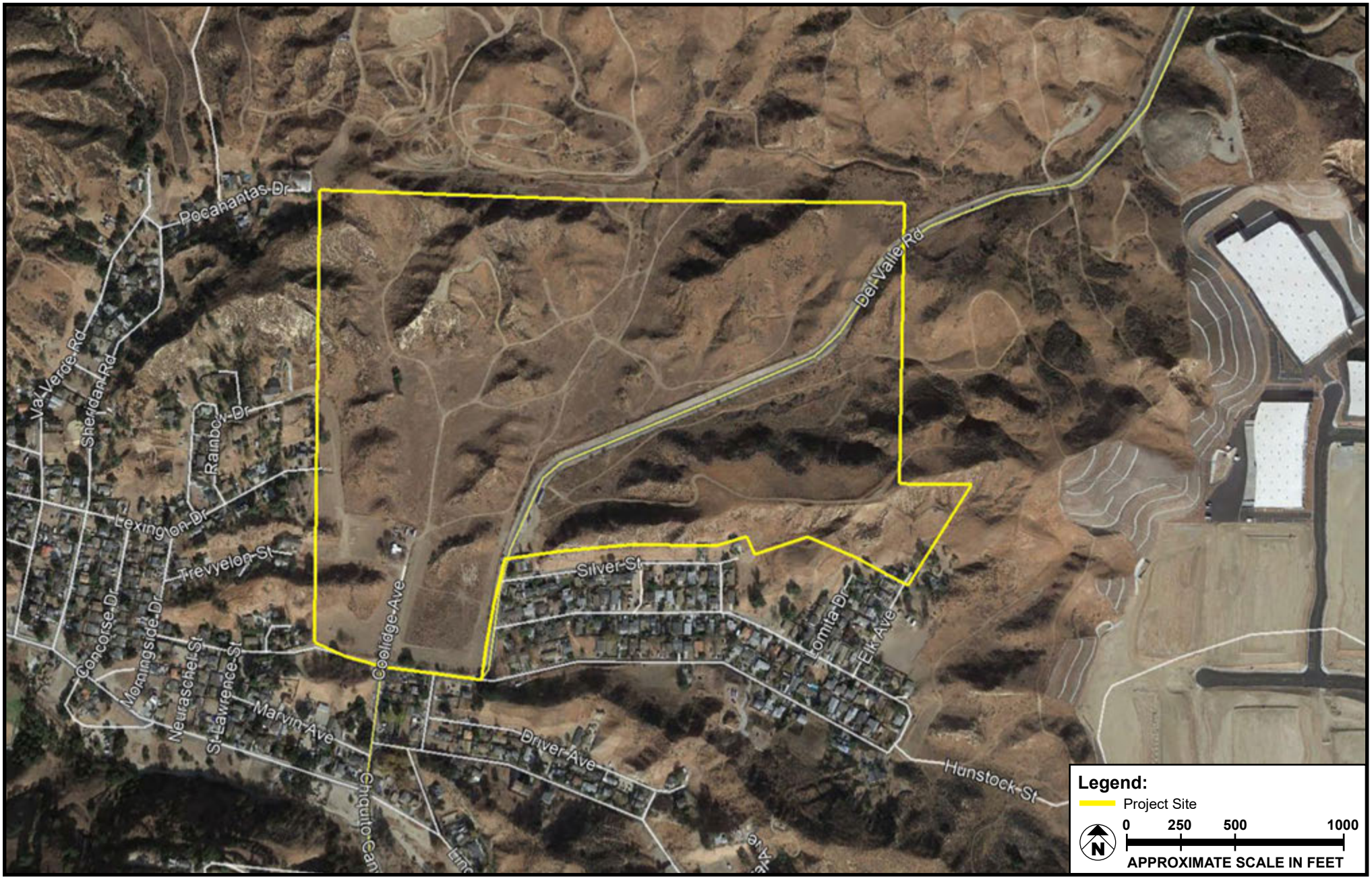


FIGURE **1**

Meridian Consultants

Regional Location Map

185-001-17



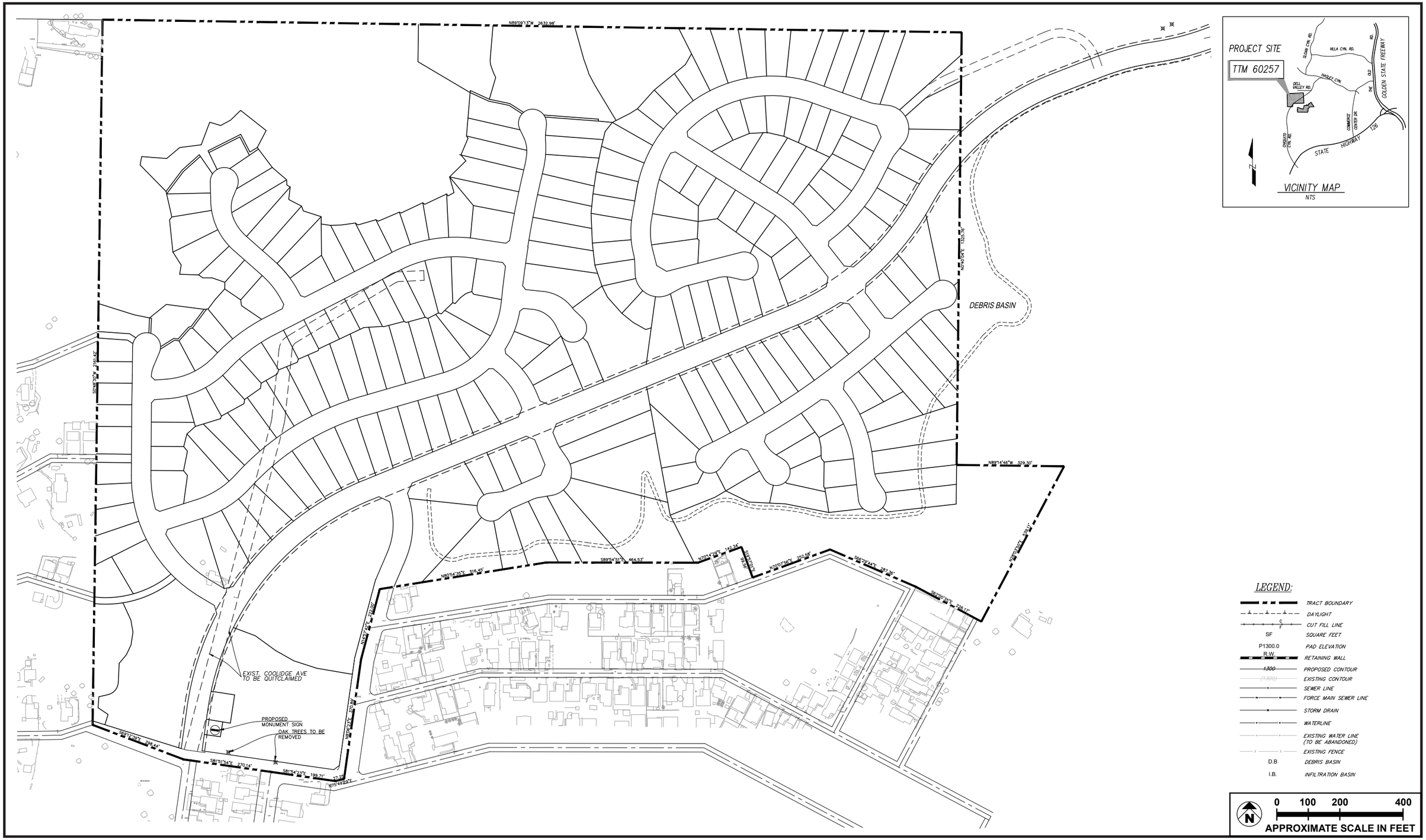
SOURCE: Google Earth - 2018

FIGURE **2**

Meridian Consultants

Project Site

185-001-17



SOURCE: Sikand - February 2019

FIGURE **3a**

Meridian Consultants

Site Plan Sheet A

185-001-18

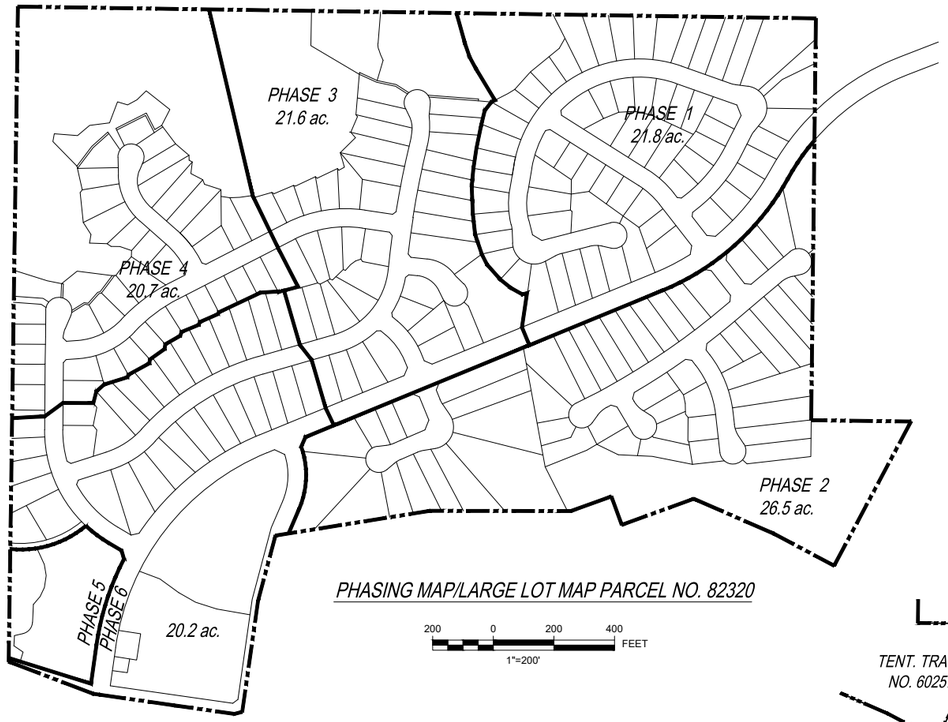
SOURCE: Sikand - February 2019

FIGURE **3b**

Meridian Consultants

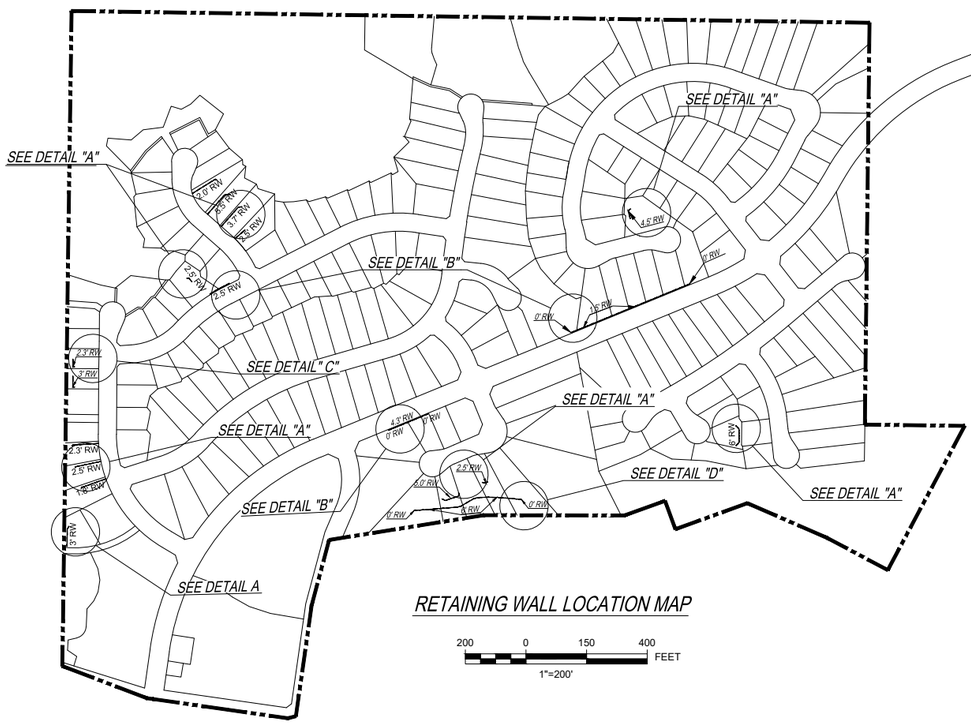
Site Plan Sheet B

185-001-18



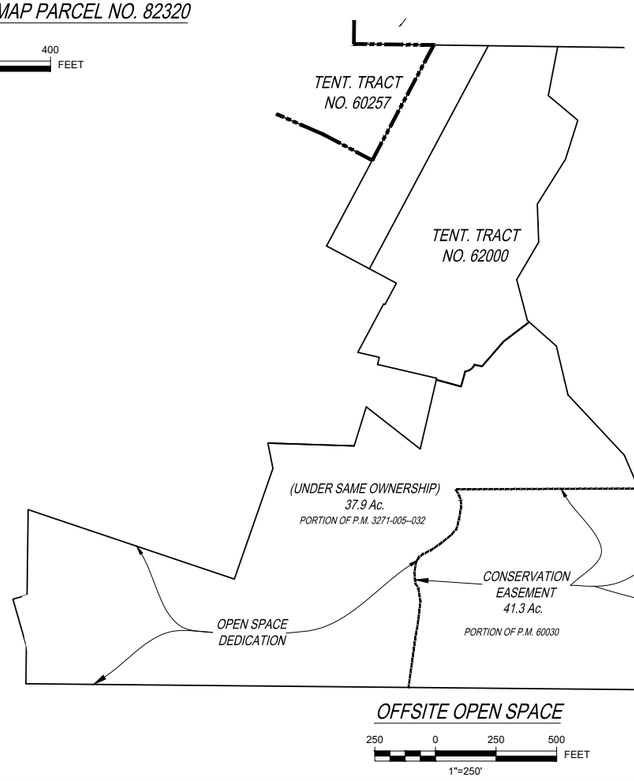
PHASING MAP/LARGE LOT MAP PARCEL NO. 82320

200 0 200 400 FEET
1"=200'



RETAINING WALL LOCATION MAP

200 0 150 400 FEET
1"=200'



OFFSITE OPEN SPACE

250 0 250 500 FEET
1"=250'

SOURCE: Sikand - February 2019

FIGURE **3c**

Meridian Consultants

Site Plan Sheet C

185-001-18

The Project would provide a private trail, the Sterling Horn Memorial Trail, ten feet in width along the southern portion of the Project site. The private trail would connect with the County's Del Valle Trail outside the Project site as identified in the County's Regional Trail Plan. The Project also would dedicate a twenty-foot wide, multiuse trail easement to the County for the Del Valle Trail, located off site, on a third party's property. The off-site trail would be a variable-width (five-foot to eight-foot wide), natural soil surface trail within a twenty-foot dedication. An easement for the off-site grading from the adjacent owner has been obtained for this work, including the agreement to dedicate easements to the County upon request.

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The proposed uses and densities are consistent with the existing General Plan, the Area Plan land use designations, zoning, and CSD development standards. The Project includes requests for approval of a vesting tentative tract map to create 249 lots, a conditional use permit (CUP) for development within a Hillside Management Area, the grading of more than 100,000 cubic yards of earth, clustering and the maintenance of water tanks for the storage and distribution of water and an oak tree permit. While the Project would have one mass grading plan and storm drain plan for the entire Project site, the Project could be constructed in up to six phases, with the commercial portion constructed during Phase 5. The Los Angeles County Waterworks District No. 36 would provide water to the Project, the Los Angeles County Sewer Maintenance Division would operate the pump station, and the Los Angeles County Sanitation District would provide wastewater treatment collection and treatment.

The Project's system of public streets would access Del Valle Road. The extension of Chiquito Canyon Road (as Sterling Parkway) would provide access to the Project site and would include four new intersections with local roadways constructed within the Project site.

The Project site is primarily undeveloped, with the exception of one single-family residential structure, man-made hiking trails and dirt roads. The Project would demolish and remove the existing on-site residential structure, which is located off Hunstock Street and Coolidge Avenue (proposed Sterling Parkway).

The Project would require an Oak Tree Permit (OTP No. 200700007) to remove two jurisdictional oak trees. The two trees are located at the corner of Hunstock Street and what is currently Coolidge Avenue.

Surrounding land uses and setting: The Project site lies on both sides of Del Valle Road, south of Hasley Creek Canyon. The community of Val Verde lies south and west of the Project site. The Valencia Commerce Center with commercial and industrial uses lies east of the Project site. Residential uses border the Project site on the west and south. Largely undeveloped land lies north of the Project site. Surrounding land uses designations include H5 (Residential 5, 0-5 du/ac) to the south and west, RL2 (Rural Land 5, 1 du/2ac) to the north, and IO (Industrial Office) to the east. Surrounding zoning uses include R-1 (Single-family residence) to the south and west, A2-2 (Light and Heavy Agriculture) to the north, and MPD-DP (Manufacturing industrial planned development) to the east.

The Chiquito Canyon Sanitary Landfill is located approximately 1 mile southeast of the Project site beyond the residential uses. Val Verde Community Regional Park, which is a 58-acre community regional facility, is located approximately 0.25 miles southwest of the Project site.

Interstate 5 (I-5) is located approximately 2 miles east of the Project site and State Route 126 (SR 126) is located approximately 2 miles south of the Project site. Chiquito Canyon Road via SR 126 and Del Valle Road via I-5 would provide access to the Project site.

The topography of the surrounding area consists of low-lying rolling hills. The Project site varies from flat to moderately steep north and south facing slopes with elevations ranging from approximately 1,200 feet above mean sea level (amsl) along the southern boundary of the Project site to approximately 1,400 feet amsl in the northeastern portion of the Project site. The on-site vegetation is typical of an arid California climate, and primarily consists of annual brome grasslands and coastal sage scrub.

Within the Project site, two ephemeral channel features are present that support indicators of an ordinary high water mark (OHWM), bed and bank, and riparian vegetation. Based on these indicators, the features would be jurisdictional to the U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW). These ephemeral channel features are currently within the Project footprint and would be impacted; therefore, mitigation for impacts would be required and is currently proposed to be fulfilled via the purchase of credits through a local mitigation bank or conservation organization. The mitigation requirement would be finalized during the Clean Water Act (CWA) Section 404 permitting process with the USACE, the CWA Section 401 Water Quality Certification with the RWQCB, and the California Department of Fish and Game Code (DFG Code) section 1600 Lake or Streambed Alteration Agreement (LSAA) permitting process.

Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code § 21080.3.1? If so, is there a plan for consultation that includes, for example, the determination of significance of impacts to tribal cultural resources, procedures regarding confidentiality, etc.?

On September 27, 2017, a search of the Sacred Lands Files from the Native American Heritage Commission (NAHC) was requested. A response letter was received via email from the NAHC on September 28, 2017, stating the Sacred Lands File did not indicate the presence of Native American cultural resources in the immediate project area. The NAHC also provided a list of 11 Native American groups and individuals who may have knowledge of cultural resources in the project area. Letters were sent to each representative on October 23, 2017. This coordination was conducted for informational purposes only and does not constitute formal government-to-government consultation. To date, two responses were received: Fernandeno Tataviam Band of Mission Indians (Tataviam), Jairo Avila; and Santa Ynez Band of Mission Indians (Chumash), Freddie Romero.

Other public agencies whose approval may be required (e.g., permits, financing approval, or participation agreement):

Public Agency	*Approval Required*
_____	_____
_____	_____

Major projects in the area:

Project/Case No.	*Description and Status*
02-121/TR61105	Mission Village. 621 lots on 598 acres, Newhall Ranch, Approved March 28, 2019
98034/TR52584-1	Amendment to Revised Los Valles, 564 lots on 430.4 acres, approved February 5, 2019
R2012-02667/TR072126	Tapia Ranch, 511 lots on 1,167 acres pending review.
2018-003253/PM82110	Three commercial parcels on 2.52 acres pending review.
PM060030	Commercial/industrial parcels on 116.6 gross acres.
R2004-00559	Chiquita Canyon, LLC landfill lateral expansion, increased maximum height elevation and increased daily disposal limits on 639 acres

Reviewing Agencies:

Responsible Agencies

- ☐ None
- Regional Water Quality Control Board:
  - ☒ Los Angeles Region
  - ☐ Lahontan Region
- ☐ Coastal Commission
- ☐ Army Corps of Engineers
- ☐ LAFCO

Special Reviewing Agencies

- ☒ None
- ☐ Santa Monica Mountains Conservancy
- ☐ National Parks
- ☐ National Forest
- ☐ Edwards Air Force Base
- ☐ Resource Conservation District of Santa Monica Mountains Area

Regional Significance

- ☐ None
- ☒ SCAG Criteria
- ☒ Air Quality
- ☐ Water Resources
- ☐ Santa Monica Mtns. Area

Trustee Agencies

- ☐ None
- ☒ State Dept. of Fish and Wildlife
- ☒ State Dept. of Parks and Recreation
- ☐ State Lands Commission
- ☐ University of California (Natural Land and Water Reserves System)

County Reviewing Agencies

- ☒ DPW
- ☒ Fire Department
  - Forestry, Environmental Division
  - Planning Division
  - Land Development Unit
  - Health Hazmat
- ☒ Sanitation District
- ☐ Public Health/Environmental Health Division: Land Use Program (OWTS), Drinking Water Program (Private Wells), Toxics Epidemiology Program (Noise)
- ☒ Sheriff Department
- ☒ Parks and Recreation
- ☒ Subdivision Committee

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project.

☒ Aesthetics	☒ Greenhouse Gas Emissions	☒ Public Services
☐ Agriculture/Forestry	☒ Hazards/Hazardous Materials	☒ Recreation
☒ Air Quality	☒ Hydrology/Water Quality	☒ Transportation
☒ Biological Resources	☐ Land Use/Planning	☒ Tribal Cultural Resources
☒ Cultural Resources	☐ Mineral Resources	☒ Utilities/Services
☐ Energy	☒ Noise	☒ Wildfire
☒ Geology/Soils	☐ Population/Housing	☒ Mandatory Findings of Significance

DETERMINATION: (To be completed by the Lead Department.)
On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☒ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

_____ _____

Signature (Prepared by) Date

_____ _____

Signature (Approved by) Date

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources the Lead Department cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the Lead Department has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level. (Mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced.)

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA processes, an effect has been adequately analyzed in an earlier EIR or negative declaration. (State CEQA Guidelines § 15063(c)(3)(D).) In this case, a brief discussion should identify the following:

   a) Earlier Analysis Used. Identify and state where they are available for review.

   b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of, and adequately analyzed in, an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

7) The explanation of each issue should identify: the significance threshold, if any, used to evaluate each question, and; mitigation measures identified, if any, to reduce the impact to less than significance. Sources of thresholds include the County General Plan, other County planning documents, and County ordinances. Some thresholds are unique to geographical locations.

1. AESTHETICS

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Except as provided in Public Resources Code Section 21099, would the project:				
a) Have a substantial adverse effect on a scenic vista?	☒	☐	☐	☐

For purposes of determining significance under CEQA, a scenic vista is defined as a viewpoint that provides expansive views of a highly valued landscape for the benefit of the general public. The Santa Clarita Area Plan discusses scenic resources within the area and states that urban development has the potential to impair scenic resources if not carefully planned and controlled. The Santa Clarita Area Plan has designated specific ridgelines and established land use policies designed to preserve the views of these ridgelines. The Project sits in a canyon area, surrounded by mountains and rolling hills. Scenic ridgelines surround the Project site, the closest being the ridgeline between the Project site and the commercial and industrial uses to the east.

SR 126 is located approximately 2 miles south of the Project site and is a state designated scenic highway. Because the Project sits in a canyon, it is not be visible from SR 126 and, for this reason, there would be no impact to scenic vistas visible from this state designated scenic highway.

The Project does not propose changes to the scenic ridgeline that sits between the Project site and the commercial and industrial uses to the east. However, the Project would change views from the ridgeline from mostly vacant, undeveloped land, to primarily residential uses. Further analysis of potential impacts on a scenic resource are required.

b) Be visible from or obstruct views from a regional riding, hiking, or multi-use trail?	☒	☐	☐	☐

The Project site is located in a portion of the Santa Clarita Valley that contains several trails identified as "Existing Official Trails on Public Lands" on the County of Los Angeles "Trail Network Map." The only trail that currently exists near the Project site is the Hasley Canyon Trail, an approximately two-mile-long hiking, bicycling, and horseback riding trail located just over 0.50 miles northeast of the Project site. Due to the elevations of the surrounding area, portions of the Project may be visible from the trail. The Project would also include the construction of two additional trails. The Sterling Horn Memorial Trail would be a private trail, ten-feet in width along the southern portion of the Project site. This trail would connect with the County's Del Valle Trail outside the Project site as identified in the County's Regional Trail Plan.

The Project would also dedicate a twenty-foot wide, multiuse trail easement to the County for the Del Valle Trail, located off site, on a third party's property. on the off-site parcel. The off-site trail would be a variable width (five-foot to eight-foot-wide), natural soil surface trail within a twenty-foot dedication. An easement for the off-site grading from the adjacent owner has been obtained for this work, including the agreement to dedicate easements to the County upon request. Further evaluation of the visibility of the Project site from trails in the area is needed to determine the significance of any impact.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
c) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐

The Project site contains native and nonnative plant species on rolling topography, including three oak trees, two of which are afforded protection under the Los Angeles County Oak Tree Ordinance, while the third oak tree does not meet the size criteria under the ordinance. All three of these oak trees are proposed for removal. An oak tree report has been conducted, and oak tree permits have been obtained in order to remove the two jurisdictional oak trees from the property. The Project would be required to mitigate removal of the two trees by payment of in-lieu fees, which is further discussed in Section 4, Biological Resources below. Impacts on oak trees would be considered less than significant.

As mentioned, scenic ridgelines surround the Project site, the closest being the ridgeline between the Project site and the commercial and industrial uses to the east. The Project does not propose changes to the scenic ridgeline that sits between the Project site and the commercial and industrial uses to the east. The Project would be required to adhere to the Hillside Management Regulations/Guidelines in order to protect views of this ridgeline. The Hillside Design Guidelines are intended to implement policies by ensuring that hillside development projects use sensitive and creative engineering, architectural, and landscaping site design techniques. The Guidelines also help ensure that hillside development projects are designed in a manner that allows a project to meet the findings of the Hillside Management Areas Ordinance. The Guidelines are divided into five major design categories (site planning, grading and facilities, road circulation, building design, and landscaping) containing a variety of sensitive hillside design measures. In order to comply with the ordinance, all projects must use the design measure contained in the Guidelines that reasonably can be implement into a project's design. The Project would be required to incorporate these design measures, and impacts would be considered less than significant.

Additionally, SR 126, located approximately 2 miles south of the Project site is a state designated scenic highway. Because the Project site sits in a canyon, it is not visible from SR 126 and, therefore, there would be no impact.

d) Substantially degrade the existing visual character or quality of public views of the site and its surroundings because of height, bulk, pattern, scale, character, or other features or conflict with applicable zoning and other regulations governing scenic quality? (Public views are those that are experienced from publicly accessible vantage point)	☒	☐	☐	☐

The Project site is undeveloped except for one single-family residence. The Project would include grading and the development of 222 single-family homes and 21,000 square feet of commercial uses, both of which would alter the visual character of the Project site.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
e) Create a new source of substantial shadows, light, or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

The Project would include development of one- and two-story homes on lots between 7,000 square feet to greater than 10,000 square feet and single-story commercial uses that would not create substantial shadows affecting any solar access or sensitive uses.

The Project would be built according to the Community Standards District (CSD) and County rural standards, which require fewer street lights than typical lighting associated with single-family homes and a small commercial center. The Project would be developed in accordance with applicable standards and would not create substantial light adversely affecting nighttime views. The homes and commercial center also would not include reflective materials adversely affecting daytime views. Impacts would be less than significant.

2. AGRICULTURE / FOREST

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒

The Project site is identified as "Grazing Land" and "Other Land" on the Los Angeles Important Farmland 2016 map by the California Department of Conservation.[1] Grazing Land is defined as land on which the existing vegetation is suited to the grazing of livestock and Other Land is defined as land not included in any other mapping category. Common examples include low density rural developments, brush, timber, wetland, and riparian areas. The site is not identified as Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. Due to the lack of historic agricultural use, no impact to important farmland would occur.

b) Conflict with existing zoning for agricultural use, with a designated Agricultural Resource Area, or with a Williamson Act contract?	☐	☐	☐	☒

The Project site is presently undeveloped land and is zoned R-1 (Single Family Residence) and C-2 (Neighborhood Commercial). Additionally, the site is not under a Williamson Act Contract.[2] No impact to land zoned for agricultural use or subject to a Williamson Act contract would occur.

c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code § 12220 (g)), timberland (as defined in Public Resources Code § 4526), or timberland zoned Timberland Production (as defined in Government Code § 51104(g))?	☐	☐	☐	☒

1 California Department of Conservation Division of Land Resource Protection Farmland Mapping and Monitoring Program, https://maps.conservation.ca.gov/agriculture/#dataviewer.

2 State of California Department of Conservation, http://www.conservation.ca.gov/dlrp/Pages/qh_maps.aspx.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*

The Project site is zoned R-1 (Single Family Residence) and C-2 (Neighborhood Commercial). No impact to land zoned as forestland, timberland or Timberland Production land would occur.

d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒

The Project site is not forest land, so no impact to forest land would occur.

e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

Agricultural uses and forest land are not located in the immediate vicinity or on the Project site. The Project site is surrounded by developed uses to the east, south, and west. No impact would occur.

3. AIR QUALITY

Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Conflict with or obstruct implementation of applicable air quality plans of either the South Coast AQMD (SCAQMD) or the Antelope Valley AQMD (AVAQMD)?	☒	☐	☐	☐

Construction of the Project would involve the use of heavy-duty construction vehicles and on-site stationary equipment which may generate air pollutant emissions in excess of applicable emissions standards. In addition, fugitive dust emissions would be generated during grading and excavation of the Project site. Construction emissions would be short-term in nature, limited to the periods when construction activity would be taking place. Therefore, construction emissions would not add to long-term air quality degradation. However, daily emissions from construction sources may exceed daily SCAQMD emissions thresholds for criteria pollutants. Further evaluation of potential air quality impacts associated with short-term construction activities is needed to determine the significance of these impacts.

Occupancy and use of the Project site would also increase traffic in the area and may result in an increase in emissions from stationary sources associated with natural gas and electrical consumption. Daily emissions from vehicular and stationary sources may exceed daily SCAQMD emissions thresholds for criteria pollutants. Further evaluation is needed to determine the significance of these emissions.

b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☒	☐	☐	☐

The Project site is located within the South Coast Air Basin (SCAB), which is currently in nonattainment for several criteria pollutants. Operational activities associated with the Project may result in a cumulative increase in air pollutant emissions. Further evaluation of the Project's contribution to cumulative regional air quality impacts is needed to determine the significance of this contribution.

c) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐	☐

The Project would develop a residential community and, therefore, would not be considered a sensitive use. However, the Project site is located approximately 285 feet north of Macedonia Church of God, which is considered a sensitive use.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☒	☐	☐	☐

Grading and construction activities may result in short-term fugitive dust or other potential emissions. Further evaluation of the significance of this impact is required.

4. BIOLOGICAL RESOURCES

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife (CDFW) or U.S. Fish and Wildlife Service (USFWS)?	☒	☐	☐	☐

A Draft Biological Technical Report was drafted in April 2019 by Dudek. The Technical Report noted two special status plant species, Slender Mariposa lily and Peirson's morning-glory, which were documented on the Project site during studies conducted in 2014 and 2017.

Additionally, the Technical Report noted the 2017 and 2018 field investigations found a total of four special-status wildlife species on the site, including: southern California rufous crowned sparrow, oak titmouse, Vauxs swift, and San Diegan tiger whiptail. Two additional special-status reptile species, Blainvilles horned lizard and San Diegan tiger whiptail, have potential to occur on the Project site. Special-status bird species may nest and forage within suitable habitat present on the Project site. Additionally, three mammals, American badger, San Diego black-tailed jackrabbit, and San Diego desert woodrat, could occur in grassland, coastal scrub, woodland, and riparian vegetation communities as well as disturbed lands on the Project site. No state or federally listed wildlife species were detected during focused surveys conducted by Dudek in 2017 and 2018. The Project may have an effect on sensitive species and further evaluation is required to determine if any significant impacts would result from the Project.

b) Have a substantial adverse effect on any sensitive natural communities (e.g., riparian habitat, coastal sage scrub, oak woodlands, non-jurisdictional wetlands) identified in local or regional plans, policies, regulations or by CDFW or USFWS?	☒	☐	☐	☐

As noted in the Draft Biological Technical Report, the Project site is not considered an oak woodland and does not otherwise contain communities of other unique native trees. The Project site does not contain riparian habitat or coastal sage scrub.

However, as noted in the report, within the Project site, there are two unnamed ephemeral waterways, characterized as nonwetland waters of the U.S. and state subject to the jurisdiction of the USACE, RWQCB, and CDFW, that would be impacted by Project construction.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
c) Have a substantial adverse effect on federally protected wetlands (including, but not limited to, marshes, vernal pools, coastal wetlands, and drainages) or waters of the United States or California, as defined by § 404 of the federal Clean Water Act or California Fish & Game code § 1600, et seq. through direct removal, filling, hydrological interruption, or other means?	☒	☐	☐	☐

The Draft Biological Technical Report states that within the Project site there are two unnamed ephemeral waterways, characterized as nonwetland waters of the U.S. and state subject to the jurisdiction of the USACE, RWQCB, and CDFW, that would be impacted by Project construction.

d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☒	☐	☐	☐

The Santa Clara River is considered to be an important wildlife movement and migration corridor.[3] However, as previously mentioned, the Project site is located approximately 1.75 miles west and approximately 2 miles north of the Santa Clara River. As stated in the Draft Biological Technical Report, the Project would potentially interfere with movement by removing access to suitable habitat patches and established native wildlife nursery sites. Further evaluation of the potential impacts to wildlife movements is required.

e) Convert oak woodlands (as defined by the state, oak woodlands are oak stands with greater than 10% canopy cover with oaks at least 5 inch in diameter measured at 4.5 feet above mean natural grade) or other unique native woodlands (juniper, Joshua, southern California black walnut, etc.)?	☐	☐	☒	☐

The Project site contains native and nonnative plant species on rolling topography, including three oak trees, two of which are afforded protection under the Los Angeles County Oak Tree Ordinance. The Project site is not considered an oak woodland and does not otherwise contain communities of other unique native trees.

The Project would permanently impact 0.46 acre of mapped nonnative woodland. The nonnative woodland vegetation community is not recognized in A Manual of California Vegetation, Second Edition (MCV2) and does not carry a global and/or state rarity rank. This vegetation community is comprised of nonnative species and is present in small patches adjacent to existing developed areas associated with the community of Val

3 Santa Clara River Enhancement and Management Plan, May 2005, https://dpw.lacounty.gov/wmd/watershed/sc/docs/SCREMP_Full_Report.pdf and Santa Clarita Valley Area Plan, Conservation and Open Space Element, 2012, Page 144, http://planning.lacounty.gov/assets/upl/project/ovov_2012-ch_04_os.pdf.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*

Verde. Due to the nonnative character and small, patchy distribution of this vegetation community, impacts would be less than significant.

f) Conflict with any local policies or ordinances protecting biological resources, including Wildflower Reserve Areas (L.A. County Code, Title 12, Ch. 12.36), the Los Angeles County Oak Tree Ordinance (L.A. County Code, Title 22, Ch. 22.174), the Significant Ecological Areas (SEAs) (L.A. County Code, Title 22, Ch. 102), and Sensitive Environmental Resource Areas (SERAs) (L.A. County Code, Title 22, Ch. 22.44)?	☐	☐	☐	☒

The Project site is not located in area covered by local policies or ordinances protecting biological resources. The Project site is also not in a Significant Ecological Area (SEA).[4] The Project site is also not located within a Wildflower Reserve Area[5] or a Sensitive Environmental Resource Area.[6] The Project site contains three oak trees, two of which are afforded protection under the Los Angeles County Oak Tree Ordinance. In compliance with the County's Oak Tree Ordinance, the Project would require an Oak Tree Permit (OTP No. 200700007) to remove these oak trees. However, the Project site is not considered an oak woodland and does not otherwise contain communities of other unique native trees. As such, the Project would not conflict with local policies or ordinances protecting biological resources and there would be no impact.

g) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved state, regional, or local habitat conservation plan?	☐	☐	☐	☒

The Project site is not located within an area covered by any adopted Habitat Conservation Plans, Natural Community Conservation Plans, or any other approved local, regional, or state habitat conservation plans. As such, implementation of the Project would not conflict with any provisions related to such plans.

4 Santa Clarita Valley Area Plan, 2012, Appendix II: Maps, Figure CO-5: Significant Ecological Areas, http://planning.lacounty.gov/assets/upl/project/ovov_2012-ch_a2.pdf.

5 Los Angeles County Code of Ordinances Title 12, Chapter 12.36, http://lacounty-ca.elaws.us/code/coor_title12_ch12.36_sec12.36.020.

6 Los Angeles County GIS Data Portal, Sensitive Environmental Resource Areas (SERA), https://egis3.lacounty.gov/dataportal/2015/08/06/sensitive-environmental-resource-areas-sera.

5. CULTURAL RESOURCES

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource pursuant to CEQA Guidelines § 15064.5?	☐	☐	☒	☐

A Final Cultural Resources Inventory (Inventory) for the Project was conducted by Dudek in August 2018. The report notes no cultural resources have been recorded within the Project site and only three are located within a one-mile search buffer of the Project site. Since there are no known historical resources on the site, the Project would not impact any known historical resources and impacts would be less than significant.

b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to CEQA Guidelines § 15064.5?	☐	☐	☒	☐

Four archaeological sites (SR-S-01, SR-S-02, SR-S-03, and SR-S-04) and one built environment resource (SR-S-05) were identified and recorded within the Project area during an archeological survey for the Project. The archaeological sites include one slab foundation (SR-S-01), one decomposing asphalt road (SR-S-02), and two historic refuse deposits (SR-S-03 and -04). SR-S-01 has been recommended not eligible for the National Register of Historic Places (NRHP) or the California Register (CR). SR-S-02, SR-S-03, and SR-S-04 were identified in the southern section of the Project area. This area will be preserved and placed in a conservation easement as a component of this Project and therefore these resources would not be impacted by the Project. The built environment resource (SR-S-05) is a single-family, one-story vernacular building built in 1936. This resource was evaluated in a Historic Resource Assessment (HRA) prepared in July 2018 and was determined to be not eligible for listing on either the NRHP or the CR.

Further, any potential impacts associated with the Project would be reduced to a level of less than significant through adherence to State Health and Safety Code Section 7050.5 and other relevant regulatory requirements.

c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☒	☐	☐	☐

The Final Cultural Resources Inventory notes ground disturbance would occur in areas of high paleontological sensitivity, and adverse effects to paleontological resources could occur if significant resources were uncovered during ground disturbance and subsequently destroyed. Further analysis of grading impacts to paleontological resources is required.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
d) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☒	☐

See 5(b) above. Although no known burial areas are located near the Project site, any potential impacts associated with the Project would be reduced to a level of less than significant through adherence to State Health and Safety Code Section 7050.5 and all relevant regulatory requirements.

6. ENERGY

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☒	☐

The proposed homes and commercial center would be designed in compliance with the County Green Building Ordinance and the County of Los Angeles Green Building Standards. Further, the Project would be developed in compliance with all state and local regulations related to energy conservation. As such, less than significant impacts would occur.

b) Conflict with or obstruct a state or local plan for renewal energy or energy efficiency?	☐	☐	☒	☐

The Project would involve the construction of standard residential and commercial buildings and would be designed in compliance with the County Green Building Ordinance and the County of Los Angeles Green Building Standards. Compliance with these standards would ensure impacts would remain less than significant.

7. GEOLOGY AND SOILS

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known active fault trace? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒

The Project site is not located within a mapped Alquist-Priolo Earthquake fault zone. The Holser Fault is directly south of the Project site, but this fault is not identified on the Alquist-Priolo Earthquake Fault Map. No additional analysis of potential impacts related to this topic is required.

ii) Strong seismic ground shaking?	☒	☐	☐	☐

The Project area is located in a seismically active area and the potentially active Holser Fault is directly south of the Project site and could generate a maximum estimated earthquake magnitude of 6.5. Other faults near the Project site include the Del Valle Fault, the San Gabriel Fault Zone, the Santa Felicia Fault, and the San Andreas Fault. There is the potential for strong seismic ground shaking to occur due to the proximity of the Project site to several faults.

iii) Seismic-related ground failure, including liquefaction and lateral spreading?	☒	☐	☐	☐

As indicated on the State of California Seismic Hazards Zones for the Val Verde Quadrangle, the Project site is located in an area mapped as being potentially susceptible to liquefaction. Liquefaction areas have been mapped through the Project site. For this reason, further evaluation of this topic is required.

iv) Landslides?	☒	☐	☐	☐

As indicated on the State of California Seismic Hazards Zones for the Val Verde Quadrangle, the Project site is within an area where earthquake-induced landslides have been previously identified. Landslide areas have been mapped along the borders of the Project site. Based on this information, further evaluation of potential impacts related to landslides is required.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
b) Result in substantial soil erosion or the loss of topsoil?	☒	☐	☐	☐

Grading would occur on the 113.9-acre portion of the Project site where development is proposed. This grading would involve the cut of approximately 1.5 million cubic yards and 1.5 million cubic yards of fill. No earth materials would be exported from the site. Development of the Project would involve grading of slopes greater than 25 percent. Given the amount of grading proposed, further evaluation of potential impacts related to grading is warranted.

c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☒	☐	☐	☐

See **7(a)(iv)**, above. Further evaluation of the potential impacts is required.

d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial direct or indirect risks to life or property?	☒	☐	☐	☐

According to the results of the Geotechnical Report, Preliminary Infiltration Testing, prepared on November 6, 2017, some soil samples contain small percentages of clay which can typically result in expansion. For this reason, further evaluation of this topic is required. Source: Allan E. Seward, Geotechnical Report Results of Preliminary Infiltration Testing, November 6, 2017.

e) Have soils incapable of adequately supporting the use of on-site wastewater treatment systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

Septic tanks are not proposed as part of the Project.

f) Conflict with the Hillside Management Area Ordinance (L.A. County Code, Title 22, Ch. 22.104)?	☐	☐	☒	☐

The Project would involve grading of slopes greater than 25 percent with surrounding significant ridgelines,[7] and would therefore need to adhere to the requirements of the Hillside Management Regulations/Guidelines. The Hillside Design Guidelines are intended to implement policies by ensuring that hillside development projects use sensitive and creative engineering, architectural, and landscaping site design techniques. The

7 Santa Clarita Valley Area Plan, 2012, Appendix II: Maps, Figure CO-1: Hillsides and Designated Ridgelines, http://planning.lacounty.gov/assets/upl/project/ovov_2012-ch_a2.pdf.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*

Guidelines also help ensure that hillside development projects are designed in a manner that allows a project to meet the findings of the Hillside Management Areas Ordinance. The Guidelines are divided into five major design categories (site planning, grading and facilities, road circulation, building design, and landscaping) containing a variety of sensitive hillside design measures. In order to comply with the ordinance, all projects must use the design measures contained in the Guidelines that reasonably can be implement into a project's design. The Project would be required to incorporate these design measures, and impacts would be considered less than significant.

8. GREENHOUSE GAS EMISSIONS

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Generate greenhouse gas (GHGs) emissions, either directly or indirectly, that may have a significant impact on the environment?	☒	☐	☐	☐

The Project would result in short-term emissions of greenhouse gas (GHG) emissions during construction. These emissions would generally be associated with the operation of construction equipment and the disposal of construction waste and demolition debris. GHG emissions would also result from operation of the Project, such as mobile vehicles traveling to and from the site, as well as electricity, natural gas, water, landscape equipment, and generation of solid waste and wastewater. Any potential impacts associated with the Project would be reduced to a level of less than significant through the implementation of mitigation and/or adherence to regulatory requirements.

b) Conflict with any applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☒	☐	☐	☐

Because the Project would have the potential to emit GHG emissions, the Project would have the potential to conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases, e.g., Assembly Bill 32, the State's 2013 Green Building Standards Code, or the County's General Plan. However, based on the Project's design, the Project would not conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of greenhouse gases.

9. HAZARDS AND HAZARDOUS MATERIALS

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, storage, production, use, or disposal of hazardous materials?	☐	☐	☒	☐

The Project site is currently and has historically been mostly undeveloped other than one single-family home. During construction, potentially hazardous substances used to maintain and operate construction equipment such as fuels, lubricants, and solvents would be present on the Project site. Occupancy and use of the proposed homes and commercial center would involve the storage and use of small amounts of potentially hazardous materials, such as cleaning supplies, fertilizers, and pesticides needed to maintain the facilities and houses. Typical household waste would be produced by the Project, but it would not pose a risk or significant impact, provided it is disposed of properly and in accordance with the applicable regulations. The existing home on the site would be demolished and removed, which potentially could include hazardous materials such as lead or asbestos. However, the transport, use, storage, and disposal of hazardous materials, such as lead and asbestos, during construction and operation of the Project would be conducted in accordance with all applicable state and federal and state laws, such as the Hazardous Materials Transportation Act, Resource Conservation and Recovery Act, the California Hazardous Material Management Act, and the California Code of Regulations, Title 22. Impacts from the routine transport, storage, production, use, or disposal of hazardous materials would be less than significant.

b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials or waste into the environment?	☐	☐	☒	☐

As mentioned above, during construction of the Project, potentially hazardous substances used to maintain and operate construction equipment, such as fuels, lubricants, and solvents, would be present on the Project site. Operation of the Project would involve storage of potentially hazardous materials such as cleaning supplies, fertilizers, and pesticides needed to maintain the facilities and houses. Typical household waste would be produced by the Project, but it would not pose a risk or significant impact, provided it is disposed of properly and in accordance with the applicable regulations. The existing home on the site would be demolished and removed, which potentially could include hazardous materials such as lead or asbestos. The transport, use, storage, and disposal of hazardous materials during construction and operation of the Project would be conducted in accordance with all applicable state and federal and state laws, such as the Hazardous Materials Transportation Act, Resource Conservation and Recovery Act, the California Hazardous Material Management Act, and the California Code of Regulations, Title 22. Impacts involving a release of hazardous material or waste into the environment would be less than significant.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of sensitive land uses?	☐	☐	☒	☐

The Project site is located approximately 285 feet north of Macedonia Church of God, which is considered a sensitive use. However, the Project would involve residential and some commercial uses, which would not create hazardous emissions. Additionally, the Project would balance the cut and fill on the site; therefore, there would be significantly fewer trucks during construction. The Project would comply with all applicable state and federal and state laws, such as the Hazardous Materials Transportation Act, Resource Conservation and Recovery Act, the California Hazardous Material Management Act, and the California Code of Regulations, Title 22. Impacts would be less than significant.

d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code § 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☒	☐

The Project site is currently and has historically been undeveloped except for the one single-family home and hiking trails. A site within 1 mile of the Project site is listed on EnviroStor for a School Investigation for Hasley Canyon School Site. There are two sites listed on GeoTracker within approximately 1 mile of the Project site. The first site is a UNOCAL Cleanup Program Site, which is an open but inactive since January 1965, located at the northern end of the Project site. The second site is a Former SADD Lease North and South Pads Cleanup Program Site, which is now closed and located approximately 3,300 feet north of the Project site. Since there are no hazardous materials sites located on the Project site, impacts would be less than significant.

e) For a project located within an airport land use plan, or where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒

The Project site is not within an airport land use plan, within 2 miles of a public or private use airport, or within the vicinity of a private airstrip, which could create a safety hazard for people residing or working in the Project area. In addition, the Project does not propose construction of any structure equal to or greater than 150 feet in height, constituting a safety hazard to aircraft and/or operations from an airport. No impact would occur.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
f) Substantially impair implementation of, or physically interfere with, an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐

Interstate 5 located east of the site, and State Route 126 west of the Project site, are both Primary Disaster Routes. There are no other evacuation routes located near the Project site. During construction and infrastructure improvements, temporary road closure/blockage/detour may be necessary, however, closure of the Primary Disaster Routes would not occur, and therefore impacts to existing emergency routes would be less than significant.

g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving fires, because the project is located:				
i) within a high fire hazard area with inadequate access?	☒	☐	☐	☐

The Project site is located in a very high fire hazard severity zone. A fire technical report will be prepared for the and the Los Angeles County Fire Department would be required to review the proposed Project and the report. Further evaluation of the fire hazard area is required.

ii) within an area with inadequate water and pressure to meet fire flow standards?	☒	☐	☐	☐

Water is provided to the Val Verde area from LA County Waterworks District #36, which is a purveyor under the Castaic Lake Water Agency. There are no known water supply or pressure problems in the area. Fire flow requirements for the Project would be determined by the Fire Department. Further analysis of water supply and fire flow standards is required.

iii) within proximity to land uses that have the potential for dangerous fire hazard?	☒	☐	☐	☐

As stated above, the Project site is located in a very high fire hazard severity zone. A fire technical report will be prepared for the Project and the Los Angeles County Fire Department would be required to review the Project and the report.

h) Does the proposed use constitute a potentially dangerous fire hazard?	☒	☐	☐	☐

See **9(g)(i)** through **(iii)**, above. Further evaluation is required.

10. HYDROLOGY AND WATER QUALITY

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☒	☐

Per State regulations, the applicant would be required to prepare a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP would require the use of BMPs (such as gravel bags, silt fences, hay bales, check dams, hydro seed, mulch, and soil binders) during construction, which would prevent excessive storm water runoff pollution. The SWPPP must be approved by the County prior to the issuance of a grading or building permit.

The Project would be required to comply with the County's MS4 permit, which requires the amount of runoff from the site to be the same before and after construction of a project. The Project also includes improvements to stormwater runoff, such as incorporating six infiltration basins throughout the Project site. Because the Project would be required to include site drainage systems according to standards and provisions set forth by the County, impacts related to water quality would be less than significant.

b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☒	☐	☐	☐

Water is provided to the Val Verde area from Valencia Water Company, which is a purveyor under the Castaic Lake Water Agency. Local groundwater is a source of supply to the purveyors under Castaic Lake Water Agency. The Project would develop 222 single-family units and approximately 21,000 square feet of commercial uses, which would increase demand for water. Further analysis is required to determine whether the Project would cause a significant impact.

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river or through the addition of impervious surfaces, in a manner which would:				
(i) Result in substantial erosion or siltation on- or off-site?	☒	☐	☐	☐

The site currently does not contain any stream or river; however, it does contain ephemeral drainages. Site drainage would be modified substantially by grading, paving, new building construction, and related improvements.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
(ii) Substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☒	☐	☐	☐

The Project site currently does not contain any stream or river; however, it does contain ephemeral drainages. As the Project would substantially alter the existing drainage on the Project site, further review is required.

(iii) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☒	☐

The Project would be required to comply with the County's MS4 permit, which requires the amount of runoff from the site to be the same before and after construction of a project. The Project also includes improvements to stormwater runoff, such as incorporating six infiltration basins throughout the Project site. Because the Project would be required to include site drainage systems according to standards and provisions set forth by the County, impacts related to water quality would be less than significant.

(iv) Impede or redirect flood flows?	☒	☐	☐	☐

Site drainage would be substantially modified by grading, paving, new building construction, and related improvements. Additionally, the site is in Flood Zone D, which is defined as areas in which flood hazards are undetermined, but possible. Further analysis of flood flows is required.

d) Conflict with the Los Angeles County Low Impact Development Ordinance (L.A. County Code, Title 12, Ch. 12.84)?	☒	☐	☐	☐

LID requirements would apply to the Project. The Project's consistency with the LID ordinance requires further analysis.

e) Use on-site wastewater treatment systems in areas with known geological limitations (e.g. high groundwater) or in close proximity to surface water (including, but not limited to, streams, lakes, and drainage course)?	☐	☐	☐	☒

No on-site wastewater treatment systems exist on the Project site and none are proposed. No further analysis is required.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
f) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☒	☐	☐	☐

The Project site is not within a coastal area. Therefore, tsunamis (seismic sea waves) are not considered a significant hazard at the site. In addition, the Project site is not located downslope of any large bodies of water that could adversely affect the site in the event of earthquake-induced seiches, which are wave oscillations in an enclosed or semi-enclosed body of water. According to Federal Emergency Management Agency (FEMA) Map number 06037C0800F, the Project site is not located in a known flood zone. However, as the site is in Zone D, which is defined as areas in which flood hazards are undetermined, but possible, further analysis of potential flooding is required.

g) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☒	☐	☐	☐

As previously mentioned, the water needed for the Project would come, in part, from groundwater, so further analysis, including analysis of the consistency of the Project with the Santa Clarita Valley Sustainable Groundwater Management Act, is required.

11. LAND USE AND PLANNING

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Physically divide an established community?	☐	☐	☒	☐

Val Verde is located in unincorporated Los Angeles County, and is developed primarily with single-family homes in a rural setting, surrounded by chaparral-covered hillsides and scattered canyon oaks. The Project would develop 222 single-family homes and 21,000 square feet of commercial uses along the edge of the existing Val Verde community. The Project would not create physically divide or create any barriers dividing the existing Val Verde community.

Land Use Policy LU-1.2.9 provides: In Val Verde, protect the existing rural lifestyle and small-town community character while providing residents with additional access to needed services; ensure compatibility between existing residential areas and the nearby landfill; and maintain community character in accordance with the County's Castaic Area Community Standards District; and Land Use Policy LU-4.3.2: Promote business development in Castaic and Val Verde to provide a greater range of goods and services to area residents.[8]

The Project would develop residential lots, all of which would be greater than 7,000 square feet and most of which would be greater than 10,000 square feet, to ensure that the Project would be consistent with the existing rural lifestyle and community character. Additionally, the Project would involve the development of 21,000 square feet of commercial uses to the provide the community with additional commercial uses to meet day-to-day needs within the community. Impacts would be less than significant.

b) Cause a significant environmental impact due to a conflict with any County land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐

The Project is consistent with the zoning and land use designation for the Project site. The Santa Clarita Valley Area Plan (SCVAP), which was approved by the County in 2012, designates the vast majority of the Project site as H2 (Urban, 2 DU/Acre) with two smaller areas in the southeast portion of Project site designated as CG (General Commercial) and H5 (Urban 5 DU/Acre). The zoning for most of the Project site is R1 (Single Family Residential) with a small portion in the southeast portion of the Project site designated C2 (Commercial). The Project would provide 222 detached single-family residential lots on 57.9 acres, 21,000 square feet of commercial uses with 71 parking spaces on 2.5 acres, a community park on 3.4 acres, five open spaces lots on 21.0 acres, three infiltration basins and six debris basins on 8.8 acres, a pump station on 0.1 acres, and streets for the community on 19.6 acres. The SCVAP would allow 239.9 single-family residential units. The Project would provide fewer dwelling units than allowed under the SCVAP.

The Project would be consistent with the Santa Clarita Valley Area Plan, One Valley One Vision (OVOV), 2012. The proposed uses are allowed under the existing land use designations. These designations have been

8 Santa Clarita Valley Area Plan, 2012, Land Use Element, http://planning.lacounty.gov/assets/upl/project/ovov_2012-ch-02-landuse.pdf.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*

adopted to maintain the environmental quality and resources in Val Verde, and no land use designation changes are proposed by the Project. Impacts would be less than significant.

Further, the Project would be compatible with and enhance community character. The Project has been designed to preserve the highest points within the Project site and to minimize impacts on the steeper slopes (greater than 50%) on the Project site. The Project would avoid approximately 28.9 % of the 27.0 acres with slopes of greater than 50% and approximately 14.8 % of the 25.6 acres with slopes between 25 and 49.99%. The Project would locate the vast majority (over 75 %) of development on the portions of the Project site with slopes less than 50%.

The Project would meet or exceed all requirements of the Castaic Area Community Standards District, including providing lots with a minimum of 7,000 square feet and with an overall lot average of 10,000 square feet. The CSD also requires the provision of 25% of the Project site as open space. The Project would provide 33.9 acres of open area with 12.7 acres preserved as natural open space, focused on the steep slopes in the northwest and southeast portions of the Project site. Accordingly, the Project would provide 29.8 % of the Project site as open space. Further, the Project would preserve in perpetuity a 37.9-acre undeveloped parcel in a Hillside Management Area just south of VTTM No. 60257. Accordingly, the Project would preserve 50.6 acres of natural open space. With the preservation of this parcel, the Project would provide 90.6 acres of open space or 59.7 % of the total 151.8 acres covered by the Project.

c) Conflict with the goals and policies of the General Plan related to Hillside Management Areas or Significant Ecological Areas?	☐	☐	☒	☐

The Project would involve grading of slopes greater than 25 percent with surrounding significant ridgelines,[9] and is required to conform to the requirements of the Hillside Management Regulations/Guidelines. The Hillside Design Guidelines are intended to implement policies by ensuring that hillside development projects use sensitive and creative engineering, architectural, and landscaping site design techniques. The Guidelines also help ensure that hillside development projects are designed in a manner that allows a project to meet the findings of the Hillside Management Areas Ordinance. The Guidelines are divided into five major design categories (site planning, grading and facilities, road circulation, building design, and landscaping) containing a variety of sensitive hillside design measures. In order to comply with the ordinance, all projects must use the design measure contained in the Guidelines that reasonably can be implement into a project's design. The Project conforms with the Hillside Management Regulations/Guidelines and incorporate these design measures.

To the greatest extent feasible, the Project would preserve the physical integrity of the HMAs on the Project site. Of the 113.9-acre project site, 52.6 acres are designated as Hillside Management Areas. The Project site contains slopes of greater than 50% on 27.0 acres, slopes of 25% to 49.99% on 25.6 acres, slopes of less than 25% on 57.3 acres, and a portion of Del Valle Road, an excluded public street on 4.0 acres. Accordingly, approximately 25% of the Project site contains slopes greater than 50%. The Project would preserve 12.7 acres of the 52.6 acres of the Project site designated Hillside Management Area and has been designed to minimize impacts on the steeper slopes (greater than 50%) on the Project site. The Project would avoid approximately 28.9 % of the 27.0 acres with slopes of greater than 50% and approximately 14.8 % of the 25.6

9 Santa Clarita Valley Area Plan, 2012, Appendix II: Maps, Figure CO-1: Hillsides and Designated Ridgelines, http://planning.lacounty.gov/assets/upl/project/ovov_2012-ch_a2.pdf.

acres with slopes between 25 and 49.99%. The Project would locate the vast majority (over 75 %) of development on the portions of the Project site with slopes less than 50%. The Project would provide 33.9 acres of open space area which includes 12.7 acres preserved as natural open space, focused on the steep slopes in the northwest and southeast portions of the Project site. Further, the Project would preserve in perpetuity a 37.9-acre undeveloped parcel in a Hillside Management Area just south of VTTM No. 60257. Accordingly, the Project would preserve 50.6 acres of natural open space.

The Project also would incorporate sensitive hillside design techniques, including contour grading, retention of natural vegetation and undulating slopes.

The Project has been designed to preserve the highest points within the Project site. Most of the grading would be conducted in areas containing slopes of less than 50%. Small areas containing slopes greater than 50% in the northeast area of the Project site would be graded to balance the dirt of the Project site and accommodate required debris and infiltration basins.

These smaller slopes have minimal scenic value. The slopes having maximum scenic value, particularly the highest points within the Project site, would be retained as part of the Project. The Project site does not contain primary or secondary ridgelines. As indicated in the submitted view study, the Project would maintain off-site scenic views and would not impact scenic views of the major ridgelines and slopes surrounding the Project site. As stated above, the Project would be in substantial compliance with the Hillside Design Guidelines as the Project would comply with most of the items on the checklist for the Hillside Design Guidelines. As such, impacts in this regard would be considered less than significant.

Further, as the Project is not located within a Significant Ecological Area[10], there would be no impact to Significant Ecological Areas.

10 Santa Clarita Valley Area Plan, 2012, Appendix II: Maps, Figure CO-5: Significant Ecological Areas, http://planning.lacounty.gov/assets/upl/project/ovov_2012-ch_a2.pdf.

12. MINERAL RESOURCES

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒

According to the Santa Clarita Valley Area Plan Mineral Resource Map, the Project site is not located within a Mineral Resource Zone. There would be no loss of a known mineral resource and therefore no impacts would occur.

b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

As noted in response 12a above, the Santa Clarita Valley Area Plan Mineral Resource Map, has not designated the Project site as a Mineral Resource Zone. Therefore, no impacts would occur.

13. NOISE

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project result in:				
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the County General Plan or noise ordinance (Los Angeles County Code, Title 12, Chapter 12.08), or applicable standards of other agencies?	☒	☐	☐	☐

Noise from construction activity would occur, including haul route trucks arriving, loading graded materials, and departing, although these would be temporary impacts. There also would be unavoidable noise from construction equipment and construction-related activities. There also would be some noise generated by the residents of the Project site when it is occupied, including traffic related noise. Further analysis is required.

b) Generation of excessive groundborne vibration or groundborne noise levels?	☒	☐	☐	☐

Groundborne vibration or related noise could potentially occur as a result of grading and construction activities, and the hauling of graded materials by truck off-site. Further analysis of groundborne vibration or noise levels is required.

c) For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

The Project site is not located within 2 miles of a private airstrip. The closest airport to the Project site is the Whiteman Airport located in the San Fernando Valley approximately 20 miles south of the Project site. No impacts would occur.

14. POPULATION AND HOUSING

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒	☐

The Project would be located within the Santa Clarita Valley, which had an estimated population of 210,888 person in 2017. The average household size for the area is 3.06 persons per household based on data estimates from 2013 to 2017.[11] The Project would include the development of 222 single-family homes. Based on the average persons per household, the Project would add approximately 680 persons to the area. The area is forecast to have 262,200 persons by year 2040.[12] Based on these estimates, the Project would represent approximately 1.33% of the estimated increase by 2040, which is considered minimal and consistent with SCAG projections.

The Project also would develop 21,000 square feet of commercial uses, which could add approximately 9 employees to the area.[13] These employees likely would be residents of the area and would not contribute overall to the population increase. However, this increase in employment would contribute to expected employment increases for the area. In 2012, the number of jobs in the area was 73,500, and the 2040 estimated employment for the area is 95,900 jobs.[14] This increase would be consistent with SCAG projections and would represent approximately 0.04% of the overall increase in employment.

Additionally, roadway and infrastructure improvements would connect into existing roadways and infrastructure and would extend to the Project site only, which would not allow for substantial growth beyond the Project. Since the Project is consistent with population projections and wouldn't result in unplanned population growth, impacts would be considered less than significant.

b) Displace substantial numbers of existing people or housing, especially affordable housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☒	☐

The Project would demolish one existing single-family home and would include the development of 222 single-family homes and 21,000 square feet of commercial uses. The Project would result in a net increase in housing and would not displace substantial numbers of existing housing as the Project would displace one single-family home. Impacts would be considered less than significant.

11 United States Census Bureau, Quick Facts, Santa Clarita City, https://www.census.gov/quickfacts/fact/table/santaclaritacitycalifornia/HSD310217#HSD310217.

12 Southern California Association of Governments (SCAG), Demographics and Growth Forecast, Final Adopted April 2016.

13 Employment Density Study Summary Report, October 31, 2001, https://www.mwcog.org/file.aspx?A=QTTlTR24POOOUIw5mPNzK8F4d8djdJe4LF9Exj6lXOU%3D.

14 Southern California Association of Governments (SCAG), Demographics and Growth Forecast, Final Adopted April 2016.

15. PUBLIC SERVICES

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Would the project create capacity or service level problems, or result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:				
i. Fire protection?	☒	☐	☐	☐

Fire protection services for the Project site and surrounding are provided by the Los Angeles County Fire Department. The nearest fire station to the Project site is County Fire Station No. 143, located approximately 0.9 miles east of the Project site. As previously mentioned, the Project would add 680 residents to the area designated as a Very High Fire Hazard Zone and the Project would require fire protection. Further analysis of available fire protection in the area is required.

ii. Sheriff protection?	☒	☐	☐	☐

Sheriff protection services for the Project site and surrounding area are provided by the Los Angeles County Sheriff's Department (LACSD) through the Santa Clarita Station, which operates out of its sheriff facility at 23740 Magic Mountain Parkway, approximately 6 miles southeast of the Project site. The Project would add 680 residents to the area and would require sheriff protection. Further analysis of available sheriff protection is required.

iii. Schools?	☐	☐	☒	☐

The Project would be part of the Castaic Union School District, which has a total of three elementary schools (Live Oak Elementary, Castaic Elementary and Northlake Hills Elementary), one middle school (Castaic Middle), and one high school (Castaic High). Total enrollment for elementary schools is 1,497, total middle school enrollment is 539, and current high school enrollment is 0 since the school is opening August 2019.

Castaic Union School District has student generation rates for K-6 and 7-8, which are 0.329 and 0.141 students per residential housing unit, respectively.[15] There is no high school student generation rate since the high school has not yet opened, however, assuming an overall average of 0.47 students per residential housing unit, the Project would generate approximately 105 students for all grade levels.

This increase in students would represent a small percentage of the total existing enrollment of the schools. Additionally, the Project would be required to pay developer school fees, which would ensure impacts to schools from the Project would remain less than significant. Impacts would be less than significant.

15 Castaic Union School District, Thursday, August 11, 2016 Agenda, Student Generation Rates Table.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
iv. Parks?	☒	☐	☐	☐

The Project would introduce a 3.4-acre passive park, a 0.2-acre passive pocket park, and two trails, however, it also would add approximately 680 new residents to the area, which would potentially result in increased usage of existing parks. Further analysis of availability of parks is required.

v. Libraries?	☐	☐	☒	☐

Library services would be provided by the closest libraries to the site, which would be the Castaic Library, the Stevenson Ranch Library and the Santa Clarita Library. The nearest library is the Castaic Library, located at 27971 Sloan Canyon Road in Castaic, approximately 3.25 miles northeast of the Project site. The Project would increase the population by approximately 680 people, however, increased demand to library services would be nominal. According to Los Angeles County Code, the applicant would be responsible for paying all impact fees associated with the Project, such as a library facilities mitigation fee, which in part is intended to ensure adequate funding is available for personnel, materials and equipment needed to provide proper service. However, because increased demand for library facilities from the Project would be nominal, additional library facilities would not be needed. Impacts would be less than significant.

v. Other public facilities?	☒	☐	☐	☐

Impacts to other public facilities (e.g., sewer, storm drains, and roadways) are discussed in Section 17, Transportation/Traffic, and Section 19, Utilities and Public Services, of this Initial Study. As discussed in these sections, impacts to these other facilities need to be further analyzed.

16. RECREATION

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐

The Project would add approximately 680 new residents to the area, however, it also would introduce a 3.4-acre passive park, a 0.2-acre passive pocket park, and two trails that would meet the residents' needs for neighborhood parks. Regional parks may have increased usage; however, the usage would not be considered substantial and would not cause physical deterioration. Impacts would be considered less than significant.

b) Does the project include neighborhood and regional parks or other recreational facilities or require the construction or expansion of such facilities which might have an adverse physical effect on the environment?	☒	☐	☐	☐

In addition to the 3.4-acre passive park and 0.2-acre passive pock park, the Project would include the construction of two additional trails. The Sterling Horn Memorial Trail would be a private trail, ten-feet in width along the southern portion of the Project site. This trail would connect with the County's Del Valle Trail outside the Project site as identified in the County's Regional Trail Plan. The Project also would dedicate a twenty-foot wide, multiuse trail easement to the County for the Del Valle Trail, located off-site on a third party's parcel. The off-site trial would be a variable width (five-foot to eight-foot-wide), natural soil surface trail within a twenty-foot dedication. An easement for the off-site grading from the adjacent owner has been obtained for this work, including the agreement to dedicate easements to the County upon request.

Potential impacts related to the construction of these facilities will be analyzed in the EIR.

c) Would the project interfere with regional open space connectivity?	☐	☐	☒	☐

As mentioned in 16(b) above, the Project would construct two trails that would allow for better access to existing County trails. Additionally, the location of the Project site would continue to allow for open space connectivity just north of the Project site, on either side of Del Valle Road. Impacts to regional open space connectivity would be considered less than significant.

17. TRANSPORTATION

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Conflict with a program plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☒	☐	☐	☐

The Project would result in increased traffic and an increase in need for public transportation. The Project's consistency with applicable plans, ordinances, and other policies requires further analysis.

b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☒	☐	☐	☐

While this Checklist Question in Appendix G of the CEQA Guidelines has been modified by the Natural Resources Agency to address consistency with CEQA Guidelines section 15064.3, subdivision (b), which relates to use of the vehicle miles travelled (VMT) as the methodology for evaluating traffic impacts, the County has not yet adopted a VMT methodology to address this updated Checklist Question as the effective date for Section 15064.3 is July 1, 2020. For this reason, the transportation impacts of the Project will be assessed under the County's current guidelines, which require, among other things, use of LOS to evaluate traffic impacts of a Project. At this time, it has not been determined if the Project would result in any significant impacts or changes related to existing levels of service and further analysis is warranted.

c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☒	☐	☐	☐

The Project would add additional streets and would slightly alter the existing roadway along Del Valle Road. The increase in potential hazards from these additions and changes needs to be further analyzed.

d) Result in inadequate emergency access?	☐	☐	☒	☐

The Project would include the construction of three access strip lots: one at Trevylon Street (20' emergency access); one at Rainbow Drive (20' emergency access); and one at Lexington Drive (26' project access) on 0.2 acres. The installation of these roadways would connect into existing roadways and would provide sufficient access for emergency vehicles. Additionally, the County of Los Angeles Fire Department Fire Prevention Division, has reviewed the Project and has provided a list of conditions the Project must meet to provide adequate emergency access. With adherence to these conditions, impacts would be less than significant.

18. TRIBAL CULTURAL RESOURCES

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code §21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code § 5020.1(k), or	☐	☐	☒	☐

As noted in Section 5(a) above, a Final Cultural Resources Inventory for the Project was conducted by Dudek in August 2018. The report notes no cultural resources have been recorded within the Project area and only three cultural resources are located within a one-mile search buffer. Since there are no known historical resources on the site, the Project would not impact any known historical resources. Further, the Project would comply with the State Health and Safety Code Section 7050.5 and other regulations further reducing the likelihood of impacts to historic resources. Impacts would be less than significant.

ii) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code § 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code § 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☒	☐	☐	☐

Public Resources Code Section 21080.3.1 establishes a formal process for Lead Agencies to consult with California Native American Tribes to identify potentially significant impacts to Tribal Cultural Resources, as defined in Public Resources Code Section 21074. Letters were sent to each representative of eleven Native American groups and individuals who may have knowledge of cultural resources in the Project area on October 23, 2017. This coordination was conducted for informational purposes only and does not constitute formal government-to-government consultation. To date, no responses have been received.

The Project Applicant is required to comply with existing regulations, including California Public Resources Code Section 21083.2, that specifies a protocol if archaeological resources are discovered during excavation, grading, or construction activities. As the Project would develop and historically undeveloped site, impacts to buried Tribal Cultural Resources could be potentially significant. Further analysis is required.

19. UTILITIES AND SERVICE SYSTEMS

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
Would the project:				
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, storm water draining, electric power, natural gas, or telecommunication facilities, the construction or relocation of which could cause significant environmental effects?	☒	☐	☐	☐

The Project would add residents and commercial uses to the area which would result in increased usage of utilities and service systems. The Project also would create an increase in the impervious area of the site and would alter the drainage patterns due to grading. Further evaluation of the potential impacts from increased usage of water, electricity, natural gas, and telecommunications as well as the increased generation of wastewater and storm water is required.

b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☒	☐	☐	☐

As previously mentioned, the Project would add residents and commercial uses to the area, which would increase water demand. Further analysis of water demand is required.

c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☒	☐	☐	☐

The Project would be connected to a public sewer system. The Project would add residents and commercial uses to the area, which would result in increased wastewater generation. Further evaluation of wastewater treatment is required.

d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☒	☐	☐	☐

The Project would add residents and commercial uses to the area, which would result in an increase in solid waste. Further evaluation of the Project's solid waste generation is required.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☒	☐	☐	☐

As mentioned above, the Project's solid waste generation requires further evaluation, and, therefore, compliance with regulations related to solid waste also requires further evaluation.

20. WILDFIRE

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, Would the project:				
a) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☒	☐	☐	☐

The Project site is located in a Very High Fire Hazard Severity Zone (Fire Zone 4). For this reason, further evaluation of potential impacts from fire events is needed to determine the significance of any potential impacts.

b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☒	☐	☐	☐

The Project site is surrounded by ridgelines and slopes, which may have the potential to contribute to exacerbating wildfire risks. Further evaluation of potential impacts from fire events is needed to determine the significance of any potential impacts.

c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☒	☐

The Project involves the construction of a one-million-gallon water tank, located on approximately 1.4 acres of disturbed land, approximately 2.2 miles westerly from the project site, and in the vicinity of the existing Cuyama water tank site. The Project would also include the construction of three access strip lots: one at Trevylon Street (20' emergency access); one at Rainbow Drive (20' emergency access); and one at Lexington Drive (26' project access) on 0.2 acres. The installation of the water tank and would supplement available water sources for the Project, and the roadways would connect into existing roadways and would not cause a significant impact to the environment due to their size and location. Impacts would be less than significant.

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☒	☐	☐	☐

As previously mentioned, landslide areas have been mapped along the borders of the Project site. Additionally, the Project site is located within a Very High Fire Hazard Severity Zone (Fire Zone 4). Potential impacts due to fire related flooding impacts requires further evaluation to determine the significance of any potential impacts.

21. MANDATORY FINDINGS OF SIGNIFICANCE

	Potentially Significant Impact	*Less Than Significant Impact with Mitigation Incorporated*	*Less Than Significant Impact*	*No Impact*
a) Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐

As mentioned above, the Project would further review biological resources in the EIR. Additionally, although there are no streams on the Project site, the Project is near the Santa Clara River. The Project may have an effect on fish and wildlife habitat and further evaluation is required to determine if any significant impacts would result from the Project.

b) Does the project have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals?	☒	☐	☐	☐

As mentioned in the analysis above, further evaluation is required to state the level of significance for several impacts. In order to discuss short-term versus long-term environmental goals, further evaluation is required.

c) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐

As mentioned in the analysis above, further evaluation is required to state the level of significance for several impacts. In order to discuss cumulatively considerable impacts, further evaluation is required.

d) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐

As mentioned in the analysis above, further evaluation is required to state the level of significance for several impacts. In order to discuss substantial adverse effects on human beings, further evaluation is required.

APPENDIX A.3

Agency and Public Comment Letters

DEPARTMENT OF TRANSPORTATION
DISTRICT 7 – Office of Regional Planning
100 S. MAIN STREET, MS 16
LOS ANGELES, CA 90012
PHONE (213) 897-0475
FAX (213) 897-1337
TTY 711
www.dot.ca.gov

Making Conservation a California Way of Life.

September 5, 2019

Mr. Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

RE: Sterling Ranch Residential Project – Notice of Preparation (NOP) and Initial Study
SCH # 2019080092
GTS # 07-LA-2019-02735
Vic. LA-126/PM: R2.895
LA-5/PM: R56.401

Dear Mr. Steven Jones:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced NOP and Initial Study. The proposed project is a 113.9-acre residential community consisting of 222 detached single-family residential lots on 57.9 acres, a passive pocket park on 0.2 acres, a passive park with a tot lot, shade structure and tables on 3.4 acres, and 21,000 square feet of commercial uses with 71 parking spaces on 2.5 acres. The project also would include five open space lots on 21 acres, six landscaped/open space homeowner association lots on 0.1 acres, three access strip lots at Trevylon Street, Rainbow Drive, and Lexington Drive on 0.2 acres, three infiltration basins and six debris basins on 8.8 acres, a pump station on 0.1 acres, and streets for the community on 19.7 acres. The County of Los Angeles is considered the Lead Agency under the California Environmental Quality Act (CEQA).

The nearest State facilities to the proposed project are State Route 126 (SR-126) and Interstate 5 (I-5). In the Transportation section of the proposed project's Initial Study checklist, it states that the project would have a potentially significant impact in terms of:

a. Conflicting with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities;

b. Conflicting or being inconsistent with CEQA Guidelines section 15064.3, subdivision (b); and

c. Substantially increasing hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)

The Initial Study checklist also states that the project would have a less than significant impact in terms of causing inadequate emergency access.

As stated in the Initial Study, many of the potentially significant impacts require further analysis. Caltrans looks forward to reviewing this analysis in the upcoming Draft Environmental Impact Report (DEIR) and

to provide further comments, if warranted. From reviewing the Initial Study, Caltrans recommends that for the forthcoming transportation impact study (TIS), which will be included in the DEIR, the Tenth Edition of the Institute of Transportation Engineers' Trip Generation Manual be used for determining trip generation forecasts and trip reductions (e.g. pass-by, diverted, and internal capture trips). Local trip generation rates are acceptable if appropriate validation is provided. Also, Caltrans recommends using the Highway Capacity Manual (HCM) method for conducting all operational and conflict analyses on State highway facilities. Specifically, queuing analyses based on the HCM queuing methodology are required for any Caltrans off-ramps that would be potentially significantly impacted by the project. Also, when the State highway facility has saturated flows, it is encouraged that a micro-simulation model be used for the analyses.

If intersections on the state highway are to be modified, a complete Intersection Control Evaluation (ICE) study is required. Also, if construction traffic is expected to cause delays on any State facilities, please submit a construction traffic management plan detailing these delays for Caltrans' review. Any transportation of heavy construction equipment and/or materials which requires use of oversized-transport vehicles on State highways will need a Caltrans transportation permit. We recommend large size truck trips be limited to off-peak commute periods.

As a reminder, Senate Bill 743 (2013) mandates that Vehicle Miles Traveled (VMT) be used as the primary metric in identifying transportation impacts of all future development projects under CEQA, starting July 1, 2020. For information on determining transportation impacts in terms of VMT on the State Highway System, see the Technical Advisory on Evaluating Transportation Impacts in CEQA by the California Governor's Office of Planning and Research, dated December 2018: http://opr.ca.gov/docs/20190122-743_Technical_Advisory.pdf.

The following information is included for your consideration.

The mission of Caltrans is to provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability. Therefore, Caltrans encourages the Lead Agency to integrate transportation and land use in a way that reduces Vehicle Miles Traveled (VMT) and Greenhouse Gas (GHG) emissions, as well as facilitates a high level of non-motorized travel and transit use. We encourage the Lead Agency to evaluate the potential of Transportation Demand Management (TDM) strategies and Intelligent Transportation System (ITS) applications to meet these goals. Potential strategies for this project include:

- Implement buffered bike lanes with green paint on Del Valle Road
- Create a Class I bike trail to provide access to Castaic Middle and Elementary schools
- Incorporate mixed-uses (i.e., commercial and residential) throughout the development to reduce car-dependency and associated vehicle miles traveled (VMT)
- Install canopy trees, bioswales, drought-tolerant native landscaping, and street furniture to create a livable community and reduce storm water run-off, which is a sensitive issue for Los Angeles county and needs to be accounted for during project design
- Build wide, unobstructed, and Americans with Disabilities Act (ADA)-compliant sidewalks
- Place utilities underground to reduce fire risk and keep sidewalks unobstructed
- Create high-visibility continental crosswalks at intersections and mid-block crosswalks with flashing beacons
- If gated, ensure pedestrian access to transit and main roads with additional entrance/exit doors
- Provide bus shelters and bulb-outs
- Design a grid pattern with short blocks to increase walkability
- Offer bicycle parking at the park, schools, and commercial centers

If you have any questions about these comments, please contact Emily Gibson, the project coordinator, at Emily.Gibson@dot.ca.gov, and refer to GTS # 07-LA-2019-02735.

Sincerely,

MIYA EDMONSON
IGR/CEQA Branch Chief
cc: Scott Morgan, State Clearinghouse

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DEPT OF REVENUE

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
South Coast Region
3883 Ruffin Road
San Diego, CA 92123
(858) 467-4201
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

August 28, 2019

Steven Jones
County of Los Angeles, Department of Regional Planning
320 West Temple Street, Room 1362
Los Angeles, CA 90012
Tel: 213-974-6433
sdjones@planning.lacounty.gov

Subject: Comments on the Notice of Preparation of a Draft Environmental Impact Report for the Sterling Ranch Residential Project, SCH# 2019080092, Los Angeles County

Dear Mr. Jones:

The California Department of Fish and Wildlife (CDFW) has reviewed the above-referenced Notice of Preparation (NOP) for the Sterling Ranch Residential Project (Project) Draft Environmental Impact Report (DEIR) prepared by the County of Los Angeles acting as Lead Agency under the California Environmental Quality Act (CEQA).

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Project that CDFW, by law, may be required to carry out or approve through the exercise of its own regulatory authority under the Fish and Game Code.

CDFW's Role

CDFW is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the State [Fish & Game Code, §§ 711.7, subdivision (a) & 1802; Public Resources Code, § 21070; CEQA Guidelines, § 15386, subdivision (a)]. CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (Id., § 1802). Similarly, for purposes of CEQA, CDFW is charged by law to provide, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect state fish and wildlife resources.

CDFW is also submitting comments as a Responsible Agency under CEQA (Public Resources Code, § 21069; CEQA Guidelines, § 15381). CDFW expects that it may need to exercise regulatory authority as provided by the Fish and Game Code, including lake and streambed alteration regulatory authority (Fish & Game Code, § 1600 et seq.). Likewise, to the extent implementation of the Project as proposed may result in "take" (see Fish & Game Code, § 2050) of any species protected under the California Endangered Species Act (CESA; Fish & Game Code, § 2050 et seq.) or the Native Plant Protection Act (NPPA; Fish & Game Code, §1900 et seq.), CDFW recommends the project proponent obtain appropriate authorization under the Fish and Game Code.

Project Location: The Project site is located at 29053 Coolidge Avenue, Val Verde, CA 91384. The Project site straddles Del Valle Road, south of Hasley Creek Canyon. The community of Val Verde lies south and west of the Project site, the Valencia Commerce Center lies to the east, and residential uses to the west and south. Open space is located north of the Project site.

The Santa Clara River is located two miles north of the Project. The Project contains two ephemeral drainages that are tributary to the Santa Clara River.

Project Description/Objectives: The proposed Project would develop on approximately 113.9 acres of land. Development includes 222 single-family homes with related infrastructure, 21,000 square feet of commercial use, open space, trails, recreation, stormwater retention, and landscape elements. The residential lot sizes would range from 7,000 to over 10,000 square feet. Approximately 21 acres of land in an unknown portion of the Project site will remain open space with the opportunity for hiking and equestrian trail connections in the area. The site is currently undeveloped open space.

COMMENTS AND RECOMMENDATIONS

CDFW offers the following comments and recommendations to assist the County of Los Angeles Department of Regional Planning (County) in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife (biological) resources.

Specific Comments

1) Regional Setting. CEQA Guidelines section 15125(c) require the Lead Agency to include information on the regional setting that is critical to an assessment of environmental impacts, with special emphasis placed on resources that are rare or unique to the region. The DEIR should include measures to fully avoid and otherwise protect Sensitive Natural Communities from Project-related impacts. CDFW considers these communities as threatened habitats having both regional and local significance. Plant communities, alliances, and associations with a state-wide ranking of S-1, S-2, S-3 and S-4 should be considered sensitive and declining at the local and regional level. These ranks can be obtained by visiting https://www.wildlife.ca.gov/Data/VegCAMP/Natural-Communities#sensitive%20natural%20communities.

2) Jurisdictional Waters. The Project proposes to impact two tributaries to the Santa Clara River. CDFW recommends the Project be designed to avoid all impacts to these tributary drainages, including their floodplain and a suitable buffer. These areas should be avoided and protected under a conservation easement.

   As a Responsible Agency under CEQA, CDFW has authority over activities in streams and/or lakes that will divert or obstruct the natural flow, or change the bed, channel, or bank (including vegetation associated with the stream or lake) of a river or stream, or use material from a streambed. For any such activities, the project applicant (or "entity") must provide written notification to CDFW pursuant to Fish and Game Code Section 1600 *et seq*.

   a) CDFW's issuance of a LSA for a project that is subject to CEQA will require CEQA compliance actions by CDFW as a Responsible Agency. As a Responsible Agency,

CDFW may consider the Environmental Impact Report of the local jurisdiction (Lead Agency) for the Project. To minimize additional requirements by CDFW pursuant to section 1600 *et seq.* and/or under CEQA, the document should fully identify the potential impacts to the stream or riparian resources and provide adequate avoidance, mitigation, monitoring and reporting commitments for issuance of the LSA[1].

b) The Project area may support aquatic, riparian, and wetland habitats; therefore, a preliminary delineation of the streams and their associated riparian habitats should be included in the DEIR. The delineation should be conducted pursuant to the U. S. Fish and Wildlife Service (FWS) wetland definition adopted by CDFW (Cowardin et al., 1970). Be advised that some wetland and riparian habitats subject to CDFW's authority may extend beyond the jurisdictional limits of the U.S. Army Corps of Engineers' Section 404 permit and Regional Water Quality Control Board Section 401 Certification.

c) In Project areas which may support ephemeral or episodic streams, herbaceous vegetation, woody vegetation, and woodlands also serve to protect the integrity of these resources and help maintain natural sedimentation processes; therefore, CDFW recommends effective setbacks of sufficient size be established to maintain vegetated buffer areas adjoining ephemeral drainages.

d) Project-related changes in upstream and downstream drainage patterns, runoff, and sedimentation should be included and evaluated in the DEIR.

e) As part of the LSA Notification process, CDFW requests the 100, 50, 25, 10, 5, and 2-year frequency storm event for existing and proposed conditions. CDFW recommends the DEIR evaluate the results and address avoidance, minimization, and/or mitigation measures that may be necessary to reduce potential significant impacts.

3) San Fernando Valley Spineflower. San Fernando Valley spineflower (*Chorizanthe parryi var. Fernandina*), covered under CESA, is known to occur at the adjacent Valencia Commerce Center. The DEIR should include information as to how the Project was surveyed to determine the potential presence of this species on the Project site.

Surveys should cover all areas of the Project, including off-site trails, parks, and any proposed fuel modification requirements for this Project to allow CDFW to assess potential impacts to San Fernando Valley Spineflower.

4) Fuel Modification. CDFW recommends all fuel modification requirements be met on the Project, and not in mitigation lands or habitat adjacent to the Project. Habitat being subjected to fuel modification (e.g., thinning, trimming, removal of mulch layer) should be considered an impact to these vegetation communities and mitigated accordingly. CDFW also recommends any irrigation proposed in fuel modification zones drain back into the development and not onto natural habitat land as perennial sources of water allow for the introduction of invasive Argentine ants.

5) Rodenticide Use. Impacts to biological resources can occur from wildlife directly consuming poison. Impacts can also occur through secondary poisoning where an animal consumes

[1] A notification package for a LSA may be obtained by accessing the Department's web site at www.wildlife.ca.gov/habcon/1600.

another organism that has consumed poison. CDFW confirmed anticoagulant rodenticide in 14 of 14 mountain lions necropsied in 2013 (McMillin, 2013). Lima et al. (2010), tested 96 birds (11 raptor species) in California and found 86 out of 96 raptors tested positive for second generation anticoagulant rodenticides. CDFW recommends the DEIR contain language disallowing the use of rodenticides that could result in direct or secondary poisoning to native mammals, birds, and raptors.

6) Landscaping. CDFW recommends using native, locally appropriate plant species for landscaping on the Project site. CDFW recommends invasive/exotic plants, including pepper trees (*Schinus* genus) and fountain grasses (*Pennisetum* genus), be restricted from use in landscape plans for this Project. A list of invasive/exotic plants that should be avoided as well as suggestions for better landscape plants can be found at http://www.cal-ipc.org/landscaping/dpp/planttypes.php?region=socal.

General Comments

1) Project Description and Alternatives. To enable CDFW to adequately review and comment on the proposed Project from the standpoint of the protection of plants, fish, and wildlife, we recommend the following information be included in the DEIR:

   a) A complete discussion of the purpose and need for, and description of, the proposed Project, including all staging areas and access routes to the construction and staging areas; and,

   b) A range of feasible alternatives to Project component location and design features to ensure that alternatives to the proposed Project are fully considered and evaluated. The alternatives should avoid or otherwise minimize direct and indirect impacts to sensitive biological resources and wildlife movement areas.

2) Wetlands Resources. CDFW, as described in Fish and Game Code section 703(a), is guided by the Fish and Game Commission's policies. The Wetlands Resources policy (http://www.fgc.ca.gov/policy/) of the Fish and Game Commission "...seek[s] to provide for the protection, preservation, restoration, enhancement and expansion of wetland habitat in California. Further, it is the policy of the Fish and Game Commission to strongly discourage development in or conversion of wetlands. It opposes, consistent with its legal authority, any development or conversion that would result in a reduction of wetland acreage or wetland habitat values. To that end, the Commission opposes wetland development proposals unless, at a minimum, project mitigation assures there will be 'no net loss' of either wetland habitat values or acreage. The Commission strongly prefers mitigation which would achieve expansion of wetland acreage and enhancement of wetland habitat values."

   a) The Wetlands Resources policy provides a framework for maintaining wetland resources and establishes mitigation guidance. CDFW encourages avoidance of wetland resources as a primary mitigation measure and discourages the development or type conversion of wetlands to uplands. CDFW encourages activities that would avoid the reduction of wetland acreage, function, or habitat values. Once avoidance and minimization measures have been exhausted, the Project must include mitigation measures to assure a "no net loss" of either wetland habitat values, or acreage, for unavoidable impacts to wetland resources. Conversions include, but are not limited to, conversion to subsurface drains, placement of fill or building of structures within the wetland, and channelization or

removal of materials from the streambed. All wetlands and watercourses, whether ephemeral, intermittent, or perennial, should be retained and provided with substantial setbacks, which preserve the riparian and aquatic values and functions for the benefit to on-site and off-site wildlife populations. CDFW recommends mitigation measures to compensate for unavoidable impacts be included in the DEIR and these measures should compensate for the loss of function and value.

b) The Fish and Game Commission's Water policy guides CDFW on the quantity and quality of the waters of this state that should be apportioned and maintained respectively so as to produce and sustain maximum numbers of fish and wildlife; to provide maximum protection and enhancement of fish and wildlife and their habitat; encourage and support programs to maintain or restore a high quality of the waters of this state; prevent the degradation thereof caused by pollution and contamination; and, endeavor to keep as much water as possible open and accessible to the public for the use and enjoyment of fish and wildlife. CDFW recommends avoidance of water practices and structures that use excessive amounts of water, and minimization of impacts that negatively affect water quality, to the extent feasible (Fish & Game Code, § 5650).

3) CESA. CDFW considers adverse impacts to a species protected by CESA to be significant without mitigation under CEQA. As to CESA, take of any endangered, threatened, candidate species, or State-listed rare plant species that results from the Project is prohibited, except as authorized by state law (Fish and Game Code, §§ 2080, 2085; Cal. Code Regs., tit. 14, §786.9). Consequently, if the Project, Project construction, or any Project-related activity during the life of the Project will result in take of a species designated as endangered or threatened, or a candidate for listing under CESA, CDFW recommends that the Project proponent seek appropriate take authorization under CESA prior to implementing the Project. Appropriate authorization from CDFW may include an Incidental Take Permit (ITP) or a consistency determination in certain circumstances, among other options [Fish & Game Code, §§ 2080.1, 2081, subds. (b) and (c)]. Early consultation is encouraged, as significant modification to a Project and mitigation measures may be required in order to obtain a CESA Permit. Revisions to the Fish and Game Code, effective January 1998, may require that CDFW issue a separate CEQA document for the issuance of an ITP unless the Project CEQA document addresses all Project impacts to CESA-listed species and specifies a mitigation monitoring and reporting program that will meet the requirements of an ITP. For these reasons, biological mitigation monitoring and reporting proposals should be of sufficient detail and resolution to satisfy the requirements for a CESA ITP.

4) Biological Baseline Assessment. To provide a complete assessment of the flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered, threatened, sensitive, regionally and locally unique species, and sensitive habitats, the DEIR should include the following information:

a) Information on the regional setting that is critical to an assessment of environmental impacts, with special emphasis on resources that are rare or unique to the region [CEQA Guidelines, § 15125(c)];

b) A thorough, recent, floristic-based assessment of special status plants and natural communities, following CDFW's *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* (see https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline);

c) Floristic, alliance- and/or association-based mapping and vegetation impact assessments conducted at the Project site and within the neighboring vicinity. *The Manual of California Vegetation*, second edition, should also be used to inform this mapping and assessment (Sawyer, 2008). Adjoining habitat areas should be included in this assessment where site activities could lead to direct or indirect impacts offsite. Habitat mapping at the alliance level will help establish baseline vegetation conditions;

d) A complete, recent, assessment of the biological resources associated with each habitat type on site and within adjacent areas that could also be affected by the project. CDFW's California Natural Diversity Data Base (CNDDB) in Sacramento should be contacted to obtain current information on any previously reported sensitive species and habitat. CDFW recommends that CNDDB Field Survey Forms be completed and submitted to CNDDB to document survey results. Online forms can be obtained and submitted at http://www.dfg.ca.gov/biogeodata/cnddb/submitting_data_to_cnddb.asp;

e) A complete, recent, assessment of rare, threatened, and endangered, and other sensitive species on site and within the area of potential effect, including California SSC and California Fully Protected Species (Fish & Game Code, §§ 3511, 4700, 5050 and 5515). Species to be addressed should include all those which meet the CEQA definition of endangered, rare or threatened species (CEQA Guidelines, § 15380). Seasonal variations in use of the project area should also be addressed. Focused species-specific surveys, conducted at the appropriate time of year and time of day when the sensitive species are active or otherwise identifiable, are required. Acceptable species-specific survey procedures should be developed in consultation with CDFW and the USFWS; and,

f) A recent, wildlife and rare plant survey. CDFW generally considers biological field assessments for wildlife to be valid for a one-year period, and assessments for rare plants may be considered valid for a period of up to three years. Some aspects of the proposed project may warrant periodic updated surveys for certain sensitive taxa, particularly if build out could occur over a protracted time frame, or in phases.

5) Biological Direct, Indirect, and Cumulative Impacts. To provide a thorough discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, with specific measures to offset such impacts, the following should be addressed in the DEIR:

a) A discussion of potential adverse impacts from lighting, noise, human activity, exotic species, and drainage. The latter subject should address Project-related changes on drainage patterns and downstream of the project site; the volume, velocity, and frequency of existing and post-Project surface flows; polluted runoff; soil erosion and/or sedimentation in streams and water bodies; and, post-Project fate of runoff from the project site. The discussion should also address the proximity of the extraction activities to the water table, whether dewatering would be necessary and the potential resulting impacts on the habitat (if any) supported by the groundwater. Mitigation measures proposed to alleviate such Project impacts should be included;

b) A discussion regarding indirect Project impacts on biological resources, including resources in nearby public lands, open space, adjacent natural habitats, riparian

ecosystems, and any designated and/or proposed or existing reserve lands (e.g., preserve lands associated with a Natural Community Conservation Plan (NCCP, Fish & Game Code, § 2800 et. seq.). Impacts on, and maintenance of, wildlife corridor/movement areas, including access to undisturbed habitats in adjacent areas, should be fully evaluated in the DEIR;

c) An analysis of impacts from land use designations and zoning located nearby or adjacent to natural areas that may inadvertently contribute to wildlife-human interactions. A discussion of possible conflicts and mitigation measures to reduce these conflicts should be included in the DEIR; and,

d) A cumulative effects analysis, as described under CEQA Guidelines section 15130. General and specific plans, as well as past, present, and anticipated future projects, should be analyzed relative to their impacts on similar plant communities and wildlife habitats.

6) Compensatory Mitigation. The DEIR should include mitigation measures for adverse Project-related impacts to sensitive plants, animals, and habitats. Mitigation measures should emphasize avoidance and reduction of Project impacts. For unavoidable impacts, on-site habitat restoration or enhancement should be discussed in detail. If on-site mitigation is not feasible or would not be biologically viable and therefore not adequately mitigate the loss of biological functions and values, off-site mitigation through habitat creation and/or acquisition and preservation in perpetuity should be addressed. Areas proposed as mitigation lands should be protected in perpetuity with a conservation easement, financial assurance and dedicated to a qualified entity for long-term management and monitoring. Under Government Code section 65967, the Lead Agency must exercise due diligence in reviewing the qualifications of a governmental entity, special district, or nonprofit organization to effectively manage and steward land, water, or natural resources on mitigation lands it approves.

7) Long-term Management of Mitigation Lands. For proposed preservation and/or restoration, the DEIR should include measures to protect the targeted habitat values from direct and indirect negative impacts in perpetuity. The objective should be to offset the Project-induced qualitative and quantitative losses of wildlife habitat values. Issues that should be addressed include (but are not limited to) restrictions on access, proposed land dedications, monitoring and management programs, control of illegal dumping, water pollution, and increased human intrusion. An appropriate non-wasting endowment should be set aside to provide for long-term management of mitigation lands.

8) Nesting Birds. CDFW recommends that measures be taken to avoid Project impacts to nesting birds. Migratory nongame native bird species are protected by international treaty under the Federal Migratory Bird Treaty Act (MBTA) of 1918 (Title 50, § 10.13, Code of Federal Regulations). Sections 3503, 3503.5, and 3513 of the California Fish and Game Code prohibit take of all birds and their active nests including raptors and other migratory nongame birds (as listed under the Federal MBTA). Proposed Project activities including (but not limited to) staging and disturbances to native and nonnative vegetation, structures, and substrates should occur outside of the avian breeding season which generally runs from February 1 through September 1 (as early as January 1 for some raptors) to avoid take of birds or their eggs. If avoidance of the avian breeding season is not feasible, CDFW recommends surveys by a qualified biologist with experience in conducting breeding bird

surveys to detect protected native birds occurring in suitable nesting habitat that is to be disturbed and (as access to adjacent areas allows) any other such habitat within 300-feet of the disturbance area (within 500-feet for raptors). Project personnel, including all contractors working on site, should be instructed on the sensitivity of the area. Reductions in the nest buffer distance may be appropriate depending on the avian species involved, ambient levels of human activity, screening vegetation, or possibly other factors.

9) Translocation/Salvage of Plants and Animal Species. Translocation and transplantation is the process of moving an individual from the Project site and permanently moving it to a new location. CDFW generally does not support the use of, translocation or transplantation as the primary mitigation strategy for unavoidable impacts to rare, threatened, or endangered plant or animal species. Studies have shown that these efforts are experimental and the outcome unreliable. CDFW has found that permanent preservation and management of habitat capable of supporting these species is often a more effective long-term strategy for conserving sensitive plants and animals and their habitats.

10) Moving out of Harm's Way. The proposed Project is anticipated to result in clearing of natural habitats that support many species of indigenous wildlife. To avoid direct mortality, we recommend that a qualified biological monitor approved by CDFW be on-site prior to and during ground and habitat disturbing activities to move out of harm's way special status species or other wildlife of low mobility that would be injured or killed by grubbing or Project-related construction activities. It should be noted that the temporary relocation of on-site wildlife does not constitute effective mitigation for the purposes of offsetting project impacts associated with habitat loss. If the project requires species to be removed, disturbed, or otherwise handled, we recommend that the DEIR clearly identify that the designated entity shall obtain all appropriate state and federal permits.

11) Revegetation/Restoration Plan. Plans for restoration and re-vegetation should be prepared by persons with expertise in southern California ecosystems and native plant restoration techniques. Plans should identify the assumptions used to develop the proposed restoration strategy. Each plan should include, at a minimum: (a) the location of restoration sites and assessment of appropriate reference sites; (b) the plant species to be used, sources of local propagules, container sizes, and seeding rates; (c) a schematic depicting the mitigation area; (d) a local seed and cuttings and planting schedule; (e) a description of the irrigation methodology; (f) measures to control exotic vegetation on site; (g) specific success criteria; (h) a detailed monitoring program; (i) contingency measures should the success criteria not be met; and (j) identification of the party responsible for meeting the success criteria and providing for conservation of the mitigation site in perpetuity. Monitoring of restoration areas should extend across a sufficient time frame to ensure that the new habitat is established, self-sustaining, and capable of surviving drought.

    a) CDFW recommends that local on-site propagules from the Project area and nearby vicinity be collected and used for restoration purposes. On-site seed collection should be initiated in the near future to accumulate sufficient propagule material for subsequent use in future years. On-site vegetation mapping at the alliance and/or association level should be used to develop appropriate restoration goals and local plant palettes. Reference areas should be identified to help guide restoration efforts. Specific restoration plans should be developed for various Project components as appropriate.

b) Restoration objectives should include providing special habitat elements where feasible to benefit key wildlife species. These physical and biological features can include (for example) retention of woody material, logs, snags, rocks and brush piles.

CONCLUSION

CDFW appreciates the opportunity to comment on the NOP to assist the County in identifying and mitigating Project impacts on biological resources. If you have any questions or comments regarding this letter, please contact Kelly Schmoker-Stanphill, Senior Environmental Scientist (Specialist), at (626) 335-9092 or by email at Kelly.schmoker@wildlife.ca.gov.

Sincerely,

Erinn Wilson
Environmental Program Manager I

cc: CDFW
Erinn Wilson – Los Alamitos
Victoria Tang – Los Alamitos
Joseph Stanovich – Los Alamitos
Andrew Valand – Los Alamitos
Karen Drewe – Los Alamitos
Kelly Schmoker – Glendora

State Clearinghouse
Scott Morgan

References

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Lima, L. and T. Salmon. 2010. Lima, L. and T. Salmon. 2010. Assessing some potential environmental impacts from agricultural anticoagulant uses. Proceedings of Vertebrate Pest Conference.

McMillin, Stella, California Department of Fish and Game. Wildlife Investigations Laboratory.

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COUNTY OF LOS ANGELES
Public Health

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC HEALTH
ENVIRONMENTAL HEALTH

5050 COMMERCE DRIVE BALDWIN PARK, CA 91706 (626) 430-5380

August 8, 2019

Case No: RENV-IS03-250-28680
Project: TR060257
Planner: Jones, Steven
Location: 29053 Coolidge Avenue Castaic CA 91384

The Department of Public Health – Environmental Health Division has reviewed the Environmental Assessment for Sterling gateway residential development and recommends that this project not be approved at this time.

DPH agrees that the project could have a potentially significant impact as proposed regarding safe and reliable potable water availability and infrastructure for wastewater disposal and therefore recommends an EIR.

Drinking Water

1. Ultimately, A *Water Availability* letter will be required from the Los Angeles County Waterworks District 36 for the vesting tract map. Although a project with as little as 300 lots under certain conditions may require Water Supply Assessment (WSA), this Department recommends the assurance of potable water supply via a WSA as a significant water demand will be generated from residential, commercial and irrigation demands from the project.

Wastewater

2. Project intends to connect to the Sanitation Districts. Assure the ability of the project to connect to the system by annexing into the sewer district service area by LAFCO or other sewer purveyor resolution.

Contact Vincent Gallegos, Land Use Program For any questions regarding this report at vgallegos@ph.lacounty.gov

Prepared by:
Vincent Gallegos, REHS
Environmental Health Specialist IV
SD-5

COUNTY OF LOS ANGELES
DEPARTMENT OF PARKS AND RECREATION
"Parks Make Life Better!"
John Wicker, Director
Norma E. Garcia, Chief Deputy Director

July 11, 2019

TO: Steven Jones
Department of Regional Planning

FROM: Julie Yom, AICP
Planning and CEQA Section

SUBJECT: **RENV-IS03-250-28680**
TR060257
STERLING RANCH RESIDENTIAL PROJECT
INITIAL STUDY (IS)

The IS for the proposed project has been reviewed for potential impacts on the facilities of the Department of Parks and Recreation (DPR). The document correctly states the park obligations for the project and we do not have any further comments.

Thank you for including this Department in the review of this document. If you have any questions, please contact me at jyom@parks.lacounty.gov or (626) 588-5311.

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

MARK PESTRELLA, Director

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100
http://dpw.lacounty.gov

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

IN REPLY PLEASE
REFER TO FILE: LD-2

August 21, 2019

TO: Joshua Huntington
Land Divisions
Department of Regional Planning

Attention Steven Jones

FROM: Art Vander Vis
Land Development Division
Department of Public Works

RENV-IS03-250-28680 (DRAFT INITIAL STUDY)
TRACT NO. 60257
UNINCORPORATED COUNTY COMMUNITY OF VAL VERDE

This letter supersedes our letter dated August 1, 2019

Thank you for the opportunity to review the draft initial study (DIS) for Tract No. 60257, which proposes to create 222 single-family residential lots, 1 commercial lot, 2 recreation center lots, 5 open space lots, 3 infiltration basin lots, 6 debris basin lots, and a pump station lot.

For specific revisions, additions, or deletions of wording directly from the project document, the specific section, subsection, and/or item along with the page number are first referenced and then the excerpt from the document is copied within quotations using the following nomenclature:

Deletions are represented by a ~~strikethrough~~.
Additions are represented by *italics* along with an underline.
Revisions are represented by a combination of the above.

The following comments should be addressed prior to releasing the DIS to the public. We request all future environmental documents associated with this project be submitted to Public Works for review and comments.

1. **ENVIRONMENTAL CHECKLIST FORM**

    1.1. "Project location" subsection (Page 1/47)

        1.1.1. Add the "s" to "APN" and correct the description of APN 3271-005-032 as shown on the tentative map.

        "APN*s*: 3271-004-012, 3271-004-013, and *a portion of* 3271-005-032 *(offsite)"*

2. **SECTION 10. HYDROLOGY AND WATER QUALITY**

    2.1. Subsections 10a-10g (Pages 29-31/47)

        2.1.1. Public Works, Land Development Division, Drainage Section cannot substantiate the DIS findings until the hydrology study for subject development is approved. The approved hydrology study will require the proposed subdivision to be in compliance with all applicable hydrology and water quality standards and requirements to achieve "less than significant impact" or "no impact".

If you have any questions regarding the above hydrology comment, please contact Nargiss Majrooh of Public Works, Land Development Division, at (626) 458-4921 or nmajrooh@pw.lacounty.gov.

3. **SECTION 19. UTILITIES AND SERVICE SYSTEMS**

    3.1. Subsections 19a-19c (Page 43-44/47)

        3.1.1. Public Works, Land Development Division, Sewer Unit cannot substantiate the DIS findings relating to wastewater and solid waste. The impacts of the proposed project on the existing sewer system cannot be verified until a sewer area study is reviewed and approved by Public Works. Sewer mitigations and impacts found in the approved sewer area study, if any, should be reflected in the environmental document.

If you have any questions regarding the above sewer comment, please contact Pedro Romero of Public Works, Land Development Division, at (626) 458-4921 or promero@pw.lacounty.gov.

Once all the above changes are made, the DIS will not need to be re-submitted to Public Works for review. With the changes made, Public Works clears the subject DIS. However, we will reserve our comments for the Draft Environmental Impact Report.

If you have any other questions or require additional information, please contact Phoenix Khoury of Public Works, Land Development Division, at (626) 458-4921 or pkhoury@pw.lacounty.gov.

PK:
P:\ldpub\SUBPCHECK\Plan Checking Files\Tract Map\TR 060257\RENV-IS03-250-28680\2019-07-01 SUBMITTAL\DPW notcleared_2019-07-29 (rev'd 2019-08-19)_tr60257 DIS new RENV-IS03-250-28680.docx

COUNTY OF LOS ANGELES FIRE DEPARTMENT
FIRE PREVENTION DIVISION

Land Development Unit
5823 Rickenbacker Road
Commerce, CA 90040
Telephone (323) 890-4243, Fax (323) 890-9783

CASE NUMBER: RENV-IS03-25028680 MAP DATE: July 2, 2019
PROJECT NUMBER: TR060257 PLANNER: Steven Jones

THE FIRE DEPARTMENT RECOMMENDS THAT THIS PROJECT NOT TO BE APPROVED AT THIS TIME AND NOT TO PROCEED WITH THE PUBLIC HEARING PROCESS. THIS RECOMMENDATION MAYBE CHANGED WHEN THE HOLDS BELOW HAVE BEEN ADDRESSED.

HOLDS

Access

1. Fire Apparatus Access Roads must be installed and maintained in a serviceable manner prior to and during the time of construction. Fire Code 501.4

2. For proposed streets less than 28'-0" in width, parking is only permitted on one side of the street. "No Parking At Any Time" shall be posted on either side of the street as to maintain the required 20'-0" fire department vehicular access roadway. The minimum width for parking on a cul-de-sac street is 34'-0" for parking on both sides.

3. The cul-de-sac detail shown on the site map shows a typical street width of 56'-0". This is not consistent with the proposed streets sections shown on the site maps. Should the cul-de-sac width be 56'-0", the street alignments should match. Additionally the cul-de-sac detail does not show the centerline turning radius dimension of 32'-0". Revise the proposed cu-de-sac detail to be consistent with the proposed street widths and required turning radii.

WATER

4. Show all existing public fire hydrants to within 300' of all property lines. Should hydrants be in excess of 300', show the nearest public fire hydrant represented by a broken dimension arrow in the location(s) which they exist. Provide the distance dimensions on the site plan.

5. All fire hydrants shall measure 6"x 4"x 2-1/2" brass or bronze, conforming to current AWWA standard C503 or approved equal, and shall be installed in accordance with the County of Los Angeles Fire Department C105.1 CFC.

Reviewed by: Joseph Youman Date: August 1, 2019

6. All required PUBLIC fire hydrants shall be installed, tested and accepted prior to beginning construction. Fire Code 501.4

7. The required fire for the public fire hydrants for single family residential homes less than a total square footage of 3600 feet is 500 gpm at 20 psi residual pressure for 2 hours with one public fire hydrant flowing. Any single family residential home 3601 square feet or greater shall comply too Table B105.1 of the Fire Code in Appendix B

8. Additional fire hydrants and their locations to be determined upon verification of all existing public fire hydrants.

9. Provide a Form 195 signed and completed by the local water purveyor.

CONDITIONS OF APPROVAL – FUEL MODIFICATION

10. This property is located within the area described by the Fire Department as the Very High Fire Hazard Severity Zone. A "Preliminary Fuel Modification Plan" shall be submitted and approved prior to public hearing. For details, please contact the Department's Fuel Modification Unit which is located at Fire Station 32, 605 North Angeleno Avenue in the City of Azusa CA 91702-2904. They may be reached at (626) 969-5205.

Additional comments pending the information returned by the applicant for Fire Department plan check; presently all outstanding comments have been addressed via plan check.

For any questions regarding the report, please contact Joseph Youman at (323) 890-4243 or Joseph.Youman@fire.lacounty.gov.

Reviewed by: Joseph Youman Date: August 1, 2019

OFFICE OF THE SHERIFF

COUNTY OF LOS ANGELES

HALL OF JUSTICE

ALEX VILLANUEVA, SHERIFF

September 20, 2019

Mr. Steven Jones
Los Angeles County
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, California 90012

Dear Mr. Jones:

REVIEW COMMENTS
NOTICE OF PREPARATION
DRAFT ENVIRONMENTAL IMPACT REPORT
STERLING RANCH RESIDENTIAL PROJECT

Thank you for inviting the Los Angeles County Sheriff's Department (Department) to review and comment on the August 2019 Notice of Preparation (NOP) of a Draft Environmental Impact Report (Draft EIR) for the Sterling Ranch Residential Project (Project). The proposed Project, a residential community located at 29053 Coolidge Avenue, Val Verde, CA 91384, involves the development of 222 detached single-family residential units, approximately 30 acres of amenities including landscaped/open space HOA lots, strip lots, infiltration and debris basins, and a pump station; and 19.7 acres for public and private streets for the community.

The proposed Project is located within the service area of the Department's Santa Clarita Valley Station (Station) and may impact the current level of service provided by the Station due to the potential increase in resident population proposed by the Project. The Department will provide further comments for the Draft EIR during the public review period.

Also, for future reference, the Department provides the following updated address and contact information for all requests for review comments, law enforcement service information, California Environmental Quality Act documents, and other related correspondence:

Tracey Jue, Director
Facilities Planning Bureau
Los Angeles County Sheriff's Department
211 West Temple Street
Los Angeles, California 90012

Attention: Planning Section

Should you have any questions regarding this matter, please contact me at (323) 526-5657, or your staff may contact Ms. Rochelle Campomanes of my staff, at (323) 526-5614.

Sincerely,

ALEX VILLANUEVA, SHERIFF

Tracey Jue, Director
Facilities Planning Bureau

TJ:RC:rc/mm

Attachment

c: Robert J. Lewis, Captain, Santa Clarita Valley Station (SCV)
John Lecrivain, Operations Lieutenant, SCV
Meghan Wang, Supervising Facilities Project Manager, (FPB)
Rochelle Campomanes, Departmental Facilities Planner I, FPB
Chrono
(EIR-Sterling Ranch Residential Project)

SANITATION DISTRICTS OF LOS ANGELES COUNTY

Converting Waste Into Resources

Robert C. Ferrante
Chief Engineer and General Manager
1955 Workman Mill Road, Whittier, CA 90601-1400
Mailing Address: P.O. Box 4998, Whittier, CA 90607-4998
(562) 699-7411 • www.lacsd.org

September 4, 2019

Ref. DOC 5257886

Mr. Steven Jones
Los Angeles County
Department of Regional Planning
320 West Temple Street
Room 1362
Los Angeles, CA 90012

Dear Mr. Jones:

NOP Response for the Sterling Ranch Residential Project

The Santa Clarita Valley Sanitation District (District) received a Notice of Preparation of a Draft Environmental Impact Report for the subject project on August 8, 2019.We offer the following comments regarding sewerage service:

1. The majority of the project area is located outside the sphere of influence of the District, as adopted by the Local Agency Formation Commission (LAFCO). Therefore, until the current sphere of influence for the Santa Clarita Valley Sanitation District has been amended by LAFCO to include this area, the District will be unable to annex the area and provide sewerage service.

2. The entire project area is outside the jurisdictional boundaries of the District and will require annexation into the District before sewerage service can be provided to the proposed development. For a copy of the District's Annexation Information and Processing Fee sheets, go to www.lacsd.org, Wastewater & Sewer Systems, Will Serve Program, and click on the appropriate link. For more specific information regarding the annexation procedure and fees, please contact Ms. Donna Curry at (562) 908-4288, extension 2708.

3. Because of the project's location, the flow originating from the proposed project would have to be transported to the District's trunk sewer by local sewer(s) that are not maintained by the District. If no local sewer lines currently exist, it is the responsibility of the developer to convey any wastewater generated by the project to the nearest local sewer and/or District's trunk sewer. The nearest District's trunk sewer is the Castaic Trunk Sewer, located in Hasley Canyon Road just west of The Old Road. The Districts' 15–inch diameter trunk sewer has a capacity of 3 million gallons per day (mgd) and conveyed a peak flow of 1.5 mgd when last measured in 2018.

4. The District operates two water reclamation plants (WRPs), the Saugus WRP and the Valencia WRP, which provide wastewater treatment in the Santa Clarita Valley. These facilities are interconnected to form a regional treatment system known as the Santa Clarita Valley Joint Sewerage System (SCVJSS). The SCVJSS has a capacity of 28.1 mgd and currently produces an average recycled water flow of 19.6 mgd.

Printed on Recycled Paper

5. The expected average wastewater flow from the project, described in the notice as 222 single family homes and 21,000 square feet of commercial space, is 64,545 gallons per day. For a copy of the District's average wastewater generation factors, go to www.lacsd.org, Wastewater & Sewer Systems, click on Will Serve Program, and click on the Table 1, Loadings for Each Class of Land Use link.

6. The District is empowered by the California Health and Safety Code to charge a fee for the privilege of connecting (directly or indirectly) to the District's Sewerage System for increasing the strength or quantity of wastewater discharged from connected facilities. This connection fee is a capital facilities fee that is imposed in an amount sufficient to construct an incremental expansion of the Sewerage System to accommodate the proposed project. Payment of a connection fee will be required before a permit to connect to the sewer is issued. For more information and a copy of the Connection Fee Information Sheet, go to www.lacsd.org, Wastewater & Sewer Systems, click on Will Serve Program, and search for the appropriate link. In determining the impact to the Sewerage System and applicable connection fees, the Districts' Chief Engineer and General Manager will determine the user category (e.g. Condominium, Single Family home, etc.) that best represents the actual or anticipated use of the parcel or facilities on the parcel. For more specific information regarding the connection fee application procedure and fees, the developer should contact the Connection Fee Counter at (562) 908-4288, extension 2727.

7. In order for the District to conform to the requirements of the Federal Clean Air Act (CAA), the capacities of District wastewater treatment facilities are based on the regional growth forecast adopted by the Southern California Association of Governments (SCAG). Specific policies included in the development of the SCAG regional growth forecast are incorporated into clean air plans, which are prepared by the South Coast and Antelope Valley Air Quality Management Districts in order to improve air quality in the South Coast and Mojave Desert Air Basins as mandated by the CCA. All expansions of District facilities must be sized and service phased in a manner that will be consistent with the SCAG regional growth forecast for the counties of Los Angeles, Orange, San Bernardino, Riverside, Ventura, and Imperial. The available capacity of District treatment facilities will, therefore, be limited to levels associated with the approved growth identified by SCAG. As such, this letter does not constitute a guarantee of wastewater service, but is to advise the developer that the District intends to provide this service up to the levels that are legally permitted and to inform the developer of the currently existing capacity and any proposed expansion of District facilities.

If you have any questions, please contact the undersigned at (562) 908-4288, extension 2717.

Very truly yours,

Adriana Raza
Customer Service Specialist
Facilities Planning Department

AR:ar

cc: D. Curry
A. Schmidt
A. Howard

NATIVE AMERICAN HERITAGE COMMISSION
Cultural and Environmental Department
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691 Phone: (916) 373-3710
Email: nahc@nahc.ca.gov
Website: http://www.nahc.ca.gov

Governor's Office of Planning & Research

AUG 20 2019

STATE CLEARINGHOUSE

August 15, 2019

Steven Jones
Los Angeles County
320 West Temple Street
Los Angeles, CA 90012

RE: SCH# 2019080092, Sterling Ranch Residential Project, Los Angeles County

Dear Mr. Jones:

The Native American Heritage Commission (NAHC) has received the Notice of Preparation (NOP) for the project referenced above. The California Environmental Quality Act (CEQA) (Pub. Resources Code §21000 et seq.), specifically Public Resources Code §21084.1, states that a project that may cause a substantial adverse change in the significance of a historical resource, is a project that may have a significant effect on the environment. (Pub. Resources Code § 21084.1; Cal. Code Regs., tit.14, §15064.5 (b) (CEQA Guidelines §15064.5 (b)). If there is substantial evidence, in light of the whole record before a lead agency, that a project may have a significant effect on the environment, an Environmental Impact Report (EIR) shall be prepared. (Pub. Resources Code §21080 (d); Cal. Code Regs., tit. 14, § 5064 subd.(a)(1) (CEQA Guidelines §15064 (a)(1)). In order to determine whether a project will cause a substantial adverse change in the significance of a historical resource, a lead agency will need to determine whether there are historical resources within the area of potential effect (APE).

CEQA was amended significantly in 2014. Assembly Bill 52 (Gatto, Chapter 532, Statutes of 2014) (AB 52) amended CEQA to create a separate category of cultural resources, "tribal cultural resources" (Pub. Resources Code §21074) and provides that a project with an effect that may cause a substantial adverse change in the significance of a tribal cultural resource is a project that may have a significant effect on the environment. (Pub. Resources Code §21084.2). Public agencies shall, when feasible, avoid damaging effects to any tribal cultural resource. (Pub. Resources Code §21084.3 (a)). **AB 52 applies to any project for which a notice of preparation, a notice of negative declaration, or a mitigated negative declaration is filed on or after July 1, 2015.** If your project involves the adoption of or amendment to a general plan or a specific plan, or the designation or proposed designation of open space, on or after March 1, 2005, it may also be subject to Senate Bill 18 (Burton, Chapter 905, Statutes of 2004) (SB 18). **Both SB 18 and AB 52 have tribal consultation requirements**. If your project is also subject to the federal National Environmental Policy Act (42 U.S.C. § 4321 et seq.) (NEPA), the tribal consultation requirements of Section 106 of the National Historic Preservation Act of 1966 (154 U.S.C. 300101, 36 C.F.R. §800 et seq.) may also apply.

The NAHC recommends consultation with California Native American tribes that are traditionally and culturally affiliated with the geographic area of your proposed project as early as possible in order to avoid inadvertent discoveries of Native American human remains and best protect tribal cultural resources. Below is a brief summary of portions of AB 52 and SB 18 as well as the NAHC's recommendations for conducting cultural resources assessments.

Consult your legal counsel about compliance with AB 52 and SB 18 as well as compliance with any other applicable laws.

AB 52

AB 52 has added to CEQA the additional requirements listed below, along with many other requirements:

1. Fourteen Day Period to Provide Notice of Completion of an Application/Decision to Undertake a Project: Within fourteen (14) days of determining that an application for a project is complete or of a decision by a public agency to undertake a project, a lead agency shall provide formal notification to a designated contact of, or tribal representative of, traditionally and culturally affiliated California Native American tribes that have requested notice, to be accomplished by at least one written notice that includes:
   - **a.** A brief description of the project.
   - **b.** The lead agency contact information.
   - **c.** Notification that the California Native American tribe has 30 days to request consultation. (Pub. Resources Code §21080.3.1 (d)).
   - **d.** A "California Native American tribe" is defined as a Native American tribe located in California that is on the contact list maintained by the NAHC for the purposes of Chapter 905 of Statutes of 2004 (SB 18). (Pub. Resources Code §21073).

2. Begin Consultation Within 30 Days of Receiving a Tribe's Request for Consultation and Before Releasing a Negative Declaration, Mitigated Negative Declaration, or Environmental Impact Report: A lead agency shall begin the consultation process within 30 days of receiving a request for consultation from a California Native American tribe that is traditionally and culturally affiliated with the geographic area of the proposed project. (Pub. Resources Code §21080.3.1, subds. (d) and (e)) and prior to the release of a negative declaration, mitigated negative declaration or Environmental Impact Report. (Pub. Resources Code §21080.3.1(b)).
   - **a.** For purposes of AB 52, "consultation shall have the same meaning as provided in Gov. Code §65352.4 (SB 18). (Pub. Resources Code §21080.3.1 (b)).

3. Mandatory Topics of Consultation If Requested by a Tribe: The following topics of consultation, if a tribe requests to discuss them, are mandatory topics of consultation:
   - **a.** Alternatives to the project**.**
   - **b.** Recommended mitigation measures**.**
   - **c.** Significant effects**.** (Pub. Resources Code §21080.3.2 (a)).

4. Discretionary Topics of Consultation: The following topics are discretionary topics of consultation:
   - **a.** Type of environmental review necessary.
   - **b.** Significance of the tribal cultural resources.
   - **c.** Significance of the project's impacts on tribal cultural resources.
   - **d.** If necessary, project alternatives or appropriate measures for preservation or mitigation that the tribe may recommend to the lead agency. (Pub. Resources Code §21080.3.2 (a)).

5. Confidentiality of Information Submitted by a Tribe During the Environmental Review Process: With some exceptions, any information, including but not limited to, the location, description, and use of tribal cultural resources submitted by a California Native American tribe during the environmental review process shall not be included in the environmental document or otherwise disclosed by the lead agency or any other public agency to the public, consistent with Government Code §6254 (r) and §6254.10. Any information submitted by a California Native American tribe during the consultation or environmental review process shall be published in a confidential appendix to the environmental document unless the tribe that provided the information consents, in writing, to the disclosure of some or all of the information to the public. (Pub. Resources Code §21082.3 (c)(1)).

6. Discussion of Impacts to Tribal Cultural Resources in the Environmental Document: If a project may have a significant impact on a tribal cultural resource, the lead agency's environmental document shall discuss both of the following:
   - **a.** Whether the proposed project has a significant impact on an identified tribal cultural resource.
   - **b.** Whether feasible alternatives or mitigation measures, including those measures that may be agreed to pursuant to Public Resources Code §21082.3, subdivision (a), avoid or substantially lessen the impact on the identified tribal cultural resource. (Pub. Resources Code §21082.3 (b)).

7. Conclusion of Consultation: Consultation with a tribe shall be considered concluded when either of the following occurs:
    a. The parties agree to measures to mitigate or avoid a significant effect, if a significant effect exists, on a tribal cultural resource; or
    b. A party, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached. (Pub. Resources Code §21080.3.2 (b)).

8. Recommending Mitigation Measures Agreed Upon in Consultation in the Environmental Document: Any mitigation measures agreed upon in the consultation conducted pursuant to Public Resources Code §21080.3.2 shall be recommended for inclusion in the environmental document and in an adopted mitigation monitoring and reporting program, if determined to avoid or lessen the impact pursuant to Public Resources Code §21082.3, subdivision (b), paragraph 2, and shall be fully enforceable. (Pub. Resources Code §21082.3 (a)).

9. Required Consideration of Feasible Mitigation: If mitigation measures recommended by the staff of the lead agency as a result of the consultation process are not included in the environmental document or if there are no agreed upon mitigation measures at the conclusion of consultation, or if consultation does not occur, and if substantial evidence demonstrates that a project will cause a significant effect to a tribal cultural resource, the lead agency shall consider feasible mitigation pursuant to Public Resources Code §21084.3 (b). (Pub. Resources Code §21082.3 (e)).

10. Examples of Mitigation Measures That, If Feasible, May Be Considered to Avoid or Minimize Significant Adverse Impacts to Tribal Cultural Resources:
    a. Avoidance and preservation of the resources in place, including, but not limited to:
        i. Planning and construction to avoid the resources and protect the cultural and natural context.
        ii. Planning greenspace, parks, or other open space, to incorporate the resources with culturally appropriate protection and management criteria.
    b. Treating the resource with culturally appropriate dignity, taking into account the tribal cultural values and meaning of the resource, including, but not limited to, the following:
        i. Protecting the cultural character and integrity of the resource.
        ii. Protecting the traditional use of the resource.
        iii. Protecting the confidentiality of the resource.
    c. Permanent conservation easements or other interests in real property, with culturally appropriate management criteria for the purposes of preserving or utilizing the resources or places.
    d. Protecting the resource. (Pub. Resource Code §21084.3 (b)).
    e. Please note that a federally recognized California Native American tribe or a non-federally recognized California Native American tribe that is on the contact list maintained by the NAHC to protect a California prehistoric, archaeological, cultural, spiritual, or ceremonial place may acquire and hold conservation easements if the conservation easement is voluntarily conveyed. (Civ. Code §815.3 (c)).
    f. Please note that it is the policy of the state that Native American remains and associated grave artifacts shall be repatriated. (Pub. Resources Code §5097.991).

11. Prerequisites for Certifying an Environmental Impact Report or Adopting a Mitigated Negative Declaration or Negative Declaration with a Significant Impact on an Identified Tribal Cultural Resource: An Environmental Impact Report may not be certified, nor may a mitigated negative declaration or a negative declaration be adopted unless one of the following occurs:
    a. The consultation process between the tribes and the lead agency has occurred as provided in Public Resources Code §21080.3.1 and §21080.3.2 and concluded pursuant to Public Resources Code §21080.3.2.
    b. The tribe that requested consultation failed to provide comments to the lead agency or otherwise failed to engage in the consultation process.
    c. The lead agency provided notice of the project to the tribe in compliance with Public Resources Code §21080.3.1 (d) and the tribe failed to request consultation within 30 days. (Pub. Resources Code §21082.3 (d)).

The NAHC's PowerPoint presentation titled, "Tribal Consultation Under AB 52: Requirements and Best Practices" may be found online at: http://nahc.ca.gov/wp-content/uploads/2015/10/AB52TribalConsultation_CalEPAPDF.pdf

SB 18

SB 18 applies to local governments and requires local governments to contact, provide notice to, refer plans to, and consult with tribes prior to the adoption or amendment of a general plan or a specific plan, or the designation of open space. (Gov. Code §65352.3). Local governments should consult the Governor's Office of Planning and Research's "Tribal Consultation Guidelines," which can be found online at: https://www.opr.ca.gov/docs/09_14_05_Updated_Guidelines_922.pdf.

Some of SB 18's provisions include:

1. Tribal Consultation: If a local government considers a proposal to adopt or amend a general plan or a specific plan, or to designate open space it is required to contact the appropriate tribes identified by the NAHC by requesting a "Tribal Consultation List." If a tribe, once contacted, requests consultation the local government must consult with the tribe on the plan proposal. **A tribe has 90 days from the date of receipt of notification to request consultation unless a shorter timeframe has been agreed to by the tribe.** (Gov. Code §65352.3 (a)(2)).
2. No Statutory Time Limit on SB 18 Tribal Consultation. There is no statutory time limit on SB 18 tribal consultation.
3. Confidentiality: Consistent with the guidelines developed and adopted by the Office of Planning and Research pursuant to Gov. Code §65040.2, the city or county shall protect the confidentiality of the information concerning the specific identity, location, character, and use of places, features and objects described in Public Resources Code §5097.9 and §5097.993 that are within the city's or county's jurisdiction. (Gov. Code §65352.3 (b)).
4. Conclusion of SB 18 Tribal Consultation: Consultation should be concluded at the point in which:
    a. The parties to the consultation come to a mutual agreement concerning the appropriate measures for preservation or mitigation; or
    b. Either the local government or the tribe, acting in good faith and after reasonable effort, concludes that mutual agreement cannot be reached concerning the appropriate measures of preservation or mitigation. (Tribal Consultation Guidelines, Governor's Office of Planning and Research (2005) at p. 18).

Agencies should be aware that neither AB 52 nor SB 18 precludes agencies from initiating tribal consultation with tribes that are traditionally and culturally affiliated with their jurisdictions before the timeframes provided in AB 52 and SB 18. For that reason, we urge you to continue to request Native American Tribal Contact Lists and "Sacred Lands File" searches from the NAHC. The request forms can be found online at: http://nahc.ca.gov/resources/forms/

NAHC Recommendations for Cultural Resources Assessments

To adequately assess the existence and significance of tribal cultural resources and plan for avoidance, preservation in place, or barring both, mitigation of project-related impacts to tribal cultural resources, the NAHC recommends the following actions:

1. Contact the appropriate regional California Historical Research Information System (CHRIS) Center (http://ohp.parks.ca.gov/?page_id=1068) for an archaeological records search. The records search will determine:
    a. If part or all of the APE has been previously surveyed for cultural resources.
    b. If any known cultural resources have already been recorded on or adjacent to the APE.
    c. If the probability is low, moderate, or high that cultural resources are located in the APE.
    d. If a survey is required to determine whether previously unrecorded cultural resources are present.

2. If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
    a. The final report containing site forms, site significance, and mitigation measures should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum and not be made available for public disclosure.
    b. The final written report should be submitted within 3 months after work has been completed to the appropriate regional CHRIS center.

3. Contact the NAHC for:
    a. A Sacred Lands File search. Remember that tribes do not always record their sacred sites in the Sacred Lands File, nor are they required to do so. A Sacred Lands File search is not a substitute for consultation with tribes that are traditionally and culturally affiliated with the geographic area of the project's APE.
    b. A Native American Tribal Consultation List of appropriate tribes for consultation concerning the project site and to assist in planning for avoidance, preservation in place, or, failing both, mitigation measures.

4. Remember that the lack of surface evidence of archaeological resources (including tribal cultural resources) does not preclude their subsurface existence.
    a. Lead agencies should include in their mitigation and monitoring reporting program plan provisions for the identification and evaluation of inadvertently discovered archaeological resources per Cal. Code Regs., tit. 14, §15064.5(f) (CEQA Guidelines §15064.5(f)). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American with knowledge of cultural resources should monitor all ground-disturbing activities.
    b. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the disposition of recovered cultural items that are not burial associated in consultation with culturally affiliated Native Americans.
    c. Lead agencies should include in their mitigation and monitoring reporting program plans provisions for the treatment and disposition of inadvertently discovered Native American human remains. Health and Safety Code §7050.5, Public Resources Code §5097.98, and Cal. Code Regs., tit. 14, §15064.5, subdivisions (d) and (e) (CEQA Guidelines §15064.5, subds. (d) and (e)) address the processes to be followed in the event of an inadvertent discovery of any Native American human remains and associated grave goods in a location other than a dedicated cemetery.

If you have any questions or need additional information, please contact me at my email address: Andrew.Green@nahc.ca.gov.

Sincerely,

Andrew Green
Staff Services Analyst

cc: State Clearinghouse

South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

SENT VIA USPS AND E-MAIL: September 3, 2019

sdjones@planning.lacounty.gov
Steven Jones
County of Los Angeles, Regional Planning Department
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Notice of Preparation of a Draft Environmental Impact Report for the Proposed Sterling Ranch Residential Project

South Coast Air Quality Management District (South Coast AQMD) staff appreciates the opportunity to comment on the above-mentioned document. South Coast AQMD staff's comments are recommendations regarding the analysis of potential air quality impacts from the Proposed Project that should be included in the Draft Environmental Impact Report (EIR). Please send South Coast AQMD a copy of the Draft EIR upon its completion. Note that copies of the Draft EIR that are submitted to the State Clearinghouse are not forwarded to South Coast AQMD. Please forward a copy of the Draft EIR directly to South Coast AQMD at the address shown in the letterhead. **In addition, please send with the Draft EIR all appendices or technical documents related to the air quality, health risk, and greenhouse gas analyses and electronic versions of all air quality modeling and health risk assessment files[1]. These include emission calculation spreadsheets and modeling input and output files (not PDF files). Without all files and supporting documentation, South Coast AQMD staff will be unable to complete our review of the air quality analyses in a timely manner. Any delays in providing all supporting documentation will require additional time for review beyond the end of the comment period.**

Air Quality Analysis

South Coast AQMD adopted its California Environmental Quality Act (CEQA) Air Quality Handbook in 1993 to assist other public agencies with the preparation of air quality analyses. South Coast AQMD recommends that the Lead Agency use this Handbook as guidance when preparing its air quality analysis. Copies of the Handbook are available from South Coast AQMD's Subscription Services Department by calling (909) 396-3720. More guidance developed since this Handbook is also available on South Coast AQMD's website at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/ceqa-air-quality-handbook-(1993). South Coast AQMD staff also recommends that the Lead Agency use the CalEEMod land use emissions software. This software has recently been updated to incorporate up-to-date state and locally approved emission factors and methodologies for estimating pollutant emissions from typical land use development. CalEEMod is the only software model maintained by the California Air Pollution Control Officers Association (CAPCOA) and replaces the now outdated URBEMIS. This model is available free of charge at: www.caleemod.com.

[1] Pursuant to the CEQA Guidelines Section 15174, the information contained in an EIR shall include summarized technical data, maps, plot plans, diagrams, and similar relevant information sufficient to permit full assessment of significant environmental impacts by reviewing agencies and members of the public. Placement of highly technical and specialized analysis and data in the body of an EIR should be avoided through inclusion of supporting information and analyses as appendices to the main body of the EIR. Appendices to the EIR may be prepared in volumes separate from the basic EIR document, but shall be readily available for public examination and shall be submitted to all clearinghouses which assist in public review.

South Coast AQMD has also developed both regional and localized significance thresholds. South Coast AQMD staff requests that the Lead Agency quantify criteria pollutant emissions and compare the results to South Coast AQMD's CEQA regional pollutant emissions significance thresholds to determine air quality impacts. South Coast AQMD's CEQA regional pollutant emissions significance thresholds can be found here at: http://www.aqmd.gov/docs/default-source/ceqa/handbook/scaqmd-air-quality-significance-thresholds.pdf. In addition to analyzing regional air quality impacts, South Coast AQMD staff recommends calculating localized air quality impacts and comparing the results to localized significance thresholds (LSTs). LSTs can be used in addition to the recommended regional significance thresholds as a second indication of air quality impacts when preparing a CEQA document. Therefore, when preparing the air quality analysis for the Proposed Project, it is recommended that the Lead Agency perform a localized analysis by either using the LSTs developed by South Coast AQMD staff or performing dispersion modeling as necessary. Guidance for performing a localized air quality analysis can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/localized-significance-thresholds.

The Lead Agency should identify any potential adverse air quality impacts that could occur from all phases of the Proposed Project and all air pollutant sources related to the Proposed Project. Air quality impacts from both construction (including demolition, if any) and operations should be calculated. Construction-related air quality impacts typically include, but are not limited to, emissions from the use of heavy-duty equipment from grading, earth-loading/unloading, paving, architectural coatings, off-road mobile sources (e.g., heavy-duty construction equipment) and on-road mobile sources (e.g., construction worker vehicle trips, material transport trips). Operation-related air quality impacts may include, but are not limited to, emissions from stationary sources (e.g., boilers), area sources (e.g., solvents and coatings), and vehicular trips (e.g., on- and off-road tailpipe emissions and entrained dust). Air quality impacts from indirect sources, such as sources that generate or attract vehicular trips, should be included in the analysis.

In the event that the Proposed Project generates or attracts vehicular trips, especially heavy-duty diesel-fueled vehicles, it is recommended that the Lead Agency perform a mobile source health risk assessment. Guidance for performing a mobile source health risk assessment ("*Health Risk Assessment Guidance for Analyzing Cancer Risk from Mobile Source Diesel Idling Emissions for CEQA Air Quality Analysis*") can be found at: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mobile-source-toxics-analysis. An analysis of all toxic air contaminant impacts due to the use of equipment potentially generating such air pollutants should also be included.

In addition, guidance on siting incompatible land uses can be found in the California Air Resources Board's *Air Quality and Land Use Handbook: A Community Health Perspective*, which can be found at: http://www.arb.ca.gov/ch/handbook.pdf. CARB's Land Use Handbook is a general reference guide for evaluating and reducing air pollution impacts associated with new projects that go through the land use decision-making process. Guidance[2] on strategies to reduce air pollution exposure near high-volume roadways can be found at: https://www.arb.ca.gov/ch/rd_technical_advisory_final.PDF.

Mitigation Measures

In the event that the Proposed Project generates significant adverse air quality impacts, CEQA requires that all feasible mitigation measures that go beyond what is required by law be utilized during project construction and operation to minimize these impacts. Pursuant to CEQA Guidelines Section 15126.4 (a)(1)(D), any impacts resulting from mitigation measures must also be discussed. Several resources are

[2] In April 2017, CARB published a technical advisory, *Strategies to Reduce Air Pollution Exposure Near High-Volume Roadways: Technical Advisory*, to supplement CARB's Air Quality and Land Use Handbook: A Community Health Perspective. This technical advisory is intended to provide information on strategies to reduce exposures to traffic emissions near high-volume roadways to assist land use planning and decision-making in order to protect public health and promote equity and environmental justice. The technical advisory is available at: https://www.arb.ca.gov/ch/landuse.htm.

available to assist the Lead Agency with identifying potential mitigation measures for the Proposed Project, including:

- Chapter 11 "Mitigating the Impact of a Project" of South Coast AQMD'S *CEQA Air Quality Handbook* South Coast AQMD's CEQA web pages available here: http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook/mitigation-measures-and-control-efficiencies
- South Coast AQMD's Rule 403 – Fugitive Dust, and the Implementation Handbook for controlling construction-related emissions and Rule 1403 – Asbestos Emissions from Demolition/Renovation Activities
- South Coast AQMD's Mitigation Monitoring and Reporting Plan (MMRP) for the 2016 Air Quality Management Plan (2016 AQMP) available here (starting on page 86): http://www.aqmd.gov/docs/default-source/Agendas/Governing-Board/2017/2017-mar3-035.pdf
- CAPCOA's *Quantifying Greenhouse Gas Mitigation Measures* available here: http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

Alternatives

In the event that the Proposed Project generates significant adverse air quality impacts, CEQA requires the consideration and discussion of alternatives to the project or its location which are capable of avoiding or substantially lessening any of the significant effects of the project. The discussion of a reasonable range of potentially feasible alternatives, including a "no project" alternative, is intended to foster informed decision-making and public participation. Pursuant to CEQA Guidelines Section 15126.6(d), the Draft EIR shall include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the Proposed Project.

Permits

If implementation of the Proposed Project requires a permit from South Coast AQMD, South Coast AQMD should be identified as a Responsible Agency for the Proposed Project in the EIR. For more information on permits, please visit South Coast AQMD's webpage at: http://www.aqmd.gov/home/permits. Questions on permits can be directed to South Coast AQMD's Engineering and Permitting staff at (909) 396-3385.

Data Sources

South Coast AQMD rules and relevant air quality reports and data are available by calling South Coast AQMD's Public Information Center at (909) 396-2039. Much of the information available through the Public Information Center is also available at South Coast AQMD's webpage at: http://www.aqmd.gov.

South Coast AQMD staff is available to work with the Lead Agency to ensure that project's air quality and health risk impacts are accurately evaluated and mitigated where feasible. If you have any questions regarding this letter, please contact me at lsun@aqmd.gov.

Sincerely,

Lijin Sun

Lijin Sun, J.D.
Program Supervisor, CEQA IGR
Planning, Rule Development & Area Sources

LS
LAC190806-02
Control Number

Sterling Ranch Residential Project

Summary

SCH Number	2019080092
Lead Agency	Los Angeles County
Document Title	Sterling Ranch Residential Project
Document Type	NOP - Notice of Preperation
Received	8/5/2019
Project Applicant	Meridian Consultants
Present Land Use	R1 (single family residence) C2 (neighborhood commercial), H2 Residential. H5 Residential, CG General Commercial
Document Description	113.9-acre residential community consisting of 222 detached single-family residential lots on 57.9 acres, a passive pocket park on 0.2 acres, a passive park with a tot lot, shade structure and tables o n 3.4 acres, and 21 ,000 square feet of commercial uses with 71 parking spaces on 2.5 acres
Contact Information	Steven Jones Los Angeles Department of Regional Planning 320 West Temple Street Los Angeles, CA 90012 Phone : (213) 974-6433

Location

Coordinates	34°26'53.5"N 118°39'26.3"W
Cities	Val Verde
Counties	Los Angeles
Cross Streets	Coolidge Avenue and Del Valle Road
Zip	91384
Total Acres	151.8
Parcel #	327-1004-012
State Highways	Interstate 5/State Route 1
Schools	Castaic Union School
Waterways	2 unnamed ephemeral waterways
Township	T04N
Range	R17W
Section	10
Base	San Be

Notice of Completion

Review Period Start 8/5/2019

Review Period End 9/3/2019

Development Type Residential (222 Units, 57.9 Acres) | Commercial (21,000 Sq. Ft.) | Recreational (open space/parks makes up remaining acreage)

Local Action Site Plan | Use Permit

Project Issues Aesthetic/Visual | Agricultural Land | Air Quality | Archaeologic-Historic | Biological Resources | Drainage/Absorption | Economics/Jobs | Flood Plain/Flooding | Forest Land/Fire Hazard | Geologic/Seismic | Minerals | Noise | Population/Housing Balance | Public Services | Recreation/Parks | Schools/Universities | Septic System | Sewer Capacity | Soil Erosion/Compaction/Grading | Solid Waste | Toxic/Hazardous | Traffic/Circulation | Vegetation | Water Quality | Water Supply | Wetland/Riparian | Wildlife | Growth Inducing | Land Use | Cumulative Effects

Reviewing Agencies Air Resources Board, Transportation Projects | Cal Fire | California Department of Parks and Recreation | California Highway Patrol | Caltrans, District 7 | Department of Conservation | Department of Fish and Wildlife, Region 5 | Department of Toxic Substances Control | Office of Emergency Services, California | Office of Historic Preservation | Regional Water Quality Control Board, Region 4 | Resources Agency | State Lands Commission | State Water Resources Control Board | Native American Heritage Commission

Attachments

Environmental Document Sterling Ranch IS_080519 PDF 4699 K | Sterling Ranch NOP 080519 PDF 3339 K

NOC Letter PDF 574 K | NOC PDF 1458 K

State Comments 2019080092_NAHC_NOP Sterling Ranch Residential Project 8 PDF 167 K

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August 26, 2019

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Division Section
320 West Temple Street, Room 1362
Los Angeles, California 90012

Notice of Preparation Comments
Sterling Ranch Estates Residential Project VTPM No. 0602257

Dear Mr. Jones:

The Santa Monica Mountains Conservancy (Conservancy) offers the following comments on the Notice of Preparation for the Sterling Ranch Estates Residential Project proposal to construct 222 single family homes on approximately 114 acres in the most easterly extent of the Sierra Madre Mountains north of Highway 126 and east of Interstate 5. The Conservancy opposes the project as proposed because both the ratio of permanent natural open space to development area and the poor connectivity of the proposed dedicated open space are not adequate to offset the loss of habitat from the greater Los Padres and western Angeles National Forest core habitat areas. To reduce these potential significant biological impacts to a less than significant level, the Conservancy offers the following comments to shape the range of alternatives and mitigation measures.

Biological Resources

The Initial Study fails to recognize high biological value plant communities located over large portions of the subject property. The Initial Study asserts, based on the Draft Biological Technical Report, that the "Project site is not considered an oak woodland ... [and] does not contain riparian habitat or coastal sage scrub." However, data layers from GAP/LANDFIRE National Terrestrial Ecosystems dataset produced by the United States Geological Survey documents that mixed oak savanna and coastal sage scrub and chaparral (CSS/C) exist within the Project site. A cursory review of Google Earth also indicates CSS/C exists on northern slopes throughout the Project site. Further, many northern-facing slopes with CSS/C in this immediate area also contain a soil crust of lichens and bryophytes that take over 100 years to fully develop. Venturan sage scrub is increasingly rare in the Santa Clara River watershed. As proposed the project would eliminate scores of acres of

ecologically valuable habitat that remains well connected to core habitat of statewide significance.

Areas south of Del Valle Road appear to contain a low shrub and grassland habitat sometimes termed "Box Springs Goldenbush-grassland" that typically blooms in late August through September and may have been missed by biologists performing Spring surveys. Supplemental biological surveys should be required to ensure this unique and rare habitat is accounted for in the DEIR.

Grasslands (including non-native annual) andscrub-grassland complexes are essential to many raptors for prey hunting. In addition, burrowing owl (*Athene cunicularia*) could well use the grassland habitats onsite to hunt and nest. A focused survey for burrowing owl using California Department of Fish and Wildlife protocol must be conducted prior the release of the Draft EIR.

Because of its regional sensitivity Venturan sage scrub (CSS) should be avoided where possible and set back over 200 feet from homes to prevent inclusion on fuel modification zones. The DEIR should include at least one alternative that, in part, is specifically designed to avoid and permanently protect a minimum 20-acre contiguous block of sage scrub - grassland complex within the 114-acre project boundary. No more than 2 acres of that preserved onsite area should be within any part of a fuel modification zone.

As a Condition of Approval for the nearly adjacent Sterling Gateway Industrial Park, the construction and maintenance of an ephemeral pond was required to mitigate for impacts to western spadefoot toad (*Spea hammondii*) habitat. Regular monitoring visits to this toad pond by Mountains Recreation and Conservation Authority (MRCA) staff have documented intermittent occurrences of western spadefoot toad tadpoles. Given this propensity for western spadefoot toads in the Project site's vicinity (less than one-half mile), additional surveys and mitigation measures for avoidance and potential compensatory loss of this species are recommended. The MRCA holds conservation easements over the pond and its watershed as shown on the attached figure.

Need for Habitat Replacement Mitigation

Time and time again the Regional Planning staff is seeing that the creation and enhancement of upland habitat types as compensatory mitigation is cost prohibitive because of water/irrigation costs, weeding costs, herbivory exclusion, inadequate nursery stock and timing, and susceptibility to drought. The myth of successful upland habitat creation and restoration is near fully exposed. Can the Regional Planning staff or the DEIR preparers identify a single example of a fully successful upland habitat restoration project that is greater than a quarter-acre in size in any County watershed let alone the Santa Clara River watershed? If not, how can such mitigation continue to be allowed to used in EIRs overseen by County staff?

The formation of upland habitats with their soil composition and fauna and age classes of perennial vegetation cannot be cost effectively created even in 5-7 year mitigation time windows. The establishment of either container plants or of all forms of seeding in all types and disturbances states of upland habitats does not adequately mitigate for the elimination of established plant communities – even at high replacement ratios. Upland plant community habitat restoration cannot be included as a mitigation measure to offset habitat loss until the success of such restoration has been demonstrated.

For any impacted chaparral, coastal sage scrub, or shrub-grassland complex onsite, the County should maintain its consistency with conditioning Santa Clara River watershed projects and require that permanent offsite preservation of ecologically equivalent habitat of equal or greater acreage. Required protection of replacement habitat is the only effective mitigation. Furthermore, the long-term efficacy of that replacement habitat mitigation requires permanent protection via conservation easements or fee simple transfers to public park agencies prior to any grading or grubbing impacts. In addition, for that level of ecological mitigation to be sustainable, the property must have a permanently funded form of oversight to both prevent and remedy human-caused degradation. The DEIR mitigation for open space dedications and the requirement of replacement habitat would remain deficient until it includes both permanent protection and a permanent oversight funding source that adjusts for inflation.

Wildlife Movement

As proposed the Project would sever all onsite wildlife movement from regionally significant core habitat area to the northwest to key habitat resources to the south that include protected MRCA habitat, the project's proposed fee simple open space dedication, and habitat linkages that reach both lower Haskell Creek and Castaic Creek. The rights-of-ways for high tension power lines help facilitate these habitat linkages that each only cross one paved road. The DEIR must address the existence and value of these habitat linkages to nearby unchannelized stream courses. How else will wildlife from the Los Padres National Forest ecosystem reach the either the Santa Clara River or Castaic Creek in Los Angeles County given the immense barriers approved with the total Newhall Ranch project?

The project's complete barrier to wildlife movement through the site in any direction is an avoidable significant biological impact. At least two project alternatives must include permanently protected habitat linkages free of all fencing and all other barriers that would adversely affect movement of mule deer, bobcats, and grey foxes from the northern project boundary to the southeastern project corner. Such linkages should include a wildlife underpass beneath De Valle Road that is at least ten feet tall and fifteen feet wide. Attached is a figure that shows such a habitat linkage centerline through the middle of the project aligned with a potential road underpass location. To remain permanently effective, the onsite designated habitat linkage must be covered by a conservation easement.

The proposed 37.9-acre fee simple open space dedication would lose significant ecological value if it is not connected to larger habitat blocks to the north in particular. A near ecologically isolated 37.9 acres habitat block has only a fraction of the wildlife habitat value as a moderately well connected habitat block of the same size and composition. The project proponent cannot control land use on adjoining private properties, but the Draft EIR must at least analyze and disclose what specific real estate ownership offsite protection measures could secure permanent habitat connectivity between the project site and the subject 37.9-acre proposed dedication. Without such information, decision makers cannot adequately assess the ecological value of the 37.9-acre proposed dedication.

The DEIR should also analyze alternatives that incorporate permanent native vegetation growth in additional and/or larger debris or infiltration basins in order to provide cover habitat for species to move through the proposed Project site. Considering the high number of housing units in the project and the total volume of grading required to build the Project as proposed, such additional or larger detention basins and a wildlife crossing structure are project costs that should be easily absorbed. In short, well designed detention and retention basins can be part of a functional wildlife corridor if fencing requirements can be addressed–such as by gentle sloping sides and post and rail fencing.

A dedicated wildlife corridor would also provide opportunities to incorporate additional open space to help mitigate for urbanized heat island effects as climate change continues to raise temperatures in Southern California.

Fee Dedicated Open Space and Long-term Management Funding

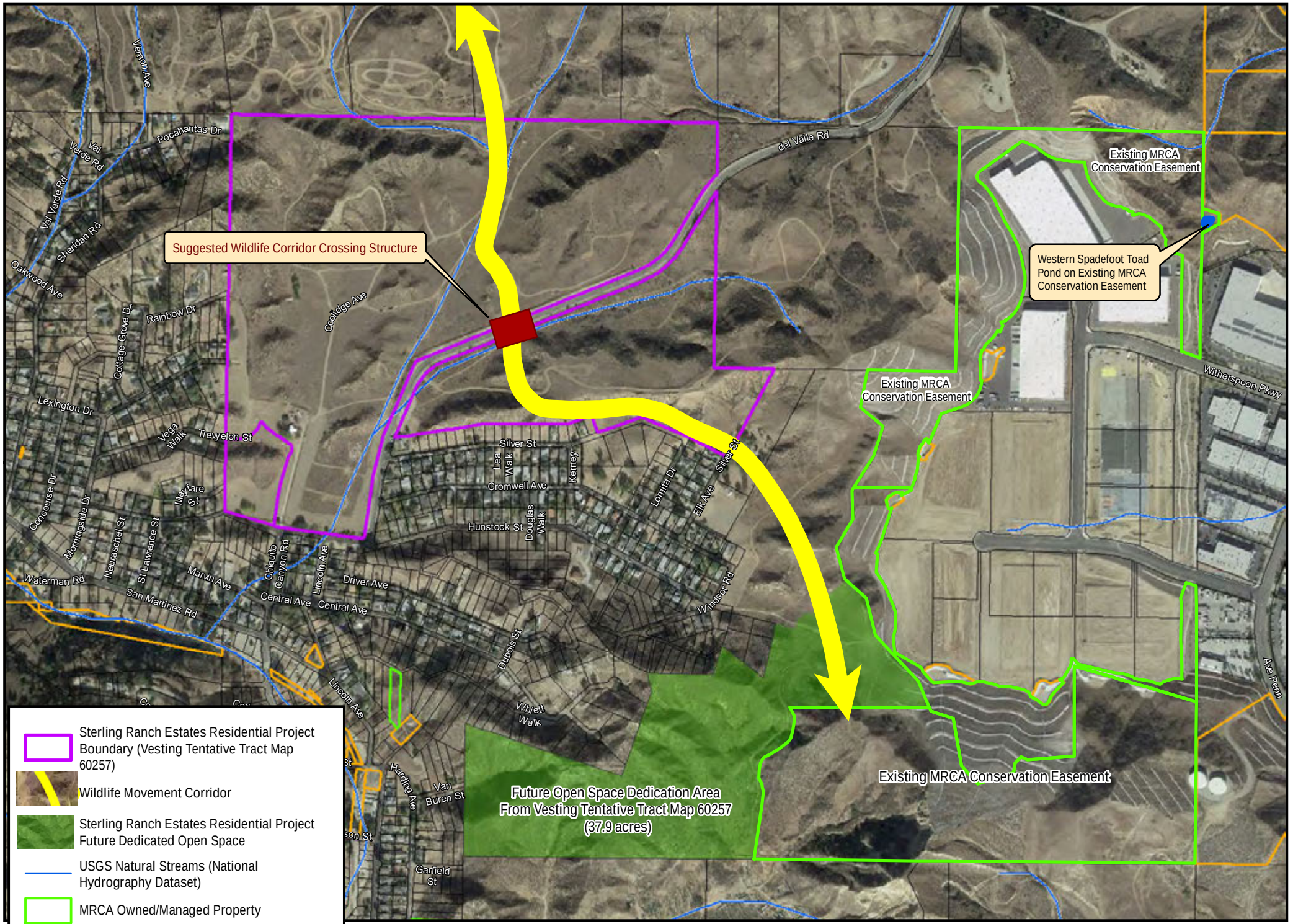
In order to ensure long-term protection and mitigation value of the proposed non-contiguous off-site open space dedication, a permanent funding source must be set up as a condition of approval. The options for a permanent funding source to monitor and protect fee simple open space include a developer-funded long-term management account, landscape maintenance district, or community facilities district. Home Owners Association funding via CC&Rs for non-tract-contiguous fee simple open space is not reliable enough over decades to ensure adequate open space oversight and protection.

The optimal ecosystem benefit would come from the fee simple dedication of the off-site open space dedication to a public agency as a condition of tract map recordation. To maintain the ecological value of said dedication, the public agency must have a permanent dedicated funding source from the project via its conditions of approval. The open space will be in close proximity to residential neighborhoods and people like to explore, walk dogs, and revisit open lands near where they live. A guaranteed annual payment of $5,000 with a CPI inflation adjustor to the fee simple holding public agency is essential to ensure the integrity of the open space over the course of decades and increasing pressures from humans and domestic pets.

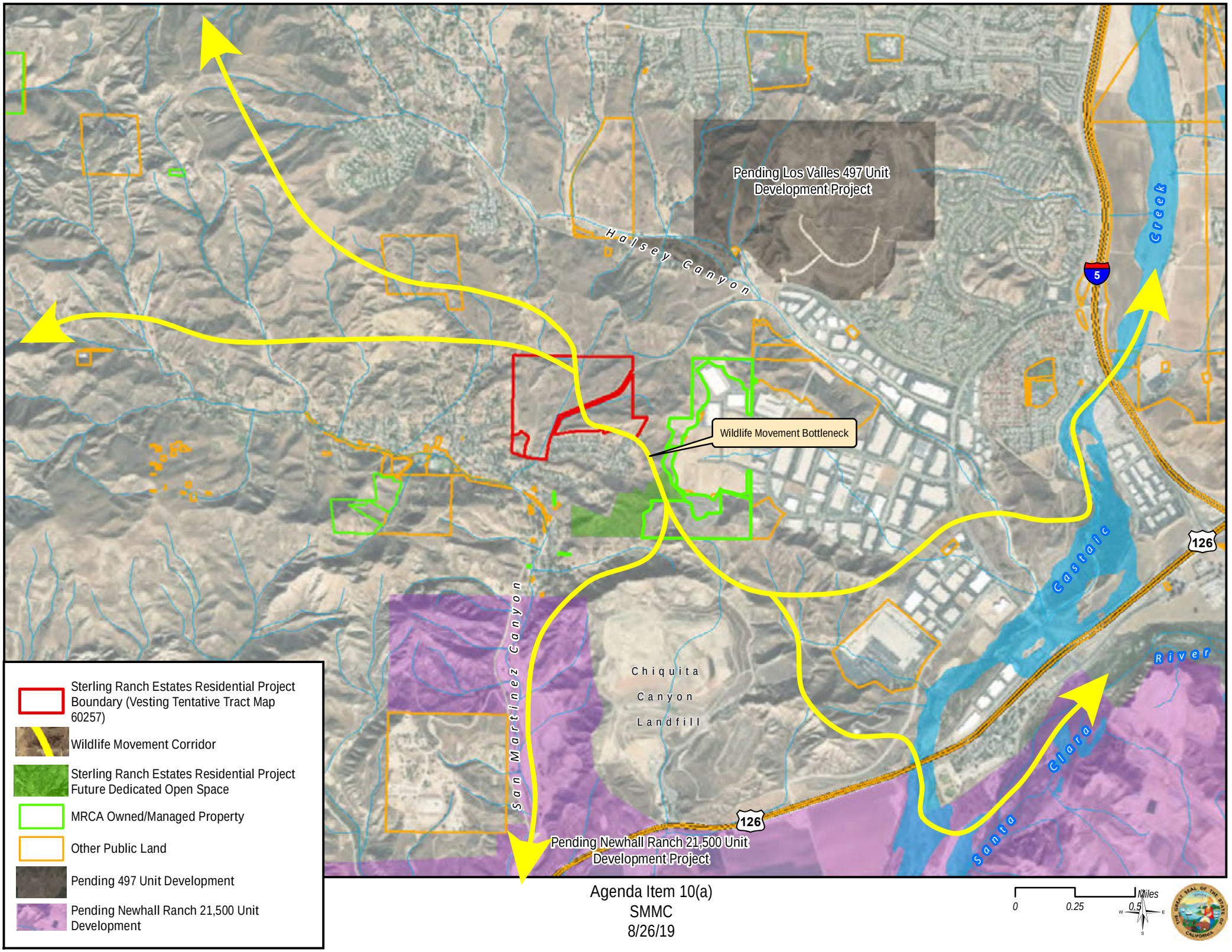
Please address any future correspondence to Paul Edelman, Deputy Director Natural Resources and Planning, at the above letterhead address, by email at edelman@smmc.ca.gov, or by phone at (310) 589-3200 ext. 128.

Sincerely,

IRMA MUÑOZ
Chairperson



Agenda Item 10(a)
SMMC
8/26/19



Agenda Item 10(a)
SMMC
8/26/19

Kelene Strain

From: Steven Jones <sdjones@planning.lacounty.gov>
Sent: Tuesday, August 27, 2019 5:46 PM
To: Kelene Strain; Mari Prutz
Cc: Hunt Williams; Kathleen Truman
Subject: FW: Sterling Ranch - Project No. 03-250-(5)

You asked about the call/message regarding project site location.

From: Eileen.C [mailto:Eileen.C@verizon.net]
Sent: Tuesday, August 27, 2019 12:54 PM
To: Steven Jones <sdjones@planning.lacounty.gov>
Subject: RE: Sterling Ranch - Project No. 03-250-(5)

CAUTION: This email originated outside of the County. Please do not click links or open attachments unless you recognize the sender and expect the message.

Thank you. I am guessing that this property will not likely be worth too much being outside of the proposed areas.

Thank you for letting me understand where it is located in relationship to the proposed new housing / green space.

Your help is appreciated very much.

Eileen Chapman

From: Steven Jones [mailto:sdjones@planning.lacounty.gov]
Sent: Tuesday, August 27, 2019 11:45 AM
To: Eileen.C
Subject: RE: Sterling Ranch - Project No. 03-250-(5)

No problem. It's about 359 feet from the nearest proposed developed portion of the site and about 1,530 feet from the proposed open space of the project.

From: Eileen.C [mailto:Eileen.C@verizon.net]
Sent: Thursday, August 15, 2019 2:10 PM
To: Steven Jones <sdjones@planning.lacounty.gov>
Subject: RE: Sterling Ranch - Project No. 03-250-(5)

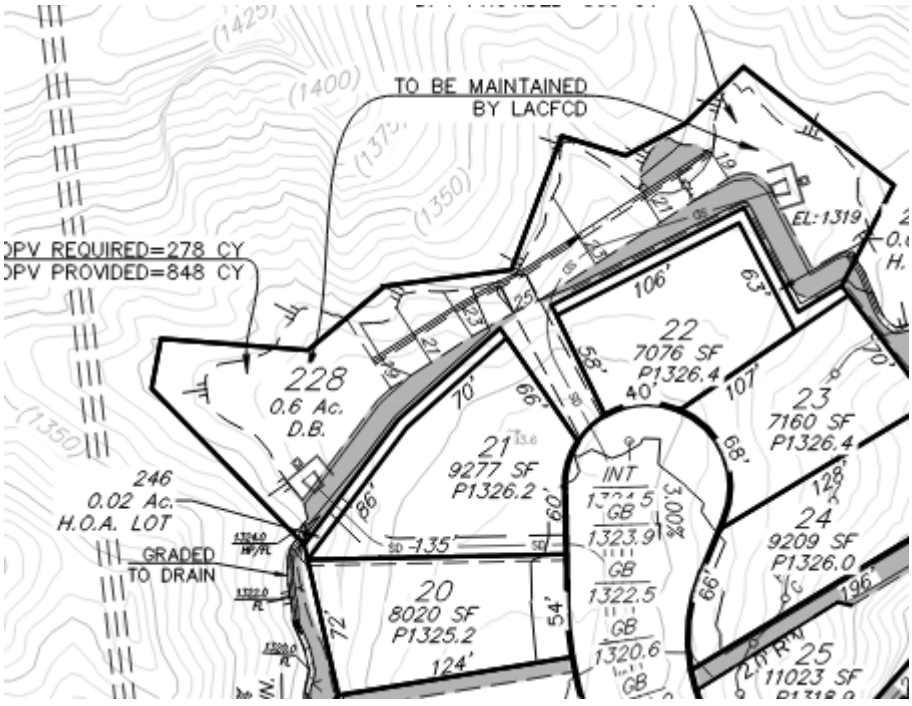
Does Lot 22 in this Assessor's Map = Lot 22 on the project map? Or is Lot 22 on the project map completely different?

I am just trying to figure out where my property is located in relation to the Sterling Ranch project. Thank you for helping me. I appreciate it.

Eileen Chapman

Assessor Map

Project Map



From: Steven Jones [mailto:sdjones@planning.lacounty.gov]
Sent: Tuesday, August 13, 2019 5:27 PM

To: Eileen.C
Subject: RE: Sterling Ranch - Project No. 03-250-(5)

Hello,

The scope of the proposed EIR only includes the following APNs:

3271004003
3271004013
3271005024

Your property is a few feet away from the southern end (Hunstock and Chiquito Canyon Road) of the project area.

Please visit the project page on the DRP website for more information and feel free to contact me if you have questions regarding the file material.

Thanks,
Steven Jones
(213)974-6433

From: Eileen.C [mailto:Eileen.C@verizon.net]
Sent: Friday, August 09, 2019 8:46 AM
To: Steven Jones <sdjones@planning.lacounty.gov>
Subject: Sterling Ranch - Project No. 03-250-(5)

Dear Mr. Jones,

Can you tell me if the property I own is within the scope of the map sent in the recent letter requesting input for an Environmental Impact Report?

My property:

AIN: 3271 018 001

Tract #8672 Lot 22

If it is not in the scope if the project, what is the proximity to the project? Will the roads be improved in the area of my property?

I live about 1 1/2 hours away from the physical documents. Any help you can give will be greatly appreciated.

Thank you.

Eileen Chapman
42036 47th Street West
Quartz Hill, CA 93536
661-722-7933

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

The following is Quote from the Castaic Standards District filed with the County of Los Angeles for more than two decades. I believe this has not been met in regards to the above referenced proposed project.

> Substantial *Community* Support. The project must have substantial *community* support. For purposes of this requirement, substantial *community* support requires at least two-thirds of all written comment letters received from residents, property owners, and businesses **within 1,000 feet from the project boundary** to support the project. In reaching this threshold, every person signing a written comment letter shall be counted separately, provided that such signature has been verified. The position of elected *community* organizations such as the Castaic Area Town Council will be considered and counted as one comment letter in determining substantial *community* support, provided it is the formal position of the governing board of such organization;

This project does NOT have that support in place and the members of this community within the 1,000 feet of the boundary have not been consulted and informed they have this right. It is shameful that this potential project is trying to ignore the rights of this historical community.

This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: Harry Cohen

Print Name: Harry Cohen

Print Address: 30052 Hunstock St Castaic CA 91384

Print Phone Number(s): 661-312-5374

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

The following is Quote from the Castaic Standards District filed with the County of Los Angeles for more than two decades. I believe this has not been met in regards to the above referenced proposed project.

> Substantial *Community* Support. The project must have substantial *community* support. For purposes of this requirement, substantial *community* support requires at least two-thirds of all written comment letters received from residents, property owners, and businesses **within 1,000 feet from the project boundary** to support the project. In reaching this threshold, every person signing a written comment letter shall be counted separately, provided that such signature has been verified. The position of elected *community* organizations such as the Castaic Area Town Council will be considered and counted as one comment letter in determining substantial *community* support, provided it is the formal position of the governing board of such organization;

This project does NOT have that support in place and the members of this community within the 1,000 feet of the boundary have not been consulted and informed they have this right. It is shameful that this potential project is trying to ignore the rights of this historical community.

This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: D Cotton

Print Name: [illegible]

Print Address: 30053 Hunstock St

Print Phone Number(s): 661 618 - 6608

September 18, 2019 **Delivered Via E-mail: sdjones@planning.lacountry.gov**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

Per the meeting held on August 5, 2019, at Live Oak Elementary School, regarding the proposed environmental impact report for the projected noted above, the following is Quote from the Castaic Standards District that I believe has not been met:

> Substantial *Community* Support. The project must have substantial *community* support. For purposes of this requirement, substantial *community* support requires at least two-thirds of all written comment letters received from residents, property owners, and businesses **within 1,000 feet from the project boundary** to support the project. In reaching this threshold, every person signing a written comment letter shall be counted separately, provided that such signature has been verified. The position of elected *community* organizations such as the Castaic Area Town Council will be considered and counted as one comment letter in determining substantial *community* support, provided it is the formal position of the governing board of such organization;

This project does NOT have that support in place and the members of this community within the 1,000 feet of the boundary have not been consulted and informed they have this right. It is shameful that this potential project is trying to ignore the rights of this historical community.

This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Abigail DeSesa

Abigail DeSesa
29145 Cottage Grove Drive
Castaic, CA 91384
661-775-2771

September 19, 2019 **Delivered Via E-mail: sdjones@planning.lacounty.gov**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

Per the meeting held on August 5, 2019, at Live Oak Elementary School, regarding the proposed environmental impact report for the projected noted above, the following is a list of some of my concerns as a twenty-year resident in Val Verde, residing within 1,000 feet of this proposed project.

- Valley Fever and the very real potential harm that can come to the current residents by disrupting that much soil directly in the middle of the community.
- Project does not meet the Castaic Standards District on file with the County regarding the destruction of ridgelines.
- Suburban HOA Tract Housing in the middle of a rural historical community. This creates a neighborhood of the *Haves And The Have Nots*. The social impact could be devastating.
- The private hiking trails as part of this development continues to create a divide in the neighborhood of the *Haves And The Have Nots*.
- The continued concern that the development wants to put in gates to the new HOA development which continues with the *Haves And The Have Nots* by dividing the community up. More social division creates a lack of cohesiveness.
- Extremely High Fire Zone – will cause current residents to have higher insurance premiums with higher end homes being built inside the current rural neighborhood. Most homeowners are barely able to get and afford the current high premiums for insurance now. This has the potential to create a very real financial hardship on the current residents.
- Widening Three Streets: Lexington will become a drive through street and there is simply not enough space to take the required property to build them without disastrously taking property away from current homeowners' property. They will lose their driveways and front yards. The other two streets set for widening would become fire/emergency streets. These also stand to take property away from current homeowners' property. It is not right to force current people out for an unwanted HOA tract housing development to move in.

- The rest of the entire neighborhood has very thin streets and has always been a concern with the fire department and emergency services trying to get through. Adding a nearly 25% increase in automobiles trying to evacuate during an emergency will cause a bottle neck and people may be killed. This is highly irresponsible of the County to consider such a large project in this area.
- Current homes in the area will have a loss in property value especially during construction. No one will want to buy a home smack in the middle of a massive messy development. After built, the current homes will not be "new" and will not be able to compete with the higher end homes causing a loss in value again.
- After the recent approval for another thirty years of what will become one of the largest landfills in the country under a mile away (Chiquita Canyon Landfill), how can the County justify more people living in the shadow of this giant landfill? The health risks to the residents are still unknown.
- The proposed drainage basin and shopping plaza will divide the existing Val Verde with the private HOA tract housing subdivision. The current residents along Hunstock will have a major drop in the value of their homes with a smelly large drainage basin becoming their direct view in their front yards.
- It is irresponsible of the County to even remotely consider any development in Val Verde until the serious flooding is handled at Del Valle and Hasley Canyon. Currently, the rural community of Val Verde is trapped in the canyon during annual heavy rains when that intersection floods out. A bridge is needed there and has been needed for decades. Adding approximately a 25% increase in population in this canyon is irresponsible without having that project completed first.
- How is it the County of Los Angeles can afford to a lot more water to more homes when we are regularly put under water usage restrictions. This does not add up and is again irresponsible to consider.
- A development of this size would cause a 100% disruption to the current residents with noise, dust, reduced air quality and traffic detours and delays in a HIGH RISK FIRE area.
- This project does NOT satisfy the states low income housing requirements.
- The potential for the 222 new homes to build a second unit/home/living space on their property could become 444 total new homes. That means it would nearly **double** the entire population in the rural canyon community. The impact on the community could be catastrophic. Nothing is designed to handle that many people and automobiles in this high fire risk canyon.
- The wellbeing to he culture of this historical canyon and the feel of life out here would be destroyed forever!
- Quote from the Castaic Standards District: "Substantial *Community* Support. The project must have substantial *community* support. For purposes of this requirement, substantial *community* support requires at least two-thirds of all written comment letters received from residents, property owners, and businesses **within 1,000 feet from the project boundary** to support the project. In reaching this threshold, every person signing a written comment letter shall be counted separately, provided that such signature has been verified. The position of elected *community* organizations such as the Castaic Area Town Council will be considered and counted as one comment letter in determining substantial *community* support, provided it is the formal position of the governing board of such organization;" This project does NOT have

that support. This letter is to officially go on record that I am **against** the proposed project.

The above is a list of my initial comments and concerns, but are not limited to them. I reserve the right to have additional comments and concerns as time reveals more information that come to light with this proposed project.

These concerns and comments are submitted respectfully for your consideration. Thank you for your attention to this matter.

Respectfully,

Abigail DeSesa

Abigail DeSesa
29145 Cottage Grove Drive
Castaic, CA 91384
661-775-2771

September 19, 2019 **Delivered Via E-mail: sdjones@planning.lacounty.gov**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

Per the meeting held on August 5, 2019, at Live Oak Elementary School, regarding the proposed environmental impact report for the projected noted above, the following is a few ideas for some alternate use for the land. You requested ideas be sent in to you by September 20, 2019.

Develop the land for a destination medium size hotel (maybe 50 or 60 guest rooms) with lots of amenities that a rural area like this can support and uniquely offer. It can include things like hiking trails, country venue setting for weddings and corporate retreats, both inside and outside. The hotel can include a restaurant to service the guests and people from the greater Santa Clarita Valley area. It could offer a beautiful pool, yoga classes / retreats, and a country setting spa for messages and other pampering services for both guests and the people of greater Santa Clarita Valley area. It would bring employment to the area and generate taxes for the County of Los Angeles. The majority of the land could still be open space and utilized for the beauty as well as the hiking trails. The property would have a large increase in value with a development like this and could have a larger buffer between the current residents and the hotel. It would not take nearly as long to develop or require so many changes to the streets. The current proposal has 222 homes which represents a bare minimum of 444 additional vehicles on the streets from those homes without counting any of the delivery vehicles or hired vehicles bringing in the workers like gardeners and repairmen. A hotel of that size would not bring in more than 100 vehicles on average with full occupancy, employees and the local patrons.

An executive golf course could be developed on this land. I understand that is smaller than the traditional full-size golf course. It would keep down the daily traffic and pollution associated with the HOA tract housing development as shown in the first example. It would bring a large increase in value to the land for the land owner, create employment, and generates taxes for the County of Los Angeles. It also creates an astatically pleasing environment and could be developed to be environmentally friendly. It could have a clubhouse that has the ability to hold weddings and corporate retreats to generate more money for the owner of the golf course.

With a little thought, and possibly rezoning of that land, there is potentially a long list of things that it could be used for. The land could still become more valuable for the land owner, which is clearly what is driving this proposed project, and even generate money for the County of Los Angeles. The above is only two ideas without any research. I believe with a little input from the current residents, and some research, a more agreeable option for this land could be discovered.

I am a resident of Val Verde Canyon for over 20 years. I feel putting in this 222 HOA tract housing subdivision, smack in the middle of this historical rural canyon, will destroy it. Please try to consider other options.

I am officially going on the record as **opposed** to the current project being considered for that land.

Thank you for your attention to this matter.

Respectfully,

Abigail DeSesa

Abigail DeSesa
29145 Cottage Grove Drive
Castaic, CA 91384
661-775-2771

Sterling Ranch Residential Project

SCH No. 2019080092

Environmental Impact Report Scoping Meeting

Please use this page to submit questions or comments regarding the scope and content of the environmental review and other information that should be included in the Environmental Impact Report.

Regarding perhaps a traditional definition of environmental impact, I would like to suggest that considerations of the impact on wildlife also take pollinators into account. This project proposes to raze acres and acres of sage, buckwheat, seasonal wildflowers, and other forage that is critical to the survival of both native pollinators and honeybees. Most new developments in Santa Clarita have not been replacing this forage with landscaping that is hospitible to pollinators. Additionally, other small fauna such as other insects, small reptiles, and birds need to be considered, as they all operate in balance with each other and with larger fauna, local flora, and us. The space and forage for these small, less considered, and not yet endangered creatures is critical.

See other side →

(If necessary, use the reverse side of the paper.)

Please complete the information below and print clearly to ensure that your comments are included in the record.

Name: Robin Dodge Phone:

Organization (if applicable):

Address: 30138 Trevyelon St.

City: Val Verde State: CA Zip: 91384

Email Address: (optional):

You may submit your comments during the meeting or to:

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012
Tel: 213-974-6433
Fax: (213) 626-0434
sdjones@planning.lacounty.gov

Please submit comments by 5:00 PM on, September 20, 2019.

Additionally, while perhaps not under the traditional purview of environmental impact, the history and current culture of the town needs to be considered. The town was created as a vacation destination for people of color, at a time when they were often unwelcome in County parks and pools. The town is currently very ethnically diverse, and still carries the vestige of a destination for those who are unwelcome elsewhere. It is not a wealthy community, but it is a community with a common sense of pride about our remote and quiet location. Much of the culture of the town runs contrary to the culture of HOA communities. Sticking a high-end HOA community into the middle of Val Verde would be a slap in the face to all of our diverse, working-class residents, who moved to Val Verde to get away from elitism, city-influences, and who frankly could not afford to go anywhere else. Development is fine, building is fine, but building Stevenson Ranch in the middle of Val Verde is a recipe for disaster.

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

The following is Quote from the Castaic Standards District filed with the County of Los Angeles for more than two decades. I believe this has not been met in regards to the above referenced proposed project.

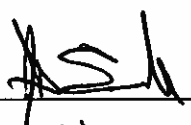
> Substantial *Community* Support. The project must have substantial *community* support. For purposes of this requirement, substantial *community* support requires at least two-thirds of all written comment letters received from residents, property owners, and businesses **within 1,000 feet from the project boundary** to support the project. In reaching this threshold, every person signing a written comment letter shall be counted separately, provided that such signature has been verified. The position of elected *community* organizations such as the Castaic Area Town Council will be considered and counted as one comment letter in determining substantial *community* support, provided it is the formal position of the governing board of such organization;

This project does NOT have that support in place and the members of this community within the 1,000 feet of the boundary have not been consulted and informed they have this right. It is shameful that this potential project is trying to ignore the rights of this historical community.

This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: 

Print Name: JIM EARLEY

Print Address: 28926 CHIQUITO CYN RD

Print Phone Number(s): 661 904 7479

September 19, 2019 Delivered Via E-mail: sdjones@planning.lacounty.gov

Steven Jones
County of Los Angeles
Department of Regional Planning
Lands Divisions Section
320 W. Temple St. Room 1362
Los Angeles, CA 90012
sdjones@planning.lacounty.gov

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012,3271-004-013, and 3271-005-032

Dear Mr. Jones,

I attended the meeting on August 5, 2019, at Live Oak Elementary School, regarding the proposed environmental impact of the project noted above.

As a resident for 18 years and my husband as a resident of 35 years, we have concerns about this project.

- I certainly hope the County of Los Angeles is aware of the historical value of this town and its buildings and amenities. During the early part of the 1900's segregation was a normal practice. The town of Val Verde was THE place to go for blacks. It was considered the black Palm Springs.
- The amount of soil being moved is enormous. I am fully aware of the existence of Valley Fever due to the 1994 earthquake. This amount of soil movement will bring the spores up into the air and make people sick. A housing project is not worth the illness it will cause.
- You have to consider the Chiquita Canyon Landfill's close proximity to the project and the health concerns the current residents have. This project will only add to the health concerns in contention in the courts right now between Los Angeles County, Chiquita Canyon Landfill and the current residents with ill health that is directly related to the operation of the landfill.
- The streets inside this HOA private project will empty on to existing streets in the town of Val Verde. Those existing streets were created in the early 20th century and this project does not address a four lane street emptying on to two (2) lane streets, Del Valle and Chiquito Canyon Road. Nor does it address the emergency streets that barely have room for one car to get through without avoiding other cars either parked or traveling on those roads.
- This project will possibly add over 600 more cars to this historic rural town with the possibility of doubling that number if those homeowners build additional

"homes" on their lots. This project adds 222 homes, at least two possibly three more drivers/cars on the roads. These roads can barely handle the traffic that is funneled through when Interstate 5 is closed, which happens frequently. They will definitely not handle 440+ more residents driving through. If necessary, I can provide pictures of the traffic when Interstate 5 is shut down.

- There is no provision for low income housing. The entire town of Val Verde is low income. This project will give the perception of the haves and the have nots.
- This area is geologically unstable per your own report. The hillsides along Chiquito Canyon Road and Del Valle do become impassable in rain storms. This town has been locked down and/or evacuated for fires and for mud slides on the existing roads. This project will only add to the problem by adding more homes and cars with no improvement to the two existing roads that we use to come into town and leave town.
- The placement of the catch basins is a big concern. The catch basins currently in this area frequently fill up and over flow across streets. The washes that exist overflow onto the roads during heavy rains and also undermine roads. The County of LA does not maintain the roads and washes well enough and streets that are undermined and cave in. I am still waiting for LA County to fill the road on Lincoln that was washed away. The catch basins in this project will overflow into homes in addition to the roads.
- Your own report highlights three areas that will potentially cause significant impact the Aesthetics
- Your own report highlights four areas that will potentially cause significant impact the Air Quality. I receive alerts from the AQMD a couple of times a day. The air is good until about 9 am. Then it becomes unhealthy for Sensitive groups, of which I am one. The quality does NOT go back to good until long after the midnight hour.
- Your own report highlights four areas that will potentially cause significant impact on the biological resources.
- Your own report highlights one area that will potentially cause significant impact on the cultural resources.
- Your own report highlights six areas that will potentially cause significant impact on the Geology and soils.
- Your own report highlights two areas that will potentially cause significant impact on the greenhouse gas emissions.
- Your own report highlights four areas that will potentially cause significant impact on the hazards and hazardous materials.
- Your own report highlights seven areas that will potentially cause significant impact on the hydrology and water quality
- Your report does not highlight the land use and planning impacts as causing significant impact. This development creates two towns. One is a town of the haves and the other of have nots.
- Your own report highlights six areas that will potentially cause significant impact on the noise.
- Your own report highlights three areas that will potentially cause significant impact on the transportation.

- Your own report highlights five areas that will potentially cause significant impact on the utilities and services.
- Your own report highlights three areas that will potentially cause significant impact on the wildfires. The entire Santa Clarita Valley is in a high risk area for wildfires. Current homeowners are having their insurance cancelled and are struggling to get coverage for their homes that they can afford.
- Your own report highlights four areas that will potentially cause significant impact on the mandatory findings of significance.

With all those significant impacts of the project on the area why is this even being considered? The town doesn't want it and we have told Hunt Williams that since he began his quest to develop the land 20 or more years ago. He claims he is honoring his grandfather's legacy. I don't believe that is the reason he wants to develop the land. He wants to make money, plain and simple, at the expense of the residents of this historic community.

This letter only touches on the concerns. I reserve the right to have additional comments and concerns about this project in the future.

Thank you for considering my concerns and your attention to this project.

Respectfully,

Susan M. Evans

Susan M. Evans
29830 Lincoln Ave.
Val Verde, CA 91384
Home 661-702-9782
Email Sheffs@pacbell.net

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

The following is Quote from the Castaic Standards District filed with the County of Los Angeles for more than two decades. I believe this has not been met in regards to the above referenced proposed project.

> Substantial *Community* Support. The project must have substantial *community* support. For purposes of this requirement, substantial *community* support requires at least two-thirds of all written comment letters received from residents, property owners, and businesses **within 1,000 feet from the project boundary** to support the project. In reaching this threshold, every person signing a written comment letter shall be counted separately, provided that such signature has been verified. The position of elected *community* organizations such as the Castaic Area Town Council will be considered and counted as one comment letter in determining substantial *community* support, provided it is the formal position of the governing board of such organization;

This project does NOT have that support in place and the members of this community within the 1,000 feet of the boundary have not been consulted and informed they have this right. It is shameful that this potential project is trying to ignore the rights of this historical community.

This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: Jennifer Fields

Print Name: Jennifer Fields

Print Address: 29667 Cromwell Ave, Val Verde, CA 91384

Print Phone Number(s): 661-904-1228

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
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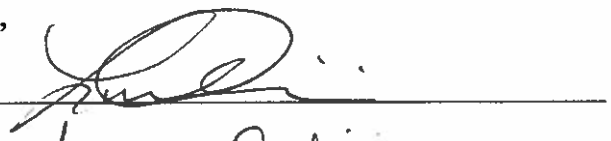
Thank you for your attention to this matter.

Respectfully,

Signature: 

Print Name: Lorena Galicia

Print Address: 30004 Marvin Ave Val Verde CA 91384

Print Phone Number(s): (661-312-1011

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
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This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: Jeanette Grant

Print Name: JEANETTE GRANT

Print Address: 28927 Morningside DR

Print Phone Number(s): 661-2953805

September 19, 2019 **Delivered Via E-mail: sdjones@planning.lacounty.gov**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

Per the meeting held on August 5, 2019, at Live Oak Elementary School, regarding the proposed environmental impact report for the projected noted above, the following is a list of some of my concerns.

1. Mr. Williams' former project, IAC Commerce Center, Valencia, had flaws in the plans. After the company had broken ground, the rains came and the project caused a landslide. Due to the landslide, a hillside protected by the CSD, Castaic Community Standards District, was drastically taken down. Today, the once beautiful hillside looks artificially sloped. This created a decrease in property value, as numerous residents' views were compromised. I am concerned that another occurrence could happen with the Sterling Ranch Residential Project. What measures would be in effect to prevent another environmental impact in the building of the new development?
2. Val Verde is a rural community with fewer than 2,500 residents. If the Sterling Ranch Residential Project were to be approved as proposed, the new residents would consist of approximately 20% of the town's population. Our roads leading in and out of town would be affected with at least 400 additional vehicles driving through the streets. I am concerned about the additional traffic that would be created by the project.
3. The area that the Sterling Ranch Residential Project is planned for is a haven for wildlife. After the building of the IAC Commerce Center, Valencia, wildlife populations increased in the neighborhoods. Residents have found an increased number of wild animals (i.e. rats) in their yards and through the streets. I am concerned that the homes of the wild animals will be taken and they will not have any where to go but in our neighborhoods. I am not in favor of exterminating these animals, as they have a right to live in their natural environment (they were here before we were).

The above is a list of my initial comments and concerns, but are not limited to them. I reserve the right to have additional comments and concerns as time reveals more information that come to light with this proposed project. This letter is to officially go on record that I am **against** the proposed project.

These concerns and comments are submitted respectfully for your consideration. Thank you for your attention to this matter.

Respectfully,

Cynthia Kimura

Cynthia Kimura
29027 Elk Avenue
Castaic, CA 91384
(562) 498-1106

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
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This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: Daryl Kratz

Print Name: Daryl Kratz

Print Address: 28946 Chiquito Canyon Rd, Castaic, CA 91384

Print Phone Number(s): 661-433-3818

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

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This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: _____

Print Name: Cynthia Kimura

Print Address: 29027 ELK AVE., CASTAIC, CA 91384

Print Phone Number(s): (562) 498-1106

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
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This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: Martha Lomeli

Print Name: MARTHA LOMELI

Print Address: 29526 CROMWELL AVE

Print Phone Number(s): (661) 702-0516

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
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This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: _____

Print Name: Arthur [illegible]

Print Address: 29651 Cromwell Dr

Print Phone Number(s): 661-295-1203

September 20, 2019

Mr. Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA. 90012

Title

Resident Letter Regarding Sterling Ranch Residential Project
by Frank Miscione 30014 Lexington Drive, Val Verde, Ca. 91384

Mr. Jones please enter this letter into the file as part of Public Record regarding Sterling Ranch Residential.

At a time when we should be preserving habitat for all things living by preserving the environment and enter into a new paradigm that requires moral clarity on the part of everybody including the County. To provide leadership in a Just Transition away from fossil fuels, and the antiquated, petro-chemical based models of urban sprawl to which the Sterling Project is fully entrenched, the County is inept to do so as evident as the purveyor of this process. I have gone to great sacrifices economically to remove myself as a Civil Engineer from subdivision projects in an effort to combat the effects of abrupt climate change. For years I have made this sacrifice because I know that beyond pensions and paychecks, I have as a minimum to the future generations a living planet. And here we are, making way for the bulldozers to come in and level the hills, disrupt the hydrological cycle and the EIR has no authority to actually take into account the larger critical issues facing all of us and you are assisting this. A family that has benefitted from the extraction of fossil fuels and the general partner is removed to a residence next to a world class ski resort who's only mission is a fiduciary responsibility to maximize land use to profit his family. The irony is that his family is also at risk. Where is the leadership of the County? As witness to decades of urban sprawl in the Santa Clarita Valley, the vision has been co-opted by developers. The reason why I'am against this project is that I'am on the side of humanity, and the science that is all too clear.

Respectfully,

ENGINEER'S STATEMENT

PREPARED UNDER THE DIRECTION OF;

FRANK MISCIONE R.C.E. 69031 EXP. 6-30-20

Frank Miscione P.E.
Resident/Property owner

September 19, 2019 **Delivered Via United States Postal Service**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

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This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

Signature: Etelvina Marquez

Print Name: Etelvina Marquez

Print Address: 29708 Cromwell ave

Print Phone Number(s): 661 7755976

September 18, 2019 **Delivered Via E-mail: sdjones@planning.lacountry.gov**

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012

Subject: Draft Environmental Impact Report
Sterling Ranch Residential Project SCH No. 2019080092
Project Location – 29053 Coolidge Avenue, Val Verde, CA 91384
APN: 3271-004-012, 3271-004-013, and 3271-005-032

Dear Mr. Jones,

Per the meeting held on August 5, 2019, at Live Oak Elementary School, regarding the proposed environmental impact report for the projected noted above, the following is Quote from the Castaic Standards District that I believe has not been met:

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This letter is to officially go on record that I am **against** the proposed project.

Thank you for your attention to this matter.

Respectfully,

George Ordway

George Ordway
29145 Cottage Grove Drive
Castaic, CA 91384
661-775-2771

Kelene Strain

From: Steven Jones <sdjones@planning.lacounty.gov>
Sent: Thursday, September 19, 2019 8:26 AM
To: Kelene Strain; Mari Prutz
Subject: FW: Sterling Ranch Project- public comment

FYI

From: Laurel Taylor [mailto:laurel-taylor@sbcglobal.net]
Sent: Wednesday, September 18, 2019 2:48 PM
To: Steven Jones <sdjones@planning.lacounty.gov>
Subject: Sterling Ranch Project- public comment

CAUTION: This email originated outside of the County. Please do not click links or open attachments unless you recognize the sender and expect the message.

To. Mr. Steven Jones

County of Los Angeles

Department of Regional Planning

Re: Public Comment for Sterling Ranch Residential Project

Project no. 03-250(5)

Mr. Jones,

I am contacting you regarding the public comment for the upcoming EIR for the Sterling Ranch project proposed for Val Verde.

As a resident of Val Verde, a "sensitive receptor", who lives on the border of the proposed project and already bearing the burden of the 30 year extension for the Chiquita Canyon Landfill, I know that I will be greatly, and obviously, negatively, impacted by this project. I feel that being sandwiched in from both sides by projects with such unhealthful impacts is an unjust burden to ask our community and myself to bear.

I have a right to enjoy my home, modest though it may be, and not be subjected to both the nuisance and possible health damages this project, in addition to the landfill, would naturally incur.

My issues are:

Safety-(this one is multi-factorial)

1. Fire-Val Verde is, for all intents and purposes, a "one road town" and, as we discovered during the massive fires during late 2016, we can be trapped in here very easily. At one point during those fires we were surrounded on three sides by fire, so our need to get in and out of Val Verde safely in the event of fire is , without exaggeration , a matter of life and death. According to the proposed map the project will be relocating Del Valle road which leaves my road, Silver, as well as Huntstock and Cromwell streets, completely cut off from egress via Del Valle while they move the access point from that direction. Originally Mr. Williams was required to create another access road out of town for safety concerns but I can see from this map that is no longer the case. We will be trapped in here as fires continue to rage and threaten our state.

   Fire insurance- as homeowners in the entire state are seeing a widespread contagion of insurance companies either dropping them due to "high fire risk", or not insuring people up front, how exactly are these new homes going to be insurable? Will anyone tell the new homeowners that they are less than a mile from a dump and uninsurable? I sure will. These mega-homes will cost a lot more than mine to cover ; has anyone bothered to check with insurance companies to see if these homes are insurable given the "high fire risk" assessment placed on this area?

2. Valley Fever (Coccidioidomycosis)- The disruption of soils inherent in this construction project can disturb the fungus and release the spores, which can cause Valley Fever, which can be fatal. It seems to me not worth the risk to endanger the lives of this community, regardless of the current housing crisis in Los Angeles. The analysis of risk vs. reward for 221 houses, all out of economic reach of the average working class resident, is just not worth the possible lawsuit costs in the event of loss of life.

Traffic-

As previously mentioned, there is really only one way in and one way out of Val Verde. The traffic congestion caused by the addition of trucks, earth movers, bull dozers, workers, etc. will place a large burden on me and add to my already very long commute. Again, I mention the previously proposed addition of a road out of town which has somewhere along the line been forgotten? Our safety is not worth the effort or expense I suspect. How will I be expected to access my home while they move Del Valle road? The intersection to my home at Silver and Del Valle will be greatly impacted.

Dust-

Aside from being an annoyance, and a health risk as previously mentioned, the dust that will be an inevitable by product of this project is unhealthful as a general rule. The PM2.5 threshold will be exceeded if it isn't already by the landfill, so the additional cloud of dust that will permeate this valley, settling on us, and in our lungs is truly adding insult to injury, as well as aggravating chronic asthma and bronchial issues. There will be no viable way to 'mitigate' this issue. It is airborne and uncontrollable, despite watering efforts. During the previous three years of construction on the 5North I could see clouds of dust constantly billowing up from the sites despite watering trucks, and this project will literally sit on top of me and my home, for years.

Nuisance- I have a right to a quality of life and enjoyment of my home with undue disturbances, including noise violations, dust, unhealthful burdens, etc. Unlike the current mega project happening behind Magic Mountain, this one, albeit much smaller and more contained, is literally tearing through our community and is right on top of me since I live on Silver Street. There is no way this construction will not impact my quality of life given its proximity to my home.

Housing- Clearly, LA County is using the 'housing crisis' in LA as a smoke screen to approve this project. We do face an unparalleled housing crisis in LA, but building one more private, unaffordable subdivision, in no way will mitigate the issue. And in fact, as all developments are, this one is required to include a portion of housing for low income residents, and just like the safety access road our community was promised, there are no low income units included in this project. Looks like a violation of the law, if I am not mistaken. LA doesn't have a housing crisis; it has an affordable housing crisis and developers have no interest in resolving that issue. And, just like the case of the approval Chiquita Canyon Landfill for 30 more years, the money that LA County stands to make is more important than the health and welfare of its citizens. The priorities are truly transparent and our recourse very little, but that's the point isn't it.

In conclusion, I am aware that Mr. Williams can do with his land what he pleases. I am painfully aware that the Board of Supervisors, and particularly, Ms. Barger, have no concern for the health and welfare of the community of Val Verde, (that was made eminently obvious when she approved the CCL extension BEFORE the appeal process had even been heard). But I also know that making my case, as a 'sensitive receptor' and a voting citizen, is important in a civil society as well as a matter of public record.

Thank you for accepting my submission for public comment, and thank you for your time,

Sincerely, Laurel M. Taylor

29716 Silver Street

CENTER for BIOLOGICAL DIVERSITY Because life is good.

Protecting and restoring natural ecosystems and imperiled species through Science, education, policy, and environmental law

SUBMITTED VIA EMAIL

9/5/2019

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012
sdjones@planning.lacounty.gov

RE: Scoping comments on Notice of Preparation of a Draft Environmental Impact Report for the Sterling Ranch Residential Project/Project No. 03-250-(5)/Vesting Tentative Parcel Map No. 060257/Conditional Use Permit No. 03-250/ / Oak Tree Permit No. 200700007 /Environmental Assessment No. 03-250.

Dear Mr. Jones,

The Center for Biological Diversity ("the Center") submits the following comments on the Notice of Preparation of a Draft Environmental Impact Report for the Sterling Ranch Residential Project/Project No. 03-250-(5)/Vesting Tentative Parcel Map No. 060257/Conditional Use Permit No. 03-250/ / Oak Tree Permit No. 200700007 /Environmental Assessment No. 03-250. The Center is a non-profit, public interest environmental organization dedicated to the protection of native species and their habitats through science, policy, and environmental law. The Center has 1.6 million members and supporters, including many that live, visit and enjoy the native wildlife and landscapes in southern California.

The Sterling Ranch Estates Residential Project (Project) would develop approximately 114 acres into a residential community of 222 residential lots and associated commercial space and infrastructure, while setting aside only 21 acres of "open space" on five lots. While it adjacent on the south side primarily to existing residential development in Val Verde, the project area is currently open space and mostly adjacent to existing open space, further urbanizing wildlands and pushing development into the more remote areas of the County. This type of proposal is antithetical to smart planning. The environmental review must include an analysis of how the proposed project fits into the State goals for affordable housing that the governor recently proposed in order to provide affordable housing in southern California by building housing where housing demands are highest, in existing cities with strong job growth.[1] The proposed project is already an outdated proposal which would fragment Los Angeles County's diminishing open space and wildlife connectivity and habitat, require long commutes on already gridlocked freeways, exacerbate already poor air quality and excessive traffic while increasing

1 https://www.latimes.com/california/story/2019-08-22/southern-california-housing-growth

Ileene Anderson, Senior Scientist
660 S. Figueroa Street, Suite 1000, Los Angeles, California 90017
tel: (213) 785 -5407 *email*: ianderson@biologicaldiversity.org
www.BiologicalDiversity.org

the County's greenhouse gas production. The CEQA review must also discuss how the proposed project conforms to the County's newly adopted Our County Plan[2] that was recently unanimously adopted on August 6, 2019 by the County's Board of Supervisors.

In addition, as part of the CEQA review process, the Environmental Impact Report needs to provide:

- a robust analysis of greenhouse gas emissions and climate change impacts from all sources associated with the Project using existing conditions as the analytic baseline;
- a robust analysis of the impact from on-going climate change including an analysis of maintaining wildlife connectivity between the Santa Clara River Significant Ecological Area and the Santa Felicia Significant Ecological Area;
- consideration of alternatives involving zero net-energy use by all Project residences and commercial buildings;
- water supply availability and water quality analysis incorporating the most recent information on anticipated frequency and severity of long-term drought conditions;
- cumulative impacts from adjacent planned and existing projects;
- analysis of air quality impacts of Project including construction and vehicle miles travelled;
- analysis of impacts from additional housing near and upwind from the Chiquita Canyon landfill;
- Analysis of impacts to the Santa Clara River watershed from the additional development and hardening of the landscape;
- Analysis of fire threats due to the fact that the proposed project lies with the Very High Fire Severity Hazard Zone in a State Responsibility Area.[3]

Biological Surveys and Mapping

In order to present a full picture of the biological impacts of the project, thorough, seasonally-appropriate surveys must be performed for sensitive plant species and vegetation communities, and animal species. The Center requests that thorough, seasonal surveys be performed for sensitive plant species and vegetation communities, and animal species under the direction and supervision of the County and resource agencies such as the US Fish and Wildlife Service[4] and the California Department of Fish and Wildlife[5]. For those species that have agency-identified survey protocols, those protocol level surveys must be required, implemented and disclosed in the EIR. Full disclosure of survey methods and results to the public and other agencies without limitations imposed by the applicant must be implemented to assure full CEQA compliance.

Confidentiality agreements should not be allowed for any survey in support of the proposed project. Surveys for the plants and plant communities should follow California Native

2 https://ourcountyla.org/#
3 https://osfm.fire.ca.gov/media/6475/fhszs_map19.jpg
4 https://www.fws.gov/ventura/endangered/species/surveys-protocol.html
5 https://www.wildlife.ca.gov/Conservation/Survey-Protocols

Plant Society (CNPS)[6] and California Department of Fish and Wildlife (CDFW) floristic survey guidelines[7] and should be documented as recommended by CNPS[8]. A full floral inventory of all species encountered needs to be documented and included in the EIR. Surveys for animals should include an evaluation of the California Wildlife Habitat Relationship System's (CWHR) Habitat Classification Scheme. All rare species (plants or animals) need to be documented with a California Natural Diversity Data Base form and submitted to the California Department of Fish and Wildlife using the CNDDB Form[9] as per the State's instructions[10].

In order for the public to properly evaluate the data, the vegetation maps must be at a large enough scale to be useful for evaluating the impacts. Vegetation/wetland habitat mapping should be at such a scale to provide an accurate accounting of wetland and adjacent habitat types that will be directly or indirectly affected by the proposed activities. A half-acre minimum mapping unit size is recommended, such as has been used for other development projects. Habitat classification should follow CNPS' *Manual of California Vegetation* and should follow the CDFW protocol[11].

Adequate surveys must be implemented, not just a single season of surveys, in order to evaluate the existing on-site conditions. Due to unpredictable precipitation in this relatively arid environment, organisms in the proposed project area have evolved to survive in harsh conditions and if surveys are performed at inappropriate times or year or in particularly dry years many plants that are in fact on-site may not be apparent during surveys (ex. annual and herbaceous perennial plants).

Impact Analysis

The EIR must evaluate all direct, indirect, and cumulative impacts to sensitive habitats, including impacts associated with the establishment of intermitted recreational activities, the introduction of non-native plants, the introduction of lighting, noise, and the loss and disruption of essential habitat due to edge effects.

A number of rare resources are known to occur or have high potential to occur on the proposed project site. The proposed set aside of only 21 acres of "open space" appears to be inadequate to allow for adequate wildlife connectivity and preservation, so the EIR needs to carefully detail the open space proposal including how the lands will be managed in perpetuity for conservation which is part of the strategy to avoid, minimize and mitigate impacts to the species found on site. The EIR must also consider open space land acquisition if the on-site conservation of plant communities or wildlife is infeasible. Management plans for the conservation investments must be included as part of the public review EIR.

6 https://www.cnps.org/plant-science/field-protocols-guidelines
7 https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline
8 https://www.cnps.org/plant-science/field-protocols-guidelines
9 https://www.wildlife.ca.gov/Data/CNDDB/Submitting-Data#44524419-online-field-survey-form
10 IBID
11 https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=18959&inline

For rare plants, avoidance is preferable because of the general lack of success in transplanting rare plants[12]. If transplantation is to be a part of the mitigation strategy, a detailed plan must be included as part of the EIR on the methodology for determination of appropriate conservation areas where plants may be transplanted, when/how plant are to be transplanted and identification of success criteria for transplantation. Monitoring of the transplanted plants needs to occur for a time period that is realistic to evaluate *long-term success* of the plants.

Locally Rare Species

The Center requests that the EIR evaluate the impact of the proposed permitted activities on locally rare species (not merely federal- and state-listed threatened and endangered species). The preservation of regional and local scales of genetic diversity is very important to maintaining species. Therefore, we request that all species found at the edge of their ranges or that occur as disjunct locations be evaluated for impacts by the proposed permitted activities.

Alternatives

The EIR must include a robust analysis of alternatives. The stated objectives of the project must not unreasonably constrain the range of feasible alternatives evaluated in the EIR. The County must establish an independent set of objectives that do not unreasonably limit the EIR's analysis of feasible alternatives including alternative sites. At a minimum, alternatives including the no-action alternative, an environmentally preferred alternative, and several on-site alternatives with configurations that accommodate wildlife connectivity/passage, avoid sensitive resources and other conservation-oriented alternatives.

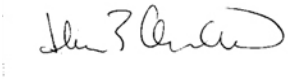
Cumulative Impacts

The cumulative impacts section must also include the number of permitted but unbuilt housing units that the County and local municipalities in the Santa Clara River Valley have already permitted, in Los Angeles County as well as Ventura County. It is our understanding that there are numerous permitted projects in the valley that have yet to be built due to economics. Therefore, the EIR needs to disclose the current permitted projects, including the number of housing units and the proximity to the proposed project in order to evaluate the need for more housing in this area.

12 Fiedler 1991. https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=3173

Thank you for the opportunity to submit scoping comments on this proposed Project. Please do not hesitate to contact the Center with any questions at the contact information provided. We look forward to reviewing all further environmental documentation on this project. Please add us to the list for all notices and dissemination of information pertaining to this project.

Sincerely,



Ileene Anderson
Senior Scientist

cc via email:
Gary Gero, L.A. County Chief Sustainability Officer, sustainability@lacounty.gov

CBFC Land Development Committee
30300 Arlington Street
Val Verde, California 91384
661 257 7636

September 18, 2019

Mr. Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA. 90012

Subject: Notice of Preparation of a Draft Environmental Impact Report and Public Scoping Meeting, Sterling Ranch Residential Project.

Please include the following comment as part of the Public Review Period for the subject NOP pursuant to Title 14, section 15082(b) of the California Code of Regulations ending on September 20th, 2019.

The specific topic of this comment is directed to the Transportation/Traffic environmental effects of the Project.

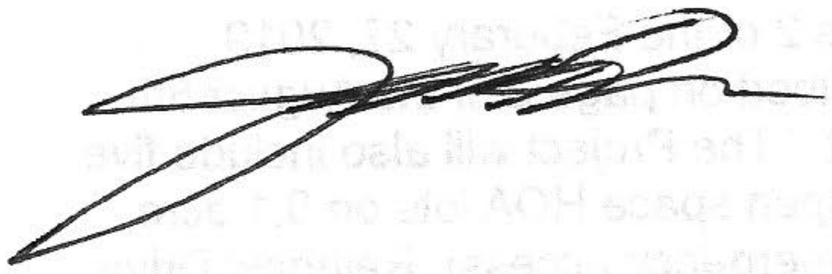
The proposed access roads as shown on page 2 of the Feburary 27, 2019 Tentative Map No. 060257(TTM) and as described on page 2 of the August 5th, 2019 County Document, where it is stated that, ' The Project will also include five open space lots on 21 acres, six landscaped/open space HOA lots on 0.1 acre, three access strip lots at Trevylon Street(20' emergency access), Rainbow Drive (20' emergency access) and Lexington Drive (26' project access) on 0.2 acre,...', are inconclusive and unreliable for the public to provide any comment regarding the environmental effects due to Transportation/Traffic for these specific areas. These proposed access roads are connected in plan view by way of the existing roads. The 26' width shown on the Plan for Lexington Drive, for example, is the current right of way width, however, the County has been derelict in both enforcing and maintaining a 26' right of way since the establishment of this road as well as others.

Attached are civil plans(C1,C2&C3) prepared by FMConsulting that reproduces (see C3) the proposed 26' access road section(Sheet 1) of the TTM superimposed on sections A,B & C that have been mapped in the field. The centerline for these section were established using centerline hubs provided by County Public Works Survey. On August 28, 2019 County Department of Public Works Survey crew were observed to be locating centerline hubs in the intersections of Lexington/Cottage Grove and Lexington/Rainbow Drive. This was confirmed when the 2 crew members were asked if the centerline was being located. The centerline was then projected by FMC using the existing hubs east

where the enclosed sections were mapped out.

By observation of the sections by FMConsulting, it can be seen that several issues arise with respect to drainage, hazards and access related to Transportation with stated road widths. The environmental consequences and variability of effects can not be understood at this time and we demand that; The County disclose as to what degree(using visual aides and commentary) the residents will be impeded upon with respect to both access and egress of properties by enforcing the existing right of ways stated and any related hazards including environmental variability effects related to establishing stated road widths on the TTM. At which point the community may then be able to make informed comments. Its is our assertion that due to insufficient information related the environmental effects of establishing the stated road widths for project, as shown in Civil drawings by FMConsulting, the existing NOP for this environmental review is invalid and must be withdrawn.

Respectfully submitted,



Jaime Briano
CBFC Land Development Committee

Attachments:

August 5th County NOP and Public Scoping Meeting Mailer
Civil Drawings (3)

Los Angeles County
Department of Regional Planning

Planning for the Challenges Ahead

Amy J. Bodek, AICP
Director of Regional Planning

Dennis Slavin
Chief Deputy Director,
Regional Planning

NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT AND PUBLIC SCOPING MEETING

DATE: August 5, 2019

TO: State Clearinghouse, Responsible Agencies, Trustee Agencies, Organizations and Interested Parties

SUBJECT: Notice of Preparation of a Draft Environmental Impact Report in Compliance with Title 14, section 15082(a) of the California Code of Regulations

The County of Los Angeles (County) is the lead agency pursuant to the California Environmental Quality Act (CEQA) and intends to prepare an Environmental Impact Report (EIR) for the proposed Project identified below. The County has prepared this Notice of Preparation (NOP) to provide Responsible Agencies and other interested parties with information describing the Project and to identify its potential environmental effects pursuant to State requirements.

AGENCIES: The County requests your agency's views on the scope and content of the environmental information relevant to your agency's statutory responsibilities in connection with the proposed Project, in accordance with Title 14, section 15082(b) of the California Code of Regulations. Your agency will need to use the EIR prepared by the County when considering any permits that your agency must issue, or other approval for the Project.

ORGANIZATIONS AND INTERESTED PARTIES: The County requests your comments and concerns regarding the environmental issues associated with construction and operation of the proposed Project.

PROJECT & PERMIT(S): Sterling Ranch Residential Project/Project No. 03-250-(5)/Vesting Tentative Parcel Map No. 060257/Conditional Use Permit No. 03-250/ / Oak Tree Permit No. 200700007 /Environmental Assessment No. 03-250.

PROJECT APPLICANT: Sterling Gateway, LP

PROJECT LOCATION: 29053 Coolidge Avenue, Val Verde, CA 91384 APN: 3271-004-012, 3271-004-013, and 3271-005-032

PROJECT DESCRIPTION: To create 222 detached single-family residential lots on 57.9 acres, a passive pocket park on 0.2 acre, a passive park with a tot lot, shade structure and tables on 3.4 acres, and 21,000 square feet of commercial uses with 71 parking spaces on 2.5 acres, five undisturbed open space lots on 21 acres, six landscaped open space HOA lots on 0.1 acre, three access strip lots on 0.2 acre, three infiltration basin lots and six debris basin lots on 8.8 acres, a pump station lot on 0.1 acre, and 19.7 acres of public right-of-way and private and future streets within Zone R-1 on 113.9 acres.

Sterling Gateway, LP proposes the Sterling Ranch Estates Residential Project (Project), a 113.9-acre residential community (See **Figure 1: Site Plan Sheet A**). Of the proposed 222 residential lots, 91 residential lots would be 7,000 square feet to 10,000 square feet in size and 131 residential lots would be greater than 10,000 square feet in size, for an average of 11,364 square feet, consistent with Castaic Area Community Standards District (CSD) development standards. The Project also would include five open space lots on 21 acres, six landscaped/open space HOA lots on 0.1 acre, three access strip lots at Trevylon Street (20' emergency access), Rainbow Drive (20' emergency access) and Lexington Drive (26' project access) on 0.2 acre, three infiltration basins and six debris basins on 8.8 acres, a pump station on 0.1 acre, and public streets and private and future streets for the community on 19.7 acres (See **Figure 2: Site Plan Sheet B**).

The Project would provide a private trail, the Sterling Horn Memorial Trail, ten feet in width along the southern portion of the Project site. The private trail would connect with the County's Del Valle Trail outside the Project site as identified in the County's Regional Trail Plan. The Project also would dedicate a twenty-foot wide, multiuse trail easement to the County for the Del Valle Trail, located off-site, on a third party's property. The off-site trail would be a variable-width (five-foot to eight-foot wide), natural soil surface trail within a twenty-foot dedication. An easement for the off-site grading from the adjacent owner has been obtained for this work, including the agreement to dedicate easements to the County upon request.

The off-site improvements consist of the following: a portion of Del Valle Road from the easterly Project boundary to approximately 772-feet east of the Project boundary within the adjacent property; the off-site construction of a mainline sewer from the Project site to Hasley Canyon Road within Del Valle Road; the upsizing of the existing water line within Hasley Canyon Road; and the dedication of off-site permanent open space on 37.9 acres. The Project also involves the construction of a one-million-gallon water tank, located on approximately 1.4 acres of disturbed land, at an elevation of 1575 feet, approximately 2.2 miles westerly from the Project site, and in the vicinity of the existing Cuyama water tank site.

The proposed uses and densities are consistent with the existing General Plan, the Area Plan land use designations, zoning, and CSD development standards. The Project includes requests for approval of a vesting tentative tract map to create 249 lots, a conditional use permit (CUP) for development within a Hillside Management Area, the grading of more than 100,000 cubic yards of earth and construction and maintenance of a water tank, and an oak tree permit. While the Project would have one mass grading plan and storm drain plan for the entire Project site, the Project could be constructed in up to six phases, with the commercial portion constructed during

Phase 5. The Los Angeles County Waterworks District No. 36 would provide water to the Project, the Los Angeles County Sewer Maintenance Division would operate the pump station, and the Los Angeles County Sanitation District would provide wastewater treatment collection and treatment.

The Project's system of public streets would access Del Valle Road. The extension of Chiquito Canyon Road (as Sterling Parkway) would provide access to the Project site and would include four new intersections with local roadways constructed within the Project site.

The Project site is primarily undeveloped, with the exception of one single-family residential structure, unimproved hiking trails and dirt roads. The Project would demolish and remove the existing on-site residential structure, which is located off Hunstock Street and Coolidge Avenue (proposed Sterling Parkway).

The Project would require an Oak Tree Permit (OTP No. 200700007) to remove two jurisdictional oak trees. The two trees are located at the corner of Hunstock Street and what is currently Coolidge Avenue.

POTENTIAL ENVIRONMENTAL EFFECTS OF THE PROJECT

Based on a preliminary review of the proposed Project consistent with section 15060 of the CEQA Guidelines, the County has determined that an EIR should be prepared for this proposed Project. In addition, consistent with section 15082 of the CEQA Guidelines, the County has identified the following probable environmental effects of the Project, which will be addressed in the EIR for this project:

- Aesthetics
- Air Quality
- Biological Resources
- Cultural Resources
- Geology / Soils
- Greenhouse Gas Emissions
- Hazards/Hazardous Materials
- Hydrology / Water Quality
- Noise
- Public Services
- Recreation
- Transportation / Traffic
- Tribal Cultural Resources

- Utilities / Services Systems
- Wildfire

The County has determined that there is not a likelihood of potentially significant effects related to the following environmental topics:

- Agricultural and Forestry Resources
- Energy
- Land Use / Planning
- Mineral Resources
- Population / Housing

The EIR will include information on the reasons why these effects were determined not to be significant and are therefore not addressed in detail in the EIR.

NOTICE OF SCOPING MEETING: The County will conduct a public scoping meeting for the purpose of soliciting oral and written comments from interested parties as to the appropriate scope and content of the EIR.

All interested parties are invited to attend the scoping meeting to assist in identifying issues to be addressed in the EIR. The scoping meetings will include a brief presentation of the Project to be addressed in the EIR and will provide attendees with an opportunity to provide input to the scope of the EIR. The Scoping Meeting will be held on Thursday August 29, 2019 at 6:30 PM at the following location:

Live Oak Elementary
27715 Saddleridge Way
Castaic, CA 91384

Translation in other languages can be made available at the meeting upon request. Please submit translation requests at least seven business days in advance of each scheduled meeting to sdjones@planning.lacounty.gov.

PUBLIC REVIEW PERIOD: The County has determined to make this NOP available for public review and comment pursuant to Title 14, section 15082(b) of the California Code of Regulations. The comment period for the NOP begins on Monday, August 5, 2019 and ends on Thursday, September 5, 2019.

Any comments provided should identify specific topics of environmental concern and your reason for suggesting the study of these topics in the EIR.

Please direct all written comments to the following address:

Steven Jones
County of Los Angeles
Department of Regional Planning
Land Divisions Section
320 West Temple Street, Room 1362
Los Angeles, CA 90012
Tel: 213-974-6433
Fax: (213) 626-0434
sdjones@planning.lacounty.gov

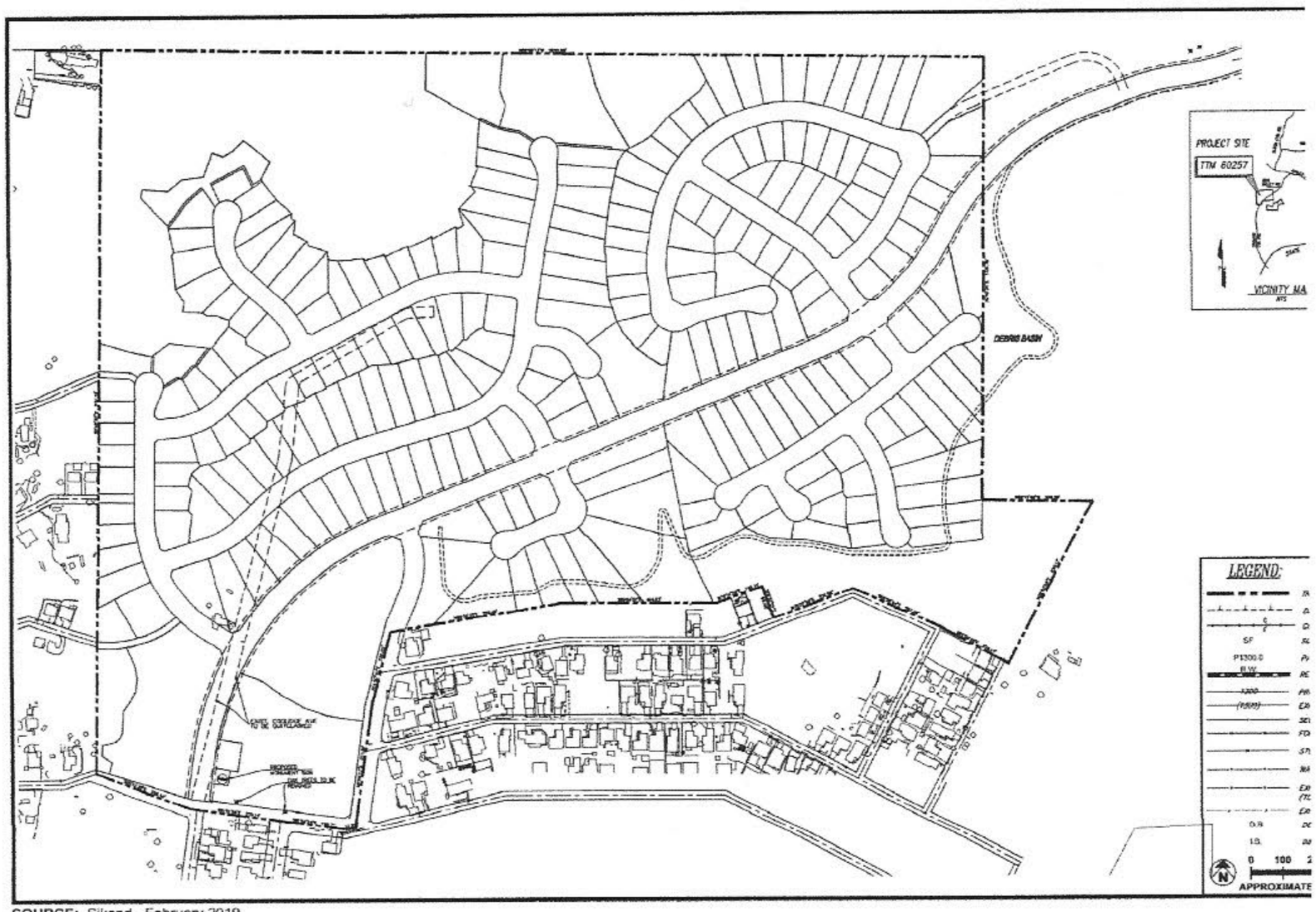
All written responses will be included as Appendices in the Draft EIR and their contents considered in accordance with State and County environmental guidelines.

DOCUMENT AVAILABILITY: The NOP and Initial Study are available for public review during regular business hours at the Los Angeles County Department of Regional Planning address listed above and the following locations:

- Castaic Library, 27971 Sloan Canyon Road, Castaic, CA 91384
- Stevenson Ranch, 25950 The Old Road, Stevenson Ranch, CA 91381

The public is also encouraged to visit the Department of Regional Planning's website to review the initial study at http://planning.lacounty.gov/case/view/03-250.

Thank you for your participation in the environmental review of this project.

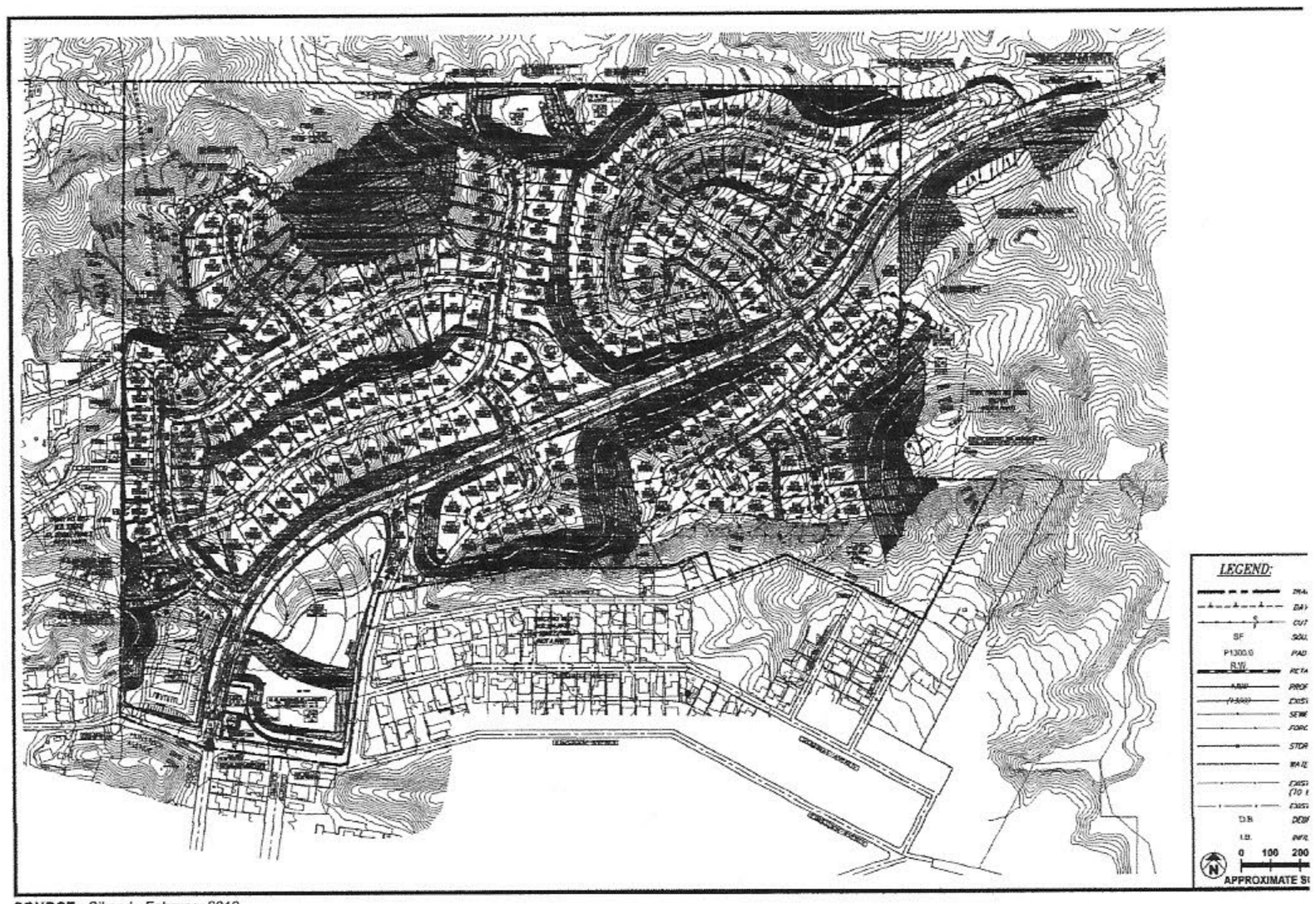


SOURCE: Sikand - February 2019

Meridian Consultants

Site Plan Sl

185-001-16



SOURCE: Sikand - February 2019

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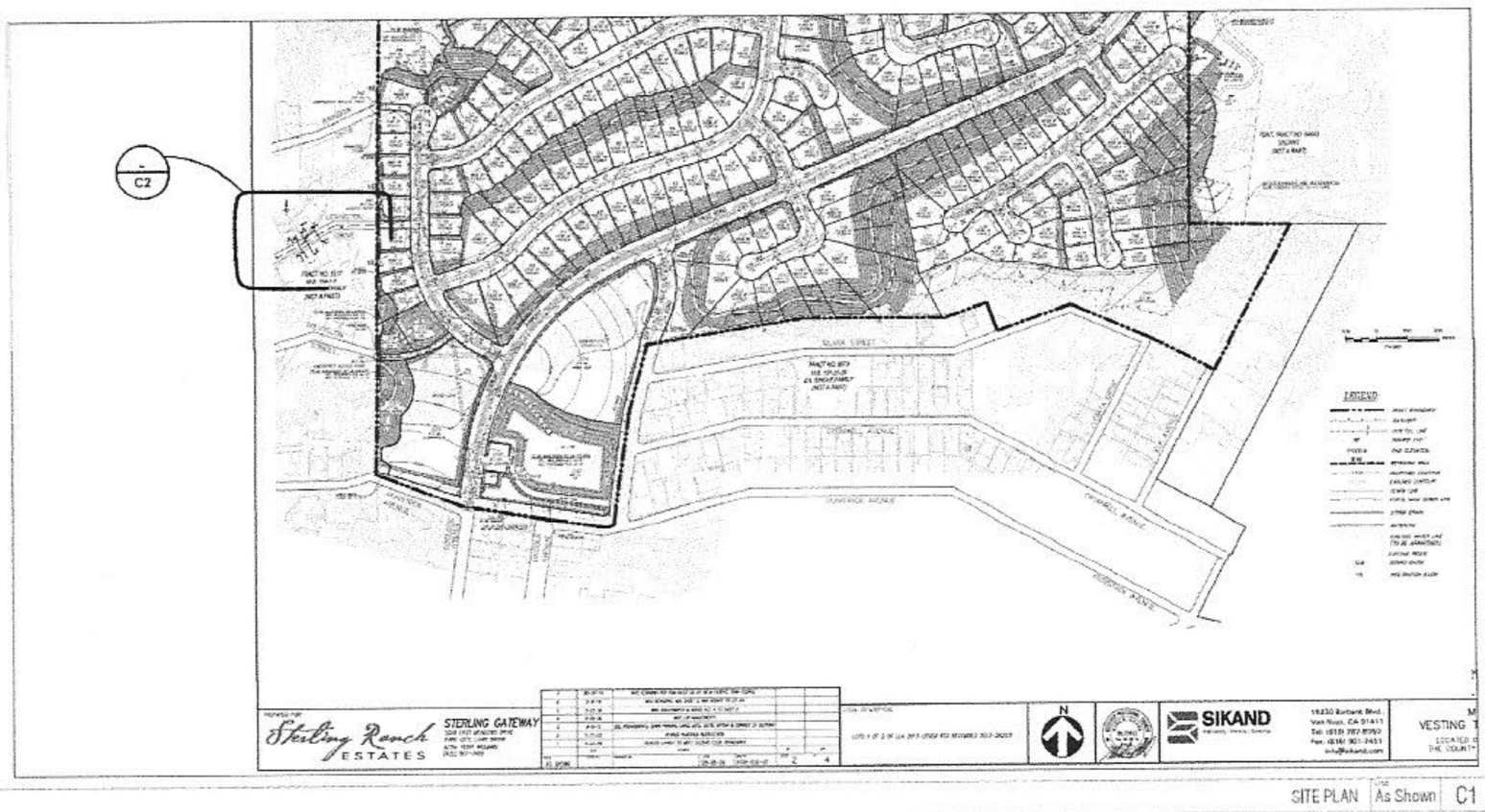
Meridian Consultants

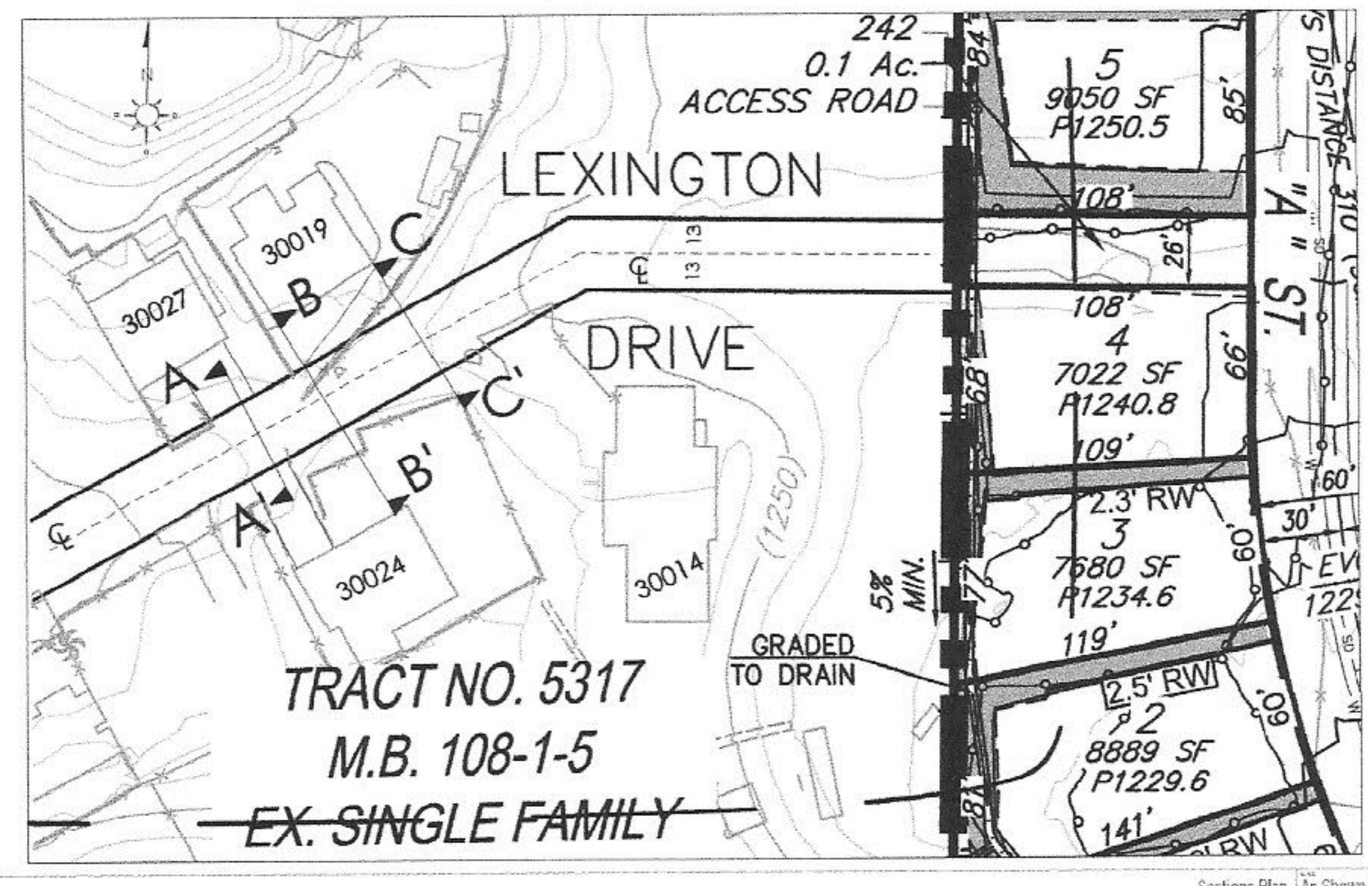
Site Plan Sh

185-001-18



SITE PLAN | As Shown | C1

FMConsulting 30014 Lexington Drive Castaic Ca. 91384 Telephone (661) 645-6168	PREPARED FOR: CBFC Land Development Committee 30300 Arlington Street CASTAIC, Ca. 91384
Site Plan SHEET 1 OF 3	DATE / REVISIONS



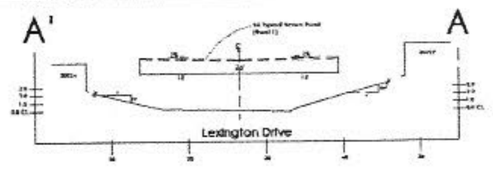
Sections Plan | As Shown | C2

FMConsulting 30014 Lexington Drive Castaic Ca. 91384 Telephone (661) 645-6168	PREPARED FOR: CBFC Land Development Committee 30300 Arlington Street CASTAIC, Ca. 91384	Sections Location Plan SHEET 2 OF 5	DATE / REVISIONS

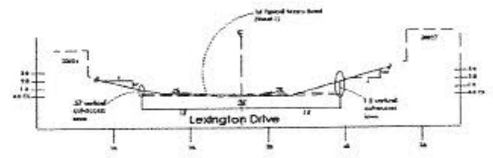
A'

A

Existing Access Grade



Condition 1
(Typical centerline elevation match existing centerline grade)



Condition 2
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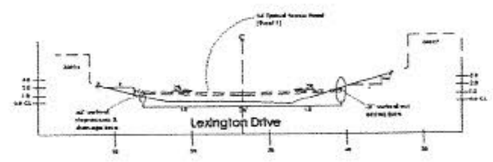
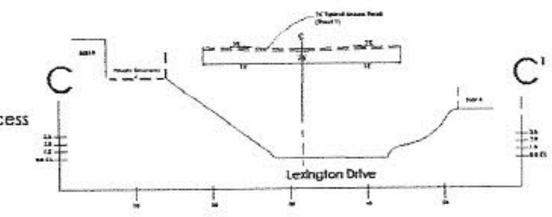


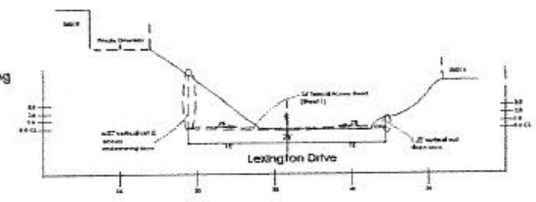
C

C'

Existing Access Grade



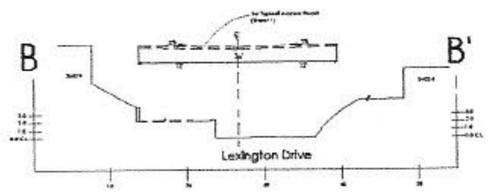
Condition 1
(Typical centerline elevation match existing centerline grade)



B

B'

Existing Access Grade



Condition 1
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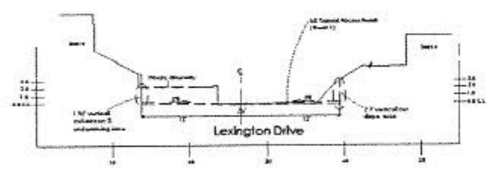


ENGINEER'S STATEMENT

Sections | As Shown | C3

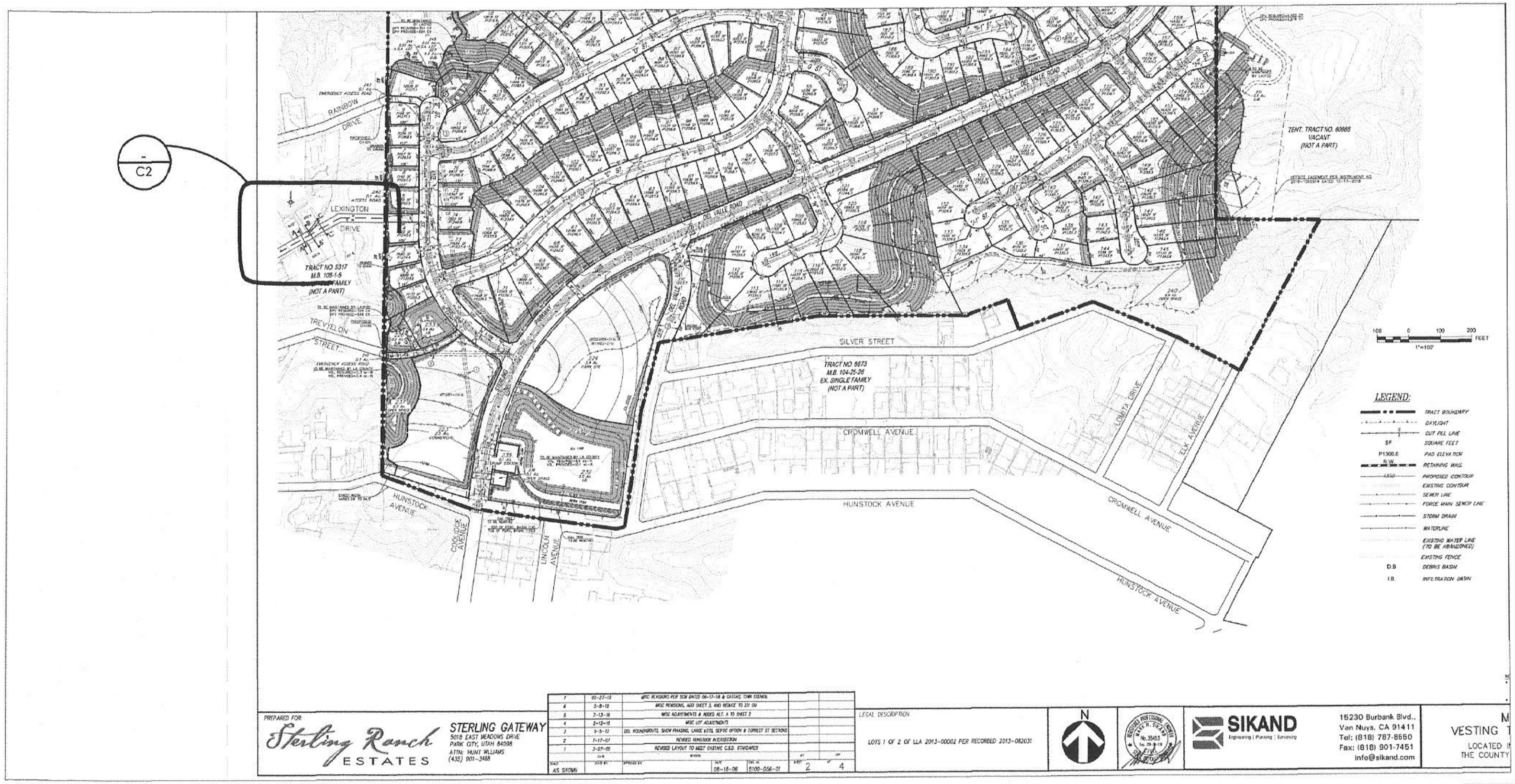
FMConsulting
30014 Lexington Drive Castaic Ca. 91384
Telephone (661) 645-6168

PREPARED FOR:
CBFC
Land Development Committee
30300 Arlington Street
CASTAIC, Ca. 91384

Sections A, B, C

SHEET 3 OF 3

DATE	REVISIONS



PREPARED FOR:

Sterling Ranch ESTATES

STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

7	02-27-10	MISC REVISIONS PER SCM DATED 06-17-18 & CASTAIC TOWN COUNCIL		
6	5-8-18	MISC REVISIONS, ADD SHEET 3, AND REDUCE TO 23' OU		
5	7-13-16	MISC ADJUSTMENTS & ADDED ALT. A TO SHEET 2		
4	2-12-16	MISC LOT ADJUSTMENTS		
3	9-5-12	DEL HOUNDABOUTS, SHOW PHASING, LARGE 60TS, SEPTIC OPTION & CORRECT ST SECTIONS		
2	7-17-07	REVISED HUNSTOCK INTERSECTION		
1	3-27-05	REVISED LAYOUT TO MEET CASTAIC C.S.D. STANDARDS		
DATE	DATE	REVISION	BY	CHK
AS SHOWN	2-27-01	APPROVED BY: DATE 08-18-06	DWG NO. 5100-056-01	SHEET 2 OF 4

LEGAL DESCRIPTION

LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031

N

REGISTERED PROFESSIONAL ENGINEER
MARK N. SIKAND
No. 35453
Exp. 06-30-19
CIVIL
STATE OF CALIFORNIA

SIKAND
Engineering | Planning | Surveying

15230 Burbank Blvd.,
Van Nuys, CA 91411
Tel: (818) 787-8650
Fax: (818) 901-7451
info@sikand.com

M
VESTING T
LOCATED I
THE COUNTY

SITE PLAN | SCALE As Shown | C1

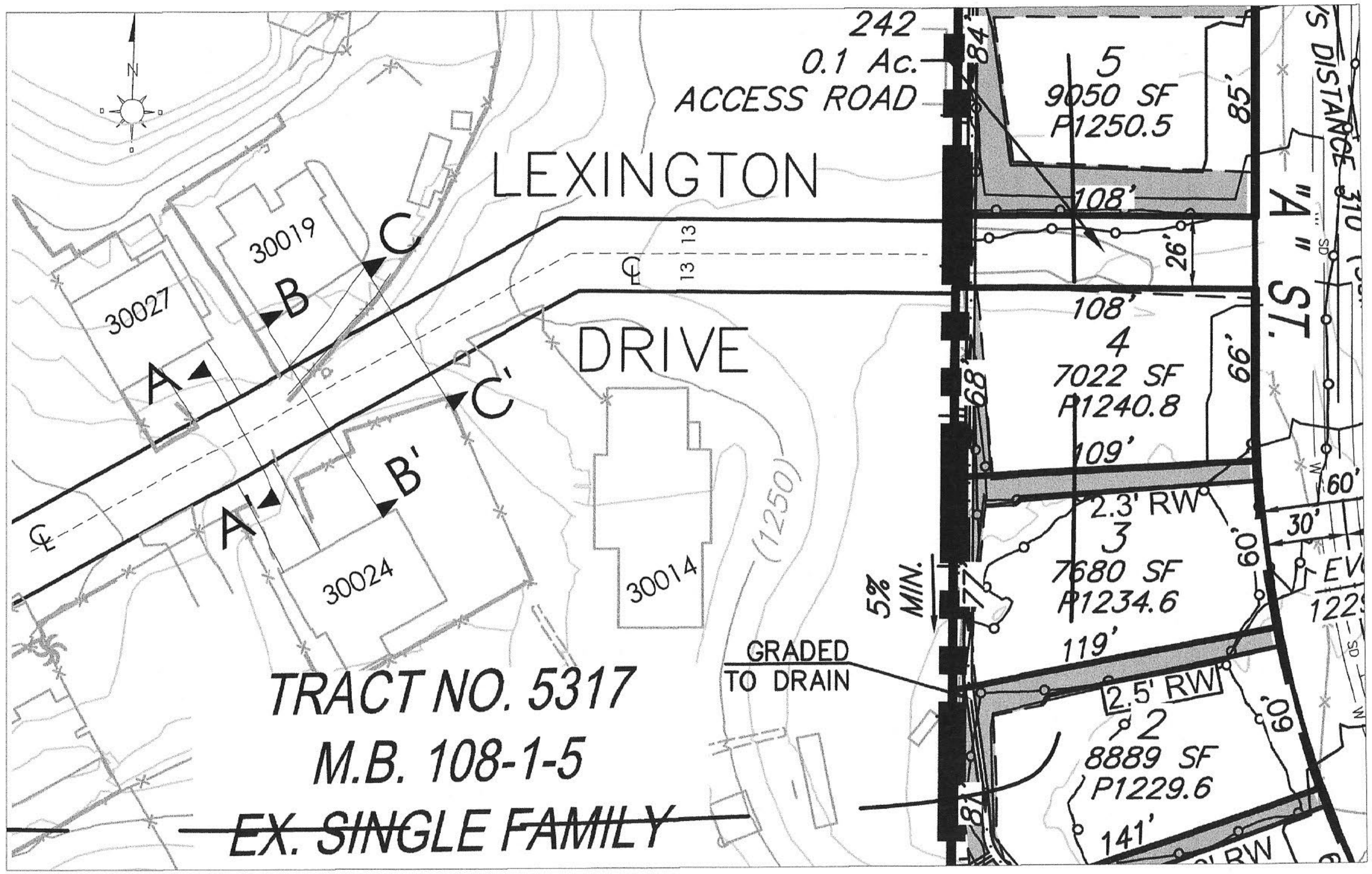
FMConsulting
30014 Lexington Drive Castaic Ca. 91384
Telephone (661) 645-6168

PREPARED FOR:
CBFC
Land Development Committee
30300 Arlington Street
CASTAIC, Ca. 91384

Site Plan

SHEET 1 OF 3

DATE	REVISIONS



Sections Plan | SCALE As Shown | C2

FMConsulting
30014 Lexington Drive Castaic Ca. 91384
Telephone (661) 645-6168

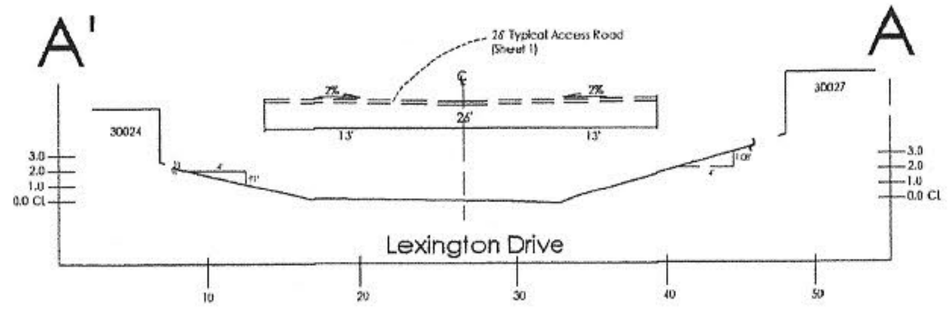
PREPARED FOR:
CBFC
Land Development Committee
30300 Arlington Street
CASTAIC, Ca. 91384

Sections Location Plan

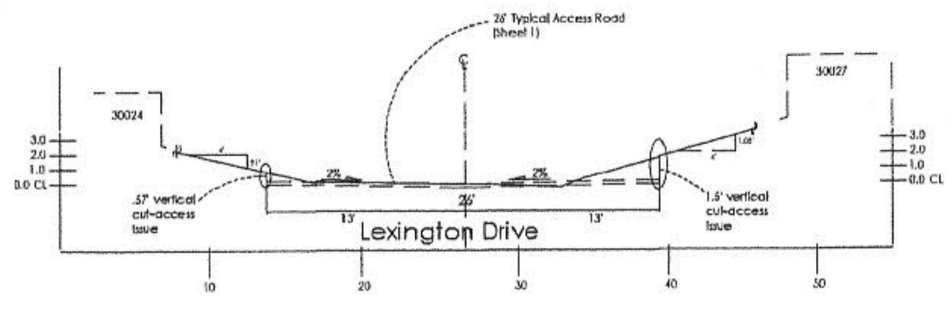
SHEET 2 OF 3

DATE	REVISIONS

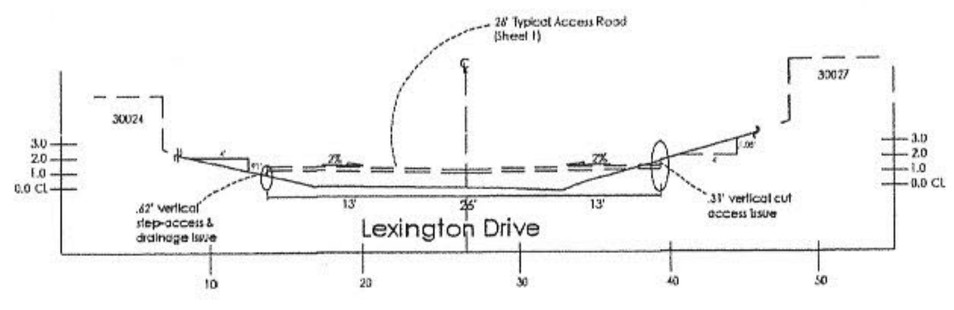
Existing Access Grade



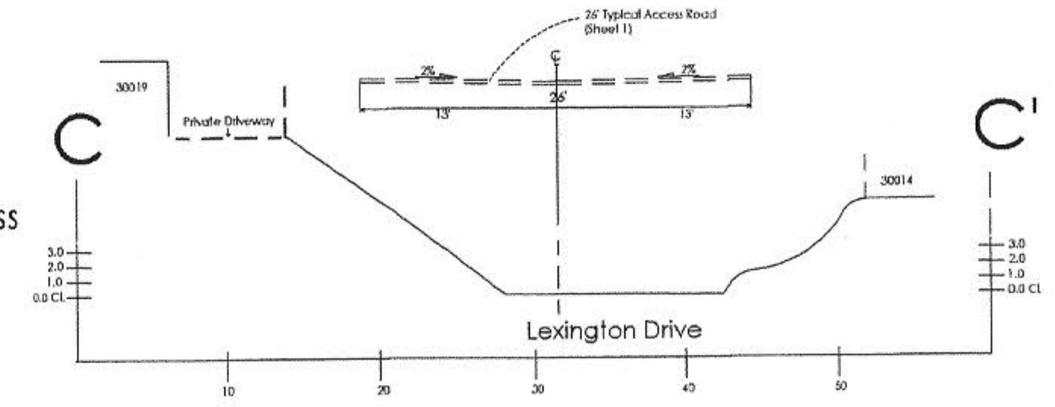
Condition 1
(Typical centerline elevation match existing centerline grade)



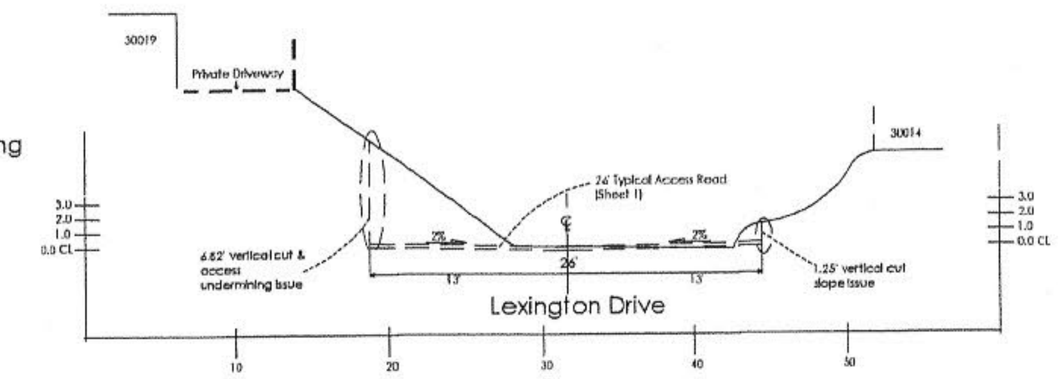
Condition 2
(Centerline raised elevation 1.25' above existing centerline grade to limit vertical cuts at RW)



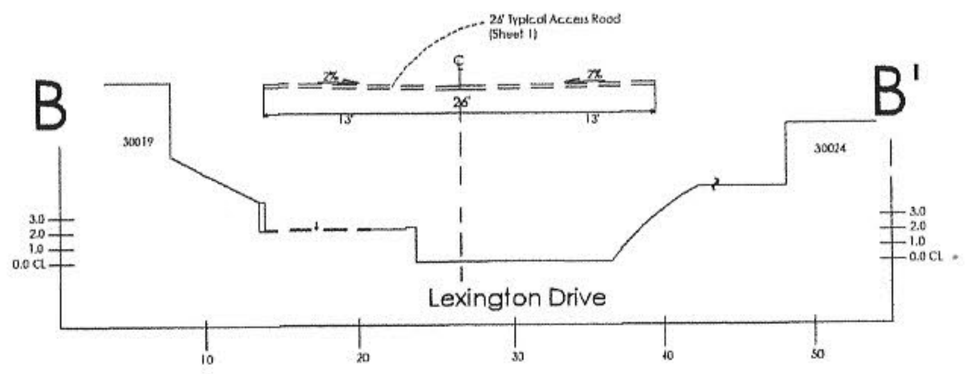
Existing Access Grade



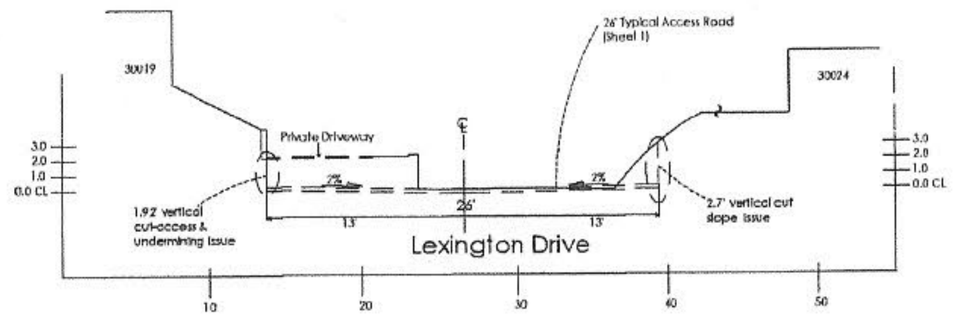
Condition 1
(Typical centerline elevation match existing centerline grade)



Existing Access Grade



Condition 1
(Typical centerline elevation match existing centerline grade)



ENGINEER'S STATEMENT

PREPARED UNDER THE DIRECTION OF:

FRANK MISSIONE R.C.E. 69631 EXP. 6-30-20

Sections | SCALE: As Shown | C3

FMConsulting 30014 Lexington Drive Castaic Ca. 91384 Telephone (661) 645-6168	PREPARED FOR: CBFC Land Development Committee 30300 Arlington Street CASTAIC, Ca. 91384	Sections A, B, C SHEET 3 OF 3

DATE	REVISIONS

Steven Jones

From: Dan Silver <dsilverla@me.com>
Sent: Monday, August 12, 2019 10:57 AM
To: Steven Jones
Subject: Sterling Ranch Residential Project

August 12, 2019

VIA ELECTRONIC MAIL

Steven Jones
Dept of Regional Planning
Land Divisions Section
320 W Temple St Rm 1362
Los Angeles CA 90012

RE: Sterling Ranch Residential Project

Dear Mr Jones

Endangered Habitats League (EHL) is in receipt of the NOP for an EIR for this project. While consistent with the land use designations of the General Plan, EHL is nevertheless concerned over continued automobile dependent sprawl development, GHG emissions therefrom, biological impacts, water supply, and expansion of the wildland-urban interface and fire hazard. For your reference, EHL is a Southern California conservation group dedicated to ecosystem protection and sustainable land use, with a particular interest in Significant Ecological Areas.

Please place or retain EHL on all mailing and distribution lists for the project, including CEQA documents and public hearings.

Thank you
Dan Silver

Dan Silver, Executive Director
Endangered Habitats League
8424 Santa Monica Blvd., Suite A 592
Los Angeles, CA 90069-4267

213-804-2750
dsilverla@me.com
www.ehleague.org

Friends of the Santa Clara River
PO Box 7719 Ventura, California 90006 (805) 320-2265
www.fscr.org

September 5, 2019

Mr. Steven Jones
Los Angeles County Dept of Regional Planning
320 W. Temple St.
Los Angeles, CA 90012

Sent via email to: sdjones@planning.lacounty.gov

Re: Sterling Ranch Residential Project/Project No. 03-250-(5)/Vesting Tentative Parcel Map No. 060257/Conditional Use Permit No. 03-250/ / Oak Tree Permit No. 200700007 /Environmental Assessment No. 03-250

Dear Mr. Jones:

The Friends of the Santa Clara River, now celebrating 26 years of conservation efforts on behalf of the Santa Clara River, wish to express our concerns with several aspects of this project and ask that these issues be addressed by revising the initial study and by addressing them in the Environmental Impact Report for this project.

Sterling Gateway proposes to create 222 detached single-family residential lots on 57.9 acres, as well as additional infrastructure and three debris basins in the rural community of Val Verde, increasing its current population by approximately 25%. The project is located in a Very High Fire Hazard area with only one two lane road in an out f the community. The housing will be located in close proximity to the existing and proposed expansions of the Chiquita Canyon Landfill, making future residents subject to odors and poor air quality caused by this landfill.

We begin by noting that although the community is statistically a majority Hispanic community and a large percentage of the community speaks Spanish at home, no notices or signage where provided in that language so that affected members of the community could participate in their native language. None of the materials received by our group were translated into Spanish nor did any statement appear in Spanish offering to answer questions. We therefore request that the SCOPING meeting be re-scheduled and re-noticed with Spanish translation so that all residents of this community can be informed as to what is being proposed.

Nor did the Notice of Preparation mention anywhere the proximity of the Chiquita Canyon Landfill and the information that the project is proposed in a very high fire hazard area. These are facts important to the public's ability to make meaning suggestions for the NOP process. We request that this information be included when the Department properly re-notices this project.

Notice of Preparation

We concur with the County's preliminarily review that, consistent with section 15060 of the CEQA Guidelines, an EIR should be prepared for this proposed Project. In addition, consistent with section 15082 of the CEQA Guidelines, the County has identified the following probable environmental effects of the Project, which will be addressed in the EIR for this project: •Aesthetics •Air Quality •Biological Resources •Cultural Resources •Geology / Soils •Greenhouse Gas Emissions• Hazards/Hazardous Materials •Hydrology / Water Quality •Noise •Public Services •Recreation •Transportation / Traffic •Tribal Cultural Resources •Utilities / Services Systems •Wildfire.

We do not agree with the County's determination regarding the unlikelihood of potentially significant effects related to the following environmental areas – Energy •Land Use / Planning •Mineral Resource •Population / Housing. We believe that energy should be discussed to ensure that this new community has full access to solar and no new lines creating sources of wildfire ignition will be added. Energy is related to other Chapters such as GHG and Utilities and should be included. Both landuse and population should be included because of the substantial increase to the current population of this rural community that would be incurred by this project. Although the County states that the EIR will include the reasons why they believe these effects would not to be significant, we believe this is not sufficient and these areas should be fully addressed.

Initial Study

Hydrology – The initial study states that two ephemeral channel features are present that support indicators of an ordinary high water mark (OHWM), bed and bank, and riparian vegetation within the Project site, and that, based on these indicators, the features would be jurisdictional to the U.S. Army Corps of Engineers (USACE), Regional Water Quality Control Board (RWQCB), and California Department of Fish and Wildlife (CDFW). These ephemeral channel features are currently within the Project footprint and would be impacted. The IA states that mitigation for impacts would be required and is currently proposed to be fulfilled via the purchase of credits through a local mitigation bank or conservation organization.

The Friends support the preservation of natural bed and banks of streams and creeks to ensure sustainable groundwater recharge and the maintenance of natural habitat. We therefore request that the EIR include an alternative that provides for the preservation of these ephemeral streams.

Surrounding Landuses – The County failed to include the approved 1544 unit Landmark project directly across Hwy 126 directly across from Chiquito Canyon Rd which is the entrance to community of Val Verde. Other smaller projects were also not included.

Biology – At this time we concur with statements made and rely on the letters submitted by the Santa Monica Mountains Conservancy and the CA Fish and Wildlife regarding this project. We

note that the recently approved Spring Canyon project in the upper watershed had CUP conditions placed on it against the use of rodenticides and trapping f wildlife due to predation on household pets. We ask that any approval of this project include similar restrictions due to its location in a wildlife corridor.

We also ask that an alternative that preserves the two oak trees on site be developed.

Water Supply – The community of Val Verde is currently served by only one water well. It is important that the County determine the sufficiency of the water supply and that the water quality of that well is not being affected by the Chiquita Canyon Landfill.

We request that a Water Supply Assessment be provided for this project and that any additional proposed pumping to serve this project be coordinated and reviewed by the appropriate ground water sustainability agency.

Cumulative Impacts to the Santa Clara River and its tributaries - We urge that new information regarding cumulative impacts to streams and tributaries of the Santa Clara River be reviewed in light of the 2014 Sustainable Groundwater Management Act.

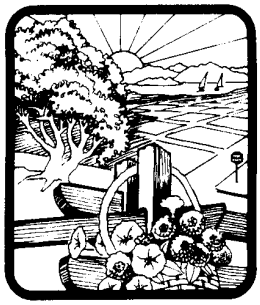
Conclusion

Thank you in advance for your attention to our concerns. We look forward to the re-notice of this matter with Spanish translation.

Sincerely,

James Danza
Chair

SCOPE
Santa Clarita Organization for Planning and the Environment
TO PROMOTE, PROTECT AND PRESERVE THE ENVIRONMENT, ECOLOGY
AND QUALITY OF LIFE IN THE SANTA CLARITA VALLEY
POST OFFICE BOX 1182, SANTA CLARITA, CA 91386
www.scope.org



9-19-19

Mr. Steven Jones
Los Angeles County Dept of Regional Planning
320 W. Temple St.
Los Angeles, CA 90012

Sent via email to : sdjones@planning.lacounty.gov

Re: Sterling Ranch Residential Project/Project No. 03-250-(5)/Vesting Tentative Parcel Map No. 060257/Conditional Use Permit No. 03-250/ Oak Tree Permit No. 200700007 /Environmental Assessment No. 03-250

Dear Mr. Jones:

The SCOPE Board has reviewed the Notice of Preparation for this project and submits below our comments and concerns. We respectfully ask that these issues be addressed by revising the initial study and by addressing them in the Environmental Impact Report for this project.

These comments are timely made since an extension to Sept. 20th was verbally granted at the scoping meeting and later posted to the County website, though no official notice of extension was circulated to interested parties.

Sterling Gateway proposes to create 222 detached single-family residential lots on 57.9 acres, as well as additional infrastructure and three debris basins in the rural community of Val Verde, increasing its current population by approximately 25%. The housing will be located in close proximity to the existing and proposed expansions of the Chiquita Canyon Landfill, making future residents subject to odors and poor air quality caused by this landfill.

The project is located in a hillside management area and in a Very High Fire Hazard area with only one two lane road in an out f the community. It is subject to the Los Angeles County General Plan, the new County Sustainability Plan, the Santa Clarita Valley area plan and the Val Verde Community Standard District, as well as permitting by numerous resource agencies. The DEIR should describe what is required by each of these plans and how this project will be consistent with the plans and how will abide by the various resources agencies requirements.

The Notice of Preparation does not mention the proximity of the Chiquita Canyon Landfill and the information that the project is proposed in a very high fire hazard area. These are facts important to the public's ability to make meaningful suggestions for the NOP process. We request that this information be included when the Department properly re-notices this project.

Community Standards District According to the Castaic CSD[1], "The Castaic Area Community Standards District ("CSD") is established to protect the rural character, unique appearance, and natural

[1]https://library.municode.com/ca/los_angeles_county/codes/code_of_ordinances?nodeId=TIT22PLZO_DIV10COSTDI_CH22.312CAARCOSTDI

resources of the Castaic Area communities. This CSD also ensures that new development will be compatible with the Castaic area's existing rural neighborhoods and with the goals of the Santa Clarita Valley Area Plan"... "This CSD generally includes the existing communities of Castaic, Castaic Junction, Val Verde, Hasley Canyon, Hillcrest, and Paradise Ranch: the canyons of Charlie, Tapia, Romero, Sloan and Violin canyons…etc." and thus covers the community of Val Verde where this project is located.

We do not believe that this project qualifies for clustering under the CSD. The CSD states that-

2. Clustering is allowed within this CSD only if findings are made that clustering can:
    a. Reduce grading alterations;
    b. Preserve native vegetation;
    c. Preserve unique land features;
    d. Preserve open space;
    e. Enhance recreational areas; or
    f. Protect view corridors and view sheds.

While clustering would create open space, because the proposed open space appears to be too steep to accommodate hiking trails and park space, it will not enhance recreational features. Clustering does not protect the two oak trees slated for removal, so does not preserve native vegetation. The massive amount of grading proposed for this project seems to indicate that grading will not be reduced and hillsides and land features will also not be preserved. The preserved open space is unbuildable, so all that is gained by clustering is pushing more houses into a small area with nothing of the required amenities for the community. The zoning should not be changed to allow clustered housing without the required findings being achievable. We do not see any exception in the Standards that would allow for clustering to violate the Special Standards District.

An alternative that complies with hillside management should be included in the EIR.

Further, it appears that a significant ridgeline runs through the project area. The Castaic CSD includes strict prohibitions against grading significant ridgelines.

Even if the project fills the CSD requirements as it claims to do, it ignores the intent of the CSD which is to maintain the rural character of Val Verde. The County's seeming willingness to permit such an action, i.e., cramming houses into a small buildable area and using the un-buildable area that would not be disturbed anyway to count as open space, is unacceptable

Notice of Preparation

We concur with the County's preliminarily review that, consistent with section 15060 of the CEQA Guidelines, an EIR should be prepared for this proposed Project. In addition, consistent with section 15082 of the CEQA Guidelines, the County has identified the following probable environmental effects of the Project, which will be addressed in the EIR for this project: •Aesthetics •Air Quality •Biological Resources •Cultural Resources •Geology / Soils •Greenhouse Gas Emissions• Hazards/Hazardous Materials •Hydrology / Water Quality •Noise •Public Services •Recreation •Transportation / Traffic •Tribal Cultural Resources •Utilities / Services Systems •Wildfire.

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believe these effects would not to be significant, we believe this is not sufficient and these areas should be fully addressed.

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SCOPE supports the preservation of natural bed and banks of streams and creeks to ensure sustainable groundwater recharge and the maintenance of natural habitat. We therefore request that the EIR include an alternative that provides for the preservation of these ephemeral streams.

Further, it appears that there may be some serious problems with drainage on this project. Local residents have reported flooding and sheet flows across the road and have raised concerns that the intense grading may result in landslides and mudflows. Some retention basins appear to be inadequately sized and piping may not be sufficient to provide drainage for storm water runoff. We have attached maps with notes that indicate potential problem areas.

Surrounding Land uses – The County failed to include the approved 1544 unit Landmark project directly across Hwy 126 directly across from Chiquito Canyon Rd which is the entrance to community of Val Verde. Other smaller projects were also not included.

Biology – At this time we concur with statements made and rely on the letters submitted by the Santa Monica Mountains Conservancy and the CA Fish and Wildlife regarding this project. We note that the recently approved Spring Canyon project in the upper watershed had CUP conditions placed on it against the use of rodenticides and trapping of wildlife due to predation on household pets. We ask that any approval of this project include similar restrictions due to its location in a wildlife corridor.

We also ask that an alternative that preserves the two oak trees on site be developed.

Water Supply – The community of Val Verde is currently served by only one water well. It is important that the County determine the sufficiency of the water supply and that the water quality of that well is not being affected by the Chiquita Canyon Landfill.

We request that a Water Supply Assessment be provided for this project and that any additional proposed pumping to serve this project be coordinated and reviewed by the appropriate ground water sustainability agency.

Conclusion

Should the County allow this project to move forward after correcting the serious errors and deviations in road width and the drainage maps, we ask that the following conditions be required of this project in order to protect the community:

1. The open space must be released to the Conservancy 60 days after project approval not after the project completion. Without this requirement, the community cannot be assured that the open space will be preserved. Failure to require or ensure open space conservation transfer or restrictions in other county projects has resulted in park or open space being lost in future development proposals.
2. Due to the proposed housing density and due to potential fire danger, the Chiquita Canyon road should be widened to 3-4 lanes at developer's cost

3. A bridge at Hasley and Del Vale must be completed to guarantee access during flooding.
4. Traffic lights must be installed at the two intersections along Chiquita canyon
5. The impact of this project will damage the charm and rural atmosphere of the community therefore some compensation money should go to the Val Verde community for local improvements of their choosing.

Traffic and Evacuation in a Very High Fire Hazard Area

As discussed by many residents that attended the scoping meeting, the access roads in and out of the project vary in width throughout the community. In some instances they don't even match up to roads within the project (i.e. Lexington, Rainbow Dr, and Trevylon). Ingress and egress to the project is on two lane roads. This community could already face serious evacuation dangers in the event of a fast moving wildfire. Adding another 222 residences to this dangerous situation could create a situation similar to Paradise where people were unable to get out. We noted these issues on the attached map.

Proximity to the Chiquita Canyon Landfill

We oppose placing additional homes near a very large and expanding regional landfill. The community of Val Verde is burdened by air quality and odor problems that impact the quality of life for its current residents. The County should not allow housing that subjects additional residents to this burden. In the event that the County choices to expose new and potentially unaware buyers to this deteriorating environmental situation, the County should require full disclose of the landfill, odor complaints and any violations against to all potential buyers.

Signage and Notice should be provided in Spanish

During the recent Chiquita Canyon Landfill public process, we objected to your department that although the community is statistically a majority Hispanic community and a large percentage of the community speaks Spanish at home, no notices or signage where provided in that language. This resulted in barriers to participation for many of the affected members of the community because they could not participate in their native language.

Although the County stated at the scoping hearing that material were available in Spanish, none of the materials received by our group were translated into Spanish nor did any statement appear in Spanish offering to answer questions. We therefore request that the SCOPING meeting be re-scheduled and re-noticed with Spanish translation so that all residents of this community can be informed as to what is being proposed.

Thank you in advance for your attention to our concerns. We look forward to the re-notice of this matter with Spanish translation.

Sincerely,

President
Attachment: Maps with notes

RECEIVED
DEPT OF REGIONAL PLANNING
TR060257 TENTATIVE PG 1 OF 4
27 FEB 2019

DATA SUMMARY

GROSS ACRES	151.8 AC (113.9 AC ON SITE & 37.9 OFFSITE OPEN SPACE)
NET ACRES (EXCLUDED OFF SITE & DEL VALLE ROAD)	107.5 AC
EXISTING & PROPOSED ZONING	R1, C2 & RL5 (OFFSITE)
EXISTING & PROPOSED GENERAL PLAN	H5, H2, CG & RL5 (OFFSITE)
ALLOWABLE DU PER OVOV	239
EXISTING LAND USE PROPOSED LAND USE	1 SINGLE FAMILY RESIDENTIAL PROPOSED USE 222 DETACHED SINGLE FAMILY LOTS, TWO RECREATION CENTER LOTS, ONE COMMERICAL LOT, FIVE OPEN SPACE LOTS, SIX DEBRIS BASIN LOTS, THREE INFILTRATION BASIN LOTS, AND A PUMP STATION LOT.
A.P.N.	3271-004-012, -013 & PORTION OF 3271-005-032 (OFFSITE)

UTILITIES AND SERVICES

WATER:	WATERWORKS DISTRICT #36
SEWER:	LOS ANGELES COUNTY SANITATION DISTRICT NO.32
GAS:	SOUTHERN CALIFORNIA GAS CO.
ELECTRICITY:	SOUTHERN CALIFORNIA EDISON COMPANY
SCHOOL DISTRICT:	WILLIAM S. HART

LOT & AREA SUMMARY

SINGLE FAMILY RESIDENTIAL LOTS (1-222)*	57.9 AC
7,000 TO 10,000 S.F.	91 LOTS (41%)
≥ 10,000 S.F.	131 LOTS (59%)
COMMERCIAL (223)	2.5 AC
PARK SITE (224-225)	3.6 AC
DEBRIS BASIN (226-231)	3.6 AC
INFILTRATION BASIN (232-234)	5.2 AC
PUMP STATION (235)	0.1 AC
OPEN SPACE (236-240)	
NATURAL OPEN SPACE	12.6 AC
MANUFACTURED OPEN SPACE	8.4 AC
ACCESS ROAD (241-243)	0.3 AC
H.O.A LOT (244-249)	0.1 AC
STREET (PUBLIC R/W & PRIVATE AND FUTURE STREET)	19.6 AC
TOTAL	113.9 AC

*SINGLE FAMILY RESIDENTAL LOTS INCLUDED 19.5 AC. OF MANUFACTURED AND NATURAL OPEN SPACE

NOTES

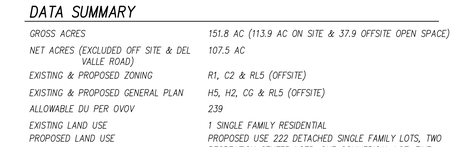
1. PROPOSED GRADING IS APPROXIMATE ONLY AND SUBJECT TO 5'+/-ADJUSTMENTS PENDING DETERMINATION OF FINAL DEVELOPMENT LAYOUT AND PLANS.
2. UNIT PHASING IS REQUESTED.
3. ADJUSTMENT OF LOT LINES AT THE TIME OF FINAL MAP IS REQUESTED
4. REQUESTED PERMISSION TO RECORD A LARGE LOT PARCEL MAP 82320 (20.0 Ac Min.)
5. TOTAL EARTHWORK APPROXIMATELY CUT ±1,500,000 C.Y. FILL ±1,500,000 C.Y. (TO BE BALANCED ON SITE).
6. ALL PROPOSED CUL-DE-SACS TO BE DESIGNED PER LOS ANGELES COUNTY ROAD DEPARTMENT STANDARD PLAN 12-01, DO NOT EXCEED 700'.
7. TWO EXISTING OAK TREES ADJACENT TO HUNSTOCK AVENUE AND TWO EXISTING OAK TREES ADJACENT TO DEL VALLE ROAD ARE TO BE REMOVED.
8. NO SIGNIFICANT RIDGE LINES ARE LOCATED WITHIN THE PROJECT BOUNDARY.
9. AN IEC ALIGNMENT (P-289) FOR DEL VALLE ROAD IS BEING PROCESSED CONCURRENTLY.
10. CONDITIONAL USE PERMIT NO. 03-250 AND OAK TREE PERMIT NO. 200700007 HAVE BEEN FILED CONCURRENTLY.
11. ALL LANDINGS ARE 3% MAX.
12. PORTION OF DEL VALLE ROAD WILL BE ABANDONED AND REPLACED WITH STERLING PARKWAY.
13. NO RESIDENTIAL DRIVEWAYS ACCESS ON STERLING PARKWAY & DEL VALLE ROAD.
14. MAXIMUM RETAINING WALL HEIGHT TO BE 6 FEET.
15. ALL EXISTING FENCES WITHIN PROJECT BOUNDARY TO BE REMOVED.
16. ALL SINGLE FAMILY LOTS WILL BE SERVED BY SEPARATE SEWER LATERAL FOR EACH INDIVIDUAL LOT. ALL COMMERCIAL BUILDINGS WILL BE SERVED BY SEPARATE SEWER LATERAL FOR EACH INDIVIDUAL BUILDING.

BENCH MARK

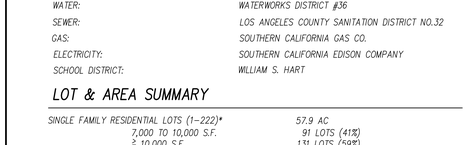
NEWHALL (1983) LAFC BM MON 32FT E/O C/L CHIQUITO CN RD & 0.7MI N/O INT HENRY MAYO DR (HWY 126) 31FT S/O PP NO. 1882927E MKD (BM 147-00440 1965) 2IN IP 3FT UP & 3FT W. ELEV = 1054.756 BM NUMBER = 4521.

LEGAL DESCRIPTION

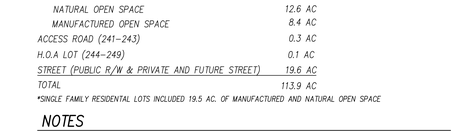
LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031



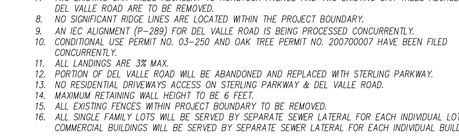
TYPICAL SECTION
SCALE:1"=10'
80' STREET – LIMITED SECONDARY HIGHWAY
STERLING PARKWAY
(FROM HUNSTOCK AVE. TO DEL VALLE ROAD)
DEL VALLE ROAD (FROM 422' NE'LY DEL VALLE ROAD TO TRACT BOUNDARY)



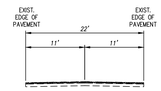
TYPICAL SECTION
SCALE:1"=10'
DEL VALLE ROAD (FROM TRACT BOUNDARY TO 422' NE'LY DEL VALLE ROAD)



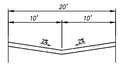
TYPICAL SECTION
SCALE:1"=10'
"A" ST., "C" ST., "D" ST., "E" ST., "F" ST.,
"I" ST., "J" ST., "M" ST., "N" ST.



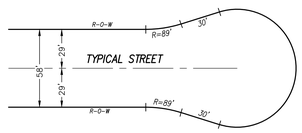
TYPICAL SECTION
SCALE:1"=10'
"B" ST.,"C-1" ST., "E" ST., "G" ST., "H" ST., "J-1" ST.,
"J-2" ST.,"K" ST., "L" ST., "N-1" ST.



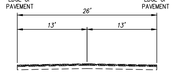
TYPICAL SECTION
SCALE:1"=10'
EXIST. HUNSTOCK AVE



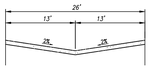
TYPICAL ACCESS ROAD
SCALE: 1"=10'



TYPICAL STREET
CUL-DE-SAC
N.T.S.



TYPICAL SECTION
SCALE:1"=10'
EXIST. DE VALLE ROAD



TYPICAL ACCESS ROAD
SCALE: 1"=10'

DOCUMENT "A" USED:

ITEM #		STATUS
	FIDELITY NATIONAL TITLE COMPANY PRELIMINARY TITLE REPORT ORDER NO. 997-00098213-MM7 DATED OCTOBER 10, 2018.	
1	SOUTHERN CALIFORNIA EDISON COMPANY, HOLDER OFAN EASEMENT FOR PUBLIC UTILITIES AND INCIDENTIAL PURPOSES IN THE DOCUMENT RECORDED JUNE 9, 1945 IN BOOK 22010 PAGE 287 OF OFFICIAL RECORDS.	TO BE RELOCATED
2	COUNTY OF LOS ANGELES, HOLDER OF AN EASEMENT FOR WATER PIPELINE AND APPURTENANT AND INCIDENTAL PURPOSES IN THE DOCUMENT RECORDED FEBRUARY 4, 1971 AS INSTRUMENT NO. 1912 OF OFFICIALS RECORDS.	TO BE RELOCATED
3	ESTATE DEVELOPMENT CORPORATION, HOLDER OF AN EASEMENT FOR PUBLIC ROAD AND HIGHWAY PURPOSES AND INCIDENTAL PURPOSES IN THE DOCUMENT RECORDED IN BOOK 12815 PAGE 340 OF OFFICIAL RECORDS.	TO BE RELOCATED
4	SAUGUS PROPERTIES, HOLDER OF AN EASEMENT FOR INGRESS, EGRESS AND ACCESS AS DISCLOSED IN A LICENSE AND EASEMENT AGREEMENT RECORDED OCTOBER 17, 2018 AS INSTRUMENT NO. 2018-1055514 OF OFFICIAL RECORDS.	TO BE TERMINATED UPON CONSTRUCTION OF DEL VALLE ROAD

SUBDIVIDER:
STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
(TEL) 435-901-3488
Attn: HUNT WILLIAMS

GEOLOGIST:
AES, INC.
27825 SMYTH DRIVE
VALENCIA CA 91355
(TEL) 1-661-294-0065
(FAX) 1-661-294-0833
Attn: ERIC SEWARD

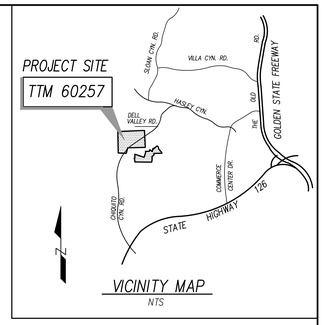
ARCHITECTS:
RRM DESIGN GROUP
10E FIGUEROA STREET, STE 200
SANTA BARBARA, CA 93101
(TEL) 1-805-963-8283
Attn: DELTEV PIEKERT

TRAFFIC ENGINEER:
STANTEC
38 TECHNOLOGY DRIVE, STE 100
IRIVINE, CA 92618-5312
(TEL) 949-923-6074
(FAX) 949-923-0121
Attn: DARYL ZERFASS

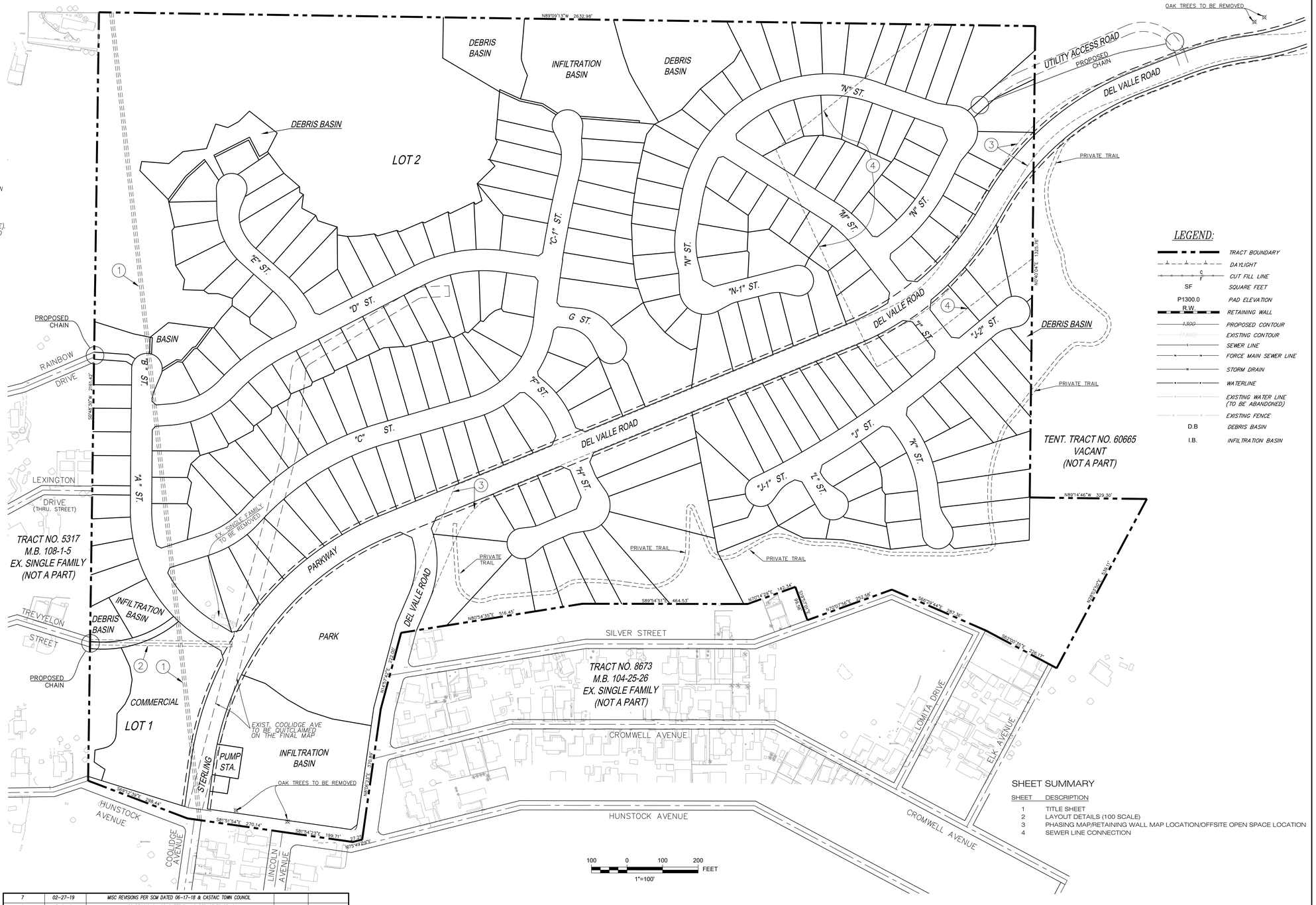
BIOLOGIST/OAK TREE:
DUDEK
25124 SPRINGFIELD COURT, STE 210
VALENCIA, CA 91355
(TEL) 1-661-705-8614
Attn: RANDALL McINVALE

EIR:
MERIDIAN
910 HAMSPHIRE ROAD, STE V
WESTLAKE VILLAGE, CA 91361
(TEL) 1-805-367-5720
Attn: KALENE STRAIN

LANDSCAPE:
OAKRIDGE LANDSCAPE, INC.
28064 AVENUE STANFORD, UNIT K
VALENCIA, CA 91355
(TEL) 1-818-891-0468
Attn: KEN ALDRICH



VICINITY MAP
NTS



LEGEND:

	TRACT BOUNDARY
	DAYLIGHT
C F	CUT FILL LINE
SF	SQUARE FEET
P1300.0	PAD ELEVATION
R.W.	RETAINING WALL
1300	PROPOSED CONTOUR
1300	EXISTING CONTOUR
	SEWER LINE
	FORCE MAIN SEWER LINE
	STORM DRAIN
	WATERLINE
	EXISTING WATER LINE (TO BE ABANDONED)
	EXISTING FENCE
D.B	DEBRIS BASIN
I.B.	INFILTRATION BASIN

SHEET SUMMARY

SHEET	DESCRIPTION
1	TITLE SHEET
2	LAYOUT DETAILS (100 SCALE)
3	PHASING MAP/RETAINING WALL MAP LOCATION/OFFSITE OPEN SPACE LOCATION
4	SEWER LINE CONNECTION

PREPARED FOR:
Sterling Ranch ESTATES
STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

	DATE	REVISION	BY	APP
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6	5-8-18	MISC REVISIONS, ADD SHEET 3, AND REDUCE TO 231 DU		
5	7-13-16	MISC ADJUSTMENTS & ADDED ALT. A TO SHEET 2		
4	2-12-16	MISC LOT ADJUSTMENTS		
3	9-5-12	DEL ROUNDABOUTS, SHOW PHASING, LARGE LOTS, SEPTIC OPTION & CORRECT ST SECTIONS		
2	7-17-07	REVISED HUNSTOCK INTERSECTION		
1	3-27-05	REVISED LAYOUT TO MEET CASTAIC C.S.D. STANDARDS		

SCALE:	DWN'D BY:	APPROVED BY:	DATE:	DWG. NO.	SHEET	OF
AS SHOWN			08-18-06	5100-056-01	1	4

LEGAL DESCRIPTION
LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031

N

REGISTERED PROFESSIONAL ENGINEER
MARK R. SIKAND
No.35453
Exp. 09-30-19
CIVIL
STATE OF CALIFORNIA

SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd.,
Van Nuys, CA 91411
Tel: (818) 787-8550
Fax: (818) 901-7451
info@sikand.com

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT NO. 60257

LOCATED IN THE UNINCORPORATED TERRITORY OF
THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

RECEIVED
DEPT OF REGIONAL PLANNING
TR060257 TENTATIVE PG 2 OF 4
27 FEB 2019

LOT AREA SUMMARY

Lot No.	Gross Area (sq.ft.)	Frontage (ft.)
1	11172	60
2	8889	60
3	7680	60
4	7022	66
5	9050	85
6	7142	67
7	7027	66
8	7034	66
9	7195	54*
10	10558	44*
11	10452	145
12	7972	89
13	7837	63
14	11999	107
15	10117	111
16	7371	71
17	7527	63
18	12819	61
19	11621	62
20	8020	54*
21	9277	60
22	7076	40*
23	7160	68
24	9209	66
25	11023	86
26	11666	65
27	11581	60
28	11569	60
29	9330	63
30	9740	67
31	10180	71
32	7065	60
33	7084	61
34	7274	60
35	8073	60
36	10260	65
37	11918	87
38	11991	68
39	13872	69
40	11640	61
41	10025	67
42	10502	53*
43	10330	57*
44	9848	60
45	11867	60
46	10664	66
47	12055	71
48	13187	71
49	14393	71
50	19423	70
51	37426	111
52	10230	77
53	10577	81
54	10981	60
55	10158	62
56	8249	65
57	13426	72
58	11467	60
59	10246	60
60	10067	63
61	10936	65
62	11395	65
63	11088	64
64	11915	73
65	12073	74
66	12107	75
67	12196	78
68	11628	76
69	12532	67
70	13689	63
71	17593	63
72	17458	129
73	11654	136
74	7822	74
75	8547	74
76	8837	74
77	7594	64
78	7838	64
79	7529	72
80	7880	84
81	7583	78
82	7148	70
83	7104	70
84	7271	70
85	7456	65
86	9091	66
87	10051	65
88	10017	77
89	10137	81
90	8253	79
91	10092	81
92	13246	118
93	10026	93
94	10382	93
95	10888	61
96	11149	61
97	11537	60
98	11947	61
99	12120	60
100	12051	61
101	11740	62
102	11602	63
103	11024	64
104	10498	65
105	11576	65
106	11869	61
107	15368	157
108	10942	64
109	7769	60
110	8240	61
111	19182	40*
112	37132	40*
113	23602	40*
114	11081	60
115	14477	61
116	13603	72
117	21183	54**
118	56261	44**
119	35729	43**
120	18859	53**
121	21584	78
122	13775	81
123	10479	68
124	10735	64
125	11343	60
126	11204	62

Lot No.	Gross Area (sq.ft.)	Frontage (ft.)
127	12263	60
128	12627	61
129	12842	61
130	13323	60
131	21490	46*
132	14218	40*
133	7935	40*
134	11925	40*
135	9398	73
136	8124	54*
137	10451	40*
138	8400	44*
139	7966	66
140	9773	73
141	8483	100
142	8653	112
143	7693	80
144	7336	78
145	13120	49*
146	14235	66
147	19021	69
148	22625	60
149	12194	60
150	8263	75
151	8209	63
152	15390	64
153	16334	63
154	12493	60
155	8103	62
156	11224	75
157	9286	66
158	14532	50*
159	25178	47*
160	9606	76
161	8888	77
162	7961	69
163	7890	70
164	7870	70
165	12162	67
166	17136	41**
167	34287	69
168	13826	60
169	12674	60
170	11461	60
171	10271	60
172	11834	60
173	10057	60
174	10403	60
175	11752	60
176	14349	60
177	7399	60
178	7202	64
179	7031	63
180	8197	60
181	10171	60
182	9448	60
183	8394	60
184	7671	60
185	9115	60
186	7724	61
187	7221	71
188	7201	44**
189	7196	44**
190	15411	47**
191	10588	64
192	10352	60
193	9990	61
194	10241	81
195	13159	88
196	14945	165
197	10830	65
198	10680	96
199	10571	107
200	8210	78
201	7084	70
202	8617	70
203	7432	70
204	7919	76
205	8519	94
206	7822	70
207	13075	85
208	8219	71
209	8092	80
210	7558	75
211	7018	64
212	7415	89
213	7834	66
214	7919	60
215	7467	71
216	7630	77
217	7229	77
218	7080	77
219	10140	131
220	10600	70
221	10390	63
222	11989	60

Lot No.	Area (ac.)	Lot Use
223	2.5	COMMERICAL
224	3.4	PARK
225	0.2	
226	0.2	DEBRIS BASIN
227	0.3	
228	0.6	
229	0.9	
230	1.5	
231	0.1	
232	3.0	INFILTRATION BASIN
233	0.4	
234	1.8	
235	0.1	PUMP STATION
236	0.1	
237	0.7	OPEN SPACE
238	14.2	
239	0.2	
240	5.9	
241	0.1	ACCESS ROAD
242	0.1	
243	0.1	
244	0.01	H.O.A LOT
245	0.03	
246	0.02	
247	0.03	
248	0.02	
249	0.02	

*CUL-DE-SAC
**KNUCKLE

NOTE:
- THE GROSS AREA OF LOT 21 (1235 SQ.FT), LOT 180 (1390 SQ.FT) AND 194 (2475 SQ.FT.) SQUARE FOOTAGES ARE INCLUDING THE SQUARE FOOTAGES FOR SD AND SEWER EASEMENT.
- AVERAGE LOT SIZE IS 11,634 SQ.FT.

100 0 100 200 FEET
1"=100'

LEGEND:

- TRACT BOUNDARY
- DAYLIGHT
- CUT FILL LINE (C / F)
- SF — SQUARE FEET
- P1300.0 — PAD ELEVATION
- R.W — RETAINING WALL
- PROPOSED CONTOUR
- EXISTING CONTOUR
- SEWER LINE
- FORCE MAIN SEWER LINE
- STORM DRAIN
- WATERLINE
- EXISTING WATER LINE (TO BE ABANDONED)
- EXISTING FENCE
- D.B — DEBRIS BASIN
- I.B. — INFILTRATION BASIN

PREPARED FOR:
Sterling Ranch ESTATES

STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

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	DATE	REVISION		BY	APP

SCALE:	DWN BY:	APPROVED BY:	DATE:	DWG. NO.	SHEET	OF
AS SHOWN			08-18-06	5100-056-01	2	4

LEGAL DESCRIPTION

LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031

N

REGISTERED PROFESSIONAL ENGINEER MARK R. SIKAND No.35453 Exp. 09-30-19 CIVIL

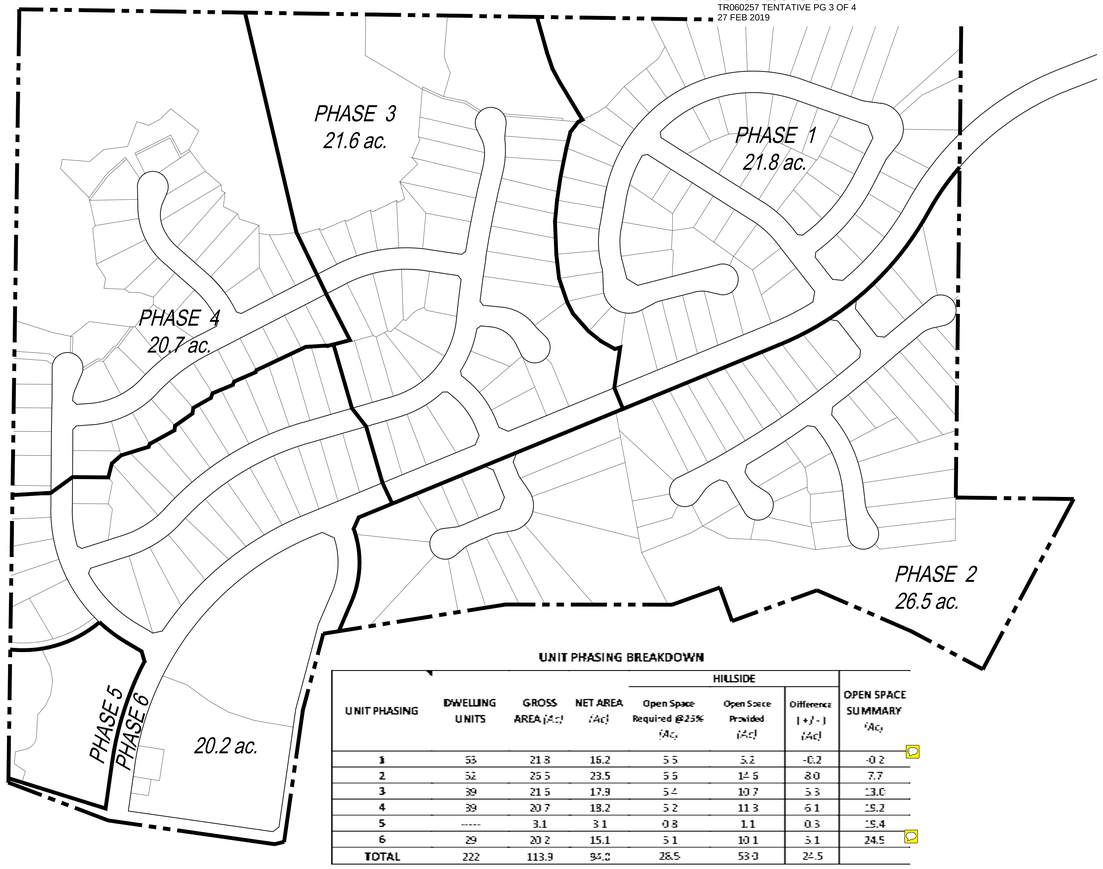
SIKAND
Engineering | Planning | Surveying

15230 Burbank Blvd.,
Van Nuys, CA 91411
Tel: (818) 787-8550
Fax: (818) 901-7451
info@sikand.com

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT NO. 60257

LOCATED IN THE UNINCORPORATED TERRITORY OF
THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

RECEIVED
DEPT OF REGIONAL PLANNING
TR060257 TENTATIVE PG 3 OF 4
27 FEB 2019

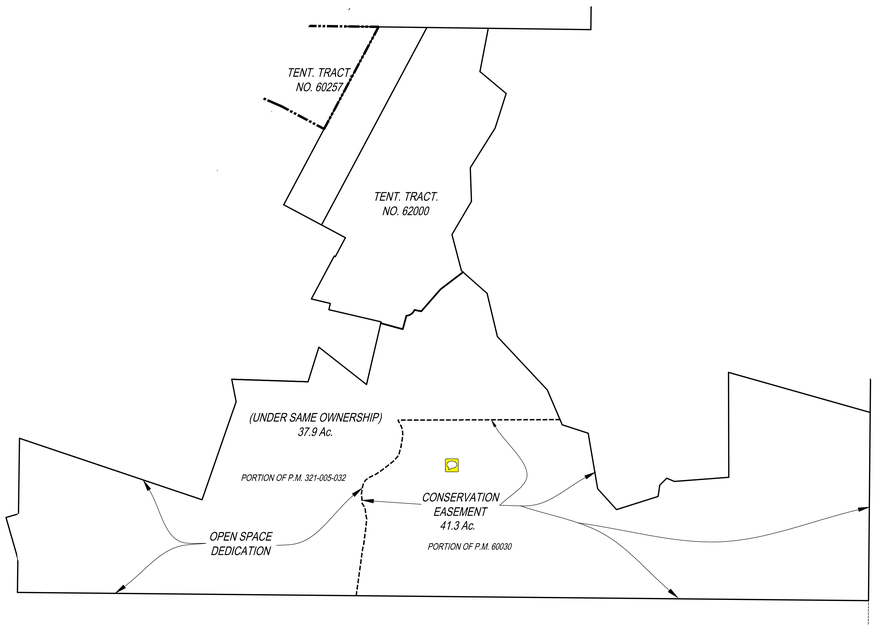


UNIT PHASING BREAKDOWN

UNIT PHASING	DWELLING UNITS	GROSS AREA (Ac)	NET AREA (Ac)	HILLSIDE Open Space Required @25% (Ac)	HILLSIDE Open Space Provided (Ac)	HILLSIDE Difference (+) / (-) (Ac)	OPEN SPACE SUMMARY (Ac)
1	55	21.8	16.2	5.5	5.2	-0.2	-0.2
2	52	25.5	23.5	5.5	12.5	8.0	7.7
3	39	21.5	17.9	5.4	10.7	5.3	13.0
4	39	20.7	18.2	5.2	11.3	6.1	19.2
5	-----	3.1	3.1	0.8	1.1	0.3	19.4
6	29	20.2	15.1	5.1	10.1	5.1	24.5
TOTAL	222	113.9	94.0	28.5	53.0	24.5	

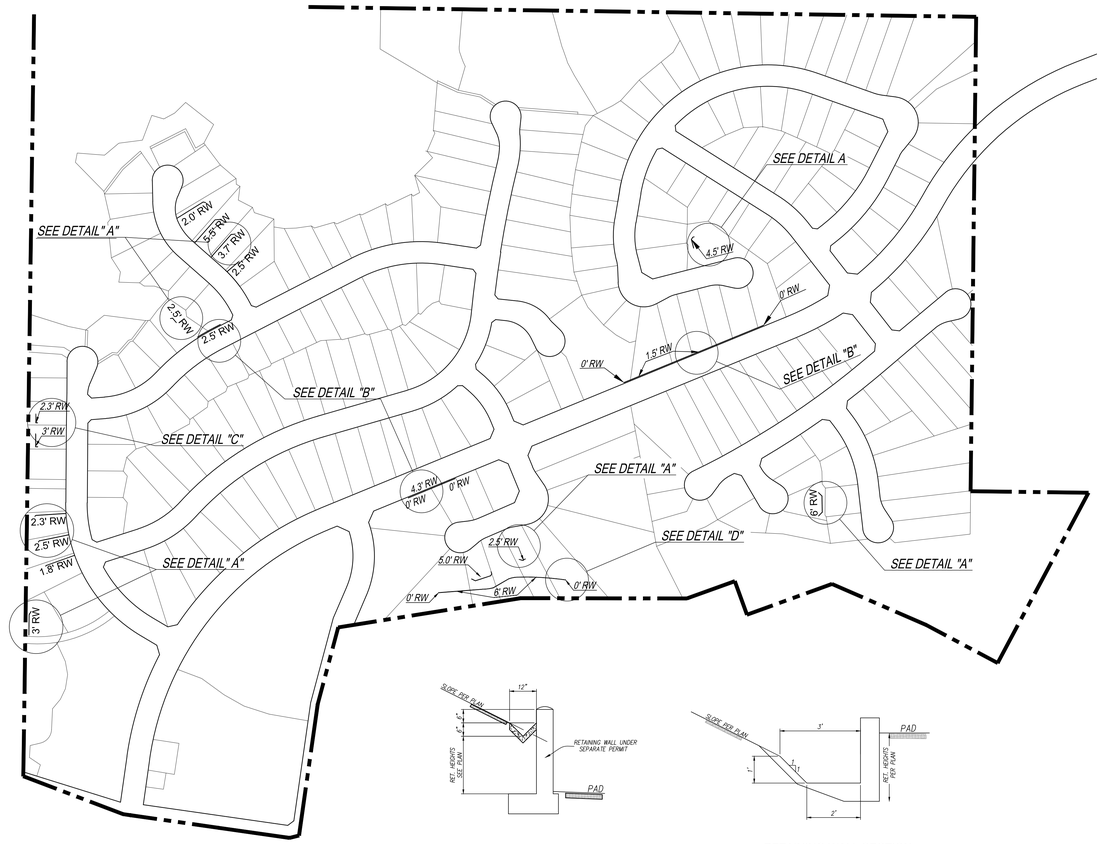
PHASING MAP/LARGE LOT MAP PARCEL NO. 82320

150 0 150 300 FEET
1"=150'



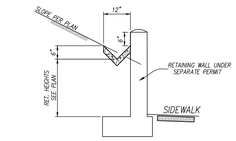
OFFSITE OPEN SPACE

250 0 250 500 FEET
1"=250'

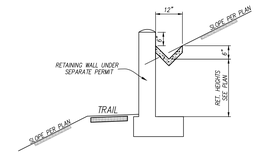


A RETAINING WALL SECTION
SCALE: 1"=20'

C RETAINING WALL SECTION
SCALE: 1"=20'



B RETAINING WALL SECTION
SCALE: 1"=20'



D RETAINING WALL SECTION
SCALE: 1"=20'

RETAINING WALL LOCATION MAP

150 0 150 300 FEET
1"=150'

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AS SHOWN			08-18-06	5100-056-01	3	4

PREPARED FOR:
Sterling Ranch ESTATES

STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

LEGAL DESCRIPTION

LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031

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REGISTERED PROFESSIONAL ENGINEER
MARK R. SIKAND
No.35453
Exp. 09-30-19
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MAJOR LAND DIVISION
VESTING TENTATIVE TRACT NO. 60257

LOCATED IN THE UNINCORPORATED TERRITORY OF
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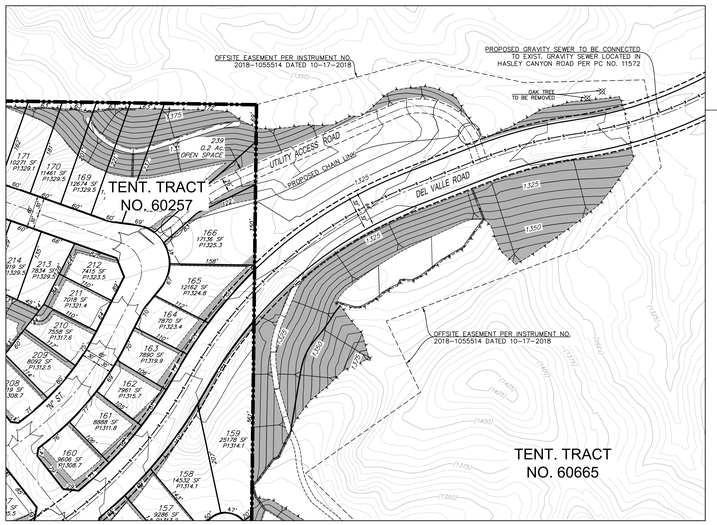
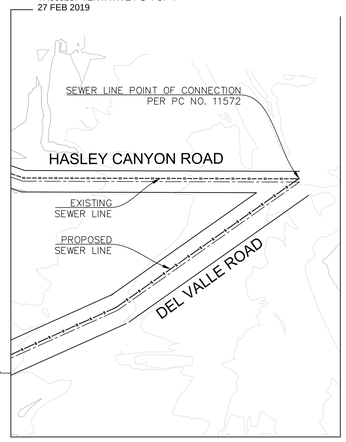
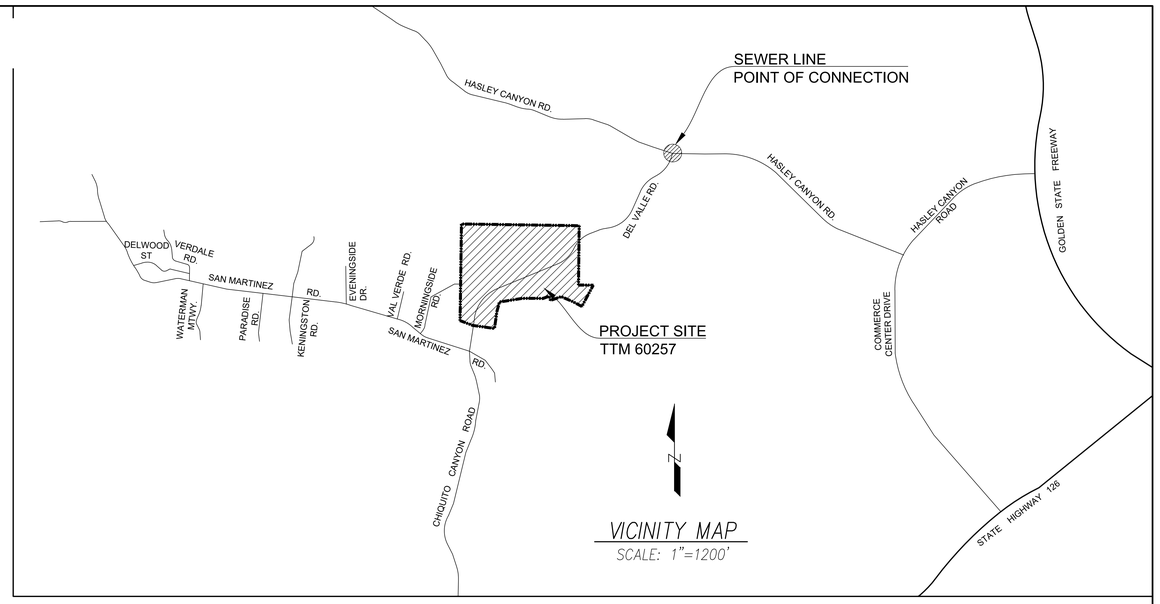
RECEIVED
DEPT OF REGIONAL PLANNING
TR060257 TENTATIVE PG 4 OF 4
27 FEB 2019







VICINITY MAP
SCALE: 1"=1200'

APPROXIMATE OFFSITE SEWER LENGTH (TRACT BOUNDARY TO POINT OF CONNECTION) IS 3422 LINEAR FEET.

SEWER LINE POINT OF CONNECTION
SCALE: 1"=100'

7	02-27-19	MISC REVISIONS PER SCM DATED 06-17-18 & CASTAIC TOWN COUNCIL		
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AS SHOWN			08-18-06	5100-056-01	4	4

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PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

LEGAL DESCRIPTION

LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031

N

REGISTERED PROFESSIONAL ENGINEER
MARK R. SIKAND
No.35453
Exp. 09-30-19
CIVIL
STATE OF CALIFORNIA

SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd.,
Van Nuys, CA 91411
Tel: (818) 787-8550
Fax: (818) 901-7451
info@sikand.com

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT NO. 60257
LOCATED IN THE UNINCORPORATED TERRITORY OF
THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

09-20-2019

Steven D. Jones, AICP
County of Los Angeles Department of Regional Planning
320 West Temple Street
Los Angeles, CA 90012
(213) 974-6433
sdjones@planning.lacounty.gov

SUBJECT: Notice of Preparation of a Draft Environmental Impact Report in Compliance with Title 14, section 15082(a) of the California Code of Regulations for Project No. 03-250-(5), Sterling Gateway LP

Dear Mr. Jones,

Thank you for the opportunity for the Val Verde Civic Association (VVCA) to submit comments on the Sterling Gateway project's preparation of a Draft Environmental Impact Report. This project is entirely in the Val Verde, CA area for which we are the County's advisory committee so it is important we are able to voice impacts we foresee with this project. Additionally, please submit this comment letter and attachments into the public record.

We had time to review the project as well as the Scoping Meeting Preparation notes and have received feedback from community members on this development. Below are the main factors we believe need to be addressed in the DEIR or potentially in the final Permit if they do not fall under the CEQA EIR guidelines.

REGARDING THIS PARTICULAR PROCESS

Signage and notices in Spanish

The community of Val Verde is majority spanish speaking in the home. As it was with the Chiquita Canyon Landfill DEIR process, we feel it is necessary to have all information regarding this development including signage and mailings to be distributed in both English and Spanish. It has been voiced to our group that Spanish speaking neighbors are not aware of this project. For this reason, we would like to request an extension on the comment period for Spanish speaking residents and in addition, the scoping meeting notice to be re-distributed in Spanish and any future notifications to be English and Spanish . This project will have a significant impact on most if not all of our residents so we feel it is of utmost importance that our residents receive equal opportunity to be notified and informed of any land developments happening around their homes and in their community. Asking them to contact you if they want information does not account for their work schedules nor offer them this information outright as it is with the English speaking residents. This is discriminatory to our neighbors.

Lack of Identified Developer

Our land use committee has brought forth a major recurring concern about this project, which is the lack of an identified developer. It was expressed to our board and in the development presentation delivered at our public land use committee meeting, that the plans we are now reviewing are not for a developer applying to build but plans to be included in the sale of the land. Due to this, our board and land use committee do not know what developer will potentially instigate this project. This raises concern as the process of public participation may be compromised and the community will potentially not receive the opportunity to directly and publicly navigate the permitting process with the developer. We find it very problematic to go through the permitting process and not know which entity may end up developing this project.

PUBLIC SERVICES

Emergency access points on the western and southern portion of the project pose a substantial impact and high risk to community members as well as those dwelling in the proposed project. Particularly Rainbow Drive, Lexington Drive, and Trevyelon Street. These streets contain blind corners and hills, are very narrow, including only one lane at certain points and often hill-sided with significant grades on one or both sides. This would make it extremely hard for emergency vehicles to navigate getting to the proposed residential area. Additionally, the extreme drop in width from Sterling Gateway to Coolidge will also likely cause issues. This is a high traffic intersection and Huntstock also contains blind hills and narrow streets. To better illustrate the issues we have included images of these streets from a variety of angles. The VVCA requests the scoping for public service access be expanded further in order for this plan to address how large emergency and or maintenance vehicles will access the development at these entry points.

TRAFFIC

The Hwy. 126/Chiquito Canyon Drive Intersection

During the construction of this project, there may be stretches where the only outlet from Val Verde would be the Highway 126/Chiquito Canyon Intersection. Left turns from Chiquito Canyon onto the 126 are extremely dangerous. Many accidents and fatalities have occurred when exiting Val Verde East on the 126 due to it being a higher speed limit, 4 lanes, and a blind curve. Anyone leaving Val Verde and trying to turn East onto the 126 is at a higher risk of harm. In fact, many in the community already refuse to use this outlet and will send visitors out the Del Valle exit due to this situation. There have been a series of formal requests to local government officials including Dante Acosta and now Scott WIlk on installing a temporary light until a permanent light is installed as part of the Newhall Land Development. This temporary light has yet to be installed nor instigated as being so. Regarding the Sterling Gateway Development, Del Valle will be compromised as an exit route whether as a single lane or closed completely sending our residents out on the 126. For this reason it is imperative to include safety measures in the scope of this DEIR including the installation of a temporary light on the 126 exit or additional measures so our residents can safely leave the area on a regular basis. Please see attached correspondances on the Highway 126 matter.

Addition to this will be a large increase in population density for the area (nearly 25% more) adding a significant amount of cars on the road affecting the pace and maneuverability of existing roads and

byways in and around Val Verde.

Limited entry and exit routes for increased population

Currently there are only two entry and outlet points for Val Verde. Del Valle to Hasley Canyon and Chiquito Canyon to the 126 Highway. As it is with our current population of around 2,600 people, two exits have put residents at risk. There have been multiple incidences with weather and fire where residents were not able to use these routes to enter or exit the community. Beyond the current scope of this development is the intersection of Del Valle and Hasley Canyon with even the slightest rainfall produces water run over making it dangerous to drive through. Likewise, Chiquito Canyon Road which allows residents to enter and exit the 126 has also been compromised due to landslides in the past. The Rye canyon fire sent vast numbers of commuters through Val Verde looking for a detour around the I5 shutdown producing panic and stand still traffic exiting and entering the community. With this development's significant increase of traffic and density in Val Verde, we are very concerned with how only two routes in and out of the area will not further endanger our community. We feel this is a significant safety issue which this development can not mitigate but further exacerbate it.

WILDFIRE

As it is with our traffic concerns, our community is already at high risk for wildfire danger. With only two exits it further exacerbates emergency response coming into the community as well as our ability to evacuate in the case of wildfire. Sterling Gateway, adding 220 homes will further impact the safety of the community and its ability to respond to a wildfire emergency. In addition to this major concern is our community members being impacted by increases in fire insurance which have already begun. Ours is a low income community and many residents cannot take on higher insurance fees to protect themselves in the untimely chance damage and destruction from a wildfire occurs.

AESTHETICS

Val Verde is of historical significance and prides itself on being a rural community that is welcoming, quiet, unique, and a refreshing departure from development tracts often found in the area. There are ranches dating back 5 generations of families, farms, large and small homes, many hand built, that are new and older some dating back to the 40's during our community's era as the "Black Palm Springs". Our community has a large ratio of open land and hills to homes and entering or exiting Val Verde along Del Valle has always exemplified this. It is also one of our most beautiful driving routes where the canyon opens up to the road and is the basis for our VVCA logo as seen on this very page. The Sterling Gateway project will completely change these aesthetics into what our residents came to Val Verde to avoid. As it is planned, Sterling Gateway will include two large clusters of gated communities each lining Del Valle as you enter Val Verde. Instead of our lovely open hills, there will be walls, gates, and landscaped grated slopes. All of which are not found in our community and eliminate our welcoming and open aesthetic. Although there are tracts in Val Verde, many are no more than a dozen homes at best and none of these tracts are gated or walled in. The Sterling Gateway project is a typical run of the mill housing tract development and by being so will entirely re-create the aesthetics of our community as well as eliminate our historical and rural feel. We do not feel this is something that can be mitigated.

GREENHOUSE GAS EMISSIONS / AIR QUALITY / WATER QUALITY

Currently Val Verde is surrounded by several developments under construction or pending construction, some will be ongoing for decades. These projects include; Mission Village, Los Valles, Tapia Ranch, Commercial and Industrial ongoing in the Valencia Commerce Center and the IAC Commerce Center, and the massive Newhall Land Development along the 126 highway. These developments have existing impacts on air quality, greenhouse gas emissions, and water quality. Increases in risk of valley fever exposure is a concern of our community as well as the number of children attending preschool and school in our 3 mile radius which is approximately 1500 souls. In addition to the ongoing construction from the developments on our borders is the additional pollution from the Chiquita Canyon Landfill which is adjacent to our community and has now been permitted to double its daily intake. Residents on a near daily basis are reporting landfill odors to SCAQMD. Any additional impact on our air quality is significant largely due to the fact our community is held in a canyon where many of the gasses or air pollutants settle. The Sterling Gateway development, located within our canyon, will have an extremely significant impact on the greenhouse gas and air quality of our canyon. The VVCA requests impact reports on these areas to reflect our topography and relation to surrounding pollutants

HYDROLOGY

Val Verde's drainage systems are extremely limited and any runoff from the development will easily flood the area. As it is now, any increased rainfall inhibits several roads in Val Verde. The VVCA feels further scoping should be included regarding Hydrology based on the surrounding systems and not just that within this project. This includes during construction and after completion.

NOISE

Residents are concerned with noise particularly created during construction with the increase of equipment and noise from the pump station located on the southern edge of the project. As mentioned earlier, our community exists within a canyon so noise is significantly amplified throughout the area. This would be a negative impact on our neighbors' quality of life. Additionally, the pump station location is directly adjacent to existing residential homes potentially affecting their ability to enjoy their backyards etc.

UTILITIES / SERVICE SYSTEMS

One benefit to the project is the replacement of the existing water main along Del Valle. This main has broken repeatedly in the recent past and needs to be replaced.

RECREATION

Sterling Horn Memorial Trail

The VVCA requests the Sterling Horn Memorial Trail be publicly accessible and not a private trail. This particular trail connects with public trails and also allows our residents a safer path alongside the Del Valle Road and exit access to the Hasley Canyon area which is greatly beneficial to our residents. We want to encourage ease of access to the future County trail plans and as this is, the private trail would make an access point inaccessible.

NOT ADDRESSED IN THE SCOPE OF THIS DEIR

LAND USE / PLANNING OR POPULATION / HOUSING
The VVCA believes there is significant impact on the areas of Land Use, Planning or Population, and housing which are currently not included in the scoping documents. 2010 Census data states Val Verde's population as 2,468 residents and around 800 homes. Sterling gateway is an additional 220 homes which is a significant increase in population density for our area. This will in turn affect the impact on existing byways, services, and accessibility of our area.

SOCIAL OR ECONOMIC CHANGE RELATED TO A PHYSICAL CHANGE
At this time we want to address issues surrounding the nature of the project as a social or economic change as a physical change in regards to our existing community. The VVCA bases this on 15382 of the CEQA Guidelines:

> 15382. SIGNIFICANT EFFECT ON THE ENVIRONMENT "Significant effect on the environment" means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. An economic or social change by itself shall not be considered a significant effect on the environment. A social or economic change related to a physical change may be considered in determining whether the physical change is significant. Note: Authority cited: Section 21083, Public Resources Code; Reference: Sections 21068, 21083, 21100, and 21151, Public Resources Code; Hecton v. People of the State of California, 58 Cal. App. 3d 653.

Sterling Gateway is gated and therefore is automatically "walled off" from public access and the rest of the community. It in turn creates its own "neighborhood" within Val Verde. Economically speaking, Sterling Gateway will be a cluster of brand new homes, a shopping center and park in place to serve the development. The homes will cost more which will decrease the appeal and value of the homes surrounding placing an economic burden on our residents who are primarily low-income minority population. A Sterling Gateway HOA creates an even deeper divide from the community including our role as the Civic Association for all of Val Verde.

In layman terms, it will be automatically establish a new and affluent neighborhood excluding existing residents both socially and economically. We feel this development falls under the auspice of residential segregation and its physical change to the environment should be included in the DEIR as a significant impact on a historical minority and low-income community.

Please feel free to contact us for any further information at vvcivic@gmail.com or 661.670.8663.

Thank you,

The Val Verde Civic Association Board
www.vvcivic.com
vvcivic@gmail.com
661.670.8663

ATTACHMENTS
Highway 126 Correspondances
Pictures of intersections of concern
Pictures of Aesthetics

May 18, 2016

Malcolm Dougherty
Director Caltrans
California Department of Transportation
1120 N Street
MS 49
Sacramento, California 95814

Dear Mr. Dougherty

On behalf of the Castaic community, the Castaic Area Town Council would like to express our grave concern of the traffic situation at the corner of SR 126 and Chiquita Canyon Road. In light of the fact that we have had 2 deaths and a significant number of accidents at this uncontrolled intersection within the past year we would like to ask to have a traffic study to best evaluate this intersection. The two tragic deaths occurred when the vehicles were both entering the east bound lanes of SR 126 coming from south bound on Chiquita canyon road.

Presently there is only a stop sign that holds southbound traffic on Chiquita Canyon Road coming from Val Verde. This traffic must cross two uncontrolled lanes of traffic moving westbound and then merge into the eastbound lanes along SR126. Most Chiquita Canyon southbound traffic proceeds eastbound having to cross oncoming traffic with speeds above 60 MPH. This situation is further complicated by a curve and hill that hides the westbound oncoming traffic on SR 126 from view of the stopped traffic at Chiquita Canyon Rd. This situation gives very little time to make a good judgment to proceed and merge across the lanes.

The Castaic Area Town Council is requesting that a traffic study be conducted to determine the need for a traffic light at this intersection. We realize that this particular traffic light is detailed to be installed in the Newhall Land Mission Village Project, but it is the consensus of the council that the community can wait for this improvement the years this project will take to develop along. We also would like Caltrans to consider the repurpose of the light that will be removed at the corner of SR 126 and Commerce Drive with the completion of the over pass in that area.

Sincerely,

Sandia Ennis President
Castaic Area Town Council

LEC/05-2016

Traffic Study Request by the Castaic Area Town Council

July 18, 2016 Page **2** of **2**

To: Malcolm Dougherty
Director Caltrans
California Department of Transportation
1120 N Street
MS 49
Sacramento, CA 95814

From:
Castaic Area Town Council
PO Box 325
Castaic, CA 91310

Dear Mr. Dougherty

On behalf of the Castaic community the Castaic Area Town Council would like to express our grave concern of the traffic situation at the corner of SR126 and Chiquita Canyon Road. In light of the fact that we have had 2 deaths and a significant number of accidents at this uncontrolled intersection within the past year we would like to ask to have a traffic study to best control this intersection. The two tragic deaths occurred when the vehicles were entering the east bound lanes of SR126 coming from south bound on Chiquita canyon road.

Presently there is only a stop sign that holds southbound traffic on Chiquita Canyon Road coming from Val Verde. This traffic must cross two uncontrolled lanes of traffic moving westbound and then merge into the eastbound lanes along SR126. Most Chiquita Canyon southbound traffic is proceeding eastbound having to cross oncoming traffic with speeds above 60 MPH. This situation is further complicated by a curve and hill that hides the westbound oncoming traffic on SR126 from view of the stopped traffic at Chiquita Canyon Rd. This situation gives very little time to make a good judgment to proceed and merge across the state rout.

The Castaic Area Town Council is asking that a traffic study be conducted to determine the need for a traffic light at this intersection. We realize that this needed light is built into the Newhall Land Mission Village Project, but we do not feel that the community can wait the years this project will take to move along. We also would like Caltrans to consider the repurpose of the light that will be removed at the corner of SR126 and Commerce Drive with the completion of the over pass.

Sincerely,
Castaic Area Town Council

Sandia Ennis President

See page 2 for copy addresses: Supervisor Michal Antonovich, Senator Sharon Runner and Assemblyman Scott Wilk

CC addresses:

Supervisor Michal Antonovich
5th District Los Angeles Co.
500 West Temple Street, Room 869
Los Angeles, CA 90012

District 21 CA Senate
848 W. Lancaster Blvd, Suite 101
Lancaster, CA 93534
Att: Donna Termeer - Director

Assemblyman Scott Wilk
38th CA Assembly Dist.
27441 Tourney Road, Suite #160
Santa Clarita, CA 91355

LEC/7-2016

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7
100 S. MAIN STREET, SUITE 100
LOS ANGELES, CA 90012
PHONE (213) 897-0362
FAX (213) 897-0360
TTY 711
www.dot.ca.gov

Serious drought.
Help save water!

September 29, 2016

Ms. Sandia Ennis
President
Castaic Area Town Council
P.O. Box 325
Castaic, CA 91310

Dear Ms. Ennis:

This is in response to your letter to Mr. Malcolm Dougherty, Director of the California Department of Transportation (Caltrans), in which you expressed concerns about the traffic conditions at the intersection of State Route 126 and Chiquita Canyon Road in Los Angeles County.

The Office of Traffic Engineering will initiate a traffic investigation. We anticipate the results of our investigation will be available in three to four weeks, which will be provided to you.

Thank you for bringing this matter to our attention. Caltrans relies on our civic partners for input regarding the state highway system.

If you should have any further questions regarding this matter, please do not hesitate to contact Mr. Ali Zaghari, Deputy District Director, Traffic Operations, at (213) 897-0362.

Sincerely,

for CARRIE L. BOWEN
District Director

c: Mike Antonovich, LA County Board of Supervisors, District 5
Donna Tremeer, District Director, Senate, District 21
Scott Wilk, Assemblymember, District 38

"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability"

STATE OF CALIFORNIA—CALIFORNIA STATE TRANSPORTATION AGENCY EDMUND G. BROWN Jr., Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7
100 S. MAIN STREET, SUITE 100
LOS ANGELES, CA 90012
PHONE (213) 897-0362
FAX (213) 897-0360
TTY 711
www.dot.ca.gov

Serious drought. Help save water!

March 3, 2017

Ms. Sandia Ennis
President
Castaic Area Town Council
P.O. Box 325
Castaic, CA 91310

Dear Ms. Ennis,

This is a follow up response to the acknowledgement letter sent to you dated September 29, 2016. A field investigation was conducted at the corner of State Route 126 (SR-126) and Chiquita Canyon Road, the location mentioned in your response.

We have initiated an investigation for the installation of a traffic signal at this location. Based on the findings, we have initiated an Installation Order for the following signs to be installed:

- Two CROSS TRAFFIC AHEAD signs, one in each direction, 1000 feet east and 1500 west of the intersection.
- AHEAD sign on the existing CROSS TRAFFIC AHEAD signs on SR-126, east and west of the intersection.
- A LANE ENDS sign 500 feet west of the intersection in the westbound direction on SR-126.
- A CROSS ROAD AHEAD sign on Chiquita Canyon Road, just south of SR-126.

The signs will be special ordered, and may take up to four months to be manufactured. We anticipate the installation of signs to occur in early April 2017. We will continue our investigation into the installation of a traffic signal. We anticipate the results of this investigation to be available by June 2017.

"Provide a safe, sustainable, integrated and efficient transportation system to enhance California's economy and livability."

If you should have further questions regarding this matter, please do not hesitate to contact Mr. Abdi Saghafi, Office Chief, Traffic Engineering-North at (213) 897-9810.

Sincerely,

ALI F. ZAGHARI
Deputy District Director, Traffic Operations

APPENDIX B

Air Quality Model Output

APPENDIX B.1

Proposed Summer

Sterling Ranch Project

Los Angeles-South Coast County, Summer

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	19.70	Acre	19.70	858,132.00	0
City Park	12.80	Acre	12.80	557,568.00	0
Single Family Housing	222.00	Dwelling Unit	57.90	399,600.00	635
Regional Shopping Center	21.00	1000sqft	2.50	21,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	33
Climate Zone	8			**Operational Year**	2027
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Park acreage includes passive park and shade structures and debris and pump stations
Asphalt surfaces include public right-of-way and private and future streets

Construction Phase - Construction to begin August 2021

Off-road Equipment -

Off-road Equipment -

Off-road Equipment - Grading equipment per applicant.

Off-road Equipment -

Grading -

Vehicle Trips - Weekday trip rates adjusted per traffic study. Weekend trip rates adjusted per CalEEMod default weekday/weekend ratios.

Woodstoves - No woodstoves.

Construction Off-road Equipment Mitigation - 25 percent of equipment fleet would meet Tier 4 Final specifications. Remaining 75 percent would meet Tier 3/Tier 4 Interim requirements.

Area Mitigation - Compliant with SCAQMD Rule 1113 - Architectural Coating (<50gms/liter).

Energy Mitigation -

Water Mitigation -

Mobile Land Use Mitigation -

Table Name	Column Name	Default Value	New Value
tblAreaMitigation	UseLowVOCPaintParkingCheck	False	True
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	20
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	110.00	130.00
tblConstructionPhase	NumDays	1,550.00	783.00
tblConstructionPhase	NumDays	110.00	132.00
tblFireplaces	FireplaceWoodMass	1,019.20	0.00
tblFireplaces	NumberWood	11.10	0.00
tblLandUse	LotAcreage	72.08	57.90
tblLandUse	LotAcreage	0.48	2.50
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	10.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	8.00
tblVehicleTrips	CC_TL	8.40	0.00
tblVehicleTrips	CC_TTP	48.00	0.00
tblVehicleTrips	CC_TTP	64.70	64.40
tblVehicleTrips	CNW_TL	6.90	0.00
tblVehicleTrips	CNW_TTP	19.00	0.00
tblVehicleTrips	CW_TL	16.60	0.00
tblVehicleTrips	CW_TTP	33.00	0.00
tblVehicleTrips	CW_TTP	16.30	16.60
tblVehicleTrips	DV_TP	28.00	0.00
tblVehicleTrips	DV_TP	35.00	40.00
tblVehicleTrips	HO_TL	8.70	13.00
tblVehicleTrips	HS_TL	5.90	13.30
tblVehicleTrips	HW_TL	14.70	24.20
tblVehicleTrips	PB_TP	6.00	0.00
tblVehicleTrips	PB_TP	11.00	15.00
tblVehicleTrips	PR_TP	66.00	0.00
tblVehicleTrips	PR_TP	54.00	45.00
tblVehicleTrips	ST_TR	22.75	0.00
tblVehicleTrips	ST_TR	49.97	42.04
tblVehicleTrips	SU_TR	16.74	0.00
tblVehicleTrips	SU_TR	25.24	20.43
tblVehicleTrips	WD_TR	1.89	0.00
tblVehicleTrips	WD_TR	42.70	44.32
tblWoodstoves	NumberCatalytic	11.10	0.00
tblWoodstoves	NumberNoncatalytic	11.10	0.00
tblWoodstoves	WoodstoveDayYear	25.00	0.00
tblWoodstoves	WoodstoveWoodMass	999.60	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	19.4155	211.1379	106.6854	0.2323	70.3801	9.2595	79.6396	34.2959	8.5187	42.8146	0.0000	22,528.3059	22,528.3059	7.1020	0.0000	22,705.8559
2022	16.3052	173.4974	96.7896	0.2323	70.3801	7.4861	77.8662	34.2959	6.8872	41.1831	0.0000	22,522.0323	22,522.0323	7.1053	0.0000	22,699.6653
2023	4.6887	34.1694	45.1660	0.1631	9.2702	0.7786	10.0488	2.4962	0.7318	3.2279	0.0000	16,598.6747	16,598.6747	1.1529	0.0000	16,627.4981
2024	4.4356	33.0147	43.3384	0.1605	9.2702	0.6911	9.9613	2.4962	0.6492	3.1454	0.0000	16,348.0314	16,348.0314	1.1290	0.0000	16,376.2552
2025	23.1985	31.7600	41.5689	0.1574	9.2703	0.6038	9.8741	2.4962	0.5672	3.0634	0.0000	16,040.6455	16,040.6455	1.1056	0.0000	16,068.2852
2026	23.1775	1.3972	5.5773	0.0160	1.5202	0.0623	1.5825	0.4032	0.0614	0.4646	0.0000	1,575.7324	1,575.7324	0.0439	0.0000	1,576.8297
Maximum	**23.1985**	**211.1379**	**106.6854**	**0.2323**	**70.3801**	**9.2595**	**79.6396**	**34.2959**	**8.5187**	**42.8146**	**0.0000**	**22,528.3059**	**22,528.3059**	**7.1053**	**0.0000**	**22,705.8559**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	4.6322	69.3148	116.8909	0.2323	22.2747	0.3937	22.6684	10.7863	0.3933	11.1795	0.0000	22,528.3059	22,528.3059	7.1020	0.0000	22,705.8559
2022	4.6173	69.2991	116.7194	0.2323	22.2747	0.3935	22.6682	10.7863	0.3931	11.1794	0.0000	22,522.0323	22,522.0323	7.1053	0.0000	22,699.6653
2023	3.7281	31.7228	46.7958	0.1631	7.7104	0.1457	7.8561	2.1133	0.1402	2.2535	0.0000	16,598.6747	16,598.6747	1.1529	0.0000	16,627.4981

2024	3.5762	31.5092	45.0453	0.1605	7.7105	0.1446	7.8551	2.1133	0.1392	2.2525	0.0000	16,348.0314	16,348.0314	1.1290	0.0000	16,376.2552
2025	23.0821	31.2287	43.3580	0.1574	7.7105	0.1431	7.8536	2.1133	0.1378	2.2511	0.0000	16,040.6455	16,040.6455	1.1056	0.0000	16,068.2852
2026	23.0611	1.3116	5.6006	0.0160	1.2558	0.0114	1.2672	0.3383	0.0105	0.3488	0.0000	1,575.7324	1,575.7324	0.0439	0.0000	1,576.8297
Maximum	**23.0821**	**69.3148**	**116.8909**	**0.2323**	**22.2747**	**0.3937**	**22.6684**	**10.7863**	**0.3933**	**11.1795**	**0.0000**	**22,528.3059**	**22,528.3059**	**7.1053**	**0.0000**	**22,705.8559**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**31.27**	**51.67**	**-10.40**	**0.00**	**59.47**	**93.47**	**62.87**	**63.06**	**93.03**	**68.62**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	10.3805	3.3410	19.6354	0.0210		0.3546	0.3546		0.3546	0.3546	0.0000	4,028.9903	4,028.9903	0.1082	0.0733	4,053.5268
Energy	0.1705	1.4577	0.6250	9.3000e-003		0.1178	0.1178		0.1178	0.1178		1,860.0129	1,860.0129	0.0357	0.0341	1,871.0660
Mobile	4.9007	22.3375	73.0934	0.3198	30.2997	0.2240	30.5238	8.1061	0.2081	8.3142		32,655.8844	32,655.8844	1.3765		32,690.2960
Total	**15.4517**	**27.1362**	**93.3537**	**0.3500**	**30.2997**	**0.6965**	**30.9962**	**8.1061**	**0.6805**	**8.7866**	**0.0000**	**38,544.8876**	**38,544.8876**	**1.5203**	**0.1074**	**38,614.8889**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Area	10.3805	3.3410	19.6354	0.0210		0.3546	0.3546		0.3546	0.3546	0.0000	4,028.9903	4,028.9903	0.1082	0.0733	4,053.5268
Energy	0.1705	1.4577	0.6250	9.3000e-003		0.1178	0.1178		0.1178	0.1178		1,860.0129	1,860.0129	0.0357	0.0341	1,871.0660
Mobile	4.5185	20.5177	63.5276	0.2752	25.8835	0.1937	26.0772	6.9246	0.1799	7.1045		28,106.7653	28,106.7653	1.1970		28,136.6894
Total	**15.0695**	**25.3165**	**83.7880**	**0.3054**	**25.8835**	**0.6661**	**26.5496**	**6.9246**	**0.6523**	**7.5769**	**0.0000**	**33,995.7686**	**33,995.7686**	**1.3408**	**0.1074**	**34,061.2823**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**2.47**	**6.71**	**10.25**	**12.74**	**14.58**	**4.36**	**14.35**	**14.58**	**4.14**	**13.77**	**0.00**	**11.80**	**11.80**	**11.81**	**0.00**	**11.79**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	8/1/2021	3/4/2022	5	155	
2	Building Construction	Building Construction	3/5/2022	3/5/2025	5	783	
3	Paving	Paving	3/6/2025	9/6/2025	5	132	
4	Architectural Coating	Architectural Coating	9/7/2025	3/7/2026	5	130	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 1395

Acres of Paving: 19.7

Residential Indoor: 809,190; Residential Outdoor: 269,730; Non-Residential Indoor: 31,500; Non-Residential Outdoor: 10,500; Striped

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Graders	2	8.00	187	0.41
Grading	Rubber Tired Dozers	10	8.00	247	0.40
Grading	Scrapers	8	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37

Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	22	55.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	681.00	259.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	136.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					69.7654	0.0000	69.7654	34.1329	0.0000	34.1329			0.0000			0.0000
Off-Road	19.1798	210.9759	104.4702	0.2260		9.2545	9.2545		8.5142	8.5142		21,901.9825	21,901.9825	7.0835		22,079.0711
Total	**19.1798**	**210.9759**	**104.4702**	**0.2260**	**69.7654**	**9.2545**	**79.0199**	**34.1329**	**8.5142**	**42.6470**		**21,901.9825**	**21,901.9825**	**7.0835**		**22,079.0711**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2358	0.1621	2.2153	6.2900e-003	0.6148	4.9700e-003	0.6197	0.1630	4.5800e-003	0.1676		626.3234	626.3234	0.0185		626.7848
Total	**0.2358**	**0.1621**	**2.2153**	**6.2900e-003**	**0.6148**	**4.9700e-003**	**0.6197**	**0.1630**	**4.5800e-003**	**0.1676**		**626.3234**	**626.3234**	**0.0185**		**626.7848**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Fugitive Dust					21.7668	0.0000	21.7668	10.6495	0.0000	10.6495			0.0000			0.0000
Off-Road	4.3965	69.1528	114.6756	0.2260		0.3887	0.3887		0.3887	0.3887	0.0000	21,901.9825	21,901.9825	7.0835		22,079.0711
Total	**4.3965**	**69.1528**	**114.6756**	**0.2260**	**21.7668**	**0.3887**	**22.1555**	**10.6495**	**0.3887**	**11.0382**	**0.0000**	**21,901.9825**	**21,901.9825**	**7.0835**		**22,079.0711**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2358	0.1621	2.2153	6.2900e-003	0.5079	4.9700e-003	0.5129	0.1368	4.5800e-003	0.1414		626.3234	626.3234	0.0185		626.7848
Total	**0.2358**	**0.1621**	**2.2153**	**6.2900e-003**	**0.5079**	**4.9700e-003**	**0.5129**	**0.1368**	**4.5800e-003**	**0.1414**		**626.3234**	**626.3234**	**0.0185**		**626.7848**

3.2 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					69.7654	0.0000	69.7654	34.1329	0.0000	34.1329			0.0000			0.0000
Off-Road	16.0843	173.3510	94.7458	0.2263		7.4813	7.4813		6.8828	6.8828		21,917.7406	21,917.7406	7.0886		22,094.9566
Total	**16.0843**	**173.3510**	**94.7458**	**0.2263**	**69.7654**	**7.4813**	**77.2467**	**34.1329**	**6.8828**	**41.0157**		**21,917.7406**	**21,917.7406**	**7.0886**		**22,094.9566**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2208	0.1464	2.0438	6.0600e-003	0.6148	4.8100e-003	0.6196	0.1630	4.4300e-003	0.1675		604.2918	604.2918	0.0167		604.7087
Total	**0.2208**	**0.1464**	**2.0438**	**6.0600e-003**	**0.6148**	**4.8100e-003**	**0.6196**	**0.1630**	**4.4300e-003**	**0.1675**		**604.2918**	**604.2918**	**0.0167**		**604.7087**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					21.7668	0.0000	21.7668	10.6495	0.0000	10.6495			0.0000			0.0000
Off-Road	4.3965	69.1528	114.6756	0.2263		0.3887	0.3887		0.3887	0.3887	0.0000	21,917.7405	21,917.7405	7.0886		22,094.9566
Total	**4.3965**	**69.1528**	**114.6756**	**0.2263**	**21.7668**	**0.3887**	**22.1555**	**10.6495**	**0.3887**	**11.0382**	**0.0000**	**21,917.7405**	**21,917.7405**	**7.0886**		**22,094.9566**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2208	0.1464	2.0438	6.0600e-003	0.5079	4.8100e-003	0.5127	0.1368	4.4300e-003	0.1412		604.2918	604.2918	0.0167		604.7087
Total	**0.2208**	**0.1464**	**2.0438**	**6.0600e-003**	**0.5079**	**4.8100e-003**	**0.5127**	**0.1368**	**4.4300e-003**	**0.1412**		**604.2918**	**604.2918**	**0.0167**		**604.7087**

3.3 Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612		2,554.3336	2,554.3336	0.6120		2,569.6322
Total	**1.7062**	**15.6156**	**16.3634**	**0.0269**		**0.8090**	**0.8090**		**0.7612**	**0.7612**		**2,554.3336**	**2,554.3336**	**0.6120**		**2,569.6322**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

Vendor	0.7389	23.9135	6.2199	0.0660	1.6582	0.0450	1.7032	0.4774	0.0430	0.5204		7,057.3845	7,057.3845	0.4050		7,067.5094
Worker	2.7344	1.8124	25.3061	0.0751	7.6120	0.0596	7.6716	2.0187	0.0549	2.0736		7,482.2309	7,482.2309	0.2065		7,487.3937
Total	**3.4732**	**25.7260**	**31.5260**	**0.1411**	**9.2702**	**0.1045**	**9.3747**	**2.4962**	**0.0979**	**2.5940**		**14,539.6154**	**14,539.6154**	**0.6115**		**14,554.9031**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6122	11.9384	17.8738	0.0269		0.0669	0.0669		0.0669	0.0669	0.0000	2,554.3336	2,554.3336	0.6120		2,569.6322
Total	**0.6122**	**11.9384**	**17.8738**	**0.0269**		**0.0669**	**0.0669**		**0.0669**	**0.0669**	**0.0000**	**2,554.3336**	**2,554.3336**	**0.6120**		**2,569.6322**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.7389	23.9135	6.2199	0.0660	1.4219	0.0450	1.4669	0.4194	0.0430	0.4624		7,057.3845	7,057.3845	0.4050		7,067.5094
Worker	2.7344	1.8124	25.3061	0.0751	6.2885	0.0596	6.3480	1.6939	0.0549	1.7488		7,482.2309	7,482.2309	0.2065		7,487.3937
Total	**3.4732**	**25.7260**	**31.5260**	**0.1411**	**7.7104**	**0.1045**	**7.8149**	**2.1133**	**0.0979**	**2.2112**		**14,539.6154**	**14,539.6154**	**0.6115**		**14,554.9031**

3.3 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**1.5728**	**14.3849**	**16.2440**	**0.0269**		**0.6997**	**0.6997**		**0.6584**	**0.6584**		**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5482	18.1447	5.6173	0.0638	1.6582	0.0210	1.6792	0.4774	0.0200	0.4975		6,835.2024	6,835.2024	0.3589		6,844.1747
Worker	2.5678	1.6398	23.3047	0.0723	7.6120	0.0579	7.6699	2.0187	0.0533	2.0720		7,208.2624	7,208.2624	0.1862		7,212.9173
Total	**3.1159**	**19.7845**	**28.9220**	**0.1361**	**9.2702**	**0.0789**	**9.3491**	**2.4962**	**0.0733**	**2.5695**		**14,043.4647**	**14,043.4647**	**0.5451**		**14,057.0920**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6122	11.9384	17.8738	0.0269		0.0669	0.0669		0.0669	0.0669	0.0000	2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**0.6122**	**11.9384**	**17.8738**	**0.0269**		**0.0669**	**0.0669**		**0.0669**	**0.0669**	**0.0000**	**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5482	18.1447	5.6173	0.0638	1.4220	0.0210	1.4429	0.4195	0.0200	0.4395		6,835.2024	6,835.2024	0.3589		6,844.1747
Worker	2.5678	1.6398	23.3047	0.0723	6.2885	0.0579	6.3463	1.6939	0.0533	1.7472		7,208.2624	7,208.2624	0.1862		7,212.9173
Total	**3.1159**	**19.7845**	**28.9220**	**0.1361**	**7.7104**	**0.0789**	**7.7893**	**2.1133**	**0.0733**	**2.1867**		**14,043.4647**	**14,043.4647**	**0.5451**		**14,057.0920**

3.3 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.6989	2,555.6989	0.6044		2,570.8077

Total	**1.4716**	**13.4438**	**16.1668**	**0.0270**		**0.6133**	**0.6133**		**0.5769**	**0.5769**		**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5350	18.0755	5.4462	0.0635	1.6583	0.0207	1.6790	0.4775	0.0198	0.4972		6,807.4635	6,807.4635	0.3538		6,816.3080
Worker	2.4291	1.4954	21.7254	0.0701	7.6120	0.0571	7.6690	2.0187	0.0525	2.0713		6,984.8690	6,984.8690	0.1708		6,989.1395
Total	**2.9640**	**19.5709**	**27.1716**	**0.1336**	**9.2702**	**0.0778**	**9.3480**	**2.4962**	**0.0723**	**2.5685**		**13,792.3325**	**13,792.3325**	**0.5246**		**13,805.4476**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6122	11.9384	17.8738	0.0270		0.0669	0.0669		0.0669	0.0669	0.0000	2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**0.6122**	**11.9384**	**17.8738**	**0.0270**		**0.0669**	**0.0669**		**0.0669**	**0.0669**	**0.0000**	**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5350	18.0755	5.4462	0.0635	1.4220	0.0207	1.4427	0.4195	0.0198	0.4392		6,807.4635	6,807.4635	0.3538		6,816.3080
Worker	2.4291	1.4954	21.7254	0.0701	6.2885	0.0571	6.3455	1.6939	0.0525	1.7464		6,984.8690	6,984.8690	0.1708		6,989.1395
Total	**2.9640**	**19.5709**	**27.1716**	**0.1336**	**7.7105**	**0.0778**	**7.7882**	**2.1133**	**0.0723**	**2.1856**		**13,792.3325**	**13,792.3325**	**0.5246**		**13,805.4476**

3.3 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3674	12.4697	16.0847	0.0270		0.5276	0.5276		0.4963	0.4963		2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**1.3674**	**12.4697**	**16.0847**	**0.0270**		**0.5276**	**0.5276**		**0.4963**	**0.4963**		**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5215	17.9220	5.3063	0.0631	1.6583	0.0204	1.6787	0.4775	0.0195	0.4970		6,769.9539	6,769.9539	0.3488		6,778.6743
Worker	2.3065	1.3683	20.1780	0.0673	7.6120	0.0559	7.6679	2.0187	0.0514	2.0702		6,714.2172	6,714.2172	0.1558		6,718.1128
Total	**2.8280**	**19.2903**	**25.4843**	**0.1304**	**9.2703**	**0.0763**	**9.3465**	**2.4962**	**0.0709**	**2.5671**		**13,484.1711**	**13,484.1711**	**0.5047**		**13,496.7872**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6122	11.9384	17.8738	0.0270		0.0669	0.0669		0.0669	0.0669	0.0000	2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**0.6122**	**11.9384**	**17.8738**	**0.0270**		**0.0669**	**0.0669**		**0.0669**	**0.0669**	**0.0000**	**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5215	17.9220	5.3063	0.0631	1.4220	0.0204	1.4424	0.4195	0.0195	0.4390		6,769.9539	6,769.9539	0.3488		6,778.6743

Worker	2.3065	1.3683	20.1780	0.0673	6.2885	0.0559	6.3443	1.6939	0.0514	1.7453		6,714.2172	6,714.2172	0.1558		6,718.1128
Total	**2.8280**	**19.2903**	**25.4843**	**0.1304**	**7.7105**	**0.0763**	**7.7867**	**2.1133**	**0.0709**	**2.1843**		**13,484.1711**	**13,484.1711**	**0.5047**		**13,496.7872**

3.4 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9152	8.5816	14.5780	0.0228		0.4185	0.4185		0.3850	0.3850		2,206.7452	2,206.7452	0.7137		2,224.5878
Paving	0.3910					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.3062**	**8.5816**	**14.5780**	**0.0228**		**0.4185**	**0.4185**		**0.3850**	**0.3850**		**2,206.7452**	**2,206.7452**	**0.7137**		**2,224.5878**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0508	0.0301	0.4445	1.4800e-003	0.1677	1.2300e-003	0.1689	0.0445	1.1300e-003	0.0456		147.8903	147.8903	3.4300e-003		147.9761
Total	**0.0508**	**0.0301**	**0.4445**	**1.4800e-003**	**0.1677**	**1.2300e-003**	**0.1689**	**0.0445**	**1.1300e-003**	**0.0456**		**147.8903**	**147.8903**	**3.4300e-003**		**147.9761**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3341	10.0395	17.2957	0.0228		5.6100e-003	5.6100e-003		5.6100e-003	5.6100e-003	0.0000	2,206.7452	2,206.7452	0.7137		2,224.5878
Paving	0.3910					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.7251**	**10.0395**	**17.2957**	**0.0228**		**5.6100e-003**	**5.6100e-003**		**5.6100e-003**	**5.6100e-003**	**0.0000**	**2,206.7452**	**2,206.7452**	**0.7137**		**2,224.5878**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0508	0.0301	0.4445	1.4800e-003	0.1385	1.2300e-003	0.1397	0.0373	1.1300e-003	0.0384		147.8903	147.8903	3.4300e-003		147.9761
Total	**0.0508**	**0.0301**	**0.4445**	**1.4800e-003**	**0.1385**	**1.2300e-003**	**0.1397**	**0.0373**	**1.1300e-003**	**0.0384**		**147.8903**	**147.8903**	**3.4300e-003**		**147.9761**

3.5 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Archit. Coating	22.5670					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1709	1.1455	1.8091	2.9700e-003		0.0515	0.0515		0.0515	0.0515		281.4481	281.4481	0.0154		281.8319
Total	**22.7379**	**1.1455**	**1.8091**	**2.9700e-003**		**0.0515**	**0.0515**		**0.0515**	**0.0515**		**281.4481**	**281.4481**	**0.0154**		**281.8319**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.4606	0.2733	4.0297	0.0135	1.5202	0.0112	1.5313	0.4032	0.0103	0.4134		1,340.8716	1,340.8716	0.0311		1,341.6496
Total	**0.4606**	**0.2733**	**4.0297**	**0.0135**	**1.5202**	**0.0112**	**1.5313**	**0.4032**	**0.0103**	**0.4134**		**1,340.8716**	**1,340.8716**	**0.0311**		**1,341.6496**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	22.5670					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0545	1.0598	1.8324	2.9700e-003		5.9000e-004	5.9000e-004		5.9000e-004	5.9000e-004	0.0000	281.4481	281.4481	0.0154		281.8319

Total	**22.6215**	**1.0598**	**1.8324**	**2.9700e-003**		**5.9000e-004**	**5.9000e-004**		**5.9000e-004**	**5.9000e-004**	**0.0000**	**281.4481**	**281.4481**	**0.0154**		**281.8319**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.4606	0.2733	4.0297	0.0135	1.2558	0.0112	1.2670	0.3383	0.0103	0.3486		1,340.8716	1,340.8716	0.0311		1,341.6496
Total	**0.4606**	**0.2733**	**4.0297**	**0.0135**	**1.2558**	**0.0112**	**1.2670**	**0.3383**	**0.0103**	**0.3486**		**1,340.8716**	**1,340.8716**	**0.0311**		**1,341.6496**

3.5 Architectural Coating - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	22.5670					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1709	1.1455	1.8091	2.9700e-003		0.0515	0.0515		0.0515	0.0515		281.4481	281.4481	0.0154		281.8319
Total	**22.7379**	**1.1455**	**1.8091**	**2.9700e-003**		**0.0515**	**0.0515**		**0.0515**	**0.0515**		**281.4481**	**281.4481**	**0.0154**		**281.8319**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.4396	0.2517	3.7682	0.0130	1.5202	0.0108	1.5309	0.4032	9.9200e-003	0.4131		1,294.2843	1,294.2843	0.0285		1,294.9978
Total	**0.4396**	**0.2517**	**3.7682**	**0.0130**	**1.5202**	**0.0108**	**1.5309**	**0.4032**	**9.9200e-003**	**0.4131**		**1,294.2843**	**1,294.2843**	**0.0285**		**1,294.9978**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	22.5670					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0545	1.0598	1.8324	2.9700e-003		5.9000e-004	5.9000e-004		5.9000e-004	5.9000e-004	0.0000	281.4481	281.4481	0.0154		281.8319
Total	**22.6215**	**1.0598**	**1.8324**	**2.9700e-003**		**5.9000e-004**	**5.9000e-004**		**5.9000e-004**	**5.9000e-004**	**0.0000**	**281.4481**	**281.4481**	**0.0154**		**281.8319**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.4396	0.2517	3.7682	0.0130	1.2558	0.0108	1.2666	0.3383	9.9200e-003	0.3482		1,294.2843	1,294.2843	0.0285		1,294.9978
Total	**0.4396**	**0.2517**	**3.7682**	**0.0130**	**1.2558**	**0.0108**	**1.2666**	**0.3383**	**9.9200e-003**	**0.3482**		**1,294.2843**	**1,294.2843**	**0.0285**		**1,294.9978**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Increase Diversity

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

Provide Traffic Calming Measures

Expand Transit Network

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	4.5185	20.5177	63.5276	0.2752	25.8835	0.1937	26.0772	6.9246	0.1799	7.1045		28,106.7653	28,106.7653	1.1970		28,136.6894
Unmitigated	4.9007	22.3375	73.0934	0.3198	30.2997	0.2240	30.5238	8.1061	0.2081	8.3142		32,655.8844	32,655.8844	1.3765		32,690.2960

4.2 Trip Summary Information

	Average Daily Trip Rate		
	Unmitigated	Mitigated	

Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Regional Shopping Center	930.72	882.84	429.03	1,621,411	1,385,087
Single Family Housing	2,113.44	2,200.02	1913.64	11,899,571	10,165,183
Total	3,044.16	3,082.86	2,342.67	13,520,982	11,550,270

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0
Other Asphalt Surfaces	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0
Regional Shopping Center	16.60	8.40	6.90	16.60	64.40	19.00	45	40	15
Single Family Housing	24.20	13.30	13.00	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827
Other Asphalt Surfaces	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827
Regional Shopping Center	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827
Single Family Housing	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Install Energy Efficient Appliances

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.1705	1.4577	0.6250	9.3000e-003		0.1178	0.1178		0.1178	0.1178		1,860.0129	1,860.0129	0.0357	0.0341	1,871.0660
NaturalGas Unmitigated	0.1705	1.4577	0.6250	9.3000e-003		0.1178	0.1178		0.1178	0.1178		1,860.0129	1,860.0129	0.0357	0.0341	1,871.0660

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	115.068	1.2400e-003	0.0113	9.4800e-003	7.0000e-005		8.6000e-004	8.6000e-004		8.6000e-004	8.6000e-004		13.5375	13.5375	2.6000e-004	2.5000e-004	13.6179
Single Family Housing	15695	0.1693	1.4464	0.6155	9.2300e-003		0.1169	0.1169		0.1169	0.1169		1,846.4754	1,846.4754	0.0354	0.0339	1,857.4481
Total		**0.1705**	**1.4577**	**0.6250**	**9.3000e-003**		**0.1178**	**0.1178**		**0.1178**	**0.1178**		**1,860.0129**	**1,860.0129**	**0.0357**	**0.0341**	**1,871.0660**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					

City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	0.115068	1.2400e-003	0.0113	9.4800e-003	7.0000e-005		8.6000e-004	8.6000e-004		8.6000e-004	8.6000e-004		13.5375	13.5375	2.6000e-004	2.5000e-004	13.6179
Single Family Housing	15.695	0.1693	1.4464	0.6155	9.2300e-003		0.1169	0.1169		0.1169	0.1169		1,846.4754	1,846.4754	0.0354	0.0339	1,857.4481
Total		**0.1705**	**1.4577**	**0.6250**	**9.3000e-003**		**0.1178**	**0.1178**		**0.1178**	**0.1178**		**1,860.0129**	**1,860.0129**	**0.0357**	**0.0341**	**1,871.0660**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Low VOC Paint - Residential Interior

Use Low VOC Paint - Residential Exterior

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use Low VOC Cleaning Supplies

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	10.3805	3.3410	19.6354	0.0210		0.3546	0.3546		0.3546	0.3546	0.0000	4,028.9903	4,028.9903	0.1082	0.0733	4,053.5268
Unmitigated	10.3805	3.3410	19.6354	0.0210		0.3546	0.3546		0.3546	0.3546	0.0000	4,028.9903	4,028.9903	0.1082	0.0733	4,053.5268

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.8038					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.6606					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.3663	3.1302	1.3320	0.0200		0.2531	0.2531		0.2531	0.2531	0.0000	3,996.0000	3,996.0000	0.0766	0.0733	4,019.7462
Landscaping	0.5499	0.2108	18.3034	9.7000e-004		0.1016	0.1016		0.1016	0.1016		32.9903	32.9903	0.0316		33.7806
Total	**10.3805**	**3.3410**	**19.6354**	**0.0210**		**0.3546**	**0.3546**		**0.3546**	**0.3546**	**0.0000**	**4,028.9903**	**4,028.9903**	**0.1082**	**0.0733**	**4,053.5268**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.8038					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.6606					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.3663	3.1302	1.3320	0.0200		0.2531	0.2531		0.2531	0.2531	0.0000	3,996.0000	3,996.0000	0.0766	0.0733	4,019.7462
Landscaping	0.5499	0.2108	18.3034	9.7000e-004		0.1016	0.1016		0.1016	0.1016		32.9903	32.9903	0.0316		33.7806
Total	**10.3805**	**3.3410**	**19.6354**	**0.0210**		**0.3546**	**0.3546**		**0.3546**	**0.3546**	**0.0000**	**4,028.9903**	**4,028.9903**	**0.1082**	**0.0733**	**4,053.5268**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX B.2

Proposed Winter

Sterling Ranch Project

Los Angeles-South Coast County, Winter

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	19.70	Acre	19.70	858,132.00	0
City Park	12.80	Acre	12.80	557,568.00	0
Single Family Housing	222.00	Dwelling Unit	57.90	399,600.00	635
Regional Shopping Center	21.00	1000sqft	2.50	21,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	33
Climate Zone	8			**Operational Year**	2027
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Park acreage includes passive park and shade structures and debris and pump stations
Asphalt surfaces include public right-of-way and private and future streets

Construction Phase - Construction to begin August 2021

Off-road Equipment -

Off-road Equipment -

Off-road Equipment - Grading equipment per applicant.

Off-road Equipment -

Grading -

Vehicle Trips - Weekday trip rates adjusted per traffic study. Weekend trip rates adjusted per CalEEMod default weekday/weekend ratios.

Woodstoves - No woodstoves.

Construction Off-road Equipment Mitigation - 25 percent of equipment fleet would meet Tier 4 Final specifications. Remaining 75 percent would meet Tier 3/Tier 4 Interim requirements.

Area Mitigation - Compliant with SCAQMD Rule 1113 - Architectural Coating (<50gms/liter).

Energy Mitigation -

Water Mitigation -

Mobile Land Use Mitigation -

Table Name	Column Name	Default Value	New Value
tblAreaMitigation	UseLowVOCPaintParkingCheck	False	True
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	20
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	3.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	10.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	8.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	5.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	110.00	130.00
tblConstructionPhase	NumDays	1,550.00	783.00
tblConstructionPhase	NumDays	110.00	132.00
tblFireplaces	FireplaceWoodMass	1,019.20	0.00
tblFireplaces	NumberWood	11.10	0.00
tblLandUse	LotAcreage	72.08	57.90
tblLandUse	LotAcreage	0.48	2.50
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	10.00

tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	8.00
tblVehicleTrips	CC_TL	8.40	0.00
tblVehicleTrips	CC_TTP	48.00	0.00
tblVehicleTrips	CC_TTP	64.70	64.40
tblVehicleTrips	CNW_TL	6.90	0.00
tblVehicleTrips	CNW_TTP	19.00	0.00
tblVehicleTrips	CW_TL	16.60	0.00
tblVehicleTrips	CW_TTP	33.00	0.00
tblVehicleTrips	CW_TTP	16.30	16.60
tblVehicleTrips	DV_TP	28.00	0.00
tblVehicleTrips	DV_TP	35.00	40.00
tblVehicleTrips	HO_TL	8.70	13.00
tblVehicleTrips	HS_TL	5.90	13.30
tblVehicleTrips	HW_TL	14.70	24.20
tblVehicleTrips	PB_TP	6.00	0.00
tblVehicleTrips	PB_TP	11.00	15.00
tblVehicleTrips	PR_TP	66.00	0.00
tblVehicleTrips	PR_TP	54.00	45.00
tblVehicleTrips	ST_TR	22.75	0.00
tblVehicleTrips	ST_TR	49.97	42.04
tblVehicleTrips	SU_TR	16.74	0.00
tblVehicleTrips	SU_TR	25.24	20.43
tblVehicleTrips	WD_TR	1.89	0.00
tblVehicleTrips	WD_TR	42.70	44.32
tblWoodstoves	NumberCatalytic	11.10	0.00
tblWoodstoves	NumberNoncatalytic	11.10	0.00
tblWoodstoves	WoodstoveDayYear	25.00	0.00
tblWoodstoves	WoodstoveWoodMass	999.60	0.00

2.0 Emissions Summary

2.1 Overall Construction (Maximum Daily Emission)

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	19.4420	211.1553	106.4956	0.2320	70.3801	9.2595	79.6396	34.2959	8.5187	42.8146	0.0000	22,491.7206	22,491.7206	7.1009	0.0000	22,669.2430
2022	16.3306	173.5130	96.6112	0.2320	70.3801	7.4861	77.8662	34.2959	6.8872	41.1831	0.0000	22,486.7538	22,486.7538	7.1043	0.0000	22,664.3615
2023	5.0224	34.2614	43.5919	0.1571	9.2702	0.7797	10.0499	2.4962	0.7328	3.2290	0.0000	15,992.4769	15,992.4769	1.1622	0.0000	16,021.5324
2024	4.7603	33.0953	41.8635	0.1547	9.2702	0.6920	9.9623	2.4962	0.6501	3.1463	0.0000	15,756.6329	15,756.6329	1.1383	0.0000	15,785.0914
2025	23.2566	31.8278	40.2042	0.1518	9.2703	0.6047	9.8750	2.4962	0.5680	3.0642	0.0000	15,467.2861	15,467.2861	1.1152	0.0000	15,495.1648
2026	23.2345	1.4238	5.2308	0.0152	1.5202	0.0623	1.5825	0.4032	0.0614	0.4646	0.0000	1,500.2434	1,500.2434	0.0421	0.0000	1,501.2947
Maximum	**23.2566**	**211.1553**	**106.4956**	**0.2320**	**70.3801**	**9.2595**	**79.6396**	**34.2959**	**8.5187**	**42.8146**	**0.0000**	**22,491.7206**	**22,491.7206**	**7.1043**	**0.0000**	**22,669.2430**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	lb/day										lb/day					
2021	4.6587	69.3321	116.7010	0.2320	22.2747	0.3937	22.6684	10.7863	0.3933	11.1795	0.0000	22,491.7206	22,491.7206	7.1009	0.0000	22,669.2430
2022	4.6428	69.3148	116.5411	0.2320	22.2747	0.3935	22.6682	10.7863	0.3931	11.1794	0.0000	22,486.7537	22,486.7537	7.1043	0.0000	22,664.3615
2023	4.0618	31.8148	45.2217	0.1571	7.7104	0.1468	7.8572	2.1133	0.1413	2.2546	0.0000	15,992.4769	15,992.4769	1.1622	0.0000	16,021.5323

2024	3.9009	31.5899	43.5704	0.1547	7.7105	0.1456	7.8560	2.1133	0.1401	2.2534	0.0000	15,756.6329	15,756.6329	1.1383	0.0000	15,785.0914
2025	23.1402	31.2965	41.9934	0.1518	7.7105	0.1440	7.8545	2.1133	0.1386	2.2520	0.0000	15,467.2861	15,467.2861	1.1152	0.0000	15,495.1648
2026	23.1181	1.3382	5.2541	0.0152	1.2558	0.0114	1.2672	0.3383	0.0105	0.3488	0.0000	1,500.2434	1,500.2434	0.0421	0.0000	1,501.2947
Maximum	**23.1402**	**69.3321**	**116.7010**	**0.2320**	**22.2747**	**0.3937**	**22.6684**	**10.7863**	**0.3933**	**11.1795**	**0.0000**	**22,491.7206**	**22,491.7206**	**7.1043**	**0.0000**	**22,669.2430**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**30.99**	**51.64**	**-10.56**	**0.00**	**59.47**	**93.46**	**62.87**	**63.06**	**93.01**	**68.62**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Area	10.3805	3.3410	19.6354	0.0210		0.3546	0.3546		0.3546	0.3546	0.0000	4,028.9903	4,028.9903	0.1082	0.0733	4,053.5268
Energy	0.1705	1.4577	0.6250	9.3000e-003		0.1178	0.1178		0.1178	0.1178		1,860.0129	1,860.0129	0.0357	0.0341	1,871.0660
Mobile	4.7562	22.9060	68.5645	0.3049	30.2997	0.2246	30.5243	8.1061	0.2086	8.3147		31,157.9853	31,157.9853	1.3698		31,192.2296
Total	**15.3072**	**27.7047**	**88.8249**	**0.3351**	**30.2997**	**0.6970**	**30.9968**	**8.1061**	**0.6810**	**8.7872**	**0.0000**	**37,046.9885**	**37,046.9885**	**1.5136**	**0.1074**	**37,116.8225**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Area	10.3805	3.3410	19.6354	0.0210		0.3546	0.3546		0.3546	0.3546	0.0000	4,028.9903	4,028.9903	0.1082	0.0733	4,053.5268
Energy	0.1705	1.4577	0.6250	9.3000e-003		0.1178	0.1178		0.1178	0.1178		1,860.0129	1,860.0129	0.0357	0.0341	1,871.0660
Mobile	4.3811	20.9757	59.8697	0.2623	25.8835	0.1942	26.0777	6.9246	0.1804	7.1050		26,806.5250	26,806.5250	1.1940		26,836.3738
Total	**14.9321**	**25.7744**	**80.1301**	**0.2925**	**25.8835**	**0.6667**	**26.5502**	**6.9246**	**0.6528**	**7.5775**	**0.0000**	**32,695.5283**	**32,695.5283**	**1.3378**	**0.1074**	**32,760.9667**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**2.45**	**6.97**	**9.79**	**12.72**	**14.58**	**4.35**	**14.35**	**14.58**	**4.14**	**13.77**	**0.00**	**11.75**	**11.75**	**11.62**	**0.00**	**11.74**

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	8/1/2021	3/4/2022	5	155	
2	Building Construction	Building Construction	3/5/2022	3/5/2025	5	783	
3	Paving	Paving	3/6/2025	9/6/2025	5	132	
4	Architectural Coating	Architectural Coating	9/7/2025	3/7/2026	5	130	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 1395

Acres of Paving: 19.7

Residential Indoor: 809,190; Residential Outdoor: 269,730; Non-Residential Indoor: 31,500; Non-Residential Outdoor: 10,500; Striped

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Graders	2	8.00	187	0.41
Grading	Rubber Tired Dozers	10	8.00	247	0.40
Grading	Scrapers	8	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37

Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42
Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	22	55.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	681.00	259.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	136.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					69.7654	0.0000	69.7654	34.1329	0.0000	34.1329			0.0000			0.0000
Off-Road	19.1798	210.9759	104.4702	0.2260		9.2545	9.2545		8.5142	8.5142		21,901.9825	21,901.9825	7.0835		22,079.0711
Total	**19.1798**	**210.9759**	**104.4702**	**0.2260**	**69.7654**	**9.2545**	**79.0199**	**34.1329**	**8.5142**	**42.6470**		**21,901.9825**	**21,901.9825**	**7.0835**		**22,079.0711**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2623	0.1794	2.0254	5.9200e-003	0.6148	4.9700e-003	0.6197	0.1630	4.5800e-003	0.1676		589.7381	589.7381	0.0174		590.1719
Total	**0.2623**	**0.1794**	**2.0254**	**5.9200e-003**	**0.6148**	**4.9700e-003**	**0.6197**	**0.1630**	**4.5800e-003**	**0.1676**		**589.7381**	**589.7381**	**0.0174**		**590.1719**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Fugitive Dust					21.7668	0.0000	21.7668	10.6495	0.0000	10.6495			0.0000			0.0000
Off-Road	4.3965	69.1528	114.6756	0.2260		0.3887	0.3887		0.3887	0.3887	0.0000	21,901.9825	21,901.9825	7.0835		22,079.0711
Total	**4.3965**	**69.1528**	**114.6756**	**0.2260**	**21.7668**	**0.3887**	**22.1555**	**10.6495**	**0.3887**	**11.0382**	**0.0000**	**21,901.9825**	**21,901.9825**	**7.0835**		**22,079.0711**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2623	0.1794	2.0254	5.9200e-003	0.5079	4.9700e-003	0.5129	0.1368	4.5800e-003	0.1414		589.7381	589.7381	0.0174		590.1719
Total	**0.2623**	**0.1794**	**2.0254**	**5.9200e-003**	**0.5079**	**4.9700e-003**	**0.5129**	**0.1368**	**4.5800e-003**	**0.1414**		**589.7381**	**589.7381**	**0.0174**		**590.1719**

3.2 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					69.7654	0.0000	69.7654	34.1329	0.0000	34.1329			0.0000			0.0000
Off-Road	16.0843	173.3510	94.7458	0.2263		7.4813	7.4813		6.8828	6.8828		21,917.7406	21,917.7406	7.0886		22,094.9566
Total	**16.0843**	**173.3510**	**94.7458**	**0.2263**	**69.7654**	**7.4813**	**77.2467**	**34.1329**	**6.8828**	**41.0157**		**21,917.7406**	**21,917.7406**	**7.0886**		**22,094.9566**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2463	0.1620	1.8655	5.7100e-003	0.6148	4.8100e-003	0.6196	0.1630	4.4300e-003	0.1675		569.0132	569.0132	0.0157		569.4049
Total	**0.2463**	**0.1620**	**1.8655**	**5.7100e-003**	**0.6148**	**4.8100e-003**	**0.6196**	**0.1630**	**4.4300e-003**	**0.1675**		**569.0132**	**569.0132**	**0.0157**		**569.4049**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Fugitive Dust					21.7668	0.0000	21.7668	10.6495	0.0000	10.6495			0.0000			0.0000
Off-Road	4.3965	69.1528	114.6756	0.2263		0.3887	0.3887		0.3887	0.3887	0.0000	21,917.7405	21,917.7405	7.0886		22,094.9566
Total	**4.3965**	**69.1528**	**114.6756**	**0.2263**	**21.7668**	**0.3887**	**22.1555**	**10.6495**	**0.3887**	**11.0382**	**0.0000**	**21,917.7405**	**21,917.7405**	**7.0886**		**22,094.9566**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.2463	0.1620	1.8655	5.7100e-003	0.5079	4.8100e-003	0.5127	0.1368	4.4300e-003	0.1412		569.0132	569.0132	0.0157		569.4049
Total	**0.2463**	**0.1620**	**1.8655**	**5.7100e-003**	**0.5079**	**4.8100e-003**	**0.5127**	**0.1368**	**4.4300e-003**	**0.1412**		**569.0132**	**569.0132**	**0.0157**		**569.4049**

3.3 Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.7062	15.6156	16.3634	0.0269		0.8090	0.8090		0.7612	0.7612		2,554.3336	2,554.3336	0.6120		2,569.6322
Total	**1.7062**	**15.6156**	**16.3634**	**0.0269**		**0.8090**	**0.8090**		**0.7612**	**0.7612**		**2,554.3336**	**2,554.3336**	**0.6120**		**2,569.6322**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000

Vendor	0.7759	23.8485	6.8834	0.0642	1.6582	0.0464	1.7046	0.4774	0.0444	0.5218		6,862.7302	6,862.7302	0.4313		6,873.5128
Worker	3.0498	2.0058	23.0979	0.0707	7.6120	0.0596	7.6716	2.0187	0.0549	2.0736		7,045.4180	7,045.4180	0.1940		7,050.2679
Total	**3.8257**	**25.8544**	**29.9813**	**0.1349**	**9.2702**	**0.1060**	**9.3762**	**2.4962**	**0.0993**	**2.5954**		**13,908.1482**	**13,908.1482**	**0.6253**		**13,923.7807**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6122	11.9384	17.8738	0.0269		0.0669	0.0669		0.0669	0.0669	0.0000	2,554.3336	2,554.3336	0.6120		2,569.6322
Total	**0.6122**	**11.9384**	**17.8738**	**0.0269**		**0.0669**	**0.0669**		**0.0669**	**0.0669**	**0.0000**	**2,554.3336**	**2,554.3336**	**0.6120**		**2,569.6322**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.7759	23.8485	6.8834	0.0642	1.4219	0.0464	1.4683	0.4194	0.0444	0.4638		6,862.7302	6,862.7302	0.4313		6,873.5128
Worker	3.0498	2.0058	23.0979	0.0707	6.2885	0.0596	6.3480	1.6939	0.0549	1.7488		7,045.4180	7,045.4180	0.1940		7,050.2679
Total	**3.8257**	**25.8544**	**29.9813**	**0.1349**	**7.7104**	**0.1060**	**7.8164**	**2.1133**	**0.0993**	**2.2126**		**13,908.1482**	**13,908.1482**	**0.6253**		**13,923.7807**

3.3 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.5728	14.3849	16.2440	0.0269		0.6997	0.6997		0.6584	0.6584		2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**1.5728**	**14.3849**	**16.2440**	**0.0269**		**0.6997**	**0.6997**		**0.6584**	**0.6584**		**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5764	18.0623	6.1166	0.0621	1.6582	0.0220	1.6803	0.4774	0.0211	0.4985		6,649.5999	6,649.5999	0.3797		6,659.0922
Worker	2.8732	1.8142	21.2313	0.0681	7.6120	0.0579	7.6699	2.0187	0.0533	2.0720		6,787.6671	6,787.6671	0.1747		6,792.0341
Total	**3.4497**	**19.8765**	**27.3479**	**0.1302**	**9.2702**	**0.0799**	**9.3501**	**2.4962**	**0.0744**	**2.5706**		**13,437.2670**	**13,437.2670**	**0.5544**		**13,451.1263**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6122	11.9384	17.8738	0.0269		0.0669	0.0669		0.0669	0.0669	0.0000	2,555.2099	2,555.2099	0.6079		2,570.4061
Total	**0.6122**	**11.9384**	**17.8738**	**0.0269**		**0.0669**	**0.0669**		**0.0669**	**0.0669**	**0.0000**	**2,555.2099**	**2,555.2099**	**0.6079**		**2,570.4061**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5764	18.0623	6.1166	0.0621	1.4220	0.0220	1.4440	0.4195	0.0211	0.4405		6,649.5999	6,649.5999	0.3797		6,659.0922
Worker	2.8732	1.8142	21.2313	0.0681	6.2885	0.0579	6.3463	1.6939	0.0533	1.7472		6,787.6671	6,787.6671	0.1747		6,792.0341
Total	**3.4497**	**19.8765**	**27.3479**	**0.1302**	**7.7104**	**0.0799**	**7.7903**	**2.1133**	**0.0744**	**2.1877**		**13,437.2670**	**13,437.2670**	**0.5544**		**13,451.1263**

3.3 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.4716	13.4438	16.1668	0.0270		0.6133	0.6133		0.5769	0.5769		2,555.6989	2,555.6989	0.6044		2,570.8077

Total	**1.4716**	**13.4438**	**16.1668**	**0.0270**		**0.6133**	**0.6133**		**0.5769**	**0.5769**		**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5622	17.9975	5.9311	0.0618	1.6583	0.0217	1.6799	0.4775	0.0207	0.4982		6,623.8103	6,623.8103	0.3739		6,633.1587
Worker	2.7265	1.6540	19.7655	0.0660	7.6120	0.0571	7.6690	2.0187	0.0525	2.0713		6,577.1237	6,577.1237	0.1601		6,581.1251
Total	**3.2887**	**19.6515**	**25.6967**	**0.1278**	**9.2702**	**0.0787**	**9.3490**	**2.4962**	**0.0732**	**2.5694**		**13,200.9340**	**13,200.9340**	**0.5340**		**13,214.2838**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6122	11.9384	17.8738	0.0270		0.0669	0.0669		0.0669	0.0669	0.0000	2,555.6989	2,555.6989	0.6044		2,570.8077
Total	**0.6122**	**11.9384**	**17.8738**	**0.0270**		**0.0669**	**0.0669**		**0.0669**	**0.0669**	**0.0000**	**2,555.6989**	**2,555.6989**	**0.6044**		**2,570.8077**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5622	17.9975	5.9311	0.0618	1.4220	0.0217	1.4437	0.4195	0.0207	0.4402		6,623.8103	6,623.8103	0.3739		6,633.1587
Worker	2.7265	1.6540	19.7655	0.0660	6.2885	0.0571	6.3455	1.6939	0.0525	1.7464		6,577.1237	6,577.1237	0.1601		6,581.1251
Total	**3.2887**	**19.6515**	**25.6967**	**0.1278**	**7.7105**	**0.0787**	**7.7892**	**2.1133**	**0.0732**	**2.1866**		**13,200.9340**	**13,200.9340**	**0.5340**		**13,214.2838**

3.3 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	1.3674	12.4697	16.0847	0.0270		0.5276	0.5276		0.4963	0.4963		2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**1.3674**	**12.4697**	**16.0847**	**0.0270**		**0.5276**	**0.5276**		**0.4963**	**0.4963**		**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day											lb/day				
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5479	17.8451	5.7797	0.0614	1.6583	0.0213	1.6796	0.4775	0.0203	0.4978		6,588.2931	6,588.2931	0.3683		6,597.5010
Worker	2.5971	1.5130	18.3399	0.0634	7.6120	0.0559	7.6679	2.0187	0.0514	2.0702		6,322.5187	6,322.5187	0.1459		6,326.1658
Total	**3.1450**	**19.3581**	**24.1196**	**0.1248**	**9.2703**	**0.0771**	**9.3474**	**2.4962**	**0.0717**	**2.5679**		**12,910.8118**	**12,910.8118**	**0.5142**		**12,923.6667**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.6122	11.9384	17.8738	0.0270		0.0669	0.0669		0.0669	0.0669	0.0000	2,556.4744	2,556.4744	0.6010		2,571.4981
Total	**0.6122**	**11.9384**	**17.8738**	**0.0270**		**0.0669**	**0.0669**		**0.0669**	**0.0669**	**0.0000**	**2,556.4744**	**2,556.4744**	**0.6010**		**2,571.4981**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.5479	17.8451	5.7797	0.0614	1.4220	0.0213	1.4433	0.4195	0.0203	0.4398		6,588.2931	6,588.2931	0.3683		6,597.5010

Worker	2.5971	1.5130	18.3399	0.0634	6.2885	0.0559	6.3443	1.6939	0.0514	1.7453		6,322.5187	6,322.5187	0.1459		6,326.1658
Total	**3.1450**	**19.3581**	**24.1196**	**0.1248**	**7.7105**	**0.0771**	**7.7876**	**2.1133**	**0.0717**	**2.1851**		**12,910.8118**	**12,910.8118**	**0.5142**		**12,923.6667**

3.4 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.9152	8.5816	14.5780	0.0228		0.4185	0.4185		0.3850	0.3850		2,206.7452	2,206.7452	0.7137		2,224.5878
Paving	0.3910					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**1.3062**	**8.5816**	**14.5780**	**0.0228**		**0.4185**	**0.4185**		**0.3850**	**0.3850**		**2,206.7452**	**2,206.7452**	**0.7137**		**2,224.5878**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0572	0.0333	0.4040	1.4000e-003	0.1677	1.2300e-003	0.1689	0.0445	1.1300e-003	0.0456		139.2625	139.2625	3.2100e-003		139.3429
Total	**0.0572**	**0.0333**	**0.4040**	**1.4000e-003**	**0.1677**	**1.2300e-003**	**0.1689**	**0.0445**	**1.1300e-003**	**0.0456**		**139.2625**	**139.2625**	**3.2100e-003**		**139.3429**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Off-Road	0.3341	10.0395	17.2957	0.0228		5.6100e-003	5.6100e-003		5.6100e-003	5.6100e-003	0.0000	2,206.7452	2,206.7452	0.7137		2,224.5878
Paving	0.3910					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Total	**0.7251**	**10.0395**	**17.2957**	**0.0228**		**5.6100e-003**	**5.6100e-003**		**5.6100e-003**	**5.6100e-003**	**0.0000**	**2,206.7452**	**2,206.7452**	**0.7137**		**2,224.5878**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.0572	0.0333	0.4040	1.4000e-003	0.1385	1.2300e-003	0.1397	0.0373	1.1300e-003	0.0384		139.2625	139.2625	3.2100e-003		139.3429
Total	**0.0572**	**0.0333**	**0.4040**	**1.4000e-003**	**0.1385**	**1.2300e-003**	**0.1397**	**0.0373**	**1.1300e-003**	**0.0384**		**139.2625**	**139.2625**	**3.2100e-003**		**139.3429**

3.5 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e

Category	lb/day										lb/day					
Archit. Coating	22.5670					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1709	1.1455	1.8091	2.9700e-003		0.0515	0.0515		0.0515	0.0515		281.4481	281.4481	0.0154		281.8319
Total	**22.7379**	**1.1455**	**1.8091**	**2.9700e-003**		**0.0515**	**0.0515**		**0.0515**	**0.0515**		**281.4481**	**281.4481**	**0.0154**		**281.8319**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.5187	0.3022	3.6626	0.0127	1.5202	0.0112	1.5313	0.4032	0.0103	0.4134		1,262.6469	1,262.6469	0.0291		1,263.3753
Total	**0.5187**	**0.3022**	**3.6626**	**0.0127**	**1.5202**	**0.0112**	**1.5313**	**0.4032**	**0.0103**	**0.4134**		**1,262.6469**	**1,262.6469**	**0.0291**		**1,263.3753**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	22.5670					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0545	1.0598	1.8324	2.9700e-003		5.9000e-004	5.9000e-004		5.9000e-004	5.9000e-004	0.0000	281.4481	281.4481	0.0154		281.8319

Total	**22.6215**	**1.0598**	**1.8324**	**2.9700e-003**		**5.9000e-004**	**5.9000e-004**		**5.9000e-004**	**5.9000e-004**	**0.0000**	**281.4481**	**281.4481**	**0.0154**		**281.8319**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.5187	0.3022	3.6626	0.0127	1.2558	0.0112	1.2670	0.3383	0.0103	0.3486		1,262.6469	1,262.6469	0.0291		1,263.3753
Total	**0.5187**	**0.3022**	**3.6626**	**0.0127**	**1.2558**	**0.0112**	**1.2670**	**0.3383**	**0.0103**	**0.3486**		**1,262.6469**	**1,262.6469**	**0.0291**		**1,263.3753**

3.5 Architectural Coating - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	22.5670					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.1709	1.1455	1.8091	2.9700e-003		0.0515	0.0515		0.0515	0.0515		281.4481	281.4481	0.0154		281.8319
Total	**22.7379**	**1.1455**	**1.8091**	**2.9700e-003**		**0.0515**	**0.0515**		**0.0515**	**0.0515**		**281.4481**	**281.4481**	**0.0154**		**281.8319**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.4966	0.2783	3.4217	0.0122	1.5202	0.0108	1.5309	0.4032	9.9200e-003	0.4131		1,218.7953	1,218.7953	0.0267		1,219.4628
Total	**0.4966**	**0.2783**	**3.4217**	**0.0122**	**1.5202**	**0.0108**	**1.5309**	**0.4032**	**9.9200e-003**	**0.4131**		**1,218.7953**	**1,218.7953**	**0.0267**		**1,219.4628**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Archit. Coating	22.5670					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Off-Road	0.0545	1.0598	1.8324	2.9700e-003		5.9000e-004	5.9000e-004		5.9000e-004	5.9000e-004	0.0000	281.4481	281.4481	0.0154		281.8319
Total	**22.6215**	**1.0598**	**1.8324**	**2.9700e-003**		**5.9000e-004**	**5.9000e-004**		**5.9000e-004**	**5.9000e-004**	**0.0000**	**281.4481**	**281.4481**	**0.0154**		**281.8319**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000		0.0000
Worker	0.4966	0.2783	3.4217	0.0122	1.2558	0.0108	1.2666	0.3383	9.9200e-003	0.3482		1,218.7953	1,218.7953	0.0267		1,219.4628
Total	**0.4966**	**0.2783**	**3.4217**	**0.0122**	**1.2558**	**0.0108**	**1.2666**	**0.3383**	**9.9200e-003**	**0.3482**		**1,218.7953**	**1,218.7953**	**0.0267**		**1,219.4628**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Increase Diversity

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

Provide Traffic Calming Measures

Expand Transit Network

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	4.3811	20.9757	59.8697	0.2623	25.8835	0.1942	26.0777	6.9246	0.1804	7.1050		26,806.5250	26,806.5250	1.1940		26,836.3738
Unmitigated	4.7562	22.9060	68.5645	0.3049	30.2997	0.2246	30.5243	8.1061	0.2086	8.3147		31,157.9853	31,157.9853	1.3698		31,192.2296

4.2 Trip Summary Information

	Average Daily Trip Rate		
	Unmitigated	Mitigated	

Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Regional Shopping Center	930.72	882.84	429.03	1,621,411	1,385,087
Single Family Housing	2,113.44	2,200.02	1913.64	11,899,571	10,165,183
Total	3,044.16	3,082.86	2,342.67	13,520,982	11,550,270

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0
Other Asphalt Surfaces	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0
Regional Shopping Center	16.60	8.40	6.90	16.60	64.40	19.00	45	40	15
Single Family Housing	24.20	13.30	13.00	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827
Other Asphalt Surfaces	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827
Regional Shopping Center	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827
Single Family Housing	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Install Energy Efficient Appliances

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
NaturalGas Mitigated	0.1705	1.4577	0.6250	9.3000e-003		0.1178	0.1178		0.1178	0.1178		1,860.0129	1,860.0129	0.0357	0.0341	1,871.0660
NaturalGas Unmitigated	0.1705	1.4577	0.6250	9.3000e-003		0.1178	0.1178		0.1178	0.1178		1,860.0129	1,860.0129	0.0357	0.0341	1,871.0660

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	115.068	1.2400e-003	0.0113	9.4800e-003	7.0000e-005		8.6000e-004	8.6000e-004		8.6000e-004	8.6000e-004		13.5375	13.5375	2.6000e-004	2.5000e-004	13.6179
Single Family Housing	15695	0.1693	1.4464	0.6155	9.2300e-003		0.1169	0.1169		0.1169	0.1169		1,846.4754	1,846.4754	0.0354	0.0339	1,857.4481
Total		**0.1705**	**1.4577**	**0.6250**	**9.3000e-003**		**0.1178**	**0.1178**		**0.1178**	**0.1178**		**1,860.0129**	**1,860.0129**	**0.0357**	**0.0341**	**1,871.0660**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	lb/day										lb/day					

City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	0.115068	1.2400e-003	0.0113	9.4800e-003	7.0000e-005		8.6000e-004	8.6000e-004		8.6000e-004	8.6000e-004		13.5375	13.5375	2.6000e-004	2.5000e-004	13.6179
Single Family Housing	15.695	0.1693	1.4464	0.6155	9.2300e-003		0.1169	0.1169		0.1169	0.1169		1,846.4754	1,846.4754	0.0354	0.0339	1,857.4481
Total		**0.1705**	**1.4577**	**0.6250**	**9.3000e-003**		**0.1178**	**0.1178**		**0.1178**	**0.1178**		**1,860.0129**	**1,860.0129**	**0.0357**	**0.0341**	**1,871.0660**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Low VOC Paint - Residential Interior

Use Low VOC Paint - Residential Exterior

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use Low VOC Cleaning Supplies

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	lb/day										lb/day					
Mitigated	10.3805	3.3410	19.6354	0.0210		0.3546	0.3546		0.3546	0.3546	0.0000	4,028.9903	4,028.9903	0.1082	0.0733	4,053.5268
Unmitigated	10.3805	3.3410	19.6354	0.0210		0.3546	0.3546		0.3546	0.3546	0.0000	4,028.9903	4,028.9903	0.1082	0.0733	4,053.5268

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.8038					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.6606					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.3663	3.1302	1.3320	0.0200		0.2531	0.2531		0.2531	0.2531	0.0000	3,996.0000	3,996.0000	0.0766	0.0733	4,019.7462
Landscaping	0.5499	0.2108	18.3034	9.7000e-004		0.1016	0.1016		0.1016	0.1016		32.9903	32.9903	0.0316		33.7806
Total	**10.3805**	**3.3410**	**19.6354**	**0.0210**		**0.3546**	**0.3546**		**0.3546**	**0.3546**	**0.0000**	**4,028.9903**	**4,028.9903**	**0.1082**	**0.0733**	**4,053.5268**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	lb/day										lb/day					
Architectural Coating	0.8038					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Consumer Products	8.6606					0.0000	0.0000		0.0000	0.0000			0.0000			0.0000
Hearth	0.3663	3.1302	1.3320	0.0200		0.2531	0.2531		0.2531	0.2531	0.0000	3,996.0000	3,996.0000	0.0766	0.0733	4,019.7462
Landscaping	0.5499	0.2108	18.3034	9.7000e-004		0.1016	0.1016		0.1016	0.1016		32.9903	32.9903	0.0316		33.7806
Total	**10.3805**	**3.3410**	**19.6354**	**0.0210**		**0.3546**	**0.3546**		**0.3546**	**0.3546**	**0.0000**	**4,028.9903**	**4,028.9903**	**0.1082**	**0.0733**	**4,053.5268**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

8.0 Waste Detail

8.1 Mitigation Measures Waste

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX B.3

Health Risk Assessment Worksheets

Discrete Receptor ID (Group Name)	X	Y	Concentration (AVERAGE CONC) [ug/m^3]	Elevation (ZELEV)	Hill Heights (ZHILL)	Flagpole (ZFLAG)	Averagin Period (AVE)	Source Group (GRP)	Num Years (NUM YRS)
UCART1	347790.7	3812070	0.0002	337.32	623	0	ANNUAL	ALL	5
UCART1	347909	3812070	0.00016	370.65	555	0	ANNUAL	ALL	5
UCART1	347790.7	3812162	0.00032	341.75	623	0	ANNUAL	ALL	5
UCART1	347909	3812162	0.00033	347.46	623	0	ANNUAL	ALL	5
UCART1	347790.7	3812255	0.00037	342.9	623	0	ANNUAL	ALL	5
UCART1	347909	3812255	0.00038	347.94	623	0	ANNUAL	ALL	5
UCART1	347790.7	3812348	0.00039	346.84	623	0	ANNUAL	ALL	5
UCART1	347909	3812348	0.00038	348.61	623	0	ANNUAL	ALL	5
UCART1	347790.7	3812440	0.00035	353.25	623	0	ANNUAL	ALL	5
UCART1	347909	3812440	0.00033	349.93	623	0	ANNUAL	ALL	5
UCART1	347081.1	3812903	8.00E-05	378.84	649	0	ANNUAL	ALL	5
UCART1	347199.3	3812903	0.0001	374.56	649	0	ANNUAL	ALL	5
UCART1	346489.7	3812995	4.00E-05	398.06	713	0	ANNUAL	ALL	5
UCART1	346608	3812995	4.00E-05	393.27	713	0	ANNUAL	ALL	5
UCART1	346726.3	3812995	5.00E-05	389.14	713	0	ANNUAL	ALL	5
UCART1	346844.5	3812995	6.00E-05	383.38	708	0	ANNUAL	ALL	5
UCART1	346962.8	3812995	8.00E-05	382.15	670	0	ANNUAL	ALL	5
UCART1	347081.1	3812995	9.00E-05	378.66	649	0	ANNUAL	ALL	5
UCART1	347199.3	3812995	0.00012	376.84	649	0	ANNUAL	ALL	5
UCART1	346371.5	3813088	4.00E-05	403.39	713	0	ANNUAL	ALL	5
UCART1	346489.7	3813088	4.00E-05	395.37	713	0	ANNUAL	ALL	5
UCART1	346608	3813088	5.00E-05	392.06	713	0	ANNUAL	ALL	5
UCART1	346726.3	3813088	6.00E-05	389.21	713	0	ANNUAL	ALL	5
UCART1	346844.5	3813088	7.00E-05	388.06	670	0	ANNUAL	ALL	5
UCART1	346962.8	3813088	8.00E-05	386.15	670	0	ANNUAL	ALL	5
UCART1	347081.1	3813088	9.00E-05	395.87	648	0	ANNUAL	ALL	5
UCART1	347199.3	3813088	0.00013	384.31	648	0	ANNUAL	ALL	5
UCART1	346371.5	3813180	4.00E-05	398.14	716	0	ANNUAL	ALL	5
UCART1	346489.7	3813180	5.00E-05	398.46	713	0	ANNUAL	ALL	5
UCART1	346608	3813180	6.00E-05	395.01	713	0	ANNUAL	ALL	5
UCART1	346726.3	3813180	6.00E-05	393.8	713	0	ANNUAL	ALL	5
UCART1	346844.5	3813180	8.00E-05	392.91	670	0	ANNUAL	ALL	5
UCART1	346962.8	3813180	9.00E-05	389.95	649	0	ANNUAL	ALL	5
UCART1	347081.1	3813180	0.00012	389.72	649	0	ANNUAL	ALL	5
UCART1	347199.3	3813180	0.00016	382.9	627	0	ANNUAL	ALL	5
UCART1	346844.5	3813273	9.00E-05	395.84	670	0	ANNUAL	ALL	5
UCART1	347081.1	3813273	0.00011	404.45	627	0	ANNUAL	ALL	5
UCART1	347199.3	3813273	0.00019	386.55	627	0	ANNUAL	ALL	5
UCART1	347081.1	3813365	0.00013	406.07	627	0	ANNUAL	ALL	5

UCART1		347199.3	3813365	0.00019	400.33	627	0	ANNUAL	ALL	5
UCART1		347081.1	3813458	0.00015	408.78	627	0	ANNUAL	ALL	5
UCART1		347199.3	3813458	0.00017	417.25	627	0	ANNUAL	ALL	5
UCART1		347081.1	3813551	0.00016	411.96	627	0	ANNUAL	ALL	5
UCART1		347199.3	3813551	0.00023	404.45	627	0	ANNUAL	ALL	5
	47	347914.2	3813006	0.00157	367.57	565	0	ANNUAL	ALL	5
	48	347959.1	3813016	0.00132	369.34	555	0	ANNUAL	ALL	5
	49	348032	3813029	0.00128	371.18	551	0	ANNUAL	ALL	5
	50	348121.9	3813027	0.00121	376.01	535	0	ANNUAL	ALL	5
	51	348193.3	3813027	0.00119	381.46	509	0	ANNUAL	ALL	5
	52	347746.7	3812885	0.00088	362.29	623	0	ANNUAL	ALL	5
	53	347777.7	3812886	0.00096	362.3	623	0	ANNUAL	ALL	5
	54	347821.2	3812882	0.00097	364.12	623	0	ANNUAL	ALL	5
	55	348427.4	3813024	0.00097	394.7	504	0	ANNUAL	ALL	5
	56	347622.3	3813235	0.00153	380.97	565	0	ANNUAL	ALL	5
	57	347615	3813105	0.00111	380.2	623	0	ANNUAL	ALL	5
	58	347613.2	3812972	0.00076	369.15	623	0	ANNUAL	ALL	5
	59	347846.5	3812833	0.0006	366.05	565	0	ANNUAL	ALL	5
	47	347613.4	3813181	0.00126	381.57	623	0	ANNUAL	ALL	5
UCART1		347473	3812834	0.00017	365.56	623	0	ANNUAL	ALL	5
UCART1		347523	3812834	0.0002	363.1	623	0	ANNUAL	ALL	5
UCART1		347573	3812834	0.00025	361.45	623	0	ANNUAL	ALL	5
UCART1		347623	3812834	0.00031	361.13	623	0	ANNUAL	ALL	5
UCART1		347673	3812834	0.00042	362.73	623	0	ANNUAL	ALL	5
UCART1		347723	3812834	0.00051	363.45	623	0	ANNUAL	ALL	5
UCART1		347773	3812834	0.00056	362.14	623	0	ANNUAL	ALL	5
UCART1		347823	3812834	0.0006	364.56	623	0	ANNUAL	ALL	5
UCART1		347873	3812834	0.0006	367.87	565	0	ANNUAL	ALL	5
UCART1		347923	3812834	0.00053	370.85	565	0	ANNUAL	ALL	5
UCART1		348223	3812834	0.00037	396.96	504	0	ANNUAL	ALL	5
UCART1		348273	3812834	0.0004	390.33	504	0	ANNUAL	ALL	5
UCART1		348323	3812834	0.00039	390.81	504	0	ANNUAL	ALL	5
UCART1		348373	3812834	0.00038	391.5	504	0	ANNUAL	ALL	5
UCART1		348423	3812834	0.00036	391.42	504	0	ANNUAL	ALL	5
UCART1		348473	3812834	0.00034	393.84	504	0	ANNUAL	ALL	5
UCART1		347473	3812884	0.00019	366.45	623	0	ANNUAL	ALL	5
UCART1		347523	3812884	0.00023	364.78	623	0	ANNUAL	ALL	5
UCART1		347573	3812884	0.0003	364.33	623	0	ANNUAL	ALL	5
UCART1		347623	3812884	0.00041	365.51	623	0	ANNUAL	ALL	5
UCART1		347673	3812884	0.00063	373.75	623	0	ANNUAL	ALL	5
UCART1		347723	3812884	0.00085	363.86	623	0	ANNUAL	ALL	5
UCART1		347773	3812884	0.00093	362.14	623	0	ANNUAL	ALL	5
UCART1		347823	3812884	0.00101	364.29	623	0	ANNUAL	ALL	5

UCART1	348223	3812884	0.0005	387.69	509	0	ANNUAL	ALL	5
UCART1	348273	3812884	0.0005	384.89	509	0	ANNUAL	ALL	5
UCART1	348323	3812884	0.00049	386.19	504	0	ANNUAL	ALL	5
UCART1	348373	3812884	0.00047	388.14	504	0	ANNUAL	ALL	5
UCART1	348423	3812884	0.00044	389.81	504	0	ANNUAL	ALL	5
UCART1	348473	3812884	0.00041	392.74	504	0	ANNUAL	ALL	5
UCART1	347473	3812934	0.00022	368.41	623	0	ANNUAL	ALL	5
UCART1	347523	3812934	0.00028	367.77	623	0	ANNUAL	ALL	5
UCART1	347573	3812934	0.00036	374.96	623	0	ANNUAL	ALL	5
UCART1	347923	3812934	0.00116	366.89	565	0	ANNUAL	ALL	5
UCART1	347973	3812934	0.00088	367.35	555	0	ANNUAL	ALL	5
UCART1	348023	3812934	0.00077	370.26	555	0	ANNUAL	ALL	5
UCART1	348073	3812934	0.00072	372.28	539	0	ANNUAL	ALL	5
UCART1	348123	3812934	0.00069	376.22	539	0	ANNUAL	ALL	5
UCART1	348173	3812934	0.00067	379.34	509	0	ANNUAL	ALL	5
UCART1	348223	3812934	0.00065	381.5	509	0	ANNUAL	ALL	5
UCART1	348273	3812934	0.00063	384.02	509	0	ANNUAL	ALL	5
UCART1	348323	3812934	0.00061	385.61	504	0	ANNUAL	ALL	5
UCART1	348373	3812934	0.00058	387.44	504	0	ANNUAL	ALL	5
UCART1	348423	3812934	0.00055	389.92	504	0	ANNUAL	ALL	5
UCART1	347473	3812984	0.00026	371.85	623	0	ANNUAL	ALL	5
UCART1	347523	3812984	0.00034	372.59	623	0	ANNUAL	ALL	5
UCART1	347573	3812984	0.00051	370.44	623	0	ANNUAL	ALL	5
UCART1	347923	3812984	0.00139	367.07	565	0	ANNUAL	ALL	5
UCART1	347973	3812984	0.00109	368.73	555	0	ANNUAL	ALL	5
UCART1	348023	3812984	0.00097	370.4	555	0	ANNUAL	ALL	5
UCART1	348073	3812984	0.00092	372.28	539	0	ANNUAL	ALL	5
UCART1	348123	3812984	0.00089	375.62	539	0	ANNUAL	ALL	5
UCART1	348173	3812984	0.00087	378.95	509	0	ANNUAL	ALL	5
UCART1	348223	3812984	0.00085	382.14	509	0	ANNUAL	ALL	5
UCART1	348273	3812984	0.00083	385.36	504	0	ANNUAL	ALL	5
UCART1	348323	3812984	0.0008	387.85	504	0	ANNUAL	ALL	5
UCART1	348373	3812984	0.00077	389.08	504	0	ANNUAL	ALL	5
UCART1	348423	3812984	0.00072	391.56	504	0	ANNUAL	ALL	5
UCART1	347473	3813034	0.0003	378.47	623	0	ANNUAL	ALL	5
UCART1	347523	3813034	0.00034	385	623	0	ANNUAL	ALL	5
UCART1	347573	3813034	0.00049	385.13	623	0	ANNUAL	ALL	5
UCART1	347923	3813034	0.00169	369.24	555	0	ANNUAL	ALL	5
UCART1	347973	3813034	0.00144	369.44	555	0	ANNUAL	ALL	5
UCART1	348023	3813034	0.00135	371.07	551	0	ANNUAL	ALL	5
UCART1	348073	3813034	0.00131	372.2	539	0	ANNUAL	ALL	5
UCART1	348123	3813034	0.0013	376.46	509	0	ANNUAL	ALL	5
UCART1	348173	3813034	0.0013	381.46	509	0	ANNUAL	ALL	5

UCART1	348223	3813034	0.00128	384.46	509	0	ANNUAL	ALL	5
UCART1	348373	3813034	0.00115	392.97	504	0	ANNUAL	ALL	5
UCART1	348423	3813034	0.00108	395.47	504	0	ANNUAL	ALL	5
UCART1	347473	3813084	0.00037	374.55	623	0	ANNUAL	ALL	5
UCART1	347523	3813084	0.00048	378.43	623	0	ANNUAL	ALL	5
UCART1	347573	3813084	0.00056	387.09	623	0	ANNUAL	ALL	5
UCART1	347623	3813084	0.00115	380.28	623	0	ANNUAL	ALL	5
UCART1	347473	3813134	0.00041	377.68	623	0	ANNUAL	ALL	5
UCART1	347523	3813134	0.00048	385.9	623	0	ANNUAL	ALL	5
UCART1	347573	3813134	0.00056	393.79	565	0	ANNUAL	ALL	5
UCART1	347623	3813134	0.00112	384.87	565	0	ANNUAL	ALL	5
UCART1	347473	3813184	0.00046	378.77	627	0	ANNUAL	ALL	5
UCART1	347523	3813184	0.00062	378.77	623	0	ANNUAL	ALL	5
UCART1	347573	3813184	0.00085	382.07	623	0	ANNUAL	ALL	5
UCART1	347473	3813234	0.00049	383.1	627	0	ANNUAL	ALL	5
UCART1	347523	3813234	0.0006	387.35	623	0	ANNUAL	ALL	5
UCART1	347573	3813234	0.00086	386.66	565	0	ANNUAL	ALL	5
UCART1	347623	3813234	0.00154	380.89	565	0	ANNUAL	ALL	5
UCART1	347473	3813284	0.00051	386.78	623	0	ANNUAL	ALL	5
UCART1	347523	3813284	0.00066	387.66	623	0	ANNUAL	ALL	5
UCART1	347573	3813284	0.00086	390.89	565	0	ANNUAL	ALL	5
UCART1	347473	3813334	0.0005	394.49	565	0	ANNUAL	ALL	5
UCART1	347523	3813334	0.00062	396	551	0	ANNUAL	ALL	5
UCART1	347573	3813334	0.00084	396.3	551	0	ANNUAL	ALL	5
UCART1	347473	3813534	0.00056	402.53	627	0	ANNUAL	ALL	5
UCART1	347573	3813534	0.00083	413.32	517	0	ANNUAL	ALL	5
	347648.1	3813548	0.00142	425.96	442	0	ANNUAL	ALL	5
	347627.1	3812947	0.00077	372.81	623	0	ANNUAL	ALL	5
	347653.3	3812931	0.00056	375.51	623	0	ANNUAL	ALL	5
	347691.6	3812914	0.00108	370.98	623	0	ANNUAL	ALL	5
	347730	3812907	0.00122	363.21	623	0	ANNUAL	ALL	5
	347860.7	3812886	0.00101	364.95	565	0	ANNUAL	ALL	5
	347879.8	3812973	0.0016	365.54	565	0	ANNUAL	ALL	5
	347899	3813055	0.00209	369.98	555	0	ANNUAL	ALL	5
	348034.9	3813071	0.00163	374.76	539	0	ANNUAL	ALL	5
	348169.1	3813076	0.00168	383.02	509	0	ANNUAL	ALL	5
	348202.2	3813074	0.00175	385.32	509	0	ANNUAL	ALL	5
	348238.8	3813086	0.0018	388.41	504	0	ANNUAL	ALL	5
	348258	3813064	0.00151	388.32	504	0	ANNUAL	ALL	5
	348326	3813090	0.00167	399.05	504	0	ANNUAL	ALL	5
	348458.4	3813025	0.00092	395.28	504	0	ANNUAL	ALL	5
	348543.8	3813161	0.0009	420.13	504	0	ANNUAL	ALL	5
	348448	3813166	0.00142	430.2	464	0	ANNUAL	ALL	5

348451.4	3813531		0.00111	413.36	475	0	ANNUAL	ALL	5

*HARP - HRACalc v17023 5/6/2020 9:48:42 AM - Cancer Risk

INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	RISK_SUM	SCENARIO	DETAILS	INH_RISK	SOIL_RISK	DERMAL_RISK	MMILK_RISK
2			9901	DieselExhP	0.00064	5.54E-07	30YrCancer	*	5.54E-07	0.00E+00	0.00E+00	0.00E+00

WATER_RISK	FISH_RISK	CROP_RISK	BEEF_RISK	DAIRY_RISK	PIG_RISK	CHICKEN_RISK	EGG_RISK	1ST_DRIVER	2ND_DRIVER	PASTURE_CONC	FISH_CONC	WATER_CONC
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION		0.00E+00	0.00E+00	0.00E+00

*HARP - HRACalc v17023 5/6/2020 9:48:42 AM - Acute Risk

INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	SCENARIO	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL
	2		9901	DieselExhP	0	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD	ODOR	GENERAL
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

*HARP - HRACalc v17023 5/6/2020 9:48:42 AM - Chronic Risk

INDEX	GRP1	GRP2	POLID	POLABBREV	CONC	SCENARIO	CV	CNS	IMMUN	KIDNEY	GILV	REPRO/DEVEL
	2		9901	DieselExhP	0.00064	NonCancer	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

RESP	SKIN	EYE	BONE/TEETH	ENDO	BLOOD	ODOR	GENERAL	DETAILS	INH_CONC	SOIL_DOSE	DERMAL_DOSE	MMILK_DOSE
1.28E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	*	6.40E-04	0.00E+00	0.00E+00	0.00E+00

WATER_DOSE	FISH_DOSE	CROP_DOSE	BEEF_DOSE	DAIRY_DOSE	PIG_DOSE	CHICKEN_DOSE	EGG_DOSE	1ST_DRIVER	2ND_DRIVER	3RD_DRIVER	PASTURE_CONC	FISH_CONC
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	INHALATION			0.00E+00	0.00E+00

WATER_C
ONC
0.00E+00

APPENDIX C

Biological Resources Documentation

FINAL

BIOLOGICAL TECHNICAL REPORT FOR THE STERLING RANCH ESTATES RESIDENTIAL PROJECT

Prepared for:

Sterling Ranch ESTATES

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MAY 2021

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Table of Contents

SECTION PAGE NO.

ACRONYMS AND ABBREVIATIONS V

1 INTRODUCTION 1
1.1 Project Description 1

2 PROJECT SETTING 11
2.1 Project Location 11
2.2 Land Uses 11
2.2.1 On-Site Land Uses 11
2.2.2 Surrounding Land Uses 11
2.3 Biological Setting 12
2.4 Watersheds and Hydrology 12

3 REGULATORY SETTING 13
3.1 Endangered Species Acts 13
3.1.1 California Endangered Species Act 13
3.1.2 Federal Endangered Species Act 14
3.2 Fish and Game Code 15
3.3 Migratory Bird Treaty Act 15
3.4 Jurisdictional Water Resources, Waters of the United States/State, Including Wetlands 16
3.4.1 U.S. Army Corps of Engineers 16
3.4.2 California Fish and Game Code 18
3.4.3 California Regional Water Quality Control Board 18
3.4.4 County of Los Angeles 19
3.5 California Environmental Quality Act 19
3.6 Local Laws, Ordinances, Regulations, and Standards 19
3.6.1 Los Angeles County Planning Area 20
3.6.2 Los Angeles County Low Impact Development 20
3.6.3 Los Angeles County Oak Woodlands 20
3.6.4 Los Angeles County Oak Tree Ordinance 22
3.6.5 Los Angeles County Fuel Modification Zones 22

4 METHODS 23
4.1 Literature Review 23
4.2 Biological Field Surveys 24
4.2.1 Vegetation Community and Land Cover Mapping 28
4.2.2 Flora 29
4.2.3 Fauna 29

4.2.4 Special-Status and/or Regulated Resources 29
4.2.5 Survey Limitations 35

5 RESULTS 37
5.1 Vegetation Communities and Land Cover Types 37
5.1.1 Natural Vegetated Communities 42
5.1.2 Other Land Cover Types 56
5.2 Plant Species 57
5.3 Wildlife Species 57
5.3.1 Invertebrates 57
5.3.2 Amphibians and Reptiles 57
5.3.3 Birds 58
5.3.4 Mammals 58
5.4 Special-Status/Regulated Resources 58
5.4.1 Sensitive Vegetation Communities 58
5.4.2 Special-Status Plant Species 63
5.4.3 Oak Trees 71
5.4.4 Special-Status Wildlife Species 72
5.4.5 Critical Habitat 84
5.4.6 Jurisdictional Waters 84
5.5 Wildlife Corridors and Habitat Linkages 96

6 PROJECT IMPACTS AND PROPOSED MITIGATION 101
6.1 Explanation of Findings of Significance 101
6.2 Definition of Impacts 102
6.2.1 Direct Impacts 102
6.2.2 Indirect Impacts 102
6.3 Impacts to Special-Status Plant Species 103
6.3.1 Direct Impacts to Special-Status Plant Species and Proposed Mitigation 103
6.3.2 Indirect Impacts to Special-Status Plant Species and Proposed Mitigation 109
6.4 Impacts to Special-Status Wildlife Species 113
6.4.1 Direct Impacts to Special-Status Wildlife Species and Proposed Mitigation 113
6.4.2 Indirect Impacts to Special-Status Wildlife Species and Proposed Mitigation 121
6.5 Impacts to Critical Habitat 124
6.6 Impacts to Vegetation Communities and Land Cover Types 125
6.6.1 Direct Impacts to Vegetation Communities and Land Cover Types and Proposed Mitigation 125
6.6.2 Indirect Impacts to Vegetation Communities and Land Cover Types and Proposed Mitigation 133
6.7 Impacts to Jurisdictional Water Resources 145
6.7.1 Direct Impacts to Jurisdictional Water Resources 145
6.7.2 Indirect Impacts to Jurisdictional Waters 146

6.8 Impacts to Wildlife Corridors and Habitat Connectivity 147
6.9 Impacts to Regional Resource Planning 160

7 REFERENCES 161

APPENDICES

A Oak Woodland Report
B Tract Map Site, Off-Site Roadway Improvement Area, and Off-Site Open Space Area Oak Tree Report
C Oak Tree Report for the Sterling Ranch Estates, Off-Site Water Tank
D 2018 Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project
E 2020 Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project
F Plant Species Compendium
G Wildlife Species Compendium
H Site Photographs
I Special-Status Plant Species Not Expected or With a Low Potential to Occur on the Project Site
J Special-Status Wildlife Species Not Expected or With a Low Potential to Occur on the Project Site
K Wetland Delineation Data Forms and Ordinary High Water Mark Data Forms
L Palmer's Goldenbush Scrub at Sterling Ranch Estates

FIGURES

1 Project Location 3
2A Tract Map Site, Off-Site Roadway Improvement Area, Off-Site Open Space Area Biological Survey Area, Project Components and Site Plan 5
2B Off-Site Water Tank Area Biological Survey Area and Site Plan 7
2C Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area Biological Survey Area 9
3A Track Map Site, Off-Site Roadway Improvement Area, and Off-Site Open Space Area Vegetation Communities and Land Cover Types 45
3B Off-Site Water Tank Area Vegetation Communities and Land Cover Types 47
3C Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area Vegetation Communities and Land Cover Types 49
4A/4C Special-Status Plants and Wildlife On-Site and Within 0.5 Miles of the Biological Survey Area 67
4B Special-Status Plants and Wildlife On-Site and Within 0.5 Miles of the Biological Survey Area 69
5A Tract Map Site, Off-Site Roadway Improvement Area, Off-Site Open Space Area Biological Survey Area Soils 87
5B Off-Site Water Tank Area Biological Survey Area Soils 89
5C Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area Biological Survey Area Soils 91
6 Watersheds 93
7 Potential Jurisdictional Water Resources 99

8A Proposed Preservation Areas 135
9B Off-Site Water Tank Area Proposed Impact Area 137
9C Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area Proposed Impact Area 139
8A Proposed Preservation Areas 141
8B Proposed Preservation Areas Overview 143

TABLES

1 Biological Surveys Completed on the Project Site 24
2 Hydrophytic Vegetation Indicator Categories 34
3 Existing Vegetation Communities and Land Cover Types in the Project Site 39
4 Oak Woodland 1 Understory Assessment 60
5 Oak Woodland 2 Understory Assessment 61
6 Oak Woodland 3 Understory Assessment 62
7 Oak Woodland Vegetation Community Descriptions 62
8 List of Associated Native Plant Species for the Oak Woodland Understory 63
9 Special-Status Plant Species with Moderate to High Potential to Occur and Present on the Project Site 64
10 Special-Status Wildlife Species that have Potential to Occur on the Project Site 73
11 Potential Jurisdictional Water Resources within the Tract Map Site BSA 86
12 Direct Impacts to Existing Vegetation Communities and Land Cover Types within the Project Site 127
13 Impacts to Jurisdictional Waters within the Project Site 145
14 Summary of Tree Disposition 153
15 Summary of Direct Tree Impacts 159
16 Summary of Indirect Tree Impacts 159

Acronyms and Abbreviations

Acronym or Abbreviation	Definition
amsl	above mean sea level
Applicant	Sterling Ranch Estates
APN	Assessor's Parcel Number
BCC	Bird of Conservation Concern
BMP	Best Management Practice
BSA	Biological Survey Area
CCR	California Code of Regulations
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CMP	Conservation Management Plan
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
County	Los Angeles County
CRPR	California Rare Plant Rank
CSC	California Species of Special Concern
CWA	Clean Water Act
DSH	diameter at standard height
ESA	Endangered Species Act
FACU	Facultative Upland Plant
FACW	Facultative Wetland Plant
FP	Fully Protected
FPP	Fire Protection Plan
GIS	geographic information system
Guide	Oak Woodlands Conservation Management Plan Guide
HMMP	Habitat Mitigation and Monitoring Plan
HOA	homeowners' association
IPaC	Invasive Plant Council
ISA	International Society of Arboriculture
LID	Low-Impact Development
MBTA	Migratory Bird Treaty Act
OHWM	Ordinary High Water Mark
OW	Oak Woodland
Project	Sterling Ranch Estates Residential Project
report	Biological Technical Report for the Sterling Ranch Estates Residential Project
RWQCB	Regional Water Quality Control Board
SCAP	Santa Clarita Valley Area Plan
SEAs	Significant Ecological Areas
SMLMMP	Slender Mariposa Lily Mitigation and Monitoring Plan
SOI	sphere of influence
SWPPP	Stormwater Pollution Prevention Plan
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

Acronym or Abbreviation	Definition
WCP	Weed Control Plan
WEAP	Worker Environmental Awareness Program
WL	Watch List

1 Introduction

Dudek has prepared this Biological Technical Report (report) for Sterling Ranch Estates (Applicant) in support of the Sterling Ranch Estates Residential Project (Project) located in the community of Val Verde in unincorporated Los Angeles County (County), as shown on Figure 1. The purpose of this report is to provide the methods and results of focused and reconnaissance level biological surveys conducted in 2016, 2017, 2018, and 2020, which included vegetation mapping, focused botanical and special-status plant species surveys, general wildlife habitat assessment, coastal California gnatcatcher (*Polioptila californica californica*) and burrowing owl (*Athene cunicularia*) protocol surveys, and a formal (routine) wetland delineation. This report also includes an impact analysis based on survey results and federal, state, and local regulations, and measures for avoiding and minimizing impacts to biological resources. This report has been prepared to assist the County of Los Angeles in the California Environmental Quality Act (CEQA) review process for the Project. It is also intended to support environmental review by other applicable regulatory resource agencies, specifically the U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), California Department of Fish and Wildlife (CDFW), and the Regional Water Quality Control Board (RWQCB), as needed.

1.1 Project Description

The Project includes the development of approximately 222 detached single-family residential lots and a commercial lot with neighborhood-serving retail, recreation/open space (park sites, natural open space, manufactured open space), a homeowners association (HOA) lot, roads, and utility infrastructure (debris basin, infiltration basin, and pump station) within Assessor's Parcel Numbers (APNs) 3271-004-012 and 3271-004-013, herein referred to as Tract Map Site, which comprise approximately 114.3 acres.

Off-site areas include the Off-Site Roadway Improvement Area, Off-Site Open Space Area, Off-Site Water Tank Area, Off-Site Water Line Improvement Area, and Off-Site Sewer Line Improvement Area. The Off-Site Roadway Improvement Area is immediately east of PN 3271-004-013 and totals approximately 6.6 acres.

The Project will conserve in perpetuity, through a conservation easement, 37.9 acres of APN 3271-005-032, referred to herein as the Off-Site Open Space Area. The 41.3 acres of APN 3271-005-032 just east of the proposed 37.9-acre Off-Site Open Space Area conservation easement is already subject to preservation in perpetuity through a conservation easement held by the Mountains Recreation & Conservation Authority. The 16.1 acres of APN 3271-005-032 just north of the proposed 37.9-acre Off-Site Open Space Area conservation easement area is Tentative Tract No. 62000, which is currently proposed for residential development; however, entitlements for Tentative Tract No. 62000 are not being pursued actively at this time. The 41.3-acre conservation easement held by the Mountains Recreation & Conservation Authority and the 16.1-acre Tentative Tract No. 62000 are not a part of the Project but are included as a visual for the contiguous open space area, as shown on Figure 2A.

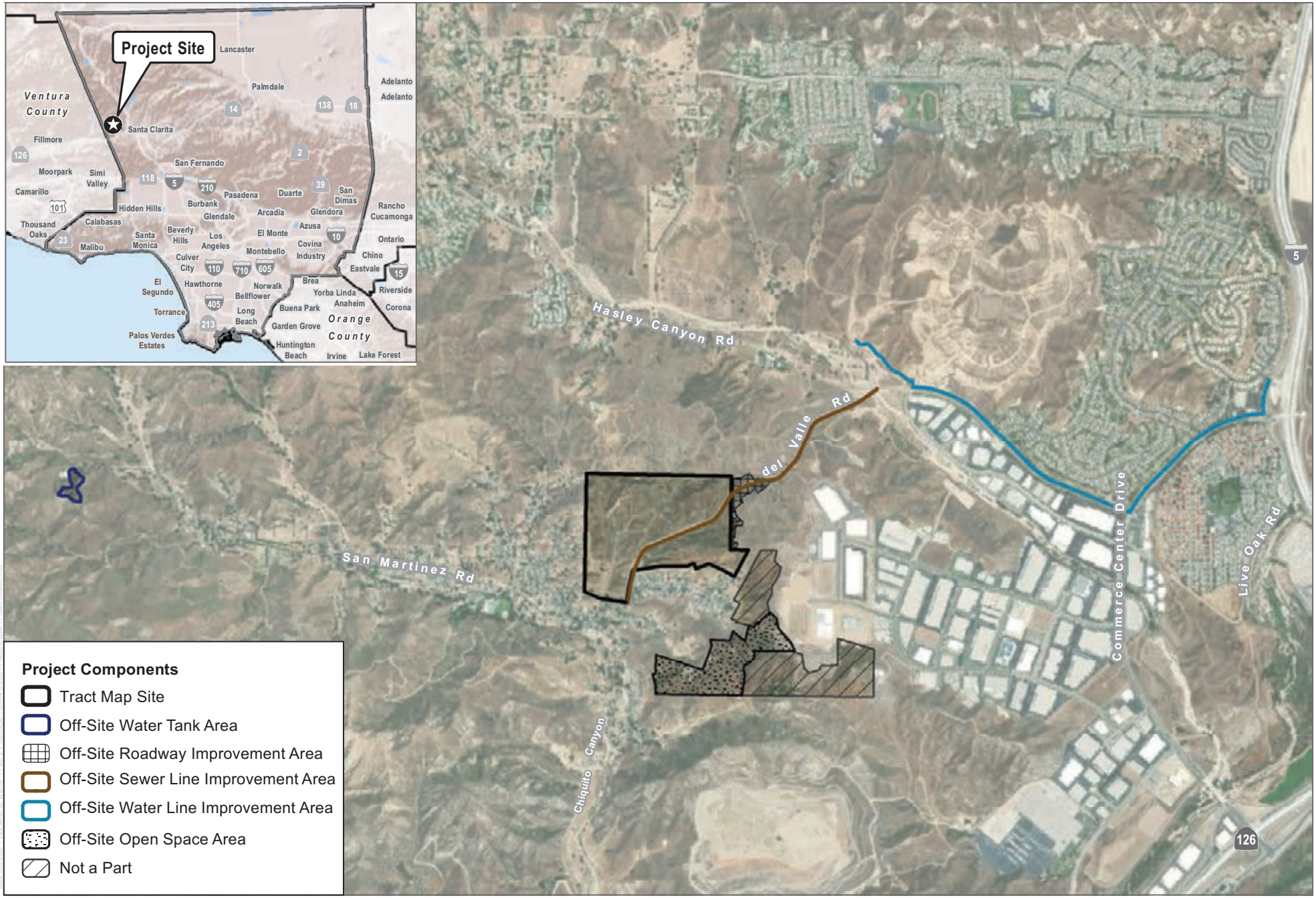
In conjunction with approval of Project, Los Angeles County Waterworks District No. 36 has required the construction of a water tank. The Project includes a one million gallon-water tank, more capacity than required by Los Angeles County Waterworks District No. 36 for firefighting purposes, at the elevation of the existing Cuyama tanks, referred to herein as Off-Site Water Tank Area, as shown on Figure 2B. The Off-Site Water Tank Area lies in and adjacent to the existing Los Angeles County Waterworks District No. 36 Cuyama tank site. The water tank is located within the District's 1598 pressure zone APNs 3272-029-902 and 3272-029-023, comprising approximately 2.8 acres. Initially the water tank was planned right next to the existing water tank reservoirs; however, this was not feasible due the geologic instability of the slope directly behind the proposed

location. Multiple alternative sites under various ownerships were then explored to find an alternate site at the correct elevation. Due to ownership and geotechnical constraints, none of these alternative sites were feasible. Since the alternative sites were not feasible options, the area slightly to the east of the adjacent water tanks was selected. This site allowed for appropriate water tank siting with the correct elevation and ability to stabilize the adjacent hill by grading a manufactured 2:1 slope. Through researching multiple alternative water tank locations, the proposed location of the Off-Site Water Tank Area is the only site considered feasible for the one million gallon-water tank.

The Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area are proposed in existing roadways, as shown on Figure 2C. The Off-Site Water Line Improvement Area is approximately 10,600 linear feet and would be upgraded along Hasley Canyon Road within approximately 2.4 acres. The Off-Site Sewer Line Improvement Area includes a proposed 12-inch sewer mainline within the existing Del Valle Road right-of-way within the Tract Map Site extending northeast approximately 3,425 feet, approximately 0.8 acres, to the point of connection with the existing 12-inch sewer line in Hasley Canyon Road.

The Project site includes the Tract Map Site, the Off-Site Roadway Improvement Area, the Off-Site Open Space Area, the Off-Site Water Tank Area, the Off-Site Water Line Improvement Area, and the Off-Site Sewer Line Improvement Area, all of which are coterminous with the Biological Survey Areas (BSAs). The Tract Map Site BSA, Off-Site Roadway Improvement Area BSA, and Off-Site Open Space Area BSA are displayed on Figure 2A; the Off-Site Water Tank BSA is displayed on Figure 2B; and the Off-Site Water Line Improvement Area BSA and Off-Site Sewer Line Improvement Area BSA are displayed on Figure 2C.

The Project will involve mass grading within the parcels to facilitate the residential development and associated infrastructure; however, several areas will remain undeveloped and will be preserved as open space. The Project will incorporate Low Impact Development (LID) design standards based on the Los Angeles County Department of Public Works LID Standards Manual (County of Los Angeles 2014a). Tract map preserved parcels are anticipated to be maintained by the HOA. As mentioned above, the Off-Site Open Space Area will conserve, in perpetuity through a conservation easement, 37.9 acres maintained by a third party.



SOURCE: DigitalGlobe 2017

DUDEK

0 1,000 2,000 Feet

FIGURE 1

Project Location

Biological Technical Report for the Sterling Ranch Estates Residential Project

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Biological Survey Area

Project Components

Tract Map Site

Off-Site Roadway Improvement Area

Off-Site Sewer Line Improvement Area

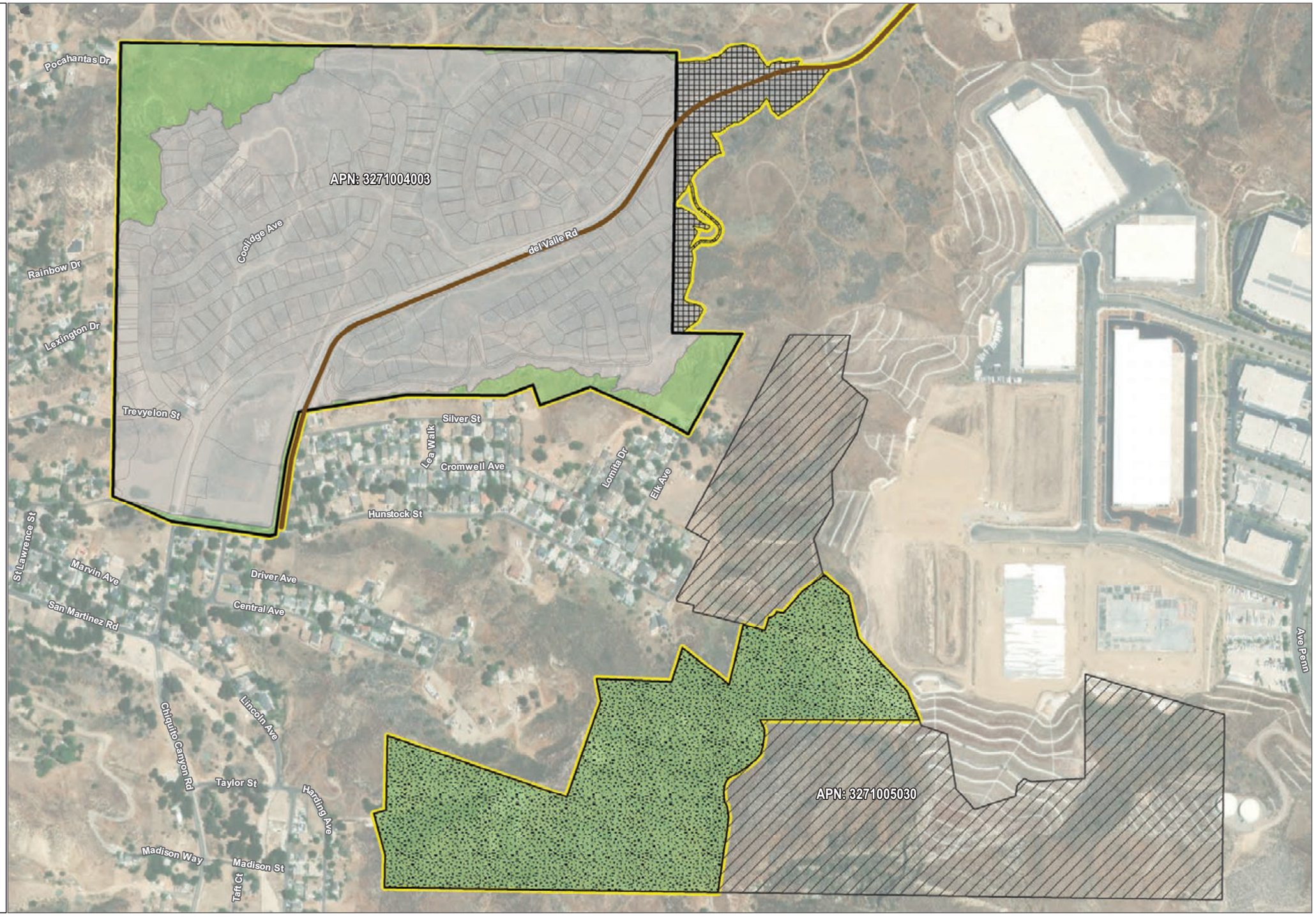
Off-Site Open Space Area

Not a Part

Site Plan Areas

Development Footprint

Open Space



SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 230 460 Feet

FIGURE 2A

Tract Map Site, Off-Site Roadway Improvement Area, Off-Site Open Space Area Biological Survey Area

Biological Technical Report for the Sterling Ranch Estates Residential Project

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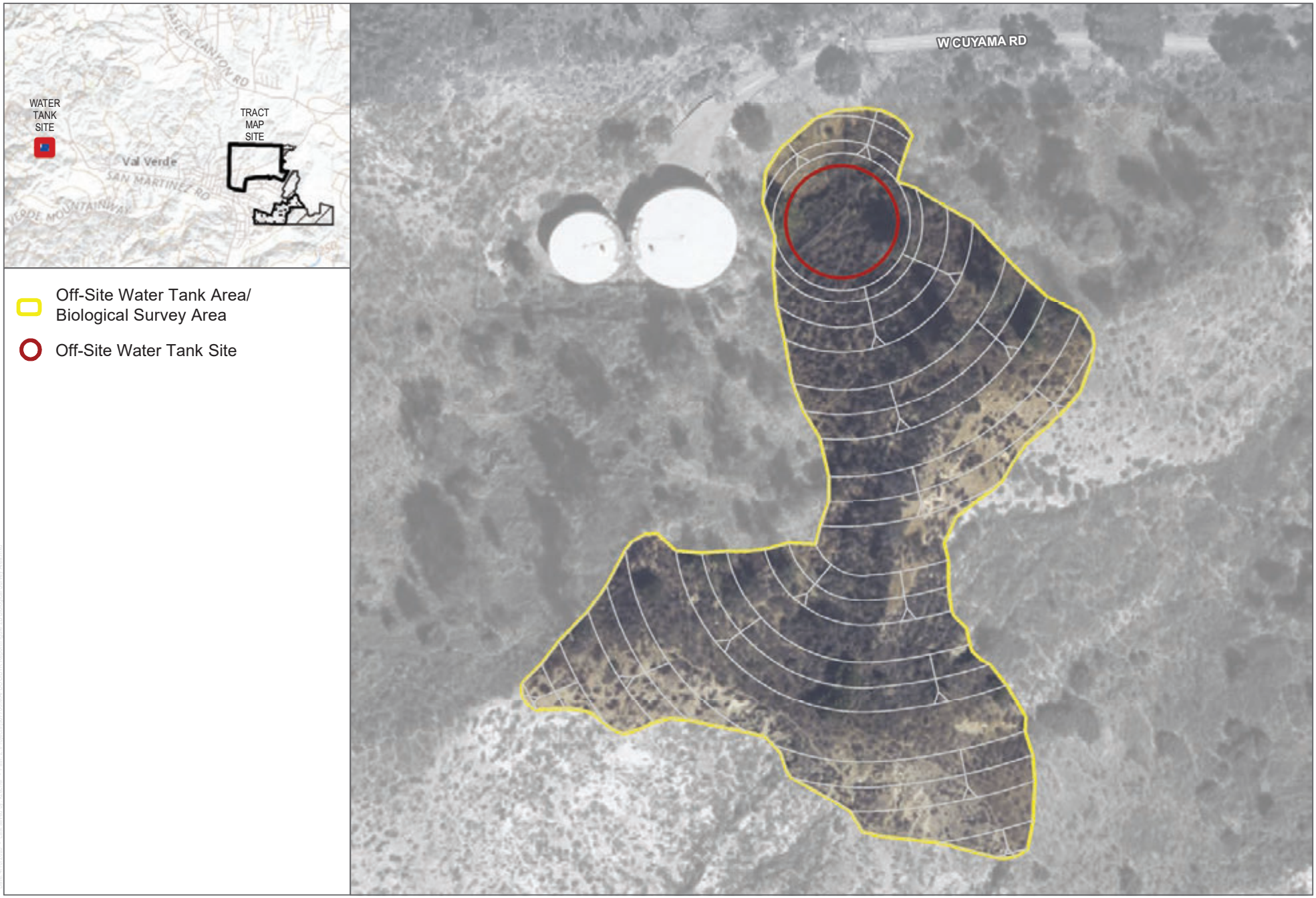

SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 50 100 Feet

FIGURE 2B

Off-Site Water Tank Area Biological Survey Area and Site Plan

Biological Technical Report for the Sterling Ranch Estates Residential Project

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Biological Survey Area

Project Components

Tract Map Site

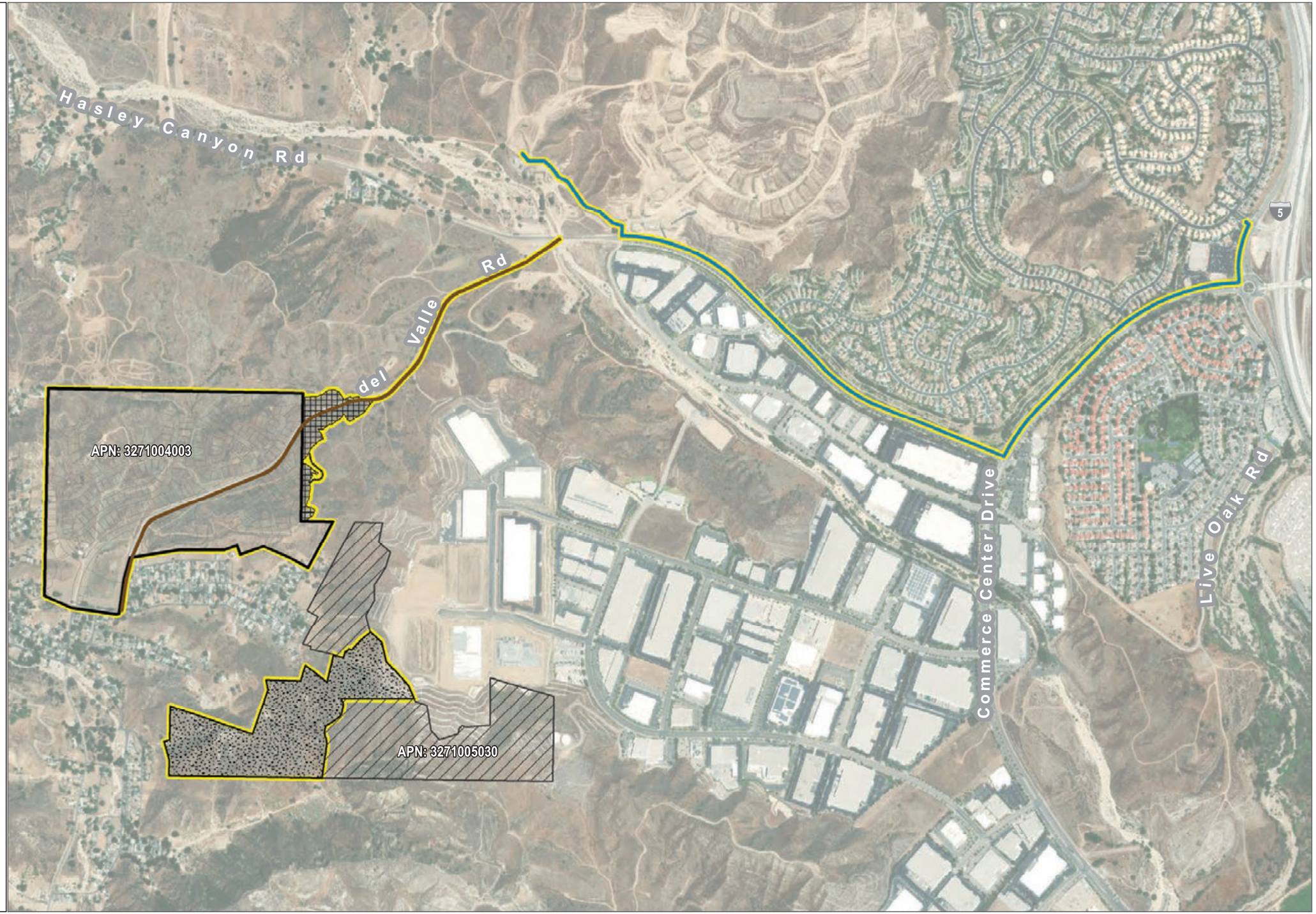
Off-Site Roadway Improvement Area

Off-Site Sewer Line Improvement Area

Off-Site Water Line Improvement Area

Off-Site Open Space Area

Not a Part



SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 500 1,000 Feet

FIGURE 2C

Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area Biological Survey Area

Biological Technical Report for the Sterling Ranch Estates Residential Project

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2 Project Setting

2.1 Project Location

The Project is located in the community of Val Verde, north of Chiquito Canyon Road, and northwest and southeast of Del Valle Road. The Project site lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. The Project site and BSA, including the Off-Site Water Tank Area, occur entirely within the U.S. Geological Survey (USGS) 7.5-minute Val Verde quadrangle (USGS 2017a). The Tract Map Site is centered at approximately 34 27′1.00″ N 118 39′ 12.00″ W and falls within Township 4 north, Range 17 west, sections 9 and 10, San Bernardino meridian. The Off-Site Water Tank Area site is centered at approximately 34 27′09.95″ N 118 41′ 22.08″ W and falls within Township 4 north, Range 17 west, section 8.

2.2 Land Uses

2.2.1 On-Site Land Uses

The Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA have remained undeveloped and in largely the same condition for the past 20 years. One residence is located in the southwestern portion of the Tract Map Site BSA, and several access roads are present; however, the lands within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA are best characterized as undeveloped.

The Off-Site Water Tank Area BSA is partially within the existing Los Angeles County Waterworks District No. 36 Cuyama tank site and adjacent private property. The Off-Site Water Tank Area BSA can be characterized as undeveloped.

2.2.2 Surrounding Land Uses

Existing land uses in the immediate vicinity of the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA include residential development in the community of Val Verde to the south and west, commercial/ industrial development associated with the Valencia Commerce Center to the east, oil field operations in the Hasley Canyon Oil Field to the northeast, and undeveloped property to the north of the Tract Map Site BSA and north and east of the Off-Site Open Space Area BSA.

Existing land uses in the immediate vicinity of the Off-Site Water Line Improvement Area BSA include the existing paved Hasley Canyon Road, commercial buildings, residential development, and Interstate 5. Land in the immediate vicinity of the Off-Site Sewer Line Improvement Area BSA is Del Valle Road, and adjacent areas are largely undeveloped.

Land in the immediate vicinity of the Off-Site Water Tank Area BSA is largely undeveloped with the exception of the existing Los Angeles County Waterworks District No. 36 Cuyama tank site.

2.3 Biological Setting

The Project is located within the Transverse Range geomorphic province of Southern California. Topographically, the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA vary from flat to moderate north- and south-facing slopes with elevations ranging from approximately 1,200 feet above mean sea level (amsl) along the southern boundary to approximately 1,400 feet amsl in the northeastern portion of the BSA. Topographically, the Off-Site Water Tank Area BSA consists of moderate north- and south-facing slopes with elevations ranging from approximately 1,550 feet amsl along the northern boundary to approximately 1,750 feet amsl in the southern portion of the site. Soils present within the Project site generally consist of loams, sandy loams, and silty clay loams, which are derived from sedimentary rock or granite. The Project region has a Mediterranean climate with cool, wet winters and hot, dry summers. Rainfall occurs primarily between October and March.

The Project region is located in a broad ecological and biogeographic transition zone for the coastal and mountain ecoregions. The Santa Clara River Valley also provides access via the Santa Clara River to the edges of the Mojave Desert and the foothills of the San Gabriel Mountains. While much of the region has been subject to rapid urbanization and historical agricultural and oil development practices, large areas of open space and natural lands border the region. The Los Padres National Forest is located to the north of the Project site, and the Angeles National Forest lies to the north and east of the Project site. The Santa Susana Mountains, a region of gently rolling hills and sharp, steep walled canyons, are south of the Project site and south of the Santa Clara River.

2.4 Watersheds and Hydrology

The Project site is located largely within the Salt Canyon-Santa Clara River watershed, though the far northeastern portion of the Project is located within the Lower Castaic Creek watershed (HUC 12). Waterways in the vicinity include Chiquito Canyon Creek, located approximately 0.15 miles (776 feet) south of the Tract Map Site BSA, and Castaic Creek, located approximately 0.53 miles (2,790 feet) northeast of the Tract Map Site BSA. Chiquito Canyon Creek and Castaic Creek are both tributaries to the Santa Clara River, and the confluence point of both waterways is located approximately 2 miles south of the Project site. The Santa Clara River flows from east to west and discharges into the Pacific Ocean in Ventura County approximately 39 miles west of the Project site.

The majority of the Project site is situated in the upper elevations of the respective watersheds, and as such, the hydrologic features encountered within the Project site consist of first order (according to the Strahler, “top-down” method of stream order classification) tributaries. These upper watershed features vary in size and formation, from discontinuous swales to ephemeral channels, which directly influence the presence of surface hydrologic indicators, including, but not limited to, an ordinary high water mark (OHWM) and a defined bed and bank. However, each feature mapped during the field assessment and presented herein is assumed to have a hydrologic connection to downslope waters within the overall watershed described above.

3 Regulatory Setting

This section outlines the federal, state, and local regulations pertinent to the biological resources located on the Project site. Some of the biological resources that may be affected by the Project are regulated by resource agencies, which often overlap in jurisdiction. This section identifies and discusses the various programs regulating state- and/or federally listed threatened or endangered plants and wildlife, and jurisdictional aquatic/hydrologic features, such as drainages, streambeds, riparian habitat, and wetlands.

3.1 Endangered Species Acts

3.1.1 California Endangered Species Act

CDFW administers the California Endangered Species Act (CESA) (California Fish and Game Code, Sections 2050, et seq.), which prohibits the "take" of plant and animal species designated by the California Fish and Game Commission as endangered or threatened in the state of California. Under CESA, "take" is defined as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill" (California Fish and Game Code, Section 86). CESA stipulates that state agencies may not approve projects that will "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy" (California Fish and Game Code, Section 2053).

CESA defines an "endangered species" as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (California Fish and Game Code, Section 2062). CESA defines a "threatened species" as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter. Any animal determined by the Commission as rare on or before January 1, 1985, is a threatened species" (California Fish and Game Code, Section 2067). "Candidate species" are defined as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that the Commission has formally noticed as being under review by the department for addition to either the list of endangered species or the list of threatened species, or a species for which the Commission has published a notice of proposed regulation to add the species to either list" (California Fish and Game Code, Section 2068).

CESA addresses the taking of threatened, endangered, or candidate species by stating, "No person shall import into this state, export out of this state, or take, possess, purchase, or sell within this state, any species, or any part or product thereof, that the Commission determines to be an endangered species or a threatened species, or attempt any of those acts, except as otherwise provided in this chapter, the Native Plant Protection Act (Fish and Game Code, Sections 1900–1913), or the California Desert Native Plants Act (Food and Agricultural Code, Section 80001)" (California Fish and Game Code, Sections 2080–2085).

Sections 2081(b) and 2081(c) of the California Fish and Game Code authorize take of endangered, threatened, or candidate species if take is incidental to otherwise lawful activity and if specific criteria are met. These criteria are reiterated in California Code of Regulations (CCR), Title 14, Sections 783.4(a) and 783.4(b). These provisions also

require CDFW to coordinate consultations with the USFWS for actions involving federally listed species that are also state-listed species. In certain circumstances, California Fish and Game Code Section 2080.1 allows CDFW to adopt a federal incidental take statement or a Section 10(a) permit as its own based on its findings that the federal permit adequately protects the species and is consistent with state law.

A Section 2081(b) permit may not authorize the take of fully protected species and "specified birds" (California Fish and Game Code, Sections 3505, 3511, 4700, 5050, 5515, and 5517). However, CDFW may authorize take of those species for necessary scientific research, including efforts to recover fully protected, threatened, or endangered species, and may authorize the live capture and relocation of those species pursuant to a permit for the protection of livestock. If a project is planned in an area where a fully protected species or a specified bird occurs, an applicant must design the project to avoid take.

3.1.2 Federal Endangered Species Act

The federal Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), as amended, is administered by the USFWS and the National Oceanic and Atmospheric Administration National Marine Fisheries Service. This legislation is intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide programs for the conservation of those species, thus preventing extinction of plants and wildlife. The ESA defines an "endangered species" as "any species that is in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as "any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Under the provisions of Section 9(a)(1)(B) of the ESA, it is unlawful to "take" any listed species. "Take" is defined in Section 3(19) of the ESA as, "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." A Final Rule published in the Federal Register on November 8, 1999, further defines "harm" as any act that kills or injures fish or wildlife, and emphasizes that such acts may include significant habitat modification or degradation that significantly impairs essential behavioral patterns (e.g., nesting or reproduction) of fish or wildlife (64 CFR 60727–60731). Further, USFWS, through regulation, has interpreted the terms "harm" and "harass" to include certain types of habitat modification that result in injury to or death of species, which therefore are defined as forms of take. These interpretations, however, are generally considered and applied on a case-by-case basis and often vary from species to species.

In a case where a property owner seeks permission from a federal agency for an action that could affect a federally listed plant or wildlife species, the property owner and agency are required to consult with USFWS. Take prohibitions in ESA Section 9 (16 USC 1531 et seq.) do not expressly encompass all plants. Property owners may take listed plant species without violating the take prohibition if:

- The proposed development is private and does not require federal authorization or permit.
- There are no special federal regulations under Section 4(d) that prohibit take of the plant species.
- There are no state laws prohibiting take of the plant species.

Section 9(a)(2) of the ESA (16 USC 1531 et seq.) addresses the protections afforded to listed plants. Unlike CESA, the ESA provides protection to invertebrate species by listing them as threatened or endangered.

Issuance of an incidental take permit by the USFWS or National Marine Fisheries Service is a federal action that is subject to ESA Section 7 (16 USC 1531 et seq.). Section 7 stipulates that any federal agency action that may affect a species listed as threatened or endangered requires a formal consultation with USFWS to ensure that the action

is not likely to jeopardize the continued existence of the listed species or result in destruction or adverse modification of designated critical habitat (16 USC Section 1536(a)(2)). A biological opinion issued by the USFWS at the conclusion of the consultation may include authorization for incidental take of a listed species. In the absence of federal agency involvement, habitat conservation plans under ESA Section 10(a)(1)(B) are required as part of the incidental take permit. The ESA prohibits the transportation of endangered plants across state lines or engaging in trade in any listed species, but it does not prohibit the destruction of endangered plants unless they occur on federal land or the plant species is protected by state law.

3.2 Fish and Game Code

According to Sections 3511, 4700, 5550, and 5515 of the California Fish and Game Code, which regulate birds, mammals, herps, and fish, respectively, a "fully protected" species may not be taken or possessed except for scientific purposes, with a permit from the Fish and Game Commission.

Pursuant to Section 3503.5 of the California Fish and Game Code, it is unlawful to take, possess, or destroy any birds of prey, or to take, possess, or destroy any nest or eggs of such birds. "Birds of prey" refer to species in the orders Falconiformes and Strigiformes (and, by extension Accipitriformes, which includes species previously included under Falconiformes). Active nests of all other birds (except house sparrow [*Passer domesticus*], European starling [*Sturnus vulgaris*], and several other non-native species) are similarly protected under Sections 3503 and 3513 of the Fish and Game Code. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered "take" by the CDFW. This statute does not provide for the issuance of an incidental take permit.

3.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) was originally passed in 1918 and implements four bilateral treaties, or conventions, for the protection of a shared migratory bird resource (16 USC 703–712). The primary motivation for the international negotiations was to stop the "indiscriminate slaughter" of migratory birds by market hunters and others. Each of the treaties protects selected species of birds and provides for closed and open seasons for hunting game birds. The MBTA protects more than 800 species of birds, which are listed in the Code of Federal Regulations (50 CFR 10.13). Two species of eagles that are native to the United States, the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), were granted additional protection within the United States under the Bald and Golden Eagle Protection Act (16 USC 668–668d) to prevent the species from becoming extinct.

The MBTA prohibits the "take" of any migratory bird or any part, nest, or eggs of any such bird. Under the MBTA, "take" is defined as pursuing, hunting, shooting, capturing, collecting, or killing, or attempting to do so. Additionally, Executive Order 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds," requires that any project with federal involvement address impacts of federal actions on migratory birds with the purpose of promoting conservation of migratory bird populations. The Executive Order requires federal agencies to work with the USFWS to develop a memorandum of understanding. The USFWS reviews actions that might affect these species.

3.4 Jurisdictional Water Resources, Waters of the United States/State, Including Wetlands

There are three primary agencies that regulate activities within inland streams, wetlands, and riparian areas in California: the USACE Regulatory Program regulates activities pursuant to Section 404 of the federal Clean Water Act (CWA); CDFW regulates activities under California Fish and Game Code Sections 1600–1616; and the California RWQCB regulates activities under the Porter-Cologne Water Quality Control Act and CWA Section 401. The following discussion provides information on each agency's regulatory program. In addition, Section IV, Appendix G (Environmental Checklist Form), of the CEQA Statutes and Guidelines (14 CCR Section 15000 et seq.) requires an evaluation of impacts which could have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

3.4.1 U.S. Army Corps of Engineers

Pursuant to CWA Section 404, USACE regulates the discharge of dredged and/or fill material into "waters of the United States." The term "waters of the United States" (waters) is defined in the Definition of Waters of the United States in the USACE regulations (33 CFR 328.3(a)) as:

1. All waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide;
2. All interstate waters including interstate wetlands;
3. All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect foreign commerce including any such waters:
    i. which are or could be used by interstate or foreign travelers for recreational or other purposes; or
    ii. from which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or
    iii. which are used or could be used for industrial purpose by industries in interstate commerce;
4. All impoundments of waters otherwise defined as waters of the United States under the definition;
5. Tributaries of waters identified in paragraphs (a) (1) through (4) of this section;
6. The territorial seas;
7. Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a)(1) through (6) of this section.

The term "wetlands" (a subset of waters) is defined in 33 CFR Section 328.3(b) as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

In the absence of wetlands, the limits of USACE jurisdiction in non-tidal waters, such as intermittent streams, extend to the OHWM, which is defined in 33 CFR Section 328.3(e) as "that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving,

changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas."

On April 12, 2020, the U.S. Environmental Protection Agency and the Department of the Army published the Navigable Waters Protection Rule to define "waters of the United States." The definition was streamlined to include four categories of jurisdictional waters, provide clear exclusions for many water features that traditionally have not been regulated, and define terms in the regulatory text. The four categories regulated include:

1. The territorial seas and traditional navigable waters;
2. Perennial and intermittent tributaries to those waters;
3. Certain lakes, ponds, and impoundments; and
4. Wetlands adjacent to jurisdictional waters.

The Navigable Waters Protection Rule also details 12 categorical exclusions, features that are not "waters of the United States," including:

1. Waterbodies that are not included in the four categories of "waters of the United States."
2. Groundwater, including groundwater drained through subsurface Ephemeral Stream systems, such as drains in agricultural lands.
3. Ephemeral features, including ephemeral streams, swales, gullies, rills, and pools.
4. Diffuse stormwater run-off and directional sheet flow over upland.
5. Many farm and roadside ditches.
6. Prior converted cropland. This exclusion will cease to apply when cropland is abandoned (i.e., not used for, or in support of, agricultural purposes in the immediately preceding five years) and has reverted to wetlands.
7. Artificially irrigated areas, including fields flooded for agricultural production, that would revert to upland should application of irrigation water to that area cease.
8. Artificial lakes and ponds, including water storage reservoirs and farm, irrigation, stock watering, and log cleaning ponds, constructed or excavated in upland or in non-jurisdictional waters.
9. Water-filled depressions constructed or excavated in upland or in non-jurisdictional waters incidental to mining or construction activity, and pits excavated in upland or in non-jurisdictional waters for the purpose of obtaining fill, sand, or gravel.
10. Stormwater control features excavated or constructed in upland or in non-jurisdictional waters to convey, treat, infiltrate, or store stormwater run-off.
11. Groundwater recharge, water reuse, and wastewater recycling structures, including detention, retention and infiltration basins and ponds, that are constructed in upland or in non-jurisdictional waters.
12. Waste treatment systems have been excluded from the definition of "waters of the United States" since 1979 and will continue to be exclude under the final rule. Waste treatment systems are defined as:
    - A waste treatment system includes all components, including lagoons and treatment ponds (such as settling or cooling ponds), designed to either convey or retain, concentrate, settle, reduce, or remove pollutants, either actively or passively, from wastewater or stormwater prior to discharge (or eliminating any such discharge).

The Navigable Waters Protection Rule became effective on June 22, 2020. The discharge of dredge or fill material into waters of the United States, including wetlands, requires authorization from USACE prior to impacts.

3.4.2 California Fish and Game Code

Under California Fish and Game Code Sections 1600–1616, CDFW has authority to regulate work that will substantially divert or obstruct the natural flow, or substantially change or use any material from the bed, channel, or bank of any river, stream, or lake. CDFW also has authority to regulate work that will deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. This regulation takes the form of a requirement for a Lake or Streambed Alteration Agreement and is applicable to all federal and nonfederal projects.

Per 14 CCR Section 1.72, a "stream" (including creeks and rivers) is "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having surface or subsurface flow that supports or has supported riparian vegetation."

Per 14 CCR Section 1.56, a "lake" includes "natural lakes or man-made reservoirs." Diversion, obstruction, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake that supports fish or wildlife requires authorization from CDFW by means of entering into an agreement pursuant to Section 1602 of the Fish and Game Code.

3.4.3 California Regional Water Quality Control Board

Pursuant to Section 401 of the federal CWA, the RWQCB regulates discharging waste, or proposing to discharge waste, within any region that could affect a "water of the state" (Water Code, Section 13260(a)), pursuant to provisions of the Porter-Cologne Water Quality Control Act. Waters of the state are defined as "any surface water or groundwater, including saline waters, within the boundaries of the state" (Water Code, Section 13050(e)). Before USACE will issue a CWA Section 404 permit, applicants must receive a CWA Section 401 Water Quality Certification from the RWQCB. If a CWA Section 404 permit is not required for the project, the RWQCB may still require a permit (i.e., Waste Discharge Requirement) under the Porter-Cologne Water Quality Control Act.

In April 2020, the State Water Resources Control Board released Implementation Guidance for the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Water of the State (2020). The procedures define an area as a wetland if, under normal circumstances:

1. The area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both;
2. The duration of such saturation is sufficient to cause anerobic conditions in the upper substrate; and
3. The areas vegetation is dominated by hydrophytes or the area lacks vegetation.

This modified three-parameter definition is similar to the federal definition in that it identifies three wetland characteristics that determine the presence of a wetland: wetland hydrology, hydric soils, and hydrophytic vegetation. Unlike the federal definition, however, the Procedures' wetland definition allows for the presence of hydric substrates as a criterion for wetland identification (not just wetland soils) and wetland hydrology for an area devoid of vegetation (less than 5% cover) to be considered a wetland.

Furthermore, the Implementation Guidance for the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Water of the State (State Water Resources Control Board 2020) includes California Code of Regulations, Title 23, Section 3831(w), which states that "all waters of the United States are also 'waters of the

state.'" This regulation has remained in effect despite Supreme Court decisions such as Rapanos (EPA 2007) and Solid Waste Agency of Northern Cook County and USACE/U.S. Environmental Protection Agency rules such as the Navigable Waters Protection Rule, which limit features that could be considered a water of the United States. Therefore, the regulation reflects the Water Boards intent to include a broad interpretation of waters of the U.S. into the definition of waters of the state. Waters of the state includes features that have been determined by the U.S. Environmental Protection Agency or the USACE to be "waters of the United States." in an approved jurisdictional determination; "waters of the United States" identified in an aquatic resource report certified by the USACE upon which a permitting decision was based; and features that are consistent with any current or historic final judicial interpretation of "waters of the United States" or any current or historic federal regulation defining "waters of the United States."

3.4.4 County of Los Angeles

The Los Angeles County Santa Clarita Valley Area Plan (SCAP; County of Los Angeles 2012) includes goals, objectives, and policies intended to balance the protection of the environment with the social and economic needs within the plan area. Goal CO-3 (Biological Resources) addresses the protection of biological resources via Objective CO-3.1 and Policy CO-3.1.2, which state: "avoid designating or approving new development that will adversely impact wetlands, floodplains, threatened or endangered species and habitat, and water bodies supporting fish or recreational uses, and establish an adequate buffer area as deemed appropriate through site specific review." Further, Objective CO-3.2 and Policy CO-3.2.1 state: "protect wetlands from development impacts, with the goal of achieving no net loss (or functional reduction) of jurisdictional wetlands within the planning area."

3.5 California Environmental Quality Act

CEQA requires identification of a project's potentially significant impacts on biological resources and ways that such impacts can be avoided, minimized, or mitigated. The act also provides guidelines and thresholds for use by lead agencies for evaluating the significance of proposed impacts.

CEQA Guidelines Section 15380(b)(1) defines endangered animals or plants as species or subspecies whose "survival and reproduction in the wild are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, disease, or other factors." A rare animal or plant is defined in CEQA Guidelines Section 15380(b)(2) as a species that, although not presently threatened with extinction, exists "in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens; or … [t]he species is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and may be considered 'threatened' as that term is used in the federal Endangered Species Act." Additionally, an animal or plant may be presumed to be endangered, rare, or threatened if it meets the criteria for listing, as defined further in CEQA Guidelines Section 15380(c).

3.6 Local Laws, Ordinances, Regulations, and Standards

In addition to the federal and state regulations identified above, the following local laws, ordinances, regulations, and standards apply to the environmental review of potential impacts on biological resources as a result of the Project.

3.6.1 Los Angeles County Planning Area

The Project site is located within the SCAP (County of Los Angeles 2012), Castaic Area Community Standards District. The Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and Off-Site Sewer Line Improvement Area BSA are within both the Val Verde Subarea and the Hasley Canyon Subarea. The Off-Site Open Space Area BSA and the Off-Site Water Tank Area BSA are within the Val Verde Subarea. The SCAP (County of Los Angeles 2012) is a component of the Los Angeles County General Plan, which provides a focused framework for development within the Santa Clarita Valley geographic area. The SCAP includes a set of goals and objectives that provide the basis for the policies adopted in the plan. Policies detailed in the SCAP will be incorporated into the Project planning process to provide consistency with regional planning standards.

3.6.2 Los Angeles County Low Impact Development

In addition to the SCAP, Los Angeles Countywide planning efforts related to biological resources include LID standards (County of Los Angeles 2014a). The Project will adhere to these ordinances during the Project planning phase and comply with their specific requirements.

3.6.3 Los Angeles County Oak Woodlands

In response to regulations enacted by the State of California (California Public Resources Code, Section 21083.4), the County of Los Angeles adopted the Los Angeles County Oak Woodlands Conservation Management Plan (Plan) (August 23, 2011; County of Los Angeles 2011) and drafted the Oak Woodlands Conservation Management Plan Guide (Guide) (March 18, 2014; County of Los Angeles 2014b) as an implementing document for the Plan. The purpose of the regulations and the adopted Oak Woodlands Conservation Management Plan is to determine whether the development of a proposed project "may result in a conversion of oak woodlands that will have a significant effect on the environment" (County of Los Angeles 2011). Should the proposed project result in loss of oak woodlands, the County of Los Angeles requires mitigation measures to offset the losses.

3.6.3.1 Los Angeles County Oak Woodlands Conservation Management Plan

The main goal of the Oak Woodlands Conservation Management Plan is to "preserve and restore oak woodlands so they are conserved in perpetuity with no net loss of existing woodlands. There are three important objectives of the Oak Woodlands Conservation Management Plan: prioritize the preservation of oak woodlands, promote conservation by integrating oak woodlands into the development process in a sustainable manner and effectively mitigate the loss of oak woodlands" (County of Los Angeles 2014).

The Oak Woodlands Conservation Management Plan Guide (County of Los Angeles 2014) interprets the Oak Woodlands Conservation Management Plan's definition of an oak woodland as follows: "an oak stand, including its understory, which consists of two or more oak trees of at least five inches in diameter measured at 4.5 feet above mean natural grade, with greater than 10% canopy cover or that may have historically supported greater than 10% canopy cover as early as January 1, 2005."

In accordance with the Oak Woodlands Conservation Management Plan Guide, when a discretionary project site is found to support oak woodlands, an Oak Woodland Report must be submitted to document potential impacts to oak woodlands resulting from the development of that project.

3.6.3.1.1 Tree and Woodland Definitions

Oak tree is defined by the Oak Woodlands Conservation Management Plan as "all native trees of the genus *Quercus.*" This includes small shrubby oaks typically clustered on slopes, as well as individual large oaks that are naturally widely distributed across the landscape. Under California state law, "oaks [that are part of a woodland] greater than 5 inch diameters at standard height (DSH) are also protected" (California Public Resources Code 21083.4a).

Oak stand is defined by the Oak Woodlands Conservation Management Plan as "a group of similar [oak] trees growing in a contiguous pattern, having sufficiently diverse age-class distribution, composition and structure, and growing on a site of sufficiently uniform quality that it is distinguishable as a unit. Stands are a basic physical unit of vegetation in the landscape and do not have a set size."

Oak woodlands are defined by California Fish and Wildlife Code Section 1361.h and by the Oak Woodlands Conservation Management Plan (County of Los Angeles 2011, page 28) as "an oak stand with a greater than 10% canopy cover or that may have historically supported greater than 10% canopy cover." (Ten times an individual oak tree's canopy is considered by the County as representative of the tree's sphere of influence [SOI]; where these SOIs overlap, they are collectively defined as oak woodlands, each having 10% or greater relative cover of oak tree canopy [woodland].)

This document interprets the Oak Woodlands Conservation Management Plan's definition of an oak woodland (County of Los Angeles 2011) as an oak stand, including its understory, that consists of two or more oak trees of at least 5 inches in diameter measured at 4.5 feet above mean natural grade with greater than 10% canopy cover or that may have historically supported greater than 10% canopy cover as early as January 1, 2005 (effective date of California Public Resources Code, Section 21083.4).

Oak Savanna is lightly wooded grassland with oaks as the dominant tree species. The canopy cover of an oak savanna may often be less than 10%, and therefore oak savannas are not necessarily subject to California Public Resources Code, Section 21083.4. Nevertheless, CDFW considers some types of oak savanna to be sensitive CDFW, and these are given consideration as sensitive natural communities under CEQA (see CDFW Natural Communities List [CDFW 2019a] and CEQA Guidelines Appendix G).

3.6.3.1.2 Conditions and Criteria Definitions

- **Intact** – The site is currently in a "wild" state where all ecological functions such as groundwater infiltration, shade, habitat, nutrient cycling, carbon sequestration, wind/noise/dust abatement, and the stand are self-sustaining and regenerating. Understory may be dominated by invasive grasses and forbs. Fire exclusion or frequency may have altered native woodland. Woodland supports associated flora and fauna and is free from destructive land practices that limit long-term persistence.
- **Moderately Degraded** – Even though the site has been altered, oak woodlands persist and retain some of their functions. Natural regeneration is possible, wildlife use still occurs, and some level of ecosystem services is still present. The majority of oak woodlands in the County fall within this category.
- **Severely Degraded** – The site has been drastically altered from the natural condition to accommodate residential, commercial, or industrial uses, and oak woodlands remain in scattered locations. Natural regeneration is not possible. Soil is compacted, contaminated, or paved. Wildlife habitat is limited, and associated understory vegetation has been replaced by managed non-native landscaping.

3.6.3.2 Oak Woodland Guide

The Oak Woodlands Conservation Management Plan Guide focuses on two categories of recommendations to preserve and restore oak woodlands: (1) alterations to the County's development and environmental review process and (2) revisions to the process by which Los Angeles County agencies address impacts to oak woodlands. The Oak Woodlands Conservation Management Plan Guide is intended to implement portions of the Plan and to be a resource for processing development applications for discretionary projects that are not exempt from CEQA and that may impact oak woodlands.

3.6.4 Los Angeles County Oak Tree Ordinance

3.6.4.1 Regulations

The Los Angeles County Oak Tree Ordinance was established to recognize oak trees as significant historical, aesthetic, and ecological resources. The goal of the ordinance is to create favorable conditions for the preservation and propagation of this unique and threatened plant heritage. By making this part of the project development process, healthy oak trees will be preserved and maintained. The Los Angeles County Oak Tree Ordinance applies to all unincorporated areas of the County of Los Angeles.

Under the Los Angeles County Oak Tree Ordinance, a person shall not cut, destroy, remove, relocate, inflict damage, or encroach into the protected zone of any tree of the oak tree genus that is 8 inches or more in diameter; 4.5 feet above mean natural grade; or, in the case of oaks with multiple trunks, a combined diameter of 12 inches or more of the two largest trunks, without first obtaining a permit.

3.6.4.2 Definitions

Trees subject to County permit requirements include those defined by Title 22.56.2060, as follows:

> Any tree of the oak genus which is (a) 25 inches or more in circumference (eight inches in diameter) as measured four and one-half feet above mean natural grade; in the case of an oak with more than one trunk, whose combined circumference of any two trunks is at least 38 inches (12 inches in diameter) as measured four and one half feet above mean natural grade.

Additionally, the Los Angeles County Oak Tree Ordinance defines the "Protected Zone" of a tree as "that area within the dripline of an oak tree and extending therefrom to a point at least five feet outside the dripline, or 15 feet from the trunks of a tree, whichever distance is greater" (Title 22.56.2060).

For the purposes of determining tree impacts, trees that have protected zones that have been encroached upon would also be considered impacted.

3.6.5 Los Angeles County Fuel Modification Zones

In accordance with Los Angeles County regulations, a 200-foot fuel modification zone will be established and maintained as stipulated in County of Los Angeles Fire Department Fuel Modification Guidelines (Los Angeles County Fire Department 2011). Fuel modification in Zones A and B (0–100 feet from future structures) will occur within an irrigated and maintained buffer and in Zone C (100–200 feet from future structures) in an unirrigated "thinning zone" to selectively thin vegetation, as determined to be necessary based on a site assessment by fire suppression professionals.

4 Methods

Dudek conducted a literature review and subsequent reconnaissance-level and focused surveys to determine the presence or potential presence of sensitive biological resources on the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, the Off-Site Water Tank Area BSA, the Off-Site Water Line Improvement Area BSA, and the Off-Site Sewer Line Improvement Area BSA. This section describes the literature review, methods of field surveys, and survey limitations.

4.1 Literature Review

According to California Fish and Game Code Sections 3511, 4700, 5550, and 5515 , which regulate birds, mammals, amphibians, reptiles, and fish, respectively, a "fully protected" species may not be taken or possessed except for scientific purposes, with a permit from the Fish and Game Commission.

Prior to conducting the field investigation, Dudek conducted a review of the existing biological resources and species within the vicinity of the survey area using the CDFW California Natural Diversity Database (CNDDB) and the California Native Plant Society (CNPS) Inventory of Rare and Endangered Plants. Dudek obtained special-status species and sensitive vegetation community occurrence data from the above sources by querying records within the Val Verde USGS quadrangle map and the eight quadrangles surrounding the Project site, including the Cobblestone Mountain, Whitaker Peak, Warm Springs Mountain, Piru, Newhall, Simi, Santa Susana, and Oat Mountain USGS quadrangle maps. USFWS Information, Planning, and Consultation (IPaC) and Critical Habitat and Occurrence Data also assisted in determining other species present in the region with potential to occur on site. Dudek reviewed the following available resources to assess the potential for biological and aquatic resources within the Tract Map Site BSA, Off-Site Roadway Improvement Area BSA, Off-Site Open Space Area BSA, and Off-Site Water Tank Area BSA and vicinity:

- CDFW CNDDB (CDFW 2018a, 2020a)
- CNPS Inventory of Rare and Endangered Plants (CNPS 2018, 2020)
- List of potentially occurring listed species generated from a review of the USFWS's IPaC Trust Resources Report (USFWS 2017, 2020a) list of federal and threatened species
- USFWS Critical Habitat and Occurrence Data (USFWS 2018a)
- Los Angeles County Sensitive Bird Species (Audubon 2009)
- USGS National Hydrography Dataset (USGS 2017b, 2020a)
- USFWS National Wetlands Inventory (USFWS 2018b, 2020b)
- StreamStats (USGS 2017c)
- U.S. Department of Agriculture, Natural Resources Conservation Service Web Soil Survey (USDA 2021)

Prior environmental documents prepared for the Project provided information on biological resource constraints previously identified. Prior documents reviewed include:

- Rare Plant Surveys, Sterling Residential Site, Los Angeles County, California (FLx 2014)
- Submittal of 45-Day Report for Coastal California Gnatcatcher Surveys for the Industrial Portion of Green Valley Ranch, a 100-Acre Property in the City of Valencia, Los Angeles County, California (Glenn Lukos 2007)

4.2 Biological Field Surveys

Dudek biologists completed habitat suitability assessments, vegetation mapping, focused botanical and special-status plant species surveys, focused surveys for coastal California gnatcatcher and burrowing owl, and aquatic resource delineation surveys within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA to gain a clear understanding of natural resources present and to identify those species with potential to occur based on the habitats present. Each of the surveys included an inventory of the plant and wildlife species encountered. Biologists documented the presence of special-status species, but negative surveys were not considered confirmation of absence.

The 164.8 acres are composed of the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, Off-Site Water Tank Area BSA, Off-Site Water Line Improvement Area BSA, Off-Site Sewer Line Improvement Area BSA, and the Off-Site Open Space Area BSA includes the proposed residential development area as well as improved recreational open space and preserved open space areas, as shown on Figure 2A, Figure 2B, and Figure 2C. The 2.8-acre Off-Site Water Tank Area BSA includes the one million gallon-water tank and the surrounding hillsides for cut and hillside stabilization required for the water tank protection per Los Angeles County building codes, as shown on Figure 2B. The 3.1 acres of Off-Site Water Line Improvement Area BSA and Off-Site Sewer Line Improvement Area include a proposed water line and sewer line within the existing Del Valle Road and Hasley Canyon Road roadways, as shown on Figure 2C.

Survey methodologies are detailed below. During surveys, biologists walked the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA and recorded visual and audial observations. Table 1 provides the dates, times, site conditions, and observations for each survey.

Table 1. Biological Surveys Completed on the Project Site

Date(s)	Personnel	Survey Type	Survey Time	Air Temp. (°F)	Cloud Cover (%)	Wind Speed (mph)
5/20/2016	RM	TMS, OSRIA, and OSOSA Habitat Assessment	1230– 1700	54°–73°	NR	0–3
10/10/2016	RM, HM	TMS, OSRIA, and OSOSA Wetland Delineation, TMS, OSRIA, and OSOSA Habitat Assessment	0800– 1330	64°–87°	5%–20%	0–4
01/16/2017	RM	TMS, OSRIA, and OSOSA Wetland Delineation, TMS, OSRIA, and OSOSA Habitat Assessment	0900–1000	NR	NR	NR
01/25/2017	RM	TMS, OSRIA, and OSOSA Wetland Delineation, TMS, OSRIA, and OSOSA Habitat Assessment	0830–0945	NR	NR	NR

Table 1. Biological Surveys Completed on the Project Site

Date(s)	Personnel	Survey Type	Survey Time	Air Temp. (°F)	Cloud Cover (%)	Wind Speed (mph)
05/08/2017	RM	TMS, OSRIA, and OSOSA Focused Botanical and Special-Status Plant Species Survey	1500–1700	77°–78°	0%	1–3
05/09/2017	RM	TMS, OSRIA, and OSOSA Focused Botanical and Special-Status Plant Species Survey, TMS, OSRIA, and OSOSA Vegetation Mapping	0730–1800	59°–72°	0%–10%	0–3
07/25/2017	RM	TMS, OSRIA, and OSOSA Focused Botanical and Special-Status Plant Species Survey	0730–1645	66°–92°	10%–20%	3–7
03/14/2018	RM, HM	TMS, OSRIA, and OSOSA Focused Burrowing Owl Survey	0745–1630	52°-60°	30%–50%	1–6
03/29/2018 – 3/30/2018	MB	TMS, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 1)	0705–1200 0645–1120	52°-74° 51°-76°	0% 0%	0–1 0–1
04/13/2018 – 04/14/2018	MB	TMS, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 2)	0658–1148 0646–1114	51°–68° 55°–70°	0% 0%	1–6 0–1
05/03/2018 – 05/04/2018	MB	TMS, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 3)	0642–1127 0658–0935	55°–79° 54.5°–74°	0% 0%	0–2 0–2
05/17/2018 – 05/18/2018	MB	TMS, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 4)	0640–1041 0648–0910	56°–71° 61°–63°	0% 40%–80%	0–6 0–1
05/29/2018	RM	TMS, OSRIA, and OSOSA Focused Burrowing Owl Survey	0615–0800	64°–70°	5%–50%	0–1

Table 1. Biological Surveys Completed on the Project Site

Date(s)	Personnel	Survey Type	Survey Time	Air Temp. (°F)	Cloud Cover (%)	Wind Speed (mph)
06/06/2018 – 06/07/18	MB	TMS, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 5)	0713–1127 0710–0935	58°–72° 63°–74°	0%–5% 0%	0–3 0–2
06/21/2018 – 06/22/2018	MB	TMS, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 6)	0630–1015 0658–0930	59°–78° 62°–72°	0% 0%	0–1 0–1
06/22/2018	RM	TMS, OSRIA, and OSOSA Focused Burrowing Owl Survey	1815–1945	77°–81°	0%	0–2
06/29/2018	RM	Pre-application site visit meeting with U.S. Army Corps of Engineers Zac Schakner and California Department of Fish and Wildlife Brock Warmuth	—	—	—	—
07/13/2018	RM	TMS, OSRIA, and OSOSA Focused Burrowing Owl Survey	1830–1975	82°–84°	0%	0
02/12/2020	HM, RA, TP	TMS, OSRIA, and OSOSA Vegetation Mapping Updates, OSWTA Vegetation Mapping, OSWTA Wetland Assessment, OSWTA Habitat Assessment, OSWTA Oak Woodland Assessment	0730–1535	44°–72°	0%	1–3
04/30/2020 05/01/2020	TM	TMS, OSWTA, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 1)	0630-1100 0700-1100	55°–61° 61°–78°	0% 0%	1–2 0–2
05/07/2020 05/08/2020	TM	TMS, OSWTA, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 2)	0630-1100 0700-1030	54°–75° 58°–63°	0%–10% 0%	0–1 0–1

Table 1. Biological Surveys Completed on the Project Site

Date(s)	Personnel	Survey Type	Survey Time	Air Temp. (°F)	Cloud Cover (%)	Wind Speed (mph)
05/08/2020	AD, MF	OSWTA Focused Botanical and Special-Status Plant Species Survey	0851–1308	79°–93°	0%	0–5
05/20/2020	HM, MF	OSRIA and TMS Focused Botanical and Special-Status Plant Species Survey	0810–1745	64°–78°	0%	0–4
05/22/2020	HM, MF	OSWTA Focused Botanical and Special-Status Plant Species Survey	0815–0929	73°–78°	0%	0–2
05/22/2020	HM, MF	OSRIA, OSSLIA, OSWLIA, and TMS Focused Botanical and Special-Status Plant Species Survey	0954–1615	76°–78°	0%–10%	0–4
05/28/2020 05/29/2020	JP MB	TMS, OSWTA, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 3)	0625–1200 0705–1048	56°–86° 61°–74°	0% 10%–70%	0–5 0–3
06/04/2020 06/05/2020	JP	TMS, OSWTA, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 4)	0630–1047 0630–1032	68°–88° 58°–68°	0% 100%	0–3 0–5
06/18/2020 06/19/2020	JP	TMS, OSWTA, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 5)	0630–1103 0635–1045	55°–72° 57°–68°	0%–100% 50%–100%	0–5 0–4
06/29/2020 06/30/2020	MB	TMS, OSWTA, OSRIA, and OSOSA Protocol Coastal California Gnatcatcher Survey (Pass 6)	0637–1048 0715–1003	60°–78° 62°–74°	30%–80% 0%–5%	0–3 0–2
07/08/2020	HM	OSWTA Oak Woodland Assessment	1150–1220	88°–89°	0%	2
8/4/2020	HM, MF	TMS Focused Botanical and Special-Status Plant Species Survey	0734–1512	70°–90°	0%	0–5
8/5/2020	HM, MF	OSWTA Focused Botanical and Special-Status Plant Species Survey	0758–1201	67°–77°	0%	0–5

Table 1. Biological Surveys Completed on the Project Site

Date(s)	Personnel	Survey Type	Survey Time	Air Temp. (°F)	Cloud Cover (%)	Wind Speed (mph)
8/5/2020	HM, MF	OSRIA, OSSLIA, OSWLIA, and TMS Focused Botanical and Special-Status Plant Species Survey	1230–1430	83°–87°	0%	2–8
8/6/2020	HM, MF	TMS Focused Botanical and Special-Status Plant Species Survey	0750–1130	63°–78°	10%–100%	0–3

Personnel: AD = Andrea Dransfield, HM = Heather Moine, JP = Jeffrey Priest, MB = Melissa Blundell, MF = Mackenzie Forgey, RA = Ryan Allen, RM = Randall McInvale, TM = Tommy Molioo, TP = Tracy Park.
Survey Type: Biological Survey Area: OSOSA = Off-Site Open Space Area, OSRIA = Off-Site Roadway Improvement Area, OSWLIA = Off-Site Water Line Improvement Area, OSSLIA = Off-Site Sewer Line Improvement Area, OSWTA = Off-Site Water Tank Area, TMS =Tract Map Site.
Notes: °F = degrees Fahrenheit; mph = miles per hour; NR = Not Recorded.

4.2.1 Vegetation Community and Land Cover Mapping

In 2003, the Vegetation Classification and Mapping Program of the CDFW, Wildlife and Habitat Data Analysis Branch, published the List of California Terrestrial Natural Communities Recognized by the CNDDB; the list was updated in 2011 (CDFG 2011). In September 2010, CDFW published the Natural Communities List (CDFG 2010), which used the scientific name of the dominant species in that alliance as the alliance name, and that was based on the Manual of California Vegetation, Second Edition (Sawyer et al. 2009). These classification systems focused on a quantified, hierarchical approach that included both botanical (plant species) and physiognomic (community structure and form) factors as currently observed (as opposed to predicting climax or successional stages). After Dudek conducted field work for vegetation mapping in 2017, CDFW updated the Natural Communities List in its California Natural Communities List (CDFW 2019a), which incorporated changes based on taxonomic revisions related to dominant plants, reassignment of associations to new or different alliances, and revisions to the rarities rankings of some communities. Therefore, nomenclature for on-site vegetation communities reflects the most current system, found in the Manual of California Vegetation and the updated Natural Communities list (CDFW 2019a). All vegetation communities were mapped based on these sources.

Vegetation mapping was conducted within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA in May 2017, in conjunction with the initial focused botanical and special-status plant species survey, and updated in February 2020. The Off-Site Water Tank Area BSA vegetation mapping was conducted in February 2020, as shown in Table 1. All mapping was performed in the field, through interpretation of field maps with a high quality aerial photographic base and/or delineation using a Trimble Geo XT GPS unit capable of submeter accuracy for all sensitive vegetation. Additionally, ESRI Collector was used for vegetation mapping. The maximum scale of the field map was 200-scale (1-inch = 200-foot) base. The GPS data was downloaded into geographic information system (GIS) ArcView for placement onto an aerial figure. In combination with the GPS data, GIS technicians digitized the delineated vegetation boundaries from field maps using ArcView to create the vegetation community map.

4.2.2 Flora

All plant species encountered during the field surveys were identified to subspecies or variety, if possible. Species that could not be identified in the field were brought into the laboratory for further investigation. Scientific and common names for plant species with a California Rare Plant Rank (CRPR; formerly CNPS List) follow the CNPS On-Line Inventory of Rare, Threatened, and Endangered Plants of California (CNPS 2020b). For plant species without a CRPR, scientific names follow the Jepson Interchange List of Currently Accepted Names of Native and Naturalized Plants of California (Jepson Flora Project 2020) and common names follow the California Natural Community List (CDFW 2019a) or the U.S. Department of Agriculture, Natural Resources Conservation Service State Plants Checklist (USDA 2020).

4.2.3 Fauna

Biologists recorded all wildlife species detected during field surveys by sight, calls, tracks, scat, or other signs. Scientific and common names for vertebrate species referred to in this report follow Crother (2017) for amphibians and reptiles, American Ornithological Society (AOS 2018) for birds, and Wilson and Reeder (2005) for mammals.

4.2.4 Special-Status and/or Regulated Resources

Special-status biological resources are those defined as follows: (1) species that have been given special recognition by federal, state, or local resource agencies and environmental organizations due to limited, declining, or threatened population sizes; (2) species and habitat types recognized by local and regional resource agencies as special-status; (3) habitat areas or vegetation communities that are unique, are of relatively limited distribution, or are of particular value to wildlife; (4) wildlife corridors and habitat linkages; and (5) USACE jurisdictional waters of the United States (including wetlands), CDFW jurisdictional streams, and waters of the state subject to the permitting authority of the RWQCB.

In addition to state, federal, and Los Angeles County special-status designations, the CNPS (2017) assigns a CRPR to designate the degree of concern for and rarity of plant taxa in California. Special-status plants are assigned to one of six CRPR categories.

CRPR 1A: Plants presumed extirpated in California and either rare or extinct elsewhere

CRPR 1B: Plants rare, threatened, or endangered in California and elsewhere

CRPR 2A: Plants extirpated in California, but common elsewhere

CRPR 2B: Plants rare, threatened, or endangered in California, but more common elsewhere

CRPR 3: Plants about which more information is needed – A Review List

CRPR 4: Plants of limited distribution – A Watch List

In addition to the CRPR, CNPS assigns threat categories to the lists as follows:

> 0.1—Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat) (e.g., 1B.1 would be a plant rare, threatened, or endangered in California and elsewhere and more than 80% of the occurrences threatened or with a high degree of threat).
>
> 0.2—Moderately threatened in California (20% to 80% of occurrences threatened/moderate degree and immediacy of threat)
>
> 0.3—Not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

The CNPS rarely assigns a threat category of 0.1 to CRPR 4 plants because they generally have large enough populations to not be significantly threatened in California.

4.2.4.1 Oak Woodlands

The complete Oak Woodland Report for the Sterling Ranch Estates Project is included in Appendix A. Below is a summary of the methods.

4.2.4.1.1 Oak Woodland Assessment Methodology

A field survey to assess and record the condition of the oak woodlands was conducted over several days between February 12, 2020, and July 8, 2020, by Dudek International Society of Arboriculture (ISA) Certified Arborist Ryan Allen and Dudek Biologists Heather Moine, Andrea Dransfield, Mackenzie Forgey, and Tracy Park. Information collected during the survey (Dudek 2020) and discussed includes the following:

- The condition of the oak woodlands, including oak species present, age classes of oaks present, understory vegetation, and surrounding vegetation communities
- The presence and/or potential occurrence of special-status species
- Potential project impacts to the surveyed woodlands

Dudek mapped tree locations for all woodlands located on the Project site (Appendix A, Figure 3, Tree Locations). Tree mapping was conducted using a Trimble Pathfinder Pro XH GPS receiver with H-Star Technology. Since tree canopies can sometimes cause loss of satellite lock by blocking the line-of-sight to satellites, an electronic compass and reflectorless, electronic distance-measuring device were also used in mapping tree locations. The reflectorless, electronic distance-measuring device/compass combination operates in concert with the Pathfinder system to position offsets, and offset information is automatically attached to the GPS position data string. The electronic tree locations were then evaluated using ArcView 10.4 software to determine the position of the trees related to the Project development footprint.

Tree trunk diameters were measured using a diameter tape providing adjusted figures[1] for diameter measurements when wrapping the tape around an object's circumference. Diameter measurements were taken using protocols provided by the Council of Tree and Landscape Appraisers in the Guide for Plant Appraisal (ISA 2020). The trunk diameter measurement of each tree was taken at 4.5 feet above the ground along the trunk axis, with common

[1] Inches divided by 3.14 (π) provide diameter measurement in inches.

exceptions. For example, in cases where a tree's trunk was located on a slope, the 4.5-foot distance was approximated as the average of the shortest and longest sides of the trunk (i.e., the uphill side and downhill side of a tree's trunk, respectively), and the measurement was made at this point. Tree height was visually estimated by experienced tree surveyors.

Tree canopy diameters were typically estimated by "pacing off" the measurement based on the investigator's knowledge of their stride length or by visually estimating the canopy width. The crown diameter measurements were made along an imaginary line intersecting the tree trunk that best approximated the average canopy diameter.

4.2.4.1.2 Oak Woodlands Mapping Methodology

According to the Oak Woodlands Conservation Management Plan, in addition to assessing the oak woodland condition, an accurate estimation of the woodland area is needed to evaluate oak woodlands. The Oak Woodlands Conservation Management Plan Guide requires that a map depicting the proximity of project development to the on-site oak woodlands' SOI be used to determine impacts resulting from the proposed project (Appendix A, Figure 4, Vegetation Communities and Land Cover Types. The Oak Woodlands Conservation Management Plan defines the SOI as the total area of the subject canopy multiplied by 10 (or 3.2 times the radius). The Oak Woodland Report provides survey results for the oak woodlands with SOIs within 200 feet of the limits of Project disturbance activities.

4.2.4.2 Focused Surveys for Special-Status Plant Species

Prior to field surveys, Dudek reviewed the report of a previous special-status plant survey, Rare Plant Species Surveys for the Sterling Residential Site completed by FLx (2014). The FLx report included a detailed inventory of the plant species present within the Project site and detailed the identification of two special-status plant species within the Project site: slender mariposa lily (*Calochortus clavatus* var. *gracilis*) and Peirson's morning glory (*Calystegia peirsonii*), as well as location information for slender mariposa lily. FLx (2014) identified no other special special-status plant species.

Based on the literature review, Dudek identified special-status plant species that had occurred, or that could occur, within or in the vicinity of the Project site. Dudek biologists familiar with the target special-status plant species and general flora of the northern Los Angeles County and Santa Clarita Valley regions conducted seasonally timed focused surveys of the Tract Map Site BSA, Off-Site Roadway Improvement Area BSA, and Off-Site Open Space Area BSA in May and July 2017. Additionally, in May 2020 Dudek biologists familiar with the target special-status plant species and general flora of the northern Los Angeles County and Santa Clarita Valley regions conducted seasonally timed focused surveys of the Tract Map Site BSA, Off-Site Roadway Improvement Area BSA, Off-Site Water Tank Area BSA, Off-Site Water Line Improvement Area BSA, and Off-Site Sewer Line Improvement Area BSA.

The focused botanical surveys were conducted in accordance with the Cypher, CDFW, and CNPS guidelines (Cypher 2002; CDFW 2018b; CNPS 2001). These surveys involved pedestrian transects spaced approximately 20 to 30 meters (66 to 98 feet) apart, depending on topography and vegetative cover. During the surveys, when a special-status plant species was observed, the occurrence was mapped using sub-meter accuracy GPS equipment.

4.2.4.3 Oak Trees

Dudek performed two separate oak tree inventories and evaluations for oak trees within the Project site; as such, the reports are discussed separately.

4.2.4.3.1 Tract Map Site, Off-Site Open Space Area, and Off-Site Roadway Improvement Area Oak Trees

The complete Oak Tree Report for the Sterling Ranch Estates Project, which includes the Tract Map Site, Off-Site Open Space Area, and Off-Site Roadway Improvement Area, is included in Appendix B. Below is a summary of the methods.

Dudek conducted an individual tree evaluation documenting the locations for all oak trees within the Tract Map Site BSA, Off-Site Open Space Area BSA, and Off-Site Roadway Improvement Area BSA. All inventoried and assessed protected trees were tagged with an aluminum tag bearing a unique identification number, which was placed on the trunk of each tree. The trunk diameter, canopy diameter, crown diameter, and composite trunk diameters were recorded. Tree health and structure was evaluated with respect to five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Tree impacts were determined by conducting a spatial analysis of individual tree locations and canopy extents visible in Project aerial imagery in relation to the proposed site development plan. Additionally, as allowed under Municipal Code Section 22.56.2140, Dudek ISA-certified arborists calculated the appraised value for each inventoried protected tree identified for removal according to the Guide for Plant Appraisal (ISA 2020).

4.2.4.3.2 Off-Site Water Tank Area Oak Trees

The complete Oak Tree Report for the Sterling Ranch Estates Project, Off-Site Water Tank Area is included in Appendix C. Below is a summary of the methods.

Dudek conducted an individual tree evaluation documenting the locations for all oak trees within the Off-Site Water Tank Area BSA. All inventoried and assessed protected trees were tagged with an aluminum tag bearing a unique identification number, which was placed on the trunk of each tree. The trunk diameter, canopy diameter, crown diameter, and composite trunk diameters were recorded. Tree health and structure was evaluated with respect to five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Tree impacts were determined by conducting a spatial analysis of individual tree locations and canopy extents visible in Project aerial imagery in relation to the proposed site development plan. Additionally, as allowed under Municipal Code Section 22.56.2140, Dudek ISA-certified arborists calculated the appraised value for each inventoried protected tree identified for removal according to the Guide for Plant Appraisal (ISA 2020).

4.2.4.4 Burrowing Owl Habitat Assessment and Breeding Season Survey

Qualified Dudek wildlife biologists conducted a habitat assessment for burrowing owls within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA in May 2017 in conjunction with the initial focused botanical and special-status plant species survey, as shown in Table 1. The habitat assessment was conducted following the guidelines in Appendix C of the Staff Report on Burrowing Owl Mitigation (CDFG 2012). Based on the results of the habitat assessment, focused breeding season surveys were conducted in 2018 following the protocol in Appendix D of the Staff Report on Burrowing Owl Mitigation (CDFG 2012). The Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA included the entirety of the BSAs; however, due to access limitations, the adjacent properties were not included in the surveys. Surveys focused on those areas considered as suitable habitat, which typically includes short or sparse vegetation; presence of burrows, burrow surrogates, or fossorial mammal dens; well-drained soils; and abundant and available prey.

Qualified Dudek wildlife biologists conducted a habitat assessment for burrowing owls within the Off-Site Water Tank Area BSA in February 2020 in conjunction with vegetation mapping, as shown in Table 1. The habitat assessment was conducted following the guidelines in Appendix C of the Staff Report on Burrowing Owl Mitigation (CDFG 2012). No additional burrowing owl surveys were conducted for the Off-Site Water Tank Area BSA due to the results of the habitat assessment.

4.2.4.5 Coastal California Gnatcatcher Protocol Survey

Qualified Dudek wildlife biologists conducted a habitat assessment for coastal California gnatcatcher within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA in May 2017 in conjunction with the initial focused botanical and special-status plant species survey, as shown in Table 1. Based on the results of the habitat assessment, focused breeding season surveys were conducted in 2018 following the currently accepted protocol of the USFWS Coastal California Gnatcatcher (*Polioptila californica californica*) Presence/Absence Survey Protocol (USFWS 1997). The focused surveys for gnatcatcher were conducted between March 29 and June 22, 2018, by Dudek Biologist Melissa Blundell (TE-97717A) and between April 30 and June 30, 2020, by Dudek Biologists Melissa Blundell (TE-97717A), Tommy Molioo (TE-02412D), and Jeffrey Priest (TE-840619). The surveys included six survey passes at a minimum of 7-day intervals. Full survey methodology is included in the 2018 and 2020 reports prepared and submitted to the USFWS documenting the results of the protocol-level surveys, which are included herein as Appendix D and Appendix E, respectively.

4.2.4.6 Wetland Delineation and Jurisdictional Determination

Dudek reviewed hydrologic features that would likely be subject to the jurisdiction of the USACE, RWQCB, and CDFW within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA. The effort included a formal wetland delineation in October 2016 and follow-up delineation field assessments in January 2017 to define and characterize the jurisdictional waters present within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA. The hydrologic features delineated on site are potentially regulated by the USACE acting under CWA Section 404, the RWQCB acting under CWA Section 401 and the Porter-Cologne Act, and the CDFW acting under California Fish and Game Code Sections 1600–1607. The hydrophytic vegetation, hydric soils, and hydrology indicators detailed below provide the basis for the determination of potential waters of the United States and state subject to the jurisdiction of the USACE, RWQCB, and CDFW.

The Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA wetland delineation was conducted in accordance with the procedures of the Corps of Engineers Wetlands Delineation Manual (USACE 1987), the Department of the Army Clarification and Interpretation of the 1987 USACE Wetland Delineation Manual (DOA 1992), and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2*)* (USACE 2008a). Wetland vegetation, if present, would be classified by Cowardin et al. (1979) and Sawyer et al. (2009). Wetland areas under the jurisdiction of the USACE are defined by the presence of hydric soils, hydrophytic vegetation, and wetland hydrology. Non-wetland waters of the United States, potentially under USACE jurisdiction, are defined by the presence of an OHWM. Identification of the OHWM followed the A Field Guide to the Identification of the Ordinary High Water Mark (OHWM) in the Arid West Region of the Western United States (USACE 2008b), where present. In addition to water of the United States, riparian vegetation associated with a stream channel (above the OWHM) and the portion of channels/streams above the OHWM up to the top of bank is regulated by CDFW and RWQCB. Also, per a site visit with CDFW, swales, which do not support an OHWM, are regulated by CDFW.

In February 2020, Dudek biologists assessed the Off-Site Water Tank Area BSA for potential jurisdictional resources. This assessment included surveying the site for hydrophytic vegetation, hydric soils, hydrology, and OHWM indicators. Based upon the existing conditions, a formal wetland delineation was not performed.

4.2.4.6.1 Hydrophytic Vegetation

Seasonal changes in species composition, land-use practices, and other natural disturbances can adversely affect the process for wetlands vegetation determination. In normal situations, a sample point is considered positive for hydrophytic vegetation if it passes the basic dominance test (Indicator 1), meaning that more than 50% of the dominant species sampled were characterized as either obligate, facultative wetland, and/or facultative per the Arid West 2016 Regional Wetland Plant List (Lichvar et al. 2016). At each seasonal feature sample point, absolute cover and dominance of each observed plant species was recorded. A description of the hydrophytic vegetation categories is provided in Table 2.

Table 2. Hydrophytic Vegetation Indicator Categories

Indicator Status	Definition
OBL (Obligate Wetland Plants)	Almost always occur in wetlands. With few exceptions, these plants (herbaceous or woody) are found in standing water or seasonally saturated soils (14 or more consecutive days) near the surface.
FACW (Facultative Wetland Plants)	Usually occur in wetlands but may occur in non-wetlands. These plants predominately occur with hydric soils, often in geomorphic settings where water saturates the soils or floods the soil surface at least seasonally.
FAC (Facultative Plants)	Occur in wetlands and non-wetlands. These plants can grow in hydric, mesic, or xeric habitats. The occurrence of these plants in different habitats represents responses to a variety of environmental variables other than just hydrology, such as shade tolerance, soil pH, and elevation, and they have a wide tolerance of soil moisture conditions.
FACU (Facultative Upland Plants)	Usually occur in non-wetlands but may occur in wetlands. These plants predominately occur on drier or more mesic sites in geomorphic settings where water rarely saturates the soils or floods the soil surface seasonally.
UPL (Upland Plants)	Almost never occur in wetlands. These plants occupy mesic to xeric non-wetland habitats. They almost never occur in standing water or saturated soils. Typical growth forms include herbaceous, shrubs, woody vines, and trees.
NI (No Indicator)*	Not included on list of hydrophytic vegetation, does not occur in wetlands in the region specified.

Source: Lichvar et al. 2012.
Note:
* Not included in Lichvar et al. 2012

4.2.4.6.2 Hydric Soils

The presence of hydric soils was determined in accordance with the Corps of Engineers Wetlands Delineation Manual (USACE 1987) and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (USACE 2008a). During the wetland delineation field assessment, the Field Indicators of Hydric Soils in the United States version 8.1 (USDA 2017) was used as a guide for determining the presence or absence of hydric soil indicators at each of the sample points. According to the National Technical Committee for Hydric Soils, hydric soils are "soils that are formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part" (59 CFR Sections 35680–35681).

Where feasible, soil pits were excavated to depths of approximately 18 to 20 inches. When soils were not naturally moist, per the Field Indicators of Hydric Soils in the United States version 8.1 (USDA 2017), delineators moistened the samples to assess the soil color under optimal conditions. Munsell Soil-Color Charts were used to determine soil chroma and value (Munsell 2009). Excavated soils were examined for evidence of hydric conditions, including low chroma values and redoximorphic features, vertical streaking, sulfidic odor, gleyed soils, and high organic matter content in the upper horizon. Soils from test pits were determined to be hydric if found to support positive indicators defined in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (USACE 2008a) and the Field Indicators of Hydric Soils in the United States version 8.1 (USDA 2017). Additionally, evidence of previous ponding or flooding was assessed along with the slope, local topography, existing landform characteristics, and soil material/composition, in order to determine if hydric soils were present.

4.2.4.6.3 Hydrology

Per the guidelines prescribed in the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0) (USACE 2008a), wetland hydrology indicators are separated into four major groups: A, B, C, and D. Group A indicators are based on direct observations of surface flow, ponding, and soil saturation/groundwater. Group B indicators consist of evidence that the site has been or is currently subjected to ponding including, but not limited to, water marks, drift deposits, aquatic invertebrates, and sediment deposits. Group C indicators include signs of previous and/or current saturation including oxidized rhizospheres surrounding living roots and the presence of reduced iron or sulfur, both of which are indicative of extended periods of soil saturation. Group D indicators consist of "vegetation and soil features that are indicative of current rather than historic wet conditions and include a shallow aquitard and results of the FAC-Neutral test." Each group is subdivided into primary and secondary categories based on their frequency and probability to occur in the Arid West region.

4.2.5 Survey Limitations

The 2017 focused botanical survey was completed in the spring and summer following an above-average rain year (NOAA 2020). The 2020 focused botanical survey was completed in the spring and summer following an average rain year (NOAA 2020). The surveys were conducted during the known blooming period for target species and were timed to coincide with peak blooming based on regional conditions. Focused wildlife surveys completed in 2018 and 2020 were conducted during daylight hours under weather conditions that allowed for quality biological observations (e.g., surveys were not conducted during rain). Because surveys were conducted during the day, the likelihood of detecting nocturnal and crepuscular species, such as many mammal species, was relatively low. Negative results for species that were not the subject of focused surveys should not be interpreted as indicating those species are absent.

The Oak Woodland Report is provided in Appendix A. The report includes an introduction, regulatory setting, methods, results, impacts, required mitigation, and conclusion. Oak woodland survey information has not fully been included in this report, and therefore the Oak Woodland Report should be referenced for information regarding the oak woodlands.

Oak tree surveys were performed for the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA and the Off-Site Water Tank Area BSA. The Tract Map Site BSA, Off-Site Roadway Improvement Area BSA, and Off-Site Open Space Area BSA oak tree survey results are included in the Oak Tree Report for the Sterling Ranch Estates Project, provided in Appendix B. The Off-Site Water Tank Area BSA oak tree survey results are included in the Oak Tree Report for the Sterling Ranch Estates Residential Project, Off-Site Water Tank Area, provided in Appendix C. Each report includes an introduction, methods, observations, regulatory definitions and requirements, impacts, mitigation, tree protection measures, and conclusion. Oak trees survey information has not fully been included in this report; therefore, the two oak tree reports should be referenced for information regarding oak trees.

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5 Results

This section discusses results of the literature review and focused surveys conducted by Dudek biologists in 2016, 2017, 2018, and 2020, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys. The Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA boundary for each focused survey is shown on Figure 2A, the Off-Site Water Tank Area BSA boundary is shown on Figure 2B, and the Off-Site Water Line Improvement Area BSA and Off-Site Sewer Line Improvement Area BSA are shown on Figure 2C. Cumulative lists of plant species and wildlife species are included in Appendix F and Appendix G, respectively. Photo documentation collected during the field surveys is provided in Appendix H.

5.1 Vegetation Communities and Land Cover Types

This section describes the vegetation communities and wildlife habitats identified in the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank BSA as shown on Figure 3A and Figure 3B, respectively. The Off-Site Water Line Improvement Area BSA and Off-Site Sewer Line Improvement Area BSA are shown in Figure 3C. A total of 18 vegetation communities, identified in A Manual of California Vegetation, Second Edition (Sawyer et al. 2009), and Natural Communities List (CDFW 2019a), were mapped during field surveys. Two land cover types characterized as disturbed habitat and urban/developed were also mapped in association with built area and anthropogenic influence. These vegetation communities and land cover types are described below. Vegetation communities encompassed by these physiognomic and physical location types are summarized in Table 3 and described further below.

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Table 3. Existing Vegetation Communities and Land Cover Types in the Project Site

	State Rank/ County Status	Tract Map Site (Acres)	Off-Site Roadway Improvement Area (Acres)	Off-Site Open Space Area (Acres)	Off-Site Water Tank Area (Acres)	Off-Site Water Line Improvement Area (Acres)	Off-Site Sewer Line Improvement Area (Acres)	Grand Total (Acres)[a]
Woodland								
Coast live oak woodland (*Quercus agrifolia*) Alliance	S4/ Sensitive	–	–	–	0.3[b]	–	–	0.3
Schinus molle Association – *Ailanthus altissima Semi-natural Association – Eucalyptus* (*globulus, camaldulensis*) Provisional Semi-natural Association	SNA/None	0.5	–	–	0.0[c]	–	–	0.5
Woodland Total	**–**	**0.5**	**–**	**–**	**0.3**	**–**	**–**	**0.8**
Riparian								
Arroyo willow thickets (*Salix lasiolepis*) Alliance	S4/None	0.1	–	–	–	–	–	0.1
Mulefat thickets (*Baccharis salicifolia*) Alliance	S4/None	0.1	–	–	–	–	–	0.1
Rhus trilobata Association	S3/None	0.9	–	–	–	–	–	0.9
Riparian Total	**–**	**1.0**	**–**	**–**	**–**	**–**	**–**	**1.0**
Chaparral								
Chamise – black sage chaparral (*Adenostoma fasciculatum – Salvia mellifera*) Alliance	S4/None	–	–	–	0.7	–	–	0.7
Chaparral Total	**–**	**–**	**–**	**–**	**0.7**	**–**	**–**	**0.7**
Scrub								
Black sage scrub (*Salvia mellifera*) Alliance	S4/None	–	–	–	0.3	–	–	0.3
Bush mallow scrub (*Malacothamnus fasciculatus – Malacothamnus* spp.) Alliance	S4/None	–	–	–	0.0[d]	–	–	0.0[d]

Table 3. Existing Vegetation Communities and Land Cover Types in the Project Site

	State Rank/ County Status	Tract Map Site (Acres)	Off-Site Roadway Improvement Area (Acres)	Off-Site Open Space Area (Acres)	Off-Site Water Tank Area (Acres)	Off-Site Water Line Improvement Area (Acres)	Off-Site Sewer Line Improvement Area (Acres)	Grand Total (Acres)[a]
California buckwheat scrub (*Eriogonum fasciculatum*) Alliance	S5/None	0.3	0.3	—	—	—	—	0.6
California sagebrush – black sage scrub (*Artemisia californica – Salvia mellifera*) Alliance	S4/None	—	—	—	0.5	—	—	0.5
California sagebrush – California buckwheat scrub (*Artemisia californica – Eriogonum fasciculatum*) Alliance	S4/None	24.8	2.3	5.7	0.2	—	—	33.1
California sagebrush scrub (*Artemisia californica*) Alliance	S5/None	5.4	—	23.9	0.6	—	—	29.8
Coyote brush scrub (*Baccharis pilularis*) Alliance	S5/None	—	0.1	—	—	—	—	0.1
Palmer's goldenbush scrub (*Ericameria palmeri*) Provisional Alliance	S3?/None	6.7	—	1.4	—	—	—	8.2
Purple sage scrub (*Salvia leucophylla*) Alliance	S4/None	5.5	0.0[e]	2.3	—	—	—	7.8
Scrub Total	**—**	**42.6**	**2.8**	**33.3**	**1.7**	**—**	**—**	**80.4**
Grass and Herb Dominated								
Brassica nigra – Bromus diandrus Semi-natural Association	SNA/None	12.4	—	—	—	—	—	12.4
Bromus diandrus Semi-natural Association	SNA/None	7.3	—	—	—	—	—	7.3
Wild oats and annual brome grasslands (*Avena* spp. – *Bromus* spp.) Semi-Natural Alliance	SNA/None	39.8	2.9	2.0	0.1	—	0.0[f]	44.8
Grass and Herb Dominated Total	**—**	**59.5**	**2.9**	**2.0**	**0.1**	**—**	**0.0[f]**	**64.6**

Table 3. Existing Vegetation Communities and Land Cover Types in the Project Site

	State Rank/ County Status	Tract Map Site (Acres)	Off-Site Roadway Improvement Area (Acres)	Off-Site Open Space Area (Acres)	Off-Site Water Tank Area (Acres)	Off-Site Water Line Improvement Area (Acres)	Off-Site Sewer Line Improvement Area (Acres)	Grand Total (Acres)[a]
Disturbed and Developed								
Disturbed Habitat	NA/None	5.1	0.0[g]	2.3	—	0.3	0.0[h]	7.8
Urban/Developed	NA/None	5.6	0.8	0.2	—	2.0	0.7	9.5
Disturbed and Developed Total	—	**10.7**	**0.9**	**2.6**	—	**2.4**	**0.7**	**17.3**
Grand Total	—	**114.3**	**6.6**	**37.9**	**2.8**	**2.4**	**0.8**	**164.8**

Notes:
SNA = Semi-Natural Alliance and Semi-Natural Association.
For alliances with state ranks of S1-S3, all associations within them are considered highly imperiled, Sensitive. A question mark (?) denotes an inexact numeric rank due to insufficient samples over the full expected range of the type, but existing information points to this rank (CDFW 2019a).
Coast live oak woodland designated as sensitive by the Los Angeles County Oak Woodlands Conservation Management Plan (County of Los Angeles 2011).

[a] Some totals may appear to be off due to rounding.
[b] A total of 0.03 acres of oak woodlands were mapped at the Water Tank Area according to A Manual of California Vegetation, Second Edition (Sawyer et a. 2009); however, in accordance with Los Angeles County Oak Woodlands Conservation Management Plan Guide (Los Angeles County 2014) there are a total of 0.65 acres of oak woodlands of which there are 0.61 acres of significant impacts to oak woodlands within OW2 and OW3.
[c] The Off-Site Water Tank Area contains 0.03 acres of Schinus molle Association – Ailanthus altissima Semi-natural Association – Eucalyptus (globulus, camaldulensis) Provisional Semi-natural Association.
[d] The Off-Site Water Tank Area contains 0.05 acres of bush mallow scrub (*Malacothamnus fasciculatus – Malacothamnus* spp.) Alliance.
[e] The Off-Site Roadway Improvement Area contains 0.04 acres of Purple sage scrub (*Salvia leucophylla*) Alliance.
[f] The Off-Site Sewer Line Improvement Area contains 0.006 acres of wild oats and annual brome grasslands (*Avena* spp. – *Bromus* spp.) Semi-Natural Alliance
[g] The Off-Site Roadway Improvement Area contains 0.04 acres of Urban/Developed.
[h] The Off-Site Sewer Line Improvement Area contains 0.00003 acres of Disturbed Habitat

5.1.1 Natural Vegetated Communities

5.1.1.1 Woodlands

5.1.1.1.1 Coast Live Oak Woodland (*Quercus agrifolia*) Alliance

The coast live oak woodland alliance vegetation community is characterized by coast live oak (*Quercus agrifolia*) being the dominant or co-dominant tree in the canopy. This alliance has an open to continuous canopy less than 30 meters (98 feet) in height, with a sparse to intermittent shrub canopy and a sparse or grassy ground layer. Coast live oak woodlands occur on alluvial terraces, canyon bottoms, stream banks, slopes, and flats. Soils are deep, sandy, or loamy with high organic matter (Sawyer et al. 2009).

Coast live oak woodlands occur in four patches within the Off-Site Water Tank Area BSA, as shown on Figure 3B. Coast live oak is the only tree species present within the vegetation community; however, a variety of herbaceous species are present. In accordance with a Manual of California Vegetation, Second Edition (Sawyer et al. 2009), mapping standards, coast live oak woodlands comprise 0.3 acres of the Off-Site Water Tank Area BSA. However, oak woodlands are defined and mapped in accordance with Los Angeles County Oak Woodlands Conservation Management Plan (County of Los Angeles 2011), and as such, the following paragraph provides how the oak woodlands are mapped and defined when compared to using Manual of California Vegetation, Second Edition (Sawyer et a. 2009).

The coast live oak woodland alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). The Los Angeles County Oak Woodlands Conservation Management Plan (County of Los Angeles 2011) designates coast live oak woodlands as a sensitive vegetation community. In accordance with the Los Angeles County Oak Woodlands Conservation Management Plan (County of Los Angeles 2011), oak woodlands are mapped differently than mapped using Manual of California Vegetation, Second Edition (Sawyer et al. 2009), resulting in 0.65 acres of oak woodlands, of which there are 0.61 acres of significant impacts to oak woodlands within OW2 and OW3. The Oak Woodland Report has been prepared and is provided in Appendix A, and results are further described in Section 5.4.1.1.

5.1.1.1.2 *Ailanthus altissima - Eucalyptus* (*globulus, camaldulensis*) - *Schinus molle* Semi-Natural Association

The *Ailanthus altissima – Eucalyptus* (*globulus*, *camaldulensis*) – *Schinus molle* semi-natural association is a combined association made up of the individual tree alliances. *Ailanthus altissima* is the tree of heaven semi-natural alliance characterized by tree of heaven (*Ailanthus altissima*) being the dominant tree in the canopy less than 60 meters (197 feet) in height with an open to continuous canopy. *Eucalyptus* (*globulus*, *camaldulensis*) is the eucalyptus semi-natural alliance characterized by *Eucalyptus* spp. being the dominant tree in the canopy less than 60 meters (197 feet) in height with an open to continuous canopy. *Schinus molle* is the pepper tree semi-natural alliance characterized by pepper tree (*Schinus molle*) being the dominant tree in the canopy less than 18 meters (59 feet) in height with an open to continuous canopy (Sawyer et al. 2009).

The *Ailanthus altissima – Eucalyptus* (*globulus*, *camaldulensis*) – *Schinus molle* semi-natural association occurs in three patches within the Tract Map Site BSA and one patch within the northwest portion of the Off-Site Water Tank Area BSA, as shown on Figure 3A and Figure 3B, respectively. Tree of heaven, eucalyptus, and pepper tree are the only tree species present within the vegetation community; however, a variety of herbaceous species are present.

Ailanthus altissima – Eucalyptus (*globulus*, *camaldulensis*) – *Schinus molle* comprises 0.5 acres of the Tract Map Site BSA and 0.0 acres (rounded from 0.03 acres) of the Off-Site Water Tank Area BSA.

Ailanthus altissima – Eucalyptus (*globulus*, *camaldulensis*) – *Schinus molle* are non-native and are not ranked as sensitive by CDFW (2019a). Los Angeles County does not designate *Ailanthus altissima – Eucalyptus* (*globulus*, *camaldulensis*) – *Schinus molle* as a sensitive vegetation community.

5.1.1.2 Riparian

5.1.1.2.1 Arroyo Willow Thickets (*Salix lasiolepis*) Alliance

The arroyo willow thickets alliance includes arroyo willow (*Salix lasiolepis*) as the dominant or co-dominant species in the tall shrub or low tree canopy (Sawyer et al. 2009). Arroyo willow thickets have an open to continuous canopy less than 10 meters (33 feet) in height with an open to continuous shrub layer with a variable herbaceous layer. Arroyo willow thickets occur on stream banks and benches, slope seeps, and stringers along drainages (Sawyer et al. 2009). Arroyo willow thickets occur in one patch in the northern portion of the Tract Map Site BSA, as shown on Figure 3A. Arroyo willow thickets comprise 0.1 acres of the Tract Map Site BSA.

The arroyo willow thickets alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate arroyo willow thickets as a sensitive vegetation community. This vegetation community is associated with an ephemeral channel and is mapped as a riparian plant community. As such, this community is under the jurisdiction of CDFW as a riparian habitat associated with a jurisdictional stream.

5.1.1.2.2 Mulefat Thickets (*Baccharis salicifolia*) Alliance

The mulefat thickets alliance includes mulefat (*Baccharis salicifolia*) as the dominant or co-dominant species in the shrub canopy. Mulefat thickets have a continuous shrub canopy less than 5 meters (16 feet) in height. The herbaceous layer is sparse. Mulefat thickets occur on both seasonally and intermittently flooded habitats, and these stands are inherently variable based on seasonal inundation and scouring (Sawyer et al. 2009).

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Biological Survey Area

Project Components

- Tract Map Site
- Off-Site Roadway Improvement Area
- Off-Site Sewer Line Improvement Area
- Off-Site Open Space Area
- Not a Part

Vegetation Communities and Land Cover Types

Grass and Herb Dominated

BN-BD = Brassica nigra - Bromus diandrus Semi-natural Association

BRDI = Bromus diandrus Semi-natural Association

WOABG = Wild oats and annual brome grasslands *(Avena spp. - Bromus spp.)* Semi-Natural Alliance

Riparian

AWT = Arroyo willow thickets *(Salix lasiolepis)* Alliance

MFT = Mulefat thickets *(Baccharis salicifolia)* Alliance

RT = Rhus trilobata Association

Scrub

CBS = California buckwheat scrub *(Eriogonum fasciculatum)* Alliance

CSB-CB = California sagebrush - California buckwheat scrub *(Artemisia californica - Eriogonum fasciculatum)* Alliance

CSS = California sagebrush scrub *(Artemisia californica)* Alliance

CYS = Coyote brush scrub *(Baccharis pilularis)* Alliance

PGBS = Palmer's goldenbush scrub *(Ericameria palmeri)* Provisional Alliance

PSS = Purple sage scrub *(Salvia leucophylla)* Alliance

Other

SCMO-AIA-EUC = Schinus molle Association - Ailanthus altissima Semi-natural Association - Eucalyptus *(globulus, camaldulensis)* Provisional Semi-natural Association

DEV = Urban/Developed

DH = Disturbed Habitat

Not a Part

(Mountains Recreation & Conservation Authority Conservation Easement)

SOURCE: Eagle Aerial Solutions 2018

0 255 510 Feet

FIGURE 3A

Track Map Site, Off-Site Roadway Improvement Area, and Off-Site Open Space Area Vegetation Communities and Land Cover Types

Biological Technical Report for the Sterling Ranch Estates Residential Project

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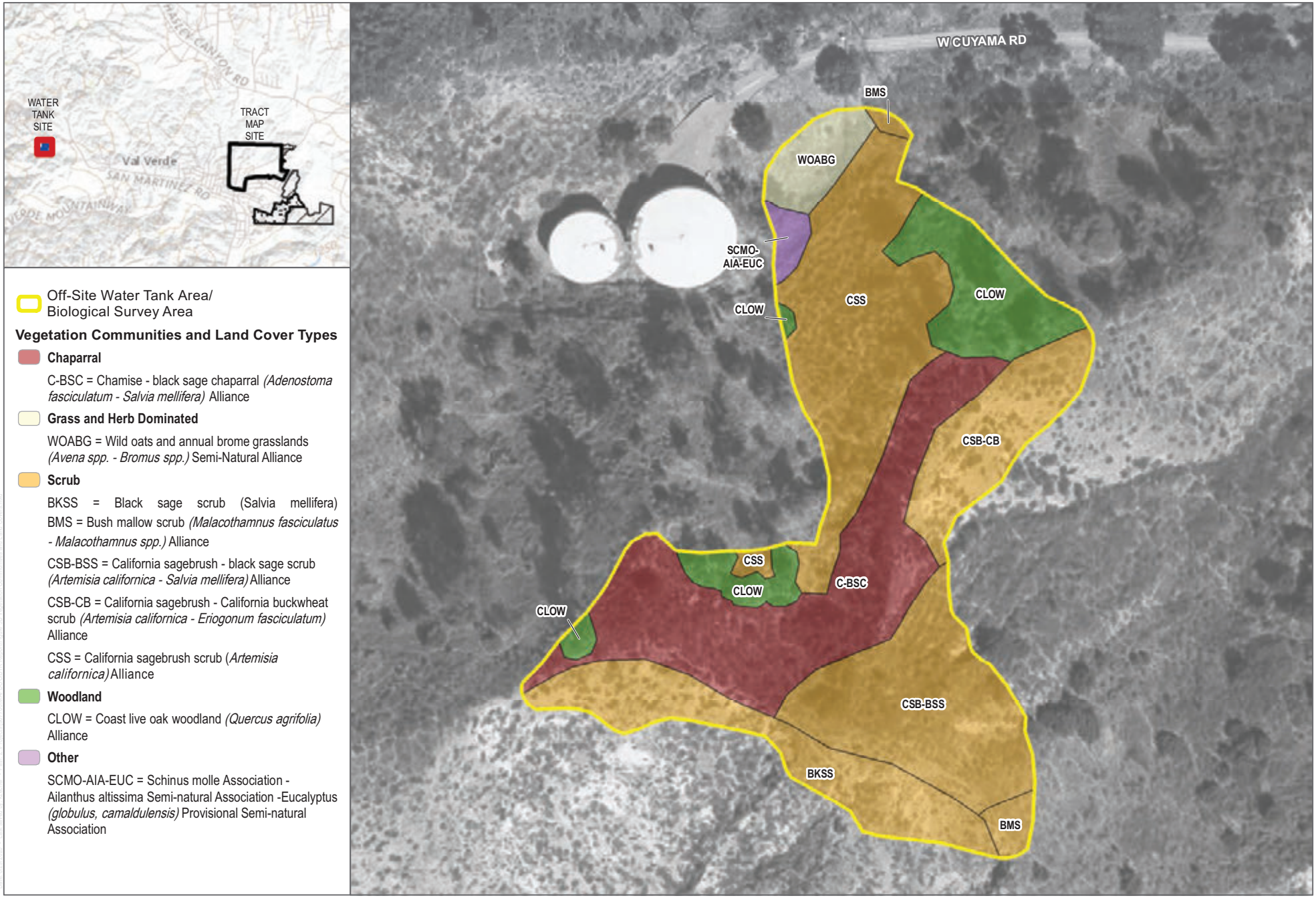

SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 50 100 Feet

FIGURE 3B

Off-Site Water Tank Area Vegetation Communities and Land Cover Types

Biological Technical Report for the Sterling Ranch Estates Residential Project

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Biological Survey Area

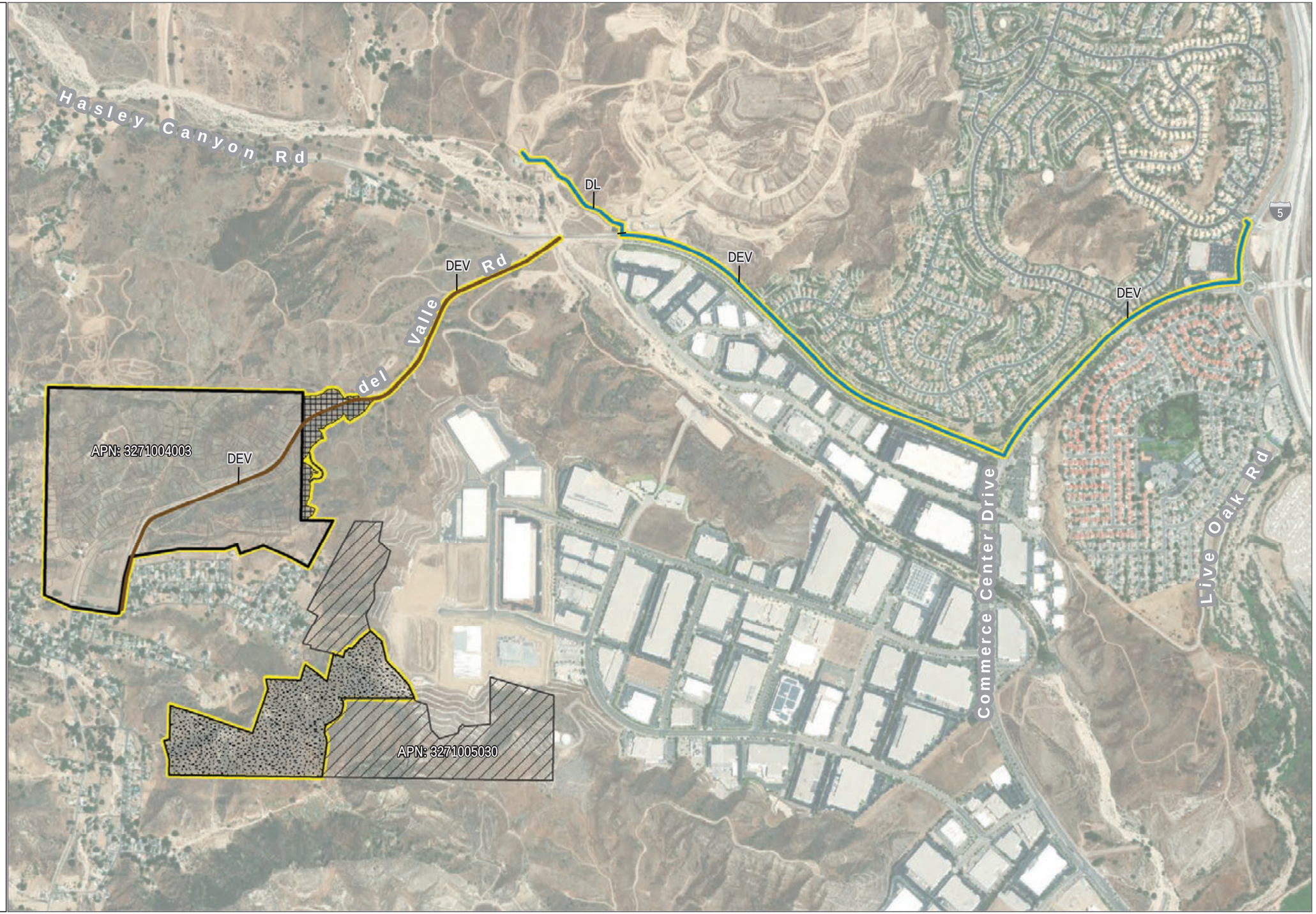
Project Components

- Tract Map Site
- Off-Site Roadway Improvement Area
- Off-Site Sewer Line Improvement Area
- Off-Site Water Line Improvement Area
- Off-Site Open Space Area
- Not a Part

Vegetation Communities and Land Cover Types

DEV = Urban/Developed

DH = Disturbed Habitat



SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 500 1,000 Feet

FIGURE 3C

Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area Vegetation Communities and Land Cover Types

Biological Technical Report for the Sterling Ranch Estates Residential Project

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Mulefat thickets occur in one patch immediately adjacent to the arroyo willow thickets vegetation community in the northern portion of the Tract Map Site BSA, as shown on Figure 3A. Mulefat is the only shrub species present within the vegetation community; however, a variety of herbaceous species are present, including tarragon (*Artemisia dracunculus*), shortpod mustard (*Hirschfeldia incana*), silverleaf phacelia (*Phacelia hastata* var. *hastata*), and California goosefoot (*Chenopodium californicum*). Mulefat thickets comprise 0.1 acres of the Tract Map Site BSA.

The mulefat thickets alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate mulefat thickets as a sensitive vegetation community. This vegetation community is associated with an ephemeral channel and is mapped as a riparian plant community. As such, this community is under the jurisdiction of CDFW as a riparian habitat associated with a jurisdictional stream.

5.1.1.2.3 *Rhus trilobata* Association

The *Rhus trilobata* association includes basket bush (*Rhus aromatica*; previously named *Rhus trilobata*) as the dominant species in the shrub canopy. Basket bush has an intermittent continuous shrub canopy less than 5 meters (16 feet) in height and the herbaceous layer is sparse to intermittent. Basket bush occurs on floodplains, stream banks, river terraces, washes, swales, shallow valleys, or upland topography (Sawyer et al. 2009).

Basket bush occurs in two patches, one of which is along the northern boundary of the Tract Map Site BSA and one immediately south of Del Valle Road, as shown on Figure 3A. Other species observed in the *Rhus trilobata* association include blue elderberry (*Sambucus nigra* ssp. *caerulea*) and poison oak (*Toxicodendron diversilobum*) in low cover. The *Rhus trilobata* association comprises 0.9 acres of the Tract Map Site BSA.

The *Rhus trilobata* association is ranked as S3 (NatureServe 2019). This ranking indicates that within California the association is considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate basket bush patches as a sensitive vegetation community. Although basket bush is not a hydrophyte and has a wetland indicator status of facultative upland (FACU), the basket bush patches are located on the slope of an ephemeral waterway south of Del Valle Road, and therefore are mapped as a riparian vegetation community. This community is under the jurisdiction of the CDFW as a riparian habitat associated with a jurisdictional stream. The basket bush patches along the northern boundary of the Tract Map Site BSA are not associated with aquatic features.

5.1.1.3 Chaparral

5.1.1.3.1 Chamise - Black Sage Chaparral (*Adenostoma fasciculatum - Salvia mellifera*) Alliance

The chamise – black sage chaparral (*Adenostoma fasciculatum – Salvia mellifera*) alliance includes chamise and black sage as the co-dominant species in the shrub canopy. The chamise – black sage chaparral alliance has a continuous to intermittent canopy less than 3 meters (10 feet) in height. The herbaceous layer is sparse. Chamise – black sage chaparral occurs on lower to upper slopes of all aspects; however, it occurs predominantly on south-facing slopes (Sawyer et al. 2009).

Chamise – black sage chaparral occurs in one area within the central portion of the Off-Site Water Tank Area BSA, as shown on Figure 3B. Other shrub species observed within the chamise – black sage chaparral vegetation community include California sagebrush (*Artemisia californica*) and California buckwheat (*Eriogonum fasciculatum*). Chamise – black sage chaparral comprises 0.7 acres of the Off-Site Water Tank Area BSA.

The chamise – black sage chaparral alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate chamise – black sage chaparral as a sensitive vegetation community.

5.1.1.4 Scrub

5.1.1.4.1 Black Sage Scrub (*Salvia mellifera*) Alliance

The black sage scrub (*Salvia mellifera*) alliance includes black sage (*Salvia mellifera*) as the dominant or co-dominant species in the shrub canopy. Black sage scrub has a continuous to intermittent shrub canopy less than 2 meters (7 feet) in height. The herbaceous layer is variable; grasses and herbs are seasonal. Black sage scrub occurs on dry slopes and alluvial fans (Sawyer et al. 2009).

Black sage scrub occurs in one patch within the southern portion of the Off-Site Water Tank Area BSA, as shown on Figure 3B. Other shrub species observed within black sage scrub include chamise, California sagebrush, and California buckwheat. Black sage scrub comprises 0.3 acres of the Off-Site Water Tank Area BSA.

The black sage scrub alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate black sage scrub as a sensitive vegetation community.

5.1.1.4.2 Bush Mallow Scrub (*Malacothamnus fasciculatus - Malacothamnus* spp.) Alliance

The bush mallow scrub (*Malacothamnus fasciculatus – Malacothamnus* spp.) alliance includes bush mallow (*Malacothamnus fasciculatus*) as the dominant or co-dominant species in the shrub canopy. Bush mallow scrub has an open to intermittent shrub canopy less than 3 meters (10 feet) in height. The herbaceous layer is usually sparse. Bush mallow occurs on gentle to very steep slopes of variable aspects (Sawyer et al. 2009).

Bush mallow scrub occurs in two patches in the Off-Site Water Tank Area BSA, as shown on Figure 3B. Other shrub species observed within bush mallow scrub include California sagebrush and California buckwheat. Bush mallow scrub comprises 0.0 acres (rounded from 0.05 acres) of the Off-Site Water Tank Area BSA.

The bush mallow scrub alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate bush mallow scrub as a sensitive vegetation community.

5.1.1.4.3 California buckwheat scrub (*Eriogonum fasciculatum*) Alliance

The California buckwheat scrub (*Eriogonum fasciculatum*) alliance includes California buckwheat as the dominant or co-dominant in the shrub canopy, comprising 50% of the relative cover in the shrub canopy. California buckwheat scrub has a continuous or intermittent canopy less than 2 meters (7 feet) in height, and the herbaceous layer is variable and may be grassy. This vegetation community is usually found on upland slopes, intermittently flooded arroyos, channels and washes, and rarely flooded low-gradient deposits (Sawyer et al. 2009).

California buckwheat scrub occurs within the northeastern portion of the Tract Map Site BSA and the northwestern portion of the Off-Site Road Improvement Area BSA on gentle to steep south-facing slopes, as shown on Figure 3A. Other species observed within California buckwheat scrub include sacapellote (*Acourtia microcephala*), California

aster (*Corethrogyne filaginifolia*), black sage, chaparral mallow (*Malacothamnus fasciculatus* var. *fasciculatus*), toyon (*Heteromeles arbutifolia*), redberry (*Rhamnus crocea*), and purple sage (*Salvia leucophylla*). California buckwheat scrub comprises 0.3 acres of the Tract Map Site BSA and 0.3 acres of the Off-Site Roadway Improvement Area BSA, for a total of 0.6 acres.

The California buckwheat scrub alliance is ranked as an S5 alliance (NatureServe 2019). This ranking indicates that within California the alliance is demonstrably secure to ineradicable and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate California buckwheat scrub as a sensitive vegetation community.

5.1.1.4.4 California Sagebrush – Black Sage Scrub (*Artemisia californica – Salvia mellifera*) Alliance

The California sagebrush (*Artemisia californica*) – black sage scrub (*Salvia mellifera*) alliance includes California sagebrush and black sage as co-dominant in the shrub canopy. California sagebrush – black sage scrub has an intermittent to continuous canopy less than 2 meters (7 feet) in height, and the herbaceous layer is variable. This vegetation community is usually found on steep east- to southwest-facing slopes, and soils are usually colluvial derived (Sawyer et al. 2009).

California sagebrush – black sage scrub occurs within the southeastern portion of the Off-Site Water Tank Area BSA, as shown on Figure 3B. Other species observed within California sagebrush – black sage scrub include purple sage and chamise. California sagebrush – black sage scrub comprises 0.5 acres of the Off-Site Water Tank Area.

The California sagebrush – black sage scrub is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate California sagebrush – black sage scrub as a sensitive vegetation community.

5.1.1.4.5 California Sagebrush – California Buckwheat Scrub (*Artemisia californica - Eriogonum fasciculatum*) Alliance

The California sagebrush – California buckwheat scrub (*Artemisia californica – Eriogonum fasciculatum*) alliance includes California sagebrush and California buckwheat as the co-dominant species in the shrub canopy; when combined, they comprise 30% to 60% of the relative cover in the shrub canopy. California sagebrush – California buckwheat scrub has an intermittent to continuous canopy that is two-tiered with most shrubs less than 2 meters (7 feet) in height with some less than 5 meters (16 feet) in height. The herbaceous layer is seasonally present. California sagebrush – California buckwheat scrub is usually found on steep slopes that are south-facing (Sawyer et al. 2009).

California sagebrush – California buckwheat scrub occurs throughout the Tract Map Site BSA, the Off-Site Road Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA, typically on steep slopes facing south, west, and slightly northwest, as shown on Figure 3A and Figure 3B. Other shrub species observed within California sagebrush – California buckwheat scrub include black sage, chaparral mallow, toyon, redberry, and purple sage. California sagebrush – California buckwheat scrub comprises 24.8 acres of the Tract Map Site BSA, 2.3 acres of the Off-Site Roadway Improvement Area BSA, 5.7 acres of the Off-Site Open Space Area BSA, and 0.2 acres of the Off-Site Water Tank Area BSA, for a total of 33.1 acres.

The California sagebrush – California buckwheat scrub alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate California sagebrush – California buckwheat scrub as a sensitive vegetation community.

5.1.1.4.6 California Sagebrush Scrub (*Artemisia californica*) Alliance

The California sagebrush scrub (*Artemisia californica*) alliance includes California sagebrush as the dominant or co-dominant species in the shrub canopy, when comprising at least 60% of the relative cover in the shrub canopy. California sagebrush scrub has an intermittent to continuous shrub canopy that is two-tiered: one tier includes shrubs less than 2 meters (7 feet) in height, and the second tier includes shrubs less than 5 meters (16 feet) in height. The herbaceous layer is variable both seasonally and annually. California sagebrush scrub is usually found on steep slopes that are rarely flooded and on low-gradient deposits along streams (Sawyer et al. 2009).

California sagebrush scrub occurs throughout the Tract Map Site BSA, the Off-Site Road Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA, particularly on the hillslopes and ridgelines, as shown on Figure 3A and Figure 3B. Other shrub species observed within California sagebrush scrub include California buckwheat, black sage, chaparral yucca (*Hesperoyucca whipplei*), and purple sage. California sagebrush scrub comprises 5.4 acres of the Tract Map Site BSA, 23.9 acres of the Off-Site Open Space Area BSA, and 0.6 acres of the Off-Site Water Tank Area BSA, for a total of 29.8 acres.

The California sagebrush scrub alliance is ranked as an S5 alliance (NatureServe 2019). This ranking indicates that within California the alliance is demonstrably secure to ineradicable and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate California sagebrush scrub as a sensitive vegetation community.

5.1.1.4.7 Coyote Brush Scrub (*Baccharis pilularis*) Alliance

The coyote brush scrub (*Baccharis pilularis*) alliance includes coyote brush (*Baccharis pilularis*) as the dominant or co-dominant shrub in the canopy. Coyote brush scrub has a variable shrub canopy less than 3 meters (10 feet) in height with a variable ground layer. Coyote brush scrub occurs within river mouths, stream sides, terraces, stabilized dunes of coastal bars, splits along the coastline, coastal bluffs, open slopes, and ridges (Sawyer et al. 2009).

Coyote brush scrub occurs in one area within the Off-Site Road Improvement Area BSA, as shown in Figure 3A. Other species observed in coyote brush scrub include common deerweed (Acmispon glaber), California buckwheat, California sagebrush, and white sage (*Salvia apiana*). Coyote brush scrub comprises 0.1 acres of the Off-Site Roadway Improvement Area BSA.

The coyote brush scrub alliance is ranked as an S5 alliance (NatureServe 2019). This ranking indicates that within California the alliance is demonstrably secure to ineradicable and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate Coyote brush scrub as a sensitive vegetation community.

5.1.1.4.8 Palmer's Goldenbush Scrub (*Ericameria palmeri*) Provisional Alliance

The Palmer's goldenbush scrub (*Ericameria palmeri*) provisional alliance includes Palmer's goldenbush (*Ericameria palmeri* var. *pachylepis*) as the dominant species in the shrub canopy. The Palmer's goldenbush scrub vegetation

community has an open shrub canopy less than 1.5 meters (4.9 feet) in height and a continuous herbaceous layer. Palmer's goldenbush scrub is usually found on flats and low slopes (Sawyer et al. 2009).

Palmer's goldenbush scrub occurs throughout the Tract Map Site BSA and the Off-Site Open Space Area BSA, typically on gently sloping terrain at the base of hillslopes of varying aspect, as shown on Figure 3A. Other species observed within Palmer's goldenbush scrub include ripgut (*Bromus diandrus*), California aster, compact brome (*Bromus madritensis*), and fascicled tarweed (*Deinandra fasciculata*). Palmer's goldenbush scrub comprises 6.7 acres of the Tract Map Site BSA and 1.4 acres of the Off-Site Open Space Area BSA, for a total of 8.2 acres. Note that due to rounding, the summed totals may be off slightly.

The Palmer's goldenbush scrub provisional alliance is ranked by CDFW (2019a) as an S3? Alliance (NatureServe 2019). This ranking indicates that within California the alliance is considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate Palmer's goldenbush scrub as a sensitive vegetation community.

5.1.1.4.9 Purple Sage Scrub (*Salvia leucophylla*) Alliance

The purple sage scrub (*Salvia leucophylla*) alliance includes purple sage as dominant or co-dominant in the shrub canopy in this vegetation community, comprising 30% of the relative cover in the shrub canopy and often co-dominant with California sagebrush. Purple sage has an intermittent to continuous shrub canopy less than 2 meters (7 feet) in height and a variable herbaceous layer. This vegetation community is found on slopes of variable aspects (Sawyer et al. 2009).

Purple sage scrub occurs throughout the Tract Map Site BSA, the Off-Site Road Improvement Area BSA, and the Off-Site Open Space Area BSA typically on steep slopes facing north, as shown on Figure 3A. Other species observed within purple sage scrub include California sage brush, white sage, giant wildrye (*Elymus condensatus*), toyon, hollyleaf redberry (*Rhamnus ilicifolia*), and grape soda lupine (*Lupinus excubitus*). Purple sage scrub comprises 5.5 acres of the Tract Map Site BSA, 0.0 acres (rounded from 0.04 acres) of the Off-Site Roadway Improvement Area BSA, and 2.3 acres of the Off-Site Open Space Area BSA, for a total of 7.8 acres.

The purple sage scrub alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019a; NatureServe 2019). Los Angeles County does not designate purple sage scrub as a sensitive vegetation community.

5.1.1.5 Grass and Herb Dominated

5.1.1.5.1 *Brassica nigra - Bromus diandrus* Semi-Natural Association

The *Brassica nigra – Bromus diandrus* semi-natural association includes black mustard (*Brassica nigra*) as dominant with associated ripgut brome (*Bromus diandrus*) with an open to continuous canopy less than 3 meters (10 feet) in height. *Brassica nigra – Bromus diandrus* occurs in grasslands, fallow fields, roadsides, and among disturbed coastal sage scrub (Sawyer et al. 2009).

Brassica nigra – Bromus diandrus occurs throughout the Tract Map Site BSA, as shown in Figure 3A. *Brassica nigra – Bromus diandrus* comprises 12.4 acres of the Tract Map Site BSA.

Brassica nigra – *Bromus diandrus* are non-native and are not ranked as sensitive by CDFW (2019a). Los Angeles County does not designate *Brassica nigra* – *Bromus diandrus* as a sensitive vegetation community.

5.1.1.5.2 *Bromus diandrus* Semi-Natural Association

Bromus diandrus semi-natural association includes ripgut brome as dominant with open to continuous cover less than 1.2 meters (3.9 feet) in height. *Bromus diandrus* occurs in all topographic settings in foothills, waste places, rangelands, and openings in woodlands (Sawyer et al. 2009).

Bromus diandrus occurs mainly in the flat valley portions of the Tract Map Site BSA, on south-facing slopes, and in openings between patches of native shrub dominated vegetation communities, as shown on Figure 3A. Other species observed in *Bromus diandrus* include red brome, and slender oat (*Avena barbata*), and native annual species are also present at low concentrations, including chick lupine (*Lupinus microcarpus* var. *densiflorus*), doveweed (*Croton setigerus*), fiddleneck (*Amsinckia menziesii*), and California chicory (*Rafinesquia californica*). *Bromus diandrus* comprises 7.3 acres of the Tract Map Site BSA.

Bromus diandrus is non-native and is not ranked as sensitive by CDFW (2019a). Los Angeles County does not designate *Bromus diandrus* as a sensitive vegetation community.

5.1.1.5.3 Wild Oats and Annual Brome Grasslands (*Avena* spp. - *Bromus* spp.) Semi-Natural Alliance

Wild oats and annual brome grasslands (*Avena* spp. – *Bromus* spp.) semi-natural alliance includes wild oat (*Avena fatua*) and ripgut brome as dominant or co-dominant with open to continuous cover less than 1.2 meters (3.9 feet) in height. Wild oat and annual brome grasslands occurs in all topographic settings in foothills, waste places, rangelands, and openings in woodlands (Sawyer et al. 2009).

Wild oats and annual brome grasslands occurs mainly in the flat valley portions, on south-facing slopes, and in openings between patches of native shrub dominated vegetation communities within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA, and within one patch in the northern part of the Off-Site Water Tank Area BSA, as shown on Figure 3A and Figure 3B respectively. Wild oats and annual brome grasslands comprise 39.8 acres of the Tract Map Site BSA, 2.9 acres of the Off-Site Roadway Improvement Area BSA, 2.0 acres of the Off-Site Open Space Area BSA, and 0.1 acres of the Off-Site Water Tank Area BSA, for a total of 44.8 acres.

Wild oats and annual brome grassland are non-native and are not ranked as sensitive by CDFW (2019a). Los Angeles County does not designate wild oats and annual brome grasslands as a sensitive vegetation community.

5.1.2 Other Land Cover Types

5.1.2.1 Disturbed Habitat

Disturbed habitat consists of the areas that have experienced physical anthropogenic disturbance, and as a result cannot be identified as native or naturalized vegetation communities. However, these areas do have a recognizable soil substrate. The existing vegetation is typically composed of non-native ornamental or exotic species. There can also be impacts from animal uses, grading, or repeated clearing for fuel management on disturbed lands, which leave the land incapable of providing a suitable or sustainable habitat in which native species can persist. Disturbed habitat comprises 5.1 acres of the Tract Map Site BSA, 0.0 acres (rounded from 0.04 acres) of the Off-Site Roadway

Improvement Area BSA, 2.3 acres of the Off-Site Open Space Area BSA, 0.3 acres of the Off-Site Water Line Improvement Area BSA, and 0.0 acres of the Off-Site Sewer Line Improvement Area BSA (rounded from 0.00003 acres), for a total of 7.8 acres. Note that due to rounding, the summed totals may be off slightly.

5.1.2.2 Urban/Developed

Urban/developed represents areas that have been constructed upon or otherwise have been physically altered to an extent that native vegetation communities are not supported. The portions of the BSA characterized as developed consists of existing access roads, graded areas, and existing buildings. Currently, no vegetation is present in these areas, and they appear to be maintained regularly. Urban/developed comprises 5.6 acres of the Tract Map Site BSA, 0.8 acres of the Off-Site Roadway Improvement Area BSA, 0.2 acres of the Off-Site Open Space Area BSA, 2.0 acres of the Off-Site Water Line Improvement Area BSA, and 0.7 acres of the Off-Site Sewer Line Improvement Area BSA, for a total of 9.5 acres. Note that due to rounding, the totals may not sum precisely.

5.2 Plant Species

The Project site supports woodland, chaparral, scrub, riparian, and grass- and herb-dominated vegetation communities. During surveys, Dudek biologists observed a total of 216 plant species, 160 (74%) of which are native species and 56 (26%) of which are non-native species. A cumulative list of the plant species observed is included in Appendix F.

5.3 Wildlife Species

The Project site supports habitat for a number of upland, woodland, and riparian wildlife species. With the exception of the disturbed and developed lands, which are regularly maintained, land covers on the Project site (grassland, shrubland, and woodland upland communities and riparian vegetation) provide a diversity of suitable habitat for the wildlife species. A total of 76 wildlife taxa were recorded on the site during surveys conducted in 2016, 2017, 2018, and 2020. Appendix G provides a cumulative list of wildlife species observed on the Project site.

5.3.1 Invertebrates

The Project site provides a variety of microhabitats that invertebrates could use for foraging and reproduction. No focused invertebrate surveys were conducted. No invertebrate species were recorded during surveys in 2017 and 2018.

5.3.2 Amphibians and Reptiles

Amphibians require standing or flowing water for part or all of their life cycles. Ponds, seasonal pools, and drainages provide suitable habitat for common amphibian species. The Tract Map Site BSA contains ephemeral waterways, and surveys completed in January 2017 included an assessment of ponding habitat for potentially occurring special-status amphibian species. These surveys were timed to follow significant rain events when conditions for ponding would be ideal. No ponding habitat was identified during the January 2017 surveys, and no amphibians were observed within the Tract Map Site BSA in 2017 and 2018; none are anticipated to occur due to the lack of suitable aquatic habitat.

Reptiles occur in a variety of habitats. Many species shelter in small burrows, which they use as refuge from extreme temperatures and to avoid predators. Biologists observed three common reptile species—common side-blotched lizard (*Uta stansburiana*), western fence lizard (*Sceloporus occidentalis*), and San Diegan tiger whiptail (*Aspidoscelis tigris stejnegeri*) —within the Tract Map Site BSA, the Off-Site Road Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA during surveys in 2016, 2017, 2018, and 2020. Other common reptiles expected to occur on site based on the habitat present include, but are not limited to, western rattlesnake (*Crotalus oreganus*), coachwhip (*Coluber flagellum*), and gopher snake (*Pituophis catenifer*).

5.3.3 Birds

Dudek observed 51 bird species representing 29 families on the Project site, including species common to grasslands, shrublands, woodlands, and riparian/wetland habitats. Grassland species occurring on the Project site include foraging raptors such as red-tailed hawk (*Buteo jamaicensis*). Common shrubland species observed on the Project site include California towhee (*Melozone crissalis*), spotted towhee (*Pipilo maculatus*), California quail (*Callipepla californica*), California scrub-jay (*Aphelocoma californica*), wrentit (*Chamaea fasciata*), California thrasher (*Toxostoma redivivum*), and phainopepla (*Phainopepla nitens*). Common woodland and riparian/wetland species observed on the Project site include great horned owl (*Bubo virginianus*). Several of the bird species observed on the Project site are species that are urban-tolerant or attracted to urban settings, including American crow (*Corvus brachyrhynchos*), white-crowned sparrow (*Zonotrichia leucophrys*), and western kingbird (*Tyrannus verticalis*). The full cumulative list of birds observed on the Project site are provided in Appendix G.

5.3.4 Mammals

The Project site provides a variety of vegetative communities that common small mammalian species can use as cover and for food gathering, in turn providing a prey base for larger mammals and birds of prey. Biologists observed three mammal species—coyote (*Canis latrans*), California ground squirrel (*Spermophilus* [=*Otospermophilus*] *beecheyi*), and desert cottontail (*Sylvilagus audubonii*)—during surveys conducted in 2017. Other common mammal species expected to occur on the Project site based on habitat present include, but are not limited to, Botta's pocket gopher (*Thomomys bottae*), desert woodrat (*Neotoma lepida*), coyote, and potentially mule deer (*Odocoileus hemionus*) and mountain lion (*Puma concolor*).

5.4 Special-Status/Regulated Resources

The following resources are discussed in this section: (1) plant and animal species present or potentially present on the Project site that are given special recognition by federal, state, or local resource agencies and environmental organizations owing to declining, limited, or threatened populations, that are the result, in most cases, of habitat reduction; (2) habitat areas that are unique, of relatively limited distribution, or of particular value to wildlife; and (3) vegetation communities that are unique, of relatively limited distribution, or of particular value to wildlife.

5.4.1 Sensitive Vegetation Communities

Sensitive vegetation communities include wetlands and riparian communities, as well as those communities that CDFW (2019a) has identified as a high priority for inventory due to rarity or threat in California and/or considered

sensitive by Los Angeles County (2011). Five vegetation types in the BSA are considered sensitive by CDFW and/or Los Angeles County:

- Arroyo willow thickets alliance is ranked as S4, which is not sensitive (CDFW 2019a; NatureServe 2019). However, this vegetation community is associated with a jurisdictional water resource and is therefore considered a sensitive community. The Tract Map Site BSA contains 0.1 acres of arroyo willow thickets.
- Mulefat thickets alliance is ranked as S4, which is not sensitive (CDFW 2019a; NatureServe 2019). However, this vegetation community is associated with a jurisdictional water resource and is therefore considered a sensitive community. The Tract Map Site BSA contains 0.1 acres of mulefat thickets.
- *Rhus trilobata* association is ranked as S3, which is sensitive (CDFW 2019a; NatureServe 2019). *Rhus trilobata* association comprises 0.9 acres of the Tract Map Site BSA. One of the occurrences of this vegetation community is located on the bank of an ephemeral waterway and therefore is considered a riparian vegetation community. The Tract Map Site BSA contains 0.6 acres of basket bush thickets associated as a riparian community.
- Palmer's goldenbush scrub alliance is ranked as S3?, which is sensitive (CDFW 2019a; NatureServe 2019). The Tract Map Site BSA contains 6.7 acres and the Off-Site Open Space Area BSA contain 1.4 acres of Palmer's goldenbush scrub, for a total of 8.2 acres. Note that due to rounding, totals may not sum precisely.
- Coast live oak woodland alliance is ranked as S4, which is not sensitive (CDFW 2019a; NatureServe 2019). The County of Los Angeles (2011, 2012) designates coast live oak woodland as a sensitive vegetation community. The Off-Site Water Tank Area BSA contains 0.3 acres of coast live oak woodlands in accordance with the Manual of California Vegetation, Second Edition (Sawyer et al. 2009). In accordance with the Los Angeles County Oak Woodlands Conservation Management Plan (County of Los Angeles 2011), there are 0.65 acres of oak woodlands.

5.4.1.1 Oak Woodland in Accordance with County Standards

5.4.1.1.1 Oak Woodland Assessment

There are three oak woodlands located within the study area comprising varying sizes and age classes of coast live oak and scrub oak (*Quercus berberidifolia*). These woodlands exhibit generally good levels of ecological health (Appendix A, Figure 5, Oak Woodland). The inventory included 52 coast live oak and 8 scrub oak trees; of the 60 total oak trees, 34 met the County of Los Angeles's criteria for a woodland. Overall, the oak woodlands exhibit conditions that are typical of their location in a native setting prone to drought and wildfires.

The woodland trees are composed of single- and multi-stemmed trees, with single-stemmed trunk diameters that range from 6 to 40 inches and multi-stemmed trunk diameters that range from 2 to 20 inches. Tree canopy extents range from 10 feet to approximately 50 feet in diameter.

The total canopy area and associated SOI of Oak Woodlands (OW) 1–3 is approximately 2.07 acres. Figure 5 in Appendix A provides the mapped locations of OW 1–3 and the associated SOIs.

5.4.1.1.2 Condition of Project Oak Woodlands

The condition and composition of OW 1–3, including oak species present, approximate density of oaks, age classes of oaks, understory vegetation, and surrounding vegetation communities, are discussed below. Based on these recorded conditions, a determination of the habitat value/integrity of the woodland was assigned using criteria

provided in the Guide. These conditions criteria definitions are provided in Table 1 of the Guide (Appendix D of Appendix A) and summarized in Section 3.6.3.1.2. In summary, OW1 is Moderately Degraded, and OW2 and OW3 are Intact. Representative photographs of the woodlands are provided in Appendix A of Appendix A.

The locations of OW 1–3 are provided in Appendix A, Figure 5. Representative photos of the surveyed woodlands are provided in Photos 1 to 10. For the purposes of this report, the terms sapling, young, and mature refer to the age-class designation of the trees present within the subject woodland. These designations are as follows: saplings are trees with a DSH measuring less than 5 inches; young trees have a DSH measuring between 5 and 9 inches; and mature trees have a DSH measuring greater than 9 inches.

Oak Woodland 1

OW1 is located adjacent to and northeast of the existing water tank site, on the northern edge of the proposed additional water tank, encompassing a canopy area of approximately 0.03 acres. A total of two coast live oaks were observed, one mature and one young, within the subject woodland. Existing conditions and the understory vegetation within OW1 vary depending on proximity to the existing road. The habitat value/integrity ranking of OW1 is **Moderately Degraded**.

OW1 has been altered from the natural condition to accommodate a paved road with highly disturbed and compacted soils. At the time of the survey, the understory conditions in the vicinity of the road were not conducive to natural regeneration, including the lack of oak seedlings and an intact oak leaf litter layer, as well the absence of understory vegetation associated with woodland habitat. Conditions present within the understory of OW1 are illustrated in Photos 1 to 4 in Appendix A of Appendix A and listed in Table 4 below.

Oak Woodland 1 Understory Assessment Results

- Native species 5%
- Non-native grass 85%
- Non-native forbs 10%

Table 4. Oak Woodland 1 Understory Assessment

Scientific Name	Common Name	Native/Non-Native	Notes
Artemisia californica	California sagebrush	Native	1 individual
Avena barbata	slender oat	Non-native	
Bromus diandrus	ripgut brome	Non-native	
Carduus pycnocephalus ssp. *pycnocephalus*	Italian plumeless thistle	Non-native	
Chenopodium murale	nettleleaf goosefoot	Non-native	
Cynodon dactylon	Bermudagrass	Non-native	
Pseudognaphalium californicum	ladies' tobacco	Native	2 individuals
Salsola tragus	prickly Russian thistle	Non-native	
Sambucus nigra ssp. *caerulea*	blue elderberry	Native	2 individuals
Stipa miliacea var. *miliacea*	smilograss	Non-native	
Artemisia californica	California sagebrush	Native	1 individual

Oak Woodland 2

OW2 is located east of the existing water tank site and is currently in a "wild" state, showing evidence of minimal disturbance. OW2 comprises 14 mature and 4 young coast live oaks and 2 young scrub oaks with a total canopy area of approximately 0.28 acres. The subject woodland supports an open overhead canopy with a relatively undisturbed oak leaf litter layer. Conditions present within the understory of OW2 are illustrated in Photos 5 to 7 in Appendix A of Appendix A and are listed Table 5 below. Based on these conditions, the habitat value/integrity ranking for OW2 is **Intact**.

Oak Woodland 2 Understory Assessment Results

- Native species 75%—Although not reflected in the percent covers, this also includes the native forbs observed during spring, which are included below in Table 5.
- Non-native grasses and forbs 25%

Table 5. Oak Woodland 2 Understory Assessment

Scientific Name	Common Name	Native/ Non-Native	Percent cover
Adenostoma fasciculatum	chamise	Native	5
Artemisia californica	California sagebrush	Native	35
Avena barbata	slender oat	Non-native	5
Bromus diandrus	ripgut brome	Non-native	20
Elymus condensatus	giant wild rye	Native	15
Eriogonum fasciculatum	California buckwheat	Native	5
Heteromeles arbutifolia	toyon	Native	5
Malacothamnus fasciculatus	bush mallow	Native	5
Salvia mellifera	black sage	Native	5

Oak Woodland 3

OW3 is located south of the existing water tank site and is currently in a "wild" state, showing evidence of minimal disturbance. OW3 comprises eight mature and four young coast live oaks with a total canopy area of approximately 0.07 acres (Table 3). The subject woodland supports an open overhead canopy with a relatively undisturbed oak leaf litter layer. Conditions present within the understory of OW3 are illustrated in Photos 8 to 10 in Appendix A of Appendix A. Based on these conditions, the habitat value/integrity ranking for OW3 is **Intact**.

Oak Woodland #3 Understory Assessment Results

- Native species 60%—Although not reflected in the percent covers, this also includes the native forbs observed during spring, which are included below in Table 6. Vegetation community descriptions are included in Table 7. A list of associated understory plant species is included in Table 8.
- Non-native grasses and forbs 40%

Table 6. Oak Woodland 3 Understory Assessment

Scientific Name	Common Name	Native/Non-Native	Percent cover
Adenostoma fasciculatum	chamise	Native	5
Artemisia californica	California sagebrush	Native	25
Avena barbata	slender oat	Non-native	10
Bromus diandrus	ripgut brome	Non-native	30
Elymus condensatus	giant wild rye	Native	5
Eriogonum fasciculatum	California buckwheat	Native	15
Malacothamnus fasciculatus	bush mallow	Native	5
Salvia mellifera	black sage	Native	5

Table 7. Oak Woodland Vegetation Community Descriptions

Code	Vegetation Community Description [a]	Oak Woodland 1 (acres)	Oak Woodland 2 (acres)	Oak Woodland 3 (acres)	Total Area (acres)
BMS	Bush mallow scrub (*Malacothamnus fasciculatus – Malacothamnus* spp.) Alliance	0.00	0.00	—	0.00
C-BSC	Chamise – black sage chaparral (Ad*enostoma fasciculatum – Salvia mellifera*) Alliance	—	0.04	0.04	0.08
CLOW	Coast live oak woodland (*Quercus agrifolia*) Alliance	—	0.22	0.07	0.28
CSB-CB	California sagebrush – California buckwheat scrub (*Artemisia californica – Eriogonum fasciculatum*) Alliance	—	0.04	—	0.04
CSS	California sagebrush scrub (*Artemisia californica*) Alliance	—	0.11	0.09	0.19
WOABG	Wild oats and annual brome grasslands (*Avena* spp. – *Bromus* spp.) Semi-Natural Alliance	0.04	—	—	0.04
	Total area (acres)	**0.04**	**0.41**	**0.20**	**0.65[b]**

Note:

[a] A Manual of California Vegetation, Second Edition (Sawyer et al. 2009), Vegetation Communities within the Los Angeles County–defined oak woodland.

[b] Note that there is a total of 0.65 acres of oak woodlands, of which there are 0.61 acres of significant impacts to oak woodlands within OW2 and OW3

Table 8. List of Associated Native Plant Species for the Oak Woodland Understory

Scientific Name	Common Name
Apiastrum angustifolium	mock parsley
Adenostoma fasciculatum	chamise
Artemisia californica	California sagebrush
Clarkia unguiculata	elegant clarkia
Claytonia perfoliata	miner's lettuce
Collinsia heterophylla var. *heterophylla*	purple Chinese houses
Delphinium parryi ssp. *parryi*	San Bernardino larkspur
Dipterostemon capitatus	bluedicks
Elymus condensatus	giant wild rye
Eriogonum fasciculatum	California buckwheat
Eriophyllum confertiflorum	golden-yarrow
Erysimum capitatum	sanddune wallflower
Heteromeles arbutifolia	toyon
Lupinus bicolor	miniature lupine
Malacothamnus fasciculatus	bush mallow
Phacelia ramosissima	branching phacelia
Pseudognaphalium californicum	ladies' tobacco
Pterostegia drymarioides	woodland pterostegia
Salvia mellifera	black sage
Sambucus nigra ssp. *caerulea*	blue elderberry

Note: This list could be used as a native seed/container plant palette.

5.4.1.1.3 Oak Woodland Special-Status Species

The Oak Woodlands Conservation Management Plan Guide requests a description of the presence or potential use of the site by special-status species. No special-status plant species or wildlife species have been found during surveys of the oak woodlands within the study area. Surveys were conducted in February and May–July 2020, as described in this report. Tables of potentially occurring special-status plant species and wildlife species are also provided in this report as Appendix B and Appendix C of Appendix A, respectively. These tables were reproduced from the Biological Technical Report and were modified for the purposes of the Oak Woodland Report to include only those species with potential to occur within oak woodland habitats. The tables include listed species and other species that, if impacted, would require a mandatory finding of significance pursuant to CEQA, but they do not include potentially occurring "watch list" species.

5.4.2 Special-Status Plant Species

Focused surveys for special-status plants were conducted in the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, the Off-Site Water Tank Area BSA, the Off-Site Water Line Improvement Area BSA, and the Off-Site Sewer Line Improvement Area BSA over three separate survey years, in 2014, 2017, and 2020. The potential for occurrence of special-status plant species in the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, the Off-Site Water Tank Area BSA, the Off-Site Water Line Improvement Area BSA, and the Off-Site Sewer Line Improvement Area BSA is described in Table 9. Appendix I provides a list of those special-status plant species considered to have low to no potential to occur. Species

are considered to have low to no potential to occur primarily due to the lack of observations within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, the Off-Site Water Tank Area BSA, Off-Site Water Line Improvement Area BSA, and Off-Site Sewer Line Improvement Area BSA during the 2014, 2017, and 2020 focused surveys. The special-status plant species in Appendix I are not analyzed in this report because no direct, indirect, or cumulative impacts are expected. Mapped locations of special-status plant species recorded within 0.5 miles the Off-Site Water Tank Area BSA and Off-Site Water Line Improvement Area BSA and Off-Site Sewer Line Improvement Area BSA are shown in Figure 4B and Figure 4A/4C, respectively.

Table 9. Special-Status Plant Species with Moderate to High Potential to Occur and Present on the Project Site

Scientific Name	Common Name	Status (Federal/State/ CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/Elevation Range (feet)	Potential to Occur
Calochortus clavatus var. *gracilis*	slender mariposa lily	None/None/1B.2	Chaparral, coastal scrub, valley and foothill grassland/perennial bulbiferous herb/Mar.–June (Nov)/1,045–3,280	Present within the Tract Map Site BSA, Off-Site Roadway Improvement Area BSA, Off-Site Open Space Area BSA, and Off-Site Water Tank Area BSA. Species identified during 2014, 2017, and 2020 focused surveys.
Calystegia peirsonii	Peirson's morning-glory	None/None/4.2	Chaparral, chenopod scrub, cismontane woodland, coastal scrub, lower montane coniferous forest, valley and foothill grassland/perennial rhizomatous herb/Apr.–June/95–4,920	Present within the Tract Map Site BSA, Off-Site Roadway Area BSA, and Off-Site Open Space Area BSA. Species identified during 2014, 2017, and 2020 focused surveys.
Juglans californica	Southern California black walnut	None/None/4.2	Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland; alluvial/perennial deciduous tree/Mar.–Aug./160–2,950	Present within the Tract Map Site BSA. Species identified in 2020 focused surveys.

Status Legend
CRPR:
1B = Plants rare, threatened, or endangered in California and elsewhere
4 = Plants of limited distribution (a watch list)
Threat Rank: 0.2—Moderately threatened in California (20%–80% occurrences threatened/moderate degree and immediacy of threat)
Note: See text for threat ranks.

Three special-status plant species were documented in the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA during focused surveys conducted in 2014, 2017, and 2020:

- Slender mariposa lily (CRPR 1B.2)
- Peirson's morning-glory (CRPR 4.2)
- Southern California black walnut (CRPR 4.2)

5.4.2.1 Slender Mariposa Lily (*Calochortus clavatus* var. *gracilis*)

Slender mariposa lily is a CRPR 1B.2 documented in the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA. This species is fairly widespread in the Santa Clarita Valley, and was observed throughout the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA, primarily on ridgelines and north- and east-facing slopes. Slender mariposa lily typically occurs in chaparral, California sagebrush scrub, and grassland, often on clay and/or rocky soils. Plants were generally mapped in areas of high vegetative cover and on soil types including loam and silty clay loam. Within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA, the number of counted flowering individuals varied from 87 in 2014 (FLx 2014) to 208 in 2017, to 8 in 2020. During 2017, the breakdown of the 208 slender mariposa lily individuals observed included 135 individuals within the Tract Map Site BSA, 31 individuals within the Off-Site Roadway Improvement Area, and 42 individuals within the Off-Site Open Space Dedicated Area. During 2020, the breakdown of the eight slender mariposa lily individuals observed included one individual within the Tract Map Site BSA, one individual within the Off-Site Roadway Improvement Area, and six individuals within the Off-Site Water Tank Area. Note that surveys conducted in 2014, 2017, and 2020 included the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA, but not all BSAs were surveyed each year. Since the Off-Site Water Tank Area was not surveyed in 2017, the 2020 survey results for the Off-Site Water Tank Area are representative (six individuals). Figure 4A/4C provides the slender mariposa lily observation locations in 2017 for the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA; and Figure 4B provides the slender mariposa lily observation locations in 2020 for the Off-Site Water Tank Area BSA.

5.4.2.2 Peirson's Morning-glory (*Calystegia peirsonii*)

Peirson's morning-glory is a CRPR 4.2 that is endemic to Los Angeles County in the northern San Gabriel Mountains and adjacent Mojave Desert (Antelope Valley). It is a weakly climbing rhizomatous perennial, typically found in chaparral, coastal scrub, chenopod scrub, cismontane woodland, lower montane coniferous forest, and grasslands. The species was observed in the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA in 2014, 2017, and 2020. It generally occurs on ridges and slopes, weakly climbing over chaparral, coastal scrub, and grasslands.

Peirson's morning-glory was observed throughout much of the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA. Given the low sensitivity status of the species and the widespread distribution in the region, the exact locations of individuals of this species within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA were not mapped.

5.4.2.3 Southern California Black Walnut (*Juglans californica*)

Southern California black walnut is a CRPR 4.2 endemic to California. It is a perennial deciduous tree which occurs in chaparral, cismontane woodland, coastal scrub, and riparian woodland. Southern California black walnut can generally be found in the southern half of California and can be either a large shrub with one to five trunks or a small single-trunked tree. The main trunk can fork close to the ground making it look like two trees that have grown together, then diverged. One multi-stemmed individual with a cumulative 47-inch DSH was observed in the Tract Map Site BSA, in 2017 and 2020. The 47-inch DSH is comprised of four stems measuring 8 inches, 9 inches, 11 inches, and 19 inches in diameter.

Biological Survey Area

Project Components

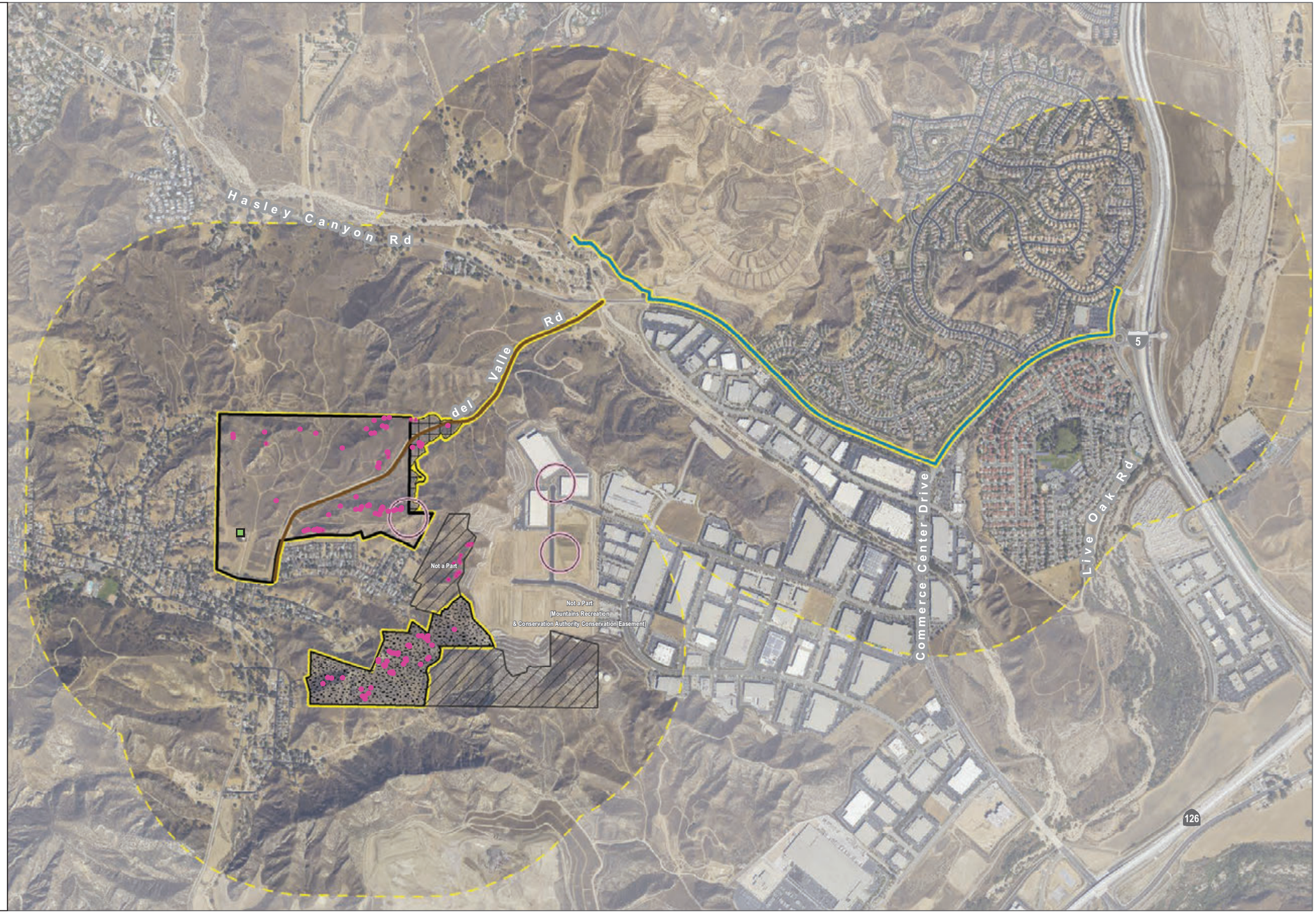
- Tract Map Site
- Off-Site Roadway Improvement Area
- Off-Site Sewer Line Improvement
- Off-Site Water Line Improvement
- Off-Site Open Space
- Not a Part
- Biological Survey Area 0.5-Mile Buffer

Focused Survey Results

- Slender mariposa lily *(Calochortus clavatus var. gracilis)*
- Southern California black walnut *(Juglans californica)*

CNDDB and USFWS Occurrence Records

- slender mariposa lily



SOURCE: Eagle Aerial Surveys 2018
Track Map Site, Off-Site Roadway Improvement Area, and Off-Site Open Space Area

DUDEK

0 650 1,300 Feet

FIGURE 4A / 4C

Special-Status Plants and Wildlife On-Site and Within 0.5-Mile of the Biological Survey Area

Biological Technical Report for the Sterling Ranch Estates Residential Project

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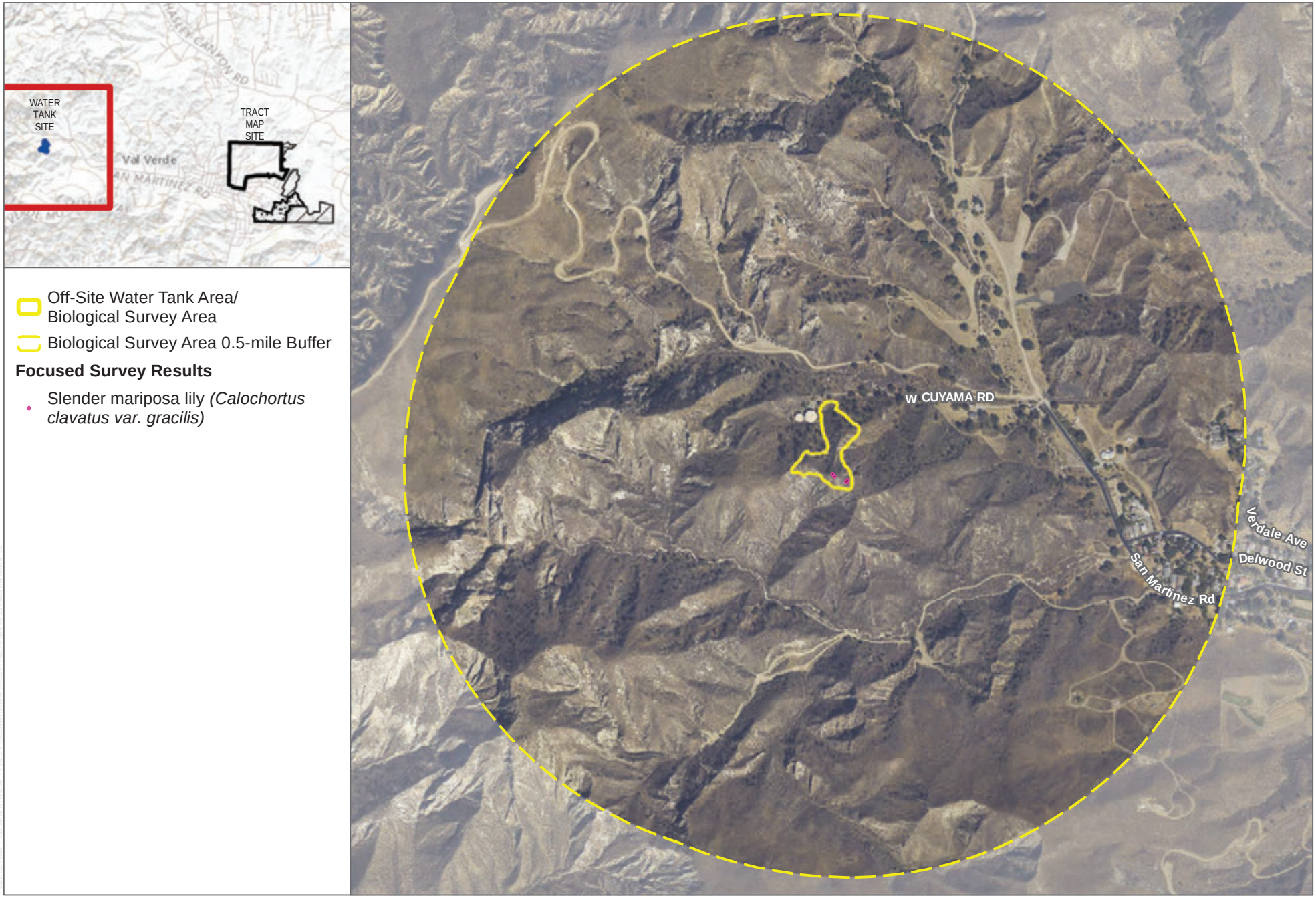

SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 440 880 Feet

FIGURE 4B

Special-Status Plants and Wildlife On-Site and Within 0.5-Mile of the Biological Survey Area

Biological Technical Report for the Sterling Ranch Estates Residential Project

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5.4.3 Oak Trees

5.4.3.1 Tract Map Site, Off-Site Open Space Area, and Off-Site Roadway Improvement Area Oak Trees

The complete Oak Tree Report for the Sterling Ranch Estates Project which includes the Tract Map Site, Off-Site Open Space Area, and Off-Site Roadway Improvement Area is included in Appendix B. Below is a summary of the results.

Three coast live oak and two valley oak (*Quercus lobata*) trees were inventoried within the Tract Map Site BSA, Off-Site Open Space Area BSA, and Off-Site Roadway Improvement Area BSA. Of the five oak trees, four meet Los Angeles County's criteria for a protected oak tree. Appendix B in the Oak Tree Report (Appendix B of this report) presents the location of the individual trees mapped and assessed impact for the Project. Overall, the trees exhibit growth and structural conditions that are typical of their locations in a native oak woodland setting prone to drought and wildfires. The trees include various trunk and branch maladies and health and structural conditions. As presented in Appendix A of the Oak Tree Report (Appendix B of this report), 40% of the individually mapped trees (2 trees) exhibit fair health; 40% (2 trees) are in poor health; and 20% (1 tree) are in good health. Structurally, 20% (1 tree) of the individually mapped trees are considered to exhibit good structure, and 80% (4 trees) exhibit fair structure. The tree in good condition exhibits acceptable vigor, healthy foliage, and adequate structure, and lacks any major maladies. Trees in fair condition are typical, with few maladies but declining vigor. Trees in poor condition exhibit declining vigor, unhealthy foliage, poor branch structure, and excessive lean. The trees in poor condition are directly attributed to the region's recent drought. No pests and/or pathogens were observed on site.

Trees within the tree survey area vary in size and stature according to species and available growing space. The site's trees are composed of single- and multi-stemmed trees, with single-stemmed trunk diameters that range from 14 to 43 inches and multi-stemmed trunk diameters that range from 1 to 17 inches. Tree heights vary from 11 to 45 feet. Tree canopy extents range from 10 feet to approximately 45 feet.

5.4.3.2 Off-Site Water Tank Area Oak Trees

The complete Oak Tree Report for the Sterling Ranch Estates Project, Off-Site Water Tank Area is included in Appendix C. Below is a summary of the results.

Fifty-five coast live oak and four scrub oak (*Quercus berberidifolia*) trees were inventoried within the Off-Site Water Tank Area BSA. Of the 59 oak trees, 36 meet Los Angeles County's criteria for a protected oak tree. Appendix A presents the location of the individual trees mapped and assessed for the Project. Overall, the trees exhibit growth and structural conditions that are typical of their location in a native oak woodland setting prone to drought and wildfires. The trees include various trunk and branch maladies and health and structural conditions. As presented in Appendix A of the Oak Tree Report (Appendix C), 11.9% (7 trees) of the individually mapped trees are in good health; 72.9% (43 trees) exhibit fair health, 13.5% (8 trees) are in poor health, and 1.7% (1 tree) is dead. Structurally, 3.3% (2 trees) of the individually mapped trees are considered to exhibit good structure; 83.1% (49 trees) exhibit fair structure; 11.9% (7 trees) poor structure; and 1 (1.7%) is dead. The trees in good condition exhibit acceptable vigor, healthy foliage, and adequate structure, and lack any major maladies. Trees in fair condition are typical, with few maladies but declining vigor. Trees in poor condition exhibit declining vigor, unhealthy foliage, poor branch structure, and excessive lean. No pests or pathogens were observed on site.

Trees within the survey area vary in size and stature according to species and available growing space. The site's trees are composed of single- and multi-stemmed trees, with single-stemmed trunk diameters that range from 6 to 44 inches, and multi-stemmed trunk diameters that range from 2 to 55 inches. Tree heights vary from 6 to 50 feet. Tree canopy extents range from 5 feet to approximately 50 feet.

5.4.4 Special-Status Wildlife Species

This section discusses results of the literature review and wildlife surveys conducted within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA in 2017 and 2018, and assesses the potential for all special-status wildlife species to occur on the Project site. Species-specific biological surveys conducted to date within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA site include protocol surveys for coastal California gnatcatcher and focused surveys for burrowing owl. Additionally, a burrowing owl habitat assessment was conducted within the Off-Site Water Tank Area BSA and concluded that no burrowing habitat was present; thus, no focused burrowing owl surveys were performed. Species-specific surveys also included observations of all wildlife detected within the Project site; however, biologists could not determine the absence of other special-status wildlife species that had potential to occur. Regardless, the species-specific biological surveys completed in 2017 and 2018 of the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA and 2020 habitat assessment of the Off-Site Water Tank Area BSA provide a sound basis for determining the occurrence potential of several special-status wildlife species within the Project site.

No state or federally listed wildlife species were detected during focused surveys conducted by Dudek in 2017 and 2018 or during the 2020 habitat assessment. A total of six special-status wildlife species were identified within the Project site during reconnaissance and focused surveys, including sharp-shinned hawk (*Accipiter striatus*; CDFW Watch List), Southern California rufous crowned sparrow (*Aimophila ruficeps canescens*; CDFW Watch List), oak titmouse (*Baeolophus inornatus*; USFWS Bird of Conservation Concern), Costa's hummingbird (*Calypte costae*; USFWS Bird of Conservation Concern), Vaux's swift (*Chaetura vauxi*; CDFW Species of Special Concern), and San Diegan tiger whiptail (*Aspidoscelis tigris stejnegeri*; CDFW Species of Special Concern). Dudek compiled a list of special-status wildlife species through a query of CNDDB (CDFW 2018a and CDFW 2020a) to determine the potential for special-status wildlife species to occur on the Project site. The query included the Val Verde USGS quadrangle, where the Project site is located, and the surrounding eight USGS quadrangles. Dudek analyzed the resulting special-status wildlife species' occurrence or potential to occur based on known elevation or geographic range, suitable habitat, or general consensus that the species has been extirpated from the region. Appendix J provides a list of those special-status wildlife species considered to have low to no potential to occur based on site surveys, lack of suitable aquatic or terrestrial habitat, and the site being out of the species' range. Species are considered to have low to no potential to occur primarily due to the lack of suitable habitat and/or no observations of the species within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, the Off-Site Water Tank Area BSA, Off-Site Water Line Improvement Area BSA, and Off-Site Sewer Line Improvement Area BSA during the 2016, 2017, 2018, and 2020 focused surveys. The special-status wildlife species in Appendix J are not analyzed in this report because no direct, indirect, or cumulative impacts are expected. In addition, many special-status wildlife species that occur in the area are avian species that may occasionally fly over or forage over the site, but that are not expected to occur during the portion of their life cycle for which their special-status is designated (usually breeding). Therefore, no impacts would occur to these species. In addition to those identified within the Project site, ten other special-status wildlife species have potential to occur based on habitat, including soils, vegetation, and elevation, and the known range of the species.

Potential occurrence of special-status wildlife species on the Project site is discussed in Table 10, Special-Status Wildlife Observed or with Moderate to High Potential to Occur on the Project Site.

In addition to federally and state-listed threatened and endangered species, Table 10 includes other federal and state:

- Birds of Conservation Concern (BCC) are bird species the USFWS considers to be of high conservation priority beyond those listed as threatened or endangered (USFWS 2008).
- California Species of Special Concern (CSC) are vertebrate species that are of concern due to suspected declining populations, limited ranges, and or continuing threats that increase their chance of extinction or extirpation in California (CDFW 2019b).
- California Fully Protected (FP) species are vertebrate species that the state identified for special protection prior to CESA protection, due to rarity or a threat of extinction. Most FP species have been state- and/or federally listed as threatened or endangered, but there are some exceptions (e.g., white-tailed kite [*Elanus leucurus*]).
- Watch List (WL) species are considered "taxa to watch," as first designated in the California Bird Species of Special Concern (Shuford and Gardali 2008) and extended to reptiles and amphibians in California Reptiles and Amphibian Species of Special Concern (Thomson et al. 2016). Species on the WL are not currently state- or federally listed as threatened or endangered, CSC, or FP species (CDFW 2019b).
- Special Animals are vertebrate and invertebrate species that do not have other state designations (i.e., CSC, FP, WL) that are listed on the Special Animals list (CDFW 2019b). "Special Animals" is also a general term for all species the CDFW is currently interested in tracking through the CNDDB. CDFW therefore considers the Special Animals list to be "species at risk" or "special-status species" (CDFW 2019b).

Table 10. Special-Status Wildlife Species that have Potential to Occur on the Project Site

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Reptiles				
Anniella spp.	California legless lizard	None/CSC	Coastal dunes, stabilized dunes, beaches, dry washes, valley–foothill, chaparral, and scrubs; pine, oak, and riparian woodlands; associated with sparse vegetation and moist sandy or loose, loamy soils.	Moderate potential to occur based on presence of suitable habitat and difficulty in detection (often subterraneous or in detritus layer). However, not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours.
Aspidoscelis tigris stejnegeri	San Diegan tiger whiptail	None/CSC	Hot and dry areas with sparse foliage, including chaparral, woodland, and riparian areas.	Present. Species observed during surveys completed in 2018.

Table 10. Special-Status Wildlife Species that have Potential to Occur on the Project Site

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Phrynosoma blainvillii	Blainville's horned lizard	None/CSC	Open areas of sandy soil in valleys, foothills, and semi-arid mountains, including coastal scrub, chaparral, valley–foothill hardwood, conifer, riparian, pine–cypress, juniper, and annual grassland habitats.	Low potential to occur based on presence of suitable habitat, but lack of flat, open terrain, and the fact that this species was not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours.
Birds				
Accipiter cooperii (nesting)	Cooper's hawk	None/WL	Nests and forages in dense stands of live oak, riparian woodlands, or other woodland habitats often near water.	Moderate potential to nest based on presence of suitable nesting habitat, and the species was observed during surveys completed in 2018 and 2020, but no nest behavior or fledgings were observed during the surveys.
Accipiter striatus (nesting)	sharp-shinned hawk	None/WL	Nests in coniferous forests, ponderosa pine, black oak, riparian deciduous, mixed conifer, Jeffrey pine; winters in lowland woodlands and other habitats.	Present. Species observed during surveys completed in 2018. Not expected to nest based on lack of suitable nesting habitat and not known to nest in the region (Allen et al. 2016).
Aimophila ruficeps canescens	Southern California rufous-crowned sparrow	None/WL	Nests and forages in open coastal scrub and chaparral with low cover of scattered scrub interspersed with rocky and grassy patches.	Present. Species observed during surveys completed in 2018.
Athene cunicularia (burrow sites and some wintering sites)	burrowing owl	BCC/CSC	Nests and forages in grassland, open scrub, and agriculture, particularly with ground squirrel burrows.	Moderate potential to occur in winter or during migration. Breeding season surveys were negative for the species. Low potential to nest. The Project site provides suitable habitat, but no known breeding records from the vicinity (Allen et al. 2016; CDFW 2018a). Nearest CNDDB record is approximately 1.5 miles east of the Project site, near the new industrial area, in winter. However, not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists which consisted of over 248 person hours inclusive of over 93

Table 10. Special-Status Wildlife Species that have Potential to Occur on the Project Site

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
				person hours of protocol coastal California gnatcatcher surveys and a burrowing owl habitat suitability survey assessment and focused burrowing owl breeding season surveys following the Staff Report on Burrowing Owl Mitigation, Appendix C (CDFG 2012).
Baeolophus inornatus (nesting)	oak titmouse	BCC/None	Montane hardwood-conifer, montane hardwood, blue oak, valley oak and coastal oak woodlands, montane and valley foothill riparian habitats.	Present. Species observed within the Tract Map Site BSA during surveys completed in 2018 and within the Off-Site Water Tank Area BSA during surveys completed in 2020. Note that the species was not observed nesting. Suitable nesting habitat present on the Off-Site Water Tank Area BSA; however, no other suitable habitat within the Project site.
Buteo regalis (wintering)	ferruginous hawk	BCC/WL	Open, dry country, grasslands, open fields, agriculture.	Moderate potential to occur in winter and during migration. Not known to nest in the region. Suitable foraging habitat present on site. However, not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.
Calypte costae (nesting)	Costa's hummingbird	BCC/None	Nests and forages in desert wash, edges of riparian and valley–foothill riparian, coastal scrub, desert scrub, desert succulent scrub, lower-elevation chaparral, and palm oasis.	Present. Species observed during surveys completed in 2020. Not expected to nest based on lack of suitable nesting habitat.
Chaetura vauxi (nesting)	Vaux's swift	None/CSC	Nests in coniferous or mixed forest. Forages in forest openings, especially above streams.	Present. Species observed during surveys completed in 2018. Not expected to nest based on lack of suitable nesting habitat.

Table 10. Special-Status Wildlife Species that have Potential to Occur on the Project Site

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Falco columbarius (wintering)	merlin	None/WL	Coastlines, wetlands, woodlands, agricultural fields, and grasslands.	Moderate potential to occur. Suitable foraging habitat present on site. However, not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.
Gymnogyps californianus	California condor	FE/SE, FP	Nests in rock formations, deep caves, and occasionally in cavities in giant sequoia trees (*Sequoiadendron giganteus*); forages in relatively open habitats where large animal carcasses can be detected.	High potential to fly over the Project site. Not expected to nest or forage on the Project site and BSA. No nesting habitat present on site, and large carrion is not expected to be present due to the lack of livestock grazing; however, there is the potential for deer, coyotes, and dogs. The species is attracted to microtrash (i.e., broken glass, paper and plastic waste, small pieces of metal), which may be brought back to the nesting site. CNDDB records indicate several observations of California condor flying through the area. However, not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.
Lanius ludovicianus (nesting)	loggerhead shrike	BCC/CSC	Nests and forages in open habitats with scattered shrubs, trees, or other perches.	Moderate potential to occur. The Project site provides suitable nesting and foraging habitat for this species. However, not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.
Polioptila californica	coastal California gnatcatcher	FT/CSC	Nests and forages in various sage scrub communities, often	Low potential to occur. Protocol breeding season surveys were negative for the species (Glenn

Table 10. Special-Status Wildlife Species that have Potential to Occur on the Project Site

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
			dominated by California sagebrush and buckwheat; generally, avoids nesting in areas with a slope of greater than 40%; majority of nesting at less than 1,000 feet amsl.	Lukos 2007; Dudek 2018 and 2020). Suitable nesting and foraging habitat present on site but determined absent based on present/absent protocol surveys. CNDDB records indicate the nearest reported location of California gnatcatcher is approximately 2.8 miles southwest of the Project site, near the Santa Clara River.
Mammals				
Lepus californicus bennettii	San Diego black-tailed jackrabbit	None/CSC	Arid habitats with open ground; grasslands, coastal scrub, agriculture, disturbed areas, and rangelands.	Low potential to occur. The Project site has areas of short grasslands and open spaced ground suitable for this species for movement. However, not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours.
Neotoma lepida intermedia	San Diego desert woodrat	None/CSC	Coastal scrub, desert scrub, chaparral, cacti, rocky areas	High potential to occur. The Project site provides suitable coastal scrub habitat, and several woodrat middens were identified during the focused wildlife surveys in 2018.
Puma concolor (southern and central coast California evolutionary significant units)	mountain lion	None/SC	Dense undergrowth and cover in deserts, humid coast forests, arid hillsides, and scrub and oak woodlands.	High potential to move through and hunt on the Project site based on presence of suitable habitat. Mule deer (*Odocoileus hemionus*) was occasionally observed foraging and moving through the Project site, specifically within the Tract Map Site BSA on three occasions (5/20/2020, 6/22/2020, and 6/22/2020). However, the mountain lion was not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours.

Table 10. Special-Status Wildlife Species that have Potential to Occur on the Project Site

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Taxidea taxus	American badger	None/CSC	Dry, open, treeless areas, including grasslands, coastal scrub, agriculture, and pastures, especially with friable soils.	Low potential to occur. The Project site provides suitable burrowing and foraging habitat. No burrows with American badger sign (claw marks, scat, fur) observed during the burrowing owl habitat suitability survey assessment or focused burrowing owl breeding season surveys following the Staff Report on Burrowing Owl Mitigation, Appendix C (CDFG 2012). Additionally, no American badgers observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours.

Status Legend
Federal
BCC = USFWS Bird of Conservation Concern
FE = Federally Endangered
FT = Federally Threatened
State
SC = California Candidate
CSC = California Species of Special Concern
FP = Fully Protected
SE = California Endangered
WL = Watch List

5.4.4.1 Reptiles

5.4.4.1.1 California Legless Lizard

California legless lizard (*Anniella* spp.) is a CSC. The California legless lizard is a burrowing animal found primarily in areas with sandy or loose soils where they typically are found beneath leaf litter and in the soil (Holland and Goodman 1998; Zeiner et al. 1988). This species may be found in sparsely vegetated areas in a variety of habitats, including beach dunes; chaparral; California sagebrush scrub; oak woodlands; pine forests; pine–oak woodland; sandy washes; and stream terraces with sycamores, cottonwoods, or oaks (Zeiner et al. 1988; Stebbins 2003; Holland and Goodman 1998). Rocky soils or areas disturbed by development, agriculture, sand mining, or other human uses where the loose substrate has been removed or altered are not suitable for legless lizards (Miller 1944; CDFG 1971; Hunt 1983; Stebbins 2003; Jennings and Hayes 1994). Soil moisture is considered essential for legless lizards to conserve energy at high temperatures and to also allow shedding to occur (Jennings and Hayes 1994). Suitable habitat for this species is present within the Project site, including within the scrub habitats, chaparral habitats, and oak woodland areas. Moderate potential to occur based on presence of suitable habitat. However, California legless lizards were not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours.

5.4.4.1.2 San Diegan Tiger Whiptail

San Diegan tiger whiptail (*Aspidoscelis tigris stejnegeri*) is a CSC. This species is slim bodied with a long slender tail and can be found in a variety of habitats, including hot and dry open areas with sparse vegetation such as chaparral, woodland, and riparian (CalHerps 2016). San Diegan tiger whiptails were observed on the Project site during the 2018 focused surveys. No San Diegan tiger whiptails were observed on the Project site in 2016, 2017, or 2020. Suitable habitat for this species is present on the Project site, including within the scrub habitats and dry open area habitats on site.

5.4.4.1.3 Blainville's Horned Lizard

Blainville's horned lizard (*Phrynosoma blainvillii*) is a CSC. The species is found in a wide variety of vegetation types in loose sandy soils, including California sagebrush scrub, annual grassland, chaparral, oak woodland, riparian woodland, and coniferous forest (Klauber 1939; Stebbins 1954). Other identified habitat characteristics include open areas with limited overstory for basking and low but relatively dense shrubs for refuge (Jennings and Hayes 1994). Suitable habitat for this species is present on the Project site, including within the scrub habitats and dry open area habitats on site. Low potential to occur based on presence of suitable habitat. However, Blainville's horned lizards not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours.

5.4.4.1.4 Birds

5.4.4.1.5 Cooper's Hawk

The Cooper's hawk (*Accipiter cooperii*; nesting) is a CDFW Watch List species. It is found throughout California in wooded areas. It inhabits live oak, riparian, deciduous, or other forest habitats (Curtis et al. 2006). This species nests in many species of trees in both extensive forests or isolated trees in natural and urbanized landscapes often within 1 kilometer of water (Curtis et al. 2006). Cooper's hawks use patchy woodlands and edges with snags for perching while they are hunting for medium-sized birds and small mammals (Zeiner et al. 1990a, Curtis et al. 2006). Although the Project site contains suitable trees for nesting, Cooper's hawks were observed flying over the Project site during 2018 and 2020 surveys. The trees on site also serve as suitable perches for hunting birds and small mammals that may occur in the grassland or scrub habitats on site. Therefore, this species has a high potential to hunt and moderate potential to nest on site.

5.4.4.1.6 Sharp-Shinned Hawk

The sharp-shinned hawk (*Accipiter striatus*; nesting) is a CDFW Watch List species. It nests in coniferous forests, ponderosa pine, black oak, riparian deciduous, mixed conifer, and Jeffrey pine; and winters in lowland woodlands and other habitats. Although the Project site lacks suitable trees for nesting, sharp-shinned hawks were observed flying over the Project site during 2018 surveys. Sharp-shinned hawks are not expected to nest based on lack of suitable nesting habitat and are not known to nest in the region (Allen et al. 2016).

5.4.4.1.7 Southern California Rufous-Crowned Sparrow

Southern California rufous-crowned sparrow (*Aimophila ruficeps canescens*) is a CDFW WL species, as well as a designated locally sensitive species within the County of Los Angeles. The avian species is a relatively large sparrow with a long tail and bright reddish-brown crown. This species prefers rocky hillsides with plenty of grass, shrubs, and small trees. Scrub vegetation offers protection for foraging; this species nests on the ground, generally in depressions or at the base of shrubs. The California sagebrush scrub on the Project site offers suitable foraging

and nesting habitat for this species. This species was observed on the Project site during the focused coastal California gnatcatcher surveys conducted in 2018. No southern California rufous-crowned sparrows were observed during surveys conducted on the Project site in 2017 and 2020.

5.4.4.1.8 Burrowing Owl

Burrowing owl is a USFWS BCC and a CSC. With a relatively wide-ranging distribution throughout the west, burrowing owls are considered to be habitat generalists (Lantz et al. 2004). In California, burrowing owls are yearlong residents of open, dry grassland and desert habitats, and in grass, forb, and open shrub stages of pinyon-juniper and ponderosa pine habitats (Zeiner et al. 1990a). Preferred habitat is generally typified by short, sparse vegetation with few shrubs, level to gentle topography, and well-drained soils (Haug et al. 1993).

The presence of burrows is the most essential component of burrowing owl habitat, as they are required for nesting, roosting, cover, and caching prey (Coulombe 1971; Martin 1973; Green and Anthony 1989; Haug et al. 1993). In California, burrowing owls most commonly live in burrows created by California ground squirrels. Burrowing owls may occur in human-altered landscapes such as agricultural areas, ruderal grassy fields, vacant lots, and pastures if the vegetation structure is suitable (i.e., open and sparse); useable burrows are available; and foraging habitat occurs in close proximity (Gervais et al. 2008). Debris piles, riprap, culverts, and pipes can be used for nesting and roosting.

A burrowing owl habitat suitability survey assessment was conducted within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA on May 20, 2016, which found that suitable nesting and foraging habitat for burrowing owl is present in grasslands throughout the BSAs. In spring and summer 2018, focused burrowing owl breeding season surveys following the Staff Report on Burrowing Owl Mitigation, Appendix C (CDFG 2012), were conducted within the BSAs. Initially, the entirety of the BSAs was surveyed via walking transects spaced approximately 20 meters apart for the presence of suitable burrows and/or burrow surrogates (e.g., debris piles and open pipes), which were mapped using a Trimble Geo XT GPS unit with sub-meter accuracy. During the initial survey, a total of five burrows were identified that met the suitability requirements for the species, including entrances of greater than 11 centimeters in diameter. The remainder of the BSAs contains numerous small mammal burrows; however, the vast majority of these burrows are well below the 11-centimeter threshold and are not considered suitable based on the habitat assessment criteria presented in Appendix B of the Staff Report on Burrowing Owl Mitigation (CDFG 2012). The subsequent survey passes consisted of walking transects spaced approximately 10 meters apart in the immediate vicinity of the mapped burrows and visual surveys over the remainder of the BSAs.

At the conclusion of the breeding season surveys, no burrowing owl or burrowing owl sign was found within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, or the Off-Site Open Space Area BSA, and this species is determined not to be breeding on site. The nearest CNDDB burrowing owl occurrence is within 1.5 miles of the Tract Map Site BSA, the only CNDDB observation within 5 miles. The Los Angeles County Breeding Bird Atlas project did not confirm breeding by burrowing owl in the Santa Clarita Valley and did not note historical occurrences in this area (Allen et al. 2016). Therefore, the species is unlikely to nest on the Project site, but potentially occurs during migration or winter. Due to the limited number of suitable burrows identified and the dense grassland growth, the BSA is determined to be sub-optimal for overwintering. However, burrowing owl were not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys, a burrowing owl habitat suitability survey assessment, and focused burrowing owl breeding season surveys following the Staff Report on Burrowing Owl Mitigation, Appendix C (CDFG 2012).

5.4.4.1.9 Oak Titmouse

The oak titmouse (*Baeolophus inornatus*) is a USFWS BCC. Oak titmouse individuals are known to occur in montane hardwood-conifer, montane hardwood, blue oak, valley oak and coastal oak woodlands, and montane and valley foothill riparian habitats. This species is known to be a common breeding resident in coast live oak and cottonwood riparian communities. Oak titmouse was observed within the Tract Map Site BSA during surveys completed in 2018 and within the Off-Site Water Tank Area BSA during surveys completed in 2020. Note that the species was not observed nesting. Suitable nesting habitat is present on the Off-Site Water Tank Area BSA; however, no other suitable habitat occurs within the Project site.

5.4.4.1.10 Ferruginous Hawk

The ferruginous hawk (*Buteo regalis*) is a USFWS BCC and a CDFW WL species. Ferruginous hawks are present in the region during the wintering season and are not known to breed in California. This species requires large, open tracts of grasslands, sparse shrub, or desert habitats, where it searches for prey from low flights and glides to intercept prey on the ground. It also hovers and hunts from high mound perches (Zeiner et al. 1990a). Suitable winter foraging habitat for this species is present on the Project site, primarily within the open grassland areas. However, ferruginous hawk were not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.

5.4.4.1.11 Costa's Hummingbird

The Costa's hummingbird (*Calypte costae*) is a USFWS BCC species. Costa's hummingbird nests and forages in desert wash, edges of riparian and valley–foothill riparian, coastal scrub, desert scrub, desert succulent scrub, lower-elevation chaparral, and palm oasis. Costa's hummingbird was observed during surveys completed in 2020. The Costa's hummingbird is not expected to nest based on lack of suitable nesting habitat.

5.4.4.1.12 Vaux's Swift

The Vaux's swift (*Chaetura vauxi*) is a CSC. Vaux's swift nests in coniferous or mixed forest and forages in forest openings, especially above streams. Vaux's swift was observed during surveys completed in 2018. Vaux's swift is not expected to nest based on lack of suitable nesting habitat.

5.4.4.1.13 Merlin

The merlin (*Falco columbarius*) is a CDFW WL species. Merlins are present in the region during the wintering season (September to May) and are not known to nest in the state. Merlins frequent open habitats at low elevation near water and dense tree stands (Zeiner et al. 1990a). Suitable winter foraging habitat for this species is present within the Project site, primarily within the open grassland areas. However, merlin was not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.

5.4.4.1.14 California Condor

California condor (*Gymnogyps californianus*) is a federally and state-listed endangered species and a California FP species. California condor is known to fly over the Project vicinity when moving from nesting areas in the Sespe Wilderness area to the northwest and foraging areas in the San Gabriel Mountains to the southeast. California

condor are strictly a scavenger, eating carrion such as cattle, sheep, deer, and ground squirrel carcasses. This species requires vast expanses of open savannah, grassland, and foothill chaparral with cliffs, large trees, and snags for roosting and nesting (Zeiner et al. 1990a).

Based on available GPS-tracking data, condors are not known to fly directly over the Project site. The annual brome grassland vegetation community provides suitable foraging habitat for this species; however, no livestock grazing takes place within the BSA, and therefore, the Project site does not support a regular, predicable source of large mammalian carrion (i.e., dead cattle) required by this species. Mule deer and other potential forage items likely occur within the Project site, though this species is not anticipated to be a common resident on site, and the site would not be expected to provide the food source necessary for regular California condor use. However, California condor was not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.

5.4.4.1.15 Loggerhead Shrike

The loggerhead shrike (*Lanius ludovicianus*) is a USFWS BCC and a CSC. It is widespread throughout the United States, Mexico, and portions of Canada (Humple 2008). The species is a yearlong resident in most of the United States, including from California east to Virginia and south to Florida, and in Mexico. In California, while shrikes are widespread at the lower elevations in the state, the largest breeding populations are located in portions of the Central Valley, the Coast Ranges, and the southeastern deserts (Humple 2008).

Preferred habitats for loggerhead shrikes are open areas that include scattered shrubs, trees, posts, fences, utility lines, or other structures that provide hunting perches with views of open ground, as well as nearby spiny vegetation or human-made structures (such as the top of chain-link fences or barbed wire) that provide a location to impale prey items for storage or manipulation (Humple 2008). Loggerhead shrikes occur most frequently in riparian areas along the woodland edge, grasslands with sufficient perch and butcher sites, scrublands, and open canopied woodlands, although they can be quite common in agricultural and grazing areas, and can sometimes be found in mowed roadsides, cemeteries, and golf courses. Loggerhead shrikes occur only rarely in heavily urbanized areas. For nesting, the height of shrubs and presence of sparse canopy cover are most important (Yosef 1996). The Project site provides suitable foraging and nesting habitat for loggerhead shrikes. However, loggerhead shrikes were not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.

5.4.4.1.16 Coastal California Gnatcatcher

The coastal California gnatcatcher is a federally listed threatened species and a CSC. It is closely associated with coastal sage scrub habitat and is thereby threatened primarily by loss, degradation, and fragmentation of this habitat. Coastal California gnatcatcher typically occurs below 820 feet amsl within 22 miles of the coast and 1,640 feet amsl for inland regions (Atwood and Bolsinger 1992). The California gnatcatcher typically occurs in or near coastal scrub vegetation, which is composed of relatively low-growing, dry-season deciduous and succulent plants. Characteristic plants of this community include California sagebrush, various species of sage (*Salvia* spp.), California buckwheat, lemonadeberry (*Rhus integrifolia*), California brittle bush (*Encelia californica*), and cactus (e.g., *Opuntia* spp.). California gnatcatchers also occur in chaparral, grassland, and riparian vegetation communities where the coastal scrub community is close by (Bontrager 1991). In addition, studies have suggested that coastal California gnatcatcher avoids nesting on very steep slopes (greater than 40%) (Bontrager 1991). Coastal California gnatcatcher is also impacted by brown-headed cowbird (*Molothrus ater*) nest parasitism (Braden et al. 1997).

No California gnatcatchers were observed during the 2018 protocol-level focused surveys within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, or the Off-Site Open Space Area BSA. No California gnatcatchers were observed during the 2020 protocol-level focused surveys within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, or the Off-Site Water Tank Area BSA. Detailed results of the 2018 and 2020 focused surveys are provided in the Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project (Appendix D and Appendix E, respectively). In summary, no coastal California gnatcatcher were observed during 2007 (Glenn Lukos2007), 2018 (Dudek 2018), or 2020 (Dudek 2020) protocol-level focused surveys.

5.4.4.2 Mammals

5.4.4.2.1 San Diego Black-Tailed Jackrabbit

The San Diego black-tailed jackrabbit (*Lepus californicus bennettii*) is listed as a CSC. Species-specific surveys were not conducted on the Project site; however, several focused burrowing owl and coastal California gnatcatcher surveys have been completed, which included an inventory of wildlife within the entire Project site. Although suitable habitat for this species is present, this species would have been detected during surveys, if present. Accordingly, San Diego black-tailed jackrabbit were not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours.

5.4.4.2.2 San Diego Desert Woodrat

The San Diego desert woodrat (*Neotoma lepida intermedia*) is listed as a CSC. The San Diego desert woodrat occupies many diverse habitats, including California sagebrush scrub present within the Project site (Zeiner et al. 1990b). Species-specific surveys were not conducted on the Project site; however, several focused burrowing owl and coastal California gnatcatcher surveys have been completed, and woodrat middens were noted as they were encountered throughout the Project site. Woodrat middens were found sporadically within the coastal sage scrub vegetation communities on slopes of varying degree and aspect, though they were most often associated with dense coastal sage scrub at the base of large shrubs. Live-trapping did not take place during the survey effort; however, San Diego desert woodrat are known to occur in the region, and based on the presence of woodrat middens, there is high potential for this species to occur on site.

5.4.4.2.3 Mountain Lion

Mountain lions (*Puma concolor*) are not threatened or endangered in California; however, the southern and central coast California evolutionary significant units are candidate species for listing under CESA. On June 25, 2019, the Center for Biological Diversity and Mountain Lion Foundation formally petitioned the California Fish and Game Commission to protect mountain lions under CESA. In April 2020, the California Fish and Game Commission voted unanimously that listing of an evolutionarily significant unit (southern and central coast California) of mountain lions may be warranted. At this time, CDFW is conducting a 1-year status review. It should be noted that during the status-review period, all candidate species are treated as though they are listed, and therefore take (hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill) cannot be permitted without a CDFW Incidental Take Permit. Mountain lions are large predatory mammals that prefer areas with dense undergrowth and cover in deserts, humid coast forests, arid hillsides, and scrub and oak woodlands. Species-specific surveys and wildlife camera surveys were not conducted; however, there is high potential to move through the Project site based on presence of suitable habitat and presence of their primary prey item, the mule deer. Mule deer (*Odocoileus hemionus*) was occasionally observed foraging and moving through the Project site, specifically within the Tract Map Site BSA on three occasions

(May 20, 2020; June 22, 2020; and June 22, 2020). However, mountain lions or their sign (i.e., scat and/or tracks) were not observed on the Project site during 2016, 2017, 2018 or 2020 surveys conducted by Dudek biologists which consisted of over 248 person hours.

5.4.4.2.4 American Badger

The American badger (*Taxidea taxus*) is a CSC. Badgers are generally associated with dry, open, treeless regions, prairies and grasslands, low-intensity agriculture (e.g., pasture and dryland crops), drier open shrublands and forest, parklands, and cold desert areas (Long 1973; Zeiner et al. 1990b). American badger habitat assessment surveys were conducted under favorable weather conditions on May 20, 2016, and October 10, 2016, and May 8 and 9, 2017, and February 12, 2020, for habitat assessment and focused survey efforts (Table 1). Suitable habitat is present for this species, primarily in the open grassland and disturbed areas. Species-specific surveys were not conducted on the Project site; however, the burrowing owl surveys included a comprehensive burrow survey throughout the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA. During the surveys, no burrows indicative of American badger, claw marks and shape, were identified on site. No individual American badgers or their sign (i.e., scat and/or tracks) have been observed on the Project site during other focused surveys conducted in 2016, 2017, 2018, and 2020 by Dudek biologists, which consisted of over 248 person hours.

5.4.5 Critical Habitat

No USFWS-designated critical habitat for listed wildlife species is located within the Project site. USFWS-designated critical habitat occurs for three species within 5 miles of the Project site: least Bell's vireo (*Vireo bellii pusillus*), southwestern willow flycatcher (*Empidonax traillii extimus*), and arroyo toad (*Anaxyrus californicus*). Of these, the closest USFWS-designated critical habitat is for arroyo toad, located approximately 1.4 miles west/southwest of the Project site. The remaining species are approximately 1.6 to 1.8 miles from the Project site. Critical habitat for all three species is associated with the Santa Clara River.

5.4.6 Jurisdictional Waters

In 2016/ 2017, Dudek conducted a formal delineation within the Tract Map Site BSA for waters of the United States (including wetlands) potentially regulated by the USACE, waters of the state potentially regulated by the Los Angeles RWQCB, and jurisdictional streambed and riparian vegetation potentially regulated by CDFW. Results following the assessment of each wetland indicator parameter are provided below, and data sheets are included in Appendix K.

5.4.6.1 Hydrophytic Vegetation

A limited variety of hydrophytic vegetation was observed and recorded within the BSA including arroyo willow (FACW), Fremont cottonwood (*Populus fremontii*; FACW), and mulefat (FACW) present within the waters of the United States and state. In general, the hydrologic features present within the BSA supported primarily upland adapted species including annual grasses and shrubs composed of soft brome (FACU), ripgut brome (Not Listed), basket bush (FACU), and blue elderberry (FACU). The hydrologic features are ephemeral in nature and are presumed to convey water only during and immediately following rainfall events. As such, these features do not provide consistent water levels sufficient to support a diverse array of hydrophytic species. Those hydrophytic species present within the Tract Map Site BSA are well established and no new recruits of these species were observed; however, seasonal variation in rainfall is anticipated to result in fluctuations in recruitment and cover of hydrophytic

species. However, any increase in hydrophytic vegetation cover is expected to be contained entirely within the areas mapped as jurisdictional waters during the 2016/2017 wetland delineation survey.

5.4.6.2 Hydric Soils

Soils present within the Project site and the Tract Map Site BSA include Castaic-Balcom silty clay loam (30% to 50% slopes), Saugus loam (30% to 50% slopes), Saugus loam (30% to 50% slopes) eroded, and Yolo loam (2% to 9% slopes) (USDA 2021). Of these, the Castaic-Balcom silty clay loam (30% to 50% slopes) is considered hydric based on the State Soils Data Hydric Soils List (USDA 2018). Soils present within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area are displayed on Figure 5A. Soils present within the Off-Site Water Tank Area BSA are displayed on Figure 5B. Soils present within the Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area are displayed on Figure 5C. It is important to emphasize that the hydric soils lists were designed primarily to generate a list of potentially hydric soils from the National Soil Information System database. Following examination of soil test pits, hydric soil indicators were not found to be present within the potential jurisdictional features (Appendix K).

5.4.6.3 Hydrology

Hydrologic input sources within the Project site are presumed to consist entirely of rainfall runoff during and immediately following storm events, primarily during the winter season. The Project site is located in the upper portion of the Salt Canyon–Santa Clara River watershed as shown on Figure 6, and the moderately to steeply sloping terrain in the northern and eastern portions of the Tract Map Site BSA appears to convey water downslope rapidly during and following rainfall events as evidenced by a clear OHWM and a defined bed and bank. As water flows downslope to the south and west through the Tract Map Site BSA, the slope flattens and the channel features dissipate, with water apparently spreading out over a relatively wide area identified as swales that did not support a readily identifiable OHWM or defined bed and bank during the 2016/2017 wetland delineation. These findings are supported by direct observation during storm events in January 2017. During these storm events, water flow was observed to infiltrate prior to discharging from the site. However, water flows are expected to reach Del Valle Road during heavy rainfall events and sheet flow to the south before discharging in Chiquito Canyon Creek and ultimately into the Santa Clara River.

Hydrology indicators observed within the Tract Map Site BSA were indicative entirely of riverine hydrology, consisting of sediment deposits (B2-riverine), drift deposits (B3-riverine), and drainage patterns (B10). These indicators, along with direct observations, support the identification of two ephemeral waterways within the Tract Map Site BSA.

5.4.6.4 Jurisdictional Delineation

The results of the delineation are summarized in Table 11 and shown in Figure 7. It is important to note that delineation results are subject to review and a final determination by the regulatory agencies. Because laws, regulatory guidance, and judicial rulings change and may affect the final jurisdictional determination, for purposes of this report, identified jurisdictional features are considered potentially regulated based on Dudek's current understanding of the regulations and discussion with CDFW staff during a site visit on June 29, 2018. Potential waters of the United States are located entirely within the CDFW streambeds and waters of the state. Potential waters of the state are coterminous with the greater extent of CDFW streambeds and bank and CDFW riparian habitat within the Tract Map Site BSA. Swales that lack an OHWM are considered potentially regulated by CDFW only. The potential jurisdictional areas are described in more detail below.

Table 11. Potential Jurisdictional Water Resources within the Tract Map Site BSA

Area	Non-Wetland Waters of the United States (acres)	CDFW-Jurisdictional Streambed and Associated Riparian Vegetation, Non-Wetland Waters of the State (acres)	CDFW-Jurisdictional Swale (acres)	Length (linear feet)
Unnamed Ephemeral Waterway 1	0.06	0.41	N/A	629
Unnamed Ephemeral Waterway 2	0.07	0.64	N/A	1,020
Swale	N/A	N/A	0.06	2,696
Total Jurisdictional Area	**0.13**	**1.05**	**0.06**	**4,345**

Biological Survey Area

Project Components

Tract Map Site

Off-Site Roadway Improvement Area

Off-Site Sewer Line Improvement Area

Off-Site Open Space

Not a Part

Soil Type

CmF2 - Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded

CmG2 - Castaic-Balcom silty clay loams, 50 to 65 percent slopes, eroded

CnG3 - Castaic and Saugus soils, 30 to 65 percent slopes, severely eroded

HcC - Hanford sandy loam, 2 to 9 percent slopes

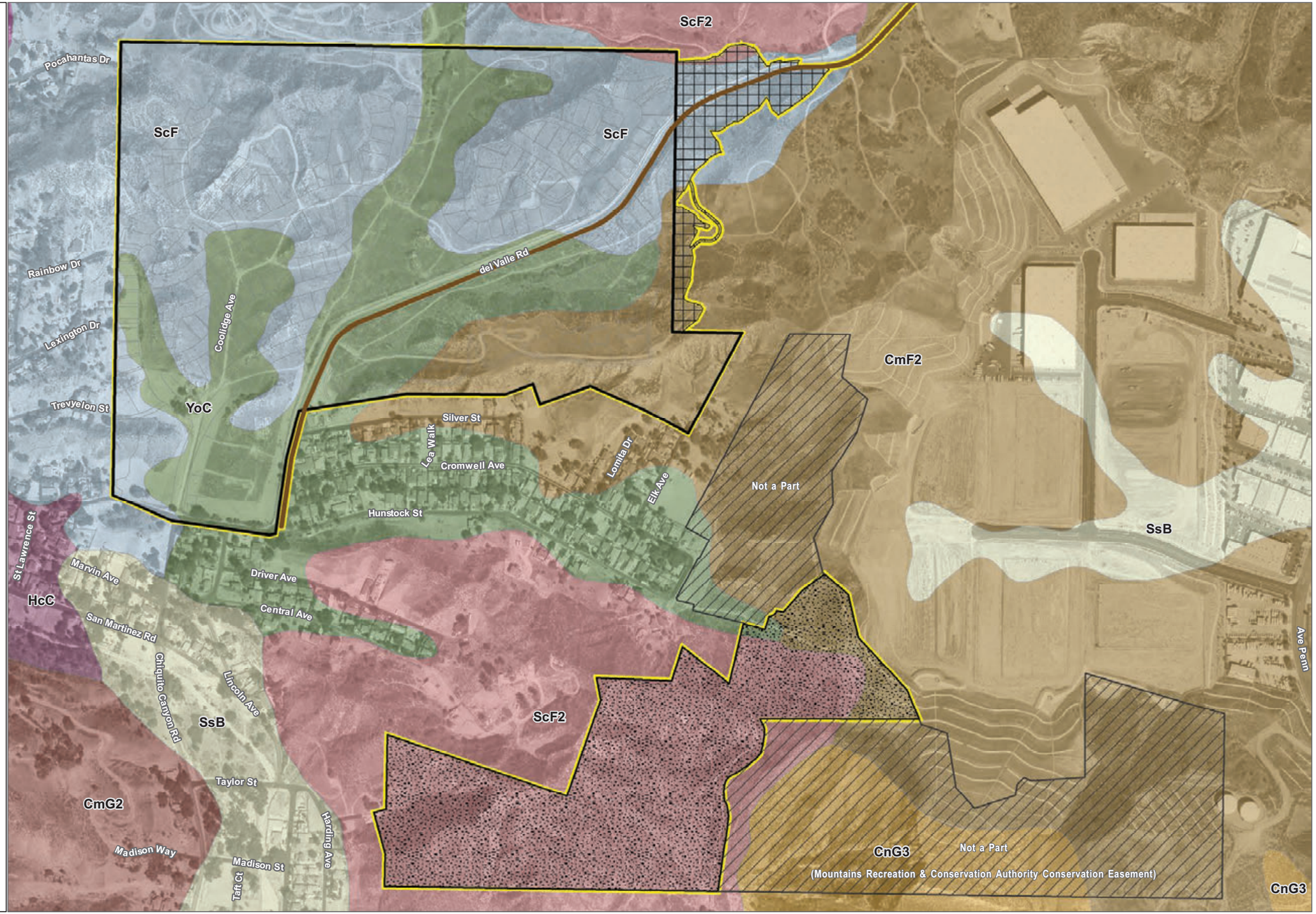
ScF - Saugus loam, 30 to 50 percent slopes

ScF2 - Saugus loam, 30 to 50 percent slopes, eroded

SsB - Sorrento loam, 2 to 5 percent slopes

YoC - Yolo loam, 2 to 9 percent slopes

ZaC - Zamora loam, 2 to 9 percent slopes



SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 230 460 Feet

FIGURE 5A

Tract Map Site, Off-Site Roadway Improvement Area, Off-Site Open Space Area Biological Survey Area Soils

Biological Technical Report for the Sterling Ranch Estates Residential Project

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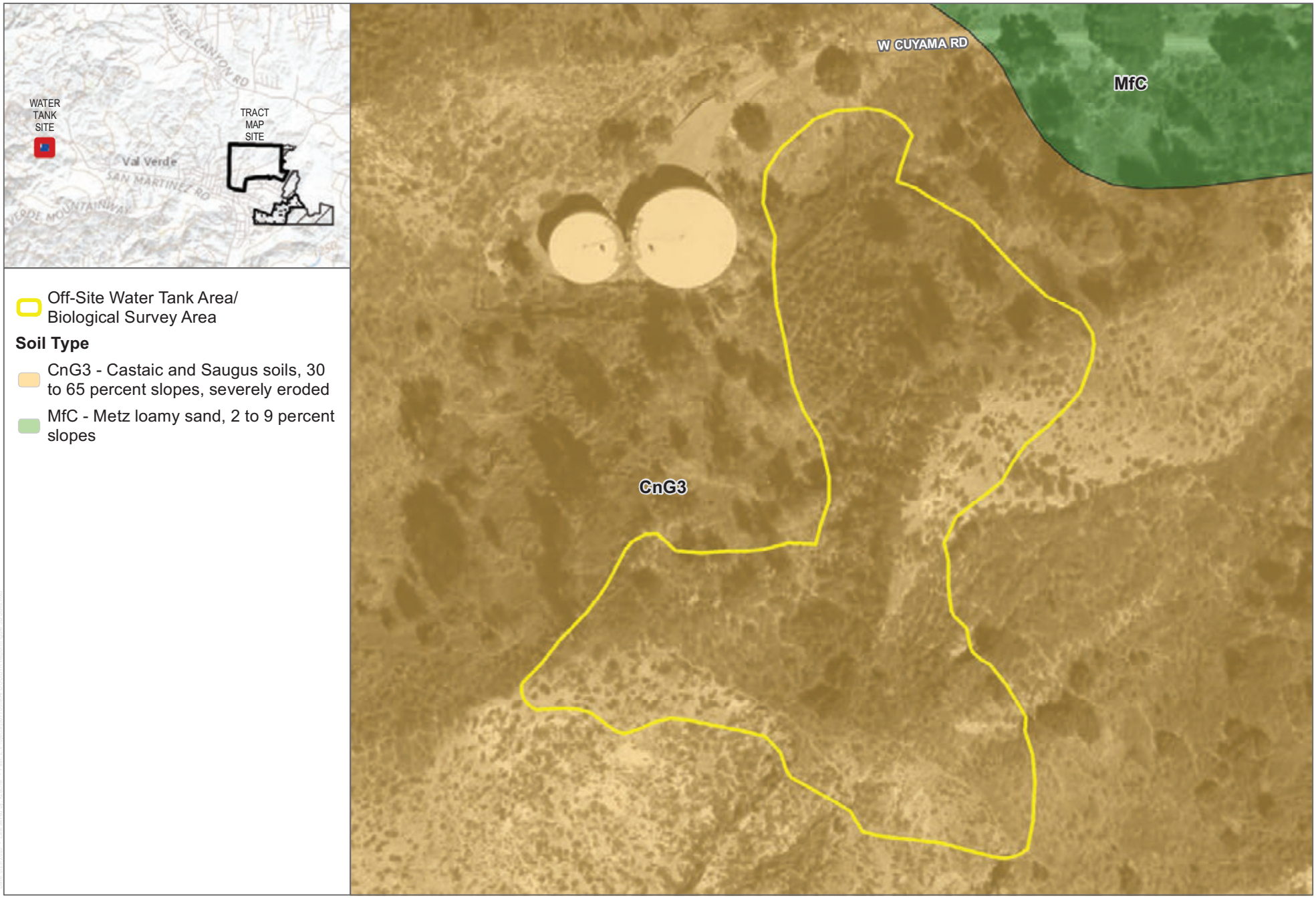

SOURCE: USDA, Eagle Aerial Solutions 2018

DUDEK

0 50 100 Feet

FIGURE 5B

Off-Site Water Tank Area Biological Survey Area Soils

Biological Technical Report for the Sterling Ranch Estates Residential Project

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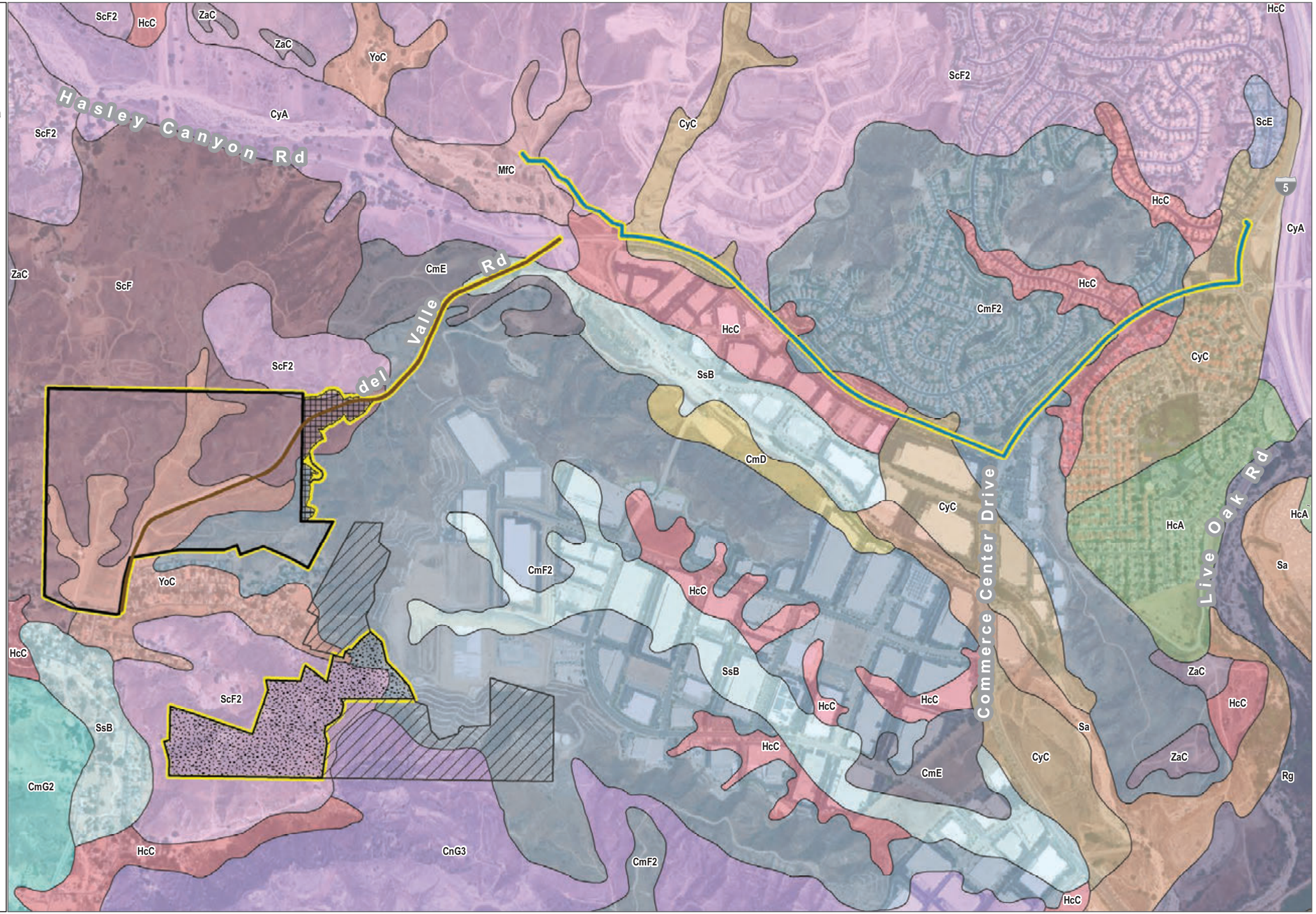
Biological Survey Area

Project Components

- Tract Map Site
- Off-Site Roadway Improvement Area
- Off-Site Sewer Line Improvement Area
- Off-Site Water Line Improvement Area
- Off-Site Open Space Area
- Not a Part

Soil Type

- CmD - Castaic-Balcom silty clay loams, 9 to 15 percent slopes
- CmE - Castaic-Balcom silty clay loams, 15 to 30 percent slopes
- CmF2 - Castaic-Balcom silty clay loams, 30 to 50 percent slopes, eroded
- CmG2 - Castaic-Balcom silty clay loams, 50 to 65 percent slopes, eroded
- CnG3 - Castaic and Saugus soils, 30 to 65 percent slopes, severely eroded
- CyA - Cortina sandy loam, 0 to 2 percent slopes
- CyC - Cortina sandy loam, 2 to 9 percent slopes
- HcA - Hanford sandy loam, 0 to 2 percent slopes
- HcC - Hanford sandy loam, 2 to 9 percent slopes
- MfC - Metz loamy sand, 2 to 9 percent slopes
- Rg - Riverwash
- Sa - Sandy alluvial land
- ScE - Saugus loam, 15 to 30 percent slopes
- ScF - Saugus loam, 30 to 50 percent slopes
- ScF2 - Saugus loam, 30 to 50 percent slopes, eroded
- SsB - Sorrento loam, 2 to 5 percent slopes
- YoC - Yolo loam, 2 to 9 percent slopes
- ZaC - Zamora loam, 2 to 9 percent slopes



SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 500 1,000 Feet

FIGURE 5C

Off-Site Water Line Improvement Area and Off-Site Sewer Line Improvement Area Biological Survey Area Soils

Biological Technical Report for the Sterling Ranch Estates Residential Project

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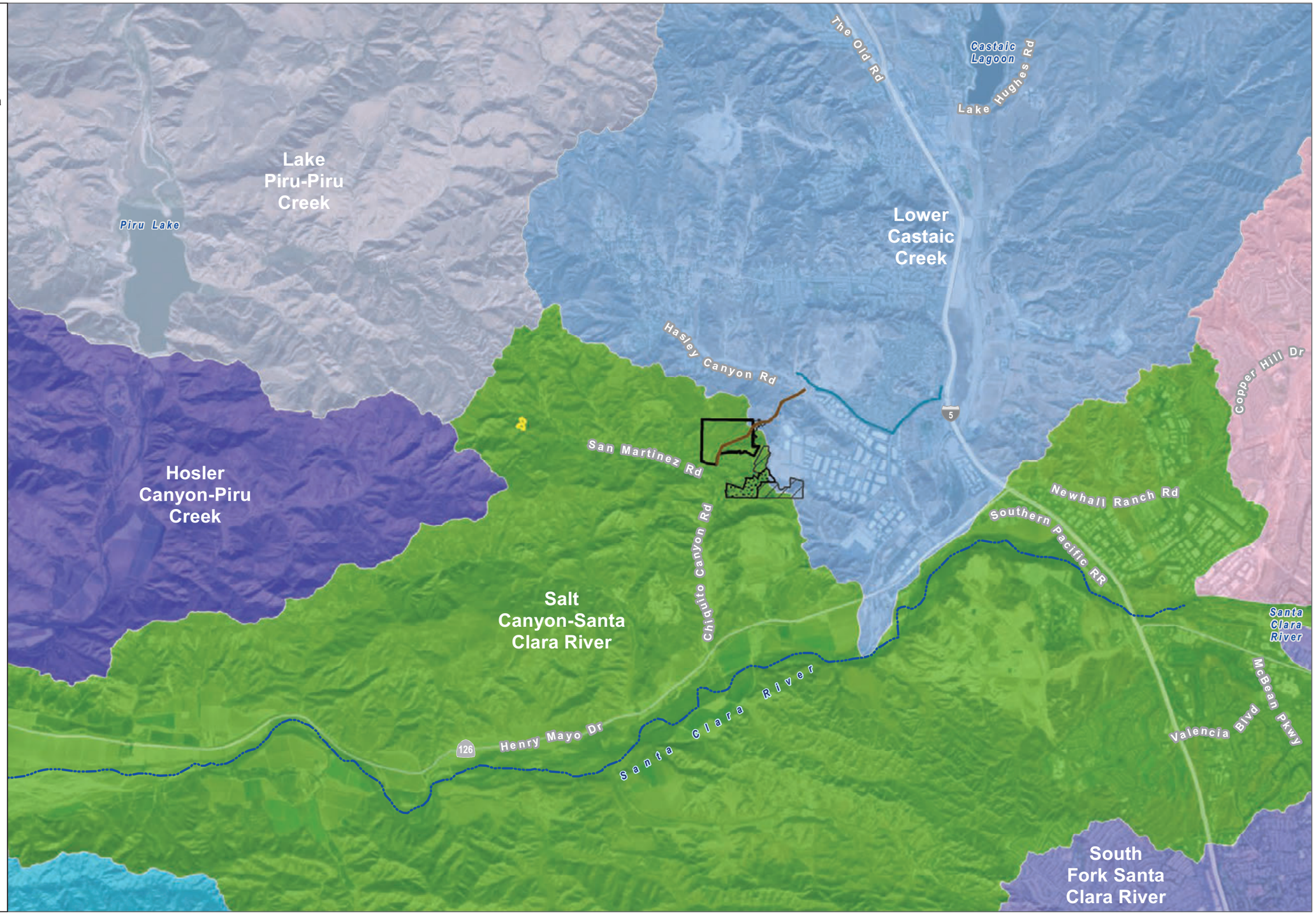
Project Components

- Tract Map Site
- Off-Site Water Tank Area
- Off-Site Roadway Improvement Area
- Off-Site Sewer Line Improvement Area
- Off-Site Water Line Improvement Area
- Off-Site Open Space Area
- Not a Part

Watershed

- Hosler Canyon-Piru Creek
- Lake Piru-Piru Creek
- Lower Castaic Creek
- Pole Creek-Santa Clara River
- Salt Canyon-Santa Clara
- San Francisquito Canyon
- South Fork Santa Clara River



SOURCE: CA DWR 2018

DUDEK

0 0.5 1 Miles

FIGURE 6

Watersheds

Biological Technical Report for the Sterling Ranch Estates Residential Project

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5.4.6.4.1 Unnamed Ephemeral Waterway 1 (North of Del Valle Road)

This feature originates north of the Tract Map Site BSA on an adjacent property, collects runoff from adjacent slopes, and directs flows to the southwest. Within the Tract Map Site BSA, the northern portion of this feature is confined within a channel displaying clear OHWM indicators and a defined bed and bank. Additionally, riparian vegetation is also present in the northern portion of this feature and comprises arroyo willow thickets and mulefat thickets. As the feature extends to the south, the channel dissipates into a wide valley floor dominated by wild oats and annual brome grassland vegetation, at which point the OWHM indicators and bed and bank disappear into a swale, as shown in Figure 7. Where the unnamed ephemeral waterway supports indicators of an OHWM, these areas are considered to be potentially jurisdictional to the USACE as non-wetland waters of the United States. While current regulations (Navigable Waters Protection Rule) exclude ephemeral streams from waters of the United States, these features have been regulated by USACE in the past and under certain procedures (e.g., a Preliminary Jurisdictional Determination) could be regulated even under current interpretations.

CDFW-jurisdictional streambed and RWQCB waters of the state include the water of the United States and additional area extending to the top-of-bank of each side of the unnamed ephemeral waterway as determined based on channel topography. Associated riparian vegetation including arroyo willow thickets and mulefat thickets that occur on the bed and bank and immediately surrounding the unnamed ephemeral channel are also considered jurisdictional to CDFW and RWQCB. As the channel slope becomes gentler and the valley widens, indicators of OHWM or bed and bank drop out, and riparian adapted plant species are no longer encountered. In these areas, the features are determined to be swales that are not jurisdictional to the USACE or RWQCB based on the lack of appropriate hydrologic indicators. However, CDFW does take jurisdiction over swales. Local topography transports water flows to the southwest, which is presumed to infiltrate and/ or be transported in sheet flow to the topographic low point where it discharges onto Del Valle Road, before ultimately flowing into Chiquito Canyon Creek approximately 750 feet (0.14 miles) south of the Tract Map Site BSA, as shown in Figure 7. Based on the USGS StreamStats data query (USGS 2017c), the drainage area of this feature totals approximately 0.1 square miles.

5.4.6.4.2 Unnamed Ephemeral Waterway 2 (South of Del Valle Road)

This feature originates north and east of the Tract Map Site BSA on adjacent properties. Similar to Unnamed Ephemeral Waterway 1, this feature collects runoff from adjacent slopes and directs flows to the west and southwest. A significant portion of the hydrologic input is presumed to be from runoff from Del Valle Road that has formed a defined channel in the road shoulder prior to entering the Tract Map Site BSA. Hydrologic inputs from the east do not appear to contribute a significant amount of flow, as no defined OHWM or bed and bank was identified in this area. Regardless, flows coalesce into a confined channel that displays clear OHWM indicators and a defined bed and bank. Where the unnamed ephemeral waterway supports indicators of an OHWM, these areas are considered potentially jurisdictional to the USACE as non-wetland waters of the United States.

CDFW-jurisdictional streambed and RWQCB waters of the state include the water of the United States and additional area extending up to the top-of-bank of each side of the unnamed ephemeral waterway as determined based on channel topography. Associated riparian vegetation including basket bush alliance, which occurs on the bed and bank and immediately surrounding the unnamed ephemeral channel, is also considered jurisdictional to CDFW and RWQCB. While the dominant species in the basket bush thickets vegetation community—basket bush—is not a hydrophytic species, the community has established on the slopes of the channel, and therefore is considered a riparian vegetation community. As the feature extends to the west, the channel transitions into a wild oats and annual brome grassland dominated area; however, OWHM indicators and bed and bank persist for a short distance prior to the point where water discharges onto Del Valle Road, as shown in Figure 7. Flows from this feature are anticipated to combine

with flows from Unnamed Ephemeral Waterway 1 prior to discharging into Chiquito Canyon Creek. Based on the USGS StreamStats data query (USGS 2017c), the drainage area of this feature totals approximately 0.03 square mile.

5.5 Wildlife Corridors and Habitat Linkages

Wildlife corridors are linear features that connect large areas of natural open space (i.e., core habitat) and provide avenues for dispersal and movement of animals and dispersal of plants (e.g., via wildlife vectors). Wildlife movement corridors contribute to population viability by ensuring exchange of genes between populations of species, which helps maintain genetic diversity, reduction in human-wildlife interactions, and reestablishment of populations in core habitats after stochastic environmental events (i.e., wildfire).

Habitat linkages are narrow or small movement pathways (i.e., trails, strips of native vegetation, etc.) that serve as connections between habitat patches by joining larger core habitat areas that help reduce the adverse effects of habitat fragmentation. Further, the habitat linkages are important in facilitating the movement of multiple small to medium species and in maintaining ecological processes. Although some individual animals may not move through a habitat linkage, the linkage is a potential route for gene flow and long-term dispersal. Habitat linkages may serve as both habitat and avenues of gene flow for small animals such as reptiles, amphibians, and rodents. Habitat linkages may be represented by continuous patches of habitat or by nearby habitat "islands" that function as steppingstones for dispersal and movement (especially for birds and flying insects). Wildlife corridors and habitat linkages provide avenues for dispersal or migration of animals that also contribute to population viability in several ways, including (1) ensuring continual exchange of genes between populations to aid in maintaining genetic diversity, (2) providing habitat for some species, (3) providing access to adjacent habitat areas representing additional territory for foraging and mating, (4) allowing for a greater carrying capacity, and (5) providing routes for colonization of habitat islands following local population extinctions or habitat recovery from ecological catastrophes.

The Project site is situated between an industrial park to the east, community of Val Verde (single-family homes) to the south and southwest, and the larger community of Castaic and Hasley Canyon community to the north with portions of mostly undeveloped surrounding lands to the northwest and west. From a regional perspective, Interstate 5 approximately 2 miles to the east of the Project site is a major barrier to wildlife movement with additional wildlife connectivity restrictions from the industrial park approximately 0.2 miles to the east of the Project site; residential developments to the north, south, and southwest; and the landfill, State Route 126, and the approved Newhall Ranch development (currently the first phase of Newhall Ranch is under construction) to the south. These existing and approved developments constrain wildlife from moving through the Project site. Additionally, there are expansive open spaces further to the west of the existing single-family residential development, which provide connecting north–south habitats and wildlife corridors between the Santa Felicia Significant Ecological Area (SEA) and Santa Clara River SEA through Los Angeles County and Ventura County.

The open space further to the west of the Project site provides important northwest–southeast wildlife habitat for wildlife between the Santa Felicia SEA and Santa Clara River SEA. The Santa Felicia SEA contains core habitat for many terrestrial species; the habitat is largely undeveloped and contains vast stands of intact coast sage scrub and chaparral communities. These intact habitats provide wildlife movement corridors through the Santa Felicia watershed to the northwest in addition to the riparian systems between Piru Lake to the northwest and the San Gabriel Mountain range to the south extending east. The southern portion of the Santa Felicia SEA contains some oil development with a network of dirt roads and few buildings scattered throughout the SEA. The Project site does not restrict movement between Lake Castaic and Castaic Lagoon and/or along the Santa Felicia SEA or the Santa Clara River SEA.

South Coast Missing Linkages: A Wildland Network for the South Coast Ecoregion (South Coast Wildlands 2008) has prioritized and designed landscape linkages that are widely considered the backbone of a conservation strategy for Southern California. The Project site is outside the designated landscape linkages. The Sierra Madre–Castaic Connection approximately 2.3 miles to the north of the Project site connects the Los Padres National Forest and Angeles National Forest. The Santa Monica–Sierra Madre Connection approximately 2.5 miles to the west of the Project site stretches from the Santa Monica Mountains to the peaks of the Santa Susana Mountains and the Sierra Madres Ranges of the Los Padres National Forest (South Coast Wildlands 2008).

The California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California (Spencer et al. 2010) was prepared because a functional network of connected wildlands is essential to the continued support of California's diverse natural communities in the face of human development and climate change. The report includes a statewide Essential Habitat Connectivity Map, data characterizing areas delineated on the map, and guidance for mitigating the fragmenting effects of roads and for developing and implementing local and regional connectivity plans. The Project site is located approximately 2 miles to the east of Essential Connectivity Areas identified in the California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California (Spencer et al. 2010).

Although the Project site does not reside within any recognized wildlife corridors identified in the Los Angeles County General Plan, the South Coast Missing Linkages Project landscape linkages (Penrod et al. 2005; South Coast Wildlands 2008), or the California Essential Habitat Connectivity Project essential habitat connectivity areas, the Project site supports natural vegetation communities dominated by woodland, grasslands, and coastal scrub habitats, which support localized wildlife movement through the area. These habitats enable wildlife to move between habitat patches within suburban development and provide habitat linkages from north–south and east–west directions.

Approximately 12.6 acres of the Tract Map site and the manufactured open space around the perimeter of the Tract Map site would continue to facilitate wildlife movement for a variety of wildlife species for the foreseeable future. This area is composed of California sagebrush – California buckwheat scrub alliance, wild oats and annual brome grasslands semi-natural alliance, *Brassica nigra – Bromus diandrus* semi-natural association, and developed habitat.

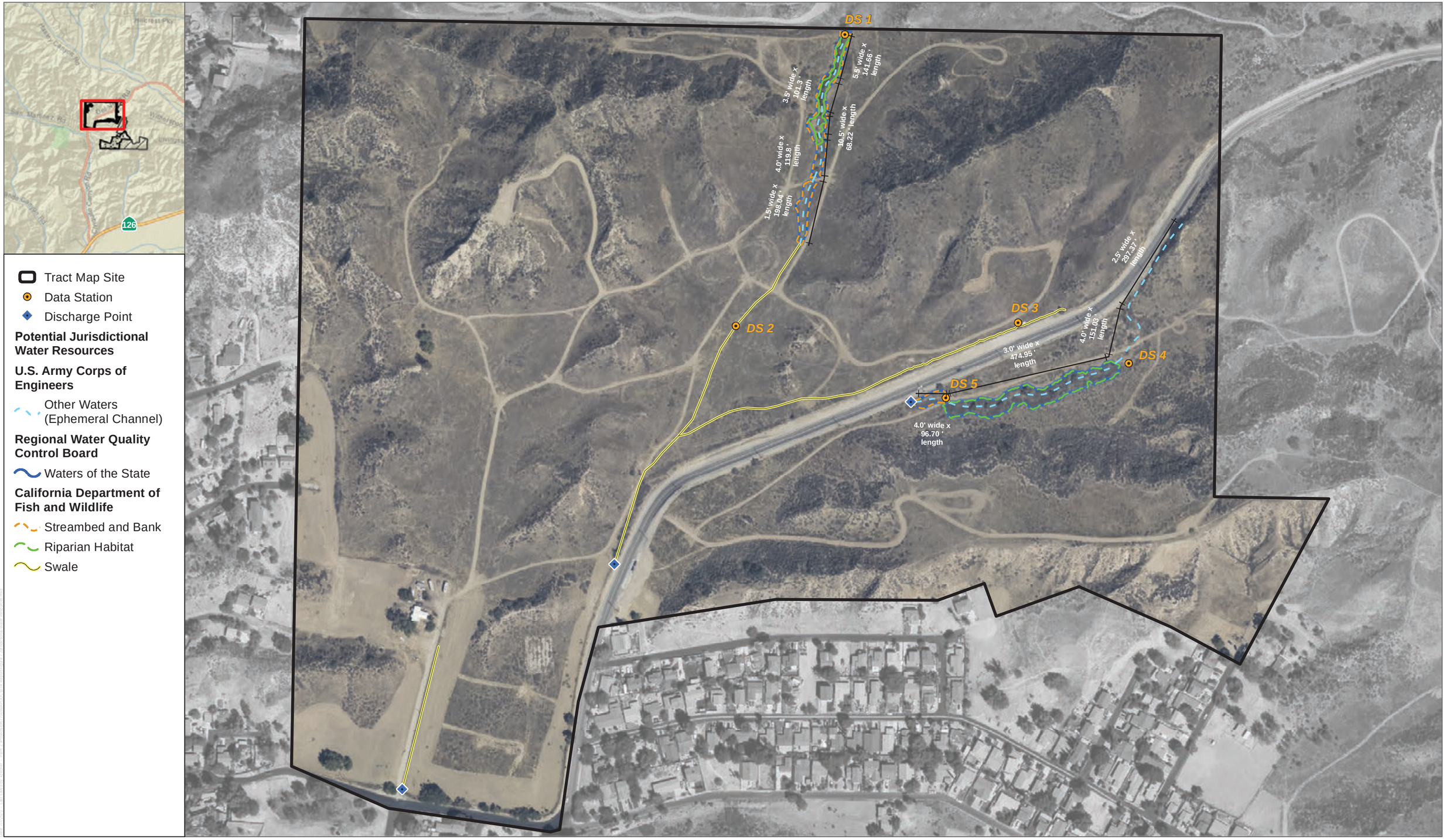
Contiguous habitat of natural vegetation within the immediate vicinity of the Project site includes:

- The Applicant proposes to dedicate the 37.9-acre Off-Site Open Space Area (within a portion of APN 3271-005-032) as a permanent open space to be preserved in perpetuity in a conservation easement.
- 12.6 acres of the Tract Map Site, particularly areas covered by invasive species such as mustard, wild oats, and annual brome grasses within the northwest and southeast portions of the Tract Map Site, may be used for habitat restoration and enhancement.
- An existing 41.3-acre conservation easement subject to preservation in perpetuity held by Mountains Recreation & Conservation Authority adjacent to the east of the proposed 37.9-acre Open Space area conservation easement (as shown on Figure 8A)
- A 16.1-acre Tentative Tract (TR062000). The tract is currently zoned R-1 (Single Family Residential). The Applicant and current landowner has dedicated a 20-foot-wide trail easement through the site (TR060257) and along the eastern boundary of the TR062000, so the three parcels will remain connected.

These portions and surrounding areas are shown in Figure 8A and Figure 8B, respectively.

Overall wildlife movement is regionally and locally constrained through the Project site from existing and approved developments including Interstate 5; the communities of Castaic, Hasley Canyon, and Val Verde; the industrial park;

the landfill; State Route 126; and the Newhall Ranch development. The Project is located outside of Los Angeles County designated SEAs, South Coast Wildlands-designed landscape linkages, and Essential Connectivity Areas identified in the California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California (Spencer et al. 2010). However, the Santa Felicia SEA, Santa Clara River SEA, Sierra Madre–Castaic Connection, and Santa Monica–Sierra Madre Connection further to the west of existing and approved developments provide largely undeveloped intact habitat for wildlife movement corridors and habitat linkages.



SOURCE: DigitalGlobe 2017

DUDEK

0 125 250 Feet

FIGURE 7

Potential Jurisdictional Water Resources

Biological Technical Report for the Sterling Ranch Estates Residential Project

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6 Project Impacts and Proposed Mitigation

Impacts and significance findings identified in this report would be mitigated through the implementation of measures proposed to avoid, minimize, or reduce potentially significant impacts to biological resources. These measures, if successfully implemented, would reduce potential Project impacts to biological resources to less than significant under CEQA.

6.1 Explanation of Findings of Significance

This report analyzes the significance of impacts due to the implementation of the Project to sensitive vegetation communities or riparian habitat, special-status plant species, special-status wildlife species, wildlife corridors and habitat connectivity, and regional resource planning.

Based on CEQA Guidelines Appendix G and other relevant criteria, the Los Angeles County Department of Regional Planning has established the following criteria for determining whether the Project would have a potentially significant impact on biological resources:

Threshold 1: Would the Project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS?

Threshold 2: Would the Project have a substantial adverse effect on any sensitive natural communities (e.g., riparian habitat, coastal sage scrub, oak woodlands, non-jurisdictional wetlands) identified in local or regional plans, policies, regulations, or by the CDFW or USFWS?

Threshold 3: Would the Project have a substantial adverse effect on federally or state protected wetlands (including, but not limited to, marshes, vernal pools, coastal wetlands, and drainages) or waters of the United States, as defined by Section 404 of the federal Clean Water Act (CWA) or California Fish and Game Code Section 1600 et seq., through direct removal, filling, hydrological interruption, or other means?

Threshold 4: Would the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

Threshold 5: Would the Project convert oak woodlands (as defined by the state, oak woodlands are oak stands with greater than 10% canopy cover with oaks at least 5 inches in diameter measured at 4.5 feet above mean natural grade) or otherwise contain oak or other unique native trees (junipers, Joshua tree, southern California black walnut, etc.)?

Threshold 6: Would the Project conflict with any local policies or ordinances protecting biological resources, including Wildflower Reserve Areas (Los Angeles County Code, Title 12, Ch. 12.36), the Los Angeles County Oak Tree Ordinance (Los Angeles County Code, Title 22, Ch. 22.56, Part 16), the Significant Ecological Areas (SEAs) (Los Angeles. County Code, Title 22, Section 22.56.215), and Sensitive Environmental Resources Areas (SERAs) (Los Angeles County Code, Title 22, Ch. 22.44, Part 6)?

Threshold 7: Would the Project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Plan, or other approved state, regional, or local habitat conservation plans?

6.2 Definition of Impacts

This section defines the types of impacts that would occur as a result of implementation of the Project, including direct permanent impacts, direct temporary impacts, and indirect impacts.

6.2.1 Direct Impacts

Direct impacts are impacts that result from direct ground-disturbing activities and consist of the loss of habitat, including any plant and wildlife species that habitat may contain. Direct impacts may be permanent or temporary.

6.2.1.1 Direct Permanent Impacts

Direct permanent impacts refer to the absolute and permanent physical loss of a biological resource due to Project construction activities, such as clearing and grading. This report analyzes five types of direct permanent impacts: (1) permanent loss of vegetation communities, land covers, and general wildlife and their habitat; (2) permanent loss of or harm to individuals of special-status plant species and special-status wildlife species; (3) permanent loss of suitable habitat for special-status species; (4) permanent loss of wildlife movement and habitat connectivity in the Project site; and (5) permanent loss of jurisdictional waters.

6.2.1.2 Direct Temporary Impacts

Direct temporary impacts refer to a temporary loss of vegetation communities and land covers due to construction of proposed temporary haul roads, new access roads, slope remediation, grade control structures, installation of culverts, and other improvements required for the Project. The main criterion for direct temporary impacts is that impacts would occur for a short period of time and would be reversible. Following completion of work, areas temporarily disturbed by construction activities would be restored and revegetated with a native species mix similar to that which existed prior to disturbance such that full biological function can be restored.

6.2.2 Indirect Impacts

Indirect impacts are reasonably foreseeable effects caused by Project implementation on remaining or adjacent biological resources outside the direct construction disturbance zone. Indirect impacts may occur during construction (i.e., short-term construction-related indirect impacts) or later in time as a result of the development (i.e., long-term, or operational, indirect impacts). Indirect impacts may affect areas within the defined Project site but outside the construction disturbance zone, including open space and areas outside the Project site, such as downstream effects.

Indirect impacts include short-term effects immediately related to construction activities and long-term or chronic effects related to the human occupation of developed areas (i.e., development-related long-term effects).

6.2.2.1 Short-Term Indirect Impacts

Short-term indirect impacts are reasonably foreseeable effects on remaining or adjacent biological resources, and that occur during Project construction, but outside the direct limits of work. Short-term indirect impacts may affect areas within the defined Project site but outside the proposed impact limits, including non-impacted areas, and areas outside the Project site, such as downstream effects. In most cases, indirect effects are not quantified, but in some cases, quantification might be included (i.e., using a noise contour to quantify indirect impacts to nesting birds). These indirect impacts may include, for example, dust and noise that could temporarily disrupt habitat and species vitality, or maintenance-related runoff.

6.2.2.2 Long-Term Indirect Impacts

Long-term indirect impacts are reasonably foreseeable effects on remaining or adjacent biological resources that are caused by Project implementation outside the direct limits of work and occur later in time. Indirect impacts may affect areas within the defined Project site but outside the proposed impact limits, including non-impacted areas and areas outside the Project site, such as downstream effects. Long-term or chronic effects related to this Project are primarily related to human occupation of developed areas (i.e., operation-related long-term effects). The Project is not expected to result in a long-term change to the use of the Project site in terms of human activity, lighting, noise, or non-native invasive animals and/or plant species during construction activities.

Each of the following impact sections identifies direct and indirect impacts for biological resources and provides a significance determination. Mitigation measures that would reduce the impact to less than significant are proposed.

6.3 Impacts to Special-Status Plant Species

Threshold 1: Would the Project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS?

This section analyzes direct and indirect impacts to all observed special-status plant species Table 9. Direct and indirect impacts to observed wildlife species are analyzed in Section 6.4.

6.3.1 Direct Impacts to Special-Status Plant Species and Proposed Mitigation

Three special-status plant species were documented within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA during surveys conducted in 2014, 2017, and 2020:

- Slender mariposa lily (CRPR 1B.2)
- Peirson's morning-glory (CRPR 4.2)
- Southern California black walnut (CRPR 4.2)

Impact BIO-1

Project construction would result in direct impacts to slender mariposa lily. Slender mariposa lily was detected within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA during surveys conducted in 2014, 2017, and 2020. Flowering individuals ranged from 87 in 2014 (FLx 2014), to 208 in 2017, and to 8 in 2020. During 2017, the breakdown of the 208 slender mariposa lily individuals observed included 135 individuals within the Tract Map Site BSA, 31 individuals within the Off-Site Roadway Improvement Area BSA, and 42 individuals within the Off-Site Open Space Area BSA. During 2020, the breakdown of the eight slender mariposa lily individuals observed included one individual within the Tract Map Site BSA, one individual within the Off-Site Roadway Improvement Area BSA, and six individuals within the Off-Site Water Tank Area BSA. Flowering individuals provide only a relative estimate of the total population and can vary widely from year to year; however, the results of the 2017 surveys are anticipated to represent a high confidence population estimate due to the optimal rainfall experienced in the region. Since the Off-Site Water Tank Area BSA was not surveyed in 2017, the 2020 survey results for the Off-Site Water Tank Area BSA are representative (six individuals).

The visibility of slender mariposa lily individuals may be more difficult within scrub communities than grass- and herb-dominated vegetation communities; however, the bright color and relatively large flower size allow for observations within more dense vegetation. It should be noted that although actual flowers of slender mariposa are quite visible, not all slender mariposa individuals bloom each year due to environmental factors. For many bulb species and other geophytes, the timing and frequency of rainfall can be just as important as total annual rainfall in determining the level of flowering in any given season. Some individuals may reach the vegetative stage, but due to site conditions (including but not limited to associated vegetation types) and precipitation timing, may actually not bloom. Wildfire also affects blooming of *Calochortus* by removing dense overgrowth, increasing nutrients in soil, and, when coupled with heavy rainfall, it can result in a greater abundance of blooming *Calochortus* plants (Gerritsen and Parsons 2007).

A total of 135 mapped slender mariposa lily individuals were observed and mapped within the Tract Map Site BSA during the 2017 surveys, of which 132 individuals would be directly impacted by construction of the Project; 2 individuals would be impacted in the fuel management zone; and 1 individual is outside of impact areas. A total of 31 mapped slender mariposa lily individuals were observed and mapped within the Off-Site Roadway Improvement Area BSA, of which 31 would be directly impacted by construction of the Project. A total of six mapped slender mariposa lily individuals were observed and mapped within the Off-Site Water Tank Area BSA, of which six individuals would be directly impacted by construction of the Project. Surveys were performed during the known blooming period and were timed to coincide with peak blooming based on regional conditions. The 2017 surveys detected the largest number of slender mariposa lilies of any survey yet conducted within the BSA and form the basis for the impact assessment for the Project. Therefore, based on 2017 survey results, the total number of slender mariposa lilies impacted by the Project is estimated to be 171 individuals. During the 2017 surveys, the highest numbers of mariposa lilies were recorded over all portions of the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and Off-Site Water Tank Area BSA, and as described above, the upper limit of the on-site slender

mariposa population is estimated to be near 166 individuals. During the same period, the number of slender mariposa lilies detected within the Off-Site Open Space Area BSA is estimated to be near 42 individuals.

The remaining 43 mapped slender mariposa lily individuals located outside of the impact area in the Tract Map Site BSA (1 individual) and the Off-Site Open Space Area BSA (42 individuals) would not be impacted by the Project. In summary, of 214 individual slender mariposa lilies detected within the BSA in 2017, 169 individuals would be directly impacted by construction of the Project; 2 individuals would be impacted by fuel management zones; and 43 individuals would be preserved outside of impact areas,

Slender mariposa lily is known to occur in chaparral, coastal sage scrub, and valley and foothill grasslands at elevations of 1,050 to 3,281 feet amsl (CNPS 2021a). During Project surveys, slender mariposa lily individuals were observed and mapped in California sagebrush – black sage scrub, California sagebrush – California buckwheat scrub, California sagebrush scrub, Palmer's goldenbush scrub, purple sage scrub, wild oats and annual brome grasslands, and *Brassica nigra – Bromus diandrus* vegetation communities. Individuals were documented in loam and silty clay loam soils at elevations of 1,272 to 1,788 feet amsl. Although individuals were documented on slope gradients from relatively flat to very steep, 5% to 89%, the majority of individuals were found on slopes of 15% to 80%. The slope aspect in areas supporting slender mariposa lily is predominantly northern (north, northwest, northeast), encompassing approximately 97% of the observed individuals, with only 3% on southwest slopes.

Based on the site characteristics described above where slender mariposa has been documented for the Project site (vegetation community, elevation, slope, aspect, and soils), a GIS analysis was conducted to identify areas in the Project site (Tract Map Site BSA, Off-Site Roadway Improvement Area BSA, Off-Site Water Tank Area BSA, Off-Site Water Line Improvement Area BSA, and Off-Site Sewer Line Improvement Area BSA) where those same characteristics occur. Based on this analysis, the Project site contains approximately 57.64 acres of suitable habitat for the slender mariposa lily. Habitat supporting documented slender mariposa lily occupies a cumulative footprint of 0.092 acres based on a 3-foot buffer radius applied to each point and polygon of slender mariposa lily mapped (2017 slender mariposa lily data was used for the Tract Map Site, Off-Site Roadway Improvement Area, and Off-Site Water Tank Area, and 2020 slender mariposa lily data was used for the Off-Site Open Space Area conservation easement). This 0.092 acres is composed of 0.044 acres of the Tract Map Site, 0.017 acres of the Off-Site Roadway Improvement Area, 0.004 acres of the Off-Site Water Tank Area, and 0.028 acres of the Off-Site Open Space Area conservation easement. Of the 0.092 acres of occupied slender mariposa lily habitat, 0.064 acres would be impacted.

Based on the same type of analysis, the Off-Site Open Space Area conservation easement contains approximately 20.32 acres of suitable habitat for the slender mariposa lily. As mentioned above, the Off-Site Open Space Area conservation easement contains 0.028 acres of habitat occupied by slender mariposa lily, which results in a remaining 20.29 acres of suitable slender mariposa lily habitat that can be utilized for mitigation efforts.

Based on this analysis, impacts to slender mariposa lily, a species that is moderately threatened in California (CRPR 1B.2), would be significant without implementation of mitigation. Based on the analysis, the Project has the potential to cause significant direct impacts to slender mariposa lily. Mitigation for impacts to 171 slender mariposa lily individuals shall include preservation of the existing population on the Off-Site Open-Space conservation easement (estimated at 42 individuals), plus a minimum 5:1 replacement mitigation for slender mariposa lily individuals impacted by proposed project development. Replacement mitigation shall be accomplished through overplanting by at least 10 times the target number of 342 slender mariposa lilies within the 20.32 acres of suitable habitat in the Off-Site Open-Space conservation easement. Overplanting shall be implemented to meet the mitigation goal and is necessary to accommodate mortality of seedlings and the normally low incidence of flowering which may result in undercounting of actual population size. Based on the assumption that one slender mariposa lily individual would occupy 28.27 square feet (3-foot buffer radius), the Off-Site Open Space Area conservation area includes sufficient suitable habitat to mitigate for impacts to slender mariposa individuals. Additionally, the conservation easement includes a slender mariposa lily mitigation and monitoring plan to further mitigate impacts through translocating bulbs and collecting and sowing seeds. Implementation of mitigation measure **MM-BIO-1 Conservation Easement**, as described below, including the off-site preservation and the translocation of impacted individuals effort, including the Slender Mariposa Lily Mitigation and Monitoring Plan, would reduce potential impacts to slender mariposa lily to less than significant.

Impact BIO-2

Project construction would result in direct impacts to Peirson's morning-glory. Peirson's morning-glory was detected within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, and the Off-Site Open Space Area BSA in 2014, 2017, and 2020. Peirson's morning-glory has a CRPR of 4.2. CRPR 4 is defined as a Watch List of plants of limited distribution or infrequent throughout a broader area in California, and their status should be monitored regularly. And threat rank 0.2 is defined as moderately threatened in California. Due to its low sensitivity status, individuals and locations were not mapped, so the impact analysis is based on loss of suitable on-site habitat, including California coastal scrub alliances and grass- and herb-dominated alliances and associations. Of the 145.0 acres of suitable on-site habitat for Pierson's morning-glory, the Project would result in permanent direct impacts to 96.5 acres and 6.7 acres of impacts from fuel management zones. Due to the low sensitivity status of this species, the observations being within the known geographic range of this species and recording a 37.9-acre Off-Site Open Space Area conservation easement (**MM-BIO-1 Conservation Easement**), impacts would be less than significant with mitigation.

The purpose of **MM-BIO-1 Conservation Easement** is to prohibit development of any kind in perpetuity within the 37.9 acres. The protected viable native habitat is known not just to support the known populations of slender mariposa lily, Peirson's morning-glory, and sensitive Palmer's goldenbush scrub, but will also support the translocated and seeded slender mariposa lily populations, along with the other native plant and wildlife species that occur in the conserved native habitat.

MM-BIO-1

Conservation Easement. Prior to issuance of grading permits for the Project, to address impacts to habitat for slender mariposa lily, Peirson's morning glory, and sensitive vegetation communities (*Rhus trilobata* association [S3, riparian], and Palmer's goldenbush

scrub [S3?]), the Project Applicant shall record a conservation easement on the 37.9 acre Off-Site Open Space Area, after review, input, and approval from the California Department of Fish and Wildlife (CDFW) and the County of Los Angeles Department of Regional Planning. This includes preservation of the remaining sensitive vegetation communities: 0.04 acres of *Rhus trilobata* association and 1.4 acres of Palmer's goldenbush scrub provisional alliance.

There shall be no grading or other construction activities within the Off-Site Open Space Area conservation easement boundaries. The conservation easement shall prohibit entry into the preserved area with the installation and maintenance of protective measures such as fencing and signage, and trash removal. Controlled entry shall be allowed for approved work, including monitoring and maintenance efforts, implementation of the Slender Mariposa Lily Mitigation and Monitoring Plan (SMLMMP), or for other activities associated with preserve management. The conservation easement shall prohibit development of any kind within the preserved area in perpetuity. The conservation easement shall also specify allowable uses, if any. Signage shall include information on the organization that holds the conservation easement, descriptions of the restoration activities, protection of biological resources, and restrictions to human access. Signage shall designate if permitted access is allowed within the conservation easement and if so, shall designate that humans and domesticated pets shall remain within designated areas, all domesticated pets shall be on leashes, owners shall clean up after domesticated pets, and that smoking is prohibited. If access is permitted in designated areas, dog waste bag dispensers and wildlife-proof receptacles for trash shall be provided. The conservation easement holder shall be an entity which has as part of its mission the protection of the environment, including lands, plant species, and/or wildlife species, and can be expected by its organization and history to remain in existence for the foreseeable future.

As part of recording the conservation easement, a Conservation Management Plan (CMP) shall be prepared that specifically identifies the required resource management activities and the entities that shall be responsible for managing those activities in perpetuity. The CMP shall include an SMLMMP to be approved by CDFW and the County of Los Angeles. The SMLMMP shall provide guidance and methods to preserve the slender mariposa lily individuals known to occur within the Off-Site Open Space Area conservation easement, along with a program of slender mariposa lily seed collection and dispersal within the Off-Site Open Space Area conservation easement. The SMLMMP shall also include methods and approach to translocating slender mariposa lily individuals proposed for impact into the Off-Site Open Space Area conservation easement. The SMLMMP shall be developed and implemented with a program that does not conflict with other conservation easement resource management objectives. The SMLMMP shall include, at minimum 5:1, mitigation for impacts to 171 slender mariposa lily individuals, as well as preservation of the existing population of slender mariposa lily individuals already documented within the Off-Site Open Space Area conservation easement. The 5:1 mitigation ratio for planted mariposa lilies shall be effected through overplanting at 10:1 (mitigation plantings: impacted individuals), in order to accommodate potential mortality of slender mariposa lily individuals and the difficulty of censusing populations due to low frequency of flowering.

The SMLMMP shall include annual pre-construction surveys to map and flag slender mariposa lily individuals recording the location and quantities of slender mariposa lily for seed collection and translocation. Seed collection shall occur for a minimum of 2 years. If Project construction is delayed additional annual surveys and seed collection may occur. Seeds shall be collected once the seed has matured, but prior to the seed capsules opening to disperse the seed. Seeds shall be stored in breathable paper bags in a cool, dry, and dark place until it can be planted within the Off-Site Open Space Area conservation easement. Upon establishment of the Off-Site Open Space Area conservation easement, seed shall be sowed within appropriate habitat in the Off-Site Open Space Area conservation easement.

During pre-construction surveys, slender mariposa lily individual locations will be marked with a high-accuracy GPS unit and a permanent marker established in the field to locate the individuals for bulb collection. Bulbs shall remain in the ground until project development. Prior to Project development, the bulbs shall be translocated within appropriate habitat in the Off-Site Open Space Area conservation easement as directed by the SMLMMP.

The SMLMMP shall provide details on site preparation measures, as well as specific methods for the pre-construction collection of slender mariposa lily seeds and the harvest of bulbs from impacted populations. The SMLMMP shall also provide detailed methods for the dispersal of that seed, and the translocation of the harvested bulbs, into the conservation easement areas. Finally, the SMLMMP shall provide a schedule and action plan for the maintenance and monitoring programs, including success criteria, and remedial contingency measures to be implemented if efforts are not successful. During slender mariposa lily monitoring, the Off-Site Open Space Area conservation easement shall be surveyed for slender mariposa lilies including the translocated bulb and seed locations recorded with a high-accuracy GPS unit and permanent field markers. Slender mariposa lily monitoring data shall include data on both blooming and vegetative slender mariposa lily individuals to track the success of establishment.

The CMP and the SMLMMP shall identify the frequency of weed management and monitoring activities to document on-site special-status plant population dynamics and general vegetation community composition and status. In addition to routine and as-needed weed management, the CMP shall include an eradication program specific to the non-native tree of heaven (*Ailanthus altissima*) individuals, along with a program to replace those non-native trees with native trees appropriate to the habitat.

Monitoring shall take place annually and in perpetuity from the time of establishment of the conservation easement. If it appears that the population of any special-status plant species or the vegetation community composition and status are on the decline or have been degraded, remedial activities shall be implemented according to the CMP and the SMLMMP. These activities may include weed control, additional seeding, native plant establishment, or other activities where appropriate.

Annual monitoring reports shall be submitted by August 31 of each year and shall include an evaluation of current monitoring data in relation to previous population observations

(during previous monitoring years) and native enhancement efforts. These reports shall also include any recommendations for remedial management measures and shall discuss other issues that need to be addressed, such as trespassing or vandalism.

Prior to Project construction, a Property Analysis Record or alternatively approved costing evaluation shall be conducted to determine two cost components: (1) initial and capital costs and (2) perpetual costs (endowment). Funding, as a condition of obtaining the conservation easement, shall be contributed in an amount sufficient to pay all costs for overseeing the conservation easement in perpetuity. This funding requirement includes, but is not limited to, staff time, biological survey costs, monitoring and reporting, conducting weed removal, and other management activities required under the terms of the conservation easement, the CMP and the SMLMMP). The funding amount shall be subject to approval of the conservation easement holder. A separate endowment fund shall be created by the owner/developer that shall be held by the conservation easement holder. This endowment fund shall be established in an amount that is calculated to provide, in 10 years, the conservation easement holder with sufficient funds for ongoing monitoring and management of the conservation easement in perpetuity.

The intent of the conservation easement shall be to protect, in perpetuity, viable native habitat that can support not just the known populations of slender mariposa lily and Peirson's morning-glory, but also the translocated slender mariposa lily populations, along with the other native plant and wildlife species that occur in the conserved coastal sage scrub habitat.

Less-Than-Significant Direct Impacts to Special-Status Plant Species

Project construction would result in direct impacts to one Southern California black walnut tree within the Tract Map Site BSA. Southern California black walnut has a CRPR of 4.2. CRPR 4 is defined as a watch list of plants of limited distribution or infrequent throughout a broader area in California, and their status should be monitored regularly. And threat rank 0.2 is defined as moderately threatened in California. Southern California black walnut is endemic to California and has been documented from San Diego County north through Siskiyou County. It is a perennial deciduous tree which occurs in chaparral, cismontane woodland, coastal scrub, and riparian woodland. The one Southern California black walnut documented at the site was adjacent to an existing residence surrounded by ornamental vegetation and non-native grasslands including annual brome grassland. There are no native woodlands or native tree stands documented near the one Southern California black walnut to indicate a natural occurrence of this individual. No other Southern California black walnut individuals were observed within the local vicinity. This single individual in an otherwise disturbed/developed setting suggests that it might not be a natural occurrence; therefore, this species is not considered sensitive, and no impacts would occur. Additionally, during surveys no special-status wildlife was observed using the tree as habitat.

6.3.2 Indirect Impacts to Special-Status Plant Species and Proposed Mitigation

Potential indirect impacts to special-status plant species include accidental clearing, grading, trampling, and litter; runoff; erosion; sedimentation; fugitive dust; chemical pollution; fertilizers and herbicides; invasive plant species; and wildfires.

Impact BIO-3 Potential indirect short-term and long-term impacts to special-status plant species include accidental clearing, grading, trampling, and litter; runoff; erosion; sedimentation; fugitive dust; chemical pollution; fertilizers and herbicides; invasive plant species; and wildfires. Based on the analysis, the Project has the potential to cause significant indirect short-term and long-term impacts to special-status plant species. However, implementation of mitigation measures **MM-BIO-2 Worker Education and Awareness Program**, **MM-BIO-3 Construction Fencing**, **MM-BIO-4 Stormwater Pollution Prevention Plan**, **MM-BIO-5 Weed Control Plan**, **MM-BIO-6 Landscaping Plan**, **MM-BIO-7 Fire Protection Plan**, and **MM-BIO-8 Biological Monitoring** would reduce potential indirect short-term and long-term impacts to special-status plant species to less than significant.

MM-BIO-2 **Worker Education and Awareness Program.** Prior to issuance of grading permits for the Project, the Applicant shall fund the development of a worker education awareness program (WEAP) by a Los Angeles County-approved biologist for the Project and submit the WEAP to the County of Los Angeles Department of Regional Planning for review and approval. The WEAP shall be attended by all individuals involved in construction of the Project prior to working on the Project and shall include, but not be limited to, the following:

- Natural history and photographs of special-status plant species and special-status wildlife species, current sensitivity status, reasons for decline, and protective measures relevant to the species and habitats;
- Description of sensitive vegetation communities and jurisdictional resources and associated construction-limit staking, and biological monitoring during vegetation clearing and grading activities;
- Active nesting birds and associated set-back work buffers in accordance with federal and state regulations;
- Litter guidelines including direction not to litter and to pick up and store all trash and litter securely at the construction site at the end of each day; and
- Avoidance of driving over or otherwise disturbing areas outside the designated construction areas.

The WEAP shall be submitted to the County of Los Angeles Department of Regional Planning for review and approval 30 days prior to implementation. Prior to entering the Project site for construction work, all workers shall attend the WEAP. Upon completion of the WEAP, attendees shall sign training attendance sheets.

MM-BIO-3 **Construction Fencing.** Prior to commencement of any ground-disturbing activities, construction fencing shall be installed to identify the limits of grading/disturbance as well as buffer areas, which would reduce potential human trampling outside of the construction limits and minimize the potential spread of non-native weeds or invasive plants. A County-approved biologist shall inspect construction fencing once installation is complete.

MM-BIO-4 **Stormwater Pollution Prevention Plan.** Prior to issuance of grading permits, the Project Applicant shall develop a Project-specific Stormwater Pollution Prevention Plan (SWPPP) to include implementation of erosion and sediment control Best Management Practices (BMPs) to be implemented during construction and submit the Project-specific SWPPP to

the County of Los Angeles Department of Regional Planning for review and approval. Implementation of BMPs, including the use of water trucks, would minimize impacts from generation of fugitive dust. Potential chemical pollutants would require secondary containment and storage away from jurisdictional resources. Los Angeles County Public Works will monitor compliance with these SWPPP requirements.

MM-BIO-5 **Weed Control Plan.** Prior to issuance of grading permits, the Applicant shall retain a Los Angeles County-approved, qualified restoration ecologist or biologist to prepare a comprehensive adaptive Weed Control Plan (WCP) to be implemented during the construction and operation of the Project and submit the WCP to the County of Los Angeles Department of Regional Planning for review and approval. The Project's homeowners' association shall implement the WCP within the landscaped areas of the Project to minimize weed invasion into open space areas. The WCP shall include, but not be limited to, the following:

- Weed control treatments shall include legally permitted herbicide, manual, and mechanical methods approved for application. The application of herbicides shall comply with state and federal laws and regulations under the prescription of a Pest Control Advisor, with the concurrence of the County of Los Angeles Department of Regional Planning, and shall be implemented by a Licensed Qualified Applicator. Herbicides shall not be applied during or within 72 hours of a forecasted measurable rain event or during high wind conditions that could cause spray drift onto native vegetation. Where manual or mechanical methods are used, plant debris shall be disposed of at an appropriate off-site location. The timing of the weed control treatment shall be determined for each plant species with the goal of controlling populations before they start producing seeds. Consultation with a County-approved, qualified wildlife biologist or botanist shall be required prior to weed control treatments to avoid any adverse impacts to plants and wildlife in the area.
- Invasive plant species (designated by California Invasive Plant Council) shall not be included in the landscaping plan as they could establish off-site and have negative impacts to the adjacent habitats.
- All seeds and straw materials used during Project construction and operation shall be weed-free rice straw or other weed-free product, and all gravel and fill material shall be weed free. If straw wattles are used, they shall not be encased in plastic mesh. All plant materials used during restoration shall be native, certified weed-free, and approved by the County of Los Angeles Department of Regional Planning.
- Prior to entry to the Project area for the first time, equipment must be free of soil and debris on tires, wheel wells, vehicle undercarriages, and other surfaces (a high-pressure washer and/or compressed air may be used to ensure that soil and debris are completely removed). Compliance with the provision is achieved by on-site inspection and verification or by demonstrating that the vehicle or equipment has been cleaned at a commercial vehicle or appropriate truck washing facility. In addition, the interior of equipment (cabs, etc.) shall be free of mud, soil, gravel and other debris (interiors may be vacuumed or washed).

MM-BIO-6 **Landscaping Plan**. Prior to the issuance of grading permits, the Applicant shall prepare a landscaping plan for the homeowners' association (HOA)-maintained areas and submit the Landscaping Plan to the County of Los Angeles Department of Regional Planning for review and approval. The Landscaping Plan for the HOA-maintained areas shall include, but not be limited to, the following:

- Plant species list shall include scientific name, common name, plant container size, and quantities.
- Plantings shall be in accordance with the County of Los Angeles Fire Department Fuel Modification Guidelines (Los Angeles County Fire Department 2011).
- Invasive plant species (designated by California Invasive Plant Council) shall not be included in the landscaping plan as they could establish off-site and have negative impacts to the adjacent habitats.
- Plant layout shall indicate the location of the plant species.
- Planting notes shall include plant installation requirements such as mulch requirements.
- Where native species are required, the species shall be indigenous native species of the region (locally indigenous native species).

MM-BIO-7 **Fire Protection Plan.** Prior to the issuance of grading permits, the Applicant shall prepare a Fire Protection Plan (FPP) that meets County of Los Angeles Fire Department requirements and submit the FPP to the County of Los Angeles Department of Regional Planning for review and approval. The FPP shall include, but not be limited to, the following:

- All construction equipment shall be equipped with appropriate spark arrestors and carry fire extinguishers.
- Provisions for fire/emergency services access shall be established if roadway blockage occurs due to large loads during construction.
- Cleared, maintained parking areas shall be designated; no parking shall be allowed in non-designated areas.

MM-BIO-8 **Biological Monitoring.** Prior to the issuance of grading permits, the Applicant shall submit the qualifications of the biologists to the County of Los Angeles Department of Regional Planning for review and approval. The Applicant shall fund a County-approved, Biological Monitor during Project construction to monitor construction activities and to ensure compliance with all mitigation measures. The Biological Monitor shall be present on site during all vegetation removal and initial ground disturbance activities for all aspects of the Project and shall regularly inspect the Project site as needed after the initial ground disturbances to ensure that all mitigation measures are being implemented. The Biological Monitor shall ensure that wildlife do not become entrapped in excavations. Safeguards shall be implemented during daytime periods of non-activity and overnight, such as a placing a platform over the entire excavation site, flush with the ground surface; installing escape ramps in trenches; or installing exclusionary fencing. Should relocation be required, construction shall be halted until the Biological Monitor arrives on site and clears the work area (in compliance with all applicable permits and authorizations).

6.4 Impacts to Special-Status Wildlife Species

This report determines the significance of direct impacts to special-status wildlife species by evaluating Project-related loss of suitable habitat for the species in question. However, in some cases, the Project's construction activities have the potential to cause direct impacts on individuals (e.g., injury, mortality) of a particular species or species guild. Where this occurs, the report will also evaluate the individual impacts for significance.

6.4.1 Direct Impacts to Special-Status Wildlife Species and Proposed Mitigation

This section analyzes direct and indirect impacts to all observed special-status wildlife species identified in Table 10.

6.4.1.1 Reptiles

Three special-status reptile species have potential to occur on the Project site: California legless lizard, Blainville's horned lizard, and San Diegan tiger whiptail. However, California legless lizard and Blainville's horned lizard were not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists.

Impact BIO-4 Project construction would result in direct impacts to suitable habitat for California legless lizard, Blainville's horned lizard, and San Diegan whiptail lizard and could directly affect individuals, which would be a significant impact absent mitigation. California legless lizard, Blainville's horned lizard, and San Diegan tiger whiptail generally inhabit grassland, coastal scrub, chaparral, riparian, and woodland communities, which total 147.4 acres within the Project site.

The Project would result in permanent direct impacts to 105.7 acres (98.9 acres from grading impacts and 6.7 acres from fuel modification zone impacts) of suitable on-site habitat for California legless lizard, Blainville's horned lizard, and San Diegan tiger whiptail on the Project site. These impacts would be less than significant due to the abundant suitable habitat present in the vicinity of the Project site. Individuals are cryptic and slow moving on the surface or are otherwise underground, and therefore, are highly vulnerable to injury and mortality during construction. Impacts to individuals would be significant because they would result in the permanent loss of individuals that could be injured and killed during construction. Based on the analysis, the Project has the potential to cause significant direct impacts to California legless lizard, Blainville's horned lizard, and San Diegan tiger whiptail. However, implementation of mitigation measures **MM-BIO-2 Worker Education and Awareness Program**, **MM-BIO-3 Construction Fencing**, **MM-BIO-8 Biological Monitoring**, and **MM-BIO-9 Reptile Pre-construction Survey and Relocation** would reduce potential impacts to California legless lizard, Blainville's horned lizard, and San Diegan tiger whiptail to less than significant.

MM-BIO-2 **Worker Education and Awareness Program**

MM-BIO-3 **Construction Fencing**

MM-BIO-8 **Biological Monitoring**

MM-BIO-9 **Reptile Pre-construction Survey and Relocation.** Prior to the issuance of grading permits, the Applicant shall submit the qualifications of the biologists to the County of Los Angeles Department of Regional Planning for review and approval. Within 30 days prior to ground-disturbance activities associated with construction or grading activities for the Project, suitable habitat shall be surveyed to capture and relocate California legless lizard, Blainville's horned lizard, and San Diegan tiger whiptail individuals. A qualified biologist in possession of a valid California Scientific Collecting Permit shall conduct the survey. The survey shall be timed to maximize capture of individual lizards and include a spring survey if construction is planned to begin in the spring or late summer, or fall survey if construction is planned to begin in the winter. Additional pre-construction clearance surveys shall be conducted such that no more than 14 days have elapsed between conclusion of the survey and the commencement of construction activities. Any California legless lizard, Blainville's horned lizard, and/or San Diegan tiger whiptail observed within the grading shall be relocated to a suitable area within the preservation area and outside of the construction zone.

6.4.1.2 Birds

Special-status bird species with potential to occur may nest and forage within suitable habitat present on the Project site including grass and herb dominated, scrub, chaparral, riparian, and woodland vegetation communities. In total, these habitats make up 147.4 acres of cover within the Project site. The Project would permanently impact 98.9 acres (67.1%) of habitat for these bird species.

Impact BIO-5 Project construction would result in direct impacts to nesting and foraging habitat for nesting birds protected under the MBTA and/or the California Fish and Game Code, including special-status species such as Cooper's hawk, loggerhead shrike, oak titmouse, southern California rufous-crowned sparrow, and burrowing owl, and could directly affect individuals, including nests, eggs, and young, which would be significant absent mitigation.

Individual adults of these species are unlikely to be directly killed or injured during construction activities because they are highly mobile and would likely leave the area during construction. Therefore, impacts arising from direct mortality of adults would be less than significant. However, if construction occurs during the breeding season for Cooper's hawk, loggerhead shrike, oak titmouse, and Southern California rufous-crowned sparrow, it could result in nest abandonment or reduced reproductive success. Nests, eggs, and young could be directly affected by vegetation clearing and grading.

The Project would result in permanent direct impacts to 98.9 acres of suitable nesting and foraging habitat for these bird species on site. The loss of nesting and foraging habitat would be less than significant because it would not substantially reduce the available habitat for these species in the Project vicinity. However, any direct impacts to individuals, nests, eggs, or young, including nest abandonment, of these special-status species as a result of construction activities would be significant.

Although sharp-shinned hawk, Costa's hummingbird, and Vaux's swift were observed during surveys, they are not expected to nest within the Project site based on the lack of suitable nesting habitat.

Burrowing owl was not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, including a burrowing owl habitat suitability survey assessment and focused burrowing owl breeding season surveys following the Staff Report on Burrowing Owl Mitigation, Appendix C (CDFG 2012). Additionally, ferruginous hawk, merlin, California condor, and loggerhead shrike were not observed during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys.

Based on the analysis, the Project has the potential to cause significant direct impacts to nesting birds protected under the MBTA and/or the California Fish and Game Code including special-status species including Cooper's hawk, loggerhead shrike, oak titmouse, Southern California rufous-crowned sparrow, and burrowing owl. However, implementation of mitigation measures **MM-BIO-2 Worker Education and Awareness Program**, **MM-BIO-3 Construction Fencing**, **MM-BIO-8 Biological Monitoring**, **MM-BIO-10 Pre-construction Nesting Bird Survey**, and **MM-BIO-11 Pre-construction Burrowing Owl Survey** would reduce potential impacts to less than significant.

MM-BIO-2 **Worker Education and Awareness Program**

MM-BIO-3 **Construction Fencing**

MM-BIO-8 **Biological Monitoring**

MM-BIO-10 **Pre-construction Nesting Bird Survey.** Prior to the issuance of grading permits, the Applicant shall submit the qualifications of the biologists to the County of Los Angeles Department of Regional Planning for review and approval. Within 30 days of ground-disturbing activities associated with construction or grading for the Project that would occur during the nesting/breeding season of native bird species potentially nesting on the site (typically February 15 through August 31 in the Project region, or as determined by the County-approved biologist), suitable habitat shall be surveyed within 7 days prior to initiation of disturbance work by a County-approved biologist to determine if active nests (actively breeding or nesting) of bird species protected by the Migratory Bird Treaty Act and/or the California Fish and Game Code are present in the disturbance zone or within 300 feet (500 feet for raptors) of the disturbance zone. If initiation of ground-disturbing activities is delayed, then additional pre-disturbance surveys shall be conducted such that no more than 7 days will have elapsed between the survey and ground-disturbing activities.

If active nests are found, clearing and construction within 300 feet of the nest (500 feet for raptors) shall be postponed or halted. At the discretion of the County-approved biologist, a no-work buffer zone shall be established suitable to the particular bird species and location of the nest until the nest is vacated and juveniles have fledged, as determined by the County-approved biologist, and there is no evidence of a second attempt at nesting. Limits of construction to avoid an active nest shall be established in the field with flagging, fencing, or other appropriate barriers, and construction personnel shall be instructed on the sensitivity of nest areas. The County-approved biologist shall serve as a construction monitor during those periods when construction activities will occur near active nest areas to ensure that no inadvertent impacts to these nests occur. The results of the surveys,

showing the locations of any active nests detected, and documentation of any avoidance measures taken, shall be submitted to the County of Los Angeles Department of Regional Planning to document compliance with applicable state and federal laws.

MM-BIO-11 **Pre-construction Burrowing Owl Survey**. Prior to the issuance of grading permits, the Applicant shall submit the qualifications of the biologists to the County of Los Angeles Department of Regional Planning for review and approval. Not less than 14 days prior to construction ground-disturbing activities, a survey for burrowing owls shall be conducted by a County-approved biologist within appropriate habitat, and in accordance with approved methodologies (CDFG 2012). If burrowing owls are found on the Project site, and pursuant to agency guidelines, a protective buffer shall be established around the occupied burrow(s) and no ground-disturbing activities will be permitted within the buffer area (CDFG 2012). The size of the buffer shall be determined as set forth in the Staff Report on Burrowing Owl Mitigation (CDFG 2012), based on the disturbance level of construction activities, whether the owl(s) are present during the breeding season (February 1 through August 31) or non-breeding season (September 1 through January 31), and as determined by the County-approved biologist. The protective buffer around active burrows shall be maintained until the County-approved biologist verifies that the birds have vacated the burrow(s) and left the site.

Impact BIO-6 Since no burrowing owls were recorded during protocol surveys, burrowing owls are not expected to occur on a regular basis, therefore impacts to burrowing owl habitat is less than significant. In addition, no impacts to individual burrowing owls are expected; however, if a burrowing owl individual is present at the time of construction, it can potentially be killed or injured during ground-disturbing activities, which would be considered a significant impact. Therefore, to reduce impacts to burrowing owl individuals to less than significant, **MM-BIO-11 Pre-construction Burrowing Owl Survey** shall be implemented.

MM-BIO-11 **Pre-construction Burrowing Owl Survey**.

6.4.1.3 Mammals

American badger, San Diego black-tailed jackrabbit, and San Diego desert woodrat may occur in grassland and herb-dominated vegetation, scrub, chaparral, riparian, and woodland vegetation communities as well as disturbed habitat. In total, these habitats make up 155.2 acres of cover within the Project site. The Project would permanently impact 105.7 acres (68.1%) of habitat for American badger, San Diego black-tailed jackrabbit, and San Diego desert woodrat on site.

Impact BIO-7 Project construction would result in direct impacts to suitable habitat for American badger, San Diego black-tailed jackrabbit, and San Diego desert woodrat and could directly affect individuals, which would be significant absent mitigation.

Individual adults of American badger, San Diego black-tailed jackrabbit, and San Diego desert woodrat are unlikely to be directly killed or injured during construction activities because they are fairly mobile and should be able to escape from construction areas. Therefore, impacts arising from direct mortality of adults are less than significant. The greatest potential for direct impacts to badgers would be mortality of young in a natal den and potentially the mother, which fiercely defends the natal den. Similarly, construction

activities could result in destruction of jackrabbit natal sites (dens, burrows, and depressions), and mortality of young, which are not well coordinated for the first 2 or 3 days after birth and are dependent on the nest. Abandonment of the natal den by the mother could also result in the mortality of young. San Diego desert woodrat young are likely to remain in woodrat middens, and therefore construction could result in mortality of young.

San Diego black-tailed jackrabbit and American badger were not observed on the Project site during 2016, 2017, 2018, or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours. Additionally, no burrows with American badger sign (claw marks, scat, fur) were observed during the burrowing owl habitat suitability survey assessment or focused burrowing owl breeding season surveys following the Staff Report on Burrowing Owl Mitigation, Appendix C (CDFG 2012).

The Project would result in permanent direct impacts to 105.7 acres of suitable habitat for American badger, San Diego black-tailed jackrabbit, and San Diego desert woodrat on site. While American badger and San Diego black-tailed jackrabbit adults are highly mobile and can usually escape human disturbances, young dependent on the nest would be highly vulnerable to injury and mortality during construction. San Diego desert woodrats are reliant on their middens. Based on the analysis, the Project has the potential to cause significant direct impacts to San Diego black-tailed jackrabbit, American badger, and San Diego desert woodrat. However, implementation of mitigation measures **MM-BIO-2 Worker Education and Awareness Program**, **MM-BIO-3 Construction Fencing**, **MM-BIO-8 Biological Monitoring**, **MM-BIO-12 Pre-construction Surveys for San Diego Black-Tailed Jackrabbit**, **MM-BIO-13 Pre-construction Surveys for American Badger**, and **MM-BIO-14 Pre-construction Surveys for San Diego Desert Woodrat** would reduce potential impacts to these species to less than significant.

MM-BIO-2 **Worker Education and Awareness Program**

MM-BIO-3 **Construction Fencing**

MM-BIO-8 **Biological Monitoring**

MM-BIO-12 **Pre-construction Surveys for San Diego Black-Tailed Jackrabbit.** Prior to the issuance of grading permits, the Applicant shall submit the qualifications of the biologists to the County of Los Angeles Department of Regional Planning for review and approval. Within 30 days prior to construction activities in grassland, scrub, chaparral, oak woodland, or other suitable habitat, a County-approved biologist shall conduct a survey within the proposed construction disturbance zone and within 200 feet of the disturbance zone, within the limits of the Project property, for San Diego black-tailed jackrabbit.

If San Diego black-tailed jackrabbits are present, non-breeding rabbits shall be flushed from areas to be disturbed. Dens, depressions, nests, or burrows occupied by pups shall be flagged and ground-disturbing activities avoided within of 200 feet of these occupied areas during the pup-rearing season (February 15 through July 1). This buffer may be reduced based on the location of the den upon consultation with California Department of Fish and Wildlife (CDFW). Occupied maternity dens, depressions, nests, or burrows shall

be flagged for avoidance, and a biological monitor shall be present during construction. If unattended young are discovered, they shall be relocated to suitable habitat by a County-approved biologist. The applicant shall document all San Diego black-tailed jackrabbit identified, avoided, or moved and provide a written report to CDFW within 72 hours of identification, avoidance or movement.

Collection and relocation of animals shall only occur with the proper scientific collection and handling permits.

MM-BIO-13 **Pre-construction Surveys for American Badger.** Prior to the issuance of grading permits, the Applicant shall submit the qualifications of the biologists to the County of Los Angeles Department of Regional Planning for review and approval. Within 30 days prior to construction activities in grassland, scrub, chaparral, oak woodland, or other suitable habitat, a County-approved biologist shall conduct a survey within the proposed construction disturbance zone and within 200 feet of the disturbance zone, within the limits of the Project site, for American badger.

If American badgers are present, occupied habitat shall be flagged and ground-disturbing activities avoided within 50 feet of the occupied den. Maternity dens shall be avoided during the pup-rearing season (February 15 through July 1) and a minimum 200-foot buffer established. This buffer may be reduced based on the location of the den upon consultation with California Department of Fish and Wildlife (CDFW). Maternity dens shall be flagged for avoidance and identified on construction maps, and a County-approved biologist shall be present during construction. If avoidance of a non-maternity den is not feasible, badgers shall be relocated either by trapping or by slowly excavating the burrow (either by hand or mechanized equipment under the direct supervision of the biologist, removing no more than 4 inches at a time) before or after the rearing season (February 15 through July 1). Any relocation of badgers shall occur only after consultation with CDFW. A written report documenting the badger removal shall be provided to CDFW within 30 days of relocation.

Collection and relocation of animals shall only occur with the proper scientific collection and handling permits.

MM-BIO-14 **Pre-construction Surveys for San Diego Desert Woodrat.** Prior to the issuance of grading permits, the Applicant shall submit the qualifications of the biologists to the County of Los Angeles Department of Regional Planning for review and approval. Within 30 days prior to construction activities in grassland, scrub, chaparral, oak woodland, or other suitable habitat, a County-approved biologist shall conduct a survey within the proposed construction disturbance zone and within 200 feet of the disturbance zone for San Diego desert woodrat.

If active San Diego desert woodrat nests (stick houses) are identified within the disturbance zone or within 100 feet of the disturbance zone, a fence shall be erected around the nest site adequate to provide the woodrat sufficient foraging habitat at the discretion of the County-approved biologist in consultation with California Department of Fish and Wildlife (CDFW). Clearing and construction within the fenced area shall be

postponed or halted until young have left the nest. The biologist shall serve as a construction monitor during those periods when disturbance activities occur near active nest areas to ensure that no inadvertent impacts to these nests occur. If avoidance is not possible, the Applicant shall take the following sequential steps: (1) all understory vegetation shall be cleared in the area immediately surrounding active nests followed by a period of one night without further disturbance to allow woodrats to vacate the nest; (2) each occupied nest shall then be disturbed by a County-approved biologist until all woodrats leave the nest and seek refuge off site; and (3) the nest sticks shall be removed from the Project site and piled at the base of a nearby hardwood tree (preferably a coast live oak or Southern California black walnut). Relocated nests shall not be spaced closer than 100 feet apart, unless a County-approved biologist has determined that a specific habitat can support a higher density of nests. The Applicant shall document all woodrat nests moved and provide a written report to CDFW.

All woodrat relocation shall be conducted by a County-approved biologist in possession of a scientific collecting permit.

Less-Than-Significant Direct Impacts to Special-Status Wildlife Species

Mountain lions are not threatened or endangered in California; however, the southern and central coast California evolutionary significant units are candidate species for listing under CESA. On June 25, 2019, the Center for Biological Diversity and Mountain Lion Foundation formally petitioned the California Fish and Game Commission to protect mountain lions under CESA. In April 2020, the California Fish and Game Commission voted unanimously that listing of an evolutionarily significant unit (southern and central coast California) of mountain lions may be warranted. At this time, CDFW is conducting a 1-year status review. It should be noted that during the status review period, all candidate species are treated as though they are listed, and therefore take (hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture or kill) cannot be permitted without a CDFW Incidental Take Permit.

Mountain lions are large predatory mammals that prefer areas with dense undergrowth and cover in deserts, humid coast forests, arid hillsides, and scrub and oak woodlands. Species-specific surveys and wildlife camera surveys were not conducted; however, there is high potential to move through the Project site based on presence of suitable habitat and presence of their primary prey item, the mule deer. Mule deer was occasionally observed foraging and moving through the Project site, specifically within the Tract Map Site BSA on three occasions (May 20, 2020; June 22, 2020; and June 22, 2020). However, mountain lions or their sign (i.e., scat and/or tracks) were not observed on the Project site during 2016, 2017, 2018 or 2020 surveys conducted by Dudek biologists, which consisted of over 248 person hours. Due to temporary presence of mountain lions, their mobile nature, and abundant suitable habitat present in the Los Angeles County Santa Clara River SEA and Santa Felicia SEA, the South Coast Missing Linkages Sierra Madre – Castaic Connection and Santa Monica – Sierra Madre Connection, and the California Essential Habitat Connectivity Project Essential Connectivity Areas to the northwest, west, and southwest of the Project site, direct impacts to mountain lions and suitable habitat would be less than significant.

Common, not sensitive, vegetation communities provide suitable habitat for special-status wildlife species that have potential to occur within the Project site (see Section 5.4.4). Impacts to special-status wildlife species are addressed by species mitigation, and a loss of suitable habitat will not result in significant impacts to the wildlife species. The establishment of the Off-Site Open Space Area conservation easement, **MM-BIO-1 Conservation Easement**, preserves adjacent natural habitats that can be used by special-status wildlife species. Additionally, mitigation measures **MM-BIO-15 Homeowners' Association Covenants, Conditions, and Restrictions; MM-BIO-16 Trash Receptacles;** and **MM-BIO-17 Lighting** will reduce impacts to special-status wildlife species.

Coastal California gnatcatcher, California condor, ferruginous hawk, and merlin have potential to occur on the Project site within scrub and grass- and herb-dominated vegetation communities on the Project site.

Project construction would result in direct impacts to suitable habitat for coastal California gnatcatcher, which is a federally listed threatened species and a CSC. Coastal California gnatcatcher occupies various alliances of coastal sage scrub but is most closely associated with alliances dominated by California sagebrush and California buckwheat. As detailed in Section 5.4.4.1.16 and Appendix D and Appendix E, focused protocol-level surveys for coastal California gnatcatcher were completed in 2018 and 2020, and no individuals were observed. Therefore, although suitable habitat exists within the Tract Map Site BSA, the Off-Site Roadway Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA, this species is determined to be absent from these areas and impacts to suitable habitat would be less than significant.

California condors are known to fly over the Project vicinity between nesting sites to the west and foraging habitat to the east and could potentially utilize the Project site; however, based on available GPS-tracking data, condors are not known to fly directly over the Project site. The species has not been recorded on the Project site. This is potentially due to the lack of suitable food sources (i.e., large carrion), which are not expected to occur with any regularity due to the lack of livestock grazing and the limited presence of mule deer. Although the complete lack of large carrion cannot be conclusively determined, it is expected that these potential food sources would be present on a very infrequent basis, if at all. Therefore, direct impacts to California condor are considered less than significant due to the expected infrequent use of the Project site and the relatively small impact to the overall foraging habitat for this species in the region.

Although California condors are not expected to occur on site, construction debris, litter, leaking equipment, or roadkill may attract California condors to the Project site during construction. This could subject condors to strikes by construction vehicles. Condors are curious birds and have been documented in close association with oil pumps and human activity on the Los Padres National Forest. During cleanup activities at trash sites, condors have been observed sitting on guard rails adjacent to the cleanup activities. Adverse effects to condors have also been documented by the animal's collection of microtrash (i.e., broken glass, paper and plastic waste, small pieces of metal). This waste is often brought back to nest sites where young birds ingest the material. This can lead to mortality of young birds. Ethylene glycol, a component in antifreeze and petroleum products, can also be ingested by condors, which can result in injury or mortality. While there is the potential for injury or mortality to condor individuals from Project activities, this potential is considered to be extremely low due to the generally sporadic occurrence in the vicinity of the site. It would be further reduced by **MM-BIO-2 Worker Education and Awareness Program,** elements of mitigation measures **MM-BIO-4 Stormwater Pollution Prevention Plan**, **MM-BIO-15 Homeowners' Association Covenants, Conditions, and Restrictions**, **MM-BIO-16 Trash Receptacles,** and **MM-BIO-17 Lighting**. **MM-BIO-2 Worker Education and Awareness Program** provides for pre-construction educational meetings and requires that all construction/contractor personnel complete a WEAP to ensure compliance with environmental/permit regulations and mitigation measures. The WEAP includes setting out procedures for minimizing harm to or harassment of wildlife, including condors, during construction and designating a contact person in the event of discovery of dead or injured wildlife. The monitoring biologist shall also be present during initial clearing and grading when the chance of collision between construction equipment and condors would be greatest. **MM-BIO-4 Stormwater Pollution Prevention Plan** also includes measures/restrictions incorporated into the SWPPP that will further reduce the risk of impacts to the condor during construction, including checking and maintaining vehicles to prevent leakage of materials (e.g., toxic antifreeze and petroleum products); removal of excess materials and debris from work areas when construction operations are completed; and installation of fully covered trash receptacles to contain food, food scraps, food wrappers, beverage containers, and other miscellaneous trash that could attract condors to a work site. Additionally, implementation of **MM-BIO-15**

Homeowners' Association Covenants, Conditions, and Restrictions; MM-BIO-16 Trash Receptacles; and **MM-BIO-17 Lighting** would minimize interface with domestic animals, restrict and discourage use of balloons, trash receptacles, and lighting. By appropriately educating construction personnel, providing biological monitoring, and preventing spills of toxic materials and the availability of microtrash, impacts to condors during construction would be less than significant.

Ferruginous hawk and merlin would only use the annual brome grasslands during the winter months as foraging habitat. Impacts to annual brome grasslands would not substantially reduce the available foraging habitat for these species in the Project vicinity, which exists to the east, west, and north of the Project site. Therefore, impacts to these species would be less than significant.

Burrowing owl typically occupies grassland habitats supporting small mammal burrows or burrow surrogates suitable for nesting and as cover. Project construction would result in direct impacts to suitable habitat for burrowing owl, which is a USFWS BCC and a CSC. As detailed in Section 5.4.4.1.16, focused surveys for burrowing owl were completed in 2018, and no individuals were observed. Therefore, although suitable habitat exists within the Project site, this species is determined to be absent from the BSA, and impacts to suitable habitat would be less than significant.

MM-BIO-15 **Homeowners' Association Covenants, Conditions, and Restrictions.** Prior to the issuance of grading permits, the Applicant shall submit the homeowners' association (HOA) Covenants, Conditions, and Restrictions to the County of Los Angeles Department of Regional Planning for review and approval. The HOA Covenants, Conditions, and Restrictions shall include the following requirements to reduce potential human impacts on adjacent habitats and wildlife species:

- All dogs and cats shall be in compliance with requirements found in Sections 10.20.150 through 10.20.350 of the Los Angeles County Code related to appropriate licensing and tagging, leashed animals when appropriate, ensuring that all dogs and cats are neutered or spayed (or an unaltered license in accordance with Los Angeles County Code), and that all dogs and cats have a microchip.
- Smoking shall be prohibited in open space areas.
- Speed limits shall be posted, and the Covenants, Conditions, and Restrictions shall require residents to comply with the posted speed limits.
- The HOA shall not use balloons for any community events, and the use of balloons by individual homeowners shall be discouraged.
- Homeowner reprisals against native wildlife species (i.e., killing or harming native wildlife species in any way) if homeowner pets are killed or harmed by wildlife shall be prohibited.

6.4.2 Indirect Impacts to Special-Status Wildlife Species and Proposed Mitigation

Indirect short-term and long-term impacts to special-status wildlife species may include both habitat degradation and effects on individuals. Indirect construction impacts to wildlife habitat may include fugitive dust; runoff, sedimentation, chemical pollution, and erosion; litter; and accidental clearing, grading, and trampling, as well as attracting predators such as American crows, common ravens (*Corvus corax*), and coyotes, and mesopredators such as raccoons (*Procyon lotor*) and striped skunks (*Mephitis mephitis*).

Since May 2016, Dudek biologists have performed over 248 person hours of surveys on the Project site inclusive of over 93 person hours of protocol coastal California gnatcatcher surveys. A total of 76 wildlife taxa were recorded on the site during surveys, including 51 bird species. A total of six special-status wildlife species were identified within the Project site during reconnaissance and focused surveys, including sharp-shinned hawk (*Accipiter striatus*; CDFW Watch List), Southern California rufous crowned sparrow (*Aimophila ruficeps canescens*; CDFW Watch List), oak titmouse (*Baeolophus inornatus*; USFWS Bird of Conservation Concern), Costa's hummingbird (*Calypte costae*; USFWS Bird of Conservation Concern), Vaux's swift (*Chaetura vauxi*; CDFW Species of Special Concern), and San Diegan tiger whiptail (*Aspidoscelis tigris stejnegeri*; CDFW Species of Special Concern). Impacts to each of these species was analyzed above, and mitigation measures were included, as appropriate, to reduce impacts to less-than-significant levels. Other special-status wildlife species with the potential to occur would likely have been detected during the 248 person hours of surveys if present; therefore, development of the Project would not have a significant impact to special-status wildlife species habitat.

Over the long term, increases in human activity along the open space–urban interface (also referred to as "edge areas") may also result in the trampling of vegetation and compaction of soils. This can affect the long-term viability of plant communities and degrade wildlife habitat quality, as well as increase harassment by pets, invasion by exotic wildlife species (e.g., Argentine ants [*Linepithema humile*]), pesticide use, altered fire regimes, and increased road kill. However, over the long term, indirect impacts on wildlife are expected to be limited along the open space–urban interface because approximately half of the Project site is bordered by existing residential development to the south and southwest; the approved fuel modification plan, which includes a conceptual landscape plan, will be incorporated; and once the residential community is developed, an HOA will oversee and regulate the activities within the development. As part of Project planning, a wildfire study was prepared and indicated that with the approved fuel modification plan, potential fire protection and wildfire effects would be less than significant. The approved fuel modification plan, which includes the conceptual landscape plan, contains specific notes that the plant selections should be made by referencing the Plant Selection Guidelines by Zone (Los Angeles County Fire Department 2011). Los Angeles County Fire-prepared guidelines which include plant selection, undesirable plants/target species, and a fuel modification plant list. The approved fuel modification plan specifically states that all future plantings shall be in accordance with the County of Los Angeles Fire Department Fuel Modification Guidelines (Los Angeles County Fire Department 2011) and approved prior to installation. As this approved fuel modification plan is part of the Project, the potential long-term impacts to adjacent wildlife will be minimized through creation of this fuel modification zone and the implementation of acceptable native plant species as part of the Plant Selection Guidelines (Los Angeles County Fire Department 2011), which provide suitable habitat for wildlife and avoidance of incorporating California Invasive Plant Council-defined invasive plant species. Through implementation of **MM-BIO-6 Landscaping Plan**, prior to issuance of grading permits, a Landscaping Plan for the HOA-maintained areas shall be prepared and submitted to the County of Los Angeles Department of Regional Planning for review and approval. Through implementation of **MM-BIO-15 Homeowners' Association Covenants, Conditions, and Restrictions**, the HOA will maintain the open space areas within the Tract Map Site and oversee the activities within the community, including requiring pets to be leashed, and restricting and discouraging use of balloons, which will decrease the interactions with and impacts on wildlife. **MM-BIO-16 Trash Receptacles** includes the incorporation of trash receptacles. Additionally, there are open space areas, a private trail, debris basins, and infiltration basins proposed within the Tract Map Site, which will act as natural buffers with wildlife. Thus, the Project has been designed along the open space–urban interface to separate sensitive vegetation communities, and potentially jurisdictional aquatic resources, from areas that would be occupied by humans.

Construction noise and vibration may disturb bird breeding activities, potentially resulting in nest abandonment or reduced productivity. Noise can raise the level of stress hormones, interfering with sleep and other activities. Chronic vehicle noise can also affect birds by masking calls, affecting behaviors such as mate attraction and

territory defense. Mammals may generally avoid noisy areas due to increased stress and associated human activities. Vibration may also directly disturb terrestrial species that occupy burrows, dens, and depressions, including reptiles and some amphibians, or cause collapse of burrow systems and dens of fossorial (burrowing) species in areas with highly friable soils.

Lighting related to Project operation and over the long term can have well-documented indirect effects on wildlife (Longcore and Rich 2004), including disorientation; avoidance of areas; disturbances of nighttime rest and sleep periods of diurnal birds; simulated increased day length, affecting reproductive cycles by triggering premature reproductive activity; and increased risk of predation.

Over the long term, pet, stray, and feral animals and mesopredators, which are likely to increase after development, may affect almost all of the wildlife through increased predation and by outcompeting smaller native species for available resources (Crooks and Soulé 1999). The increase in mesopredators in fragmented habitats is often considered an edge effect, but because some of these species can penetrate long distances into natural habitats in the absence of top predators such as coyotes and bobcats, they can also have landscape-level effects. In addition, domestic cats and dogs may be vectors for diseases that affect native wildlife, such as feline immunodeficiency virus, feline leukemia virus, feline infectious peritonitis, feline and canine distemper, panleukopenia, and rabies (Foley 1996; Florida Fish and Wildlife Conservation Commission 2003).

Vehicle collisions with wildlife would potentially increase after the Project is implemented, particularly in areas that were frequently used by wildlife before roads were constructed or improved and other development was built. Almost all of the species are vulnerable to increased traffic collision.

Invasive wildlife may affect several of the species guilds. Development attracts or can provide suitable habitat for several common native wildlife species, such as common ravens, American crows, raccoons (*Procyon lotor*), and striped skunks, and non-native species such as Argentine ants, rock pigeons (*Columba livia*), Virginia opossums (*Didelphis virginiana*), rats (*Rattus* spp.), house mice (*Mus musculus*), and feral cats and dogs. Humans may also release non-native species into the wild. For example, red-eared slider turtles (*Trachemys scripta elegans*), a common pet often bought in pet stores, are often released in nearby streams, ponds, and lakes when owners no longer want to care for their pets. Species such as these may thrive in disturbed or otherwise marginal habitats and can harm native species through predation, competition, and displacement. These risks are particularly high for native reptiles and amphibians and native nesting birds.

Trash and other garbage associated with construction activities and long-term development can degrade vegetation communities and wildlife habitat and can attract nuisance and pest species that affect several of the wildlife guilds. Trash and debris include discarded construction-related materials, such as packaging materials, which may be dispersed into natural areas by wind. Trash generated by construction personnel, such as food packaging and cigarette butts, also can be dispersed by wind and water into natural areas. Pest and predatory species, such as American crows, common ravens, coyotes, striped skunks, and northern raccoons, may be attracted to discarded food. Increased human activity over the long term is also expected to increase the amount of trash and garbage in open space areas.

Long-term indirect edge effects from noise, vibration, vehicle collisions, lighting, and pesticides (except for impacts on water quality), therefore, are less than significant. However, indirect impacts that can occur over a larger landscape could be more substantial, including increased human activity; pet, stray, and feral animals and mesopredators; exotic wildlife; trash and garbage; and disease.

Impact BIO-8 Based on the analysis above, the Project has the potential to cause significant indirect impacts, short-term impacts, and long-term impacts to special-status wildlife. However, implementation of mitigation measures **MM-BIO-2 Worker Education and Awareness Program; MM-BIO-3 Construction Fencing; MM-BIO-4 Stormwater Pollution Prevention Plan; MM-BIO-5 Weed Control Plan; MM-BIO-6 Landscaping Plan; MM-BIO-7 Fire Protection Plan; MM-BIO-8 Biological Monitoring; MM-BIO-10 Pre-construction Nesting Bird Survey; MM-BIO-15 Homeowners' Association Covenants, Conditions, and Restrictions; MM-BIO-16 Trash Receptacles;** and **MM-BIO-17 Lighting;** and implementing the approved fuel modification plan, which specifically states that All future plantings shall be in accordance with the County of Los Angeles Fire Department Fuel Modification Guidelines (Los Angeles County Fire Department 2011) and approved by County Fire and Planning prior to installation, would reduce potential indirect impacts, short-term impacts, and long-term impacts to wildlife to less than significant.

MM-BIO-2 **Worker Education and Awareness Program**

MM-BIO-3 **Construction Fencing**

MM-BIO-4 **Stormwater Pollution Prevention Plan**

MM-BIO-5 **Weed Control Plan**

MM-BIO-6 **Landscaping Plan**

MM-BIO-7 **Fire Protection Plan**

MM-BIO-8 **Biological Monitoring**

MM-BIO-10 **Pre-construction Nesting Bird Survey**

MM-BIO-15 **Homeowners' Association Covenants, Conditions, and Restrictions**

MM-BIO-16 **Trash Receptacles.** Trash and garbage shall be controlled in areas adjacent to development with waste and recycling receptacles that discourage wildlife foraging in common areas/parks.

MM-BIO-17 **Lighting.** All lighting along the perimeter of natural areas shall be downcast luminaries with light patterns directed away from natural areas.

6.5 Impacts to Critical Habitat

As noted in Section 5.4.5, no designated critical habitat occurs or adjacent to the Project site. No impacts will occur.

6.6 Impacts to Vegetation Communities and Land Cover Types

Threshold 2: Would the Project have a substantial adverse effect on any sensitive natural communities (e.g., riparian habitat, coastal sage scrub, oak woodlands, non-jurisdictional wetlands) identified in local or regional plans, policies, regulations, or by the CDFW or USFWS?

6.6.1 Direct Impacts to Vegetation Communities and Land Cover Types and Proposed Mitigation

Direct permanent and temporary impacts to vegetation communities within the Project site are summarized in Table 12 and shown in Figure 9A, Figure 9B, and Figure 9C. Excluding disturbed and developed land covers, the Project would result in the permanent loss of approximately 105.7 acres (71.7%) of the coverage of vegetation communities present in the Project Site. A total of 98.9 acres is from grading impacts, and 6.7 acres is from fuel modification zone impacts.

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Table 12. Direct Impacts to Existing Vegetation Communities and Land Cover Types within the Project Site

Vegetation Community/ Land Cover Types	State Rank/ County Status	Total Acres	Tract Map Site – Grading Limits (Acres)	Off-Site Roadway Improvement Area – Grading Limits (Acres)	Off-Site Water Tank Area – Grading Limits (Acres)	Off-Site Water Line Improvement Area – Grading Limits (Acres)	Off-Site Sewer Line Improvement Area – Grading Limits (Acres)	Total Grading Limits Impacts – Direct Permanent Impacts (Acres)	Total Fuel Management Zone Impacts (Acres)	Impacts Grand Total (Acres)[a]
Woodland										
Coast live oak woodland (*Quercus agrifolia*) Alliance	S4/ Sensitive	0.3[b]	–	–	0.3[b]	–	–	0.3 [b]	–	0.3[be]
Schinus molle Association – *Ailanthus altissima* Semi-natural Association – *Eucalyptus* (*globulus, camaldulensis*) Provisional Semi-natural Association	SNA/ None	0.5	0.5	–	0.0[c]	–	–	0.5	–	0.5
Woodland Total	**–**	**0.8**	**0.5**	**–**	**0.3**	–	–	**0.8**	**–**	**0.8**
Riparian										
Arroyo willow thickets (*Salix lasiolepis*) Alliance	S4/ None	0.1	0.1	–	–	–	–	0.1	–	0.1
Mulefat thickets (*Baccharis salicifolia*) Alliance	S4/ None	0.1	0.1	–	–	–	–	0.1	–	0.1
Rhus trilobata Association	S3/ None	0.9	0.8	–	–	–	–	0.8	–	0.8
Riparian Total		**1.0**	**1.0**	**–**	**–**	–	–	**1.0**	**–**	**1.0**
Chaparral										
Chamise – black sage chaparral (*Adenostoma fasciculatum – Salvia mellifera*) Alliance	S4/ None	0.7	–	–	0.7	–	–	0.7	–	0.7
Chaparral Total		**0.7**	**–**	**–**	**0.7**	–	–	**0.7**	**–**	**0.7**
Scrub										
Black sage scrub (*Salvia mellifera*) Alliance	S4/ None	0.3	–	–	0.3	–	–	0.3	–	0.3
Bush mallow scrub (*Malacothamnus fasciculatus – Malacothamnus* spp.) Alliance	S4/ None	0.0[c]	–	–	0.0[d]	–	–	0.0[d]	–	0.0[d]
California buckwheat scrub (*Eriogonum fasciculatum*) Alliance	S5/ None	0.6	0.3	0.3	–	–	–	0.6	0.0[e]	0.6
California sagebrush – black sage scrub (*Artemisia californica – Salvia mellifera*) Alliance	S4/ None	0.5	–	–	0.5	–	–	0.5	–	0.5
California sagebrush – California buckwheat scrub (*Artemisia californica – Eriogonum fasciculatum*) Alliance	S4/ None	33.1	15.4	2.3	0.2	–	–	18.0	5.0	23.0

Table 12. Direct Impacts to Existing Vegetation Communities and Land Cover Types within the Project Site

Vegetation Community/ Land Cover Types	State Rank/ County Status	Total Acres	Tract Map Site – Grading Limits (Acres)	Off-Site Roadway Improvement Area – Grading Limits (Acres)	Off-Site Water Tank Area – Grading Limits (Acres)	Off-Site Water Line Improvement Area – Grading Limits (Acres)	Off-Site Sewer Line Improvement Area – Grading Limits (Acres)	Total Grading Limits Impacts – Direct Permanent Impacts (Acres)	Total Fuel Management Zone Impacts (Acres)	Impacts Grand Total (Acres)[a]
California sagebrush scrub (*Artemisia californica*) Alliance	S5/ none	29.8	5.3	—	0.6	—	—	5.9	0.1	5.9
Coyote brush scrub (*Baccharis pilularis*) Alliance	S5/ None	0.1	—	0.1	—	—	—	0.1	—	0.1
Palmer's goldenbush scrub (*Ericameria palmeri*) Provisional Alliance	S3?/ None	8.2	6.7	—	—	—	—	6.7	—	6.7
Purple sage scrub (*Salvia leucophylla*) Alliance	S4/ None	7.8	5.4	0.0[f]	—	—	—	5.5	0.0[g]	5.5
Scrub Total		**80.4**	**33.2**	**2.8**	**1.7**	—	—	**37.7**	**5.1**	**42.8**
Grass and Herb Dominated										
Brassica nigra – Bromus diandrus Semi-natural Association	SNA/ None	12.4	10.6	—	—	—	—	10.6	1.0	11.6
Bromus diandrus Semi-natural Association	SNA/ None	7.3	7.2	—	—	—	—	7.2	0.0[h]	7.3
Wild oats and annual brome grasslands (*Avena* spp. – *Bromus* spp.) Semi-Natural Alliance	SNA/ None	44.8	37.9	2.9	0.1	—	0.0[i]	41.0	0.7	41.6
Grass and Herb Dominated Total		**64.6**	**55.8**	**2.9**	**0.1**	—	**0.0**	**58.8**	**1.7**	**60.5**
Disturbed and Developed										
Disturbed Habitat	NA/ None	7.8	4.9	0.0[j]	—	0.3	0.0[k]	5.3	0.0[l]	5.4
Urban/Developed	NA/ None	9.5	4.7	0.8	—	2.0	0.7	8.3	0.0[m]	8.3
Disturbed and Developed Total		**17.3**	**9.6**	**0.9**	**—**	**2.4**	**0.7**	**13.6**	**0.1**	**13.7**
Grand Total		**164.8**	**100.0**	**6.6**	**2.8**	**2.4**	**0.8**	**112.5**	**6.8**	**119.3**

Notes:
For alliances with state ranks of S1–S3, all associations within them are considered highly imperiled, Sensitive. A question mark (?) denotes an inexact numeric rank due to insufficient samples over the full expected range of the type, but existing information points to this rank (CDFW 2019a). Coast live oak woodland designated as sensitive by the Los Angeles County Oak Woodlands Conservation Management Plan (County of Los Angeles 2011).

[a] Some totals may not sum due to rounding.
[b] A total of 0.03 acres of oak woodlands were mapped at the Water Tank Area according to A Manual of California Vegetation, Second edition (Sawyer et a. 2009); however, in accordance with Los Angeles County Oak Woodlands Conservation Management Plan Guide (Los Angeles County 2014) there are a total of 0.65 acres of oak woodlands, of which there are 0.61 acres of significant impacts to oak woodlands within OW2 and OW3.
[c] A total of 0.03 acres of impacts to Schinus molle Association – *Ailanthus altissima* Semi-natural Association – *Eucalyptus (globulus, camaldulensis)* Provisional Semi-natural Association.
[d] A total of 0.05 acres of impacts to bush mallow scrub (*Malacothamnus fasciculatus – Malacothamnus* spp.) Alliance.
[e] A total of 0.0001 acres of impacts to California buckwheat scrub (*Eriogonum fasciculatum*) Alliance related to Fuel Management Zones.
[f] A total of 0.04 acres of impacts to purple sage (*Salvia leucophylla*) Alliance.
[g] A total of 0.04 acres of impacts to purple sage scrub (*Salvia leucophylla*) related to Fuel Management Zones.
[h] A total of 0.02 acres of impacts to *Bromus diandrus* Semi-Natural Alliance related to Fuel Management Zones.
[i] A total of 0.006 acres of impacts to wild oats and annual brome grasslands (*Avena* spp. – *Bromus* ssp.) Semi-Natural Alliance.
[j] A total of 0.04 acres of impacts to disturbed habitat associated with Off-Site Roadway Improvement Areas.
[k] A total of 0.00003 acres of impacts to disturbed habitat associated with Off-Site Sewer Line Improvement Areas.
[l] A total of 0.03 acres of impacts to disturbed habitat related to Fuel Management Zones.
[m] A total of 0.04 acres of impacts to urban/ developed related to Fuel Management Zones.

In addition to direct permanent impacts resulting from vegetation removal, impacts associated with fuel modification would occur due to the Project. Impacts within Zone A and Zone B between (0–100 feet from future structures) and within Zone C (100–200 feet from future structures) were quantified for vegetation management activities. Fuel Modification Zone A impacts are included in the direct permanent impacts. Fuel modification in Zone B would result in the disturbance of 2.1 acres, and fuel modification in Zone C would result in the disturbance of 4.6 acres. (Note that due to rounding, totals may not sum precisely.) These are included in the total impact acreages.

The vegetation types within the development footprint that are considered sensitive by CDFW and/or Los Angeles County, as well as under CEQA, are coast live oak woodlands (Los Angeles County sensitive), arroyo willow thickets (riparian), mulefat thickets (riparian), *Rhus trilobata* association (S3, riparian), and Palmer's goldenbush scrub provisional alliance (S3?). Coast live oak woodlands impacts and mitigation are discussed in Section 6.8, Impacts to Wildlife Corridors and Habitat Connectivity, Threshold 5. Impacts to riparian habitats arrow willow thickets, mulefat thickets, and Rhus trilobata association (and sensitive vegetation community) are discussed below in Section 6.7. Impacts to sensitive vegetation community Palmer's goldenbush scrub provisional alliance (S3?) is described below.

Impact BIO-9

Based on the analysis above, the Project has the potential to cause significant direct impacts to sensitive vegetation communities without implementation of mitigation. Project construction would result in 6.7 acres of impacts to Palmer's goldenbush scrub provisional alliance (S3?), which represents 81.7% of the total acreage of this vegetation community within the Project site.

Palmer's goldenbush scrub is an early-successional shrubland that occupies sites after disturbances, generally post-fire but also after other disturbances, in central and southern coastal California and the Sierra Nevada foothills. The early-successional shrubland is dominated by a variable mix of species such as common deerweed, California sagebrush, coyote brush, *Ceanothus* sp., bush monkeyflower (*Diplacus aurantiacus*), California brittle bush, ashy buckwheat (*Eriogonum cinereum*), California buckwheat, golden-yarrow (*Eriophyllum confertiflorum*), sawtooth golden bush (*Hazardia squarrosa*), chaparral yucca, toyon, laurel sumac (*Malosma laurina*), sugarbush (*Rhus ovata*), white sage, purple sage, and black sage (USGS 2020b). This species assemblage is not unique to Palmer's goldenbush scrub and instead are also common in the coastal sage scrub vegetation communities within the 33.3 acres of coastal sage scrub within the Off-Site Open Space Area conservation easement. Palmer's goldenbush scrub establishment is the first step in an area's recovery after disturbance. Palmer's goldenbush (*Ericameria palmeri* var. *pachylepis*), the dominant species in the Palmer's goldenbush scrub provisional alliance (S3?), is a common coastal sage scrub species known to occur from Santa Maria in northern Santa Barbara County south towards San Diego and extending east through the Angeles National Forest and San Bernardino National Forest. Additionally, Palmer's goldenbush is not a special-status plant species. The distribution of Palmer's goldenbush is not limited in the Val Verde area and instead is known to widely occur in the surrounding Los Angeles County and Ventura County areas.

Palmer's goldenbush scrub appears to be similar to that of the sawtooth goldenbush (*Hazardia squarrosa*) and Menzies' goldenbush (*Isocoma menziesii*) alliances, since the stands occur in a larger matrix of annual grasslands (CNPS 2021b). These are early-successional shrublands, generally post-fire, but also after other disturbances (Reid and Evens 2014). Stands of Palmer's goldenbush scrub develop from many types of grassland, chaparral, and coastal sage scrub after recent fires, and on heavy clay soils (Reid and Evens 2014); the locations where the Palmer's goldenbush scrub is found on the Project

site have been classified as loamy soils (USDA 2021). This alliance is transitional from either heavily disturbed annual grasslands or perennial grasslands with *Nassella pulchra* and *Hemizonia fasciculata*, to longer persisting shrublands of *Artemisia californica* or *Salvia leucophylla* (Keeler-Wolf and Evens 2006).

The locations of the Palmer's goldenbush scrub within the proposed Project site are not found within floodways (FEMA 2017) or within or adjacent to previously mapped features (USFWS 2021). As is evident on the USGS's Val Verde 7.5-minute topographic quadrangle (USGS 2021) that contains the Project site, the subwatershed that the Project site is in is relatively small and would not create hydrological conditions that would support floodways with low-energy margins. As stated in the Report, the Project site is located in the upper portion of the Salt Canyon-Santa Clara River watershed, and the moderately to steeply sloping terrain in the northern and eastern portions of the Project appears to convey water downslope rapidly during and following rainfall events. As water flows downslope to the south and west through the Project site, the slope flattens and the channel features dissipate, with water apparently spreading out over a relatively wide area identified as swales that did not support a readily identifiable OHWM or defined bed and bank. These findings are supported by direct observation during storm events in January 2017.

As shown in Figure 1 in Appendix L, the Palmer's goldenbush scrub on the Project site occurs from approximately 1,200 feet amsl at the patch between Coolidge Avenue and Del Valle Road in the southwestern portion to 1,391 feet amsl in the southeastern portion along a minor ridgeline. On a transect going straight east from a point (34.448912, -118.655148 - WGS84 datum) on Del Valle Road in the southern portion of the Project site, the Palmer's goldenbush scrub occurs from approximately 1,225 feet amsl to 1,269 feet amsl, a 44-foot rise in elevation. On a transect going straight east from a point (34.449759, -118.653244) on Del Valle Road in the middle portion of the Project site, the Palmer's goldenbush scrub occurs from approximately 1,257 feet amsl to 1,309 feet amsl, a 52-foot rise in elevation. On a transect going straight east from a point (34.450230, -118.651923) on Del Valle Road in the northern portion of the Project site, the Palmer's goldenbush scrub occurs from approximately 1,279 feet amsl to 1,312 feet amsl, a 33-foot rise in elevation.

Based upon the provided information, the Palmer's goldenbush scrub found on the Project site is not found on the low-energy margins of floodways or dependent on infrequent inundation, and is fact found on slopes based on the elevation range in which it occurs. The Project is within the boundaries of the 1988 Piru Fire, and much of the area of the current Palmer's goldenbush scrub was again burned in the 1992 Hunstock Fire (Zenter and Hagan 2019).

Establishment of 37.9 acres of the Off-Site Open Space Area conservation easement includes 33.3 acres of coastal sage scrub (which includes 1.4 acres of Palmer's goldenbush scrub) and suitable habitat for coastal California gnatcatcher. Specifically, the Off-Site Open Space Area includes 5.7 acres of California sagebrush – California buckwheat scrub alliance, 23.9 acres of California sagebrush scrub alliance, 1.4 acres of Palmer's goldenbush scrub provisional alliance, and 2.3 acres of purple sage scrub alliance. The coastal sage scrub vegetation communities preserved within the Off-Site Open Area conservation easement have similar species assemblage as those within Palmer's goldenbush scrub provisional alliance (S3?) including but not limited to; common deerweed, California sagebrush, coyote

brush, bush monkeyflower, California brittle bush, California buckwheat, golden-yarrow, sawtooth golden bush, chaparral yucca, toyon, sugarbush, white sage, purple sage, and black sage. Although not prominent in quantities to be considered a vegetation community alliance or association, Palmer's goldenbush is a component of the California sagebrush – California buckwheat scrub alliance, California sagebrush scrub alliance, and purple sage scrub alliance present within the Off-Site Open Space Area conservation easement. As Palmer's goldenbush scrub provisional alliance (S3?) is an early-successional shrubland, its type conversion to a more common coastal sage scrub overtime would be well represented by the 33.3 acres of coastal sage scrub (which includes 1.4 acres of Palmer's goldenbush scrub) in the Off-Site Open Space Area conservation easement.

Based on the analysis, the Project has the potential to cause direct impacts to 6.7 acres of Palmer's goldenbush scrub provisional alliance (S3?). As part of the Project, the following mitigation measures shall be implemented to reduce potential direct impacts to Palmer's goldenbush scrub: **MM-BIO-1 Conservation Easement, MM-BIO-2 Worker Education and Awareness Program,** and **MM-BIO-3 Construction Fencing**. The conservation easement is a 37.9-acre area owned by the Applicant located approximately 0.2 miles south of the Tract Map Site consisting of 5.7 acres of California sagebrush – California buckwheat scrub, 23.9 acres of California sagebrush scrub, 1.4 acres of Palmer's goldenbush scrub, 2.3 acres of purple sage scrub, 2.0 acres of wild oats and annual brome grasslands, 2.3 acres of disturbed habitat, and 0.2 acres of urban/developed area.

To fully mitigate for 6.7 acres of direct impacts to Palmer's goldenbush scrub, compensatory mitigation would be required. There shall be a no net loss of Palmer's goldenbush scrub (1:1); however, total mitigation shall be at a minimum of 3:1 (mitigation: impact acres) and shall include one of the options in **MM-BIO-18 Palmer's Goldenbush Scrub Mitigation**.

Additionally, the Off-Site Open Space Area conservation easement contains weed management (including removal of non-native tree of heaven [*Ailanthus altissima*] individuals and establishing native tree species), and 37.9 acres of habitat (including 33.3 acres of intact coastal sage scrub habitat). Implementation of mitigation measures **MM-BIO-1 Conservation Easement**, **MM-BIO-2 Worker Education and Awareness Program**, **MM-BIO-3 Construction Fencing,** and **MM-BIO-18 Palmer's Goldenbush Scrub Mitigation** would reduce potential direct impacts to sensitive vegetation communities to less than significant.

MM-BIO-1 **Conservation Easement**

MM-BIO-2 **Worker Education and Awareness Program**

MM-BIO-3 **Construction Fencing**

MM-BIO-18 Palmer's Goldenbush Scrub Mitigation

Prior to the issuance of grading permits, to offset the Project's 6.7 acres of direct impacts to Palmer's goldenbush scrub, compensatory mitigation is required. Subject to County approval, there shall be a no net loss of Palmer's goldenbush scrub (1:1) and total mitigation acreages shall be at a minimum of 3:1 (mitigation: impact acres) and shall include one of the following measures:

1. On-site in-kind creation (1:1) and in-kind and out-of-kind preservation (0.2:1 and 5:1) (Total > 5.2:1): In addition to the on-site habitat preservation of existing 1.4 acres of Palmer's goldenbush scrub within the conservation easement area, the Applicant will commit to the following:
   - Creation of 6.7 acres of Palmer's goldenbush in the open space areas within the Tract Map Site (1:1).
   - Establishment of a conservation easement where 31.9 acres of native scrub (a minimum of 0.2:1 in-kind and up to 5:1 out-of-kind) will be preserved in perpetuity.
2. On-site in-kind creation/enhancement and/or preservation (1:1) and in-kind and out-of-kind preservation (0.2:1 and 5:1) (Total > 5.2:1): In addition to the on-site habitat preservation of existing 1.4 acres of Palmer's goldenbush scrub, the Applicant will commit to the following:
   - Creation/enhancement of Palmer's goldenbush within portions of the proposed conservation easement and/or open space areas within the Tract Map Site and/or preservation of existing native scrub alliance(s) with Palmer's goldenbush scrub association within portions of the proposed conservation easement to total 6.7 acres (1:1).
   - Establishment of a conservation easement where 31.9 acres of native scrub (a minimum of 0.2:1 in-kind and up to 5:1 out-of-kind*) will be preserved in perpetuity. *The acreage of Palmer's goldenbush scrub association(s) would count towards in-kind preservation.
3. On-site in-kind creation/enhancement and/or preservation (1:1) and in-kind and out-of-kind preservation (0.2:1 and 5:1), plus off-site in-kind creation/enhancement: In addition to the on-site habitat preservation of existing 1.4 acres of Palmer's goldenbush scrub, the Applicant will commit to the following:
   - Creation/enhancement of Palmer's goldenbush within portions of the proposed conservation easement and/or open space areas within the Tract Map Site and/or preservation of existing native scrub alliance(s) with Palmer's goldenbush scrub association within portions of the proposed conservation easement to total 6.7 acres (1:1).
   - Establishment of a conservation easement where 31.9 acres of native scrub (a minimum of 0.2:1 in-kind and up to 5:1 out-of-kind*) will be preserved in perpetuity. *The acreage of Palmer's goldenbush scrub association(s) would count towards in-kind preservation.
   - If on-site in-kind creation/enhancement and/or preservation and in-kind and out-of-kind preservation do not achieve a total of 3:1, off-site in-kind habitat creation/enhancement will be incorporated to achieve at total of 3:1. Off-site in-kind creation/enhancement of Palmer's goldenbush scrub at a mitigation bank, such as Land Veritas, will be established with an acreage appropriate to achieve a total of 3:1.

Less-Than-Significant Direct Impacts to Vegetation Communities

The Project would permanently impact 0.5 acres of *Schinus molle* – *Ailanthus altissima* – *Eucalyptus* (*globulus*, *camaldulensis*) provisional semi-natural association (no rarity rank), 0.7 acres of Chamise – black sage chaparral alliance (S4), 0.3 acres of black sage scrub alliance (S4), 0.0 acres (rounded from 0.05 acres) (bush mallow scrub alliance (S4), 0.6 acres of California buckwheat scrub alliance (S5), 0.5 acres of California sagebrush – black sage

scrub alliance (S4), 23.0 acres of California sagebrush – California buckwheat scrub alliance (S4), 5.9 acres of California sagebrush scrub alliance (S5), 0.1 acres of coyote brush scrub alliance (S5), 5.5 acres of purple sage scrub alliance (S4), 11.6 acres of *Brassica nigra – Bromus diandrus* semi-natural association (no rarity rank), 7.3 acres of *Bromus diandrus* semi-natural association (no rarity rank), and 41.6 acres of wild oats and annual brome grasslands semi-natural alliance (no rarity rank). These vegetation communities are not considered sensitive based on CEQA standards, and therefore, impacts to these vegetation communities would be less than significant. Focused surveys for special-status wildlife species conducted in 2018 and 2020 were negative for coastal California gnatcatcher; however, other special-status species utilizing these habitats as observed during the 2018 and 2020 focused surveys include Southern California rufous-crowned sparrow, San Diegan tiger whiptail, and oak titmouse. Although the Project would impact suitable habitat for these species, the mitigation measures **MM-BIO-1 Conservation Easement**, **MM-BIO-2 Worker Education and Awareness Program**, **MM-BIO-3 Construction Fencing**, **MM-BIO-4 Stormwater Pollution Prevention Plan**, **MM-BIO-5 Weed Control Plan**, **MM-BIO-6 Landscaping Plan, MM-BIO-7 Fire Protection Plan**, **MM-BIO-8 Biological Monitoring**, **MM-BIO-9 Reptile Pre-construction Survey and Relocation**, **MM-BIO-10 Pre-construction Nesting Bird Survey**, **MM-BIO-11 Pre-construction Burrowing Owl Survey**, **MM-BIO-12 Pre-construction Surveys for San Diego Black-Tailed Jackrabbit**, **MM-BIO-13 Pre-construction Surveys for American Badger**, and **MM-BIO-14 Pre-construction Surveys for San Diego Desert Woodrat** would be sufficient to avoid direct impacts to these species. Based on the proposed preservation of suitable habitat for these species, as well as the large swaths of contiguous suitable habitat adjacent to the Project site, direct impacts to these species are anticipated to be less than significant.

6.6.2 Indirect Impacts to Vegetation Communities and Land Cover Types and Proposed Mitigation

Indirect short-term construction effects to vegetation communities may include fugitive dust; runoff, sedimentation, erosion, and chemical pollution; and accidental clearing, grading, and trampling. Excessive dust from short-term construction can decrease or limit plant survivorship by decreasing photosynthetic output, reducing transpiration, and adversely affecting reproductive success. Construction or other infrastructure upgrades, including mass grading, can severely or permanently alter the surface hydrology in an area and affect plant communities by reducing access to sheet flow during rain events or increasing the chance of erosion. Operation and maintenance of construction equipment can increase the chance of petroleum or other chemical spills or leaks (e.g., fuels, lubricants, cleaning solutions) that can enter off-site vegetation. Vegetation can also be crushed through the inadvertent clearing outside the designated Project footprint.

Over the long term, increases in human activity along the open space–urban interface (also referred to as "edge areas") and within open space areas may result in secondary effects, which include the following:

- Fertilizers and herbicides may penetrate open space areas through runoff and overspray, adversely affecting vegetation communities by killing or weakening native species and/or allowing establishment of non-native species in edge areas.
- Increased urban and stormwater runoff from impervious surfaces such as roads or structures may result in long-term hydrological alterations, including increased runoff volume, increased peak flow rates, increased duration of flows, and altered patterns in the tributary drainages on site.
- Invasive plant species that thrive in edge habitats are a well-documented problem along the open space–urban interfaces in Southern California. Invasive species can degrade habitat by forming monocultures that displace native communities and can colonize virtually any area that is subject to some kind of disturbance,

such as the banks of stream channels and adjacent upland areas, including road shoulders, cleared zones along housing developments, and fire breaks.

- Urbanization also alters wildfire regimes as a result of human activities at the open space–urban interface, such as accidental ignitions from sparks from equipment such as mowers striking rocks, cigarettes, children playing with matches, and intentional ignitions such as arson. While wildfires are most likely to be ignited in edge areas, the actual effect of large wildfires can occur at the much broader landscape level, especially when fires are quickly spread into undeveloped lands by strong winds.

The Project has an approved fuel modification plan (which includes a conceptual landscape plan). The fuel modification plan incorporates details on plant species permitted and not permitted and fuel modification zones which will create a buffer of sorts from the long-term potential impacts to adjacent vegetation. The approved fuel modification plan, which includes the conceptual landscape plan, contains specific notes that the plant selections should be made by referencing the Plant Selection Guidelines by Zone (Los Angeles County Fire Department 2011). Los Angeles County Fire prepared guidelines, which include plant selection, undesirable plants/target species, and a fuel modification plant list. The approved fuel modification plan specifically states that all future plantings shall be in accordance with the County of Los Angeles Fire Department Fuel Modification Guidelines (Los Angeles County Fire Department 2011) and approved prior to installation. As this approved fuel modification plan is part of the Project, the potential long-term impacts to adjacent vegetation will be minimized through the implementation of native plant species and avoidance of incorporating California Invasive Plant Council-defined invasive plant species.

Impact BIO-10 Based on the analysis, the Project has the potential to cause significant indirect short-term and long-term impacts to vegetation communities. However, implementation of mitigation measures **MM-BIO-2 Worker Education and Awareness Program, MM-BIO-3 Construction Fencing, MM-BIO-4 Stormwater Pollution Prevention Plan**, **MM-BIO-5 Weed Control Plan**, **MM-BIO-6 Landscaping Plan, MM-BIO-7 Fire Protection Plan**, and **MM-BIO-8 Biological Monitoring,** and the approved fuel modification plan, which includes a conceptual landscape plan and notes on plants permitted and not permitted, would reduce potential indirect short-term and long-term impacts to vegetation communities to less than significant.

MM-BIO-2 **Worker Education and Awareness Program**

MM-BIO-3 **Construction Fencing**

MM-BIO-4 **Stormwater Pollution Prevention Plan**

MM-BIO-5 **Weed Control Plan**

MM-BIO-6 **Fire Protection Plan**

MM-BIO-7 **Biological Monitoring**

Biological Survey Area

Project Components

Tract Map Site
Off-Site Roadway Improvement
Off-Sewer Line Improvement
Not a Part

Fuel Modification Zones

Zone A
Zone B
Zone C

Proposed Impact Area

Project Development Footprint
Open Space

Focused Survey Results

Slender Mariposa Lily *(Calochortus clavatus var. gracilis)*
Southern California black walnut *(Juglans californica)*

Potential Jurisdictional Water Resources

U.S. Army Corps of Engineers

Other Waters (Ephemeral Channel)

California Department of Fish and Wildlife

Streambed and Bank
Riparian Habitat
Swale
Vegetation Communities and Land Cover Types

Grass and Herb Dominated

BN-BD = Brassica nigra - Bromus diandrus Semi-natural Association
BRDI = Bromus diandrus Semi-natural
WOABG = Wild oats and annual brome grasslands *(Avena spp. - Bromus spp.)* Semi-Natural Alliance

Riparian

AWT = Arroyo willow thickets *(Salix lasiolepis)*
DOP = Basket bush - river hawthorn - desert olive patches (Rhus trilobata - Crataegus rivularis - Forestiera pubescens) Alliance
MFT = Mulefat thickets *(Baccharis salicifolia)*

Scrub

CBS = California buckwheat scrub *(Eriogonum fasciculatum)* Alliance
CSB-CB = California sagebrush - California buckwheat scrub *(Artemisia californica - Eriogonum fasciculatum)* Alliance
CSS = California sagebrush scrub *(Artemisia californica)* Alliance
CYS = Coyote brush scrub *(Baccharis pilularis)*
PGBS = Palmer's goldenbush scrub *(Ericameria palmeri)* Provisional Alliance
PSS = Purple sage scrub *(Salvia leucophylla)* Alliance

Other

SCMO-AIA-EUC = Schinus molle Association - Ailanthus altissima Semi-natural Association - Eucalyptus *(globulus, camaldulensis)* Provisional Semi-natural Association
DEV = Urban/Developed
DH = Disturbed Habitat

SOURCE: NAIP 2016

DUDEK

0 140 280 Feet

FIGURE 9A

Main Project Proposed Impact Area

Biological Technical Report for the Sterling Ranch Estates Residential Project

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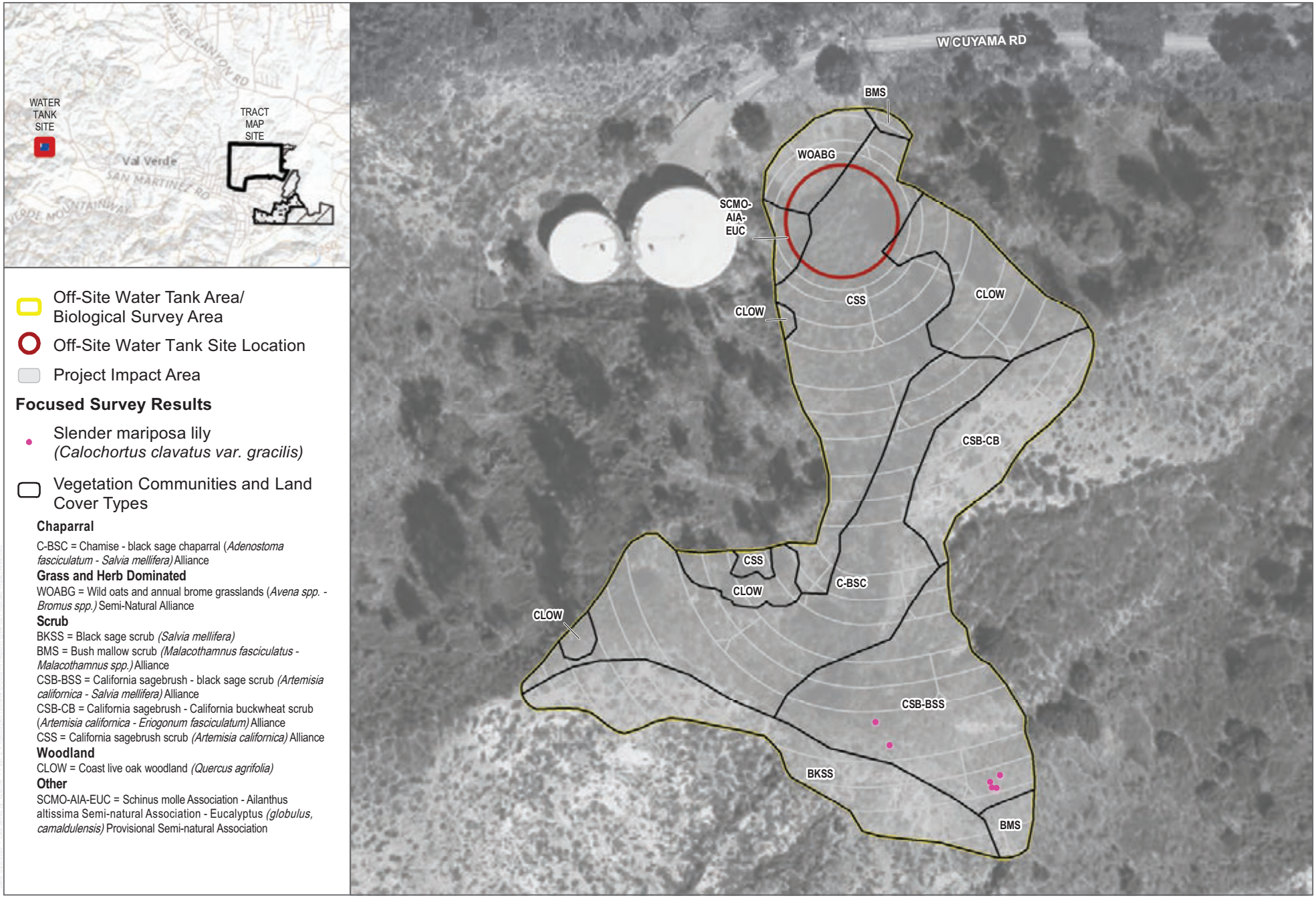

SOURCE: USDA, Eagle Aerial Solutions 2018

DUDEK

0 50 100 Feet

FIGURE 9B

Off-Site Water Tank Area Proposed Impact Area

Biological Technical Report for the Sterling Ranch Estates Residential Project

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Biological Survey Area

Project Components

Tract Map Site

Off-Site Roadway Improvement Area

Off-Site Sewer Line Improvement Area

Off-Site Water Line Improvement

Off-Site Open Space

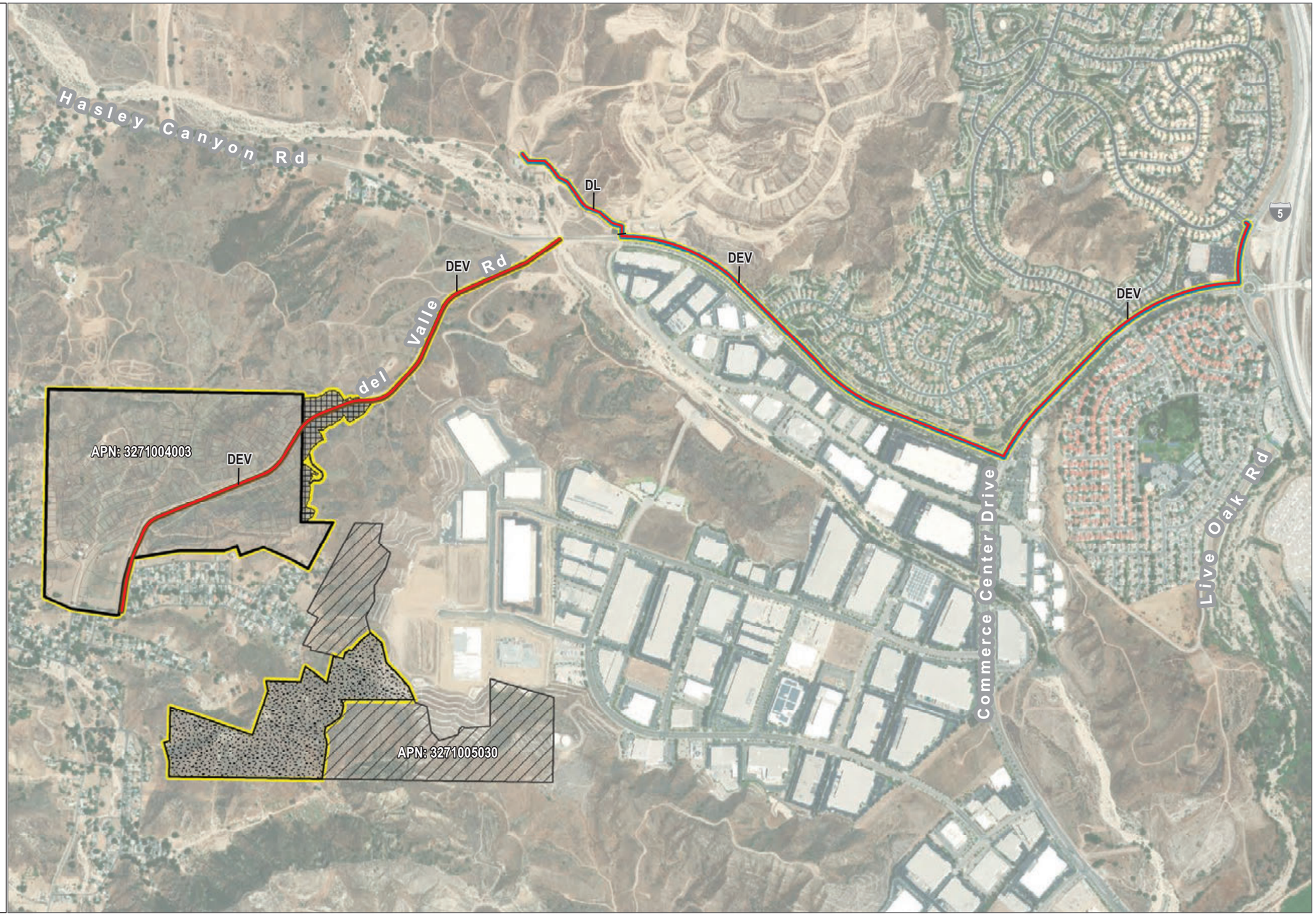
Not a Part

Proposed Impact Area

Vegetation Communities and Land Cover Types

DEV = Urban/Developed

DH = Disturbed Habitat



SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 500 1,000 Feet

FIGURE 9C

Off-Site Water Line Improvement Area and Off-Site Sewer Line Proposed Impact Area

Biological Technical Report for the Sterling Ranch Estates Residential Project

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- Biological Survey Area

Project Components

- Tract Map Site
- Off-Site Roadway Improvement Area
- Off-Site Sewer Line Improvement Area
- Off-Site Open Space Area
- Not a Part

Proposed Impact Area

- Project Development Footprint
- Open Space

Fuel Modification Zones

- Zone A
- Zone B
- Zone C

Proposed Preserved Area

- Natural Open Space

Focused Survey Results

- Slender Mariposa Lily (*Calochortus clavatus var. gracilis*)
- Vegetation Communities and Land Cover Types

Grass and Herb Dominated

BN-BD = Brassica nigra - Bromus diandrus Semi-natural Association

BRDI = Bromus diandrus Semi-natural Association

WOABG = Wild oats and annual brome grasslands *(Avena spp. - Bromus spp.)* Semi-Natural Alliance

Riparian

AWT = Arroyo willow thickets *(Salix lasiolepis)* Alliance

RT = Rhus trilobata Association

MFT = Mulefat thickets *(Baccharis salicifolia)* Alliance

Scrub

CBS = California buckwheat scrub *(Eriogonum fasciculatum)* Alliance

CSB-CB = California sagebrush - California buckwheat scrub *(Artemisia californica - Eriogonum fasciculatum)* Alliance

CSS = California sagebrush scrub *(Artemisia californica)* Alliance

CYS = Coyote brush scrub *(Baccharis pilularis)* Alliance

PGBS = Palmer's goldenbush scrub *(Ericameria palmeri)* Provisional Alliance

PSS = Purple sage scrub *(Salvia leucophylla)* Alliance

Other

SCMO-AIA-EUC = Schinus molle Association - Ailanthus altissima Semi-natural Association - Eucalyptus *(globulus, camaldulensis)* Provisional Semi-natural Association

DEV = Urban/Developed

DH = Disturbed Habitat

Not a Part

Not a Part
(Mountains Recreation & Conservation Authority Conservation Easement)

SOURCE: NAIP 2016

DUDEK

0 230 460 Feet

FIGURE 8A

Proposed Preservation Areas

Biological Technical Report for the Sterling Ranch Estates Residential Project

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Project Components

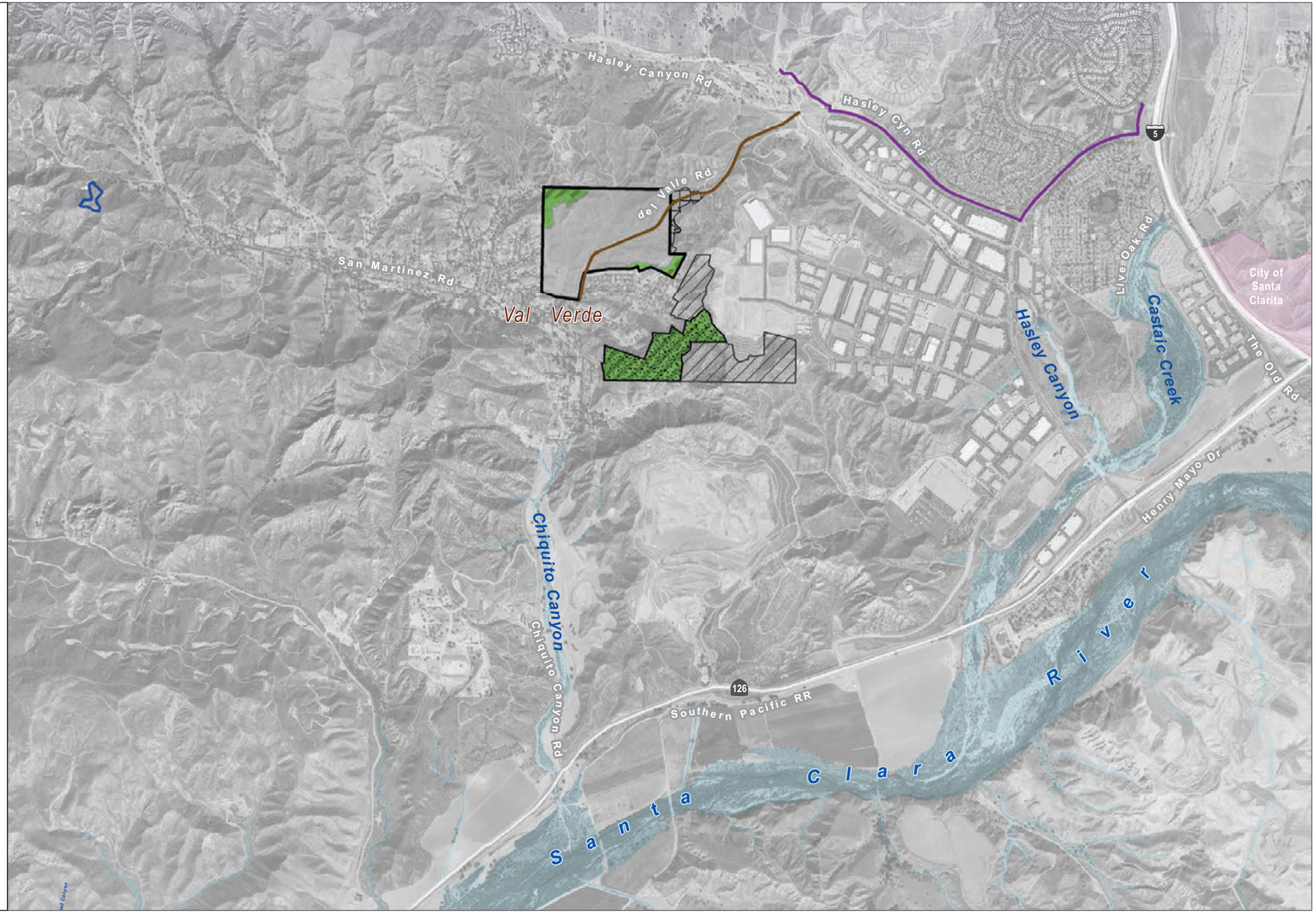
- Tract Map Site
- Off-Site Water Tank Area
- Off-Site Water Line Improvement Area
- Off-Site Roadway Improvement Area
- Off-Site Sewer Line Improvement Area Off-
- Site Open Space Area
- Not a Part

Proposed Impact Area

- Project Development Footprint
- Open Space

Proposed Preserved Area

- Natural Open Space



SOURCE: NAIP 2016

DUDEK 0 1,000 2,000 Feet

FIGURE 8B

Proposed Preservation Areas Overview

Biological Technical Report for the Sterling Ranch Estates Residential Project

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6.7 Impacts to Jurisdictional Water Resources

Threshold 3: Would the Project have a substantial adverse effect on federally or state protected wetlands (including, but not limited to, marshes, vernal pools, coastal wetlands, and drainages) or waters of the United States, as defined by Section 404 of the federal Clean Water Act (CWA) or California Fish and Game Code Section 1600 et seq., through direct removal, filling, hydrological interruption, or other means?

6.7.1 Direct Impacts to Jurisdictional Water Resources

Within the Project site there are two unnamed ephemeral waterways characterized as non-wetland waters of the United States and state subject to potential regulation by the USACE, RWQCB, and CDFW. Project construction would result in impacts to these jurisdictional water resources.

Impact BIO-11 Project construction would result in direct impacts to potential jurisdictional water resources, which would be significant absent mitigation.

In total, the Project would impact 0.13 acres of non-wetland waters of the United States subject to potential regulation by the USACE, 1.05 acres of streambed and bank and associated riparian vegetation subject to regulation by CDFW , and 0.06 acres of swales subject to regulation by CDFW. The extent of the CDFW streambed and bank and associated riparian vegetation is also under the jurisdiction of RWQCB as non-wetland waters of the state, shown on Figure 9A. Table 13 below provides the impact acreage for each jurisdictional water resource.

Table 13. Impacts to Jurisdictional Waters within the Project Site

Area	Non-Wetland Waters of the United States	CDFW-Jurisdictional Streambed and Associated Riparian Vegetation, Non-Wetland Waters of the State (acres)	CDFW-Jurisdictional Swale (acres)	Length (Linear Feet)
Unnamed Ephemeral Waterway 1	0.06	0.41	N/A	629
Unnamed Ephemeral Waterway 2	0.07	0.64	N/A	1,020
Swale	N/A	N/A	0.06	2,696
Total Impacts to Jurisdictional Areas	**0.13**	**1.05**	**0.06**	**4,345**

Based on the analysis, the Project has the potential to cause significant direct impacts to jurisdictional waters. However, implementation of mitigation measures **MM-BIO-19 Agency Permit Applications** and **MM-BIO-20 Aquatic Resource Habitat Mitigation and Monitoring Plan** would reduce potential direct impacts to less than significant.

MM-BIO-19 **Agency Permit Applications.** Prior to construction work in jurisdictional waters, applications for Clean Water Act (CWA) Section 404 and California Fish and Game Code 1602 permits shall be prepared and submitted to the regulatory agencies and the permits obtained by the Project Applicant. The compensatory mitigation requirements of the resource agencies shall be incorporated into the Aquatic Resource Habitat Mitigation and Monitoring Plan (**MM-BIO-18 Aquatic Resource Habitat Mitigation and Monitoring Plan**). Mitigation shall be proposed at a minimum 1:1 ratio, or as required by the permitting agencies, to preserve, enhance, or restore similar ephemeral streams, streambed and associated riparian habitat, and swales for no net loss of jurisdictional aquatic resources.

MM-BIO-20 **Aquatic Resource Habitat Mitigation and Monitoring Plan**. Prior to the issuance of grading permits, an Aquatic Resource Habitat Mitigation and Monitoring Plan (HMMP) shall be developed in coordination with preparation of the agency permit applications and shall be approved by the regulatory agencies and County of Los Angeles. The Aquatic Resource HMMP shall provide details on the proposed mitigation for impacts to jurisdictional resources present within the Project site including a minimum 1:1 mitigation ratio, or as required by the permitting agencies, of similar ephemeral streams, streambed and associated riparian habitat, and swales for no net loss of jurisdictional aquatic resources. The Aquatic Resource HMMP shall include an overview of the mitigation strategy for impacts to sensitive vegetation as well as specific mitigation locations proposed within off-site areas, including mitigation banks credits (i.e., Santa Paula Creek Mitigation Bank) and conservation lands, if applicable.

The Aquatic Resource HMMP shall include maintenance and monitoring requirements, performance standards, success criteria, and contingency measures, which shall guide the management of the mitigation program and provide the metrics for the determination of success of the Project mitigation.

The U.S. Fish and Wildlife Service, Regional Water Quality Control Board, California Department of Fish and Wildlife, and County of Los Angeles shall review and approve the Aquatic Resource HMMP prior to implementation, ensuring that each of the requirements of these agencies are met and that the Project is consistent with agency policy, permit requirements, and conditions of approval.

6.7.2 Indirect Impacts to Jurisdictional Waters

Indirect short-term construction effects to jurisdictional waters may include runoff, sedimentation, erosion, and chemical pollution, and accidental clearing, grading, and trampling. Construction or other infrastructure upgrades, including mass grading, can severely or permanently alter the surface hydrology in an area. Operation and maintenance of construction equipment can increase the chance of petroleum or other chemical spills or leaks (e.g., fuels, lubricants, cleaning solutions) that can enter jurisdictional water.

Over the long term, increases in human activity along the open space–urban interface (also referred to as "edge areas") and within open space areas may result in secondary effects, which include the following:

- Fertilizers and herbicides may penetrate open space areas through runoff and overspray, adversely affecting jurisdictional waters by killing or weakening native species and/or allowing establishment of non-native species in edge areas.

- Increased urban and stormwater runoff from impervious surfaces such as roads or structures may result in long-term hydrological alterations, including increased runoff volume, increased peak flow rates, increased duration of flows, and altered patterns in the tributary drainages on site.

Impact BIO-12 Based on the analysis, the Project has the potential to cause significant indirect short-term and long-term impacts to jurisdictional waters. However, implementation of mitigation measures **MM-BIO-2 Worker Education and Awareness Program, MM-BIO-3 Construction Fencing, MM-BIO-4 Stormwater Pollution Prevention Plan**, **MM-BIO-8 Biological Monitoring, MM-BIO-15 Homeowners' Association Covenants, Conditions and Restrictions**, and development of an HOA to regulate trash and potential water quality impacts would reduce potential indirect short-term and long-term impacts to jurisdictional waters to less than significant.

MM-BIO-2 **Worker Education and Awareness Program**

MM-BIO-3 **Construction Fencing**

MM-BIO-4 **Stormwater Pollution Prevention Plan**

MM-BIO-8 **Biological Monitoring**

MM-BIO-15 **Homeowners' Association Covenants, Conditions, and Restrictions**

6.8 Impacts to Wildlife Corridors and Habitat Connectivity

Threshold 4: Would the Project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

From a regional perspective, the community of Val Verde constrains access to available habitat to the south and southwest, which constitutes some level of impediment to habitat connectivity. However, the open space to the west already provides important wildlife movement corridors for wildlife.

The Project site is situated between an industrial park to the east, the community of Val Verde (single-family homes) to the south and southwest, and the larger community of Castaic and Hasley Canyon community to the north, with portions of mostly undeveloped surrounding lands to the northwest and west. From a regional perspective, Interstate 5 approximately 2 miles to the east of the Project site is a major barrier to wildlife movement, with additional wildlife connectivity restrictions from the industrial park approximately 0.2 miles to the east of the Project site; residential developments to the north, south, and southwest; and the landfill, State Route 126, and the approved Newhall Ranch development (currently the first phase of Newhall Ranch is under construction) to the south. These existing and approved developments constrain wildlife from moving through the Project site. Additionally, there are expansive open spaces further to the west of the existing single-family development which provide connecting north–south habitats and wildlife corridors between the Santa Felicia SEA and Santa Clara River SEA through Los Angeles County and Ventura County. The Santa Felicia SEA, which is largely undeveloped and contains vast stands of intact coastal sage scrub and chaparral communities, contains core habitat to many terrestrial species. These intact habitats provide wildlife movement corridors through the Santa Felicia watershed in addition to the riparian systems between Piru Lake and the San Gabriel Mountain range to the south extending east. The southern portion of the Santa Felicia SEA contains some oil development with a network of dirt roads and few buildings scattered throughout the SEA. The

Project site does not restrict movement between Lake Castaic and Castaic Lagoon and/or along the Santa Felicia SEA or the Santa Clara River SEA.

South Coast Missing Linkages: A Wildland Network for the South Coast Ecoregion (South Coast Wildlands 2008) has prioritized and designed landscape linkages that are widely considered the backbone of a conservation strategy for Southern California. The Project site is outside the designated landscape linkages. The Sierra Madre–Castaic Connection approximately 2.3 miles to the north of the Project site connects the Los Padres National Forest and Angeles National Forest. The Santa Monica–Sierra Madre Connection approximately 2.5 miles to the west of the Project site stretches from the Santa Monica Mountains to the peaks of the Santa Susana Mountains and the Sierra Madres Ranges of the Los Padres National Forest (South Coast Wildlands 2008).

The California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California (Spencer et al. 2010) was prepared because a functional network of connected wildlands is essential to the continued support of California's diverse natural communities in the face of human development and climate change. The report includes a statewide Essential Habitat Connectivity Map, data characterizing areas delineated on the map, and guidance for mitigating the fragmenting effects of roads and for developing and implementing local and regional connectivity plans. The Project site is located approximately 2 miles to the east of Essential Connectivity Areas identified in the California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California (Spencer et al. 2010).Overall wildlife movement is regionally and locally constrained through the Project site from existing and approved developments including Interstate 5; the communities of Castaic, Hasley Canyon, and Val Verde; the industrial park; the landfill; State Route 126; and the Newhall Ranch development. The Project is located outside of Los Angeles County designated SEAs, South Coast Wildlands-designed landscape linkages, and Essential Connectivity Areas identified in the California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California (Spencer et al. 2010). However, the Santa Felicia SEA, Santa Clara River SEA, Sierra Madre–Castaic Connection, and Santa Monica–Sierra Madre Connection further to the west of existing and approved developments provide largely undeveloped intact habitat for wildlife movement corridors and habitat linkages.

Although the Project site is bordered by residential development to the south and southwest, limiting wildlife movement in the area, the Project would potentially interfere with local movement by removing access to suitable habitat patches and established native wildlife nursery sites. Project development would occur within a "pocket" of approximately 144.3 acres of the Tract Map Site, immediately north, east, and northwest of established residential development, and is not expected to permanently prohibit wildlife movement to large open space areas or to natural features. The habitats preserved within the BSA, including the northwest and southeast portions of the Tract Map Site and proposed Off-Site Open Space Area conservation easement, are contiguous with the adjacent open space environments. The establishment of the Off-Site Open Space Area conservation easement would connect to the existing 41.3-acre conservation easement held by the Mountains Recreation & Conservation Authority and would continue to allow wildlife movement through the open space elements.

As previously discussed, the 41.3-acre conservation easement held by the Mountains Recreation & Conservation Authority, the 37.9 acres of open space within the Off-Site Open Space Area conservation easement, the 16.1 acres of Tentative Tract No. 62000 just north of the Off-Site Open Space Area conservation easement, approximately 12.6 acres of the Tract Map site that would remain as natural undisturbed open space, and the manufactured open space around the perimeter of the Tract Map site would continue to facilitate wildlife movement for a variety wildlife species for the foreseeable future. While Tentative Tract No. 62000 is currently proposed for residential development, entitlements for Tentative Tract No. 62000 are not being pursued actively at this time. Accordingly, wildlife movement would continue to occur across the open space areas within the Project area.

Although it is unknown when development of Tentative Tract No. 62000 would occur, several standard development features would continue to permit wildlife movement throughout the Project area. Consistent with County requirements, natural and undisturbed open space, manufactured open space, and a 20-foot-wide multiuse trail easement would be included as part of the development. The natural undisturbed open space and manufactured open space would provide wildlife movement opportunities across the site. Additionally, the 20-foot-wide multiuse trail easement would include a natural multiuse trail surface, approximately 5 to 8 feet in width, that would traverse north–south through the site as identified in the County's Master Plan of Trails. When Tentative Tract No. 62000 is developed, the open space areas and natural multiuse trail would continue to provide north–south wildlife movement opportunities for wildlife in the Project area.

For these reasons, the Project would not result in an adverse impact to identified wildlife corridors and linkages, and impacts would be less than significant.

Threshold 5: Would the Project convert oak woodlands (as defined by the state, oak woodlands are oak stands with greater than 10% canopy cover with oaks at least 5 inches in diameter measured at 4.5 feet above mean natural grade) or otherwise contain oak or other unique native trees (junipers, Joshua tree, southern California black walnut, etc.)?

Oak Woodlands

Description of Impacts

A total of 0.38 acres of canopy area/understory habitat and 1.69 acres of buffer area of County of Los Angeles-defined oak woodland were recorded on site within the Off-Site Water Tank Area BSA and surrounding area. It is anticipated that development of the Project will result in the following Project impacts:

- Removal of approximately 0.09 acres of canopy area/understory habitat
- Removal of approximately 0.56 acres of buffer habitat

Based on these assumptions, the Project design allows for approximately 1.42 acres, or 68.9%, of the existing 2.07-acre oak woodland canopy area (all on-site oak woodland canopy combined) to remain undisturbed during and after Project construction and operations. Oak woodland impacts are listed in Table 6 of Appendix A and depicted on Figure 6, Oak Woodland Impacts in Appendix A.

Oak woodland impacts were determined using GIS software and spatial locations of trees relative to the Project's impact areas (grading footprint). Impacts were further determined based on Dudek's experience with native woodland habitats and their typical responses to root disturbances from construction activities, such as soil compaction, excavation, and grading. The impact analysis results presented herein were used for recommending appropriate mitigation measures for the Project. Impact totals presented are based on proposed disturbance limits and development plans as of the date of the Oak Woodland Report.

Impact Severity and Estimated Level of Significance (Oak Woodland Guide)

Pursuant to the Oak Woodlands Conservation Management Plan Guide, a determination must be made regarding whether the Project will have a substantial adverse effect on oak woodlands and/or result in the conversion of existing oak woodlands. Further, Table 2 of the Oak Woodlands Conservation Management Plan Guide quantifies the severity of Project impacts in relation to the habitat value/integrity of the subject woodland and the anticipated

Project impact(s). Once a determination of the impact severity of the Project is made, an estimated level of significance is assigned in accordance with Table 3 of the Oak Woodlands Conservation Management Plan Guide. Subsequently, these designations are used to assess whether the Project will exceed the threshold for significance for impacts to oak woodlands. Because the Project site contains three oak woodlands, a determination of the impact severity anticipated and the level of significance was assigned for each subject woodland. These designations are discussed in detail below. Tables 2 and 3 of the Oak Woodlands Conservation Management Plan Guide are provided for reference in Appendices E and F of Appendix A, respectively. For ease of presentation, the oak woodland impacts are separated by impact category below.

Oak Woodland with No Impact or Less-Than-Significant Impacts

Oak Woodland 1

- Project impacts: Excavation and grading activities associated with the construction of the new water tank.
- Woodland Integrity Ranking: Moderately Degraded
  - Discussion regarding the woodland integrity ranking of OW1 is provided in Section 5.4.1.1.2 of this report.
- Impact Severity Ranking: Low
  - Excavation and grading activities associated with construction of the new water tank would require the removal of approximately 0.04 acres of the total 0.26-acre woodland canopy and understory habitat associated with OW1, allowing for approximately 84.5% of the total canopy area associated with OW1 to be retained. Because areas within OW1 are currently subject to roadway use, it is anticipated that these activities will continue unmodified. Pursuant to Table 2, Impact Severity, of the Oak Woodlands Conservation Management Plan Guide, Project impacts within the moderately degraded woodland will have an impact severity ranking of low based on the retention of 84.5% of oak woodland canopy associated with OW1 and the assumptions that the current regeneration potential of the subject woodland would be maintained and the current understory vegetation community will persist.
- Estimated Level of Significance: Less than Significant
  - Pursuant to Table 3, Estimated Level of Significance, of the Oak Woodlands Conservation Management Plan Guide, Project impacts within a moderately degraded woodland that have an impact severity ranking of low would be less than significant. No mitigation will be required under the Oak Woodlands Conservation Management Plan Guide.

Oak Woodlands with Less-Than-Significant Impacts with Mitigation

Oak Woodland 2

- Project impacts: Excavation and grading activities associated with the construction of the new water tank.
- Woodland Integrity Ranking: Intact
  - Discussion regarding the woodland integrity ranking of OW2 is provided in Section 5.4.1.1.2 of this report.
- Impact Severity Ranking: High
  - Excavation and grading activities associated with the new water tank will require the removal of approximately 0.41 acres of the total 1.32-acre woodland canopy and understory habitat associated with OW2, allowing for approximately 69.3% of the total canopy area associated with OW2 to be retained. Pursuant to Table 2 of the Oak Woodlands Conservation Management Plan Guide, these activities within the intact woodland will have an impact severity ranking of high based on the assumption that the impact

will result in the net loss of oak woodland acreage and the loss of habitat and understory. Mitigation will be required under the Oak Woodlands Conservation Management Plan Guide.

- Estimated Level of Significance: Potentially Significant
  - Pursuant to Table 3 of the Oak Woodlands Conservation Management Plan Guide, Project impacts within an intact woodland that have an impact severity ranking of high would be significant and result in the following impacts to OW2: net loss of oak woodland acreage and loss of wildlife habitat and food sources. Mitigation will be required under the Oak Woodlands Conservation Management Plan Guide.

Oak Woodland 3

- Project Impacts: Excavation and grading activities associated with the construction of the new water tank.
- Woodland Integrity Ranking: Intact
  - Discussion regarding the Woodland Integrity Ranking of OW3 is provided in Section 5.4.1.1.2 of this report.
- Impact Severity Ranking: High
  - Excavation and grading activities associated with the new water tank will require the removal of approximately 0.20 acres of the total 0.49-acre woodland canopy and understory habitat associated with OW2, allowing for approximately 59.5% of the total canopy area associated with OW2 to be retained. Pursuant to Table 2 of the Oak Woodlands Conservation Management Plan Guide, these activities within the intact woodland will have an impact severity ranking of high based on the assumption that the impact will result in the net loss of oak woodland acreage and the loss of habitat and understory.
- Estimated Level of Significance: Potentially Significant
  - Pursuant to Table 3 of the Oak Woodlands Conservation Management Plan Guide, Project impacts within an intact woodland that have an impact severity ranking of high would be significant and result in the following impacts to OW3: net loss of oak woodland acreage and loss of wildlife habitat and food sources. Mitigation will be required under the Oak Woodlands Conservation Management Plan Guide.

Impact BIO-13 Based on the analysis, Project development would result in a potentially significant impact to OW2 and OW3 and have a less-than-significant impact on OW1. A total of 0.61 acres of significant impacts to oak woodland canopy would occur in OW2 and OW3, combined, which would require mitigation. Implementation of mitigation measure **MM-BIO-21 Off-Site Water Tank Area Oak Woodland and Oak Tree Mitigation** would reduce oak woodland impacts to less than significant.

MM-BIO-21 **Off-Site Water Tank Area Oak Woodland and Oak Tree Mitigation**

Prior to issuance of grading permits, in accordance with the Oak Woodlands Conservation Management Plan Guide (County of Los Angeles 2011, 2014), to offset the Project's total combined significant impact of 0.61 acres of oak woodland canopy in OW2 and OW3, and in accordance with the Los Angeles Oak Tree Ordinance, to offset the Project's impacts to 12 protected oak trees at the Off-Site Water Tank Area, one of the following mitigation measures shall be implemented, subject to County of Los Angeles approval:

1. Purchase mitigation credits for 1.22 acres of oak woodlands from an off-site oak woodland habitat preservation area owned by a third party; or

2. Contribute to the Los Angeles County's Oak Forests Special Fund in an amount of $97,040 (two times the canopy cover area value).

Southern California Black Walnut

Project construction would result in direct impacts to one Southern California black walnut tree within the Tract Map Site BSA. Southern California black walnut has a CRPR of 4.2. CRPR 4 is defined as a Watch List of plants of limited distribution or infrequent throughout a broader area in California, and their status should be monitored regularly. And threat rank 0.2 is defined as moderately threatened in California. Southern California black walnut is not listed on Bureau of Land Management, USFWS, or U.S. Forest Service sensitive species lists. Southern California black walnut is endemic to California and has been documented from San Diego County north through Siskiyou County; thus, this occurrence is well within the known species' range. It is a perennial deciduous tree that occurs in chaparral, cismontane woodland, coastal scrub, and riparian woodland. The one Southern California black walnut documented at the site was adjacent to an existing residence surrounded by ornamental vegetation and non-native grasslands including annual brome grassland; thus, the Southern California black walnut was not occurring on unusual substrates. There are no native woodlands or native tree stands documented near the one Southern California black walnut to indicate a natural occurrence of this individual. No other Southern California black walnut individuals were observed within the local vicinity. This single occurrence of one individual in the disturbed habitat setting is likely not naturally occurring or may have established as a volunteer at the site; therefore, this species is not considered sensitive, and no impacts would occur. Additionally, during surveys no special-status wildlife was observed using the tree as habitat.

Threshold 6: Would the Project conflict with any local policies or ordinances protecting biological resources, including Wildflower Reserve Areas (Los Angeles County Code, Title 12, Ch. 12.36), the Los Angeles County Oak Tree Ordinance (Los Angeles County Code, Title 22, Ch. 22.56, Part 16), the Significant Ecological Areas (SEAs) (Los Angeles County Code, Title 22, Section 22.56.215), and Sensitive Environmental Resources Areas (SERAs) (Los Angeles County Code, Title 22, Ch. 22.44, Part 6)?

Oak Trees – Tract Map Site, Off-Site Open Space Area, and Off-Site Roadway Improvement Area

The complete Oak Tree Report for the Sterling Ranch Estates Project which includes the Tract Map Site, Off-Site Open Space Area, and Off-Site Roadway Improvement Area, is included in Appendix B.

Tree impacts were determined using GIS technology and spatial locations of trees relative to the Project impact areas (limits of grading). Impacts were further determined based on Dudek's experience with native and non-native trees and their typical reactions to root disturbances from construction activities such as soil compaction, excavation, and remedial grading. The impact analysis results presented were used for developing appropriate mitigation measures for the Project.

Impacts to trees can be classified as direct or indirect. Direct impacts to trees related to site improvements are typically the result of physical injuries or changes caused by machinery involved with the development process. Direct impacts include tree removal, root damage, soil excavation and compaction, grade changes, loss of canopy, and trunk wounds, among others. Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Indirect impacts include alterations to stream flow rates, diversion of groundwater flow, introduction of exotic plant species, and alterations to disturbance regimes. Wider-scale alterations to the area near trees, as well as specific changes that occur around the trees, are important considerations.

In general, there is a great deal of variation in tolerance to construction impacts among tree species, ages, and conditions. It is important to know how a certain tree, based on its species, age, and condition, would respond to different types of disturbance. The trees in the Project area are of varying ages and conditions. Mature specimens are typically more sensitive to root disturbance and grade changes. In general, healthy trees will respond better to changes in their growing environment. Trees of poor health or stressed conditions may not be vigorous enough to cope with direct or indirect impacts from construction activities.

Impact totals presented are based on conceptual disturbance limits and development plans as of the date of the oak tree report (Appendix B). As such, the actual number of trees subject to direct and indirect impacts may change as the detailed site planning process proceeds. Actual tree impact numbers may be lower than anticipated and as presented in the oak tree report once detailed grading plans are developed. Measures to reduce impacts are encouraged and would be implemented in the field during grading operations. Following completion of construction-related disturbances, actual protected tree impact totals would be updated and provided along with revised mitigation totals.

Direct Tree Impacts

For the purposes of the Tract Map Site, Off-Site Open Space Area, and Off-Site Roadway Improvement Area oak tree report, provided in Appendix B, direct impacts are those associated with tree removal or encroachment within the tree-protected zone (canopy dripline plus 5 feet or 15 feet from trunk, whichever is greater). Tree removal is expected to be required when the trunk is located inside or within 2 feet of the proposed limits of grading. Encroachment is expected when soil and roots are disturbed within the tree-protected zone. Table 14 summarizes the number of trees by species that are expected to be subject to direct construction-related impacts. Direct tree impacts will result in the removal of two protected trees. A single non-protected-size tree will be removed (Tree Number 2). The locations of impacted trees are presented by impact type on the map in Appendix B of the Oak Tree Report (Appendix B).

Table 14. Summary of Tree Disposition

Scientific Name	Common Name	Removal	Encroachment	Indirect
Quercus agrifolia	coast live oak	2 (1*)	—	—
	Total	**2 (1*)**	—	—

Note:
* (X) Indicates non-protected size tree.

Indirect Tree Impacts

Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Site-wide changes affecting trees include diverting runoff and stormwater, creating retention and detention ponds, relocating streams or making improvements to streams, lowering or raising water tables, altering the capacity for soil moisture recharge, removing vegetation, or damming underground water flow (Matheny and Clark 1998). For the purposes of this Tract Map Site, Off-Site Open Space Area, and Off-Site Roadway Improvement Area oak tree report, as provided in Appendix B, there are no indirect tree impacts expected for trees within 25 feet of the proposed Project's limits of grading.

Candidates Suitable for Preservation

Trees identified as candidates for preservation in place exhibit good health (new growth and vigor) and structure (trunk/branching), have no uncorrectable, outwardly detectable defects, and show no signs or symptoms of serious pest infestation or species-specific pathogens. For the trees to avoid incidental damage during construction, preservation and protection measures must be provided before, during, and after the construction phase.

A total of two protected trees will not be disturbed by active construction-related activities or grading; therefore, these trees will be preserved in place.

Impact BIO-14 Based on the analysis, the Project will directly impact (remove) three oak trees within the Tract Map Site BSA. Of the three oak trees proposed for impact, two are protected by the Los Angeles County Oak Tree Ordinance, and one is a heritage tree, which has the potential to cause significant impacts. The two valley oak trees that have protected zones adjacent to the active construction area shall be protected with the following tree protection measures. Implementation of mitigation measures **MM-BIO-22 Oak Plantings in Tract Map Site Zone C** and **MM-BIO-23 Tree Protection Measures** would reduce impacts to less than significant.

MM-BIO-22 **Oak Plantings in Tract Map Site Zone C.** A total of 12 coast live oak (*Quercus agrifolia*) shall be planted, maintained, monitored, and reported on within the Tract Map Site. The 12 coast live oak trees shall be locally sourced, 1-gallon oak trees planted on preferably north-facing slopes within the northwest corner of the Tract Map Site in Fuel Modification Zone C on non-graded slopes within natural open space, avoiding native habitat disturbance. The planted trees shall be subject to a 7-year monitoring period by an independent third-party certified arborist. This monitoring effort shall consider growth, health, and condition of the subject trees to evaluate success. The monitoring efforts shall result in recommendations of remedial actions should any of the tree plantings exhibit poor or declining health.

MM-BIO-23 **Tree Protection Measures.** To prevent damage to any protected trees that would be avoided during Project construction, the following measures shall be implemented by the Project Developer for any such trees within 20 feet of an active construction area.

Prior to Construction

Fencing: Chain-link fencing, no less than 4 feet high, with tree protection signs shall be erected around all undisturbed trees (or tree groups). The protective fence shall be installed at the protected zone boundary of each tree (or tree group), which is defined as 5 feet beyond the tree canopy dripline, or 1.5 feet per inch of trunk diameter, whichever is greater. The intent of protection fencing is to prevent root damage and/or compaction by grading equipment. An International Society of Arboriculture (ISA)-certified arborist may be required on site if grading activities occur within the tree's protected zone. The fencing shall be secured to 6-foot, heavy-gauge T-bar line posts, pounded in the ground a minimum of 18 inches and spaced a minimum of 8 feet on-center. Fencing shall be attached to T-bar posts with minimum 14-gauge wire fastened to the top, middle, and bottom of each post. Tree protection signs shall be attached to every fourth post. The contractor shall maintain the

fence to keep it upright, taut, and aligned at all times. Fencing shall be removed only after all construction activities in the vicinity of the affected tree(s) are complete.

Pre-construction Meeting: A pre-construction meeting shall be held between all contractors (including grading, tree removal/pruning, and builders) and an ISA-certified arborist. The meeting shall focus on instructing the contractors on tree protection practices and answering any questions. All equipment operators and spotters, assistants, or those directing operators from the ground shall provide written acknowledgement of receiving tree protection training. This training shall include information on the location and marking of protected trees, the necessity of preventing damage, and the discussion of work practices that shall accomplish these tasks.

During Construction

Once construction activities have begun, the following protection measures shall be followed.

Equipment Operation and Storage: Contractors shall avoid heavy equipment operation around the protected trees. Operating heavy machinery around the root zones of trees will increase soil compaction, which decreases soil aeration and subsequently reduces water penetration into the soil. All heavy equipment and vehicles shall, at minimum, stay out of the fenced protected tree zone unless where specifically approved in writing and under the supervision of an ISA-certified arborist or their representative.

Materials Storage and Disposal: Contractors shall not store or discard any supplies or materials, including paint, lumber, and concrete overflow, within the protected zone and shall remove all foreign debris within the protected zone. However, the contractors shall leave the duff, mulch, chips, and leaves around the retained trees for water retention and nutrient supply. In addition, the contractors shall avoid draining or leakage of equipment fluids near retained trees. Fluids such as gasoline, diesel, oils, hydraulics, brake and transmission fluids, paint, paint thinners, and glycol (anti-freeze) shall be disposed of properly. The contractors shall ensure that equipment be parked at least 50 feet from the protected zone to avoid the possibility of leakage of equipment fluids into the soil. The effect of toxic equipment fluids on the retained trees could result in tree decline and/or mortality.

Grade Changes: Contractors shall ensure that grade changes, including adding fill, shall not be permitted within the protected zone without special written authorization and under supervision by an ISA-certified arborist or their representative. Lowering the grade within the protected zone would necessitate cutting main support and feeder roots, jeopardizing the health and structural integrity of the trees. Adding soil, even temporarily, on top of the existing grade would compact the soil further and decrease water and air availability to the tree roots. Contractors shall ensure that grade changes made outside of the protected tree zone shall not create conditions that allow water to pond at the base of the tree. Water trapped at the base of a tree could lead to root rot and other detrimental tree impacts.

Moving Construction Materials: Contractors shall ensure that care be exercised when moving construction equipment or supplies near the undisturbed oak trees, especially overhead. Contractors shall ensure that damage to the trees shall be avoided when

transporting or moving construction materials and working around the tree (even outside of the fenced protected zone). Contractors shall flag aboveground tree parts that could be damaged (e.g., low limbs, scaffold branches, and trunks) with high-visibility flagging, such as florescent red or orange. If contact with the tree crown is unavoidable, conflicting branches may be pruned by an ISA-certified tree worker under supervision by an ISA-certified arborist or their representative and shall adhere to ISA standards.

Trenching: Except where specifically approved in writing beforehand, all trenching shall be outside of the fenced protected zone. Roots primarily extend in a horizontal direction, forming a support base to the tree similar to the base of a wine glass. Where trenching is necessary in areas that contain roots from retained trees, contractors shall use trenching techniques that include the use of either a root pruner (Dosko root pruner or equivalent) or an Air-Spade to limit root impacts. An ISA-certified arborist or their representative shall ensure that all pruning cuts be clean and sharp to minimize ripping, tearing, and fracturing of the root system. Root damage caused by backhoes, earthmovers, dozers, or graders is severe and may result in tree mortality. Use of both root-pruning and Air-Spade equipment shall be accompanied only by hand tools to remove soil from trench locations. The trench shall be made no deeper than necessary.

Irrigation: Irrigation of native protected trees retained on site shall seek to mimic natural rainfall patterns in Southern California. Supplemental irrigation for trees adjacent to construction activity may be necessary during winter or spring months. Summer and fall irrigation may be necessary based on variable climatic and site conditions, but should be conducted judiciously to avoid overwatering. One irrigation cycle shall thoroughly soak the root zones of the trees to a depth of 3 feet. The soil should be allowed to dry out between watering to avoid keeping a consistently wet soil. The contractor shall be responsible for irrigating (deep watering) the trees. Soil moisture shall be checked with a soil probe before irrigating. Irrigation is best accomplished by installing a temporary aboveground micro-spray system that would distribute water slowly (to avoid runoff) and evenly throughout the fenced protection zone. Over-watering of native oaks may promote the growth of tree-damaging agents, such as oak root fungus, so proper soil moisture monitoring is critical to prolonged tree health. For any trees that have been substantially root pruned (30% or more of their root zone), irrigation shall be required for the first 12 months. The first irrigation shall occur within 48 hours of root pruning. The tree(s) should be deep watered every 2 weeks during the summer and once a month during the winter (adjust accordingly with rainfall).

Canopy Pruning: The contractor shall not prune trees until all construction is completed unless standard pruning would reduce conflict between canopy and equipment. This will help protect the tree canopies from damage. All pruning shall be conducted by an ISA-certified tree worker under supervision by an ISA-certified arborist or their representative and shall adhere to ISA pruning standards.

Canopy Washing: During construction, the contractor shall wash the foliage of trees adjacent to construction activity with a strong water stream every 2 weeks before 10:00 a.m. to control mite and insect populations.

Inspection: An ISA-certified arborist or their representative shall inspect the preserved trees adjacent to grading and construction activity on a monthly basis for the duration of the proposed Project's construction period. A report summarizing site conditions, observations, tree health, and recommendations for minimizing tree damage shall be submitted by the ISA-certified arborist or their representative following each inspection.

After Construction

Following the completion of the construction activity within 20 feet of the protected zones of undisturbed oaks, the tree protection fencing may be removed, and the following measures may be performed to sustain and enhance the vigor of the trees.

Mulch: The contractors shall ensure that the natural duff layer under all trees is maintained. This would stabilize soil temperatures in root zones, conserve soil moisture, and reduce erosion. The contractors shall ensure that the mulch is kept clear of the trunk base to avoid creating conditions favorable to the establishment and growth of decay-causing fungal pathogens. Should it be necessary to add organic mulch under retained protected trees, packaged or commercial mulch shall not be used because it may contain oak root fungus. Also, the use of redwood chips shall be avoided because certain inhibitive chemicals may be present in the wood. Other wood chips and crushed walnut shells can be used, but the best mulch that provides a source of nutrients for the tree is its own leaf litter. Any organic mulch added by the contractor shall be applied to a maximum depth of 4 inches where possible.

Pruning: Regular pruning of the trees is not required. An ISA-certified tree worker, under the supervision of an ISA-certified arborist or their representative, shall only prune trees to maintain clearance and remove broken, dead, or diseased branches. No more than 15% of the canopy shall be removed at one time. All pruning shall conform to ISA standards.

Watering: The trees should not require regular irrigation, other than the 12 months following substantial root pruning, if applicable. However, soil probing shall be necessary to accurately monitor moisture levels. Supplemental irrigation for the trees that sustained root pruning and any newly planted trees may be necessary, especially in years with low winter rainfall.

Watering Adjacent Plant Material: All plants near the trees shall require moderate to low levels of water. The contractor shall infrequently water surrounding plants with deep soaks, rather than frequent light irrigation, and allow them to dry out between watering. The soil shall not be allowed to become saturated or stay continually wet, and drainage should not allow ponding of water beneath the canopy of the oak trees. Irrigation spray shall not hit the trunk of any tree. The contractor shall maintain a 30-inch dry zone around all tree trunks. An aboveground microspray irrigation system shall be used in lieu of typical underground pop-up sprays.

Chemical Applications: If the trees are maintained in a healthy state, regular spraying for insect or disease control would not be necessary. If a problem does develop, an ISA-certified arborist/licensed pest control adviser or their representative shall be consulted

since the trees may require application of insecticides to prevent the intrusion of bark-boring beetles and other invasive pests. All chemical spraying shall be performed by a licensed applicator under the direction of a licensed pest control adviser.

Monitoring: An ISA-certified arborist or their representative should inspect the trees retained on site for a period of 7 years following the completion of construction activity. Monitoring visits should be completed quarterly, totaling 20 visits. Following each monitoring visit, a report summarizing site conditions, observations, tree health, and recommendations for promoting tree health shall be submitted. Additionally, any tree mortality shall be noted, and any tree dying during the monitoring period shall be replaced with the same species as specified for minimum replacement standards in this oak tree report.

Oak Trees – Off-Site Water Tank Area

The complete Oak Tree Report for the Sterling Ranch Estates Project, Off-Site Water Tank Area is included in Appendix C.

Tree impacts were determined using GIS software and spatial locations of trees relative to the Project's impact areas (development footprint). Impacts were further determined based on Dudek's experience with native and non-native trees and their typical reactions to root disturbances from construction activities, such as soil compaction, excavation, and grading. The impact analysis results presented herein were used for developing appropriate mitigation measures for the Project.

Impacts to trees can be classified as direct or indirect. Direct impacts to trees related to site development are typically the result of physical injuries or changes caused by machinery involved with the development process. Direct impacts include tree removal, root damage, soil excavation and compaction, grade changes, loss of canopy, and trunk wounds, among others. Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Indirect impacts include alterations to stream flow rates, diversion of groundwater flow, introduction of exotic plant species, and alterations to disturbance regimes. Wider-scale alterations to the area near trees, as well as specific changes that occur around the trees, are important considerations.

In general, there is a great deal of variation in tolerance to construction impacts among tree species, ages, and conditions. It is important to know how a certain tree, based on its species, age, and condition, would respond to different types of disturbance. The trees on the Project site are of varying ages and conditions. Mature specimens are typically more sensitive to root disturbance and grade changes. In general, healthy trees will respond better to changes in their growing environment. Trees of poor health or stressed conditions may not be vigorous enough to cope with direct or indirect impacts from construction activities.

Impact totals presented are based on conceptual disturbance limits and development plans as of the date of the Oak Tree Report for the Sterling Ranch Estates Residential Project, Off-Site Water Tank Area (Dudek 2020) included in Appendix C. As such, the actual number of trees subject to direct and indirect impacts may change as the detailed site planning process proceeds. Actual tree impact numbers may be lower than anticipated and as presented in the Oak Tree Report for the Sterling Ranch Estates Residential Project, Off-Site Water Tank Area (Dudek 2020) included in Appendix C once detailed grading plans are developed. Measures to reduce impacts are encouraged and would be implemented in the field during grading operations. Following completion of construction-related disturbances, actual protected tree impact totals would be updated and provided, along with revised mitigation totals.

Direct Tree Impacts

For the purposes of this report, direct impacts are those associated with tree removal or encroachment within the tree-protected zone (canopy dripline plus 5 feet or 15 feet from trunk, whichever is greater). Tree removal is expected to be required when the trunk is located inside or within 2 feet of the proposed limits of grading. Encroachment is expected when soil and roots are disturbed within the tree protected zone. Table 15 summarizes the number of trees by species that are expected to be directly impacted by construction. Direct tree impacts would result in the removal of 12 protected trees and the encroachment of an additional 11 protected trees. Two non-protected-size trees would be removed. The locations of impacted trees are presented by impact type on the map in Appendix B in the Oak Tree Report (Appendix C).

Table 15. Summary of Direct Tree Impacts

Species		Protected Trees		Non-Protected Trees	
Scientific Name	Common Name	Trees to Remove	Impacted but Not Removed	Trees to Remove	Impacted but Not Removed
Quercus agrifolia	coast live oak	12	11	1	3
Quercus berberidifolia	scrub oak	0	0	1	0
	Total	**12**	**11**	**2**	**3**

Indirect Tree Impacts

Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Site-wide changes affecting trees include diverting runoff and stormwater, creating retention and detention ponds, relocating streams or making improvements to streams, lowering or raising water tables, altering the capacity for soil moisture recharge, removing vegetation, or damming underground water flow (Matheny and Clark 1998). For the purposes of this oak tree report, 31 indirect tree impacts are expected for trees within 25 feet of the Project development footprint. Table 16 summarizes the number of trees by species that are expected to be indirectly impacted by construction.

Table 16. Summary of Indirect Tree Impacts

Scientific Name	Common Name	Protected Trees	Non-Protected Trees
Quercus agrifolia	coast live oak	12	12
Quercus berberidifolia	scrub oak	1	6
	Total	**13**	**18**

Impact BIO-15 Based on the analysis, 28 oak trees will be directly impacted (14 removals and 14 encroachments) by the Project. Of the 28 direct impacts, 12 that are protected by the Los Angeles County Oak Tree Ordinance are expected to require removal. Mitigation is required based on the Los Angeles Oak Tree Ordinance, which can be achieved through purchasing mitigation credits or an in-lieu fee can be paid. Implementing **MM-BIO-21 Off-Site Water Tank Area Oak Woodland and Oak Tree Mitigation** and **MM-BIO-23 Tree Protection Measures** will reduce impacts to oak trees to a less than significant level

MM-BIO-21 **Off-Site Water Tank Area Oak Woodland and Oak Tree Mitigation.**

MM-BIO-23 **Tree Protection Measures**

Threshold 7: **Would the Project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved state, regional, or local habitat conservation plan?**

The Project does not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved state, regional, or local habitat conservation plan; therefore, there would be no impacts.

6.9 Impacts to Regional Resource Planning

Zoning for the Project site is R-1 (single-family residence), C-2 (neighborhood commercial), A-1-2 (light agricultural), and A-2-2 (heavy agricultural). Residential uses border the Tract Map Site BSA on the west and south. Largely undeveloped land lies north of the Tract Map Site BSA. Surrounding land use designations include H5-Residenital 5 (0–5 dwelling units per acre) to the south and west, RL2-Rural Land 5 (1 dwelling unit per 2 acres) to the north, and IO-Industrial Office to the east. Surrounding zoning uses include R-1 to the south and west, A-2-2 (light and heavy agriculture) to the north, and MPD-DP (manufacturing industrial planned development) to the east. The Project involves residential and commercial uses for the Project site, which are consistent with the SCAP. The Project would not have significant impacts with respect to SCAP goals and policies.

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Appendix A

Oak Woodland Report

OAK WOODLAND REPORT
for the
Sterling Ranch Estates – Water Tank Project
County of Los Angeles, California

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Table of Contents

SECTION PAGE NO.

ACRONYMS AND ABBREVIATIONS III

1 INTRODUCTION 1
- 1.1 Project Location 1
- 1.2 Project Description 1
- 1.3 Existing Conditions 2

2 REGULATORY SETTING 7
- 2.1 Los Angeles County Oak Woodlands Conservation Management Plan 7
  - 2.1.1 Tree and Woodland Definitions 7
  - 2.1.2 Conditions Criteria Definitions 8
- 2.2 Oak Woodland Guide 8

3 METHODS 9
- 3.1 Oak Woodland Assessment Methodology 9
- 3.2 Oak Woodlands Mapping Methodology 9

4 RESULTS 15
- 4.1 Oak Woodland Assessment 15
- 4.2 Condition of Project Oak Woodlands 15
  - 4.2.1 Oak Woodland 1 15
  - 4.2.2 Oak Woodland 2 19
  - 4.2.3 Oak Woodland 3 19
- 4.3 Oak Woodland Special-Status Species 21

5 PROJECT IMPACTS 23
- 5.1 Description of Impacts 23
- 5.2 Impact Severity and Estimated Level of Significance (Oak Woodland Guide) 23
  - 5.2.1 Oak Woodlands with No Impact or Less-Than-Significant Impacts 23
  - 5.2.2 Oak Woodlands with Significant Impacts 29
- 5.3 Impact Summary 29

6 MITIGATION MEASURES 31
- 6.1 Determination of Mitigation 31
- 6.2 Regulatory Definitions of Mitigation Options 31
- 6.3 Mitigation Provisions 31
- 6.4 Recommended Mitigation 32

7 CONCLUSION 35

8 REFERENCES 37

APPENDICES

A Representative Woodland Photos
B Potential for Occurrence of Special-Status Plant Species (Oak Woodlands)
C Potential for Occurrence of Special-Status Wildlife Species (Oak Woodlands)
D LA County Oak Woodlands Conservation Management Plan Guide: Table 1 – Woodland Integrity
E LA County Oak Woodlands Conservation Management Plan Guide: Table 2 – Impact Severity
F LA County Oak Woodlands Conservation Management Plan Guide: Table 3 – Estimated Level of Significance

FIGURES

1 Regional Map 3
2 Vicinity Map 5
3 Tree Locations 11
4 Vegetation Communities and Land Cover Types 13
5 Oak Woodland 17
6 Oak Woodland Impacts 27

TABLES

1 Oak Woodland 1 Understory Assessment 16
2 Oak Woodland 2 Understory Assessment 19
3 Oak Woodland 3 Understory Assessment 20
4 Oak Woodland Vegetation Community Descriptions 20
5 List of Associated Native Plant Species for the Oak Woodland Understory* 20
6 Oak Woodland Impact Matrix 25

Acronyms and Abbreviations

Acronym/Abbreviation	Definition
ISA	International Society of Arboriculture
CEQA	California Environmental Quality Act
County	County of Los Angeles
dsh	diameter at standard height
Guide	Oak Woodlands Conservation Management Plan Guide
OW	Oak Woodlands
Plan	Los Angeles County Oak Woodlands Conservation Management Plan
SOI	sphere of influence

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1 Introduction

This Oak Woodland Report provides an assessment of the oak woodlands located on the Sterling Ranch Estates Residential Project, Off-Site Water Tank Area (project). The project site is located in Los Angeles County, California. As such, this Oak Woodland Report addresses the regulations and requirements for the conversion and/or loss of oak woodlands within the jurisdiction of the County of Los Angeles (County).

Sterling Ranch Estates retained Dudek to conduct an oak woodlands assessment for the project site. A Dudek International Society of Arboriculture (ISA) Certified Arborist performed various functions associated with surveying, inventorying, and evaluating the condition of all protected oak trees located within the project site to meet the County's requirements. A Dudek Registered Professional Forester (RPF) conducted assessments of all potentially impacted oak tree woodlands located within the project site to meet the County's requirements.

The purpose of this Oak Woodland Report is to present the physical characteristics and mapped locations of the site's oak woodlands that may be converted or lost to development during the proposed excavation and grading related activities. This Oak Woodland Report addresses project-related impacts to oak woodlands on the project site.

Contact information for the applicant and a list of project staff are as follows:

Applicant:

Sterling Ranch Estates
P.O. Box 681007
Park City, Utah 84068
Contact: Hunt Williams

Project Staff:

Heather Moine, Biologist
Ryan Allen, Arborist
Doug Nickles, Forester

1.1 Project Location

The project site is located in the community of Val Verde, approximately 0.5 miles west of San Martinez Road (Figure 1, Regional Map). The project site lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. The project site and biological study area occur entirely within the U.S. Geological Survey 7.5-minute Val Verde quadrangle (USGS 2017).

1.2 Project Description

In conjunction with approval of the project, Los Angeles County Waterworks District 36 has required the construction of a water tank. The project includes a one-million-gallon-water tank, more capacity than required by Los Angeles County Waterworks District 36 for firefighting purposes, at the elevation of the existing Cuyama tanks, referred to herein as the Off-Site Water Tank Area. The Off-Site Water Tank Area lies in and adjacent to the existing Los Angeles County Waterworks District No. 36 Cuyama tank site. The water tank is located within the Los Angeles County

Waterworks District's 1598 pressure zone, Assessor Parcel Numbers 3272-029-902 and 3272-029-023, which comprises approximately 2.79 acres. The project site, which includes the development footprint and the overall biological study area, is depicted in Figure 2, Vicinity Map.

1.3 Existing Conditions

The project site has one paved access road that dead ends into two water storage tanks on the southwest end of the property. The remaining land within the project site is best characterized as undeveloped oak woodland. Topographically, the project site consists of moderate north- and south-facing slopes with elevations ranging from approximately 1,550 feet above mean sea level along the northern boundary to approximately 1,750 feet above mean sea level in the southern portion of the site.

SOURCE: ESRI

FIGURE 1

Regional Map

Oak Woodland Report for the Sterling Ranch Estates – Water Tank Project

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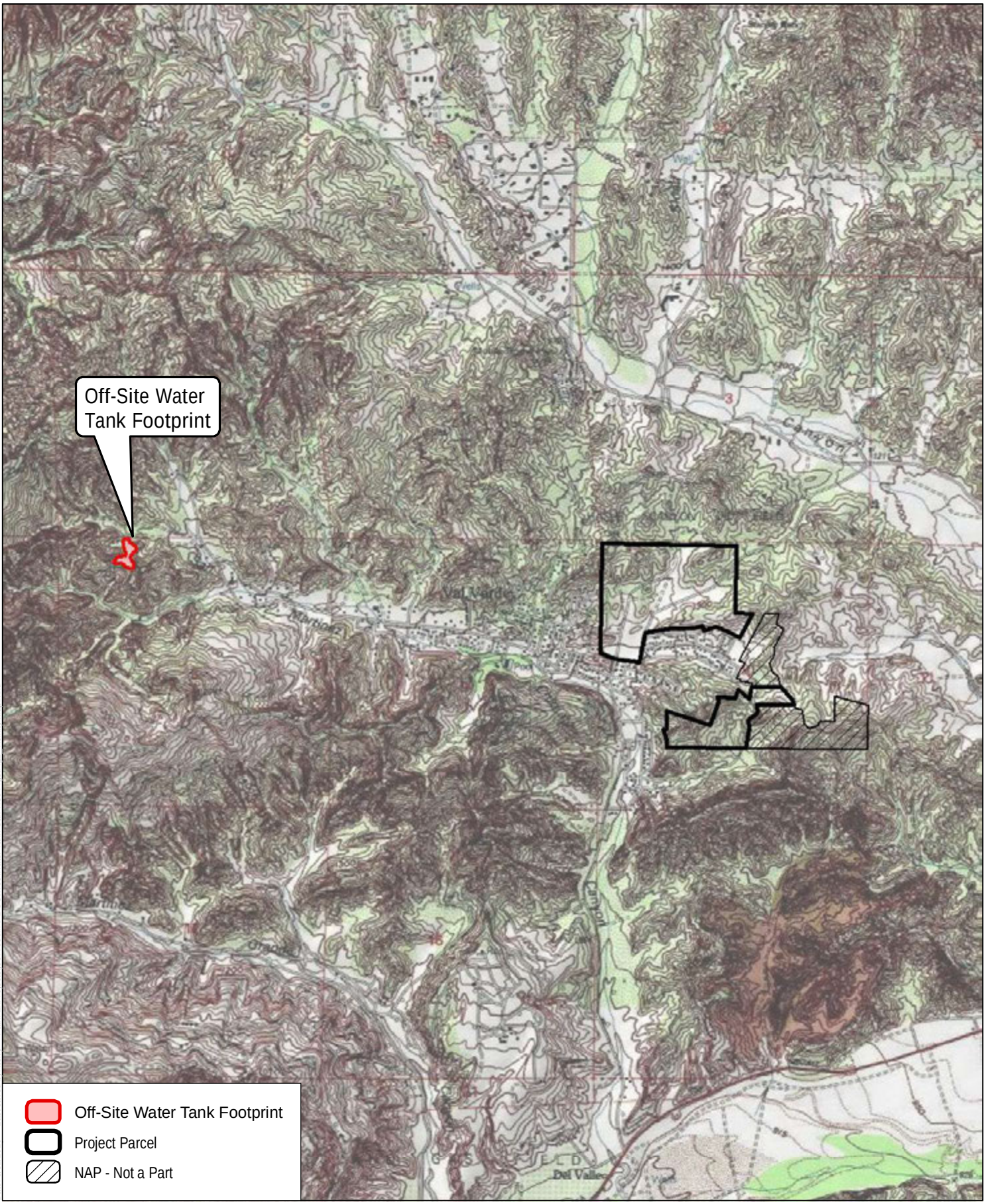

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SOURCE: USGS 7.5 Minute Series, Val Verde Quadrangle; Township 4 North; Range 17 West, Section 8

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FIGURE 2

Project Vicinity

Oak Woodland Report for the Sterling Ranch Estates – Water Tank Project

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2 Regulatory Setting

In response to regulations enacted by the State of California (California Public Resources Code, Section 21083.4), the County of Los Angeles adopted the Los Angeles County Oak Woodlands Conservation Management Plan (Plan) (August 23, 2011) and drafted the Oak Woodlands Conservation Management Plan Guide (Guide) (March 18, 2014) as an implementing document for the Plan. The purpose of the regulations and the adopted Plan is to determine whether the development of a proposed project "may result in a conversion of oak woodlands that will have a significant effect on the environment" (County of Los Angeles 2011). Should the proposed project result in loss of oak woodlands, the County requires mitigation measures to offset the losses.

2.1 Los Angeles County Oak Woodlands Conservation Management Plan

"The main goal of the Plan is to preserve and restore oak woodlands so they are conserved in perpetuity with no net loss of existing woodlands. There are three important objectives of the Plan: prioritize the preservation of oak woodlands, promote conservation by integrating oak woodlands into the development process in a sustainable manner and effectively mitigate the loss of oak woodlands" (County of Los Angeles 2014).

The Guide (County of Los Angeles 2014) interprets the Plan's definition of an oak woodland as follows:

> an oak stand, including its understory, which consists of two or more oak trees of at least five inches in diameter measured at 4.5 feet above mean natural grade, with greater than 10 percent canopy cover or that may have historically supported greater than 10 percent canopy cover as early as January 1, 2005.

In accordance with the Guide, when a discretionary project site is found to support oak woodlands, an Oak Woodland Report must be submitted to document potential impacts to oak woodlands resulting from the development of that project.

2.1.1 Tree and Woodland Definitions

Oak tree is defined by the Plan as "all native trees of the genus *Quercus*". This includes small shrubby oaks typically clustered on slopes, as well as individual large oaks that are naturally widely distributed across the landscape. Under California state law, "oaks [that are part of a woodland] greater than 5 inch diameters at breast height (DBH) are also protected" (California Public Resources Code 21083.4a).

Oak stand is defined by the Plan as "a group of similar [oak] trees growing in a contiguous pattern, having sufficiently diverse age-class distribution, composition and structure, and growing on a site of sufficiently uniform quality that it is distinguishable as a unit. Stands are a basic physical unit of vegetation in the landscape and do not have a set size."

Oak woodlands are defined by California Department of Fish and Wildlife Code Section 1361.h and by the Plan (County of Los Angeles 2011, p.28) as "an oak stand with a greater than 10 percent canopy cover or that may have historically supported greater than 10 percent canopy cover." (Ten times an individual oak tree's canopy is considered by the County as representative of the tree's sphere of influence [SOI]; where these SOIs overlap, they are collectively defined as oak woodlands, each having 10% or greater relative cover of oak tree canopy [woodland].)

This document interprets the Plan's definition of an oak woodland (County of Los Angeles 2011) as an oak stand, including its understory, that consists of two or more oak trees of at least 5 inches in diameter measured at 4.5 feet above mean natural grade with greater than 10% canopy cover or that may have historically supported greater than 10% canopy cover as early as January 1, 2005 (effective date of California Public Resources Code, Section 21083.4).

Oak Savanna is lightly wooded grassland with oaks as the dominant tree species. The canopy cover of an oak savanna may often be less than 10%, and therefore oak savannas are not necessarily subject to California Public Resources Code, Section 21083.4. Nevertheless, some types of oak savanna are considered sensitive by the California Department of Fish and Wildlife, and these are given consideration as sensitive natural communities under the California Environmental Quality Act (CEQA) (see California Department of Fish and Wildlife Natural Communities List and CEQA Guidelines Appendix G).

2.1.2 Conditions Criteria Definitions

- **Intact** - The site is currently in a "wild" state where all ecological functions such as groundwater infiltration, shade, habitat, nutrient cycling, carbon sequestration, wind/noise/dust abatement, and the stand are self-sustaining and regenerating. Understory may be dominated by invasive grasses and forbs. Fire exclusion or frequency may have altered native woodland. Woodland supports associated flora and fauna and is free from destructive land practices that limit long-term persistence.
- **Moderately Degraded** - Even though the site has been altered, oak woodlands persist and retain some of their functions. Natural regeneration is possible, wildlife use still occurs, and some level of ecosystem services is still present. The majority of oak woodlands in the County fall within this category.
- **Severely Degraded** - The site has been drastically altered from the natural condition to accommodate residential, commercial, or industrial uses, and oak woodlands remain in scattered locations. Natural regeneration is not possible. Soil is compacted, contaminated, or paved. Wildlife habitat is limited and associated understory vegetation has been replaced by managed non-native landscaping.

2.2 Oak Woodland Guide

The Guide focuses on two categories of recommendations to preserve and restore oak woodlands: (1) alterations to the County's development and environmental review process and (2) revisions to the process by which County agencies address impacts to oak woodlands. The Guide is intended to implement portions of the Plan and to be a resource for processing development applications for discretionary projects that are not exempt from CEQA and that may impact oak woodlands.

3 Methods

3.1 Oak Woodland Assessment Methodology

A field survey to assess and record the condition of the oak woodlands was conducted over several days between February 12, 2020, and July 8, 2020 by Dudek ISA Certified Arborist Ryan Allen and Dudek Biologists Heather Moine, Andrea Dransfield, Mackenzie Forgey, and Tracy Park. Information collected during the survey (Dudek 2020b) and discussed within this Report includes the following:

- The condition of the oak woodlands, including oak species present, age classes of oaks present, understory vegetation, and surrounding vegetation communities
- The presence and/or potential occurrence of special-status species
- Potential project impacts to the surveyed woodlands

Dudek mapped tree locations for all woodlands located on the project site (Figure 3, Tree Locations). Tree mapping was conducted using a Trimble Pathfinder Pro XH GPS receiver with H-Star Technology. Since tree canopies can sometimes cause loss of satellite lock by blocking the line-of-sight to satellites, an electronic compass and reflectorless, electronic distance-measuring device were also used in mapping tree locations. The reflectorless, electronic distance-measuring device/compass combination operates in concert with the Pathfinder system to position offsets, and offset information is automatically attached to the GPS position data string. The electronic tree locations were then evaluated using ArcView 10.4 software to determine the position of the trees related to the project development footprint.

Tree trunk diameters were measured using a diameter tape providing adjusted figures[1] for diameter measurements when wrapping the tape around an object's circumference. Diameter measurements were taken using protocol provided by the Council of Tree and Landscape Appraisers in the Guide for Plant Appraisal (ISA 2000). The trunk diameter measurement of each tree was taken at 4.5 feet above the ground along the trunk axis, with common exceptions. For example, in cases where a tree's trunk was located on a slope, the 4.5-foot distance was approximated as the average of the shortest and longest sides of the trunk (i.e., the uphill side and downhill side of a tree's trunk, respectively), and the measurement was made at this point. Tree height was visually estimated by experienced tree surveyors.

Tree canopy diameters were typically estimated by "pacing off" the measurement based on the investigator's knowledge of their stride length or by visually estimating the canopy width. The crown diameter measurements were made along an imaginary line intersecting the tree trunk that best approximated the average canopy diameter.

3.2 Oak Woodlands Mapping Methodology

According to the Plan, in addition to assessing the oak woodland condition, an accurate estimation of the woodland area is needed to evaluate oak woodlands. The Guide requires that a map depicting the proximity of project development to the on-site oak woodlands' sphere of influence (SOI) be used to determine impacts resulting from the proposed project (Figure 4, Vegetation Communities and Land Cover Types. The Plan defines the SOI as the total area of the subject canopy multiplied by 10 (or 3.2 times the radius). This Oak Woodland Report provides survey results for the oak woodlands with SOIs within 200 feet of the limits of project disturbance activities.

1 Inches divided by 3.14 (π) provide diameter measurement in inches.

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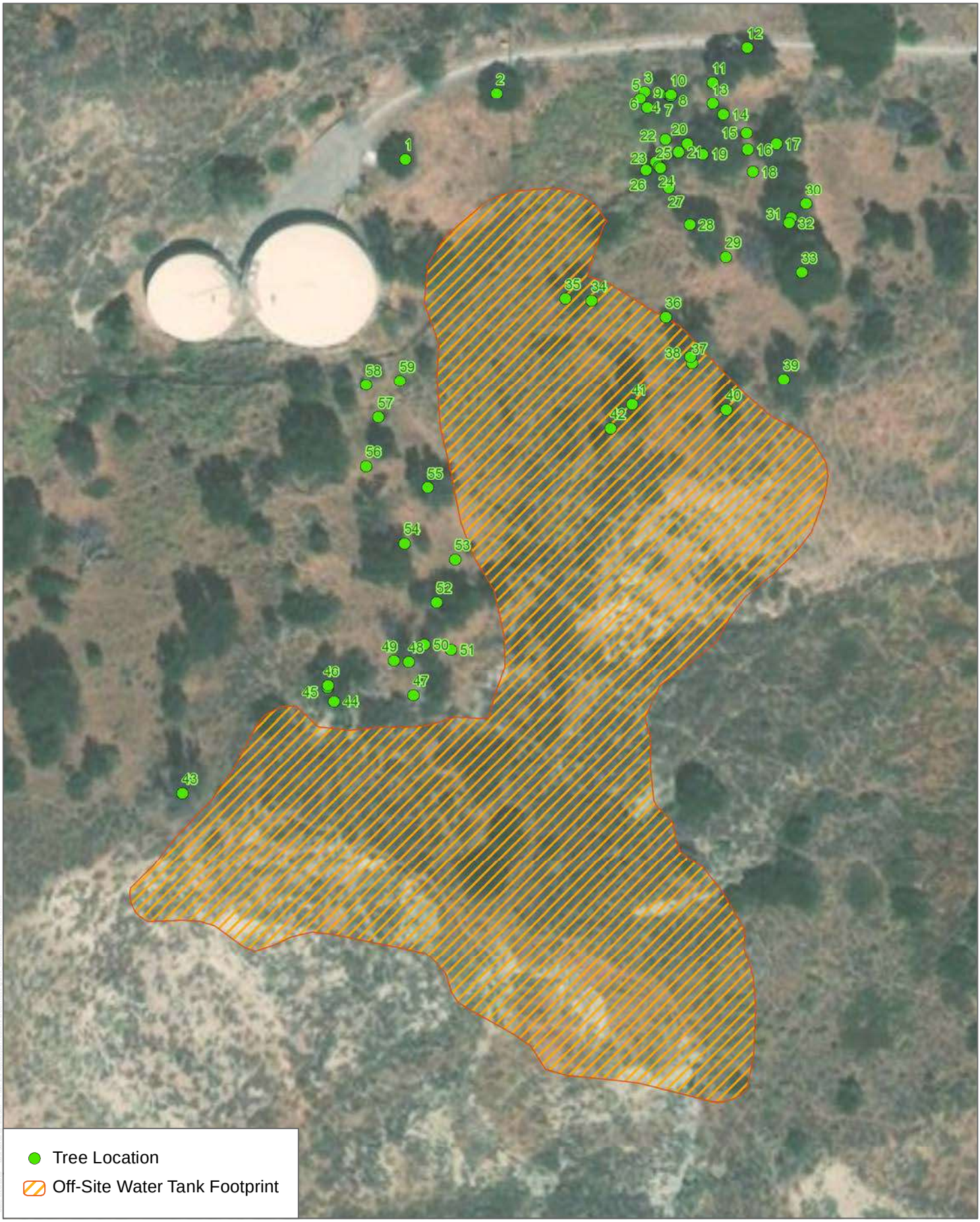

SOURCE: Bing 2019

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0 40 80 Feet

FIGURE **3**

Tree Locations

Oak Woodland Report for the Sterling Ranch Estates – Water Tank Project

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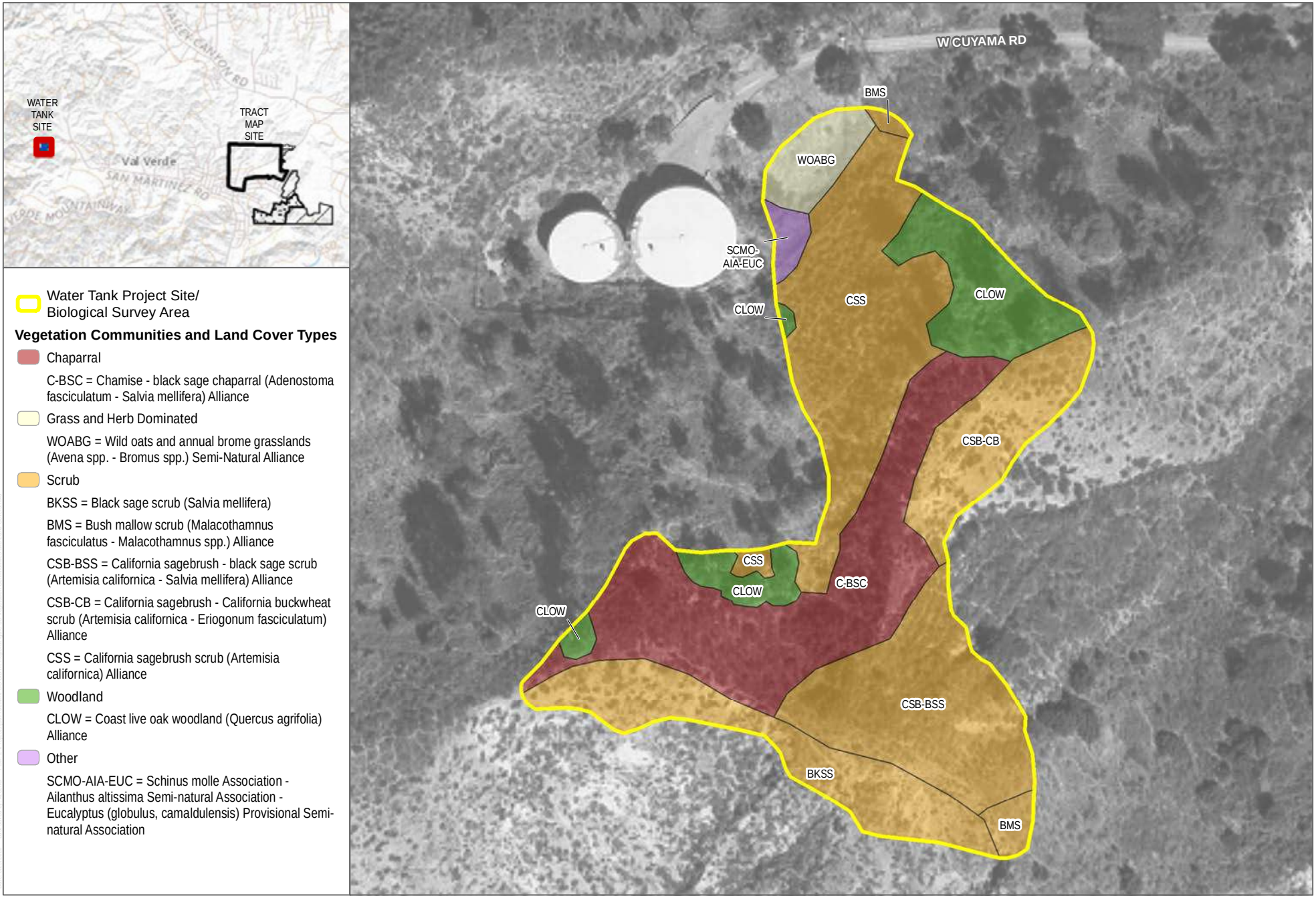

SOURCE: Eagle Aerial Solutions 2018

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0 50 100 Feet

FIGURE **4**

Vegetation Communities and Land Cover Types

Oak Woodland Report for the Sterling Ranch Estates – Water Tank Project

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4 Results

4.1 Oak Woodland Assessment

There are a total of three oak woodlands located within the study area comprising varying sizes and age classes of coast live oaks (*Quercus agrifolia*) and scrub oak (*Quercus berberidifolia*). These woodlands exhibit generally good levels of ecological health (Figure 5, Oak Woodland). Fifty-two coast live oak and eight scrub oak trees were inventoried; of the 60 total oak trees, 34 met the County's criteria for a woodland. Overall, the oak woodlands exhibit conditions that are typical of their location in a native setting prone to drought and wildfires.

The woodland trees are composed of single- and multi-stemmed trees, with single-stemmed trunk diameters that range from 6 to 40 inches and multi-stemmed trunk diameters that range from 2 to 20 inches. Tree canopy extents range from 10 feet to approximately 50 feet in diameter.

The total canopy area and associated SOI of Oak Woodlands (OW) 1–3 is approximately 2.07 acres. Figure 5 provides the mapped locations of OW 1–3 and the associated SOIs.

4.2 Condition of Project Oak Woodlands

The condition and composition of OW 1–3, including oak species present, approximate density of oaks, age classes of oaks, understory vegetation, and surrounding vegetation communities, are discussed below. Based on these recorded conditions, a determination of the habitat value/integrity of the woodland was assigned using criteria provided in the Guide. These conditions criteria definitions are provided in Table 1 of the Guide (Appendix D of this report) and summarized in Section 2.1.2. In summary, OW1 is Moderately Degraded, and OW2 and OW3 are Intact. Representative photographs of the woodlands are provided in Appendix A.

The locations of OW 1–3 are provided in Figure 5. Representative photos of the surveyed woodlands are provided in Photos 1 to 10. For the purposes of this report, the terms sapling, young, and mature refer to the age-class designation of the trees present within the subject woodland. These designations are as follows: saplings are trees with a dsh measuring less than 5 inches, young trees have a dsh measuring between 5 and 9 inches, and mature trees have a dsh measuring greater than 9 inches.

4.2.1 Oak Woodland 1

OW1 is located adjacent to and northeast of the existing water tank site, on the northern edge of the proposed additional water tank, encompassing a canopy area of approximately 0.03 acres. A total of two coast live oaks were observed, one mature and one young, within the subject woodland. Existing conditions and the understory vegetation within OW1 vary depending on proximity to the existing road. The habitat value/integrity ranking of OW1 is **Moderately Degraded**.

OW1 has been altered from the natural condition to accommodate a paved road with highly disturbed and compacted soils. At the time of the survey, the understory conditions in the vicinity of the road were not conducive to natural regeneration, including the lack of oak seedlings and an intact oak leaf litter layer, as well the absence of understory vegetation associated with woodland habitat. Conditions present within the understory of OW1 are illustrated in Photos 1 to 4.

Oak Woodland 1 Understory Assessment Results

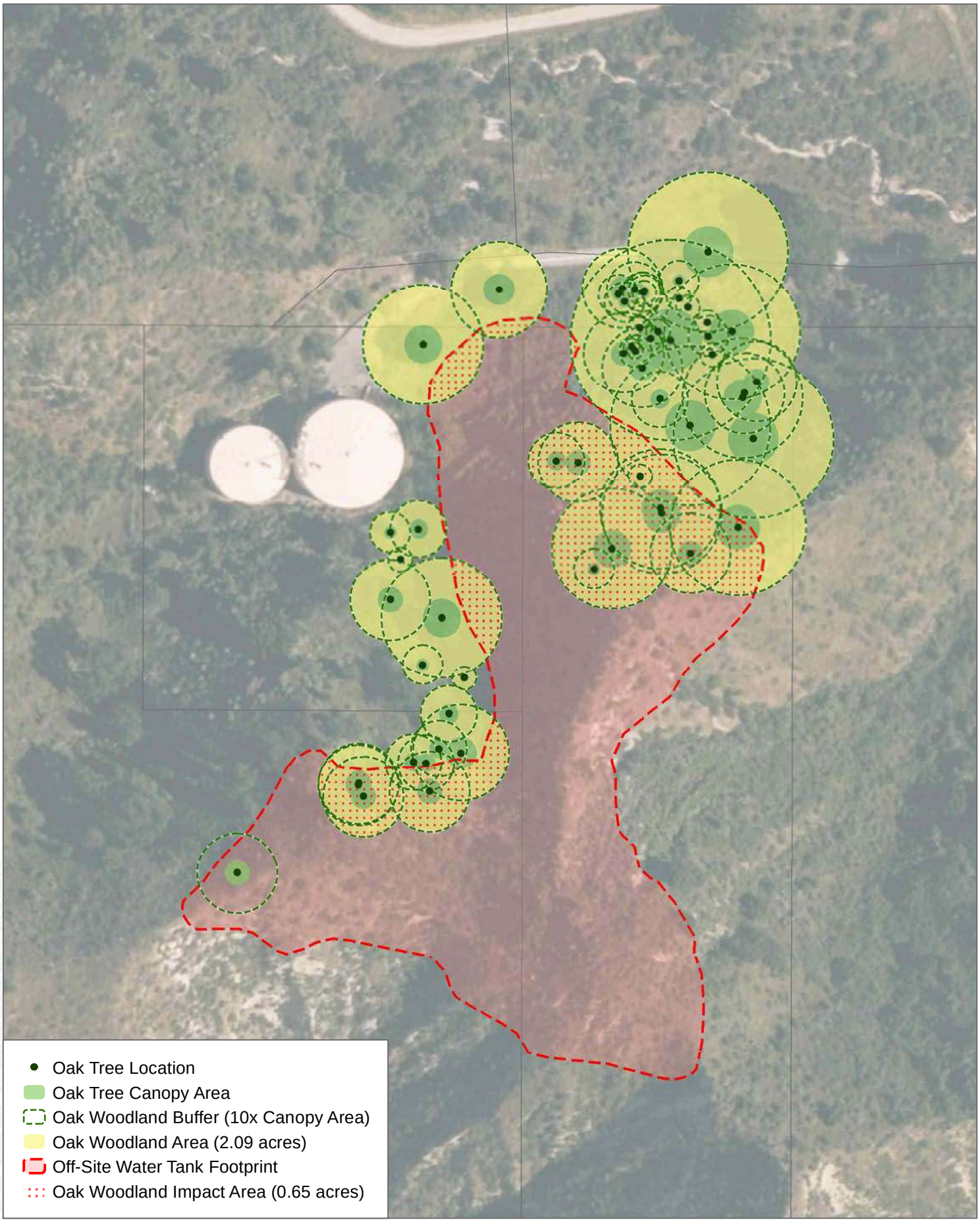
Native species 5%

Non-native grass 85%

Non-native forbs 10%

Table 1. Oak Woodland 1 Understory Assessment

Scientific Name	Common Name	Native/Non-Native	Notes
Artemisia californica	California sagebrush	Native	1 individual
Avena barbata	slender oat	Non-Native	
Bromus diandrus	ripgut brome	Non-Native	
Carduus pycnocephalus ssp. *pycnocephalus*	Italian plumeless thistle	Non-Native	
Chenopodium murale	nettleleaf goosefoot	Non-Native	
Cynodon dactylon	Bermudagrass	Non-Native	
Pseudognaphalium californicum	ladies' tobacco	Native	2 individuals
Salsola tragus	prickly Russian thistle	Non-Native	
Sambucus nigra ssp. *caerulea*	blue elderberry	Native	2 individuals
Stipa miliacea var. *miliacea*	smilograss	Non-Native	
Artemisia californica	California sagebrush	Native	1 individual



SOURCE: Bing 2019

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0 50 100 Feet

FIGURE **5**

Oak Woodland

Oak Woodland Report for the Sterling Ranch Estates – Water Tank Project

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4.2.2 Oak Woodland 2

OW2 is located east of the existing water tank site and is currently in a "wild" state, showing evidence of minimal disturbance. OW2 comprises 14 mature and 4 young coast live oaks and 2 young scrub oaks with a total canopy area of approximately 0.28 acres. The subject woodland supports an open overhead canopy with a relatively undisturbed oak leaf litter layer. Conditions present within the understory of OW2 are illustrated in Photos 5 to 7. Based on these conditions, the habitat value/integrity ranking for OW2 is **Intact**.

Oak Woodland 2 Understory Assessment Results

Native species 75% – although not reflected in the percent covers, this also includes the native forbs observed during spring, which are included below in Table 2.

Non-native grasses and forbs 25%

Table 2. Oak Woodland 2 Understory Assessment

Scientific Name	Common Name	Native/Non-Native	Percent cover
Adenostoma fasciculatum	chamise	Native	5
Artemisia californica	California sagebrush	Native	35
Avena barbata	slender oat	Non-Native	5
Bromus diandrus	ripgut brome	Non-Native	20
Elymus condensatus	giant wild rye	Native	15
Eriogonum fasciculatum	California buckwheat	Native	5
Heteromeles arbutifolia	toyon	Native	5
Malacothamnus fasciculatus	bush mallow	Native	5
Salvia mellifera	black sage	Native	5

4.2.3 Oak Woodland 3

OW3 is located south of the existing water tank site and is currently in a "wild" state, showing evidence of minimal disturbance. OW3 comprises eight mature and four young coast live oaks with a total canopy area of approximately 0.07 acres (Table 3). The subject woodland supports an open overhead canopy with a relatively undisturbed oak leaf litter layer. Conditions present within the understory of OW3 are illustrated in Photos 8 to 10. Based on these conditions, the habitat value/integrity ranking for OW3 is **Intact**.

Oak Woodland #3 Understory Assessment Results

Native species 60% - although not reflected in the percent covers, this also includes the native forbs observed during spring, which are included below in Table 3. Vegetation community descriptions are included in Table 4. A list of associated understory plant species is included in Table 5.

Non-native grasses and forbs 40%

Table 3. Oak Woodland 3 Understory Assessment

Scientific Name	Common Name	Native/Non-Native	Percent cover
Adenostoma fasciculatum	chamise	Native	5
Artemisia californica	California sagebrush	Native	25
Avena barbata	slender oat	Non-Native	10
Bromus diandrus	ripgut brome	Non-Native	30
Elymus condensatus	giant wild rye	Native	5
Eriogonum fasciculatum	California buckwheat	Native	15
Malacothamnus fasciculatus	bush mallow	Native	5
Salvia mellifera	black sage	Native	5

Table 4. Oak Woodland Vegetation Community Descriptions

Code	Vegetation Community Description*	Oak Woodland 1 (ac)	Oak Woodland 2 (ac)	Oak Woodland 3 (ac)	Total area (ac)
BMS	Bush mallow scrub (*Malacothamnus fasciculatus - Malacothamnus* spp.) Alliance	0.00	0.00		0.00
C-BSC	Chamise - black sage chaparral (Ade*nostoma fasciculatum - Salvia mellifera*) Alliance		0.04	0.04	0.08
CLOW	Coast live oak woodland (*Quercus agrifolia*) Alliance		0.22	0.07	0.28
CSB-CB	California sagebrush - California buckwheat scrub (*Artemisia californica - Eriogonum fasciculatum*) Alliance		0.04		0.04
CSS	California sagebrush scrub (*Artemisia californica*) Alliance		0.11	0.09	0.19
WOABG	Wild oats and annual brome grasslands (*Avena* spp. - *Bromus* spp.) Semi-Natural Alliance	0.04			0.04
	Total area (ac)	**0.04**	**0.41**	**0.20**	**0.65**

Note:
* A Manual of California Vegetation, Second Edition Vegetation Communities within the Los Angeles County–defined oak woodland.

Table 5. List of Associated Native Plant Species for the Oak Woodland Understory*

Scientific Name	Common Name
Apiastrum angustifolium	mock parsley
Adenostoma fasciculatum	chamise
Artemisia californica	California sagebrush
Clarkia unguiculata	elegant clarkia
Claytonia perfoliata	miner's lettuce
Collinsia heterophylla var. *heterophylla*	purple Chinese houses
Delphinium parryi ssp. *parryi*	San Bernardino larkspur

Table 5. List of Associated Native Plant Species for the Oak Woodland Understory*

Scientific Name	Common Name
Dipterostemon capitatus	bluedicks
Elymus condensatus	giant wild rye
Eriogonum fasciculatum	California buckwheat
Eriophyllum confertiflorum	golden-yarrow
Erysimum capitatum	sanddune wallflower
Heteromeles arbutifolia	toyon
Lupinus bicolor	miniature lupine
Malacothamnus fasciculatus	bush mallow
Phacelia ramosissima	branching phacelia
Pseudognaphalium californicum	ladies' tobacco
Pterostegia drymarioides	woodland pterostegia
Salvia mellifera	black sage
Sambucus nigra ssp. *caerulea*	blue elderberry

Note:
* This list could be used as a native seed/container plant palette.

4.3 Oak Woodland Special-Status Species

The Guide requests a description of the presence or potential use of the site by special-status species. No special-status plant species or wildlife species have been found during surveys of the oak woodlands within the study area. Surveys were conducted in February and May–July 2020. Refer to the Biological Technical Report for the Sterling Ranch Estates Residential Project (Dudek 2020a) for a discussion of the methods and results of these surveys, which included the project footprint and a 200-foot buffer around the project footprint. Tables of potentially occurring special-status plant species and wildlife species are also provided in this report as Appendix B and Appendix C, respectively. These tables were reproduced from the Biological Technical Report and were modified for the purposes of this report to include only those species with potential to occur within oak woodland habitats. The tables include listed species and other species that, if impacted, would require a mandatory finding of significance pursuant to CEQA, but they do not include potentially occurring "watch list" species or species considered locally important by the County. See the Biological Technical Report for additional information on potentially occurring special-status species.

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5 Project Impacts

5.1 Description of Impacts

A total of 0.38 acres of canopy area/understory habitat and 1.69 acres of buffer area were recorded on site within the project study area. It is anticipated that development of the proposed project will result in the following project impacts:

- Removal of approximately 0.09 acres of canopy area/understory habitat
- Removal of approximately 0.56 acres of buffer habitat

Based on these assumptions, the proposed project design allows for approximately 1.42 acres, or 68.9%, of the existing 2.07-acre oak woodland canopy area (all on-site oak woodland canopy combined) to remain undisturbed during and after project construction and operations. Oak woodland impacts are listed in Table 6 and depicted on Figure 6, Oak Woodland Impacts. Mitigation to offset the significant impacts to oak woodlands is discussed in Section 6, Mitigation Measures, of this report.

Oak woodland impacts were determined using geographic information system software and spatial locations of trees relative to the project's impact areas (grading footprint). Impacts were further determined based on Dudek's experience with native woodland habitats and their typical responses to root disturbances from construction activities, such as soil compaction, excavation, and grading. The impact analysis results presented herein were used for recommending appropriate mitigation measures for the proposed project. Impact totals presented are based on proposed disturbance limits and development plans as of the date of this Oak Woodland Report.

5.2 Impact Severity and Estimated Level of Significance (Oak Woodland Guide)

Pursuant to the Guide, a determination must be made regarding whether the proposed project will have a substantial adverse effect on oak woodlands and/or result in the conversion of existing oak woodlands. Further, Table 2 of the Guide quantifies the severity of project impacts in relation to the habitat value/integrity of the subject woodland and the anticipated project impact(s). Once a determination of the impact severity of the project is made, an estimated level of significance is assigned in accordance with Table 3 of the Guide. Subsequently, these designations are used to assess whether the project will exceed the threshold for significance for impacts to oak woodlands. Because the project site contains three oak woodlands, a determination of the impact severity anticipated and the level of significance was assigned for each subject woodland. These designations are discussed in detail below. Tables 2 and 3 of the Guide are provided for reference in Appendices E and F, respectively. For ease of presentation, the oak woodland impacts are separated by impact category below.

5.2.1 Oak Woodlands with No Impact or Less-Than-Significant Impacts

Oak Woodland 1

- Project impacts: Excavation and grading activities associated with the construction of the new water tank.
- Woodland Integrity Ranking: Moderately Degraded

  - Discussion regarding the woodland integrity ranking of OW1 is provided in Section 4.2.1 of this report.
- Impact Severity Ranking: Low
  - Excavation and grading activities associated with construction of the new water tank would require the removal of approximately 0.04 acres of the total 0.26-acre woodland canopy and understory habitat associated with OW1, allowing for approximately 84.5% of the total canopy area associated with OW1 to be retained. Because areas within OW1 are currently subject to roadway use, it is anticipated that these activities will continue unmodified. Pursuant to Table 2, Impact Severity, of the Guide, project impacts within the moderately degraded woodland will have an impact severity ranking of low based on no trees being proposed for removal, the retention of 84.5% of oak woodland canopy associated with OW1, and the assumptions that the current regeneration potential of the subject woodland would be maintained and the current understory vegetation community will persist.
- Estimated Level of Significance: Less than Significant
  - Pursuant to Table 3, Estimated Level of Significance, of the Guide, project impacts within a moderately degraded woodland that have an impact severity ranking of low would be less than significant. No mitigation will be required under the Guide.

Table 6. Oak Woodland Impact Matrix

Oak Woodland Report Data														Data from Oak Tree Report														
Tree #	Oak Woodland #	Woodland Integrity	Basis for Determination	Tree Canopy removed	Tree Buffer area encroached	Woodland Canopy Area	Woodland Buffer Area	Woodland Area	Woodland Impact Area	% Woodland Impacted	Development Impact	Woodland Impact Severity	Impact Level of Significance	Botanical Name	Common Name	Stems	Individual Stem Diameters (in.) D1	D2	D3	D4	D5	Height (ft.)	Canopy (ft.)	Health	Structure	Protected	Removal	Encroached	Appraised Value
1	1	Moderate Degradation	Existing road beneath canopies	No	Yes	0.03 ac / 1,198 sf	0.23 ac / 10,075 sf	0.26 ac / 11,273 sf	0.04 ac / 1,743 sf	15.5%	Excavation and grading of woodland	Low	Non-significant	*Quercus agrifolia*	coast live oak	4	11	11	10	8	0	35	30	Good	Fair	Yes	No	Yes	$11,155
2				No	Yes									*Quercus agrifolia*	coast live oak	12	8	6	6	6	6	25	25	Good	Fair	Yes	No	Yes	$6,082
														# mature trees			1												
														# young trees			1												
														Total # trees			2												
3	2	Intact	Existing road beneath canopy of Tree #12 at northern edge of woodland presents a minor degradation to the woodland	No	No	0.28 ac / 12,253 sf	1.04 ac / 45,449 sf	1.32 ac / 57,702 sf	0.41 ac / 17,742 sf	30.7%	Excavation and grading of woodland resulting in net loss of acreage, habitat and understory	High	Significant	*Quercus agrifolia*	coast live oak	**1**	9	0	0	0	0	30	20	Fair	Fair	Yes	No	No	$2,356
4				No	No									*Quercus agrifolia*	coast live oak	2	7	2	0	0	0	30	15	Fair	Fair	No	No	No	$1,758
5				No	No									*Quercus agrifolia*	coast live oak	**1**	6	0	0	0	0	20	10	Fair	Good	No	No	No	$1,395
6				No	No									*Quercus agrifolia*	coast live oak	**1**	7	0	0	0	0	20	10	Fair	Good	No	No	No	$1,673
12				No	No									*Quercus agrifolia*	coast live oak	**1**	**44**	0	0	0	0	50	40	Poor	Poor	Yes	No	No	$16,787
17				No	No									*Quercus agrifolia*	coast live oak	2	17	13	0	0	0	45	35	Fair	Fair	Yes	No	No	$10,406
19				No	No									*Quercus agrifolia*	coast live oak	4	19	12	12	9	0	35	50	Fair	Poor	Yes	No	No	$16,215
26				No	No									*Quercus berberidifolia*	scrub oak	3	6	6	3	0	0	25	20	Fair	Fair	Yes	No	No	$2,094
27				No	No									*Quercus agrifolia*	coast live oak	2	9	8	0	0	0	20	20	Fair	Fair	Yes	No	No	$3,723
28				No	No									*Quercus agrifolia*	coast live oak	2	8	6	0	0	0	25	15	Fair	Fair	Yes	No	No	$2,762
29				No	**No**									*Quercus agrifolia*	coast live oak	**1**	**20**	0	0	0	0	40	40	Fair	Fair	Yes	No	No	$9.168
30				No	No									*Quercus agrifolia*	coast live oak	2	14	9	0	0	0	30	20	Good	Fair	Yes	No	No	$7,850
31				No	No									*Quercus agrifolia*	coast live oak	**1**	**14**	0	0	0	0	40	20	Good	Fair	Yes	No	No	$5,774
32				No	No									*Quercus agrifolia*	coast live oak	**1**	**14**	0	0	0	0	25	30	Fair	Fair	Yes	No	No	$4,812
33				No	No									*Quercus agrifolia*	coast live oak	**1**	**23**	0	0	0	0	45	40	Good	Fair	Yes	No	No	$14,307
34				Yes	Yes									*Quercus agrifolia*	coast live oak	2	13	9	0	0	0	25	20	Fair	Fair	Yes	Yes	Yes	$5,965
35				Yes	Yes									*Quercus agrifolia*	coast live oak	3	13	8	3	0	0	20	15	Dead	Dead	Yes	Yes	Yes	$0
36				Yes	Yes									*Quercus berberidifolia*	scrub oak	2	5	1	0	0	0	12	6	Fair	Fair	No	Yes	Yes	$1,050
37				Yes	Yes									*Quercus agrifolia*	coast live oak	**1**	**18**	0	0	0	0	40	30	Fair	Fair	Yes	Yes	Yes	$7,545
38				Yes	Yes									*Quercus agrifolia*	coast live oak	**1**	**18**	0	0	0	0	40	30	Fair	Fair	Yes	Yes	Yes	$7,545
39				Yes	Yes									*Quercus agrifolia*	coast live oak	**1**	**19**	0	0	0	0	50	35	Fair	Fair	Yes	Yes	Yes	$8,335
40				Yes	Yes									*Quercus agrifolia*	coast live oak	5	9	9	6	5	4	20	20	Good	Fair	Yes	Yes	Yes	$6,876
41				Yes	Yes									*Quercus agrifolia*	coast live oak	3	20	20	15	0	0	35	30	Fair	Poor	Yes	Yes	Yes	$22,514
42				Yes	Yes									*Quercus agrifolia*	coast live oak	4	5	5	4	2	0	15	10	Fair	Fair	Yes	Yes	Yes	$2,121
														# mature trees			14												
														# young trees			6												
														Total # trees			20												
44	3	Intact	No existing degradation present	Yes	Yes	0.07 ac / 3,238 sf	0.42 ac / 18,055 sf	0.49 ac / 21,293 sf	0.20 ac sf / 8,623	40.5%	Excavation and grading of woodland resulting in net loss of acreage, habitat and understory	High	Significant	*Quercus agrifolia*	coast live oak	**1**	**11**	0	0	0	0	25	20	Fair	Fair	Yes	Yes	Yes	$3,210
45				Yes	Yes									*Quercus agrifolia*	coast live oak	2	11	7	0	0	0	25	20	Fair	Fair	Yes	Yes	Yes	$4,256
47				Yes	Yes									*Quercus agrifolia*	coast live oak	**1**	**16**	0	0	0	0	35	20	Poor	Fair	Yes	Yes	Yes	$2,437
48				**No**	Yes									*Quercus agrifolia*	coast live oak	2	11	11	0	0	0	20	15	Poor	Poor	Yes	No	Yes	$2,318
49				**No**	Yes									*Quercus agrifolia*	coast live oak	**1**	**13**	0	0	0	0	20	15	Poor	Poor	Yes	No	Yes	$1,694
50				No	Yes									*Quercus agrifolia*	coast live oak	**1**	**11**	0	0	0	0	20	15	Poor	Poor	Yes	No	Yes	$1,284
51				**No**	Yes									*Quercus agrifolia*	coast live oak	**1**	**16**	0	0	0	0	40	25	Fair	Fair	Yes	No	Yes	$6,093
52				No	**Yes**									*Quercus agrifolia*	coast live oak	5	6	4	2	1	1	20	15	Fair	Fair	Yes	No	Yes?	$1,865
54				No	**Yes**									*Quercus agrifolia*	coast live oak	**1**	**9**	0	0	0	0	15	10	Poor	Fair	Yes	No	Yes?	$942
55				No	Yes									*Quercus agrifolia*	coast live oak	2	19	18	0	0	0	40	30	Poor	Fair	Yes	No	Yes	$6,102
56				No	**Yes**									*Quercus agrifolia*	coast live oak	2	7	7	0	0	0	25	20	Fair	Fair	Yes	No	Yes?	$2,719
59				No	Yes									*Quercus agrifolia*	coast live oak	3	6	5	3	0	0	15	15	Fair	Fair	Yes	No	Yes	$2,121
														# mature trees			8												
														# young trees			4												
														Total # trees			12												
WOODLAND						0.38	1.69	2.07	0.65	31.1%																			
TOTALS						16,688	73,580	90,268	28,108	31.1%																			
														# mature trees			23												
														# young trees			11												
														Total # trees			34												

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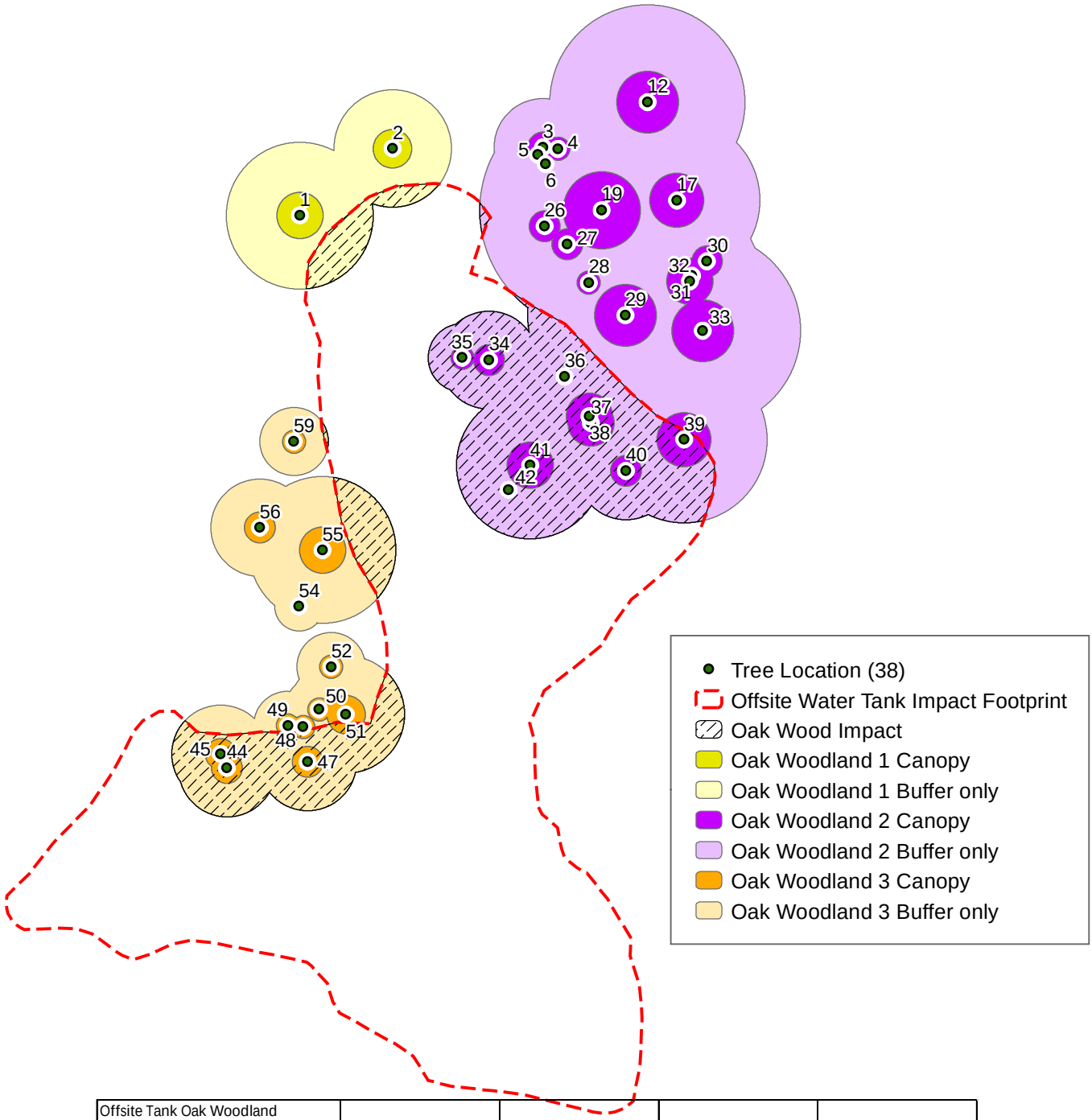

Offsite Tank Oak Woodland Summary	Oak Woodland 1	Oak Woodland 2	Oak Woodland 3	Total
Oak Tree Canopy Area	0.03 ac/ 1,198 sf	0.28 ac/ 12,253 sf	0.07 ac/ 3,238 sf	0.38 ac/ 16,688 sf
Oak Woodland Buffer Area	0.23 ac/ 10,075 sf	1.04 ac/ 45,449 sf	0.42 ac/ 18,055 sf	1.69 ac/ 73,580 sf
Oak Woodland Area	0.26 ac/ 11,273 sf	1.32 ac/ 57,702 sf	0.49 ac/ 21,293 sf	2.07 ac/ 90,268 sf
Oak Woodland Area Impact	0.04 ac/ 1,743 sf	0.41 ac/ 17,742 sf	0.20 ac/ 8,623 sf	0.65 ac/ 28,108 sf

Offsite Tank Oak Woodland Impact Areas	Oak Woodland 1	Oak Woodland 2	Oak Woodland 3	Total
Oak Tree Canopy in Impact Area	0.00 ac/ 0 sf	0.07 ac/ 3,090 sf	0.02 ac/ 1,010 sf	0.09 ac/ 4,100 sf
Oak Woodland Buffer in Impact Area	0.04 ac/ 1,743 sf	0.34 ac/ 14,652 sf	0.18 ac/ 7,613 sf	0.56 ac/ 24,008 sf

FIGURE **6**

Oak Woodland Impacts

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5.2.2 Oak Woodlands with Significant Impacts

Oak Woodland 2

- Project impacts: Excavation and grading activities associated with the construction of the new water tank.
- Woodland Integrity Ranking: Intact
  - Discussion regarding the woodland integrity ranking of OW2 is provided in Section 4.2.2 of this report.
- Impact Severity Ranking: High
  - Excavation and grading activities associated with the new water tank will require the removal of approximately 0.41 acres of the total 1.32-acre woodland canopy and understory habitat associated with OW2, allowing for approximately 69.3% of the total canopy area associated with OW2 to be retained. Pursuant to Table 2 of the Guide, these activities within the intact woodland will have an impact severity ranking of high based on the assumption that the impact will result in the net loss of oak woodland acreage and the loss of habitat and understory. Mitigation will be required under the Guide.
- Estimated Level of Significance: Significant
  - Pursuant to Table 3 of the Guide, project impacts within an intact woodland that have an impact severity ranking of high would be significant and result in the following impacts to OW2: net loss of oak woodland acreage and loss of wildlife habitat and food sources. Mitigation will be required under the Guide.

Oak Woodland 3

- Project Impacts: Excavation and grading activities associated with the construction of the new water tank.
- Woodland Integrity Ranking: Intact
  - Discussion regarding the Woodland Integrity Ranking of OW3 is provided in Section 4.2.3 of this report.
- Impact Severity Ranking: High
  - Excavation and grading activities associated with the new water tank will require the removal of approximately 0.20 acres of the total 0.49-acre woodland canopy and understory habitat associated with OW2, allowing for approximately 59.5% of the total canopy area associated with OW2 to be retained. Pursuant to Table 2 of the Guide, these activities within the intact woodland will have an impact severity ranking of high based on the assumption that the impact will result in the net loss of oak woodland acreage and the loss of habitat and understory.
- Estimated Level of Significance: Significant
  - Pursuant to Table 3 of the Guide, project impacts within an intact woodland that have an impact severity ranking of high would be significant and result in the following impacts to OW3: net loss of oak woodland acreage and loss of wildlife habitat and food sources. Mitigation will be required under the Guide.

5.3 Impact Summary

In conclusion, project development will significantly impact OW2 and OW3 and have a less-than-significant impact on OW1. A total of 0.61 acres of significant impacts to oak woodland canopy would occur in OW2 and OW3, combined, which would require mitigation. Project impacts to oak woodlands could be mitigated to a less-than-significant level. These mitigation measures are discussed below.

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6 Mitigation Measures

6.1 Determination of Mitigation

Three oak woodlands located on the project site are subject to impacts, two of which require mitigation. The following discusses the mitigation options and recommendations based on the Plan.

6.2 Regulatory Definitions of Mitigation Options

In accordance with the Guide, to offset the project's total combined significant impact of 0.61 acres of oak woodland canopy in OW2 and OW3, one of the following mitigation measures (prioritized by preference for intact woodlands) shall be implemented, subject to County approval (County of Los Angeles 2011, 2014):

1. Acquire oak woodland habitat that is comparable to the habitat that was impacted.
2. Restore degraded woodlands: off-site restoration should be prioritized over on-site restoration and where feasible, should be located nearby the impacted property, preferably within the same watershed or sub-drainage as deemed appropriate by the County Forester and staff biologist, or within the same planning area as the impacted property.

   Off-site restoration may include any of the following, and would be performed on a 2:1 acreage basis:

   - Acquiring off-site fee title for oak woodland habitat;
   - Replacement planting.
   - Restoring moderately or severely degraded oak woodlands. More specifically, removing exotics and restoring appropriate native plant diversity.

   On-site restoration "should be utilized when circumstances at the site allow for long-term sustainability of the replacement plantings, the potential to expand/connect to adjacent oak woodlands, and/or improvement of degraded woodlands. The permittee shall replace/restore lost canopy area [on a 2:1 acreage basis]. All replacement trees should be planted on native undisturbed soil and should be the same species of oak (Quercus sp.) as the removed tree with appropriate associated native vegetation in the understory. The location of the replacement tree should be in the vicinity of other oak trees of the same species. If replacement trees cannot be planted on native undisturbed soil or are not in the vicinity of the same species of oak (*Quercus* sp.) as the removed tree, the County Forester may require additional conditions to ensure the trees thrive.
3. Contributing to LA County's Oak Forests Special Fund at a minimum two to one canopy cover area for the amount removed.
4. Other mitigation measures developed by the County.

6.3 Mitigation Provisions

The following provisions apply to all of the aforementioned mitigation options (County of Los Angeles 2014):

To ensure that mitigation measures are implemented, the County Forester may require the project applicant post a bond in the amount determined by the County Forester.

If possible, on-site mitigation areas or off-site mitigation land should be located adjacent to preserved natural open space unless there are reasons that outweigh this priority (like contributing to a linkage preserving a specific location with special-status species on the mitigation site). The location of the on- or off-site mitigation shall be approved by the County Forester and County Department of Regional Planning Staff Biologist.

Mitigation areas or land should be at a minimum 2:1 canopy cover area for the amount removed. This is the expected canopy extent of the mature trees.

All mitigation areas or lands should be placed in a conservation easement. If a conservation easement is not possible, the land shall be protected in perpetuity by other means deemed acceptable by the County. Mitigation land may be designated public open space if appropriate.

In addition to mitigation for tree removal, the permittee shall prepare a plan to the satisfaction of the County Forester, for protecting remaining oak trees during and after development.

Should on- or off-site replacement plantings be provided to mitigate for significant impacts to oak woodlands, the Department of Regional Planning Staff Biologist may require a Habitat Mitigation and Monitoring Plan that details the long-term maintenance and monitoring plans for the mitigation site.

Pursuant to the Guide, the Habitat Mitigation and Monitoring Plan should be approved prior to issuance of a grading permit and include the following minimum requirements: description of the project/impact and mitigation sites, specific objectives, success criteria, plant palette, implementation plan, maintenance activities, monitoring plan (7-year period including annual reports), and contingency measures. The Habitat Mitigation and Monitoring Plan will need to be approved by the County Forester and Department of Regional Planning Staff Biologist.

6.4 Recommended Mitigation

The Plan identifies mitigation measures for woodland removal or loss associated with a development project when it cannot be resigned to avoid impacts (County of Los Angeles 2011). Below is a review of the applicability of the mitigation measure options available and the recommended option for the project.

Habitat Acquisition

Selecting Mitigation Option 1, acquiring oak woodland habitat, may be possible; it would require the acquisition of 1.22 acres (2 × 0.61 acres) of comparable oak woodland habitat. However, locating a site that has comparable habitat and a willing seller may be difficult.

Degraded Woodland Restoration

To comply with Mitigation Measure 2 requirements, off-site restoration is a priority over on-site restoration; locating a site for restoration that is near the project site, particularly within the same watershed, sub-drainage, or planning area, is preferred. Restoration may include acquiring woodland habitat, replacement planting, or degraded woodland restoration.

Due to the nature of this project, the entirety of the project area is proposed for grading, so there is limited opportunity for on-site restoration. Two of the three woodlands within the development footprint would sustain significant impacts to accommodate the proposed project. The portions of the impacted woodlands outside of the grading footprint would remain "wild," as would the adjacent land, aside from a portion of OW1. Hence, there may be an opportunity for some on-site restoration within the moderately degraded portion of OW1.

Special Fund Contribution

Mitigation Measure Option 3 allows for contribution of funds to the County's Oak Forest Special Fund as mitigation for the loss of oak woodland and habitat. However, information from the County indicates this option is not currently being considered. If the option were proposed, it would require a contribution of two times the value of the removed canopy cover area. The cost for all proposed oak woodland impacts is $48,520 per the Plan; two times the canopy cover area value would be $97,040.

Other Measures

Mitigation Option 4 is undefined, as it would require the County to develop an alternative mitigation option. However, this option may be feasible pending discussions with County staff.

Recommendation

A combination of off-site replacement planting and on-site degraded woodland restoration is the recommended mitigation measure for the project. A total of 24 coast live oak trees would need to be replanted to meet the requirements of the Plan. Dudek recommends all tree plantings be subject to a seven-year monitoring effort by an independent third-party certified arborist. This monitoring effort would consider growth, health, and condition of the subject trees to evaluate success. The monitoring effort may result in a recommendation of remedial actions should any of the tree plantings exhibit poor or declining health.

The specific location of individual mitigation tree plantings on site would be addressed in the mitigation planting plan prepared for the site. Locations may include the degraded portion of OW1, the immediate vicinity around the water tank site, and degraded oak woodlands alongside the water tank access road. The mitigation requirement and the approved tree replacement mitigation ratio is prescribed by the County.

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7 Conclusion

The project site contains three woodlands subject to conservation under the Plan. For the purposes of this Report, two of the three woodlands would be significantly impacted by the proposed project. The woodlands subject to impacts would require mitigation using a combination of off-site replacement planting and on-site degraded woodland restoration. A total of 24 coast live oak trees would need to be replanted to meet the requirements of the Plan. The mitigation requirement and the approved tree replacement mitigation ratio is prescribed by the County. Furthermore, this Oak Woodland Report recommends that the remaining three encroached oak woodlands be subject to protection measures that, when implemented, minimize the possibility that the woodlands are inadvertently damaged during the construction process.

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8 References

County of Los Angeles. 2011. Los Angeles County Oak Woodlands Conservation Management Plan. May 2011.

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Dudek. 2020a. Draft Confidential Biological Technical Report for the Sterling Ranch Estates Residential Project. Prepared for Sterling Ranch Estates. July 2020.

Dudek. 2020b. Oak Tree Report for the Sterling Ranch Estates – Water Tank Project. Prepared for Sterling Ranch Estates. March 2020.

ISA (International Society of Arboriculture). 2000. Guide for Plant Appraisal. 9th edition. Council of Tree and Landscape Appraisers.

USGS (U.S. Geological Survey). 2017. "Val Verde, California" [map]. 1:24,000. 7.5-Minute Series (Topographic). Reston, Virginia: USGS.

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Appendix A

Representative Woodland Photos

Appendix A
Oak Woodland 1 Representative Photographs

1. Representative view of Oak Woodland 1 with existing paved road in the background and associated water tank infrastructure in the foreground (coast live oak Tree Number 1).

2. Representative view of Oak Woodland 1 with existing paved road and associated water tank infrastructure in the foreground (coast live oak Tree Numbers 1 and 2).

Photographs were taken on July 8, 2020

Appendix A
Oak Woodland 1 Representative Photographs

3. Representative view of Oak Woodland 1 with existing paved road in the foreground (coast live oak Tree Numbers 1 and 2).

4. Representative view of Oak Woodland 1 with disturbed soil in the foreground and water tank in the background (coast live oak Tree Numbers 1 and 2).

Photographs were taken on July 8, 2020

Appendix A
Oak Woodland 2 Representative Photographs

5. Representative view of Oak Woodland 2.

6. Representative view of Oak Woodland 2.

Photographs were taken on July 8, 2020

Appendix A
Oak Woodland 2 Representative Photographs

7. Representative view of Oak Woodland 2.

Photographs were taken on July 8, 2020

Appendix A
Oak Woodland 3 Representative Photographs

8. Representative view of Oak Woodland 3.

9. Representative view of Oak Woodland 3 with existing water tank in the foreground.

Photographs were taken on July 8, 2020

Appendix A
Oak Woodland 3 Representative Photograph

10. Representative view of Oak Woodland 3 with water tank site fencing in the foreground.

Photographs were taken on July 8, 2020.

Appendix B

Potential for Occurrence of Special-Status Plant Species (Oak Woodlands)

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Berberis nevinii	Nevin's barberry	FE/SE/1B.1	Chaparral, Cismontane woodland, Coastal scrub, Riparian scrub; sandy or gravelly/perennial evergreen shrub/(Feb)Mar–June/225–2,705	Absent. Suitable vegetation is present for this species within the project site. This perennial shrub would have been identified during the 2020 botanical and focused rare plant surveys.
California macrophylla	round-leaved filaree	None/None/1B.2	Cismontane woodland, Valley and foothill grassland; clay/annual herb/Mar–May/45–3,935	Absent. Suitable vegetation is present for this species within the project site; however, clay substrate is absent. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Calochortus catalinae	Catalina mariposa lily	None/None/4.2	Chaparral, Cismontane woodland, Coastal scrub, Valley and foothill grassland/perennial bulbiferous herb/(Feb)Mar–June/45–2,295	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Calochortus fimbriatus	late-flowered mariposa lily	None/None/1B.3	Chaparral, Cismontane woodland, Riparian woodland; often serpentinite/perennial bulbiferous herb/June–Aug/900–6,250	Absent. Suitable vegetation is present for this species within the project site; however, serpentine substrate is absent. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Calochortus plummerae	Plummer's mariposa lily	None/None/4.2	Chaparral, Cismontane woodland, Coastal scrub, Lower	Absent. Suitable vegetation is present for this species within the project site. Botanical and

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
			montane coniferous forest, Valley and foothill grassland; granitic, rocky/perennial bulbiferous herb/May–July/325–5,575	focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Calystegia peirsonii	Peirson's morning-glory	None/None/4.2	Chaparral, chenopod scrub, cismontane woodland, coastal scrub, lower montane coniferous forest, valley and foothill grassland/perennial rhizomatous herb/Apr–June/95–4,920	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Clarkia exilis	slender clarkia	None/None/4.3	Cismontane woodland/annual herb/Apr–May/390–3,280	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Dodecahema leptoceras	slender-horned spineflower	FE/SE/1B.1	Chaparral, Cismontane woodland, Coastal scrub (alluvial fan); sandy/annual herb/Apr–June/655–2,495	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Galium grande	San Gabriel bedstraw	None/None/1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest/perennial deciduous shrub/Jan–July/1,390–4,920	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
				species would have been identified, if present.
Horkelia cuneata var. *puberula*	mesa horkelia	None/None/1B.1	Chaparral (maritime), Cismontane woodland, Coastal scrub; sandy or gravelly/perennial herb/Feb–July(Sep)/225–2,655	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Juglans californica	Southern California black walnut	None/None/4.2	Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland; alluvial/perennial deciduous tree/Mar–Aug/160–2,955	Absent. Suitable vegetation is present for this species within the project site. This perennial tree would have been identified during the 2020 botanical and focused rare plant surveys.
Lilium humboldtii ssp. *ocellatum*	ocellated Humboldt lily	None/None/4.2	Chaparral, Cismontane woodland, Coastal scrub, Lower montane coniferous forest, Riparian woodland; openings/perennial bulbiferous herb/Mar–July(Aug)/95–5,905	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Phacelia mohavensis	Mojave phacelia	None/None/4.3	Cismontane woodland, Lower montane coniferous forest, Meadows and seeps, Pinyon and juniper woodland; sandy or gravelly/annual herb/Apr–Aug/4,590–8,200	Absent. The project site is outside of the known elevation range for this species. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Pseudognaphaliu m leucocephalum	white rabbit-tobacco	None/None/2B.2	Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland; sandy, gravelly/perennial	Not expected to occur. Suitable vegetation is present for this species within the project site; however, this species is more typically associated

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
			herb/(July)Aug–Nov(Dec)/0–6,890	with sandy washes, which are not present within the project site.
Senecio aphanactis	chaparral ragwort	None/None/2B.2	Chaparral, Cismontane woodland, Coastal scrub; sometimes alkaline/annual herb/Jan–Apr(May)/45–2,625	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.
Symphyotrichum greatae	Greata's aster	None/None/1B.3	Broadleafed upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest, Riparian woodland; mesic/perennial rhizomatous herb/June–Oct/980–6,595	Absent. Suitable vegetation is present for this species within the project site. Botanical and focused rare plant surveys conducted in 2020 were timed during the species blooming period and the species would have been identified, if present.

Notes:

CRPR – California Rare Plant Rank

1A plants presumed extirpated in California and either rare or extinct elsewhere
1B plants rare, threatened, or endangered in California and elsewhere
2A plants presumed extirpated in California, but common elsewhere
2B plants rare, threatened, or endangered in California, but more common elsewhere
3 plants about which more information is needed – a review list
4 plants of limited distribution – a watch list
0.1 seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)
0.2 moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)
0.3 not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known)

State Designations

SE – State Listed as Endangered

Federal Designations

FE - Federally Listed as Endangered

Appendix C

Potential for Occurrence of Special-Status Wildlife Species (Oak Woodlands)

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Amphibians				
Rana boylii	foothill yellow-legged frog	None/CSC	Rocky streams and rivers with open banks in forest, chaparral, and woodland.	Not expected to occur. The project site is outside the known range for this species.
Rana draytonii	California red-legged frog	FT/CSC	Lowland streams, wetlands, riparian woodlands, livestock ponds; dense, shrubby or emergent vegetation associated with deep, still or slow-moving water; uses adjacent uplands.	Not expected to occur. No suitable habitat is present on the project site.
Spea hammondii	western spadefoot	None/CSC	Primarily grassland and vernal pools, but also in ephemeral wetlands that persist at least 3 weeks in chaparral, coastal scrub, valley–foothill woodlands, pastures, and other agriculture.	Not expected to occur. Suitable vegetation is present; however, ephemeral ponds and vernal pools are absent within the project site.
*Taricha torosa (*Monterey Co. south only*)*	California newt	None/CSC	Wet forests, oak forests, chaparral, and rolling grassland.	Not expected to occur. The project site is outside the known range for this species.
Reptiles				
Aspidoscelis tigris stejnegeri	San Diegan tiger whiptail	None/CSC	Hot and dry areas with sparse foliage, including chaparral, woodland, and riparian areas.	Moderate potential to occur. Suitable vegetation present.
Salvadora hexalepis virgultea	coast patch-nosed snake	None/CSC	Brushy or shrubby vegetation; requires small mammal burrows for refuge and overwintering sites.	Low potential to occur. Site lacks suitable small mammal burrows required by this species.
Birds				
*Accipiter cooperii (*nesting*)*	Cooper's hawk	None/WL	Nests and forages in dense stands of live oak, riparian woodlands, or other woodland habitats often near water.	Not expected to nest on site; however, the site provides suitable foraging for this species.
*Baeolophus inornatus (*nesting*)*	oak titmouse	BCC/SA, WL	Montane hardwood-conifer, montane hardwood, blue oak, valley oak and coastal oak woodlands, montane and valley foothill riparian habitats.	Moderate potential to occur. Suitable habitat present.

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Buteo swainsoni (nesting)	Swainson's hawk	BCC/ST	Nests in open woodland and savanna, riparian, and in isolated large trees; forages in nearby grasslands and agricultural areas such as wheat and alfalfa fields and pasture.	Not expected to occur. Outside nesting range for this species.
Coccyzus americanus occidentalis (nesting)	western yellow-billed cuckoo	FT, BCC/SE	Nests in dense, wide riparian woodlands and forest with well-developed understories.	Not expected to occur. No suitable nesting habitat on the project site.
Elanus leucurus (nesting)	white-tailed kite	None/FP	Nests in woodland, riparian, and individual trees near open lands; forages opportunistically in grassland, meadows, scrubs, agriculture, emergent wetland, savanna, and disturbed lands.	Not expected to occur. No nesting habitat present on site; however, the project site provides suitable foraging habitat.
Falco columbarius (wintering)	merlin	None/WL	Coastlines, wetlands, woodlands, agricultural fields, and grasslands.	Low potential to occur. Suitable woodland habitat present on site.
Lanius ludovicianus (nesting)	loggerhead shrike	BCC/CSC	Nests and forages in open habitats with scattered shrubs, trees, or other perches.	Low potential to occur. The project site provides suitable nesting and foraging habitat for this species.
Polioptila californica californica	coastal California gnatcatcher	FT/CSC	Nests and forages in various sage scrub communities, often dominated by California sagebrush and buckwheat; generally, avoids nesting in areas with a slope of greater than 40%; majority of nesting at less than 1,000 feet amsl.	Protocol breeding season surveys were negative for the species. Suitable nesting and foraging habitat present on site. CNDDB records indicate the nearest reported location of California gnatcatcher is approximately 2.8 miles southwest of the project site, near the Santa Clara River.
Setophaga petechia (nesting)	yellow warbler	BCC/SSC	Nests and forages in riparian and oak woodlands, montane chaparral, open ponderosa pine, and mixed-conifer habitats.	Low potential to occur. Nesting habitat present on site; however, this species can also occur as a migrant through the region. The site provides suitable foraging habitat for this species.

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Mammals				
Antrozous pallidus	pallid bat	None/CSC	Grasslands, shrublands, woodlands, forests; most common in open, dry habitats with rocky outcrops for roosting, but also roosts in man-made structures and trees.	Low potential to occur. Low overall suitable roosting habitat on site.
Eumops perotis californicus	western mastiff bat	None/CSC	Chaparral, coastal and desert scrub, coniferous and deciduous forest and woodland; roosts in crevices in rocky canyons and cliffs where the canyon or cliff is vertical or nearly vertical, trees, and tunnels,	Not expected to occur. No suitable roosting or foraging habitat present.
Nyctinomops macrotis	big free-tailed bat	None/CSC	Rocky areas; roosts in caves, holes in trees, buildings, and crevices on cliffs and rocky outcrops; forages over water.	Low potential to occur. Low overall suitable roosting habitat on site.

State
CSC - California Species of Special Concern
FP – Fully Protected
SE – California Endangered
SA – Special Animals List
ST – California Threatened
WL - Watch List

Federal
BCC – USFWS Bird of Conservation Concern
FE – Federally Endangered
FT – Federally Threatened

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Appendix D

LA County Oak Woodlands Conservation Management Plan Guide: Table 1 – Woodland Integrity

Table 1. Existing Conditions

Woodland Integrity:	Intact	Moderately Degraded	Severely Degraded
Existing Conditions:	Site is currently in a "wild" state where all ecological functions such as groundwater infiltration, shade, habitat, nutrient cycling, carbon sequestration, wind/noise/dust abatement, and the stand is self-sustaining and regenerating. Understory of grasslands may be dominated by invasive exotic grasses and forbs. Fire exclusion or frequency may have altered native woodland. Woodland supports associated flora and fauna and are free from destructive land practices that limit long-term persistence.	Even though the site has been altered, oak woodlands persist and retain some of their functions. Natural regeneration is possible, wildlife use still occurs, and some level of ecosystem services is still present. The majority of oak woodlands in the County fall within this category.	Site has been drastically altered from the natural condition to accommodate residential, commercial or industrial uses, and oak woodlands remain in scattered locations. Natural regeneration is not possible. Soil is compacted, contaminated or paved. Wildlife habitat is limited and associated understory vegetation has been replaced by managed non- native landscaping.
Examples:		Golf courses intermixed with fragmented oak woodlands, many of the subdivisions and urban wild land interface areas found in the Santa Monica Mountains, Santa Clarita Valley, along the foothills of the San Gabriel Mountains and throughout the Puente Hills.	Small clusters of oaks within or surrounding parking lots, isolated small stands in parks or open spaces surrounded by urban development, or woodlands remaining along freeway corridors.
Recommendation:	Projects that would alter the oak woodland should receive the highest level of scrutiny. Project alternatives that would avoid this alteration should be fully explored and given first consideration.	Project needs to be reviewed within the context of preventing further ecosystem function losses. This could include reduction of project scale, adjusting project footprint to reduce impacts, identifying opportunities to preserve connectivity, increase groundwater retention, and restore habitat.	Site should be reviewed within the context of adjacency to other oak woodland stands, potential for restoration and the potential to restore connectivity and ecosystem functions. A Severely Degraded site may be a good choice for a mitigation area that could be restored.

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Appendix E

LA County Oak Woodlands Conservation Management Plan Guide: Table 2 – Impact Severity

Table 2. Impact Severity

Impact Severity	Intact Woodland	Moderately Degraded Woodland	Severely Degraded Woodland
Low:	Minimal disturbance to stand structure and composition and habitat features resulting in no increased edge habitat or fragmentation; road and stream crossings are not being considered; activities will not result in the introduction of exotic or invasive species. Minimal site or spatial disturbance may still result in significant impacts to an intact or core woodland.	Regeneration potential is being maintained across the site; understory oak associates present or can be restored; expansion of developed areas are centralized; new road and stream crossings not being considered. In the absence of special circumstances, statutes or ordinances, this may represent a non-significant impact.	Majority of remnant trees are retained; understory removal or road widening does not compromise existing tree health; no further loss of ecosystem services considered. In the absence of special circumstances, statutes or ordinances, this may represent a non-significant impact.
Moderate:	Detectible change or reduction in canopy, structure or composition; loss of some habitat features, subtle impacts increasing fragmentation, edge creation or loss of connectivity (fences, roads, other artificial barriers or buffers).	Regeneration potential is being marginalized; developed areas expand into previously undeveloped areas; new roads or stream crossings proposed; habitat features are being lost; activities will add exotic an invasive species.	Loss of a majority of existing trees; activities will inhibit or harm residual tree health and vigor; barriers constructed will increase fragmentation; ecosystem services will be lost or degraded.
	These impacts are considered significant.		
High:	Obvious change or reduction or loss of canopy, structure or composition; loss of existing habitat features; fragmentation and parcelization of contiguous ownerships; introduced roads, stream crossings and/or exotic invasive species; creation of edge effects; construction of barriers (fences, roads, etc.).	Large scale impacts including loss of habitat, understory, resulting in fragmentation and increased edge effects; Loss of woodland structure and changes in composition in large continuous woodland patch.	Loss of remnant trees or stand increases fragmentation across the landscape through loss of connectivity.
	These impacts are considered significant.		

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Appendix F

LA County Oak Woodlands Conservation Management Plan Guide: Table 3 – Estimated Level of Significance

Table 3. Estimated Level of Significance

Woodland Integrity:	Intact			Moderately Degraded			Severely Degraded		
Impact Severity:	Low	Mod	High	Low	Mod	High	Low	Mod	High
Impact	Level of Significance "LTS"= Less Than Significant; "PS" =Potentially Significant; "S" = Significant								
Net loss of oak woodland acreage.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Increased habitat fragmentation.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Loss of vertical and horizontal structural complexity.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Loss of understory species diversity, locally uncommon or rare species or associations.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Loss of food sources for wildlife	PS	S	S	LTS	S	S	LTS	LTS	LTS
Loss of nesting, denning, burrowing, hibernating and roosting structures.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Loss of habitats and refugia for sedentary species and those with special habitat requirements, *i.e.* mosses, lichens, rocks, native grasses and fungi.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Road construction, grading, trenching, activities affecting changes in grade, other road-related impacts.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Stream crossings, culverts, and road associated erosion and sediment inputs.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Loss of riparian function, reduced bank stability and increasing sedimentation or water temperature that impacts native fishes and other aquatic species.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Road building activities that aggravate existing conditions	PS	S	S	LTS	LTS	S	LTS	LTS	LTS
Changes in environmental conditions that prevent existing residual trees from natural regeneration.	PS	S	S	LTS	LTS	S	LTS	LTS	LTS
Proposed project designs that result in construction that poses barriers to wildlife or fish passage.	PS	S	S	LTS	S	S	LTS	LTS	LTS
Proposed project designs that result in the probable introduction or expansion of invasive plants and animals	PS	S	S	LTS	S	S	LTS	LTS	LTS
Loss of individual heritage trees that are recognized and/or protected by ordinance or statutes.	PS	S	S	LTS	S	S	LTS	S	S
Loss of appropriate recruitment sites for recognized and/or protected heritage tree species.	PS	S	S	LTS	S	S	LTS	S	S

Woodland Integrity:	Intact			Moderately Degraded			Severely Degraded		
Impact Severity:	Low	Mod	High	Low	Mod	High	Low	Mod	High
Impact	Level of Significance "LTS"= Less Than Significant; "PS" =Potentially Significant; "S" = Significant								
Loss of individual trees where the natural occurrence and range of the species has been dramatically reduced and altered resulting in decreased recruitment/restoration potential for the species.	PS	S	S	LTS	S	S	LTS	S	S
The removal of even a few individual trees that represents a significant portion of the existing population of that species.	PS	S	S	LTS	S	S	LTS	S	S
Loss of ecosystem services such as groundwater recharge, erosion protection, water quality protection, temperature moderation.	PS	S	S	LTS	S	S	LTS	S	S
Changes to carbon sequestration potential.	PS	S	S	LTS	S	S	LTS	S	S
Loss of view-shed, aesthetics, amenity value, public recreation opportunities, historic or cultural resources.	PS	S	S	LTS	S	S	LTS	S	S

Note: The High Impact Severity column is based on Table 6 of the OWCMP on page 72. The Low and Moderate Impact Severity columns are estimates.

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Appendix B

Tract Map Site, Off-Site Roadway Improvement Area, and Off-Site Open Space Area Oak Tree Report

OAK TREE REPORT
for the
Sterling Ranch Estates Project
County of Los Angeles, California

Prepared for:

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TABLE OF CONTENTS

Section			Page No.
1	**INTRODUCTION**		**1**
	1.1	Project Location	1
	1.2	Site Characteristics	1
	1.3	Project Description	1
2	**METHODS**		**5**
	2.1	Individual Tree Evaluation	5
	2.2	Tree Impact Analysis	6
	2.3	Tree Appraisal	6
		2.3.1 Appraisal Method	6
		2.3.2 Appraisal Calculations	8
	2.4	Scope of Work Limitations	8
3	**OBSERVATIONS**		**9**
	3.1	Individual Trees	9
4	**REGULATORY DEFINITIONS AND REQUIREMENTS**		**11**
	4.1	Definitions	11
		4.1.1 Los Angeles County Oak Tree Ordinance	11
	4.2	Regulations	11
		4.2.1 Los Angeles County Oak Tree Ordinance	11
	4.3	Migratory Bird Treaty Act	12
5	**IMPACTS**		**13**
	5.1	Direct Tree Impacts	13
	5.2	Indirect Tree Impacts	14
	5.3	Candidates Suitable for Preservation	14
	5.4	Tree Impact Summary	15
6	**MITIGATION**		**16**
	6.1	Determination of Minimum Replacement Standards	16
	6.2	Recommended Mitigation	16
7	**TREE PROTECTION MEASURES**		**18**
	7.1	Tree Protection Measures Prior to Construction	18
	7.2	Protection and Maintenance during Construction	18
	7.3	Maintenance after Construction	20
8	**CONCLUSION**		**22**
9	**ARBORIST'S DISCLOSURE STATEMENT**		**24**

TABLE OF CONTENTS (CONTINUED)

Page No.

10 REFERENCES.....26

APPENDICES

A Tree Information Matrix
B Oak Tree Location and Proposed Impacts Exhibit
C Representative Protected Oak Photographs
D Appraisal Worksheets

FIGURES

1 Project Location.....3

TABLE

1 Summary of Tree Disposition.....14

1 INTRODUCTION

This oak tree report provides an inventory and evaluation of the protected oak trees located on the Sterling Ranch Estates Project (proposed project) site. The proposed project site is located in the County of Los Angeles (County), California (Figure 1). As such, this oak tree report covers the regulations and requirements for the protection and removal of protected trees within the County's jurisdiction.

Sterling Ranch Estates retained Dudek to conduct a tree inventory and assessment for the proposed project site. Dudek's Urban and Community Forestry Division's International Society of Arboriculture (ISA)-certified arborists performed various functions associated with surveying, inventorying, and evaluating the condition of all protected oak trees located within the proposed project site, as described in the following text.

The purpose of this oak tree report is to present the physical characteristics and mapped locations of the site's protected trees that are to be removed or protected in place during the proposed grading and construction-related activities. This oak tree report addresses protected and non-protected oak trees on the proposed project site.

1.1 Project Location

The proposed project is located in the community of Val Verde, north of Chiquito Canyon Road, and northwest and southeast of Del Valle Road. The project site lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. The project site and biological study area occur entirely within the U.S. Geological Survey 7.5-minute Val Verde quadrangle (USGS 2017). The project site centered at approximately 34 27′1.00″ N 118 39′ 12.00″ W and falls within Township 4 north, Range 17 west, sections 9 and 10, San Bernardino meridian.

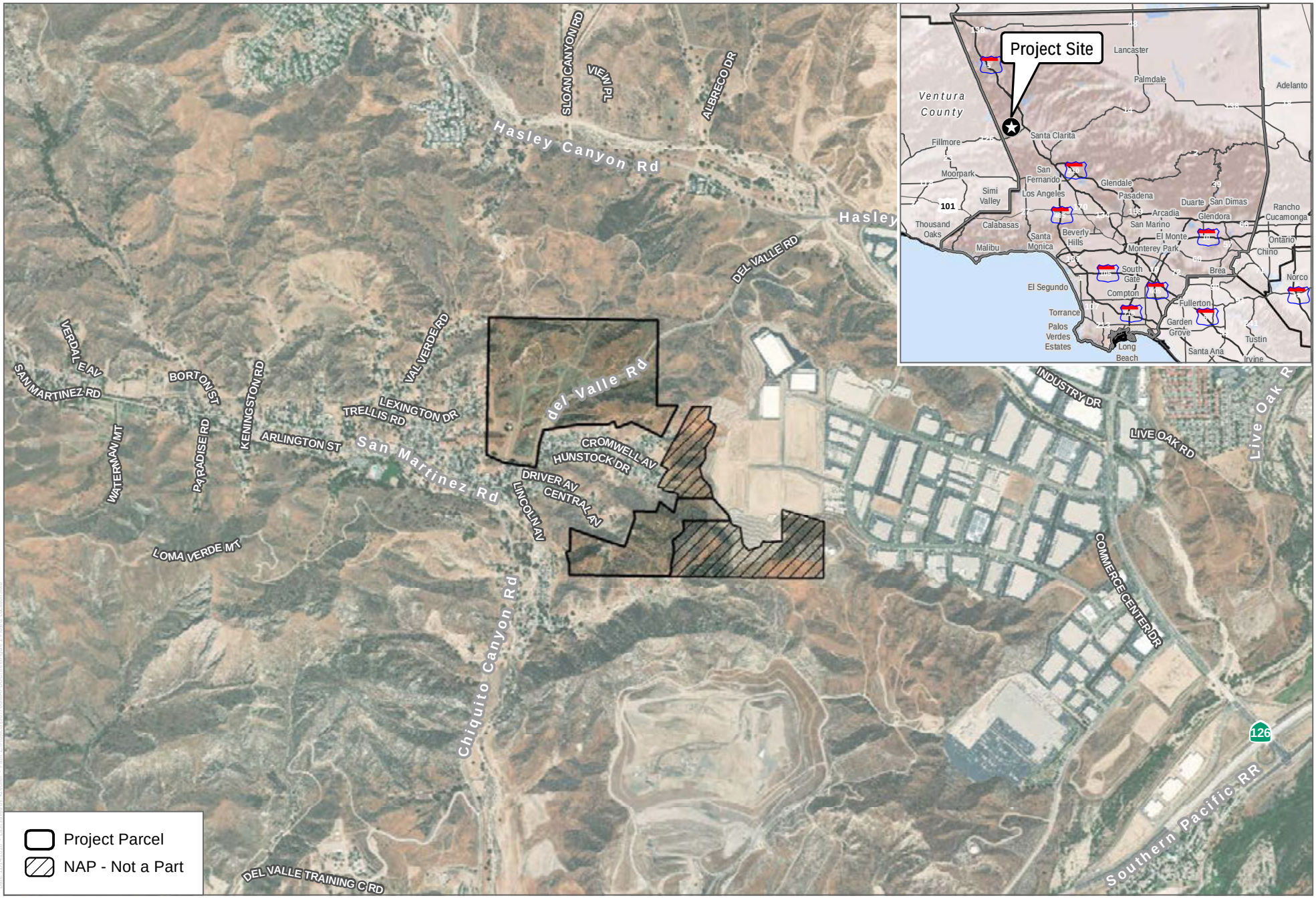
1.2 Site Characteristics

The project site and has remained undeveloped and in largely the same condition for the past 20 years. One residence is located in the southwestern portion of the project site, and several access roads are present; however, the land within the project site is best characterized as undeveloped. Topographically, the project site varies from flat to moderate north- and south-facing slopes with elevations ranging from approximately 1,200 feet above mean sea level along the southern boundary to approximately 1,400 feet above mean sea level in the northeastern portion of the site.

1.3 Project Description

The Sterling Ranch Estates Project (proposed project) includes the development of approximately 222 residential detached single-family lots along with associated commercial lots, parks, open

space lots, roads, infiltration and debris basins, and other infrastructure within Assessor's Parcel Numbers 3271-004-012 and 3271-004-012-013 which comprise approximately 113.9 acres. Off-site improvements will also take place immediately east of the APN 3271-004-012-013 totaling approximately 6.5 acres. In addition, a preservation area associated with the project is located in Assessor's Parcel Number 3271-005-032 totaling approximately 34.7 acres. The project site, which includes the development footprint, and the overall biological study area are both depicted on Figure 1. The proposed project will involve mass grading within the parcels to facilitate the residential development and associated infrastructure; however, several areas will remain undeveloped and will be preserved as open space. The proposed project will incorporate Low Impact Development design standards based on the Los Angeles County Department of Public Works *Low Impact Development Standards Manual* (County 2014). Preserved parcels are anticipated to be placed in a conservation easement, which will be managed by a third-party conservation entity.



SOURCE: DigitalGlobe 2017

DUDEK

0 1,000 2,000 Feet

FIGURE 1

Project Location

Sterling Ranch Estates Project

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2 METHODS

2.1 Individual Tree Evaluation

Dudek mapped tree locations for all trees located on the proposed project site. Tree mapping was conducted using a Trimble Pathfinder Pro XH Global Positioning System (GPS) receiver with H-Star Technology. Since tree canopies can sometimes cause loss of satellite lock by blocking the line-of-sight to satellites, an electronic compass and reflectorless, electronic distance-measuring device were also used in mapping tree locations. The reflectorless, electronic distance-measuring device/compass combination operates in concert with the Pathfinder system to position offsets, and offset information is automatically attached to the GPS position data string. The electronic tree locations were then evaluated using ArcView 10.4 software to determine the position of the trees related to the proposed project.

All inventoried and assessed protected trees were tagged with an aluminum tag bearing a unique identification number, which was placed on the trunk of each tree. These numbers correspond to the tree attribute information presented in the Tree Information Matrix in Appendix A. Tree trunk diameters were measured using a diameter tape providing adjusted figures[1] for diameter measurements when wrapping the tape around an object's circumference. Diameter measurements were taken using protocol provided by the Council of Tree and Landscape Appraisers in the *Guide for Plant Appraisal* (ISA 2000). The trunk diameter measurement of each tree was taken at 4.5 feet above the ground along the trunk axis, with common exceptions. For example, in cases in which a tree's trunk was located on a slope, the 4.5-foot distance was approximated as the average of the shortest and longest sides of the trunk (i.e., the uphill side and downhill side of a tree's trunk, respectively), and the measurement was made at this point. Tree height was visually estimated by experienced tree surveyors. Tree canopy diameters were typically estimated by "pacing-off" the measurement based on the investigator's knowledge of his stride length or by visually estimating the canopy width. The crown diameter measurements were made along an imaginary line intersecting the tree trunk that best approximated the average canopy diameter. Additionally, Dudek calculated composite trunk diameters for multiple stem trees according to ISA standards. According to these standards, the sum of all stem diameters was calculated to ascertain composite trunk diameter values for multiple stem trees.

Pursuant to the *Guide for Plant Appraisal* (ISA 2000), tree health and structure was evaluated with respect to five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Each component of the tree was assessed with regard to health factors such as insect or pathogen damage, mechanical damage, presence of decay, presence of wilted or dead leaves, and wound closure. Tree health and structure were graded as good, fair, poor, and dead, with "good"

[1] Inches divided by 3.14 (π) provide diameter measurement in inches.

representing no apparent problems, and "dead" representing a dying and/or dead tree. Good condition trees exhibit acceptable vigor, healthy foliage, and adequate structure, and lack any major maladies. Fair condition trees are typically those with few maladies but declining vigor. This method of tree condition rating is comprehensive and results in ratings that are useful for determining the status of trees based on common urban forestry standards.

Individual tree attribute data is presented in Appendix A (Tree Information Matrix), and protected oak tree locations are presented in Appendix B (Oak Tree Locations and Proposed Impacts Exhibit). Representative protected oak tree photographs are presented in Appendix C.

2.2 Tree Impact Analysis

Dudek's ISA-certified arborists determined tree impacts by conducting a spatial analysis of individual tree locations and canopy extents visible in project aerial imagery in relation to the proposed site development plan. The tree dataset, digital aerial imagery, and site development planning data were evaluated in a geographic information system to determine where individual trees were located in relation to proposed project development areas. Trees located within 5 feet of proposed grading limits are considered impacted by removal due to the extent of the anticipated disturbance (grading, root impacts, etc.). Trees with project-related construction activity occurring within their driplines are considered encroached upon for the purposes of this report. The impact analysis results were utilized for determining overall tree impacts for the project site.

2.3 Tree Appraisal

As allowed under Municipal Code Section 22.56.2140, Dudek ISA-certified arborists calculated the appraised value for each inventoried protected tree identified for removal according to the *Guide for Plant Appraisal* (ISA 2000), as discussed below.

2.3.1 Appraisal Method

Valuation of trees according to ISA standards involves incorporating ratings from three main tree features: (1) species, (2) location, and (3) overall condition. The tree data matrix presented in Appendix A provides information regarding each evaluated tree and its current condition.

The Trunk Formula Method outlined in the *Guide for Plant Appraisal* is appropriate for trees that are too large to commonly be replaced and was used to calculate appraised tree values for trees identified for removal. This method was selected given the variability of tree sizes on the site, and the inclusion of many large-diameter trees in the inventory that could not be reasonably replaced with nursery or transplant stock.

2.3.1.1 Appraisal Variables

The following variables and assumptions were included in generating the appraised tree values contained in this report and are consistent with the Trunk Formula Method for tree appraisal. Further, the descriptions contained herein coordinate with the tree appraisal data and calculations presented in Appendix D.

1. **Species**: Tree species were determined during field inspections.
2. **Condition**: Tree condition was derived from field evaluations of outwardly observable health and structural characteristics. Condition ratings can range between 25% and 100%, based on evaluations of root conditions, trunk form and observable defects, branching structure, and foliage condition.
3. **Trunk Diameter**: Trunk diameters are presented in inches measured at 4.5 feet (54 inches) above grade. Composite trunk diameters were calculated for trees with multiple stems and are the product of the square root of the sum of all squared trunk diameters.
4. **Location**: Location rating is the average value of Site, Contribution, and Placement ratings. Ratings can range from 10% to 100%. Site values are affected by the economic, functional, and aesthetic aspects of the area in which the tree is growing. Contribution accounts for the function and aesthetic values that the tree adds to the location in which it is growing. Placement ratings indicate the effectiveness of tree locations on functional and aesthetic values. Based on the remoteness of portions of the site and the degraded condition of portions of the site, location values applied to this site range from 30% to 36.7%.
5. **Species Rating**: Species rating was derived directly from the Species Classification and Group Assignment report published by the Western Chapter of ISA (Western Chapter ISA 2004). Values were determined, by species, for Southern California Inland Influence areas. Species ratings vary, with higher ratings assigned to native trees and lower ratings assigned to non-native, invasive species.
6. **Replacement Tree Size**: Replacement tree size values were derived from Table 11 of the Species Classification and Group Assignment report for the Southern California Subregion, based on species-specific nursery groups.
7. **Replacement Tree Cost**: Replacement tree costs were derived from Table 11 of the Species Classification and Group Assignment report for the Southern California Subregion and equal to $1,482.
8. **Installation Cost**: Installation costs were valued at $1,200/tree.
9. **Installed Tree Cost**: Installed tree cost is the sum of the replacement tree cost and the installation cost.

10. **Unit Tree Cost/in^2 (square inches)**: Unit tree cost was derived from Table 11 of the Species Classification and Group Assignment report for the Southern California Subregion and varied by Nursery Group number.
11. **Appraised Trunk Area**: Appraised trunk area is the product of the squared trunk diameter value multiplied by 0.785. For trees with trunk measurements exceeding 30 inches, an adjusted trunk area value was used, as identified in Table 4.4 of the *Guide for Plant Appraisal*.
12. **Appraised Tree Trunk Increase**: The appraised tree trunk increase is the difference between the appraised trunk area (11) and the replacement tree size (6).
13. **Basic Tree Cost**: Basic tree cost is the result of multiplying the unit tree cost (10) and the appraised tree trunk increase (12) and adding the installed tree cost (9).
14. **Appraised Value**: The appraised value is the result of the basic tree cost discounted by the Condition (2), Species (5), and Location (4) ratings.

2.3.2 Appraisal Calculations

The matrices presented in Appendix D presents the results of the tree appraisal conducted for trees identified for removal on the Sterling Ranch Estates project site. This matrix was created directly from the Trunk Formula Method Worksheet outlined in the *Guide for Plant Appraisal* (ISA 2000). The calculations in the matrix follow those in the worksheet.

The intent of the conversion of the standard worksheet to the matrix presented in Appendix D was to more efficiently and concisely present the tree appraisal data for the Sterling Ranch Estates project site and allow the report reviewer(s) to more easily compare appraisal value differences between individual trees.

2.4 Scope of Work Limitations

No root crown excavations or investigations, internal probing, or aerial canopy inspections were performed during the tree assessments. Therefore, the presence or absence of internal decay or other hidden or inaccessible inferiorities in individual trees could not be confirmed. It is recommended that any large tree proposed for preservation or relocation in an urban setting be thoroughly inspected for internal or subterranean decay by a qualified arborist before finalizing preservation or relocation plans.

3 OBSERVATIONS

3.1 Individual Trees

There are three coast live oak (*Quercus agrifolia*) and two valley oak (*Quercus lobata*) trees inventoried within the proposed project study area. Of the five oak trees, four meet the County's criteria for a protected oak tree. Appendix B presents the location of the individual trees mapped and assessed impact for the proposed project. Overall, the trees exhibit growth and structural conditions that are typical of their locations in a native oak woodland setting prone to drought and wildfires. The trees include various trunk and branch maladies and health and structural conditions. As presented in Appendix A, 40% of the individually mapped trees (2 trees) exhibit fair health; 40% (2 trees) are in poor health; and 20% (1 tree) are in good health. Structurally, 20% (1 tree) of the individually mapped trees are considered to exhibit good structure, and 80% (4 trees) exhibit fair structure. The tree in good condition exhibits acceptable vigor, healthy foliage, and adequate structure, and lacks any major maladies. Trees in fair condition are typical, with few maladies but declining vigor. Trees in poor condition exhibit declining vigor, unhealthy foliage, poor branch structure, and excessive lean. The trees in poor condition are directly attributed to the region's recent drought. No pests and/or pathogens were observed on site.

Trees within the tree survey area vary in size and stature according to species and available growing space. The site's trees are composed of single- and multi-stemmed trees, with single-stemmed trunk diameters that range from 14 to 43 inches and multi-stemmed trunk diameters that range from 1 to 17 inches. Tree heights vary from 11 to 45 feet. Tree canopy extents range from 10 feet to approximately 45 feet.

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4 REGULATORY DEFINITIONS AND REQUIREMENTS

A tree inventory and assessment of the proposed project was performed pursuant to the Los Angeles County Oak Ordinance. The following is an outline of the key aspects of the ordinance.

4.1 Definitions

4.1.1 Los Angeles County Oak Tree Ordinance

Trees subject to County permit requirements include those defined by Title 22.56.2060 as:

> any tree of the oak genus which is (a) 25 inches or more in circumference (eight inches in diameter) as measured four and one-half feet above mean natural grade; in the case of an oak with more than one trunk, whose combined circumference of any two trunks is at least 38 inches (12 inches in diameter) as measured four and one half feet above mean natural grade.

Additionally, the Los Angeles County Oak Tree Ordinance defines the "Protected Zone" of a tree as (Title 22.56.2060) as "that area within the dripline of an oak tree and extending therefrom to a point at least five feet outside the dripline, or 15 feet from the trunks of a tree, whichever distance is greater."

For the purposes of determining tree impacts, trees that have protected zones that have been encroached upon would also be considered impacted.

4.2 Regulations

4.2.1 Los Angeles County Oak Tree Ordinance

The Los Angeles County Oak Tree Ordinance was established to recognize oak trees as significant historical, aesthetic, and ecological resources. The goal of the ordinance is to create favorable conditions for the preservation and propagation of this unique and threatened plant heritage. By making this part of the development process, healthy oak trees will be preserved and maintained. The Los Angeles County Oak Tree Ordinance applies to all unincorporated areas of the County.

Under the Los Angeles County Ordinance, a person shall not cut, destroy, remove, relocate, inflict damage, or encroach into the protected zone of any tree of the oak tree genus, which is 8 inches or more in diameter, 4.5 feet above mean natural grade, or in the case of oaks with multiple trunks, a combined diameter of 12 inches or more of the two largest trunks, without first obtaining a permit.

4.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (1918) requires tree removal and potentially disturbing construction activities to occur during certain time periods to avoid harassment of nesting birds. According to this act, no construction or other disturbing activities can occur within 300 feet of an active bird nest (500 feet for listed species) during the period beginning in February and ending in September each year. Biological surveys should be conducted to provide clearance for project initiation.

5 IMPACTS

Tree impacts were determined using geographic information system technology and spatial locations of trees relative to the project impact areas (limits of grading). Impacts were further determined based on Dudek's experience with native and non-native trees and their typical reactions to root disturbances from construction activities such as soil compaction, excavation, and remedial grading. The impact analysis results presented were used for developing appropriate mitigation measures for the proposed project.

Impacts to trees can be classified as direct or indirect. Direct impacts to trees related to site improvements are typically the result of physical injuries or changes caused by machinery involved with the development process. Direct impacts include tree removal, root damage, soil excavation and compaction, grade changes, loss of canopy, and trunk wounds, among others. Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Indirect impacts include alterations to stream flow rates, diversion of groundwater flow, introduction of exotic plant species, and alterations to disturbance regimes. Wider-scale alterations to the area near trees, as well as specific changes that occur around the trees, are important considerations.

In general, there is a great deal of variation in tolerance to construction impacts among tree species, ages, and conditions. It is important to know how a certain tree, based on its species, age, and condition, would respond to different types of disturbance. The trees in the proposed project area are of varying ages and conditions. Mature specimens are typically more sensitive to root disturbance and grade changes. In general, healthy trees will respond better to changes in their growing environment. Trees of poor health or stressed conditions may not be vigorous enough to cope with direct or indirect impacts from construction activities.

Impact totals presented are based on conceptual disturbance limits and development plans as of the date of this oak tree report. As such, the actual number of trees subject to direct and indirect impacts may change as the detailed site planning process proceeds. Actual tree impact numbers may be lower than anticipated and as presented in this oak tree report once detailed grading plans are developed. Measures to reduce impacts are encouraged and would be implemented in the field during grading operations. Following completion of construction-related disturbances, actual protected tree impact totals would be updated and provided along with revised mitigation totals.

5.1 Direct Tree Impacts

For the purposes of this oak tree report, direct impacts are those associated with tree removal or encroachment within the tree-protected zone (canopy dripline plus 5 feet or 15 feet from trunk, whichever is greater). Tree removal is expected to be required when the trunk is located inside or

within 2 feet of the proposed limits of grading. Encroachment is expected when soil and roots are disturbed within the tree-protected zone. Table 1 summarizes the number of trees by species that are expected to be subject to direct construction-related impacts. Direct tree impacts will result in the removal of two protected trees. A single non-protected sized tree will be removed (Tree Number 2). The locations of impacted trees are presented by impact type on the map in Appendix B.

Table 1
Summary of Tree Disposition

Scientific Name	Common Name	Removal	Encroachment	Indirect
Quercus agrifolia	Coast live oak	2 (1*)	—	—
	Total	2 (1*)	—	—

Note:
* (X) Indicates non-protected size tree.

5.2 Indirect Tree Impacts

Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Site-wide changes affecting trees include diverting runoff and stormwater, creating retention and detention ponds, relocating streams or making improvements to streams, lowering or raising water tables, altering the capacity for soil moisture recharge, removing vegetation, or damming underground water flow (Matheny and Clark 1998). For the purposes of this oak tree report, there are no indirect tree impacts expected for trees within 25 feet of the proposed project's limits of grading.

5.3 Candidates Suitable for Preservation

Trees identified as candidates for preservation in place exhibit good health (new growth and vigor) and structure (trunk/branching), have no uncorrectable, outwardly detectable defects, and show no signs or symptoms of serious pest infestation or species-specific pathogens. For the trees to avoid incidental damage during construction, preservation and protection measures must be provided before, during, and after the construction phase. Measures that must be implemented during these phases are provided in Section 7, Tree Protection Measures.

A total of two (2) protected trees will not be disturbed by active construction-related activities or grading; therefore, these trees will be preserved in place.

5.4 Tree Impact Summary

In summary, three (3) trees will be directly impacted (three removals) by the proposed project. Of the three (3) direct impacts, two (2) are protected by the Los Angeles County Oak Tree Ordinance. Two protected trees will be preserved in place. Individual tree impacts can be seen in Appendix B.

6 MITIGATION

6.1 Determination of Minimum Replacement Standards

As previously stated, there are four Los Angeles County-protected oak trees located on the proposed project site; as such, mitigation is required based on the County ordinance. Furthermore, the County allows for the payment of in-lieu fees for removed protected oak trees.

6.2 Recommended Mitigation

The County Ordinance identifies tree replacement requirements for tree removal associated with a development project. The following recommendations are provided for utilization of the appraised value of removed trees presented herein.

There are a total of two protected oak trees within the proposed project footprint that will require removal to accommodate the proposed project. It should be noted that Tree Number 1 was assessed previously in 2007 for a value of $8,000, which was then paid to the County. The oak tree was not removed at that time. For purposes of this report, Tree Number One was reassessed to determine the most current value of the oak tree. Additionally, Tree Number 3 was assessed for appraised value. In total, the appraised cost for all proposed protected tree removals is $13,530 though with the subtraction of the previously paid $8,000 the remaining recommended payment balance is $5,530. The full tree appraisal data and calculations are presented in Appendix D.

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7 TREE PROTECTION MEASURES

Dudek recommends the following measures to protect the two valley oaks (Tree Numbers 4 and 5) that have protected zones adjacent to the active construction area. To the extent that protected trees for the proposed project site remain undisturbed, Dudek recommends similar tree protection measures for those retained trees.

7.1 Tree Protection Measures Prior to Construction

Fencing: Chain-link fencing, no less than 4 feet high, with tree protection signs shall be erected around all undisturbed trees (or tree groups). The protective fence shall be installed at the protected zone boundary of each tree (or tree group), which is defined as 5 feet beyond the tree canopy dripline, or 1.5 feet per inch of trunk diameter, whichever is greater. The intent of protection fencing is to prevent root damage and/or compaction by gradingequipment. An ISA-certified arborist may be required on site if grading activities occur within thetree's protected zone. The fencing shall be secured to 6-foot, heavy-gauge T-bar line posts,pounded in the ground a minimum of 18 inches and spaced a minimum of 8 feet on-center. Fencingshall be attached to T-bar posts with minimum 14-gauge wire fastened to the top, middle, andbottom of each post. Tree protection signs shall be attached to every fourth post. The contractorshall maintain the fence to keep it upright, taut, and aligned at all times. Fencing shall be removedonly after all construction activities in the vicinity of the affected tree(s) are complete.

Pre-construction Meeting: A pre-construction meeting shall be held between all contractors (including grading, tree removal/pruning, and builders) and an ISA-certified arborist. The meeting shall focus on instructing the contractors on tree protection practices and answering any questions. All equipment operators and spotters, assistants, or those directing operators from the ground shall provide written acknowledgement of receiving tree protection training. This training shall include information on the location and marking of protected trees, the necessity of preventing damage, and the discussion of work practices that shall accomplish these tasks.

7.2 Protection and Maintenance during Construction

Once construction activities have begun, the following protection measures shall be followed.

Equipment Operation and Storage: Contractors shall avoid heavy equipment operation around the protected trees. Operating heavy machinery around the root zones of trees will increase soil compaction, which decreases soil aeration and subsequently reduces water penetration into the soil. All heavy equipment and vehicles shall, at minimum, stay out of the fenced protected tree zone unless where specifically approved in writing and under the supervision of an ISA-certified arborist or their representative.

Materials Storage and Disposal: Contractors shall not store or discard any supplies or materials, including paint, lumber, and concrete overflow, within the protected zone and shall remove all foreign debris within the protected zone. However, the contractors shall leave the duff, mulch, chips, and leaves around the retained trees for water retention and nutrient supply. In addition, the contractors shall avoid draining or leakage of equipment fluids near retained trees. Fluids such as gasoline, diesel, oils, hydraulics, brake and transmission fluids, paint, paint thinners, and glycol (anti-freeze) shall be disposed of properly. The contractors shall ensure that equipment be parked at least 50 feet from the protected zone to avoid the possibility of leakage of equipment fluids into the soil. The effect of toxic equipment fluids on the retained trees could result in tree decline and/or mortality.

Grade Changes: Contractors shall ensure that grade changes, including adding fill, shall not be permitted within the protected zone without special written authorization and under supervision by an ISA-certified arborist or their representative. Lowering the grade within the protected zone would necessitate cutting main support and feeder roots, jeopardizing the health and structural integrity of the trees. Adding soil, even temporarily, on top of the existing grade would compact the soil further and decrease water and air availability to the tree roots. Contractors shall ensure that grade changes made outside of the protected tree zone shall not create conditions that allow water to pond at the base of the tree. Water trapped at the base of a tree could lead to root rot and other detrimental tree impacts.

Moving Construction Materials: Contractors shall ensure that care be exercised when moving construction equipment or supplies near the undisturbed oak trees, especially overhead. Contractors shall ensure that damage to the trees shall be avoided when transporting or moving construction materials and working around the tree (even outside of the fenced protected zone). Contractors shall flag aboveground tree parts that could be damaged (e.g., low limbs, scaffold branches, and trunks) with high-visibility flagging, such as florescent red or orange. If contact with the tree crown is unavoidable, conflicting branches may be pruned by an ISA-certified tree worker under supervision by an ISA-certified arborist or their representative and shall adhere to ISA standards.

Trenching: Except where specifically approved in writing beforehand, all trenching shall be outside of the fenced protected zone. Roots primarily extend in a horizontal direction, forming a support base to the tree similar to the base of a wine glass. Where trenching is necessary in areas that contain roots from retained trees, contractors shall use trenching techniques that include the use of either a root pruner (Dosko root pruner or equivalent) or an Air-Spade to limit root impacts. An ISA-certified arborist or their representative shall ensure that all pruning cuts be clean and sharp to minimize ripping, tearing, and fracturing of the root system. Root damage caused by backhoes, earthmovers, dozers, or graders is severe and may result in tree mortality. Use of both root-pruning and Air-Spade equipment shall be accompanied only by hand tools to remove soil from trench locations. The trench shall be made no deeper than necessary.

Irrigation: Irrigation of native protected trees retained on site shall seek to mimic natural rainfall patterns in Southern California. Supplemental irrigation for trees adjacent to construction activity may be necessary during winter or spring months. Summer and fall irrigation may be necessary based on variable climatic and site conditions, but should be conducted judiciously to avoid over-watering. One irrigation cycle shall thoroughly soak the root zones of the trees to a depth of 3 feet. The soil should be allowed to dry out between watering to avoid keeping a consistently wet soil. The contractor shall be responsible for irrigating (deep watering) the trees. Soil moisture shall be checked with a soil probe before irrigating. Irrigation is best accomplished by installing a temporary aboveground micro-spray system that would distribute water slowly (to avoid runoff) and evenly throughout the fenced protection zone. Over-watering of native oaks may promote the growth of tree-damaging agents, such as oak root fungus, so proper soil moisture monitoring is critical to prolonged tree health. For any trees that have been substantially root pruned (30% or more of their root zone), irrigation shall be required for the first 12 months. The first irrigation shall occur within 48 hours of root pruning. The tree(s) should be deep watered every 2 weeks during the summer and once a month during the winter (adjust accordingly with rainfall).

Canopy Pruning: The contractor shall not prune trees until all construction is completed unless standard pruning would reduce conflict between canopy and equipment. This will help protect the tree canopies from damage. All pruning shall be conducted by an ISA-certified tree worker under supervision by an ISA-certified arborist or their representative, and shall adhere to ISA pruning standards.

Canopy Washing: During construction, the contractor shall wash the foliage of trees adjacent to construction activity with a strong water stream every 2 weeks before 10:00 a.m. to control mite and insect populations.

Inspection: An ISA-certified arborist or their representative shall inspect the preserved trees adjacent to grading and construction activity on a monthly basis for the duration of the proposed project's construction period. A report summarizing site conditions, observations, tree health, and recommendations for minimizing tree damage shall be submitted by the ISA-certified arborist or their representative following each inspection.

7.3 Maintenance after Construction

Following the completion of the construction activity within 20 feet of the protected zones of undisturbed oaks, the tree protection fencing may be removed, and the following measures may be performed to sustain and enhance the vigor of the trees:

Mulch: The contractors shall ensure that the natural duff layer under all trees is maintained. This would stabilize soil temperatures in root zones, conserve soil moisture, and reduce erosion.

The contractors shall ensure that the mulch is kept clear of the trunk base to avoid creating conditions favorable to the establishment and growth of decay-causing fungal pathogens. Should it be necessary to add organic mulch under retained protected trees, packaged or commercial mulch shall not be used because it may contain oak root fungus. Also, the use of redwood chips shall be avoided because certain inhibitive chemicals may be present in the wood. Other wood chips and crushed walnut shells can be used, but the best mulch that provides a source of nutrients for the tree is its own leaf litter. Any organic mulch added by the contractor shall be applied to a maximum depth of 4 inches where possible.

Pruning: Regular pruning of the trees is not required. An ISA-certified tree worker, under the supervision of an ISA-certified arborist or their representative, shall only prune trees to maintain clearance and remove broken, dead, or diseased branches. No more than 15% of the canopy shall be removed at one time. All pruning shall conform to ISA standards.

Watering: The trees should not require regular irrigation, other than the 12 months following substantial root pruning, if applicable. However, soil probing shall be necessary to accurately monitor moisture levels. Supplemental irrigation for the trees that sustained root pruning and any newly planted trees may be necessary, especially in years with low winter rainfall.

Watering Adjacent Plant Material: All plants near the trees shall require moderate to low levels of water. The contractor shall infrequently water surrounding plants with deep soaks, rather than frequent light irrigation, and allow them to dry out between watering. The soil shall not be allowed to become saturated or stay continually wet, and drainage should not allow ponding of water beneath the canopy of the oak trees. Irrigation spray shall not hit the trunk of any tree. The contractor shall maintain a 30-inch dry zone around all tree trunks. An aboveground micro-spray irrigation system shall be used in lieu of typical underground pop-up sprays.

Chemical Applications: If the trees are maintained in a healthy state, regular spraying for insect or disease control would not be necessary. If a problem does develop, an ISA-certified arborist/licensed PCA or their representative shall be consulted since the trees may require application of insecticides to prevent the intrusion of bark-boring beetles and other invasive pests. All chemical spraying shall be performed by a licensed applicator under the direction of a licensed PCA.

Monitoring: An ISA-certified arborist or their representative should inspect the trees retained on site for a period of 7 years following the completion of construction activity. Monitoring visits should be completed quarterly, totaling 20 visits. Following each monitoring visit, a report summarizing site conditions, observations, tree health, and recommendations for promoting tree health shall be submitted. Additionally, any tree mortality shall be noted, and any tree dying during the monitoring period shall be replaced with the same species as specified for minimum replacement standards in this oak tree report.

8 CONCLUSION

The proposed project site includes five oak trees, four of which are protected by the by Los Angeles County. For the purposes of this oak tree report, two protected oak trees will be removed by the proposed project. The two protected trees proposed for removal will require the recommended in-lieu payment of $13,530, of which $8,000 has already been paid for a remaining balance of $5,530. Furthermore, this oak tree report also recommends that the remaining two (2) preserved in place valley oak trees be subject to protection measures that, when implemented, minimize the possibility that trees are inadvertently damaged during the construction process.

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9 ARBORIST'S DISCLOSURE STATEMENT

This oak tree report provides conclusions and recommendations based only on a visual examination of the trees and surrounding site by an ISA-certified arborist and reasonable reliance on the completeness and accuracy of the information provided to the arborist. The examination did not include subterranean or internal examination of the trees.

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near them. Although trees provide many benefits to those who live near them, they also include inherent risks from breakage or failure that can be minimized but not eliminated.

Arborists cannot detect every condition that could possibly lead to the failure of a tree. Trees are living organisms subject to attack by disease, insects, fungi, weather, and other forces of nature, and conditions that lead to failure are often hidden within trees and belowground. There are some inherent risks with trees that cannot be predicted with any degree of certainty, even by a skilled and experienced arborist. Arborists cannot predict acts of nature, including, without limitation, storms of sufficient strength, which can cause an apparently healthy tree to fail. Additionally, arborists cannot guarantee that a tree will be healthy or safe under all circumstances or for any specific period of time. A tree's condition could change over a short or long period of time due to climatic, cultural, or environmental conditions. Further, there is no guaranty or certainty that recommendations or efforts to correct unsafe conditions will prevent future breakage or failure of a tree.

To live or work near trees is to accept some degree of risk. Neither the author of this oak tree report nor Dudek have assumed any responsibility for or will be liable for any claims, losses, or damages for damage to any tree, death or injury to any person, or any loss of or damage to any personal or real property.

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10 REFERENCES

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APPENDIX A

Tree Information Matrix

APPENDIX A
Tree Information Matrix

Sterling Project

Tree No.	Botanical Name	Common Name	Number of Stems	Diameter	Individual Stems																		Height (ft.)	Canopy (ft.)	Health	Structure	Notes	Impact Status	Latitude	Longitude	Protected Status (Y/N)
					S1	*S2*	*S3*	*S4*	*S5*	*S6*	*S7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*S8*									
1	*Quercus agrifolia*	Coast live oak	1	43	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	45	Fair	Fair	Topped for Utility Lines	Removal	34.4467245	-118.65715	Yes
2	*Quercus agrifolia*	Coast live oak	2	2.236067977	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	10	Good	Good	None	Removal	34.446723	-118.65703	No
3	*Quercus agrifolia*	Coast live oak	1	14	14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	20	Fair	Fair	Topped for Utility Lines	Removal	34.4466495	-118.65668	Yes
4	*Quercus lobata*	Valley oak	3	25.19920634	17	15	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	35	Poor	Fair	Moderate Drought Stress	Preserve	34.4528077	-118.64766	Yes
5	*Quercus lobata*	Valley oak	5	17.32050808	11	8.5	7.5	5.5	4.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	30	Poor	Fair	Moderate Drought Stress	Preserve	34.4528417	-118.64756	Yes

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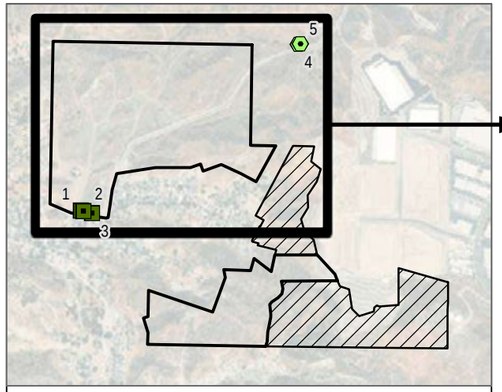
APPENDIX B

Oak Tree Location and Proposed Impacts Exhibit



Project Site

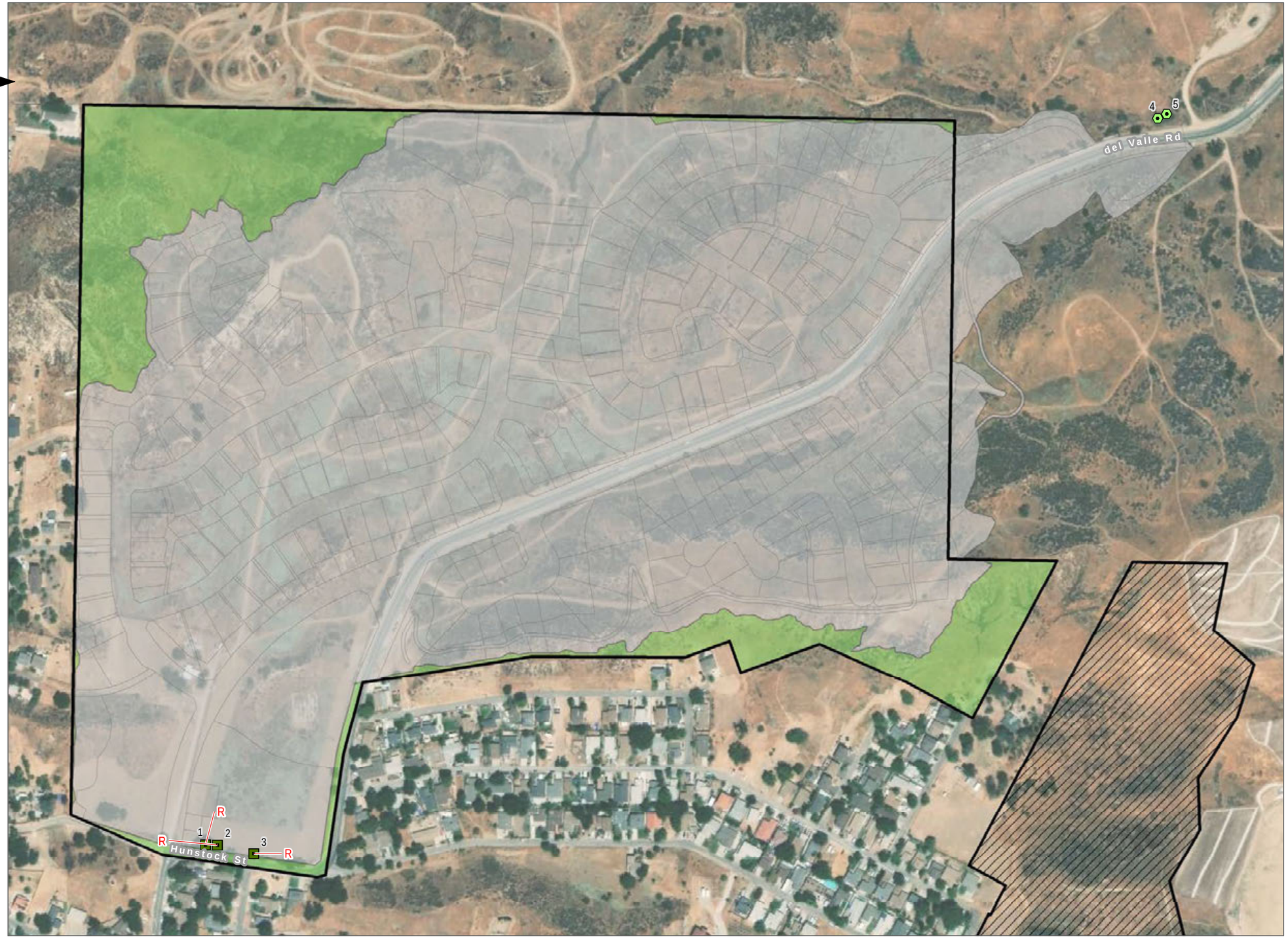
- Project Parcel
- NAP - Not a Part
- Project Development Footprint
- Natural Open Space

Surveyed Trees (with Tree Number)

- Coast live oak *(Quercus agrifolia)*
- Valley oak *(Quercus lobata)*

Tree Impact Status

R = Removal



SOURCE: NAIP 2016

DUDEK 0 150 300 Feet

APPENDIX **B**

Oak Tree Locations and Proposed Impacts Exhibit

Sterling Ranch Estates Project

APPENDIX C

Representative Protected Oak Photographs

Appendix C – Representative Protected Oak Photographs

1. Overview of coast live oak Tree Number 1. Photograph taken facing north.

2. Overview of coast live oak Tree Number 1. Photograph taken facing southwest.

Photographs were taken on October 30, 2018.

Appendix C – Representative Protected Oak Photographs

3. Overview of non-protected size coast live oak Tree Number 2. Photograph taken facing south.

4. Overview of coast live oak Tree Number 3. Photograph taken facing northwest.

Photographs were taken on October 30, 2018.

Appendix C – Representative Protected Oak Photographs

5. Overview of coast live oak Tree Number 3. Photograph taken facing southwest.

6. Overview of valley oaks (L to R) Tree Numbers 4 and 5. Photograph taken facing east.

Photographs were taken on October 30, 2018.

Appendix C – Representative Protected Oak Photographs

7. Overview of valley oaks (L to R) Tree Numbers 4 and 5. Photograph taken facing north.

8. Overview crowns of valley oaks (L to R) Tree Numbers 4 and 5. Photograph taken facing north.

Photographs were taken on October 30, 2018.

APPENDIX D

Appraisal Worksheets

Trunk Formula Method

Tree Number # 1
Project # 558-1-06 Property Sterling Gateway Date 10/10/2007

Appraiser *Richard Ibarra; TREES,etc*

Field Observations

1. Species *Quercus agrifolia*
2. Condition 55%
3. Trunk Diameter 37 in./cm
4. Location %= [Site 10% + Contribution 50% + Placement 10%] ÷ 3 = 23%

Regional Plant Appraisal Committee and/or Appraiser Developed or Modified Information

5. Species rating 90%
6. Replacement Tree Size (diameter) 5.5 in./cm
   (Trunk Area) 23.76 in^2/cm^2 TA_R ($A = \pi \cdot R^2$)
7. Replacement Tree Cost $1,700.00
   (see Regional Information to use cost selected)
8. Installation Cost $1,800.00
9. Installed Tree Cost (#7 + #8) $3,500.00
10. Unit Tree Cost $62.00 per in./cm
    (see Regional Information to use cost selected)

Calculated by Appraiser using Field and Regional Information

11. Appraised Trunk Area:
    (TA_A or ATA_A: use Table 4.4-4.7)
    or D^2 (#3) 1369.00 x 0.785 = 1074.67 in^2/cm^2

12. Appraised Tree Trunk Increase (TA_{INCR}) =
    TA_A or ATA_A 1074.67 in^2/cm^2 (#11) -TA_R 23.76 in^2/cm^2(#6)= 1050.91 in^2/cm^2

13. Basic Tree Cost = TA_{INCR} (#12) 1050.91 in^2/cm^2 x Unit Tree Cost (#10) $62.00
    per in^2/cm^2 + installed tree cost (#9) $3,500.00 = $68,656.22

14. Appraised Value = Basic Tree Cost (#13) $68,656.22 x Species Rating (#5) 90%
    x Condition (#2) 55% x Location(#4) 23% = $7,929.79

15. If Appraised Value is $5,000 or more, round it to the nearest $100; if it is less, round to the nearest $10 TRUE (True $_{>5000}$ or False $_{<5000}$)

16. Appraised Value = (#14) + Rounding $8,000

Items 5 through 10 are determined by the Regional Plant Appraisal Committee. The Wholesale Replacement Tree Cost, the Retail Replacement Tree Cost, or the Installed Tree Cost (#9) divided by the Replacement Tree Size (#6) can be used for the Unit Tree Cost (#10), or it can be set by the Regional Plant Appraisal Committee.

Trunk Formula Method Work Sheet

Tree # 1 Property: Sterling Ranch Estates Project 12-Nov-18

Appraiser Chris Kallstrand, ISA Certified Arborist WE-8208A

Field Observations

1. **Species**	Coast Live Oak (*Quercus agrifolia*)	
2. **Condition**	**65%**	
3. **Trunk Diameter**	**43**	inches
4. **Location**		
Site	**10%**	
Contribution	**55%**	
Placement	**10%**	
Average	**25%**	

Regional Plant Appraisal Committee and/or Appraiser-Developed or-Modified Information

5. **Species Rating**	**90%**	
6. **Replacement Tree Size** (diameter)	**5.5**	inches
(Trunk Area)	**23.76**	in^2 TA_R
7. **Replacement Tree Cost**	**$1,700.00**	
8. **Installation Cost**	**$1,200.00**	
9. **Installed Tree Cost** (#7 + #8)	**$2,900.00**	
10. **Unit Tree Cost** (#9 / Trunk Area)	**$62.00**	per in^2

Calculations by Appraiser using Field and Regional Information

11. **Appraised Trunk Area =**
(TA_A or ATA_A; use Tables 4.4-4.7)

TAA	$(\#3)^2 \times 0.785 =$	**1451**
ATAA	$(-0.335)*(\#3)^2 + 69.3(\#3) - 1087 =$	**1273**

12. **Appraised Tree Trunk Increase** (TA_{INCR}) =

TA_A or ATA_A (#11)	**1273**	in^2
- TA_R (#6)	**23.76**	in^2
=	**1250**	in^2

13. **Basic Tree Cost** =

TA_{INCR} (#12)	**1250**
x **Unit Tree Cost** (#10)	**$62.00**
Installed Tree Cost (#9)	**$2,900.00**
=	**$80,382.95**

14. **Appraised Value** =

Basic Tree Cost (#13)	**$80,382.95**
x **Species** rating (#5)	**90%**
x **Condition** (#2)	**65%**
x **Location** (#4)	**25%**
=	**$11,756**

15. If the **Appraised** Value is $5,000 or more, round it to the nearest $100; if it is less, round it to the nearest $10.

16. **Appraised Value** = (#14) **$11,800**

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Trunk Formula Method Work Sheet

Tree # 3 Property: Sterling Ranch Estates Project 12-Nov-18

Appraiser Chris Kallstrand, ISA Certified Arborist WE-8208A

Field Observations

1. **Species**	Coast Live Oak (*Quercus agrifolia*)	
2. **Condition**	**70%**	
3. **Trunk Diameter**	**14**	inches
4. **Location**		
Site	**10%**	
Contribution	**55%**	
Placement	**10%**	
Average	**25%**	

Regional Plant Appraisal Committee and/or Appraiser-Developed or-Modified Information

5. **Species Rating**	**90%**	
6. **Replacement Tree Size** (diameter)	**5.5**	inches
(Trunk Area)	**23.76**	in^2 TA_R
7. **Replacement Tree Cost**	**$1,700.00**	
8. **Installation Cost**	**$1,200.00**	
9. **Installed Tree Cost** (#7 + #8)	**$2,900.00**	
10. **Unit Tree Cost** (#9 / Trunk Area)	**$62.00**	per in^2

Calculations by Appraiser using Field and Regional Information

11. **Appraised Trunk Area =**
(TA_A or ATA_A; use Tables 4.4-4.7)

TAA	$(\#3)^2 \times 0.785 =$	**154**
ATAA	$(-0.335)*(\#3)^2 + 69.3(\#3) - 1087 =$	**N/A**

12. **Appraised Tree Trunk Increase** (TA_{INCR}) =

TA_A or ATA_A (#11)	**154**	in^2
- TA_R (#6)	**23.76**	in^2
=	**130**	in^2

13. **Basic Tree Cost** =

TA_{INCR} (#12)	**130**
x **Unit Tree Cost** (#10)	**$62.00**
Installed Tree Cost (#9)	**$2,900.00**
=	**$10,966.20**

14. **Appraised Value** =

Basic Tree Cost (#13)	**$10,966.20**
x **Species** rating (#5)	**90%**
x **Condition** (#2)	**70%**
x **Location** (#4)	**25%**
=	**$1,727**

15. If the **Appraised** Value is $5,000 or more, round it to the nearest $100; if it is less, round it to the nearest $10.

16. **Appraised Value** = (#14) **$1,730**

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Appendix C

Oak Tree Report for the Sterling Ranch Estates, Off-Site Water Tank

OAK TREE REPORT
for the
Sterling Ranch Estates Residential Project,
Off-Site Water Tank Area
County of Los Angeles, California

Prepared for:

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TABLE OF CONTENTS

Section **Page No.**

ACRONYMS AND ABBREVIATIONS III

1 INTRODUCTION 1
1.1 Project Location 1
1.2 Site Characteristics 1
1.3 Project Description 1

2 METHODS 7
2.1 Individual Tree Evaluation 7
2.2 Tree Impact Analysis 8
2.3 Tree Appraisal 8
2.3.1 Appraisal Method 8
2.3.2 Appraisal Calculations 10
2.4 Scope of Work Limitations 10

3 OBSERVATIONS 11
3.1 Individual Trees 11

4 REGULATORY DEFINITIONS AND REQUIREMENTS 13
4.1 Definitions 13
4.1.1 Los Angeles County Oak Tree Ordinance 13
4.2 Regulations 13
4.2.1 Los Angeles County Oak Tree Ordinance 13

5 IMPACTS 15
5.1 Direct Tree Impacts 15
5.2 Indirect Tree Impacts 16
5.3 Tree Impact Summary 16

6 MITIGATION 17
6.1 Determination of Minimum Replacement Standards 17
6.2 Recommended Mitigation 17

7 TREE PROTECTION MEASURES 19

8 CONCLUSION 21

9 ARBORIST'S DISCLOSURE STATEMENT 23

10 REFERENCES 25

TABLE OF CONTENTS (CONTINUED)

Page No.

APPENDICES

A Tree Information Matrix
B Oak Tree Location and Proposed Impacts Exhibit
C Representative Protected Oak Photographs
D Tree Protection Measures

FIGURES

1 Regional Map 3
2 Vicinity Map 5

TABLE

1 Summary of Direct Tree Impacts 16
2 Summary of Indirect Tree Impacts 16

ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
County	County of Los Angeles
GPS	Global Positioning System
ISA	International Society of Arboriculture
project	Sterling Ranch Estates Water Tank

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1 INTRODUCTION

This oak tree report provides an inventory and evaluation of the protected oak trees located on the proposed Water Tank site (project site). The project site is located in Los Angeles County, California (Figure 1). As such, this oak tree report covers the regulations and requirements for the protection and removal of protected trees within the jurisdiction of the County of Los Angeles (County).

Sterling Ranch Estates retained Dudek to conduct a tree inventory and assessment for the project site. A Dudek International Society of Arboriculture (ISA)-Certified Arborist performed various functions associated with surveying, inventorying, and evaluating the condition of all protected oak trees located within the project site to meet the requirements of the County Code, Title 22, Part 6, Oak Tree Permits.

The purpose of this oak tree report is to present the physical characteristics and mapped locations of the site's protected trees that are to be removed or protected in place during the proposed grading and construction-related activities. This oak tree report addresses protected and non-protected oak trees on the project site.

1.1 Project Location

The project site is located in the community of Val Verde, approximately 0.5 miles west of San Martinez Road. The water tank site lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. The site and biological study area occur entirely within the U.S. Geological Survey 7.5-minute Val Verde quadrangle (USGS 2017).

1.2 Site Characteristics

The project site has one paved access road that dead-ends into two water storage tanks on the southwest end of the property. The remaining land within the project site is best characterized as undeveloped oak woodland. Topographically, the project site consists of moderate north- and south-facing slopes with elevations ranging from approximately 1,550 feet above mean sea level along the northern boundary to approximately 1,750 feet above mean sea level in the southern portion of the site.

1.3 Project Description

A 1 million-gallon water tank is proposed in and adjacent to the existing Los Angeles County's Waterworks District No. 36 Cuyama tank site as a component of the Sterling Ranch Project. The water tank is located within the Waterworks District's 1598 pressure zone (Assessor's Parcel Numbers 3272-029-902 and 3272-029-023) comprising approximately 2.79 acres. The project site, which includes the development footprint and the overall biological study area, is depicted in Figure 2.

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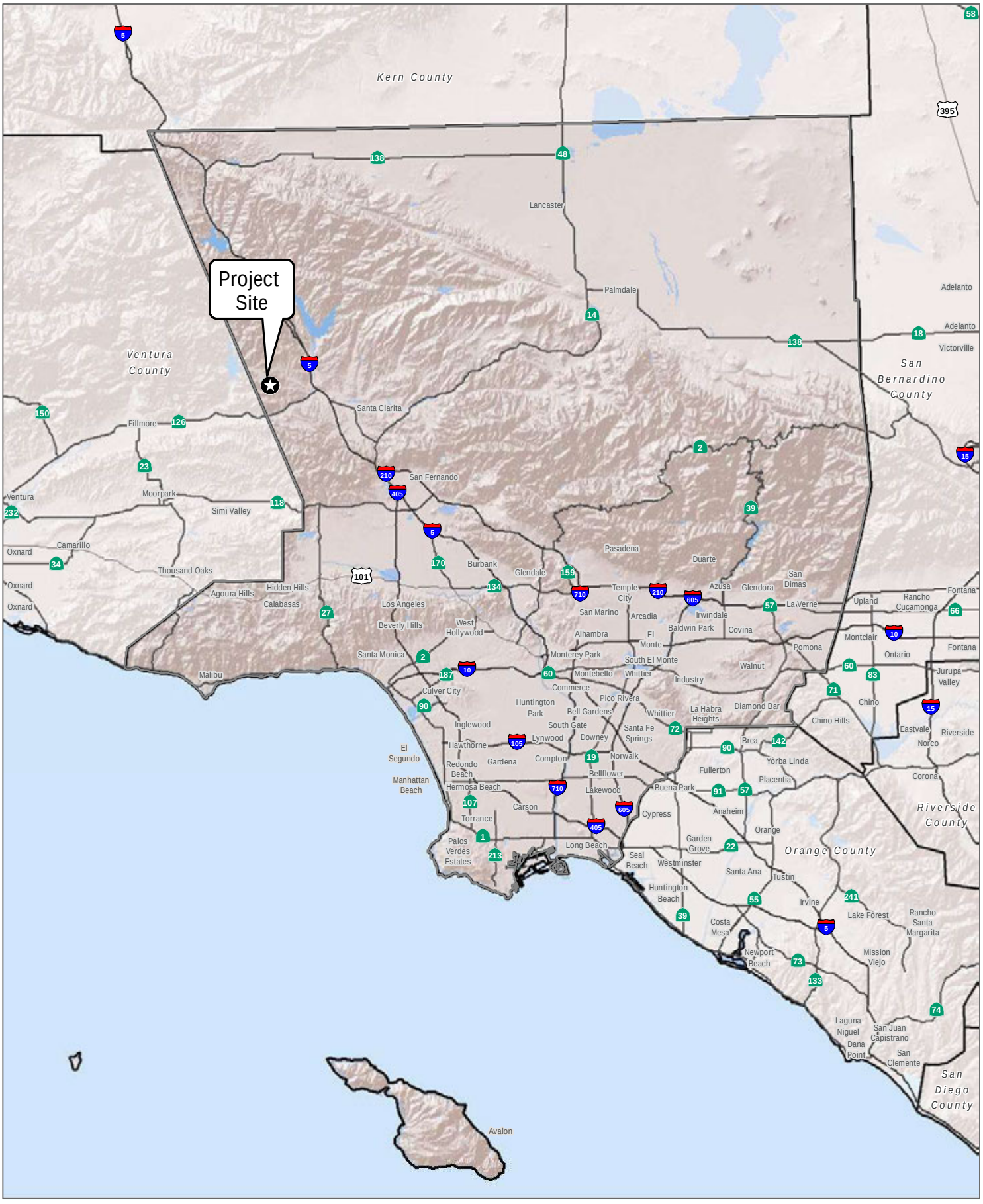

SOURCE: ESRI

FIGURE 1

Regional Map

Oak Tree Report for the Sterling Ranch Estates Residential Project, Off-Ste Water Tank Area

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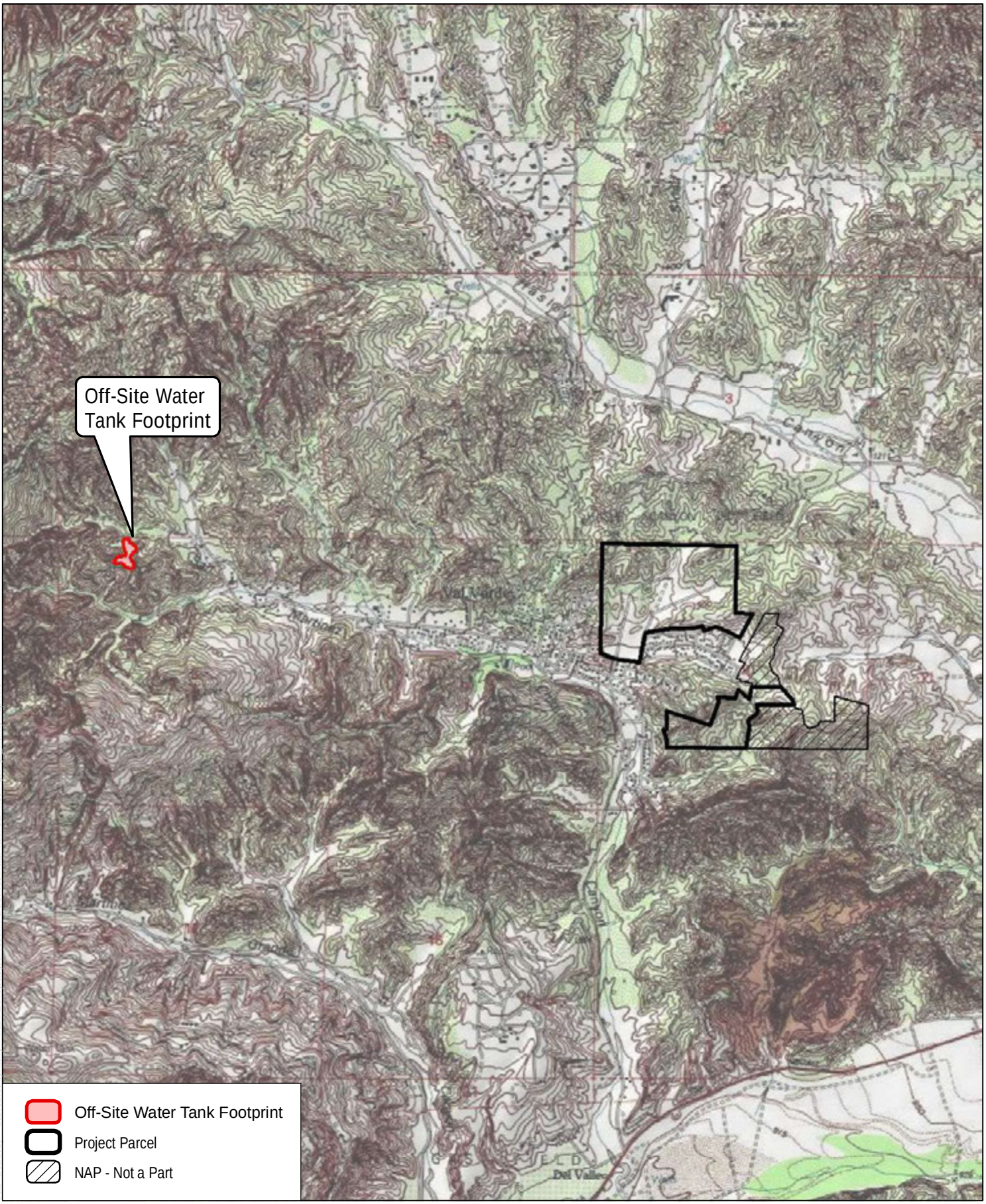

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SOURCE: USGS 7.5 Minute Series, Val Verde Quadrangle; Township 4 North; Range 17 West, Section 8

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FIGURE 2

Vicinity Map

Oak Tree Report for the Sterling Ranch Estates Residential Project, Off-Site - Water Tank Area

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2 METHODS

2.1 Individual Tree Evaluation

Dudek mapped tree locations for all trees located on the project site. Tree mapping was conducted using a Trimble Pathfinder Pro XH Global Positioning System (GPS) receiver with H-Star Technology. Since tree canopies can sometimes cause loss of satellite lock by blocking the line-of-sight to satellites, an electronic compass and reflectorless, electronic distance-measuring device were also used in mapping tree locations. The reflectorless, electronic distance-measuring device/compass combination operates in concert with the Pathfinder system to position offsets, and offset information is automatically attached to the GPS position data string. The electronic tree locations were then evaluated using ArcView 10.4 software to determine the position of the trees related to the project development footprint.

All inventoried trees and assessed protected trees were tagged with an aluminum tag bearing a unique identification number, which was placed on the trunk of each tree. These numbers correspond to the tree attribute information presented in the Tree Information Matrix in Appendix A. Tree trunk diameters were measured using a diameter tape providing adjusted figures[1] for diameter measurements when wrapping the tape around an object's circumference. Diameter measurements were taken using protocol provided by the Council of Tree and Landscape Appraisers in the Guide for Plant Appraisal (ISA 2000). The trunk diameter measurement of each tree was taken at 4.5 feet above the ground along the trunk axis, with common exceptions. For example, in cases where a tree's trunk was located on a slope, the 4.5-foot distance was approximated as the average of the shortest and longest sides of the trunk (i.e., the uphill side and downhill side of a tree's trunk, respectively), and the measurement was made at this point. Tree height was visually estimated by experienced tree surveyors. Tree canopy diameters were typically estimated by "pacing-off" the measurement based on the investigator's knowledge of their stride length or by visually estimating the canopy width. The crown diameter measurements were made along an imaginary line intersecting the tree trunk that best approximated the average canopy diameter. Additionally, Dudek arborists calculated composite trunk diameters for multiple-stem trees according to ISA standards. According to these standards, the sum of all stem diameters was calculated to ascertain composite trunk diameter values for multiple-stem trees.

Pursuant to the Guide for Plant Appraisal (ISA 2000), tree health and structure were evaluated with respect to five distinct tree components: roots, trunk, scaffold branches, small branches, and foliage. Each component of the tree was assessed with regard to health factors such as insect and pathogen damage, mechanical damage, presence of decay, presence of wilted or dead leaves, and wound closure. Tree health and structure were graded as good, fair, poor, and dead, with "good" representing no apparent problems, and "dead" representing a dying and/or dead tree. Good condition trees exhibit acceptable vigor, healthy foliage, and adequate structure, and lack any major maladies. Fair condition trees are typically those with few maladies but declining vigor. This method of tree condition rating is comprehensive and results in ratings that are useful for determining the status of trees based on common urban forestry standards.

[1] Inches divided by 3.14 (π) provide diameter measurement in inches.

Individual tree attribute data is presented in Appendix A (Tree Information Matrix), and protected oak tree locations are presented in Appendix B (Oak Tree Locations and Proposed Impacts Exhibit). Representative protected oak tree photographs are presented in Appendix C.

2.2 Tree Impact Analysis

Dudek's ISA-certified arborists determined tree impacts by conducting a spatial analysis of individual tree locations and canopy extents visible in project site aerial imagery in relation to the water tank development plan. The tree dataset, digital aerial imagery, and site development planning data were evaluated using GIS software to determine where individual trees were located in relation to proposed water tank development areas. Per the Los Angeles County Oak Tree Ordinance, the "Protected Zone" of a tree is "that area within the dripline of an oak tree and extending there from to a point at least five feet outside the dripline, or 15 feet from the trunks of a tree, whichever distance is greater." Trees with project-related construction activity proposed within their protected zones are considered encroached upon for the purposes of this report. The impact analysis results were used to determine overall tree impacts for the project site.

2.3 Tree Appraisal

As allowed under Municipal Code Section 22.56.2140, Dudek ISA-certified arborists calculated the appraised value for each inventoried protected tree identified for removal according to the Guide for Plant Appraisal (ISA 2000), as discussed below.

2.3.1 Appraisal Method

Valuation of trees according to ISA standards involves incorporating ratings from three main tree features: species, location, and overall condition. The tree data matrix presented in Appendix A provides information regarding each evaluated tree and its current condition.

The Trunk Formula Method outlined in the Guide for Plant Appraisal is appropriate for trees that are too large to commonly be replaced and was used to calculate appraised tree values for trees identified for removal (ISA 2000). This method was selected given the variability of tree sizes on the site, and the inclusion of many large-diameter trees in the inventory that could not be reasonably replaced with nursery or transplant stock.

2.3.1.1 Appraisal Variables

The following variables and assumptions were included in generating the appraised tree values contained in this report, and are consistent with the Trunk Formula Method for tree appraisal (ISA 2000). Further, the descriptions contained herein coordinate with the tree appraisal data and calculations presented in Appendix A, Tree Information Matrix.

1. **Species**: Tree species were determined during field inspections.

2. **Condition**: Tree conditions were derived from field evaluations of outwardly observable health and structural characteristics. Condition ratings can range between 25% and 100% based on evaluations of root conditions, trunk form and observable defects, branching structure, and foliage condition.
3. **Trunk Diameter**: Trunk diameters are presented in inches measured at 4.5 feet (54 inches) above grade. Composite trunk diameters were calculated for trees with multiple stems and are the product of the square root of the sum of all squared trunk diameters.
4. **Location**: Location rating is the average value of site, contribution, and placement ratings. Ratings can range from 10% to 100%. Site values are affected by the economic, functional, and aesthetic aspects of the area where a tree is growing. Contribution accounts for the function and aesthetic values that the tree adds to the location where it is growing. Placement ratings indicate the effectiveness of tree locations on functional and aesthetic values. Based on the remoteness of portions of the project site and the degraded condition of portions of the site, location values applied to this site ranged from 37% to 43.0%.
5. **Species Rating**: Species rating was derived directly from the Species Classification and Group Assignment report published by the Western Chapter of ISA (Western Chapter ISA 2004). Values were determined by species for Southern California Inland Influence areas. Species ratings vary, with higher ratings assigned to native trees and lower ratings assigned to non-native, invasive species.
6. **Replacement Tree Size**: Replacement tree size values were derived from Table 11 of the Species Classification and Group Assignment report for the Southern California Subregion (Western Chapter ISA 2004), based on species-specific nursery groups.
7. **Replacement Tree Cost**: Replacement tree costs were derived from Table 11 of the Species Classification and Group Assignment report for the Southern California Subregion (Western Chapter ISA 2004), and were assessed to be $1,700.
8. **Installation Cost**: Installation costs were valued at $1,200 per tree.
9. **Installed Tree Cost**: Installed tree cost is the sum of the replacement tree cost and the installation cost.
10. **Unit Tree Cost per Square Inch**: Unit tree cost was derived from Table 11 of the Species Classification and Group Assignment report for the Southern California Subregion and varied by Nursery Group number.
11. **Appraised Trunk Area**: Appraised trunk area is the product of the squared trunk diameter value multiplied by 0.785. For trees with trunk measurements exceeding 30 inches, an adjusted trunk area value was used, as identified in Table 4.4 of the Guide for Plant Appraisal (ISA 2000).
12. **Appraised Tree Trunk Increase**: The appraised tree trunk increase is the difference between the appraised trunk area (No. 11) and the replacement tree size (No. 6).
13. **Basic Tree Cost**: Basic tree cost is the result of multiplying the unit tree cost (No. 10) and the appraised tree trunk increase (No. 12), and adding the installed tree cost (No. 9).
14. **Appraised Value**: The appraised value is the result of the basic tree cost discounted by the condition (No. 2), species (No. 5), and location (No. 4) ratings.

2.3.2 Appraisal Calculations

The matrix in Appendix A presents the results of the tree appraisal conducted for trees identified for removal on the project site. This matrix was created directly from the Trunk Formula Method Worksheet outlined in the Guide for Plant Appraisal (ISA 2000). The calculations in the matrix follow those in the worksheet.

The intent of the conversion of the standard worksheet to the matrix presented in Appendix A was to more efficiently and concisely present the tree appraisal data for the project site, and to allow the report reviewers to more easily compare appraisal value differences between trees.

2.4 Scope of Work Limitations

No root crown excavations or investigations, internal probing, or aerial canopy inspections were performed during the tree assessments. Therefore, the presence or absence of internal decay or other hidden or inaccessible inferiorities in individual trees could not be confirmed. While not a mitigation requirement, it is recommended that any large tree proposed for preservation or relocation in an urban setting be thoroughly inspected for internal or subterranean decay by a qualified arborist before finalizing preservation or relocation plans.

3 OBSERVATIONS

3.1 Individual Trees

Fifty-five coast live oak (*Quercus agrifolia*) and four scrub oak (*Quercus berberidifolia*) trees were inventoried within the biological study area. Of the 59 oak trees, 36 meet the County's criteria for a protected oak tree. Appendix B presents the location of the individual trees mapped and assessed for the proposed project.Overall, the trees exhibit growth and structural conditions that are typical of their location in a native oakwoodland setting prone to drought and wildfires. The trees include various trunk and branch maladies and health and structural conditions. As presented in Appendix A, 11.9% (7 trees) of theindividually mapped trees are in good health; 72.9% (43 trees) exhibit fair health, 13.5% (8 trees) are in poor health, and 1.7% (1 tree) is dead. Structurally, 3.3% (2 trees) of the individually mapped trees areconsidered to exhibit good structure, 83.1% (49 trees) exhibit fair structure, 11.9% (7 trees) poorstructure, and 1 (1.7%) is dead. The trees in good condition exhibit acceptable vigor, healthyfoliage,and adequate structure, and lack any major maladies. Trees in fair condition are typical, withfewmaladies but declining vigor. Trees in poor condition exhibit declining vigor, unhealthy foliage,poorbranch structure, and excessive lean. No pests or pathogens were observed on site.

Trees within the biological study area vary in size and stature according to species and available growing space. The site's trees are composed of single- and multi-stemmed trees, with single-stemmed trunk diameters that range from 6 to 44 inches, and multi-stemmed trunk diameters that range from 2 to 55 inches. Tree heights vary from 6 to 50 feet. Tree canopy extents range from 5 feet to approximately 50 feet.

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4 REGULATORY DEFINITIONS AND REQUIREMENTS

A tree inventory and assessment of the project site was performed pursuant to the Los Angeles County Oak Tree Ordinance. The following is an outline of the key aspects of the ordinance.

4.1 Definitions

4.1.1 Los Angeles County Oak Tree Ordinance

Trees subject to County permit requirements include those defined by Title 22.56.2060, as follows:

> any tree of the oak genus which is (a) 25 inches or more in circumference (eight inches in diameter) as measured four and one-half feet above mean natural grade; in the case of an oak with more than one trunk, whose combined circumference of any two trunks is at least 38 inches (12 inches in diameter) as measured four and one half feet above mean natural grade.

Additionally, the Los Angeles County Oak Tree Ordinance defines the "Protected Zone" of a tree as (Title 22.56.2060) as "that area within the dripline of an oak tree and extending therefrom to a point at least five feet outside the dripline, or 15 feet from the trunks of a tree, whichever distance is greater."

For the purposes of determining tree impacts, trees that have protected zones that have been encroached upon would also be considered impacted.

4.2 Regulations

4.2.1 Los Angeles County Oak Tree Ordinance

The Los Angeles County Oak Tree Ordinance was established to recognize oak trees as significant historical, aesthetic, and ecological resources. The goal of the ordinance is to create favorable conditions for the preservation and propagation of this unique and threatened plant heritage. By making this part of the project development process, healthy oak trees will be preserved and maintained. The County Oak Tree Ordinance applies to all unincorporated areas of the County.

Under the County Oak Tree Ordinance, a person shall not cut, destroy, remove, relocate, inflict damage, or encroach into the protected zone of any tree of the oak tree genus that is 8 inches or more in diameter; 4.5 feet above mean natural grade; or, in the case of oaks with multiple trunks, a combined diameter of 12 inches or more of the two largest trunks, without first obtaining a permit.

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5 IMPACTS

Tree impacts were determined using GIS software and spatial locations of trees relative to the project's impact areas (development footprint). Impacts were further determined based on Dudek's experience with native and non-native trees and their typical reactions to root disturbances from construction activities, such as soil compaction, excavation, and grading. The impact analysis results presented herein were used for developing appropriate mitigation measures for the proposed project.

Impacts to trees can be classified as direct or indirect. Direct impacts to trees related to site development are typically the result of physical injuries or changes caused by machinery involved with the development process. Direct impacts include tree removal, root damage, soil excavation and compaction, grade changes, loss of canopy, and trunk wounds, among others. Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Indirect impacts include alterations to stream flow rates, diversion of groundwater flow, introduction of exotic plant species, and alterations to disturbance regimes. Wider-scale alterations to the area near trees, as well as specific changes that occur around the trees, are important considerations.

In general, there is a great deal of variation in tolerance to construction impacts among tree species, ages, and conditions. It is important to know how a certain tree, based on its species, age, and condition, would respond to different types of disturbance. The trees on the project site are of varying ages and conditions. Mature specimens are typically more sensitive to root disturbance and grade changes. In general, healthy trees will respond better to changes in their growing environment. Trees of poor health or stressed conditions may not be vigorous enough to cope with direct or indirect impacts from construction activities.

Impact totals presented are based on conceptual disturbance limits and development plans as of the date of this oak tree report. As such, the actual number of trees subject to direct and indirect impacts may change as the detailed site planning process proceeds. Actual tree impact numbers may be lower than anticipated and as presented in this oak tree report once detailed grading plans are developed. Measures to reduce impacts are encouraged and would be implemented in the field during grading operations. Following completion of construction-related disturbances, actual protected tree impact totals would be updated and provided, along with revised mitigation totals.

5.1 Direct Tree Impacts

For the purposes of this oak tree report, direct impacts are those associated with tree removal or encroachment within the tree-protected zone (canopy dripline plus 5 feet or 15 feet from trunk, whichever is greater). Tree removal is expected to be required when the trunk is located inside or within 2 feet of the proposed limits of grading. Encroachment is expected when soil and roots are disturbed within the tree protected zone. Table 1 summarizes the number of trees by species that are expected to be directly impacted by construction. Direct tree impacts would result in the removal of 12 protected trees and the encroachment of an additional 11 protected trees. Two non-protected sized trees would be removed. The locations of impacted trees are presented by impact type on the map in Appendix B. Measures to minimize the extent of impacts to encroached trees are provided in Section 7, Tree Protection Measures.

Table 1
Summary of Direct Tree Impacts

Species		Protected Trees		Non-Protected Trees	
Scientific Name	*Common Name*	*Trees to Remove*	*Impacted but Not Removed*	*Trees to Remove*	*Impacted but Not Removed*
Quercus agrifolia	coast live oak	12	11	1	3
Quercus berberidifolia	scrub oak	0	0	1	0
	Total	12	11	2	3

5.2 Indirect Tree Impacts

Indirect impacts to trees are the result of changes to the site that may cause tree decline, even when the tree is not directly injured. Site-wide changes affecting trees include diverting runoff and stormwater, creating retention and detention ponds, relocating streams or making improvements to streams, lowering or raising water tables, altering the capacity for soil moisture recharge, removing vegetation, or damming underground water flow (Matheny and Clark 1998). For the purposes of this oak tree report, 31 indirect tree impacts are expected for trees within 25 feet of the proposed project's development footprint.

Table 2
Summary of Indirect Tree Impacts

Scientific Name	Common Name	Protected Trees	Non-Protected Trees
Quercus agrifolia	coast live oak	12	12
Quercus berberidifolia	scrub oak	1	6
	Total	13	18

5.3 Tree Impact Summary

In summary, 28 trees will be directly impacted (14 removals and 14 encroachments) by the proposed project. Of the 28 direct impacts, 12 that are protected by the County Oak Tree Ordinance are expected to require removal. Individual tree impacts can be found in Appendix B.

6 MITIGATION

6.1 Determination of Minimum Replacement Standards

Twelve County-protected oak trees are located on the project site. As such, mitigation is required based on the County Oak Tree Ordinance. The County allows for the payment of in-lieu fees for removed protected oak trees.

6.2 Recommended Mitigation

The County Oak Tree Ordinance identifies tree replacement requirements for tree removal associated with a development project. The following recommendations are provided for tree replacement using the appraised value of removed trees presented herein.

A total of 12 protected oak trees occur within the development footprint that will require removal to accommodate the proposed project. To mitigate their removal, 24 coast live oak trees would need to be replanted to meet the requirements of the County Oak TreeOrdinance. Dudek recommends all tree plantings be subject to a 7-year monitoring effort by an independent third-party certified arborist. This monitoring effort would consider growth, health, and condition of the subject trees to evaluate success.The monitoring effort may result in a recommendation of remedial actions should any of the tree plantings exhibit poor or declining health.

The specific location of individual mitigation tree plantings on site would be addressed in the mitigation planting plan or landscape design plan prepared for the site. The mitigation requirement and the approved tree replacement mitigation ratio is at the discretion of the County and subject to a final tree impactanalysis. As such, the final tree numbers associated with tree replacement and other mitigation components may vary from that presented in this tree inventory and assessment.

At the discretion of the County, an in-lieu fee can be paid for the appraised value of the oak trees as an alternative to mitigation tree planting. If the in-lieu fee is choosen, the appraised cost for all proposed protected tree removals is $48,520.The full tree appraisal data and calculations with individual assessment methods for each tree to beremoved can be provided.

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7 TREE PROTECTION MEASURES

A total of 45 trees located on the project site would have direct or indirect impacts from construction-related activities. As such, tree protection is required and recommended. Dudek recommends that any County protected tree be preserved according to the tree protection measures discussed in Appendix D.

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8 CONCLUSION

The project site contains 59 oak trees, of which 36 are protected by the County. For the purposes of this oak tree report, 23 protected oak trees (12 removed and 11 encroached) would be impacted by the proposed project. The 12 protected oak trees proposed for removal will require the recommended planting of 24 coast live oak trees to meet the requirements of the County Oak Tree Ordinance. Specific replacement planting locations should be accomodated within the Sterling Ranch Estates, in a natural oak woodland landscape. If it is found that a suitable location does not exist on-site for replacement tree plantings, an appropriate off-site location can be determined between the client and County. The mitigation requirement and the approved tree replacement mitigation ratio and planting locations are at the discretion of the County and subject to a final tree impact analysis. As such, the final tree numbers associated with tree replacement and other mitigation components may vary from that presented in this tree inventory and assessment. Furthermore, this oak tree report recommends that the remaining 11 encroached oak trees be subject to protection measures that, when implemented, minimize the possibility that the trees are inadvertently damaged during the construction process. An in-lieu payment of the appraised value of the trees, $48,250, can be made into County Oak Tree Fund, if tree planting is not selected as the method of mitigation by the County,

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9 ARBORIST'S DISCLOSURE STATEMENT

This oak tree report provides conclusions and recommendations based only on a visual examination of the trees and surrounding site by an ISA-certified arborist and reasonable reliance on the completeness and accuracy of the information provided to the arborist. The examination did not include subterranean or internal examination of the trees.

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees; recommend measures to enhance the beauty and health of trees; and attempt to reduce the risk of living near them. Although trees provide many benefits to those who live near them, they also include inherent risks from breakage or failure that can be minimized but not eliminated.

Arborists cannot detect every condition that could possibly lead to the failure of a tree. Trees are living organisms subject to attack by disease, insects, fungi, weather, and other forces of nature, and conditions that lead to failure are often hidden within trees and belowground. There are some inherent risks with trees that cannot be predicted with any degree of certainty, even by a skilled and experienced arborist. Arborists cannot predict acts of nature, including, without limitation, storms of sufficient strength, which can cause an apparently healthy tree to fail. Additionally, arborists cannot guarantee that a tree will be healthy or safe under all circumstances or for any specific period of time. A tree's condition could change over a short or long period of time due to climatic, cultural, and/or environmental conditions. Further, there is no guaranty or certainty that recommendations or efforts to correct unsafe conditions will prevent future breakage or failure of a tree.

To live or work near trees is to accept some degree of risk. Neither the author of this oak tree report nor Dudek assume any responsibility for or will be liable for any claims, losses, or damages for damage to any tree, death or injury to any person, or any loss of or damage to any personal or real property.

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APPENDIX A

Tree Information Matrix

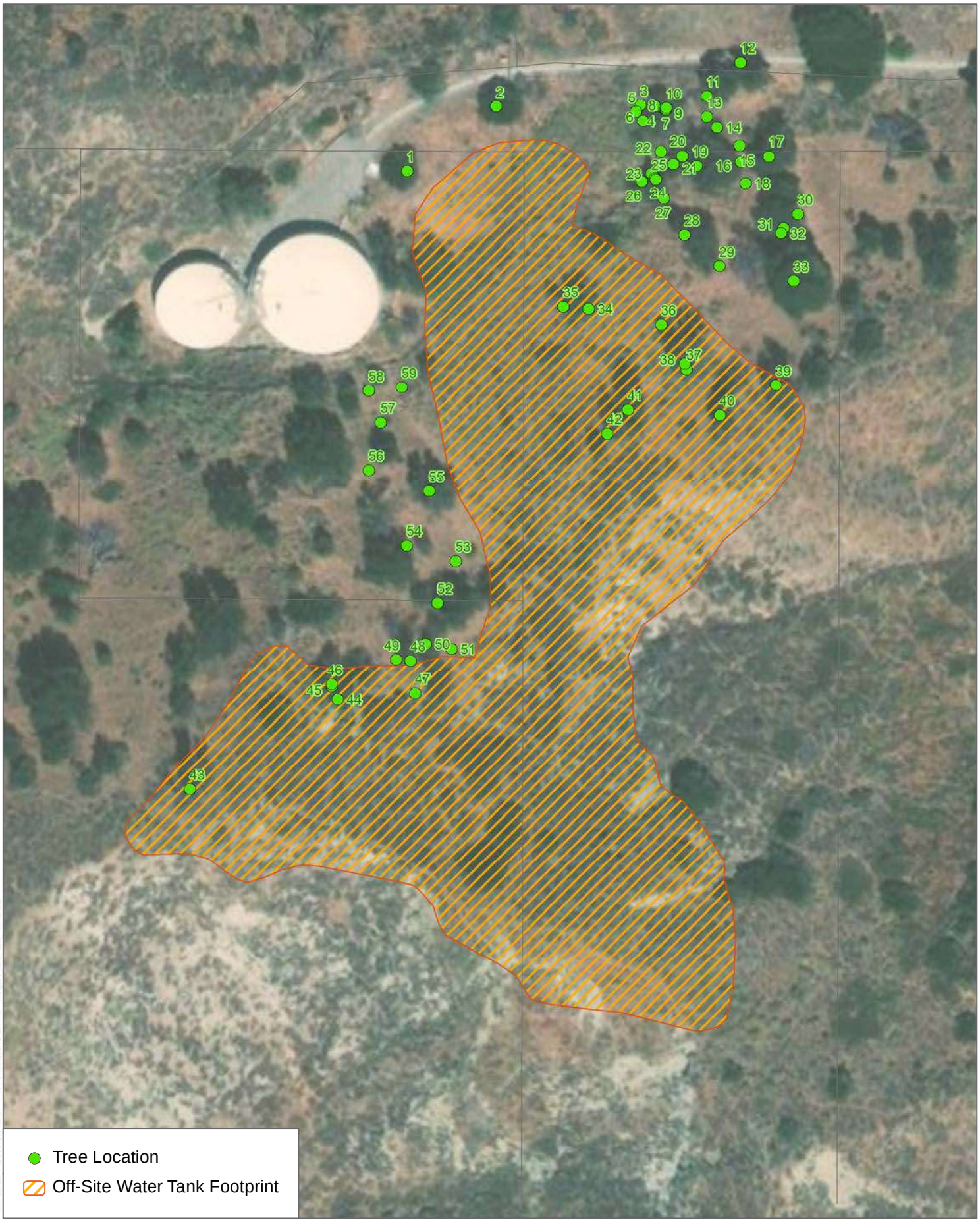
Appendix A
Tree Information Matrix

Tree #	Botanical Name	Common Name	Stems	Individual Stem Diameters (in.)					Height (ft.)	Canopy (ft.)	Health	Structure	Protected	Removal	Encroached	Appraised Value
				D1	*D2*	*D3*	*D4*	*D5*								
1	*quercus agrifolia*	coast live oak	4	11	11	10	8	0	35	30	Good	Fair	Yes	No	Yes	$6,900
2	*quercus agrifolia*	coast live oak	12	8	6	6	6	6	25	25	Good	Fair	Yes	No	Yes	$3,740
3	*quercus agrifolia*	coast live oak	1	9	0	0	0	0	30	20	Fair	Fair	Yes	No	No	$1,330
4	*quercus agrifolia*	coast live oak	2	7	2	0	0	0	30	15	Fair	Fair	No	No	No	$1,000
5	*quercus agrifolia*	coast live oak	1	6	0	0	0	0	20	10	Fair	Good	No	No	No	$790
6	*quercus agrifolia*	coast live oak	1	7	0	0	0	0	20	10	Fair	Good	No	No	No	$940
7	*quercus agrifolia*	coast live oak	4	1	1	1	1	0	10	10	Fair	Fair	No	No	No	$400
8	*quercus agrifolia*	coast live oak	4	1	1	1	1	0	10	10	Fair	Fair	No	No	No	$400
9	*quercus agrifolia*	coast live oak	2	2	2	0	0	0	10	6	Fair	Fair	No	No	No	$450
10	*quercus agrifolia*	coast live oak	9	1	1	1	1	1	10	8	Fair	Fair	No	No	No	$410
11	*quercus agrifolia*	coast live oak	6	3	2	1	1	1	10	10	Fair	Fair	No	No	No	$550
12	*quercus agrifolia*	coast live oak	1	44	0	0	0	0	50	40	Poor	Poor	Yes	No	No	$11,200
13	*quercus agrifolia*	coast live oak	5	1	1	1	1	1	12	7	Fair	Fair	No	No	No	$410
14	*quercus agrifolia*	coast live oak	10	1	1	1	1	1	12	7	Fair	Fair	No	No	No	$410
15	*quercus agrifolia*	coast live oak	7	1	1	1	1	1	8	7	Fair	Fair	No	No	No	$410
16	*quercus agrifolia*	coast live oak	5	4	3	3	2	2	25	10	Fair	Fair	Yes	No	No	$860
17	*quercus agrifolia*	coast live oak	2	17	13	0	0	0	45	35	Fair	Fair	Yes	No	No	$6,400
18	*quercus agrifolia*	coast live oak	2	3	3	0	0	0	10	6	Fair	Fair	No	No	No	$570
19	*quercus agrifolia*	coast live oak	4	19	12	12	9	0	35	50	Fair	Poor	Yes	No	No	$10,800
20	*quercus berberidifolia*	scrub oak	4	1	1	1	1	0	6	6	Fair	Fair	No	No	No	$360
21	*quercus berberidifolia*	scrub oak	6	1	1	1	1	1	6	6	Fair	Fair	No	No	No	$370
22	*quercus berberidifolia*	scrub oak	4	3	2	1	1	0	12	6	Fair	Fair	No	No	No	$480
23	*quercus berberidifolia*	scrub oak	2	1	1	0	0	0	6	5	Fair	Fair	No	No	No	$340
24	*quercus berberidifolia*	scrub oak	2	2	2	0	0	0	8	5	Fair	Fair	No	No	No	$400
25	*quercus berberidifolia*	scrub oak	2	4	4	0	0	0	12	8	Fair	Fair	No	No	No	$660
26	*quercus berberidifolia*	scrub oak	3	6	6	3	0	0	25	20	Fair	Fair	Yes	No	No	$1,180
27	*quercus agrifolia*	coast live oak	2	9	8	0	0	0	20	20	Fair	Fair	Yes	No	No	$2,100
28	*quercus agrifolia*	coast live oak	2	8	6	0	0	0	25	15	Fair	Fair	Yes	No	No	$1,560
29	*quercus agrifolia*	coast live oak	1	20	0	0	0	0	40	40	Fair	Fair	Yes	No	No	$5,640
30	*quercus agrifolia*	coast live oak	2	14	9	0	0	0	30	20	Good	Fair	Yes	No	No	$4,830
31	*quercus agrifolia*	coast live oak	1	14	0	0	0	0	40	20	Good	Fair	Yes	No	No	$3,550
32	*quercus agrifolia*	coast live oak	1	14	0	0	0	0	25	30	Fair	Fair	Yes	No	No	$2,960
33	*quercus agrifolia*	coast live oak	1	23	0	0	0	0	45	40	Good	Fair	Yes	No	No	$8,800
34	*quercus agrifolia*	coast live oak	2	13	9	0	0	0	25	20	Fair	Fair	Yes	Yes	Yes	$3,670
35	*quercus agrifolia*	coast live oak	3	13	8	3	0	0	20	15	Dead	Dead	Yes	Yes	Yes	$0
36	*quercus berberidifolia*	scrub oak	2	5	1	0	0	0	12	6	Fair	Fair	No	Yes	Yes	$600
37	*quercus agrifolia*	coast live oak	1	18	0	0	0	0	40	30	Fair	Fair	Yes	Yes	Yes	$4,640
38	*quercus agrifolia*	coast live oak	1	18	0	0	0	0	40	30	Fair	Fair	Yes	Yes	Yes	$4,640
39	*quercus agrifolia*	coast live oak	1	19	0	0	0	0	50	35	Fair	Fair	Yes	Yes	Yes	$5,100
40	*quercus agrifolia*	coast live oak	5	9	9	6	5	4	20	20	Good	Fair	Yes	Yes	Yes	$4,230
41	*quercus agrifolia*	coast live oak	3	20	20	15	0	0	35	30	Fair	Poor	Yes	Yes	Yes	$15,000
42	*quercus agrifolia*	coast live oak	4	5	5	4	2	0	15	10	Fair	Fair	Yes	Yes	Yes	$1,200

Tree #	Botanical Name	Common Name	Stems	Individual Stem Diameters (in.)					Height (ft.)	Canopy (ft.)	Health	Structure	Protected	Removal	Encroached	Appraised Value
				D1	*D2*	*D3*	*D4*	*D5*								
43	*quercus agrifolia*	coast live oak	1	23	0	0	0	0	30	20	Poor	Poor	Yes	Yes	Yes	$2,940
44	*quercus agrifolia*	coast live oak	1	11	0	0	0	0	25	20	Fair	Fair	Yes	Yes	Yes	$1,800
45	*quercus agrifolia*	coast live oak	2	11	7	0	0	0	25	20	Fair	Fair	Yes	Yes	Yes	$2,600
46	*quercus agrifolia*	coast live oak	4	3	2	2	2	0	25	20	Fair	Fair	No	Yes	Yes	$600
47	*quercus agrifolia*	coast live oak	1	16	0	0	0	0	35	20	Poor	Fair	Yes	Yes	Yes	$1,500
48	*quercus agrifolia*	coast live oak	2	11	11	0	0	0	20	15	Poor	Poor	Yes	No	Yes	$1,430
49	*quercus agrifolia*	coast live oak	1	13	0	0	0	0	20	15	Poor	Poor	Yes	No	Yes	$1,040
50	*quercus agrifolia*	coast live oak	1	11	0	0	0	0	20	15	Poor	Poor	Yes	No	Yes	$720
51	*quercus agrifolia*	coast live oak	1	16	0	0	0	0	40	25	Fair	Fair	Yes	No	Yes	$3,750
52	*quercus agrifolia*	coast live oak	5	6	4	2	1	1	20	15	Fair	Fair	Yes	No	Yes	$1,050
53	*quercus agrifolia*	coast live oak	1	4	0	0	0	0	10	7	Good	Fair	No	No	Yes	$660
54	*quercus agrifolia*	coast live oak	1	9	0	0	0	0	15	10	Poor	Fair	Yes	No	Yes	$530
55	*quercus agrifolia*	coast live oak	2	19	18	0	0	0	40	30	Poor	Fair	Yes	No	Yes	$4,070
56	*quercus agrifolia*	coast live oak	2	7	7	0	0	0	25	20	Fair	Fair	Yes	No	Yes	$1,530
57	*quercus agrifolia*	coast live oak	4	2	1	1	1	0	10	6	Fair	Fair	No	No	Yes	$440
58	*quercus agrifolia*	coast live oak	4	3	3	3	2	0	15	10	Fair	Fair	No	No	Yes	$730
59	*quercus agrifolia*	coast live oak	3	6	5	3	0	0	15	15	Fair	Fair	Yes	No	Yes	$1,200

APPENDIX B

Oak Tree Location and Proposed Impacts Exhibit



SOURCE: Bing 2019

Attachment B

DUDEK

0 40 80 Feet

Off-Site Water Tank - Tree Locations

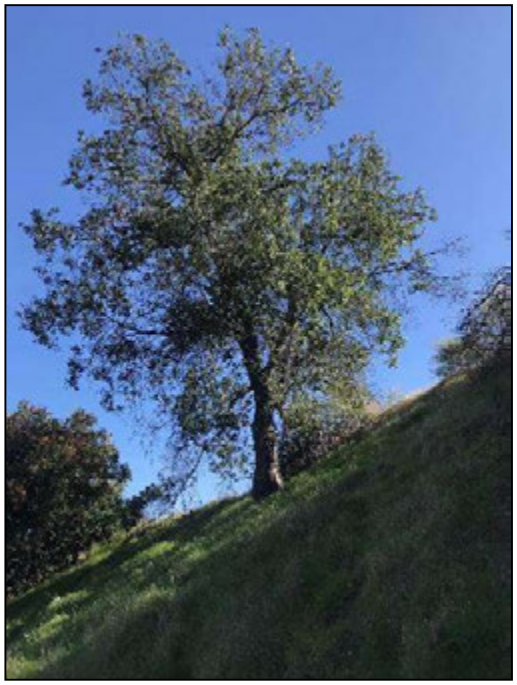
Sterling Ranch Estates Residential Project, Off-Site Water Tank Area

APPENDIX C

Representative Protected Oak Photographs

Appendix C – Representative Protected Oak Photographs

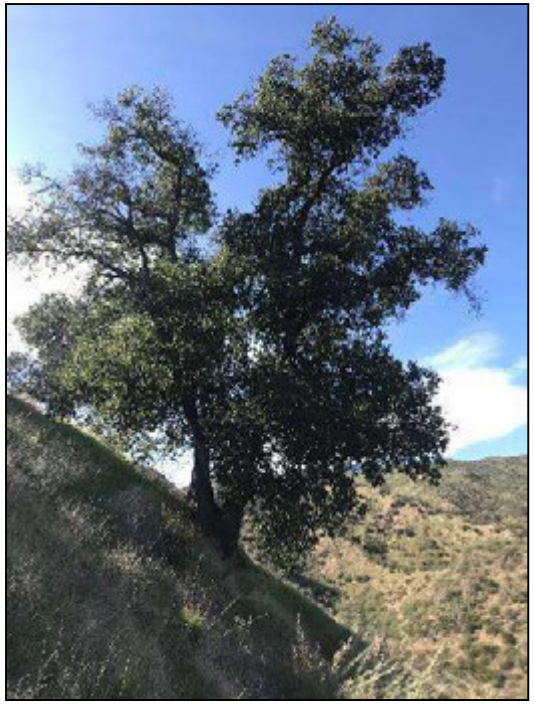
1. Overview of coast live oak Tree Number 34. Photograph taken facing west.



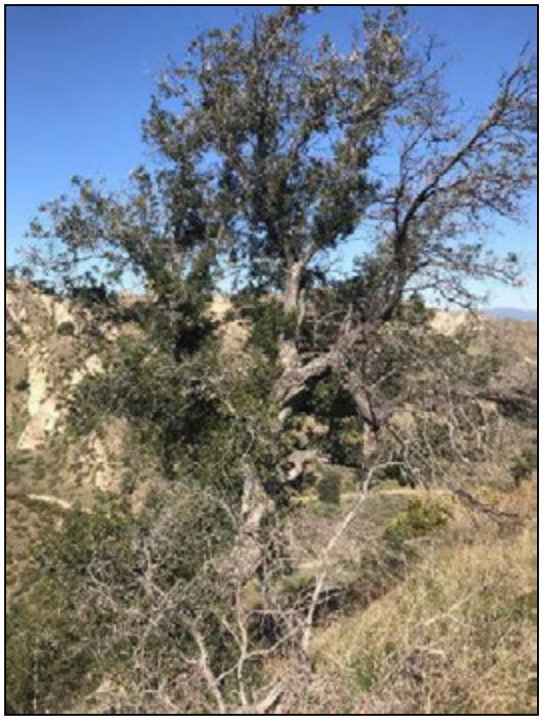
2. Overview of coast live oak Tree Number 39. Photograph taken facing northeast.

Photographs were taken on February 12, 2020

Appendix C – Representative Protected Oak Photographs



3. Overview of coast live oak Tree Number 42. Photograph taken facing west.

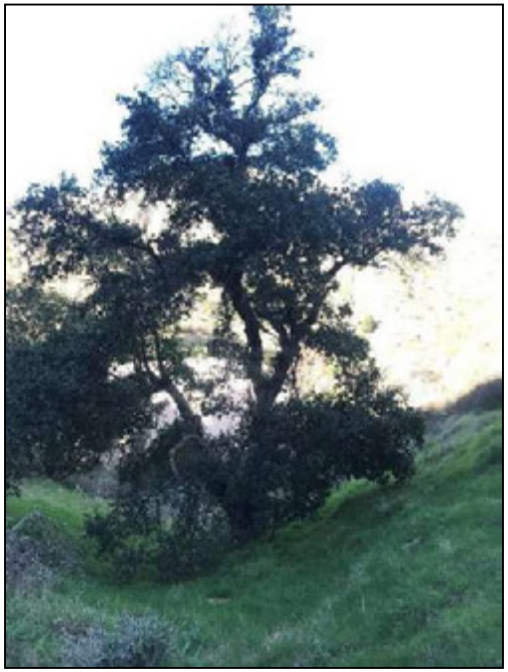


4. Overview of coast live oak Tree Number 43. Photograph taken facing south.

Photographs were taken on February 12, 2020.

Appendix C – Representative Protected Oak Photographs

5. Overview of coast live oak Tree Numbers 44, 45, 46. Photograph taken facing north.



6. Overview of coast live oak Tree Number 55. Photograph taken facing west.

Photographs were taken on February 12, 2020

Appendix C – Representative Protected Oak Photographs

7. Overview of coast live oak Tree Number 1. Photograph taken facing north.

8. Overview of coast live oak Tree Number 2. Photograph taken facing north.

Photographs were taken on February 12, 2020

Appendix C – Representative Protected Oak Photographs

9. Overview of coast live oak Tree Number 12. Photograph taken facing west.

10. Overview of coast live oak Tree Numbers 30,31,32. Photograph taken facing south.

Photographs were taken on February 12, 2020

APPENDIX D

Tree Protection Measures

Appendix D – Tree Protection Measures

The following sections are included as general guidelines for tree protection from construction impacts. The measures presented should be monitored by arborists and enforced by contractors and developers for maximum benefit to the trees.

Tree Protection Measures Prior to Construction

Fencing: All remaining trees that will not be relocated or removed should be preserved and protected in place. Trees within approximately 15 feet of proposed construction activity should be temporarily fenced with chain link or other material satisfactory to City planning staff throughout grading and construction activities. The fencing should be installed 3 feet outside of the dripline of each tree (or edge of canopy for cluster of trees), be 4 feet tall, and staked every 6 feet. The fenced area should be considered the tree protection zone (TPZ) unless proximate construction required temporary removal.

Pre-Construction Meeting: A pre-construction meeting should be held between all contractors (including grading, tree removal/pruning, builders, etc.) and the arborist. The arborist will instruct the contractors on tree protection practices and answer any questions. All equipment operators and spotters, assistants, or those directing operators from the ground, should provide written acknowledgement of their receiving tree protection training. This training should include information on the location and marking of protected trees, the necessity of preventing damage, and the discussion of work practices that will accomplish such.

Protection and Maintenance During Construction

Once construction activities have begun the following measures should be adhered to:

Equipment Operation and Storage: Avoid heavy equipment operation around the trees. Operating heavy machinery around the root zones of trees will increase soil compaction, which decreases soil aeration and subsequently reduces water penetration in the soil. All heavy equipment and vehicles should, at minimum, stay out of the fenced TPZ, unless where specifically approved in writing and under the supervision of a Certified Arborist or as provided by the approved landscape plan.

Storage and Disposal: Do not store or discard any supply or material, including paint, lumber, concrete overflow, etc. within the protection zone. Remove all foreign debris within the protection zone; it is important to leave the duff, mulch, chips, and leaves around the retained trees for water retention and nutrients. Avoid draining or leakage of equipment fluids near retained trees. Fluids such as gasoline, diesel, oils, hydraulics, brake and transmission fluids, paint, paint thinners, and glycol (anti-freeze) should be disposed of properly. Keep equipment parked at least 50 feet away from retained trees to avoid the possibility of leakage of equipment fluids into the soil. The effect of toxic equipment fluids on the retained trees could lead to decline and death.

Grade Changes: Grade changes, including adding fill, are not permitted within the TPZ without special written authorization and under the supervision of a Certified Arborist or as provided by the approved landscape plan. Lowering the grade within this area will necessitate cutting main support and feeder roots, jeopardizing the health and structural integrity of the tree(s). Adding soil, even temporarily, on top of the existing grade will compact the soil further, and decrease both water and air availability to the trees' roots.

Moving Construction Materials: Care will be taken when moving equipment or supplies near the trees, especially overhead. Avoid damaging the tree(s) when transporting or moving construction materials and working around the tree (even outside of the fenced tree protection zone). Above ground tree parts that could be damaged (e.g., low limbs, trunks) should be flagged with red ribbon. If contact with the tree crown is unavoidable, prune the conflicting branch(es) using International Society of Arboriculture (ISA) standards.

Root Pruning: Except where specifically approved in writing or as provided in Attachment 3, all trenching should be outside of the fenced protection zone. Roots primarily extend in a horizontal direction forming a support base to the tree similar to the base of a wineglass. Where trenching is necessary in areas that contain tree roots, prune the roots using a Dosko root pruner or equivalent. All cuts should be clean and sharp, to minimize ripping, tearing, and fracturing of the root system. The trench should be made no deeper than necessary.

Irrigation: Trees that have been substantially root pruned (30% or more of their root zone) will require irrigation for the first 12 months. The first irrigation should be within 48 hours of root pruning. They should be deep watered every 2 to 4 weeks during the summer and once a month during the winter (adjust accordingly with rainfall). One irrigation cycle should thoroughly soak the root zones of the trees to a depth of 3 feet. The soil should dry out between watering; avoid keeping a consistently wet soil. Designate one person to be responsible for irrigating (deep watering) the trees. Check soil moisture with a soil probe before irrigating. Irrigation is best accomplished by installing a temporary above ground micro-spray system that will distribute water slowly (to avoid runoff) and evenly throughout the fenced protection zone ***but never soaking the area located within 6 feet of the tree trunk, especially during warmer months***.

Pruning: Do not prune any of the trees until all construction is completed. This will help protect the tree canopies from damage. All pruning should be completed under the direction of an ISA Certified Arborist and using ISA guidelines. Only dead wood should be removed from tree canopies.

Washing: During construction in summer and autumn months, wash foliage of trees adjacent to the construction sites with a strong water stream every two weeks in early hours before 10:00 a.m. to control mite and insect populations.

Inspection: An ISA Certified Arborist should inspect the impacted preserved trees on a monthly basis during construction. A report comparing tree health and condition to the original, pre-construction baseline should be submitted following each inspection. Photographs of representative trees are to be included in the report on a minimum annual basis.

Maintenance After Construction

Once construction is complete the fencing may be removed and the following measures performed to sustain and enhance the vigor of the preserved trees.

Mulch: Provide a 4-inch mulch layer under the canopy of trees. Mulch should include clean, organic mulch that will provide long-term soil conditioning, soil moisture retention, and soil temperature control.

Pruning: The trees will not require regular pruning. Pruning should *only* be done to maintain clearance and remove broken, dead or diseased branches. Pruning should only take place following a recommendation by an ISA Certified Arborist and performed under the supervision of an ISA Certified Arborist. No more than 20% of the canopy should be removed at any one time. All pruning should conform to ISA standards.

Watering: The natural trees that are not disturbed should not require regular irrigation, other than the 12 months following substantial root pruning. However, soil probing will be necessary to accurately monitor moisture levels. Especially in years with low winter rainfall, supplemental irrigation for the trees that sustained root pruning and any newly planted trees may be necessary. The trees should be irrigated *only* during the winter and spring months.

Watering Adjacent Plant Material: All plants near the trees should be compatible with water requirements of said trees. The surrounding plants should be watered infrequently with deep soaks and allowed to dry out in-between, rather than frequent light irrigation. The soil should not be allowed to become saturated or stay continually wet. Irrigation spray should not hit the trunk of any tree. A 60-inch dry-zone should be maintained around all tree trunks. An aboveground micro-spray irrigation system is recommended over typical underground pop-up sprays.

Washing: Periodic washing of the foliage is recommended during construction but no more than once every 2 weeks. Washing should include the upper and lower leaf surfaces and the tree bark. This should continue beyond the construction period at a less frequent rate with a high-powered hose only in the early morning hours. Washing will help control dirt/dust buildup that can lead to mite and insect infestations.

Spraying: If the trees are maintained in a healthy state, regular spraying for insect or disease control should not be necessary. If a problem does develop, an ISA Certified Arborist should be consulted; the trees may require application of insecticides to prevent the intrusion of bark-boring beetles and other invading pests. All chemical spraying should be performed by a licensed applicator under the direction of a licensed pest control advisor.

Inspection: All trees that were impacted during construction within the TPZ should be monitored by an ISA Certified Arborist for the first 5 years after construction completion. The Arborist should submit an annual report, photograph each tree and compare tree health and condition to the original, pre-construction baseline.

Appendix D

2018 Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project

DUDEK

621 CHAPALA STREET
SANTA BARBARA, CALIFORNIA 93101
T 805.963.0651 F 805.963.2074

August 2, 2018 9677

U.S. Fish and Wildlife Service
Attn: Recovery Permit Coordinator
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

Subject: ***Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project, Val Verde, Los Angeles County, California***

Dear Recovery Permit Coordinator:

This report documents the results of protocol-level presence/absence surveys for the coastal California gnatcatcher (*Polioptila californica californica*; hereafter, gnatcatcher). Focused surveys were conducted throughout all areas of suitable habitat for the Sterling Ranch Estates Project (Project) located in the community of Val Verde in unincorporated Los Angeles County (*Figure 1*). There are approximately 78.58 acres of suitable habitat for gnatcatcher in the Project site (*Figure 2* and *3*).

The gnatcatcher is a federally listed threatened species and a California Department of Fish and Wildlife (CDFW) Species of Special Concern (SSC). It is closely associated with coastal sage scrub habitat and typically occurs below 950 feet elevation and on slopes less than 40% (Atwood 1990), but gnatcatchers have been observed at elevations greater than 2,000 feet. The species is threatened primarily by loss, degradation, and fragmentation of coastal sage scrub habitat, and is also impacted by brown-headed cowbird (*Molothrus ater*) nest parasitism (Braden et al. 1997).

LOCATION AND EXISTING CONDITIONS

The Project is located in the community of Val Verde, north of Chiquito Canyon Road, as well as northwest and southeast of Del Valle Road. The Project site lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. The Project site occurs entirely within the U.S. Geological Survey (USGS) 7.5-minute Val Verde quadrangle (USGS 2017). The Project site is centered at approximately 34 27′1.00″ N 118 39′ 12.00″ W and falls within Township 4 north, Range 17 west, sections 9 and 10, San Bernardino meridian.

The Sterling Ranch Estates Project includes the development of approximately 239 residential lots along with associated parks, open space lots, roads, and other infrastructure within assessor parcel numbers (APNs) 3271-004-012 and 3271-004-013. Overall, the subject parcels comprise

approximately 114 acres. In addition, a preservation area associated with the project is located in APN 3271-005-032 totaling approximately 34 acres. The Project will involve mass grading within the parcels to facilitate the residential development and associated infrastructure; however, several areas will remain undeveloped and will be preserved as open space.

The Project site is located within the Transverse Range geomorphic province of southern California. Topographically, the Project site varies from flat to moderate north and south facing slopes with elevations ranging from approximately 1,200 feet above mean sea level (amsl) along the southern boundary to approximately 1,400 feet amsl in the northeastern portion of the site. Soils present within the site generally consist of loams, sandy loams, and silty clay loams, which are derived from sedimentary rock or granite. The Project region has a Mediterranean climate with cool, wet winters and hot, dry summers. Rainfall occurs primarily between October and March.

VEGETATION COMMUNITIES

In 2003, the Vegetation Classification and Mapping Program of the California Department of Fish and Game (CDFG; now called the California Department of Fish and Wildlife [CDFW]), Wildlife and Habitat Data Analysis Branch, published the *List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database* (CNDDB) (CDFG 2003 [updated 2011]). In September 2010, the CDFG published the *Natural Communities List* (NCL; CDFG 2010), which uses the scientific name of the dominant species in that alliance as the alliance name, and is based on the *Manual of California Vegetation, Second Edition* (MCV2; Sawyer et al. 2009). These classification systems focus on a quantified, hierarchical approach that includes both botanical (plant species) and physiognomic (community structure and form) factors as currently observed (as opposed to predicting climax or successional stages). Nomenclature for on-site vegetation communities reflects the most current system, MCV2, and NCL. All vegetation communities were mapped based on these sources.

Vegetation mapping was conducted in May 2017. All mapping was performed in the field, through interpretation of field maps with a high quality aerial photographic base and/or delineation using a Trimble Geo XT Global Position System (GPS) unit capable of submeter accuracy for all sensitive vegetation. The maximum scale of the field map was 200-scale (1-inch = 200-foot) base. The GPS data was downloaded into GIS ArcView for placement onto an aerial figure. In combination with the GPS data, GIS technicians digitized the delineated vegetation boundaries from field maps using ArcView to create the vegetation community map.

Vegetation communities (and alliances/sub-associations) that provide potential habitat for the gnatcatcher include basket bush thickets, California buckwheat scrub, California sagebrush scrub, California sagebrush-California buckwheat scrub, Palmer's goldenbush, and purple sagebrush scrub (*Figure 3*). Vegetation communities are described below and acreages present in the survey area are shown in *Table 1*.

Table 1
Existing Vegetation Communities and Land Cover Types in the Survey Area

Macrogroup	Alliance (Code)	State Rank*	Acres
MG049. Western Cordilleran Montane Shrubland and Grassland	*Rhus trilobata* (basket bush thickets) provisional alliance (BABT)	S3?	0.55
MG044. California Coastal Scrub	*Artemisia californica* (California sagebrush scrub) alliance (CSB)	S5	37.92
	Artemisia californica–Eriogonum fasciculatum (California sagebrush–California buckwheat) alliance (CSB-CB)	S4	20.07
	Eriogonum fasciculatum (California buckwheat scrub) alliance (CBS)	S5	6.19
	Ericameria palmeri (Palmer's goldenbush scrub) alliance (PGBS)	S3?	6.98
	Salvia leucophylla (purple sage scrub) alliance (PSS)	S4	6.88
		Total	78.58

* For alliances with state ranks of S1-S3, all associations within them are considered highly imperiled. A question mark (?) denotes an inexact numeric rank due to insufficient samples over the full expected range of the type, but existing information points to this rank (CDFW 2017f).

Basket Bush Thickets

The basket bush thickets vegetation community includes skunk bush (*Rhus aromatica*) as the dominant species in the shrub canopy. The basket bush thickets vegetation community has a continuous shrub canopy less than 2 meters (6.5 feet) in height and the herbaceous layer is grassy or open. Basket bush thickets occur on stream terraces, swales, shallow valleys, or upland topography (Sawyer et al. 2009). Basket bush thickets occur in one patch immediately south of Del Valle Road (*Figure 3*). Skunk bush is the dominant species, although blue elderberry (*Sambucus nigra* ssp. *caerulea*) and poison oak (*Toxicodendron diversilobum*) are also present in lower overall concentrations.

California Sagebrush Scrub

The California sagebrush scrub vegetation community includes California sagebrush (*Artemisia californica*) as the dominant or co-dominant species in the shrub canopy, when comprising at least 60% of the relative cover in the shrub canopy. This vegetation community has an intermittent to continuous shrub canopy that is two-tiered: one tier includes shrubs less than 2 meters (6.5 feet) in height and the second tier includes shrubs less than 5 meters (16 feet) in height. The herbaceous layer is variable both seasonally and annually. This vegetation community is usually found on steep slopes that are rarely flooded and on low-gradient deposits along streams (Sawyer et al. 2009). This vegetation community occurs throughout the survey area, particularly on the hillslopes and ridgelines (*Figure 3*). Dominant species present in this vegetation community include California sagebrush, California buckwheat (*Eriogonum fasciculatum*), black sage (*Salvia mellifera*), chaparral yucca (*Hesperoyucca whipplei*), and purple sage (*Salvia leucophylla*).

California Sagebrush – California Buckwheat Scrub

The California sagebrush-California buckwheat scrub vegetation community includes California sagebrush and California buckwheat as the co-dominant species in the shrub canopy, when combined they comprise 30–60% of the relative cover in the shrub canopy. This vegetation community has an intermittent to continuous shrub canopy that is two-tiered with most shrubs less than 2 meters (6.5 feet) in height. The herbaceous layer is seasonally present. This vegetation community is usually found on steep slopes that are usually south facing (Sawyer et al. 2009). This vegetation community occurs throughout the survey area, typically on steep slopes facing south, west, and slightly northwest (*Figure 3*). Dominant species present in this vegetation community include California sagebrush and California buckwheat. Co-occurring species include black sage, chaparral mallow (*Malacothamnus fasciculatus* var. *fasciculatus*), toyon (*Heteromeles arbutifolia*), redberry (*Rhamnus crocea*), and purple sage.

California Buckwheat Scrub

The California buckwheat scrub vegetation community includes California buckwheat as the dominant or co-dominant in the shrub canopy in this vegetation community, comprising 50% of the relative cover in the shrub canopy. The California buckwheat scrub vegetation community has a continuous or intermittent shrub canopy less than 2 meters (6.5 feet) in height and the herbaceous layer is variable. This vegetation community is usually found on upland slopes, intermittently flooded arroyos, channels and washes, and rarely flooded low-gradient deposits (Sawyer et al. 2009). This vegetation community occurs entirely within the northeastern portion

of the survey area on gentle to steep south-facing slopes (*Figure 3*). Dominant species present in this vegetation community include California buckwheat. Co-occurring species include sacapellote (*Acourtia microcephala*), California aster (*Corethrogyne filaginifolia*), black sage, chaparral mallow, toyon, redberry, and purple sage.

Palmer's Goldenbush Scrub

The Palmer's goldenbush scrub vegetation community includes Palmer's goldenbush (*Ericameria palmeri* ssp. *pachylepis*) as the dominant species in the shrub canopy. The Palmer's goldenbush scrub vegetation community has an open shrub canopy less than 1.5 meters (5 feet) in height and a continuous herbaceous layer. This vegetation community is usually found on flats and low slopes (Sawyer et al. 2009). This vegetation community occurs throughout the survey area, typically on gently sloping terrain at the base of hillslopes of varying aspect (*Figure 3*). Dominant species present in this vegetation community include Palmer's goldenbush. Co-occurring species include ripgut (*Bromus diandrus*), California aster, red brome (*Bromus madritensis* ssp. *rubens*), and fascicled tarweed (*Deinandra fasciculata*).

Purple Sage Scrub

Purple sage is dominant or co-dominant in the shrub canopy in this vegetation community, comprising 30% of the relative cover in the shrub canopy and often co-dominant with California sagebrush. The purple sage scrub vegetation community has an intermittent to continuous shrub canopy less than 2 meters (6.5 feet) in height and a variable herbaceous layer. This vegetation community is found on slopes of variable aspect (Sawyer et al. 2009). This vegetation community was found to occur typically in the northern portion of the survey area, typically on steep slopes facing north *(Figure 3*). Dominant species present in this vegetation community include purple sage and California sagebrush. Co-occurring species include white sage (*Salvia apiana*), giant wildrye (*Elymus condensatus*), toyon, hollyleaf redberry (*Rhamnus ilicifolia*), and grape soda lupine (*Lupinus excubitus* var. *excubitus*).

METHODS

The focused surveys for gnatcatcher were conducted between March 29 and June 22, 2018, by Melissa Blundell (TE97717A)(*Table 2*). The surveys were conducted following the currently accepted protocol of the U.S. Fish and Wildlife Service (USFWS) *Coastal California Gnatcatcher (*Polioptila californica californica*) Presence/Absence Survey Protocol* (USFWS 1997). The surveys included six survey passes at a minimum of 7-day intervals. Due to the size of the survey area, each survey pass was conducted across two days resulting in less than 80 acres of suitable habitat

surveyed during each visit (*Table 2*). Survey routes are shown on *Figure 3* and allowed for complete audible and visual coverage of all suitable gnatcatcher habitat on site. Appropriate birding binoculars were used to aid in detecting and identifying bird species. A tape of recorded vocalizations was used frequently in order to elicit a response from the species. The tape was played approximately every 50 to 100 feet. If gnatcatchers were detected, the playing of the tape would cease to avoid harassment.

A topographic map at 200-scale of the site (1 inch = 200 feet) overlain with vegetation polygons and the site area was carried during the survey. Additionally, digital mobile maps were utilized during the surveys to assist in navigating and mapping any gnatcatchers present. Appropriate binoculars (e.g., 8x42 magnification) were used to aid in detecting and identifying bird species. Vocalization-playback would have been terminated immediately upon detection of any gnatcatchers to minimize the potential for harassment. Weather conditions, time of day, and season were appropriate for the detection of gnatcatchers and are provided in *Table 2*.

Table 2
Survey Dates and Conditions

Survey Pass	Date	Biologist's Initials[1]	Time	Survey Conditions[2]
1	3/29/2018 3/30/2018	MB	0705-1200 0645-1120	52-74°F; 0% cc; 0-–1 mph wind 51-76°F; 0% cc; 0–1 mph wind
2	4/13/2018 4/14/2018	MB	0658-1148 0646-1114	51-68°F; 0% cc; 1–6 mph wind 55-70°F; 0% cc; 0–1 mph wind
3	5/03/2018 5/04/2018	MB	0642-1127 0658-0935	55-79°F; 0% cc; 0–2 mph wind 54.5-74°F; 0% cc; 0–2 mph wind
4	5/17/2018 5/18/2018	MB	0640-1041 0648-0910	56-71°F; 0% cc; 0–6 mph wind 61-63°F; 40-80% cc; 0–1 mph wind
5	6/07/2018 6/08/2018	MB	0713-1127 0710-0935	58-72°F; 0-5% cc; 0–3 mph wind 63-74°F; 0% cc; 0–2 mph wind
6	6/21/2018 6/22/2018	MB	0630-1015 0658-0930	59-78°F; 0% cc; 0–1 mph wind 62-72°F; 0% cc; 0–1 mph wind

[1]Biologist Initials: MB = Melissa Blundell
[2]Survey Conditions: °F = degrees Fahrenheit; % cc = percent cloud cover; mph = mile per hour

RESULTS

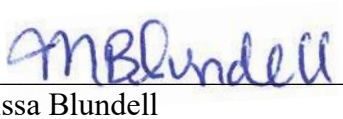
No California gnatcatchers were observed during the focused surveys. Five special-status species were observed during the surveys including Cooper's hawk (*Accipiter cooperii*; CDFW Watch List), sharp-shinned hawk (*Accipiter striatus*; CDFW Watch List), San Diegan tiger whiptail

(*Aspidoscelis tigris stejnegeri*; CDFW SSC), oak titmouse (*Baeolophus inornatus*; USFWS Birds of Conservation Concern), and Vaux's swift (*Chaetura vauxi*; CDFW SSC).

Overall, forty-nine wildlife species were observed during the surveys. A full list of wildlife species observed during the survey is provided in *Attachment A*. Photo plates of the survey area is provided in *Attachment B*. Please feel free to contact me at mblundell@dudek.com or (760) 214-1878 (cell) with questions or if you require additional information regarding this survey.

I certify that the information in this survey report and attached exhibits fully and accurately represent my work.

Sincerely,



Melissa Blundell
Biologist (TE97717A)

Att: Figure 1-3
Attachment A, List of Wildlife Species Observed
Attachment B, Photo Plates

Cc: Hunt Williams, Sterling Ranch Estates
Esther Burkett, CDFW
Brian Acord, CDFW

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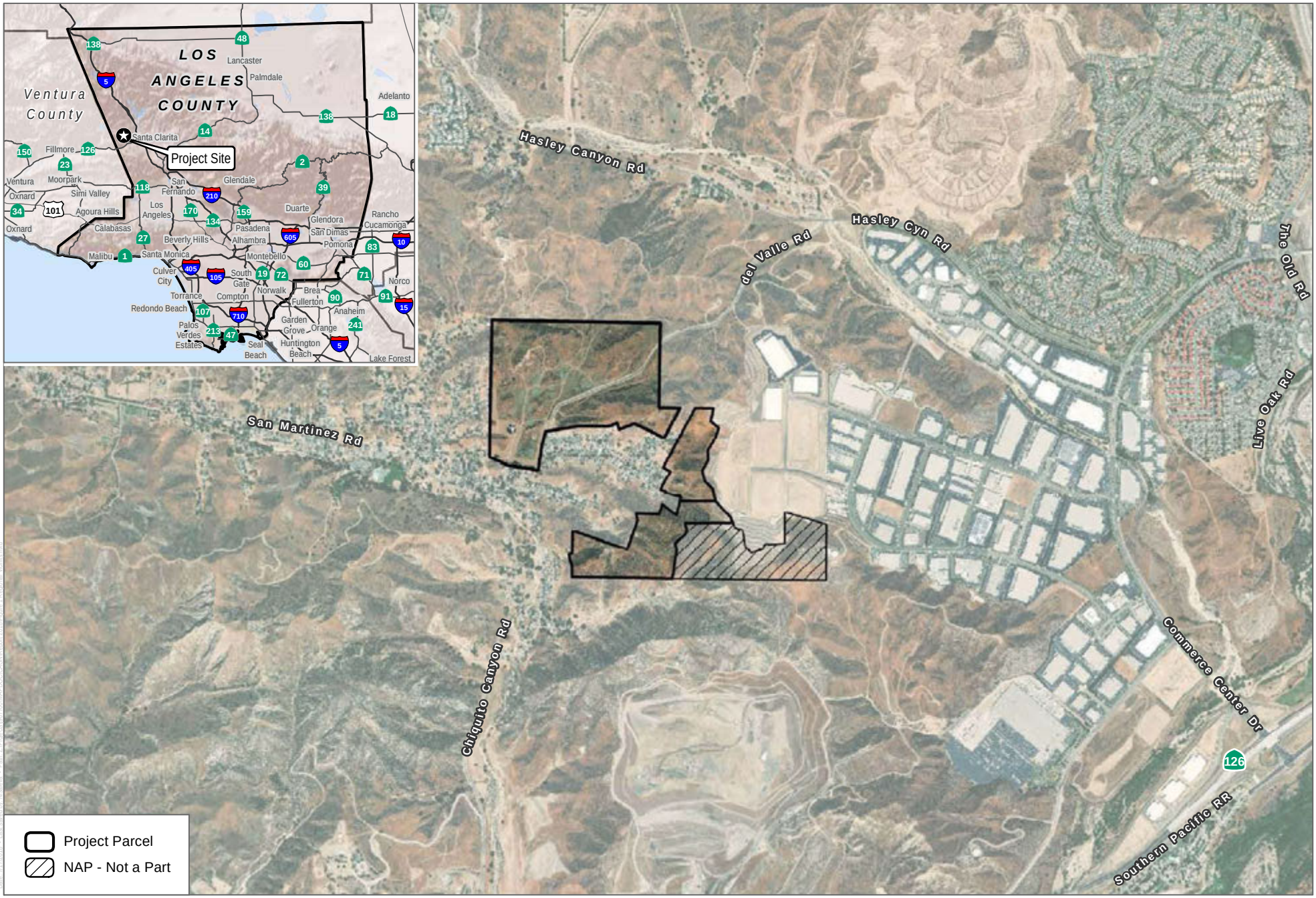


SOURCE: DigitalGlobe 2017

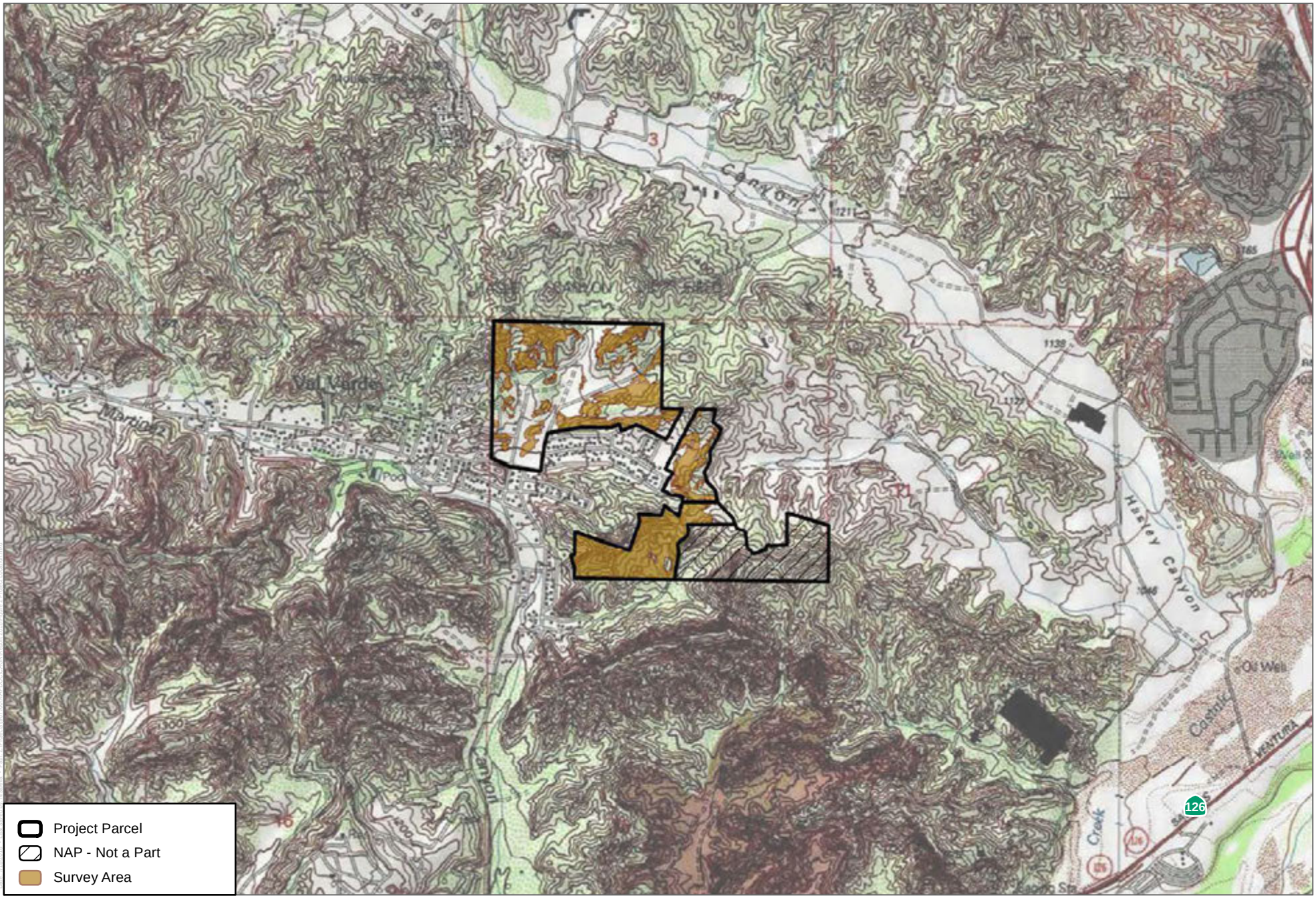
FIGURE 1

Regional/Vicinity Map

Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project

DUDEK

0 1,000 2,000 Feet

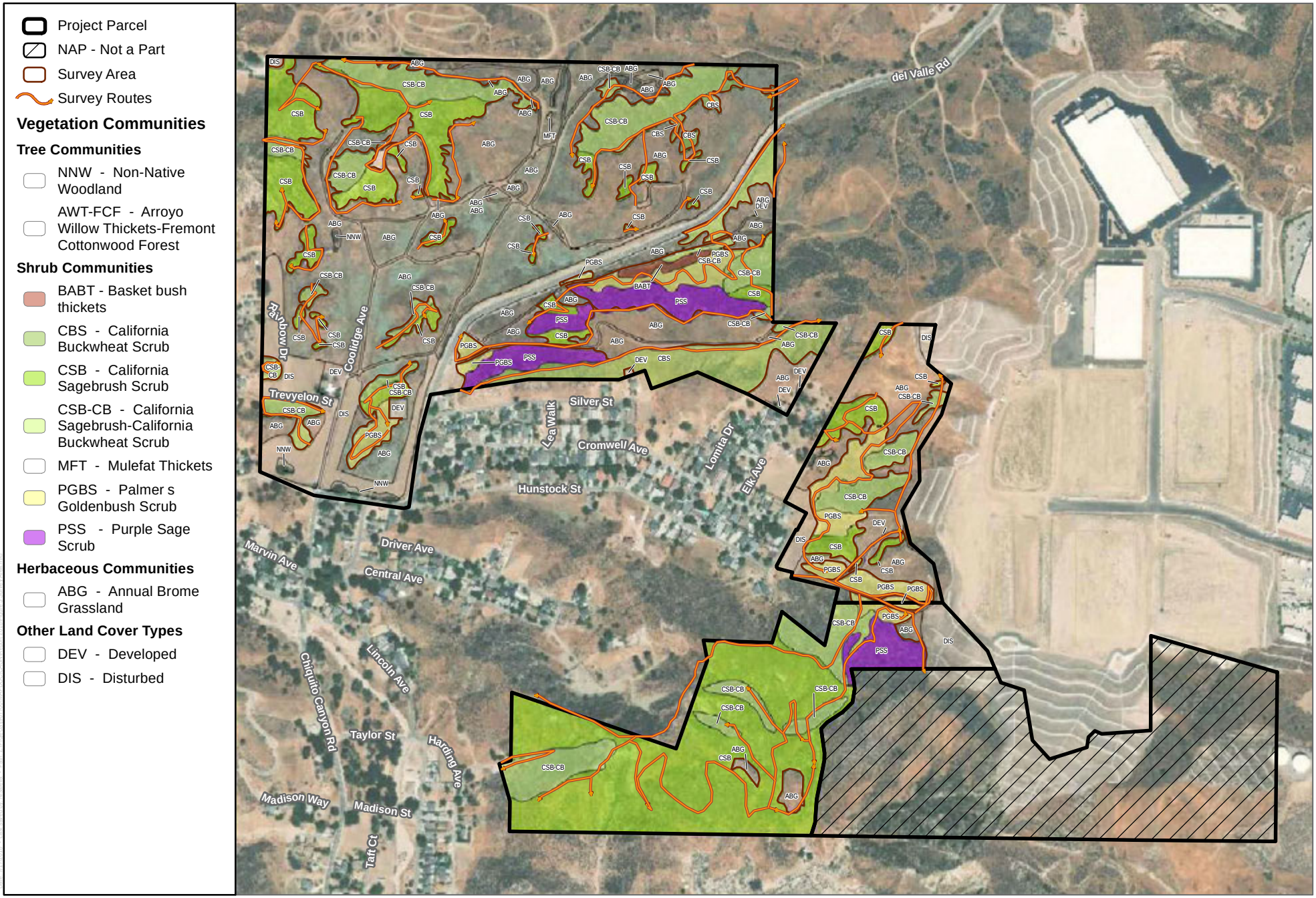


SOURCE: USA Topo7.5 Minute Series Val Verde Quadrangle

FIGURE 2

Project Location

Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project



SOURCE: DigitalGlobe 2017

DUDEK

0 500 1,000 Feet

FIGURE 3

Survey Area

Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project

ATTACHMENT A

List of Wildlife Species Observed

ATTACHMENT A
List of Wildlife Species Observed

BIRD

BLACKBIRDS, ORIOLES & ALLIES

ICTERIDAE—BLACKBIRDS

Icterus cucullatus—hooded oriole
Sturnella neglecta—western meadowlark

BUSHTITS

AEGITHALIDAE—LONG-TAILED TITS & BUSHTITS

Psaltriparus minimus—bushtit

CARDINALS, GROSBEAKS & ALLIES

CARDINALIDAE—CARDINALS & ALLIES

Passerina amoena—lazuli bunting
Piranga ludoviciana—western tanager

FINCHES

FRINGILLIDAE—FRINGILLINE & CARDUELINE FINCHES & ALLIES

Haemorhous mexicanus—house finch
Spinus psaltria—lesser goldfinch

FLYCATCHERS

TYRANNIDAE—TYRANT FLYCATCHERS

Myiarchus cinerascens—ash-throated flycatcher
Sayornis nigricans—black phoebe
Sayornis saya—Say's phoebe
Tyrannus vociferans—Cassin's kingbird

HAWKS

ACCIPITRIDAE—HAWKS, KITES, EAGLES, & ALLIES

Accipiter cooperii—Cooper's hawk
Accipiter striatus—sharp-shinned hawk
Buteo jamaicensis—red-tailed hawk

HUMMINGBIRDS

TROCHILIDAE—HUMMINGBIRDS

Calypte anna—Anna's hummingbird

Selasphorus sasin—Allen's hummingbird

JAYS, MAGPIES & CROWS

CORVIDAE—CROWS & JAYS

Aphelocoma californica—California scrub-jay
Corvus brachyrhynchos—American crow
Corvus corax—common raven

MOCKINGBIRDS & THRASHERS

MIMIDAE—MOCKINGBIRDS & THRASHERS

Mimus polyglottos—northern mockingbird
Toxostoma redivivum—California thrasher

NEW WORLD QUAIL

ODONTOPHORIDAE—NEW WORLD QUAIL

Callipepla californica—California quail

NEW WORLD VULTURES

CATHARTIDAE—NEW WORLD VULTURES

Cathartes aura—turkey vulture

OLD WORLD SPARROWS

PASSERIDAE—OLD WORLD SPARROWS

* *Passer domesticus*—house sparrow

OLD WORLD WARBLERS & GNATCATCHERS

SYLVIIDAE—SYLVIID WARBLERS

Polioptila caerulea—blue-gray gnatcatcher

PIGEONS & DOVES

COLUMBIDAE—PIGEONS & DOVES

Zenaida macroura—mourning dove

SILKY FLYCATCHERS

PTILOGONATIDAE—SILKY-FLYCATCHERS

Phainopepla nitens—phainopepla

SWALLOWS

HIRUNDINIDAE—SWALLOWS

Petrochelidon pyrrhonota—cliff swallow

SWIFTS

APODIDAE—SWIFTS

Aeronautes saxatalis—white-throated swift
Chaetura vauxi—Vaux's swift

THRUSHES

TURDIDAE—THRUSHES

Sialia mexicana—western bluebird

TITMICE

PARIDAE—CHICKADEES & TITMICE

Baeolophus inornatus—oak titmouse

WATERFOWL

ANATIDAE—DUCKS, GEESE, & SWANS

Branta canadensis—Canada goose

WOOD WARBLERS & ALLIES

PARULIDAE—WOOD-WARBLERS

Oreothlypis celata—orange-crowned warbler
Setophaga townsendi—Townsend's warbler

WOODPECKERS

PICIDAE—WOODPECKERS & ALLIES

Melanerpes formicivorus—acorn woodpecker
Picoides pubescens—downy woodpecker

WRENS

TROGLODYTIDAE—WRENS

Thryomanes bewickii—Bewick’s wren

WRENTITS

TIMALIIDAE—BABBLERS

Chamaea fasciata—wrentit

NEW WORLD SPARROWS

PASSERELLIDAE—NEW WORLD SPARROWS

Aimophila ruficeps—rufous-crowned sparrow
Melospiza melodia—song sparrow
Melozone crissalis—California towhee
Passerculus sandwichensis—savannah sparrow
Pipilo maculatus—spotted towhee
Zonotrichia leucophrys—white-crowned sparrow

MAMMAL

CANIDS

CANIDAE—WOLVES & FOXES

Canis latrans—coyote

HARES & RABBITS

LEPORIDAE—HARES & RABBITS

Sylvilagus bachmani—brush rabbit

SQUIRRELS

SCIURIDAE—SQUIRRELS

Spermophilus (*Otospermophilus*) *beecheyi*—California ground squirrel

REPTILE

LIZARDS

TEIIDAE—WHIPTAIL LIZARDS

Aspidoscelis tigris stejnegeri—San Diegan tiger whiptail

* Species marked with an asterisk are non-native species.

ATTACHMENT B

Photo Plates

ATTACHMENT B
Photo Plates

Photo 1. Northern section of the survey area. Photo oriented north. June 21, 2018.

Photo 2. Central section of the survey area. Photo oriented southwest. June 21, 2018.

ATTACHMENT B
Photo Plates

Photo 3. Central section of the survey area. Photo oriented west. May 17, 2018.

Photo 4. Southern section of the survey area. Photo oriented northeast. May 18, 2018.

ATTACHMENT B
Photo Plates

Photo 5. Southern section of the survey area. Photo oriented south. June 22, 2018.

Appendix E

2020 Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project

621 CHAPALA STREET
SANTA BARBARA, CALIFORNIA 93101
T 805.963.0651 F 805.963.2074

July 20, 2020 9677

U.S. Fish and Wildlife Service
Attn: Recovery Permit Coordinator
Ventura Fish and Wildlife Office
2493 Portola Road, Suite B
Ventura, California 93003

Subject: Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project

Dear Recovery Permit Coordinator:

This report documents the results of protocol-level presence/absence surveys for the coastal California gnatcatcher (*Polioptila californica californica*; hereafter, gnatcatcher). Focused surveys were conducted throughout all areas of suitable habitat for the Sterling Ranch Estates Project (Project) located in the community of Val Verde in unincorporated Los Angeles County (Figures 1). There are approximately 80.5 acres of suitable habitat for gnatcatcher in the Project site, including within the Tract Map Site, Off-Site Water Tank Area, Off-Site Roadway Improvement Area, and Off-Site Open Space (Figure 2). The Off-Site Waterline Improvement Area and Off-Site Sewer Line Improvement Area lie in existing roads and contain no suitable habitat for gnatcatchers; therefore, these areas were not included in the survey.

The gnatcatcher is a federally listed threatened species and a California Department of Fish and Wildlife (CDFW) Species of Special Concern (SSC). It is closely associated with coastal sage scrub habitat and typically occurs below 950 feet elevation and on slopes less than 40% (Atwood 1990), but gnatcatchers have been observed at elevations greater than 2,000 feet. The species is threatened primarily by loss, degradation, and fragmentation of coastal sage scrub habitat, and is also impacted by brown-headed cowbird (*Molothrus ater*) nest parasitism (Braden et al. 1997).

LOCATION AND EXISTING CONDITIONS

The Project is located in the community of Val Verde, north of Chiquito Canyon Road, as well as northwest and southeast of Del Valle Road. The Project site lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. The Project site occurs entirely within the U.S. Geological Survey (USGS) 7.5-minute Val Verde quadrangle (USGS 2020). The Project site is centered at approximately 34 27′1.00″ N 118 39′ 12.00″ W and falls within Township 4 north, Range 17 west, sections 9 and 10, San Bernardino meridian.

The Sterling Ranch Estates Project includes the development of approximately 222 detached single-family residential lots; a commercial lot with neighborhood-serving retail; recreation/open space (park sites, natural open space, manufactured open space) lots; and a homeowner's association lot, including roads and utility infrastructure (debris basin, infiltration basin, and pump station) within Assessor's Parcel Numbers (APNs) 3271-004-012 and 3271-004-013. Overall, the subject parcels comprise approximately 113.9 acres. Off-site areas include the Off-Site Roadway Improvement Area, Off-Site Open Space Area, and Off-Site Water Tank Area. The Off-Site Roadway Improvement Area is situated immediately east of the APN 3271-004-013 and totals approximately 6.5 acres.

The Project will conserve in perpetuity through a conservation easement 37.9 acres of APN 3271-005-032, referred to herein as the Off-Site Open Space Area. The 41.3 acres of APN 3271-005-032 located just east of the proposed 37.9-acre Off-Site Open Space Area conservation easement is already subject to preservation in perpetuity through a conservation easement held by the Mountains Recreation & Conservation Authority. The 16.1 acres of APN 3271-005-032 located just north of the proposed 37.9-acre Off-Site Open Space Area conservation easement area is Tentative Tract No. 62000, which is currently proposed for residential development; however, entitlements for Tentative Tract No. 62000 are not being pursued actively at this time. The 41.3-acre conservation easement held by the Mountains Recreation & Conservation Authority and the 16.1-acre Tentative Tract No. 62000 are not a part of the Project but are included as a visual for the contiguous open space area.

The Project site is located within the Transverse Range geomorphic province of southern California. Topographically, the Project site varies from flat to steep north and south facing slopes with elevations ranging from approximately 1,200 feet above mean sea level (amsl) along the southern boundary to approximately 1,400 feet amsl in the northeastern portion of the site. Soils present within the site generally consist of loams, sandy loams, and silty clay loams, which are derived from sedimentary rock or granite. The Project region has a Mediterranean climate with cool, wet winters and hot, dry summers. Rainfall occurs primarily between October and March.

VEGETATION COMMUNITIES

In 2003, the Vegetation Classification and Mapping Program of the California Department of Fish and Game (CDFG; now called the California Department of Fish and Wildlife [CDFW]), Wildlife and Habitat Data Analysis Branch, published the *List of California Terrestrial Natural Communities Recognized by the California Natural Diversity Database* (CNDDB) (CDFG 2003 [updated 2011]). In September 2010, the CDFG published the *Natural Communities List* (NCL; CDFG 2010), which uses the scientific name of the dominant species in that alliance as the alliance name, and is based on the *Manual of California Vegetation, Second Edition* (MCV2; Sawyer et al. 2009). These classification systems focus on a quantified, hierarchical approach that includes both botanical (plant species) and physiognomic (community structure and form) factors as currently observed (as opposed to predicting climax or successional stages). After Dudek conducted field work for vegetation mapping in 2017, CDFW updated the Natural Communities List in its California Natural Communities List (CDFW 2019), which incorporated changes based on taxonomic revisions related to dominant plants, reassignment of associations to new or different alliances, and revisions to the rarities rankings of some communities. Therefore, nomenclature for on-site vegetation communities reflects the most current system, in the Manual of California Vegetation and the updated Natural Communities list (CDFW 2019). All vegetation communities were mapped based on these sources.

Vegetation mapping was conducted in May 2017 in conjunction with the initial focused botanical and special-status plant species survey and updated in February 2020. All mapping was performed in the field, through interpretation of field maps with a high quality aerial photographic base and/or delineation using a Trimble Geo XT Global Position System (GPS) unit capable of submeter accuracy for all sensitive vegetation. The maximum scale of the field map was 200-scale (1-inch = 200-foot). The GPS data was downloaded into GIS ArcView for placement onto an aerial figure. In combination with the GPS data, GIS technicians digitized the delineated vegetation boundaries from field maps using ArcView to create the vegetation community map.

Vegetation communities (and alliances/sub-associations) that provide potential habitat for the gnatcatcher include the scrub communities on-site including: black sage scrub, bush mallow scrub, California buckwheat scrub, California sagebrush – black sage scrub, California sagebrush – California buckwheat scrub, California sagebrush

scrub, coyote brush scrub, Palmer's goldenbush scrub, purple sage scrub, and chamise – black sage chaparral (Figure 3A and 3B). Vegetation communities are described below and acreages present in the survey area are shown in Table 1.

Table 1
Existing Vegetation Communities and Land Cover Types in the Survey Area

Vegetation Community	Alliance (Code)	State Rank[1]	Acres[2]
California Coastal Scrub	Black sage scrub (*Salvia mellifera*) Alliance	S4	0.3
	Bush mallow scrub (*Malacothamnus fasciculatus - Malacothamnus* spp.) Alliance	S4	<0.1
	California buckwheat scrub (*Eriogonum fasciculatum*) Alliance	S5	0.6
	California sagebrush - black sage scrub (*Artemisia californica - Salvia mellifera*) Alliance	S4	0.5
	California sagebrush - California buckwheat scrub (*Artemisia californica - Eriogonum fasciculatum*) Alliance	S4	33.1
	California sagebrush scrub (*Artemisia californica*) Alliance	S5	29.5
	Coyote brush scrub (*Baccharis pilularis*) Alliance	S5	0.1
	Palmer's goldenbush scrub (*Ericameria palmeri*) Provisional Alliance	S3?	8.2
	Purple sage scrub (*Salvia leucophylla*) Alliance	S4	7.8
Chaparral	Chamise - black sage chaparral (*Adenostoma fasciculatum - Salvia mellifera*) Alliance	S4	0.7
		Total	**80.5**

Notes:
[1] For alliances with state ranks of S1-S3, all associations within them are considered highly imperiled. A question mark (?) denotes an inexact numeric rank due to insufficient samples over the full expected range of the type, but existing information points to this rank (CDFW 2019).
[2] The total acres may appear to be off due to rounding.

California Coastal Scrub

Black Sage Scrub (*Salvia mellifera*) Alliance

The black sage scrub (*Salvia mellifera*) alliance includes black sage (*Salvia mellifera*) as the dominant or co-dominant species in the shrub canopy. Black sage scrub has a continuous to intermittent shrub canopy less than 2 meters (7 feet) in height. The herbaceous layer is variable; grasses and herbs are seasonal. Black sage scrub occurs on dry slopes and alluvial fans (Sawyer et al. 2009).

Black sage scrub occurs in one patch within the southern portion of the Off-Site Water Tank Area, as shown on Figure 3B. Other shrub species observed within black sage scrub include chamise, California sagebrush, and California buckwheat. Black sage scrub comprises 0.3 acres of the Off-Site Water Tank Area.

The black sage scrub alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate black sage scrub as a sensitive vegetation community.

Bush Mallow Scrub (*Malacothamnus fasciculatus - Malacothamnus* spp.) Alliance

The bush mallow scrub (*Malacothamnus fasciculatus – Malacothamnus* spp.) alliance includes bush mallow as the dominant or co-dominant species in the shrub canopy. Bush mallow scrub has an open to intermittent shrub canopy less than 3 meters (10 feet) in height. The herbaceous layer is usually sparse. Bush mallow occurs on gentle to very steep slopes of variable aspects (Sawyer et al. 2009).

Bush mallow scrub occurs in two patches in the Off-Site Water Tank Area BSA (Biological Survey Area), as shown on Figure 3B. Other shrub species observed within bush mallow scrub include California sagebrush and California buckwheat. Bush mallow scrub comprises 0.0 acres (rounded from 0.05 acres) of the Off-Site Water Tank Area BSA.

The bush mallow scrub alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate bush mallow scrub as a sensitive vegetation community.

California buckwheat scrub (*Eriogonum fasciculatum*) Alliance

The California buckwheat scrub (*Eriogonum fasciculatum*) alliance includes California buckwheat as the dominant or co-dominant in the shrub canopy, comprising 50% of the relative cover in the shrub canopy. California buckwheat scrub has a continuous or intermittent canopy less than 2 meters (7 feet) in height, and the herbaceous layer is variable and may be grassy. This vegetation community is usually found on upland slopes, intermittently flooded arroyos, channels and washes, and rarely flooded low-gradient deposits (Sawyer et al. 2009).

California buckwheat scrub occurs within the northeastern portion of the Tract Map Site BSA and the northwestern portion of the Off-Site Road Improvement Area BSA on gentle to steep south-facing slopes, as shown on Figure 3A. Other species observed within California buckwheat scrub include sacapellote (*Acourtia microcephala*), California aster (*Corethrogyne filaginifolia*), black sage, chaparral mallow, toyon (*Heteromeles arbutifolia*), redberry (*Rhamnus crocea*), and purple sage (*Salvia leucophylla*). California buckwheat scrub comprises 0.3 acres of the Tract Map Site BSA and 0.3 acres of the Off-Site Roadway Improvement Area BSA, for a total of 0.6 acres.

The California buckwheat scrub alliance is ranked as an S5 alliance (NatureServe 2019). This ranking indicates that within California the alliance is demonstrably secure to ineradicable and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate California buckwheat scrub as a sensitive vegetation community.

California Sagebrush – Black Sage Scrub (*Artemisia californica – Salvia mellifera*) Alliance

The California sagebrush (*Artemisia californica*) – black sage scrub (*Salvia mellifera*) alliance includes California sagebrush and black sage as co-dominant in the shrub canopy. California sagebrush – black sage scrub has an intermittent to continuous canopy less than 2 meters (7 feet) in height, and the herbaceous layer is variable. This

vegetation community is usually found on steep east- to southwest-facing slopes, and soils are usually colluvial derived (Sawyer et al. 2009).

California sagebrush – black sage scrub occurs within the southeastern portion of the Off-Site Water Tank Area BSA, as shown on Figure 3B. Other species observed within California sagebrush – black sage scrub include purple sage and chamise. California sagebrush – black sage scrub comprises 0.5 acres of the Off-Site Water Tank Area.

The California sagebrush – black sage scrub is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate California sagebrush – black sage scrub as a sensitive vegetation community.

California Sagebrush - California Buckwheat Scrub (*Artemisia californica – Eriogonum fasciculatum*) Alliance

The California sagebrush - California buckwheat scrub (*Artemisia californica – Eriogonum fasciculatum*) alliance includes California sagebrush and California buckwheat as the co-dominant species in the shrub canopy; when combined, they comprise 30% to 60% of the relative cover in the shrub canopy. California sagebrush – California buckwheat scrub has an intermittent to continuous canopy that is two-tiered with most shrubs less than 2 meters (7 feet) in height with some less than 5 meters (16 feet) in height. The herbaceous layer is seasonally present. California sagebrush – California buckwheat scrub is usually found on steep slopes that are usually south-facing (Sawyer et al. 2009).

California sagebrush – California buckwheat scrub occurs throughout the Tract Map Site BSA, the Off-Site Road Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Reservoir Area BSA typically on steep slopes facing south, west, and slightly northwest, as shown on Figure 3A and Figure 3B. Other shrub species observed within California sagebrush – California buckwheat scrub include black sage, chaparral mallow (*Malacothamnus fasciculatus* var. *fasciculatus*), toyon, redberry, and purple sage. California sagebrush - California buckwheat scrub comprises 24.7 acres of the Tract Map Site BSA, 2.4 acres of the Off-Site Roadway Improvement Area BSA, 5.7 acres of the Off-Site Open Space Area BSA, and 0.2 acres of the Off-Site Water Tank Area BSA, for a total of 33.1 acres.

The California sagebrush – California buckwheat scrub alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate California sagebrush – California buckwheat scrub as a sensitive vegetation community.

California Sagebrush Scrub (*Artemisia californica*) Alliance

The California sagebrush scrub (*Artemisia californica*) alliance includes California sagebrush as the dominant or co-dominant species in the shrub canopy, when comprising at least 60% of the relative cover in the shrub canopy. California sagebrush scrub has an intermittent to continuous shrub canopy that is two-tiered: one tier includes shrubs less than 2 meters (7 feet) in height, and the second tier includes shrubs less than 5 meters (16 feet) in height. The herbaceous layer is variable both seasonally and annually. California sagebrush scrub is usually found on steep slopes that are rarely flooded and on low-gradient deposits along streams (Sawyer et al. 2009).

California sagebrush scrub occurs throughout the Tract Map Site BSA, the Off-Site Road Improvement Area BSA, the Off-Site Open Space Area BSA, and the Off-Site Water Tank Area BSA, particularly on the hillslopes and ridgelines, as shown on Figure 3A and Figure 3B. Other shrub species observed within California sagebrush scrub include California buckwheat, black sage, chaparral yucca (*Hesperoyucca whipplei*), and purple sage. California sagebrush scrub comprises 5.4 acres of the Tract Map Site BSA, 23.6 acres of the Off-Site Open Space Area BSA, and 0.6 acres of the Off-Site Water Tank Area BSA, for a total of 29.5 acres.

The California sagebrush scrub alliance is ranked as an S5 alliance (NatureServe 2019). This ranking indicates that within California the alliance is demonstrably secure to ineradicable and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate California sagebrush scrub as a sensitive vegetation community.

Coyote Brush Scrub (*Baccharis pilularis*) Alliance

The coyote brush scrub (*Baccharis pilularis*) alliance includes coyote brush as the dominant or co-dominant shrub in the canopy. Coyote brush scrub has a variable shrub canopy less than 3 meters (10 feet) in height with a variable ground layer. Coyote brush scrub occurs within river mouths, stream sides, terraces, stabilized dunes of coastal bars, splits along the coastline, coastal bluffs, open slopes, and ridges (Sawyer et al. 2009).

Coyote brush scrub occurs in one area within the Off-Site Road Improvement Area BSA, as shown in Figure 3A. Other species observed in coyote brush scrub include common deerweed (Acmispon glaber), California buckwheat, California sagebrush, and white sage (*Salvia apiana*). Coyote brush scrub comprises 0.1 acres of the Off-Site Roadway Improvement Area BSA.

The coyote brush scrub alliance is ranked as an S5 alliance (NatureServe 2019). This ranking indicates that within California the alliance is demonstrably secure to ineradicable and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate Coyote brush scrub as a sensitive vegetation community.

Palmer's Goldenbush Scrub (*Ericameria palmeri*) Provisional Alliance

The Palmer's goldenbush scrub (*Ericameria palmeri*) provisional alliance includes Palmer's goldenbush (*Ericameria palmeri* ssp. *pachylepis*) as the dominant species in the shrub canopy. The Palmer's goldenbush scrub vegetation community has an open shrub canopy less than 1.5 meters (4.9 feet) in height and a continuous herbaceous layer. Palmer's goldenbush scrub is usually found on flats and low slopes (Sawyer et al. 2009).

Palmer's goldenbush scrub occurs throughout the Tract Map Site BSA and the Off-Site Open Space Area BSA, typically on gently sloping terrain at the base of hillslopes of varying aspect, as shown on Figure 3A. Other species observed within Palmer's goldenbush scrub include ripgut (*Bromus diandrus*), California aster, compact brome (*Bromus madritensis*), and fascicled tarweed (*Deinandra fasciculata*). Palmer's goldenbush scrub comprises 6.7 acres of the Tract Map Site BSA and 1.4 acres of the Off-Site Open Space Area BSA, for a total of 8.2 acres. Note that due to rounding, the summed totals may be off slightly.

The Palmer's goldenbush scrub provisional alliance is ranked by CDFW (2019) as an S3? Alliance (NatureServe 2019). This ranking indicates that within California the alliance is considered a sensitive vegetation community

(CDFW 2019; NatureServe 2019). Los Angeles County does not designate Palmer's goldenbush scrub as a sensitive vegetation community.

Purple Sage Scrub (*Salvia leucophylla*) Alliance

The purple sage scrub (*Salvia leucophylla*) alliance includes purple sage as dominant or co-dominant in the shrub canopy in this vegetation community, comprising 30% of the relative cover in the shrub canopy and often co-dominant with California sagebrush. Purple sage has an intermittent to continuous shrub canopy less than 2 meters (7 feet) in height and a variable herbaceous layer. This vegetation community is found on slopes of variable aspects (Sawyer et al. 2009).

Purple sage scrub occurs throughout the Tract Map Site BSA, the Off-Site Road Improvement Area BSA, and the Off-Site Open Space Area BSA typically on steep slopes facing north, as shown on Figure 3A. Other species observed within purple sage scrub include California sage brush, white sage (*Salvia apiana*), giant wildrye (*Elymus condensatus*), toyon, hollyleaf redberry (*Rhamnus ilicifolia*), and grape soda lupine (*Lupinus excubitus*). Purple sage scrub comprises 5.5 acres of the Tract Map Site BSA, 0.0 acres (rounded from 0.04 acres) of the Off-Site Roadway Improvement Area BSA, and 2.3 acres of the Off-Site Open Space Area BSA, for a total of 7.8 acres.

The purple sage scrub alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate purple sage scrub as a sensitive vegetation community.

Chaparral

Chamise - Black Sage Chaparral (*Adenostoma fasciculatum - Salvia mellifera*) Alliance

The chamise – black sage chaparral (Adenostoma fasciculatum – Salvia mellifera) alliance includes chamise and black sage as the co-dominant species in the shrub canopy. The chamise – black sage chaparral alliance has a continuous to intermittent canopy less than 3 meters (10 feet) in height. The herbaceous layer is sparse. Chamise – black sage chaparral occurs on lower to upper slopes of all aspects; however, it occurs predominantly on south-facing slopes (Sawyer et al. 2009).

Chamise – black sage chaparral occurs in one area within the central portion of the Off-Site Water Tank Area BSA, as shown on Figure 3B. Other shrub species observed within the chamise – black sage chaparral vegetation community include California sagebrush (Artemisia californica) and California buckwheat (Eriogonum fasciculatum). Chamise – black sage chaparral comprises 0.7 acres of the Off-Site Water Tank Area BSA.

The chamise – black sage chaparral alliance is ranked as an S4 alliance (NatureServe 2019). This ranking indicates that within California the alliance is apparently secure and not considered a sensitive vegetation community (CDFW 2019; NatureServe 2019). Los Angeles County does not designate chamise – black sage chaparral as a sensitive vegetation community.

METHODS

The focused surveys for gnatcatcher were conducted between April 30 and June 30, by Melissa Blundell (TE-97717A), Tommy Molioo (TE-02412D), and Jeff Priest (TE-840619) (Table 2). The surveys were conducted following the currently accepted protocol of the U.S. Fish and Wildlife Service (USFWS) *Coastal California Gnatcatcher (Polioptila californica californica) Presence/Absence Survey Protocol* (USFWS 1997). The surveys included six survey passes at a minimum of 7-day intervals. Due to the size of the survey area, each survey pass was conducted across two days resulting in less than 80 acres of suitable habitat surveyed during each visit (Table 2). Survey routes are shown on Figure 3A and 3B and allowed for complete audible and visual coverage of all suitable gnatcatcher habitat on site. Appropriate birding binoculars were used to aid in detecting and identifying bird species. Recorded vocalizations were used frequently in order to elicit a response from the species. The tape was played approximately every 50 to 100 feet. If gnatcatchers would have been detected, the playing of the tape would have ceased to avoid harassment.

A topographic map at 200-scale of the site (1 inch = 200 feet) overlain with vegetation polygons and the site area was used for the survey. Additionally, digital mobile maps were utilized during the surveys to assist in navigating and mapping any gnatcatchers present. Appropriate binoculars (e.g., 8x42 magnification) were used to aid in detecting and identifying bird species. Vocalization-playback would have been terminated immediately upon detection of any gnatcatchers to minimize the potential for harassment. Weather conditions, time of day, and season were appropriate for the detection of gnatcatchers and are provided in Table 2.

Table 2
Survey Dates and Conditions

Survey Pass	Date	Biologist's Initials[1]	Time	Survey Conditions[2]
1	4/30/2020 5/01/2020	TM	0630-1100 0700-1100	55-61°F; 0% cc; 1 - 2 mph wind 61-78°F; 0% cc; 0 - 2 mph wind
2	5/07/2020 5/08/2020	TM	0630-1100 0700-1030	54-75°F; 0-10% cc; 0–1 mph wind 58-63°F; 0% cc; 0–1 mph wind
3	5/28/2020 5/29/2020	JP MB	0625-1200 0705-1048	56–86°F; 0% cc; 0–5 mph wind 61-74°F; 10-70% cc; 0–3 mph wind
4	6/04/2020 6/05/2020	JP	0630-1047 0630-1032	68–88°F; 0% cc; 0–3 mph wind 58–68°F; 100% cc; 0–5 mph wind
5	6/18/2020 6/19/2020	JP	0630-1103 0635-1045	55–72°F; 0–100% cc; 0–5 mph wind 57–68°F; 50–100% cc; 0–4 mph wind
6	6/29.2020 6/30/2020	MB	0637-1048 0715-1003	60-78°F; 30-80% cc; 0–3 mph wind 62-74°F; 0-5% cc; 0–2 mph wind

[1]Biologist Initials: MB = Melissa Blundell, TM=Tommy Molioo, JP = Jeffrey Priest.
[2]Survey Conditions: °F = degrees Fahrenheit; % cc = percent cloud cover; mph = mile per hour

RESULTS

No California gnatcatchers were observed during the focused surveys. Two special-status species were observed during the surveys including Cooper's hawk (*Accipiter cooperii*; CDFW Watch List) and Costa's hummingbird (*Calypte costae*; USFWS Bird of Conservation Concern).

Overall, fifty-nine wildlife species were observed during the surveys. A full list of wildlife species observed during the survey is provided in Attachment A. Photo documentation of the survey area is provided in Attachment B. Please feel free to contact me at mblundell@dudek.com or (760) 214-1878 (cell) with questions or if you require additional information regarding this survey.

I certify that the information in this survey report and attached exhibits fully and accurately represent my work.

Sincerely,

Melissa Blundell	Tommy Molioo	Jeff Priest
Biologist (TE-97717A)	Biologist (TE-02412D)	Biologist (TE-840619)

Att: *Figures 1 through 3B*
Attachment A, List of Wildlife Species Observed
Attachment B, Photo Documentation

Cc: *Hunt Williams, Sterling Ranch Estates*
Heather Moine, Dudek
Esther Burkett, CDFW
Brian Acord, CDFW

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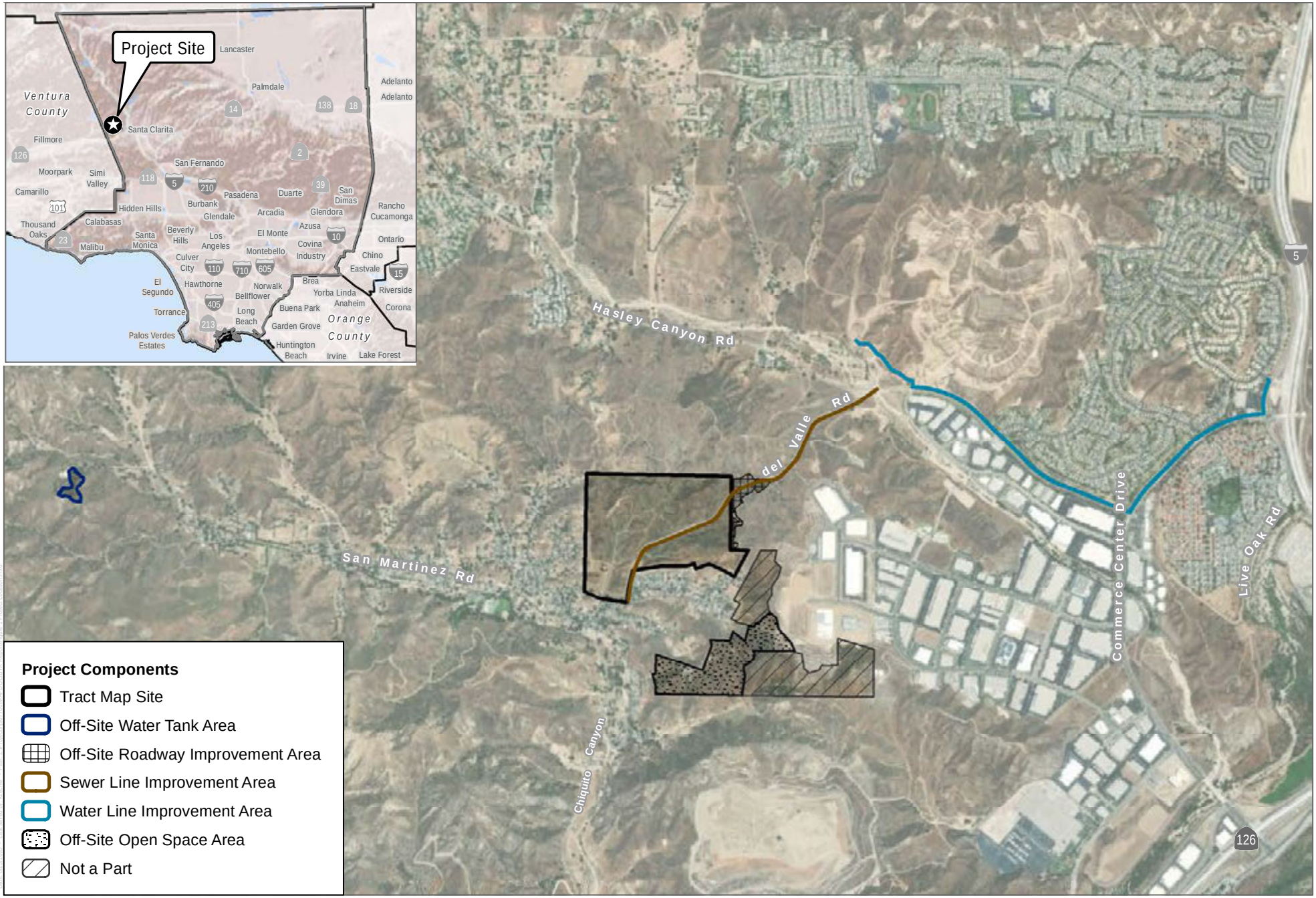


SOURCE: DigitalGlobe 2017

DUDEK

0 1,000 2,000 Feet

FIGURE 1

Project Location

Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project

CAGN Survey

Biological Survey Area

Project Components

Tract Map Site

Off-Site Water Tank Area

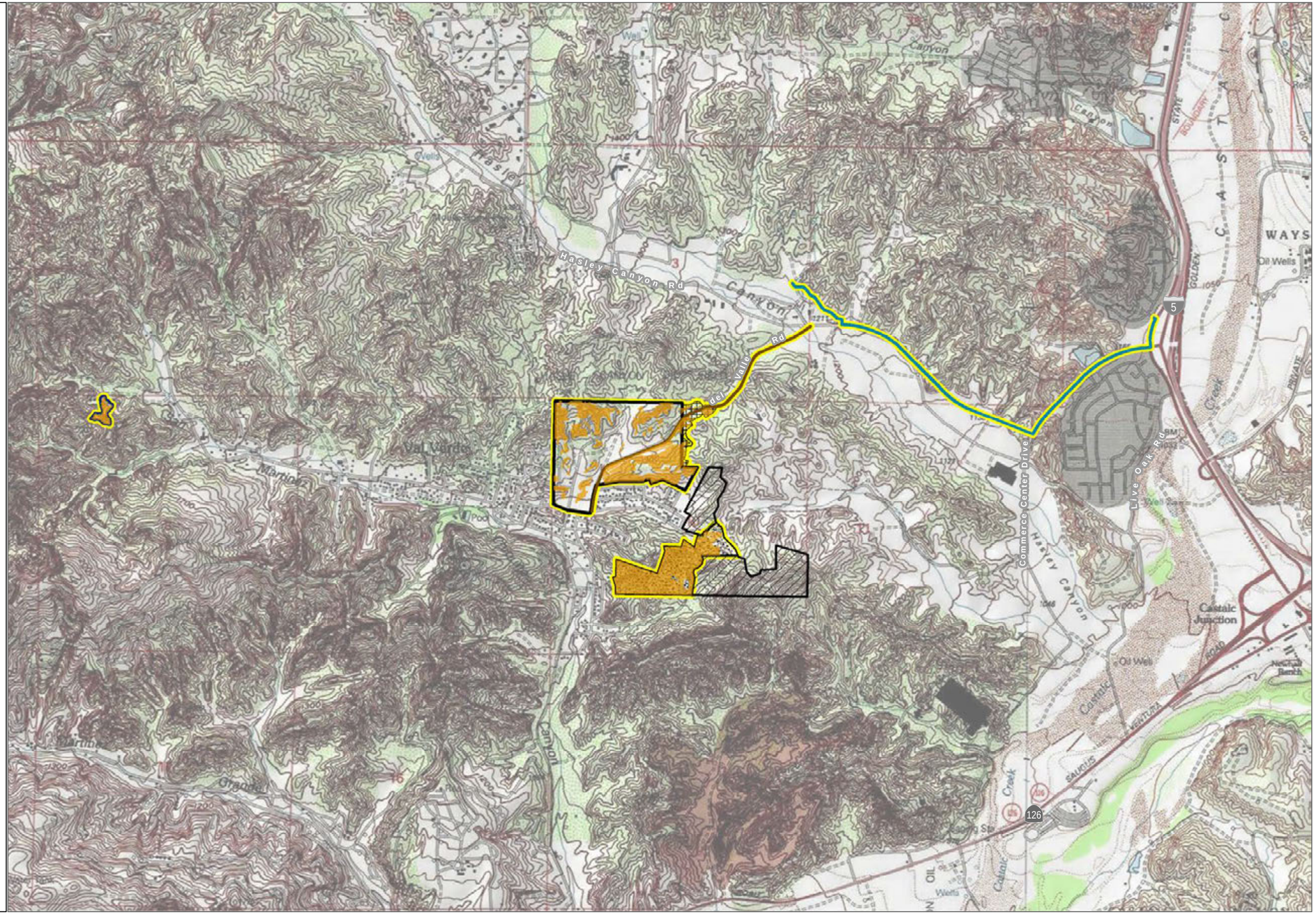
Off-Site Roadway Improvement Area

Sewer Line Improvement

Water Line Improvement

Off-Site Open Space

Not a Part



SOURCE: USGS 1:24,000 Topo

DUDEK

0 1,000 2,000 Feet

FIGURE 2

Project Location

Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project

CAGN Survey Area

CAGN Survey Routes

Biological Survey Area

Project Components

Tract Map Site

Off-Site Roadway Improvement Area

Sewer Line Improvement Area

Off-Site Open Space Area

Not a Part

Vegetation Communities and Land Cover Types

Grass and Herb Dominated

BN-BD = Brassica nigra - Bromus diandrus Semi-natural Association

BRDI = Bromus diandrus Semi-natural Association

WOABG = Wild oats and annual brome grasslands (Avena spp. - Bromus spp.) Semi-Natural Alliance

Riparian

AWT = Arroyo willow thickets (Salix lasiolepis) Alliance

MFT = Mulefat thickets (Baccharis salicifolia) Alliance

RT = Rhus trilobata Association

Scrub

CBS = California buckwheat scrub (Eriogonum fasciculatum) Alliance

CSB-CB = California sagebrush - California buckwheat scrub (Artemisia californica - Eriogonum fasciculatum) Alliance

CSS = California sagebrush scrub (Artemisia californica) Alliance

CYS = Coyote brush scrub (Baccharis pilularis) Alliance

PGBS = Palmer's goldenbush scrub (Ericameria palmeri) Provisional Alliance

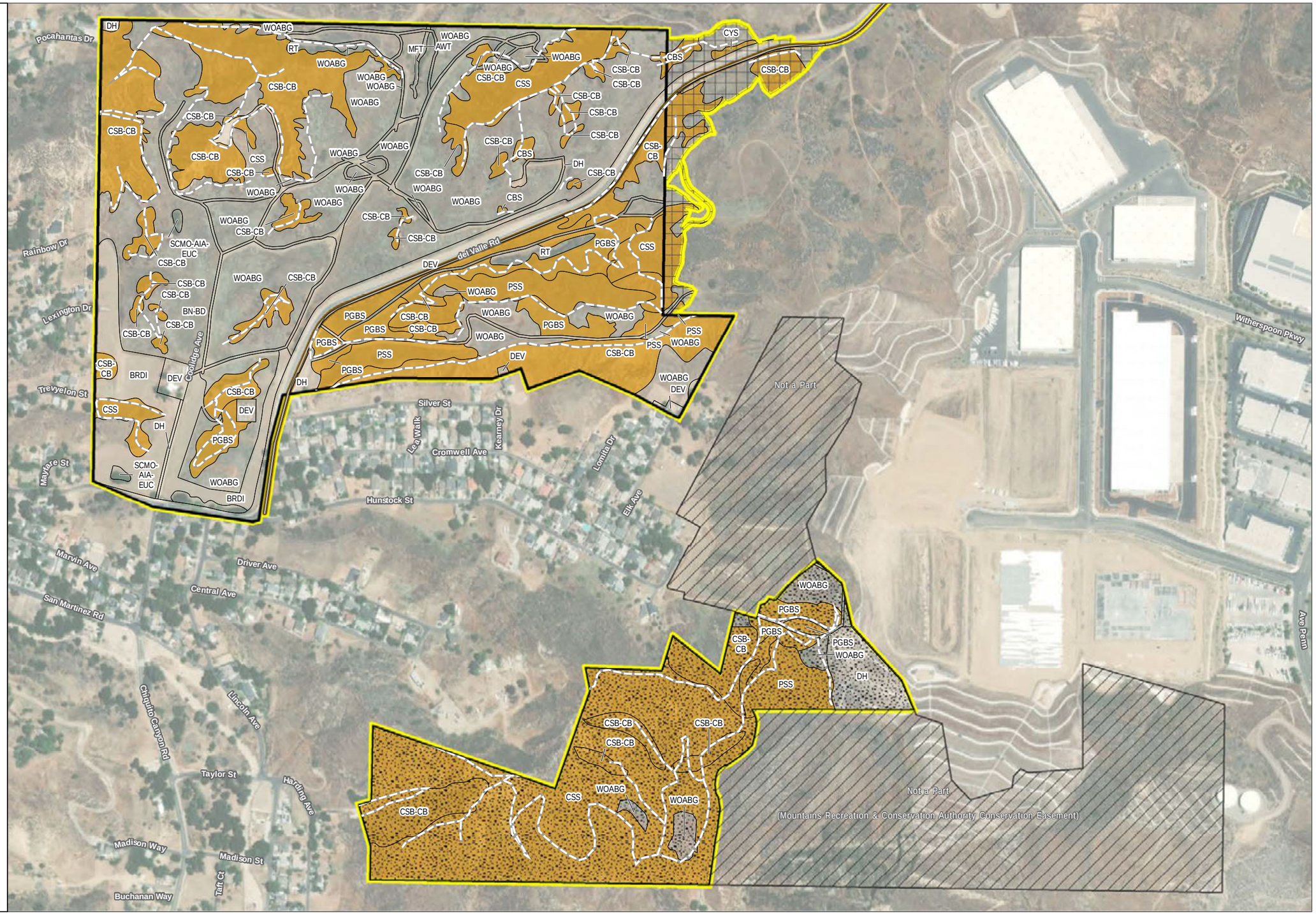
PSS = Purple sage scrub (Salvia leucophylla) Alliance

Other

SCMO-AIA-EUC = Schinus molle Association - Ailanthus altissima Semi-natural Association - Eucalyptus (globulus, camaldulensis) Provisional Semi-natural Association

DEV = Urban/Developed

DH = Disturbed Habitat



SOURCE: Eagle Aerial Solutions 2018

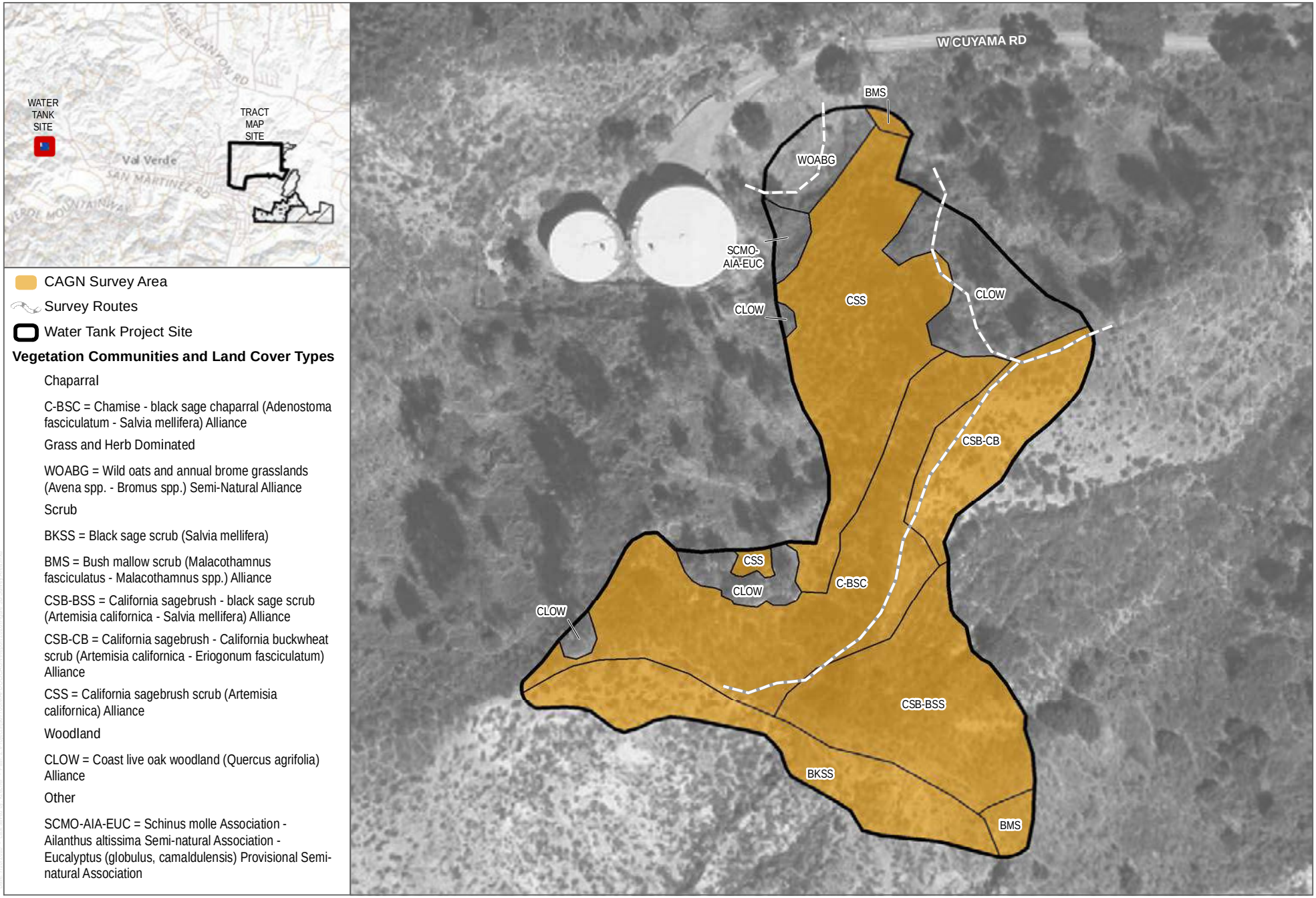
DUDEK

0 225 450 Feet

FIGURE 3A

Survey Area

Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project



SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 50 100 Feet

FIGURE 3B

Survey Area

Focused California Gnatcatcher Survey Results for the Sterling Ranch Estates Project

Attachment A

List of Wildlife Species Observed

BIRDS

BLACKBIRDS, ORIOLES & ALLIES

ICTERIDAE—BLACKBIRDS

Icterus cucullatus—hooded oriole

BUSHTITS

AEGITHALIDAE—LONG-TAILED TITS & BUSHTITS

Psaltriparus minimus—bushtit

CARDINALS, GROSBEAKS & ALLIES

CARDINALIDAE—CARDINALS & ALLIES

Passerina amoena—lazuli bunting

FINCHES

FRINGILLIDAE—FRINGILLINE & CARDUELINE FINCHES & ALLIES

Haemorhous mexicanus—house finch
Spinus psaltria—lesser goldfinch
Spinus tristis—American goldfinch

FLYCATCHERS

TYRANNIDAE—TYRANT FLYCATCHERS

Empidonax difficilis—Pacific-slope flycatcher
Myiarchus cinerascens—ash-throated flycatcher
Sayornis nigricans—black phoebe
Sayornis saya—Say's phoebe
Tyrannus vociferans—Cassin's kingbird

HAWKS

ACCIPITRIDAE—HAWKS, KITES, EAGLES, & ALLIES

Accipiter cooperii—Cooper's hawk
Buteo jamaicensis—red-tailed hawk

HUMMINGBIRDS

TROCHILIDAE—HUMMINGBIRDS

Calypte anna—Anna's hummingbird
Calypte costae—Costa's hummingbird
Selasphorus sasin—Allen's hummingbird

JAYS, MAGPIES & CROWS

CORVIDAE—CROWS & JAYS

Aphelocoma californica—California scrub-jay
Corvus brachyrhynchos—American crow
Corvus corax—common raven

MOCKINGBIRDS & THRASHERS

MIMIDAE—MOCKINGBIRDS & THRASHERS

Mimus polyglottos—northern mockingbird
Toxostoma redivivum—California thrasher

NEW WORLD QUAIL

ODONTOPHORIDAE—NEW WORLD QUAIL

Callipepla californica—California quail

NEW WORLD VULTURES

CATHARTIDAE—NEW WORLD VULTURES

Cathartes aura—turkey vulture

OLD WORLD SPARROWS

PASSERIDAE—OLD WORLD SPARROWS

* *Passer domesticus*—house sparrow

OLD WORLD WARBLERS & GNATCATCHERS

POLIOPTILIDAE—GNATCATCHERS

Polioptila caerulea—blue-gray gnatcatcher

PIGEONS & DOVES

COLUMBIDAE—PIGEONS & DOVES

Streptopelia decaocto—Eurasian collared-dove

* *Zenaida macroura*—mourning dove

ROADRUNNERS & CUCKOOS

CUCULIDAE—CUCKOOS, ROADRUNNERS, & ANIS

Geococcyx californianus—greater roadrunner

SILKY FLYCATCHERS

PTILOGONATIDAE—SILKY-FLYCATCHERS

Phainopepla nitens—phainopepla

STARLINGS & ALLIES

STURNIDAE—STARLINGS

* *Sturnus vulgaris*—European starling

SWALLOWS

HIRUNDINIDAE—SWALLOWS

Petrochelidon pyrrhonota—cliff swallow

Stelgidopteryx serripennis—northern rough-winged swallow

Tachycineta thalassina—violet-green swallow

SWIFTS

APODIDAE—SWIFTS

Aeronautes saxatalis—white-throated swift

WOODPECKERS

PICIDAE—WOODPECKERS & ALLIES

Colaptes auratus—northern flicker

Dryobates nuttallii—Nuttall's woodpecker

Melanerpes formicivorus—acorn woodpecker

WRENS

TROGLODYTIDAE—WRENS

Catherpes mexicanus—canyon wren
Thryomanes bewickii—Bewick's wren
Troglodytes aedon—house wren

NEW WORLD SPARROWS

PASSERELLIDAE—NEW WORLD SPARROWS

Aimophila ruficeps—rufous-crowned sparrow
Melospiza melodia—song sparrow
Melozone crissalis—California towhee
Pipilo maculatus—spotted towhee

TYPICAL WARBLERS, PARROTBILLS, WRENTIT

SYLVIIDAE—SYLVIID WARBLERS

Chamaea fasciata—wrentit

INVERTEBRATES

BUTTERFLIES

LYCAENIDAE—BLUES, HAIRSTREAKS, & COPPERS

Icaricia acmon acmon—Acmon blue

HESPERIIDAE—SKIPPERS

Erynnis funeralis—funereal duskywing

PIERIDAE—WHITES & SULFURS

Pieris rapae—cabbage white
Pontia protodice—checkered white

MAMMALS

CANIDS

CANIDAE—WOLVES & FOXES

Canis latrans—coyote

CATS

FELIDAE—CATS

Lynx rufus—bobcat

HARES & RABBITS

LEPORIDAE—HARES & RABBITS

Sylvilagus audubonii—desert cottontail

Sylvilagus bachmani—brush rabbit

KANGAROO RATS

HETEROMYDIAE—POCKET MICE & KANGAROO RATS

Dipodomsy sp.—kangaroo rat

POCKET GOPHERS

GEOMYIDAE—POCKET GOPHERS

Thomomys bottae—Botta's pocket gopher

SQUIRRELS

SCIURIDAE—SQUIRRELS

Spermophilus (Otospermophilus) beecheyi—California ground squirrel

UNGULATES

CERVIDAE—DEERS

Odocoileus hemionus—mule deer

REPTILES

LIZARDS

PHRYNOSOMATIDAE—IGUANID LIZARDS

Sceloporus occidentalis—western fence lizard

Uta stansburiana—common side-blotched lizard

* *Indicates non-native species*

Attachment B

Photo Documentation

Photo 1. California sagebrush scrub along the Off-Site Water Tanks. Photo oriented south. June 29, 2020.

Photo 2. California sagebrush – California buckwheat scrub along the southern portion of the On-Site Survey Area. Photo oriented southwest. June 29, 2020.

Photo 3. Purple sage scrub along the central portion of the On-Site Survey Area. Photo oriented southwest. June 29, 2020.

Photo 4. California sagebrush – California buckwheat scrub (CSB-CB) along the central portion of the On-Site Survey Area (foreground); patches of CSB-CB on hills visible in the northern portion of the Survey Area (background). Photo oriented northwest. June 29, 2020.

Appendix F

Plant Species Compendium

Eudicots

ADOXACEAE—MUSKROOT FAMILY

Sambucus nigra ssp. *caerulea*—blue elderberry

AMARANTHACEAE—AMARANTH FAMILY

Amaranthus blitoides—mat amaranth

ANACARDIACEAE—SUMAC OR CASHEW FAMILY

Rhus aromatica—basket bush

Rhus ovata—sugarbush

* *Schinus molle*—Peruvian peppertree

Toxicodendron diversilobum—poison oak

APIACEAE—CARROT FAMILY

Apiastrum angustifolium—mock parsley

Daucus pusillus—American wild carrot

Lomatium utriculatum—common lomatium

APOCYNACEAE—DOGBANE FAMILY

Asclepias californica—California milkweed

Asclepias fascicularis—Mexican whorled milkweed

ASTERACEAE—SUNFLOWER FAMILY

Acourtia microcephala—sacapellote

Ambrosia acanthicarpa—flatspine bur ragweed

Artemisia californica—California sagebrush

Artemisia dracunculus—wild tarragon

Baccharis pilularis—coyote brush

Baccharis salicifolia ssp. *salicifolia*—mulefat

Brickellia nevinii—Nevin's brickellbush

* *Carduus pycnocephalus* ssp. *pycnocephalus*—Italian plumeless thistle

* *Centaurea benedicta*—blessed thistle

* *Centaurea melitensis*—Maltese star-thistle

Chaenactis glabriuscula var. *glabriuscula*—yellow pincushion

Corethrogyne filaginifolia—sand-aster

Deinandra fasciculata—clustered tarweed

Encelia californica—California brittle bush

Encelia farinosa—brittle bush

Ericameria palmeri var. *pachylepis*—Palmer's rabbitbrush

Ericameria pinifolia—pinebush

* *Erigeron bonariensis*—asthmaweed
Erigeron canadensis—Canadian horseweed
Erigeron foliosus var. *foliosus*—leafy fleabane
Eriophyllum confertiflorum var. *confertiflorum*—golden-yarrow
Hazardia squarrosa var. *grindelioides*—sawtooth bristleweed
Helianthus gracilentus—slender sunflower
Heterotheca grandiflora—telegraphweed
Heterotheca sessiliflora ssp. *echioides*—sessileflower false goldenaster
* *Hypochaeris glabra*—smooth cat's ear
Isocoma menziesii var. *menziesii*—Menzies' goldenbush
* *Lactuca serriola*—prickly lettuce
Lasthenia californica ssp. *californica*—California goldfields
Leptosyne bigelovii—Bigelow's tickseed
Logfia filaginoides—California cottonrose
* *Logfia gallica*—narrowleaf cottonrose
Malacothrix coulteri—snake's head
Malacothrix saxatilis var. *tenuifolia*—cliff desertdandelion
Pseudognaphalium californicum—ladies' tobacco
Pseudognaphalium microcephalum—Wright's cudweed
Rafinesquia californica—California plumeseed
* *Senecio vulgaris*—old-man-in-the-Spring
* *Silybum marianum*—blessed milkthistle
* *Sonchus oleraceus*—common sowthistle
Stephanomeria exigua—small wirelettuce
Stephanomeria pauciflora—brownplume wirelettuce
Stephanomeria virgata ssp. *virgata*—rod wirelettuce
Stylocline gnaphaloides—mountain neststraw
Uropappus lindleyi—Lindley's silverpuffs

BIGNONIACEAE—BIGNONIA FAMILY

* *Catalpa speciosa*—northern catalpa

BORAGINACEAE—BORAGE FAMILY

Amsinckia intermedia—common fiddleneck
Amsinckia menziesii—Menzies' fiddleneck
Amsinckia tessellata var. *tessellata*—bristly fiddleneck
Cryptantha intermedia var. *intermedia*—Clearwater cryptantha
Cryptantha muricata var. *muricata*—pointed cryptantha
Eucrypta chrysanthemifolia var. *chrysanthemifolia*—spotted hideseed
Pectocarya linearis ssp. *ferocula*—sagebrush combseed

Phacelia distans—distant phacelia
Phacelia hastata var. *hastata*—silverleaf phacelia
Phacelia imbricata var. *patula*—imbricate phacelia
Phacelia ramosissima—branching phacelia
Phacelia viscida var. *viscida*—tacky phacelia
Plagiobothrys canescens var. *canescens*—valley popcornflower

BRASSICACEAE—MUSTARD FAMILY

* *Brassica nigra*—black mustard
Erysimum capitatum—sanddune wallflower
* *Hirschfeldia incana*—shortpod mustard
* *Sisymbrium irio*—London rocket
* *Sisymbrium orientale*—Indian hedgemustard
Thysanocarpus laciniatus—mountain fringepod

CACTACEAE—CACTUS FAMILY

Opuntia basilaris var. *basilaris*—beavertail pricklypear
Opuntia littoralis—coast prickly pear

CAPRIFOLIACEAE—HONEYSUCKLE FAMILY

Lonicera interrupta—chaparral honeysuckle

CHENOPODIACEAE—GOOSEFOOT FAMILY

* *Atriplex semibaccata*—Australian saltbush
* *Chenopodium album*—lambsquarters
Chenopodium californicum—California goosefoot
* *Chenopodium murale*—nettleleaf goosefoot
Salicornia bigelovii—dwarf saltwort
* *Salsola australis*—Russian thistle
* *Salsola tragus*—prickly Russian thistle

CONVOLVULACEAE—MORNING-GLORY FAMILY

Calystegia macrostegia—island false bindweed
Calystegia peirsonii—Peirson's morning-glory
* *Convolvulus arvensis*—field bindweed
Cuscuta californica var. *californica*—chaparral dodder

CRASSULACEAE—STONECROP FAMILY

Crassula connata—sand pygmyweed
Dudleya lanceolata—lanceleaf liveforever

CUCURBITACEAE—GOURD FAMILY

Marah macrocarpa—Cucamonga manroot

EUPHORBIACEAE—SPURGE FAMILY

Croton setiger—dove weed
Euphorbia albomarginata—whitemargin sandmat
Stillingia linearifolia—queen's root

FABACEAE—LEGUME FAMILY

Acmispon americanus var. *americanus*—American bird's-foot trefoil
Acmispon glaber—deer weed
Acmispon maritimus—coastal bird's-foot trefoil
Acmispon strigosus—strigose bird's-foot trefoil
Astragalus didymocarpus var. *didymocarpus*—dwarf white milkvetch
* *Gleditsia triacanthos*—honeylocust
Lupinus albifrons—silver bush lupine
Lupinus bicolor—miniature lupine
Lupinus excubitus var. *hallii*—Hall's bush lupine
Lupinus formosus var. *formosus*—summer lupine
Lupinus hirsutissimus—stinging annual lupine
Lupinus microcarpus var. *densiflorus*—whitewhorl lupine
Lupinus microcarpus var. *microcarpus*—valley lupine
Lupinus sparsiflorus—Coulter's lupine
Lupinus succulentus—hollowleaf annual lupine
Lupinus truncatus—collared annual lupine
* *Medicago polymorpha*—burclover
* *Melilotus indicus*—annual yellow sweetclover
* *Spartium junceum*—Spanish broom
Trifolium albopurpureum—rancheria clover
Trifolium ciliolatum—foothill clover

FAGACEAE—OAK FAMILY

Quercus agrifolia—coast live oak
Quercus berberidifolia—Inland scrub oak
Quercus lobata—valley oak

GERANIACEAE—GERANIUM FAMILY

* *Erodium botrys*—longbeak stork's bill
* *Erodium cicutarium*—redstem stork's bill
* *Geranium dissectum*—cutleaf geranium

JUGLANDACEAE—WALNUT FAMILY

Juglans californica—Southern California black walnut

LAMIACEAE—MINT FAMILY

* *Marrubium vulgare*—horehound

Monardella breweri ssp. *breweri*—Brewer's monardella

Salvia apiana—white sage

Salvia columbariae—chia

Salvia leucophylla—purple sage

Salvia mellifera—black sage

Trichostema lanceolatum—vinegarweed

LYTHRACEAE—LOOSESTRIFE FAMILY

* *Punica granatum*—pomegranate

MALVACEAE—MALLOW FAMILY

Malacothamnus fasciculatus—bush mallow

* *Malva parviflora*—cheeseweed mallow

MONTIACEAE—MONTIA FAMILY

Calandrinia menziesii—red maids

Claytonia perfoliata—miner's lettuce

MYRSINACEAE—MYRSINE FAMILY

* *Lysimachia arvensis*—scarlet pimpernel

MYRTACEAE—MYRTLE FAMILY

* *Eucalyptus camaldulensis*—river redgum

NYCTAGINACEAE—FOUR O'CLOCK FAMILY

Mirabilis laevis var. *crassifolia*—California four o'clock

OLEACEAE—OLIVE FAMILY

Fraxinus velutina—velvet ash

ONAGRACEAE—EVENING PRIMROSE FAMILY

Camissonia campestris ssp. *campestris*—Mojave suncup

Camissoniopsis bisorta—southern suncup

Camissoniopsis hirtella—Santa Cruz Island suncup

Camissoniopsis micrantha—miniature suncup

Clarkia cylindrica—speckled clarkia

Clarkia purpurea ssp. *quadrivulnera*—winecup clarkia

Clarkia unguiculata—elegant clarkia
Epilobium canum ssp. *canum*—hummingbird trumpet
Eulobus californicus—California suncup

OROBANCHACEAE—BROOM-RAPE FAMILY

Castilleja affinis ssp. *affinis*—coast Indian paintbrush
Castilleja exserta ssp. *exserta*—exserted Indian paintbrush

PAPAVERACEAE—POPPY FAMILY

Eschscholzia californica—California poppy

PHRYMACEAE—LOPSEED FAMILY

Diplacus aurantiacus—bush monkeyflower

PLANTAGINACEAE—PLANTAIN FAMILY

Antirrhinum coulterianum—Coulter's snapdragon
Collinsia heterophylla var. *heterophylla*—purple Chinese houses
Keckiella cordifolia—heartleaf keckiella
Plantago erecta—dwarf plantain

PLATANACEAE—PLANE TREE, SYCAMORE FAMILY

Platanus racemosa—California sycamore

POLEMONIACEAE—PHLOX FAMILY

Gilia angelensis—chaparral gilia
Gilia capitata ssp. *abrotanifolia*—bluehead gilia
Leptosiphon parviflorus—variable linanthus

POLYGONACEAE—BUCKWHEAT FAMILY

Chorizanthe staticoides—Turkish rugging
Eriogonum angulosum—anglestem buckwheat
Eriogonum elongatum var. *elongatum*—longstem buckwheat
Eriogonum fasciculatum var. *foliolosum*—California buckwheat
Eriogonum gracile var. *gracile*—slender woolly buckwheat
Pterostegia drymarioides—woodland pterostegia
* *Rumex crispus*—curly dock

RANUNCULACEAE—BUTTERCUP FAMILY

Delphinium parryi ssp. *parryi*—San Bernardino larkspur

RHAMNACEAE—BUCKTHORN FAMILY

Rhamnus crocea—redberry buckthorn

Rhamnus ilicifolia—hollyleaf redberry

ROSACEAE—ROSE FAMILY

Adenostoma fasciculatum—chamise
Heteromeles arbutifolia—toyon

RUBIACEAE—MADDER FAMILY

Galium angustifolium ssp. *angustifolium*—narrowleaf bedstraw
Galium aparine—stickywilly

SALICACEAE—WILLOW FAMILY

Populus fremontii ssp. *fremontii*—Fremont cottonwood
Salix laevigata—red willow
Salix lasiolepis—arroyo willow

SAPINDACEAE—SOAPBERRY FAMILY

Acer negundo—box-elder

SIMAROUBACEAE—QUASSIA OR SIMAROUBA FAMILY

* *Ailanthus altissima*—tree of heaven

SOLANACEAE—NIGHTSHADE FAMILY

Datura wrightii—sacred thorn-apple
* *Nicotiana glauca*—tree tobacco
* *Solanum xanti*—Purple nightshade

ULMACEAE—ELM FAMILY

* *Ulmus parvifolia*—Chinese elm

Ferns and Fern Allies

PTERIDACEAE—BRAKE FAMILY

Pellaea andromedifolia—coffee cliffbrake

SELAGINELLACEAE—SPIKE-MOSS FAMILY

Selaginella bigelovii—bushy spikemoss

Monocots

AGAVACEAE—AGAVE FAMILY

Hesperoyucca whipplei—chaparral yucca

LILIACEAE—LILY FAMILY

Calochortus clavatus var. *gracilis*—slender mariposa lily

POACEAE—GRASS FAMILY

* *Arundo donax*—giant reed
* *Avena barbata*—slender oat
* *Avena fatua*—wild oat
* *Bromus diandrus*—ripgut brome
* *Bromus hordeaceus*—soft brome
* *Bromus madritensis*—compact brome
* *Bromus rubens*—red brome
* *Bromus tectorum*—cheatgrass
* *Cynodon dactylon*—Bermudagrass
Elymus condensatus—giant wild rye
Elymus glaucus—blue wildrye
Elymus triticoides—creeping ryegrass
* *Festuca myuros*—rat-tail fescue
* *Hordeum murinum*—mouse barley
Melica imperfecta—smallflower melicgrass
Muhlenbergia microsperma—littleseed muhly
* *Poa annua*—annual bluegrass
Poa secunda—onesided bluegrass
* *Schismus arabicus*—Arabian schismus
* *Schismus barbatus*—common Mediterranean grass
Stipa cernua—nodding needlegrass
Stipa coronata—giant ricegrass
Stipa lepida—foothill needlegrass
* *Stipa miliacea* var. *miliacea*—smilograss
Stipa pulchra—purple needlegrass
* *Triticum aestivum*—common wheat

THEMIDACEAE—BRODIAEA FAMILY

Bloomeria crocea var. *crocea*—common goldenstar
Dichelostemma capitatum ssp. *capitatum*—bluedicks

* signifies introduced (non-native) species

Appendix G

Wildlife Species Compendium

Birds

Blackbirds, Orioles and Allies

ICTERIDAE—BLACKBIRDS

Icterus cucullatus—hooded oriole
Sturnella neglecta—western meadowlark

Bushtits

AEGITHALIDAE—LONG-TAILED TITS AND BUSHTITS

Psaltriparus minimus—bushtit

Cardinals, Grosebeaks and Allies

CARDINALIDAE—CARDINALS AND ALLIES

Passerina amoena—lazuli bunting
Piranga ludoviciana—western tanager

Falcons

FALCONIDAE—CARACARAS AND FALCONS

Falco sparverius—American kestrel

Finches

FRINGILLIDAE—FRINGILLINE & CARDUELINE FINCHES AND ALLIES

Haemorhous mexicanus—house finch
Spinus psaltria—lesser goldfinch
Spinus tristis—American goldfinch

Flycatchers

TYRANNIDAE—TYRANT FLYCATCHERS

Empidonax difficilis—Pacific-slope flycatcher
Myiarchus cinerascens—ash-throated flycatcher
Sayornis nigricans—black phoebe
Sayornis saya—Say's phoebe
Tyrannus verticalis—western kingbird
Tyrannus vociferans—Cassin's kingbird

Hawks

ACCIPITRIDAE—HAWKS, KITES, EAGLES, AND ALLIES

Accipiter cooperii—Cooper's hawk
Accipiter striatus—sharp-shinned hawk
Buteo jamaicensis—red-tailed hawk

Hummingbirds

TROCHILIDAE—HUMMINGBIRDS

Calypte anna—Anna's hummingbird
Calypte costae—Costa's hummingbird
Selasphorus sasin—Allen's hummingbird

Jays, Magpies and Crows

CORVIDAE—CROWS AND JAYS

Aphelocoma californica—California scrub-jay
Corvus brachyrhynchos—American crow
Corvus corax—common raven

Mockingbirds and Thrashers

MIMIDAE—MOCKINGBIRDS AND THRASHERS

Mimus polyglottos—northern mockingbird
Toxostoma redivivum—California thrasher

New World Quail

ODONTOPHORIDAE—NEW WORLD QUAIL

Callipepla californica—California quail

New World Vultures

CATHARTIDAE—NEW WORLD VULTURES

Cathartes aura—turkey vulture

Old World Sparrows

PASSERIDAE—OLD WORLD SPARROWS

* Passer domesticus—house sparrow

Old World Warblers and Gnatcatchers

POLIOPTILIDAE—GNATCATCHERS

Polioptila caerulea—blue-gray gnatcatcher

Owls

STRIGIDAE—TYPICAL OWLS

Bubo virginianus—great horned owl

Pigeons and Doves

COLUMBIDAE—PIGEONS AND DOVES

* Streptopelia decaocto—Eurasian collared-dove

Zenaida macroura—mourning dove

Roadrunners and Cuckoos

CUCULIDAE—CUCKOOS, ROADRUNNERS, AND ANIS

Geococcyx californianus—greater roadrunner

Shorebirds

CHARADRIIDAE—LAPWINGS AND PLOVERS

Charadrius vociferus—killdeer

Silky Flycatchers

PTILOGONATIDAE—SILKY-FLYCATCHERS

Phainopepla nitens—phainopepla

Starlings and Allies

STURNIDAE—STARLINGS

* Sturnus vulgaris—European starling

Swallows

HIRUNDINIDAE—SWALLOWS

Petrochelidon pyrrhonota—cliff swallow

Stelgidopteryx serripennis—northern rough-winged swallow

Tachycineta thalassina—violet-green swallow

Swifts

APODIDAE—SWIFTS

Aeronautes saxatalis—white-throated swift
Chaetura vauxi—Vaux's swift

Titmice

PARIDAE—CHICKADEES AND TITMICE

Baeolophus inornatus—oak titmouse

Waterfowl

ANATIDAE—DUCKS, GEESE, AND SWANS

Branta canadensis—Canada goose

Wood Warblers and Allies

PARULIDAE—WOOD-WARBLERS

Cardellina pusilla—Wilson's warbler
Setophaga townsendi—Townsend's warbler
Leiothlypis celata—orange-crowned warbler

Woodpeckers

PICIDAE—WOODPECKERS AND ALLIES

Colaptes auratus—northern flicker
Dryobates nuttallii—Nuttall's woodpecker
Dryobates pubescens—downy woodpecker
Melanerpes formicivorus—acorn woodpecker

Wrens

TROGLODYTIDAE—WRENS

Catherpes mexicanus—canyon wren
Thryomanes bewickii—Bewick's wren
Troglodytes aedon—house wren

New World Sparrows

PASSERELLIDAE—NEW WORLD SPARROWS

Aimophila ruficeps—rufous-crowned sparrow
Melospiza melodia—song sparrow
Melozone crissalis—California towhee
Passerculus sandwichensis—savannah sparrow
Pipilo maculatus—spotted towhee
Zonotrichia leucophrys—white-crowned sparrow

Typical Warblers, Parrotbills, Wrentit

SYLVIIDAE—SYLVIID WARBLERS

Chamaea fasciata—wrentit

TURDIDAE—THRUSHES

Sialia mexicana—western bluebird

Invertebrates

Butterflies

LYCAENIDAE—BLUES, HAIRSTREAKS, AND COPPERS

Icaricia acmon acmon—Acmon blue

HESPERIIDAE—SKIPPERS

Erynnis funeralis—funereal duskywing

PIERIDAE—WHITES AND SULFURS

Pieris rapae—cabbage white
Pontia protodice—checkered white

Mammals

Canids

CANIDAE—WOLVES AND FOXES

Canis latrans—coyote

Cats

FELIDAE—CATS

Lynx rufus—bobcat

Hares and Rabbits

LEPORIDAE—HARES AND RABBITS

Sylvilagus audubonii—desert cottontail

Sylvilagus bachmani—brush rabbit

Kangaroo Rats

HETEROMYDIAE—POCKET MICE AND KANGAROO RATS

Dipodomys sp.—kangaroo rat

Pocket Gophers

GEOMYIDAE—POCKET GOPHERS

Thomomys bottae—Botta's pocket gopher

Squirrels

SCIURIDAE—SQUIRRELS

Spermophilus (*Otospermophilus*) *beecheyi*—California ground squirrel

Ungulates

CERVIDAE—DEERS

Odocoileus hemionus—mule deer

Reptiles

Lizards

PHRYNOSOMATIDAE—IGUANID LIZARDS

Sceloporus occidentalis—western fence lizard

Uta stansburiana—common side-blotched lizard

TEIIDAE—WHIPTAIL LIZARDS

Aspidoscelis tigris stejnegeri—San Diegan tiger whiptail

* signifies introduced (non-native) species

Appendix H

Site Photographs

Photograph 1. View of the southwestern portion of the Project site, facing south.

Photograph 2. View of the central portion of the Project site, facing north.

Photograph 3. View of the northwestern portion of the Project site, facing west.

Photograph 4. View of the northwestern portion of the Project site, facing south.

Photograph 5. View of the northwestern portion of the Project site, facing east.

Photograph 6. View of the northwestern portion of the Project site, facing southeast.

Photograph 7. Slender mariposa lily (*Calochortus clavatus* var. *gracilis*) within the Project site.

Photograph 8. View of the north-central portion of the Project site, facing west.

Photograph 9. View of the southeastern portion of the Project site, facing southwest.	**Photograph 10.** View of the southeastern portion of the Project site, south of Del Valle Road, facing west.
Photograph 11. Preservation area immediately east of Hunstock Street, facing east.	**Photograph 12.** View of the preservation area, facing west.

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Appendix I

Special-Status Plant Species Not Expected or With a Low Potential to Occur on the Project Site

APPENDIX I
Special-Status Plant Species Not Expected or With a Low Potential to Occur on the Project Site

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Acanthoscyphus parishii var. *parishii*	Parish's oxytheca	None/None/4.2	Chaparral, Lower montane coniferous forest; sandy or gravelly/annual herb/June–Sep/4,000–8,530	Not expected to occur. The Project site is outside of the known elevation range for this species.
Allium howellii var. *clokeyi*	Mt. Pinos onion	None/None/1B.3	Great Basin scrub, Meadows and seeps (edges), Pinyon and juniper woodland/perennial bulbiferous herb/Apr–June/4,265–6,070	Not expected to occur. The Project site is outside of the known elevation range for this species.
Astragalus brauntonii	Braunton's milk-vetch	FE/None/1B.1	Chaparral, Coastal scrub, Valley and foothill grassland; recent burns or disturbed areas, usually sandstone with carbonate layers/perennial herb/Jan–Aug/10–2,100	Absent. Suitable vegetation is present for this species within the Project site; however, sandstone substrate is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Berberis nevinii	Nevin's barberry	FE/SE/1B.1	Chaparral, Cismontane woodland, Coastal scrub, Riparian scrub; sandy or gravelly/perennial evergreen shrub/(Feb)Mar–June/225–2,705	Absent. Suitable vegetation is present for this species within the Project site. This perennial shrub would have been identified during the 2014, 2017, and 2020 botanical and focused rare plant surveys.
California macrophylla	round-leaved filaree	None/None/1B.2	Cismontane woodland, Valley and foothill grassland; clay/annual herb/Mar–May/45–3,935	Absent. Suitable vegetation is present for this species within the Project site; however, clay substrate is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Calochortus catalinae	Catalina mariposa lily	None/None/4.2	Chaparral, Cismontane woodland, Coastal scrub, Valley and foothill grassland/perennial bulbiferous herb/(Feb)Mar–June/45–2,295	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Calochortus clavatus var. *clavatus*	club-haired mariposa lily	None/None/4.3	Chaparral, Cismontane woodland, Coastal scrub, Valley and foothill grassland; usually serpentinite, clay, rocky/perennial bulbiferous herb/(Mar)May–June/98–4,265	Absent. Suitable vegetation is present for this species within the Project site; however, serpentine substrate is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Calochortus fimbriatus	late-flowered mariposa lily	None/None/1B.3	Chaparral, Cismontane woodland, Riparian woodland; often serpentinite/perennial bulbiferous herb/June–Aug/900–6,250	Absent. Suitable vegetation is present for this species within the Project site; however, serpentine substrate is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Calochortus plummerae	Plummer's mariposa lily	None/None/4.2	Chaparral, Cismontane woodland, Coastal scrub, Lower montane coniferous forest, Valley and foothill grassland; granitic, rocky/perennial bulbiferous herb/May–July/325–5,575	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Castilleja gleasoni	Mt. Gleason paintbrush	None/SR/1B.2	Chaparral, Lower montane coniferous forest, Pinyon and juniper woodland; granitic/perennial herb (hemiparasitic)/May–June(Sep)/3,805–7,120	Not expected to occur. The Project site is outside of the known elevation range for this species.
Cercocarpus betuloides var. *blancheae*	island mountain-mahogany	None/None/4.3	Closed-cone coniferous forest, Chaparral/perennial evergreen shrub/Feb–May/95–1,970	Absent. Suitable vegetation is present for this species within the Project site. This perennial shrub would have been identified during the 2014, 2017, and 2020 botanical and focused rare plant surveys.
Chorizanthe parryi var. *Fernandina*	San Fernando Valley spineflower	FC/SE/1B.1	Coastal scrub (sandy), Valley and foothill grassland/annual herb/Apr–July/490–4,005	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Clarkia exilis	slender clarkia	None/None/4.3	Cismontane woodland/annual herb/Apr–May/390–3,280	Not expected to occur. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Clinopodium mimuloides	monkey-flower savory	None/None/4.2	Chaparral, North Coast coniferous forest; streambanks, mesic/perennial herb/June–Oct/1,000–5,905	Not expected to occur. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Convolvulus simulans	small-flowered morning-glory	None/None/4.2	Chaparral (openings), Coastal scrub, Valley and foothill grassland; clay, serpentinite seeps/annual herb/Mar–July/95–2,430	Absent. Suitable vegetation is present for this species within the Project site; however, serpentine seep habitat is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Deinandra minthornii	Santa Susana tarplant	None/SR/1B.2	Chaparral, Coastal scrub; rocky/perennial deciduous shrub/July–Nov/915–2,495	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Deinandra paniculata	paniculate tarplant	None/None/4.2	Coastal scrub, Valley and foothill grassland, Vernal pools; usually vernally mesic, sometimes sandy/annual herb/(Mar)Apr–Nov/80–3,085	Absent. Suitable vegetation is present for this species within the Project site; however, vernal pool habitat is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Delphinium parryi ssp. *purpureum*	Mt. Pinos larkspur	None/None/4.3	Chaparral, Mojavean desert scrub, Pinyon and juniper woodland/perennial herb/May–June/3,280–8,530	Not expected to occur. The Project site is outside of the known elevation range for this species.
Dodecahema leptoceras	slender-horned spineflower	FE/SE/1B.1	Chaparral, Cismontane woodland, Coastal scrub (alluvial fan); sandy/annual herb/Apr–June/655–2,495	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Dudleya parva	Conejo dudleya	FT/None/1B.2	Coastal scrub, Valley and foothill grassland; rocky or gravelly, clay or volcanic/perennial herb/May–June/195–1,475	Absent. Suitable vegetation is present for this species within the Project site; however, clay/ volcanic substrate is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Galium grande	San Gabriel bedstraw	None/None/1B.2	Broadleafed upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest/perennial deciduous shrub/Jan–July/1,390–4,920	Not expected to occur. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Harpagonella palmeri	Palmer's grapplinghook	None/None/4.2	Chaparral, Coastal scrub, Valley and foothill grassland; Clay; open grassy areas within shrubland/annual herb/Mar–May/65–3,135	Absent. Suitable vegetation is present for this species within the Project site; however, clay substrate is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Helianthus inexpectatus	Newhall sunflower	None/None/1B.1	Marshes and swamps, Riparian woodland; freshwater, seeps/perennial rhizomatous herb/Aug–Oct/1,000–1,000	Not expected to occur. No suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed outside of the species blooming period; however, vegetative growth of this species would have been observed, if present.
Helianthus nuttallii ssp. *parishii*	Los Angeles sunflower	None/None/1A	Marshes and swamps (coastal salt and freshwater)/perennial rhizomatous herb/Aug–Oct/30–5,005	Not expected to occur. No suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed outside of the species blooming period; however, vegetative growth of this species would have been observed, if present. Species is presumed to be extirpated in the vicinity.
Hordeum intercedens	vernal barley	None/None/3.2	Coastal dunes, Coastal scrub, Valley and foothill grassland (saline flats and depressions), Vernal pools/annual herb/Mar–June/15–3,280	Absent. Suitable vegetation is present for this species within the Project site; however, vernal pool habitat is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Horkelia cuneata var. *puberula*	mesa horkelia	None/None/1B.1	Chaparral (maritime), Cismontane woodland, Coastal scrub; sandy or gravelly/perennial herb/Feb–July(Sep)/225–2,655	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Lepechinia fragrans	fragrant pitcher sage	None/None/4.2	Chaparral/perennial shrub/Mar–Oct/65–4,300	Not expected to occur. Suitable vegetation is present for this species within the Project site. This perennial shrub would have been identified during the 2014, 2017, and 2020 botanical and focused rare plant surveys, which were timed during the species blooming period.

Scientific Name	Common Name	Status (Federal/State/CRPR)	Primary Habitat Associations/ Life Form/ Blooming Period/ Elevation Range (feet)	Potential to Occur
Lepechinia rossii	Ross' pitcher sage	None/None/1B.2	Chaparral/perennial shrub/May–Sep/1,000–2,590	Not expected to occur. Suitable vegetation is present for this species within the Project site. This perennial shrub would have been identified during the 2014, 2017, and 2020 botanical and focused rare plant surveys, which were timed during the species blooming period.
Lilium humboldtii ssp. *ocellatum*	ocellated Humboldt lily	None/None/4.2	Chaparral, Cismontane woodland, Coastal scrub, Lower montane coniferous forest, Riparian woodland; openings/perennial bulbiferous herb/Mar–July(Aug)/95–5,905	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Lupinus paynei	Payne's bush lupine	None/None/3.1	Coastal scrub, Riparian scrub, Valley and foothill grassland; Sandy/perennial shrub/Mar–Apr(May–July)/720–1,380	Absent. Suitable vegetation is present for this species within the Project site. This perennial shrub would have been identified during the 2014, 2017, and 2020 botanical and focused rare plant surveys, which were timed during the species blooming period.
Monardella linoides ssp. *oblonga*	Tehachapi monardella	None/None/1B.3	Lower montane coniferous forest, Pinyon and juniper woodland, Upper montane coniferous forest/perennial rhizomatous herb/(May)June–Aug/2,950–8,105	Not expected to occur. The Project site is outside of the known elevation range for this species.
Navarretia ojaiensis	Ojai navarretia	None/None/1B.1	Chaparral (openings), Coastal scrub (openings), Valley and foothill grassland/annual herb/May–July/900–2,035	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020were timed during the species blooming period and the species would have been identified, if present.
Opuntia basilaris var. *brachyclada*	short-joint beavertail	None/None/1B.2	Chaparral, Joshua tree woodland, Mojavean desert scrub, Pinyon and juniper woodland/perennial stem succulent/Apr–June(Aug)/1,390–5,905	Absent. Suitable vegetation is present for this species within the Project site. This perennial stem succulent would have been identified during the 2014, 2017, and 2020 botanical and focused rare plant surveys, which were timed during the species blooming period.
Orcuttia californica	California Orcutt grass	FE/SE/1B.1	Vernal pools/annual herb/Apr–Aug/45–2165	Not expected to occur. No suitable vernal pool habitat is present within the Project site.
Pentachaeta lyonii	Lyon's pentachaeta	FE/SE/1B.1	Chaparral (openings), Coastal scrub, Valley and foothill grassland; rocky, clay/annual herb/(Feb)Mar–Aug/95–2,265	Absent. Suitable vegetation is present for this species within the Project site; however, rocky/ clay substrate is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Phacelia hubbyi	Hubby's phacelia	None/None/4.2	Chaparral, Coastal scrub, Valley and foothill grassland; gravelly, rocky, talus/annual herb/Apr–July/0–3,280	Absent. Suitable vegetation is present for this species within the Project site; however, rocky/ talus habitat is absent. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Phacelia mohavensis	Mojave phacelia	None/None/4.3	Cismontane woodland, Lower montane coniferous forest, Meadows and seeps, Pinyon and juniper woodland; sandy or gravelly/annual herb/Apr–Aug/4,590–8,200	Not expected to occur. The Project site is outside of the known elevation range for this species.
Pseudognaphalium leucocephalum	white rabbit-tobacco	None/None/2B.2	Chaparral, Cismontane woodland, Coastal scrub, Riparian woodland; sandy, gravelly/perennial herb/(July)Aug–Nov(Dec)/0–6,890	Absent. Suitable vegetation is present for this species within the Project site; however, this species is more typically associated with sandy washes, which are not present within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Senecio aphanactis	chaparral ragwort	None/None/2B.2	Chaparral, Cismontane woodland, Coastal scrub; sometimes alkaline/annual herb/Jan–Apr(May)/45–2,625	Absent. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Stylocline masonii	Mason's neststraw	None/None/1B.1	Chenopod scrub, Pinyon and juniper woodland; sandy/annual herb/Mar–May/325–3,935	Not expected to occur. No suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.
Symphyotrichum greatae	Greata's aster	None/None/1B.3	Broadleafed upland forest, Chaparral, Cismontane woodland, Lower montane coniferous forest, Riparian woodland; mesic/perennial rhizomatous herb/June–Oct/980–6,595	Not expected to occur. Suitable vegetation is present for this species within the Project site. Botanical and focused rare plant surveys conducted in 2014, 2017, and 2020 were timed during the species blooming period and the species would have been identified, if present.

Notes:

CRPR – California Rare Plant Rank
1A – plants presumed extirpated in California and either rare or extinct elsewhere
1B – plants rare, threatened, or endangered in California and elsewhere
2A – plants presumed extirpated in California, but common elsewhere
2B – plants rare, threatened, or endangered in California, but more common elsewhere
3 – plants about which more information is needed – a review list
4 – plants of limited distribution – a watch list
0.1 – seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat)
0.2 – moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)
0.3 – not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known)
State Designations
SE – State Listed as Endangered
Federal Designations
FE – Federally Listed as Endangered

Appendix J

Special-Status Wildlife Species Not Expected or With a Low Potential to Occur on the Project Site

APPENDIX J
Special-Status Wildlife Species Not Expected or With a Low Potential to Occur on the Project Site

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
Invertebrates				
Bombus crotchii	Crotch bumble bee	None/None*	Open grassland and scrub communities supporting suitable floral resources.	Low potential for nesting, and low potential for foraging based on its current lack of status, lack of knowledge about the species, and generally wide distribution. The range for this species is very broad (southern half of California and includes locations from coast to desert; however, primarily thought to occur in the central valley [Xerces Society et al. 2018]).There is too little known about the species other than that listing proposal to conclude that it has more than a low chance of occurring. Suitable shrubland for nesting and floral resources occur on Project site.
Danaus plexippus	Monarch butterfly	None/None	Wind-protected tree groves with nectar sources and nearby water sources.	Not expected to occur. No suitable vegetation present.
Streptocephalus woottoni	Riverside fairy shrimp	FE/None	Vernal pools, non-vegetated ephemeral pools.	Not expected to occur. No suitable habitat present.
Fishes				
Catostomus santaanae	Santa Ana sucker	FT/None	Small, shallow, cool, clear streams less than 7 meters (23 feet) in width and a few centimeters to more than a meter (1.5 inches to more than 3 feet) in depth; substrates are generally coarse gravel, rubble, and boulder.	Not expected to occur. No suitable habitat present.
Gasterosteus aculeatus williamsoni	unarmored threespine stickleback	FE/SE, FP	Slow-moving and backwater areas.	Not expected to occur. No suitable habitat present.
Gila orcuttii	arroyo chub	None/CSC	Warm, fluctuating streams with slow-moving or backwater sections of warm to cool streams at depths >40 centimeters (16 inches); substrates of sand or mud.	Not expected to occur. No suitable habitat present.
Oncorhynchus mykiss irideus	steelhead rainbow trout (southern California ESU)	FE/CSC	Clean, clear, cool well-oxygenated streams. Needs relatively deep pools in migration and gravelly substrate to spawn.	Not expected to occur. The Project site is outside the known range for this species. This species is not known to occur above Piru Creek confluence in Ventura County.
Amphibians				
Anaxyrus californicus	arroyo toad	FE/CSC	Semi-arid areas near washes, sandy riverbanks, riparian areas, palm oasis, Joshua tree, mixed chaparral and sagebrush; stream channels for breeding (typically third order); adjacent stream terraces and uplands for foraging and wintering.	Not expected to occur. The Project site does not contain water sources to support this species. In addition, CNDDB records show this species over 2 miles from the Project site.
Rana boylii	foothill yellow-legged frog	None/CSC	Rocky streams and rivers with open banks in forest, chaparral, and woodland.	Not expected to occur. The Project site is outside the known range for this species.
Rana draytonii	California red-legged frog	FT/CSC	Lowland streams, wetlands, riparian woodlands, livestock ponds; dense, shrubby or emergent vegetation associated with deep, still or slow-moving water; uses adjacent uplands.	Not expected to occur. No suitable habitat is present on the Project Site.
Spea hammondii	western spadefoot	None/CSC	Primarily grassland and vernal pools, but also in ephemeral wetlands that persist at least 3 weeks in chaparral, coastal scrub, valley–foothill woodlands, pastures, and other agriculture.	Not expected to occur. Suitable vegetation is present; however, ephemeral ponds and vernal pools are absent within the BSA.
Taricha torosa (Monterey Co. south only)	California newt	None/CSC	Wet forests, oak forests, chaparral, and rolling grassland.	Not expected to occur. The Project site is outside the known range for this species.
Reptiles				
Actinemys marmorata	western pond turtle	None/CSC	Slow-moving permanent or intermittent streams, ponds, small lakes, and reservoirs with emergent basking sites; adjacent uplands used for nesting and during winter.	Not expected to occur. No suitable breeding or foraging on site due to lack of aquatic habitat.
Arizona elegans occidentalis	California glossy snake	None/CSC	Commonly occurs in desert regions throughout southern California. Also inhabits arid scrub, rocky washes, grasslands, and chaparral. Prefers open sandy areas with scattered brush. Also found in rocky areas.	Low potential to occur. However, the Project does contain suitable habitat for this species.
Salvadora hexalepis virgultea	coast patch-nosed snake	None/CSC	Brushy or shrubby vegetation; requires small mammal burrows for refuge and overwintering sites.	Low potential to occur. Site lacks suitable small mammal burrows required by this species.
Thamnophis hammondii	two-striped gartersnake	None/CSC	Streams, creeks, pools, streams with rocky beds, ponds, lakes, vernal pools.	Not expected to occur. No suitable habitat present.

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
		Birds		
Accipiter cooperii (nesting)	Cooper's hawk	None/WL	Nests and forages in dense stands of live oak, riparian woodlands, or other woodland habitats often near water.	Not expected to nest on site; however, the site provides suitable foraging for this species.
Agelaius tricolor (nesting colony)	tricolored blackbird	BCC/CSC	Nests near fresh water, emergent wetland with cattails or tules; forages in grasslands, woodland, agriculture.	Not expected to nest based on lack of suitable nesting habitat.
Ammodramus savannarum (nesting)	grasshopper sparrow	None/CSC	Dense, dry or well-drained annual and native grasslands with mix of grasses and forbs. May occur in fallow agricultural fields, especially those periodically planted in oats and barley.	Low potential to occur. Suitable nesting and foraging habitat is present; however, this species is not known to nest in the vicinity (Allen et al. 2016).
Artemisiospiza (Amphispiza) belli belli	Bell's sparrow	BCC/WL	Coastal scrub and chaparral.	Low potential to occur. The Project site provides suitable nesting and foraging habitat; however, this species is not known to nest in the vicinity (Allen et al. 2016).
Buteo swainsoni (nesting)	Swainson's hawk	BCC/ST	Nests in open woodland and savanna, riparian, and in isolated large trees; forages in nearby grasslands and agricultural areas such as wheat and alfalfa fields and pasture.	Not expected to occur. Outside nesting range for this species.
Calypte costae (nesting)	Costa's hummingbird	None/SA	Shrubs and arid habitats. Edges of desert riparian and valley foothill riparian, coastal scrub, desert scrub, desert succulent scrub, arid shrublands, lower elevation chaparral, and palm oasis.	Not expected to nest based on lack of suitable nesting habitat.
Coccyzus americanus occidentalis (nesting)	western yellow-billed cuckoo	FT, BCC/SE	Nests in dense, wide riparian woodlands and forest with well-developed understories.	Not expected to occur. No suitable nesting habitat on the Project Site.
Elanus leucurus (nesting)	white-tailed kite	None/FP	Nests in woodland, riparian, and individual trees near open lands; forages opportunistically in grassland, meadows, scrubs, agriculture, emergent wetland, savanna, and disturbed lands.	Low potential to occur. Nesting habitat present on site and the Project Site provides suitable foraging habitat.
Empidonax traillii extimus (nesting)	southwestern willow flycatcher	FE/SE	Riparian woodlands along streams and rivers with mature, dense stands of willows or alders; may nest in thickets dominated by tamarisk.	Not expected to nest based on lack of suitable nesting habitat.
Eremophila alpestris actia	California horned lark	None/WL	Nests and forages in grasslands, disturbed lands, agriculture, and beaches; nests in alpine fell fields of the Sierra Nevada.	Low potential to occur. Marginally suitable nesting and foraging habitat present on site. Grasslands present are densely vegetated and do not provide ideal nesting habitat for this species.
Falco mexicanus (nesting)	prairie falcon	BCC/WL	Forages in grassland, savanna, rangeland, agriculture, desert scrub, alpine meadows; nest on cliffs or bluffs.	Not expected to occur. No nesting habitat present on site; however, the Project Site provides suitable foraging habitat.
Icteria virens (nesting)	yellow-breasted chat	None/SSC	Nests and forages in dense, relatively wide riparian woodlands and thickets of willows, vine tangles, and dense brush.	Not expected to occur. No suitable habitat present on site.
Passerculus sandwichensis beldingi	Belding's savannah sparrow	None/SE	Nests and forages in coastal saltmarsh dominated by pickleweed (Salicornia spp.).	Not expected to occur. No suitable habitat present.
Pyrocephalus rubinus (nesting)	vermilion flycatcher	None/CSC	Breeding habitat includes riparian woodlands, riparian scrub, and freshwater marshes.	Not expected to nest based on lack of suitable nesting habitat.
Riparia riparia (nesting)	bank swallow	None/ST	Nests in riparian, lacustrine, and coastal areas with vertical banks, bluffs, and cliffs with sandy soils; open country and water during migration.	Not expected to occur. No suitable habitat present. Formerly known to breed in the region; however, the Project site is now outside the current known nesting range for this species.
Setophaga petechia (nesting)	yellow warbler	BCC/SSC	Nests and forages in riparian and oak woodlands, montane chaparral, open ponderosa pine, and mixed-conifer habitats.	Not expected to nest on site. However, the site provides suitable foraging habitat for this species. No nesting habitat present on site; however, this species can occur as a migrant through the region.
Spinus (Carduelis) lawrencei (nesting)	Lawrence's goldfinch	BCC/SA	Valley foothill hardwood, valley foothill hardwood-conifer; and, in S. CA., desert riparian, palm oasis, pinyon-juniper and lower montane habitats.	Not expected to nest based on lack of suitable nesting habitat.
Sternula antillarum browni (nesting colony)	California least tern	FE/SE, FP	Forages in shallow estuaries and lagoons; nests on sandy beaches or exposed tidal flats.	Not expected to occur. No suitable nesting or foraging on site.
Vireo bellii pusillus (nesting)	least Bell's vireo	FE/SE	Nests and forages in low, dense riparian thickets along water or along dry parts of intermittent streams; forages in riparian and adjacent shrubland late in nesting season.	Not expected to occur. No suitable nesting or foraging on site.

Scientific Name	Common Name	Status (Federal/State)	Habitat	Potential to Occur
		Mammals		
Antrozous pallidus	pallid bat	None/CSC	Grasslands, shrublands, woodlands, forests; most common in open, dry habitats with rocky outcrops for roosting, but also roosts in man-made structures and trees.	Low potential to occur. Low overall suitable roosting habitat on site.
Euderma maculatum	spotted bat	None/CSC	Foothills, mountains, desert regions of southern California, including arid deserts, grasslands, and mixed-conifer forests; roosts in rock crevices and cliffs; feeds over water and along washes.	Not expected to occur. No suitable roosting or foraging habitat present.
Eumops perotis californicus	western mastiff bat	None/CSC	Chaparral, coastal and desert scrub, coniferous and deciduous forest and woodland; roosts in crevices in rocky canyons and cliffs where the canyon or cliff is vertical or nearly vertical, trees, and tunnels,	Not expected to occur. No suitable roosting or foraging habitat present.
Macrotus californicus	Californian leaf-nosed bat	None/CSC	Riparian woodlands, desert wash, desert scrub; roosts in mines and caves, occasionally buildings.	Not expected to occur. No suitable roosting or foraging habitat present.
Nyctinomops macrotis	big free-tailed bat	None/CSC	Rocky areas; roosts in caves, holes in trees, buildings, and crevices on cliffs and rocky outcrops; forages over water.	Low potential to occur. Low overall suitable roosting habitat on site.

State
CSC - California Species of Special Concern
FP – Fully Protected
SE – California Endangered
SA – Special Animals List
ST – California Threatened
WL - Watch List

Federal
BCC – USFWS Bird of Conservation Concern
FE – Federally Endangered
FT – Federally Threatened

Notes
* A recent Sacramento Superior Court ruling, *Almond Alliance et al. v. California Fish and Game Commission* (Cases No.: 34-2019-80003216), decided that California Fish and Game Commission has no power to list insects per the language of the CESA and thus Crotch bumble bee has no CESA status.

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Appendix K

Wetland Delineation Data Forms and Ordinary High Water Mark Data Forms

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Sterling Estates City/County: Los Angeles Sampling Date: 10/10/16

Applicant/Owner: Sterling Ranch Estates State: CA Sampling Point: DS1

Investigator(s): R. McIntyre & H. Moine Section, Township, Range: Sec 10, T4N, R7W

Landform (hillslope, terrace, etc.): Valley / canyon bottom Local relief (concave, convex, none): Concave Slope (%): ~1-2

Subregion (LRR): C Lat: Long: Datum:

Soil Map Unit Name: Yolo Loam 2-9% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No Y	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes X	No ____	

Remarks: Riparian hydrology is present.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 5m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Populus fremontii	25	Y	FACW
2.			
3.			
4.			
	25 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. Baccharis pilularis	5	Y	N/L
2. Baccharis salicifolia	10	Y	FAC
3. Ribes aureum	2	N	FAC
4. Rhus trilobata	2	N	N/L
5.			
	19 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. Bromus diandrus	75	Y	N/L
2. Marrubium vulgare	1	N	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	76 = Total Cover		
Woody Vine Stratum (Plot size: 1m)			
1. N/A			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 24 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species 25	x 2 = 50
FAC species 12	x 3 = 36
FACU species 1	x 4 = 4
UPL species 82	x 5 = 410
Column Totals: 120 (A)	500 (B)

Prevalence Index = B/A = 4.16

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks: Bare ground is mostly crushed vegetation – appears that the area is used as a trail

SOIL

Sampling Point: DS1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 3/4	100	N/A				Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks: Surface covered by accumulation of woody (branches / debris)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- X Drift Deposits (B3) **(Riverine)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Riverine hydrology is present.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Sterling Estates City/County: Los Angeles Sampling Date: 10/10/16

Applicant/Owner: Sterling Ranch Estates State: CA Sampling Point: DS4

Investigator(s): R. McInnate & H. Moine Section, Township, Range: Sec 10, T4N, R17W

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): Flat Slope (%): ~1-2

Subregion (LRR): C Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: Saugus loam, 30-50% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	Is the Sampled Area within a Wetland? Yes ____ No ____
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes X	No ____	

Remarks:
Riverine hydrology indicators present.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 3m)	Absolute % Cover	Dominant Species?	Indicator Status
1. N/A			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 3 m)			
1. Ericameria palmeri	5	Y	N/L
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. Bromus madritensis	60	Y	UPL
2. Erodium cicutarium	15	N	N/L
3. Stipa pulchra	5	N	N/L
4. Hirschfeldia incana	1	N	N/L
5.			
6.			
7.			
8.			
	81 = Total Cover		
Woody Vine Stratum (Plot size: 1m)			
1. N/A			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 19 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species	86	x 5 = 430
Column Totals:	86 (A)	430 (B)

Prevalence Index = B/A = 5

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks:

SOIL

Sampling Point: DS4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	7.5YR4/6	100					Sandy loam	
3-4.5	7.5YR4/6	100					loamy sand	
4.5-12	7.5YR4/6	100					Sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- X Sediment Deposits (B2) **(Riverine)**
- X Drift Deposits (B3) **(Riverine)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Water flows off of the paved road & sheets over the landscape. DS4 is at the beginning of where the feature coalesces into a discernable channel. Channel is weakly formed. The water source may be from a buried pipe under Del Valle Rd that caused road scour.

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Sterling Estates City/County: Los Angeles Sampling Date: 10/18/16

Applicant/Owner: Sterling Ranch Estates State: CA Sampling Point: DS 5

Investigator(s): R. McInnis & H. Moine Section, Township, Range: Sec 10, T4N, R17W

Landform (hillslope, terrace, etc.): Valley / canyon bottom Local relief (concave, convex, none): Concave to flat Slope (%): ~3

Subregion (LRR): C Lat: Long: Datum:

Soil Map Unit Name: Yolo loamy 2-9% slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____ No X	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____ No X	
Wetland Hydrology Present?	Yes X No ____	

Remarks: Riverine hydrology indicators are present. Water source possibly from a burst pipe along Del Valle Rd. Pipe appears to have been repaired.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 3m)			
1. N/A			
2.			
3.			
4.			
	____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 3m)			
1. Ericameria pin	5	Y	N/L
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. Elymus triticoides	10	N	FAC
2. Bromus diandrus	25	Y	N/L
3. Hirschfeldia incana	2	N	N/L
4. Erodium cicutarium	5	N	N/L
5. Bromus madritensis	25	Y	UPL
6.			
7.			
8.			
	67 = Total Cover		
Woody Vine Stratum (Plot size: 1m)			
1. N/A			
2.			
	____ = Total Cover		

% Bare Ground in Herb Stratum 33 % Cover of Biotic Crust ____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species 10	x 3 = 30
FACU species ____	x 4 = ____
UPL species 62	x 5 = 310
Column Totals: 72 (A)	340 (B)

Prevalence Index = B/A = 4.72

Hydrophytic Vegetation Indicators:

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

Sampling Point: DS 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR3/3	100	—	—	—	—	loamy sand	
4-12	10YR3/3	100	—	—	—	—	loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: none

Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks: top layer had less moisture than lower layer, thus the reason for analyzing the layers separately

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- X Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No X Depth (inches): ___

Water Table Present? Yes ___ No X Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No X Depth (inches): ___

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Riverine hydrology indicators are present. Water source suspected to be a burst pipe outside of the project boundary.

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Sterling Estates
Project Number: 9677
Stream: Unnamed ephemeral water
Investigator(s): R McInvale & H. Moine

Date: 10/10/16
Town: Val Verde
Photo begin file#:

Time:
State:
Photo end file#:

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: DS 1

Projection:
Datum:
Coordinates:

Potential anthropogenic influences on the channel system:

Lightly used access road crosses the channel. No other apparent influences.

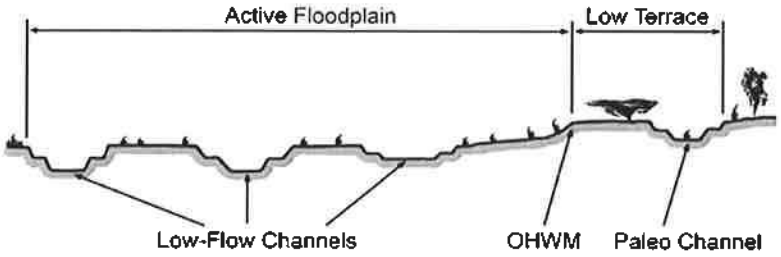
Brief site description:

Site is at the northern (upstream) limit of the property. Channel is small (~6 feet wide) & currently filled w/ Russian thistle. Bed & bank features are present, clearly defining the channel.

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [ ] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [ ] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

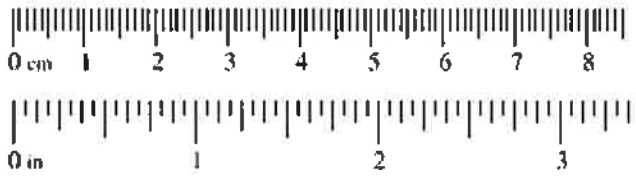


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [ ] Mapping on aerial photograph
   - [X] GPS
   - [ ] Digitized on computer
   - [ ] Other:

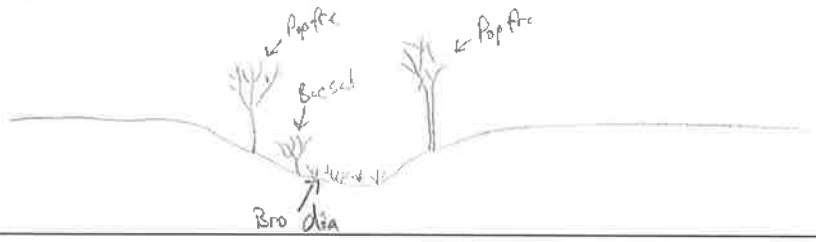
Wentworth Size Classes

Inches (in)	Millimeters (mm)	Wentworth size class	
10.08	256	Boulder	
2.56	64	Cobble	Gravel
0.157	4	Pebble	
0.079	2.00	Granule	
0.039	1.00	Very coarse sand	
0.020	0.50	Coarse sand	
1/2 0.0098	0.25	Medium sand	Sand
1/4 0.005	0.125	Fine sand	
1/8 0.0025	0.0625	Very fine sand	
1/16 0.0012	0.031	Coarse silt	
1/32 0.00061	0.0156	Medium silt	Silt
1/64 0.00031	0.0078	Fine silt	
1/128 0.00015	0.0039	Very fine silt	
		Clay	Mud



Project ID: Sterling Estates **Cross section ID:** DS 1 **Date:** 10/10/16 **Time:**

Cross section drawing:



OHWM

GPS point: DS 1

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☒ Change in vegetation cover
- ☒ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

Drought conditions likely reduced the OHWM indicators present; however, there is a clear break in the bank slope & vegetation is less dense below the OHWM.

Floodplain unit:

☒ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: Loam

Total veg cover: 120 % Tree: 25 % Shrub: 19 % Herb: 76 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☒ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

Bed & bank features are weak but there are obvious drainage patterns beginning on the adjacent property to the north. Defined edge of riparian veg & break of bank slope.

Project ID: Sterling Estates **Cross section ID:** DS 1 **Date:** 10/10/2016 **Time:**

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____% Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A - No additional floodplain features at this data point.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____% Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Sterling Estates
Project Number: 9677
Stream: Unnamed ephemeral water
Investigator(s): R. McTavish & H. Moine

Date: 10/10/2016
Town: Val Verde
Photo begin file#:

Time:
State:
Photo end file#:

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: DS 2

Projection: **Datum:**
Coordinates:

Potential anthropogenic influences on the channel system:

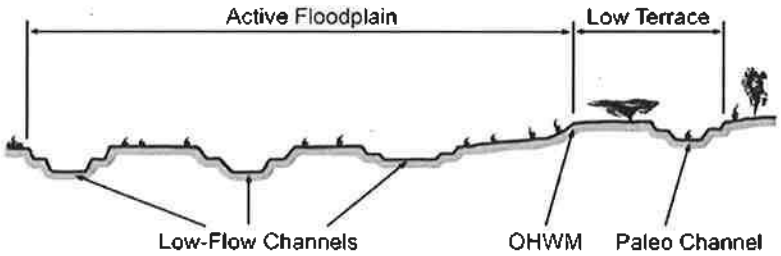
No apparent influences.

Brief site description: The site is downstream from the defined channel, in an area where there is apparent sheet flow over a broad area

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [ ] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [ ] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
- [ ] History of recent effective discharges
- [ ] Results of flood frequency analysis
- [ ] Most recent shift-adjusted rating
- [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

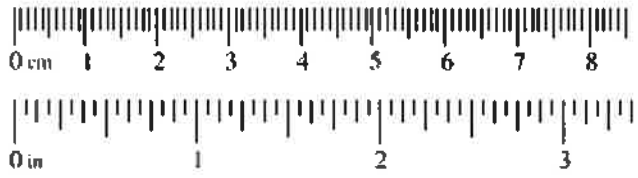


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [ ] Digitized on computer
   - [X] GPS
   - [ ] Other:

Wentworth Size Classes

Inches (in)	Millimeters (mm)	Wentworth size class	
10.08	256	Boulder	
		Cobble	Gravel
2.56	64		
		Pebble	
0.157	4		
		Granule	
0.079	2.00		
0.039	1.00	Very coarse sand	
		Coarse sand	
0.020	0.50		
		Medium sand	Sand
1/2 0.0098	0.25		
		Fine sand	
1/4 0.005	0.125		
		Very fine sand	
1/8 0.0025	0.0625		
		Coarse silt	
1/16 0.0012	0.031		
		Medium silt	
1/32 0.00061	0.0156		Silt
		Fine silt	
1/64 0.00031	0.0078		
		Very fine silt	
1/128 0.00015	0.0039		
		Clay	Mud



Project ID: Sterling Falls **Cross section ID:** DS2 **Date:** 10/10/2016 **Time:**

Cross section drawing:

OHWM

GPS point: _____

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☒ Break in bank slope ← minor
- ☒ Other: _____
- ☐ Other: _____

Comments:

No OHWM indicators though a small dip in the topography would presumably direct the water flows. Based on topography, water would generally flow to the south.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____% Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A.

Project ID: Sterling Estates **Cross section ID:** DS 2 **Date:** 10/10/2016 **Time:**

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Sterling Estates
Project Number: 9677
Stream: Unnamed ephemeral water
Investigator(s): R. McInvale & H. Moine

Date: 10/10/2016 **Time:**
Town: Del Valle **State:**
Photo begin file#: **Photo end file#:**

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: DS 3

Projection: **Datum:**
Coordinates:

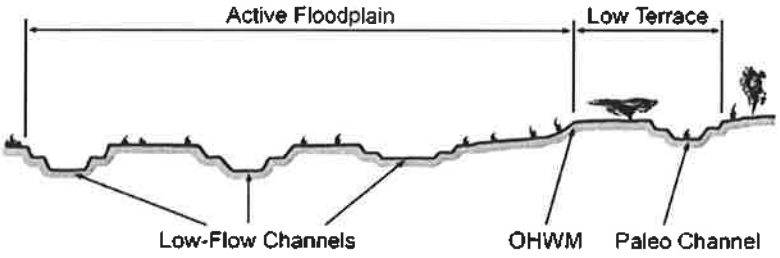
Potential anthropogenic influences on the channel system:
Run-off from Del Valle Rd. likely contributes to the flows w/in the channel, which appears to have been constructed to accommodate the road.

Brief site description: The site is immediately adjacent to Del Valle Rd & parallels the road for several hundred feet.

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [ ] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [ ] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

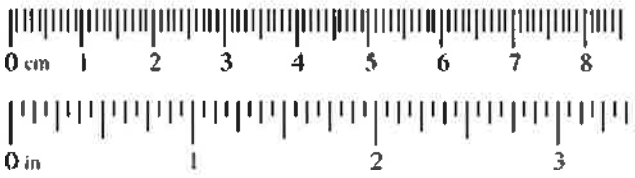


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [X] GPS
   - [ ] Digitized on computer
   - [ ] Other:

Wentworth Size Classes

Inches (in)	Millimeters (mm)	Wentworth size class	
10.06	256	Boulder	
2.56	64	Cobble	Gravel
0.157	4	Pebble	
0.079	2.00	Granule	
0.039	1.00	Very coarse sand	
0.020	0.50	Coarse sand	
1/2 0.0098	0.25	Medium sand	Sand
1/4 0.005	0.125	Fine sand	
1/8 0.0025	0.0625	Very fine sand	
1/16 0.0012	0.031	Coarse silt	
1/32 0.00061	0.0156	Medium silt	Silt
1/64 0.00031	0.0078	Fine silt	
1/128 0.00015	0.0039	Very fine silt	
		Clay	Mud



Project ID: Sterling Estates **Cross section ID:** DS 3 **Date:** 10/10/16 **Time:**

Cross section drawing:

OHWM

GPS point: _____

Indicators:

- ☐ Change in average sediment texture
- ☐ Change in vegetation species
- ☐ Change in vegetation cover
- ☐ Break in bank slope
- ☐ Other: _____
- ☐ Other: _____

Comments:

No clear indicators of OHWM - Paved road & dirt road from the swale, which is a topographical depression that directs flow down slope. The swale disappears into a broad, open slope approx. 300' southwest of the data point.

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: 102 % Tree: _____ % Shrub: 2 % Herb: 100 %

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A

Project ID: Sterling Estates **Cross section ID:** DS 3 **Date:** 10/12/16 **Time:**

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____% Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____% Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A

Arid West Ephemeral and Intermittent Streams OHWM Datasheet

Project: Sterling Estates
Project Number: 9677
Stream: Ephemeral water
Investigator(s): R. McInnis & H. Moine

Date: 10/10/16
Town: Jal Jurde
Time:
State:
Photo begin file#:
Photo end file#:

Y [X] / N [ ] Do normal circumstances exist on the site?

Y [ ] / N [X] Is the site significantly disturbed?

Location Details: DS 6

Projection: **Datum:**
Coordinates:

Potential anthropogenic influences on the channel system:

No apparent influences

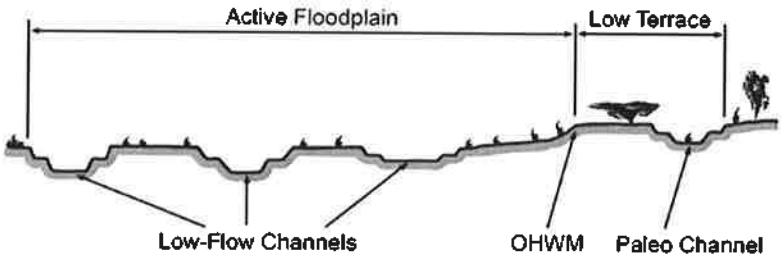
Brief site description:

Channel is located on a very steep slope & conveys run-off onto an adjacent property. Channel indicators are not apparent on the adjacent property

Checklist of resources (if available):

- [X] Aerial photography
  Dates:
- [ ] Topographic maps
- [ ] Geologic maps
- [ ] Vegetation maps
- [X] Soils maps
- [ ] Rainfall/precipitation maps
- [ ] Existing delineation(s) for site
- [ ] Global positioning system (GPS)
- [ ] Other studies
- [ ] Stream gage data
  Gage number:
  Period of record:
  - [ ] History of recent effective discharges
  - [ ] Results of flood frequency analysis
  - [ ] Most recent shift-adjusted rating
  - [ ] Gage heights for 2-, 5-, 10-, and 25-year events and the most recent event exceeding a 5-year event

Hydrogeomorphic Floodplain Units

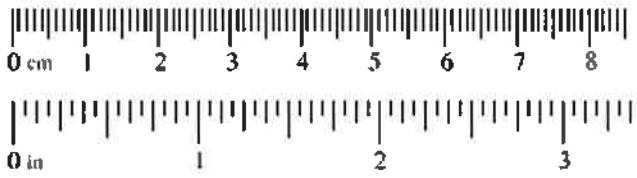


Procedure for identifying and characterizing the floodplain units to assist in identifying the OHWM:

1. Walk the channel and floodplain within the study area to get an impression of the geomorphology and vegetation present at the site.
2. Select a representative cross section across the channel. Draw the cross section and label the floodplain units.
3. Determine a point on the cross section that is characteristic of one of the hydrogeomorphic floodplain units.
   a) Record the floodplain unit and GPS position.
   b) Describe the sediment texture (using the Wentworth class size) and the vegetation characteristics of the floodplain unit.
   c) Identify any indicators present at the location.
4. Repeat for other points in different hydrogeomorphic floodplain units across the cross section.
5. Identify the OHWM and record the indicators. Record the OHWM position via:
   - [X] Mapping on aerial photograph
   - [ ] Digitized on computer
   - [ ] GPS
   - [ ] Other:

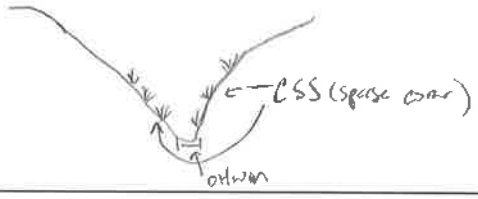
Wentworth Size Classes

Inches (in)	Millimeters (mm)	Wentworth size class	
10.08	256	Boulder	
2.56	64	Cobble	Gravel
0.157	4	Pebble	
0.079	2.00	Granule	
0.039	1.00	Very coarse sand	
0.020	0.50	Coarse sand	
1/2 0.0098	0.25	Medium sand	Sand
1/4 0.005	0 125	Fine sand	
1/8 0.0025	0.0625	Very fine sand	
1/16 0.0012	0.031	Coarse silt	
1/32 0.00061	0.0156	Medium silt	Silt
1/64 0.00031	0.0078	Fine silt	
1/128 0.00015	0.0039	Very fine silt	
		Clay	Mud



Project ID: Sterling Estates **Cross section ID:** DS 6 **Date:** 6/10/2016 **Time:**

Cross section drawing:



OHWM

GPS point: N/A

Indicators:

- [ ] Change in average sediment texture
- [ ] Change in vegetation species
- [x] Change in vegetation cover
- [x] Break in bank slope
- [ ] Other: _____
- [ ] Other: _____

Comments:

Deeply incised canyon - some indicators of OHWM & bed/bank but this area is covered by eroded slope/canyon.

Floodplain unit:

- [ ] Low-Flow Channel
- [ ] Active Floodplain
- [ ] Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____ % Tree: _____ % Shrub: _____ % Herb: _____ %

Community successional stage:

- [ ] NA
- [ ] Early (herbaceous & seedlings)
- [ ] Mid (herbaceous, shrubs, saplings)
- [ ] Late (herbaceous, shrubs, mature trees)

Indicators:

- [ ] Mudcracks
- [ ] Ripples
- [ ] Drift and/or debris
- [ ] Presence of bed and bank
- [ ] Benches
- [ ] Soil development
- [ ] Surface relief
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

Comments:

N/A - No floodplain features associated w/ the canyon

Project ID: Sterling Estates **Cross section ID:** DS 6 **Date:** 10/10/16 **Time:**

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____% Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A

Floodplain unit: ☐ Low-Flow Channel ☐ Active Floodplain ☐ Low Terrace

GPS point: _____

Characteristics of the floodplain unit:

Average sediment texture: _____

Total veg cover: _____% Tree: _____% Shrub: _____% Herb: _____%

Community successional stage:

- ☐ NA
- ☐ Early (herbaceous & seedlings)
- ☐ Mid (herbaceous, shrubs, saplings)
- ☐ Late (herbaceous, shrubs, mature trees)

Indicators:

- ☐ Mudcracks
- ☐ Ripples
- ☐ Drift and/or debris
- ☐ Presence of bed and bank
- ☐ Benches
- ☐ Soil development
- ☐ Surface relief
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

Comments:

N/A

Appendix L

Palmer's Goldenbush Scrub at Sterling Ranch Estates

Project Components

Sterling Ranch Estates Tract Map Site

Vegetation Communities and Land Cover Types

Grass and Herb Dominated

BN-BD = Brassica nigra - Bromus diandrus Semi-natural Association

BRDI = Bromus diandrus Semi-natural Association

WOABG = Wild oats and annual brome grasslands (Avena spp. - Bromus spp.) Semi-Natural Alliance

Riparian

AWT = Arroyo willow thickets (Salix lasiolepis) Alliance

MFT = Mulefat thickets (Baccharis salicifolia) Alliance

RT = Rhus trilobata Association

Scrub

CBS = California buckwheat scrub (Eriogonum fasciculatum) Alliance

CSB-CB = California sagebrush - California buckwheat scrub (Artemisia californica - Eriogonum fasciculatum) Alliance

CSS = California sagebrush scrub (Artemisia californica) Alliance

CYS = Coyote brush scrub (Baccharis pilularis) Alliance

PGBS = Palmer s goldenbush scrub (Ericameria palmeri) Provisional Alliance

PSS = Purple sage scrub (Salvia leucophylla) Alliance

Other

SCMO-AIA-EUC = Schinus molle Association - Ailanthus altissima Semi-natural Association - Eucalyptus (globulus, camaldulensis) Provisional Semi-natural Association

DEV = Urban/Developed

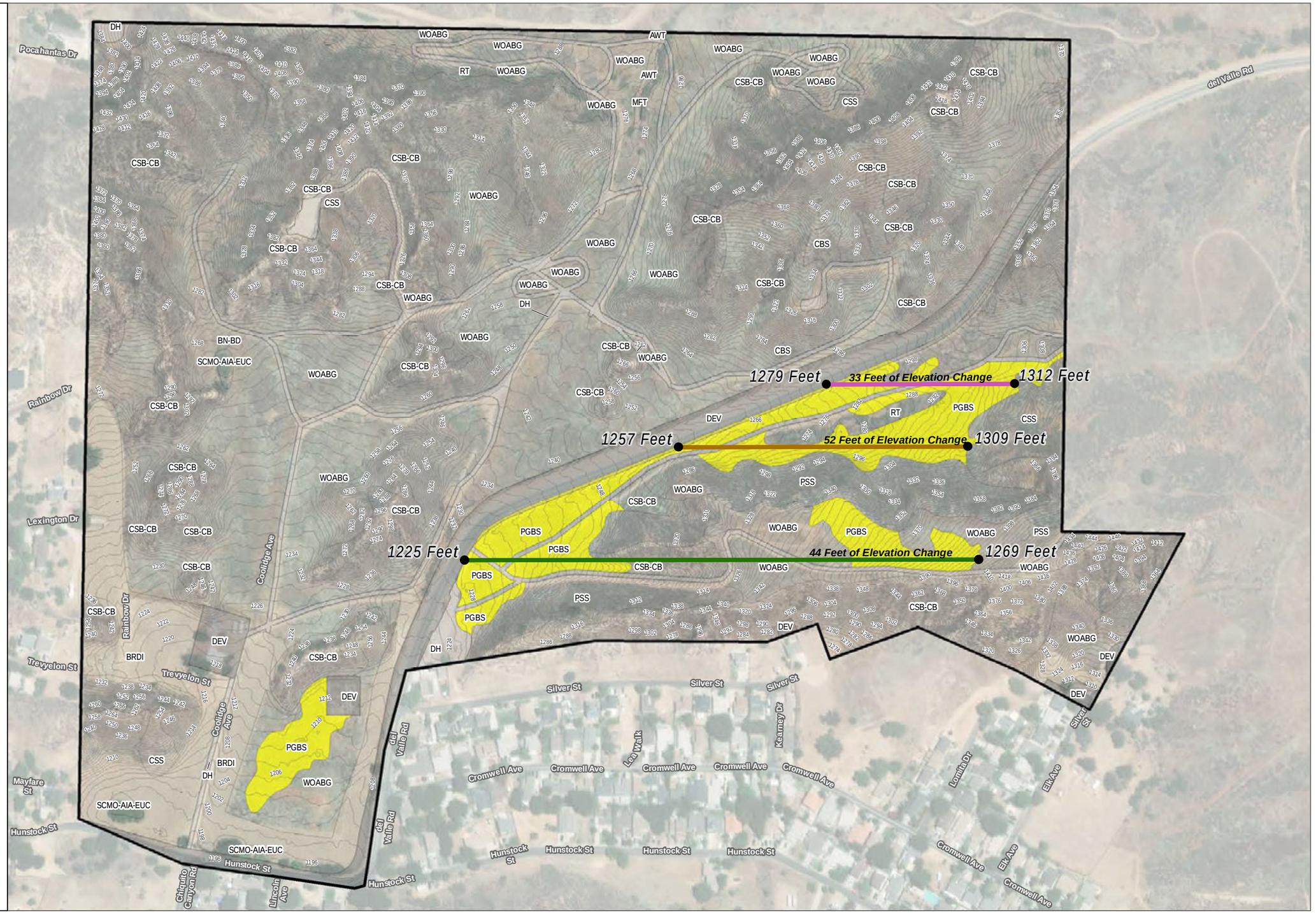
DH = Disturbed Habitat

PGBS Transect Line with Elevation at Start and End Points

Northern Transect

Middle Transect

Southern Transect



SOURCE: Eagle Aerial Solutions 2018

DUDEK

0 130 260 Feet

FIGURE 1

Palmer s Goldenbush Scrub at Sterling Ranch Estates

Response to Comments on the Sterling Ranch Estates Residential Project - Revised Draft Biological Technical Report

APPENDIX D

Cultural Resources

APPENDIX D.1

Cultural Resources Inventory for the Sterling Ranch Estates Project in the Community of Val Verde, Los Angeles County, California [2018]

FINAL

Cultural Resources Inventory for the Sterling Ranch Estates Project in the Community of Val Verde, Los Angeles County, California

Prepared for:

Sterling Ranch Estates
P.O. Box 681007
Park City, Utah 84068
Contact: Hunt Williams

Prepared by:

Elizabeth Denniston, MA, RPA,
Erica Nicolay, MA
and
Samantha Murray, MA, RPA

Prepared by:

DUDEK
38 Marengo Avenue
Pasadena, California 91101

AUGUST 2018

Final - Cultural Resources Inventory for the Sterling Ranch Estates Project

EXECUTIVE SUMMARY

Dudek was retained by Sterling Ranch Estates to conduct a cultural and paleontological resources inventory in support of the Sterling Ranch Estates Project (project). This study included the following components: (1) cultural and paleontological records searches covering the proposed project area plus a 1-mile radius, (2) a review of the California Native American Heritage Commission's (NAHC's) Sacred Lands File, (3) a pedestrian survey of the project area for cultural resources, and (4) recommendations.

This study is compliant with California Public Resources Code (PRC) Section 5024.1, Sections 21083.2 and 21084.1 of the California Environmental Quality Act (CEQA) (California PRC Section 21000 et. seq.), and Section 15064.5 of the CEQA Guidelines (California Code of Regulations Section 15000 et. seq.). PRC Section 5024.1 requires identification and evaluation of historical resources that may be affected by a proposed project.

No cultural resources have been recorded within the current project area and only three are located within the one-mile search buffer. The Native American Heritage Commission (NAHC) was contacted to request a search of the Sacred Lands File for the surrounding area. A response letter was received stating that the results of the Sacred Lands File search failed to indicate the presence of Native American cultural resources in the immediate project area. The NAHC provided a list of 11 Native American groups and individuals who may have knowledge of cultural resources in the project area. Letters were sent to each representative. To date, no responses have been received. Should any responses be received, they will be forwarded to the Los Angeles County Department of Public Works.

A Dudek archaeologist performed an intensive pedestrian survey of the project area. As a result of the survey, four newly-identified archaeological site (SR-S-01, SR-S-02, SR-S-03, and SR-S-04) and one built environment resource (SR-S-05) have been identified and recorded within the proposed project area. The archaeological sites include one slab foundation (SR-S-01), one decomposing asphalt road (SR-S-02), and two historic refuse deposits (SR-S-03 and -04). SR-S-01 has been recommended not eligible for the National Register of Historic Places (NRHP) or the California Register (CR). SR-S-02, SR-S-03, and SR-S-04 were identified in the southern section of the project area. This area will be preserved and placed in a conservation easement as a component of this project and therefore these resources will not be impacted as part of the proposed project. The built environment resource (SR-S-05) is a single-family, one-story vernacular building built in 1936. This resource was evaluated in a Historic Resource Assessment (HRA) prepared by Dudek in July 2018 and was determined to be not eligible for listing on either the NRHP or the CR (Corder and Murray 2018)

Construction activities associated with the proposed project would involve ground disturbance in areas of high paleontological sensitivity. Adverse effects to paleontological resources can occur if significant resources are uncovered during ground disturbance and subsequently

destroyed, otherwise harmed, and/or not properly preserved. As such, mitigation should be implemented to ensure that potential impacts to paleontological resources are reduced to a level below significance. It recommended that a qualified paleontologist be retained for the project to ensure implementation of a paleontological monitoring program.

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TABLE OF CONTENTS

Section **Page No.**

EXECUTIVE SUMMARY ..... **I**

1 INTRODUCTION **1**
1.1 Proposed Project Work 1
1.2 Project Location 1

2 REGULATORY SETTING **5**
2.1 Federal 5
2.1.1 36 CFR 800 and Section 106 of the NHPA 5
2.2 State 7
2.2.1 California Environmental Quality Act 7
2.2.2 California Health and Safety Code 13
2.2.3 Paleontological Resources 13
2.3 Local 13
2.3.1 Los Angeles County 13

3 SETTING **17**
3.1 Environmental and Geological Setting 17
3.2 Prehistoric Context 17
3.2.1 Terminal Pleistocene (pre – 10,000 bp) 18
3.2.2 Early Holocene (10,000 – 7500 bp) 20
3.2.3 Middle Holocene (7500-4000 bp) 22
3.2.4 Late Holocene (post – 4000 bp) 24
3.3 Ethnographic Overview 29
3.3.1 Tataviam 29
3.3.2 Further Ethnohistoric Considerations 32
3.4 Historic-Period Overview 33
3.4.1 Spanish Period (1769–1821) 33
3.4.2 Mexican Period (1821–1846) 34
3.4.3 American Period (1846–Present) 35
3.4.4 Local History of the Project Area 35

4 RESEARCH METHODS **39**
4.1 Cultural Resources 39
4.1.1 Cultural Resources Literature Review 39
4.1.2 NAHC Sacred Lands File Search 39
4.1.3 Field Methodology 39
4.2 Paleontological Resources Records Search 40

TABLE OF CONTENTS

Section **Page No.**

5 RESULTS 41
5.1 Cultural Resources 41
5.1.1 Records Search Results 41
5.1.2 Historic Aerial Photography Research 44
5.1.3 Historic Structure Research 44
5.1.4 Survey Results 45
5.2 Paleontological Resources 51
5.2.1 Geological and Paleontological Map and Literature Review 51

6 SUMMARY AND MANAGEMENT RECOMMENDATIONS 54
6.1 Management Recommendations 54
6.1.1 Unanticipated Discovery of Archaeological Resources 54
6.1.2 Unanticipated Discovery of Human Remains 55
6.1.3 Paleontological Resources 55

7 BIBLIOGRAPHY 58

APPENDICES

A SCCIC Records Search Results
B Informational Native American Coordination
C Department of Parks and Recreation Series 523 Forms

FIGURES

1 Project Location Map 3
2 Overview of historic structure, view facing southwest. 46
3 Overview of historic structure, view facing southeast. 46
4 Overview from the southwestern portion of the project area, view facing northeast 47
5 Overview from the northwestern portion of the project area, view facing north 47
6 Overview from the central portion of project area, view facing southwest. 48
7 Overview from the southern portion of project area, view facing east. 48

TABLES

1 Previous Technical Studies Within the One-Mile Search Buffer 41
2 Previously Recorded Cultural Resources Within the One Mile Search Buffer 44

1 INTRODUCTION

Dudek was retained by Sterling Ranch Estates to conduct a cultural and paleontological resources inventory in support of the Sterling Ranch Estates Project (project). This study included the following components: (1) cultural and paleontological records searches covering the proposed project area plus a 1-mile radius, (2) a review of the California Native American Heritage Commission's (NAHC's) Sacred Lands File, (3) a pedestrian survey of the project area for cultural resources, and (4) recommendations.

This study is compliant with California Public Resources Code (PRC) Section 5024.1, Sections 21083.2 and 21084.1 of the California Environmental Quality Act (CEQA) (California PRC Section 21000 et. seq.), and Section 15064.5 of the CEQA Guidelines (California Code of Regulations Section 15000 et. seq.). PRC Section 5024.1 requires identification and evaluation of historical resources that may be affected by a proposed project.

1.1 Proposed Project Work

The Sterling Ranch Estates Project (Project) includes the development of approximately 221 residential detached single-family lots along with associated commercial lots, parks, open space lots, roads, infiltration and debris basins, and other infrastructure within assessor parcel numbers (APNs) 3271-004-012 and 3271-004-012-013. The subject parcels comprise approximately 114 acres. In addition, a preservation area associated with the project is located in APN 3271-005-032 totaling approximately 34 acres.

The Project would provide a private trail, the Sterling Horn Memorial Trail, along the southern portion of the Project Site, which would connect to the County's Del Valle Regional Trail. The Project also would dedicate a twenty-foot wide, multi-use trail easement to the County for the Del Valle Trail, as identified in the Regional Trail Plan, outside of the Project Site. The off-site trail would be a variable-width (five-foot to eight-foot wide), natural soil surface trail.

1.2 Project Location

The project area is located in the community of Val Verde, north of Chiquito Canyon Road as well as northwest and southeast of Del Valle Road. It lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. Specifically, the project area is within Sections 9 and 10 of Township 4N, Range 17W as depicted on the U.S. Geological Survey (USGS) 7.5-minute *Val Verde* quadrangle (Figure 1).

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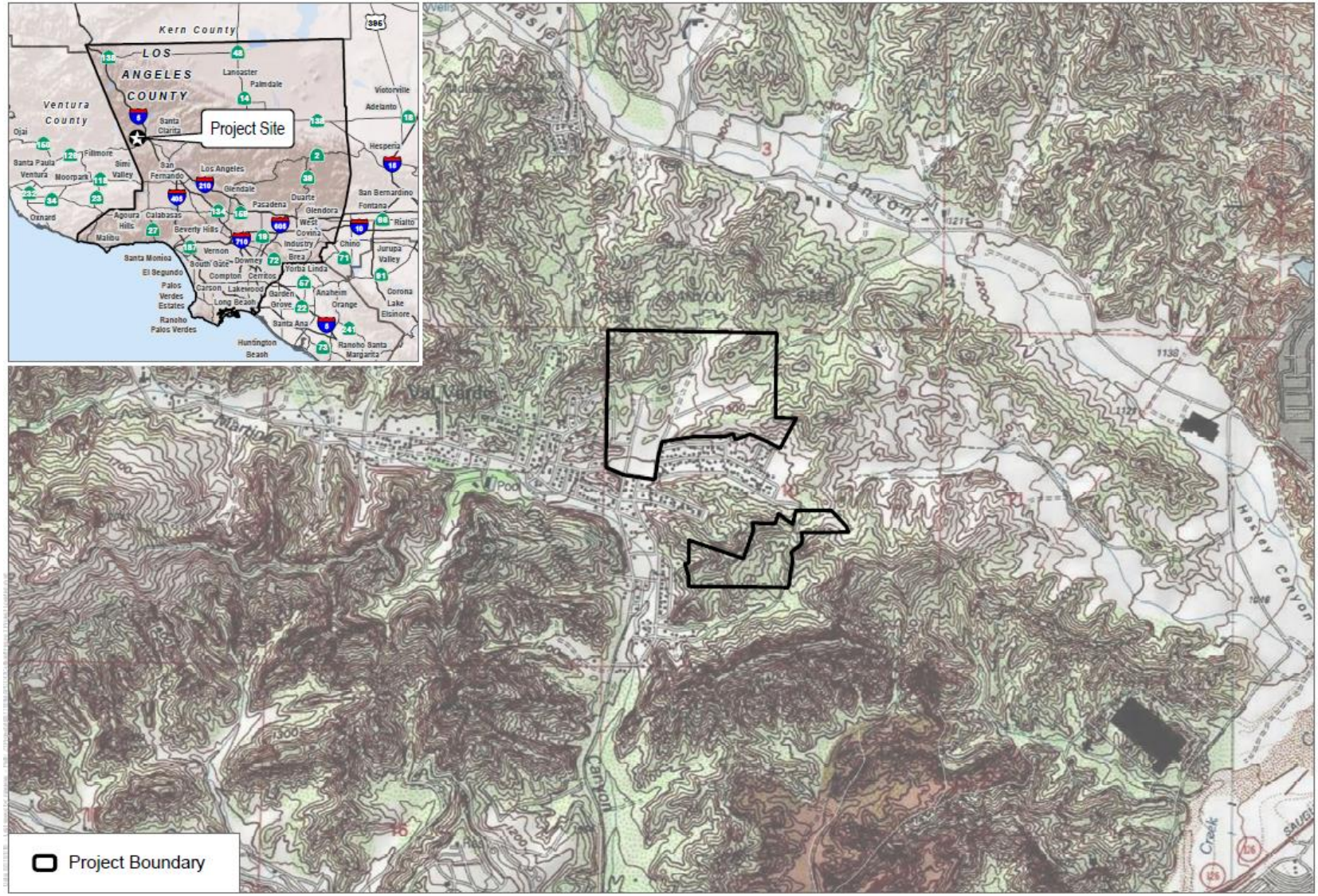

SOURCE: USGS 7.5-Minute Series Val Verde Quadrangle

DUDEK 0 1,000 2,000 Feet

FIGURE 1
Project Location
Sterling Ranch Estates Project

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2 REGULATORY SETTING

2.1 Federal

2.1.1 36 CFR 800 and Section 106 of the NHPA

The National Historic Preservation Act (NHPA) established the National Register of Historic Places (NRHP) and the President's Advisory Council on Historic Preservation (ACHP), and provided that states may establish State Historic Preservation Officers (SHPOs) to carry out some of the functions of the NHPA. Most significantly for federal agencies responsible for managing cultural resources, Section 106 of the NHPA directs that "[t]he head of any Federal agency having direct or indirect jurisdiction over a proposed Federal or federally assisted undertaking in any State and the head of any Federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any Federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP." Section 106 also affords the ACHP a reasonable opportunity to comment on the undertaking (16 U.S.C. 470f).

36 Code of Federal Regulations, Part 800 (36 CFR 800) implements Section 106 of the NHPA. It defines the steps necessary to identify historic properties (those cultural resources listed in or eligible for listing in the NRHP), including: consultation with federally recognized Native American tribes to identify resources with important cultural values; determine whether or not they may be adversely affected by a proposed undertaking; and outline the process for eliminating, reducing, or mitigating the adverse effects.

The content of 36 CFR 60.4 defines criteria for determining eligibility for listing in the NRHP. The significance of cultural resources identified during an inventory must be formally evaluated for historical significance in consultation with the California SHPO to determine if the resources are eligible for inclusion in the NRHP. Cultural resources may be considered eligible for listing if they possess integrity of location, design, setting, materials, workmanship, feeling, and association. The criteria for determining eligibility are essentially the same in content and order as those outlined under the California Environmental Quality Act (CEQA), but the criteria under NHPA are labeled A through D (rather than 1–4 under CEQA).

Regarding criteria A through D of Section 106, the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, cultural resources,

buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and that:

A. Are associated with events that have made a significant contribution to the broad patterns of our history; or

B. Are associated with the lives of persons significant in our past; or

C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. Have yielded or may be likely to yield, information important in prehistory or history [36 CFR 60.4].

The current evaluation of prehistoric cultural resources was performed with the intent of assessing historical significance under Criterion D. The ability of an archaeological site to yield important information to history or prehistory is based upon the site's ability to address specific research themes. The research themes addressed in this study are presented in Chapter 3, and these derive from the cultural resources overview presented in this chapter, above.

The ACHP provides methodological and conceptual guidance for identifying historic properties. In 36 CFR 800.4, the steps necessary for identifying historic properties include:

- Determine and document the APE (36 CFR 800.16(d)
- Review existing information on historic properties within the APE, including preliminary data
- Confer with consulting parties to obtain additional information on historic properties or concerns about effects to these
- Consult with Native American tribes (36 CFR 800.3(f)) to obtain knowledge on resources that are identified with places which they attach cultural or religious significance
- Appropriate fieldwork (including phased identification and evaluation)
- Apply NRHP criteria to determine a resource eligibility for NRHP listing

Fulfilling these steps is generally thought to constitute a reasonable effort to identify historic properties within the APE for an undertaking. The obligations of a federal agency must also assess whether an undertaking will have an adverse effect on cultural resources. An undertaking will have an adverse effect when:

> "an undertaking may alter, directly or indirectly, any of the characteristics of a historic property hat qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative" (36 CFR Part 800.5(1)).

The process of determining whether an undertaking may have an adverse effect requires the federal agency to confer with consulting parties in order to appropriately consider all relevant stakeholder concerns and values. Consultation regarding the treatment of a historic property may result in a Programmatic Agreement (PA) and/or Memorandum of Agreement (MOA) between consulting parties that typically include the lead federal agency, State Historic Preservation Officer (SHPO), and Native American tribes if they agree to be signatories to these documents. Treatment documents—whether resource-specific or generalized—provide guidance for resolving potential or realized adverse effects to known historic properties or to those that may be discovered during implementation of the undertaking. In all cases, avoidance of adverse effects to historic properties is the preferred treatment measure and it is generally the burden of the federal agency to demonstrate why avoidance may not be feasible. Avoidance of adverse effects may not be feasible if it would compromise the objectives of an undertaking that can be reasonably said to have public benefit. Other non-archaeological considerations about the benefit of an undertaking may also apply, resulting in the determination that avoidance is not feasible. In general, avoidance of adverse effects is most difficult when a permitted undertaking is being implemented, such as identification of an NRHP-eligible archaeological resource during earthmoving.

2.2 State

2.2.1 California Environmental Quality Act

2.2.1.1 The California Register of Historical Resources (Public Resources Code section 5020 et seq.)

In California, the term "historical resource" includes but is not limited to "any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California" (California Public Resources Code section 5020.1(j)). In 1992, the California legislature established CRHR "to be

used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (California Public Resources Code section 5024.1(a)). A resource is eligible for listing in the CRHR if the State Historical Resources Commission determines that it is a significant resource and that it meets any of the following National Register of Historic Places (NRHP) criteria:

1. Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
2. Associated with the lives of persons important in our past.
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
4. Has yielded, or may be likely to yield, information important in prehistory or history.

(California Public Resources Code section 5024.1(c).) Resources less than 50 years old are not considered for listing in the CRHR, but may be considered if it can be demonstrated that sufficient time has passed to understand the historical importance of the resource (see 14 CCR, section 4852(d)(2)).

The CRHR protects cultural resources by requiring evaluations of the significance of prehistoric and historic resources. The criteria for the CRHR are nearly identical to those for the NRHP, and properties listed or formally designated as eligible for listing on the NRHP are automatically listed on the CRHR, as are the state landmarks and points of interest. The CRHR also includes properties designated under local ordinances or identified through local historical resource surveys. The State Historic Preservation Officer maintains the CRHR.

2.2.1.2 Native American Historic Cultural Sites (California Public Resources Code section 5097 et seq.)

The Native American Historic Resources Protection Act (Public Resources Code section 5097, et seq.) addresses the disposition of Native American burials in archaeological sites and protects such remains from disturbance, vandalism, or inadvertent destruction; establishes procedures to be implemented if Native American skeletal remains are discovered during construction of a project; and establishes the NRHC to resolve disputes regarding the disposition of such remains. In addition, the Native American Historic Resource Protection Act makes it a misdemeanor punishable by up to 1 year in jail to deface or destroy an Indian historic or cultural site that is listed or may be eligible for listing in the CRHR.

2.2.1.3 California Native American Graves Protection and Repatriation Act

The California Native American Graves Protection and Repatriation Act (California Repatriation Act), enacted in 2001, requires all state agencies and museums that receive state funding and that have possession or control over collections of human remains or cultural items, as defined, to complete an inventory and summary of these remains and items on or before January 1, 2003, with certain exceptions. The California Repatriation Act also provides a process for the identification and repatriation of these items to the appropriate tribes.

2.2.1.4 California Environmental Quality Act Statues and Guidelines

As described further below, the following CEQA statutes and CEQA Guidelines are relevant to the analysis of archaeological and historic resources:

1. California Public Resources Code section 21083.2(g): Defines "unique archaeological resource."
2. California Public Resources Code section 21084.1 and CEQA Guidelines section 15064.5(a): Defines historical resources. In addition, CEQA Guidelines section 15064.5(b) defines the phrase "substantial adverse change in the significance of an historical resource. It also defines the circumstances when a project would materially impair the significance of a historical resource.
3. California Public Resources Code section 5097.98 and CEQA Guidelines section 15064.5(e): These statutes sets forth standards and steps to be employed following the accidental discovery of human remains in any location other than a dedicated ceremony.
4. California Public Resources Code sections 21083.2(b)-(c) and CEQA Guidelines section 15126.4: These statutes and regulations provide information regarding the mitigation framework for archaeological and historic resources, including options of preservation-in-place mitigation measures; identifies preservation-in-place as the preferred manner of mitigating impacts to significant archaeological sites.

Under CEQA, a project may have a significant effect on the environment if it may cause "a substantial adverse change in the significance of an historical resource" (California Public Resources Code section 21084.1; CEQA Guidelines section 15064.5(b)). An "historical resource" is any site listed or eligible for listing in the CRHR. The CRHR listing criteria are intended to examine whether the resource in question: (a) is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; (b) is associated with the lives of persons important in our past; (c) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative

individual, or possesses high artistic values; or (d) has yielded, or may be likely to yield, information important in pre-history or history.

The term "historical resource" also includes any site described in a local register of historic resources, or identified as significant in a historical resources survey (meeting the requirements of California Public Resources Code section 5024.1(q)).

CEQA also applies to "unique archaeological resources". Public Resources Code section 21083.2(g) defines a "unique archaeological resource" as any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

In 2014, CEQA was amended to applies to "tribal culture resources" as well, but the amendment did not provide a definition for such resources or identify how they were to be evaluated or mitigated. (Pub.Res.Code §§ 21084.2 and 21084.3.) Instead, Public Resources Code section 21083.09 required that the Office of Planning and Resource develop and adopt guidelines for analyzing "tribal cultural resources" by July 1, 2016. As of the effective date of this Draft EIR, however, those guidelines have not been finalized or adopted. Consequently, this EIR addresses only historic resources and unique archaeological resources.

All historical resources and unique archaeological resources – as defined by statute – are presumed to be historically or culturally significant for purposes of CEQA (California Public Resources Code section 21084.1; CEQA Guidelines section 15064.5(a)). The lead agency is not precluded from determining that a resource is a historical resource even if it does not fall within this presumption (California Public Resources Code section 21084.1; CEQA Guidelines section 15064.5(a)). A site or resource that does not meet the definition of "historical resource" or "unique archaeological resource" is not considered significant under CEQA and need not be analyzed further. (Public Resources Code section 21083.2(a); CEQA Guidelines section 15064.5(c)(4)).

Under CEQA and significant cultural impact results from a "substantial adverse change in the significance of an historical resource [including a unique archaeological resource]" due to the "physical demolition, destruction, relocation, or alteration of the resource or its immediate

surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines section 15064.5(b)(1); California Public Resources Code section 5020.1(q)). In turn, the significance of a historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register; or
2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
3. Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register as determined by a lead agency for purposes of CEQA.

CEQA Guidelines section 15064.5(b)(2).

Pursuant to these sections, the CEQA first evaluates evaluating whether a project area contains any "historical resources," then assesses whether that project will cause a substantial adverse change in the significance of a historical resource such that the resource's historical significance is materially impaired.

When a project significantly affects a unique archeological resources, CEQA imposes special mitigation requirements. Specifically, "[i]f it can be demonstrated that a project will cause damage to a unique archeological resource, the lead agency may require reasonable efforts to be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. Examples of that treatment, in no order of preference, may include, but are not limited to, any of the following:"

A. "Planning construction to avoid archeological sites."
B. "Deeding archeological sites into permanent conservation easements."
C. "Capping or covering archeological sites with a layer of soil before building on the sites."
D. "Planning parks, greenspace, or other open space to incorporate archeological sites."

Pub. Resources Code section 21083.2(b)(1)-(4).

If these "preservation in place" options are not feasible, mitigation may be accomplished through data recovery. (Pub.Res. Code § 21083.2(d); CEQA Guidelines § 15126.4(b)(3)(C).) Public Resources Code section 21083.2(d) states that "[e]xcavation as mitigation shall be restricted to those parts of the unique archeological resource that would be damaged or destroyed by the project. Excavation as mitigation shall not be required for a unique archeological resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the resource, if this determination is documented in the environmental impact report."

These same requirements are set forth in slightly greater detail in CEQA Guidelines section 15126.4(b)(3), as follows:

A. Preservation in place is the preferred manner of mitigating impacts to archeological sites. Preservation in place maintains the relationship between artifacts and the archeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site.

B. Preservation in place may be accomplished by, but is not limited to, the following:

    1. Planning construction to avoid archeological sites;

    2. Incorporation of sites within parks, greenspace, or other open space;

    3. Covering the archeological sites with a layer of chemically stable soil before building tennis courts, parking lots, or similar facilities on the site[; and]

    4. Deeding the site into a permanent conservation easement.

C. When data recovery through excavation is the only feasible mitigation, a data recovery plan, which makes provision for adequately recovering the scientifically consequential information from and about the historical resource, shall be prepared and adopted prior to any excavation being undertaken.

Note that, when conducting data recovery, "[i]f an artifact must be removed during project excavation or testing, curation may be an appropriate mitigation." (Ibid.) However, "[d]ata recovery shall not be required for an historical resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the archeological or historic resource, provided that determination is documented in the EIR and that the studies are deposited with the California Historical Resources Regional Information Center." (CEQA Guidelines section 15126.4(b)(3)(D).)

2.2.2 California Health and Safety Code

CEQA Guidelines section 15064.5 assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. As described below, these procedures are detailed in PRC section 5097.98.

California law protects Native American burials, skeletal remains, and associated grave goods, regardless of their antiquity, and provides for the sensitive treatment and disposition of those remains. Health and Safety Code section 7050.5 requires that if human remains are discovered in any place other than a dedicated cemetery, no further disturbance or excavation of the site or nearby area reasonably suspected to contain human remains shall occur until the County coroner has examined the remains (section 7050.5b). PRC Section 5097.98 also outlines the process to be followed in the event that remains are discovered. If the coroner determines or has reason to believe the remains are those of a Native American, the coroner must contact the Native American Heritage Commission (NAHC) within 24 hours (section 7050.5c). The NAHC will notify the Most Likely Descendant (MLD). With the permission of the landowner, the MLD may inspect the site of discovery. The inspection must be completed within 48 hours of notification of the MLD by the NAHC. The MLD may recommend means of treating or disposing of, with appropriate dignity, the human remains and items associated with Native Americans.

2.2.3 Paleontological Resources

Paleontological resources are limited, nonrenewable resources of scientific, cultural, and educational value and are afforded protection under state (CEQA) laws and regulations. This study satisfies project requirements in accordance with CEQA (13 PRC, 2100 et seq.) and Public Resources Code Section 5097.5 (Stats 1965, c 1136, p. 2792). This analysis also complies with guidelines and significance criteria specified by the Society of Vertebrate Paleontology (SVP) (1995).

2.3 Local

2.3.1 Los Angeles County

Historical, cultural, and paleontological resources are discussed in the County's Conservation and Natural Resources Element of the Los Angeles County General Plan 2035, which was adopted in October of 2015. The County recognizes that historical and cultural resources are an important part of the County's identity and contribute to the local economy. The goals and policies that apply to historical, cultural, and paleontological resources are as follows:

- **Policy C/NR 14.1:** Mitigate all impacts from new development on or adjacent to historic, cultural, and paleontological resources to the greatest extent feasible.

- **Policy C/NR 14.2:** Support an inter-jurisdictional collaborative system that protects and enhances the County's historic, cultural, and paleontological resources.
- **Policy C/NR 14.3:** Support the preservation and rehabilitation of historic buildings.
- **Policy C/NR 14.4**: Ensure proper notification procedures to Native American tribes in accordance with Senate Bill 18 (2004).
- **Policy C/NR 14.5:** Promote public awareness of the County's historic, cultural, and paleontological resources.
- **Policy C/NR 14.6:** Ensure proper notification and recovery processes are carried out for development on or near historic, cultural, and paleontological resources.

The Department of Regional Planning, working with the Historical Landmarks and Records Commission and the Regional Planning Commission, completed and adopted a comprehensive historic preservation ordinance for the unincorporated areas of Los Angeles County. The following text was taken from the Historic Preservation Ordinance for Los Angeles County, which was adopted by the Board of Supervisors in September, 2015:

22.52.3060 Criteria for Designation of Landmarks and Historic Districts.

A. Property which is more than 50 years of age may be designated as a landmark if it satisfies one or more of the following criteria:

   1. It is associated with events that have made a significant contribution to the broad patterns of the history of the nation, State, County, or community.
   2. It is associated with the lives of persons who are significant in the history of the nation, State, County, or community.
   3. It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the nation, State, County, or community; or possesses artistic values of significance to the nation, State, County, or community.
   4. It has yielded, or may be likely to yield, information important locally in prehistory or history.
   5. It is listed or has been formally determined eligible by the National Park Service for listing on the National Register of Historic Places, or is listed or has been determined eligible by the State Historical Resources Commission for listing on the California Register of Historical Resources.

6. It is one of the largest or oldest trees of the species located in the County.
7. It is a tree, plant, or other natural land feature having historical significance due to an association with a historic event, person, site, street, or structure, or because it is a defining or significant outstanding feature of a neighborhood.

B. Property less than 50 years of age may be designated as a landmark if it meets one or more of the criteria set forth in subsection (A) of this section, and exhibits exceptional importance.

C. The interior space of a property, or other space held open to the general public, including but not limited to a lobby, may itself be designated as a landmark or included in the landmark designation of a property if the space is more than 50 years of age and satisfies one or more of the criteria set forth in subsection (A) of this section, or if the space is less than 50 years of age and satisfies the requirements of subsection (B) of this section.

D. Historic Districts. A geographic area or a noncontiguous grouping of thematically related properties may be designated as a historic district if greater than 50% of owners in the proposed district consent to the designation, and if the geographic area or noncontiguous grouping meets one or more of the criteria set forth in subsections (A)(1) through (A)(5) of this section and one or more of the following criteria:

1. It exhibits a concentration of historic, scenic or thematic sites, which contribute to each other and are unified aesthetically by plan, physical development or architectural quality; or
2. It exhibits significant geographical patterns, associated with different eras of settlement and growth, particular transportation modes, or distinctive examples of parks or community planning.

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3 SETTING

3.1 Environmental and Geological Setting

The project area occurs at the base of the northern flanks of the north-south trending Chiquito Canyon, which lies between the Topatopa Mountains to the west and the Santa Susana Mountains to the South. Topography within the project area varies from gently sloping in the southern portion to steeply sloping in the northern and eastern portions with elevations ranging from 1,200 to 1,435 feet (366 to 437 meters) above mean sea level (amsl). The project is underlain by the following geological units (from youngest to oldest): Quaternary alluvium (map unit Qa), the Saugus Formation (map unit Qts), and the Pico Formation (map unit Tps).

The project area has remained undeveloped and in largely the same condition for the past 20 years. One residence is located in the southwestern portion of the project area and several access roads are present. Existing land uses in the immediate vicinity of the project area include residential development in the community of Val Verde, commercial/industrial development associated with the Valencia Commerce Center, oil field operations in the Hasley Canyon Oil Field, and undeveloped property.

3.2 Prehistoric Context

The project area falls within a part of California that is poorly understood regarding aboriginal occupation. The few significant archaeological studies in the area (e.g., Waugh 1999) have not fully defined local culture history and as a result, researchers have imposed cultural historical schemes developed in adjacent regions onto the Santa Clarita Valley. Even the most recent published archaeological summaries casually lump the Santa Clarita Valley into neighboring cultural historical schemes of the southern California coast (i.e., Glassow et al. 2007). The same is true of the ethnohistoric record, which is based wholly on second-hand accounts of descendants claiming traditional ties to the area (see Section 3.2.2, below).

Note also that one artifact type defined for one region may or may not represent the same time period or human behavior in another. The simple correlations of artifact types or styles does not necessarily indicate a direct functional or causal relationship. That is, the presence of coastal or desert-derived artifacts in Santa Clarita Valley does not necessarily indicate cultural or socioeconomic relationships with inhabitants of those areas. Such relationships must be demonstrated in the archaeological record by ruling out other functional interpretations as less plausible.

To avoid the pitfalls of extending culture histories from adjacent regions into the Santa Clarita Valley, the following sections discuss major archaeological trends in southern California according to a geologic time scale: Terminal Pleistocene (pre-10,000 years before present—bp),

Early Holocene (10,000 – 7500 bp), Middle Holocene (7500 – 4000 bp), and Late Holocene (post – 4000 bp). Reginal culture historical frameworks are then discussed within these categories as appropriate, providing an opportunity to consider their local application.

3.2.1 Terminal Pleistocene (pre – 10,000 bp)

The terminal Pleistocene period has been the subject of much research in North America, although it remains hotly debated in terms of human adaptations. A few things are certain: terminal Pleistocene environments were rapidly changing at the end of the Wisconsonin glaciation period after 18,000 bp; definitive evidence places humans in North American by at least 12,500 bp.

The last major glaciation period (Wisconsonin) ended by about 18,000 bp, marked by a warming and drying trend that started at this time, lasting until at least 15,000 bp (Grayson 1993). Glaciers that covered most of northern North America began to melt forming pluvial lakes; Pleistocene Lake Lahonton being one of the largest covering the Great Basin of western North American (Grayson 1993). In southern California, many of the vegetation communities found at high elevations today were found at lower elevations then. Wood rat middens from the Mojave Desert indicate that the area was covered by a coniferous forest characterized by juniper and sage by 15,000 bp (Spaulding 1983, 1990). As the Pleistocene came to a close by about 10,000 bp, the warming trend continued and upward migration of vegetation communities occurred, firmly establishing desert sage scrub communities and coastal chaparral from 10,000 to 8000 bp. Ocean core sediment analysis of oxygen isotopes and pollen indicate much cooler ocean surface temperatures. Coupled with rising sea levels at a rate of about one meter per century through close of the Pleistocene (Inman 1983), the early Holocene was set to be much more moderate in climatic stability than the Pleistocene.

These environmental changes have been often cited as a key agent in cultural adaptation. A very unique technology defined by fluted projectile points and a highly formal lithic tool kit with almost no processing equipment is recognized as the earliest evidence of human adaptation to North America. Widely known as "Clovis," regional manifestations of this toolkit show important variability both in projectile point styles and tool kit composition. In western North American, fluted points and related items are most often found near or along pluvial lakeshores, leading to the definition of the Western Pluvial Lakes Tradition (WPLT, Bedwell 1973). The WPLT holds as its primary tenet that human adaptive strategies at in the terminal Pleistocene were evolved to exploit the rich flora and fauna located along pluvial shorelines. Emma Lou Davis' (1978) work at China Lake near the Coso Range is one of the more well known examples of a pluvial association with fluted points. Indeed, there is good evidence that Pleistocene megafauna were persisted alongside modern fauna, and tended to cluster around pluvial lakeshores (Grayson 1993).

However, recent research questions the reality of the WPLT through discoveries of Paleoindian toolkits, including fluted points in areas far removed from pluvial lake shores (Basgall et al. 2002). Moreover, the variability in terminal Pleistocene tool kits is just beginning to be understood as various kinds of stemmed projectile points are being reliably assigned to pre-10,000 bp contexts, such as Great Basined Stemmed and Lake Mojave projectile point forms (Basgall et al. 2002; Basgall 2000; Warren 2004).

Whether or not terminal Pleistocene humans focused on hunting large animals or not is also debated. Most hold Clovis and other fluted point-dominated assemblages as a highly specialized large animal hunting complex, but others interpret these technological complexes as generalized, allowing for rapid movement across large areas with flexibility (i.e., Kelly and Todd 1988). Resolution to this issue has yet to come, but strong evidence suggests on either side with direct evidence of megafauna procurement using fluted and other stemmed points (see Meltzer 1993), as well as direct evidence of stemmed projectile points for cutting and grinding, indicating a more generalized intent of use (see Basgall 1993). The truth probably rests in regional variation where localized climatic and environmental patterns affect the resources humans exploit and as a result, their response to changes in the availability of those.

Further complicating the picture is the realization that vegetal processing technology was being intensively used prior to 10,000 bp. The discovery in La Jolla of a robust assemblage of millingstones, handstones, and battered implements, with virtually no formal flaked lithic items associated with dozens of human burials and radiocarbon dates in excess of 10,000 bp indicates at the very least that socioeconomic adaptation was occurring rapidly among California hunter-gatherers during the terminal Pleistocene (Hale 2010a; see also Ike et al. 1979). Assemblages of this nature are often attributed to the Milling Stone pattern that has been interpreted as a response to punctuated middle Holocene aridity (see middle Holocene discussion, below). Regardless, discoveries of artifacts, such as fluted points that are exclusive to terminal Pleistocene cultural adaptations associated with pre-10,000 bp radiocarbon dates indicates that humans reached the coastal margins of western North America during this period (see Erlandson 1988, 1991; Erlandson et al. 2008; Fitzgerald 2000; Rogers 1938; Warren 1968).

Initial efforts to parse out archaeological components somewhat arbitrarily ascribed the "Early Man" phase to southern California (Wallace 1955). Wallace's Early Man phase (10,000 – 6000 B.C. (12,000 – 8000 bp) was allocated to the terminal Pleistocene and early Holocene, but without the benefit of radiocarbon dates. The Early Man phase was ill-defined and based off of Rogers (1938) work with San Dieguito collections—a hunting-related toolkit defined at the Harris Site containing stemmed projectile points similar to Lake Mojave points located in desert regions to the north. Other fluted point discoveries to the north near Pleistocene Lake Tulare certainly biased Wallace's (1955) efforts to define an early phase of human occupation, especially since his primary

region of study (Los Angeles and Ventura Counties) was nestled in between San Dieguito and Lake Tulare archaeological discoveries.

Regardless of early efforts to define a terminal Pleistocene cultural chronology, the upper Santa Clarita River Valley has yielded no evidence of terminal Pleistocene human occupation. Earliest radiocarbon dates extend only into the middle Holocene, and these are also rare. Given the early timeframe, that preservation of organic materials dramatically decreases with time, and that the accretional and degredational depositional context of the upper Santa Clarita River Valley has obscured or wiped out any such evidence, it is unlikely that a terminal Pleistocene component will ever be identified there.

3.2.2 Early Holocene (10,000 – 7500 bp)

Human occupation of southern California during the early Holocene period (10,000 – 7500 bp) is better understood than the terminal Pleistocene, although archaeological evidence for early Holocene human occupation still tends to be regionally clustered. Early Holocene environments continued the warming and drying trend initiated during the terminal Pleistocene, but most of the major pluvial lake systems were fully dessicated, with periodic recharge of some basins provided by seasonal precipitation rather than melting glaciers (Basgall 1993; Waters 1991). Most studies converge on the idea that the early Holocene was noticeably more arid since desert vegetation communities appear strongly established in composition and distribution by 9000 bp (Spaulding and Graumlich 1986; Van Devender et al. 1987). All megafauna (i.e., elephants, camelids, sloths, etc.) were all but gone by 10,000 bp, however with modern fauna attaining their modern vegetation associations by this time.

Most cultural chronologies have their roots in the early Holocene, save for the WPLT, San Dieguito, and other stemmed and fluted point traditions noted earlier. David Banks (D.B.) Rogers (1929) was the first to propose a cultural chronology, though his age estimates suffered from the lack of absolute dating techniques and data at the time. D.B. Rogers (1929) proposed Oak Grove as the earliest robust cultural tradition beginning just after the Pleistocene and early Holocene transition at around 10,000 bp. Later known as the Milling Stone Horizon (Wallace 1955), or Encinitas Tradition (Warren 1968), Oak Grove was recognizable by the large amounts of processing equipment dominated by basined millingstones and handstones, along with a general lack of formal flakedstone hunting tools. Wallace (1955) built on D.B. Roger's work, with Oak Grove representing the Milling Stone Horizon, but the interpretation was the same: an economy dominated by vegetal processing and a general lack of hunting. Warren (1968) sought to clarify regional variability during the early Holocene and proposed the Encinitas Tradition, comprised of various local manifestations of the Milling Stone Horizon assemblages that had locally specific environmental agents driving the development of the processing economies. Warren, however significantly added to the discourse by better defining the San Dieguito

complex as preceding the Milling Stone pattern and being comprised of stemmed projectile points and bifacial knives, with few processing tools (see Warren 2004). San Dieguito appeared to be a coastal southern California manifestation of what is known as Lake Mojave in the northern high deserts.

Coastal evidence for early Holocene human occupation is increasingly common, mostly in the form of pre – 7500 bp radiocarbon dates (Byrd 1997; Curtis 1965; Erlandson 1988, 1991, 1997; Erlandson et al. 1993, 2008; Gallegos and Kyle 1998; Glassow et al. 2007; Hale 2009, 2010a, 2010b; Hale and Becker 2006; Kaldenberg 1982; Levulett et al. 2002; Salls 1991; True 1980). Since the definition of the Milling Stone pattern by Wallace (1955) and Warren (1968), extensive archaeological work in regulatory settings has generated a robust database of radiocarbon dated sites resulting in a clear picture that the Milling Stone pattern is firmly rooted in the early Holocene, by as much as 10,000 bp (see Hale 2010a). In fact, early Holocene radiocarbon dates have come to be expected in certain depositional contexts along the southern California coast because of their commonality and the consistency of the associated archaeological deposit (Hale 2009). Early Holocene dates along the coastal plain of southern California and interior ranges are currently considered part of the "Archaic" pattern; an umbrella term synonymous with Milling Stone.

Desert regions to the north and interior Peninsular Ranges (and intervening valleys) to the east also have relatively robust early Holocene records. To the east, the early Holocene continues to align with the Archaic or Milling Stone pattern (see Hale 2009; Hale and Comeau 2009; Sutton 2011). In the Mojave Desert, traditional early Holocene chronologies are being revised. The Lake Mojave (11,000 – 7500 bp) complex still appears to be the oldest stemmed point tradition that followed fluted point toolkits. Lake Mojave assemblages are characterized by weak shouldered stemmed projectile points and large amounts of formed flake tools with lesser amounts of expedient flaked tools and groundstone. However, recent evidence is pushing back dates for the Pinto complex to as much as 8000 bp, presenting an overlap problem with Lake Mojave (Basgall 2000; Sutton et al. 2007). The significance here is that Pinto sites are dominated by large amounts of ground and battered stone with relatively small amounts of formed flakedstone tools (Basgall and Hall 1993, 1994; Campbell and Campbell 1935; Giambastiani and Basgall 1999; Hall 1992; Schroth 1994; Warren 1968, 1980); Pinto is the first robust processing economy that appears in California deserts and is similar in many respects to the Milling Stone pattern of southern California, though not as old as Milling Stone. The similarities with the Milling Stone pattern include settlement that was characterized by serial occupation of specific sites producing robust assemblages through tool reuse (Hale 2001).

The early Holocene is not represented in Santa Clarita Valley by direct archaeological evidence, despite being known in adjacent desert and coastal regions. No doubt prehistoric populations took advantage of the natural travel corridors linking interior areas to the coast and southern coastal plain. However, as with archaeological deposits of later periods, damaging erosion and flooding have either

destroyed or obscured any such deposits that may have existed. Attempts to locate buried deposits using hollow stem augers (i.e., core samples) in other parts of southern California, such as the Las Flores watershed (Hale and Becker 2006) or Otay River floodplain (Cook and Andrews 2003; Comeau et al. 2014) focused on floodplains with a gradual sedimentation sequence and less frequent and less destructive erosional events. It is no surprise, then that intact archaeological deposits dating to the early Holocene (and later) were identified in those areas. The same is not true for the Santa Clarita River floodplain and surrounding geologic landscape that has seen frequent intervals of violent flooding that eroded any riverbed or nearby terrace deposits.

3.2.3 Middle Holocene (7500-4000 bp)

The middle Holocene (7500-4000 bp) witnessed a continuation of archaeological patterns defined in the early Holocene. However, the middle Holocene was marked by periods of extreme aridity collectively termed the Altithermal by Ernst Antevs (1953). After much research since Antevs' (1953) original work the Altithermal is better understood as having variable effects at a subregional scale. Southern California was already characterized as an arid landscape by the inception of the middle Holocene, thus notable changes include adjustments in the elevation and density of existing vegetation communities and related fauna (Mehringer 1967; Spaulding 1985, 1990; Wells 1983). To be sure, humans respond to changes in the resources they exploit and it is plausible that plants and animals that were the focus of subsistence either decreased in abundance or congregated in more favorable areas. Warren (1968) postulates as much, suggesting that the Encinitas Tradition (i.e., Milling Stone pattern) was adapted in the coastal plain to the margins of lagoons that were magnet locations for vegetation and fauna, and as a result, human occupation.

Whatever the regional environmental differences were, it was clear that humans have been present in southern California throughout the middle Holocene with widespread evidence of humans hunkering down and increasing vegetal processing intensity, rather than depopulating whole areas. In fact, the origin of Milling Stone pattern itself was thought to be a response to Altithermal conditions (Wallace 1955; see Hale 2001, Erlandson 1997). The early Holocene appearance of Milling Stone adaptations, however, runs counter to this explanation, suggesting instead that Milling Stone economies were the first socioeconomic adaptation to stable California environments after the waning of terminal Pleistocene transitions (Hale 2010a, 2011). Regardless, processing economies were apparently well-suited to the arid middle Holocene conditions, based on the ubiquity of Milling Stone assemblages.

Regional cultural histories adjacent to the upper Santa Clarita River Valley continue in the same nomenclature. In the deserts to the north, the Pinto period reigns until at least the end of the middle Holocene (4000 bp); although, Gypsum period assemblages characterized by contracting stem dart points, larger numbers of small flake tools, and some mortar/pestle technology have pushed their

4000 bp inception date to some degree (Hale 2011). Southern coastal regions such as San Diego County and parts of Orange and Los Angeles Counties also retain Milling Stone assemblage dominance, including at the Tank Sites (CA-LAN-1 and -2) in Topanga Canyon that date as late as 2000 bp (see Hale 2001). The middle Holocene is one of the best represented periods in San Diego County and keeping with the Milling Stone or Archiac pattern (Masters and Gallegos 1997; see Hale 2009 for assemblage summaries).

Real socioeconomic change during the middle Holocene appears first in the Santa Barbara Channel with the abrupt appearance of bowl mortars by at least 5500 bp at sites such as CA-SBA-53, CA-SBA-54, CA-SBA-75, and CA-SBA-84 to name a few (Hale 2009; see also Erlandson et al. 2008, Harrison and Harrison 1966; Levulett et al. 2002). Mortars are costly to manufacture (mortar surfaces are manufactured, rather than mostly accruing depth through use), and thus their manufacture in noticeable quantities necessarily signals a shift to a more intensive processing economy (Hale 2010b). It is thought that mortars in the Santa Barabara Channel were used to intensively process nuts such as acorn and buckberry that have substantial nutritional value when processed in mass quantities (Bettinger et al. 1997; Bettinger and Tushingham 2013). Moreover, the complex ecology of acorn masting requires storage for it to be an efficient economic pursuit of humans (Hale 2009; 2010a). The attendant social shifts that must occur to make an acorn economy economically viable are no less complex, requiring defense of territories containing acorn producing oaks and storage facilities; concepts not altogether welcoming to hunter-gatherer societies that have evolved social institutions precisely to cull such behavior (Bettinger 1999).

Other refinements to culture historical frameworks are based on King's (1981) chronology of burial patterns and related artifacts. Minor refinements to King's chronology occur when assemblage data warrant as much, but substantial numbers of Olivella sp. shell beads present in burial populations of the last 3000 years in King's study laid a strong chronological foundation for determining the kinds of socioeconomic patterns that developed during the late Holocene, discussed below.

Overall, the middle Holocene in southern California is primarily defined by processing economies of the Milling Stone pattern, which is undeniably the most robust and visible archaeological pattern found in California (Hale 2001, 2009; Fitzgerald 2000). Archaeologists continued until the turn of the century to be captivated by the Milling Stone pattern, resulting in numerous graduate theses and dissertations, monographs, and articles that focused on analyzing regional variability. That is, research focused on understanding how the Milling Stone pattern varied from place to place. Perhaps the most exhaustive review of the Milling Stone pattern was completed by Basgall and True (1985) for a Caltrans project along the Interstate 15 corridor. Basgall and True (1985) investigated archaeological sites belonging to the Sayles Complex—an inland, Transverse Ranges manifestation of the Milling Stone pattern. They review most of the significant contributions to

the Milling Stone pattern concept as of 1985, and provide an analytical framework for investigating and interpreting archaeological deposits of this kind. Since then, certain early contributions to the topic (i.e., Warren 1968) have been more supported than refuted (see Hale 2001).

Locally, the upper Santa Clarita River Valley certainly has evidence of Milling Stone occupations, but these are confined to the late Holocene period, after 4000 bp, including the work by Waugh (1999) at CA-LAN-2233 and CA-LAN-2235. The Milling Stone component there is dated by proxy with a small number of obsidian hydration readings. Its presence in the upper Santa Clarita River Valley is not surprising; sites of this nature are visible precisely because they were repeatedly occupied on a seasonal basis for a similar processing purpose, resulting aggregations of reused grinding and processing tools.

3.2.4 Late Holocene (post – 4000 bp)

The late Holocene (post – 4000 bp) is characterized by increased variation in environmental conditions and archaeological assemblages. Part of this variability is due to better resolution in both records, but much of it represents an accurate sample of prehistoric times over the last 4000 years. A summary of the various regionally specific paleoenvironmental conditions will not be provided in this brief overview. However, some patterns warrant discussion. With the dissipation of Altithermal conditions after about 4000 bp, increased precipitation is generally evident for southern California. In desert regions, spring flows markedly increased along with the stabilization of marshes, and some lake basins retained shallow waters from runoff (Batchelder 1970; Hunt and Mabey 1966; La Marche 1973; Mehringer 1987; Mehringer and Sheppard 1978; Mehringer and Warren 1976; Smith 1979; Stine 1990, 1994, 1995; Weide 1982). In coastal southern California, lagoons stabilized and destructive erosional processes that gutted them stopped after about 3000 bp (see Byrd and Reddy 2003; Erlandson and Rick 2003). Pollen and oxygen isotope studies from ocean and estuary cores sometimes present conflicting information, but all generally point to climatic instability during the last 3000 years, with a few pronounced periods of extreme climate, such as the Medeival Climatic Anomaly (MCA) from approximately 800 – 1200 BP (see Munns and Arnold 2003).

Erlandson suggests that southern California Mediterranean climates were more characterized by instability and fluctuations in resource availability than by sustained abundance (Erlandson 2003). It is a fact that southern California hunter-gatherer populations grew overtime. Coupled with instability in climate and resource availability, dense aggregations of hunter-gatherers would certainly elicit a socioeconomic response—this seems to be borne out in the archaeological record, at least in coastal regions.

Along the northern bight (Santa Barbara and Ventura coastal plain), archaeological assemblages are referred to as Canalino (D.B. Rogers 1929), or Late Prehistoric (Wallace 1955), while King's (1990) cultural chronology separates the last 2600 years into various divisions of the Middle Period (950-2600 bp [2600 B.C. – A.D. 1150]) and Late Period (post 950 bp [A.D. 1150]). The Southern California Bight (roughly, Orange and San Diego Counties) is characterized uniformly as the Late Prehistoric in most areas, although Gabrielino territory (parts of Orange County and Los Angeles County) tend to mimic the Northern California Bight chronology. Notably, the Southern California Bight witnesses a wholesale continuation of the Milling Stone pattern into the late Holocene, changing little in assemblge composition excepting the addition of the bow and arrow and ceramics (Hale 2009, 2010a). Significant socioeconomic shifts occur just prior to Spanish contact at approximately 450 – 650 bp with an acorn economy starting to emerge (Hale 2009, 2010a).

Santa Barbara, Ventura, and parts of coastal Los Angeles exhibit significant changes in archaeological assemblages. Mortars and pestles are firmly established in the late Holocene by 3500 bp. This is followed by the appearance of the single piece fishhook by approximately 2900 bp, the plank canoe at approximately 1600 bp, bow and arrow (1500 bp), circular fishhook (700 bp), and microlithic tools (700 bp) (Arnold 1992; 1997; Gamble 2002; Glassow 1996; Kennett 2005; C. King 1990; Rick et al. 2002; Strudwick 1985). These technological innovations are successively accompanied by related increases in the formality of other kinds of subsistence tools already present in tool kits (Hale 2010a). Olivella sp. bead manufacturing is present throughout the late Holocene, but becomes a robust industry in the last thousand years. Other items characteristic of late Holocene coastal regions include steatite cooking vessels and containers, perforated stones, arrow shaft straighteners made of steatite, a variety of bone tools, and personal ornaments made from shell, bone, and stone. There is also an increased use of asphalt for waterproofing and as an adhesive.

Many late Holocene coastal sites contain complex objects of art and decoration. Ornaments include drilled whole venus clam (Chione spp.) and drilled abalone (Haliotis spp.). Steatite effigies become more common, with scallop (Pecten spp. and Argopecten spp.) shell rattles common in middens. Mortuary customs are elaborate and include cremation and interment with abundant grave goods.

In Warren's (1968) cultural ecological scheme, the period between A.D. 500 and European contact is divided into three regional patterns. The Chumash Tradition is present mainly in the region of Santa Barbara and Ventura counties; the Takic or Numic Tradition is present in the Los Angeles, Orange, and western Riverside counties region; and the Yuman Tradition is present in the San Diego region. The seemingly abrupt changes in material culture, burial practices, and subsistence focus at the beginning of the Late Prehistoric period was taken to be the result of a migration to the coast of peoples from inland desert regions to the east. In addition to the small triangular and triangular side-notched points similar to those found in the desert regions in the Great Basin and Lower Colorado River,

Colorado River pottery and the introduction of cremation in the archaeological record are diagnostic of the Yuman Tradition in the San Diego region.

In Los Angeles, Orange, and western Riverside counties, similar changes (introduction of cremation, pottery, and small triangular arrow points) are thought to be the result of a Takic migration to the coast from inland desert regions. This Takic or Numic Tradition was formerly referred to as the "Shoshonean wedge" or "Shoshonean intrusion" (Warren 1968). This terminology, used originally to describe a Uto-Aztecan language group, is generally no longer used to avoid confusion with ethnohistoric and modern Shoshonean groups who spoke Numic languages (Heizer 1978:5; Shipley 1978:88, 90).

The growing body of archaeological literature, however, either contradicts the notion of a population migration, or indicates that when they arrived, they adopted local socioeconomic practices (Hale 2009). The longstanding archaeological patterns in the San Diego region are evidence of this. To the north, the similarity of archaeological assemblages and ethnic customs between the Los Angeles region and the Ventura and Santa Barbara regions is interesting, considering the two areas have distinct linguistic profiles. This disparity highlights the problem of considering any artifact type as an ethnic marker, which is not considered good scientific practice because it cannot be supported in the material record. Behavioral norms are the best ethnic marker, but tying behaviors to specific artifact types or patterns, as archaeologists do, measures only similarity in socioeconomic adaptation, which can exist between groups that share no ethnicity. Because of this, the archaeological record is generally the wrong context to measure ethnic association. Rather, among all ethnographic and ethnohistoric studies in California, language is the best discriminator of ethnic identity. Dialectical differences are better indicators of ethnicity when ethnographic information is the only representation of past populations, even though true ethnic markers are embodied in behavioral norms (see McElreath et al. 2003).

Items manufactured in coastal locales, such as shell ornaments and steatite vessels commonly made their way to the interior of California, being found in archeological deposits in the Transverse Ranges and Mojave Desert (e.g., Basgall and Hall 1994; Schroth 1994; Sutton 1980). Likewise, obsidian from the Coso volcanic field near Ridgecrest, California made its way to coastal environments. Whether these artifacts were carried to their location of deposition in the hands of those who made them or whether they were procured through trade is a question specific to each occurrence, ruling out various explanations in favor the most plausible scenario. Regardless, ethnographic and ethnohistoric accounts indicate that transregional trade and exchange was common and did not equate to similarity in ethnic identity since exchanges traversed traditional cultural boundaries (see Heizer 1978). For this reason alone, none of the artifacts common to southern California archaeological assemblages can be considered ethnic markers. This is especially true for ornaments, such as shell beads that may have been used as

form of currency (Arnold 1991, 1997), or the bow and arrow that is widely considered one of the most significant technological innovations of the prehistoric world and that spread rapidly across the globe through adoption (Bettinger 1991).

The archaeological record in the Santa Clarita Valley is best represented by late Holocene assemblages. CA-LAN-2235 (Chiquito Creek I) and -2233 (Chiquito Creek II) are sites with a relatively typical Milling Stone period deposit with no surprising attributes relatively to the norm for this pattern (Waugh 1999; Whitley and Simon 1994a). The Milling Stone component at CA-LAN-2235 dates to approximately 4000 – 3000 bp, predating the cemetery component at CA-LAN-2233 that is bracketed between 2000 and 1630 bp. The latter contains artifacts characteristic of the late Holocene in general, fitting within Wallace's (1955) Late Prehistoric period, including mortars and pestles, time-sensitive shell beads, and the like (Waugh 1999). However, Waugh (1999) concludes that adaptive strategy represented by the Late Prehistoric component is similar to that of the earlier Milling Stone component, despite differences in milling technology. An interesting conclusion by Waugh (1999) is that mitochondrial DNA analysis of burials indicates no physical relationship to Chumash peoples to the west, but strong ties to Tataviam and other Takic peoples located to the east and northeast in desert landscapes.

Also in the upper Santa Clarita River Valley, Whitley and Simon (W&S) (1994a, 1994b) documented several other sites that generally lack substantial assemblages, but can be characterized as Late Prehistoric temporary encampments generally post dating 3000 bp. Aside from their work at CA-LAN-2233 and LAN-2235, W&S (1994a, 1994b) evaluated several other small sites but failed to identify significant archaeological deposits.

W&S (2009) evaluated CA-LAN-4355 along Santa Clarita River in Sand Canyon, California, finding artifacts consistent with prehistoric habitation dating to the Late Prehistoric era (though no radiocarbon dates were provided). These artifacts included mortars and pestles, projectile points, flaked stone tools, steatite ornaments, bone tools, and various cobble based tools. W&S interpreted this site as dating between 400 and 800 bp, based on time sensitive artifacts. CA-LAN-1077, also located in Sand Canyon, was evaluated by Robinson (1980) who had findings similar to those of W&S (2009). CA-LAN-1077 had a weakly developed midden deposit with excavations producing four steatite beads/pendants, three cores, two retouched flakes, one hammerstone, five handstones, two battered cobbles, and fire-affected rock; no chronological placement was offered (Robinson 1980). None of the artifacts from CA-LAN-1077 or CA-LAN-4355 are specific to coastal locales; all types of artifacts recovered can be found in coastal, riparian, or desert environments.

One of the more well-known archaeological sites in the Santa Clarita River Valley dating to the late Holocene is CA-LAN-324. Loetzerich (1998) analyzed the collection from this massive site that contained human remains, residential features, thermal features, one flower pot mortar,

mortars and pestles, millingstones and handstones, flakedstone tools (including bifaces), cobble tools, and several exotic items such as quartz crystals, and schist and other stone beads. The site was interpreted as representing aboriginal occupation continuously from 2600 bp to 400 bp, based on various time-sensitive artifacts (including the flower pot mortar which tend to date to the last 300 years), and that it reflected a well-stratified aboriginal society similar to those seen in Gabrielino territory. The latter is consistent with Loetzerich's findings that burial patterns were similar to those seein the San Fernando Valley.

A few archaeological sites near Vaszquez Rocks in the Sand Canyon area to the northeast of Santa Clarita Valley, such as CA-LAN-618 produced Olivella sp. beads that were tentatively thought to date prior to Chester King's (1990) Early Period have subsequently been found to date after 4000 bp (W&S 1994b). Additionally, Love and Witt (1990) revisted these sites concluding that their earliest documented occupation occurred no earlier than about 2700 bp. In her review, Waugh (1999) reviews the chronological evidence from this site according to the coastally derived cultural chronology developed by King (1990). The reference to King's (1990) bead chronology is justified in the sense that it is a baseline for review of shell bead types but it leaves the impression that the occupants were socioculturally connected to coastal areas, while the non-ornamental archaeological assemblage provides no such justification.

Farther to the north in Antelope Valley, Sutton (1980) studied CA-LAN-488—a substantial prehistoric site dating from 2200 – 300 bp and containing a prehistoric cemetery, including a child burial associated with more than 5,000 shell beads. The archaeological assemblage from this site, dating within the late Holocene was decidedly desert focused, despite this strong shell bead component.

Finally, investigations of the Lovejoy Springs site (CA-LAN-192) summarized nearly a century of investigation at a large, desert site near Lake Los Angeles in the Antelope Valley (Price et al. 2009). The assemblage from CA-LAN-192, dating from approximately 3500 bp to historic times is characteristic of those found in the western Mojave Desert, being dominated almost exclusively by millingstone and handstone technology and the appropriate time-sensitive, desert projectile point forms. A few fragments of mortars and pestles (one decorated), and steatite vessels are present. Similar to CA-LAN-488, thousands of Olivella sp. shell beads were found interred with several of the nine human burials and in the general deposit (Price et al. 2009). Together, the site spans the Gypsum (4000 – 1500 bp), Saratoga Springs (1500 – 900 bp) and the Late Prehistoric periods (post – 900 bp), and exhibits many of the assemblage changes characteristic of each time period within the Mojave Desert.

In sum, the late Holocene saw major socioeconomic development among aboriginal populations within and surrounding Santa Clarita Valley, but that each region is distinct, from the Mojave to the northeast, to the west along the Coast, to the south in the Los Angeles Basin and San Diego County. The

archaeological record within Santa Clarita Valley is meager compared to these other regions and resists efforts to make socioeconomic connections to neighboring regions or their inhabitants. Simple assemblage similarities, such as the presence of coastal beads or burial patterns in Santa Clarita or the Mojave, are not direct evidence of cultural affiliation. If it were, burials located in some of the Mojave Desert sites, such as CA-LAN-488 or CA-LAN-192 would require the assumption that they were Chumash in origin, which is the least likely explanation and one that few archaeologists (if any) would suggest. Rather, it is likely that trade and exchange networks between different ethnic groups were well established with the onset of the late Holocene by at least 3000 years ago (Price et al. 2009). Such networks allowed for the exchange of goods, such as beads across ethnic boundaries without carrying implications for population movement or replacement.

Overall, the archaeological record of the upper Santa Clarita River Valley is poorly understood, especially in comparison to neighboring regions. This is likely a function of the complex geomorphology of the Santa Clarita River watershed reviewed earlier in this report. The areas that would have attracted prehistoric human occupation, such as river terraces and flat ground in valley bottoms, were subject to periodic and destructive flooding and sedimentation, which likely wiped out a large portion of the archaeological record. The San Francisquito Dam failure of 1927 probably exacted a heavy toll on the archaeological landscape of the floodplain since that event undoubtedly trumped previous natural flood events with its near 60-foot high wall of water instantly released into the Santa Clarita River Floodplain.

3.3 Ethnographic Overview

3.3.1 Tataviam

The project area falls within the ethnographic boundary of the Tataviam (Johnson and Earle 1990; King and Blackburn 1978; Kroeber 1925). Tataviam territories included the upper reaches of the Santa Clara River drainage east of Piru Creek, but also encompassed the Sawmill Mountains to the north and the southwestern portion of the Antelope Valley (King and Blackburn 1978). Tataviam territory is bounded by various branches of Chumash to the north and west (including the Ventureño to the west, and Castac and Emigdiano to the northwest), Kitanemuk to the northeast, Serrano to the east, and Gabrielino to the south (King and Blackburn 1978).

Note that there is almost no ethnographic data (i.e., data acquired by means of observation or taken from persons who practiced native lifeways) in existence concerning the Tataviam and their native lifeways. Most of what is known today about the Tataviam comes in the form of ethnohistory (i.e., historical accounts developed through examination of historical records and oral histories) as presented in the works of anthropologists Alfred L. Kroeber (1915, 1925) and John P. Harrington (1935). Their data is largely based on interviews conducted in the early 1900s with a Native American consultant

named Juan José Fustero, a man who spoke Kitanemuk and claimed that his grandparents were born near the town of Newhall and spoke a language that is no longer extant (Bright 1975). Most of the subsequent works published on the Tatatviam (Bright 1975; Hudson 1982; King and Blackburn 1978), including discussions of their cultural and geographic affiliations, were based on the Kroeber and Harrington interviews with Fustero and several other Kitanemuk consultants. Other studies have analyzed Spanish mission baptismal, marriage, and burial registers in an attempt to better understand the distribution of historic village settlements and kinship ties between settlements (Johnson 1978 and 1997; NEA and King 2004).

Early ethnologies referred to the Tataviam as Ataplili'ish (Kroeber 1915), but Kroeber found this name to be too general since it had already been used to describe other indigenous groups (namely the Gabrielino). Kroeber changed the term to Alliklik (1925), which was noted to be a Ventureño Chumash name for the group (although it is believed to be a derogatory term for the sound of the language), but offered almost no information concerning their native lifeways:

In fact, there is nothing known about them except that they held the river up from a point between Sespe and Piru, most of Piru Creek, Castac Creek, and probably Pastoria Creek across the mountains in the San Joaquin Valley drainage and adjacent to the Yokuts (Kroeber 1925:613-614).

The Tataviam are linguistically classified as an Uto-Aztecan Serran sub-branch of Takic speaking groups consisting of Kitanemuk, Serrano (including Vanyume), and Tataviam (Golla 2011; Sutton 2009). William Bright has suggested that Tataviam was actually a separate language with Takic affinities, or perhaps a "remnant, influenced by Takic, of a language family otherwise unknown in southern California" (Bright 1975:230). However, the current and most widely accepted view is that Tataviam is in fact a Takic language (King and Blackburn 1978; Johnson and Earle 1990; Sutton 2009).

King and Blackburn (1978:536) noted several Tataviam settlements based on information provided by Harrington and other sources, including mission registers. Among these is the putative village of tsawayung (also referred to as Chaguayabit, Chaguayanga, takuyama'm), which some believe was located near Castaic Junction at the site of Rancho San Francisco. However, there is a lack of consensus – indeed, significant confusion – as to its exact location. Harrington's own notes reflect this confusion: "Jose Juan Olivas thinks it is over by San Francisquito [Rancho San Francisco] but does not know and never did know just where" (NEA and King 2004:119). Based on diary entries from the Portolá Expedition (Perkins 1957), some have hypothesized that Estancia San Francisco de Xavier (often incorrectly referred to as an asistencia) was placed at the location of the village of tsawayang, but this is based on descriptive diary entries and has never been confirmed by archaeological or other historic evidence. In fact, no physical evidence of the village has ever been found. Other Tataviam villages mapped outside

of the project area include tikatsing located on upper Castaic Creek, and pi'ing located where Castaic Creek meets Elizabeth Lake Canyon. The village of Tochonaga, was recorded on an 1843 land grant map. This site appears to be located to the southeast of Newhall, but it's precise location has also never been confirmed: "Tochononga was located in the mountains northwest of San Fernando…over by Los Alamos somewhere here in the Tejon Ranch " (NEA and King 2004:117). Other villages and seasonal camp sites identified by Harrington include akure'eng, which was located at the original Newhall townsite; apatsitsing, located on upper Castaic Creek; and naqava'atang, located east of Townsend Peak. Piru Creek also contained several village and rancheria sites, located on the northern edge of Tataviam territory (Johnson and Earle 1990).

Pedro Fage's account of the 1769 Portola expedition indicates that the first Chumash settlement encountered upon leaving Tataviam territory was located west of the mouth of Piru Creek. The village of kamulus (Camulos), located east of Piru Canyon, bears a Chumash name (Johnson and Earle 1990), leading to speculation that this village consisted of a mixed Chumash-Tataviam population. There has been much discussion regarding Chumash ties to areas generally accepted as Tataviam territory (see Beeler and Klar 1977).

More recent studies have examined additional Tataviam investigations conducted by Harrington with neighboring groups (Johnson and Earle 1990). These studies support the original Kroeber and Harrington findings that the Tataviam were a distinct group:

> The correspondence between (1) ancestral villages traced using genealogical evidence and (2) independently elicited information regarding Tataviam territoriality builds confidence in the realiability of the ethnographic record compiled by Kroeber and Harrington. The distinctiveness of the Tataviam as an ethnic entity, separate from the Kitanemuk and Fernandeño, is supported by our research (Johnson and Earle 1990:209).

Additional evidence on the subject of Chumash ties to the region has come to light through bioarchaeological studies. In 1999 archaeologists excavated 45 burials from CA-LAN-2233, a prehistoric cemetery dating from approximately 2000 to 1630 bp and located within the Homestead South project area, within Tataviam territory. Examination of mitochondrial DNA (mtDNA) from five burials at CA-LAN-2233 found that these individuals were genetically linked to modern Uto-Aztecan speaking groups, such as the Tataviam:

As Chumash speakers are very low in haplogroup C, this high frequency is not consistent with a close mtDNA genetic affinity with the CA-LAN-2233 population. Additionally, the lack of haplogroup A, which is the most common haplogroup among Chumash samples analyzed,

further suggests that the CA-LAN-2233 population does not have a mtDNA affinity with the Chumash (Waugh 1999:87).

While mortuary customs are largely unknown, mortuary data from Tataviam territory indicates that inhumation is the most frequently observed pattern, with ocassional instances of cremation (Sutton 2009).

3.3.2 Further Ethnohistoric Considerations

The preponderance of evidence indicates that the Tataviam inhabited the Santa Clarita Valley at the time of Spanish Contact in the 1700s and for sometime thereafter, and that there is no demonstrable link indicating direct and prolonged occupation by neighboring Chumash, Kitanemuk, Gabrielino, Serrano, or other ethnohistorically known native groups. The archaeological record contains artifacts that are commonly found in both coastal and desert regions, which is not surprising since Santa Clarita Valley is in the midst of natural corridors connecting the Ventura Coast, southern San Joaquin Valley, and Mojave Desert. The commonality of coastal artifacts in the desert, and desert artifacts at the coast testifies to extensive movement of these items. Artifact translocation primarily occurred through trade and exchange. The widespread manifestation of earlier Milling Stone assemblages throughout all parts of southern California indicates that human populations were strongly established during the early Holocene, likely resulting in the development of ethnic borders and some degree of territoriality. The ethnographic and ethnohistoric record in California indicates that such sociocultural conditions are more conducive to trade and exchange than to open travel through multiethnic territories by unaffiliated individuals or groups.

Considering the ethnohistorically mapped aboriginal villages, any efforts to rectify mapped locations with archaeological deposits would be wrought with tenuous assumptions. Ethnohistoric village location maps for the Santa Clarita Valley were developed through interviews with persons far removed from any aboriginal occupation of those settlements and are estimates only. Discovering an archaeological deposit near a mapped village location does not itself prove that the ethnohistoric village has been located.

With respect to the putative Tataviam village of tsawayung, it was mapped using ethnohistorical data only; no archaeological evidence exists that could confirm its location. Even if archaeological deposits dating to the last few hundred years are identified in the general area, those deposits must be studied to first address basic anthropological questions of settlement, subsistence, and general socioeconomic adapatations, followed by a test of expectations regarding what the ethnohistoric settlement may have looked like. The devastating effect of introduced disease, along with Missionization of California Indians, would have certainly modified the nature of aboriginal

occupation of any village, creating an archaeological signature distinct from the traditional Late Prehistoric record. Moreover, the ethnohistoric period archaeological record from neighboring regions can only be used as a proxy for the kinds of archaeological patterns that may appear in the Santa Clarita Valley. Socioeconomic adaptations in Chumash and Kitanemuk territories were regionally specific and can be expected to have responded differently to the effects of introduced disease, Missionization, and integration into Mexican and American economies—all of which preceded development of the ethnographic and ethnohistoric records of southern California aboriginal groups during the early 1900s.

3.4 Historic-Period Overview

Post-Contact history for the State of California is generally divided into three periods: the Spanish Period (1769–1821), Mexican Period (1821–1848), and American Period (1846–present). Although Spanish, Russian, and British explorers visited the area for brief periods between 1529 and 1769, the Spanish Period in California begins with the establishment in 1769 of a settlement at San Diego and the founding of Mission San Diego de Alcalá, the first of 21 missions constructed between 1769 and 1823. Independence from Spain in 1821 marks the beginning of the Mexican Period, and the signing of the Treaty of Guadalupe Hidalgo in 1848, ending the Mexican–American War, signals the beginning of the American Period when California became a territory of the United States.

3.4.1 Spanish Period (1769–1821)

Spanish explorers made sailing expeditions along the coast of southern California between the mid-1500s and mid-1700s. In search of the legendary Northwest Passage, Juan Rodríquez Cabrílllo stopped in 1542 at present-day San Diego Bay. With his crew, Cabrílllo explored the shorelines of present Catalina Island as well as San Pedro and Santa Monica Bays. Much of the present California and Oregon coastline was mapped and recorded in the next half-century by Spanish naval officer Sebastián Vizcaíno. Vizcaíno's crew also landed on Santa Catalina Island and at San Pedro and Santa Monica Bays, giving each location its long-standing name. The Spanish crown laid claim to California based on the surveys conducted by Cabrílllo and Vizcaíno (Bancroft 1885; Gumprecht 1999).

More than 200 years passed before Spain began the colonization and inland exploration of Alta California. The 1769 overland expedition by Captain Gaspar de Portolá marks the beginning of California's Historic period, occurring just after the King of Spain installed the Franciscan Order to direct religious and colonization matters in assigned territories of the Americas. With a band of 64 soldiers, missionaries, Baja (lower) California Native Americans, and Mexican civilians, Portolá established the Presidio of San Diego, a fortified military outpost, as the first Spanish

settlement in Alta California. In July of 1769, while Portolá was exploring southern California, Franciscan Fr. Junípero Serra founded Mission San Diego de Alcalá at Presidio Hill, the first of the 21 missions that would be established in Alta California by the Spanish and the Franciscan Order between 1769 and 1823.

The Portolá expedition first reached the present-day boundaries of Los Angeles in August 1769, thereby becoming the first Europeans to visit the area. Father Crespi named "the campsite by the river Nuestra Señora la Reina de los Angeles de la Porciúncula" or "Our Lady the Queen of the Angeles of the Porciúncula." Two years later, Friar Junípero Serra returned to the valley to establish a Catholic mission, the Mission San Gabriel Arcángel, on September 8, 1771 (Kyle 2002). Mission San Fernando Rey de España was established nearly 30 years later on September 8, 1797.

3.4.2 Mexican Period (1821–1846)

A major emphasis during the Spanish Period in California was the construction of missions and associated presidios to integrate the Native American population into Christianity and communal enterprise. Incentives were also provided to bring settlers to pueblos or towns, but just three pueblos were established during the Spanish Period, only two of which were successful and remain as California cities (San José and Los Angeles). Several factors kept growth within Alta California to a minimum, including the threat of foreign invasion, political dissatisfaction, and unrest among the indigenous population. After more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain in 1821. In 1822, the Mexican legislative body in California ended isolationist policies designed to protect the Spanish monopoly on trade, and decreed California ports open to foreign merchants (Dallas 1955).

Extensive land grants were established in the interior during the Mexican Period, in part to increase the population inland from the more settled coastal areas where the Spanish had first concentrated their colonization efforts. Nine ranchos were granted between 1837 and 1846 in the future Orange County (Middlebrook 2005). Among the first ranchos deeded within the future Orange County were Manuel Nieto's Rancho Las Bolsas (partially in future Los Angeles County), granted by Spanish Governor Pedro Fages in 1784, and the Rancho Santiago de Santa Ana, granted by Governor José Joaquín Arrillaga to José Antonio Yorba and Juan Pablo Peralta in 1810 (Hallan-Gibson 1986). The secularization of the missions (enacted 1833) following Mexico's independence from Spain resulted in the subdivision of former mission lands and establishment of many additional ranchos.

During the supremacy of the ranchos (1834–1848), landowners largely focused on the cattle industry and devoted large tracts to grazing. Cattle hides became a primary southern California export, providing a commodity to trade for goods from the east and other areas in the United States

and Mexico. The number of nonnative inhabitants increased during this period because of the influx of explorers, trappers, and ranchers associated with the land grants. The rising California population contributed to the introduction and rise of diseases foreign to the Native American population, who had no associated immunities.

3.4.3 American Period (1846–Present)

War in 1846 between Mexico and the United States precipitated the Battle of Chino, a clash between resident Californios and Americans in the San Bernardino area. The Mexican-American War ended with the Treaty of Guadalupe Hidalgo in 1848, ushering California into its American Period.

California officially became a state with the Compromise of 1850, which also designated Utah and New Mexico (with present-day Arizona) as U.S. Territories (Waugh 2003). Horticulture and livestock, based primarily on cattle as the currency and staple of the rancho system, continued to dominate the southern California economy through 1850s. The Gold Rush began in 1848, and with the influx of people seeking gold, cattle were no longer desired mainly for their hides but also as a source of meat and other goods. During the 1850s cattle boom, rancho vaqueros drove large herds from southern to northern California to feed that region's burgeoning mining and commercial boom. Cattle were at first driven along major trails or roads such as the Gila Trail or Southern Overland Trail, then were transported by trains when available. The cattle boom ended for southern California as neighbor states and territories drove herds to northern California at reduced prices. Operation of the huge ranchos became increasingly difficult, and droughts severely reduced their productivity (Cleland 2005).

3.4.4 Local History of the Project Area

In 1795 Fr. Fermin Lasuen ordered a new report on possible mission sites, and the Francisco Reyes Rancho was ultimately chosen as the new mission site, with Mission San Fernando Rey de España being formally founded in 1797 (Perkins 1957). Shortly thereafter, many of the local Tataviam people were removed from their homeland, relocated to the mission, and their native lifeways taken away.

Despite the fact that the new mission was to be built elsewhere, Mission San Fernando acquired the headwaters of the Santa Clara River east from Piru and named the land Rancho San Francisco. When Mission padres learned that Francisco Avila had claimed a large portion of this land as his own, they protested to Governor José Arrillaga at Monterey, insisting that these lands belonged to the church and not Avila. After acknowledging the church's title to the land, Avila's land grant was rescinded and the padres quickly made plans to build in the area in order to more clearly establish their presence (Perkins 1957).

Using Native American labor in 1804, the church built an "asistencia" at the location that Fr. Crespi has first noted in his diary entry (Perkins 1957). However, it is important to note that mission records suggest that this was actually an outpost known as Estancia San Francisco de Xavier, and that it was likely never elevated to the status of asistencia or sub-mission.

By 1813, Rancho San Francisco had increased its production and herds of cattle had grown larger. It became necessary to construct a fence to keep mission cattle separate from neighboring cattle. The fence was erected at Piru Creek across the river, establishing a formal boundary between San Francisco and Triunfo ranches. An irrigation canal was dug and a small dam built at the eastern boundary of the rancho in order to provide the western side of the rancho with much needed water. (Perkins 1957).

Following secularization of the missions in 1833, the Mexican Government confiscated all mission land holdings and commissioned Lieutenant Antonio Del Valle to take over Mission San Fernando by inventory from the incumbent Padre, Fr. Ybarra in 1834. After meeting his wife Doña Jacoba Felix and having two children, de Valle decided to settle his family on a piece of land. In 1838, he resigned his army commission and petitioned the Mexican Government for Rancho San Francisco (despite the fact that the land was supposed to revert back to Native Americans). On January 22, 1839, the request was granted, and Del Valle became the owner of 48,829 acres of Rancho San Francisco. Just two years later, Antonio Del Valle died, leaving behind thousands of heads of livestock, over 75 square miles of land, and no legal will. Legal battles ensued between his widow Jacoba Felix Del Valle and his oldest son Ygnacio Del Valle, with a judge eventually dividing up the land amongst the parties and their children . Ygnacio would go on to build his own corral on the western edge of the property (in present-day Ventura County in Piru) surrounding the former village of kamulus (Rasmussen 2001). The Camulos Rancho was formerly established by Ygnacio in 1853.

Rancho San Francisco was owned and operated by Ygnacio Del Valle until 1865, by which time it was deep in debt as a result of three years of drought which killed most of the cattle. Del Valle eventually lost the rancho to his financiers who then sold it to oil speculators. This resulted in the first major discovery of oil on the Rancho, and just seven weeks later, the first oil well was installed on the south side of the Santa Clara River near the Del Valle residence. The region eventually be surrounded by oil fields including the Hasley Canyon and Castaic Junction Oil Fields to the north and the historic Pico Oil Field to the south.

The land changed hands a few more times until it was acquired by Henry Mayo Newhall in 1875. Shortly thereafter in 1876, a new townsite known as "Newhall" was founded and a Southern Pacific Railroad (SPRR) right-of-way was granted across the rancho (Perkins 1957). In 1875, work had already begun on the San Fernando Railroad Tunnel, which was constructed by over 1,000

Chinese and 500 white laborers, and overseen Frank Frates. The completion of the tunnel in 1876 resulted in the completion of the SPRR at Lang Station. A Golden Spike ceremony was held the day the final pieces of track were laid (Pollack 2010). That same year the Newhall station was built, although adverse conditions from sand storms would result in the building (and the rest of the townsite) being moved three miles to the south.

When gold was struck in the 1800s, colonial Mexican settlers soon built a boomtown named Val Verde. The town was short lived and by the early 1900s, had dissipated. As tracts of land came up for sale, a group of black professionals, fed up with the Jim Crow laws of the nearby cities, purchased the 30-acre tract encompassing the old boomtown (Worden 1996). Marketing the town as "Eureka Villa," they began to sell parcels to black professionals looking for a place to relax and dine in peace. In 1928, the town of Eureka Villa became an independent township and residents decided to change the name of the community back to Val Verde (Flamming 2005).

In the 1930s, the Works Progress Administration dedicated $39,000 for the development of an Olympic swimming pool within the community. Celebrated with a gala opening attended by black celebrities of the era, the pool remained intact until the 1994 Northridge earthquake (Flamming 2005). In addition to damaging the pool, the earthquake damaged the majority of the original structures.

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4 RESEARCH METHODS

4.1 Cultural Resources

4.1.1 Cultural Resources Literature Review

On September 25, 2017, Dudek completed a search at the SCCIC, located on the campus of California State University, Fullerton. This search included mapped prehistoric, historical, and built-environment resources; Department of Parks and Recreation (DPR) site records; technical reports; archival resources; and ethnographic references. Additional consulted sources included historical maps of the project area, the NRHP, the CRHR, the California Historic Property Data File, and the lists of California State Historical Landmarks, California Points of Historical Interest, and the Archaeological Determinations of Eligibility. The confidential records search results are also provide in Appendix A.

4.1.2 NAHC Sacred Lands File Search

On September 27, 2017, Dudek requested a search of the Sacred Lands Files from the Native American Heritage Commission (NAHC). A response letter was received via email from the NAHC on September 28, 2017, stating that the results of the Sacred Lands File search failed to indicate the presence of Native American cultural resources in the immediate project area. The NAHC also provided a list of 11 Native American groups and individuals who may have knowledge of cultural resources in the project area. Letters were sent to each representative October 23, 2017. This coordination was conducted for informational purposes only and does not constitute formal government-to-government consultation. To date, no responses have been received. Should any responses be received, they will be forwarded to LADPW. Documentation of coordination with Native American groups and individuals is provided in Appendix B.

4.1.3 Field Methodology

Dudek archaeologists conducted the intensive-level pedestrian survey on October 13, 2017 using standard archaeological procedures and techniques. All field practices met the Secretary of Interior's standards and guidelines for a cultural resources inventory. Where vegetation allowed and slope was 30% or less, pedestrian transects were spaced at 15-m intervals (49-ft) were utilized. Discretionary pedestrian survey was utilized in areas with a slope over 30% and in heavily vegetated areas where systematic survey was not possible. Ground disturbances such as burrows, cut banks, and drainages were also visually inspected for exposed subsurface materials and to record locational information.). Ground disturbances such as burrows, cut banks, and drainages were also visually inspected for exposed subsurface materials. No artifacts were collected during the surveys.

All fieldwork was documented using field notes and iPad technology with close-scale field maps, and aerial photographs. Location-specific photographs were taken using an Apple 3rd Generation IPad equipped with 8 mega-pixel (MP) resolution and georeferenced PDF maps of the project area. All field notes, photographs, and records related to the current study are on file at Dude's Pasadena, California office.

4.2 Paleontological Resources Records Search

Determining potential impacts to significant paleontological resources during the construction phase of a project requires the analysis of the geological units within the proposed project to determine the likelihood of their yielding significant paleontological resources. To determine the paleontological sensitivity of the project, Dudek paleontologists conducted geological and paleontological map and literature reviews. In addition, a paleontological records search, requesting an inventory of paleontological resources within a one-mile-buffer, was sent to the Natural History Museum of Los Angeles (LACM) on December 20, 2017.

5 RESULTS

This section presents the results of the records searches and field survey for the current study. Cultural and paleontological resources are discussed separately.

5.1 Cultural Resources

5.1.1 Records Search Results

5.1.1.1 Previously Conducted Cultural Resource Studies

The SCCIC records indicate that 34 previous cultural resources technical investigations have been conducted within 1.0-mile (1,608 m) of the project area between 1963 and 2013. Of these 34 studies, five overlap with the project area (LA-00285, -02259, -02437, -06585, and -10119) while the remaining 29 are within the records search buffer. All 34 technical investigations are summarized in Table 1.

Table 1
Previous Technical Studies Within the One-Mile Search Buffer

Report Number (LA-)	Authors	Date	Title	Proximity
00285	Tartaglia, Louis J.	1988	Cultural Resources Archaeological Survey Hasley Canyon, California Tentative Parcel Map No. 19784.	Within
00394	Singer, Clay A.	1978	Systematic Testing of Two Archaeological Sites (LAN-956 and An-957) in the Seminole Hot Springs Area of the Santa Monica Mountains, Los Angeles County, California	Outside
00990	Tartaglia, Louis J.	1981	Cultural Resource Survey, Chiquita Landfill, Newhall, California	Outside
01223	Romani, Gwendolyn R.	1980	A Survey of Cultural Resources and Assessment of Impacts for Tentative Tract No. 34031, Hasley Canyon, Los Angeles County, California	Outside
01318	Tartaglia, Louis J.	1983	Preliminary Archaeological Reconnaissance-hasley Canyon	Outside
01753	Tartaglia, Louis J.	1989	Cultural Resources Archaeological Survey Hasley Canyon, California Tentative Parcel Map No. 19784	Outside
01775	Love, Bruce	1989	Cultural Resource Assessment for Three Postal Service Sites, Os Angeles County	Outside
01785	Tartaglia, Louis J.	1989	Cultural Resources Archaeological Survey Hasley Canyon, California Tentative Tract No. 45084	Outside
01832	Cooley, Theodore G. and Toren, George A.	1989	Cultural Resource Survey of 408 Acres of Land for the Proposed Chiquita Canyon Sanitary Landfill Expansion Los Angeles County California	Outside
01839	Romani, Gwendolyn R.	1989	Cultural Resource Investigation: Del Valle Regional Emergency Training Center Project, Los Angeles County	Outside

Table 1
Previous Technical Studies Within the One-Mile Search Buffer

Report Number (LA-)	Authors	Date	Title	Proximity
02259	Tartaglia, Louis J.	1990	Cultural Resources Assessment Report He Pyle Ranch and Tsavangu Rancheria Site Complex Tentative Parcel Map 19784 Los Angeles County, California	Within
02362	Elsasser, Albert B.	1963	The Archaelogy of Bowers Cave, Los Angeles County, California	Outside
02437	Simon, Joseph M., Tamara K. Whitley, and David S. Whitley	1991	Phase I Archaeological Survey and Cultural Resources Assessment of an 80.4 Gross Acres Parcel, Val Verde, Los Angeles County, California	Within
02980	Cooley, Theodore G., A.George Toren, and Loren J. Santoro	1993	Phase I Cultural Resources Evaluation of the Chiquita Canyon Sanitary Landfill Expansion Los Angeles County, California.	Outside
03360	Tartaglia, Louis J.	1996	Cultural Resources Survey Report, Tentative Parcel Map No. 20685	Outside
03397	Whitley, David S. and Joseph M. Simon	1994	Intensive Phase 1 Archaeological Survey of the West Ranch Project Area, Los Angeles County, California	Outside
04739	Maki, Mary K.	1999	Negative Phase I Archaeological Survey and Impact Assessment of 70 Acres for the Sloan Canyon Greystone Homes Project Vesting Tentative Tract No. 52475 Los Angeles County, California	Outside
04859	Maki, Mary K.	2000	Negative Phase 1 Archaeological Survey of Approximately 0.12 Acre for the Val Verde Acquisition Project APN 3270-007-043, Sheridan Road Val Verde, Los Angeles County, California	Outside
05893	Anonymous	1998	Phase I Archaeological Survey of the Hasley Canyon Land Company Study Area, Los Angeles County, California	Outside
06585	McKenna, Jeanette A.	2003	A Phase I Cultural Resources Investigation of the Proposed Sterling Gateway Project Area in the Martinez Canyon/val Verde Area of Los Angeles County, California	Within
07861	Jordan, Stacey C. and Patterson, Joshua D.	2006	Archaeological Survey Report for the Southern California Edison Company Replacement of 30 Deteriorated Poles Private and Public Inholdings, Ventura, Los Angeles, and Santa Barbara Counties, California	Outside
10112	McKenna, Jeanette A.	2003	A Phase I Cultural Resources Investigation of the Proposed Wshuhsd Hasley-sloan School Sites in the Hasley Canyon Area of Northern Los Angeles County, California	Outside
10114	McKenna, Jeanette A.	2004	Addendum Studies: a Phase I Cultural Resources Investigation of the Proposed Sterling Gateway Project Area in the Martinez Canyon/val Verde Area, Los Angeles County, California	Adjacent
10119	Whitley, David S.	2003	Phase I Archaeological Survey of the 325 Acres Del Valle Specific Plan Study Area, Los Angeles County, California	Within

Table 1
Previous Technical Studies Within the One-Mile Search Buffer

Report Number (LA-)	Authors	Date	Title	Proximity
10359	Tebo, Susan, Judy Charles, Joe Decruyendere, and Mark Austin	2009	Draft Program EIR for the County of Los Angeles' Proposed Santa Clarita Valley Area Plan	Outside
10481	Romani, Gwen R.	2010	Phase I Cultural Resources Investigation for the proposed William S. Hart Union High School District, Hasley-Sloan High School Site, Located in the Castaic Area of Los Angeles County, California	Outside
10557	Schmidt, James J.	2006	Commerce Center Relocation Project, Los Angeles County, California	Outside
10792	Unknown	2010	Revised Draft Program EIR for the County of Los Angeles' Proposed Santa Clarita Valley Area Plan, Vol. 1	Outside
10995	Hatoff, Brian	2011	Verizon Cellular Communications Tower Site - Val Verde, Rainbow Drive, Castaic, Los Angeles County, CA 91384	Outside
11113	unknown	2011	County of Los Angeles' Proposed Santa Clarita Valley Area Plan, Final Program Environmental Impact Report. Volumes I through III	Outside
11454	Orfila, Rebecca	2011	Archaeological Survey for the Southern California Edison Company: Replacement of three deteriorated power poles near Newhall and Santa Clarita in Los Angeles County, California (WO6088-4800 0-4892 and wo 6088-4800, RSO Consulting CWA 9)	Outside
11514	Schmidt, James	2011	Archaeological Letter Report: Trumpet, Crabtree, Nero, and Davenport 16kV Deteriorated Pole Replacement Projects (WO 6059-4800, I-4805 & 0-4888), Los Angeles County, California	Outside
11713	Schmidt, James	2012	Archaeological Survey Report for Southern California Edison Company's Replacement of Two Deteriorated Power Pole Structures on the Bouquet 16kV and Trumpet 16 kV Distribution Circuits, Santa Clarita, Los Angeles County, CA	Outside
12681	Simon, Joseph	2013	Intensive Phase I Archaeological Survey of the Los Valles Study Area, Los Angeles County, California	Outside

5.1.1.2 Previously Recorded Cultural Resources

The SCCIC records indicate that three resources have been recorded within 1.0-mile (1,608 m) of the project area. Of these, none are within the boundaries of the current project area, though one is immediately adjacent to the east. All three resources are summarized in Table 2.

Table 2
Previously Recorded Cultural Resources Within the One Mile Search Buffer

Primary Number (P-19-)	Trinomial (CA-LAN-)	Period	NRHP/CRHP Status	Recorded By/Year	Description	Proximity
36	000036/H	Multi-component	6Z (Ineligible)	(Baumhoff); 1981 (L. Tartaglia and R. Wlodarski); 1991 (DS & TK Whitley and J. Simon, W&S Consutlants)	Bower's Cave with rock shelter, a ceramic scatter and caches of artifacts	Outside
100027	000036/H	Historic	7 (Not evaluated)	1989 (A.G. Toren, D. James, T. Hannahs, ERCE)	U.S. Forest Reserve boundary monument	Outside
100511	--	Prehistoric isolate	6Z (Ineligible)	2005 (J. A. McKenna, McKenna et al.)	Franciscan chert projectile point	Adjacent

5.1.2 Historic Aerial Photography Research

Dudek consulted historic maps and aerial photographs to understand development of the project area and surrounding properties. Topographic maps are available from 1903 to the present and aerial images are available from 1947 to the present (NETR 2018). These images indicate that until the late 1950s, the project area was primarily used for ranching, with roads extending through the area and sporadic homesteads. By 1994, the neighborhoods to the southeast and southwest of the project area are beginning to become more established as the ranching land is divided up for single-family homes. One residence, the current caretakers home, is observed within the project area on the 1952 quadrangle.

5.1.3 Historic Structure Research

Historic aerial photographs and preliminary parcel research indicate that the existing residence is located on Assessor Parcel Number (APN) 3271-004-013 and was constructed in 1936, making it over 45 years old (Figures 2 and 3). The residence has not previously been recorded and therefore has not been formally evaluated as an historical resource under CEQA or the Los Angeles County guidelines.

5.1.4 Survey Results

Surface visibility varied throughout the project area with dirt roadways having a visibility greater than 90% and off road areas having a much lower visibility of approximately 10% to 15% (Figures 4 through 7). Surface vegetation consisted of weed and chaparral communities. At the time of survey the project area extended to the southeast. Several resources were recorded in this area; however, because they are no longer within the proposed project, they are not discussed in this report and they have not been analyzed for significance as part of this report.

As a result of the survey, two newly-identified archaeological sites (SR-S-01) and one built environment resource (SR-S-05) was identified and recorded. No resources have been previously-recorded within the project area. Both resources are detailed below.

Figure 2. Overview of historic structure, view facing southwest.

Figure 3. Overview of historic structure, view facing southeast.

Figure 4. Overview from the southwestern portion of the project area, view facing northeast

Figure 5. Overview from the northwestern portion of the project area, view facing north.

Figure 6. Overview from the central portion of project area, view facing southwest.

Figure 7. Overview from the southern portion of project area, view facing east.

5.1.4.1 Newly Identified Cultural Resources

During the current field efforts, four newly-identified archaeological sites (SR-S-01) and one built environment resource (SR-S-05) was identified and recorded. California DPR 523 Series forms for all recorded resources are included as Appendix C.

Site SR-S-1

This historic archaeological feature consists of the fragmented remnant of a concrete slab foundation first visible on the 1947 aerial photo. The foundation is set back 267 feet from the centerline of Coolidge Avenue. The rectangular foundation roughly measures 107 feet (north-south) by 74 feet (east-west) and is flush with the ground. The full extent of the foundation is unknown as portions of the slab are buried and edges are obscured by vegetation. No siding or walls could be discerned within the foundation given the poor condition of the slab. No historic artifacts or features associated with the foundation were identified. Disturbances to the site area include the removal of all the original construction materials and All Terrain Vehicle (ATV) activity. Based on historic aerial review the site has existed since at least 1947. Aerials from this period show the concrete pad; however, it does not appear that anything has ever been built on the pad. The site does not show up on any historical topographic maps. It's function is unclear, as these images do not indicate any nearby structures or facilities that could be associated with it. Research into the town of Eureka has failed to identify any important persons that are associated with the site. Additionally the site does not have any interesting or notable characteristics, nor is further study likely to yield any important information pertaining to the prehistory or history of the area. As a result of these factors, this site is recommended as not eligible for the NHRP or the CRHR.

Site SR-S-2

Site SR-S-2 is a decomposing asphalt road, first seen on the 1947 aerial photo. The road connects what is currently Hunstock Street at the northern extent with Jackson Street at the southern extent. Based on the 1947 aerial photograph, the road appears to lead from Hunstock Street south approximately 0.3 miles (0.4 km) to an industrial operation to the south, possibly related to mining activity. Historic debris was observed along the entire extent of the road and two large historic refuse deposits were recorded immediately off of the roadway to the west (SR-S-3 and -4, below). Although no measurements were possible due to deterioration, all of the cans appear to date to sometime between the 1920s and 1930s based on morphological characteristics (Simonis n.d.). Disturbances include continued occasional use and ATV activity. This resource is located in the southern section of proposed project. This area will be placed and placed in a conservation easement as a component of this project and therefore these resource will not be impacted as part of the proposed project.

Site SR-S-3

Measuring 40 feet (east-west) by 33 feet (north-south), site SR-S-4 is a historic refuse deposit located on the side of a very steep drainage adjacent to SR-S-2 (decomposed asphalt road). Within the deposit, whole bottles, discrete can dumps, modern construction debris, and modern washed out car parts were observed.

Can types observed included double seam sanitary-type food, key-wind meat, and flat top beverage dating to a range of 1935–1970s (Simonis n.d.). Several complete bottles were observed, including one medicine bottle with an automatic bottle machine suction scar along with an Illinois Glass Company I-Diamond trademark providing a date from 1919 and 1929 and one a clear glass jar base with Hazel-Atlas Glass Company mark dating provide from 1920 to 1964 (Miller 2002, Toulouse 1971). Disturbances include continued occasional use of SR-S-2, pot hunting pits, modern dumping, and ATV activity. This resource is located in the southern section of proposed project. This area will be placed and placed in a conservation easement as a component of this project and therefore these resource will not be impacted as part of the proposed project.

Site SR-S-4

Site SR-S-4 measures 30 feet (north-south) by 20 feet (east-west) and is located approximately 210 feet to the southwest, along the western side of SR-S-02. The site is a historic refuse deposit consisting of approximately 20 crushed cans including sanitary, church-key open and paint, as well as fragments of bottle glass. Modern beer cans were observed throughout the site. Although no measurements were possible due to deterioration, all of the cans appear to date to sometime between the 1930s and 1940s based on morphological characteristics (Simonis n.d.). Disturbances include continued occasional use of SR-S-2 and ATV activity, indicating that the modern beer cans were deposited separately from the historic refuse. This resource is located in the southern section of proposed project. This area will be placed and placed in a conservation easement as a component of this project and therefore these resource will not be impacted as part of the proposed project.

Built Environment Resource SR-S-5

Resource SR-S-05 is a 1936 single-family, one-story vernacular building, irregular in plan with stucco cladding and a low-pitched roof. The main elevation of the building presents as three sections: a left (eastern) section projecting approximately 6 feet from the main body of the building that features a vinyl, horizontal slider window and a small opening that is likely for ventilation, an offset to the east section featuring a wooden projecting porch and entry door, and a right (western) section featuring a vinyl, horizontal slider window. Fenestration across all elevations is irregular and includes entry doors

on the main elevation, the northeast elevation and the southeast elevation, as well as, a variety of sizes of vinyl, horizontal slider windows. The northeast elevation was modified to include a shed roof addition. The site features mature trees, a chain link fence across portions of the main elevation, and multiple dirt areas around the building that are used for parking and storage for the property. This resource was evaluated in a separate HRA and was determined to be not eligible for listing on either the NRHP or the CRHR (Murray and Corder 2018).

5.2 Paleontological Resources

The paleontological records search results were received from the LACM on January 3, 2018. The results of the paleontological records search are included in the discussion of the geological units present within the project area below.

5.2.1 Geological and Paleontological Map and Literature Review

According to surficial geological mapping by Dibblee and Ehrenspeck (1993) at a scale of 1:24,000, the project is underlain by the following geological units (from youngest to oldest): Quaternary alluvium (map unit Qa), the Saugus Formation (map unit Qts), and the Pico Formation (map unit Tps).

5.2.1.1 Quaternary alluvium

Holocene age (< 12,000 years ago) Quaternary alluvium is mapped in the lower drainages within the project area. Dibblee and Ehrenspeck (1993) describe Quaternary alluvium as gravels, sand, and silt deposited within valleys and floodplains. In the paleontological records search, the LACM did not report any fossil localities from Quaternary alluvium within or near the project area, but older, more paleontologically sensitive geological units likely underlie the alluvium at a relatively shallow depth (McLeod, 2018). According to the Society of Vertebrate Paleontology guidelines for the mitigation of adverse impacts to paleontological resources (SVP, 2010), significant paleontological resources (fossils) need to be older than middle Holocene or approximately 5,000 years or older. Therefore, unless excavations are substantial (frequently greater than 5 feet), Quaternary alluvium is generally too young to yield significant paleontological resources, so is it assigned low paleontological sensitivity on the surface, increasing to high at depth.

5.2.1.2 The Saugus Formation

The Pleistocene (~2.6 million years – 12,000 years ago) and possibly late Pliocene (~3.6 million years – 2.6 million years ago) Saugus Formation is mapped in a large percentage of the elevated areas of the northwestern project area. According to Dibblee and Ehrenspeck (1993), the Saugus Formation is terrestrial within the project area; however, some portions of the formation are marine in other parts of

northern Los Angeles County. The Saugus Formation has yielded marine invertebrate fossils (Groves, 1991) and terrestrial vertebrates (Jefferson, 1991) in northern Los Angeles County. McLeod (2018) reported no Saugus Formation localities from within the project area; however, nearby localities produced fossil specimens. The closest of these localities, LACM 6062, is located east of the project area and produced fossil specimens of alligator lizard (*Gerrhonotus*), rabbit (*Leporidae*), pocket mouse (*Perognathus*), and pocket gopher (*Thomomys*). LACM 6063, which is the next closest fossil locality located southeast of the project area on the west side of Castaic Creek between Hasley Canyon Road and Highway 126, yielded a specimen of fossil horse (*Equus*). LACM 1293 is located south of LACM 6063 on a ridge on the north side of the drainage north of Portrero Canyon and produced a fossil camel (Camelidae). McLeod (2018) also suggested collecting sediment samples to test for the presence of microvertebrate specimens. The Saugus Formation is assigned high paleontological sensitivity.

5.2.1.3 The Pico Formation

The Pliocene (~5.3 – 2.6 million years ago) Pico Formation has produced many significant vertebrate and invertebrate fossils in Los Angeles County. Squires et al. (2006) document 53 species of fossil invertebrates from the Pico Formation of the Valencia area, and fossil fishes have been identified in and around the greater Los Angeles area (Fierstine et al., 2012).

McLeod (2018) reported no Pico Formation fossil localities from within the project area; however, nearby localities yielded fossil vertebrate specimens. The nearest locality (LACM 6365), which is located southeast of the project area, produced a fossil sea lion (Otariidae) skull. Further southeast of LACM 6365 west of the Old Road and Interstate 5 north of Calgrove Boulevard between Lyon and Towsley Canyons, LACM 6145 – 6146 yielded bat ray (*Myliobatis*), guitarfish (*Rhinobatos*), requiem shark (*Carcharhinus*), basking shark (*Cetorhinus*), and sheephead (*Semicossyphus*). LACM 6145 – 6146 were recovered from sediments originally mapped as Saugus Formation; however, McLeod (2018) stated these localities are more likely from the underlying Pico Formation. The Pico Formation is assigned high paleontological sensitivity.

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6 SUMMARY AND MANAGEMENT RECOMMENDATIONS

Dudek was retained by Sterling Ranch Estates to conduct a cultural and paleontological resources inventory in support of the Sterling Ranch Estates Project. This development includes approximately 220 residential units, associated parks, open space, roads and other infrastructure on approximately 220 acres in the community of Val Verde. The SCCIC records search indicated that three resources have been recorded within 1.0-mile (1,608 m) of the project area, none of which are within its boundaries. As a result of the survey, four newly-identified archaeological sites (SR-S-01, SR-S-02, SR-S-03, and SR-S-04) and one built environment resource (SR-S-05) were identified and recorded within the current project area. The archaeological sites includes one decomposing concrete pad (SR-S-01), one decomposing asphalt road (SR-S-02), and two historic refuse deposits (SR-S-03 and -04) were identified in the southern section of the project area. The built environment resource (SR-S-05) is a single-family, one-story vernacular building built in 1936. SR-S-02, SR-S-03, and SR-S-04 were identified in the southern section of the project area. This area will be preserved and placed in a conservation easement as a component of this project and therefore these resources will not be impacted as part of the proposed project. SR-S-01 and SR-S-05 have both been recommended as ineligible for listing on the NRHP or the CRHR, and as such do not constitute significant resources under CEQA. Impacts to cultural resources resulting from the project as currently designed will be less than significant. Having considered all available information, archaeological, monitoring is recommended only in the event that unanticipated archaeological material is identified. Section 6.1.1 and 6.1.2 below summarized the recommendations for cultural resources.

Though no paleontological resources were observed during survey, the paleontological records search and research into the geological setting of the area indicates that it is an area of high paleontological sensitivity. Therefore monitoring during ground disturbance is recommended. Section 6.1.3 below summarizes the management recommendations for paleontological resources.

6.1 Management Recommendations

6.1.1 Unanticipated Discovery of Archaeological Resources

If archaeological resources (sites, features, or artifacts) are exposed during construction activities for the proposed project, all construction work occurring within 100 feet of the find shall immediately stop until a qualified archaeologist, meeting the Secretary of the Interior's Professional Qualification Standards, can evaluate the significance of the find and determine whether or not additional study is warranted. Depending upon the significance of the find under CEQA (14 CCR 15064.5(f); California Public Resources Code, Section 21082), the archaeologist may simply record the find and allow work to continue. If the discovery proves significant under

CEQA, additional work, such as preparation of an archaeological treatment plan and data recovery, may be warranted.

6.1.2 Unanticipated Discovery of Human Remains

In accordance with Section 7050.5 of the California Health and Safety Code, if human remains are found, the County coroner shall be immediately notified of the discovery. No further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent remains shall occur until the County coroner has determined, within 2 working days of notification of the discovery, the appropriate treatment and disposition of the human remains. If the County coroner determines that the remains are, or are believed to be, Native American, he or she shall notify the NAHC in Sacramento within 24 hours. In accordance with California Public Resources Code, Section 5097.98, the NAHC must immediately notify those persons it believes to be the most likely descendant from the deceased Native American. The most likely descendant shall complete their inspection within 48 hours of being granted access to the site. The designated Native American representative would then determine, in consultation with the property owner, the disposition of the human remains.

6.1.3 Paleontological Resources

Construction activities associated with the proposed project would involve ground disturbance in areas of high paleontological sensitivity. Adverse effects to paleontological resources can occur if significant resources are uncovered during ground disturbance and subsequently destroyed, otherwise harmed, and/or not properly preserved. As such, mitigation should be implemented to ensure that potential impacts to paleontological resources are reduced to a level below significance.

The project is underlain by recent Quaternary alluvium, the Pleistocene to Pliocene Saugus Formation, and the Pliocene Pico Formation. Shallow excavations into Quaternary alluvium will not likely impact sediments old enough to contain significant paleontological resources; however, the Saugus and Pico formations have yielded significant paleontological resources in Los Angeles County and therefore paleontological mitigation is recommended for the project. It recommended that a qualified paleontologist be retained for the project to ensure implementation of a paleontological monitoring program. The SVP (2010) defines a qualified paleontologist as having:

1. A graduate degree in paleontology or geology, and/or a publication record in peer reviewed journals; and demonstrated competence in field techniques, preparation, identification, curation, and reporting in the state or geologic province in which the project occurs. An advanced degree is less important than demonstrated competence and regional experience.

2. At least two full years professional experience as assistant to a Project Paleontologist with administration and project management experience; supported by a list of projects and referral contacts.
3. Proficiency in recognizing fossils in the field and determining their significance.
4. Expertise in local geology, stratigraphy, and biostratigraphy.
5. Experience collecting vertebrate fossils in the field.

The qualified paleontologist should attend any preconstruction meetings and manage the paleontological monitor(s) if he or she is not doing the monitoring. A paleontological monitor should be on site during all excavations in areas mapped as Saugus Formation and Pico Formation on the surface and excavations below a depth of five feet in areas mapped as having Quaternary alluvium of the surface. The SVP (2010) defines a qualified paleontological monitor as having:

1. "BS or BA degree in geology or paleontology and one year experience monitoring in the state or geologic province of the specific project. An associate degree and/or demonstrated experience showing ability to recognize fossils in a biostratigraphic context and recover vertebrate fossils in the field may be substituted for a degree. An undergraduate degree in geology or paleontology is preferable, but is less important than documented experience performing paleontological monitoring, or
2. AS or AA in geology, paleontology, or biology and demonstrated two years experience collecting and salvaging fossil materials in the state or geologic province of the specific project, or
3. Enrollment in upper division classes pursuing a degree in the fields of geology or paleontology and two years of monitoring experience in the state or geologic province of the specific project.
4. Monitors must demonstrate proficiency in recognizing various types of fossils, in collection methods, and in other paleontological field techniques."

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APPENDIX A
SCCIC Records Search Results

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APPENDIX B
Informational Native American Coordination

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APPENDIX C

Department of Parks and Recreation
Series 523 Forms

APPENDIX D.2

Phase I Archaeological Survey Report for the Off-Site Water Tank Site [2020]

PHASE I ARCHAEOLOGICAL SURVEY REPORT

FOR THE STERLING RANCH ESTATES WATER TANK SITE PROJECT

Prepared for:

Sterling Ranch ESTATES

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MAY 2020

Project Information Page

Report Title:	Phase I Archaeological Survey Report for the Sterling Ranch Estates Project
Lead Agency:	County of Los Angeles
Authors:	Heather McDaniel McDevitt, MA, RPA; Micah Hale, Ph.D., RPA; Jennifer De Alba B.A.
Firm:	Dudek 621 Chapala Street Santa Barbara, California 93101 805.963.2074
Project Proponent:	Mr. Hunt Williams
Report Date:	May 2020
Type of Study:	Phase I Archaeological Survey Report
USGS Quads:	Val Verde
Resources:	none within project site; none within 1-mile radius
KEYWORDS:	Phase I Archaeological Survey, Sterling Ranch Estates, Residential Development

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TABLE OF CONTENTS

Section		Page No.
1.0	**INTRODUCTION**	**1**
2.0	**REGULATORY SETTING**	**5**
2.1	State	14
2.2	Local	11
3.0	**PROJECT DESCRIPTION AND ENVIRONMENTAL SETTING**	**14**
3.1	Project Description	14
3.2	Environmental Setting	14
4.0	**BACKGROUND RESEARCH**	**17**
4.1	Prehistoric Setting	17
4.2	Ethnohistory	28
4.3	Historic Setting	30
4.4	Previous Research	33
5.0	**FIELD INVESTIGATIONS**	**36**
6.0	**ASSESSMENT OF POTENTIAL FOR UNRECORDED ARCHAEOLOGICAL RESOURCES**	**37**
7.0	**EVALUATION OF POTENTIAL PROJECT EFFECTS**	**38**
8.0	**RECOMMENDATIONS**	**38**
9.0	**REFERENCES**	**39**

FIGURES

1	Project Vicinity	3
2	Tentative Parcel Map	15

TABLES

1	Cultural Resources Investigations Conducted within 1-Mile of the Project Area	34

APPENDICES

Appendix A SCCIC Records Search
Appendix B NAHC Sacred Land Files Search Results

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1.0 INTRODUCTION

This report presents the results of a cultural resources inventory for the Sterling Ranch Estates Tank Site Project (Project) located in Los Angeles County, California (see Figure 1). The cultural resources investigation included background research, a records search, Native American Heritage Commission (NAHC) Sacred Land Files search request and an intensive surface survey of the entire Project site, pursuant to California Environmental Quality Act (CEQA) and Los Angeles County cultural resources guidelines.

Project Description

The proposed Project is an offsite improvement associated with the Sterling Ranch Estates Project and includes a one million-gallon storage tank in and adjacent to the existing Los Angeles County's Waterworks District No. 36 Cuyama tank site. The water tank is located within the District's 1598 pressure zone APN 3272-029-902 and 3272-029-023 comprising approximately 2.79 acres.

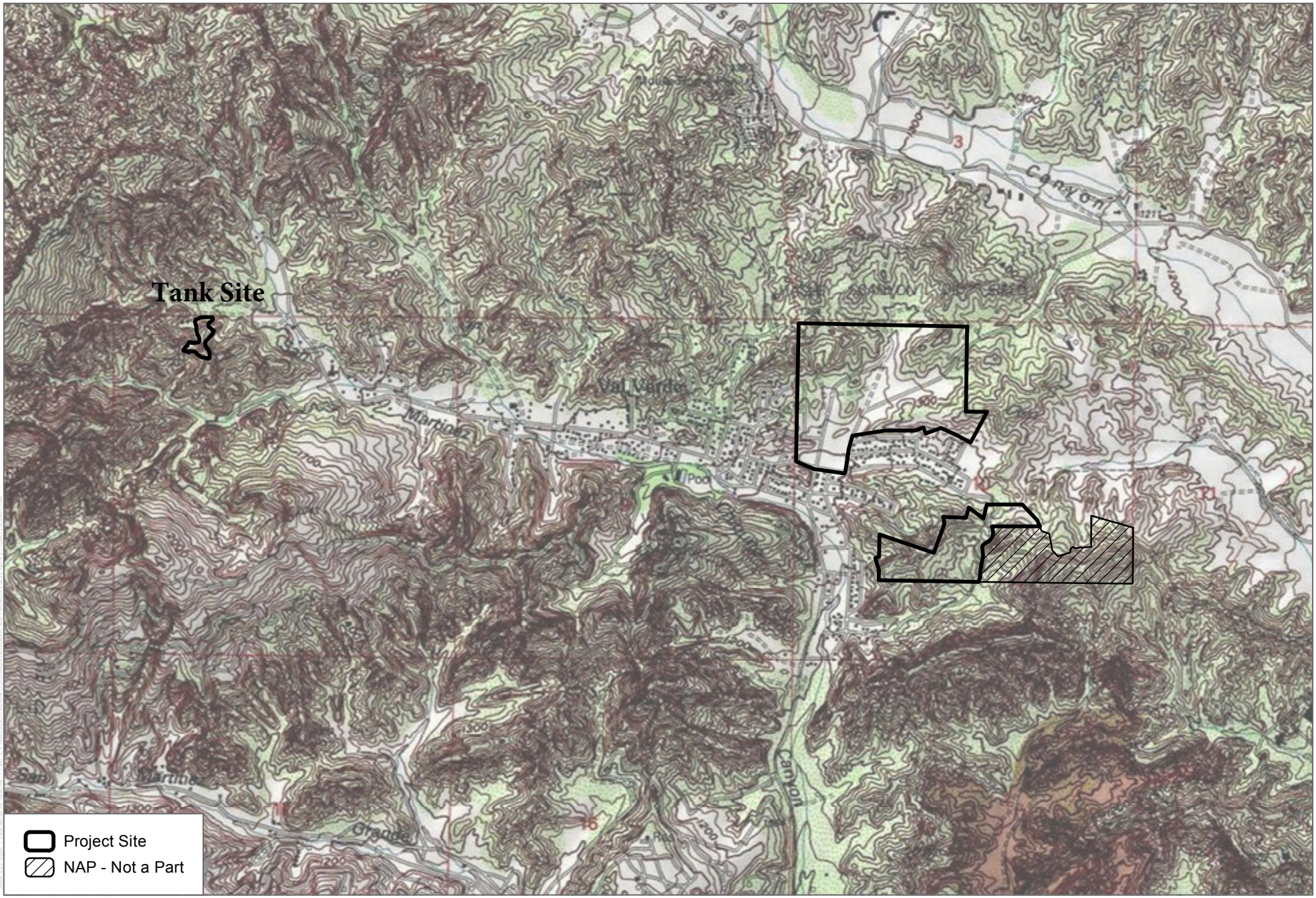
Summary of Cultural Resources Inventory

A records search conducted at the California Historical Resources Information System (CHRIS), South Central Coastal Information Center (SCCIC) located at California State University, Fullerton determined that no cultural resources have been previously identified within the Project area nor within 1-mile of the proposed Project site. One (1) cultural resource inventory of over 150 acres was completed approximately 500 feet north of the proposed Project site; No previous cultural resource studies have addressed any portion of the proposed Project site.

The proposed Project site was intensively surveyed by Dudek staff archaeologists on February 12, 2020 using 5-meter (approximately 16-foot) transect intervals when appropriate and meandering transects in steep terrain. Ground surface visibility within the proposed Project area was generally good. Special attention was given to barren ground including at the base of trees, within animal trails/paths, areas surrounding structural features such as fence lines and the extant water tanks as well as subsurface soils exposed by burrowing animals. To increase surface visibility, vegetation was casually cleared using shovels or boots at 5 to 10 meter intervals. No prehistoric or historic resources were discovered as a result of the survey. Based on the generally good ground surface visibility and use of shovel/ foot scrapes in areas with more surface vegetation, the intensive archaeological survey results are considered to be reliable. Due to the negative CHRIS records search results and NAHC Sacred Land Files results, negative survey results, and documented evidence of disturbance within the Project site since at least 1928, the potential for buried prehistoric or historic archaeological resources within the proposed Project is considered low.

The proposed Project improvements are not considered to have the potential for significant impacts on prehistoric or historic cultural remains. As a result, no mitigation measures are recommended. In the unlikely event that potentially significant cultural materials are encountered during construction/grading, ground

disturbing activities should be temporarily redirected and/or suspended and a qualified archaeologist contacted in order to assess the nature, extent and significance of any discoveries and develop appropriate management recommendations for archaeological resource treatment consistent with CEQA and County of Los Angeles Cultural Resource Guidelines.



SOURCE: USGS 1:24,000 Topo, Val Verde Quadrangle

DUDEK

0 1,000 2,000 Feet

FIGURE 1

Project Vicinity

Sterling Ranch Estates Tank Site Project

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2.0 Regulatory Setting

2.1 State

2.1.a The California Register of Historical Resources (Public Resources Code section 5020 et seq.)

In California, the term "historical resource" includes but is not limited to "any object, building, structure, site, area, place, record, or manuscript which is historically or archaeologically significant, or is significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California" (California Public Resources Code section 5020.1(j)). In 1992, the California legislature established CRHR "to be used by state and local agencies, private groups, and citizens to identify the state's historical resources and to indicate what properties are to be protected, to the extent prudent and feasible, from substantial adverse change" (California Public Resources Code section 5024.1(a)). A resource is eligible for listing in the CRHR if the State Historical Resources Commission determines that it is a significant resource and that it meets any of the following National Register of Historic Places (NRHP) criteria:

1. Associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage.
2. Associated with the lives of persons important in our past.
3. Embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values.
4. Has yielded, or may be likely to yield, information important in prehistory or history.

(California Public Resources Code section 5024.1(c).) Resources less than 50 years old are not considered for listing in the CRHR, but may be considered if it can be demonstrated that sufficient time has passed to understand the historical importance of the resource (see 14 CCR, section 4852(d)(2)).

The CRHR protects cultural resources by requiring evaluations of the significance of prehistoric and historic resources. The criteria for the CRHR are nearly identical to those for the NRHP, and properties listed or formally designated as eligible for listing on the NRHP are automatically listed on the CRHR, as are the state landmarks and points of interest. The CRHR also includes properties designated under local ordinances or identified through local historical resource surveys. The State Historic Preservation Officer maintains the CRHR.

2.1.b Assembly Bill 52

Assembly Bill 52 of 2014 (AB 52) amended PRC Section 5097.94 and added PRC Sections 21073, 21074, 21080.3.1, 21080.3.2, 21082.3, 21083.09, 21084.2, and 21084.3.

Consultation with Native Americans

AB 52 formalizes the consultation process between lead agencies and tribal representatives, requiring the lead agency to initiate consultation with California Native American groups that are traditionally and culturally affiliated with a project area. This includes tribes that may not be federally recognized. Lead agencies are required to begin consultation prior to the release of a negative declaration, mitigated negative declaration, or environmental impact report.

Tribal Cultural Resources

Section 4 of AB 52 adds Sections 21074 (a) and (b) to the PRC, addressing tribal cultural resources and cultural landscapes. Section 21074 (a) defines tribal cultural resources as one of the following:

1. Sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either of the following:
    a. Included or determined to be eligible for inclusion in the California Register of Historical Resources.
    b. Included in a local register of historical resources as defined in subdivision (k) of Section 5020.1.
2. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Section 5024.1. In applying the criteria set forth in subdivision (c) of Section 5024.1 for the purposes of this paragraph, the lead agency shall consider the significance of the resource to a California Native American tribe.

Section 1 (a)(9) of AB 52 establishes that "a substantial adverse change to a tribal cultural resource has a significant effect on the environment." Effects on tribal cultural resources should be considered under CEQA. Section 6 of AB 52 adds Section 21080.3.2 to the PRC, which states that parties may propose mitigation measures "capable of avoiding or substantially lessening potential significant impacts to a tribal cultural resource or alternatives that would avoid significant impacts to a tribal cultural resource." Further, if a California Native American tribe requests consultation regarding project alternatives, mitigation measures, or significant effects to tribal cultural resources, the consultation shall include those topics (PRC Section 21080.3.2[a]). The environmental document and the mitigation monitoring and reporting program (where applicable) shall include any mitigation measures that are adopted (PRC Section 21082.3[a]). Information Center." (CEQA Guidelines section 15126.4(b)(3)(D).)

2.1.c Native American Historic Cultural Sites (California Public Resources Code section 5097 et seq.)

The Native American Historic Resources Protection Act (Public Resources Code section 5097, et seq.) addresses the disposition of Native American burials in archaeological sites and protects such remains from disturbance, vandalism, or inadvertent destruction; establishes procedures to be implemented if Native

American skeletal remains are discovered during construction of a project; and establishes the NRHC to resolve disputes regarding the disposition of such remains. In addition, the Native American Historic Resource Protection Act makes it a misdemeanor punishable by up to 1 year in jail to deface or destroy an Indian historic or cultural site that is listed or may be eligible for listing in the CRHR.

2.1.d California Native American Graves Protection and Repatriation Act

The California Native American Graves Protection and Repatriation Act (California Repatriation Act), enacted in 2001, requires all state agencies and museums that receive state funding and that have possession or control over collections of human remains or cultural items, as defined, to complete an inventory and summary of these remains and items on or before January 1, 2003, with certain exceptions. The California Repatriation Act also provides a process for the identification and repatriation of these items to the appropriate tribes.

2.1.e California Environmental Quality Act Statues and Guidelines

As described further below, the following CEQA statutes and CEQA Guidelines are relevant to the analysis of archaeological and historic resources:

1. California Public Resources Code section 21083.2(g): Defines "unique archaeological resource."
2. California Public Resources Code section 21084.1 and CEQA Guidelines section 15064.5(a): Defines historical resources. In addition, CEQA Guidelines section 15064.5(b) defines the phrase "substantial adverse change in the significance of an historical resource. It also defines the circumstances when a project would materially impair the significance of a historical resource.
3. California Public Resources Code section 5097.98 and CEQA Guidelines section 15064.5(e): These statutes sets forth standards and steps to be employed following the accidental discovery of human remains in any location other than a dedicated ceremony.
4. California Public Resources Code sections 21083.2(b)-(c) and CEQA Guidelines section 15126.4: These statutes and regulations provide information regarding the mitigation framework for archaeological and historic resources, including options of preservation-in-place mitigation measures; identifies preservation-in-place as the preferred manner of mitigating impacts to significant archaeological sites.

Under CEQA, a project may have a significant effect on the environment if it may cause "a substantial adverse change in the significance of an historical resource" (California Public Resources Code section 21084.1; CEQA Guidelines section 15064.5(b)). An "historical resource" is any site listed or eligible for listing in the CRHR. The CRHR listing criteria are intended to examine whether the resource in question: (a) is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage; (b) is associated with the lives of persons important in our past; (c) embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or (d) has yielded, or may be likely to

yield, information important in pre-history or history.

The term "historical resource" also includes any site described in a local register of historic resources, or identified as significant in a historical resources survey (meeting the requirements of California Public Resources Code section 5024.1(q)).

CEQA also applies to "unique archaeological resources". Public Resources Code section 21083.2(g) defines a "unique archaeological resource" as any archaeological artifact, object, or site about which it can be clearly demonstrated that, without merely adding to the current body of knowledge, there is a high probability that it meets any of the following criteria:

1. Contains information needed to answer important scientific research questions and that there is a demonstrable public interest in that information.
2. Has a special and particular quality such as being the oldest of its type or the best available example of its type.
3. Is directly associated with a scientifically recognized important prehistoric or historic event or person.

All historical resources and unique archaeological resources – as defined by statute – are presumed to be historically or culturally significant for purposes of CEQA (California Public Resources Code section 21084.1; CEQA Guidelines section 15064.5(a)). The lead agency is not precluded from determining that a resource is a historical resource even if it does not fall within this presumption (California Public Resources Code section 21084.1; CEQA Guidelines section 15064.5(a)). A site or resource that does not meet the definition of "historical resource" or "unique archaeological resource" is not considered significant under CEQA and need not be analyzed further. (Public Resources Code section 21083.2(a); CEQA Guidelines section 15064.5(c)(4)).

Under CEQA and significant cultural impact results from a "substantial adverse change in the significance of an historical resource [including a unique archaeological resource]" due to the "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines section 15064.5(b)(1); California Public Resources Code section 5020.1(q)). In turn, the significance of a historical resource is materially impaired when a project:

1. Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register; or
2. Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the

project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or

3. Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register as determined by a lead agency for purposes of CEQA.

2.1.f CEQA Guidelines section 15064.5(b)(2).

Pursuant to these sections, the CEQA first evaluates evaluating whether a project site contains any "historical resources," then assesses whether that project will cause a substantial adverse change in the significance of a historical resource such that the resource's historical significance is materially impaired.

When a project significantly affects a unique archeological resources, CEQA imposes special mitigation requirements. Specifically, "[i]f it can be demonstrated that a project will cause damage to a unique archeological resource, the lead agency may require reasonable efforts to be made to permit any or all of these resources to be preserved in place or left in an undisturbed state. Examples of that treatment, in no order of preference, may include, but are not limited to, any of the following:"

1. "Planning construction to avoid archeological sites."
2. "Deeding archeological sites into permanent conservation easements."
3. "Capping or covering archeological sites with a layer of soil before building on the sites."
4. "Planning parks, greenspace, or other open space to incorporate archeological sites."

2.1.g Pub. Resources Code section 21083.2(b)(1)-(4).

If these "preservation in place" options are not feasible, mitigation may be accomplished through data recovery. (Pub.Res. Code § 21083.2(d); CEQA Guidelines § 15126.4(b)(3)(C).) Public Resources Code section 21083.2(d) states that "[e]xcavation as mitigation shall be restricted to those parts of the unique archeological resource that would be damaged or destroyed by the project. Excavation as mitigation shall not be required for a unique archeological resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the resource, if this determination is documented in the environmental impact report."

These same requirements are set forth in slightly greater detail in CEQA Guidelines section 15126.4(b)(3), as follows:

(A) Preservation in place is the preferred manner of mitigating impacts to archeological sites. Preservation in place maintains the relationship between artifacts and the archeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site.

(B) Preservation in place may be accomplished by, but is not limited to, the following:

1. Planning construction to avoid archeological sites;
2. Incorporation of sites within parks, greenspace, or other open space;
3. Covering the archeological sites with a layer of chemically stable soil before building tennis courts, parking lots, or similar facilities on the site[; and]
4. Deeding the site into a permanent conservation easement.

(C) When data recovery through excavation is the only feasible mitigation, a data recovery plan, which makes provision for adequately recovering the scientifically consequential information from and about the historical resource, shall be prepared and adopted prior to any excavation being undertaken.

Note that, when conducting data recovery, "[i]f an artifact must be removed during project excavation or testing, curation may be an appropriate mitigation." (Ibid.) However, "[d]ata recovery shall not be required for an historical resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the archeological or historic resource, provided that determination is documented in the EIR and that the studies are deposited with the California Historical Resources Regional Information Center." (CEQA Guidelines section 15126.4(b)(3)(D).)

2.1.h California Health and Safety Code

CEQA Guidelines section 15064.5 assigns special importance to human remains and specifies procedures to be used when Native American remains are discovered. As described below, these procedures are detailed in PRC section 5097.98.

California law protects Native American burials, skeletal remains, and associated grave goods, regardless of their antiquity, and provides for the sensitive treatment and disposition of those remains. Health and Safety Code section 7050.5 requires that if human remains are discovered in any place other than a dedicated cemetery, no further disturbance or excavation of the site or nearby area reasonably suspected to contain human remains shall occur until the County coroner has examined the remains (section 7050.5b). PRC Section 5097.98 also outlines the process to be followed in the event that remains are discovered. If the coroner determines or has reason to believe the remains are those of a Native American, the coroner must contact the Native American Heritage Commission (NAHC) within 24 hours (section 7050.5c). The NAHC will notify the Most Likely Descendant (MLD). With the permission of the landowner, the MLD may inspect the site of discovery. The inspection must be completed within 48 hours of notification of the MLD by the NAHC. The MLD may recommend means of treating or disposing of, with appropriate dignity, the human remains and items associated with Native Americans.

2.2 Local

2.2.a Los Angeles County

Historical, cultural, and paleontological resources are discussed in the County's Conservation and Natural Resources Element of the Los Angeles County General Plan 2035, which was adopted in October of 2015. The County recognizes that historical and cultural resources are an important part of the County's identity and contribute to the local economy. The goals and policies that apply to historical, cultural, and paleontological resources and are specifically relevant to this projects regulatory setting are as follows:

22.44.1570 Archaeological/Paleontological/Historic Cultural Resources.

A. Purpose. The intent of these provisions is protect and preserve archaeological, historical, and paleontological resources from destruction, and avoid impacts to such resources where feasible. Where avoidance is not feasible, impacts to resources shall be minimized to the maximum extent feasible.

C. Applicability. A Cultural Resource Review pursuant to this section shall be required for all projects prior to the issuance of a planning approval, coastal development permit, geological/geotechnical exploratory excavation permit, sewer permit, building permit, grading permit, or prior to the commencement of government-initiated or funded works except those projects necessary for emergency purposes.

F. Archaeological Discoveries. Any person who discovers important cultural resources during the course of construction for a project shall notify the Director of the discovery. Once important cultural resources are discovered, no further excavation shall be permitted without approval of the Director.

The Department of Regional Planning, working with the Historical Landmarks and Records Commission and the Regional Planning Commission, completed and adopted a comprehensive historic preservation ordinance for the unincorporated areas of Los Angeles County. The following text was taken from the Historic Preservation Ordinance for Los Angeles County:

Chapter 22.124 – Historic Preservation

22.124.020 - Purpose.

The purpose of the Historic Preservation Ordinance is to:

A. Enhance and preserve the County's distinctive historic, architectural, and landscape characteristics that are part of the County's cultural, social, economic, political, and architectural history;

B. Foster community pride in the beauty and noble accomplishments of the past as represented by the County's historic resources;

C. Stabilize and improve property values in and around the County's historic resources, and enhance the aesthetic and visual character and environmental amenities of these historic resources;

D. Recognize the County's historic resources as economic assets and encourage and promote the adaptive reuse of these historic resources;

E. Further establish the County as a destination for tourists and as a desirable location for businesses; and

F. Specify significance criteria and procedures for the designation of landmarks and historic districts and provide for the ongoing preservation and maintenance of these landmarks and historic districts.

22.124.050 - County of Los Angeles Register of Landmarks and Historic Districts.

A County Register of Landmarks and Historic Districts is hereby created to record and maintain an inventory of landmarks and historic districts. The Landmarks Commission shall, upon designation by the Board, update and keep a record of landmarks and historic districts on this register.

22.124.070 - Criteria for Designation of Landmarks and Historic Districts.

A. A structure, site, object, tree, landscape, or natural land feature may be designated as a landmark if it is 50 years of age or older and satisfies one or more of the following criteria:

1. It is associated with events that have made a significant contribution to the broad patterns of the history of the nation, State, County, or community in which it is located;

2. It is associated with the lives of persons who are significant in the history of the nation, State, County, or community in which it is located;

3. It embodies the distinctive characteristics of a type, architectural style, period, or method of construction, or represents the work of an architect, designer, engineer, or builder whose work is of significance to the nation, State, County, or community in which it is located; or possesses artistic values of significance to the nation, State, County, or community in which it is located;

4. It has yielded, or may be likely to yield, significant and important information regarding the prehistory or history of the nation, State, County, or community in which it is located;

5. It is listed, or has been formally determined eligible by the United States National Park Service for listing, in the National Register of Historic Places, or is listed, or has been formally determined eligible by the State Historical

Resources Commission for listing, on the California Register of Historical Resources;

6. If it is a tree, it is one of the largest or oldest trees of the species located in the County; or

7. If it is a tree, landscape, or other natural land feature, it has historical significance due to an association with a historic event, person, site, street, or structure, or because it is a defining or significant outstanding feature of a neighborhood.

B. Property less than 50 years of age may be designated as a landmark if it meets one or more of the criteria set forth in Subsection A, above, and exhibits exceptional importance.

C. The interior space of a property, or other space held open to the general public, including but not limited to a lobby, may be designated as a landmark or included in the landmark designation of a property if the space qualifies for designation as a landmark under Subsection A or B, above.

D. Historic Districts. A geographic area, including a noncontiguous grouping of related properties, may be designated as a historic district if all of the following requirements are met:1.More than 50 percent of owners in the proposed district consent to the designation;2.The proposed district satisfies one or more of the criteria set forth in Subsections A.1 through A.5, above; and 3.The proposed district exhibits either a concentration of historic, scenic, or sites containing common character-defining features, which contribute to each other and are unified aesthetically by plan, physical development, or architectural quality; or significant geographical patterns, associated with different eras of settlement and growth, particular transportation modes, or distinctive examples of parks or community planning.

2.2.b Santa Clarita Valley Area Plan (SCVAP)

The Santa Clarita Valley Area Plan Update was adopted by the County Board of Supervisors on November 27, 2012. The Plan Amendment and related zone changes took effect on December 27, 2012.

Chapter 4. Conservation and Open Space Element; Section VII. Cultural & Historical Resources provides a historical overview of the Santa Clarita Valley, describes the City's identification of historical sites, local historic preservation efforts, and detailed previously identified historical and cultural resources within the Planning Area. The subject property is not identified in any of these lists.

3.0 PROJECT DESCRIPTION AND ENVIRONMENTAL SETTING

3.1 Project Description

The Sterling Ranch Estates Project includes the development of approximately 222 residential detached single-family lots along with associated commercial lot, park, open space lot, roads, infiltration and debris basins, and other infrastructure within assessor parcel numbers (APNs) 3271-004-012 and 3271-004-013, which comprise approximately 113.9 acres. Off-site improvements will also take place immediately east of the APN 3271-004-013 totaling approximately 6.5 acres. The Project site this specific investigation is concerning includes a proposed one million-gallon storage tank in and adjacent to the existing Los Angeles County's Waterworks District No. 36 Cuyama tank site. The water tank is located within the District's 1598 pressure zone APN 3272-029-902 and 3272-029-023 comprising approximately 2.79 acres. In addition, a preservation area associated with the Project is located in APN 3271-005-032 totaling approximately 34.7 acres. The Project will involve mass grading within the parcels to facilitate the residential development and associated infrastructure; however, several areas will remain undeveloped and will be preserved as open space. The Project will incorporate Low Impact Development (LID) design standards based on the Los Angeles County Department of Public Works (LADPW) LID standards manual (County 2014). Preserved parcels are anticipated to be placed in a conservation easement, which will be managed by a third-party conservation entity.

3.2 Environmental Setting

The Sterling Ranch Estates Project is located in the community of Val Verde, north of Chiquito Canyon Road, as well as northwest and southeast of Del Valle Road with the tank site (Project) located in the foothills west of San Martinez Road and approximately 1.8 miles due west of the proposed residential development. The Project site lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. The Project site, Off-Site Open Space Area conservation easement and the Off-Site Water Reservoir Area, including the water tank, occur entirely within the U.S. Geological Survey (USGS) 7.5-minute Val Verde quadrangle (USGS 2017a). The Main Project site centered at approximately 34 27'1.00" N 118 39' 12.00" W and falls within Township 4 north, Range 17 west, sections 9 and 10, San Bernardino meridian. The Water Tank Project site is centered at approximately 34 27'09.95" N 118 41' 22.08" W and falls within Township 4 north, Range 17 west, Section 8.

Soils in the proposed Project site are characterized as Metz loamy sand with and Castiac and Saugus soils comprised of residuum weathered from sedimentary rock (United States Department of Agriculture 2019). The Metz loamy sand exists at 0 to 2 percent slopes and has a series profile typically consisting of 0-8 centimeters of dark greyish brown loamy sand; 8-45 centimeters of light yellowish brown loamy sand; 45-95 centimeters of light gray sand; 95-125 centimeters of light olive gray stratified silt loam and fine sand; 125-200 centimeters of light grey sand (USDA 2017). The tank site is located within the southeastern foothills of the Topatopa Mountains and includes both steep undeveloped terrain and relatively flat partially disturbed terrain

resulting from the construction of and access to extant water tanks.

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SOURCE: USDA, Eagle Aerial Solutions 2018

DUDEK

0 50 100 Feet

FIGURE 2

Proposed Impact Area

Sterling Ranch Estates Tank Site Project

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4.0 BACKGROUND RESEARCH

4.1 Prehistoric Setting

The Project area falls within a part of California that is poorly understood regarding aboriginal occupation. The few significant archaeological studies in the area (e.g., Waugh 1999) have not fully defined local culture history and as a result, researchers have imposed cultural historical schemes developed in adjacent regions onto the Santa Clarita Valley. Even the most recent published archaeological summaries casually lump the Santa Clarita Valley into neighboring cultural historical schemes of the southern California coast (i.e., Glassow et al. 2007). The same is true of the ethnohistoric record, which is based wholly on second-hand accounts of descendants claiming traditional ties to the area (see Section 3.2, below).

Note also that one artifact type defined for one region may or may not represent the same time period or human behavior in another. The simple correlations of artifact types or styles does not necessarily indicate a direct functional or causal relationship. That is, the presence of coastal or desert-derived artifacts in Santa Clarita Valley does not necessarily indicate cultural or socioeconomic relationships with inhabitants of those areas. Such relationships must be demonstrated in the archaeological record by ruling out other functional interpretations as less plausible.

To avoid the pitfalls of extending culture histories from adjacent regions into the Santa Clarita Valley, the following sections discuss major archaeological trends in southern California according to a geologic time scale: Terminal Pleistocene (pre-10,000 years before present—BP), Early Holocene (10,000 – 7500 BP), Middle Holocene (7500 – 4000 BP), and Late Holocene (post – 4000 BP). Regional culture historical frameworks are then discussed within these categories as appropriate, providing an opportunity to consider their local application.

Terminal Pleistocene (pre – 10,000 BP)

The terminal Pleistocene period has been the subject of much research in North America, although it remains hotly debated in terms of human adaptations. A few things are certain: terminal Pleistocene environments were rapidly changing at the end of the Wisconsonin glaciation period after 18,000 BP; definitive evidence places humans in North American by at least 12,500 BP.

The last major glaciation period (Wisconsonin) ended by about 18,000 BP, marked by a warming and drying trend that started at this time, lasting until at least 15,000 BP (Grayson 1993). Glaciers that covered most of northern North America began to melt forming pluvial lakes; Pleistocene Lake Lahonton being one of the largest covering the Great Basin of western North America (Grayson 1993). In southern California, many of the vegetation communities found at high elevations today were found at lower elevations then. Wood rat middens from the Mojave Desert indicate that the area was covered by a coniferous forest characterized by juniper and sage by 15,000 BP (Spaulding 1983, 1990). As the Pleistocene came to a close by about 10,000 BP, the warming trend continued and upward migration of

vegetation communities occurred, firmly establishing desert sage scrub communities and coastal chaparral from 10,000 to 8,000 BP. Ocean core sediment analysis of oxygen isotopes and pollen indicate much cooler ocean surface temperatures. Coupled with rising sea levels at a rate of about one meter per century through close of the Pleistocene (Inman 1983), the early Holocene was set to be much more moderate in climatic stability than the Pleistocene.

These environmental changes have been often cited as a key agent in cultural adaptation. A very unique technology defined by fluted projectile points and a highly formal lithic tool kit with almost no processing equipment is recognized as the earliest evidence of human adaptation to North America. Widely known as "Clovis," regional manifestations of this toolkit show important variability both in projectile point styles and tool kit composition. In western North America, fluted points and related items are most often found near or along pluvial lakeshores, leading to the definition of the Western Pluvial Lakes Tradition (WPLT, Bedwell 1973). The WPLT holds as its primary tenet that human adaptive strategies in the terminal Pleistocene were evolved to exploit the rich flora and fauna located along pluvial shorelines. Emma Lou Davis' (1978) work at China Lake near the Coso Range is one of the more well-known examples of a pluvial association with fluted points. Indeed, there is good evidence that Pleistocene megafauna persisted alongside modern fauna and tended to cluster around pluvial lakeshores (Grayson 1993). However, recent research questions the reality of the WPLT through discoveries of Paleoindian toolkits, including fluted points in areas far removed from pluvial lakeshores (Basgall et al. 2002). Moreover, the variability in terminal Pleistocene tool kits is just beginning to be understood as various kinds of stemmed projectile points are being reliably assigned to pre-10,000 BP contexts, such as Great Basined Stemmed and Lake Mojave projectile point forms (Basgall et al. 2002; Basgall 2000; Warren 2004).

Whether or not terminal Pleistocene humans focused on hunting large animals or not is also debated. Most hold Clovis and other fluted point-dominated assemblages as a highly specialized large animal hunting complex, but others interpret these technological complexes as generalized, allowing for rapid movement across large areas with flexibility (i.e., Kelly and Todd 1988). Resolution to this issue has yet to come, but strong evidence suggests on either side with direct evidence of megafauna procurement using fluted and other stemmed points (see Meltzer 1993), as well as direct evidence of stemmed projectile points for cutting and grinding, indicating a more generalized intent of use (see Basgall 1993). The truth probably rests in regional variation where localized climatic and environmental patterns affect the resources humans exploit and as a result, their response to changes in the availability of those.

Further complicating the picture is the realization that vegetal processing technology was being intensively used prior to 10,000 BP. The discovery in La Jolla of a robust assemblage of millingstones, handstones, and battered implements, with virtually no formal flaked lithic items associated with dozens of human burials and radiocarbon dates in excess of 10,000 BP indicates at the very least that socioeconomic adaptation was occurring rapidly among California hunter-gatherers during the terminal Pleistocene (Hale 2010a; see also Ike et al. 1979). Assemblages of this nature are often attributed to the Milling Stone pattern that has been interpreted as a response to punctuated middle Holocene aridity (see middle Holocene discussion, below).

Regardless, discoveries of artifacts, such as fluted points that are exclusive to terminal Pleistocene cultural adaptations associated with pre-10,000 BP radiocarbon dates indicates that humans reached the coastal margins of western North America during this period (see Erlandson 1988, 1991; Erlandson et al. 2008; Fitzgerald and Jones 2000; Rogers 1938; Warren 1968).

Initial efforts to parse out archaeological components somewhat arbitrarily ascribed the "Early Man" phase to southern California (Wallace 1955). Wallace's Early Man phase (10,000 – 6000 B.C. (12,000 – 8000 BP) was allocated to the terminal Pleistocene and early Holocene, but without the benefit of radiocarbon dates. The Early Man phase was ill-defined and based off of Rogers (1938) work with San Dieguito collections—a hunting-related toolkit defined at the Harris Site containing stemmed projectile points similar to Lake Mojave points located in desert regions to the north. Other fluted point discoveries to the north near Pleistocene Lake Tulare certainly biased Wallace's (1955) efforts to define an early phase of human occupation, especially since his primary region of study (Los Angeles and Ventura Counties) was nestled in between San Dieguito and Lake Tulare archaeological discoveries.

Regardless of early efforts to define a terminal Pleistocene cultural chronology, the upper Santa Clarita River Valley has yielded no evidence of terminal Pleistocene human occupation. Earliest radiocarbon dates extend only into the middle Holocene, and these are also rare. Given the early timeframe, that preservation of organic materials dramatically decreases with time, and that the accretional and degredational depositional context of the upper Santa Clarita River Valley has obscured or wiped out any such evidence, it is unlikely that a terminal Pleistocene component will ever be identified there.

Early Holocene (10,000 – 7500 BP)

Human occupation of southern California during the early Holocene period (10,000 – 7500 BP) is better understood than the terminal Pleistocene, although archaeological evidence for early Holocene human occupation still tends to be regionally clustered. Early Holocene environments continued the warming and drying trend initiated during the terminal Pleistocene, but most of the major pluvial lake systems were fully desiccated, with periodic recharge of some basins provided by seasonal precipitation rather than melting glaciers (Basgall 1993; Waters 1991). Most studies converge on the idea that the early Holocene was noticeably more arid since desert vegetation communities appear strongly established in composition and distribution by 9000 BP (Spaulding and Graumlich 1986; Van Devender et al. 1987). All megafauna (i.e., elephants, camelids, sloths, etc.) were all but gone by 10,000 BP, however with modern fauna attaining their modern vegetation associations by this time.

Most cultural chronologies have their roots in the early Holocene, save for the WPLT, San Dieguito, and other stemmed and fluted point traditions noted earlier. David Banks (D.B.) Rogers (1929) was the first to propose a cultural chronology, though his age estimates suffered from the lack of absolute dating techniques and data at the time. D.B. Rogers (1929) proposed Oak Grove as the earliest robust cultural tradition beginning just after the Pleistocene and early Holocene transition at around 10,000 BP. Later

known as the Milling Stone Horizon (Wallace 1955), or Encinitas Tradition (Warren 1968), Oak Grove was recognizable by the large amounts of processing equipment dominated by basined millingstones and handstones, along with a general lack of formal flakedstone hunting tools. Wallace (1955) built on D.B. Roger's work, with Oak Grove representing the Milling Stone Horizon, but the interpretation was the same: an economy dominated by vegetal processing and a general lack of hunting. Warren (1968) sought to clarify regional variability during the early Holocene and proposed the Encinitas Tradition, comprised of various local manifestations of the Milling Stone Horizon assemblages that had locally specific environmental agents driving the development of the processing economies. Warren, however significantly added to the discourse by better defining the San Dieguito complex as preceding the Milling Stone pattern and being comprised of stemmed projectile points and bifacial knives, with few processing tools (see Warren 2004). San Dieguito appeared to be a coastal southern California manifestation of what is known as Lake Mojave in the northern high deserts.

Coastal evidence for early Holocene human occupation is increasingly common, mostly in the form of pre – 7500 BP radiocarbon dates (Byrd 1997; Curtis 1965; Erlandson 1988, 1991, 1997; Erlandson et al. 1993, 2008; Gallegos and Kyle 1998; Glassow et al. 2007; Hale 2009, 2010a, 2010b; Hale and Becker 2006; Kaldenberg 1982; Levulett et al. 2002; Salls 1991; True 1980). Since the definition of the Milling Stone pattern by Wallace (1955) and Warren (1968), extensive archaeological work in regulatory settings has generated a robust database of radiocarbon dated sites resulting in a clear picture that the Milling Stone pattern is firmly rooted in the early Holocene, by as much as 10,000 BP (see Hale 2010a). In fact, early Holocene radiocarbon dates have come to be expected in certain depositional contexts along the southern California coast because of their commonality and the consistency of the associated archaeological deposit (Hale 2009). Early Holocene dates along the coastal plain of southern California and interior ranges are currently considered part of the "Archaic" pattern; an umbrella term synonymous with Milling Stone.

Desert regions to the north and interior Peninsular Ranges (and intervening valleys) to the east also have relatively robust early Holocene records. To the east, the early Holocene continues to align with the Archaic or Milling Stone pattern (see Hale 2009; Hale and Comeau 2009; Sutton 2011). In the Mojave Desert, traditional early Holocene chronologies are being revised. The Lake Mojave (11,000 – 7500 BP) complex still appears to be the oldest stemmed point tradition that followed fluted point toolkits. Lake Mojave assemblages are characterized by weak shouldered stemmed projectile points and large amounts of formed flake tools with lesser amounts of expedient flaked tools and groundstone. However, recent evidence is pushing back dates for the Pinto complex to as much as 8000 BP, presenting an overlap problem with Lake Mojave (Basgall 2000; Sutton et al. 2007). The significance here is that Pinto sites are dominated by large amounts of ground and battered stone with relatively small amounts of formed flakedstone tools (Basgall and Hall 1993, 1994; Campbell and Campbell 1935; Giambastiani and Basgall 1999; Hall 1992; Schroth 1994; Warren 1968, 1980); Pinto is the first robust processing economy that appears in California deserts and is similar in many respects to the Milling Stone pattern of southern California, though not as old as Milling Stone. The similarities with the Milling Stone pattern include

settlement that was characterized by serial occupation of specific sites producing robust assemblages through tool reuse (Hale 2001).

The early Holocene is not represented in Santa Clarita Valley by direct archaeological evidence, despite being known in adjacent desert and coastal regions. No doubt prehistoric populations took advantage of the natural travel corridors linking interior areas to the coast and southern coastal plain. However, as with archaeological deposits of later periods, damaging erosion and flooding have either destroyed or obscured any such deposits that may have existed. Attempts to locate buried deposits using hollow stem augers (i.e., core samples) in other parts of southern California, such as the Las Flores watershed (Hale and Becker 2006) or Otay River floodplain (Cook and Andrews 2003; Comeau et al. 2014) focused on floodplains with a gradual sedimentation sequence and less frequent and less destructive erosional events. It is no surprise, then that intact archaeological deposits dating to the early Holocene (and later) were identified in those areas. The same is not true for the Santa Clarita River floodplain and surrounding geologic landscape that has seen frequent intervals of violent flooding that eroded any riverbed or nearby terrace deposits.

Middle Holocene (7500-4000 BP)

The middle Holocene (7500-4000 BP) witnessed a continuation of archaeological patterns defined in the early Holocene. However, the middle Holocene was marked by periods of extreme aridity collectively termed the Altithermal by Ernst Antevs (1953). After much research since Antevs' (1953) original work the Altithermal is better understood as having variable effects at a subregional scale. Southern California was already characterized as an arid landscape by the inception of the middle Holocene, thus notable changes include adjustments in the elevation and density of existing vegetation communities and related fauna (Mehringer 1967; Spaulding 1985, 1990; Wells 1983). To be sure, humans respond to changes in the resources they exploit and it is plausible that plants and animals that were the focus of subsistence either decreased in abundance or congregated in more favorable areas. Warren (1968) postulates as much, suggesting that the Encinitas Tradition (i.e., Milling Stone pattern) was adapted in the coastal plain to the margins of lagoons that were magnet locations for vegetation and fauna, and as a result, human occupation.

Whatever the regional environmental differences were, it was clear that humans have been present in southern California throughout the middle Holocene with widespread evidence of humans hunkering down and increasing vegetal processing intensity, rather than depopulating whole areas. In fact, the origin of Milling Stone pattern itself was thought to be a response to Altithermal conditions (Wallace 1955; see Hale 2001, Erlandson 1997). The early Holocene appearance of Milling Stone adaptations, however, runs counter to this explanation, suggesting instead that Milling Stone economies were the first socioeconomic adaptation to stable California environments after the waning of terminal Pleistocene transitions (Hale 2010a, 2011). Regardless, processing economies were apparently well-suited to the arid middle Holocene conditions, based on the ubiquity of Milling Stone assemblages.

Regional cultural histories adjacent to the upper Santa Clarita River Valley continue in the same

nomenclature. In the deserts to the north, the Pinto period reigns until at least the end of the middle Holocene (4000 BP); although, Gypsum period assemblages characterized by contracting stem dart points, larger numbers of small flake tools, and some mortar/pestle technology have pushed their 4000 BP inception date to some degree (Hale 2011). Southern coastal regions such as San Diego County and parts of Orange and Los Angeles Counties also retain Milling Stone assemblage dominance, including at the Tank Sites (CA-LAN-1 and -2) in Topanga Canyon that date as late as 2000 BP (see Hale 2001). The middle Holocene is one of the best represented periods in San Diego County and keeping with the Milling Stone or Archiac pattern (Masters and Gallegos 1997; see Hale 2009 for assemblage summaries).

Real socioeconomic change during the middle Holocene appears first in the Santa Barbara Channel with the abrupt appearance of bowl mortars by at least 5500 BP at sites such as CA-SBA-53, CA-SBA-54, CA-SBA-75, and CA-SBA-84 to name a few (Hale 2009; see also Erlandson et al. 2008, Harrison and Harrison 1966; Levulett et al. 2002). Mortars are costly to manufacture (mortar surfaces are manufactured, rather than mostly accruing depth through use), and thus their manufacture in noticeable quantities necessarily signals a shift to a more intensive processing economy (Hale 2010b). It is thought that mortars in the Santa Barbara Channel were used to intensively process nuts such as acorn and buckberry that have substantial nutritional value when processed in mass quantities (Bettinger et al. 1997; Bettinger and Tushingham 2013). Moreover, the complex ecology of acorn masting requires storage for it to be an efficient economic pursuit of humans (Hale 2009; 2010a). The attendant social shifts that must occur to make an acorn economy economically viable are no less complex, requiring defense of territories containing acorn producing oaks and storage facilities; concepts not altogether welcoming to hunter-gatherer societies that have evolved social institutions precisely to cull such behavior (Bettinger 1999).

Other refinements to culture historical frameworks are based on King's (1981) chronology of burial patterns and related artifacts. Minor refinements to King's chronology occur when assemblage data warrant as much, but substantial numbers of *Olivella sp.* shell beads present in burial populations of the last 3000 years in King's study laid a strong chronological foundation for determining the kinds of socioeconomic patterns that developed during the late Holocene, discussed below.

Overall, the middle Holocene in southern California is primarily defined by processing economies of the Milling Stone pattern, which is undeniably the most robust and visible archaeological pattern found in California (Hale 2001, 2009; Fitzgerald and Jones 2000). Archaeologists continued until the turn of the century to be captivated by the Milling Stone pattern, resulting in numerous graduate theses and dissertations, monographs, and articles that focused on analyzing regional variability. That is, research focused on understanding how the Milling Stone pattern varied from place to place. Perhaps the most exhaustive review of the Milling Stone pattern was completed by Basgall and True (1985) for a Caltrans project along the Interstate 15 corridor. Basgall and True (1985) investigated archaeological sites belonging to the Sayles Complex—an inland, Transverse Ranges manifestation of the Milling Stone pattern. They reviewed most of the significant contributions to the Milling Stone pattern concept as of 1985 and provide an analytical framework for investigating and interpreting archaeological deposits of this kind. Since then,

certain early contributions to the topic (i.e., Warren 1968) have been more supported than refuted (see Hale 2001).

Locally, the upper Santa Clarita River Valley certainly has evidence of Milling Stone occupations, but these are confined to the late Holocene period, after 4000 BP, including the work by Waugh (1999) at CA-LAN-2233 and CA-LAN-2235. The Milling Stone component there is dated by proxy with a small number of obsidian hydration readings. Its presence in the upper Santa Clarita River Valley is not surprising; sites of this nature are visible precisely because they were repeatedly occupied on a seasonal basis for a similar processing purpose, resulting aggregations of reused grinding and processing tools

Late Holocene (post – 4000 BP)

The late Holocene (post – 4000 BP) is characterized by increased variation in environmental conditions and archaeological assemblages. Part of this variability is due to better resolution in both records, but much of it represents an accurate sample of prehistoric times over the last 4000 years. A summary of the various regionally specific paleoenvironmental conditions will not be provided in this brief overview. However, some patterns warrant discussion. With the dissipation of Altithermal conditions after about 4000 BP, increased precipitation is generally evident for southern California. In desert regions, spring flows markedly increased along with the stabilization of marshes, and some lake basins retained shallow waters from runoff (Batchelder 1970; Hunt and Mabey 1966; La Marche 1973; Mehringer 1987; Mehringer and Sheppard 1978; Mehringer and Warren 1976; Smith 1979; Stine 1990, 1994, 1995; Weide 1982). In coastal southern California, lagoons stabilized and destructive erosional processes that gutted them stopped after about 3000 BP (see Byrd and Reddy 2003; Erlandson and Rick 2002). Pollen and oxygen isotope studies from ocean and estuary cores sometimes present conflicting information, but all generally point to climatic instability during the last 3000 years, with a few pronounced periods of extreme climate, such as the Medeival Climatic Anomaly (MCA) from approximately 800 – 1200 BP (see Munns and Arnold 2003).

Erlandson suggests that southern California Mediterranean climates were more characterized by instability and fluctuations in resource availability than by sustained abundance (Erlandson 2003). It is a fact that southern California hunter-gatherer populations grew overtime. Coupled with instability in climate and resource availability, dense aggregations of hunter-gatherers would certainly elicit a socioeconomic response—this seems to be borne out in the archaeological record, at least in coastal regions.

Along the Northern California Bight (Santa Barbara and Ventura coastal plain), archaeological assemblages are referred to as Canaliño (D.B. Rogers 1929), or Late Prehistoric (Wallace 1955), while King's (1990) cultural chronology separates the last 2600 years into various divisions of the Middle Period (950-2600 BP [2600 B.C. – A.D. 1150]) and Late Period (post 950 BP [A.D. 1150]). The Southern California Bight (roughly, Orange and San Diego Counties) is characterized uniformly as the Late Prehistoric in most areas, although Gabrielino territory (parts of Orange County and Los Angeles County) tend to mimic the Northern California Bight chronology. Notably, the Southern California Bight witnesses a wholesale

continuation of the Milling Stone pattern into the late Holocene, changing little in assemblage composition excepting the addition of the bow and arrow and ceramics (Hale 2009, 2010a). Significant socioeconomic shifts occur just prior to Spanish contact at approximately 450 – 650 BP with an acorn economy starting to emerge (Hale 2009, 2010a).

Santa Barbara, Ventura, and parts of coastal Los Angeles exhibit significant changes in archaeological assemblages. Mortars and pestles are firmly established in the late Holocene by 3500 BP. This is followed by the appearance of the single piece fishhook by approximately 2900 BP, the plank canoe at approximately 1600 BP, bow and arrow (1500 BP), circular fishhook (700 BP), and microlithic tools (700 BP) (Arnold 1992; 1997; Gamble 2002; Glassow 1996; Kennett 2005; C. King 1990; Rick et al. 2002; Strudwick 1985). These technological innovations are successively accompanied by related increases in the formality of other kinds of subsistence tools already present in tool kits (Hale 2010a). *Olivella sp.* bead manufacturing is present throughout the late Holocene but becomes a robust industry in the last thousand years. Other items characteristic of late Holocene coastal regions includes steatite cooking vessels and containers, perforated stones, arrow shaft straighteners made of steatite, a variety of bone tools, and personal ornaments made from shell, bone, and stone. There is also an increased use of asphaltum for waterproofing and as an adhesive.

Many late Holocene coastal sites contain complex objects of art and decoration. Ornaments include drilled whole venus clam (*Chione spp.*) and drilled abalone (*Haliotis spp.*). Steatite effigies become more common, with scallop (*Pecten spp. and Argopecten spp.*) shell rattles common in middens. Mortuary customs are elaborate and include cremation and interment with abundant grave goods.

In Warren's (1968) cultural ecological scheme, the period between A.D. 500 and European contact is divided into three regional patterns. The Chumash Tradition is present mainly in the region of Santa Barbara and Ventura counties; the Takic or Numic Tradition is present in the Los Angeles, Orange, and western Riverside counties region; and the Yuman Tradition is present in the San Diego region. The seemingly abrupt changes in material culture, burial practices, and subsistence focus at the beginning of the Late Prehistoric period was taken to be the result of a migration to the coast of peoples from inland desert regions to the east. In addition to the small triangular and triangular side-notched points similar to those found in the desert regions in the Great Basin and Lower Colorado River, Colorado River pottery and the introduction of cremation in the archaeological record are diagnostic of the Yuman Tradition in the San Diego region.

In Los Angeles, Orange, and western Riverside counties, similar changes (introduction of cremation, pottery, and small triangular arrow points) are thought to be the result of a Takic migration to the coast from inland desert regions. This Takic or Numic Tradition was formerly referred to as the "Shoshonean wedge" or "Shoshonean intrusion" (Warren 1968). This terminology used originally to describe a Uto-Aztecan language group, is generally no longer used to avoid confusion with ethnohistoric and modern Shoshonean groups who spoke Numic languages (Heizer 1978:5; Shipley 1978:88, 90).

The growing body of archaeological literature, however, either contradicts the notion of a population migration, or indicates that when they arrived, they adopted local socioeconomic practices (Hale 2009). The longstanding archaeological patterns in the San Diego region are evidence of this. To the north, the similarity of archaeological assemblages and ethnic customs between the Los Angeles region and the Ventura and Santa Barbara regions is interesting, considering the two areas have distinct linguistic profiles. This disparity highlights the problem of considering any artifact type as an ethnic marker, which is not considered good scientific practice because it cannot be supported in the material record. Behavioral norms are the best ethnic marker, but tying behaviors to specific artifact types or patterns, as archaeologists do, measures only similarity in socioeconomic adaptation, which can exist between groups that share no ethnicity. Because of this, the archaeological record is generally the wrong context to measure ethnic association. Rather, among all ethnographic and ethnohistoric studies in California, language is the best discriminator of ethnic identity. Dialectical differences are better indicators of ethnicity when ethnographic information is the only representation of past populations, even though true ethnic markers are embodied in behavioral norms (see McElreath et al. 2003).

Items manufactured in coastal locales, such as shell ornaments and steatite vessels commonly made their way to the interior of California, being found in archeological deposits in the Transverse Ranges and Mojave Desert (e.g., Basgall and Hall 1994; Schroth 1994; Sutton 1980). Likewise, obsidian from the Coso volcanic field near Ridgecrest, California made its way to coastal environments. Whether these artifacts were carried to their location of deposition in the hands of those who made them or whether they were procured through trade is a question specific to each occurrence, ruling out various explanations in favor the most plausible scenario. Regardless, ethnographic and ethnohistoric accounts indicate that transregional trade and exchange was common and did not equate to similarity in ethnic identity since exchanges traversed traditional cultural boundaries (see Heizer 1978). For this reason alone, none of the artifacts common to southern California archaeological assemblages can be considered ethnic markers. This is especially true for ornaments, such as shell beads that may have been used as form of currency (Arnold 1991, 1997), or the bow and arrow that is widely considered one of the most significant technological innovations of the prehistoric world and that spread rapidly across the globe through adoption (Bettinger 1991).

The archaeological record in the Santa Clarita Valley is best represented by late Holocene assemblages. CA-LAN-2235 (Chiquito Creek I) and -2233 (Chiquito Creek II) are sites with a relatively typical Milling Stone period deposit with no surprising attributes relatively to the norm for this pattern (Waugh 1999; Whitley and Simon 1994a). The Milling Stone component at CA-LAN-2235 dates to approximately 4000 – 3000 BP, predating the cemetery component at CA-LAN-2233 that is bracketed between 2000 and 1630 BP. The latter contains artifacts characteristic of the late Holocene in general, fitting within Wallace's (1955) Late Prehistoric period, including mortars and pestles, time-sensitive shell beads, and the like (Waugh 1999). However, Waugh (1999) concludes that adaptive strategy represented by the Late Prehistoric component is similar to that of the earlier Milling Stone component, despite differences in milling

technology. An interesting conclusion by Waugh (1999) is that mitochondrial DNA analysis of burials indicates no physical relationship to Chumash peoples to the west, but strong ties to Tataviam and other Takic peoples located to the east and northeast in desert landscapes.

Also in the upper Santa Clarita River Valley, Whitley and Simon (W&S) (1994a, 1994b) documented several other sites that generally lack substantial assemblages, but can be characterized as Late Prehistoric temporary encampments generally postdating 3000 BP. Aside from their work at CA-LAN-2233 and LAN-2235, W&S (1994a, 1994b) evaluated several other small sites but failed to identify significant archaeological deposits.

W&S (2009) evaluated CA-LAN-4355 along Santa Clarita River in Sand Canyon, California, finding artifacts consistent with prehistoric habitation dating to the Late Prehistoric era (though no radiocarbon dates were provided). These artifacts included mortars and pestles, projectile points, flaked stone tools, steatite ornaments, bone tools, and various cobble based tools. W&S interpreted this site as dating between 400 and 800 BP, based on time sensitive artifacts. CA-LAN-1077, also located in Sand Canyon, was evaluated by Robinson (1980) who had findings similar to those of W&S (2009). CA-LAN-1077 had a weakly developed midden deposit with excavations producing four steatite beads/pendants, three cores, two retouched flakes, one hammerstone, five handstones, two battered cobbles, and fire-affected rock; no chronological placement was offered (Robinson 1980). None of the artifacts from CA-LAN-1077 or CA-LAN-4355 are specific to coastal locales; all types of artifacts recovered can be found in coastal, riparian, or desert environments.

One of the more well-known archaeological sites in the Santa Clarita River Valley dating to the late Holocene is CA-LAN-324. Loetzerich (1998) analyzed the collection from this massive site that contained human remains, residential features, thermal features, one flower pot mortar, mortars and pestles, millingstones and handstones, flakedstone tools (including bifaces), cobble tools, and several exotic items such as quartz crystals, and schist and other stone beads. The site was interpreted as representing aboriginal occupation continuously from 2600 BP to 400 Bp, based on various time-sensitive artifacts (including the flower pot mortar which tend to date to the last 300 years), and that it reflected a well-stratified aboriginal society similar to those seen in Gabrielino territory. The latter is consistent with Loetzerich's findings that burial patterns were similar to those seen in the San Fernando Valley.

A few archaeological sites near Vaszquez Rocks in the Sand Canyon area to the northeast of Santa Clarita Valley, such as CA-LAN-618 produced *Olivella sp.* beads that were tentatively thought to date prior to Chester King's (1990) Early Period have subsequently been found to date after 4000 BP (W&S 1994b). Additionally, Love and Witt (1990) revisited these sites concluding that their earliest documented occupation occurred no earlier than about 2700 BP. In her review, Waugh (1999) reviews the chronological evidence from this site according to the coastally derived cultural chronology developed by King (1990). The reference to King's (1990) bead chronology is justified in the sense that it is a baseline for review of shell bead types but it leaves the impression that the occupants were socioculturally connected to coastal

areas, while the non-ornamental archaeological assemblage provides no such justification.

Farther to the north in Antelope Valley, Sutton (1980) studied CA-LAN-488—a substantial prehistoric site dating from 2200 – 300 BP and containing a prehistoric cemetery, including a child burial associated with more than 5,000 shell beads. The archaeological assemblage from this site, dating within the late Holocene was decidedly desert focused, despite this strong shell bead component.

Finally, investigations of the Lovejoy Springs site (CA-LAN-192) summarized nearly a century of investigation at a large, desert site near Lake Los Angeles in the Antelope Valley (Price et al. 2009). The assemblage from CA-LAN-192, dating from approximately 3500 BP to historic times is characteristic of those found in the western Mojave Desert, being dominated almost exclusively by millingstone and handstone technology and the appropriate time-sensitive, desert projectile point forms. A few fragments of mortars and pestles (one decorated), and steatite vessels are present. Similar to CA-LAN-488, thousands of *Olivella sp.* shell beads were found interred with several of the nine human burials and in the general deposit (Price et al. 2009). Together, the site spans the Gypsum (4000 – 1500 BP), Saratoga Springs (1500 – 900 BP) and the Late Prehistoric periods (post – 900 BP), and exhibits many of the assemblage changes characteristic of each time period within the Mojave Desert.

In sum, the late Holocene saw major socioeconomic development among aboriginal populations within and surrounding Santa Clarita Valley, but that each region is distinct, from the Mojave to the northeast, to the west along the Coast, to the south in the Los Angeles Basin and San Diego County. The archaeological record within Santa Clarita Valley is meager compared to these other regions and resists efforts to make socioeconomic connects to neighboring regions or their inhabitants. Simple assemblage similarities, such as the presence of coastal beads or burial patterns in Santa Clarita or the Mojave, are not direct evidence of cultural affiliation. If it were, burials located in some of the Mojave Desert sites, such as CA-LAN-488 or CA-LAN-192 would require the assumption that they were Chumash in origin, which is the least likely explanation and one that few archaeologists (if any) would suggest. Rather, it is likely that trade and exchange networks between different ethnic groups were well established with the onset of the late Holocene by at least 3000 years ago (Price et al. 2009). Such networks allowed for the exchange of goods, such as beads, across ethnic boundaries without carrying implications for population movement or replacement.

Overall, the archaeological record of the upper Santa Clarita River Valley is poorly understood, especially in comparison to neighboring regions. This is likely a function of the complex geomorphology of the Santa Clarita River watershed reviewed earlier in this report. The areas that would have attracted prehistoric human occupation, such as river terraces and flat ground in valley bottoms, were subject to periodic and destructive flooding and sedimentation, which likely wiped out a large portion of the archaeological record. The San Francisquito Dam failure of 1927 probably exacted a heavy toll on the archaeological landscape of the floodplain since that event undoubtedly trumped previous natural flood events with its near 60-foot high wall of water instantly released into the Santa Clarita River Floodplain.

4.2 Ethnohistory

Tataviam

The Project area falls within the ethnographic boundary of the Tataviam (Johnson and Earle 1990; King and Blackburn 1978; Kroeber 1925). Tataviam territories included the upper reaches of the Santa Clara River drainage east of Piru Creek, but also encompassed the Sawmill Mountains to the north and the southwestern portion of the Antelope Valley (King and Blackburn 1978). Tataviam territory is bound by various branches of Chumash to the north and west (including the Ventureño to the west, and Castac and Emigdiano to the northwest), Kitanemuk to the northeast, Serrano to the east, and Gabrielino to the south (King and Blackburn 1978).

Note that there is limited ethnographic data (i.e., data acquired by means of observation or taken from persons who practiced native lifeways) available concerning the Tataviam and their native lifeways. Most of what is known today about the Tataviam comes in the form of ethnohistory (i.e., historical accounts developed through examination of historical records and oral histories) as presented in the works of anthropologists Alfred L. Kroeber (1915, 1925) and John P. Harrington (1935). Their data is largely based on interviews conducted in the early 1900s with a Native American consultant named Juan José Fustero, a man who spoke Kitanemuk and claimed that his grandparents were born near the town of Newhall and spoke a language that is no longer extant (Bright 1975). Most of the subsequent works published on the Tatatviam (Bright 1975; Hudson 1982; King and Blackburn 1978), including discussions of their cultural and geographic affiliations, were based on the Kroeber and Harrington interviews with Fustero and several other Kitanemuk consultants. Other studies have analyzed Spanish mission baptismal, marriage, and burial registers in an attempt to better understand the distribution of historic village settlements and kinship ties between settlements (Johnson 1978 and 1997; NEA and King 2004).

Early ethnologies referred to the Tataviam as Ataplili'ish (Kroeber 1915), but Kroeber found this name to be too general since it had already been used to describe other indigenous groups (namely the Gabrielino). Kroeber changed the term to Alliklik (1925), which was noted to be a Ventureño Chumash name for the group (although it is believed to be a derogatory term for the sound of the language) but offered almost no information concerning their native lifeways. One account of the Tatavium, provides a narrative that they held the river up from a point between Sespe and Piru, most of Piru Creek, Castac Creek, and probably Pastoria Creek across the mountains in the San Joaquin Valley drainage and adjacent to the Yokuts (Kroeber 1925:613-614).

The Tataviam are linguistically classified as an Uto-Aztecan Serran sub-branch of Takic speaking groups consisting of Kitanemuk, Serrano (including Vanyume), and Tataviam (Golla 2011; Sutton 1980). William Bright has suggested that Tataviam was actually a separate language with Takic affinities, or perhaps a "remnant, influenced by Takic, of a language family otherwise unknown in southern California" (Bright 1975:230). However, the current and most widely accepted view is that Tataviam is in fact a Takic language

(King and Blackburn 1978; Johnson and Earle 1990; Sutton et al. 2007).

King and Blackburn (1978:536) noted several Tataviam settlements based on information provided by Harrington and other sources, including mission registers. Among these is the putative village of *tsawayung* (also referred to as *Chaguayabit*, *Chaguayanga*, *takuyama'm*), which some believe was located near Castaic Junction at the site of Rancho San Francisco. However, there is a lack of consensus as to the village's exact location. Harrington's own notes reflect this uncertainty: "Jose Juan Olivas thinks it is over by San Francisquito [Rancho San Francisco] but does not know and never did know just where" (NEA and King 2004:119). Based on diary entries from the Portolá Expedition (Perkins 1957), some have hypothesized that Estancia San Francisco de Xavier (often incorrectly referred to as an asistencia) was placed at the location of the village of *tsawayang*, but this is based on descriptive diary entries and has never been confirmed by archaeological or other historic evidence. In fact, no physical evidence of the village has ever been found. Other Tataviam villages mapped outside of the proposed Project area include *tikatsing* located on upper Castaic Creek, and *pi'ing* located where Castaic Creek meets Elizabeth Lake Canyon. The village of *Tochonaga*, was recorded on an 1843 land grant map. This site appears to be located to the southeast of Newhall, but it's precise location has also never been confirmed: "Tochononga was located in the mountains northwest of San Fernando…over by Los Alamos somewhere here in the Tejon Ranch" (NEA and King 2004:117). Other villages and seasonal camp sites identified by Harrington include *akure'eng*, which was located at the original Newhall town site; *apatsitsing*, located on upper Castaic Creek; and *naqava'atang*, located east of Townsend Peak. Piru Creek also contained several village and rancheria sites, located on the northern edge of Tataviam territory (Johnson and Earle 1990).

Pedro Fage's account of the 1769 Portola expedition indicates that the first Chumash settlement encountered upon leaving Tataviam territory was located west of the mouth of Piru Creek. The village of *kamulus* (*Camulos*), located east of Piru Canyon, bears a Chumash name (Johnson and Earle 1990), leading to speculation that this village consisted of a mixed Chumash-Tataviam population. There has been much discussion regarding Chumash ties to areas generally accepted as Tataviam territory (see Beeler and Klar 1977).

More recent studies have examined additional Tataviam investigations conducted by Harrington with neighboring groups (Johnson and Earle 1990). These studies support the original Kroeber and Harrington findings that the Tataviam were a distinct group:

> The correspondence between (1) ancestral villages traced using genealogical evidence and (2) independently elicited information regarding Tataviam territoriality builds confidence in the reliability of the ethnographic record compiled by Kroeber and Harrington. The distinctiveness of the Tataviam as an ethnic entity, separate from the Kitanemuk and Fernandeño, is supported by our research (Johnson and Earle 1990:209).

In 1996, as the result of a Caltrans District 7 highway widening project for SR-126, archaeologists discovered and excavated 45 burials from CA-LAN-2233, a prehistoric village site dating from

approximately 2000 to 1640 years before present (BP) and located within Tataviam territory. Examination of mitochondrial DNA (mtDNA) from five burials at CA-LAN-2233 found that these individuals were genetically linked to modern Uto-Aztecan speaking groups, such as the Tataviam (Miller et al. 2003).

4.3 Historic Setting

Post-Contact history for the State of California is generally divided into three periods: the Spanish Period (1769–1821), Mexican Period (1821–1848), and American Period (1846–present). Although Spanish, Russian, and British explorers visited the area for brief periods between 1529 and 1769, the Spanish Period in California begins with the establishment in 1769 of a settlement at San Diego and the founding of Mission San Diego de Alcalá, the first of 21 missions constructed between 1769 and 1823. Independence from Spain in 1821 marks the beginning of the Mexican Period, and the signing of the Treaty of Guadalupe Hidalgo in 1848, ending the Mexican–American War, signals the beginning of the American Period when California became a territory of the United States.

Spanish Period (1769–1821)

Spanish explorers made sailing expeditions along the coast of southern California between the mid-1500s and mid-1700s. In search of the legendary Northwest Passage, Juan Rodríquez Cabrillo stopped in 1542 at present-day San Diego Bay. With his crew, Cabrillo explored the shorelines of present Catalina Island as well as San Pedro and Santa Monica Bays. Much of the present California and Oregon coastline was mapped and recorded in the next half-century by Spanish naval officer Sebastián Vizcaíno. Vizcaíno's crew also landed on Santa Catalina Island and at San Pedro and Santa Monica Bays, giving each location its long-standing name. The Spanish crown laid claim to California based on the surveys conducted by Cabrillo and Vizcaíno (Bancroft 1885; Gumprecht 1999).

More than 200 years passed before Spain began the colonization and inland exploration of Alta California. The 1769 overland expedition by Captain Gaspar de Portolá marks the beginning of California's Historic period, occurring just after the King of Spain installed the Franciscan Order to direct religious and colonization matters in assigned territories of the Americas. With a band of 64 soldiers, missionaries, Baja (lower) California Native Americans, and Mexican civilians, Portolá established the Presidio of San Diego, a fortified military outpost, as the first Spanish settlement in Alta California. In July of 1769, while Portolá was exploring southern California, Franciscan Fr. Junípero Serra founded Mission San Diego de Alcalá at Presidio Hill, the first of the 21 missions that would be established in Alta California by the Spanish and the Franciscan Order between 1769 and 1823.

The Portolá expedition first reached the present-day boundaries of Los Angeles in August 1769, thereby becoming the first Europeans to visit the area. Father Crespi named "the campsite by the river Nuestra Señora la Reina de los Angeles de la Porciúncula" or "Our Lady the Queen of the Angeles of the Porciúncula." Two years later, Friar Junípero Serra returned to the valley to establish a Catholic mission,

the Mission San Gabriel Arcángel, on September 8, 1771 (Kyle 2002). Mission San Fernando Rey de España, the mission that served the proposed Project area, was established nearly 30 years later on September 8, 1797.

Mexican Period (1821–1846)

A major emphasis during the Spanish Period in California was the construction of missions and associated presidios to integrate the Native American population into Christianity and communal enterprise. Incentives were also provided to bring settlers to pueblos or towns, but just three pueblos were established during the Spanish Period, only two of which were successful and remain as California cities (San José and Los Angeles). Several factors kept growth within Alta California to a minimum, including the threat of foreign invasion, political dissatisfaction, and unrest among the indigenous population. After more than a decade of intermittent rebellion and warfare, New Spain (Mexico and the California territory) won independence from Spain in 1821. In 1822, the Mexican legislative body in California ended isolationist policies designed to protect the Spanish monopoly on trade, and decreed California ports open to foreign merchants (Dallas 1955).

Extensive land grants were established in the interior during the Mexican Period, in part to increase the population inland from the more settled coastal areas where the Spanish had first concentrated their colonization efforts. Nine ranchos were granted between 1837 and 1846 in the future Orange County (Middlebrook 2005). Among the first ranchos deeded within the future Orange County were Manuel Nieto's Rancho Las Bolsas (partially in future Los Angeles County), granted by Spanish Governor Pedro Fages in 1784, and the Rancho Santiago de Santa Ana, granted by Governor José Joaquín Arrillaga to José Antonio Yorba and Juan Pablo Peralta in 1810 (Hallan-Gibson 1986). The secularization of the missions (enacted 1833) following Mexico's independence from Spain resulted in the subdivision of former mission lands and establishment of many additional ranchos.

During the supremacy of the ranchos (1834–1848), landowners largely focused on the cattle industry and devoted large tracts to grazing. Cattle hides became a primary southern California export, providing a commodity to trade for goods from the east and other areas in the United States and Mexico. The number of nonnative inhabitants increased during this period because of the influx of explorers, trappers, and ranchers associated with the land grants. The rising California population contributed to the introduction and rise of diseases foreign to the Native American population, who had no associated immunities.

American Period (1846–Present)

War in 1846 between Mexico and the United States precipitated the Battle of Chino, a clash between resident Californios and Americans in the San Bernardino area. The Mexican-American War ended with the Treaty of Guadalupe Hidalgo in 1848, ushering California into its American Period.

California officially became a state with the Compromise of 1850, which also designated Utah and New

Mexico (with present-day Arizona) as U.S. Territories (Waugh 2003). Horticulture and livestock, based primarily on cattle as the currency and staple of the rancho system, continued to dominate the southern California economy through 1850s. The Gold Rush began in 1848, and with the influx of people seeking gold, cattle were no longer desired mainly for their hides but also as a source of meat and other goods. During the 1850s cattle boom, rancho vaqueros drove large herds from southern to northern California to feed that region's burgeoning mining and commercial boom. Cattle were at first driven along major trails or roads such as the Gila Trail or Southern Overland Trail, then were transported by trains when available. The cattle boom ended for southern California as neighboring states and territories drove herds to northern California at reduced prices. Operation of the huge ranchos became increasingly difficult, and droughts severely reduced their productivity (Cleland 2005).

Local History of the Project Area

In 1795, Fr. Fermin Lasuen ordered a report to identify potential new mission sites. As a result, the Francisco Reyes Rancho was proposed as the site for the new Mission San Fernando Rey de España formally (Perkins 1957). The mission, founded in 1797, was ultimately located elsewhere; however, Mission San Fernando acquired the headwaters of the Santa Clara River east from Piru and named the land Rancho San Francisco. Shortly thereafter, many of the local Tataviam people were removed from their homeland and relocated to the mission where many of their traditional lifeways were no longer feasible.

When Mission padres were made aware that Francisco Avila, wealthy ranchero and alcalde (mayor) of the pueblo of Los Angeles (1810 – 1811), had claimed a large portion of Mission lands as his own, they protested to Governor José Arrillaga at Monterey. The governor acknowledged the church's title to the land, Avila's land grant was rescinded, and the padres quickly made plans to build in the area in order to more clearly establish their presence (Perkins 1957). The church built an outpost at the location using Native American labor, Rancho San Francisco, Fr. Crespi had first noted in his diary entry as a potential Mission site (Perkins 1957). Mission records suggest that this was an outpost known as Estancia San Francisco de Xavier and that it was likely never elevated to the status of "asistencia" or sub-mission.

By 1813, Rancho San Francisco had increased its production and the herds of cattle had grown larger eventually necessitating the need to construct a fence to keep mission cattle separate from neighboring cattle. The fence was erected at Piru Creek across the river, establishing a formal boundary between San Francisco and Triunfo ranches. Additionally, an irrigation canal was dug and a small dam was built at the eastern boundary of the rancho in order to provide the western side of the rancho with much needed water. (Perkins 1957).

Following secularization of the missions in 1833, the Mexican Government confiscated all mission land holdings and commissioned Lieutenant Antonio Del Valle to take over Mission San Fernando by inventory from the incumbent Padre, Fr. Ybarra. Along with his wife Doña Jacoba Felix and two children, Del Valle decided to settle his family on a portion of Rancho San Francisco. In 1838, Del Valle resigned his army

commission, petitioned the Mexican Government for title of Rancho San Francisco and became owner of 48,829 acres of Rancho San Francisco on January 22, 1839. Just two years later, Antonio Del Valle died, leaving behind thousands of heads of livestock, over 75 square miles of land, and no legal will. Legal battles ensued between his widow and his oldest son Ygnacio Del Valle. A judge eventually divided up the land amongst the parties and Ygnacio built his own corral on the western edge of the property (in present-day Piru, Ventura County) surrounding the former village of *kamulus* (Rasmussen 2001) for which the Camulos Rancho was named in 1853.

As a result of three year long drought, which killed most of his cattle, Del Valle eventually lost the rancho in 1865 to his financiers who then sold it to oil speculators. The first significant discovery of oil on the Rancho occurred just seven weeks after the sale and the first oil well was installed on the south side of the Santa Clara River near the Del Valle residence. The region would eventually be surrounded by oil fields including the Hasley Canyon and Castaic Junction Oil Fields to the north and the historic Pico Oil Field to the south.

The Del Valle's portion of Rancho San Francisco changed hands a few more times until it was acquired by Henry Mayo Newhall in 1875. The San Fernando Railroad Tunnel was constructed by over 1,000 Chinese and 500 white laborers, the Southern Pacific Railroad (SPRR) right-of-way was granted across the rancho and the town of "Newhall" was founded in 1876 (Perkins 1957). The Lang and Newhall Railroad Stations were built the same year. The town of Val Verde was founded by colonial Mexican settlers in an effort to take advantage of the gold strike in the late 1800s. The town was short lived and by the early 1900s, had all but disappeared.

In the mid-1920s, a group of black professionals led by insurance man, Norman Houston, and newspaper publisher, Charlotta Bass, began purchasing half-acre lots of a 30-acre tract named Eureka located in the rolling hills west of Castaic Junction between Hasley Canyon and the Santa Clara River. The weekend and summer resort town nicknamed the "Black Palm Springs" eventually became an independent township and retuned to name Val Verde in 1926 (Flamming 2005).

In the 1930s, the Works Progress Administration dedicated $39,000 for the development of an Olympic swimming pool within the community. Celebrated with a gala opening attended by black celebrities of the era, the pool remained intact until the 1994 Northridge earthquake (Flamming 2005). In addition to damaging the pool, the earthquake damaged the majority of the original structures built by the original residents of Eureka and Val Verde.

4.4 Previous Research

CHRIS Records Search

On February 19, 2020, Dudek conducted a search of the California Historical Resources Information System (CHRIS) at the South Central Coast Information Center (SCCIC), located on the campus of California State

University, Fullerton. The search included any previously recorded cultural resources and investigations within a 1-mile radius of the Project area. The CHRIS search also included a review of the NRHP, the CRHR, the California Points of Historical Interest list, the California Historical Landmarks list, the Archaeological Determinations of Eligibility list, and the California State Historic Resources Inventory list. Confidential Appendix A provides the records search results maps and a complete bibliography of all prior cultural resources studies occurring within 1-mile of the Project area.

Previously Recorded Cultural Resources

No previously recorded cultural resources were identified within the Project site nor within a 1-mile-radius of the Project site as a result of the CHRIS records search conducted at the SCCIC.

Previous Cultural Resources Studies

Results of the CHRIS search indicate that one (1) previously conducted study was identified within the 1-mile records search radius (see Table 2). The study does not overlap the proposed Project area.

Table 1. Cultural Resource Investigations Conducted within 1-Mile of the Project Area

Year	Author	CCIC ID	Report Title	Addresses Project Site
1980	Rechtman, Robert B.	LA-00895	A Preliminary Archaeological Resource Survey of the Garcia Ranch, Los Angeles County, California	No

Native American Heritage Commission Sacred Land Files Request

A search of the Native American Heritage Commission's (NAHC's) Sacred Land File, requested on February 19, 2020 and was conducted on March 30, 2020 by Steven Quinn, NAHC Staff Services Analyst, to determine the presence of any Native American cultural resources within the proposed Project site (see Appendix B). The NAHC results were negative for Native American heritage resources within the proposed Project site. The NAHC identified twelve (12) Native American individuals who would potentially have specific knowledge of the cultural resources identified within the Project site that could be at-risk. Dudek has made no attempt at contact with the individuals identified by the NAHC.

Historic Aerials and Maps

Dudek consulted historic Topographic maps and aerial photographs to better understand development of the Project site and surrounding properties. Topographic maps of the Project site exist for the years 1903, 1908, 1916, 1924, 1930, 1939, 1940, 1943, 1948, 1953, 1959, 1964, 1966, 1967, 1970, 1984, 1988, 1995, and 1999 (NETR 2020). Aerial photographs of the Project site exist for the years 1928, 1930, 1938, 1945, 1947, 1952,

1954, 1963, 1969, 1977, 1978, 1994, 2002, 2010, 2012, 2014, 2016 (Frame Finder, NETR 2020).

Historic Aerials:

- 1928 - historic aerial shows two possible small rectangular structures located where the current water tanks are located.
- 1930 and 1938 - It is difficult to determine in the 1930 historic aerial if the structures were present, due to the quality of the photo. However, the 1930 and 1938 historic aerials show vegetation in a small grid like pattern within the Project area.
- 1945 - historic aerial shows the Project area as modified; possibly graded, but not completely clear of vegetation.
- 1947 - historic aerial shows what appears to be a small rectangular structure present within the Project area. It is possible that structure was not visible on the 1945 historic aerial due to the quality of the photo.
- 1952 - historic aerial does not show vegetation in a grid like pattern.
- 1954 - historic aerial displays no change to the Project area since the 1952 historic aerial.
- 1959 - historic aerial shows something manmade, directly east of the location of the current water tanks. The angles on the object indicates that it was manmade, however due to the quality of the photo you cannot determine its exact nature.
- 1963 - historic aerial displays no change to the Project area since the 1959 historic aerial.
- 1969 - historic aerial does not show any structures within the Project area.
- 1977 - historic aerial shows the current water tanks and only vegetation within the Project area.
- 1978, 1994, 2002, 2010, 2012, 2014, and 2016 – historic aerials show no change to the Project area.

Topographic Maps

- 1953 Topographic map is the earliest map to show a structure present within the Project area. The structure was depicted as small and rectangular.
- 1959, 1966, 1970 and 1984 - topographic maps illustrate the structure as present within the proposed Project site.
- 1964 and 1967 topographic maps do not illustrate a structure within the proposed Project site.
- 1988 - topographic maps illustrating the current water tanks for the first time.

5.0 FIELD INVESTIGATIONS

An intensive archaeological survey of the proposed Project site was completed on February 12, 2020 by Dudek Staff Archaeologists. The pedestrian survey covered the entire Project site in 5-meter (approximately 16-foot) parallel transects. Careful attention was given to barren ground including at the base of trees, within animal trails/paths, areas surrounding structural features such as fence lines and the extant water tanks as well as subsurface soils exposed by burrowing animals. Dense ground cover was occasionally cleared by boot and shovel, when appropriate, to enhance detection of archaeological materials that may have been obscured on the surface.

The proposed Project site includes the areas surrounding the extant water tanks, the majority of which consist of undeveloped land: two ridges that orient northeast-southwest as well as the slopes surrounding these ridges and fairly flat terrain along the northernmost portion of the Project site that parallels West Cuyama Road. Major landscape features within the proposed Project site were identified to provide relative orientation during field documentation; as a result, the northeastern ridge east of the water tanks is referred to as Ridge 1 and the southwestern ridge is referred to as Ridge 2. For purposes of elucidation ground surface visibility is communicated utilizing the following ranges: 0 percent = no visibility; 0-20 percent = poor visibility; 20-40 percent = fair visibility; 40-60 percent = good visibility; 60-80 percent = very good visibility; 80-100 percent = excellent visibility.

Just east of the two extant water tanks and south of West Cuyama Road is a relatively flat area with dense vegetation. Exposed soils in this area are a result of the following: pedestrian foot traffic, animal trails, bioturbation and predominately roadside and/or maintenance activities that are likely associated with West Cuyama Road and the extant water tanks. Dense vegetation, including grasses, bushes, and trees cover approximately 90 percent of this area. Ground visibility was excellent (80-100 percent) within exposed soils and poor to good (20-60 percent) within areas of dense vegetation. In order to improve ground surface visibility within areas of dense vegetation, boot and had scrapes were employed at 10 meter intervals and subjectively as appropriate. Refuse items, including paint cans and buckets, were identified just south of West Cuyama Road. Since no diagnostic (dateable traits) were present and the items were discovered within the same context and location of modern refuse, these items are unlikely to be historic-period resources. The relatively flat terrain drastically increases in slope heading southward with an inclination of approximately 45 degrees or more. Where possible and safe to do so, the slope was surveyed with observations focused on identifying any evident surficial cultural material and/or exposed soils while maintaining a 5-meter spaced transect. Ground surface visibility within this area was poor (between 0-10 percent). Boot and hand scrapes up the slope at 5 to 10 meter intervals were implemented to identify subsurface conditions, when appropriate. No cultural materials were observed in this survey area.

The northeast-southwest oriented Ridge 1 is located south of the flat terrain area previously described. Vegetation atop the ridge is moderately dense with poor to fair (10-20 percent) ground surface visibility. Given the steep terrain and loose sediments presenting an unstable and unsafe surface for an intensive-level

survey, an opportunistic approach was applied. An emphasis was given to identifying and observing exposed soils and photo-documenting areas that were inaccessible due to the steep slopes and dense vegetation. When soils were not observed, boot scrapes were employed at 10 to 20-meter intervals to identify subsurface conditions improving ground surface visibility to good (40-60 percent). No cultural materials were observed within the Ridge 1 survey area.

The northeast-southwest oriented Ridge 2 located southwest of Ridge 1 and presented the same survey conditions and observations. Accordingly, the same survey approach was applied. No cultural materials were observed within the Ridge 2 survey area.

South of the extant water tanks and west and northwest of ridges 1 and 2, respectively, is a heavily vegetated area that slopes north and northwest An opportunistic survey approach was applied by surveying along accessible pathways and seeking exposed ground soils when possible. Ground surface visibility within this area was poor (5-20 percent) depending on the density of trees and bushes. When soils were not observed, boot scrapes were employed at 10 to 20-meter intervals to identify subsurface conditions improving ground surface visibility to good (40-60 percent). Soils identified within this area are consistent with the sandy loam just south of West Cuyama Road as well as sandy, coarse-grained, accumulated decomposed rock from the ridges above. The remains of a fallen wooden fence post and barbed wire, likely used for property boundary delineation, was observed, but no visible diagnostic traits/markers were identified on the post. Additionally, a review of SCCIC records did not identify any historical resources within the Project area. As such, no cultural materials of historical significance were observed within this survey area.

All soils appear to be consistent with the USDA's characterization of Metz loamy sand with and Castiac and Saugus soils comprised of residuum weathered from sedimentary rock (United States Department of Agriculture 2019).

6.0 ASSESSMENT OF POTENTIAL FOR UNRECORDED ARCHAEOLOGICAL RESOURCES

Based on the generally good ground surface visibility and use of shovel scrapes in areas with more surface vegetation, the intensive archaeological pedestrian survey results are considered reliable. Due to the absence of any prehistoric or historic remains identified during background research and the intensive pedestrian survey, and the evidence of disturbance noted on historic aerial imagery, the potential for buried prehistoric or historic archaeological resources within the proposed Project site considered low. Since a large portion of the proposed Project site is located on exposed ridgelines, it is unlikely that the surface soils along ridges 1 and 2 are a function of relatively recent alluvium associated with flooding runoff that could bury potential prehistoric deposits.

7.0 EVALUATION OF POTENTIAL PROJECT EFFECTS

As stated in CEQA Guidelines Section 15064.5(b)(1), a project causing a substantial adverse change in the significance of an historical resource is one that could result in the physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings, such that the significance of an historical resource would be materially impaired (i.e., altering those physical characteristics that convey its historical significance and that justify its inclusion in, or eligibility for, inclusion in the California Register of Historical Resources as determined by a lead agency [the County of Los Angeles] for purposes of CEQA; or its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code).

Based on the negative CHRIS records search results and NAHC Sacred Land Files results and the negative survey results in reliable conditions, the potential for proposed Project improvements to cause a substantial adverse change to unknown cultural resources is considered unlikely. Should the proposed Project improvements change in location or nature, this determination should be reconsidered.

8.0 RECOMMENDATIONS

Since no potentially significant resources, as defined by CEQA Guidelines and County of Los Angeles Cultural Guidelines, were identified within the proposed Project site, the proposed Project is not considered to have the potential to result in a significant impact on cultural resources as defined by CEQA Guidelines Section 15064.5(c)(4). As a result, no mitigation measures are recommended.

In the unlikely event that isolated cultural resources are encountered during ground disturbing activities, a County-qualified archaeologist should be notified immediately to assess the significance of the find pursuant to the County of Los Angeles Cultural Resources Guidelines criteria. This standard discovery process would ensure that any inadvertent discovery would be treated appropriately and thus the potential for impacts to cultural resources during Project construction activities would remain less than significant.

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APPENDIX A

SCCIC Records Search

CONFIDENTIAL

APPENDIX B

NAHC Sacred Land Files Search Request

CONFIDENTIAL

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Pomo

NAHC HEADQUARTERS
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March 30, 2020

Heather McDevitt
Dudek

Via Email to: hmcdevitt@dudek.com

Re: Sterling Ranch Estates – Tank Site Project, Los Angeles County

Dear Ms. McDevitt:

A record search of the Native American Heritage Commission (NAHC) Sacred Lands File (SLF) was completed for the information you have submitted for the above referenced project. The results were negative. However, the absence of specific site information in the SLF does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites.

Attached is a list of Native American tribes who may also have knowledge of cultural resources in the project area. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated; if they cannot supply information, they might recommend others with specific knowledge. By contacting all those listed, your organization will be better able to respond to claims of failure to consult with the appropriate tribe. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call or email to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from tribes, please notify me. With your assistance, we can assure that our lists contain current information.

If you have any questions or need additional information, please contact me at my email address: steven.quinn@nahc.ca.gov.

Sincerely,

Steven Quinn
Cultural Resources Analyst

Attachment

APPENDIX E

Energy Calculations

Table 1. Summary of Energy Use During Construction

Fuel Type	Quantity
Diesel	
On-Site Construction Equipment	268,585 Gallons
Off-Site Motor Vehicles	441,278 Gallons
Total	709,863 Gallons
Gasoline	
On-Site Construction Equipment	0 Gallons
Off-Site Motor Vehicles	305,861 Gallons
Total	305,861 Gallons
Electricity	40,978.9 kWh

Table 2. Summary of Annual Energy Use During Operation

Source	Units	Buildout
Electricity	kWh/yr	
Single Family	kWh/yr	1,742,800
Commercial	kWh/yr	240,240
Total Building	kWh/yr	1,983,040
Water	kWh/yr	431,053
Total Electricty	kWh/yr	2,414,093
Natural Gas		
Single Family	kBTU/yr	5,728,690
Commercial	kBTU/yr	42,000
Total	kBTU/yr	5,770,690
Transportation/On-Site Sources		
Diesel	gallons	76,560
Gasoline	gallons	353,811
Total	gallons	430,371

Table 3. Water by Land Use "Regulatory Compliance"

		Project		
Land Use	**Units**	**Indoor/Outdoor Use**	**Indoor Use**	**Outdoor Use**
Buildout	Mgal	12.8158/23.7784	12.8158	23.7784

Water and Wastewater Electricity Intensity (kWh/gallon)

Supply Water	0.009727
Treat Water	0.000111
Distribute Water	0.001272
Wastewater Treatment	0.001911

Source: CalEEMod User's Guide, Appendix D, Table 9.2 Los Angeles - South Coast Air District

Indoor Water Factor	0.013021	kWh/gallon (supply, treat, distribute, wastewater treatment)
Outdoor Water Factor	0.01111	kWh/gallon (supply, treat, and distribute)

Notes:

Electricity and Natural Gas for the Proposed Project is total operational usage. Electricity, natural gas, and mobile usage was calculated from CalEEMod in ***Appendix G*** *of the EIR. Indoor water factor used for entire Project Site for conservative analysis.*

Table 4. Off-Road Equipment Fuel Usage During Construction

Phase Name	Off-road Equipment Type	Amount	Hours per Day	Horsepower	Load Factor	Number of Days	Diesel Fuel Usage (Gallons per Project)
Grading	Graders	2	8	187	0.41	155	9,507
Grading	Rubber Tired Dozers	10	8	247	0.4	155	61,256
Grading	Scrapers	8	8	367	0.48	155	87,375
Grading	Tractors/Loaders/Backhoes	2	8	97	0.37	155	4,450
Building Construction	Cranes	1	7	231	0.29	783	18,359
Building Construction	Forklifts	3	8	89	0.2	783	16,725
Building Construction	Generator Sets	1	8	84	0.74	783	19,469
Building Construction	Tractors/Loaders/Backhoes	3	7	97	0.37	783	29,507
Building Construction	Welders	1	8	46	0.45	783	6,483
Architectural Coating	Air Compressors	1	6	78	0.48	130	1,460
Paving	Pavers	2	8	130	0.42	132	5,766
Paving	Paving Equipment	2	8	132	0.36	132	5,018
Paving	Rollers	2	8	80	0.38	132	3,210
Total							**268,585**

Notes:

Equipment assumptions from CalEEMod.

Fuel usage estimate of 0.05 gallons per horsepower-hour is from the SCAQMD CEQA Air Quality Handbook, Table A9-3 E.

Table 5. On-Road Vehicle Fuel Usage During Construction

		Daily Trips		Total			Trip Length (Miles)			Total Length (Miles)			Fuel Consumption (Gallons)	
	Days	Worker	Vendor	Worker Trips	Vendor Trips	Haul Trips	Worker	Vendor	Hauling	Worker	Vendor	Hauling	Gasoline	Diesel
Grading	155	55	0	8,525	0	0	14.7	6.9	20	125,318	0	0	4,645	3,397
Building Construction	783	681	259	533,223	202,797	0	14.7	6.9	20	7,838,378	1,399,299	0	290,506	430,048
Architectural Coating	130	136	0	17,680	0	0	14.7	6.9	20	259,896	0	0	9,632	7,044
Paving	132	15	0	1,980	0	0	14.7	6.9	20	29,106	0	0	1,079	789
Total	**1200**	**887**	**259**	**561,408**	**202,797**	**0**	**n/a**	**n/a**	**n/a**	**8,252,698**	**1,399,299**	**0**	**305,861**	**441,278**

Fuel Efficiency	Gas	DSL
Workers	26.98	36.89
Vendor/Haul Trucks	0	6.43

Notes:

Fuel efficiency calculated in ***Table 10: EMFAC2017 Results - Construction.***

Table 6. Water Usage for Control of Fugitive Dust During Construction

Phase Name	Total Acres Graded	Acres/Day	Gallons for Project	Electricity (kWh)
Project	1,395	9.0	**4,212,900**	**40,978.9**

Notes:

Total disturbed acreage for grading per CalEEMod for proposed Project.

Construction Schedule

155 days of grading

Water Usage

3,020 gallons per acre per day

Source: Air & Waste Management Association, Air Pollution Engineering Manual, 1992 Edition

Supply Water Electricity Intensity

0.009727 kWh/gallons (CalEEMod default for South Coast Air Basin)

Table 10. EMFAC2017 Results - Construction

Vehicle Class	Fuel	VMT (miles per day)	Fuel (1,000 gal per day)	Fuel Efficiency (miles per gallon)	Fuel	VMT (miles per day)	Fuel (1,000 gal per day)	Fuel Efficiency (miles per gallon)
LDA	GAS	154,957,028	5,253.04	29.50	DSL	1,336,170	29.00	46.08
LDT1	GAS	17,065,391	670.36	25.46	DSL	7,338	0.34	21.57
LDT2	GAS	52,553,142	2,238.86	23.47	DSL	355,535	10.51	33.84
			Average (LDA, LDT1, LDT2)	**26.98**				**36.89**
T7 Tractor Construction	DSL	246,432	38.32	6.43				

Construction Worker Fleet Mix

LDA	50%
LDT1	25%
LDT2	25%

Vendor and Delivery/Haul Truck Fleet Mix

HHDT	100%

EMFAC2017 (v1.0.2) Emissions Inventory
Region Type: County
Region: Los Angeles
Calendar Year: 2021
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	CalYr	VehClass	MdlYr	Speed	Fuel	Population	VMT	Trips	Fuel_Consumption
LOS ANGELES	2021	LDA	Aggregated	Aggregated	GAS	3998082.55	154957028.3	18859046.25	5253.036076
LOS ANGELES	2021	LDA	Aggregated	Aggregated	DSL	33364.94911	1336170.355	157695.7088	28.995514
LOS ANGELES	2021	LDA	Aggregated	Aggregated	ELEC	67210.71775	2697315.265	336259.3563	0
LOS ANGELES	2021	LDT1	Aggregated	Aggregated	GAS	451923.1455	17065391.26	2083892.52	670.3612556
LOS ANGELES	2021	LDT1	Aggregated	Aggregated	DSL	297.0410267	7338.123275	1055.645987	0.340197438
LOS ANGELES	2021	LDT1	Aggregated	Aggregated	ELEC	2539.277034	100849.3946	12618.75756	0
LOS ANGELES	2021	LDT2	Aggregated	Aggregated	GAS	1370275.92	52553142.22	6426189.155	2238.862589
LOS ANGELES	2021	LDT2	Aggregated	Aggregated	DSL	8126.390234	355535.4183	40234.87001	10.50575614
LOS ANGELES	2021	T7 tractor constr	Aggregated	Aggregated	DSL	3547.888701	246432.0056	16039.86688	38.32018639
									8240.421574
									8240421.574
		Gas	8162.25992	8162259.92	2979224871			3,007,753,874.51	
		Diesel	78.16165397	78161.65397	28529003.7				

Table 7. On road Vehicles - Operational

Scenario	Annual VMT	Fuel Consumption (gal)		
		Gasoline	Diesel	Total
Project	11,550,270	353,811	76,560	430,371

Table 8. Fuel Consumption Summary

Fuel	Fuel Efficiency (MPG)	%Fleet
Gasoline	30.0	92.0%
Diesel	12.1	8.0%

Notes:

Percent fleet based on VMT from EMFAC2017 as shown in ***Table 9: EMFAC2017 Emissions Inventory-Operations***

Annual VMT obtained from the CalEEMod Output files in **Appendix G**.

Fuel efficiency based on calculations in ***Table 9: EMFAC2017 Emissions Inventory-Operations,*** *from EMFAC2017.*

Table 9. EMFAC2017 Emissions Inventory - Operations

Fuel	VMT (miles/day)	Fuel Consumption (1,000 gal/day)	Fuel Efficiency (miles per gallon)	Fuel Percentage
GAS	264,978,918	8,823	30.0	93
DSL	21,279,675	1,763	12.1	7

Note: Fuel percentage based on VMT.
Fuel efficiency calculated using fuel consumption and VMT from EMFAC2017.

Buildout

EMFAC2017 (v1.0.2) Emissions Inventory
Region Type: County
Region: Los Angeles
Calendar Year: 2028
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	CalYr	VehClass	MdlYr	Speed	Fuel	Population	VMT	Trips	Fuel_Consumption
LOS ANGELES	2028	All Other Buses	Aggregated	Aggregated	DSL	3028.051473	170951.1317	25435.632	14.8562285
LOS ANGELES	2028	LDA	Aggregated	Aggregated	DSL	45151.7604	1679125.713	216188.02	30.7581088
LOS ANGELES	2028	LDT1	Aggregated	Aggregated	DSL	138.0170597	3764.186379	544.22733	0.15256681
LOS ANGELES	2028	LDT2	Aggregated	Aggregated	DSL	13534.56727	504449.4711	65431.78	12.5372934
LOS ANGELES	2028	LHD1	Aggregated	Aggregated	DSL	92816.51093	3542244.231	1167514.9	148.272161
LOS ANGELES	2028	LHD2	Aggregated	Aggregated	DSL	37777.42206	1383164.119	475192.45	64.388286
LOS ANGELES	2028	MDV	Aggregated	Aggregated	DSL	29374.54339	1032500.346	141788.13	33.1111338
LOS ANGELES	2028	MH	Aggregated	Aggregated	DSL	7816.990283	76000.88399	781.69903	6.63504553
LOS ANGELES	2028	Motor Coach	Aggregated	Aggregated	DSL	846.6414022	102483.9657	12360.964	14.0783393
LOS ANGELES	2028	PTO	Aggregated	Aggregated	DSL	0	83753.37523	0	15.3005154
LOS ANGELES	2028	SBUS	Aggregated	Aggregated	DSL	3978.821935	125716.6889	45915.053	15.312471
LOS ANGELES	2028	T6 Ag	Aggregated	Aggregated	DSL	12.9853684	70.52520942	57.135621	0.00835451
LOS ANGELES	2028	T6 CAIRP heavy	Aggregated	Aggregated	DSL	409.7003034	74066.87496	5981.6244	5.43905165
LOS ANGELES	2028	T6 CAIRP small	Aggregated	Aggregated	DSL	223.8114985	10517.78044	3267.6479	0.8534893
LOS ANGELES	2028	T6 instate construct	Aggregated	Aggregated	DSL	2818.886743	171712.3474	12744.077	15.3761474
LOS ANGELES	2028	T6 instate construct	Aggregated	Aggregated	DSL	9000.654181	456790.5901	40691.608	39.2662373
LOS ANGELES	2028	T6 instate heavy	Aggregated	Aggregated	DSL	14242.83921	1689774.124	164360.39	135.250075
LOS ANGELES	2028	T6 instate small	Aggregated	Aggregated	DSL	47385.47844	2266994.994	546821.85	193.270716
LOS ANGELES	2028	T6 OOS heavy	Aggregated	Aggregated	DSL	237.6248765	43058.46001	3469.3232	3.16003569
LOS ANGELES	2028	T6 OOS small	Aggregated	Aggregated	DSL	127.7762081	5969.085353	1865.5326	0.48505245

LOS ANGELES	2028	T6 Public	Aggregated	Aggregated	DSL	4798.579398	75671.49216	14555.691	8.27784369
LOS ANGELES	2028	T6 utility	Aggregated	Aggregated	DSL	1084.617911	17993.35762	12473.106	1.63697769
LOS ANGELES	2028	T7 Ag	Aggregated	Aggregated	DSL	6.732828346	21.51531405	29.624445	0.00488466
LOS ANGELES	2028	T7 CAIRP	Aggregated	Aggregated	DSL	6466.504783	1248733.655	94410.97	152.243029
LOS ANGELES	2028	T7 CAIRP constructi	Aggregated	Aggregated	DSL	671.4071864	123342.4708	3035.4058	14.5378709
LOS ANGELES	2028	T7 NNOOS	Aggregated	Aggregated	DSL	8325.235654	1522176.498	121548.44	177.312969
LOS ANGELES	2028	T7 NOOS	Aggregated	Aggregated	DSL	2582.082985	490658.5044	37698.412	61.5217315
LOS ANGELES	2028	T7 POLA	Aggregated	Aggregated	DSL	9086.792339	1462035.636	69059.622	216.409023
LOS ANGELES	2028	T7 Public	Aggregated	Aggregated	DSL	5827.275878	118051.7777	17676.07	18.2467225
LOS ANGELES	2028	T7 Single	Aggregated	Aggregated	DSL	6183.515388	421798.7386	71356.91	57.4621221
LOS ANGELES	2028	T7 single constructi	Aggregated	Aggregated	DSL	4328.621552	305989.9836	19569.53	40.2983515
LOS ANGELES	2028	T7 SWCV	Aggregated	Aggregated	DSL	773.0643777	31584.9816	3014.9511	15.4870628
LOS ANGELES	2028	T7 tractor	Aggregated	Aggregated	DSL	15101.21747	1777391.57	191785.46	216.409065
LOS ANGELES	2028	T7 tractor construct	Aggregated	Aggregated	DSL	3664.045457	252414.7969	16565.007	33.5004479
LOS ANGELES	2028	T7 utility	Aggregated	Aggregated	DSL	429.5905176	8700.873304	4940.291	1.27257891
LOS ANGELES	2028	UBUS	Aggregated	Aggregated	DSL	0	0	0	0
LOS ANGELES	2028	LDA	Aggregated	Aggregated	ELEC	170919.7038	6950369.331	842885.87	0
LOS ANGELES	2028	LDT1	Aggregated	Aggregated	ELEC	11328.09342	469619.7788	56210.559	0
LOS ANGELES	2028	LDT2	Aggregated	Aggregated	ELEC	40872.83739	1170687.267	202752.79	0
LOS ANGELES	2028	MDV	Aggregated	Aggregated	ELEC	27357.67712	799584.3056	136637.31	0
LOS ANGELES	2028	UBUS	Aggregated	Aggregated	ELEC	2	147.1503742	8	0
LOS ANGELES	2028	LDA	Aggregated	Aggregated	GAS	4260665.777	151032519.1	20071135	4281.76191
LOS ANGELES	2028	LDT1	Aggregated	Aggregated	GAS	547345.8492	18937123.51	2537622.8	629.60734
LOS ANGELES	2028	LDT2	Aggregated	Aggregated	GAS	1555368.616	54793345.98	7301460.1	1863.58517
LOS ANGELES	2028	LHD1	Aggregated	Aggregated	GAS	107836.2516	3756340.734	1606599.5	330.408535
LOS ANGELES	2028	LHD2	Aggregated	Aggregated	GAS	18955.01525	636747.7133	282401.48	64.4164612
LOS ANGELES	2028	MCY	Aggregated	Aggregated	GAS	218157.5601	1403717.656	436315.12	39.6208573
LOS ANGELES	2028	MDV	Aggregated	Aggregated	GAS	1003846.118	33141341.44	4671965.4	1389.99253
LOS ANGELES	2028	MH	Aggregated	Aggregated	GAS	19829.72329	198357.4129	1983.7655	35.0505841
LOS ANGELES	2028	OBUS	Aggregated	Aggregated	GAS	4004.854903	151310.7632	80129.137	27.4929325
LOS ANGELES	2028	SBUS	Aggregated	Aggregated	GAS	2007.891274	76428.4286	8031.5651	7.79659701
LOS ANGELES	2028	T6TS	Aggregated	Aggregated	GAS	15672.41942	844458.7493	313573.77	151.493127
LOS ANGELES	2028	T7IS	Aggregated	Aggregated	GAS	53.00274758	7079.013563	1060.479	1.49994603
LOS ANGELES	2028	UBUS	Aggregated	Aggregated	GAS	480.5220833	34770.19391	1922.0883	7.11291123
LOS ANGELES	2028	T7 SWCV	Aggregated	Aggregated	NG	3583.592281	146013.0157	13976.01	58.995236
LOS ANGELES	2028	UBUS	Aggregated	Aggregated	NG	4376.254608	464705.5557	17505.018	118.147886

	VMT Sum	Fuel Sum	Fuel Sum/Year
Diesel	21279674.74	1763.131989	**643,543,176**
Gas	264978917.6	8822.725991	**3,220,294,987**
			3,863,838,163

Existing

EMFAC2017 (v1.0.2) Emissions Inventory

Region Type: County
Region: Los Angeles
Calendar Year: 2018
Season: Annual
Vehicle Classification: EMFAC2011 Categories
Units: miles/day for VMT, trips/day for Trips, tons/day for Emissions, 1000 gallons/day for Fuel Consumption

Region	CalYr	VehClass	MdlYr	Speed	Fuel	Population	VMT	Trips	Fuel_Consumption
LOS ANGELES	2018	All Other Buses	Aggregated	Aggregated	DSL	2238.994297	127988.0373	18807.552	13.5265256
LOS ANGELES	2018	LDA	Aggregated	Aggregated	DSL	26109.46075	1060329.627	121602.56	25.0515768
LOS ANGELES	2018	LDT1	Aggregated	Aggregated	DSL	383.8029222	9868.193952	1375.3699	0.46876784
LOS ANGELES	2018	LDT2	Aggregated	Aggregated	DSL	5343.689056	250979.8747	26547.372	8.11547066
LOS ANGELES	2018	LHD1	Aggregated	Aggregated	DSL	47262.47124	2072151.258	594502.43	101.568823
LOS ANGELES	2018	LHD2	Aggregated	Aggregated	DSL	18979.4185	807216.1924	238737.21	43.9330698
LOS ANGELES	2018	MDV	Aggregated	Aggregated	DSL	12020.11742	523107.5092	59585.038	21.9435182
LOS ANGELES	2018	MH	Aggregated	Aggregated	DSL	4914.104545	52174.61107	491.41045	5.17708998
LOS ANGELES	2018	Motor Coach	Aggregated	Aggregated	DSL	683.4991193	85672.59207	9979.0871	14.3025621
LOS ANGELES	2018	PTO	Aggregated	Aggregated	DSL	0	75485.06278	0	16.1984753
LOS ANGELES	2018	SBUS	Aggregated	Aggregated	DSL	3779.498338	120028.9943	43614.887	16.2975777
LOS ANGELES	2018	T6 Ag	Aggregated	Aggregated	DSL	12.17663633	113.4299469	53.5772	0.01355055
LOS ANGELES	2018	T6 CAIRP heavy	Aggregated	Aggregated	DSL	304.6902387	61502.42819	4448.4775	5.89331498
LOS ANGELES	2018	T6 CAIRP small	Aggregated	Aggregated	DSL	160.4544596	8587.803697	2342.6351	0.86979438
LOS ANGELES	2018	T6 instate construct	Aggregated	Aggregated	DSL	2327.985923	154590.3274	10524.734	16.5060244
LOS ANGELES	2018	T6 instate construct	Aggregated	Aggregated	DSL	8214.310082	408001.6137	37136.577	43.2533656
LOS ANGELES	2018	T6 instate heavy	Aggregated	Aggregated	DSL	9238.199896	1249038.11	106607.55	126.514566
LOS ANGELES	2018	T6 instate small	Aggregated	Aggregated	DSL	35757.6526	1747323.43	412638.35	184.692086
LOS ANGELES	2018	T6 OOS heavy	Aggregated	Aggregated	DSL	174.5263455	35367.69264	2548.0846	3.38706278
LOS ANGELES	2018	T6 OOS small	Aggregated	Aggregated	DSL	92.14522607	4913.257172	1345.3203	0.49799275
LOS ANGELES	2018	T6 Public	Aggregated	Aggregated	DSL	4436.262148	67405.44545	13456.662	8.90334873
LOS ANGELES	2018	T6 utility	Aggregated	Aggregated	DSL	986.7933279	16519.68068	11348.123	1.87652414
LOS ANGELES	2018	T7 Ag	Aggregated	Aggregated	DSL	4.476059052	132.8750216	19.69466	0.02454972
LOS ANGELES	2018	T7 CAIRP	Aggregated	Aggregated	DSL	5356.00899	1045528.801	78197.731	164.009561
LOS ANGELES	2018	T7 CAIRP constructi	Aggregated	Aggregated	DSL	565.9059137	111043.5751	2558.4386	16.6963858
LOS ANGELES	2018	T7 NNOOS	Aggregated	Aggregated	DSL	6173.516129	1274572.674	90133.335	193.372875
LOS ANGELES	2018	T7 NOOS	Aggregated	Aggregated	DSL	2107.788275	410786.5567	30773.709	65.8100848
LOS ANGELES	2018	T7 POLA	Aggregated	Aggregated	DSL	7450.606724	870378.8046	56624.611	159.526221
LOS ANGELES	2018	T7 Public	Aggregated	Aggregated	DSL	5270.316277	106796.5828	15986.626	19.4615115
LOS ANGELES	2018	T7 Single	Aggregated	Aggregated	DSL	5704.976857	380157.8644	65834.642	62.5487328
LOS ANGELES	2018	T7 single constructi	Aggregated	Aggregated	DSL	4027.315735	275478.6854	18207.338	44.4698562
LOS ANGELES	2018	T7 SWCV	Aggregated	Aggregated	DSL	2065.265457	84382.82284	8054.5353	41.7388692
LOS ANGELES	2018	T7 tractor	Aggregated	Aggregated	DSL	10943.33814	1556243.703	138980.39	240.391151
LOS ANGELES	2018	T7 tractor construct	Aggregated	Aggregated	DSL	3246.106546	227245.6621	14675.521	36.9477146

LOS ANGELES	2018	T7 utility	Aggregated	Aggregated	DSL	393.4050124	7988.540201	4524.1576	1.35857019
LOS ANGELES	2018	UBUS	Aggregated	Aggregated	DSL	84.4305	10591.53369	337.722	1.83357061
LOS ANGELES	2018	LDA	Aggregated	Aggregated	ELEC	42368.59396	1624269.413	214048.73	0
LOS ANGELES	2018	LDT1	Aggregated	Aggregated	ELEC	985.0680806	31466.15645	4677.8417	0
LOS ANGELES	2018	LDT2	Aggregated	Aggregated	ELEC	4800.935399	173726.9165	24577.91	0
LOS ANGELES	2018	MDV	Aggregated	Aggregated	ELEC	552.2853059	19117.13868	2776.3085	0
LOS ANGELES	2018	UBUS	Aggregated	Aggregated	ELEC	14	1217.553685	56	0
LOS ANGELES	2018	LDA	Aggregated	Aggregated	GAS	3871282.859	156451258.2	18230154	5708.44196
LOS ANGELES	2018	LDT1	Aggregated	Aggregated	GAS	408035.3812	15773309.28	1860776	668.647064
LOS ANGELES	2018	LDT2	Aggregated	Aggregated	GAS	1300769.78	51437930.82	6067452.2	2433.25129
LOS ANGELES	2018	LHD1	Aggregated	Aggregated	GAS	109991.9819	4146746.351	1638716.6	412.77019
LOS ANGELES	2018	LHD2	Aggregated	Aggregated	GAS	17474.98225	631402.5424	260351.2	72.2007875
LOS ANGELES	2018	MCY	Aggregated	Aggregated	GAS	151841.883	1132730.444	303683.77	31.6532382
LOS ANGELES	2018	MDV	Aggregated	Aggregated	GAS	898470.2247	32992479.19	4143345.3	1889.76657
LOS ANGELES	2018	MH	Aggregated	Aggregated	GAS	20036.23326	196497.0838	2004.4248	40.1657843
LOS ANGELES	2018	OBUS	Aggregated	Aggregated	GAS	4100.145149	189469.378	82035.704	39.4708912
LOS ANGELES	2018	SBUS	Aggregated	Aggregated	GAS	984.9230078	42861.79151	3939.692	4.81684293
LOS ANGELES	2018	T6TS	Aggregated	Aggregated	GAS	14549.78454	806422.7702	291112.09	167.730218
LOS ANGELES	2018	T7IS	Aggregated	Aggregated	GAS	79.28906698	5926.200364	1586.4157	1.59720983
LOS ANGELES	2018	UBUS	Aggregated	Aggregated	GAS	448.6238021	32808.15398	1794.4952	8.11792829
LOS ANGELES	2018	T7 SWCV	Aggregated	Aggregated	NG	1903.182221	77561.24807	7422.4107	36.4990057
LOS ANGELES	2018	UBUS	Aggregated	Aggregated	NG	4032.681802	426812.5434	16130.727	106.896616

	VMT Sum	Fuel Sum	Fuel Sum/Year
Diesel	15299693.85	1707.180742	**623,120,971**
Gas	263839842.2	11478.62997	**4,189,699,939**
			4,812,820,910
Difference		118179.6696	8.96263963

APPENDIX F

Geotechnical Review

APPENDIX F.1

Geologic and Geotechnical Report, Review of Vesting Tentative Tract Map, dated June 8, 2018.

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOLOGIC AND GEOTECHNICAL REPORT
Review of Vesting Tentative Tract Map, dated May 8, 2018

Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California

Prepared for:

Sterling Gateway, L.P.
1887 Gold Dust Lane, #303
P.O. Box 681007
Park City, UT 84068

Job No.: 18-1245A-4
Dated June 8, 2018

27825 Smyth Drive, Valencia, California 91355 661-294-0065 FAX 661-294-0833

TABLE OF CONTENTS

1.0 SCOPE OF WORK 1
2.0 SITE DESCRIPTION 4
3.0 PROPOSED DEVELOPMENT 4
4.0 FIELD EXPLORATION, SAMPLING, AND LABORATORY TESTING 5
4.1 Surface Mapping 5
4.2 Subsurface Investigations Sterling Ranch Estates 5
4.3 Del Valle Road Off-site 6
4.4 Sampling Procedures 6
4.5 Laboratory Program 6
5.0 GENERALIZED GEOLOGIC/GEOTECHNICAL SUBSURFACE CONDITIONS AND SOIL PROPERTIES 7
5.1 Regional Geology 7
5.2 Geologic Structure 7
5.3 Geomorphology 8
5.4 Geologic Units 8
5.4.1 Pico Formation (Tp) 9
5.4.2 Saugus Formation (TQs) 9
5.4.3 Terrace Deposits (Qt) 9
5.4.4 Older Alluvium (Qoa) 9
5.4.5 Alluvium (Qal) 9
5.4.6 Slopewash (Qsw) 10
5.4.7 Residual Soil 10
5.4.8 Artificial Fill (af) 10
5.4.9 Landslides (Qls) 11
5.4.10 Surficial Failures (Qsf) 12
5.5 Ground Water 12
5.6 Soil Compressibility 12
5.7 Expansion Potential of Soils 13
5.8 Potential Corrosivity of Soils 13
5.9 Soils Shear Strength 14
5.1 Erosion Potential 14
5.2 Debris Flow Hazards 14
6.0 SEISMIC CONSIDERATIONS 17
6.1 Introduction 17
6.2 Ground Rupture 18
6.2.1 Age of Fault Movement 19
6.2.2 Building Setbacks 19
6.3 Ground Failure 20
6.3.1 Potential for Liquefaction and Associated Ground Failure 20
6.3.1 Potential for Other Modes of Ground Failure 20
6.4 Earthquake Ground Motion 21

TABLE OF CONTENTS

6.4.1 General 21
6.4.2 Earthquake Magnitude 21
6.4.3 Evaluation of Peak Ground Acceleration 22
6.4.4 Deaggregation of Fault Hazard 22
6.4.5 Building Code Response Spectrum Parameters 23

7.0 GENERAL CONCLUSIONS AND RECOMMENDATIONS 23
7.1 Feasibility of Development 23
7.2 Earthwork and Grading Recommendations 23
7.2.1 Removals and Benching 23
7.2.2 Dewatering During Removals 24
7.2.3 Over-Excavation 24
7.2.4 Rippability 25
7.2.5 Fill Materials 25
7.2.6 Fill Compaction 25
7.2.7 Construction of Fill Slopes 26
7.3 Shrinkage, Bulking and Subsidence 26
7.4 Proposed Fill Slopes 27
7.5 Proposed Cut-Slopes 27
7.6 Natural Slopes 28
7.7 Landslides 28
7.7.1 Landslide Qls-1 28
7.7.2 Landslide Qls-2 29
7.7.3 Landslide Qls-3 29
7.7.4 Landslides Qls-4 and 5 29
7.7.5 Landslides Qls-6 through Qls-10 29
7.8 Deep Fill Areas 29
7.9 Low Impact Development Facilities 30
7.9.1 General 30
7.9.2 Subsurface Conditions, Basin Parameters and Design Infiltration Rates 30
7.9.3 Transient Seepage Analysis 31
7.9.4 General LID Findings, Conclusions and Design Considerations 33
7.10 Oil Wells 33
7.11 Drainage Control 34
7.11.1 Surface Drainage and Erosion Control 34
7.11.2 Subsurface Water Control 35
7.12 Sewage Disposal 35
7.13 Restricted Use Areas 35
7.14 Foundation and Settlement Considerations 36
7.15 Building Setbacks 37
7.16 Soil Compressibility Considerations 37
7.17 Expansive Soils Considerations 37
7.18 Soil Corrosivity Considerations 38
7.19 Retaining Walls and Pavement Design 38

TABLE OF CONTENTS

8.0 GEOLOGIST/GEOTECHNICAL ENGINEER OF RECORD..... 38

9.0 LIMITATIONS..... 39

Location Map following page 2
References
Summary of Cut-Slopes Table 1

APPENDIX A – Subsurface Logs

- **Continuous Trench Logs** (7/12/91) (In Pockets)
  - T-1, T-2 and T-3 Plate III
  - T-4 and T-5 Plate IV
  - T-6, T-7, and T-8 Plate V
  - T-9, thru T-12 Plate VI
  - T-13, T-14 and T-15 Plate VII
  - T-16, T-17 and T-18 Plate VIII
  - T-19, thru T-22 Plate IX
  - T-23, T-24 and T-25 Plate X
- **Trench Logs**
  - T-1A thru T-48A
  - PT-7 thru PT-10
- **Trench and Dozer Cut Logs** (Offsite)
  - T-39, T-77, T-78, T-105, T-122, T-123 and T-124
  - T-94 and DC-3 Plate A1
- **Bucket-Auger Boring Logs**
  - B-1A and B-2A
  - B-24 (Offsite)
- **Hollow-Stem-Auger Boring Logs**
  - HS-1A through HS-12A
  - Key to Symbols
- **CPT Data**
  - CPT 1 thru 20

APPENDIX B – Laboratory Test Results

APPENDIX C – Liquefaction Potential Assessment and Evaluation of Earthquake-Induced Settlements

TABLE OF CONTENTS

APPENDIX D – Seismicity Figures
- Modified Mercalli Scale, 1956 Version
- Fault and Earthquake Epicenter Location Map Figure D1
- Magnitude-Distance Contributions to Hazard Figure D2
- USGS Deaggregation Parameters and Output

APPENDIX E – Slope Stability Analyses

APPENDIX F – Seepage Analyses Figures

APPENDIX G – Figures

Stereonet Plot–Oak Canyon Anticline Figure 1
Minimum Foundation and Slab Recommendations for Expansive Soils Table G1
Oil Well Abandonment Records
Construction Diagrams
- Fill Over Natural Slope 5:1 or Steeper
- Rock Disposal
- Fill Slope Over Natural Slope 5:1 or Steeper
- Fill Slope Toeing Out on Flat Alluviated Canyon
- Over-excavation for Transitional Cut and Cut-Fill Lots
- Stability/Buttress Fill and Backdrains
- Canyon Subdrain

APPENDIX H – Map and Cross Sections (plates in pockets)
- Cross Sections 1-1' through 27-27'
- Cross Sections 28-28' through 30-30' Plate I
- **Geotechnical Map** Plate II

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

June 8, 2018 Job No.: 18-1245A-4

Sterling Gateway, L.P.
1887 Gold Dust Lane, #303
P.O. Box 681007
Park City, UT 84068

Attention: Mr. Hunt Williams

Subject: **GEOLOGIC AND GEOTECHNICAL REPORT**
Review of Vesting Tentative Tract Map 60257 (Dated May 8, 2018)

Project: Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California

References: See at end of text

Dear Mr. Williams:

This report presents our opinions on the existing geologic and geotechnical conditions on the above-referenced site and their effects on the Vesting Tentative Tract Map (VTTM) 60257 prepared by Sikand Engineering, dated May 8, 2018.

1.0 SCOPE OF WORK

The scope of work performed for this study included the following:

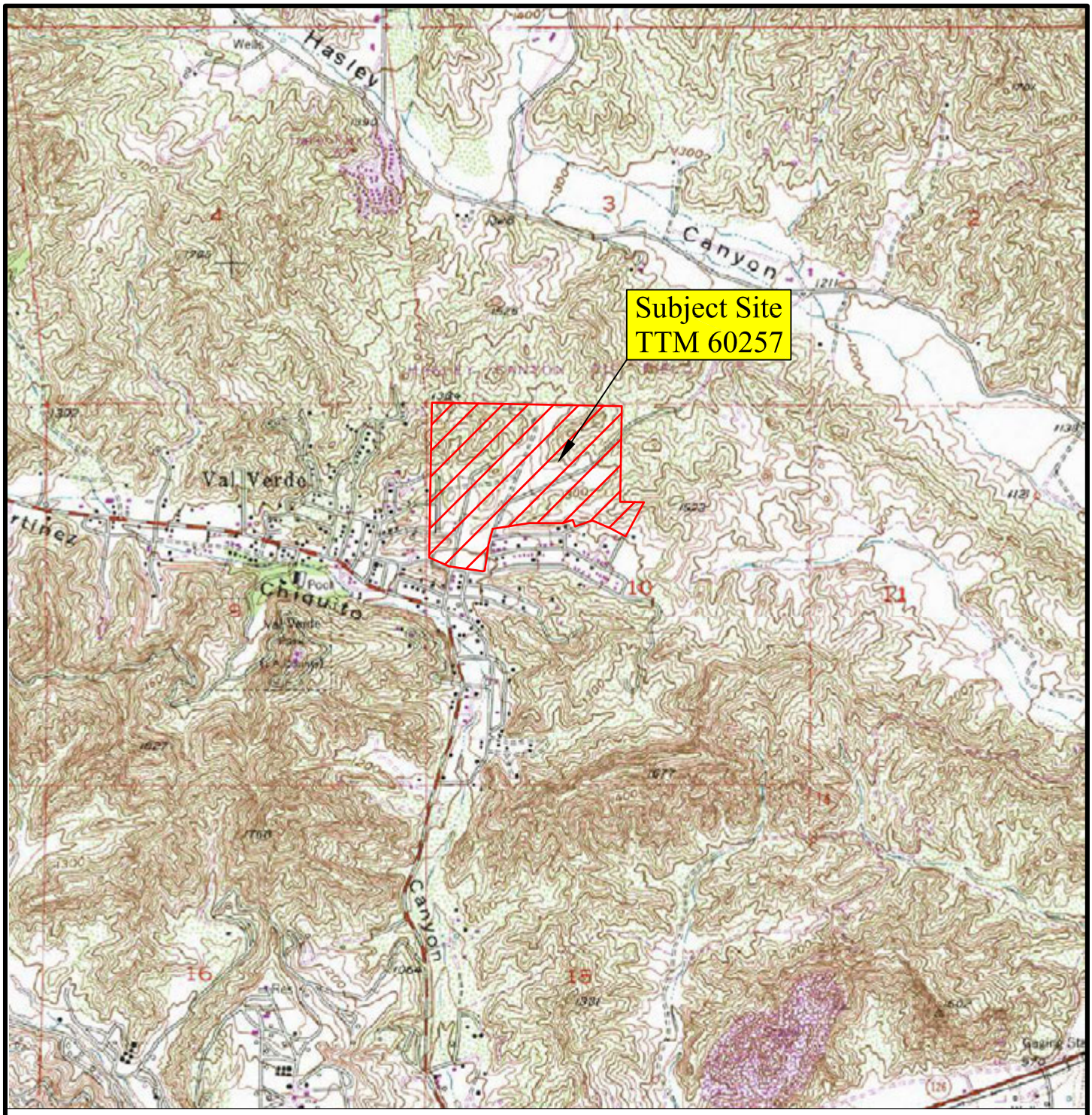
1. Review of previous reports by this firm in the vicinity of the subject site.
2. Review of published reports and maps listed in the References section.
3. Review of the 2003 Munger Map Book, California-Alaska Oil & Gas Field and review of records on the Division of Oil, Gas, and Geothermal Resources (DOGGR) website.
4. Review of Alquist-Priolo Fault Rupture Hazard Zones in California (CDMG Special Publication 42).
5. Coordination with the Supervising Civil Engineer, Sikand Engineering.
6. Review of the site topography and the Vesting Tentative Tract Map design, dated May 8, 2018, provided to our office in computerized format (AutoCAD), prepared by Sikand

Engineering. This computerized map was used as the base for our 80-scale Geotechnical Map. We make no representations regarding the accuracy of this base map.

7. Review of the following aerial photographs:

YEAR	PHOTO	SCALE	AGENCY
1928	E-67 & E-68	1" = 1700'±	Fairchild
11/3/52	AXJ-2K-30, 2K-85 & 2K-86	1" = 1800'±	USDA
6/19/80	105, 106, 107, 108,119, 120 & 121	1" = 1500'±	American Aerial Survey
1980	1080-151 & 1521-VEN 2-47	1" = 3333'±	USDA
1985	-	1" = 4000'±	USDA

8. Coordination with Underground Service Alert to obtain clearance from potentially impacted utilities prior to the subsurface exploration.
9. Preparation of an Access Road and SWPPPS plan in order to perform our subsurface exploration.
10. Obtain a grading permit from the County of Los Angeles Department of Public Works in order to construct the proposed access roads and drill pads for our subsurface investigation.
11. Coordination with California Department of Conservation Division of Oil, Gas and Geothermal Resources (DOGGR).
12. Review of our existing subsurface Trench logs presented within our previous reports for the site. These logs are presented within **Appendix A**.
13. Review of our subsurface excavation logs from our reports from VTTM 60257. Logs in the vicinity of the proposed off-site grading for Del Valle Road are included within **Appendix A**.
14. Geologic field mapping of the site.
15. Excavation, sampling and logging of 12 hollow-stem-auger borings (HS-1A through HS-12A) drilled to a maximum depth of 55 feet, and 2 bucket-auger borings (B-1A and B-2A) drilled to a maximum depth of 80 feet.
16. Excavation, sampling and logging of 48 backhoe trenches (T-1A through T-48A) excavated to a maximum depth of 13 feet.
17. Performed 20 Cone Penetrometer Test (CPT) soundings within the alluvial areas.



Source: U.S. Geological Survey Val Verde Quadrangle, Dated 1952 Photorevised 1988

Approximate Scale: 1"=2,000'

NOTE: THIS IS NOT A SURVEY OF THE PROPERTY

N

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

LOCATION MAP

JOB NO.: *18-1245A-4* | DATE: *6/08/18*

18. Laboratory testing of samples obtained during our subsurface investigations. Testing included dry density and moisture content of in-situ soils, percent finer than the #200 sieve size, grain-size analysis including hydrometer, Atterberg limits, compaction (modified proctor), direct shear and re-shear, consolidation, hydro-compression (collapse), expansion index, permeability, and corrosivity (soluble sulfate and chloride chloride content, pH and soil resistivity).

19. Performed general earthquake ground motion characterization utilizing the latest seismic ground-motion and active fault data, in accordance with the 2016 California Building Code (CBC), ASCE 7-10, and Special Publication 117A (Guidelines for Evaluating and Mitigating Seismic Hazards in California), dated September 11, 2008. Our evaluation included calculation of CBC response spectrum parameters and potential ground accelerations that could be generated at the site during future earthquakes on nearby faults.

20. Geotechnical assessment of liquefaction potential of site alluvial soils and calculation of associated seismic settlements and lateral spread displacements based on subsurface data, laboratory test results, and estimated ground motions.

21. Geotechnical evaluation of soil density, shear strength, compressibility, permeability, corrosion potential, expansion potential, and shrinkage and bulking factors.

22. Assessment of recommended grading removal depths based on weak soils, calculated seismic settlements, and proposed fill heights above the exiting ground surface.

23. Preparation of 27 cross sections illustrating anticipated geologic conditions for the proposed cut, fill and natural slopes.

24. Preparation of 3 cross sections illustrating anticipated geotechnical conditions within critical alluvial canyon areas.

25. Slope stability analyses of proposed cut slopes, fill slopes, and natural slopes on the site.

26. Geotechnical analyses to assess potential steady-state and transient seepage emanating from proposed stormwater infiltration areas an evaluation of potential hazards to the proposed development and adjacent off-site existing development.

27. Preparation of the enclosed Geotechnical Map (**Plate II**) illustrating our geologic data and recommended mitigation measures in relation to the proposed Vesting Tentative Tract Map design.

28. Preparation of figures and illustrations, including Location Map, drill hole logs, trench logs, CPT logs, laboratory test reports, liquefaction and lateral spreading results and

calculations, slope stability graphical results and data output, and pertinent construction details for inclusion in this report.

29. Preparation of this Geologic and Geotechnical report for submittal to the Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division.

2.0 SITE DESCRIPTION

The subject site consists of approximately 113 acres (gross area) located approximately 2.5 miles west-northwest of Castaic Junction. Access to the site is available from Del Valle Road as well as from the intersection of Chiquito Canyon Road via State Route SR-126. Existing Del Valle Road bisects the subject property. The site is bounded by undeveloped Vesting Tentative Tract Map 60665 to the east, undeveloped property to the north and developed Tracts 8673 and 5317 to the south and west respectively. Elevations on the site range from 1195 to 1446 feet. The specific details of the site topography are shown on the Location Map and Geotechnical Map that accompany this report.

The site is largely undeveloped except for roads and pads associated an existing residential structure and with past oil well drilling and operations. A large (75ft. by 100 ft.) concrete pad/slab is located on the southern portion of the site.

Slopes range from relatively gentle in the canyon floor areas to steep along the northerly and easterly-facing bedrock elevated areas. Vegetation on the site consists of annual grasses to chaparral.

3.0 PROPOSED DEVELOPMENT

The Vesting Tentative Tract Map (VTTM) 60257 proposes 231 residential lots, 1 commercial lot, 7 debris basin lots, 3 infiltration basin lots, 1 pump station lot, and 3 open space lots. The VTTM illustrates the proposed improvement and off-site grading for Del Valle Road. Conventional cut and fill grading techniques will be utilized to construct the proposed development consisting of relatively level building pads and cut and fill slopes. Cut and fill slopes are proposed at gradients of 2:1 (h:v) or flatter. The maximum proposed cut-slope (CS-7) height is 135 feet, which has slope gradient of 3:1. The maximum proposed 2:1 gradient cut slope height is approximately 118 feet (CS-8) and the maximum proposed fill slope height is approximately 70 feet in the vicinity of Lot 140. The maximum depth of cut will be about 90 feet in the vicinity of Lot 223. The maximum depth of proposed fill will be about 55 feet in the vicinity of Lot 135.

4.0 FIELD EXPLORATION, SAMPLING, AND LABORATORY TESTING

4.1 Surface Mapping

For this report, surface geologic mapping in conjunction with aerial photo interpretations was undertaken by personnel from Allan E. Seward Engineering Geology Inc. (AESEGI) using the proposed 80-scale VTTM as the base map. We also reviewed all our previous geologic/geotechnical data and available data by others in the vicinity of the project.

4.2 Subsurface Investigations Sterling Ranch Estates

In 1990 and 1991, this office performed a geologic fault investigation for the project site. This fault investigation included excavation and geologic logging of 25 long trenches (T-1 through T-25) totaling 4,158 lineal feet.

In 2006 and 2007 additional subsurface explorations were performed, which included 7 CPT soundings (CPT-1 through CPT-7), 9 hollow-stem-auger (HS-1A through HS-9A) drill holes, 2 bucket-auger (BA-1A and BA-2A) drill holes, and 36 backhoe trenches (T-1A through T-36A). Valley Well Drilling performed the hollow-stem-auger drill holes. Allways Drilling excavated the bucket-auger drill holes, D.E. Eddings and John Watson excavated the trenches, and Holguin, Fahan & Associates performed the CPT soundings. Bulldozer work was performed by Larry Price.

In 2017 and 2018 additional subsurface explorations were performed, which included 13 CPT soundings (CPT-8 through CPT-20), logging and sampling of 3 hollow-stem-auger (HS-10A through HS-12A) drill holes, and logging of 12 backhoe trenches (T-37A through T-48A). Six of these trench locations were selected for infiltration testing. The infiltration testing (PT-1 through PT-6) was performed in shallow test pits excavated with a backhoe. Infiltration testing (PT-7 through PT-10) was performed in deeper test pits excavated with a loader. Choice Drilling performed the hollow-stem-auger drill holes, Barkley Engineering Corp. excavated the trenches, Kennedy Heavy Equipment Rentals excavated the deeper infiltrations test pits, and Middle Earth Geo Testing performed the CPT soundings.

The drill holes, trenches, and infiltration test pits were logged and sampled by AESEGI personnel. The drill hole logs, trench logs, and CPT soundings are presented in **Appendix A**. Trench logs for PT-1 through PT-6 were not prepared due to their proximity to an existing Trench Log. The locations of the drill holes, trenches and CPTs are shown on the **Geotechnical Map**. The subsurface explorations after 1991 have been designated with an "A" (B-2A, HS-9A, CPT-7A and T-36A) descriptor to separate it from the prior subsurface explorations. The subsurface exploration logs presented within our previous reports for the property are presented within this report for ease of review.

The drill hole logs included in **Appendix A** represent our interpretation of field data prepared for each boring by our geologic/engineering staff at the time of drilling, along with refinements based on observations and laboratory test results. Unit boundaries shown in the graphic log column of our hollow-stem-auger drill hole logs are approximate and may represent gradual transitions.

4.3 Del Valle Road Off-site

The proposed off-site grading of Del Valle Road is on Vesting Tentative Tract Map 60665. Subsurface explorations have been completed by this firm during various phases spanning from 2002 through 2007 for the VTTM 60665 and adjacent parcels for a prior developer entity. These investigations included 34 bucket-auger drill holes, 4 hollow-stem-auger drill holes, 144 pit and long trenches, and 3 dozer cuts. A Geologic and Geotechnical Report, dated 2/5/16, was prepared for this VTTM (see ref. 3) that illustrates the subsurface locations and geologic data. The subsurface explorations that are relevant to the proposed off-site grading for Del Valle Road per VTTM 60257 included 1 bucket-auger drill hole (B-24), 7 pit trenches, 1 long trench (T-94), and 1 dozer cut (DC-3). The drill holes, trench and dozer cut logs are presented in **Appendix A**. The locations of the subsurface explorations are shown on the **Geotechnical Map**.

4.4 Sampling Procedures

California-Drive (relatively undisturbed ring samples) and Standard Penetration Test (SPT) samples were obtained in the exploratory drill holes at various depths (see logs in **Appendix A**). Recovered soil samples were sealed in plastic containers and brought to our laboratory for further classification and testing.

Bulk (disturbed) samples of the near surface soils and bedrock were obtained from cuttings developed during excavation of the exploratory drill holes and trenches. The bulk samples were collected for classification and testing purposes and represent a mixture of soils within the noted depths.

4.5 Laboratory Program

After visual and tactile classification in the field, the soil samples were brought to our laboratory. The soil classifications were checked in accordance with the Unified Soils Classification System. The field logs were reviewed to assess which samples would be analyzed or tested further. The results of the field investigation and the laboratory tests were used as the basis for our analyses and recommendations presented in this report. Laboratory test results are presented in **Appendix B**. In addition, laboratory shear test data from adjacent properties PM 60030 and VTTM 60665 are also presented to supplement the on-site data.

5.0 GENERALIZED GEOLOGIC/GEOTECHNICAL SUBSURFACE CONDITIONS AND SOIL PROPERTIES

5.1 Regional Geology

VTTM 60257 is located in the Transverse Ranges geomorphic province of Southern California in the eastern portion of the Ventura Basin. The Ventura Basin is a west-trending depositional basin produced by tectonic down-warping initiated during the early Miocene geologic epoch (5 to 24 million years ago). This depositional basin has developed a thick accumulation of Cenozoic sediments. The site is underlain by sedimentary rock of the Saugus and Pico Formations. The contact between the Saugus Formation and the Pico Formation is located at the southwestern portion of the site. Alluvium is present in the larger drainage areas and soil and slopewash mantle most of the site. Remnants of fluvial terrace deposits are present in isolated areas of the subject site.

5.2 Geologic Structure

Bedrock on the site has been strongly deformed by north-south compressional tectonic forces producing geologic structures (faults and folds) which trend east-west. These structures include the south branch of the Holser fault, one related sub-parallel fault located at the project northern tract boundary, and the east plunging Oak Canyon anticline (Yeats, et al 1985) traverses the northern portion of the site. The east-west trending, south dipping reverse fault at the northern project boundary was designated informally as the "Oak Canyon fault" for the VTTM 60665 (see ref. 3). The location of the south branch of Holser fault and Oak Canyon fault on the site are not obvious owing to alluvial deposits. Bedrock located near these fault breaks on adjacent properties are strongly deformed due to drag and shearing along the fault. Based on the structural trend and orientation of the faulting and folding, we judge that the Oak Canyon fault and anticline are structurally associated with the Holser fault. The three-dimensional geometry of the subsurface geologic structure is illustrated on the Geotechnical Map and cross sections.

The south branch of the Holser fault is defined by the east-west trending canyon on the southeastern margin of the subject site and by the change from Pico Formation on the south to the Saugus Formation to the north. No geomorphic evidence for recent activity on the South Branch of this fault was observed on the site.

The north branch of the Holser fault is mapped on Parcel Map 60030 which is approximately 1,300 ft to the east of the site. This fault is characterized by steep bedding adjacent to the faults and significant shear zone. However, on the western portion of PM 60030, the steepness of the bedding and the severity of the faulting appears to diminish to the west of the mapped intersection with the Oak Canyon anticline. Test pits and borings adjacent to

the eastern property line of the VTTM 60665 on strike with the north-branch of the Holser fault all reveal regional bedding typically dipping 25 to 35° to the south. The north branch of the Holser fault at the western edge of PM 60030 is not easily identified because it interpreted to be bedding parallel or to end on the eastern portion of VTTM 60665. Shortening along the North Branch may be taken up by the Oak Canyon fault father to the west. Evidence for the north branch of the Holser fault on the VTTM 60257 was not observed. For more detailed discussion on the age of fault movement, see the **Seismic Considerations** section of this report.

South of the Oak Canyon anticline axis bedding generally strikes east west and dips about 23° to 40° to the south. North of the anticline axis bedding generally strikes parallel to the anticline axis and dips about 25° to 55° north. Analysis of folding with an equal-area plot of the poles indicates a fold with a narrow hinge and plunge of the fold axis is approximately 11° to the east (see Stereonet Plot in Appendix G). The Oak Canyon fault is approximately 150 to 200 ft north of the Oak Canyon anticline axial hinge trace. The Oak Canyon fault was observed in trench on the adjacent properties to the north. Bedding adjacent to fault is generally steeply dipping to the north of over-turned with steep dips to the south.

5.3 Geomorphology

The site geomorphology is dominated by four main canyon tributaries of the southward-draining Chiquito Canyon. The three western canyons cut across the structural grain of the underlying Saugus Formation bedrock and the eastern canyon roughly parallels it. Where the intervening ridges are perpendicular to structure, resistant sandstone units form knobs and finer grained units form saddles. Small remnant outliers of Quaternary fluvial terrace deposits have been found at elevations ranging from 1280 to 1400 ft. Recent alluvium is present in each of the major drainages and has locally been incised. The small landslide deposits mapped on the site are poorly to moderately well-defined geomorphically. They are primarily bedding plane failures found on the south-facing dip slopes. The landslide shown in Trenches T-16 and T-17 has poor geomorphic expression and appears to be a remnant of a cross-bedding failure.

The subject property has been affected by slope movements that range in size from small debris flows to larger deeper-seated bedrock failures. Nine landslides have been mapped on the site of which five are located in the southeastern edge of the VTTM.

5.4 Geologic Units

A general description of geologic units, including bedrock, terrace deposits, alluvium, landslides, and artificial fill are presented below. Distribution of these units is shown on the Geotechnical Map, **Plate II**.

5.4.1 Pico Formation (Tp)

The Pliocene, shallow marine Pico Formation consists of moderately indurated, light greenish- to bluish-gray siltstone and sandy siltstone, light brown sandstone, and conglomerate. The Pico Formation is in fault contact with the Saugus Formation along portions of the south branch of the Holser Fault. This fault contact places the Pico Formation over the younger Saugus Formation. The Pico Formation likely underlies the site at depth but is not exposed at the surface with the project site. However, there are outcrops to the south of the site.

5.4.2 Saugus Formation (TQs)

The bedrock underlying the majority of the site consists of the lowermost portion of Plio-Pleistocene Saugus Formation. This section contains fluvial and transitional lithologies of the lower Saugus Formation, including light gray sandstone and conglomerate, greenish-gray siltstone, silty sandstone, claystone and mudstone. The unit is typically moderately cemented and indurated. Sandstone beds are commonly well exposed in outcrop, but overall the Saugus Formation is not well exposed except in existing cuts.

5.4.3 Terrace Deposits (Qt)

Remnants of fluvial terrace deposits are present in isolated areas of the subject site. These deposits consist primarily of moderate to well-bedded, moderately consolidated, light-gray to yellowish-orange sandstone and conglomerate with sandy siltstone interbeds.

5.4.4 Older Alluvium (Qoa)

The Quaternary alluvium that is present the off-site portion on Del Valle Road in the canyon areas that are elevated above the existing active drainages are mapped as older alluvium deposits. These deposits generally consist of interbedded sands, silty and clayey sands, and sandy, silty clays.

5.4.5 Alluvium (Qal)

Recent alluvium deposits occur within the canyon bottoms and associated tributaries. These unconsolidated deposits consist primarily of light to dark yellowish-brown, brown, to reddish-brown fine- to coarse-grained sand, silty sand, and silty clayey sand with trace gravel. Interbedded stiff, sandy lean clays and sandy silts were encountered at some limited locations.

The alluvial areas have been delineated on the Geotechnical Map as Alluvial Canyons 1 through 4. The alluvium is generally loose to medium dense down to the bedrock contact, which generally ranges from about 30 to 50 in maximum depth (see profiles for Canyons 2 and 3 on Cross Sections 28-28’ and 29-29’ in Appendix H).

Based upon blow counts, dry densities, moisture contents and consolidation test results, the upper alluvial soils are considered unsuitable for support of structural fills. Additionally, alluvial soils potentially susceptible to liquefaction are widespread within the canyon areas. Accumulation of loose, potentially liquefiable sediments are particularly thick at the canyon mouths where the adjacent bedrock topography narrows (i.e. at CPT-3 and CPT-13).

Removal and recompaction of alluvial soils that are considered to subject to potential static and seismic settlement have been recommended on the subject site. Please refer to the **Geotechnical Map** for removal depths and limits.

5.4.6 Slopewash (Qsw)

Slopewash, or colluvium, is a heterogeneous deposit formed on slopes as a result of weathering, sheet wash, creep and shallow debris flows on sloping ground. This unit is generally thickest in swales and side canyons, and at the toe of existing natural slopes, where it commonly interfingers with the canyon alluvial deposits. The slopewash generally consists of poorly sorted, pebbly silty sand, but varies depending on the composition of the underlying source material. The maximum thickness of slopewash encountered in our exploratory excavations is about 10 feet.

Slopewash has been noted on the Geologic logs and is indicated on the **Geotechnical Map** where it is estimated to be greater than 4 feet in thickness. In addition, slopewash deposits that may affect the proposed development are also shown on the attached Geotechnical Map. All slopewash in areas of proposed development shall be completely removed prior to the placement of compacted fill.

5.4.7 Residual Soil

Natural areas of the site are mantled by surface soils consisting of moderate to yellowish-brown and yellowish-gray silty sand with scattered pebbles. This unit is noted on our geologic logs but is not shown on the Geotechnical Map.

5.4.8 Artificial Fill (af)

Existing non-compacted artificial fill on the site ranges from minor spill fills generated during past grading of minor roads and oil well pads to larger accumulations placed to bridge roads across drainages (see **Geotechnical Map**). In proposed fill areas, artificial fill should be entirely removed prior to placement of compacted fill. If artificial fill is present below proposed cut grade elevations, it shall be completely removed and replaced with compacted fill.

5.4.9 Landslides (Qls)

Ten landslides, Qls-1 through Qls-10, have been mapped on the project site. In addition, three landslides, Qls-A, Qls-B and Qls-C, have been mapped along proposed off-site grading for Del Valle Road. In general, the mapped landslides are translational failures, which occurred where daylighted (unsupported) clay-rich beds of the Saugus Formation bedrock. However, landslides exhibiting cross bedding failure have been encountered in the vicinity of the Oak Canyon anticline.

The landslide limits and designations are illustrated on the Geotechnical Map. Cross sections have been constructed to illustrate the three-dimensional geometry of the more significant landslides and proposed grades. Stability of the landslides not removed by proposed grades are discussed in the Slope Stability appendix. Remediation recommendations for the landslides that affect the proposed development are discussed in the Earthworks section of this report.

5.4.9.1 Landslide Qls-1 & Qls-2

Landslide Qls-1 on the western edge of the commercial site and a portion of the landslide is off-site. Cross section 1-1' illustrates the interpreted geometry, proposed grades, and partial remedial removal of the landslide. Landslide Qls-2 is contained with the proposed commercial site lot. Proposed grades will remove the majority of the landslide.

5.4.9.2 Landslide Qls-3

Landslide Qls-3 is contained within Open Space Lot 245.

5.4.9.3 Landslides Qls-4 and 5

Landslides Qls-4 and Qls-5 is located in the vicinity of Lot 185. These landslides observed in Trenches T-16 and T-17 have poor geomorphic expression and are opined to be remnant of a cross-bedding failure.

5.4.9.4 Landslides Qls-6 through Qls-10

Landslide Qls-6 through Qls-10 are located within Open Space Lot 246 at the southeastern portion of the project. These landslides are interpreted to be translational failures. Cross Section 23-23' illustrates the interpreted geometry of Landslides Qls-6 and Qls-7. Landslides Qls-8, Qls-9 and Qls-10 are outside the area of proposed development.

5.4.9.5 Landslides Qls-A, Qls-B and Qls-C

These landslides are located to the east of the site south of the existing Del Valle Road. Qls-A is based on similarity of the geomorphology to other landslides on VTTM 60665. Landslides Qls-B and Qls-C are based on the observed discontinuous bedding, fractures and disrupted appearance of the bedrock that was observed in Trenches T-77, T-78 and T-94. These landslides are judged to be circular cross bedding failures based on geologic structure and the findings of subsurface investigation of other landslides on VTTM 60665.

5.4.10 Surficial Failures (Qsf)

Shallow surficial failures involving soil, slopewash and weathered bedrock were observed. Approximate locations and extent are shown on the Geotechnical Map. Any of the surficial failure material, which exists in areas of proposed development, shall be removed prior to the placement of compacted fill.

5.5 Ground Water

Based on the historically highest ground water contours included in the Seismic Hazard Zone Report for the Val Verde 7.5-Minute Quadrangle, the interpolated historic high ground water elevations are 10 feet beneath the elevation of the existing ground surface for the alluvial canyon areas. This historic high groundwater elevation was used in our liquefaction assessment.

Hollow-stem auger Borings HS-1A through HS-9A were drilled in November of 2006 and encountered groundwater at a depth of 20 ft below the ground surface or deeper in Borings HS-2A, HS-3A, HS-5A, HS-6A and HS-7A. Hollow-stem auger Borings HS-10A, HS-11A and HS-12A were drilled in January 2018; groundwater was only encountered in HS-10A at a depth of 45.5 ft following a 24-hour monitoring period.

Ground water was noted in a water well located in the vicinity of the existing residence on the subject site at a depth of 45 ft in 1991. This water well could not be located during our recent investigation of the site.

5.6 Soil Compressibility

Data from CPT soundings and from consolidation testing (including hydro-compression) performed on soil samples from the borings were used to evaluate compressibility of alluvial soils under static loading conditions from proposed fills. Based on this evaluation, potentially compressible layers exist at depths of up to about 30 ft in the alluvium. The recommended removal depths provided in the Earthworks Recommendations section of this report consider these data.

Generally, soils at the site that have an in-situ dry density of 108 pcf or less and in-situ moisture content of 8 percent or less are considered susceptible to hydro-compression. Review of the results of consolidation and density testing of samples from our borings indicates on-site alluvium materials display a minor potential for hydro-compression due to water incursion. Test results of three samples of the alluvium show negligible amounts (~0.1%) of hydro-compression (see **Appendix B** for lab test data). No significant hydro-compression effects due to water incursion are expected at the site after the removals recommended in the Earthwork and Grading section of this report are performed.

5.7 Expansion Potential of Soils

Based on CPT and boring data, alluvial soils at the site generally consist of fine-to medium grained sands, silty sands and clayey sands with interbedded silts and clays. Bedrock (TQs) at the site generally consists of pebbly sandstone to silty sandstone with common claystone beds ("red beds"). The fine-grained materials of the Saugus Formation bedrock may have medium to locally high expansion potential. Results of Expansion Index testing (**Appendix B**) indicate that expansion potential of future fill materials derived from a mixture of alluvial and bedrock soils will be very low to low (Expansion Index $\leq$ 50).

5.8 Potential Corrosivity of Soils

Laboratory testing to measure the soil resistivity and pH (Caltrans 643), soluble sulfate content (Caltrans 417), and soluble chloride content (Caltrans 422) was performed on a mixture of bedrock and alluvium. The tests were performed to evaluate potential corrosive characteristics of future compacted fill soils to exposed concrete, steel reinforcement, and buried metal utilities.

The Geotechnical and Materials Engineering Division (GMED) of the Los Angeles County Department of Public Works regards soil at a site to be corrosive to concrete and/or steel if the measured resistivity is 1,000 ohm-cm or less, and/or if the sulfate concentration is 2000 ppm (0.20%) or greater, and/or if the pH is 5.5 or less. Also, a soil with a chloride concentration greater than or equal to 500 ppm is considered deleterious to ferrous metals.

Based on the measured chloride content (42 ppm), sulfate content (0.02%), resistivity (1295 ohm-cm) and pH (7.6) values, the tested sample does not classify as corrosive to concrete or buried metal based on criteria presented in the current GMED Manual for Preparation of Geotechnical Reports, revised December 2014.

Recommendations based on the anticipated corrosion potential of site soils are provided in the **Design Considerations and Recommendations** section of this report.

5.9 Soils Shear Strength

Direct Shear testing was performed on relatively undisturbed samples of Quaternary Terrace Deposits (Qt), Saugus Formation bedrock (TQs), and on remolded samples of on-site soils from the project site. Direct Shear testing presented for older alluvium, alluvium and landslide mass (Qls) are from the adjacent property VTTM 60665 (see reference 3 for the subsurface locations). Direct Shear testing presented for landslide plane is from PM 60030 (see reference 2 for the subsurface location). The slide plane shear test is from a landslide that is on the boundary between VTTM 60065 and PM 60030, which is on structural trend with the mapped Landslides Qls-A through Qls-C along the proposed off-site grading for Del Valle Road. Results of the on- and off-site testing are presented in **Appendix B** and were used to select design values of shear strength of site materials. Soil shear strength parameters used in design and analyses are presented in **Appendix E**, Slope Stability Analysis.

5.1 Erosion Potential

The existing provisions in the Grading Ordinance for planting and irrigation of constructed slopes in conjunction with drainage recommendations provided in the section "Surface Drainage and Erosion Control," will be sufficient mitigation against potential erosion within the subject site.

5.2 Debris Flow Hazards

Debris flows typically require a combination of loose colluvial soil, steep slopes and be exposed to period(s) of intense rainfall. Destructive debris flows originate on slopes with gradients between 26 to 56 degrees (Campbell 1975). Debris flows on slopes of 27 degrees or less do not tend to accelerate and are not considered a hazard.

Potential debris flow hazard on the natural slopes adjacent to the proposed building pads has been evaluated. Methodology used to assess the site and identify the potential debris source areas are outlined below:

- Review of historic aerial photographs covering the site and adjacent areas for evidence of debris flow in the form of scars, bare rock, variation of vegetation densities that might indicate locations where older debris source areas might be present and geomorphic lobes that might represent accumulation for a debris flow.
- Review of the topographic base map to determine areas that are steeper than approximately 26 degrees or approximately 2:1 horizontal to vertical.

- Field mapping by an engineering geologist to determine locations and general composition of loose colluvial soil. The lateral limits of the debris flow source areas were mapped using the project topographic map as a base.

Review of the tentative tract map design, the topographic base map, and field mapping of the site indicates that potential debris flow hazard relative to proposed development exists at Lots 10, 18 through 22, and 35. The subject slope areas are noted on the attached Geotechnical Map with the abbreviation "PDFH".

Potential debris flow hazard on the VTTM is mitigated by either a debris basin and conveyance channel, debris basin or impact walls. Debris Basins and impact walls are designed for complete containment of potential debris volumes. A summary of the potential debris flow hazard is discussed below for each of the lots.

- Lot 10: The volume of debris is estimated at 572 cubic yards. To mitigate hazard from debris flow from the north and from offsite to the northwest, a minimum freeboard height of 4.5 feet impact/diverter wall is recommended at the top of the proposed cut slope located at the north and west portion of the Lot 10 (see Geotechnical Map). Based on volume calculations it is determined that the designed impact/diverter wall will provide a containment volume of 635 cubic yards and mitigates the potential flow hazard to Lot 10.

- Lots 18 and 19: A debris conveyance channel is illustrated along the toe of natural slope located west of Lots 18 through 20. This channel directs debris material towards the south to a basin located east of Lot 10 and provides for mitigation for potential impact from debris flow by providing an up-slope from the channel bottom up to the proposed pad. Calculated debris volume from the mapped debris flow source areas located directly adjacent to Lots 18 and 19 (see Geotechnical Map) is 42 cubic yards. At the location of potential impact from debris flow adjacent to Lot 18, the up-slope height ranges from 3.7 to 5 feet with an average of about 4.4 feet. The longitudinal length of the channel at this location of potential impact is 34 feet. Based on the average up-slope height of 4.4 feet, and measured channel length of 34 feet, the calculated volume/capacity for this portion of the channel adjacent to Lot 18 is 55 cubic yards. At the location of potential impact from debris flow adjacent to Lot 19, the up-slope height ranges from 6.0 to 7.9 feet with an average of about 6.8 feet. The length of the channel at this location of potential impact is 40 ft. Based on the average up-slope height of 6.8 feet, and measured channel length of 40 feet, the calculated volume/capacity for this portion of the channel adjacent to Lot 19 is 151 cubic yards. The total capacity of the channel adjacent to Lots 18 and 19 is 206 cubic yards (55+151) which is greater than the calculated debris volume

of 42 cubic yards. Based on volume calculations it is determined that the designed conveyance channel provides sufficient mitigation of the potential debris flow hazard for Lots 18 and 19.

- Lot 20: A debris conveyance channel is illustrated along the toe of natural slope located west of Lots 18 through 20. This channel directs debris material to the basin located east of Lot 10 and provides for mitigation for potential impact from debris flow by providing an up-slope from the channel bottom up to the proposed pad. Calculated debris volume from the mapped debris flow source areas located directly adjacent to Lot 20 (see Geotechnical Map) where potential impact could occur is 35 cubic yards. At the location of potential impact from debris flow adjacent to Lot 20, the up-slope height ranges from 3.3 to 5.0 feet with an average of about 4.0 feet. The longitudinal length of the channel at this location of potential impact is 32 feet. Based on the average up-slope height of 4.0 feet, and measured channel length of 32 feet, the calculated volume/capacity for this portion of the channel adjacent to Lot 20 is 45 cubic yards which is greater than the calculated debris volume (35 cubic yards) from the mapped source area. Based on volume calculations it is determined that the designed conveyance channel sufficient mitigation of the potential debris flow hazard for Lot 20.

- Basin Lot 234: The volume of debris from the source areas located along the conveyance channel adjacent to Lots 18-20 (77 cubic yards) combined with the estimated debris volume (301 cubic yards) from the canyon area located north to northwest of the designed basin within Lot 234 is 378 cubic yards (see Geotechnical Map). This combined volume is less than the designed volume of the basin of 696 cubic yards by the Supervising Civil Engineer. Based on volume calculations it is determined that the debris basin at Lot 234 is of sufficient size for 100 percent containment of the potential debris flow hazard volume.

- Lot 21: The west debris basin within Lot 235 located north and northwest of Lot 21 provides mitigation for potential debris flow hazard from the ascending natural slopes. The volume of debris from the source areas adjacent to this lot is calculated to be 609 cubic yards (see Geotechnical Map). This volume is less than the designed volume of the basin of 685 cubic yards by the Supervising Civil Engineer. Based on volume calculations it is determined that the designed basin at Lot 235 is of sufficient size for 100 percent containment of the potential debris flow hazard volume.

- Lot 22: There are two main debris flow source areas located in the vicinity of Lot 22. Calculated debris volume from the mapped potential debris flow source areas located north to north east of this lot (see Geotechnical Map) is 497 cubic yards. This area drains

directly towards the main portion of the basin. The canyon area located north to northwest of the lot has a calculate debris volume from the mapped potential debris flow source areas of 204 cubic yards. This canyon area drains towards the proposed lot where the VTTM illustrates an up-slope from the access road to the lot. At the location of potential impact from debris flow, the up-slope height ranges from 3.4 to 5.4 feet with an average of about 4.4 feet. The width of potential debris containment adjacent to the lot will range from 32 feet at the back of the canyon area to up to 50 feet wide along the access road with an average of 40 feet. Length of the potential containment averages about 40 feet. Based on the average up-slope height of 4.4 feet, and measured containment width of 40 feet, and length of 40 feet, the calculated volume/capacity along the access road where potential impact could occur is 288 cubic yards which is greater than the calculated debris volume (204 cubic yards) from the mapped source area. It is our opinion that the up slope berm provides sufficient protection against impact from debris flow. Based on the volume calculations it is determined that the designed debris conveyance along the basin access road and total volume of potential debris material entering the basin provides mitigation of hazard from debris flow for Lot 20. The total calculated volume of potential debris flow material from the mapped source areas (497 + 204) entering the basin is 701 cubic yards which is less than the provided basin capacity of 806 cubic yards. The debris basin is of sufficient size for 100 percent containment of the potential debris flow hazard volume.

- Lot 35: The debris basin within Lot 236, located north of Lot 35 provides mitigation for potential debris flow hazard from the ascending natural slopes. The volume of debris from the source areas adjacent to this lot is calculated to be 312 cubic yards (see Geotechnical Map). This volume is less than the designed volume of the basin of 564 cubic yards by the Supervising Civil engineer. Based on volume calculations it is determined that the designed basin at Lot 236 is of sufficient size for 100 percent containment of the potential debris flow hazard volume.

6.0 SEISMIC CONSIDERATIONS

6.1 Introduction

The subject property is within the Transverse Ranges Geomorphic Province of southern California. The Transverse Ranges consist of a series of west-trending mountains and intervening valleys. These ranges largely resulted from north-south compression, ultimately causing east-west-trending folds and thrust faults. The south branch of the Holser fault traverse the southern edge of the site. Other faults near the site are the Santa Susana, Northridge (East Oakridge), Del Valle and Sierra Madre (San Fernando) reverse/thrust

faults. The January 17, 1994 Northridge (M6.8) Earthquake occurred on a south-dipping thrust fault which uplifted the Santa Susana Mountains at least 40 cm.

The southern California region is traversed by the San Andreas Fault, which is a transform boundary between the Pacific Plate and the North American Plate. The San Andreas Fault is part of the San Andreas system of northwest-striking, right-lateral faults. The faults of this system are generally historically active, as evidenced by the June 28, 1992 Landers (M7.6).

The southern California region is seismically active and commonly experiences strong ground shaking resulting from earthquakes along active faults. Earthquakes along these faults are part of a continuous, naturally occurring process, which has contributed to the characteristic landscape of the region.

Three common types of geologic hazards may be produced during a seismic event (earthquake). These include:

1. Ground Rupture;
2. Ground Failure; and
3. Ground Motion.

6.2 Ground Rupture

The potential for ground rupture on the site was evaluated utilizing published maps in conjunction with field mapping and subsurface exploration programs. Review of the Earthquake Fault Zone Maps provided in the California Department of Conservation, Division of Mines and Geology, Special Publication 42 indicates that there are not any known active faults within the project site, per Alquist-Priolo criteria. The published references indicate that the south branch of the Holser Fault, which is mapped by Yeats, et al (1985) surface trace traverse the southern edge of the site. The Alquist-Priolo Special Studies Zones Map does not consider the Holser Fault as active, however the Los Angeles County Safety Element (Leighton, 1990) does classify it as active.

Based on regional mapping the south branch of the Holser fault traverse the very southern edge of the VTTM, but its probable location is obscured by alluvium deposit. The north branch of the Holser Fault is mapped to the east of the site on PM 60030 and the projected trace is towards the site. In the 1990's we completed an extensive subsurface investigation of long trench excavations to evaluate the extent and activity of north branch of the Holser fault on the site. We found no significant faults in our subsurface explorations across the trend of the projected trace of the North Branch of the fault. Based on geologic mapping and on the trench exposures we judge that the north branch of the Holser fault is not present

on the site. The 1990 subsurface explorations trench logs on the VTTM 60257 are presented within this report.

In addition, extensive subsurface fault investigation studies have been performed on the adjacent properties to the north and east. The subsurface investigations performed on the property to the north and VTTM 60665 identified several zones of faulting. An east-west trending fault, informally designated as the Oak Canyon fault, is opined to traverse the northern portion of the site, but its probable location is obscured by alluvial deposits. Based on the structural trend and orientation of the faulting, this fault is considered to be structurally associated with the Holser fault.

6.2.1 Age of Fault Movement

Subsequent geologic investigations (since the 1990 Los Angeles County Safety Element) evaluating the activity of the Holser fault by this firm and others indicate no direct evidence of Holocene activity. As a result of these investigations the Los Angeles County Department of Public Works, Geotechnical Materials and Engineering Division is not requiring building setbacks for mitigation of surface fault rupture hazard for the Holser fault.

The age of the last movement on the Oak Canyon fault is poorly constrained based on existing data. Based on the degree of deformation observed along many of the faults and geologically young age of the Saugus Formation bedrock, there has been substantial movement on the observed faults during late Quaternary times. Evidence of Holocene activity is currently lacking; however, no evidence to preclude Holocene fault rupture has been found. The Oak Canyon fault is not overlain by pre-Holocene deposits that could potentially be used to determine if the fault is active per Alquist-Priolo criteria. Based on lack evidence for recent activity on the Holser fault, and no evidence of recent activity on Oak Canyon fault documented during our subsurface explorations, we opine that none of the fault traces on the subject site have produced surface ground rupture during the Holocene (~last 11,000 yrs).

6.2.2 Building Setbacks

Based on lack of evidence for recent activity on faults documented during our subsurface explorations, we judge that none of the fault traces on the subject site have produced surface ground rupture during the Holocene (~last 11,000 yrs). CGS Special Publication 42 defines an active fault as one which has had surface displacement within Holocene time (about the last 11,000 years). Accordingly, the faults observed on the subject site are not considered active as defined by California regulations. We therefore find that the **building setbacks** to mitigate potential ground rupture hazard for these faults are **not required** for

standard commercial and residential development according to current State of California criteria.

6.3 Ground Failure

Ground Failure is a general term describing seismically induced secondary permanent ground deformation caused by strong ground motion. This includes liquefaction, lateral spreading, seismic settlement of poorly consolidated materials (dynamic densification), differential materials response, slope failures, sympathetic movement on weak bedding planes or non-causative faults, shattered ridge effects and ground lurching. Review of the Seismic Hazard Zones map for the Val Verde Quadrangle indicates that the subject site is located within an area of required investigation for both liquefaction and earthquake induced landslides.

Potential secondary seismic hazards to VTTM are described below. The potential for liquefaction and seismic settlement are evaluated in detail in **Appendix C**. The potential for adverse impacts to the proposed development from liquefaction and other secondary seismic effects is considered to be low to non-existent provided that our recommendations are incorporated into the future grading plan and implemented during construction.

6.3.1 Potential for Liquefaction and Associated Ground Failure

Potential for liquefaction at the site and the magnitude of associated liquefaction-induced ground failure (i.e. seismic settlement, lateral spread displacements, and surface manifestation) were evaluated using data from our subsurface explorations, in compliance with the procedures and policies of the County of Los Angeles and the State of California. Ground motions estimated using USGS seismic design map web applications and mapped historic high ground water levels were used in this evaluation. The procedures and results of the evaluation are described in detail in **Appendix C**.

In summary, our evaluation indicates that potential for liquefaction is present within the alluvial portions of the site and that liquefaction-induced ground surface settlement up to about 7.1 inches (prior to recommended removals) could occur if site soils were to liquefy. Review of CPT and boring logs indicates that characteristics for potential lateral spreading are present within the liquefiable soils. Remedial measures to reduce the hazard of liquefaction and associated liquefaction-induced ground failures are described in **Appendix C**.

6.3.1 Potential for Other Modes of Ground Failure

Earthquake-induced slope failures include activation and reactivation of landslides, rock falls, debris flows and surficial failures. The potential for earthquake-induced slope

failures to adversely impact the proposed development is considered negligible, provided that our recommendations and those of the Supervising Civil Engineer are incorporated into the proposed design and implemented during construction.

6.4 Earthquake Ground Motion

6.4.1 General

The proposed development is located in Southern California, which is in a geologically and seismically active region where large magnitude, potentially destructive earthquakes are common. Therefore, it is reasonable to assume that moderate or large magnitude earthquakes will affect the site during the life of a given structure. The San Gabriel fault, which has a surface trace located about 6.2 km northeast of the project site, is the closest known active or potentially active fault to the project site. The active **San Andreas fault** is located about 35 km north of the project site. Large earthquakes along these, or along any of the other numerous faults in the region, are expected to produce strong ground shaking at the project site in the future.

The current standards for construction provided in the 2016 California Building Code are designed to safeguard against major failures and loss of life, but are not intended to limit damage, maintain functions or provide for easy repair. Per Structural Engineers Association of California (SEAOC), conformance to these recommendations does not constitute any kind of guarantee or assurance that significant structural damage will not occur in the event of a maximum level of earthquake ground motion. However, it is reasonable to expect that a well-planned and constructed structure will not collapse in a major earthquake and that protection of life is reasonably provided, but not with complete assurance.

Although research on earthquakes during the last fifty years has greatly enhanced the level of understanding of earthquake faulting in California, the record is much too short to constrain behavior of all faults in Southern California and the attenuation characteristics of all areas relative to each future potential earthquakes. Predicted accelerations should, therefore, be considered **rough estimates** rather than precise facts and ground motions from future earthquakes may exceed the predicted accelerations. Neither the **Time, Location, nor Magnitude** of an earthquake can be accurately predicted at this time.

6.4.2 Earthquake Magnitude

Earthquake **magnitude** is a quantitative measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic or geologic observations. It does not vary with distance or the underlying earth material. This differs from **intensity**, which is a qualitative measure of the effects a given earthquake has on people, structures,

loose objects, and the ground at a specific location. Intensity generally increases with increasing magnitude and in areas underlain by unconsolidated materials,and decreases with distance from the epicenter. The approximate magnitude necessary to generate these effects is shown on the 1956 version of the Modified Mercalli intensity scale (appended). A map illustrating the locations of major faults and historic earthquakes is provided in **Figure D1**.

6.4.3 Evaluation of Peak Ground Acceleration

In compliance with criteria presented in the 2016 California Building Code (CBC) and ASCE 7-10, an updated Probabilistic Seismic Hazard Analysis (PSHA) was completed to evaluate the site peak ground acceleration for use in our liquefaction analyses.

The peak ground acceleration (PGA_M) consistent with maximum considered earthquake (MCE_R) ground motions was evaluated at the site for alluvial soil conditions (Site Class D) in accordance with ASCE 7-10. The mapped PGA_M adjusted for Site Class effects was determined using the U.S. Seismic Design Maps web tool by the United States Geological Survey (USGS) for a 2% probability of exceedance in 50 years (i.e. 2,475-year return period). Based on our evaluation, a probabilistic PGA_M of 1.02g would be produced by the maximum considered earthquake.

Site-specific evaluation of potential ground motions generally utilize multiple attenuation models to capture the uncertainty in both the source and the propagation of seismic waves to obtain a mean hazard. The PGA_M was determined for the site using a weighted average of accelerations estimated with ground motion prediction equations (GMPE) by Boore and Atkinson (2008), Campbell and Borzognia (2008), and Chiou and Youngs (2008).

6.4.4 Deaggregation of Fault Hazard

A probabilistic analysis evaluates a range of magnitudes from 5.0 to the maximum magnitude for each fault. However, the dominant magnitude which statistically generates the peak acceleration within a limited time period (e.g. 2,475 years) is typically less than the maximum magnitude for a given fault.

In order to evaluate what dominant magnitude-distance combination produces the PGA_M, the hazard was deaggregated using the USGS *Beta – Unified Hazard Tool* and an estimated average shear wave velocity ($V_{S,30}$) for the upper 100 feet (~30 meters) of 259 meters per second based on Site Class D soil conditions. Review of the magnitude-distance contributions to the hazard indicates that this acceleration would most likely be generated by a magnitude 6.79 earthquake on the Santa Susana fault located at a distance (Rrup) of less than 10 km from the project site, as shown graphically in **Figure D2**.

A magnitude weighting factor of $M_W^{2.56}/10^{2.24}$ from Youd and Idriss (1997) was used to normalize the MCE_R ground motions to an "equivalent" magnitude 7.5 event. Based on this relationship a weighted peak ground acceleration of 0.84g was used for evaluation of liquefaction potential at the site (see **Appendix C**).

6.4.5 Building Code Response Spectrum Parameters

The following maximum considered earthquake (MCE_R) ground motion parameters should be used for calculation of the 2016 California Building Code (CBC) response spectrum:

FACTOR	VALUE
Site Class	D
Site Coefficient, F_a	1.0
Site Coefficient, F_v	1.5
Short Period Spectral Response Acceleration Adjusted for Site Class, S_{MS}	2.888
1-Second Period Spectral Response Acceleration Adjusted for Site Class, S_{M1}	1.531
Design Spectral Response Acceleration at Short Period, S_{DS}	1.925
Design Spectral Response Acceleration 1-Second Period, S_{D1}	1.021

The values listed above were obtained in accordance with Section 1613.3 of the 2016 CBC for site coordinates of 34.4491°N, 118.6505°W using the U.S. Seismic Design Maps

7.0 GENERAL CONCLUSIONS AND RECOMMENDATIONS

7.1 Feasibility of Development

The Vesting Tentative Tract Map No. 60257 dated May 8, 2018 is feasible for development from a of geology/geotechnical standpoint provided our recommendations are followed and implemented during design and construction.

7.2 Earthwork and Grading Recommendations

7.2.1 Removals and Benching

In order to provide a uniform firm bottom prior to placing fill soil, unconsolidated alluvium, artificial fill, slopewash, colluvium, weathered terrace deposits, severely weathered bedrock, and landslide materials should be removed from areas to receive fill. The estimated depths of removals (excluding landslides) are 10 to 30 feet as shown on the **Geotechnical Map**. Additional alluvial removals are shown in limited areas where shear keys down to bedrock are recommended for mitigation of potential lateral spreading hazard (see Appendix C). Alluvial removals are also recommended below portion of existing Del Valle Road (see Geotechnical Map). Removals at the locations of exploratory

trenches shall be extended to the bottom of the trench backfill if the adjacent removal depths are shallower than the trench (see **Geotechnical Map** for locations). The excavated soils may be used as fill material.

Removal depths for these areas are based on our subsurface investigations, laboratory testing, proposed fill heights, intended use, and analysis results (including liquefaction, seismic settlement, and lateral spreading assessment) as well as geologic and geotechnical judgment. The exact depth and extent of necessary removals will be determined in the field during the grading operations when observations and more location-specific evaluations can be performed.

In areas to receive compacted fill where the surface gradient is steeper than 5:1 (H:V) the soil mantle, colluvium and unsuitable material should be removed and such areas benched horizontally into competent material prior to our in conjunction with fill placement (See **Appendix G, Fill Over Natural Slope**).

7.2.2 Dewatering During Removals

Dewatering may be required to achieve the recommended remedial removals depending on the season when these removals are performed. Ground water was encountered within the alluvium at depths as shallow as 20 feet during our subsurface exploration of the site in 2006 and the mapped historic high ground water level is at a depth of 10 ft; therefore, ground water has the potential to impede the grading operations where deep removals are needed. The grading contractor should be prepared to implement dewatering measures as necessary, if in the event ground water is encountered during the alluvial removals.

Where recommended removals encounter ground water, water levels will probably have to be controlled by providing an adequate excavation bottom slope and sumps for pumping water out as the excavation proceeds, or ground water may be lowered by installing shallow dewatering well points prior to grading. Partial removals of soils above the water table and soil improvement below the water table (e.g. shallow compaction grouting) may be another option.

7.2.3 Over-Excavation

It is recommended that a minimum 5-foot thick over-excavation be performed on all cut-lots, and transitional lots (transitions between bedrock, fill, terrace deposits and alluvium) and a minimum 3-foot thick over-excavation on streets. This over-excavation will provide attenuation of potential differential settlements or differential material response to seismic events and provide a uniform base for structural support of buildings. If on a cut/fill transition lot the maximum depth of fill exceeds 15 feet, then the thickness of the fill cap

should be one-third of the deepest fill thickness below any proposed structure (see **Appendix G, Over-excavation for Transitional Cut and Cut-Fill Lot**).

The bedrock of the Saugus Formation may contain expansive claystone beds that could cause differential expansion. If excavation of the bedrock exposes expansive materials below proposed structures, then the bedrock should be over-excavated beneath the proposed structures and replaced with a compacted fill. A minimum fill cap thickness of 8 ft is recommended to provide a surcharge of sufficient overburden pressure to limit bedrock expansion to acceptable levels for proposed structures. The building over-excavations required to achieve the minimum fill cap thickness are recommended to extend at least 8 feet outside the footprint of the building foundation. The fill cap thickness required to provide a surcharge of sufficient overburden pressure to limit expansion should be confirmed during the grading operations based on swell testing of potentially expansive beds.

7.2.4 Rippability

The bedrock encountered at the site consists primarily of siltstone and sandstone of the Saugus Formation. This formation generally is graded using typical grading equipment and techniques. Heavy single-shank ripping may be required within the more indurated portions.

7.2.5 Fill Materials

Onsite soils that are free of debris, over-size rocks, topsoil and organic matter may be used as sources for compacted fills. Rock or similar irreducible material with a maximum dimension greater than eight (8) inches may not be placed in the fill. Rocks or hard fragments larger than four (4) inches shall not compose more than 25 percent of the fill and/or lift. Any large rock fragments over eight (8) inches in size, may be incorporated into the fill as rockfill in windrows after being reduced to the specific maximum rock fill size (see **Appendix G, Rock Disposal**). Where fill depths are too shallow to allow large rock disposal, special handling or removal may be required.

7.2.6 Fill Compaction

All fill material should be placed in uniform lifts not exceeding eight (8) inches in its loose state, water conditioned to at least optimum moisture content, thoroughly mixed to obtain a near uniform moisture condition and uniform blend of materials, and compacted to a relative compaction to at least 90 percent of Maximum Dry Density (MDD), per ASTM D1557. For fills deeper than 40 feet, the portion of fill below a depth of 40 feet should be compacted to a relative compaction of at least 93 percent of MDD.

7.2.7 Construction of Fill Slopes

Fill slope inclination should not be steeper than 2:1 (h:v). The fill material within approximately one equipment width (typically 12 feet) of the slope face should be constructed with cohesive material obtained from on-site soils. The relative compaction requirement of the finished fill-slope faces depends on the construction method. A compaction of at least 90 percent of the MDD, per ASTM D1557, is for finished fill-slope faces constructed by over-building the slope, typically 2 ft vertically, and cutting back to the compacted fill material. If the fill-slope face is constructed basically on-grade then the outer 10 feet, measured horizontal from the slope face, shall be compacted to at least 92 percent of the MDD, per ASTM D1557.

Where fill slopes are constructed above natural ground with a gradient of 5:1 (H:V) or steeper, all topsoil, colluvium, and unsuitable material shall be removed and a keyway should be constructed at the toe of the fill slope with a minimum width of 15 feet, and a minimum depth of 3 feet into firm undisturbed earth (see **Fill Slope Over Natural Slope** detail in **Appendix G**). It is recommended that a minimum 15-foot width, measured horizontally from the slope face to the bench and/or backcut, be maintained.

Where fill slopes toe out on relatively level natural ground, the removals should be performed to a minimum 1:1 projection from the toe of slope to the recommended removal depth, (see **Fill Slope Toeing Out on Flat Alluviated Canyon** detail in **Appendix G**).

Where sliver fill-slopes are proposed, it is recommended that the slope be constructed with a minimum 15-foot width Stability Fill throughout, which is keyed in at the toe of slope (see **Stability/Buttress Fill and Backdrains** detail in **Appendix G**).

7.3 Shrinkage, Bulking and Subsidence

The following bulking and shrinkage factors are based on and in-situ densities compared to average of 92 percent relative to the maximum dry density as determined per the ASTM D 1557 test, judgment, and our past experience. For the materials encountered at the site, shrinkage (decrease in volume) or bulking of those materials, when excavated, placed and compacted as controlled fill is estimated to be as follows:

MATERIAL TYPE	SHRINKAGE (%)	BULKING (%)
Artificial Fill (af)	12 – 18	
Alluvium (Qal)	18 – 20	
Slopewash (SW)	18 – 20	
Terrace Deposits (Qt)	10 – 16	
Bedrock (TQs) 0-3′ depth[1]	4	

MATERIAL TYPE	SHRINKAGE (%)	BULKING (%)
Bedrock (TQs) >3' depth		0 – 6

[1] Denotes typical upper weathered zones in Saugus Formation (TQs) that are prone to shrinkage.

The above shrinkage, bulking and subsidence factors are only approximations. The actual volume changes from cut to fill depend on the quality or degree of compaction and mixing. The Supervising Civil Engineer should design pad grades with sufficient flexibility to accommodate a possible shortage or excess of fill of up to 10 percent of the total yardage graded.

7.4 Proposed Fill Slopes

Review of the VTTM indicates that fill slopes are proposed at a 2:1 gradient (h:v) or flatter. The maximum proposed fill slope height is 70 feet. Slope stability analyses performed on this 2:1 fill slope, which is considered to be the most critical fill slope (located at Cross Section 31-31'), indicates that the internal stability of proposed fill slopes on the VTTM satisfy the Los Angeles County factor of safety requirements for slope stability under static and pseudostatic loading conditions.

7.5 Proposed Cut-Slopes

We have identified 16 proposed 2:1 gradient or flatter cut-slopes (25± feet or higher) on the VTTM. These cut-slopes have been designated as CS-1 through CS-16 on the Geotechnical Map. The slope geometry, anticipated geologic conditions and recommended mitigation, if necessary, for each slope are presented in **Table 1 – Summary of Cut Slopes** located at the end of the text, and are shown on the Geotechnical Maps. Cross sections have been constructed to illustrate the anticipated geologic conditions relative to the VTTM design. The proposed cut slopes were evaluated and critical slopes that were analyzed within **Appendix E** satisfy the Los Angeles County factor of safety requirements for slope stability for static and pseudostatic loading conditions. See the Slope Stability Appendix for details.

If any of the smaller proposed cut-slopes (less than 25± feet in height) have adverse geologic or grading configurations (fill over cut) they can be mitigated if necessary with a standard 15 to 20-foot wide key (depending on the proposed cut-slope height) and benching similar to a Stability Fill.

Permanent cut-slopes should be constructed at a slope ratio not steeper than 2:1 (horizontal to vertical). All permanent cut-slopes in artificial fill, alluvium or slopewash should be constructed as a Stability Fill. Temporary cut slopes should be evaluated during the Grading Plan stage.

7.6 Natural Slopes

The natural slopes proposed on VTTM have gradients ranging from 5:1 to 1.5:1 (h:v). Natural slopes that are relatively steep and have accumulations of soil and slopewash are prone to debris flow hazard. Cross sections were constructed for analysis where natural slopes are in close proximity to the proposed building pads and/or the adverse geologic conditions either above or below the proposed building pads.

The easterly facing natural slope that ascends from the proposed residential Lots 18 through 20, designated as NS-1 on the Geotechnical Map, has been evaluated. The three-dimensional geometry of the Saugus Formation bedrock is illustrated on Cross Sections 5-5' and 6-6' which are constructed to illustrate the steep natural slopes adjacent to the development. The natural slopes evaluated within **Appendix E** do not satisfy the Los Angeles County factor of safety requirements for slope stability. A RUA is recommended at the toe of the ascending natural slopes for the rear portions of Lots 18 through 21. See **Appendix E** for details.

The south facing natural slope that descends in the vicinity of proposed residential Lots 142, 144, 145 and 152, designated as NS-2 on the Geotechnical Map, has been evaluated. The three-dimensional geometry of the Saugus Formation bedrock is illustrated on Cross Sections 24-24' through 27-27' which are constructed to illustrate the steep natural slopes adjacent to the development. The natural slopes evaluated within **Appendix E** do not satisfy the Los Angeles County factor of safety requirements for slope. A RUA is recommended at the top of the descending natural slopes, which is contained in Open Space Lot 246. The proposed lots that are setback for the natural slopes satisfy the Los Angeles County factor of safety requirements for slope stability under static and pseudostatic loading conditions. See **Appendix E** for details.

7.7 Landslides

Removal depth ranges for landslides located in areas of proposed development are shown on the attached **Geotechnical Map**. Discussion of the landslide and mitigation measures (if required) are discussed below.

7.7.1 Landslide Qls-1

Landslide Qls-1 on the western edge of the commercial site and a portion of the landslide is off-site. Cross Section 1-1' illustrates the interpreted geometry, proposed grades, and partial remedial removal of the landslide. The recommended removals at the toe of the landslide and proposed grades create a toe berm Buttress. Slope stability analysis on Cross Section 1-1' indicates this slope satisfies the Los Angeles County minimum safety factor

requirement of 1.50. Temporary backcuts for the Buttress should be evaluated during the grading plan stage.

7.7.2 Landslide Qls-2

Landslide Qls-2 is contained with the proposed commercial site lot. Proposed grades will remove the majority of the Landslide Qls-2. Based on proposed grading design the landslide will be grossly stable by inspection. Compressible landslide material shall be removed below proposed grade and replaced as compacted fill if a structure is proposed over the remaining landslide material. The required depth of removal should be evaluated at the grading plan stage. The landslide material below proposed grade may be left in-place if structures are not planned over the remaining landslide. LACDPW may require the remaining in-place landslide debris to be recorded as a Restricted Use Area (RUA) on the Final Map.

7.7.3 Landslide Qls-3

Landslide Qls-3 is contained within Open Space Lot 239. A debris basin has been incorporated into the VTTM design to contain the landslide material. The Slope Stability in Appendix E presents a post failure analysis for sizing of the debris basin.

7.7.4 Landslides Qls-4 and 5

Landslide Qls-4 will be completely removed by proposed grades. Landslide Qls-5 is recommended for complete removal.

7.7.5 Landslides Qls-6 through Qls-10

Landslide Qls-6 through Qls-10 are located within Open Space Lot 247 at the southeastern portion of the project. These landslides are interpreted to be translational failures. Cross Section 23-23' illustrates the interpreted geometry of Landslides Qls-6 and Qls-7. The proposed grading removes the top portion of these landslides. The proposed grading increases the gross stability of the landslides by reducing some of the driving force. Landslides Qls-8, Qls-9 and Qls-10 are outside the area of proposed development.

Landslides Qls-6 through Qls-10 should be designated as a Restricted Use Areas (RUA) on the Final Map.

7.8 Deep Fill Areas

The design grading of the subject site proposes some areas of deep fills (deeper than 40 feet). Due to the susceptibility of deeper fills to have a higher degree of settlement over time than thin fills, it is recommended that settlement monitoring be performed for some of the deeper fill areas. Delineation of fills deeper than 40 ft and settlement monument locations should

be performed at the Grading Plan stage. The Los Angeles County Grading Code requires a minimum compaction of at least 93 percent of Maximum Dry Density, per ASTM D1557, for fills placed deeper than 40 ft from proposed grade. This higher compaction requirement may reduce the amount of post grading settlement of the deeper fills.

7.9 Low Impact Development Facilities

7.9.1 General

Low Impact Development (LID) facilities for stormwater retention and infiltration are proposed at the following locations on the VTTM:

- Lot 236, located at the northeast corner of Sterling Parkway (proposed) and Hunstock Avenue (existing).
- Lot 237, located at the western property boundary just north of the proposed commercial site.
- Lot 241, located at the northern property line in Alluvial Canyon 3.

Evaluation of the infiltration basin locations has been performed in accordance with Administrative Manual GS200.2 (dated 6/30/17), *Guidelines for Geotechnical Investigation and Reporting, Low Impact Development Stormwater Infiltration*, prepared by the County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division (GMED). Information contained in the Hydrology Study prepared by Sikand Engineering Associates, dated April 20, 2018, was used also used for site-specific seepage analyses, as detailed below.

Our evaluation included site-specific field and laboratory testing to measure infiltration rates of native alluvium at infiltration basin locations. The results of field and laboratory testing that was performed to assess the in-situ infiltration rate of on-site materials was previously presented in our Geotechnical Report dated May 9, 2018 (see reference 4). A detailed discussion of field and laboratory test procedures and results, existing subsurface conditions and soil properties, assessment criteria and methodology, and conclusions and recommended design (corrected) infiltration rates for each basin were presented therein. Our overall conclusions and design considerations relative to site infiltration and geotechnical hazards is discussed below.

7.9.2 Subsurface Conditions, Basin Parameters and Design Infiltration Rates

General subsurface conditions, basin parameters, and the recommended design infiltration rates are summarized herein for reference.

7.9.2.1 Basin 154A at Lot 240

This proposed infiltration basin will be underlain by alluvial soils and require 10 to 17 ft of cut to achieve proposed grade at the invert elevation. Based on the project Hydrology Study this basin has a footprint of 1.8 acres, a storage volume of 8.9 acre-feet, and a maximum retention height of 8 feet. A design (corrected) infiltration rate of 2.3 inches/hour was recommended based on a total reduction factor of $RF_T = 4$.

7.9.2.2 Basin 306A at Lot 241

This proposed infiltration basin will be underlain by alluvial soils and require 10 ft of cut to achieve proposed grade at the invert elevation. Based on the project Hydrology Study this basin has a footprint of 0.3 acres, a storage volume of 0.4 acre-feet, and a maximum retention height of about 3 feet. A design (corrected) infiltration rate of 2.3 inches/hour was recommended based on a total reduction factor of $RF_T = 4$.

7.9.2.3 Basin 203A at Lot 242

This proposed infiltration basin will be underlain by alluvial soils and require 1 to 9 ft of cut to achieve proposed grade at the invert elevation. Based on the project Hydrology Study this basin has a footprint of 1.6 acres, a storage volume of 6.5 acre-feet, and a maximum retention height of about 9 feet. A design (corrected) infiltration rate of 1.7 inches/hour was recommended based on a total reduction factor of $RF_T = 4$.

7.9.3 Transient Seepage Analysis

Analyses were performed to evaluate potential hazards to off-site property due to transient seepage emanating from the infiltration basin on Lot 240. Existing and proposed grades, existing downstream topography, and subsurface conditions were modeled using Slide (by RocScience) based on Cross Section 30-30'. The finite element groundwater seepage analysis option in the software was then used to model time-dependent changes in ground water conditions due to stormwater infiltration. Field and laboratory test data, including site-specific permeability test results, were used to model the subsurface profile and hydraulic properties of the soil. The following parameters were used:

Geologic Unit / Soil Description	Permeability (in/hr)	Residual Water Content (%)	Saturated Water Content (%)
Alluvium (Qal) – Sandy clay to silty, sandy clay	0.5	5	18
Alluvium (Qal) – Silty sand	1.7	5	18
Alluvium (Qal) – Silty sand to sandy silt	0.2	5	18
Alluvium (Qal) – Poorly graded sand with silt	3.0	5	18

Geologic Unit / Soil Description	Permeability (in/hr)	Residual Water Content (%)	Saturated Water Content (%)
Compacted Fill (Cf)	< 0.001	8	15
Saugus Formation Bedrock (TQs)	< 0.001	8	15

The infiltration component of the seepage model was based on data contained in the Hydrology Study and historic rainfall data for the general area on-file in this office. The following information and assumptions were used to generate a transient boundary condition at the basin invert elevation that is considered to be representative of normal seasonal storm events:

- Average seasonal rainfall of 18 inches.
- The LID Design Frequency storm event contributes to 85% of the seasonal rainfall, with an intensity of 1.05 inches per event. 15 storm events are assumed totaling 15.75 inches of rainfall.
- The LID Design Frequency storm event produces a volume of 4.07 ac-ft and equivalent water height of 4.2 ft at Basin 154A. Based on the design infiltration rate for this basin (2.3 inches per hour), the basin drawdown time is about 22 hours.
- A 5-year storm event will contribute 3.4 inches of rain; 1 5-year storm event is assumed, bringing the seasonal total to 19.15 inches.
- Following a 5-year storm event the volume remaining in Basin 154A is 7.7 feet. Based on the design infiltration rate the basin drawdown time for this event is about 40 hours.
- A total of 16 storm events were modeled at 10-day intervals over a period of about 150 days (i.e. from about November through March).

Water entering the basin from the storm events was modeled in the transient seepage analysis as a pressure head equivalent to the maximum water height produced by the storm event and reducing (with time) to zero at the end of the drawdown time. An initial steady-state ground water condition was assumed at a depth of 45 ft, equivalent to what was observed during the most recent site investigation. Six (6) time stages ranging from 15 days to 360 days were analyzed for the transient analysis to assess the potential impact of infiltration to the steady-state ground water level. Results of the analysis are presented on Figures F1 through F7 in **Appendix F**.

7.9.4 General LID Findings, Conclusions and Design Considerations

- Remedial grading required to mitigate seismically induced settlements at the project site will result in the removal of existing soils and replacement with compacted fill to depths of up to 30 feet below existing grades. It is recommended that these removals not be performed beneath planned infiltration basins to preserve infiltration rates.
- Based on seasonal high groundwater elevations and groundwater level monitoring data in June 2018, groundwater elevations are at least 10 feet below anticipated infiltration invert elevations.
- Based on transient seepage analysis, the steady-state ground water elevation is not expected to be significantly impacted beyond the project boundary by stormwater infiltration generated by normal seasonal rainfall; therefore, storm water infiltration is not anticipated to pose a risk of causing sewage effluent mobilization from septic pits, seepage lines, or other sewage disposal within existing developments downstream of the project site.
- Based on shallow historic high groundwater levels used to in our liquefaction evaluation and associated remedial removal depths, stormwater infiltration is not anticipated to increase the potential for liquefaction-induced seismic settlement.

7.10 Oil Wells

Review of the 2003 Munger Map book and the California Department of Conservation Division of Oil, Gas and Geothermal Resources (DOGGR) web page map (DOMSWRBMAP) indicates that the Fernando Oil Co. #1 oil well, which was drilled in the early 1920's, is present within the project limits. Oil well records on file with the DOGGR were obtained for this well and are included after the references. This well was abandoned in 1923 by the operator.

There is no physical evidence of a pad or road for the well location per the DOGGR records. Review of the 1928 aerial photographs indicate a road and possible pad approximately 350 ft southeast of the DOGGR location. Subsequently, a casing was exposed in this area and surveyed. This casing is assumed to be the Fernando Oil Co. #1 oil well. A surface plug was not observed in the casing. The oil well records indicate a plug from 30 ft to surface. The location of this oil well is shown on the Geotechnical Map.

DOGGR will require the future grading plans to be submitted for review relative to the proposed development relative to the oil well. It is opined that DOGGR will require that the well casing be adjusted to 5 ft below proposed grade. This well was abandoned, however

DOGGR will review of the original abandonment files relative to the proposed development and possibly require re-abandonment to the latest DOGGR requirements.

The 2017 County of Los Angeles Building Code, Chapter 1 Section 110.4 Methane Gas Hazards states:

> *Permits shall not be issued for new buildings or enclosed structures regulated by this Code on, adjacent to, or within 300 feet of active, abandoned or idle oil or gas well(s) unless designed according to recommendations contained in a report prepared by a registered design professional, such as a licensed civil engineer and/or licensed petroleum engineer, to evaluate whether such wells are being properly operated or maintained or abandoned. No permits shall be issued until documentation of proper operations, maintenance, or abandonment or reabandonment is submitted to and approved by the Building Official.*

It is our understanding that Los Angeles County Department of Public Works, Environmental Programs Division (EPD) guidelines, dictate that sub-slab methane barriers be installed for structures within 300 feet of an abandoned oil well.

7.11 Drainage Control

Ground water and soil moisture conditions can vary seasonally or for other reasons. It must be recognized that we do not and cannot have complete knowledge of the subsurface conditions at the site. It is possible that seepage could be encountered while stripping and excavating during site preparation at some areas (e.g. in drainages or along terrace/bedrock contacts on the site). Whenever seepage is observed, the condition must be evaluated by the Engineering Geologist and Geotechnical Engineer prior to covering with fill material.

7.11.1 Surface Drainage and Erosion Control

Surface drainage control design should include provisions for positive surface gradients to ensure that surface runoff is not permitted to pond, particularly above slopes or adjacent to building foundations or slabs. Surface runoff should be directed away from slopes and foundations and collected in lined ditches or drainage swales, via non-erodible drainage devices, which should discharge to paved roadways, or existing watercourses. If these facilities discharge onto natural ground, means should be provided for control erosion and to create sheet flow.

It should be expected that, even with the construction of carefully planned and designed erosion control measures, some erosion may occur during the first few wet seasons after the project is completed. Site grading should be observed, particularly after heavy,

prolonged rainfall, to identify erosion areas at an early stage. Maintenance work should be done as soon as practical to repair these areas and prevent their enlargement.

7.11.2 Subsurface Water Control

Fill slopes, Buttress Fill and Stability Fills, as applicable, shall be provided with subsurface drainage as necessary for stability. A typical backdrain detail is included in **Appendix G**. Also, subdrains along the bottom of canyon fills should be constructed (see **Canyon Subdrain** detail in **Appendix G**). Recommended locations for canyon subdrains shall be provided at the grading plan stage.

Compacted fill shear keys that extend down to bedrock and across canyons are recommended for mitigation of potential lateral spreading. Subsurface drainage through these shear keys will be required to prevent the build-up of pore water pressure and ground water elevations up canyon from the shear keys. Recommendations for subsurface drainage devices shall be provided at the grading plan stage.

7.12 Sewage Disposal

It is our understanding that sewage disposal will be by public sanitary sewers.

7.13 Restricted Use Areas

Areas of geologic hazards that will remain after the proposed grading and mitigation measures have been performed shall be shown on the Final Map as Restricted Use Area (RUA). The following recommended RUA's are shown on the Geotechnical Map.

A Restricted Use Area (RUA) is recommended for the graded area above the descending natural slope in the vicinity of Lots 142 through 152. A RUA is recommended for Landslides Qls-6 through Qls-10.

A RUA is recommended at the toe of the ascending natural slopes for the rear portions of Lots 18 through 21. It is our understanding based on discussion with the Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division that this RUA can be part of the Lots if a maintenance easement of covenant is recorded on the Final Map.

7.14 Foundation and Settlement Considerations

No specific building foundation designs have been provided at this time. The following general foundation criteria are provided for future design and planning consideration. The proposed Vesting Tentative Tract Map may generally involve the following foundation support conditions:

- Foundation support within engineered fill
- Foundation support within transition zones of cut and fill

Shallow spread footings for foundation support of residential and commercial structures can adequately be founded on compacted fill. Support for heavier structures, if applicable, should be addressed at the Grading Plan stage. Minimum recommended continuous foundation dimensions are 12 inches width and 12 inches depth below lowest adjacent grade for residential and commercial structures. Tentatively, an allowable bearing capacity of **1,800 psf** can be used for (minimum-sized) shallow foundations constructed in certified compacted fill or bedrock. This tentative allowable bearing value should be confirmed by further field and laboratory testing of the site soils before use in design. Lateral resistance of footing walls should be provided at the Grading Plan stage.

The **Over-excavation for Transitional Cut and Cut-Fill Lots** detail included in **Appendix G** provides a grading detail for locations where foundations will straddle transition zones between cut and fill materials. If the remaining cut-fill transition is steep at depth below the building area, the geometry of the transition should be reviewed during grading operations by the soils engineer on a site-specific basis to evaluate the need for additional over-excavation removals and/or additional foundation reinforcement. As a general guideline, steep cut/fill transitions would include slope gradients steeper than 4:1 (h:v) and overall variations in fill thickness of greater than 15 feet which occur within 20 feet of final pad grade.

To minimize significant settlements, it is recommended that the unsuitable soils in areas to receive fills be removed and replaced with compacted fill. No specific foundation design loads are available at this time. Some settlements will be expected due to loads from high fills (e.g. higher than 30 feet). The locations of proposed deep fills (> 40 ft.) will be provided during the 40-Scale Grading Plan study. Most of the settlements due to the load of added fill will occur during and shortly after rough grading is complete. A settlement monitoring program for some of the deeper fill areas will be necessary at the completion of grading. A settlement monitoring program shall be presented during the 40-Scale Grading Plan study.

At other areas, potential settlements in alluvium will be minimized by the removals and recompaction recommended in this report. Also, potential effects from localized seismically-induced settlements will be attenuated by the recompacted upper layers and proposed additional fills (see **Appendix C**).

7.15 Building Setbacks

The standard setbacks from ascending and descending slopes provided in the Los Angeles County/California Building Code shall be followed. Proposed development areas impacted by natural slopes that do not meet the minimum factor of safety requirements for gross stability are shown as a Restricted Use Area (RUA) on the Geotechnical Map. These non-buildable areas should also be recorded as a Restricted Use Area on the Final Map. The standard building code setbacks from ascending and descending slopes shall be applied from the RUA line delineated on the Geotechnical Map.

7.16 Soil Compressibility Considerations

Based on consolidation testing performed for this project and estimated CPT-based static settlements under future fill loads, **compressibility** and hydro-compression (collapse) settlement potential of subsurface soils below the recommended removal depths are considered to be **low**. Proposed grades are not expected to be adversely affected by soil compressibility or by hydro-compression (collapse) settlement, provided that our recommendations are incorporated into project design and construction.

Due to the predominantly coarse-grained nature of the alluvial soils, it is anticipated that potential static settlement of alluvial soils beneath planned fills will generally occur during grading. However, the settlement monitoring program recommended for deep fill areas (to be established at the 40-scale plan review) may be expanded to assess and confirm completion of primary settlement of alluvial soils where future overburden pressures will be significantly higher than existing overburden pressures.

7.17 Expansive Soils Considerations

Soil expansion has been found to be a significant consideration for design and construction of foundations and concrete slabs-on-grade. The recommendations presented in the attached **Table G1, Minimum Foundation and Slab Recommendations for Expansive Soils**, in **Appendix G**, have been found to minimize the effects of soil expansion potential in southern California when followed during project design and construction. It is anticipated that compacted fill from the onsite materials will have a very low to medium expansion potential. The expansion potential of the site soils exposed at the completion of grading should be tested and the final foundation design should be based on those expansion test results.

7.18 Soil Corrosivity Considerations

The tested soil does not classify as corrosive to concrete. Pending additional testing, either Type I or II cement may be considered for use in concrete placed in contact with the ground.

The tested soil does not classify as corrosive to ferrous metals. However, it is recommended that the following precautionary measures be implemented to mitigate a less significant corrosion potential as indicated by the measured resistivity value:

- Steel and wire reinforcement in concrete structures cast against site soils should have at least 3 inches of concrete cover.
- Buried utilities made of ferrous metals should be protected with polyethylene extruded coating, or with tape over primer per AWWA Standard C209 or C203, or with hot-applied coal tar enamel, or as recommended by manufacturers of the utility conduits.
- Metallic pipes that penetrate concrete structures should be surrounded by plastic sleeves, rubber seals, boots, or other dielectric material in order to prevent contact between the pipe and the concrete structure.
- Below-grade ferrous metals should be electrically insulated (isolated) from above-grade metals.

Mitigating recommendations against soil corrosivity should be revised/expanded based on additional confirmatory tests that should be performed at the completion of the grading operations. Final recommendations for concrete will be in accordance with the latest CBC requirements, and a corrosion specialist should provide mitigating recommendations for potential corrosion of metals in contact with on-site soils.

7.19 Retaining Walls and Pavement Design

Geotechnical recommendations for the design and construction of retaining walls and vehicle pavements will be provided at the Grading Plan stage.

8.0 GEOLOGIST/GEOTECHNICAL ENGINEER OF RECORD

This report has been prepared assuming that Allan E. Seward Engineering Geology, Inc. will refine all geology and geotechnically-related data for the Grading Plan stage of this project. If the recommendations contained in this report are to be utilized and expansion of the geology/geotechnical work is performed by others, the party performing the work must review this report and assume full responsibility for recommendations contained herein. That party would then assume the title of responsibility as "Geologist/Geotechnical Engineer of Record" for the specific work.

9.0 LIMITATIONS

This report has been prepared for the exclusive use of Sterling Gateway, L.P. and their design consultants for the specific site discussed herein. This report should not be considered transferable. Prior to use by others, we should be notified, as additional work may be required to update this report.

In the event that any modifications in the design or location of the proposed development, as discussed herein, are planned, the conclusions and recommendations contained in this report will require a written review by this firm with respect to the planned modifications.

The proposed development is located in southern California, a geologically and tectonically active region, where large magnitude, potentially destructive earthquakes are common. Therefore, ground motions from moderate or large magnitude earthquakes could affect the site during the life of the proposed structure(s).

Typically, faulting is confined to the area adjacent to a known fault. However, absolute assurance against future fault displacement is not possible in tectonically active regions because new faults can form over time as the orientation and magnitude of deformational forces change in the earth's crust. Therefore, the location and magnitude of new ground surface ruptures during a seismic event cannot be anticipated.

In performing these professional services, this firm has used the degree of care and skill ordinarily exercised under similar circumstances by reputable geologists and geotechnical engineers practicing in this or similar localities. The data presented in this report are based on the results of pertinent field and laboratory testing. It should be recognized that subsurface conditions can vary in time, and laterally, and with depth at a given site and that the conclusions and recommendations presented in this report are based on our observations and testing. Therefore, our **conclusions** and **recommendations** are **professional opinions** and are **not meant** to be a control of nature. We make no other **warranty**, either **expressed** or **implied**.

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This opportunity to be of service is greatly appreciated. Please contact us if you would like to discuss this report further.

Respectfully submitted,

Eric J. Seward, CEG 2110
Principal Engineering Geologist
Vice President

Kevin P. Callahan, MS, GE 2989
Principal Geotechnical Engineer

The following attachments and appendices complete this report.

Location Map following page 2
References
Summary of Cut-Slopes Table 1

APPENDIX A – Subsurface Logs

- **Continuous Trench Logs** (7/12/91) (In Pockets)
  - T-1, T-2 and T-3 Plate III
  - T-4 and T-5 Plate IV
  - T-6, T-7, and T-8 Plate V
  - T-9, thru T-12 Plate VI
  - T-13, T-14 and T-15 Plate VII
  - T-16, T-17 and T-18 Plate VIII
  - T-19, thru T-22 Plate IX
  - T-23, T-24 and T-25 Plate X
- **Trench Logs**
  - T-1A thru T-48A
  - PT-7 thru PT-10
- **Trench and Dozer Cut Logs** (Offsite)
  - T-39, T-77, T-78, T-105, T-122, T-123 and T-124
  - T-94 and DC-3 Plate A1

- **Bucket-Auger Boring Logs**
  - B-1A and B-2A
  - B-24 (Offsite)
- **Hollow-Stem-Auger Boring Logs**
  - HS-1A through HS-12A
  - Key to Symbols
- **CPT Data**
  - CPT 1 thru 20

APPENDIX B – Laboratory Test Results

APPENDIX C – Liquefaction Potential Assessment and Evaluation of Earthquake-Induced Settlements

APPENDIX D – Seismicity Figures

- Modified Mercalli Scale, 1956 Version
- Fault and Earthquake Epicenter Location Map Figure D1
- Magnitude-Distance Contributions to Hazard Figure D2
- USGS Deaggregation Parameters and Output

APPENDIX E – Slope Stability Analyses

APPENDIX F – Seepage Analyses Figures

APPENDIX G – Figures

Stereonet Plot–Oak Canyon Anticline Figure 1
Minimum Foundation and Slab Recommendations for Expansive Soils Table G1
Oil Well Abandonment Records
Construction Diagrams
- Fill Over Natural Slope 5:1 or Steeper
- Rock Disposal
- Fill Slope Over Natural Slope 5:1 or Steeper
- Fill Slope Toeing Out on Flat Alluviated Canyon
- Over-excavation for Transitional Cut and Cut-Fill Lots
- Stability/Buttress Fill and Backdrains
- Canyon Subdrain

APPENDIX H – Map and Cross Sections (plates in pockets)

- Cross Sections 1-1’ through 27-27’
- Cross Sections 28-28’ through 30-30’ Plate I
- **Geotechnical Map** Plate II

Distribution:

Sterling Gateway, L.P. (1 hard copy and electronic in PDF format)
Attn: Mr. Hunt Williams

Sikand Engineering (PDF format)
Attn: Mr. Doug Farmer

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division (PDF format via EpicLA)

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Hasley Canyon Area
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Vesting Tentative Tract Map No. 60257
Green Valley Ranch
Val Verde, County of Los Angeles, California
Dated May 9, 2018 - JN: 18-1245A-4

Table 1 – SUMMARY OF CUT SLOPES

Proposed Cut-slope CS-1

Slope Parameters: 50± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Semicircular - easterly

Cross Section: 1-1'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) striking roughly east-west to N 80 E and dipping approximately 31-38° towards the south. This structural configuration is neutral to the proposed slope face. Landslide Qls-1 will be exposed at the southern portion of the slope. Slope stability analysis performed on critical Cross Section 1-1' indicates that slope mitigation is necessary to achieve the minimum factor of safety requirement for slope stability. Slope stability analysis on Cross Section 1-1', with a proposed remedial toe berm buttress fill, indicates this slope satisfies the Los Angeles County minimum factor of safety requirement of 1.50. **Calculated grossly stable**.

Mitigation Measures: Recommend that the southern portion of the slope be constructed as a **Buttress Fill** utilizing a 22 ft wide by 14 ft deep keyway.

Proposed Cut-slope CS-2

Slope Parameters: 33± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Semicircular - easterly

Cross Section: None

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) striking roughly east-west to N 80 E and dipping 36-37° towards the south. This structural configuration is neutral to the proposed slope face. Comparison of the slope parameters and geologic conditions of this slope to a more critical proposed cut slope (i.e. Cut-slope CS-8) that satisfies the Los Angeles County minimum factor of safety requirement of 1.50 indicates that this slope will also satisfy minimum safety factor requirements. **Grossly stable by comparison**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-3

Slope Parameters: 30± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Southeast

Cross Sections: 2-2' and 3-3'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding striking roughly parallel to the slope face with 27-37° dips to the south, which are steeper than the proposed cut slope face. Comparison of the slope parameters and geologic conditions of this slope to a more critical proposed cut slope (i.e. Cut-slope CS-8) that satisfies the Los

Table 1 – SUMMARY OF CUT SLOPES

Angeles County minimum factor of safety requirement of 1.50 indicates that this slope will also satisfy minimum safety factor requirements. **Grossly stable by comparison**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-4

Slope Parameters: 34± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Southeast

Cross Sections: 8-8' and 9-9'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding striking parallel to the slope face with 27-37° dips to the south, which are steeper than the proposed cut slope face. Comparison of the slope parameters and geologic conditions of this slope to a more critical proposed cut slope (i.e. Cut-slope CS-8) that satisfies the Los Angeles County minimum factor of safety requirement of 1.50 indicates that this slope will also satisfy minimum safety factor requirements. **Grossly stable by comparison**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-5

Slope Parameters: 31± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Southeast

Cross Section: None

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding striking roughly parallel to the slope face with 32-42° dips to the south, which are steeper than the proposed cut slope face. Comparison of the slope parameters and geologic conditions of this slope to a more critical proposed cut slope (i.e. Cut-slope CS-8) that satisfies the Los Angeles County minimum factor of safety requirement of 1.50 indicates that this slope will also satisfy minimum safety factor requirements. **Grossly stable by comparison**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-6

Slope Parameters: 38± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Southeast

Cross Section: 4-4'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding striking roughly parallel to the slope face with 32-42° dips to the south, which are steeper than the proposed cut slope face. Comparison of the slope parameters and geologic conditions of this slope to a more critical proposed cut slope (i.e. Cut-slope CS-8) that satisfies the Los

Table 1 – SUMMARY OF CUT SLOPES

Angeles County minimum factor of safety requirement of 1.50 indicates that this slope will also satisfy minimum safety factor requirements. **Grossly stable by comparison**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-7

Slope Parameters: 122± feet high with a 3:1 (h:v) slope gradient

Direction Slope Faces: Semicircular – Southwest to south to southeast

Cross Sections: 8-8' 10-10' and 11-11'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding roughly striking east-west and dipping towards the south. Bedding dips towards the south at angles ranging from 17° near the upper portion of the slope where it nears the axis to the Oak Canyon Anticline to 38° near the bottom of the slope. Bedding illustrated on cross sections 10-10' and 11-11'indicate that the upper portion of the slope will have bedding plans (apparent dips) dipping out of the slope face. Slope stability analysis performed on critical Cross Section 11-11' indicate that this slope satisfies the Los Angeles County minimum factor of safety requirement of 1.50. **Calculated grossly stable**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-8

Slope Parameters: 118± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Northeast

Cross Sections: 12-12' and 13-13'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with the axis of the approximately east-west trending, east plunging Oak Canyon Anticline within the slope face. Stereonet analysis of bedding plane data from the fold limbs indicates that the fold is plunging approximately 11° towards the east. Cross section 13-13' is oriented along the fold axis and illustrates this bedding configuration relative to the slope face. North of the fold axis apparent dip of the bedding is 28° as illustrated on Cross section 12-12'. Slope stability analysis performed on critical Cross Sections 12-12' and 13-13' indicate that this slope satisfies the Los Angeles County minimum factor of safety requirement of 1.50. **Calculated grossly stable**.

Mitigation Measures: Not required.

Table 1 – SUMMARY OF CUT SLOPES

Proposed Cut-slope CS-9

Slope Parameters: 33± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Northeast, east and southeast

Cross Section: None

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) striking roughly east-west to N80E and dipping 20-34° towards the south. This structural configuration is neutral to the proposed slope face. Comparison of the slope parameters and geologic conditions of this slope to a more critical proposed cut slope (i.e. Cut-slope CS-8) that satisfies the Los Angeles County minimum factor of safety requirement of 1.50 indicates that this slope will also satisfy minimum safety factor requirements. **Grossly stable by comparison**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-10

Slope Parameters: 56± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: South to Southwest

Cross Sections: 14-14'and 15-15'

Anticipated Geologic Conditions: Anticipated to expose TQs bedrock mantled by a relatively thin thickness of terrace deposits (Qt). The terrace deposits are anticipated to be exposed at the top of the slope. The axis of the approximately east-west trending, east plunging Oak Canyon Anticline will be exposed within the proposed slope face. Stereonet analysis indicates an 11° plunge to the east. The Oak Canyon Fault is located approximately 150 ft north of the slope. Bedding on the north limb of the fold is anticipated to be dipping into the slope face. Bedding on the south limb is anticipated to be dipping out of the slope face. Slope stability analysis performed on critical Cross Section 15-15' indicate that this slope satisfies the Los Angeles County minimum factor of safety requirement of 1.50. **Calculated grossly stable**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-11

Slope Parameters: 50± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Northwest

Cross Sections: 16-16', 17-17', 18-18'and 19-19'

Anticipated Geologic Conditions: The eastern portion of this slope is anticipated to expose landslide deposits from designated Qls-B and Qls-C overlying bedrock (TQs) with the fold axis for the Oak Canyon Anticline. These landslide failures are circular as depicted on Cross Sections 16-16', 17-17' and 18-18'. The western portion of the slope is anticipated to expose artificial fill (af) and older alluvium (Qoa). Landslide deposits from designated

Table 1 – SUMMARY OF CUT SLOPES

Qls-A as well as bedrock (TQs) dipping into the slope face may also be exposed. Landslide Qls-A is also a circular type failure and is illustrated on Cross Section 19-19' and is attributed to local deformation along the fold axis and proximity to the Oak Canyon fault located to the north. Slope stability analysis performed on critical Cross Section 18-18' indicate that slope mitigation is necessary to achieve the minimum factor of safety requirement for slope stability. A Buttress Fill would be required to achieve the required factor of safety. The required width of the Buttress keyway would likely require the complete removal of the landslide material and slip surface for temporary stability. However, a 3:1 gradient slope satisfies the Los Angeles County minimum factor of safety requirement of 1.50 for gross stability. Slope stability analysis performed on Cross Section 19-19' satisfies the Los Angeles County minimum factor of safety requirement of 1.50 for gross stability. However, this slope is anticipated to be surficially unstable.

Mitigation Measures: It is recommended that the supervising civil engineer re-design the eastern portion of the is slope to a 3:1 gradient. In addition, it is recommended that this 3:1 slope be constructed as a **Stability Fill** utilizing a 25 ft wide by 5 ft deep keyway to mitigate surficial stability of the landslide debris exposed in the slope face. It is also recommended that the western portion of the proposed 2:1 slope be constructed as a **Stability Fill** utilizing a 15 ft wide by 3 ft deep keyway to mitigate surficial stability.

Proposed Cut-slope CS-12

Slope Parameters: 100± feet high, with a 2:1 (h:v) slope gradient

Direction Slope Faces: Northwest

Cross Section: 20-20'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) striking to the northeast and dipping to the south into the proposed slope face. This slope is anticipated to be **grossly stable**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-13

Slope Parameters: 33± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Northwest

Cross Sections: 21-21'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding striking to the east and northeast and dipping to the south into the proposed slope face. This slope is anticipated to be **grossly stable**.

Mitigation Measures: Not required.

Table 1 – SUMMARY OF CUT SLOPES

Proposed Cut-slope CS-14

Slope Parameters: 106± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: Westerly

Cross Sections: 22-22'

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding striking to the east and dipping to the south neutral to the proposed slope face. This slope is anticipated to be **grossly stable**.

Mitigation Measures: None

Proposed Cut-slope CS-15

Slope Parameters: 69± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: West to northwest

Cross Sections: None

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding striking roughly east-west and dipping 37 to 43° to the south. This configuration is considered neutral to the proposed slope face. This slope is anticipated to be **grossly stable**.

Mitigation Measures: Not required.

Proposed Cut-slope CS-16

Slope Parameters: 53± feet high with a 2:1 (h:v) slope gradient

Direction Slope Faces: North

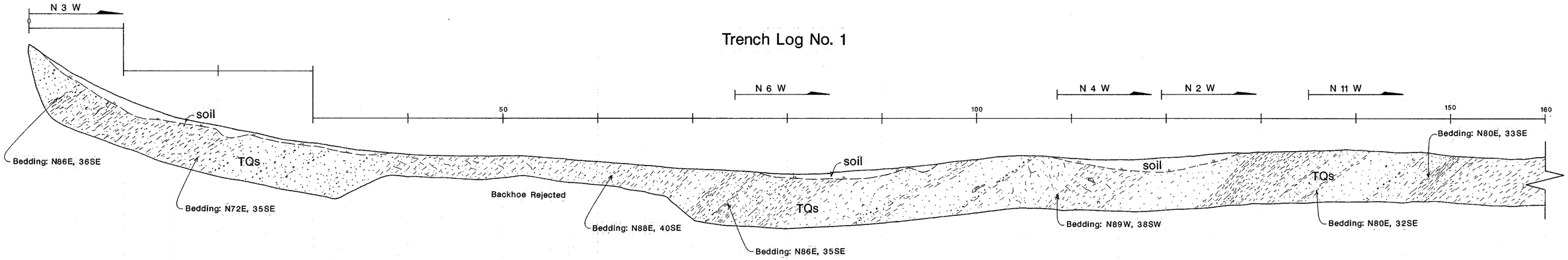
Cross Sections: None

Anticipated Geologic Conditions: Anticipated to expose bedrock (TQs) with bedding striking roughly east-west and dipping 37 to 43° to the south into the proposed slope face. This slope is anticipated to be **grossly stable**.

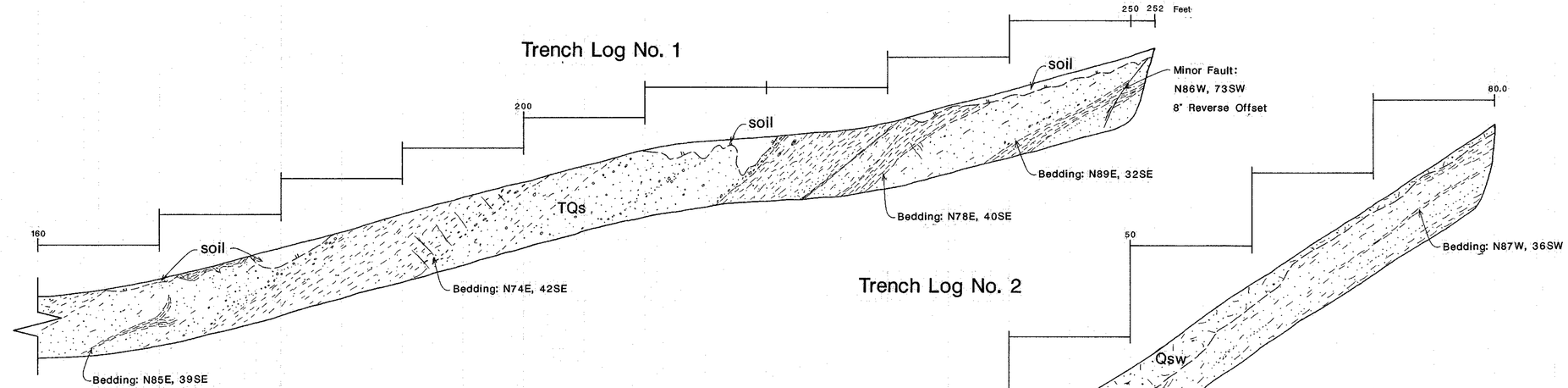
Mitigation Measures: Not required.

Appendix A

Trench Log No. 1

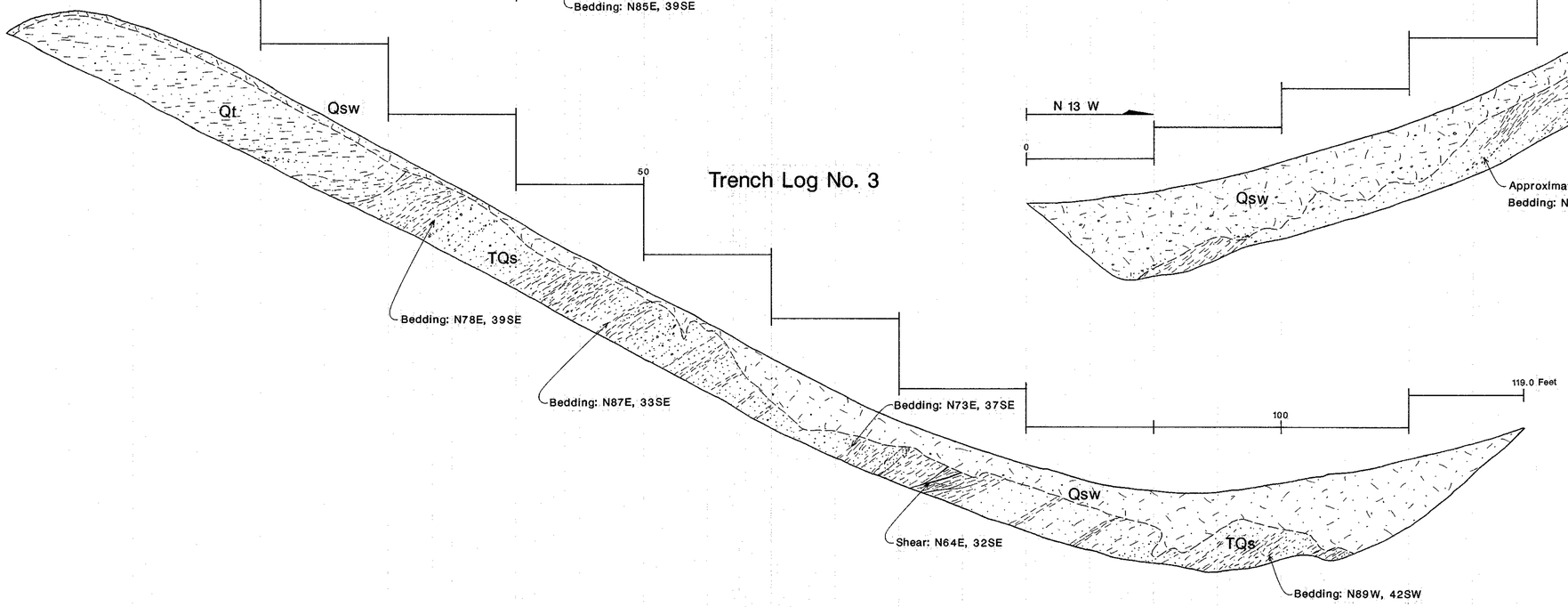


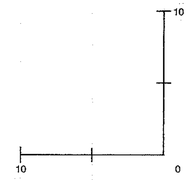
Trench Log No. 1



Trench Log No. 2

Trench Log No. 3

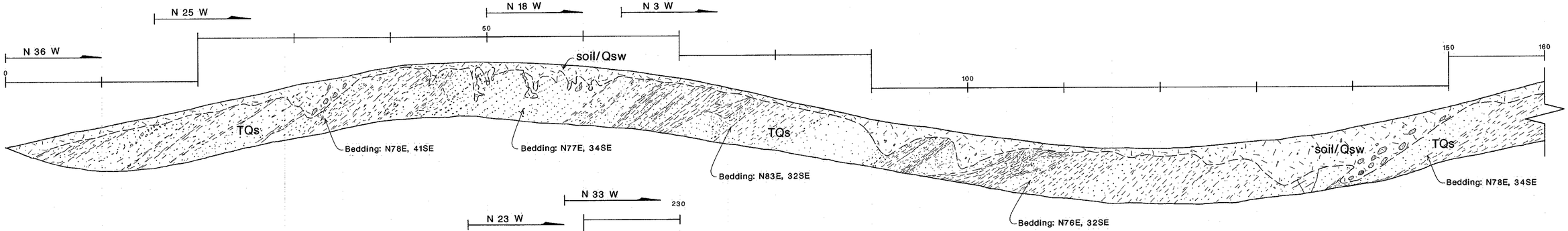




ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
SINCE 1958

Date: 7/12/91	Job No.: 91-1245-1
Scale: 1"=5'	Geology by: / Drawn by: BJS/jlc
	Revised:

Trench Log No. 4



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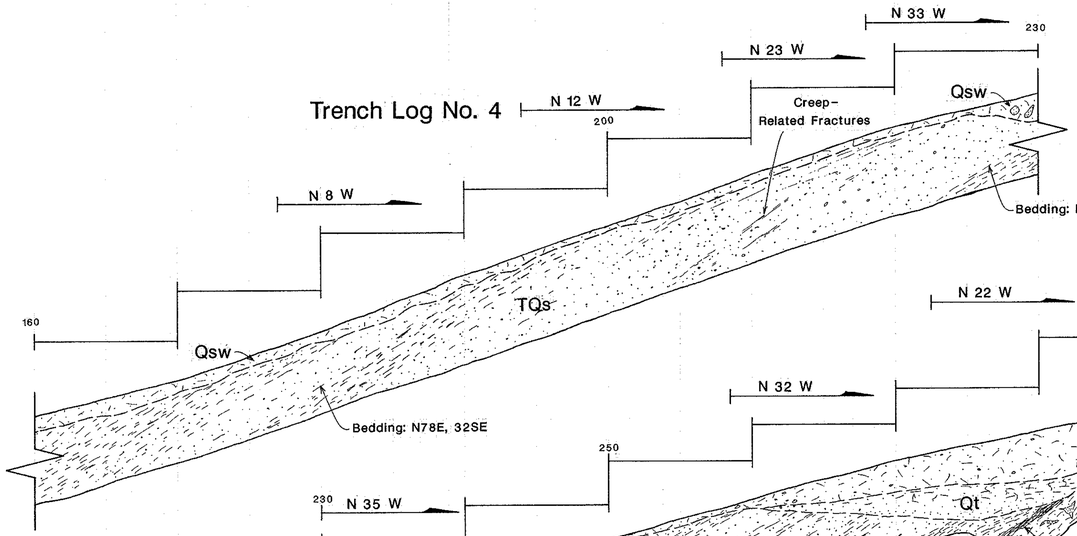

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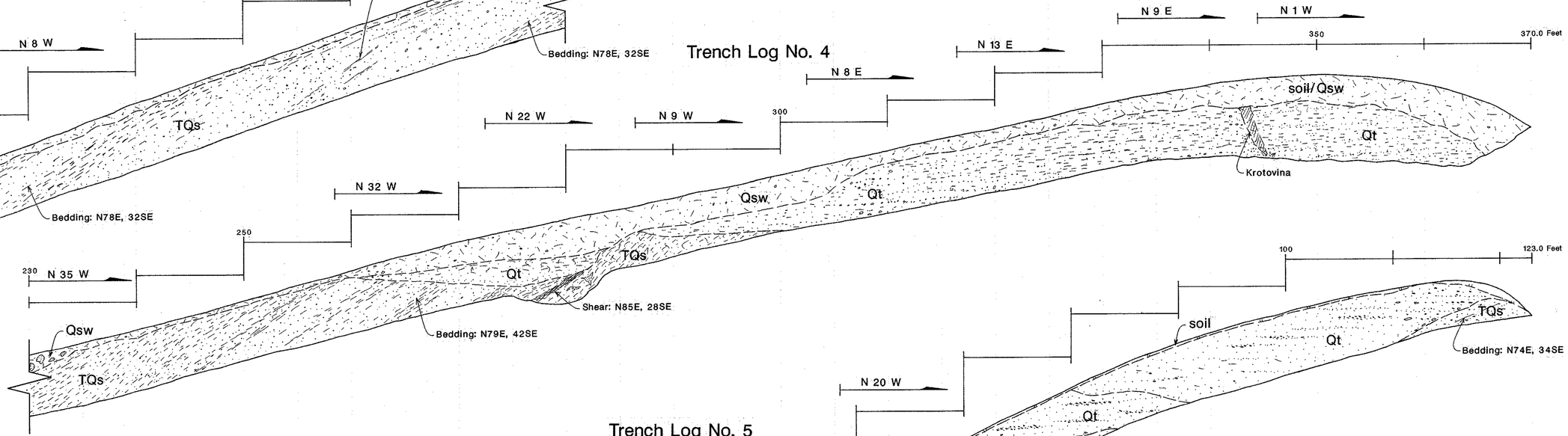

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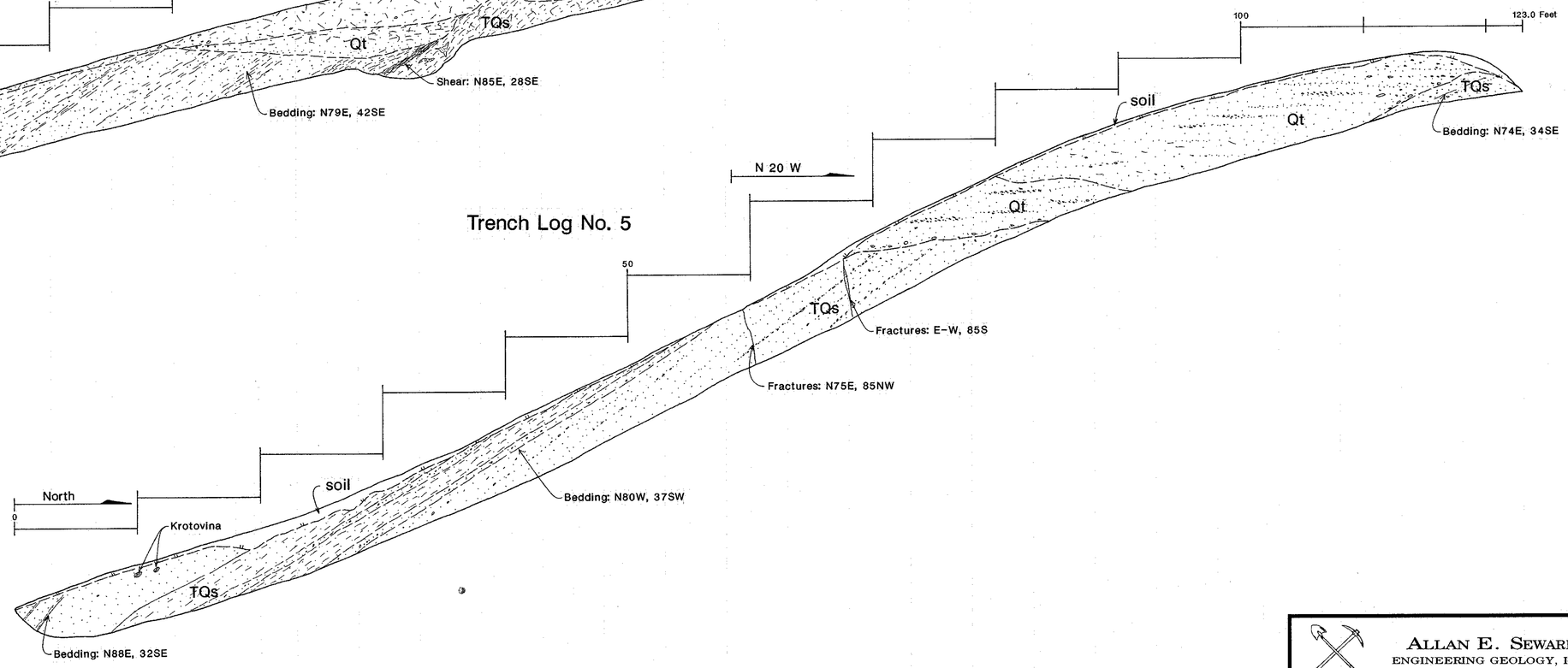

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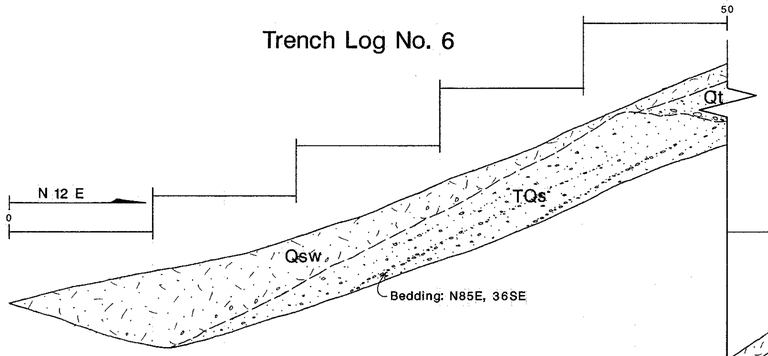
Date: 7/12/91		Job No.: 91-1245-1
Scale: 1"=5'	Geology by: Drawn by: BJS/jlc	Revised:

1245

Trench Log No. 6



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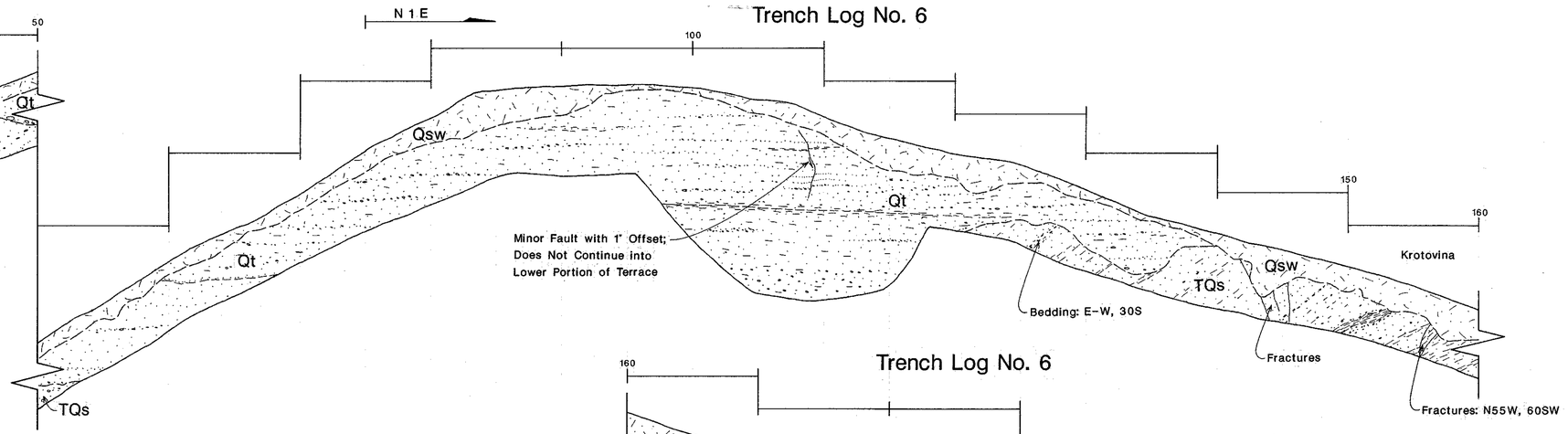

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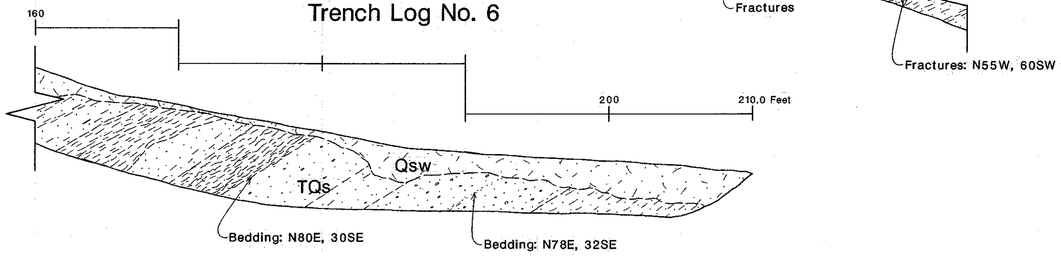

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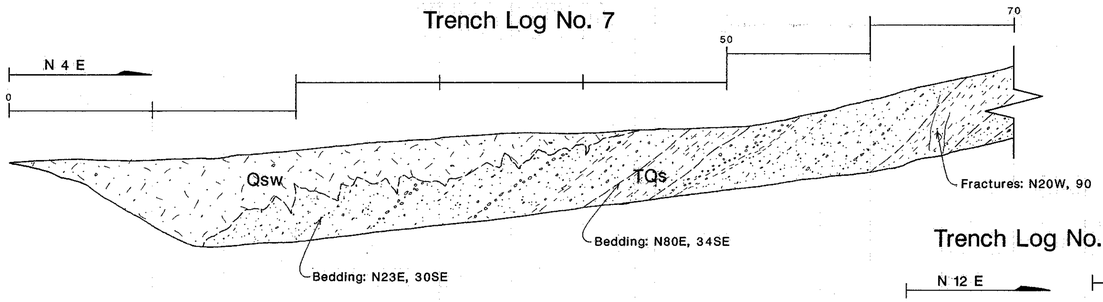

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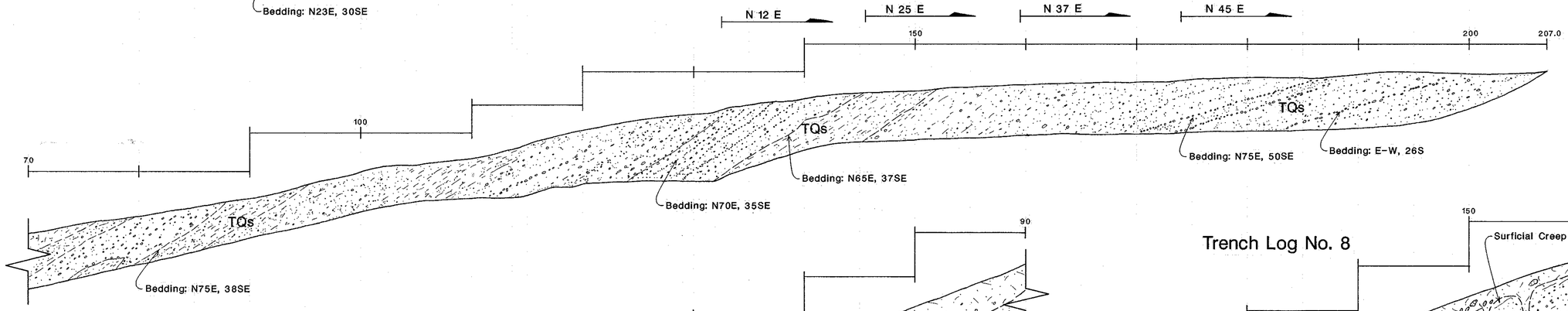

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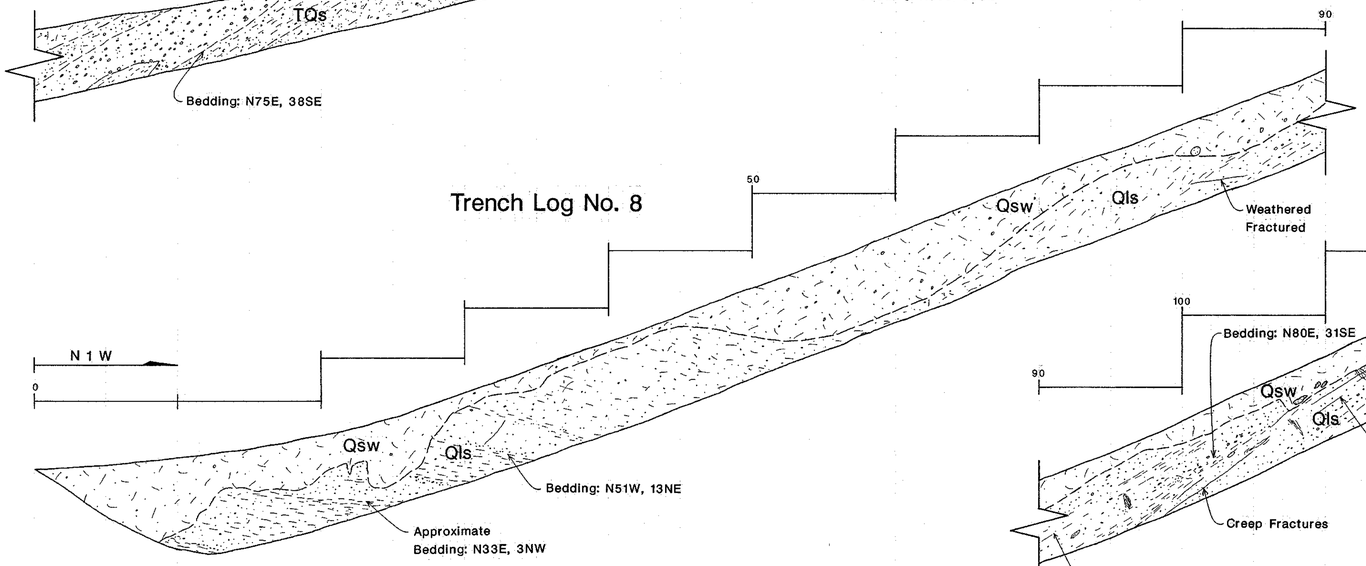

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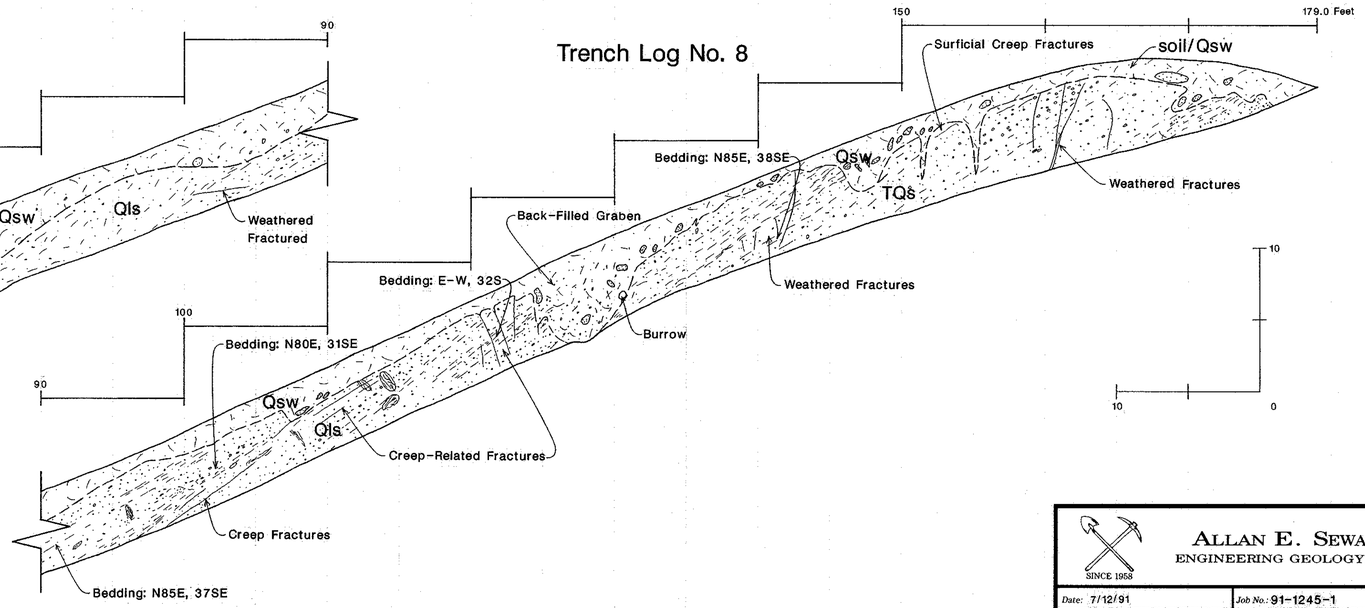

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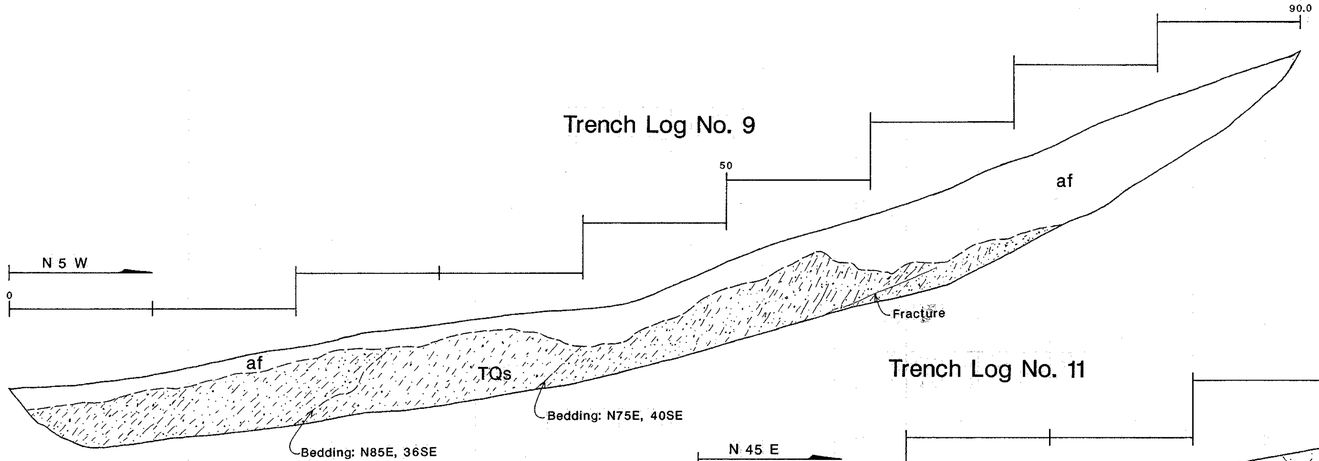
Date: 7/12/91	Job No.: 91-1245-1	
Scale: 1"=5'	Geology by:	Revised:
	Drawn by: BJS/jlc	

Trench Log No. 9



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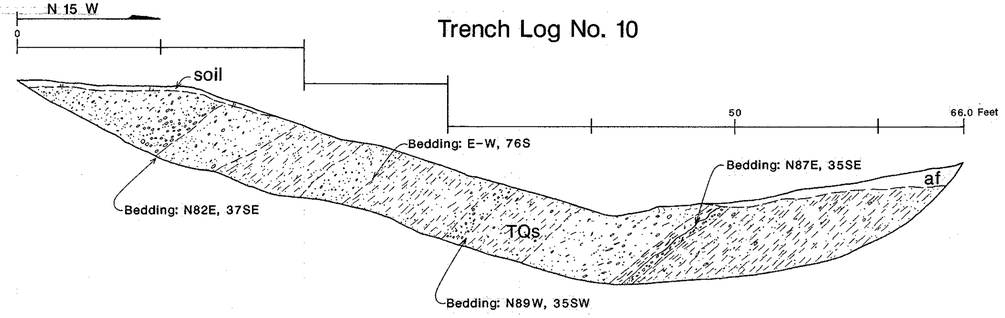

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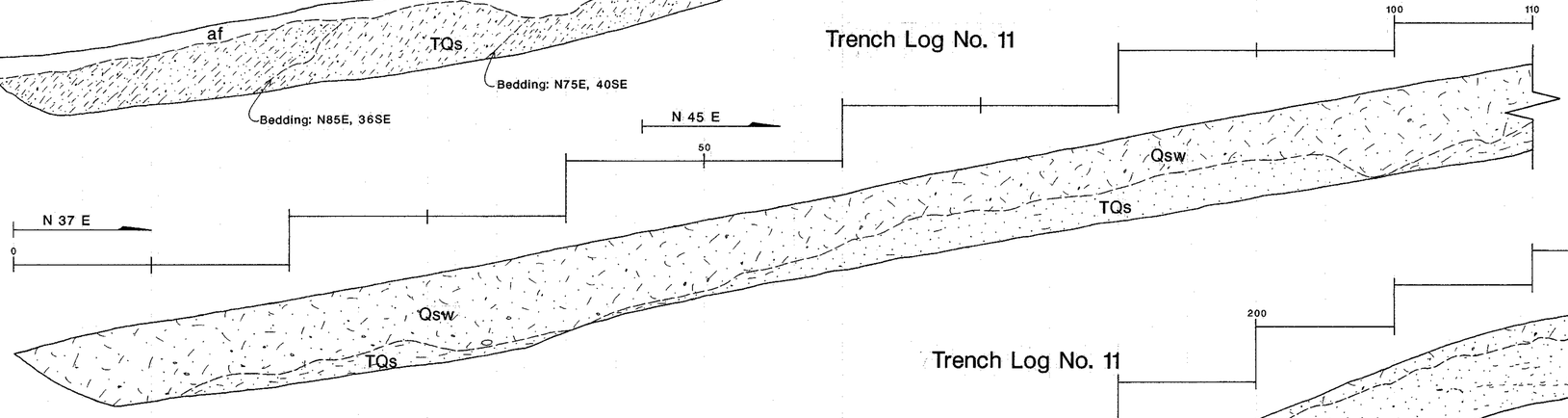

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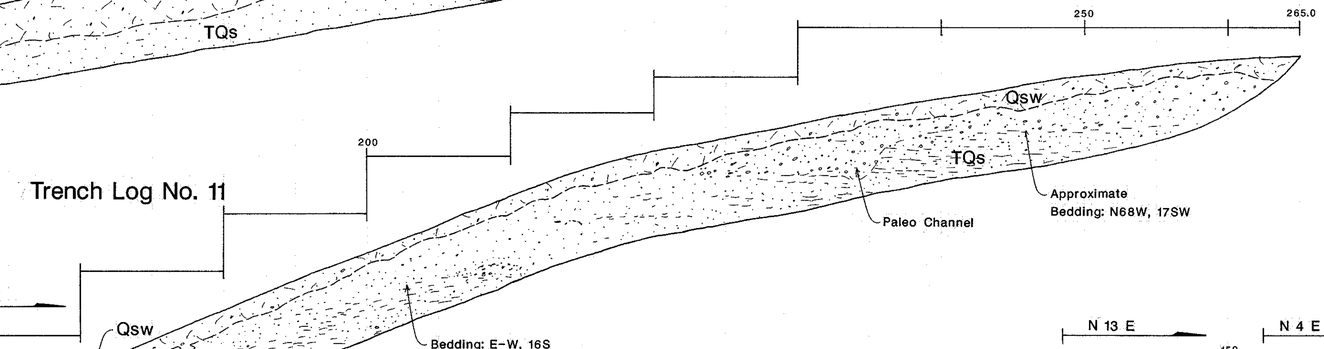

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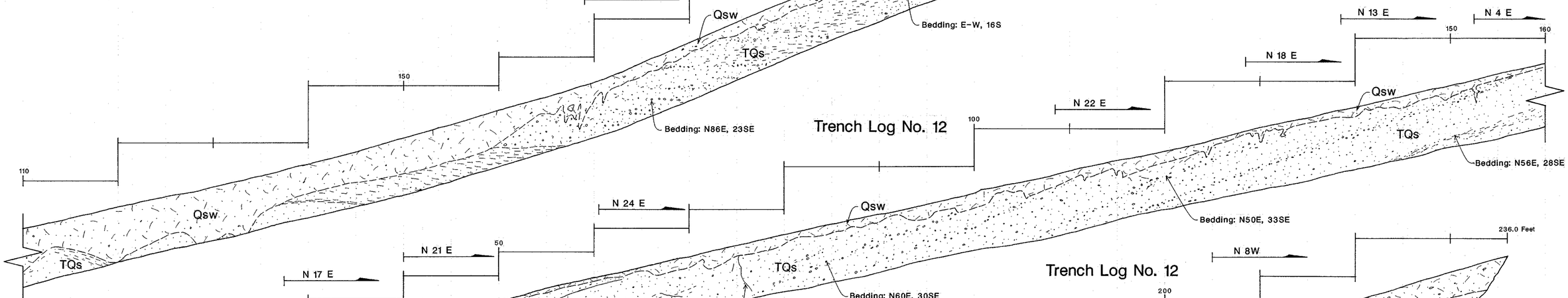
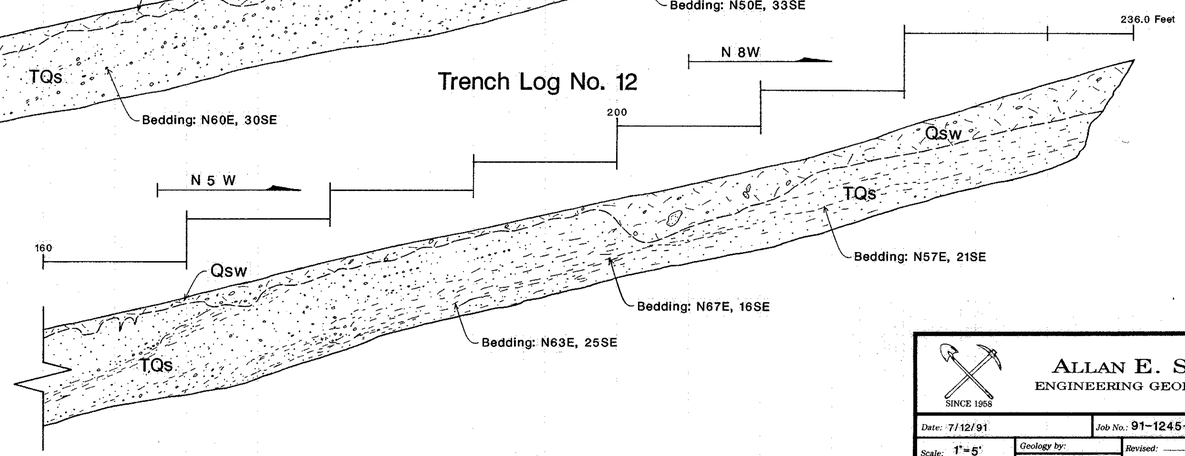


Trench Log No. 12



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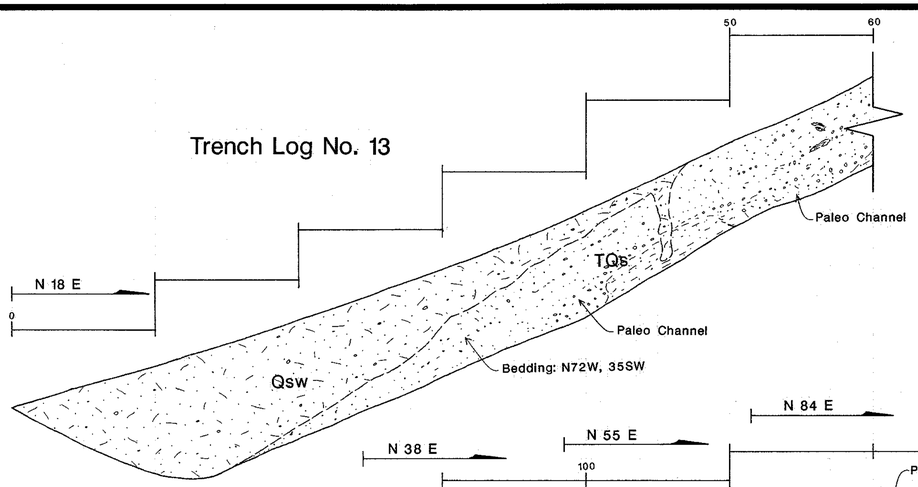
SINCE 1968

Date: 7/12/91	Job No.: 91-1245-1
Scale: 1"=5'	Geology by:
	Drawn by: BJS/jlc
	Revised:

Trench Log No. 13



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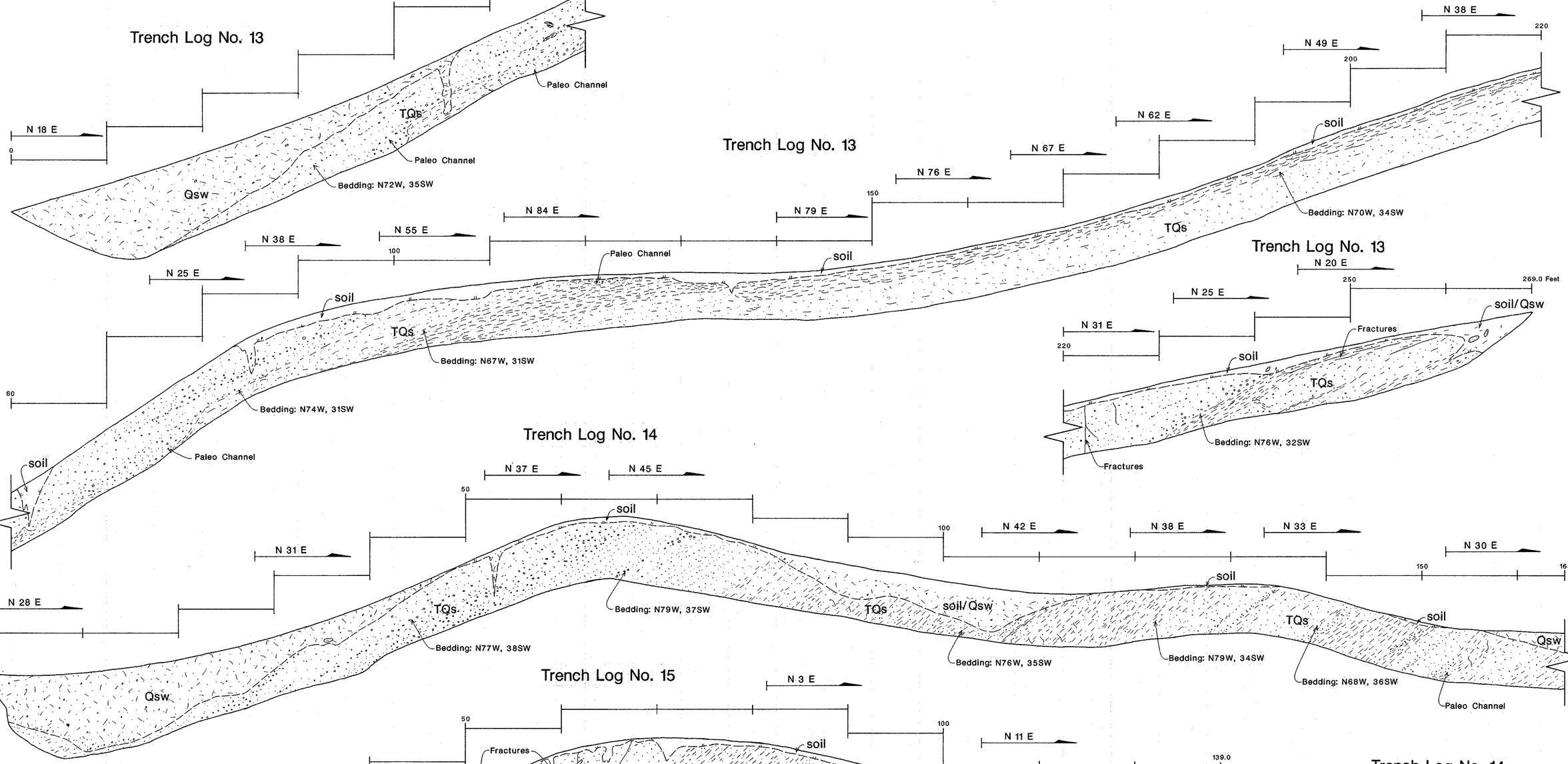
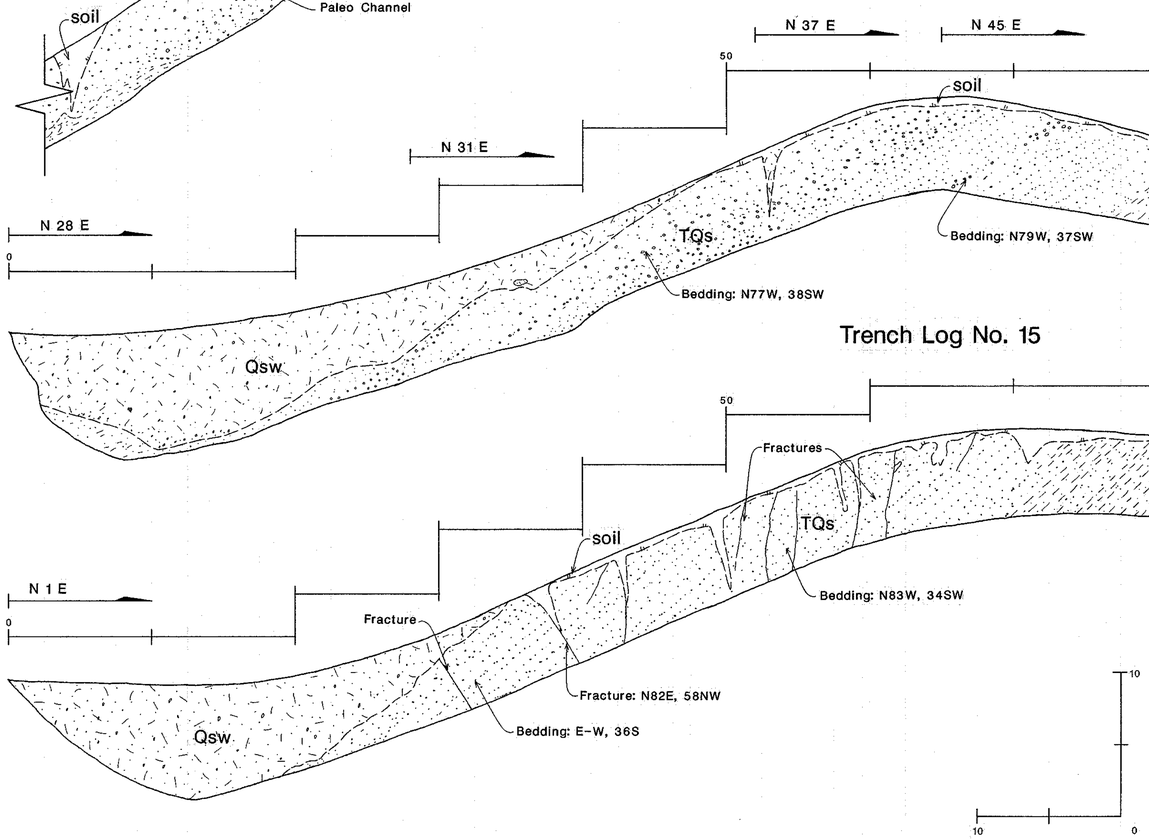


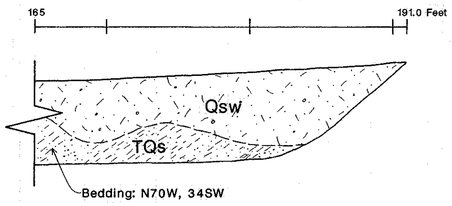
Trench Log No. 13

Trench Log No. 14



Trench Log No. 15

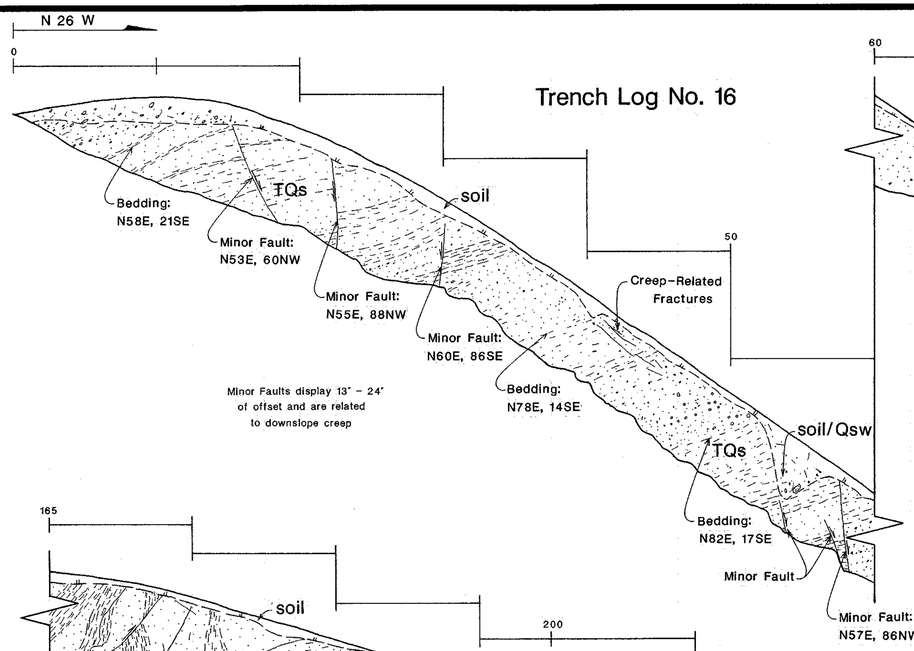
Trench Log No. 14



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
SINCE 1958

Date: 7/12/91 | Job No.: 91-1245-1
Scale: 1"=5' | Geology by: | Drawn by: BJS/jlc | Revised:

Trench Log No. 16



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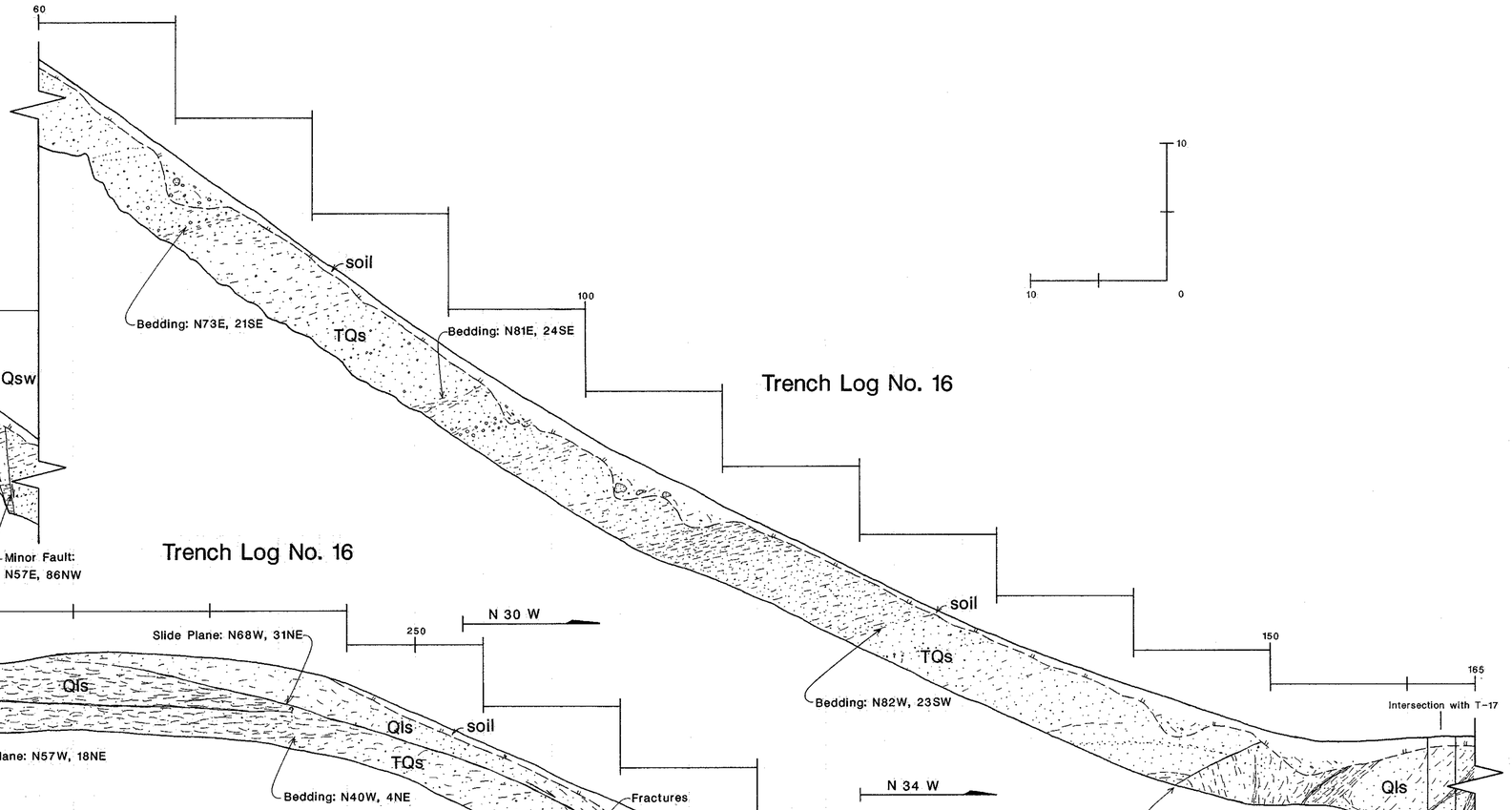

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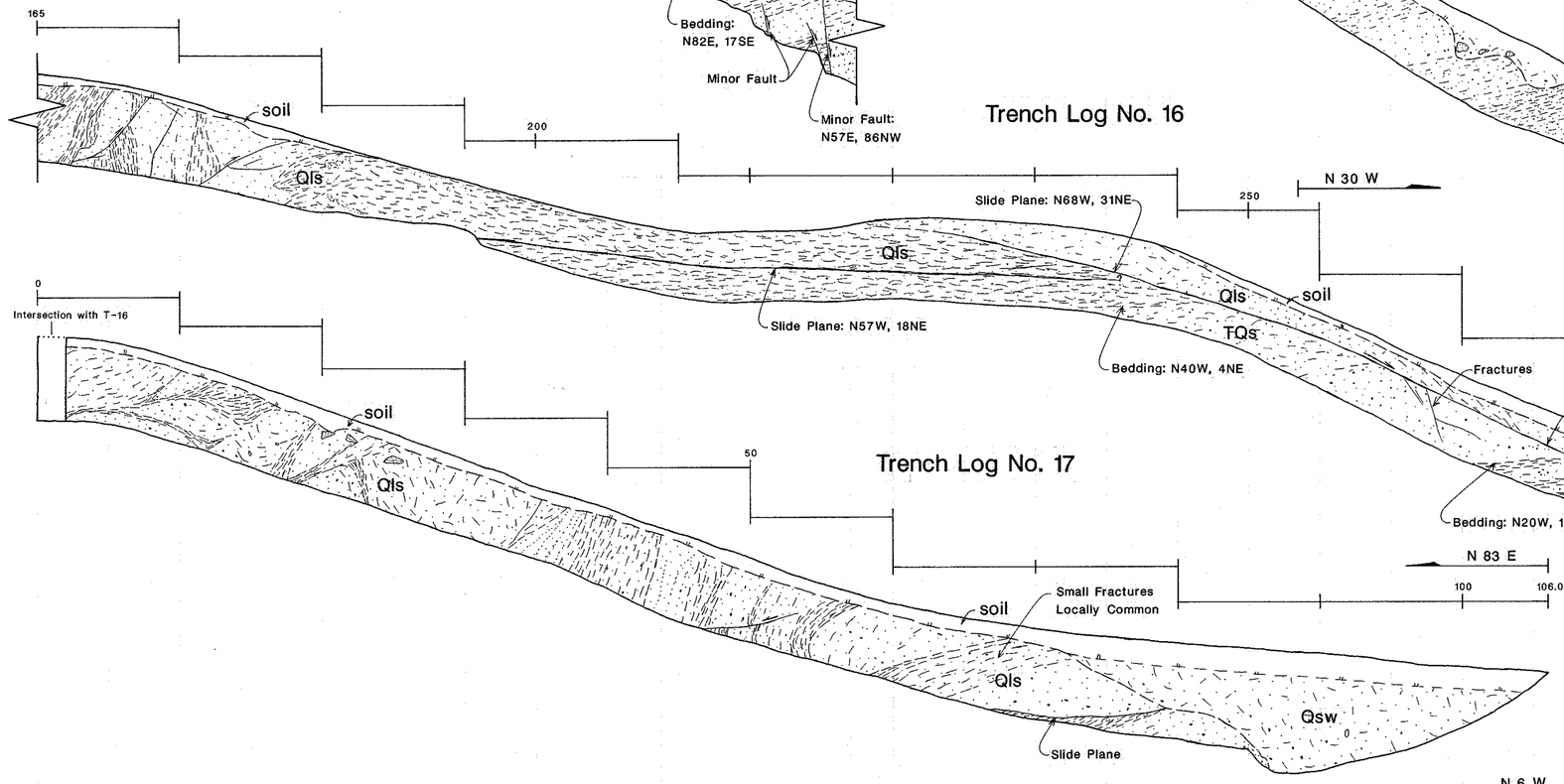

Trench Log No. 17

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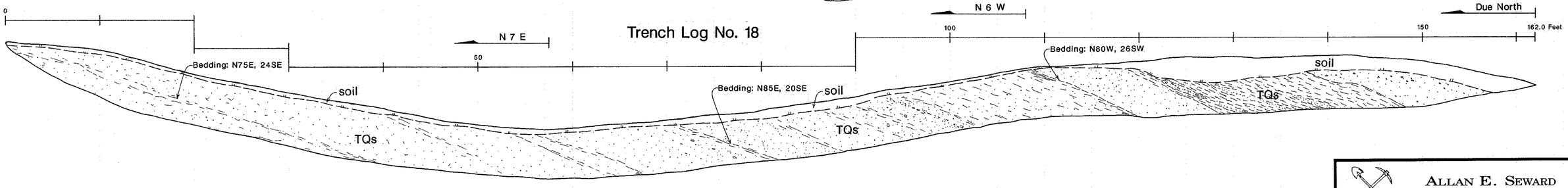

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Date: 7/12/91	Job No.: 91-1245-1
Scale: 1"=5'	Geology by: / Drawn by: BJS/jlc
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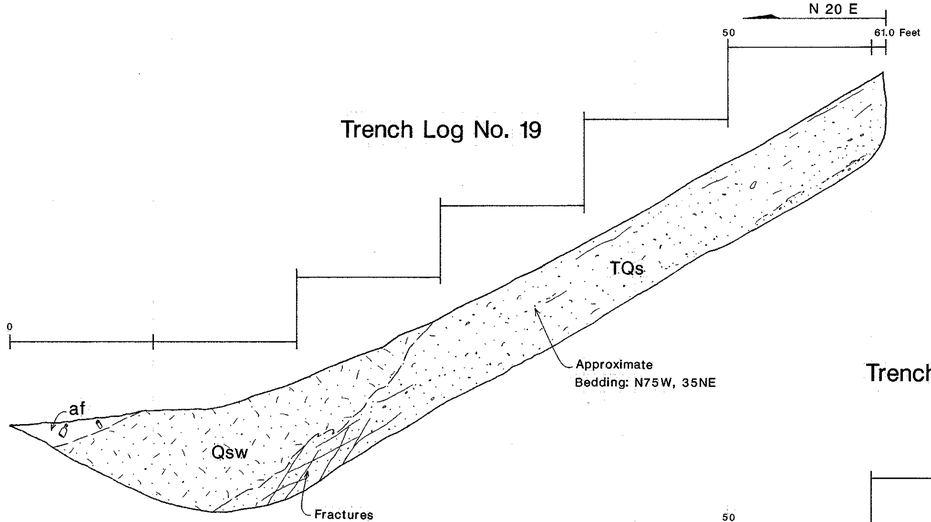
Trench Log No. 19



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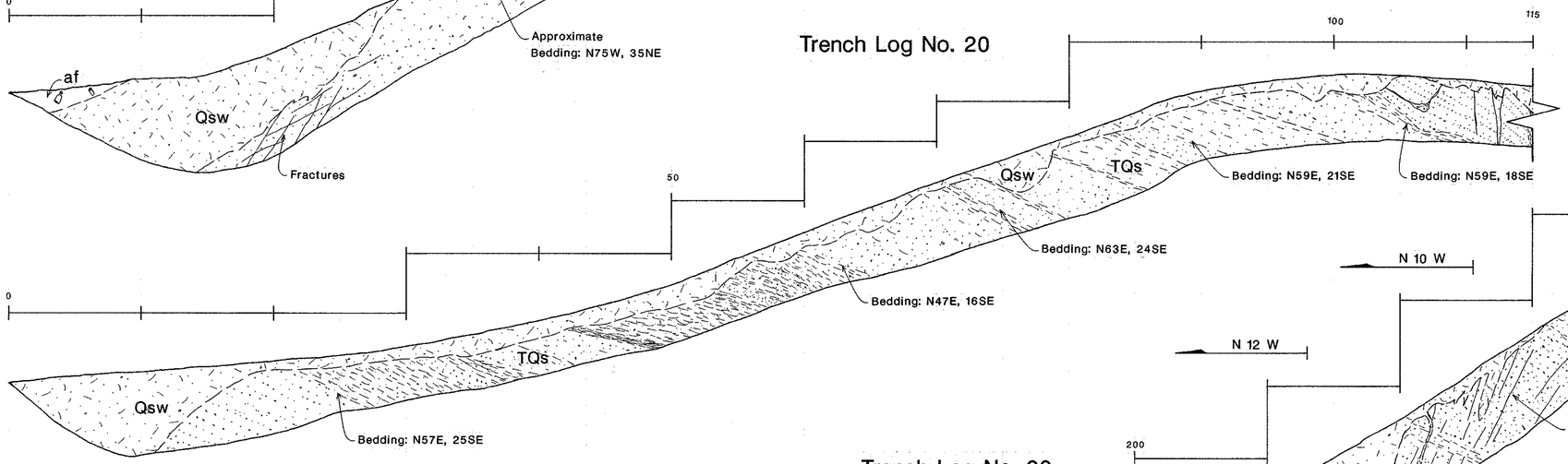

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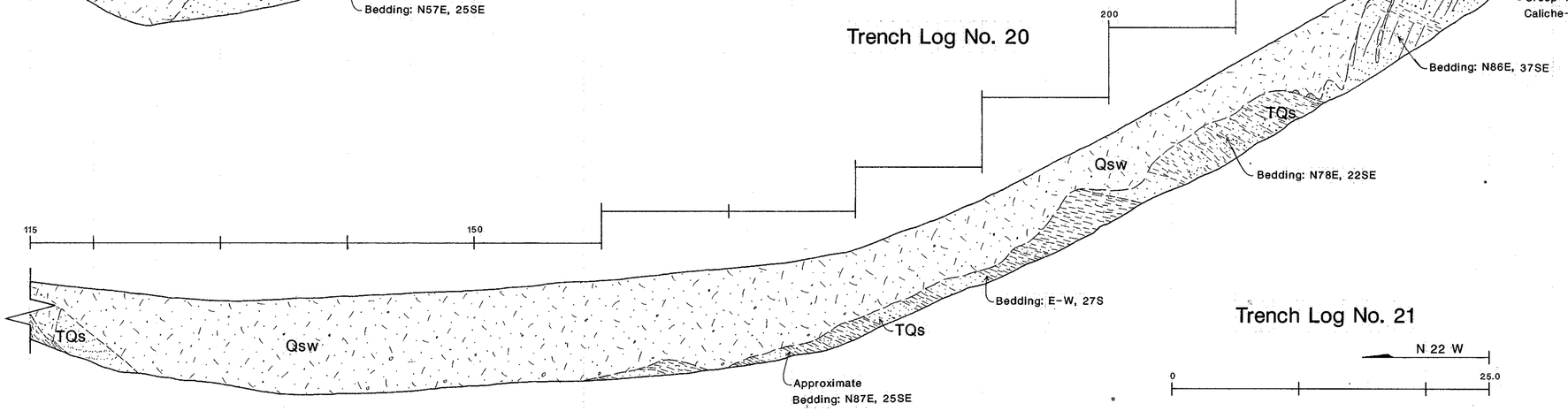

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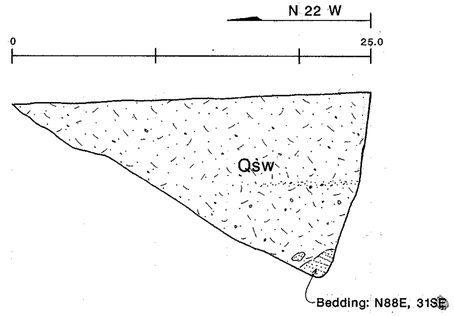

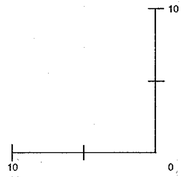

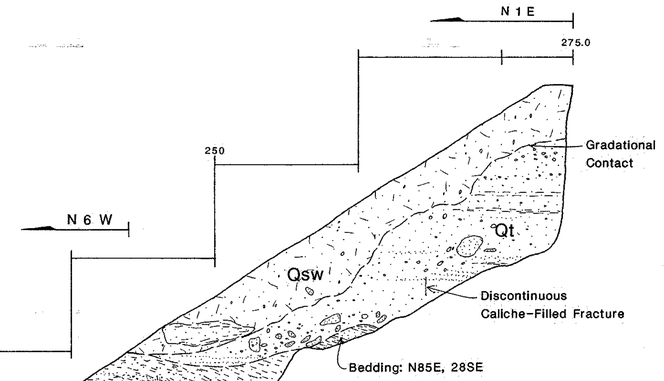

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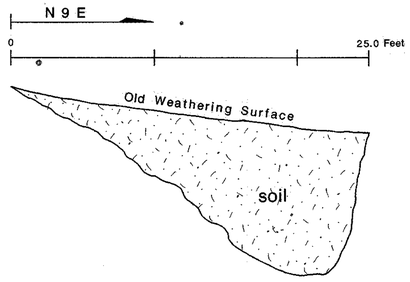

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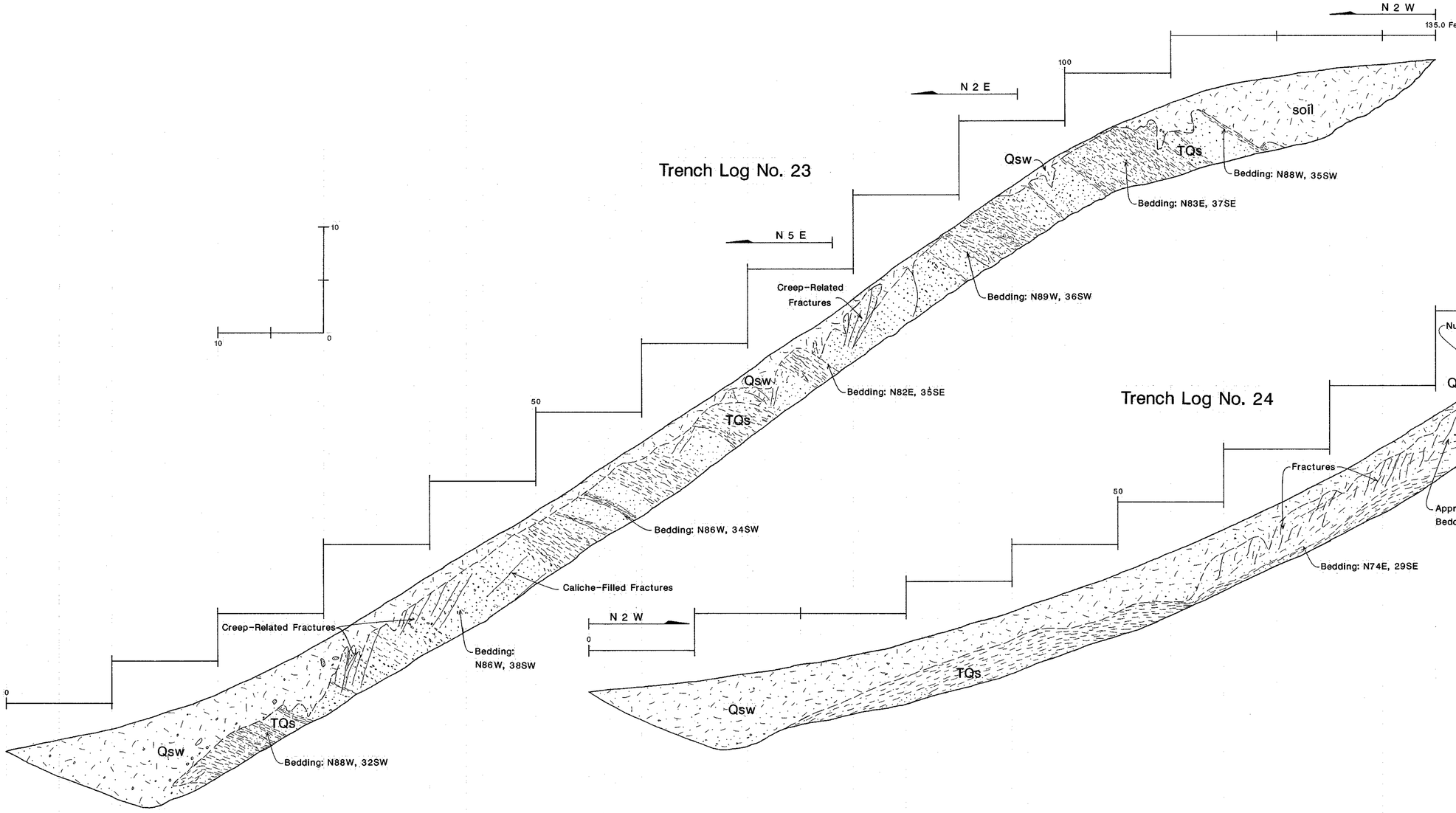
ENGINEERING GEOLOGY, INC.
SINCE 1958

Date: 7/12/91	Job No.: 91-1245-1
Scale: 1"=5'	Geology by: / Drawn by: BJS/jlc
	Revised:

PLATE X

Trench Log No. 23



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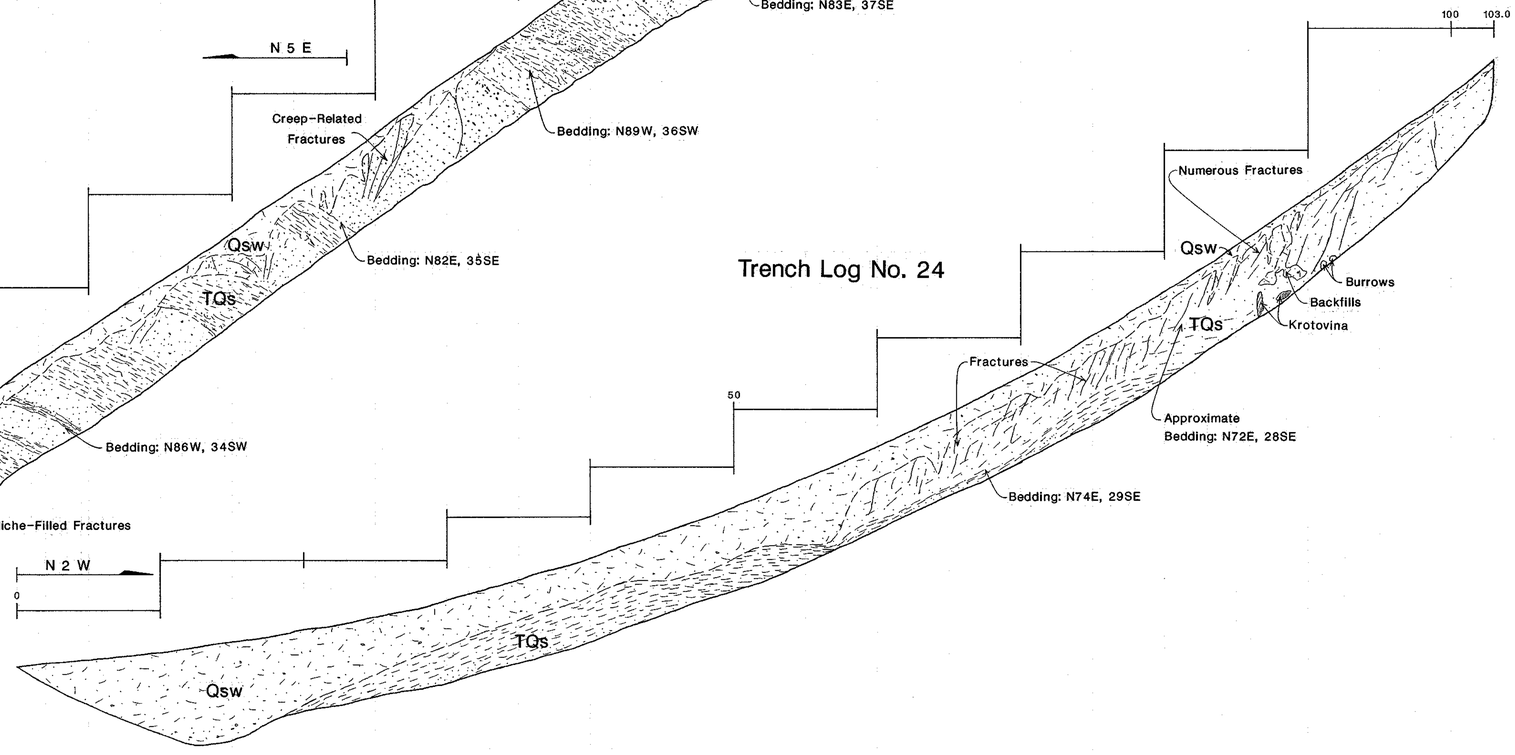

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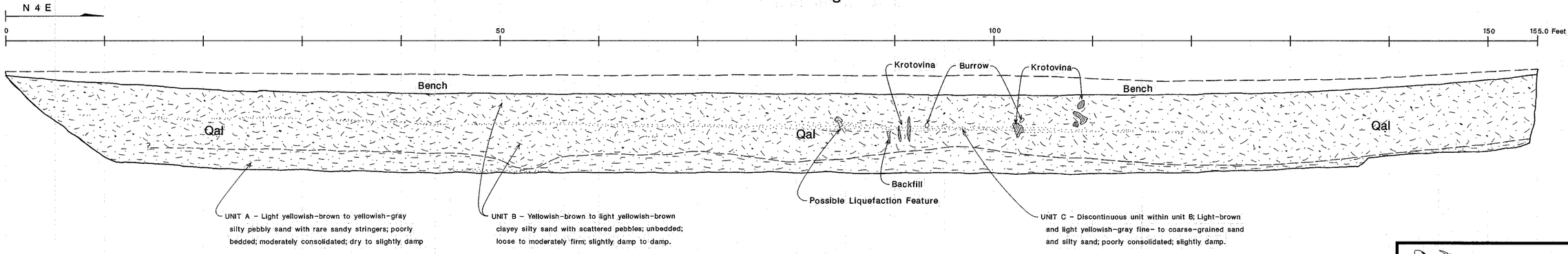


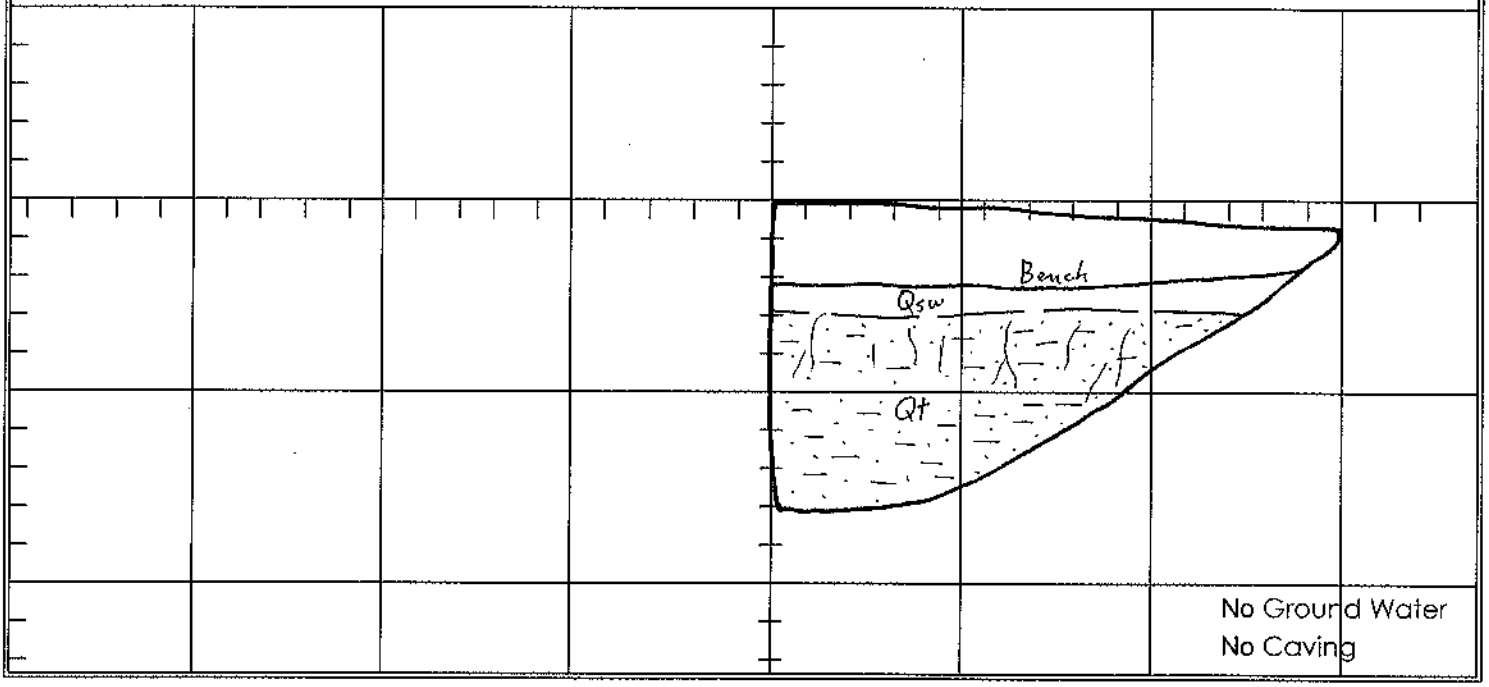
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
SINCE 1968

Date: 7/12/91 | Job No.: 91-1245-1
Scale: 1"=5' | Geology by: | Drawn by: BJS/jlc | Revised:

CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-1A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1365	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 3)** @ 0' Brown silty, clayey sand; loose; dry to damp; numerous voids up to 1/8" diameter **QUATERNARY TERRACE DEPOSITS; Qt (3 - 8')** @ 3' Brown to strong brown clayey sandstone; soft to moderately hard; damp; massive; voids up to 1/16" diameter @ 5' Strong brown; moderately hard; no voids **COMMENTS:** Qt is weathered to 5'	Structureless			
5									
10									
15									
20									

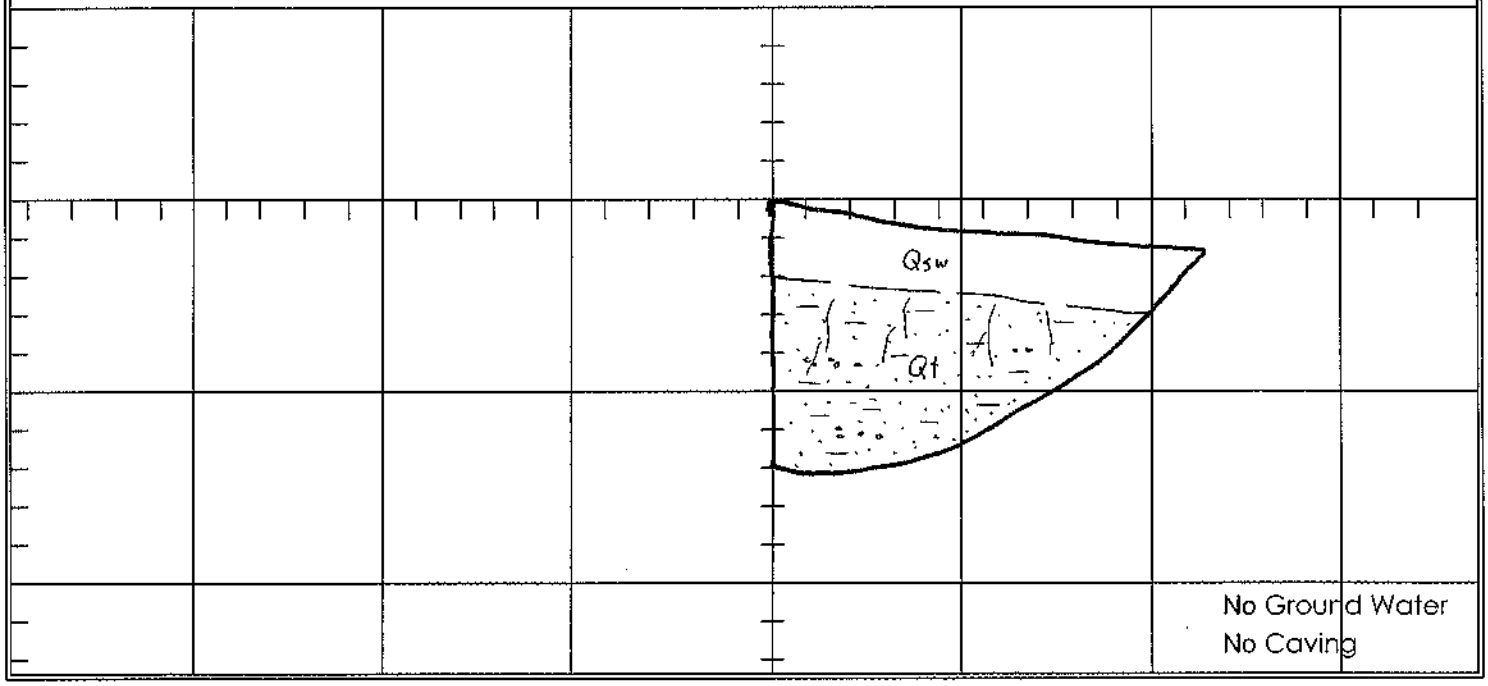
TOTAL DEPTH: 8 feet ←N4W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-2A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1342	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2')** 0' Brown clayey sand; loose; dry to damp; voids up to 1/16" diameter **QUATERNARY TERRACE DEPOSITS; Qt (2 - 7')** @ 2' Strong-brown clayey sandstone with scattered pebbles; moderately hard; damp; scattered pinhole voids to approximately 4.5'; massive with some pebbly layers (possibly channelized) **COMMENTS:** Qt is weathered to 4.5'	ApxB7: N5W, 13SW Vague pebble line			
5									
10									
15									
20									

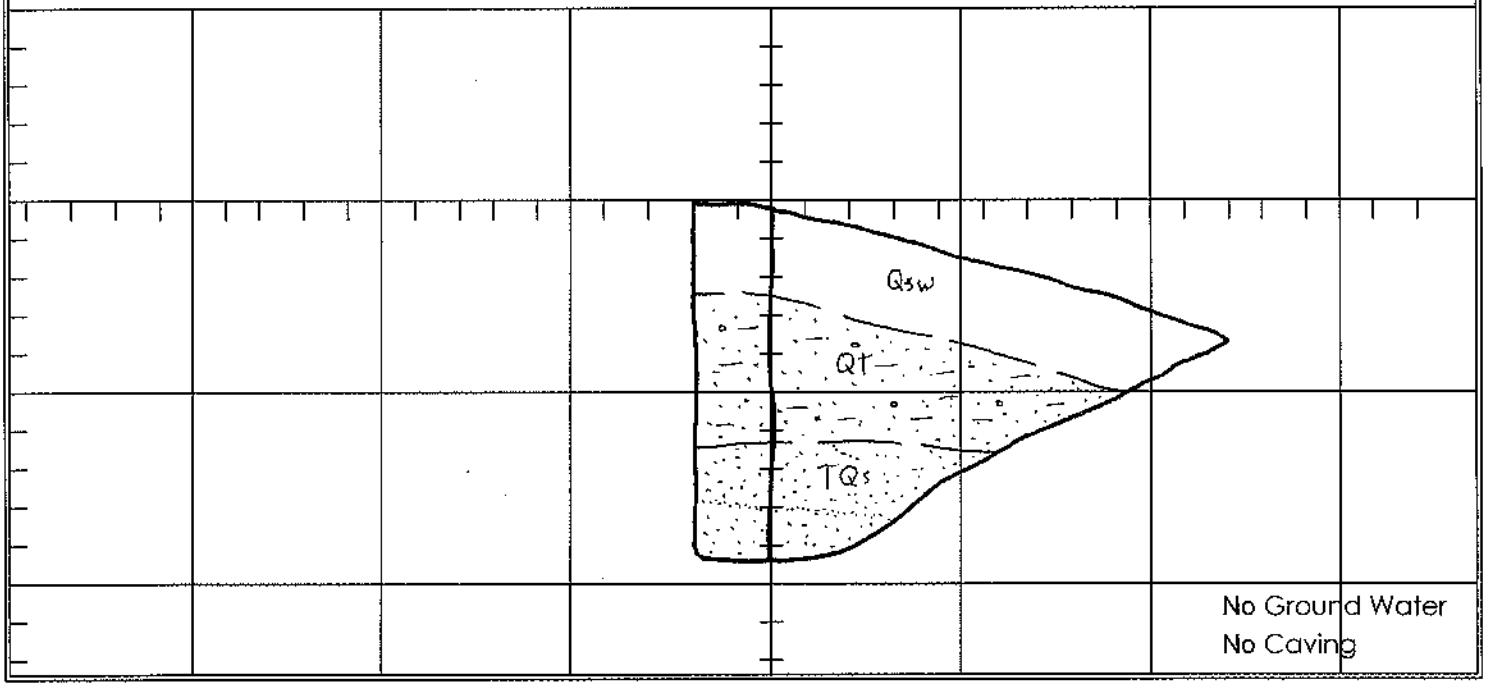
TOTAL DEPTH: 7 feet ←N26E SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-3A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1310	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2.5')** @ 0' Brown clayey sand; loose; dry to damp; voids up to 1/8" diameter **QUATERNARY TERRACE DEPOSITS; Qt (2.5 - 6.5')** @ 2.5' Strong brown clayey sandstone with scattered pebbles; soft to moderately hard; dry to damp **BEDROCK; TQs (6.5 - 8')** @ 6.5' Gray sandstone; moderately hard to hard; dry to damp; massive @ 8' Oxidized layer (bedding?) **COMMENTS:** Qt is weathered to 5'	Cnt: N46SE, 5NW			
5									
10									
15									
20									

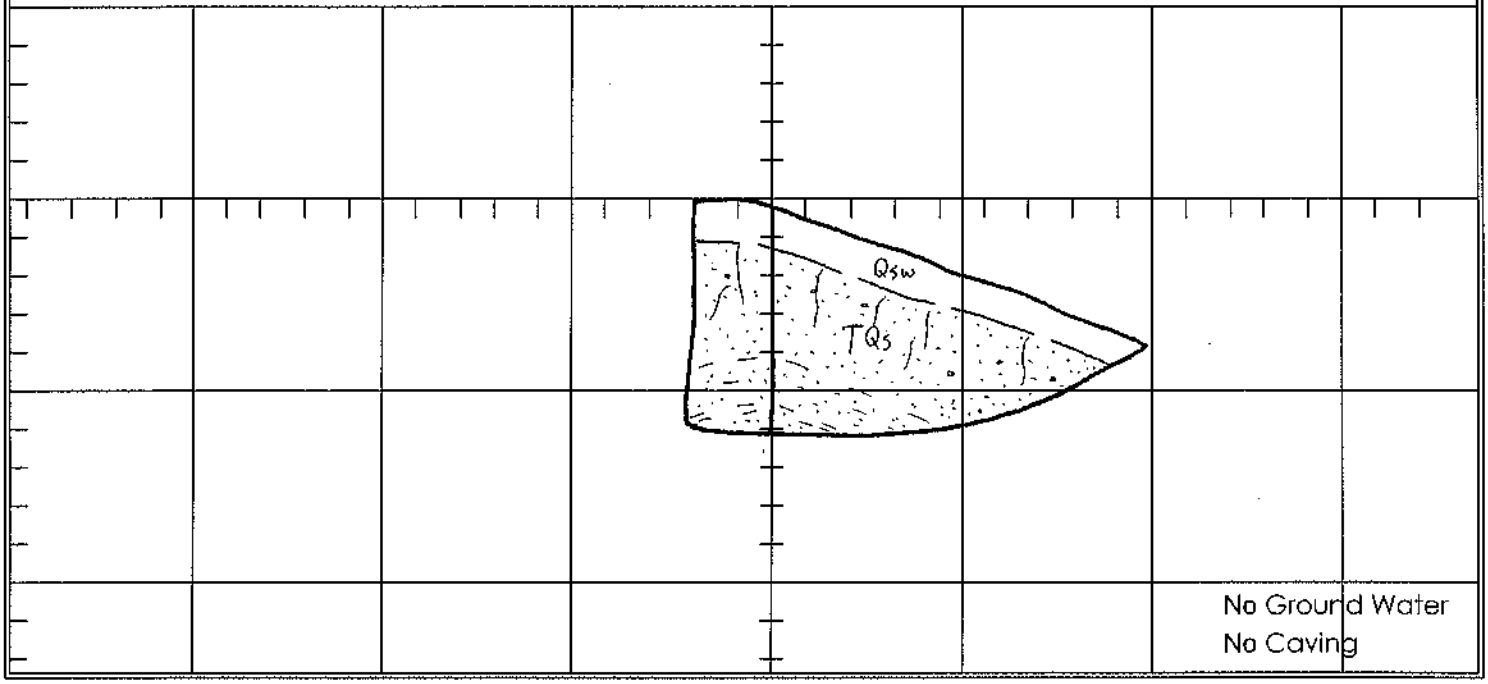
TOTAL DEPTH: 9.5 feet ←N46E SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-4A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1298	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 1')** @ 0' Brown clayey sand; soft; damp **BEDROCK; TQs (1 - 6')** @ 1' Mottled gray and yellowish brown sandstone and pebbly sandstone; moderately hard @ 3' Gray; moderately hard to hard @ 4' 1 to 3"-thick brown siltstone interbeds **COMMENTS:** Bedrock is weathered to 3'	B: N86E, 24SE B: N79W, 28SW			
5									
10									
15									
20									

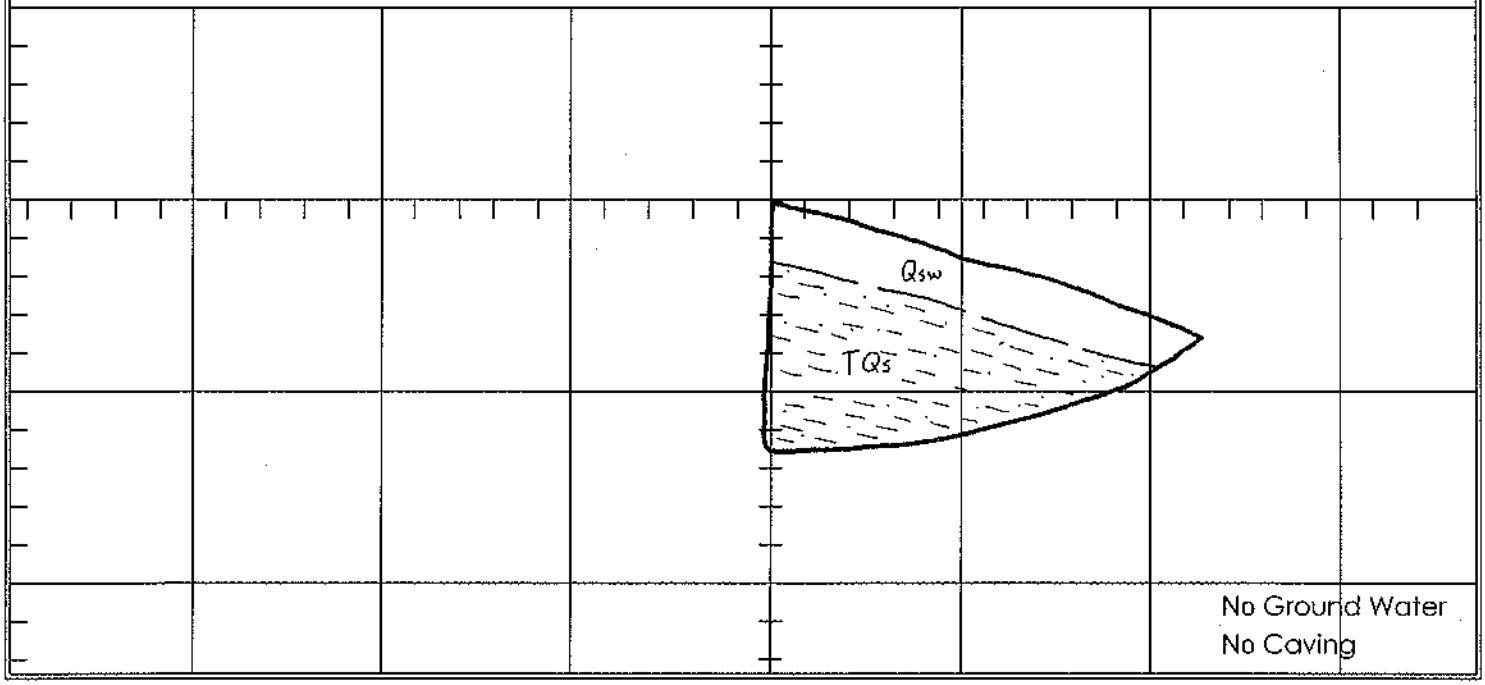
TOTAL DEPTH: 6 feet ←N18W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-5A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1285	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 1.5')** @ 0' Brown to yellowish-brown silty sand; loose; dry to damp **BEDROCK; TQs (1.5 - 6.5')** @ 1.5' Strong brown mudstone @ 3' Gray sandy mudstone @ 4' Strong brown (with same gray mottling) **COMMENTS:** Bedrock is weathered to 4' Bulk sample @ 6 - 6.5'	Apx B: N74E, 25SE			
5									
10									
15									
20									

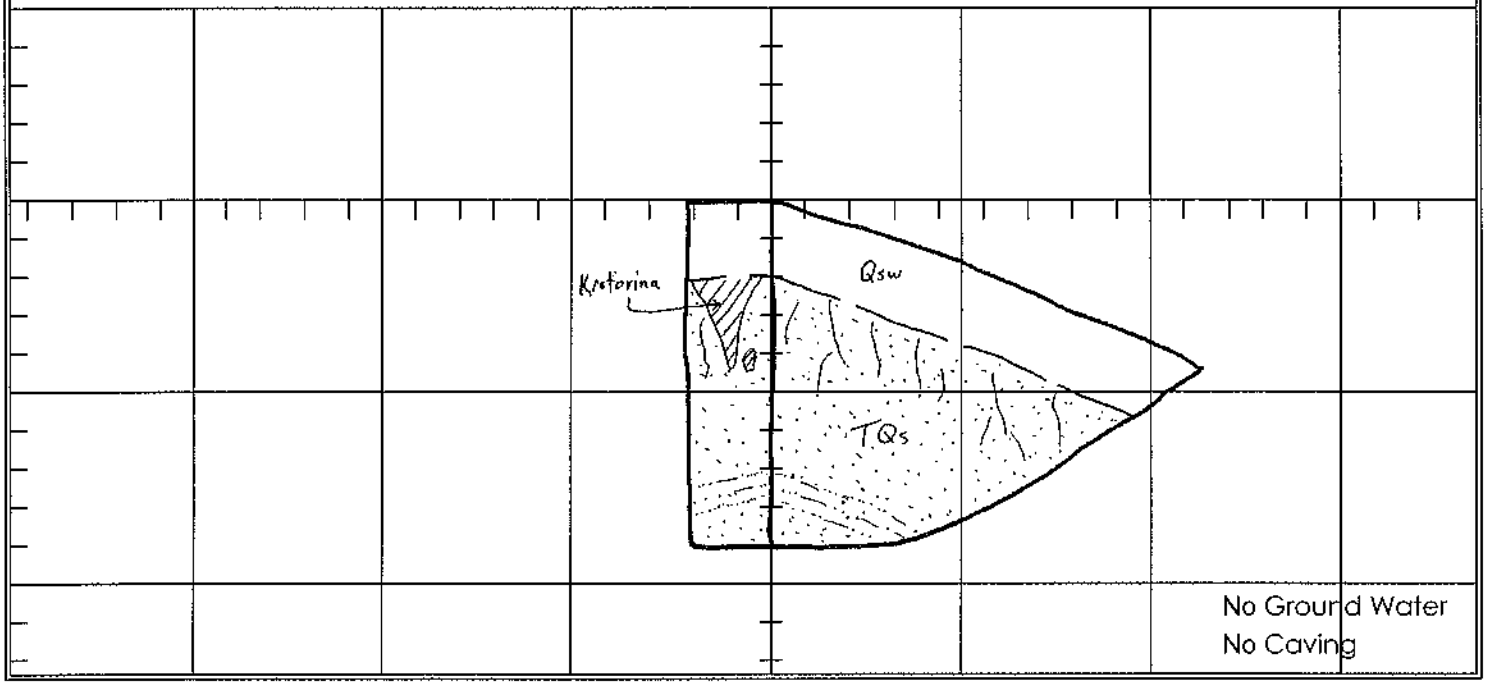
TOTAL DEPTH: 6.5 feet ←N42E SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-6A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1272	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2')** @ 0' Brown silty sand; loose; dry to damp @ 2' Yellowish-brown sandstone; moderately hard; dry to damp; some krotovina; massive				
5					**BEDROCK; TQs (2 - 9')** @ 5' Moderately hard to hard @ 7' 6"-thick laminated silty sandstone band @ 8' Very pale gray	B: N85W, 28SW			
10					**COMMENTS:** Bedrock is weathered to 5'				
15									
20									

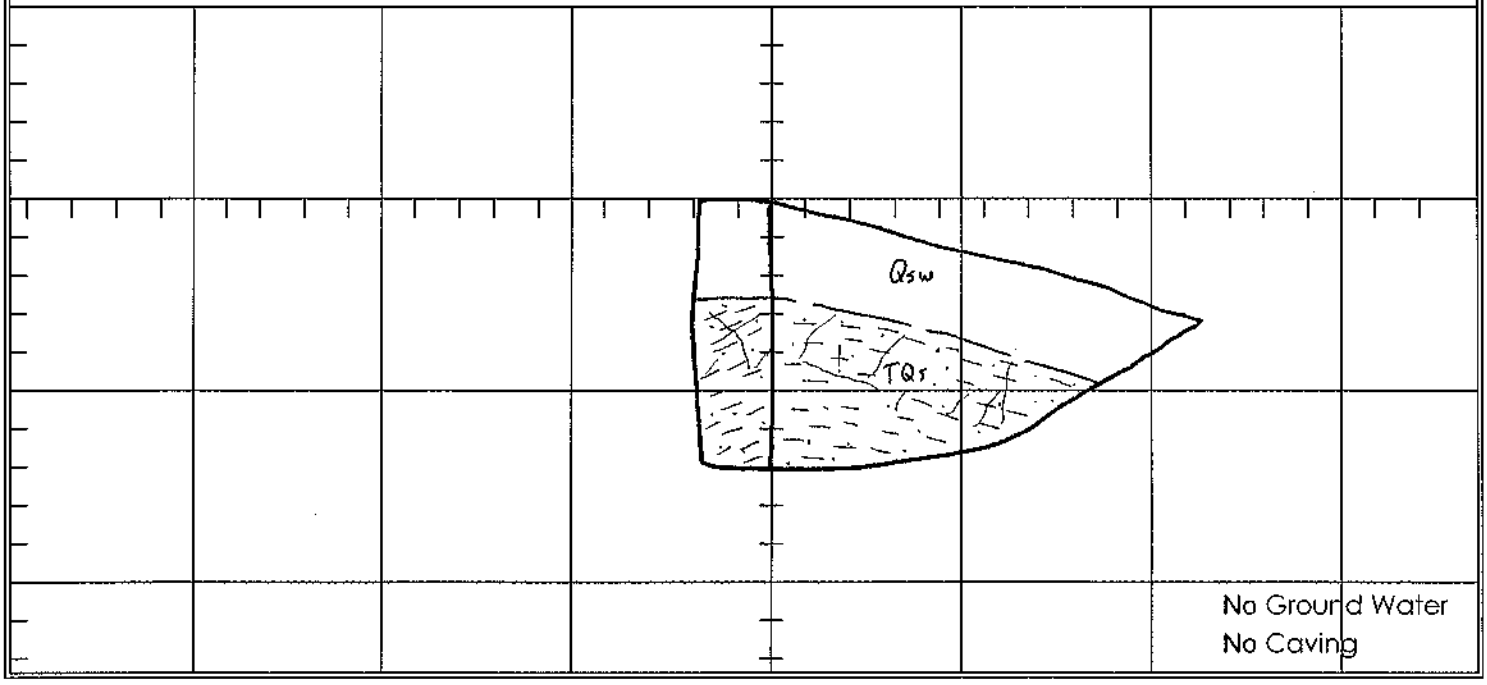
TOTAL DEPTH: 9 feet ←N17W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-7A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1279	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2.5')** @ 0' Dark yellowish-brown silty, clayey sand; loose; dry to damp **BEDROCK; TQs (2.5 - 7')** @ 2.5' Brown to dark yellowish-brown sandy mudstone; moderately hard; damp; several caliche-lined fractures to approximately 4' (possibly creep affected) **COMMENTS:** Bedrock is weathered to 4'	B: N79E, 27SW			
5									
10									
15									
20									

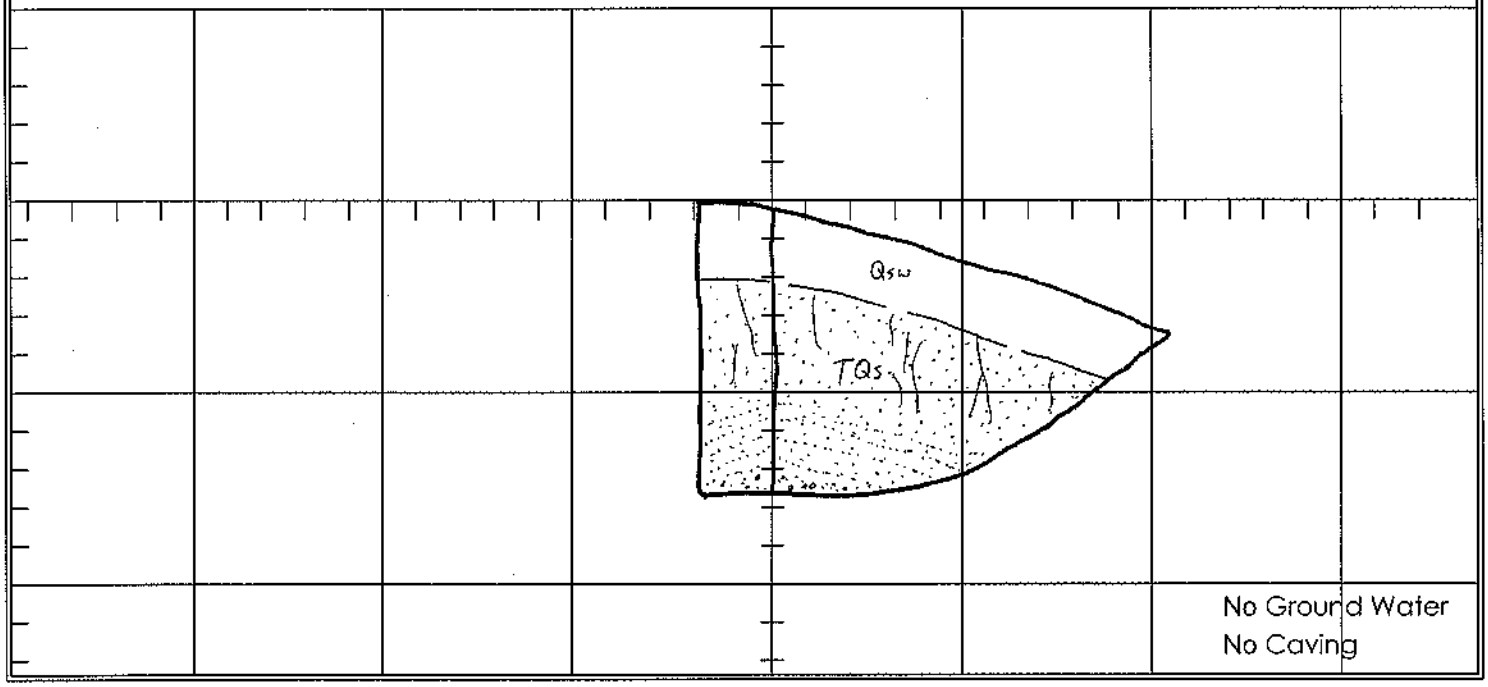
TOTAL DEPTH: 7 feet ←N46W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-8A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1274	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2')** @ 0' Brown sitly sand; loose; dry to damp				
					BEDROCK; TQs (2 - 7.5') @ 2' Yellowish-brown sandstone; soft to moderately hard; damp				
5					@ 4.5' Moderately hard @ 5' Laminated sandstone	B: N75W, 28SW B: N81W, 26SW			
					@ 7' Pebbly sandstone				
10					**COMMENTS:** Bedrock is weathered to 4.5'				
15									
20									

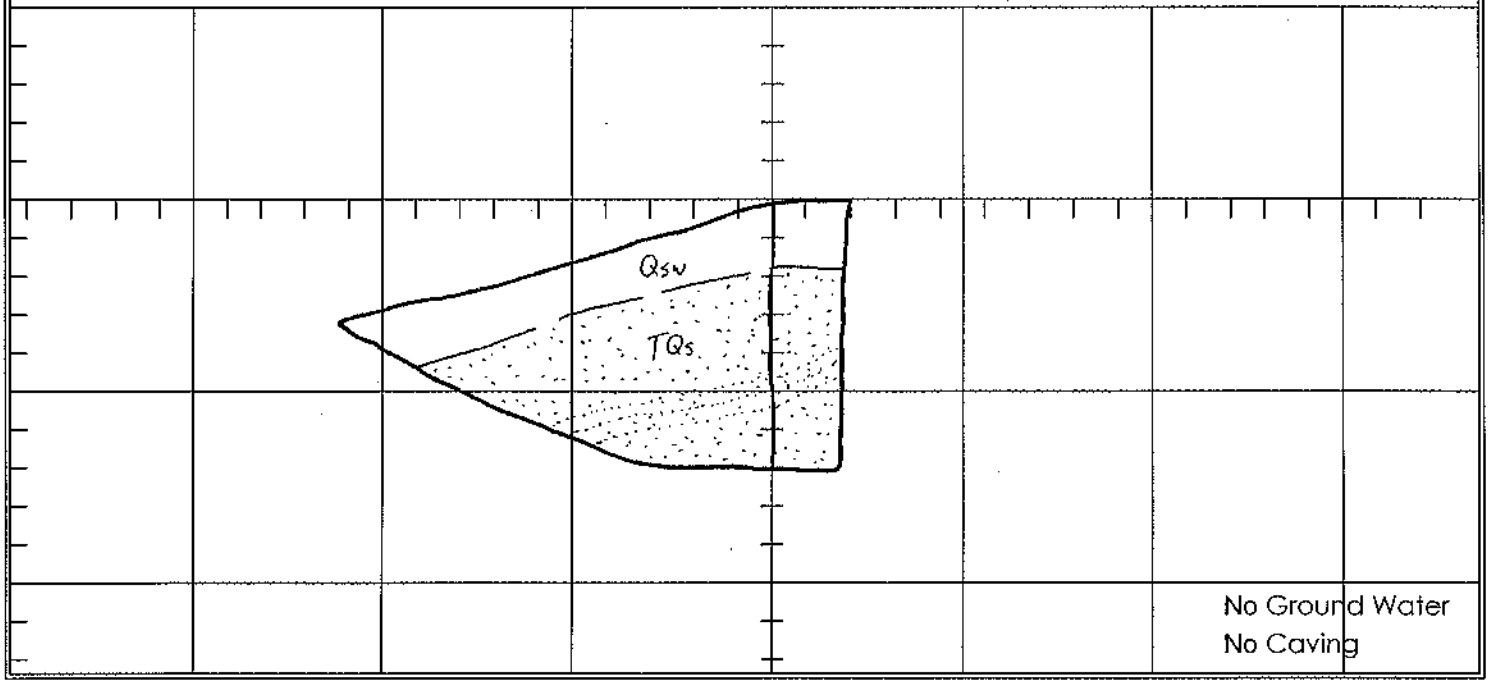
TOTAL DEPTH: 7.5 feet ←N30W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-9A**	
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18		
	LOGGED BY: MBW		
	EXCAVATED: 4/30/07		
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1295		

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 1.75')** @ 0' Brown silty sand; loose; dry to damp; abundant voids (up to 1/8" diameter) **BEDROCK; TQs (1.75 - 7')** @ 1.75' Pale yellowish-brown sandstone; moderately hard; dry to damp; massive @ 4.5' 1'-thick laminated sandstone bed	B: N74E, 30SE			
5									
10									
15									
20									

TOTAL DEPTH: 7 feet West→ SCALE: 1 inch = 5 feet

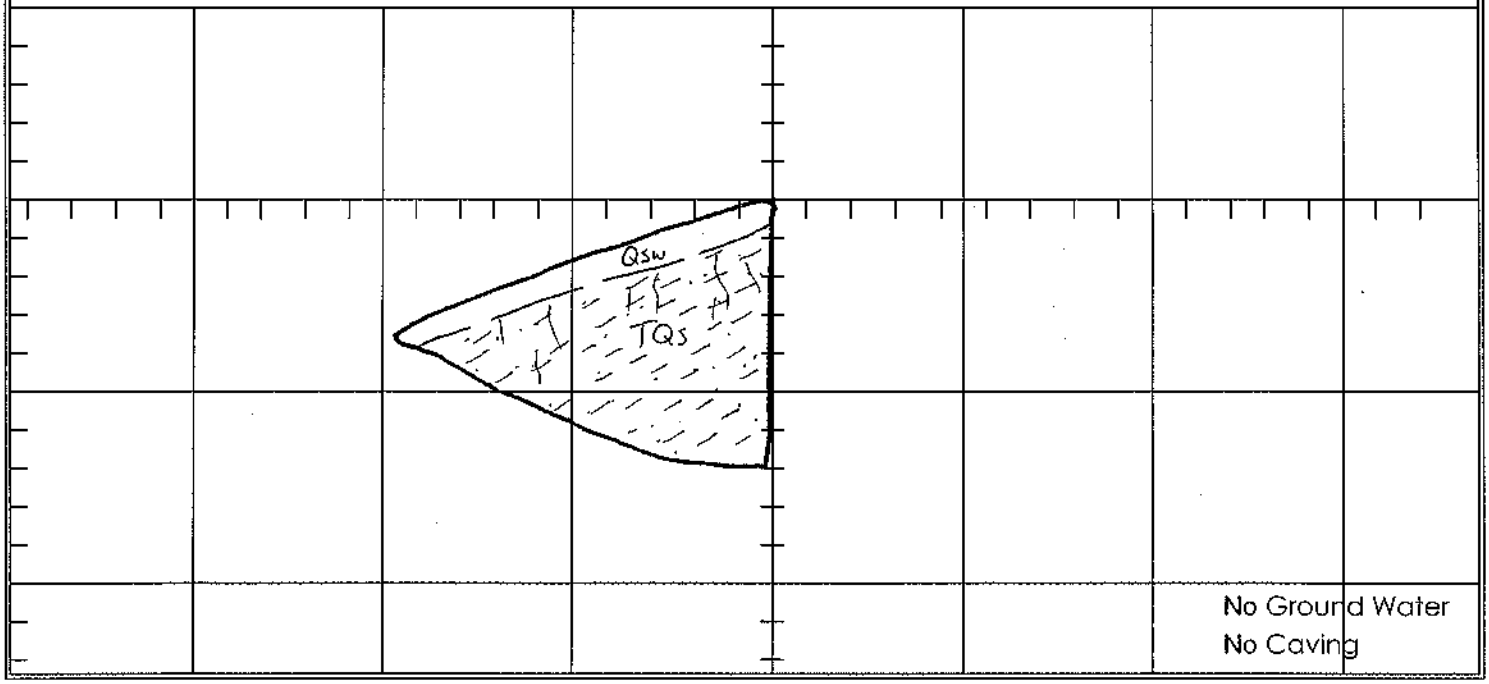


CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-10A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1275	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 0.75')** @ 0' Brown clayey sand; loose; dry to damp **BEDROCK; TQs (0.75 - 7')** @ 0.75' Strong-brown mudstone; moderately hard; damp @ 2' gray @ 4' Grades to olive-gray siltstone	Apx B: E-W, 31S			
5									
10									
15									
20									

COMMENTS:
Bedrock is weathered to 2'

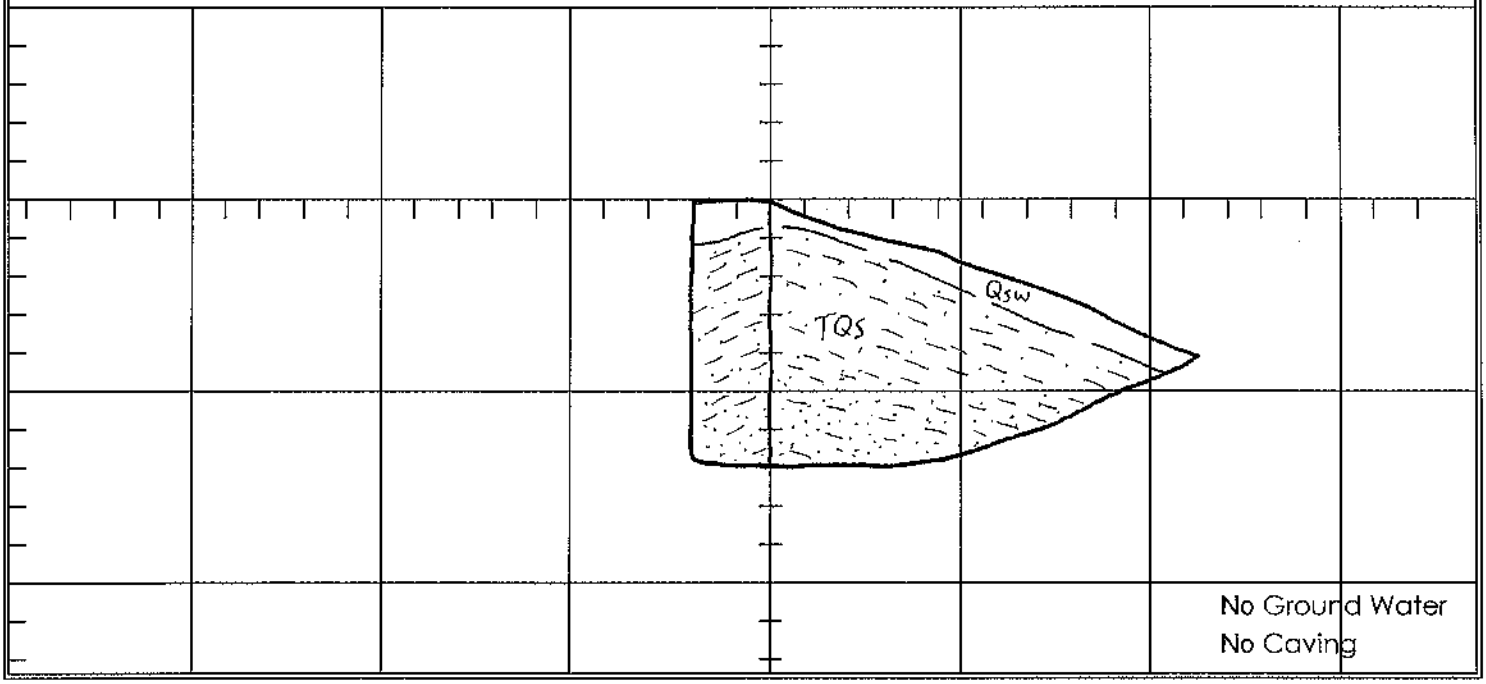
TOTAL DEPTH: 7 feet N34W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-11A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1260	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 1')** @ 0' Brown silty sand with pebbles; loose; dry to damp **BEDROCK; TQs (1 - 7')** @ 1' Strong brown sandy mudstone; moderately hard; damp; massive				
5					@ 5' Gray clayey sandstone; moderately hard to hard; massive	Apx B: N79E, 30SE			
10					**COMMENTS:** Bedrock is weathered to 4'				
15									
20									

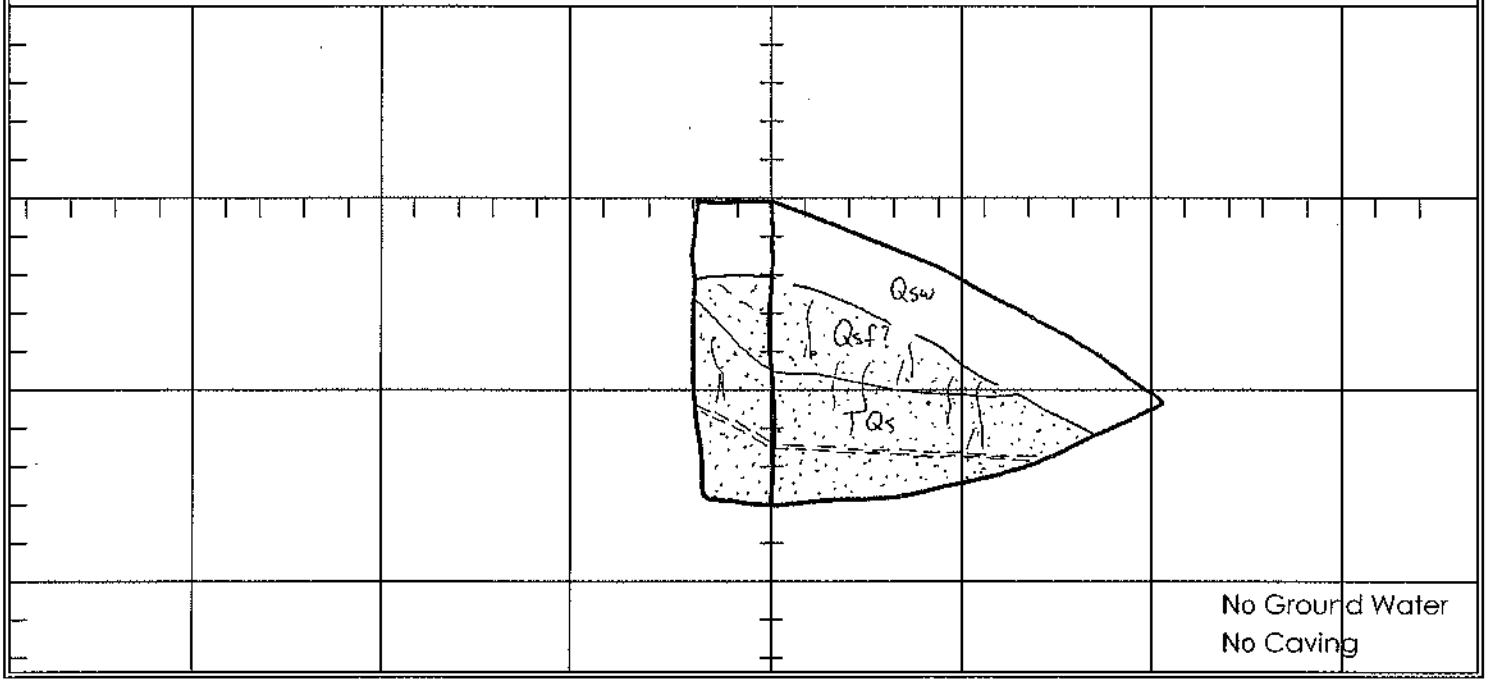
TOTAL DEPTH: 7 feet ←N85W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-12A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1340	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2')** @ 0' Yellowish-brown silty sand; loose; dry				
					SURFICIAL FAILURE?; Qsf? (2 - 4.5') @ 2' Yellowish-brown sand and pebbly sand; loose to moderately hard; dry	SS: N74E, 39SE			
5					**BEDROCK; TQs (4.5 - 8')** @ 4.5' Yellowish-brown sandstone; moderately hard; dry to damp @ 6' 2"-thick brown clay bed	B: N69E, 28SE			
					COMMENTS: Bedrock is weathered to 6'				
10									
15									
20									

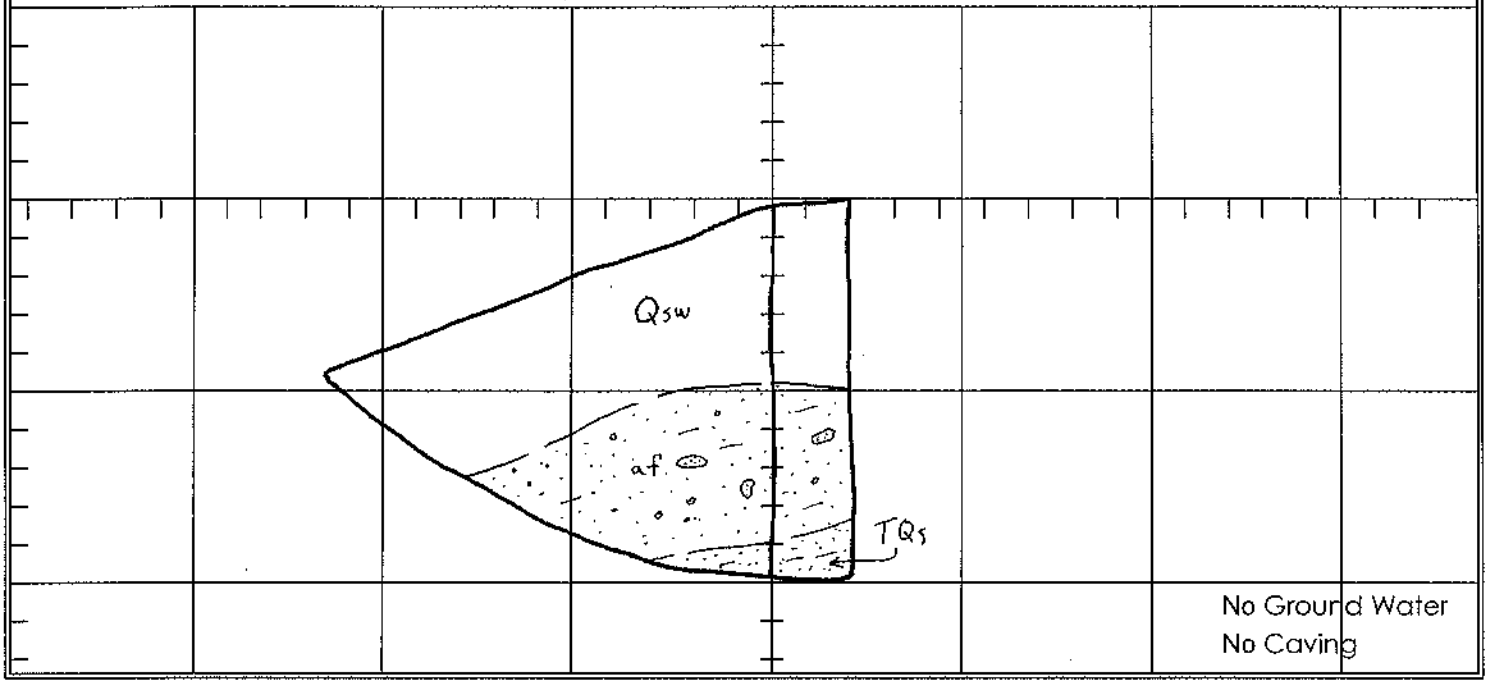
TOTAL DEPTH: 8 feet ←N75E SCALE: 1 inch = 5 feet

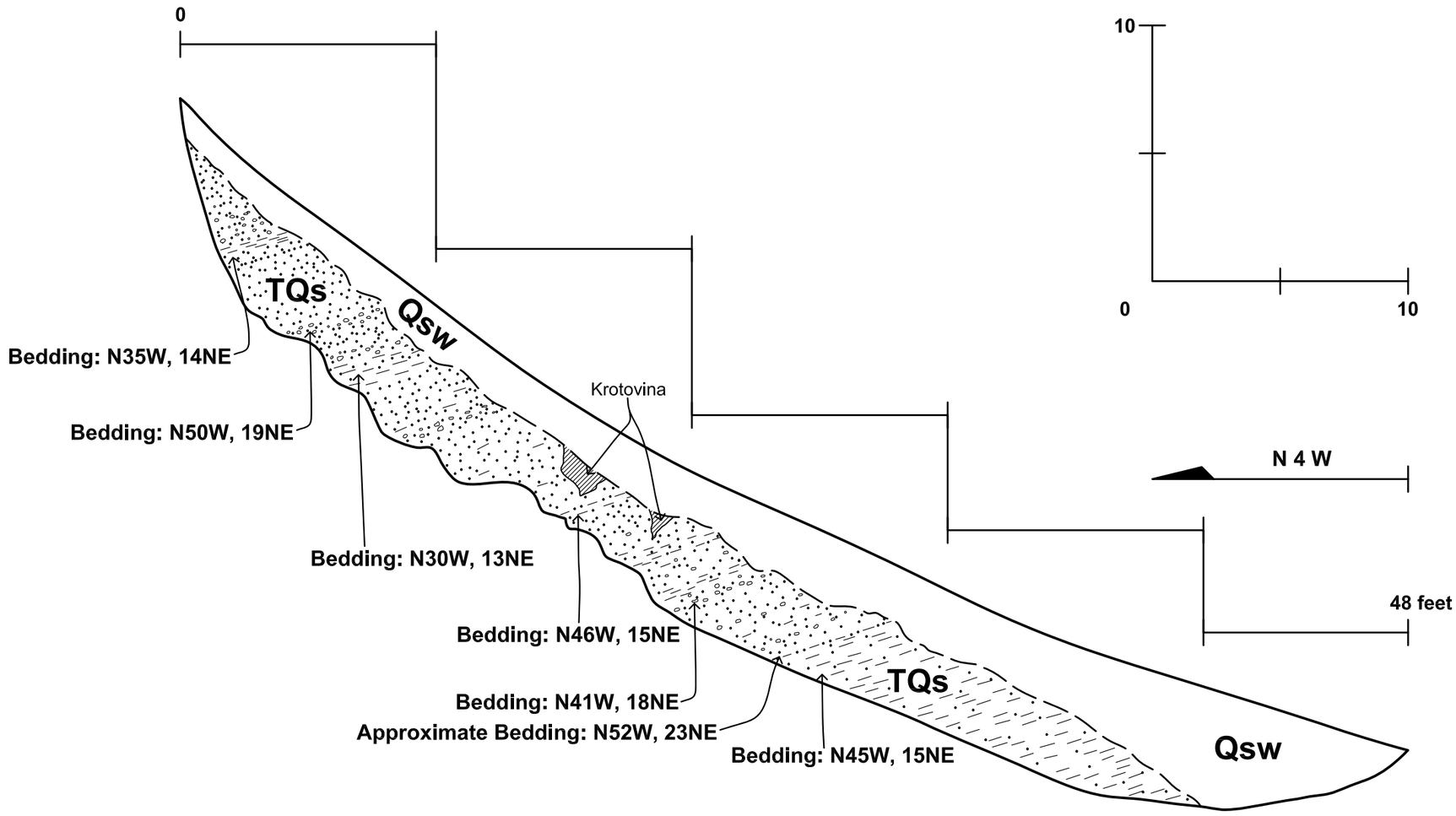


CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-13A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 4/30/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1304	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 5')** @ 0' Yellowish-brown silty, pebbly sand; loose; dry to damp				
5					**ARTIFICIAL FILL; af (5 - 9')** @ 5' Yellowish-brown silty sand with pebbles and clasts of light-gray sandstone; loose; friable; dry to damp	Col: N80W, 28SW			
10					**BEDROCK; TQs (9 - 10')** @ 9' Yellowish-brown silty fine-grained sandstone; moderately hard; damp				
15									
20									

TOTAL DEPTH: 10 feet N55W→ SCALE: 1 inch = 5 feet





Slopewash (Qsw): Brown silty sand; loose; dry to damp

Saugus Formation (TQs: Interbedded yellowish-brown to light gray sandstone to pebbly sandstone and strong brown to gray mudstone to sandy mudstone; moderately hard to hard; dry to damp

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

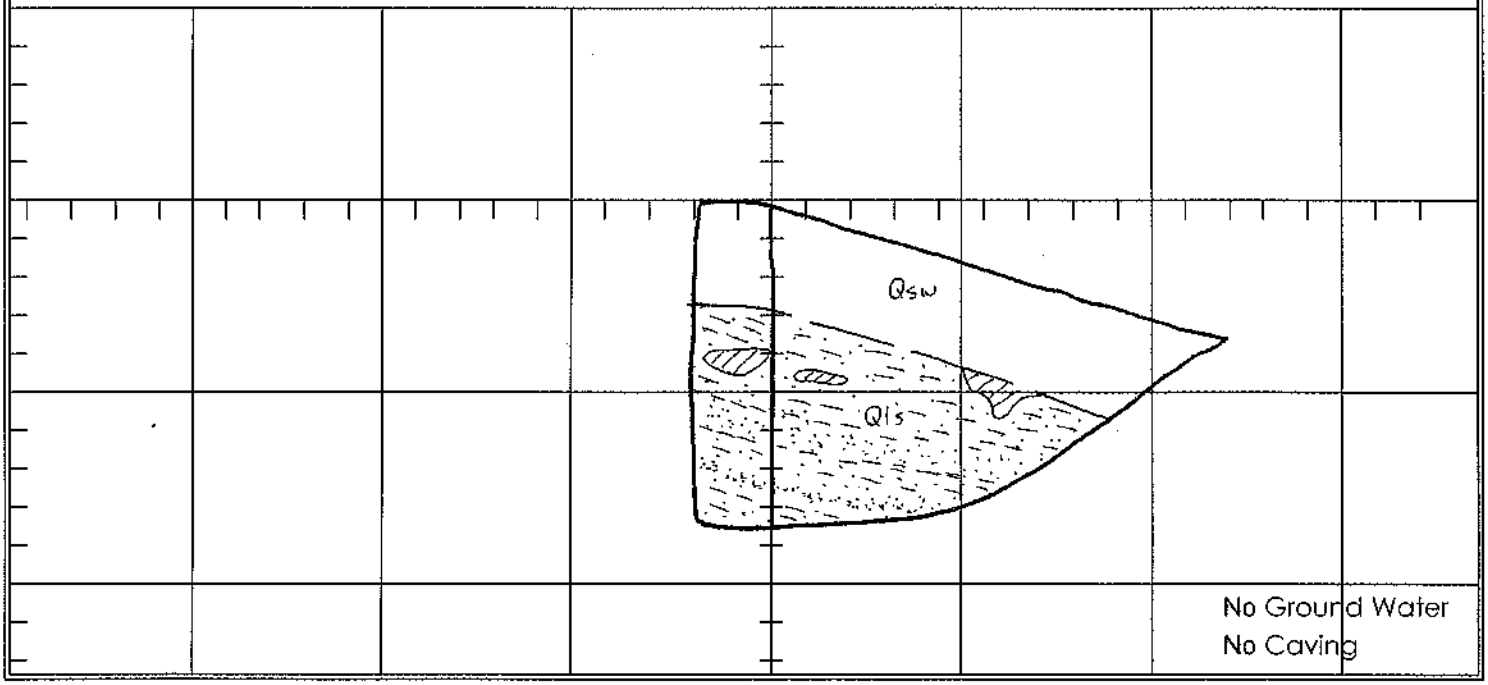
TRENCH LOG - T14A

Date: 6/8/18	*Job No.:* 07-1245A-4
Scale: 1" = 5'	
Geology by: MBW	*Revised:*
Drawn by: MBW	

CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-15A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/1/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1201	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2.75')** @ 0' Brown silty sand; loose; dry to damp; abundant voids (up to 1/8" diameter)				
					QUATERNARY LANDSLIDE; Qls (2.75 - 8.5') @ 2.75' Strong brown sandy mudstone; soft to moderately hard; massive @ 4' Large krotovina				
5					@ 5.5' Interbedded yellowish-brown siltstone, brown mudstone, and light gray sandstone	B: N40W, 21WE B: N50W, 20NE			
					COMMENTS: Abundant krotovina				
10									
15									
20									

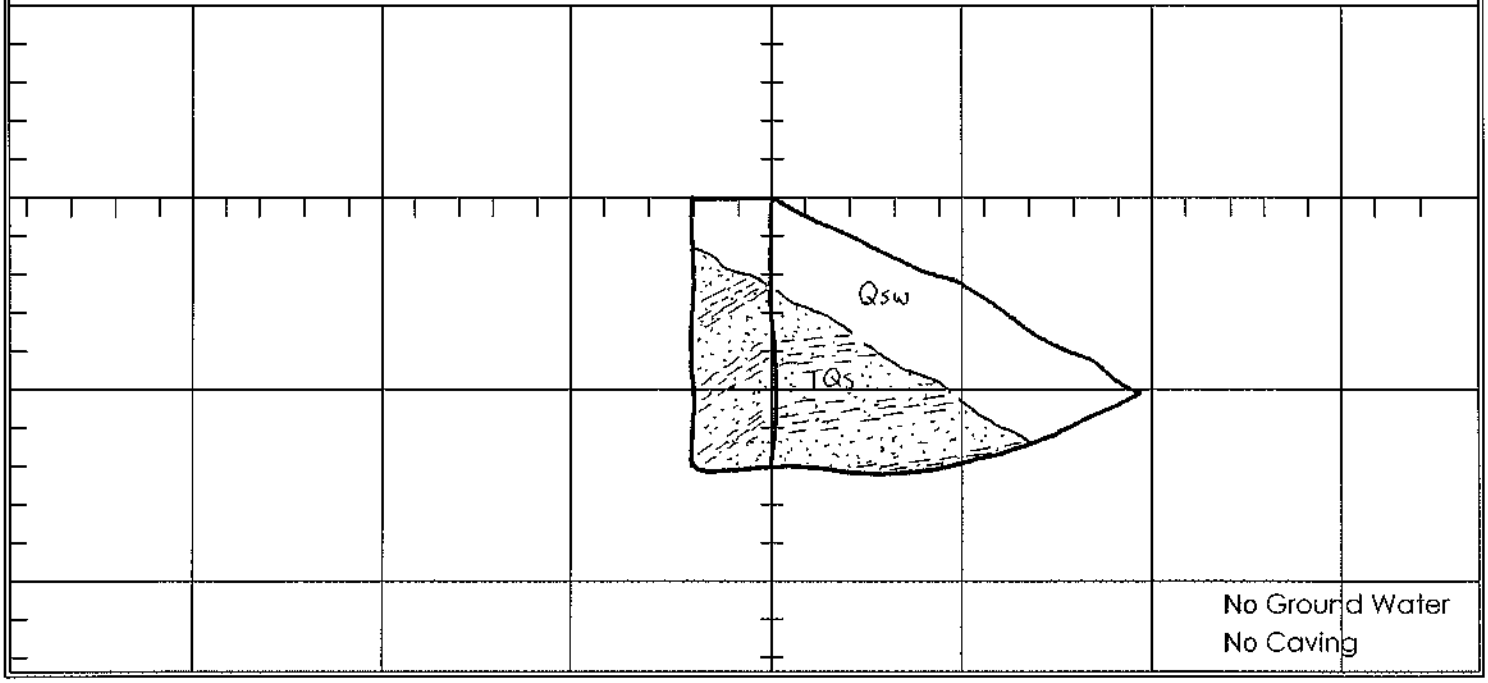
TOTAL DEPTH: 8.5 feet ←N24W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-16A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/1/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1228	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2')** @ 0' Brown silty, clayey sand; loose; dry to damp **BEDROCK; TQs (2 - 7')** @ 2' Interbedded strong-brown mudstone and light-gray sandstone; moderately hard; dry to damp @ 3' Moderately hard to hard	B: N83E, 36SE B: N80E, 37SE			
5					**COMMENTS:** Bedrock is weathered to 3'				
10									
15									
20									

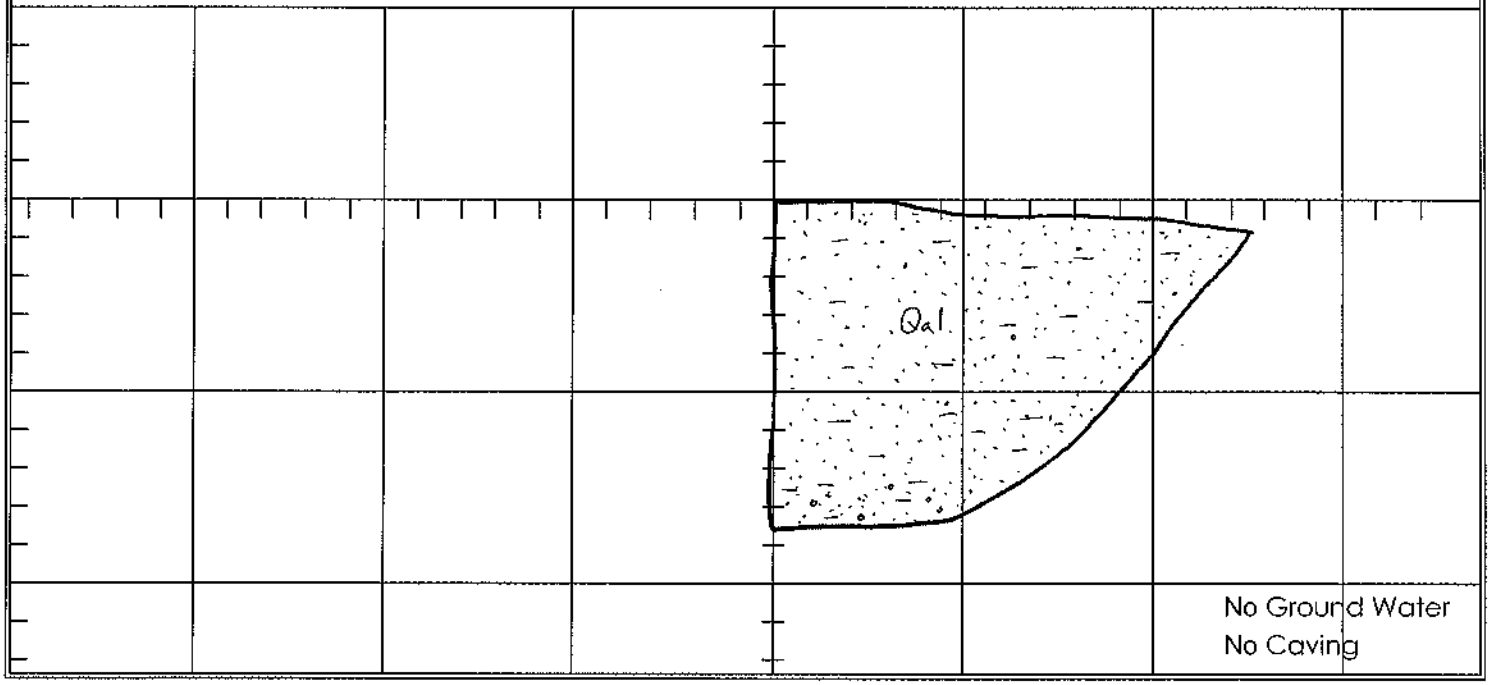
TOTAL DEPTH: 7 feet N85SE→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-17A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/1/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1236	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY ALLUVIUM; Qal (0 - 8.5')** @ 0' Brown silty sand; loose; dry to damp; abundant voids; abundant roots to 2'				
5					@ 5' Dark yellowish-brown; damp; scattered voids				
					@ 7' Silty sand with pebbles; medium dense; damp to moist; very few voids				
10					**COMMENTS:** Bulk sample @ 0 - 7'				
15									
20									

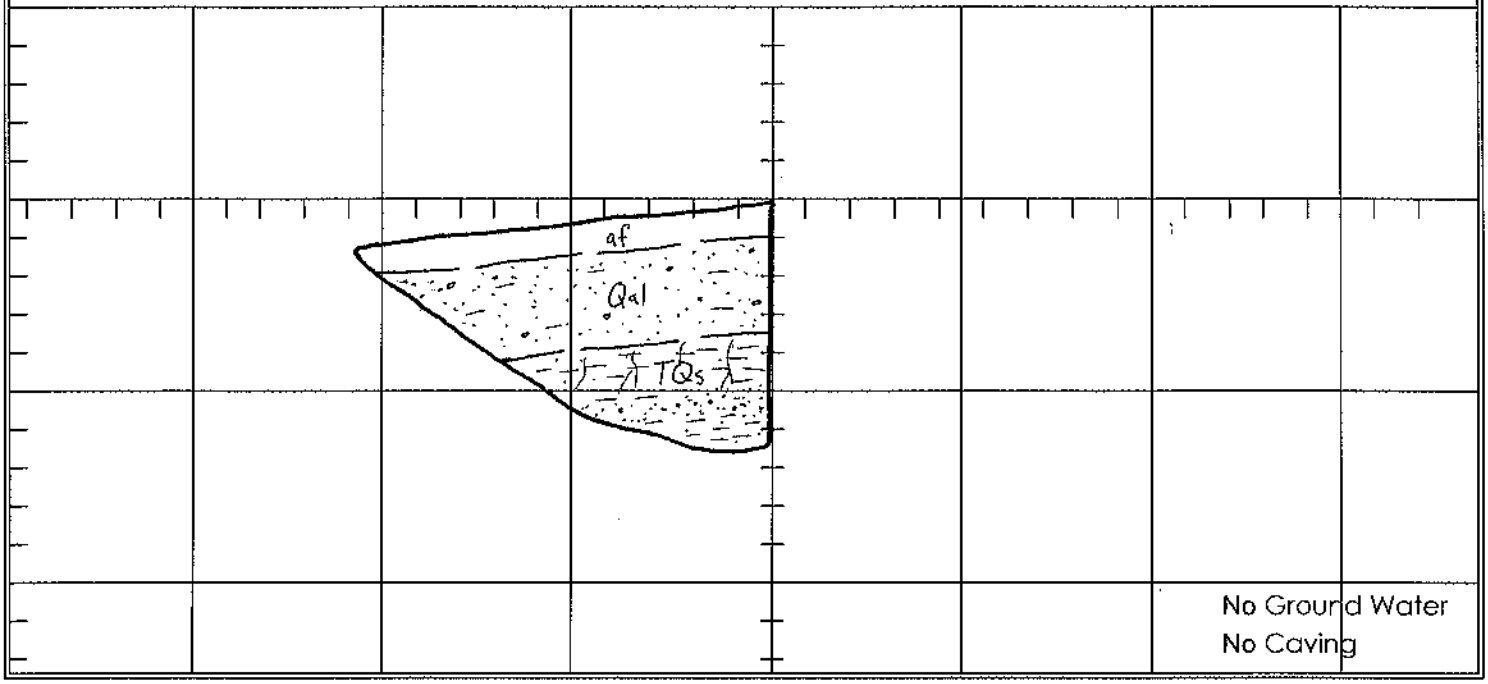
TOTAL DEPTH: 8.5 feet ←N85W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-18A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/1/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1282	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**ARTIFICIAL FILL; af (0 - 1')** @ 0' Yellowish-brown silty sand with pebbles; loose; dry; contains pieces of trash **QUATERNARY ALLUVIUM; Qal (1 - 3.5')** @ 1' Brown silty sand with pebbles; loose; dry to damp **BEDROCK; TQs (3.5 - 6.5')** @ 3.5' Brown sandy mudstone; moderatly hard; damp; massive @ 4.5' Brown clayey sandstone @ 5' Strong brown mudstone **COMMENTS:** Bedrock is weathered to 5'				
5									
10									
15									
20									

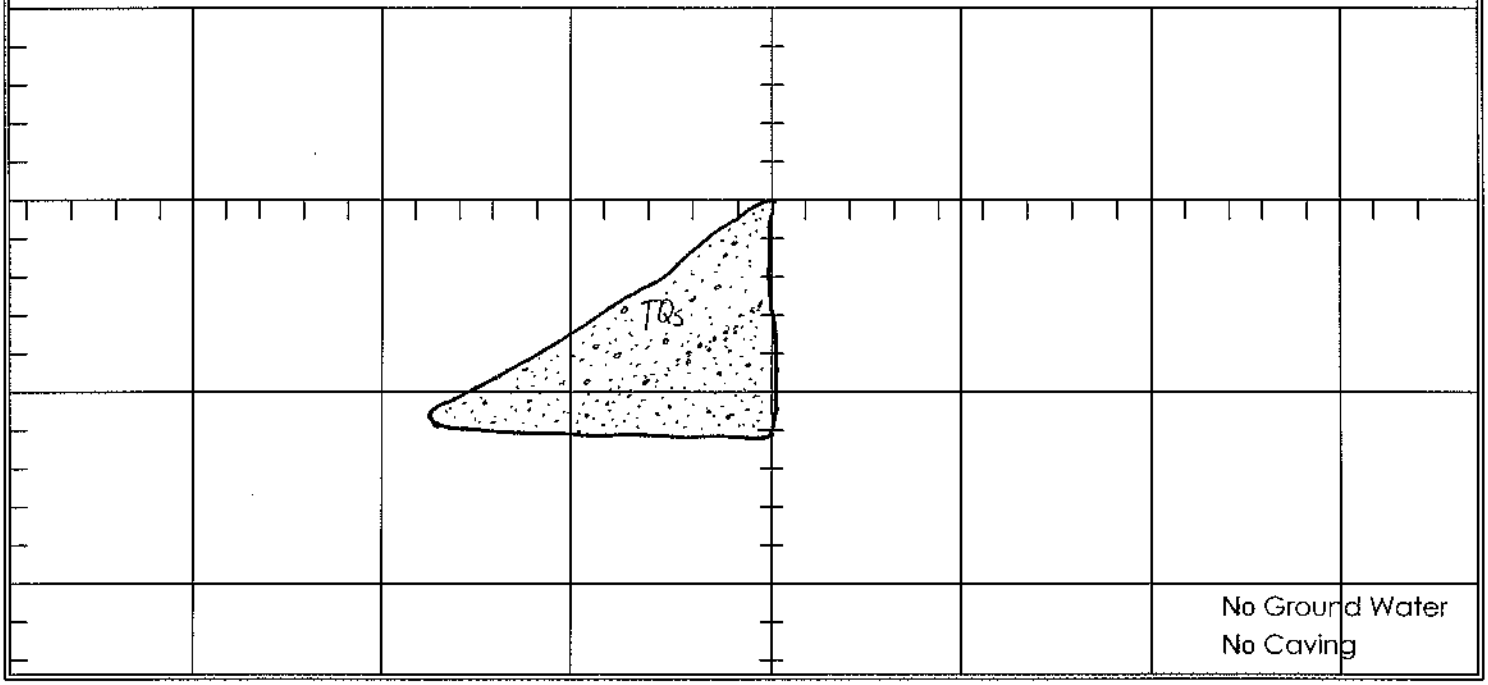
TOTAL DEPTH: 6.5 feet N7E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-19A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/1/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1279	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**BEDROCK; TQs (0 - 6')** @ 0' Yellowish-brown pebbly sandstone; hard; dry to damp; massive	Apx B: N85W, 43SW			
5					**COMMENTS:** Bulk sample @ 0 - 6'				
10									
15									
20									

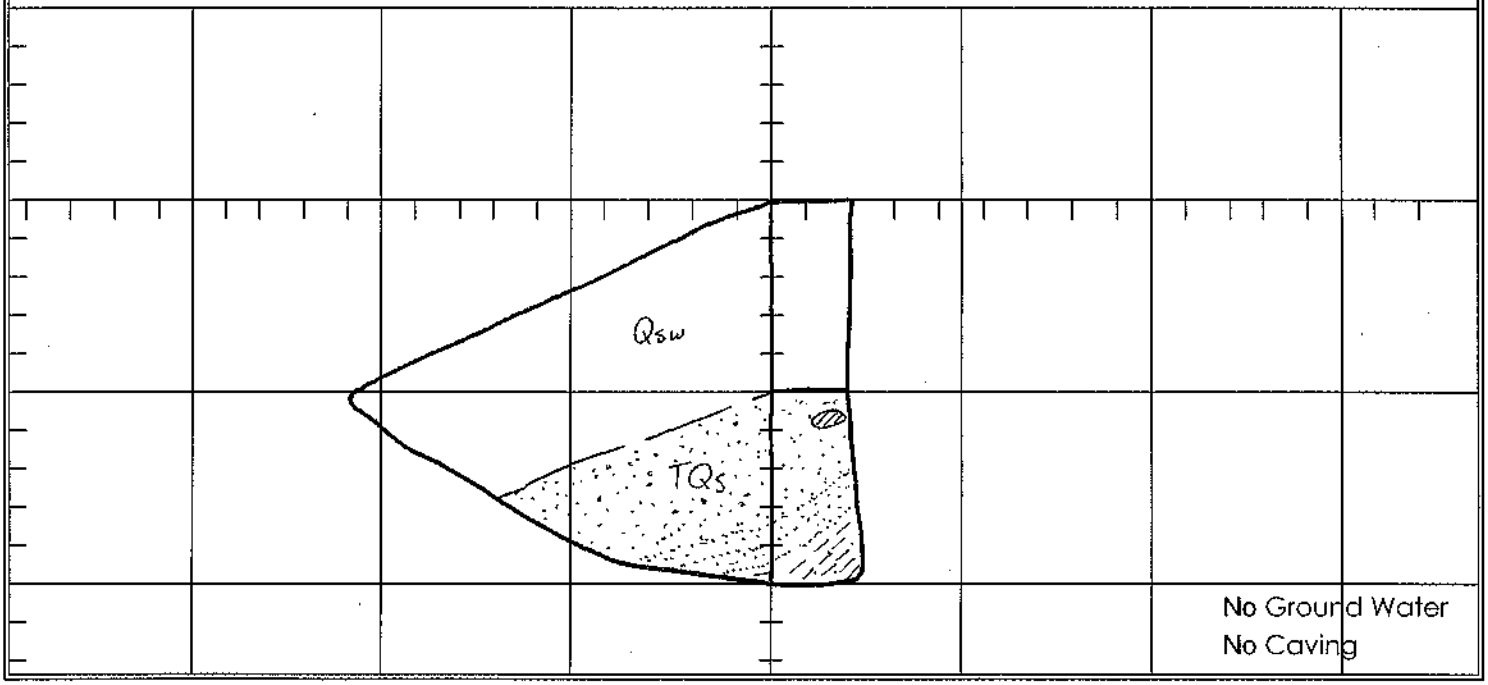
TOTAL DEPTH: 6 feet N13W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-20A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/1/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1304	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 5')** @ 0' Brown silty sand; loose; dry				
5					**BEDROCK; TQs (5 - 10)** @ 5' Pale yellowish-brown sandstone; moderately hard; damp				
					@ 8' Laminated sandstone	B: E - W; 43S			
10					@ 9' Brown mudstone	B: N87W, 44SW			
					COMMENTS: Bedrock is weathered to 6' Drive sample @ 6' (trench was benched to the south)				
15									
20									

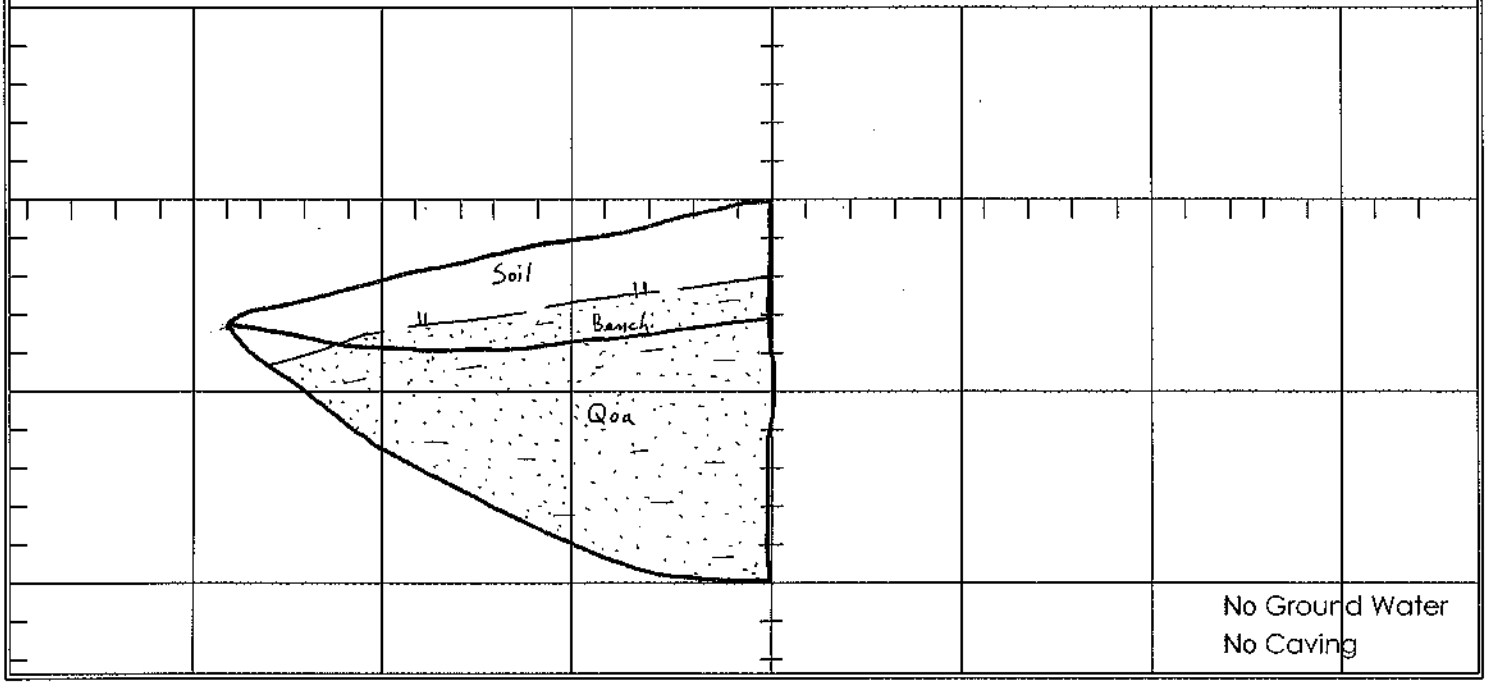
TOTAL DEPTH: 10 feet N77W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-21A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1286	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SOIL; s (0 - 2')** @ 0' Brown silty, clayey sand with scattered pebbles; loose; damp; abundant roots and voids (up to 1/8" diamter) **QUATERNARY ALLUVIUM; Qal (2 - 10')** @ 2' Brown to dark yellowish-brown silty sand; loose; damp; voids (up to 1/16" diameter) @ 6' Dark yellowish-brown; loose to moderately dense; voids up to 1/32" diameter @ 8' Moderately dense; pinhole voids @ 9' No voids observed				
5									
10									
15									
20									

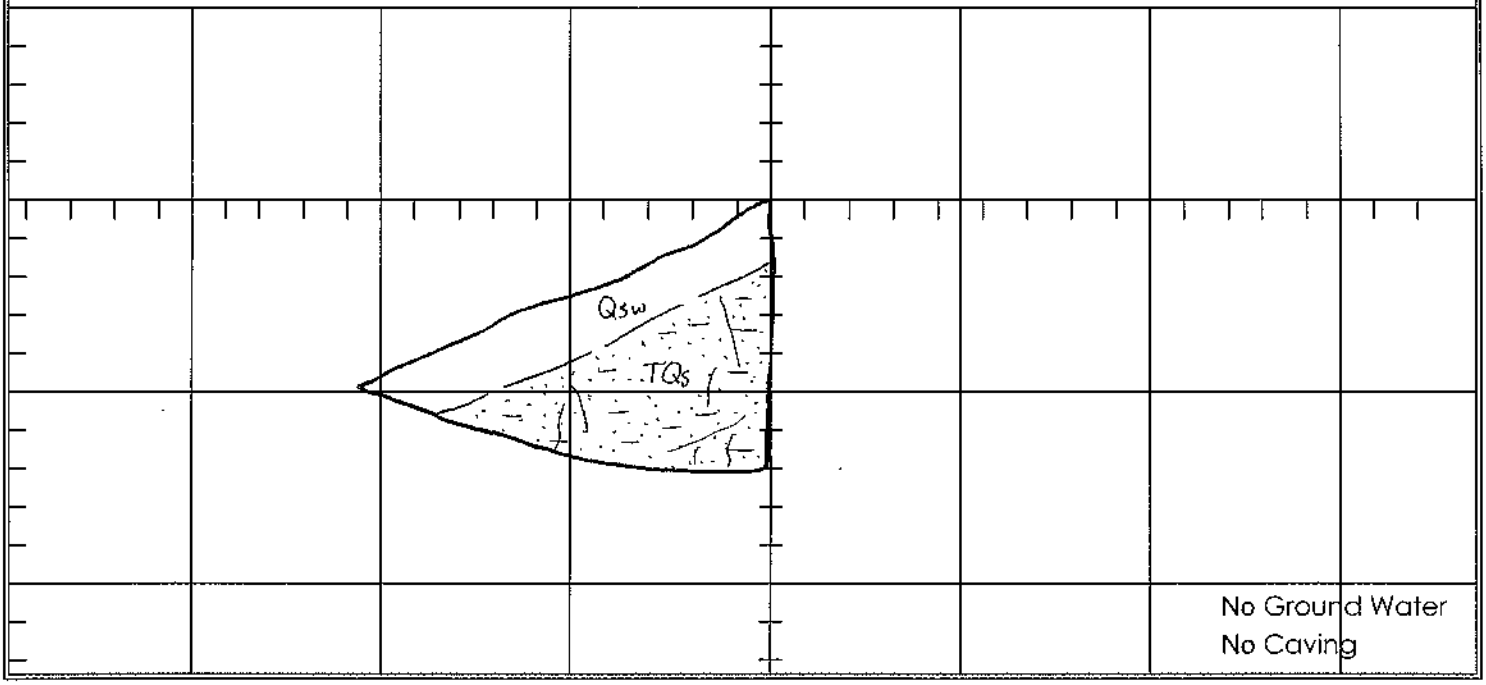
TOTAL DEPTH: 10 feet ←N8W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-22A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1317	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 1.5')** @ 0' Yellowish-brown pebbly sand; loose; dry to damp @ 1' Brown silty sand; damp **BEDROCK; TQs (1.5 - 7')** @ 1.5' Strong brown clayey sandstone; moderately hard; dry to damp; massive @ 5' Grades to gray clayey sandstone; scattered caliche-lined fractures; moderately hard to hard **COMMENTS:** Bedrock is weathered to 5'	Structureless			
5									
10									
15									
20									

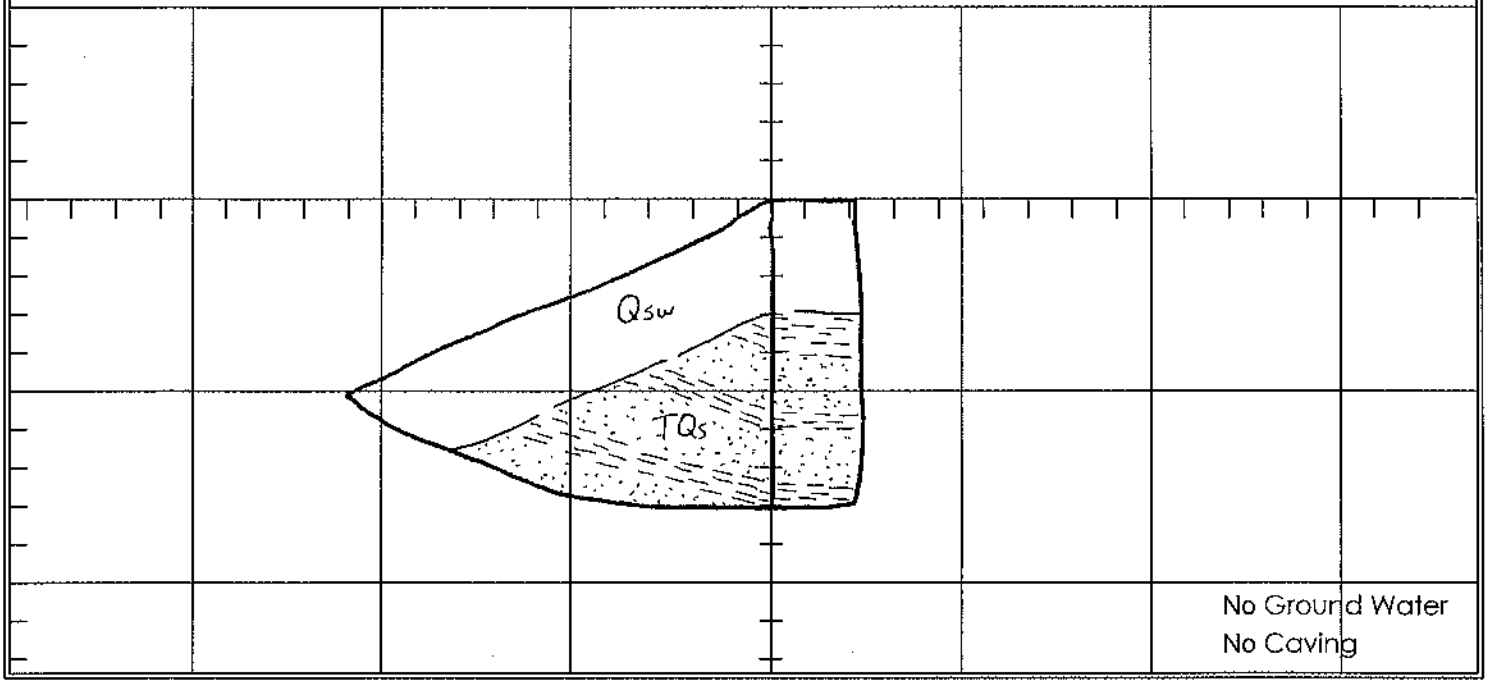
TOTAL DEPTH: 7 feet ←N70W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-23A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1319	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 3')** @ 0' Yellowish-brown silty sand; loose; dry to damp				
5					**BEDROCK; TQs (3 - 8')** @ 3' Interbedded strong-brown mudstone and light-gray sandstone; moderately hard; damp	B: N56E, 23SW B: N58E, 22SW			
10					**COMMENTS:** Bedrock is weathered to 4.5'				
15									
20									

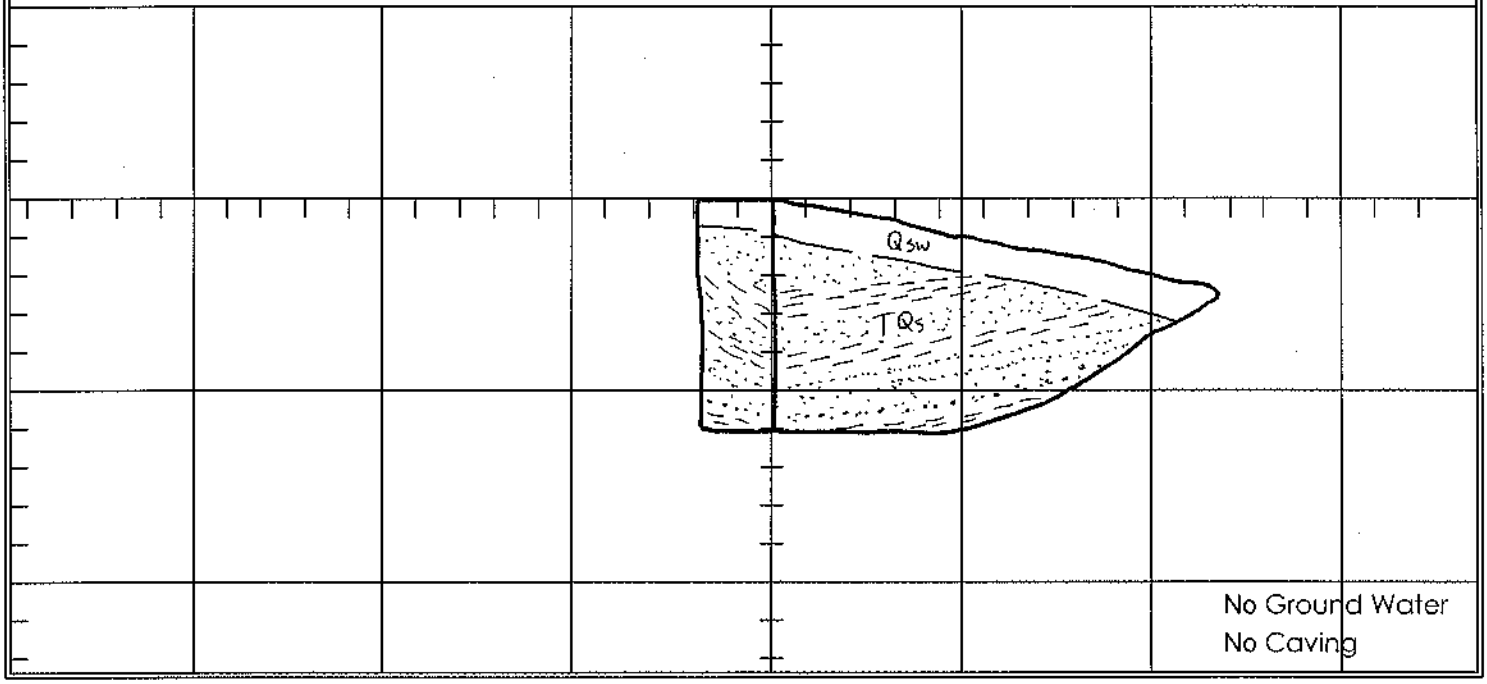
TOTAL DEPTH: 8 feet ←N43W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-24A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1308	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 0.75')** @ 0' Brown silty sand; loose; dry to damp **BEDROCK; TQs (0.75 - 6')** @ 0.75' Yellowish-brown sandstone; moderately hard; dry to damp @ 2' Interbedded strong brown to gray mudstone and sandstone	B: N63E, 25SE			
5					@ 5' Local laminations within the sandstone	B: N72E, 28SE			
10					**COMMENTS:** Bedrock is weathered to 3'				
15									
20									

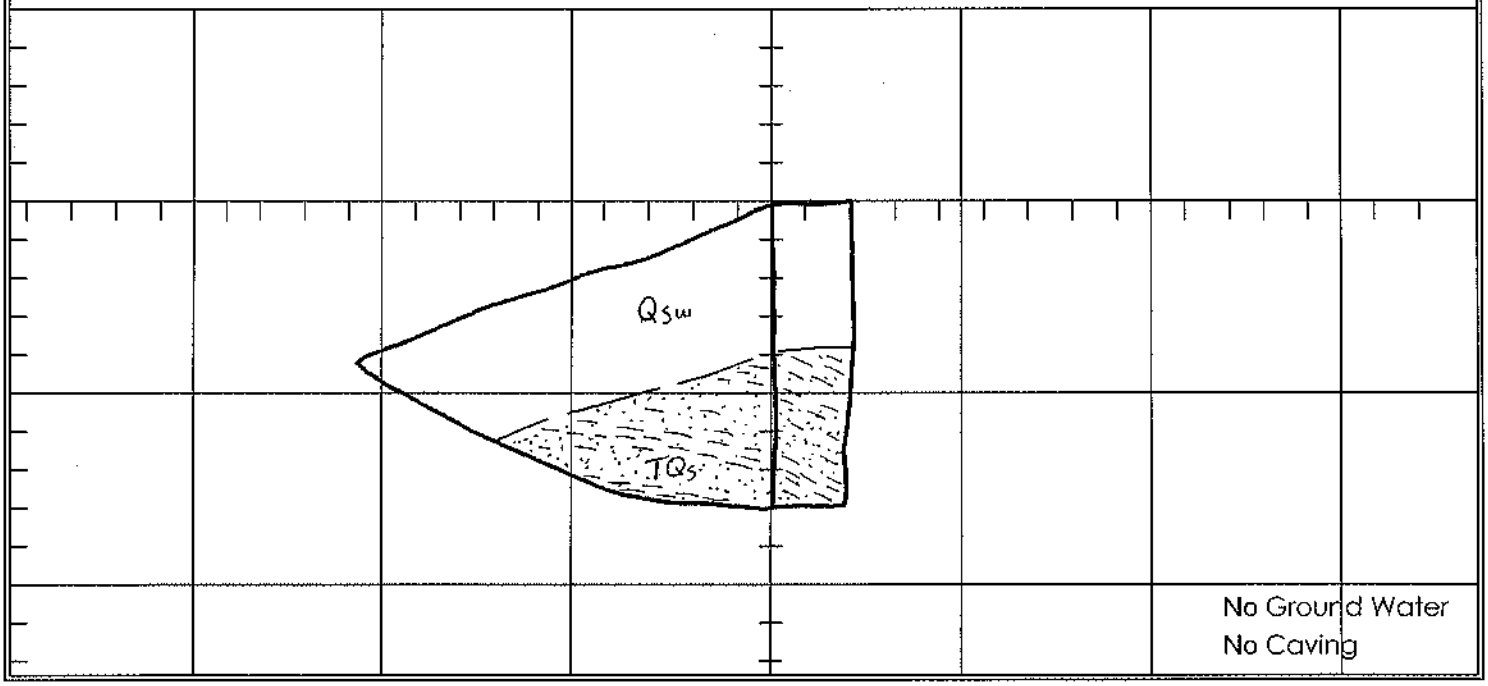
TOTAL DEPTH: 6 feet N72W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-25A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1309	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 4')** @ 0' Yellowish-brown silty sand; loose; dry to damp				
5					**BEDROCK; TQs (4 - 8')** @ 4' Interbedded strong-brown mudstone and gray sandy mudstone to clayey sandstone; moderately hard; dry to damp	B: N65E, 22SE B: N69E, 24SE			
10					**COMMENTS:** Bedrock is weathered to 5'				
15									
20									

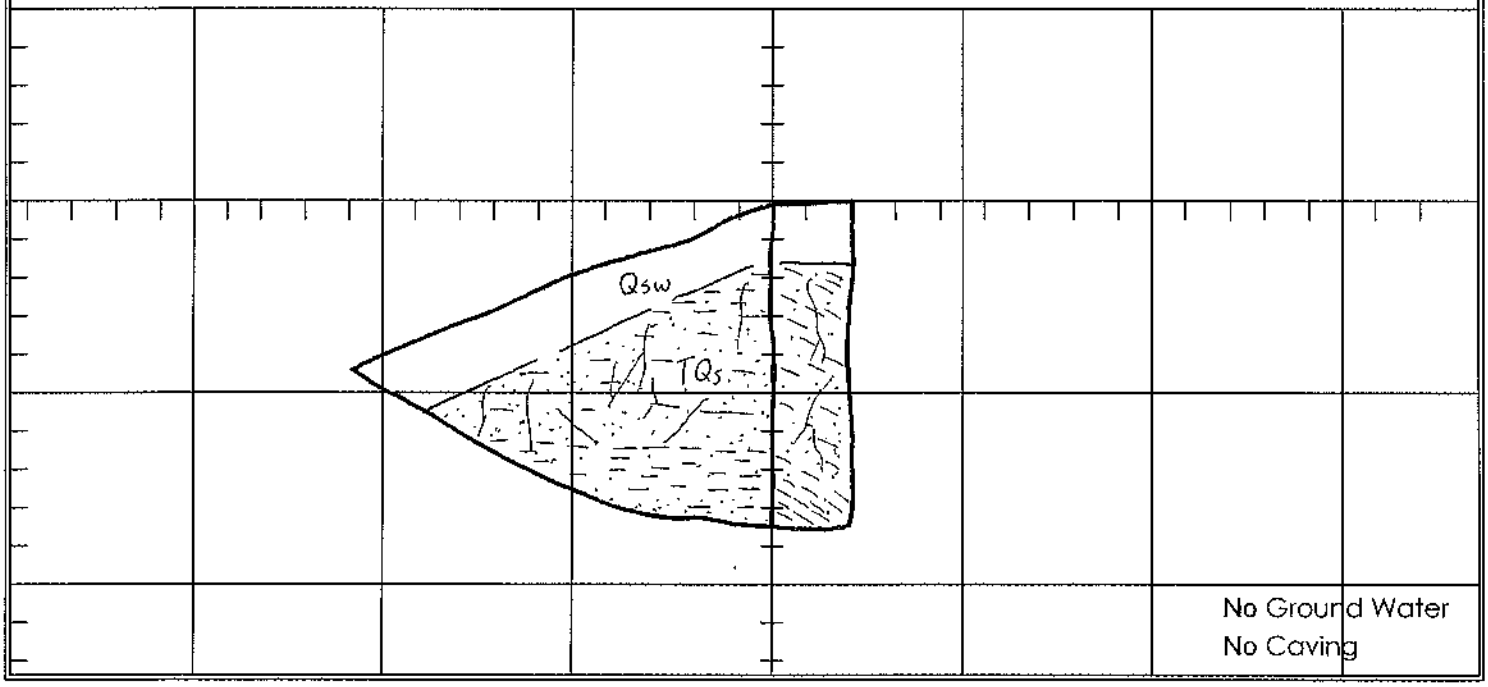
TOTAL DEPTH: 8 feet ←N78W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-26A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1264	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 1.5')** @ 0' Dark yellowish-brown silty sand with pebbles; loose; dry to damp **BEDROCK; TQs (1.5 - 8.5')** @ 1.5' Strong-brown mudstone; soft to moderately hard; dry to damp @ 3' Grayish-brown clayey sandstone; moderately hard to hard; abundant caliche-lined fractures				
5					@ 6' Strong brown mudstone	B: N86W, 87SW			
10					**COMMENTS:** Bedrock is weathered to 3'				
15									
20									

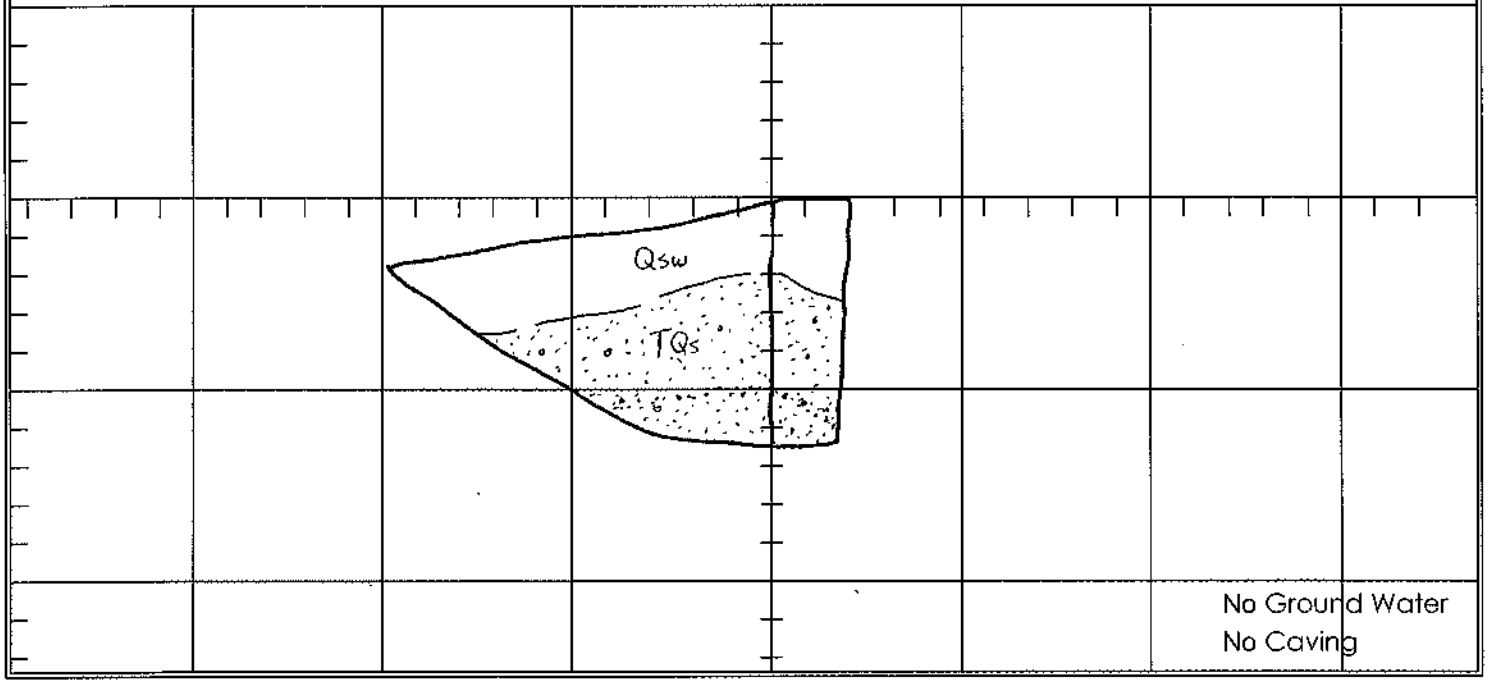
TOTAL DEPTH: 8.5 feet ←N76W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-27A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1244	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 2.5')** @ 0' Brown silty sand with pebbles; loose; dry to damp				
					BEDROCK; TQs (2.5 - 6.5') @ 2.5' Pale yellowish-brown sandstone and pebbly sandstone; moderately hard; dry to damp; massive				
5					@ 5' Pebble line	Apx B: N76W, 31SW			
					COMMENTS: Bedrock is weathered to 3.5'				
10									
15									
20									

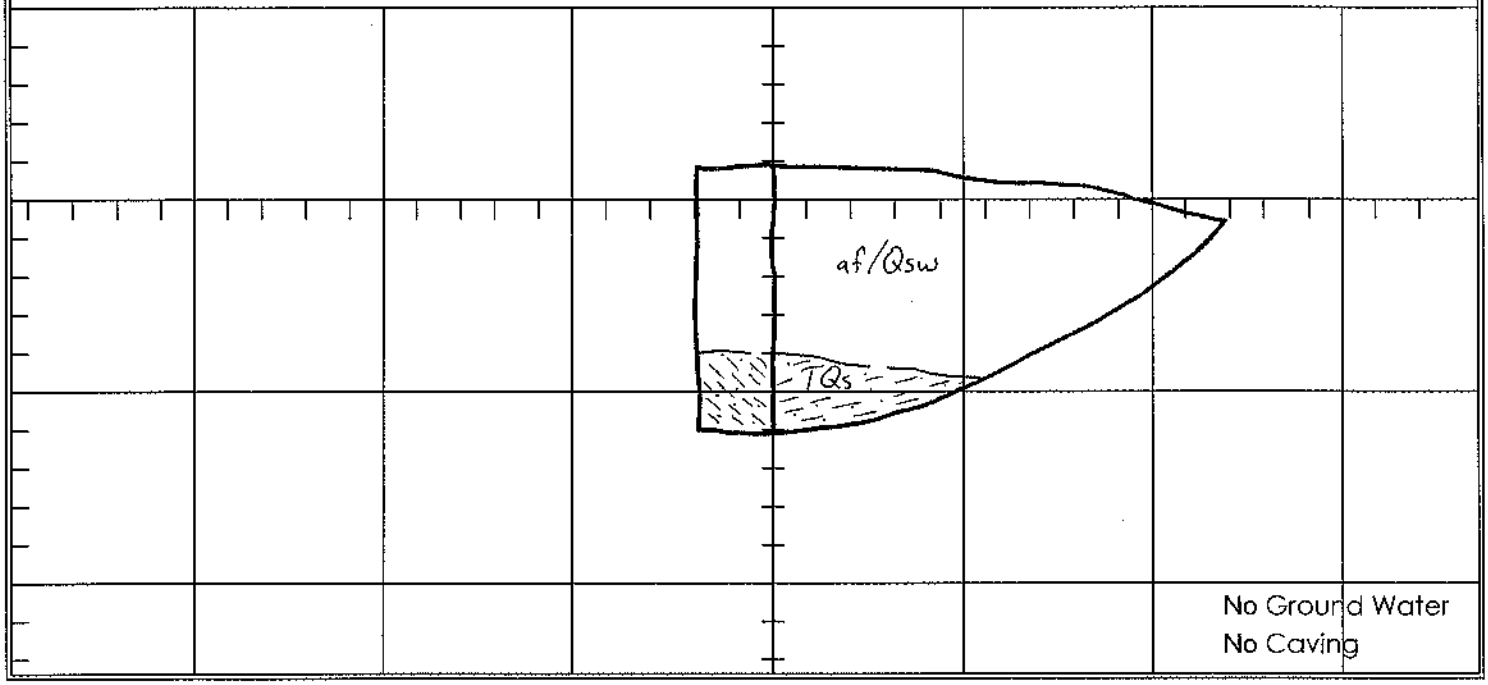
TOTAL DEPTH: 6.5 feet N56E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-28A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1289	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**ARTIFICIAL FILL/QUATERNARY SLOPEWASH; af/Qsw (0 - 4')** @ 0' Brown to dark yellowish-brown silty, clayey sand with pebbles; loose to moderately dense; dry to damp				
5					**BEDROCK; TQs (4 - 7')** @ 4' Brown mudstone; soft to moderately hard; damp @ 6' Moderately hard; vague bedding within the mudstone	B: N77E, 43SE			
10					**COMMENTS:** Bedrock is weathered to 6'				
15									
20									

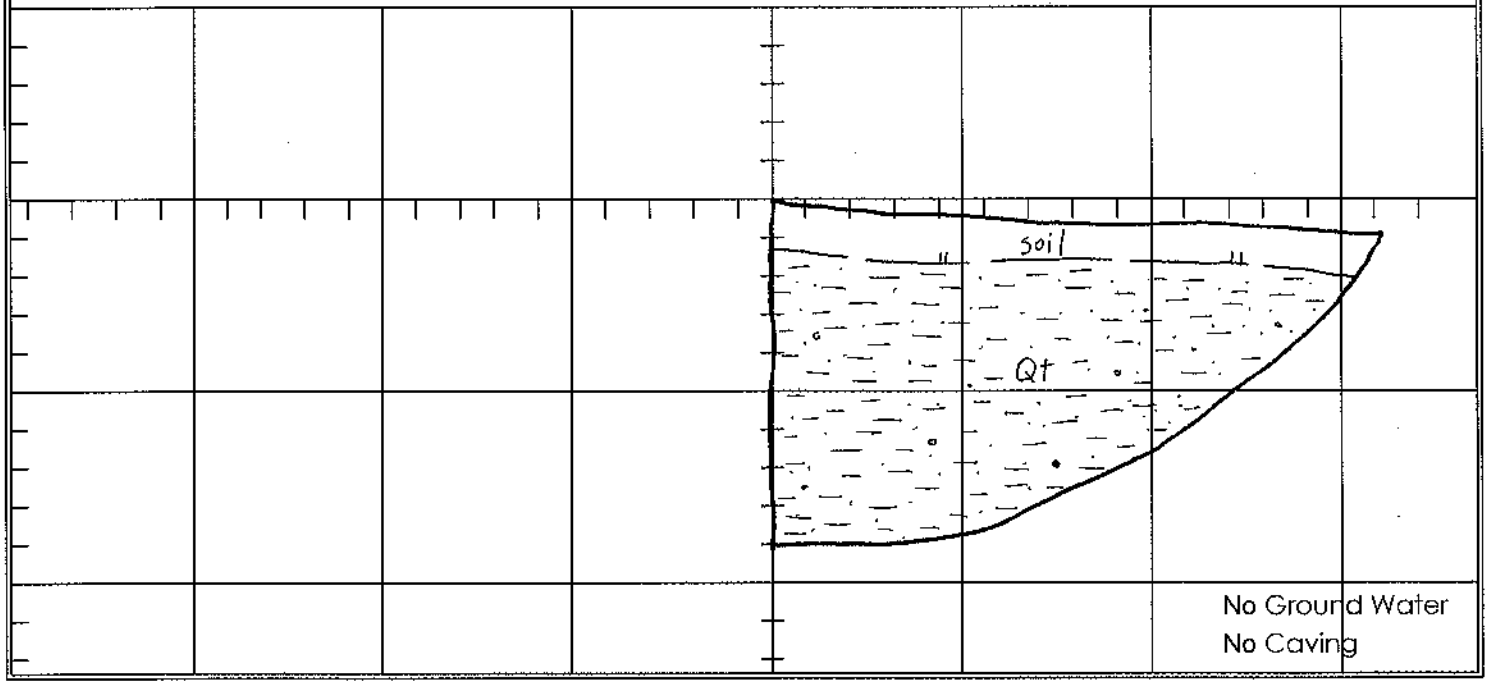
TOTAL DEPTH: 7 feet N86W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-29A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1342	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SOIL; s (0 - 1')** @ 0' Brown silty, clayey sand; loose; dry to damp **QUATERNARY TERRACE DEPOSITS; Qt (1 - 9')** @ 1' Brown clayey siltstone with sand and scattered pebbles; stiff damp to moist; abundant wispy caliche; blocky fracture; massive **COMMENTS:** Void observed down to at least 8.5'				
5									
10									
15									
20									

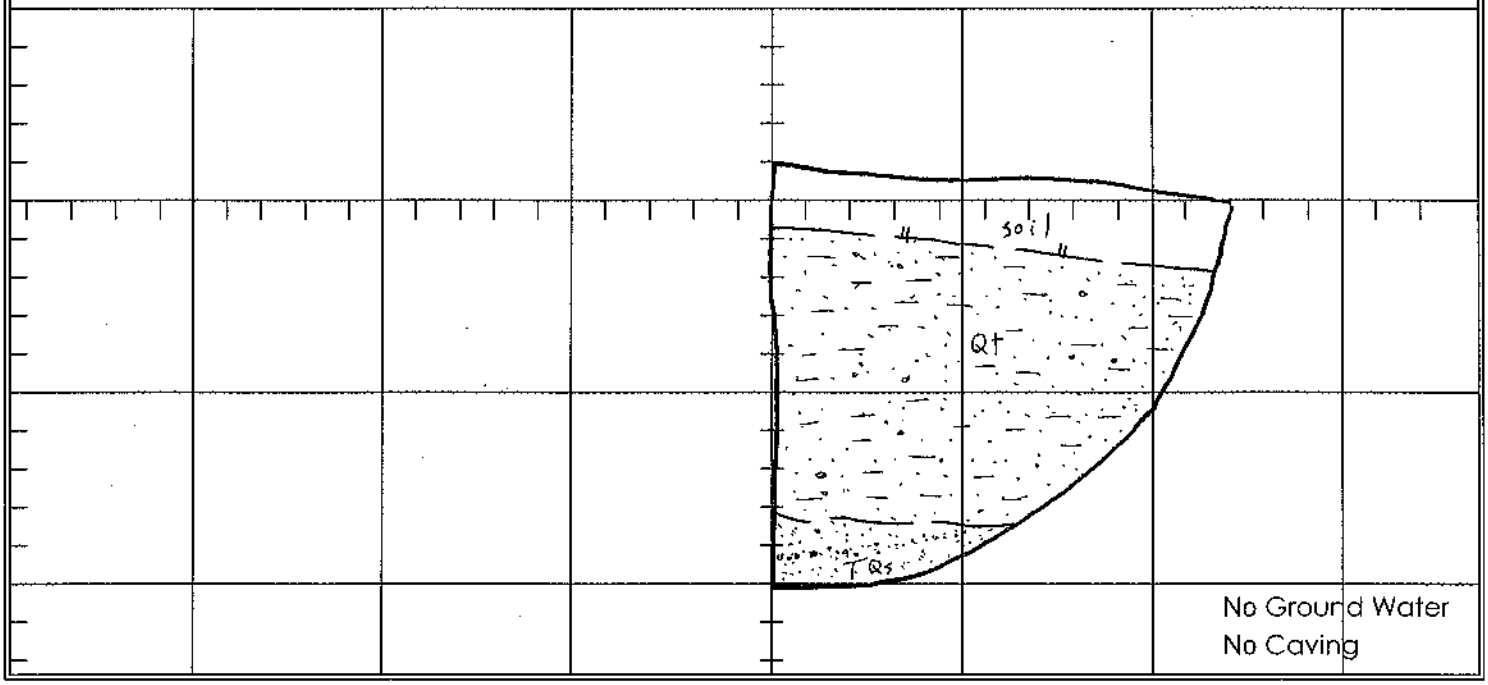
TOTAL DEPTH: 9 feet N59W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-30A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1342	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	Other Tests
0					**SOIL; s (0 - 1.5')** @ 0' Brown silty, clayey sand; loose; dry to damp **QUATERNARY TERRACE DEPOSITS; Qt (1.5 - 9')** @ 1.5' Brown clayey siltstone with sand and scattered pebbles; stiff; damp to moist; abundant wispy caliche; blocky fracture				
5					@ 8' Dark yellowish-brown silty sandstone				
10					**BEDROCK; TQs (9 - 11')** @ 9' Yellowish-brown pebbly sandstone; moderately hard; damp	Apx B: N75E, 34SE			
15					**COMMENTS:** Voids in the Qt to approximately 8'				
20									

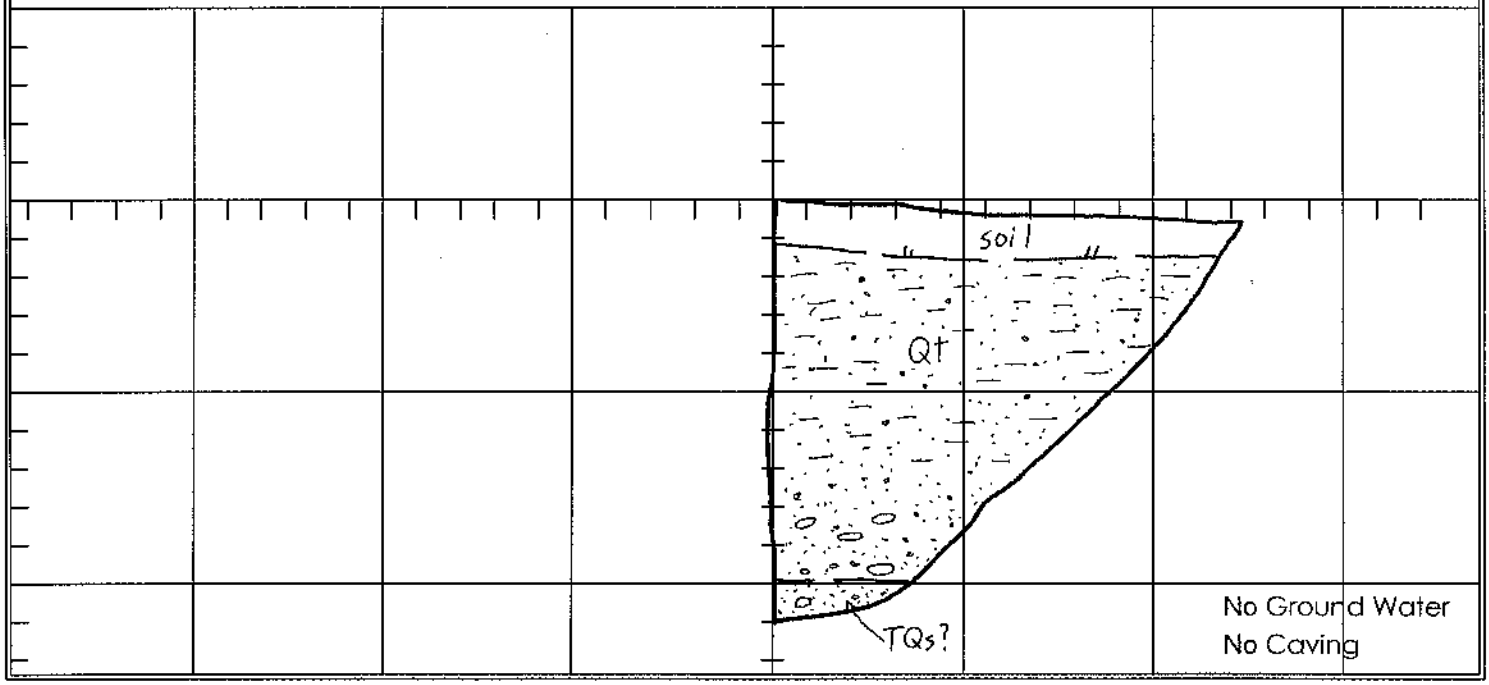
TOTAL DEPTH: 11 feet N37W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-31A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1366	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**<u>SOIL</u>; s (0 - 1')** @ 0' Brown silty, clayey sand; loose; dry to damp **<u>QUATERNARY TERRACE DEPOSITS</u>; Qt (1 - 10')** @ 1' Brown clayey siltstone with sand and pebbles; stiff; damp to moist abundant voids				
5					@ 6' Yellowish-brown claystone and silty sandstone with pebbles; medium dense @ 8' Cobbly; very few voids @ 9' Scattered boulders				
10					**<u>BEDROCK?</u>; TQs? (10 - 11')** @ 10' Pebbly, cobbly sandstone; moderately hard; damp to moist; little to no fines				
15									
20									

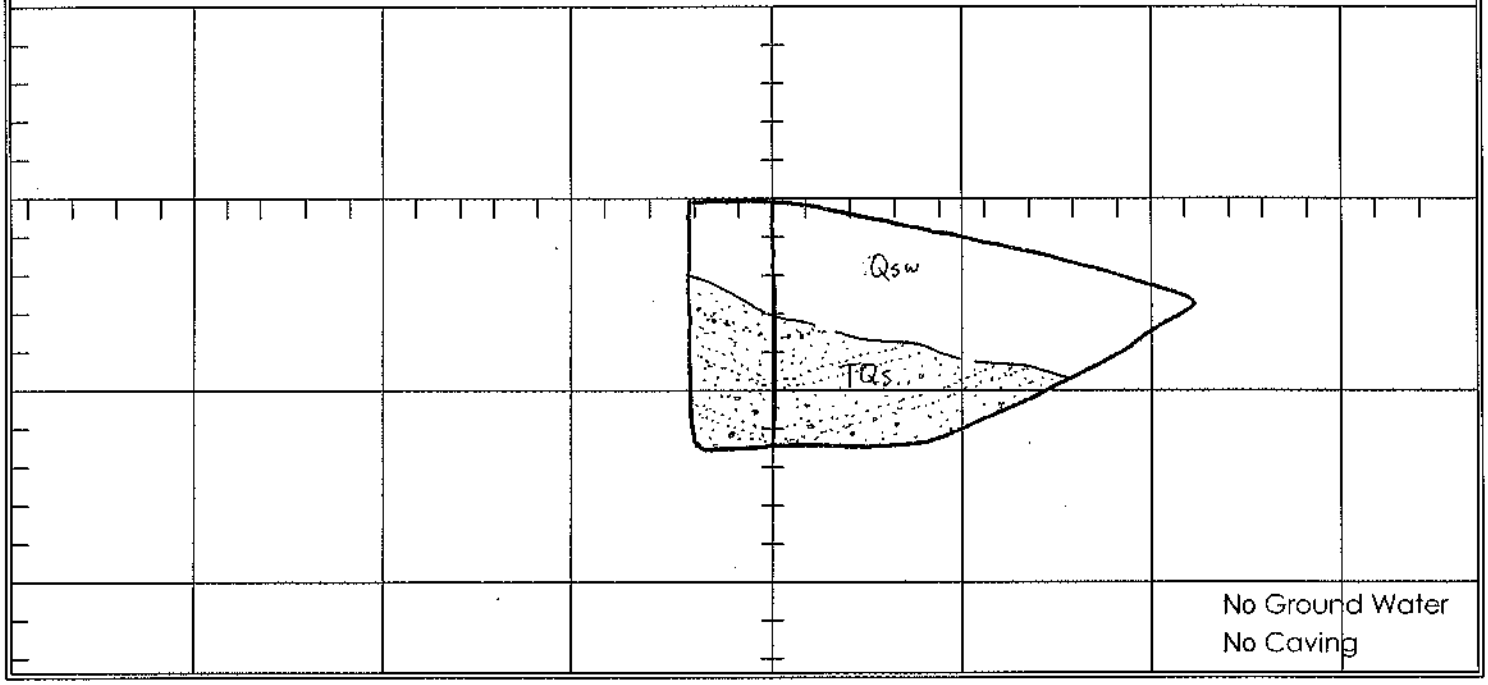
TOTAL DEPTH: 11 feet N64W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-32A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1443	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY SLOPEWASH; Qsw (0 - 3')** @ 0' Brown silty, pebbly sand; loose; dry to damp				
5					**BEDROCK; TQs (3 - 6.5')** @ 3' White to pale yellowish-brown sandstone to pebbly sandstone; locally laminated	B: N80E, 30SE B: N82E, 32SE			
10					**COMMENTS:** Bedrock is weathered to 4'				
15									
20									

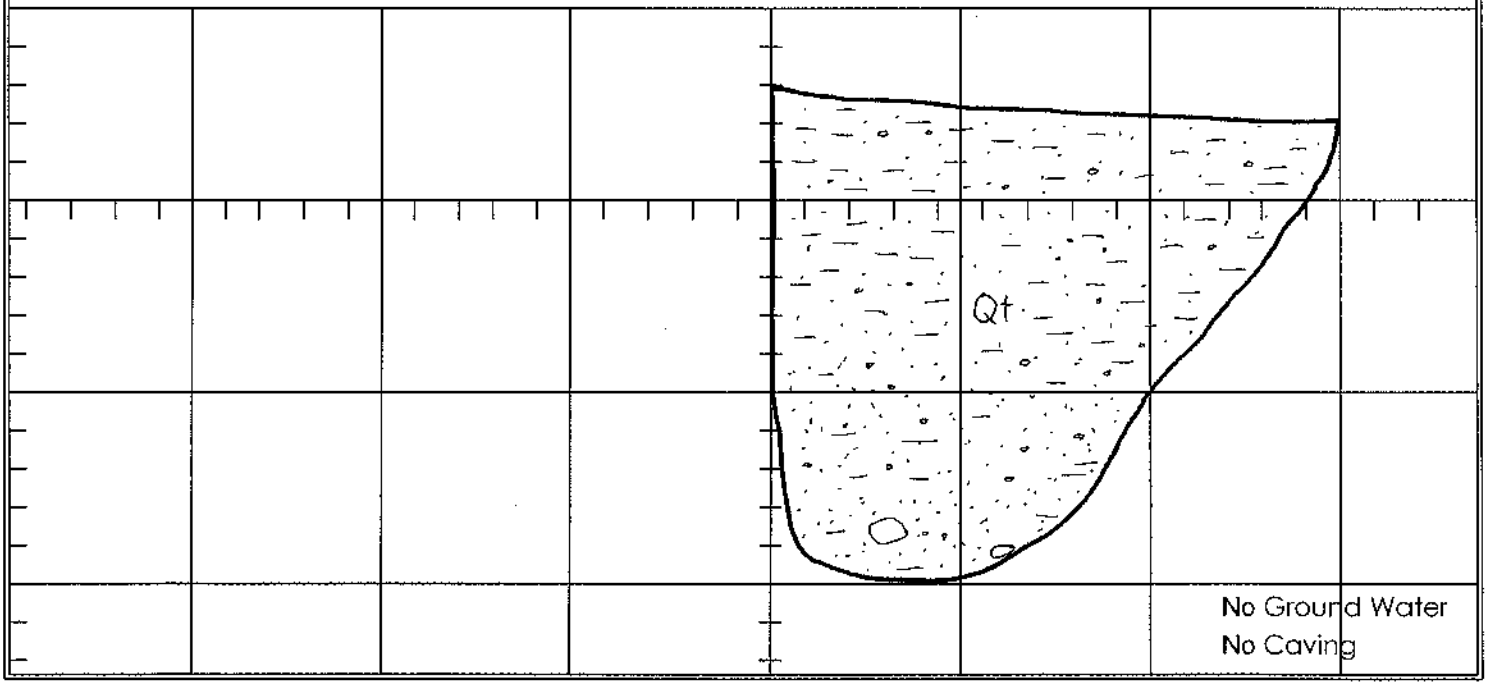
TOTAL DEPTH: 6.5 feet N48W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.		JOB NO: 07-1245A-4	**TRENCH LOG NO. T-33A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch		DATE: 6/8/18	
		LOGGED BY: MBW	
		EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket		ELEVATION: 1420	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY TERRACE DEPOSITS; Qt (0 - 13')** @ 0' Brown clayey siltstone with sand and pebbles; stiff; damp to moist; abundant caliche; abundant voids				
5					@ 7' Dark yellowish-brown clayey, silty sandstone with pebbles				
10					@ 10' Scattered cobbles				
15					**COMMENTS:** Went down quickly to verify the lack of TQs; trench was thereafter logged from the surface				
20									

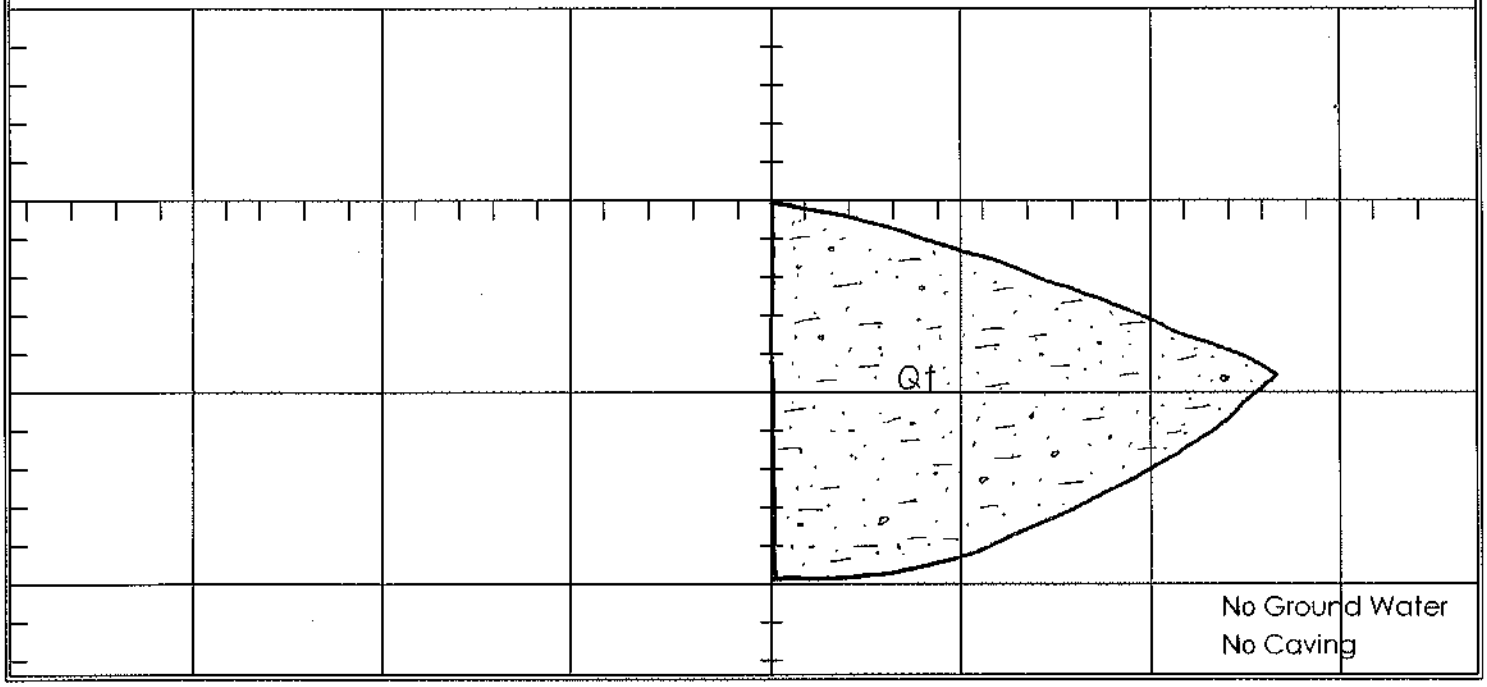
TOTAL DEPTH: 13 feet N62W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-34A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/2/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1429	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**QUATERNARY TERRACE DEPOSITS; Qt (0 - 10')** @ 0' Brown clayey, sandy siltstone with pebbles; stiff; damp to moist; abundant voids; abundant caliche				
5					@ 6' Moist				
					@ 8' Mottled yellowish-brown and grayish-brown; very stiff				
10									
15									
20									

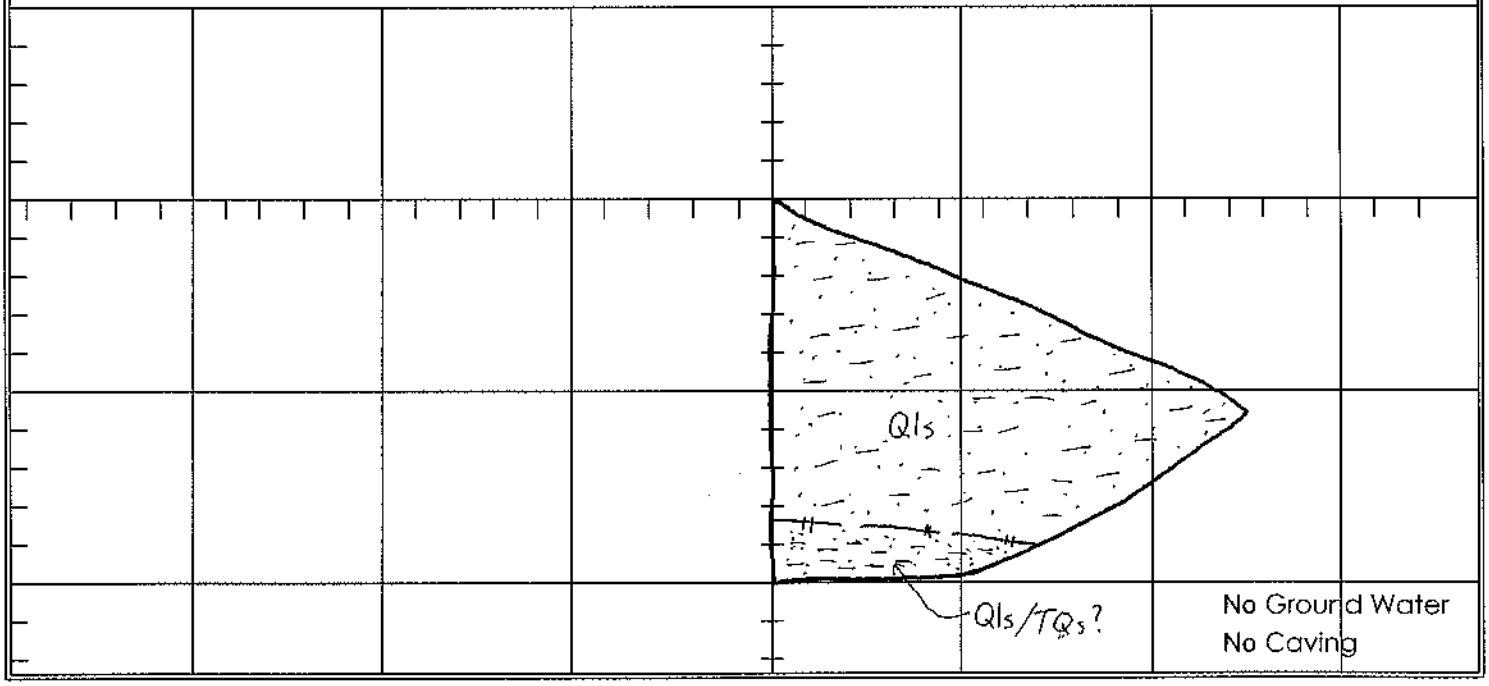
TOTAL DEPTH: 10 feet N60W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 07-1245A-4	**TRENCH LOG NO. T-35A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 5/3/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket	ELEVATION: 1359	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**<u>LANDSLIDE</u>; Qls (0 - 8')** @ 0' Mottled gray and brown silty clay; soft; moist; massive; punky fracture				
5									
10					**<u>LANDSLIDE/BEDROCK?</u>; Qls/TQs? (8 - 10')** @ 8' Brown sandy mudstone; moderately hard to hard; damp; some gray mottling; massive; no distinct contact with overlying softer material (gradational)				
15									
20									

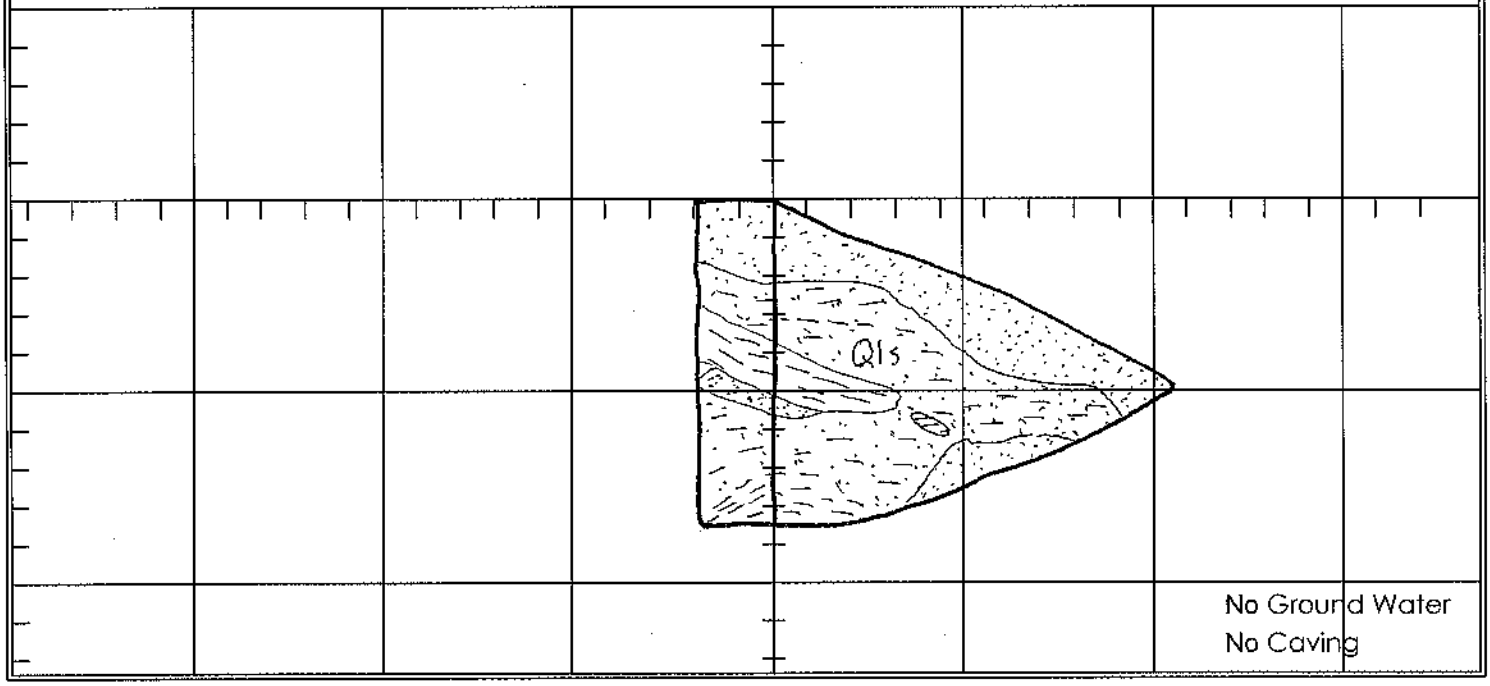
TOTAL DEPTH: 10 feet ←N5E SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.		JOB NO: 07-1245A-4	**TRENCH LOG NO. T-36A**
PROJECT: Tentative Tract Map 60257 Green Valley Ranch		DATE: 6/8/18	
		LOGGED BY: MBW	
		EXCAVATED: 5/3/07	
EXCAVATION METHOD: Track-Mounted Backhoe with 24" Bucket		ELEVATION: 1341	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**LANDSLIDE; Qls (0 - 8.5')** @ 0' Jumbled-up brown mudstone; yellowish-brown sandstone; and dark yellowish-brown siltstone; soft; damp				
5					@ 7' Soft to moderately hard; moist	B: N2E, 34NW			
10									
15									
20									

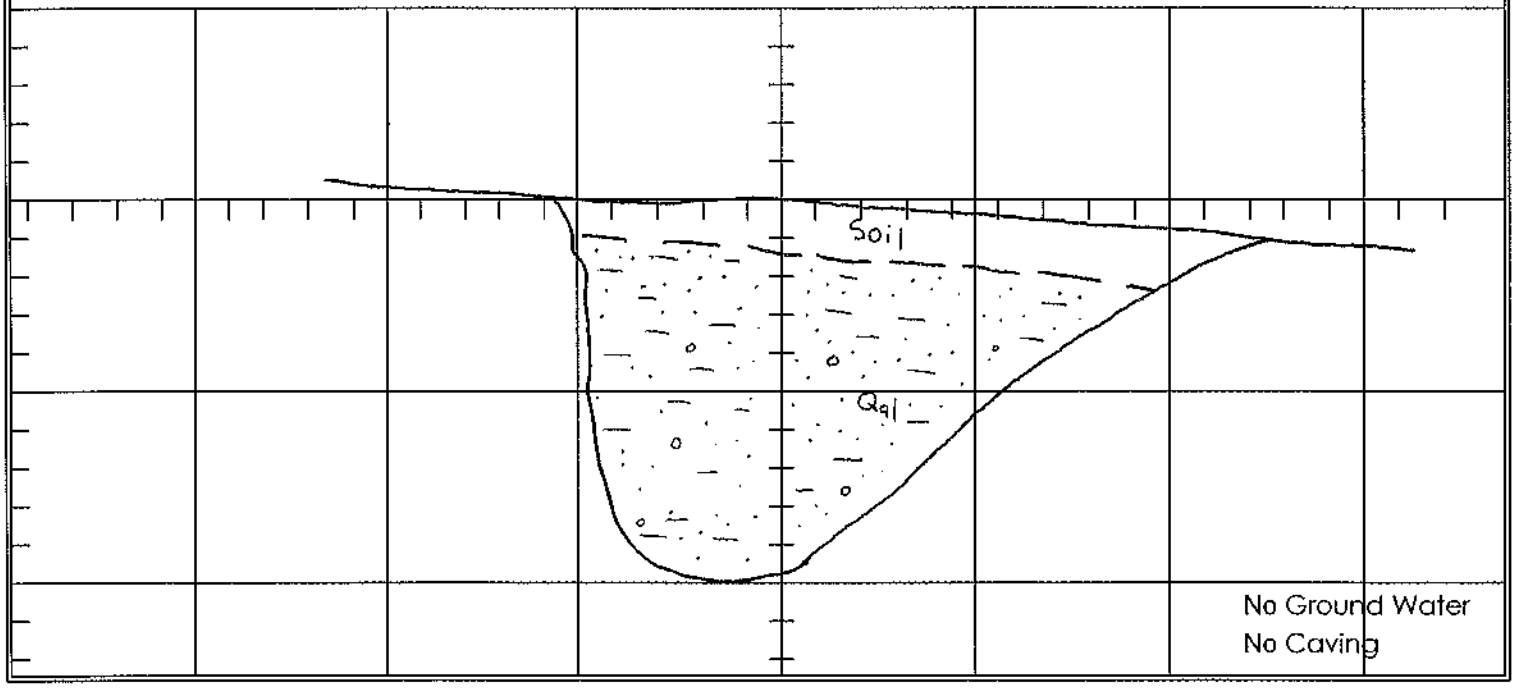
TOTAL DEPTH: 8.5 feet ←N39W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.		JOB NO: 18-1245A-4	**TRENCH LOG NO. T-37A**
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 6/8/18	
		LOGGED BY: VCG	
		EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket		ELEVATION: 1284'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**SOIL; (0 - 1.5')** @ 0' Silty SAND with trace gravel; loose; dry; voids; gradational contact with underlying alluvium; upper 12 inches of surface hard crust				
				SM	**ALLUVIUM; Qal (1.5 - 10')** @ 1.5' Silty SAND with trace gravel; loose; dry; yellowish brown (10YR 5/4); gravel to 1"; voids; massive				
2.5		1			@ 3' - damp		4.4		%<#4 sieve= 91.1 % fines=22.7
5									
7.5		2					4.7		%<#4 sieve= 95.0 % fines=27.1
10									

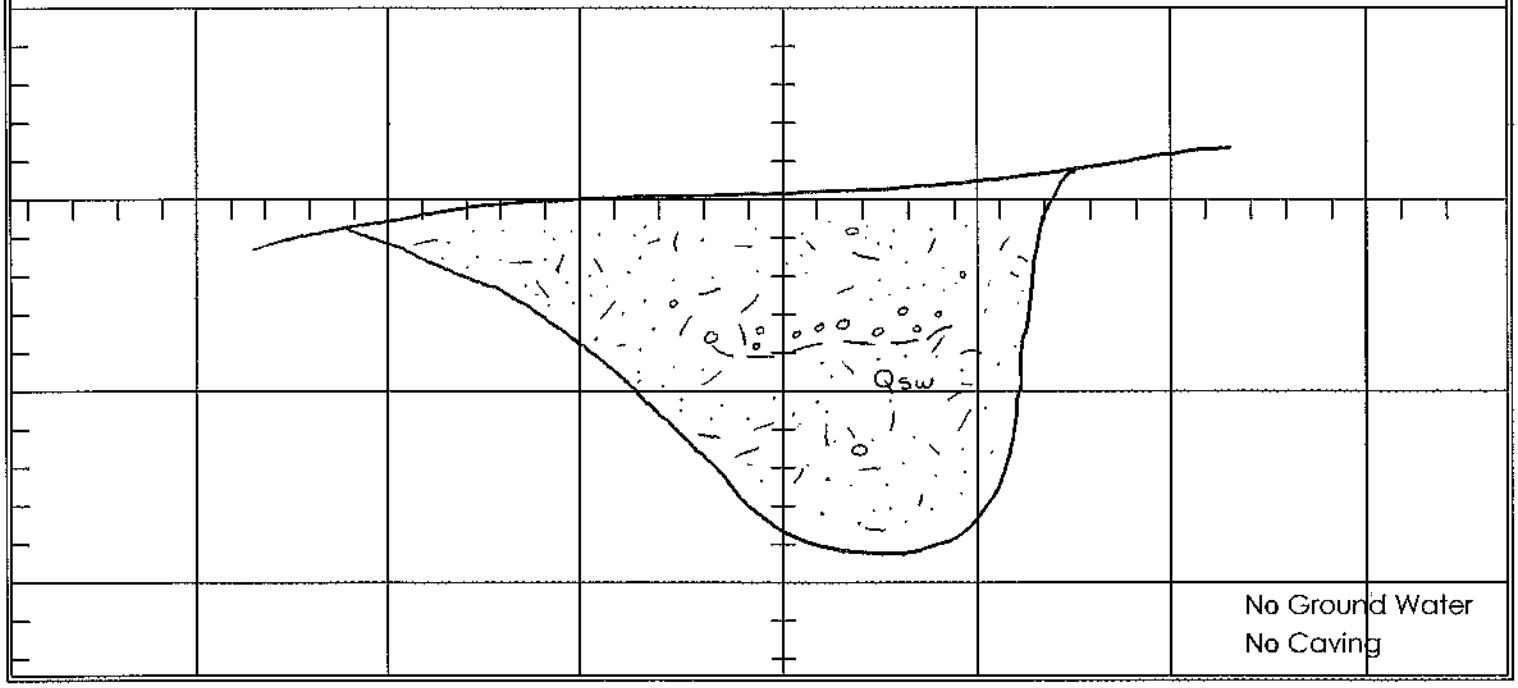
TOTAL DEPTH: 10 feet N85W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-38A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1280'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**SLOPEWASH; Qsw (0 - 10')** @ 0' Silty SAND with trace gravel; loose; dry; yellowish brown 10YR 5/4; massive; roots hairs to 4'				
2.5					@ 2' - less silt more sand and trace gravel to 2"; damp				
		1		SM	@ 3' - 1 ft thick gravel lens		4.7		Gradation %<#4 sieve= 92.9 % fines=36.7 %-5 micron=14.9
5									
7.5									
		2			@ 8' - harder excavating; less silty and trace gravel		4.7		%<#4 sieve= 91.8 % fines=29.5
10									

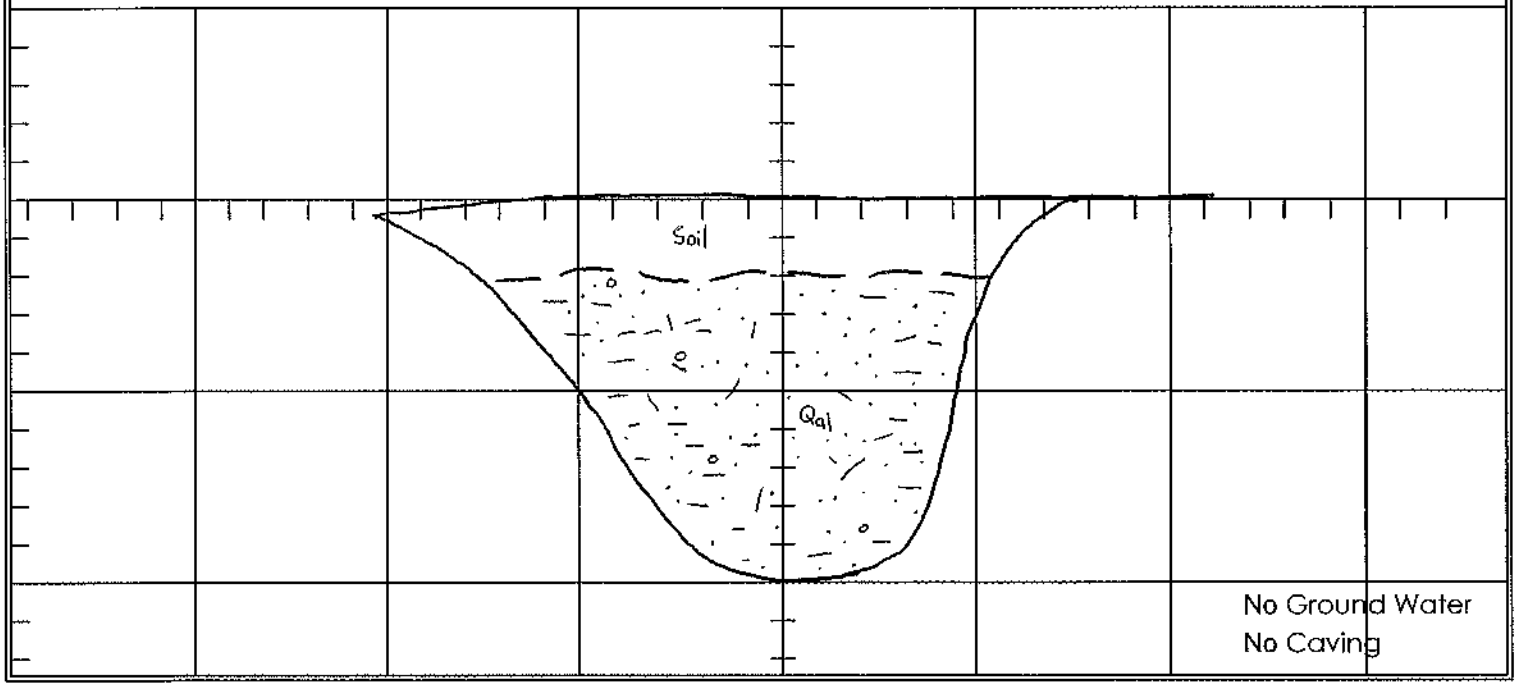
TOTAL DEPTH: 10 feet N25W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-39A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1249'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**SOIL; (0 - 2')** @ 0' Silty SAND/ Clayey SAND; loose; dry; light brownish gray 10YR 6/2; abundant voids; gradational contact with underlying alluvium; upper 1.5 ft of surface hard crust				
2.5				SM	**ALLUVIUM; Qal (2 - 10')** @ 2' Silty SAND / Clayey SAND; loose; dry; reddish brown 5YR 4/4; gravel to 3/4"; massive @ 3.5' - damp				
5		1					4.1		%<#4 sieve= 98.3 % fines=44.0
7.5				CL	@ 7' Sandy lean CLAY; abundant voids				
10		2					4.7		%<#4 sieve= 98.9 % fines=53.0

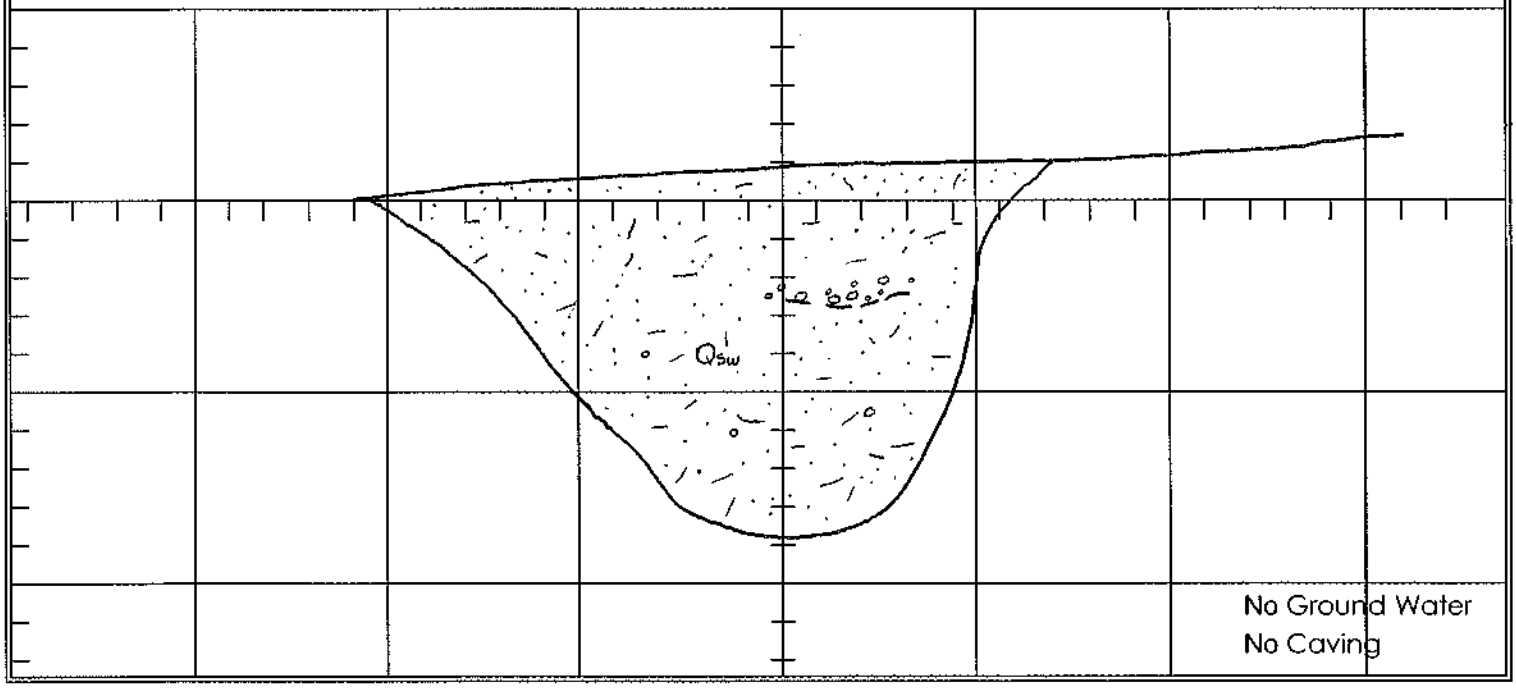
TOTAL DEPTH: 10 feet ←N45E SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.		JOB NO: 18-1245A-4	**TRENCH LOG NO. T-40A**
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 6/8/18	
		LOGGED BY: VCG	
		EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket		ELEVATION: 1317'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**SLOPEWASH; Qsw (0 - 10')** @ 0' Silty SAND with trace gravel; loose; dry; brown 10YR 5/3; massive				
2.5		1			@ 3' - damp @ 3.5' - gravel lens		6.2		%<#4 sieve= 88.6 % fines=29.1
5									
7.5									
10		2							

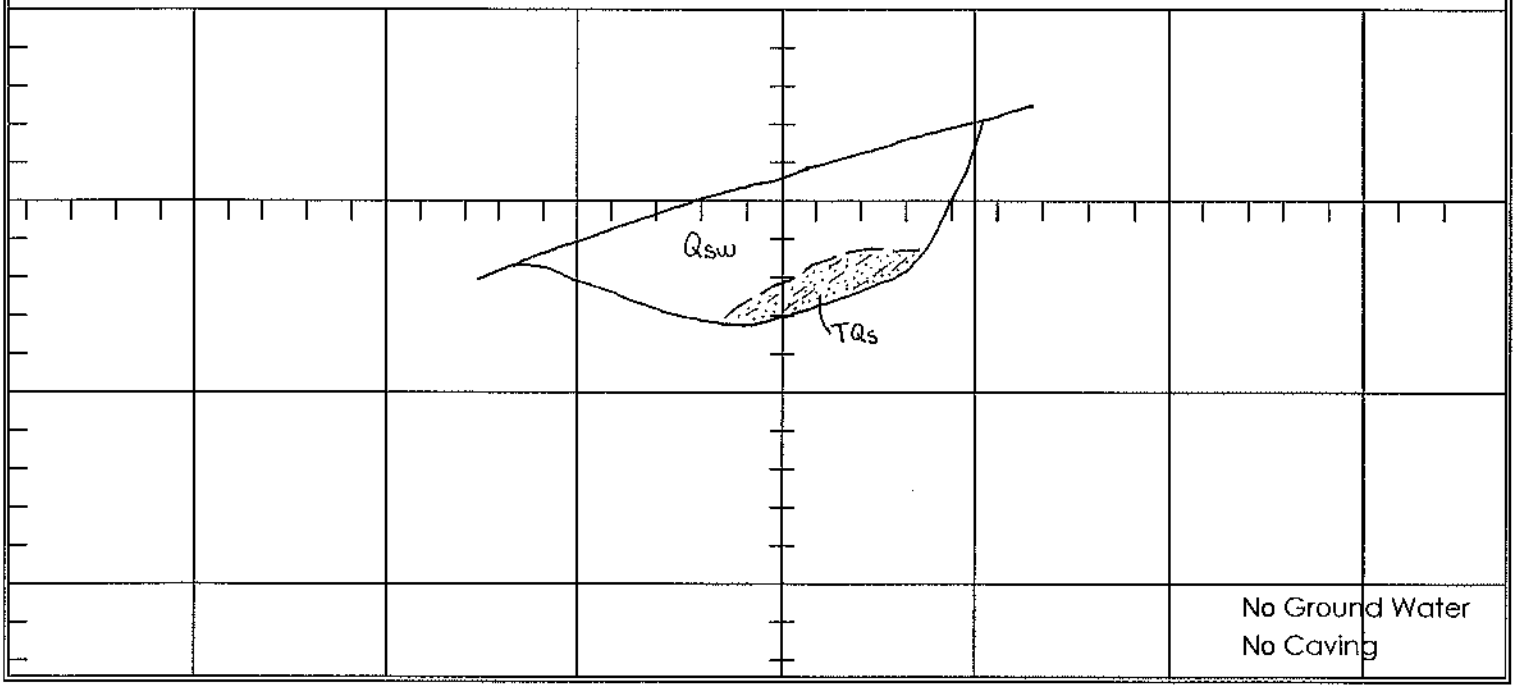
TOTAL DEPTH: 10 feet N35E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-41A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1271'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**SLOPEWASH; sw (0 - 3')** @ 0' Silty SAND; loose; dry; light reddish brown 5YR 6/4				
2.5		1			**BEDROCK; TQs (3 - 3.5')** @ 3' Reddish-brown, clayey sandstone; dense; bedded	B: N85E, 37S			
5									
7.5									
10									

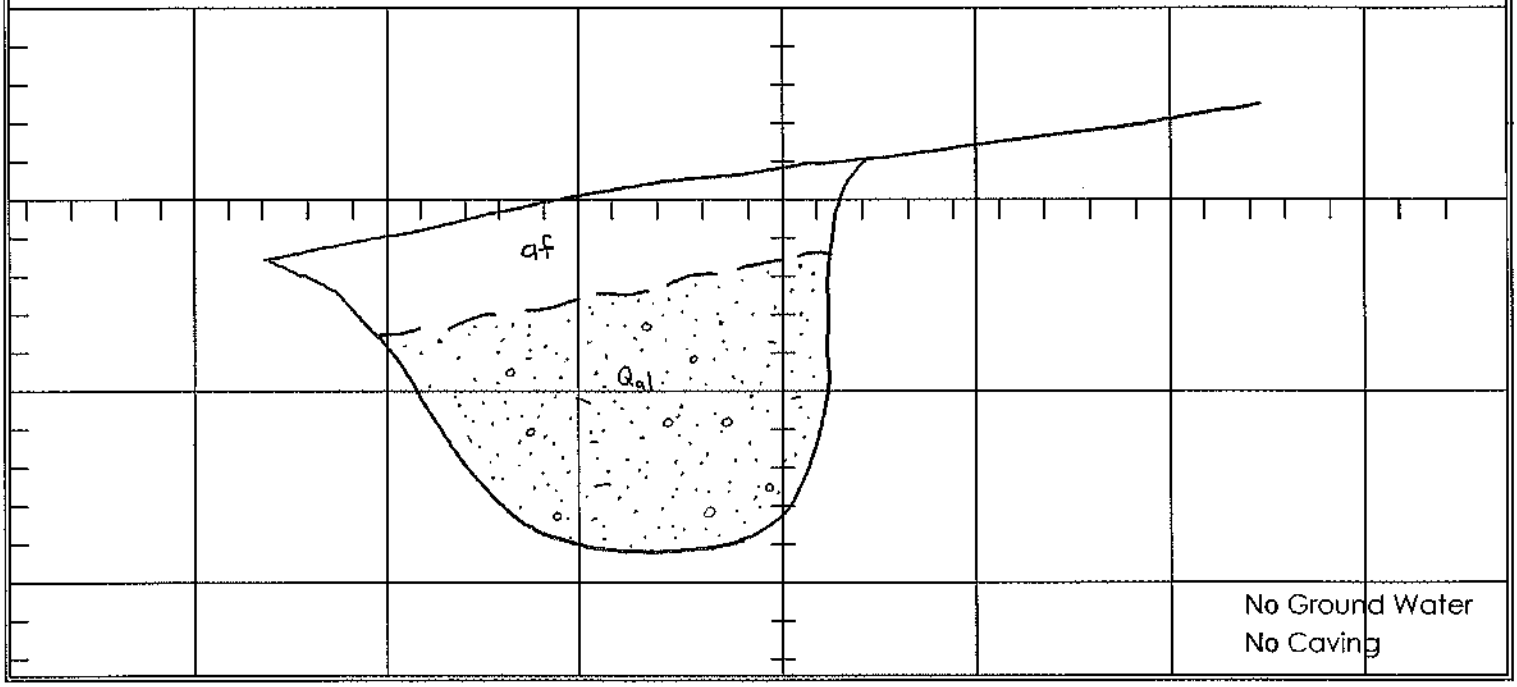
TOTAL DEPTH: 3.5 feet West→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.		JOB NO: 18-1245A-4	**TRENCH LOG NO. T-42A**
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 6/8/18	
		LOGGED BY: VCG	
		EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket		ELEVATION: 1224'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**ARTIFICIAL FILL; af (0 - 2')** @ 0' Silty SAND with gravel; loose; dry				
2.5				SM	**ALLUVIUM; Qal (2 - 10')** @ 2' Silty SAND; loose; moist; dark yellowish brown (10YR 4/4); massive				
		1					9.1		%<#4 sieve= 96.1 % fines=36.6
5									
7.5		2					9.7		%<#4 sieve= 94.1 % fines=35.7
10									

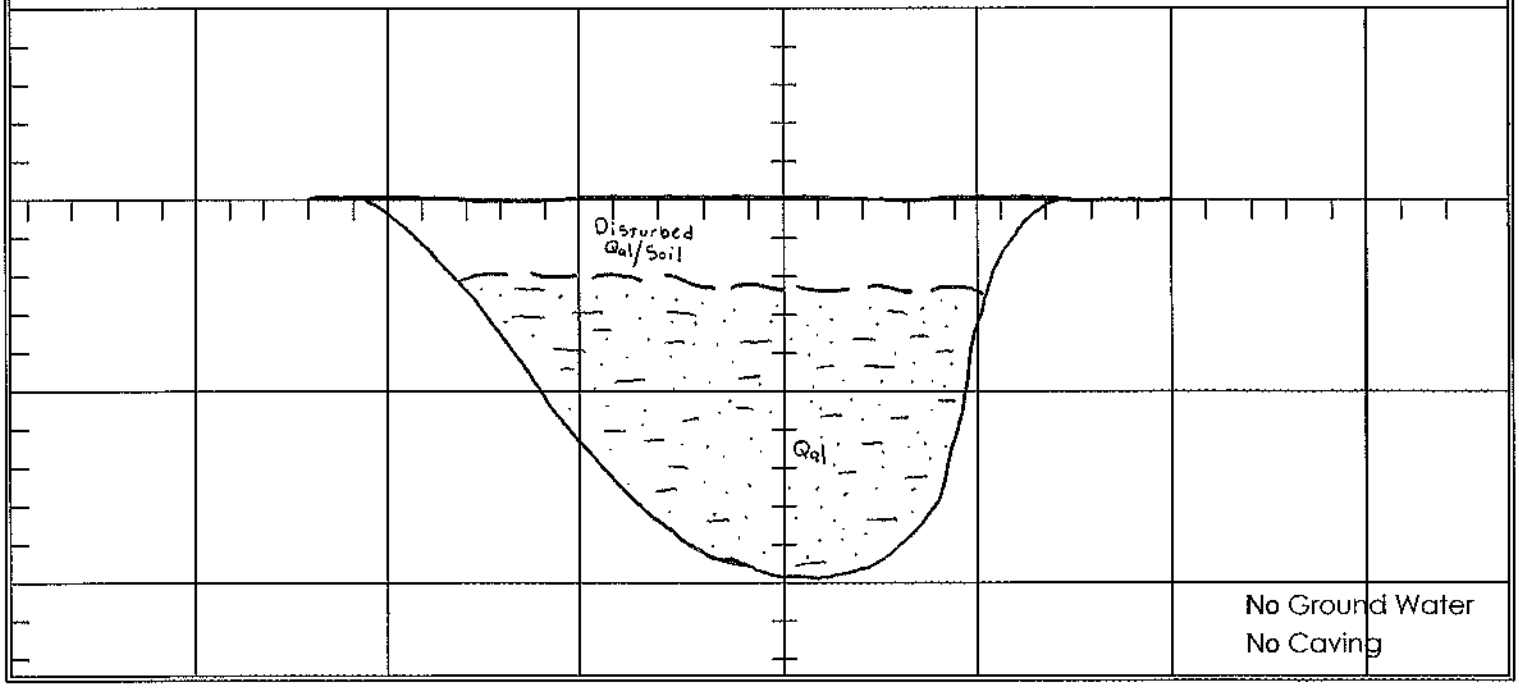
TOTAL DEPTH: 10 feet ←N82E SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-43A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1199'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**UNDIFFERENTIATED SOIL/ ALLUVIUM; (0 - 2.25')** @ 0' Silty SAND with trace gravel; loose; disturbed soil or alluvium				
2.5		1		SM	**ALLUVIUM; Qal (2.25 - 10')** @ 2.25' Silty SAND wth trace gravel; loose; damp to moist; reddish brown 5YR 4/3; massive		9.1		Gradation %<#4 sieve= 94.1 % fines=36.2 %-5 micron=12.8
5									
7.5					@ 7' - very little gravel				
10		2					9.6		%<#4 sieve= 95.2 % fines=37.4

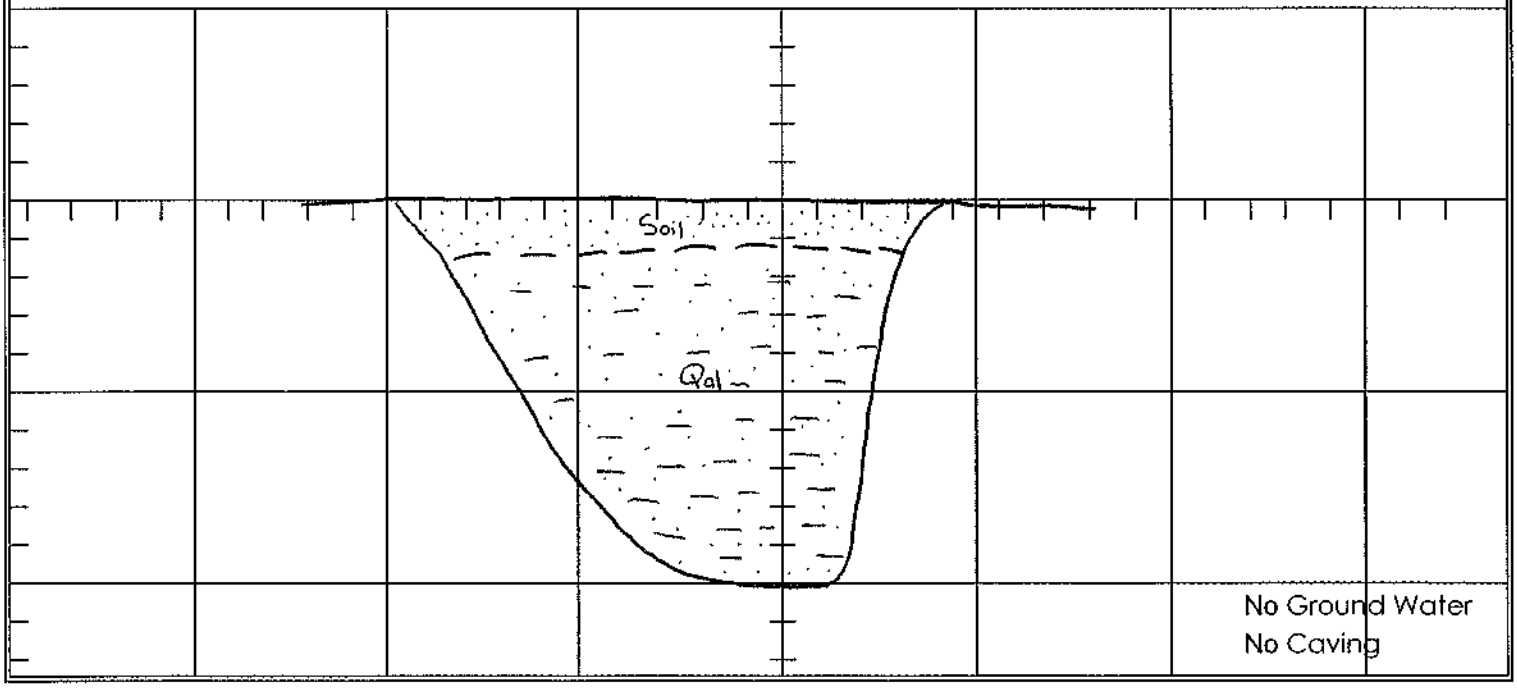
TOTAL DEPTH: 10 feet N85E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-44A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1198'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**SOIL; (0 - 1')** @ 0' Silty SAND with trace gravel; loose; dry				
				SM	**ALLUVIUM; Qal (1 - 10')** @ 1' Silty SAND; loose; dry; brown (10YR 4/3); massive				
2.5		1			@ 3' - alternating coarse to fine-grained silty SAND with trace gravel; damp; bedding to 10'		6.5		%<#4 sieve= 97.3 % fines=25.9
5									
7.5									
		2					6.8		%<#4 sieve= 93.4 % fines=22.0
10									

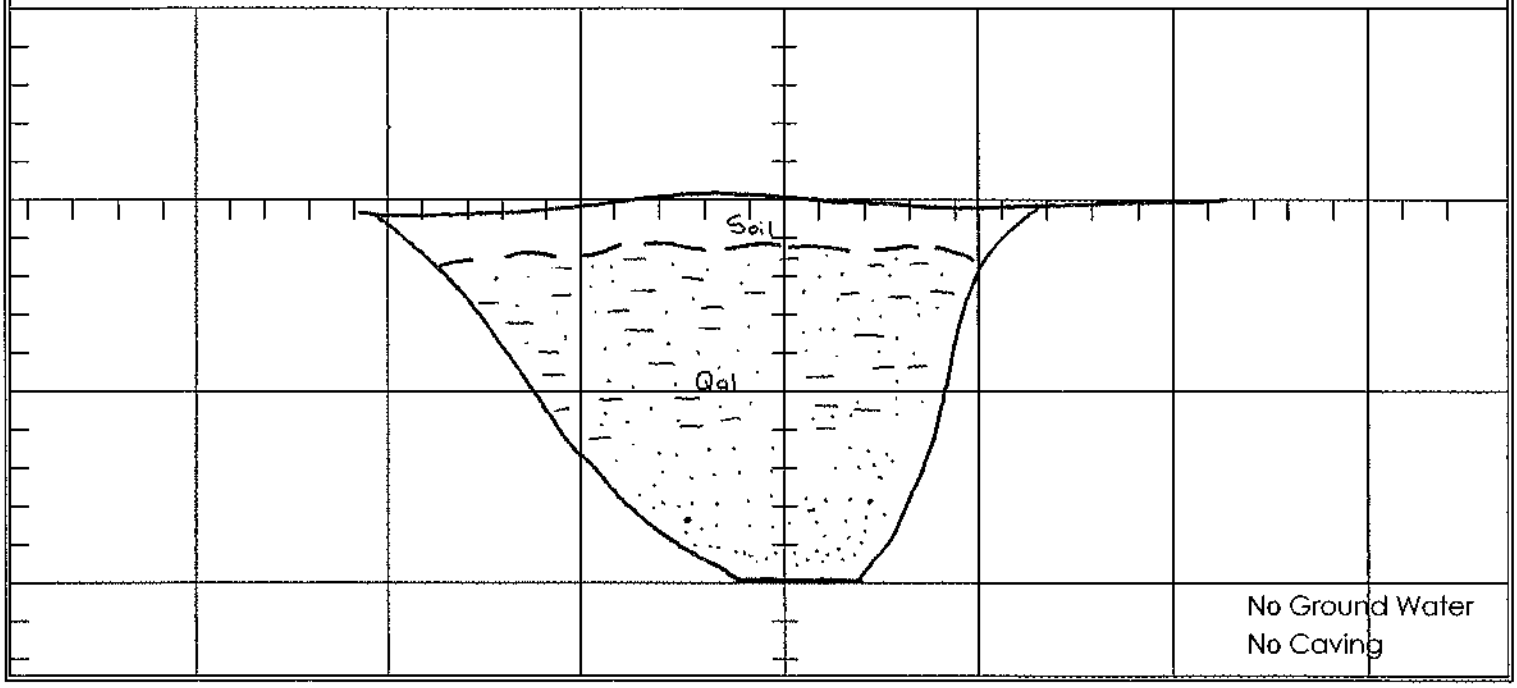
TOTAL DEPTH: 10 feet N8E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-45A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/2/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1207'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**SOIL; (0 - 1')** @ 0' Silty SAND with trace gravel; upper 12 inches hard surface crust; dry; voids; light brownish gray 10YR 6/2; gradational contact with underlying alluvium **ALLUVIUM; Qal (1 - 10')** @ 1' Silty SAND; loose; dry; brown 10YR 5/3; faint bedding				
2.5		1		SM	@ 3' - damp		4.0		Gradation %<#4 sieve= 96.7 % fines=42.5 %-5 micron=14.0
5									
				SP-SM	@ 6' Poorly graded SAND with silt				
7.5		2					2.4		%<#4 sieve= 95.1 % fines=9.3
10									

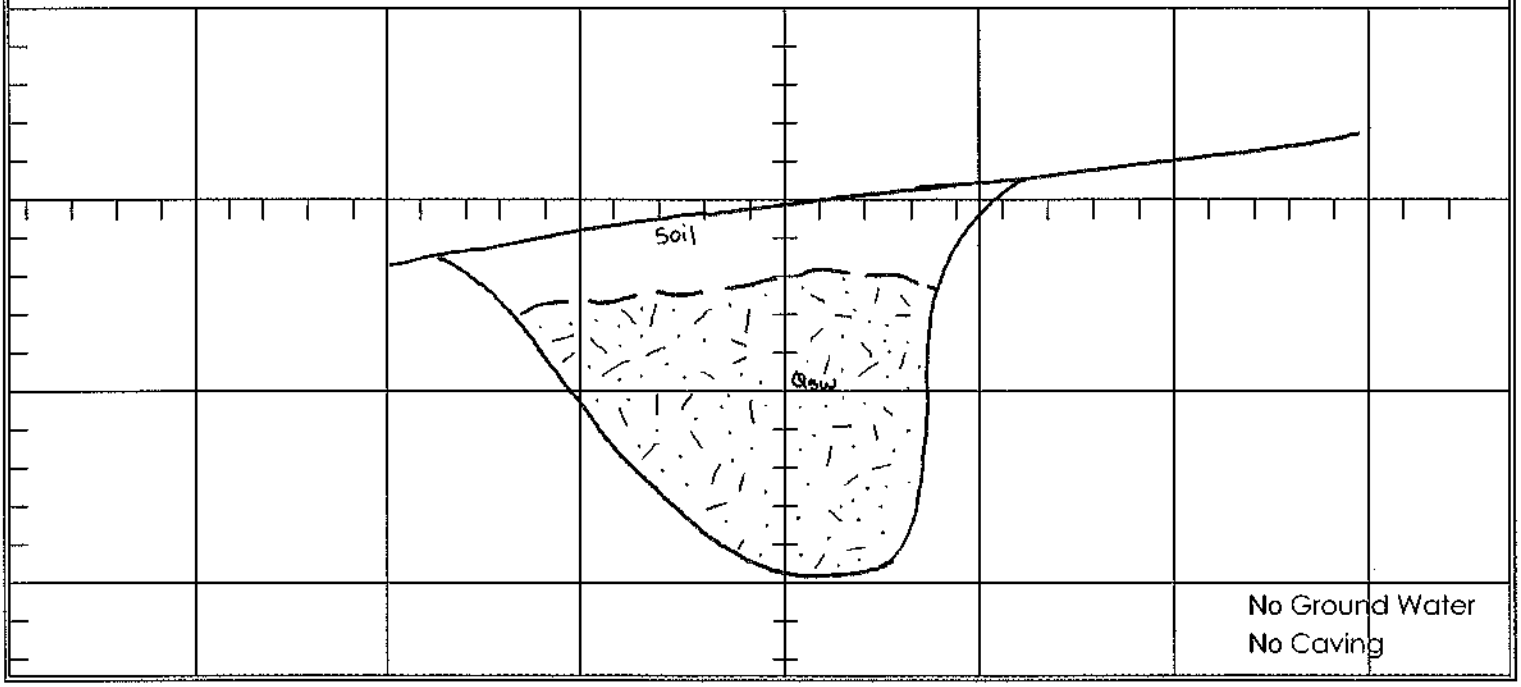
TOTAL DEPTH: 10 feet N75W→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-46A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/3/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1310'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**SOIL; (0 - 1.5')** @ 0' Silty SAND with trace gravel; loose; light brownish gray 10YR 6/2; root hairs to 3'; gradational contact with underlying alluvium; upper 12 inches hard surface crust **SLOPEWASH; Qsw (1.5 - 10')** @ 1.5' Silty clayey SAND; loose; dry; reddish brown 5YR 4/4; massive				
2.5		1		SM-SC	@ 3' - damp		4.4		Gradation %<#4 sieve= 96.3 % fines=35.0 %-5 micron=15.1
5				SM	@ 6' Silty SAND; abundant voids to bottom of excavation; possible alluvium				
7.5		2					4.4		%<#4 sieve= 95.9 % fines=29.5
10									

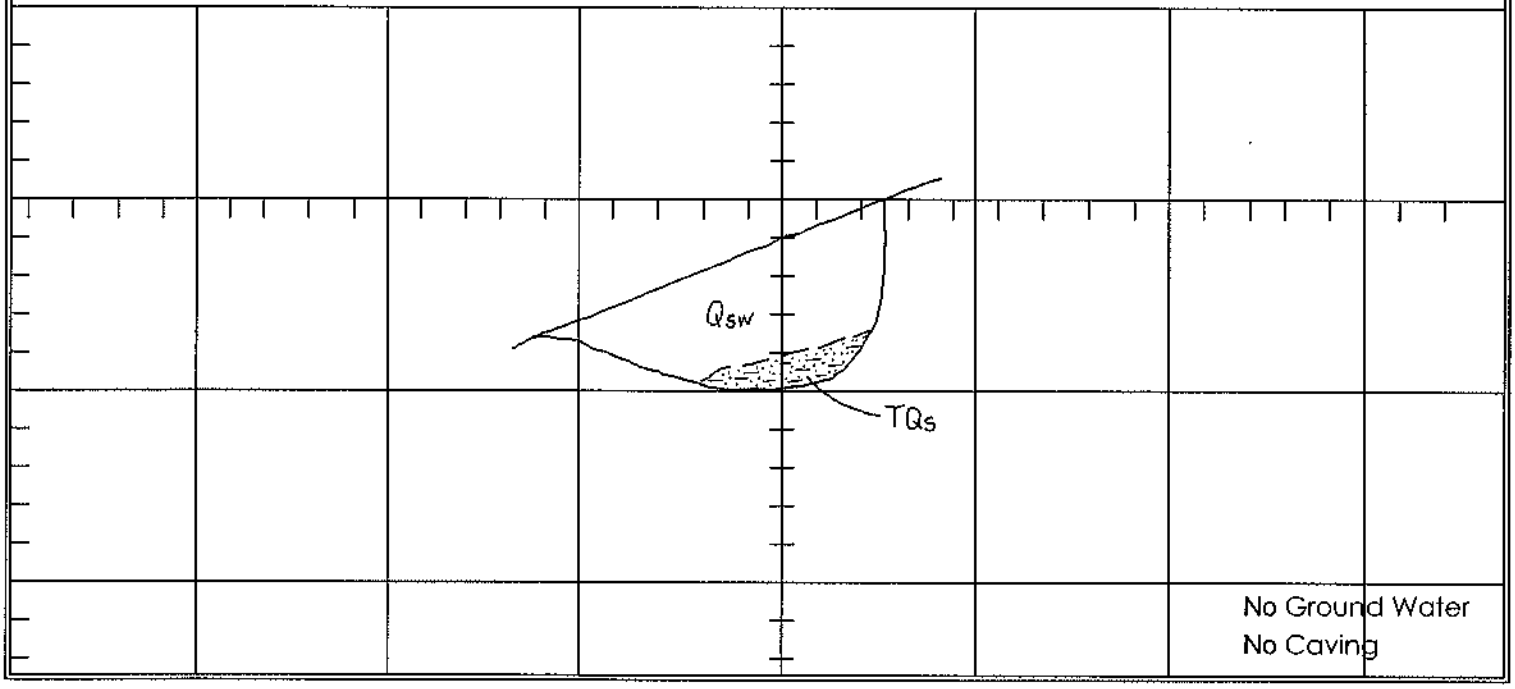
TOTAL DEPTH: 10 feet N80E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-47A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/3/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1315'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM-SC	**SLOPEWASH; sw (0 - 3')** @ 0' Silty clayey SAND with trace gravel; loose; dry; voids				
2.5		1			**WEATHERED BEDROCK; TQs (3 - 5')** @ 3' Reddish-brown to mottled greenish-brown, clayey sandstone with trace gravel; hard; very difficult excavating		5.5		%<#4 sieve= 97.5 % fines=41.9
5									
7.5									
10									

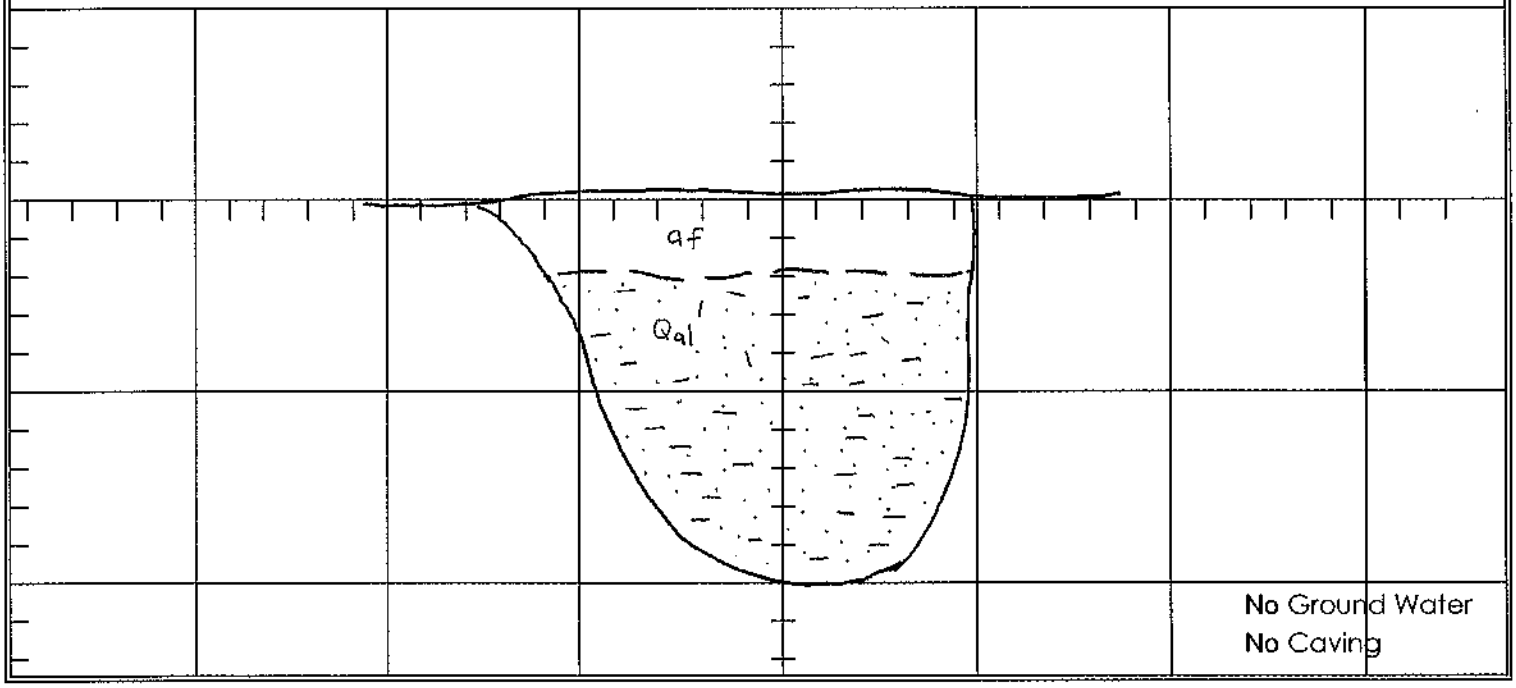
TOTAL DEPTH: 5 feet ←N77W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. T-48A**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: VCG	
	EXCAVATED: 10/3/17	
EXCAVATION METHOD: Rubber-tire Backhoe with 24" Bucket	ELEVATION: 1220'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM-SC	**ARTIFICIAL FILL; af (0 - 2')** @ 0' Silty clayey SAND with gravel; loose to dense; dry				
2.5				SM-SC	**ALLUVIUM; Qal (2 - 10')** @ 2' Silty clayey SAND; dense; damp; reddish brown 5YR 4/3; massive				
		1					6.2		%<#4 sieve= 97.5 % fines=42.9
5					@ 5' - less gravel				
7.5									
		2					6.6		%<#4 sieve= 98.1 % fines=44.9
10									

TOTAL DEPTH: 10 feet N45E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. PT-7**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: KPC	
	EXCAVATED: 1/15/18	
EXCAVATION METHOD: Front-end loader	ELEVATION: 1201.5	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**ALLUVIUM; Qal (0 - 14.5')** @ 0' Silty, fine- to medium-grained SAND; loose to medium dense; brown				
5				SM					Gradation %<#4 sieve= 97.7 % fines=30.5 %-5 micron=11.3 Infiltration test at 5'
10									
15				SP-SM	@ 13' Poorly graded SAND with silt; medium dense; damp; yellowish brown				% fines=7.3
20									

TOTAL DEPTH: 14.5 feet

SCALE: 1 inch = 5 feet

No Ground Water
No Caving

CLIENT: Sterling Gateway, L.P.		JOB NO: 18-1245A-4	**TRENCH LOG NO.** PT-8
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 6/8/18	
		LOGGED BY: KPC	
		EXCAVATED: 1/15/18	
EXCAVATION METHOD: Front-end loader		ELEVATION: 1201.5	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**ALLUVIUM; Qal (0 - 14.5')** @ 0' Silty, fine-grained SAND; loose to medium dense; damp; brown				
5				CL-ML	@ 5.5' Sandy, clayey SILT to silty SAND; firm/medium dense; damp; brown				Gradation %<#4 sieve= 99.0 % fines=51.6 %-5 micron=16.7 LL=25 PI=7 %<#4 sieve= 100 Infiltration test at 5.5'
10									
15				SM					%<#4 sieve= 100 % fines=28.7
20									

TOTAL DEPTH: 15 feet

SCALE: 1 inch = 5 feet

No Ground Water
No Caving

CLIENT: Sterling Gateway, L.P.		JOB NO: 18-1245A-4	**TRENCH LOG NO.** PT-9
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 6/8/18	
		LOGGED BY: KPC	
		EXCAVATED: 1/15/18	
EXCAVATION METHOD: Front-end loader		ELEVATION: 1196'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				ML	**ALLUVIUM; Qal (0 - 13')** @ 0' Sandy SILT; firm; damp; dark yellowish-brown				
5		1		ML SM- ML	@ 5.5' Silty, fine-grained SAND to sandy SILT; medium dense/firm; damp; brown				Gradation %<#4 sieve= 99.4 % fines=51.3 %-5 micron=17.9 Infiltration test at 5'
10									
15									
20									

TOTAL DEPTH: 15 feet

SCALE: 1 inch = 5 feet

Ground Water
Caving

CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245A-4	**TRENCH LOG NO. PT-10**
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18	
	LOGGED BY: KPC	
	EXCAVATED: 1/15/18	
EXCAVATION METHOD: Front-end loader	ELEVATION: 1274'	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0				SM	**ALLUVIUM; Qal (0 - 11.5')** @ 0' Silty, fine- to medium-grained SAND; loose to medium dense; damp to moist; dark brown; coarser with depth				
5				SM					Gradation %<#4 sieve= 95.3 % fines=32.3 %-5 micron=13.1 Infiltration test at 5.5' % fines=28.2
10									
15									
20									

TOTAL DEPTH: 11.5 feet

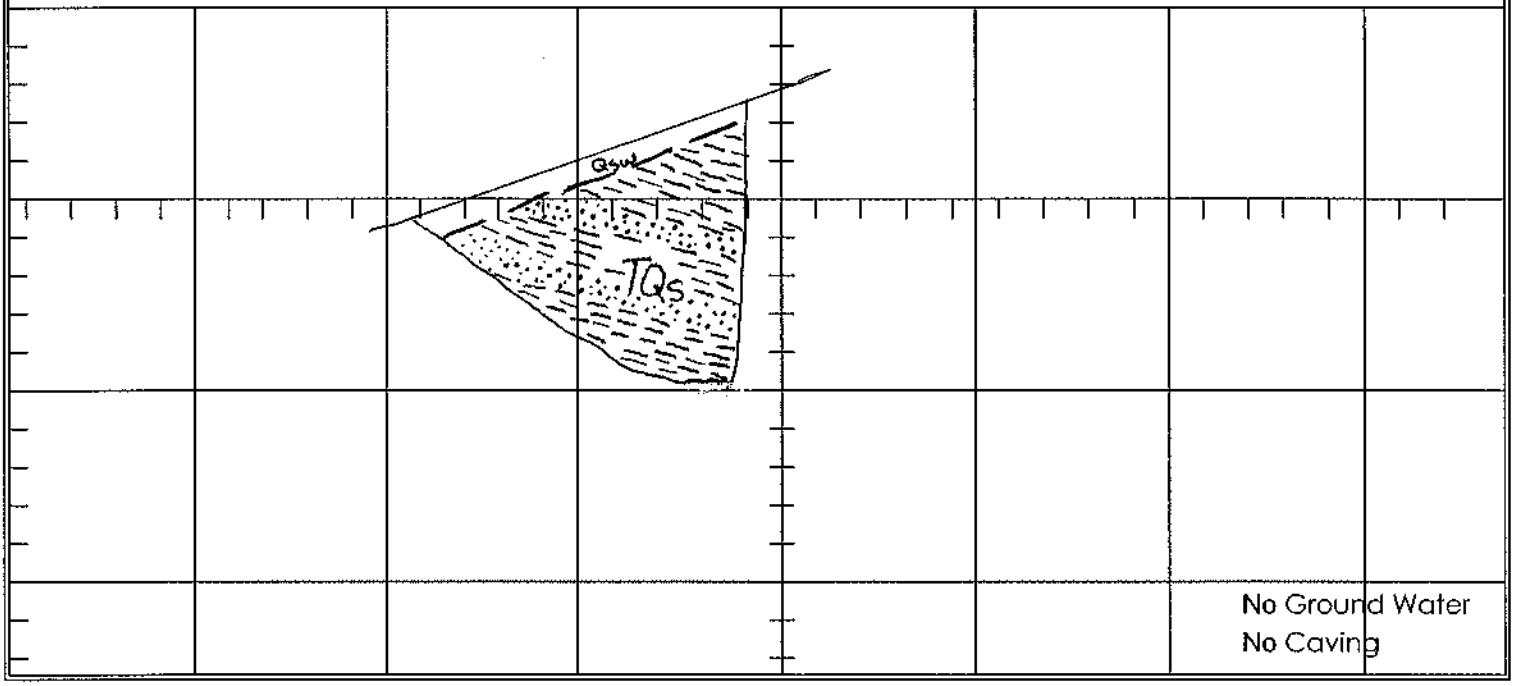
SCALE: 1 inch = 5 feet

No Ground Water
No Caving

CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245a-4	**TRENCH LOG NO. T-39**
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading	DATE: 6/8/18	
	LOGGED BY: MJD	
	EXCAVATED: 10/24/02	
EXCAVATION METHOD: Track-Mounted Backhoe	ELEVATION: 1390±	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SLOPEWASH; Qsw (0 - 0.5')** @ 0' Medium-brown silty clayey sand; soft; dry; roots void **BEDROCK; TQs (0.5 - 8')** @ 0.5' Reddish-brown siltstone and mudstone, and yellowish-gray to yellowish-brown sandstone and pebbly sandstone; moderately hard to hard; dry to slightly damp; caliche-lined fracture surfaces COMMENTS: Highly weathered/fractured to 5 ft.	B: N61E, 25SE			
5									
10									
15									
20									

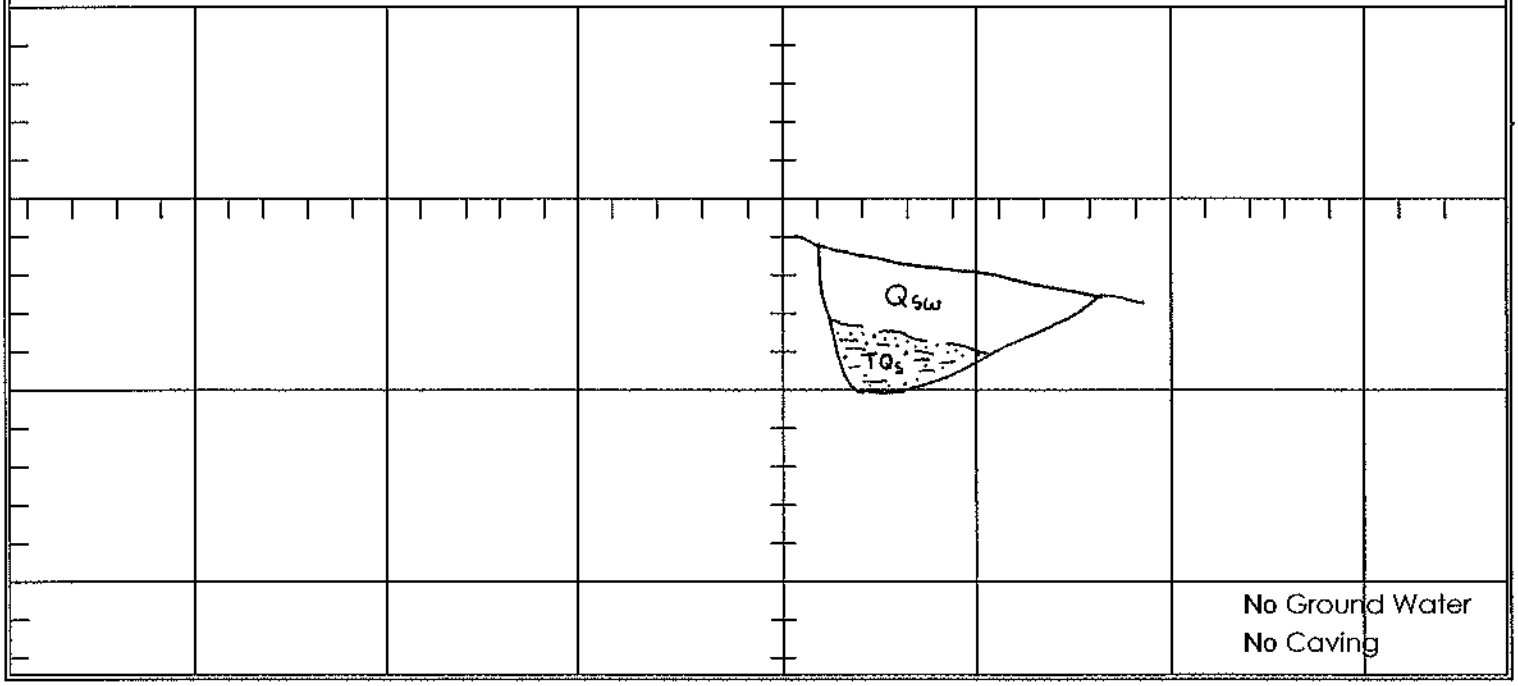
TOTAL DEPTH: 8 feet ←N37W SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.		JOB NO: 18-1245a-4	**TRENCH LOG NO. T-77**
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading		DATE: 6/8/18	
		LOGGED BY: MJD	
		EXCAVATED: 11/5/02	
EXCAVATION METHOD: Track-Mounted Backhoe		ELEVATION: 1320±	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SLOPEWASH; Qsw (0 - 2')** @ 0' Grayish-brown sandy silt/silty sand; soft to firm; dry; roots/voids **LANDSLIDE; Qls (2 - 4')** @ 2' Reddish-brown sandy siltstone; hard; slightly damp; structureless; weathered; pinhole voids COMMENTS: -Very hard to dig				
5									
10									
15									
20									

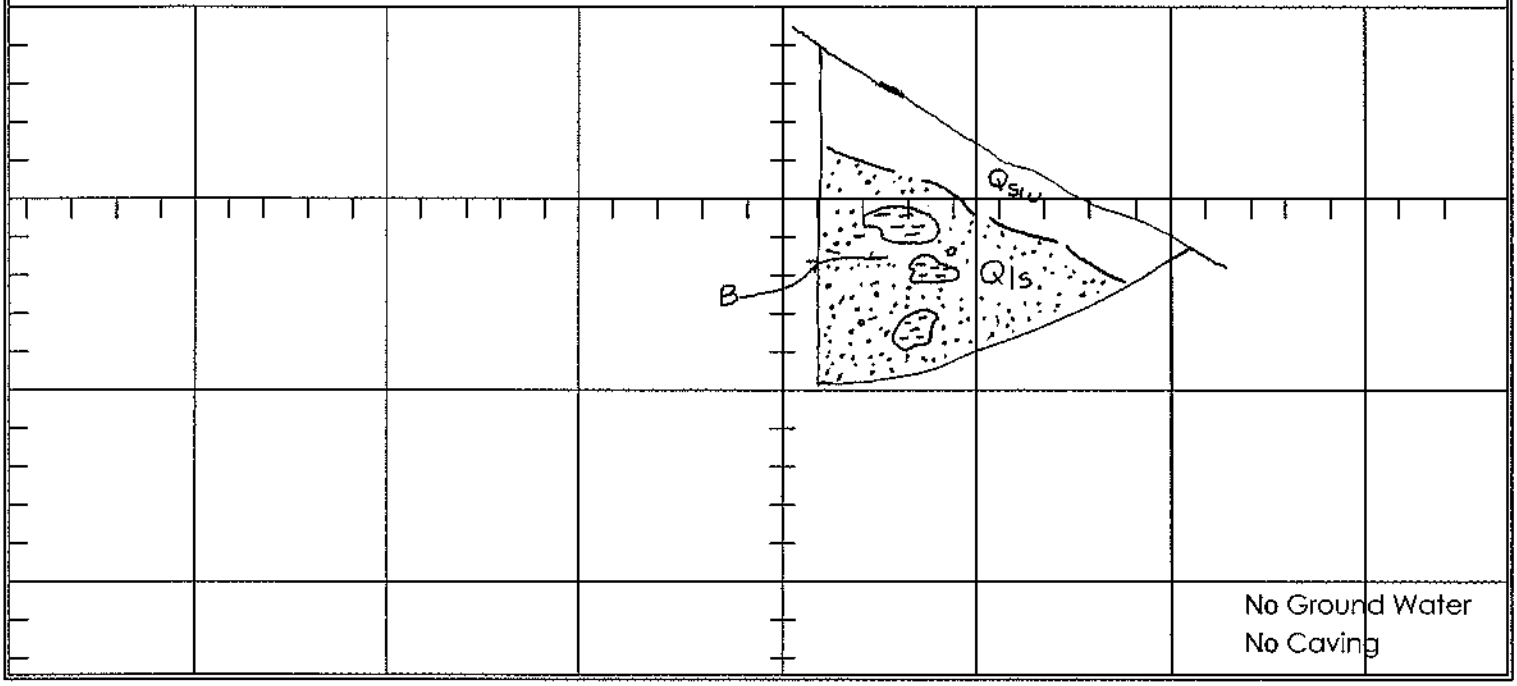
TOTAL DEPTH: 4 feet N64E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.		JOB NO: 18-1245a-4	**TRENCH LOG NO. T-78**
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading		DATE: 6/8/18	
		LOGGED BY: MJD	
		EXCAVATED: 11/5/02	
EXCAVATION METHOD: Track-Mounted Backhoe		ELEVATION: 1360±	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SLOPEWASH; Qsw (0 - 2.5')** @ 0' Grayish-brown silty pebbly sand; soft; dry; roots/voids				
5					**LANDSLIDE; Qls (2.5 - 9')** @ 2.5' Yellowish-brown sandstone and greenish-gray and reddish-brown siltstone; soft to firm; dry to damp; mottled, splotchy; random, irregular shaped siltstone blocks in sandy, pebbly matrix; sand locally laminated, but not planar or continuous	B: N11E, 10SE			
10					COMMENTS: -Looks disrupted				
15									
20									

TOTAL DEPTH: 9 feet N48E→ SCALE: 1 inch = 5 feet

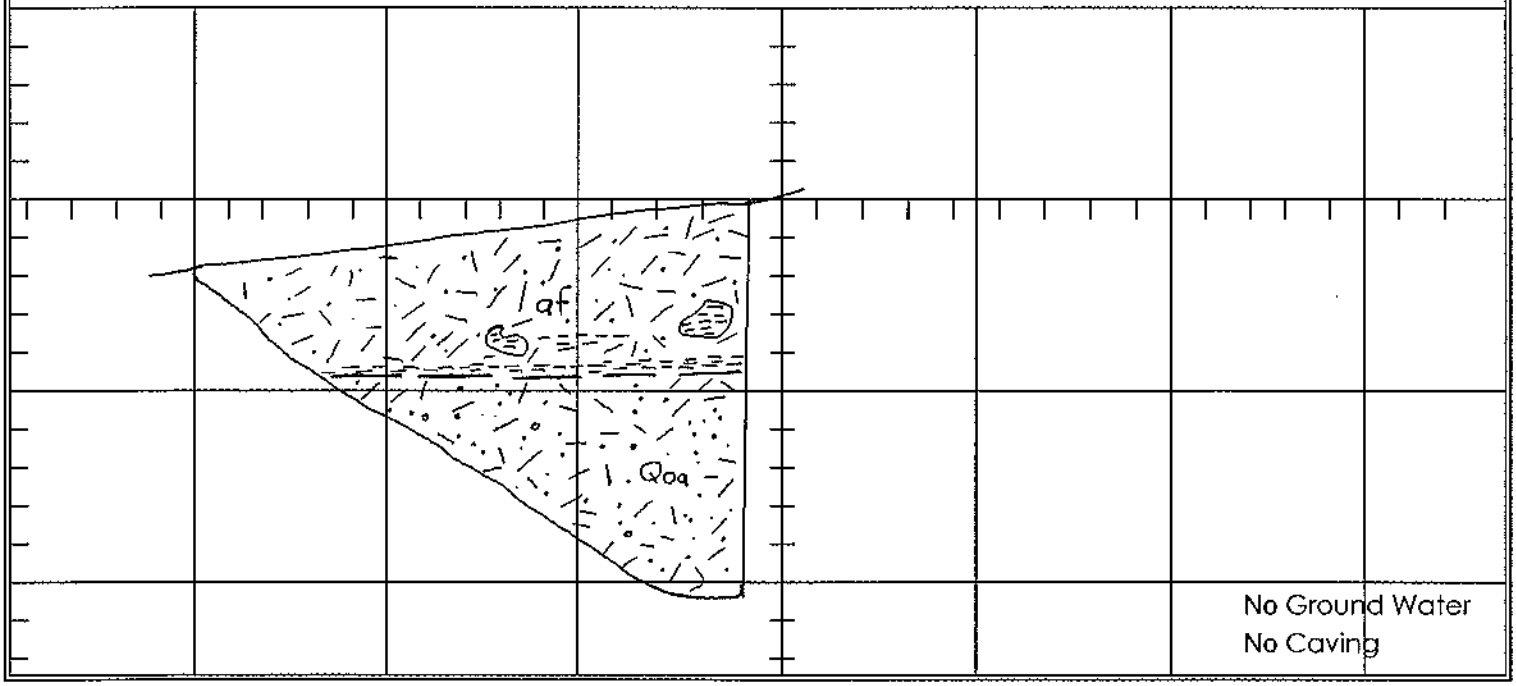


No Ground Water
No Caving

CLIENT: Sterling Gateway, L.P.		JOB NO: 18-1245a-4	**TRENCH LOG NO. T-105**
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading		DATE: 6/8/18	
		LOGGED BY: MJD	
		EXCAVATED: 3/5/03	
EXCAVATION METHOD: Trackhoe		ELEVATION: 1334'±	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**ARTIFICIAL FILL; af (0 - 4.5')** @ 0' Medium-brown sandy, silty clay with blocks of brown mudstone; soft; moist to damp; roots/voids; scattered trash; sharp contact with Qoa below; local discontinuous lifts				
5					**OLDER ALLUVIUM; Qoa (4.5 - 10.5')** @ 4.5' Medium-brown sandy, silty clay with scattered pebbles; firm; damp; roots; voids; structureless				
10					Comments: Highly weathered to 10.5'				
15									
20									

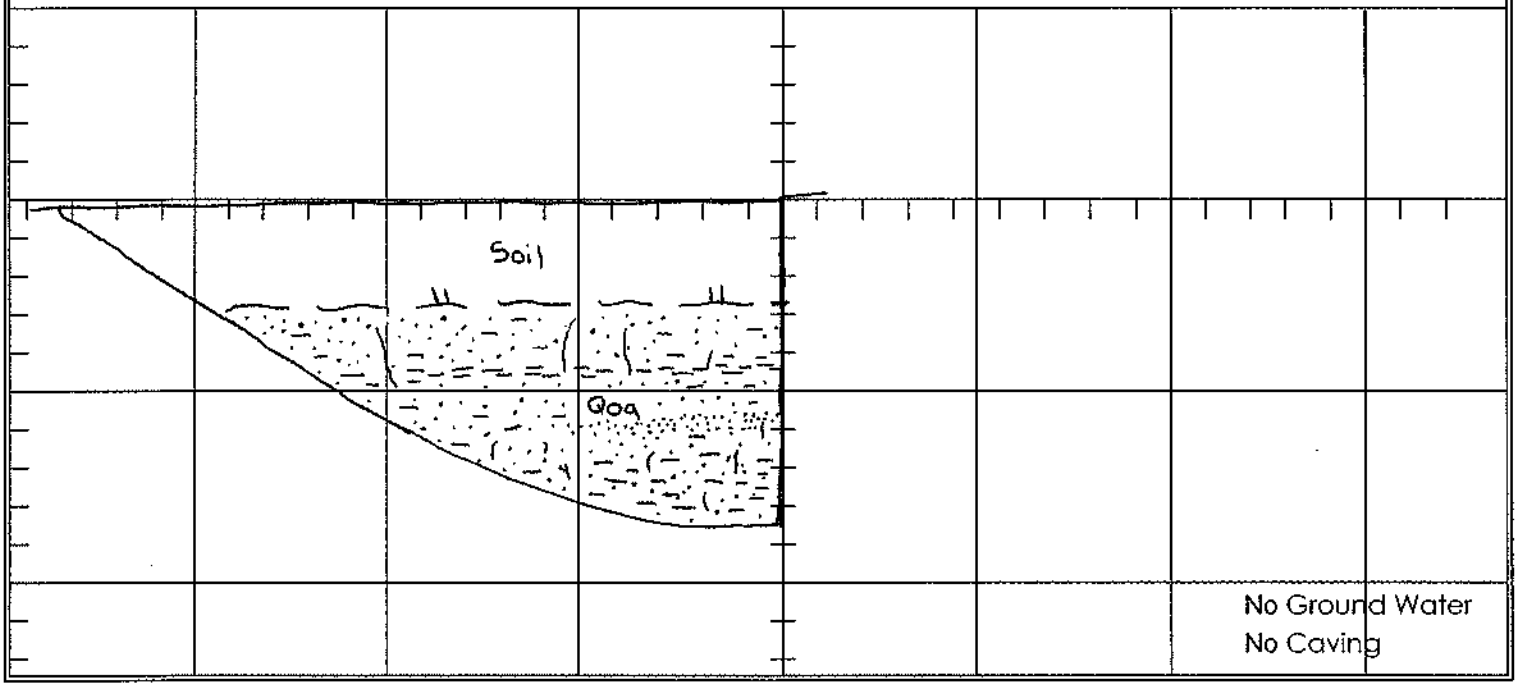
TOTAL DEPTH: 10.5 feet ←N88E SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245a-4	**TRENCH LOG NO. T-122**
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 2/8/08	
EXCAVATION METHOD: Trackhoe	ELEVATION: 1317'±	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SOIL; (0 - 2.75')** @ 0' Dark-brown (10YR 3/3) clayey sand; soft; very moist				
5					**OLDER ALLUVIUM; Qoa (2.75 - 8.5')** @ 2.75' Dark yellowish-brown (10YR 4/6) clayey sand; soft; moist; some caliche-lined fractures (generally along roots); fractures die out at depth @ 4' Brown to dark-brown (7.5YR 4/4) sandy silty clay lens; 2"-thick; possible old soil horizon @ 5.5' Dark yellowish-brown (10YR 4/6) clayey sand with scattered pebbles; soft to moderately hard; damp to moist, scattered caliche stringers @ 6' 2"-thick dark yellowish-brown sand lens; pinches out to southwest	Apx B: Horizontal			
10									
15									
20									

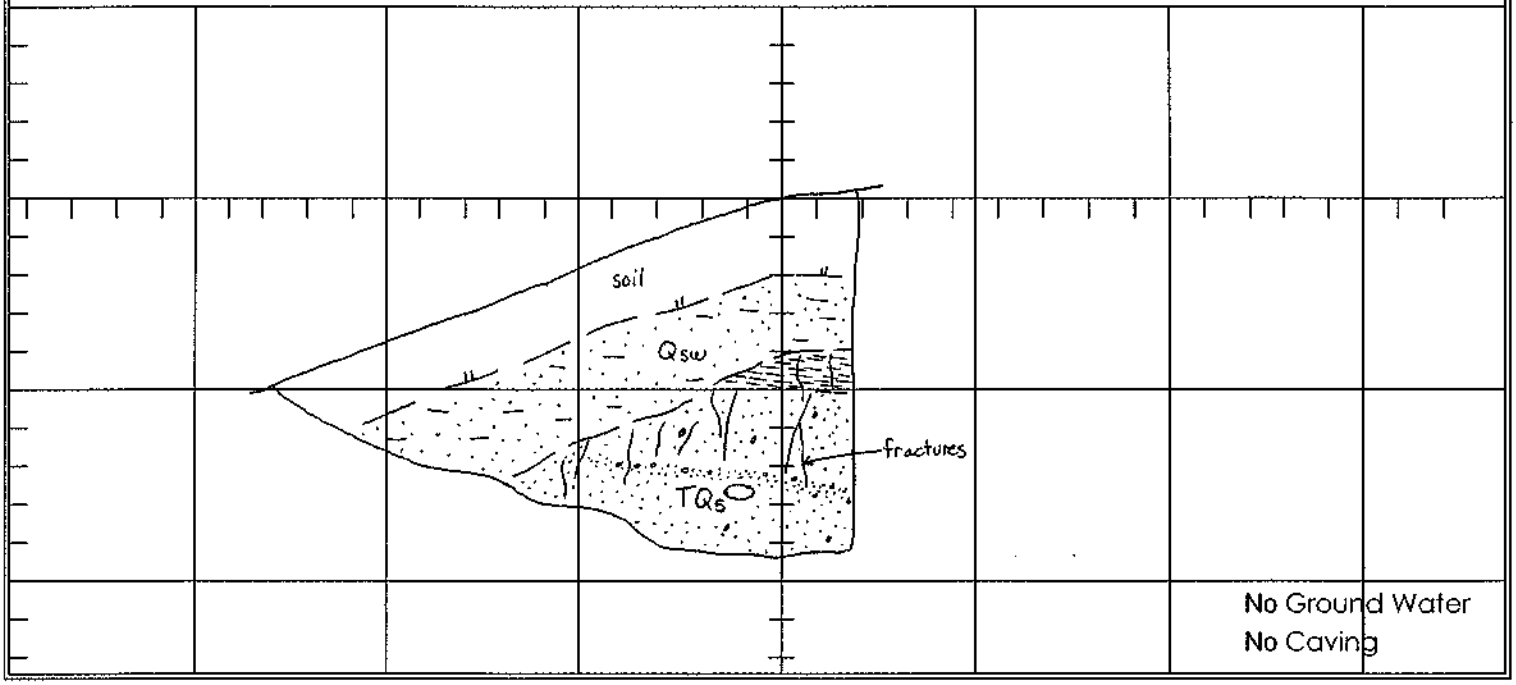
TOTAL DEPTH: 8.5 feet N43E→ SCALE: 1 inch = 5 feet



CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245a-4	**TRENCH LOG NO. T-123**
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 2/8/08	
EXCAVATION METHOD: Trackhoe	ELEVATION: 1352'±	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SOIL; (0 - 2')** @ 0' Dark-brown sandy, clayey silt; soft; very moist **SLOPEWASH; Qsw (2 - 4')** @ 2' Brown clayey sand; soft; very moist **BEDROCK; TQs (4 - 9.5')** @ 4' Strong-brown sandy mudstone; soft; moist @ 5' Pale yellowish-brown sandstone with scattered pebbles; moderately hard; damp to moist; widely spaced fractures; generally massive; fractures not through going @ 6' Moderately hard to hard; damp COMMENTS: Weathered to 5'	B: N69E, 19SE			
5									
10									
15									
20									

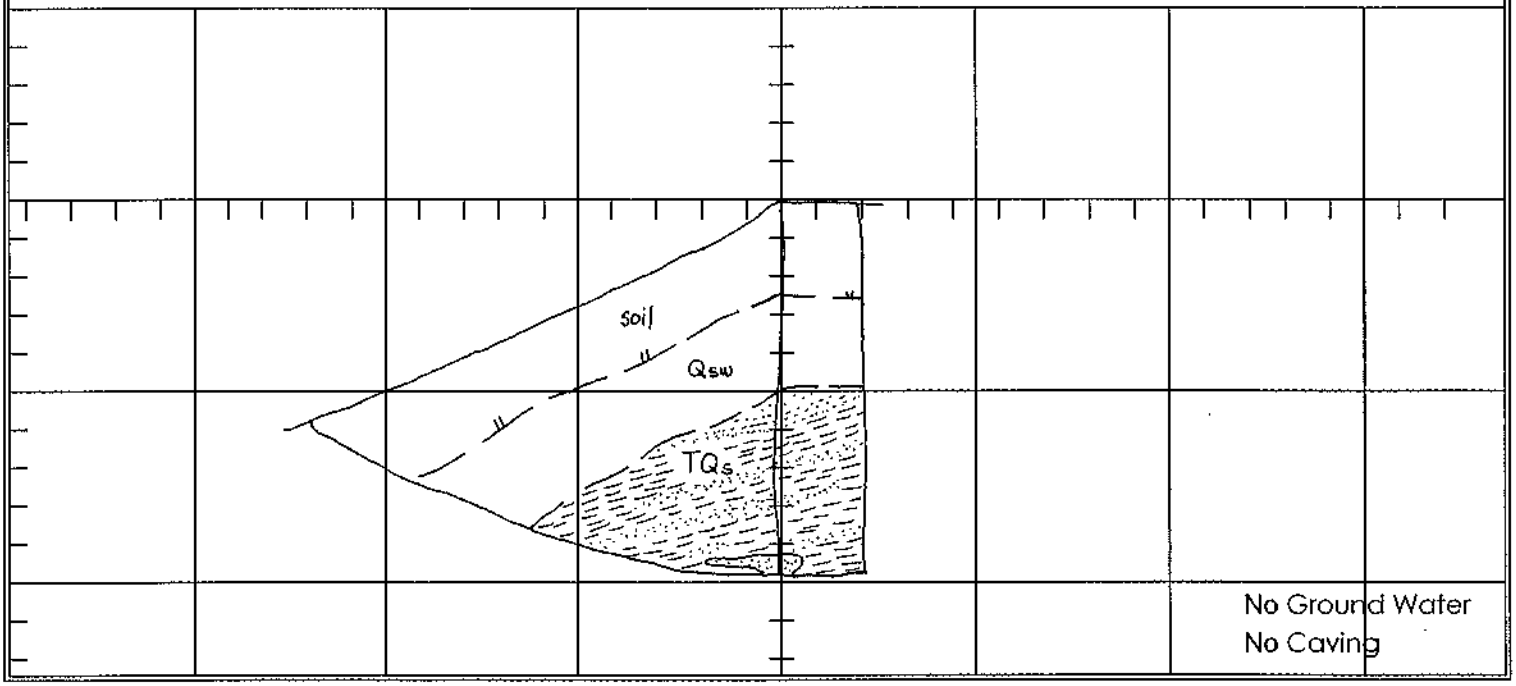
TOTAL DEPTH: 9.5 feet ←N61W SCALE: 1 inch = 5 feet



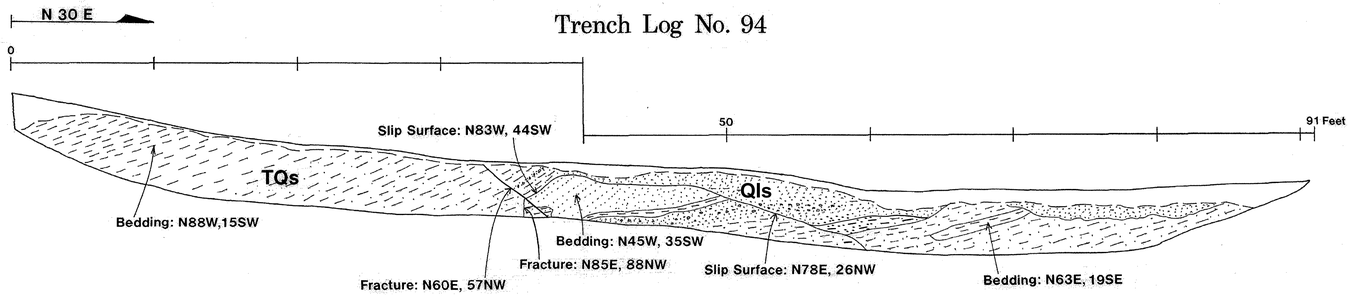
CLIENT: Sterling Gateway, L.P.	JOB NO: 18-1245a-4	**TRENCH LOG NO. T-124**
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading	DATE: 6/8/18	
	LOGGED BY: MBW	
	EXCAVATED: 2/8/08	
EXCAVATION METHOD: Trackhoe	ELEVATION: 1353'±	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SOIL; (0 - 2.5')** @ 0' Brown to dark-brown sandy clayey silt; soft; very moist				
					SLOPEWASH; Qsw (2.5 - 5') @ 2.5' Brown clayey sand; soft; moist				
5					**BEDROCK; TQs (5 - 10')** @ 5' Gray clayey sandstone; soft; moist @ 6' Strong-brown mudstone @ 6.5' Interbeded strong-brown mudstone and gray clayey sandstone; moderately hard	B: N49E, 16SE			
10					@ 9.5' Gray sandstone rip-up clast				
15									
20									

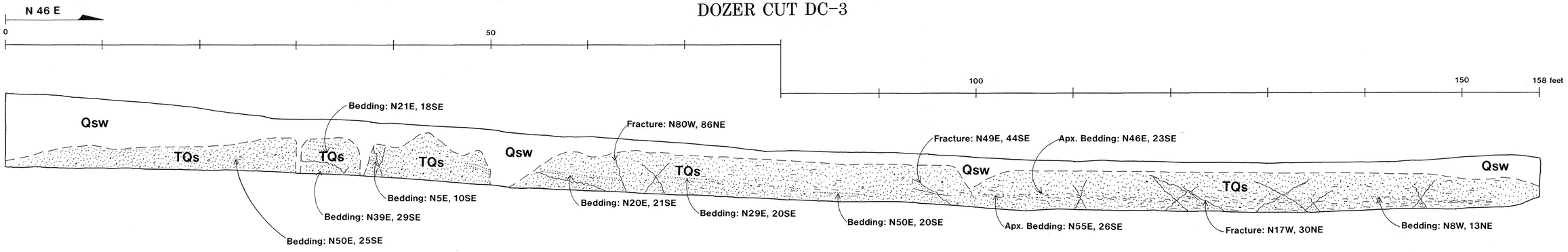
TOTAL DEPTH: 10 feet N73W→ SCALE: 1 inch = 5 feet



Trench Log No. 94



DOZER CUT DC-3



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOLOGIC LOGS - T-94 & DC-3

DATE: 6/8/18	JOB NO.: 18-124.5A-4
SCALE: 1" = 5'	FILE NAME: PLATE X DC3_T94
PLATE A1	GEOLOGY BY: STAFF
	DRAWN BY: STAFF
	REVISED:

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245a-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: VCG/BMW		
DRILLING COMPANY: AllWays Drilling Company	DRILLED: 1/24/07 - 1/30/07		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-1A	
DRIVING WEIGHTS: 0 - 30' = 4,780 lbs, 31 - 60' = 3,218 lbs, 61 - 80' = 2,280 lbs	ELEVATION: 1380'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
						BEDROCK; TQs (0 - 80')	
						@ 0' Orangish-yellow medium- to coarse-grained, sandstone with pebbly sandstone with scattered gravel interbeds; dense; dry to damp	
5		7 7/4"		117 / -		@ 5' No pebbles	
10		15 10/4"		115 / 4.1			% fines = 23 Shear Test
				B: N74E, 34SE			
15		18 6/4"		118 / -			
				B: N87W, 36SW			
20		10 6/4"		120 / 5.0		@ 20' Pebbles	% fines = 19 Shear Test
				B: N85E, 33SE		@ 22' Greenish-gray silty sandstone mottled with iron oxide staining; upper contact with pebbly sandstone/conglomerate is irregular	
25						@ 26' Grades to fine- to coarse-grained, sandstone with pebbly sandstone interbeds; iron oxide staining and mottling	
30		15 16		111 / 18.7	CL	@ 30' Olive-brown to grayish-blue silty sandstone with minor clay; dense; damp	LL= 39 PI= 17 % fines = 86 % -5 micron= 25 Shear Test
				B: N78E, 32SE		@ 31' Grades to yellowish-brown sandy siltstone with interbedded pebbly sandstone and fine-to medium-grained sandstone	
35							

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245a-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: VCG/BMW		
DRILLING COMPANY: AllWays Drilling Company	DRILLED: 1/24/07 - 1/30/07		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-1A	
DRIVING WEIGHTS: 0 - 30' = 4,780 lbs, 31 - 60' = 3,218 lbs, 61 - 80' = 2,280 lbs	ELEVATION: 1380'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
40		20/6"		119 / 10.1 B: N87E, 35SE		@ 40' Reddish-brown coarse-grained sandstone with iron oxide staining and interbedded bluish-gray sandy siltstone; irregular bounding contacts; dense; damp	% fines = 52 Shear Test
						@ 41' 1"-thick bluish-gray sandy siltstone interbed	
				B: N85E, 34SE		@ 43' Light-to-yellowish-brown fine to medium grained sandstone; cross-bedded	
45							
						@ 46' Grades to yellowish-brown to gray sandy siltstone with minor clay	
50		20/6"		121 / -		@ 50' Dark-olive-gray silty sandstone with scattered pebbles; massive; dense; damp	
						@ 52' Grades back to yellowish-brown sandstone with pebbly sandstone interbeds	
55							
60		29/6"		120 / 6.0 B: N68E, 31SE			% fines = 16 Shear Test
				B: N86W, 32SW		@ 63' Bluish-gray sandy siltstone with iron oxide straining	
65							
						@ 67' Grades to light-brown sandstone and silty sandstone	
				B: N84W, 32SW			
70		23/6"		107 / -		@ 70' Grades to olive-brown sandy siltstone mottled with iron-oxide stains; stiff; damp	
				B: N88E, 31SE			

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245a-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: VCG/BMW		
DRILLING COMPANY: AllWays Drilling Company	DRILLED: 1/24/07 - 1/30/07		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-1A	
DRIVING WEIGHTS: 0 - 30' = 4,780 lbs, 31 - 60' = 3,218 lbs, 61 - 80' = 2,280 lbs	ELEVATION: 1380'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf) MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
75						@ 75' Grades to bluish-gray sandy siltstone	
80		18 19		125 / 5.0		@ 79' Dark-greenish-gray sandy siltstone with plastic clay layers approximately 0.5" thick; stiff; damp TOTAL DEPTH 80' (Elev. 1300') No Ground Water No Caving Note: Samples to 60' taken with rig B-1. Samples at 70' and 80' taken with rig B-3. The driving weights for each rig are accurately reflected from this.	
85							
90							
95							
100							
105							
110							

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245a-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: VCG/MBW		
DRILLING COMPANY: AllWays Drilling Company	DRILLED: 2/2/07		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-2A	
DRIVING WEIGHTS: 0 - 30' = 5,619 lbs, 31 - 60' = 3,745 lbs, 61 - 90' = 2,280 lbs	ELEVATION: 1328'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
						TERRACE DEPOSITS; Qt (0 - 35.75')	@ 0-2' Casing
						@ 2' Yellowish-brown clayey, pebbly sand; moderately hard; damp; massive	
5							
		1 1		104 / -		@ 5' Light brown sandy silt with clay and pebbles	
				Apx B: N80E, 5SE		@ 6' 1/2"-thick silt bed; laminated	
			Qt			@ 7' Pebbly sands with interbedded sandy clay; soft to moderately hard; moist; undulatory bedding but generally horizontal to sub-horizontal	
10							
		2 4		119 / -			% fines = 83 Shear Test
						@ 12.5' Clayey, pebbly sand; massive	
15							
		2 2		108 / 4.7		@ 15' Interbedded pebbly sands and sandy clay/silt	% fines = 17 Shear Test
						@ 18.5' 5"-thick laminated silt; generally horizontal	
20							
		2 4		115 / -			
25							
						@ 27' Rip-ups	
						@ 28' Brown clayey pebbly sand; massive	
30							
		2 4		121 / -			
						@ 31' Mottled brown and grayish-brown; some oxidization	
						@ 32' Wispy oxidized fractures	
35							
				Apx B: N71W, 31SW		**BEDROCK; TQs (35.75 - 80')**	@ 35.75' Qt/TQs contact is oxidized and undulatory, but generally horizontal
						@ 35.75' Grayish-brown pebbly, clayey sandstone; moderately hard; damp	

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245a-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: VCG/MBW		
DRILLING COMPANY: AllWays Drilling Company	DRILLED: 2/2/07		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-2A	
DRIVING WEIGHTS: 0 - 30' = 5,619 lbs, 31 - 60' = 3,745 lbs, 61 - 90' = 2,280 lbs	ELEVATION: 1328'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES; DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
				Apx B: N86W, 30SW		@ 36' Olive-brown sandy siltstone; damp; firm; massive; gradational transition	
						@ 38' Oxidized bed	
40							
		4 16					% fines = 65 Shear Test
						@ 41' Scattered oxidized fractures	
						@ 43' Bluish-gray	
						@ 44' Interbed of yellowish-brown sandstone; pinches out to the south	
45							
						@ 46' Yellowish-brown pebbly sandstone; massive	
			TQs				
50							
		13/3"		111 / -			
						@ 53' More pebbly	
55							
						@ 58' Less pebbly	
60							
						*No sample taken at 60'. Driller reported the rock was even harder than at 50'	
65				B: N86W, 35SW		@ 65' Bluish-gray sandy claystone	
		16 10/2"		119 / 9.9 B: N80W, 38SW	CL	@ 66' 6"-thick interbedded sandstone	LL= 34 PI= 14 % fines = 61 % -5 micron= 16 Shear Test
				B: N80E, 33SE		@ 68.5' 10"-thick interbedded sandstone	
70							
		29/6"		110 / - B: N87E, 27SE		@ 70' Mottled greyish-brown	
						@ 72' Massive	

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245a-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: VCG/MBW		
DRILLING COMPANY: AllWays Drilling Company	DRILLED: 2/2/07		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-2A	
DRIVING WEIGHTS: 0 - 30' = 5,619 lbs, 31 - 60' = 3,745 lbs, 61 - 90' = 2,280 lbs	ELEVATION: 1328'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
75						@ 77' Yellowish-brown clayey sandstone	
80		17 10/2"		125 / 9.1		@ 80' Olive-brown sandy siltstone to silty sandstone; mottled with bluish-gray and iron-oxide stains; dense; dry to damp	% fines = 70 Shear Test
85						TOTAL DEPTH 80' (Elev. 1248') No Ground Water No Caving	
90							
95							
100							
105							
110							

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading	DATE: 6/8/18		
	LOGGED BY: BMW/BJS		
DRILLING COMPANY: All Ways Drilling	DRILLED: 9/26/07		
DRILLING METHOD: Bucket-Auger - 90' Rig	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelley Bar	AVERAGE DROP: 12"	**BORING NO.** B-24	
DRIVING WEIGHTS: 0-30' = 4,365 lbs; 30-60' = 2,898 lbs; 60-90' = 1,841 lbs	ELEVATION: 1308'±		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
			soil			**SOIL; (0 - 3.5')** @ 0' Light grayish-brown sandy silt; soft; dry	
5		1 2	Qoa	108 / 5.7		**OLDER ALLUVIUM; Qoa (3.5 - 9')** @ 3.5' Yellowish-brown (10YR 5/8) silty clayey sand; stiff; dry to damp	
						@ 8' Discontinuous silty sand interbed	
10		7 10		97 / 3.3 B: N83W, 60NE		**BEDROCK; TQs (9 - 50')** @ 9' Erosional contact with pale-yellow (5Y 7/3) silty sandstone with interbedded yellowish-red sandy mudstone; moderately hard; dry; grades to pebbly sandstone	
15		8 9	TQs	126 / 2.5			
				MF: N50E, 11SE		@ 17' Minor fault; 1/4"- to 2"-thick reddish-brown silty clay gouge; moderately plastic; pale-olive (5Y 6/3) silty sandstone below fault	
20		9 10		131 / 6.8			
						@ 21' Irregular contact to yellowish-red (5Y 6/3) sandy mudstone; moderately hard; damp; poorly bedded	
				Apx B: N67W, 45NE		@ 24' Sandstone lens possibly truncated by low angle minor fault	
25		15 bounce		124 / 10.8			
				Ctc: N60W, 40NE		@ 26' Erosional contact	
						@ 28' Minor fault with 6" separation	
30		10 15		MF: N68W, 54NE 124 / 5.1 MF: N84E, 20SE		@ 31' Faulted contact with dark-brown (7.5YR 3/4) sandy mudstone; hard; damp; some bluish-green alteration	
35		17 20		136 / 4.8			

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Del Valle Rd Off-site Grading	DATE: 6/8/18		
	LOGGED BY: BMW/BJS		
DRILLING COMPANY: All Ways Drilling	DRILLED: 9/26/07		
DRILLING METHOD: Bucket-Auger - 90' Rig	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelley Bar	AVERAGE DROP: 12"	**BORING NO.** B-24	
DRIVING WEIGHTS: 0-30' = 4,365 lbs; 30-60' = 2,898 lbs; 60-90' = 1,841 lbs	ELEVATION: 1308'±		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
40		30 12/2"	TQs	MF: N70W, 41NE Apx B: N75W, 54NE		@ 40' Fault contact with little to no gouge; dark greenish-gray (Gley 1 4/1) clayey sandstone; hard; damp; poorly bedded.	
45				MF: N84W, 60SW		@ 44' Multiple minor faults; 1/8- to 1/4"-thick silty clay gouge; contact to yellowish-red (5Y 6/3) sandy mudstone; hard; damp	Minor fault @ 44' offsets other minor fault
50						TOTAL DEPTH: 50' (Elev. 1258') No Ground Water No Caving	Backfill Tamped
55							
60							
65							
70							

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/6/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-1A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1244'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ALLUVIUM; Qal (0 - 30')** Bulk sample of cuttings collected from 0 - 15 ft.				
		8		SM	@ 3' Silty SAND; loose; dry; yellowish brown	2.3	109		
5		5							
		9			@ 9' - damp; orangish brown	5.0	117		
10		11		SM		4.9	115		Swell/Consol
15		6							
20		12			@ 20' - with gravel	7.0	116		
25		8		SC	@ 25' Clayey SAND; loose; damp; yellowish brown				
30		79/ 11"			**BEDROCK; TQs (30 - 33')** @ 30' Gray mudstone; hard; damp	15.4	117		
		Ref/ 6"			@ 33' Light brownish-gray, clayey sandstone; very dense; damp				
35					TOTAL DEPTH 33' (Elev. 1211') No Ground Water				

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/7/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-2A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1212'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ALLUVIUM; Qal (0 - 35')** Bulk sample of cuttings collected from 0 - 20 ft.				
		4		SM	@ 3' Silty SAND; very loose; damp; yellowish brown	2.6	105		
5		5		SM-SC	@ 7' Silty, clayey SAND; loose; damp; yellowish brown				
10		11			@ 10' - orangish brown	7.3	112		
		6							
15		8				8.4	113		
20		6			@ 20' - damp to moist; yellowish brown			47	
25		3			@ 25' - no recovery; wet sampler				
		4		SM-SC	@ 28' - very loose; wet	23.4	101		Added H_2O @ 28' Swell/Consol
30		push			@ 32' - very loose (small recovery)			32	
35		84/ 10"			**BEDROCK; TQs (35')** @ 35' Sandstone; very dense; damp				
					TOTAL DEPTH 35' (Elev. 1177') Ground Water @ 25' (11/7/06) Ground Water @ 20.5' (11/8/06)				

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/7/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-3A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1236'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ALLUVIUM; Qal (0 - 50')** Bulk sample of cuttings collected from 10 - 30 ft.				
		19		SM-SC	@ 3' Silty, clayey SAND; medium dense; dry; brown			45	
5		12			@ 6' - orangish brown			42	
		11		CL	@ 9' Sandy lean CLAY; stiff; damp; orangish brown			51	
10		18		SC	@ 13' Clayey SAND; medium dense; dry			36	
15		21		SM-SC	@ 15' Silty, clayey SAND; medium dense; dry; orangish brown			49	
		13		SP-SM	@ 18' Poorly graded SAND with silt; medium dense; dry; yellowish brown			11	
20		9		SM	@ 21' Silty SAND; loose; damp to moist; orangish brown			22	
		5		SC-SM	@ 24' Silty, clayey SAND; loose; wet; orangish brown			26	
25		5						18	Added H_2O @ 27'
30		6						15	
		23		SP-SM	@ 33' Poorly graded SAND with silt; medium dense; wet; orangish brown			11	
35		22		SM	@ 36' Silty SAND; medium dense; wet; orangish brown			24	

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/7/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-3A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1236'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
40		38			@ 39' - dense			17	
		6		SC	@ 42' Clayey SAND; loose; wet; orangish brown			42	
45		11		SM	@ 45' Silty SAND; medium dense; wet; yellowish brown with black interbed			24	
		54			@ 47.5' - dense; wet; light gray			33	
50		84/ 11"			**BEDROCK; TQs (50')** @ 50' Sandy mudstone; very dense; damp			68	
					TOTAL DEPTH 50' (Elev. 1186') Ground Water @ 24' (11/7/06) Caved to 11' (11/8/06)				
55									
60									
65									
70									
75									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/6/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-4A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1249'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**<u>ALLUVIUM</u>; Qal (0 - 25')**				
		13		SM	@ 3' Silty SAND; loose; dry; yellowish brown	4.2	106		
5		14				3.5	109	40	
		29			@ 9' - medium dense	3.9	114		
10		15		SM	@ 12' - loose; dry to damp; orangish brown	4.3	109		Swell/Consol
15		9		SM-SC	@ 15' Silty, clayey SAND; loose; damp; yellowish brown to orangish brown			35	
20		13				5.9	118		
25		74/8"			**<u>BEDROCK</u>; TQs (25 - 30')** @ 25' Sandstone; very dense; damp				
30		50/5"			@ 30' Clayey sandstone				
					TOTAL DEPTH 30' (Elev. 1219') No Ground Water				
35									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/7/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-5A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1294'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ALLUVIUM; Qal (0 - 25.5')**				
		9		SM	@ 3' Silty SAND; loose; dry; yellowish brown				
5		17			@ 6' - cobbles	3.4	119		
		5			@ 9' - no cobbles			36	
10		9			@ 12' - orangish brown				
		25			@ 15' - medium dense; light yellowish brown to orangish brown	1.8	134		
15									
		37			@ 20' - dense				
20									
		68/8"			@ 25' - medium dense; wet **BEDROCK; TQs (25.5')** @ 25.5' Sandstone; very dense; dry				
25					TOTAL DEPTH 25' (Elev. 1269') Ground Water @ 25' (11/7/06) Dry @ 25' (11/8/06)				
30									
35									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/6/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-6A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1246'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**<u>ALLUVIUM</u>; Qal (0 - 45')**				
		6		CL-ML	@ 3' Sandy, silty CLAY; firm; dry; yellowish brown	4.3	101		
5		8		SM	@ 6' Silty SAND; loose; dry; yellowish brown	5.5	110		
		11				8.1	111		
10		6		SM-SC	@ 12' Silty, clayey SAND; loose; damp; yellowish brown			45	
15		9		SM	@ 15' Silty SAND; loose; dry; yellowish brown	8.3	104		Swell/Consol
20		4		SP-SM SC	@ 20' Poorly graded SAND with silt; loose; wet; light gray @ 20.5' Clayey SAND; loose; wet; brown			44	
25		7		CL-ML	@ 25' Sandy silty CLAY; soft; wet; brown	20.6	107	58	Swell/Consol
30		10		SC	@ 30' Clayey SAND; loose; wet; brown	16.8	114	34	
35		9		SM	@ 35' Silty SAND; loose; wet; orangish brown				
					@ 38' Drilling became harder				

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/6/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-6A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1246'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
40									
		50/2"			**<u>BEDROCK</u>; TQs (40-45')** @ 40' Sandstone; very dense; moist; orangish brown	10.4	125		
45		Ref/ 6"							
					TOTAL DEPTH 45' (Elev. 1201') Ground Water @ 20' (11/6/06) Ground Water @ 22.5' (11/7/06)				
50									
55									
60									
65									
70									
75									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/6/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-7A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1274'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ALLUVIUM; Qal (0 - 35')** Bulk sample of cuttings collected from 10 - 20 ft.				
		7		SM/ ML	@ 3' Silty SAND/sandy SILT; loose/firm; damp; yellowish brown	3.7	99		
5		12		SM	@ 6' Silty SAND; loose; damp; yellowish brown	2.3	112		
		12				6.6	116		
10		7							
15		13		SC-SM	@ 15' Silty, clayey SAND; loose; damp; orangish brown	6.4	111		
20		7							
25		17		SM	@ 25' Silty SAND; loose; damp; orangish brown	10.9	110		
30		9		SC-SM	@ 30' Silty, clayey SAND; loose; wet; yellowish brown				
35		63			**BEDROCK; TQs (35 - 40')** @35' Sandstone with gravel; dense (rock in tip); wet; brown	9.4	130		

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/6/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-7A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1274'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
40		75			@ 40' Sandy mudstone; hard; damp to moist				
					TOTAL DEPTH 40' (Elev. 1234') Ground Water @ 30' (11/6/06) Caved @ 23' (11/7/06)				
45									
50									
55									
60									
65									
70									
75									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/7/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-8A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1257'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ALLUVIUM; Qal (0 - 34')** Bulk sample of cuttings collected from 0 - 20 ft.				
		7		SM	@ 3' Silty SAND; loose; dry; brown to orangish brown; rootlets; voids	3.4	99		
5		14			@ 6' - medium dense; rootlets; voids				
		18			@ 9' - loose to medium dense; rootlets; voids	3.3	114		
10		5			@ 12' - loose				
15		10				6.1	113		
20		9							
25		16				5.9	113		
30		11		SC	@ 30' Clayey SAND; medium dense; moist; orangish brown				
					BEDROCK; TQs (34 - 35')				
35		Ref/ 5"			@ 34' Gray, FeO_2 stained sandstone; very dense; damp	7.2	128		
					TOTAL DEPTH 35' (Elev. 1222') No Ground Water				

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Valley Well Drilling	DRILLED: 11/8/06		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 6"	**BORING NO.** HS-9A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1294'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**<u>ALLUVIUM</u>; Qal (0 - 25')**				
		17		SM	@ 3' Silty SAND; loose; damp; orangish brown; rootlets; voids	2.7	107		
5		18			@ 6' - medium dense; yellowish brown				
		12		SM-SC	@ 9' Silty, clayey SAND; loose; damp; orangish brown	4.4	114		
10		11		SM	@ 12' Silty SAND; medium dense; damp; orangish brown				
15		28				2.6	119		
20		32		SM-SC	@ 20' Silty, clayey SAND; medium dense to dense; damp; yellowish brown				
25		45			**<u>BEDROCK</u>; TQs (25')** @ 25' Sandstone; dense; damp; friable				
					TOTAL DEPTH 25' (Elev. 1269') No Ground Water				
30									
35									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Choice Drilling Inc.	DRILLED: 1/15/18		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 8"	**BORING NO.** HS-10A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1205.5		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**<u>ALLUVIUM</u>; Qal (0- 50')**				
		11		SM-SC	@ 3' Silty, clayey SAND; loose; dry; yellowish brown (10YR 5/4); pinhole voids and rootlets	3.9	104	44	
5		12		SM	@ 6' Silty, fine- to medium-grained SAND with gravel; loose; dry; yellowish brown (10YR 5/4)	4.3	99	38	
		19		ML	@ 9' Sandy SILT; stiff; damp; yellowish brown (10YR 5/4)	6.6	100	55	
10		27		SM	@ 12' Silty, fine-grained SAND; medium dense; damp; light yellowish brown (10YR 6/4)	4.2	110	40	
		28			@ 15' - mottled light yellowish brown (10YR 6/4) and dark yellowish brown (10YR 4/4)	4.8	115	34	
15					@ 16.5' - with gravel				
		50/5"			@ 18' - very dense; yellowish brown (10YR 5/4)	2.7	110	22	
		33			@ 21' - minor gravel (approx. < 15%); medium dense	1.9	105	27	
20		34		ML	@ 24' SILT with sand; stiff; damp; light yellowish brown (10YR 6/4)	4.5	107	73	
		45/6"		SP-SM	@ 27' Poorly graded, medium- to coarse-grained SAND with silt; dense; damp; yellowish brown (10YR 5/4)	1.9	118	8	@ 27' Visually coarser soil with less fines content
25		38			@ 30' - with gravel; medium dense	2.2	116	11	
		21				2.2	113	6	
30									
35									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Choice Drilling Inc.	DRILLED: 1/15/18		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 8"	**BORING NO.** HS-10A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1205.5		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
40		28		SM-SC	@ 40' Silty, clayey, fine- to medium-grained SAND with scattered gravel; medium dense; moist; dark yellowish brown (10YR 4/4)	8.2	114	33	
45		51		SP-SM	@ 45' Poorly graded, medium- to coarse-grained SAND; medium dense; moist to wet; dark yellowish brown (10YR 4/4)	8.0	125	9	
50		50/5"			**BEDROCK; TQs (50 - 55')** @ 50' Moderate yellowish-brown (10YR 5/4) sandstone with gravel; well sorted; very dense; wet				
55		50/3"			@ 55' - yellowish-gray (5Y 7/2) sandstone; very dense; damp				
					TOTAL DEPTH 55' (Elev. 1150.5') Caved to 47' Groundwater at 46.5 ft (during drilling) Groundwater at 45.5 ft (24 hr reading on 1/16/18)				
60									
65									
70									
75									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Choice Drilling Inc.	DRILLED: 1/15/18		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 8"	**BORING NO.** HS-11A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1197'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ALLUVIUM; Qal (0 - 32')**				
		9		SM-SC	@ 3' Silty, clayey SAND; loose; damp; brown (10YR 4/3)	5.9	103	43	
5		12		SM	@ 6' Silty, fine-grained SAND; loose; damp; yellowish brown (10YR 5/4)	4.5	105	37	k=3.5E-04 cm/s Sieve % -5 micron= 11
10		12			@ 9' - dark yellowish brown (10YR 3/4)	9.5	112	49	
		16		SM	@ 12' - dark yellowish brown (10YR 4/4)	5.3	107	19	k=1.5E-03 cm/s Sieve % -5 micron= 6
15		21		SM	@ 15' medium dense; pinhole voids	10.3	93	48	k=1.4E-04 cm/s Sieve % -5 micron= 15
		13			@ 18' - loose	6.7	100	44	
20		33		SM	@ 21' Silty, fine- to medium-grained SAND with scattered gravel; medium dense; damp; yellowish brown (10YR 5/4)	3.3	104	20	k=1.2E-03 cm/s Sieve % -5 micron= 7
25		18			@ 24' Silty, medium-grained SAND; loose	5.3	110	19	
		53		SP-SM	@ 27' Poorly graded, medium- to coarse-grained SAND with silt and scattered gravel; dense; damp; yellowish brown (10YR 5/4) and light yellowish brown (10YR 6/4)	2.9	105	12	k=2.0E-03 cm/s Sieve % -5 micron= 6
30		64		SC	@ 30' Clayey, medium- to coarse-grained SAND; dense; damp; yellowish brown (10YR 5/4)	8.9	127	29	
					BEDROCK; TQs/Tp? (32 - 40')				
35		50/3"			@ 35' Pale olive (10Y 6/2) claystone; very hard; damp; plastic			91	

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Choice Drilling Inc.	DRILLED: 1/15/18		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 8"	**BORING NO.** HS-11A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1197'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
40									
		50/3"			@ 40' - pale olive (10Y 6/2) and light brown (5YR 6/6)				
					TOTAL DEPTH 40' (Elev. 1157') No Groundwater No Caving				
45									
50									
55									
60									
65									
70									
75									

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Choice Drilling Inc.	DRILLED: 1/15/18		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 8"	**BORING NO.** HS-12A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1201.5		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**<u>ALLUVIUM</u>; Qal (0 - 34')** @ 0-15' Silty, fine-grained SAND; loose to medium dense; damp; yellowish brown (10YR 5/4)				Generalized description based on cuttings
15	■	31		SW-SM	@ 15' Silty, medium- to coarse-grained SAND with scattered gravel; medium dense; damp; yellowish brown (10YR 5/4)	5.2	109	10	k=2.8E-03 cm/s Sieve % -5 micron= 5
25	■	18		CL-ML SM	@ 25' Sandy, silty CLAY; firm; moist; yellowish brown (10YR 5/4) @ 26' Silty, fine- to medium-grained SAND; loose to medium dense; damp; light yellowish brown (10YR 6/4)	6.4	105	34	
35	■	50/2"			**<u>BEDROCK</u>; TQs (34 - 40')** @ 35' Moderate-brown (5YR 3/4) claystone with sand; hard; damp			83	

CLIENT: Sterling Gateway, L.P.	JOB NO.: 18-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 6/8/18		
	LOGGED BY: KPC		
DRILLING COMPANY: Choice Drilling Inc.	DRILLED: 1/15/18		
DRILLING METHOD: Hollow-Stem Auger	HOLE DIA: 8"	**BORING NO.** HS-12A	
HAMMER TYPE: Automatic	AVERAGE DROP: 30"		
DRIVING WEIGHTS: 140 lbs	ELEVATION: 1201.5		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
40									
		50/6"			@ 40' - light olive gray (5Y 5/2)				
					TOTAL DEPTH 40' (Elev. 1161.5') No Groundwater				
45									
50									
55									
60									
65									
70									
75									

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE SIZE)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE SIZE)	CLEAN SANDS (LITTLE OR NO FINES)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	Silty sands, sand-silt mixtures
				SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	Inorganic silts and very fine sands, clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
				OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	Inorganic silts, micaceous or diatomaceous fine, sandy or silty soils, elastic silts
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils

Notes:
(1) Dual USCS symbols, such as SP-SM, denote 5 to 12% of minor constituent.
(2) Dual USCS symbols, such as SM/ML, denote borderline soil classifications.
(3) Subsurface information from boring and test pit logs depict conditions only at the specific locations. and dates indicated. Soil conditions and water levels at other locations may differ from conditions at these locations. Also, the conditions at these locations may change with time.
(4) Blow counts on logs are the number of blows to drive the sampler with the weight and drop height indicated on each log.
(5) Split-barrel sampler driving record applies only to hollow-stem-auger and rotary-wash borings.
(6) These logs are subject to the limitations, conclusions, and recommendations in this report.

HS: Hollow-stem-auger boring
RW: Rotary-wash boring
B: Bucket-auger boring

SAMPLE TYPE

STANDARD PENETRATION TEST
Split barrel sampler in accordance with ASTM D-1586 Test Method

CALIFORNIA DRIVE
Split-barrel sampler in accordance with ASTM D-3550 Test Method

DISTURBED CALIFORNIA DRIVE

SHELBY TUBE
Thin-walled sampler in accordance with ASTM D-1587 Test Method

BULK SAMPLE

NO RECOVERY

GROUND WATER DATA

GROUND WATER WHILE DRILLING

GROUND WATER AFTER DRILLING

DENSITY OF GRANULAR SOILS	
DESCRIPTION	SPT BLOWS PER FOOT
Very Loose	< 4
Loose	4 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

STRENGTH OF COHESIVE SOILS	
CONSISTENCY	SPT BLOWS PER FOOT
Very Soft	< 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	> 30

SPLIT-BARREL SAMPLER DRIVING RECORD	
BLOW COUNT	DESCRIPTION
25	25 blows drove the sampler 12 inches, after initial 6 inches of seating
50/7"	50 blows drove the sampler 7 inches, after initial 6 inches of seating
Ref/3"	50 blows drove the sampler 3 inches during initial 6-inch seating interval

LABORATORY TESTING ABBREVIATIONS

Plasticity Index	PI	Compaction Curve	Curve=A
Liquid Limit	LL	Consolidation / Collapse	Consol
Hydrometer	%-5 micron	Direct Shear / Reshear / Remold	Shear Test
Expansion Index	EI		
Corrosivity Analysis	Cor		

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

USCS Soil Classification and Key to Boring Log Symbols

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 10/27/2006 15:48
PROJECT NO.: 18-1245A-4
CONE/RIG: DSG0906
ASSUMED DEPTH OF WATER TABLE: 25 feet
SOUNDING: CPT-01

Depth (m)	Depth (ft)	Cone Resistance, q_t (tsf)	Friction Ratio, R_f (%)	Soil Behavior Type, SBT	I_c	K_c	$N_{1(60)}$
	0.16	29.28	1.23	Sand mixtures - silty sand to sandy silt	2.17	1.58	17
	0.33	1.00	1.06	Sensitive, fine-grained	3.44		1
	0.49	1.76	23.70	Unstable clayey silts	3.94		3
	0.66	49.87	2.17	Sand mixtures - silty sand to sandy silt	2.16	1.56	29
	0.82	68.10	2.10	Sand mixtures - silty sand to sandy silt	2.06	1.37	37
	0.98	62.74	2.36	Sand mixtures - silty sand to sandy silt	2.12	1.48	35
	1.15	55.93	2.35	Sand mixtures - silty sand to sandy silt	2.15	1.54	32
	1.31	46.44	2.13	Sand mixtures - silty sand to sandy silt	2.18	1.60	27
	1.48	38.62	2.01	Sand mixtures - silty sand to sandy silt	2.22	1.69	23
	1.64	33.28	1.79	Sand mixtures - silty sand to sandy silt	2.23	1.73	20
	1.80	39.39	2.74	Sand mixtures - silty sand to sandy silt	2.30	1.95	25
	1.97	44.81	2.22	Sand mixtures - silty sand to sandy silt	2.20	1.66	26
	2.13	37.61	2.35	Sand mixtures - silty sand to sandy silt	2.27	1.85	23
	2.30	36.31	1.61	Sand mixtures - silty sand to sandy silt	2.17	1.59	21
	2.46	35.19	1.31	Sand mixtures - silty sand to sandy silt	2.12	1.49	20
	2.62	28.17	1.35	Sand mixtures - silty sand to sandy silt	2.21	1.68	17
	2.79	24.68	1.66	Sand mixtures - silty sand to sandy silt	2.31	1.97	16
	2.95	25.71	2.11	Sand mixtures - silty sand to sandy silt	2.36	2.15	17
	3.12	33.95	1.67	Sand mixtures - silty sand to sandy silt	2.20	1.67	20
	3.28	43.33	1.60	Sand mixtures - silty sand to sandy silt	2.11	1.47	24
	3.44	47.17	1.70	Sand mixtures - silty sand to sandy silt	2.10	1.45	26
	3.61	46.44	1.67	Sand mixtures - silty sand to sandy silt	2.10	1.45	26
	3.77	43.99	1.59	Sand mixtures - silty sand to sandy silt	2.11	1.46	24
	3.94	41.75	1.53	Sand mixtures - silty sand to sandy silt	2.11	1.47	23
	4.10	36.19	1.43	Sand mixtures - silty sand to sandy silt	2.14	1.52	20
	4.27	29.96	1.42	Sand mixtures - silty sand to sandy silt	2.20	1.66	18
	4.43	31.18	1.47	Sand mixtures - silty sand to sandy silt	2.20	1.65	18
	4.59	37.64	1.53	Sand mixtures - silty sand to sandy silt	2.15	1.54	21
	4.76	45.63	1.52	Sand mixtures - silty sand to sandy silt	2.08	1.42	25
	4.92	43.58	1.20	Sands - clean sands to silty sand	2.03	1.33	23
	5.09	30.98	1.46	Sand mixtures - silty sand to sandy silt	2.20	1.65	18
	5.25	33.13	1.14	Sand mixtures - silty sand to sandy silt	2.11	1.47	18
	5.41	38.39	1.24	Sand mixtures - silty sand to sandy silt	2.08	1.41	21
	5.58	39.28	1.71	Sand mixtures - silty sand to sandy silt	2.17	1.58	23
	5.74	36.94	2.40	Sand mixtures - silty sand to sandy silt	2.29	1.89	23
	5.91	34.64	2.63	Sand mixtures - silty sand to sandy silt	2.33	2.05	22
	6.07	32.77	2.94	Sand mixtures - silty sand to sandy silt	2.39	2.25	22
	6.23	49.26	2.16	Sand mixtures - silty sand to sandy silt	2.17	1.58	28
	6.40	71.69	1.92	Sand mixtures - silty sand to sandy silt	2.02	1.32	37
	6.56	79.86	1.92	Sands - clean sands to silty sand	1.99	1.29	40
	6.73	79.03	1.99	Sand mixtures - silty sand to sandy silt	2.01	1.31	39

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 18-1245A-4 SOUNDING: CPT-01

Depth (m)	Depth (ft)	Cone Resistance, q_t (tsf)	Friction Ratio, R_f (%)	Soil Behavior Type, SBT	I_c	K_c	$N_{1(60)}$
	6.89	81.54	2.12	Sand mixtures - silty sand to sandy silt	2.03	1.33	41
	7.05	79.39	2.46	Sand mixtures - silty sand to sandy silt	2.08	1.41	41
	7.22	73.39	2.72	Sand mixtures - silty sand to sandy silt	2.14	1.52	40
	7.38	77.00	2.66	Sand mixtures - silty sand to sandy silt	2.12	1.49	40
	7.55	91.53	2.37	Sand mixtures - silty sand to sandy silt	2.05	1.36	44
	7.71	103.34	2.16	Sand mixtures - silty sand to sandy silt	1.99	1.28	46
	7.87	105.33	2.26	Sand mixtures - silty sand to sandy silt	2.00	1.30	47
	8.04	104.22	2.59	Sand mixtures - silty sand to sandy silt	2.05	1.37	48
	8.20	103.50	2.66	Sand mixtures - silty sand to sandy silt	2.07	1.39	48
	8.37	93.12	2.99	Sand mixtures - silty sand to sandy silt	2.13	1.51	45
	8.53	79.51	3.06	Sand mixtures - silty sand to sandy silt	2.18	1.62	40
	8.69	73.61	2.78	Sand mixtures - silty sand to sandy silt	2.18	1.60	36
	8.86	65.57	2.97	Sand mixtures - silty sand to sandy silt	2.23	1.73	34
	9.02	66.53	3.14	Sand mixtures - silty sand to sandy silt	2.25	1.78	34
	9.19	77.36	2.85	Sand mixtures - silty sand to sandy silt	2.18	1.61	37
	9.35	88.82	2.70	Sand mixtures - silty sand to sandy silt	2.13	1.50	40
	9.51	95.67	2.85	Sand mixtures - silty sand to sandy silt	2.13	1.51	43
	9.68	99.93	2.97	Sand mixtures - silty sand to sandy silt	2.14	1.52	44
	9.84	95.21	3.00	Sand mixtures - silty sand to sandy silt	2.16	1.56	42
	10.01	90.16	2.87	Sand mixtures - silty sand to sandy silt	2.16	1.56	40
	10.17	88.16	3.11	Sand mixtures - silty sand to sandy silt	2.19	1.64	40
	10.33	90.32	2.94	Sand mixtures - silty sand to sandy silt	2.17	1.59	39
	10.50	88.63	3.26	Sand mixtures - silty sand to sandy silt	2.21	1.69	40
	10.66	96.57	3.20	Sand mixtures - silty sand to sandy silt	2.19	1.63	42
	10.83	102.82	3.07	Sand mixtures - silty sand to sandy silt	2.16	1.57	43
	10.99	101.21	2.83	Sand mixtures - silty sand to sandy silt	2.14	1.52	41
	11.15	104.90	2.41	Sand mixtures - silty sand to sandy silt	2.08	1.42	40
	11.32	112.97	2.39	Sand mixtures - silty sand to sandy silt	2.06	1.38	42
	11.48	113.24	1.95	Sands - clean sands to silty sand	2.00	1.29	40
	11.65	93.99	2.07	Sand mixtures - silty sand to sandy silt	2.07	1.40	35
	11.81	83.19	2.29	Sand mixtures - silty sand to sandy silt	2.14	1.52	32
	11.98	73.94	2.47	Sand mixtures - silty sand to sandy silt	2.20	1.66	30
	12.14	65.85	2.57	Sand mixtures - silty sand to sandy silt	2.25	1.79	27
	12.30	57.29	2.94	Sand mixtures - silty sand to sandy silt	2.33	2.05	25
	12.47	52.99	3.20	Sand mixtures - silty sand to sandy silt	2.38	2.24	24
	12.63	49.38	3.18	Silt mixtures - clayey silt to silty clay	2.41	2.33	23
	12.80	47.30	2.98	Sand mixtures - silty sand to sandy silt	2.40	2.31	21
	12.96	47.85	3.11	Silt mixtures - clayey silt to silty clay	2.42	2.36	22
	13.12	50.63	2.86	Sand mixtures - silty sand to sandy silt	2.38	2.21	22
	13.29	50.91	2.67	Sand mixtures - silty sand to sandy silt	2.36	2.14	22
	13.45	47.11	2.75	Sand mixtures - silty sand to sandy silt	2.39	2.27	20
	13.62	41.75	3.04	Silt mixtures - clayey silt to silty clay	2.46	2.58	19
	13.78	42.93	2.79	Silt mixtures - clayey silt to silty clay	2.43	2.44	19
	13.94	46.49	2.51	Sand mixtures - silty sand to sandy silt	2.38	2.22	19
	14.11	48.84	2.42	Sand mixtures - silty sand to sandy silt	2.36	2.13	20
	14.27	49.91	2.45	Sand mixtures - silty sand to sandy silt	2.36	2.13	20
	14.44	51.38	2.38	Sand mixtures - silty sand to sandy silt	2.34	2.08	20

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 18-1245A-4 SOUNDING: CPT-01

Depth (m)	Depth (ft)	Cone Resistance, q_t (tsf)	Friction Ratio, R_f (%)	Soil Behavior Type, SBT	I_c	K_c	$N_{1(60)}$
	14.60	51.67	2.28	Sand mixtures - silty sand to sandy silt	2.33	2.04	20
	14.76	51.14	2.35	Sand mixtures - silty sand to sandy silt	2.35	2.09	20
	14.93	40.71	3.94	Silt mixtures - clayey silt to silty clay	2.57	4.52	18
	15.09	52.10	2.80	Sand mixtures - silty sand to sandy silt	2.40	2.28	20
	15.26	47.80	3.13	Silt mixtures - clayey silt to silty clay	2.46	2.56	20
	15.42	51.55	2.19	Sand mixtures - silty sand to sandy silt	2.33	2.05	19
	15.58	49.47	2.12	Sand mixtures - silty sand to sandy silt	2.34	2.07	18
	15.75	45.52	2.52	Sand mixtures - silty sand to sandy silt	2.42	2.38	18
	15.91	44.21	2.38	Sand mixtures - silty sand to sandy silt	2.42	2.36	17
	16.08	44.32	2.33	Sand mixtures - silty sand to sandy silt	2.41	2.35	17
	16.24	46.12	2.14	Sand mixtures - silty sand to sandy silt	2.38	2.21	17
	16.40	46.82	1.95	Sand mixtures - silty sand to sandy silt	2.35	2.10	17
	16.57	44.67	2.17	Sand mixtures - silty sand to sandy silt	2.40	2.29	16
	16.73	45.44	2.19	Sand mixtures - silty sand to sandy silt	2.40	2.29	16
	16.90	47.05	2.09	Sand mixtures - silty sand to sandy silt	2.37	2.20	17
	17.06	46.33	1.89	Sand mixtures - silty sand to sandy silt	2.35	2.12	16
	17.22	44.99	1.95	Sand mixtures - silty sand to sandy silt	2.38	2.20	16
	17.39	45.94	2.06	Sand mixtures - silty sand to sandy silt	2.39	2.25	16
	17.55	47.93	2.13	Sand mixtures - silty sand to sandy silt	2.38	2.23	17
	17.72	49.50	1.99	Sand mixtures - silty sand to sandy silt	2.36	2.13	17
	17.88	45.72	2.06	Sand mixtures - silty sand to sandy silt	2.40	2.28	16
	18.04	44.06	2.14	Sand mixtures - silty sand to sandy silt	2.42	2.39	15
	18.21	43.63	2.31	Sand mixtures - silty sand to sandy silt	2.45	2.51	15
	18.37	45.00	2.30	Sand mixtures - silty sand to sandy silt	2.44	2.47	16
	18.54	45.00	2.35	Sand mixtures - silty sand to sandy silt	2.45	2.51	16
	18.70	47.03	2.18	Sand mixtures - silty sand to sandy silt	2.42	2.36	16
	18.86	47.65	2.24	Sand mixtures - silty sand to sandy silt	2.42	2.39	16
	19.03	48.69	2.14	Sand mixtures - silty sand to sandy silt	2.40	2.31	16
	19.19	47.93	2.19	Sand mixtures - silty sand to sandy silt	2.42	2.37	16
	19.36	44.70	2.13	Sand mixtures - silty sand to sandy silt	2.44	2.45	15
	19.52	40.05	2.61	Silt mixtures - clayey silt to silty clay	2.53	3.53	14
	19.69	38.55	2.69	Silt mixtures - clayey silt to silty clay	2.56	4.16	14
	19.85	41.23	2.68	Silt mixtures - clayey silt to silty clay	2.54	3.58	14
	20.01	43.01	2.71	Silt mixtures - clayey silt to silty clay	2.53	3.38	15
	20.18	42.63	2.76	Silt mixtures - clayey silt to silty clay	2.54	3.64	14
	20.34	41.76	3.08	Silt mixtures - clayey silt to silty clay	2.58	4.77	14
	20.51	38.91	3.79	Silt mixtures - clayey silt to silty clay	2.67	8.37	14
	20.67	36.51	4.31	Silt mixtures - clayey silt to silty clay	2.73		14
	20.83	37.64	4.14	Silt mixtures - clayey silt to silty clay	2.71		14
	21.00	41.01	3.52	Silt mixtures - clayey silt to silty clay	2.64	6.84	14
	21.16	42.44	3.16	Silt mixtures - clayey silt to silty clay	2.60	5.24	14
	21.33	43.09	2.90	Silt mixtures - clayey silt to silty clay	2.57	4.36	14
	21.49	46.18	2.60	Silt mixtures - clayey silt to silty clay	2.51	3.07	15
	21.65	48.56	2.25	Sand mixtures - silty sand to sandy silt	2.46	2.54	15
	21.82	47.71	2.20	Sand mixtures - silty sand to sandy silt	2.46	2.55	14
	21.98	50.37	2.18	Sand mixtures - silty sand to sandy silt	2.44	2.46	15
	22.15	54.61	2.11	Sand mixtures - silty sand to sandy silt	2.40	2.31	16

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 18-1245A-4 SOUNDING: CPT-01

Depth (m)	Depth (ft)	Cone Resistance, q_t (tsf)	Friction Ratio, R_f (%)	Soil Behavior Type, SBT	I_c	K_c	$N_{1(60)}$
	22.31	52.15	2.22	Sand mixtures - silty sand to sandy silt	2.44	2.45	15
	22.47	56.94	2.32	Sand mixtures - silty sand to sandy silt	2.42	2.38	16
	22.64	62.63	2.23	Sand mixtures - silty sand to sandy silt	2.38	2.21	17
	22.80	55.92	2.05	Sand mixtures - silty sand to sandy silt	2.39	2.28	16
	22.97	51.05	2.45	Silt mixtures - clayey silt to silty clay	2.48	2.66	15
	23.13	46.72	2.96	Silt mixtures - clayey silt to silty clay	2.57	4.48	14
	23.29	47.31	3.16	Silt mixtures - clayey silt to silty clay	2.59	4.99	15
	23.46	49.80	2.81	Silt mixtures - clayey silt to silty clay	2.54	3.59	15
	23.62	52.26	2.57	Silt mixtures - clayey silt to silty clay	2.50	2.73	15
	23.79	51.36	2.39	Silt mixtures - clayey silt to silty clay	2.48	2.67	15
	23.95	49.21	2.47	Silt mixtures - clayey silt to silty clay	2.51	3.01	14
	24.11	51.86	2.35	Silt mixtures - clayey silt to silty clay	2.48	2.65	15
	24.28	57.12	2.21	Sand mixtures - silty sand to sandy silt	2.43	2.42	15
	24.44	56.58	2.24	Sand mixtures - silty sand to sandy silt	2.44	2.46	15
	24.61	53.26	2.60	Silt mixtures - clayey silt to silty clay	2.51	2.91	15
	24.77	53.28	2.62	Silt mixtures - clayey silt to silty clay	2.51	3.00	15
	24.93	64.97	2.17	Sand mixtures - silty sand to sandy silt	2.39	2.24	17
	25.10	55.34	2.33	Sand mixtures - silty sand to sandy silt	2.47	2.59	15
	25.26	49.28	2.88	Silt mixtures - clayey silt to silty clay	2.57	4.47	14
	25.43	41.79	3.93	Silt mixtures - clayey silt to silty clay	2.72		13
	25.59	41.40	3.45	Silt mixtures - clayey silt to silty clay	2.69	9.57	12
	25.75	41.21	3.03	Silt mixtures - clayey silt to silty clay	2.65	7.65	12
	25.92	41.25	2.97	Silt mixtures - clayey silt to silty clay	2.65	7.43	12
	26.08	44.67	2.86	Silt mixtures - clayey silt to silty clay	2.61	5.78	13
	26.25	48.56	2.65	Silt mixtures - clayey silt to silty clay	2.56	4.13	13
	26.41	52.28	2.45	Silt mixtures - clayey silt to silty clay	2.51	2.98	14
	26.57	58.06	2.26	Sand mixtures - silty sand to sandy silt	2.45	2.51	15
	26.74	59.54	2.12	Sand mixtures - silty sand to sandy silt	2.42	2.39	15
	26.90	58.58	2.28	Sand mixtures - silty sand to sandy silt	2.45	2.51	15
	27.07	58.01	2.57	Silt mixtures - clayey silt to silty clay	2.49	2.70	15
	27.23	78.34	2.58	Sand mixtures - silty sand to sandy silt	2.39	2.24	20
	27.40	116.45	1.56	Sand mixtures - silty sand to sandy silt	2.10	1.44	25
	27.56	127.40	1.52	Sand mixtures - silty sand to sandy silt	2.06	1.38	27
	27.72	112.39	1.43	Sand mixtures - silty sand to sandy silt	2.08	1.42	24
	27.89	81.70	2.07	Sand mixtures - silty sand to sandy silt	2.31	1.96	19
	28.05	69.13	2.40	Sand mixtures - silty sand to sandy silt	2.41	2.35	17
	28.22	63.11	2.55	Silt mixtures - clayey silt to silty clay	2.46	2.58	16
	28.38	67.60	2.16	Sand mixtures - silty sand to sandy silt	2.39	2.26	17
	28.54	84.29	1.86	Sand mixtures - silty sand to sandy silt	2.27	1.84	19
	28.71	111.49	1.39	Sand mixtures - silty sand to sandy silt	2.08	1.41	23
	28.87	134.13	1.44	Sands - clean sands to silty sand	2.03	1.33	27
	29.04	126.85	1.55	Sand mixtures - silty sand to sandy silt	2.07	1.40	26
	29.20	111.07	2.41	Sand mixtures - silty sand to sandy silt	2.26	1.81	25
	29.36	116.42	1.72	Sand mixtures - silty sand to sandy silt	2.14	1.51	25
	29.53	163.46	1.44	Sands - clean sands to silty sand	1.97	1.25	32
	29.69	210.96	0.95	Sands - clean sands to silty sand	1.75	1.07	37
	29.86	212.61	0.82	Sands - clean sands to silty sand	1.70	1.03	36

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 18-1245A-4 SOUNDING: CPT-01

Depth (m)	Depth (ft)	Cone Resistance, q_t (tsf)	Friction Ratio, R_f (%)	Soil Behavior Type, SBT	I_c	K_c	$N_{1(60)}$
	30.02	200.18	0.82	Sands - clean sands to silty sand	1.73	1.05	34
	30.18	188.71	1.17	Sands - clean sands to silty sand	1.85	1.14	35
	30.35	165.21	1.17	Sands - clean sands to silty sand	1.90	1.18	31
	30.51	140.49	1.44	Sands - clean sands to silty sand	2.02	1.32	28
	30.68	126.79	1.77	Sand mixtures - silty sand to sandy silt	2.12	1.49	26
	30.84	132.94	1.77	Sand mixtures - silty sand to sandy silt	2.11	1.46	27
	31.00	148.61	1.33	Sands - clean sands to silty sand	1.98	1.27	29
	31.17	128.94	1.77	Sand mixtures - silty sand to sandy silt	2.12	1.48	27
	31.33	123.70	1.47	Sand mixtures - silty sand to sandy silt	2.08	1.40	25
	31.50	116.13	1.57	Sand mixtures - silty sand to sandy silt	2.12	1.48	24
	31.66	118.75	1.57	Sand mixtures - silty sand to sandy silt	2.11	1.47	24
	31.82	112.82	1.67	Sand mixtures - silty sand to sandy silt	2.15	1.54	23
	31.99	109.95	2.08	Sand mixtures - silty sand to sandy silt	2.23	1.73	24
	32.15	113.04	1.76	Sand mixtures - silty sand to sandy silt	2.17	1.58	24
	32.32	112.25	1.68	Sand mixtures - silty sand to sandy silt	2.15	1.55	23
	32.48	113.09	1.63	Sand mixtures - silty sand to sandy silt	2.14	1.53	23
	32.64	114.98	1.61	Sand mixtures - silty sand to sandy silt	2.13	1.51	23
	32.81	121.22	1.59	Sand mixtures - silty sand to sandy silt	2.11	1.47	24
	32.97	129.64	1.55	Sand mixtures - silty sand to sandy silt	2.08	1.41	26
	33.14	141.67	1.59	Sand mixtures - silty sand to sandy silt	2.06	1.38	28
	33.30	163.05	2.19	Sand mixtures - silty sand to sandy silt	2.12	1.48	33
	33.46	198.45	1.77	Sands - clean sands to silty sand	1.99	1.28	37
	33.63	206.37	1.30	Sands - clean sands to silty sand	1.87	1.16	37
	33.79	221.69	1.30	Sands - clean sands to silty sand	1.85	1.14	39
	33.96	258.67	1.20	Sands - clean sands to silty sand	1.78	1.08	44
	34.12	292.65	0.79	Sands - clean sands to silty sand	1.60	1.00	45
	34.28	275.10	0.67	Sands - clean sands to silty sand	1.57	1.00	42
	34.45	239.69	0.99	Sands - clean sands to silty sand	1.74	1.06	40
	34.61	209.20	1.04	Sands - clean sands to silty sand	1.80	1.10	36
	34.78	177.52	1.19	Sands - clean sands to silty sand	1.90	1.18	32
	34.94	154.81	1.48	Sands - clean sands to silty sand	2.02	1.31	29
	35.10	99.74	1.82	Sand mixtures - silty sand to sandy silt	2.23	1.74	21
	35.27	127.22	1.40	Sand mixtures - silty sand to sandy silt	2.07	1.39	24
	35.43	104.43	1.57	Sand mixtures - silty sand to sandy silt	2.17	1.60	21
	35.60	93.37	1.83	Sand mixtures - silty sand to sandy silt	2.26	1.82	19
	35.76	88.80	1.85	Sand mixtures - silty sand to sandy silt	2.28	1.88	19
	35.93	85.56	1.54	Sand mixtures - silty sand to sandy silt	2.24	1.77	18
	36.09	80.63	1.68	Sand mixtures - silty sand to sandy silt	2.29	1.92	17
	36.25	64.47	2.42	Silt mixtures - clayey silt to silty clay	2.49	2.68	15
	36.42	53.84	3.02	Silt mixtures - clayey silt to silty clay	2.62	6.19	13
	36.58	45.14	2.85	Silt mixtures - clayey silt to silty clay	2.67	8.57	11
	36.75	39.68	3.43	Silt mixtures - clayey silt to silty clay	2.78		10
	36.91	27.93	5.08	Clays - silty clay to clay	3.02		8
	37.07	36.73	3.85	Clays - silty clay to clay	2.84		10
	37.24	57.76	2.43	Silt mixtures - clayey silt to silty clay	2.53	3.51	13
	37.40	79.58	1.84	Sand mixtures - silty sand to sandy silt	2.33	2.04	17
	37.57	113.28	1.30	Sand mixtures - silty sand to sandy silt	2.10	1.44	21

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 18-1245A-4 SOUNDING: CPT-01

Depth (m)	Depth (ft)	Cone Resistance, q_t (tsf)	Friction Ratio, R_f (%)	Soil Behavior Type, SBT	I_c	K_c	$N_{1(60)}$
	37.73	129.72	1.34	Sand mixtures - silty sand to sandy silt	2.06	1.38	24
	37.89	139.60	1.16	Sands - clean sands to silty sand	1.99	1.28	25
	38.06	174.72	0.91	Sands - clean sands to silty sand	1.84	1.13	29
	38.22	227.43	0.76	Sands - clean sands to silty sand	1.68	1.02	35
	38.39	217.16	0.82	Sands - clean sands to silty sand	1.72	1.05	34
	38.55	192.69	0.83	Sands - clean sands to silty sand	1.77	1.08	31
	38.71	172.74	0.97	Sands - clean sands to silty sand	1.86	1.15	29
	38.88	182.78	0.69	Sands - clean sands to silty sand	1.74	1.06	29
	39.04	177.84	1.10	Sands - clean sands to silty sand	1.89	1.17	30
	39.21	209.19	0.70	Sands - clean sands to silty sand	1.69	1.03	32
	39.37	209.62	0.71	Sands - clean sands to silty sand	1.70	1.03	32
	39.53	206.81	0.50	Sands - clean sands to silty sand	1.60	1.00	31
	39.70	201.01	0.52	Sands - clean sands to silty sand	1.63	1.00	30
	39.86	208.74	0.55	Sands - clean sands to silty sand	1.63	1.00	31
	40.03	228.34	0.68	Sands - clean sands to silty sand	1.66	1.00	35
	40.19	275.27	1.63	Sands - clean sands to silty sand	1.88	1.16	46
	40.35	235.45	3.42	Very stiff sand to clayey sand	2.19	1.64	45
	40.52	165.72	6.17	Very stiff, fine grained	2.51	3.02	36
	40.68	168.32	6.72	Very stiff, fine grained	2.54	3.63	37
	40.85	173.43	8.19	Very stiff, fine grained	2.61	5.60	39
	41.01	201.32	7.89	Very stiff, fine grained	2.55	3.97	45
	41.17	197.88	8.22	Very stiff, fine grained	2.57	4.54	44
	41.34	196.43	8.36	Very stiff, fine grained	2.58	4.81	44
	41.50	195.82	8.27	Very stiff, fine grained	2.58	4.73	44
	41.67	197.09	8.26	Very stiff, fine grained	2.58	4.68	44

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 11/1/2006 9:26
PROJECT NO.: 17-1245A-4
CONE/RIG: DSG0705
ASSUMED DEPTH OF WATER TABLE: 37.4 feet
SOUNDING: CPT-02

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	8.44	5.21	Clays - silty clay to clay	2.98		8
	0.33	69.63	1.01	Sands - clean sands to silty sand	1.82	1.12	32
	0.49	59.91	1.22	Sands - clean sands to silty sand	1.93	1.21	29
	0.66	33.39	2.03	Sand mixtures - silty sand to sandy silt	2.26	1.83	20
	0.82	29.90	1.90	Sand mixtures - silty sand to sandy silt	2.28	1.88	19
	0.98	27.10	1.47	Sand mixtures - silty sand to sandy silt	2.24	1.77	16
	1.15	25.25	1.55	Sand mixtures - silty sand to sandy silt	2.28	1.88	16
	1.31	26.64	1.49	Sand mixtures - silty sand to sandy silt	2.25	1.79	16
	1.48	25.98	1.58	Sand mixtures - silty sand to sandy silt	2.28	1.86	16
	1.64	24.41	1.56	Sand mixtures - silty sand to sandy silt	2.30	1.92	15
	1.80	19.78	1.43	Sand mixtures - silty sand to sandy silt	2.35	2.09	13
	1.97	13.76	1.55	Sand mixtures - silty sand to sandy silt	2.50	2.74	10
	2.13	12.39	1.20	Sand mixtures - silty sand to sandy silt	2.48	2.63	9
	2.30	12.35	0.51	Sand mixtures - silty sand to sandy silt	2.30	1.94	8
	2.46	10.32	0.09	Sand mixtures - silty sand to sandy silt	2.19	1.00	6
	2.62	17.07	2.34	Silt mixtures - clayey silt to silty clay	2.53	3.42	12
	2.79	28.93	2.10	Sand mixtures - silty sand to sandy silt	2.32	2.01	18
	2.95	21.97	1.90	Sand mixtures - silty sand to sandy silt	2.39	2.24	15
	3.12	3.78	1.63	Clays - silty clay to clay	3.01		4
	3.28	3.37	2.16	Clays - silty clay to clay	3.12		4
	3.44	6.72	2.15	Silt mixtures - clayey silt to silty clay	2.85		6
	3.61	8.13	2.39	Silt mixtures - clayey silt to silty clay	2.80		7
	3.77	15.28	1.65	Sand mixtures - silty sand to sandy silt	2.48	2.65	11
	3.94	17.38	1.63	Sand mixtures - silty sand to sandy silt	2.43	2.42	12
	4.10	16.85	1.80	Sand mixtures - silty sand to sandy silt	2.47	2.59	12
	4.27	17.38	1.78	Sand mixtures - silty sand to sandy silt	2.45	2.53	12
	4.43	19.16	1.61	Sand mixtures - silty sand to sandy silt	2.39	2.27	13
	4.59	20.76	1.80	Sand mixtures - silty sand to sandy silt	2.39	2.28	14
	4.76	22.00	1.67	Sand mixtures - silty sand to sandy silt	2.35	2.12	14
	4.92	23.00	1.62	Sand mixtures - silty sand to sandy silt	2.33	2.04	15
	5.09	21.77	1.73	Sand mixtures - silty sand to sandy silt	2.37	2.17	14
	5.25	20.24	1.98	Sand mixtures - silty sand to sandy silt	2.43	2.43	14
	5.41	19.22	2.15	Sand mixtures - silty sand to sandy silt	2.47	2.61	13
	5.58	17.24	2.30	Silt mixtures - clayey silt to silty clay	2.53	3.38	13
	5.74	16.13	2.11	Silt mixtures - clayey silt to silty clay	2.53	3.37	12
	5.91	16.28	1.78	Sand mixtures - silty sand to sandy silt	2.48	2.66	11
	6.07	15.73	2.04	Silt mixtures - clayey silt to silty clay	2.53	3.41	11
	6.23	15.82	2.10	Silt mixtures - clayey silt to silty clay	2.53	3.53	12
	6.40	16.90	2.28	Silt mixtures - clayey silt to silty clay	2.53	3.51	12
	6.56	19.70	2.25	Sand mixtures - silty sand to sandy silt	2.48	2.64	14
	6.73	22.16	1.99	Sand mixtures - silty sand to sandy silt	2.40	2.31	15

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-02

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	21.41	1.72	Sand mixtures - silty sand to sandy silt	2.38	2.20	14
	7.05	19.33	1.75	Sand mixtures - silty sand to sandy silt	2.42	2.37	13
	7.22	14.42	1.51	Sand mixtures - silty sand to sandy silt	2.49	2.68	10
	7.38	5.56	1.10	Silt mixtures - clayey silt to silty clay	2.80		5
	7.55	1.38	2.15	Clays - silty clay to clay	3.64		2
	7.71	1.60	2.38	Clays - silty clay to clay	3.58		2
	7.87	6.06	3.28	Clays - silty clay to clay	3.02		6
	8.04	9.68	2.09	Silt mixtures - clayey silt to silty clay	2.72		8
	8.20	11.95	2.43	Silt mixtures - clayey silt to silty clay	2.68	9.02	10
	8.37	17.30	2.55	Silt mixtures - clayey silt to silty clay	2.57	4.32	13
	8.53	24.75	2.46	Sand mixtures - silty sand to sandy silt	2.45	2.51	16
	8.69	30.42	2.41	Sand mixtures - silty sand to sandy silt	2.38	2.24	18
	8.86	32.61	2.19	Sand mixtures - silty sand to sandy silt	2.34	2.08	19
	9.02	32.76	2.51	Sand mixtures - silty sand to sandy silt	2.38	2.23	19
	9.19	30.55	3.55	Silt mixtures - clayey silt to silty clay	2.50	2.88	20
	9.35	31.03	3.81	Silt mixtures - clayey silt to silty clay	2.52	3.30	20
	9.51	32.93	3.37	Silt mixtures - clayey silt to silty clay	2.48	2.63	20
	9.68	38.46	2.55	Sand mixtures - silty sand to sandy silt	2.36	2.13	21
	9.84	40.47	2.36	Sand mixtures - silty sand to sandy silt	2.32	2.01	21
	10.01	39.96	2.52	Sand mixtures - silty sand to sandy silt	2.35	2.10	21
	10.17	39.30	2.64	Sand mixtures - silty sand to sandy silt	2.37	2.18	21
	10.33	37.42	2.70	Sand mixtures - silty sand to sandy silt	2.40	2.28	20
	10.50	38.70	2.65	Sand mixtures - silty sand to sandy silt	2.38	2.23	20
	10.66	40.42	2.54	Sand mixtures - silty sand to sandy silt	2.36	2.15	20
	10.83	39.86	2.72	Sand mixtures - silty sand to sandy silt	2.39	2.26	20
	10.99	42.60	2.67	Sand mixtures - silty sand to sandy silt	2.37	2.17	21
	11.15	46.22	2.31	Sand mixtures - silty sand to sandy silt	2.30	1.95	21
	11.32	47.37	2.07	Sand mixtures - silty sand to sandy silt	2.27	1.84	21
	11.48	49.21	2.02	Sand mixtures - silty sand to sandy silt	2.25	1.80	21
	11.65	51.13	2.11	Sand mixtures - silty sand to sandy silt	2.26	1.81	22
	11.81	51.85	2.31	Sand mixtures - silty sand to sandy silt	2.28	1.88	23
	11.98	51.36	2.34	Sand mixtures - silty sand to sandy silt	2.29	1.91	22
	12.14	52.23	2.19	Sand mixtures - silty sand to sandy silt	2.27	1.85	22
	12.30	54.36	2.05	Sand mixtures - silty sand to sandy silt	2.24	1.77	22
	12.47	56.98	1.88	Sand mixtures - silty sand to sandy silt	2.21	1.67	22
	12.63	60.84	1.71	Sand mixtures - silty sand to sandy silt	2.16	1.57	23
	12.80	64.52	1.36	Sand mixtures - silty sand to sandy silt	2.08	1.42	23
	12.96	59.09	1.35	Sand mixtures - silty sand to sandy silt	2.11	1.47	21
	13.12	53.17	1.67	Sand mixtures - silty sand to sandy silt	2.21	1.68	20
	13.29	49.90	1.89	Sand mixtures - silty sand to sandy silt	2.27	1.83	20
	13.45	47.35	2.01	Sand mixtures - silty sand to sandy silt	2.30	1.95	19
	13.62	46.80	1.99	Sand mixtures - silty sand to sandy silt	2.31	1.96	19
	13.78	48.77	1.92	Sand mixtures - silty sand to sandy silt	2.29	1.89	19
	13.94	50.08	1.75	Sand mixtures - silty sand to sandy silt	2.26	1.80	19
	14.11	52.55	1.70	Sand mixtures - silty sand to sandy silt	2.23	1.74	19
	14.27	53.66	1.57	Sand mixtures - silty sand to sandy silt	2.21	1.68	19
	14.44	51.80	2.22	Sand mixtures - silty sand to sandy silt	2.32	2.00	20

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-02

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	51.74	1.86	Sand mixtures - silty sand to sandy silt	2.27	1.85	19
	14.76	44.32	2.30	Sand mixtures - silty sand to sandy silt	2.38	2.24	18
	14.93	46.98	1.82	Sand mixtures - silty sand to sandy silt	2.30	1.95	17
	15.09	52.99	1.74	Sand mixtures - silty sand to sandy silt	2.25	1.80	19
	15.26	62.02	1.95	Sand mixtures - silty sand to sandy silt	2.24	1.75	22
	15.42	82.09	1.46	Sand mixtures - silty sand to sandy silt	2.07	1.39	25
	15.58	81.42	1.53	Sand mixtures - silty sand to sandy silt	2.09	1.42	25
	15.75	73.04	1.30	Sand mixtures - silty sand to sandy silt	2.08	1.41	22
	15.91	67.19	1.61	Sand mixtures - silty sand to sandy silt	2.17	1.58	22
	16.08	69.02	1.76	Sand mixtures - silty sand to sandy silt	2.19	1.62	22
	16.24	60.36	1.81	Sand mixtures - silty sand to sandy silt	2.24	1.76	20
	16.40	57.68	1.77	Sand mixtures - silty sand to sandy silt	2.25	1.79	19
	16.57	56.16	1.78	Sand mixtures - silty sand to sandy silt	2.27	1.83	19
	16.73	54.73	1.75	Sand mixtures - silty sand to sandy silt	2.27	1.85	18
	16.90	54.43	1.71	Sand mixtures - silty sand to sandy silt	2.27	1.84	18
	17.06	54.29	1.82	Sand mixtures - silty sand to sandy silt	2.29	1.91	18
	17.22	52.91	1.92	Sand mixtures - silty sand to sandy silt	2.32	1.99	18
	17.39	53.50	2.54	Sand mixtures - silty sand to sandy silt	2.40	2.28	19
	17.55	56.68	1.80	Sand mixtures - silty sand to sandy silt	2.28	1.87	18
	17.72	53.90	2.37	Sand mixtures - silty sand to sandy silt	2.38	2.21	18
	17.88	62.03	2.01	Sand mixtures - silty sand to sandy silt	2.29	1.89	20
	18.04	54.47	2.10	Sand mixtures - silty sand to sandy silt	2.34	2.09	18
	18.21	53.60	1.87	Sand mixtures - silty sand to sandy silt	2.32	2.00	17
	18.37	52.95	1.79	Sand mixtures - silty sand to sandy silt	2.31	1.98	17
	18.54	52.73	1.93	Sand mixtures - silty sand to sandy silt	2.34	2.06	17
	18.70	51.67	1.89	Sand mixtures - silty sand to sandy silt	2.34	2.08	16
	18.86	51.06	2.09	Sand mixtures - silty sand to sandy silt	2.38	2.21	17
	19.03	51.82	1.97	Sand mixtures - silty sand to sandy silt	2.36	2.13	16
	19.19	53.57	2.14	Sand mixtures - silty sand to sandy silt	2.37	2.19	17
	19.36	56.51	2.04	Sand mixtures - silty sand to sandy silt	2.34	2.08	18
	19.52	56.63	2.09	Sand mixtures - silty sand to sandy silt	2.35	2.11	18
	19.69	56.39	2.09	Sand mixtures - silty sand to sandy silt	2.35	2.12	17
	19.85	57.91	1.96	Sand mixtures - silty sand to sandy silt	2.33	2.03	17
	20.01	60.02	1.83	Sand mixtures - silty sand to sandy silt	2.30	1.94	18
	20.18	65.14	2.10	Sand mixtures - silty sand to sandy silt	2.31	1.98	19
	20.34	62.13	2.07	Sand mixtures - silty sand to sandy silt	2.33	2.03	18
	20.51	55.10	2.10	Sand mixtures - silty sand to sandy silt	2.38	2.20	17
	20.67	56.72	1.88	Sand mixtures - silty sand to sandy silt	2.34	2.06	17
	20.83	54.44	1.98	Sand mixtures - silty sand to sandy silt	2.37	2.17	16
	21.00	53.23	1.87	Sand mixtures - silty sand to sandy silt	2.36	2.15	16
	21.16	54.48	2.03	Sand mixtures - silty sand to sandy silt	2.38	2.22	16
	21.33	55.04	2.14	Sand mixtures - silty sand to sandy silt	2.39	2.27	16
	21.49	53.32	2.45	Sand mixtures - silty sand to sandy silt	2.45	2.50	16
	21.65	54.16	2.34	Sand mixtures - silty sand to sandy silt	2.43	2.42	16
	21.82	56.26	2.03	Sand mixtures - silty sand to sandy silt	2.38	2.21	16
	21.98	58.26	1.93	Sand mixtures - silty sand to sandy silt	2.35	2.12	16
	22.15	70.56	1.52	Sand mixtures - silty sand to sandy silt	2.22	1.70	18

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-02

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	80.13	1.34	Sand mixtures - silty sand to sandy silt	2.14	1.52	20
	22.47	83.77	1.16	Sand mixtures - silty sand to sandy silt	2.09	1.42	20
	22.64	81.36	1.03	Sands - clean sands to silty sand	2.06	1.39	19
	22.80	79.35	1.19	Sand mixtures - silty sand to sandy silt	2.12	1.48	19
	22.97	75.66	1.35	Sand mixtures - silty sand to sandy silt	2.17	1.59	19
	23.13	71.94	1.28	Sand mixtures - silty sand to sandy silt	2.18	1.60	18
	23.29	70.25	1.17	Sand mixtures - silty sand to sandy silt	2.16	1.57	17
	23.46	71.87	1.24	Sand mixtures - silty sand to sandy silt	2.17	1.59	17
	23.62	80.26	1.23	Sand mixtures - silty sand to sandy silt	2.13	1.51	19
	23.79	92.08	1.47	Sand mixtures - silty sand to sandy silt	2.13	1.51	22
	23.95	102.36	1.59	Sand mixtures - silty sand to sandy silt	2.12	1.49	24
	24.11	130.60	1.17	Sands - clean sands to silty sand	1.95	1.23	27
	24.28	209.88	1.19	Sands - clean sands to silty sand	1.80	1.10	40
	24.44	287.88	2.09	Sands - clean sands to silty sand	1.90	1.18	58
	24.61	242.23	2.56	Sand mixtures - silty sand to sandy silt	2.02	1.32	52
	24.77	187.89	2.08	Sand mixtures - silty sand to sandy silt	2.02	1.32	40
	24.93	168.48	1.83	Sand mixtures - silty sand to sandy silt	2.02	1.31	36
	25.10	137.26	1.88	Sand mixtures - silty sand to sandy silt	2.09	1.43	30
	25.26	110.88	1.38	Sand mixtures - silty sand to sandy silt	2.07	1.39	24
	25.43	85.64	1.34	Sand mixtures - silty sand to sandy silt	2.15	1.55	19
	25.59	68.53	1.62	Sand mixtures - silty sand to sandy silt	2.29	1.90	16
	25.75	61.66	1.83	Sand mixtures - silty sand to sandy silt	2.36	2.16	15
	25.92	60.04	1.96	Sand mixtures - silty sand to sandy silt	2.40	2.28	15
	26.08	63.54	1.68	Sand mixtures - silty sand to sandy silt	2.33	2.04	15
	26.25	64.95	1.52	Sand mixtures - silty sand to sandy silt	2.30	1.93	15
	26.41	68.33	1.48	Sand mixtures - silty sand to sandy silt	2.28	1.86	16
	26.57	71.31	1.38	Sand mixtures - silty sand to sandy silt	2.24	1.76	16
	26.74	90.61	1.45	Sand mixtures - silty sand to sandy silt	2.17	1.58	20
	26.90	105.44	1.29	Sand mixtures - silty sand to sandy silt	2.08	1.41	22
	27.07	111.93	1.08	Sands - clean sands to silty sand	2.01	1.30	22
	27.23	119.76	1.32	Sands - clean sands to silty sand	2.05	1.36	24
	27.40	124.25	1.22	Sands - clean sands to silty sand	2.01	1.31	25
	27.56	102.71	1.57	Sand mixtures - silty sand to sandy silt	2.16	1.56	22
	27.72	93.27	1.47	Sand mixtures - silty sand to sandy silt	2.17	1.59	20
	27.89	105.76	1.93	Sand mixtures - silty sand to sandy silt	2.21	1.68	23
	28.05	184.89	1.66	Sands - clean sands to silty sand	1.98	1.27	35
	28.22	330.80	0.69	Sands - clean sands to silty sand	1.50	1.00	50
	28.38	435.35	1.26	Sands - clean sands to silty sand	1.63	1.00	70
	28.64	527.73	2.01	Sands - clean sands to silty sand	1.76	1.08	90
	28.71	486.21	1.69	Sands - clean sands to silty sand	1.72	1.04	81
	28.87	319.11	1.14	Sands - clean sands to silty sand	1.69	1.03	52
	29.04	216.84	0.82	Sands - clean sands to silty sand	1.71	1.04	36
	29.20	154.17	0.98	Sands - clean sands to silty sand	1.89	1.17	27
	29.36	108.48	1.12	Sands - clean sands to silty sand	2.05	1.37	21
	29.53	88.88	0.94	Sand mixtures - silty sand to sandy silt	2.08	1.42	17
	29.69	72.44	0.92	Sand mixtures - silty sand to sandy silt	2.16	1.56	14
	29.86	64.82	1.12	Sand mixtures - silty sand to sandy silt	2.26	1.81	14

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-02

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	67.70	1.23	Sand mixtures - silty sand to sandy silt	2.27	1.84	14
	30.18	81.33	1.99	Sand mixtures - silty sand to sandy silt	2.34	2.06	17
	30.35	95.60	1.53	Sand mixtures - silty sand to sandy silt	2.20	1.66	19
	30.51	113.17	0.90	Sands - clean sands to silty sand	1.99	1.27	20
	30.68	130.89	0.73	Sands - clean sands to silty sand	1.87	1.16	22
	30.84	116.79	0.67	Sands - clean sands to silty sand	1.90	1.18	20
	31.00	86.78	0.74	Sands - clean sands to silty sand	2.04	1.35	16
	31.17	66.32	0.93	Sand mixtures - silty sand to sandy silt	2.22	1.70	13
	31.33	52.97	1.21	Sand mixtures - silty sand to sandy silt	2.38	2.21	11
	31.50	47.54	1.12	Sand mixtures - silty sand to sandy silt	2.41	2.32	10
	31.66	57.28	2.13	Silt mixtures - clayey silt to silty clay	2.51	2.91	13
	31.82	140.27	3.52	Sand mixtures - silty sand to sandy silt	2.35	2.12	29
	31.99	175.34	2.79	Sand mixtures - silty sand to sandy silt	2.21	1.67	34
	32.15	132.92	3.66	Silt mixtures - clayey silt to silty clay	2.39	2.25	28
	32.32	134.53	1.35	Sand mixtures - silty sand to sandy silt	2.06	1.38	24
	32.48	123.70	1.32	Sand mixtures - silty sand to sandy silt	2.08	1.42	22
	32.64	120.35	1.78	Sand mixtures - silty sand to sandy silt	2.19	1.62	23
	32.81	115.21	1.59	Sand mixtures - silty sand to sandy silt	2.17	1.58	21
	32.97	75.37	2.59	Silt mixtures - clayey silt to silty clay	2.48	2.63	16
	33.14	48.82	3.68	Silt mixtures - clayey silt to silty clay	2.75		11
	33.30	41.42	4.25	Clays - silty clay to clay	2.85		10
	33.46	59.19	2.54	Silt mixtures - clayey silt to silty clay	2.57	4.34	13
	33.63	95.43	1.89	Sand mixtures - silty sand to sandy silt	2.30	1.93	18
	33.79	125.19	1.45	Sand mixtures - silty sand to sandy silt	2.12	1.48	22
	33.96	123.85	1.91	Sand mixtures - silty sand to sandy silt	2.21	1.68	23
	34.12	117.66	2.06	Sand mixtures - silty sand to sandy silt	2.25	1.80	22
	34.28	105.70	2.07	Sand mixtures - silty sand to sandy silt	2.30	1.92	20
	34.45	122.03	1.49	Sand mixtures - silty sand to sandy silt	2.14	1.53	22
	34.61	166.35	1.61	Sand mixtures - silty sand to sandy silt	2.06	1.38	28
	34.78	292.00	2.07	Sands - clean sands to silty sand	1.97	1.25	48
	34.94	332.61	1.64	Sands - clean sands to silty sand	1.84	1.13	51
	35.10	295.77	1.65	Sands - clean sands to silty sand	1.88	1.16	46
	35.27	243.35	1.69	Sands - clean sands to silty sand	1.95	1.24	39
	35.43	183.71	2.52	Sand mixtures - silty sand to sandy silt	2.18	1.62	32
	35.60	135.04	3.56	Silt mixtures - clayey silt to silty clay	2.40	2.31	26
	35.76	101.86	4.68	Silt mixtures - clayey silt to silty clay	2.59	5.13	21
	35.93	90.31	4.63	Silt mixtures - clayey silt to silty clay	2.63	6.58	19
	36.09	97.03	4.74	Silt mixtures - clayey silt to silty clay	2.62	5.99	20
	36.25	119.27	3.90	Silt mixtures - clayey silt to silty clay	2.48	2.66	23
	36.42	143.24	3.43	Silt mixtures - clayey silt to silty clay	2.38	2.21	26
	36.58	177.38	2.90	Sand mixtures - silty sand to sandy silt	2.25	1.79	31
	36.75	242.03	2.72	Sand mixtures - silty sand to sandy silt	2.13	1.51	40
	36.91	310.79	2.35	Sand mixtures - silty sand to sandy silt	2.01	1.30	49
	37.07	410.75	2.22	Sands - clean sands to silty sand	1.91	1.19	62
	37.24	429.12	2.59	Very stiff sand to clayey sand	1.96	1.24	66
	37.40	516.60	1.85	Sands - clean sands to silty sand	1.78	1.09	74
	37.57	471.72	1.68	Sands - clean sands to silty sand	1.77	1.08	67

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 11/1/2006 13:48
PROJECT NO.: 17-1245A-4
CONE/RIG: DSG0705
ASSUMED DEPTH OF WATER TABLE: 24 feet
SOUNDING: CPT-03

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	56.27	0.01	Sands - clean sands to silty sand	1.58	1.00	22
	0.33	70.71	0.11	Sands - clean sands to silty sand	1.37	1.00	24
	0.49	72.74	0.44	Sands - clean sands to silty sand	1.59	1.00	29
	0.66	64.05	0.55	Sands - clean sands to silty sand	1.69	1.02	27
	0.82	55.43	0.68	Sands - clean sands to silty sand	1.79	1.10	25
	0.98	51.56	0.66	Sands - clean sands to silty sand	1.81	1.11	24
	1.15	49.49	0.64	Sands - clean sands to silty sand	1.82	1.11	23
	1.31	48.67	0.77	Sands - clean sands to silty sand	1.87	1.16	23
	1.48	44.31	0.85	Sands - clean sands to silty sand	1.93	1.21	22
	1.64	42.00	0.47	Sands - clean sands to silty sand	1.81	1.00	19
	1.80	47.35	0.83	Sands - clean sands to silty sand	1.90	1.18	23
	1.97	64.79	1.12	Sands - clean sands to silty sand	1.88	1.16	31
	2.13	81.36	1.38	Sands - clean sands to silty sand	1.87	1.16	39
	2.30	95.91	1.64	Sands - clean sands to silty sand	1.88	1.16	46
	2.46	102.41	1.99	Sands - clean sands to silty sand	1.93	1.21	50
	2.62	105.46	2.35	Sand mixtures - silty sand to sandy silt	1.98	1.26	54
	2.79	105.63	2.63	Sand mixtures - silty sand to sandy silt	2.02	1.31	55
	2.95	110.59	2.44	Sand mixtures - silty sand to sandy silt	1.98	1.26	56
	3.12	113.18	2.26	Sands - clean sands to silty sand	1.94	1.23	56
	3.28	116.99	1.69	Sands - clean sands to silty sand	1.83	1.13	54
	3.44	113.46	2.17	Sands - clean sands to silty sand	1.93	1.21	56
	3.61	108.64	2.06	Sands - clean sands to silty sand	1.92	1.20	53
	3.77	103.71	2.14	Sands - clean sands to silty sand	1.95	1.23	52
	3.94	103.86	2.00	Sands - clean sands to silty sand	1.93	1.21	51
	4.10	93.07	1.99	Sands - clean sands to silty sand	1.95	1.24	47
	4.27	86.40	1.66	Sands - clean sands to silty sand	1.91	1.19	42
	4.43	85.45	1.66	Sands - clean sands to silty sand	1.92	1.20	42
	4.59	93.40	1.45	Sands - clean sands to silty sand	1.85	1.14	44
	4.76	94.10	1.45	Sands - clean sands to silty sand	1.85	1.14	44
	4.92	80.33	1.42	Sands - clean sands to silty sand	1.88	1.17	38
	5.09	71.83	2.05	Sand mixtures - silty sand to sandy silt	2.04	1.34	38
	5.25	77.99	1.95	Sands - clean sands to silty sand	2.00	1.29	40
	5.41	81.93	2.57	Sand mixtures - silty sand to sandy silt	2.08	1.40	44
	5.58	80.45	2.69	Sand mixtures - silty sand to sandy silt	2.10	1.44	44
	5.74	78.23	2.38	Sand mixtures - silty sand to sandy silt	2.06	1.38	42
	5.91	74.17	2.07	Sand mixtures - silty sand to sandy silt	2.03	1.33	39
	6.07	66.14	1.82	Sand mixtures - silty sand to sandy silt	2.02	1.32	35
	6.23	47.83	2.25	Sand mixtures - silty sand to sandy silt	2.19	1.63	28
	6.40	38.08	2.25	Sand mixtures - silty sand to sandy silt	2.26	1.81	23
	6.56	30.71	2.63	Sand mixtures - silty sand to sandy silt	2.37	2.19	20
	6.73	37.09	1.94	Sand mixtures - silty sand to sandy silt	2.22	1.71	22

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-03

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	49.33	2.38	Sand mixtures - silty sand to sandy silt	2.20	1.65	29
	7.05	60.24	2.42	Sand mixtures - silty sand to sandy silt	2.15	1.54	33
	7.22	61.00	2.44	Sand mixtures - silty sand to sandy silt	2.15	1.55	33
	7.38	61.14	2.40	Sand mixtures - silty sand to sandy silt	2.15	1.55	33
	7.55	64.49	2.12	Sand mixtures - silty sand to sandy silt	2.10	1.45	33
	7.71	65.52	2.11	Sand mixtures - silty sand to sandy silt	2.10	1.45	33
	7.87	72.11	2.01	Sand mixtures - silty sand to sandy silt	2.07	1.39	34
	8.04	71.13	2.03	Sand mixtures - silty sand to sandy silt	2.08	1.40	34
	8.20	74.20	1.81	Sand mixtures - silty sand to sandy silt	2.04	1.34	33
	8.37	79.04	1.77	Sands - clean sands to silty sand	2.02	1.31	34
	8.53	84.13	1.13	Sands - clean sands to silty sand	1.87	1.16	32
	8.69	82.52	1.45	Sands - clean sands to silty sand	1.95	1.24	33
	8.86	67.61	1.97	Sand mixtures - silty sand to sandy silt	2.10	1.44	31
	9.02	64.55	2.42	Sand mixtures - silty sand to sandy silt	2.18	1.60	31
	9.19	65.86	3.00	Sand mixtures - silty sand to sandy silt	2.24	1.76	33
	9.35	74.50	2.94	Sand mixtures - silty sand to sandy silt	2.20	1.67	36
	9.51	76.06	3.09	Sand mixtures - silty sand to sandy silt	2.22	1.70	37
	9.68	86.70	2.45	Sand mixtures - silty sand to sandy silt	2.11	1.47	38
	9.84	82.70	2.41	Sand mixtures - silty sand to sandy silt	2.12	1.49	36
	10.01	82.70	2.21	Sand mixtures - silty sand to sandy silt	2.10	1.45	35
	10.17	82.03	2.34	Sand mixtures - silty sand to sandy silt	2.12	1.49	35
	10.33	82.53	1.80	Sand mixtures - silty sand to sandy silt	2.05	1.36	32
	10.50	73.35	1.87	Sand mixtures - silty sand to sandy silt	2.09	1.43	30
	10.66	69.33	2.25	Sand mixtures - silty sand to sandy silt	2.17	1.58	29
	10.83	62.90	2.81	Sand mixtures - silty sand to sandy silt	2.26	1.83	29
	10.99	66.75	3.00	Sand mixtures - silty sand to sandy silt	2.27	1.85	30
	11.15	63.94	3.41	Sand mixtures - silty sand to sandy silt	2.33	2.02	30
	11.32	59.16	3.90	Silt mixtures - clayey silt to silty clay	2.39	2.27	29
	11.48	57.35	3.77	Silt mixtures - clayey silt to silty clay	2.39	2.27	28
	11.65	56.80	3.46	Silt mixtures - clayey silt to silty clay	2.37	2.19	27
	11.81	58.65	2.45	Sand mixtures - silty sand to sandy silt	2.26	1.82	25
	11.98	43.36	2.72	Sand mixtures - silty sand to sandy silt	2.39	2.25	20
	12.14	43.57	3.27	Silt mixtures - clayey silt to silty clay	2.44	2.48	21
	12.30	47.36	3.72	Silt mixtures - clayey silt to silty clay	2.46	2.56	23
	12.47	57.10	3.82	Silt mixtures - clayey silt to silty clay	2.42	2.37	27
	12.63	59.34	4.30	Silt mixtures - clayey silt to silty clay	2.45	2.50	28
	12.80	61.02	4.46	Silt mixtures - clayey silt to silty clay	2.45	2.53	29
	12.96	67.41	4.09	Silt mixtures - clayey silt to silty clay	2.40	2.30	30
	13.12	84.87	3.25	Sand mixtures - silty sand to sandy silt	2.27	1.83	34
	13.29	90.21	2.57	Sand mixtures - silty sand to sandy silt	2.18	1.60	33
	13.45	71.96	2.09	Sand mixtures - silty sand to sandy silt	2.18	1.62	26
	13.62	71.27	2.28	Sand mixtures - silty sand to sandy silt	2.21	1.69	26
	13.78	113.25	1.72	Sands - clean sands to silty sand	1.99	1.28	35
	13.94	136.19	1.40	Sands - clean sands to silty sand	1.88	1.16	39
	14.11	126.68	1.38	Sands - clean sands to silty sand	1.90	1.18	36
	14.27	106.53	1.96	Sand mixtures - silty sand to sandy silt	2.06	1.38	34
	14.44	96.49	2.78	Sand mixtures - silty sand to sandy silt	2.20	1.66	34

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-03

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	90.15	3.69	Sand mixtures - silty sand to sandy silt	2.31	1.98	34
	14.76	83.82	3.88	Very stiff, fine grained	2.35	2.12	32
	14.93	80.51	3.27	Sand mixtures - silty sand to sandy silt	2.31	1.97	30
	15.09	79.42	2.67	Sand mixtures - silty sand to sandy silt	2.25	1.80	28
	15.26	86.03	2.63	Sand mixtures - silty sand to sandy silt	2.23	1.73	30
	15.42	79.94	3.08	Sand mixtures - silty sand to sandy silt	2.30	1.94	29
	15.58	73.87	3.71	Silt mixtures - clayey silt to silty clay	2.39	2.24	28
	15.75	72.02	3.87	Silt mixtures - clayey silt to silty clay	2.41	2.33	28
	15.91	73.96	3.47	Silt mixtures - clayey silt to silty clay	2.37	2.18	27
	16.08	79.02	3.56	Silt mixtures - clayey silt to silty clay	2.36	2.14	29
	16.24	91.25	3.37	Sand mixtures - silty sand to sandy silt	2.30	1.95	32
	16.40	91.70	3.42	Sand mixtures - silty sand to sandy silt	2.31	1.97	32
	16.57	93.03	3.22	Sand mixtures - silty sand to sandy silt	2.29	1.90	31
	16.73	92.34	3.49	Sand mixtures - silty sand to sandy silt	2.32	2.00	32
	16.90	96.69	3.49	Sand mixtures - silty sand to sandy silt	2.31	1.96	33
	17.06	101.95	3.22	Sand mixtures - silty sand to sandy silt	2.27	1.84	33
	17.22	109.23	2.01	Sand mixtures - silty sand to sandy silt	2.10	1.44	32
	17.39	127.63	1.84	Sand mixtures - silty sand to sandy silt	2.03	1.33	35
	17.55	159.61	1.49	Sands - clean sands to silty sand	1.89	1.18	40
	17.72	191.98	1.08	Sands - clean sands to silty sand	1.74	1.06	43
	17.88	203.74	1.07	Sands - clean sands to silty sand	1.72	1.05	45
	18.04	190.01	1.26	Sands - clean sands to silty sand	1.79	1.10	44
	18.21	167.46	1.41	Sands - clean sands to silty sand	1.87	1.15	40
	18.37	155.87	1.42	Sands - clean sands to silty sand	1.89	1.18	38
	18.54	159.99	0.95	Sands - clean sands to silty sand	1.76	1.08	35
	18.70	159.22	0.93	Sands - clean sands to silty sand	1.76	1.07	35
	18.86	146.57	0.82	Sands - clean sands to silty sand	1.75	1.07	32
	19.03	128.31	0.72	Sands - clean sands to silty sand	1.77	1.08	28
	19.19	87.38	0.92	Sands - clean sands to silty sand	1.97	1.25	22
	19.36	54.74	1.39	Sand mixtures - silty sand to sandy silt	2.25	1.78	16
	19.52	40.69	2.38	Silt mixtures - clayey silt to silty clay	2.50	2.85	14
	19.69	28.23	3.98	Clays - silty clay to clay	2.78		11
	19.85	20.67	5.60	Clays - silty clay to clay	2.99		9
	20.01	21.31	5.99	Clays - silty clay to clay	3.01		10
	20.18	23.69	5.14	Clays - silty clay to clay	2.93		10
	20.34	20.27	5.41	Clays - silty clay to clay	3.00		9
	20.51	21.60	4.97	Clays - silty clay to clay	2.96		9
	20.67	23.19	4.58	Clays - silty clay to clay	2.91		10
	20.83	35.05	2.86	Silt mixtures - clayey silt to silty clay	2.63	6.49	12
	21.00	48.70	2.16	Sand mixtures - silty sand to sandy silt	2.43	2.44	15
	21.16	49.06	2.15	Sand mixtures - silty sand to sandy silt	2.43	2.43	15
	21.33	47.26	2.35	Sand mixtures - silty sand to sandy silt	2.47	2.63	15
	21.49	53.46	1.73	Sand mixtures - silty sand to sandy silt	2.35	2.09	15
	21.65	56.33	0.75	Sand mixtures - silty sand to sandy silt	2.12	1.47	14
	21.82	53.19	0.96	Sand mixtures - silty sand to sandy silt	2.20	1.65	14
	21.98	55.34	1.15	Sand mixtures - silty sand to sandy silt	2.23	1.73	15
	22.15	65.42	1.03	Sand mixtures - silty sand to sandy silt	2.14	1.53	16

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-03

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	62.71	0.98	Sand mixtures - silty sand to sandy silt	2.15	1.54	16
	22.47	48.86	1.21	Sand mixtures - silty sand to sandy silt	2.30	1.93	13
	22.64	37.92	1.60	Sand mixtures - silty sand to sandy silt	2.47	2.60	11
	22.80	33.26	1.66	Sand mixtures - silty sand to sandy silt	2.53	3.46	10
	22.97	30.28	1.44	Sand mixtures - silty sand to sandy silt	2.54	3.57	9
	23.13	27.73	1.69	Silt mixtures - clayey silt to silty clay	2.61	5.90	9
	23.29	21.81	2.44	Silt mixtures - clayey silt to silty clay	2.81		8
	23.46	17.38	3.04	Clays - silty clay to clay	2.96		7
	23.62	19.19	2.68	Clays - silty clay to clay	2.89		7
	23.79	24.20	1.69	Silt mixtures - clayey silt to silty clay	2.68	8.96	8
	23.95	21.58	1.69	Silt mixtures - clayey silt to silty clay	2.73		7
	24.11	21.30	1.79	Silt mixtures - clayey silt to silty clay	2.75		7
	24.28	27.41	1.48	Silt mixtures - clayey silt to silty clay	2.60	5.47	8
	24.44	30.68	1.39	Sand mixtures - silty sand to sandy silt	2.54	3.68	9
	24.61	29.56	1.34	Sand mixtures - silty sand to sandy silt	2.55	3.91	9
	24.77	34.66	0.89	Sand mixtures - silty sand to sandy silt	2.39	2.26	9
	24.93	29.27	0.78	Sand mixtures - silty sand to sandy silt	2.43	2.44	8
	25.10	26.16	1.03	Sand mixtures - silty sand to sandy silt	2.54	3.75	7
	25.26	35.14	0.85	Sand mixtures - silty sand to sandy silt	2.38	2.20	9
	25.43	46.14	1.13	Sand mixtures - silty sand to sandy silt	2.33	2.05	12
	25.59	52.99	0.97	Sand mixtures - silty sand to sandy silt	2.24	1.77	13
	25.75	74.79	0.65	Sands - clean sands to silty sand	2.01	1.30	16
	25.92	71.82	0.73	Sands - clean sands to silty sand	2.05	1.37	16
	26.08	48.22	1.52	Sand mixtures - silty sand to sandy silt	2.40	2.29	13
	26.25	23.77	2.49	Silt mixtures - clayey silt to silty clay	2.81		8
	26.41	15.13	2.11	Clays - silty clay to clay	2.96		5
	26.57	10.70	2.26	Clays - silty clay to clay	3.13		4
	26.74	8.68	2.16	Clays - silty clay to clay	3.22		4
	26.90	7.25	2.71	Clays - silty clay to clay	3.37		3
	27.07	6.48	3.37	Clays - silty clay to clay	3.48		3
	27.23	6.74	3.08	Clays - silty clay to clay	3.44		3
	27.40	6.86	4.22	Clays - silty clay to clay	3.51		3
	27.56	8.69	4.91	Clays - silty clay to clay	3.43		4
	27.72	11.96	4.92	Clays - silty clay to clay	3.28		5
	27.89	11.43	4.99	Clays - silty clay to clay	3.31		5
	28.05	11.29	4.10	Clays - silty clay to clay	3.26		5
	28.22	9.45	4.20	Clays - silty clay to clay	3.36		4
	28.38	9.31	3.89	Clays - silty clay to clay	3.35		4
	28.54	8.31	4.07	Clays - silty clay to clay	3.41		4
	28.71	7.82	3.42	Clays - silty clay to clay	3.41		4
	28.87	6.87	5.22	Unstable clayey silts	3.58		3
	29.04	9.79	3.83	Clays - silty clay to clay	3.32		4
	29.20	11.05	4.67	Clays - silty clay to clay	3.32		5
	29.36	14.30	3.80	Clays - silty clay to clay	3.15		5
	29.53	16.72	2.61	Clays - silty clay to clay	2.99		6
	29.69	18.48	2.54	Clays - silty clay to clay	2.95		6
	29.86	17.47	3.02	Clays - silty clay to clay	3.01		6

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-03

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	16.58	3.64	Clays - silty clay to clay	3.08		6
	30.18	17.34	3.77	Clays - silty clay to clay	3.08		6
	30.35	19.76	3.37	Clays - silty clay to clay	2.99		7
	30.51	23.33	2.79	Clays - silty clay to clay	2.88		7
	30.68	17.90	3.61	Clays - silty clay to clay	3.06		6
	30.84	16.99	2.86	Clays - silty clay to clay	3.02		6
	31.00	46.96	0.89	Sand mixtures - silty sand to sandy silt	2.30	1.95	11
	31.17	74.26	0.79	Sand mixtures - silty sand to sandy silt	2.09	1.42	15
	31.33	89.86	0.83	Sands - clean sands to silty sand	2.03	1.33	18
	31.50	109.16	0.80	Sands - clean sands to silty sand	1.94	1.22	21
	31.66	130.57	0.35	Sands - clean sands to silty sand	1.67	1.00	22
	31.82	115.13	0.45	Sands - clean sands to silty sand	1.78	1.00	20
	31.99	83.85	0.61	Sands - clean sands to silty sand	1.98	1.27	16
	32.15	71.98	0.56	Sands - clean sands to silty sand	2.03	1.33	14
	32.32	57.03	0.65	Sand mixtures - silty sand to sandy silt	2.16	1.56	12
	32.48	41.39	0.78	Sand mixtures - silty sand to sandy silt	2.34	2.06	9
	32.64	32.83	1.13	Sand mixtures - silty sand to sandy silt	2.52	3.27	8
	32.81	33.43	1.05	Sand mixtures - silty sand to sandy silt	2.50	2.82	8
	32.97	35.42	0.93	Sand mixtures - silty sand to sandy silt	2.45	2.50	9
	33.14	37.38	1.06	Sand mixtures - silty sand to sandy silt	2.46	2.54	9
	33.30	40.08	1.07	Sand mixtures - silty sand to sandy silt	2.43	2.42	10
	33.46	41.63	1.05	Sand mixtures - silty sand to sandy silt	2.41	2.34	10
	33.63	57.46	0.59	Sand mixtures - silty sand to sandy silt	2.14	1.52	12
	33.79	82.19	0.72	Sands - clean sands to silty sand	2.04	1.35	16
	33.96	96.11	0.90	Sands - clean sands to silty sand	2.03	1.34	19
	34.12	129.16	0.65	Sands - clean sands to silty sand	1.83	1.13	23
	34.28	156.79	0.58	Sands - clean sands to silty sand	1.73	1.05	26
	34.45	149.10	0.56	Sands - clean sands to silty sand	1.74	1.06	25
	34.61	120.73	0.65	Sands - clean sands to silty sand	1.86	1.15	21
	34.78	90.74	0.31	Sands - clean sands to silty sand	1.82	1.00	16
	34.94	72.63	0.49	Sands - clean sands to silty sand	2.01	1.30	14
	35.10	51.14	0.73	Sand mixtures - silty sand to sandy silt	2.25	1.78	11
	35.27	39.36	1.05	Sand mixtures - silty sand to sandy silt	2.44	2.49	9
	35.43	41.02	1.25	Sand mixtures - silty sand to sandy silt	2.47	2.62	10
	35.60	61.42	0.92	Sand mixtures - silty sand to sandy silt	2.23	1.73	13
	35.76	84.50	0.86	Sand mixtures - silty sand to sandy silt	2.08	1.41	16
	35.93	107.77	0.81	Sands - clean sands to silty sand	1.97	1.25	20
	36.09	132.45	0.78	Sands - clean sands to silty sand	1.88	1.16	23
	36.25	149.34	0.81	Sands - clean sands to silty sand	1.85	1.13	26
	36.42	143.78	0.96	Sands - clean sands to silty sand	1.91	1.19	26
	36.58	122.76	1.13	Sands - clean sands to silty sand	2.02	1.32	23
	36.75	114.28	1.00	Sands - clean sands to silty sand	2.01	1.30	21
	36.91	120.67	0.76	Sands - clean sands to silty sand	1.91	1.19	21
	37.07	133.41	0.34	Sands - clean sands to silty sand	1.68	1.00	21
	37.24	138.00	0.32	Sands - clean sands to silty sand	1.65	1.00	22
	37.40	123.73	0.39	Sands - clean sands to silty sand	1.74	1.00	20
	37.57	87.60	0.54	Sands - clean sands to silty sand	1.96	1.24	16

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-03

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	37.73	60.47	0.85	Sand mixtures - silty sand to sandy silt	2.23	1.72	12
	37.89	44.37	1.38	Sand mixtures - silty sand to sandy silt	2.48	2.65	10
	38.06	37.68	2.05	Silt mixtures - clayey silt to silty clay	2.66	7.70	9
	38.22	43.34	0.65	Sand mixtures - silty sand to sandy silt	2.31	1.98	9
	38.39	51.48	1.19	Sand mixtures - silty sand to sandy silt	2.38	2.23	11
	38.55	25.44	2.64	Clays - silty clay to clay	2.89		7
	38.71	19.02	3.70	Clays - silty clay to clay	3.10		6
	38.88	27.70	4.15	Clays - silty clay to clay	2.98		8
	39.04	43.79	2.92	Silt mixtures - clayey silt to silty clay	2.70		11
	39.21	80.24	2.10	Sand mixtures - silty sand to sandy silt	2.37	2.19	17
	39.37	119.82	1.39	Sand mixtures - silty sand to sandy silt	2.10	1.45	23
	39.53	102.29	1.91	Sand mixtures - silty sand to sandy silt	2.26	1.80	21
	39.70	85.81	2.10	Sand mixtures - silty sand to sandy silt	2.35	2.10	18
	39.86	81.64	1.96	Sand mixtures - silty sand to sandy silt	2.35	2.10	17
	40.03	84.46	1.37	Sand mixtures - silty sand to sandy silt	2.23	1.73	17
	40.19	78.28	1.33	Sand mixtures - silty sand to sandy silt	2.25	1.79	16
	40.35	73.60	1.61	Sand mixtures - silty sand to sandy silt	2.33	2.04	15
	40.52	82.58	1.52	Sand mixtures - silty sand to sandy silt	2.27	1.85	17
	40.68	79.37	1.51	Sand mixtures - silty sand to sandy silt	2.29	1.89	16
	40.85	77.83	1.60	Sand mixtures - silty sand to sandy silt	2.31	1.97	16
	41.01	80.67	1.52	Sand mixtures - silty sand to sandy silt	2.28	1.88	16
	41.17	79.60	1.26	Sand mixtures - silty sand to sandy silt	2.23	1.74	16
	41.34	77.28	1.08	Sand mixtures - silty sand to sandy silt	2.21	1.67	15
	41.50	73.08	0.67	Sand mixtures - silty sand to sandy silt	2.11	1.46	13
	41.67	75.64	1.11	Sand mixtures - silty sand to sandy silt	2.22	1.71	15
	41.83	85.57	0.98	Sand mixtures - silty sand to sandy silt	2.14	1.52	16
	41.99	84.45	0.92	Sand mixtures - silty sand to sandy silt	2.13	1.50	16
	42.16	70.49	1.24	Sand mixtures - silty sand to sandy silt	2.28	1.89	14
	42.32	63.92	1.41	Sand mixtures - silty sand to sandy silt	2.36	2.15	13
	42.49	72.49	1.20	Sand mixtures - silty sand to sandy silt	2.26	1.83	14
	42.65	79.51	1.33	Sand mixtures - silty sand to sandy silt	2.26	1.81	15
	42.81	75.93	1.53	Sand mixtures - silty sand to sandy silt	2.32	2.00	15
	42.98	70.25	1.58	Sand mixtures - silty sand to sandy silt	2.36	2.14	14
	43.14	73.30	1.60	Sand mixtures - silty sand to sandy silt	2.35	2.09	15
	43.31	82.33	1.26	Sand mixtures - silty sand to sandy silt	2.23	1.74	16
	43.47	84.33	1.16	Sand mixtures - silty sand to sandy silt	2.20	1.66	16
	43.64	79.59	1.32	Sand mixtures - silty sand to sandy silt	2.26	1.82	15
	43.80	73.74	1.13	Sand mixtures - silty sand to sandy silt	2.25	1.78	14
	43.96	74.17	1.03	Sand mixtures - silty sand to sandy silt	2.22	1.71	14
	44.13	70.08	1.12	Sand mixtures - silty sand to sandy silt	2.27	1.84	13
	44.29	66.80	1.58	Sand mixtures - silty sand to sandy silt	2.39	2.24	13
	44.46	68.39	1.92	Sand mixtures - silty sand to sandy silt	2.43	2.44	14
	44.62	73.44	1.36	Sand mixtures - silty sand to sandy silt	2.31	1.96	14
	44.78	82.43	1.24	Sand mixtures - silty sand to sandy silt	2.23	1.74	15
	44.95	91.24	1.00	Sand mixtures - silty sand to sandy silt	2.13	1.51	16
	45.11	96.86	0.99	Sand mixtures - silty sand to sandy silt	2.11	1.46	17
	45.28	87.67	1.21	Sand mixtures - silty sand to sandy silt	2.21	1.67	16

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-03

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	45.44	84.75	1.23	Sand mixtures - silty sand to sandy silt	2.22	1.72	16
	45.60	88.83	0.62	Sands - clean sands to silty sand	2.03	1.33	15
	45.77	72.58	0.96	Sand mixtures - silty sand to sandy silt	2.22	1.71	13
	45.93	50.61	1.54	Sand mixtures - silty sand to sandy silt	2.50	2.82	10
	46.10	30.78	1.52	Silt mixtures - clayey silt to silty clay	2.72		7
	46.26	20.50	2.45	Clays - silty clay to clay	3.02		6
	46.42	20.34	4.00	Clays - silty clay to clay	3.14		6
	46.59	30.16	2.74	Clays - silty clay to clay	2.88		7
	46.75	35.56	1.73	Silt mixtures - clayey silt to silty clay	2.69	9.72	8
	46.92	34.78	1.52	Silt mixtures - clayey silt to silty clay	2.67	8.45	8
	47.08	31.30	1.62	Silt mixtures - clayey silt to silty clay	2.74		7
	47.24	32.92	1.79	Silt mixtures - clayey silt to silty clay	2.74		7
	47.41	38.90	1.53	Silt mixtures - clayey silt to silty clay	2.62	6.28	8
	47.57	48.44	1.73	Silt mixtures - clayey silt to silty clay	2.56	4.20	10
	47.74	62.14	2.35	Silt mixtures - clayey silt to silty clay	2.55	3.86	13
	47.90	105.38	1.69	Sand mixtures - silty sand to sandy silt	2.24	1.77	19
	48.06	125.01	1.09	Sands - clean sands to silty sand	2.05	1.36	21
	48.23	123.89	0.85	Sands - clean sands to silty sand	1.98	1.27	20
	48.39	116.26	1.26	Sand mixtures - silty sand to sandy silt	2.12	1.48	20
	48.56	139.98	1.10	Sands - clean sands to silty sand	2.01	1.30	23
	48.72	173.33	1.59	Sand mixtures - silty sand to sandy silt	2.05	1.36	29
	48.88	210.55	2.23	Sand mixtures - silty sand to sandy silt	2.10	1.44	36
	49.05	292.69	2.19	Sand mixtures - silty sand to sandy silt	1.99	1.28	47
	49.21	390.11	1.88	Sands - clean sands to silty sand	1.85	1.14	60
	49.38	381.36	2.35	Sands - clean sands to silty sand	1.94	1.23	60
	49.54	346.01	3.72	Very stiff sand to clayey sand	2.15	1.54	59
	49.70	293.02	5.41	Very stiff, fine grained	2.34	2.05	54
	49.87	243.16	7.02	Very stiff, fine grained	2.48	2.68	47
	50.03	229.66	6.94	Very stiff, fine grained	2.50	2.73	45

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 11/1/2006 11:47
PROJECT NO.: 17-1245A-4
CONE/RIG: DSG0705
ASSUMED DEPTH OF WATER TABLE: 20 feet
SOUNDING: CPT-04

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	35.44	0.08	Sands - clean sands to silty sand	1.65	1.00	15
	0.33	117.88	1.13	Sands - clean sands to silty sand	1.70	1.03	50
	0.49	170.71	1.36	Sands - clean sands to silty sand	1.66	1.01	71
	0.66	175.12	2.02	Sands - clean sands to silty sand	1.80	1.10	79
	0.82	152.94	2.46	Very stiff sand to clayey sand	1.90	1.18	74
	0.98	112.83	2.47	Sand mixtures - silty sand to sandy silt	1.98	1.26	57
	1.15	37.30	2.80	Sand mixtures - silty sand to sandy silt	2.33	2.03	24
	1.31	25.21	1.31	Sand mixtures - silty sand to sandy silt	2.24	1.75	15
	1.48	13.90	1.50	Sand mixtures - silty sand to sandy silt	2.48	2.67	10
	1.64	13.47	1.44	Sand mixtures - silty sand to sandy silt	2.49	2.69	10
	1.80	10.99	1.65	Silt mixtures - clayey silt to silty clay	2.59	5.20	8
	1.97	10.83	2.11	Silt mixtures - clayey silt to silty clay	2.66	7.93	9
	2.13	13.41	1.23	Sand mixtures - silty sand to sandy silt	2.45	2.52	9
	2.30	10.81	1.06	Sand mixtures - silty sand to sandy silt	2.50	2.75	8
	2.46	8.75	1.60	Silt mixtures - clayey silt to silty clay	2.67	8.64	7
	2.62	9.57	2.34	Silt mixtures - clayey silt to silty clay	2.73		8
	2.79	13.70	2.31	Silt mixtures - clayey silt to silty clay	2.60	5.50	10
	2.95	20.32	2.06	Sand mixtures - silty sand to sandy silt	2.44	2.45	14
	3.12	25.51	2.50	Sand mixtures - silty sand to sandy silt	2.41	2.36	17
	3.28	24.32	3.08	Silt mixtures - clayey silt to silty clay	2.49	2.71	17
	3.44	20.56	3.27	Silt mixtures - clayey silt to silty clay	2.56	4.29	15
	3.61	22.37	2.83	Silt mixtures - clayey silt to silty clay	2.49	2.72	16
	3.77	31.62	2.39	Sand mixtures - silty sand to sandy silt	2.33	2.05	20
	3.94	45.34	2.22	Sand mixtures - silty sand to sandy silt	2.20	1.65	27
	4.10	55.00	2.35	Sand mixtures - silty sand to sandy silt	2.16	1.56	31
	4.27	60.89	2.49	Sand mixtures - silty sand to sandy silt	2.15	1.54	35
	4.43	68.33	1.69	Sands - clean sands to silty sand	1.99	1.28	35
	4.59	70.56	1.94	Sand mixtures - silty sand to sandy silt	2.02	1.32	37
	4.76	63.57	2.15	Sand mixtures - silty sand to sandy silt	2.09	1.42	35
	4.92	55.52	2.09	Sand mixtures - silty sand to sandy silt	2.12	1.48	31
	5.09	49.20	1.78	Sand mixtures - silty sand to sandy silt	2.10	1.45	27
	5.25	47.70	1.21	Sands - clean sands to silty sand	2.00	1.29	25
	5.41	47.56	0.90	Sands - clean sands to silty sand	1.92	1.20	23
	5.58	53.03	0.80	Sands - clean sands to silty sand	1.85	1.14	25
	5.74	51.29	0.76	Sands - clean sands to silty sand	1.86	1.15	24
	5.91	53.96	1.18	Sands - clean sands to silty sand	1.95	1.24	27
	6.07	56.55	1.05	Sands - clean sands to silty sand	1.91	1.19	27
	6.23	51.74	1.25	Sands - clean sands to silty sand	1.99	1.28	26
	6.40	51.02	0.72	Sands - clean sands to silty sand	1.87	1.15	22
	6.56	43.76	0.81	Sands - clean sands to silty sand	1.94	1.23	21
	6.73	34.76	0.86	Sands - clean sands to silty sand	2.04	1.34	18

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-04

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	28.80	0.94	Sand mixtures - silty sand to sandy silt	2.12	1.48	16
	7.05	26.75	0.98	Sand mixtures - silty sand to sandy silt	2.16	1.56	15
	7.22	30.57	0.82	Sand mixtures - silty sand to sandy silt	2.08	1.41	16
	7.38	40.11	0.73	Sands - clean sands to silty sand	1.97	1.26	18
	7.55	57.88	0.63	Sands - clean sands to silty sand	1.83	1.12	22
	7.71	71.43	0.79	Sands - clean sands to silty sand	1.81	1.11	27
	7.87	76.84	0.42	Sands - clean sands to silty sand	1.65	1.00	24
	8.04	67.48	0.72	Sands - clean sands to silty sand	1.82	1.11	25
	8.20	58.31	1.11	Sands - clean sands to silty sand	1.97	1.26	25
	8.37	59.86	1.52	Sand mixtures - silty sand to sandy silt	2.05	1.36	27
	8.53	66.25	1.45	Sands - clean sands to silty sand	2.01	1.31	28
	8.69	70.67	1.65	Sand mixtures - silty sand to sandy silt	2.03	1.34	31
	8.86	70.06	1.47	Sands - clean sands to silty sand	2.01	1.30	29
	9.02	65.50	1.46	Sands - clean sands to silty sand	2.03	1.33	27
	9.19	56.77	1.68	Sand mixtures - silty sand to sandy silt	2.11	1.47	25
	9.35	58.30	1.76	Sand mixtures - silty sand to sandy silt	2.12	1.48	26
	9.51	55.32	2.00	Sand mixtures - silty sand to sandy silt	2.18	1.60	26
	9.68	53.95	2.11	Sand mixtures - silty sand to sandy silt	2.20	1.66	25
	9.84	54.19	2.10	Sand mixtures - silty sand to sandy silt	2.20	1.66	25
	10.01	57.49	2.01	Sand mixtures - silty sand to sandy silt	2.18	1.60	26
	10.17	62.24	1.78	Sand mixtures - silty sand to sandy silt	2.12	1.49	26
	10.33	66.21	1.57	Sand mixtures - silty sand to sandy silt	2.07	1.40	26
	10.50	70.71	1.46	Sands - clean sands to silty sand	2.03	1.34	27
	10.66	68.86	2.44	Sand mixtures - silty sand to sandy silt	2.19	1.64	30
	10.83	72.31	1.64	Sand mixtures - silty sand to sandy silt	2.07	1.39	28
	10.99	63.37	1.72	Sand mixtures - silty sand to sandy silt	2.12	1.49	25
	11.15	74.00	1.02	Sands - clean sands to silty sand	1.94	1.22	25
	11.32	67.96	1.24	Sands - clean sands to silty sand	2.02	1.31	24
	11.48	60.29	1.49	Sand mixtures - silty sand to sandy silt	2.11	1.46	23
	11.65	52.07	1.84	Sand mixtures - silty sand to sandy silt	2.21	1.69	22
	11.81	38.75	2.30	Sand mixtures - silty sand to sandy silt	2.37	2.19	18
	11.98	34.10	3.02	Silt mixtures - clayey silt to silty clay	2.49	2.71	17
	12.14	33.65	3.16	Silt mixtures - clayey silt to silty clay	2.51	3.03	17
	12.30	34.31	2.81	Silt mixtures - clayey silt to silty clay	2.48	2.63	17
	12.47	37.76	2.73	Silt mixtures - clayey silt to silty clay	2.44	2.47	18
	12.63	42.09	2.39	Sand mixtures - silty sand to sandy silt	2.37	2.19	19
	12.80	54.22	1.73	Sand mixtures - silty sand to sandy silt	2.21	1.67	21
	12.96	83.35	1.15	Sands - clean sands to silty sand	1.96	1.24	26
	13.12	118.61	1.00	Sands - clean sands to silty sand	1.81	1.11	33
	13.29	136.15	1.01	Sands - clean sands to silty sand	1.77	1.08	37
	13.45	128.42	1.20	Sands - clean sands to silty sand	1.84	1.13	36
	13.62	123.39	1.38	Sands - clean sands to silty sand	1.90	1.18	36
	13.78	122.62	1.35	Sands - clean sands to silty sand	1.90	1.18	35
	13.94	123.70	1.23	Sands - clean sands to silty sand	1.87	1.16	35
	14.11	120.66	1.16	Sands - clean sands to silty sand	1.86	1.15	34
	14.27	115.42	1.27	Sands - clean sands to silty sand	1.90	1.19	33
	14.44	119.98	1.22	Sands - clean sands to silty sand	1.88	1.17	33

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-04

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	127.12	0.76	Sands - clean sands to silty sand	1.73	1.06	31
	14.76	140.10	0.95	Sands - clean sands to silty sand	1.76	1.08	35
	14.93	147.36	1.03	Sands - clean sands to silty sand	1.78	1.08	37
	15.09	167.93	1.08	Sands - clean sands to silty sand	1.75	1.07	41
	15.26	189.70	1.14	Sands - clean sands to silty sand	1.73	1.06	46
	15.42	199.44	1.13	Sands - clean sands to silty sand	1.72	1.05	47
	15.58	211.65	1.18	Sands - clean sands to silty sand	1.72	1.04	50
	15.75	219.52	1.24	Sands - clean sands to silty sand	1.73	1.05	52
	15.91	211.71	1.33	Sands - clean sands to silty sand	1.76	1.07	51
	16.08	197.45	1.30	Sands - clean sands to silty sand	1.77	1.08	48
	16.24	193.79	1.26	Sands - clean sands to silty sand	1.77	1.08	46
	16.40	196.54	1.15	Sands - clean sands to silty sand	1.74	1.06	46
	16.57	183.54	1.21	Sands - clean sands to silty sand	1.78	1.08	44
	16.73	169.54	1.21	Sands - clean sands to silty sand	1.80	1.10	41
	16.90	153.94	1.38	Sands - clean sands to silty sand	1.87	1.16	39
	17.06	143.94	1.36	Sands - clean sands to silty sand	1.89	1.17	36
	17.22	137.84	1.26	Sands - clean sands to silty sand	1.88	1.17	34
	17.39	122.65	1.30	Sands - clean sands to silty sand	1.93	1.21	31
	17.55	101.39	1.55	Sand mixtures - silty sand to sandy silt	2.05	1.36	28
	17.72	89.71	2.07	Sand mixtures - silty sand to sandy silt	2.17	1.59	27
	17.88	108.74	1.28	Sands - clean sands to silty sand	1.97	1.26	28
	18.04	142.46	1.27	Sands - clean sands to silty sand	1.88	1.17	35
	18.21	162.73	1.04	Sands - clean sands to silty sand	1.78	1.09	37
	18.37	144.70	1.13	Sands - clean sands to silty sand	1.85	1.14	34
	18.54	122.59	1.25	Sands - clean sands to silty sand	1.93	1.21	30
	18.70	110.42	1.59	Sand mixtures - silty sand to sandy silt	2.04	1.35	29
	18.86	118.25	1.59	Sands - clean sands to silty sand	2.02	1.32	31
	19.03	122.22	1.75	Sand mixtures - silty sand to sandy silt	2.04	1.35	32
	19.19	126.34	1.67	Sands - clean sands to silty sand	2.02	1.32	32
	19.36	135.99	1.51	Sands - clean sands to silty sand	1.97	1.25	33
	19.52	156.59	1.23	Sands - clean sands to silty sand	1.86	1.15	36
	19.69	162.81	1.16	Sands - clean sands to silty sand	1.83	1.12	36
	19.85	172.08	1.16	Sands - clean sands to silty sand	1.81	1.11	38
	20.01	191.32	1.09	Sands - clean sands to silty sand	1.76	1.08	40
	20.18	195.32	1.19	Sands - clean sands to silty sand	1.79	1.09	42
	20.34	174.68	1.25	Sands - clean sands to silty sand	1.84	1.13	38
	20.51	179.47	1.35	Sands - clean sands to silty sand	1.85	1.14	40
	20.67	187.34	1.33	Sands - clean sands to silty sand	1.84	1.13	41
	20.83	212.67	1.28	Sands - clean sands to silty sand	1.79	1.09	45
	21.00	227.49	0.77	Sands - clean sands to silty sand	1.61	1.00	43
	21.16	199.37	0.94	Sands - clean sands to silty sand	1.71	1.04	40
	21.33	161.44	0.87	Sands - clean sands to silty sand	1.76	1.07	33
	21.49	121.56	0.97	Sands - clean sands to silty sand	1.89	1.17	27
	21.65	97.15	1.15	Sands - clean sands to silty sand	2.01	1.31	23
	21.82	84.78	1.25	Sand mixtures - silty sand to sandy silt	2.08	1.42	21
	21.98	81.04	1.31	Sand mixtures - silty sand to sandy silt	2.11	1.47	21
	22.15	85.80	1.29	Sand mixtures - silty sand to sandy silt	2.09	1.43	21

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-04

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	99.60	1.18	Sands - clean sands to silty sand	2.01	1.31	24
	22.47	102.88	1.28	Sands - clean sands to silty sand	2.03	1.33	25
	22.64	100.37	1.41	Sand mixtures - silty sand to sandy silt	2.06	1.39	25
	22.80	99.12	1.38	Sand mixtures - silty sand to sandy silt	2.06	1.38	24
	22.97	101.38	1.21	Sands - clean sands to silty sand	2.02	1.32	24
	23.13	99.45	1.14	Sands - clean sands to silty sand	2.01	1.30	23
	23.29	89.70	1.28	Sand mixtures - silty sand to sandy silt	2.08	1.41	22
	23.46	84.66	1.38	Sand mixtures - silty sand to sandy silt	2.12	1.48	21
	23.62	83.13	1.54	Sand mixtures - silty sand to sandy silt	2.16	1.57	21
	23.79	96.52	1.32	Sand mixtures - silty sand to sandy silt	2.07	1.39	23
	23.95	119.63	0.98	Sands - clean sands to silty sand	1.91	1.19	26
	24.11	138.19	0.97	Sands - clean sands to silty sand	1.85	1.14	29
	24.28	147.03	1.03	Sands - clean sands to silty sand	1.85	1.14	31
	24.44	157.59	0.47	Sands - clean sands to silty sand	1.61	1.00	29
	24.61	170.72	0.58	Sands - clean sands to silty sand	1.64	1.00	32
	24.77	164.92	0.72	Sands - clean sands to silty sand	1.71	1.04	32
	24.93	174.22	0.72	Sands - clean sands to silty sand	1.69	1.03	33
	25.10	176.31	0.55	Sands - clean sands to silty sand	1.61	1.00	32
	25.26	173.66	0.64	Sands - clean sands to silty sand	1.66	1.01	32
	25.43	162.16	0.56	Sands - clean sands to silty sand	1.65	1.00	30
	25.59	162.01	0.61	Sands - clean sands to silty sand	1.67	1.02	30
	25.75	167.82	0.65	Sands - clean sands to silty sand	1.68	1.02	31
	25.92	189.82	0.53	Sands - clean sands to silty sand	1.58	1.00	34
	26.08	195.54	0.61	Sands - clean sands to silty sand	1.61	1.00	35
	26.25	186.71	0.73	Sands - clean sands to silty sand	1.68	1.02	35
	26.41	162.04	0.72	Sands - clean sands to silty sand	1.72	1.05	31
	26.57	120.07	0.72	Sands - clean sands to silty sand	1.83	1.13	24
	26.74	90.23	1.11	Sands - clean sands to silty sand	2.06	1.37	21
	26.90	84.16	1.33	Sand mixtures - silty sand to sandy silt	2.13	1.51	20
	27.07	85.00	0.99	Sands - clean sands to silty sand	2.05	1.36	19
	27.23	89.84	0.91	Sands - clean sands to silty sand	2.01	1.30	20
	27.40	81.42	0.99	Sands - clean sands to silty sand	2.07	1.39	19
	27.56	71.22	1.51	Sand mixtures - silty sand to sandy silt	2.23	1.74	18
	27.72	73.80	0.80	Sands - clean sands to silty sand	2.05	1.36	17
	27.89	89.77	1.03	Sands - clean sands to silty sand	2.04	1.35	20
	28.05	92.84	1.04	Sands - clean sands to silty sand	2.03	1.34	21
	28.22	100.69	1.39	Sand mixtures - silty sand to sandy silt	2.09	1.43	23
	28.38	120.55	1.16	Sands - clean sands to silty sand	1.97	1.26	26
	28.54	137.26	0.69	Sands - clean sands to silty sand	1.78	1.09	26
	28.71	125.47	0.78	Sands - clean sands to silty sand	1.85	1.14	25
	28.87	111.29	0.94	Sands - clean sands to silty sand	1.94	1.23	23
	29.04	106.95	1.28	Sands - clean sands to silty sand	2.05	1.36	24
	29.20	132.40	1.10	Sands - clean sands to silty sand	1.93	1.21	27
	29.36	142.62	1.07	Sands - clean sands to silty sand	1.90	1.18	29
	29.53	129.54	1.21	Sands - clean sands to silty sand	1.97	1.25	27
	29.69	125.04	1.34	Sands - clean sands to silty sand	2.01	1.30	27
	29.86	121.38	1.16	Sands - clean sands to silty sand	1.98	1.27	26

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-04

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	116.75	0.91	Sands - clean sands to silty sand	1.92	1.21	24
	30.18	109.01	1.05	Sands - clean sands to silty sand	1.99	1.28	23
	30.35	100.03	1.69	Sand mixtures - silty sand to sandy silt	2.16	1.57	23
	30.51	100.37	1.99	Sand mixtures - silty sand to sandy silt	2.21	1.68	24
	30.68	109.93	1.69	Sand mixtures - silty sand to sandy silt	2.13	1.50	25
	30.84	117.44	2.04	Sand mixtures - silty sand to sandy silt	2.17	1.58	27
	31.00	163.35	2.58	Sand mixtures - silty sand to sandy silt	2.14	1.53	37
	31.17	288.35	0.62	Sands - clean sands to silty sand	1.50	1.00	46
	31.33	485.18	1.20	Sands - clean sands to silty sand	1.57	1.00	81
	31.50	497.46	2.03	Sands - clean sands to silty sand	1.76	1.08	92

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 11/1/2006 11:12
PROJECT NO.: 17-1245A-4
CONE/RIG: DSG0705
ASSUMED DEPTH OF WATER TABLE: 30 feet
SOUNDING: CPT-05

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	10.64	2.35	Silt mixtures - clayey silt to silty clay	2.69	9.50	9
	0.33	44.23	1.64	Sand mixtures - silty sand to sandy silt	2.11	1.47	25
	0.49	61.98	1.69	Sands - clean sands to silty sand	2.01	1.31	32
	0.66	58.86	1.72	Sand mixtures - silty sand to sandy silt	2.04	1.34	31
	0.82	55.32	1.46	Sands - clean sands to silty sand	2.01	1.30	29
	0.98	50.47	2.21	Sand mixtures - silty sand to sandy silt	2.16	1.57	29
	1.15	49.65	2.33	Sand mixtures - silty sand to sandy silt	2.18	1.61	29
	1.31	45.78	2.92	Sand mixtures - silty sand to sandy silt	2.28	1.87	28
	1.48	43.53	2.53	Sand mixtures - silty sand to sandy silt	2.25	1.78	26
	1.64	37.92	2.69	Sand mixtures - silty sand to sandy silt	2.31	1.97	24
	1.80	31.32	2.64	Sand mixtures - silty sand to sandy silt	2.36	2.16	20
	1.97	26.63	2.71	Sand mixtures - silty sand to sandy silt	2.42	2.39	18
	2.13	28.82	2.41	Sand mixtures - silty sand to sandy silt	2.36	2.15	19
	2.30	33.14	2.19	Sand mixtures - silty sand to sandy silt	2.29	1.91	21
	2.46	33.71	2.34	Sand mixtures - silty sand to sandy silt	2.31	1.95	21
	2.62	33.84	2.69	Sand mixtures - silty sand to sandy silt	2.35	2.09	22
	2.79	32.48	2.70	Sand mixtures - silty sand to sandy silt	2.36	2.14	21
	2.95	34.00	2.54	Sand mixtures - silty sand to sandy silt	2.33	2.03	22
	3.12	35.64	2.68	Sand mixtures - silty sand to sandy silt	2.33	2.03	23
	3.28	37.78	2.49	Sand mixtures - silty sand to sandy silt	2.29	1.90	24
	3.44	38.23	2.57	Sand mixtures - silty sand to sandy silt	2.30	1.92	24
	3.61	35.05	2.57	Sand mixtures - silty sand to sandy silt	2.32	2.01	22
	3.77	30.19	2.36	Sand mixtures - silty sand to sandy silt	2.34	2.08	19
	3.94	32.41	2.35	Sand mixtures - silty sand to sandy silt	2.32	2.00	21
	4.10	33.94	2.40	Sand mixtures - silty sand to sandy silt	2.31	1.98	21
	4.27	35.20	2.71	Sand mixtures - silty sand to sandy silt	2.34	2.06	23
	4.43	39.58	2.78	Sand mixtures - silty sand to sandy silt	2.31	1.97	25
	4.59	42.40	2.63	Sand mixtures - silty sand to sandy silt	2.27	1.85	26
	4.76	42.11	2.68	Sand mixtures - silty sand to sandy silt	2.28	1.87	26
	4.92	42.01	2.29	Sand mixtures - silty sand to sandy silt	2.23	1.74	25
	5.09	40.65	1.86	Sand mixtures - silty sand to sandy silt	2.18	1.61	24
	5.25	39.91	2.04	Sand mixtures - silty sand to sandy silt	2.21	1.69	24
	5.41	38.73	2.18	Sand mixtures - silty sand to sandy silt	2.24	1.77	23
	5.58	41.14	2.27	Sand mixtures - silty sand to sandy silt	2.24	1.75	25
	5.74	42.30	2.39	Sand mixtures - silty sand to sandy silt	2.24	1.77	26
	5.91	42.22	2.55	Sand mixtures - silty sand to sandy silt	2.26	1.83	26
	6.07	41.34	2.73	Sand mixtures - silty sand to sandy silt	2.29	1.91	26
	6.23	46.80	2.58	Sand mixtures - silty sand to sandy silt	2.24	1.75	28
	6.40	56.61	2.83	Sand mixtures - silty sand to sandy silt	2.21	1.68	34
	6.56	61.34	2.94	Sand mixtures - silty sand to sandy silt	2.20	1.66	36
	6.73	57.93	2.94	Sand mixtures - silty sand to sandy silt	2.22	1.70	34

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-05

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	47.14	2.68	Sand mixtures - silty sand to sandy silt	2.25	1.78	29
	7.05	43.73	2.48	Sand mixtures - silty sand to sandy silt	2.25	1.77	26
	7.22	48.01	2.48	Sand mixtures - silty sand to sandy silt	2.22	1.71	28
	7.38	57.45	1.82	Sand mixtures - silty sand to sandy silt	2.09	1.43	29
	7.55	64.74	1.88	Sand mixtures - silty sand to sandy silt	2.07	1.39	32
	7.71	71.19	1.86	Sand mixtures - silty sand to sandy silt	2.04	1.35	34
	7.87	72.71	1.72	Sands - clean sands to silty sand	2.02	1.32	33
	8.04	70.59	2.21	Sand mixtures - silty sand to sandy silt	2.10	1.45	34
	8.20	67.92	2.11	Sand mixtures - silty sand to sandy silt	2.10	1.45	33
	8.37	62.08	2.16	Sand mixtures - silty sand to sandy silt	2.14	1.52	30
	8.53	64.52	2.21	Sand mixtures - silty sand to sandy silt	2.14	1.52	31
	8.69	73.74	2.02	Sand mixtures - silty sand to sandy silt	2.08	1.41	33
	8.86	79.09	2.19	Sand mixtures - silty sand to sandy silt	2.09	1.42	36
	9.02	88.25	2.85	Sand mixtures - silty sand to sandy silt	2.14	1.53	41
	9.19	91.95	2.92	Sand mixtures - silty sand to sandy silt	2.14	1.53	42
	9.35	79.23	3.08	Sand mixtures - silty sand to sandy silt	2.20	1.66	38
	9.51	78.39	2.73	Sand mixtures - silty sand to sandy silt	2.17	1.59	36
	9.68	76.22	2.76	Sand mixtures - silty sand to sandy silt	2.18	1.62	35
	9.84	73.44	2.50	Sand mixtures - silty sand to sandy silt	2.17	1.58	33
	10.01	62.95	2.23	Sand mixtures - silty sand to sandy silt	2.18	1.61	28
	10.17	54.46	2.21	Sand mixtures - silty sand to sandy silt	2.22	1.71	25
	10.33	51.82	2.37	Sand mixtures - silty sand to sandy silt	2.26	1.82	24
	10.50	50.82	2.61	Sand mixtures - silty sand to sandy silt	2.30	1.93	24
	10.66	52.32	2.69	Sand mixtures - silty sand to sandy silt	2.30	1.94	25
	10.83	52.81	2.77	Sand mixtures - silty sand to sandy silt	2.31	1.97	25
	10.99	51.73	2.62	Sand mixtures - silty sand to sandy silt	2.30	1.95	24
	11.15	49.13	2.54	Sand mixtures - silty sand to sandy silt	2.31	1.98	23
	11.32	44.87	2.45	Sand mixtures - silty sand to sandy silt	2.33	2.05	21
	11.48	45.34	2.25	Sand mixtures - silty sand to sandy silt	2.31	1.97	21
	11.65	47.82	2.13	Sand mixtures - silty sand to sandy silt	2.28	1.88	21
	11.81	50.42	1.84	Sand mixtures - silty sand to sandy silt	2.23	1.73	21
	11.98	46.99	1.92	Sand mixtures - silty sand to sandy silt	2.26	1.83	20
	12.14	42.24	1.84	Sand mixtures - silty sand to sandy silt	2.29	1.90	18
	12.30	33.77	2.05	Sand mixtures - silty sand to sandy silt	2.39	2.28	16
	12.47	35.13	1.92	Sand mixtures - silty sand to sandy silt	2.37	2.18	16
	12.63	38.57	1.68	Sand mixtures - silty sand to sandy silt	2.31	1.95	16
	12.80	34.88	1.91	Sand mixtures - silty sand to sandy silt	2.38	2.21	15
	12.96	34.15	2.39	Sand mixtures - silty sand to sandy silt	2.45	2.50	16
	13.12	34.41	2.62	Silt mixtures - clayey silt to silty clay	2.47	2.62	16
	13.29	37.90	2.43	Sand mixtures - silty sand to sandy silt	2.42	2.40	17
	13.45	42.21	2.12	Sand mixtures - silty sand to sandy silt	2.35	2.12	18
	13.62	42.39	1.92	Sand mixtures - silty sand to sandy silt	2.33	2.03	17
	13.78	45.09	1.95	Sand mixtures - silty sand to sandy silt	2.32	1.99	18
	13.94	53.44	1.50	Sand mixtures - silty sand to sandy silt	2.19	1.64	19
	14.11	56.23	1.72	Sand mixtures - silty sand to sandy silt	2.22	1.69	20
	14.27	52.69	2.05	Sand mixtures - silty sand to sandy silt	2.29	1.90	20
	14.44	52.83	2.34	Sand mixtures - silty sand to sandy silt	2.33	2.03	20

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-05

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	50.45	2.61	Sand mixtures - silty sand to sandy silt	2.38	2.21	20
	14.76	50.50	3.06	Silt mixtures - clayey silt to silty clay	2.43	2.41	21
	14.93	57.74	2.76	Sand mixtures - silty sand to sandy silt	2.36	2.13	22
	15.09	54.78	2.34	Sand mixtures - silty sand to sandy silt	2.33	2.03	21
	15.26	56.00	1.93	Sand mixtures - silty sand to sandy silt	2.27	1.84	20
	15.42	76.64	1.57	Sand mixtures - silty sand to sandy silt	2.11	1.46	24
	15.58	85.43	1.93	Sand mixtures - silty sand to sandy silt	2.14	1.52	27
	15.75	74.28	1.54	Sand mixtures - silty sand to sandy silt	2.12	1.48	23
	15.91	58.40	2.25	Sand mixtures - silty sand to sandy silt	2.31	1.96	21
	16.08	54.55	2.20	Sand mixtures - silty sand to sandy silt	2.33	2.02	19
	16.24	50.68	2.56	Sand mixtures - silty sand to sandy silt	2.40	2.29	19
	16.40	46.85	2.68	Sand mixtures - silty sand to sandy silt	2.44	2.46	18
	16.57	49.38	2.49	Sand mixtures - silty sand to sandy silt	2.40	2.31	18
	16.73	52.31	2.08	Sand mixtures - silty sand to sandy silt	2.34	2.06	18
	16.90	57.44	1.85	Sand mixtures - silty sand to sandy silt	2.27	1.85	19
	17.06	55.51	2.10	Sand mixtures - silty sand to sandy silt	2.32	2.01	19
	17.22	48.85	2.04	Sand mixtures - silty sand to sandy silt	2.36	2.14	17
	17.39	47.90	2.58	Sand mixtures - silty sand to sandy silt	2.44	2.45	17
	17.55	50.51	2.22	Sand mixtures - silty sand to sandy silt	2.38	2.21	17
	17.72	55.40	3.86	Silt mixtures - clayey silt to silty clay	2.52	3.13	21
	17.88	65.27	2.52	Sand mixtures - silty sand to sandy silt	2.34	2.06	22
	18.04	46.18	2.86	Silt mixtures - clayey silt to silty clay	2.49	2.70	17
	18.21	44.48	2.37	Sand mixtures - silty sand to sandy silt	2.45	2.52	16
	18.37	42.08	2.42	Silt mixtures - clayey silt to silty clay	2.48	2.64	15
	18.54	44.70	1.95	Sand mixtures - silty sand to sandy silt	2.40	2.29	15
	18.70	50.32	2.16	Sand mixtures - silty sand to sandy silt	2.39	2.25	17
	18.86	59.10	1.74	Sand mixtures - silty sand to sandy silt	2.27	1.86	18
	19.03	57.78	2.07	Sand mixtures - silty sand to sandy silt	2.33	2.05	18
	19.19	55.69	2.06	Sand mixtures - silty sand to sandy silt	2.35	2.10	17
	19.36	53.37	2.65	Sand mixtures - silty sand to sandy silt	2.44	2.46	18
	19.52	66.49	2.67	Sand mixtures - silty sand to sandy silt	2.37	2.18	21
	19.69	71.36	2.42	Sand mixtures - silty sand to sandy silt	2.32	2.00	22
	19.85	64.73	2.66	Sand mixtures - silty sand to sandy silt	2.38	2.23	20
	20.01	69.40	2.15	Sand mixtures - silty sand to sandy silt	2.30	1.93	20
	20.18	99.67	1.28	Sands - clean sands to silty sand	2.03	1.33	25
	20.34	143.93	0.81	Sands - clean sands to silty sand	1.77	1.08	30
	20.51	162.18	1.15	Sands - clean sands to silty sand	1.84	1.13	35
	20.67	167.34	0.78	Sands - clean sands to silty sand	1.71	1.04	34
	20.83	125.07	0.96	Sands - clean sands to silty sand	1.87	1.16	28
	21.00	102.17	0.96	Sands - clean sands to silty sand	1.95	1.23	23
	21.16	87.10	1.11	Sands - clean sands to silty sand	2.04	1.35	21
	21.33	67.54	1.40	Sand mixtures - silty sand to sandy silt	2.20	1.66	18
	21.49	56.13	1.70	Sand mixtures - silty sand to sandy silt	2.32	2.01	16
	21.65	55.41	1.93	Sand mixtures - silty sand to sandy silt	2.37	2.17	16
	21.82	61.67	1.65	Sand mixtures - silty sand to sandy silt	2.28	1.89	17
	21.98	77.52	3.03	Sand mixtures - silty sand to sandy silt	2.39	2.27	22
	22.15	156.06	2.07	Sand mixtures - silty sand to sandy silt	2.05	1.37	37

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-05

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	135.81	1.96	Sand mixtures - silty sand to sandy silt	2.08	1.41	32
	22.47	131.97	1.11	Sands - clean sands to silty sand	1.91	1.20	28
	22.64	133.56	1.24	Sands - clean sands to silty sand	1.94	1.23	29
	22.80	112.51	1.34	Sands - clean sands to silty sand	2.03	1.33	26
	22.97	106.89	1.66	Sand mixtures - silty sand to sandy silt	2.11	1.47	25
	23.13	84.87	1.51	Sand mixtures - silty sand to sandy silt	2.16	1.57	21
	23.29	70.39	1.24	Sand mixtures - silty sand to sandy silt	2.18	1.60	17
	23.46	66.58	1.20	Sand mixtures - silty sand to sandy silt	2.19	1.64	16
	23.62	62.51	1.49	Sand mixtures - silty sand to sandy silt	2.27	1.86	16
	23.79	61.62	1.25	Sand mixtures - silty sand to sandy silt	2.23	1.75	15
	23.95	58.56	1.31	Sand mixtures - silty sand to sandy silt	2.27	1.84	15
	24.11	56.23	0.81	Sand mixtures - silty sand to sandy silt	2.16	1.57	13
	24.28	54.21	0.92	Sand mixtures - silty sand to sandy silt	2.21	1.69	13
	24.44	51.28	0.98	Sand mixtures - silty sand to sandy silt	2.25	1.79	13
	24.61	48.29	1.02	Sand mixtures - silty sand to sandy silt	2.29	1.90	12
	24.77	45.44	1.07	Sand mixtures - silty sand to sandy silt	2.33	2.02	11
	24.93	45.46	3.51	Silt mixtures - clayey silt to silty clay	2.66	7.75	14
	25.10	54.22	3.19	Silt mixtures - clayey silt to silty clay	2.57	4.37	15
	25.26	94.33	2.29	Sand mixtures - silty sand to sandy silt	2.28	1.87	23
	25.43	145.03	1.32	Sands - clean sands to silty sand	1.96	1.25	30
	25.59	178.66	1.26	Sands - clean sands to silty sand	1.88	1.17	35
	25.75	156.01	1.58	Sands - clean sands to silty sand	2.00	1.29	32
	25.92	171.18	1.76	Sands - clean sands to silty sand	2.01	1.30	35
	26.08	165.69	1.49	Sands - clean sands to silty sand	1.96	1.25	33
	26.25	133.58	1.89	Sand mixtures - silty sand to sandy silt	2.11	1.47	29
	26.41	122.12	1.65	Sand mixtures - silty sand to sandy silt	2.10	1.45	26
	26.57	100.45	1.87	Sand mixtures - silty sand to sandy silt	2.21	1.67	22
	26.74	102.84	0.93	Sands - clean sands to silty sand	2.00	1.29	21
	26.90	81.49	2.66	Sand mixtures - silty sand to sandy silt	2.39	2.26	20
	27.07	111.38	3.38	Sand mixtures - silty sand to sandy silt	2.37	2.18	27
	27.23	204.87	3.47	Very stiff sand to clayey sand	2.20	1.66	45
	27.40	244.49	3.94	Very stiff sand to clayey sand	2.20	1.66	53
	27.56	215.55	3.71	Very stiff sand to clayey sand	2.21	1.69	47
	27.72	218.62	4.00	Very stiff sand to clayey sand	2.24	1.75	48
	27.89	164.05	6.22	Very stiff, fine grained	2.48	2.65	40
	28.05	203.78	5.57	Very stiff, fine grained	2.38	2.23	48
	28.22	157.38	6.95	Very stiff, fine grained	2.53	3.51	39
	28.38	124.00	7.47	Very stiff, fine grained	2.63	6.44	32
	28.54	102.57	6.94	Clays - silty clay to clay	2.66	7.81	27
	28.71	87.01	7.08	Clays - silty clay to clay	2.72		23
	28.87	81.22	6.70	Clays - silty clay to clay	2.72		22
	29.04	76.63	7.01	Clays - silty clay to clay	2.76		21
	29.20	70.88	6.54	Clays - silty clay to clay	2.76		19
	29.36	72.28	5.85	Clays - silty clay to clay	2.72		19
	29.53	78.91	6.44	Clays - silty clay to clay	2.72		21
	29.69	74.05	7.81	Clays - silty clay to clay	2.81		20
	29.86	107.75	5.45	Silt mixtures - clayey silt to silty clay	2.57	4.47	26

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-05

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	119.07	5.37	Silt mixtures - clayey silt to silty clay	2.54	3.58	28
	30.18	117.24	6.71	Very stiff, fine grained	2.62	6.22	29
	30.35	157.62	6.10	Very stiff, fine grained	2.50	2.86	36
	30.51	175.97	5.95	Very stiff, fine grained	2.46	2.58	40
	30.68	171.57	5.67	Very stiff, fine grained	2.45	2.53	39
	30.84	159.87	5.70	Very stiff, fine grained	2.48	2.64	36
	31.00	152.51	6.78	Very stiff, fine grained	2.55	4.00	36
	31.17	194.42	5.81	Very stiff, fine grained	2.43	2.43	43
	31.33	199.71	5.99	Very stiff, fine grained	2.44	2.45	44
	31.50	193.90	5.84	Very stiff, fine grained	2.43	2.44	43
	31.66	197.07	5.96	Very stiff, fine grained	2.44	2.46	43
	31.82	230.08	5.53	Very stiff, fine grained	2.37	2.18	49
	31.99	237.22	5.84	Very stiff, fine grained	2.38	2.23	51
	32.15	243.25	5.77	Very stiff, fine grained	2.37	2.19	52
	32.32	256.49	5.71	Very stiff, fine grained	2.36	2.13	54
	32.48	261.54	5.87	Very stiff, fine grained	2.36	2.15	55
	32.64	261.67	5.88	Very stiff, fine grained	2.36	2.16	55
	32.81	267.25	5.83	Very stiff, fine grained	2.36	2.13	56

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 11/1/2006 10:22
PROJECT NO.: 17-1245A-4
CONE/RIG: DSG0705
ASSUMED DEPTH OF WATER TABLE: 25 feet
SOUNDING: CPT-06

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	4.85	0.09	Sensitive, fine-grained	2.51	3.06	3
	0.33	19.86	0.00	Sands - clean sands to silty sand	2.23	1.00	12
	0.49	7.66	0.00	Sand mixtures - silty sand to sandy silt	2.92		7
	0.66	9.66	0.00	Sand mixtures - silty sand to sandy silt	2.84		9
	0.82	6.57	0.00	Sensitive, fine-grained	2.97		6
	0.98	5.76	0.14	Sand mixtures - silty sand to sandy silt	2.46	2.57	4
	1.15	7.81	0.35	Sand mixtures - silty sand to sandy silt	2.43	2.42	5
	1.31	20.47	0.75	Sand mixtures - silty sand to sandy silt	2.18	1.61	12
	1.48	22.18	1.00	Sand mixtures - silty sand to sandy silt	2.22	1.70	13
	1.64	18.76	0.73	Sand mixtures - silty sand to sandy silt	2.21	1.67	11
	1.80	15.37	0.16	Sand mixtures - silty sand to sandy silt	2.05	1.00	8
	1.97	14.64	0.58	Sand mixtures - silty sand to sandy silt	2.26	1.81	9
	2.13	5.22	1.95	Silt mixtures - clayey silt to silty clay	2.91		5
	2.30	14.02	1.03	Sand mixtures - silty sand to sandy silt	2.40	2.28	9
	2.46	17.37	1.25	Sand mixtures - silty sand to sandy silt	2.36	2.15	11
	2.62	18.27	1.37	Sand mixtures - silty sand to sandy silt	2.37	2.17	12
	2.79	19.42	1.72	Sand mixtures - silty sand to sandy silt	2.40	2.31	13
	2.95	21.55	1.56	Sand mixtures - silty sand to sandy silt	2.34	2.07	14
	3.12	15.75	2.19	Silt mixtures - clayey silt to silty clay	2.54	3.66	12
	3.28	24.41	1.24	Sand mixtures - silty sand to sandy silt	2.24	1.75	15
	3.44	27.73	1.31	Sand mixtures - silty sand to sandy silt	2.21	1.67	16
	3.61	31.10	1.82	Sand mixtures - silty sand to sandy silt	2.26	1.81	19
	3.77	36.21	1.64	Sand mixtures - silty sand to sandy silt	2.18	1.60	21
	3.94	37.21	1.43	Sand mixtures - silty sand to sandy silt	2.13	1.50	21
	4.10	40.63	1.44	Sand mixtures - silty sand to sandy silt	2.10	1.45	22
	4.27	50.45	1.12	Sands - clean sands to silty sand	1.96	1.24	25
	4.43	51.59	1.01	Sands - clean sands to silty sand	1.92	1.20	25
	4.59	55.27	0.87	Sands - clean sands to silty sand	1.86	1.15	26
	4.76	55.96	0.78	Sands - clean sands to silty sand	1.83	1.12	26
	4.92	57.02	0.86	Sands - clean sands to silty sand	1.85	1.14	27
	5.09	61.37	1.22	Sands - clean sands to silty sand	1.92	1.20	30
	5.25	65.14	1.48	Sands - clean sands to silty sand	1.96	1.25	33
	5.41	67.81	1.50	Sands - clean sands to silty sand	1.95	1.24	34
	5.58	76.66	1.31	Sands - clean sands to silty sand	1.87	1.16	36
	5.74	89.09	1.24	Sands - clean sands to silty sand	1.82	1.12	40
	5.91	91.96	1.08	Sands - clean sands to silty sand	1.78	1.09	38
	6.07	84.51	1.19	Sands - clean sands to silty sand	1.83	1.13	37
	6.23	90.42	1.77	Sands - clean sands to silty sand	1.93	1.21	43
	6.40	81.34	2.13	Sand mixtures - silty sand to sandy silt	2.02	1.32	42
	6.56	70.06	2.29	Sand mixtures - silty sand to sandy silt	2.08	1.41	38
	6.73	57.35	1.54	Sands - clean sands to silty sand	2.03	1.33	29

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-06

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	50.00	1.01	Sands - clean sands to silty sand	1.96	1.25	23
	7.05	49.06	0.79	Sands - clean sands to silty sand	1.92	1.20	21
	7.22	52.84	2.24	Sand mixtures - silty sand to sandy silt	2.17	1.58	29
	7.38	69.68	1.42	Sands - clean sands to silty sand	1.97	1.25	31
	7.55	68.33	1.78	Sand mixtures - silty sand to sandy silt	2.04	1.34	32
	7.71	88.85	1.13	Sands - clean sands to silty sand	1.84	1.13	34
	7.87	93.45	1.17	Sands - clean sands to silty sand	1.84	1.13	36
	8.04	86.93	1.05	Sands - clean sands to silty sand	1.84	1.13	33
	8.20	73.23	1.06	Sands - clean sands to silty sand	1.89	1.18	29
	8.37	67.32	1.08	Sands - clean sands to silty sand	1.93	1.21	27
	8.53	62.00	1.30	Sands - clean sands to silty sand	2.00	1.30	26
	8.69	61.42	1.38	Sands - clean sands to silty sand	2.03	1.33	26
	8.86	62.64	1.48	Sand mixtures - silty sand to sandy silt	2.04	1.35	27
	9.02	66.74	1.15	Sands - clean sands to silty sand	1.96	1.24	26
	9.19	72.55	1.16	Sands - clean sands to silty sand	1.94	1.22	28
	9.35	75.97	0.98	Sands - clean sands to silty sand	1.88	1.17	27
	9.51	86.42	0.98	Sands - clean sands to silty sand	1.85	1.14	30
	9.68	100.68	0.95	Sands - clean sands to silty sand	1.80	1.10	33
	9.84	96.23	0.96	Sands - clean sands to silty sand	1.82	1.11	32
	10.01	100.04	1.15	Sands - clean sands to silty sand	1.86	1.14	34
	10.17	117.28	0.92	Sands - clean sands to silty sand	1.75	1.07	36
	10.33	118.92	0.82	Sands - clean sands to silty sand	1.72	1.04	35
	10.50	91.55	1.18	Sands - clean sands to silty sand	1.90	1.18	31
	10.66	92.33	0.99	Sands - clean sands to silty sand	1.85	1.14	30
	10.83	121.57	0.84	Sands - clean sands to silty sand	1.72	1.05	35
	10.99	126.09	0.94	Sands - clean sands to silty sand	1.75	1.06	37
	11.15	121.82	0.98	Sands - clean sands to silty sand	1.77	1.08	36
	11.32	96.89	1.12	Sands - clean sands to silty sand	1.88	1.16	31
	11.48	84.56	1.01	Sands - clean sands to silty sand	1.90	1.18	27
	11.65	72.78	1.11	Sands - clean sands to silty sand	1.97	1.26	25
	11.81	86.88	1.02	Sands - clean sands to silty sand	1.89	1.18	28
	11.98	142.06	0.91	Sands - clean sands to silty sand	1.72	1.04	39
	12.14	169.78	0.90	Sands - clean sands to silty sand	1.66	1.01	44
	12.30	162.07	0.91	Sands - clean sands to silty sand	1.68	1.02	42
	12.47	146.42	0.84	Sands - clean sands to silty sand	1.69	1.03	38
	12.63	110.38	0.90	Sands - clean sands to silty sand	1.80	1.10	31
	12.80	81.78	0.85	Sands - clean sands to silty sand	1.88	1.17	24
	12.96	56.00	0.85	Sands - clean sands to silty sand	2.02	1.31	18
	13.12	41.01	1.15	Sand mixtures - silty sand to sandy silt	2.20	1.65	15
	13.29	31.58	1.29	Sand mixtures - silty sand to sandy silt	2.32	2.01	13
	13.45	29.57	1.21	Sand mixtures - silty sand to sandy silt	2.33	2.05	12
	13.62	34.51	1.26	Sand mixtures - silty sand to sandy silt	2.29	1.91	14
	13.78	37.59	1.24	Sand mixtures - silty sand to sandy silt	2.26	1.82	14
	13.94	43.96	1.40	Sand mixtures - silty sand to sandy silt	2.24	1.76	16
	14.11	47.78	1.49	Sand mixtures - silty sand to sandy silt	2.23	1.73	18
	14.27	45.63	1.50	Sand mixtures - silty sand to sandy silt	2.25	1.79	17
	14.44	48.72	1.59	Sand mixtures - silty sand to sandy silt	2.25	1.78	18

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-06

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	61.22	1.47	Sand mixtures - silty sand to sandy silt	2.15	1.55	21
	14.76	74.66	1.44	Sand mixtures - silty sand to sandy silt	2.09	1.42	24
	14.93	83.28	1.04	Sands - clean sands to silty sand	1.96	1.25	24
	15.09	84.93	1.85	Sand mixtures - silty sand to sandy silt	2.12	1.48	27
	15.26	90.61	1.56	Sand mixtures - silty sand to sandy silt	2.05	1.37	28
	15.42	75.78	1.62	Sand mixtures - silty sand to sandy silt	2.12	1.49	24
	15.58	83.25	1.15	Sands - clean sands to silty sand	2.00	1.29	24
	15.75	94.35	1.05	Sands - clean sands to silty sand	1.93	1.22	26
	15.91	100.29	1.08	Sands - clean sands to silty sand	1.92	1.21	27
	16.08	96.95	1.20	Sands - clean sands to silty sand	1.97	1.25	27
	16.24	86.66	1.36	Sands - clean sands to silty sand	2.04	1.35	25
	16.40	74.28	1.76	Sand mixtures - silty sand to sandy silt	2.17	1.58	23
	16.57	65.82	1.90	Sand mixtures - silty sand to sandy silt	2.23	1.74	21
	16.73	57.24	2.12	Sand mixtures - silty sand to sandy silt	2.31	1.97	20
	16.90	71.24	1.45	Sand mixtures - silty sand to sandy silt	2.13	1.51	21
	17.06	101.47	1.17	Sands - clean sands to silty sand	1.96	1.24	27
	17.22	108.08	0.99	Sands - clean sands to silty sand	1.89	1.17	27
	17.39	104.44	1.03	Sands - clean sands to silty sand	1.92	1.20	27
	17.55	101.25	1.15	Sands - clean sands to silty sand	1.96	1.24	26
	17.72	119.94	1.24	Sands - clean sands to silty sand	1.93	1.21	30
	17.88	143.87	1.31	Sands - clean sands to silty sand	1.89	1.17	35
	18.04	159.00	1.29	Sands - clean sands to silty sand	1.85	1.14	38
	18.21	166.90	1.30	Sands - clean sands to silty sand	1.85	1.13	39
	18.37	184.87	1.14	Sands - clean sands to silty sand	1.77	1.08	41
	18.54	201.92	1.01	Sands - clean sands to silty sand	1.71	1.04	43
	18.70	199.05	0.87	Sands - clean sands to silty sand	1.67	1.01	41
	18.86	163.53	0.79	Sands - clean sands to silty sand	1.71	1.04	35
	19.03	127.57	0.82	Sands - clean sands to silty sand	1.80	1.10	28
	19.19	92.66	0.86	Sands - clean sands to silty sand	1.93	1.21	22
	19.36	67.43	0.83	Sands - clean sands to silty sand	2.04	1.34	17
	19.52	56.28	1.03	Sand mixtures - silty sand to sandy silt	2.16	1.57	16
	19.69	55.21	1.28	Sand mixtures - silty sand to sandy silt	2.23	1.72	16
	19.85	56.77	1.13	Sand mixtures - silty sand to sandy silt	2.19	1.63	16
	20.01	45.83	1.16	Sand mixtures - silty sand to sandy silt	2.27	1.86	13
	20.18	39.39	1.33	Sand mixtures - silty sand to sandy silt	2.37	2.18	12
	20.34	41.88	1.48	Sand mixtures - silty sand to sandy silt	2.38	2.21	13
	20.51	46.10	1.73	Sand mixtures - silty sand to sandy silt	2.38	2.24	14
	20.67	42.43	2.02	Sand mixtures - silty sand to sandy silt	2.46	2.56	13
	20.83	32.91	2.63	Silt mixtures - clayey silt to silty clay	2.63	6.48	11
	21.00	33.82	2.10	Silt mixtures - clayey silt to silty clay	2.56	4.16	11
	21.16	40.42	1.62	Sand mixtures - silty sand to sandy silt	2.43	2.41	12
	21.33	53.30	1.46	Sand mixtures - silty sand to sandy silt	2.30	1.93	15
	21.49	64.86	1.27	Sand mixtures - silty sand to sandy silt	2.19	1.64	17
	21.65	67.08	1.16	Sand mixtures - silty sand to sandy silt	2.16	1.56	17
	21.82	66.16	0.97	Sand mixtures - silty sand to sandy silt	2.12	1.48	16
	21.98	51.27	1.40	Sand mixtures - silty sand to sandy silt	2.31	1.97	14
	22.15	41.87	2.04	Sand mixtures - silty sand to sandy silt	2.49	2.70	13

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-06

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	50.46	2.25	Sand mixtures - silty sand to sandy silt	2.45	2.52	15
	22.47	98.05	1.77	Sand mixtures - silty sand to sandy silt	2.15	1.55	24
	22.64	166.05	1.08	Sands - clean sands to silty sand	1.83	1.12	34
	22.80	262.53	0.85	Sands - clean sands to silty sand	1.61	1.00	47
	22.97	330.20	1.10	Sands - clean sands to silty sand	1.63	1.00	60
	23.13	337.76	1.61	Sands - clean sands to silty sand	1.76	1.07	65
	23.29	389.63	1.91	Sands - clean sands to silty sand	1.79	1.09	76
	23.46	359.94	2.42	Very stiff sand to clayey sand	1.89	1.18	75
	23.62	328.05	1.87	Sands - clean sands to silty sand	1.82	1.12	65
	23.79	374.89	2.41	Very stiff sand to clayey sand	1.89	1.17	77
	23.95	370.53	2.91	Very stiff sand to clayey sand	1.96	1.24	79
	24.11	268.69	3.53	Very stiff sand to clayey sand	2.11	1.47	62
	24.28	226.22	2.27	Sand mixtures - silty sand to sandy silt	2.00	1.29	48
	24.44	196.70	1.01	Sands - clean sands to silty sand	1.77	1.08	37
	24.61	129.47	1.48	Sands - clean sands to silty sand	2.03	1.33	28
	24.77	100.19	1.36	Sand mixtures - silty sand to sandy silt	2.09	1.43	22
	24.93	81.02	1.43	Sand mixtures - silty sand to sandy silt	2.19	1.62	19
	25.10	78.41	1.21	Sand mixtures - silty sand to sandy silt	2.15	1.55	18
	25.26	77.17	1.15	Sand mixtures - silty sand to sandy silt	2.15	1.53	17
	25.43	73.27	1.12	Sand mixtures - silty sand to sandy silt	2.16	1.56	17
	25.59	71.95	1.14	Sand mixtures - silty sand to sandy silt	2.17	1.59	16
	25.75	80.84	0.57	Sands - clean sands to silty sand	1.95	1.24	16
	25.92	87.71	1.09	Sand mixtures - silty sand to sandy silt	2.09	1.42	19
	26.08	39.26	2.25	Silt mixtures - clayey silt to silty clay	2.59	5.06	11
	26.25	96.15	0.86	Sands - clean sands to silty sand	1.99	1.28	20
	26.41	110.53	0.89	Sands - clean sands to silty sand	1.95	1.23	22
	26.57	121.02	0.87	Sands - clean sands to silty sand	1.91	1.19	24
	26.74	142.94	0.83	Sands - clean sands to silty sand	1.83	1.13	27
	26.90	168.19	0.67	Sands - clean sands to silty sand	1.72	1.04	30
	27.07	174.06	0.54	Sands - clean sands to silty sand	1.65	1.00	30
	27.23	181.66	0.43	Sands - clean sands to silty sand	1.57	1.00	30
	27.40	189.15	0.51	Sands - clean sands to silty sand	1.60	1.00	31
	27.56	197.24	0.78	Sands - clean sands to silty sand	1.71	1.04	34
	27.72	220.42	0.87	Sands - clean sands to silty sand	1.70	1.03	38
	27.89	222.58	0.69	Sands - clean sands to silty sand	1.63	1.00	37
	28.05	199.12	0.67	Sands - clean sands to silty sand	1.66	1.01	34
	28.22	154.96	0.78	Sands - clean sands to silty sand	1.80	1.10	28
	28.38	101.86	1.22	Sand mixtures - silty sand to sandy silt	2.07	1.40	21
	28.54	61.89	2.56	Silt mixtures - clayey silt to silty clay	2.47	2.63	16
	28.71	54.33	4.52	Silt mixtures - clayey silt to silty clay	2.70	9.99	16
	28.87	67.20	4.28	Silt mixtures - clayey silt to silty clay	2.61	5.73	18
	29.04	138.28	2.20	Sand mixtures - silty sand to sandy silt	2.16	1.56	30
	29.20	221.61	1.11	Sands - clean sands to silty sand	1.78	1.09	40
	29.36	217.57	0.99	Sands - clean sands to silty sand	1.75	1.07	38
	29.53	195.07	0.97	Sands - clean sands to silty sand	1.78	1.09	35
	29.69	183.84	0.79	Sands - clean sands to silty sand	1.74	1.06	32
	29.86	179.39	0.89	Sands - clean sands to silty sand	1.79	1.09	32

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-06

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	146.96	1.25	Sands - clean sands to silty sand	1.96	1.24	28
	30.18	184.57	1.00	Sands - clean sands to silty sand	1.81	1.11	33
	30.35	190.00	0.74	Sands - clean sands to silty sand	1.71	1.04	32
	30.51	183.65	0.75	Sands - clean sands to silty sand	1.73	1.05	32
	30.68	175.71	0.81	Sands - clean sands to silty sand	1.77	1.08	31
	30.84	179.36	0.76	Sands - clean sands to silty sand	1.74	1.06	31
	31.00	190.89	0.62	Sands - clean sands to silty sand	1.67	1.01	32
	31.17	199.00	0.68	Sands - clean sands to silty sand	1.67	1.02	33
	31.33	204.88	0.70	Sands - clean sands to silty sand	1.67	1.02	34
	31.50	217.46	0.64	Sands - clean sands to silty sand	1.63	1.00	35
	31.66	240.17	0.61	Sands - clean sands to silty sand	1.58	1.00	38
	31.82	247.14	1.08	Sands - clean sands to silty sand	1.75	1.06	42
	31.99	269.30	1.30	Sands - clean sands to silty sand	1.78	1.09	47
	32.15	276.73	1.39	Sands - clean sands to silty sand	1.80	1.10	48
	32.32	349.75	1.23	Sands - clean sands to silty sand	1.69	1.02	58
	32.48	400.51	1.12	Sands - clean sands to silty sand	1.62	1.00	64
	32.64	395.07	1.08	Sands - clean sands to silty sand	1.61	1.00	62
	32.81	377.90	1.19	Sands - clean sands to silty sand	1.65	1.00	61
	32.97	321.27	0.93	Sands - clean sands to silty sand	1.62	1.00	51
	33.14	312.45	0.74	Sands - clean sands to silty sand	1.55	1.00	48
	33.30	335.25	0.61	Sands - clean sands to silty sand	1.47	1.00	49
	33.46	308.57	0.79	Sands - clean sands to silty sand	1.58	1.00	48
	33.63	269.95	0.73	Sands - clean sands to silty sand	1.60	1.00	42
	33.79	243.55	0.88	Sands - clean sands to silty sand	1.69	1.03	40
	33.96	247.29	0.85	Sands - clean sands to silty sand	1.68	1.02	40
	34.12	264.74	0.99	Sands - clean sands to silty sand	1.70	1.03	43
	34.28	279.80	1.03	Sands - clean sands to silty sand	1.70	1.03	46
	34.45	298.52	0.97	Sands - clean sands to silty sand	1.66	1.01	48
	34.61	312.84	0.94	Sands - clean sands to silty sand	1.63	1.00	49
	34.78	346.03	1.97	Sands - clean sands to silty sand	1.87	1.15	61
	34.94	370.37	1.35	Sands - clean sands to silty sand	1.71	1.04	60
	35.10	281.44	1.63	Sands - clean sands to silty sand	1.86	1.14	49
	35.27	242.51	1.60	Sands - clean sands to silty sand	1.90	1.18	43
	35.43	173.05	2.38	Sand mixtures - silty sand to sandy silt	2.14	1.52	34
	35.60	177.69	2.06	Sand mixtures - silty sand to sandy silt	2.08	1.41	34
	35.76	197.83	1.80	Sands - clean sands to silty sand	2.00	1.29	37
	35.93	194.13	1.15	Sands - clean sands to silty sand	1.86	1.15	34
	36.09	149.57	1.08	Sands - clean sands to silty sand	1.94	1.22	27
	36.25	132.41	0.74	Sands - clean sands to silty sand	1.87	1.16	23
	36.42	106.94	1.59	Sand mixtures - silty sand to sandy silt	2.17	1.60	21
	36.58	110.11	3.28	Silt mixtures - clayey silt to silty clay	2.40	2.29	24
	36.75	149.82	4.81	Very stiff, fine grained	2.43	2.45	33
	36.91	309.83	3.50	Very stiff sand to clayey sand	2.12	1.48	60
	37.07	353.44	2.74	Very stiff sand to clayey sand	1.99	1.28	64
	37.24	314.23	1.81	Sands - clean sands to silty sand	1.87	1.16	54
	37.40	327.28	1.21	Sands - clean sands to silty sand	1.71	1.04	52
	37.57	321.51	1.84	Sands - clean sands to silty sand	1.87	1.16	55

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-06

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	37.73	332.07	1.40	Sands - clean sands to silty sand	1.76	1.08	54
	37.89	296.16	1.89	Sands - clean sands to silty sand	1.90	1.19	51
	38.06	233.74	1.96	Sands - clean sands to silty sand	1.99	1.28	42
	38.22	192.86	2.13	Sand mixtures - silty sand to sandy silt	2.08	1.40	36
	38.39	194.31	2.38	Sand mixtures - silty sand to sandy silt	2.11	1.47	37
	38.55	157.10	3.10	Sand mixtures - silty sand to sandy silt	2.27	1.85	32
	38.71	131.47	3.82	Silt mixtures - clayey silt to silty clay	2.40	2.30	28
	38.88	118.47	3.62	Silt mixtures - clayey silt to silty clay	2.42	2.37	25
	39.04	107.51	4.40	Silt mixtures - clayey silt to silty clay	2.52	3.10	24
	39.21	112.99	4.51	Silt mixtures - clayey silt to silty clay	2.51	2.98	25
	39.37	113.81	4.64	Silt mixtures - clayey silt to silty clay	2.52	3.15	25
	39.53	107.55	5.08	Silt mixtures - clayey silt to silty clay	2.57	4.37	24
	39.70	118.87	5.34	Silt mixtures - clayey silt to silty clay	2.55	4.01	27
	39.86	147.14	5.03	Very stiff, fine grained	2.47	2.60	32
	40.03	202.89	5.00	Very stiff, fine grained	2.37	2.20	42
	40.19	200.12	5.19	Very stiff, fine grained	2.39	2.27	42
	40.35	161.33	5.84	Very stiff, fine grained	2.50	2.74	35
	40.52	162.19	5.78	Very stiff, fine grained	2.49	2.72	35
	40.68	197.38	5.18	Very stiff, fine grained	2.40	2.29	41
	40.85	205.86	5.66	Very stiff, fine grained	2.42	2.38	43
	41.01	185.16	5.74	Very stiff, fine grained	2.46	2.54	39
	41.17	174.10	4.48	Very stiff, fine grained	2.38	2.23	36
	41.34	154.07	4.58	Very stiff, fine grained	2.43	2.41	32
	41.50	151.89	4.59	Very stiff, fine grained	2.43	2.44	32
	41.67	155.74	4.96	Very stiff, fine grained	2.45	2.53	33
	41.83	158.58	5.37	Very stiff, fine grained	2.48	2.65	34
	41.99	158.72	5.55	Very stiff, fine grained	2.49	2.71	34
	42.16	152.34	5.29	Very stiff, fine grained	2.49	2.68	32
	42.32	139.55	5.55	Very stiff, fine grained	2.53	3.42	30
	42.49	128.03	5.46	Silt mixtures - clayey silt to silty clay	2.55	3.94	28
	42.65	117.03	6.10	Clays - silty clay to clay	2.62	6.11	26
	42.81	119.10	6.36	Clays - silty clay to clay	2.63	6.53	27
	42.98	171.75	4.88	Very stiff, fine grained	2.42	2.40	35
	43.14	173.20	5.20	Very stiff, fine grained	2.45	2.49	36
	43.31	180.81	4.92	Very stiff, fine grained	2.41	2.36	37
	43.47	177.93	4.91	Very stiff, fine grained	2.42	2.37	36
	43.64	163.22	4.88	Very stiff, fine grained	2.44	2.48	33
	43.80	155.03	4.84	Very stiff, fine grained	2.46	2.54	32
	43.96	156.22	4.88	Very stiff, fine grained	2.46	2.54	32
	44.13	168.33	4.90	Very stiff, fine grained	2.44	2.45	34
	44.29	181.08	5.29	Very stiff, fine grained	2.44	2.48	37
	44.46	171.20	6.01	Very stiff, fine grained	2.51	2.95	36
	44.62	166.71	6.78	Very stiff, fine grained	2.56	4.19	35
	44.78	214.02	6.23	Very stiff, fine grained	2.46	2.56	43
	44.95	238.67	6.61	Very stiff, fine grained	2.45	2.53	48
	45.11	246.24	6.88	Very stiff, fine grained	2.46	2.57	50
	45.28	231.85	6.65	Very stiff, fine grained	2.46	2.58	47

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-06

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	45.44	191.31	7.11	Very stiff, fine grained	2.54	3.72	40
	45.60	184.28	6.79	Very stiff, fine grained	2.54	3.57	38
	45.77	222.29	6.78	Very stiff, fine grained	2.48	2.68	45
	45.93	253.57	7.53	Very stiff, fine grained	2.49	2.71	51
	46.10	281.35	6.17	Very stiff, fine grained	2.39	2.25	55
	46.26	200.04	6.48	Very stiff, fine grained	2.50	2.74	40
	46.42	172.38	6.46	Very stiff, fine grained	2.54	3.64	35
	46.59	147.01	6.26	Very stiff, fine grained	2.58	4.61	31
	46.75	105.83	6.36	Clays - silty clay to clay	2.68	9.20	23
	46.92	76.83	8.56	Clays - silty clay to clay	2.88		19
	47.08	119.00	6.93	Clays - silty clay to clay	2.68	8.91	26
	47.24	146.79	6.91	Very stiff, fine grained	2.61	5.93	31
	47.41	206.41	6.04	Very stiff, fine grained	2.47	2.59	41
	47.57	230.61	6.29	Very stiff, fine grained	2.45	2.53	45
	47.74	233.20	5.94	Very stiff, fine grained	2.43	2.42	45
	47.90	228.72	5.76	Very stiff, fine grained	2.42	2.39	44
	48.06	213.18	5.78	Very stiff, fine grained	2.44	2.49	41
	48.23	196.43	5.78	Very stiff, fine grained	2.47	2.59	38
	48.39	186.36	5.92	Very stiff, fine grained	2.49	2.71	37
	48.56	180.08	6.47	Very stiff, fine grained	2.54	3.55	36
	48.72	176.41	6.66	Very stiff, fine grained	2.55	3.98	35
	48.88	184.98	6.40	Very stiff, fine grained	2.52	3.31	37
	49.05	192.98	6.53	Very stiff, fine grained	2.52	3.23	38
	49.21	193.40	0.62	Sands - clean sands to silty sand	1.73	1.05	28
	49.38	194.29	6.69	Very stiff, fine grained	2.53	3.41	38
	49.54	85.08	14.10	Clays - silty clay to clay	3.03		22
	49.70	185.48	6.26	Very stiff, fine grained	2.52	3.18	36

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 11/1/2006 13:13
PROJECT NO.: 17-1245A-4
CONE/RIG: DSG0705
ASSUMED DEPTH OF WATER TABLE: 25 feet
SOUNDING: CPT-07

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	8.96	2.30	Silt mixtures - clayey silt to silty clay	2.74		7
	0.33	48.11	1.90	Sand mixtures - silty sand to sandy silt	2.13	1.50	27
	0.49	159.92	1.58	Sands - clean sands to silty sand	1.73	1.05	69
	0.66	186.19	1.97	Sands - clean sands to silty sand	1.77	1.08	83
	0.82	143.31	2.30	Sands - clean sands to silty sand	1.89	1.17	69
	0.98	109.67	2.14	Sands - clean sands to silty sand	1.93	1.21	54
	1.15	84.21	2.27	Sand mixtures - silty sand to sandy silt	2.02	1.32	44
	1.31	71.54	1.56	Sands - clean sands to silty sand	1.95	1.23	36
	1.48	70.28	1.89	Sand mixtures - silty sand to sandy silt	2.01	1.31	37
	1.64	72.77	1.96	Sand mixtures - silty sand to sandy silt	2.02	1.31	38
	1.80	74.61	2.09	Sand mixtures - silty sand to sandy silt	2.03	1.33	39
	1.97	79.49	2.05	Sand mixtures - silty sand to sandy silt	2.00	1.30	41
	2.13	81.88	1.76	Sands - clean sands to silty sand	1.95	1.23	41
	2.30	79.57	1.68	Sands - clean sands to silty sand	1.94	1.22	40
	2.46	82.56	1.69	Sands - clean sands to silty sand	1.93	1.21	41
	2.62	83.06	1.89	Sands - clean sands to silty sand	1.97	1.25	42
	2.79	93.04	2.01	Sands - clean sands to silty sand	1.96	1.24	47
	2.95	104.14	2.13	Sands - clean sands to silty sand	1.94	1.23	52
	3.12	105.27	2.39	Sand mixtures - silty sand to sandy silt	1.98	1.27	54
	3.28	95.67	2.43	Sand mixtures - silty sand to sandy silt	2.01	1.31	50
	3.44	86.19	2.49	Sand mixtures - silty sand to sandy silt	2.05	1.36	46
	3.61	79.44	2.21	Sand mixtures - silty sand to sandy silt	2.03	1.34	42
	3.77	77.14	2.02	Sand mixtures - silty sand to sandy silt	2.01	1.30	40
	3.94	79.72	1.83	Sands - clean sands to silty sand	1.97	1.25	40
	4.10	70.76	1.66	Sands - clean sands to silty sand	1.97	1.26	36
	4.27	69.59	1.86	Sand mixtures - silty sand to sandy silt	2.01	1.31	36
	4.43	72.08	1.77	Sands - clean sands to silty sand	1.99	1.28	37
	4.59	73.61	1.87	Sands - clean sands to silty sand	2.00	1.29	38
	4.76	71.25	1.76	Sands - clean sands to silty sand	1.99	1.28	37
	4.92	67.94	2.13	Sand mixtures - silty sand to sandy silt	2.06	1.38	37
	5.09	67.02	2.43	Sand mixtures - silty sand to sandy silt	2.11	1.47	37
	5.25	75.07	2.18	Sand mixtures - silty sand to sandy silt	2.04	1.35	40
	5.41	72.90	1.88	Sands - clean sands to silty sand	2.00	1.30	38
	5.58	76.03	2.06	Sand mixtures - silty sand to sandy silt	2.02	1.32	40
	5.74	78.14	2.07	Sand mixtures - silty sand to sandy silt	2.01	1.31	41
	5.91	85.50	1.91	Sands - clean sands to silty sand	1.96	1.25	43
	6.07	80.25	1.76	Sands - clean sands to silty sand	1.96	1.24	40
	6.23	65.45	1.95	Sand mixtures - silty sand to sandy silt	2.05	1.36	35
	6.40	53.45	2.22	Sand mixtures - silty sand to sandy silt	2.15	1.54	30
	6.56	47.47	2.22	Sand mixtures - silty sand to sandy silt	2.19	1.62	28
	6.73	47.94	2.41	Sand mixtures - silty sand to sandy silt	2.21	1.68	28

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-07

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	53.95	2.15	Sand mixtures - silty sand to sandy silt	2.14	1.52	30
	7.05	53.68	2.13	Sand mixtures - silty sand to sandy silt	2.14	1.53	30
	7.22	46.30	1.80	Sand mixtures - silty sand to sandy silt	2.14	1.53	25
	7.38	41.16	2.22	Sand mixtures - silty sand to sandy silt	2.24	1.75	24
	7.55	38.58	2.21	Sand mixtures - silty sand to sandy silt	2.26	1.82	23
	7.71	35.54	2.31	Sand mixtures - silty sand to sandy silt	2.30	1.94	22
	7.87	35.33	1.86	Sand mixtures - silty sand to sandy silt	2.25	1.78	20
	8.04	35.70	2.09	Sand mixtures - silty sand to sandy silt	2.28	1.88	21
	8.20	36.14	2.11	Sand mixtures - silty sand to sandy silt	2.28	1.89	21
	8.37	38.05	2.33	Sand mixtures - silty sand to sandy silt	2.30	1.94	22
	8.53	37.99	2.51	Sand mixtures - silty sand to sandy silt	2.33	2.02	22
	8.69	35.98	3.01	Sand mixtures - silty sand to sandy silt	2.40	2.29	22
	8.86	33.96	3.81	Silt mixtures - clayey silt to silty clay	2.49	2.68	22
	9.02	33.71	4.58	Silt mixtures - clayey silt to silty clay	2.55	3.81	23
	9.19	33.41	5.20	Silt mixtures - clayey silt to silty clay	2.59	5.10	23
	9.35	31.65	5.70	Clays - silty clay to clay	2.64	6.89	23
	9.51	31.29	6.04	Clays - silty clay to clay	2.66	8.08	23
	9.68	31.86	6.09	Clays - silty clay to clay	2.66	8.16	23
	9.84	31.75	6.14	Clays - silty clay to clay	2.67	8.56	22
	10.01	35.57	5.63	Silt mixtures - clayey silt to silty clay	2.62	6.09	24
	10.17	32.57	6.44	Clays - silty clay to clay	2.69	9.45	23
	10.33	32.34	6.24	Clays - silty clay to clay	2.68	9.23	22
	10.50	32.60	6.68	Clays - silty clay to clay	2.71		22
	10.66	31.12	6.78	Clays - silty clay to clay	2.73		21
	10.83	31.09	6.95	Clays - silty clay to clay	2.74		21
	10.99	31.30	6.94	Clays - silty clay to clay	2.74		21
	11.15	32.48	7.01	Clays - silty clay to clay	2.74		22
	11.32	36.69	6.91	Clays - silty clay to clay	2.70		23
	11.48	40.36	6.96	Clays - silty clay to clay	2.68	9.18	25
	11.65	41.65	7.28	Clays - silty clay to clay	2.69	9.72	26
	11.81	45.99	6.70	Clays - silty clay to clay	2.64	7.11	27
	11.98	47.96	6.62	Very stiff, fine grained	2.63	6.59	27
	12.14	48.80	6.83	Very stiff, fine grained	2.64	6.96	28
	12.30	50.33	6.15	Clays - silty clay to clay	2.60	5.42	27
	12.47	46.39	6.08	Clays - silty clay to clay	2.62	6.22	25
	12.63	66.28	4.11	Silt mixtures - clayey silt to silty clay	2.40	2.30	30
	12.80	104.00	2.92	Sand mixtures - silty sand to sandy silt	2.17	1.59	39
	12.96	114.17	3.18	Sand mixtures - silty sand to sandy silt	2.18	1.60	43
	13.12	69.85	5.13	Very stiff, fine grained	2.47	2.59	32
	13.29	60.43	5.72	Very stiff, fine grained	2.55	3.79	30
	13.45	74.12	6.45	Very stiff, fine grained	2.53	3.52	36
	13.62	90.53	7.15	Very stiff, fine grained	2.52	3.24	43
	13.78	127.31	6.84	Very stiff, fine grained	2.43	2.42	55
	13.94	148.61	7.71	Very stiff, fine grained	2.44	2.46	64
	14.11	187.23	7.65	Very stiff, fine grained	2.39	2.26	77
	14.27	222.61	8.14	Very stiff, fine grained	2.38	2.22	90
	14.44	234.73	8.16	Very stiff, fine grained	2.37	2.19	94

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/7/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 50.2 feet
SOUNDING: CPT-08

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	213.9	0.54	Gravelly sand to dense sand	1.28	1.00	69
	0.33	371.8	0.96	Sands - clean sands to silty sand	1.36	1.00	126
	0.49	346.3	1.31	Sands - clean sands to silty sand	1.49	1.00	128
	0.66	276.5	1.66	Sands - clean sands to silty sand	1.62	1.00	112
	0.82	199.1	2.11	Very stiff sand to clayey sand	1.78	1.09	89
	0.98	138.8	2.12	Sands - clean sands to silty sand	1.87	1.16	66
	1.15	84.9	2.30	Sand mixtures - silty sand to sandy silt	2.03	1.33	45
	1.31	56.6	2.47	Sand mixtures - silty sand to sandy silt	2.16	1.57	33
	1.48	51.9	1.91	Sand mixtures - silty sand to sandy silt	2.11	1.46	29
	1.64	53.7	1.60	Sand mixtures - silty sand to sandy silt	2.04	1.35	29
	1.80	67.0	1.26	Sands - clean sands to silty sand	1.90	1.18	32
	1.97	75.6	1.15	Sands - clean sands to silty sand	1.84	1.13	35
	2.13	76.0	1.08	Sands - clean sands to silty sand	1.82	1.11	35
	2.30	68.5	1.02	Sands - clean sands to silty sand	1.83	1.13	32
	2.46	63.4	0.85	Sands - clean sands to silty sand	1.81	1.10	29
	2.62	61.0	0.78	Sands - clean sands to silty sand	1.80	1.10	28
	2.79	64.6	1.01	Sands - clean sands to silty sand	1.85	1.14	30
	2.95	74.5	1.20	Sands - clean sands to silty sand	1.85	1.14	35
	3.12	74.6	1.40	Sands - clean sands to silty sand	1.90	1.18	36
	3.28	67.6	1.62	Sands - clean sands to silty sand	1.98	1.26	34
	3.44	62.0	1.53	Sands - clean sands to silty sand	1.99	1.27	32
	3.61	56.1	1.31	Sands - clean sands to silty sand	1.97	1.26	28
	3.77	44.3	1.31	Sands - clean sands to silty sand	2.05	1.36	24
	3.94	36.5	1.26	Sand mixtures - silty sand to sandy silt	2.10	1.45	20
	4.10	39.5	1.18	Sands - clean sands to silty sand	2.06	1.38	21
	4.27	45.4	1.01	Sands - clean sands to silty sand	1.97	1.25	23
	4.43	47.4	0.82	Sands - clean sands to silty sand	1.90	1.18	23
	4.59	42.2	0.22	Sands - clean sands to silty sand	1.67	1.00	18
	4.76	33.7	0.08	Sands - clean sands to silty sand	1.68	1.00	14
	4.92	26.8	0.20	Sands - clean sands to silty sand	1.84	1.00	13
	5.09	24.7	0.54	Sands - clean sands to silty sand	2.05	1.36	13
	5.25	31.1	0.20	Sands - clean sands to silty sand	1.78	1.00	14
	5.41	45.5	0.19	Sands - clean sands to silty sand	1.65	1.00	17
	5.58	36.4	0.12	Sands - clean sands to silty sand	1.69	1.00	14
	5.74	26.1	0.14	Sands - clean sands to silty sand	1.83	1.00	12
	5.91	20.5	0.29	Sands - clean sands to silty sand	2.01	1.00	11
	6.07	17.7	0.37	Sand mixtures - silty sand to sandy silt	2.11	1.00	10
	6.23	18.3	0.39	Sand mixtures - silty sand to sandy silt	2.11	1.00	10
	6.40	23.1	0.39	Sands - clean sands to silty sand	2.02	1.00	12
	6.56	24.6	0.34	Sands - clean sands to silty sand	1.98	1.00	12
	6.73	21.4	0.25	Sands - clean sands to silty sand	1.99	1.00	10

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-08

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	17.7	0.25	Sand mixtures - silty sand to sandy silt	2.07	1.00	9
	7.05	16.9	0.34	Sand mixtures - silty sand to sandy silt	2.13	1.00	9
	7.22	20.1	0.43	Sand mixtures - silty sand to sandy silt	2.11	1.00	11
	7.38	15.6	1.07	Sand mixtures - silty sand to sandy silt	2.38	2.20	10
	7.55	25.0	1.07	Sand mixtures - silty sand to sandy silt	2.22	1.69	14
	7.71	27.4	1.09	Sand mixtures - silty sand to sandy silt	2.19	1.64	15
	7.87	27.8	1.18	Sand mixtures - silty sand to sandy silt	2.21	1.69	15
	8.04	28.1	1.10	Sand mixtures - silty sand to sandy silt	2.20	1.65	15
	8.20	31.1	0.92	Sand mixtures - silty sand to sandy silt	2.13	1.50	15
	8.37	30.5	0.95	Sand mixtures - silty sand to sandy silt	2.15	1.54	15
	8.53	31.6	0.98	Sand mixtures - silty sand to sandy silt	2.15	1.54	15
	8.69	33.9	1.11	Sand mixtures - silty sand to sandy silt	2.16	1.56	16
	8.86	33.8	1.13	Sand mixtures - silty sand to sandy silt	2.16	1.57	16
	9.02	33.8	1.03	Sand mixtures - silty sand to sandy silt	2.15	1.54	16
	9.19	33.5	0.85	Sand mixtures - silty sand to sandy silt	2.11	1.47	15
	9.35	31.6	0.79	Sand mixtures - silty sand to sandy silt	2.12	1.49	14
	9.51	32.8	0.81	Sand mixtures - silty sand to sandy silt	2.12	1.48	14
	9.68	35.7	0.84	Sand mixtures - silty sand to sandy silt	2.10	1.45	15
	9.84	36.4	0.90	Sand mixtures - silty sand to sandy silt	2.11	1.47	16
	10.01	36.6	0.91	Sand mixtures - silty sand to sandy silt	2.12	1.48	16
	10.17	37.2	0.89	Sand mixtures - silty sand to sandy silt	2.11	1.46	16
	10.33	40.2	0.89	Sand mixtures - silty sand to sandy silt	2.09	1.42	16
	10.50	42.0	0.77	Sands - clean sands to silty sand	2.04	1.35	16
	10.66	43.1	0.68	Sands - clean sands to silty sand	2.01	1.31	16
	10.83	42.8	0.64	Sands - clean sands to silty sand	2.01	1.30	16
	10.99	39.7	0.79	Sands - clean sands to silty sand	2.08	1.41	15
	11.15	43.4	0.65	Sands - clean sands to silty sand	2.01	1.30	16
	11.32	44.4	0.44	Sands - clean sands to silty sand	1.93	1.00	15
	11.48	33.8	0.49	Sands - clean sands to silty sand	2.05	1.37	12
	11.65	29.0	0.63	Sand mixtures - silty sand to sandy silt	2.16	1.56	12
	11.81	28.4	0.93	Sand mixtures - silty sand to sandy silt	2.25	1.79	12
	11.98	35.5	0.74	Sand mixtures - silty sand to sandy silt	2.13	1.49	13
	12.14	40.8	0.71	Sands - clean sands to silty sand	2.07	1.40	15
	12.30	49.1	0.41	Sands - clean sands to silty sand	1.90	1.00	15
	12.47	43.6	0.72	Sands - clean sands to silty sand	2.06	1.37	15
	12.63	41.7	0.68	Sands - clean sands to silty sand	2.06	1.38	14
	12.80	36.0	1.03	Sand mixtures - silty sand to sandy silt	2.21	1.69	14
	12.96	36.6	0.91	Sand mixtures - silty sand to sandy silt	2.18	1.61	14
	13.12	37.9	0.90	Sand mixtures - silty sand to sandy silt	2.17	1.59	14
	13.29	36.5	0.83	Sand mixtures - silty sand to sandy silt	2.17	1.58	13
	13.45	34.9	0.88	Sand mixtures - silty sand to sandy silt	2.20	1.66	13
	13.62	34.3	0.90	Sand mixtures - silty sand to sandy silt	2.21	1.69	13
	13.78	36.5	0.80	Sand mixtures - silty sand to sandy silt	2.17	1.59	13
	13.94	36.5	0.96	Sand mixtures - silty sand to sandy silt	2.21	1.69	13
	14.11	34.9	0.87	Sand mixtures - silty sand to sandy silt	2.21	1.68	13
	14.27	35.7	0.84	Sand mixtures - silty sand to sandy silt	2.20	1.65	13
	14.44	42.8	0.83	Sand mixtures - silty sand to sandy silt	2.13	1.50	14

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-08

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	53.3	0.65	Sands - clean sands to silty sand	2.00	1.29	16
	14.76	56.0	0.57	Sands - clean sands to silty sand	1.95	1.24	16
	14.93	62.5	0.59	Sands - clean sands to silty sand	1.93	1.21	18
	15.09	61.9	0.80	Sands - clean sands to silty sand	2.00	1.29	18
	15.26	63.1	0.94	Sands - clean sands to silty sand	2.04	1.34	19
	15.42	73.6	0.83	Sands - clean sands to silty sand	1.95	1.23	21
	15.58	87.6	0.61	Sands - clean sands to silty sand	1.82	1.12	22
	15.75	106.3	0.46	Sands - clean sands to silty sand	1.69	1.00	24
	15.91	99.4	0.48	Sands - clean sands to silty sand	1.72	1.00	23
	16.08	71.7	0.52	Sands - clean sands to silty sand	1.86	1.15	18
	16.24	57.0	0.61	Sands - clean sands to silty sand	1.98	1.27	16
	16.40	40.6	1.05	Sand mixtures - silty sand to sandy silt	2.24	1.76	13
	16.57	32.2	1.57	Sand mixtures - silty sand to sandy silt	2.43	2.40	12
	16.73	29.4	1.74	Sand mixtures - silty sand to sandy silt	2.49	2.70	11
	16.90	27.8	1.68	Sand mixtures - silty sand to sandy silt	2.50	2.84	11
	17.06	27.4	1.78	Sand mixtures - silty sand to sandy silt	2.53	3.34	11
	17.22	28.7	1.68	Sand mixtures - silty sand to sandy silt	2.50	2.74	11
	17.39	31.6	1.69	Sand mixtures - silty sand to sandy silt	2.47	2.59	12
	17.55	38.6	2.41	Silt mixtures - clayey silt to silty clay	2.49	2.71	14
	17.72	35.5	2.80	Silt mixtures - clayey silt to silty clay	2.57	4.35	14
	17.88	36.1	2.66	Silt mixtures - clayey silt to silty clay	2.55	3.90	14
	18.04	48.9	1.49	Sand mixtures - silty sand to sandy silt	2.29	1.89	16
	18.21	70.1	0.61	Sands - clean sands to silty sand	1.94	1.22	18
	18.37	67.4	0.55	Sands - clean sands to silty sand	1.93	1.21	17
	18.54	59.2	0.74	Sands - clean sands to silty sand	2.05	1.36	16
	18.70	53.0	1.02	Sand mixtures - silty sand to sandy silt	2.17	1.58	15
	18.86	47.9	1.64	Sand mixtures - silty sand to sandy silt	2.33	2.04	15
	19.03	56.2	2.32	Sand mixtures - silty sand to sandy silt	2.38	2.21	18
	19.19	45.8	2.38	Sand mixtures - silty sand to sandy silt	2.46	2.55	15
	19.36	63.1	1.36	Sand mixtures - silty sand to sandy silt	2.19	1.64	18
	19.52	58.1	0.75	Sands - clean sands to silty sand	2.07	1.40	15
	19.69	63.4	0.91	Sand mixtures - silty sand to sandy silt	2.09	1.43	17
	19.85	93.4	0.67	Sands - clean sands to silty sand	1.87	1.16	21
	20.01	108.8	0.74	Sands - clean sands to silty sand	1.84	1.13	24
	20.18	128.0	0.81	Sands - clean sands to silty sand	1.81	1.11	28
	20.34	138.6	0.84	Sands - clean sands to silty sand	1.79	1.10	30
	20.51	137.2	1.04	Sands - clean sands to silty sand	1.86	1.15	30
	20.67	116.0	0.92	Sands - clean sands to silty sand	1.89	1.17	26
	20.83	84.7	1.05	Sands - clean sands to silty sand	2.04	1.34	21
	21.00	69.3	1.02	Sand mixtures - silty sand to sandy silt	2.10	1.45	17
	21.16	54.1	1.24	Sand mixtures - silty sand to sandy silt	2.25	1.78	15
	21.33	41.4	1.59	Sand mixtures - silty sand to sandy silt	2.41	2.36	12
	21.49	41.0	1.74	Sand mixtures - silty sand to sandy silt	2.44	2.49	12
	21.65	40.1	1.79	Sand mixtures - silty sand to sandy silt	2.46	2.57	12
	21.82	39.6	1.86	Sand mixtures - silty sand to sandy silt	2.48	2.66	12
	21.98	44.0	1.75	Sand mixtures - silty sand to sandy silt	2.43	2.41	13
	22.15	50.5	1.46	Sand mixtures - silty sand to sandy silt	2.33	2.03	14

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-08

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	43.2	1.56	Sand mixtures - silty sand to sandy silt	2.41	2.33	12
	22.47	44.8	1.64	Sand mixtures - silty sand to sandy silt	2.41	2.34	13
	22.64	45.9	1.62	Sand mixtures - silty sand to sandy silt	2.40	2.30	13
	22.80	44.9	1.52	Sand mixtures - silty sand to sandy silt	2.39	2.27	13
	22.97	51.4	1.32	Sand mixtures - silty sand to sandy silt	2.31	1.96	14
	23.13	60.9	1.16	Sand mixtures - silty sand to sandy silt	2.21	1.68	15
	23.29	66.7	1.07	Sand mixtures - silty sand to sandy silt	2.16	1.56	16
	23.46	69.0	1.02	Sand mixtures - silty sand to sandy silt	2.13	1.51	16
	23.62	72.1	1.26	Sand mixtures - silty sand to sandy silt	2.18	1.60	17
	23.79	80.5	1.33	Sand mixtures - silty sand to sandy silt	2.15	1.55	19
	23.95	87.7	1.41	Sand mixtures - silty sand to sandy silt	2.14	1.53	21
	24.11	88.6	1.19	Sand mixtures - silty sand to sandy silt	2.09	1.43	20
	24.28	97.0	1.15	Sands - clean sands to silty sand	2.05	1.36	21
	24.44	103.8	1.14	Sands - clean sands to silty sand	2.03	1.33	22
	24.61	99.1	1.15	Sands - clean sands to silty sand	2.05	1.36	22
	24.77	96.7	1.13	Sands - clean sands to silty sand	2.05	1.36	21
	24.93	96.8	1.17	Sand mixtures - silty sand to sandy silt	2.06	1.38	21
	25.10	98.8	1.13	Sands - clean sands to silty sand	2.05	1.36	21
	25.26	97.9	1.16	Sands - clean sands to silty sand	2.06	1.38	21
	25.43	102.1	1.13	Sands - clean sands to silty sand	2.04	1.34	22
	25.59	105.7	1.21	Sands - clean sands to silty sand	2.05	1.36	22
	25.75	122.9	1.13	Sands - clean sands to silty sand	1.98	1.26	25
	25.92	131.6	1.14	Sands - clean sands to silty sand	1.96	1.24	26
	26.08	123.6	1.19	Sands - clean sands to silty sand	1.99	1.28	25
	26.25	115.4	1.27	Sands - clean sands to silty sand	2.04	1.34	24
	26.41	129.7	1.28	Sands - clean sands to silty sand	2.00	1.29	26
	26.57	145.6	1.19	Sands - clean sands to silty sand	1.94	1.22	28
	26.74	168.3	1.38	Sands - clean sands to silty sand	1.94	1.22	33
	26.90	186.5	1.00	Sands - clean sands to silty sand	1.81	1.10	34
	27.07	174.8	0.90	Sands - clean sands to silty sand	1.80	1.10	31
	27.23	188.2	0.58	Sands - clean sands to silty sand	1.64	0.99	31
	27.40	177.9	0.58	Sands - clean sands to silty sand	1.67	1.01	30
	27.56	144.6	0.57	Sands - clean sands to silty sand	1.74	1.06	25
	27.72	100.3	0.81	Sands - clean sands to silty sand	1.98	1.26	19
	27.89	80.0	1.01	Sand mixtures - silty sand to sandy silt	2.13	1.49	17
	28.05	76.0	1.15	Sand mixtures - silty sand to sandy silt	2.18	1.61	16
	28.22	77.4	1.10	Sand mixtures - silty sand to sandy silt	2.17	1.58	16
	28.38	87.5	0.87	Sands - clean sands to silty sand	2.06	1.38	17
	28.54	92.7	0.79	Sands - clean sands to silty sand	2.01	1.30	18
	28.71	84.0	1.13	Sand mixtures - silty sand to sandy silt	2.15	1.53	17
	28.87	83.8	1.37	Sand mixtures - silty sand to sandy silt	2.20	1.67	18
	29.04	91.0	1.34	Sand mixtures - silty sand to sandy silt	2.17	1.58	19
	29.20	102.1	1.21	Sand mixtures - silty sand to sandy silt	2.10	1.44	20
	29.36	99.4	1.26	Sand mixtures - silty sand to sandy silt	2.12	1.48	20
	29.53	98.6	1.32	Sand mixtures - silty sand to sandy silt	2.14	1.52	20
	29.69	108.4	1.34	Sand mixtures - silty sand to sandy silt	2.11	1.46	21
	29.86	109.5	1.45	Sand mixtures - silty sand to sandy silt	2.13	1.50	22

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-08

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	98.0	1.50	Sand mixtures - silty sand to sandy silt	2.18	1.62	20
	30.18	85.8	1.55	Sand mixtures - silty sand to sandy silt	2.24	1.77	18
	30.35	80.0	1.77	Sand mixtures - silty sand to sandy silt	2.31	1.97	17
	30.51	79.6	1.62	Sand mixtures - silty sand to sandy silt	2.29	1.90	17
	30.68	76.1	1.45	Sand mixtures - silty sand to sandy silt	2.27	1.86	16
	30.84	63.5	1.18	Sand mixtures - silty sand to sandy silt	2.29	1.91	13
	31.00	68.3	1.01	Sand mixtures - silty sand to sandy silt	2.22	1.71	14
	31.17	60.0	1.26	Sand mixtures - silty sand to sandy silt	2.34	2.06	13
	31.33	67.6	1.48	Sand mixtures - silty sand to sandy silt	2.33	2.05	14
	31.50	98.1	1.25	Sand mixtures - silty sand to sandy silt	2.14	1.53	19
	31.66	134.0	1.17	Sands - clean sands to silty sand	2.01	1.31	24
	31.82	157.5	0.98	Sands - clean sands to silty sand	1.90	1.18	27
	31.99	178.0	0.81	Sands - clean sands to silty sand	1.80	1.10	29
	32.15	167.1	0.78	Sands - clean sands to silty sand	1.81	1.11	27
	32.32	147.3	0.80	Sands - clean sands to silty sand	1.87	1.15	24
	32.48	143.8	0.81	Sands - clean sands to silty sand	1.88	1.17	24
	32.64	155.6	0.84	Sands - clean sands to silty sand	1.87	1.15	25
	32.81	170.0	0.88	Sands - clean sands to silty sand	1.85	1.14	27
	32.97	189.0	0.87	Sands - clean sands to silty sand	1.81	1.11	30
	33.14	197.6	0.85	Sands - clean sands to silty sand	1.78	1.09	31
	33.30	190.8	0.85	Sands - clean sands to silty sand	1.80	1.10	30
	33.46	165.7	0.92	Sands - clean sands to silty sand	1.88	1.16	27
	33.63	154.3	0.97	Sands - clean sands to silty sand	1.92	1.20	25
	33.79	184.3	0.97	Sands - clean sands to silty sand	1.86	1.14	29
	33.96	208.3	1.11	Sands - clean sands to silty sand	1.85	1.14	33
	34.12	235.9	0.99	Sands - clean sands to silty sand	1.77	1.08	36
	34.28	263.6	0.85	Sands - clean sands to silty sand	1.69	1.03	39
	34.45	268.1	0.81	Sands - clean sands to silty sand	1.67	1.01	39
	34.61	241.7	0.74	Sands - clean sands to silty sand	1.68	1.02	35
	34.78	207.6	0.74	Sands - clean sands to silty sand	1.74	1.06	31
	34.94	169.9	0.83	Sands - clean sands to silty sand	1.85	1.14	26
	35.10	146.0	0.97	Sands - clean sands to silty sand	1.95	1.23	23
	35.27	135.6	1.07	Sands - clean sands to silty sand	2.01	1.31	22
	35.43	168.9	1.01	Sands - clean sands to silty sand	1.91	1.19	27
	35.60	215.7	0.89	Sands - clean sands to silty sand	1.78	1.09	32
	35.76	224.7	0.88	Sands - clean sands to silty sand	1.77	1.08	33
	35.93	234.2	0.92	Sands - clean sands to silty sand	1.77	1.08	34
	36.09	237.7	1.00	Sands - clean sands to silty sand	1.79	1.09	35
	36.25	235.4	1.06	Sands - clean sands to silty sand	1.81	1.11	35
	36.42	255.4	0.88	Sands - clean sands to silty sand	1.73	1.05	37
	36.58	286.3	0.83	Sands - clean sands to silty sand	1.67	1.01	40
	36.75	270.1	0.93	Sands - clean sands to silty sand	1.73	1.05	38
	36.91	216.2	1.03	Sands - clean sands to silty sand	1.84	1.13	32
	37.07	162.1	0.87	Sands - clean sands to silty sand	1.89	1.18	24
	37.24	120.6	0.85	Sands - clean sands to silty sand	2.01	1.30	19
	37.40	93.6	0.97	Sand mixtures - silty sand to sandy silt	2.15	1.54	15
	37.57	84.4	1.14	Sand mixtures - silty sand to sandy silt	2.24	1.75	14

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-08

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	37.73	83.5	1.26	Sand mixtures - silty sand to sandy silt	2.27	1.85	14
	37.89	84.2	1.19	Sand mixtures - silty sand to sandy silt	2.25	1.79	14
	38.06	87.9	1.02	Sand mixtures - silty sand to sandy silt	2.19	1.64	15
	38.22	94.2	0.92	Sand mixtures - silty sand to sandy silt	2.14	1.52	15
	38.39	113.5	0.77	Sands - clean sands to silty sand	2.01	1.31	17
	38.55	131.2	0.57	Sands - clean sands to silty sand	1.88	1.16	19
	38.71	128.7	0.61	Sands - clean sands to silty sand	1.90	1.19	19
	38.88	126.8	0.63	Sands - clean sands to silty sand	1.92	1.20	19
	39.04	112.3	0.60	Sands - clean sands to silty sand	1.96	1.25	17
	39.21	96.4	0.65	Sands - clean sands to silty sand	2.05	1.36	15
	39.37	85.1	0.55	Sands - clean sands to silty sand	2.06	1.39	13
	39.53	77.6	0.61	Sand mixtures - silty sand to sandy silt	2.13	1.51	12
	39.70	77.1	0.69	Sand mixtures - silty sand to sandy silt	2.16	1.58	12
	39.86	85.2	0.73	Sand mixtures - silty sand to sandy silt	2.13	1.51	13
	40.03	80.8	0.71	Sand mixtures - silty sand to sandy silt	2.15	1.55	13
	40.19	72.7	0.79	Sand mixtures - silty sand to sandy silt	2.23	1.73	12
	40.35	67.8	0.84	Sand mixtures - silty sand to sandy silt	2.28	1.86	11
	40.52	69.5	0.85	Sand mixtures - silty sand to sandy silt	2.27	1.85	11
	40.68	89.4	0.92	Sand mixtures - silty sand to sandy silt	2.18	1.62	14
	40.85	141.0	0.72	Sands - clean sands to silty sand	1.93	1.21	20
	41.01	232.1	0.60	Sands - clean sands to silty sand	1.67	1.01	30
	41.17	249.3	0.61	Sands - clean sands to silty sand	1.65	1.00	32
	41.34	244.5	0.69	Sands - clean sands to silty sand	1.70	1.03	32
	41.50	224.1	0.80	Sands - clean sands to silty sand	1.78	1.08	30
	41.67	218.0	0.80	Sands - clean sands to silty sand	1.79	1.09	29
	41.83	236.9	0.76	Sands - clean sands to silty sand	1.74	1.06	31
	41.99	253.7	0.84	Sands - clean sands to silty sand	1.75	1.07	33
	42.16	261.0	1.02	Sands - clean sands to silty sand	1.80	1.10	35
	42.32	268.8	0.98	Sands - clean sands to silty sand	1.78	1.09	35
	42.49	266.9	0.96	Sands - clean sands to silty sand	1.78	1.08	35
	42.65	274.2	0.85	Sands - clean sands to silty sand	1.73	1.05	35
	42.81	295.9	0.94	Sands - clean sands to silty sand	1.74	1.06	38
	42.98	317.5	0.81	Sands - clean sands to silty sand	1.66	1.01	40
	43.14	329.4	0.90	Sands - clean sands to silty sand	1.68	1.02	41
	43.31	336.3	1.33	Sands - clean sands to silty sand	1.81	1.11	44
	43.47	344.5	1.35	Sands - clean sands to silty sand	1.81	1.11	45
	43.64	347.4	1.37	Sands - clean sands to silty sand	1.82	1.11	45
	43.80	361.7	1.25	Sands - clean sands to silty sand	1.77	1.08	46
	43.96	353.9	1.23	Sands - clean sands to silty sand	1.77	1.08	45
	44.13	351.5	1.26	Sands - clean sands to silty sand	1.79	1.09	45
	44.29	345.4	0.94	Sands - clean sands to silty sand	1.69	1.03	43
	44.46	288.5	0.88	Sands - clean sands to silty sand	1.73	1.05	36
	44.62	291.9	0.78	Sands - clean sands to silty sand	1.69	1.03	36
	44.78	278.2	0.77	Sands - clean sands to silty sand	1.70	1.04	34
	44.95	250.0	0.87	Sands - clean sands to silty sand	1.79	1.09	31
	45.11	262.7	0.75	Sands - clean sands to silty sand	1.72	1.05	32
	45.28	261.5	0.76	Sands - clean sands to silty sand	1.73	1.05	32

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-08

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	45.44	246.9	0.75	Sands - clean sands to silty sand	1.74	1.06	30
	45.60	241.1	0.78	Sands - clean sands to silty sand	1.77	1.08	30
	45.77	231.2	0.88	Sands - clean sands to silty sand	1.82	1.12	29
	45.93	235.4	0.88	Sands - clean sands to silty sand	1.82	1.11	29
	46.10	266.8	1.01	Sands - clean sands to silty sand	1.82	1.11	33
	46.26	300.9	0.95	Sands - clean sands to silty sand	1.75	1.07	37
	46.42	298.8	0.88	Sands - clean sands to silty sand	1.73	1.05	36
	46.59	284.4	1.32	Sands - clean sands to silty sand	1.89	1.17	36
	46.75	304.4	1.05	Sands - clean sands to silty sand	1.79	1.09	37
	46.92	316.3	1.09	Sands - clean sands to silty sand	1.79	1.09	38
	47.08	320.2	1.01	Sands - clean sands to silty sand	1.76	1.07	38
	47.24	288.1	0.77	Sands - clean sands to silty sand	1.71	1.04	34
	47.41	236.6	0.68	Sands - clean sands to silty sand	1.75	1.06	28
	47.57	191.4	0.69	Sands - clean sands to silty sand	1.84	1.13	23
	47.74	156.3	0.84	Sands - clean sands to silty sand	1.98	1.27	20
	47.90	162.7	0.76	Sands - clean sands to silty sand	1.94	1.22	20
	48.06	206.9	0.73	Sands - clean sands to silty sand	1.83	1.12	25
	48.23	270.8	0.53	Sands - clean sands to silty sand	1.62	1.00	31
	48.39	254.8	0.53	Sands - clean sands to silty sand	1.65	1.00	29
	48.56	222.4	0.60	Sands - clean sands to silty sand	1.74	1.06	26
	48.72	228.1	0.62	Sands - clean sands to silty sand	1.74	1.06	27
	48.88	263.8	0.69	Sands - clean sands to silty sand	1.72	1.04	30
	49.05	298.7	0.69	Sands - clean sands to silty sand	1.67	1.01	34
	49.21	312.8	0.58	Sands - clean sands to silty sand	1.60	1.00	35
	49.38	316.3	0.54	Sands - clean sands to silty sand	1.57	1.00	35
	49.54	308.9	0.66	Sands - clean sands to silty sand	1.65	1.00	35
	49.70	299.6	0.81	Sands - clean sands to silty sand	1.72	1.05	34
	49.87	292.9	0.62	Sands - clean sands to silty sand	1.65	1.00	33
	50.03	256.5	0.76	Sands - clean sands to silty sand	1.76	1.08	29
	50.20	279.65	0.78	Sands - clean sands to silty sand	1.74	1.06	32

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/7/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 31 feet
SOUNDING: CPT-09

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	115.6	0.39	Sands - clean sands to silty sand	1.39	1.00	40
	0.33	101.6	0.47	Sands - clean sands to silty sand	1.48	1.00	37
	0.49	87.3	0.54	Sands - clean sands to silty sand	1.57	1.00	34
	0.66	65.2	0.59	Sands - clean sands to silty sand	1.70	1.03	28
	0.82	52.3	0.55	Sands - clean sands to silty sand	1.76	1.07	23
	0.98	49.7	0.45	Sands - clean sands to silty sand	1.73	1.00	22
	1.15	59.4	0.19	Sands - clean sands to silty sand	1.51	1.00	22
	1.31	73.1	0.29	Sands - clean sands to silty sand	1.50	1.00	27
	1.48	82.3	0.54	Sands - clean sands to silty sand	1.60	1.00	33
	1.64	95.3	0.74	Sands - clean sands to silty sand	1.63	1.00	39
	1.80	107.8	0.95	Sands - clean sands to silty sand	1.67	1.01	45
	1.97	117.9	1.20	Sands - clean sands to silty sand	1.72	1.04	51
	2.13	115.8	1.40	Sands - clean sands to silty sand	1.77	1.08	52
	2.30	106.2	1.39	Sands - clean sands to silty sand	1.80	1.10	48
	2.46	85.2	1.39	Sands - clean sands to silty sand	1.86	1.15	40
	2.62	77.1	1.29	Sands - clean sands to silty sand	1.87	1.15	37
	2.79	74.7	1.05	Sands - clean sands to silty sand	1.81	1.11	34
	2.95	70.5	0.90	Sands - clean sands to silty sand	1.79	1.09	32
	3.12	72.6	0.95	Sands - clean sands to silty sand	1.79	1.10	33
	3.28	73.7	0.97	Sands - clean sands to silty sand	1.79	1.10	33
	3.44	60.5	0.76	Sands - clean sands to silty sand	1.79	1.09	27
	3.61	59.5	0.85	Sands - clean sands to silty sand	1.83	1.12	28
	3.77	53.2	1.01	Sands - clean sands to silty sand	1.91	1.20	26
	3.94	49.1	1.21	Sands - clean sands to silty sand	1.99	1.28	25
	4.10	48.5	0.90	Sands - clean sands to silty sand	1.91	1.19	24
	4.27	46.6	1.27	Sands - clean sands to silty sand	2.02	1.32	24
	4.43	49.8	1.03	Sands - clean sands to silty sand	1.94	1.22	25
	4.59	46.3	1.09	Sands - clean sands to silty sand	1.98	1.27	24
	4.76	46.1	1.19	Sands - clean sands to silty sand	2.01	1.30	24
	4.92	42.3	1.51	Sand mixtures - silty sand to sandy silt	2.11	1.46	23
	5.09	39.4	1.77	Sand mixtures - silty sand to sandy silt	2.18	1.60	23
	5.25	34.8	1.42	Sand mixtures - silty sand to sandy silt	2.15	1.55	20
	5.41	36.1	1.47	Sand mixtures - silty sand to sandy silt	2.15	1.54	21
	5.58	39.3	1.65	Sand mixtures - silty sand to sandy silt	2.16	1.55	22
	5.74	40.9	1.92	Sand mixtures - silty sand to sandy silt	2.19	1.62	24
	5.91	44.6	1.84	Sand mixtures - silty sand to sandy silt	2.15	1.53	25
	6.07	46.6	1.65	Sand mixtures - silty sand to sandy silt	2.10	1.45	26
	6.23	49.4	1.53	Sand mixtures - silty sand to sandy silt	2.06	1.38	27
	6.40	54.1	1.41	Sands - clean sands to silty sand	2.01	1.31	28
	6.56	58.9	1.24	Sands - clean sands to silty sand	1.96	1.24	28
	6.73	55.3	1.10	Sands - clean sands to silty sand	1.95	1.23	26

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-09

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	52.2	1.17	Sands - clean sands to silty sand	1.99	1.28	25
	7.05	50.4	1.28	Sands - clean sands to silty sand	2.03	1.33	25
	7.22	46.6	1.55	Sand mixtures - silty sand to sandy silt	2.10	1.45	24
	7.38	44.4	1.58	Sand mixtures - silty sand to sandy silt	2.12	1.49	23
	7.55	41.0	1.77	Sand mixtures - silty sand to sandy silt	2.18	1.62	22
	7.71	45.2	1.62	Sand mixtures - silty sand to sandy silt	2.13	1.51	23
	7.87	55.3	1.53	Sand mixtures - silty sand to sandy silt	2.07	1.39	26
	8.04	66.5	1.47	Sands - clean sands to silty sand	2.00	1.30	29
	8.20	61.3	1.69	Sand mixtures - silty sand to sandy silt	2.07	1.39	28
	8.37	69.4	1.58	Sands - clean sands to silty sand	2.02	1.32	30
	8.53	69.0	1.82	Sand mixtures - silty sand to sandy silt	2.06	1.39	31
	8.69	68.4	2.12	Sand mixtures - silty sand to sandy silt	2.11	1.47	32
	8.86	68.0	2.13	Sand mixtures - silty sand to sandy silt	2.12	1.49	31
	9.02	72.2	2.06	Sand mixtures - silty sand to sandy silt	2.10	1.44	32
	9.19	71.3	2.10	Sand mixtures - silty sand to sandy silt	2.11	1.46	32
	9.35	69.6	2.03	Sand mixtures - silty sand to sandy silt	2.11	1.47	31
	9.51	72.3	2.28	Sand mixtures - silty sand to sandy silt	2.14	1.52	32
	9.68	78.4	1.92	Sand mixtures - silty sand to sandy silt	2.07	1.39	33
	9.84	77.3	1.77	Sand mixtures - silty sand to sandy silt	2.05	1.36	31
	10.01	86.7	1.51	Sands - clean sands to silty sand	1.97	1.26	32
	10.17	91.5	1.16	Sands - clean sands to silty sand	1.89	1.17	31
	10.33	83.2	1.06	Sands - clean sands to silty sand	1.89	1.18	29
	10.50	74.3	1.26	Sands - clean sands to silty sand	1.98	1.27	27
	10.66	74.5	1.95	Sand mixtures - silty sand to sandy silt	2.10	1.45	30
	10.83	89.1	2.38	Sand mixtures - silty sand to sandy silt	2.12	1.48	36
	10.99	89.3	3.25	Sand mixtures - silty sand to sandy silt	2.22	1.70	39
	11.15	100.4	2.38	Sand mixtures - silty sand to sandy silt	2.09	1.43	39
	11.32	93.3	2.35	Sand mixtures - silty sand to sandy silt	2.11	1.46	36
	11.48	86.4	2.25	Sand mixtures - silty sand to sandy silt	2.12	1.48	34
	11.65	82.9	1.92	Sand mixtures - silty sand to sandy silt	2.09	1.42	31
	11.81	79.8	1.33	Sands - clean sands to silty sand	1.99	1.28	27
	11.98	77.0	1.41	Sands - clean sands to silty sand	2.03	1.33	27
	12.14	78.9	1.91	Sand mixtures - silty sand to sandy silt	2.11	1.46	29
	12.30	84.5	2.30	Sand mixtures - silty sand to sandy silt	2.15	1.54	32
	12.47	86.8	2.48	Sand mixtures - silty sand to sandy silt	2.16	1.57	33
	12.63	81.6	2.42	Sand mixtures - silty sand to sandy silt	2.18	1.60	31
	12.80	70.1	2.41	Sand mixtures - silty sand to sandy silt	2.22	1.71	27
	12.96	62.4	2.59	Sand mixtures - silty sand to sandy silt	2.28	1.88	25
	13.12	54.3	2.75	Sand mixtures - silty sand to sandy silt	2.34	2.09	23
	13.29	47.8	2.76	Sand mixtures - silty sand to sandy silt	2.39	2.25	21
	13.45	44.1	2.50	Sand mixtures - silty sand to sandy silt	2.39	2.24	19
	13.62	45.3	1.90	Sand mixtures - silty sand to sandy silt	2.30	1.95	18
	13.78	47.5	1.54	Sand mixtures - silty sand to sandy silt	2.23	1.74	18
	13.94	49.1	1.24	Sand mixtures - silty sand to sandy silt	2.17	1.59	17
	14.11	48.4	1.18	Sand mixtures - silty sand to sandy silt	2.17	1.58	17
	14.27	44.3	1.39	Sand mixtures - silty sand to sandy silt	2.24	1.76	16
	14.44	41.4	1.56	Sand mixtures - silty sand to sandy silt	2.30	1.93	16

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-09

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	37.2	2.06	Sand mixtures - silty sand to sandy silt	2.41	2.34	15
	14.76	39.4	1.70	Sand mixtures - silty sand to sandy silt	2.34	2.08	15
	14.93	44.1	1.40	Sand mixtures - silty sand to sandy silt	2.26	1.80	16
	15.09	42.0	1.45	Sand mixtures - silty sand to sandy silt	2.29	1.89	15
	15.26	37.1	2.01	Sand mixtures - silty sand to sandy silt	2.42	2.37	15
	15.42	31.5	2.91	Silt mixtures - clayey silt to silty clay	2.58	4.65	14
	15.58	28.6	3.41	Silt mixtures - clayey silt to silty clay	2.66	7.76	13
	15.75	30.0	2.77	Silt mixtures - clayey silt to silty clay	2.59	4.94	13
	15.91	34.7	2.01	Sand mixtures - silty sand to sandy silt	2.45	2.52	14
	16.08	37.8	1.93	Sand mixtures - silty sand to sandy silt	2.41	2.35	14
	16.24	38.1	1.86	Sand mixtures - silty sand to sandy silt	2.40	2.31	14
	16.40	39.5	1.57	Sand mixtures - silty sand to sandy silt	2.35	2.11	14
	16.57	39.4	1.33	Sand mixtures - silty sand to sandy silt	2.31	1.97	14
	16.73	43.9	1.03	Sand mixtures - silty sand to sandy silt	2.21	1.68	14
	16.90	51.3	0.82	Sand mixtures - silty sand to sandy silt	2.10	1.45	15
	17.06	50.4	0.89	Sand mixtures - silty sand to sandy silt	2.13	1.51	15
	17.22	58.8	0.80	Sands - clean sands to silty sand	2.05	1.36	16
	17.39	54.6	0.85	Sand mixtures - silty sand to sandy silt	2.10	1.44	16
	17.55	49.0	0.95	Sand mixtures - silty sand to sandy silt	2.16	1.57	15
	17.72	47.9	1.13	Sand mixtures - silty sand to sandy silt	2.22	1.70	15
	17.88	56.3	1.19	Sand mixtures - silty sand to sandy silt	2.18	1.60	17
	18.04	59.8	1.08	Sand mixtures - silty sand to sandy silt	2.13	1.50	17
	18.21	51.5	1.12	Sand mixtures - silty sand to sandy silt	2.20	1.65	15
	18.37	45.2	1.38	Sand mixtures - silty sand to sandy silt	2.30	1.94	14
	18.54	45.6	1.62	Sand mixtures - silty sand to sandy silt	2.34	2.08	15
	18.70	49.3	1.71	Sand mixtures - silty sand to sandy silt	2.33	2.04	16
	18.86	52.5	1.55	Sand mixtures - silty sand to sandy silt	2.28	1.89	16
	19.03	54.0	1.35	Sand mixtures - silty sand to sandy silt	2.24	1.76	16
	19.19	58.5	1.15	Sand mixtures - silty sand to sandy silt	2.17	1.59	16
	19.36	63.5	1.09	Sand mixtures - silty sand to sandy silt	2.13	1.50	17
	19.52	57.5	1.32	Sand mixtures - silty sand to sandy silt	2.22	1.70	16
	19.69	51.9	1.59	Sand mixtures - silty sand to sandy silt	2.31	1.96	16
	19.85	49.7	1.75	Sand mixtures - silty sand to sandy silt	2.35	2.11	15
	20.01	50.0	1.77	Sand mixtures - silty sand to sandy silt	2.35	2.12	15
	20.18	51.4	1.55	Sand mixtures - silty sand to sandy silt	2.31	1.97	15
	20.34	56.7	1.49	Sand mixtures - silty sand to sandy silt	2.27	1.84	16
	20.51	60.4	1.09	Sand mixtures - silty sand to sandy silt	2.16	1.57	16
	20.67	56.6	1.10	Sand mixtures - silty sand to sandy silt	2.19	1.64	15
	20.83	56.1	1.44	Sand mixtures - silty sand to sandy silt	2.27	1.84	16
	21.00	65.9	1.24	Sand mixtures - silty sand to sandy silt	2.17	1.59	17
	21.16	81.3	0.83	Sands - clean sands to silty sand	1.99	1.28	19
	21.33	70.6	0.87	Sands - clean sands to silty sand	2.06	1.38	17
	21.49	71.6	0.99	Sand mixtures - silty sand to sandy silt	2.09	1.42	18
	21.65	69.8	0.89	Sands - clean sands to silty sand	2.07	1.40	17
	21.82	64.7	0.78	Sands - clean sands to silty sand	2.07	1.40	16
	21.98	56.8	0.90	Sand mixtures - silty sand to sandy silt	2.16	1.56	14
	22.15	65.2	2.02	Sand mixtures - silty sand to sandy silt	2.33	2.03	18

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-09

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	114.1	1.37	Sands - clean sands to silty sand	2.02	1.33	26
	22.47	145.3	1.41	Sands - clean sands to silty sand	1.95	1.24	32
	22.64	116.5	1.22	Sands - clean sands to silty sand	1.99	1.27	26
	22.80	98.9	1.19	Sands - clean sands to silty sand	2.04	1.35	23
	22.97	81.8	1.26	Sand mixtures - silty sand to sandy silt	2.12	1.49	20
	23.13	71.1	1.62	Sand mixtures - silty sand to sandy silt	2.25	1.78	18
	23.29	59.7	1.95	Sand mixtures - silty sand to sandy silt	2.36	2.16	16
	23.46	67.3	1.51	Sand mixtures - silty sand to sandy silt	2.25	1.79	17
	23.62	64.5	1.02	Sand mixtures - silty sand to sandy silt	2.16	1.57	15
	23.79	59.3	1.02	Sand mixtures - silty sand to sandy silt	2.20	1.65	14
	23.95	52.4	1.23	Sand mixtures - silty sand to sandy silt	2.30	1.92	13
	24.11	50.7	1.43	Sand mixtures - silty sand to sandy silt	2.35	2.10	13
	24.28	49.2	1.55	Sand mixtures - silty sand to sandy silt	2.39	2.24	13
	24.44	49.1	1.63	Sand mixtures - silty sand to sandy silt	2.40	2.30	13
	24.61	49.2	1.69	Sand mixtures - silty sand to sandy silt	2.41	2.35	13
	24.77	49.0	1.75	Sand mixtures - silty sand to sandy silt	2.43	2.41	13
	24.93	50.1	1.68	Sand mixtures - silty sand to sandy silt	2.41	2.33	13
	25.10	52.1	1.43	Sand mixtures - silty sand to sandy silt	2.35	2.11	13
	25.26	51.3	1.30	Sand mixtures - silty sand to sandy silt	2.33	2.05	13
	25.43	50.0	1.43	Sand mixtures - silty sand to sandy silt	2.37	2.19	13
	25.59	49.0	1.82	Sand mixtures - silty sand to sandy silt	2.45	2.50	13
	25.75	53.0	1.83	Sand mixtures - silty sand to sandy silt	2.42	2.39	14
	25.92	59.0	1.70	Sand mixtures - silty sand to sandy silt	2.36	2.15	15
	26.08	64.2	1.56	Sand mixtures - silty sand to sandy silt	2.31	1.97	15
	26.25	63.9	1.68	Sand mixtures - silty sand to sandy silt	2.33	2.05	15
	26.41	69.9	1.25	Sand mixtures - silty sand to sandy silt	2.22	1.71	16
	26.57	66.8	1.12	Sand mixtures - silty sand to sandy silt	2.21	1.68	15
	26.74	61.7	1.08	Sand mixtures - silty sand to sandy silt	2.23	1.74	14
	26.90	56.8	1.31	Sand mixtures - silty sand to sandy silt	2.32	1.99	13
	27.07	54.2	1.39	Sand mixtures - silty sand to sandy silt	2.35	2.12	13
	27.23	54.1	1.94	Sand mixtures - silty sand to sandy silt	2.45	2.50	13
	27.40	63.8	2.30	Sand mixtures - silty sand to sandy silt	2.44	2.47	16
	27.56	98.1	1.47	Sand mixtures - silty sand to sandy silt	2.15	1.55	21
	27.72	88.0	1.63	Sand mixtures - silty sand to sandy silt	2.22	1.72	19
	27.89	106.6	1.05	Sands - clean sands to silty sand	2.03	1.33	21
	28.05	106.8	1.02	Sands - clean sands to silty sand	2.02	1.32	21
	28.22	105.3	1.06	Sands - clean sands to silty sand	2.04	1.34	21
	28.38	117.5	1.10	Sands - clean sands to silty sand	2.01	1.31	23
	28.54	119.0	1.39	Sand mixtures - silty sand to sandy silt	2.08	1.40	24
	28.71	135.1	1.15	Sands - clean sands to silty sand	1.97	1.26	25
	28.87	177.9	1.10	Sands - clean sands to silty sand	1.87	1.15	32
	29.04	193.8	1.08	Sands - clean sands to silty sand	1.83	1.13	34
	29.20	190.2	1.06	Sands - clean sands to silty sand	1.83	1.13	33
	29.36	198.5	0.95	Sands - clean sands to silty sand	1.79	1.09	34
	29.53	233.0	0.80	Sands - clean sands to silty sand	1.68	1.02	37
	29.69	238.1	0.93	Sands - clean sands to silty sand	1.72	1.05	39
	29.86	225.3	1.08	Sands - clean sands to silty sand	1.79	1.09	38

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-09

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	221.8	1.17	Sands - clean sands to silty sand	1.82	1.12	38
	30.18	228.4	1.32	Sands - clean sands to silty sand	1.85	1.14	39
	30.35	232.3	1.39	Sands - clean sands to silty sand	1.87	1.15	40
	30.51	231.3	1.27	Sands - clean sands to silty sand	1.84	1.13	39
	30.68	233.8	1.12	Sands - clean sands to silty sand	1.79	1.10	39
	30.84	251.8	1.15	Sands - clean sands to silty sand	1.78	1.09	41
	31.00	301.2	1.01	Sands - clean sands to silty sand	1.68	1.02	47

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/7/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 45.9 feet
SOUNDING: CPT-10

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	61.1	0.00	Gravelly sand to dense sand	2.27	1.00	38
	0.33	119.6	0.31	Gravelly sand to dense sand	1.33	1.00	40
	0.49	123.7	0.64	Sands - clean sands to silty sand	1.51	1.00	46
	0.66	102.8	0.86	Sands - clean sands to silty sand	1.65	1.00	42
	0.82	87.5	1.03	Sands - clean sands to silty sand	1.76	1.07	39
	0.98	76.3	0.96	Sands - clean sands to silty sand	1.78	1.09	34
	1.15	76.8	0.95	Sands - clean sands to silty sand	1.77	1.08	34
	1.31	74.7	0.97	Sands - clean sands to silty sand	1.79	1.09	34
	1.48	72.0	1.04	Sands - clean sands to silty sand	1.82	1.12	33
	1.64	79.3	1.11	Sands - clean sands to silty sand	1.81	1.11	36
	1.80	87.1	1.22	Sands - clean sands to silty sand	1.81	1.11	40
	1.97	89.6	1.34	Sands - clean sands to silty sand	1.83	1.12	41
	2.13	94.6	1.28	Sands - clean sands to silty sand	1.80	1.10	43
	2.30	100.5	0.91	Sands - clean sands to silty sand	1.68	1.02	42
	2.46	92.2	0.53	Sands - clean sands to silty sand	1.55	1.00	36
	2.62	70.6	0.43	Sands - clean sands to silty sand	1.59	1.00	28
	2.79	56.6	0.78	Sands - clean sands to silty sand	1.82	1.12	26
	2.95	66.4	1.11	Sands - clean sands to silty sand	1.87	1.15	31
	3.12	77.2	1.40	Sands - clean sands to silty sand	1.89	1.17	37
	3.28	78.4	1.38	Sands - clean sands to silty sand	1.88	1.17	37
	3.44	73.2	1.06	Sands - clean sands to silty sand	1.82	1.12	34
	3.61	67.2	0.86	Sands - clean sands to silty sand	1.79	1.09	30
	3.77	58.5	0.85	Sands - clean sands to silty sand	1.83	1.13	27
	3.94	48.1	0.76	Sands - clean sands to silty sand	1.87	1.16	23
	4.10	19.8	0.02	Sands - clean sands to silty sand	1.94	1.00	10
	4.27	17.3	0.02	Sands - clean sands to silty sand	2.00	1.00	9
	4.43	15.2	0.02	Sands - clean sands to silty sand	2.06	1.00	8
	4.59	18.9	0.02	Sands - clean sands to silty sand	1.96	1.00	10
	4.76	21.6	0.47	Sands - clean sands to silty sand	2.07	1.00	12
	4.92	36.3	0.80	Sands - clean sands to silty sand	1.99	1.28	19
	5.09	51.4	1.05	Sands - clean sands to silty sand	1.94	1.22	25
	5.25	60.6	1.17	Sands - clean sands to silty sand	1.91	1.19	30
	5.41	67.4	1.37	Sands - clean sands to silty sand	1.93	1.21	33
	5.58	72.4	1.44	Sands - clean sands to silty sand	1.92	1.20	35
	5.74	68.4	1.52	Sands - clean sands to silty sand	1.96	1.24	34
	5.91	67.6	1.53	Sands - clean sands to silty sand	1.96	1.24	34
	6.07	71.0	1.95	Sand mixtures - silty sand to sandy silt	2.02	1.32	37
	6.23	77.5	2.11	Sand mixtures - silty sand to sandy silt	2.02	1.32	41
	6.40	80.6	2.39	Sand mixtures - silty sand to sandy silt	2.05	1.37	43
	6.56	80.2	2.19	Sand mixtures - silty sand to sandy silt	2.03	1.34	41
	6.73	74.8	1.99	Sand mixtures - silty sand to sandy silt	2.03	1.33	38

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-10

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	75.5	1.62	Sands - clean sands to silty sand	1.97	1.25	35
	7.05	77.1	1.60	Sands - clean sands to silty sand	1.96	1.25	35
	7.22	69.3	1.50	Sands - clean sands to silty sand	1.98	1.27	32
	7.38	72.3	1.36	Sands - clean sands to silty sand	1.94	1.23	32
	7.55	15.0	4.07	Silt mixtures - clayey silt to silty clay	2.74		13
	7.71	13.1	1.47	Sand mixtures - silty sand to sandy silt	2.52	3.13	9
	7.87	9.9	0.99	Sand mixtures - silty sand to sandy silt	2.54	3.62	7
	8.04	20.0	0.72	Sand mixtures - silty sand to sandy silt	2.22	1.72	11
	8.20	42.6	1.13	Sand mixtures - silty sand to sandy silt	2.07	1.40	20
	8.37	66.5	0.95	Sands - clean sands to silty sand	1.90	1.18	26
	8.53	62.9	1.06	Sands - clean sands to silty sand	1.95	1.23	25
	8.69	67.6	1.28	Sands - clean sands to silty sand	1.98	1.26	28
	8.86	72.7	1.45	Sands - clean sands to silty sand	1.99	1.28	30
	9.02	71.8	1.37	Sands - clean sands to silty sand	1.98	1.27	29
	9.19	71.2	1.38	Sands - clean sands to silty sand	1.99	1.28	29
	9.35	78.2	1.53	Sands - clean sands to silty sand	2.00	1.29	31
	9.51	84.6	1.62	Sands - clean sands to silty sand	1.99	1.28	33
	9.68	85.8	1.59	Sands - clean sands to silty sand	1.99	1.27	33
	9.84	98.6	1.22	Sands - clean sands to silty sand	1.87	1.16	34
	10.01	96.3	0.97	Sands - clean sands to silty sand	1.82	1.12	32
	10.17	85.7	1.09	Sands - clean sands to silty sand	1.89	1.17	29
	10.33	82.7	1.14	Sands - clean sands to silty sand	1.91	1.20	29
	10.50	79.2	1.35	Sands - clean sands to silty sand	1.98	1.27	29
	10.66	77.2	1.44	Sands - clean sands to silty sand	2.01	1.30	29
	10.83	70.8	1.89	Sand mixtures - silty sand to sandy silt	2.11	1.47	28
	10.99	75.3	1.66	Sand mixtures - silty sand to sandy silt	2.06	1.38	29
	11.15	75.8	1.51	Sands - clean sands to silty sand	2.03	1.34	28
	11.32	76.0	1.50	Sands - clean sands to silty sand	2.04	1.34	28
	11.48	87.4	1.37	Sands - clean sands to silty sand	1.97	1.26	30
	11.65	86.2	1.31	Sands - clean sands to silty sand	1.96	1.25	29
	11.81	83.2	1.39	Sands - clean sands to silty sand	1.99	1.28	29
	11.98	94.3	1.44	Sands - clean sands to silty sand	1.97	1.25	31
	12.14	100.5	1.69	Sands - clean sands to silty sand	2.00	1.29	34
	12.30	91.8	1.88	Sand mixtures - silty sand to sandy silt	2.06	1.38	32
	12.47	95.3	2.01	Sand mixtures - silty sand to sandy silt	2.07	1.40	34
	12.63	108.5	1.66	Sands - clean sands to silty sand	1.98	1.27	35
	12.80	119.6	1.42	Sands - clean sands to silty sand	1.91	1.19	36
	12.96	123.5	1.27	Sands - clean sands to silty sand	1.87	1.15	36
	13.12	108.3	1.49	Sands - clean sands to silty sand	1.95	1.24	34
	13.29	110.8	1.25	Sands - clean sands to silty sand	1.90	1.18	33
	13.45	120.3	1.11	Sands - clean sands to silty sand	1.84	1.13	34
	13.62	125.0	0.97	Sands - clean sands to silty sand	1.79	1.10	34
	13.78	132.8	0.90	Sands - clean sands to silty sand	1.76	1.07	34
	13.94	132.2	0.79	Sands - clean sands to silty sand	1.72	1.05	33
	14.11	100.7	1.23	Sands - clean sands to silty sand	1.94	1.22	30
	14.27	88.5	1.72	Sand mixtures - silty sand to sandy silt	2.08	1.40	29
	14.44	90.4	1.91	Sand mixtures - silty sand to sandy silt	2.10	1.45	30

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-10

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	90.0	1.97	Sand mixtures - silty sand to sandy silt	2.12	1.47	30
	14.76	95.1	1.84	Sand mixtures - silty sand to sandy silt	2.08	1.41	30
	14.93	106.7	1.62	Sands - clean sands to silty sand	2.01	1.30	32
	15.09	131.1	1.32	Sands - clean sands to silty sand	1.89	1.17	36
	15.26	150.0	0.94	Sands - clean sands to silty sand	1.75	1.06	37
	15.42	131.8	0.88	Sands - clean sands to silty sand	1.77	1.08	33
	15.58	110.7	0.81	Sands - clean sands to silty sand	1.81	1.11	28
	15.75	106.3	0.78	Sands - clean sands to silty sand	1.81	1.11	27
	15.91	101.8	0.74	Sands - clean sands to silty sand	1.82	1.11	26
	16.08	104.7	0.77	Sands - clean sands to silty sand	1.82	1.12	26
	16.24	111.2	1.06	Sands - clean sands to silty sand	1.89	1.17	29
	16.40	117.1	0.96	Sands - clean sands to silty sand	1.85	1.13	29
	16.57	133.8	0.90	Sands - clean sands to silty sand	1.79	1.09	32
	16.73	176.5	0.86	Sands - clean sands to silty sand	1.69	1.02	39
	16.90	215.8	0.88	Sands - clean sands to silty sand	1.63	1.00	46
	17.06	217.7	1.04	Sands - clean sands to silty sand	1.68	1.02	48
	17.22	204.4	1.20	Sands - clean sands to silty sand	1.75	1.07	47
	17.39	166.9	1.38	Sands - clean sands to silty sand	1.85	1.14	41
	17.55	130.3	1.42	Sands - clean sands to silty sand	1.94	1.22	33
	17.72	134.3	1.12	Sands - clean sands to silty sand	1.86	1.15	33
	17.88	152.2	0.98	Sands - clean sands to silty sand	1.78	1.09	35
	18.04	151.7	0.92	Sands - clean sands to silty sand	1.77	1.08	34
	18.21	167.4	0.97	Sands - clean sands to silty sand	1.75	1.07	37
	18.37	186.7	1.00	Sands - clean sands to silty sand	1.73	1.05	41
	18.54	178.7	0.95	Sands - clean sands to silty sand	1.73	1.05	39
	18.70	166.4	0.84	Sands - clean sands to silty sand	1.72	1.04	36
	18.86	169.5	0.79	Sands - clean sands to silty sand	1.70	1.03	36
	19.03	184.1	0.85	Sands - clean sands to silty sand	1.69	1.03	38
	19.19	197.5	0.90	Sands - clean sands to silty sand	1.69	1.03	41
	19.36	195.5	0.95	Sands - clean sands to silty sand	1.71	1.04	41
	19.52	193.1	1.03	Sands - clean sands to silty sand	1.74	1.06	41
	19.69	202.1	0.98	Sands - clean sands to silty sand	1.71	1.04	42
	19.85	205.8	0.94	Sands - clean sands to silty sand	1.70	1.03	42
	20.01	199.5	0.91	Sands - clean sands to silty sand	1.69	1.03	40
	20.18	169.3	1.07	Sands - clean sands to silty sand	1.80	1.10	36
	20.34	151.6	1.28	Sands - clean sands to silty sand	1.89	1.17	34
	20.51	145.1	1.46	Sands - clean sands to silty sand	1.95	1.23	34
	20.67	143.9	1.42	Sands - clean sands to silty sand	1.94	1.22	33
	20.83	129.3	1.53	Sands - clean sands to silty sand	2.00	1.29	31
	21.00	133.5	1.59	Sands - clean sands to silty sand	2.00	1.30	32
	21.16	145.5	1.43	Sands - clean sands to silty sand	1.95	1.23	33
	21.33	148.9	1.24	Sands - clean sands to silty sand	1.90	1.18	33
	21.49	142.5	1.30	Sands - clean sands to silty sand	1.93	1.21	32
	21.65	129.2	1.67	Sand mixtures - silty sand to sandy silt	2.04	1.34	31
	21.82	120.9	2.09	Sand mixtures - silty sand to sandy silt	2.13	1.51	30
	21.98	116.0	2.03	Sand mixtures - silty sand to sandy silt	2.14	1.52	29
	22.15	122.6	1.31	Sands - clean sands to silty sand	1.98	1.27	28

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-10

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	127.1	1.22	Sands - clean sands to silty sand	1.95	1.24	28
	22.47	124.0	1.49	Sands - clean sands to silty sand	2.02	1.32	28
	22.64	124.4	1.57	Sand mixtures - silty sand to sandy silt	2.04	1.35	29
	22.80	125.8	1.58	Sand mixtures - silty sand to sandy silt	2.04	1.35	29
	22.97	128.5	1.70	Sand mixtures - silty sand to sandy silt	2.06	1.37	30
	23.13	141.9	1.45	Sands - clean sands to silty sand	1.98	1.26	31
	23.29	138.4	1.47	Sands - clean sands to silty sand	1.99	1.28	30
	23.46	134.0	1.51	Sands - clean sands to silty sand	2.01	1.31	30
	23.62	132.1	1.64	Sand mixtures - silty sand to sandy silt	2.05	1.36	30
	23.79	128.2	1.90	Sand mixtures - silty sand to sandy silt	2.10	1.45	30
	23.95	127.2	1.85	Sand mixtures - silty sand to sandy silt	2.10	1.44	29
	24.11	128.6	1.84	Sand mixtures - silty sand to sandy silt	2.09	1.43	29
	24.28	136.5	1.73	Sand mixtures - silty sand to sandy silt	2.06	1.37	30
	24.44	138.3	1.60	Sands - clean sands to silty sand	2.03	1.33	30
	24.61	140.2	1.39	Sands - clean sands to silty sand	1.98	1.27	30
	24.77	157.0	1.41	Sands - clean sands to silty sand	1.95	1.23	32
	24.93	186.9	1.35	Sands - clean sands to silty sand	1.88	1.17	37
	25.10	201.7	1.32	Sands - clean sands to silty sand	1.85	1.14	39
	25.26	180.4	1.49	Sands - clean sands to silty sand	1.93	1.21	36
	25.43	186.5	1.54	Sands - clean sands to silty sand	1.93	1.21	37
	25.59	173.5	1.79	Sands - clean sands to silty sand	2.00	1.30	36
	25.75	156.8	1.98	Sand mixtures - silty sand to sandy silt	2.07	1.39	33
	25.92	143.4	2.28	Sand mixtures - silty sand to sandy silt	2.15	1.54	32
	26.08	142.5	2.44	Sand mixtures - silty sand to sandy silt	2.17	1.59	32
	26.25	144.1	2.41	Sand mixtures - silty sand to sandy silt	2.17	1.58	32
	26.41	136.8	2.36	Sand mixtures - silty sand to sandy silt	2.18	1.60	30
	26.57	131.2	2.79	Sand mixtures - silty sand to sandy silt	2.25	1.78	30
	26.74	142.5	2.61	Sand mixtures - silty sand to sandy silt	2.20	1.66	32
	26.90	143.4	2.36	Sand mixtures - silty sand to sandy silt	2.17	1.58	31
	27.07	151.5	1.87	Sand mixtures - silty sand to sandy silt	2.07	1.40	31
	27.23	151.0	1.81	Sand mixtures - silty sand to sandy silt	2.07	1.39	31
	27.40	143.7	1.90	Sand mixtures - silty sand to sandy silt	2.10	1.44	30
	27.56	142.9	1.83	Sand mixtures - silty sand to sandy silt	2.09	1.43	29
	27.72	143.4	1.62	Sand mixtures - silty sand to sandy silt	2.05	1.36	29
	27.89	153.0	1.65	Sand mixtures - silty sand to sandy silt	2.04	1.34	30
	28.05	173.9	1.32	Sands - clean sands to silty sand	1.92	1.21	32
	28.22	172.0	1.46	Sands - clean sands to silty sand	1.96	1.25	33
	28.38	167.4	1.40	Sands - clean sands to silty sand	1.96	1.24	32
	28.54	147.3	1.83	Sand mixtures - silty sand to sandy silt	2.09	1.43	29
	28.71	131.1	2.24	Sand mixtures - silty sand to sandy silt	2.20	1.64	27
	28.87	127.9	2.52	Sand mixtures - silty sand to sandy silt	2.24	1.77	27
	29.04	132.2	2.39	Sand mixtures - silty sand to sandy silt	2.22	1.70	28
	29.20	131.6	2.18	Sand mixtures - silty sand to sandy silt	2.19	1.63	27
	29.36	133.0	1.90	Sand mixtures - silty sand to sandy silt	2.14	1.53	27
	29.53	142.4	1.64	Sand mixtures - silty sand to sandy silt	2.07	1.40	27
	29.69	138.8	1.35	Sands - clean sands to silty sand	2.02	1.32	26
	29.86	134.6	1.29	Sands - clean sands to silty sand	2.02	1.32	25

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-10

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	139.4	1.25	Sands - clean sands to silty sand	2.00	1.29	26
	30.18	133.5	1.56	Sand mixtures - silty sand to sandy silt	2.09	1.42	25
	30.35	129.1	1.84	Sand mixtures - silty sand to sandy silt	2.15	1.55	25
	30.51	124.3	2.10	Sand mixtures - silty sand to sandy silt	2.21	1.68	25
	30.68	123.1	2.16	Sand mixtures - silty sand to sandy silt	2.22	1.71	25
	30.84	125.7	2.15	Sand mixtures - silty sand to sandy silt	2.22	1.69	25
	31.00	132.9	2.03	Sand mixtures - silty sand to sandy silt	2.18	1.61	26
	31.17	139.9	1.82	Sand mixtures - silty sand to sandy silt	2.13	1.50	27
	31.33	139.2	1.77	Sand mixtures - silty sand to sandy silt	2.12	1.49	26
	31.50	143.6	1.53	Sand mixtures - silty sand to sandy silt	2.07	1.39	26
	31.66	150.9	1.35	Sands - clean sands to silty sand	2.01	1.31	27
	31.82	151.7	1.28	Sands - clean sands to silty sand	1.99	1.28	27
	31.99	149.0	1.40	Sands - clean sands to silty sand	2.03	1.33	27
	32.15	152.9	1.42	Sands - clean sands to silty sand	2.03	1.33	27
	32.32	162.7	1.67	Sand mixtures - silty sand to sandy silt	2.06	1.38	29
	32.48	163.6	1.61	Sand mixtures - silty sand to sandy silt	2.05	1.36	29
	32.64	155.3	1.68	Sand mixtures - silty sand to sandy silt	2.08	1.41	28
	32.81	152.5	1.67	Sand mixtures - silty sand to sandy silt	2.08	1.42	27
	32.97	151.7	1.65	Sand mixtures - silty sand to sandy silt	2.08	1.42	27
	33.14	141.6	1.69	Sand mixtures - silty sand to sandy silt	2.12	1.48	25
	33.30	135.8	1.62	Sand mixtures - silty sand to sandy silt	2.12	1.48	24
	33.46	138.0	1.60	Sand mixtures - silty sand to sandy silt	2.11	1.47	25
	33.63	143.0	1.66	Sand mixtures - silty sand to sandy silt	2.11	1.47	25
	33.79	148.6	1.67	Sand mixtures - silty sand to sandy silt	2.10	1.45	26
	33.96	159.5	1.64	Sand mixtures - silty sand to sandy silt	2.07	1.40	28
	34.12	185.3	1.44	Sands - clean sands to silty sand	1.98	1.27	31
	34.28	194.3	1.38	Sands - clean sands to silty sand	1.95	1.23	32
	34.45	168.8	1.53	Sand mixtures - silty sand to sandy silt	2.04	1.34	28
	34.61	154.3	1.70	Sand mixtures - silty sand to sandy silt	2.10	1.45	27
	34.78	150.4	1.90	Sand mixtures - silty sand to sandy silt	2.15	1.54	26
	34.94	136.6	1.93	Sand mixtures - silty sand to sandy silt	2.19	1.63	24
	35.10	130.8	1.83	Sand mixtures - silty sand to sandy silt	2.19	1.63	23
	35.27	128.6	1.92	Sand mixtures - silty sand to sandy silt	2.21	1.68	23
	35.43	124.2	2.29	Sand mixtures - silty sand to sandy silt	2.28	1.88	23
	35.60	133.1	2.02	Sand mixtures - silty sand to sandy silt	2.22	1.70	24
	35.76	142.1	2.01	Sand mixtures - silty sand to sandy silt	2.19	1.64	25
	35.93	167.1	1.44	Sands - clean sands to silty sand	2.03	1.33	27
	36.09	162.9	1.37	Sands - clean sands to silty sand	2.02	1.32	26
	36.25	150.3	1.47	Sand mixtures - silty sand to sandy silt	2.08	1.41	25
	36.42	146.4	1.40	Sand mixtures - silty sand to sandy silt	2.07	1.40	24
	36.58	125.1	1.63	Sand mixtures - silty sand to sandy silt	2.18	1.61	21
	36.75	120.6	1.72	Sand mixtures - silty sand to sandy silt	2.21	1.68	21
	36.91	122.3	1.85	Sand mixtures - silty sand to sandy silt	2.23	1.73	21
	37.07	118.3	1.70	Sand mixtures - silty sand to sandy silt	2.22	1.70	20
	37.24	114.0	1.71	Sand mixtures - silty sand to sandy silt	2.23	1.74	20
	37.40	106.9	1.90	Sand mixtures - silty sand to sandy silt	2.29	1.91	19
	37.57	100.5	2.48	Sand mixtures - silty sand to sandy silt	2.40	2.31	18

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-10

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	37.73	99.0	2.95	Silt mixtures - clayey silt to silty clay	2.47	2.58	18
	37.89	103.0	2.81	Silt mixtures - clayey silt to silty clay	2.44	2.45	19
	38.06	99.4	2.92	Silt mixtures - clayey silt to silty clay	2.46	2.57	18
	38.22	91.4	3.67	Silt mixtures - clayey silt to silty clay	2.57	4.47	17
	38.39	83.9	4.51	Silt mixtures - clayey silt to silty clay	2.67	8.48	16
	38.55	77.4	4.74	Clays - silty clay to clay	2.72		15
	38.71	70.3	4.77	Clays - silty clay to clay	2.76		14
	38.88	56.1	5.87	Clays - silty clay to clay	2.90		12
	39.04	53.4	6.14	Clays - silty clay to clay	2.93		12
	39.21	55.2	5.81	Clays - silty clay to clay	2.90		12
	39.37	51.7	5.98	Clays - silty clay to clay	2.93		11
	39.53	57.5	5.22	Clays - silty clay to clay	2.86		12
	39.70	55.3	5.21	Clays - silty clay to clay	2.87		12
	39.86	57.1	5.00	Clays - silty clay to clay	2.85		12
	40.03	55.8	5.37	Clays - silty clay to clay	2.88		12
	40.19	49.2	5.84	Clays - silty clay to clay	2.95		11
	40.35	43.6	6.29	Clays - silty clay to clay	3.02		10
	40.52	40.3	6.72	Clays - silty clay to clay	3.06		9
	40.68	42.7	6.00	Clays - silty clay to clay	3.01		10
	40.85	51.6	4.47	Clays - silty clay to clay	2.86		11
	41.01	68.5	3.65	Silt mixtures - clayey silt to silty clay	2.70		13
	41.17	71.3	3.57	Silt mixtures - clayey silt to silty clay	2.68	9.10	13
	41.34	81.8	3.65	Silt mixtures - clayey silt to silty clay	2.64	6.92	15
	41.50	96.7	3.24	Silt mixtures - clayey silt to silty clay	2.54	3.63	17
	41.67	64.1	4.99	Clays - silty clay to clay	2.82		13
	41.83	72.3	4.30	Silt mixtures - clayey silt to silty clay	2.74		13
	41.99	66.9	5.02	Clays - silty clay to clay	2.81		13
	42.16	81.5	3.30	Silt mixtures - clayey silt to silty clay	2.61	5.95	14
	42.32	154.9	1.73	Sand mixtures - silty sand to sandy silt	2.17	1.58	23
	42.49	180.7	1.43	Sand mixtures - silty sand to sandy silt	2.05	1.36	26
	42.65	175.5	1.60	Sand mixtures - silty sand to sandy silt	2.10	1.44	25
	42.81	149.7	1.73	Sand mixtures - silty sand to sandy silt	2.18	1.61	22
	42.98	140.2	1.46	Sand mixtures - silty sand to sandy silt	2.15	1.55	21
	43.14	134.0	1.27	Sand mixtures - silty sand to sandy silt	2.13	1.50	19
	43.31	125.2	1.14	Sand mixtures - silty sand to sandy silt	2.13	1.50	18
	43.47	116.6	1.07	Sand mixtures - silty sand to sandy silt	2.14	1.52	17
	43.64	108.5	1.17	Sand mixtures - silty sand to sandy silt	2.20	1.65	16
	43.80	82.1	2.13	Sand mixtures - silty sand to sandy silt	2.49	2.70	13
	43.96	99.8	2.93	Silt mixtures - clayey silt to silty clay	2.52	3.11	16
	44.13	91.4	4.51	Silt mixtures - clayey silt to silty clay	2.69	9.83	16
	44.29	110.3	5.11	Silt mixtures - clayey silt to silty clay	2.67	8.51	19
	44.46	131.8	5.62	Clays - silty clay to clay	2.65	7.24	22
	44.62	178.3	4.86	Silt mixtures - clayey silt to silty clay	2.50	2.73	28
	44.78	211.7	5.29	Very stiff, fine grained	2.48	2.63	33
	44.95	184.3	6.59	Very stiff, fine grained	2.60	5.46	30
	45.11	249.4	5.93	Very stiff, fine grained	2.47	2.62	39
	45.28	280.9	6.12	Very stiff, fine grained	2.45	2.52	43

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-10

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	45.44	269.5	6.01	Very stiff, fine grained	2.46	2.55	41
	45.60	268.7	6.07	Very stiff, fine grained	2.46	2.58	41
	45.77	298.4	6.25	Very stiff, fine grained	2.45	2.50	45
	45.93	319.5	6.84	Very stiff, fine grained	2.47	2.58	48

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/7/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 30 feet
SOUNDING: CPT-11

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	49.0	0.02	Sands - clean sands to silty sand	1.57	1.00	19
	0.33	52.9	0.03	Sands - clean sands to silty sand	1.50	1.00	20
	0.49	88.8	0.07	Gravelly sand to dense sand	1.25	1.00	28
	0.66	127.2	0.37	Sands - clean sands to silty sand	1.35	1.00	43
	0.82	125.7	0.76	Sands - clean sands to silty sand	1.55	1.00	48
	0.98	113.3	0.89	Sands - clean sands to silty sand	1.63	1.00	46
	1.15	103.5	0.86	Sands - clean sands to silty sand	1.65	1.00	43
	1.31	80.5	1.11	Sands - clean sands to silty sand	1.81	1.10	37
	1.48	74.4	0.99	Sands - clean sands to silty sand	1.80	1.10	34
	1.64	67.5	0.82	Sands - clean sands to silty sand	1.77	1.08	30
	1.80	69.3	0.71	Sands - clean sands to silty sand	1.72	1.05	30
	1.97	67.1	0.68	Sands - clean sands to silty sand	1.73	1.05	29
	2.13	65.3	0.59	Sands - clean sands to silty sand	1.70	1.03	28
	2.30	62.8	0.62	Sands - clean sands to silty sand	1.73	1.05	27
	2.46	62.3	0.69	Sands - clean sands to silty sand	1.76	1.07	27
	2.62	69.8	0.66	Sands - clean sands to silty sand	1.71	1.04	30
	2.79	76.7	1.03	Sands - clean sands to silty sand	1.80	1.10	35
	2.95	93.7	1.14	Sands - clean sands to silty sand	1.77	1.08	42
	3.12	86.7	1.18	Sands - clean sands to silty sand	1.80	1.10	39
	3.28	66.0	1.14	Sands - clean sands to silty sand	1.88	1.16	31
	3.44	50.1	0.71	Sands - clean sands to silty sand	1.84	1.13	23
	3.61	48.4	0.76	Sands - clean sands to silty sand	1.87	1.15	23
	3.77	66.0	0.67	Sands - clean sands to silty sand	1.73	1.05	29
	3.94	73.1	0.63	Sands - clean sands to silty sand	1.68	1.02	31
	4.10	67.1	0.56	Sands - clean sands to silty sand	1.68	1.02	28
	4.27	61.9	0.42	Sands - clean sands to silty sand	1.64	1.00	25
	4.43	58.5	0.35	Sands - clean sands to silty sand	1.62	1.00	24
	4.59	57.6	0.38	Sands - clean sands to silty sand	1.65	1.00	24
	4.76	50.9	0.48	Sands - clean sands to silty sand	1.74	1.00	22
	4.92	47.3	0.52	Sands - clean sands to silty sand	1.79	1.09	21
	5.09	45.9	0.68	Sands - clean sands to silty sand	1.86	1.15	22
	5.25	54.1	0.61	Sands - clean sands to silty sand	1.78	1.09	24
	5.41	56.6	0.82	Sands - clean sands to silty sand	1.84	1.13	26
	5.58	61.1	1.05	Sands - clean sands to silty sand	1.88	1.16	29
	5.74	75.4	1.09	Sands - clean sands to silty sand	1.83	1.13	34
	5.91	90.2	1.22	Sands - clean sands to silty sand	1.82	1.11	39
	6.07	113.8	1.14	Sands - clean sands to silty sand	1.74	1.06	45
	6.23	130.1	0.89	Sands - clean sands to silty sand	1.64	1.00	45
	6.40	128.6	0.69	Sands - clean sands to silty sand	1.58	1.00	42
	6.56	112.6	0.74	Sands - clean sands to silty sand	1.64	1.00	38
	6.73	106.7	0.96	Sands - clean sands to silty sand	1.72	1.05	39

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-11

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	107.0	1.07	Sands - clean sands to silty sand	1.76	1.07	40
	7.05	97.4	1.34	Sands - clean sands to silty sand	1.85	1.14	40
	7.22	95.2	1.38	Sands - clean sands to silty sand	1.87	1.15	39
	7.38	103.3	1.18	Sands - clean sands to silty sand	1.81	1.10	39
	7.55	118.9	1.03	Sands - clean sands to silty sand	1.73	1.05	42
	7.71	145.3	0.88	Sands - clean sands to silty sand	1.63	1.00	46
	7.87	131.1	0.88	Sands - clean sands to silty sand	1.67	1.01	42
	8.04	111.9	0.82	Sands - clean sands to silty sand	1.69	1.03	37
	8.20	102.3	1.04	Sands - clean sands to silty sand	1.79	1.09	36
	8.37	103.4	1.26	Sands - clean sands to silty sand	1.84	1.13	38
	8.53	107.6	1.85	Sands - clean sands to silty sand	1.95	1.23	43
	8.69	112.2	1.96	Sands - clean sands to silty sand	1.96	1.24	45
	8.86	112.1	1.94	Sands - clean sands to silty sand	1.96	1.24	45
	9.02	118.7	1.74	Sands - clean sands to silty sand	1.91	1.19	45
	9.19	128.2	1.71	Sands - clean sands to silty sand	1.89	1.17	47
	9.35	127.7	1.83	Sands - clean sands to silty sand	1.92	1.20	47
	9.51	121.9	2.19	Sand mixtures - silty sand to sandy silt	1.99	1.27	48
	9.68	119.6	2.54	Sand mixtures - silty sand to sandy silt	2.04	1.35	49
	9.84	128.5	2.59	Sand mixtures - silty sand to sandy silt	2.03	1.34	51
	10.01	131.6	2.44	Sand mixtures - silty sand to sandy silt	2.01	1.31	51
	10.17	121.7	2.41	Sand mixtures - silty sand to sandy silt	2.03	1.33	47
	10.33	121.7	2.06	Sands - clean sands to silty sand	1.98	1.27	45
	10.50	121.3	1.99	Sands - clean sands to silty sand	1.97	1.26	44
	10.66	134.8	1.62	Sands - clean sands to silty sand	1.88	1.17	45
	10.83	153.5	1.22	Sands - clean sands to silty sand	1.76	1.07	46
	10.99	152.3	1.08	Sands - clean sands to silty sand	1.73	1.05	44
	11.15	130.1	1.29	Sands - clean sands to silty sand	1.83	1.12	40
	11.32	119.0	1.62	Sands - clean sands to silty sand	1.93	1.21	40
	11.48	116.6	1.97	Sands - clean sands to silty sand	2.00	1.29	41
	11.65	109.0	2.25	Sand mixtures - silty sand to sandy silt	2.06	1.37	40
	11.81	101.7	2.40	Sand mixtures - silty sand to sandy silt	2.10	1.45	38
	11.98	101.6	2.20	Sand mixtures - silty sand to sandy silt	2.08	1.40	37
	12.14	105.9	1.73	Sands - clean sands to silty sand	1.99	1.28	36
	12.30	98.4	1.58	Sands - clean sands to silty sand	1.99	1.28	33
	12.47	95.8	1.53	Sands - clean sands to silty sand	1.99	1.28	32
	12.63	100.0	1.64	Sands - clean sands to silty sand	2.00	1.29	33
	12.80	104.7	1.71	Sands - clean sands to silty sand	2.00	1.29	34
	12.96	101.4	1.80	Sand mixtures - silty sand to sandy silt	2.03	1.33	34
	13.12	99.5	1.66	Sands - clean sands to silty sand	2.01	1.31	32
	13.29	98.7	1.72	Sand mixtures - silty sand to sandy silt	2.03	1.33	32
	13.45	100.1	1.68	Sands - clean sands to silty sand	2.02	1.32	32
	13.62	101.1	1.75	Sand mixtures - silty sand to sandy silt	2.03	1.34	33
	13.78	95.6	1.96	Sand mixtures - silty sand to sandy silt	2.08	1.42	32
	13.94	90.7	2.09	Sand mixtures - silty sand to sandy silt	2.12	1.48	31
	14.11	93.1	2.10	Sand mixtures - silty sand to sandy silt	2.12	1.48	31
	14.27	93.8	2.17	Sand mixtures - silty sand to sandy silt	2.13	1.50	32
	14.44	95.5	2.24	Sand mixtures - silty sand to sandy silt	2.14	1.51	32

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-11

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	99.3	2.37	Sand mixtures - silty sand to sandy silt	2.14	1.53	33
	14.76	94.6	2.47	Sand mixtures - silty sand to sandy silt	2.17	1.59	32
	14.93	94.1	2.46	Sand mixtures - silty sand to sandy silt	2.18	1.60	32
	15.09	95.4	2.51	Sand mixtures - silty sand to sandy silt	2.18	1.61	32
	15.26	98.0	2.46	Sand mixtures - silty sand to sandy silt	2.17	1.58	32
	15.42	99.5	2.39	Sand mixtures - silty sand to sandy silt	2.16	1.56	32
	15.58	97.6	2.33	Sand mixtures - silty sand to sandy silt	2.16	1.56	32
	15.75	100.1	2.19	Sand mixtures - silty sand to sandy silt	2.13	1.51	32
	15.91	111.9	1.87	Sand mixtures - silty sand to sandy silt	2.05	1.37	33
	16.08	109.6	1.89	Sand mixtures - silty sand to sandy silt	2.06	1.38	32
	16.24	99.0	2.09	Sand mixtures - silty sand to sandy silt	2.13	1.50	30
	16.40	97.8	2.39	Sand mixtures - silty sand to sandy silt	2.18	1.60	31
	16.57	106.2	2.20	Sand mixtures - silty sand to sandy silt	2.13	1.49	32
	16.73	100.3	2.00	Sand mixtures - silty sand to sandy silt	2.12	1.47	30
	16.90	90.8	2.02	Sand mixtures - silty sand to sandy silt	2.15	1.55	28
	17.06	92.4	2.20	Sand mixtures - silty sand to sandy silt	2.17	1.60	28
	17.22	100.3	2.11	Sand mixtures - silty sand to sandy silt	2.14	1.52	30
	17.39	104.5	2.10	Sand mixtures - silty sand to sandy silt	2.13	1.50	31
	17.55	88.0	2.56	Sand mixtures - silty sand to sandy silt	2.24	1.77	28
	17.72	80.3	2.71	Sand mixtures - silty sand to sandy silt	2.29	1.91	26
	17.88	78.6	2.57	Sand mixtures - silty sand to sandy silt	2.28	1.88	25
	18.04	75.8	2.37	Sand mixtures - silty sand to sandy silt	2.27	1.85	24
	18.21	75.0	2.41	Sand mixtures - silty sand to sandy silt	2.28	1.88	24
	18.37	72.5	2.47	Sand mixtures - silty sand to sandy silt	2.30	1.95	23
	18.54	66.8	2.57	Sand mixtures - silty sand to sandy silt	2.34	2.09	22
	18.70	64.6	2.31	Sand mixtures - silty sand to sandy silt	2.33	2.02	20
	18.86	66.0	2.08	Sand mixtures - silty sand to sandy silt	2.29	1.90	20
	19.03	70.0	1.85	Sand mixtures - silty sand to sandy silt	2.24	1.75	21
	19.19	77.6	1.68	Sand mixtures - silty sand to sandy silt	2.18	1.60	22
	19.36	83.5	1.49	Sand mixtures - silty sand to sandy silt	2.12	1.48	23
	19.52	82.7	1.47	Sand mixtures - silty sand to sandy silt	2.12	1.49	22
	19.69	83.5	1.51	Sand mixtures - silty sand to sandy silt	2.13	1.50	22
	19.85	80.7	1.75	Sand mixtures - silty sand to sandy silt	2.19	1.62	22
	20.01	76.1	2.11	Sand mixtures - silty sand to sandy silt	2.26	1.82	22
	20.18	77.3	2.00	Sand mixtures - silty sand to sandy silt	2.24	1.77	22
	20.34	85.6	1.73	Sand mixtures - silty sand to sandy silt	2.17	1.58	23
	20.51	87.7	1.35	Sand mixtures - silty sand to sandy silt	2.09	1.43	22
	20.67	82.4	1.41	Sand mixtures - silty sand to sandy silt	2.13	1.49	21
	20.83	86.4	1.76	Sand mixtures - silty sand to sandy silt	2.18	1.60	23
	21.00	127.7	1.37	Sands - clean sands to silty sand	1.97	1.26	30
	21.16	146.8	1.00	Sands - clean sands to silty sand	1.83	1.13	31
	21.33	151.8	0.69	Sands - clean sands to silty sand	1.72	1.05	30
	21.49	142.9	0.86	Sands - clean sands to silty sand	1.80	1.10	30
	21.65	116.2	1.06	Sands - clean sands to silty sand	1.94	1.22	26
	21.82	102.9	0.95	Sands - clean sands to silty sand	1.95	1.23	23
	21.98	101.3	0.90	Sands - clean sands to silty sand	1.94	1.22	23
	22.15	86.3	0.95	Sands - clean sands to silty sand	2.02	1.32	20

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-11

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	73.6	0.99	Sand mixtures - silty sand to sandy silt	2.09	1.43	18
	22.47	65.7	1.28	Sand mixtures - silty sand to sandy silt	2.20	1.66	17
	22.64	67.1	1.50	Sand mixtures - silty sand to sandy silt	2.24	1.76	17
	22.80	68.5	1.72	Sand mixtures - silty sand to sandy silt	2.27	1.85	18
	22.97	63.8	1.95	Sand mixtures - silty sand to sandy silt	2.34	2.06	17
	23.13	66.3	2.07	Sand mixtures - silty sand to sandy silt	2.34	2.08	18
	23.29	77.5	2.04	Sand mixtures - silty sand to sandy silt	2.29	1.89	20
	23.46	84.4	2.16	Sand mixtures - silty sand to sandy silt	2.28	1.86	22
	23.62	96.9	2.30	Sand mixtures - silty sand to sandy silt	2.25	1.79	24
	23.79	121.7	2.04	Sand mixtures - silty sand to sandy silt	2.14	1.53	29
	23.95	148.9	1.55	Sands - clean sands to silty sand	1.99	1.28	32
	24.11	148.0	1.59	Sands - clean sands to silty sand	2.00	1.29	32
	24.28	118.1	1.66	Sand mixtures - silty sand to sandy silt	2.09	1.43	27
	24.44	101.4	1.93	Sand mixtures - silty sand to sandy silt	2.19	1.63	24
	24.61	105.2	1.68	Sand mixtures - silty sand to sandy silt	2.14	1.52	24
	24.77	107.2	1.70	Sand mixtures - silty sand to sandy silt	2.14	1.51	24
	24.93	106.6	1.65	Sand mixtures - silty sand to sandy silt	2.13	1.50	24
	25.10	105.0	1.70	Sand mixtures - silty sand to sandy silt	2.15	1.54	24
	25.26	124.4	1.40	Sands - clean sands to silty sand	2.03	1.33	26
	25.43	148.1	1.24	Sands - clean sands to silty sand	1.94	1.22	30
	25.59	191.2	1.18	Sands - clean sands to silty sand	1.84	1.13	36
	25.75	231.9	1.22	Sands - clean sands to silty sand	1.79	1.09	43
	25.92	250.5	1.20	Sands - clean sands to silty sand	1.76	1.07	45
	26.08	256.9	1.12	Sands - clean sands to silty sand	1.73	1.05	46
	26.25	281.9	0.97	Sands - clean sands to silty sand	1.66	1.00	48
	26.41	300.5	0.97	Sands - clean sands to silty sand	1.64	1.00	50
	26.57	292.0	1.09	Sands - clean sands to silty sand	1.68	1.02	50
	26.74	294.2	1.08	Sands - clean sands to silty sand	1.68	1.02	50
	26.90	308.2	1.05	Sands - clean sands to silty sand	1.66	1.01	52
	27.07	317.6	1.32	Sands - clean sands to silty sand	1.73	1.05	55
	27.23	300.6	1.21	Sands - clean sands to silty sand	1.72	1.04	52
	27.40	274.2	1.13	Sands - clean sands to silty sand	1.72	1.05	47
	27.56	288.0	0.98	Sands - clean sands to silty sand	1.66	1.01	48
	27.72	314.2	1.02	Sands - clean sands to silty sand	1.65	1.00	52
	27.89	382.9	0.93	Sands - clean sands to silty sand	1.56	1.00	60
	28.05	402.1	0.86	Sands - clean sands to silty sand	1.52	1.00	62
	28.22	330.8	0.83	Sands - clean sands to silty sand	1.57	1.00	52
	28.38	167.3	0.85	Sands - clean sands to silty sand	1.81	1.11	29
	28.54	102.1	0.74	Sands - clean sands to silty sand	1.96	1.24	19
	28.71	73.0	1.28	Sand mixtures - silty sand to sandy silt	2.23	1.74	16
	28.87	70.7	3.02	Silt mixtures - clayey silt to silty clay	2.50	2.86	17
	29.04	143.7	2.42	Sand mixtures - silty sand to sandy silt	2.19	1.64	30
	29.20	326.9	1.38	Sands - clean sands to silty sand	1.75	1.07	55
	29.36	455.6	1.01	Sands - clean sands to silty sand	1.55	1.00	69
	29.53	510.3	1.33	Sands - clean sands to silty sand	1.62	1.00	80
	29.69	361.1	2.30	Sands - clean sands to silty sand	1.91	1.20	64
	29.86	436.9	2.04	Sands - clean sands to silty sand	1.82	1.12	74

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/7/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 30 feet
SOUNDING: CPT-12

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	9.5	0.03	Sand mixtures - silty sand to sandy silt	2.25	1.00	6
	0.33	25.1	0.02	Sands - clean sands to silty sand	1.88	1.00	12
	0.49	69.5	0.18	Sands - clean sands to silty sand	1.43	1.00	25
	0.66	70.3	0.46	Sands - clean sands to silty sand	1.61	1.00	28
	0.82	61.1	0.57	Sands - clean sands to silty sand	1.71	1.04	26
	0.98	47.8	0.61	Sands - clean sands to silty sand	1.82	1.11	22
	1.15	43.3	0.57	Sands - clean sands to silty sand	1.84	1.13	20
	1.31	34.4	0.59	Sands - clean sands to silty sand	1.93	1.21	17
	1.48	41.0	0.39	Sands - clean sands to silty sand	1.78	1.00	18
	1.64	29.2	0.84	Sands - clean sands to silty sand	2.07	1.40	16
	1.80	26.1	0.79	Sand mixtures - silty sand to sandy silt	2.10	1.45	14
	1.97	27.0	0.72	Sands - clean sands to silty sand	2.07	1.39	15
	2.13	33.7	0.49	Sands - clean sands to silty sand	1.90	1.00	16
	2.30	33.6	0.88	Sands - clean sands to silty sand	2.04	1.34	18
	2.46	30.7	1.04	Sand mixtures - silty sand to sandy silt	2.11	1.46	17
	2.62	30.6	0.76	Sands - clean sands to silty sand	2.03	1.34	16
	2.79	35.0	0.51	Sands - clean sands to silty sand	1.90	1.18	17
	2.95	35.2	0.60	Sands - clean sands to silty sand	1.93	1.21	17
	3.12	28.9	0.50	Sands - clean sands to silty sand	1.96	1.00	15
	3.28	20.4	1.25	Sand mixtures - silty sand to sandy silt	2.31	1.95	13
	3.44	21.6	0.74	Sand mixtures - silty sand to sandy silt	2.16	1.56	12
	3.61	38.3	0.67	Sands - clean sands to silty sand	1.93	1.21	19
	3.77	30.8	0.60	Sands - clean sands to silty sand	1.98	1.27	16
	3.94	33.2	0.45	Sands - clean sands to silty sand	1.89	1.00	16
	4.10	25.8	0.79	Sand mixtures - silty sand to sandy silt	2.11	1.46	14
	4.27	33.8	0.65	Sands - clean sands to silty sand	1.96	1.25	17
	4.43	31.8	0.74	Sands - clean sands to silty sand	2.02	1.31	17
	4.59	31.2	0.71	Sands - clean sands to silty sand	2.02	1.31	16
	4.76	31.4	0.69	Sands - clean sands to silty sand	2.00	1.30	16
	4.92	32.8	0.69	Sands - clean sands to silty sand	1.99	1.28	17
	5.09	33.5	0.80	Sands - clean sands to silty sand	2.02	1.31	17
	5.25	32.3	1.12	Sand mixtures - silty sand to sandy silt	2.12	1.47	18
	5.41	30.6	0.97	Sand mixtures - silty sand to sandy silt	2.10	1.44	17
	5.58	26.8	0.94	Sand mixtures - silty sand to sandy silt	2.14	1.52	15
	5.74	27.2	0.96	Sand mixtures - silty sand to sandy silt	2.14	1.52	15
	5.91	32.7	1.16	Sand mixtures - silty sand to sandy silt	2.12	1.48	18
	6.07	35.6	1.11	Sand mixtures - silty sand to sandy silt	2.08	1.41	19
	6.23	33.1	1.19	Sand mixtures - silty sand to sandy silt	2.12	1.49	19
	6.40	31.9	1.35	Sand mixtures - silty sand to sandy silt	2.17	1.59	18
	6.56	31.3	1.11	Sand mixtures - silty sand to sandy silt	2.13	1.49	18
	6.73	31.3	1.20	Sand mixtures - silty sand to sandy silt	2.14	1.53	18

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-12

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	34.3	1.05	Sand mixtures - silty sand to sandy silt	2.09	1.43	18
	7.05	33.9	1.38	Sand mixtures - silty sand to sandy silt	2.16	1.57	19
	7.22	32.0	1.87	Sand mixtures - silty sand to sandy silt	2.26	1.82	20
	7.38	31.3	1.98	Sand mixtures - silty sand to sandy silt	2.29	1.90	19
	7.55	28.5	1.78	Sand mixtures - silty sand to sandy silt	2.29	1.92	17
	7.71	29.1	1.54	Sand mixtures - silty sand to sandy silt	2.26	1.80	17
	7.87	28.6	1.62	Sand mixtures - silty sand to sandy silt	2.28	1.87	17
	8.04	30.7	1.67	Sand mixtures - silty sand to sandy silt	2.27	1.84	17
	8.20	34.1	1.72	Sand mixtures - silty sand to sandy silt	2.25	1.78	19
	8.37	36.1	1.78	Sand mixtures - silty sand to sandy silt	2.25	1.77	20
	8.53	37.8	1.73	Sand mixtures - silty sand to sandy silt	2.23	1.72	20
	8.69	41.1	1.70	Sand mixtures - silty sand to sandy silt	2.20	1.66	21
	8.86	48.0	1.56	Sand mixtures - silty sand to sandy silt	2.14	1.51	22
	9.02	54.0	1.25	Sands - clean sands to silty sand	2.05	1.36	23
	9.19	59.7	1.65	Sand mixtures - silty sand to sandy silt	2.09	1.43	26
	9.35	64.1	1.39	Sands - clean sands to silty sand	2.03	1.33	26
	9.51	63.5	1.28	Sands - clean sands to silty sand	2.01	1.31	25
	9.68	63.3	1.31	Sands - clean sands to silty sand	2.02	1.32	25
	9.84	55.8	1.92	Sand mixtures - silty sand to sandy silt	2.17	1.58	25
	10.01	59.3	1.13	Sands - clean sands to silty sand	2.01	1.31	23
	10.17	56.9	1.17	Sands - clean sands to silty sand	2.04	1.34	22
	10.33	53.4	0.90	Sands - clean sands to silty sand	2.00	1.29	20
	10.50	47.1	1.05	Sand mixtures - silty sand to sandy silt	2.08	1.41	19
	10.66	45.9	1.09	Sand mixtures - silty sand to sandy silt	2.10	1.44	18
	10.83	42.0	1.68	Sand mixtures - silty sand to sandy silt	2.24	1.76	19
	10.99	46.5	1.48	Sand mixtures - silty sand to sandy silt	2.18	1.60	20
	11.15	45.1	1.25	Sand mixtures - silty sand to sandy silt	2.15	1.54	18
	11.32	48.7	0.92	Sands - clean sands to silty sand	2.05	1.37	18
	11.48	52.7	0.78	Sands - clean sands to silty sand	1.99	1.28	18
	11.65	57.4	0.79	Sands - clean sands to silty sand	1.97	1.25	19
	11.81	56.4	0.80	Sands - clean sands to silty sand	1.98	1.26	19
	11.98	52.7	0.80	Sands - clean sands to silty sand	2.00	1.30	18
	12.14	55.1	0.76	Sands - clean sands to silty sand	1.98	1.27	18
	12.30	59.2	0.78	Sands - clean sands to silty sand	1.96	1.25	19
	12.47	61.7	0.69	Sands - clean sands to silty sand	1.92	1.20	19
	12.63	56.9	0.72	Sands - clean sands to silty sand	1.97	1.25	18
	12.80	48.5	0.79	Sands - clean sands to silty sand	2.05	1.36	16
	12.96	44.3	1.14	Sand mixtures - silty sand to sandy silt	2.17	1.58	16
	13.12	43.2	1.33	Sand mixtures - silty sand to sandy silt	2.22	1.70	17
	13.29	42.3	1.28	Sand mixtures - silty sand to sandy silt	2.22	1.70	16
	13.45	44.2	0.87	Sand mixtures - silty sand to sandy silt	2.11	1.47	15
	13.62	45.7	0.77	Sands - clean sands to silty sand	2.07	1.40	15
	13.78	48.5	1.80	Sand mixtures - silty sand to sandy silt	2.27	1.85	19
	13.94	55.7	3.31	Silt mixtures - clayey silt to silty clay	2.41	2.33	24
	14.11	78.7	2.19	Sand mixtures - silty sand to sandy silt	2.18	1.61	28
	14.27	57.5	1.99	Sand mixtures - silty sand to sandy silt	2.25	1.79	21
	14.44	63.6	1.32	Sand mixtures - silty sand to sandy silt	2.11	1.46	21

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-12

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	64.8	1.14	Sand mixtures - silty sand to sandy silt	2.07	1.39	21
	14.76	61.3	0.98	Sands - clean sands to silty sand	2.05	1.36	19
	14.93	60.4	0.58	Sands - clean sands to silty sand	1.93	1.22	17
	15.09	49.1	0.64	Sands - clean sands to silty sand	2.03	1.34	15
	15.26	41.9	0.67	Sand mixtures - silty sand to sandy silt	2.11	1.46	13
	15.42	36.1	0.72	Sand mixtures - silty sand to sandy silt	2.18	1.61	12
	15.58	32.4	1.09	Sand mixtures - silty sand to sandy silt	2.32	2.00	12
	15.75	29.5	1.18	Sand mixtures - silty sand to sandy silt	2.37	2.20	11
	15.91	28.7	1.24	Sand mixtures - silty sand to sandy silt	2.40	2.29	11
	16.08	30.5	1.19	Sand mixtures - silty sand to sandy silt	2.37	2.18	11
	16.24	33.5	1.10	Sand mixtures - silty sand to sandy silt	2.32	2.00	12
	16.40	36.6	1.02	Sand mixtures - silty sand to sandy silt	2.27	1.84	12
	16.57	39.8	1.03	Sand mixtures - silty sand to sandy silt	2.25	1.77	13
	16.73	40.2	0.90	Sand mixtures - silty sand to sandy silt	2.21	1.69	13
	16.90	38.6	0.95	Sand mixtures - silty sand to sandy silt	2.24	1.76	12
	17.06	38.9	1.00	Sand mixtures - silty sand to sandy silt	2.25	1.80	13
	17.22	40.8	0.93	Sand mixtures - silty sand to sandy silt	2.22	1.72	13
	17.39	41.9	1.34	Sand mixtures - silty sand to sandy silt	2.30	1.95	14
	17.55	42.7	1.16	Sand mixtures - silty sand to sandy silt	2.26	1.82	14
	17.72	47.1	1.64	Sand mixtures - silty sand to sandy silt	2.32	2.00	15
	17.88	50.4	1.34	Sand mixtures - silty sand to sandy silt	2.24	1.77	16
	18.04	49.1	2.38	Sand mixtures - silty sand to sandy silt	2.41	2.36	17
	18.21	52.4	2.07	Sand mixtures - silty sand to sandy silt	2.36	2.13	17
	18.37	44.2	2.24	Sand mixtures - silty sand to sandy silt	2.44	2.46	15
	18.54	47.5	1.51	Sand mixtures - silty sand to sandy silt	2.31	1.96	15
	18.70	47.8	1.33	Sand mixtures - silty sand to sandy silt	2.28	1.86	15
	18.86	52.3	1.13	Sand mixtures - silty sand to sandy silt	2.20	1.66	15
	19.03	54.4	0.93	Sand mixtures - silty sand to sandy silt	2.14	1.53	15
	19.19	53.6	0.85	Sand mixtures - silty sand to sandy silt	2.13	1.50	15
	19.36	51.2	0.92	Sand mixtures - silty sand to sandy silt	2.17	1.58	14
	19.52	46.4	1.03	Sand mixtures - silty sand to sandy silt	2.23	1.74	13
	19.69	43.5	1.07	Sand mixtures - silty sand to sandy silt	2.27	1.84	13
	19.85	43.0	1.18	Sand mixtures - silty sand to sandy silt	2.30	1.94	13
	20.01	42.1	1.21	Sand mixtures - silty sand to sandy silt	2.32	1.99	13
	20.18	35.6	1.27	Sand mixtures - silty sand to sandy silt	2.40	2.28	11
	20.34	31.5	1.50	Sand mixtures - silty sand to sandy silt	2.49	2.69	10
	20.51	29.1	1.85	Silt mixtures - clayey silt to silty clay	2.58	4.61	10
	20.67	28.5	2.01	Silt mixtures - clayey silt to silty clay	2.61	5.65	10
	20.83	27.9	1.95	Silt mixtures - clayey silt to silty clay	2.61	5.75	10
	21.00	26.3	2.15	Silt mixtures - clayey silt to silty clay	2.66	7.92	9
	21.16	25.0	3.02	Silt mixtures - clayey silt to silty clay	2.77		9
	21.33	24.3	3.42	Clays - silty clay to clay	2.82		9
	21.49	23.8	2.92	Silt mixtures - clayey silt to silty clay	2.79		9
	21.65	20.8	2.06	Silt mixtures - clayey silt to silty clay	2.76		8
	21.82	18.7	1.45	Silt mixtures - clayey silt to silty clay	2.72		7
	21.98	17.7	1.18	Silt mixtures - clayey silt to silty clay	2.70	10.01	6
	22.15	21.0	1.23	Silt mixtures - clayey silt to silty clay	2.64	6.80	7

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-12

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	27.3	1.62	Silt mixtures - clayey silt to silty clay	2.60	5.28	9
	22.47	32.9	1.13	Sand mixtures - silty sand to sandy silt	2.43	2.45	10
	22.64	37.2	1.01	Sand mixtures - silty sand to sandy silt	2.36	2.15	10
	22.80	37.9	1.17	Sand mixtures - silty sand to sandy silt	2.39	2.27	11
	22.97	37.7	1.67	Sand mixtures - silty sand to sandy silt	2.49	2.68	11
	23.13	37.9	1.76	Sand mixtures - silty sand to sandy silt	2.50	2.83	11
	23.29	36.7	1.67	Sand mixtures - silty sand to sandy silt	2.50	2.83	11
	23.46	33.8	2.29	Silt mixtures - clayey silt to silty clay	2.62	6.18	10
	23.62	32.2	2.62	Silt mixtures - clayey silt to silty clay	2.68	8.90	10
	23.79	34.4	2.36	Silt mixtures - clayey silt to silty clay	2.63	6.46	11
	23.95	39.6	1.51	Sand mixtures - silty sand to sandy silt	2.46	2.54	11
	24.11	37.7	1.31	Sand mixtures - silty sand to sandy silt	2.44	2.48	10
	24.28	39.3	1.57	Sand mixtures - silty sand to sandy silt	2.47	2.62	11
	24.44	44.6	2.49	Silt mixtures - clayey silt to silty clay	2.56	4.05	13
	24.61	48.6	2.96	Silt mixtures - clayey silt to silty clay	2.58	4.63	14
	24.77	63.9	2.19	Sand mixtures - silty sand to sandy silt	2.39	2.27	17
	24.93	124.2	1.09	Sands - clean sands to silty sand	1.95	1.24	26
	25.10	173.5	0.77	Sands - clean sands to silty sand	1.74	1.06	32
	25.26	206.7	0.80	Sands - clean sands to silty sand	1.69	1.03	37
	25.43	262.3	0.91	Sands - clean sands to silty sand	1.65	1.00	45
	25.59	345.3	0.72	Sands - clean sands to silty sand	1.49	1.00	55
	25.75	424.6	0.63	Sands - clean sands to silty sand	1.38	1.00	63
	25.92	448.2	0.76	Sands - clean sands to silty sand	1.43	1.00	68

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/7/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 40 feet
SOUNDING: CPT-13

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	6.9	0.00	Sand mixtures - silty sand to sandy silt	2.69	9.55	6
	0.33	10.3	0.01	Sand mixtures - silty sand to sandy silt	2.37	2.20	7
	0.49	28.0	0.01	Sands - clean sands to silty sand	1.98	1.00	14
	0.66	29.6	0.01	Sands - clean sands to silty sand	1.96	1.00	15
	0.82	49.7	0.03	Sands - clean sands to silty sand	1.52	1.00	19
	0.98	64.8	0.38	Sands - clean sands to silty sand	1.60	1.00	26
	1.15	61.4	0.46	Sands - clean sands to silty sand	1.66	1.00	25
	1.31	52.5	0.54	Sands - clean sands to silty sand	1.76	1.07	23
	1.48	40.8	0.80	Sands - clean sands to silty sand	1.94	1.22	20
	1.64	43.3	0.75	Sands - clean sands to silty sand	1.90	1.19	21
	1.80	37.8	0.67	Sands - clean sands to silty sand	1.93	1.21	19
	1.97	31.8	0.60	Sands - clean sands to silty sand	1.97	1.25	16
	2.13	29.0	0.32	Sands - clean sands to silty sand	1.88	1.00	14
	2.30	26.7	0.40	Sands - clean sands to silty sand	1.95	1.00	13
	2.46	24.8	0.37	Sands - clean sands to silty sand	1.97	1.00	13
	2.62	24.5	0.55	Sands - clean sands to silty sand	2.05	1.36	13
	2.79	26.9	0.32	Sands - clean sands to silty sand	1.91	1.00	13
	2.95	27.5	0.32	Sands - clean sands to silty sand	1.90	1.00	13
	3.12	25.8	0.23	Sands - clean sands to silty sand	1.88	1.00	12
	3.28	24.3	0.25	Sands - clean sands to silty sand	1.91	1.00	12
	3.44	23.4	0.19	Sands - clean sands to silty sand	1.89	1.00	11
	3.61	24.7	0.31	Sands - clean sands to silty sand	1.94	1.00	12
	3.77	23.6	0.33	Sands - clean sands to silty sand	1.97	1.00	12
	3.94	17.6	0.20	Sands - clean sands to silty sand	2.02	1.00	9
	4.10	18.6	0.15	Sands - clean sands to silty sand	1.97	1.00	9
	4.27	20.2	0.13	Sands - clean sands to silty sand	1.92	1.00	10
	4.43	21.2	0.33	Sands - clean sands to silty sand	2.02	1.00	11
	4.59	24.4	0.52	Sands - clean sands to silty sand	2.04	1.35	13
	4.76	29.5	0.48	Sands - clean sands to silty sand	1.95	1.00	15
	4.92	35.1	0.46	Sands - clean sands to silty sand	1.87	1.00	17
	5.09	40.1	0.74	Sands - clean sands to silty sand	1.93	1.21	20
	5.25	40.7	0.82	Sands - clean sands to silty sand	1.95	1.23	20
	5.41	38.0	0.94	Sands - clean sands to silty sand	2.01	1.31	20
	5.58	37.2	0.98	Sands - clean sands to silty sand	2.03	1.33	20
	5.74	35.6	1.04	Sands - clean sands to silty sand	2.06	1.38	19
	5.91	34.8	0.97	Sands - clean sands to silty sand	2.05	1.37	19
	6.07	35.4	0.89	Sands - clean sands to silty sand	2.02	1.32	19
	6.23	35.1	0.77	Sands - clean sands to silty sand	1.99	1.28	18
	6.40	33.3	0.71	Sands - clean sands to silty sand	2.00	1.29	17
	6.56	32.7	0.59	Sands - clean sands to silty sand	1.97	1.26	16
	6.73	33.4	0.52	Sands - clean sands to silty sand	1.95	1.23	16

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-13

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	30.5	0.39	Sands - clean sands to silty sand	1.93	1.00	14
	7.05	26.2	0.64	Sands - clean sands to silty sand	2.08	1.41	14
	7.22	27.8	0.93	Sand mixtures - silty sand to sandy silt	2.14	1.52	15
	7.38	32.3	1.20	Sand mixtures - silty sand to sandy silt	2.15	1.55	17
	7.55	35.7	1.20	Sand mixtures - silty sand to sandy silt	2.13	1.50	19
	7.71	36.4	1.11	Sand mixtures - silty sand to sandy silt	2.11	1.46	18
	7.87	35.8	1.25	Sand mixtures - silty sand to sandy silt	2.14	1.53	18
	8.04	34.8	1.17	Sand mixtures - silty sand to sandy silt	2.14	1.53	18
	8.20	35.2	1.01	Sand mixtures - silty sand to sandy silt	2.11	1.46	17
	8.37	34.8	0.98	Sand mixtures - silty sand to sandy silt	2.11	1.46	17
	8.53	36.4	0.74	Sands - clean sands to silty sand	2.04	1.34	16
	8.69	29.2	1.25	Sand mixtures - silty sand to sandy silt	2.23	1.74	15
	8.86	37.9	0.99	Sand mixtures - silty sand to sandy silt	2.10	1.44	17
	9.02	41.4	0.89	Sands - clean sands to silty sand	2.05	1.36	18
	9.19	45.9	0.84	Sands - clean sands to silty sand	2.00	1.30	19
	9.35	56.7	0.98	Sands - clean sands to silty sand	1.98	1.26	22
	9.51	69.4	0.91	Sands - clean sands to silty sand	1.90	1.18	25
	9.68	87.1	0.79	Sands - clean sands to silty sand	1.79	1.10	28
	9.84	110.0	0.89	Sands - clean sands to silty sand	1.75	1.07	34
	10.01	122.1	0.80	Sands - clean sands to silty sand	1.70	1.03	36
	10.17	132.6	1.17	Sands - clean sands to silty sand	1.78	1.09	41
	10.33	151.6	0.87	Sands - clean sands to silty sand	1.66	1.01	42
	10.50	134.6	1.05	Sands - clean sands to silty sand	1.75	1.07	40
	10.66	126.2	0.71	Sands - clean sands to silty sand	1.66	1.01	35
	10.83	121.4	0.57	Sands - clean sands to silty sand	1.62	1.00	32
	10.99	114.4	0.62	Sands - clean sands to silty sand	1.67	1.01	31
	11.15	100.9	0.62	Sands - clean sands to silty sand	1.71	1.04	28
	11.32	84.5	0.89	Sands - clean sands to silty sand	1.86	1.15	27
	11.48	85.8	1.53	Sands - clean sands to silty sand	2.01	1.30	30
	11.65	76.2	1.36	Sands - clean sands to silty sand	2.01	1.31	27
	11.81	65.4	1.12	Sands - clean sands to silty sand	2.01	1.31	23
	11.98	66.1	0.71	Sands - clean sands to silty sand	1.90	1.18	21
	12.14	65.3	0.70	Sands - clean sands to silty sand	1.90	1.18	20
	12.30	66.6	0.71	Sands - clean sands to silty sand	1.90	1.18	21
	12.47	67.8	0.71	Sands - clean sands to silty sand	1.90	1.18	21
	12.63	64.4	0.74	Sands - clean sands to silty sand	1.93	1.21	20
	12.80	57.8	0.77	Sands - clean sands to silty sand	1.98	1.27	19
	12.96	52.3	0.82	Sands - clean sands to silty sand	2.03	1.33	17
	13.12	47.8	0.92	Sand mixtures - silty sand to sandy silt	2.09	1.43	17
	13.29	46.6	1.11	Sand mixtures - silty sand to sandy silt	2.15	1.54	17
	13.45	45.9	1.07	Sand mixtures - silty sand to sandy silt	2.15	1.54	16
	13.62	41.9	0.83	Sand mixtures - silty sand to sandy silt	2.12	1.49	15
	13.78	40.1	0.93	Sand mixtures - silty sand to sandy silt	2.17	1.58	14
	13.94	40.8	0.87	Sand mixtures - silty sand to sandy silt	2.15	1.54	14
	14.11	42.3	0.83	Sand mixtures - silty sand to sandy silt	2.13	1.50	14
	14.27	42.8	0.90	Sand mixtures - silty sand to sandy silt	2.15	1.53	15
	14.44	43.6	0.93	Sand mixtures - silty sand to sandy silt	2.15	1.55	15

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-13

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	42.1	0.87	Sand mixtures - silty sand to sandy silt	2.15	1.55	14
	14.76	40.5	0.71	Sand mixtures - silty sand to sandy silt	2.12	1.49	13
	14.93	36.9	0.72	Sand mixtures - silty sand to sandy silt	2.17	1.58	12
	15.09	34.8	0.87	Sand mixtures - silty sand to sandy silt	2.23	1.73	12
	15.26	36.3	0.72	Sand mixtures - silty sand to sandy silt	2.18	1.60	12
	15.42	40.9	0.78	Sand mixtures - silty sand to sandy silt	2.15	1.54	13
	15.58	45.9	0.78	Sand mixtures - silty sand to sandy silt	2.11	1.47	14
	15.75	45.5	1.04	Sand mixtures - silty sand to sandy silt	2.18	1.62	15
	15.91	43.3	1.01	Sand mixtures - silty sand to sandy silt	2.20	1.65	14
	16.08	40.2	0.86	Sand mixtures - silty sand to sandy silt	2.19	1.64	13
	16.24	40.0	0.68	Sand mixtures - silty sand to sandy silt	2.14	1.53	12
	16.40	41.7	0.79	Sand mixtures - silty sand to sandy silt	2.16	1.57	13
	16.57	41.0	0.90	Sand mixtures - silty sand to sandy silt	2.20	1.66	13
	16.73	40.3	1.01	Sand mixtures - silty sand to sandy silt	2.24	1.76	13
	16.90	39.4	0.92	Sand mixtures - silty sand to sandy silt	2.23	1.73	13
	17.06	42.1	0.98	Sand mixtures - silty sand to sandy silt	2.22	1.71	13
	17.22	42.5	1.02	Sand mixtures - silty sand to sandy silt	2.23	1.73	13
	17.39	42.6	0.89	Sand mixtures - silty sand to sandy silt	2.20	1.65	13
	17.55	41.8	0.97	Sand mixtures - silty sand to sandy silt	2.23	1.73	13
	17.72	43.8	0.96	Sand mixtures - silty sand to sandy silt	2.21	1.68	13
	17.88	44.8	0.90	Sand mixtures - silty sand to sandy silt	2.19	1.64	13
	18.04	41.2	0.92	Sand mixtures - silty sand to sandy silt	2.23	1.73	13
	18.21	37.7	1.05	Sand mixtures - silty sand to sandy silt	2.30	1.93	12
	18.37	38.8	1.19	Sand mixtures - silty sand to sandy silt	2.32	2.00	12
	18.54	42.4	1.28	Sand mixtures - silty sand to sandy silt	2.31	1.96	13
	18.70	43.1	1.69	Sand mixtures - silty sand to sandy silt	2.38	2.20	14
	18.86	45.6	2.38	Sand mixtures - silty sand to sandy silt	2.45	2.53	16
	19.03	45.4	2.79	Silt mixtures - clayey silt to silty clay	2.50	2.86	16
	19.19	40.9	2.53	Silt mixtures - clayey silt to silty clay	2.51	3.05	14
	19.36	41.2	1.38	Sand mixtures - silty sand to sandy silt	2.35	2.11	13
	19.52	39.5	1.30	Sand mixtures - silty sand to sandy silt	2.35	2.11	12
	19.69	36.8	1.33	Sand mixtures - silty sand to sandy silt	2.39	2.25	12
	19.85	35.8	1.42	Sand mixtures - silty sand to sandy silt	2.42	2.37	11
	20.01	36.6	1.53	Sand mixtures - silty sand to sandy silt	2.43	2.43	12
	20.18	38.6	1.98	Sand mixtures - silty sand to sandy silt	2.48	2.66	13
	20.34	40.3	2.13	Sand mixtures - silty sand to sandy silt	2.49	2.69	13
	20.51	42.9	1.99	Sand mixtures - silty sand to sandy silt	2.45	2.51	14
	20.67	49.1	1.31	Sand mixtures - silty sand to sandy silt	2.29	1.91	14
	20.83	49.8	0.99	Sand mixtures - silty sand to sandy silt	2.22	1.70	14
	21.00	45.3	0.78	Sand mixtures - silty sand to sandy silt	2.20	1.66	12
	21.16	41.7	0.74	Sand mixtures - silty sand to sandy silt	2.22	1.72	11
	21.33	44.1	0.92	Sand mixtures - silty sand to sandy silt	2.25	1.80	12
	21.49	51.7	1.36	Sand mixtures - silty sand to sandy silt	2.29	1.91	14
	21.65	63.2	1.34	Sand mixtures - silty sand to sandy silt	2.22	1.70	17
	21.82	70.1	1.10	Sand mixtures - silty sand to sandy silt	2.13	1.50	17
	21.98	71.4	1.06	Sand mixtures - silty sand to sandy silt	2.11	1.47	18
	22.15	77.8	0.79	Sands - clean sands to silty sand	2.01	1.30	18

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-13

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	73.4	1.79	Sand mixtures - silty sand to sandy silt	2.25	1.80	19
	22.47	94.7	1.29	Sand mixtures - silty sand to sandy silt	2.07	1.40	22
	22.64	96.5	1.25	Sand mixtures - silty sand to sandy silt	2.06	1.37	22
	22.80	117.0	0.72	Sands - clean sands to silty sand	1.84	1.13	24
	22.97	114.6	0.62	Sands - clean sands to silty sand	1.81	1.11	23
	23.13	84.5	0.63	Sands - clean sands to silty sand	1.93	1.21	18
	23.29	61.7	0.85	Sand mixtures - silty sand to sandy silt	2.13	1.50	15
	23.46	50.9	1.07	Sand mixtures - silty sand to sandy silt	2.26	1.83	13
	23.62	49.7	1.33	Sand mixtures - silty sand to sandy silt	2.33	2.04	13
	23.79	53.1	1.34	Sand mixtures - silty sand to sandy silt	2.31	1.97	14
	23.95	56.9	1.32	Sand mixtures - silty sand to sandy silt	2.28	1.88	14
	24.11	65.0	1.06	Sand mixtures - silty sand to sandy silt	2.18	1.60	15
	24.28	69.2	1.05	Sand mixtures - silty sand to sandy silt	2.15	1.55	16
	24.44	88.9	0.85	Sands - clean sands to silty sand	2.00	1.30	19
	24.61	109.3	0.70	Sands - clean sands to silty sand	1.87	1.16	22
	24.77	110.2	0.64	Sands - clean sands to silty sand	1.85	1.14	22
	24.93	113.7	0.63	Sands - clean sands to silty sand	1.84	1.13	22
	25.10	113.7	0.69	Sands - clean sands to silty sand	1.86	1.15	22
	25.26	97.1	0.90	Sands - clean sands to silty sand	1.99	1.28	20
	25.43	82.2	1.01	Sand mixtures - silty sand to sandy silt	2.09	1.42	18
	25.59	69.3	1.24	Sand mixtures - silty sand to sandy silt	2.21	1.68	16
	25.75	66.7	1.49	Sand mixtures - silty sand to sandy silt	2.28	1.86	16
	25.92	80.7	1.72	Sand mixtures - silty sand to sandy silt	2.25	1.79	19
	26.08	87.6	1.28	Sand mixtures - silty sand to sandy silt	2.14	1.52	19
	26.25	89.4	0.99	Sands - clean sands to silty sand	2.06	1.38	19
	26.41	98.4	0.81	Sands - clean sands to silty sand	1.97	1.26	20
	26.57	88.9	0.83	Sands - clean sands to silty sand	2.02	1.32	18
	26.74	70.9	1.06	Sand mixtures - silty sand to sandy silt	2.17	1.59	16
	26.90	56.5	1.41	Sand mixtures - silty sand to sandy silt	2.34	2.07	13
	27.07	54.5	1.58	Sand mixtures - silty sand to sandy silt	2.39	2.25	13
	27.23	53.6	1.63	Sand mixtures - silty sand to sandy silt	2.40	2.31	13
	27.40	53.7	1.61	Sand mixtures - silty sand to sandy silt	2.40	2.30	13
	27.56	60.2	1.37	Sand mixtures - silty sand to sandy silt	2.32	1.99	14
	27.72	56.9	1.46	Sand mixtures - silty sand to sandy silt	2.36	2.13	13
	27.89	54.7	1.99	Sand mixtures - silty sand to sandy silt	2.46	2.56	13
	28.05	65.1	2.14	Sand mixtures - silty sand to sandy silt	2.42	2.37	15
	28.22	68.5	1.95	Sand mixtures - silty sand to sandy silt	2.37	2.19	16
	28.38	72.4	1.32	Sand mixtures - silty sand to sandy silt	2.24	1.77	16
	28.54	75.6	1.21	Sand mixtures - silty sand to sandy silt	2.20	1.66	16
	28.71	77.0	1.12	Sand mixtures - silty sand to sandy silt	2.18	1.60	16
	28.87	77.5	1.12	Sand mixtures - silty sand to sandy silt	2.18	1.60	16
	29.04	74.0	1.16	Sand mixtures - silty sand to sandy silt	2.21	1.67	15
	29.20	70.0	1.32	Sand mixtures - silty sand to sandy silt	2.26	1.83	15
	29.36	76.0	1.31	Sand mixtures - silty sand to sandy silt	2.23	1.74	16
	29.53	81.8	1.38	Sand mixtures - silty sand to sandy silt	2.22	1.71	17
	29.69	75.1	1.43	Sand mixtures - silty sand to sandy silt	2.26	1.83	16
	29.86	65.5	1.37	Sand mixtures - silty sand to sandy silt	2.31	1.96	14

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-13

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	64.4	1.51	Sand mixtures - silty sand to sandy silt	2.34	2.08	14
	30.18	63.9	1.48	Sand mixtures - silty sand to sandy silt	2.34	2.08	14
	30.35	75.7	1.59	Sand mixtures - silty sand to sandy silt	2.30	1.93	16
	30.51	72.9	1.39	Sand mixtures - silty sand to sandy silt	2.28	1.87	15
	30.68	80.1	0.79	Sand mixtures - silty sand to sandy silt	2.09	1.43	15
	30.84	72.7	0.80	Sand mixtures - silty sand to sandy silt	2.14	1.52	14
	31.00	71.7	0.89	Sand mixtures - silty sand to sandy silt	2.17	1.58	14
	31.17	71.8	1.15	Sand mixtures - silty sand to sandy silt	2.24	1.75	14
	31.33	76.2	0.95	Sand mixtures - silty sand to sandy silt	2.17	1.58	15
	31.50	77.1	0.96	Sand mixtures - silty sand to sandy silt	2.17	1.58	15
	31.66	82.7	0.82	Sand mixtures - silty sand to sandy silt	2.10	1.44	15
	31.82	85.0	0.91	Sand mixtures - silty sand to sandy silt	2.12	1.47	16
	31.99	87.9	0.98	Sand mixtures - silty sand to sandy silt	2.12	1.49	16
	32.15	84.0	0.97	Sand mixtures - silty sand to sandy silt	2.14	1.52	16
	32.32	68.7	1.36	Sand mixtures - silty sand to sandy silt	2.31	1.98	14
	32.48	58.3	1.65	Sand mixtures - silty sand to sandy silt	2.44	2.45	12
	32.64	65.5	1.28	Sand mixtures - silty sand to sandy silt	2.32	2.01	13
	32.81	70.5	1.17	Sand mixtures - silty sand to sandy silt	2.27	1.84	14
	32.97	76.5	0.91	Sand mixtures - silty sand to sandy silt	2.17	1.59	14
	33.14	75.8	0.84	Sand mixtures - silty sand to sandy silt	2.16	1.56	14
	33.30	74.4	0.82	Sand mixtures - silty sand to sandy silt	2.16	1.56	14
	33.46	73.2	0.95	Sand mixtures - silty sand to sandy silt	2.20	1.66	14
	33.63	73.6	0.91	Sand mixtures - silty sand to sandy silt	2.19	1.64	14
	33.79	73.2	0.78	Sand mixtures - silty sand to sandy silt	2.16	1.56	13
	33.96	74.7	0.63	Sand mixtures - silty sand to sandy silt	2.10	1.45	13
	34.12	76.9	0.60	Sands - clean sands to silty sand	2.08	1.41	13
	34.28	79.8	0.67	Sand mixtures - silty sand to sandy silt	2.09	1.42	14
	34.45	83.4	0.74	Sand mixtures - silty sand to sandy silt	2.10	1.44	14
	34.61	84.7	0.81	Sand mixtures - silty sand to sandy silt	2.11	1.47	15
	34.78	89.7	1.06	Sand mixtures - silty sand to sandy silt	2.16	1.57	16
	34.94	108.1	0.90	Sands - clean sands to silty sand	2.05	1.36	18
	35.10	123.7	0.84	Sands - clean sands to silty sand	1.98	1.26	20
	35.27	164.5	0.76	Sands - clean sands to silty sand	1.84	1.13	25
	35.43	187.8	0.91	Sands - clean sands to silty sand	1.84	1.13	29
	35.60	177.5	1.16	Sands - clean sands to silty sand	1.94	1.22	28
	35.76	137.6	1.47	Sand mixtures - silty sand to sandy silt	2.11	1.46	23
	35.93	116.1	1.90	Sand mixtures - silty sand to sandy silt	2.25	1.78	21
	36.09	131.8	2.39	Sand mixtures - silty sand to sandy silt	2.28	1.88	24
	36.25	235.9	1.75	Sands - clean sands to silty sand	1.98	1.27	37
	36.42	386.7	1.44	Sands - clean sands to silty sand	1.76	1.07	56
	36.58	444.6	1.37	Sands - clean sands to silty sand	1.70	1.04	63
	36.75	419.6	1.49	Sands - clean sands to silty sand	1.75	1.07	60
	36.91	413.0	1.33	Sands - clean sands to silty sand	1.72	1.04	58

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/7/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 40 feet
SOUNDING: CPT-14

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	55.9	0.25	Sands - clean sands to silty sand	1.57	1.00	22
	0.33	111.0	0.33	Sands - clean sands to silty sand	1.37	1.00	38
	0.49	102.2	0.57	Sands - clean sands to silty sand	1.53	1.00	39
	0.66	95.3	0.73	Sands - clean sands to silty sand	1.63	1.00	39
	0.82	71.7	0.88	Sands - clean sands to silty sand	1.77	1.08	32
	0.98	43.1	0.99	Sands - clean sands to silty sand	1.98	1.26	22
	1.15	33.6	0.87	Sands - clean sands to silty sand	2.03	1.34	18
	1.31	26.9	0.61	Sands - clean sands to silty sand	2.03	1.33	14
	1.48	17.6	0.02	Sands - clean sands to silty sand	2.03	1.00	9
	1.64	1.2	0.23	Sensitive, fine-grained	3.23		1
	1.80	1.2	0.23	Sensitive, fine-grained	3.20		1
	1.97	1.2	0.89	Sensitive, fine-grained	3.38		2
	2.13	14.2	0.03	Sand mixtures - silty sand to sandy silt	2.08	1.00	8
	2.30	43.0	0.36	Sands - clean sands to silty sand	1.74	1.00	19
	2.46	44.9	0.73	Sands - clean sands to silty sand	1.89	1.17	22
	2.62	46.6	0.93	Sands - clean sands to silty sand	1.94	1.22	23
	2.79	47.1	1.14	Sands - clean sands to silty sand	1.99	1.28	24
	2.95	36.1	1.39	Sand mixtures - silty sand to sandy silt	2.13	1.51	20
	3.12	26.3	1.60	Sand mixtures - silty sand to sandy silt	2.28	1.87	16
	3.28	18.9	1.79	Sand mixtures - silty sand to sandy silt	2.42	2.39	13
	3.44	15.3	1.05	Sand mixtures - silty sand to sandy silt	2.37	2.17	10
	3.61	10.3	0.57	Sand mixtures - silty sand to sandy silt	2.40	2.29	7
	3.77	5.8	0.08	Sensitive, fine-grained	2.45	2.50	4
	3.94	9.8	0.43	Sand mixtures - silty sand to sandy silt	2.37	2.19	6
	4.10	33.6	0.71	Sands - clean sands to silty sand	1.99	1.27	17
	4.27	44.0	0.98	Sands - clean sands to silty sand	1.97	1.26	22
	4.43	49.0	1.11	Sands - clean sands to silty sand	1.97	1.25	25
	4.59	53.6	1.35	Sands - clean sands to silty sand	1.99	1.28	28
	4.76	54.5	1.43	Sands - clean sands to silty sand	2.01	1.30	28
	4.92	53.4	1.37	Sands - clean sands to silty sand	2.00	1.29	28
	5.09	50.8	1.36	Sands - clean sands to silty sand	2.02	1.31	26
	5.25	41.5	1.39	Sand mixtures - silty sand to sandy silt	2.09	1.42	23
	5.41	36.3	1.37	Sand mixtures - silty sand to sandy silt	2.13	1.50	20
	5.58	38.6	1.12	Sands - clean sands to silty sand	2.05	1.37	21
	5.74	37.1	1.04	Sands - clean sands to silty sand	2.05	1.36	20
	5.91	37.4	1.42	Sand mixtures - silty sand to sandy silt	2.13	1.50	21
	6.07	46.5	1.80	Sand mixtures - silty sand to sandy silt	2.13	1.50	26
	6.23	55.8	2.00	Sand mixtures - silty sand to sandy silt	2.10	1.45	31
	6.40	60.5	2.29	Sand mixtures - silty sand to sandy silt	2.12	1.49	34
	6.56	64.0	2.21	Sand mixtures - silty sand to sandy silt	2.10	1.44	35
	6.73	61.1	2.33	Sand mixtures - silty sand to sandy silt	2.13	1.49	34

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-14

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	59.6	2.44	Sand mixtures - silty sand to sandy silt	2.15	1.54	34
	7.05	62.7	2.29	Sand mixtures - silty sand to sandy silt	2.12	1.49	34
	7.22	66.7	2.07	Sand mixtures - silty sand to sandy silt	2.08	1.41	34
	7.38	73.6	1.82	Sand mixtures - silty sand to sandy silt	2.02	1.32	35
	7.55	80.9	1.84	Sands - clean sands to silty sand	2.00	1.30	37
	7.71	77.5	2.17	Sand mixtures - silty sand to sandy silt	2.07	1.39	37
	7.87	74.9	2.40	Sand mixtures - silty sand to sandy silt	2.11	1.46	37
	8.04	74.9	2.40	Sand mixtures - silty sand to sandy silt	2.11	1.47	37
	8.20	73.4	2.07	Sand mixtures - silty sand to sandy silt	2.08	1.41	34
	8.37	69.7	1.80	Sand mixtures - silty sand to sandy silt	2.05	1.37	31
	8.53	74.5	1.68	Sands - clean sands to silty sand	2.02	1.32	32
	8.69	78.6	1.59	Sands - clean sands to silty sand	1.99	1.28	33
	8.86	78.1	1.85	Sand mixtures - silty sand to sandy silt	2.04	1.35	34
	9.02	78.7	2.07	Sand mixtures - silty sand to sandy silt	2.07	1.40	34
	9.19	82.8	2.23	Sand mixtures - silty sand to sandy silt	2.09	1.42	36
	9.35	88.4	2.22	Sand mixtures - silty sand to sandy silt	2.07	1.40	38
	9.51	90.2	2.04	Sand mixtures - silty sand to sandy silt	2.04	1.35	37
	9.68	85.2	2.18	Sand mixtures - silty sand to sandy silt	2.08	1.41	36
	9.84	86.3	2.13	Sand mixtures - silty sand to sandy silt	2.08	1.40	36
	10.01	86.1	2.13	Sand mixtures - silty sand to sandy silt	2.08	1.41	35
	10.17	88.1	1.74	Sands - clean sands to silty sand	2.01	1.31	34
	10.33	86.5	1.51	Sands - clean sands to silty sand	1.98	1.27	32
	10.50	86.2	1.40	Sands - clean sands to silty sand	1.96	1.25	31
	10.66	85.2	1.44	Sands - clean sands to silty sand	1.98	1.26	31
	10.83	84.1	1.62	Sands - clean sands to silty sand	2.02	1.32	31
	10.99	89.1	1.57	Sands - clean sands to silty sand	2.00	1.29	32
	11.15	89.6	1.71	Sand mixtures - silty sand to sandy silt	2.02	1.32	33
	11.32	88.6	1.74	Sand mixtures - silty sand to sandy silt	2.03	1.34	32
	11.48	89.7	1.71	Sand mixtures - silty sand to sandy silt	2.03	1.33	32
	11.65	92.5	1.64	Sands - clean sands to silty sand	2.01	1.30	32
	11.81	91.8	1.67	Sands - clean sands to silty sand	2.02	1.32	32
	11.98	89.2	1.79	Sand mixtures - silty sand to sandy silt	2.05	1.36	32
	12.14	87.3	1.84	Sand mixtures - silty sand to sandy silt	2.07	1.39	31
	12.30	88.4	1.82	Sand mixtures - silty sand to sandy silt	2.06	1.38	31
	12.47	90.2	1.68	Sand mixtures - silty sand to sandy silt	2.03	1.34	31
	12.63	87.1	1.52	Sands - clean sands to silty sand	2.02	1.32	29
	12.80	81.4	1.50	Sand mixtures - silty sand to sandy silt	2.04	1.35	28
	12.96	72.6	1.66	Sand mixtures - silty sand to sandy silt	2.10	1.45	26
	13.12	65.9	1.63	Sand mixtures - silty sand to sandy silt	2.13	1.51	24
	13.29	60.7	1.67	Sand mixtures - silty sand to sandy silt	2.17	1.58	22
	13.45	58.8	1.61	Sand mixtures - silty sand to sandy silt	2.17	1.59	21
	13.62	58.4	1.58	Sand mixtures - silty sand to sandy silt	2.17	1.59	21
	13.78	55.8	1.54	Sand mixtures - silty sand to sandy silt	2.18	1.61	20
	13.94	55.6	1.65	Sand mixtures - silty sand to sandy silt	2.20	1.67	20
	14.11	56.3	1.90	Sand mixtures - silty sand to sandy silt	2.24	1.77	21
	14.27	58.3	1.99	Sand mixtures - silty sand to sandy silt	2.25	1.78	21
	14.44	63.0	1.72	Sand mixtures - silty sand to sandy silt	2.18	1.62	22

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-14

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	65.7	1.61	Sand mixtures - silty sand to sandy silt	2.16	1.55	22
	14.76	72.5	1.48	Sand mixtures - silty sand to sandy silt	2.10	1.45	23
	14.93	77.2	1.35	Sand mixtures - silty sand to sandy silt	2.06	1.38	24
	15.09	66.0	1.48	Sand mixtures - silty sand to sandy silt	2.14	1.51	22
	15.26	80.3	1.01	Sands - clean sands to silty sand	1.97	1.26	23
	15.42	77.7	0.83	Sands - clean sands to silty sand	1.93	1.22	22
	15.58	74.0	0.88	Sands - clean sands to silty sand	1.97	1.25	21
	15.75	71.5	0.96	Sands - clean sands to silty sand	2.00	1.30	21
	15.91	66.2	1.13	Sand mixtures - silty sand to sandy silt	2.08	1.41	20
	16.08	59.9	1.16	Sand mixtures - silty sand to sandy silt	2.12	1.48	18
	16.24	51.4	1.36	Sand mixtures - silty sand to sandy silt	2.22	1.70	17
	16.40	59.2	1.20	Sand mixtures - silty sand to sandy silt	2.14	1.52	18
	16.57	58.6	1.10	Sand mixtures - silty sand to sandy silt	2.12	1.48	18
	16.73	59.0	1.05	Sand mixtures - silty sand to sandy silt	2.11	1.46	18
	16.90	55.2	1.09	Sand mixtures - silty sand to sandy silt	2.14	1.53	17
	17.06	53.6	1.18	Sand mixtures - silty sand to sandy silt	2.18	1.60	16
	17.22	52.8	1.27	Sand mixtures - silty sand to sandy silt	2.21	1.67	16
	17.39	51.1	1.34	Sand mixtures - silty sand to sandy silt	2.23	1.74	16
	17.55	50.1	1.19	Sand mixtures - silty sand to sandy silt	2.21	1.69	15
	17.72	49.1	1.21	Sand mixtures - silty sand to sandy silt	2.23	1.72	15
	17.88	50.3	1.06	Sand mixtures - silty sand to sandy silt	2.19	1.63	15
	18.04	51.6	0.95	Sand mixtures - silty sand to sandy silt	2.15	1.55	15
	18.21	52.3	0.90	Sand mixtures - silty sand to sandy silt	2.14	1.52	15
	18.37	51.9	0.96	Sand mixtures - silty sand to sandy silt	2.16	1.56	15
	18.54	50.2	0.99	Sand mixtures - silty sand to sandy silt	2.18	1.61	15
	18.70	38.2	1.42	Sand mixtures - silty sand to sandy silt	2.37	2.20	12
	18.86	49.4	1.14	Sand mixtures - silty sand to sandy silt	2.23	1.72	15
	19.03	48.4	1.17	Sand mixtures - silty sand to sandy silt	2.24	1.77	14
	19.19	47.8	1.20	Sand mixtures - silty sand to sandy silt	2.26	1.81	14
	19.36	47.9	1.39	Sand mixtures - silty sand to sandy silt	2.30	1.92	14
	19.52	48.1	1.52	Sand mixtures - silty sand to sandy silt	2.32	2.01	15
	19.69	48.3	1.43	Sand mixtures - silty sand to sandy silt	2.31	1.96	14
	19.85	51.4	1.50	Sand mixtures - silty sand to sandy silt	2.30	1.93	15
	20.01	54.8	1.29	Sand mixtures - silty sand to sandy silt	2.24	1.75	16
	20.18	55.5	1.10	Sand mixtures - silty sand to sandy silt	2.19	1.64	15
	20.34	59.7	0.86	Sand mixtures - silty sand to sandy silt	2.11	1.46	15
	20.51	58.6	0.93	Sand mixtures - silty sand to sandy silt	2.13	1.51	15
	20.67	56.9	1.00	Sand mixtures - silty sand to sandy silt	2.17	1.58	15
	20.83	53.6	1.19	Sand mixtures - silty sand to sandy silt	2.24	1.75	15
	21.00	52.7	1.31	Sand mixtures - silty sand to sandy silt	2.27	1.84	15
	21.16	53.0	1.38	Sand mixtures - silty sand to sandy silt	2.28	1.88	15
	21.33	53.6	1.20	Sand mixtures - silty sand to sandy silt	2.25	1.77	15
	21.49	56.5	0.97	Sand mixtures - silty sand to sandy silt	2.17	1.59	15
	21.65	58.2	0.90	Sand mixtures - silty sand to sandy silt	2.15	1.53	15
	21.82	61.5	0.86	Sand mixtures - silty sand to sandy silt	2.11	1.47	15
	21.98	68.2	0.90	Sand mixtures - silty sand to sandy silt	2.09	1.42	16
	22.15	69.5	0.97	Sand mixtures - silty sand to sandy silt	2.10	1.45	17

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-14

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	72.9	1.20	Sand mixtures - silty sand to sandy silt	2.14	1.53	18
	22.47	86.6	2.06	Sand mixtures - silty sand to sandy silt	2.24	1.77	23
	22.64	105.9	1.55	Sand mixtures - silty sand to sandy silt	2.09	1.43	25
	22.80	83.3	1.67	Sand mixtures - silty sand to sandy silt	2.20	1.65	21
	22.97	76.2	0.82	Sands - clean sands to silty sand	2.03	1.34	17
	23.13	72.3	0.87	Sands - clean sands to silty sand	2.07	1.40	17
	23.29	71.3	0.81	Sands - clean sands to silty sand	2.06	1.38	16
	23.46	69.8	0.76	Sands - clean sands to silty sand	2.06	1.37	16
	23.62	71.5	0.86	Sand mixtures - silty sand to sandy silt	2.08	1.41	16
	23.79	77.8	0.83	Sands - clean sands to silty sand	2.04	1.35	17
	23.95	84.9	0.72	Sands - clean sands to silty sand	1.97	1.26	18
	24.11	88.8	0.64	Sands - clean sands to silty sand	1.93	1.21	18
	24.28	90.8	0.54	Sands - clean sands to silty sand	1.88	1.16	18
	24.44	94.0	0.72	Sands - clean sands to silty sand	1.94	1.22	19
	24.61	88.3	1.09	Sand mixtures - silty sand to sandy silt	2.07	1.40	20
	24.77	107.0	0.95	Sands - clean sands to silty sand	1.97	1.25	22
	24.93	97.1	0.89	Sands - clean sands to silty sand	1.99	1.28	20
	25.10	87.5	0.83	Sands - clean sands to silty sand	2.01	1.30	18
	25.26	80.1	0.90	Sands - clean sands to silty sand	2.07	1.39	17
	25.43	82.6	0.96	Sands - clean sands to silty sand	2.07	1.40	18
	25.59	94.6	1.34	Sand mixtures - silty sand to sandy silt	2.12	1.48	21
	25.75	104.6	1.07	Sands - clean sands to silty sand	2.02	1.32	22
	25.92	116.2	1.04	Sands - clean sands to silty sand	1.97	1.26	23
	26.08	124.0	1.34	Sands - clean sands to silty sand	2.03	1.33	26
	26.25	122.6	1.21	Sands - clean sands to silty sand	2.00	1.30	25
	26.41	110.4	0.83	Sands - clean sands to silty sand	1.94	1.22	22
	26.57	95.8	0.93	Sands - clean sands to silty sand	2.02	1.32	19
	26.74	82.6	0.98	Sand mixtures - silty sand to sandy silt	2.09	1.43	17
	26.90	73.0	1.13	Sand mixtures - silty sand to sandy silt	2.18	1.61	16
	27.07	74.3	1.01	Sand mixtures - silty sand to sandy silt	2.15	1.53	16
	27.23	77.1	0.98	Sand mixtures - silty sand to sandy silt	2.12	1.49	16
	27.40	91.8	1.13	Sand mixtures - silty sand to sandy silt	2.10	1.45	19
	27.56	108.1	0.79	Sands - clean sands to silty sand	1.94	1.22	21
	27.72	124.4	0.91	Sands - clean sands to silty sand	1.93	1.21	23
	27.89	118.1	0.87	Sands - clean sands to silty sand	1.94	1.22	22
	28.05	121.3	0.83	Sands - clean sands to silty sand	1.91	1.20	23
	28.22	113.3	0.77	Sands - clean sands to silty sand	1.92	1.20	21
	28.38	133.3	0.91	Sands - clean sands to silty sand	1.91	1.19	24
	28.54	124.5	0.81	Sands - clean sands to silty sand	1.90	1.19	23
	28.71	91.7	1.24	Sand mixtures - silty sand to sandy silt	2.14	1.52	19
	28.87	90.4	1.65	Sand mixtures - silty sand to sandy silt	2.23	1.73	19
	29.04	137.5	1.61	Sand mixtures - silty sand to sandy silt	2.08	1.40	27
	29.20	220.5	0.88	Sands - clean sands to silty sand	1.73	1.05	36
	29.36	232.8	0.81	Sands - clean sands to silty sand	1.68	1.02	38
	29.53	238.1	0.67	Sands - clean sands to silty sand	1.62	1.00	37
	29.69	227.2	0.67	Sands - clean sands to silty sand	1.63	1.00	36
	29.86	208.9	0.39	Sands - clean sands to silty sand	1.52	1.00	31

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-14

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	215.4	0.60	Sands - clean sands to silty sand	1.62	1.00	33
	30.18	129.8	1.14	Sands - clean sands to silty sand	2.00	1.29	24
	30.35	258.1	0.65	Sands - clean sands to silty sand	1.59	1.00	39
	30.51	255.2	0.61	Sands - clean sands to silty sand	1.57	1.00	38
	30.68	187.5	0.87	Sands - clean sands to silty sand	1.79	1.09	31
	30.84	144.8	0.85	Sands - clean sands to silty sand	1.88	1.17	25
	31.00	116.2	0.93	Sands - clean sands to silty sand	1.99	1.28	21
	31.17	98.5	1.24	Sand mixtures - silty sand to sandy silt	2.14	1.52	19
	31.33	90.7	1.37	Sand mixtures - silty sand to sandy silt	2.20	1.65	18
	31.50	83.4	1.42	Sand mixtures - silty sand to sandy silt	2.24	1.77	17
	31.66	79.5	1.31	Sand mixtures - silty sand to sandy silt	2.24	1.76	16
	31.82	75.1	1.48	Sand mixtures - silty sand to sandy silt	2.30	1.93	15
	31.99	76.0	1.48	Sand mixtures - silty sand to sandy silt	2.30	1.92	15
	32.15	81.3	1.59	Sand mixtures - silty sand to sandy silt	2.29	1.91	16
	32.32	85.9	1.67	Sand mixtures - silty sand to sandy silt	2.29	1.90	17
	32.48	98.2	2.65	Sand mixtures - silty sand to sandy silt	2.38	2.23	20
	32.64	132.0	2.22	Sand mixtures - silty sand to sandy silt	2.23	1.72	25
	32.81	295.6	2.03	Sands - clean sands to silty sand	1.94	1.22	50

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/7/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 40 feet
SOUNDING: CPT-15

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	97.6	0.00	Gravelly sand to dense sand	2.15	1.00	55
	0.33	124.7	0.36	Sands - clean sands to silty sand	1.35	1.00	42
	0.49	160.2	0.64	Sands - clean sands to silty sand	1.43	1.00	57
	0.66	271.1	0.50	Gravelly sand to dense sand	1.19	1.00	83
	0.82	330.5	0.84	Sands - clean sands to silty sand	1.33	1.00	110
	0.98	399.5	1.09	Sands - clean sands to silty sand	1.39	1.00	139
	1.15	325.7	1.61	Sands - clean sands to silty sand	1.58	1.00	128
	1.31	254.3	1.98	Very stiff sand to clayey sand	1.71	1.04	109
	1.48	197.0	2.17	Very stiff sand to clayey sand	1.80	1.10	89
	1.64	157.8	2.11	Sands - clean sands to silty sand	1.84	1.13	73
	1.80	127.8	1.89	Sands - clean sands to silty sand	1.85	1.14	60
	1.97	115.4	1.59	Sands - clean sands to silty sand	1.82	1.11	53
	2.13	105.8	1.15	Sands - clean sands to silty sand	1.73	1.06	46
	2.30	102.4	0.87	Sands - clean sands to silty sand	1.66	1.00	42
	2.46	91.7	0.90	Sands - clean sands to silty sand	1.70	1.03	39
	2.62	82.2	0.89	Sands - clean sands to silty sand	1.74	1.06	36
	2.79	68.8	0.35	Sands - clean sands to silty sand	1.56	1.00	27
	2.95	61.4	0.69	Sands - clean sands to silty sand	1.76	1.07	27
	3.12	31.9	0.63	Sands - clean sands to silty sand	1.98	1.26	16
	3.28	58.0	0.33	Sands - clean sands to silty sand	1.61	1.00	23
	3.44	53.9	0.31	Sands - clean sands to silty sand	1.63	1.00	22
	3.61	47.0	0.41	Sands - clean sands to silty sand	1.73	1.00	20
	3.77	48.1	0.62	Sands - clean sands to silty sand	1.82	1.12	22
	3.94	48.3	0.60	Sands - clean sands to silty sand	1.81	1.11	22
	4.10	45.8	0.63	Sands - clean sands to silty sand	1.84	1.13	21
	4.27	47.4	1.09	Sands - clean sands to silty sand	1.97	1.26	24
	4.43	41.5	1.12	Sands - clean sands to silty sand	2.03	1.33	22
	4.59	36.0	1.10	Sand mixtures - silty sand to sandy silt	2.07	1.39	19
	4.76	34.2	0.44	Sands - clean sands to silty sand	1.87	1.00	16
	4.92	34.3	0.33	Sands - clean sands to silty sand	1.82	1.00	16
	5.09	40.8	0.63	Sands - clean sands to silty sand	1.89	1.17	20
	5.25	51.3	0.43	Sands - clean sands to silty sand	1.73	1.00	22
	5.41	50.7	0.66	Sands - clean sands to silty sand	1.82	1.11	23
	5.58	41.5	0.58	Sands - clean sands to silty sand	1.86	1.15	20
	5.74	31.4	0.86	Sands - clean sands to silty sand	2.06	1.38	17
	5.91	23.9	0.62	Sand mixtures - silty sand to sandy silt	2.09	1.42	13
	6.07	21.9	0.67	Sand mixtures - silty sand to sandy silt	2.14	1.52	12
	6.23	25.3	0.29	Sands - clean sands to silty sand	1.94	1.00	12
	6.40	36.8	0.22	Sands - clean sands to silty sand	1.77	1.00	15
	6.56	44.3	0.14	Sands - clean sands to silty sand	1.66	1.00	16
	6.73	43.9	0.12	Sands - clean sands to silty sand	1.66	1.00	15

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-15

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	38.3	0.23	Sands - clean sands to silty sand	1.78	1.00	15
	7.05	31.0	0.26	Sands - clean sands to silty sand	1.87	1.00	13
	7.22	23.4	0.47	Sands - clean sands to silty sand	2.07	1.00	12
	7.38	23.2	0.25	Sands - clean sands to silty sand	1.99	1.00	11
	7.55	24.6	0.75	Sand mixtures - silty sand to sandy silt	2.15	1.54	13
	7.71	44.3	0.74	Sands - clean sands to silty sand	1.95	1.23	19
	7.87	113.1	0.95	Sands - clean sands to silty sand	1.73	1.05	39
	8.04	194.4	0.79	Sands - clean sands to silty sand	1.53	1.00	54
	8.20	200.5	1.21	Sands - clean sands to silty sand	1.65	1.00	62
	8.37	207.3	0.88	Sands - clean sands to silty sand	1.55	1.00	58
	8.53	196.8	0.82	Sands - clean sands to silty sand	1.54	1.00	54
	8.69	181.2	0.85	Sands - clean sands to silty sand	1.58	1.00	51
	8.86	166.8	0.72	Sands - clean sands to silty sand	1.56	1.00	46
	9.02	144.6	0.61	Sands - clean sands to silty sand	1.56	1.00	39
	9.19	112.8	0.69	Sands - clean sands to silty sand	1.67	1.01	34
	9.35	86.3	0.83	Sands - clean sands to silty sand	1.80	1.10	29
	9.51	75.3	0.97	Sands - clean sands to silty sand	1.89	1.17	27
	9.68	76.2	1.03	Sands - clean sands to silty sand	1.90	1.18	27
	9.84	88.7	0.78	Sands - clean sands to silty sand	1.79	1.09	28
	10.01	114.6	0.71	Sands - clean sands to silty sand	1.69	1.02	33
	10.17	138.9	0.69	Sands - clean sands to silty sand	1.62	1.00	38
	10.33	147.6	0.63	Sands - clean sands to silty sand	1.58	1.00	38
	10.50	149.4	1.01	Sands - clean sands to silty sand	1.71	1.04	43
	10.66	131.9	1.60	Sands - clean sands to silty sand	1.89	1.17	44
	10.83	78.3	2.41	Sand mixtures - silty sand to sandy silt	2.16	1.56	33
	10.99	72.2	1.32	Sands - clean sands to silty sand	2.01	1.31	26
	11.15	74.3	0.96	Sands - clean sands to silty sand	1.92	1.20	25
	11.32	89.2	0.75	Sands - clean sands to silty sand	1.80	1.10	27
	11.48	80.7	0.94	Sands - clean sands to silty sand	1.89	1.17	26
	11.65	117.3	0.73	Sands - clean sands to silty sand	1.71	1.04	32
	11.81	118.8	0.74	Sands - clean sands to silty sand	1.71	1.04	32
	11.98	109.0	0.71	Sands - clean sands to silty sand	1.73	1.05	30
	12.14	96.7	0.64	Sands - clean sands to silty sand	1.75	1.06	27
	12.30	84.3	0.72	Sands - clean sands to silty sand	1.82	1.12	25
	12.47	72.3	0.89	Sands - clean sands to silty sand	1.93	1.21	23
	12.63	78.0	0.90	Sands - clean sands to silty sand	1.91	1.19	24
	12.80	83.1	1.20	Sands - clean sands to silty sand	1.97	1.25	27
	12.96	86.4	0.89	Sands - clean sands to silty sand	1.88	1.16	26
	13.12	100.7	0.94	Sands - clean sands to silty sand	1.85	1.14	29
	13.29	120.9	0.70	Sands - clean sands to silty sand	1.71	1.04	31
	13.45	152.0	0.68	Sands - clean sands to silty sand	1.63	1.00	36
	13.62	177.1	0.61	Sands - clean sands to silty sand	1.56	1.00	40
	13.78	169.8	0.66	Sands - clean sands to silty sand	1.59	1.00	39
	13.94	143.4	0.61	Sands - clean sands to silty sand	1.63	1.00	34
	14.11	109.2	0.70	Sands - clean sands to silty sand	1.76	1.07	28
	14.27	83.2	0.81	Sands - clean sands to silty sand	1.89	1.17	23
	14.44	65.0	1.18	Sand mixtures - silty sand to sandy silt	2.07	1.39	21

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-15

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	52.6	2.22	Sand mixtures - silty sand to sandy silt	2.32	1.99	20
	14.76	52.9	2.27	Sand mixtures - silty sand to sandy silt	2.32	2.02	20
	14.93	71.8	1.70	Sand mixtures - silty sand to sandy silt	2.15	1.53	24
	15.09	97.6	1.11	Sands - clean sands to silty sand	1.93	1.21	27
	15.26	99.0	1.06	Sands - clean sands to silty sand	1.91	1.20	27
	15.42	123.4	0.81	Sands - clean sands to silty sand	1.77	1.08	30
	15.58	130.9	0.93	Sands - clean sands to silty sand	1.79	1.10	33
	15.75	152.2	0.73	Sands - clean sands to silty sand	1.68	1.02	35
	15.91	161.7	0.83	Sands - clean sands to silty sand	1.69	1.03	37
	16.08	133.9	1.10	Sands - clean sands to silty sand	1.84	1.13	34
	16.24	126.7	1.20	Sands - clean sands to silty sand	1.88	1.17	33
	16.40	137.7	0.97	Sands - clean sands to silty sand	1.80	1.10	33
	16.57	118.1	1.09	Sands - clean sands to silty sand	1.88	1.17	30
	16.73	106.6	0.86	Sands - clean sands to silty sand	1.85	1.14	27
	16.90	90.2	0.74	Sands - clean sands to silty sand	1.87	1.16	23
	17.06	76.1	0.63	Sands - clean sands to silty sand	1.90	1.18	19
	17.22	66.4	0.68	Sands - clean sands to silty sand	1.97	1.25	18
	17.39	60.2	0.78	Sands - clean sands to silty sand	2.04	1.34	17
	17.55	60.0	0.86	Sands - clean sands to silty sand	2.07	1.39	17
	17.72	57.5	0.93	Sand mixtures - silty sand to sandy silt	2.10	1.45	16
	17.88	53.6	1.14	Sand mixtures - silty sand to sandy silt	2.18	1.61	16
	18.04	58.0	1.16	Sand mixtures - silty sand to sandy silt	2.16	1.57	17
	18.21	69.3	0.85	Sands - clean sands to silty sand	2.02	1.32	18
	18.37	71.9	0.73	Sands - clean sands to silty sand	1.97	1.25	18
	18.54	71.8	0.81	Sands - clean sands to silty sand	2.00	1.29	18
	18.70	78.4	0.85	Sands - clean sands to silty sand	1.98	1.27	20
	18.86	83.2	0.84	Sands - clean sands to silty sand	1.96	1.24	21
	19.03	84.9	0.84	Sands - clean sands to silty sand	1.95	1.24	21
	19.19	89.5	0.81	Sands - clean sands to silty sand	1.93	1.21	22
	19.36	98.5	0.79	Sands - clean sands to silty sand	1.89	1.17	23
	19.52	102.7	0.73	Sands - clean sands to silty sand	1.85	1.14	23
	19.69	94.4	0.73	Sands - clean sands to silty sand	1.89	1.17	22
	19.85	74.3	0.84	Sands - clean sands to silty sand	2.01	1.31	18
	20.01	64.1	0.94	Sand mixtures - silty sand to sandy silt	2.10	1.44	17
	20.18	59.8	1.14	Sand mixtures - silty sand to sandy silt	2.18	1.60	16
	20.34	59.6	1.09	Sand mixtures - silty sand to sandy silt	2.17	1.58	16
	20.51	57.1	1.05	Sand mixtures - silty sand to sandy silt	2.18	1.60	15
	20.67	50.7	1.11	Sand mixtures - silty sand to sandy silt	2.24	1.75	14
	20.83	45.7	1.03	Sand mixtures - silty sand to sandy silt	2.26	1.81	13
	21.00	42.5	1.42	Sand mixtures - silty sand to sandy silt	2.37	2.18	13
	21.16	39.0	2.68	Silt mixtures - clayey silt to silty clay	2.58	4.67	13
	21.33	31.5	3.46	Silt mixtures - clayey silt to silty clay	2.73		11
	21.49	36.2	2.75	Silt mixtures - clayey silt to silty clay	2.62	6.01	12
	21.65	47.5	1.40	Sand mixtures - silty sand to sandy silt	2.33	2.05	13
	21.82	58.1	1.23	Sand mixtures - silty sand to sandy silt	2.23	1.73	15
	21.98	71.1	1.06	Sand mixtures - silty sand to sandy silt	2.12	1.47	17
	22.15	78.9	1.02	Sands - clean sands to silty sand	2.07	1.39	19

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-15

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	86.6	0.87	Sands - clean sands to silty sand	1.99	1.28	20
	22.47	105.0	0.90	Sands - clean sands to silty sand	1.93	1.22	23
	22.64	138.6	1.16	Sands - clean sands to silty sand	1.91	1.19	30
	22.80	178.5	1.37	Sands - clean sands to silty sand	1.88	1.17	37
	22.97	216.9	1.19	Sands - clean sands to silty sand	1.78	1.09	43
	23.13	282.2	1.13	Sands - clean sands to silty sand	1.68	1.02	52
	23.29	228.6	1.25	Sands - clean sands to silty sand	1.78	1.09	45
	23.46	242.3	0.92	Sands - clean sands to silty sand	1.66	1.01	44
	23.62	264.3	0.80	Sands - clean sands to silty sand	1.59	1.00	46
	23.79	255.7	0.76	Sands - clean sands to silty sand	1.59	1.00	44
	23.95	248.1	0.73	Sands - clean sands to silty sand	1.59	1.00	43
	24.11	230.1	0.73	Sands - clean sands to silty sand	1.62	1.00	40
	24.28	194.9	0.83	Sands - clean sands to silty sand	1.71	1.04	36
	24.44	186.7	0.70	Sands - clean sands to silty sand	1.68	1.02	33
	24.61	177.1	0.66	Sands - clean sands to silty sand	1.68	1.02	32
	24.77	132.2	0.74	Sands - clean sands to silty sand	1.82	1.12	25
	24.93	100.6	0.91	Sands - clean sands to silty sand	1.98	1.26	21
	25.10	83.5	1.06	Sand mixtures - silty sand to sandy silt	2.09	1.43	18
	25.26	84.6	1.11	Sand mixtures - silty sand to sandy silt	2.10	1.45	19
	25.43	93.2	1.24	Sand mixtures - silty sand to sandy silt	2.10	1.45	20
	25.59	85.5	1.13	Sand mixtures - silty sand to sandy silt	2.11	1.46	19
	25.75	69.0	1.24	Sand mixtures - silty sand to sandy silt	2.21	1.69	16
	25.92	62.7	1.63	Sand mixtures - silty sand to sandy silt	2.33	2.03	15
	26.08	82.4	1.28	Sand mixtures - silty sand to sandy silt	2.16	1.57	18
	26.25	83.2	1.28	Sand mixtures - silty sand to sandy silt	2.16	1.56	18
	26.41	85.8	1.41	Sand mixtures - silty sand to sandy silt	2.18	1.60	19
	26.57	99.6	1.22	Sand mixtures - silty sand to sandy silt	2.08	1.42	21
	26.74	112.3	1.11	Sands - clean sands to silty sand	2.01	1.31	23
	26.90	133.2	1.03	Sands - clean sands to silty sand	1.93	1.21	26
	27.07	189.4	0.78	Sands - clean sands to silty sand	1.73	1.05	33
	27.23	220.0	0.68	Sands - clean sands to silty sand	1.63	1.00	36
	27.40	221.5	0.55	Sands - clean sands to silty sand	1.57	1.00	35
	27.56	182.7	0.68	Sands - clean sands to silty sand	1.70	1.04	31
	27.72	179.8	0.96	Sands - clean sands to silty sand	1.81	1.11	32
	27.89	213.6	1.18	Sands - clean sands to silty sand	1.82	1.12	38
	28.05	215.4	1.08	Sands - clean sands to silty sand	1.79	1.09	38
	28.22	177.0	0.97	Sands - clean sands to silty sand	1.82	1.12	31
	28.38	144.2	0.93	Sands - clean sands to silty sand	1.89	1.17	26
	28.54	130.0	0.96	Sands - clean sands to silty sand	1.93	1.22	24
	28.71	118.9	1.22	Sands - clean sands to silty sand	2.04	1.35	23
	28.87	115.6	1.11	Sands - clean sands to silty sand	2.02	1.32	22
	29.04	122.0	1.09	Sands - clean sands to silty sand	2.00	1.29	23
	29.20	124.6	1.18	Sands - clean sands to silty sand	2.02	1.31	24
	29.36	130.1	1.25	Sands - clean sands to silty sand	2.02	1.32	25
	29.53	142.8	1.18	Sands - clean sands to silty sand	1.97	1.26	26
	29.69	139.9	1.14	Sands - clean sands to silty sand	1.97	1.25	26
	29.86	137.1	1.02	Sands - clean sands to silty sand	1.94	1.23	25

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-15

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	134.5	0.88	Sands - clean sands to silty sand	1.91	1.19	24
	30.18	123.3	0.86	Sands - clean sands to silty sand	1.94	1.22	22
	30.35	95.2	1.19	Sand mixtures - silty sand to sandy silt	2.13	1.50	18
	30.51	121.2	0.97	Sands - clean sands to silty sand	1.98	1.27	22
	30.68	128.8	0.91	Sands - clean sands to silty sand	1.94	1.23	23
	30.84	140.2	0.81	Sands - clean sands to silty sand	1.88	1.16	24
	31.00	162.8	2.18	Sand mixtures - silty sand to sandy silt	2.14	1.51	31
	31.17	200.3	2.01	Sand mixtures - silty sand to sandy silt	2.04	1.35	37
	31.33	332.7	1.40	Sands - clean sands to silty sand	1.76	1.08	53
	31.50	320.2	1.13	Sands - clean sands to silty sand	1.70	1.04	50
	31.66	317.2	1.24	Sands - clean sands to silty sand	1.74	1.06	50
	31.82	309.3	0.81	Sands - clean sands to silty sand	1.60	1.00	46
	31.99	293.0	0.83	Sands - clean sands to silty sand	1.63	1.00	44
	32.15	280.4	0.80	Sands - clean sands to silty sand	1.64	1.00	42
	32.32	263.5	0.70	Sands - clean sands to silty sand	1.61	1.00	39
	32.48	285.5	0.63	Sands - clean sands to silty sand	1.56	1.00	41
	32.64	298.3	0.64	Sands - clean sands to silty sand	1.55	1.00	42
	32.81	322.0	0.76	Sands - clean sands to silty sand	1.57	1.00	46
	32.97	341.6	0.86	Sands - clean sands to silty sand	1.60	1.00	49
	33.14	361.3	0.62	Sands - clean sands to silty sand	1.47	1.00	49
	33.30	377.6	0.92	Sands - clean sands to silty sand	1.59	1.00	54
	33.46	350.3	0.70	Sands - clean sands to silty sand	1.52	1.00	49
	33.63	312.2	0.71	Sands - clean sands to silty sand	1.57	1.00	44
	33.79	298.8	0.57	Sands - clean sands to silty sand	1.52	1.00	41
	33.96	308.7	0.69	Sands - clean sands to silty sand	1.56	1.00	43
	34.12	296.1	1.04	Sands - clean sands to silty sand	1.71	1.04	44
	34.28	322.3	0.68	Sands - clean sands to silty sand	1.55	1.00	45
	34.45	282.6	1.07	Sands - clean sands to silty sand	1.74	1.06	42
	34.61	232.5	1.69	Sands - clean sands to silty sand	1.96	1.25	38
	34.78	169.2	2.91	Sand mixtures - silty sand to sandy silt	2.25	1.80	31
	34.94	139.6	4.11	Silt mixtures - clayey silt to silty clay	2.44	2.46	27
	35.10	113.8	4.72	Silt mixtures - clayey silt to silty clay	2.55	3.98	23
	35.27	98.9	5.54	Clays - silty clay to clay	2.66	7.71	21
	35.43	104.2	5.34	Silt mixtures - clayey silt to silty clay	2.63	6.44	22
	35.60	99.9	5.61	Clays - silty clay to clay	2.66	7.91	21
	35.76	101.8	6.37	Clays - silty clay to clay	2.70	10.15	22
	35.93	106.9	5.96	Clays - silty clay to clay	2.66	8.02	22
	36.09	100.6	6.56	Clays - silty clay to clay	2.72		21
	36.25	89.6	7.03	Clays - silty clay to clay	2.78		20
	36.42	79.5	7.73	Clays - silty clay to clay	2.85		18
	36.58	110.7	6.33	Clays - silty clay to clay	2.68	8.87	23
	36.75	124.7	6.29	Clays - silty clay to clay	2.64	6.98	25
	36.91	146.5	6.27	Very stiff, fine grained	2.59	5.08	29
	37.07	173.3	6.59	Very stiff, fine grained	2.56	4.18	34
	37.24	179.9	7.02	Very stiff, fine grained	2.57	4.60	35
	37.40	222.3	5.88	Very stiff, fine grained	2.45	2.51	41
	37.57	239.8	5.54	Very stiff, fine grained	2.41	2.33	43

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-15

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	37.73	236.0	6.10	Very stiff, fine grained	2.45	2.51	43
	37.89	235.4	6.58	Very stiff, fine grained	2.48	2.66	43
	38.06	244.4	6.73	Very stiff, fine grained	2.48	2.65	45

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/8/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 40 feet
SOUNDING: CPT-16

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	15.8	0.00	Sands - clean sands to silty sand	2.32	1.00	10
	0.33	47.1	0.00	Sands - clean sands to silty sand	1.92	1.00	23
	0.49	54.5	0.00	Sands - clean sands to silty sand	1.95	1.00	27
	0.66	49.1	0.00	Sands - clean sands to silty sand	1.99	1.00	25
	0.82	44.7	0.00	Sands - clean sands to silty sand	2.02	1.00	23
	0.98	42.1	0.00	Sands - clean sands to silty sand	2.16	1.00	24
	1.15	40.6	0.00	Sands - clean sands to silty sand	1.97	1.00	21
	1.31	39.7	0.12	Sands - clean sands to silty sand	1.62	1.00	16
	1.48	39.0	0.01	Sands - clean sands to silty sand	1.83	1.00	18
	1.64	37.8	0.01	Sands - clean sands to silty sand	1.84	1.00	18
	1.80	35.2	0.01	Sands - clean sands to silty sand	1.87	1.00	17
	1.97	32.8	0.80	Sands - clean sands to silty sand	2.02	1.32	17
	2.13	34.1	0.73	Sands - clean sands to silty sand	1.99	1.27	17
	2.30	24.3	1.05	Sand mixtures - silty sand to sandy silt	2.20	1.64	14
	2.46	31.7	0.25	Sands - clean sands to silty sand	1.81	1.00	14
	2.62	31.7	0.12	Sands - clean sands to silty sand	1.72	1.00	14
	2.79	32.9	0.32	Sands - clean sands to silty sand	1.83	1.00	15
	2.95	24.4	0.53	Sands - clean sands to silty sand	2.04	1.35	13
	3.12	34.1	0.24	Sands - clean sands to silty sand	1.77	1.00	15
	3.28	34.0	0.11	Sands - clean sands to silty sand	1.69	1.00	14
	3.44	37.4	0.14	Sands - clean sands to silty sand	1.67	1.00	16
	3.61	41.8	0.30	Sands - clean sands to silty sand	1.72	1.00	18
	3.77	45.8	0.66	Sands - clean sands to silty sand	1.85	1.14	22
	3.94	44.7	0.54	Sands - clean sands to silty sand	1.82	1.11	20
	4.10	41.3	0.52	Sands - clean sands to silty sand	1.84	1.13	19
	4.27	35.0	0.52	Sands - clean sands to silty sand	1.90	1.18	17
	4.43	28.3	0.48	Sands - clean sands to silty sand	1.96	1.00	14
	4.59	32.7	0.29	Sands - clean sands to silty sand	1.82	1.00	15
	4.76	34.1	0.33	Sands - clean sands to silty sand	1.82	1.00	16
	4.92	29.7	0.38	Sands - clean sands to silty sand	1.90	1.00	14
	5.09	35.6	0.31	Sands - clean sands to silty sand	1.80	1.00	16
	5.25	35.9	0.32	Sands - clean sands to silty sand	1.79	1.00	16
	5.41	39.9	0.28	Sands - clean sands to silty sand	1.74	1.00	17
	5.58	46.9	0.26	Sands - clean sands to silty sand	1.69	1.00	18
	5.74	49.5	0.37	Sands - clean sands to silty sand	1.73	1.00	20
	5.91	47.2	0.30	Sands - clean sands to silty sand	1.72	1.00	18
	6.07	40.9	0.27	Sands - clean sands to silty sand	1.75	1.00	16
	6.23	38.8	0.33	Sands - clean sands to silty sand	1.81	1.00	16
	6.40	41.1	0.45	Sands - clean sands to silty sand	1.84	1.00	18
	6.56	40.1	0.49	Sands - clean sands to silty sand	1.87	1.00	17
	6.73	45.5	0.46	Sands - clean sands to silty sand	1.82	1.00	19

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-16

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	45.6	0.49	Sands - clean sands to silty sand	1.84	1.00	19
	7.05	44.0	0.51	Sands - clean sands to silty sand	1.86	1.15	18
	7.22	44.7	0.42	Sands - clean sands to silty sand	1.82	1.00	18
	7.38	48.0	0.47	Sands - clean sands to silty sand	1.83	1.00	19
	7.55	45.6	0.46	Sands - clean sands to silty sand	1.84	1.00	18
	7.71	38.8	0.37	Sands - clean sands to silty sand	1.87	1.00	15
	7.87	35.3	0.35	Sands - clean sands to silty sand	1.89	1.00	14
	8.04	34.7	0.31	Sands - clean sands to silty sand	1.89	1.00	14
	8.20	31.8	0.30	Sands - clean sands to silty sand	1.92	1.00	13
	8.37	31.4	0.26	Sands - clean sands to silty sand	1.90	1.00	12
	8.53	31.7	0.22	Sands - clean sands to silty sand	1.89	1.00	12
	8.69	32.7	0.43	Sands - clean sands to silty sand	1.98	1.00	13
	8.86	32.6	0.59	Sands - clean sands to silty sand	2.04	1.35	14
	9.02	27.7	0.84	Sand mixtures - silty sand to sandy silt	2.17	1.59	13
	9.19	22.6	0.83	Sand mixtures - silty sand to sandy silt	2.24	1.77	11
	9.35	23.8	0.56	Sand mixtures - silty sand to sandy silt	2.16	1.56	11
	9.51	25.2	0.19	Sands - clean sands to silty sand	1.99	1.00	10
	9.68	28.0	0.30	Sands - clean sands to silty sand	2.01	1.00	11
	9.84	31.9	0.26	Sands - clean sands to silty sand	1.94	1.00	12
	10.01	33.6	0.36	Sands - clean sands to silty sand	1.97	1.00	13
	10.17	33.2	0.41	Sands - clean sands to silty sand	2.00	1.00	13
	10.33	34.1	0.41	Sands - clean sands to silty sand	1.99	1.00	13
	10.50	31.6	0.38	Sands - clean sands to silty sand	2.01	1.00	12
	10.66	30.1	0.27	Sands - clean sands to silty sand	1.98	1.00	11
	10.83	28.5	0.29	Sands - clean sands to silty sand	2.02	1.00	11
	10.99	31.0	0.22	Sands - clean sands to silty sand	1.95	1.00	11
	11.15	33.6	0.23	Sands - clean sands to silty sand	1.93	1.00	11
	11.32	33.7	0.34	Sands - clean sands to silty sand	1.99	1.00	12
	11.48	41.3	0.31	Sands - clean sands to silty sand	1.90	1.00	13
	11.65	40.5	0.33	Sands - clean sands to silty sand	1.92	1.00	13
	11.81	42.4	0.43	Sands - clean sands to silty sand	1.95	1.00	14
	11.98	46.8	0.46	Sands - clean sands to silty sand	1.93	1.00	15
	12.14	48.8	0.56	Sands - clean sands to silty sand	1.95	1.24	16
	12.30	52.5	0.47	Sands - clean sands to silty sand	1.90	1.00	16
	12.47	54.0	0.43	Sands - clean sands to silty sand	1.87	1.00	16
	12.63	49.9	0.49	Sands - clean sands to silty sand	1.93	1.00	16
	12.80	48.9	0.54	Sands - clean sands to silty sand	1.96	1.25	16
	12.96	48.6	0.55	Sands - clean sands to silty sand	1.97	1.25	15
	13.12	49.9	0.51	Sands - clean sands to silty sand	1.95	1.23	15
	13.29	48.5	0.49	Sands - clean sands to silty sand	1.96	1.24	15
	13.45	47.6	0.52	Sands - clean sands to silty sand	1.97	1.26	15
	13.62	48.7	0.62	Sands - clean sands to silty sand	2.00	1.30	15
	13.78	49.0	0.62	Sands - clean sands to silty sand	2.01	1.30	15
	13.94	49.6	0.60	Sands - clean sands to silty sand	2.00	1.29	15
	14.11	52.9	0.49	Sands - clean sands to silty sand	1.94	1.22	16
	14.27	58.9	0.39	Sands - clean sands to silty sand	1.85	1.00	16
	14.44	60.2	0.37	Sands - clean sands to silty sand	1.84	1.00	16

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-16

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	55.4	0.40	Sands - clean sands to silty sand	1.89	1.00	15
	14.76	51.0	0.43	Sands - clean sands to silty sand	1.93	1.00	15
	14.93	51.6	0.49	Sands - clean sands to silty sand	1.96	1.00	15
	15.09	54.6	0.50	Sands - clean sands to silty sand	1.94	1.22	15
	15.26	57.1	0.56	Sands - clean sands to silty sand	1.95	1.24	16
	15.42	59.4	0.58	Sands - clean sands to silty sand	1.95	1.23	17
	15.58	55.3	0.59	Sands - clean sands to silty sand	1.98	1.27	16
	15.75	49.6	0.59	Sands - clean sands to silty sand	2.02	1.32	14
	15.91	48.9	0.55	Sands - clean sands to silty sand	2.02	1.32	14
	16.08	46.8	0.64	Sands - clean sands to silty sand	2.07	1.39	14
	16.24	47.1	0.65	Sands - clean sands to silty sand	2.07	1.40	14
	16.40	45.6	0.69	Sand mixtures - silty sand to sandy silt	2.10	1.44	14
	16.57	43.6	0.56	Sands - clean sands to silty sand	2.08	1.41	13
	16.73	43.7	0.51	Sands - clean sands to silty sand	2.06	1.38	13
	16.90	45.8	0.42	Sands - clean sands to silty sand	2.01	1.00	13
	17.06	46.7	0.62	Sands - clean sands to silty sand	2.08	1.41	13
	17.22	43.7	0.78	Sand mixtures - silty sand to sandy silt	2.16	1.55	13
	17.39	45.0	1.06	Sand mixtures - silty sand to sandy silt	2.22	1.71	14
	17.55	55.9	0.98	Sand mixtures - silty sand to sandy silt	2.12	1.49	16
	17.72	71.8	0.81	Sands - clean sands to silty sand	1.99	1.28	19
	17.88	70.6	0.58	Sands - clean sands to silty sand	1.92	1.20	18
	18.04	73.8	0.57	Sands - clean sands to silty sand	1.90	1.18	18
	18.21	66.2	0.44	Sands - clean sands to silty sand	1.89	1.00	16
	18.37	55.6	0.37	Sands - clean sands to silty sand	1.93	1.00	14
	18.54	51.3	0.39	Sands - clean sands to silty sand	1.97	1.00	13
	18.70	47.8	0.48	Sands - clean sands to silty sand	2.04	1.00	13
	18.86	48.1	0.45	Sands - clean sands to silty sand	2.03	1.00	13
	19.03	49.2	0.51	Sands - clean sands to silty sand	2.05	1.36	13
	19.19	44.2	0.92	Sand mixtures - silty sand to sandy silt	2.22	1.71	13
	19.36	38.9	1.46	Sand mixtures - silty sand to sandy silt	2.39	2.24	12
	19.52	38.2	1.98	Sand mixtures - silty sand to sandy silt	2.47	2.63	13
	19.69	46.1	1.47	Sand mixtures - silty sand to sandy silt	2.33	2.03	14
	19.85	49.4	1.16	Sand mixtures - silty sand to sandy silt	2.25	1.78	14
	20.01	50.7	0.99	Sand mixtures - silty sand to sandy silt	2.20	1.65	14
	20.18	48.1	1.21	Sand mixtures - silty sand to sandy silt	2.27	1.84	14
	20.34	41.7	1.61	Sand mixtures - silty sand to sandy silt	2.40	2.29	13
	20.51	43.3	1.21	Sand mixtures - silty sand to sandy silt	2.31	1.98	13
	20.67	48.7	0.74	Sand mixtures - silty sand to sandy silt	2.16	1.55	13
	20.83	50.9	0.49	Sands - clean sands to silty sand	2.05	1.37	13
	21.00	51.0	0.74	Sand mixtures - silty sand to sandy silt	2.14	1.53	13
	21.16	69.5	0.57	Sands - clean sands to silty sand	1.96	1.25	16
	21.33	107.8	0.62	Sands - clean sands to silty sand	1.82	1.11	23
	21.49	122.5	0.59	Sands - clean sands to silty sand	1.76	1.07	25
	21.65	90.2	0.68	Sands - clean sands to silty sand	1.91	1.19	20
	21.82	83.8	0.47	Sands - clean sands to silty sand	1.86	1.00	18
	21.98	81.2	0.45	Sands - clean sands to silty sand	1.86	1.00	17
	22.15	65.8	0.50	Sands - clean sands to silty sand	1.97	1.26	15

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-16

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	53.8	0.65	Sand mixtures - silty sand to sandy silt	2.11	1.46	13
	22.47	49.7	0.63	Sand mixtures - silty sand to sandy silt	2.14	1.52	12
	22.64	48.6	0.65	Sand mixtures - silty sand to sandy silt	2.15	1.55	12
	22.80	47.6	0.75	Sand mixtures - silty sand to sandy silt	2.20	1.65	12
	22.97	44.0	0.78	Sand mixtures - silty sand to sandy silt	2.24	1.75	11
	23.13	42.2	1.15	Sand mixtures - silty sand to sandy silt	2.35	2.11	11
	23.29	41.7	1.06	Sand mixtures - silty sand to sandy silt	2.34	2.06	11
	23.46	41.0	0.92	Sand mixtures - silty sand to sandy silt	2.31	1.98	11
	23.62	41.5	0.69	Sand mixtures - silty sand to sandy silt	2.25	1.78	10
	23.79	42.6	1.56	Sand mixtures - silty sand to sandy silt	2.43	2.44	12
	23.95	42.4	1.34	Sand mixtures - silty sand to sandy silt	2.40	2.29	11
	24.11	32.2	1.84	Silt mixtures - clayey silt to silty clay	2.59	5.11	10
	24.28	27.5	1.87	Silt mixtures - clayey silt to silty clay	2.66	7.98	8
	24.44	26.4	1.98	Silt mixtures - clayey silt to silty clay	2.69	9.84	8
	24.61	28.3	2.14	Silt mixtures - clayey silt to silty clay	2.69	9.55	9
	24.77	30.4	1.59	Silt mixtures - clayey silt to silty clay	2.59	4.96	9
	24.93	35.3	1.06	Sand mixtures - silty sand to sandy silt	2.43	2.42	9
	25.10	42.0	0.81	Sand mixtures - silty sand to sandy silt	2.30	1.93	10
	25.26	43.6	1.26	Sand mixtures - silty sand to sandy silt	2.39	2.26	11
	25.43	40.7	1.90	Silt mixtures - clayey silt to silty clay	2.53	3.37	11
	25.59	59.5	1.28	Sand mixtures - silty sand to sandy silt	2.28	1.86	14
	25.75	77.0	0.71	Sands - clean sands to silty sand	2.03	1.33	16
	25.92	93.0	0.64	Sands - clean sands to silty sand	1.93	1.21	18
	26.08	113.0	0.64	Sands - clean sands to silty sand	1.85	1.14	21
	26.25	128.2	0.72	Sands - clean sands to silty sand	1.84	1.13	24
	26.41	134.6	0.74	Sands - clean sands to silty sand	1.83	1.12	25
	26.57	135.1	0.79	Sands - clean sands to silty sand	1.85	1.14	25
	26.74	127.3	0.81	Sands - clean sands to silty sand	1.88	1.16	24
	26.90	126.2	0.74	Sands - clean sands to silty sand	1.86	1.15	23
	27.07	142.7	0.70	Sands - clean sands to silty sand	1.80	1.10	26
	27.23	155.3	0.74	Sands - clean sands to silty sand	1.78	1.09	28
	27.40	172.7	0.82	Sands - clean sands to silty sand	1.78	1.09	30
	27.56	188.1	0.72	Sands - clean sands to silty sand	1.71	1.04	32
	27.72	213.8	0.78	Sands - clean sands to silty sand	1.69	1.03	36
	27.89	253.6	0.70	Sands - clean sands to silty sand	1.60	1.00	40
	28.05	322.7	0.61	Sands - clean sands to silty sand	1.47	1.00	48
	28.22	346.1	1.09	Sands - clean sands to silty sand	1.65	1.00	56
	28.38	358.8	0.93	Sands - clean sands to silty sand	1.58	1.00	56
	28.54	348.1	0.78	Sands - clean sands to silty sand	1.53	1.00	53
	28.71	346.4	0.97	Sands - clean sands to silty sand	1.61	1.00	55
	28.87	310.7	1.61	Sands - clean sands to silty sand	1.82	1.11	54
	29.04	298.8	1.51	Sands - clean sands to silty sand	1.81	1.11	52
	29.20	421.8	1.59	Sands - clean sands to silty sand	1.73	1.05	70
	29.36	328.6	1.74	Sands - clean sands to silty sand	1.84	1.13	57
	29.53	252.1	2.17	Sand mixtures - silty sand to sandy silt	1.99	1.28	47
	29.69	237.8	1.44	Sands - clean sands to silty sand	1.87	1.15	41
	29.86	210.6	1.33	Sands - clean sands to silty sand	1.88	1.16	37

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-16

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	196.2	0.98	Sands - clean sands to silty sand	1.81	1.10	33
	30.18	199.9	0.86	Sands - clean sands to silty sand	1.76	1.07	33
	30.35	238.6	0.79	Sands - clean sands to silty sand	1.67	1.02	38
	30.51	260.2	0.83	Sands - clean sands to silty sand	1.66	1.01	41
	30.68	285.2	0.92	Sands - clean sands to silty sand	1.66	1.01	44
	30.84	272.2	0.91	Sands - clean sands to silty sand	1.68	1.02	42
	31.00	266.7	0.98	Sands - clean sands to silty sand	1.71	1.04	42
	31.17	260.0	0.97	Sands - clean sands to silty sand	1.72	1.04	41
	31.33	257.4	0.83	Sands - clean sands to silty sand	1.67	1.01	40
	31.50	244.2	0.99	Sands - clean sands to silty sand	1.74	1.06	39
	31.66	277.3	1.00	Sands - clean sands to silty sand	1.71	1.04	43
	31.82	320.3	0.85	Sands - clean sands to silty sand	1.61	1.00	48
	31.99	271.1	1.00	Sands - clean sands to silty sand	1.72	1.04	42
	32.15	246.9	1.25	Sands - clean sands to silty sand	1.82	1.12	40
	32.32	219.6	1.83	Sands - clean sands to silty sand	1.99	1.28	38
	32.48	202.8	2.85	Sand mixtures - silty sand to sandy silt	2.17	1.59	38
	32.64	198.9	3.30	Sand mixtures - silty sand to sandy silt	2.23	1.74	38
	32.81	160.6	4.36	Very stiff, fine grained	2.40	2.29	33
	32.97	133.6	5.79	Very stiff, fine grained	2.56	4.06	29
	33.14	139.5	6.34	Very stiff, fine grained	2.58	4.67	31
	33.30	198.2	6.19	Very stiff, fine grained	2.47	2.61	41
	33.46	223.4	6.16	Very stiff, fine grained	2.44	2.46	46
	33.63	315.9	4.37	Very stiff, fine grained	2.22	1.70	59

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT:	Sterling Ranch Estates	CONE/RIG:	DDG1281
DATE/TIME:	12/8/2017 0:00	ASSUMED DEPTH OF WATER TABLE:	40 feet
PROJECT NO.:	17-1245A-4	SOUNDING:	CPT-17

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	36.4	0.11	Sands - clean sands to silty sand	1.65	1.00	15
	0.33	142.9	0.47	Sands - clean sands to silty sand	1.37	1.00	49
	0.49	208.4	0.92	Sands - clean sands to silty sand	1.47	1.00	76
	0.66	202.2	1.20	Sands - clean sands to silty sand	1.57	1.00	79
	0.82	152.8	1.41	Sands - clean sands to silty sand	1.70	1.03	65
	0.98	122.0	1.54	Sands - clean sands to silty sand	1.79	1.09	55
	1.15	99.7	1.89	Sands - clean sands to silty sand	1.91	1.20	49
	1.31	81.0	1.91	Sands - clean sands to silty sand	1.98	1.26	41
	1.48	64.0	1.54	Sands - clean sands to silty sand	1.98	1.26	33
	1.64	51.9	1.32	Sands - clean sands to silty sand	2.00	1.29	27
	1.80	40.3	1.47	Sand mixtures - silty sand to sandy silt	2.11	1.46	22
	1.97	37.3	1.30	Sand mixtures - silty sand to sandy silt	2.10	1.45	21
	2.13	33.5	1.20	Sand mixtures - silty sand to sandy silt	2.12	1.48	19
	2.30	31.3	1.30	Sand mixtures - silty sand to sandy silt	2.16	1.57	18
	2.46	32.6	1.26	Sand mixtures - silty sand to sandy silt	2.14	1.52	18
	2.62	32.7	0.98	Sand mixtures - silty sand to sandy silt	2.07	1.40	18
	2.79	33.8	0.71	Sands - clean sands to silty sand	1.98	1.27	17
	2.95	35.3	0.82	Sands - clean sands to silty sand	2.00	1.29	18
	3.12	40.6	0.97	Sands - clean sands to silty sand	1.99	1.29	21
	3.28	42.3	1.27	Sand mixtures - silty sand to sandy silt	2.06	1.37	23
	3.44	38.5	1.34	Sand mixtures - silty sand to sandy silt	2.10	1.45	21
	3.61	39.4	1.30	Sand mixtures - silty sand to sandy silt	2.09	1.42	21
	3.77	38.0	1.48	Sand mixtures - silty sand to sandy silt	2.13	1.51	21
	3.94	40.0	1.64	Sand mixtures - silty sand to sandy silt	2.15	1.53	23
	4.10	39.3	1.79	Sand mixtures - silty sand to sandy silt	2.18	1.60	23
	4.27	37.0	1.93	Sand mixtures - silty sand to sandy silt	2.22	1.71	22
	4.43	33.1	1.45	Sand mixtures - silty sand to sandy silt	2.18	1.60	19
	4.59	26.3	1.28	Sand mixtures - silty sand to sandy silt	2.22	1.71	16
	4.76	17.9	0.79	Sand mixtures - silty sand to sandy silt	2.25	1.79	11
	4.92	18.4	0.70	Sand mixtures - silty sand to sandy silt	2.21	1.69	11
	5.09	18.3	1.00	Sand mixtures - silty sand to sandy silt	2.29	1.91	11
	5.25	28.4	1.21	Sand mixtures - silty sand to sandy silt	2.18	1.61	16
	5.41	41.5	1.45	Sand mixtures - silty sand to sandy silt	2.10	1.44	23
	5.58	53.2	1.61	Sand mixtures - silty sand to sandy silt	2.05	1.36	28
	5.74	56.4	1.87	Sand mixtures - silty sand to sandy silt	2.08	1.41	31
	5.91	50.2	2.32	Sand mixtures - silty sand to sandy silt	2.18	1.61	29
	6.07	41.1	2.55	Sand mixtures - silty sand to sandy silt	2.27	1.85	25
	6.23	45.7	2.30	Sand mixtures - silty sand to sandy silt	2.21	1.68	27
	6.40	66.4	1.52	Sands - clean sands to silty sand	1.97	1.26	33
	6.56	82.2	1.46	Sands - clean sands to silty sand	1.91	1.19	37
	6.73	87.5	1.46	Sands - clean sands to silty sand	1.90	1.18	39

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-17

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	98.9	1.50	Sands - clean sands to silty sand	1.88	1.16	42
	7.05	117.3	1.47	Sands - clean sands to silty sand	1.83	1.12	47
	7.22	131.2	1.30	Sands - clean sands to silty sand	1.76	1.08	49
	7.38	131.0	1.08	Sands - clean sands to silty sand	1.72	1.04	46
	7.55	110.8	1.77	Sands - clean sands to silty sand	1.91	1.19	46
	7.71	106.4	1.70	Sands - clean sands to silty sand	1.91	1.19	44
	7.87	94.3	1.61	Sands - clean sands to silty sand	1.93	1.21	39
	8.04	103.2	1.18	Sands - clean sands to silty sand	1.82	1.11	38
	8.20	89.6	1.30	Sands - clean sands to silty sand	1.89	1.17	35
	8.37	108.6	0.86	Sands - clean sands to silty sand	1.72	1.05	36
	8.53	89.9	0.98	Sands - clean sands to silty sand	1.82	1.11	32
	8.69	84.0	1.27	Sands - clean sands to silty sand	1.91	1.19	32
	8.86	83.6	1.52	Sands - clean sands to silty sand	1.97	1.25	33
	9.02	87.1	1.33	Sands - clean sands to silty sand	1.92	1.20	33
	9.19	83.6	1.04	Sands - clean sands to silty sand	1.87	1.15	30
	9.35	79.2	0.99	Sands - clean sands to silty sand	1.87	1.16	28
	9.51	74.6	1.18	Sands - clean sands to silty sand	1.94	1.22	28
	9.68	65.9	1.20	Sands - clean sands to silty sand	1.99	1.27	25
	9.84	59.5	1.06	Sands - clean sands to silty sand	1.99	1.28	23
	10.01	60.9	1.07	Sands - clean sands to silty sand	1.99	1.28	23
	10.17	66.2	1.30	Sands - clean sands to silty sand	2.02	1.31	25
	10.33	76.8	1.07	Sands - clean sands to silty sand	1.92	1.20	27
	10.50	67.6	0.92	Sands - clean sands to silty sand	1.93	1.21	24
	10.66	53.8	0.95	Sands - clean sands to silty sand	2.01	1.31	20
	10.83	46.9	1.21	Sand mixtures - silty sand to sandy silt	2.12	1.48	19
	10.99	44.9	1.55	Sand mixtures - silty sand to sandy silt	2.20	1.66	19
	11.15	50.4	1.32	Sand mixtures - silty sand to sandy silt	2.13	1.49	20
	11.32	57.2	1.20	Sand mixtures - silty sand to sandy silt	2.06	1.39	21
	11.48	56.4	1.47	Sand mixtures - silty sand to sandy silt	2.13	1.49	22
	11.65	53.0	1.61	Sand mixtures - silty sand to sandy silt	2.17	1.59	21
	11.81	47.1	1.72	Sand mixtures - silty sand to sandy silt	2.23	1.73	20
	11.98	50.8	1.47	Sand mixtures - silty sand to sandy silt	2.17	1.58	20
	12.14	60.7	1.23	Sand mixtures - silty sand to sandy silt	2.07	1.39	22
	12.30	80.7	0.87	Sands - clean sands to silty sand	1.89	1.17	25
	12.47	84.7	0.60	Sands - clean sands to silty sand	1.78	1.09	24
	12.63	72.1	0.65	Sands - clean sands to silty sand	1.86	1.15	21
	12.80	73.1	0.82	Sands - clean sands to silty sand	1.91	1.19	22
	12.96	67.6	1.09	Sands - clean sands to silty sand	2.01	1.31	22
	13.12	51.6	1.48	Sand mixtures - silty sand to sandy silt	2.19	1.62	19
	13.29	52.9	1.42	Sand mixtures - silty sand to sandy silt	2.17	1.59	19
	13.45	76.4	1.36	Sands - clean sands to silty sand	2.04	1.35	25
	13.62	100.1	1.00	Sands - clean sands to silty sand	1.87	1.16	29
	13.78	101.4	0.56	Sands - clean sands to silty sand	1.72	1.05	26
	13.94	85.2	0.49	Sands - clean sands to silty sand	1.75	1.00	22
	14.11	75.6	0.63	Sands - clean sands to silty sand	1.86	1.15	21
	14.27	67.0	0.88	Sands - clean sands to silty sand	1.98	1.27	20
	14.44	67.0	1.27	Sand mixtures - silty sand to sandy silt	2.08	1.41	22

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-17

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	71.0	1.25	Sand mixtures - silty sand to sandy silt	2.06	1.38	22
	14.76	79.3	1.35	Sands - clean sands to silty sand	2.05	1.36	25
	14.93	80.4	1.12	Sands - clean sands to silty sand	1.99	1.28	24
	15.09	71.9	1.31	Sand mixtures - silty sand to sandy silt	2.07	1.40	22
	15.26	61.5	1.30	Sand mixtures - silty sand to sandy silt	2.13	1.50	20
	15.42	72.8	1.30	Sand mixtures - silty sand to sandy silt	2.07	1.40	22
	15.58	82.6	1.22	Sands - clean sands to silty sand	2.02	1.31	24
	15.75	91.2	1.04	Sands - clean sands to silty sand	1.94	1.22	25
	15.91	112.4	0.83	Sands - clean sands to silty sand	1.82	1.11	28
	16.08	124.7	0.80	Sands - clean sands to silty sand	1.77	1.08	30
	16.24	137.5	0.80	Sands - clean sands to silty sand	1.74	1.06	32
	16.40	149.7	0.75	Sands - clean sands to silty sand	1.70	1.03	34
	16.57	151.6	0.83	Sands - clean sands to silty sand	1.72	1.05	35
	16.73	169.7	0.73	Sands - clean sands to silty sand	1.65	1.00	37
	16.90	166.0	0.60	Sands - clean sands to silty sand	1.61	1.00	35
	17.06	130.5	0.55	Sands - clean sands to silty sand	1.67	1.01	28
	17.22	106.1	0.66	Sands - clean sands to silty sand	1.79	1.09	25
	17.39	84.8	1.15	Sands - clean sands to silty sand	2.02	1.31	23
	17.55	67.6	1.86	Sand mixtures - silty sand to sandy silt	2.23	1.74	21
	17.72	58.2	2.10	Sand mixtures - silty sand to sandy silt	2.32	2.00	19
	17.88	49.1	2.06	Sand mixtures - silty sand to sandy silt	2.37	2.18	17
	18.04	55.9	1.48	Sand mixtures - silty sand to sandy silt	2.24	1.75	17
	18.21	56.0	1.42	Sand mixtures - silty sand to sandy silt	2.23	1.73	17
	18.37	47.4	2.15	Sand mixtures - silty sand to sandy silt	2.40	2.31	16
	18.54	48.3	2.35	Sand mixtures - silty sand to sandy silt	2.43	2.40	16
	18.70	63.6	1.82	Sand mixtures - silty sand to sandy silt	2.26	1.82	19
	18.86	84.5	1.26	Sand mixtures - silty sand to sandy silt	2.06	1.38	22
	19.03	88.0	1.19	Sands - clean sands to silty sand	2.03	1.34	23
	19.19	110.5	1.02	Sands - clean sands to silty sand	1.92	1.20	26
	19.36	127.9	0.96	Sands - clean sands to silty sand	1.85	1.14	29
	19.52	104.4	1.06	Sands - clean sands to silty sand	1.95	1.23	25
	19.69	79.8	1.28	Sand mixtures - silty sand to sandy silt	2.10	1.44	21
	19.85	66.0	1.58	Sand mixtures - silty sand to sandy silt	2.22	1.72	19
	20.01	64.1	1.67	Sand mixtures - silty sand to sandy silt	2.25	1.79	18
	20.18	65.8	1.33	Sand mixtures - silty sand to sandy silt	2.18	1.61	18
	20.34	64.4	1.01	Sand mixtures - silty sand to sandy silt	2.12	1.48	17
	20.51	64.4	0.80	Sands - clean sands to silty sand	2.06	1.38	16
	20.67	62.0	0.80	Sands - clean sands to silty sand	2.08	1.41	16
	20.83	51.2	0.95	Sand mixtures - silty sand to sandy silt	2.20	1.65	14
	21.00	39.5	1.75	Sand mixtures - silty sand to sandy silt	2.45	2.52	12
	21.16	36.4	2.76	Silt mixtures - clayey silt to silty clay	2.61	5.80	12
	21.33	49.1	2.05	Sand mixtures - silty sand to sandy silt	2.42	2.39	15
	21.49	43.9	1.81	Sand mixtures - silty sand to sandy silt	2.43	2.43	13
	21.65	34.0	2.23	Silt mixtures - clayey silt to silty clay	2.58	4.86	11
	21.82	23.4	3.52	Clays - silty clay to clay	2.85		9
	21.98	23.4	3.60	Clays - silty clay to clay	2.86		9
	22.15	32.0	2.39	Silt mixtures - clayey silt to silty clay	2.63	6.69	11

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-17

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	30.7	2.29	Silt mixtures - clayey silt to silty clay	2.64	6.99	10
	22.47	30.6	2.14	Silt mixtures - clayey silt to silty clay	2.63	6.41	10
	22.64	36.7	2.27	Silt mixtures - clayey silt to silty clay	2.57	4.60	11
	22.80	55.7	1.88	Sand mixtures - silty sand to sandy silt	2.37	2.19	15
	22.97	66.0	1.79	Sand mixtures - silty sand to sandy silt	2.30	1.94	17
	23.13	83.6	1.44	Sand mixtures - silty sand to sandy silt	2.16	1.55	20
	23.29	103.8	1.26	Sands - clean sands to silty sand	2.04	1.35	23
	23.46	111.6	1.37	Sands - clean sands to silty sand	2.04	1.35	25
	23.62	120.9	1.43	Sands - clean sands to silty sand	2.03	1.34	27
	23.79	127.9	1.48	Sands - clean sands to silty sand	2.02	1.33	28
	23.95	116.4	1.64	Sand mixtures - silty sand to sandy silt	2.09	1.43	26
	24.11	104.7	1.66	Sand mixtures - silty sand to sandy silt	2.13	1.50	24
	24.28	93.8	1.65	Sand mixtures - silty sand to sandy silt	2.17	1.58	22
	24.44	83.9	1.80	Sand mixtures - silty sand to sandy silt	2.23	1.74	20
	24.61	80.0	1.92	Sand mixtures - silty sand to sandy silt	2.27	1.85	20
	24.77	95.1	1.84	Sand mixtures - silty sand to sandy silt	2.20	1.66	22
	24.93	106.6	1.78	Sand mixtures - silty sand to sandy silt	2.15	1.55	24
	25.10	113.4	1.79	Sand mixtures - silty sand to sandy silt	2.14	1.52	26
	25.26	126.7	1.62	Sand mixtures - silty sand to sandy silt	2.07	1.39	27
	25.43	127.8	1.43	Sands - clean sands to silty sand	2.03	1.33	27
	25.59	120.4	1.51	Sand mixtures - silty sand to sandy silt	2.07	1.39	26
	25.75	140.6	1.33	Sands - clean sands to silty sand	1.98	1.27	29
	25.92	158.4	1.18	Sands - clean sands to silty sand	1.90	1.18	31
	26.08	154.1	1.15	Sands - clean sands to silty sand	1.91	1.19	30
	26.25	147.5	1.17	Sands - clean sands to silty sand	1.93	1.21	29
	26.41	143.8	1.32	Sands - clean sands to silty sand	1.97	1.26	29
	26.57	149.1	1.24	Sands - clean sands to silty sand	1.95	1.23	29
	26.74	150.2	1.24	Sands - clean sands to silty sand	1.94	1.23	29
	26.90	147.1	1.14	Sands - clean sands to silty sand	1.93	1.21	28
	27.07	131.7	1.10	Sands - clean sands to silty sand	1.96	1.24	26
	27.23	118.0	0.97	Sands - clean sands to silty sand	1.96	1.24	23
	27.40	105.5	0.90	Sands - clean sands to silty sand	1.98	1.27	21
	27.56	106.3	1.01	Sands - clean sands to silty sand	2.01	1.31	21
	27.72	146.4	0.95	Sands - clean sands to silty sand	1.88	1.16	27
	27.89	192.6	0.83	Sands - clean sands to silty sand	1.75	1.06	33
	28.05	240.0	0.66	Sands - clean sands to silty sand	1.60	1.00	38
	28.22	248.3	0.81	Sands - clean sands to silty sand	1.65	1.00	40
	28.38	255.1	0.90	Sands - clean sands to silty sand	1.68	1.02	42
	28.54	273.0	0.89	Sands - clean sands to silty sand	1.65	1.00	44
	28.71	290.6	0.82	Sands - clean sands to silty sand	1.61	1.00	46
	28.87	292.0	0.87	Sands - clean sands to silty sand	1.62	1.00	46
	29.04	318.7	0.80	Sands - clean sands to silty sand	1.57	1.00	49
	29.20	313.6	0.84	Sands - clean sands to silty sand	1.59	1.00	49
	29.36	320.6	0.70	Sands - clean sands to silty sand	1.53	1.00	48
	29.53	293.4	0.83	Sands - clean sands to silty sand	1.61	1.00	46
	29.69	260.1	0.81	Sands - clean sands to silty sand	1.65	1.00	41
	29.86	236.6	0.79	Sands - clean sands to silty sand	1.67	1.01	38

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-17

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	199.2	0.65	Sands - clean sands to silty sand	1.68	1.02	32
	30.18	183.0	0.56	Sands - clean sands to silty sand	1.67	1.01	29
	30.35	157.9	0.64	Sands - clean sands to silty sand	1.76	1.07	26
	30.51	153.8	0.52	Sands - clean sands to silty sand	1.72	1.05	25
	30.68	130.1	1.48	Sand mixtures - silty sand to sandy silt	2.08	1.42	25
	30.84	129.0	1.44	Sand mixtures - silty sand to sandy silt	2.08	1.41	24
	31.00	178.4	0.89	Sands - clean sands to silty sand	1.82	1.11	30
	31.17	180.4	0.66	Sands - clean sands to silty sand	1.73	1.05	29
	31.33	193.7	0.74	Sands - clean sands to silty sand	1.74	1.06	31
	31.50	181.3	0.88	Sands - clean sands to silty sand	1.81	1.11	30
	31.66	176.3	1.41	Sands - clean sands to silty sand	1.97	1.26	31
	31.82	157.9	2.56	Sand mixtures - silty sand to sandy silt	2.21	1.67	31
	31.99	109.4	4.15	Silt mixtures - clayey silt to silty clay	2.49	2.71	24
	32.15	59.3	7.42	Clays - silty clay to clay	2.89		16
	32.32	65.2	5.75	Clays - silty clay to clay	2.78		16
	32.48	72.2	5.85	Clays - silty clay to clay	2.75		17
	32.64	61.0	7.14	Clays - silty clay to clay	2.87		16
	32.81	75.1	5.32	Clays - silty clay to clay	2.71		18
	32.97	61.3	7.86	Clays - silty clay to clay	2.90		16
	33.14	135.1	4.90	Silt mixtures - clayey silt to silty clay	2.49	2.72	29
	33.30	191.2	4.75	Very stiff, fine grained	2.38	2.23	38

Ic=soil behavior type index
Kc= grain characteristics cor. factor
Su= normalized undrained shear strength

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/8/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 40 feet
SOUNDING: CPT-18

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	30.8	0.00	Sands - clean sands to silty sand	4.15		64
	0.33	61.9	0.09	Sands - clean sands to silty sand	1.41	1.00	22
	0.49	86.3	0.45	Sands - clean sands to silty sand	1.53	1.00	33
	0.66	76.5	0.78	Sands - clean sands to silty sand	1.72	1.04	33
	0.82	70.1	0.75	Sands - clean sands to silty sand	1.74	1.06	31
	0.98	98.1	1.16	Sands - clean sands to silty sand	1.76	1.07	43
	1.15	123.2	1.20	Sands - clean sands to silty sand	1.70	1.04	52
	1.31	70.3	1.59	Sands - clean sands to silty sand	1.96	1.24	35
	1.48	48.0	1.55	Sand mixtures - silty sand to sandy silt	2.07	1.39	26
	1.64	23.1	1.74	Sand mixtures - silty sand to sandy silt	2.34	2.08	15
	1.80	23.0	0.85	Sand mixtures - silty sand to sandy silt	2.16	1.57	13
	1.97	23.5	0.78	Sand mixtures - silty sand to sandy silt	2.14	1.52	13
	2.13	30.1	0.77	Sands - clean sands to silty sand	2.04	1.35	16
	2.30	35.9	0.86	Sands - clean sands to silty sand	2.01	1.30	19
	2.46	39.4	0.92	Sands - clean sands to silty sand	1.99	1.28	20
	2.62	40.1	0.98	Sands - clean sands to silty sand	2.00	1.29	21
	2.79	42.5	0.91	Sands - clean sands to silty sand	1.96	1.25	21
	2.95	45.5	1.03	Sands - clean sands to silty sand	1.97	1.26	23
	3.12	47.5	1.14	Sands - clean sands to silty sand	1.98	1.27	24
	3.28	46.3	1.20	Sands - clean sands to silty sand	2.01	1.30	24
	3.44	41.6	1.20	Sands - clean sands to silty sand	2.04	1.35	22
	3.61	39.2	1.07	Sands - clean sands to silty sand	2.03	1.34	21
	3.77	38.1	1.03	Sands - clean sands to silty sand	2.03	1.34	20
	3.94	40.3	0.90	Sands - clean sands to silty sand	1.98	1.27	21
	4.10	43.2	0.85	Sands - clean sands to silty sand	1.94	1.22	21
	4.27	43.9	0.88	Sands - clean sands to silty sand	1.94	1.23	22
	4.43	46.1	1.05	Sands - clean sands to silty sand	1.97	1.26	23
	4.59	50.2	0.85	Sands - clean sands to silty sand	1.89	1.17	24
	4.76	58.5	0.67	Sands - clean sands to silty sand	1.77	1.08	26
	4.92	74.6	0.71	Sands - clean sands to silty sand	1.70	1.04	32
	5.09	97.3	0.77	Sands - clean sands to silty sand	1.65	1.00	38
	5.25	99.8	1.02	Sands - clean sands to silty sand	1.72	1.05	42
	5.41	74.7	1.21	Sands - clean sands to silty sand	1.86	1.14	35
	5.58	51.9	2.34	Sand mixtures - silty sand to sandy silt	2.17	1.60	30
	5.74	53.0	1.48	Sands - clean sands to silty sand	2.03	1.33	28
	5.91	48.4	1.21	Sands - clean sands to silty sand	2.00	1.29	25
	6.07	52.4	0.71	Sands - clean sands to silty sand	1.84	1.13	23
	6.23	50.6	0.90	Sands - clean sands to silty sand	1.91	1.20	24
	6.40	55.5	0.94	Sands - clean sands to silty sand	1.90	1.18	25
	6.56	59.2	1.02	Sands - clean sands to silty sand	1.91	1.19	27
	6.73	59.0	1.05	Sands - clean sands to silty sand	1.92	1.20	27

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-18

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	57.3	1.22	Sands - clean sands to silty sand	1.97	1.25	27
	7.05	51.6	1.34	Sands - clean sands to silty sand	2.03	1.33	25
	7.22	53.3	1.28	Sands - clean sands to silty sand	2.01	1.31	25
	7.38	76.1	1.14	Sands - clean sands to silty sand	1.88	1.17	31
	7.55	99.0	1.19	Sands - clean sands to silty sand	1.82	1.12	38
	7.71	99.6	1.23	Sands - clean sands to silty sand	1.83	1.12	38
	7.87	99.0	1.06	Sands - clean sands to silty sand	1.80	1.10	36
	8.04	97.9	0.84	Sands - clean sands to silty sand	1.74	1.06	33
	8.20	92.4	0.78	Sands - clean sands to silty sand	1.74	1.06	31
	8.37	87.6	0.72	Sands - clean sands to silty sand	1.74	1.06	29
	8.53	84.1	0.69	Sands - clean sands to silty sand	1.75	1.07	28
	8.69	81.9	0.69	Sands - clean sands to silty sand	1.76	1.07	27
	8.86	77.0	0.62	Sands - clean sands to silty sand	1.76	1.07	25
	9.02	62.2	0.59	Sands - clean sands to silty sand	1.82	1.12	22
	9.19	55.5	0.66	Sands - clean sands to silty sand	1.89	1.17	20
	9.35	46.1	0.79	Sands - clean sands to silty sand	1.99	1.28	18
	9.51	61.9	0.89	Sands - clean sands to silty sand	1.93	1.21	23
	9.68	83.4	0.94	Sands - clean sands to silty sand	1.85	1.14	29
	9.84	98.7	0.84	Sands - clean sands to silty sand	1.77	1.08	31
	10.01	103.1	0.61	Sands - clean sands to silty sand	1.68	1.02	30
	10.17	113.1	0.60	Sands - clean sands to silty sand	1.65	1.00	32
	10.33	136.4	0.98	Sands - clean sands to silty sand	1.72	1.05	40
	10.50	156.9	0.88	Sands - clean sands to silty sand	1.66	1.00	43
	10.66	169.5	0.81	Sands - clean sands to silty sand	1.61	1.00	45
	10.83	157.4	0.70	Sands - clean sands to silty sand	1.59	1.00	41
	10.99	134.9	0.68	Sands - clean sands to silty sand	1.64	1.00	36
	11.15	127.9	0.51	Sands - clean sands to silty sand	1.59	1.00	32
	11.32	127.2	0.43	Sands - clean sands to silty sand	1.55	1.00	31
	11.48	121.6	0.42	Sands - clean sands to silty sand	1.56	1.00	30
	11.65	88.3	0.71	Sands - clean sands to silty sand	1.79	1.10	26
	11.81	90.7	0.73	Sands - clean sands to silty sand	1.80	1.10	26
	11.98	91.5	0.73	Sands - clean sands to silty sand	1.79	1.10	26
	12.14	90.5	0.75	Sands - clean sands to silty sand	1.81	1.11	26
	12.30	84.3	0.82	Sands - clean sands to silty sand	1.86	1.14	25
	12.47	66.4	1.06	Sands - clean sands to silty sand	2.00	1.30	22
	12.63	55.1	1.13	Sand mixtures - silty sand to sandy silt	2.09	1.42	19
	12.80	51.1	1.29	Sand mixtures - silty sand to sandy silt	2.15	1.53	19
	12.96	51.4	1.10	Sand mixtures - silty sand to sandy silt	2.11	1.46	18
	13.12	49.0	0.87	Sands - clean sands to silty sand	2.07	1.39	17
	13.29	40.9	0.92	Sand mixtures - silty sand to sandy silt	2.15	1.54	15
	13.45	39.6	1.10	Sand mixtures - silty sand to sandy silt	2.21	1.67	15
	13.62	42.6	1.09	Sand mixtures - silty sand to sandy silt	2.18	1.61	15
	13.78	49.2	0.79	Sands - clean sands to silty sand	2.06	1.38	16
	13.94	47.7	0.69	Sands - clean sands to silty sand	2.04	1.35	15
	14.11	44.4	0.74	Sand mixtures - silty sand to sandy silt	2.09	1.42	15
	14.27	45.7	0.90	Sand mixtures - silty sand to sandy silt	2.12	1.49	15
	14.44	46.2	1.06	Sand mixtures - silty sand to sandy silt	2.16	1.57	16

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-18

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	48.3	1.05	Sand mixtures - silty sand to sandy silt	2.15	1.54	16
	14.76	49.8	1.15	Sand mixtures - silty sand to sandy silt	2.16	1.57	17
	14.93	60.3	1.00	Sands - clean sands to silty sand	2.06	1.38	19
	15.09	66.7	0.86	Sands - clean sands to silty sand	1.99	1.28	20
	15.26	51.5	0.85	Sand mixtures - silty sand to sandy silt	2.08	1.42	16
	15.42	52.4	0.67	Sands - clean sands to silty sand	2.02	1.33	16
	15.58	51.4	0.80	Sands - clean sands to silty sand	2.08	1.40	16
	15.75	57.1	0.85	Sands - clean sands to silty sand	2.05	1.37	17
	15.91	62.0	0.82	Sands - clean sands to silty sand	2.02	1.32	18
	16.08	75.5	0.74	Sands - clean sands to silty sand	1.92	1.20	20
	16.24	79.3	0.72	Sands - clean sands to silty sand	1.90	1.18	21
	16.40	78.7	0.69	Sands - clean sands to silty sand	1.90	1.18	20
	16.57	76.1	0.75	Sands - clean sands to silty sand	1.93	1.21	20
	16.73	75.5	0.80	Sands - clean sands to silty sand	1.95	1.24	20
	16.90	72.6	0.89	Sands - clean sands to silty sand	1.99	1.29	20
	17.06	72.2	0.98	Sands - clean sands to silty sand	2.03	1.33	20
	17.22	75.5	1.00	Sands - clean sands to silty sand	2.02	1.31	21
	17.39	89.0	0.83	Sands - clean sands to silty sand	1.91	1.19	23
	17.55	89.8	0.69	Sands - clean sands to silty sand	1.87	1.15	22
	17.72	81.1	0.58	Sands - clean sands to silty sand	1.87	1.15	20
	17.88	59.4	0.55	Sands - clean sands to silty sand	1.97	1.26	15
	18.04	48.0	0.61	Sands - clean sands to silty sand	2.08	1.41	13
	18.21	43.4	0.66	Sand mixtures - silty sand to sandy silt	2.14	1.52	12
	18.37	41.5	0.64	Sand mixtures - silty sand to sandy silt	2.15	1.55	12
	18.54	41.2	0.72	Sand mixtures - silty sand to sandy silt	2.18	1.61	12
	18.70	43.2	0.91	Sand mixtures - silty sand to sandy silt	2.22	1.71	13
	18.86	49.3	1.00	Sand mixtures - silty sand to sandy silt	2.20	1.64	14
	19.03	72.7	0.92	Sands - clean sands to silty sand	2.03	1.34	19
	19.19	125.0	0.66	Sands - clean sands to silty sand	1.75	1.07	27
	19.36	159.0	0.57	Sands - clean sands to silty sand	1.63	1.00	32
	19.52	164.2	0.63	Sands - clean sands to silty sand	1.65	1.00	33
	19.69	171.4	0.68	Sands - clean sands to silty sand	1.66	1.00	34
	19.85	163.1	0.75	Sands - clean sands to silty sand	1.70	1.04	33
	20.01	157.9	0.73	Sands - clean sands to silty sand	1.71	1.04	32
	20.18	147.8	0.79	Sands - clean sands to silty sand	1.75	1.07	31
	20.34	146.4	0.81	Sands - clean sands to silty sand	1.77	1.08	31
	20.51	184.8	0.77	Sands - clean sands to silty sand	1.67	1.02	37
	20.67	230.8	0.75	Sands - clean sands to silty sand	1.60	1.00	43
	20.83	270.9	0.74	Sands - clean sands to silty sand	1.54	1.00	49
	21.00	294.6	0.70	Sands - clean sands to silty sand	1.50	1.00	52
	21.16	299.2	0.74	Sands - clean sands to silty sand	1.51	1.00	53
	21.33	298.2	0.84	Sands - clean sands to silty sand	1.56	1.00	54
	21.49	316.3	0.84	Sands - clean sands to silty sand	1.54	1.00	56
	21.65	334.3	0.88	Sands - clean sands to silty sand	1.54	1.00	59
	21.82	356.3	0.88	Sands - clean sands to silty sand	1.52	1.00	62
	21.98	362.8	0.89	Sands - clean sands to silty sand	1.52	1.00	63
	22.15	358.7	1.00	Sands - clean sands to silty sand	1.57	1.00	64

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-18

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	346.3	1.12	Sands - clean sands to silty sand	1.62	1.00	63
	22.47	347.2	1.03	Sands - clean sands to silty sand	1.59	1.00	62
	22.64	358.7	1.03	Sands - clean sands to silty sand	1.58	1.00	64
	22.80	370.9	1.07	Sands - clean sands to silty sand	1.59	1.00	66
	22.97	357.8	1.02	Sands - clean sands to silty sand	1.58	1.00	63
	23.13	358.7	0.91	Sands - clean sands to silty sand	1.54	1.00	61
	23.29	394.5	0.85	Sands - clean sands to silty sand	1.49	1.00	65
	23.46	409.7	0.79	Sands - clean sands to silty sand	1.46	1.00	67
	23.62	342.2	0.87	Sands - clean sands to silty sand	1.54	1.00	58
	23.79	294.5	0.80	Sands - clean sands to silty sand	1.56	1.00	50
	23.95	247.7	0.68	Sands - clean sands to silty sand	1.57	1.00	42
	24.11	215.9	0.68	Sands - clean sands to silty sand	1.62	1.00	38
	24.28	170.9	1.13	Sands - clean sands to silty sand	1.85	1.14	34
	24.44	164.9	1.04	Sands - clean sands to silty sand	1.84	1.13	32
	24.61	143.7	1.25	Sands - clean sands to silty sand	1.94	1.22	30
	24.77	137.2	1.14	Sands - clean sands to silty sand	1.93	1.21	28
	24.93	138.1	1.07	Sands - clean sands to silty sand	1.91	1.19	28
	25.10	135.4	1.09	Sands - clean sands to silty sand	1.93	1.21	27
	25.26	128.9	1.18	Sands - clean sands to silty sand	1.97	1.25	26
	25.43	131.5	1.22	Sands - clean sands to silty sand	1.97	1.26	27
	25.59	136.2	1.29	Sands - clean sands to silty sand	1.98	1.26	28
	25.75	140.5	1.08	Sands - clean sands to silty sand	1.92	1.20	28
	25.92	126.4	1.02	Sands - clean sands to silty sand	1.94	1.22	25
	26.08	111.5	1.19	Sands - clean sands to silty sand	2.03	1.33	23
	26.25	111.7	1.44	Sand mixtures - silty sand to sandy silt	2.09	1.42	24
	26.41	153.1	1.31	Sands - clean sands to silty sand	1.95	1.23	30
	26.57	163.6	1.51	Sands - clean sands to silty sand	1.98	1.26	33
	26.74	197.0	1.47	Sands - clean sands to silty sand	1.91	1.19	38
	26.90	212.9	1.47	Sands - clean sands to silty sand	1.89	1.17	40
	27.07	234.0	1.33	Sands - clean sands to silty sand	1.82	1.12	43
	27.23	250.2	1.24	Sands - clean sands to silty sand	1.78	1.09	44
	27.40	265.4	1.21	Sands - clean sands to silty sand	1.76	1.07	46
	27.56	272.0	1.20	Sands - clean sands to silty sand	1.75	1.06	47
	27.72	266.4	1.18	Sands - clean sands to silty sand	1.75	1.07	46
	27.89	283.2	1.07	Sands - clean sands to silty sand	1.70	1.03	47
	28.05	280.9	1.00	Sands - clean sands to silty sand	1.68	1.02	47
	28.22	282.6	1.00	Sands - clean sands to silty sand	1.68	1.02	47
	28.38	297.3	0.97	Sands - clean sands to silty sand	1.65	1.00	48
	28.54	305.5	1.01	Sands - clean sands to silty sand	1.66	1.01	50
	28.71	301.6	0.93	Sands - clean sands to silty sand	1.64	1.00	48

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Green Valley Ranch
DATE/TIME: 12/8/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 40 feet
SOUNDING: CPT-19

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	20.3	0.00	Sands - clean sands to silty sand	2.29	1.00	13
	0.33	50.7	0.17	Sands - clean sands to silty sand	1.56	1.00	20
	0.49	38.4	0.54	Sands - clean sands to silty sand	1.87	1.16	18
	0.66	27.0	0.62	Sands - clean sands to silty sand	2.03	1.33	14
	0.82	20.8	0.54	Sand mixtures - silty sand to sandy silt	2.11	1.46	11
	0.98	17.3	0.52	Sand mixtures - silty sand to sandy silt	2.17	1.59	10
	1.15	15.5	0.55	Sand mixtures - silty sand to sandy silt	2.22	1.72	9
	1.31	12.6	0.51	Sand mixtures - silty sand to sandy silt	2.29	1.92	8
	1.48	10.6	0.63	Sand mixtures - silty sand to sandy silt	2.40	2.31	7
	1.64	9.5	0.47	Sand mixtures - silty sand to sandy silt	2.39	2.27	6
	1.80	8.9	0.51	Sand mixtures - silty sand to sandy silt	2.44	2.45	6
	1.97	10.0	0.58	Sand mixtures - silty sand to sandy silt	2.41	2.35	7
	2.13	10.2	0.46	Sand mixtures - silty sand to sandy silt	2.36	2.16	7
	2.30	8.6	0.05	Sand mixtures - silty sand to sandy silt	2.27	1.00	5
	2.46	9.4	0.61	Sand mixtures - silty sand to sandy silt	2.44	2.49	6
	2.62	11.7	0.50	Sand mixtures - silty sand to sandy silt	2.32	2.01	7
	2.79	14.9	0.38	Sand mixtures - silty sand to sandy silt	2.18	1.00	9
	2.95	17.7	0.32	Sand mixtures - silty sand to sandy silt	2.08	1.00	10
	3.12	18.6	0.36	Sand mixtures - silty sand to sandy silt	2.08	1.00	10
	3.28	19.1	0.44	Sand mixtures - silty sand to sandy silt	2.10	1.00	11
	3.44	20.0	0.46	Sand mixtures - silty sand to sandy silt	2.09	1.00	11
	3.61	21.4	0.68	Sand mixtures - silty sand to sandy silt	2.15	1.54	12
	3.77	22.9	0.63	Sand mixtures - silty sand to sandy silt	2.10	1.45	13
	3.94	28.2	0.74	Sands - clean sands to silty sand	2.06	1.38	15
	4.10	30.2	0.73	Sands - clean sands to silty sand	2.03	1.33	16
	4.27	28.2	0.49	Sands - clean sands to silty sand	1.97	1.00	14
	4.43	26.7	0.34	Sands - clean sands to silty sand	1.92	1.00	13
	4.59	26.3	0.39	Sands - clean sands to silty sand	1.96	1.00	13
	4.76	26.0	0.31	Sands - clean sands to silty sand	1.92	1.00	13
	4.92	26.8	0.31	Sands - clean sands to silty sand	1.91	1.00	13
	5.09	28.5	0.32	Sands - clean sands to silty sand	1.89	1.00	14
	5.25	30.9	0.40	Sands - clean sands to silty sand	1.90	1.00	15
	5.41	34.4	0.31	Sands - clean sands to silty sand	1.81	1.00	16
	5.58	38.2	0.35	Sands - clean sands to silty sand	1.80	1.00	17
	5.74	42.8	0.32	Sands - clean sands to silty sand	1.75	1.00	18
	5.91	45.3	0.45	Sands - clean sands to silty sand	1.79	1.00	19
	6.07	45.0	0.44	Sands - clean sands to silty sand	1.80	1.00	19
	6.23	43.7	0.46	Sands - clean sands to silty sand	1.82	1.00	19
	6.40	44.2	0.45	Sands - clean sands to silty sand	1.82	1.00	18
	6.56	42.2	0.44	Sands - clean sands to silty sand	1.83	1.00	18
	6.73	40.0	0.54	Sands - clean sands to silty sand	1.89	1.18	18

Ic=soil behavior type index
Kc= grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-19

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	6.89	41.0	0.55	Sands - clean sands to silty sand	1.90	1.18	18
	7.05	40.0	0.51	Sands - clean sands to silty sand	1.89	1.18	17
	7.22	39.0	0.50	Sands - clean sands to silty sand	1.90	1.18	17
	7.38	36.4	0.60	Sands - clean sands to silty sand	1.96	1.25	16
	7.55	33.6	0.69	Sands - clean sands to silty sand	2.02	1.32	16
	7.71	31.4	0.60	Sands - clean sands to silty sand	2.02	1.32	14
	7.87	28.9	0.50	Sands - clean sands to silty sand	2.03	1.33	13
	8.04	26.4	0.40	Sands - clean sands to silty sand	2.03	1.00	12
	8.20	24.1	0.23	Sands - clean sands to silty sand	1.99	1.00	10
	8.37	22.3	0.26	Sands - clean sands to silty sand	2.04	1.00	10
	8.53	19.8	0.44	Sand mixtures - silty sand to sandy silt	2.16	1.00	10
	8.69	17.5	0.67	Sand mixtures - silty sand to sandy silt	2.28	1.88	10
	8.86	17.7	0.59	Sand mixtures - silty sand to sandy silt	2.26	1.81	9
	9.02	17.2	0.59	Sand mixtures - silty sand to sandy silt	2.27	1.85	9
	9.19	17.5	0.56	Sand mixtures - silty sand to sandy silt	2.26	1.82	9
	9.35	19.3	0.55	Sand mixtures - silty sand to sandy silt	2.23	1.73	9
	9.51	20.7	0.48	Sand mixtures - silty sand to sandy silt	2.18	1.00	10
	9.68	21.4	0.53	Sand mixtures - silty sand to sandy silt	2.19	1.64	10
	9.84	20.2	0.84	Sand mixtures - silty sand to sandy silt	2.31	1.95	10
	10.01	19.9	1.13	Sand mixtures - silty sand to sandy silt	2.38	2.21	11
	10.17	20.5	1.30	Sand mixtures - silty sand to sandy silt	2.40	2.30	11
	10.33	20.9	1.64	Sand mixtures - silty sand to sandy silt	2.45	2.53	12
	10.50	22.0	1.68	Sand mixtures - silty sand to sandy silt	2.45	2.49	12
	10.66	24.5	1.59	Sand mixtures - silty sand to sandy silt	2.40	2.30	13
	10.83	26.4	1.44	Sand mixtures - silty sand to sandy silt	2.35	2.12	13
	10.99	26.0	1.79	Sand mixtures - silty sand to sandy silt	2.42	2.37	13
	11.15	27.9	1.86	Sand mixtures - silty sand to sandy silt	2.41	2.33	14
	11.32	28.9	1.97	Sand mixtures - silty sand to sandy silt	2.41	2.36	14
	11.48	29.5	1.81	Sand mixtures - silty sand to sandy silt	2.39	2.26	14
	11.65	30.5	1.51	Sand mixtures - silty sand to sandy silt	2.34	2.06	14
	11.81	32.7	1.05	Sand mixtures - silty sand to sandy silt	2.23	1.73	14
	11.98	32.4	1.05	Sand mixtures - silty sand to sandy silt	2.24	1.75	13
	12.14	32.5	1.22	Sand mixtures - silty sand to sandy silt	2.27	1.86	14
	12.30	32.8	1.39	Sand mixtures - silty sand to sandy silt	2.30	1.95	14
	12.47	32.4	1.44	Sand mixtures - silty sand to sandy silt	2.32	2.01	14
	12.63	31.4	1.64	Sand mixtures - silty sand to sandy silt	2.37	2.18	14
	12.80	31.8	2.35	Sand mixtures - silty sand to sandy silt	2.46	2.57	15
	12.96	31.0	1.96	Sand mixtures - silty sand to sandy silt	2.43	2.41	14
	13.12	28.0	1.15	Sand mixtures - silty sand to sandy silt	2.33	2.05	12
	13.29	26.9	0.66	Sand mixtures - silty sand to sandy silt	2.23	1.74	10
	13.45	39.6	0.46	Sands - clean sands to silty sand	2.02	1.00	13
	13.62	39.2	0.34	Sands - clean sands to silty sand	1.97	1.00	12
	13.78	33.6	0.38	Sands - clean sands to silty sand	2.06	1.00	11
	13.94	28.9	0.49	Sand mixtures - silty sand to sandy silt	2.17	1.58	10
	14.11	27.9	0.64	Sand mixtures - silty sand to sandy silt	2.23	1.74	10
	14.27	30.7	1.03	Sand mixtures - silty sand to sandy silt	2.30	1.93	12
	14.44	38.0	0.85	Sand mixtures - silty sand to sandy silt	2.18	1.61	13

Ic=soil behavior type index
Kc= grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-19

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.60	42.0	0.54	Sands - clean sands to silty sand	2.05	1.36	13
	14.76	44.8	0.64	Sands - clean sands to silty sand	2.06	1.38	14
	14.93	43.5	0.95	Sand mixtures - silty sand to sandy silt	2.17	1.58	15
	15.09	39.8	1.25	Sand mixtures - silty sand to sandy silt	2.27	1.83	14
	15.26	37.3	1.24	Sand mixtures - silty sand to sandy silt	2.29	1.90	13
	15.42	34.2	1.28	Sand mixtures - silty sand to sandy silt	2.33	2.04	13
	15.58	33.0	1.43	Sand mixtures - silty sand to sandy silt	2.38	2.20	12
	15.75	35.3	1.44	Sand mixtures - silty sand to sandy silt	2.36	2.13	13
	15.91	42.1	1.03	Sand mixtures - silty sand to sandy silt	2.21	1.69	14
	16.08	43.2	0.72	Sand mixtures - silty sand to sandy silt	2.12	1.49	13
	16.24	40.0	0.55	Sand mixtures - silty sand to sandy silt	2.10	1.45	12
	16.40	41.8	0.72	Sand mixtures - silty sand to sandy silt	2.14	1.53	13
	16.57	52.5	0.77	Sands - clean sands to silty sand	2.07	1.40	15
	16.73	68.6	0.64	Sands - clean sands to silty sand	1.93	1.22	18
	16.90	79.2	0.60	Sands - clean sands to silty sand	1.87	1.16	20
	17.06	74.7	0.80	Sands - clean sands to silty sand	1.96	1.25	20
	17.22	67.7	1.13	Sand mixtures - silty sand to sandy silt	2.09	1.42	19
	17.39	62.9	1.37	Sand mixtures - silty sand to sandy silt	2.17	1.58	19
	17.55	64.2	1.32	Sand mixtures - silty sand to sandy silt	2.15	1.55	19
	17.72	64.1	1.33	Sand mixtures - silty sand to sandy silt	2.16	1.56	19
	17.88	66.5	1.30	Sand mixtures - silty sand to sandy silt	2.14	1.52	19
	18.04	68.6	1.37	Sand mixtures - silty sand to sandy silt	2.15	1.53	20
	18.21	77.2	1.28	Sand mixtures - silty sand to sandy silt	2.09	1.43	21
	18.37	73.5	1.21	Sand mixtures - silty sand to sandy silt	2.09	1.43	20
	18.54	65.3	1.22	Sand mixtures - silty sand to sandy silt	2.14	1.52	18
	18.70	73.5	0.97	Sands - clean sands to silty sand	2.04	1.34	19
	18.86	80.5	0.84	Sands - clean sands to silty sand	1.97	1.25	20
	19.03	68.4	0.87	Sands - clean sands to silty sand	2.04	1.35	18
	19.19	61.9	0.89	Sand mixtures - silty sand to sandy silt	2.08	1.42	16
	19.36	53.7	1.29	Sand mixtures - silty sand to sandy silt	2.23	1.74	16
	19.52	50.4	1.51	Sand mixtures - silty sand to sandy silt	2.30	1.94	15
	19.69	54.6	1.66	Sand mixtures - silty sand to sandy silt	2.30	1.94	16
	19.85	57.1	1.51	Sand mixtures - silty sand to sandy silt	2.26	1.82	17
	20.01	59.8	1.22	Sand mixtures - silty sand to sandy silt	2.19	1.63	16
	20.18	61.4	0.95	Sand mixtures - silty sand to sandy silt	2.12	1.48	16
	20.34	61.9	1.04	Sand mixtures - silty sand to sandy silt	2.14	1.52	16
	20.51	62.7	1.07	Sand mixtures - silty sand to sandy silt	2.14	1.53	16
	20.67	62.5	1.14	Sand mixtures - silty sand to sandy silt	2.17	1.58	17
	20.83	61.8	1.12	Sand mixtures - silty sand to sandy silt	2.17	1.58	16
	21.00	59.9	1.12	Sand mixtures - silty sand to sandy silt	2.18	1.61	16
	21.16	59.5	1.67	Sand mixtures - silty sand to sandy silt	2.29	1.92	17
	21.33	60.8	1.70	Sand mixtures - silty sand to sandy silt	2.29	1.91	17
	21.49	68.2	1.41	Sand mixtures - silty sand to sandy silt	2.20	1.66	18
	21.65	86.7	0.90	Sands - clean sands to silty sand	1.99	1.28	20
	21.82	78.7	0.82	Sands - clean sands to silty sand	2.01	1.30	18
	21.98	76.7	0.83	Sands - clean sands to silty sand	2.02	1.32	18
	22.15	72.1	1.12	Sand mixtures - silty sand to sandy silt	2.13	1.50	18

Ic=soil behavior type index
Kc= grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-19

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.31	63.0	1.40	Sand mixtures - silty sand to sandy silt	2.24	1.76	16
	22.47	57.6	1.73	Sand mixtures - silty sand to sandy silt	2.33	2.04	16
	22.64	56.0	1.76	Sand mixtures - silty sand to sandy silt	2.35	2.11	15
	22.80	52.5	1.92	Sand mixtures - silty sand to sandy silt	2.40	2.30	15
	22.97	51.6	1.91	Sand mixtures - silty sand to sandy silt	2.41	2.32	14
	23.13	51.3	2.10	Sand mixtures - silty sand to sandy silt	2.44	2.45	15
	23.29	55.8	1.75	Sand mixtures - silty sand to sandy silt	2.36	2.13	15
	23.46	61.1	1.37	Sand mixtures - silty sand to sandy silt	2.26	1.81	16
	23.62	53.2	1.80	Sand mixtures - silty sand to sandy silt	2.39	2.25	14
	23.79	46.8	2.16	Sand mixtures - silty sand to sandy silt	2.49	2.69	13
	23.95	47.3	2.07	Sand mixtures - silty sand to sandy silt	2.47	2.63	13
	24.11	49.9	1.26	Sand mixtures - silty sand to sandy silt	2.32	2.01	13
	24.28	51.8	1.08	Sand mixtures - silty sand to sandy silt	2.27	1.85	13
	24.44	57.0	1.34	Sand mixtures - silty sand to sandy silt	2.29	1.91	14
	24.61	57.4	1.24	Sand mixtures - silty sand to sandy silt	2.27	1.85	14
	24.77	64.2	2.30	Sand mixtures - silty sand to sandy silt	2.40	2.32	17
	24.93	87.7	1.69	Sand mixtures - silty sand to sandy silt	2.21	1.67	21
	25.10	83.2	1.68	Sand mixtures - silty sand to sandy silt	2.22	1.72	20
	25.26	83.2	0.95	Sands - clean sands to silty sand	2.07	1.39	18
	25.43	84.3	0.69	Sands - clean sands to silty sand	1.98	1.27	17
	25.59	83.5	0.67	Sands - clean sands to silty sand	1.98	1.27	17
	25.75	78.2	0.68	Sands - clean sands to silty sand	2.01	1.31	16
	25.92	74.9	0.71	Sands - clean sands to silty sand	2.04	1.35	16
	26.08	78.3	0.76	Sands - clean sands to silty sand	2.04	1.35	16
	26.25	79.5	0.81	Sands - clean sands to silty sand	2.05	1.37	17
	26.41	83.2	0.87	Sands - clean sands to silty sand	2.06	1.37	17
	26.57	83.3	0.74	Sands - clean sands to silty sand	2.02	1.31	17
	26.74	86.5	0.72	Sands - clean sands to silty sand	2.00	1.29	17
	26.90	100.6	0.64	Sands - clean sands to silty sand	1.91	1.19	19
	27.07	104.8	0.60	Sands - clean sands to silty sand	1.88	1.16	20
	27.23	97.3	0.58	Sands - clean sands to silty sand	1.90	1.18	18
	27.40	89.3	0.61	Sands - clean sands to silty sand	1.95	1.23	17
	27.56	83.5	0.67	Sands - clean sands to silty sand	2.00	1.29	16
	27.72	82.6	0.73	Sands - clean sands to silty sand	2.03	1.33	16
	27.89	87.0	0.71	Sands - clean sands to silty sand	2.00	1.29	17
	28.05	95.7	0.76	Sands - clean sands to silty sand	1.98	1.27	18
	28.22	105.9	0.81	Sands - clean sands to silty sand	1.96	1.24	20
	28.38	108.9	0.87	Sands - clean sands to silty sand	1.97	1.26	21
	28.54	114.0	0.96	Sands - clean sands to silty sand	1.98	1.27	22
	28.71	124.4	0.96	Sands - clean sands to silty sand	1.95	1.24	23
	28.87	120.7	0.91	Sands - clean sands to silty sand	1.95	1.23	22
	29.04	107.2	0.82	Sands - clean sands to silty sand	1.97	1.25	20
	29.20	95.5	0.75	Sands - clean sands to silty sand	1.99	1.28	18
	29.36	94.4	0.77	Sands - clean sands to silty sand	2.00	1.30	18
	29.53	96.4	0.82	Sands - clean sands to silty sand	2.01	1.31	18
	29.69	100.4	0.89	Sands - clean sands to silty sand	2.02	1.32	19
	29.86	108.8	0.98	Sands - clean sands to silty sand	2.02	1.32	20

Ic=soil behavior type index
Kc= grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-19

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.02	128.7	1.03	Sands - clean sands to silty sand	1.97	1.26	23
	30.18	157.1	1.01	Sands - clean sands to silty sand	1.90	1.18	27
	30.35	182.8	1.02	Sands - clean sands to silty sand	1.85	1.14	31
	30.51	209.0	1.21	Sands - clean sands to silty sand	1.86	1.14	36
	30.68	244.7	1.25	Sands - clean sands to silty sand	1.81	1.11	41
	30.84	300.4	1.47	Sands - clean sands to silty sand	1.81	1.11	50
	31.00	314.3	1.46	Sands - clean sands to silty sand	1.79	1.10	52
	31.17	339.2	1.58	Sands - clean sands to silty sand	1.80	1.10	56
	31.33	369.6	1.36	Sands - clean sands to silty sand	1.72	1.05	58
	31.50	331.4	1.50	Sands - clean sands to silty sand	1.79	1.09	54
	31.66	278.4	1.31	Sands - clean sands to silty sand	1.80	1.10	45
	31.82	245.7	1.09	Sands - clean sands to silty sand	1.78	1.09	39
	31.99	203.8	0.81	Sands - clean sands to silty sand	1.75	1.07	32
	32.15	197.9	0.75	Sands - clean sands to silty sand	1.74	1.06	31
	32.32	219.2	0.65	Sands - clean sands to silty sand	1.66	1.01	33
	32.48	220.2	0.65	Sands - clean sands to silty sand	1.66	1.01	33
	32.64	210.6	0.66	Sands - clean sands to silty sand	1.68	1.02	32
	32.81	194.5	0.75	Sands - clean sands to silty sand	1.75	1.07	30
	32.97	182.5	0.79	Sands - clean sands to silty sand	1.79	1.09	29
	33.14	175.3	0.76	Sands - clean sands to silty sand	1.80	1.10	28
	33.30	161.0	0.74	Sands - clean sands to silty sand	1.82	1.12	25
	33.46	143.0	0.87	Sands - clean sands to silty sand	1.92	1.20	23
	33.63	134.0	1.07	Sands - clean sands to silty sand	2.00	1.29	23
	33.79	127.6	1.24	Sand mixtures - silty sand to sandy silt	2.06	1.39	22
	33.96	136.1	1.33	Sand mixtures - silty sand to sandy silt	2.06	1.38	23
	34.12	146.1	1.38	Sand mixtures - silty sand to sandy silt	2.05	1.36	25
	34.28	149.3	1.33	Sands - clean sands to silty sand	2.03	1.34	25
	34.45	143.7	1.28	Sands - clean sands to silty sand	2.04	1.34	24
	34.61	140.6	1.41	Sand mixtures - silty sand to sandy silt	2.08	1.40	24
	34.78	153.2	1.34	Sands - clean sands to silty sand	2.03	1.33	26
	34.94	169.6	1.33	Sands - clean sands to silty sand	1.99	1.28	28
	35.10	180.1	1.21	Sands - clean sands to silty sand	1.94	1.22	29
	35.27	176.3	1.06	Sands - clean sands to silty sand	1.91	1.19	28
	35.43	163.9	0.97	Sands - clean sands to silty sand	1.91	1.19	26
	35.60	152.6	0.97	Sands - clean sands to silty sand	1.94	1.22	24
	35.76	130.5	1.08	Sands - clean sands to silty sand	2.03	1.33	21
	35.93	112.1	1.22	Sand mixtures - silty sand to sandy silt	2.13	1.50	19
	36.09	97.2	1.32	Sand mixtures - silty sand to sandy silt	2.21	1.67	17
	36.25	83.8	1.40	Sand mixtures - silty sand to sandy silt	2.28	1.88	15
	36.42	73.8	1.36	Sand mixtures - silty sand to sandy silt	2.33	2.03	13
	36.58	61.4	1.17	Sand mixtures - silty sand to sandy silt	2.36	2.16	11

Ic=soil behavior type index
Kc= grain characteristics cor. factor
N1(60) = interpreted SPT blow count

CPT INTERPRETATION

PROJECT: Sterling Ranch Estates
DATE/TIME: 12/8/2017 0:00
PROJECT NO.: 17-1245A-4
CONE/RIG: DDG1281
ASSUMED DEPTH OF WATER TABLE: 40 feet
SOUNDING: CPT-20

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	0.16	23.43	0.65	Sand mixtures - silty sand to sandy silt	2.10	1.44	13
	0.33	39.01	0.32	Sands - clean sands to silty sand	1.76	1.00	17
	0.49	9.81	0.09	Sand mixtures - silty sand to sandy silt	2.21	1.00	6
	0.66	9.39	0.30	Sand mixtures - silty sand to sandy silt	2.33	1.00	6
	0.82	8.04	1.61	Silt mixtures - clayey silt to silty clay	2.70		7
	0.98	31.60	0.59	Sands - clean sands to silty sand	1.96	1.25	16
	1.15	50.53	0.69	Sands - clean sands to silty sand	1.83	1.12	23
	1.31	66.98	0.62	Sands - clean sands to silty sand	1.70	1.04	29
	1.48	77.26	0.75	Sands - clean sands to silty sand	1.70	1.04	33
	1.64	73.14	0.74	Sands - clean sands to silty sand	1.72	1.05	32
	1.80	30.72	0.74	Sands - clean sands to silty sand	2.03	1.33	16
	1.97	20.19	0.56	Sand mixtures - silty sand to sandy silt	2.13	1.49	11
	2.13	13.05	0.65	Sand mixtures - silty sand to sandy silt	2.33	2.02	8
	2.30	14.09	0.71	Sand mixtures - silty sand to sandy silt	2.31	1.98	9
	2.46	20.95	0.59	Sand mixtures - silty sand to sandy silt	2.12	1.49	12
	2.62	20.34	0.46	Sand mixtures - silty sand to sandy silt	2.08	1.00	11
	2.79	18.60	0.60	Sand mixtures - silty sand to sandy silt	2.17	1.59	11
	2.95	20.32	0.60	Sand mixtures - silty sand to sandy silt	2.14	1.52	11
	3.12	19.22	0.54	Sand mixtures - silty sand to sandy silt	2.14	1.52	11
	3.28	17.86	0.46	Sand mixtures - silty sand to sandy silt	2.14	1.00	10
	3.44	15.97	0.51	Sand mixtures - silty sand to sandy silt	2.20	1.67	9
	3.61	16.23	0.44	Sand mixtures - silty sand to sandy silt	2.17	1.00	9
	3.77	18.48	0.41	Sand mixtures - silty sand to sandy silt	2.11	1.00	10
	3.94	20.76	0.41	Sands - clean sands to silty sand	2.06	1.00	11
	4.10	23.34	0.44	Sands - clean sands to silty sand	2.02	1.00	12
	4.27	26.09	0.78	Sand mixtures - silty sand to sandy silt	2.10	1.45	14
	4.43	28.34	0.82	Sand mixtures - silty sand to sandy silt	2.08	1.41	15
	4.59	27.35	1.14	Sand mixtures - silty sand to sandy silt	2.18	1.60	16
	4.76	28.66	0.89	Sand mixtures - silty sand to sandy silt	2.10	1.45	16
	4.92	28.52	0.77	Sands - clean sands to silty sand	2.07	1.39	15
	5.09	29.84	0.84	Sands - clean sands to silty sand	2.07	1.40	16
	5.25	33.04	0.72	Sands - clean sands to silty sand	2.00	1.29	17
	5.41	31.15	0.75	Sands - clean sands to silty sand	2.03	1.33	16
	5.58	30.98	0.74	Sands - clean sands to silty sand	2.03	1.33	16
	5.74	34.56	0.83	Sands - clean sands to silty sand	2.01	1.31	18
	5.91	40.51	0.81	Sands - clean sands to silty sand	1.95	1.23	20
	6.07	47.79	1.02	Sands - clean sands to silty sand	1.96	1.24	24
	6.23	63.88	0.91	Sands - clean sands to silty sand	1.85	1.14	28
	6.40	75.05	0.61	Sands - clean sands to silty sand	1.71	1.04	28
	6.56	66.33	1.00	Sands - clean sands to silty sand	1.87	1.15	29
	6.73	61.19	1.47	Sands - clean sands to silty sand	2.00	1.29	30
	6.89	56.51	1.77	Sand mixtures - silty sand to sandy silt	2.07	1.40	29

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-20

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	7.05	62.59	1.41	Sands - clean sands to silty sand	1.99	1.28	29
	7.22	69.42	1.26	Sands - clean sands to silty sand	1.93	1.21	30
	7.38	72.78	1.14	Sands - clean sands to silty sand	1.89	1.18	30
	7.55	70.70	1.01	Sands - clean sands to silty sand	1.87	1.16	29
	7.71	64.12	1.13	Sands - clean sands to silty sand	1.94	1.22	27
	7.87	63.81	1.26	Sands - clean sands to silty sand	1.97	1.25	28
	8.04	62.53	1.40	Sands - clean sands to silty sand	2.01	1.30	28
	8.20	62.48	1.35	Sands - clean sands to silty sand	2.00	1.30	27
	8.37	66.53	1.18	Sands - clean sands to silty sand	1.95	1.24	27
	8.53	73.49	1.11	Sands - clean sands to silty sand	1.91	1.19	29
	8.69	63.68	1.34	Sands - clean sands to silty sand	2.01	1.30	27
	8.86	69.86	1.20	Sands - clean sands to silty sand	1.95	1.23	28
	9.02	61.84	1.23	Sands - clean sands to silty sand	2.00	1.29	25
	9.19	60.83	1.25	Sands - clean sands to silty sand	2.01	1.31	25
	9.35	58.67	1.27	Sands - clean sands to silty sand	2.03	1.33	24
	9.51	55.96	1.29	Sands - clean sands to silty sand	2.05	1.37	23
	9.68	53.93	1.32	Sand mixtures - silty sand to sandy silt	2.07	1.40	23
	9.84	47.87	1.39	Sand mixtures - silty sand to sandy silt	2.13	1.50	21
	10.01	48.66	1.45	Sand mixtures - silty sand to sandy silt	2.14	1.52	21
	10.17	47.04	1.62	Sand mixtures - silty sand to sandy silt	2.18	1.61	21
	10.33	45.08	1.74	Sand mixtures - silty sand to sandy silt	2.22	1.70	20
	10.50	48.05	1.71	Sand mixtures - silty sand to sandy silt	2.20	1.64	21
	10.66	49.46	1.70	Sand mixtures - silty sand to sandy silt	2.19	1.63	21
	10.83	46.17	1.71	Sand mixtures - silty sand to sandy silt	2.21	1.69	20
	10.99	42.21	1.86	Sand mixtures - silty sand to sandy silt	2.27	1.84	19
	11.15	40.49	1.96	Sand mixtures - silty sand to sandy silt	2.30	1.94	19
	11.32	38.64	1.77	Sand mixtures - silty sand to sandy silt	2.29	1.91	17
	11.48	34.02	2.56	Sand mixtures - silty sand to sandy silt	2.43	2.45	17
	11.65	36.80	2.98	Silt mixtures - clayey silt to silty clay	2.46	2.54	19
	11.81	42.99	3.06	Silt mixtures - clayey silt to silty clay	2.42	2.39	21
	11.98	44.79	3.17	Silt mixtures - clayey silt to silty clay	2.42	2.39	22
	12.14	48.62	2.85	Sand mixtures - silty sand to sandy silt	2.37	2.18	22
	12.30	57.23	2.17	Sand mixtures - silty sand to sandy silt	2.24	1.77	23
	12.47	70.55	1.51	Sand mixtures - silty sand to sandy silt	2.08	1.41	25
	12.63	71.96	1.29	Sands - clean sands to silty sand	2.03	1.34	24
	12.80	66.79	1.70	Sand mixtures - silty sand to sandy silt	2.14	1.51	24
	12.96	70.83	1.82	Sand mixtures - silty sand to sandy silt	2.14	1.52	26
	13.12	73.71	1.91	Sand mixtures - silty sand to sandy silt	2.14	1.53	27
	13.29	79.57	1.68	Sand mixtures - silty sand to sandy silt	2.09	1.42	27
	13.45	77.28	1.55	Sand mixtures - silty sand to sandy silt	2.07	1.40	26
	13.62	80.82	1.57	Sand mixtures - silty sand to sandy silt	2.07	1.39	27
	13.78	85.34	1.66	Sand mixtures - silty sand to sandy silt	2.07	1.39	28
	13.94	91.03	1.71	Sand mixtures - silty sand to sandy silt	2.06	1.38	30
	14.11	90.25	1.76	Sand mixtures - silty sand to sandy silt	2.07	1.40	29
	14.27	91.59	1.80	Sand mixtures - silty sand to sandy silt	2.08	1.41	30
	14.44	94.26	1.82	Sand mixtures - silty sand to sandy silt	2.07	1.40	30
	14.60	98.70	1.26	Sands - clean sands to silty sand	1.96	1.24	29

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-20

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	14.76	104.51	1.73	Sand mixtures - silty sand to sandy silt	2.03	1.34	32
	14.93	82.60	2.30	Sand mixtures - silty sand to sandy silt	2.19	1.64	28
	15.09	113.70	1.73	Sands - clean sands to silty sand	2.01	1.31	34
	15.26	117.19	1.55	Sands - clean sands to silty sand	1.97	1.26	34
	15.42	122.91	1.32	Sands - clean sands to silty sand	1.91	1.19	34
	15.58	112.07	1.24	Sands - clean sands to silty sand	1.92	1.20	31
	15.75	96.35	1.36	Sands - clean sands to silty sand	2.00	1.29	28
	15.91	92.24	1.47	Sands - clean sands to silty sand	2.04	1.35	27
	16.08	100.93	1.52	Sands - clean sands to silty sand	2.02	1.32	29
	16.24	106.97	1.45	Sands - clean sands to silty sand	1.99	1.28	30
	16.40	106.25	1.32	Sands - clean sands to silty sand	1.97	1.25	29
	16.57	109.03	1.22	Sands - clean sands to silty sand	1.94	1.22	29
	16.73	104.19	1.24	Sands - clean sands to silty sand	1.96	1.24	28
	16.90	94.82	1.25	Sands - clean sands to silty sand	2.00	1.29	26
	17.06	81.15	1.44	Sand mixtures - silty sand to sandy silt	2.09	1.43	23
	17.22	77.17	1.64	Sand mixtures - silty sand to sandy silt	2.15	1.54	23
	17.39	87.46	1.60	Sand mixtures - silty sand to sandy silt	2.10	1.45	25
	17.55	94.82	1.52	Sand mixtures - silty sand to sandy silt	2.06	1.38	26
	17.72	85.80	1.44	Sand mixtures - silty sand to sandy silt	2.08	1.41	24
	17.88	76.59	1.53	Sand mixtures - silty sand to sandy silt	2.14	1.52	22
	18.04	81.91	1.61	Sand mixtures - silty sand to sandy silt	2.13	1.51	23
	18.21	81.93	1.54	Sand mixtures - silty sand to sandy silt	2.12	1.48	23
	18.37	79.54	1.39	Sand mixtures - silty sand to sandy silt	2.10	1.45	22
	18.54	76.42	1.37	Sand mixtures - silty sand to sandy silt	2.12	1.47	21
	18.70	79.77	1.37	Sand mixtures - silty sand to sandy silt	2.10	1.45	22
	18.86	76.96	1.41	Sand mixtures - silty sand to sandy silt	2.13	1.49	21
	19.03	81.87	1.36	Sand mixtures - silty sand to sandy silt	2.10	1.44	22
	19.19	91.64	1.47	Sand mixtures - silty sand to sandy silt	2.08	1.41	24
	19.36	101.32	1.20	Sands - clean sands to silty sand	1.99	1.28	25
	19.52	91.28	1.08	Sands - clean sands to silty sand	2.00	1.29	23
	19.69	86.38	1.19	Sands - clean sands to silty sand	2.05	1.36	22
	19.85	91.66	1.22	Sands - clean sands to silty sand	2.04	1.35	23
	20.01	93.32	1.24	Sands - clean sands to silty sand	2.04	1.34	23
	20.18	90.85	1.31	Sand mixtures - silty sand to sandy silt	2.06	1.38	23
	20.34	90.72	1.39	Sand mixtures - silty sand to sandy silt	2.08	1.42	23
	20.51	89.41	1.60	Sand mixtures - silty sand to sandy silt	2.13	1.51	23
	20.67	88.15	1.61	Sand mixtures - silty sand to sandy silt	2.14	1.52	23
	20.83	97.44	1.48	Sand mixtures - silty sand to sandy silt	2.08	1.42	24
	21.00	114.57	1.18	Sands - clean sands to silty sand	1.96	1.25	27
	21.16	119.75	1.02	Sands - clean sands to silty sand	1.91	1.19	27
	21.33	128.60	0.99	Sands - clean sands to silty sand	1.88	1.16	28
	21.49	136.55	0.87	Sands - clean sands to silty sand	1.82	1.12	29
	21.65	149.12	0.73	Sands - clean sands to silty sand	1.74	1.06	30
	21.82	170.68	0.67	Sands - clean sands to silty sand	1.68	1.02	33
	21.98	173.14	0.90	Sands - clean sands to silty sand	1.76	1.07	35
	22.15	163.12	1.17	Sands - clean sands to silty sand	1.86	1.14	34
	22.31	165.40	1.14	Sands - clean sands to silty sand	1.85	1.14	34

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-20

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	22.47	155.17	1.15	Sands - clean sands to silty sand	1.87	1.15	33
	22.64	153.59	1.28	Sands - clean sands to silty sand	1.91	1.19	33
	22.80	147.89	1.21	Sands - clean sands to silty sand	1.91	1.19	31
	22.97	146.36	1.09	Sands - clean sands to silty sand	1.88	1.16	30
	23.13	128.83	1.05	Sands - clean sands to silty sand	1.91	1.19	27
	23.29	116.00	1.05	Sands - clean sands to silty sand	1.95	1.23	25
	23.46	103.94	1.26	Sands - clean sands to silty sand	2.04	1.35	23
	23.62	83.19	1.82	Sand mixtures - silty sand to sandy silt	2.23	1.74	21
	23.79	95.10	2.02	Sand mixtures - silty sand to sandy silt	2.22	1.71	23
	23.95	117.73	1.48	Sand mixtures - silty sand to sandy silt	2.05	1.37	26
	24.11	202.24	1.25	Sands - clean sands to silty sand	1.83	1.12	40
	24.28	184.32	2.49	Sand mixtures - silty sand to sandy silt	2.09	1.42	41
	24.44	202.23	1.98	Sands - clean sands to silty sand	1.98	1.27	43
	24.61	203.34	1.51	Sands - clean sands to silty sand	1.89	1.17	41
	24.77	143.15	0.81	Sands - clean sands to silty sand	1.82	1.11	27
	24.93	120.51	0.95	Sands - clean sands to silty sand	1.93	1.21	24
	25.10	89.30	1.28	Sand mixtures - silty sand to sandy silt	2.12	1.48	20
	25.26	77.47	1.37	Sand mixtures - silty sand to sandy silt	2.19	1.64	18
	25.43	73.36	1.99	Sand mixtures - silty sand to sandy silt	2.32	2.01	18
	25.59	80.17	2.10	Sand mixtures - silty sand to sandy silt	2.31	1.97	19
	25.75	92.80	1.98	Sand mixtures - silty sand to sandy silt	2.24	1.77	22
	25.92	103.29	1.62	Sand mixtures - silty sand to sandy silt	2.15	1.53	23
	26.08	123.17	1.35	Sands - clean sands to silty sand	2.03	1.34	26
	26.25	165.12	0.88	Sands - clean sands to silty sand	1.80	1.10	30
	26.41	185.09	0.91	Sands - clean sands to silty sand	1.78	1.08	33
	26.57	196.40	0.97	Sands - clean sands to silty sand	1.78	1.08	35
	26.74	210.03	1.41	Sands - clean sands to silty sand	1.88	1.16	40
	26.90	230.70	1.23	Sands - clean sands to silty sand	1.80	1.10	42
	27.07	262.51	1.09	Sands - clean sands to silty sand	1.72	1.05	45
	27.23	228.82	1.00	Sands - clean sands to silty sand	1.74	1.06	40
	27.40	239.83	1.00	Sands - clean sands to silty sand	1.73	1.05	41
	27.56	237.34	1.11	Sands - clean sands to silty sand	1.76	1.08	41
	27.72	238.97	1.32	Sands - clean sands to silty sand	1.82	1.12	43
	27.89	241.69	1.51	Sands - clean sands to silty sand	1.86	1.15	44
	28.05	266.15	1.24	Sands - clean sands to silty sand	1.77	1.08	46
	28.22	240.64	1.27	Sands - clean sands to silty sand	1.81	1.11	42
	28.38	253.07	1.07	Sands - clean sands to silty sand	1.74	1.06	43
	28.54	236.23	1.06	Sands - clean sands to silty sand	1.76	1.07	40
	28.71	212.25	1.35	Sands - clean sands to silty sand	1.87	1.16	38
	28.87	199.64	1.70	Sands - clean sands to silty sand	1.97	1.26	37
	29.04	204.15	1.86	Sands - clean sands to silty sand	2.00	1.29	38
	29.20	218.09	1.65	Sands - clean sands to silty sand	1.94	1.22	40
	29.36	257.38	1.33	Sands - clean sands to silty sand	1.81	1.11	44
	29.53	285.24	1.19	Sands - clean sands to silty sand	1.74	1.06	47
	29.69	318.52	1.36	Sands - clean sands to silty sand	1.76	1.07	53
	29.86	383.49	1.01	Sands - clean sands to silty sand	1.60	1.00	59
	30.02	355.58	1.12	Sands - clean sands to silty sand	1.66	1.01	56

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

PROJECT NO.: 17-1245A-4 SOUNDING: CPT-20

Depth (m)	Depth (ft)	Total Cone Resistance (tsf)	Friction Ratio %	Soil Behavior Type	I_c	K_c	$N_{1(60)}$
	30.18	345.98	1.23	Sands - clean sands to silty sand	1.70	1.03	55
	30.35	319.35	1.26	Sands - clean sands to silty sand	1.73	1.06	52
	30.51	294.46	1.34	Sands - clean sands to silty sand	1.78	1.09	49
	30.68	264.78	1.35	Sands - clean sands to silty sand	1.82	1.11	44
	30.84	253.84	1.27	Sands - clean sands to silty sand	1.81	1.11	42
	31.00	242.58	1.25	Sands - clean sands to silty sand	1.82	1.12	40
	31.17	232.13	1.22	Sands - clean sands to silty sand	1.83	1.12	39
	31.33	213.67	1.15	Sands - clean sands to silty sand	1.84	1.13	35
	31.50	179.37	1.19	Sands - clean sands to silty sand	1.91	1.19	31
	31.66	151.18	1.39	Sands - clean sands to silty sand	2.02	1.32	27
	31.82	143.38	1.68	Sand mixtures - silty sand to sandy silt	2.10	1.45	26
	31.99	178.91	1.37	Sands - clean sands to silty sand	1.96	1.24	31
	32.15	194.83	1.17	Sands - clean sands to silty sand	1.88	1.16	32
	32.32	182.03	0.95	Sands - clean sands to silty sand	1.84	1.13	30
	32.48	157.68	1.16	Sands - clean sands to silty sand	1.96	1.24	27
	32.64	136.05	1.72	Sand mixtures - silty sand to sandy silt	2.13	1.51	25
	32.81	174.86	1.30	Sands - clean sands to silty sand	1.96	1.24	30
	32.97	227.10	0.92	Sands - clean sands to silty sand	1.76	1.07	35
	33.14	264.81	0.81	Sands - clean sands to silty sand	1.66	1.01	39
	33.30	287.59	0.81	Sands - clean sands to silty sand	1.64	1.00	42
	33.46	303.05	0.83	Sands - clean sands to silty sand	1.63	1.00	44
	33.63	330.50	0.69	Sands - clean sands to silty sand	1.54	1.00	46
	33.79	370.05	0.85	Sands - clean sands to silty sand	1.57	1.00	52
	33.96	366.70	0.87	Sands - clean sands to silty sand	1.58	1.00	52
	34.12	341.15	0.96	Sands - clean sands to silty sand	1.64	0.99	49
	34.28	334.64	0.92	Sands - clean sands to silty sand	1.63	1.00	48
	34.45	295.30	1.28	Sands - clean sands to silty sand	1.79	1.09	45
	34.61	184.10	2.70	Sand mixtures - silty sand to sandy silt	2.20	1.66	33
	34.78	125.68	3.94	Silt mixtures - clayey silt to silty clay	2.45	2.53	25
	34.94	103.46	4.80	Silt mixtures - clayey silt to silty clay	2.59	5.01	22
	35.10	119.22	4.42	Silt mixtures - clayey silt to silty clay	2.51	3.09	24
	35.27	125.38	4.51	Silt mixtures - clayey silt to silty clay	2.51	2.94	25
	35.43	117.27	5.27	Silt mixtures - clayey silt to silty clay	2.58	4.89	24
	35.60	104.15	5.16	Silt mixtures - clayey silt to silty clay	2.62	6.03	22
	35.76	79.97	6.11	Clays - silty clay to clay	2.76		17
	35.93	97.78	4.97	Silt mixtures - clayey silt to silty clay	2.63	6.46	20
	36.09	103.93	5.65	Clays - silty clay to clay	2.65	7.61	22

Ic = soil behavior type index
Kc = grain characteristics cor. factor
N1(60) = interpreted SPT blow count

Appendix B

APPENDIX B

GEOTECHNICAL LABORATORY INVESTIGATION

1. General

   a. The laboratory investigation used current, accepted test procedures of the American Society of Testing and Materials (ASTM) and/or California Test Standards, wherever practical.

   b. Bulk samples, Standard Penetration Test samples, and Modified California ring samples were obtained during the field investigation. Laboratory sample identification is by project name and number, boring number or trench number, and depth.

1. Geotechnical Index Parameter Tests

   The following Geotechnical Index Parameters tests were performed on samples of in-situ soil/rock collected during the field exploration.

TEST TYPE	NUMBER OF TESTS PERFORMED	TESTING STANDARD
In-situ Moisture Content and Dry Density	37	ASTM D2216 and D7263
Percent-Finer Than #200 Sieve	29	ASTM D1140
Particle-Size Analysis	2	ASTM D422 and D1140
Atterberg Limits	1	ASTM D4318
Expansion Index	2	ASTM D4829

   The purpose of each test type is briefly described below.

   a. In-Situ Moisture Content (ASTM D2216) and Dry Density (ASTM D7263) testing of soils provide an indication of the strength and compressibility of in-situ soils. These data, in conjunction with sampler blow count data, aid in evaluation of soil consistency and in selection of samples for additional laboratory testing. Results of Moisture Content and Dry Density testing are recorded on the Boring and Trench Logs within **Appendix A**.

   b. Percent Finer than #200 Sieve (ASTM D1140) testing was performed on soil samples to aid in classification of the samples in accordance with the Unified Soil Classification System (USCS). Results of Percent Finer than #200 Sieve testing are recorded on the Boring and Trench Logs within **Appendix A** and on applicable laboratory test reports in this Appendix.

   c. Mechanical particle-size analyses of soil fractions larger than 75 microns (No. 200 sieve) and hydrometer analyses of soil fractions smaller than 75 microns were conducted to aid in classification of soils in accordance with the Unified Soil

APPENDIX B

Classification System (USCS). Results of the Particle Size Analysis testing are presented on Lab Report **Figure B1.1** through **B1.9** in this Appendix.

d. Liquid Limit and Plastic Limit tests (ASTM D4318) aid in classification of soils in accordance with the USCS. Results of the Liquid Limit and Plastic Limit testing performed on a selected soil sample are presented on Lab Report **Figure B2** in this Appendix.

e. Expansion Index tests (ASTM D4829) are used to assess expansion potential of soils when inundated with water. Results of Expansion Index testing performed on site soils are presented in the following table.

Sample Location	USCS	% Fines	Expansion Index	Expansion Potential
T-5A & T-17A Mix	SC	40.0	6	Very low

2. Geotechnical Engineering Parameters Tests

The following Geotechnical Engineering Parameters Tests were performed on Modified California ring samples of soil/rock collected at the project site.

Test Type	Number of Tests Performed	Testing Standard
Modified Proctor	2	ASTM D1557
Collapse of Soils	3	ASTM D4546
Direct Shear	20	ASTM D3080
Consolidation	2	ASTM D2435
Permeability	6	ASTM D5084 (Method C)

The purpose of each test type is briefly described below.

a. Modified Proctor (ASTM D1557) tests were performed on selected bulk samples to assess their compacted moisture-density relationship for future use during grading operations. Results of the Modified Proctor tests are presented on **Figures B3.1** and **B3.2** in this Appendix.

b. One-dimensional Collapse of Soils (ASTM D4546) testing was performed on California drive ring samples to assess the hydro-compression potential of alluvial soils when inundated with water under future loading conditions. The samples were incrementally loaded to normal pressures ranging from 200 to 6,400 psf in accordance with Procedure B. The "hydro-compression" was taken as the percent strain when inundated with water under an applied pressure approximately equal to the existing overburden pressure plus future applied foundation bearing pressure at that depth. Results of collapse testing are presented on **Figures B4.1** through **B4.3** in this

Appendix.

c. Direct Shear (ASTM D3080) testing was performed on a mixture of soil from Trenches (remolded to approximately 90 percent of maximum dry density) and on California drive ring samples of bedrock, landslide, terrace deposits and alluvium using a displacement-controlled Direct Shear machine. Prior to shearing, the samples were inundated and consolidated under normal pressures ranging from 1,500 psf to 12,000 psf. Thereafter, the samples were sheared horizontally at a controlled displacement rate until the horizontal shear force reduced to a stable value. For remolded specimens, material passing the No. 4 sieve was used. Results of the Direct Shear testing, including interpreted peak strength and residual shear strength parameters, are presented on **Figures B5.1** through **B5.17** within this Appendix.

d. One-dimensional Consolidation (ASTM D2435) testing was performed on selected ring samples to assess in-situ soil compressibility at applied vertical pressures ranging from 400 psf to 12,800 psf. The soil samples were allowed to consolidate under each applied pressure until the rate of settlement was less than 0.0002 inches per hour. Results of the consolidation testing are presented on **Figures B6.1** and **B6.2** in this Appendix.

e. Permeability tests were performed[1] in a tri-axial compression cell on three (3) selected Modified California ring samples of coarse-grained alluvial soils. The permeability testing was performed in accordance with ASTM D5084 (Method C). Confining pressure approximately equal to the existing over-burden pressure (ranging from about 1,500 to 3,200 psf) was applied to the samples prior to testing. Results of the permeability testing are presented on the attached **Figures 7.1** through **7.6**, prepared by Fugro, in this Appendix.

4. Corrosion Tests

The following corrosivity tests were performed on a mixture of bulk samples of bedrock and alluvial soil obtained at the project site.

TEST TYPE	NUMBER OF TESTS PERFORMED	TESTING STANDARD
Sulfate-Content	1	California Test Method 417
Chloride-Content	1	California Test Method 422
Resistivity and pH	1	California Test 643

[1] Permeability testing was performed in the laboratory of Fugro West, Inc., in Ventura, California.

APPENDIX B

Soluble Sulfates Content, Chloride Content, Resistivity, and pH tests were performed to evaluate corrosivity of soil/rock material from the project site to concrete, ferrous metals, and non-ferrous metals. Results of the testing are presented in the following table.

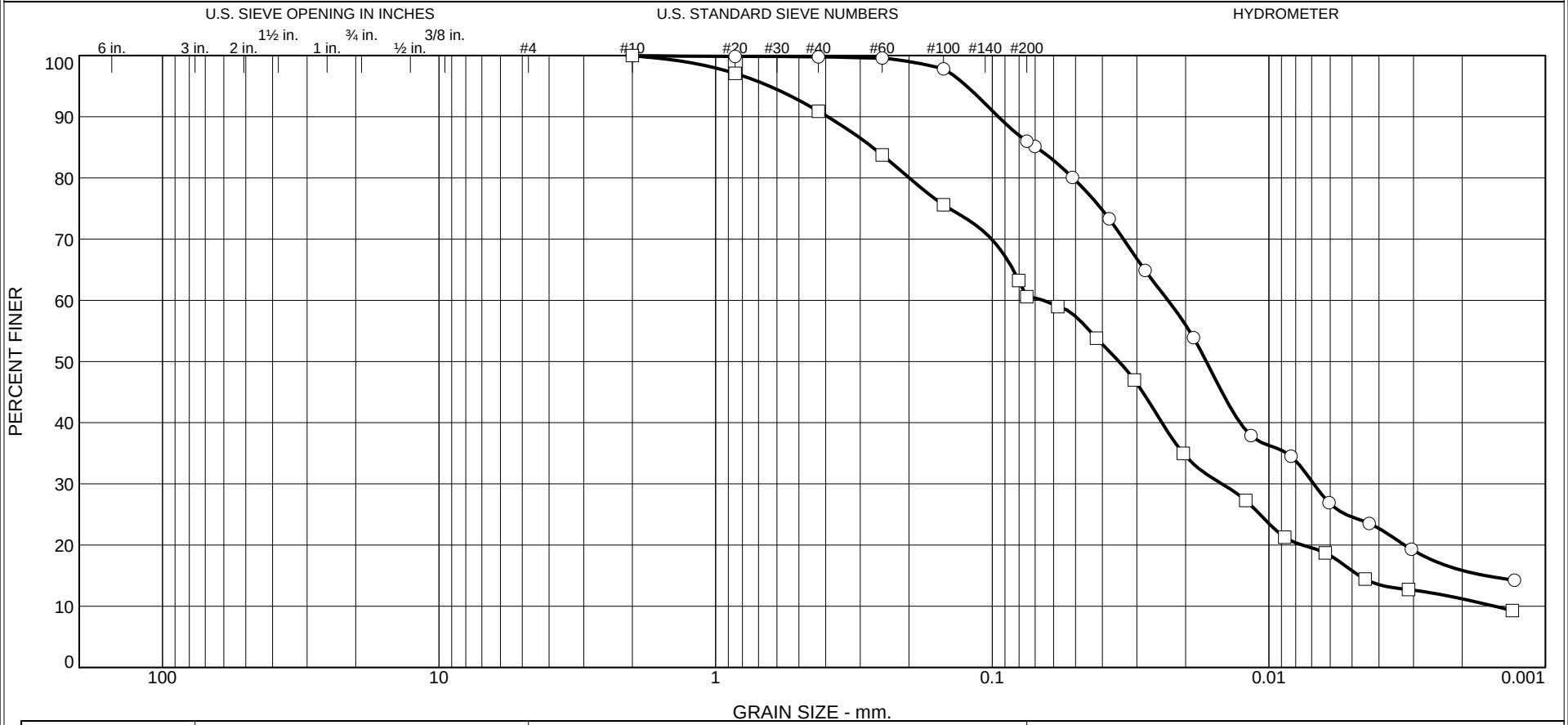
LOCATION	USCS	RESISTIVITY	CHEMICAL ANALYSES		
		SATURATED (OHM-CM)	pH	CHLORIDE Cl (PPM)	SULFATE SO_4 (%)
T-5A & T-17A Mix	SC	1295	7.6	42	0.02

The following attachments complete this Appendix.

LABORATORY TEST RESULTS

- Particle Size Distribution Test Reports Figures B1.1 thru B1.9
- Liquid and Plastic Limits Test Report Figure B2
- Compaction Test Reports Figures B3.1 and B3.2
- Swell/Consolidation Test Reports Figures B4.1 thru B4.3
- Direct Shear Test Reports Figures B5.1 thru B5.20
- Consolidation Test Reports Figures B6.1 and B6.2
- Permeability Test Reports (Fugro) Figures B7.1 thru B7.6

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.2	13.8	61.4	24.6
□	0.0	0.0	0.0	0.0	9.1	30.3	44.8	15.8

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	B-1A		30	1/25/07	CL	Claystone with minor sand (USCS lean clay)		39	22
□	B-2A		66	2/2/07	CL	sandy claystone (USCS sandy lean clay)		34	20

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.1

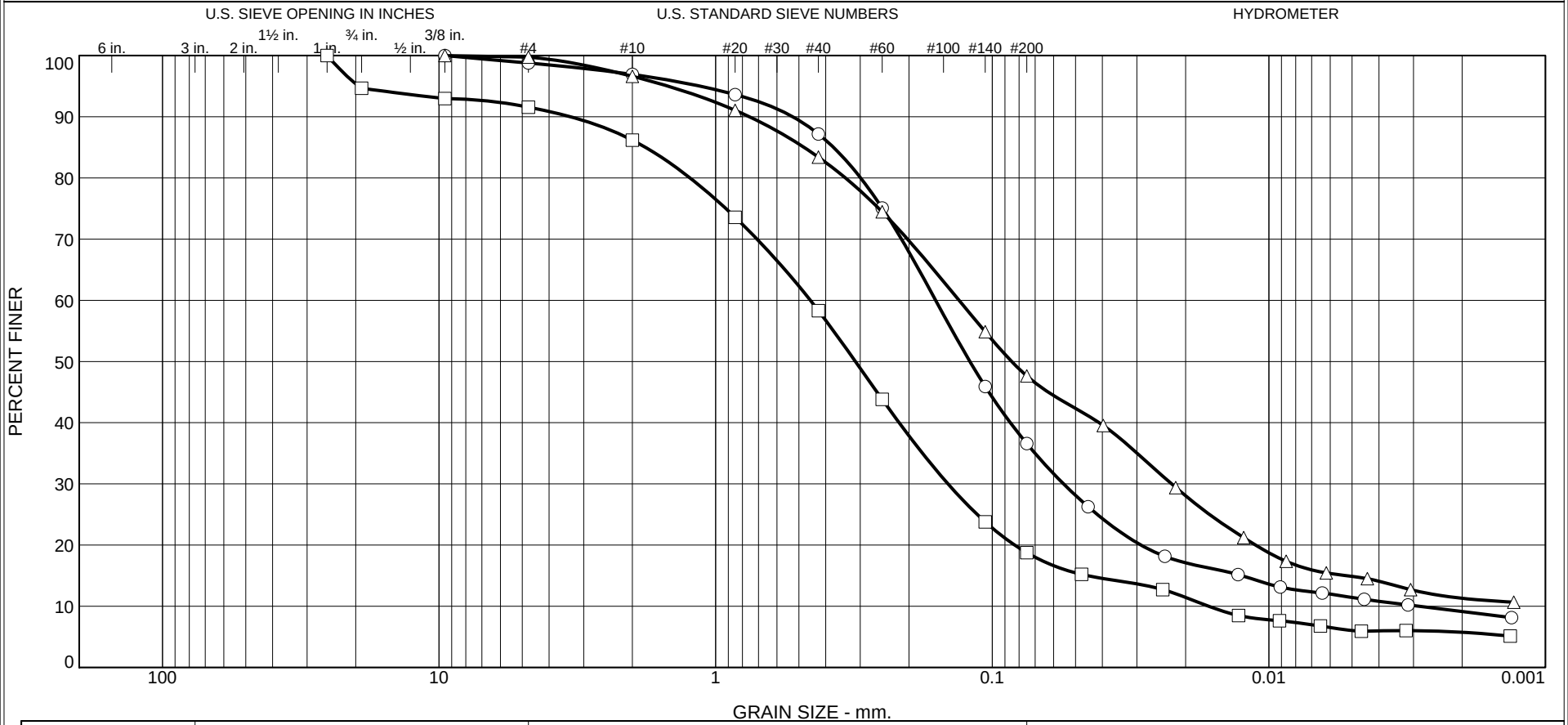
ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

Valencia, California

○ Bedrock (TQs)
□ Bedrock (TQs)

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.2	1.9	9.7	50.6	25.2	11.4
□	0.0	5.3	3.1	5.4	27.9	39.5	12.8	6.0
△	0.0	0.0	0.2	3.2	13.2	35.8	32.7	14.9

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	HS-11A		7	1/15/18	SM	Silty, fine-grained SAND			
□	HS-11A		13	4/3/18	SM	Silty, fine- to medium-grained SAND			
△	HS-11A		16	4/3/18	SM	Silty, fine-grained SAND			

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Sterling Ranch Estates

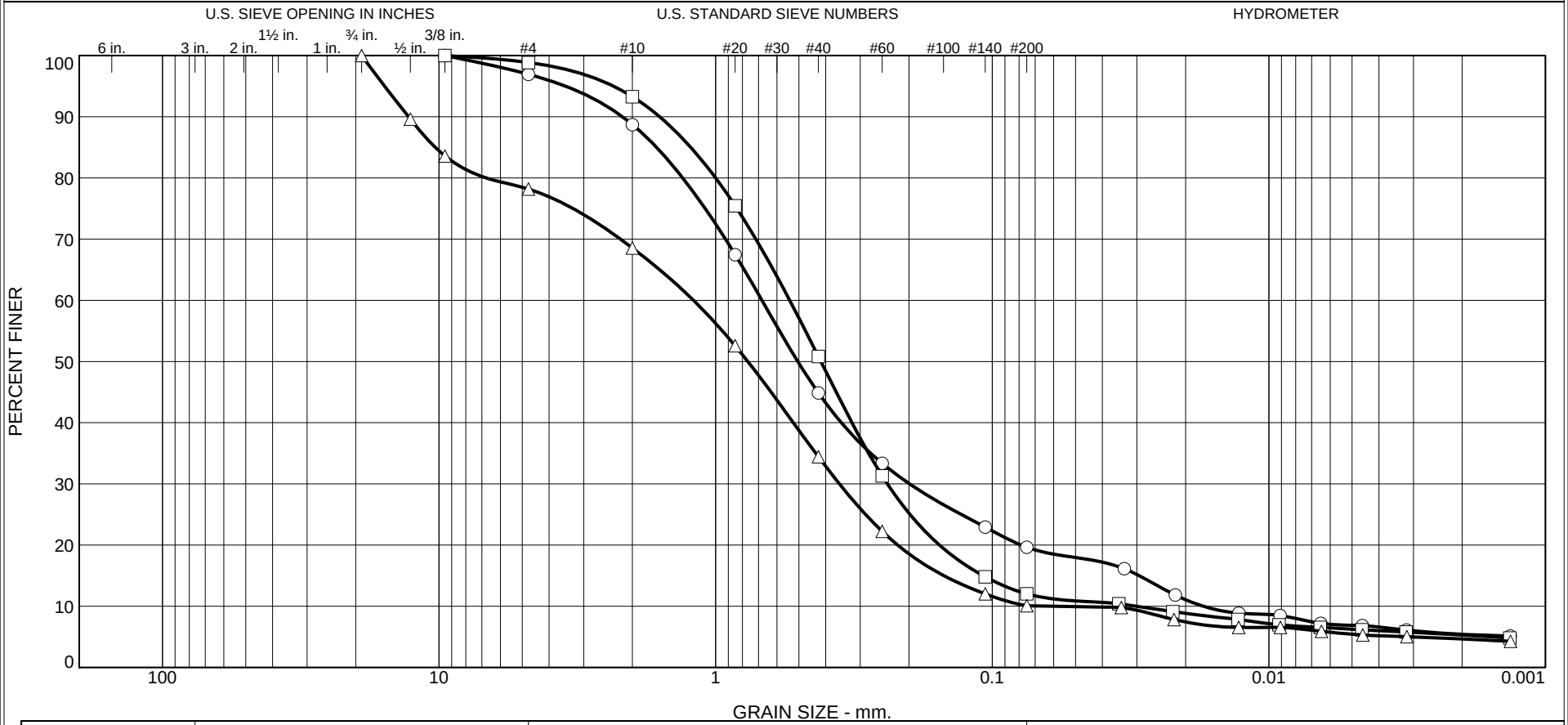
Project No. 18-1245A-4 Figure B1.2

ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

Valencia, California

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.1	8.2	43.8	25.3	12.7	6.9
□	0.0	0.0	1.1	5.6	42.5	38.8	5.8	6.2
△	0.0	0.0	21.8	9.6	34.2	24.3	4.7	5.4

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	HS-11A		22	4/3/18	SM	Silty, fine- to medium-grained SAND			
□	HS-11A		28	4/3/18	SP-SM	Poorly graded, fine-to medium grained SAND with silt			
△	HS-12A		16	4/3/18	SW-SM	Well-graded, fine- to medium-grained SAND with silt and gravel			

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Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.3

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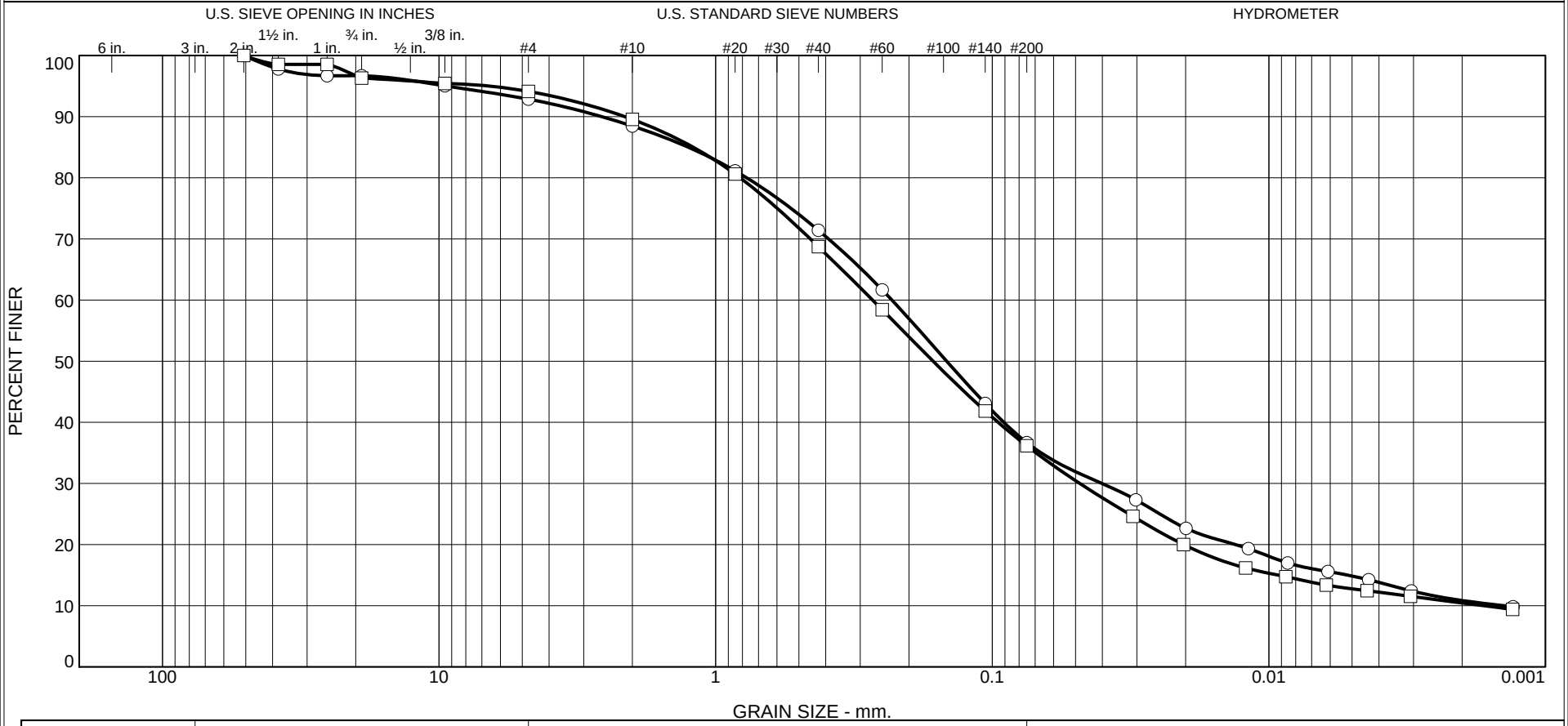
Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	3.3	3.8	4.4	17.1	34.7	21.8	14.9
□	0.0	3.7	2.2	4.5	20.9	32.5	23.4	12.8

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	T-38A	1	3	10/2/17	SM	silty SAND; yellowish-brown (10YR 5/4)			
□	T-43A	1	3	10/2/17	SM	silty SAND; reddish-brown (5YR 4/3)			

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Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.4

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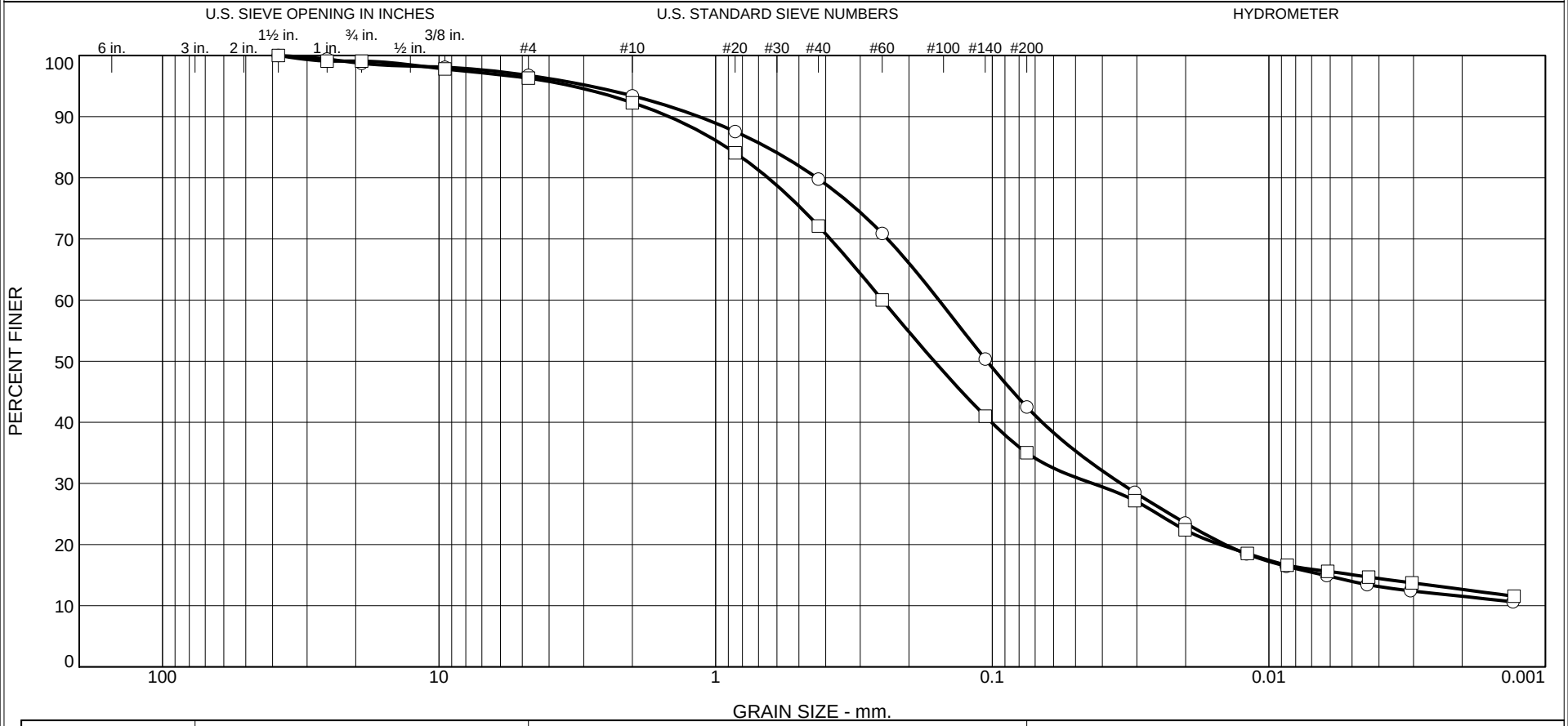
ENGINEERING GEOLOGY, INC.

Valencia, California

○ Slopewash (Qsw)
□ Alluvium (Qal)

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	1.3	2.0	3.3	13.6	37.3	28.5	14.0
□	0.0	0.9	2.8	4.0	20.2	37.1	19.9	15.1

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	T-45A	1	2.5	10/2/17	SM	silty SAND; brown (10YR 5/3)			
□	T-46A	1	3	10/3/17	SM-SC	silty clayey SAND; reddish-brown (5YR 4/4)			

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Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.5

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ENGINEERING GEOLOGY, INC.

Valencia, California

○ Alluvium (Qal)
□ Slopewash (Qsw)

Particle Size Distribution Test Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.6	1.9	3.5	19.6	38.1	23.9	12.4
□	0.0	0.0	3.8	4.1	18.4	40.8	21.7	11.2
△	0.0	0.4	3.7	7.4	28.1	36.2	15.6	8.6

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	PT-1	1	2.5	10/16/17	SM	silty SAND; brown (7.5YR 5/4)			
□	PT-2	1	2.5	10/16/17	SM	silty SAND; yellowish-brown (10YR 5/4)			
△	PT-3	1	2.5	10/17/17	SM	silty SAND; brown (7.5YR 5/4)			

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.6

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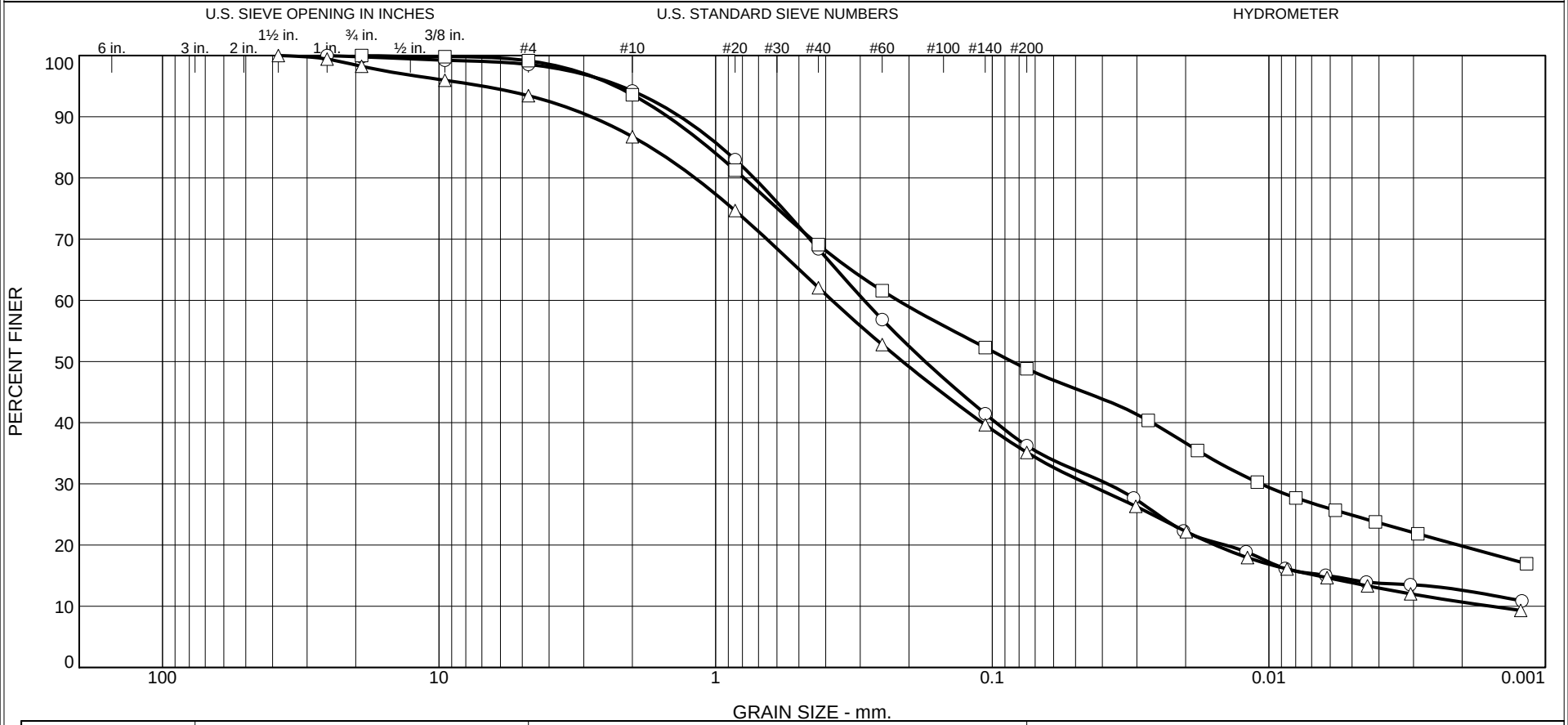
○ Alluvium (Qal)
Lot 240 Infiltration Basin
□ Slopewash (Qsw)
△ Alluvium (Qal)
Lot 242 Infiltration Basin

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.2	1.2	4.4	25.8	32.1	22.0	14.3
□	0.0	0.0	0.8	5.6	24.5	20.3	23.9	24.9
△	0.0	1.8	4.8	6.7	24.6	27.0	21.3	13.8

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	PT-4	1	2.5	10/17/18	SM	silty SAND; reddish-brown (5YR 5/4)			
□	PT-5	1	2.5	10/18/17	SC	clayey SAND; reddish-brown (5YR 5/4)			
△	PT-6	1	3	10/18/17	SM	silty SAND; brown (7.5YR 5/3)			

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.7

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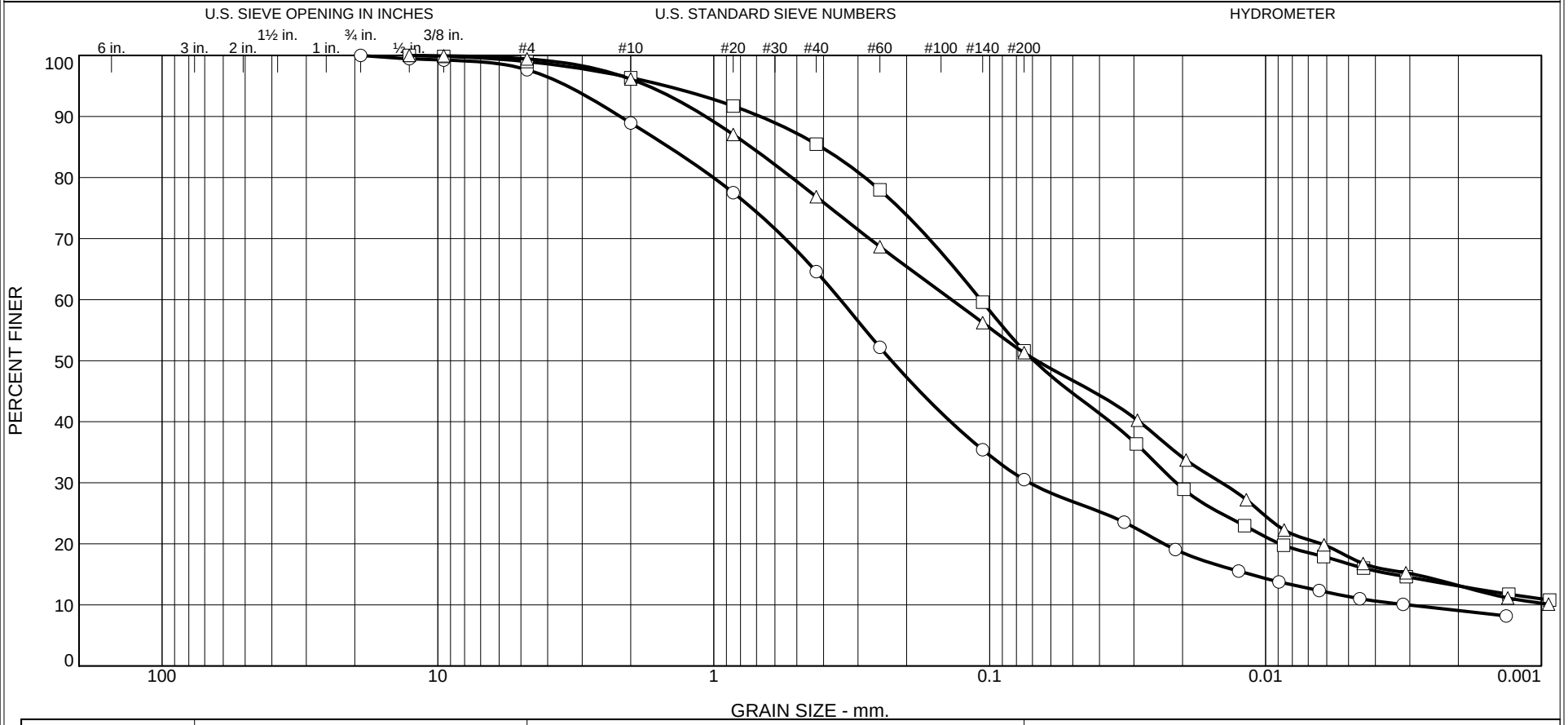
○ Alluvium (Qal)
□ Alluvium (Qal)
△ Alluvium (Qal)
Adjacent to Lot 241 Infiltration Basin

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.3	8.8	24.3	34.1	19.2	11.3
□	0.0	0.0	1.0	2.7	10.8	33.9	34.9	16.7
△	0.0	0.0	0.6	3.3	19.2	25.6	33.4	17.9

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	PT-7		5	1/17/18	SM	silty SAND; brown (7.5YR 5/3)			
□	PT-8		5.5	1/17/18	CL-ML	sandy silty clay; brown (7.5YR 5/3)		25	18
△	PT-9	1	5	1/17/18	ML	sandy SILT; dark yellowish-brown (10YR 3/4)			

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.8

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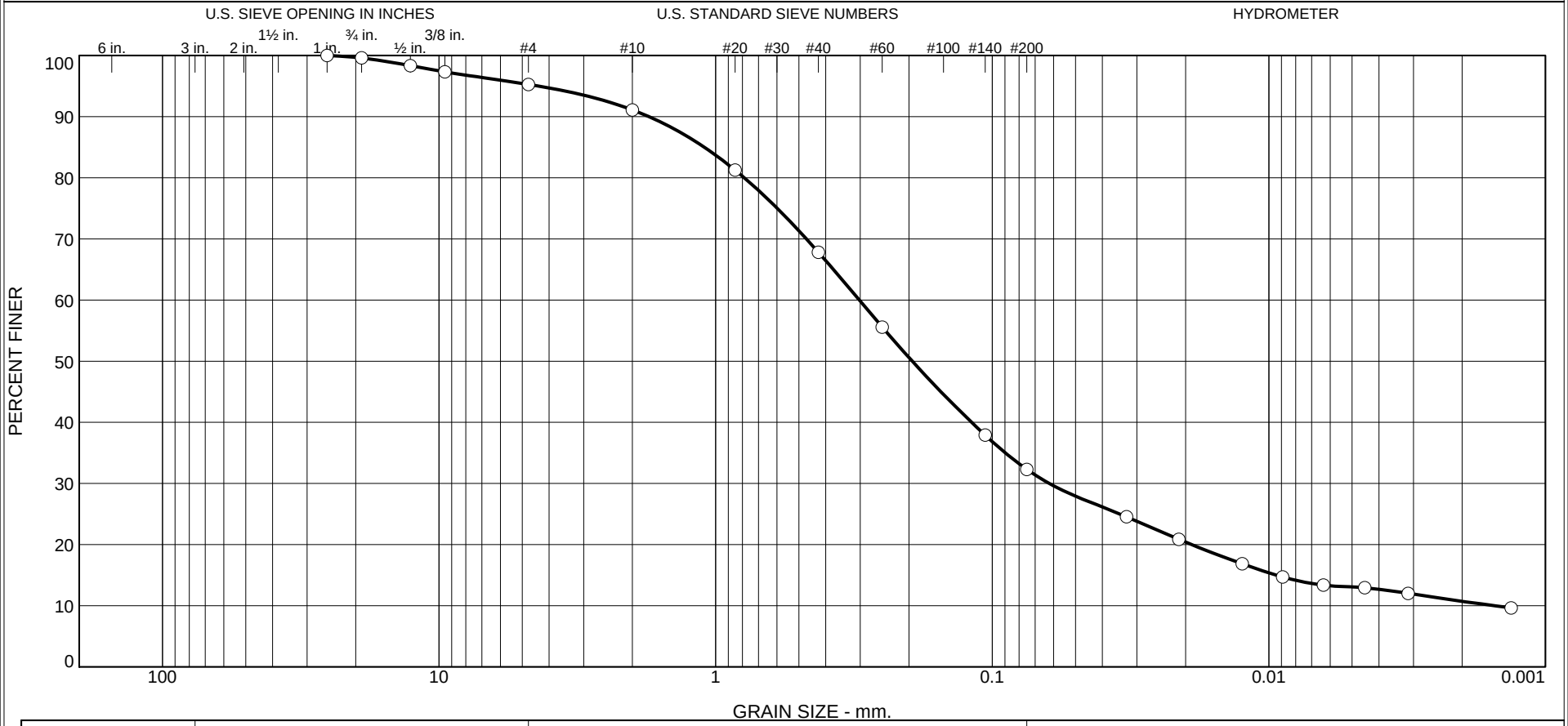
○ Alluvium (Qal)
Lot 240 Infiltration Basin

□ Alluvium (Qal)
Lot 240 Infiltration Basin

△ Alluvium (Qal)

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.4	4.3	4.2	23.3	35.5	19.2	13.1

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	PT-10		5.5	1/17/18	SM	silty SAND; dark brown (7.5YR 5/3)			

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.9

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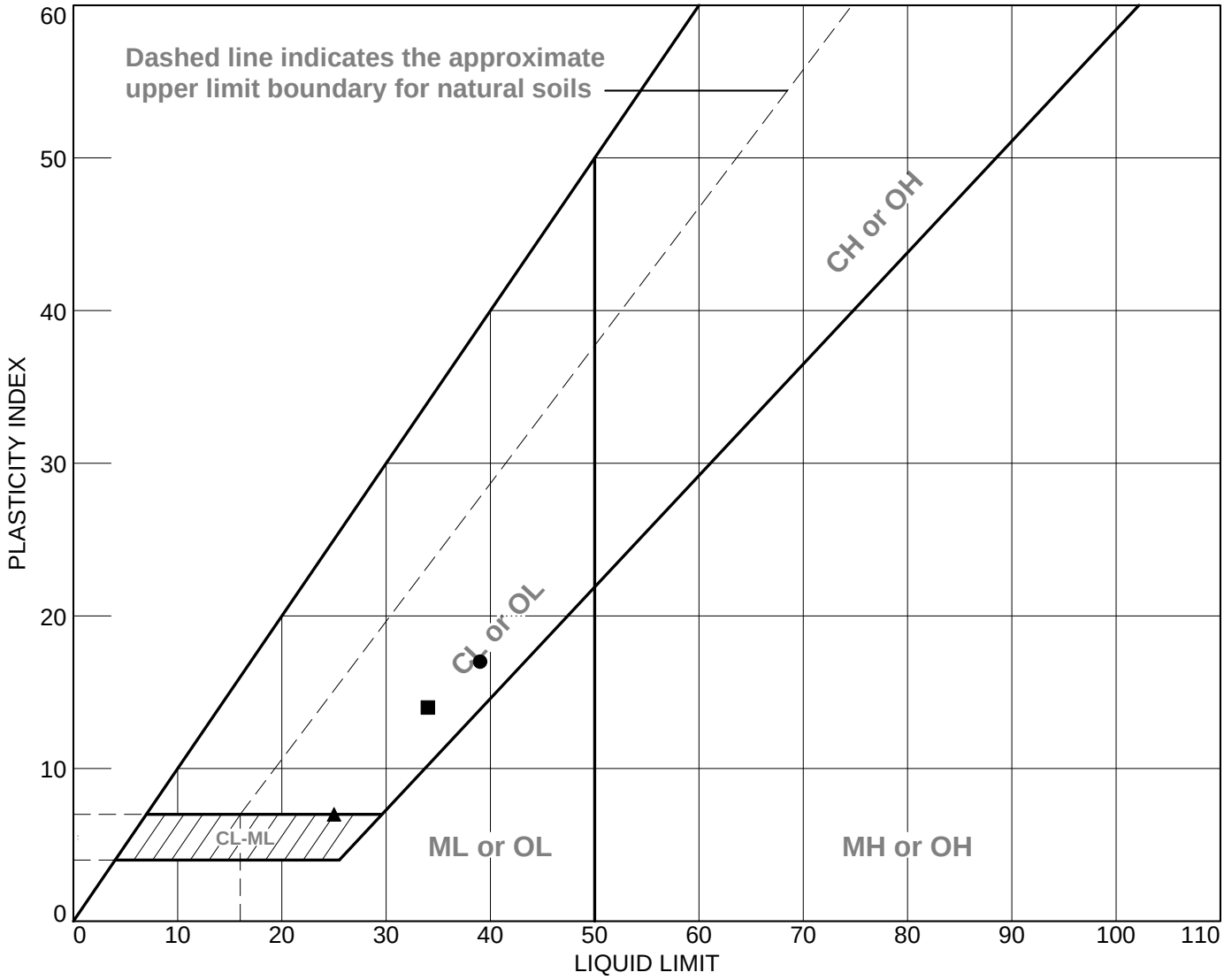
○ Alluvium (Qal)
Lot 242 Infiltration Basin

LIQUID AND PLASTIC LIMITS TEST REPORT



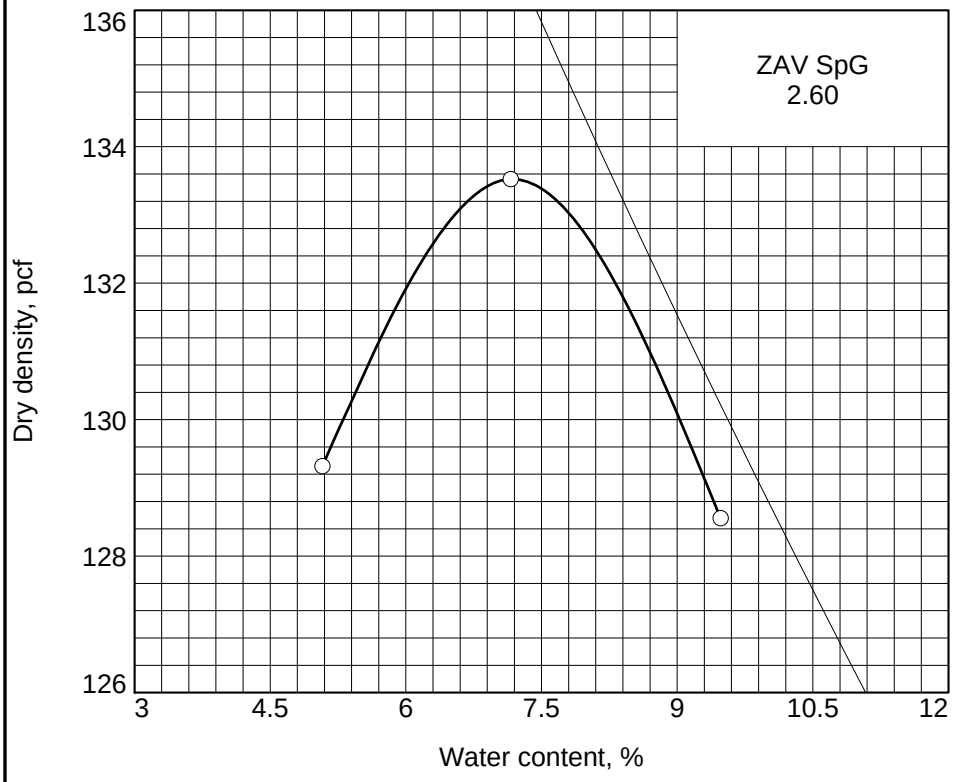
SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●	B-1A		30		22	39	17	CL
■	B-2A		66		20	34	14	CL
▲	PT-8		5.5		18	25	7	CL-ML

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California

Client: Sterling Gateway, L.P.
Project: VTTM 60257
Sterling Ranch Estates
Project No.: 18-1245A-4 **Figure** B2

COMPACTION TEST REPORT



Curve No.
A

Test Specification:
ASTM D 1557-12 Method A Modified

Hammer Wt.: 10 lb.
Hammer Drop: 18 in.
Number of Layers: five
Blows per Layer: 25
Mold Size: 0.03333 cu. ft.

Test Performed on Material Passing #4 **Sieve**

Soil Data

NM _____ **Sp.G.** 2.60
LL _____ **PI** _____
%>#4 3.1 **%<#200** 40.0
USCS SC **AASHTO** _____

TESTING DATA

	1	2	3	4	5	6
WM + WS	8.96	9.20	9.12			
WM	4.43	4.43	4.43			
WW + T #1	462.9	469.2	489.3			
WD + T #1	442.0	440.0	449.5			
TARE #1	30.1	31.8	29.6			
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	5.1	7.2	9.5			
DRY DENSITY	129.3	133.5	128.6			

TEST RESULTS

Maximum dry density = 133.5 pcf

Optimum moisture = 7.2 %

Material Description

Reddish-brown, clayey SAND (SC)

Project No. 18-1245A-4 **Client:** Sterling Gateway, L.P.
Project: VTTM 60257
Sterling Ranch Estates
○ **Location:** T-5A @ 6-6.5' & T-17A @ 0-7' 2:1 Mix

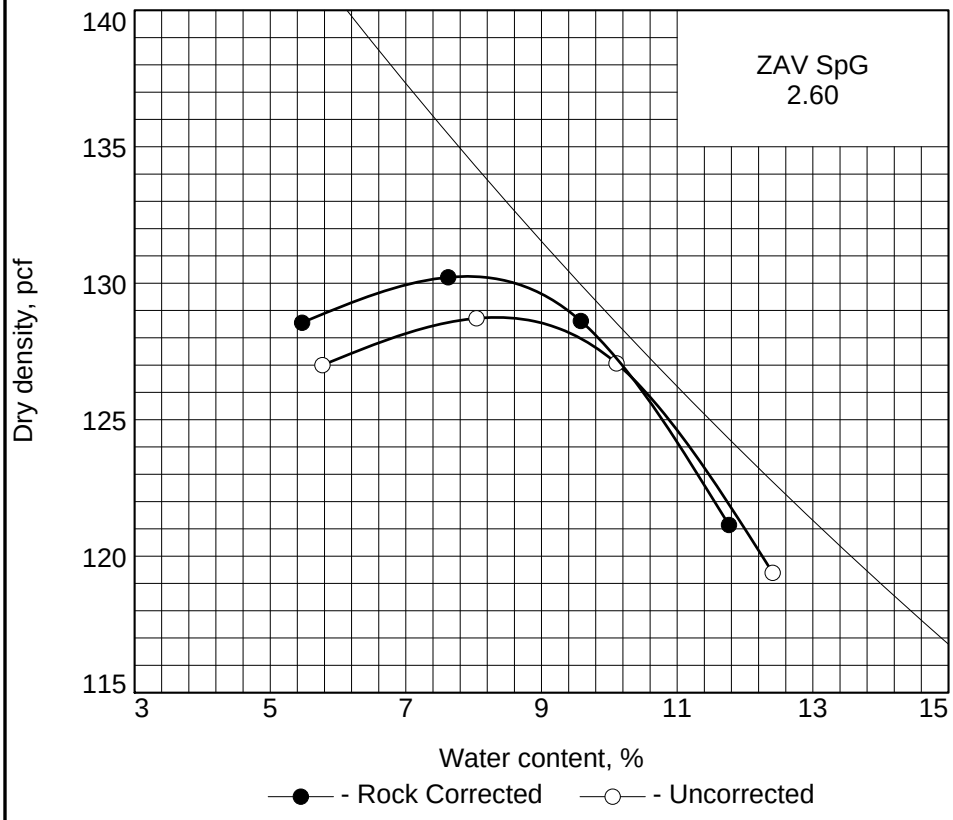
Remarks:
2:1 Saugus Formation/Alluvium Mix

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Valencia, California

Figure B3.1

COMPACTION TEST REPORT



Curve No.
B

Test Specification:
ASTM D 1557-12 Method A Modified
ASTM D4718-15 Oversize Corr. Applied to

Hammer Wt.: 10 lb.
Hammer Drop: 18 in.
Number of Layers: five
Blows per Layer: 25
Mold Size: 0.03333 cu. ft.

Test Performed on Material Passing #4 **Sieve**

Soil Data

NM _____ **Sp.G.** 2.60
LL _____ **PI** _____
%>#4 5.2 **%<#200** 40.5
USCS SC **AASHTO** _____

TESTING DATA

	1	2	3	4	5	6
WM + WS	8.91	9.07	9.10	8.91		
WM	4.43	4.43	4.43	4.43		
WW + T #1	453.1	495.4	507.6	519.8		
WD + T #1	430.2	460.9	464.0	465.9		
TARE #1	31.8	31.7	32.9	32.1		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	5.5	7.6	9.6	11.8		
DRY DENSITY	128.5	130.2	128.6	121.1		

ROCK CORRECTED TEST RESULTS

Maximum dry density = 130.2 pcf

Optimum moisture = 7.9 %

Material Description

Yellowish-brown, clayey SAND (SC)

Project No. 18-1245A-4 **Client:** Sterling Gateway, L.P.
Project: VTTM 60257
Sterling Ranch Estates
○ **Location:** T-19A @ 0-6' & T-13B @ 5-10' 1:1 Mix

Remarks:
1:1 Saugus Formation/Alluvium Mix

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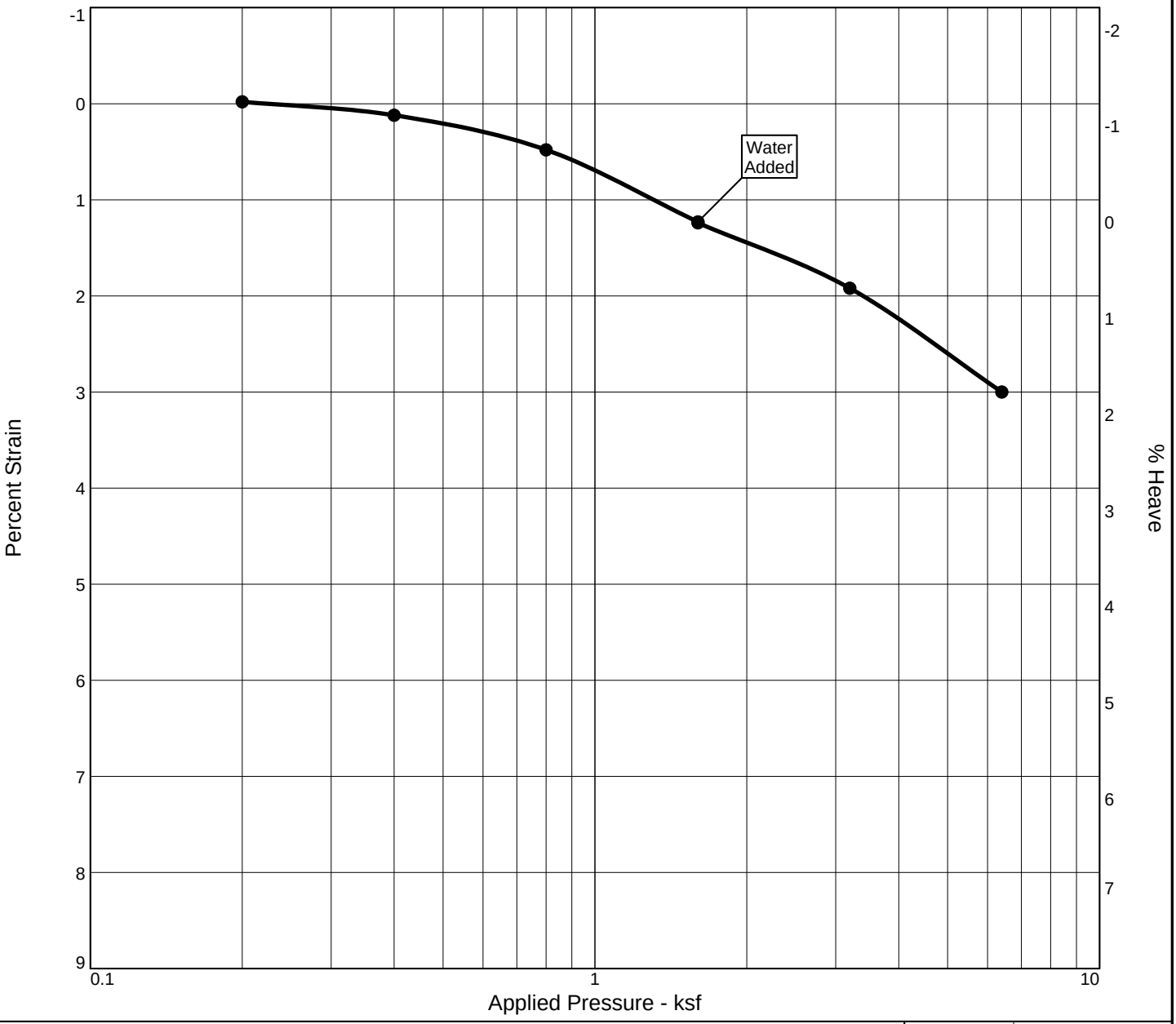
Figure B3.2

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Orangish-brown silty sand	SM	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	1.44	108.7	112.0	5.8 %	18.1	29.4 %	100.0	0.522	0.476	2.4	0.06

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Method C; Inundated with distilled water at 1,600 psf

D2435 Method	C_r	Swell Press. (ksf)	Heave %
D4546			0.0

Project No. 18-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-1A **Depth:** 12'

Remarks:
Alluvium (Qal)

Checked By: K. Callahan

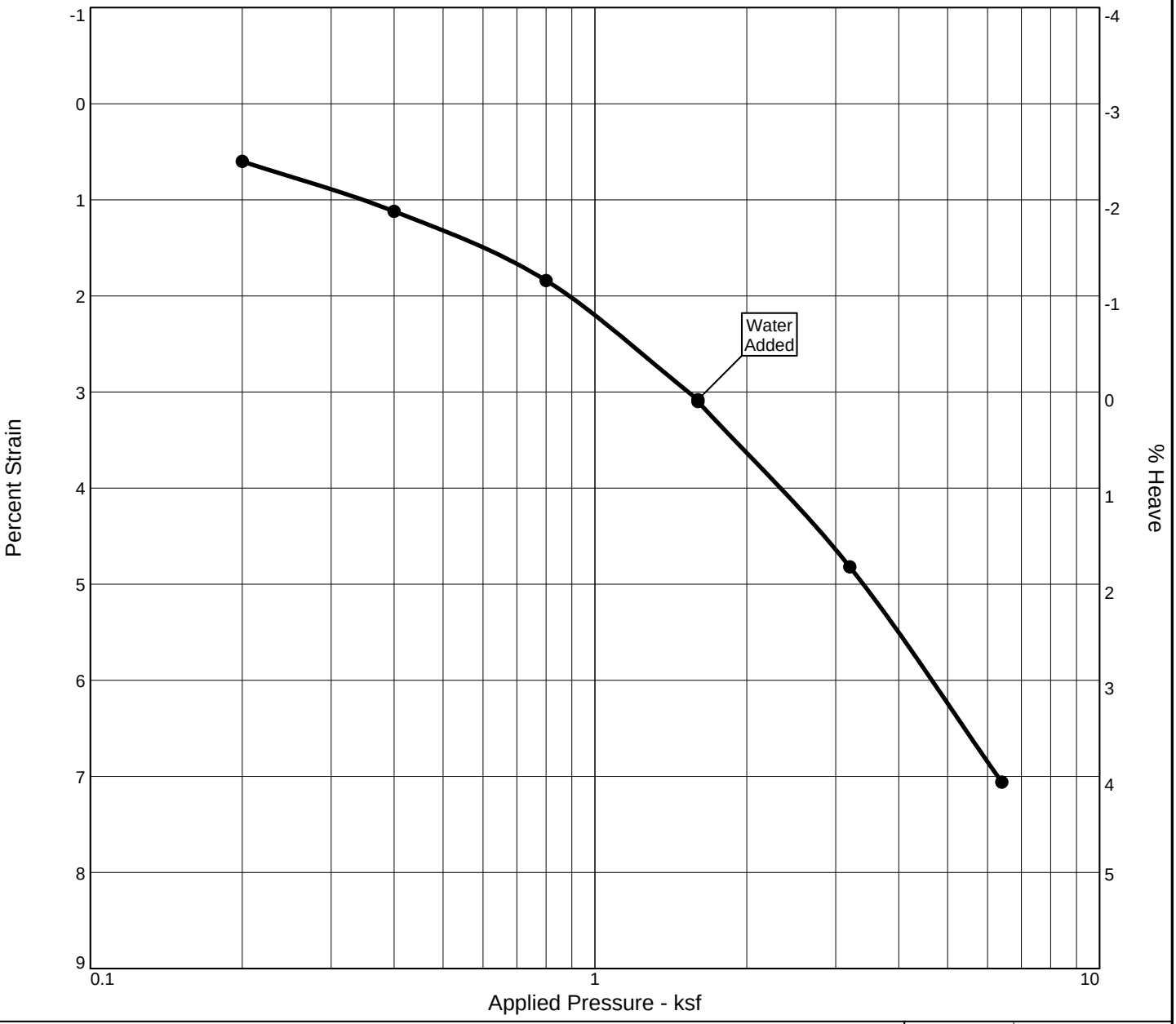
Title: Geotechnical Engineer

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Valencia, California

Figure B4.1

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Orangish-brown, silty sand	SM	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	1.44	104.5	112.4	5.1 %	17.9	23.3 %	100.0	0.583	0.471	2.1	0.12

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Method C; Inundated with distilled water 1,600 at psf

D2435 Method	C_r	Swell Press. (ksf)	Heave %
D4546			0.0

Project No. 18-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-4A **Depth:** 12'

Remarks:
Alluvium (Qal)

Checked By: K. Callahan

Title: Geotechnical Engineer

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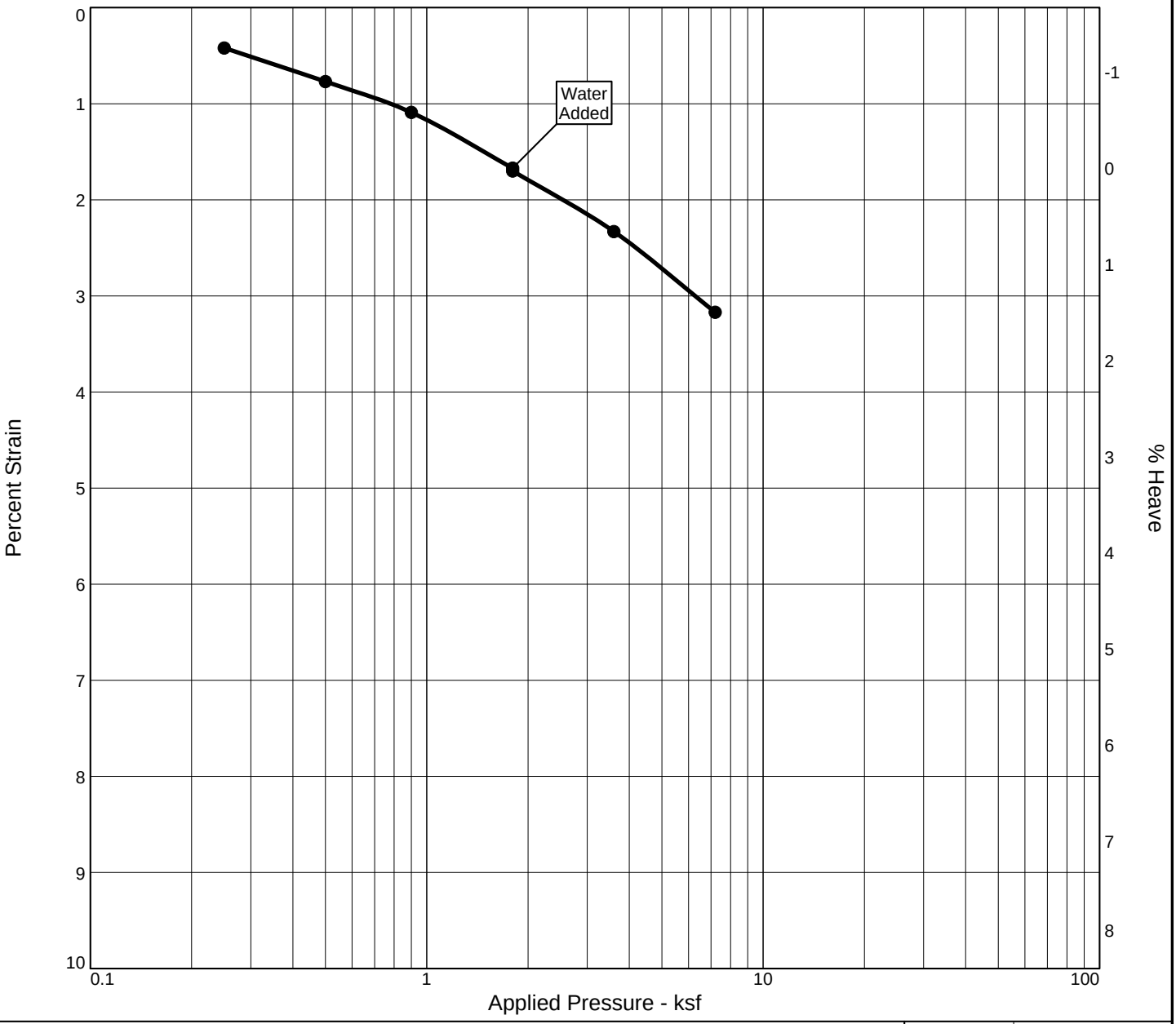
Valencia, California

Figure B4.2

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Yellowish-brown, silty sand	SM	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	1.8	102.9	106.3	6.1 %	21.0	26.7 %	100.0	0.608	0.557	2.4	0.05

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Method C; Inundated with distilled water at 1,800 psf

D2435 Method	C_r	Swell Press. (ksf)	Heave %
D4546			0.0

Project No. 18-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-6A **Depth:** 15'

Remarks:
Alluvium (Qal)

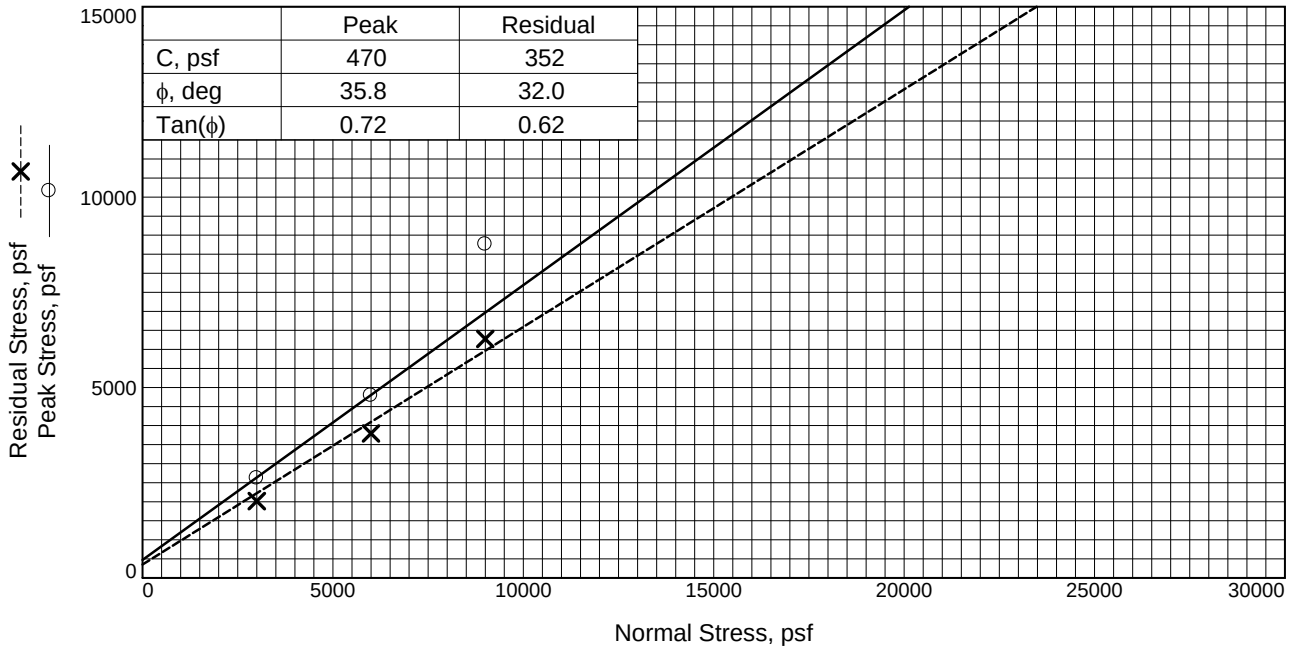
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

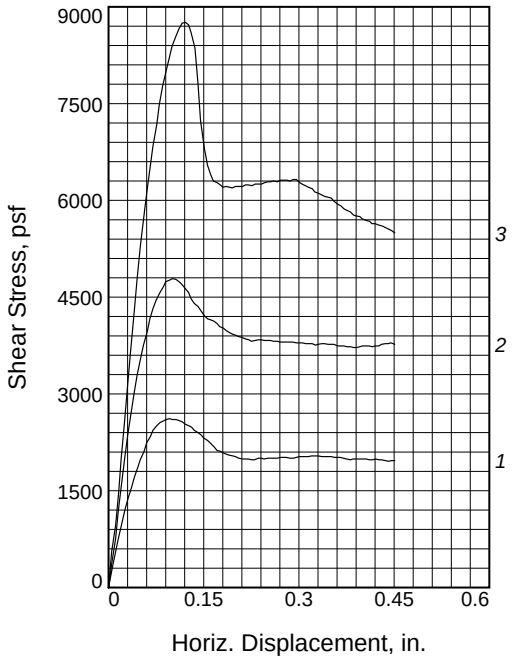
Valencia, California

Checked By: K. Callahan

Title: Geotechnical Engineer

Figure B4.3





Sample No.		1	2	3
Initial	Water Content, %	3.5	4.9	3.8
	Dry Density, pcf	113.3	112.5	118.0
	Saturation, %	20.4	27.6	24.8
	Void Ratio	0.4598	0.4708	0.4018
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	15.8	16.0	13.3
	Dry Density, pcf	116.7	116.3	122.3
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4177	0.4228	0.3526
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.97	0.97	0.96
Normal Stress, psf		3000	6000	9000
Peak Stress, psf		2616	4788	8759
Displacement, in.		0.10	0.10	0.12
Residual Stress, psf		2016	3792	6276
Displacement, in.		0.30	0.30	0.30
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: California Drive
Description: Fine- to coarse-grained Sandstone (USCS silty sand)

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross Bedding
% Fines = 22.6

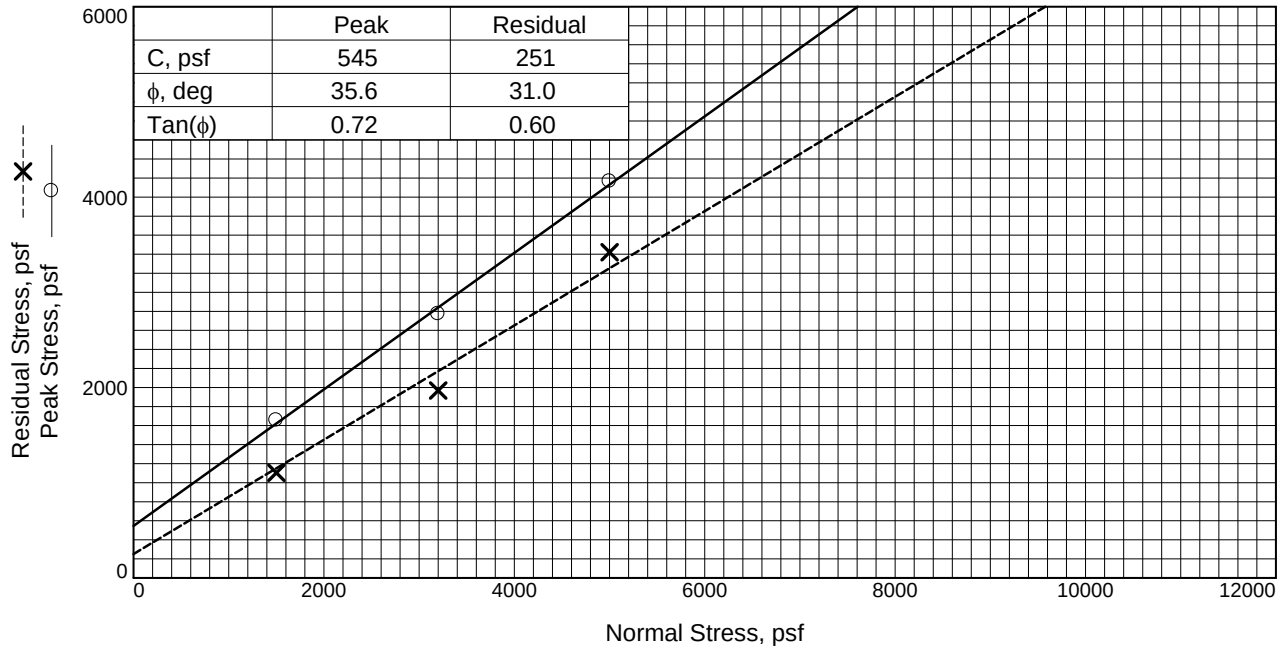
Figure B5.1

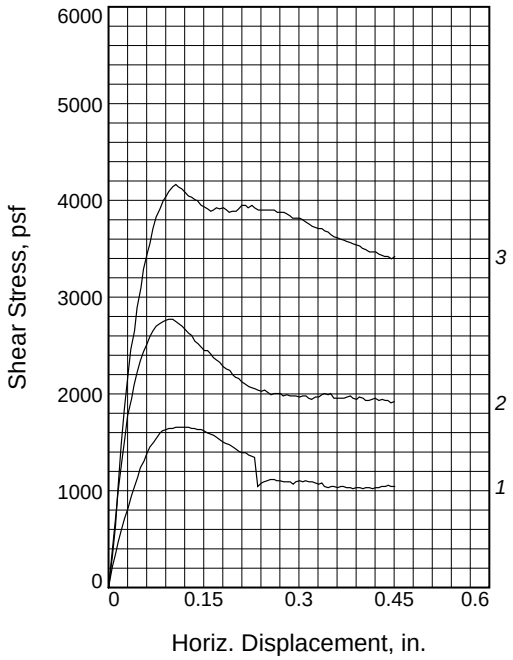
Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1A **Depth:** 10

Proj. No.: 18-1245A-4 **Date Sampled:** 1/24/07

DIRECT SHEAR TEST REPORT
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	5.2	5.6	4.1
	Dry Density, pcf	124.3	120.2	114.2
	Saturation, %	41.4	39.3	24.3
	Void Ratio	0.3312	0.3766	0.4483
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	12.1	13.7	15.9
	Dry Density, pcf	125.3	121.4	116.5
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3207	0.3624	0.4205
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.98
Normal Stress, psf		1500	3200	5000
Peak Stress, psf		1656	2772	4164
Displacement, in.		0.11	0.10	0.11
Residual Stress, psf		1104	1968	3420
Displacement, in.		0.30	0.30	0.45
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: California Drive
Description: medium- to coarse-grained Sandstone (USCS silty sand)

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 18.6

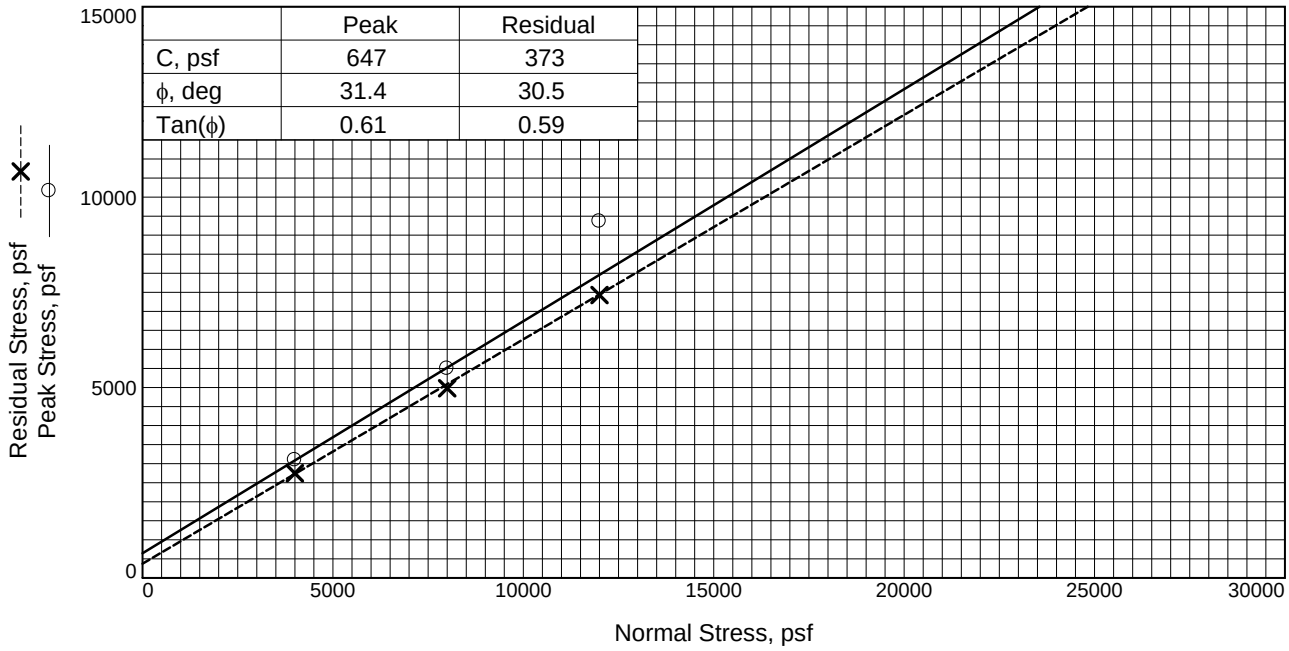
Figure B5.2

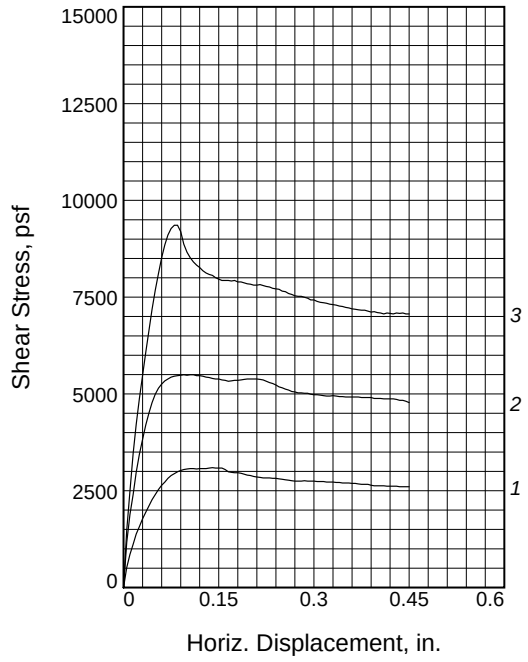
Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1A **Depth:** 20

Proj. No.: 18-1245A-4 **Date Sampled:** 1/24/07

DIRECT SHEAR TEST REPORT
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	10.2	10.5	9.5
	Dry Density, pcf	113.1	119.2	125.4
	Saturation, %	58.6	71.4	79.2
	Void Ratio	0.4623	0.3883	0.3192
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	15.3	13.0	10.6
	Dry Density, pcf	117.7	122.9	129.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4060	0.3457	0.2813
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.96	0.97	0.97
Normal Stress, psf		4000	8000	12000
Peak Stress, psf		3096	5495	9359
Displacement, in.		0.14	0.11	0.09
Residual Stress, psf		2748	4980	7427
Displacement, in.		0.30	0.30	0.30
Strain rate, %/min.		0.0050	0.0050	0.0050

Sample Type: California Drive
Description: Sandy siltstone (USCS sandy silt)

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 52.3

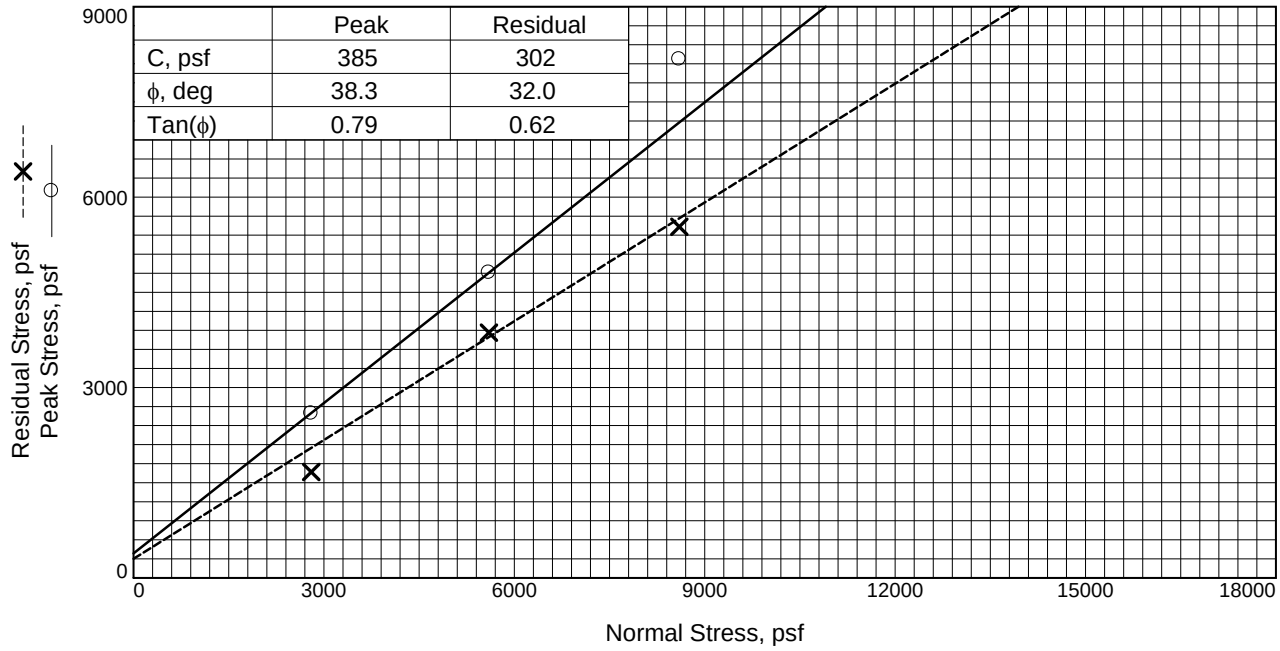
Figure B5.3

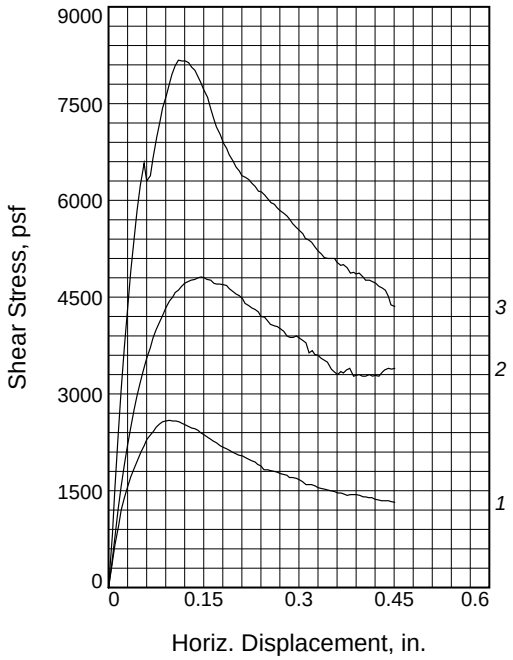
Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1A **Depth:** 40'

Proj. No.: 18-1245A-4 **Date Sampled:** 1/25/07

DIRECT SHEAR TEST REPORT
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	8.4	3.4	6.2
	Dry Density, pcf	121.1	115.6	124.7
	Saturation, %	60.7	21.0	50.5
	Void Ratio	0.3664	0.4308	0.3268
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	13.2	14.9	11.1
	Dry Density, pcf	122.5	118.5	127.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3503	0.3957	0.2932
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.98	0.97
Normal Stress, psf		2800	5600	8600
Peak Stress, psf		2592	4812	8172
Displacement, in.		0.10	0.15	0.11
Residual Stress, psf		1668	3864	5532
Displacement, in.		0.30	0.30	0.30
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: California Drive
Description: fine- to coarse-grained Sandstone (USCS silty sand)

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross Bedding
% Fines = 16.4

Figure B5.4

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1A **Depth:** 60

Proj. No.: 18-1245A-4 **Date Sampled:** 1/25/07

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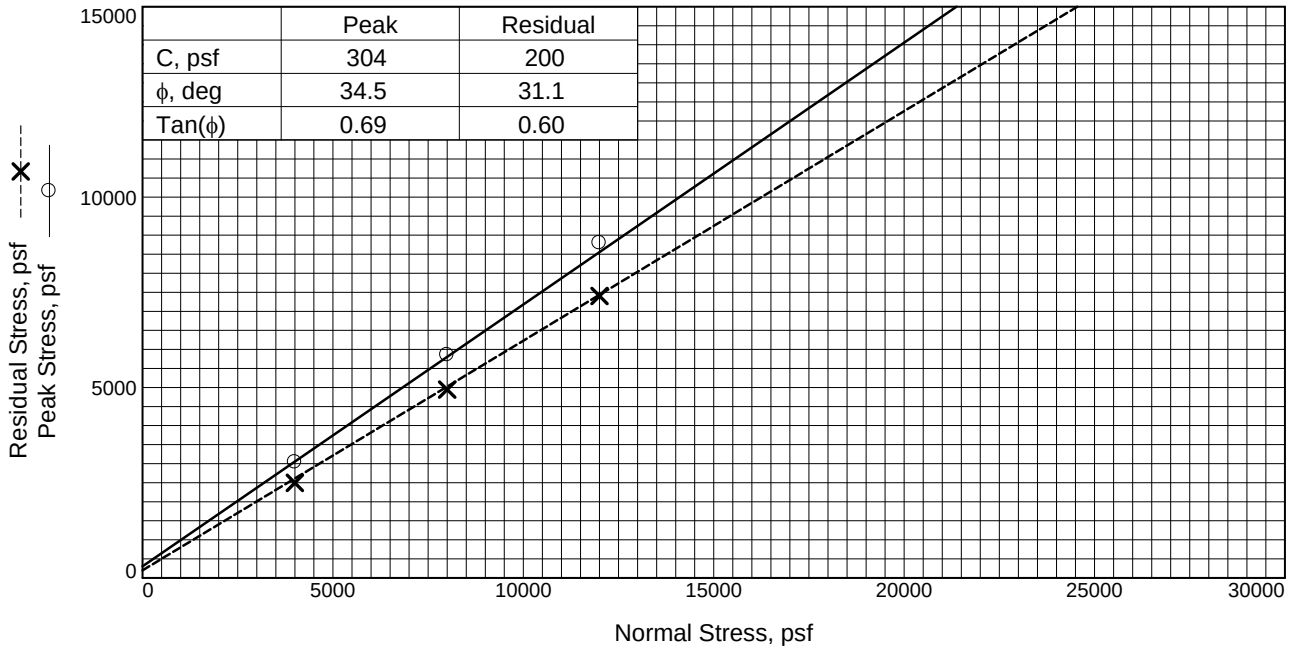

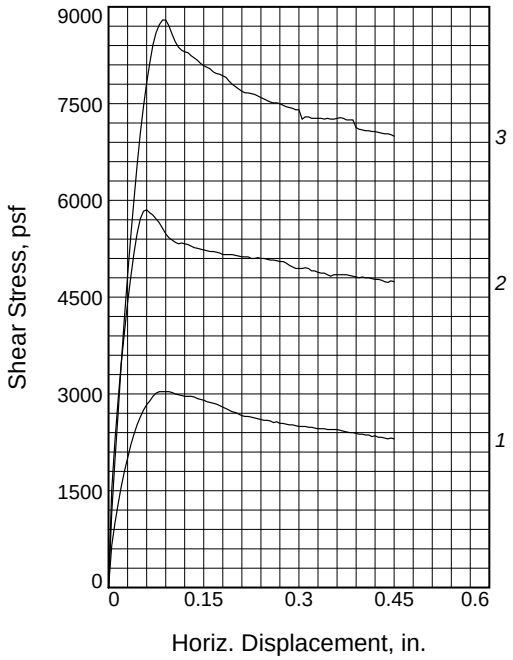

Sample No.		1	2	3
Initial	Water Content, %	10.3	9.4	10.1
	Dry Density, pcf	115.2	121.2	119.0
	Saturation, %	62.3	67.9	68.8
	Void Ratio	0.4365	0.3654	0.3906
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	15.0	12.6	13.1
	Dry Density, pcf	118.5	124.1	122.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3963	0.3327	0.3481
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.97	0.98	0.97
Normal Stress, psf		4000	8000	12000
Peak Stress, psf		3036	5855	8795
Displacement, in.		0.08	0.06	0.09
Residual Stress, psf		2496	4944	7403
Displacement, in.		0.30	0.30	0.30
Strain rate, %/min.		0.0050	0.0050	0.0050

Sample Type: California Drive
Description: sandy claystone (USCS sandy lean clay)
LL= 34 **PL=** 20 **PI=** 14
Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 60.6

Figure B5.5

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-2A **Depth:** 66

Proj. No.: 18-1245A-4 **Date Sampled:** 2/2/07

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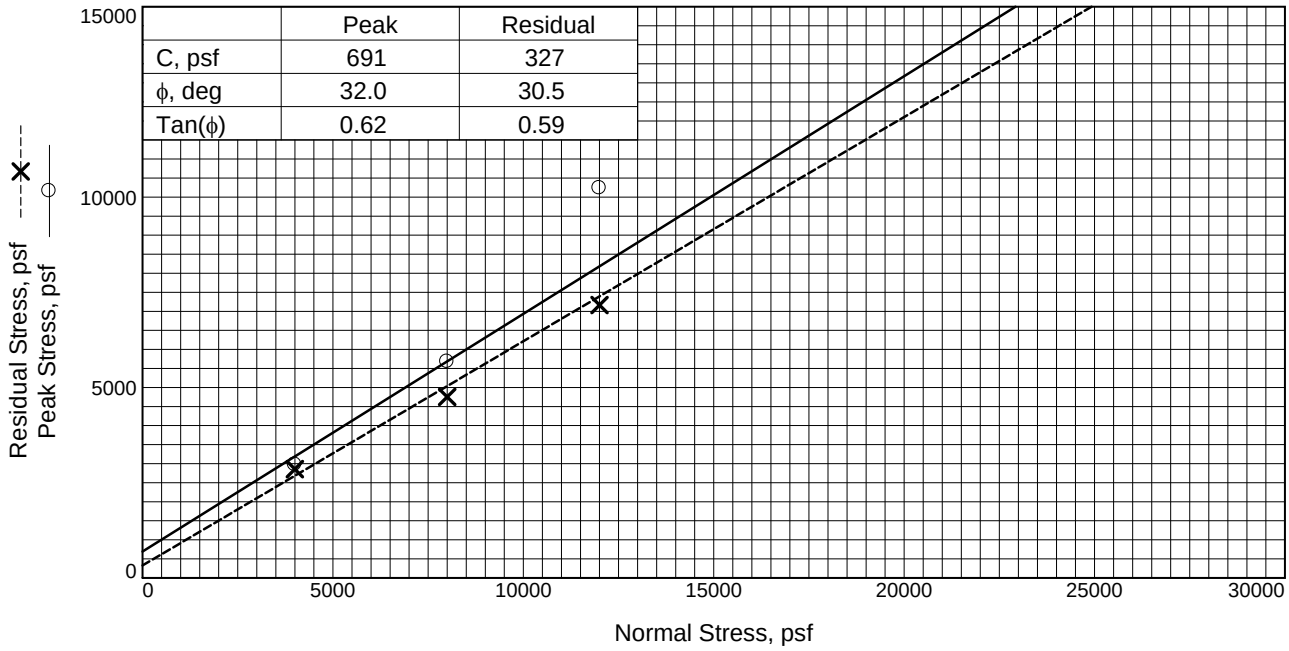

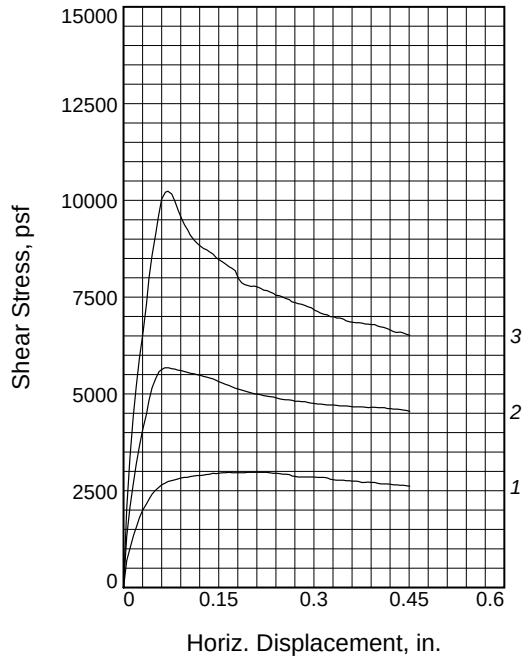

Sample No.		1	2	3
Initial	Water Content, %	8.7	9.1	9.1
	Dry Density, pcf	112.3	124.7	129.4
	Saturation, %	48.6	73.9	86.9
	Void Ratio	0.4737	0.3269	0.2784
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	16.5	10.7	9.2
	Dry Density, pcf	115.0	128.8	133.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4385	0.2843	0.2431
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.97	0.97
Normal Stress, psf		4000	8000	12000
Peak Stress, psf		2976	5676	10235
Displacement, in.		0.20	0.07	0.07
Residual Stress, psf		2856	4752	7164
Displacement, in.		0.30	0.30	0.30
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: California Drive
Description: Sandy siltstone (USCS sandy silt)

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 69.5

Figure B5.6

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-2A **Depth:** 80

Proj. No.: 18-1245A-4 **Date Sampled:** 2/2/07

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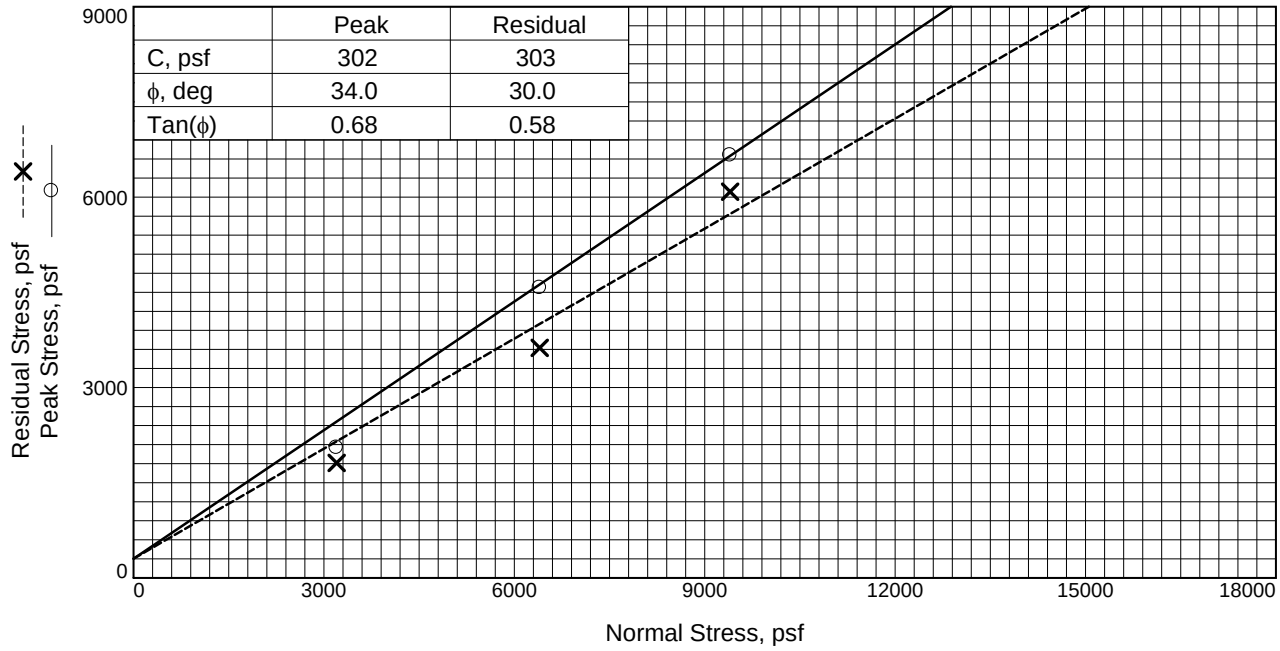

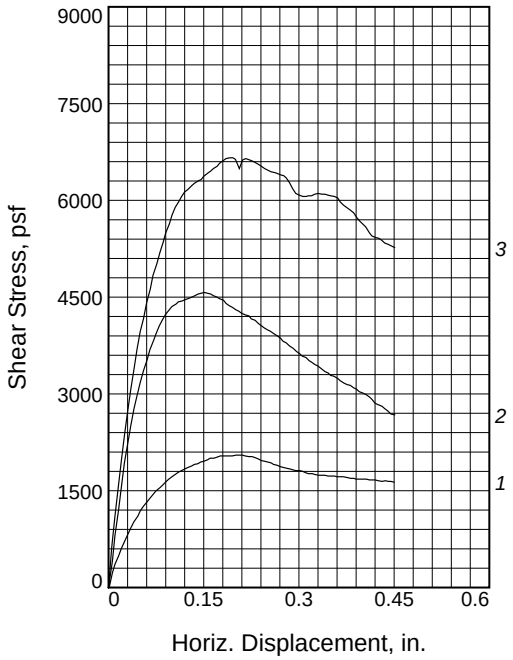

Sample No.		1	2	3
Initial	Water Content, %	7.5	5.8	8.1
	Dry Density, pcf	113.8	121.2	121.2
	Saturation, %	44.0	42.5	58.7
	Void Ratio	0.4540	0.3645	0.3650
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	16.0	12.7	11.8
	Dry Density, pcf	116.3	123.9	126.0
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4230	0.3353	0.3134
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.96
Normal Stress, psf		3200	6400	9400
Peak Stress, psf		2052	4572	6660
Displacement, in.		0.20	0.15	0.19
Residual Stress, psf		1812	3624	6084
Displacement, in.		0.30	0.30	0.30
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: California Drive
Description: fine- to coarse-grained Sandstone (USCS silty sand)

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 24.6

Figure B5.7

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: T-20A **Depth:** 6

Proj. No.: 18-1245A-4 **Date Sampled:**

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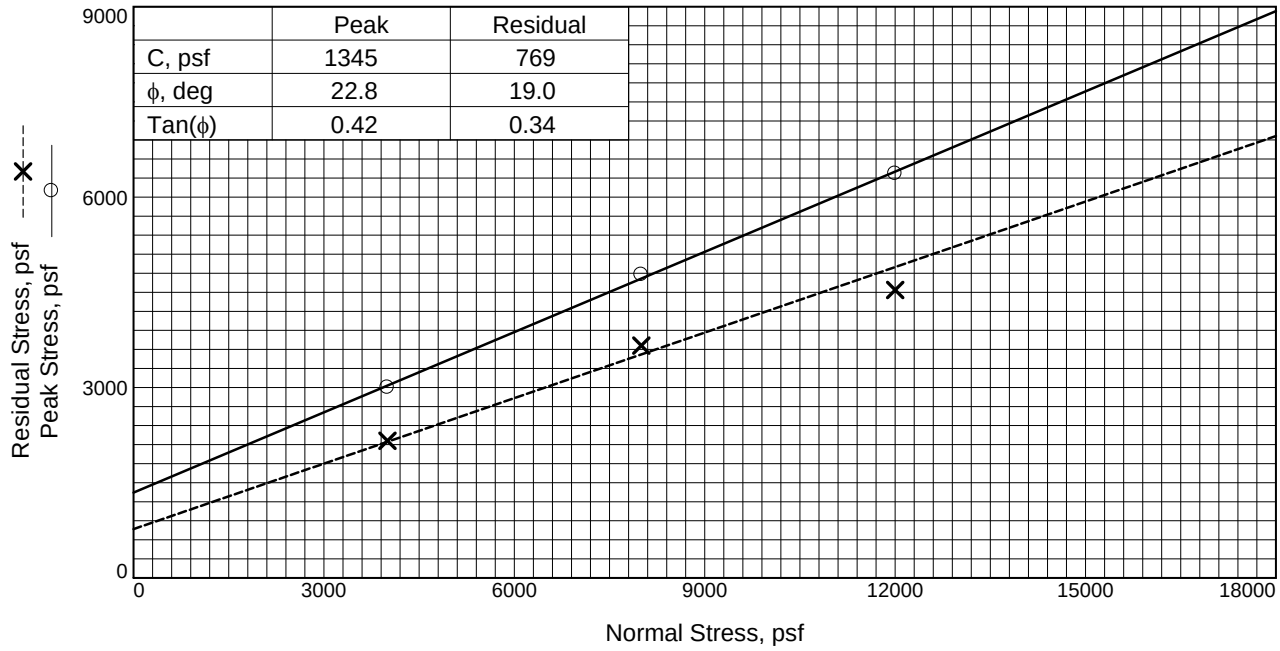

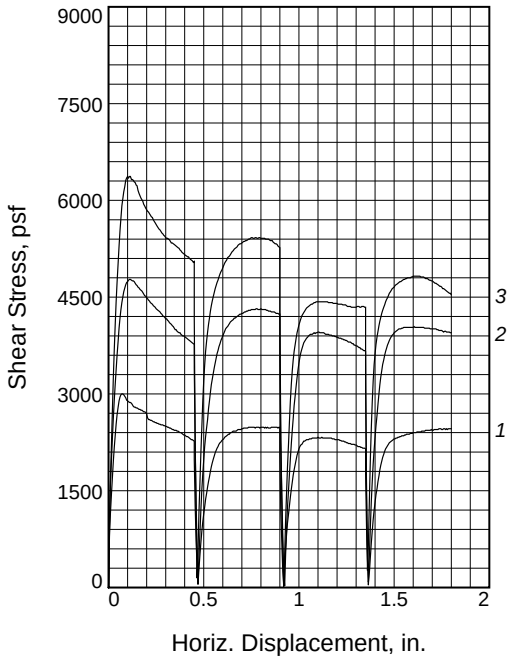

Sample No.		1	2	3
Initial	Water Content, %	13.1	13.8	14.2
	Dry Density, pcf	112.2	110.3	111.2
	Saturation, %	73.1	73.3	77.1
	Void Ratio	0.4743	0.5000	0.4871
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	16.4	16.5	15.3
	Dry Density, pcf	115.3	115.2	117.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4354	0.4360	0.4043
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.97	0.96	0.94
Normal Stress, psf		4000	8000	12000
Peak Stress, psf		3000	4776	6371
Displacement, in.		0.08	0.12	0.10
Residual Stress, psf		2160	3660	4536
Displacement, in.		1.34	1.35	1.80
Strain rate, %/min.		0.0050	0.0050	0.0050

Sample Type: California Drive
Description: Claystone with minor sand (USCS lean clay)
LL= 39 **PL=** 22 **PI=** 17
Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Along bedding
% Fines = 86.0

Figure B5.8

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1A **Depth:** 30

Proj. No.: 18-1245A-4 **Date Sampled:** 1/25/07

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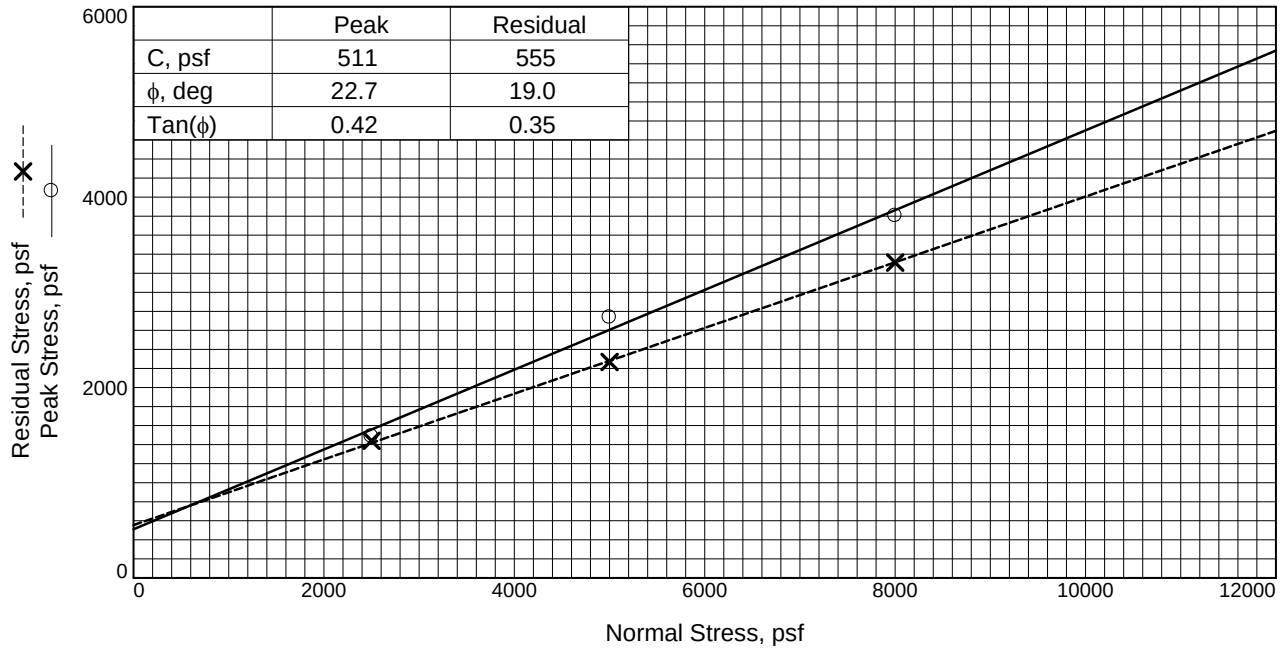

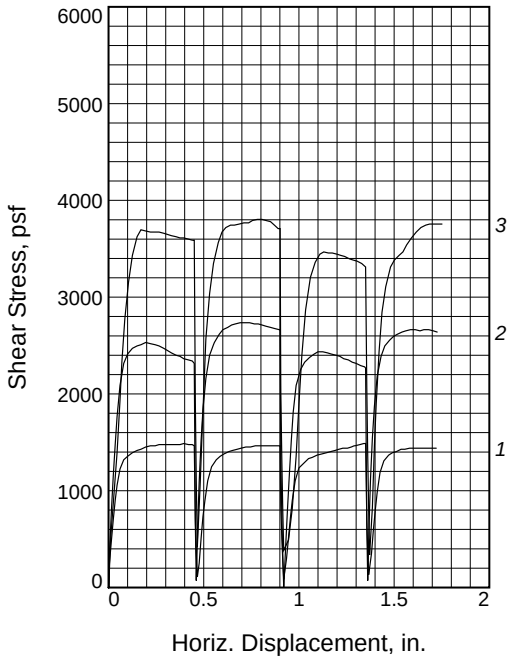

Sample No.		1	2	3
Initial	Water Content, %	5.4	6.3	5.7
	Dry Density, pcf	121.2	121.4	124.5
	Saturation, %	39.1	45.7	45.8
	Void Ratio	0.3644	0.3627	0.3288
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	12.8	12.7	11.9
	Dry Density, pcf	123.5	123.8	125.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3396	0.3367	0.3142
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.99
Normal Stress, psf		2500	5000	8000
Peak Stress, psf		1488	2736	3804
Displacement, in.		0.40	0.72	0.78
Residual Stress, psf		1440	2268	3312
Displacement, in.		1.72	1.35	1.35
Strain rate, %/min.		0.0050	0.0050	0.0050

Sample Type: Modified California Drive
Description: Sandy siltstone (USCS sandy silt)

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Along bedding
% Fines = 65.1

Figure B5.9

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-2A **Depth:** 40

Proj. No.: 18-1245A-4 **Date Sampled:** 2/2/07

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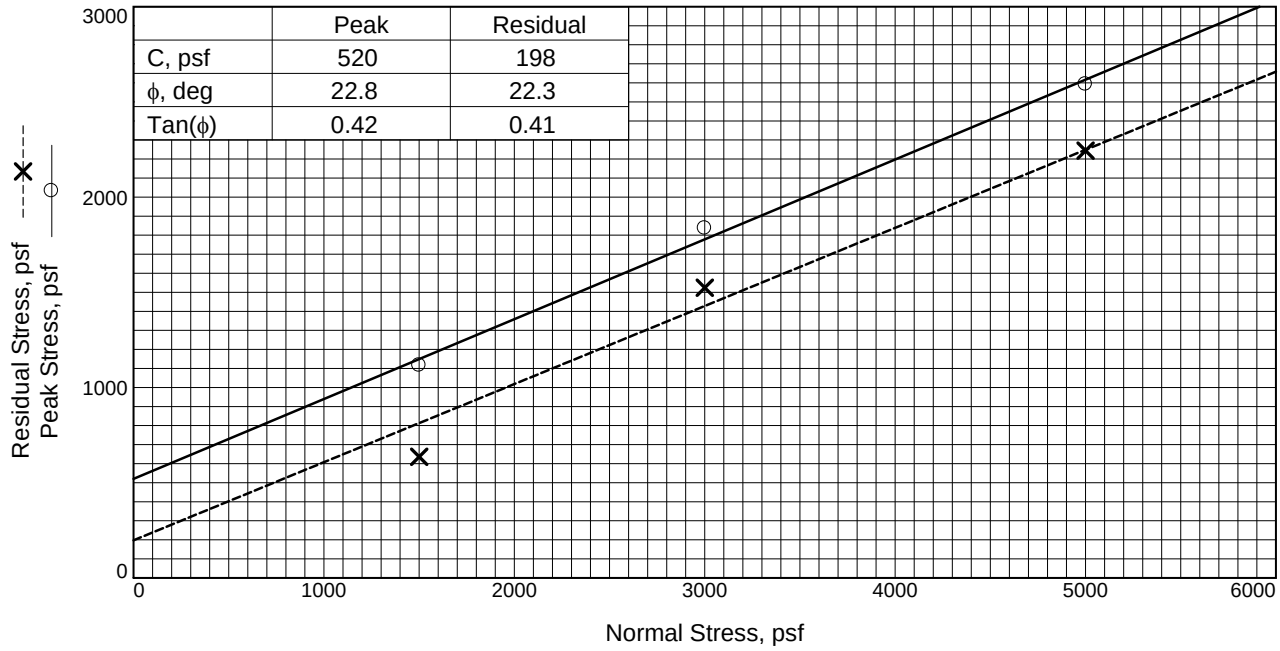

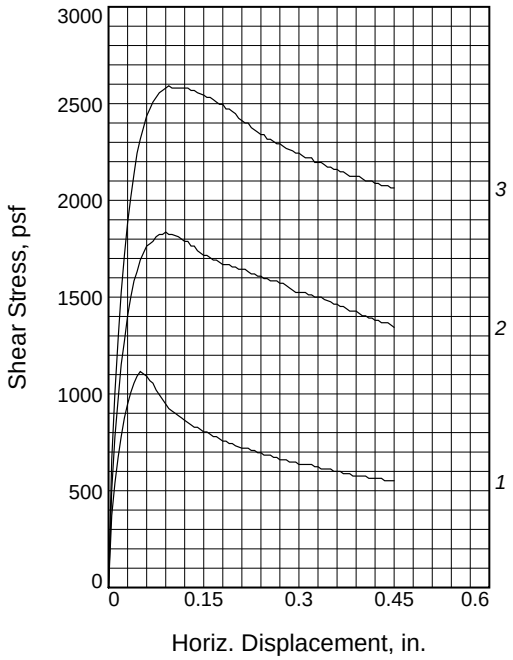

Sample No.		1	2	3
Initial	Water Content, %	22.8	21.1	17.5
	Dry Density, pcf	100.1	102.0	109.2
	Saturation, %	92.7	89.8	89.9
	Void Ratio	0.6528	0.6218	0.5154
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	23.9	22.6	18.2
	Dry Density, pcf	101.2	103.5	111.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6348	0.5987	0.4827
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.98
Normal Stress, psf		1500	3000	5000
Peak Stress, psf		1116	1836	2592
Displacement, in.		0.05	0.09	0.10
Residual Stress, psf		636	1524	2244
Displacement, in.		0.30	0.30	0.30
Strain rate, %/min.		0.0050	0.0050	0.0050

Sample Type: California Drive
Description: lean clay with sand (CL)

Assumed Specific Gravity= 2.65
Remarks: Terrace Deposit (Qt)
% Fines = 83.2

Figure B5.10

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-2A **Depth:** 10

Proj. No.: 18-1245A-4 **Date Sampled:** 2/2/07

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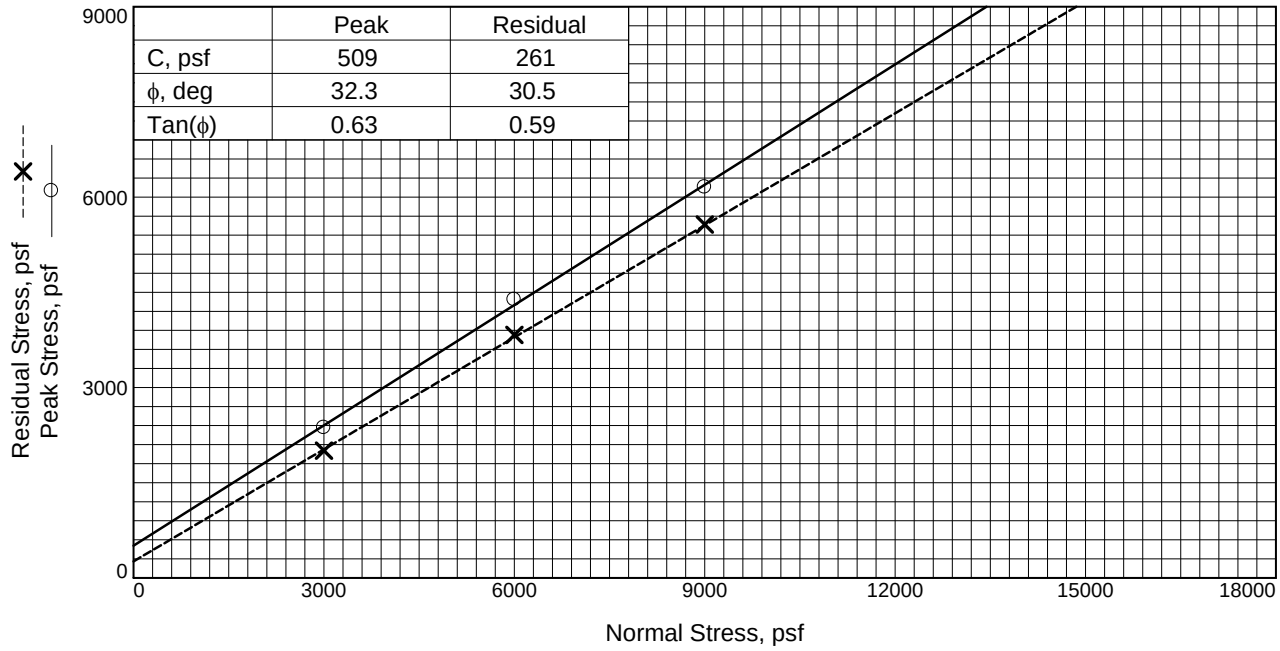

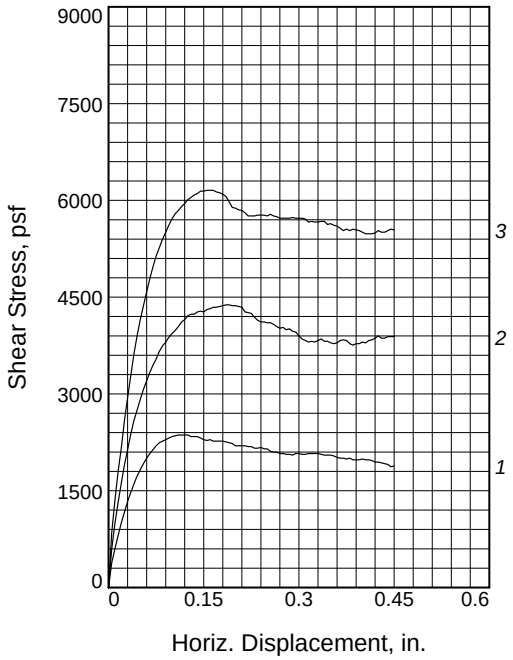

Sample No.		1	2	3
Initial	Water Content, %	3.9	5.0	5.2
	Dry Density, pcf	107.3	110.2	105.2
	Saturation, %	18.8	26.7	24.0
	Void Ratio	0.5422	0.5017	0.5725
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	18.1	16.8	18.9
	Dry Density, pcf	111.9	114.5	110.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4787	0.4449	0.5008
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.96	0.96	0.95
Normal Stress, psf		3000	6000	9000
Peak Stress, psf		2364	4380	6155
Displacement, in.		0.11	0.19	0.16
Residual Stress, psf		2004	3828	5567
Displacement, in.		0.36	0.36	0.36
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: California Drive
Description: Silty SAND (SM)

Assumed Specific Gravity= 2.65
Remarks: Terrace Deposit (Qt)
% Fines = 17.2

Figure B5.11

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-2A **Depth:** 15'

Proj. No.: 18-1245A-4 **Date Sampled:** 2/2/07

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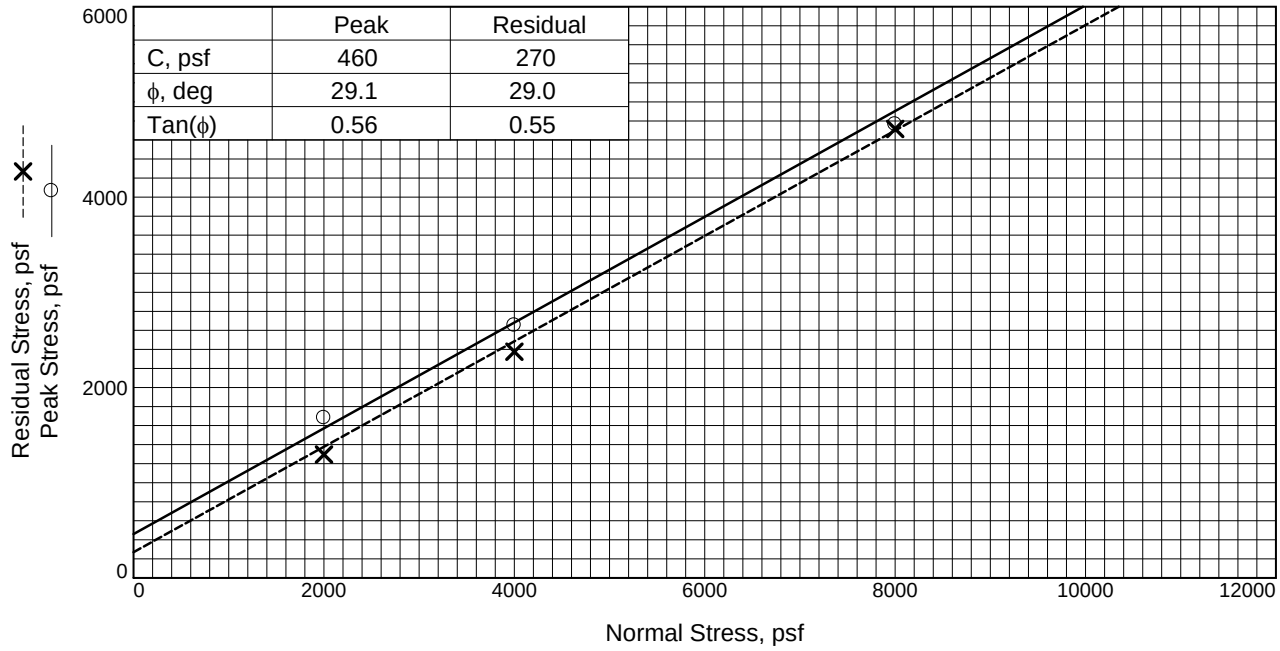

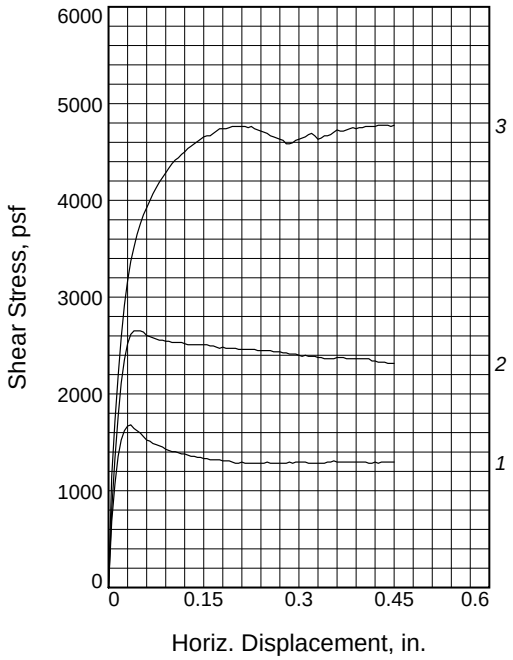

Sample No.		1	2	3
Initial	Water Content, %	7.7	7.8	7.9
	Dry Density, pcf	124.1	124.0	123.9
	Saturation, %	61.2	62.0	62.3
	Void Ratio	0.3325	0.3340	0.3349
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	12.1	11.9	11.5
	Dry Density, pcf	125.3	125.7	126.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3208	0.3161	0.3050
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.98
Normal Stress, psf		2000	4000	8000
Peak Stress, psf		1680	2652	4764
Displacement, in.		0.04	0.04	0.20
Residual Stress, psf		1296	2376	4716
Displacement, in.		0.36	0.36	0.36
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Remold

Description: Reddish-brown, clayey SAND (SC)

Assumed Specific Gravity= 2.65

Remarks: Proposed Compacted Fill
Remolded to approx. 90% of MDD
Qal/TQs derived
% Fines = 40.0

Figure B5.12

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Location: T-5A @ 6-6.5' & T-17A @ 0-7' 2:1 Mix

Proj. No.: 18-1245A-4 **Date Sampled:** 4/30 & 5/1/07

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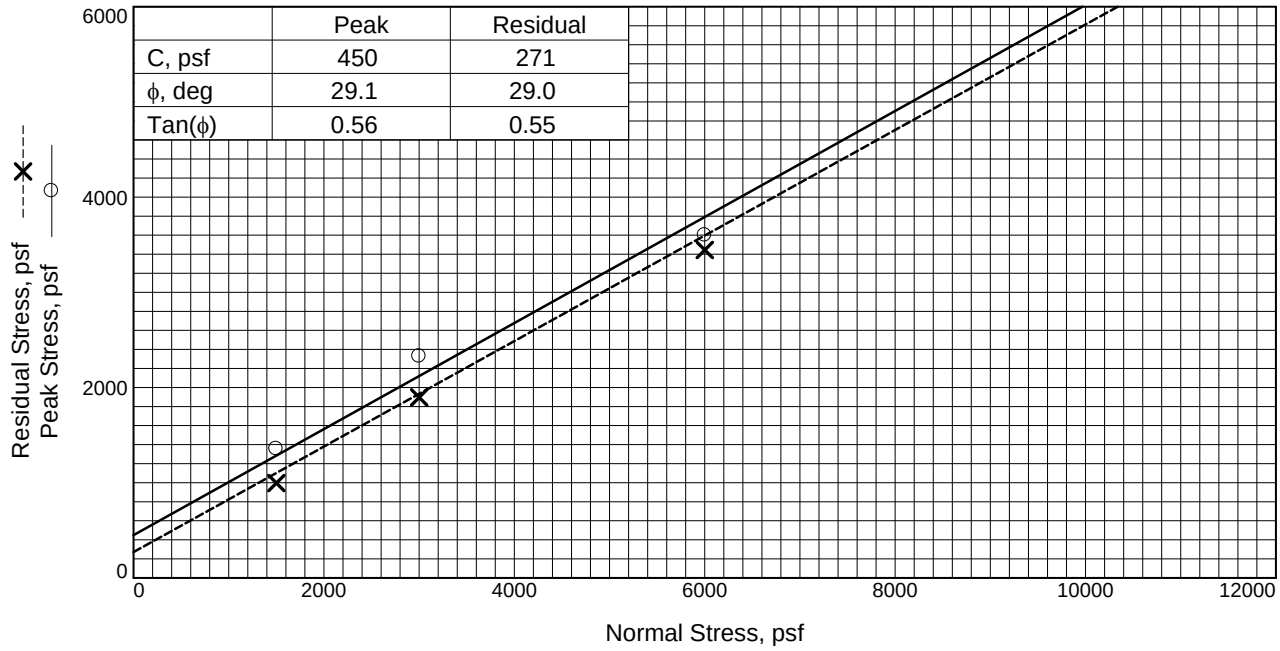

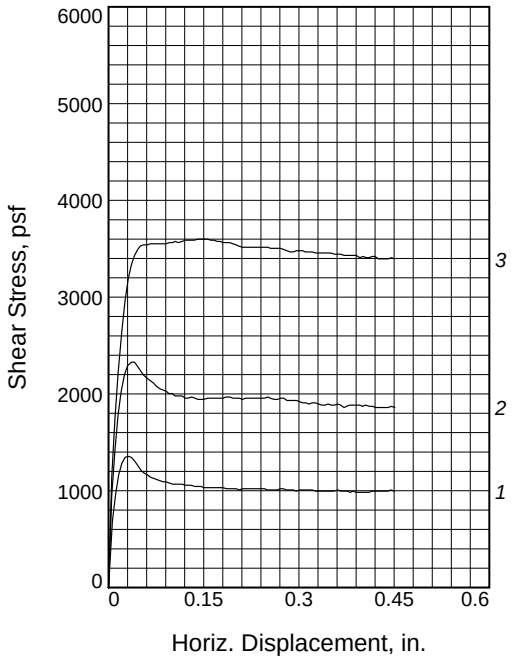

Sample No.		1	2	3
Initial	Water Content, %	8.9	9.0	9.3
	Dry Density, pcf	120.2	120.1	119.7
	Saturation, %	62.7	62.9	64.3
	Void Ratio	0.3764	0.3771	0.3821
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	13.8	13.7	13.5
	Dry Density, pcf	121.0	121.4	121.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3669	0.3632	0.3574
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.98
Normal Stress, psf		1500	3000	6000
Peak Stress, psf		1356	2328	3600
Displacement, in.		0.03	0.04	0.14
Residual Stress, psf		996	1896	3444
Displacement, in.		0.45	0.35	0.37
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Remold

Description: Yellowish-brown, clayey SAND (SC)

Assumed Specific Gravity= 2.65

Remarks: Proposed Compacted Fill
Remolded to approx. 90% of MDD
Qal/TQs derived
% Fines = 40.5

Figure B5.13

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Location: T-19A @ 0-6' & T-13B @ 5-10' 1:1 Mix

Proj. No.: 18-1245A-4 **Date Sampled:** 5/1 & 5/3/07

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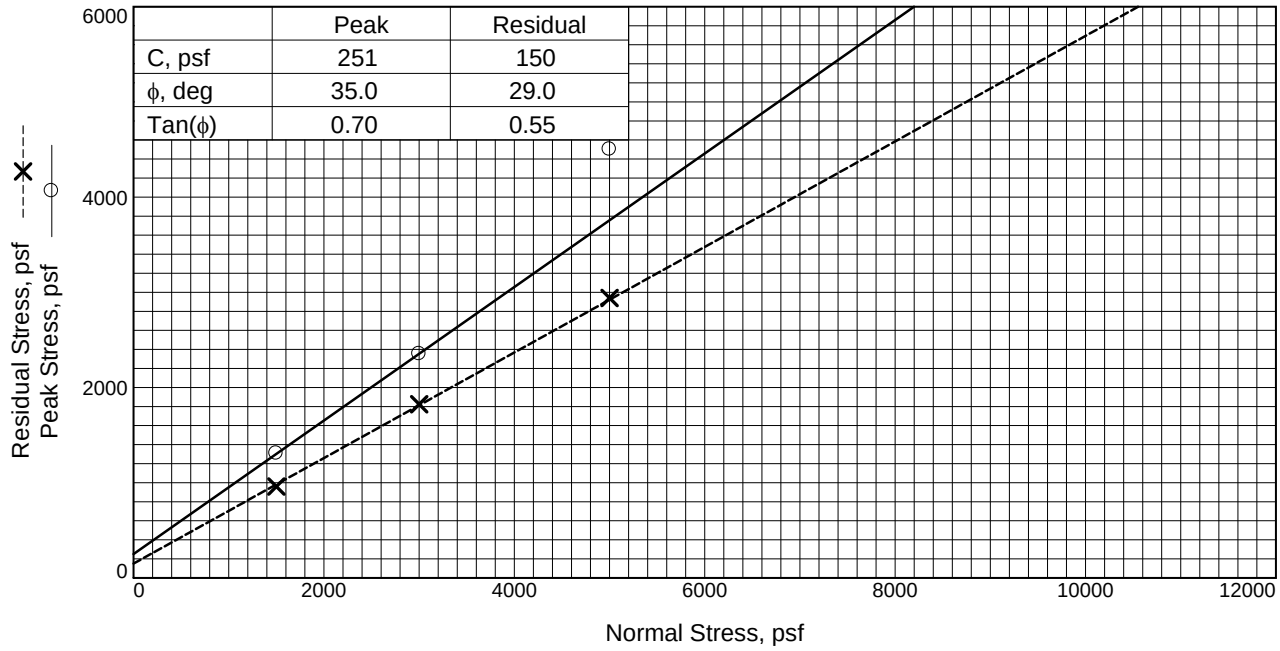
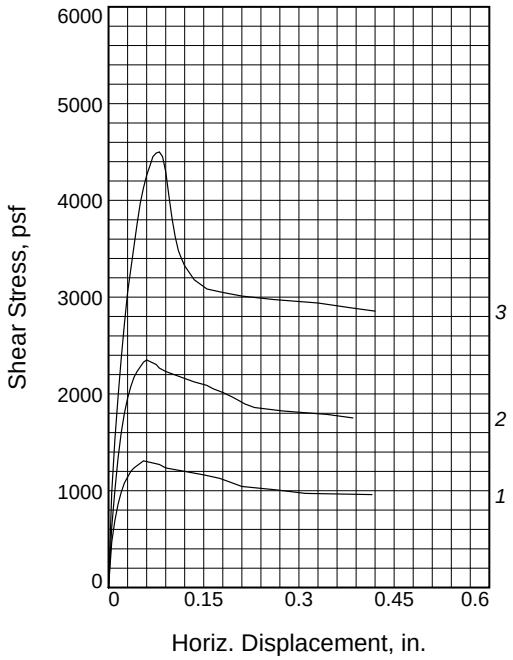




Sample No.		1	2	3
Initial	Water Content, %	8.5	9.9	9.7
	Dry Density, pcf	121.4	119.9	124.9
	Saturation, %	62.4	69.0	79.3
	Void Ratio	0.3626	0.3793	0.3248
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	13.3	13.8	12.9
	Dry Density, pcf	122.3	121.1	123.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3530	0.3657	0.3423
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	1.01
Normal Stress, psf		1500	3000	5000
Peak Stress, psf		1308	2352	4500
Displacement, in.		0.06	0.06	0.08
Residual Stress, psf		960	1824	2940
Displacement, in.		0.41	0.28	0.33
Strain rate, %/min.		0.0050	0.0050	0.0050

Sample Type: Undisturbed
Description: Clayey sand (SC)

Assumed Specific Gravity= 2.65
Remarks: Landslide Mass (Qls)
TQs derived
% Fines = 46.0

Figure B5.14

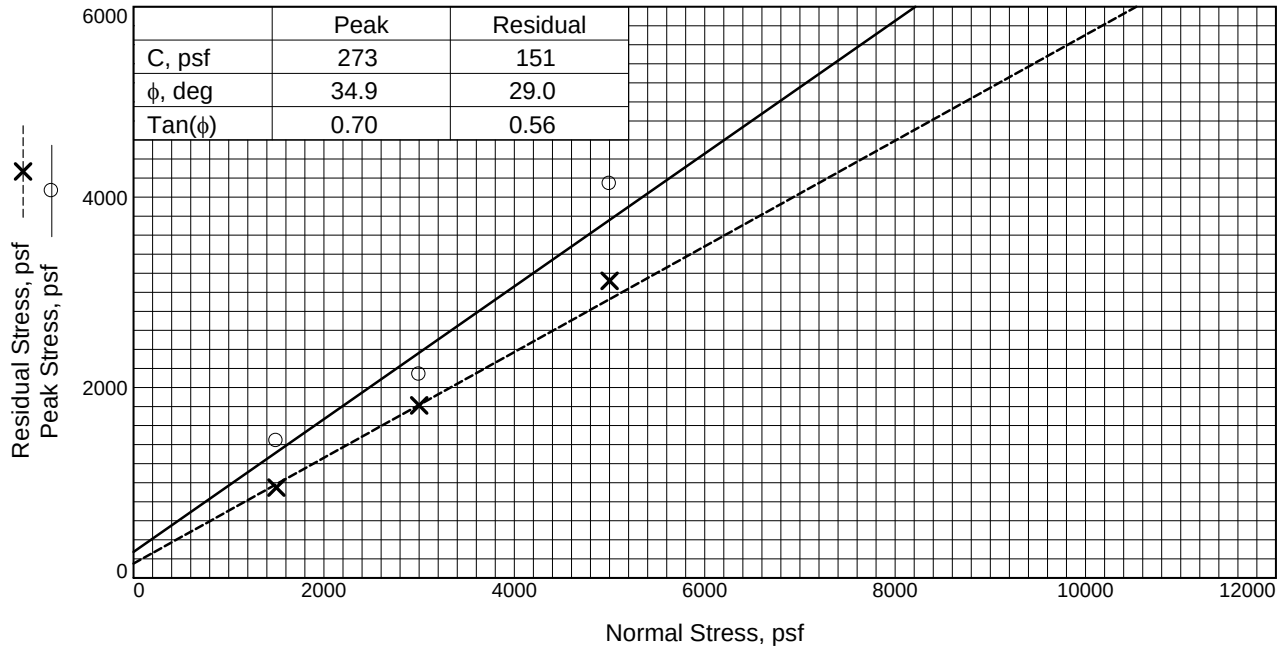
Client:

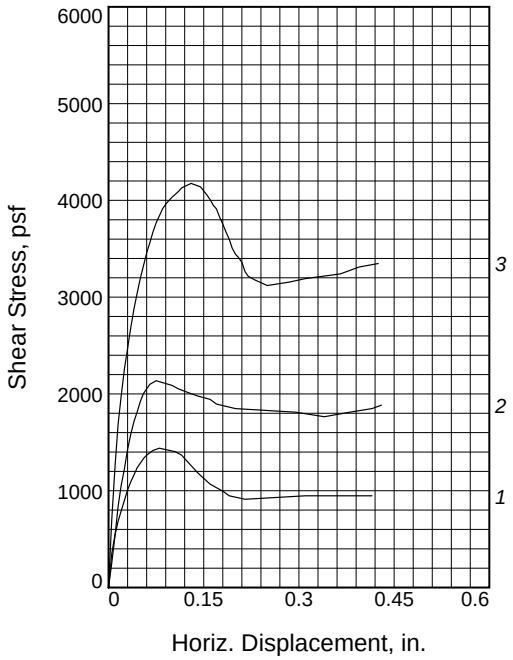
Project: VTTM 60665

Source of Sample: B-8 **Depth:** 15'

Proj. No.: 18-1257-4 **Date Sampled:** 11/19/02

DIRECT SHEAR TEST REPORT
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	4.7	3.9	3.8
	Dry Density, pcf	112.9	112.5	112.4
	Saturation, %	26.6	21.8	21.2
	Void Ratio	0.4656	0.4708	0.4714
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	17.2	17.0	16.4
	Dry Density, pcf	113.6	114.1	115.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4565	0.4503	0.4355
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.98
Normal Stress, psf		1500	3000	5000
Peak Stress, psf		1440	2136	4140
Displacement, in.		0.08	0.08	0.14
Residual Stress, psf		948	1812	3120
Displacement, in.		0.41	0.38	0.25
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Undisturbed

Description: Poorly graded sand with silt (SP-SM)

Assumed Specific Gravity= 2.65

Remarks: Landslide Mass (Qls)

TQs derived

% Fines = 9.8

Figure B5.15

Client:

Project: VTTM 60665

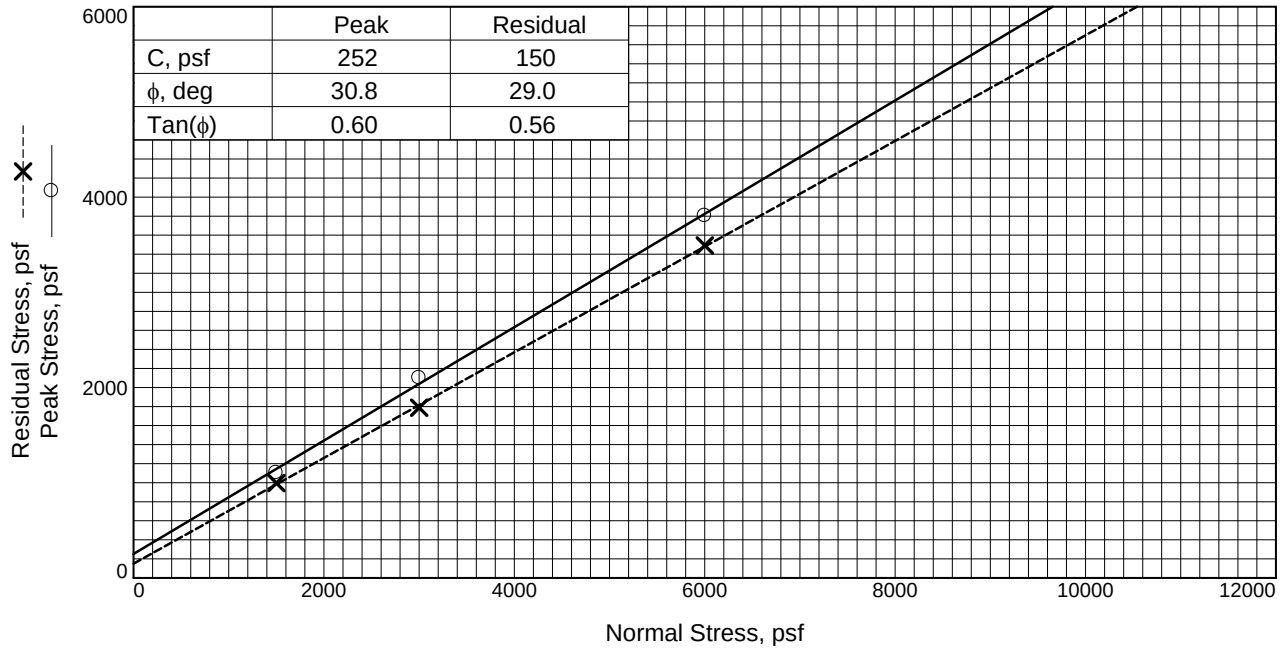
Source of Sample: B-11 **Depth:** 15'

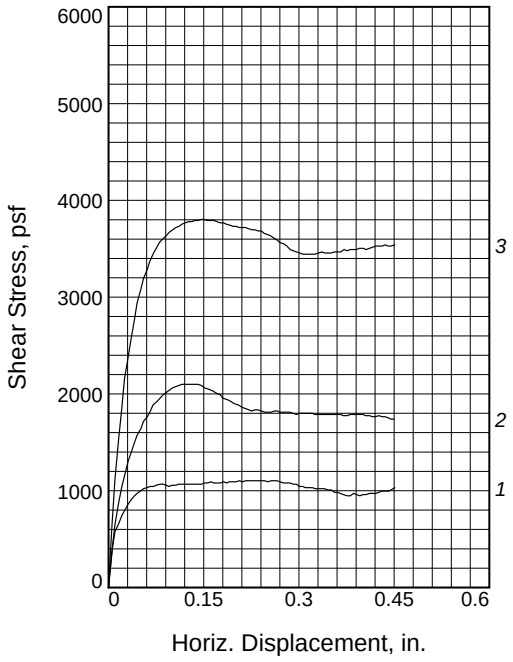
Proj. No.: 18-1257-4 **Date Sampled:** 11/22/02

DIRECT SHEAR TEST REPORT

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	6.2	7.2	8.2
	Dry Density, pcf	114.4	111.7	110.3
	Saturation, %	36.9	39.9	43.7
	Void Ratio	0.4463	0.4807	0.4996
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	15.6	16.5	15.6
	Dry Density, pcf	117.0	115.2	117.0
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4139	0.4363	0.4139
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.97	0.94
Normal Stress, psf		1500	3000	6000
Peak Stress, psf		1104	2100	3804
Displacement, in.		0.21	0.12	0.15
Residual Stress, psf		996	1788	3492
Displacement, in.		0.44	0.40	0.41
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Undisturbed
Description: Silty sand (SM)

Assumed Specific Gravity= 2.65
Remarks: Landslide Mass (Qls)
TQs derived
% Fines = 22.2

Figure B5.16

Client:

Project: VTTM 60665

Source of Sample: B-23 **Depth:** 15'

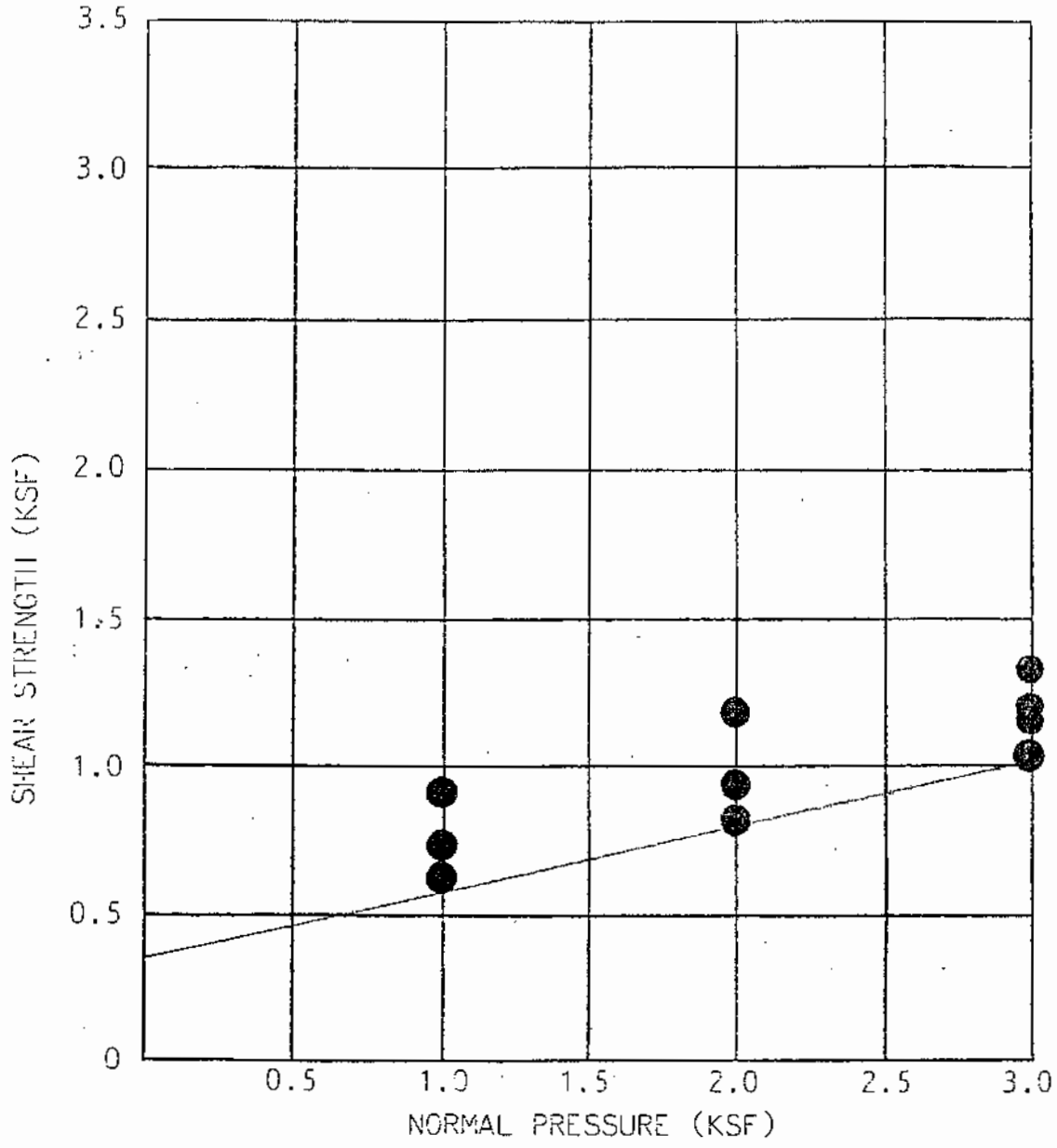
Proj. No.: 18-1257-4 **Date Sampled:** 9/25/07

DIRECT SHEAR TEST REPORT
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California

Subject DIRECT SHEAR TEST

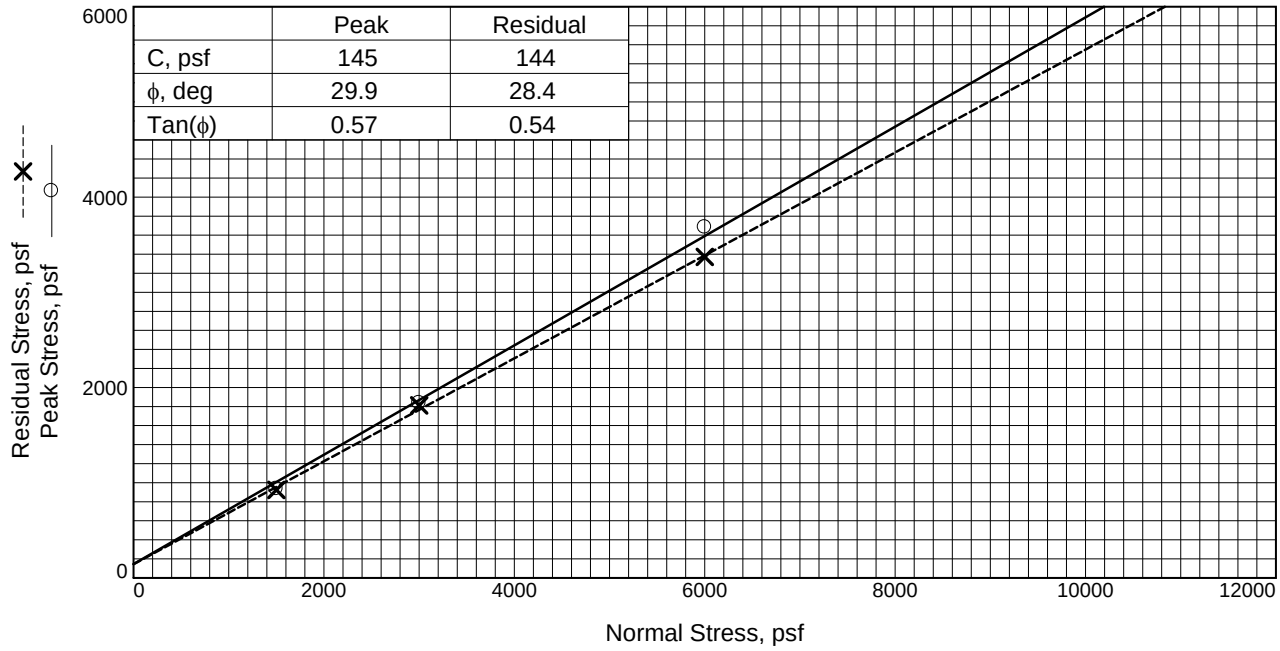
Job No. 0-1260 By D.LEAVER Scale
Client STERLING Date 10-22-90 Sheet No. 3 of 6

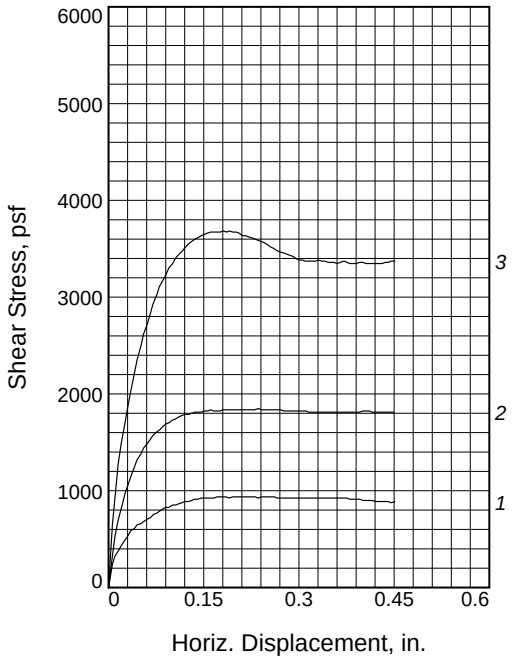
SLIDE PLANE - Clay - Sample from B1 @ 34.5 feet saturated and repeatedly sheared parallel to slide plane until lowest value obtained.



cohesion = 340 p.s.f.
friction angle = 12 deg.

Figure B5.17





Sample No.		1	2	3
Initial	Water Content, %	5.4	5.1	4.9
	Dry Density, pcf	104.7	97.0	102.7
	Saturation, %	24.8	19.3	21.4
	Void Ratio	0.5805	0.7052	0.6107
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	20.1	24.1	20.3
	Dry Density, pcf	107.9	101.0	107.5
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5339	0.6377	0.5392
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.97	0.96	0.96
Normal Stress, psf		1500	3000	6000
Peak Stress, psf		936	1836	3684
Displacement, in.		0.17	0.16	0.18
Residual Stress, psf		924	1812	3372
Displacement, in.		0.38	0.45	0.45
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Silty SAND (SM)

Assumed Specific Gravity= 2.65
Remarks: Older Alluvium (Qoa)
% Fines = 35.3

Figure B5.18

Client:

Project: VTTM 60665

Source of Sample: B-22 **Depth:** 10'

Proj. No.: 18-1257-4 **Date Sampled:** 9/24/07

DIRECT SHEAR TEST REPORT
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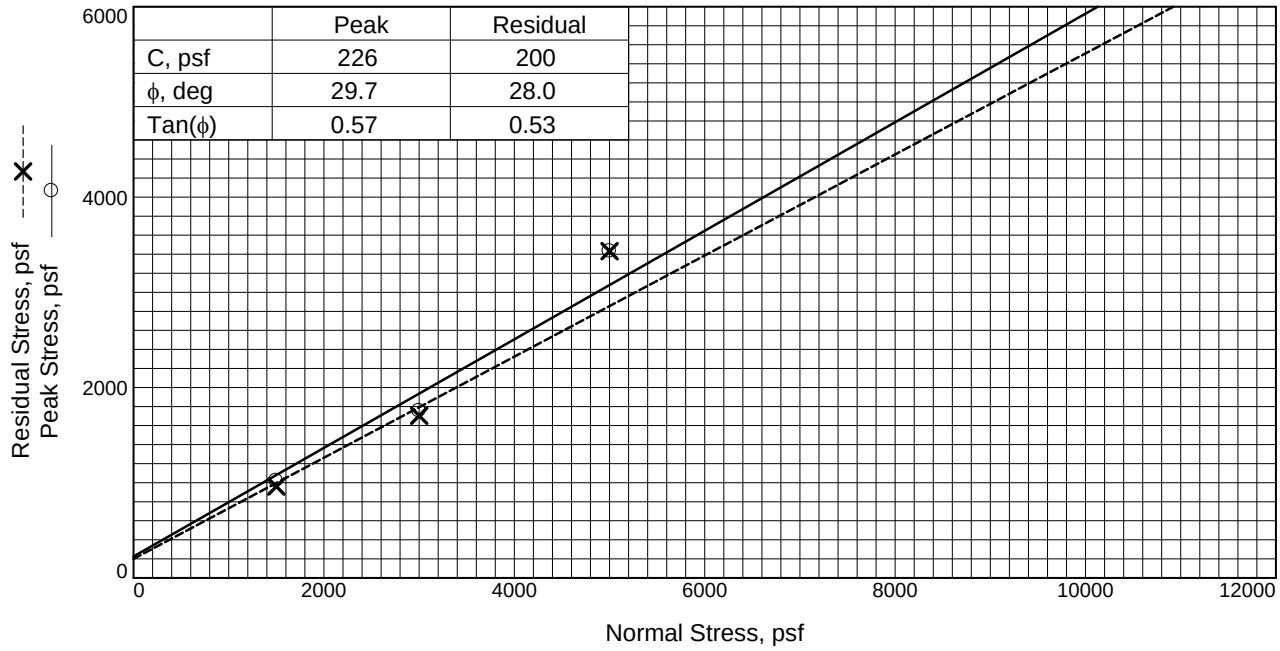
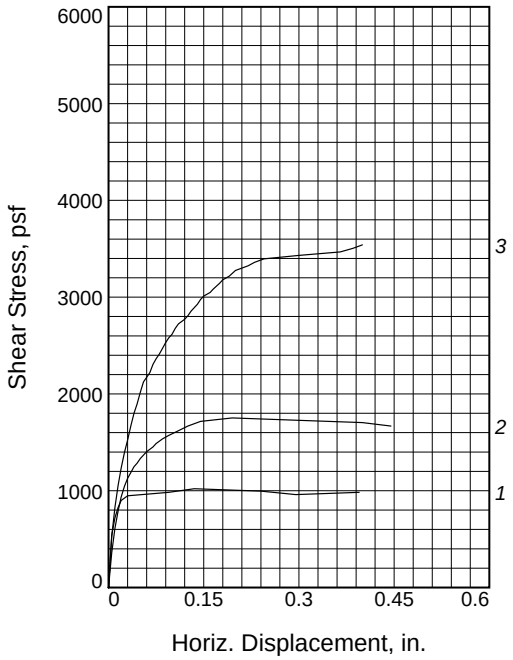
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	6.5	6.8	6.3
	Dry Density, pcf	115.9	112.0	107.4
	Saturation, %	40.2	37.8	30.9
	Void Ratio	0.4270	0.4774	0.5402
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	15.9	17.2	17.8
	Dry Density, pcf	116.4	113.6	112.4
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4213	0.4560	0.4715
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	0.99	0.96
Normal Stress, psf		1500	3000	5000
Peak Stress, psf		1020	1752	3432
Displacement, in.		0.14	0.20	0.30
Residual Stress, psf		960	1704	3432
Displacement, in.		0.29	0.40	0.30
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Silty sand (SM)

Assumed Specific Gravity= 2.65
Remarks: Alluvium (Qal)
% Fines = 33.9

Figure B5.19

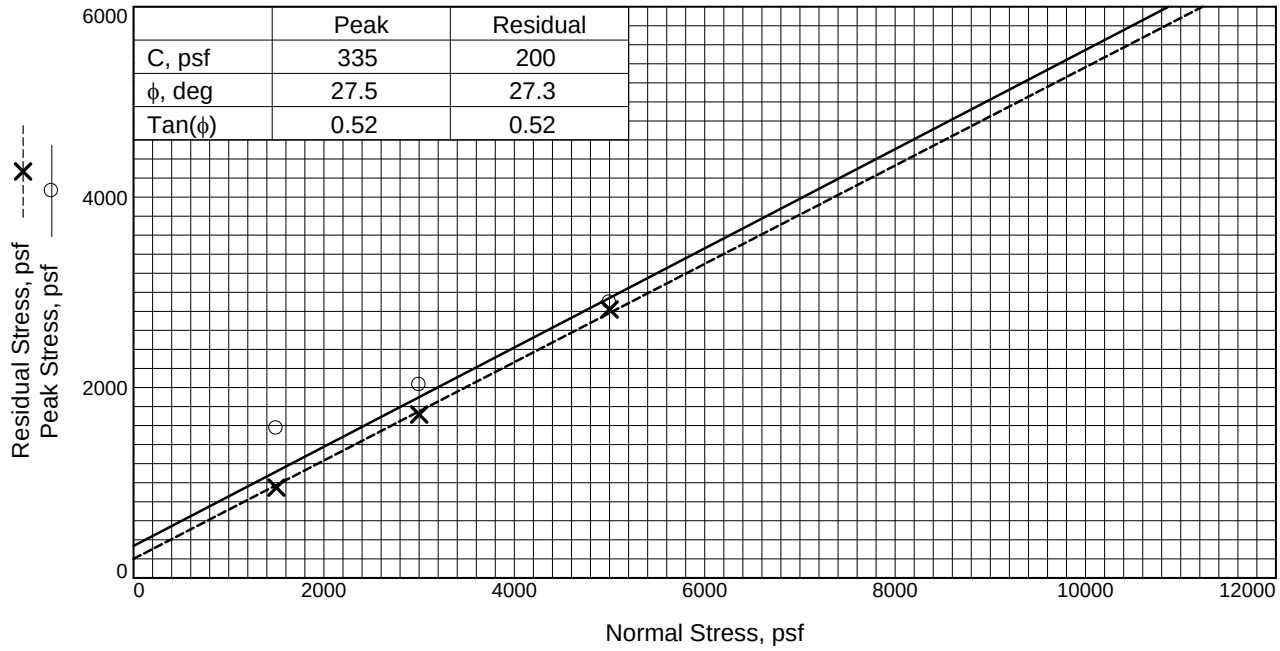
Client:

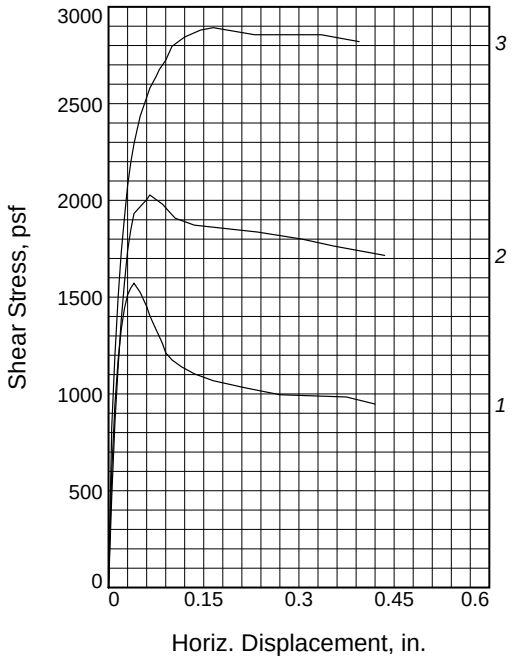
Project: VTTM 60665

Source of Sample: B-12 **Depth:** 10'

Proj. No.: 18-1257-4 **Date Sampled:** 11/22/02

DIRECT SHEAR TEST REPORT
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	10.6	11.0	10.1
	Dry Density, pcf	120.7	115.5	112.1
	Saturation, %	75.9	67.5	56.3
	Void Ratio	0.3709	0.4318	0.4754
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	13.7	16.0	17.1
	Dry Density, pcf	121.3	116.2	113.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3634	0.4240	0.4530
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.98
Normal Stress, psf		1500	3000	5000
Peak Stress, psf		1572	2028	2892
Displacement, in.		0.04	0.07	0.17
Residual Stress, psf		948	1716	2820
Displacement, in.		0.42	0.44	0.40
Strain rate, %/min.		0.0050	0.0050	0.0050

Sample Type: Modified California Drive
Description: Sandy lean clay (CL)

Assumed Specific Gravity= 2.65
Remarks: Alluvium (Qal)
% Fines = 60.3

Figure B5.20

Client:

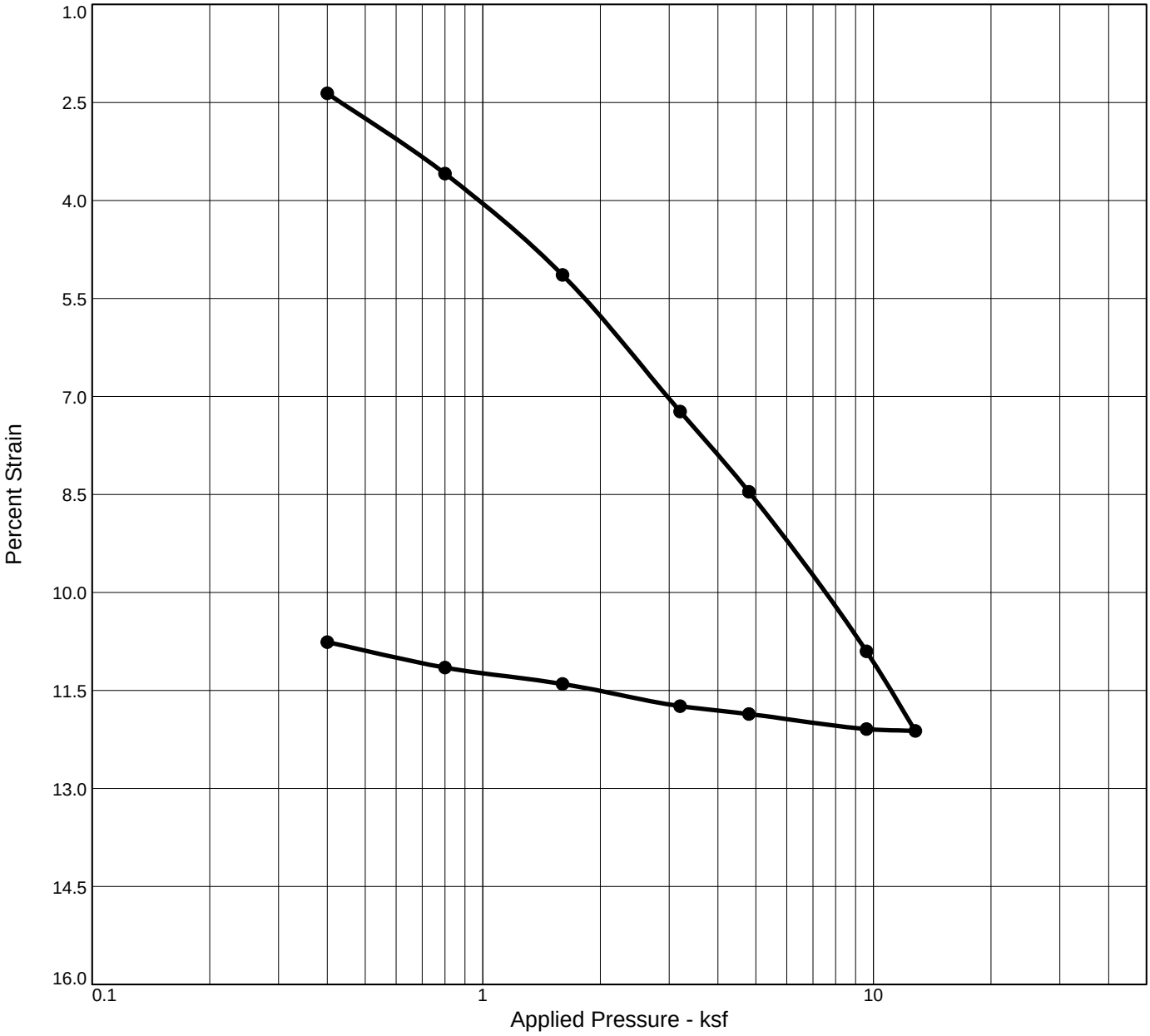
Project: VTTM 60665

Source of Sample: B-12 **Depth:** 20'

Proj. No.: 18-1257-4 **Date Sampled:** 11/22/02

DIRECT SHEAR TEST REPORT
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Yellowish-brown, silty clayey sand	SC-SM	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	3.36	99.2	112.9	24.4 %	18.5	96.9 %	100.0	0.667	0.488	3.1	0.16

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Natural moisture

D2435 Method	C_r	Swell Press. (ksf)	%
B	0.01		

Project No. 18-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-2A **Depth:** 28'

Remarks:
Alluvium (Qal)

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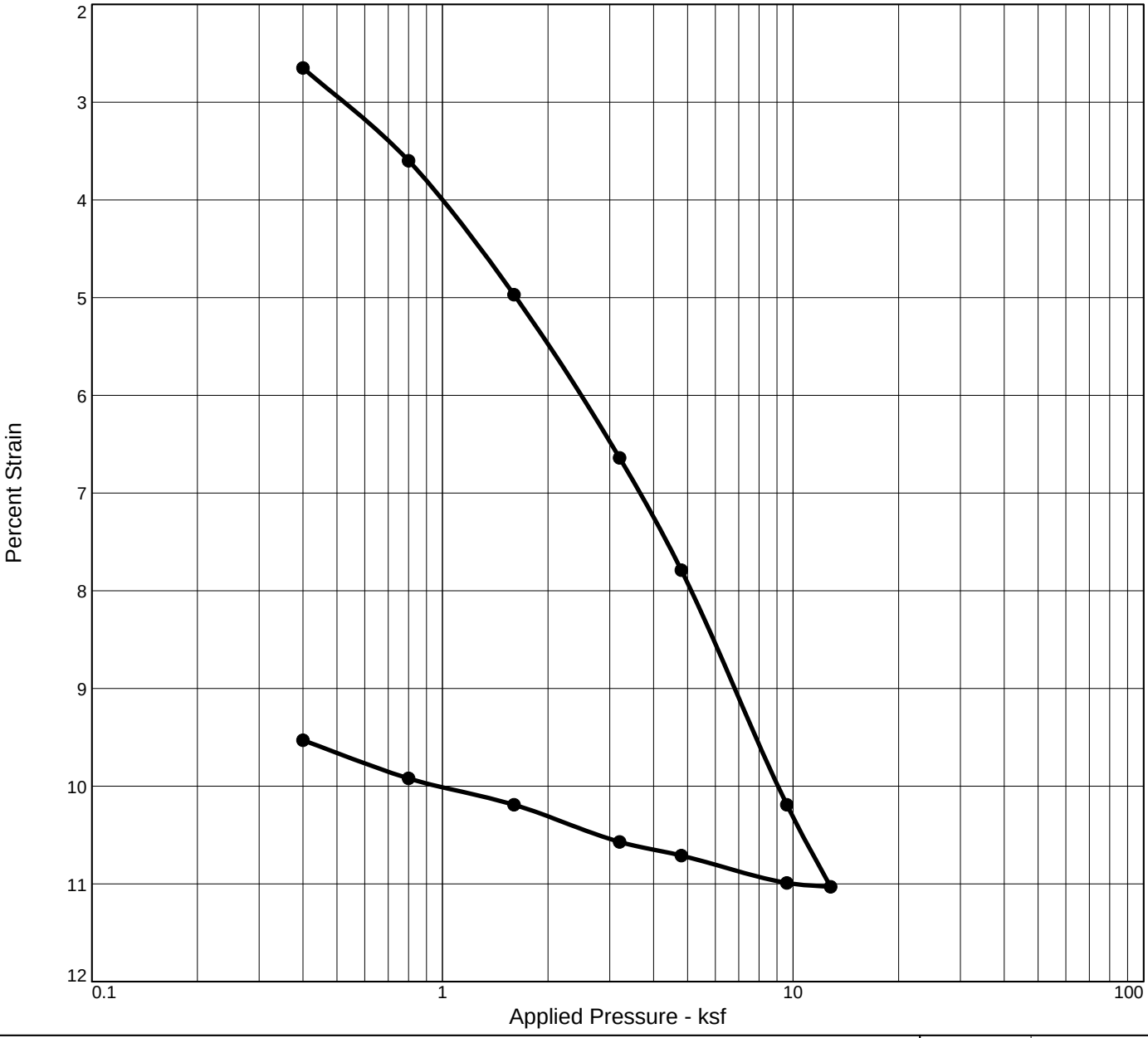
Valencia, California

Checked By: K. Callahan

Title: Geotechnical Engineer

Figure B6.1

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Brown, sandy silty clay	CL-ML	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	3.0	106.7	120.0	22.2 %	16.9	107.2	100.0	0.550	0.402	9.5	0.10

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Natural moisture

D2435 Method	C_r	Swell Press. (ksf)	%
B	0.01		

Project No. 18-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-6A **Depth:** 25'

Remarks:
Alluvium (Qal)

Checked By: K. Callahan

Title: Geotechnical Engineer

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.

Valencia, California

Figure B6.2

SAMPLE ID

Boring Number	HS-11A
Sample Number	HAS-11A @ 7'
Sample Depth, ft	7.00
Classification	Silty SAND (SM); light yellowish brown.

SAMPLE PROPERTIES

	Intial	Final
Mass, g	421.33	472.53
Water Content, %	4.5%	17.2%
Dry Density, pcf	105.0	114.1
Saturation, %	21%	100%
Void Ratio	0.59	0.46
Diameter, in	2.42	2.38
Height, in	3.18	3.03
Area, in^2	4.60	4.44
Volume, in^3	14.62	13.47

CLASSIFICATION

Sieve Size	% Passing
3/8-in. (9.5mm)	---
#4 (4.75mm)	---
#16 (1.18mm)	---
#30 (0.6mm)	---
#100 (0.150mm)	---
#200 (0.075mm)	---

Other Parameters	
Liquid Limit	---
Plastic Limit	---
Plasticity Index	---
Estimated Gs	2.67

TEST SUMMARY

Sample Type	ModCal
Permeant	Deaired Tap-Water
Pipette Area, cm^2	0.971
k_{avg} 20ºC, cm/s	3.5E-04
Tested By	NS

REMARKS

Test Method: ASTM D5084 (Method C)

PERMEATION DATA

Trial	Date	Time, sec	$Temp_{Avg}$, ºC	σ', ksf	μ, ksf	i_o	i_f	k_t, cm/s
1	2/28/18	94	18.1	0.8	5.0	2.3	2.2	3.2E-04
2	2/28/18	94	18.1	0.8	5.0	2.2	2.1	3.4E-04
3	2/28/18	94	18.1	0.8	5.0	2.2	2.1	3.4E-04
4	2/28/18	94	18.1	0.8	5.0	2.2	2.1	3.4E-04
5								
6								

SAMPLE IMAGES

Laboratory Permeability Test Result

Green Valley Ranch

Los Angeles County, California

Figure B7.1

SAMPLE ID

Boring Number	HS-11A
Sample Number	HS-11A @ 13'
Sample Depth, ft	13.00
Classification	Silty SAND (SM) yellowish brown, moist, trace fine gravel

SAMPLE PROPERTIES

	Intial	Final
Mass, g	400.56	445.22
Water Content, %	5.3%	17.0%
Dry Density, pcf	107.4	115.3
Saturation, %	25%	100%
Void Ratio	0.56	0.46
Diameter, in	2.40	2.33
Height, in	2.99	2.96
Area, in^2	4.52	4.25
Volume, in^3	13.50	12.57

CLASSIFICATION

Sieve Size	% Passing
3/8-in. (9.5mm)	---
#4 (4.75mm)	---
#16 (1.18mm)	---
#30 (0.6mm)	---
#100 (0.150mm)	---
#200 (0.075mm)	---

Other Parameters	
Liquid Limit	---
Plastic Limit	---
Plasticity Index	---
Estimated Gs	2.69

TEST SUMMARY

Sample Type	Mod Cal
Permeant	Deaired Tap-Water
Pipette Area, cm^2	0.971
k_{avg} 20ºC, cm/s	1.5E-03
Tested By	NS

REMARKS

Test Method: ASTM D5084 (Method C)

PERMEATION DATA

Trial	Date	Time, sec	$Temp_{Avg}$, ºC	σ', ksf	μ, ksf	i_o	i_f	k_t, cm/s
1	2/28/18	91	18.6	1.5	5.0	2.0	1.2	1.5E-03
2	2/28/18	91	18.6	1.5	5.0	2.1	1.3	1.4E-03
3	2/28/18	91	18.6	1.5	5.0	2.1	1.3	1.4E-03
4	2/28/18	91	18.6	1.5	5.0	2.1	1.3	1.4E-03
5								
6								

SAMPLE IMAGES

Laboratory Permeability Test Result
Green Valley Ranch
Los Angeles County, California

Figure B7.2

SAMPLE ID

Boring Number	HS-11A
Sample Number	HS-11A @ 16'
Sample Depth, ft	16.00
Classification	Silty SAND (SM); yellowish brown, trace fine gravel

SAMPLE PROPERTIES

	Intial	Final
Mass, g	378.82	414.19
Water Content, %	10.3%	20.6%
Dry Density, pcf	92.5	106.6
Saturation, %	35%	100%
Void Ratio	0.78	0.55
Diameter, in	2.40	2.25
Height, in	3.13	3.09
Area, in^2	4.52	3.98
Volume, in^3	14.15	12.28

CLASSIFICATION

Sieve Size	% Passing
3/8-in. (9.5mm)	---
#4 (4.75mm)	---
#16 (1.18mm)	---
#30 (0.6mm)	---
#100 (0.150mm)	---
#200 (0.075mm)	---

Other Parameters	
Liquid Limit	---
Plastic Limit	---
Plasticity Index	---
Estimated Gs	2.64

TEST SUMMARY

Sample Type	ModCal
Permeant	Deaired Tap-Water
Pipette Area, cm^2	0.971
k_{avg} 20ºC, cm/s	1.4E-04
Tested By	NS

REMARKS

Test Method: ASTM D5084 (Method C)

PERMEATION DATA

Trial	Date	Time, sec	$Temp_{Avg}$, ºC	σ', ksf	μ, ksf	i_o	i_f	k_t, cm/s
1	2/23/18	300	18.7	1.8	6.2	1.6	1.4	1.4E-04
2	2/23/18	300	18.7	1.8	6.2	1.3	1.2	1.4E-04
3	2/23/18	300	18.7	1.8	6.2	1.5	1.4	1.3E-04
4	2/23/18	300	18.7	1.8	6.2	1.5	1.4	1.4E-04
5								
6								

SAMPLE IMAGES

Laboratory Permeability Test Result

Green Valley Ranch

Los Angeles County, California

Figure B7.3

SAMPLE ID

Boring Number	HS-11A
Sample Number	HS-11A @ 22'
Sample Depth, ft	22.00
Classification	Poorly-Graded SAND with Silt and Gravel (SP-SM) yellowish brown, moist

SAMPLE PROPERTIES

	Intial	Final
Mass, g	248.28	279.76
Water Content, %	3.3%	16.4%
Dry Density, pcf	103.8	118.5
Saturation, %	14%	100%
Void Ratio	0.65	0.45
Diameter, in	2.24	2.24
Height, in	2.23	1.97
Area, in^2	3.95	3.93
Volume, in^3	8.82	7.73

CLASSIFICATION

Sieve Size	% Passing
3/8-in. (9.5mm)	---
#4 (4.75mm)	---
#16 (1.18mm)	---
#30 (0.6mm)	---
#100 (0.150mm)	---
#200 (0.075mm)	---

Other Parameters	
Liquid Limit	---
Plastic Limit	---
Plasticity Index	---
Estimated Gs	2.75

TEST SUMMARY

Sample Type	Mod Cal
Permeant	Deaired Tap-Water
Pipette Area, cm^2	0.971
k_{avg} 20°C, cm/s	1.2E-03
Tested By	NS

REMARKS

Test Method: ASTM D5084 (Method C)

PERMEATION DATA

Trial	Date	Time, sec	$Temp_{Avg}$, °C	σ', ksf	μ, ksf	i_o	i_f	k_t, cm/s
1	2/28/18	100	17.8	2.5	4.9	3.3	2.2	1.1E-03
2	2/28/18	99	17.8	2.5	4.9	3.2	2.0	1.2E-03
3	2/28/18	99	17.8	2.5	4.9	3.2	2.0	1.2E-03
4	2/28/18	99	17.8	2.5	4.9	3.2	2.0	1.2E-03
5	2/28/18	99	17.8	2.5	4.9	3.2	2.0	1.2E-03
6								

SAMPLE IMAGES

Laboratory Permeability Test Result

Green Valley Ranch

Los Angeles County, California

Figure B7.4

SAMPLE ID

Boring Number	HS-11A
Sample Number	HS-11A @ 28'
Sample Depth, ft	28.00
Classification	Silty SAND (SM); yellowish brown, moist, trace fine gravel

SAMPLE PROPERTIES

	Intial	Final
Mass, g	408.84	468.04
Water Content, %	2.9%	17.8%
Dry Density, pcf	105.4	112.5
Saturation, %	13%	100%
Void Ratio	0.57	0.47
Diameter, in	2.42	2.35
Height, in	3.12	3.10
Area, in^2	4.60	4.34
Volume, in^3	14.37	13.45

CLASSIFICATION

Sieve Size	% Passing
3/8-in. (9.5mm)	---
#4 (4.75mm)	---
#16 (1.18mm)	---
#30 (0.6mm)	---
#100 (0.150mm)	---
#200 (0.075mm)	---

Other Parameters	
Liquid Limit	---
Plastic Limit	---
Plasticity Index	---
Estimated Gs	2.65

TEST SUMMARY

Sample Type	Mod Cal
Permeant	Deaired Tap-Water
Pipette Area, cm^2	0.971
k_{avg} 20ºC, cm/s	2.0E-03
Tested By	NS

REMARKS

Test Method: ASTM D5084 (Method C)

PERMEATION DATA

Trial	Date	Time, sec	$Temp_{Avg}$, ºC	σ', ksf	μ, ksf	i_o	i_f	k_t, cm/s
1	2/23/18	53	19.6	3.2	6.3	1.7	1.2	2.0E-03
2	2/23/18	53	19.6	3.2	6.3	1.6	1.1	2.0E-03
3	2/23/18	53	19.6	3.2	6.3	1.6	1.1	2.0E-03
4	2/23/18	53	19.6	3.2	6.3	1.6	1.1	2.0E-03
5								
6								

SAMPLE IMAGES

Laboratory Permeability Test Result
Green Valley Ranch
Los Angeles County, California

Figure B7.5

SAMPLE ID

Boring Number	HS-12A
Sample Number	HS-12A @ 16'
Sample Depth, ft	16.00
Classification	Silty SAND with Gravel (SM); yellowish brown, moist

SAMPLE PROPERTIES

	Intial	Final
Mass, g	481.23	532.46
Water Content, %	5.2%	16.4%
Dry Density, pcf	108.6	115.4
Saturation, %	26%	100%
Void Ratio	0.52	0.43
Diameter, in	2.41	2.34
Height, in	3.53	3.52
Area, in^2	4.55	4.29
Volume, in^3	16.04	15.11

CLASSIFICATION

Sieve Size	% Passing
3/8-in. (9.5mm)	---
#4 (4.75mm)	---
#16 (1.18mm)	---
#30 (0.6mm)	---
#100 (0.150mm)	---
#200 (0.075mm)	---

Other Parameters	
Liquid Limit	---
Plastic Limit	---
Plasticity Index	---
Estimated Gs	2.65

TEST SUMMARY

Sample Type	Mod Cal
Permeant	Deaired Tap-Water
Pipette Area, cm^2	0.971
k_{avg} 20ºC, cm/s	2.8E-03
Tested By	NS

REMARKS

Test Method: ASTM D5084 (Method C)

PERMEATION DATA

Trial	Date	Time, sec	$Temp_{Avg}$, ºC	σ', ksf	μ, ksf	i_o	i_f	k_t, cm/s
1	2/23/18	60	17.4	1.8	5.7	1.3	0.7	3.1E-03
2	2/23/18	60	17.4	1.8	5.7	1.2	0.7	2.7E-03
3	2/23/18	60	17.4	1.8	5.7	1.2	0.8	2.6E-03
4	2/23/18	60	17.4	1.8	5.7	1.2	0.8	2.6E-03
5	2/23/18	60	17.4	1.8	5.7	1.2	0.8	2.6E-03
6	2/23/18	60	17.4	1.8	5.7	1.2	0.8	2.6E-03

SAMPLE IMAGES

No cross section photo available

Laboratory Permeability Test Result
Green Valley Ranch
Los Angeles County, California

Figure B7.6

Appendix C

APPENDIX C

EVALUATION OF LIQUEFACTION POTENTIAL AND ASSOCIATED GROUND FAILURE

1. Introduction

Potential at the site for seismic soil liquefaction and for associated ground failure (i.e., earthquake-induced settlement, lateral spread displacements, surface manifestations, and loss of bearing capacity) has been assessed by Allan E. Seward Engineering Geology, Inc. (AESEGI) using data from Cone Penetration Test (CPT) soundings. Soil Behavior Type (SBT) data and apparent fines content (FC) interpreted from a representative CPT sounding (CPT-3) were correlated with visual classifications of soils observed in adjacent hollow-stem auger boring HS-3 and with results of geotechnical index tests performed on selected soil samples from the boring, as discussed herein. The calculation procedures described in the following references were used herein for assessment of liquefaction potential (and associated ground failure):

- *Cyclic Liquefaction and its Evaluation Based on the SPT and CPT*, by Robertson and Wride, 1997.
- *Liquefaction Resistance of Soils: Summary Report* (NCEER/NSF, 2001), by Youd, Idriss, et al.
- *Performance-based Earthquake Design using the CPT*, by Robertson, 2009.
- *Interpretation of Cone Penetration Tests – A Unified Approach*, by Robertson, 2009.
- *SPT-Based Probabilistic Assessment of Seismic Soil Liquefaction Potential*, by Cetin, et. al., 2004.
- *Evaluation of Settlements in Sands Due to Earthquake Shaking*, Tokimatsu and Seed, ASCE, August, 1987.
- *Estimating Liquefaction-Induced Lateral Displacements using the Standard Penetration Test or Cone Penetration Test*, by Zhang et. al., 2004.
- *Evaluation of Flow Liquefaction and Liquefied Strength using the Cone Penetration Test*, by P.K. Robertson, ASCE, August, 2010.

APPENDIX C

Our analyses of liquefaction potential and associated phenomena at the site were performed in accordance with the guidelines and requirements contained in the following documents:

- *Review of Geotechnical Reports Addressing Liquefaction*, memorandum from Los Angeles County Department of Public Works (LACDPW), dated February 24, 2009.
- *Special Publication 117A: Guidelines for Evaluating and Mitigating Seismic Hazards in California*, revised and re-adopted by California State Mining and Geology Board, September 11, 2008.
- *Manual for Preparation of Geotechnical Reports*, LACDPW, July 2013.

2. Data and Assumptions

Factors that affect potential for liquefaction triggering at the site include estimated ground motion parameters, engineering characteristics of site soils, historic high ground water depth, and proposed grading (i.e., removals and/or raising of grade).

a. Estimated Ground Motion Parameters

Based on our probabilistic seismic hazard analyses (PSHA) the Peak Ground Acceleration (PGA_M) at the site, consistent with maximum considered earthquake (MCE_R) ground motions and generated by a magnitude 6.79 earthquake, is 1.02g. This magnitude-acceleration pair is considered to be equivalent to a magnitude 7.5 earthquake (i.e., the "standard" magnitude used to evaluate liquefaction triggering) and a corresponding PGA of 0.79g. This magnitude-acceleration pair was used in our liquefaction potential analyses.

b. Engineering Characteristics of Site Soils

Engineering characteristics of site soils were interpreted from Cone Penetration Test (CPT) corrected cone resistance (q_t) and friction ratio (R_f) and used herein for assessment of soil liquefaction potential and associated seismic settlements and lateral spread displacements. The interpreted soil characteristics include Soil Behavior Type (SBT) and SBT Index (I_c), apparent fines content (FC), relative density (D_r), and liquefied shear strength ($s_{u,liq}$).

The appended CPT logs include raw q_c and R_f data, as well as interpreted SBT classification, SBT Index (I_c), correction factor for grain size (K_c), and equivalent Standard Penetration Test (SPT) blow count data adjusted to 1.0 ton/ft^2 effective vertical soil pressure ($N1_{60}$). These interpreted data were calculated using the procedures in the referenced article by Youd and Idriss (2001) with updates by Zhang et. al. (2002) and Robertson (2009). The CPT logs are presented in **Appendix A**.

APPENDIX C

Per the guidelines of SP117A, the accuracy of the CPT interpretations used for assessment of liquefaction potential should be checked by comparison with data obtained from a correlation boring adjacent to a representative CPT sounding. The visual classifications of soils and results of laboratory testing (measured fines content) on select soil samples from hollow-stem auger boring HS-3 were used to check the SBT classification and apparent fines content (FC) interpreted from adjacent CPT-3. Additionally, boring $N_{1,60}$ values from SPT blow count data were used to check the equivalent SPT $N_{1,60}$ values interpreted from the CPT. The classifications of soils and blow count data obtained from boring HS-3 are generally consistent with data interpreted from adjacent CPT-3. However, the apparent fines content interpreted from the CPT is typically less (and more conservative) than the measured fines content from the boring. Therefore, it may be concluded that the data interpreted from the CPT soundings at the site are an accurate representation of soil conditions at the site and that data from the CPT soundings at the site are appropriate for use in interpretation of liquefaction potential.

c. Ground Water Depth

Based on measurements taken at the CPT sounding and boring locations at the site during the various phases of subsurface exploration, ground water was encountered as shallow as 20 feet. As discussed in the Ground Water section of the report, the historic high ground water depth at the site is shown as 10 feet on the seismic hazard map. The measured and historic high ground water depths at the location of each CPT soundings and boring analyzed are shown on the **Analysis of Liquefaction Potential** sheets at the end of this appendix (**Figures C1.1** through **C1.20**).

Effective vertical soil pressure based on measured ground water depths at the time of the exploration (if encountered) was used in our calculations to adjust CPT tip resistance and friction ratio data to the standard effective vertical soil pressure (i.e., 1.0 ton/ft^2), and ultimately for calculation of the soils cyclic resistance to earthquake shaking. Effective vertical soil pressure based on the historic high ground water depth was used to estimate cyclic shear stress that would be induced by earthquake shaking.

d. Proposed Grading

The liquefaction potential analyses were performed herein for the remedial removals and replacements as shown on **Table C1.**

APPENDIX C

3. Methods of Analysis

a. Liquefaction Potential

Liquefaction is a phenomenon in which pore water pressure generated by earthquake shaking causes sudden, temporary reduction or loss of shear strength in saturated soils with negligible to low plasticity. Structures founded on liquefied soils may experience subsidence and/or lateral movement.

Analyses to evaluate liquefaction potential typically are performed by a method first proposed by Seed and Idriss (1970) and subsequently revised by Youd and Idriss (2001). In these methods, estimated earthquake-induced cyclic shear stress in the ground is compared with cyclic shear strength (i.e., soil resistance to liquefaction) derived empirically from earthquake case histories.

The Youd and Idriss (2001) methodology with updates by Robertson (2009) was used herein for evaluation of liquefaction potential. This procedure estimates cyclic shear strength against liquefaction based on in-situ effective vertical soil pressure, cone resistance (q_t) and friction ration (R_f) data normalized to 1.0 ton/ft^2 vertical effective soil pressure, and fines content data estimated from the normalized q_t and R_f data. The normalized cone resistance ($Q_{t,1N}$) and normalized friction ratio (F_r) values and the interpreted apparent fines content (FC) values are summarized on the **Analysis of Liquefaction Potential** sheets at the end of this appendix, **Figures C1.1** through **C1.19**.

Normalized CPT cone penetration resistance ($Q_{t,1N}$) is used to calculate the Cyclic Resistance Ratio (CRR) for clean sandy soils subjected to magnitude 7.5 earthquakes. Normalization of the tip resistance is performed using the following equations (from Robertson, 2009):

$$C_N = (p_a/\sigma'_o)^n, \quad C_N \leq 2.0,$$
$$Q_{t,1N} = [(q_t - \sigma_o) / p_a] \cdot C_N$$

where: n = variable stress exponent ≤ 1.0
σ'_o = effective vertical soil pressure [tsf]
σ_o = total vertical soil pressure [tsf]
p_a = reference pressure [tsf]
q_t = CPT cone resistance [tsf]

$Q_{t,1N}$ is further corrected for fines content in order to obtain an equivalent clean sand CPT tip resistance value $(Q_{t,1N})_{cs}$ (per Youd and Idriss, 2001, and Robertson, 2009).

APPENDIX C

$(Q_{t,1N})_{cs}$ is used to calculate the Cyclic Resistance Ratio (CRR) against liquefaction (per Youd and Idriss, 2001).

The earthquake-induced cyclic shear stress ratio (CSR or τ_{av}/σ'_v) for each depth in question is calculated using the following equation (by Youd and Idriss, 2001):

$$\tau_{av}/\sigma'_v = 0.65 \cdot (a_{max}/g) \cdot \sigma_o/\sigma'_v \cdot r_d$$

where: a_{max}/g = Peak ground acceleration (PGA_M) at the ground surface divided by the acceleration of gravity

σ_o = Total vertical soil pressure at the depth in question

σ'_v = Effective vertical soil pressure at the depth in question

r_d = Shear stress reduction factor to account for soil deformability at the depth in question

Cyclic Resistance Ratio (CRR) vs. corrected cone-tip resistance $(Q_{t,1N})_{cs}$ curves (based on case histories of clean sands subjected to earthquakes with a magnitude of about 7.5) are presented by Youd and Idriss (2001). Soils with $(Qt,_{1N})_{cs}$ and CSR values that plot above these curves are potentially liquefiable, and soils with $(Q_{t,1N})_{cs}$ and CSR values that plot below these curves generally are not liquefiable. In accordance with the guidelines of the County of Los Angeles Department of Public Works, a soil deposit is considered to be potentially liquefiable if its factor of safety against liquefaction (i.e., CRR divided by CSR) is less than 1.3.

Values of the factor of safety against liquefaction for the soil profiles in each of the CPT logs are calculated at 6-inch intervals using fines content corrected values of tip resistance $(Q_{t,1N})_{cs}$ (per Youd and Idriss, 2001, and updated by Robertson, 2009). A typical spreadsheet with Liquefaction Triggering Analysis calculations is included as **Figure C2.1**.

b. Earthquake-Induced Settlement of Soils

Soils that liquefy as a result of earthquake shaking can densify as earthquake-induced excess pore water pressure in the soil dissipates. Likewise, earthquake shaking can densify predominantly granular, saturated soils (with low liquefaction potential) and unsaturated soils. Soil densification of potentially liquefiable soils and earthquake-induced soil densification that occurs in the absence of liquefaction are both included in our earthquake-induced settlement estimates.

APPENDIX C

The procedures described in Tokimatsu and Seed (1987) are used herein for estimation of earthquake-induced densification of sands that occurs as the result of liquefaction and that occurs in the absence of liquefaction. The Tokimatsu and Seed method is discussed below.

One-dimensional volumetric strain of unsaturated sandy soils caused by earthquake shaking is estimated based on $N1_{60}$ values (estimated from the CPT sounding data) and earthquake-induced cyclic shear strain (estimated using the $N1_{60}$ values and the CSR). This one-dimensional shear strain is doubled in order to estimate volumetric strain produced by multi-directional earthquake shaking. Settlement is calculated by multiplying the volumetric strain value by the thickness of the soil layer. This procedure for estimating earthquake-induced densification was developed based on data from clean to slightly silty sands, therefore the $N1_{60}$ values estimated based on the normalized CPT tip resistance ($q_{c,1N}$) of unsaturated soils were corrected for fines content.

Volumetric strain of saturated sands caused by earthquake shaking is evaluated using $N1_{60}$ values (estimated from the CPT sounding data) and earthquake-induced cyclic shear strain (estimated from the $N1_{60}$ values and the CSR). Since the volumetric strain obtained from the analysis method for saturated sands includes the effect of multi-directional earthquake shaking, it is not necessary to double the volumetric strain calculated for saturated sand deposits. Although this procedure for calculation of volumetric strains strictly applies only to saturated clean sands, the estimated $N1_{60}$ values are corrected for fines content as described in SP 117. Settlement is calculated by multiplying the thickness of the saturated soil layer by the volumetric strain.

A typical spreadsheet with Cyclic Settlement Analysis calculations is included as **Figure C2.2**.

c. Potential for Lateral Spreading

Regression equations for potential lateral spread displacement associated with liquefaction of soil beneath a gently sloping site are presented in the referenced article by Zhang, et al (2004). According to these equations, the magnitude of lateral spreading displacement depends on the factor of safety (FS) against liquefaction (evaluated using the CPT-based method described above), thickness of liquefied layers, maximum cyclic shear strains of saturated sands under seismic loading (γ_{max}), relative density (D_r), grain size characteristics and percent fines, and ground surface geometry. The effects of earthquake characteristics on lateral spread displacements, including magnitude, PGA, and site to fault distance, are assumed to be quantified by

their effects on FS determined in the liquefaction analysis. The effect of fines content on lateral spreading is assumed to be similar as on liquefaction triggering. The equivalent clean sand normalized cone resistance, $(Q_{t,1N})_{cs}$ is used to account for fines content when estimating γ_{max}.

In summary, the $(Q_{t,1N})_{cs}$ and FS estimated from the CPT-based evaluation of liquefaction potential were subsequently used to estimate γ_{max} from the regression equations for different values of relative density, Dr, where,

$$D_r = -85 + 76 \log (Q_{t,1N})_{cs} \qquad (Q_{t,1N})_{cs} \leq 200$$

Integrating γ_{max} with depth yields a value defined as the Lateral Displacement Index (LDI) that quantifies potential for lateral displacement. Based on the analyzed case histories where lateral displacement was observed, empirical correlations were developed to estimate lateral displacement (LD) based on the calculated LDI, ground slope, and/or free face height and distance to free face.

The data base used to develop the lateral spread displacement regression equations is based on case histories in which the liquefiable layers extended laterally for substantial distances without being impeded by boundary effects. It may be inferred that significant lateral spreading has not been observed at narrow sites that are bounded by denser soils or bedrock, or at sites where liquefiable layers are laterally discontinuous. In addition, significant lateral spreading is expected only if a site is underlain by a **laterally continuous**, liquefiable layer of sufficient thickness that has a relative density that corresponds to an equivalent **$N1_{60}$ blow count ≤ 15**. Per the guidelines established by the County of Los Angeles Department of Public Works, soil layers with equivalent $N1_{60}$ blow counts < 15 should be evaluated for lateral spreading hazard. For the CPT-based analyses included herein, potentially liquefiable soil layers (i.e. safety factor against liquefaction ≤ 1.3) with a corrected CPT cone resistance of $(Q_{t,1N})_{cs} \leq 84$ (equivalent to an $N1_{60}$ blow count of 15 with correction for fines content) were included in the evaluation.

The estimated maximum cyclic shear strains and cumulative lateral displacements at the location of each CPT sounding analyzed are shown on the CPT-Based Evaluation of Liquefaction-Induced Lateral Displacement sheets at the end of this appendix (**Figures C3.1** through **C3.16**). A typical spreadsheet with Lateral Spread Displacement Calculations is included as **Figure C4.1**.

APPENDIX C

d. Surface Manifestations and Loss of Bearing Capacity

Surface manifestations of liquefaction, such as sand boils and fissures, do not occur provided there is a sufficient thickness of non-liquefiable soil over potentially liquefiable soil layers with low blow count (i.e. $N1_{60} \leq 10$). Although there is no analytical model available for evaluating the required thickness of this cover, an empirical model for estimation of the cover thickness needed to mitigate surface manifestations of liquefaction was developed by Professor Kenji Ishihara ("Stability Of Natural Deposits During Earthquakes", Proceedings of 11th ICSMFE, 1985) based on a limited number of case histories of vertically continuous liquefied sand deposits subjected to peak horizontal ground acceleration values up to about 0.5g.

4. Results of Analysis

a. Liquefaction Potential Assessment

Results of our liquefaction potential assessment for analyzed CPT sounding and boring locations at the site are graphically summarized herein on individual sheets (**Analysis of Liquefaction Potential - Figures C1.1** through **C1.20**). These sheets present plots of depth vs. normalized CPT cone resistance and friction ratio, fines content interpreted from the CPT data, cyclic shear stress induced by earthquake shaking, resistance to liquefaction caused by cyclic shear stress, and cumulative settlement that would be caused by earthquake shaking (before and after recommended removals). The sheets also display ground water depths at the time of the CPT soundings and estimated historic high ground water depths. Based on data from our CPT soundings, potentially liquefiable soil layers are present at depths ranging from 10 feet (historic high ground water level) to 50 feet (maximum depth analyzed).

b. Earthquake-Induced Settlement

The results of the analyses of potential earthquake-induced settlement are presented in column (d) of Figures C1.1 through C1.20. Based on these analyses, potential earthquake-induced total settlement at the site range from about 2.0 to 7.1 inches.

The Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division (GMED) has developed criteria to determine when structural mitigation and ground improvement is required to mitigate seismically-induced settlement. Total seismic settlements up to 4 inches and differential seismic settlements up to 1 inch (over a horizontal distance of 30 feet) can be mitigated using structural methods, such as additional foundation reinforcement or alternate

foundation types. Calculated settlements in excess of these values would warrant ground improvement, or a combination of ground improvement and structural methods.

Remedial removals are proposed to reduce total seismic settlement generally to less than 2.0 inches and differential seismic settlement to less than 1.0 inch, in order to avoid alternate ground improvement methods.

c. Lateral Spreading

As stated above, significant lateral spreading is expected only if a site is underlain by a laterally continuous liquefiable layer that a relative density that corresponds to a corrected CPT cone resistance of $(Q_{t,1N})_{cs} \leq 84$. Based on our evaluation of lateral spreading hazard, laterally continuous, potentially liquefiable layers with substantial thicknesses of material with a relative density that corresponds to $N1_{60} \leq 15$ blows/ft were identified at most CPT locations analyzed within Alluvial Canyons 1, 2 and 3. Therefore, the risk of lateral spreading at these locations is **moderate to significant**. Within Alluvial Canyon 4, similar soil conditions were observed (HS-8A and HS-9A). However, due to the orientation of proposed fill slopes (slope faces descend across canyon) and confinement of the slopes provided by the bedrock topography, the potential for lateral spreading hazard is considered low.

d. Surface Manifestations

Based on the proposed grading, a cap of non-liquefiable material at least 15 ft in thickness will be present over potentially liquefiable soils within the tract boundaries where structures are proposed. The thickness of the non-liquefiable surface layer and the effective thickness of underlying liquefiable layers with interpreted $N1_{60}$ blow counts ≤ 10 following the recommended removals were reviewed at each analyzed CPT location. Based on this review, the effective thickness of potentially liquefiable layers with low interpreted blow counts is predominantly < 1 ft. The one exception is at CPT-3 where 5.3 feet of potentially liquefiable layers (with low blow counts) will remain following removals. Using the Ishihara model in conjunction with the thickness of potentially liquefiable soils with low blow counts that would remain following the removals (see Summary of Estimated Cyclic Settlements and Removal Depths, **Table C4**), the thickness of the cap of non-liquefiable materials above the remaining potentially liquefiable materials will be sufficient to mitigate the hazard of surface manifestations of liquefaction.

APPENDIX C

e. Conclusions and Recommendations

The principle findings of our liquefaction analyses are as follows:

- Layers of potentially liquefiable alluvial soils are present at the site at depths ranging from about 10 ft to 50 ft. Potential liquefaction and earthquake-induced densification of these soils could cause total ground settlement at the site up to about 7.1 inches. The corresponding differential ground settlement (between locations of adjacent footing foundations or over a horizontal distance of 30 ft) would be up to about 3.5 inch. Since this potential differential settlement exceeds the maximum potential differential settlement considered to be tolerable by Los Angeles County (i.e., 1 inch), removal of in-situ site soils and replacement with compacted fill are recommended as shown on the Geotechnical Map and on the Summary of Estimated Cyclic Settlements and Removal Depths (**Table C4**).

- Following the recommended removals and replacement, potential liquefaction and earthquake-induced densification of soils could cause total ground settlement over most of the site generally up to about 2 inches. The corresponding differential ground settlement (between locations of adjacent footing foundations or over a horizontal distance of 30 ft) would be up to 1.0 inch. The cumulative thickness of potentially liquefiable soil layers remaining varies from 2.5 ft to about 9 ft.

- Near the mouth of Alluvial Canyon 3 (CPT-3 and HS-3) up to 4 inches of potential seismic settlement will remain following removal and replacement. However, due to the confined nature of the area, uniform settlement potential, lack of steep subsurface transitions within and adjacent to this area, and distance between adjacent CPTs indicating less settlement (CP-11), differential seismic settlements over a distance of 30 feet are also expected to be 1 inch, or less.

- Differential settlement could occur over a horizontal distance of 30 ft or between locations of adjacent columns, whichever distance is smaller. For purposes of design, the earthquake-induced settlement should be added to the static settlement that will be caused by structure loads.

- Potential for lateral spreading (following proposed grading) is believed to be moderate to significant within Alluvial Canyon 1, 2 and 3. Following recommended remedial removals, the remaining thickness of soils with potential for lateral spreading and the estimated potential lateral displacements are provided below in Tables C1 to C3.

APPENDIX C

Table C1 – Lateral Spreading Hazard, Canyon 1

Analyzed Location	Total Depth (feet)	Removal Depth (Feet)	Remaining Thickness of Soils with Potential for Lateral Spreading (feet)	Estimated Lateral Spread Displacement (feet)
CPT-16	33.6	19	5.2	5.3

Table C2 – Lateral Spreading Hazard, Canyon 2

Analyzed Location	Total Depth (feet)	Removal Depth (Feet)	Remaining Thickness of Soils with Potential for Lateral Spreading (feet)	Estimated Lateral Spread Displacement (feet)
CPT-1	41.8	24	0.0	0.0
CPT-2	37.4	22	1.3	2.1
CPT-12	25.9	17	3.8	6.0
CPT-13	36.9	26	6.9	10.3
CPT-14	32.8	21	3.1	4.3

Table C3 – Lateral Spreading Hazard, Canyon 3

Analyzed Location	Total Depth (feet)	Removal Depth (Feet)	Remaining Thickness of Soils with Potential for Lateral Spreading (feet)	Estimated Lateral Spread Displacement (feet)
CPT-3	50.2	30	8.9	8.6
CPT-4	31.7	13	0.2	0.1
CPT-6	49.9	15	2.0	1.6
CPT-8	50.2	29	3.6	3.5
CPT-9	31.0	20	$\geq$ 2.1	$\geq$ 1.8
CPT-11	29.9	10	0.2	0.1
CPT-15	38.1	16	2.5	2.0
CPT-17	33.3	15	0.8	0.7
CPT-18	28.7	16	$\geq$ 1.2	$\geq$ 1.2
CPT-20	36.1	10	0.0	0.0

APPENDIX C

In order to mitigate the potential for lateral spreading, shear keys are recommended as shown on the Geotechnical Map. The engineered fill shear keys are to be at least 50 feet in width and extended into bedrock to intercept laterally continuous layers subject to potential lateral spread hazard. Cross Sections 28-28' and 29-29' (see Appendix G) were constructed through Alluvial Canyons 2 and 3, respectively, and illustrate existing grade, proposed grade, depth to bedrock, and recommended removal depths. For the analyses, these cross-section profiles were modeled using the 2D limit equilibrium software, Slide 2018, by RocScience,

Slope stability analyses was performed on each cross section to identify critical areas where potential failure surfaces along liquefied soil layers subject to lateral spreading yield safety factors less than 1.5. An iterative approach was then used to determine the critical locations and widths of remedial shear keys to obtain safety factors of at least 1.5. General shear strength parameters used in the analyses are discussed in Appendix E – Slope Stability Analyses. However, a liquefied shear strength ratio of $s_{u(liq)} / \sigma'_{vo} = 0.5$ was applied to the alluvial soils remaining in place to represent the shear strength of liquefied soils during earthquake loading. This value represents a lower-bound CPT-based estimate using the following equation (Robertson, 2010):

$$s_{u(liq)} / \sigma'_{vo} = [0.02199 - 0.0003124\,(Q_{t,1N})_{cs}] / [1 - 0.02676\,(Q_{t,1N})_{cs} + 0.0001783\,[(Q_{t,1N})_{cs}]^2]$$

Results of the slope stability analyses to evaluate the recommended shear keys for mitigation of potential lateral spreading hazard are included on the appended Slope Stability Diagrams and Data Sheets.

- The cap of non-liquefiable soils (following proposed grading) will be thick enough to mitigate surface manifestations of potential liquefaction, such as sand boils, fissures, and loss of bearing capacity.

APPENDIX C

The following attachments complete this Appendix.

- References - Assessment of Liquefaction Potential and Estimated Cyclic Settlements
- Summary of Estimated Cyclic Settlements and Removal Depths — Table C4
- Analysis of Liquefaction Potential Based on q_t and F_R from CPT Data — Figures C1.1 through C1.19
- SPT-Based Assessment of Seismic Soil Liquefaction Potential (HS-3) — Figure C1.20
- Correlation of N1(60) Blow Count and Percent Fines - Boring vs. CPT Interpretation (HS-3 vs. CPT-3) — Figure C1.21
- Typical Spreadsheet of Liquefaction Triggering Analysis (based on CPT-10) (6 sheets) — Figure C2.1
- Typical Spreadsheet of Cyclic Settlement Analysis (based on CPT-10) (6 sheets) — Figure C2.2
- CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements — Figures C3.1 through C3.16
- Typical Spreadsheet of Lateral Spread Displacement Calculations (based on CPT-9) (5 sheets) — Figure C4.1
- Slope Stability Diagrams and Data Sheets (for Cross Sections 28-28’ and 29-29’)

APPENDIX C

REFERENCES FOR ASSESSMENT OF LIQUEFACTION POTENTIAL AND ESTIMATED CYCLIC SETTLEMENTS

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APPENDIX C

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Table C4 – Summary of Estimated Cyclic Settlements and Removal Depths

Analyzed Location	Total Depth (feet)	Depth to Bedrock (feet)	Groundwater Depth (feet)		Total Seismic Settlement Before Removals (inches)	Limit Differential Seismic Settlement ≤ 1.0 inch *(taken as ½ of total)*		Limit Total Seismic Settlement ≤ 4.0 inch		Thickness of Potentially Liquefiable Soils Remaining (feet)
			Existing GWT	Historical GWT		Removal Depth (ft)	Total Seismic Settlement	Removal Depth (ft)	Total Seismic Settlement	
CPT-1	41.8	40.5	25	10	4.1	24	1.8	--	--	10.5
CPT-2	37.4	36	>37.4	10	4.2	22	1.8	--	--	9.8
CPT-3	50.2	49	24	10	6.0	--	--	30	4.0	17.4
HS-3	50.0	>50	24	10	6.3	--	--	25	3.8	12
CPT-4	31.7	31	20	10	1.8	13	1.2	--	--	7.9
CPT-5	32.8	27	30	10	2.8	15	1.8	--	--	10.0
CPT-6	49.9	39	25	10	2.5	15	1.8	--	--	10.2
CPT-8	50.2	>50.2	>50.2	10	6.3	29	2.0	--	--	11.0
CPT-9 [1]	31.0	>31	>31.0	10	3.5	24	1.0	--	--	≥ 4.8
CPT-10	45.9	44	>45.9	10	2.4	15	2.0	--	--	12.8
CPT-11	29.9	29.5	>29.9	10	1.3	10	1.2	--	--	7.7

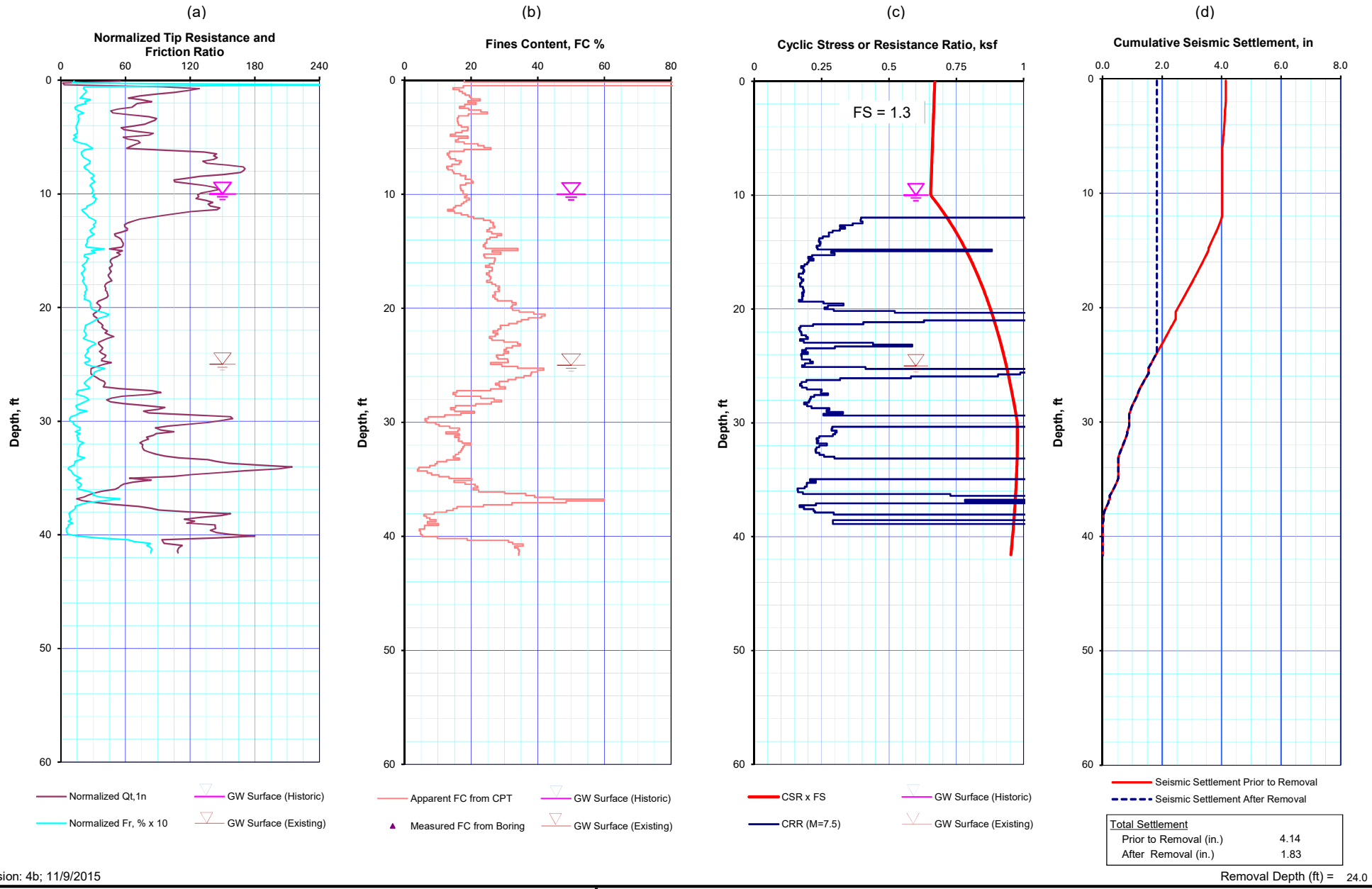
[1] Subsurface exploration did not reach bedrock and depth is less than 50 ft depth; values for remedial removals, seismic settlement, and lateral displacement are only representative of the depth explored and could exceed the values shown.

Table C4 – Summary of Estimated Cyclic Settlements and Removal Depths

Analyzed Location	Total Depth (feet)	Depth to Bedrock (feet)	Groundwater Depth (feet)		Total Seismic Settlement Before Removals (inches)	Limit Differential Seismic Settlement ≤ 1.0 inch *(taken as ½ of total)*		Limit Total Seismic Settlement ≤ 4.0 inch		Thickness of Potentially Liquefiable Soils Remaining (feet)
			Existing GWT	Historical GWT		Removal Depth (ft)	Total Seismic Settlement	Removal Depth (ft)	Total Seismic Settlement	
CPT-12	25.9	25.6	>25.9	10	3.7	17	1.9	--	--	7.5
CPT-13	36.9	36.4	>36.9	10	5.9	26	2.0	--	--	9.0
CPT-14	32.8	32.8	>32.8	10	3.7	21	1.9	--	--	10.2
CPT-15	38.1	37	>38.1	10	2.8	16	1.9	--	--	10.7
CPT-16	33.6	32.5	>33.6	10	4.8	19	1.9	--	--	8.4
CPT-17	33.3	33	>33.3	10	2.9	15	2.0	--	--	11.5
CPT-18 [1]	28.7	> 28.7	>28.7	10	2.0	16	0.9	--	--	≥ 4.9
CPT-19 [1, 2]	36.6	>36.6	>36.6	10	5.9	--	--	--	--	≥ 23.8
CPT-20	36.1	35	>36.1	10	2.4	15	1.3	--	--	8.9

[2] CPT-19 is located in the vicinity of the planned infiltration basin at the southern end of the site where no removals are proposed.

Location..... **CPT-01**
Elevation (MSL)..... 1233 ft



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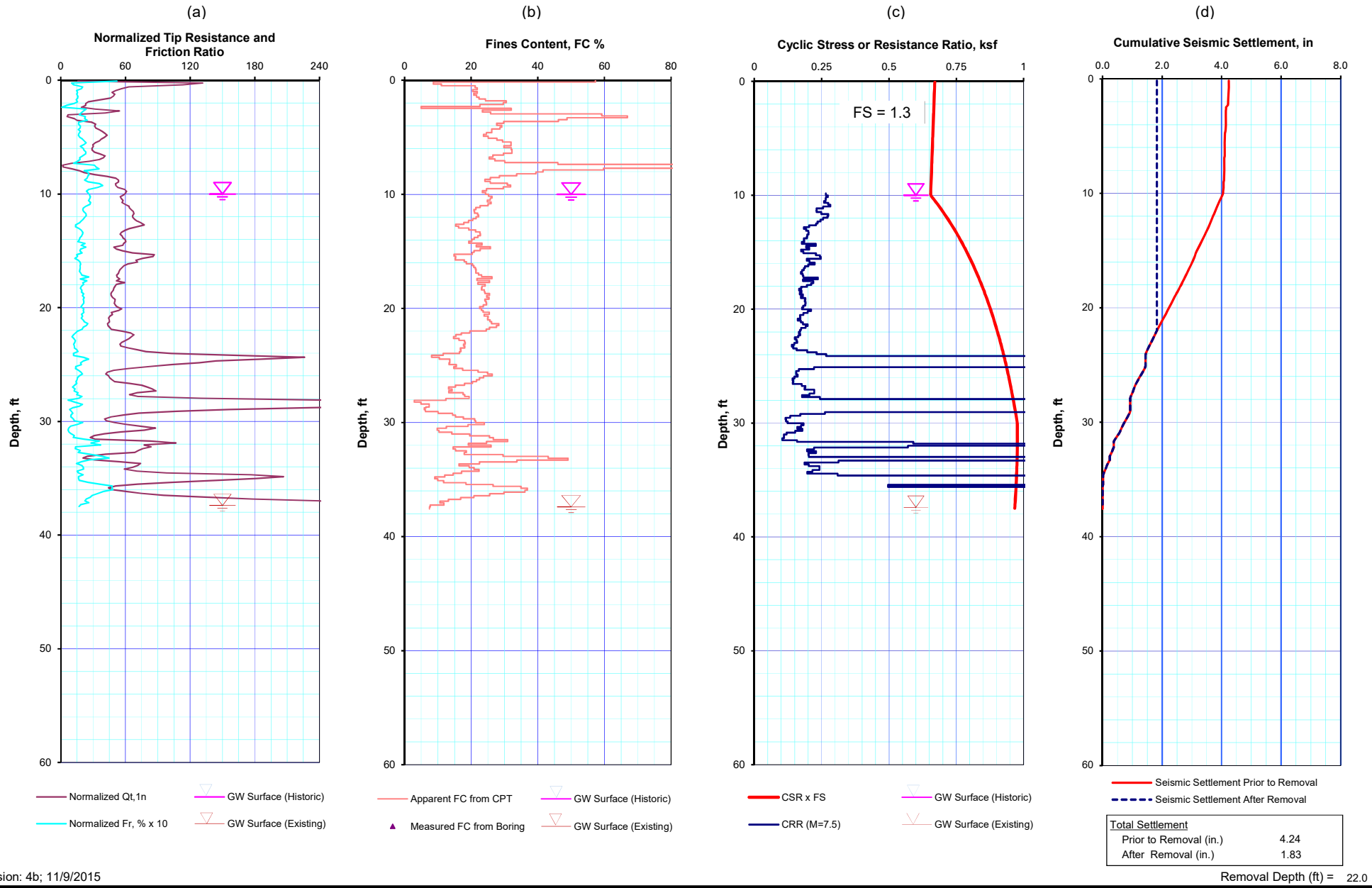
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5)..... 0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79)..... 1.02 g	Figure No.	C1.1
For: Sterling Gateway, L.P.	Mag. Weighting Factor..... 0.77	Date	6-8-2018

Location..... **CPT-02**
Elevation (MSL)..... 1256 ft



Total Settlement	
Prior to Removal (in.)	4.24
After Removal (in.)	1.83

Removal Depth (ft) = 22.0

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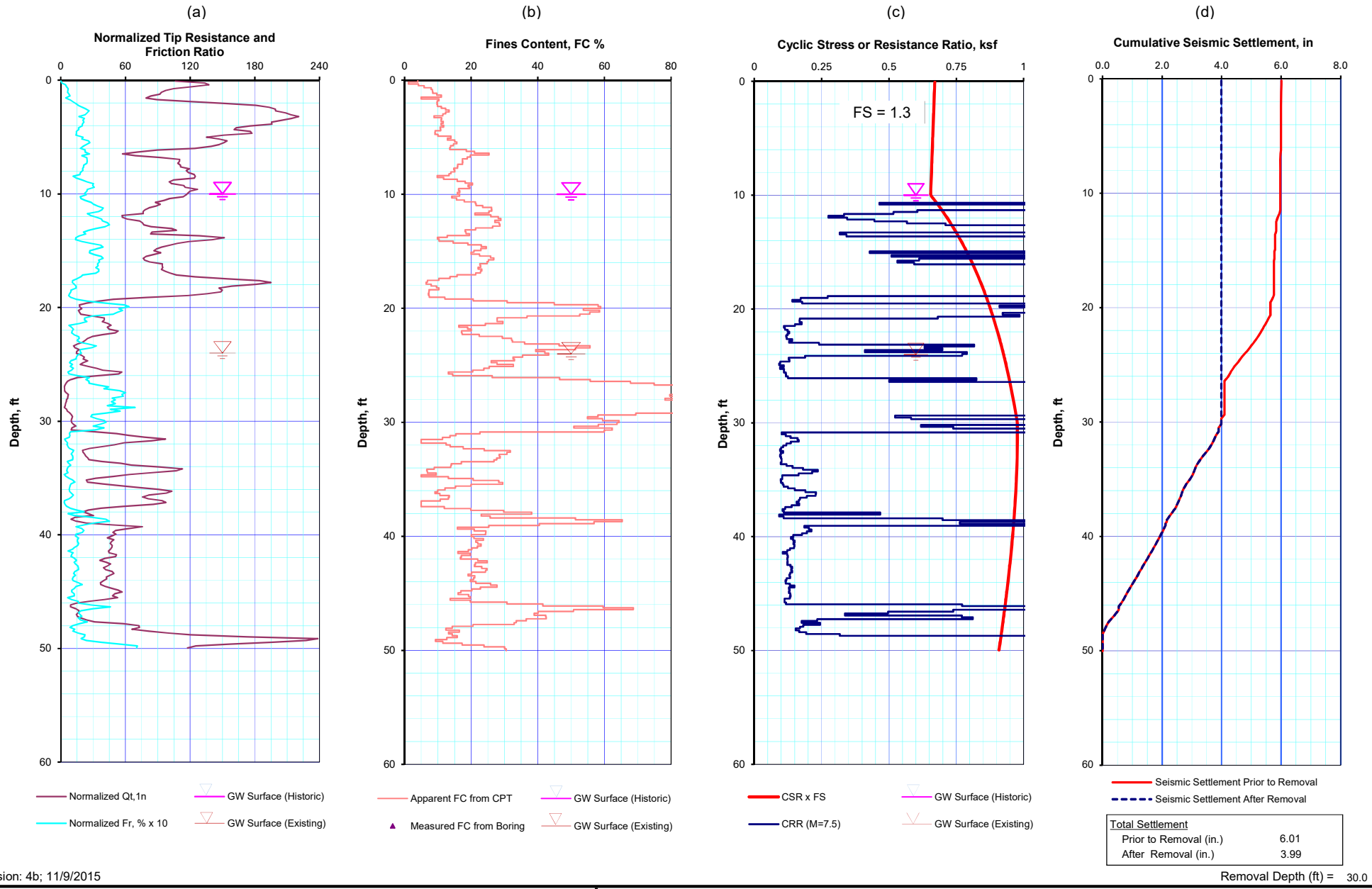
Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.2
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-03**
Elevation (MSL)..... 1237 ft



Total Settlement	
Prior to Removal (in.)	6.01
After Removal (in.)	3.99

Removal Depth (ft) = 30.0

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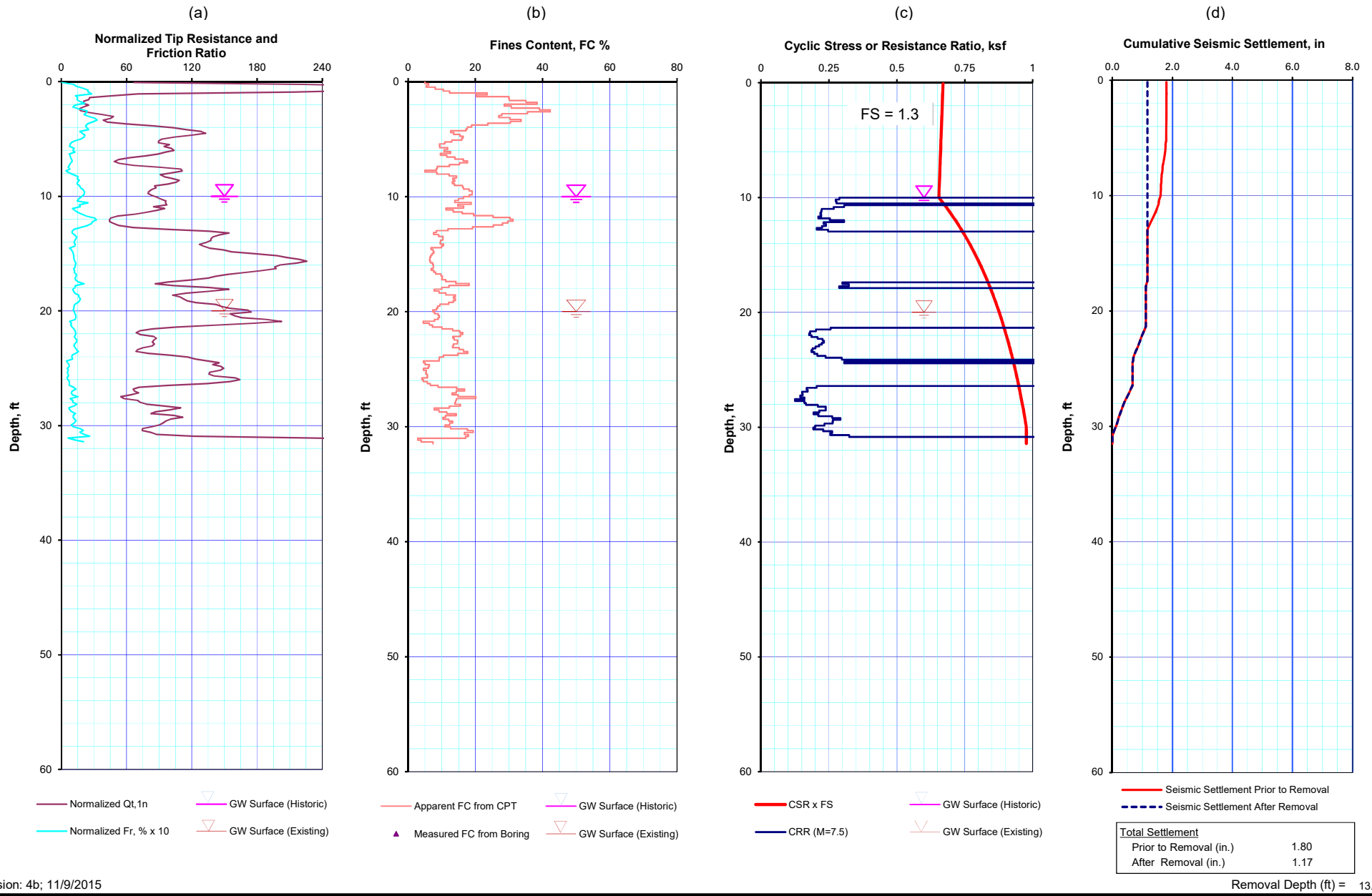
Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.3
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-04**
Elevation (MSL)..... 1243 ft



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Removal Depth (ft) = 13.0

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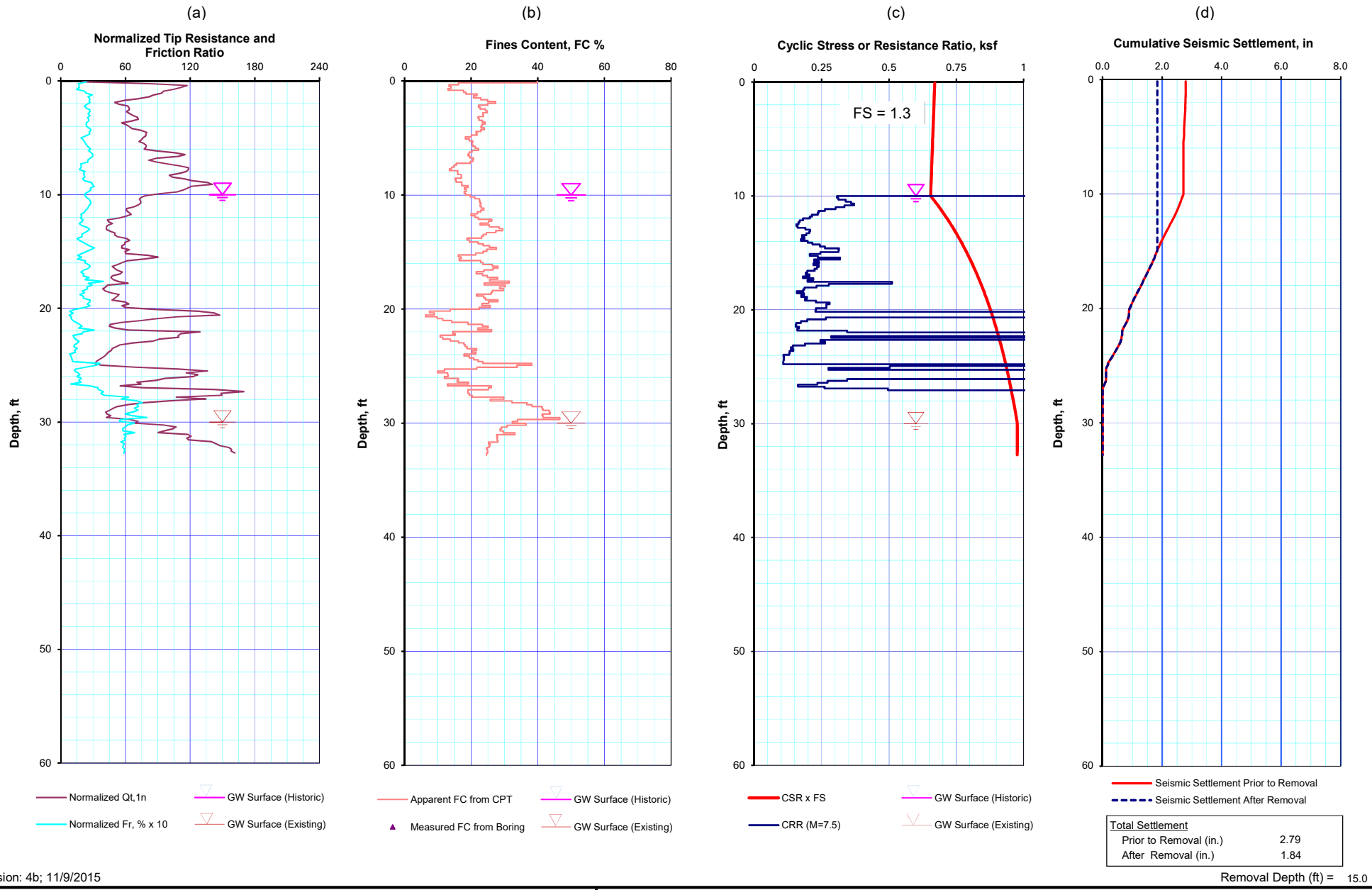
Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No. 18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No. C1.4
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date 6-8-2018

Location..... **CPT-05**
Elevation (MSL)..... 1258 ft



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Removal Depth (ft) = 15.0

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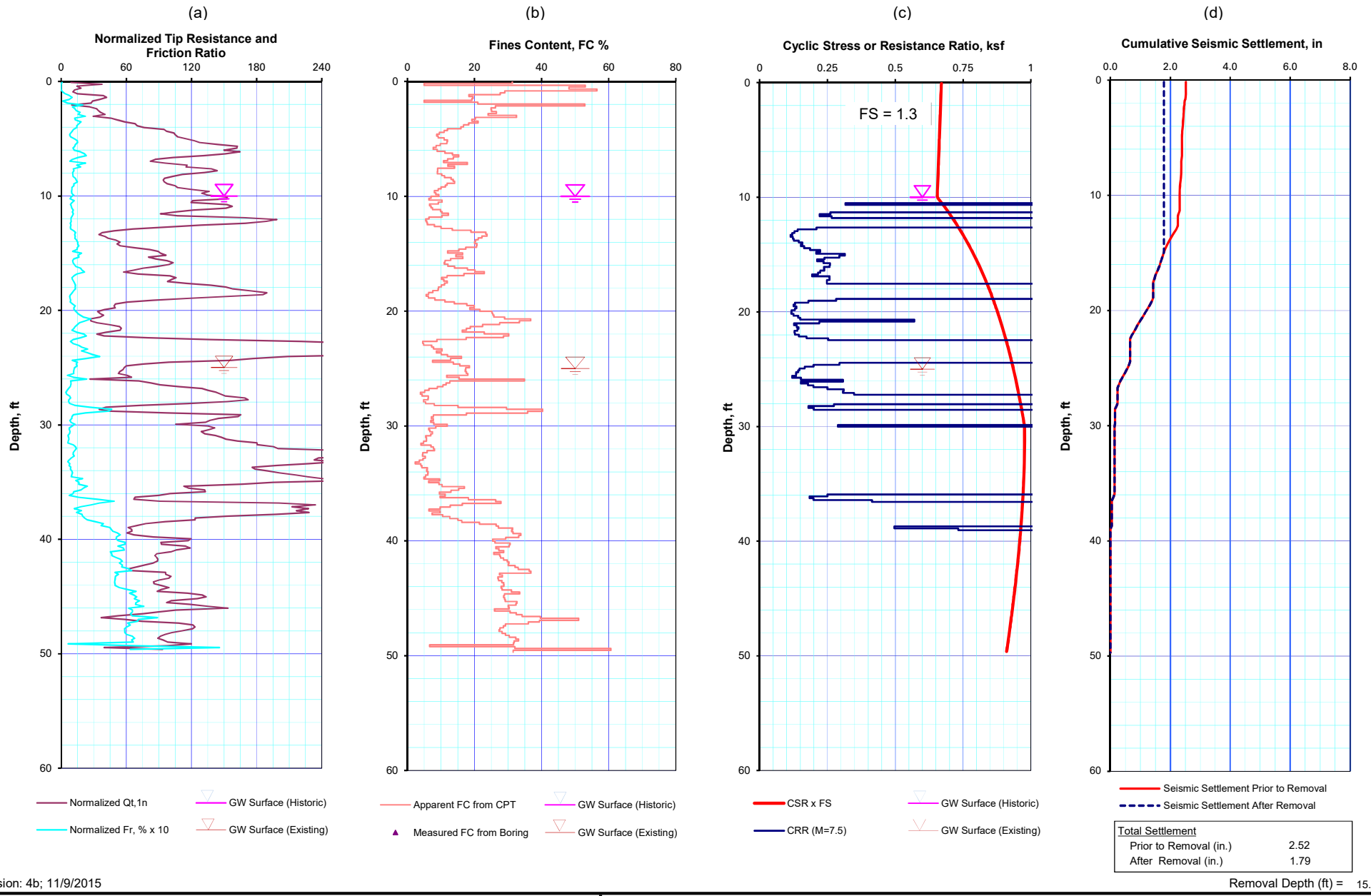
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.5
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-06**
Elevation (MSL)..... 1263 ft



Total Settlement	
Prior to Removal (in.)	2.52
After Removal (in.)	1.79

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Removal Depth (ft) = 15.0

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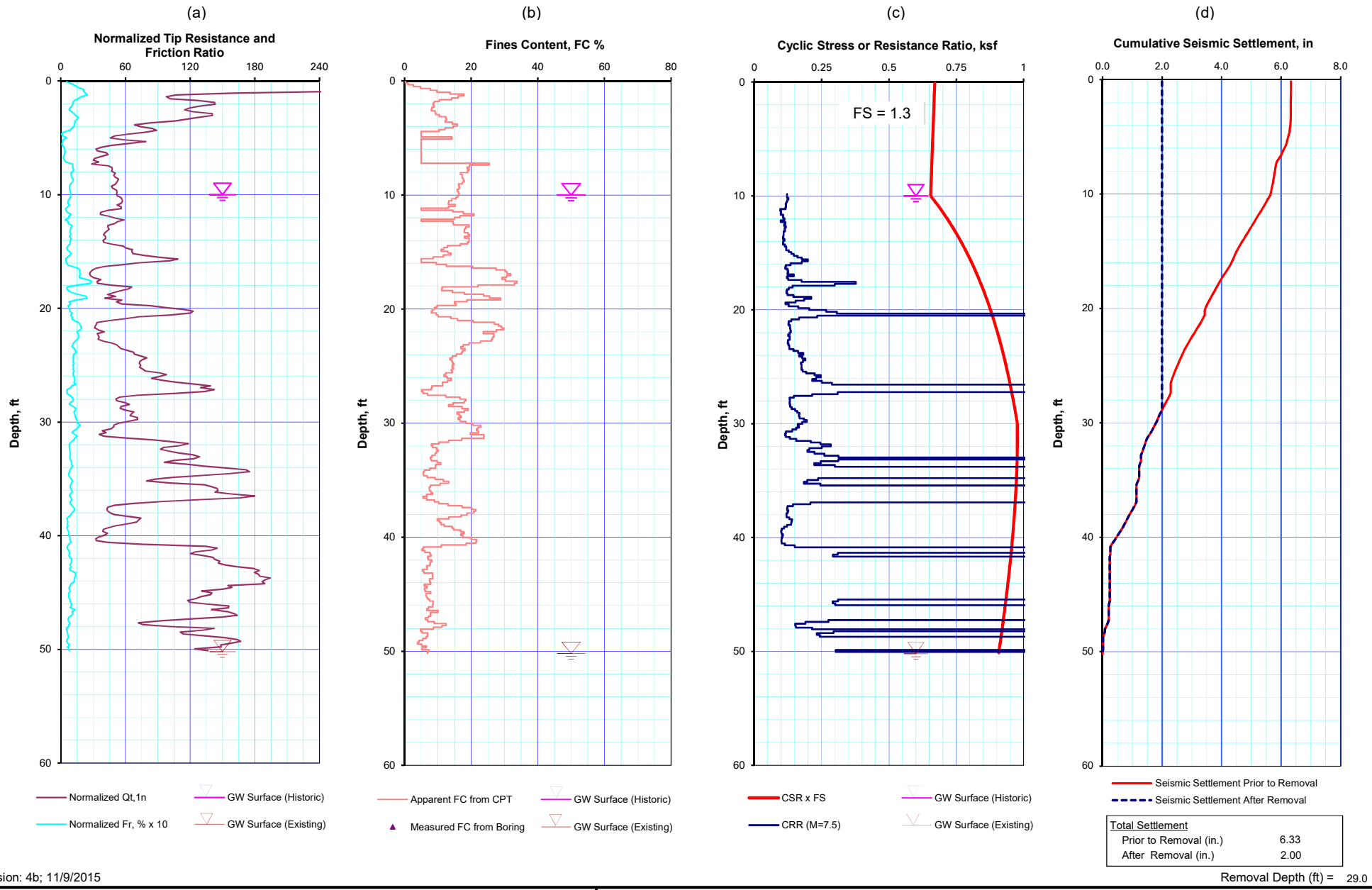
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.6
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-08**
Elevation (MSL)..... 1221.5 ft



Total Settlement	
Prior to Removal (in.)	6.33
After Removal (in.)	2.00

Removal Depth (ft) = 29.0

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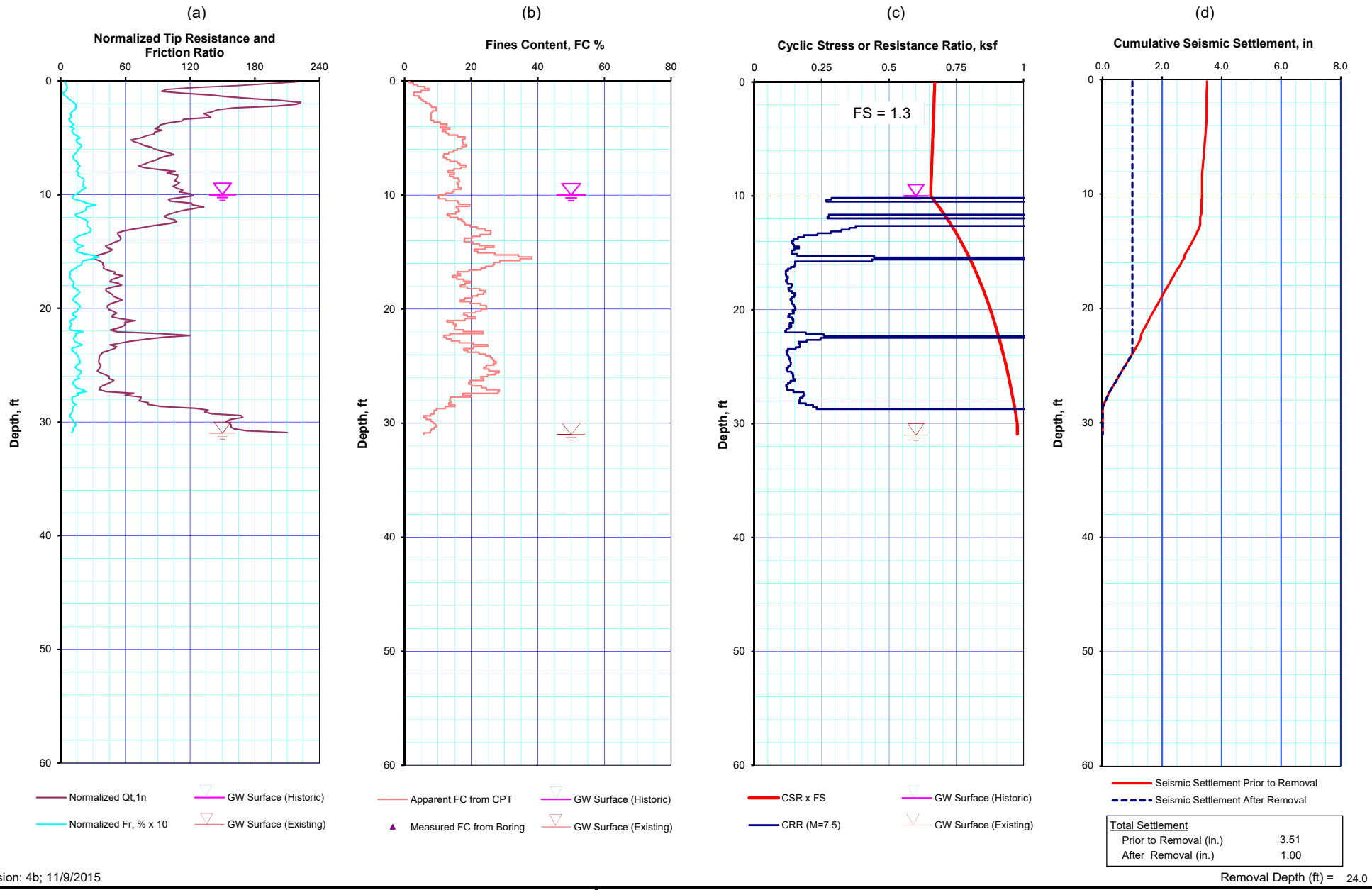
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.7
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-09**
Elevation (MSL)..... 1228 ft



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Removal Depth (ft) = 24.0

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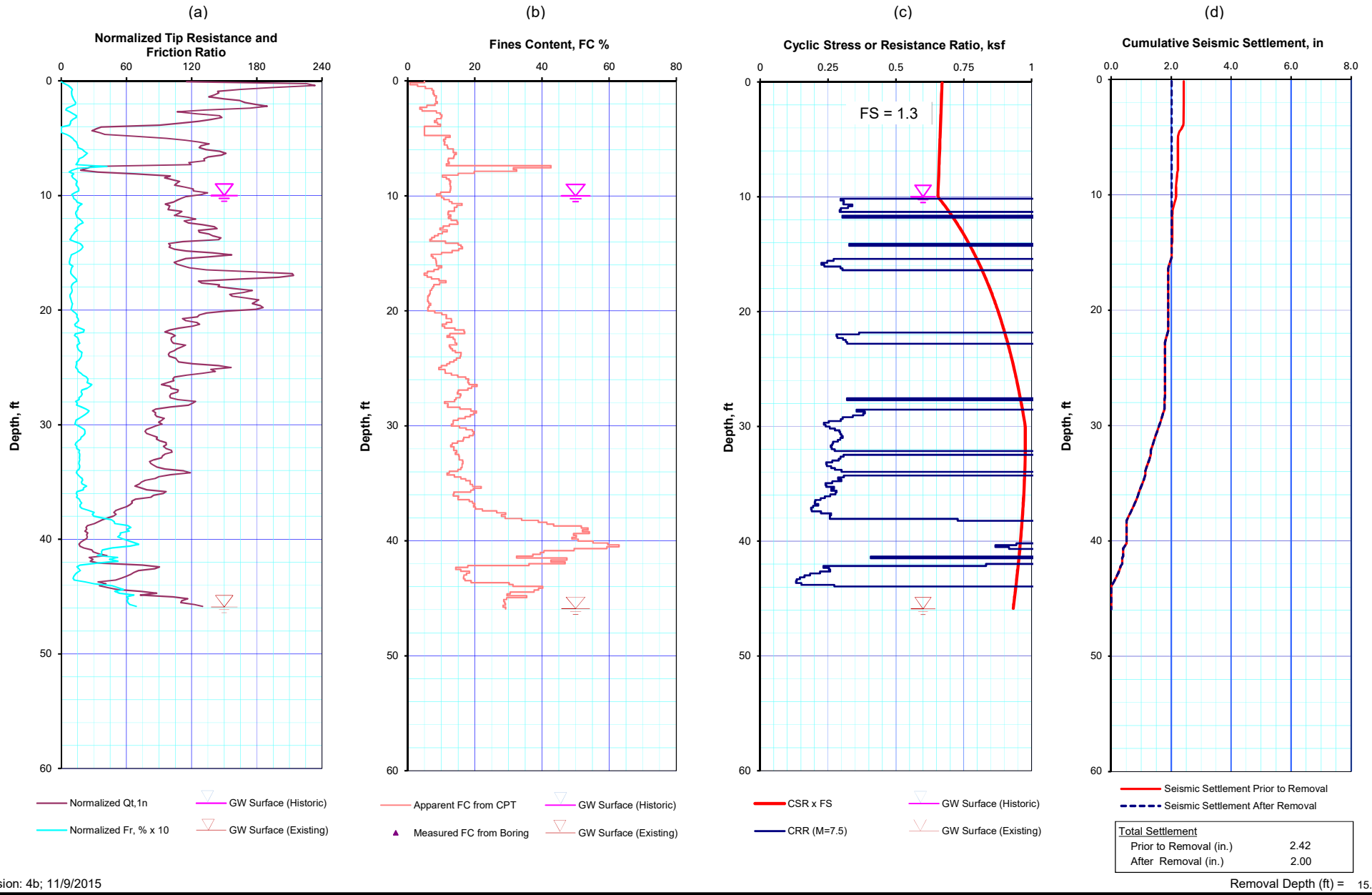
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5)..... 0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79)..... 1.02 g	Figure No.	C1.8
For: Sterling Gateway, L.P.	Mag. Weighting Factor..... 0.77	Date	6-8-2018

Location..... **CPT-10**
Elevation (MSL)..... 1244 ft



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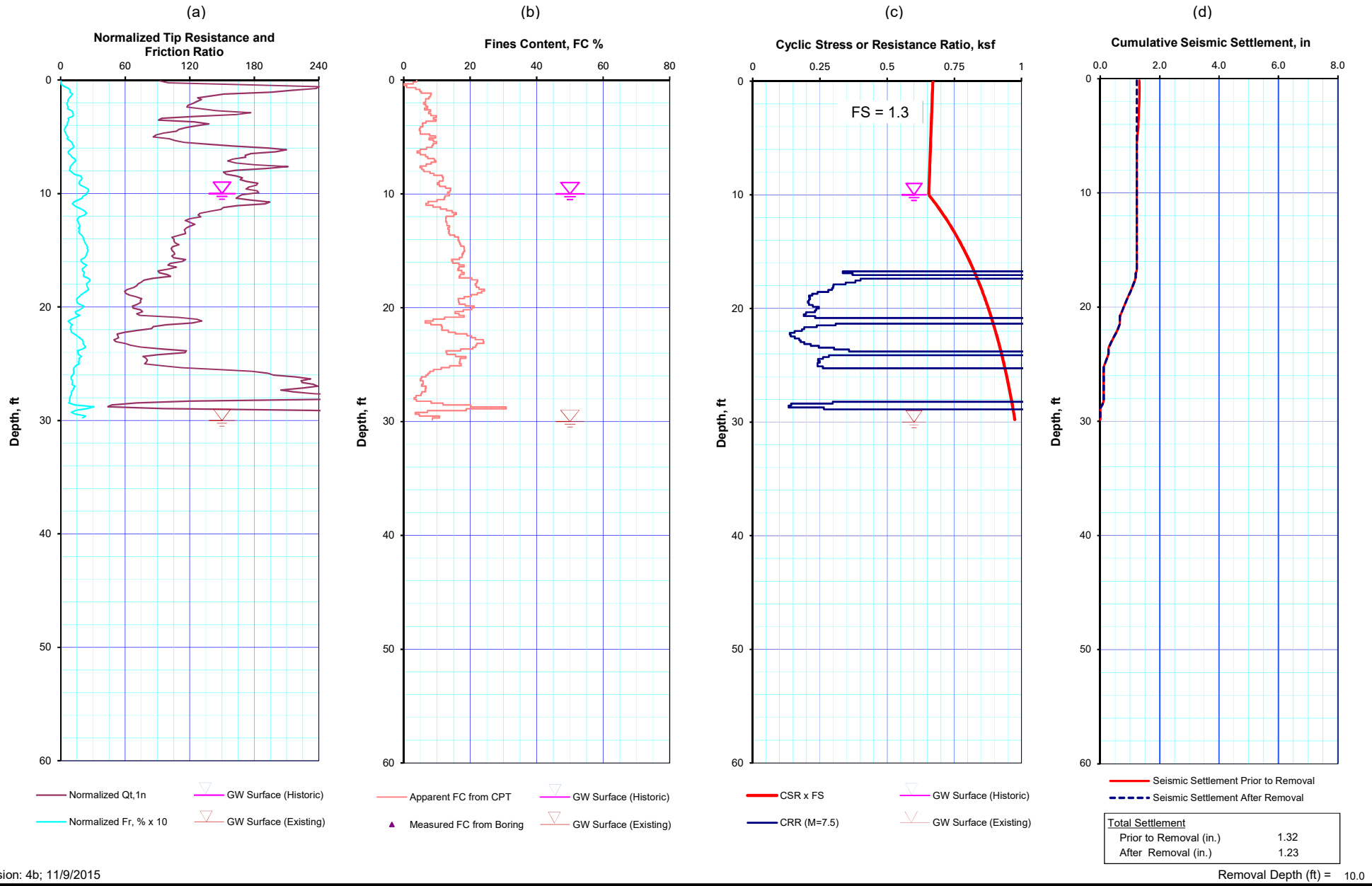
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.9
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-11**
Elevation (MSL)..... 1239 ft



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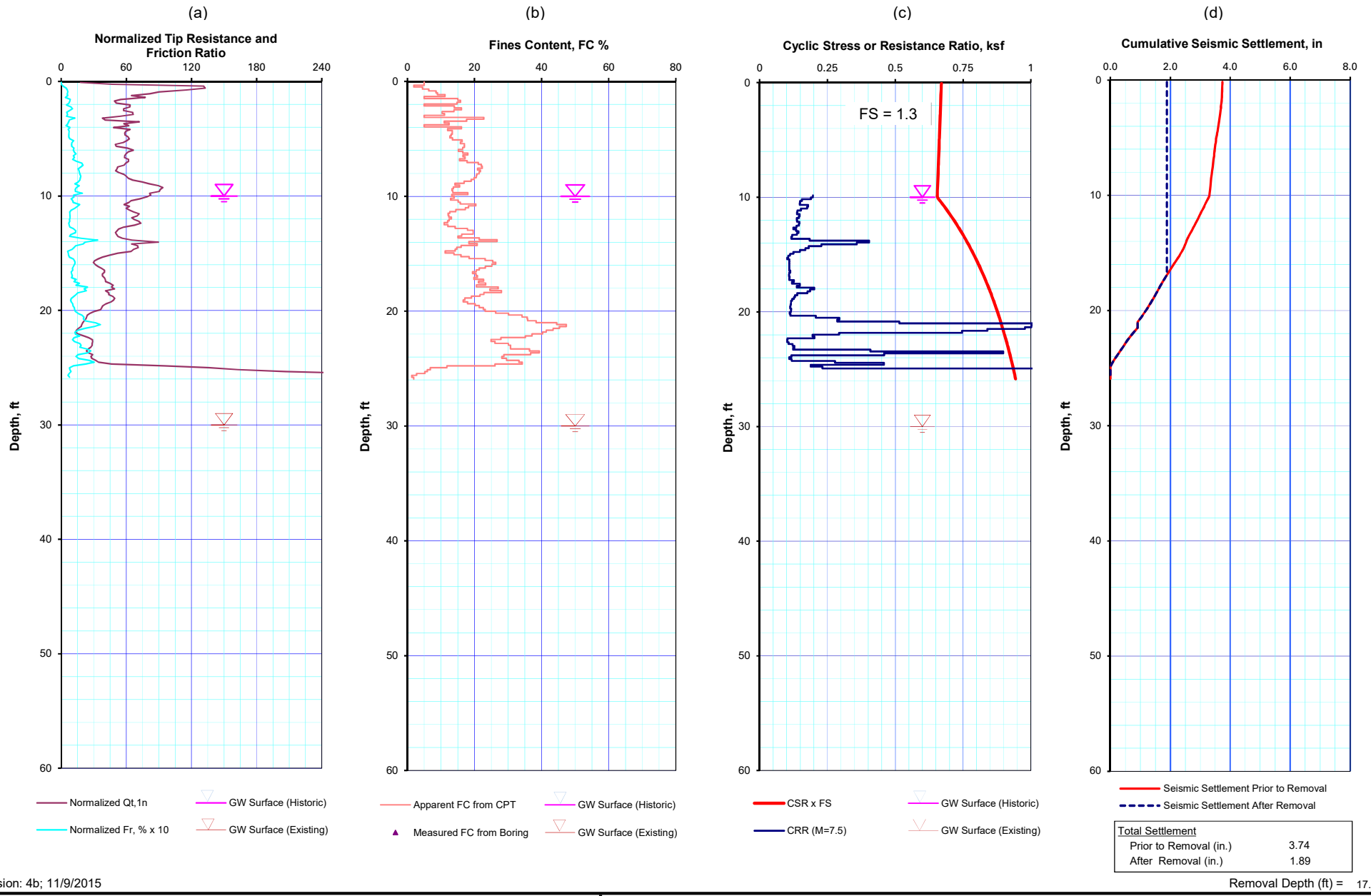
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.10
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-12**
Elevation (MSL)..... 1250 ft



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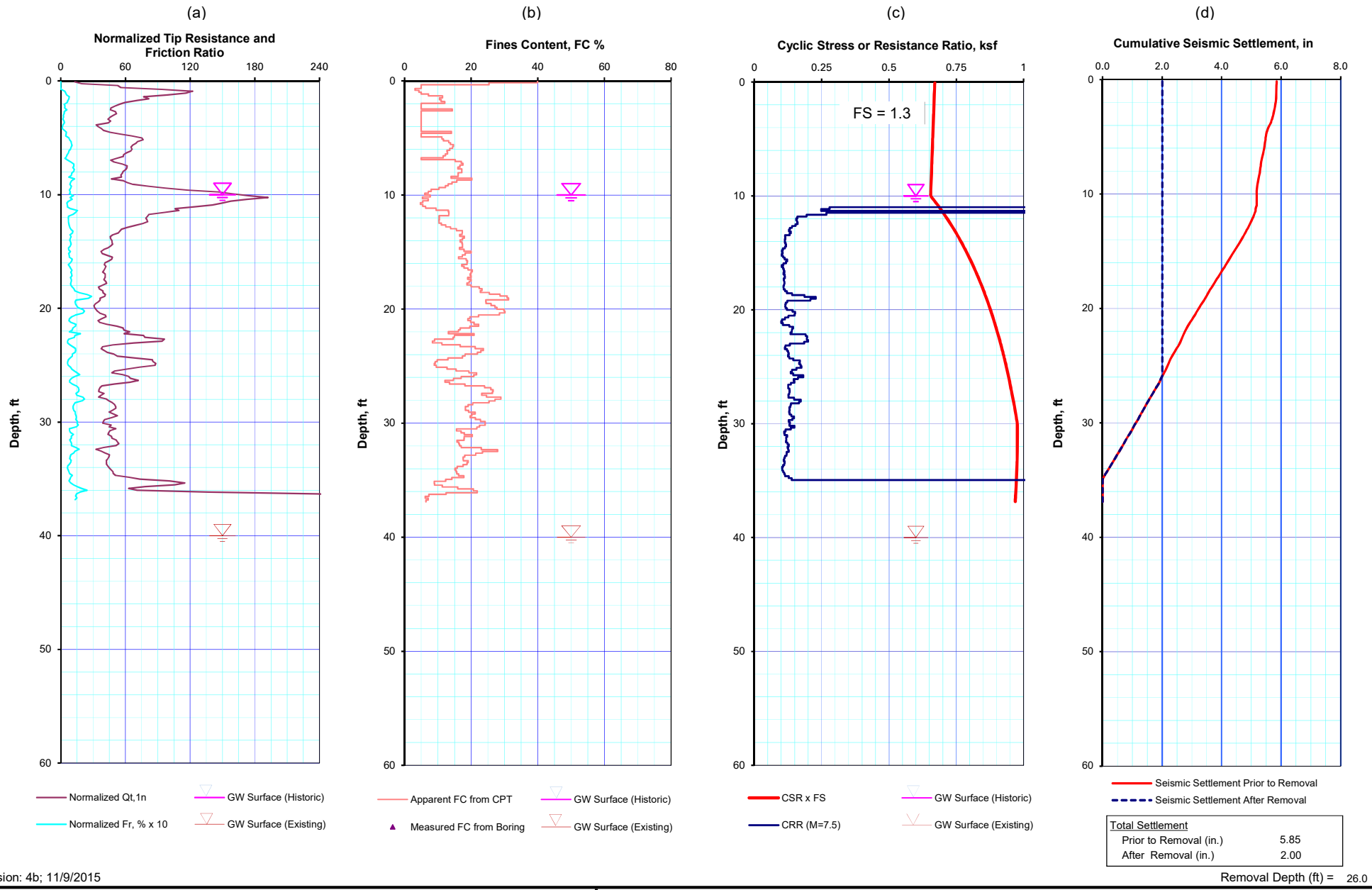
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.11
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-13**
Elevation (MSL)..... 1223 ft



Version: 4b; 11/9/2015

Removal Depth (ft) = 26.0

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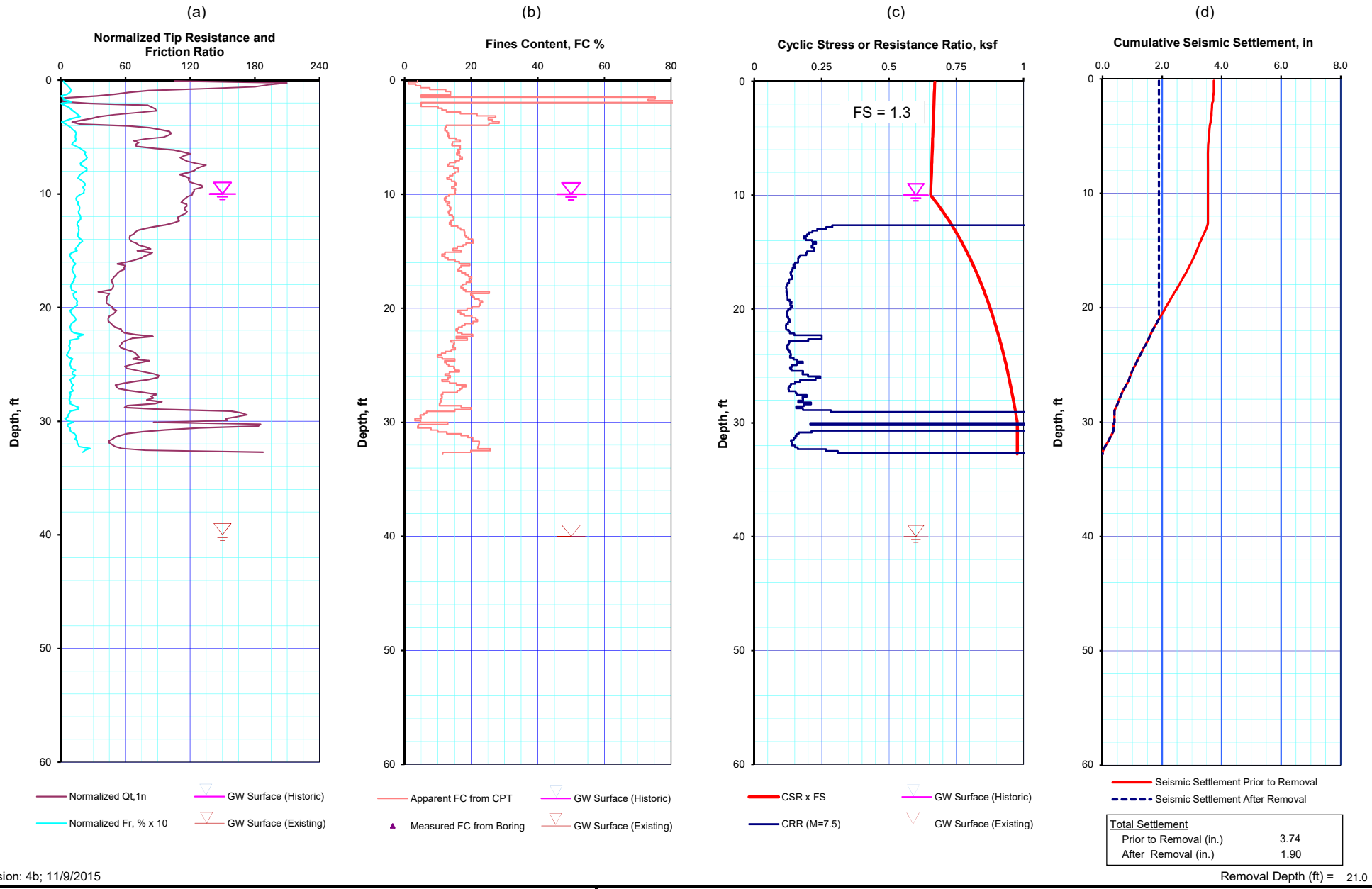
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.12
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-14**
Elevation (MSL)..... 1248 ft



Version: 4b; 11/9/2015

Removal Depth (ft) = 21.0

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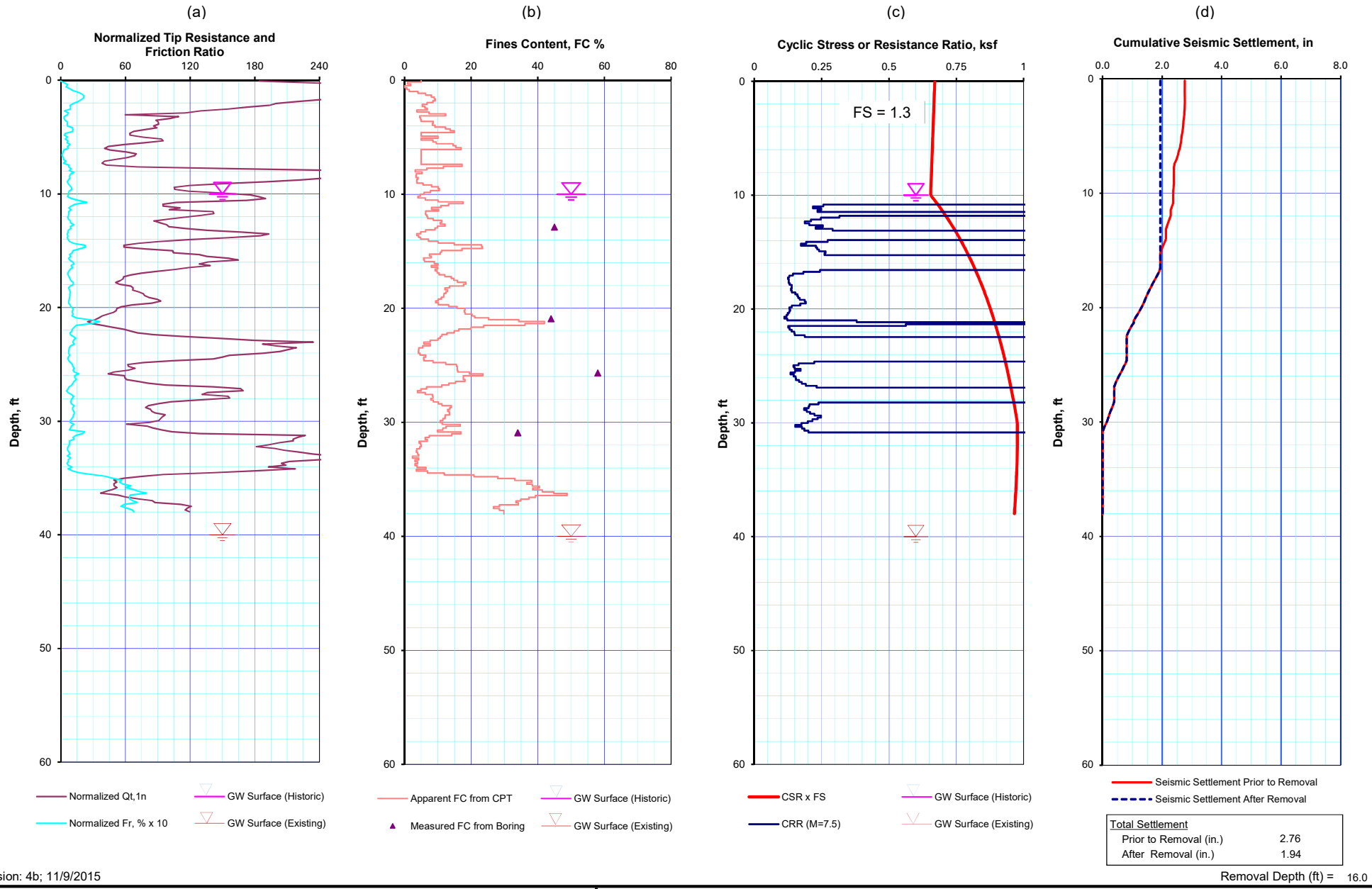
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5)..... 0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79)..... 1.02 g	Figure No.	C1.13
For: Sterling Gateway, L.P.	Mag. Weighting Factor..... 0.77	Date	6-8-2018

Location..... **CPT-15**
Elevation (MSL)..... 1249 ft



Total Settlement	
Prior to Removal (in.)	2.76
After Removal (in.)	1.94

Removal Depth (ft) = 16.0

Version: 4b; 11/9/2015

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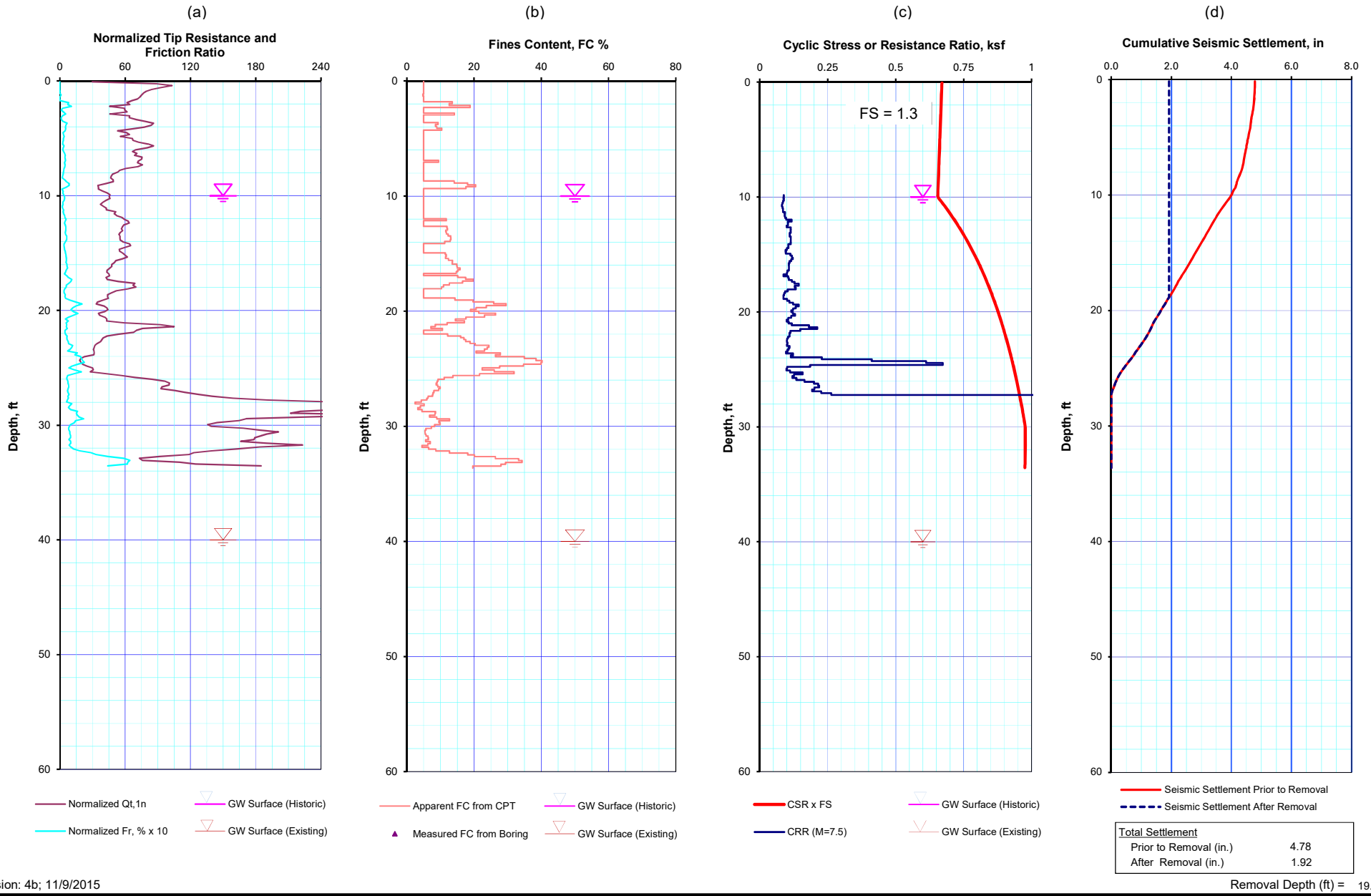
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.14
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-16**
Elevation (MSL)..... 1222.5 ft



Total Settlement	
Prior to Removal (in.)	4.78
After Removal (in.)	1.92

Version: 4b; 11/9/2015

Removal Depth (ft) = 19.0

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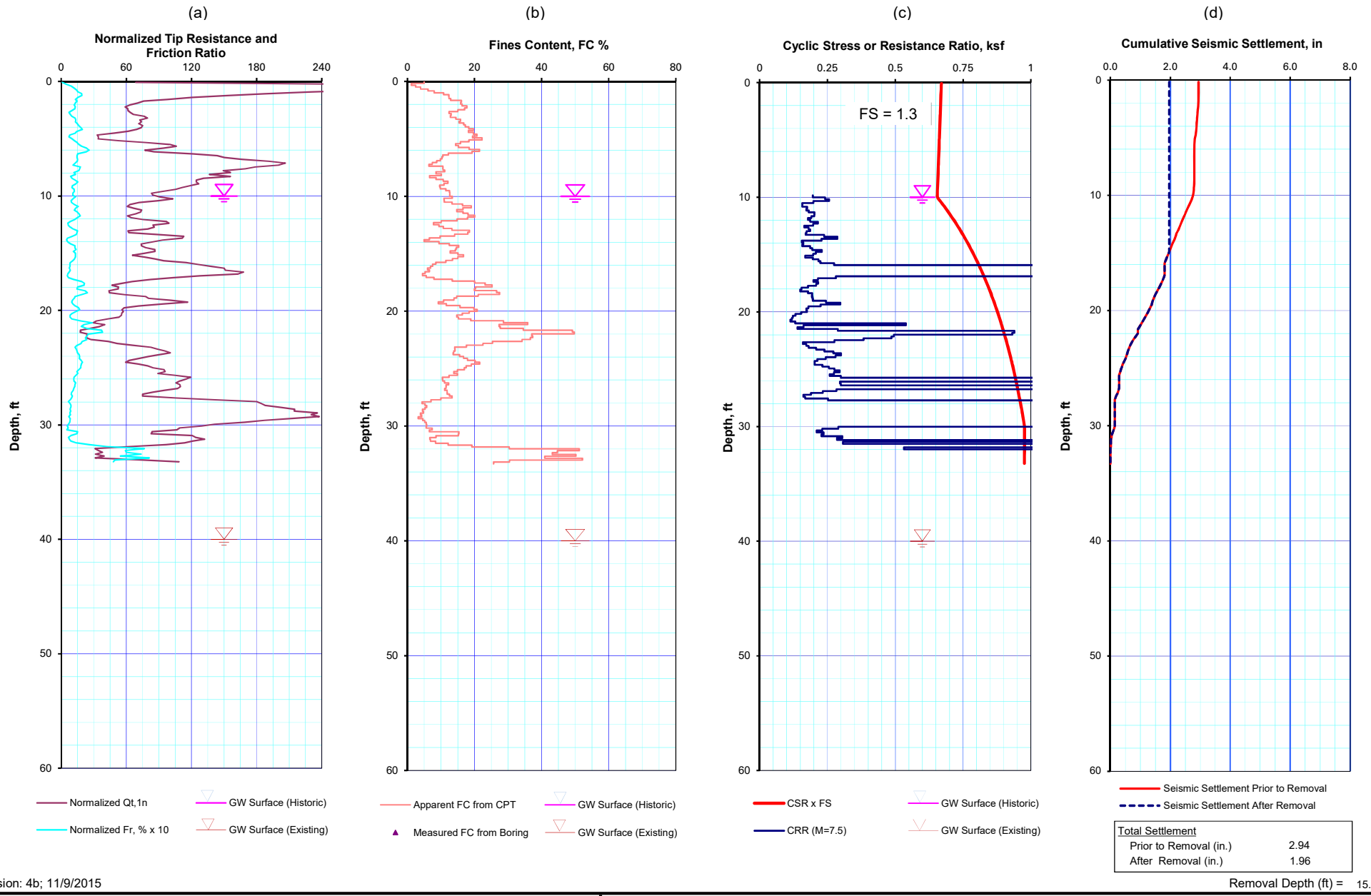
Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.15
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-17**
Elevation (MSL)..... 1280 ft



Total Settlement	
Prior to Removal (in.)	2.94
After Removal (in.)	1.96

Version: 4b; 11/9/2015

Removal Depth (ft) = 15.0

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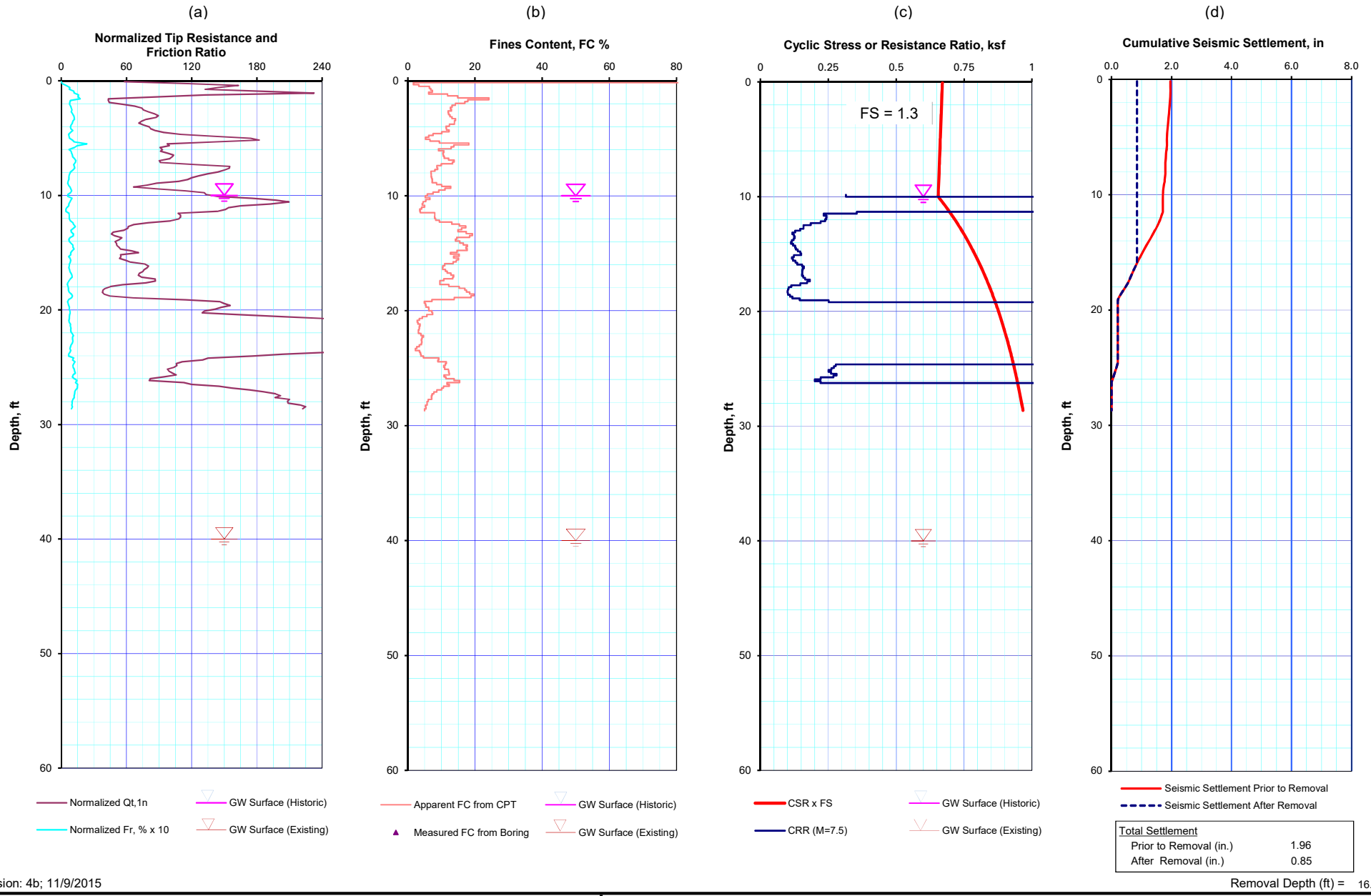
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.16
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-18**
Elevation (MSL)..... 1252 ft



Version: 4b; 11/9/2015

Removal Depth (ft) = 16.0

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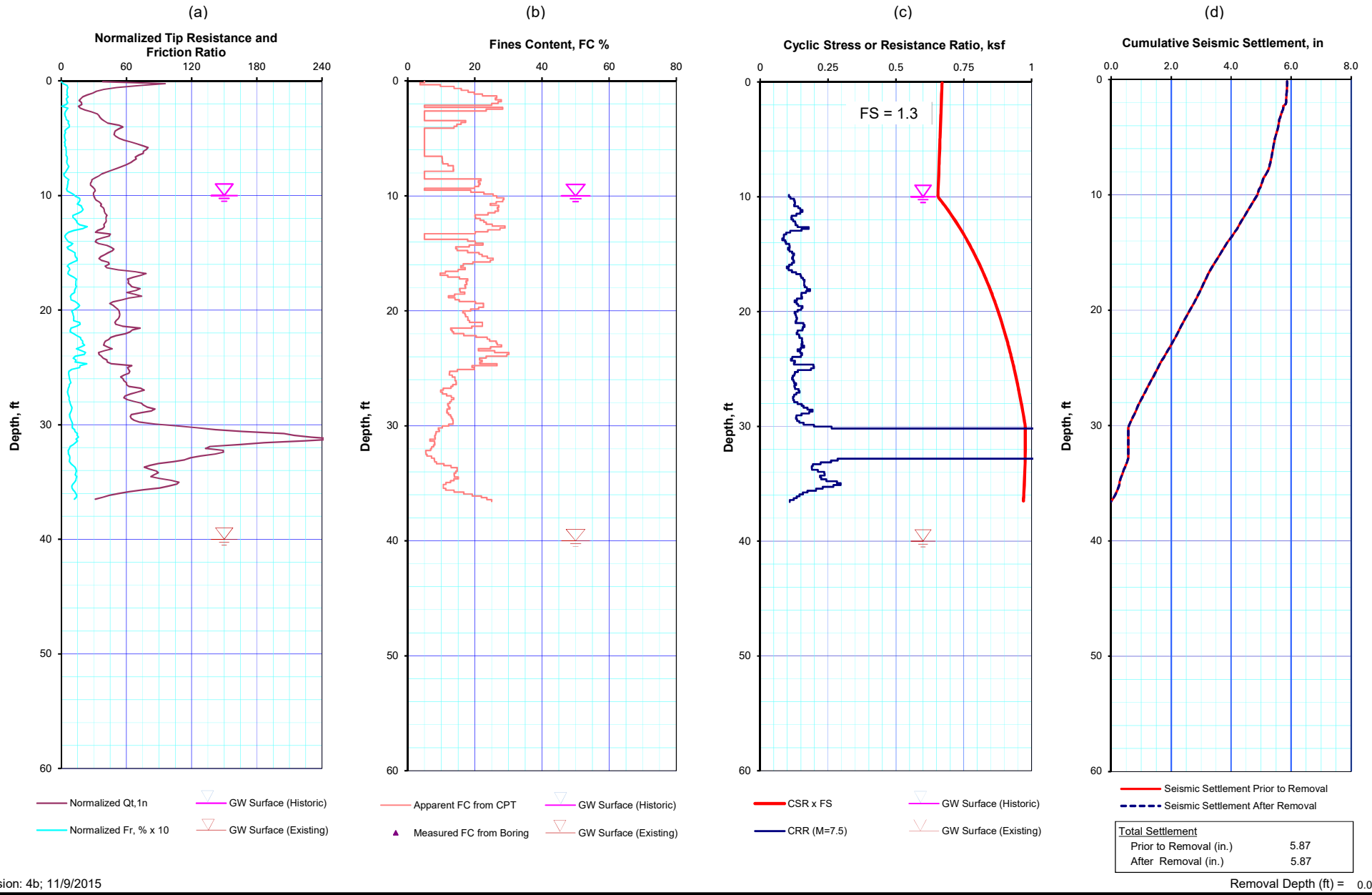
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5)..... 0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79)..... 1.02 g	Figure No.	C1.17
For: Sterling Gateway, L.P.	Mag. Weighting Factor..... 0.77	Date	6-8-2018

Location..... **CPT-19**
Elevation (MSL)..... 1199.5 ft



Total Settlement	
Prior to Removal (in.)	5.87
After Removal (in.)	5.87

Version: 4b; 11/9/2015

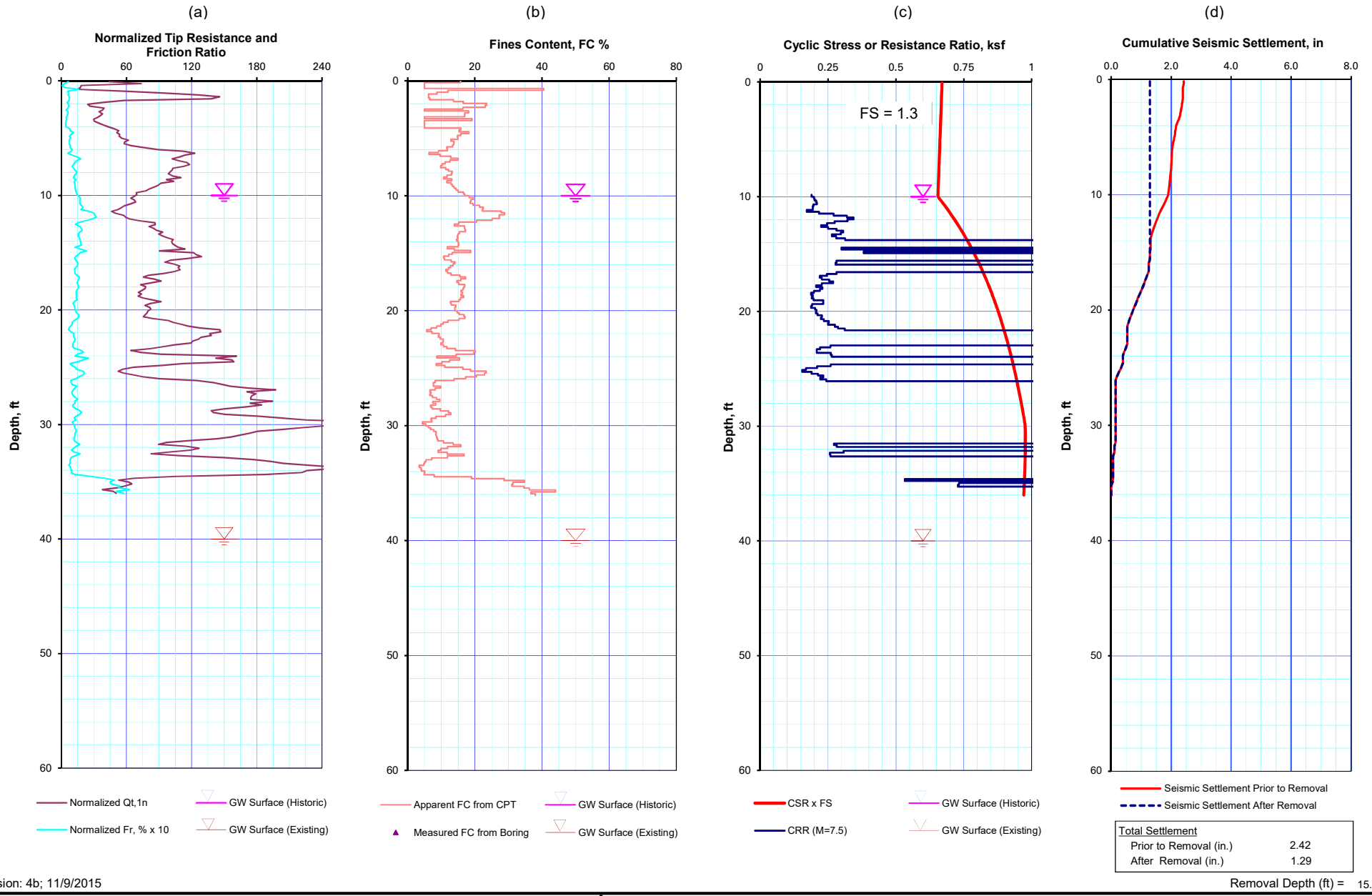
Removal Depth (ft) = 0.0

ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.18
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

Location..... **CPT-20**
Elevation (MSL)..... 1272 ft



Version: 4b; 11/9/2015

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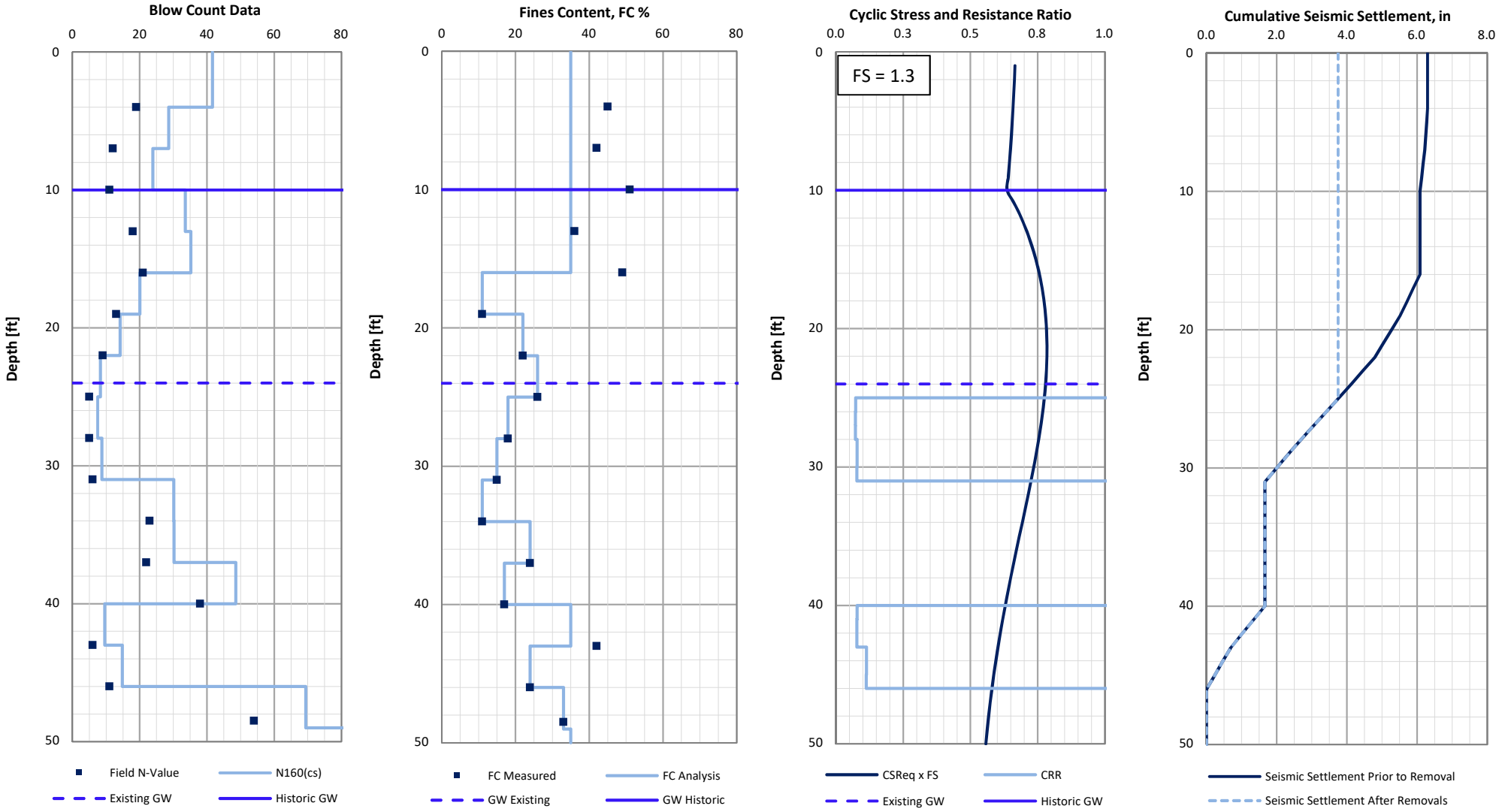
Geological and Geotechnical Consultants

Analysis of Liquefaction Potential Based on q_t and f_s from CPT Data

Sterling Ranch Estates	Weighted PGA (M=7.5).....	0.79 g	Project No.	18-1245A-4
Val Verde, LA County, California	Design PGA (M=6.79).....	1.02 g	Figure No.	C1.19
For: Sterling Gateway, L.P.	Mag. Weighting Factor.....	0.77	Date	6-8-2018

SPT-Based Assessment of Seismic Soil Liquefaction Potential



References:

1. Cetin, et al., ASCE Journal of Geotechnical and Environmental Engineering,December 2004, pp. 1314 - 1340

2. Tokimatsu and Seed, ASCE Journal of Geotechnical Engineering,August, 1987

Location:	**HS-3**
Elevation (MSL):	1124
Removal Depth (ft):	25
Total Settlement (in)	
Prior to Removal:	6.30
After Removal:	3.75

SPT Liq v1a; Feb 2017

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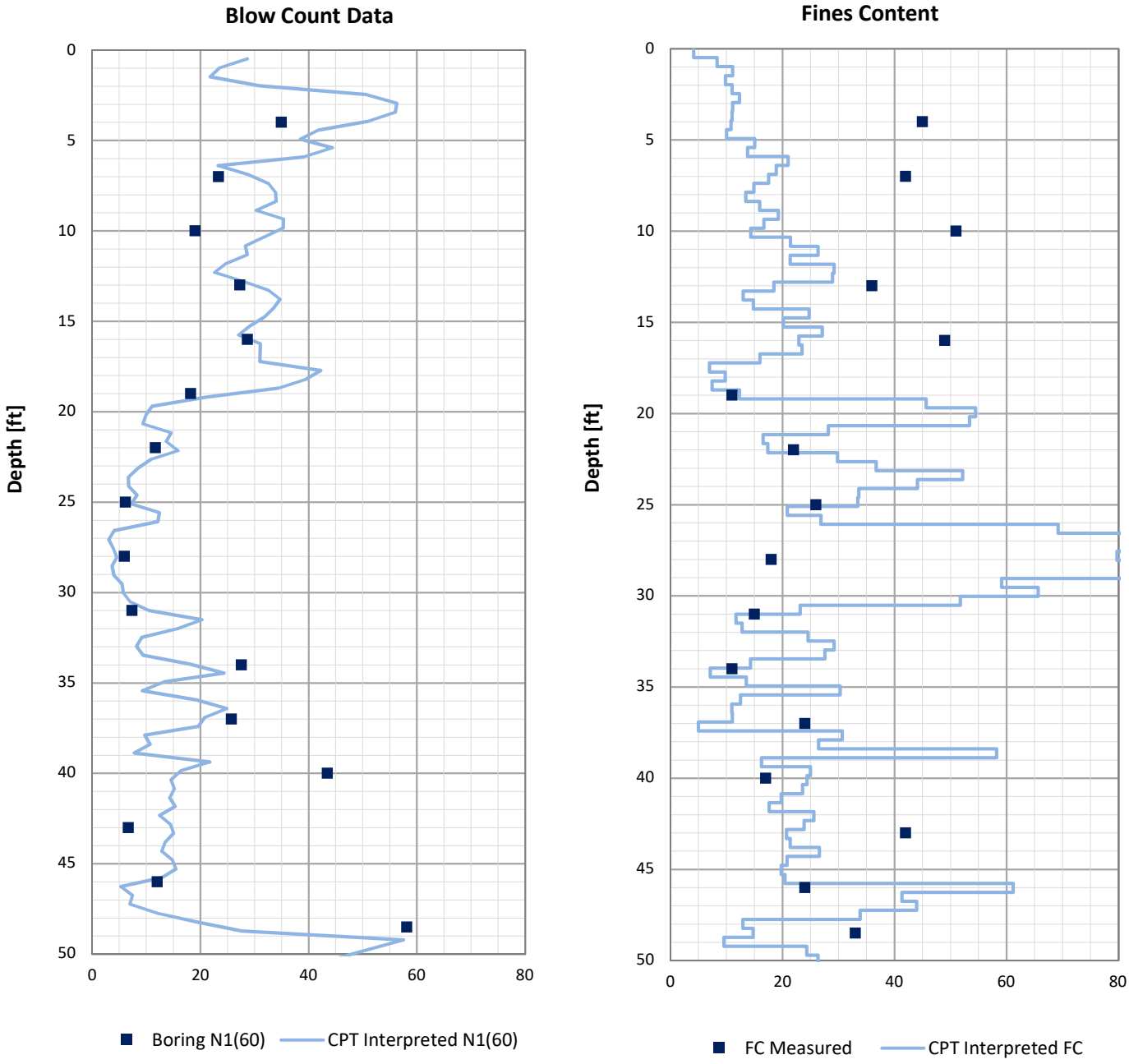
Client:	Sterling Gateway, L.P.	Magnitude, M_w	6.79
Project:	VTTM 60257	Acceleration, PGA (g)	1.02
	Sterling Ranch Estates	Magnitude Weighted PGA (g)	0.79
Job No.:	18-1245A-4	Existing GW Elev. (ft)	24
Date:	6/8/18	Historic GW Elev. (ft)	10

Figure: C1.20

Location……. **HS-3**
CPT-3



Correlation of N1(60) Blow Count and Percent Fines - Boring vs. CPT Interpretation

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Geological and Geotechnical Consultants

Client:	Sterling Gateway, L.P.
Project:	VTTM 60257
	Sterling Ranch Estates
Proj. No.:	18-1245A-4
Date:	6/8/18
Figure:	C1.21

LIQUEFACTION TRIGGERING ANALYSIS

Project: Sterling Ranch Estates
Val Verde, LA County, California

Project No.: 18-1245A-4
Date: 6/8/2018
Figure No.: C2.1

Location	CPT-10	MCE Mean Magnitude =	6.8
Type of Sampler (CPT/SPT/CD)	CPT	Peak Ground Accel. (M = 6.79) =	1.02 g
Ground Surface Elevation	1244 ft. above MSL	Approx. Distance From Site (miles) =	1.4
Existing Ground Water Depth	45.9 ft. BGS	Basic Earthquake Magnitude =	7.5
Historic Ground Water Depth	10.0 ft. BGS	Magnitude Weighted PGA (M = 7.5) =	0.79 g
		Magnitude Scaling Factor =	1.29

Conditions: CPT Interpretation based on ground water conditions at time of investigation
Evaluation of cyclic stress ratio based on historic high ground water conditions

Layer No.	Mid-layer Depth	Elevation	Depth of layer below ground surface [ft]		Total Unit Weight., γ	Total Vertical Stress, σ_{vo}	In-Situ Effective Vertical Stress, σ'_{vo}	H.H. Effective Vertical Stress, σ'_{vo}	Total Cone Resistance, q_t	Sleeve Friction, f_s	Robertson and Wride (1998) Procedure (Updated by Zhang et al. 2002 and Robertson 2009)											Apparent Fines Content, FC		Stress Reduction Factor, r_d	Cyclic Resistance Ratio, $CRR_{7.5}$	Cyclic Stress Ratio, CSR*	Calculated Factor of Safety, FS
											Evaluation of Soil Behavior Type Index Through Iterations							Corrections to Tip Resistance									
											Normalized Friction Ratio, F_r	Normalized Cone Resistance, $Q_{t,1}$	Normalized Behavior Type Index, $(I_C)_1$	n	Δn	Final n	Final I_c	Normalizing Factor, C_N	For Overburden, $q_{t,1N}$	Fines Factor, K_c	for "Clean Sand" $(q_{t,1N})_{CS}$	Estimated	Lab		M_W = 7.5	for FS = 1.3	$CRR_{7.5}/CSR^*$
	(ft)	(ft. MSL)	Top	Bottom	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[%]	trial 1 (assume n = 1.0)										[%]	[%]			
1	0.08	1243.9	0.00	0.16	0.115	0.009	0.009	0.009	122.22	0.001	0.001	13283.78	1.90	0.57	0.00	0.71	2.27	2.00	115.46	1.00	115.46	5		1.000	0.223	0.670	Non Liquefiable
2	0.25	1243.8	0.16	0.33	0.115	0.028	0.028	0.028	239.18	0.749	0.313	8488.09	0.85	0.17	0.00	0.36	1.33	2.00	225.93	1.00	225.93	1		0.999	>0.8	0.670	Non Liquefiable
3	0.41	1243.6	0.33	0.49	0.115	0.047	0.047	0.047	247.36	1.586	0.641	5245.24	1.06	0.25	0.00	0.42	1.51	2.00	233.64	1.00	233.64	3		0.999	>0.8	0.670	Non Liquefiable
4	0.58	1243.4	0.49	0.66	0.115	0.066	0.066	0.066	205.64	1.773	0.862	3108.87	1.16	0.29	0.00	0.48	1.65	2.00	194.21	1.00	194.38	5		0.999	>0.8	0.669	Non Liquefiable
5	0.74	1243.3	0.66	0.82	0.115	0.085	0.085	0.085	174.98	1.804	1.032	2055.17	1.24	0.33	0.00	0.52	1.76	2.00	165.23	1.07	177.01	7		0.998	>0.8	0.669	Non Liquefiable
6	0.90	1243.1	0.82	0.98	0.115	0.104	0.104	0.104	152.68	1.461	0.958	1474.17	1.24	0.32	0.00	0.53	1.78	2.00	144.14	1.09	156.47	8		0.998	0.436	0.669	Non Liquefiable
7	1.07	1242.9	0.98	1.15	0.115	0.122	0.122	0.122	153.60	1.462	0.953	1253.13	1.26	0.33	0.00	0.53	1.77	2.00	145.00	1.08	157.05	8		0.998	0.440	0.669	Non Liquefiable
8	1.23	1242.8	1.15	1.31	0.115	0.141	0.141	0.141	149.36	1.450	0.972	1054.92	1.29	0.34	0.00	0.54	1.79	2.00	140.97	1.09	154.15	8		0.997	0.421	0.668	Non Liquefiable
9	1.40	1242.6	1.31	1.48	0.115	0.160	0.160	0.160	144.08	1.491	1.036	897.11	1.34	0.36	0.00	0.55	1.82	2.00	135.97	1.12	151.68	9		0.997	0.405	0.668	Non Liquefiable
10	1.56	1242.4	1.48	1.64	0.115	0.179	0.179	0.179	158.68	1.757	1.108	883.50	1.37	0.38	0.00	0.54	1.81	2.00	149.74	1.11	165.91	8		0.996	0.505	0.668	Non Liquefiable
11	1.72	1242.3	1.64	1.80	0.115	0.198	0.198	0.198	174.20	2.122	1.219	879.69	1.41	0.39	0.00	0.54	1.81	2.00	164.39	1.11	182.24	8		0.996	>0.8	0.667	Non Liquefiable
12	1.89	1242.1	1.80	1.97	0.115	0.217	0.217	0.217	179.20	2.396	1.339	825.66	1.46	0.41	0.00	0.55	1.83	2.00	169.09	1.12	190.14	9		0.996	>0.8	0.667	Non Liquefiable
13	2.05	1242.0	1.97	2.13	0.115	0.236	0.236	0.236	189.22	2.416	1.279	801.63	1.44	0.41	0.00	0.54	1.80	2.00	178.54	1.10	196.70	8		0.995	>0.8	0.667	Non Liquefiable
14	2.22	1241.8	2.13	2.30	0.115	0.255	0.255	0.255	200.96	1.823	0.908	787.93	1.31	0.36	0.00	0.49	1.68	2.00	189.61	1.02	192.81	6		0.995	>0.8	0.667	Non Liquefiable
15	2.38	1241.6	2.30	2.46	0.115	0.274	0.274	0.274	184.30	0.982	0.534	672.36	1.14	0.29	0.00	0.45	1.55	2.00	173.86	1.00	173.86	4		0.994	>0.8	0.666	Non Liquefiable
16	2.54	1241.5	2.46	2.62	0.115	0.292	0.292	0.292	141.14	0.605	0.430	482.19	1.16	0.30	0.00	0.46	1.59	2.00	133.06	1.00	133.06	4		0.994	0.299	0.666	0.58
17	2.71	1241.3	2.62	2.79	0.115	0.311	0.311	0.311	113.24	0.882	0.781	363.03	1.44	0.41	0.00	0.55	1.82	2.00	106.69	1.12	119.11	9		0.994	0.237	0.666	0.46
18	2.87	1241.1	2.79	2.95	0.115	0.330	0.330	0.330	132.76	1.478	1.116	401.24	1.54	0.44	0.00	0.57	1.87	2.00	125.11	1.15	144.37	10		0.993	0.360	0.666	Non Liquefiable
19	3.04	1241.0	2.95	3.12	0.115	0.349	0.349	0.349	154.42	2.160	1.402	441.43	1.60	0.47	0.00	0.58	1.89	2.00	145.56	1.17	170.86	10		0.993	0.544	0.665	Non Liquefiable
20	3.20	1240.8	3.12	3.28	0.115	0.368	0.368	0.368	156.78	2.162	1.382	425.03	1.60	0.47	0.00	0.58	1.88	2.00	147.77	1.17	172.26	10		0.993	0.555	0.665	Non Liquefiable
21	3.36	1240.6	3.28	3.44	0.115	0.386	0.386	0.386	146.42	1.556	1.066	377.93	1.53	0.44	0.00	0.55	1.82	2.00	137.96	1.12	154.29	9		0.992	0.422	0.665	Non Liquefiable
22	3.53	1240.5	3.44	3.61	0.115	0.405	0.405	0.405	134.30	1.158	0.865	330.30	1.50	0.43	0.00	0.54	1.79	2.00	126.49	1.09	138.48	8		0.992	0.327	0.665	Non Liquefiable
23	3.69	1240.3	3.61	3.77	0.115	0.424	0.424	0.424	116.94	0.995	0.854	274.57	1.55	0.45	0.00	0.56	1.83	2.00	110.08	1.13	124.02	9		0.991	0.257	0.664	0.50
24	3.86	1240.1	3.77	3.94	0.115	0.443	0.443	0.443	96.12	0.734	0.768	215.82	1.58	0.46	0.00	0.57	1.87	2.00	90.39	1.16	104.76	10		0.991	0.187	0.664	0.37
25	4.02	1240.0	3.94	4.10	0.115	0.462	0.462	0.462	39.52	0.009	0.024	84.49	1.59	0.47	0.00	0.60	1.94	2.00	36.90	1.00	36.90	5		0.991	0.081	0.664	0.16
26	4.19	1239.8	4.10	4.27	0.115	0.481	0.481	0.481	34.66	0.008	0.024	71.02	1.67	0.50	0.00	0.62	2.00	2.00	32.29	1.00	32.29	5		0.990	0.077	0.664	0.15
27	4.35	1239.7	4.27	4.43	0.115	0.500	0.500	0.500	30.40	0.007	0.024	59.77	1.74	0.52	0.00	0.65	2.06	2.00	28.25	1.00	28.25	5		0.990	0.074	0.663	0.14
28	4.51	1239.5	4.43	4.59	0.115	0.519	0.519	0.519	37.74	0.009	0.024	71.77	1.66	0.50	0.00	0.61	1.96	2.00	35.16	1.00	35.16	5		0.989	0.079	0.663	0.16
29	4.68	1239.3	4.59	4.76	0.115	0.538	0.538	0.538	43.14	0.201	0.473	79.24	1.81	0.55	0.00	0.65	2.07	2.00	40.25	1.00	40.25	5		0.989	0.084	0.663	0.16
30	4.84	1239.2	4.76	4.92	0.115	0.557	0.557	0.557	72.62	0.582	0.808	129.47	1.76	0.54	0.00	0.62	1.99	2.00	68.08	1.28	86.90	13		0.989	0.141	0.663	0.28
31	5.01	1239.0	4.92	5.09	0.115	0.576	0.576	0.576	102.84	1.078	1.054	177.67	1.74	0.53	0.00	0.60	1.94	2.00	96.61	1.22	117.67	11		0.988	0.232	0.662	0.45
32	5.17	1238.8	5.09	5.25	0.115	0.595	0.595	0.595	121.18	1.413	1.172	202.82	1.74	0.53	0.00	0.59	1.91	2.00	113.92	1.19	136.04	11		0.988	0.314	0.662	0.62
33	5.33	1238.7	5.25	5.41	0.115	0.613	0.613	0.613	134.74	1.846	1.376	218.82	1.77	0.54	0.00	0.60	1.93	2.00	126.71	1.21	153.16	11		0.988	0.414	0.662	Non Liquefiable
34	5.50	1238.5	5.41	5.58	0.115	0.632	0.632	0.632	144.70	2.076	1.441	227.98	1.77	0.54	0.00	0.60	1.92	2.00	136.11	1.20	163.48	11		0.987	0.486	0.662	Non Liquefiable
35	5.66	1238.3	5.58	5.74	0.115	0.651	0.651	0.651	136.84	2.081	1.528	209.23	1.81	0.56	0.00	0.61	1.96	2.00	128.66	1.24	159.31	12		0.987	0.456	0.661	Non Liquefiable
36	5.83	1238.2	5.74	5.91	0.115	0.670	0.670	0.670	135.20	2.069	1.538	200.83	1.83	0.56	0.00	0.61	1.96	2.00	127.10	1.24	158.17	12		0.986	0.448	0.661	Non Liquefiable
37	5.99	1238.0	5.91	6.07	0.115	0.689	0.689	0.689	141.94	2.768	1.960	205.05	1.90	0.59	0.00	0.64	2.02	2.00	133.44	1.32	176.64	14		0.986	0.593	0.661	Non Liquefiable
38	6.15	1237.9	6.07	6.23	0.115	0.707	0.707	0.707	155.06	3.273	2.121	218.24	1.92	0.60	0.00	0.64	2.02	2.00	145.82	1.32	193.17	14		0.986	0.750	0.661	Non Liquefiable
39	6.32	1237.7	6.23	6.40	0.115	0.726	0.726	0.726	161.20	3.846	2.397	220.97	1.96	0.61	0.00	0.65	2.05	2.00	151.60	1.37	207.61	14		0.985	0.912	0.660	Non Liquefiable
40	6.48	1237.5	6.40	6.56	0.115	0.745	0.745	0.745	160.48	3.508	2.196	214.35	1.93	0.60	0.00	0.64	2.03	1.95	147.51	1.34	197.18	14		0.985	0.793	0.660	Non Liquefiable
41	6.65	1237.4	6.56	6.73	0.115	0.764	0.764	0.764	149.60	2.976	1.999	194.77	1.93	0.60	0.00	0.64	2.03	1.92	134.99	1.33	179.30	14		0.985	0.616	0.660	Non Liquefiable
42	6.81	1237.2	6.73	6.89	0.115	0.783	0.783	0.783	150.96	2.440	1.624	191.76	1.86	0.58	0.00	0.62	1.97	1.85	131.22	1.25	164.45	12		0.984	0.494	0.660	Non Liquefiable
43	6.97	1237.0	6.89	7.05	0.115	0.802	0.802	0.802	154.20	2.466	1.607	191.38	1.86	0.58	0.00	0.62	1.96	1.82	131.93	1.25	164.59	12		0.984	0.495	0.659	Non Liquefiable
44	7.14	1236.9	7.05	7.22	0.115	0.821	0.821	0.821	138.58	2.075	1.506	167.89	1.87	0.58	0.00	0.62	1.98	1.81	117.46	1.27	148.60	12		0.983	0.385	0.659	Non Liquefiable
45	7.30	1236.7	7.22	7.38	0.115	0.840	0.840	0.840	144.50	1.971	1.372	171.13	1.84	0.57	0.00	0.61	1.94	1.76	119.40	1.23	146.50	12		0.983	0.372	0.659	Non Liquefiable
46	7.47	1236.5	7.38	7.55	0.115	0.858	0.858	0.858	30.08	1.224	4.190	34.04	2.67	0.89	0.00	0.91	2.74	2.00	27.61	Ic>2.7	--	43		0.983	1.463	0.659	2.00
47	7.63	1236.4	7.55	7.71	0.115	0.877	0.877	0.877	26.28	0.387	1.522	28.95	2.45	0.80	0.00	0.83	2.52	2.00	24.00	3.13	75.23	31		0.982	0.120	0.658	0.24
48	7.79	1236.2	7.71	7.87	0.115	0.896	0.896	0.896	19.78	0.195	1.032	21.08	2.48	0.81	0.00	0.84	2.54	2.00	17.84	3.62	64.59	32		0.982	0.105	0.658	0.21

LIQUEFACTION TRIGGERING ANALYSIS

Layer No.	Mid-layer Depth	Elevation	Depth of layer below ground surface [ft]		Total Unit Weight., γ	Total Vertical Stress, σ_{vo}	In-Situ Effective Vertical Stress, σ'_{vo}	H.H. Effective Vertical Stress, σ'_{vo}	Total Cone Resistance, q_t	Sleeve Friction, f_s	Normalized Friction Ratio, F_r	Normalized Cone Resistance, $Q_{t,1}$	Normalized Behavior Type Index, $(I_c)_1$	n	Δn	Final n	Final I_c	Normalizing Factor, C_N	For Overburden, $q_{t,1N}$	Fines Factor, K_c	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC		Stress Reduction Factor, r_d	Cyclic Resistance Ratio, $CRR_{7.5}$	Cyclic Stress Ratio, CSR*	Calculated Factor of Safety, FS
																						Estimated	Lab				
	(ft)	(ft. MSL)	Top	Bottom	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[%]	trial 1 (assume n = 1.0)										[%]	[%]		M_W = 7.5	for FS = 1.3	$CRR_{7.5}/CSR^*$
49	7.96	1236.0	7.87	8.04	0.115	0.915	0.915	0.915	40.00	0.287	0.735	42.72	2.14	0.69	0.00	0.72	2.22	1.83	33.76	1.72	58.02	20		0.981	0.098	0.658	0.19
50	8.12	1235.9	8.04	8.20	0.115	0.934	0.934	0.934	85.24	0.959	1.137	90.28	1.98	0.63	0.00	0.66	2.07	1.72	68.47	1.40	95.85	15		0.981	0.162	0.657	0.32
51	8.29	1235.7	8.20	8.37	0.115	0.953	0.953	0.953	133.06	1.265	0.958	138.66	1.79	0.55	0.00	0.60	1.90	1.61	100.37	1.18	118.38	10		0.981	0.234	0.657	0.46
52	8.45	1235.6	8.37	8.53	0.115	0.972	0.972	0.972	125.84	1.336	1.070	128.50	1.85	0.58	0.00	0.61	1.95	1.61	95.16	1.23	116.84	12		0.980	0.228	0.657	0.45
53	8.61	1235.4	8.53	8.69	0.115	0.990	0.990	0.990	135.18	1.733	1.291	135.52	1.89	0.59	0.00	0.63	1.98	1.61	102.03	1.26	128.86	12		0.980	0.279	0.657	0.55
54	8.78	1235.2	8.69	8.86	0.115	1.009	1.009	1.009	145.30	2.110	1.462	142.99	1.91	0.60	0.00	0.63	1.99	1.60	108.95	1.28	139.75	13		0.980	0.334	0.656	0.66
55	8.94	1235.1	8.86	9.02	0.115	1.028	1.028	1.028	143.64	1.972	1.383	138.71	1.90	0.60	0.00	0.63	1.98	1.58	106.20	1.27	135.08	13		0.979	0.309	0.656	0.61
56	9.11	1234.9	9.02	9.19	0.115	1.047	1.047	1.047	142.42	1.958	1.385	135.02	1.91	0.60	0.00	0.63	1.99	1.56	104.28	1.28	133.44	13		0.979	0.301	0.656	0.60
57	9.27	1234.7	9.19	9.35	0.115	1.066	1.066	1.066	156.42	2.390	1.538	145.73	1.92	0.61	0.00	0.64	2.00	1.55	113.49	1.29	145.98	13		0.978	0.369	0.656	Non Liquefiable
58	9.43	1234.6	9.35	9.51	0.115	1.084	1.084	1.084	169.18	2.736	1.627	155.01	1.92	0.61	0.00	0.63	1.99	1.53	121.40	1.28	155.67	13		0.978	0.431	0.655	Non Liquefiable
59	9.60	1234.4	9.51	9.68	0.115	1.103	1.103	1.103	171.62	2.727	1.599	154.53	1.92	0.61	0.00	0.63	1.99	1.51	121.65	1.27	155.07	13		0.978	0.427	0.655	Non Liquefiable
60	9.76	1234.2	9.68	9.84	0.115	1.122	1.122	1.122	197.24	2.408	1.228	174.73	1.79	0.56	0.00	0.59	1.87	1.45	134.74	1.16	156.10	10		0.977	0.434	0.655	Non Liquefiable
61	9.93	1234.1	9.84	10.01	0.115	1.141	1.141	1.141	192.68	1.873	0.978	167.81	1.74	0.54	0.00	0.57	1.82	1.42	128.72	1.12	143.66	9		0.977	0.356	0.655	Non Liquefiable
62	10.09	1233.9	10.01	10.17	0.115	1.160	1.160	1.155	171.36	1.861	1.093	146.68	1.81	0.57	0.00	0.60	1.89	1.43	115.13	1.17	134.95	10		0.976	0.309	0.658	Non Liquefiable
63	10.25	1233.8	10.17	10.33	0.115	1.179	1.179	1.163	165.32	1.876	1.143	139.25	1.84	0.58	0.00	0.61	1.91	1.43	110.65	1.20	132.37	11		0.976	0.296	0.663	0.58
64	10.42	1233.6	10.33	10.50	0.115	1.198	1.198	1.172	158.44	2.144	1.363	131.28	1.91	0.61	0.00	0.63	1.98	1.43	106.48	1.27	134.77	12		0.976	0.308	0.668	0.60
65	10.58	1233.4	10.50	10.66	0.115	1.217	1.217	1.181	154.42	2.230	1.455	125.92	1.95	0.62	0.00	0.64	2.01	1.43	103.37	1.30	134.62	13		0.975	0.307	0.674	0.59
66	10.75	1233.3	10.66	10.83	0.115	1.236	1.236	1.189	141.56	2.670	1.903	113.56	2.06	0.66	0.00	0.68	2.11	1.45	95.80	1.47	140.74	16		0.975	0.339	0.679	0.65
67	10.91	1233.1	10.83	10.99	0.115	1.255	1.255	1.198	150.68	2.504	1.676	119.10	2.01	0.64	0.00	0.66	2.06	1.42	99.94	1.38	137.87	15		0.975	0.324	0.684	0.62
68	11.07	1232.9	10.99	11.15	0.115	1.273	1.273	1.206	151.54	2.285	1.521	118.04	1.98	0.63	0.00	0.66	2.03	1.40	99.05	1.34	132.65	14		0.974	0.297	0.689	0.56
69	11.24	1232.8	11.15	11.32	0.115	1.292	1.292	1.215	151.90	2.280	1.514	116.57	1.98	0.64	0.00	0.66	2.04	1.38	98.36	1.34	131.84	14		0.974	0.293	0.694	0.55
70	11.40	1232.6	11.32	11.48	0.115	1.311	1.311	1.224	174.80	2.402	1.384	132.33	1.92	0.61	0.00	0.63	1.97	1.35	110.93	1.26	139.31	12		0.973	0.331	0.699	Non Liquefiable
71	11.57	1232.4	11.48	11.65	0.115	1.330	1.330	1.232	172.46	2.264	1.323	128.67	1.91	0.61	0.00	0.63	1.96	1.34	108.34	1.25	135.30	12		0.973	0.310	0.704	Non Liquefiable
72	11.73	1232.3	11.65	11.81	0.115	1.349	1.349	1.241	166.48	2.314	1.401	122.41	1.94	0.62	0.00	0.64	1.99	1.34	104.16	1.28	133.79	13		0.973	0.303	0.709	0.56
73	11.90	1232.1	11.81	11.98	0.115	1.368	1.368	1.250	188.60	2.714	1.450	136.87	1.92	0.61	0.00	0.63	1.97	1.32	116.58	1.25	146.19	12		0.972	0.371	0.713	Non Liquefiable
74	12.06	1231.9	11.98	12.14	0.115	1.387	1.387	1.258	201.00	3.391	1.699	143.93	1.96	0.63	0.00	0.64	2.00	1.31	123.85	1.29	159.98	13		0.972	0.461	0.718	Non Liquefiable
75	12.22	1231.8	12.14	12.30	0.115	1.405	1.405	1.267	183.54	3.452	1.896	129.61	2.02	0.65	0.00	0.67	2.06	1.32	113.15	1.38	156.16	15		0.972	0.434	0.722	Non Liquefiable
76	12.39	1231.6	12.30	12.47	0.115	1.424	1.424	1.275	190.64	3.822	2.020	132.85	2.03	0.66	0.00	0.67	2.07	1.31	116.71	1.40	163.16	15		0.971	0.484	0.727	Non Liquefiable
77	12.55	1231.5	12.47	12.63	0.115	1.443	1.443	1.284	216.90	3.603	1.672	149.29	1.94	0.62	0.00	0.64	1.98	1.28	129.99	1.27	164.75	12		0.971	0.496	0.731	Non Liquefiable
78	12.72	1231.3	12.63	12.80	0.115	1.462	1.462	1.293	239.22	3.392	1.427	162.60	1.86	0.59	0.00	0.61	1.91	1.25	140.80	1.19	167.29	11		0.970	0.515	0.736	Non Liquefiable
79	12.88	1231.1	12.80	12.96	0.115	1.481	1.481	1.301	246.90	3.136	1.278	165.69	1.82	0.58	0.00	0.60	1.87	1.24	143.44	1.15	165.30	10		0.970	0.500	0.740	Non Liquefiable
80	13.04	1231.0	12.96	13.12	0.115	1.500	1.500	1.310	216.60	3.217	1.495	143.44	1.92	0.62	0.00	0.63	1.95	1.24	126.26	1.24	156.18	12		0.970	0.434	0.744	Non Liquefiable
81	13.21	1230.8	13.12	13.29	0.115	1.519	1.519	1.319	221.58	2.765	1.257	144.91	1.86	0.59	0.00	0.61	1.90	1.22	127.27	1.18	150.25	10		0.969	0.395	0.748	Non Liquefiable
82	13.37	1230.6	13.29	13.45	0.115	1.538	1.538	1.327	240.50	2.679	1.121	155.42	1.80	0.57	0.00	0.59	1.84	1.21	136.25	1.13	154.38	9		0.969	0.422	0.752	Non Liquefiable
83	13.54	1230.5	13.45	13.62	0.115	1.557	1.557	1.336	249.92	2.417	0.973	159.56	1.75	0.55	0.00	0.57	1.79	1.19	139.79	1.10	153.16	8		0.968	0.414	0.756	Non Liquefiable
84	13.70	1230.3	13.62	13.78	0.115	1.576	1.576	1.345	265.62	2.388	0.904	167.59	1.71	0.54	0.00	0.56	1.76	1.18	146.99	1.07	157.24	7		0.968	0.442	0.760	Non Liquefiable
85	13.86	1230.1	13.78	13.94	0.115	1.594	1.594	1.353	264.30	2.088	0.795	164.82	1.68	0.53	0.00	0.54	1.72	1.17	144.82	1.05	151.81	7		0.968	0.405	0.764	Non Liquefiable
86	14.03	1230.0	13.94	14.11	0.115	1.613	1.613	1.362	201.36	2.483	1.243	123.85	1.90	0.61	0.00	0.63	1.94	1.19	111.86	1.22	136.18	11		0.967	0.315	0.768	Non Liquefiable
87	14.19	1229.8	14.11	14.27	0.115	1.632	1.632	1.370	176.90	3.048	1.739	107.40	2.05	0.67	0.00	0.68	2.08	1.19	98.81	1.40	138.68	15		0.967	0.328	0.772	0.55
88	14.36	1229.6	14.27	14.44	0.115	1.651	1.651	1.379	180.74	3.456	1.930	108.48	2.08	0.68	0.00	0.69	2.10	1.19	100.44	1.45	145.69	16		0.967	0.368	0.775	Non Liquefiable
89	14.52	1229.5	14.44	14.60	0.115	1.670	1.670	1.388	180.06	3.545	1.987	106.83	2.09	0.69	0.00	0.70	2.12	1.18	99.38	1.47	146.44	16		0.966	0.372	0.779	Non Liquefiable
90	14.68	1229.3	14.60	14.76	0.115	1.688	1.688	1.396	190.14	3.493	1.853	111.63	2.06	0.67	0.00	0.68	2.08	1.17	103.89	1.41	146.55	15		0.966	0.373	0.783	Non Liquefiable
91	14.85	1229.2	14.76	14.93	0.115	1.707	1.707	1.405	213.34	3.450	1.630	123.97	1.99	0.65	0.00	0.66	2.01	1.15	115.12	1.30	150.09	13		0.965	0.394	0.786	Non Liquefiable
92	15.01	1229.0	14.93	15.09	0.115	1.726	1.726	1.414	262.18	3.448	1.324	150.89	1.86	0.60	0.00	0.61	1.89	1.13	139.33	1.17	162.96	10		0.965	0.482	0.790	Non Liquefiable
93	15.18	1228.8	15.09	15.26	0.115	1.745	1.745	1.422	299.90	2.804	0.940	170.85	1.72	0.55	0.00	0.56	1.75	1.11	156.82	1.06	166.79	7		0.965	0.512	0.793	Non Liquefiable
94	15.34	1228.7	15.26	15.42	0.115	1.764	1.764	1.431	263.64	2.315	0.884	148.45	1.75	0.56	0.00	0.57	1.77	1.11	137.16	1.08	148.21	8		0.964	0.383	0.797	Non Liquefiable
95	15.50	1228.5	15.42	15.58	0.115	1.783	1.783	1.439	221.44	1.794	0.817	123.23	1.78	0.57	0.00	0.58	1.81	1.11	114.67	1.11	126.94	8		0.964	0.270	0.800	0.44
96	15.67	1228.3	15.58	15.75	0.115	1.801	1.801	1.448	212.56	1.658	0.787	116.99	1.79	0.58	0.00	0.58	1.81	1.10	109.39	1.11	121.59	8		0.963	0.247	0.803	0.40
97	15.83	1228.2	15.75	15.91	0.115	1.820	1.820	1.457	203.50	1.508	0.748	110.79	1.80	0.58	0.00	0.59	1.82	1.09	104.07	1.11	115.96	9		0.963	0.225	0.807	0.36
98	16.00	1228.0	15.91	16.08	0.115	1.839	1.839	1.465	209.46	1.621	0.781	112.87	1.80	0.58	0.00	0.59	1.82	1.09	106.52	1.12	118.96	9		0.963	0.237	0.810	0.38
99	16.16	1227.8	16.08	16.24	0.115	1.858	1.858	1.474	222.46	2.358	1.069	118.71	1.87	0.61	0.00	0.61	1.89	1.08	112.88	1.17	132.30	10		0.962	0.295	0.813	0.47
100	16.32	1227.7	16.24	16.40	0.115	1.877	1.877	1.482	234.20	2.239	0.964	123.79	1.83	0.59	0.00	0.60	1.85	1.07	117.93	1.13	133.84	9		0.962	0.303	0.816	0.48
101	16.49	1227.5	16.40	16.57	0.115	1.896	1.896	1.491	267.52	2.408	0.906	140.11	1.77	0.57	0.00	0.58	1.79	1.07	133.70	1.09	145.91	8		0.962	0.369	0.819	Non Liquefiable
102	16.65	1227.4	16.57	16.73	0.115	1.915	1.915	1.500	352.94	3.032	0.864	183.33	1.67	0.53	0.00	0.54	1.69	1.06	175.01	1.02	179.13	6		0.961	>0.8	0.822	Non Liquefiable
103	16.82	1227.2	16.73	16.90	0.115	1.934	1.934	1.508	431.54	3.798	0.884	222.17	1.62	0.51	0.00	0.52	1.63	1.05	212.67	1.00	212.67	5		0.961	>0.8	0.825	Non Liquefiable
104	16.98	1227.0	16.90	17.06	0.115	1.953	1.953	1.517	435.38	4.506	1.040	221.96	1.67	0.53	0.00	0.54	1.68	1.04	213.81	1.02	218.29	6		0.960	>0.8	0.828	Non Liquefiable
105	17.14	1226.9	17.06	17.22	0.115	1.971	1.971	1.526	408.86	4.914	1.208	206.43	1.74	0.56	0.00	0.56	1.75	1.04	200.09	1.07	213.29	7		0.960	>0.8	0.831	Non Liquefiable

LIQUEFACTION TRIGGERING ANALYSIS

Layer No.	Mid-layer Depth	Elevation	Depth of layer below ground surface [ft]		Total Unit Weight., γ	Total Vertical Stress, σ_{vo}	In-Situ Effective Vertical Stress, σ'_{vo}	H.H. Effective Vertical Stress, σ'_{vo}	Total Cone Resistance, q_t	Sleeve Friction, f_s	Normalized Friction Ratio, F_r	Normalized Cone Resistance, $Q_{t,1}$	Normalized Behavior Type Index, $(I_c)_1$	n	Δn	Final n	Final I_c	Normalizing Factor, C_N	For Overburden, $q_{t,1N}$	Fines Factor, K_c	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC		Stress Reduction Factor, r_d	Cyclic Resistance Ratio, $CRR_{7.5}$	Cyclic Stress Ratio, CSR*	Calculated Factor of Safety, FS
																						Estimated	Lab				
	(ft)	(ft. MSL)	Top	Bottom	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[%]	trial 1 (assume n = 1.0)										[%]	[%]		M_W = 7.5	for FS = 1.3	$CRR_{7.5}/CSR^*$
106	17.31	1226.7	17.22	17.39	0.115	1.990	1.990	1.534	333.72	4.599	1.386	166.69	1.85	0.60	0.00	0.60	1.85	1.04	162.66	1.14	185.81	9		0.960	>0.8	0.834	Non Liquefiable
107	17.47	1226.5	17.39	17.55	0.115	2.009	2.009	1.543	260.68	3.707	1.433	128.75	1.94	0.63	0.00	0.64	1.94	1.03	126.33	1.22	154.45	11		0.959	0.423	0.837	Non Liquefiable
108	17.64	1226.4	17.55	17.72	0.115	2.028	2.028	1.552	268.52	3.018	1.133	131.40	1.86	0.61	0.00	0.61	1.86	1.03	129.21	1.15	148.47	10		0.959	0.384	0.840	Non Liquefiable
109	17.80	1226.2	17.72	17.88	0.115	2.047	2.047	1.560	304.48	2.993	0.990	147.74	1.78	0.58	0.00	0.58	1.78	1.02	145.66	1.09	158.76	8		0.958	0.452	0.843	Non Liquefiable
110	17.96	1226.0	17.88	18.04	0.115	2.065	2.065	1.569	303.36	2.794	0.927	145.88	1.76	0.57	0.00	0.57	1.77	1.01	144.35	1.08	155.71	7		0.958	0.431	0.845	Non Liquefiable
111	18.13	1225.9	18.04	18.21	0.115	2.084	2.084	1.577	334.82	3.244	0.975	159.63	1.75	0.57	0.00	0.57	1.75	1.01	158.56	1.07	169.42	7		0.958	0.532	0.848	Non Liquefiable
112	18.29	1225.7	18.21	18.37	0.115	2.103	2.103	1.586	373.40	3.723	1.003	176.53	1.73	0.56	0.00	0.56	1.73	1.00	176.02	1.05	185.25	7		0.957	>0.8	0.851	Non Liquefiable
113	18.46	1225.5	18.37	18.54	0.115	2.122	2.122	1.595	357.46	3.385	0.953	167.43	1.73	0.56	0.00	0.56	1.73	1.00	167.61	1.05	176.36	7		0.957	>0.8	0.854	Non Liquefiable
114	18.62	1225.4	18.54	18.70	0.115	2.141	2.141	1.603	332.70	2.781	0.841	154.37	1.72	0.56	0.00	0.55	1.72	0.99	155.16	1.04	162.01	6		0.957	0.475	0.856	Non Liquefiable
115	18.78	1225.2	18.70	18.86	0.115	2.160	2.160	1.612	338.90	2.677	0.795	155.92	1.70	0.55	0.00	0.55	1.70	0.99	157.34	1.03	162.09	6		0.956	0.476	0.859	Non Liquefiable
116	18.95	1225.1	18.86	19.03	0.115	2.179	2.179	1.621	368.22	3.123	0.853	168.01	1.70	0.55	0.00	0.55	1.69	0.98	170.22	1.03	174.81	6		0.956	>0.8	0.861	Non Liquefiable
117	19.11	1224.9	19.03	19.19	0.115	2.198	2.198	1.629	395.04	3.567	0.908	178.76	1.69	0.55	0.00	0.55	1.69	0.98	181.82	1.03	186.48	6		0.955	>0.8	0.864	Non Liquefiable
118	19.28	1224.7	19.19	19.36	0.115	2.217	2.217	1.638	391.06	3.696	0.950	175.42	1.71	0.56	0.00	0.55	1.71	0.97	179.06	1.04	185.87	6		0.955	>0.8	0.866	Non Liquefiable
119	19.44	1224.6	19.36	19.52	0.115	2.236	2.236	1.647	386.28	3.983	1.037	171.79	1.75	0.57	0.00	0.57	1.74	0.97	175.90	1.06	186.36	7		0.955	>0.8	0.869	Non Liquefiable
120	19.61	1224.4	19.52	19.69	0.115	2.255	2.255	1.655	404.14	3.973	0.989	178.25	1.72	0.56	0.00	0.56	1.71	0.97	183.31	1.04	190.87	6		0.954	>0.8	0.871	Non Liquefiable
121	19.77	1224.2	19.69	19.85	0.115	2.274	2.274	1.664	411.50	3.885	0.949	179.99	1.71	0.55	0.00	0.55	1.70	0.96	185.87	1.03	191.47	6		0.954	>0.8	0.874	Non Liquefiable
122	19.93	1224.1	19.85	20.01	0.115	2.292	2.292	1.672	399.04	3.611	0.910	173.11	1.71	0.55	0.00	0.55	1.69	0.96	179.41	1.03	184.59	6		0.954	>0.8	0.876	Non Liquefiable
123	20.10	1223.9	20.01	20.18	0.115	2.311	2.311	1.681	338.64	3.623	1.077	145.54	1.81	0.59	0.00	0.59	1.80	0.95	150.86	1.10	165.96	8		0.953	0.505	0.878	Non Liquefiable
124	20.26	1223.7	20.18	20.34	0.115	2.330	2.330	1.690	303.22	3.875	1.288	129.14	1.90	0.63	0.00	0.63	1.89	0.94	133.87	1.17	157.03	10		0.953	0.440	0.880	Non Liquefiable
125	20.43	1223.6	20.34	20.51	0.115	2.349	2.349	1.698	290.16	4.228	1.469	122.53	1.96	0.65	0.00	0.65	1.95	0.93	127.11	1.23	156.18	12		0.952	0.434	0.883	Non Liquefiable
126	20.59	1223.4	20.51	20.67	0.115	2.368	2.368	1.707	287.70	4.085	1.432	120.50	1.96	0.65	0.00	0.65	1.94	0.93	125.37	1.22	153.55	11		0.952	0.417	0.885	Non Liquefiable
127	20.75	1223.3	20.67	20.83	0.115	2.386	2.386	1.715	258.50	3.955	1.544	107.33	2.01	0.67	0.00	0.67	2.00	0.92	111.67	1.29	144.52	13		0.952	0.361	0.887	Non Liquefiable
128	20.92	1223.1	20.83	21.00	0.115	2.405	2.405	1.724	267.08	4.244	1.603	110.04	2.02	0.68	0.00	0.67	2.00	0.92	114.77	1.30	149.00	13		0.951	0.388	0.889	Non Liquefiable
129	21.08	1222.9	21.00	21.16	0.115	2.424	2.424	1.733	290.90	4.166	1.444	119.00	1.96	0.65	0.00	0.65	1.95	0.92	124.79	1.23	153.39	12		0.951	0.416	0.892	Non Liquefiable
130	21.25	1222.8	21.16	21.33	0.115	2.443	2.443	1.741	297.72	3.689	1.249	120.86	1.91	0.64	0.00	0.63	1.90	0.91	127.44	1.18	150.19	10		0.950	0.395	0.894	Non Liquefiable
131	21.41	1222.6	21.33	21.49	0.115	2.462	2.462	1.750	284.94	3.690	1.306	114.73	1.94	0.65	0.00	0.64	1.93	0.91	121.11	1.21	146.16	11		0.950	0.370	0.896	Non Liquefiable
132	21.57	1222.4	21.49	21.65	0.115	2.481	2.481	1.759	258.36	4.322	1.689	103.15	2.05	0.69	0.00	0.69	2.04	0.90	108.43	1.34	145.82	14		0.950	0.368	0.898	Non Liquefiable
133	21.74	1222.3	21.65	21.82	0.115	2.500	2.500	1.767	241.78	5.063	2.116	95.73	2.15	0.73	0.00	0.72	2.13	0.89	100.26	1.51	151.03	17		0.949	0.400	0.900	Non Liquefiable
134	21.90	1222.1	21.82	21.98	0.115	2.519	2.519	1.776	231.92	4.717	2.056	91.09	2.15	0.73	0.00	0.72	2.14	0.88	95.56	1.52	145.01	17		0.949	0.364	0.902	0.52
135	22.07	1221.9	21.98	22.15	0.115	2.537	2.537	1.785	245.12	3.199	1.319	95.60	2.00	0.67	0.00	0.67	1.98	0.89	101.56	1.27	129.20	13		0.949	0.281	0.904	0.40
136	22.23	1221.8	22.15	22.31	0.115	2.556	2.556	1.793	254.24	3.104	1.233	98.45	1.97	0.66	0.00	0.65	1.95	0.88	105.07	1.24	129.93	12		0.948	0.284	0.906	0.41
137	22.39	1221.6	22.31	22.47	0.115	2.575	2.575	1.802	247.96	3.687	1.503	95.30	2.04	0.69	0.00	0.68	2.02	0.88	101.43	1.32	134.24	14		0.948	0.305	0.908	0.44
138	22.56	1221.4	22.47	22.64	0.115	2.594	2.594	1.810	248.82	3.904	1.586	94.93	2.06	0.70	0.00	0.69	2.04	0.87	101.12	1.35	136.33	14		0.947	0.316	0.910	0.45
139	22.72	1221.3	22.64	22.80	0.115	2.613	2.613	1.819	251.50	3.981	1.600	95.26	2.06	0.70	0.00	0.69	2.04	0.86	101.69	1.35	137.23	14		0.947	0.320	0.912	0.46
140	22.89	1221.1	22.80	22.97	0.115	2.632	2.632	1.828	256.98	4.356	1.713	96.65	2.08	0.70	0.00	0.70	2.06	0.86	103.25	1.37	141.88	15		0.947	0.346	0.914	Non Liquefiable
141	23.05	1221.0	22.97	23.13	0.115	2.651	2.651	1.836	283.84	4.110	1.462	106.08	2.00	0.67	0.00	0.67	1.98	0.86	114.35	1.26	144.55	12		0.946	0.361	0.915	Non Liquefiable
142	23.21	1220.8	23.13	23.29	0.115	2.669	2.669	1.845	276.74	4.079	1.488	102.68	2.02	0.68	0.00	0.67	1.99	0.86	110.78	1.28	142.13	13		0.946	0.347	0.917	Non Liquefiable
143	23.38	1220.6	23.29	23.46	0.115	2.688	2.688	1.854	268.08	4.056	1.528	98.73	2.04	0.69	0.00	0.68	2.01	0.85	106.56	1.31	139.51	13		0.945	0.333	0.919	Non Liquefiable
144	23.54	1220.5	23.46	23.62	0.115	2.707	2.707	1.862	264.12	4.342	1.661	96.57	2.07	0.70	0.00	0.69	2.05	0.84	104.13	1.36	141.16	14		0.945	0.342	0.921	Non Liquefiable
145	23.71	1220.3	23.62	23.79	0.115	2.726	2.726	1.871	256.34	4.865	1.918	93.03	2.12	0.72	0.00	0.72	2.10	0.83	99.97	1.45	144.94	16		0.945	0.363	0.923	Non Liquefiable
146	23.87	1220.1	23.79	23.95	0.115	2.745	2.745	1.880	254.32	4.715	1.874	91.65	2.12	0.72	0.00	0.71	2.10	0.83	98.70	1.44	142.51	16		0.944	0.349	0.924	Non Liquefiable
147	24.03	1220.0	23.95	24.11	0.115	2.763	2.763	1.888	257.10	4.720	1.856	92.04	2.12	0.72	0.00	0.71	2.09	0.83	99.35	1.43	142.56	16		0.944	0.349	0.926	Non Liquefiable
148	24.20	1219.8	24.11	24.28	0.115	2.782	2.782	1.897	272.98	4.709	1.743	97.11	2.08	0.71	0.00	0.70	2.06	0.83	105.43	1.37	144.70	15		0.944	0.362	0.928	Non Liquefiable
149	24.36	1219.6	24.28	24.44	0.115	2.801	2.801	1.905	276.56	4.414	1.612	97.72	2.06	0.70	0.00	0.69	2.03	0.82	106.61	1.33	141.97	14		0.943	0.346	0.929	Non Liquefiable
150	24.53	1219.5	24.44	24.61	0.115	2.820	2.820	1.914	280.38	3.883	1.399	98.41	2.01	0.68	0.00	0.67	1.98	0.82	108.13	1.27	137.24	12		0.943	0.320	0.931	Non Liquefiable
151	24.69	1219.3	24.61	24.77	0.115	2.839	2.839	1.923	314.04	4.425	1.422	109.60	1.98	0.67	0.00	0.66	1.95	0.82	121.09	1.23	149.43	12		0.942	0.390	0.933	Non Liquefiable
152	24.85	1219.2	24.77	24.93	0.115	2.858	2.858	1.931	373.74	5.038	1.358	129.78	1.92	0.65	0.00	0.63	1.88	0.83	144.81	1.17	168.90	10		0.942	0.528	0.934	Non Liquefiable
153	25.02	1219.0	24.93	25.10	0.115	2.877	2.877	1.940	403.44	5.317	1.327	139.24	1.89	0.64	0.00	0.62	1.85	0.83	156.27	1.14	178.28	9		0.942	0.607	0.936	Non Liquefiable
154	25.18	1218.8	25.10	25.26	0.115	2.896	2.896	1.948	360.78	5.361	1.498	123.59	1.96	0.67	0.00	0.65	1.93	0.82	137.78	1.21	166.66	11		0.941	0.510	0.938	Non Liquefiable
155	25.35	1218.7	25.26	25.43	0.115	2.915	2.915	1.957	372.90	5.739	1.551	126.94	1.96	0.67	0.00	0.65	1.93	0.81	141.77	1.21	171.84	11		0.941	0.552	0.939	Non Liquefiable
156	25.51	1218.5	25.43	25.59	0.115	2.934	2.934	1.966	346.90	6.192	1.800	117.25	2.03	0.69	0.00	0.68	2.00	0.80	130.04	1.30	168.65	13		0.941	0.526	0.941	Non Liquefiable
157	25.67	1218.3	25.59	25.75	0.115	2.952	2.952	1.974	313.56	6.196	1.995	105.22	2.10	0.72	0.00	0.71	2.07	0.79	115.93	1.39	161.67	15		0.940	0.473	0.942	Non Liquefiable
158	25.84	1218.2	25.75	25.92	0.115	2.971	2.971	1.983	286.74	6.541	2.305	95.51	2.17	0.75	0.00	0.74	2.15	0.78	104.37	1.54	160.46	17		0.940	0.464	0.944	Non Liquefiable
159	26.00	1218.0	25.92	26.08	0.115	2.990	2.990	1.992	285.02	6.940	2.461	94.32	2.20	0.76	0.00	0.75	2.17	0.77	102.89	1.59	163.80	18		0.939	0.489	0.945	Non Liquefiable
160	26.17	1217.8	26.08	26.25	0.115	3.009	3.009	2.000	288.18	6.942	2.434	94.77	2.19	0.76	0.00	0.75	2.17	0.77	103.60	1.58	163.67	18		0.939	0.488	0.947	Non Liquefiable
161	26.33	1217.7	26.25	26.41	0.115	3.028	3.028	2.009	273.52	6.444	2.382	89.33	2.20	0.76	0.00	0.75	2.18	0.76	97.65	1.60	156.56	18		0.939	0.437	0.948	Non Liquefiable
162	26.49	1217.5	26.41	26.57	0.115	3.046	3.046	2.017	262.48	7.318	2.821	85.16	2.27	0.79	0.00	0.78	2.25	0.75	92.31	1.78	164.48	21		0.938	0.494	0.950	Non Liquefiable

LIQUEFACTION TRIGGERING ANALYSIS

Layer No.	Mid-layer Depth	Elevation	Depth of layer below ground surface [ft]		Total Unit Weight., γ	Total Vertical Stress, σ_{vo}	In-Situ Effective Vertical Stress, σ'_{vo}	H.H. Effective Vertical Stress, σ'_{vo}	Total Cone Resistance, q_t	Sleeve Friction, f_s	Normalized Friction Ratio, F_r	Normalized Cone Resistance, $Q_{t,1}$	Normalized Behavior Type Index, $(I_c)_1$	n	Δn	Final n	Final I_c	Normalizing Factor, C_N	For Overburden, $q_{t,1N}$	Fines Factor, K_c	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC		Stress Reduction Factor, r_d	Cyclic Resistance Ratio, $CRR_{7.5}$	Cyclic Stress Ratio, CSR*	Calculated Factor of Safety, FS
																						Estimated	Lab				
	(ft)	(ft. MSL)	Top	Bottom	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[%]	trial 1 (assume n = 1.0)										[%]	[%]		M_W = 7.5	for FS = 1.3	$CRR_{7.5}/CSR^*$
163	26.66	1217.3	26.57	26.74	0.115	3.065	3.065	2.026	285.02	7.448	2.641	91.98	2.23	0.77	0.00	0.76	2.20	0.75	100.47	1.66	166.98	19		0.938	0.513	0.951	Non Liquefiable
164	26.82	1217.2	26.74	26.90	0.115	3.084	3.084	2.035	286.72	6.761	2.384	91.96	2.20	0.76	0.00	0.75	2.17	0.75	101.08	1.58	159.79	18		0.937	0.459	0.952	Non Liquefiable
165	26.99	1217.0	26.90	27.07	0.115	3.103	3.103	2.043	302.92	5.662	1.888	96.61	2.11	0.73	0.00	0.71	2.07	0.76	107.79	1.40	151.10	15		0.937	0.401	0.954	Non Liquefiable
166	27.15	1216.9	27.07	27.23	0.115	3.122	3.122	2.052	301.90	5.464	1.829	95.69	2.10	0.72	0.00	0.71	2.07	0.76	107.06	1.39	148.68	15		0.937	0.386	0.955	Non Liquefiable
167	27.32	1216.7	27.23	27.40	0.115	3.141	3.141	2.061	287.48	5.456	1.919	90.52	2.13	0.74	0.00	0.72	2.10	0.75	100.93	1.44	145.82	16		0.936	0.368	0.956	Non Liquefiable
168	27.48	1216.5	27.40	27.56	0.115	3.160	3.160	2.069	285.76	5.241	1.855	89.42	2.13	0.73	0.00	0.72	2.09	0.75	99.97	1.43	143.07	16		0.936	0.352	0.958	Non Liquefiable
169	27.64	1216.4	27.56	27.72	0.115	3.179	3.179	2.078	286.72	4.631	1.633	89.20	2.09	0.72	0.00	0.71	2.05	0.75	100.50	1.36	137.13	14		0.936	0.320	0.959	0.43
170	27.81	1216.2	27.72	27.89	0.115	3.198	3.198	2.087	306.02	5.034	1.662	94.70	2.08	0.72	0.00	0.70	2.04	0.75	107.10	1.34	143.86	14		0.935	0.357	0.960	Non Liquefiable
171	27.97	1216.0	27.89	28.05	0.115	3.217	3.217	2.095	347.82	4.584	1.330	107.13	1.97	0.68	0.00	0.66	1.92	0.76	123.54	1.21	149.01	11		0.935	0.388	0.962	Non Liquefiable
172	28.14	1215.9	28.05	28.22	0.115	3.236	3.236	2.104	344.06	5.034	1.477	105.34	2.01	0.69	0.00	0.67	1.96	0.75	120.93	1.25	150.87	12		0.934	0.399	0.963	Non Liquefiable
173	28.30	1215.7	28.22	28.38	0.115	3.255	3.255	2.113	334.80	4.687	1.414	101.87	2.00	0.69	0.00	0.67	1.96	0.75	117.23	1.24	145.75	12		0.934	0.368	0.964	Non Liquefiable
174	28.46	1215.5	28.38	28.54	0.115	3.273	3.273	2.121	294.50	5.389	1.851	88.98	2.13	0.74	0.00	0.72	2.09	0.73	100.37	1.43	143.31	16		0.934	0.354	0.966	Non Liquefiable
175	28.63	1215.4	28.54	28.71	0.115	3.292	3.292	2.130	262.18	5.862	2.264	78.64	2.23	0.78	0.00	0.76	2.20	0.71	87.28	1.64	143.52	19		0.933	0.355	0.967	0.48
176	28.79	1215.2	28.71	28.87	0.115	3.311	3.311	2.138	255.86	6.443	2.551	76.28	2.27	0.79	0.00	0.78	2.24	0.70	84.05	1.77	148.74	20		0.933	0.386	0.968	0.52
177	28.96	1215.0	28.87	29.04	0.115	3.330	3.330	2.147	264.42	6.322	2.421	78.41	2.25	0.79	0.00	0.77	2.22	0.70	86.88	1.70	147.68	20		0.932	0.380	0.969	0.51
178	29.12	1214.9	29.04	29.20	0.115	3.349	3.349	2.156	263.14	5.734	2.207	77.58	2.22	0.78	0.00	0.76	2.19	0.70	86.47	1.63	141.12	19		0.932	0.341	0.970	0.46
179	29.28	1214.7	29.20	29.36	0.115	3.367	3.367	2.164	266.06	5.042	1.919	78.02	2.18	0.76	0.00	0.75	2.14	0.71	87.78	1.53	134.05	17		0.932	0.304	0.972	0.41
180	29.45	1214.6	29.36	29.53	0.115	3.386	3.386	2.173	284.74	4.655	1.655	83.09	2.12	0.74	0.00	0.72	2.07	0.71	94.77	1.40	132.68	15		0.931	0.297	0.973	0.40
181	29.61	1214.4	29.53	29.69	0.115	3.405	3.405	2.181	277.66	3.743	1.365	80.54	2.07	0.72	0.00	0.70	2.02	0.72	92.83	1.32	122.83	14		0.931	0.252	0.974	0.34
182	29.78	1214.2	29.69	29.86	0.115	3.424	3.424	2.190	269.24	3.471	1.306	77.63	2.07	0.72	0.00	0.70	2.02	0.71	89.63	1.32	118.41	14		0.931	0.234	0.975	0.31
183	29.94	1214.1	29.86	30.02	0.115	3.443	3.443	2.199	278.84	3.486	1.266	79.99	2.05	0.71	0.00	0.69	2.00	0.71	92.83	1.29	120.10	13		0.930	0.241	0.976	0.32
184	30.10	1213.9	30.02	30.18	0.115	3.462	3.462	2.207	266.96	4.157	1.577	76.12	2.13	0.74	0.00	0.73	2.09	0.70	87.08	1.42	123.74	15		0.929	0.256	0.976	0.34
185	30.27	1213.7	30.18	30.35	0.115	3.480	3.480	2.216	258.26	4.739	1.860	73.20	2.19	0.77	0.00	0.75	2.15	0.69	82.82	1.55	127.96	17		0.928	0.275	0.977	0.37
186	30.43	1213.6	30.35	30.51	0.115	3.499	3.499	2.225	248.60	5.221	2.130	70.04	2.24	0.79	0.00	0.77	2.21	0.68	78.46	1.68	131.66	19		0.926	0.292	0.977	0.39
187	30.60	1213.4	30.51	30.68	0.115	3.518	3.518	2.233	246.22	5.316	2.190	68.98	2.26	0.79	0.00	0.78	2.22	0.67	77.14	1.71	132.15	20		0.925	0.295	0.977	0.39
188	30.76	1213.2	30.68	30.84	0.115	3.537	3.537	2.242	251.44	5.396	2.177	70.08	2.25	0.79	0.00	0.78	2.22	0.67	78.56	1.69	133.06	20		0.924	0.299	0.977	0.40
189	30.92	1213.1	30.84	31.00	0.115	3.556	3.556	2.250	265.88	5.397	2.058	73.77	2.22	0.78	0.00	0.76	2.18	0.67	83.36	1.61	134.03	18		0.922	0.304	0.977	0.40
190	31.09	1212.9	31.00	31.17	0.115	3.575	3.575	2.259	279.84	5.079	1.838	77.28	2.17	0.76	0.00	0.74	2.13	0.68	88.33	1.50	132.23	17		0.921	0.295	0.977	0.39
191	31.25	1212.8	31.17	31.33	0.115	3.594	3.594	2.268	278.42	4.936	1.796	76.47	2.17	0.76	0.00	0.74	2.12	0.67	87.58	1.49	130.36	17		0.920	0.286	0.977	0.38
192	31.42	1212.6	31.33	31.50	0.115	3.613	3.613	2.276	287.22	4.400	1.552	78.50	2.11	0.74	0.00	0.72	2.07	0.68	91.03	1.39	126.47	15		0.918	0.268	0.977	0.36
193	31.58	1212.4	31.50	31.66	0.115	3.632	3.632	2.285	301.88	4.066	1.363	82.12	2.06	0.72	0.00	0.70	2.01	0.68	96.46	1.31	125.97	13		0.917	0.266	0.977	0.35
194	31.74	1212.3	31.66	31.82	0.115	3.650	3.650	2.294	303.42	3.884	1.296	82.13	2.05	0.72	0.00	0.70	1.99	0.68	96.92	1.28	124.49	13		0.916	0.259	0.977	0.35
195	31.91	1212.1	31.82	31.99	0.115	3.669	3.669	2.302	297.94	4.177	1.419	80.20	2.08	0.73	0.00	0.71	2.03	0.68	94.06	1.33	125.42	14		0.914	0.263	0.977	0.35
196	32.07	1211.9	31.99	32.15	0.115	3.688	3.688	2.311	305.84	4.346	1.438	81.93	2.08	0.73	0.00	0.71	2.03	0.67	96.27	1.33	127.89	14		0.913	0.275	0.977	0.37
197	32.24	1211.8	32.15	32.32	0.115	3.707	3.707	2.320	325.48	5.439	1.690	86.80	2.11	0.74	0.00	0.72	2.06	0.67	101.43	1.38	139.60	15		0.912	0.333	0.976	Non Liquefiable
198	32.40	1211.6	32.32	32.48	0.115	3.726	3.726	2.328	327.26	5.256	1.624	86.83	2.10	0.74	0.00	0.72	2.05	0.67	101.88	1.36	138.11	14		0.910	0.325	0.976	Non Liquefiable
199	32.56	1211.4	32.48	32.64	0.115	3.744	3.744	2.337	310.62	5.215	1.699	81.96	2.13	0.75	0.00	0.73	2.08	0.66	95.57	1.41	134.66	15		0.909	0.307	0.976	0.41
200	32.73	1211.3	32.64	32.81	0.115	3.763	3.763	2.345	305.00	5.078	1.686	80.04	2.13	0.75	0.00	0.73	2.08	0.66	93.34	1.42	132.30	15		0.908	0.295	0.976	0.39
201	32.89	1211.1	32.81	32.97	0.115	3.782	3.782	2.354	303.44	5.007	1.671	79.23	2.13	0.75	0.00	0.73	2.08	0.65	92.48	1.42	131.12	15		0.906	0.290	0.976	0.39
202	33.06	1210.9	32.97	33.14	0.115	3.801	3.801	2.363	283.14	4.782	1.712	73.48	2.16	0.76	0.00	0.75	2.12	0.65	85.24	1.48	125.92	16		0.905	0.266	0.976	0.35
203	33.22	1210.8	33.14	33.30	0.115	3.820	3.820	2.371	271.52	4.409	1.647	70.07	2.17	0.77	0.00	0.75	2.12	0.64	81.30	1.48	120.65	16		0.904	0.243	0.976	0.32
204	33.38	1210.6	33.30	33.46	0.115	3.839	3.839	2.380	276.02	4.427	1.627	70.90	2.16	0.76	0.00	0.75	2.11	0.64	82.50	1.47	121.13	16		0.902	0.245	0.975	0.33
205	33.55	1210.5	33.46	33.63	0.115	3.858	3.858	2.388	285.94	4.741	1.681	73.12	2.16	0.76	0.00	0.75	2.11	0.64	85.17	1.47	124.98	16		0.901	0.262	0.975	0.35
206	33.71	1210.3	33.63	33.79	0.115	3.877	3.877	2.397	297.18	4.957	1.690	75.66	2.15	0.76	0.00	0.74	2.10	0.64	88.42	1.45	128.09	16		0.900	0.275	0.975	0.37
207	33.88	1210.1	33.79	33.96	0.115	3.896	3.896	2.406	318.92	5.221	1.657	80.87	2.12	0.75	0.00	0.73	2.07	0.64	95.25	1.40	133.17	15		0.898	0.300	0.975	0.40
208	34.04	1210.0	33.96	34.12	0.115	3.915	3.915	2.415	370.54	5.321	1.451	93.66	2.04	0.72	0.00	0.70	1.98	0.65	112.85	1.27	142.92	12		0.897	0.351	0.975	Non Liquefiable
209	34.20	1209.8	34.12	34.28	0.115	3.933	3.933	2.423	388.60	5.374	1.397	97.80	2.01	0.71	0.00	0.69	1.95	0.65	118.75	1.23	146.64	12		0.896	0.373	0.974	Non Liquefiable
210	34.37	1209.6	34.28	34.45	0.115	3.952	3.952	2.432	337.54	5.168	1.549	84.41	2.09	0.74	0.00	0.72	2.04	0.64	100.61	1.34	134.84	14		0.894	0.308	0.974	0.41
211	34.53	1209.5	34.45	34.61	0.115	3.971	3.971	2.440	308.62	5.256	1.725	76.72	2.15	0.76	0.00	0.74	2.10	0.63	90.09	1.45	130.55	16		0.893	0.287	0.974	0.38
212	34.70	1209.3	34.61	34.78	0.115	3.990	3.990	2.449	300.88	5.714	1.925	74.41	2.19	0.78	0.00	0.76	2.15	0.62	86.49	1.54	133.05	17		0.892	0.299	0.974	0.40
213	34.86	1209.1	34.78	34.94	0.115	4.009	4.009	2.458	273.12	5.271	1.959	67.13	2.23	0.80	0.00	0.78	2.19	0.61	77.33	1.63	125.87	19		0.890	0.265	0.973	0.35
214	35.02	1209.0	34.94	35.10	0.115	4.027	4.027	2.466	261.52	4.794	1.862	63.94	2.23	0.80	0.00	0.78	2.19	0.61	73.71	1.63	119.97	19		0.889	0.241	0.973	0.32
215	35.19	1208.8	35.10	35.27	0.115	4.046	4.046	2.475	257.16	4.932	1.949	62.55	2.25	0.80	0.00	0.79	2.21	0.60	71.78	1.68	120.66	19		0.888	0.243	0.973	0.33
216	35.35	1208.7	35.27	35.43	0.115	4.065	4.065	2.483	248.40	5.691	2.329	60.10	2.32	0.83	0.00	0.82	2.28	0.59	67.80	1.88	127.37	22		0.886	0.272	0.972	0.36
217	35.52	1208.5	35.43	35.60	0.115	4.084	4.084	2.492	266.20	5.369	2.048	64.18	2.26	0.81	0.00	0.79	2.22	0.59	73.62	1.70	125.04	20		0.885	0.262	0.972	0.35
218	35.68	1208.3	35.60	35.76	0.115	4.103	4.103	2.501	284.26	5.702	2.035	68.28	2.24	0.80	0.00	0.78	2.19	0.60	78.84	1.64	129.35	19		0.884	0.281	0.972	0.38
219	35.85	1208.2	35.76	35.93	0.115	4.122	4.122	2.509	334.28	4.797	1.453	80.09	2.09	0.74	0.00	0.72	2.03	0.62	96.49	1.33	128.49	14		0.882	0.277	0.971	0.37

LIQUEFACTION TRIGGERING ANALYSIS

Layer No.	Mid-layer Depth	Elevation	Depth of layer below ground surface [ft]		Total Unit Weight., γ	Total Vertical Stress, σ_{vo}	In-Situ Effective Vertical Stress, σ'_{vo}	H.H. Effective Vertical Stress, σ'_{vo}	Total Cone Resistance, q_t	Sleeve Friction, f_s	Normalized Friction Ratio, F_r	Normalized Cone Resistance, $Q_{t,1}$	Normalized Behavior Type Index, $(I_c)_1$	n	Δn	Final n	Final I_c	Normalizing Factor, C_N	For Overburden, $q_{t,1N}$	Fines Factor, K_c	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC		Stress Reduction Factor, r_d	Cyclic Resistance Ratio, $CRR_{7.5}$	Cyclic Stress Ratio, CSR*	Calculated Factor of Safety, FS
																						Estimated	Lab				
	(ft)	(ft. MSL)	Top	Bottom	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[%]	trial 1 (assume n = 1.0)										[%]	[%]		M_W = 7.5	for FS = 1.3	$CRR_{7.5}/CSR^*$
220	36.01	1208.0	35.93	36.09	0.115	4.141	4.141	2.518	325.70	4.449	1.384	77.65	2.09	0.74	0.00	0.72	2.02	0.62	93.77	1.32	124.17	14		0.881	0.258	0.971	0.35
221	36.17	1207.8	36.09	36.25	0.115	4.160	4.160	2.527	300.60	4.416	1.490	71.27	2.13	0.76	0.00	0.74	2.08	0.61	84.97	1.41	119.45	15		0.880	0.239	0.971	0.32
222	36.34	1207.7	36.25	36.42	0.115	4.179	4.179	2.535	292.76	4.084	1.415	69.06	2.13	0.76	0.00	0.74	2.07	0.61	82.53	1.40	115.29	15		0.878	0.223	0.970	0.30
223	36.50	1207.5	36.42	36.58	0.115	4.198	4.198	2.544	250.18	4.085	1.661	58.60	2.23	0.80	0.00	0.78	2.18	0.59	68.14	1.61	109.64	18		0.877	0.203	0.970	0.27
224	36.67	1207.3	36.58	36.75	0.115	4.216	4.216	2.553	241.24	4.140	1.747	56.21	2.26	0.81	0.00	0.79	2.21	0.58	64.88	1.68	109.15	19		0.876	0.201	0.969	0.27
225	36.83	1207.2	36.75	36.91	0.115	4.235	4.235	2.561	244.66	4.514	1.878	56.76	2.27	0.82	0.00	0.80	2.23	0.57	65.23	1.73	112.95	20		0.874	0.214	0.969	0.29
226	36.99	1207.0	36.91	37.07	0.115	4.254	4.254	2.570	236.68	4.026	1.732	54.64	2.26	0.81	0.00	0.80	2.22	0.57	63.02	1.70	107.16	20		0.873	0.194	0.968	0.26
227	37.16	1206.8	37.07	37.24	0.115	4.273	4.273	2.578	228.04	3.890	1.739	52.37	2.28	0.82	0.00	0.80	2.23	0.57	60.18	1.74	104.87	20		0.872	0.187	0.968	0.25
228	37.32	1206.7	37.24	37.40	0.115	4.292	4.292	2.587	213.80	4.052	1.934	48.82	2.33	0.84	0.00	0.82	2.29	0.56	55.25	1.91	105.64	22		0.870	0.190	0.968	0.25
229	37.49	1206.5	37.40	37.57	0.115	4.311	4.311	2.596	200.94	4.989	2.537	45.61	2.43	0.88	0.00	0.87	2.40	0.54	50.13	2.31	115.71	27		0.869	0.224	0.967	0.30
230	37.65	1206.4	37.57	37.73	0.115	4.330	4.330	2.604	198.00	5.847	3.019	44.73	2.49	0.90	0.00	0.89	2.47	0.53	48.34	2.58	124.94	29		0.868	0.261	0.967	0.35
231	37.81	1206.2	37.73	37.89	0.115	4.348	4.348	2.613	205.90	5.778	2.867	46.35	2.46	0.89	0.00	0.88	2.44	0.53	50.50	2.45	123.81	28		0.866	0.256	0.966	0.35
232	37.98	1206.0	37.89	38.06	0.115	4.367	4.367	2.621	198.80	5.795	2.980	44.52	2.49	0.90	0.00	0.89	2.46	0.52	48.16	2.57	123.88	29		0.865	0.257	0.966	0.35
233	38.14	1205.9	38.06	38.22	0.115	4.386	4.386	2.630	182.78	6.715	3.764	40.67	2.59	0.94	0.00	0.93	2.57	0.51	42.71	4.47	190.98	34		0.864	0.728	0.965	0.98
234	38.31	1205.7	38.22	38.39	0.115	4.405	4.405	2.639	167.88	7.568	4.629	37.11	2.68	0.97	0.00	0.97	2.67	0.49	37.89	8.48	321.39	39		0.862	3.167	0.965	2.00
235	38.47	1205.5	38.39	38.55	0.115	4.424	4.424	2.648	154.86	7.347	4.884	34.00	2.72	0.99	0.00	0.99	2.72	0.48	34.25	Ic>2.7	--	41		0.861	1.815	0.964	2.00
236	38.63	1205.4	38.55	38.71	0.115	4.442	4.442	2.656	140.66	6.709	4.926	30.66	2.76	1.00		1.00	2.76	0.48	30.66	Ic>2.7	--	43		0.860	1.625	0.964	2.00
237	38.80	1205.2	38.71	38.88	0.115	4.461	4.461	2.665	112.22	6.592	6.117	24.15	2.90	1.00		1.00	2.90	0.47	24.15	Ic>2.7	--	52		0.858	1.280	0.963	1.73
238	38.96	1205.0	38.88	39.04	0.115	4.480	4.480	2.673	106.82	6.553	6.404	22.84	2.93	1.00		1.00	2.93	0.47	22.84	Ic>2.7	--	54		0.857	1.211	0.963	1.64
239	39.13	1204.9	39.04	39.21	0.115	4.499	4.499	2.682	110.34	6.412	6.058	23.52	2.90	1.00		1.00	2.90	0.47	23.52	Ic>2.7	--	52		0.856	1.247	0.962	1.68
240	39.29	1204.7	39.21	39.37	0.115	4.518	4.518	2.691	103.32	6.175	6.250	21.87	2.93	1.00		1.00	2.93	0.47	21.87	Ic>2.7	--	54		0.854	1.159	0.961	1.57
241	39.45	1204.6	39.37	39.53	0.115	4.537	4.537	2.699	115.02	6.004	5.434	24.35	2.86	1.00		1.00	2.86	0.47	24.35	Ic>2.7	--	49		0.853	1.291	0.961	1.75
242	39.62	1204.4	39.53	39.70	0.115	4.556	4.556	2.708	110.62	5.762	5.433	23.28	2.87	1.00		1.00	2.87	0.46	23.28	Ic>2.7	--	50		0.852	1.234	0.960	1.67
243	39.78	1204.2	39.70	39.86	0.115	4.575	4.575	2.716	114.20	5.707	5.206	23.96	2.85	1.00		1.00	2.85	0.46	23.96	Ic>2.7	--	49		0.850	1.270	0.960	1.72
244	39.95	1204.1	39.86	40.03	0.115	4.594	4.594	2.725	111.62	5.996	5.603	23.30	2.88	1.00		1.00	2.88	0.46	23.30	Ic>2.7	--	51		0.849	1.235	0.959	1.67
245	40.11	1203.9	40.03	40.19	0.115	4.613	4.613	2.734	98.32	5.744	6.130	20.32	2.95	1.00		1.00	2.95	0.46	20.32	Ic>2.7	--	55		0.848	1.077	0.958	1.46
246	40.27	1203.7	40.19	40.35	0.115	4.631	4.631	2.742	87.10	5.480	6.645	17.81	3.02	1.00		1.00	3.02	0.46	17.81	Ic>2.7	--	60		0.846	0.944	0.958	1.28
247	40.44	1203.6	40.35	40.52	0.115	4.650	4.650	2.751	80.68	5.423	7.133	16.35	3.06	1.00		1.00	3.06	0.46	16.35	Ic>2.7	--	63		0.845	0.867	0.957	1.18
248	40.60	1203.4	40.52	40.68	0.115	4.669	4.669	2.760	85.44	5.128	6.349	17.30	3.01	1.00		1.00	3.01	0.45	17.30	Ic>2.7	--	59		0.844	0.917	0.957	1.25
249	40.77	1203.2	40.68	40.85	0.115	4.688	4.688	2.768	103.26	4.613	4.679	21.03	2.86	1.00		1.00	2.86	0.45	21.03	Ic>2.7	--	50		0.842	1.114	0.956	1.52
250	40.93	1203.1	40.85	41.01	0.115	4.707	4.707	2.777	136.96	4.998	3.779	28.10	2.70	0.99	0.00	0.99	2.70	0.45	28.30	Ic>2.7	--	41		0.841	1.500	0.955	2.00
251	41.09	1202.9	41.01	41.17	0.115	4.725	4.725	2.785	142.50	5.089	3.693	29.16	2.69	0.99	0.00	0.98	2.68	0.45	29.55	9.10	268.85	40		0.840	1.887	0.955	2.00
252	41.26	1202.7	41.17	41.34	0.115	4.744	4.744	2.794	163.62	5.972	3.759	33.49	2.65	0.97	0.00	0.97	2.64	0.46	34.38	6.92	237.82	37		0.838	1.331	0.954	1.81
253	41.42	1202.6	41.34	41.50	0.115	4.763	4.763	2.803	193.30	6.259	3.320	39.58	2.56	0.94	0.00	0.93	2.54	0.47	41.90	3.63	152.09	32		0.837	0.407	0.953	0.56
254	41.59	1202.4	41.50	41.67	0.115	4.782	4.782	2.811	128.14	6.388	5.178	25.79	2.82	1.00		1.00	2.82	0.44	25.79	Ic>2.7	--	47		0.836	1.367	0.953	1.87
255	41.75	1202.3	41.67	41.83	0.115	4.801	4.801	2.820	144.54	6.215	4.448	29.10	2.74	1.00		1.00	2.74	0.44	29.10	Ic>2.7	--	43		0.834	1.543	0.952	2.00
256	41.91	1202.1	41.83	41.99	0.115	4.820	4.820	2.828	133.84	6.724	5.212	26.77	2.81	1.00		1.00	2.81	0.44	26.77	Ic>2.7	--	47		0.833	1.419	0.951	1.94
257	42.08	1201.9	41.99	42.16	0.115	4.839	4.839	2.837	162.92	5.371	3.398	32.67	2.63	0.96	0.00	0.96	2.61	0.45	33.76	5.95	200.70	36		0.832	0.832	0.950	1.14
258	42.24	1201.8	42.16	42.32	0.115	4.858	4.858	2.846	309.80	5.356	1.757	62.78	2.22	0.81	0.00	0.79	2.17	0.52	74.73	1.58	117.96	18		0.830	0.233	0.950	0.32
259	42.41	1201.6	42.32	42.49	0.115	4.877	4.877	2.855	361.42	5.168	1.450	73.11	2.12	0.77	0.00	0.75	2.05	0.54	90.38	1.36	123.04	14		0.829	0.253	0.949	0.35
260	42.57	1201.4	42.49	42.65	0.115	4.896	4.896	2.863	351.02	5.630	1.627	70.70	2.16	0.79	0.00	0.77	2.10	0.53	86.08	1.44	124.25	16		0.828	0.258	0.948	0.35
261	42.73	1201.3	42.65	42.81	0.115	4.914	4.914	2.872	299.42	5.168	1.755	59.93	2.24	0.82	0.00	0.80	2.18	0.51	71.07	1.61	114.73	18		0.826	0.220	0.948	0.30
262	42.90	1201.1	42.81	42.98	0.115	4.933	4.933	2.880	280.44	4.089	1.484	55.85	2.21	0.81	0.00	0.79	2.15	0.51	66.86	1.55	103.78	18		0.825	0.184	0.947	0.25
263	43.06	1200.9	42.98	43.14	0.115	4.952	4.952	2.889	268.06	3.407	1.295	53.13	2.20	0.80	0.00	0.78	2.13	0.52	64.12	1.50	96.42	17		0.824	0.163	0.946	0.22
264	43.23	1200.8	43.14	43.31	0.115	4.971	4.971	2.898	250.36	2.852	1.162	49.37	2.19	0.80	0.00	0.78	2.13	0.51	59.69	1.50	89.24	17		0.822	0.146	0.945	0.20
265	43.39	1200.6	43.31	43.47	0.115	4.990	4.990	2.906	233.10	2.503	1.097	45.71	2.21	0.81	0.00	0.78	2.14	0.51	55.06	1.52	83.78	17		0.821	0.135	0.945	0.19
266	43.56	1200.4	43.47	43.64	0.115	5.009	5.009	2.915	216.96	2.547	1.202	42.32	2.26	0.83	0.00	0.81	2.20	0.50	50.05	1.65	82.46	19		0.820	0.132	0.944	0.18
267	43.72	1200.3	43.64	43.80	0.115	5.028	5.028	2.924	164.16	3.495	2.196	31.65	2.51	0.93	0.00	0.92	2.49	0.45	34.00	2.70	91.79	30		0.818	0.152	0.943	0.21
268	43.88	1200.1	43.80	43.96	0.115	5.046	5.046	2.932	199.66	5.840	3.001	38.57	2.54	0.94	0.00	0.93	2.52	0.45	41.07	3.11	127.58	31		0.817	0.273	0.942	0.38
269	44.05	1200.0	43.96	44.13	0.115	5.065	5.065	2.941	182.74	8.249	4.643	35.08	2.70	1.00	0.00	1.00	2.69	0.42	35.19	9.83	346.10	40		0.816	3.936	0.941	Non Liquefiable
270	44.21	1199.8	44.13	44.29	0.115	5.084	5.084	2.949	220.50	11.257	5.225	42.37	2.67	0.99	0.00	0.99	2.67	0.42	42.82	8.51	364.46	39		0.814	4.582	0.941	Non Liquefiable
271	44.38	1199.6	44.29	44.46	0.115	5.103	5.103	2.958	263.64	14.806	5.727	50.66	2.65	0.98	0.00	0.98	2.65	0.42	51.63	7.24	373.89	38		0.813	4.941	0.940	Non Liquefiable
272	44.54	1199.5	44.46	44.62	0.115	5.122	5.122	2.967	356.56	17.322	4.929	68.61	2.52	0.93	0.00	0.92	2.50	0.44	73.51	2.73	200.90	31		0.812	0.834	0.939	Non Liquefiable
273	44.70	1199.3	44.62	44.78	0.115	5.141	5.141	2.975	423.40	22.406	5.357	81.37	2.50	0.92	0.00	0.91	2.48	0.44	87.77	2.63	231.12	30		0.810	1.228	0.938	Non Liquefiable
274	44.87	1199.1	44.78	44.95	0.115	5.159	5.159	2.984	368.56	24.284	6.683	70.43	2.61	0.97	0.00	0.96	2.60	0.42	72.80	5.46	397.23	35		0.809	5.909	0.937	Non Liquefiable
275	45.03	1199.0	44.95	45.11	0.115	5.178	5.178	2.993	498.74	29.580	5.993	95.31	2.49	0.92	0.00	0.91	2.47	0.44	102.89	2.62	269.58	29		0.808	1.902	0.937	Non Liquefiable
276	45.20	1198.8	45.11	45.28	0.115	5.197	5.197	3.001	561.84	34.368	6.174	107.10	2.47	0.92	0.00	0.91	2.45	0.44	116.42	2.52	293.82	29		0.806	2.439	0.936	Non Liquefiable

LIQUEFACTION TRIGGERING ANALYSIS

Layer No.	Mid-layer Depth	Elevation	Depth of layer below ground surface [ft]		Total Unit Weight., γ	Total Vertical Stress, σ_{vo}	In-Situ Effective Vertical Stress, σ'_{vo}	H.H. Effective Vertical Stress, σ'_{vo}	Total Cone Resistance, q_t	Sleeve Friction, f_s	Normalized Friction Ratio, F_r	Normalized Cone Resistance, $Q_{t,1}$	Normalized Behavior Type Index, $(I_c)_1$	n	Δn	Final n	Final I_c	Normalizing Factor, C_N	For Overburden, $q_{t,1N}$	Fines Factor, K_c	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC		Stress Reduction Factor, r_d	Cyclic Resistance Ratio, $CRR_{7.5}$	Cyclic Stress Ratio, CSR*	Calculated Factor of Safety, FS
																						Estimated	Lab				
	(ft)	(ft. MSL)	Top	Bottom	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[ksf]	[%]	trial 1 (assume n = 1.0)										[%]	[%]		M_W = 7.5	for FS = 1.3	$CRR_{7.5}/CSR^*$
277	45.36	1198.6	45.28	45.44	0.115	5.216	5.216	3.010	538.96	32.413	6.073	102.32	2.48	0.92	0.00	0.91	2.46	0.44	110.99	2.55	283.21	29		0.805	2.192	0.935	Non Liquefiable
278	45.52	1198.5	45.44	45.60	0.115	5.235	5.235	3.018	537.48	32.641	6.133	101.67	2.48	0.92	0.00	0.91	2.46	0.44	110.07	2.58	283.71	29		0.804	2.204	0.934	Non Liquefiable
279	45.69	1198.3	45.60	45.77	0.115	5.254	5.254	3.027	596.80	37.282	6.302	112.59	2.47	0.91	0.00	0.91	2.45	0.44	122.60	2.50	306.40	28		0.802	2.755	0.933	Non Liquefiable
280	45.85	1198.2	45.77	45.93	0.115	5.273	5.273	3.036	638.94	43.710	6.898	120.18	2.48	0.92	0.00	0.91	2.47	0.43	130.02	2.58	335.90	29		0.801	3.605	0.932	Non Liquefiable

CYCLIC SETTLEMENT ANALYSIS

Project:	Sterling Ranch Estates Val Verde, LA County, California	Project No.:	18-1245A-4
		Date:	6/8/2018
		Figure No.:	C2.2

Location	CPT-10	MCE Mean Magnitude =	6.8
Type of Sampler (CPT/SPT/CD)	CPT	Peak Ground Accel. (M = 6.79) =	1.02 g
Ground Surface Elevation	1244 ft. above MSL	Approx. Distance From Site (miles) =	1.4
Existing Ground Water Depth	45.9 ft. BGS	Basic Earthquake Magnitude =	7.5
Historic Ground Water Depth	10.0 ft. BGS	Magnitude Weighted PGA (M = 7.5) =	0.79 g
		Magnitude Scaling Factor =	1.29

Conditions: CPT Interpretation based on ground water conditions at time of investigation

Evaluation of cyclic stress ratio based on historic high ground water conditions

Vol. Strain Ratio For Dry Sands= 0.858

Layer No.	Depth of layer below ground surface [ft]		Layer Thickness	H.H. Effective Vertical Stress, σ'_{vo}	Cone Tip Resistance, q_t	Cyclic Stress Ratio, CSR	Calculated Factor of Safety, FS	Dry Settlement									Wet Settlement		Cumulative Settlement
								a	b	Low Strain Shear Modulus G_{max}	Induced Cyclic Stress (γ_{eff} x G_{eff})	γ_{eff} x (G_{eff} / G_{max})	Cyclic Shear Strain, γ_{cyc} (γ_{eff} x 100)	Volumetric Strain M = 7.5	Volumetric Strain M = 6.5	Volumetric Strain w/ 3D Effect	Settlement	Volumetric Strain, %	Settlement	
	Top	Bottom	[ft]	[psf]	[ksf]		$CRR_{7.5}$/CSR*			[psf]	M=7.5 [ksf]		[%]	[%]	[%]	[%]	[inches]	[%]	[inches]	[inches]
1	0.00	0.16	0.16	9.20	122.2	0.52	Non Liquefiable	0.610	2.65	166938	0.005	2.84E-05	3.23E-03	0.002	0.002	0.004	0.000			0.000
2	0.16	0.33	0.17	28.18	239.2	0.52	Non Liquefiable	0.635	2.48	297180	0.015	4.88E-05	8.76E-03	0.005	0.005	0.009	0.000			0.000
3	0.33	0.49	0.16	47.15	247.4	0.52	Non Liquefiable	0.648	2.40	402773	0.024	6.03E-05	1.27E-02	0.007	0.006	0.012	0.000			0.000
4	0.49	0.66	0.17	66.13	205.6	0.51	Non Liquefiable	0.656	2.35	462736	0.034	7.36E-05	1.88E-02	0.011	0.010	0.019	0.000			0.000
5	0.66	0.82	0.16	85.10	175.0	0.51	Non Liquefiable	0.662	2.32	512138	0.044	8.55E-05	2.52E-02	0.016	0.014	0.027	0.000			0.000
6	0.82	0.98	0.16	103.50	152.7	0.51	Non Liquefiable	0.667	2.29	539549	0.053	9.87E-05	3.38E-02	0.025	0.021	0.042	0.000			0.000
7	0.98	1.15	0.17	122.48	153.6	0.51	Non Liquefiable	0.671	2.27	586927	0.063	1.07E-04	3.92E-02	0.029	0.025	0.049	0.000			0.000
8	1.15	1.31	0.16	141.45	149.4	0.51	Non Liquefiable	0.674	2.25	630757	0.073	1.15E-04	4.44E-02	0.032	0.028	0.056	0.000			0.000
9	1.31	1.48	0.17	160.43	144.1	0.51	Non Liquefiable	0.677	2.23	665081	0.082	1.24E-04	5.07E-02	0.038	0.033	0.065	0.000			0.000
10	1.48	1.64	0.16	179.40	158.7	0.51	Non Liquefiable	0.680	2.22	724013	0.092	1.27E-04	5.14E-02	0.035	0.030	0.061	0.000			0.000
11	1.64	1.80	0.16	197.80	174.2	0.51	Non Liquefiable	0.683	2.20	787409	0.102	1.29E-04	5.07E-02	0.031	0.027	0.054	0.000			0.000
12	1.80	1.97	0.17	216.78	179.2	0.51	Non Liquefiable	0.685	2.19	831126	0.111	1.34E-04	5.34E-02	0.032	0.028	0.055	0.000			0.000
13	1.97	2.13	0.16	235.75	189.2	0.51	Non Liquefiable	0.687	2.18	880608	0.121	1.37E-04	5.47E-02	0.032	0.027	0.054	0.000			0.000
14	2.13	2.30	0.17	254.73	201.0	0.51	Non Liquefiable	0.689	2.17	908210	0.131	1.44E-04	5.92E-02	0.035	0.030	0.060	0.000			0.000
15	2.30	2.46	0.16	273.70	184.3	0.51	Non Liquefiable	0.691	2.16	894277	0.140	1.57E-04	7.16E-02	0.049	0.042	0.085	0.000			0.000
16	2.46	2.62	0.16	292.10	141.1	0.51	0.584	0.693	2.15	849609	0.150	1.76E-04	9.40E-02	0.083	0.071	0.143	0.003			0.003
17	2.62	2.79	0.17	311.08	113.2	0.51	0.463	0.694	2.14	855377	0.159	1.86E-04	1.05E-01	0.100	0.086	0.172	0.004			0.006
18	2.79	2.95	0.16	330.05	132.8	0.51	Non Liquefiable	0.696	2.14	934282	0.169	1.81E-04	9.37E-02	0.075	0.064	0.129	0.000			0.006
19	2.95	3.12	0.17	349.03	154.4	0.51	Non Liquefiable	0.697	2.13	1019130	0.179	1.75E-04	8.33E-02	0.056	0.048	0.096	0.000			0.006
20	3.12	3.28	0.16	368.00	156.8	0.51	Non Liquefiable	0.698	2.12	1046466	0.188	1.80E-04	8.65E-02	0.058	0.050	0.099	0.000			0.006
21	3.28	3.44	0.16	386.40	146.4	0.51	Non Liquefiable	0.700	2.12	1042507	0.198	1.90E-04	9.63E-02	0.070	0.060	0.121	0.000			0.006
22	3.44	3.61	0.17	405.38	134.3	0.51	Non Liquefiable	0.701	2.11	1024164	0.207	2.02E-04	1.11E-01	0.092	0.079	0.158	0.000			0.006
23	3.61	3.77	0.16	424.35	116.9	0.51	0.504	0.702	2.11	1011698	0.217	2.14E-04	1.26E-01	0.116	0.099	0.198	0.004			0.010
24	3.77	3.94	0.17	443.33	96.1	0.51	0.366	0.703	2.10	980252	0.226	2.31E-04	1.50E-01	0.161	0.138	0.277	0.006			0.016
25	3.94	4.10	0.16	462.30	39.5	0.51	0.158	0.704	2.09	758338	0.236	3.11E-04	3.37E-01	0.837	0.718	1.436	0.028			0.043
26	4.10	4.27	0.17	481.28	34.7	0.51	0.151	0.705	2.09	747042	0.246	3.29E-04	3.83E-01	1.056	0.906	1.812	0.037			0.080
27	4.27	4.43	0.16	500.25	30.4	0.51	0.144	0.706	2.08	732303	0.255	3.49E-04	4.40E-01	1.364	1.170	2.341	0.045			0.125
28	4.43	4.59	0.16	518.65	37.7	0.51	0.155	0.707	2.08	803226	0.265	3.29E-04	3.61E-01	0.894	0.767	1.534	0.029			0.155
29	4.59	4.76	0.17	537.63	43.1	0.51	0.164	0.708	2.08	869029	0.274	3.15E-04	3.09E-01	0.638	0.547	1.095	0.022			0.177
30	4.76	4.92	0.16	556.60	72.6	0.51	0.277	0.709	2.07	1030600	0.284	2.75E-04	2.05E-01	0.267	0.229	0.459	0.009			0.186
31	4.92	5.09	0.17	575.58	102.8	0.51	0.454	0.710	2.07	1148414	0.293	2.55E-04	1.63E-01	0.162	0.139	0.277	0.006			0.191
32	5.09	5.25	0.16	594.55	121.2	0.51	0.617	0.711	2.06	1240325	0.303	2.44E-04	1.41E-01	0.117	0.100	0.201	0.004			0.195
33	5.25	5.41	0.16	612.95	134.7	0.51	Non Liquefiable	0.712	2.06	1300024	0.312	2.40E-04	1.32E-01	0.100	0.085	0.171	0.000			0.195
34	5.41	5.58	0.17	631.93	144.7	0.51	Non Liquefiable	0.713	2.06	1346138	0.322	2.39E-04	1.28E-01	0.091	0.078	0.156	0.000			0.195
35	5.58	5.74	0.16	650.90	136.8	0.51	Non Liquefiable	0.713	2.05	1353061	0.331	2.45E-04	1.34E-01	0.097	0.084	0.167	0.000			0.195
36	5.74	5.91	0.17	669.88	135.2	0.51	Non Liquefiable	0.714	2.05	1372642	0.341	2.48E-04	1.36E-01	0.099	0.085	0.170	0.000			0.195
37	5.91	6.07	0.16	688.85	141.9	0.51	Non Liquefiable	0.715	2.05	1431738	0.350	2.45E-04	1.28E-01	0.086	0.074	0.148	0.000			0.195
38	6.07	6.23	0.16	707.25	155.1	0.51	Non Liquefiable	0.715	2.04	1501234	0.359	2.39E-04	1.19E-01	0.072	0.062	0.124	0.000			0.195
39	6.23	6.40	0.17	726.23	161.2	0.51	Non Liquefiable	0.716	2.04	1545584	0.369	2.39E-04	1.16E-01	0.067	0.058	0.115	0.000			0.195

CYCLIC SETTLEMENT ANALYSIS

Layer No.	Depth of layer below ground surface [ft]		Layer Thickness	H.H. Effective Vertical Stress, σ'_{vo}	Cone Tip Resistance, q_t	Cyclic Stress Ratio, CSR	Calculated Factor of Safety, FS	Dry Settlement										Wet Settlement		Cumulative Settlement
								a	b	Low Strain Shear Modulus G_{max}	Induced Cyclic Stress (γ_{eff} x G_{eff})	γ_{eff} x (G_{eff} / G_{max})	Cyclic Shear Strain, γ_{cyc} (γ_{eff} x 100)	Volumetric Strain M = 7.5	Volumetric Strain M = 6.5	Volumetric Strain w/ 3D Effect	Settlement	Volumetric Strain, %	Settlement	
	Top	Bottom	[ft]	[psf]	[ksf]		$CRR_{7.5}$/CSR*			[psf]	M=7.5 [ksf]		[%]	[%]	[%]	[%]	[inches]	[%]	[inches]	[inches]
40	6.40	6.56	0.16	745.20	160.5	0.51	Non Liquefiable	0.717	2.04	1540985	0.378	2.46E-04	1.23E-01	0.074	0.064	0.128	0.000			0.195
41	6.56	6.73	0.17	764.18	149.6	0.51	Non Liquefiable	0.718	2.03	1521452	0.388	2.55E-04	1.33E-01	0.087	0.074	0.149	0.000			0.195
42	6.73	6.89	0.16	783.15	151.0	0.51	Non Liquefiable	0.718	2.03	1498578	0.397	2.65E-04	1.44E-01	0.102	0.088	0.176	0.000			0.195
43	6.89	7.05	0.16	801.55	154.2	0.51	Non Liquefiable	0.719	2.03	1516080	0.407	2.68E-04	1.46E-01	0.104	0.089	0.178	0.000			0.195
44	7.05	7.22	0.17	820.53	138.6	0.51	Non Liquefiable	0.719	2.02	1488778	0.416	2.79E-04	1.60E-01	0.124	0.106	0.212	0.000			0.195
45	7.22	7.38	0.16	839.50	144.5	0.51	Non Liquefiable	0.720	2.02	1505894	0.425	2.83E-04	1.62E-01	0.125	0.107	0.215	0.000			0.195
46	7.38	7.55	0.17	858.48	30.1	0.51	2.000	0.721	2.02	1301991	0.435	3.34E-04	2.46E-01	0.305	0.262	0.524	0.000			0.195
47	7.55	7.71	0.16	877.45	26.3	0.51	0.236	0.721	2.02	1221946	0.444	3.64E-04	3.04E-01	0.471	0.404	0.807	0.000			0.195
48	7.71	7.87	0.16	895.85	19.8	0.51	0.208	0.722	2.01	1180940	0.453	3.84E-04	3.46E-01	0.613	0.526	1.051	0.000			0.195
49	7.87	8.04	0.17	914.83	40.0	0.51	0.194	0.722	2.01	1247699	0.463	3.71E-04	3.09E-01	0.480	0.411	0.823	0.017			0.212
50	8.04	8.20	0.16	933.80	85.2	0.51	0.320	0.723	2.01	1442995	0.472	3.27E-04	2.18E-01	0.226	0.193	0.387	0.007			0.220
51	8.20	8.37	0.17	952.78	133.1	0.51	0.463	0.723	2.01	1496995	0.482	3.22E-04	2.06E-01	0.196	0.168	0.336	0.007			0.226
52	8.37	8.53	0.16	971.75	125.8	0.51	0.452	0.724	2.00	1492192	0.491	3.29E-04	2.15E-01	0.213	0.183	0.365	0.007			0.233
53	8.53	8.69	0.16	990.15	135.2	0.51	0.552	0.724	2.00	1564242	0.500	3.20E-04	1.96E-01	0.174	0.149	0.298	0.006			0.239
54	8.69	8.86	0.17	1009.13	145.3	0.50	0.661	0.725	2.00	1615897	0.510	3.15E-04	1.87E-01	0.154	0.133	0.265	0.005			0.245
55	8.86	9.02	0.16	1028.10	143.6	0.50	0.613	0.725	2.00	1612691	0.519	3.22E-04	1.94E-01	0.166	0.142	0.285	0.005			0.250
56	9.02	9.19	0.17	1047.08	142.4	0.50	0.597	0.726	1.99	1627505	0.528	3.25E-04	1.96E-01	0.167	0.143	0.287	0.006			0.256
57	9.19	9.35	0.16	1066.05	156.4	0.50	Non Liquefiable	0.726	1.99	1679101	0.538	3.20E-04	1.86E-01	0.149	0.128	0.256	0.000			0.256
58	9.35	9.51	0.16	1084.45	169.2	0.50	Non Liquefiable	0.727	1.99	1729193	0.547	3.16E-04	1.78E-01	0.134	0.115	0.230	0.000			0.256
59	9.51	9.68	0.17	1103.43	171.6	0.50	Non Liquefiable	0.727	1.99	1744256	0.556	3.19E-04	1.80E-01	0.135	0.116	0.232	0.000			0.256
60	9.68	9.84	0.16	1122.40	197.2	0.50	Non Liquefiable	0.728	1.99	1776782	0.565	3.18E-04	1.76E-01	0.129	0.110	0.221	0.000			0.256
61	9.84	10.01	0.17	1141.38	192.7	0.50	Non Liquefiable	0.728	1.98	1755894	0.575	3.27E-04	1.87E-01	0.145	0.124	0.249	0.000			0.256
62	10.01	10.17	0.16	1154.73	171.4	0.51	Non Liquefiable	0.729	1.98	1728551	0.584	3.38E-04	2.01E-01	0.166	0.142	0.285	0.000	0.00	0.00	0.256
63	10.17	10.33	0.16	1163.15	165.3	0.51	0.580	0.729	1.98	1734838	0.593	3.42E-04	2.06E-01	0.170	0.146	0.292	0.000	0.80	0.02	0.271
64	10.33	10.50	0.17	1171.83	158.4	0.51	0.598	0.729	1.98	1741299	0.602	3.46E-04	2.11E-01	0.174	0.149	0.299	0.000	0.80	0.02	0.288
65	10.50	10.66	0.16	1180.51	154.4	0.52	0.592	0.729	1.98	1747735	0.612	3.50E-04	2.16E-01	0.178	0.153	0.306	0.000	0.80	0.02	0.303
66	10.66	10.83	0.17	1189.19	141.6	0.52	0.650	0.729	1.98	1734437	0.621	3.58E-04	2.27E-01	0.194	0.167	0.334	0.000	0.92	0.02	0.322
67	10.83	10.99	0.16	1197.87	150.7	0.53	0.615	0.729	1.98	1760537	0.630	3.58E-04	2.26E-01	0.187	0.160	0.320	0.000	0.80	0.02	0.337
68	10.99	11.15	0.16	1206.28	151.5	0.53	0.561	0.730	1.98	1746859	0.639	3.66E-04	2.38E-01	0.203	0.174	0.349	0.000	0.92	0.02	0.355
69	11.15	11.32	0.17	1214.96	151.9	0.53	0.549	0.730	1.98	1753132	0.649	3.70E-04	2.43E-01	0.208	0.178	0.356	0.000	0.92	0.02	0.373
70	11.32	11.48	0.16	1223.64	174.8	0.54	Non Liquefiable	0.730	1.98	1798932	0.658	3.66E-04	2.34E-01	0.188	0.161	0.322	0.000	0.00	0.00	0.373
71	11.48	11.65	0.17	1232.32	172.5	0.54	Non Liquefiable	0.730	1.98	1785676	0.667	3.74E-04	2.46E-01	0.203	0.175	0.349	0.000	0.00	0.00	0.373
72	11.65	11.81	0.16	1241.00	166.5	0.55	0.555	0.730	1.97	1791953	0.676	3.77E-04	2.51E-01	0.208	0.178	0.356	0.000	0.80	0.02	0.389
73	11.81	11.98	0.17	1249.68	188.6	0.55	Non Liquefiable	0.731	1.97	1837312	0.686	3.73E-04	2.43E-01	0.188	0.161	0.323	0.000	0.00	0.00	0.389
74	11.98	12.14	0.16	1258.36	201.0	0.55	Non Liquefiable	0.731	1.97	1899584	0.695	3.66E-04	2.29E-01	0.163	0.139	0.279	0.000	0.00	0.00	0.389
75	12.14	12.30	0.16	1266.77	183.5	0.56	Non Liquefiable	0.731	1.97	1868908	0.704	3.77E-04	2.46E-01	0.185	0.158	0.317	0.000	0.00	0.00	0.389
76	12.30	12.47	0.17	1275.45	190.6	0.56	Non Liquefiable	0.731	1.97	1912444	0.713	3.73E-04	2.38E-01	0.169	0.145	0.290	0.000	0.00	0.00	0.389
77	12.47	12.63	0.16	1284.13	216.9	0.56	Non Liquefiable	0.731	1.97	1937044	0.722	3.73E-04	2.37E-01	0.163	0.140	0.280	0.000	0.00	0.00	0.389
78	12.63	12.80	0.17	1292.81	239.2	0.57	Non Liquefiable	0.732	1.97	1961410	0.731	3.73E-04	2.36E-01	0.158	0.136	0.271	0.000	0.00	0.00	0.389
79	12.80	12.96	0.16	1301.49	246.9	0.57	Non Liquefiable	0.732	1.97	1950091	0.741	3.80E-04	2.46E-01	0.169	0.145	0.290	0.000	0.00	0.00	0.389
80	12.96	13.12	0.16	1309.90	216.6	0.57	Non Liquefiable	0.732	1.97	1938101	0.750	3.87E-04	2.56E-01	0.181	0.155	0.311	0.000	0.00	0.00	0.389
81	13.12	13.29	0.17	1318.58	221.6	0.58	Non Liquefiable	0.732	1.97	1925813	0.759	3.94E-04	2.67E-01	0.194	0.167	0.334	0.000	0.00	0.00	0.389
82	13.29	13.45	0.16	1327.26	240.5	0.58	Non Liquefiable	0.732	1.97	1932140	0.768	3.97E-04	2.71E-01	0.198	0.170	0.339	0.000	0.00	0.00	0.389
83	13.45	13.62	0.17	1335.94	249.9	0.58	Non Liquefiable	0.732	1.97	1938447	0.777	4.01E-04	2.76E-01	0.201	0.173	0.345	0.000	0.00	0.00	0.389
84	13.62	13.78	0.16	1344.62	265.6	0.58	Non Liquefiable	0.733	1.96	1944734	0.786	4.04E-04	2.80E-01	0.204	0.175	0.351	0.000	0.00	0.00	0.389
85	13.78	13.94	0.16	1353.04	264.3	0.59	Non Liquefiable	0.733	1.96	1931494	0.795	4.12E-04	2.92E-01	0.219	0.188	0.377	0.000	0.00	0.00	0.389
86	13.94	14.11	0.17	1361.72	201.4	0.59	Non Liquefiable	0.733	1.96	1897715	0.804	4.24E-04	3.13E-01	0.250	0.215	0.430	0.000	0.00	0.00	0.389
87	14.11	14.27	0.16	1370.39	176.9	0.59	0.553	0.733	1.96	1883059	0.813	4.32E-04	3.27E-01	0.270	0.232	0.464	0.000	0.80	0.02	0.404
88	14.27	14.44	0.17	1379.07	180.7	0.60	Non Liquefiable	0.733	1.96	1909772	0.823	4.31E-04	3.23E-01	0.258	0.221	0.443	0.000	0.00	0.00	0.404

CYCLIC SETTLEMENT ANALYSIS

Layer No.	Depth of layer below ground surface [ft]		Layer Thickness	H.H. Effective Vertical Stress, σ'_{vo}	Cone Tip Resistance, q_t	Cyclic Stress Ratio, CSR	Calculated Factor of Safety, FS	Dry Settlement										Wet Settlement		Cumulative Settlement
								a	b	Low Strain Shear Modulus G_{max}	Induced Cyclic Stress (γ_{eff} x G_{eff})	γ_{eff} x (G_{eff} / G_{max})	Cyclic Shear Strain, γ_{cyc} (γ_{eff} x 100)	Volumetric Strain M = 7.5	Volumetric Strain M = 6.5	Volumetric Strain w/ 3D Effect	Settlement	Volumetric Strain, %	Settlement	
	Top	Bottom	[ft]	[psf]	[ksf]		$CRR_{7.5}$/CSR*			[psf]	M=7.5 [ksf]		[%]	[%]	[%]	[%]	[inches]	[%]	[inches]	[inches]
89	14.44	14.60	0.16	1387.75	180.1	0.60	Non Liquefiable	0.733	1.96	1915772	0.832	4.34E-04	3.28E-01	0.262	0.225	0.450	0.000	0.00	0.00	0.404
90	14.60	14.76	0.16	1396.17	190.1	0.60	Non Liquefiable	0.734	1.96	1921573	0.841	4.37E-04	3.32E-01	0.266	0.228	0.456	0.000	0.00	0.00	0.404
91	14.76	14.93	0.17	1404.85	213.3	0.60	Non Liquefiable	0.734	1.96	1968127	0.850	4.32E-04	3.19E-01	0.240	0.206	0.412	0.000	0.00	0.00	0.404
92	14.93	15.09	0.16	1413.53	262.2	0.61	Non Liquefiable	0.734	1.96	2050941	0.859	4.19E-04	2.94E-01	0.197	0.169	0.338	0.000	0.00	0.00	0.404
93	15.09	15.26	0.17	1422.21	299.9	0.61	Non Liquefiable	0.734	1.96	2057228	0.868	4.22E-04	2.98E-01	0.200	0.171	0.343	0.000	0.00	0.00	0.404
94	15.26	15.42	0.16	1430.88	263.6	0.61	Non Liquefiable	0.734	1.96	1986282	0.877	4.41E-04	3.33E-01	0.250	0.215	0.429	0.000	0.00	0.00	0.404
95	15.42	15.58	0.16	1439.30	221.4	0.62	0.439	0.734	1.96	1885945	0.886	4.70E-04	3.89E-01	0.344	0.296	0.591	0.000	1.00	0.02	0.423
96	15.58	15.75	0.17	1447.98	212.6	0.62	0.400	0.735	1.96	1868830	0.895	4.79E-04	4.07E-01	0.374	0.321	0.641	0.000	1.07	0.02	0.445
97	15.75	15.91	0.16	1456.66	203.5	0.62	0.363	0.735	1.96	1850990	0.904	4.88E-04	4.26E-01	0.406	0.349	0.697	0.000	1.14	0.02	0.467
98	15.91	16.08	0.17	1465.34	209.5	0.62	0.380	0.735	1.95	1856496	0.913	4.92E-04	4.32E-01	0.412	0.353	0.706	0.000	1.14	0.02	0.490
99	16.08	16.24	0.16	1474.02	222.5	0.63	0.472	0.735	1.95	1952955	0.922	4.72E-04	3.86E-01	0.319	0.274	0.547	0.000	0.80	0.02	0.506
100	16.24	16.40	0.16	1482.43	234.2	0.63	0.483	0.735	1.95	1936515	0.931	4.81E-04	4.02E-01	0.344	0.295	0.590	0.000	0.92	0.02	0.523
101	16.40	16.57	0.17	1491.11	267.5	0.63	Non Liquefiable	0.735	1.95	2006962	0.940	4.68E-04	3.74E-01	0.290	0.249	0.497	0.000	0.00	0.00	0.523
102	16.57	16.73	0.16	1499.79	352.9	0.63	Non Liquefiable	0.736	1.95	2149995	0.949	4.41E-04	3.19E-01	0.203	0.174	0.348	0.000	0.00	0.00	0.523
103	16.73	16.90	0.17	1508.47	431.5	0.63	Non Liquefiable	0.736	1.95	2278181	0.958	4.20E-04	2.81E-01	0.151	0.130	0.260	0.000	0.00	0.00	0.523
104	16.90	17.06	0.16	1517.15	435.4	0.64	Non Liquefiable	0.736	1.95	2317369	0.967	4.17E-04	2.74E-01	0.142	0.122	0.243	0.000	0.00	0.00	0.523
105	17.06	17.22	0.16	1525.56	408.9	0.64	Non Liquefiable	0.736	1.95	2307536	0.976	4.23E-04	2.82E-01	0.149	0.128	0.256	0.000	0.00	0.00	0.523
106	17.22	17.39	0.17	1534.24	333.7	0.64	Non Liquefiable	0.736	1.95	2211104	0.985	4.45E-04	3.20E-01	0.194	0.166	0.333	0.000	0.00	0.00	0.523
107	17.39	17.55	0.16	1542.92	260.7	0.64	Non Liquefiable	0.736	1.95	2083207	0.994	4.77E-04	3.80E-01	0.277	0.238	0.476	0.000	0.00	0.00	0.523
108	17.55	17.72	0.17	1551.60	268.5	0.65	Non Liquefiable	0.736	1.95	2068372	1.003	4.85E-04	3.94E-01	0.296	0.254	0.509	0.000	0.00	0.00	0.523
109	17.72	17.88	0.16	1560.28	304.5	0.65	Non Liquefiable	0.737	1.95	2115232	1.011	4.78E-04	3.79E-01	0.269	0.230	0.461	0.000	0.00	0.00	0.523
110	17.88	18.04	0.16	1568.70	303.4	0.65	Non Liquefiable	0.737	1.95	2100534	1.020	4.86E-04	3.93E-01	0.286	0.246	0.491	0.000	0.00	0.00	0.523
111	18.04	18.21	0.17	1577.38	334.8	0.65	Non Liquefiable	0.737	1.95	2166550	1.029	4.75E-04	3.69E-01	0.247	0.212	0.424	0.000	0.00	0.00	0.523
112	18.21	18.37	0.16	1586.05	373.4	0.65	Non Liquefiable	0.737	1.95	2248128	1.038	4.62E-04	3.41E-01	0.207	0.177	0.354	0.000	0.00	0.00	0.523
113	18.37	18.54	0.17	1594.73	357.5	0.66	Non Liquefiable	0.737	1.94	2217003	1.047	4.72E-04	3.60E-01	0.229	0.196	0.393	0.000	0.00	0.00	0.523
114	18.54	18.70	0.16	1603.41	332.7	0.66	Non Liquefiable	0.737	1.94	2164499	1.056	4.88E-04	3.89E-01	0.268	0.230	0.460	0.000	0.00	0.00	0.523
115	18.70	18.86	0.16	1611.83	338.9	0.66	Non Liquefiable	0.738	1.94	2170172	1.065	4.91E-04	3.93E-01	0.271	0.232	0.465	0.000	0.00	0.00	0.523
116	18.86	19.03	0.17	1620.51	368.2	0.66	Non Liquefiable	0.738	1.94	2215580	1.074	4.85E-04	3.79E-01	0.247	0.212	0.424	0.000	0.00	0.00	0.523
117	19.03	19.19	0.16	1629.19	395.0	0.66	Non Liquefiable	0.738	1.94	2278491	1.082	4.75E-04	3.58E-01	0.217	0.186	0.372	0.000	0.00	0.00	0.523
118	19.19	19.36	0.17	1637.87	391.1	0.67	Non Liquefiable	0.738	1.94	2284552	1.091	4.78E-04	3.62E-01	0.219	0.188	0.376	0.000	0.00	0.00	0.523
119	19.36	19.52	0.16	1646.54	386.3	0.67	Non Liquefiable	0.738	1.94	2290597	1.100	4.80E-04	3.65E-01	0.221	0.190	0.379	0.000	0.00	0.00	0.523
120	19.52	19.69	0.17	1655.22	404.1	0.67	Non Liquefiable	0.738	1.94	2315148	1.109	4.79E-04	3.61E-01	0.213	0.183	0.366	0.000	0.00	0.00	0.523
121	19.69	19.85	0.16	1663.90	411.5	0.67	Non Liquefiable	0.738	1.94	2321210	1.118	4.82E-04	3.64E-01	0.215	0.185	0.369	0.000	0.00	0.00	0.523
122	19.85	20.01	0.16	1672.32	399.0	0.67	Non Liquefiable	0.739	1.94	2289533	1.127	4.92E-04	3.83E-01	0.238	0.204	0.408	0.000	0.00	0.00	0.523
123	20.01	20.18	0.17	1681.00	338.6	0.68	Non Liquefiable	0.739	1.94	2216248	1.136	5.12E-04	4.23E-01	0.291	0.250	0.500	0.000	0.00	0.00	0.523
124	20.18	20.34	0.16	1689.68	303.2	0.68	Non Liquefiable	0.739	1.94	2201195	1.144	5.20E-04	4.37E-01	0.310	0.266	0.532	0.000	0.00	0.00	0.523
125	20.34	20.51	0.17	1698.36	290.2	0.68	Non Liquefiable	0.739	1.94	2206841	1.153	5.23E-04	4.41E-01	0.312	0.268	0.536	0.000	0.00	0.00	0.523
126	20.51	20.67	0.16	1707.03	287.7	0.68	Non Liquefiable	0.739	1.94	2191197	1.162	5.30E-04	4.56E-01	0.333	0.285	0.571	0.000	0.00	0.00	0.523
127	20.67	20.83	0.16	1715.45	258.5	0.68	Non Liquefiable	0.739	1.94	2152648	1.171	5.44E-04	4.84E-01	0.375	0.322	0.644	0.000	0.00	0.00	0.523
128	20.83	21.00	0.17	1724.13	267.1	0.68	Non Liquefiable	0.739	1.94	2180337	1.179	5.41E-04	4.75E-01	0.357	0.307	0.613	0.000	0.00	0.00	0.523
129	21.00	21.16	0.16	1732.81	290.9	0.69	Non Liquefiable	0.739	1.94	2207677	1.188	5.38E-04	4.67E-01	0.341	0.292	0.585	0.000	0.00	0.00	0.523
130	21.16	21.33	0.17	1741.49	297.7	0.69	Non Liquefiable	0.740	1.93	2213199	1.197	5.41E-04	4.71E-01	0.343	0.295	0.589	0.000	0.00	0.00	0.523
131	21.33	21.49	0.16	1750.17	284.9	0.69	Non Liquefiable	0.740	1.93	2196738	1.206	5.49E-04	4.87E-01	0.366	0.314	0.628	0.000	0.00	0.00	0.523
132	21.49	21.65	0.16	1758.58	258.4	0.69	Non Liquefiable	0.740	1.93	2179543	1.214	5.57E-04	5.04E-01	0.391	0.335	0.670	0.000	0.00	0.00	0.523
133	21.65	21.82	0.17	1767.26	241.8	0.69	Non Liquefiable	0.740	1.93	2161913	1.223	5.66E-04	5.22E-01	0.418	0.358	0.717	0.000	0.00	0.00	0.523
134	21.82	21.98	0.16	1775.94	231.9	0.69	0.524	0.740	1.93	2143657	1.232	5.75E-04	5.41E-01	0.447	0.384	0.768	0.000	0.80	0.02	0.539
135	21.98	22.15	0.17	1784.62	245.1	0.70	0.404	0.740	1.93	2124742	1.241	5.84E-04	5.62E-01	0.480	0.412	0.824	0.000	0.92	0.02	0.557
136	22.15	22.31	0.16	1793.30	254.2	0.70	0.408	0.740	1.93	2129902	1.250	5.87E-04	5.66E-01	0.484	0.415	0.830	0.000	0.92	0.02	0.575
137	22.31	22.47	0.16	1801.71	248.0	0.70	0.437	0.741	1.93	2134894	1.258	5.89E-04	5.70E-01	0.487	0.418	0.836	0.000	0.92	0.02	0.593

CYCLIC SETTLEMENT ANALYSIS

Layer No.	Depth of layer below ground surface [ft]		Layer Thickness	H.H. Effective Vertical Stress, σ'_{vo}	Cone Tip Resistance, q_t	Cyclic Stress Ratio, CSR	Calculated Factor of Safety, FS	Dry Settlement										Wet Settlement		Cumulative Settlement
								a	b	Low Strain Shear Modulus G_{max}	Induced Cyclic Stress (γ_{eff} x G_{eff})	γ_{eff} x (G_{eff} / G_{max})	Cyclic Shear Strain, γ_{cyc} (γ_{eff} x 100)	Volumetric Strain M = 7.5	Volumetric Strain M = 6.5	Volumetric Strain w/ 3D Effect	Settlement	Volumetric Strain, %	Settlement	
	Top	Bottom	[ft]	[psf]	[ksf]		$CRR_{7.5}$/CSR*			[psf]	M=7.5 [ksf]		[%]	[%]	[%]	[%]	[inches]	[%]	[inches]	[inches]
138	22.47	22.64	0.17	1810.39	248.8	0.70	0.451	0.741	1.93	2164350	1.267	5.85E-04	5.57E-01	0.460	0.395	0.790	0.000	0.80	0.02	0.609
139	22.64	22.80	0.16	1819.07	251.5	0.70	0.457	0.741	1.93	2169532	1.276	5.88E-04	5.61E-01	0.464	0.398	0.796	0.000	0.80	0.02	0.625
140	22.80	22.97	0.17	1827.75	257.0	0.70	Non Liquefiable	0.741	1.93	2198601	1.284	5.84E-04	5.49E-01	0.439	0.377	0.754	0.000	0.00	0.00	0.625
141	22.97	23.13	0.16	1836.43	283.8	0.70	Non Liquefiable	0.741	1.93	2227262	1.293	5.81E-04	5.38E-01	0.417	0.358	0.715	0.000	0.00	0.00	0.625
142	23.13	23.29	0.16	1844.85	276.7	0.71	Non Liquefiable	0.741	1.93	2208859	1.302	5.89E-04	5.56E-01	0.445	0.382	0.764	0.000	0.00	0.00	0.625
143	23.29	23.46	0.17	1853.53	268.1	0.71	Non Liquefiable	0.741	1.93	2214049	1.310	5.92E-04	5.60E-01	0.448	0.384	0.769	0.000	0.00	0.00	0.625
144	23.46	23.62	0.16	1862.20	264.1	0.71	Non Liquefiable	0.741	1.93	2219226	1.319	5.94E-04	5.64E-01	0.451	0.387	0.774	0.000	0.00	0.00	0.625
145	23.62	23.79	0.17	1870.88	256.3	0.71	Non Liquefiable	0.742	1.93	2224392	1.328	5.97E-04	5.68E-01	0.454	0.390	0.779	0.000	0.00	0.00	0.625
146	23.79	23.95	0.16	1879.56	254.3	0.71	Non Liquefiable	0.742	1.93	2205309	1.336	6.06E-04	5.88E-01	0.486	0.417	0.834	0.000	0.00	0.00	0.625
147	23.95	24.11	0.16	1887.98	257.1	0.71	Non Liquefiable	0.742	1.93	2210241	1.345	6.08E-04	5.91E-01	0.489	0.419	0.839	0.000	0.00	0.00	0.625
148	24.11	24.28	0.17	1896.66	273.0	0.71	Non Liquefiable	0.742	1.92	2239661	1.353	6.04E-04	5.78E-01	0.463	0.397	0.794	0.000	0.00	0.00	0.625
149	24.28	24.44	0.16	1905.34	276.6	0.71	Non Liquefiable	0.742	1.92	2244780	1.362	6.07E-04	5.82E-01	0.466	0.399	0.799	0.000	0.00	0.00	0.625
150	24.44	24.61	0.17	1914.02	280.4	0.72	Non Liquefiable	0.742	1.92	2249887	1.371	6.09E-04	5.86E-01	0.468	0.402	0.804	0.000	0.00	0.00	0.625
151	24.61	24.77	0.16	1922.69	314.0	0.72	Non Liquefiable	0.742	1.92	2302469	1.379	5.99E-04	5.58E-01	0.419	0.360	0.720	0.000	0.00	0.00	0.625
152	24.77	24.93	0.16	1931.11	373.7	0.72	Non Liquefiable	0.742	1.92	2397203	1.388	5.79E-04	5.08E-01	0.341	0.292	0.585	0.000	0.00	0.00	0.625
153	24.93	25.10	0.17	1939.79	403.4	0.72	Non Liquefiable	0.743	1.92	2445116	1.397	5.71E-04	4.89E-01	0.311	0.267	0.534	0.000	0.00	0.00	0.625
154	25.10	25.26	0.16	1948.47	360.8	0.72	Non Liquefiable	0.743	1.92	2407953	1.405	5.84E-04	5.14E-01	0.345	0.296	0.592	0.000	0.00	0.00	0.625
155	25.26	25.43	0.17	1957.15	372.9	0.72	Non Liquefiable	0.743	1.92	2434858	1.414	5.81E-04	5.06E-01	0.330	0.283	0.566	0.000	0.00	0.00	0.625
156	25.43	25.59	0.16	1965.83	346.9	0.72	Non Liquefiable	0.743	1.92	2418655	1.422	5.88E-04	5.20E-01	0.349	0.299	0.599	0.000	0.00	0.00	0.625
157	25.59	25.75	0.16	1974.24	313.6	0.72	Non Liquefiable	0.743	1.92	2356463	1.431	6.07E-04	5.63E-01	0.410	0.352	0.704	0.000	0.00	0.00	0.625
158	25.75	25.92	0.17	1982.92	286.7	0.73	Non Liquefiable	0.743	1.92	2338253	1.439	6.16E-04	5.81E-01	0.436	0.374	0.749	0.000	0.00	0.00	0.625
159	25.92	26.08	0.16	1991.60	285.0	0.73	Non Liquefiable	0.743	1.92	2343364	1.448	6.18E-04	5.84E-01	0.439	0.376	0.753	0.000	0.00	0.00	0.625
160	26.08	26.25	0.17	2000.28	288.2	0.73	Non Liquefiable	0.743	1.92	2348464	1.457	6.20E-04	5.87E-01	0.441	0.378	0.757	0.000	0.00	0.00	0.625
161	26.25	26.41	0.16	2008.96	273.5	0.73	Non Liquefiable	0.744	1.92	2305013	1.465	6.36E-04	6.23E-01	0.498	0.428	0.855	0.000	0.00	0.00	0.625
162	26.41	26.57	0.16	2017.37	262.5	0.73	Non Liquefiable	0.744	1.92	2309836	1.473	6.38E-04	6.26E-01	0.501	0.430	0.860	0.000	0.00	0.00	0.625
163	26.57	26.74	0.17	2026.05	285.0	0.73	Non Liquefiable	0.744	1.92	2363546	1.482	6.27E-04	5.96E-01	0.448	0.384	0.769	0.000	0.00	0.00	0.625
164	26.74	26.90	0.16	2034.73	286.7	0.73	Non Liquefiable	0.744	1.92	2344432	1.491	6.36E-04	6.15E-01	0.477	0.409	0.818	0.000	0.00	0.00	0.625
165	26.90	27.07	0.17	2043.41	302.9	0.73	Non Liquefiable	0.744	1.92	2349427	1.499	6.38E-04	6.19E-01	0.479	0.411	0.823	0.000	0.00	0.00	0.625
166	27.07	27.23	0.16	2052.09	301.9	0.73	Non Liquefiable	0.744	1.92	2354411	1.508	6.40E-04	6.22E-01	0.482	0.413	0.827	0.000	0.00	0.00	0.625
167	27.23	27.40	0.17	2060.77	287.5	0.74	Non Liquefiable	0.744	1.92	2334547	1.516	6.49E-04	6.42E-01	0.514	0.441	0.882	0.000	0.00	0.00	0.625
168	27.40	27.56	0.16	2069.45	285.8	0.74	Non Liquefiable	0.744	1.91	2314027	1.525	6.59E-04	6.64E-01	0.549	0.471	0.942	0.000	0.00	0.00	0.625
169	27.56	27.72	0.16	2077.86	286.7	0.74	0.433	0.744	1.91	2318727	1.533	6.61E-04	6.67E-01	0.551	0.473	0.946	0.000	0.80	0.02	0.640
170	27.72	27.89	0.17	2086.54	306.0	0.74	Non Liquefiable	0.745	1.91	2349101	1.542	6.56E-04	6.51E-01	0.521	0.447	0.894	0.000	0.00	0.00	0.640
171	27.89	28.05	0.16	2095.22	347.8	0.74	Non Liquefiable	0.745	1.91	2403553	1.550	6.45E-04	6.20E-01	0.466	0.400	0.800	0.000	0.00	0.00	0.640
172	28.05	28.22	0.17	2103.90	344.1	0.74	Non Liquefiable	0.745	1.91	2432613	1.559	6.41E-04	6.07E-01	0.443	0.380	0.760	0.000	0.00	0.00	0.640
173	28.22	28.38	0.16	2112.58	334.8	0.74	Non Liquefiable	0.745	1.91	2413489	1.567	6.49E-04	6.26E-01	0.470	0.403	0.807	0.000	0.00	0.00	0.640
174	28.38	28.54	0.16	2121.00	294.5	0.74	Non Liquefiable	0.745	1.91	2342670	1.575	6.72E-04	6.83E-01	0.564	0.484	0.968	0.000	0.00	0.00	0.640
175	28.54	28.71	0.17	2129.68	262.2	0.74	0.477	0.745	1.91	2294088	1.584	6.90E-04	7.28E-01	0.645	0.553	1.107	0.000	1.00	0.02	0.660
176	28.71	28.87	0.16	2138.35	255.9	0.74	0.518	0.745	1.91	2298758	1.592	6.93E-04	7.31E-01	0.648	0.556	1.111	0.000	1.00	0.02	0.679
177	28.87	29.04	0.17	2147.03	264.4	0.75	0.509	0.745	1.91	2330520	1.601	6.87E-04	7.12E-01	0.609	0.523	1.045	0.000	0.92	0.02	0.698
178	29.04	29.20	0.16	2155.71	263.1	0.75	0.457	0.745	1.91	2308069	1.609	6.97E-04	7.38E-01	0.653	0.561	1.121	0.000	1.00	0.02	0.717
179	29.20	29.36	0.16	2164.13	266.1	0.75	0.407	0.746	1.91	2312570	1.617	6.99E-04	7.41E-01	0.656	0.563	1.126	0.000	1.00	0.02	0.737
180	29.36	29.53	0.17	2172.81	284.7	0.75	0.397	0.746	1.91	2317202	1.626	7.02E-04	7.44E-01	0.659	0.565	1.131	0.000	1.00	0.02	0.757
181	29.53	29.69	0.16	2181.49	277.7	0.75	0.337	0.746	1.91	2293849	1.634	7.12E-04	7.71E-01	0.708	0.608	1.215	0.000	1.07	0.02	0.778
182	29.69	29.86	0.17	2190.17	269.2	0.75	0.313	0.746	1.91	2269675	1.643	7.24E-04	8.00E-01	0.763	0.655	1.310	0.000	1.14	0.02	0.801
183	29.86	30.02	0.16	2198.84	278.8	0.75	0.321	0.746	1.91	2302957	1.651	7.17E-04	7.77E-01	0.714	0.613	1.225	0.000	1.07	0.02	0.821
184	30.02	30.18	0.16	2207.26	267.0	0.75	0.341	0.746	1.91	2278515	1.658	7.28E-04	8.05E-01	0.768	0.659	1.317	0.000	1.14	0.02	0.843
185	30.18	30.35	0.17	2215.94	258.3	0.75	0.366	0.746	1.91	2282990	1.665	7.29E-04	8.06E-01	0.769	0.659	1.319	0.000	1.14	0.02	0.867
186	30.35	30.51	0.16	2224.62	248.6	0.75	0.389	0.746	1.91	2287457	1.671	7.31E-04	8.07E-01	0.769	0.660	1.320	0.000	1.14	0.02	0.888

CYCLIC SETTLEMENT ANALYSIS

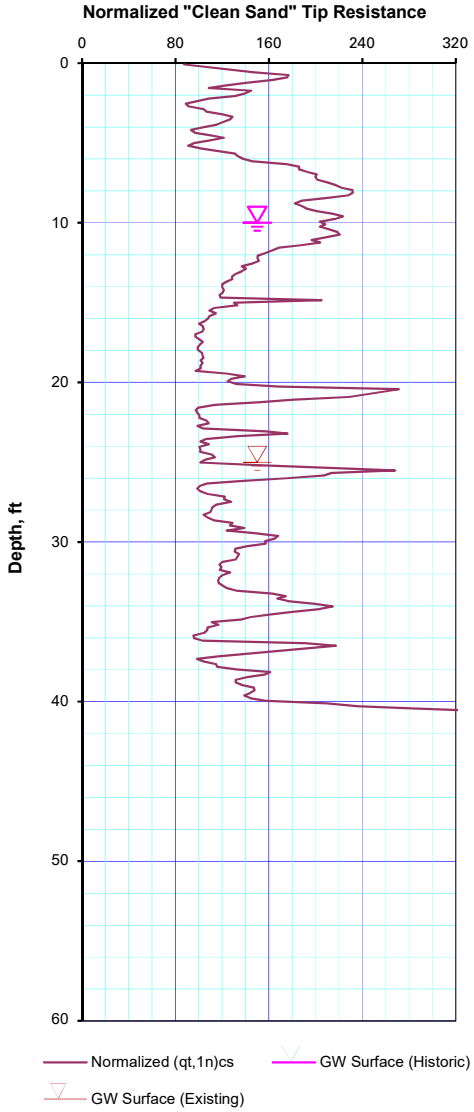
Layer No.	Depth of layer below ground surface [ft]		Layer Thickness	H.H. Effective Vertical Stress, σ'_{vo}	Cone Tip Resistance, q_t	Cyclic Stress Ratio, CSR	Calculated Factor of Safety, FS	Dry Settlement										Wet Settlement		Cumulative Settlement
								a	b	Low Strain Shear Modulus G_{max}	Induced Cyclic Stress (γ_{eff} x G_{eff})	γ_{eff} x (G_{eff} / G_{max})	Cyclic Shear Strain, γ_{cyc} (γ_{eff} x 100)	Volumetric Strain M = 7.5	Volumetric Strain M = 6.5	Volumetric Strain w/ 3D Effect	Settlement	Volumetric Strain, %	Settlement	
	Top	Bottom	[ft]	[psf]	[ksf]		$CRR_{7.5}$/CSR*			[psf]	M=7.5 [ksf]		[%]	[%]	[%]	[%]	[inches]	[%]	[inches]	[inches]
187	30.51	30.68	0.17	2233.30	246.2	0.75	0.392	0.746	1.91	2291915	1.678	7.32E-04	8.08E-01	0.770	0.661	1.322	0.000	1.14	0.02	0.912
188	30.68	30.84	0.16	2241.98	251.4	0.75	0.398	0.747	1.91	2296364	1.684	7.34E-04	8.09E-01	0.771	0.662	1.323	0.000	1.14	0.02	0.934
189	30.84	31.00	0.16	2250.39	265.9	0.75	0.405	0.747	1.91	2329795	1.691	7.26E-04	7.83E-01	0.719	0.617	1.234	0.000	1.07	0.02	0.954
190	31.00	31.17	0.17	2259.07	279.8	0.75	0.393	0.747	1.90	2362753	1.697	7.18E-04	7.59E-01	0.673	0.577	1.154	0.000	1.00	0.02	0.974
191	31.17	31.33	0.16	2267.75	278.4	0.75	0.381	0.747	1.90	2338763	1.704	7.29E-04	7.85E-01	0.721	0.618	1.237	0.000	1.07	0.02	0.995
192	31.33	31.50	0.17	2276.43	287.2	0.75	0.357	0.747	1.90	2343234	1.710	7.30E-04	7.85E-01	0.721	0.619	1.238	0.000	1.07	0.02	1.017
193	31.50	31.66	0.16	2285.11	301.9	0.75	0.354	0.747	1.90	2376330	1.717	7.22E-04	7.62E-01	0.675	0.579	1.158	0.000	1.00	0.02	1.036
194	31.66	31.82	0.16	2293.52	303.4	0.75	0.345	0.747	1.90	2380702	1.723	7.24E-04	7.62E-01	0.675	0.579	1.158	0.000	1.00	0.02	1.055
195	31.82	31.99	0.17	2302.20	297.9	0.75	0.351	0.747	1.90	2385202	1.730	7.25E-04	7.63E-01	0.676	0.580	1.159	0.000	1.00	0.02	1.076
196	31.99	32.15	0.16	2310.88	305.8	0.75	0.365	0.747	1.90	2389694	1.736	7.26E-04	7.63E-01	0.676	0.580	1.160	0.000	1.00	0.02	1.095
197	32.15	32.32	0.17	2319.56	325.5	0.75	Non Liquefiable	0.747	1.90	2449876	1.742	7.11E-04	7.20E-01	0.595	0.510	1.021	0.000	0.00	0.00	1.095
198	32.32	32.48	0.16	2328.24	327.3	0.75	Non Liquefiable	0.748	1.90	2454455	1.749	7.12E-04	7.20E-01	0.595	0.511	1.022	0.000	0.00	0.00	1.095
199	32.48	32.64	0.16	2336.66	310.6	0.75	0.409	0.748	1.90	2431257	1.755	7.22E-04	7.42E-01	0.635	0.544	1.089	0.000	0.92	0.02	1.113
200	32.64	32.81	0.17	2345.34	305.0	0.75	0.393	0.748	1.90	2407442	1.761	7.31E-04	7.65E-01	0.678	0.582	1.163	0.000	1.00	0.02	1.133
201	32.81	32.97	0.16	2354.01	303.4	0.75	0.386	0.748	1.90	2411892	1.767	7.33E-04	7.66E-01	0.678	0.582	1.164	0.000	1.00	0.02	1.152
202	32.97	33.14	0.17	2362.69	283.1	0.75	0.354	0.748	1.90	2357376	1.773	7.52E-04	8.17E-01	0.779	0.669	1.337	0.000	1.14	0.02	1.175
203	33.14	33.30	0.16	2371.37	271.5	0.75	0.324	0.748	1.90	2331027	1.780	7.63E-04	8.46E-01	0.839	0.720	1.439	0.000	1.21	0.02	1.199
204	33.30	33.46	0.16	2379.79	276.0	0.75	0.327	0.748	1.90	2365889	1.786	7.55E-04	8.18E-01	0.780	0.669	1.338	0.000	1.14	0.02	1.221
205	33.46	33.63	0.17	2388.47	285.9	0.75	0.349	0.748	1.90	2370199	1.792	7.56E-04	8.18E-01	0.780	0.669	1.339	0.000	1.14	0.02	1.244
206	33.63	33.79	0.16	2397.15	297.2	0.75	0.367	0.748	1.90	2404562	1.798	7.48E-04	7.92E-01	0.727	0.624	1.248	0.000	1.07	0.02	1.264
207	33.79	33.96	0.17	2405.83	318.9	0.75	0.400	0.748	1.90	2466979	1.804	7.31E-04	7.45E-01	0.637	0.546	1.093	0.000	0.92	0.02	1.283
208	33.96	34.12	0.16	2414.50	370.5	0.75	Non Liquefiable	0.749	1.90	2553865	1.810	7.09E-04	6.85E-01	0.531	0.455	0.910	0.000	0.00	0.00	1.283
209	34.12	34.28	0.16	2422.92	388.6	0.75	Non Liquefiable	0.749	1.90	2584689	1.816	7.03E-04	6.67E-01	0.501	0.430	0.860	0.000	0.00	0.00	1.283
210	34.28	34.45	0.17	2431.60	337.5	0.75	0.411	0.749	1.90	2480158	1.822	7.35E-04	7.45E-01	0.637	0.547	1.093	0.000	0.92	0.02	1.302
211	34.45	34.61	0.16	2440.28	308.6	0.75	0.383	0.749	1.90	2455687	1.828	7.44E-04	7.68E-01	0.680	0.584	1.167	0.000	1.00	0.02	1.321
212	34.61	34.78	0.17	2448.96	300.9	0.75	0.399	0.749	1.90	2430408	1.834	7.55E-04	7.93E-01	0.728	0.625	1.249	0.000	1.07	0.02	1.343
213	34.78	34.94	0.16	2457.64	273.1	0.75	0.355	0.749	1.90	2373046	1.840	7.75E-04	8.47E-01	0.840	0.721	1.442	0.000	1.21	0.02	1.366
214	34.94	35.10	0.16	2466.05	261.5	0.75	0.321	0.749	1.89	2344979	1.846	7.87E-04	8.78E-01	0.907	0.778	1.556	0.000	1.29	0.02	1.391
215	35.10	35.27	0.17	2474.73	257.2	0.75	0.325	0.749	1.89	2349102	1.852	7.88E-04	8.78E-01	0.907	0.778	1.556	0.000	1.29	0.03	1.417
216	35.27	35.43	0.16	2483.41	248.4	0.75	0.364	0.749	1.89	2353217	1.857	7.89E-04	8.78E-01	0.907	0.778	1.556	0.000	1.29	0.02	1.442
217	35.43	35.60	0.17	2492.09	266.2	0.75	0.350	0.749	1.89	2389622	1.863	7.80E-04	8.47E-01	0.840	0.721	1.442	0.000	1.21	0.02	1.467
218	35.60	35.76	0.16	2500.77	284.3	0.75	0.376	0.750	1.89	2425280	1.869	7.71E-04	8.19E-01	0.781	0.670	1.340	0.000	1.14	0.02	1.489
219	35.76	35.93	0.17	2509.45	334.3	0.75	0.371	0.750	1.89	2490247	1.875	7.53E-04	7.68E-01	0.680	0.584	1.167	0.000	1.00	0.02	1.509
220	35.93	36.09	0.16	2518.13	325.7	0.75	0.345	0.750	1.89	2464492	1.881	7.63E-04	7.92E-01	0.728	0.624	1.249	0.000	1.07	0.02	1.529
221	36.09	36.25	0.16	2526.54	300.6	0.75	0.319	0.750	1.89	2437746	1.886	7.74E-04	8.18E-01	0.780	0.670	1.339	0.000	1.14	0.02	1.551
222	36.25	36.42	0.17	2535.22	292.8	0.75	0.298	0.750	1.89	2410212	1.892	7.85E-04	8.46E-01	0.839	0.720	1.440	0.000	1.21	0.02	1.576
223	36.42	36.58	0.16	2543.90	250.2	0.75	0.272	0.750	1.89	2313618	1.898	8.20E-04	9.45E-01	1.065	0.914	1.828	0.000	1.43	0.03	1.603
224	36.58	36.75	0.17	2552.58	241.2	0.75	0.269	0.750	1.89	2317561	1.903	8.21E-04	9.44E-01	1.065	0.913	1.827	0.000	1.43	0.03	1.633
225	36.75	36.91	0.16	2561.26	244.7	0.75	0.287	0.750	1.89	2321498	1.909	8.22E-04	9.44E-01	1.064	0.913	1.826	0.000	1.43	0.03	1.660
226	36.91	37.07	0.16	2569.67	236.7	0.74	0.261	0.750	1.89	2289529	1.914	8.36E-04	9.82E-01	1.160	0.996	1.991	0.000	1.50	0.03	1.689
227	37.07	37.24	0.17	2578.35	228.0	0.74	0.251	0.750	1.89	2293392	1.920	8.37E-04	9.82E-01	1.160	0.995	1.990	0.000	1.50	0.03	1.720
228	37.24	37.40	0.16	2587.03	213.8	0.74	0.255	0.750	1.89	2260190	1.926	8.52E-04	1.02E+00	1.270	1.090	2.179	0.000	1.57	0.03	1.750
229	37.40	37.57	0.17	2595.71	200.9	0.74	0.301	0.751	1.89	2263978	1.931	8.53E-04	1.02E+00	1.269	1.089	2.178	0.000	1.57	0.03	1.782
230	37.57	37.73	0.16	2604.39	198.0	0.74	0.352	0.751	1.89	2267760	1.937	8.54E-04	1.02E+00	1.268	1.088	2.176	0.000	1.57	0.03	1.812
231	37.73	37.89	0.16	2612.81	205.9	0.74	0.345	0.751	1.89	2308664	1.942	8.41E-04	9.80E-01	1.157	0.993	1.985	0.000	1.50	0.03	1.841
232	37.89	38.06	0.17	2621.49	198.8	0.74	0.346	0.751	1.89	2275190	1.947	8.56E-04	1.02E+00	1.267	1.087	2.173	0.000	1.57	0.03	1.873
233	38.06	38.22	0.16	2630.16	182.8	0.74	0.980	0.751	1.89	2240320	1.953	8.72E-04	1.07E+00	1.393	1.195	2.391	0.000	1.64	0.03	1.904
234	38.22	38.39	0.17	2638.84	167.9	0.74	2.000	0.751	1.89	2203933	1.958	8.88E-04	1.12E+00	1.541	1.322	2.644	0.000	0.00	0.00	1.904
235	38.39	38.55	0.16	2647.52	154.9	0.74	2.000	0.751	1.89	2165892	1.964	9.07E-04	1.17E+00	1.714	1.470	2.941	0.000	0.00	0.00	1.904

CYCLIC SETTLEMENT ANALYSIS

Layer No.	Depth of layer below ground surface [ft]		Layer Thickness	H.H. Effective Vertical Stress, σ'_{vo}	Cone Tip Resistance, q_t	Cyclic Stress Ratio, CSR	Calculated Factor of Safety, FS	Dry Settlement										Wet Settlement		Cumulative Settlement
								a	b	Low Strain Shear Modulus G_{max}	Induced Cyclic Stress (γ_{eff} x G_{eff})	γ_{eff} x (G_{eff} / G_{max})	Cyclic Shear Strain, γ_{cyc} (γ_{eff} x 100)	Volumetric Strain M = 7.5	Volumetric Strain M = 6.5	Volumetric Strain w/ 3D Effect	Settlement	Volumetric Strain, %	Settlement	
	Top	Bottom	[ft]	[psf]	[ksf]		$CRR_{7.5}$/CSR*			[psf]	M=7.5 [ksf]		[%]	[%]	[%]	[%]	[inches]	[%]	[inches]	[inches]
236	38.55	38.71	0.16	2655.94	140.7	0.74	2.000	0.751	1.89	2125934	1.969	9.26E-04	1.24E+00	1.919	1.646	3.293	0.000	0.00	0.00	1.904
237	38.71	38.88	0.17	2664.62	112.2	0.74	1.728	0.751	1.89	2129404	1.974	9.27E-04	1.24E+00	1.917	1.645	3.290	0.000	0.00	0.00	1.904
238	38.88	39.04	0.16	2673.30	106.8	0.74	1.635	0.751	1.89	2132869	1.979	9.28E-04	1.24E+00	1.915	1.643	3.287	0.000	0.00	0.00	1.904
239	39.04	39.21	0.17	2681.98	110.3	0.74	1.685	0.751	1.89	2136329	1.985	9.29E-04	1.23E+00	1.913	1.642	3.283	0.000	0.00	0.00	1.904
240	39.21	39.37	0.16	2690.65	103.3	0.74	1.567	0.752	1.89	2094241	1.990	9.50E-04	1.31E+00	2.158	1.852	3.704	0.000	0.00	0.00	1.904
241	39.37	39.53	0.16	2699.07	115.0	0.74	1.746	0.752	1.88	2049827	1.995	9.73E-04	1.39E+00	2.455	2.107	4.214	0.000	0.00	0.00	1.904
242	39.53	39.70	0.17	2707.75	110.6	0.74	1.671	0.752	1.88	2146569	2.000	9.32E-04	1.23E+00	1.907	1.637	3.273	0.000	0.00	0.00	1.904
243	39.70	39.86	0.16	2716.43	114.2	0.74	1.721	0.752	1.88	2056407	2.005	9.75E-04	1.38E+00	2.450	2.102	4.204	0.000	0.00	0.00	1.904
244	39.86	40.03	0.17	2725.11	111.6	0.74	1.674	0.752	1.88	2153439	2.010	9.34E-04	1.23E+00	1.903	1.633	3.266	0.000	0.00	0.00	1.904
245	40.03	40.19	0.16	2733.79	98.3	0.74	1.460	0.752	1.88	2110960	2.015	9.55E-04	1.30E+00	2.146	1.841	3.683	0.000	0.00	0.00	1.904
246	40.19	40.35	0.16	2742.20	87.1	0.74	1.281	0.752	1.88	2066140	2.020	9.78E-04	1.38E+00	2.441	2.094	4.189	0.000	2.00	0.04	1.943
247	40.35	40.52	0.17	2750.88	80.7	0.74	1.177	0.752	1.88	2018914	2.025	1.00E-03	1.47E+00	2.804	2.405	4.811	0.000	2.10	0.04	1.985
248	40.52	40.68	0.16	2759.56	85.4	0.74	1.246	0.752	1.88	2072669	2.031	9.80E-04	1.37E+00	2.435	2.089	4.178	0.000	2.00	0.04	2.024
249	40.68	40.85	0.17	2768.24	103.3	0.74	1.516	0.752	1.88	2025273	2.036	1.01E-03	1.47E+00	2.796	2.399	4.798	0.000	0.00	0.00	2.024
250	40.85	41.01	0.16	2776.92	137.0	0.73	2.000	0.752	1.88	2127548	2.041	9.59E-04	1.29E+00	2.133	1.830	3.659	0.000	0.00	0.00	2.024
251	41.01	41.17	0.16	2785.33	142.5	0.73	2.000	0.752	1.88	2130769	2.045	9.60E-04	1.29E+00	2.130	1.827	3.655	0.000	0.00	0.00	2.024
252	41.17	41.34	0.17	2794.01	163.6	0.73	1.814	0.753	1.88	2225006	2.050	9.21E-04	1.15E+00	1.682	1.443	2.886	0.000	0.00	0.00	2.024
253	41.34	41.50	0.16	2802.69	193.3	0.73	0.555	0.753	1.88	2312631	2.055	8.89E-04	1.05E+00	1.364	1.171	2.341	0.000	1.64	0.03	2.055
254	41.50	41.67	0.17	2811.37	128.1	0.73	1.866	0.753	1.88	2140705	2.060	9.62E-04	1.28E+00	2.121	1.820	3.639	0.000	0.00	0.00	2.055
255	41.67	41.83	0.16	2820.05	144.5	0.73	2.000	0.753	1.88	2144007	2.065	9.63E-04	1.28E+00	2.118	1.817	3.634	0.000	0.00	0.00	2.055
256	41.83	41.99	0.16	2828.47	133.8	0.73	1.939	0.753	1.88	2147204	2.070	9.64E-04	1.28E+00	2.115	1.814	3.629	0.000	0.00	0.00	2.055
257	41.99	42.16	0.17	2837.15	162.9	0.73	1.138	0.753	1.88	2197260	2.074	9.44E-04	1.21E+00	1.871	1.605	3.210	0.000	1.86	0.04	2.093
258	42.16	42.32	0.16	2845.82	309.8	0.73	0.318	0.753	1.88	2519079	2.079	8.25E-04	8.50E-01	0.878	0.753	1.507	0.000	1.29	0.02	2.118
259	42.32	42.49	0.17	2854.50	361.4	0.73	0.347	0.753	1.88	2623940	2.084	7.94E-04	7.68E-01	0.705	0.605	1.210	0.000	1.07	0.02	2.140
260	42.49	42.65	0.16	2863.18	351.0	0.73	0.354	0.753	1.88	2595073	2.089	8.05E-04	7.92E-01	0.755	0.648	1.296	0.000	1.14	0.02	2.162
261	42.65	42.81	0.16	2871.60	299.4	0.73	0.302	0.753	1.88	2494816	2.093	8.39E-04	8.77E-01	0.946	0.812	1.624	0.000	1.36	0.03	2.188
262	42.81	42.98	0.17	2880.28	280.4	0.73	0.253	0.753	1.88	2461834	2.098	8.52E-04	9.10E-01	1.026	0.880	1.760	0.000	1.43	0.03	2.217
263	42.98	43.14	0.16	2888.96	268.1	0.73	0.224	0.754	1.88	2388441	2.102	8.80E-04	9.86E-01	1.223	1.049	2.098	0.000	1.57	0.03	2.247
264	43.14	43.31	0.17	2897.64	250.4	0.73	0.201	0.754	1.88	2351475	2.107	8.96E-04	1.03E+00	1.343	1.152	2.305	0.000	1.64	0.03	2.281
265	43.31	43.47	0.16	2906.31	233.1	0.73	0.185	0.754	1.88	2312932	2.112	9.13E-04	1.08E+00	1.483	1.272	2.545	0.000	1.71	0.03	2.313
266	43.47	43.64	0.17	2914.99	217.0	0.73	0.182	0.754	1.88	2272667	2.116	9.31E-04	1.13E+00	1.647	1.413	2.826	0.000	1.79	0.04	2.350
267	43.64	43.80	0.16	2923.67	164.2	0.73	0.209	0.754	1.88	2183042	2.121	9.71E-04	1.26E+00	2.077	1.782	3.565	0.000	1.92	0.04	2.387
268	43.80	43.96	0.16	2932.09	199.7	0.72	0.377	0.754	1.88	2323165	2.125	9.15E-04	1.07E+00	1.476	1.266	2.532	0.000	1.71	0.03	2.420
269	43.96	44.13	0.17	2940.77	182.7	0.72	Non Liquefiable	0.754	1.88	2326601	2.130	9.15E-04	1.07E+00	1.473	1.264	2.528	0.000	0.00	0.00	2.420
270	44.13	44.29	0.16	2949.45	220.5	0.72	Non Liquefiable	0.754	1.87	2452886	2.134	8.70E-04	9.35E-01	1.104	0.948	1.895	0.000	0.00	0.00	2.420
271	44.29	44.46	0.17	2958.13	263.6	0.72	Non Liquefiable	0.754	1.87	2568302	2.138	8.33E-04	8.33E-01	0.861	0.739	1.478	0.000	0.00	0.00	2.420
272	44.46	44.62	0.16	2966.80	356.6	0.72	Non Liquefiable	0.754	1.87	2770675	2.143	7.73E-04	6.90E-01	0.570	0.489	0.979	0.000	0.00	0.00	2.420
273	44.62	44.78	0.16	2975.22	423.4	0.72	Non Liquefiable	0.754	1.87	2920897	2.147	7.35E-04	6.06E-01	0.430	0.369	0.737	0.000	0.00	0.00	2.420
274	44.78	44.95	0.17	2983.90	368.6	0.72	Non Liquefiable	0.754	1.87	2839070	2.151	7.58E-04	6.52E-01	0.505	0.433	0.867	0.000	0.00	0.00	2.420
275	44.95	45.11	0.16	2992.58	498.7	0.72	Non Liquefiable	0.754	1.87	3088053	2.156	6.98E-04	5.31E-01	0.321	0.275	0.551	0.000	0.00	0.00	2.420
276	45.11	45.28	0.17	3001.26	561.8	0.72	Non Liquefiable	0.755	1.87	3189994	2.160	6.77E-04	4.91E-01	0.271	0.232	0.465	0.000	0.00	0.00	2.420
277	45.28	45.44	0.16	3009.94	539.0	0.72	Non Liquefiable	0.755	1.87	3146556	2.164	6.88E-04	5.09E-01	0.294	0.252	0.504	0.000	0.00	0.00	2.420
278	45.44	45.60	0.16	3018.35	537.5	0.72	Non Liquefiable	0.755	1.87	3150952	2.169	6.88E-04	5.08E-01	0.293	0.251	0.503	0.000	0.00	0.00	2.420
279	45.60	45.77	0.17	3027.03	596.8	0.72	Non Liquefiable	0.755	1.87	3250437	2.173	6.68E-04	4.72E-01	0.249	0.214	0.427	0.000	0.00	0.00	2.420
280	45.77	45.93	0.16	3035.71	638.9	0.72	Non Liquefiable	0.755	1.87	3322928	2.177	6.55E-04	4.48E-01	0.222	0.191	0.382	0.000	0.00	0.00	2.420

Location……. **CPT-01**
Elevation (MSL)……. 1233 ft

(a)



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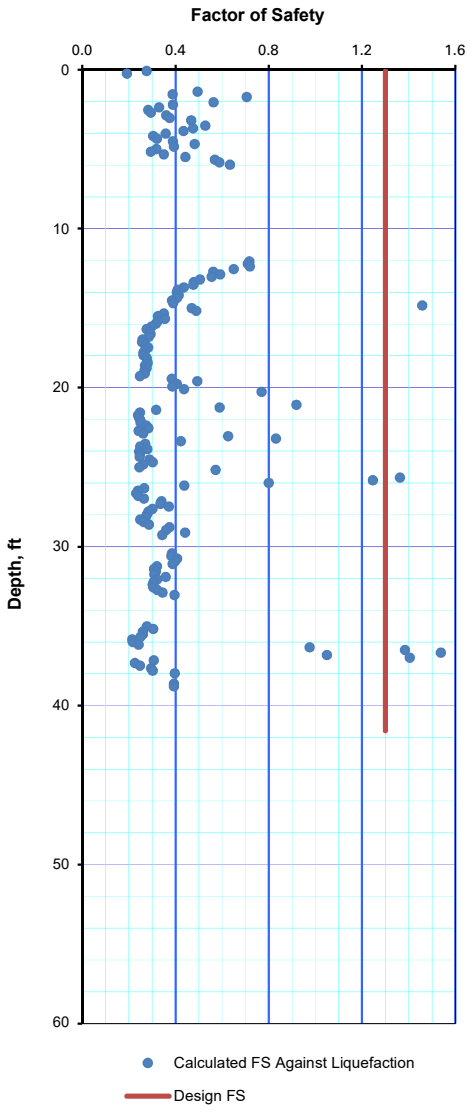

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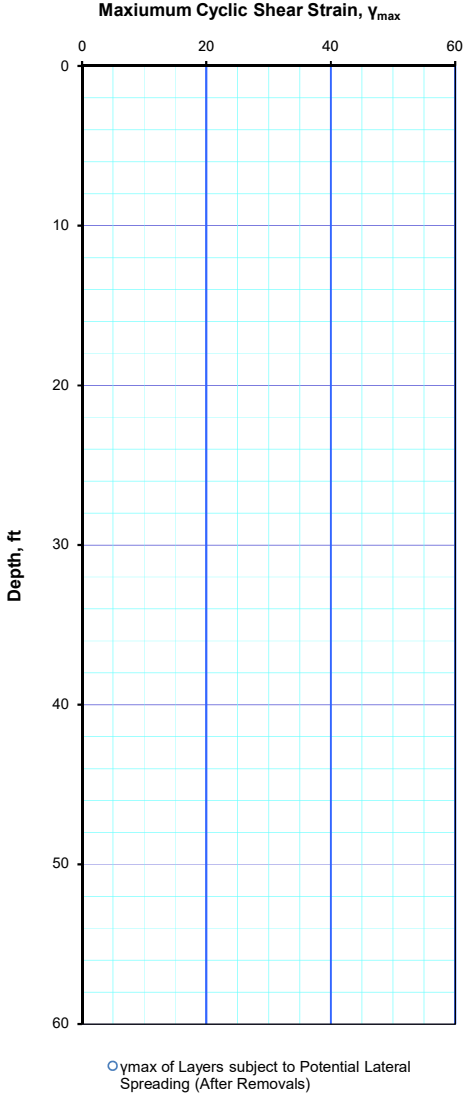

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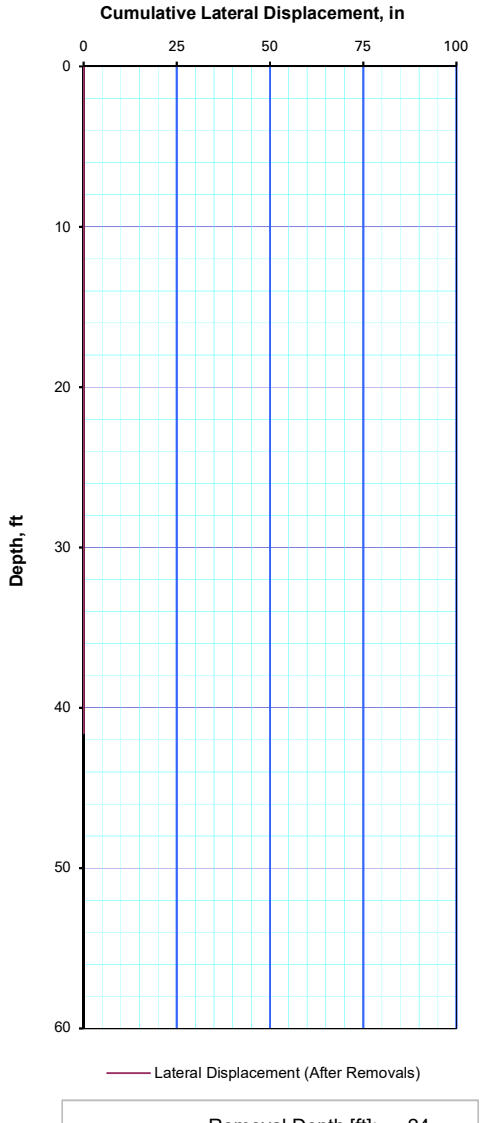


Removal Depth [ft]:	24
Estimated Lateral Disp. [ft]:	0.0

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

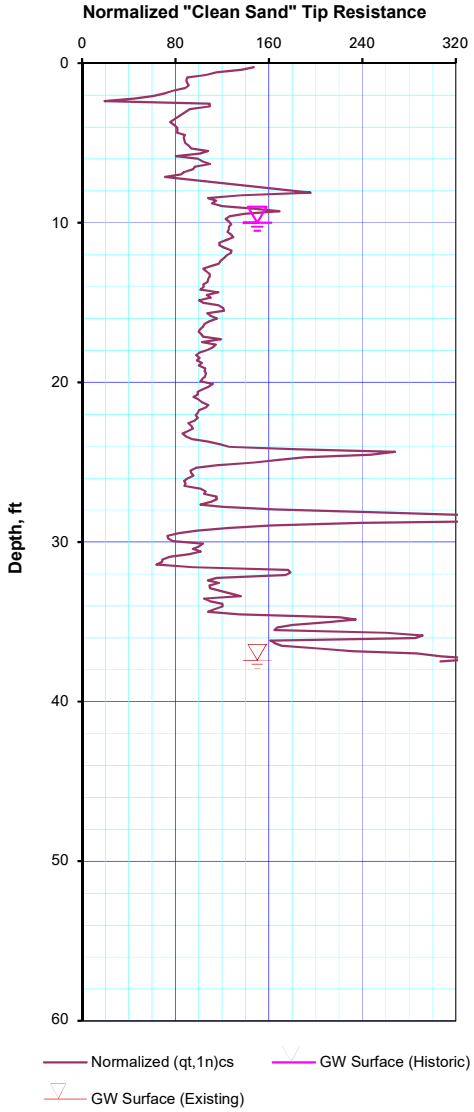
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

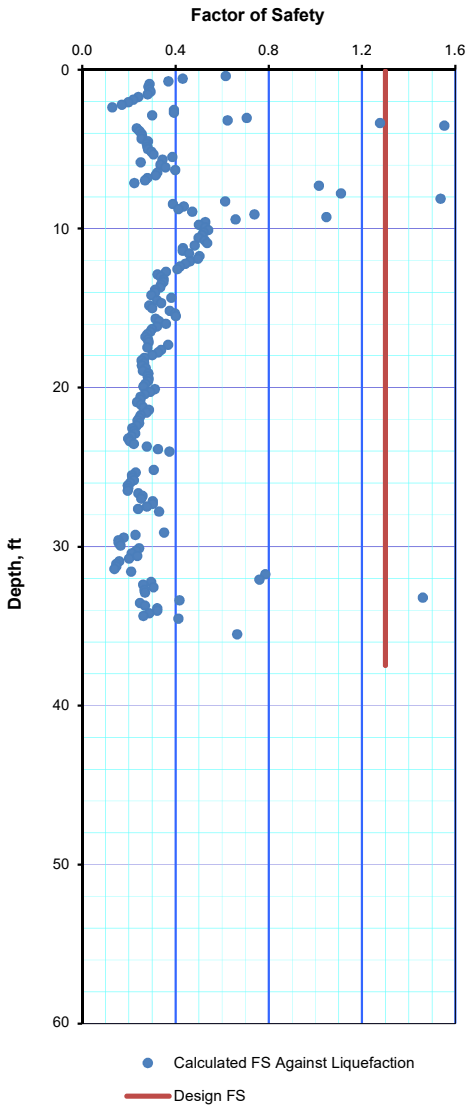
Sterling Ranch Estates	Ground Slope [%]:	5.7	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.1
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location……. **CPT-02**
Elevation (MSL)……. 1256 ft

(a)



(b)



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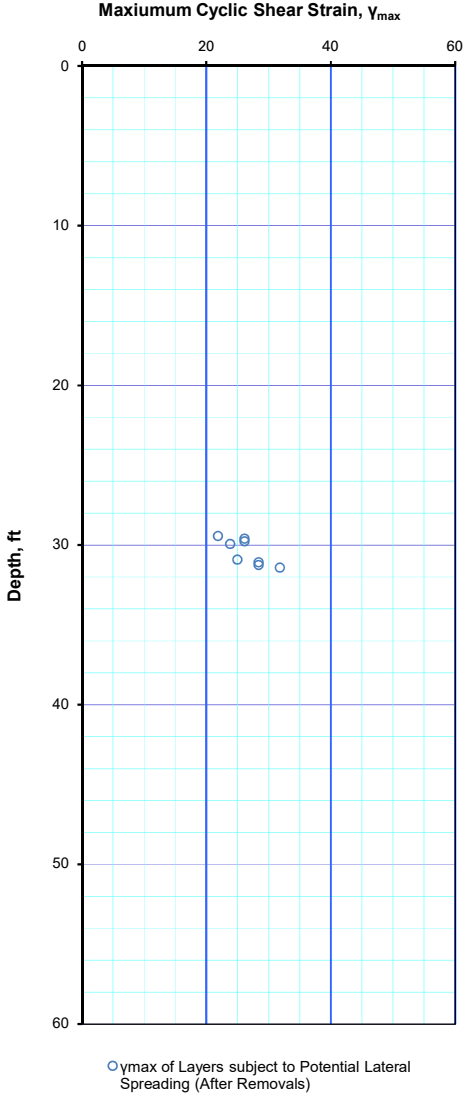

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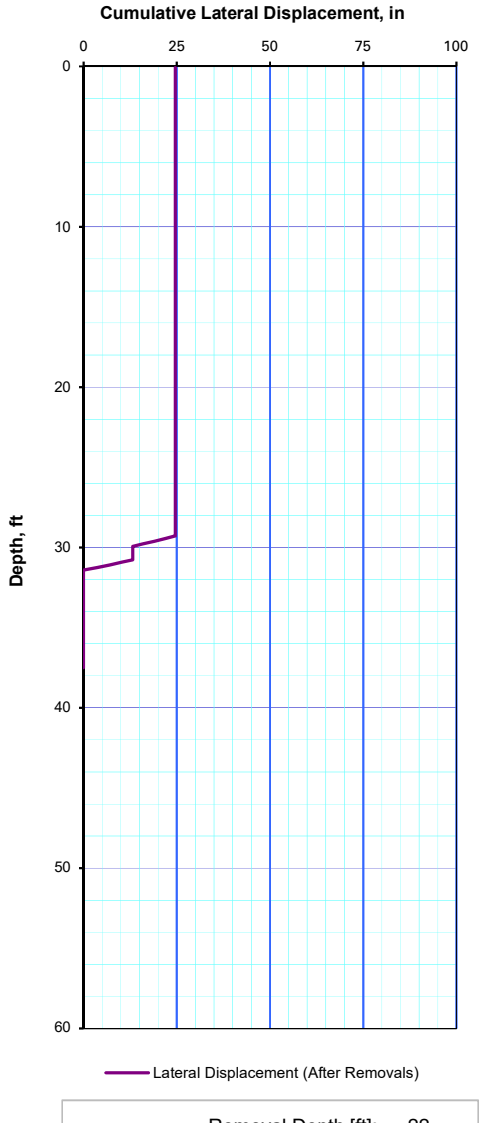

Removal Depth [ft]:	22
Estimated Lateral Disp. [ft]:	2.1

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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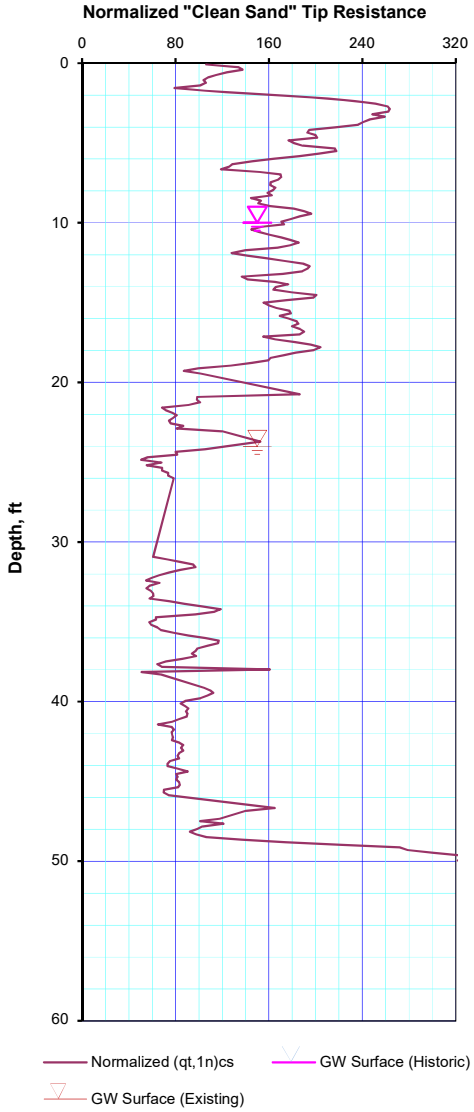
Geological and Geotechnical Consultants

CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

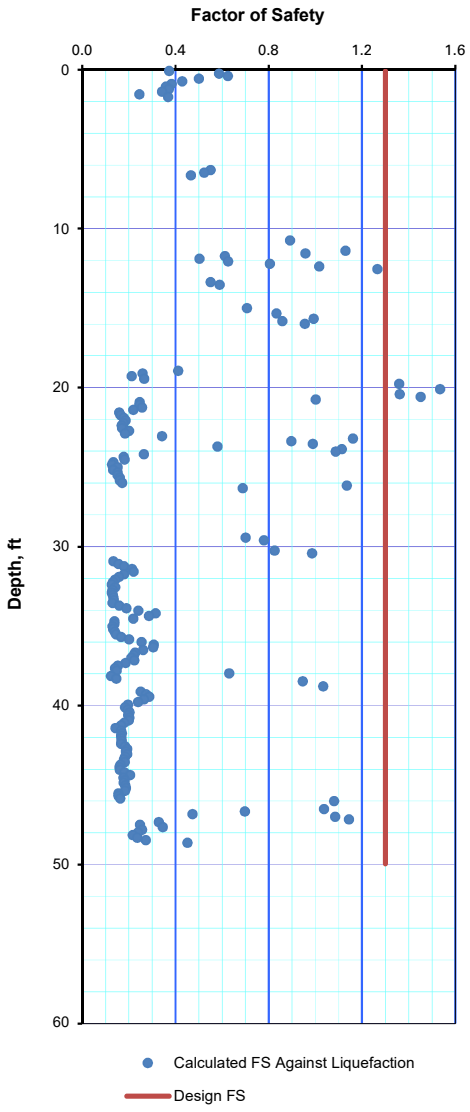
Sterling Ranch Estates	Ground Slope [%]:	5.7	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.2
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location……. **CPT-03**
Elevation (MSL)……. 1237 ft

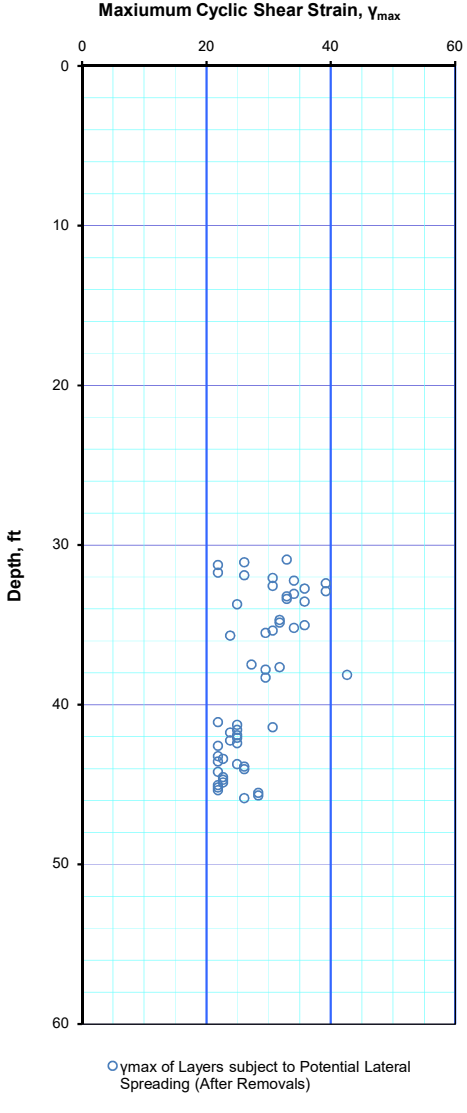
(a)



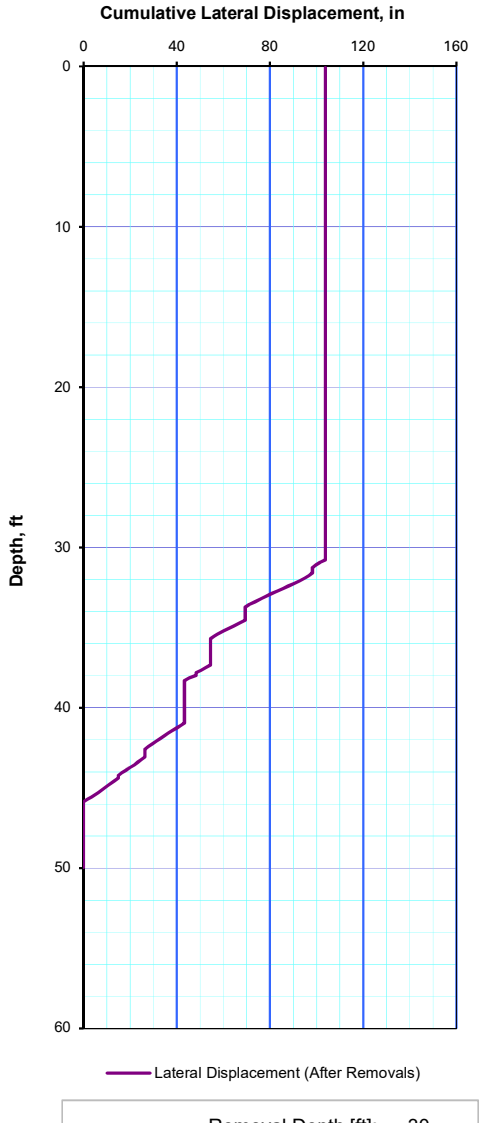
(b)



(c)



(d)



Removal Depth [ft]:	30
Estimated Lateral Disp. [ft]:	8.6

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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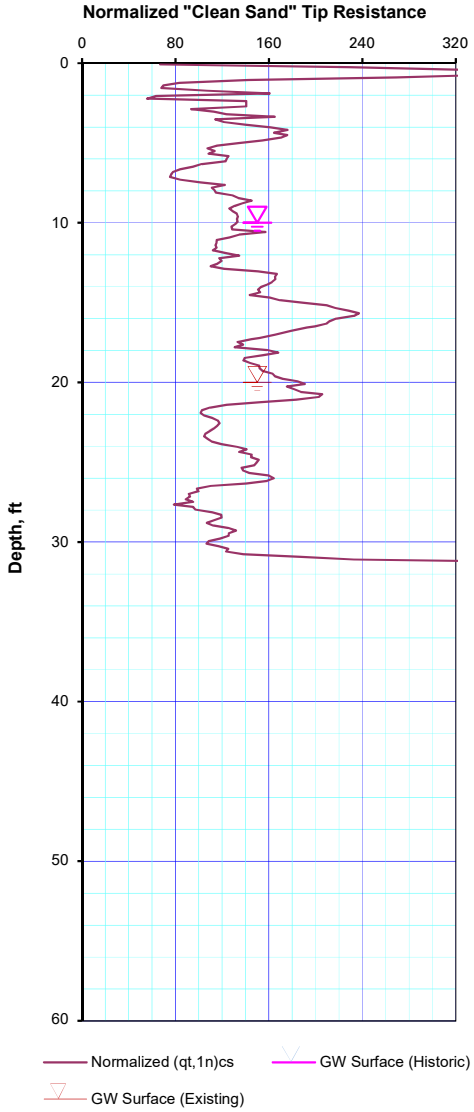
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

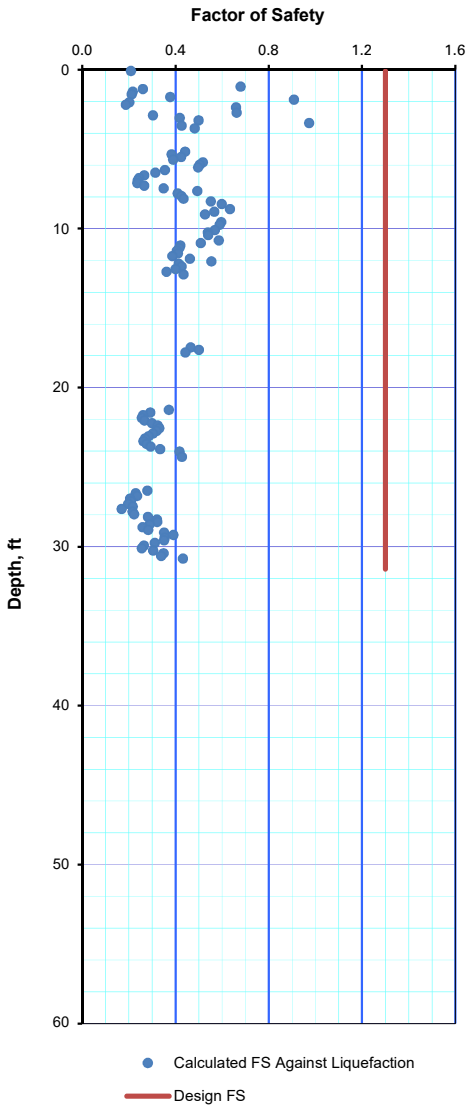
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.3
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location……. **CPT-04**
Elevation (MSL)……. 1243 ft

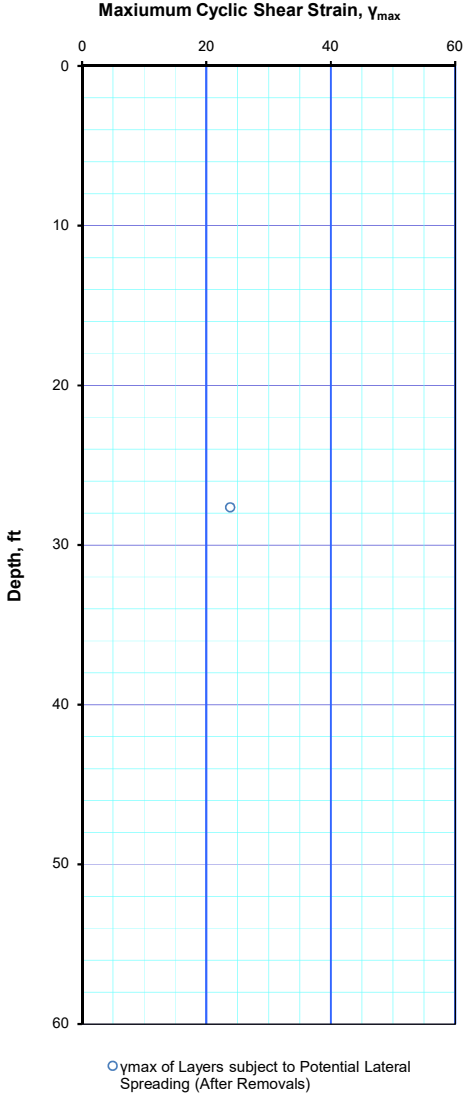
(a)



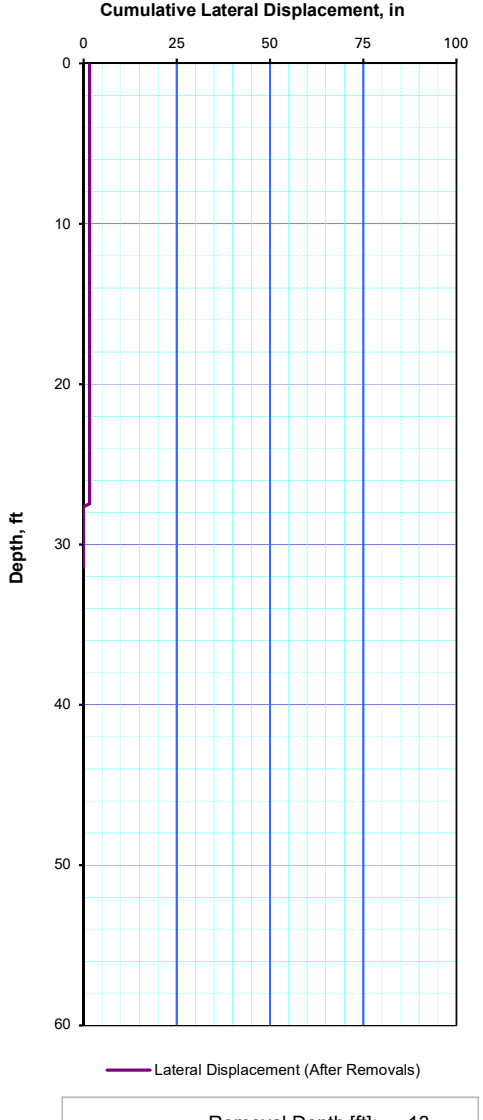
(b)



(c)



(d)



Removal Depth [ft]:	13
Estimated Lateral Disp. [ft]:	0.1

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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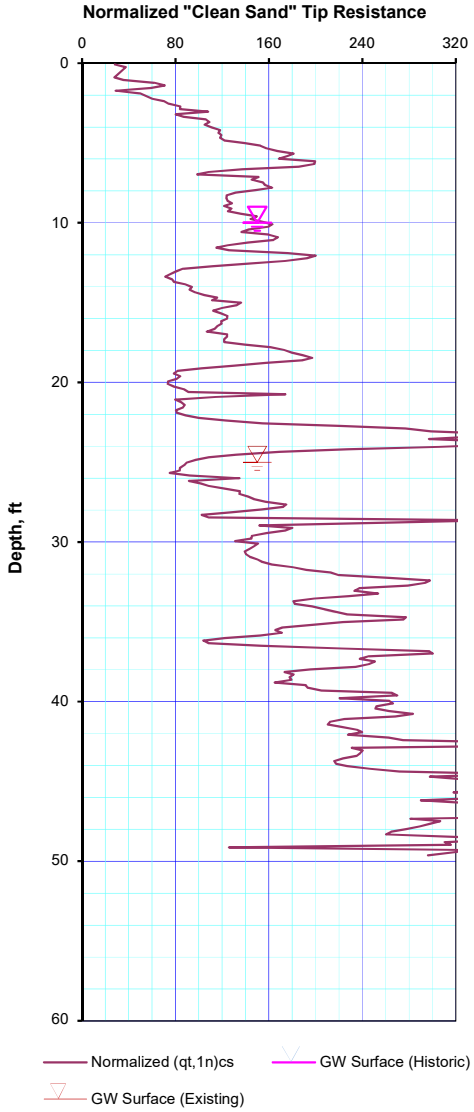
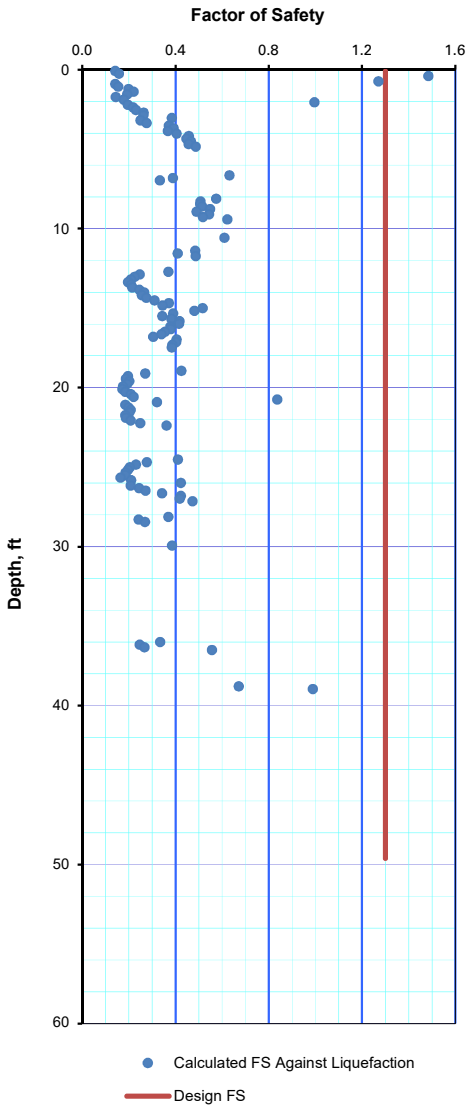
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.4
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location……. **CPT-06**
Elevation (MSL)……. 1263 ft

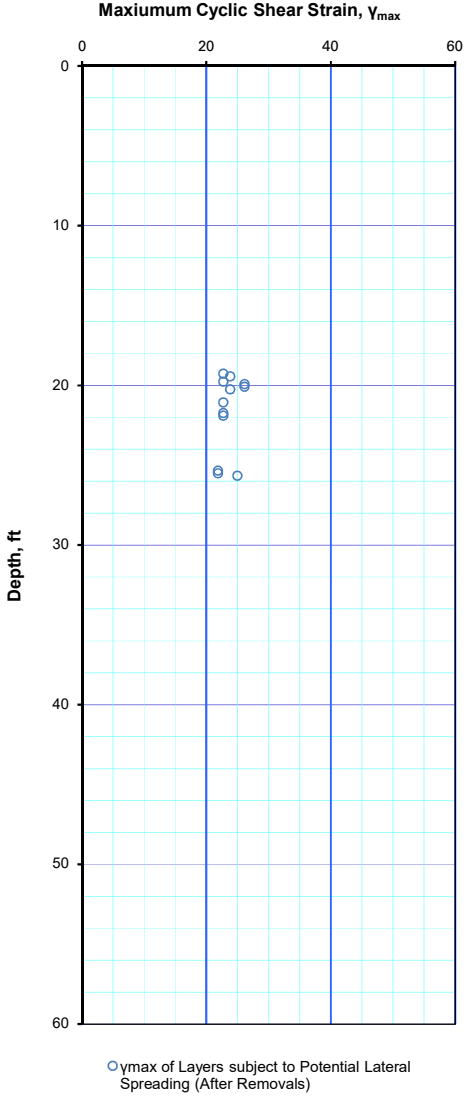
(a)



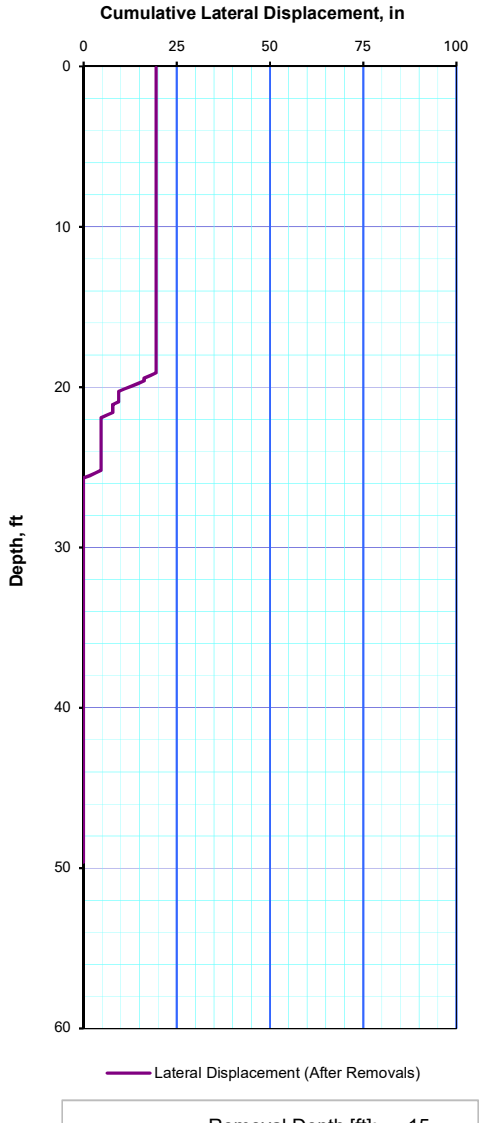
(b)



(c)



(d)



Removal Depth [ft]:	15
Estimated Lateral Disp. [ft]:	1.6

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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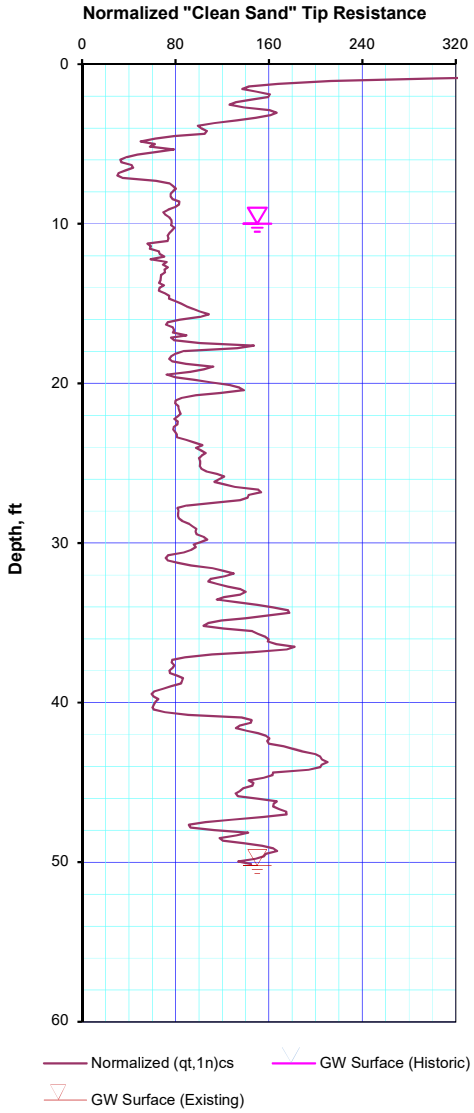
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

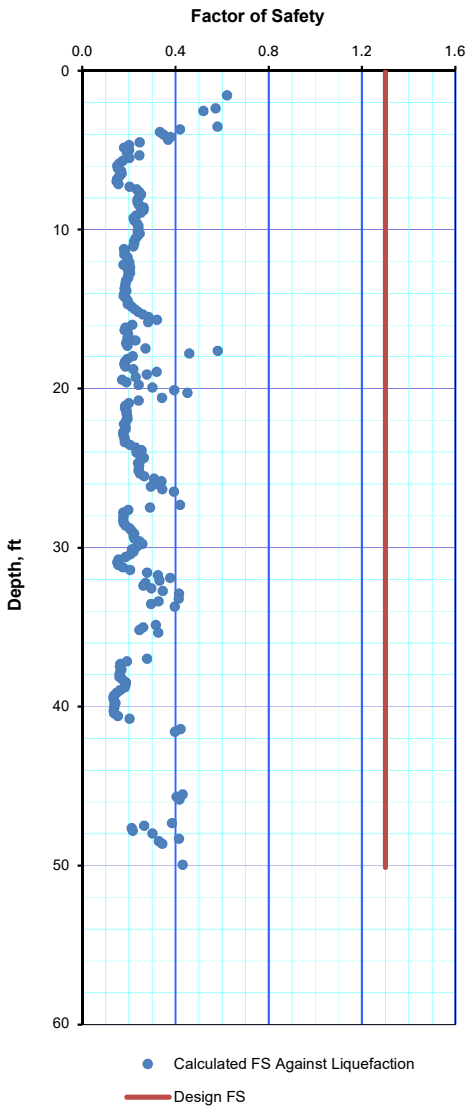
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.5
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location……. **CPT-08**
Elevation (MSL)……. 1221.5 ft

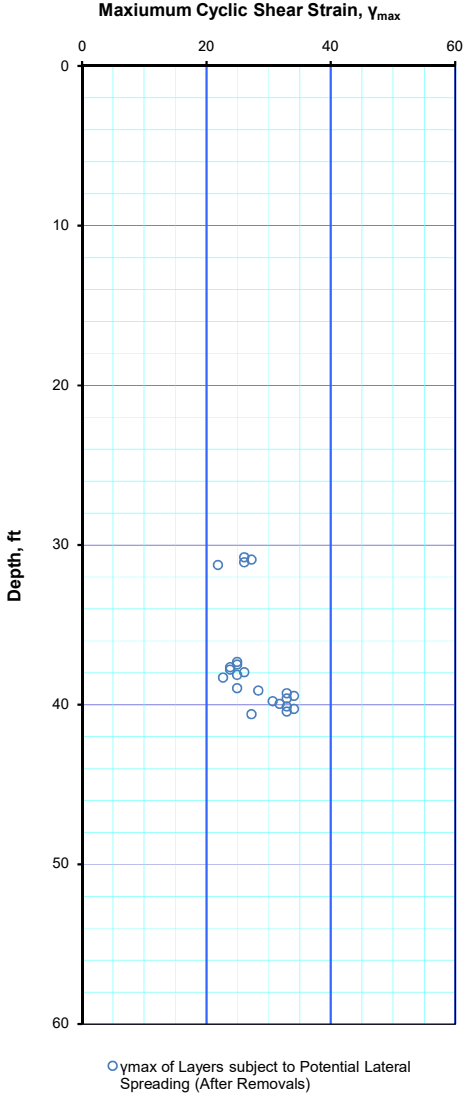
(a)



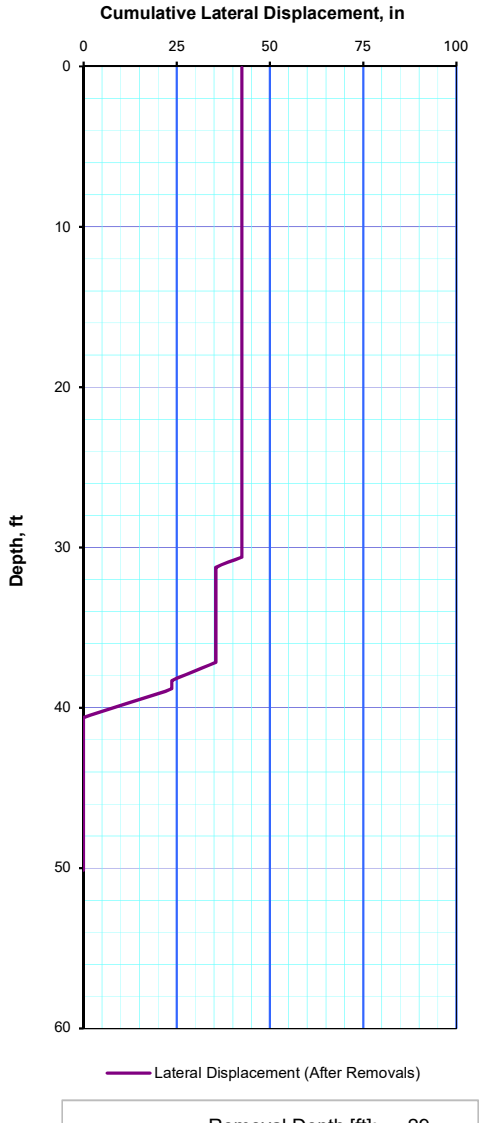
(b)



(c)



(d)



Removal Depth [ft]:	29
Estimated Lateral Disp. [ft]:	3.5

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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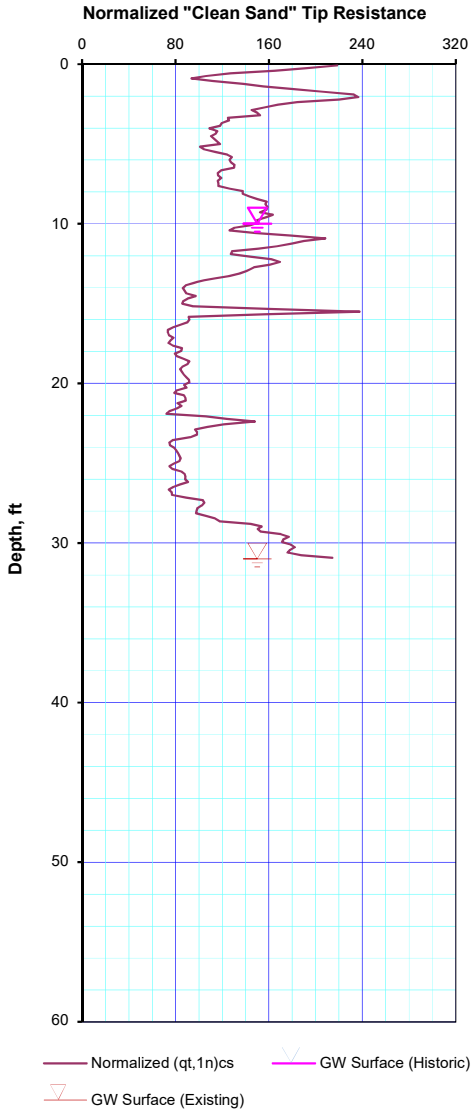
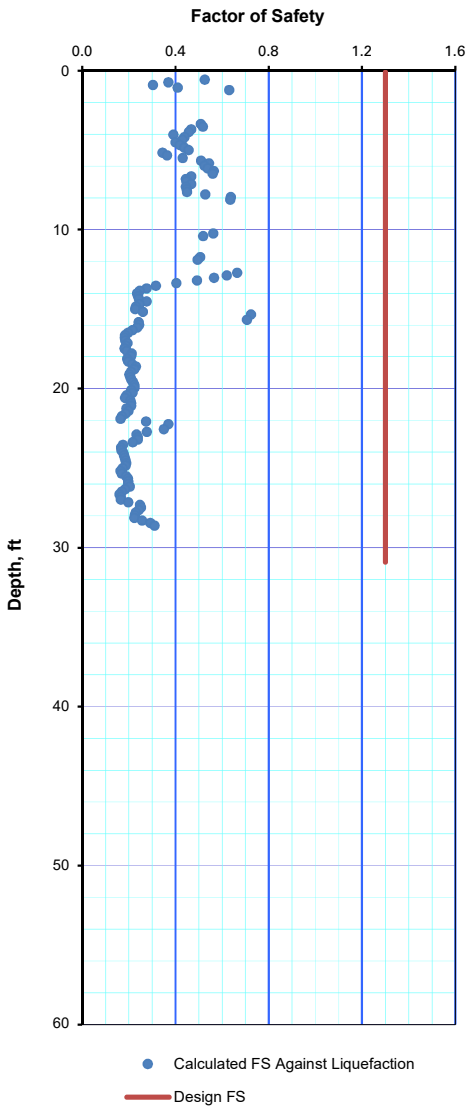
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.6
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location……. **CPT-09**
Elevation (MSL)……. 1228 ft

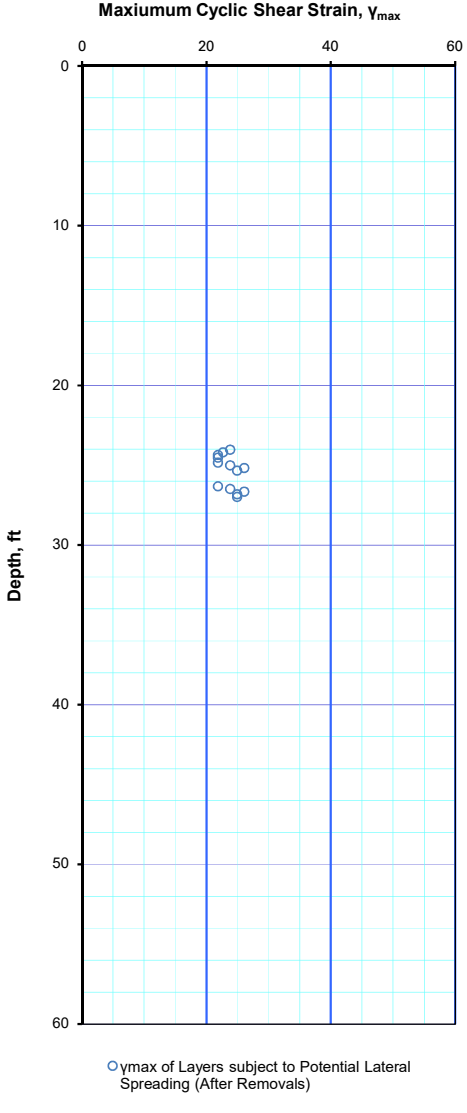
(a)



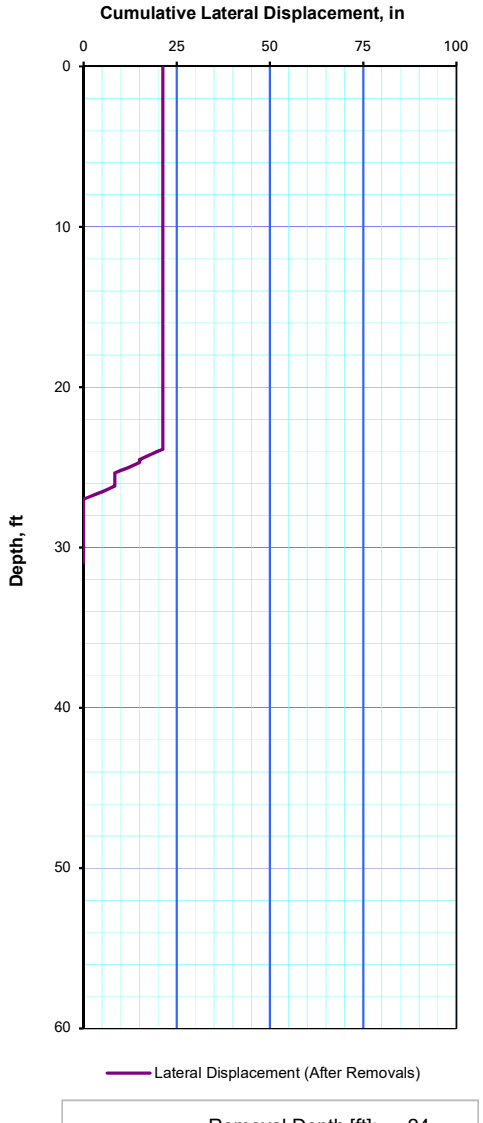
(b)



(c)



(d)



Removal Depth [ft]:	24
Estimated Lateral Disp. [ft]:	1.8

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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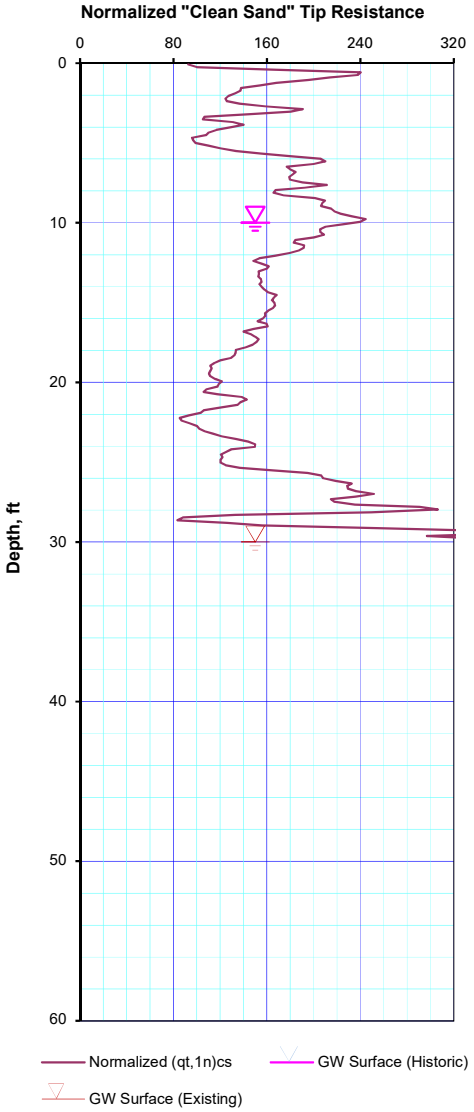
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

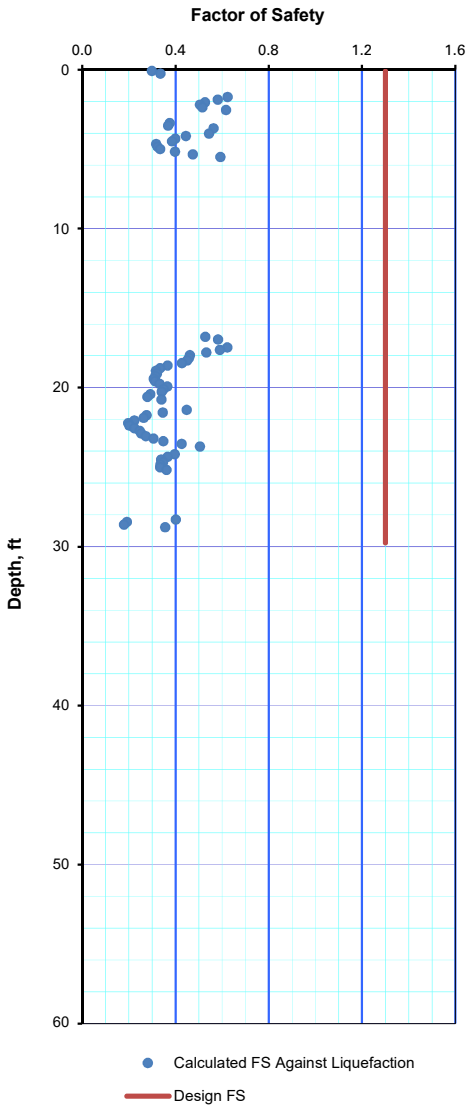
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.7
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location..... **CPT-11**
Elevation (MSL)..... 1239 ft

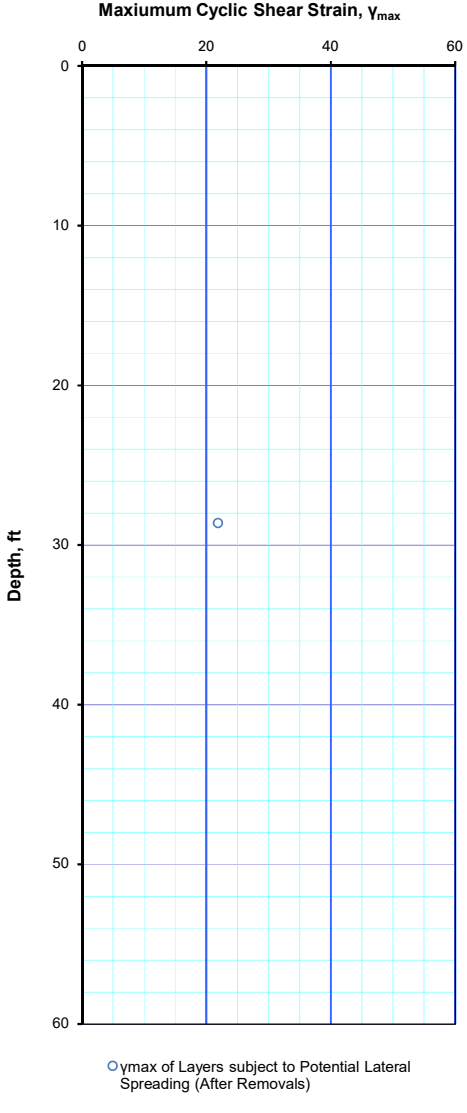
(a)



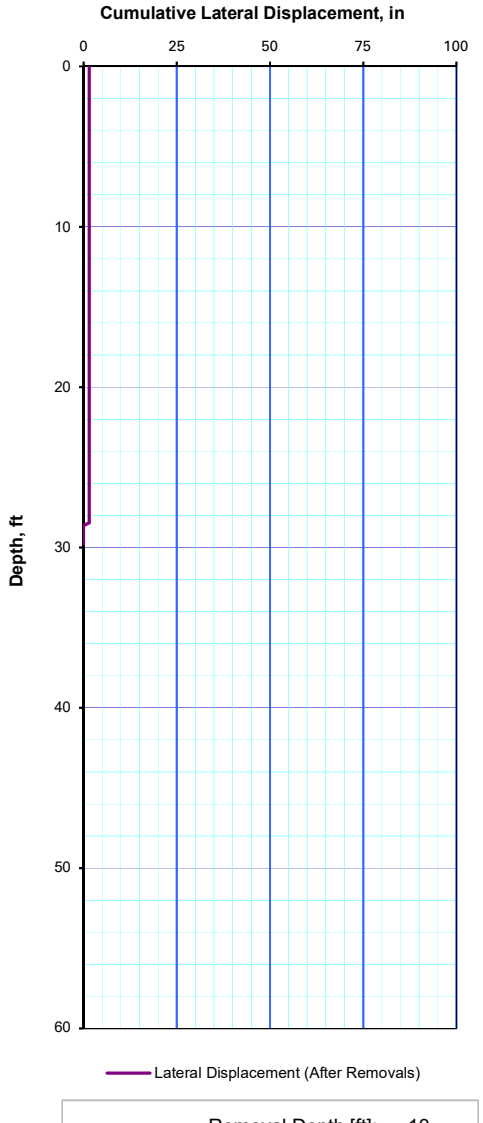
(b)



(c)



(d)



Removal Depth [ft]:	10
Estimated Lateral Disp. [ft]:	0.1

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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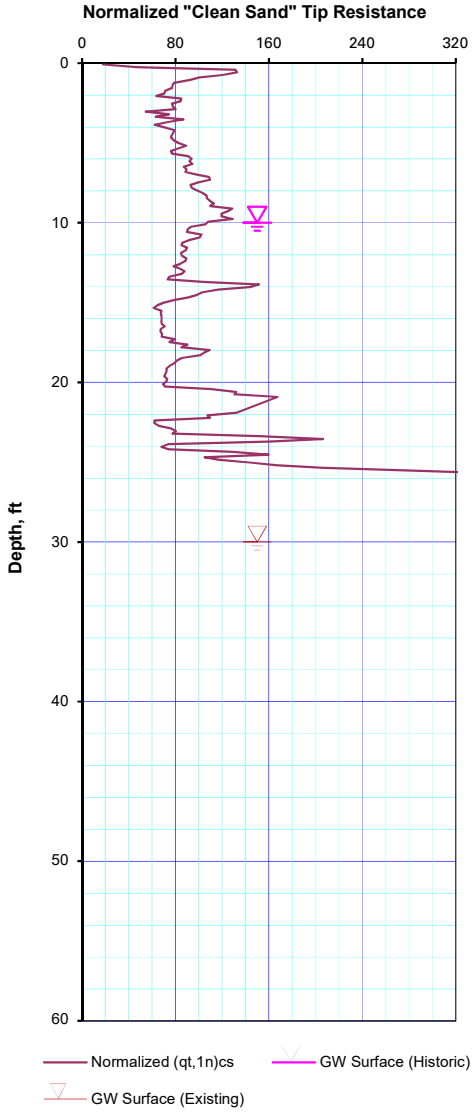
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

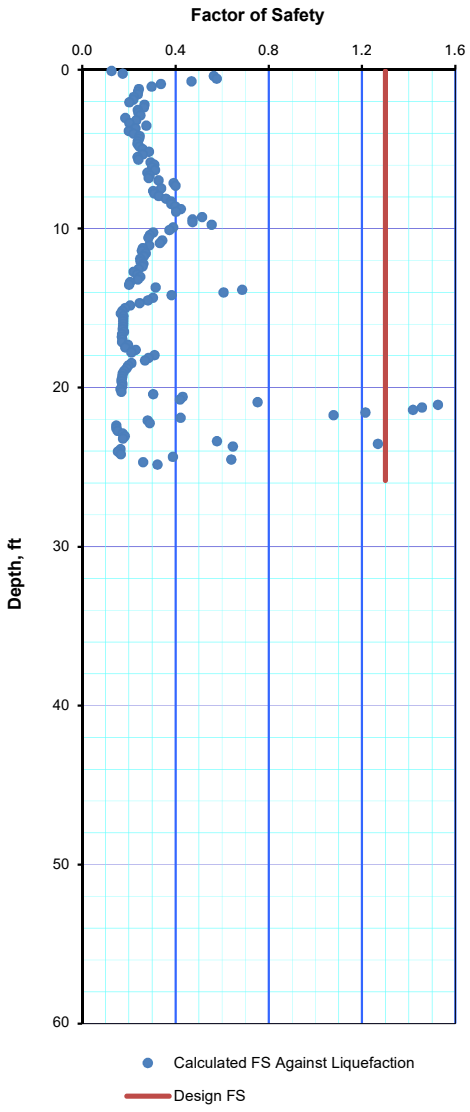
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.8
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location..... **CPT-12**
Elevation (MSL)..... 1212 ft

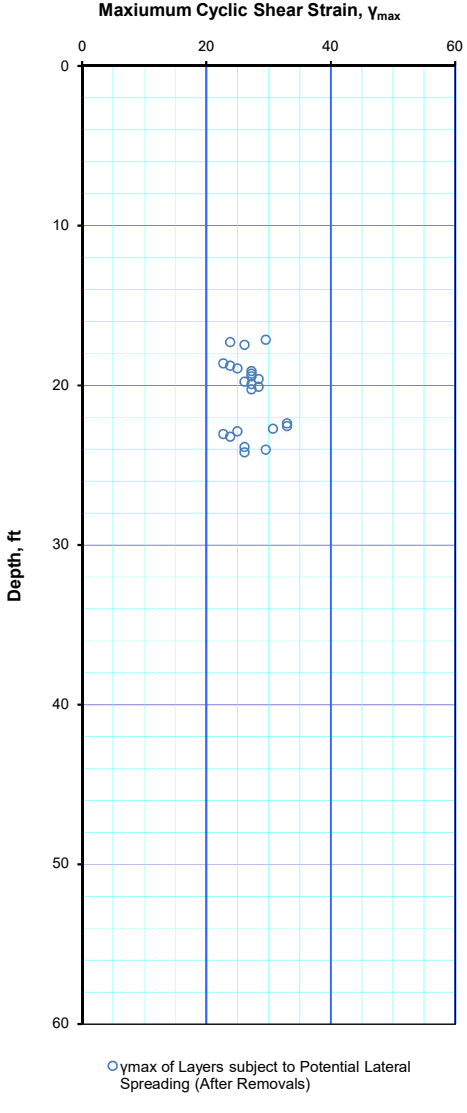
(a)



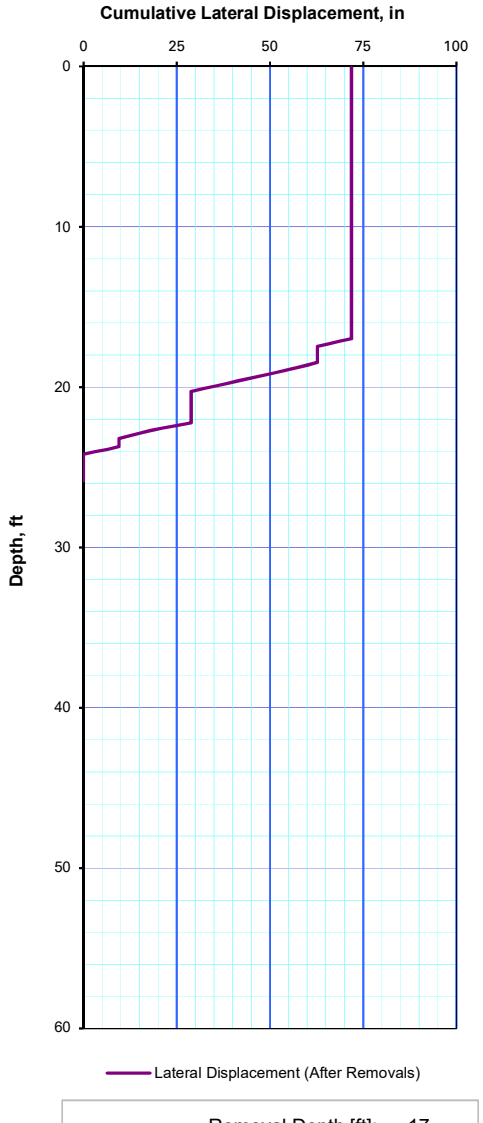
(b)



(c)



(d)



Removal Depth [ft]:	17
Estimated Lateral Disp. [ft]:	6.0

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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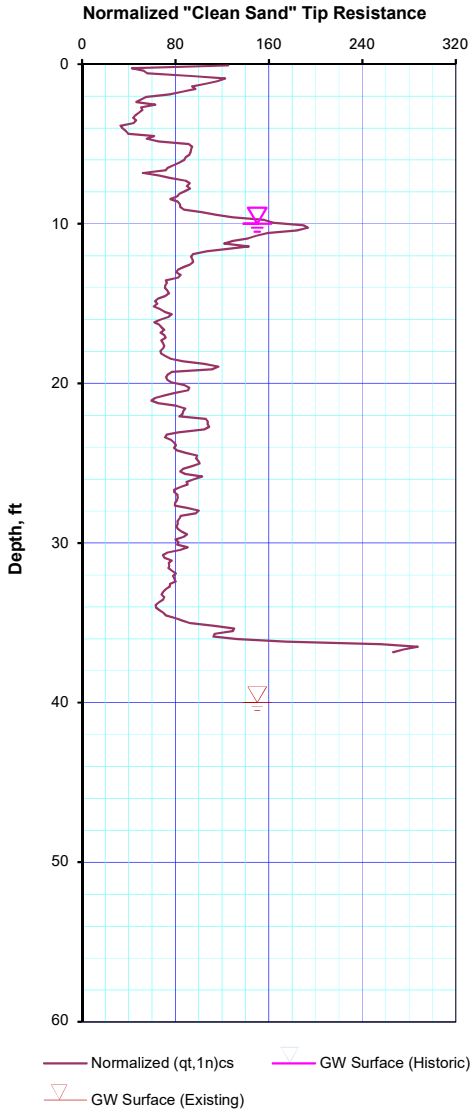
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

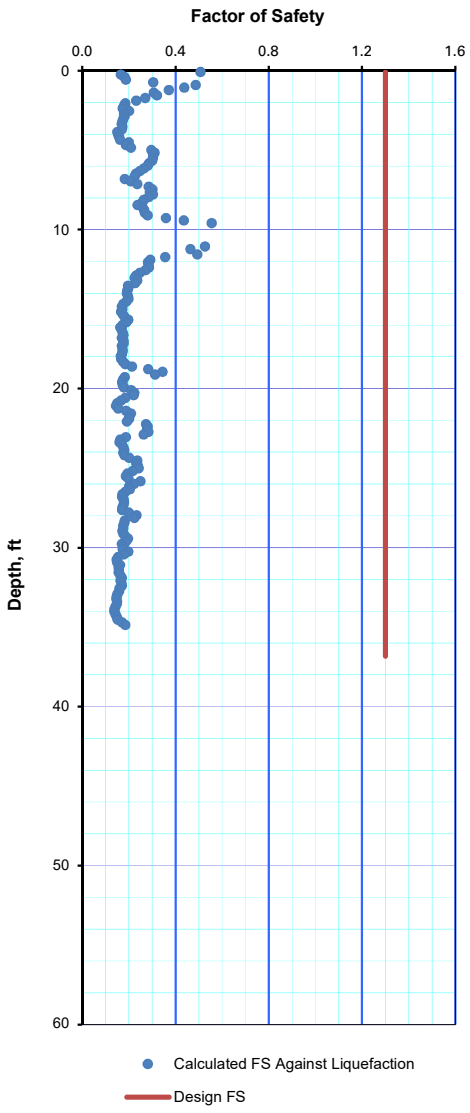
Sterling Ranch Estates	Ground Slope [%]:	5.7	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.9
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location……. **CPT-13**
Elevation (MSL)……. 1223 ft

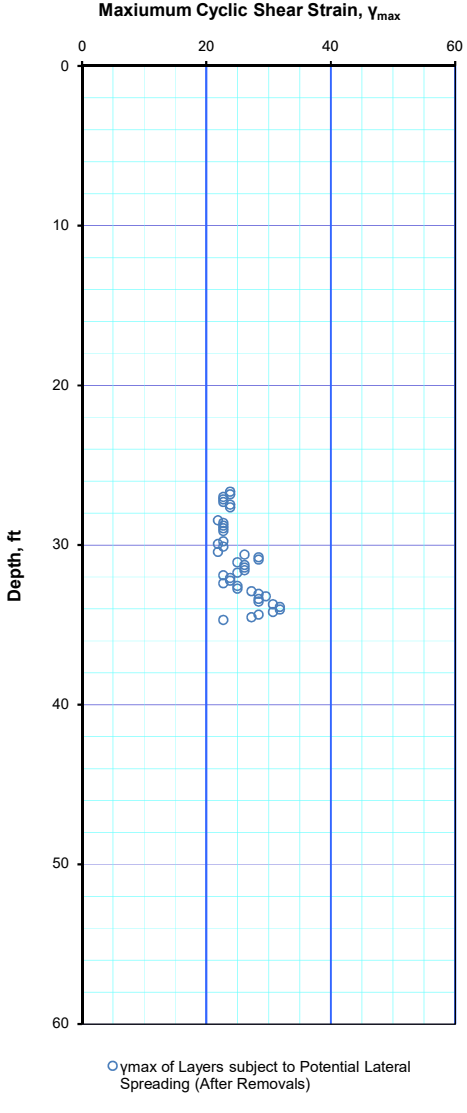
(a)



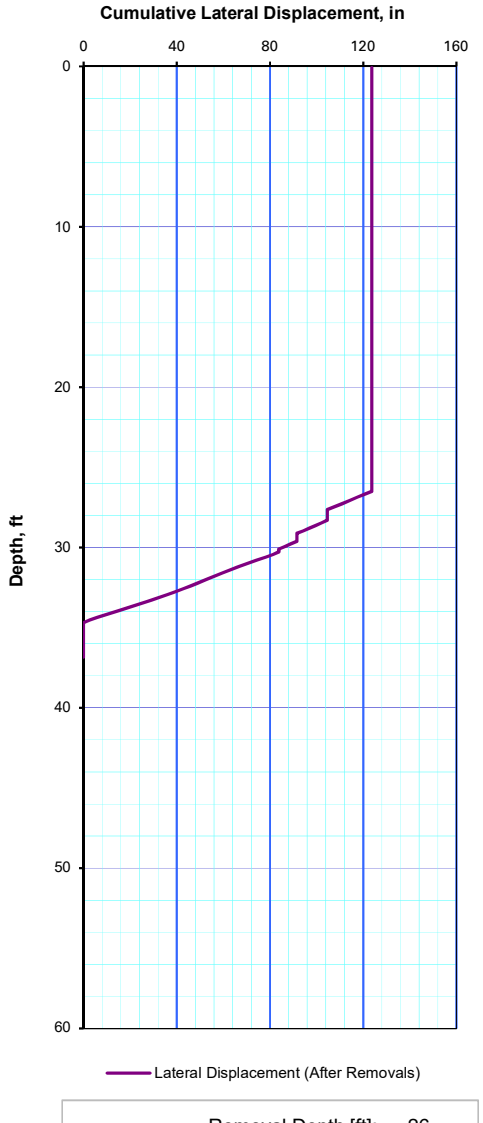
(b)



(c)



(d)



Removal Depth [ft]:	26
Estimated Lateral Disp. [ft]:	10.3

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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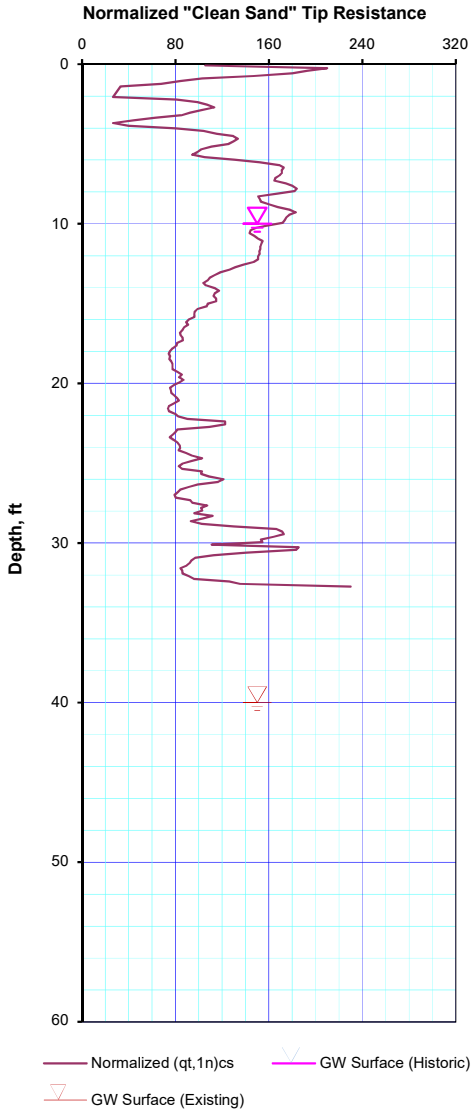
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

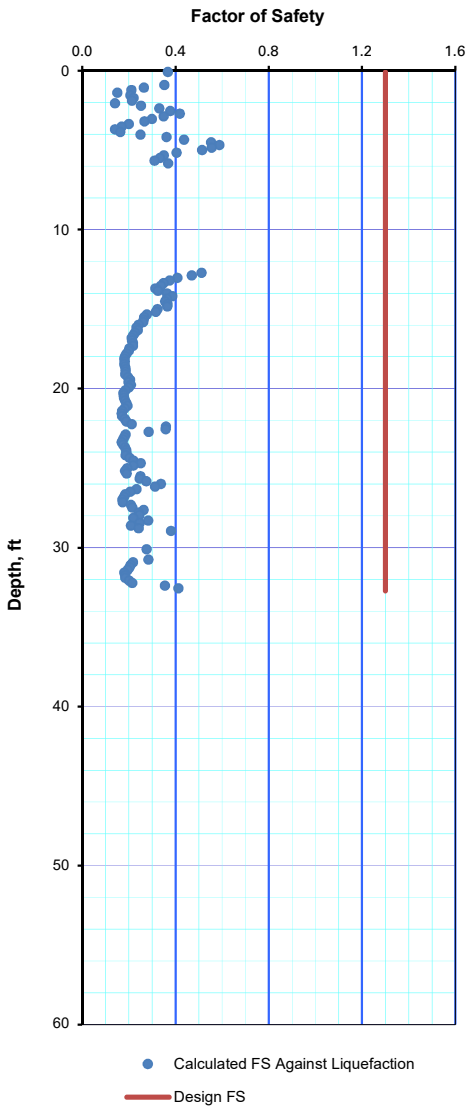
Sterling Ranch Estates	Ground Slope [%]:	5.7	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.10
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location..... **CPT-14**
Elevation (MSL)..... 1248 ft

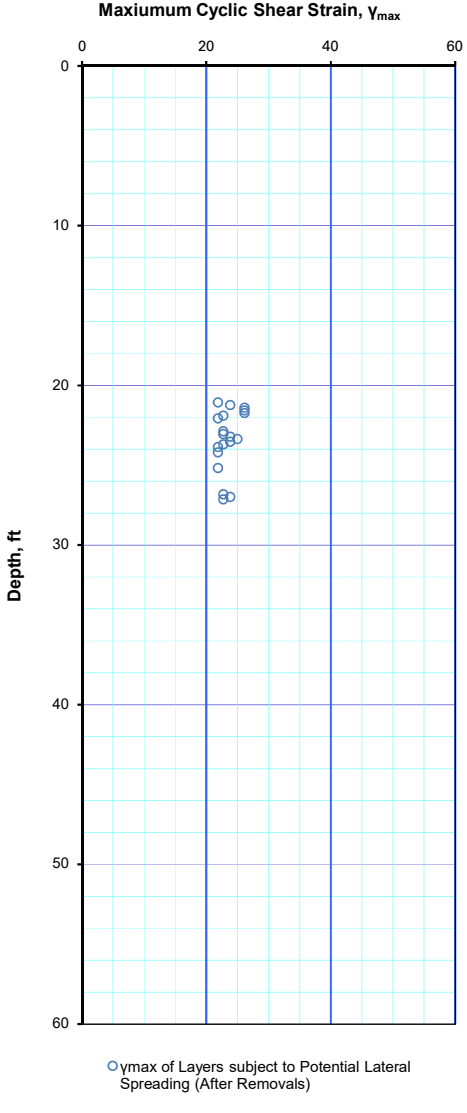
(a)



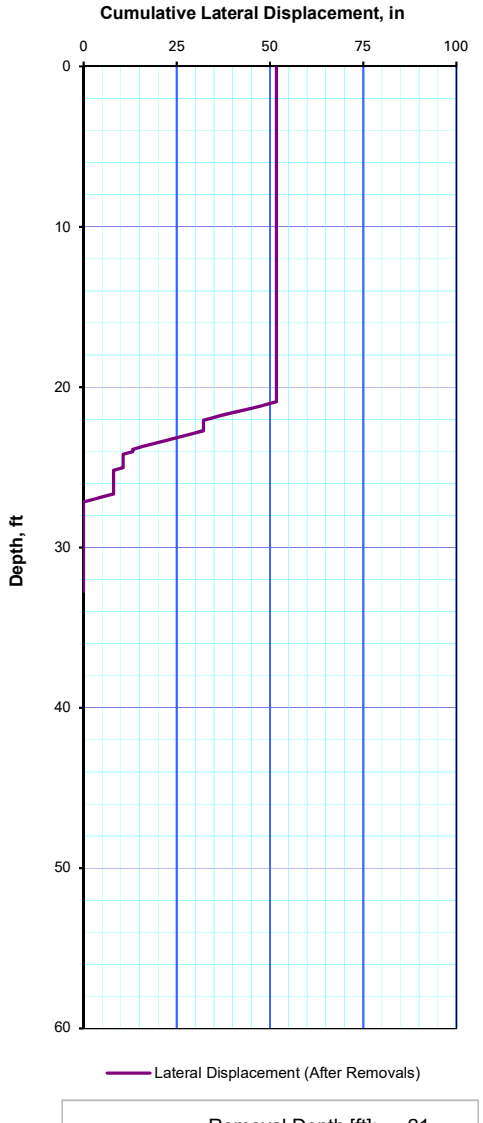
(b)



(c)



(d)



Removal Depth [ft]:	21
Estimated Lateral Disp. [ft]:	4.3

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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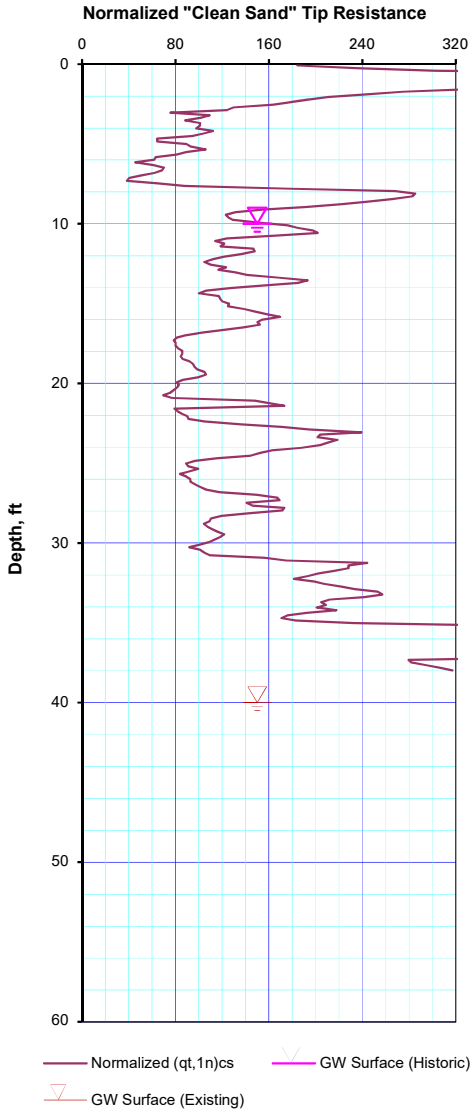
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

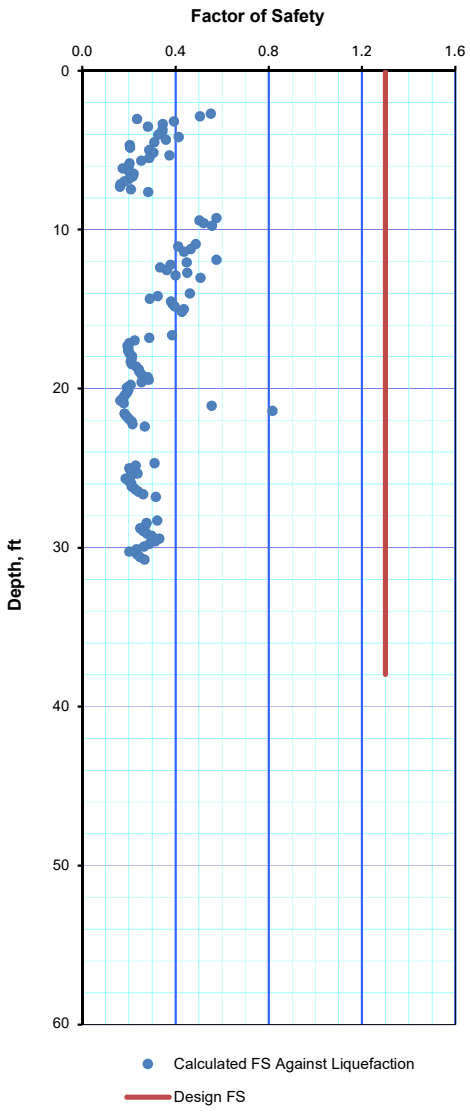
Sterliing Ranch Estates	Ground Slope [%]:	5.7	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.11
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location..... **CPT-15**
Elevation (MSL)..... 1249 ft

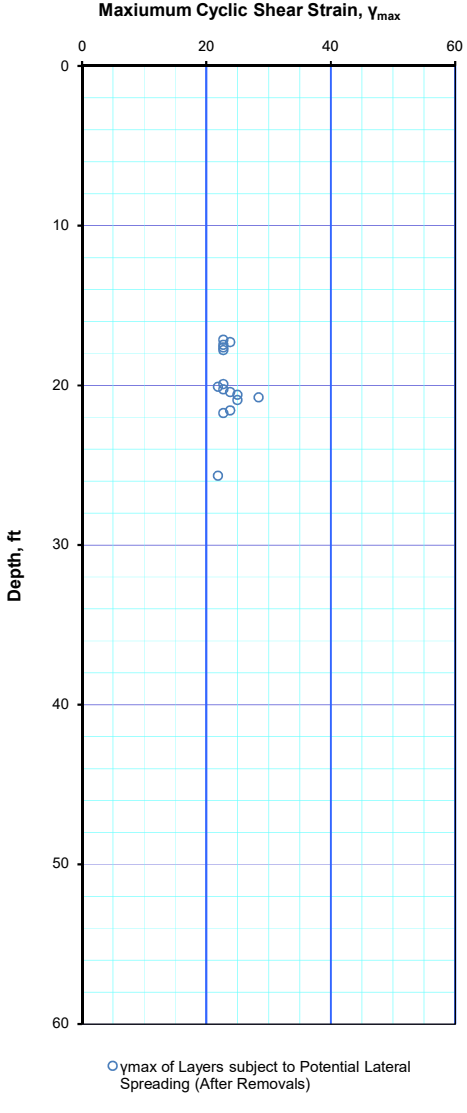
(a)



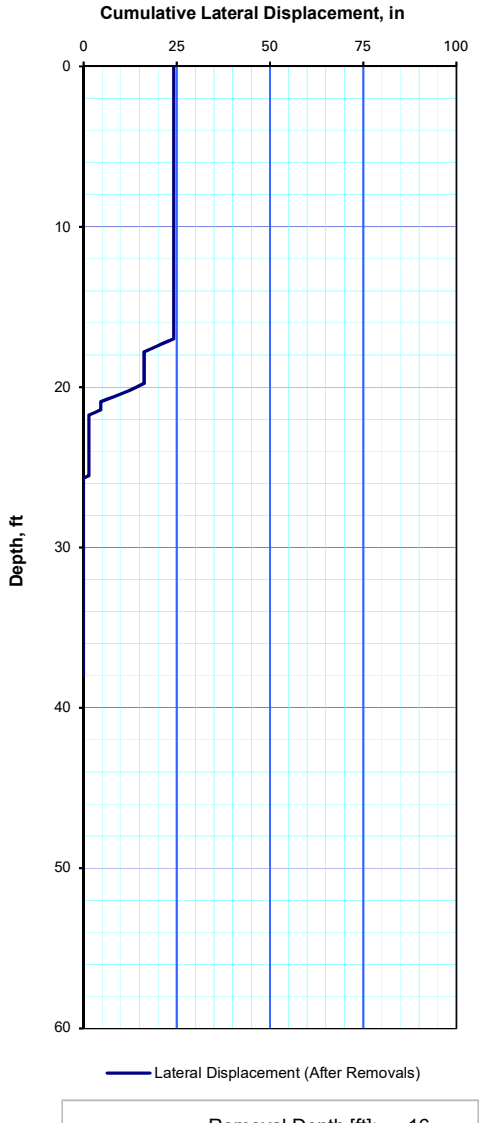
(b)



(c)



(d)



Removal Depth [ft]:	16
Estimated Lateral Disp. [ft]:	2.0

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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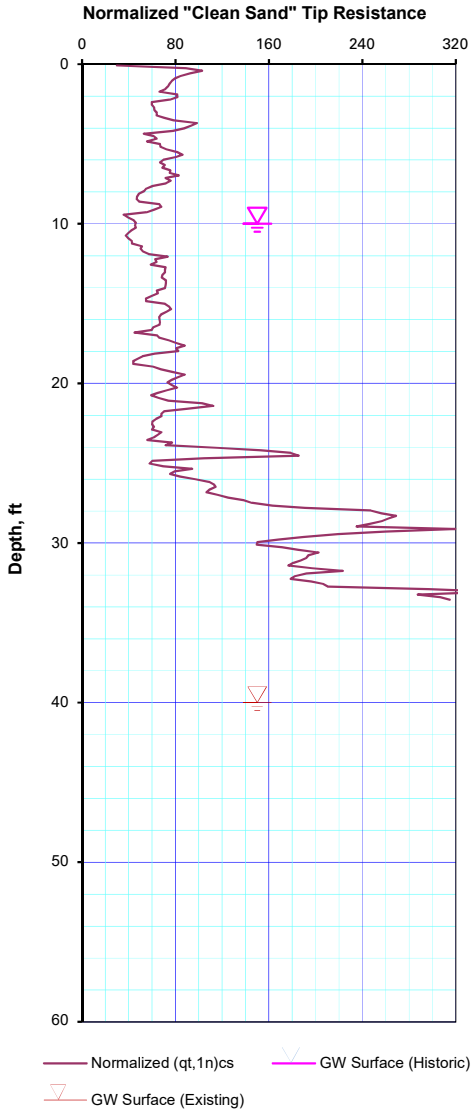
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

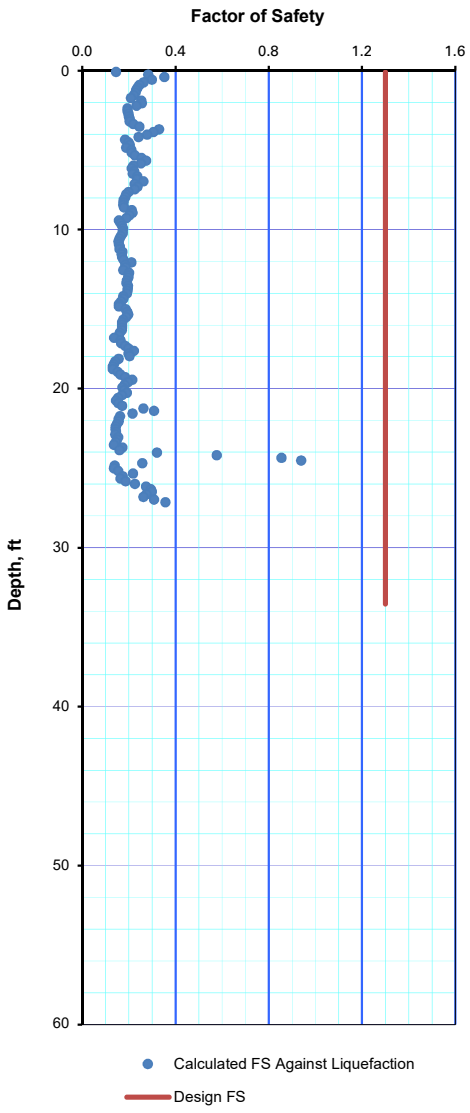
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.12
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location..... **CPT-16**
Elevation (MSL)..... 1222.5 ft

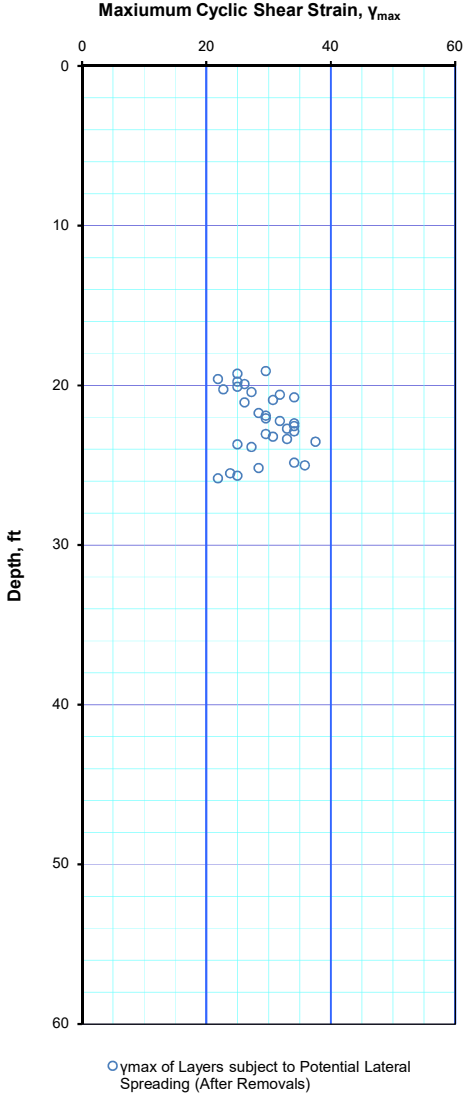
(a)



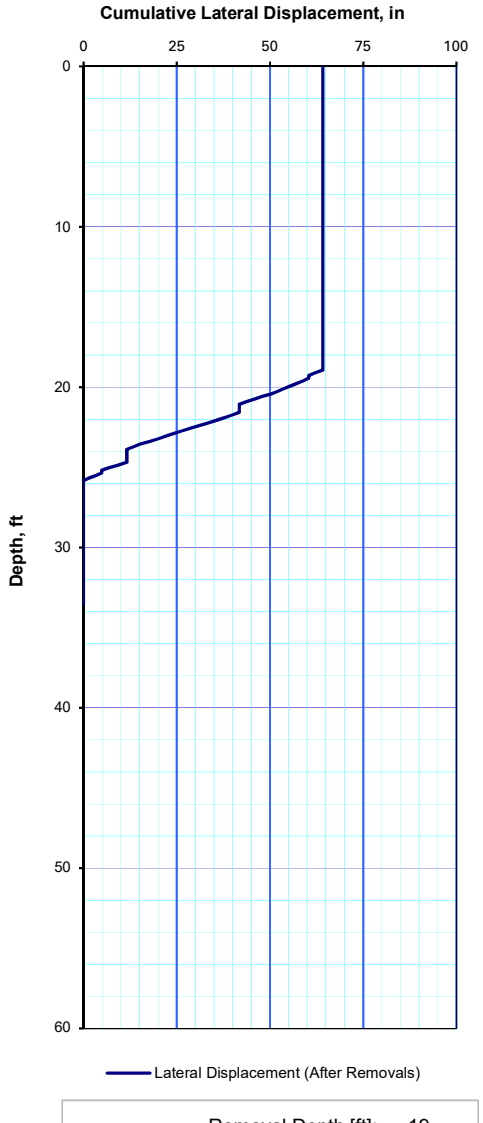
(b)



(c)



(d)



Removal Depth [ft]:	19
Estimated Lateral Disp. [ft]:	5.3

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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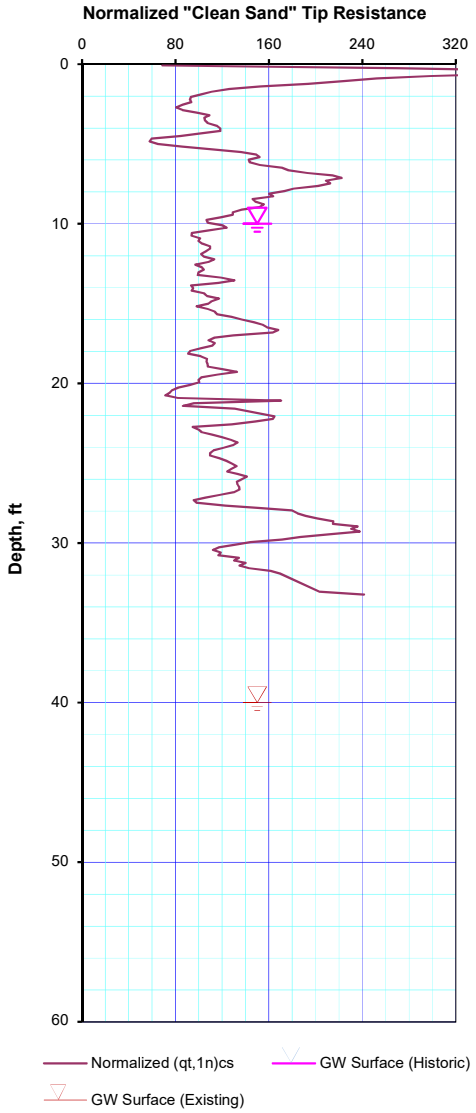
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

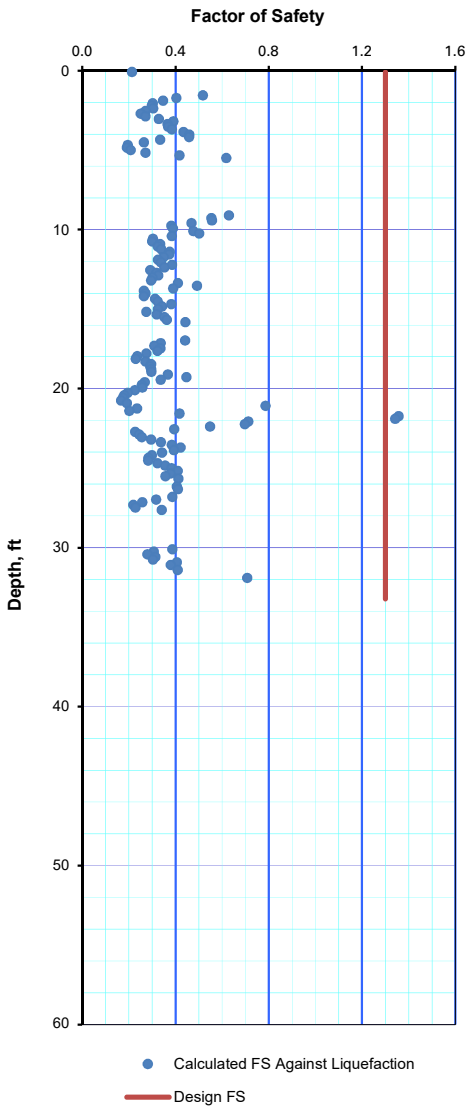
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.13
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location..... **CPT-17**
Elevation (MSL)..... 1280 ft

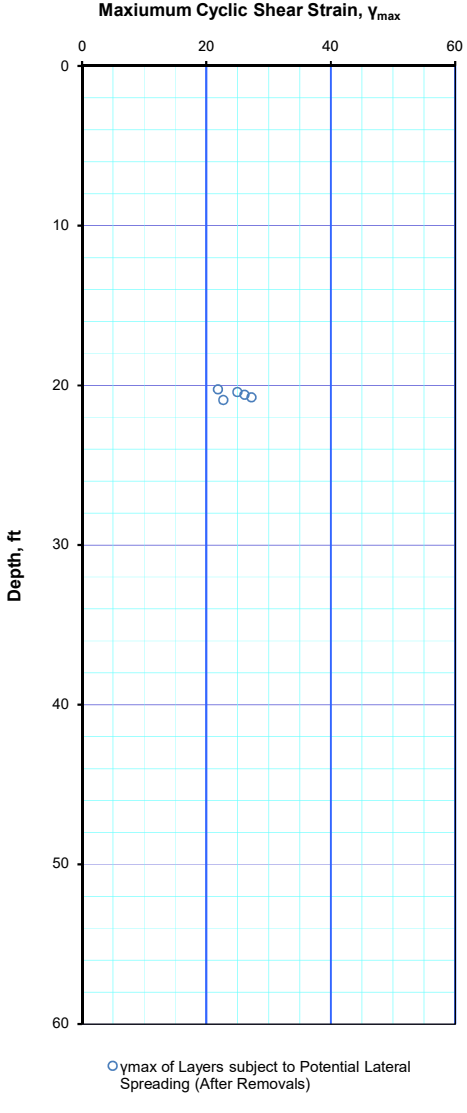
(a)



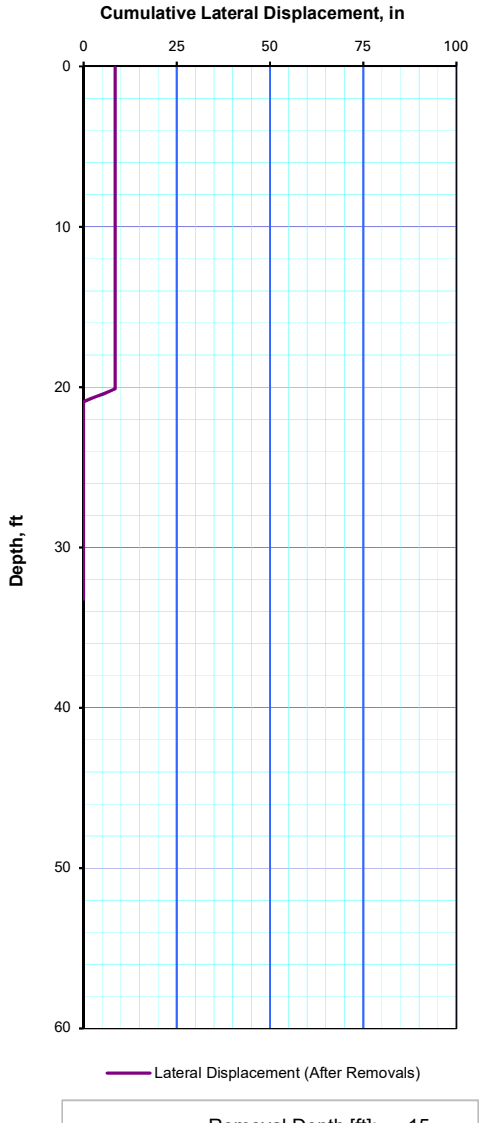
(b)



(c)



(d)



Removal Depth [ft]:	15
Estimated Lateral Disp. [ft]:	0.7

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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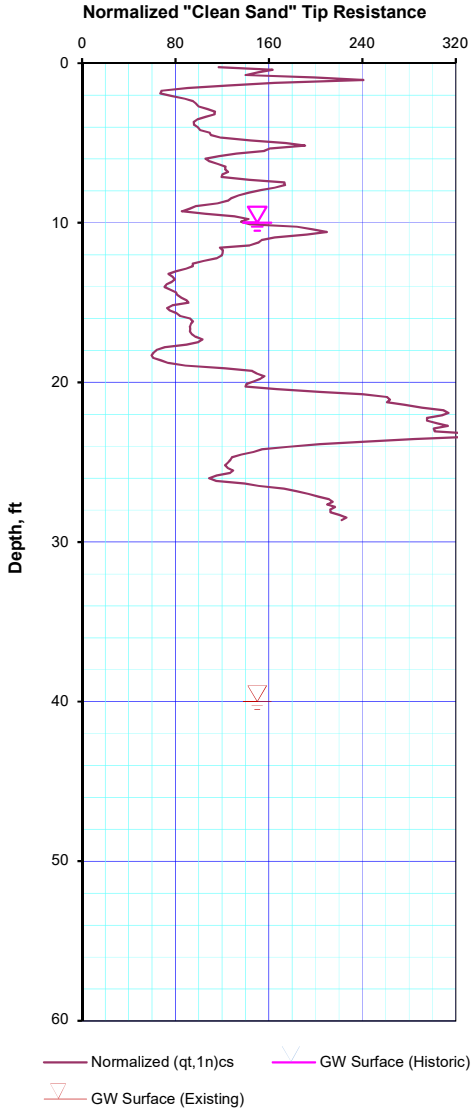
Geological and Geotechnical Consultants

CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

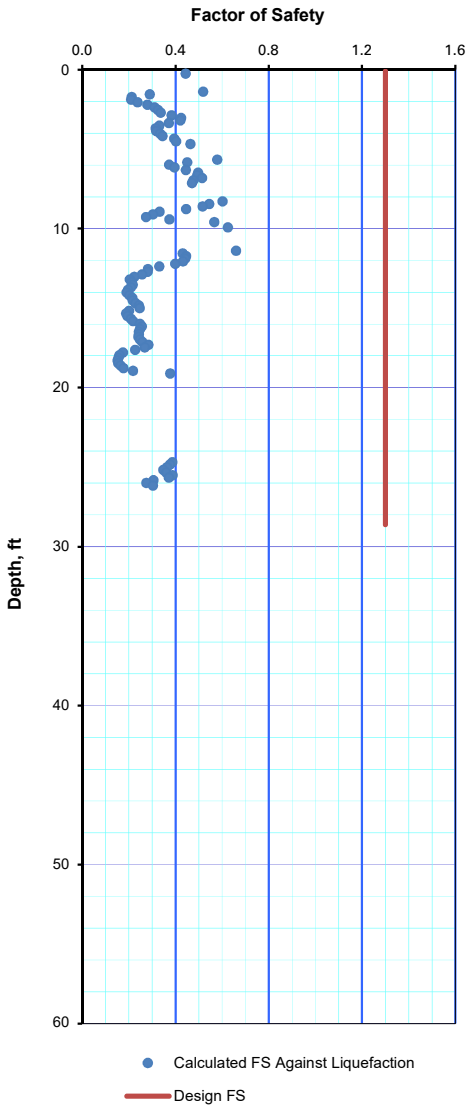
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.14
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location..... **CPT-18**
Elevation (MSL)..... 1252 ft

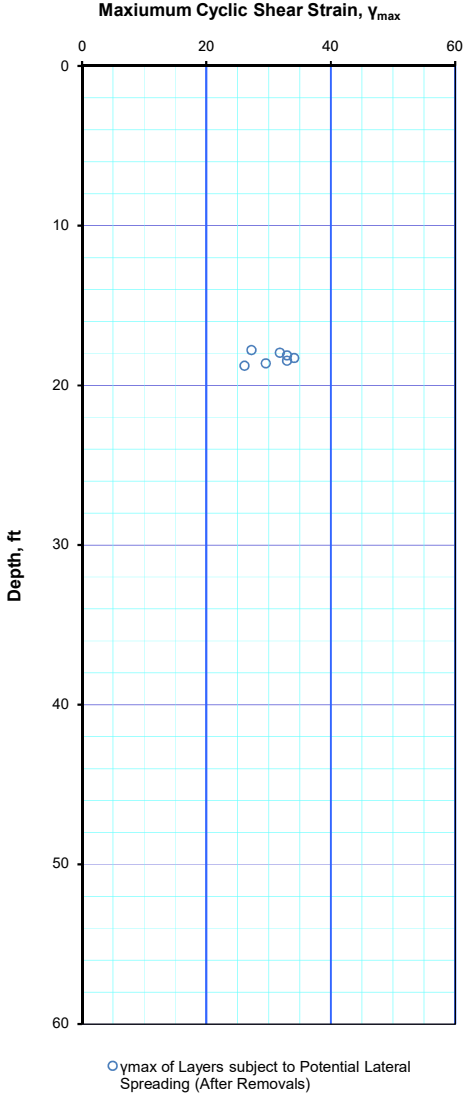
(a)



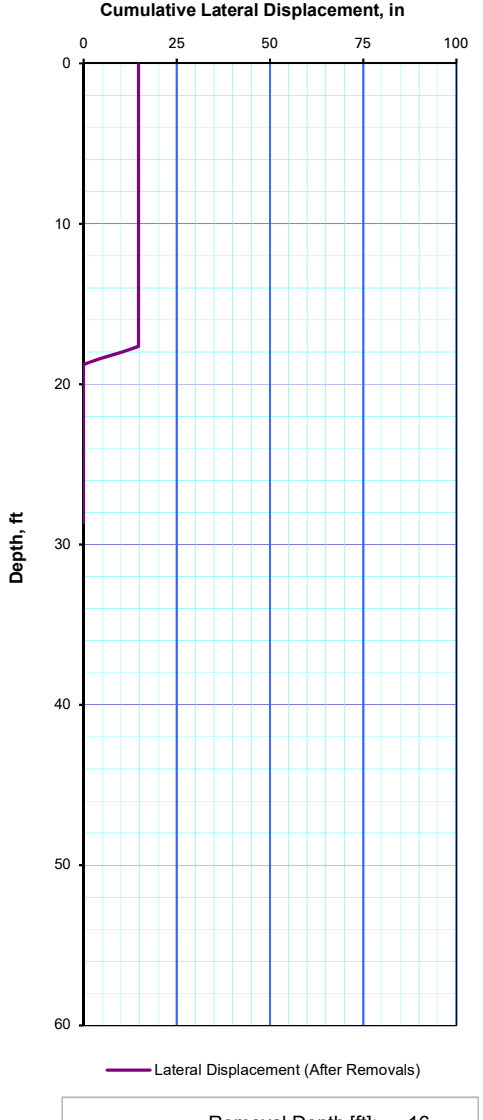
(b)



(c)



(d)



Removal Depth [ft]:	16
Estimated Lateral Disp. [ft]:	1.2

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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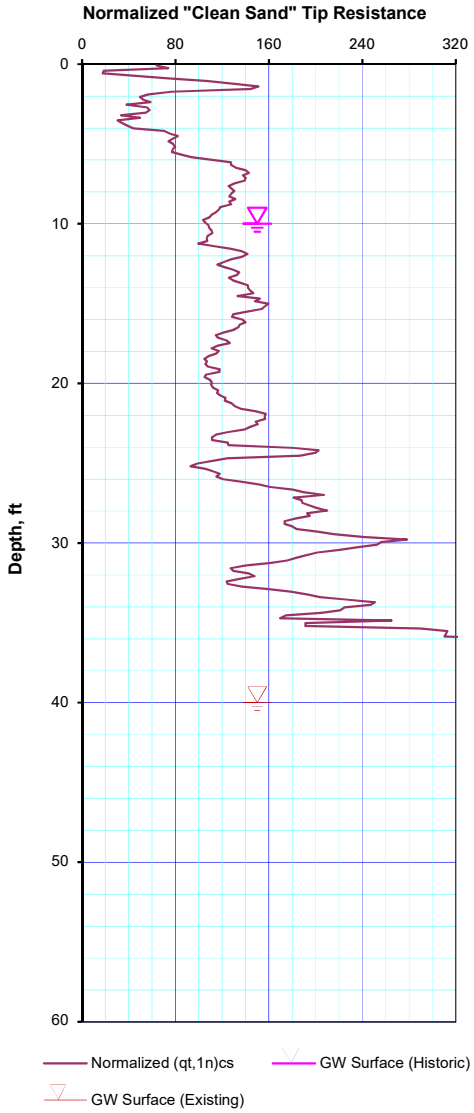
CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

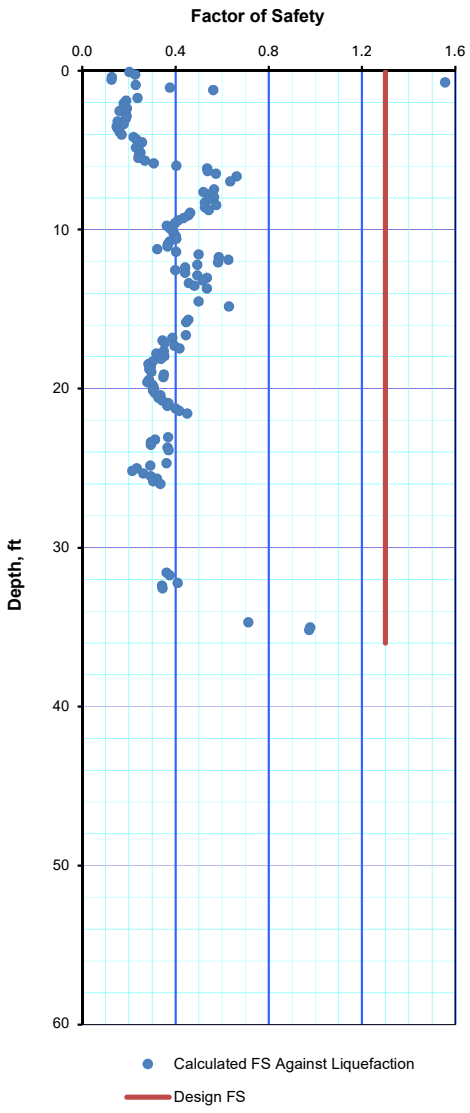
Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.15
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

Location..... **CPT-20**
Elevation (MSL)..... 1272 ft

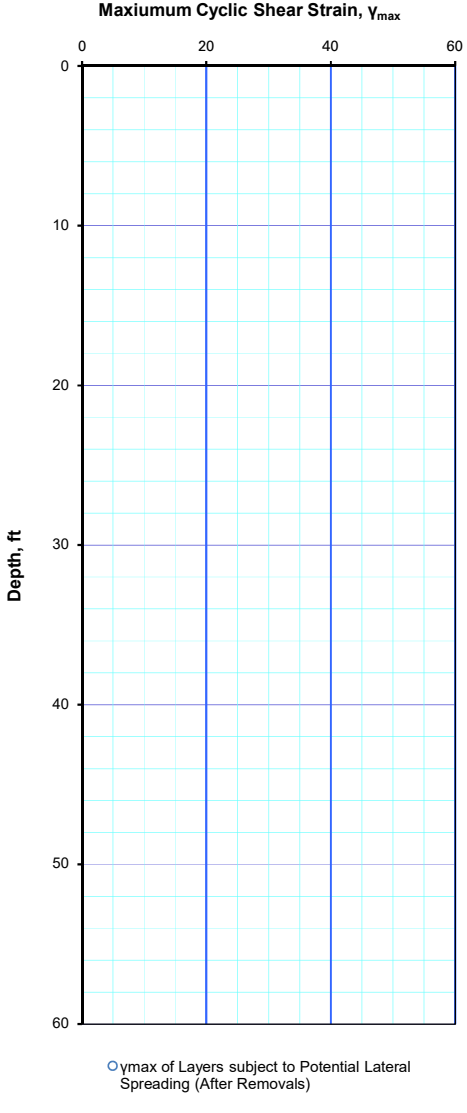
(a)



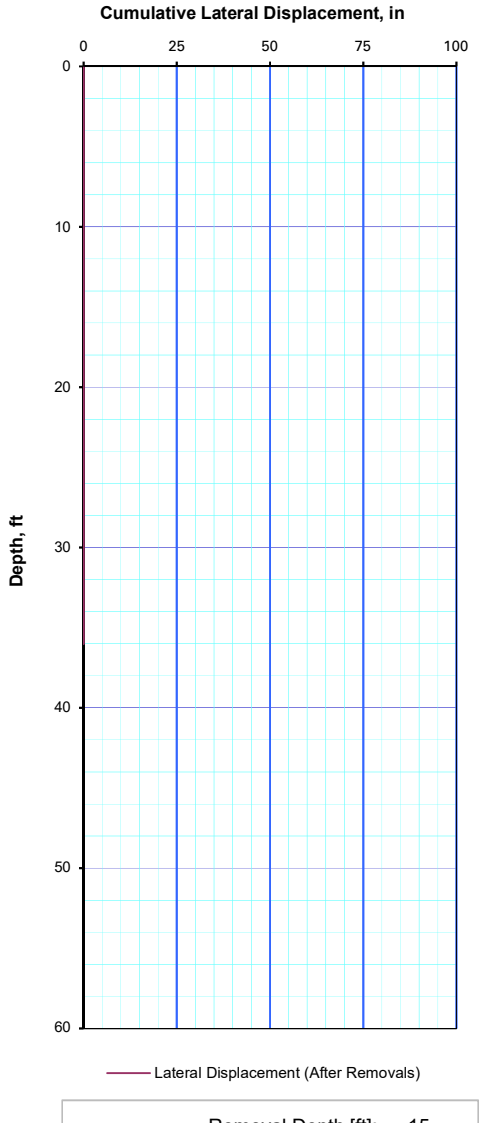
(b)



(c)



(d)



Removal Depth [ft]:	15
Estimated Lateral Disp. [ft]:	0.0

Version v1a; 1/23/18
Reference: Zhang et. al. 2004

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Geological and Geotechnical Consultants

CPT-Based Evaluation of Liquefaction-Induced Lateral Displacements

Sterling Ranch Estates	Ground Slope [%]:	3.3	Project No.:	18-1245A-4
Val Verde, LA County, California	Dist.to Free Face [ft]:	0	Figure No.:	C3.16
For: Sterling Gateway, L.P.	Free Face Height [ft]:	0	Date:	6/8/2018

LATERAL SPREAD DISPLACEMENT ANALYSIS

Project:	Sterling Ranch Estates Val Verde, LA County, California	Project No.: Date: Figure No.:	18-1245A-4 6/8/2018 C4.1

Location	CPT-09		MCE Mean Magnitude =	6.79	
Ground Surface Elevation	1228	ft. above MSL	Peak Ground Accel. (M = 6.79) =	1.02	g
Existing Ground Water Depth	31.0	ft. BGS	Approx. Distance From Site (miles) =	1.4	
Historic Ground Water Depth	25.0	ft. BGS	Basic Earthquake Magnitude =	7.5	
Removal Depth	20	ft.	Magnitude Weighted PGA (M = 7.5) =	0.79	g
Design Safety Factor	1.3		Magnitude Scaling Factor =	1.29	

Options:					
	SS	Free Face Condition [FF] or Gently Sloping Surface [SS]	(Range is 0.2% to 3.5%) Ground Slope, S =	3.3	[%]
	84	$q_{t,1N}$ cut-off value [tsf]	Distance to Free Face, L =		[ft]
	3.5	I_c cut-off value	Free Face Height, H =		[ft]
			(Range is 4 < L/H < 40) L/H =		
			Thickness of Susceptible Layers, T =	3.6	[ft]

Procedure by Zhang et. al., 2004

Mid-layer Depth	Elevation	For Overburden, $q_{t,1N}$	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC	Calculated Factor of Safety, FS	Relative Density, D_r	Max Cyclic Shear Strain, γ_{max}	Lateral Displacement Index, LDI	Lateral Displ.	Cumulative Lateral Displ.
[ft]	[ft. MSL]			[%]	$CRR_{7.5}/CSR^*$		[%]	[in]	[in]	36.5
0.08	1227.9	218.34	218.34	1	2.00	93	#N/A	#N/A	0.00	36.5
0.25	1227.8	191.91	191.91	3	2.00	89	#N/A	#N/A	0.00	36.5
0.41	1227.6	164.94	164.94	4	2.00	84	#N/A	#N/A	0.00	36.5
0.58	1227.4	123.07	127.07	6	0.53	75	#N/A	#N/A	0.00	36.5
0.74	1227.3	98.70	106.02	7	0.37	69	#N/A	#N/A	0.00	36.5
0.90	1227.1	93.85	93.85	5	0.30	65	#N/A	#N/A	0.00	36.5
1.07	1226.9	112.02	112.02	3	0.41	71	#N/A	#N/A	0.00	36.5
1.23	1226.8	137.99	137.99	3	0.63	78	#N/A	#N/A	0.00	36.5
1.40	1226.6	155.29	155.29	4	2.00	82	#N/A	#N/A	0.00	36.5
1.56	1226.4	179.84	179.84	5	2.00	86	#N/A	#N/A	0.00	36.5
1.72	1226.3	203.48	206.02	6	2.00	91	#N/A	#N/A	0.00	36.5
1.89	1226.1	222.62	232.30	6	2.00	95	#N/A	#N/A	0.00	36.5
2.05	1226.0	218.58	236.47	8	2.00	95	#N/A	#N/A	0.00	36.5
2.22	1225.8	200.36	220.02	8	2.00	93	#N/A	#N/A	0.00	36.5
2.38	1225.6	160.65	184.18	9	2.00	87	#N/A	#N/A	0.00	36.5
2.54	1225.5	145.42	167.63	10	2.00	84	#N/A	#N/A	0.00	36.5
2.71	1225.3	140.91	156.36	8	2.00	82	#N/A	#N/A	0.00	36.5
2.87	1225.1	132.80	145.13	8	2.00	79	#N/A	#N/A	0.00	36.5
3.04	1225.0	136.77	149.81	8	2.00	80	#N/A	#N/A	0.00	36.5
3.20	1224.8	138.98	152.44	8	2.00	81	#N/A	#N/A	0.00	36.5
3.36	1224.6	114.02	124.79	8	0.51	74	#N/A	#N/A	0.00	36.5
3.53	1224.5	112.12	125.86	9	0.52	75	#N/A	#N/A	0.00	36.5
3.69	1224.3	100.08	119.65	11	0.47	73	#N/A	#N/A	0.00	36.5
3.86	1224.1	92.35	118.37	13	0.46	73	#N/A	#N/A	0.00	36.5
4.02	1224.0	91.11	108.86	11	0.39	70	#N/A	#N/A	0.00	36.5
4.19	1223.8	87.50	115.89	14	0.44	72	#N/A	#N/A	0.00	36.5
4.35	1223.7	93.57	114.52	11	0.43	71	#N/A	#N/A	0.00	36.5
4.51	1223.5	86.90	110.28	12	0.40	70	#N/A	#N/A	0.00	36.5
4.68	1223.3	86.65	112.99	13	0.42	71	#N/A	#N/A	0.00	36.5
4.84	1223.2	79.40	115.59	16	0.44	72	#N/A	#N/A	0.00	36.5
5.01	1223.0	73.86	118.02	18	0.46	72	#N/A	#N/A	0.00	36.5
5.17	1222.8	65.27	101.02	17	0.35	67	#N/A	#N/A	0.00	36.5

LATERAL SPREAD DISPLACEMENT ANALYSIS

Procedure by Zhang et. al., 2004										
Mid-layer Depth	Elevation	For Overburden, $q_{t,1N}$	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC	Calculated Factor of Safety, FS	Relative Density, D_r	Max Cyclic Shear Strain, γ_{max}	Lateral Displacement Index, LDI	Lateral Displ.	Cumulative Lateral Displ.
[ft]	[ft. MSL]			[%]	$CRR_{7.5}/CSR^*$		[%]	[in]	[in]	36.5
5.33	1222.7	67.63	104.45	17	0.37	68	#N/A	#N/A	0.00	36.5
5.50	1222.5	73.68	114.52	18	0.43	71	#N/A	#N/A	0.00	36.5
5.66	1222.3	76.70	124.54	19	0.51	74	#N/A	#N/A	0.00	36.5
5.83	1222.2	83.66	128.38	17	0.54	75	#N/A	#N/A	0.00	36.5
5.99	1222.0	87.32	126.28	16	0.53	75	#N/A	#N/A	0.00	36.5
6.15	1221.9	92.65	127.71	15	0.54	75	#N/A	#N/A	0.00	36.5
6.32	1221.7	99.96	130.57	13	0.57	76	#N/A	#N/A	0.00	36.5
6.48	1221.5	104.82	130.05	12	0.56	76	#N/A	#N/A	0.00	36.5
6.65	1221.4	96.71	119.27	12	0.47	73	#N/A	#N/A	0.00	36.5
6.81	1221.2	91.20	116.29	13	0.45	72	#N/A	#N/A	0.00	36.5
6.97	1221.0	87.93	116.58	14	0.45	72	#N/A	#N/A	0.00	36.5
7.14	1220.9	82.32	119.21	16	0.47	73	#N/A	#N/A	0.00	36.5
7.30	1220.7	77.95	116.24	17	0.45	72	#N/A	#N/A	0.00	36.5
7.47	1220.5	72.22	116.66	18	0.45	72	#N/A	#N/A	0.00	36.5
7.63	1220.4	77.26	116.81	17	0.45	72	#N/A	#N/A	0.00	36.5
7.79	1220.2	91.17	126.36	15	0.53	75	#N/A	#N/A	0.00	36.5
7.96	1220.0	106.22	137.70	13	0.64	78	#N/A	#N/A	0.00	36.5
8.12	1219.9	98.64	137.52	15	0.64	78	#N/A	#N/A	0.00	36.5
8.29	1219.7	108.63	143.12	13	2.00	79	#N/A	#N/A	0.00	36.5
8.45	1219.6	108.21	149.93	15	2.00	80	#N/A	#N/A	0.00	36.5
8.61	1219.4	107.44	158.05	16	2.00	82	#N/A	#N/A	0.00	36.5
8.78	1219.2	105.62	156.88	16	2.00	82	#N/A	#N/A	0.00	36.5
8.94	1219.1	110.13	158.74	16	2.00	82	#N/A	#N/A	0.00	36.5
9.11	1218.9	107.79	157.89	16	2.00	82	#N/A	#N/A	0.00	36.5
9.27	1218.7	103.93	152.37	16	2.00	81	#N/A	#N/A	0.00	36.5
9.43	1218.6	107.50	163.25	17	2.00	83	#N/A	#N/A	0.00	36.5
9.60	1218.4	113.27	157.39	15	2.00	82	#N/A	#N/A	0.00	36.5
9.76	1218.2	109.99	149.85	14	2.00	80	#N/A	#N/A	0.00	36.5
9.93	1218.1	119.96	151.12	12	2.00	81	#N/A	#N/A	0.00	36.5
10.09	1217.9	122.90	143.78	10	2.00	79	#N/A	#N/A	0.00	36.5
10.25	1217.8	110.93	130.55	10	0.56	76	#N/A	#N/A	0.00	36.5
10.42	1217.6	99.75	126.30	12	0.52	75	#N/A	#N/A	0.00	36.5
10.58	1217.4	101.82	148.01	16	2.00	80	#N/A	#N/A	0.00	36.5
10.75	1217.3	120.98	178.79	16	2.00	86	#N/A	#N/A	0.00	36.5
10.91	1217.1	122.42	208.44	20	2.00	91	#N/A	#N/A	0.00	36.5
11.07	1216.9	132.89	189.80	16	2.00	88	#N/A	#N/A	0.00	36.5
11.24	1216.8	122.72	179.57	16	2.00	86	#N/A	#N/A	0.00	36.5
11.40	1216.6	112.69	167.05	16	2.00	84	#N/A	#N/A	0.00	36.5
11.57	1216.4	106.33	151.13	15	2.00	81	#N/A	#N/A	0.00	36.5
11.73	1216.3	99.86	128.30	13	0.51	75	#N/A	#N/A	0.00	36.5
11.90	1216.1	95.98	127.30	14	0.50	75	#N/A	#N/A	0.00	36.5
12.06	1215.9	98.73	144.08	16	2.00	79	#N/A	#N/A	0.00	36.5
12.22	1215.8	105.52	162.06	17	2.00	83	#N/A	#N/A	0.00	36.5
12.39	1215.6	107.65	169.35	18	2.00	84	#N/A	#N/A	0.00	36.5
12.55	1215.5	100.44	160.90	18	2.00	83	#N/A	#N/A	0.00	36.5
12.72	1215.3	85.87	147.17	20	0.67	80	#N/A	#N/A	0.00	36.5
12.88	1215.1	76.21	143.22	22	0.62	79	#N/A	#N/A	0.00	36.5
13.04	1215.0	66.13	137.91	24	0.57	78	#N/A	#N/A	0.00	36.5
13.21	1214.8	57.82	129.86	26	0.49	76	#N/A	#N/A	0.00	36.5
13.37	1214.6	52.76	118.39	26	0.40	73	#N/A	#N/A	0.00	36.5

LATERAL SPREAD DISPLACEMENT ANALYSIS

Procedure by Zhang et. al., 2004										
Mid-layer Depth	Elevation	For Overburden, $q_{t,1N}$	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC	Calculated Factor of Safety, FS	Relative Density, D_r	Max Cyclic Shear Strain, γ_{max}	Lateral Displacement Index, LDI	Lateral Displ.	Cumulative Lateral Displ.
[ft]	[ft. MSL]			[%]	$CRR_{7.5}/CSR^*$		[%]	[in]	[in]	36.5
13.54	1214.5	53.24	103.93	23	0.32	68	#N/A	#N/A	0.00	36.5
13.70	1214.3	54.94	95.84	20	0.28	66	#N/A	#N/A	0.00	36.5
13.86	1214.1	55.91	88.84	18	0.25	63	#N/A	#N/A	0.00	36.5
14.03	1214.0	54.57	86.17	18	0.24	62	#N/A	#N/A	0.00	36.5
14.19	1213.8	49.83	87.81	20	0.24	63	#N/A	#N/A	0.00	36.5
14.36	1213.6	46.30	89.14	22	0.24	63	#N/A	#N/A	0.00	36.5
14.52	1213.5	41.61	97.32	27	0.28	66	#N/A	#N/A	0.00	36.5
14.68	1213.3	43.48	90.35	24	0.25	64	#N/A	#N/A	0.00	36.5
14.85	1213.2	47.98	86.53	21	0.23	62	#N/A	#N/A	0.00	36.5
15.01	1213.0	45.39	85.84	22	0.23	62	#N/A	#N/A	0.00	36.5
15.18	1212.8	40.02	94.79	27	0.26	65	#N/A	#N/A	0.00	36.5
15.34	1212.7	33.86	157.60	34	0.72	82	#N/A	#N/A	0.00	36.5
15.50	1212.5	30.63	237.58	38	2.00	96	#N/A	#N/A	0.00	36.5
15.67	1212.3	31.69	156.60	35	0.71	82	#N/A	#N/A	0.00	36.5
15.83	1212.2	36.19	91.24	29	0.24	64	#N/A	#N/A	0.00	36.5
16.00	1212.0	39.10	92.01	27	0.24	64	#N/A	#N/A	0.00	36.5
16.16	1211.8	39.00	90.28	27	0.24	64	#N/A	#N/A	0.00	36.5
16.32	1211.7	40.11	84.44	24	0.22	61	#N/A	#N/A	0.00	36.5
16.49	1211.5	39.54	78.08	23	0.20	59	#N/A	#N/A	0.00	36.5
16.65	1211.4	43.71	73.52	19	0.18	57	#N/A	#N/A	0.00	36.5
16.82	1211.2	50.61	73.42	16	0.18	57	#N/A	#N/A	0.00	36.5
16.98	1211.0	49.41	74.45	17	0.19	57	#N/A	#N/A	0.00	36.5
17.14	1210.9	57.36	78.21	14	0.19	59	#N/A	#N/A	0.00	36.5
17.31	1210.7	52.87	75.99	16	0.19	58	#N/A	#N/A	0.00	36.5
17.47	1210.5	47.08	74.05	18	0.18	57	#N/A	#N/A	0.00	36.5
17.64	1210.4	45.69	77.80	20	0.19	59	#N/A	#N/A	0.00	36.5
17.80	1210.2	53.52	85.64	18	0.21	62	#N/A	#N/A	0.00	36.5
17.96	1210.0	56.47	84.94	17	0.21	62	#N/A	#N/A	0.00	36.5
18.13	1209.9	48.17	79.48	19	0.19	59	#N/A	#N/A	0.00	36.5
18.29	1209.7	41.91	81.24	23	0.20	60	#N/A	#N/A	0.00	36.5
18.46	1209.5	41.98	87.21	24	0.22	62	#N/A	#N/A	0.00	36.5
18.62	1209.4	45.16	92.00	24	0.23	64	#N/A	#N/A	0.00	36.5
18.78	1209.2	47.85	90.25	22	0.22	64	#N/A	#N/A	0.00	36.5
18.95	1209.1	48.89	85.91	20	0.21	62	#N/A	#N/A	0.00	36.5
19.11	1208.9	52.81	83.88	18	0.20	61	#N/A	#N/A	0.00	36.5
19.28	1208.7	57.01	85.60	17	0.21	62	#N/A	#N/A	0.00	36.5
19.44	1208.6	51.13	87.14	20	0.21	62	#N/A	#N/A	0.00	36.5
19.61	1208.4	45.64	89.49	23	0.22	63	#N/A	#N/A	0.00	36.5
19.77	1208.2	43.32	91.45	24	0.22	64	#N/A	#N/A	0.00	36.5
19.93	1208.1	43.29	91.94	25	0.23	64	#N/A	#N/A	0.00	36.5
20.10	1207.9	44.32	87.44	23	0.21	63	#N/A	#N/A	0.00	36.5
20.26	1207.7	48.70	89.50	21	0.22	63	#N/A	#N/A	0.00	36.5
20.43	1207.6	51.88	81.49	18	0.19	60	22.70	0.45	1.57	34.9
20.59	1207.4	48.22	79.03	19	0.18	59	23.84	0.47	1.65	33.3
20.75	1207.3	47.32	87.11	21	0.21	62	#N/A	#N/A	0.00	33.3
20.92	1207.1	55.63	88.57	18	0.21	63	#N/A	#N/A	0.00	33.3
21.08	1206.9	69.15	88.73	13	0.21	63	#N/A	#N/A	0.00	33.3
21.25	1206.8	59.37	81.78	15	0.19	60	22.70	0.45	1.57	31.7
21.41	1206.6	59.79	85.15	15	0.20	62	#N/A	#N/A	0.00	31.7
21.57	1206.4	57.96	81.10	15	0.19	60	22.70	0.44	1.53	30.2

LATERAL SPREAD DISPLACEMENT ANALYSIS

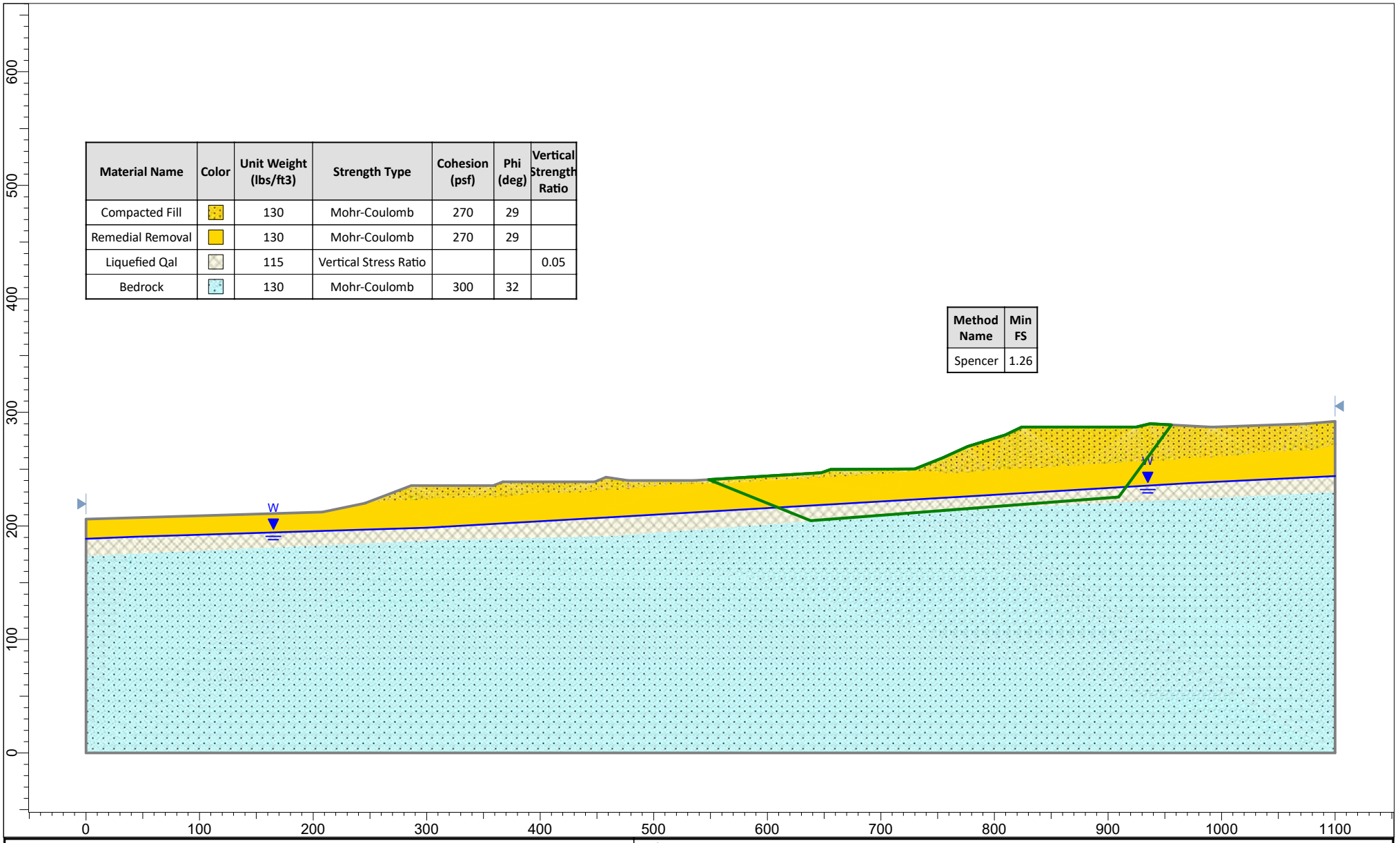
Procedure by Zhang et. al., 2004										
Mid-layer Depth	Elevation	For Overburden, $q_{t,1N}$	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC	Calculated Factor of Safety, FS	Relative Density, D_r	Max Cyclic Shear Strain, γ_{max}	Lateral Displacement Index, LDI	Lateral Displ.	Cumulative Lateral Displ.
[ft]	[ft. MSL]			[%]	$CRR_{7.5}/CSR^*$		[%]	[in]	[in]	36.5
21.74	1206.3	53.35	74.55	15	0.17	57	26.12	0.52	1.81	28.3
21.90	1206.1	46.16	72.24	18	0.17	56	27.26	0.54	1.89	26.5
22.07	1205.9	52.26	106.08	24	0.27	69	#N/A	#N/A	0.00	26.5
22.23	1205.8	93.70	124.22	14	0.37	74	#N/A	#N/A	0.00	26.5
22.39	1205.6	119.62	148.08	12	2.00	80	#N/A	#N/A	0.00	26.5
22.56	1205.4	95.06	121.19	13	0.35	73	#N/A	#N/A	0.00	26.5
22.72	1205.3	79.77	107.30	14	0.28	69	#N/A	#N/A	0.00	26.5
22.89	1205.1	65.01	96.78	17	0.23	66	#N/A	#N/A	0.00	26.5
23.05	1205.0	55.44	98.46	21	0.24	66	#N/A	#N/A	0.00	26.5
23.21	1204.8	45.63	98.39	25	0.24	66	#N/A	#N/A	0.00	26.5
23.38	1204.6	51.79	92.61	21	0.22	64	#N/A	#N/A	0.00	26.5
23.54	1204.5	49.73	78.10	18	0.18	59	23.84	0.47	1.65	24.8
23.71	1204.3	45.26	74.64	19	0.17	57	26.12	0.52	1.81	23.0
23.87	1204.1	39.27	75.43	22	0.17	58	24.98	0.49	1.73	21.3
24.03	1204.0	37.57	78.92	24	0.18	59	23.84	0.46	1.60	19.7
24.20	1203.8	36.02	80.66	26	0.18	60	22.70	0.45	1.57	18.1
24.36	1203.6	35.71	82.22	26	0.18	61	21.88	0.43	1.52	16.6
24.53	1203.5	35.54	83.35	27	0.19	61	21.88	0.43	1.52	15.1
24.69	1203.3	35.11	84.48	27	0.19	61	#N/A	#N/A	0.00	15.1
24.85	1203.2	35.81	83.52	27	0.19	61	21.88	0.42	1.47	13.6
25.02	1203.0	37.30	78.82	24	0.17	59	23.84	0.47	1.65	11.9
25.18	1202.8	36.55	74.94	24	0.17	57	26.12	0.52	1.81	10.1
25.35	1202.7	35.21	77.15	25	0.17	58	24.98	0.49	1.73	8.4
25.51	1202.5	34.00	85.04	28	0.19	62	#N/A	#N/A	0.00	8.4
25.67	1202.3	36.80	87.80	27	0.20	63	#N/A	#N/A	0.00	8.4
25.84	1202.2	41.16	88.52	25	0.20	63	#N/A	#N/A	0.00	8.4
26.00	1202.0	44.93	88.32	23	0.20	63	#N/A	#N/A	0.00	8.4
26.17	1201.8	44.32	90.71	24	0.21	64	#N/A	#N/A	0.00	8.4
26.33	1201.7	49.09	83.75	20	0.18	61	21.88	0.43	1.52	6.9
26.49	1201.5	46.72	78.34	19	0.17	59	23.84	0.46	1.60	5.3
26.66	1201.3	42.66	74.22	20	0.16	57	26.12	0.52	1.81	3.5
26.82	1201.2	38.52	76.71	23	0.17	58	24.98	0.49	1.73	1.7
26.99	1201.0	36.32	76.88	25	0.17	58	24.98	0.49	1.73	0.0
27.15	1200.9	35.59	89.10	28	0.20	63	#N/A	#N/A	0.00	0.0
27.32	1200.7	41.98	103.49	28	0.25	68	#N/A	#N/A	0.00	0.0
27.48	1200.5	67.68	104.72	17	0.25	69	#N/A	#N/A	0.00	0.0
27.64	1200.4	59.67	102.34	20	0.24	68	#N/A	#N/A	0.00	0.0
27.81	1200.2	74.35	98.97	14	0.23	67	#N/A	#N/A	0.00	0.0
27.97	1200.0	74.23	98.06	14	0.23	66	#N/A	#N/A	0.00	0.0
28.14	1199.9	72.69	97.68	14	0.23	66	#N/A	#N/A	0.00	0.0
28.30	1199.7	81.22	106.11	13	0.26	69	#N/A	#N/A	0.00	0.0
28.46	1199.5	81.11	113.93	15	0.29	71	#N/A	#N/A	0.00	0.0
28.63	1199.4	93.35	117.71	12	0.31	72	#N/A	#N/A	0.00	0.0
28.79	1199.2	125.06	144.18	10	2.00	79	#N/A	#N/A	0.00	0.0
28.96	1199.0	136.62	153.73	9	2.00	81	#N/A	#N/A	0.00	0.0
29.12	1198.9	133.57	150.41	9	2.00	80	#N/A	#N/A	0.00	0.0
29.28	1198.7	140.10	152.84	8	2.00	81	#N/A	#N/A	0.00	0.0
29.45	1198.6	167.19	170.31	6	2.00	85	#N/A	#N/A	0.00	0.0
29.61	1198.4	168.99	176.95	7	2.00	86	#N/A	#N/A	0.00	0.0
29.78	1198.2	157.33	172.08	8	2.00	85	#N/A	#N/A	0.00	0.0

LATERAL SPREAD DISPLACEMENT ANALYSIS

Procedure by Zhang et. al., 2004										
Mid-layer Depth	Elevation	For Overburden, $q_{t,1N}$	for "Clean Sand" $(q_{t,1N})_{CS}$	Apparent Fines Content, FC	Calculated Factor of Safety, FS	Relative Density, D_r	Max Cyclic Shear Strain, γ_{max}	Lateral Displacement Index, LDI	Lateral Displ.	Cumulative Lateral Displ.
[ft]	[ft. MSL]			[%]	$CRR_{7.5}/CSR^*$		[%]	[in]	[in]	36.5
29.94	1198.1	153.38	171.22	9	2.00	85	#N/A	#N/A	0.00	0.0
30.10	1197.9	156.53	178.53	9	2.00	86	#N/A	#N/A	0.00	0.0
30.27	1197.7	158.25	182.20	10	2.00	87	#N/A	#N/A	0.00	0.0
30.43	1197.6	157.77	178.10	9	2.00	86	#N/A	#N/A	0.00	0.0
30.60	1197.4	160.25	175.81	8	2.00	86	#N/A	#N/A	0.00	0.0
30.76	1197.2	172.49	187.59	8	2.00	88	#N/A	#N/A	0.00	0.0
30.92	1197.1	210.07	214.17	6	2.00	92	#N/A	#N/A	0.00	0.0

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.26



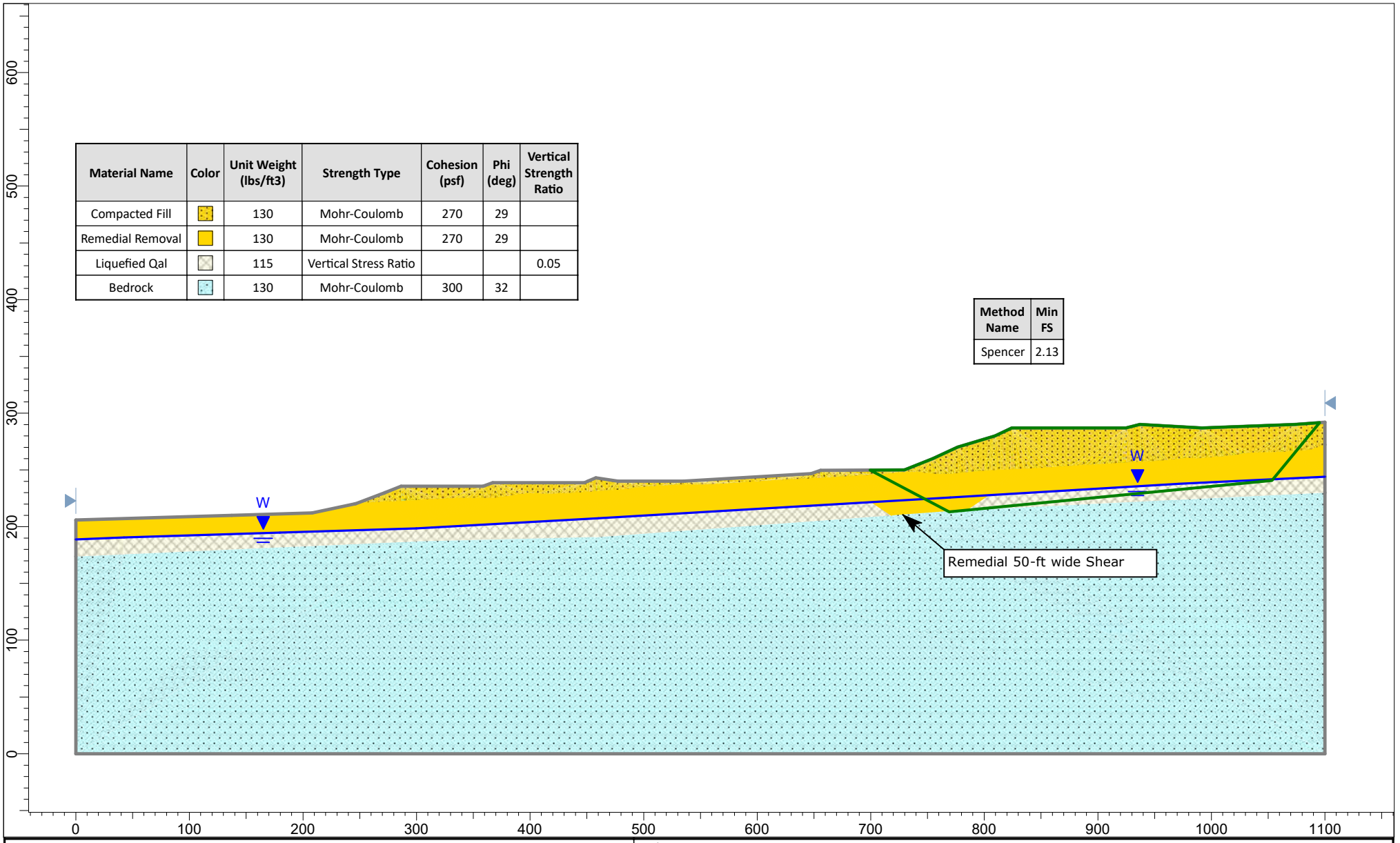
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 28-28'; Alluvial Canyon 2; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	Drawn By:	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	File Name:	t28s1a.slmd
		Scale:	1:1400
Project No.:	18-1245A-4	Date: 6/8/2018	Figure No.:

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	2.13



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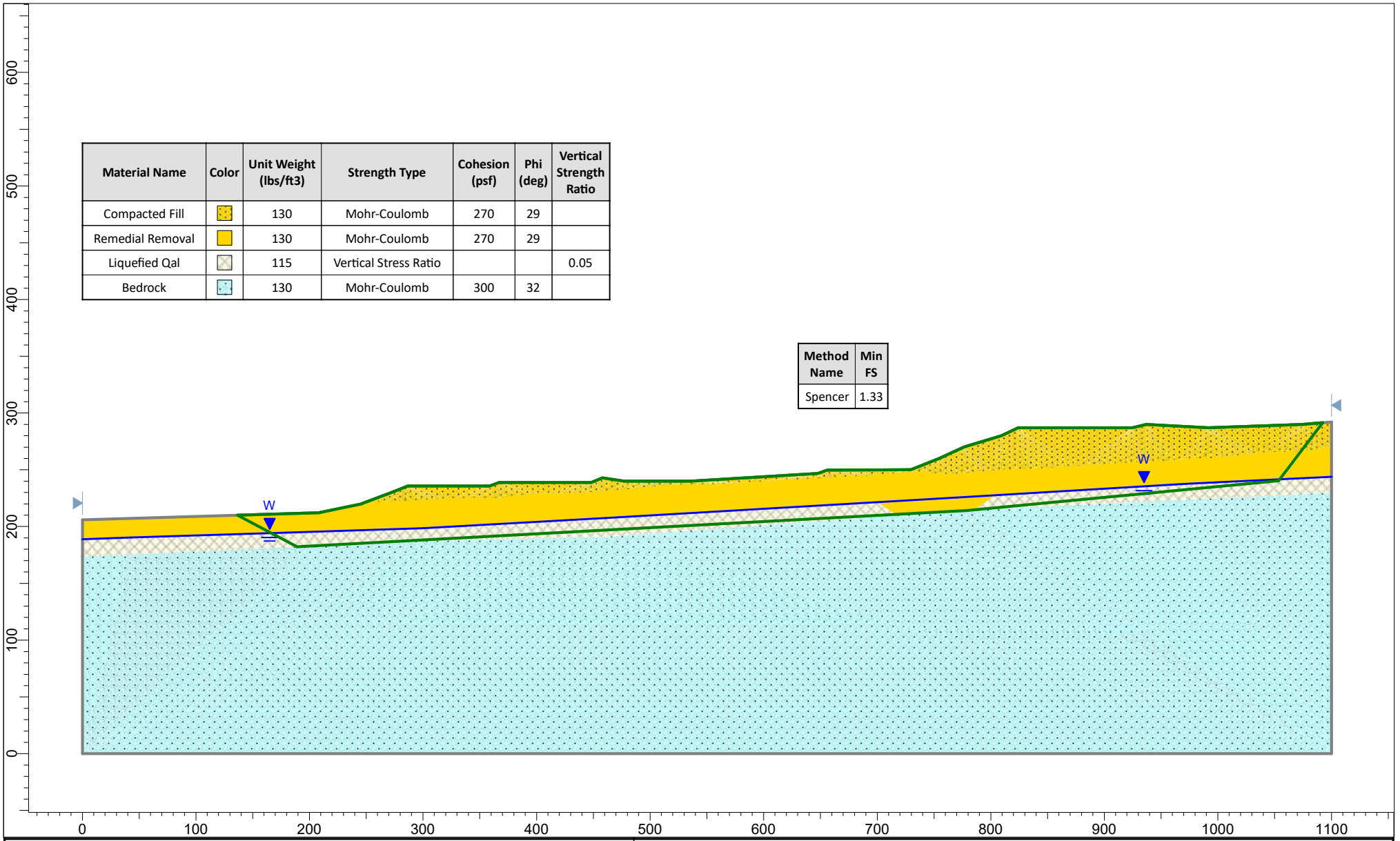
Analysis:	Section 28-28'; Alluvial Canyon 2; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	Drawn By:	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	File Name:	t28s1a.slmd
		Scale:	1:1400
Project No.:	18-1245A-4	Date: 6/8/2018	Figure No.:

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.33



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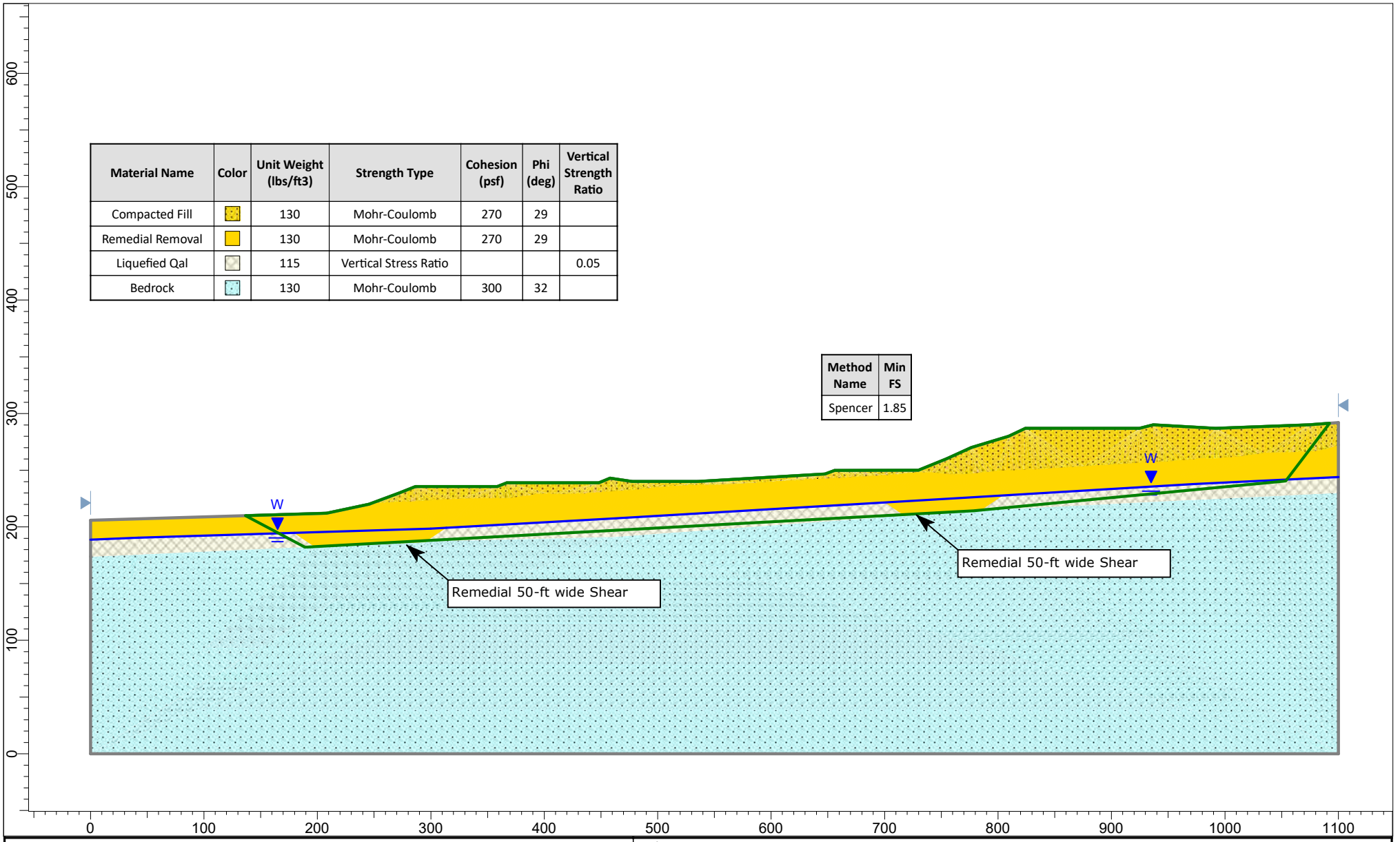
Analysis:	Section 28-28'; Alluvial Canyon 2; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t28s1a.slmd
		Scale:	1:1400
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:*

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.85



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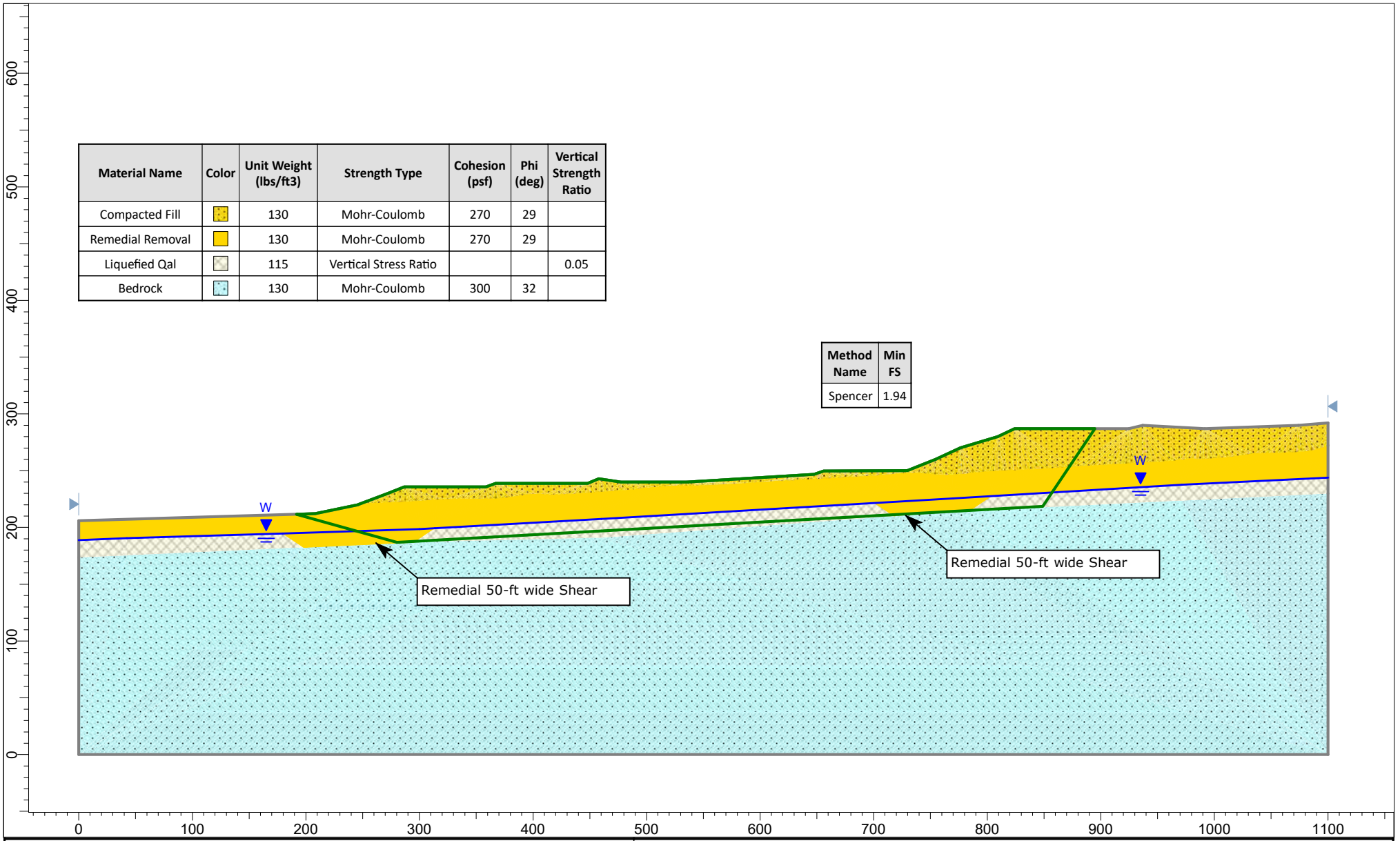
Analysis:	Section 28-28'; Alluvial Canyon 2; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	Drawn By:	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	File Name:	t28s1a.slmd
		Scale:	1:1400
Project No.:	18-1245A-4	Date: 6/8/2018	Figure No.:

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.94



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SLIDEINTERPRET 8.014

Analysis:	Section 28-28'; Alluvial Canyon 2; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t28s1a.slmd
		Scale:	1:1400
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:*

Slide Analysis Information
t28s1a

Project Summary

File Name: t28s1a.slmd
Slide Modeler Version: 8.014
Project Title: VTTM 60257
Analysis: Section 28-28'; Alluvial Canyon 2; Shear Keys for Lateral Spread Mitigation
Author: K. Callahan
Date Created: 6/8/2018

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245-A-4

Current/Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Lateral Spread - Shear Key 2	Master Scenario	Spencer: 1.264180	00h:00m:01.663s
	Thru shear key 2	Spencer: 1.131610	00h:00m:01.724s
	Thru shear key 2 (2)	Spencer: 1.329080	00h:00m:01.854s
	Thru shear keys 1 and 2	Spencer: 1.840820	00h:00m:01.870s
	Between shear keys 1 and 2	Spencer: 1.940780	00h:00m:01.847s

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Data Output: Standard
Failure Direction: Right to Left

Analysis Options

All Open Scenarios

Slices Type: Vertical

Analysis Methods Used

Spencer

Number of slices: 50
Tolerance: 0.005
Maximum number of iterations: 75
Check maljha < 0.2: Yes
Create interslice boundaries at intersections with water tables and piezos: Yes
Initial trial value of FS: 1
Steffensen iteration: Yes

Groundwater Analysis

All Open Scenarios

Groundwater Method: Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]: 62.4
Use negative pore pressure cutoff: Yes
Maximum negative pore pressure [psf]: 0
Advanced Groundwater Method: None

Random Numbers

All Open Scenarios

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

All Open Scenarios

Surface Type: Non-Circular Block Search
Number of Surfaces: 5000
Multiple Groups: Disabled
Pseudo-Random Surfaces: Enabled
Convex Surfaces Only: Disabled
Left Projection Angle (Start Angle) [°]: 115
Left Projection Angle (End Angle) [°]: 165
Right Projection Angle (Start Angle) [°]: 15
Right Projection Angle (End Angle) [°]: 65
Minimum Elevation: Not Defined
Minimum Depth: Not Defined
Minimum Area: Not Defined
Minimum Weight: Not Defined

Seismic Loading

All Open Scenarios

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Materials

Property	Compacted Fill	Remedial Removal	Liquefied Qal	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Vertical Stress Ratio	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	130	115	130
Cohesion [psf]	270	270		300
Friction Angle [°]	29	29		32
Tru Ru Ratio			0.05	
Min. Strength [psf]			0	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	Automatically Calculated	Automatically Calculated	Automatically Calculated	Automatically Calculated

Materials in Use

Material	Master Scenario	Thru shear key 2	Thru shear key 2 (2)	Thru shear keys 1 and 2	Between shear keys 1 and 2
Compacted Fill	✓	✓	✓	✓	✓
Remedial Removal	✓	✓	✓	✓	✓
Liquefied Qal	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓

Global Minimums

Lateral Spread - Shear Key 2 - Master Scenario — Method: spencer

FS	1.264180
Axis Location:	703.910, 672.522
Left Slip Surface Endpoint:	548.270, 240.773
Right Slip Surface Endpoint:	955.925, 288.960
Resisting Moment:	1.311e+08 lb-ft
Driving Moment:	1.037e+08 lb-ft
Resisting Horizontal Force:	243608 lb
Driving Horizontal Force:	192701 lb
Total Slice Area:	17693.1 ft2
Surface Horizontal Width:	407.655 ft
Surface Average Height:	43.4022 ft

Lateral Spread - Shear Key 2 - Thru shear key 2 — Method: spencer

FS	1.131610
Axis Location:	855.663, 666.652
Left Slip Surface Endpoint:	699.485, 249.877
Right Slip Surface Endpoint:	1091.376, 291.645
Resisting Moment:	1.930564e+08 lb-ft
Driving Moment:	9.058729e+07 lb-ft
Resisting Horizontal Force:	384294 lb
Driving Horizontal Force:	180284 lb
Total Slice Area:	19314.7 ft2
Surface Horizontal Width:	395.896 ft
Surface Average Height:	48.7878 ft

Lateral Spread - Shear Key 2 - Thru shear key 2 (2) — Method: spencer

FS	1.329080
Axis Location:	532.963, 1206.471
Left Slip Surface Endpoint:	136.504, 209.978
Right Slip Surface Endpoint:	1092.282, 291.407
Resisting Moment:	5.476664e+08 lb-ft
Driving Moment:	4.121e+08 lb-ft
Resisting Horizontal Force:	526997 lb
Driving Horizontal Force:	396008 lb
Total Slice Area:	42371.3 ft2
Surface Horizontal Width:	955.778 ft
Surface Average Height:	44.3317 ft

Lateral Spread - Shear Key 2 - Thru shear keys 1 and 2 — Method: spencer

FS	1.840820
Axis Location:	532.963, 1206.471
Left Slip Surface Endpoint:	136.504, 209.978
Right Slip Surface Endpoint:	1092.282, 291.407
Resisting Moment:	8.054e+08 lb-ft
Driving Moment:	4.354e+08 lb-ft
Resisting Horizontal Force:	759304 lb
Driving Horizontal Force:	410474 lb
Total Slice Area:	42371.3 ft2
Surface Horizontal Width:	955.778 ft
Surface Average Height:	44.3317 ft

Lateral Spread - Shear Key 2 - Between shear keys 1 and 2 — Method: spencer

FS	1.940780
Axis Location:	467.860, 952.437
Left Slip Surface Endpoint:	191.662, 211.639
Right Slip Surface Endpoint:	864.780, 287.000
Resisting Moment:	5.136914e+08 lb-ft
Driving Moment:	2.646834e+08 lb-ft
Resisting Horizontal Force:	622112 lb
Driving Horizontal Force:	320548 lb
Total Slice Area:	29176.5 ft2
Surface Horizontal Width:	703.118 ft
Surface Average Height:	41.4959 ft

Global Minimum Coordinates

Lateral Spread - Shear Key 2 - Master Scenario — Method: spencer

X	Y
548.27	240.773
638.175	206.543
909.505	225.399
955.925	288.96

Lateral Spread - Shear Key 2 - Thru shear key 2 — Method: spencer

X	Y
699.485	249.877
769.057	212.969
1053.21	240.628
1091.38	291.645

Lateral Spread - Shear Key 2 - Thru shear key 2 (2) — Method: spencer

X	Y
136.504	209.978
189.067	182.194
778.423	214.123
1053.47	240.411
1092.28	291.407

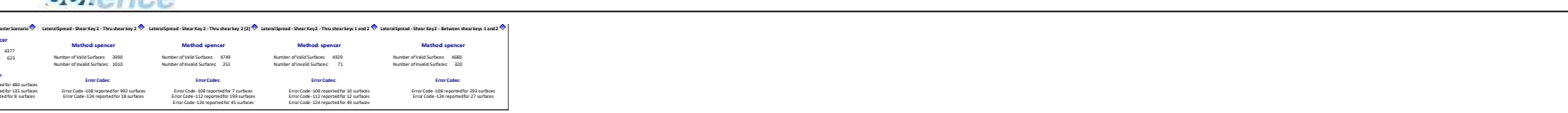
Lateral Spread - Shear Key 2 - Thru shear keys 1 and 2 — Method: spencer

X	Y
136.504	209.978
189.067	182.194
778.423	214.123
1053.47	240.411
1092.28	291.407

Lateral Spread - Shear Key 2 - Between shear keys 1 and 2 — Method: spencer

X	Y
191.662	211.639
280.095	186.81
848.874	218.483
864.78	287

Valid/Invalid Surfaces



Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 kN/m or 0.1 kip/ft).

-112 = The coefficient M-Alpha = cos(alpha)[1+tan(alpha)tan(phi)/F] = 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep-seated slip surfaces with many high negative base angle slices in the passive zone.

-124 = A slice has a width less than the minimum acceptable value.

Slice Data

Lateral Spread - Shear Key 2 - Master Scenario

Global Minimum Query (spencer) - Safety Factor: 1.26418

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Effective Shear Stress [psf]
1	9.29392	2597.87	21.9485	Compacted Fill	270	29	421.782	533.209	474.862	3004.87	1408.5
2	8.16661	7050.11	21.9485	Remedial Removal	270	29	721.329	911.89	1158.01	8427.323	867.323
3	8.16661	11516.2	21.9485	Remedial Removal	270	29	1009.55	1276.25	1815.33	8605.13	1404.51
4	8.16661	15982.2	21.9485	Remedial Removal	270	29	1297.77	1640.61	2472.65	8783.937	1940.68
5	8.16661	20448.2	21.9485	Remedial Removal	270	29	1585.98	2004.97	3129.98	8962.746	2476.86
6	8.16661	24914.3	21.9485	Remedial Removal	270	29	1874.2	2369.33	3787.3	9141.554	3013.04
7	8.16661	29380.3	21.9485	Remedial Removal	270	29	2162.42	2733.69	4444.63	9320.363	3549.23
8	7.22777	27908.2	21.9485	Liquefied Fill	187.877	0	1481.6	187.877	3993.98	103.706	3890.28
9	7.22777	30689	21.9485	Liquefied Fill	196.742	0	1626.98	196.742	4388.42	111.139	4277.28
10	7.22777	33469.7	21.9485	Liquefied Fill	205.607	0	1772.35	205.607	4782.85	118.573	4664.28
11	7.22777	36250.4	21.9485	Liquefied Fill	214.472	0	1917.73	214.472	5177.29	126.006	5051.28
12	8.22213	42753.2	21.9546	Liquefied Fill	218.737	0	2179.07	218.737	5177.15	825.033	4352.12
13	8.22213	45596.1	21.9546	Liquefied Fill	224.332	0	2277.62	224.332	5279.19	815.663	4463.53
14	8.22213	48052.7	21.9546	Liquefied Fill	229.927	0	2376.17	229.927	5381.23	806.293	4574.94
15	8.22213	44370.6	21.9546	Liquefied Fill	229.979	0	2191.92	229.979	5372.91	796.893	4576.02
16	8.22213	40748.6	21.9546	Liquefied Fill	229.979	0	2012.71	229.979	5364.59	787.514	4576.81
17	8.22213	43128.2	21.9546	Liquefied Fill	229.979	0	2130.21	229.979	5356.27	778.134	4577.59
18	8.22213	42507	21.9546	Liquefied Fill	229.053	0	2099.55	229.053	5347.95	768.754	4578.5
19	8.22213	41885.4	21.9546	Liquefied Fill	228.127	0	2068.89	228.127	5339.63	759.374	4579.42
20	8.22213	41264.6	21.9546	Liquefied Fill	227.201	0	2038.23	227.201	5331.31	749.995	4580.34
21	8.22213	40643.4	21.9546	Liquefied Fill	226.275	0	2007.57	226.275	5322.99	740.615	4581.26
22	8.22213	40022.2	21.9546	Liquefied Fill	225.349	0	1976.91	225.349	5314.67	731.235	4582.18
23	8.22213	40741.3	21.9546	Liquefied Fill	224.423	0	2012.38	224.423	5306.35	721.855	4583.1
24	8.22213	41560.6	21.9546	Liquefied Fill	223.497	0	2052.83	223.497	5298.03	712.475	4584.02
25	8.22213	42379.9	21.9546	Liquefied Fill	222.571	0	2093.28	222.571	5289.71	703.096	4584.94
26	8.22213	43488.8	21.9546	Liquefied Fill	266.239	0	2160.602	266.239	5991.94	693.716	5298.22
27	8.22213	52844.1	21.9546	Liquefied Fill	267.129	0	2607.136	267.129	6268.67	684.336	5784.33
28	8.22213	56186.8	21.9546	Liquefied Fill	307.921	0	2463.574	307.921	6803.3	675.179	6128.12
29	8.22213	58646.9	21.9546	Liquefied Fill	323.315	0	2585.752	323.315	7103.19	666.515	6439.61
30	8.22213	60650	21.9546	Liquefied Fill	338.709	0	2685.798	338.709	7403.08	657.851	6744.3
31	8.22213	62665.1	21.9546	Liquefied Fill	348.616	0	2775.765	348.616	7587.57	649.187	6938.38
32	8.22213	64697.7	21.9546	Liquefied Fill	361.41	0	2865.885	361.41	7771.96	640.523	7131.44
33	8.22213	67697.4	21.9546	Liquefied Fill	380.085	0	3000.657	380.085	8146.79	631.859	7514.94
34	8.22213	70902.3	21.9546	Liquefied Fill	400.088	0	3141.437	400.088	8566.58	623.195	7943.39
35	8.22213	74062.1	21.9546	Liquefied Fill	401.294	0	3317.434	401.294	8605.75	614.531	7987.22
36	8.22213	77222	21.9546	Liquefied Fill	402.499	0	3493.431	402.499	8644.92	605.867	8039.05
37	8.22213	69725.8	21.9546	Liquefied Fill	394.153	0	3096.145	394.153	8446.29	597.203	7849.09
38	8.22213	69653.7	21.9546	Liquefied Fill	386.438	0	3093.944	386.438	8281.08	588.539	7692.64
39	8.22213	68409.1	21.9546	Liquefied Fill	378.722	0	3038.662	378.722	8115.87	579.875	7535.99
40	8.22213	67750.8	21.9546	Liquefied Fill	383.442	0	3009.313	383.442	8203.17	571.211	7631.96
41	8.22213	67092.4	21.9546	Liquefied Fill	388.162	0	2979.972	388.162	8290.47	562.547	7727.92
42	8.22213	66434.1	21.9546	Liquefied Fill	392.882	0	2950.631	392.882	8377.77	553.883	7823.89
43	8.22213	65775.7	21.9546	Liquefied Fill	397.602	0	2921.289	397.602	8465.07	545.219	7919.85
44	8.22213	65117.4	21.9546	Liquefied Fill	369.161	0	2892.016	369.161	7884.31	536.555	7347.75
45	6.5377	48131.1	5.81816	Liquefied Fill	354.798	0	2880.653	354.798	6445.08	266.106	6349.08
46	8.11844	49700	5.81816	Remedial Removal	270	29	1775.68	2244.76	3562.61	6993.95	1693.96
47	8.11844	38882.4	5.81816	Remedial Removal	270	29	1419.16	1794.08	2749.51	6692.7	1293.7
48	7.88195	28326.3	5.81816	Remedial Removal	270	29	1099.28	1389.69	2019.97	6525.16	1025.16
49	7.88195	17252.2	5.81816	Remedial Removal	270	29	723.36	914.457	1162.63	6357.62	713.62
50	7.88195	5750.72	5.81816	Remedial Removal	270	29	333.051	421.036	272.476	6189.08	324.708

Lateral Spread - Shear Key 2 - Thru shear key 1

Global Minimum Query (spencer) - Safety Factor: 2.13161

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Effective Shear Stress [psf]
1	7.13888	17700.84	-27.9661	Compacted Fill	270	29	2302.054	490.385	997.185	0	397.585
2	8.21655	6422.14	-27.9661	Remedial Removal	270	29	400.724	854.187	1053.9	0	1053.9
3	8.21655	11110.8	-27.9661	Remedial Removal	270	29	583.372	1243.52	1756.28	0	1756.28
4	8.21655	15868.7	-27.9661	Remedial Removal	270	29	768.485	1638.31	2468.13	0	2468.13
5	8.21655	22907.7	-27.9661	Remedial Removal	270	29	1042.51	2222.23	3521.92	0	3521.92
6	8.21655	31091.2	-27.9661	Remedial Removal	270	29	1361.1	2901.31	4747.05	0	4747.05
7	10.0618	49256.8	-27.9661	Remedial Removal	270	29	1659.6	3537.63	6079.24	184.271	5894.97
8	10.0618	62091.4	-27.9661	Remedial Removal	270	29	1953.59	4164.3	7578.35	552.823	7025.51
9	1.23683	8463.36	-27.9661	Bedrock	300	32	2448.32	5218.87	8631.43	759.583	7871.84
10	7.91578	56677.1	5.55956	Bedrock	300	32	1980.11	4220.82	7047.26	772.638	6274.63
11	7.91578	58898.8	5.55956	Bedrock	300	32	2064.4	4400.76	7223.21	756.162	6467.05
12	8.13513	63857	5.55956	Liquefied Soil	344.012	0	161.386	344.012	7564.19	735.253	6828.94
13	8.13513	65139.9	5.55956	Liquefied Soil	352.638	0	165.434	352.638	7754.72	715.744	7038.98
14	8.13513	66613.2	5.55956	Liquefied Soil	362.387	0	170.006	362.387	7890.38	696.235	7194.15
15	8.13513	69013	5.55956	Liquefied Soil	382.429	0	178.936	382.429	8223.26	676.726	7546.53
16	8.13513	72676.6	5.55956	Liquefied Soil	400.505	0	187.888	400.505	8608.76	657.217	7951.55
17	8.13513	75581.7	5.55956	Liquefied Soil	402.439	0	197.533	402.439	8675.92	637.708	8038.22
18	8.13513	75985.5	5.55956	Liquefied Soil	398.335	0	186.87	398.335	8536.88	618.198	7908.68
19	8.13513	71135.3	5.55956	Liquefied Soil	394.24	0	184.949	394.24	8436.15	598.689	7837.46
20	8.13513	70295	5.55956	Liquefied Soil	390.146	0	183.028	390.146	8335.43	579.18	7756.25
21	8.13513	69434.8	5.55956	Liquefied Soil	386.051	0	181.108	386.051	8234.71	559.671	7675.04
22	8.13513	68585.5	5.55956	Liquefied Soil	381.957	0	179.187	381.957	8133.98	540.162	7593.82
23	8.13513	67734.3	5.55956	Liquefied Soil	377.863	0	177.266	377.863	8033.25	520.653	7512.6
24	8.13513	66883	5.55956	Liquefied Soil	373.768	0	175.345	373.768	7932.53	501.144	7431.39
25	8.13513	66033.8	5.55956	Liquefied Soil	369.674	0	173.425	369.674	7831.81	481.634	7350.17
26	8.13513	65183.6	5.55956	Liquefied Soil	365.579	0	171.504	365.579	7731.08	462.125	7268.96
27	8.13513	64333.3	5.55956	Liquefied Soil	361.485	0	169.583	361.485	7630.37	442.616	7187.75
28	8.13513	63682.5	5.55956	Liquefied Soil	358.102	0	167.996	358.102	7533.29	423.107	7110.68
29	8.13513	64482.6	5.55956	Liquefied Soil	364.314	0	168.409	364.314	7637.78	403.598	7234.18
30	8.13513	64845.1	5.55956	Liquefied Soil	367.462	0	172.387	367.462	7680.93	384.089	7296.84
31	8.13513	63518.9	5.55956	Liquefied Soil	366153	0	169.115	360.53	7523.83	364.58	7159.25
32	8.13513	62167.2	5.55956	Liquefied Soil	353.466	0	165.812	353.446	7362.72	345.071	7017.65
33	8.13513	60810.4	5.55956	Liquefied Soil	341.314	0	162.488	346.361	7203.1	325.561	6877.54
34	8.13513	59467.3	5.55956	Liquefied Soil	339.353	0	159.2	339.353	7043.89	306.052	6737.84
35	8.13513	58127.8	5.55956	Liquefied Soil	332.638	0	156.124	332.638	6885.16	286.543	6598.62
36	8.13513	56836.4	5.55956	Liquefied Soil	326.215	0	153.037	326.215	6732.23	253.93	6478.3
37	8.13513	56150.5	5.55956	Liquefied Soil	323.4	0	151.716	323.4	6650.96	228.431	6422.53
38	8.13513	55645.5	5.55956	Liquefied Soil	321.664	0	150.902	321.664	6591.13	202.933	6388.2
39	8.13513	55140.4	5.55956	Liquefied Soil	319.927	0	150.087	319.927	6531.28	177.436	6353.85
40	8.13513	54635.4	5.55956	Liquefied Soil	318.191	0	149.273	318.191	6471.41	151.938	6319.51
41	8.13513	54130.4	5.55956	Liquefied Soil	316.454	0	148.458	316.454	6411.61	126.437	6285.17
42	8.13513	53631.3	5.55956	Liquefied Soil	314.717	0	147.643	314.717	6351.76	100.939	6250.82
43	8.13513	53130.3	5.55956	Liquefied Soil	312.981	0	146.828	312.981	6291.93	75.4402	6216.49
44	0.8675533	5416.54	50.4277	Liquefied Soil	310.75	0	145.782	310.75	6257.36	31.9496	6225.41
45	6.86884	38903.8	50.4277	Remedial Removal	270	29	1171.08	2496.29	4016.33	0	4016.33
46	6.86884	31705.9	50.4277	Remedial Removal	270	29	972.739	2073.5	3253.61	0	3253.61
47	6.86884	24509.3	50.4277	Remedial Removal	270	29	774.443	1650.81	2491.04	0	2491.04
48	6.89653	17516.3	50.4277	Remedial Removal	270	29	579.81	1235.93	1742.58	0	1742.58
49	6.89653	10509.8	50.4277	Remedial Removal	270	29	387.519	826.04	1003.12	0	1003.12
50	6.89653	3503.27	50.4277	Compacted Fill	270	29	195.453	416.629	264.525	0	264.525

Lateral Spread - Shear Key 2 - Thru shear key 2 (2)

Global Minimum Query (spencer) - Safety Factor: 1.32908

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Effective Shear Stress [psf]
1	22.914	66205.8	-27.8598	Liquefied Soil	134.478	0	93.6573	124.478	3058.23	399.747	2658.49
2	20.2959	73023.3	3.10097	Liquefied Soil	140.65	0	105.835	140.65	3585.99	784.929	2801.06
3	8.47024	32575.4	3.10097	Liquefied Soil	152.55	0	114.779	152.55	1496.13	755.776	1030.61
4	20.2959	80032.6	3.10097	Liquefied Soil	175.368	0	131.947	175.368	4220.05	736.623	3493.43
5	20.2959	100538	3.10097	Liquefied Soil	212.807	0	160.116	212.807	4937.4	697.47	4239.93
6	20.2959	117858	3.10097	Liquefied Soil	256.933	0	193.316	256.933	5788.05	658.317	5129.73
7	20.2959	121810	3.10097	Liquefied Soil	268.134	0	201.744	268.134	5982.14	619.008	5363.13
8	20.2959	118913	3.10097	Liquefied Soil	260.873	0	196.281	260.873	5839.86	641.495	5198.36
9	20.2959	116009	3.10097	Liquefied Soil	253.572	0	190.798	253.572	5696.79	663.982	5052.81
10	20.2959	114806	3.10097	Liquefied Soil	255.433	0	192.188	255.433	5726.39	644.669	5081.72
11	20.2959	113603	3.10097	Liquefied Soil	258.769	0	195.45	258.769	5825.3	625.355	5199.95
12	20.2959	111703	3.10097	Liquefied Soil	252.468	0	189.957	252.468	5683.23	651.442	5030.78
13	20.2959	110797	3.10097	Liquefied Soil	245.167	0	184.464	245.167	5539.15	677.529	4885.23
14	20.2959	110516	3.10097	Liquefied Soil	239.442	0	180.156	239.442	5437.47	656.415	4777.06
15	20.2959	110482	3.10097	Liquefied Soil	248.938	0	188.053	248.938	5634.47	635.146	4980.11
16	20.2959	110567	3.10097	Liquefied Soil	258.942	0	193.982	258.942	5806.31	647.104	5159.2
17	20.2959	110693	3.10097	Liquefied Soil	258.01	0	193.478	258.01	5790.13	649.654	5140.48
18	20.2959	110471	3.10097	Liquefied Soil	232.372	0	168.065	223.372	5120.77	670.118	4450.65
19	20.2959	101343	3.10097	Liquefied Soil	215.885	0	161.432	215.885	4976.96	675.604	4301.36
20	20.2959	99825.9	3.10097	Liquefied Soil	211.872	0	159.413	211.872	4902.42	681.09	4221.33
21	20.2959	98298.1	3.10097	Liquefied Soil	212.243	0	159.696	212.243	4911.41	686.576	4224.84
22	20.2959	100361	3.10097	Liquefied Soil	212.641	0	159.991	212.641	4921.02	692.062	4228.63
23	20.2959	100621	3.10097	Liquefied Soil	210.093	0	160.286	210.093	4861.08	697.548	4164.43
24	20.2959	100902	3.10097	Liquefied Soil	213.425	0	160.581	213.425	4955.26	703.034	4252.23
25	20.2959	101521	3.10097	Liquefied Soil	217.14	0	161.076	217.14	5044.72	708.52	4336.2
26	20.2959	100549	3.10097	Liquefied Soil	226.789	0	170.636	226.789	5232.6	704.006	4528.59
27	20.2959	101839	3.10097	Liquefied Soil	219.838	0	165.406	219.838	5099.51	719.493	4380.02
28	20.2959	102542	3.10097	Liquefied Soil	221.757	0	166.796	221.757	5139.79	734.979	4404.81
29	23.7114	121890	3.10097	Remedial Removal	270	29	2047.36	2721.15	5152.84	730.926	6421.91
30	23.7114	141305	3.10097	Remedial Removal	270	29	2422.34	3219.49	6058.33	737.335	5321
31	19.2242	99767.3	3.10097	Bedrock	300	32	3181.21	4238.08	7028.73	742.455	6286.27
32	19.2242	101054.2	3.10097	Bedrock	300	32	3275.24	4353.05	7219.56	733.934	6485.22
33	4.40903	32814.9	5.45957	Remedial Removal	270	29	2947.66	3917.68	7317.36	736.782	6580.58
34	19.2242	167634	5.45957	Liquefied Soil	248.449	0	262.173	348.449	7621.86	793.583	6911.28
35	19.2242	167403	5.45957	Liquefied Soil	277.803	0	261.811	347.967	7611.31	784.965	6901.83
36	19.2242	166282	5.45957	Liquefied Soil	401.213	0	301.873	401.213	8584.38	625.338	7959.04
37	19.2242	161965	5.45957	Liquefied Soil	392.066	0	294.991	392.066	8360.53	582.716	7777.81
38	18.8049	87180.9	52.7279	Remedial Removal	270	29	1338.52	1772.35	2710.31	0	2710.31
39	19.2242	153157	5.45957	Liquefied Soil	373.47	0	280.999	373.47	7906.77	497.472	7409.29
40	19.2242	152837	5.45957	Liquefied Soil	364.172	0	274.003	364.172	7679.86	454.849	7225.01
41	19.2242	147210	5.45957	Liquefied Soil	362.264	0	272.567	362.264	7599.65	412.227	7187.42
42	19.2242	145957	5.45957	Liquefied Soil	361.235	0	271.793	361.235	7536.89	369.605	7167.28
43	19.2242	138967	5.45957	Liquefied Soil	345.088	0	259.644	345.088	7174.05	326.982	6847.07
44	19.2242	132086	5.45957	Liquefied Soil	329.829	0	248.163	329.829	6818.78	284.359	6534.42
45	19.2242	128157	5.45957	Liquefied Soil	322.428	0	242.595	322.428	6615.95	217.869	6398.08
46	19.2242	125577	5.45957	Liquefied Soil	318.536	0	239.667	318.536	6482.72	161.517	6321.2
47	19.2242	122997	5.45957	Liquefied Soil	314.644	0	236.738	314.644	6349.48	105.166	6244.31
48	0.8773571	6117.43	52.7279	Liquefied Soil	311.029	0	234.018	311.029	5469.45	38.4901	5430.96
49	18.8049	87180.9	52.7279	Remedial Removal	270	29	1338.52	1772.35	2710.31	0	2710.31
50	18.9627	28918.5	52.7279	Compacted Fill	270	29	533.768	709.421	792.737	0	792.737

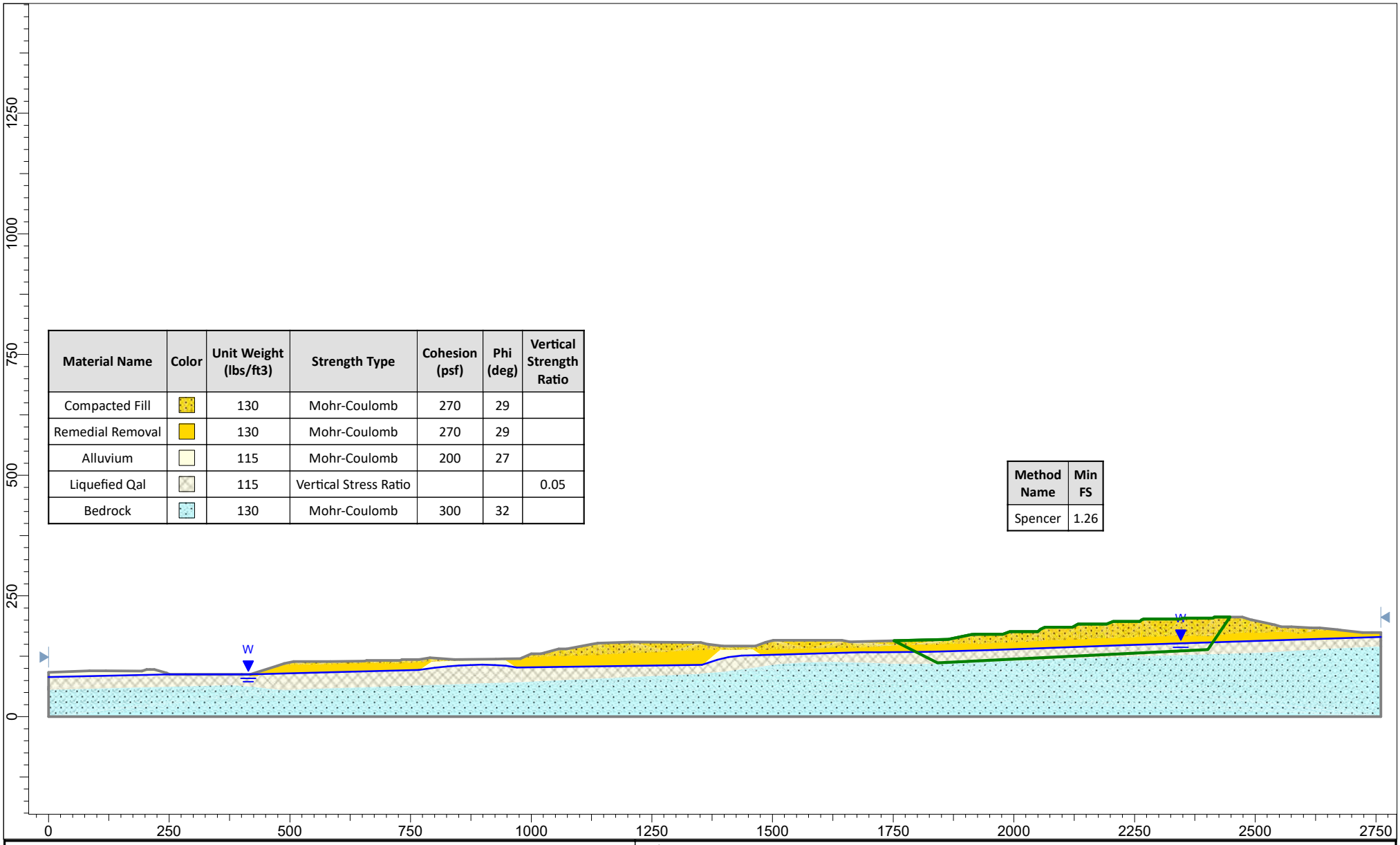
Lateral Spread - Shear Key 2 - Thru shear key 1 and 2

Global Minimum Query (spencer) - Safety Factor: 1.83682

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Effective Shear Stress [psf]
1	29.6488	31922	-27.8598	Liquefied Soil	270	29	5904.05	1092.34	1483.18	0	1483.18
2	22.914	66669.7	-27.8598	Liquefied Soil	125.491	0	67.8096	125.491	3061.7	399.747	2661.95
3	8.47024	32575.4	3.10097	Liquefied Soil	148.195	0	80.1132	148.195	1744.35	793.278	951.07
4	19.8064	75502.8	3.10097	Liquefied Soil	270	29	1357.07	1955.38	3808.41	736.623	3071.79
5	19.8064	82177.6	3.10097	Liquefied Soil	270	29	1166.68	2158.15	4150.69	744.376	3406.31
6	19.8064	91541.4	3.10097	Liquefied Soil	270	29	1317	2436.22	4623.9	715.926	3907.97
7	19.8064	107221	3.10097	Liquefied Soil	270	29	1562.94	2891.56	5416.21	687.477	4728.73
8	19.8064	121551	3.10097	Liquefied Soil	270	29	1788.66	3308.33	6146.32	659.027	5487.29
9	19.9996	120486	3.10097	Liquefied Soil	269.235	0	1455.67	269.235	6004.12	629.753	5364.37
10	19.9996	116359	3.10097	Liquefied Soil	258.794	0	1399.02	258.794	5798.67	642.203	5156.27
11	19.9996	113521	3.10097	Liquefied Soil	251.6	0	1360.17	251.6	5657.47	654.653	5002.82
12	19.9996	116517	3.10097	Liquefied Soil	258.942	0	1399.82	258.942	5806.31	647.104	5159.2
13	19.9996	116183	3.10097	Liquefied Soil	258.01	0	1394.78	258.01	5790.13	649.654	5140.48
14	19.9996	113364	3.10097	Liquefied Soil	250.816	0	1355.89	250.816	5669.19	652.005	4997.18
15	19.9996	110535	3.10097	Liquefied Soil	215.885	0	1162.452	215.885	4976.96	675.604	4301.36
16	19.9996	109761	3.10097	Liquefied Soil	241.563	0	1301.587	241.563	5469.65	656.906	4812.74
17	19.9996	112067	3.10097	Liquefied Soil	247.115	0	1331.583	247.115	5597.47	638.207	4959.26
18	19.9996	105153	3.10097	Liquefied Soil	229.61	0	1241.126	229.61	5239.98	665.553	4574.42
19	19.9996	102307	3.10097	Liquefied Soil	222.224	0	1201.13	222.224	5098.13	670.959	4427.17
20	19.9996	99471.6	3.10097	Liquefied Soil	216.172	0	1168.376	217.14	5044.72	676.365	4368.48
21	19.9996	98395.6	3.10097	Liquefied Soil	211.906	0	1145.551	211.906	4903.32	681.771	4221.45
22	19.9996	98618.2	3.10097	Liquefied Soil	212.302	0	1147.694	212.302	4912.93	687.177	4225.75
23	19.9996	98920.8	3.10097	Liquefied Soil	212.678	0	1149.72	212.678	4929.39	692.583	4236.81
24	19.9996	99344.3	3.10097	Liquefied Soil	213.582	0	1154.609	213.582	4942.48	697.989	4244.49
25	19.9996	99946.1	3.10097	Liquefied Soil	213.45	0	1153.896	213.45	4955.56	703.395	4252.16
26	19.9996	100744	3.10097	Liquefied Soil	217.305	0	1174.722	217.305	5045.15	708.801	4336.35
27	19.9996	104896	3.10097	Liquefied Soil	236.536	0	1278.664	236.536	5227.15	714.207	4512.94
28	19.9996	102265	3.10097	Liquefied Soil	219.686	0	1187.61	219.686	5096.04	719.613	4376.42
29	19.9996	101066	3.10097	Liquefied Soil	216.37	0	1169.682	216.37	5035.32	725.019	4310.3
30	23.7114	121890	3.10097	Remedial Removal	270	29	1468.05	2715.63	5142.99	730.926	4412.06
31	23.7114	141305	3.10097	Remedial Removal	270	29	1736.93	3213.05	6046.67	737.335	5309.33
32	14.2403	89767.3	3.10097	Bedrock	300	32	2280.48	4218.47	7013.3	742.455	6270.84
33	14.2403	90178.2	3.10097	Bedrock	300	32	2260.78	4182.02	7251.6	743.314	6508.57
34	4.40903	32814.9	5.45957	Remedial Removal	270	29	2123.92	3928.87	7327.57	736.782	6600.79
35	20.703	159381

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Alluvium		115	Mohr-Coulomb	200	27	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.26



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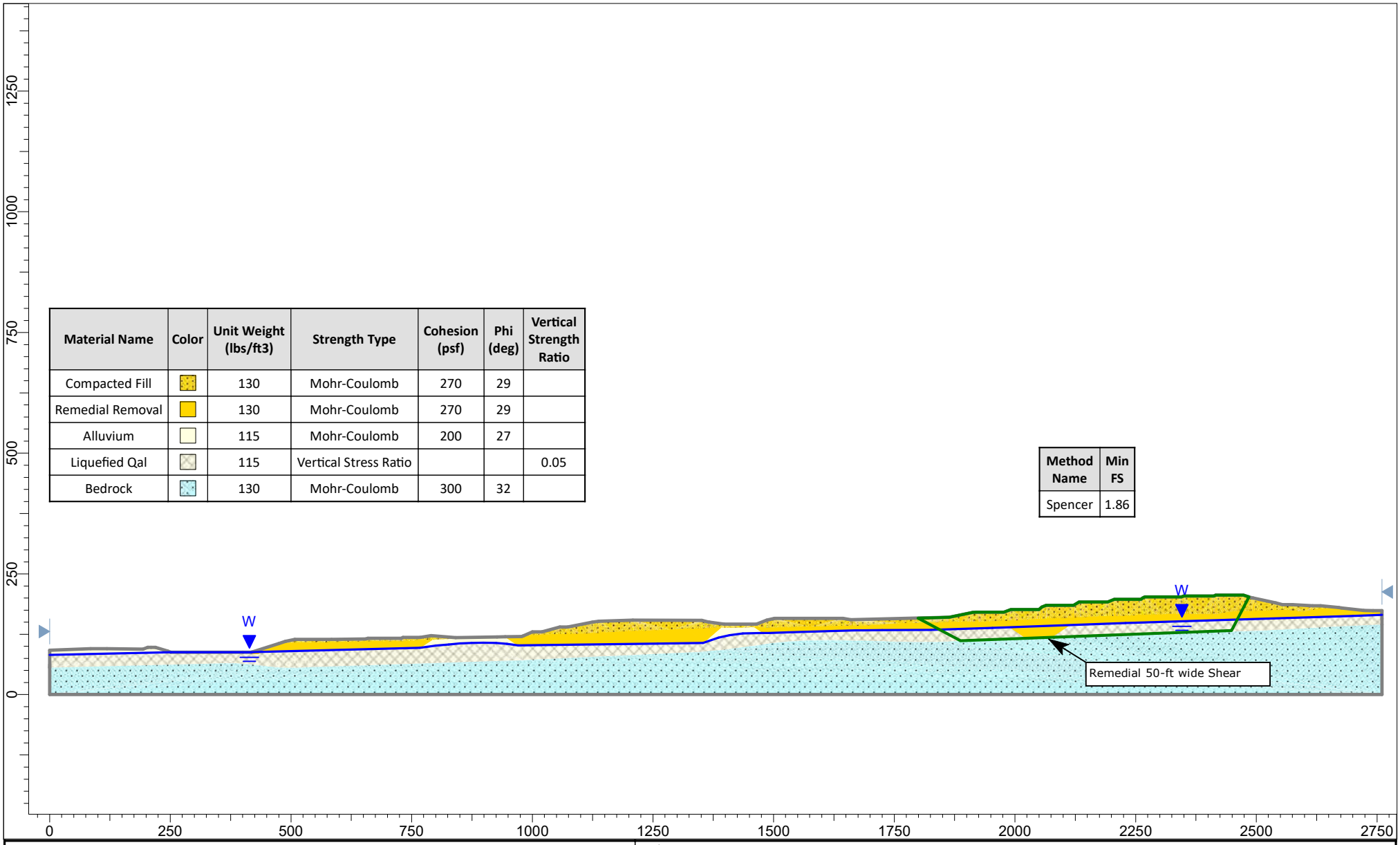
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 29-29'; Alluvial Canyon 3; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	Drawn By:	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	File Name:	t29s1a.slmd
		Scale:	1:3300
Project No.:	18-1245A-4	Date: 6/8/2018	Figure No.:

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Alluvium		115	Mohr-Coulomb	200	27	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.86



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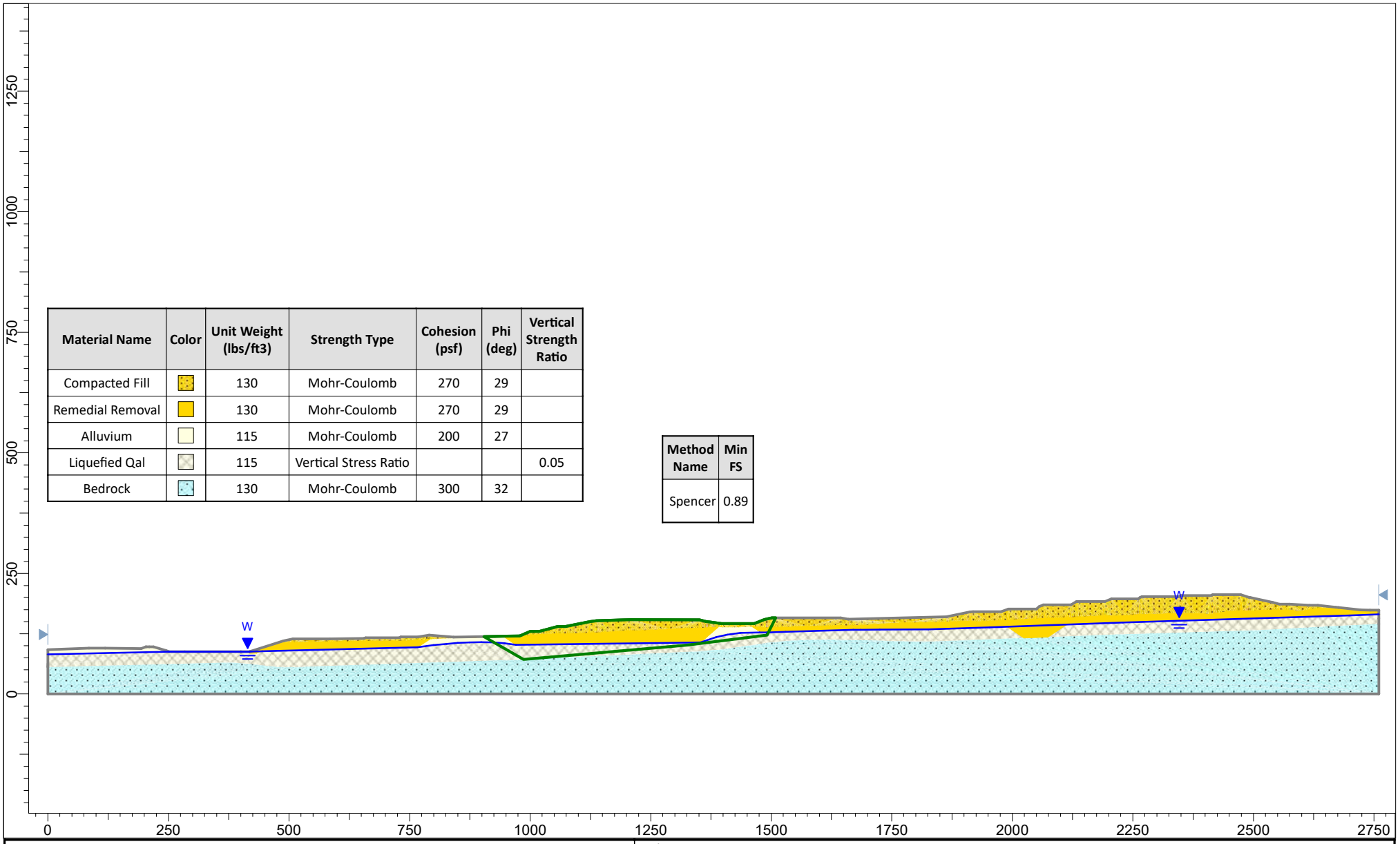
Analysis:	Section 29-29'; Alluvial Canyon 3; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	Drawn By:	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	File Name:	t29s1a.slmd
		Scale:	1:3300
Project No.:	18-1245A-4	Date: 6/8/2018	Figure No.:

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Alluvium		115	Mohr-Coulomb	200	27	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	0.89



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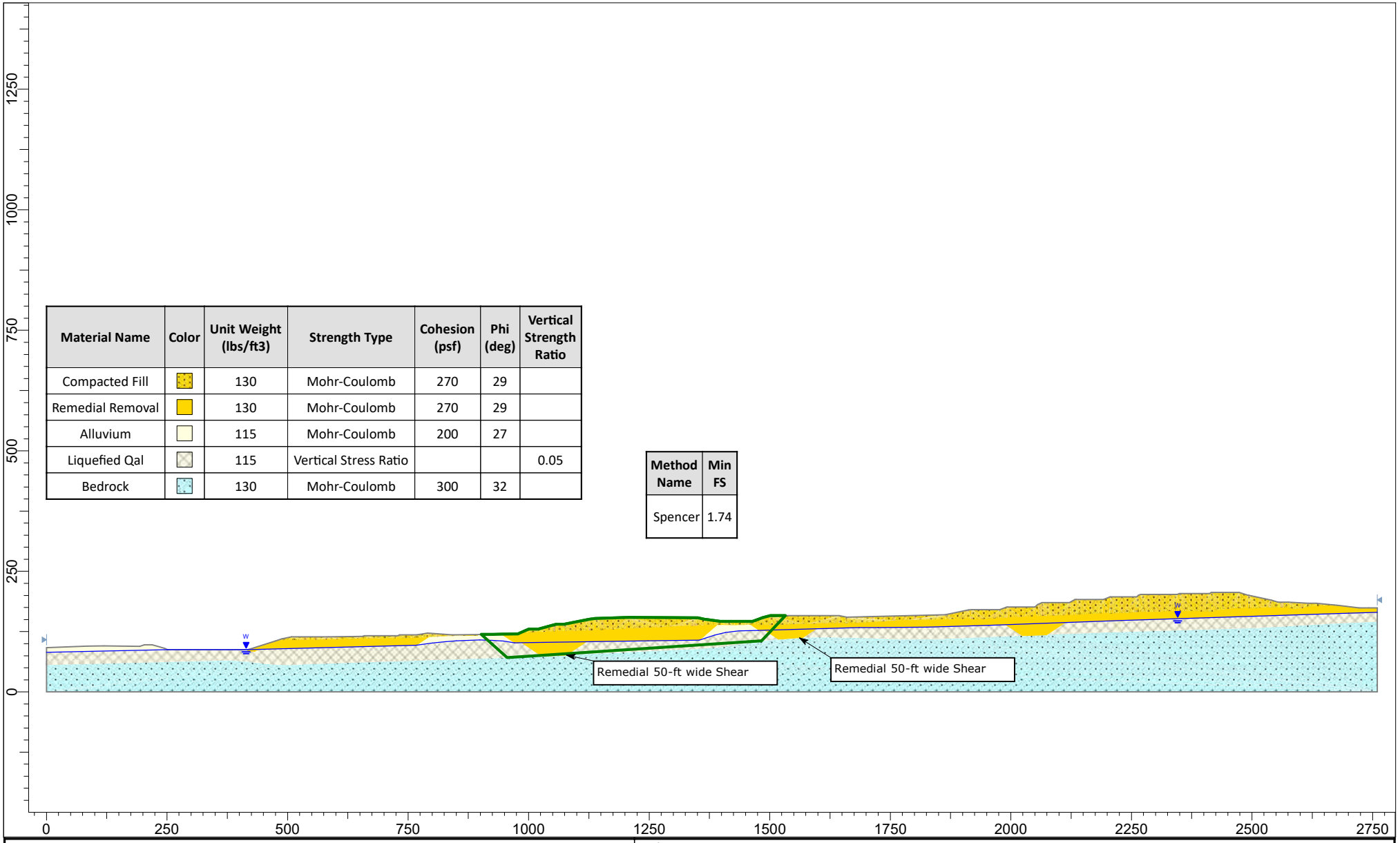
SLIDEINTERPRET 8.014

Analysis:	Section 29-29'; Alluvial Canyon 3; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	Drawn By:	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	File Name:	t29s1a.slmd
		Scale:	1:3300
Project No.:	18-1245A-4	Date: 6/8/2018	Figure No.:

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Alluvium		115	Mohr-Coulomb	200	27	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.74



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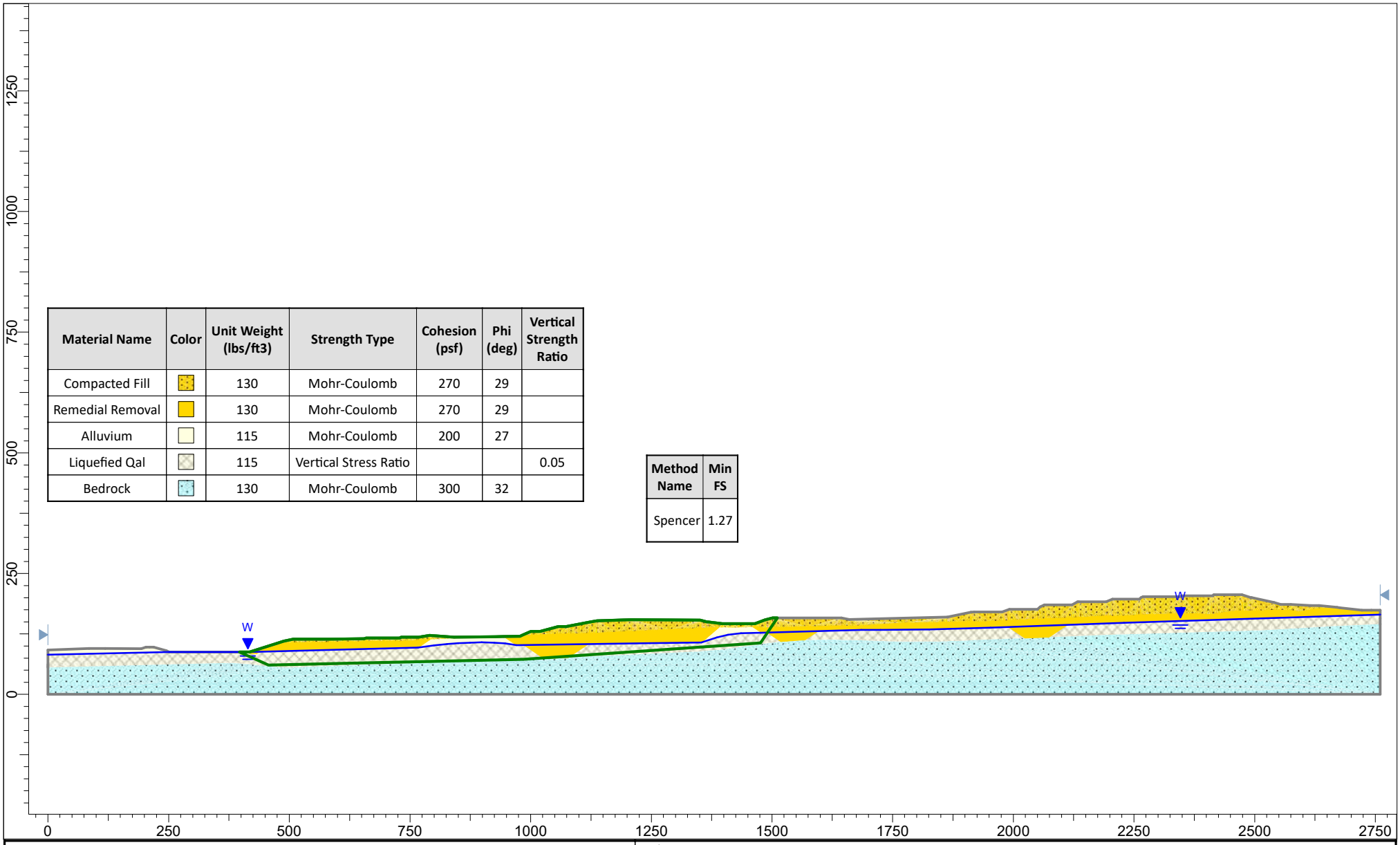
SLIDEINTERPRET 8.014

Analysis:	Section 29-29'; Alluvial Canyon 3; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	Drawn By:	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	File Name:	t29s1a.slmd
		Scale:	1:3300
Project No.:	18-1245A-4	Date: 6/8/2018	Figure No.:

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Alluvium		115	Mohr-Coulomb	200	27	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.27



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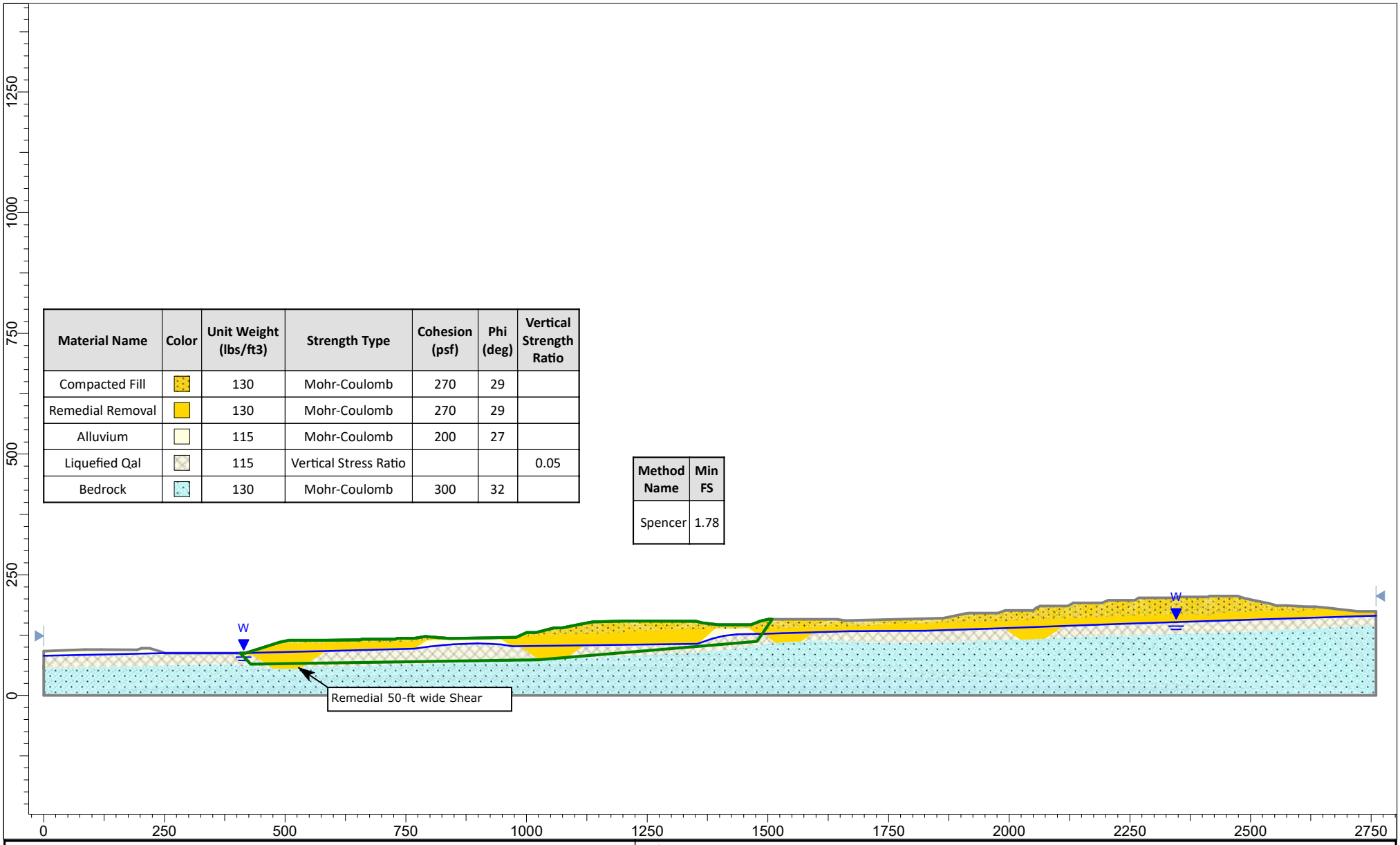
SLIDEINTERPRET 8.014

Analysis:	Section 29-29'; Alluvial Canyon 3; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t29s1a.slmd
		Scale:	1:3300
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:*

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Alluvium		115	Mohr-Coulomb	200	27	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

Method Name	Min FS
Spencer	1.78



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SLIDEINTERPRET 8.014

Analysis:	Section 29-29'; Alluvial Canyon 3; Shear Keys for Lateral Spread Mitigation		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t29s1a.slmd
		Scale:	1:3300
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:*

Slide Analysis Information
t29s1a

Project Summary

File Name: t29s1a.slmd
Slide Modeler Version: 8.014
Project Title: VTTM60257
Analysis: Section 29-29'; Alluvial Canyon 2; Shear Keys for Lateral Spread Mitigation
Author: K. Callahan
Date Created: 6/8/2018

Comments

SterlingGateway
SterlingRanch Estates
18-1245-A-4

Currently Open Scenarios

Group Name	Scenario Name	Description	Global Minimum	Compute Time
Lateral Spread - Shear Key 4	Before	No shear keys, assumes liquefied strength for all alluvium left below HW water table	Spencer: 1.259100	00h:00m:02.694s
	thru shear key 4		Spencer: 1.856380	00h:00m:02.742s
	Before (2)		Bishop Simplified: 0.874448 Janbu Simplified: 0.862667 Janbu Corrected: 0.863987 Spencer: 0.865812	00h:00m:02.714s
Lateral Spread - Shear Key 3	Thru shear key 2 only		Bishop Simplified: 1.688280 Janbu Simplified: 1.646220 Janbu Corrected: 1.701380 Spencer: 1.737720	00h:00m:02.636s
Lateral Spread - Shear Key 2	Thru shear key 2 only (b)		Bishop Simplified: 1.248120 Janbu Simplified: 1.230220 Janbu Corrected: 1.257140 Spencer: 1.271520	00h:00m:02.614s
	Thru shear key 1 and 2		Bishop Simplified: 1.768080 Janbu Simplified: 1.731880 Janbu Corrected: 1.774810 Spencer: 1.784440	00h:00m:02.842s
Lateral Spread - Shear Key 1				

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Data Output: Standard
Failure Direction: Right to Left

Analysis Options

Lateral Spread - Shear Key 4		Lateral Spread - Shear Key 3		Lateral Spread - Shear Key 2		Lateral Spread - Shear Key 1	
Slices Type:	Vertical	Slices Type:	Vertical	Slices Type:	Vertical	Slices Type:	Vertical
Analysis Methods Used		**Analysis Methods Used**		**Analysis Methods Used**		**Analysis Methods Used**	
	Spencer		Bishop simplified Janbu simplified Janbu corrected Spencer		Bishop simplified Janbu simplified Janbu corrected Spencer		Bishop simplified Janbu simplified Janbu corrected Spencer
Number of slices:	50	Number of slices:	50	Number of slices:	50	Number of slices:	50
Tolerance	0.005	Tolerance	0.005	Tolerance	0.005	Tolerance	0.005
Maximum number of iterations:	75	Maximum number of iterations:	75	Maximum number of iterations:	75	Maximum number of iterations:	75
Check maJpha < 0.2:	Yes	Check maJpha < 0.2:	Yes	Check maJpha < 0.2:	Yes	Check maJpha < 0.2:	Yes
Create interslice boundaries at intersections with water tables and piezos:	Yes	Create interslice boundaries at intersections with water tables and piezos:	Yes	Create interslice boundaries at intersections with water tables and piezos:	Yes	Create interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1	Initial trial value of FS:	1	Initial trial value of FS:	1	Initial trial value of FS:	1
Steffensen iteration:	Yes	Steffensen iteration:	Yes	Steffensen iteration:	Yes	Steffensen iteration:	Yes

Groundwater Analysis

AllOpen Scenarios

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

AllOpen Scenarios

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

AllOpen Scenarios

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Enabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	115
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	65
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

AllOpen Scenarios

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

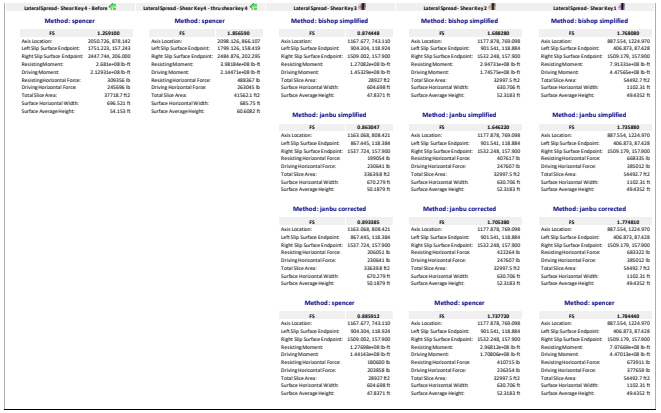
Materials

Property	Compacted Fill	Remedial Removal	Alluvium	Liquefied Qal	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Vertical Stress Ratio	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	130	115	115	130
Cohesion [psf]	270	270	200		300
Friction Angle [°]	29	29	27		32
Tau/Sigma Ratio				0.05	
Min. Strength [psf]				0	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Ho Value	1	Automatically Calculated	1	1	1

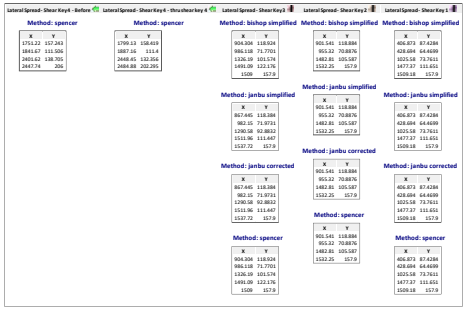
Materials In Use

Material	Before	thru shear key 4	Before (2)	Thru shear key 2 only	Thru shear key 2 only (b)	Thru shear key 1 and 2
Compacted Fill	✓	✓	✓	✓	✓	✓
Remedial Removal	✓	✓	✓	✓	✓	✓
Alluvium	✓	✓	✓	✓	✓	✓
Liquefied Qal	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓

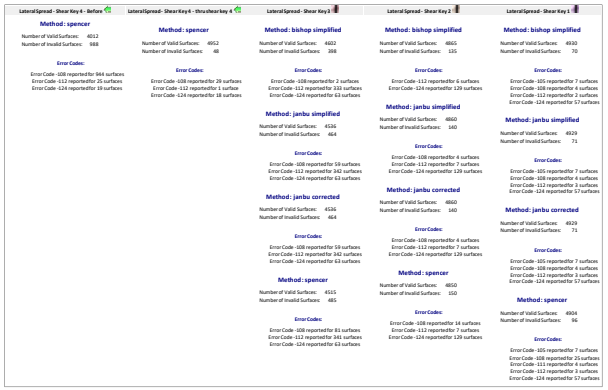
Global Minimums



Global Minimum Coordinates



Valid/Invalid Surfaces

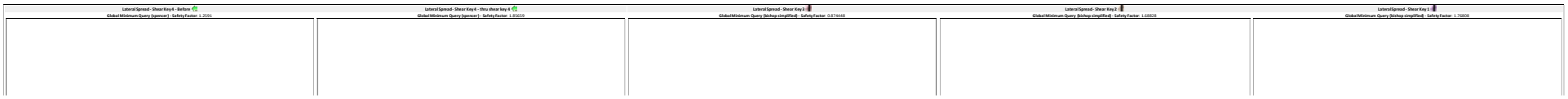


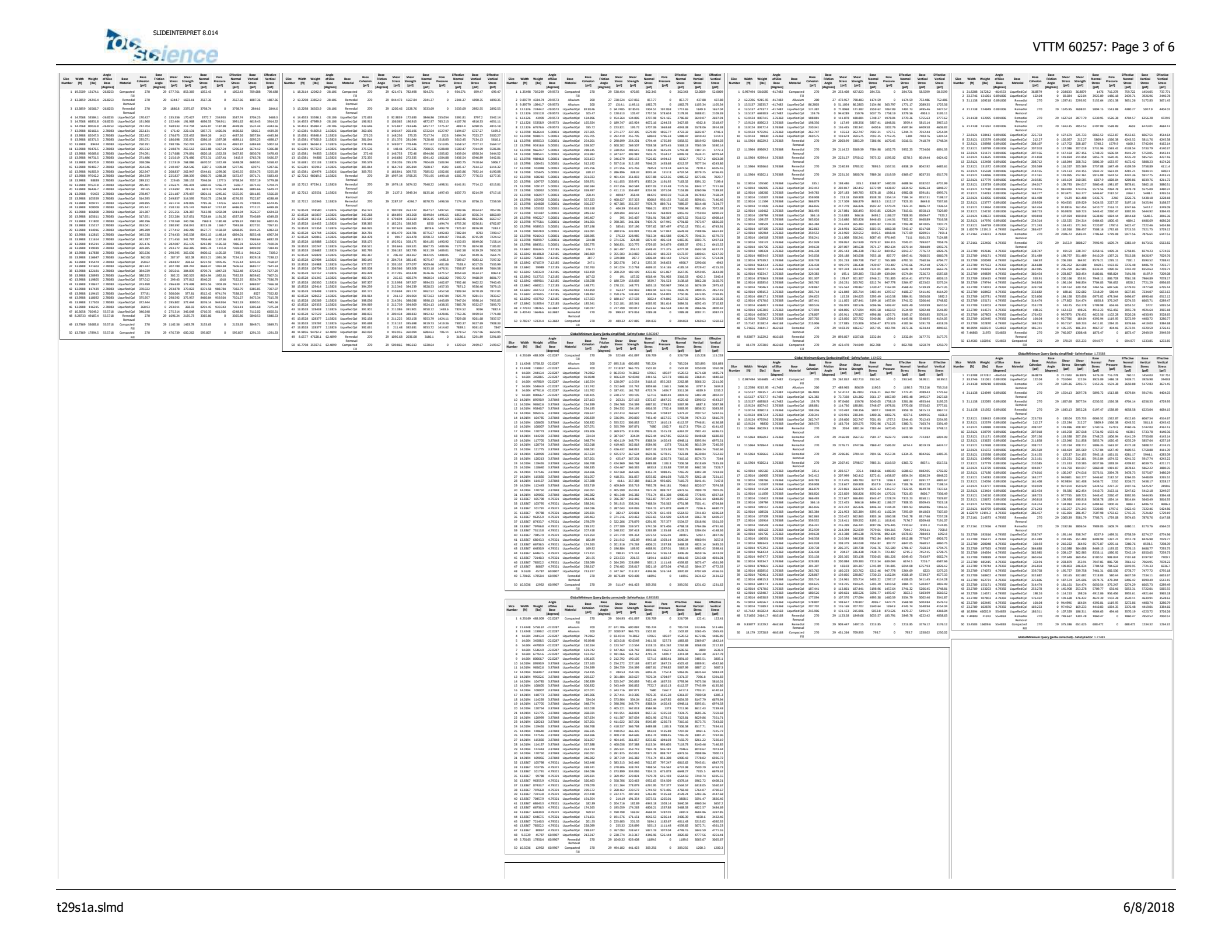
Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-124 = A slice has a width less than the minimum acceptable value.

Slice Data

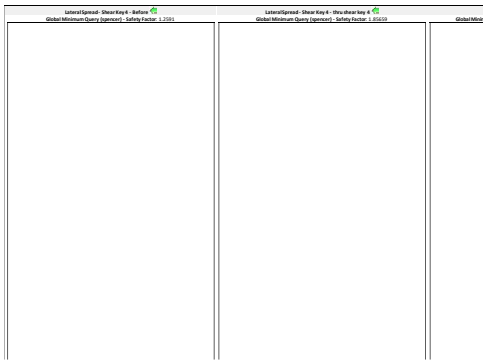




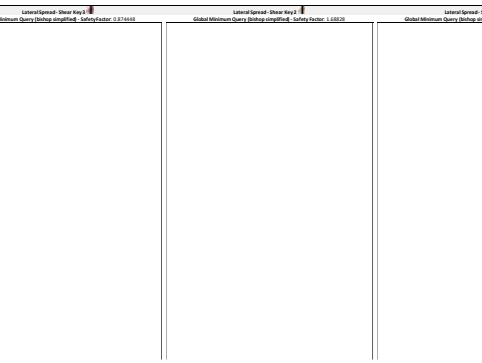
Global Minimum Query (spencer) - Safety Factor: 0.85912

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.35498	705239	-29.9573	Compacted Fill	270	29	548.142	485.606	188.963	0	188.963	71.0365	71.0365
2	9.89779	43314.74	-29.9573	Alluvium	200	27	743.967	659.089	901.009	0	901.009	472.218	472.218
3	9.89779	109417	-29.9573	Alluvium	200	27	1346.36	1192.76	1948.39	0	1948.39	1172.41	1172.41
4	11.1326	224442	-29.9573	Liquefied Gut	82.8526	0	93.5224	82.8526	1936.41	192.868	1743.55	1882.5	1689.65
5	12.1326	326128	-29.9573	Liquefied Gut	105.47	0	119.052	105.47	2803.39	578.624	2224.77	2734.77	2156.15
6	12.1326	43909	-29.9573	Liquefied Gut	134.896	0	152.268	134.896	3769.49	921.165	2848.32	3681.73	2760.56
7	12.1326	553589	-29.9573	Liquefied Gut	165.924	0	187.292	165.924	4749.57	1244.33	3505.24	4641.63	3397.3
8	12.1326	676766	-29.9573	Liquefied Gut	195.72	0	220.925	195.72	5801.45	1563.68	4137.77	5674.12	4010.44
9	11.0798	863644	5.00851	Liquefied Gut	237.305	0	267.865	237.305	6571.04	1856.77	4714.27	6594.52	4737.75
10	11.0798	903871	5.00851	Liquefied Gut	255.705	0	288.635	255.705	6876.52	1796.33	5080.29	6801.91	5105.58
11	11.0798	892013	5.00851	Liquefied Gut	254.201	0	286.937	254.201	6786.42	1735.89	5050.53	6811.57	5075.68
12	11.0798	924166	5.00851	Liquefied Gut	269.507	0	304.214	269.507	7030.46	1675.45	5355.01	7057.12	5381.67
13	11.0798	968267	5.00851	Liquefied Gut	288.615	0	325.783	288.615	7350.11	1615.01	5735.1	7378.67	5763.66
14	11.0798	998541	5.00851	Liquefied Gut	303.982	0	343.129	303.982	7595.38	1554.57	6040.81	7625.45	6070.88
15	11.0798	988468	5.00851	Liquefied Gut	303.153	0	342.193	303.153	7518.61	1494.12	6024.49	7548.6	6054.48
16	11.0798	100421	5.00851	Liquefied Gut	312.192	0	352.396	312.192	7638.03	1433.68	6204.35	7668.91	6235.23
17	11.0798	103048	5.00851	Liquefied Gut	325.256	0	367.143	325.256	7837.5	1373.24	6464.26	7869.67	6496.43
18	11.0798	105675	5.00851	Liquefied Gut	338.32	0	381.889	338.32	8036.96	1312.8	6724.16	8070.43	6757.63
19	11.0798	108210	5.00851	Liquefied Gut	351.033	0	396.239	351.033	8229.5	1252.36	6977.14	8264.23	7011.87
20	11.0798	109757	5.00851	Liquefied Gut	359.975	0	406.328	359.975	8346.87	1191.92	7154.95	8382.48	7190.56
21	11.0798	109127	5.00851	Liquefied Gut	360.584	0	407.02	360.584	8298.73	1131.48	7167.25	8334.4	7202.92
22	11.0798	108052	5.00851	Liquefied Gut	359.497	0	405.793	359.497	8216.86	1071.04	7145.82	8252.42	7181.38
23	11.0798	106977	5.00851	Liquefied Gut	358.41	0	404.566	358.41	8134.98	1010.59	7124.39	8170.44	7159.85
24	11.0798	105902	5.00851	Liquefied Gut	357.323	0	403.339	357.323	8053.09	950.152	7102.88	8088.38	7138.23
25	11.0798	104828	5.00851	Liquefied Gut	356.237	0	402.113	356.237	7971.16	889.711	7081.45	8006.4	7116.69
26	11.0798	103352	5.00851	Liquefied Gut	353.618	0	399.157	353.618	7858.75	829.27	7029.48	7893.73	7064.46
27	11.0798	101487	5.00851	Liquefied Gut	349.512	0	394.522	349.512	7716.86	768.828	6948.03	7751.43	6983.6
28	11.0798	99622.7	5.00851	Liquefied Gut	345.407	0	389.889	345.407	7574.89	708.387	6866.5	7609.06	6900.67
29	11.0798	977581	5.00851	Liquefied Gut	341.301	0	385.254	341.301	7432.96	647.945	6785.01	7466.72	6818.77
30	11.0798	958915	5.00851	Liquefied Gut	337.196	0	380.62	337.196	7291.01	587.497	6703.52	7324.37	6736.87
31	11.0798	940249	5.00851	Liquefied Gut	333.091	0	375.987	333.091	7149.08	527.042	6622.04	7182.03	6654.99
32	11.0798	921643	5.00851	Liquefied Gut	328.985	0	371.352	328.985	7007.14	466.588	6540.55	7039.68	6573.09
33	11.0798	902997	5.00851	Liquefied Gut	324.88	0	366.718	324.88	6865.2	406.134	6459.07	6897.34	6491.21
34	11.0798	884351	5.00851	Liquefied Gut	320.775	0	362.084	320.775	6723.27	345.679	6377.59	6755	6409.32
35	12.6862	836245	7.12185	Liquefied Gut	316.11	0	356.819	316.11	6536.53	273.375	6260.15	6581.11	6309.73
36	12.6862	831868	7.12185	Liquefied Gut	310.869	0	350.903	310.869	6344.78	183.222	6161.55	6388.62	6205.4
37	12.6862	752081	7.12185	Liquefied Gut	287.7	0	324.75	287.7	5885.43	183.142	5702.29	5926	5742.86
38	12.6862	671073	7.12185	Liquefied Gut	247.1	0	278.922	247.1	5245.59	348.653	4896.94	5280.44	4931.79
39	12.6862	59989	7.12185	Liquefied Gut	210.763	0	237.905	210.763	4690.26	514.165	4176.09	4719.98	4205.82
40	12.6862	540329	7.12185	Liquefied Gut	182.199	0	205.663	182.199	4225.42	615.867	3609.56	4251.12	3635.25
41	12.6862	512715	7.12185	Liquefied Gut	167.02	0	188.529	167.02	4010.28	701.902	3308.38	4033.84	3331.94
42	12.6862	489901	7.12185	Liquefied Gut	158.038	0	178.39	158.038	3831.86	701.523	3130.33	3854.15	3152.62
43	12.6862	466321	7.12185	Liquefied Gut	148.771	0	167.93	148.771	3647.61	700.967	2946.64	3668.59	2967.63
44	12.6862	442723	7.12185	Liquefied Gut	142.859	0	161.256	142.859	3462.85	633.156	2829.69	3483	2849.84
45	12.6862	421605	7.12185	Liquefied Gut	138.492	0	156.327	138.492	3297.39	554.001	2743.39	3316.92	2762.92
46	12.6862	459792	7.12185	Liquefied Gut	157.503	0	177.786	157.503	3595.34	474.846	3120.49	3617.55	3142.7
47	12.6862	519094	7.12185	Liquefied Gut	185.541	0	209.435	185.541	4058.2	381.614	3676.59	4084.37	3702.75
48	2.72923	108265	63.3682	Liquefied Gut	190.017	0	214.487	190.017	3364.2	166.534	3197.67	3791.93	3625.4
49	5.40145	166466	63.3682	Remedial Removal	270	29	983.028	871.674	1085.45	0	1085.45	3047.59	3047.59
50	9.78317	123314	63.3682	Compacted Fill	270	29	486.272	430.794	290.08	0	290.08	1259.8	1259.8

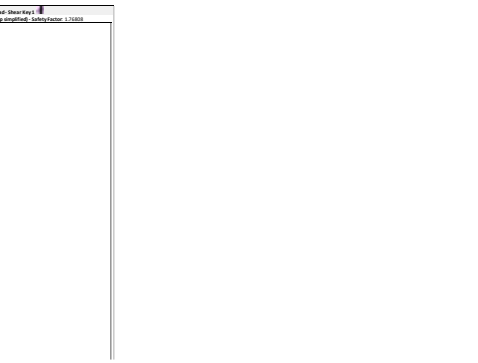
Global Minimum Query (spencer) - Safety Factor: 0.85912



Global Minimum Query (spencer) - Safety Factor: 1.72772



Global Minimum Query (spencer) - Safety Factor: 1.72772



Global Minimum Query (spencer) - Safety Factor: 1.72772

Global Minimum Query (spencer) - Safety Factor: 1.73444

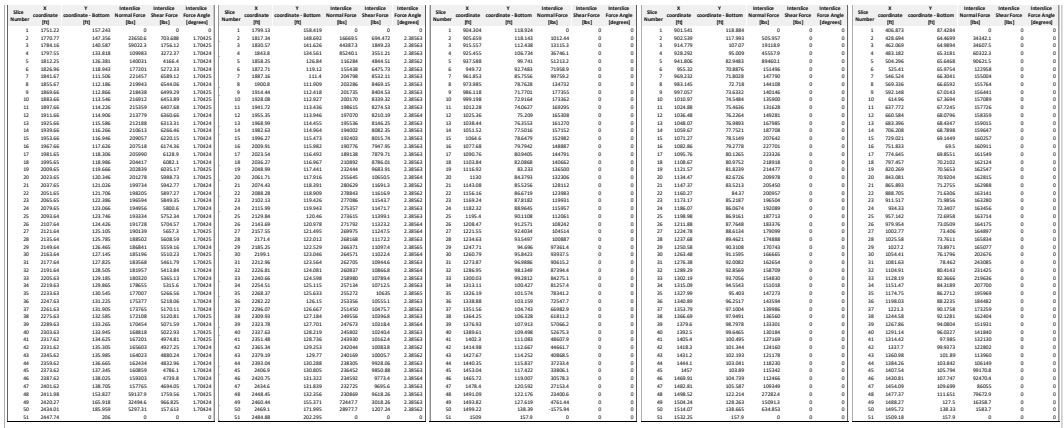
Global Minimum Query (spencer) - Safety Factor: 1.73444

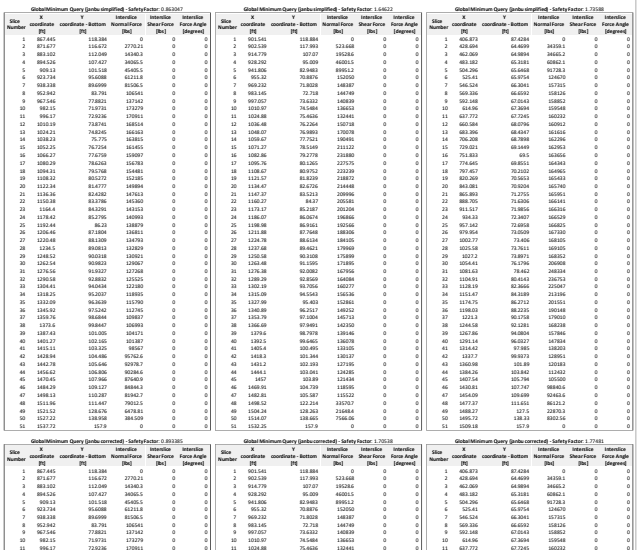
Global Minimum Query (spencer) - Safety Factor: 1.73444

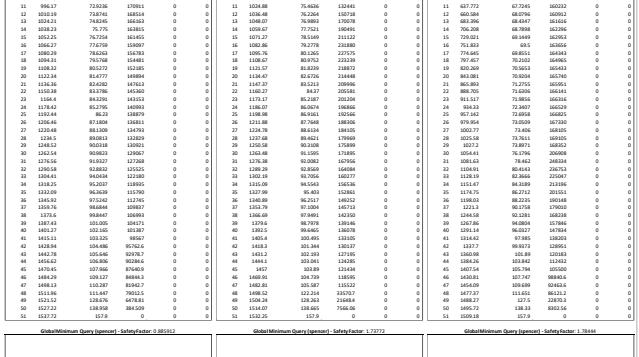
Global Minimum Query (spencer) - Safety Factor: 1.73444

Interslice Data

Lateral Spread - Shear Key 4 - Before	Lateral Spread - Shear Key 4 - thru shear key 4	Lateral Spread - Shear Key 3	Lateral Spread - Shear Key 2	Lateral Spread - Shear Key 1
Global Minimum Query (spencer) - Safety Factor: 1.2591	Global Minimum Query (spencer) - Safety Factor: 1.85659	Global Minimum Query (Bishop simplified) - Safety Factor: 0.874448	Global Minimum Query (Bishop simplified) - Safety Factor: 1.68828	Global Minimum Query (Bishop simplified) - Safety Factor: 1.76808







Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	904.304	118.924	0	0	0
2	905.659	118.143	1047.32	28.1919	1.54192
3	911.557	112.438	13150.2	364.889	1.54193
4	925.455	106.734	38010.2	1023.3	1.54193
5	937.588	99.741	52669.9	1418.37	1.54193
6	949.72	92.7482	73741.3	1984.98	1.54192
7	961.853	85.7556	101950	2746.3	1.54192
8	973.985	78.7628	127427	3689.54	1.54193
9	986.118	71.7701	180689	4863.81	1.54192
10	999.198	72.9164	176664	4755.47	1.54192
11	1012.28	74.0627	172561	4645.02	1.54192
12	1025.36	75.209	168539	4536.76	1.54192
13	1038.44	76.3553	164463	4427.05	1.54193
14	1051.52	77.5016	160304	4315.09	1.54193
15	1064.6	78.6479	156090	4201.67	1.54193
16	1077.68	79.7942	151953	4090.29	1.54192
17	1090.76	80.9405	147852	3978.83	1.54193
18	1103.84	82.0868	143635	3866.4	1.54193
19	1116.92	83.233	139423	3753.02	1.54193
20	1130	84.3793	135178	3638.76	1.54193
21	1143.08	85.5256	130991	3524.43	1.54193
22	1156.16	86.6719	126788	3411.83	1.54193
23	1169.24	87.8182	122663	3301.12	1.54192
24	1182.32	88.9645	118615	3192.91	1.54193
25	1195.4	90.1108	114666	3086.59	1.54192
26	1208.47	91.2571	110794	2982.37	1.54193
27	1221.55	92.4034	107012	2880.57	1.54193
28	1234.63	93.5497	103333	2781.52	1.54192
29	1247.71	94.696	99754.9	2685.22	1.54193
30	1260.79	95.8423	96279.3	2591.66	1.54192
31	1273.87	96.9886	92905.7	2500.85	1.54192
32	1286.95	98.1349	89634.1	2412.79	1.54193
33	1300.03	99.2812	86464.5	2327.47	1.54193
34	1313.11	100.427	83397	2246.9	1.54193
35	1326.19	101.574	80431.5	2165.07	1.54193
36	1338.88	103.159	76603.4	2068.19	1.54193
37	1351.56	104.743	69004	1857.46	1.54192
38	1364.25	106.328	63800.5	1717.39	1.54192
39	1376.93	107.913	59020.1	1588.96	1.54192
40	1389.61	109.498	54616.9	1470.19	1.54193
41	1402.3	111.083	50522	1360.23	1.54193
42	1414.98	112.667	46570.5	1253.59	1.54192
43	1427.67	114.252	43763	1151.1	1.54192
44	1440.35	115.837	39114.6	1052.89	1.54192
45	1453.04	117.422	35674.4	960.289	1.54192
46	1465.72	119.007	32433.7	873.057	1.54193
47	1478.4	120.592	28993.4	780.45	1.54193
48	1491.09	122.176	25223.4	678.915	1.54193
49	1493.82	127.619	7497.45	201.818	1.54193
50	1499.22	138.39	1126.16	30.3161	1.54192
51	1509	157.9	0	0	0

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	901.641	118.884	0	0	0
2	902.539	117.993	533.589	26.4922	2.86235
3	914.779	107.07	203462	1009.87	2.86234
4	926.292	95.009	479674	2381.55	2.86235
5	941.806	82.9483	938521	4659.66	2.86234
6	951.32	70.8876	158694	7879.01	2.86235
7	969.232	71.8028	154958	7693.51	2.86234
8	983.445	72.718	151244	7508.09	2.86234
9	997.057	73.6332	147243	7310.48	2.86235
10	1010.07	74.5484	142953	7097.46	2.86234
11	1024.88	75.4636	138634	6883.02	2.86234
12	1036.48	76.2264	155882	7739.36	2.86233
13	1048.07	76.9893	174158	8646.75	2.86234
14	1059.67	77.7521	193433	9603.75	2.86234
15	1071.27	78.5149	212916	10571.1	2.86235
16	1082.86	79.2778	232521	11544.4	2.86234
17	1096.76	80.1365	228091	11324.5	2.86235
18	1108.67	80.9752	223627	11102.9	2.86236
19	1121.57	81.8199	219128	10879.5	2.86235
20	1134.47	82.6726	214549	10652.2	2.86236
21	1147.37	83.5253	209980	10425.3	2.86235
22	1160.27	84.37	205436	10199.2	2.86235
23	1173.17	85.2187	200931	9975.08	2.86234
24	1186.07	86.0674	196435	9752.79	2.86234
25	1198.98	86.9161	191997	9532.46	2.86234
26	1211.88	87.7648	187599	9314.11	2.86235
27	1224.78	88.6134	183260	9098.7	2.86235
28	1237.68	89.4621	178989	8886.62	2.86234
29	1250.58	90.3108	174784	8677.85	2.86234
30	1263.48	91.1595	170646	8472.43	2.86235
31	1276.38	92.0082	166575	8270.3	2.86235
32	1289.29	92.8569	162572	8071.52	2.86234
33	1302.19	93.7056	158635	7876.06	2.86234
34	1315.09	94.5543	154765	7683.92	2.86234
35	1327.99	95.403	150962	7495.11	2.86234
36	1340.89	96.2517	147226	7309.63	2.86235
37	1353.79	97.1004	143562	7127.68	2.86234
38	1366.69	97.9491	140085	6955.07	2.86234
39	1379.6	98.7978	136781	6791.06	2.86235
40	1392.5	99.6465	133628	6634.48	2.86234
41	1405.4	100.495	130579	6483.13	2.86235
42	1418.3	101.344	127540	6332.34	2.86235
43	1431.2	102.193	124529	6182.75	2.86235
44	1444.1	103.041	121554	6035.02	2.86234
45	1457	103.89	118639	5890.28	2.86233
46	1468.91	104.739	115735	5746.12	2.86234
47	1482.81	105.587	112585	5589.73	2.86234
48	1498.52	122.214	344919	1712.58	2.86235
49	1504.24	128.263	223653	1110.41	2.86233
50	1514.07	138.665	7928.72	393.653	2.86234
51	1532.25	157.9	0	0	0

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	406.873	87.4284	0	0	0
2	428.694	64.4699	36326.2	1900.74	2.99523
3	462.069	64.9894	36567	1913.34	2.99523
4	483.182	65.3181	62390.5	3264.54	2.99523
5	504.396	65.6468	93818.4	4816.65	2.99523
6	525.61	65.9754	125292	6555.84	2.99524
7	546.524	66.3041	157474	8239.73	2.99523
8	569.336	66.6592	158303	8277.86	2.99523
9	592.148	67.0143	158851	8311.76	2.99523
10	614.96	67.3694	159470	8344.17	2.99524
11	637.772	67.7245	160079	8376	2.99522
12	660.584	68.0796	160683	8407.62	2.99523
13	683.396	68.4347	161309	8440.39	2.99523
14	706.208	68.7898	161913	8471.97	2.99522
15	729.021	69.1449	162494	8502.37	2.99522
16	751.833	69.5	163119	8535.07	2.99522
17	774.645	69.8551	163728	8566.92	2.99522
18	797.457	70.2102	164273	8595.46	2.99523
19	820.269	70.5653	164870	8626.72	2.99522
20	843.081	70.9204	164493	8628.96	2.99523
21	865.893	71.2755	165064	8656.88	2.99524
22	888.705	71.6306	165196	8643.73	2.99522
23	911.517	71.9856	165312	8649.83	2.99523
24	934.33	72.3407	165466	8657.86	2.99522
25	957.142	72.6958	165700	8670.15	2.99523
26	979.954	73.0509	166191	8692.89	2.99523
27	1002.77	73.406	166825	8728.98	2.99522
28	1025.58	73.7611	167725	8776.08	2.99523
29	1027.2	73.8971	160968	8736.45	2.99522
30	1054.41	76.1796	204429	10696.6	2.99523
31	1081.63	78.462	244686	12803.5	2.99522
32	1104.91	80.4143	210040	12193.6	2.99522
33	1128.19	82.3666	221253	11576.9	2.99523
34	1151.47	84.3189	209319	10952.4	2.99521
35	1174.75	86.2712	197588	10338.7	2.99524
36	1198.03	88.2235	186101	9737.58	2.99522
37	1221.3	90.1758	174877	9150.29	2.99522
38	1244.58	92.1281	164020	8582.22	2.99523
39	1267.86	94.0804	153544	8034.09	2.99523
40	1291.14	96.0327	143450	7505.9	2.99522
41	1314.42	97.985	133736	6997.64	2.99523
42	1337.7	99.9373	124404	6509.33	2.99522
43	1360.98	101.89	115457	6040.83	2.99523
44	1384.26	103.842	107745	5637.66	2.99522
45	1407.54	105.794	100769	5272.67	2.99523
46	1430.81	107.747	94073.5	4922.33	2.99523
47	1454.09	109.699	87663.3	4586.92	2.99523
48	1477.37	111.651	81385.5	4253.2	2.99523
49	1488.27	127.5	22387.9	1171.43	2.99523
50	1495.72	138.33	8078.25	423.089	2.99523
51	1509.18	157.9	0	0	0

Appendix D

APPENDIX D

GROUND MOTION AND RESPONSE SPECTRA REFERENCES

Abrahamson, N. A., and W. J. Silva (2008), Summary of the Abrahamson & Silva NGA Ground-Motion Relations, Earthquake Spectra, 24(1), 67-97.

Boore, D. M., and G. M. Atkinson (2008), Ground-motion prediction equations for the average horizontal component of PGA, PGV, and 5%-Damped PSA at spectral periods between 0.01s and 10.0s, Earthquake Spectra, 24(1), 99-138.

Campbell, K. W. and Y. Bozorgnia (2008), NGA ground motion model for the geometric mean horizontal component of PGA, PGV, PGD and 5% damped linear elastic response spectra for periods ranging from 0.01 to 10s, Earthquake Spectra, 24(1), 139-171.

Chiou, B. S.-J. and Youngs R. R. (2008), An NGA model for the average horizontal component of peak ground motion and response spectra, Earthquake Spectra, 24(1), 173-215.

U.S. Geological Survey, United States Seismic Design Maps web application, http://earthquake.usgs.gov/designmaps/us/application.php

U.S. Geological Survey, Interactive Deaggregation web application, http://geohazards.usgs.gov/deaggint/2008/

MODIFIED MERCALLI SCALE, 1956 VERSION *

	Intensity	Effects	v† cm/s	g‡
M§	I.	Not felt. Marginal and long-period effects of large earthquakes(for details see text).		
3	II.	Felt by persons at rest, on upper floors, or favorably placed.		
	III.	Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognized as an earthquake.		0.0035-0.007
4	IV.	Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of wooden walls walls and frame creak.		0.007-0.015
	V.	Felt outdoors: direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.	1-3	0.015-0.035
5	VI.	Felt by all. Many frightened and run outdoors. Persons walk unsteadily. Windows, dishes, glassware broken. Kinickkacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells ring (church or school). Trees, bushes shaken (visibly, or heard to rustle - CFR).	3-7	0.035-0.07
	VII.	Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices (also unbraced parapets and architectural ornaments - CFR). Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Concrete irrigation ditches damaged.	7-20	0.07-0.15
6				
	VIII.	Steering from motor cars affected. Damage to masonry C; partial collaspe. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks, Frame houses moved on foundations if not bolted down, loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.	20-60	0.15-0.35
	IX.	General panic. Masonry D destroyed; masonry C heavely damaged, sometimes with complete collaspe; masonry B seriously damaged. (General damage to foundations - CFR.) Frame structures, if not bolted, shifted off foundations. Frames rocked. Serious damage to reserviors. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas sand and mud ejected, earthquake fountains, sand craters.	60-200	0.35-0.7
7				
	X.	Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage to dams, dikes embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails slightly bent.	200-500	0.7-1.2
8				
	XI.	Rails bent greatly. Underground pipelines completely out of service		>1.2
	XII.	Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.	From Fig. 11.14	

NOTE: Masonry A, B, C, D. To avoid ambiguity of language, the quality of masonry, brick or otherwise, is specified by the following lettering (which has no connection to the conventional Class A, B, C construction).

- *Masonry A*: Good workmanship, mortar, and design; reinforced, especially laterally, and bound together by using steel, concrete, etc.; designed to resist lateral forces.
- *Masonry B*: Good workmanship and mortar; reinforced, but not designed to resist lateral forces.
- *Masonry C*: Ordinary workmanship and mortar; no extreme weaknesses such as non-tied-in corners, but masonry is neither reinforced nor designed against horizontal forces.
- *Masonry D*: Weak materials, such as adobe; poor mortar; low standard of workmanship; weak horizontally.

* From Richter (1958). Adapted with permission of W.H. Freeman and Company.

† Average peak ground velocity, cm/s.

‡ Average peak acceleration (away from source).

§ Magnitude correlation.

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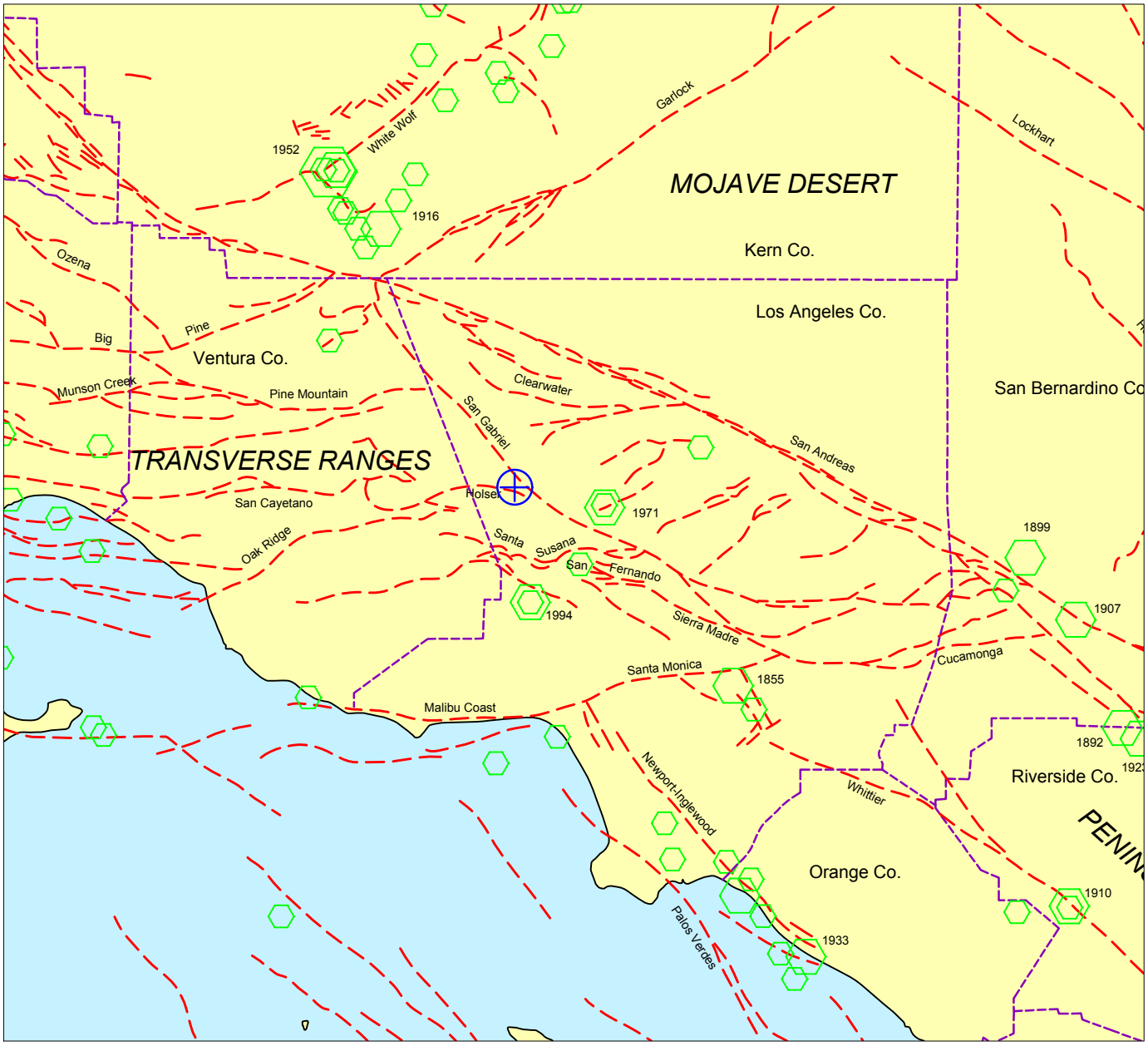
MODIFIED MERCALLI SCALE



EXPLANATION

APPROXIMATE LOCATION OF SUBJECT SITE

APPROXIMATE LOCATION OF MAJOR KNOWN FAULTS

San Andreas

EARTHQUAKE EPICENTERS

Location	Magnitude
⬡	5.0 - 5.9
⬡	6.0 - 6.9
⬡	7.0 - 7.9

Compiled and modified from: Jennings (1994), Real et al. (1978), Yerkes (1985), Ziony and Jones (1989), and Shakal et al. (1994)

N

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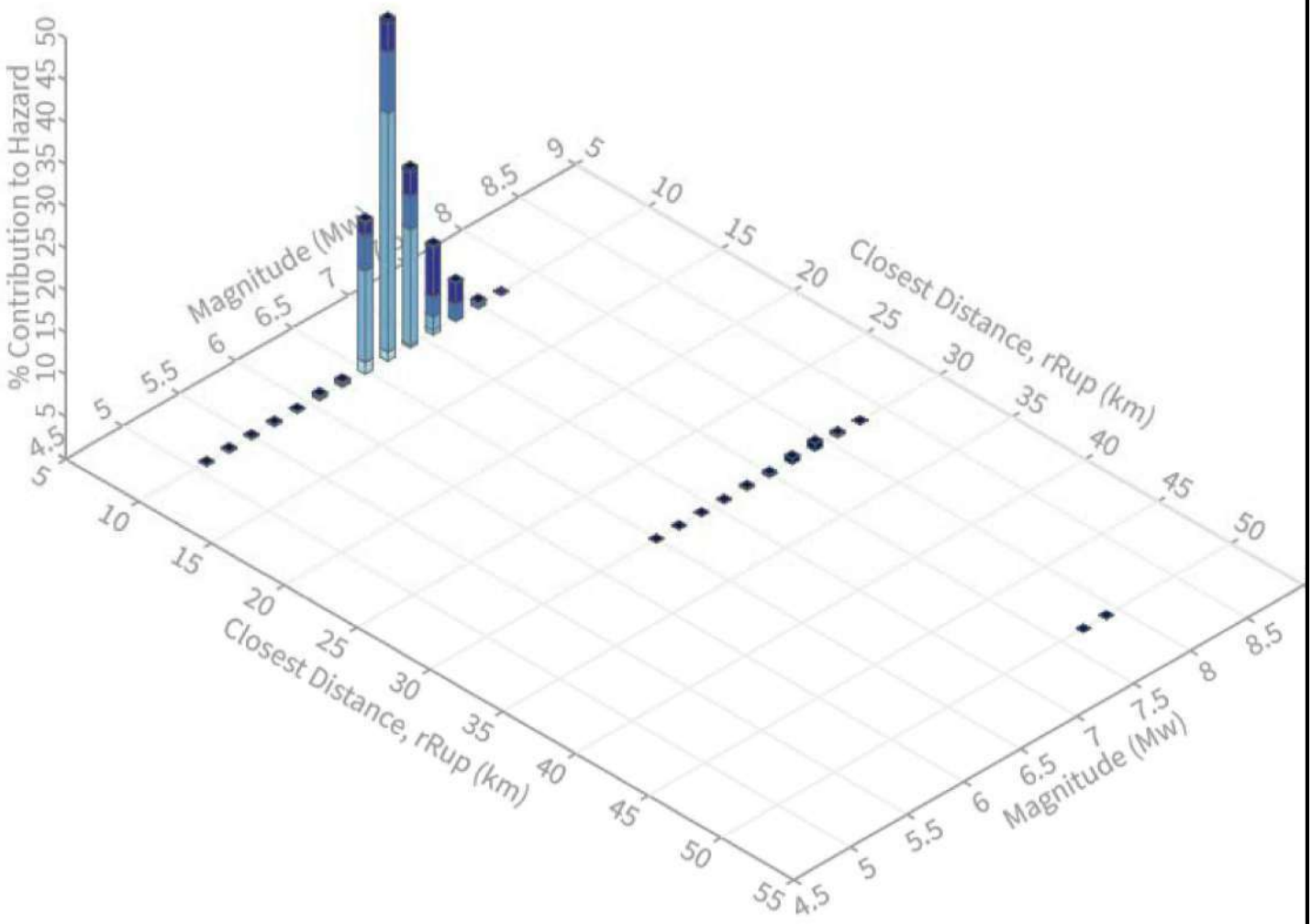
FAULT AND EARTHQUAKE EPICENTER LOCATION MAP

Job No.: 18-1245A-4

Date: 6/8/18

Figure: D1

HAZARD CONTRIBUTIONS



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MAGNITUDE/DISTANCE
DEAGGREGATION OF HAZARD

JOB NO.: 18-1245A-4

DATE: 6/8/18 | FIGURE: D2

APPENDIX D

USGS DEAGGREGATION OUTPUT AND PARAMETERS

*** Deaggregation of Seismic Hazard at One Period of Spectral Acceleration ***
*** Data from Dynamic: Conterminous U.S. 2008 (v3.3.1) ****

PSHA Deaggregation. %contributions.
site: Sterling Gateway, L.P.; VTMN 60257
longitude: 118.650°W
latitude: 34.449°E
imt: Peak ground acceleration
vs30 = 259 m/s (Site class D)
return period: 2475 yrs.
This deaggregation corresponds to: Total

Summary statistics for PSHA PGA deaggregation, r=distance, ε=epsilon:

Deaggregation targets:
- Return period: 2475 yrs
- Exceedance rate: 0.0004040404 yr^{-1}
- PGA ground motion: 0.95072606 g

Recovered targets:
- Return period: 3025.8929 yrs
- Exceedance rate: 0.00033048096 yr^{-1}

Totals:
- Binned: 100 %
- Residual: 0 %
- Trace: 0.01 %

Mean (for all sources):
- r: 9.37 km
- m: 6.79
- ε_0: 1.56 σ

Mode (largest r-m bin):
- r: 9.08 km
- m: 6.69
- ε_0: 1.42 σ
- Contribution: 40.45 %

Mode (largest ε_0 bin):
- r: 9.36 km
- m: 6.69
- ε_0: 1.24 σ
- Contribution: 28.36 %

Discretization:
- r: min = 0.0, max = 1000.0, Δ = 20.0 km
- m: min = 4.4, max = 9.4, Δ = 0.2
- ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys:
- ε0: [-∞ ‥ -2.5)
- ε1: [-2.5 ‥ -2.0)
- ε2: [-2.0 ‥ -1.5)
- ε3: [-1.5 ‥ -1.0)
- ε4: [-1.0 ‥ -0.5)
- ε5: [-0.5 ‥ 0.0)
- ε6: [0.0 ‥ 0.5)
- ε7: [0.5 ‥ 1.0)
- ε8: [1.0 ‥ 1.5)
- ε9: [1.5 ‥ 2.0)
- ε10: [2.0 ‥ 2.5)
- ε11: [2.5 ‥ +∞]

APPENDIX D

Closest Distance, rRup (km)	Mag. (Mw)	ALL_ε	ε=[2.5,∞)	ε=[2,2.5)	ε=[1.5,2)	ε=[1,1.5)	ε=[0.5,1)	ε=(-∞,0.5)	ε=[-0.5,∞)	ε=[-1,-0.5)	ε=[-1.5,-1)	ε=[-2,-1.5)	ε=[-2.5,-2)	ε=(-∞,-2.5)
50	7.7	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
50	7.9	0.003	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	6.5	0.029	0.029	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	6.7	0.062	0.062	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	6.9	0.052	0.052	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	7.1	0.095	0.095	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	7.3	0.178	0.010	0.167	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	7.5	0.264	0.011	0.252	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	7.7	0.603	0.603	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	7.9	0.799	0.799	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	8.1	0.300	0.287	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
30	8.3	0.012	0.011	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	5.1	0.132	0.132	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	5.3	0.167	0.028	0.139	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	5.5	0.181	0.106	0.075	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	5.7	0.185	0.174	0.011	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	5.9	0.191	0.161	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	6.1	0.493	0.307	0.127	0.059	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	6.3	0.574	0.030	0.015	0.277	0.180	0.071	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	6.5	18.131	1.409	10.838	4.135	1.499	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	6.7	40.453	1.077	28.361	7.120	3.485	0.409	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	6.9	21.196	0.310	13.711	3.897	2.906	0.371	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	7.1	10.561	0.509	1.593	2.298	5.869	0.292	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	7.3	4.627	2.031	2.523	0.073	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	7.5	0.700	0.528	0.169	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
10	7.7	0.014	0.012	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

APPENDIX D

Principal Sources (faults, subduction, random seismicity having > 3% contribution

bFault.ch:
Percent Contributed: 57.88
Distance (km): null
Magnitude: null
Epsilon (mean values): null

Santa Susana - alt 1:
Percent Contributed: 32.25
Distance (km): 9.8480217
Magnitude: 6.7800281
Epsilon (mean values): 1.2578468
Azimuth: 205.7559
Latitude: 34.35059
Longitude: -118.70806

Northridge:
Percent Contributed: 8.19
Distance (km): 8.7178109
Magnitude: 6.783511
Epsilon (mean values): 1.7553402
Azimuth: 163.20284
Latitude: 34.404
Longitude: -118.634

San Cayetano:
Percent Contributed: 4.75
Distance (km): 10.237556
Magnitude: 7.1601443
Epsilon (mean values): 2.210457
Azimuth: 261.98461
Latitude: 34.4361
Longitude: -118.762

Holser - alt 1:
Percent Contributed: 4.4
Distance (km): 0.23920446
Magnitude: 6.6716977
Epsilon (mean values): 1.1315165
Azimuth: 93.719466
Latitude: 34.44868
Longitude: -118.64267

Oak Ridge (Onshore):
Percent Contributed: 4.37
Distance (km): 8.7996133
Magnitude: 7.1557688
Epsilon (mean values): 2.0670573
Azimuth: 229.26333
Latitude: 34.39777
Longitude: -118.7227

San Gabriel:
Percent Contributed: 2.06
Distance (km): 5.2271101
Magnitude: 7.251155
Epsilon (mean values): 1.8334181
Azimuth: 4.7032349
Latitude: 34.5142
Longitude: -118.644

Oak Ridge Connected:
Percent Contributed: 1.13
Distance (km): 8.7631717
Magnitude: 7.3558869
Epsilon (mean values): 2.0014996
Azimuth: 229.26333
Latitude: 34.39777
Longitude: -118.7227

bFault.gr:
Percent Contributed: 37.72
Distance (km): null
Magnitude: null
Epsilon (mean values): null

Santa Susana - alt 1:
Percent Contributed: 23.59
Distance (km): 9.8519859
Magnitude: 6.6482868
Epsilon (mean values): 1.3646641
Azimuth: 205.7559
Latitude: 34.35059
Longitude: -118.70806

Northridge:
Percent Contributed: 5.75
Distance (km): 8.8845193
Magnitude: 6.649331
Epsilon (mean values): 1.8274669
Azimuth: 163.20284
Latitude: 34.404
Longitude: -118.634

Holser - alt 1:
Percent Contributed: 2.71
Distance (km): 1.2779596
Magnitude: 6.5862013
Epsilon (mean values): 1.2161007
Azimuth: 93.719466
Latitude: 34.44868
Longitude: -118.64267

San Gabriel:
Percent Contributed: 2.34
Distance (km): 5.9213216
Magnitude: 6.8922205
Epsilon (mean values): 1.9729413
Azimuth: 4.7032349
Latitude: 34.5142
Longitude: -118.644

San Cayetano:
Percent Contributed: 1.61
Distance (km): 12.997604
Magnitude: 6.8798789
Epsilon (mean values): 2.4467337
Azimuth: 261.98461
Latitude: 34.4361
Longitude: -118.762

Oak Ridge (Onshore):
Percent Contributed: 1.3
Distance (km): 11.503638
Magnitude: 6.8927629
Epsilon (mean values): 2.3345172
Azimuth: 229.26333
Latitude: 34.39777
Longitude: -118.7227

aFault_aPriori_D2.1:
Percent Contributed: 1.17
Distance (km): null
Magnitude: null
Epsilon (mean values): null

Appendix E

APPENDIX E

SLOPE STABILITY ANALYSES

General

Limit equilibrium analyses were performed to evaluate the stability of proposed cut and fill slopes, critical natural slopes proposed to remain adjacent to the development, and landslide areas which may impact the proposed development. The stability analyses utilized cross sections that were constructed to illustrate the critical structural geometries and maximum heights for each analyzed slope. The analyses included evaluation of gross slope stability, under static and pseudostatic loading conditions, and surficial slope stability. Based on the results, the need for stabilization measures was explored, as needed, and design of appropriate mitigations was performed in a step-by-step fashion to achieve minimum safety factor requirements. Mitigation of proposed cut, fill and natural slopes that did not meet the minimum required safety factors for gross stability included buttress fills and building setback zones.

The analyzed cross sections, calculation procedures and methods, slope conditions, and calculated factors of safety are summarized in **Table E1** along with recommended mitigations. Slope stability diagrams graphically illustrating the results of our analyses for each cross section are attached for review. Critical failure surfaces (factor of safety 1.70 or less) were plotted on the respective cross sections in **Appendix H**.

Geometry and Groundwater

As shown on the cross sections, the analyzed geometries of cut-slopes and natural slopes included removal of vegetation, topsoil, artificial fill, alluvium, landslide debris and bedrock materials and adding compacted fill to achieve the proposed grades, or remedial grades, as needed on portions of the slopes. Anticipated removal depths were shown on the cross section in **Appendix H** only if integral to slope stability calculations. Analyses included across bedding (anti-dip to neutral) and potential adverse bedding with dips ranging from 25 to 38 degrees toward the slope face, depending on geologic data obtained near each cross section listed in **Table E1**. In general, adverse bedding conditions with anisotropic shear strengths were modeled where the dip direction of the bedding was no more than 45 degrees off of the cross section trend (or associated trend directly down slope). Except where subsurface data indicates otherwise, it has been conservatively assumed for the purposes of stability analysis that weak bedding planes may occur anywhere in the proposed cut-slopes.

Where the bedding dip direction was greater than 45 degrees off of the cross section trend (i.e. extreme bedding component), the bedding was considered to be generally neutral to the slope and across bedding shear strengths were used in our assessment. The need for remedial stability fills on slopes with extreme, daylighted bedding components, should be reviewed at the grading plan stage and during grading operations.

APPENDIX E

Review of ground water data in the vicinity and trench and boring log data indicates that the proposed cut-slopes in bedrock are above historic high ground water levels. Ground water was modeled in the slope stability source where a potential for future ground water existed directly up gradient (updip) of the slope being analyzed. In general, a static water table was modeled where existing ground water was encountered and an assumed pore water pressure coefficient (r_u of 0.10) was utilized where a future source of ground water seepage could potentially exist, directly above and directly updip of the slope.

Shear Strength Parameters

Shear strength parameters for bedrock (TQs), terrace deposits (Qt), and proposed compacted fill (Cf) are based on results of direct shear tests performed on representative samples collected at the project site for this study. Direct shear tests were not performed on landslide mass (Qls) or landslide plane (sp) material because of the limited extent of landslides present at the site within the development area and the low impact to development. However, shear strength values adopted from Parcel Map 60030, located approximately 1,300 ft to the east of the site, have been used (See Reference 2). Additionally, shear strength parameters for alluvium are based on direct shear tests performed on samples collected on adjacent VTTM 60665 (see Reference 3) directly to the east. A summary of design shear strength values used in our slope stability analyses is presented in the following table. Associated direct shear test reports are presented in **Appendix B**.

Summary of Design Shear Strength Values

Geologic Unit	Moist Unit Weight, pcf	Peak Shear Strength		Residual Shear Strength	
		Phi, degrees	Cohesion, psf	Phi, degrees	Cohesion, psf
Saugus Formation Bedrock (TQs) across bedding	130	36	300	32	300
Saugus Formation Bedrock (TQs) along bedding	125	23	500	18	300
Landslide Mass (Qls)	120	--	--	29	150
Landslide Plane	120	--	--	12	340
Post-Failure Mass (Qls-PF)	*105*	--	--	*25*	*150*
Terrace Deposits (Qt)	120	32	500	30	260
Alluvium (Qal/Qoa)	115	--	--	27	200
Proposed Compacted Fill (Cf)	130	29	450	29	270

In our analyses, residual shear strengths were utilized for both static and pseudostatic gross slope stability.

APPENDIX E

Building Setbacks for Natural Slopes

Where steep natural slopes are proposed to remain adjacent to proposed development, analyses were completed to evaluate the stability of the slope and to develop appropriate setbacks for future buildings and roads. In all cases, the proposed grading does not adversely impact the existing slope stability and in some cases, the proposed grading reduces the existing driving forces by lowering grade at the top of slopes.

Where development is proposed at the top of a natural slope, the stability of the slope was analyzed. If the slope met or exceeded the minimum factor of safety accepted by the County of Los Angeles (F.S. = 1.50), standard H/3 (40' maximum) setbacks apply. If the slope did not meet the minimum County requirements, additional analyses were completed to locate where potential failure surfaces meet or exceed minimum County requirements. In general, the potential failure surface with a 1.55 factor of safety farthest from the top of the slope was determined and is presented on the applicable cross sections. A Restricted Use Area (RUA), wherein structures and roadways are prohibited, is delineated on the map to encompass areas where the calculated safety factor is less than 1.55 surfaces. Standard H/3 (40' maximum) setbacks should then be applied from the RUA line.

Where development is proposed at the toe of a natural slope, the stability of the slope was analyzed. If the slope met or exceeded the minimum factor of safety accepted by the County of Los Angeles (F.S. = 1.50), standard H/2 (15' maximum) setbacks apply. If the slope did not meet the minimum county requirements, additional analyses were completed to determine an appropriate building setback at the toe of the slope.

Where building pads are proposed at the toe of a natural slope the stability of the ascending slope was evaluated to determine appropriate building setbacks. For slopes that meet or exceed the minimum factor of safety accepted by the County of Los Angeles (F.S. = 1.50), standard H/3 (15' maximum) setbacks apply. For the steep natural slopes that did not meet the minimum county requirements, a stable post-failure geometry was predicted based on the pre-failure critical surface. The post-failure geometry was modeled on applicable cross sections assuming bulking of the failure mass by approximately 20 percent and a runout of the failure mass that yielded a stable condition (i.e. where potential failure surfaces meet or exceed minimum County requirements). A Restricted Use Area (RUA), wherein structures and roadways are prohibited, is delineated on the map to encompass areas where the calculated safety factor is less than 1.55 surfaces. Standard H/2 (15' maximum) setbacks should then be applied from the RUA line.

APPENDIX E

Methods of Analysis

The slope stability analyses performed for this study used the 2D limit equilibrium software, Slide 2018, by RocScience. This software utilizes robust search methods to locate critical circular and non-circular slip surfaces and computes associated minimum factors of safety. The analyses used Spencer's complete equilibrium procedure to evaluate critical potential failure surfaces under static and pseudostatic loading conditions. In general, various search methods were employed for each cross section analyzed to determine either the critical circular failure surfaces (i.e. Grid Search, Slope Search, and Auto Refine) or critical non-circular failure surfaces (Cuckoo Search, Block Search, and Path Search). Critical non-circular slip surfaces were further optimized using the Surface Altering optimization option to assess potential surfaces with lower safety factors. Global and local minimum factors of safety were based on the results that each search method produced.

Analysis for seismic slope stability was performed using the pseudostatic procedure. In this procedure the seismic loading is introduced into the conventional limit equilibrium analysis as a static horizontal force equal to the soil weight multiplied by a seismic coefficient, *k*. The seismic coefficient is an empirical value which in no way models actual seismic forces. However, the pseudostatic procedure does provide some indication of slope stability or instability during seismic loading. In accordance with Los Angeles County Guidelines, we selected a seismic coefficient value of $k = 0.15$ for our analyses.

Surficial Stability Evaluation

Surficial slope stability of fill and cut slopes was not analyzed using the "Infinite Slope" method since the lower-bound cohesion value of bedrock and proposed fill materials is greater than 250 psf. Stability fills are needed and shown on the Geotechnical Map for cut-slopes that exhibit daylighted bedding conditions or have a fill over cut configuration. Surficial stability calculations were not performed on natural slopes because the proposed grading configuration and our debris flow hazard mitigation measure precluded the need for analyses.

Conclusion

The analyzed cut-slopes, proposed grades, remedial grades and compacted fill slopes comply with Los Angeles County minimum requirements for gross stability under static and pseudostatic loading conditions and for surficial stability, as applicable, provided our recommendations are followed and incorporated into project construction. The results of the stability analyses are summarized in **Table E1**.

APPENDIX E

The following attachments complete this Appendix.

Slope Stability Analyses Results Table E1
Slope Stability Diagrams and Data Sheets for Run No. 1 through 42

Table E1 – SLOPE STABILITY ANALYSES RESULTS

Cross Section	File Name	Slope Designation	Analyzed Plane	Method	Factor of Safety		Comments	Run No.
					Static	Pseudostatic[1] (Coeff = 0.15)		
1-1′	T1S1A T1PS1A	Landslide Qls-1	Bedding Plane	Spencer	1.52	1.12	Non-circular (cuckoo) search with bedding plane component; critical surface behind Qls-1 and extends thru planned fill berm; remedial removals shown in Qal and on slope face for berm construction.	1 2
1-1′	T1S2A T1PS2A	Landslide Qls-1	Landslide Plane	Spencer	2.20	1.57	Non-circular (block) search along Qls plane; run represents min FS achieved along Qls plane with various entry and exit points on slip surface.	3 4
4-4′	T4S1A	Cut-Slope CS-6	Bedding Plane	Spencer	1.57	1.16	Non-circular (cuckoo) search with bedding plane component. Run represents minimum FS achieved.	5 6
5-5′	T5S1A	Natural Slope NS-1	Non-Circular	Spencer	1.27	--	Non-circular (cuckoo) search for minimum FS, which is < 1.5; critical surface used as failure plane to model a potential post-failure slope geometry.	7
5-5′	T5S2A T5PS2A	Natural Slope NS-1	Non-Circular	Spencer	1.56	1.14	Non-circular (cuckoo) search thru estimated post-failure geometry; run represents min FS achieved. Slope setback should be applied from toe of post-failure geometry.	8 9
6-6′	T6S1A	Natural Slope NS-1	Non-Circular	Spencer	1.36	--	Non-circular (cuckoo) search for minimum FS, which is < 1.5; critical surface used as failure plane to model a potential post-failure slope geometry.	10

[1] Peak shear strength values were not utilized.

Table E1 – SLOPE STABILITY ANALYSES RESULTS

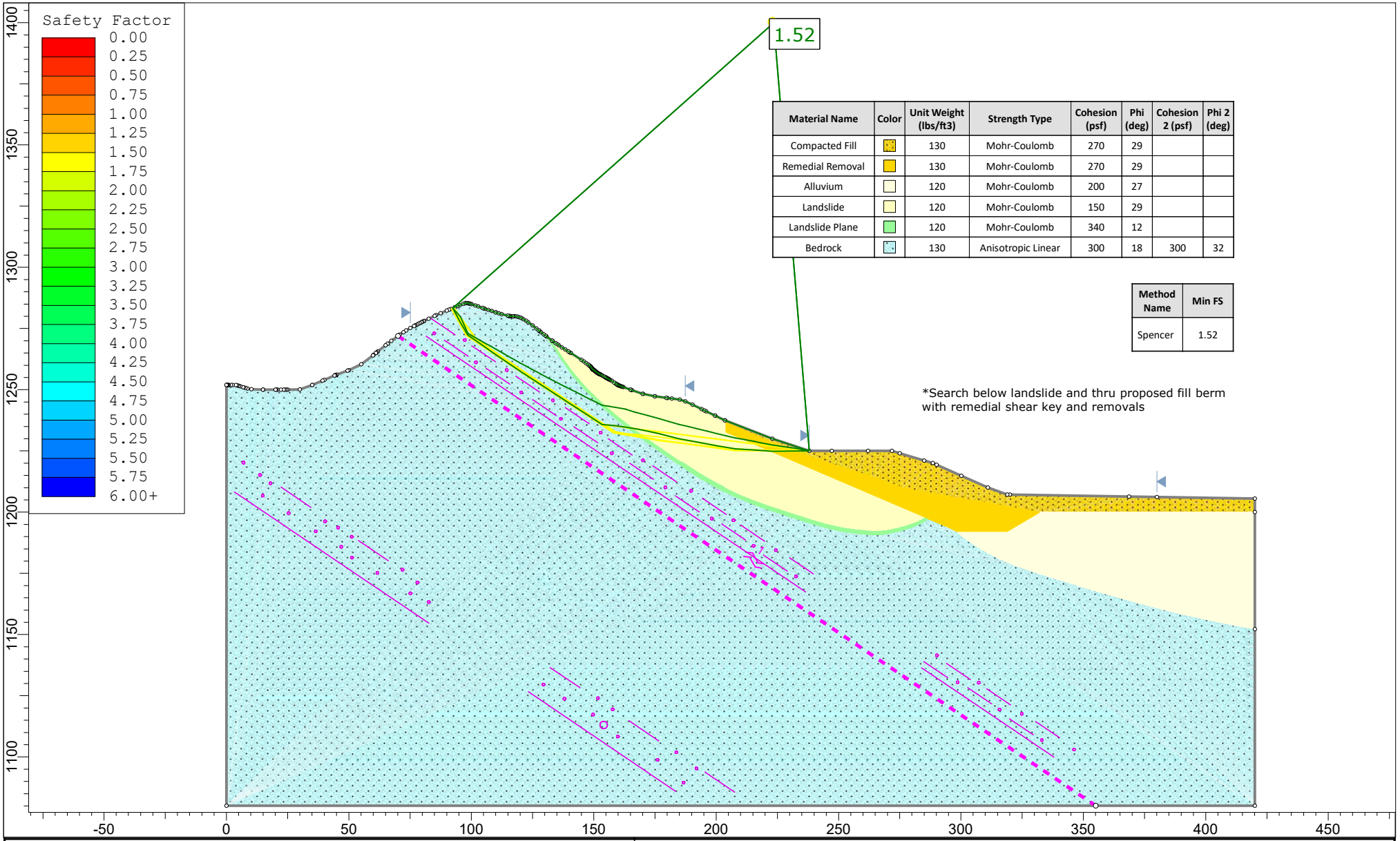
Cross Section	File Name	Slope Designation	Analyzed Plane	Method	Factor of Safety		Comments	Run No.
					Static	Pseudostatic[1] (Coeff = 0.15)		
6-6′	T6S2A T6PS2A	Natural Slope NS-1	Non-Circular	Spencer	1.65	1.17	Non-circular (cuckoo) search thru estimated post-failure geometry; run represents min FS achieved. Slope setback should be applied from toe of post-failure geometry.	11 12
7-7′	T7S1A	Landslide Qls-3 & Natural Slope	Bedding Plane	Spencer	1.00	--	Non-circular (cuckoo) search for minimum FS, which is < 1.5; FS=1.0 surface used as failure plane to model a potential post-failure slope geometry.	13
7-7′	T7S2A T7PS2A	Landslide Qls-3 & Natural Slope	Bedding Plane	Spencer	1.63	1.11	Non-circular (cuckoo) search thru estimated post-failure geometry; run represents min FS achieved. Slope setback should be applied from toe of post-failure geometry.	14 15
11-11′	T11S1A	Cut-Slope CS-7	Bedding Plane	Spencer	2.10	--	Non-circular (cuckoo) search with bedding plane component. Run represents minimum FS achieved.	16
12-12′	T12S1A	Cut-Slope CS-8	Bedding Plane	Spencer	1.72	1.26	Non-circular (cuckoo) search with bedding plane component. Run represents minimum FS achieved.	17 18
13-13′	T13S1A	Cut-Slope CS-8	Bedding Plane	Spencer	1.58	--	Global min FS, located above cut slope; Non-circular (cuckoo) search along bedding plane.	19
					1.99	--	Non-circular (cuckoo) search along anticline plunge with toe-out at base of slope.	20
15-15′	T15S1A	Cut-Slope CS-10	Bedding Plane	Spencer	2.06	--	Non-circular (cuckoo) search with bedding plane component. Run represents minimum FS achieved.	21

Table E1 – SLOPE STABILITY ANALYSES RESULTS

Cross Section	File Name	Slope Designation	Analyzed Plane	Method	Factor of Safety		Comments	Run No.
					Static	Pseudostatic[1] (Coeff = 0.15)		
16-16′	T16S1A	Cut-Slope CS-11 / Landslide Qls-C	Non-circular	Spencer	2.89	--	Non-circular (cuckoo) search; resulting critical failure plane within upper Qls mass.	22
					2.25	--	Non-circular (block) search along Qls plane; run represents min FS achieved along Qls plane with various entry and exit points on slip surface.	23
18-18′	T18S1A	Cut-Slope CS-11 / Landslide Qls-B	Non-circular	Spencer	1.18	--	Non-circular (cuckoo) search; resulting critical surface along landslide plane. Min safety factor < 1.5; see mitigation below.	24
18-18′	T18S2A	Cut-Slope CS-11 / Landslide Qls-B	Non-circular	Spencer	1.72	1.21	Remedial 3:1 (h:v) slope; non-circular (cuckoo) search; resulting critical surface along landslide plane.	25 26
19-19′	T19S1A	Cut-Slope CS-11 / Landslide Qls-A	Non-circular	Spencer	2.12	--	Non-circular (cuckoo) search with upslope limits restricted to top of cut slope. Run represents minimum FS achieved.	27
					2.84	--	Non-circular (cuckoo) search along landslide plane with upslope limits restricted to top of landslide.	28
23-23′	T23S1A	Natural Slope NS-2 / Landslides Qls-6 & Qls-7	Non-circular	Spencer	2.93	--	Non-circular (block) search along bedding plane behind landslide; Ru = 0.1.	29
24-24′	T24S1A	Natural Slope NS-2	Non-circular	Spencer	1.81	--	Non-circular (cuckoo) search with bedding plane component. Run represents minimum FS achieved.	30

Table E1 – SLOPE STABILITY ANALYSES RESULTS

Cross Section	File Name	Slope Designation	Analyzed Plane	Method	Factor of Safety		Comments	Run No.
					Static	Pseudostatic[1] (Coeff = 0.15)		
25-25′	T25S1A T25PS1A	Natural Slope NS-2	Non-circular	Spencer	1.41	--	Non-circular (cuckoo) search with bedding plane component. Min safety factor < 1.5; see analysis for slope setback below.	31
					1.56	1.21	Non-circular (cuckoo) search with bedding plane component; upslope limits restricted to determine FS>1.55 setback at top of slope.	32 33
26-26′	T26S1A T26PS1A	Natural Slope NS-2	Non-circular	Spencer	1.13	--	Non-circular (cuckoo) search with bedding plane component. Min safety factor < 1.5; see analysis for slope setback below.	34
					1.55	1.18	Non-circular (cuckoo) search with bedding plane component; upslope limits restricted to determine FS>1.55 setback at top of slope.	35 36
27-27′	T27S1A T27PS1A	Natural Slope NS-2	Non-circular	Spencer	1.13	--	Non-circular (cuckoo) search with bedding plane component. Min safety factor < 1.5; see analysis for slope setback below.	37
					1.55	1.18	Non-circular (cuckoo) search with bedding plane component; upslope limits restricted to determine FS>1.55 setback at top of slope.	38 39
31-31′	T31S1A T31PS1A	Fill Slope	Non-Circular	Spencer	1.82	1.29	Non-circular (cuckoo) internal search thru highest fill slope.	40 41
31-31′	T31S2A	Fill Slope	Non-Circular	Spencer	1.56	--	Non-circular search considering potential post-liquefaction strengths in alluvium below remedial canyon removals.	42



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Remedial Removal		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Landslide		120	Mohr-Coulomb	150	29		
Landslide Plane		120	Mohr-Coulomb	340	12		
Bedrock		130	Anisotropic Linear	300	18	300	32

Method Name	Min FS
Spencer	1.52

*Search below landslide and thru proposed fill berm with remedial shear key and removals

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; bedding plane; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1s1a.slmd
		Scale:	1:650
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 1

Slide Analysis Information

t1s1a

Project Summary

File Name:	t1s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:15.587s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; bedding plane; static
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Remedial Removal	Alluvium	Landslide	Landslide Plane	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	130	120	120	120	130
Cohesion [psf]	270	270	200	150	340	
Friction Angle [°]	29	29	27	29	12	
Cohesion 1 [psf]						300
Cohesion 2 [psf]						300
Friction Angle 1 [°]						18
Friction Angle 2 [°]						32
A [°]						1
B [°]						1
Anisotropic Definition						Surface
Angle from 1 [°]						
Anisotropic Surface						Anisotropic Surface 1
Tensile Strength [psf]						0
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.522910
Axis Location:	223.535, 1399.838
Left Slip Surface Endpoint:	92.383, 1283.320
Right Slip Surface Endpoint:	238.058, 1225.006
Resisting Moment:	2.62959e+07 lb-ft
Driving Moment:	1.72831e+07 lb-ft
Resisting Horizontal Force:	136820 lb
Driving Horizontal Force:	89925.2 lb
Total Slice Area:	2075.71 ft2
Surface Horizontal Width:	145.675 ft
Surface Average Height:	14.2489 ft

Global Minimum Coordinates

Method: spencer

X	Y
92.3828	1283.32
95.5308	1277.4
98.5281	1272.36
103.262	1269.06
107.996	1265.76
112.738	1262.45
117.479	1259.14
122.315	1255.99
127.151	1252.84
132.413	1249.42
137.675	1246.01
142.937	1242.6
148.2	1239.18
153.462	1235.77
158.724	1235.27
163.174	1234.69
167.623	1233.96
172.073	1233.07
176.67	1232.03
180.653	1230.99
184.637	1229.95
192.603	1228.55
200.291	1227.12
207.897	1225.83
215.523	1225.34
223.15	1224.84
230.678	1224.92
238.058	1225.01

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6846
Number of Invalid Surfaces: 3210

Error Codes:

Error Code -108 reported for 9 surfaces
Error Code -111 reported for 9 surfaces
Error Code -112 reported for 24 surfaces
Error Code -114 reported for 42 surfaces
Error Code -121 reported for 881 surfaces
Error Code -124 reported for 10 surfaces
Error Code -1000 reported for 2235 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

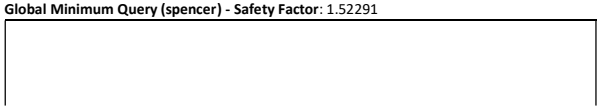
Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.52291

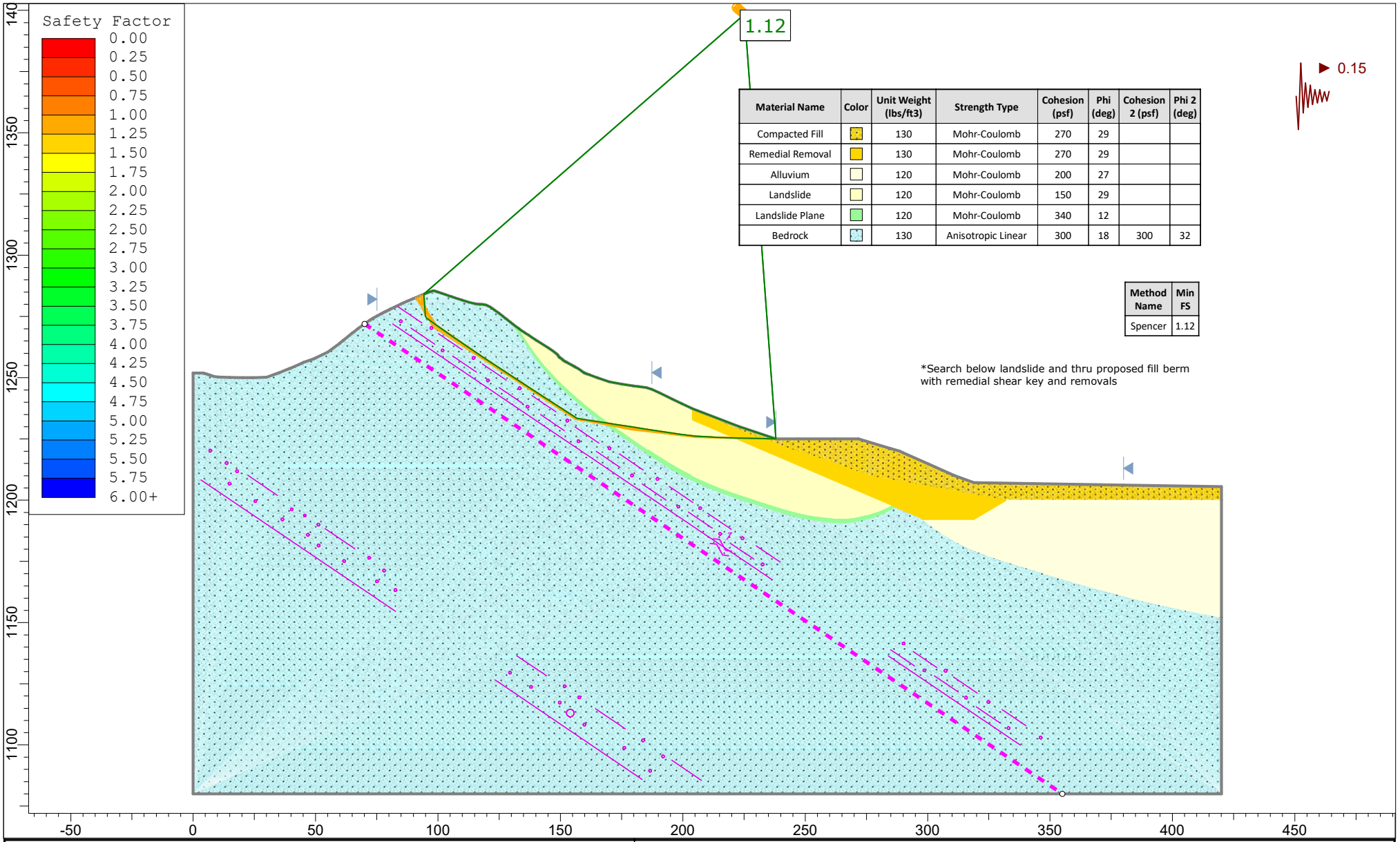
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.14795	1475.31	-61.9867	Bedrock	300	32	225.411	343.281	69.2642	0	69.2642	492.963	492.963
2	2.9973	3996.08	-59.2939	Bedrock	300	32	402.11	612.378	499.91	0	499.91	1176.98	1176.98
3	2.36693	4153.28	-34.8518	Bedrock	300	18	469.036	714.299	1275.08	0	1275.08	1601.7	1601.7
4	2.36693	4418.25	-34.8518	Bedrock	300	18	487.093	741.799	1359.72	0	1359.72	1698.91	1698.91
5	2.36702	4680.08	-34.862	Bedrock	300	18	504.882	768.89	1443.09	0	1443.09	1794.81	1794.81
6	2.36702	4943.85	-34.862	Bedrock	300	18	522.855	796.261	1527.33	0	1527.33	1891.57	1891.57
7	2.37086	5221.75	-34.9209	Bedrock	300	18	540.942	823.806	1612.11	0	1612.11	1989.77	1989.77
8	2.37086	5501.27	-34.9209	Bedrock	300	18	559.945	852.746	1701.18	0	1701.18	2092.11	2092.11
9	2.37085	5809.37	-34.9536	Bedrock	300	18	580.728	884.397	1798.59	0	1798.59	2204.52	2204.52
10	2.37085	6189.23	-34.9536	Bedrock	300	18	606.543	923.711	1919.59	0	1919.59	2343.56	2343.56
11	2.41786	6752.53	-33.0836	Bedrock	300	18	646.504	984.568	2106.89	0	2106.89	2528.07	2528.07
12	2.41786	6956.64	-33.0836	Bedrock	300	18	660.385	1005.71	2171.94	0	2171.94	2602.17	2602.17
13	2.41786	6958.62	-33.0831	Bedrock	300	18	660.522	1005.92	2172.59	0	2172.59	2602.9	2602.9
14	2.41786	6876.51	-33.0831	Bedrock	300	18	654.938	997.412	2146.41	0	2146.41	2573.09	2573.09
15	2.63103	7362.92	-32.9695	Bedrock	300	18	648.094	986.989	2114.33	0	2114.33	2534.72	2534.72
16	2.63103	7236.93	-32.9695	Bedrock	300	18	640.211	974.984	2077.39	0	2077.39	2492.66	2492.66
17	2.63113	7105.06	-32.9723	Bedrock	300	18	631.928	962.37	2038.57	0	2038.57	2448.51	2448.51
18	2.63113	7011.65	-32.9723	Bedrock	300	18	626.084	953.469	2011.17	0	2011.17	2417.32	2417.32
19	5.26225	13853.2	-32.9668	Bedrock	300	18	620.792	945.41	1986.36	0	1986.36	2389	2389
20	2.63113	6870	-32.9791	Bedrock	300	18	617.186	939.918	1969.46	0	1969.46	2369.95	2369.95
21	2.63113	6819.98	-32.9791	Bedrock	300	18	614.055	935.151	1954.79	0	1954.79	2353.25	2353.25
22	2.63113	6605.34	-32.963	Bedrock	300	18	600.711	914.829	1892.25	0	1892.25	2281.8	2281.8
23	2.63113	6476.71	-32.963	Bedrock	300	18	592.663	902.572	1854.53	0	1854.53	2238.86	2238.86
24	2.63113	6289.29	-5.41282	Bedrock	300	32	1282.85	1953.66	2646.42	0	2646.42	2767.97	2767.97
25	2.63113	5834.97	-5.41282	Bedrock	300	32	1206.12	1836.81	2459.42	0	2459.42	2573.7	2573.7
26	4.23181	8483.4	-7.38839	Bedrock	300	32	1082.72	1648.88	2158.65	0	2158.65	2299.05	2299.05
27	0.217863	418.75	-7.38839	Landslide Plane	340	12	494.975	753.802	1946.79	0	1946.79	2010.97	2010.97
28	3.32147	6245.22	-9.34646	Landslide Plane	340	12	483.585	736.457	1865.18	0	1865.18	1944.78	1944.78
29	1.1282	2066.84	-9.34646	Landslide	150	29	781.786	1190.59	1877.26	0	1877.26	2005.94	2005.94
30	4.44968	7969.43	-11.2828	Landslide	150	29	748.622	1140.08	1786.16	0	1786.16	1935.51	1935.51
31	2.29839	4102.09	-12.7847	Landslide	150	29	732.85	1116.07	1742.83	0	1742.83	1909.12	1909.12
32	2.29839	4129.54	-12.7847	Landslide	150	29	737.063	1122.48	1754.4	0	1754.4	1921.65	1921.65
33	3.98338	7310.95	-14.6125	Landslide	150	29	734.278	1118.24	1746.75	0	1746.75	1938.19	1938.19
34	3.98338	7553.08	-14.6125	Landslide	150	29	755.212	1150.12	1804.27	0	1804.27	2001.17	2001.17
35	3.98338	7577.77	-9.97736	Landslide	150	29	801.452	1220.54	1931.31	0	1931.31	2072.3	2072.3
36	3.98338	7087.84	-9.97736	Landslide	150	29	756.453	1152.01	1807.67	0	1807.67	1940.74	1940.74
37	3.84385	6289.21	-10.5808	Landslide	150	29	698.882	1064.33	1649.5	0	1649.5	1780.05	1780.05
38	3.84385	5767.13	-10.5808	Landslide	150	29	649.577	989.248	1514.04	0	1514.04	1635.38	1635.38
39	3.80287	5208.7	-9.56491	Landslide	150	29	609.59	928.351	1404.18	0	1404.18	1506.9	1506.9
40	3.80287	4940.67	-9.56491	Landslide	150	29	583.66	888.861	1332.94	0	1332.94	1431.29	1431.29
41	3.81319	4488.86	-3.73245	Landslide	150	29	578.855	881.544	1319.74	0	1319.74	1357.5	1357.5
42	3.81319	3933.03	-3.73245	Landslide	150	29	520.832	793.181	1160.33	0	1160.33	1194.3	1194.3
43	2.85259	2578.71	-3.72176	Landslide	150	29	470.167	716.022	1021.13	0	1021.13	1051.71	1051.71
44	2.85259	2267.47	-3.72176	Landslide	150	29	426.73	649.871	901.79	0	901.79	929.548	929.548
45	1.92122	1345.22	-3.72176	Remedial Removal	270	29	477.253	726.813	824.11	0	824.11	855.155	855.155
46	3.76393	2175.55	0.63164	Remedial Removal	270	29	450.176	685.577	749.721	0	749.721	744.758	744.758
47	3.76393	1547.1	0.63164	Remedial Removal	270	29	379.477	577.909	555.481	0	555.481	551.298	551.298
48	2.01826	570.692	0.640469	Remedial Removal	270	29	325.194	495.241	406.346	0	406.346	402.711	402.711
49	2.68119	478.553	0.640469	Compacted Fill	270	29	281.033	427.988	285.018	0	285.018	281.876	281.876
50	2.68119	159.518	0.640469	Compacted Fill	270	29	231.879	353.131	149.973	0	149.973	147.381	147.381

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.52291



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	92.3828	1283.32	0	0	0
2	95.5308	1277.4	-299.009	-109.697	20.1465
3	98.5281	1272.36	1019.93	374.18	20.1465
4	100.895	1270.71	2012.53	738.333	20.1465
5	103.262	1269.06	3101.93	1138	20.1465
6	105.629	1267.41	4287.65	1573	20.1465
7	107.996	1265.76	5569.77	2043.37	20.1465
8	110.367	1264.11	6956.99	2552.29	20.1464
9	112.738	1262.45	8446.63	3098.8	20.1465
10	115.109	1260.79	10051.9	3687.71	20.1464
11	117.479	1259.14	11796.5	4327.77	20.1465
12	119.897	1257.56	13553.7	4972.43	20.1465
13	122.315	1255.99	15379.9	5642.39	20.1465
14	124.733	1254.41	17206.7	6312.57	20.1464
15	127.151	1252.84	19005.7	6972.58	20.1465
16	129.782	1251.13	20910.7	7671.45	20.1464
17	132.413	1249.42	22773.3	8354.79	20.1465
18	135.044	1247.72	24591.9	9021.97	20.1464
19	137.675	1246.01	26379.1	9677.63	20.1464
20	142.937	1242.6	29895.2	10967.6	20.1465
21	145.568	1240.89	31635.4	11606	20.1464
22	148.2	1239.18	33358.9	12238.3	20.1465
23	150.831	1237.48	35008.6	12843.5	20.1464
24	153.462	1235.77	36615.1	13432.9	20.1465
25	156.093	1235.52	33903	12437.9	20.1464
26	158.724	1235.27	31346	11499.8	20.1464
27	162.956	1234.72	27953.4	10255.2	20.1465
28	163.174	1234.69	27900.7	10235.9	20.1465
29	166.495	1234.15	27315.8	10021.3	20.1465
30	167.623	1233.96	26783.3	9825.92	20.1464
31	172.073	1233.07	25041.2	9186.82	20.1465
32	174.372	1232.55	24267.5	8902.98	20.1465
33	176.67	1232.03	23490.2	8617.8	20.1465
34	180.653	1230.99	22382.4	8211.36	20.1464
35	184.637	1229.95	21250.9	7796.28	20.1465
36	188.62	1229.25	19415.1	7122.77	20.1464
37	192.603	1228.55	17671.7	6483.17	20.1464
38	196.447	1227.83	16172.4	5933.15	20.1465
39	200.291	1227.12	14765.3	5416.9	20.1464
40	204.094	1226.47	13349.3	4897.42	20.1464
41	207.897	1225.83	11986.1	4397.33	20.1465
42	211.71	1225.58	10109.4	3708.82	20.1465
43	215.523	1225.34	8414.07	3086.85	20.1465
44	218.376	1225.15	7263.73	2664.83	20.1465
45	221.228	1224.97	6215.04	2280.1	20.1465
46	223.15	1224.84	5402.07	1981.84	20.1464
47	226.914	1224.88	3678.27	1349.44	20.1465
48	230.678	1224.92	2228.37	817.515	20.1464
49	232.696	1224.95	1563.55	573.615	20.1464
50	235.377	1224.98	802.278	294.33	20.1465
51	238.058	1225.01	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; bedding plane; pseudo		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1ps1a.slmd
		Scale:	1:650
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 2

Slide Analysis Information

t1ps1a

Project Summary

File Name:	t1ps1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:22.776s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; bedding plane; pseudo
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Remedial Removal	Alluvium	Landslide	Landslide Plane	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	130	120	120	120	130
Cohesion [psf]	270	270	200	150	340	
Friction Angle [°]	29	29	27	29	12	
Cohesion 1 [psf]						300
Cohesion 2 [psf]						300
Friction Angle 1 [°]						18
Friction Angle 2 [°]						32
A [°]						1
B [°]						1
Anisotropic Definition						Surface
Angle from 1 [°]						
Anisotropic Surface						Anisotropic Surface 1
Tensile Strength [psf]						0
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.116380
Axis Location:	225.208, 1398.380
Left Slip Surface Endpoint:	94.218, 1284.075
Right Slip Surface Endpoint:	238.058, 1225.006
Resisting Moment:	2.61316e+07 lb-ft
Driving Moment:	2.34622e+07 lb-ft
Resisting Horizontal Force:	138373 lb
Driving Horizontal Force:	124238 lb
Total Slice Area:	2158.34 ft2
Surface Horizontal Width:	143.84 ft
Surface Average Height:	15.0052 ft

Global Minimum Coordinates

Method: spencer

X	Y
94.2185	1284.08
94.8052	1275.31
95.3919	1274.25
99.178	1271.61
105.539	1267.18
111.91	1262.76
118.305	1258.41
124.912	1254
130.214	1250.55
135.516	1247.11
140.819	1243.67
146.124	1240.23
151.429	1236.79
156.733	1233.35
162.261	1232.49
167.789	1231.63
173.317	1230.78
178.845	1229.92
185.506	1228.89
192.163	1227.87
198.819	1226.84
205.475	1226.09
209.604	1225.85
213.73	1225.61
217.857	1225.48
221.983	1225.38
230.04	1225.19
238.058	1225.01

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6702
Number of Invalid Surfaces: 3357

Error Codes:

Error Code -108 reported for 14 surfaces
Error Code -111 reported for 6 surfaces
Error Code -112 reported for 45 surfaces
Error Code -114 reported for 19 surfaces
Error Code -121 reported for 924 surfaces
Error Code -124 reported for 5 surfaces
Error Code -1000 reported for 2344 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

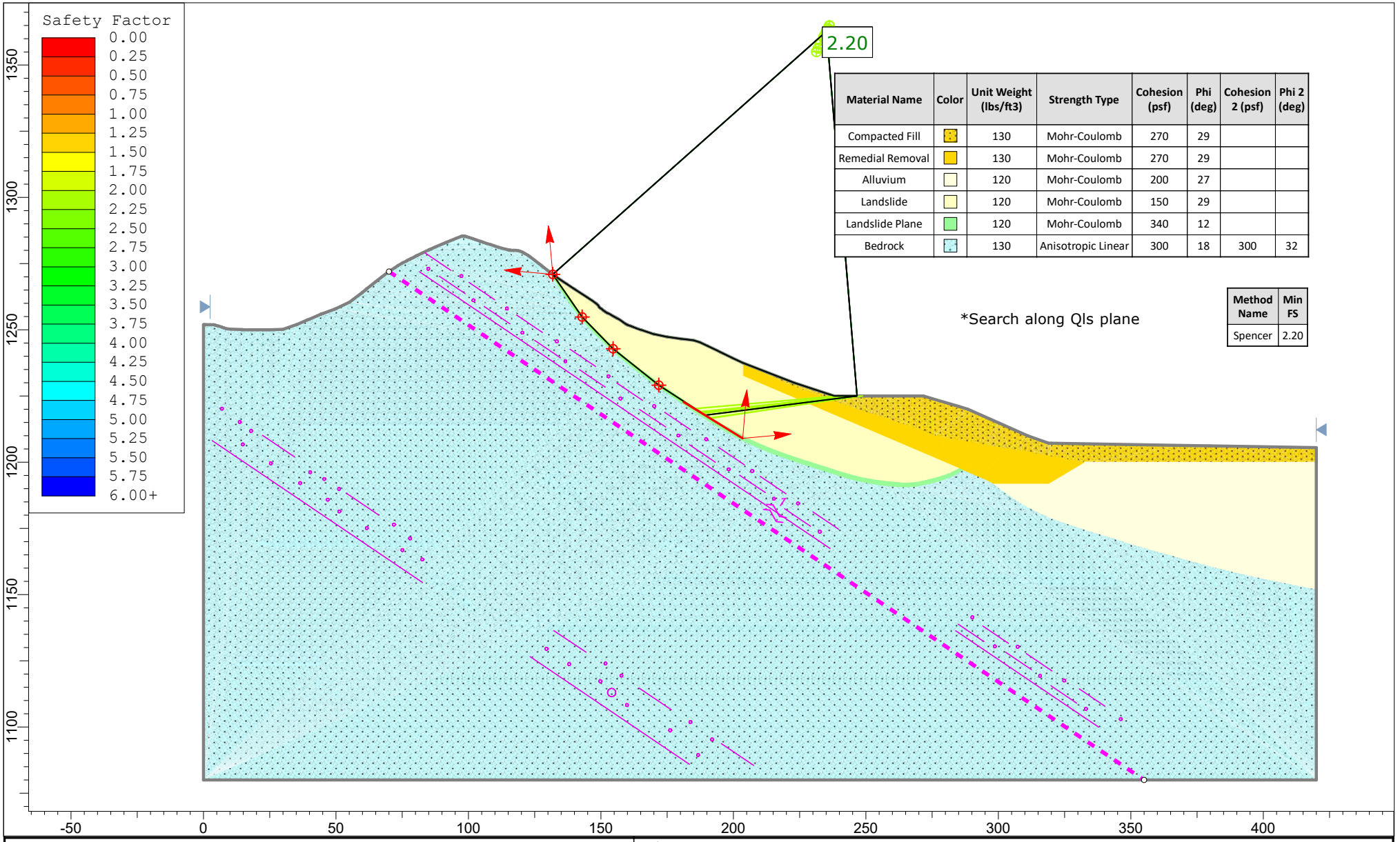
Global Minimum Query (spencer) - Safety Factor: 1.11638

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.586686	343.406	-86.1715	Bedrock	300	32	37.4252	41.7807	0	0	0	559.251	559.251
2	0.586686	736.298	-61.0604	Bedrock	300	32	440.946	492.263	307.685	0	307.685	1105.15	1105.15
3	3.78618	6012.62	-34.8782	Bedrock	300	18	563.421	628.992	1012.53	0	1012.53	1405.26	1405.26
4	3.18058	5862.81	-34.8107	Bedrock	300	18	613.458	684.852	1184.45	0	1184.45	1610.99	1610.99
5	3.18058	6334.79	-34.8107	Bedrock	300	18	642.325	717.079	1283.64	0	1283.64	1730.24	1730.24
6	3.18557	6820.31	-34.7909	Bedrock	300	18	671.508	749.658	1383.9	0	1383.9	1850.46	1850.46
7	3.18557	7308.71	-34.7909	Bedrock	300	18	701.341	782.963	1486.41	0	1486.41	1973.69	1973.69
8	3.19722	7858.99	-34.2104	Bedrock	300	18	737.785	823.648	1611.62	0	1611.62	2113.22	2113.22
9	3.19722	8532.52	-34.2104	Bedrock	300	18	779.099	869.77	1753.57	0	1753.57	2283.25	2283.25
10	3.30345	9496.78	-33.7031	Bedrock	300	18	824.093	920.001	1908.17	0	1908.17	2457.83	2457.83
11	3.30345	9623.69	-33.7031	Bedrock	300	18	831.679	928.47	1934.23	0	1934.23	2488.96	2488.96
12	2.65114	7626.54	-33.114	Bedrock	300	18	829.812	926.386	1927.82	0	1927.82	2469.05	2469.05
13	2.65114	7502.37	-33.114	Bedrock	300	18	820.49	915.979	1895.79	0	1895.79	2430.95	2430.95
14	2.65114	7372.88	-32.9636	Bedrock	300	18	812.099	906.611	1866.95	0	1866.95	2393.6	2393.6
15	2.65114	7244.02	-32.9636	Bedrock	300	18	802.405	895.789	1833.65	0	1833.65	2354.02	2354.02
16	2.65159	7156.67	-32.9636	Bedrock	300	18	795.743	888.352	1810.76	0	1810.76	2326.81	2326.81
17	2.65159	7097.04	-32.9636	Bedrock	300	18	791.258	883.345	1795.35	0	1795.35	2308.48	2308.48
18	2.65229	7056.26	-32.9636	Bedrock	300	18	788.052	879.765	1784.33	0	1784.33	2295.39	2295.39
19	2.65229	7021.42	-32.9636	Bedrock	300	18	785.431	876.84	1775.33	0	1775.33	2284.69	2284.69
20	2.65229	6957.58	-32.9636	Bedrock	300	18	780.631	871.481	1758.84	0	1758.84	2265.08	2265.08
21	2.65229	6699.56	-32.9636	Bedrock	300	18	761.23	849.822	1692.18	0	1692.18	2185.84	2185.84
22	2.65229	6643.08	-32.9636	Bedrock	300	18	756.983	845.081	1677.58	0	1677.58	2168.49	2168.49
23	2.65229	6707.81	-32.9636	Bedrock	300	18	761.851	850.515	1694.31	0	1694.31	2188.37	2188.37
24	2.76402	6771.5	-8.85253	Bedrock	300	32	1744.94	1948.02	2637.38	0	2637.38	2909.15	2909.15
25	2.76402	6346.2	-8.85253	Bedrock	300	32	1655.51	1848.18	2477.61	0	2477.61	2735.45	2735.45
26	2.27103	5032.19	-8.80361	Bedrock	300	32	1610.37	1797.79	2396.97	0	2396.97	2646.37	2646.37
27	2.27103	4875.74	-8.80361	Bedrock	300	32	1570.3	1753.05	2325.37	0	2325.37	2568.57	2568.57
28	0.98597	2074.36	-8.80361	Landslide Plane	340	12	690.553	770.919	2027.31	0	2027.31	2134.26	2134.26
29	2.7029	5578.13	-8.78705	Landslide Plane	340	12	683.633	763.194	1990.97	0	1990.97	2096.64	2096.64
30	2.82513	5746.6	-8.78705	Landslide	150	29	1185.06	1322.98	2116.1	0	2116.1	2299.29	2299.29
31	2.76402	5586.05	-8.77677	Landslide	150	29	1178.65	1315.82	2103.19	0	2103.19	2285.17	2285.17
32	2.76402	5586.02	-8.77677	Landslide	150	29	1178.64	1315.81	2103.18	0	2103.18	2285.16	2285.16
33	3.33013	6746.71	-8.77677	Landslide	150	29	1181.16	1318.62	2108.25	0	2108.25	2290.61	2290.61
34	3.33013	6779.37	-8.77677	Landslide	150	29	1186.11	1324.15	2118.23	0	2118.23	2301.36	2301.36
35	3.32884	6645.55	-8.77677	Landslide	150	29	1166.2	1301.92	2078.13	0	2078.13	2258.18	2258.18
36	3.32884	6256.15	-8.77677	Landslide	150	29	1107.1	1235.94	1959.08	0	1959.08	2130.01	2130.01
37	3.3279	5813.48	-8.77677	Landslide	150	29	1040.15	1161.2	1824.25	0	1824.25	1984.85	1984.85
38	3.3279	5375.7	-8.77677	Landslide	150	29	973.678	1086.99	1690.38	0	1690.38	1840.71	1840.71
39	3.32791	4918.04	-6.38883	Landslide	150	29	942.976	1052.72	1628.55	0	1628.55	1734.14	1734.14
40	3.32791	4546.44	-6.38883	Landslide	150	29	883.937	986.81	1509.65	0	1509.65	1608.62	1608.62
41	4.12929	5161.54	-3.38915	Landslide	150	29	868.195	969.235	1477.94	0	1477.94	1529.35	1529.35
42	4.12637	4494.4	-3.38478	Landslide	150	29	778.095	868.65	1296.48	0	1296.48	1342.5	1342.5
43	4.12637	3801.93	-1.75326	Landslide	150	29	704.628	786.633	1148.52	0	1148.52	1170.09	1170.09
44	2.29529	1800.2	-1.34251	Landslide	150	29	629.9	703.208	998.015	0	998.015	1012.78	1012.78
45	1.83109	1265.99	-1.34251	Remedial Removal	270	29	712.794	795.749	948.476	0	948.476	965.181	965.181
46	4.02834	2262.19	-1.34251	Remedial Removal	270	29	636.92	711.045	795.668	0	795.668	810.595	810.595
47	4.02834	1611.71	-1.34251	Remedial Removal	270	29	542.542	605.683	605.59	0	605.59	618.305	618.305
48	2.12022	588.34	-1.34251	Remedial Removal	270	29	470.886	525.688	461.273	0	461.273	472.309	472.309
49	2.94904	520.242	-1.34251	Compacted Fill	270	29	411.809	459.735	342.288	0	342.288	351.939	351.939
50	2.94904	173.414	-1.34251	Compacted Fill	270	29	348.186	388.708	214.155	0	214.155	222.315	222.315

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.11638

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	94.2185	1284.08	0	0	0
2	94.8052	1275.31	29.4633	13.959	25.3505
3	95.3919	1274.25	206.609	97.8862	25.3504
4	99.178	1271.61	1638.68	776.366	25.3504
5	102.359	1269.4	3178.24	1505.77	25.3504
6	105.539	1267.18	4915.74	2328.95	25.3504
7	108.725	1264.97	6853.77	3247.14	25.3504
8	111.91	1262.76	8996.51	4262.31	25.3504
9	115.108	1260.58	11309.9	5358.34	25.3504
10	118.305	1258.41	13900.2	6585.57	25.3504
11	121.608	1256.21	16795.6	7957.31	25.3504
12	124.912	1254	19742.2	9353.35	25.3504
13	127.563	1252.28	22010.7	10428.1	25.3504
14	130.214	1250.55	24230	11479.5	25.3503
15	132.865	1248.83	26383.9	12500	25.3504
16	135.516	1247.11	28486.9	13496.4	25.3505
17	138.168	1245.39	30555.5	14476.4	25.3504
18	140.819	1243.67	32600.5	15445.3	25.3504
19	143.472	1241.95	34629.2	16406.4	25.3504
20	146.124	1240.23	36644.3	17361.1	25.3504
21	148.776	1238.51	38634.1	18303.8	25.3503
22	151.429	1236.79	40522.3	19198.4	25.3504
23	154.081	1235.07	42388.2	20082.4	25.3503
24	156.733	1233.35	44279.6	20978.5	25.3504
25	159.497	1232.92	41587.8	19703.2	25.3504
26	162.261	1232.49	39011.5	18482.6	25.3503
27	164.532	1232.14	36937	17499.8	25.3504
28	166.803	1231.78	34905.4	16537.3	25.3504
29	167.789	1231.63	34842.4	16507.4	25.3503
30	170.492	1231.21	34655.5	16418.9	25.3504
31	173.317	1230.78	33079.8	15672.4	25.3504
32	176.081	1230.35	31544	14944.7	25.3503
33	178.845	1229.92	30008.2	14217.1	25.3504
34	182.175	1229.41	28154.5	13338.9	25.3504
35	185.506	1228.89	26294.2	12457.5	25.3504
36	188.834	1228.38	24461	11589	25.3504
37	192.163	1227.87	22705.7	10757.4	25.3504
38	195.491	1227.35	21039.2	9967.84	25.3504
39	198.819	1226.84	19460.4	9219.84	25.3504
40	202.147	1226.47	17653.9	8363.94	25.3503
41	205.475	1226.09	15944.6	7554.11	25.3503
42	209.604	1225.85	13480.4	6386.64	25.3503
43	213.73	1225.61	11246.9	5328.51	25.3505
44	217.857	1225.48	9042.73	4284.21	25.3504
45	220.152	1225.43	7914.67	3749.76	25.3503
46	221.983	1225.38	6834.69	3238.1	25.3504
47	226.012	1225.29	4672.8	2213.85	25.3504
48	230.04	1225.19	2777.15	1315.74	25.3504
49	232.16	1225.14	1885.81	893.45	25.3504
50	235.109	1225.07	768.049	363.882	25.3504
51	238.058	1225.01	0	0	0



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ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; Qls plane; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1s2a.slmd
		Scale:	1:600
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 3

Slide Analysis Information

t1s2a

Project Summary

File Name:	t1s2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:01.587s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; Qls plane; static
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	95
Left Projection Angle (End Angle) [°]:	175
Right Projection Angle (Start Angle) [°]:	5
Right Projection Angle (End Angle) [°]:	85
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Remedial Removal	Alluvium	Landslide	Landslide Plane	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	130	120	120	120	130
Cohesion [psf]	270	270	200	150	340	
Friction Angle [°]	29	29	27	29	12	
Cohesion 1 [psf]						300
Cohesion 2 [psf]						300
Friction Angle 1 [°]						18
Friction Angle 2 [°]						32
A [°]						1
B [°]						1
Anisotropic Definition						Surface
Angle from 1 [°]						
Anisotropic Surface						Anisotropic Surface 1
Tensile Strength [psf]						0
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Global Minimums

Method: spencer

FS	2.199540
Axis Location:	235.160, 1362.743
Left Slip Surface Endpoint:	131.846, 1270.931
Right Slip Surface Endpoint:	246.622, 1225.004
Resisting Moment:	1.54562e+07 lb-ft
Driving Moment:	7.02701e+06 lb-ft
Resisting Horizontal Force:	98100.5 lb
Driving Horizontal Force:	44600.5 lb
Total Slice Area:	1475.06 ft2
Surface Horizontal Width:	114.776 ft
Surface Average Height:	12.8517 ft

Global Minimum Coordinates

Method: spencer

X	Y
131.846	1270.93
142.871	1254.81
154.576	1242.81
171.835	1229.04
189.341	1217.73
246.622	1225

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1403
Number of Invalid Surfaces: 3597

Error Codes:

Error Code -105 reported for 2048 surfaces
Error Code -108 reported for 1289 surfaces
Error Code -111 reported for 4 surfaces
Error Code -112 reported for 237 surfaces
Error Code -124 reported for 19 surfaces

Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-124 = A slice has a width less than the minimum acceptable value.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.19954

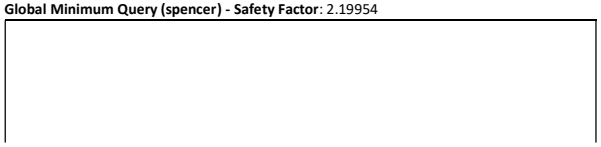
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.205	212.3	-55.6251	Landslide Plane	340	12	150.286	330.561	-44.407	0	-44.407	175.287	175.287
2	2.205	656.344	-55.6251	Landslide Plane	340	12	162.499	357.424	81.9724	0	81.9724	319.52	319.52
3	2.205	1118.06	-55.6251	Landslide Plane	340	12	175.198	385.355	213.381	0	213.381	469.491	469.491
4	2.205	1591.29	-55.6251	Landslide Plane	340	12	188.214	413.984	348.067	0	348.067	623.204	623.204
5	2.205	2068.12	-55.6251	Landslide Plane	340	12	201.328	442.83	483.779	0	483.779	778.088	778.088
6	2.341	2574.62	-45.7345	Landslide Plane	340	12	223.393	491.361	712.099	0	712.099	941.294	941.294
7	2.341	2813.37	-45.7345	Landslide Plane	340	12	230.46	506.905	785.225	0	785.225	1021.67	1021.67
8	2.341	2955.13	-45.7345	Landslide Plane	340	12	234.655	516.134	828.646	0	828.646	1069.4	1069.4
9	2.341	3040.12	-45.7345	Landslide Plane	340	12	237.171	521.667	854.675	0	854.675	1098.01	1098.01
10	2.341	3322.59	-45.7345	Landslide Plane	340	12	245.531	540.056	941.191	0	941.191	1193.1	1193.1
11	2.46557	3749.07	-38.5682	Landslide Plane	340	12	262.383	577.123	1115.57	0	1115.57	1324.79	1324.79
12	2.46557	3883.72	-38.5682	Landslide Plane	340	12	266.451	586.069	1157.67	0	1157.67	1370.13	1370.13
13	2.46557	4050.77	-38.5682	Landslide Plane	340	12	271.497	597.169	1209.88	0	1209.88	1426.37	1426.37
14	2.46557	4363.91	-38.5682	Landslide Plane	340	12	280.957	617.976	1307.77	0	1307.77	1531.8	1531.8
15	2.46557	4685.2	-38.5682	Landslide Plane	340	12	290.663	639.324	1408.21	0	1408.21	1639.98	1639.98
16	2.46557	5018.66	-38.5682	Landslide Plane	340	12	300.736	661.48	1512.45	0	1512.45	1752.25	1752.25
17	2.46557	5381.41	-38.5682	Landslide Plane	340	12	311.694	685.583	1625.84	0	1625.84	1874.38	1874.38
18	2.18823	5096.2	-32.8814	Landslide Plane	340	12	332.898	732.222	1845.26	0	1845.26	2060.47	2060.47
19	2.18823	5358.79	-32.8814	Landslide Plane	340	12	342.29	752.881	1942.45	0	1942.45	2163.73	2163.73
20	2.18823	5644.13	-32.8814	Landslide Plane	340	12	352.496	775.329	2048.06	0	2048.06	2275.94	2275.94
21	2.18823	5932.8	-32.8814	Landslide Plane	340	12	362.821	798.039	2154.91	0	2154.91	2389.46	2389.46
22	2.18823	6228.27	-32.8814	Landslide Plane	340	12	373.389	821.284	2264.26	0	2264.26	2505.65	2505.65
23	2.18823	6526.59	-32.8814	Landslide Plane	340	12	384.059	844.754	2374.68	0	2374.68	2622.96	2622.96
24	2.18823	6779.04	-32.8814	Landslide Plane	340	12	393.089	864.614	2468.12	0	2468.12	2722.23	2722.23
25	2.18823	6937.69	-32.8814	Landslide Plane	340	12	398.763	877.096	2526.84	0	2526.84	2784.63	2784.63
26	0.730995	2315.31	7.24132	Landslide Plane	340	12	495.227	1089.27	3525.05	0	3525.05	3462.12	3462.12
27	2.3065	7049.81	7.24132	Landslide	150	29	983.797	2163.9	3633.18	0	3633.18	3508.18	3508.18
28	2.3065	6657.4	7.24132	Landslide	150	29	933.327	2052.89	3432.91	0	3432.91	3314.32	3314.32
29	2.3065	6265.64	7.24132	Landslide	150	29	882.944	1942.07	3232.97	0	3232.97	3120.78	3120.78
30	2.3065	5878.79	7.24132	Landslide	150	29	833.188	1832.63	3035.55	0	3035.55	2929.68	2929.68
31	2.3065	5492.85	7.24132	Landslide	150	29	783.55	1723.45	2838.58	0	2838.58	2739.02	2739.02
32	2.3065	5122.96	7.24132	Landslide	150	29	735.977	1618.81	2649.81	0	2649.81	2556.29	2556.29
33	2.3065	4875.31	7.24132	Landslide	150	29	704.124	1548.75	2523.42	0	2523.42	2433.95	2433.95
34	2.3065	4549.19	7.24132	Landslide	150	29	662.184	1456.5	2356.98	0	2356.98	2272.84	2272.84
35	2.3065	4223.06	7.24132	Landslide	150	29	620.239	1364.24	2190.54	0	2190.54	2111.74	2111.74
36	2.3065	3896.94	7.24132	Landslide	150	29	578.294	1271.98	2024.1	0	2024.1	1950.63	1950.63
37	2.3065	3570.82	7.24132	Landslide	150	29	536.349	1179.72	1857.67	0	1857.67	1789.52	1789.52
38	2.3065	3244.69	7.24132	Landslide	150	29	494.406	1087.47	1691.23	0	1691.23	1628.41	1628.41
39	2.3065	2918.57	7.24132	Landslide	150	29	452.461	995.207	1524.79	0	1524.79	1467.3	1467.3
40	2.3065	2592.44	7.24132	Landslide	150	29	410.517	902.949	1358.35	0	1358.35	1306.19	1306.19
41	2.3065	2277.48	7.24132	Landslide	150	29	370.008	813.848	1197.61	0	1197.61	1150.6	1150.6
42	2.3065	1989.54	7.24132	Landslide	150	29	332.975	732.392	1050.66	0	1050.66	1008.36	1008.36
43	2.29064	1677.52	7.24132	Remedial Removal	270	29	356.013	783.064	925.59	0	925.59	880.354	880.354
44	2.29064	1365.62	7.24132	Remedial Removal	270	29	315.619	694.217	765.308	0	765.308	725.205	725.205
45	2.29064	1053.71	7.24132	Remedial Removal	270	29	275.226	605.37	605.022	0	605.022	570.051	570.051
46	2.29064	741.803	7.24132	Remedial Removal	270	29	234.832	516.523	444.74	0	444.74	414.902	414.902
47	2.6208	476.683	7.24132	Compacted Fill	270	29	192.721	423.898	277.639	0	277.639	253.152	253.152
48	2.6208	284.013	7.24132	Compacted Fill	270	29	170.913	375.929	191.102	0	191.102	169.385	169.385
49	2.6208	170.408	7.24132	Compacted Fill	270	29	158.054	347.646	140.077	0	140.077	119.994	119.994
50	2.6208	56.8026	7.24132	Compacted Fill	270	29	141.955	312.237	76.1968	0	76.1968	58.1596	58.1596

Query 1 (spencer) - Safety Factor: 2.19954

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.205	212.3	-55.6251	Landslide Plane	340	12	150.286	330.561	-44.407	0	-44.407	175.287	175.287
2	2.205	656.344	-55.6251	Landslide Plane	340	12	162.499	357.424	81.9724	0	81.9724	319.52	319.52
3	2.205	1118.06	-55.6251	Landslide Plane	340	12	175.198	385.355	213.381	0	213.381	469.491	469.491
4	2.205	1591.29	-55.6251	Landslide Plane	340	12	188.214	413.984	348.067	0	348.067	623.204	623.204
5	2.205	2068.12	-55.6251	Landslide Plane	340	12	201.328	442.83	483.779	0	483.779	778.088	778.088
6	2.341	2574.62	-45.7345	Landslide Plane	340	12	223.393	491.361	712.099	0	712.099	941.294	941.294
7	2.341	2813.37	-45.7345	Landslide Plane	340	12	230.46	506.905	785.225	0	785.225	1021.67	1021.67
8	2.341	2955.13	-45.7345	Landslide Plane	340	12	234.655	516.134	828.646	0	828.646	1069.4	1069.4
9	2.341	3040.12	-45.7345	Landslide Plane	340	12	237.171	521.667	854.675	0	854.675	1098.01	1098.01
10	2.341	3322.59	-45.7345	Landslide Plane	340	12	245.531	540.056	941.191	0	941.191	1193.1	1193.1
11	2.46557	3749.07	-38.5682	Landslide Plane	340	12	262.383	577.123	1115.57	0	1115.57	1324.79	1324.79
12	2.46557	3883.72	-38.5682	Landslide Plane	340	12	266.451	586.069	1157.67	0	1157.67	1370.13	1370.13
13	2.46557	4050.77	-38.5682	Landslide Plane	340	12	271.497	597.169	1209.88	0	1209.88	1426.37	1426.37
14	2.46557	4363.91	-38.5682	Landslide Plane	340	12	280.957	617.976	1307.77	0	1307.77	1531.8	1531.8
15	2.46557	4685.2	-38.5682	Landslide Plane	340	12	290.663	639.324	1408.21	0	1408.21	1639.98	1639.98
16	2.46557	5018.66	-38.5682	Landslide Plane	340	12	300.736	661.48	1512.45	0	1512.45	1752.25	1752.25
17	2.46557	5381.41	-38.5682	Landslide Plane	340	12	311.694	685.583	1625.84	0	1625.84	1874.38	1874.38
18	2.18823	5096.2	-32.8814	Landslide Plane	340	12	332.898	732.222	1845.26	0	1845.26	2060.47	2060.47
19	2.18823	5358.79	-32.8814	Landslide Plane	340	12	342.29	752.881	1942.45	0	1942.45	2163.73	2163.73
20	2.18823	5644.13	-32.8814	Landslide Plane	340	12	352.496	775.329	2048.06	0	2048.06	2275.94	2275.94
21	2.18823	5932.8	-32.8814	Landslide Plane	340	12	362.821	798.039	2154.91	0	2154.91	2389.46	2389.46
22	2.18823	6228.27	-32.8814	Landslide Plane	340	12	373.389	821.284	2264.26	0	2264.26	2505.65	2505.65
23	2.18823	6526.59	-32.8814	Landslide Plane	340	12	384.059	844.754	2374.68	0	2374.68	2622.96	2622.96
24	2.18823	6779.04	-32.8814	Landslide Plane	340	12	393.089	864.614	2468.12	0	2468.12	2722.23	2722.23
25	2.18823	6937.69	-32.8814	Landslide Plane	340	12	398.763	877.096	2526.84	0	2526.84	2784.63	2784.63
26	0.730995	2315.31	7.24132	Landslide Plane	340	12	495.227	1089.27	3525.05	0	3525.05	3462.12	3462.12
27	2.3065	7049.81	7.24132	Landslide	150	29	983.797	2163.9	3633.18	0	3633.18	3508.18	3508.18
28	2.3065	6657.4	7.24132	Landslide	150	29	933.327	2052.89	3432.91	0	3432.91	3314.32	3314.32
29	2.3065	6265.64	7.24132	Landslide	150	29	882.944	1942.07	3232.97	0	3232.97	3120.78	3120.78
30	2.3065	5878.79	7.24132	Landslide	150	29	833.188	1832.63	3035.55	0	3035.55	2929.68	2929.68
31	2.3065	5492.85	7.24132	Landslide	150	29	783.55	1723.45	2838.58	0	2838.58	2739.02	2739.02
32	2.3065	5122.96	7.24132	Landslide	150	29	735.977	1618.81	2649.81	0	2649.81	2556.29	2556.29
33	2.3065	4875.31	7.24132	Landslide	150	29	704.124	1548.75	2523.42	0	2523.42	2433.95	2433.95
34	2.3065	4549.19	7.24132	Landslide	150	29	662.184	1456.5	2356.98	0	2356.98	2272.84	2272.84
35	2.3065	4223.06	7.24132	Landslide	150	29	620.239	1364.24	2190.54	0	2190.54	2111.74	2111.74
36	2.3065	3896.94	7.24132	Landslide	150	29	578.294	1271.98	2024.1	0	2024.1	1950.63	1950.63
37	2.3065	3570.82	7.24132	Landslide	150	29	536.349	1179.72	1857.67	0	1857.67	1789.52	1789.52
38	2.3065	3244.69	7.24132	Landslide	150	29	494.406	1087.47	1691.23	0	1691.23	1628.41	1628.41
39	2.3065	2918.57	7.24132	Landslide	150	29	452.461	995.207	1524.79	0	1524.79	1467.3	1467.3
40	2.3065	2592.44	7.24132	Landslide	150	29	410.517	902.949	1358.35	0	1358.35	1306.19	1306.19
41	2.3065	2277.48	7.24132	Landslide	150	29	370.008	813.848	1197.61	0	1197.61	1150.6	1150.6
42	2.3065	1989.54	7.24132	Landslide	150	29	332.975	732.392	1050.66	0	1050.66	1008.36	1008.36
43	2.29064	1677.52	7.24132	Remedial Removal	270	29	356.013	783.064	925.59	0	925.59	880.354	880.354
44	2.29064	1365.62	7.24132	Remedial Removal	270	29	315.619	694.217	765.308	0	765.308	725.205	725.205
45	2.29064	1053.71	7.24132	Remedial Removal	270	29	275.226	605.37	605.022	0	605.022	570.051	570.051
46	2.29064	741.803	7.24132	Remedial Removal	270	29	234.832	516.523	444.74	0	444.74	414.902	414.902
47	2.6208	476.683	7.24132	Compacted Fill	270	29	192.721	423.898	277.639	0	277.639	253.152	253.152
48	2.6208	284.013	7.24132	Compacted Fill	270	29	170.913	375.929	191.102	0	191.102	169.385	169.385
49	2.6208	170.408	7.24132	Compacted Fill	270	29	158.054	347.646	140.077	0	140.077	119.994	119.994
50	2.6208	56.8026	7.24132	Compacted Fill	270	29	141.955	312.237	76.1968	0	76.1968	58.1596	58.1596

Interslice Data

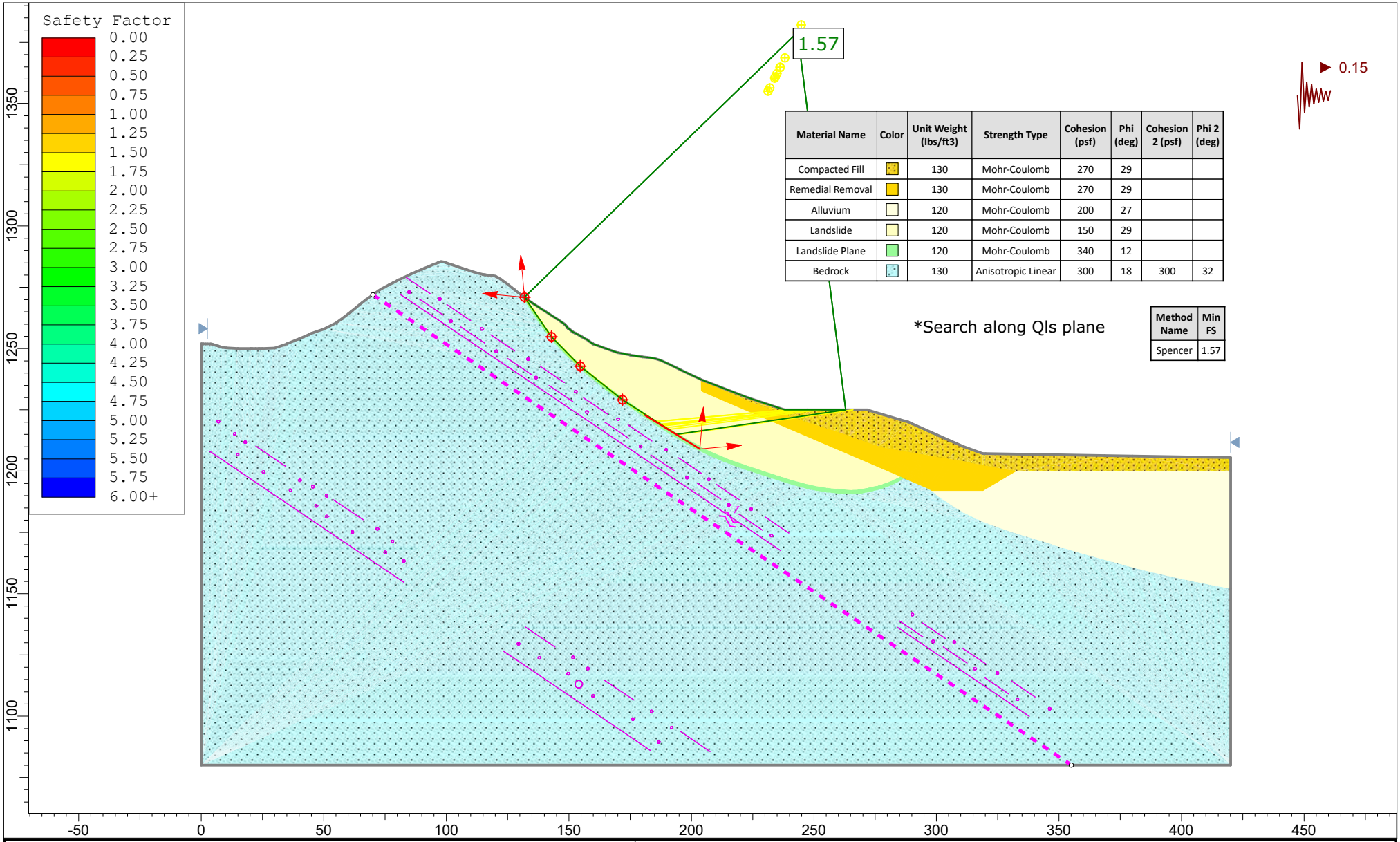
Global Minimum Query (spencer) - Safety Factor: 2.19954



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	131.846	1270.93	0	0	0
2	134.051	1267.71	-473.803	-148.152	17.3638
3	136.256	1264.48	-567.113	-177.329	17.3638
4	138.461	1261.26	-264.791	-82.7967	17.3638
5	140.666	1258.04	443.032	138.531	17.3639
6	142.871	1254.81	1559.45	487.619	17.3638
7	145.212	1252.41	2747.94	859.245	17.3638
8	147.553	1250.01	4095.55	1280.63	17.3638
9	149.894	1247.61	5537.65	1731.55	17.3638
10	152.235	1245.21	7036.4	2200.19	17.3638
11	154.576	1242.81	8723.4	2727.7	17.3638
12	157.042	1240.84	10271.1	3211.64	17.3638
13	159.507	1238.87	11891.5	3718.33	17.3638
14	161.973	1236.91	13602.2	4253.24	17.3638
15	164.438	1234.94	15482.1	4841.05	17.3638
16	166.904	1232.97	17535.5	5483.14	17.3638
17	169.369	1231.01	19769.1	6181.55	17.3638
18	171.835	1229.04	22198.7	6941.24	17.3638
19	174.023	1227.63	24082.1	7530.18	17.3638
20	176.211	1226.21	26082.6	8155.7	17.3638
21	178.4	1224.8	28210.2	8820.96	17.3638
22	180.588	1223.38	30466.3	9526.44	17.3638
23	182.776	1221.97	32854.1	10273.1	17.3639
24	184.964	1220.56	35374.8	11061.3	17.3639
25	187.153	1219.14	38008	11884.6	17.3638
26	189.341	1217.73	40711.8	12730.1	17.3638
27	190.072	1217.82	40023.1	12514.7	17.3638
28	192.378	1218.11	36694.2	11473.8	17.3638
29	194.685	1218.41	33540	10487.5	17.3638
30	196.991	1218.7	30560.4	9555.86	17.3638
31	199.298	1218.99	27753.2	8678.08	17.3638
32	201.604	1219.28	25118	7854.07	17.3638
33	203.911	1219.58	22647.5	7081.6	17.3638
34	206.217	1219.87	20287.4	6343.63	17.3638
35	208.524	1220.16	18072.7	5651.1	17.3638
36	210.83	1220.46	16003.2	5004	17.3638
37	213.137	1220.75	14079.1	4402.34	17.3637
38	215.443	1221.04	12300.2	3846.12	17.3638
39	217.75	1221.34	10666.7	3335.34	17.3638
40	220.056	1221.63	9178.48	2870	17.3638
41	222.363	1221.92	7835.58	2450.09	17.3638
42	224.669	1222.21	6633.02	2074.06	17.3638
43	226.976	1222.51	5558.76	1738.15	17.3638
44	229.266	1222.8	4475.63	1399.47	17.3638
45	231.557	1223.09	3531.48	1104.25	17.3638
46	233.848	1223.38	2726.31	852.482	17.3638
47	236.138	1223.67	2060.11	644.171	17.3638
48	238.759	1224.01	1463.67	457.67	17.3638
49	241.38	1224.34	953.07	298.013	17.3638
50	244.001	1224.67	493.093	154.184	17.3638
51	246.622	1225	0	0	0

Query 1 (spencer) - Safety Factor: 2.19954

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	131.846	1270.93	0	0	0
2	134.051	1267.71	-473.803	-148.152	17.3638
3	136.256	1264.48	-567.113	-177.329	17.3638
4	138.461	1261.26	-264.791	-82.7967	17.3638
5	140.666	1258.04	443.032	138.531	17.3639
6	142.871	1254.81	1559.45	487.619	17.3638
7	145.212	1252.41	2747.94	859.245	17.3638
8	147.553	1250.01	4095.55	1280.63	17.3638
9	149.894	1247.61	5537.65	1731.55	17.3638
10	152.235	1245.21	7036.4	2200.19	17.3638
11	154.576	1242.81	8723.4	2727.7	17.3638
12	157.042	1240.84	10271.1	3211.64	17.3638
13	159.507	1238.87	11891.5	3718.33	17.3638
14	161.973	1236.91	13602.2	4253.24	17.3638
15	164.438	1234.94	15482.1	4841.05	17.3638
16	166.904	1232.97	17535.5	5483.14	17.3638
17	169.369	1231.01	19769.1	6181.55	17.3638
18	171.835	1229.04	22198.7	6941.24	17.3638
19	174.023	1227.63	24082.1	7530.18	17.3638
20	176.211	1226.21	26082.6	8155.7	17.3638
21	178.4	1224.8	28210.2	8820.96	17.3638
22	180.588	1223.38	30466.3	9526.44	17.3638
23	182.776	1221.97	32854.1	10273.1	17.3639
24	184.964	1220.56	35374.8	11061.3	17.3639
25	187.153	1219.14	38008	11884.6	17.3638
26	189.341	1217.73	40711.8	12730.1	17.3638
27	190.072	1217.82	40023.1	12514.7	17.3638
28	192.378	1218.11	36694.2	11473.8	17.3638
29	194.685	1218.41	33540	10487.5	17.3638
30	196.991	1218.7	30560.4	9555.86	17.3638
31	199.298	1218.99	27753.2	8678.08	17.3638
32	201.604	1219.28	25118	7854.07	17.3638
33	203.911	1219.58	22647.5	7081.6	17.3638
34	206.217	1219.87	20287.4	6343.63	17.3638
35	208.524	1220.16	18072.7	5651.1	17.3638
36	210.83	1220.46	16003.2	5004	17.3638
37	213.137	1220.75	14079.1	4402.34	17.3637
38	215.443	1221.04	12300.2	3846.12	17.3638
39	217.75	1221.34	10666.7	3335.34	17.3638
40	220.056	1221.63	9178.48	2870	17.3638
41	222.363	1221.92	7835.58	2450.09	17.3638
42	224.669	1222.21	6633.02	2074.06	17.3638
43	226.976	1222.51	5558.76	1738.15	17.3638
44	229.266	1222.8	4475.63	1399.47	17.3638
45	231.557	1223.09	3531.48	1104.25	17.3638
46	233.848	1223.38	2726.31	852.482	17.3638
47	236.138	1223.67	2060.11	644.171	17.3638
48	238.759	1224.01	1463.67	457.67	17.3638
49	241.38	1224.34	953.07	298.013	17.3638
50	244.001	1224.67	493.093	154.184	17.3638
51	246.622	1225	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Remedial Removal		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Landslide		120	Mohr-Coulomb	150	29		
Landslide Plane		120	Mohr-Coulomb	340	12		
Bedrock		130	Anisotropic Linear	300	18	300	32

Method Name	Min FS
Spencer	1.57

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; Qls plane; pseudo		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1ps2a.slmd
		Scale:	1:650
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 4

Slide Analysis Information

t1ps2a

Project Summary

File Name:	t1ps2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:01.578s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; QIs plane; pseudo
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	95
Left Projection Angle (End Angle) [°]:	175
Right Projection Angle (Start Angle) [°]:	5
Right Projection Angle (End Angle) [°]:	85
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Remedial Removal	Alluvium	Landslide	Landslide Plane	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	130	120	120	120	130
Cohesion [psf]	270	270	200	150	340	
Friction Angle [°]	29	29	27	29	12	
Cohesion 1 [psf]						300
Cohesion 2 [psf]						300
Friction Angle 1 [°]						18
Friction Angle 2 [°]						32
A [°]						1
B [°]						1
Anisotropic Definition						Surface
Angle from 1 [°]						
Anisotropic Surface						Anisotropic Surface 1
Tensile Strength [psf]						0
Water Surface	None	None	None	None	None	None
Ru Value	0	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.566580
Axis Location:	243.317, 1379.047
Left Slip Surface Endpoint:	131.846, 1270.931
Right Slip Surface Endpoint:	262.927, 1225.000
Resisting Moment:	1.95772e+07 lb-ft
Driving Moment:	1.24968e+07 lb-ft
Resisting Horizontal Force:	111973 lb
Driving Horizontal Force:	71475.7 lb
Total Slice Area:	1652.05 ft2
Surface Horizontal Width:	131.081 ft
Surface Average Height:	12.6032 ft

Global Minimum Coordinates

Method: spencer

X	Y
131.846	1270.93
142.871	1254.81
154.576	1242.81
171.835	1229.04
193.859	1214.95
262.927	1225

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 1336
Number of Invalid Surfaces: 3664

Error Codes:

Error Code -105 reported for 2048 surfaces
Error Code -108 reported for 1104 surfaces
Error Code -111 reported for 64 surfaces
Error Code -112 reported for 429 surfaces
Error Code -124 reported for 19 surfaces

Error Codes

The following errors were encountered during the computation:

-105 = More than two surface / slope intersections with no valid slip surface.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-124 = A slice has a width less than the minimum acceptable value.

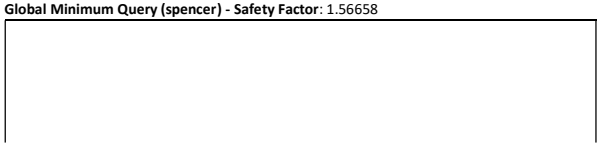
Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.56658

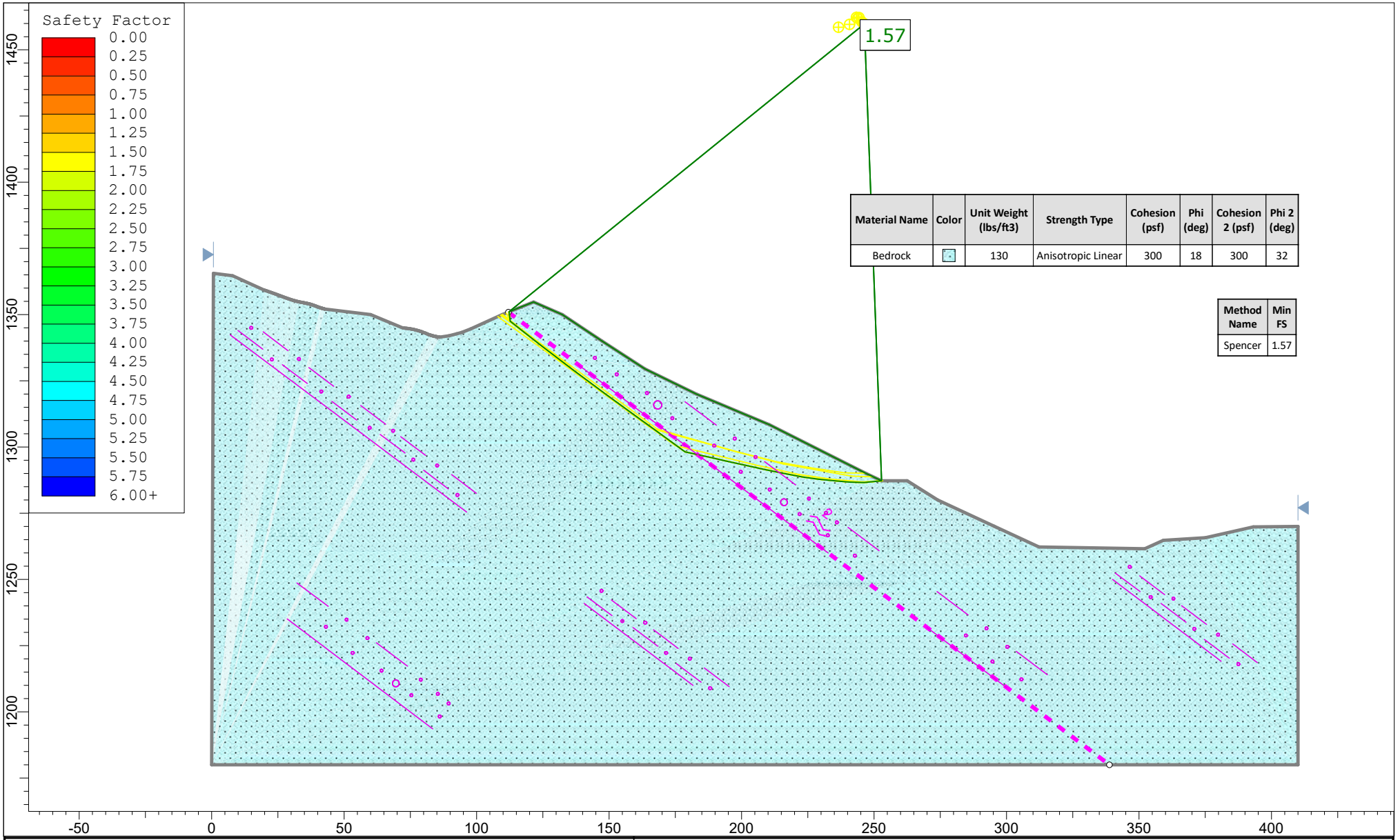
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.75625	334.035	-55.6251	Landslide Plane	340	12	203.143	318.24	-102.372	0	-102.372	194.59	194.59
2	2.75625	1034.84	-55.6251	Landslide Plane	340	12	224.087	351.05	51.9881	0	51.9881	379.566	379.566
3	2.75625	1766.69	-55.6251	Landslide Plane	340	12	245.959	385.314	213.185	0	213.185	572.736	572.736
4	2.75625	2510.54	-55.6251	Landslide Plane	340	12	268.189	420.139	377.025	0	377.025	769.073	769.073
5	2.92625	3256.78	-45.7345	Landslide Plane	340	12	302.714	474.226	631.486	0	631.486	942.062	942.062
6	2.92625	3612.22	-45.7345	Landslide Plane	340	12	313.796	491.587	713.162	0	713.162	1035.11	1035.11
7	2.92625	3735.7	-45.7345	Landslide Plane	340	12	317.646	497.618	741.537	0	741.537	1067.43	1067.43
8	2.92625	4101.13	-45.7345	Landslide Plane	340	12	329.04	515.467	825.508	0	825.508	1163.09	1163.09
9	2.8765	4390.49	-38.5682	Landslide Plane	340	12	354.821	555.856	1015.52	0	1015.52	1298.45	1298.45
10	2.8765	4559.68	-38.5682	Landslide Plane	340	12	360.565	564.854	1057.85	0	1057.85	1345.36	1345.36
11	2.8765	4875.77	-38.5682	Landslide Plane	340	12	371.296	581.665	1136.95	0	1136.95	1433.01	1433.01
12	2.8765	5308.1	-38.5682	Landslide Plane	340	12	385.974	604.659	1245.12	0	1245.12	1552.89	1552.89
13	2.8765	5757.66	-38.5682	Landslide Plane	340	12	401.237	628.57	1357.61	0	1357.61	1677.55	1677.55
14	2.8765	6241.05	-38.5682	Landslide Plane	340	12	417.648	654.279	1478.57	0	1478.57	1811.59	1811.59
15	2.44711	5713.89	-32.624	Landslide Plane	340	12	449.634	704.388	1714.31	0	1714.31	2002.13	2002.13
16	2.44711	6041.39	-32.624	Landslide Plane	340	12	463.416	725.978	1815.88	0	1815.88	2112.52	2112.52
17	2.44711	6395.84	-32.624	Landslide Plane	340	12	478.331	749.344	1925.81	0	1925.81	2232	2232
18	2.44711	6754.46	-32.624	Landslide Plane	340	12	493.422	772.985	2037.03	0	2037.03	2352.88	2352.88
19	2.44711	7122.17	-32.624	Landslide Plane	340	12	508.896	797.226	2151.08	0	2151.08	2476.83	2476.83
20	2.44711	7468.69	-32.624	Landslide Plane	340	12	523.477	820.069	2258.55	0	2258.55	2593.63	2593.63
21	2.44711	7695.68	-32.624	Landslide Plane	340	12	533.029	835.033	2328.95	0	2328.95	2670.15	2670.15
22	2.44711	7823.29	-32.624	Landslide Plane	340	12	538.399	843.445	2368.52	0	2368.52	2713.16	2713.16
23	2.44711	7934.63	-32.624	Landslide Plane	340	12	543.084	850.785	2403.05	0	2403.05	2750.69	2750.69
24	0.668677	2166.11	8.28294	Landslide Plane	340	12	704.352	1103.42	3591.62	0	3591.62	3489.08	3489.08
25	2.65945	8279.71	8.28294	Landslide	150	29	1455.55	2280.24	3843.04	0	3843.04	3631.14	3631.14
26	2.65945	7749.75	8.28294	Landslide	150	29	1369.85	2145.98	3600.84	0	3600.84	3401.42	3401.42
27	2.65945	7220.93	8.28294	Landslide	150	29	1284.33	2012	3359.14	0	3359.14	3172.17	3172.17
28	2.65945	6784.71	8.28294	Landslide	150	29	1213.78	1901.49	3159.77	0	3159.77	2983.07	2983.07
29	2.65945	6384.07	8.28294	Landslide	150	29	1148.99	1799.99	2976.66	0	2976.66	2809.38	2809.38
30	2.65945	5934.78	8.28294	Landslide	150	29	1076.33	1686.16	2771.31	0	2771.31	2614.61	2614.61
31	2.65945	5485.49	8.28294	Landslide	150	29	1003.68	1572.34	2565.96	0	2565.96	2419.85	2419.85
32	2.65945	5036.21	8.28294	Landslide	150	29	931.015	1458.51	2360.61	0	2360.61	2225.08	2225.08
33	2.65945	4586.92	8.28294	Landslide	150	29	858.354	1344.68	2155.27	0	2155.27	2030.31	2030.31
34	2.65945	4137.64	8.28294	Landslide	150	29	785.699	1230.86	1949.92	0	1949.92	1835.54	1835.54
35	2.65945	3691.01	8.28294	Landslide	150	29	713.471	1117.71	1745.79	0	1745.79	1641.92	1641.92
36	2.65945	3281.95	8.28294	Landslide	150	29	647.317	1014.07	1558.83	0	1558.83	1464.6	1464.6
37	2.65945	2885.03	8.28294	Landslide	150	29	583.127	913.515	1377.42	0	1377.42	1292.53	1292.53
38	2.65945	2488.11	8.28294	Landslide	150	29	518.937	812.956	1196	0	1196	1120.45	1120.45
39	2.34199	1846.71	8.28294	Remedial Removal	270	29	548.938	859.956	1064.31	0	1064.31	984.393	984.393
40	2.34199	1507.46	8.28294	Remedial Removal	270	29	486.638	762.357	888.238	0	888.238	817.393	817.393
41	2.34199	1179.56	8.28294	Remedial Removal	270	29	426.424	668.027	718.058	0	718.058	655.979	655.979
42	2.34199	1019.74	8.28294	Remedial Removal	270	29	397.073	622.047	635.11	0	635.11	577.304	577.304
43	2.72493	1055.68	8.28294	Compacted Fill	270	29	376.428	589.705	576.761	0	576.761	521.961	521.961
44	2.72493	914.989	8.28294	Compacted Fill	270	29	354.223	554.918	514.008	0	514.008	462.44	462.44
45	2.72493	774.27	8.28294	Compacted Fill	270	29	332.013	520.125	451.237	0	451.237	402.902	402.902
46	2.72493	633.481	8.28294	Compacted Fill	270	29	309.791	485.313	388.437	0	388.437	343.337	343.337
47	2.72493	492.688	8.28294	Compacted Fill	270	29	287.57	450.501	325.632	0	325.632	283.768	283.768
48	2.72493	351.896	8.28294	Compacted Fill	270	29	265.348	415.689	262.829	0	262.829	224.2	224.2
49	2.72493	211.104	8.28294	Compacted Fill	270	29	243.126	380.876	200.026	0	200.026	164.632	164.632
50	2.72493	70.3248	8.28294	Compacted Fill	270	29	229.941	360.221	162.763	0	162.763	129.288	129.288

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.56658



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	131.846	1270.93	0	0	0
2	134.602	1266.9	-923.462	-308.066	18.4486
3	137.359	1262.87	-1177.71	-392.882	18.4486
4	140.115	1258.84	-733.094	-244.559	18.4486
5	142.871	1254.81	421.835	140.724	18.4487
6	145.797	1251.81	1918.54	640.024	18.4487
7	148.724	1248.81	3681.28	1228.07	18.4486
8	151.65	1245.81	5536.44	1846.95	18.4486
9	154.576	1242.81	7665.11	2557.07	18.4486
10	157.452	1240.51	9630.16	3212.61	18.4486
11	160.329	1238.22	11701.1	3903.48	18.4487
12	163.206	1235.92	13970	4660.37	18.4486
13	166.082	1233.63	16509.5	5507.55	18.4486
14	168.958	1231.34	19330.5	6448.63	18.4486
15	171.835	1229.04	22454.1	7490.66	18.4486
16	174.282	1227.48	24893.9	8304.58	18.4486
17	176.729	1225.91	27508.2	9176.7	18.4486
18	179.176	1224.34	30311.2	10111.8	18.4487
19	181.623	1222.78	33305.3	11110.6	18.4486
20	184.071	1221.21	36495.2	12174.8	18.4487
21	186.518	1219.64	39869.7	13300.5	18.4487
22	188.965	1218.08	43365	14466.5	18.4486
23	191.412	1216.51	46928.4	15655.3	18.4487
24	193.859	1214.95	50551	16863.8	18.4487
25	194.528	1215.04	50054.3	16698.1	18.4487
26	197.187	1215.43	45929.3	15322	18.4487
27	199.847	1215.82	42046.9	14026.8	18.4486
28	202.506	1216.2	38406.7	12812.4	18.4486
29	205.165	1216.59	34966.3	11664.7	18.4486
30	207.825	1216.98	31709.3	10578.2	18.4487
31	210.484	1217.37	28658.1	9560.32	18.4487
32	213.144	1217.75	25812.6	8611.07	18.4487
33	215.803	1218.14	23172.9	7730.47	18.4487
34	218.463	1218.53	20739	6918.5	18.4486
35	221.122	1218.91	18510.7	6175.17	18.4487
36	223.782	1219.3	16487.1	5500.07	18.4486
37	226.441	1219.69	14650.7	4887.46	18.4487
38	229.1	1220.08	12996.1	4335.49	18.4487
39	231.76	1220.46	11523.3	3844.16	18.4486
40	234.102	1220.8	10149.1	3385.73	18.4486
41	236.444	1221.14	8930.27	2979.13	18.4487
42	238.786	1221.49	7861.6	2622.62	18.4486
43	241.128	1221.83	6866.13	2290.53	18.4486
44	243.853	1222.22	5767.78	1924.13	18.4487
45	246.578	1222.62	4733.85	1579.21	18.4487
46	249.303	1223.02	3764.37	1255.79	18.4486
47	252.028	1223.41	2859.37	953.882	18.4486
48	254.753	1223.81	2018.83	673.481	18.4487
49	257.477	1224.21	1242.78	414.589	18.4486
50	260.202	1224.6	531.194	177.206	18.4487
51	262.927	1225	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 4-4'; CS-6; non-circular search; bedding plane; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t4s1a.slmd
		Scale:	1:600
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 5

Slide Analysis Information

t4s1a

Project Summary

File Name:	t4s1a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257
Analysis:	Section 4-4'; non-circular search; bedding plane; static
Author:	K. Callahan
Comments	
	Sterling Gateway, L.P.
	Sterling Ranch Estates
	18-1245A-4

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Non-circular search, static	Master Scenario	Spencer: None	00h:00m:06.683s
	Bedding plane	Spencer: 1.572230	00h:00m:16.878s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

All Open Scenarios	
Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

All Open Scenarios	
Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Bedrock
Color	
Strength Type	Anisotropic Linear
Unit Weight [lbs/ft3]	130
Cohesion 1 [psf]	300
Cohesion 2 [psf]	300
Friction Angle 1 [°]	18
Friction Angle 2 [°]	32
A [°]	1
B [°]	1
Anisotropic Definition	Surface
Angle from 1 [°]	
Anisotropic Surface	Assigned per scenario
Tensile Strength [psf]	0
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Master Scenario	Bedding plane
Bedrock	✓	✓

Global Minimums

Non-circular search, static - Master Scenario		Non-circular search, static - Bedding plane	
Method: spencer		**Method: spencer**	
Resisting Moment:	0 lb-ft	**FS**	**1.572230**
Driving Moment:	0 lb-ft	Axis Location:	246.317, 1459.752
Resisting Horizontal Force:	0 lb	Left Slip Surface Endpoint:	112.244, 1351.071
Driving Horizontal Force:	0 lb	Right Slip Surface Endpoint:	252.818, 1287.285
Total Slice Area:	0 ft2	Resisting Moment:	3.14841e+07 lb-ft
Surface Horizontal Width:	0 ft	Driving Moment:	2.00252e+07 lb-ft
Surface Average Height:	0 ft	Resisting Horizontal Force:	167656 lb
		Driving Horizontal Force:	106636 lb
		Total Slice Area:	2241.52 ft2
		Surface Horizontal Width:	140.574 ft
		Surface Average Height:	15.9454 ft

Global Minimum Coordinates

Non-circular search, static - Master Scenario | Non-circular search, static - Bedding plane

Method: spencer

X	Y
112.244	1351.07
112.64	1347.49
118.196	1343.17
123.753	1338.86
128.689	1335.03
133.577	1331.31
136.77	1328.89
139.963	1326.48
146.162	1321.84
149.83	1319.17
154.044	1316.11
158.269	1313.04
162.021	1310.31
167.561	1306.28
173.101	1302.26
178.641	1298.23
183.612	1297.11
188.583	1296
193.554	1294.9
198.525	1293.79
203.426	1292.7
208.325	1291.62
215.7	1290.08
223.063	1288.71
229.087	1287.87
235.111	1287.26
240.686	1286.79
246.261	1286.65
252.818	1287.28

Valid/Invalid Surfaces

Non-circular search, static - Master Scenario

Method: spencer

Number of Valid Surfaces: 0
Number of Invalid Surfaces: 1

Error Codes:

Error Code -129 reported for 1 surface

Non-circular search, static - Bedding plane

Method: spencer

Number of Valid Surfaces: 7942
Number of Invalid Surfaces: 2120

Error Codes:

Error Code -106 reported for 23 surfaces
Error Code -108 reported for 73 surfaces
Error Code -111 reported for 6 surfaces
Error Code -112 reported for 25 surfaces
Error Code -114 reported for 50 surfaces
Error Code -121 reported for 574 surfaces
Error Code -124 reported for 12 surfaces
Error Code -600 reported for 19 surfaces
Error Code -1000 reported for 1338 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-129 = Can not compute anisotropic angle along slip surface.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

Non-circular search, static - Master Scenario

Non-circular search, static - Bedding plane

Global Minimum Query (spencer) - Safety Factor: 1.57223

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.396376	96.3866	-83.6872	Bedrock	300	32	28.2753	44.4553	0	0	0	255.589	255.589
2	2.77823	1941	-37.8398	Bedrock	300	18	283.705	446.05	449.495	0	449.495	669.875	669.875
3	2.77823	3120.67	-37.8398	Bedrock	300	18	345.897	543.83	750.431	0	750.431	1019.12	1019.12
4	2.77822	4300.34	-37.8398	Bedrock	300	18	408.089	641.61	1051.37	0	1051.37	1368.37	1368.37
5	2.77822	5212.61	-37.8398	Bedrock	300	18	456.184	717.226	1284.09	0	1284.09	1638.45	1638.45
6	2.4679	4926.26	-37.8012	Bedrock	300	18	473.915	745.104	1369.89	0	1369.89	1737.51	1737.51
7	2.4679	5189.43	-37.8012	Bedrock	300	18	489.542	769.672	1445.5	0	1445.5	1825.25	1825.25
8	2.44423	5393.31	-37.269	Bedrock	300	18	507.304	797.598	1531.45	0	1531.45	1917.48	1917.48
9	2.44423	5617.18	-37.269	Bedrock	300	18	520.817	818.844	1596.84	0	1596.84	1993.15	1993.15
10	3.19299	7471.24	-37.0847	Bedrock	300	18	527.907	829.991	1631.14	0	1631.14	2030.18	2030.18
11	3.19299	7588.73	-37.0847	Bedrock	300	18	533.348	838.546	1657.48	0	1657.48	2060.62	2060.62
12	3.09942	7474.5	-36.8372	Bedrock	300	18	539.791	848.675	1688.65	0	1688.65	2093.01	2093.01
13	3.09942	7576.75	-36.8372	Bedrock	300	18	544.684	856.369	1712.33	0	1712.33	2120.36	2120.36
14	3.66776	9086.18	-36.0092	Bedrock	300	18	553.931	870.907	1757.07	0	1757.07	2159.66	2159.66
15	2.10715	5280.68	-36.0092	Bedrock	300	18	558.243	877.686	1777.93	0	1777.93	2183.66	2183.66
16	2.10715	5325.57	-36.0092	Bedrock	300	18	561.436	882.707	1793.39	0	1793.39	2201.43	2201.43
17	4.22503	10813.5	-36.0092	Bedrock	300	18	566.234	890.25	1816.6	0	1816.6	2228.14	2228.14
18	3.75245	9755.3	-36.0092	Bedrock	300	18	572.279	899.754	1845.85	0	1845.85	2261.78	2261.78
19	2.76996	7309.43	-36.0092	Bedrock	300	18	578.141	908.971	1874.22	0	1874.22	2294.41	2294.41
20	2.76996	7524.48	-36.0092	Bedrock	300	18	589.779	927.268	1930.53	0	1930.53	2359.18	2359.18
21	2.76996	7763.03	-36.0092	Bedrock	300	18	602.688	947.564	1993	0	1993	2431.02	2431.02
22	2.76996	8001.58	-36.0092	Bedrock	300	18	615.597	967.86	2055.46	0	2055.46	2502.87	2502.87
23	2.76996	8240.12	-36.0092	Bedrock	300	18	628.507	988.157	2117.93	0	2117.93	2574.72	2574.72
24	2.76996	8478.67	-36.0092	Bedrock	300	18	641.416	1008.45	2180.39	0	2180.39	2646.57	2646.57
25	2.48548	7609.58	-12.6958	Bedrock	300	32	1406.94	2212.03	3059.89	0	3059.89	3376.85	3376.85
26	2.48548	7400.71	-12.6958	Bedrock	300	32	1374	2160.24	2977.01	0	2977.01	3286.55	3286.55
27	2.48548	7227.98	-12.5598	Bedrock	300	32	1349.33	2121.45	2914.93	0	2914.93	3215.55	3215.55
28	2.48548	7068.88	-12.5598	Bedrock	300	32	1324.18	2081.92	2851.67	0	2851.67	3146.68	3146.68
29	2.48548	6909.78	-12.5598	Bedrock	300	32	1299.04	2042.39	2788.4	0	2788.4	3077.82	3077.82
30	2.48548	6750.68	-12.5598	Bedrock	300	32	1273.9	2002.86	2725.14	0	2725.14	3008.95	3008.95
31	2.48548	6591.58	-12.5598	Bedrock	300	32	1248.75	1963.33	2661.88	0	2661.88	2940.09	2940.09
32	2.48548	6432.48	-12.5598	Bedrock	300	32	1223.61	1923.79	2598.61	0	2598.61	2871.22	2871.22
33	2.45047	6185.52	-12.4749	Bedrock	300	32	1199.96	1886.61	2539.11	0	2539.11	2804.58	2804.58
34	2.45047	6029.65	-12.4749	Bedrock	300	32	1174.94	1847.28	2476.16	0	2476.16	2736.1	2736.1
35	2.44957	5871.61	-12.4701	Bedrock	300	32	1150	1808.07	2413.41	0	2413.41	2667.73	2667.73
36	2.44957	5715.8	-12.4701	Bedrock	300	32	1124.98	1768.73	2350.46	0	2350.46	2599.25	2599.25
37	3.68741	8287.5	-11.8235	Bedrock	300	32	1100.99	1731.01	2290.09	0	2290.09	2520.57	2520.57
38	3.68741	7791.64	-11.8235	Bedrock	300	32	1047.58	1647.03	2155.7	0	2155.7	2375	2375
39	3.68172	7238.69	-10.5332	Bedrock	300	32	1006.96	1583.17	2053.5	0	2053.5	2240.74	2240.74
40	3.68172	6677.54	-10.5332	Bedrock	300	32	945.212	1486.09	1898.14	0	1898.14	2073.89	2073.89
41	3.01178	5017.23	-7.88537	Bedrock	300	32	918.422	1443.97	1830.74	0	1830.74	1957.94	1957.94
42	3.01178	4585.78	-7.88537	Bedrock	300	32	857.941	1348.88	1678.55	0	1678.55	1797.38	1797.38
43	3.01181	4132.72	-5.81124	Bedrock	300	32	817.845	1285.84	1577.68	0	1577.68	1660.91	1660.91
44	3.01181	3657.95	-5.81124	Bedrock	300	32	749.041	1177.66	1404.56	0	1404.56	1480.79	1480.79
45	2.78768	2953.79	-4.81508	Bedrock	300	32	690.929	1086.3	1258.34	0	1258.34	1316.55	1316.55
46	2.78768	2529.34	-4.81508	Bedrock	300	32	623.383	980.102	1088.39	0	1088.39	1140.9	1140.9
47	2.78771	2075.37	-1.47525	Bedrock	300	32	577.19	907.475	972.165	0	972.165	987.03	987.03
48	2.78771	1591.82	-1.47525	Bedrock	300	32	495.794	779.502	767.365	0	767.365	780.134	780.134
49	3.27828	1183.16	5.55451	Bedrock	300	32	438.279	689.075	622.649	0	622.649	580.027	580.027
50	3.27828	393.94	5.55451	Bedrock	300	32	309.688	486.9	299.102	0	299.102	268.985	268.985

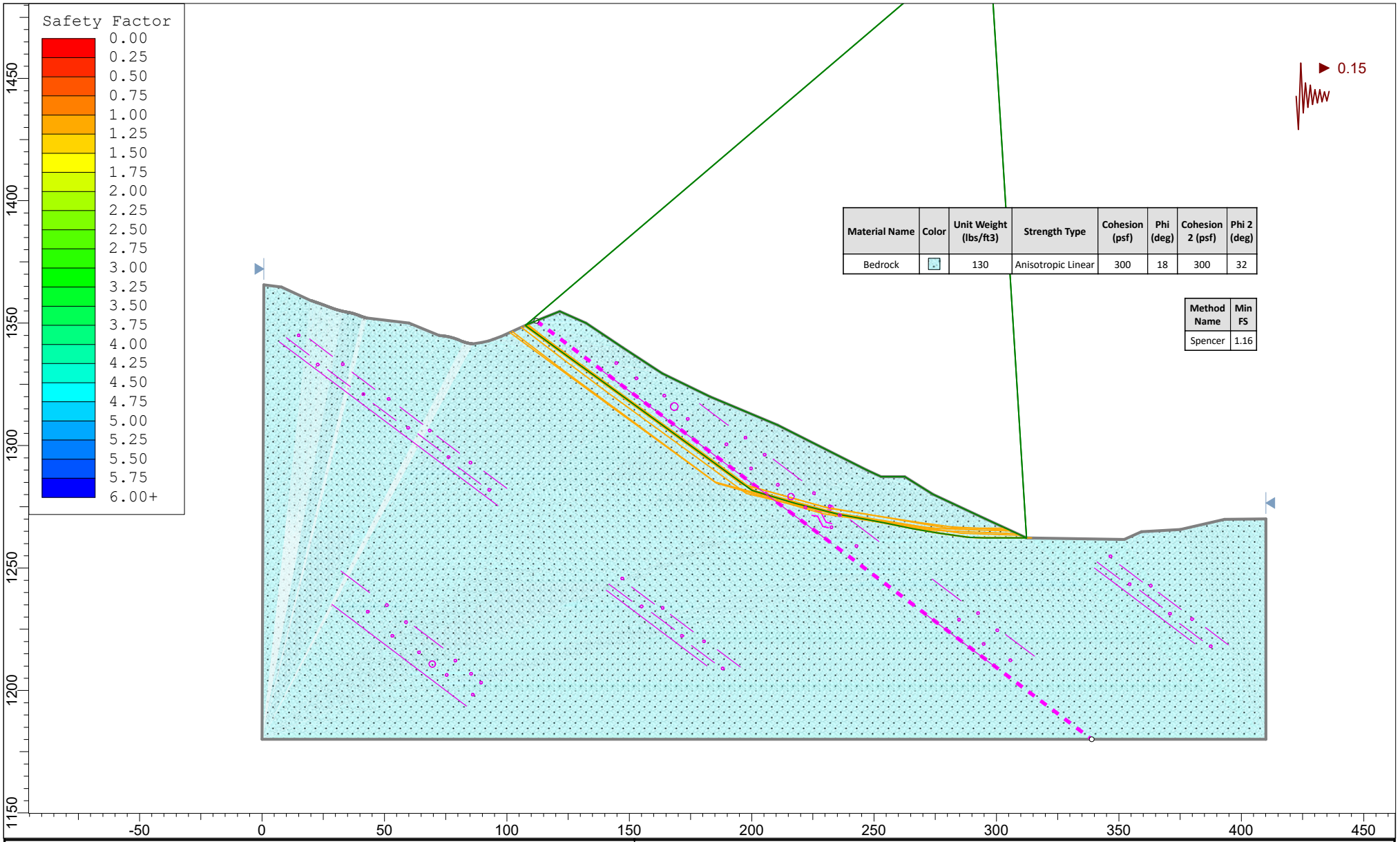
Interslice Data

Non-circular search, static - Master Scenario

Non-circular search, static - Bedding plane

Global Minimum Query (spencer) - Safety Factor: 1.57223

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	112.244	1351.07	0	0	0
2	112.64	1347.49	-11.2077	-4.92349	23.7157
3	115.418	1345.33	170.65	74.9656	23.7156
4	118.196	1343.17	829.177	364.253	23.7156
5	120.975	1341.01	1964.37	862.939	23.7157
6	123.753	1338.86	3468.19	1523.56	23.7157
7	126.221	1336.94	4921.1	2161.81	23.7156
8	128.689	1335.03	6480.2	2846.72	23.7156
9	131.133	1333.17	8088.59	3553.28	23.7157
10	133.577	1331.31	9785.57	4298.75	23.7156
11	136.77	1328.89	12036.7	5287.67	23.7157
12	139.963	1326.48	14334	6296.87	23.7157
13	143.062	1324.16	16581.7	7284.25	23.7156
14	146.162	1321.84	18869.2	8289.13	23.7156
15	149.83	1319.17	21521.3	9454.18	23.7156
16	151.937	1317.64	23067.8	10133.6	23.7157
17	154.044	1316.11	24631.2	10820.4	23.7157
18	158.269	1313.04	27817.1	12219.9	23.7156
19	162.021	1310.31	30703.7	13488	23.7157
20	164.791	1308.3	32875.4	14442	23.7156
21	167.561	1306.28	35128.2	15431.6	23.7156
22	170.331	1304.27	37471	16460.8	23.7156
23	173.101	1302.26	39903.9	17529.6	23.7157
24	175.871	1300.24	42426.7	18637.8	23.7156
25	178.641	1298.23	45039.5	19785.6	23.7156
26	181.127	1297.67	43255.9	19002.1	23.7156
27	183.612	1297.11	41507.7	18234.1	23.7156
28	186.098	1296.56	39768.1	17469.9	23.7156
29	188.583	1296	38055.9	16717.8	23.7157
30	191.069	1295.45	36371.2	15977.7	23.7157
31	193.554	1294.9	34714	15249.7	23.7157
32	196.04	1294.34	33084.2	14533.7	23.7156
33	198.525	1293.79	31481.9	13829.8	23.7156
34	200.975	1293.25	29918	13142.8	23.7156
35	203.426	1292.7	28381.2	12467.7	23.7156
36	205.876	1292.16	26871.6	11804.5	23.7155
37	208.325	1291.62	25389.1	11153.3	23.7156
38	212.012	1290.85	23097.1	10146.4	23.7156
39	215.7	1290.08	20898.2	9180.49	23.7157
40	219.382	1289.39	18596.7	8169.41	23.7156
41	223.063	1288.71	16416.1	7211.49	23.7156
42	226.075	1288.29	14413.6	6331.83	23.7157
43	229.087	1287.87	12529.9	5504.31	23.7156
44	232.099	1287.57	10550.3	4634.67	23.7155
45	235.111	1287.26	8724.81	3832.76	23.7156
46	237.898	1287.03	7094.2	3116.45	23.7157
47	240.686	1286.79	5611.98	2465.32	23.7157
48	243.474	1286.72	4072.73	1789.13	23.7156
49	246.261	1286.65	2745.69	1206.17	23.7157
50	249.54	1286.97	1110.37	487.781	23.7157
51	252.818	1287.28	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 4-4'; CS-6; non-circular search; bedding plane; pseudo		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t4ps1a.slmd
		Scale:	1:650
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 6

Slide Analysis Information

t4ps1a

Project Summary

File Name:	t4ps1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:06.107s
Project Title:	VTTM 60257
Analysis:	Section 4-4'; CS-6; non-circular search; bedding plane; pseudo
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Bedrock
Color	
Strength Type	Anisotropic Linear
Unit Weight [lbs/ft3]	130
Cohesion 1 [psf]	300
Cohesion 2 [psf]	300
Friction Angle 1 [°]	18
Friction Angle 2 [°]	32
A [°]	1
B [°]	1
Anisotropic Definition	Surface
Angle from 1 [°]	
Anisotropic Surface	Anisotropic Surface 2
Tensile Strength [psf]	0
Water Surface	None
Ru Value	0

Global Minimums

Method: spencer

FS	1.159620
Axis Location:	296.680, 1510.392
Left Slip Surface Endpoint:	107.543, 1349.065
Right Slip Surface Endpoint:	312.260, 1262.286
Resisting Moment:	7.51335e+07 lb-ft
Driving Moment:	6.47912e+07 lb-ft
Resisting Horizontal Force:	283662 lb
Driving Horizontal Force:	244616 lb
Total Slice Area:	3944.57 ft2
Surface Horizontal Width:	204.716 ft
Surface Average Height:	19.2685 ft

Global Minimum Coordinates

Method: spencer

X	Y
107.543	1349.06
116.145	1342.8
124.746	1336.53
133.67	1330.03
142.594	1323.53
149.787	1318.3
156.979	1313.06
164.172	1307.83
171.365	1302.59
178.558	1297.35
185.751	1292.12
192.943	1286.88
200.136	1281.65
209.033	1279.01
217.93	1276.37
226.827	1274.13
235.723	1271.89
245.68	1270
255.637	1268.12
265.613	1266.1
275.588	1264.34
281.977	1263.43
288.367	1262.52
295.069	1262.32
301.77	1262.28
312.26	1262.29

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 8048
Number of Invalid Surfaces: 2006

Error Codes:

Error Code -106 reported for 24 surfaces
Error Code -108 reported for 35 surfaces
Error Code -111 reported for 23 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 43 surfaces
Error Code -121 reported for 419 surfaces
Error Code -124 reported for 7 surfaces
Error Code -600 reported for 47 surfaces
Error Code -1000 reported for 1385 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

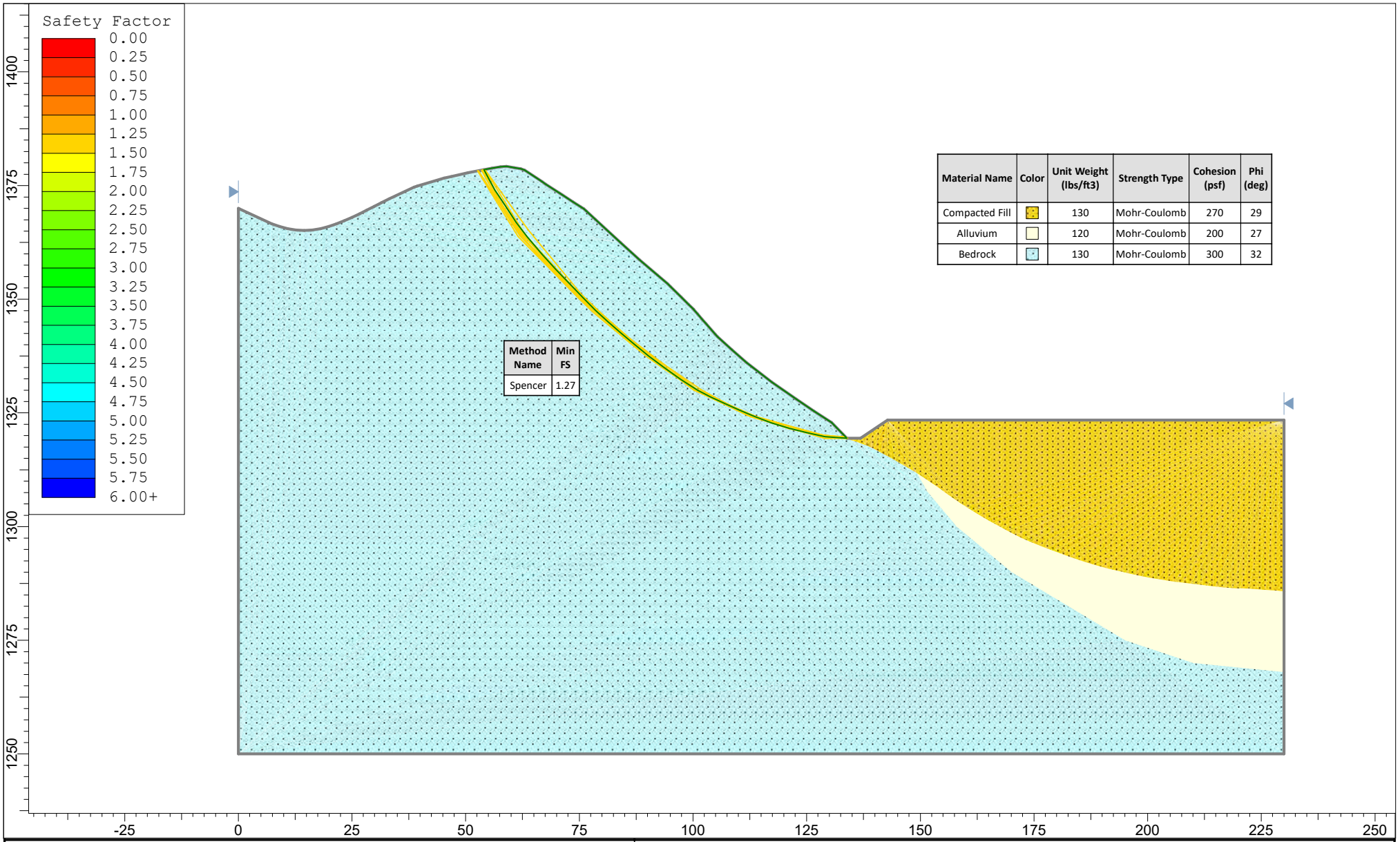
Global Minimum Query (spencer) - Safety Factor: 1.15962

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.30062	1410.82	-36.0767	Bedrock	300	18	307.476	356.555	174.058	0	174.058	398.081	398.081
2	4.30062	4139.86	-36.0767	Bedrock	300	18	420.838	488.012	578.642	0	578.642	885.259	885.259
3	4.30062	6850.71	-36.0767	Bedrock	300	18	533.445	618.593	980.53	0	980.53	1369.19	1369.19
4	4.30062	8999.89	-36.0767	Bedrock	300	18	622.72	722.119	1299.15	0	1299.15	1752.86	1752.86
5	4.46204	10130.7	-36.0642	Bedrock	300	18	654.558	759.039	1412.78	0	1412.78	1889.46	1889.46
6	4.46204	10841.8	-36.0642	Bedrock	300	18	683.036	792.062	1514.41	0	1514.41	2011.83	2011.83
7	4.46204	11141.2	-36.0642	Bedrock	300	18	695.023	805.963	1557.19	0	1557.19	2063.35	2063.35
8	4.46204	11299.1	-36.0642	Bedrock	300	18	701.349	813.298	1579.77	0	1579.77	2090.53	2090.53
9	3.59638	9221.71	-36.0518	Bedrock	300	18	707.147	820.022	1600.46	0	1600.46	2115.21	2115.21
10	3.59638	9331.01	-36.0518	Bedrock	300	18	712.578	826.32	1619.85	0	1619.85	2138.55	2138.55
11	3.59638	9462.19	-36.0518	Bedrock	300	18	719.097	833.879	1643.11	0	1643.11	2166.56	2166.56
12	3.59638	9594.86	-36.0518	Bedrock	300	18	725.689	841.524	1666.64	0	1666.64	2194.89	2194.89
13	3.59638	9727.56	-36.0517	Bedrock	300	18	732.283	849.17	1690.17	0	1690.17	2223.22	2223.22
14	3.59638	9864.71	-36.0517	Bedrock	300	18	739.098	857.073	1714.5	0	1714.5	2252.5	2252.5
15	3.59638	10177.9	-36.0517	Bedrock	300	18	754.663	875.122	1770.04	0	1770.04	2319.38	2319.38
16	3.59638	10582	-36.0517	Bedrock	300	18	774.74	898.404	1841.7	0	1841.7	2405.65	2405.65
17	3.59638	10986	-36.0517	Bedrock	300	18	794.817	921.686	1913.35	0	1913.35	2491.92	2491.92
18	3.59638	11390	-36.0517	Bedrock	300	18	814.895	944.968	1985.01	0	1985.01	2578.19	2578.19
19	3.59638	11794.1	-36.0517	Bedrock	300	18	834.972	968.25	2056.66	0	2056.66	2664.46	2664.46
20	3.59638	12231.8	-36.0517	Bedrock	300	18	856.723	993.473	2134.29	0	2134.29	2757.92	2757.92
21	3.59638	12745.2	-36.0517	Bedrock	300	18	882.235	1023.06	2225.34	0	2225.34	2867.54	2867.54
22	3.59638	13261.4	-36.0517	Bedrock	300	18	907.887	1052.8	2316.89	0	2316.89	2977.76	2977.76
23	3.59638	13777.7	-36.0517	Bedrock	300	18	933.54	1082.55	2408.45	0	2408.45	3088	3088
24	3.59638	14293.9	-36.0517	Bedrock	300	18	959.193	1112.3	2499.99	0	2499.99	3198.21	3198.21
25	4.44854	17840	-16.5125	Bedrock	300	32	2219.96	2574.31	3639.65	0	3639.65	4297.76	4297.76
26	4.44854	17519.8	-16.5125	Bedrock	300	32	2185.34	2534.16	3575.4	0	3575.4	4223.25	4223.25
27	4.44854	17151.4	-16.5125	Bedrock	300	32	2145.5	2487.96	3501.48	0	3501.48	4137.51	4137.51
28	4.44854	16628.2	-16.5125	Bedrock	300	32	2088.91	2422.34	3396.45	0	3396.45	4015.71	4015.71
29	4.44816	16034.4	-14.1311	Bedrock	300	32	2117.28	2455.24	3449.1	0	3449.1	3982.15	3982.15
30	4.44816	15384.6	-14.1311	Bedrock	300	32	2043.57	2369.77	3312.32	0	3312.32	3826.81	3826.81
31	4.44816	14734.8	-14.1311	Bedrock	300	32	1969.87	2284.3	3175.54	0	3175.54	3671.48	3671.48
32	4.44816	14085	-14.1311	Bedrock	300	32	1896.16	2198.83	3038.76	0	3038.76	3516.14	3516.14
33	4.97865	14894.1	-10.7387	Bedrock	300	32	1929.95	2238.01	3101.46	0	3101.46	3467.48	3467.48
34	4.97865	13879.9	-10.7387	Bedrock	300	32	1819.71	2110.17	2896.88	0	2896.88	3241.99	3241.99
35	4.97865	12898.6	-10.7387	Bedrock	300	32	1713.04	1986.47	2698.92	0	2698.92	3023.8	3023.8
36	4.97865	12242.8	-10.7387	Bedrock	300	32	1641.75	1903.81	2566.63	0	2566.63	2877.99	2877.99
37	4.98753	12756	-11.428	Bedrock	300	32	1672.5	1939.46	2623.69	0	2623.69	2961.77	2961.77
38	4.98753	13012.6	-11.428	Bedrock	300	32	1699.94	1971.29	2674.63	0	2674.63	3018.26	3018.26
39	4.98753	11741	-10.0213	Bedrock	300	32	1607.31	1863.87	2502.72	0	2502.72	2786.75	2786.75
40	4.98753	10310.8	-10.0213	Bedrock	300	32	1449.75	1681.16	2210.31	0	2210.31	2466.5	2466.5
41	3.19486	6008.23	-8.09402	Bedrock	300	32	1399.2	1622.54	2116.51	0	2116.51	2315.5	2315.5
42	3.19486	5575.75	-8.09402	Bedrock	300	32	1321.64	1532.6	1972.57	0	1972.57	2160.53	2160.53
43	3.19486	5143.28	-8.09402	Bedrock	300	32	1244.08	1442.66	1828.63	0	1828.63	2005.56	2005.56
44	3.19486	4710.8	-8.09402	Bedrock	300	32	1166.51	1352.71	1684.69	0	1684.69	1850.59	1850.59
45	3.35082	4394	-1.70146	Bedrock	300	32	1225.88	1421.56	1794.87	0	1794.87	1831.29	1831.29
46	3.35082	3754.05	-1.70146	Bedrock	300	32	1098.74	1274.12	1558.92	0	1558.92	1591.55	1591.55
47	3.35082	3101.7	-0.348407	Bedrock	300	32	998.682	1158.09	1373.23	0	1373.23	1379.31	1379.31
48	3.35082	2438.5	-0.348407	Bedrock	300	32	862.283	999.921	1120.11	0	1120.11	1125.35	1125.35
49	5.24462	2473.27	0.0397735	Bedrock	300	32	691.429	801.795	803.039	0	803.039	802.559	802.559
50	5.24462	824.422	0.0397735	Bedrock	300	32	472.587	548.021	396.917	0	396.917	396.589	396.589

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.15962

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	107.543	1349.06	0	0	0
2	111.844	1345.93	-565.327	-301.255	28.0525
3	116.145	1342.8	58.8859	31.3795	28.0526
4	120.445	1339.66	1864.71	993.68	28.0526
5	124.746	1336.53	4607.33	2455.18	28.0525
6	129.208	1333.28	7797.08	4154.96	28.0526
7	133.67	1330.03	11296.7	6019.85	28.0525
8	138.132	1326.78	14926.7	7954.26	28.0526
9	142.594	1323.53	18625.6	9925.34	28.0526
10	146.19	1320.92	21655.5	11539.9	28.0525
11	149.787	1318.3	24733	13179.9	28.0526
12	153.383	1315.68	27867.7	14850.3	28.0525
13	156.979	1313.06	31060.1	16551.5	28.0525
14	160.576	1310.44	34310.4	18283.5	28.0525
15	164.172	1307.83	37620.4	20047.4	28.0525
16	167.769	1305.21	41066.8	21883.9	28.0525
17	171.365	1302.59	44689.1	23814.2	28.0525
18	174.961	1299.97	48487.5	25838.3	28.0525
19	178.558	1297.35	52461.9	27956.2	28.0525
20	182.154	1294.74	56612.2	30167.9	28.0526
21	185.751	1292.12	60953.2	32481.1	28.0525
22	189.347	1289.5	65517.8	34913.5	28.0525
23	192.943	1286.88	70307.3	37465.8	28.0525
24	196.54	1284.26	75321.6	40137.8	28.0525
25	200.136	1281.65	80560.7	42929.7	28.0525
26	204.585	1280.33	78161	41650.9	28.0525
27	209.033	1279.01	75782.5	40383.5	28.0526
28	213.482	1277.69	73428.5	39129.1	28.0526
29	217.93	1276.37	71109.3	37893.2	28.0526
30	222.378	1275.25	67959	36214.4	28.0525
31	226.827	1274.13	64885.9	34576.8	28.0525
32	231.275	1273.01	61889.9	32980.3	28.0526
33	235.723	1271.89	58971.2	31425	28.0526
34	240.702	1270.95	54525.2	29055.7	28.0525
35	245.68	1270	50282.7	26795	28.0526
36	250.659	1269.06	46237.2	24639.2	28.0526
37	255.637	1268.12	42323.3	22553.5	28.0525
38	260.625	1267.11	38540.2	20537.5	28.0525
39	265.613	1266.1	34710.1	18496.5	28.0525
40	270.6	1265.22	30660.4	16338.5	28.0525
41	275.588	1264.34	26924.4	14347.6	28.0525
42	278.782	1263.88	24317	12958.2	28.0525
43	281.977	1263.43	21827.2	11631.4	28.0525
44	285.172	1262.97	19454.8	10367.2	28.0526
45	288.367	1262.52	17200	9165.67	28.0526
46	291.718	1262.42	13930.1	7423.14	28.0525
47	295.069	1262.32	10966.6	5843.97	28.0526
48	298.419	1262.3	8113.45	4323.55	28.0526
49	301.77	1262.28	5612.68	2990.92	28.0525
50	307.015	1262.28	2354.44	1254.65	28.0526
51	312.26	1262.29	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 5-5'; NS-1 critical failure surface; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t5s1a.slmd
		Scale:	1:350
Project No.:	18-1245A-4	*Date:* 6/25/2018	*Figure No.:* Run No. 7

Slide Analysis Information

t5s1a

Project Summary

File Name:	t5s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:03.261s
Project Title:	VTTM 60257
Analysis:	Section 5-5'; NS-1 critical failure surface; non-circular search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Materials

Property	Compacted Fill	Alluvium	Bedrock
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	120	130
Cohesion [psf]	270	200	300
Friction Angle [°]	29	27	32
Tensile Strength [psf]			0
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS	1.269950
Axis Location:	153.032, 1428.769
Left Slip Surface Endpoint:	54.018, 1378.507
Right Slip Surface Endpoint:	133.834, 1319.400
Resisting Moment:	1.13989e+07 lb-ft
Driving Moment:	8.97587e+06 lb-ft
Resisting Horizontal Force:	81819.9 lb
Driving Horizontal Force:	64427.5 lb
Total Slice Area:	1063.86 ft2
Surface Horizontal Width:	79.816 ft
Surface Average Height:	13.3289 ft

Global Minimum Coordinates

Method: spencer

X	Y
54.0177	1378.51
56.3878	1374.03
58.753	1370.44
61.1182	1366.88
63.4834	1363.75
65.1321	1361.8
66.8158	1359.86
69.8094	1356.57
72.8	1353.46
75.7906	1350.35
78.5026	1347.57
81.2146	1345.09
83.9266	1342.78
86.6386	1340.48
90.2201	1337.5
93.8015	1334.85
97.383	1332.31
101.003	1329.96
104.02	1328.42
107.074	1327.01
110.128	1325.65
113.215	1324.35
117.17	1322.85
121.126	1321.6
125.081	1320.63
129.037	1319.78
133.834	1319.4

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6766
Number of Invalid Surfaces: 3289

Error Codes:

Error Code -106 reported for 1 surface
Error Code -108 reported for 145 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 31 surfaces
Error Code -112 reported for 40 surfaces
Error Code -114 reported for 50 surfaces
Error Code -121 reported for 870 surfaces
Error Code -124 reported for 4 surfaces
Error Code -600 reported for 74 surfaces
Error Code -1000 reported for 2073 surfaces

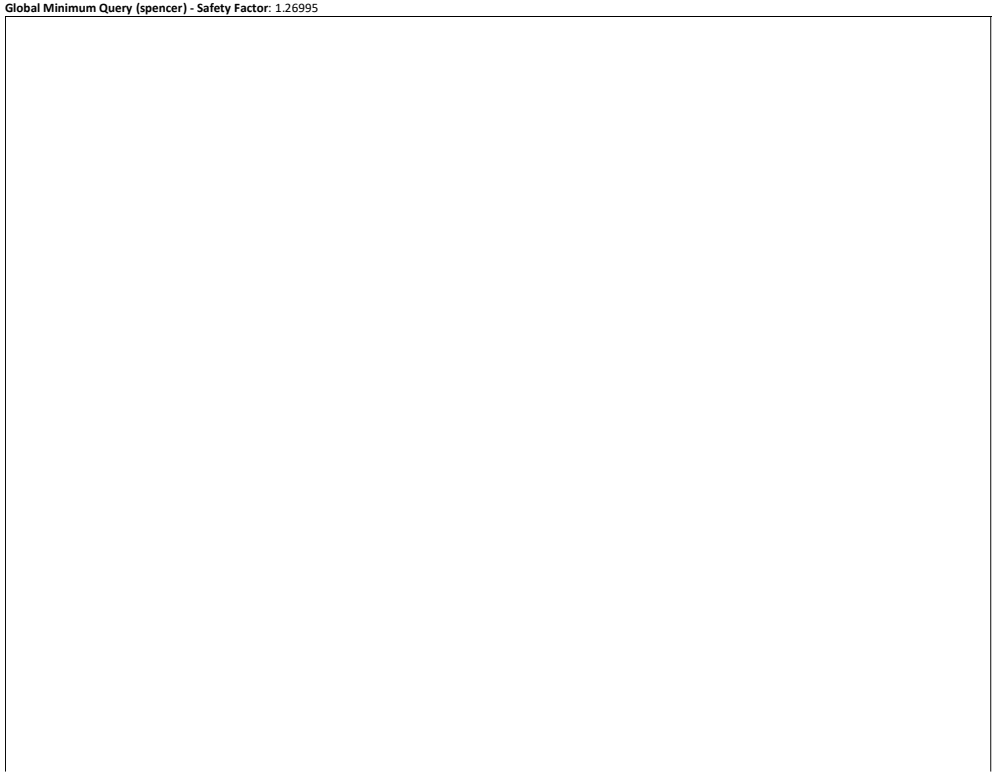
Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

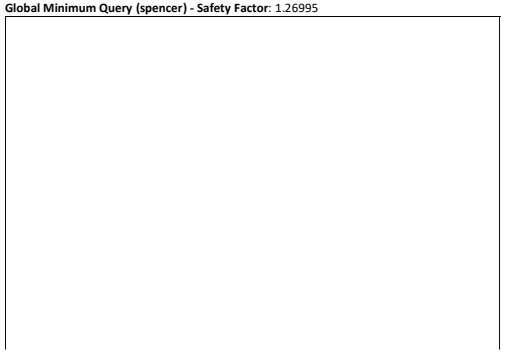
Global Minimum Query (spencer) - Safety Factor: 1.26995



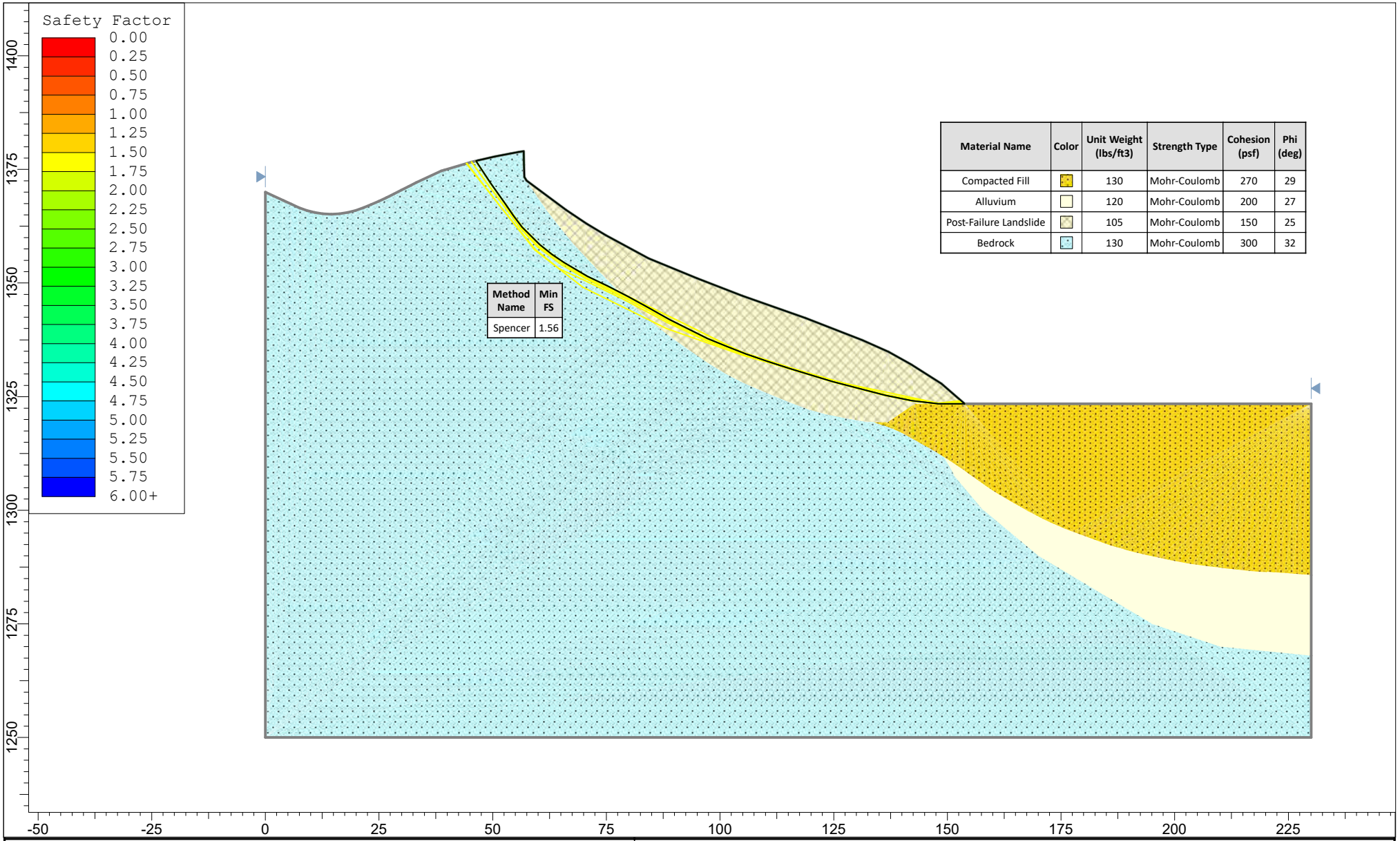
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.18505	188.169	-62.0921	Bedrock	300	32	127.741	162.225	0	0	0	241.181	241.181
2	1.18505	564.229	-62.0921	Bedrock	300	32	268.137	340.521	64.8468	0	64.8468	571.101	571.101
3	1.18258	902.366	-56.6027	Bedrock	300	32	350.122	444.638	231.469	0	231.469	762.512	762.512
4	1.18258	1199.7	-56.6027	Bedrock	300	32	401.491	509.873	335.868	0	335.868	944.822	944.822
5	2.36517	3192.68	-56.4468	Bedrock	300	32	471.445	598.711	478.037	0	478.037	1188.88	1188.88
6	2.36517	4073.95	-52.9455	Bedrock	300	32	587.366	745.926	713.629	0	713.629	1491.55	1491.55
7	1.64873	3155.32	-49.7426	Bedrock	300	32	670.367	851.333	882.32	0	882.32	1673.98	1673.98
8	1.68371	3408.59	-49.048	Bedrock	300	32	706.451	897.158	955.652	0	955.652	1769.71	1769.71
9	1.49679	3167	-47.659	Bedrock	300	32	748.266	950.26	1040.63	0	1040.63	1861.78	1861.78
10	1.49679	3297.83	-47.659	Bedrock	300	32	770.543	978.551	1085.91	0	1085.91	1931.51	1931.51
11	1.49531	3419.96	-46.1562	Bedrock	300	32	814.445	1034.3	1175.13	0	1175.13	2023.13	2023.13
12	1.49531	3533.47	-46.1562	Bedrock	300	32	834.456	1059.72	1215.8	0	1215.8	2084.64	2084.64
13	1.49531	3647.14	-46.1562	Bedrock	300	32	854.493	1085.16	1256.52	0	1256.52	2146.22	2146.22
14	1.49531	3763.8	-46.1562	Bedrock	300	32	875.058	1111.28	1298.32	0	1298.32	2209.43	2209.43
15	1.356	3487.29	-45.706	Bedrock	300	32	897.024	1139.18	1342.96	0	1342.96	2262.37	2262.37
16	1.356	3513.91	-45.706	Bedrock	300	32	902.25	1145.81	1353.59	0	1353.59	2278.35	2278.35
17	1.356	3526.57	-42.3862	Bedrock	300	32	961.935	1221.61	1474.88	0	1474.88	2352.83	2352.83
18	1.356	3525.81	-42.3862	Bedrock	300	32	961.775	1221.41	1474.56	0	1474.56	2352.35	2352.35
19	1.356	3517.78	-40.4264	Bedrock	300	32	994.682	1263.2	1541.44	0	1541.44	2388.77	2388.77
20	1.356	3502.49	-40.4264	Bedrock	300	32	991.322	1258.93	1534.61	0	1534.61	2379.08	2379.08
21	1.356	3486.6	-40.3535	Bedrock	300	32	989.122	1256.14	1530.14	0	1530.14	2370.56	2370.56
22	1.356	3470.01	-40.3535	Bedrock	300	32	985.472	1251.5	1522.72	0	1522.72	2360.04	2360.04
23	1.79073	4553.6	-39.7631	Bedrock	300	32	991.056	1258.59	1534.07	0	1534.07	2358.7	2358.7
24	1.79073	4535.83	-39.7631	Bedrock	300	32	988.058	1254.78	1527.98	0	1527.98	2350.12	2350.12
25	1.79073	4510.79	-36.5036	Bedrock	300	32	1042.18	1323.52	1637.98	0	1637.98	2409.25	2409.25
26	1.79073	4466.36	-36.5036	Bedrock	300	32	1034.17	1313.35	1621.7	0	1621.7	2387.05	2387.05
27	1.79073	4402.19	-35.2703	Bedrock	300	32	1044.9	1326.97	1643.49	0	1643.49	2382.51	2382.51
28	1.79073	4286.6	-35.2703	Bedrock	300	32	1023.54	1299.84	1600.08	0	1600.08	2323.99	2323.99
29	1.80999	4199.96	-33.0369	Bedrock	300	32	1038.66	1319.05	1630.83	0	1630.83	2306.29	2306.29
30	1.80999	4046.94	-33.0369	Bedrock	300	32	1009.41	1281.9	1571.38	0	1571.38	2227.83	2227.83
31	1.50845	3198.17	-27.0938	Bedrock	300	32	1073.62	1363.45	1701.87	0	1701.87	2251.12	2251.12
32	1.50845	3008	-27.0938	Bedrock	300	32	1024.56	1301.14	1602.16	0	1602.16	2126.31	2126.31
33	1.52713	2847.68	-24.7456	Bedrock	300	32	1014.34	1288.16	1581.39	0	1581.39	2048.91	2048.91
34	1.52713	2682.81	-24.7456	Bedrock	300	32	970.319	1232.26	1491.92	0	1491.92	1939.15	1939.15
35	1.52713	2543.26	-24.0226	Bedrock	300	32	944.679	1199.7	1439.81	0	1439.81	1860.86	1860.86
36	1.52713	2408.65	-24.0226	Bedrock	300	32	908.214	1153.39	1365.71	0	1365.71	1770.5	1770.5
37	1.5433	2299.74	-22.8416	Bedrock	300	32	889.878	1130.1	1328.44	0	1328.44	1703.27	1703.27
38	1.5433	2175.64	-22.8416	Bedrock	300	32	855.816	1086.84	1259.22	0	1259.22	1619.7	1619.7
39	1.31849	1768.08	-20.7603	Bedrock	300	32	856.507	1087.72	1260.62	0	1260.62	1585.3	1585.3
40	1.31849	1679.43	-20.7603	Bedrock	300	32	826.798	1049.99	1200.24	0	1200.24	1513.66	1513.66
41	1.31849	1590.77	-20.7603	Bedrock	300	32	797.089	1012.26	1139.86	0	1139.86	1442.01	1442.01
42	1.97774	2220.77	-17.4517	Bedrock	300	32	804.438	1021.6	1154.79	0	1154.79	1407.69	1407.69
43	1.97774	2027.83	-17.4517	Bedrock	300	32	758.285	962.984	1061	0	1061	1299.38	1299.38
44	1.97774	1817.78	-13.839	Bedrock	300	32	754.168	957.756	1052.63	0	1052.63	1238.41	1238.41
45	1.97774	1593.27	-13.839	Bedrock	300	32	696.146	884.071	934.711	0	934.711	1106.2	1106.2
46	1.97774	1362.39	-12.0466	Bedrock	300	32	656.824	834.134	854.791	0	854.791	994.962	994.962
47	1.97774	1141.99	-12.0466	Bedrock	300	32	597.559	758.87	734.348	0	734.348	861.871	861.871
48	1.59898	745.637	-4.58288	Bedrock	300	32	617.685	784.429	775.251	0	775.251	824.763	824.763
49	1.59898	482.2	-4.58288	Bedrock	300	32	512.908	651.367	562.304	0	562.304	603.417	603.417
50	1.59898	160.733	-4.58288	Bedrock	300	32	385.118	489.081	302.593	0	302.593	333.463	333.463

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.26995



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	54.0177	1378.51	0	0	0
2	55.2028	1376.27	-151.379	-97.6756	32.8317
3	56.3878	1374.03	-324.044	-209.086	32.8317
4	57.5704	1372.24	-322.914	-208.357	32.8317
5	58.753	1370.44	-195.276	-126	32.8317
6	61.1182	1366.88	394.447	254.512	32.8316
7	63.4834	1363.75	1240.66	800.523	32.8317
8	65.1321	1361.8	1853.33	1195.84	32.8317
9	66.8158	1359.86	2518	1624.71	32.8317
10	68.3126	1358.22	3107.33	2004.97	32.8317
11	69.8094	1356.57	3737.7	2411.7	32.8316
12	71.3047	1355.02	4349.43	2806.42	32.8317
13	72.8	1353.46	4994.56	3222.68	32.8316
14	74.2953	1351.9	5673.13	3660.52	32.8317
15	75.7906	1350.35	6386.01	4120.5	32.8317
16	77.1466	1348.96	7036.15	4539.99	32.8316
17	78.5026	1347.57	7693.96	4964.44	32.8317
18	79.8586	1346.33	8214.89	5300.56	32.8316
19	81.2146	1345.09	8735.64	5636.57	32.8317
20	82.5706	1343.94	9167.4	5915.16	32.8317
21	83.9266	1342.78	9595.84	6191.6	32.8316
22	85.2826	1341.63	10017.5	6463.7	32.8318
23	86.6386	1340.48	10435.6	6733.47	32.8317
24	88.4293	1338.99	10946.7	7063.25	32.8317
25	90.2201	1337.5	11454.1	7390.63	32.8317
26	92.0108	1336.17	11758.6	7587.08	32.8316
27	93.8015	1334.85	12055.8	7778.86	32.8316
28	95.5923	1333.58	12266.2	7914.61	32.8316
29	97.383	1332.31	12459.8	8039.56	32.8317
30	99.193	1331.14	12499.5	8065.14	32.8316
31	101.003	1329.96	12522.1	8079.73	32.8316
32	102.511	1329.19	12215.9	7882.18	32.8317
33	104.02	1328.42	11906.8	7682.74	32.8317
34	105.547	1327.71	11470.9	7401.46	32.8316
35	107.074	1327.01	11039.2	7122.93	32.8317
36	108.601	1326.33	10576.6	6824.42	32.8316
37	110.128	1325.65	10119.2	6529.29	32.8316
38	111.672	1325	9609.41	6200.36	32.8317
39	113.215	1324.35	9107.2	5876.31	32.8316
40	114.533	1323.85	8607.97	5554.19	32.8316
41	115.852	1323.35	8117.73	5237.87	32.8317
42	117.17	1322.85	7636.48	4927.35	32.8317
43	119.148	1322.22	6763.5	4364.07	32.8317
44	121.126	1321.6	5923.49	3822.06	32.8316
45	123.104	1321.12	4944.79	3190.57	32.8317
46	125.081	1320.63	4023.4	2596.05	32.8316
47	127.059	1320.21	3085.15	1990.66	32.8317
48	129.037	1319.78	2213.28	1428.09	32.8316
49	130.636	1319.66	1324.98	854.927	32.8316
50	132.235	1319.53	576.92	372.251	32.8317
51	133.834	1319.4	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 5-5'; NS-1 post-failure geometry; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t5s2a.slmd
		Scale:	1:350
Project No.:	18-1245A-4	*Date:* 6/25/2018	*Figure No.:* Run No. 8

Slide Analysis Information

t5s2a

Project Summary

File Name:	t5s2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:09.542s
Project Title:	VTTM 60257
Analysis:	Section 5-5'; NS-1 post-failure geometry; non-circular search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Materials

Property	Compacted Fill	Alluvium	Post-Failure Landslide	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	120	105	130
Cohesion [psf]	270	200	150	300
Friction Angle [°]	29	27	25	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

Global Minimums

Method: spencer

FS	1.562590
Axis Location:	153.488, 1457.604
Left Slip Surface Endpoint:	46.297, 1376.852
Right Slip Surface Endpoint:	153.775, 1323.400
Resisting Moment:	1.09822e+07 lb-ft
Driving Moment:	7.03833e+06 lb-ft
Resisting Horizontal Force:	71319.3 lb
Driving Horizontal Force:	45707.3 lb
Total Slice Area:	1124.57 ft2
Surface Horizontal Width:	107.478 ft
Surface Average Height:	10.4633 ft

Global Minimum Coordinates

Method: spencer

X	Y
46.2972	1376.85
49.5139	1372
52.7336	1367.45
54.529	1364.85
56.4791	1362.26
60.3771	1358.44
63.0303	1356.3
65.7092	1354.5
70.7984	1351.49
75.3016	1349.32
79.8289	1346.99
84.3568	1344.5
88.885	1341.95
93.074	1339.85
97.263	1337.77
101.451	1336.08
105.638	1334.39
110.429	1332.77
115.229	1331.2
120.03	1329.73
124.834	1328.27
130.633	1326.77
136.433	1325.27
142.221	1324.11
148.01	1323.41
153.775	1323.4

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6834
Number of Invalid Surfaces: 3225

Error Codes:

Error Code -106 reported for 4 surfaces
Error Code -108 reported for 138 surfaces
Error Code -111 reported for 20 surfaces
Error Code -112 reported for 51 surfaces
Error Code -114 reported for 32 surfaces
Error Code -121 reported for 639 surfaces
Error Code -124 reported for 4 surfaces
Error Code -600 reported for 5 surfaces
Error Code -1000 reported for 2332 surfaces

Error Codes

The following errors were encountered during the computation:

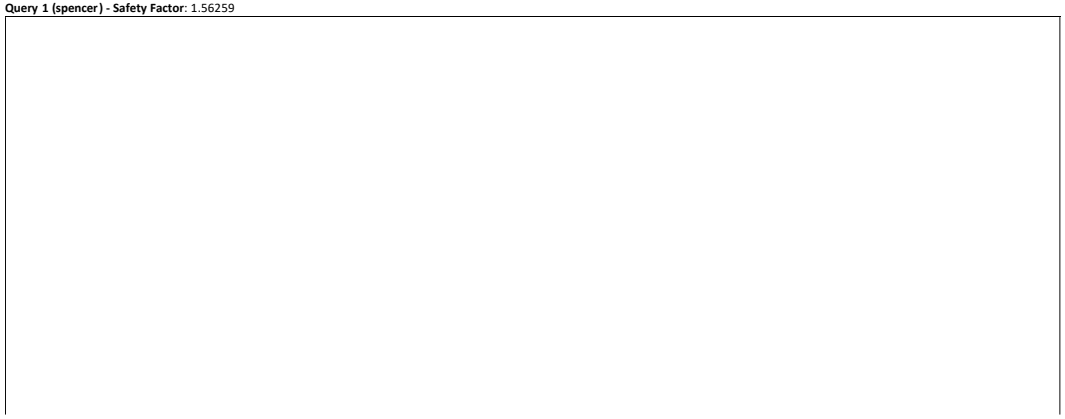
-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.56259

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.60835	291.79	-56.4372	Bedrock	300	32	164.391	256.875	0	0	0	247.776	247.776
2	1.60835	875.659	-56.4372	Bedrock	300	32	255.98	399.992	160.02	0	160.02	545.844	545.844
3	3.21972	3433.54	-54.7266	Bedrock	300	32	368.266	575.448	440.808	0	440.808	961.44	961.44
4	1.79542	2865.48	-55.383	Bedrock	300	32	470.845	735.738	697.327	0	697.327	1379.42	1379.42
5	1.95008	3855.43	-53.0587	Bedrock	300	32	568.805	888.809	942.289	0	942.289	1698.73	1698.73
6	1.94903	3154.23	-44.4351	Bedrock	300	32	560.593	875.977	921.755	0	921.755	1471.4	1471.4
7	1.94903	2881.89	-44.4351	Bedrock	300	32	526.448	822.623	836.371	0	836.371	1352.54	1352.54
8	2.65313	3929.34	-38.8127	Bedrock	300	32	568.273	887.978	940.962	0	940.962	1398.07	1398.07
9	2.67896	3864.56	-33.8734	Bedrock	300	32	594.455	928.89	1006.43	0	1006.43	1405.49	1405.49
10	1.6964	2356.26	-30.662	Bedrock	300	32	602.711	941.79	1027.08	0	1027.08	1384.4	1384.4
11	1.6964	2289.31	-30.662	Bedrock	300	32	590.767	923.126	997.211	0	997.211	1347.45	1347.45
12	1.6964	2230.64	-30.662	Bedrock	300	32	580.299	906.77	971.036	0	971.036	1315.07	1315.07
13	2.25158	2857.26	-25.6439	Bedrock	300	32	602.25	941.07	1025.92	0	1025.92	1315.04	1315.04
14	2.25158	2721.59	-25.6439	Bedrock	300	32	582.618	910.393	976.833	0	976.833	1256.53	1256.53
15	2.43086	2824.93	-27.2477	Bedrock	300	32	556.552	869.663	911.651	0	911.651	1198.27	1198.27
16	2.09642	2390.07	-27.2477	Post-Failure Landslide	150	25	366.658	572.936	906.99	0	906.99	1095.81	1095.81
17	2.26398	2575.54	-28.8066	Post-Failure Landslide	150	25	359.896	562.37	884.328	0	884.328	1082.24	1082.24
18	2.26398	2578.86	-28.8066	Post-Failure Landslide	150	25	360.24	562.907	885.481	0	885.481	1083.58	1083.58
19	2.26408	2625.4	-29.4302	Post-Failure Landslide	150	25	362.56	566.532	893.257	0	893.257	1097.8	1097.8
20	2.26408	2709.09	-29.4302	Post-Failure Landslide	150	25	371.157	579.966	922.066	0	922.066	1131.46	1131.46
21	2.09451	2565.93	-26.5659	Post-Failure Landslide	150	25	389.905	609.261	984.888	0	984.888	1179.85	1179.85
22	2.09451	2608	-26.5659	Post-Failure Landslide	150	25	394.752	616.835	1001.13	0	1001.13	1198.52	1198.52
23	2.0945	2649.45	-26.4305	Post-Failure Landslide	150	25	400.125	625.232	1019.14	0	1019.14	1218.03	1218.03
24	2.0945	2695.92	-26.4305	Post-Failure Landslide	150	25	405.489	633.613	1037.11	0	1037.11	1238.67	1238.67
25	2.09377	2723.57	-21.9822	Post-Failure Landslide	150	25	429.395	670.968	1117.22	0	1117.22	1290.55	1290.55
26	2.09377	2730.65	-21.9822	Post-Failure Landslide	150	25	430.261	672.321	1120.12	0	1120.12	1293.8	1293.8
27	2.09377	2737.74	-21.9822	Post-Failure Landslide	150	25	431.127	673.674	1123.02	0	1123.02	1297.06	1297.06
28	2.09377	2745.94	-21.9822	Post-Failure Landslide	150	25	432.129	675.24	1126.38	0	1126.38	1300.82	1300.82
29	2.39524	3146.13	-18.6998	Post-Failure Landslide	150	25	448.694	701.125	1181.89	0	1181.89	1333.76	1333.76
30	2.39524	3136.67	-18.6998	Post-Failure Landslide	150	25	447.641	699.479	1178.36	0	1178.36	1329.88	1329.88
31	2.40039	3130.52	-18.1198	Post-Failure Landslide	150	25	449.099	701.757	1183.25	0	1183.25	1330.2	1330.2
32	2.40039	3114.21	-18.1198	Post-Failure Landslide	150	25	447.273	698.904	1177.13	0	1177.13	1323.49	1323.49
33	2.40019	3091.01	-16.9772	Post-Failure Landslide	150	25	450.404	703.797	1187.62	0	1187.62	1325.13	1325.13
34	2.40019	3058.72	-16.9772	Post-Failure Landslide	150	25	446.735	698.064	1175.33	0	1175.33	1311.71	1311.71
35	2.40214	3013.19	-16.9105	Post-Failure Landslide	150	25	441.613	690.06	1158.16	0	1158.16	1292.42	1292.42
36	2.40214	2962.4	-16.9105	Post-Failure Landslide	150	25	435.842	681.043	1138.83	0	1138.83	1271.33	1271.33
37	1.93312	2338.31	-14.5321	Post-Failure Landslide	150	25	440.925	688.985	1155.85	0	1155.85	1270.15	1270.15
38	1.93312	2287.83	-14.5321	Post-Failure Landslide	150	25	433.578	677.505	1131.24	0	1131.24	1243.63	1243.63
39	1.93312	2237.35	-14.5321	Post-Failure Landslide	150	25	426.232	666.026	1106.62	0	1106.62	1217.11	1217.11
40	2.89969	3246.29	-14.5321	Post-Failure Landslide	150	25	415.585	649.389	1070.94	0	1070.94	1178.67	1178.67
41	2.89969	3083.76	-14.5321	Post-Failure Landslide	150	25	399.816	624.748	1018.1	0	1018.1	1121.74	1121.74
42	1.92957	1939.9	-11.3077	Post-Failure Landslide	150	25	397.371	620.928	1009.91	0	1009.91	1089.37	1089.37
43	1.92957	1802.73	-11.3077	Post-Failure Landslide	150	25	376.519	588.345	940.036	0	940.036	1015.32	1015.32
44	1.92957	1663.03	-11.3077	Post-Failure Landslide	150	25	355.283	555.162	868.874	0	868.874	939.917	939.917
45	1.92948	1489.66	-6.85747	Post-Failure Landslide	150	25	345.378	539.684	835.681	0	835.681	877.216	877.216
46	1.92948	1287.74	-6.85747	Post-Failure Landslide	150	25	312.825	488.817	726.598	0	726.598	764.218	764.218
47	1.92948	1085.82	-6.85747	Post-Failure Landslide	150	25	280.272	437.951	617.515	0	617.515	651.221	651.221
48	1.92163	838.643	-0.119421	Post-Failure Landslide	150	25	258.851	404.478	545.729	0	545.729	546.268	546.268
49	1.92163	506.621	-0.119421	Post-Failure Landslide	150	25	199.878	312.327	348.11	0	348.11	348.527	348.527
50	1.92163	168.874	-0.119421	Post-Failure Landslide	150	25	139.747	218.367	146.613	0	146.613	146.904	146.904

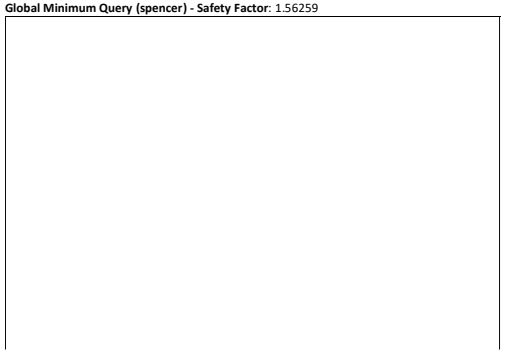
Query 1 (spencer) - Safety Factor: 1.56259



Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.60835	291.79	-56.4372	Bedrock	300	32	164.391	256.875	0	0	0	247.776	247.776
2	1.60835	875.659	-56.4372	Bedrock	300	32	255.98	399.992	160.02	0	160.02	545.844	545.844
3	3.21972	3433.54	-54.7266	Bedrock	300	32	368.266	575.448	440.808	0	440.808	961.44	961.44
4	1.79542	2865.48	-55.383	Bedrock	300	32	470.845	735.738	697.327	0	697.327	1379.42	1379.42
5	1.95008	3855.43	-53.0587	Bedrock	300	32	568.805	888.809	942.289	0	942.289	1698.73	1698.73
6	1.94903	3154.23	-44.4351	Bedrock	300	32	560.593	875.977	921.755	0	921.755	1471.4	1471.4
7	1.94903	2881.89	-44.4351	Bedrock	300	32	526.448	822.623	836.371	0	836.371	1352.54	1352.54
8	2.65313	3929.34	-38.8127	Bedrock	300	32	568.273	887.978	940.962	0	940.962	1398.07	1398.07
9	2.67896	3864.56	-33.8734	Bedrock	300	32	594.455	928.89	1006.43	0	1006.43	1405.49	1405.49
10	1.6964	2356.26	-30.662	Bedrock	300	32	602.711	941.79	1027.08	0	1027.08	1384.4	1384.4
11	1.6964	2289.31	-30.662	Bedrock	300	32	590.767	923.126	997.211	0	997.211	1347.45	1347.45
12	1.6964	2230.64	-30.662	Bedrock	300	32	580.299	906.77	971.036	0	971.036	1315.07	1315.07
13	2.25158	2857.26	-25.6439	Bedrock	300	32	602.25	941.07	1025.92	0	1025.92	1315.04	1315.04
14	2.25158	2721.59	-25.6439	Bedrock	300	32	582.618	910.393	976.833	0	976.833	1256.53	1256.53
15	2.43086	2824.93	-27.2477	Bedrock	300	32	556.552	869.663	911.651	0	911.651	1198.27	1198.27
16	2.09642	2390.07	-27.2477	Post-Failure Landslide	150	25	366.658	572.936	906.99	0	906.99	1095.81	1095.81
17	2.26398	2575.54	-28.8066	Post-Failure Landslide	150	25	359.896	562.37	884.328	0	884.328	1082.24	1082.24
18	2.26398	2578.86	-28.8066	Post-Failure Landslide	150	25	360.24	562.907	885.481	0	885.481	1083.58	1083.58
19	2.26408	2625.4	-29.4302	Post-Failure Landslide	150	25	362.56	566.532	893.257	0	893.257	1097.8	1097.8
20	2.26408	2709.09	-29.4302	Post-Failure Landslide	150	25	371.157	579.966	922.066	0	922.066	1131.46	1131.46
21	2.09451	2565.93	-26.5659	Post-Failure Landslide	150	25	389.905	609.261	984.888	0	984.888	1179.85	1179.85
22	2.09451	2608	-26.5659	Post-Failure Landslide	150	25	394.752	616.835	1001.13	0	1001.13	1198.52	1198.52
23	2.0945	2649.45	-26.4305	Post-Failure Landslide	150	25	400.125	625.232	1019.14	0	1019.14	1218.03	1218.03
24	2.0945	2695.92	-26.4305	Post-Failure Landslide	150	25	405.489	633.613	1037.11	0	1037.11	1238.67	1238.67
25	2.09377	2723.57	-21.9822	Post-Failure Landslide	150	25	429.395	670.968	1117.22	0	1117.22	1290.55	1290.55
26	2.09377	2730.65	-21.9822	Post-Failure Landslide	150	25	430.261	672.321	1120.12	0	1120.12	1293.8	1293.8
27	2.09377	2737.74	-21.9822	Post-Failure Landslide	150	25	431.127	673.674	1123.02	0	1123.02	1297.06	1297.06
28	2.09377	2745.94	-21.9822	Post-Failure Landslide	150	25	432.129	675.24	1126.38	0	1126.38	1300.82	1300.82
29	2.39524	3146.13	-18.6998	Post-Failure Landslide	150	25	448.694	701.125	1181.89	0	1181.89	1333.76	1333.76
30	2.39524	3136.67	-18.6998	Post-Failure Landslide	150	25	447.641	699.479	1178.36	0	1178.36	1329.88	1329.88
31	2.40039	3130.52	-18.1198	Post-Failure Landslide	150	25	449.099	701.757	1183.25	0	1183.25	1330.2	1330.2
32	2.40039	3114.21	-18.1198	Post-Failure Landslide	150	25	447.273	698.904	1177.13	0	1177.13	1323.49	1323.49
33	2.40019	3091.01	-16.9772	Post-Failure Landslide	150	25	450.404	703.797	1187.62	0	1187.62	1325.13	1325.13
34	2.40019	3058.72	-16.9772	Post-Failure Landslide	150	25	446.735	698.064	1175.33	0	1175.33	1311.71	1311.71
35	2.40214	3013.19	-16.9105	Post-Failure Landslide	150	25	441.613	690.06	1158.16	0	1158.16	1292.42	1292.42
36	2.40214	2962.4	-16.9105	Post-Failure Landslide	150	25	435.842	681.043	1138.83	0	1138.83	1271.33	1271.33
37	1.93312	2338.31	-14.5321	Post-Failure Landslide	150	25	440.925	688.985	1155.85	0	1155.85	1270.15	1270.15
38	1.93312	2287.83	-14.5321	Post-Failure Landslide	150	25	433.578	677.505	1131.24	0	1131.24	1243.63	1243.63
39	1.93312	2237.35	-14.5321	Post-Failure Landslide	150	25	426.232	666.026	1106.62	0	1106.62	1217.11	1217.11
40	2.89969	3246.29	-14.5321	Post-Failure Landslide	150	25	415.585	649.389	1070.94	0	1070.94	1178.67	1178.67
41	2.89969	3083.76	-14.5321	Post-Failure Landslide	150	25	399.816	624.748	1018.1	0	1018.1	1121.74	1121.74
42	1.92957	1939.9	-11.3077	Post-Failure Landslide	150	25	397.371	620.928	1009.91	0	1009.91	1089.37	1089.37
43	1.92957	1802.73	-11.3077	Post-Failure Landslide	150	25	376.519	588.345	940.036	0	940.036	1015.32	1015.32
44	1.92957	1663.03	-11.3077	Post-Failure Landslide	150	25	355.283	555.162	868.874	0	868.874	939.917	939.917
45	1.92948	1489.66	-6.85747	Post-Failure Landslide	150	25	345.378	539.684	835.681	0	835.681	877.216	877.216
46	1.92948	1287.74	-6.85747	Post-Failure Landslide	150	25	312.825	488.817	726.598	0	726.598	764.218	764.218
47	1.92948	1085.82	-6.85747	Post-Failure Landslide	150	25	280.272	437.951	617.515	0	617.515	651.221	651.221
48	1.92163	838.643	-0.119421	Post-Failure Landslide	150	25	258.851	404.478	545.729	0	545.729	546.268	546.268
49	1.92163	506.621	-0.119421	Post-Failure Landslide	150	25	199.878	312.327	348.11	0	348.11	348.527	348.527
50	1.92163	168.874	-0.119421	Post-Failure Landslide	150	25	139.747	218.367	146.613	0	146.613	146.904	146.904

Interslice Data

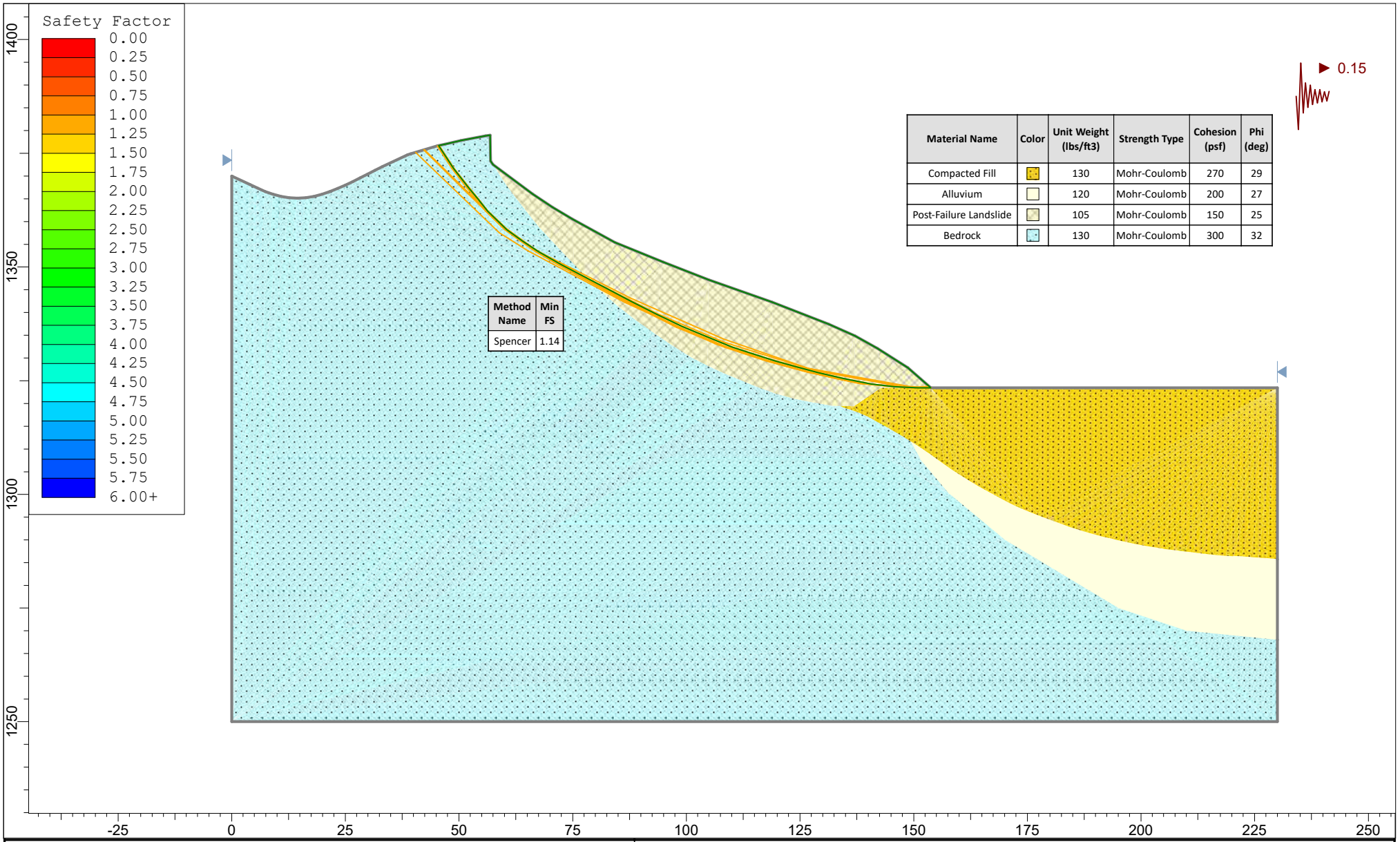
Global Minimum Query (spencer) - Safety Factor: 1.56259



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	46.2972	1376.85	0	0	0
2	47.9055	1374.43	-264.892	-114.316	23.343
3	49.5139	1372	-289.451	-124.914	23.3428
4	52.7336	1367.45	529.117	228.344	23.3429
5	54.529	1364.85	1495.89	645.561	23.3429
6	56.4791	1362.26	2828.3	1220.57	23.3429
7	58.4281	1360.35	3495.1	1508.33	23.3429
8	60.3771	1358.44	4065.4	1754.45	23.3429
9	63.0303	1356.3	4563.02	1969.2	23.3429
10	65.7092	1354.5	4777.47	2061.75	23.3429
11	67.4056	1353.5	4786.08	2065.46	23.3429
12	69.102	1352.49	4784.95	2064.97	23.3429
13	70.7984	1351.49	4775.28	2060.8	23.3429
14	73.05	1350.41	4525.65	1953.08	23.343
15	75.3016	1349.32	4267.25	1841.56	23.3429
16	77.7325	1348.07	4053.07	1749.13	23.3429
17	79.8289	1346.99	4262.17	1839.37	23.343
18	82.0929	1345.75	4546.81	1962.21	23.343
19	84.3568	1344.5	4832.12	2085.33	23.3429
20	86.6209	1343.23	5150.69	2222.81	23.3429
21	88.885	1341.95	5486.56	2367.76	23.3429
22	90.9795	1340.9	5699.84	2459.8	23.3429
23	93.074	1339.85	5919.96	2554.8	23.3429
24	95.1685	1338.81	6141.36	2650.34	23.3429
25	97.263	1337.77	6370.22	2749.11	23.3429
26	99.3568	1336.93	6413.74	2767.89	23.3429
27	101.451	1336.08	6457.9	2786.95	23.3429
28	103.544	1335.24	6502.69	2806.28	23.3429
29	105.638	1334.39	6548.21	2825.92	23.3429
30	108.033	1333.58	6429.67	2774.77	23.343
31	110.429	1332.77	6310.79	2723.46	23.3429
32	112.829	1331.98	6160.19	2658.47	23.3429
33	115.229	1331.2	6009.17	2593.3	23.343
34	117.63	1330.47	5796.34	2501.45	23.3429
35	120.03	1329.73	5583.33	2409.52	23.3429
36	122.432	1329	5366.34	2315.88	23.3429
37	124.834	1328.27	5149.12	2222.14	23.343
38	126.767	1327.77	4874.36	2103.56	23.3429
39	128.7	1327.27	4601.49	1985.8	23.3429
40	130.633	1326.77	4330.52	1868.86	23.3429
41	133.533	1326.02	3928.17	1695.23	23.343
42	136.433	1325.27	3531.91	1524.22	23.3429
43	138.362	1324.88	3153.38	1360.86	23.3429
44	140.292	1324.49	2788.2	1203.27	23.343
45	142.221	1324.11	2436.62	1051.54	23.3429
46	144.151	1323.88	1962.88	847.094	23.3429
47	146.08	1323.64	1526.76	658.884	23.343
48	148.01	1323.41	1128.26	486.906	23.3428
49	149.932	1323.41	632.096	272.785	23.3429
50	151.853	1323.4	248.682	107.32	23.3429
51	153.775	1323.4	0	0	0

Query 1 (spencer) - Safety Factor: 1.56259

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	46.2972	1376.85	0	0	0
2	47.9055	1374.43	-264.892	-114.316	23.343
3	49.5139	1372	-289.451	-124.914	23.3428
4	52.7336	1367.45	529.117	228.344	23.3429
5	54.529	1364.85	1495.89	645.561	23.3429
6	56.4791	1362.26	2828.3	1220.57	23.3429
7	58.4281	1360.35	3495.1	1508.33	23.3429
8	60.3771	1358.44	4065.4	1754.45	23.3429
9	63.0303	1356.3	4563.02	1969.2	23.3429
10	65.7092	1354.5	4777.47	2061.75	23.3429
11	67.4056	1353.5	4786.08	2065.46	23.3429
12	69.102	1352.49	4784.95	2064.97	23.3429
13	70.7984	1351.49	4775.28	2060.8	23.3429
14	73.05	1350.41	4525.65	1953.08	23.343
15	75.3016	1349.32	4267.25	1841.56	23.3429
16	77.7325	1348.07	4053.07	1749.13	23.3429
17	79.8289	1346.99	4262.17	1839.37	23.343
18	82.0929	1345.75	4546.81	1962.21	23.343
19	84.3568	1344.5	4832.12	2085.33	23.3429
20	86.6209	1343.23	5150.69	2222.81	23.3429
21	88.885	1341.95	5486.56	2367.76	23.3429
22	90.9795	1340.9	5699.84	2459.8	23.3429
23	93.074	1339.85	5919.96	2554.8	23.3429
24	95.1685	1338.81	6141.36	2650.34	23.3429
25	97.263	1337.77	6370.22	2749.11	23.3429
26	99.3568	1336.93	6413.74	2767.89	23.3429
27	101.451	1336.08	6457.9	2786.95	23.3429
28	103.544	1335.24	6502.69	2806.28	23.3429
29	105.638	1334.39	6548.21	2825.92	23.3429
30	108.033	1333.58	6429.67	2774.77	23.343
31	110.429	1332.77	6310.79	2723.46	23.3429
32	112.829	1331.98	6160.19	2658.47	23.3429
33	115.229	1331.2	6009.17	2593.3	23.343
34	117.63	1330.47	5796.34	2501.45	23.3429
35	120.03	1329.73	5583.33	2409.52	23.3429
36	122.432	1329	5366.34	2315.88	23.3429
37	124.834	1328.27	5149.12	2222.14	23.343
38	126.767	1327.77	4874.36	2103.56	23.3429
39	128.7	1327.27	4601.49	1985.8	23.3429
40	130.633	1326.77	4330.52	1868.86	23.3429
41	133.533	1326.02	3928.17	1695.23	23.343
42	136.433	1325.27	3531.91	1524.22	23.3429
43	138.362	1324.88	3153.38	1360.86	23.3429
44	140.292	1324.49	2788.2	1203.27	23.343
45	142.221	1324.11	2436.62	1051.54	23.3429
46	144.151	1323.88	1962.88	847.094	23.3429
47	146.08	1323.64	1526.76	658.884	23.343
48	148.01	1323.41	1128.26	486.906	23.3428
49	149.932	1323.41	632.096	272.785	23.3429
50	151.853	1323.4	248.682	107.32	23.3429
51	153.775	1323.4	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 5-5'; NS-1 post-failure geometry; non-circular search; pseudo		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t5ps2a.slmd
		Scale:	1:350
Project No.:	18-1245A-4	*Date:* 6/25/2018	*Figure No.:* Run No. 9

Slide Analysis Information

t5ps2a

Project Summary

File Name:	t5ps2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:08.813s
Project Title:	VTTM 60257
Analysis:	Section 5-5'; NS-1 post-failure geometry; non-circular search; pseudo
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Alluvium	Post-Failure Landslide	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	120	105	130
Cohesion [psf]	270	200	150	300
Friction Angle [°]	29	27	25	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

Global Minimums

Method: spencer

FS	1.142450
Axis Location:	152.919, 1458.297
Left Slip Surface Endpoint:	45.515, 1376.674
Right Slip Surface Endpoint:	153.775, 1323.400
Resisting Moment:	1.06968e+07 lb-ft
Driving Moment:	9.38276e+06 lb-ft
Resisting Horizontal Force:	69753.7 lb
Driving Horizontal Force:	61184.6 lb
Total Slice Area:	1155.75 ft2
Surface Horizontal Width:	108.26 ft
Surface Average Height:	10.6756 ft

Global Minimum Coordinates

Method: spencer

X	Y
45.5145	1376.67
48.7992	1371.62
52.0846	1367.48
54.1981	1364.88
56.3116	1362.25
60.5435	1358.18
64.0038	1355.64
67.4824	1353.36
72.59	1350.44
77.701	1347.79
82.8803	1345.06
88.0596	1342.31
93.5397	1339.54
99.0197	1336.9
104.501	1334.65
109.982	1332.41
114.732	1330.86
119.465	1329.33
124.197	1328.02
128.924	1326.77
134.815	1325.38
140.703	1324.22
145.818	1323.65
150.933	1323.4
153.775	1323.4

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6253
Number of Invalid Surfaces: 3804

Error Codes:

Error Code -106 reported for 5 surfaces
Error Code -108 reported for 230 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 157 surfaces
Error Code -112 reported for 58 surfaces
Error Code -114 reported for 56 surfaces
Error Code -121 reported for 871 surfaces
Error Code -124 reported for 11 surfaces
Error Code -600 reported for 7 surfaces
Error Code -1000 reported for 2408 surfaces

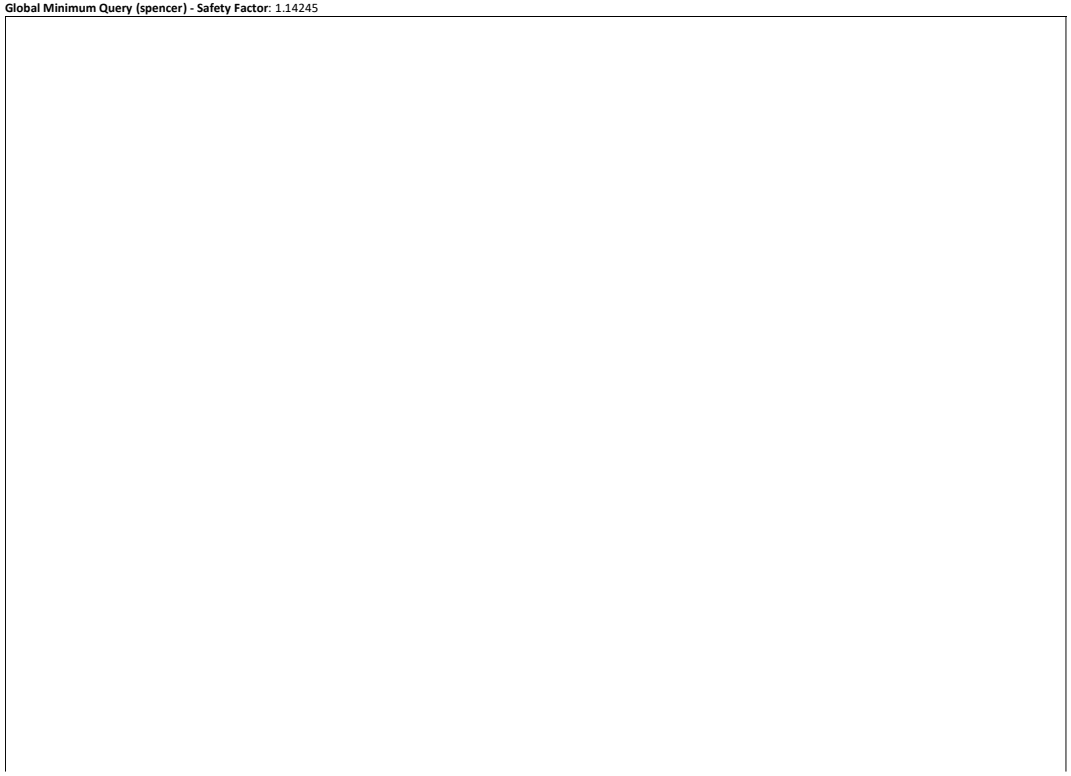
Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

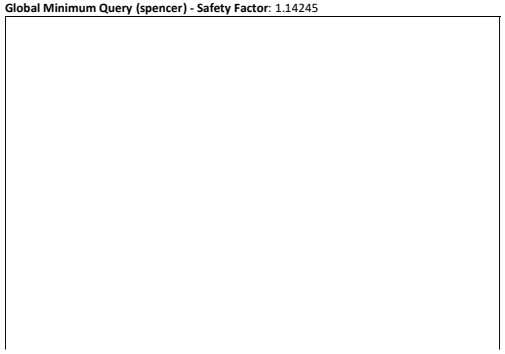
Global Minimum Query (spencer) - Safety Factor: 1.14245



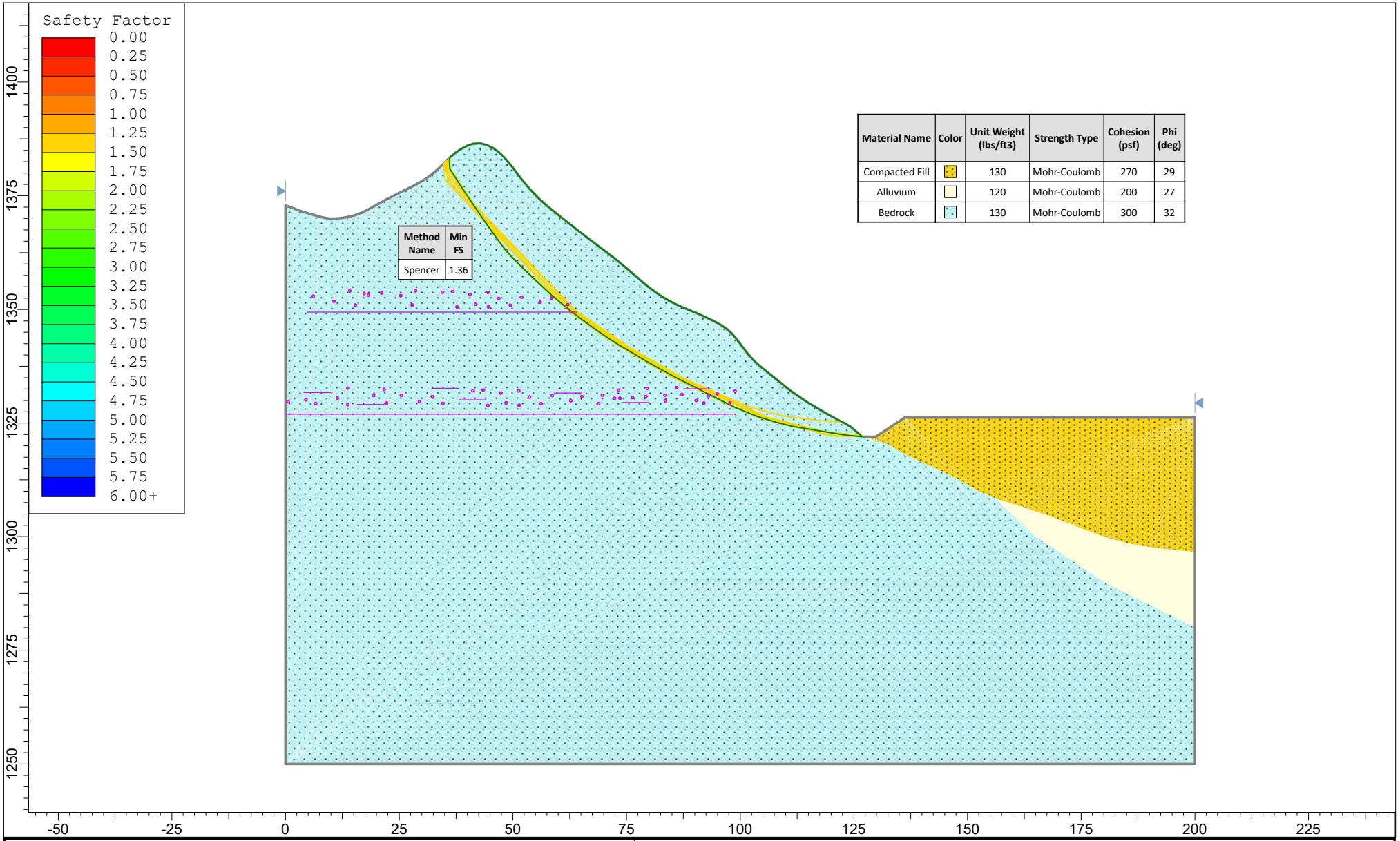
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.64235	309.428	-56.9576	Bedrock	300	32	176.288	201.4	0	0	0	271.021	271.021
2	1.64235	928.647	-56.9576	Bedrock	300	32	320.295	365.921	105.496	0	105.496	597.909	597.909
3	3.28542	3518.22	-51.6192	Bedrock	300	32	468.445	535.175	376.358	0	376.358	967.796	967.796
4	2.11346	3340.12	-50.8945	Bedrock	300	32	596.787	681.799	611.008	0	611.008	1345.21	1345.21
5	2.11344	4163.78	-51.1317	Bedrock	300	32	687.558	785.501	776.965	0	776.965	1630.03	1630.03
6	2.11598	3555.01	-43.8837	Bedrock	300	32	701.959	801.953	803.293	0	803.293	1478.42	1478.42
7	2.11598	3160.87	-43.8837	Bedrock	300	32	650.016	742.611	708.327	0	708.327	1333.49	1333.49
8	1.73017	2578.73	-36.3326	Bedrock	300	32	737.244	842.264	867.802	0	867.802	1410.01	1410.01
9	1.73017	2533.37	-36.3326	Bedrock	300	32	728.704	832.508	852.19	0	852.19	1388.12	1388.12
10	1.73925	2487.97	-33.1846	Bedrock	300	32	756.65	864.435	903.286	0	903.286	1398.13	1398.13
11	1.73925	2421.11	-33.1846	Bedrock	300	32	743.294	849.176	878.865	0	878.865	1364.98	1364.98
12	2.55381	3440.24	-29.7658	Bedrock	300	32	770.643	880.421	928.869	0	928.869	1369.61	1369.61
13	2.55381	3305.89	-29.7658	Bedrock	300	32	751.034	858.019	893.019	0	893.019	1322.54	1322.54
14	2.55551	3187.26	-27.4593	Bedrock	300	32	762.359	870.957	913.722	0	913.722	1309.89	1309.89
15	2.55551	3071.74	-27.4593	Bedrock	300	32	744.687	850.768	881.413	0	881.413	1268.4	1268.4
16	0.680677	802.029	-27.7662	Bedrock	300	32	731.648	835.871	857.571	0	857.571	1242.77	1242.77
17	2.24933	2635.59	-27.7662	Post-Failure Landslide	150	25	471.285	538.42	832.969	0	832.969	1081.09	1081.09
18	2.24933	2626.37	-27.7662	Post-Failure Landslide	150	25	470.11	537.077	830.089	0	830.089	1077.6	1077.6
19	1.72644	2011.16	-27.9799	Post-Failure Landslide	150	25	467.845	534.489	824.539	0	824.539	1073.09	1073.09
20	1.72644	2035.96	-27.9799	Post-Failure Landslide	150	25	471.947	539.176	834.59	0	834.59	1085.32	1085.32
21	1.72644	2074.32	-27.9799	Post-Failure Landslide	150	25	478.294	546.427	850.14	0	850.14	1104.24	1104.24
22	1.82668	2231.94	-26.7973	Post-Failure Landslide	150	25	492.775	562.971	885.621	0	885.621	1134.51	1134.51
23	1.82668	2265.71	-26.7973	Post-Failure Landslide	150	25	498.169	569.133	898.834	0	898.834	1150.45	1150.45
24	1.82668	2299.48	-26.7973	Post-Failure Landslide	150	25	503.562	575.294	912.047	0	912.047	1166.38	1166.38
25	1.82667	2329.35	-25.7154	Post-Failure Landslide	150	25	516.749	590.36	944.358	0	944.358	1193.22	1193.22
26	1.82667	2360.01	-25.7154	Post-Failure Landslide	150	25	521.742	596.064	956.585	0	956.585	1207.86	1207.86
27	1.82667	2392.71	-25.7154	Post-Failure Landslide	150	25	527.066	602.146	969.631	0	969.631	1223.47	1223.47
28	2.74054	3623.18	-22.3339	Post-Failure Landslide	150	25	559.148	638.799	1048.23	0	1048.23	1277.94	1277.94
29	2.74054	3640.96	-22.3339	Post-Failure Landslide	150	25	561.199	641.142	1053.26	0	1053.26	1283.81	1283.81
30	1.82703	2440.69	-22.2171	Post-Failure Landslide	150	25	564.545	644.965	1061.45	0	1061.45	1292.04	1292.04
31	1.82703	2459.49	-22.2171	Post-Failure Landslide	150	25	567.805	648.689	1069.44	0	1069.44	1301.35	1301.35
32	1.82703	2478.51	-22.2171	Post-Failure Landslide	150	25	571.102	652.456	1077.52	0	1077.52	1310.78	1310.78
33	2.37531	3226.21	-18.0375	Post-Failure Landslide	150	25	610.928	697.955	1175.09	0	1175.09	1374.04	1374.04
34	2.37531	3209.3	-18.0375	Post-Failure Landslide	150	25	608.492	695.172	1169.13	0	1169.13	1367.28	1367.28
35	2.36611	3179.51	-17.942	Post-Failure Landslide	150	25	606.919	693.375	1165.27	0	1165.27	1361.79	1361.79
36	2.36611	3160.84	-17.942	Post-Failure Landslide	150	25	604.215	690.285	1158.64	0	1158.64	1354.29	1354.29
37	2.36641	3114.62	-15.4379	Post-Failure Landslide	150	25	622.345	710.998	1203.06	0	1203.06	1374.93	1374.93
38	2.36641	3048.94	-15.4379	Post-Failure Landslide	150	25	612.373	699.606	1178.63	0	1178.63	1347.74	1347.74
39	2.36341	2976.23	-14.8391	Post-Failure Landslide	150	25	607.862	694.452	1167.58	0	1167.58	1328.63	1328.63
40	2.36341	2904.14	-14.8391	Post-Failure Landslide	150	25	596.778	681.789	1140.43	0	1140.43	1298.54	1298.54
41	1.9636	2352.13	-13.2679	Post-Failure Landslide	150	25	600.932	686.535	1150.6	0	1150.6	1292.3	1292.3
42	1.9636	2283.24	-13.2679	Post-Failure Landslide	150	25	587.794	671.525	1118.41	0	1118.41	1257.02	1257.02
43	1.9636	2199.11	-13.2679	Post-Failure Landslide	150	25	571.75	653.196	1079.11	0	1079.11	1213.93	1213.93
44	2.94387	3118.48	-11.1977	Post-Failure Landslide	150	25	568.217	649.16	1070.45	0	1070.45	1182.94	1182.94
45	2.94387	2821.79	-11.1977	Post-Failure Landslide	150	25	528.924	604.269	974.184	0	974.184	1078.89	1078.89
46	2.55761	2150.43	-6.3418	Post-Failure Landslide	150	25	523.992	598.635	962.1	0	962.1	1020.34	1020.34
47	2.55761	1797.06	-6.3418	Post-Failure Landslide	150	25	464.599	530.781	816.586	0	816.586	868.221	868.221
48	2.55765	1414.32	-2.74486	Post-Failure Landslide	150	25	425.127	485.686	719.88	0	719.88	740.262	740.262
49	2.55765	947.348	-2.74486	Post-Failure Landslide	150	25	340.468	388.968	512.467	0	512.467	528.791	528.791
50	2.84141	369.474	-0.0856471	Post-Failure Landslide	150	25	247.601	282.872	284.946	0	284.946	285.316	285.316

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.14245



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	45.5145	1376.67	0	0	0
2	47.1569	1374.15	-243.964	-153.225	32.1314
3	48.7992	1371.62	-365.885	-229.799	32.1314
4	52.0846	1367.48	179.424	112.69	32.1315
5	54.1981	1364.88	1004.12	630.653	32.1315
6	56.3116	1362.25	2208.64	1387.17	32.1315
7	58.4275	1360.22	2886.96	1813.2	32.1315
8	60.5435	1358.18	3423.13	2149.94	32.1314
9	62.2737	1356.91	3634.87	2282.93	32.1314
10	64.0038	1355.64	3834.75	2408.47	32.1315
11	65.7431	1354.5	3915.53	2459.2	32.1314
12	67.4824	1353.36	3981.79	2500.82	32.1315
13	70.0362	1351.9	3880.62	2437.28	32.1315
14	72.59	1350.44	3757.16	2359.74	32.1315
15	75.1455	1349.12	3494.73	2194.91	32.1314
16	77.701	1347.79	3217.36	2020.7	32.1313
17	78.3817	1347.43	3145.51	1975.58	32.1314
18	80.631	1346.24	3464.08	2175.67	32.1315
19	82.8803	1345.06	3780.52	2374.41	32.1315
20	84.6068	1344.14	4028.37	2530.07	32.1314
21	86.3332	1343.23	4282.05	2689.4	32.1314
22	88.0596	1342.31	4544.76	2854.4	32.1314
23	89.8863	1341.39	4793.85	3010.84	32.1314
24	91.713	1340.46	5050.31	3171.91	32.1314
25	93.5397	1339.54	5314.14	3337.62	32.1315
26	95.3663	1338.66	5547.61	3484.25	32.1314
27	97.193	1337.78	5787.28	3634.78	32.1314
28	99.0197	1336.9	6033.59	3789.48	32.1314
29	101.76	1335.78	6220.36	3906.78	32.1314
30	104.501	1334.65	6409.83	4025.78	32.1314
31	106.328	1333.9	6533.55	4103.48	32.1314
32	108.155	1333.16	6660.07	4182.95	32.1314
33	109.982	1332.41	6789.44	4264.2	32.1314
34	112.357	1331.64	6726.89	4224.92	32.1315
35	114.732	1330.86	6663	4184.79	32.1314
36	117.099	1330.1	6592.43	4140.46	32.1314
37	119.465	1329.33	6520.4	4095.23	32.1315
38	121.831	1328.68	6296.74	3954.75	32.1314
39	124.197	1328.02	6070.93	3812.93	32.1314
40	126.561	1327.4	5807.6	3647.54	32.1314
41	128.924	1326.77	5542.74	3481.19	32.1314
42	130.888	1326.31	5244.83	3294.09	32.1315
43	132.852	1325.85	4947.57	3107.39	32.1314
44	134.815	1325.38	4651.08	2921.17	32.1314
45	137.759	1324.8	4065.01	2553.08	32.1314
46	140.703	1324.22	3494.34	2194.67	32.1315
47	143.26	1323.93	2746.27	1724.83	32.1314
48	145.818	1323.65	2056.18	1291.41	32.1314
49	148.376	1323.53	1266.08	795.176	32.1313
50	150.933	1323.4	597.655	375.366	32.1315
51	153.775	1323.4	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 6-6'; NS-1 critical failure surface; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t6s1a.slmd
		Scale:	1:350
Project No.: 18-1245A-4	*Date:* 6/25/2018	*Figure No.:*	Run No. 10

Slide Analysis Information

t6s1a

Project Summary

File Name:	t6s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:08.153s
Project Title:	VTTM 60257
Analysis:	Section 6-6'; NS-1 critical failure surface; non-circular search; static
Author:	K. Callahan
Comments	
	Sterling Gateway
	Sterling Ranch Estates
	18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Bedrock
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	120	130
Cohesion [psf]	270	200	300
Friction Angle [°]	29	27	32
Tensile Strength [psf]			0
Water Surface	None	None	None
Ru Value	0	0	0

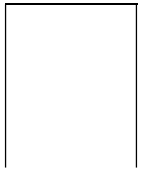
Global Minimums

Method: spencer

FS	1.358370
Axis Location:	142.710, 1443.408
Left Slip Surface Endpoint:	36.028, 1383.303
Right Slip Surface Endpoint:	126.784, 1322.000
Resisting Moment:	1.50491e+07 lb-ft
Driving Moment:	1.10815e+07 lb-ft
Resisting Horizontal Force:	100500 lb
Driving Horizontal Force:	74004.1 lb
Total Slice Area:	1265.14 ft2
Surface Horizontal Width:	90.7559 ft
Surface Average Height:	13.94 ft

Global Minimum Coordinates

Method: spencer



X	Y
36.0284	1383.3
36.0862	1380.97
38.1073	1377.85
40.1283	1374.73
42.2216	1371.67
45.3603	1367.11
48.543	1362.8
51.9888	1359.25
55.364	1356.07
58.7413	1352.9
62.1475	1350.12
64.9728	1347.95
67.7667	1345.88
70.5589	1343.97
73.3524	1342.15
76.2598	1340.43
79.1672	1338.71
82.0738	1337.03
84.9805	1335.47
89.2811	1333.27
94.0851	1330.82
98.887	1328.37
103.864	1326.41
107.673	1325.26
111.48	1324.25
115.277	1323.62
119.075	1323
122.989	1322.38
126.784	1322

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6883
Number of Invalid Surfaces: 3173

Error Codes:

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 137 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 57 surfaces
Error Code -112 reported for 33 surfaces
Error Code -114 reported for 92 surfaces
Error Code -121 reported for 1028 surfaces
Error Code -124 reported for 18 surfaces
Error Code -600 reported for 64 surfaces
Error Code -1000 reported for 1741 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.

-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

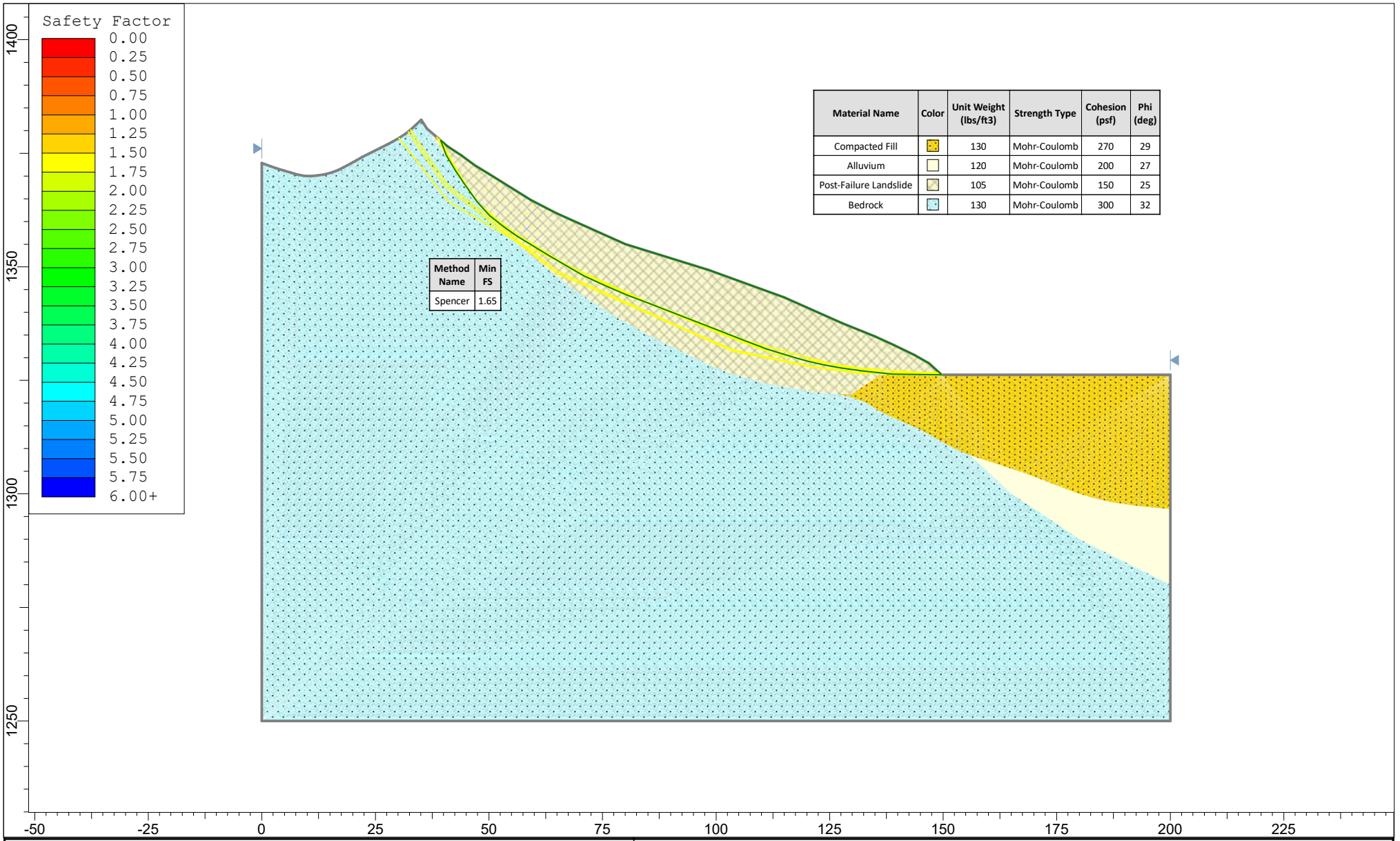
Global Minimum Query (spencer) - Safety Factor: 1.35837

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.0577755	8.97333	-88.5818	Bedrock	300	32	3.89431	5.28992	0	0	0	157.302	157.302
2	2.02108	1258.76	-57.0781	Bedrock	300	32	302.68	411.151	177.879	0	177.879	645.358	645.358
3	2.02108	2431.44	-57.0687	Bedrock	300	32	414.005	562.372	419.882	0	419.882	1059.07	1059.07
4	2.09327	3578.87	-55.5918	Bedrock	300	32	526.926	715.76	665.355	0	665.355	1434.67	1434.67
5	1.56932	3247	-55.4646	Bedrock	300	32	600.416	815.587	825.112	0	825.112	1697.57	1697.57
6	1.56932	3619.42	-55.4646	Bedrock	300	32	648.056	880.3	928.675	0	928.675	1870.35	1870.35
7	1.59139	3946.52	-53.5895	Bedrock	300	32	710.73	965.434	1064.92	0	1064.92	2028.56	2028.56
8	1.59139	4111.78	-53.5895	Bedrock	300	32	732.65	995.21	1112.57	0	1112.57	2105.93	2105.93
9	1.72287	4473.74	-45.8436	Bedrock	300	32	854.621	1160.89	1377.71	0	1377.71	2257.88	2257.88
10	1.72287	4376.49	-45.8436	Bedrock	300	32	840.334	1141.48	1346.66	0	1346.66	2212.11	2212.11
11	1.68761	4183.57	-43.2299	Bedrock	300	32	863.887	1173.48	1397.86	0	1397.86	2209.95	2209.95
12	1.68761	4114.18	-43.2299	Bedrock	300	32	852.896	1158.55	1373.96	0	1373.96	2175.72	2175.72
13	1.68866	4100.44	-43.1878	Bedrock	300	32	850.938	1155.89	1369.71	0	1369.71	2168.45	2168.45
14	1.68866	4122.26	-43.1878	Bedrock	300	32	854.396	1160.59	1377.22	0	1377.22	2179.21	2179.21
15	1.7031	4179.45	-39.2629	Bedrock	300	32	917.229	1245.94	1513.82	0	1513.82	2263.57	2263.57
16	1.7031	4188.23	-39.2629	Bedrock	300	32	918.721	1247.96	1517.06	0	1517.06	2268.03	2268.03
17	1.41264	3475.91	-37.5141	Bedrock	300	32	946.323	1285.46	1577.06	0	1577.06	2303.57	2303.57
18	1.41264	3472.14	-37.5141	Bedrock	300	32	945.523	1284.37	1575.32	0	1575.32	2301.22	2301.22
19	2.79393	6853.14	-36.5309	Bedrock	300	32	959.481	1303.33	1605.67	0	1605.67	2316.45	2316.45
20	1.39607	3412.28	-34.3828	Bedrock	300	32	991.173	1346.38	1674.55	0	1674.55	2352.79	2352.79
21	1.39607	3394.97	-34.3828	Bedrock	300	32	987.235	1341.03	1666	0	1666	2341.54	2341.54
22	1.39679	3371.85	-33.1412	Bedrock	300	32	1001.64	1360.6	1697.31	0	1697.31	2351.3	2351.3
23	1.39679	3336.39	-33.1412	Bedrock	300	32	993.389	1349.39	1679.38	0	1679.38	2327.98	2327.98
24	2.90738	6765.81	-30.5918	Bedrock	300	32	1014.4	1377.93	1725.05	0	1725.05	2324.77	2324.77
25	1.45369	3273.6	-30.5781	Bedrock	300	32	988.994	1343.42	1669.83	0	1669.83	2254.21	2254.21
26	1.45369	3201.71	-30.5781	Bedrock	300	32	972.143	1320.53	1633.18	0	1633.18	2207.61	2207.61
27	1.45333	3138.38	-30.0809	Bedrock	300	32	965.142	1311.02	1617.97	0	1617.97	2177.02	2177.02
28	1.45333	3092.16	-30.0809	Bedrock	300	32	954.202	1296.16	1594.19	0	1594.19	2146.89	2146.89
29	1.45332	3060.84	-28.2271	Bedrock	300	32	975.316	1324.84	1640.09	0	1640.09	2163.65	2163.65
30	1.45332	3044.82	-28.2271	Bedrock	300	32	971.392	1319.51	1631.56	0	1631.56	2153.01	2153.01
31	2.15031	4509.94	-27.0256	Bedrock	300	32	991.144	1346.34	1674.49	0	1674.49	2180.07	2180.07
32	2.15031	4547.67	-27.0256	Bedrock	300	32	997.526	1355.01	1688.37	0	1688.37	2197.2	2197.2
33	2.402	5139.98	-27.0256	Bedrock	300	32	1006.62	1367.36	1708.14	0	1708.14	2221.6	2221.6
34	2.402	5184.14	-27.0256	Bedrock	300	32	1013.31	1376.45	1722.68	0	1722.68	2239.55	2239.55
35	2.40097	5181.18	-27.0256	Bedrock	300	32	1013.19	1376.29	1722.43	0	1722.43	2239.25	2239.25
36	2.40097	5030.15	-27.0256	Bedrock	300	32	990.305	1345.2	1672.68	0	1672.68	2177.82	2177.82
37	2.48838	4644.86	-21.5332	Bedrock	300	32	990.93	1346.05	1674.03	0	1674.03	2065.03	2065.03
38	2.48838	3979.45	-21.5332	Bedrock	300	32	883.214	1199.73	1439.87	0	1439.87	1788.37	1788.37
39	1.90467	2728.32	-16.8064	Bedrock	300	32	880.87	1196.55	1434.78	0	1434.78	1700.83	1700.83
40	1.90467	2488.47	-16.8064	Bedrock	300	32	825.385	1121.18	1314.16	0	1314.16	1563.46	1563.46
41	1.90358	2236.68	-14.7987	Bedrock	300	32	793.039	1077.24	1243.84	0	1243.84	1453.36	1453.36
42	1.90358	1988.12	-14.7987	Bedrock	300	32	733.211	995.972	1113.79	0	1113.79	1307.5	1307.5
43	1.89859	1741.9	-9.38647	Bedrock	300	32	738.712	1003.44	1125.75	0	1125.75	1247.86	1247.86
44	1.89859	1503.21	-9.38647	Bedrock	300	32	674.436	916.133	986.02	0	986.02	1097.51	1097.51
45	1.89859	1284.87	-9.37597	Bedrock	300	32	615.745	836.409	858.434	0	858.434	960.105	960.105
46	1.89859	1084.62	-9.37597	Bedrock	300	32	561.806	763.14	741.181	0	741.181	833.945	833.945
47	1.95697	924.675	-8.97525	Bedrock	300	32	514.551	698.951	638.454	0	638.454	719.723	719.723
48	1.95697	742.03	-8.97525	Bedrock	300	32	466.42	633.571	533.826	0	533.826	607.493	607.493
49	1.89785	511.475	-5.70039	Bedrock	300	32	430.618	584.938	455.996	0	455.996	498.98	498.98
50	1.89785	181.225	-5.70039	Bedrock	300	32	326.872	444.013	230.469	0	230.469	263.098	263.098

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.35837

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	36.0284	1383.3	0	0	0
2	36.0862	1380.97	-0.225491	-0.134845	30.8797
3	38.1073	1377.85	-58.0612	-34.721	30.8797
4	40.1283	1374.73	413.558	247.311	30.8798
5	42.2216	1371.67	1341.6	802.286	30.8797
6	43.7909	1369.39	2278.83	1362.76	30.8798
7	45.3603	1367.11	3377.29	2019.65	30.8798
8	46.9516	1364.95	4541.51	2715.86	30.8798
9	48.543	1362.8	5773.59	3452.65	30.8797
10	50.2659	1361.02	6742.52	4032.08	30.8798
11	51.9888	1359.25	7681.01	4593.3	30.8797
12	53.6764	1357.66	8437.51	5045.69	30.8797
13	55.364	1356.07	9174.69	5486.53	30.8797
14	57.0527	1354.49	9905.69	5923.67	30.8797
15	58.7413	1352.9	10642.7	6364.44	30.8798
16	60.4444	1351.51	11184.6	6688.48	30.8798
17	62.1475	1350.12	11728.4	7013.69	30.8798
18	63.5601	1349.03	12099	7235.31	30.8798
19	64.9728	1347.95	12468.9	7456.47	30.8797
20	67.7667	1345.88	13105.5	7837.21	30.8798
21	69.1628	1344.93	13318.4	7964.53	30.8798
22	70.5589	1343.97	13528.7	8090.25	30.8797
23	71.9556	1343.06	13674.5	8177.42	30.8796
24	73.3524	1342.15	13815.4	8261.72	30.8798
25	76.2598	1340.43	13824.8	8267.34	30.8798
26	77.7135	1339.57	13818.3	8263.43	30.8797
27	79.1672	1338.71	13804.8	8255.38	30.8798
28	80.6205	1337.87	13761.1	8229.24	30.8797
29	82.0738	1337.03	13713.3	8200.66	30.8798
30	83.5272	1336.25	13572.3	8116.31	30.8797
31	84.9805	1335.47	13430.3	8031.4	30.8797
32	87.1308	1334.37	13131	7852.43	30.8797
33	89.2811	1333.27	12833.2	7674.33	30.8797
34	91.6831	1332.05	12502.8	7476.78	30.8798
35	94.0851	1330.82	12174.2	7280.26	30.8797
36	96.4861	1329.6	11845.7	7083.8	30.8797
37	98.887	1328.37	11511.3	6883.83	30.8797
38	101.375	1327.39	10683.7	6388.95	30.8798
39	103.864	1326.41	9894.89	5917.21	30.8797
40	105.768	1325.83	9038.84	5405.29	30.8797
41	107.673	1325.26	8219.32	4915.21	30.8797
42	109.577	1324.75	7331.92	4384.54	30.8797
43	111.48	1324.25	6493.26	3883.02	30.8798
44	113.379	1323.94	5440.98	3253.75	30.8798
45	115.277	1323.62	4467.16	2671.39	30.8797
46	117.176	1323.31	3564.65	2131.69	30.8798
47	119.075	1323	2728.03	1631.38	30.8797
48	121.032	1322.69	1916.19	1145.9	30.8798
49	122.989	1322.38	1166.42	697.525	30.8796
50	124.886	1322.19	433.756	259.389	30.8797
51	126.784	1322	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Compacted Fill		130	Mohr-Coulomb	270	29
Alluvium		120	Mohr-Coulomb	200	27
Post-Failure Landslide		105	Mohr-Coulomb	150	25
Bedrock		130	Mohr-Coulomb	300	32

Method Name	Min FS
Spencer	1.65

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 6-6'; NS-1 post-failure geometry; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t6s2a.slmd
		Scale:	1:350
Project No.:	18-1245A-4	*Date:* 6/25/2018	*Figure No.:* Run No. 11

Slide Analysis Information

t6s2a

Project Summary

File Name:	t6s2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:09.210s
Project Title:	VTTM 60257
Analysis:	Section 6-6'; NS-1 post-failure geometry; non-circular search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Post-Failure Landslide	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	120	105	130
Cohesion [psf]	270	200	150	300
Friction Angle [°]	29	27	25	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

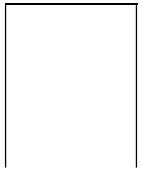
Global Minimums

Method: spencer

FS	1.646170
Axis Location:	146.171, 1462.354
Left Slip Surface Endpoint:	39.353, 1377.855
Right Slip Surface Endpoint:	149.680, 1326.200
Resisting Moment:	9.3004e+06 lb-ft
Driving Moment:	5.65104e+06 lb-ft
Resisting Horizontal Force:	61937.6 lb
Driving Horizontal Force:	37634.1 lb
Total Slice Area:	1073.14 ft2
Surface Horizontal Width:	110.327 ft
Surface Average Height:	9.72694 ft

Global Minimum Coordinates

Method: spencer



X	Y
39.3533	1377.85
40.5491	1374.64
42.5873	1371.27
44.5177	1368.36
47.3584	1364.33
50.1991	1361.21
52.9837	1359.01
56.009	1356.84
59.0373	1354.97
63.6248	1352.21
67.2255	1350.11
70.8294	1348.03
75.5692	1345.87
80.3098	1343.83
85.0504	1341.99
90.2955	1339.95
95.5407	1337.9
100.786	1335.86
106.024	1333.82
111.262	1331.84
116.485	1330.25
120.131	1329.2
123.776	1328.4
127.397	1327.72
130.332	1327.35
134.613	1326.81
138.894	1326.38
142.572	1326.32
146.251	1326.26
149.68	1326.2

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 7694
Number of Invalid Surfaces: 2365

Error Codes:

Error Code -106 reported for 6 surfaces
Error Code -108 reported for 107 surfaces
Error Code -111 reported for 20 surfaces
Error Code -112 reported for 29 surfaces
Error Code -114 reported for 23 surfaces
Error Code -121 reported for 496 surfaces
Error Code -124 reported for 6 surfaces
Error Code -600 reported for 2 surfaces
Error Code -1000 reported for 1676 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

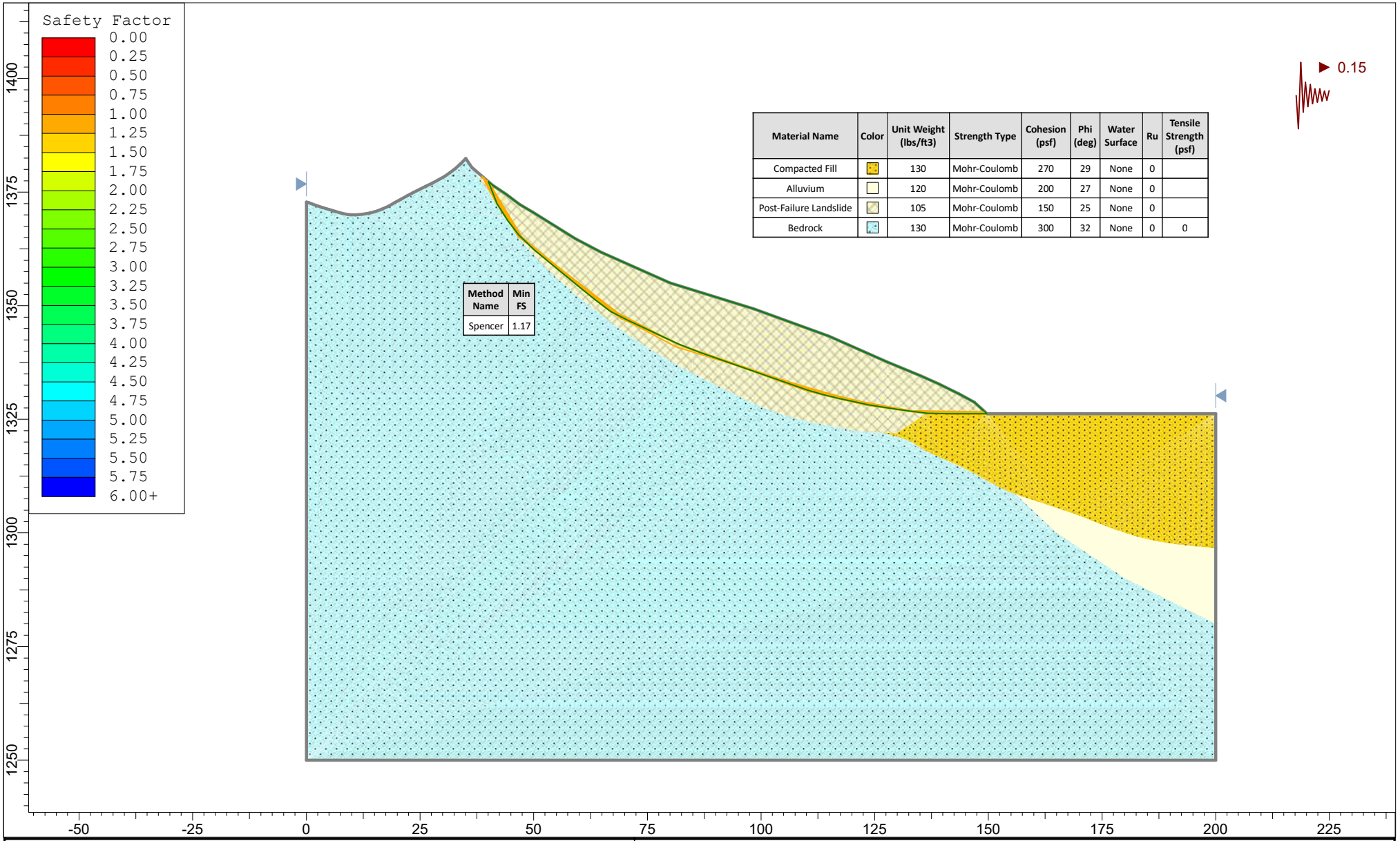
Global Minimum Query (spencer) - Safety Factor: 1.64617

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.19585	137.046	-69.5944	Post-Failure Landslide	150	25	77.6967	127.902	-47.3896	0	-47.3896	161.468	161.468
2	2.03819	671.057	-58.8506	Post-Failure Landslide	150	25	121.672	200.293	107.854	0	107.854	309.16	309.16
3	1.93039	1004.47	-56.4528	Post-Failure Landslide	150	25	154.646	254.573	224.259	0	224.259	457.485	457.485
4	2.84062	1996.66	-54.8186	Post-Failure Landslide	150	25	186.675	307.298	337.327	0	337.327	602.137	602.137
5	2.84072	2506.41	-47.646	Post-Failure Landslide	150	25	234.918	386.715	507.637	0	507.637	765.32	765.32
6	2.78465	2727.84	-38.3397	Post-Failure Landslide	150	25	279.584	460.242	665.314	0	665.314	886.43	886.43
7	3.02531	3081.55	-35.5761	Post-Failure Landslide	150	25	295.864	487.043	722.792	0	722.792	934.424	934.424
8	3.0283	3126.88	-31.7982	Post-Failure Landslide	150	25	310.605	511.309	774.83	0	774.83	967.4	967.4
9	2.29375	2386.04	-30.9705	Post-Failure Landslide	150	25	314.913	518.401	790.038	0	790.038	979.036	979.036
10	2.29375	2431.15	-30.9705	Post-Failure Landslide	150	25	319.228	525.503	805.27	0	805.27	996.858	996.858
11	1.80031	1938.59	-30.3252	Post-Failure Landslide	150	25	325.065	535.112	825.875	0	825.875	1016.02	1016.02
12	1.80031	1980.19	-30.3252	Post-Failure Landslide	150	25	330.173	543.521	843.908	0	843.908	1037.04	1037.04
13	1.80197	2027.86	-30.0156	Post-Failure Landslide	150	25	336.863	554.533	867.524	0	867.524	1062.13	1062.13
14	1.80197	2072.5	-30.0156	Post-Failure Landslide	150	25	342.36	563.583	886.932	0	886.932	1084.72	1084.72
15	2.3699	2757.49	-24.4677	Post-Failure Landslide	150	25	365.35	601.429	968.092	0	968.092	1134.34	1134.34
16	2.3699	2762.37	-24.4677	Post-Failure Landslide	150	25	365.838	602.232	969.813	0	969.813	1136.29	1136.29
17	2.37029	2760.13	-23.2381	Post-Failure Landslide	150	25	370.127	609.292	984.953	0	984.953	1143.88	1143.88
18	2.37029	2750.55	-23.2381	Post-Failure Landslide	150	25	369.155	607.692	981.522	0	981.522	1140.03	1140.03
19	2.37028	2778.15	-21.2686	Post-Failure Landslide	150	25	379.41	624.573	1017.73	0	1017.73	1165.41	1165.41
20	2.37028	2824.12	-21.2686	Post-Failure Landslide	150	25	384.182	632.429	1034.57	0	1034.57	1184.12	1184.12
21	2.62259	3178.31	-21.2686	Post-Failure Landslide	150	25	389.208	640.703	1052.32	0	1052.32	1203.82	1203.82
22	2.62259	3234.59	-21.2686	Post-Failure Landslide	150	25	394.488	649.395	1070.96	0	1070.96	1224.51	1224.51
23	1.7484	2187.66	-21.2686	Post-Failure Landslide	150	25	398.888	656.638	1086.49	0	1086.49	1241.76	1241.76
24	1.7484	2212.68	-21.2686	Post-Failure Landslide	150	25	402.408	662.432	1098.92	0	1098.92	1255.56	1255.56
25	1.7484	2237.69	-21.2686	Post-Failure Landslide	150	25	405.928	668.227	1111.34	0	1111.34	1269.35	1269.35
26	2.6226	3403.43	-21.2686	Post-Failure Landslide	150	25	410.328	675.47	1126.87	0	1126.87	1286.59	1286.59
27	2.6226	3443.86	-21.2686	Post-Failure Landslide	150	25	414.122	681.715	1140.27	0	1140.27	1301.46	1301.46
28	2.61895	3459.14	-21.2686	Post-Failure Landslide	150	25	416.007	684.818	1146.92	0	1146.92	1308.85	1308.85
29	2.61895	3479.12	-21.2686	Post-Failure Landslide	150	25	417.883	687.907	1153.54	0	1153.54	1316.21	1316.21
30	2.61894	3494.98	-20.701	Post-Failure Landslide	150	25	421.816	694.381	1167.43	0	1167.43	1326.83	1326.83
31	2.61894	3506.76	-20.701	Post-Failure Landslide	150	25	422.931	696.216	1171.36	0	1171.36	1331.18	1331.18
32	2.61186	3483.17	-16.9972	Post-Failure Landslide	150	25	437.896	720.851	1224.19	0	1224.19	1358.05	1358.05
33	2.61186	3432.51	-16.9972	Post-Failure Landslide	150	25	432.88	712.594	1206.49	0	1206.49	1338.81	1338.81
34	1.82255	2335.92	-16.0176	Post-Failure Landslide	150	25	428.75	705.796	1191.91	0	1191.91	1314.99	1314.99
35	1.82255	2280.52	-16.0176	Post-Failure Landslide	150	25	420.797	692.704	1163.83	0	1163.83	1284.63	1284.63
36	1.82254	2213.39	-12.4029	Post-Failure Landslide	150	25	426.703	702.426	1184.68	0	1184.68	1278.52	1278.52
37	1.82254	2134.56	-12.4029	Post-Failure Landslide	150	25	414.898	682.993	1143.01	0	1143.01	1234.25	1234.25
38	1.81048	2036.66	-10.5759	Post-Failure Landslide	150	25	409.915	674.79	1125.42	0	1125.42	1201.95	1201.95
39	1.81048	1947.44	-10.5759	Post-Failure Landslide	150	25	396.171	652.164	1076.89	0	1076.89	1150.86	1150.86
40	2.93496	2953.81	-7.18749	Post-Failure Landslide	150	25	390.299	642.499	1056.17	0	1056.17	1105.39	1105.39
41	2.1406	1994.05	-7.18749	Post-Failure Landslide	150	25	368.548	606.693	979.379	0	979.379	1025.86	1025.86
42	2.1406	1859	-7.18749	Post-Failure Landslide	150	25	350.221	576.524	914.685	0	914.685	958.851	958.851
43	2.1406	1711.12	-5.82686	Post-Failure Landslide	150	25	334.783	551.109	860.18	0	860.18	894.344	894.344
44	2.1406	1542.22	-5.82686	Post-Failure Landslide	150	25	311.482	512.752	777.924	0	777.924	809.711	809.711
45	1.8392	1169.84	-0.939474	Post-Failure Landslide	150	25	301.231	495.878	741.736	0	741.736	746.675	746.675
46	1.8392	1002.42	-0.939474	Post-Failure Landslide	150	25	272.661	448.846	640.879	0	640.879	645.35	645.35
47	1.83919	832.637	-0.939474	Post-Failure Landslide	150	25	243.687	401.151	538.594	0	538.594	542.59	542.59
48	1.83919	645.068	-0.939474	Post-Failure Landslide	150	25	211.678	348.458	425.594	0	425.594	429.065	429.065
49	1.7148	407.865	-0.939474	Post-Failure Landslide	150	25	176.247	290.133	300.516	0	300.516	303.407	303.407
50	1.7148	138.65	-0.939474	Post-Failure Landslide	150	25	126.916	208.925	126.365	0	126.365	128.447	128.447

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.64617

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	39.3533	1377.85	0	0	0
2	40.5491	1374.64	-245.111	-94.5277	21.0893
3	42.5873	1371.27	-129.024	-49.7583	21.0892
4	44.5177	1368.36	225.781	87.0732	21.0893
5	47.3584	1364.33	1055.61	407.097	21.0892
6	50.1991	1361.21	1971.08	760.152	21.0893
7	52.9837	1359.01	2658.95	1025.43	21.0892
8	56.009	1356.84	3329.35	1283.97	21.0892
9	59.0373	1354.97	3844.91	1482.8	21.0893
10	61.3311	1353.59	4211.25	1624.08	21.0893
11	63.6248	1352.21	4588.68	1769.64	21.0893
12	65.4252	1351.16	4874.06	1879.69	21.0892
13	67.2255	1350.11	5169.25	1993.54	21.0893
14	69.0274	1349.07	5466.27	2108.08	21.0893
15	70.8294	1348.03	5773.59	2226.6	21.0893
16	73.1993	1346.95	5953.06	2295.81	21.0892
17	75.5692	1345.87	6133.23	2365.3	21.0893
18	77.9395	1344.85	6259.72	2414.08	21.0893
19	80.3098	1343.83	6385	2462.39	21.0892
20	82.6801	1342.91	6426.05	2478.22	21.0892
21	85.0504	1341.99	6471.35	2495.69	21.0892
22	87.6729	1340.97	6526.42	2516.93	21.0893
23	90.2955	1339.95	6586.69	2540.17	21.0892
24	92.0439	1339.27	6629.76	2556.79	21.0893
25	93.7923	1338.59	6675.15	2574.29	21.0893
26	95.5407	1337.9	6722.84	2592.68	21.0893
27	98.1633	1336.88	6798.72	2621.94	21.0892
28	100.786	1335.86	6878.34	2652.65	21.0893
29	103.405	1334.84	6959.7	2684.03	21.0893
30	106.024	1333.82	7042.9	2716.11	21.0892
31	108.643	1332.83	7095.23	2736.29	21.0892
32	111.262	1331.84	7148.54	2756.85	21.0892
33	113.874	1331.05	6983.93	2693.37	21.0893
34	116.485	1330.25	6818.26	2629.48	21.0893
35	118.308	1329.72	6661.65	2569.08	21.0892
36	120.131	1329.2	6504.82	2508.6	21.0893
37	121.953	1328.8	6203.14	2392.26	21.0893
38	123.776	1328.4	5906.25	2277.76	21.0893
39	125.586	1328.06	5545.66	2138.7	21.0893
40	127.397	1327.72	5193.51	2002.89	21.0893
41	130.332	1327.35	4440.65	1712.55	21.0893
42	132.472	1327.08	3917.31	1510.72	21.0893
43	134.613	1326.81	3415.68	1317.26	21.0892
44	136.753	1326.6	2888.03	1113.78	21.0893
45	138.894	1326.38	2392.22	922.567	21.0893
46	140.733	1326.35	1861.41	717.857	21.0892
47	142.572	1326.32	1380.02	532.209	21.0893
48	144.411	1326.29	948.757	365.891	21.0893
49	146.251	1326.26	572.866	220.927	21.0892
50	147.965	1326.23	279.545	107.807	21.0892
51	149.68	1326.2	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 6-6'; NS-1 post-failure geometry; non-circular search; pseudo		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t6ps2a.slmd
		Scale:	1:350
Project No.:	18-1245A-4	*Date:* 6/25/2018	*Figure No.:* Run No. 12

Slide Analysis Information

t6ps2a

Project Summary

File Name:	t6ps2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:07.929s
Project Title:	VTTM 60257
Analysis:	Section 6-6'; NS-1 post-failure geometry; non-circular search; pseudo
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Alluvium	Post-Failure Landslide	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	120	105	130
Cohesion [psf]	270	200	150	300
Friction Angle [°]	29	27	25	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

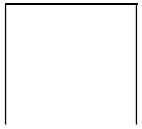
Global Minimums

Method: spencer

FS	1.166800
Axis Location:	145.937, 1461.430
Left Slip Surface Endpoint:	39.999, 1377.297
Right Slip Surface Endpoint:	149.680, 1326.200
Resisting Moment:	9.30771e+06 lb-ft
Driving Moment:	7.98603e+06 lb-ft
Resisting Horizontal Force:	62394.7 lb
Driving Horizontal Force:	53534.7 lb
Total Slice Area:	1137.22 ft2
Surface Horizontal Width:	109.681 ft
Surface Average Height:	10.3684 ft

Global Minimum Coordinates

Method: spencer



X	Y
39.9993	1377.3
41.9215	1372.44
44.3095	1368.72
46.6983	1365.61
50.0214	1362.36
53.3457	1359.63
56.6601	1356.91
59.9744	1354.19
63.4346	1351.35
66.8954	1348.71
70.6139	1346.86
74.3327	1345.11
78.0514	1343.36
81.7702	1341.61
86.4902	1339.74
91.2107	1338.08
95.9309	1336.43
100.651	1334.77
105.371	1333.11
110.084	1331.46
113.75	1330.42
117.416	1329.54
120.56	1328.84
123.704	1328.16
128.029	1327.5
132.354	1326.84
136.679	1326.33
141.533	1326.2
146.388	1326.2
149.68	1326.2

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6909
Number of Invalid Surfaces: 3147

Error Codes:

Error Code -106 reported for 2 surfaces
Error Code -108 reported for 175 surfaces
Error Code -111 reported for 122 surfaces
Error Code -112 reported for 46 surfaces
Error Code -114 reported for 20 surfaces
Error Code -121 reported for 561 surfaces
Error Code -124 reported for 9 surfaces
Error Code -600 reported for 6 surfaces
Error Code -1000 reported for 2206 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

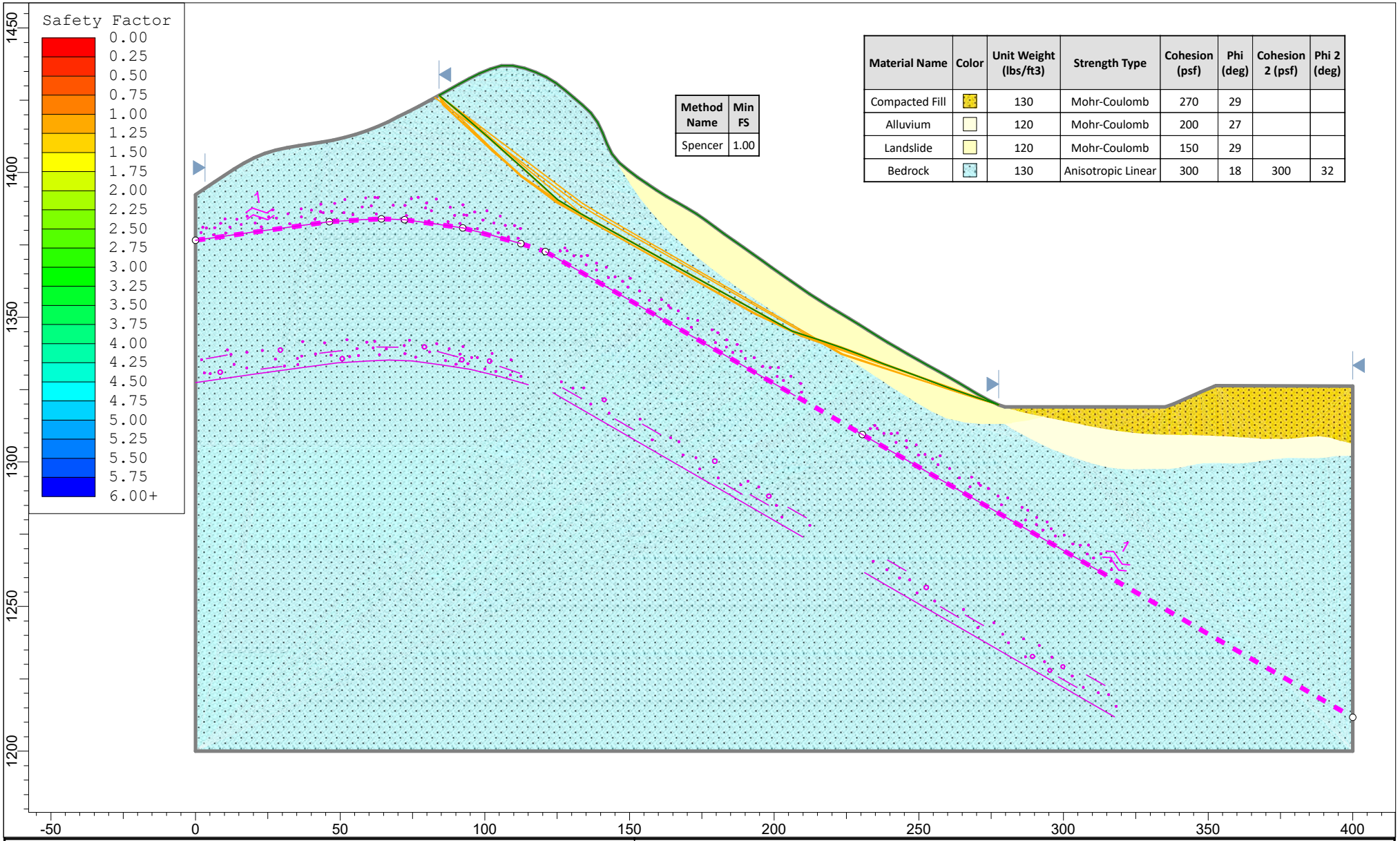
Global Minimum Query (spencer) - Safety Factor: 1.1668

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.92227	333.989	-68.3888	Post-Failure Landslide	150	25	109.849	128.172	-46.8108	0	-46.8108	230.478	230.478
2	2.38792	1122.69	-57.3257	Post-Failure Landslide	150	25	183.237	213.802	136.823	0	136.823	422.526	422.526
3	2.3888	1551.98	-52.4521	Post-Failure Landslide	150	25	230.563	269.021	255.24	0	255.24	555.196	555.196
4	3.32312	2595.79	-44.388	Post-Failure Landslide	150	25	285.815	333.489	393.493	0	393.493	673.266	673.266
5	1.66215	1434.86	-39.3908	Post-Failure Landslide	150	25	324.801	378.978	491.046	0	491.046	757.753	757.753
6	1.66215	1492.14	-39.3908	Post-Failure Landslide	150	25	333.078	388.635	511.756	0	511.756	785.259	785.259
7	1.65721	1544.73	-39.3908	Post-Failure Landslide	150	25	341.342	398.278	532.433	0	532.433	812.722	812.722
8	1.65721	1601.67	-39.3908	Post-Failure Landslide	150	25	349.595	407.907	553.083	0	553.083	840.149	840.149
9	1.65716	1658.55	-39.3908	Post-Failure Landslide	150	25	357.846	417.535	573.734	0	573.734	867.575	867.575
10	1.65716	1718.92	-39.3908	Post-Failure Landslide	150	25	366.598	427.746	595.629	0	595.629	896.657	896.657
11	1.73006	1883.37	-39.3908	Post-Failure Landslide	150	25	378.929	442.134	626.483	0	626.483	937.636	937.636
12	1.73006	1978.56	-39.3908	Post-Failure Landslide	150	25	392.143	457.553	659.548	0	659.548	981.553	981.553
13	1.73041	2065.42	-37.3359	Post-Failure Landslide	150	25	415.656	484.988	718.384	0	718.384	1035.44	1035.44
14	1.73041	2157.49	-37.3359	Post-Failure Landslide	150	25	428.87	500.406	751.448	0	751.448	1078.59	1078.59
15	1.85928	2380.81	-26.4629	Post-Failure Landslide	150	25	507.125	591.714	947.257	0	947.257	1199.69	1199.69
16	1.85928	2399.32	-26.4629	Post-Failure Landslide	150	25	510.065	595.144	954.614	0	954.614	1208.51	1208.51
17	1.85939	2413.05	-25.2052	Post-Failure Landslide	150	25	521.126	608.05	982.292	0	982.292	1227.57	1227.57
18	1.85939	2421.73	-25.2052	Post-Failure Landslide	150	25	522.531	609.689	985.806	0	985.806	1231.75	1231.75
19	1.85932	2430.3	-25.2052	Post-Failure Landslide	150	25	523.936	611.329	989.325	0	989.325	1235.93	1235.93
20	1.85932	2438.97	-25.2052	Post-Failure Landslide	150	25	525.342	612.969	992.839	0	992.839	1240.1	1240.1
21	3.7188	4926.47	-25.2052	Post-Failure Landslide	150	25	529.255	617.535	1002.63	0	1002.63	1251.74	1251.74
22	2.36002	3207.31	-21.5755	Post-Failure Landslide	150	25	567.444	662.094	1098.19	0	1098.19	1322.58	1322.58
23	2.36002	3256.5	-21.5755	Post-Failure Landslide	150	25	574.097	669.856	1114.83	0	1114.83	1341.85	1341.85
24	2.36023	3292.94	-19.3337	Post-Failure Landslide	150	25	597.549	697.22	1173.52	0	1173.52	1383.17	1383.17
25	2.36023	3316.06	-19.3337	Post-Failure Landslide	150	25	600.79	701.002	1181.63	0	1181.63	1392.42	1392.42
26	2.36013	3339.04	-19.3337	Post-Failure Landslide	150	25	604.032	704.785	1189.74	0	1189.74	1401.67	1401.67
27	2.36013	3362.16	-19.3337	Post-Failure Landslide	150	25	607.274	708.567	1197.85	0	1197.85	1410.92	1410.92
28	2.36019	3385.37	-19.3337	Post-Failure Landslide	150	25	610.515	712.349	1205.96	0	1205.96	1420.16	1420.16
29	2.36019	3394.34	-19.3337	Post-Failure Landslide	150	25	611.772	713.816	1209.11	0	1209.11	1423.75	1423.75
30	2.36006	3387.91	-19.3337	Post-Failure Landslide	150	25	610.898	712.796	1206.92	0	1206.92	1421.26	1421.26
31	2.36006	3381.68	-19.3337	Post-Failure Landslide	150	25	610.024	711.776	1204.73	0	1204.73	1418.76	1418.76
32	2.35643	3370.25	-19.3337	Post-Failure Landslide	150	25	609.15	710.756	1202.55	0	1202.55	1416.27	1416.27
33	2.35643	3364.03	-19.3337	Post-Failure Landslide	150	25	608.276	709.737	1200.36	0	1200.36	1413.78	1413.78
34	1.83281	2600.18	-15.7809	Post-Failure Landslide	150	25	636.94	743.182	1272.08	0	1272.08	1452.09	1452.09
35	1.83281	2572.35	-15.7809	Post-Failure Landslide	150	25	631.617	736.971	1258.76	0	1258.76	1437.27	1437.27
36	1.83286	2535.35	-13.5396	Post-Failure Landslide	150	25	645.268	752.899	1292.92	0	1292.92	1448.31	1448.31
37	1.83286	2469.21	-13.5396	Post-Failure Landslide	150	25	632.144	737.586	1260.08	0	1260.08	1412.31	1412.31
38	3.14432	4058.82	-12.6331	Post-Failure Landslide	150	25	619.828	723.215	1229.26	0	1229.26	1368.18	1368.18
39	3.14432	3824.13	-12.1664	Post-Failure Landslide	150	25	596.329	695.797	1170.46	0	1170.46	1299.03	1299.03
40	2.16234	2475.45	-8.64119	Post-Failure Landslide	150	25	600.353	700.492	1180.53	0	1180.53	1271.77	1271.77
41	2.16234	2331.3	-8.64119	Post-Failure Landslide	150	25	574.012	669.757	1114.62	0	1114.62	1201.85	1201.85
42	2.16243	2199.05	-8.64119	Post-Failure Landslide	150	25	549.829	641.541	1054.11	0	1054.11	1137.67	1137.67
43	2.16243	2073.92	-8.64119	Post-Failure Landslide	150	25	526.966	614.864	996.905	0	996.905	1076.99	1076.99
44	2.16252	1940.51	-6.72377	Post-Failure Landslide	150	25	517.099	603.351	972.213	0	972.213	1033.18	1033.18
45	2.16252	1792.22	-6.72377	Post-Failure Landslide	150	25	489.085	570.664	902.119	0	902.119	959.779	959.779
46	4.85432	3300.94	-1.56639	Post-Failure Landslide	150	25	462.851	540.055	836.475	0	836.475	849.132	849.132
47	2.42731	1219.53	-0.0149678	Post-Failure Landslide	150	25	392.36	457.806	660.093	0	660.093	660.195	660.195
48	2.42731	891.425	-0.0149678	Post-Failure Landslide	150	25	329.951	384.987	503.932	0	503.932	504.019	504.019
49	1.64626	385.196	-0.0149678	Post-Failure Landslide	150	25	268.423	313.196	349.974	0	349.974	350.045	350.045
50	1.64626	130.083	-0.0149678	Post-Failure Landslide	150	25	211.391	246.65	207.268	0	207.268	207.323	207.323

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.1668

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	39.9993	1377.3	0	0	0
2	41.9215	1372.44	-388.996	-198.614	27.048
3	44.3095	1368.72	-150.37	-76.7762	27.048
4	46.6983	1365.61	322.816	164.824	27.048
5	50.0214	1362.36	1038.8	530.392	27.048
6	51.6835	1361	1382.34	705.795	27.0479
7	53.3457	1359.63	1748.92	892.967	27.048
8	55.0029	1358.27	2137.37	1091.3	27.048
9	56.6601	1356.91	2548.73	1301.33	27.0479
10	58.3173	1355.55	2982.98	1523.05	27.0479
11	59.9744	1354.19	3441.53	1757.18	27.048
12	61.7045	1352.77	3956	2019.86	27.048
13	63.4346	1351.35	4508.77	2302.09	27.048
14	65.165	1350.03	5044.84	2575.8	27.048
15	66.8954	1348.71	5615.42	2867.13	27.048
16	68.7547	1347.78	5902.79	3013.85	27.048
17	70.6139	1346.86	6194.27	3162.67	27.0479
18	72.4733	1345.98	6443.28	3289.81	27.0479
19	74.3327	1345.11	6694.04	3417.85	27.048
20	76.192	1344.23	6946.55	3546.78	27.048
21	78.0514	1343.36	7200.82	3676.6	27.048
22	81.7702	1341.61	7719.16	3941.25	27.048
23	84.1302	1340.67	7880.9	4023.84	27.048
24	86.4902	1339.74	8049.8	4110.08	27.048
25	88.8504	1338.91	8099.88	4135.64	27.048
26	91.2107	1338.08	8152.46	4162.49	27.048
27	93.5708	1337.25	8207.54	4190.61	27.048
28	95.9309	1336.43	8265.13	4220.02	27.048
29	98.2911	1335.6	8325.23	4250.7	27.048
30	100.651	1334.77	8386.29	4281.88	27.048
31	103.011	1333.94	8446.68	4312.72	27.048
32	105.371	1333.11	8506.4	4343.2	27.048
33	107.728	1332.29	8565.34	4373.3	27.048
34	110.084	1331.46	8623.62	4403.05	27.048
35	111.917	1330.94	8500.77	4340.33	27.048
36	113.75	1330.42	8376.64	4276.95	27.048
37	115.583	1329.98	8140.46	4156.36	27.048
38	117.416	1329.54	7904.02	4035.64	27.048
39	120.56	1328.84	7422.89	3789.99	27.048
40	123.704	1328.16	6907.87	3527.02	27.0479
41	125.867	1327.83	6364.08	3249.38	27.048
42	128.029	1327.5	5834.18	2978.82	27.048
43	130.191	1327.17	5317.01	2714.76	27.048
44	132.354	1326.84	4811.9	2456.86	27.0479
45	134.516	1326.59	4228.4	2158.94	27.048
46	136.679	1326.33	3665.59	1871.58	27.048
47	141.533	1326.2	2016.49	1029.58	27.048
48	143.96	1326.2	1243.88	635.103	27.048
49	146.388	1326.2	574.011	293.079	27.048
50	148.034	1326.2	188.387	96.1869	27.048
51	149.68	1326.2	0	0	0



Method Name	Min FS
Spencer	1.00

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Landslide		120	Mohr-Coulomb	150	29		
Bedrock		130	Anisotropic Linear	300	18	300	32

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 7-7'; non-circular search; bedding plane; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t7s1a.slmd
		Scale:	1:550
Project No.:	18-1245A-4	*Date:* 6/25/2018	*Figure No.:* Run No. 13

Slide Analysis Information

t7s1a

Project Summary

File Name:	t7s1a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257
Analysis:	Section 7-7'; non-circular search; bedding plane; static
Author:	K. Callahan
Comments	
	Sterling Gateway
	Sterling Ranch Estates
	18-1245A-4

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Planar - static	Master Scenario	Spencer: 0.922335	00h:00m:13.937s
	Cuckoo search	Spencer: 0.922335	00h:00m:13.872s
	Cuckoo search thru toe	Spencer: 1.001390	00h:00m:12.121s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

All Open Scenarios	
Search Method:	Cuckoo Search
Initial # of Surface Vertices:	20
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation [ft]:	1230
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

All Open Scenarios	
Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Landslide	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	130
Cohesion [psf]	270	200	150	
Friction Angle [°]	29	27	29	
Cohesion 1 [psf]				300
Cohesion 2 [psf]				300
Friction Angle 1 [°]				18
Friction Angle 2 [°]				32
A [°]				1
B [°]				1
Anisotropic Definition				Surface
Angle from 1 [°]				
Anisotropic Surface				Assigned per scenario
Tensile Strength [psf]				0
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Ru Value	0	0	0	0

Materials In Use

Material	Master Scenario	Cuckoo search	Cuckoo search thru toe
Compacted Fill	✓	✓	✓
Alluvium	✓	✓	✓
Landslide	✓	✓	✓
Bedrock	✓	✓	✓

Global Minimums

Planar - static - Master Scenario		Planar - static - Cuckoo search		Planar - static - Cuckoo search thru toe	
Method: spencer		**Method: spencer**		**Method: spencer**	
FS	**0.922335**	**FS**	**0.922335**	**FS**	**1.001390**
Axis Location:	254.193, 1511.542	Axis Location:	254.193, 1511.542	Axis Location:	287.869, 1566.639
Left Slip Surface Endpoint:	107.634, 1436.924	Left Slip Surface Endpoint:	107.634, 1436.924	Left Slip Surface Endpoint:	84.152, 1426.673
Right Slip Surface Endpoint:	225.952, 1349.523	Right Slip Surface Endpoint:	225.952, 1349.523	Right Slip Surface Endpoint:	277.611, 1319.685
Resisting Moment:	2.16443e+07 lb-ft	Resisting Moment:	2.16443e+07 lb-ft	Resisting Moment:	5.52278e+07 lb-ft
Driving Moment:	2.34702e+07 lb-ft	Driving Moment:	2.34702e+07 lb-ft	Driving Moment:	5.51513e+07 lb-ft
Resisting Horizontal Force:	101200 lb	Resisting Horizontal Force:	101200 lb	Resisting Horizontal Force:	197726 lb
Driving Horizontal Force:	109737 lb	Driving Horizontal Force:	109737 lb	Driving Horizontal Force:	197452 lb
Total Slice Area:	1951.43 ft2	Total Slice Area:	1951.43 ft2	Total Slice Area:	3561.83 ft2
Surface Horizontal Width:	118.318 ft	Surface Horizontal Width:	118.318 ft	Surface Horizontal Width:	193.459 ft
Surface Average Height:	16.4931 ft	Surface Average Height:	16.4931 ft	Surface Average Height:	18.4113 ft

Global Minimum Coordinates

Planar - static - Master Scenario		Planar - static - Cuckoo search		Planar - static - Cuckoo search thru toe	
Method: spencer		**Method: spencer**		**Method: spencer**	
X	**Y**	**X**	**Y**	**X**	**Y**
107.634	1436.92	107.634	1436.92	84.1518	1426.67
107.807	1431.5	107.807	1431.5	89.2531	1422.57
110.585	1426.36	110.585	1426.36	94.3543	1418.19
112.766	1422.33	112.766	1422.33	102.556	1410.86
115.056	1418.41	115.056	1418.41	107.573	1406.46
117.346	1414.49	117.346	1414.49	112.59	1402.04
119.781	1410.31	119.781	1410.31	118.851	1396.35
122.849	1405.72	122.849	1405.72	125.111	1390.64
125.886	1401.59	125.886	1401.59	133.328	1385.71
128.904	1397.58	128.904	1397.58	141.699	1381.03
131.887	1393.62	131.887	1393.62	148.398	1377.29
134.956	1389.88	134.956	1389.88	155.097	1373.55
139.691	1387.03	139.691	1387.03	161.407	1370.05
144.426	1384.25	144.426	1384.25	167.718	1366.54
149.476	1381.36	149.476	1381.36	173.4	1363.39
153.707	1379.01	153.707	1379.01	179.422	1360.05
158.103	1376.58	158.103	1376.58	185.444	1356.7
163.143	1373.78	163.143	1373.78	192.281	1352.91
167.051	1371.62	167.051	1371.62	199.309	1349.02
170.958	1369.45	170.958	1369.45	206.336	1345.12
175.576	1366.89	175.576	1366.89	215.111	1342.27
180.224	1364.31	180.224	1364.31	223.887	1339.21
186.225	1360.99	186.225	1360.99	230.585	1336.72
190.047	1359.5	190.047	1359.5	237.693	1333.91
193.857	1358.12	193.857	1358.12	247.608	1330.28
198.211	1356.59	198.211	1356.59	253.969	1327.93
202.579	1355.07	202.579	1355.07	260.33	1325.59
209.373	1352.79	209.373	1352.79	268.971	1322.55
215.312	1351.42	215.312	1351.42	277.611	1319.69
221.069	1350.09	221.069	1350.09		
225.952	1349.52	225.952	1349.52		

Valid/Invalid Surfaces

Planar - static - Master Scenario	Planar - static - Cuckoo search	Planar - static - Cuckoo search thru toe
Method: spencer	**Method: spencer**	**Method: spencer**
Number of Valid Surfaces: 8680	Number of Valid Surfaces: 8680	Number of Valid Surfaces: 4987
Number of Invalid Surfaces: 1381	Number of Invalid Surfaces: 1381	Number of Invalid Surfaces: 5075
Error Codes:	**Error Codes:**	**Error Codes:**
Error Code -106 reported for 11 surfaces	Error Code -106 reported for 11 surfaces	Error Code -114 reported for 16 surfaces
Error Code -108 reported for 64 surfaces	Error Code -108 reported for 64 surfaces	Error Code -121 reported for 4157 surfaces
Error Code -109 reported for 4 surfaces	Error Code -109 reported for 4 surfaces	Error Code -124 reported for 1 surface
Error Code -111 reported for 42 surfaces	Error Code -111 reported for 42 surfaces	Error Code -1000 reported for 901 surfaces
Error Code -112 reported for 1 surface	Error Code -112 reported for 1 surface	
Error Code -114 reported for 33 surfaces	Error Code -114 reported for 33 surfaces	
Error Code -121 reported for 835 surfaces	Error Code -121 reported for 835 surfaces	
Error Code -124 reported for 12 surfaces	Error Code -124 reported for 12 surfaces	
Error Code -600 reported for 2 surfaces	Error Code -600 reported for 2 surfaces	
Error Code -1000 reported for 376 surfaces	Error Code -1000 reported for 376 surfaces	

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

Planar - static - Cuckoo search thru toe

Global Minimum Query (spencer) - Safety Factor: 1.00139

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	5.10122	2317.85	-38.7982	Bedrock	300	32	438.318	438.927	222.33	0	222.33	574.723	574.723
2	5.10122	7029.01	-40.6635	Bedrock	300	32	776.719	777.799	764.639	0	764.639	1431.86	1431.86
3	4.1011	9084.78	-41.7951	Bedrock	300	32	1072.01	1073.5	1237.86	0	1237.86	2196.18	2196.18
4	4.1011	12017.4	-41.7951	Bedrock	300	32	1336.79	1338.65	1662.18	0	1662.18	2857.2	2857.2
5	5.01686	18236.1	-41.2577	Bedrock	300	32	1613.83	1616.07	2106.16	0	2106.16	3521.83	3521.83
6	5.01686	21205.2	-41.3798	Bedrock	300	32	1831.15	1833.7	2454.43	0	2454.43	4067.66	4067.66
7	3.13018	14350.1	-42.2681	Bedrock	300	32	1931.82	1934.51	2615.76	0	2615.76	4371.62	4371.62
8	3.13018	15060	-42.2681	Bedrock	300	32	2015	2017.8	2749.05	0	2749.05	4580.51	4580.51
9	3.13018	15648.7	-42.363	Bedrock	300	32	2080.19	2083.08	2853.51	0	2853.51	4750.52	4750.52
10	3.13018	16081.5	-42.363	Bedrock	300	32	2130.79	2133.75	2934.62	0	2934.62	4877.78	4877.78
11	4.10858	21087.9	-30.9522	Bedrock	300	32	2630.57	2634.23	3735.55	0	3735.55	5313.18	5313.18
12	4.10858	20553.6	-30.9522	Bedrock	300	18	1516.36	1518.47	3750.08	0	3750.08	4659.48	4659.48
13	4.18537	20252.3	-29.2128	Bedrock	300	18	1508.25	1510.35	3725.07	0	3725.07	4568.45	4568.45
14	4.18537	18272.1	-29.2128	Bedrock	300	18	1389.36	1391.29	3358.65	0	3358.65	4135.54	4135.54
15	3.34949	12033.7	-29.1639	Bedrock	300	18	1195.8	1197.46	2762.09	0	2762.09	3429.42	3429.42
16	3.34949	10856.5	-29.1639	Bedrock	300	18	1107.42	1108.96	2489.72	0	2489.72	3107.72	3107.72
17	3.34949	10334.6	-29.1639	Bedrock	300	18	1068.24	1069.72	2368.96	0	2368.96	2965.09	2965.09
18	3.34949	9992.64	-29.1639	Bedrock	300	18	1042.57	1044.02	2289.85	0	2289.85	2871.65	2871.65
19	3.15528	9176.15	-29.0431	Bedrock	300	18	1025.1	1026.53	2236.02	0	2236.02	2805.26	2805.26
20	3.15528	8998.3	-29.0431	Bedrock	300	18	1010.91	1012.31	2192.27	0	2192.27	2753.62	2753.62
21	3.15528	8869.86	-29.0431	Bedrock	300	18	1000.65	1002.04	2160.66	0	2160.66	2716.32	2716.32
22	3.15528	8789.12	-29.0431	Bedrock	300	18	994.207	995.589	2140.8	0	2140.8	2692.88	2692.88
23	5.68231	15666	-29.0183	Bedrock	300	18	987.297	988.669	2119.5	0	2119.5	2667.18	2667.18
24	3.01106	8129.47	-29.0385	Bedrock	300	18	972.682	974.034	2074.46	0	2074.46	2614.48	2614.48
25	3.01106	7927.53	-29.0385	Bedrock	300	18	955.788	957.117	2022.4	0	2022.4	2553.04	2553.04
26	3.01106	7712.41	-29.0385	Bedrock	300	18	937.79	939.094	1966.93	0	1966.93	2487.58	2487.58
27	3.01106	7521.96	-29.0385	Bedrock	300	18	921.858	923.139	1917.82	0	1917.82	2429.63	2429.63
28	3.41816	8332.63	-29.0274	Bedrock	300	18	906.767	908.027	1871.31	0	1871.31	2374.51	2374.51
29	3.41816	8112	-29.0274	Bedrock	300	18	890.504	891.742	1821.2	0	1821.2	2315.37	2315.37
30	3.51387	8097.37	-29.0004	Bedrock	300	18	873.434	874.648	1768.58	0	1768.58	2252.74	2252.74
31	3.51387	7845.79	-29.0004	Bedrock	300	18	855.389	856.578	1712.97	0	1712.97	2187.13	2187.13
32	3.51387	7595.64	-29.0004	Bedrock	300	18	837.447	838.611	1657.67	0	1657.67	2121.88	2121.88
33	3.51387	7354.53	-29.0004	Bedrock	300	18	820.152	821.292	1604.37	0	1604.37	2059	2059
34	4.35762	8530.31	-17.9789	Bedrock	300	32	1472.52	1474.57	1879.71	0	1879.71	2357.56	2357.56
35	4.35762	7676.71	-17.9789	Bedrock	300	32	1357.59	1359.48	1695.52	0	1695.52	2136.08	2136.08
36	0.0600033	100.074	-17.9789	Landslide	150	29	1021.11	1022.52	1574.08	0	1574.08	1905.44	1905.44
37	8.77524	13378.5	-19.233	Landslide	150	29	927.445	928.734	1404.87	0	1404.87	1728.44	1728.44
38	3.34913	4489.17	-20.3663	Landslide	150	29	819.064	820.202	1209.08	0	1209.08	1513.14	1513.14
39	3.34913	4158.53	-20.3663	Landslide	150	29	770.29	771.361	1120.96	0	1120.96	1406.92	1406.92
40	7.10798	7785.39	-21.6232	Landslide	150	29	683.916	684.867	964.926	0	964.926	1236.03	1236.03
41	4.9575	4611.47	-20.1079	Landslide	150	29	618.96	619.82	847.578	0	847.578	1074.18	1074.18
42	4.9575	3957.34	-20.1079	Landslide	150	29	553.466	554.235	729.259	0	729.259	931.886	931.886
43	3.1806	2222.94	-20.2112	Landslide	150	29	503.345	504.045	638.715	0	638.715	824.022	824.022
44	3.1806	1987.58	-20.2112	Landslide	150	29	466.684	467.333	572.483	0	572.483	744.293	744.293
45	3.1806	1754.59	-20.2112	Landslide	150	29	430.392	430.99	506.92	0	506.92	665.369	665.369
46	3.1806	1518.62	-20.2112	Landslide	150	29	393.635	394.182	440.514	0	440.514	585.431	585.431
47	4.32021	1651.29	-19.4006	Landslide	150	29	350.531	351.018	362.646	0	362.646	486.091	486.091
48	4.32021	1129.88	-19.4006	Landslide	150	29	289.853	290.256	253.028	0	253.028	355.105	355.105
49	4.32021	583.949	-18.341	Landslide	150	29	229.354	229.673	143.734	0	143.734	219.768	219.768
50	4.32021	150.435	-18.341	Landslide	150	29	193.511	193.78	78.9811	0	78.9811	143.132	143.132

All other Scenarios

Global Minimum Query (spencer) - Safety Factor: 0.922335

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.173202	61.1296	-88.1723	Bedrock	300	32	11.4516	10.5622	0	0	0	358.86	358.86
2	2.77837	2882.55	-61.5734	Bedrock	300	32	466.268	430.055	208.131	0	208.131	1069.52	1069.52
3	2.18097	3449.08	-61.5734	Bedrock	300	32	594.171	548.025	396.923	0	396.923	1494.6	1494.6
4	2.28975	4641.62	-59.7384	Bedrock	300	32	731.634	674.812	599.825	0	599.825	1853.79	1853.79
5	2.28952	5578.34	-59.7384	Bedrock	300	32	833.224	768.512	749.776	0	749.776	2177.86	2177.86
6	2.43506	6915.74	-59.7384	Bedrock	300	32	933.391	860.899	897.625	0	897.625	2497.39	2497.39
7	3.06823	9927.48	-56.2251	Bedrock	300	32	1125.69	1038.26	1181.46	0	1181.46	2864.59	2864.59
8	3.03745	10811.7	-53.6787	Bedrock	300	32	1290.33	1190.12	1424.49	0	1424.49	3179.69	3179.69
9	3.01776	11424.6	-53.0453	Bedrock	300	32	1376.87	1269.93	1552.22	0	1552.22	3382.39	3382.39
10	2.98266	11847.6	-53.0453	Bedrock	300	32	1432.33	1321.09	1634.09	0	1634.09	3537.99	3537.99
11	3.06921	12719.7	-50.6291	Bedrock	300	32	1568.86	1447.01	1835.6	0	1835.6	3747.53	3747.53
12	2.36754	9822.17	-30.9689	Bedrock	300	18	1400.14	1291.4	3051.21	0	3051.21	3891.47	3891.47
13	2.36754	9290.25	-30.9689	Bedrock	300	18	1341.84	1237.62	2885.7	0	2885.7	3690.97	3690.97
14	2.36761	8256.97	-30.4459	Bedrock	300	18	1237.38	1141.28	2589.18	0	2589.18	3316.48	3316.48
15	2.36761	7057.31	-30.4459	Bedrock	300	18	1104.76	1018.96	2212.74	0	2212.74	2862.1	2862.1
16	2.52496	6809.66	-29.7972	Bedrock	300	18	1039.34	958.621	2027.03	0	2027.03	2622.2	2622.2
17	2.52496	6439.84	-29.7972	Bedrock	300	18	1000.6	922.892	1917.07	0	1917.07	2490.05	2490.05
18	2.11558	5204.8	-29.0033	Bedrock	300	18	986.895	910.248	1878.15	0	1878.15	2425.27	2425.27
19	2.11558	5065.74	-29.0033	Bedrock	300	18	969.284	894.005	1828.16	0	1828.16	2365.52	2365.52
20	2.198	5141.49	-29.0033	Bedrock	300	18	954.463	880.335	1786.08	0	1786.08	2315.22	2315.22
21	2.198	5035.63	-29.0033	Bedrock	300	18	941.559	868.433	1749.46	0	1749.46	2271.44	2271.44
22	2.51998	5665.95	-29.0033	Bedrock	300	18	930.147	857.907	1717.06	0	1717.06	2232.72	2232.72
23	2.51998	5575.19	-29.0033	Bedrock	300	18	920.497	849.007	1689.67	0	1689.67	2199.98	2199.98
24	1.95372	4277.47	-29.0033	Bedrock	300	18	914.338	843.326	1672.19	0	1672.19	2179.08	2179.08
25	1.95372	4248.01	-29.0033	Bedrock	300	18	910.298	839.6	1660.72	0	1660.72	2165.38	2165.38
26	1.95372	4226.75	-29.0033	Bedrock	300	18	907.383	836.911	1652.44	0	1652.44	2155.48	2155.48
27	1.95372	4203.93	-29.0033	Bedrock	300	18	904.254	834.025	1643.56	0	1643.56	2144.87	2144.87
28	2.30893	4923.82	-29.0033	Bedrock	300	18	899.097	829.269	1628.93	0	1628.93	2127.37	2127.37
29	2.30893	4842.76	-29.0033	Bedrock	300	18	889.693	820.595	1602.22	0	1602.22	2095.46	2095.46
30	2.32405	4763.18	-29.0033	Bedrock	300	18	876.863	808.761	1565.81	0	1565.81	2051.92	2051.92
31	2.32405	4630.07	-29.0033	Bedrock	300	18	861.519	794.609	1522.25	0	1522.25	1999.86	1999.86
32	3.00018	5793.56	-29.0033	Bedrock	300	18	845.131	779.494	1475.73	0	1475.73	1944.26	1944.26
33	3.00018	5611.45	-29.0033	Bedrock	300	18	828.868	764.494	1429.57	0	1429.57	1889.08	1889.08
34	1.91141	3452.83	-21.2111	Landslide	150	29	1161.23	1071.04	1661.6	0	1661.6	2112.27	2112.27
35	1.91141	3316.87	-21.2111	Landslide	150	29	1122.61	1035.42	1597.34	0	1597.34	2033.02	2033.02
36	1.90489	3161.85	-20.0173	Landslide	150	29	1107.61	1021.58	1572.38	0	1572.38	1975.89	1975.89
37	1.90489	3011.69	-20.0173	Landslide	150	29	1063.69	981.078	1499.3	0	1499.3	1886.82	1886.82
38	2.17682	3250.88	-19.2529	Landslide	150	29	1030.39	950.366	1443.9	0	1443.9	1803.79	1803.79
39	2.17682	3042.45	-19.2529	Landslide	150	29	976.159	900.346	1353.66	0	1353.66	1694.61	1694.61
40	2.18397	2842.64	-19.2529	Landslide	150	29	921.746	850.159	1263.12	0	1263.12	1585.06	1585.06
41	2.18397	2633.38	-19.2529	Landslide	150	29	867.475	800.103	1172.82	0	1172.82	1475.8	1475.8
42	2.26485	2508.04	-18.5214	Landslide	150	29	823.397	759.448	1099.47	0	1099.47	1375.32	1375.32
43	2.26485	2280.19	-18.5214	Landslide	150	29	765.503	706.05	1003.14	0	1003.14	1259.59	1259.59
44	2.26485	2058.32	-18.5214	Landslide	150	29	709.128	654.054	909.339	0	909.339	1146.9	1146.9
45	2.96952	2320.9	-13.0057	Landslide	150	29	707.756	652.788	907.053	0	907.053	1070.53	1070.53
46	2.96952	1864.45	-13.0057	Landslide	150	29	607.766	560.564	740.675	0	740.675	881.053	881.053
47	2.87827	1395.35	-13.0057	Landslide	150	29	514.697	474.723	585.817	0	585.817	704.698	704.698
48	2.87827	1011.94	-13.0057	Landslide	150	29	428.044	394.8	441.632	0	441.632	540.499	540.499
49	2.4416	526.411	-6.63848	Landslide	150	29	380.646	351.083	362.764	0	362.764	407.065	407.065
50	2.4416	175.969	-6.63848	Landslide	150	29	275.179	253.807	187.274	0	187.274	219.3	219.3

Interslice Data

Planar - static - Cuckoo search thru toe

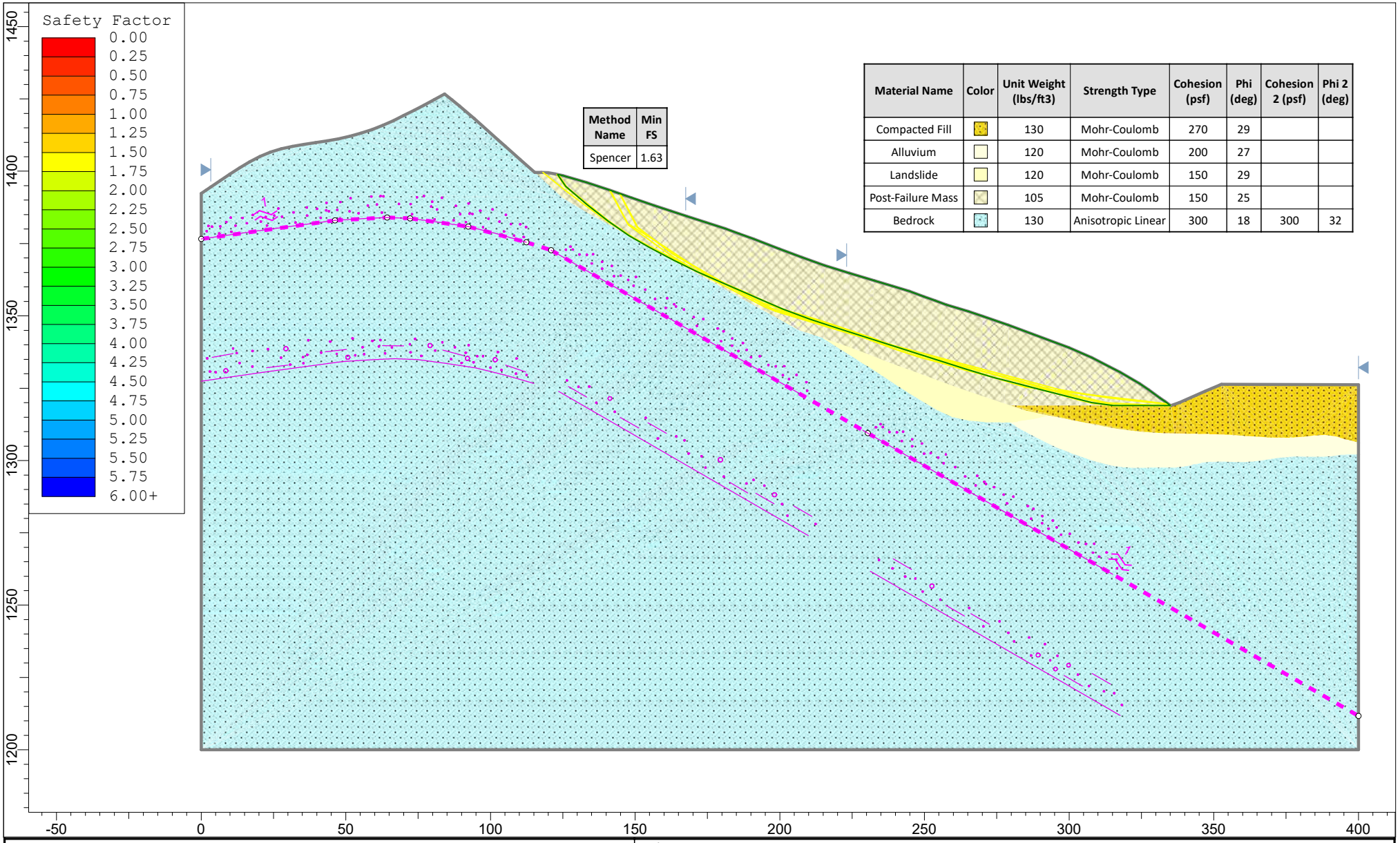
Global Minimum Query (spencer) - Safety Factor: 1.00139

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	84.1518	1426.67	0	0	0
2	89.2531	1422.57	-1327.66	-622.249	25.1116
3	94.3543	1418.19	-1945.4	-911.775	25.1117
4	98.4554	1414.52	-1810.54	-848.57	25.1117
5	102.556	1410.86	-1207.64	-566	25.1117
6	107.573	1406.46	-47.8594	-22.4309	25.1117
7	112.59	1402.04	1599.16	749.496	25.1116
8	115.72	1399.19	2984.68	1398.87	25.1117
9	118.851	1396.35	4488.68	2103.76	25.1116
10	121.981	1393.49	6112.55	2864.85	25.1117
11	125.111	1390.64	7809.28	3660.07	25.1116
12	129.219	1388.17	6188.81	2900.59	25.1117
13	133.328	1385.71	9189.16	4306.8	25.1117
14	137.513	1383.37	11584.6	5429.5	25.1117
15	141.699	1381.03	13620.9	6383.86	25.1116
16	145.048	1379.16	14772.1	6923.45	25.1117
17	148.398	1377.29	15710.8	7363.37	25.1116
18	151.747	1375.42	16555.1	7759.11	25.1117
19	155.097	1373.55	17337.7	8125.9	25.1117
20	158.252	1371.8	18015.9	8443.74	25.1117
21	161.407	1370.05	18662.3	8746.68	25.1116
22	164.563	1368.3	19285.7	9038.85	25.1116
23	167.718	1366.54	19894.6	9324.26	25.1117
24	173.4	1363.39	20956.6	9822	25.1117
25	176.411	1361.72	21491.1	10072.5	25.1117
26	179.422	1360.05	21989.4	10306.1	25.1118
27	182.433	1358.38	22449.4	10521.6	25.1116
28	185.444	1356.7	22875.3	10721.2	25.1116
29	188.863	1354.81	23320.5	10929.9	25.1116
30	192.281	1352.91	23726.4	11120.1	25.1116
31	195.795	1350.96	24097.3	11294	25.1117
32	199.309	1349.02	24423.3	11446.8	25.1117
33	202.822	1347.07	24704.8	11578.7	25.1116
34	206.336	1345.12	24943.4	11690.5	25.1116
35	210.694	1343.71	21174.7	9924.19	25.1116
36	215.051	1342.29	17647.1	8270.89	25.1117
37	215.111	1342.27	17616.4	8256.49	25.1116
38	223.887	1339.21	13766.1	6451.92	25.1116
39	227.236	1337.97	12521.8	5868.76	25.1117
40	230.585	1336.72	11331.6	5310.94	25.1117
41	237.693	1333.91	9181.48	4303.2	25.1117
42	242.65	1332.09	7646.48	3583.77	25.1117
43	247.608	1330.28	6221.93	2916.11	25.1117
44	250.789	1329.11	5366.36	2515.12	25.1117
45	253.969	1327.93	4550.03	2132.52	25.1117
46	257.15	1326.76	3772.55	1768.13	25.1117
47	260.33	1325.59	3034.4	1422.17	25.1117
48	264.651	1324.07	2069.39	969.886	25.1116
49	268.971	1322.55	1200.16	562.493	25.1116
50	273.291	1321.12	413.594	193.844	25.1116
51	277.611	1319.69	0	0	0

All other Scenarios

Global Minimum Query (spencer) - Safety Factor: 0.922335

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	107.634	1436.92	0	0	0
2	107.807	1431.5	-1.98828	-1.17798	30.6451
3	110.585	1426.36	-232.32	-137.64	30.645
4	112.766	1422.33	67.9039	40.2303	30.645
5	115.056	1418.41	742.541	439.926	30.6451
6	117.346	1414.49	1772.37	1050.06	30.6451
7	119.781	1410.31	3240.22	1919.7	30.645
8	122.849	1405.72	5198.01	3079.61	30.645
9	125.886	1401.59	7154.76	4238.91	30.6451
10	128.904	1397.58	9215.95	5460.08	30.645
11	131.887	1393.62	11411.9	6761.11	30.6451
12	134.956	1389.88	13450.9	7969.1	30.645
13	137.324	1388.46	14463.1	8568.8	30.645
14	139.691	1387.03	15378.5	9111.16	30.6451
15	142.059	1385.64	16044.9	9505.96	30.645
16	144.426	1384.25	16502.2	9776.87	30.645
17	146.951	1382.81	16802.3	9954.7	30.6451
18	149.476	1381.36	17041.5	10096.4	30.645
19	151.592	1380.19	17151.4	10161.5	30.645
20	153.707	1379.01	17239.9	10213.9	30.6449
21	155.905	1377.8	17313.3	10257.4	30.645
22	158.103	1376.58	17370.4	10291.3	30.6451
23	160.623	1375.18	17419.6	10320.4	30.645
24	163.143	1373.78	17454.8	10341.3	30.6451
25	165.097	1372.7	17475.2	10353.4	30.6451
26	167.051	1371.62	17491.2	10362.8	30.645
27	169.005	1370.53	17503.8	10370.3	30.645
28	170.958	1369.45	17513	10375.7	30.6449
29	173.267	1368.17	17517.1	10378.1	30.6448
30	175.576	1366.89	17508.7	10373.2	30.645
31	177.9	1365.6	17483.3	10358.1	30.6449
32	180.224	1364.31	17437.4	10331	30.6451
33	183.224	1362.65	17350.2	10279.3	30.645
34	186.225	1360.99	17235.1	10211.1	30.645
35	188.136	1360.25	16242.7	9623.14	30.645
36	190.047	1359.5	15276.6	9050.78	30.6451
37	191.952	1358.81	14252.8	8444.2	30.645
38	193.857	1358.12	13262.1	7857.26	30.645
39	196.034	1357.36	12111.4	7175.54	30.6451
40	198.211	1356.59	11010.5	6523.29	30.6451
41	200.395	1355.83	9956.04	5898.55	30.645
42	202.579	1355.07	8951.5	5303.4	30.645
43	204.844	1354.31	7916.29	4690.08	30.645
44	207.108	1353.55	6939.44	4111.34	30.645
45	209.373	1352.79	6019.41	3566.25	30.645
46	212.343	1352.11	4534.7	2686.63	30.6451
47	215.312	1351.42	3233.53	1915.74	30.6451
48	218.191	1350.76	2137.93	1266.64	30.6451
49	221.069	1350.09	1196.49	708.873	30.6451
50	223.51	1349.81	367.921	217.978	30.645
51	225.952	1349.52	0	0	0



Method Name	Min FS
Spencer	1.63

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Landslide		120	Mohr-Coulomb	150	29		
Post-Failure Mass		105	Mohr-Coulomb	150	25		
Bedrock		130	Anisotropic Linear	300	18	300	32

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 7-7'; NS-1 post-failure geometry; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t7s2a.slmd
		Scale:	1:550
Project No.:	18-1245A-4	*Date:* 6/25/2018	*Figure No.:* Run No. 14

Slide Analysis Information

t7s2a

Project Summary

File Name:	t7s2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:07.256s
Project Title:	VTTM 60257
Analysis:	Section 7-7'; NS-1 post-failure geometry; non-circular search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	20
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation [ft]:	1230
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Landslide	Post-Failure Mass	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	105	130
Cohesion [psf]	270	200	150	150	
Friction Angle [°]	29	27	29	25	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.632620
Axis Location:	308.964, 1570.768
Left Slip Surface Endpoint:	123.171, 1398.878
Right Slip Surface Endpoint:	335.000, 1319.000
Resisting Moment:	4.80243e+07 lb-ft
Driving Moment:	2.94162e+07 lb-ft
Resisting Horizontal Force:	183763 lb
Driving Horizontal Force:	112560 lb
Total Slice Area:	3480.27 ft2
Surface Horizontal Width:	211.829 ft
Surface Average Height:	16.4296 ft

Global Minimum Coordinates

Method: spencer

X	Y
123.171	1398.88
126.021	1394.75
133.377	1388.46
140.732	1382.67
147.877	1377.72
155.022	1373.6
163.285	1369.23
171.512	1365.19
179.53	1361.67
187.547	1358.19
194.198	1355.3
200.935	1352.39
210.569	1348.75
220.203	1345.67
226.057	1343.8
231.91	1341.93
240.117	1339.31
248.325	1336.69
256.049	1334.22
263.774	1331.76
273.84	1328.72
280.767	1326.92
287.685	1325.14
294.055	1323.5
300.421	1321.86
307.854	1319.95
315.288	1319
321.117	1319
326.946	1319
335	1319

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6576
Number of Invalid Surfaces: 3481

Error Codes:

Error Code -109 reported for 1 surface
Error Code -112 reported for 1 surface
Error Code -114 reported for 19 surfaces
Error Code -121 reported for 2565 surfaces
Error Code -124 reported for 10 surfaces
Error Code -1000 reported for 885 surfaces

Error Codes

The following errors were encountered during the computation:

-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

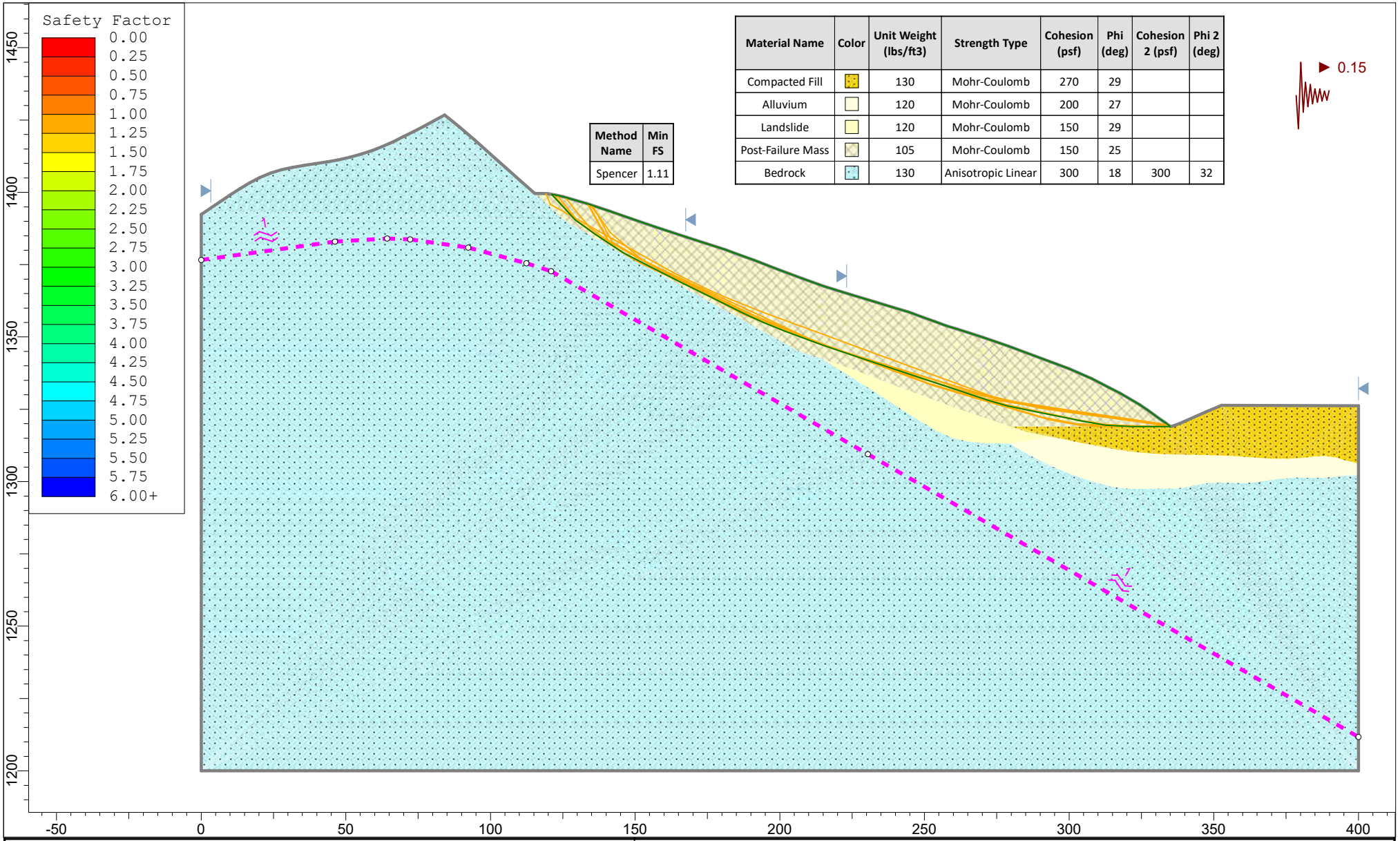
Global Minimum Query (spencer) - Safety Factor: 1.63262

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.8503	525.738	-55.3863	Post-Failure Mass	150	25	104.627	170.816	44.6398	0	44.6398	196.228	196.228
2	3.67774	1731.57	-40.5489	Post-Failure Mass	150	25	176.031	287.391	294.636	0	294.636	445.24	445.24
3	3.67774	2528.93	-40.5489	Post-Failure Mass	150	25	219.208	357.883	445.805	0	445.805	633.35	633.35
4	3.67772	3250.1	-38.1853	Post-Failure Mass	150	25	264.588	431.972	604.69	0	604.69	812.791	812.791
5	3.67772	3901.22	-38.1853	Post-Failure Mass	150	25	300.902	491.259	731.832	0	731.832	968.494	968.494
6	3.57247	4340.05	-34.7393	Post-Failure Mass	150	25	344.62	562.633	884.893	0	884.893	1123.87	1123.87
7	3.57247	4804.95	-34.7393	Post-Failure Mass	150	25	372.447	608.065	982.322	0	982.322	1240.6	1240.6
8	3.57245	5191.33	-29.9595	Post-Failure Mass	150	25	415.423	678.228	1132.79	0	1132.79	1372.24	1372.24
9	3.57245	5499.32	-29.9595	Post-Failure Mass	150	25	434.912	710.046	1201.02	0	1201.02	1451.71	1451.71
10	4.13152	6706.95	-27.8486	Post-Failure Mass	150	25	463.71	757.062	1301.85	0	1301.85	1546.84	1546.84
11	4.13152	7061.91	-27.8486	Post-Failure Mass	150	25	483.601	789.537	1371.49	0	1371.49	1626.99	1626.99
12	8.2267	14998.2	-26.1657	Post-Failure Mass	150	25	518.739	846.904	1494.51	0	1494.51	1749.38	1749.38
13	4.00889	7693.55	-23.6806	Post-Failure Mass	150	25	555.168	906.378	1622.06	0	1622.06	1865.53	1865.53
14	4.00889	7887.78	-23.6806	Post-Failure Mass	150	25	566.919	925.564	1663.2	0	1663.2	1911.83	1911.83
15	4.00889	8066.31	-23.4748	Post-Failure Mass	150	25	578.925	945.164	1705.23	0	1705.23	1956.66	1956.66
16	4.00889	8194.92	-23.4748	Post-Failure Mass	150	25	586.724	957.897	1732.54	0	1732.54	1987.35	1987.35
17	3.32548	6892.04	-23.4748	Post-Failure Mass	150	25	593.606	969.133	1756.64	0	1756.64	2014.43	2014.43
18	3.32548	6960.71	-23.4748	Post-Failure Mass	150	25	598.626	977.328	1774.21	0	1774.21	2034.19	2034.19
19	3.36828	7101.44	-23.406	Post-Failure Mass	150	25	602.737	984.04	1788.6	0	1788.6	2049.51	2049.51
20	3.36828	7153.94	-23.406	Post-Failure Mass	150	25	606.529	990.231	1801.88	0	1801.88	2064.42	2064.42
21	9.63404	20626.7	-20.6816	Post-Failure Mass	150	25	627.776	1024.92	1876.26	0	1876.26	2113.25	2113.25
22	4.81696	10292.5	-17.7149	Post-Failure Mass	150	25	645.758	1054.28	1939.23	0	1939.23	2145.5	2145.5
23	4.81696	10251.3	-17.7149	Post-Failure Mass	150	25	643.539	1050.65	1931.46	0	1931.46	2137.02	2137.02
24	5.85371	12497.8	-17.7149	Post-Failure Mass	150	25	645.318	1053.56	1937.69	0	1937.69	2143.82	2143.82
25	5.85368	12541.9	-17.7149	Post-Failure Mass	150	25	647.27	1056.75	1944.52	0	1944.52	2151.27	2151.27
26	4.1036	8820.73	-17.7149	Post-Failure Mass	150	25	649.07	1059.68	1950.82	0	1950.82	2158.16	2158.16
27	4.1036	8849.16	-17.7149	Post-Failure Mass	150	25	650.864	1062.61	1957.11	0	1957.11	2165.01	2165.01
28	4.10362	8877.76	-17.7149	Post-Failure Mass	150	25	652.666	1065.56	1963.42	0	1963.42	2171.9	2171.9
29	4.10362	8866.09	-17.7149	Post-Failure Mass	150	25	651.929	1064.35	1960.84	0	1960.84	2169.08	2169.08
30	3.86225	8271.64	-17.7149	Post-Failure Mass	150	25	647.036	1056.36	1943.7	0	1943.7	2150.39	2150.39
31	3.86225	8207.77	-17.7149	Post-Failure Mass	150	25	642.753	1049.37	1928.71	0	1928.71	2134.02	2134.02
32	3.86224	8159.95	-17.7149	Post-Failure Mass	150	25	639.55	1044.14	1917.49	0	1917.49	2121.78	2121.78
33	3.86224	8172.94	-17.7149	Post-Failure Mass	150	25	640.421	1045.56	1920.54	0	1920.54	2125.11	2125.11
34	5.03304	10635.5	-16.7618	Post-Failure Mass	150	25	645.834	1054.4	1939.49	0	1939.49	2134.01	2134.01
35	5.03304	10544.5	-16.7618	Post-Failure Mass	150	25	641.106	1046.68	1922.94	0	1922.94	2116.04	2116.04
36	3.46346	7173.3	-14.5602	Post-Failure Mass	150	25	649.131	1059.78	1951.04	0	1951.04	2119.64	2119.64
37	3.46346	7068.84	-14.5602	Post-Failure Mass	150	25	641.045	1046.58	1922.73	0	1922.73	2089.23	2089.23
38	3.45911	6919.86	-14.4821	Post-Failure Mass	150	25	630.686	1029.67	1886.46	0	1886.46	2049.36	2049.36
39	3.45911	6773.16	-14.4821	Post-Failure Mass	150	25	619.306	1011.09	1846.62	0	1846.62	2006.58	2006.58
40	3.18511	6106.42	-14.4314	Post-Failure Mass	150	25	608.646	993.687	1809.29	0	1809.29	1965.92	1965.92
41	3.18511	5981.03	-14.4314	Post-Failure Mass	150	25	598.077	976.432	1772.29	0	1772.29	1926.2	1926.2
42	3.18278	5851.4	-14.4314	Post-Failure Mass	150	25	587.512	959.184	1735.3	0	1735.3	1886.49	1886.49
43	3.18278	5725.4	-14.4314	Post-Failure Mass	150	25	576.884	941.832	1698.09	0	1698.09	1846.55	1846.55
44	3.7168	6473.65	-14.4314	Post-Failure Mass	150	25	561.543	916.787	1644.38	0	1644.38	1788.89	1788.89
45	3.7168	6216.7	-14.4314	Post-Failure Mass	150	25	542.985	886.488	1579.4	0	1579.4	1719.14	1719.14
46	3.71678	5801.05	-7.292	Post-Failure Mass	150	25	551.145	899.81	1607.97	0	1607.97	1678.5	1678.5
47	3.71678	5234.32	-7.292	Post-Failure Mass	150	25	506.832	827.464	1452.83	0	1452.83	1517.68	1517.68
48	5.82885	6823.67	0.0114222	Post-Failure Mass	150	25	471.992	770.584	1330.85	0	1330.85	1330.75	1330.75
49	5.82885	4716.3	0.0114222	Post-Failure Mass	150	25	357.645	583.898	930.498	0	930.498	930.426	930.426
50	8.0546	2455.58	0.0114222	Post-Failure Mass	150	25	199.283	325.353	376.046	0	376.046	376.006	376.006

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.63262

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	123.171	1398.88	0	0	0
2	126.021	1394.75	-113.865	-38.9083	18.8656
3	129.699	1391.6	165.832	56.6657	18.8656
4	133.377	1388.46	762.398	260.515	18.8655
5	137.055	1385.56	1538.44	525.692	18.8655
6	140.732	1382.67	2548.69	870.901	18.8656
7	144.305	1380.19	3509.75	1199.3	18.8656
8	147.877	1377.72	4612.75	1576.2	18.8656
9	151.45	1375.66	5461.33	1866.16	18.8655
10	155.022	1373.6	6380.8	2180.35	18.8655
11	159.154	1371.41	7306.67	2496.72	18.8655
12	163.285	1369.23	8302.38	2836.96	18.8655
13	171.512	1365.19	10075.7	3442.91	18.8655
14	175.521	1363.43	10702	3656.91	18.8655
15	179.53	1361.67	11353.5	3879.54	18.8655
16	183.539	1359.93	12001.5	4100.98	18.8656
17	187.547	1358.19	12665.9	4327.98	18.8655
18	190.873	1356.75	13228.8	4520.36	18.8656
19	194.198	1355.3	13800.5	4715.7	18.8656
20	197.567	1353.85	14378.2	4913.09	18.8655
21	200.935	1352.39	14962.4	5112.72	18.8655
22	210.569	1348.75	15738.3	5377.83	18.8655
23	215.386	1347.21	15611.6	5334.55	18.8655
24	220.203	1345.67	15483.6	5290.83	18.8656
25	226.057	1343.8	15329.4	5238.12	18.8655
26	231.91	1341.93	15176.5	5185.87	18.8655
27	236.014	1340.62	15070.2	5149.54	18.8655
28	240.117	1339.31	14964.7	5113.51	18.8655
29	244.221	1338	14860.2	5077.78	18.8655
30	248.325	1336.69	14755.2	5041.93	18.8656
31	252.187	1335.46	14654.2	5007.42	18.8656
32	256.049	1334.22	14551.3	4972.25	18.8655
33	259.911	1332.99	14446.9	4936.57	18.8655
34	263.774	1331.76	14342.9	4901.03	18.8655
35	268.807	1330.24	14032.5	4794.98	18.8656
36	273.84	1328.72	13720.9	4688.49	18.8655
37	277.303	1327.82	13227.9	4520.02	18.8655
38	280.767	1326.92	12737.3	4352.41	18.8656
39	284.226	1326.03	12241.2	4182.88	18.8656
40	287.685	1325.14	11748.8	4014.63	18.8656
41	290.87	1324.32	11293.3	3858.97	18.8655
42	294.055	1323.5	10841.1	3704.44	18.8655
43	297.238	1322.68	10392.5	3551.17	18.8656
44	300.421	1321.86	9947.29	3399.04	18.8656
45	304.137	1320.9	9433.02	3223.31	18.8656
46	307.854	1319.95	8925.58	3049.91	18.8655
47	311.571	1319.47	7641.9	2611.27	18.8655
48	315.288	1319	6449.13	2203.7	18.8656
49	321.117	1319	3696.47	1263.1	18.8655
50	326.946	1319	1610.78	550.411	18.8655
51	335	1319	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Landslide		120	Mohr-Coulomb	150	29		
Post-Failure Mass		105	Mohr-Coulomb	150	25		
Bedrock		130	Anisotropic Linear	300	18	300	32

Method Name	Min FS
Spencer	1.11

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 7-7'; NS-1 post-failure geometry; non-circular search; pseudo		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t7ps2a.slmd
		Scale:	1:550
Project No.:	18-1245A-4	*Date:* 6/25/2018	*Figure No.:* Run No. 15

Slide Analysis Information

t7ps2a

Project Summary

File Name:	t7ps2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:07.758s
Project Title:	VTTM 60257
Analysis:	Section 7-7'; NS-1 post-failure geometry; non-circular search; pseudo
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	20
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation [ft]:	1230
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Alluvium	Landslide	Post-Failure Mass	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	105	130
Cohesion [psf]	270	200	150	150	
Friction Angle [°]	29	27	29	25	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.107020
Axis Location:	308.345, 1573.062
Left Slip Surface Endpoint:	121.088, 1399.300
Right Slip Surface Endpoint:	335.000, 1319.000
Resisting Moment:	4.72917e+07 lb-ft
Driving Moment:	4.27219e+07 lb-ft
Resisting Horizontal Force:	179472 lb
Driving Horizontal Force:	162130 lb
Total Slice Area:	3541.45 ft2
Surface Horizontal Width:	213.912 ft
Surface Average Height:	16.5557 ft

Global Minimum Coordinates

Method: spencer

X	Y
121.088	1399.3
125.159	1394.89
129.231	1390.48
135.791	1385.73
140.951	1382.33
146.11	1378.94
154.477	1374.63
160.497	1371.53
166.439	1368.58
176.646	1363.5
182.142	1360.77
187.638	1358.04
194.489	1354.93
201.34	1352.14
208.124	1349.62
214.907	1347.1
220.7	1345.13
226.493	1343.2
233.278	1340.94
243.569	1337.51
253.86	1334.08
263.263	1330.95
271.679	1328.14
278.792	1326.06
285.905	1324.63
293.07	1323.18
298.51	1322.09
303.95	1320.99
312.647	1319.45
321.656	1319.01
329.118	1319.01
335	1319

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6413
Number of Invalid Surfaces: 3643

Error Codes:

Error Code -108 reported for 36 surfaces
Error Code -111 reported for 89 surfaces
Error Code -114 reported for 21 surfaces
Error Code -121 reported for 2605 surfaces
Error Code -124 reported for 10 surfaces
Error Code -1000 reported for 882 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

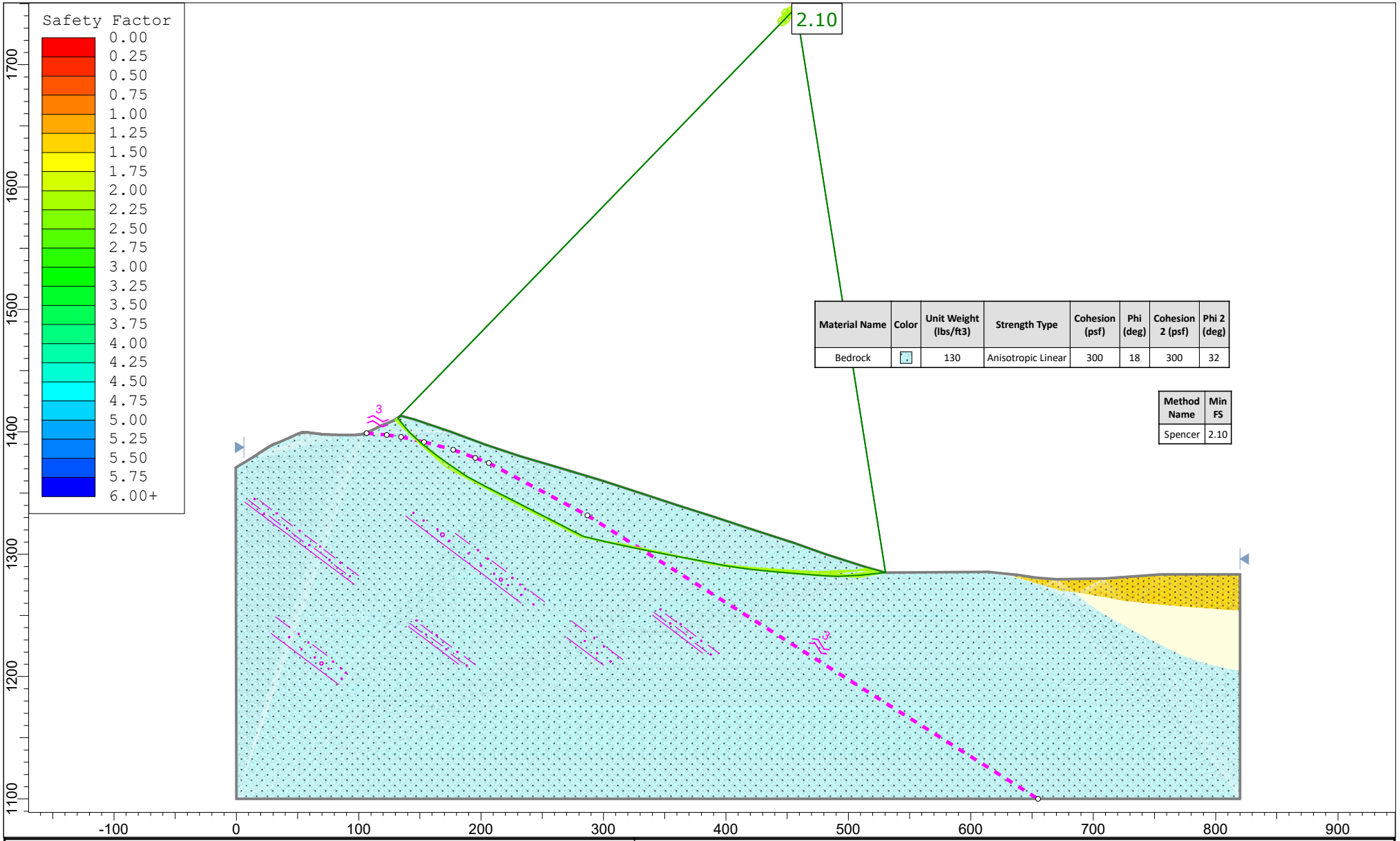
Global Minimum Query (spencer) - Safety Factor: 1.10702

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.07134	766.58	-47.3017	Post-Failure Mass	150	25	157.814	174.703	52.9761	0	52.9761	224.008	224.008
2	4.07134	2211.55	-47.3017	Post-Failure Mass	150	25	234.692	259.809	235.486	0	235.486	489.835	489.835
3	3.28012	2578.33	-35.9064	Post-Failure Mass	150	25	335.318	371.204	474.374	0	474.374	717.162	717.162
4	3.28012	3051.5	-35.9064	Post-Failure Mass	150	25	373.312	413.264	564.572	0	564.572	834.869	834.869
5	5.15963	5613.96	-33.3399	Post-Failure Mass	150	25	430.059	476.084	699.288	0	699.288	982.213	982.213
6	5.15963	6510.57	-33.3399	Post-Failure Mass	150	25	477.85	528.99	812.746	0	812.746	1127.11	1127.11
7	4.18357	5786.2	-27.2336	Post-Failure Mass	150	25	558.536	618.31	1004.29	0	1004.29	1291.76	1291.76
8	4.18357	6095.12	-27.2336	Post-Failure Mass	150	25	581.038	643.221	1057.72	0	1057.72	1356.76	1356.76
9	3.01001	4577.15	-27.2336	Post-Failure Mass	150	25	600.46	664.721	1103.82	0	1103.82	1412.86	1412.86
10	3.01001	4749.64	-27.2336	Post-Failure Mass	150	25	617.923	684.053	1145.28	0	1145.28	1463.31	1463.31
11	5.94122	9860.99	-26.4373	Post-Failure Mass	150	25	650.526	720.145	1222.68	0	1222.68	1546.13	1546.13
12	5.10377	8972.98	-26.4373	Post-Failure Mass	150	25	680.904	753.774	1294.8	0	1294.8	1633.35	1633.35
13	5.10377	9447.7	-26.4373	Post-Failure Mass	150	25	709.633	785.578	1363	0	1363	1715.84	1715.84
14	5.496	10702.9	-26.4373	Post-Failure Mass	150	25	739.368	818.495	1433.59	0	1433.59	1801.22	1801.22
15	5.49599	11173.7	-26.4373	Post-Failure Mass	150	25	765.827	847.786	1496.41	0	1496.41	1877.19	1877.19
16	3.42542	7156.1	-24.4002	Post-Failure Mass	150	25	807.923	894.387	1596.34	0	1596.34	1962.84	1962.84
17	3.42542	7250.76	-24.4002	Post-Failure Mass	150	25	816.759	904.168	1617.32	0	1617.32	1987.82	1987.82
18	3.42542	7300.5	-22.1885	Post-Failure Mass	150	25	849.931	940.891	1696.07	0	1696.07	2042.72	2042.72
19	3.42542	7325.47	-22.1885	Post-Failure Mass	150	25	852.35	943.569	1701.81	0	1701.81	2049.45	2049.45
20	3.39188	7280.12	-20.3506	Post-Failure Mass	150	25	879.778	973.932	1766.93	0	1766.93	2093.25	2093.25
21	3.39188	7288.69	-20.3506	Post-Failure Mass	150	25	880.644	974.891	1768.98	0	1768.98	2095.63	2095.63
22	3.39188	7297.27	-20.3506	Post-Failure Mass	150	25	881.51	975.849	1771.04	0	1771.04	2098	2098
23	3.39188	7305.85	-20.3506	Post-Failure Mass	150	25	882.376	976.808	1773.1	0	1773.1	2100.38	2100.38
24	5.7929	12525.2	-18.8003	Post-Failure Mass	150	25	907.065	1004.14	1831.71	0	1831.71	2140.5	2140.5
25	5.7929	12628.9	-18.4301	Post-Failure Mass	150	25	918.73	1017.05	1859.39	0	1859.39	2165.55	2165.55
26	3.39244	7438.39	-18.4301	Post-Failure Mass	150	25	923.182	1021.98	1869.97	0	1869.97	2177.61	2177.61
27	3.39244	7469.96	-18.4301	Post-Failure Mass	150	25	926.477	1025.63	1877.79	0	1877.79	2186.53	2186.53
28	5.14538	11396.4	-18.4301	Post-Failure Mass	150	25	931.061	1030.7	1888.67	0	1888.67	2198.94	2198.94
29	5.14538	11479.7	-18.4301	Post-Failure Mass	150	25	936.792	1037.05	1902.28	0	1902.28	2214.45	2214.45
30	5.14538	11513.3	-18.4301	Post-Failure Mass	150	25	939.1	1039.6	1907.75	0	1907.75	2220.7	2220.7
31	5.14538	11431.8	-18.4301	Post-Failure Mass	150	25	933.497	1033.4	1894.46	0	1894.46	2205.54	2205.54
32	4.70167	10384.1	-18.4301	Post-Failure Mass	150	25	928.833	1028.24	1883.39	0	1883.39	2192.91	2192.91
33	4.70167	10407	-18.4301	Post-Failure Mass	150	25	930.556	1030.14	1887.48	0	1887.48	2197.57	2197.57
34	4.20796	9357.76	-18.4301	Post-Failure Mass	150	25	934.225	1034.21	1896.19	0	1896.19	2207.51	2207.51
35	4.20796	9358.08	-18.4301	Post-Failure Mass	150	25	934.251	1034.24	1896.25	0	1896.25	2207.58	2207.58
36	3.55666	7876.73	-16.3382	Post-Failure Mass	150	25	962.628	1065.65	1963.62	0	1963.62	2245.8	2245.8
37	3.55666	7817.13	-16.3382	Post-Failure Mass	150	25	956.475	1058.84	1949.01	0	1949.01	2229.39	2229.39
38	3.55666	7675.1	-11.3804	Post-Failure Mass	150	25	1021.52	1130.84	2103.42	0	2103.42	2309.03	2309.03
39	3.55666	7444.4	-11.3804	Post-Failure Mass	150	25	995.499	1102.04	2041.65	0	2041.65	2242.02	2242.02
40	3.58215	7264.46	-11.3804	Post-Failure Mass	150	25	969.374	1073.12	1979.63	0	1979.63	2174.74	2174.74
41	3.58215	7030.33	-11.3804	Post-Failure Mass	150	25	943.155	1044.09	1917.38	0	1917.38	2107.22	2107.22
42	5.44019	10229.1	-11.3804	Post-Failure Mass	150	25	910.137	1007.54	1838.99	0	1838.99	2022.18	2022.18
43	5.44019	9638.31	-11.3804	Post-Failure Mass	150	25	866.572	959.312	1735.58	0	1735.58	1910	1910
44	4.3482	7162.93	-10.0799	Post-Failure Mass	150	25	834.398	923.695	1659.2	0	1659.2	1807.52	1807.52
45	4.3482	6548.99	-10.0799	Post-Failure Mass	150	25	776.399	859.489	1521.51	0	1521.51	1659.52	1659.52
46	4.50471	5940.43	-2.76183	Post-Failure Mass	150	25	792.1	876.871	1558.78	0	1558.78	1596.99	1596.99
47	4.50471	4897.68	-2.76183	Post-Failure Mass	150	25	682.781	755.852	1299.26	0	1299.26	1332.19	1332.19
48	3.73113	3147.73	-0.0586345	Post-Failure Mass	150	25	595.118	658.807	1091.14	0	1091.14	1091.75	1091.75
49	3.73113	2177.84	-0.0586345	Post-Failure Mass	150	25	465.458	515.271	783.326	0	783.326	783.802	783.802
50	5.88195	1307.36	-0.0586345	Post-Failure Mass	150	25	284.292	314.717	353.236	0	353.236	353.527	353.527

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.10702

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	121.088	1399.3	0	0	0
2	125.159	1394.89	-294.983	-162.318	28.8223
3	129.231	1390.48	118.489	65.1999	28.8223
4	132.511	1388.1	529.916	291.591	28.8222
5	135.791	1385.73	1101.68	606.209	28.8222
6	140.951	1382.33	2094.32	1152.42	28.8222
7	146.11	1378.94	3359.53	1848.61	28.8222
8	150.294	1376.78	4048.81	2227.9	28.8222
9	154.477	1374.63	4805.14	2644.08	28.8223
10	157.487	1373.08	5390.93	2966.42	28.8223
11	160.497	1371.53	6014.17	3309.36	28.8223
12	166.439	1368.58	7233.03	3980.05	28.8222
13	171.542	1366.04	8383.05	4612.86	28.8222
14	176.646	1363.5	9630.46	5299.26	28.8222
15	182.142	1360.77	11082.3	6098.14	28.8222
16	187.638	1358.04	12630.7	6950.16	28.8222
17	191.064	1356.48	13411.9	7380.04	28.8223
18	194.489	1354.93	14209.6	7818.98	28.8222
19	197.914	1353.53	14757.4	8120.41	28.8222
20	201.34	1352.14	15308.7	8423.75	28.8222
21	204.732	1350.88	15634	8602.75	28.8222
22	208.124	1349.62	15960.2	8782.25	28.8222
23	211.515	1348.36	16287.3	8962.27	28.8223
24	214.907	1347.1	16615.4	9142.8	28.8223
25	220.7	1345.13	16842.1	9267.54	28.8222
26	226.493	1343.2	16993.8	9350.99	28.8222
27	229.886	1342.07	17085.8	9401.64	28.8222
28	233.278	1340.94	17180.2	9453.59	28.8223
29	238.423	1339.23	17328.4	9535.15	28.8223
30	243.569	1337.51	17482.9	9620.16	28.8223
31	248.714	1335.8	17640	9706.57	28.8222
32	253.86	1334.08	17790.8	9789.59	28.8223
33	258.561	1332.51	17924.1	9862.89	28.8222
34	263.263	1330.95	18059	9937.14	28.8222
35	267.471	1329.55	18183	10005.4	28.8223
36	271.679	1328.14	18307.1	10073.7	28.8223
37	275.235	1327.1	18105.7	9962.87	28.8223
38	278.792	1326.06	17902.1	9850.83	28.8223
39	282.349	1325.34	16919.2	9309.96	28.8222
40	285.905	1324.63	15950.1	8776.73	28.8223
41	289.488	1323.91	14988.2	8247.41	28.8222
42	293.07	1323.18	14040.3	7725.84	28.8223
43	298.51	1322.09	12627.8	6948.58	28.8223
44	303.95	1320.99	11250.8	6190.89	28.8223
45	308.298	1320.22	9972.84	5487.65	28.8222
46	312.647	1319.45	8748.98	4814.21	28.8222
47	317.151	1319.23	6403.9	3523.81	28.8222
48	321.656	1319.01	4339.39	2387.8	28.8223
49	325.387	1319.01	2591.1	1425.78	28.8223
50	329.118	1319.01	1180.82	649.759	28.8223
51	335	1319	0	0	0



ALLAN E. SEWARD
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Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 11-11'; CS-7; non-circular search; bedding plane; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t11s1a.slmd
		Scale:	1:1300
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 16

Slide Analysis Information

t11s1a

Project Summary

File Name:	t11s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:27.333s
Project Title:	VTTM 60257
Analysis:	Section 11-11'; CS-7; non-circular search; bedding plane; static
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Bedrock
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	130
Cohesion [psf]	270	200	
Friction Angle [°]	29	27	
Cohesion 1 [psf]			300
Cohesion 2 [psf]			300
Friction Angle 1 [°]			18
Friction Angle 2 [°]			32
A [°]			1
B [°]			1
Anisotropic Definition			Surface
Angle from 1 [°]			
Anisotropic Surface			Anisotropic Surface 3
Tensile Strength [psf]			0
Water Surface	None	None	None
Ru Value	0	0	0

Global Minimums

Method: spencer

FS	2.104840
Axis Location:	457.272, 1746.610
Left Slip Surface Endpoint:	131.806, 1411.224
Right Slip Surface Endpoint:	530.302, 1285.005
Resisting Moment:	4.72097e+08 lb-ft
Driving Moment:	2.24291e+08 lb-ft
Resisting Horizontal Force:	967633 lb
Driving Horizontal Force:	459717 lb
Total Slice Area:	12855.1 ft2
Surface Horizontal Width:	398.495 ft
Surface Average Height:	32.2591 ft

Global Minimum Coordinates

Method: spencer

X	Y
131.806	1411.22
141.069	1399.87
151.83	1390.06
162.615	1381.6
173.267	1373.78
188.709	1363.29
204.182	1354.98
219.569	1347.14
234.947	1339.3
247.089	1333.12
259.232	1326.93
271.377	1320.74
283.597	1314.52
301.403	1310.27
319.668	1306.25
338.981	1302.28
358.294	1298.54
377.607	1294.81
388.721	1292.66
399.834	1290.51
411.662	1288.75
423.538	1287.33
437.036	1285.9
448.669	1284.89
460.601	1283.92
472.531	1282.97
482.119	1282.3
491.628	1281.81
509.49	1282.82
530.302	1285.01

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 8693
Number of Invalid Surfaces: 1369

Error Codes:

Error Code -106 reported for 8 surfaces
Error Code -108 reported for 270 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 5 surfaces
Error Code -112 reported for 43 surfaces
Error Code -114 reported for 39 surfaces
Error Code -121 reported for 435 surfaces
Error Code -124 reported for 4 surfaces
Error Code -600 reported for 1 surface
Error Code -1000 reported for 562 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

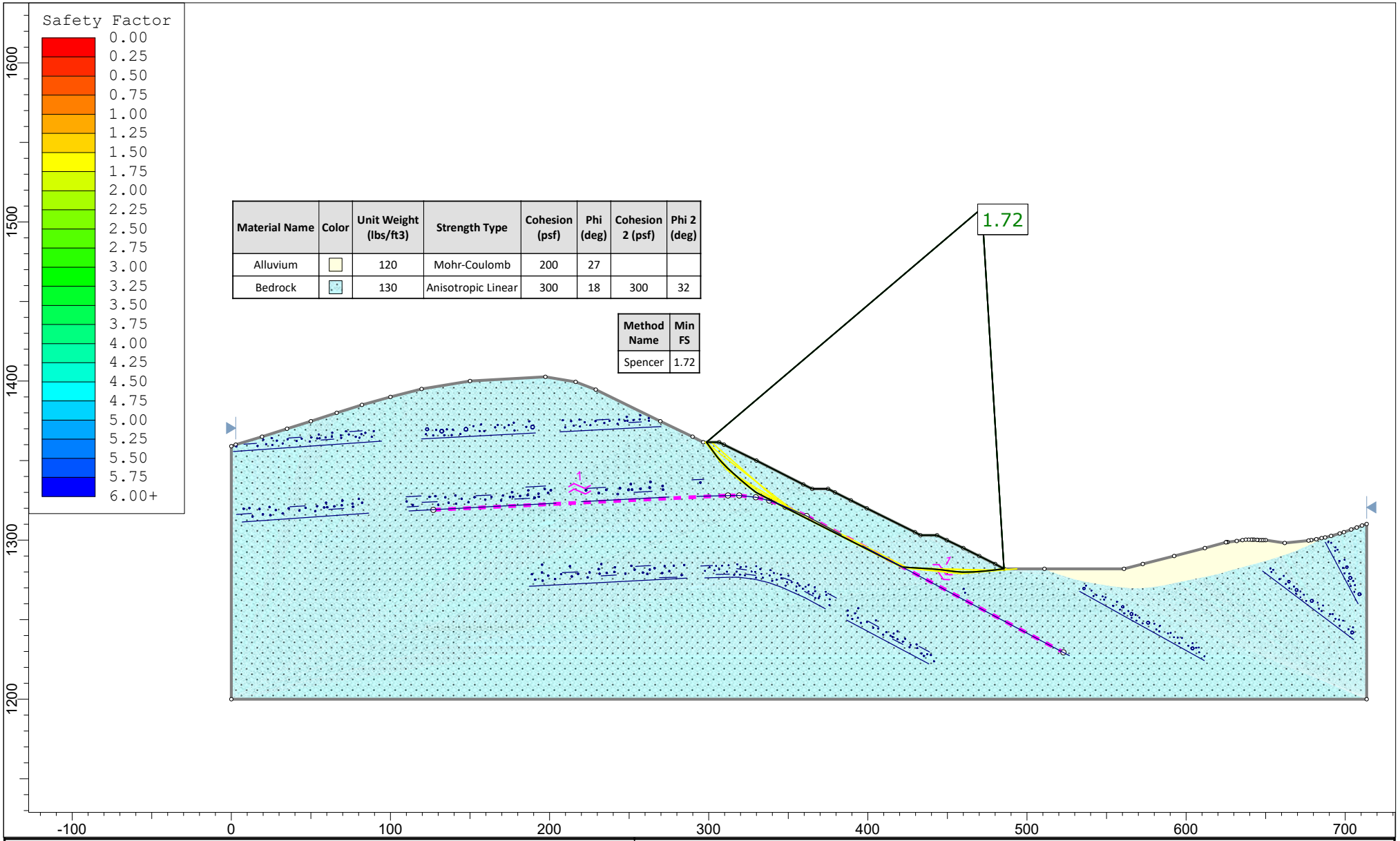
Global Minimum Query (spencer) - Safety Factor: 2.10484

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	9.26239	7950.02	-50.7855	Bedrock	300	32	274.146	577.033	443.345	0	443.345	779.307	779.307
2	10.7611	20507.2	-42.3699	Bedrock	300	32	514.29	1082.5	1252.26	0	1252.26	1721.37	1721.37
3	10.7854	28371.8	-38.1002	Bedrock	300	32	695.079	1463.03	1861.24	0	1861.24	2406.25	2406.25
4	10.6522	34309.2	-36.286	Bedrock	300	32	838.905	1765.76	2345.7	0	2345.7	2961.62	2961.62
5	7.72093	28254	-34.1997	Bedrock	300	32	956.819	2013.95	2742.9	0	2742.9	3393.14	3393.14
6	7.72093	30646.4	-34.1997	Bedrock	300	32	1026.82	2161.3	2978.7	0	2978.7	3676.53	3676.53
7	7.73633	32542.5	-28.2324	Bedrock	300	32	1149.55	2419.61	3392.08	0	3392.08	4009.3	4009.3
8	7.73633	33825.7	-28.2324	Bedrock	300	18	702.78	1479.24	3629.32	0	3629.32	4006.66	4006.66
9	7.69333	34967.9	-26.9967	Bedrock	300	18	731.685	1540.08	3816.57	0	3816.57	4189.33	4189.33
10	7.69333	36309.9	-26.9967	Bedrock	300	18	754.452	1588	3964.04	0	3964.04	4348.4	4348.4
11	7.68931	37632	-26.9967	Bedrock	300	18	777.209	1635.9	4111.48	0	4111.48	4507.43	4507.43
12	7.68931	38992.8	-26.9967	Bedrock	300	18	800.308	1684.52	4261.11	0	4261.11	4668.83	4668.83
13	6.07108	31910.1	-26.9967	Bedrock	300	18	824.457	1735.35	4417.53	0	4417.53	4837.56	4837.56
14	6.07108	32949.1	-26.9967	Bedrock	300	18	846.791	1782.36	4562.23	0	4562.23	4993.63	4993.63
15	12.1428	69019.1	-26.9967	Bedrock	300	18	880.295	1852.88	4779.26	0	4779.26	5227.73	5227.73
16	6.07236	36074	-26.9967	Bedrock	300	18	913.799	1923.4	4996.31	0	4996.31	5461.85	5461.85
17	6.07236	37089.9	-26.9967	Bedrock	300	18	935.634	1969.36	5137.75	0	5137.75	5614.41	5614.41
18	12.2203	77613.2	-26.9967	Bedrock	300	18	967.366	2036.15	5343.31	0	5343.31	5836.14	5836.14
19	8.90312	57648.9	-13.4214	Bedrock	300	32	1968.97	4144.37	6152.28	0	6152.28	6622.13	6622.13
20	8.90312	56961.2	-13.4214	Bedrock	300	32	1947.21	4098.56	6078.97	0	6078.97	6543.63	6543.63
21	9.13203	57492.8	-12.4016	Bedrock	300	32	1938.02	4079.23	6048.03	0	6048.03	6474.19	6474.19
22	9.13203	56394	-12.4016	Bedrock	300	32	1903.76	4007.12	5932.64	0	5932.64	6351.26	6351.26
23	6.43774	39057.4	-11.6297	Bedrock	300	32	1887.37	3972.61	5877.4	0	5877.4	6265.84	6265.84
24	6.43774	38434.5	-11.6297	Bedrock	300	32	1859.6	3914.16	5783.86	0	5783.86	6166.59	6166.59
25	6.43774	37782.4	-11.6297	Bedrock	300	32	1830.52	3852.96	5685.92	0	5685.92	6062.67	6062.67
26	9.6566	55349.7	-10.9464	Bedrock	300	32	1803.44	3795.96	5594.7	0	5594.7	5943.51	5943.51
27	9.6566	53701	-10.9464	Bedrock	300	32	1754.1	3692.09	5428.47	0	5428.47	5767.73	5767.73
28	9.65662	52087.7	-10.9464	Bedrock	300	32	1705.8	3590.43	5265.79	0	5265.79	5595.71	5595.71
29	9.65662	50549	-10.9464	Bedrock	300	32	1659.74	3493.49	5110.65	0	5110.65	5431.66	5431.66
30	11.1134	56273.2	-10.9464	Bedrock	300	32	1610.29	3389.4	4944.07	0	4944.07	5255.52	5255.52
31	11.1132	54212.3	-10.9464	Bedrock	300	32	1556.71	3276.63	4763.6	0	4763.6	5064.69	5064.69
32	5.91402	27882.6	-8.44367	Bedrock	300	32	1547.6	3257.46	4732.92	0	4732.92	4962.66	4962.66
33	5.91402	27076.1	-8.44367	Bedrock	300	32	1507.14	3172.29	4596.62	0	4596.62	4820.35	4820.35
34	5.93832	26310.6	-6.83677	Bedrock	300	32	1487.19	3130.3	4529.42	0	4529.42	4707.73	4707.73
35	5.93832	25366.6	-6.83677	Bedrock	300	32	1439.22	3029.32	4367.82	0	4367.82	4540.38	4540.38
36	6.74877	27642.2	-6.05533	Bedrock	300	32	1397.16	2940.79	4226.15	0	4226.15	4374.36	4374.36
37	6.74877	26342.1	-6.05533	Bedrock	300	32	1338.53	2817.39	4028.65	0	4028.65	4170.65	4170.65
38	5.81654	21616.8	-4.93539	Bedrock	300	32	1296.31	2728.52	3886.44	0	3886.44	3998.38	3998.38
39	5.81654	20564.2	-4.93539	Bedrock	300	32	1240.57	2611.2	3698.7	0	3698.7	3805.82	3805.82
40	5.96583	19978.8	-4.66101	Bedrock	300	32	1186.39	2497.17	3516.21	0	3516.21	3612.93	3612.93
41	5.96583	18759.9	-4.66101	Bedrock	300	32	1123.27	2364.31	3303.6	0	3303.6	3395.18	3395.18
42	5.96525	17514.6	-4.54077	Bedrock	300	32	1060.16	2231.47	3091.01	0	3091.01	3175.21	3175.21
43	5.96525	16266.3	-4.54077	Bedrock	300	32	995.434	2095.23	2872.96	0	2872.96	2952.02	2952.02
44	9.58807	23472.9	-3.99544	Bedrock	300	32	914.188	1924.22	2599.3	0	2599.3	2663.15	2663.15
45	9.50867	20034	-2.94909	Bedrock	300	32	816.475	1718.55	2270.16	0	2270.16	2312.22	2312.22
46	8.93115	15334.1	3.21019	Bedrock	300	32	738.712	1554.87	2008.21	0	2008.21	1966.78	1966.78
47	8.93115	11384.8	3.21019	Bedrock	300	32	589.493	1240.79	1505.58	0	1505.58	1472.52	1472.52
48	6.93712	5981.36	6.00769	Bedrock	300	32	463.238	975.041	1080.29	0	1080.29	1031.54	1031.54
49	6.93712	3544.09	6.00769	Bedrock	300	32	340.636	716.985	667.315	0	667.315	631.466	631.466
50	6.93712	1181.36	6.00769	Bedrock	300	32	221.782	466.816	266.961	0	266.961	243.621	243.621

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.10484

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	131.806	1411.22	0	0	0
2	141.069	1399.87	2493.14	731.691	16.356
3	151.83	1390.06	9250.82	2714.95	16.356
4	162.615	1381.6	17494.4	5134.29	16.356
5	173.267	1373.78	26903.6	7895.7	16.356
6	180.988	1368.53	33908.2	9951.45	16.356
7	188.709	1363.29	41609.7	12211.7	16.356
8	196.446	1359.13	46806.5	13736.9	16.3561
9	204.182	1354.98	56445.1	16565.6	16.356
10	211.875	1351.06	65774.6	19303.7	16.356
11	219.569	1347.14	75507	22159.9	16.356
12	227.258	1343.22	85636.9	25132.9	16.356
13	234.947	1339.3	96175.2	28225.7	16.356
14	241.018	1336.21	104833	30766.6	16.356
15	247.089	1333.12	113803	33399	16.356
16	259.232	1326.93	132679	38938.8	16.356
17	265.305	1323.84	142586	41846.5	16.356
18	271.377	1320.74	152799	44843.7	16.356
19	283.597	1314.52	174243	51137.2	16.356
20	292.5	1312.39	169784	49828.5	16.356
21	301.403	1310.27	165363	48530.9	16.356
22	310.535	1308.26	159809	46901.2	16.3561
23	319.668	1306.25	154337	45295.2	16.356
24	326.105	1304.93	149974	44014.7	16.356
25	332.543	1303.6	145666	42750.4	16.356
26	338.981	1302.28	141415	41502.8	16.356
27	348.637	1300.41	134449	39458.4	16.356
28	358.294	1298.54	127649	37462.8	16.3561
29	367.951	1296.68	121012	35514.8	16.356
30	377.607	1294.81	114530	33612.4	16.356
31	388.721	1292.66	107261	31479.1	16.356
32	399.834	1290.51	100200	29406.8	16.356
33	405.748	1289.63	95202.4	27940.2	16.356
34	411.662	1288.75	90324.6	26508.6	16.356
35	417.6	1288.04	84718	24863.2	16.356
36	423.538	1287.33	79281.2	23267.6	16.356
37	430.287	1286.61	72877.7	21388.3	16.356
38	437.036	1285.9	66728.5	19583.6	16.356
39	442.852	1285.4	61140.5	17943.6	16.356
40	448.669	1284.89	55782.4	16371.1	16.356
41	454.635	1284.41	50414.9	14795.8	16.3559
42	460.601	1283.92	45320.5	13300.7	16.356
43	466.566	1283.45	40460.7	11874.5	16.356
44	472.531	1282.97	35883.7	10531.2	16.356
45	482.119	1282.3	28859.1	8469.63	16.356
46	491.628	1281.81	22207.6	6517.53	16.356
47	500.559	1282.31	14604.1	4286.04	16.356
48	509.49	1282.82	8585.08	2519.56	16.356
49	516.427	1283.55	4582.86	1344.99	16.356
50	523.364	1284.28	1732.65	508.5	16.356
51	530.302	1285.01	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Alluvium		120	Mohr-Coulomb	200	27		
Bedrock		130	Anisotropic Linear	300	18	300	32

Method Name	Min FS
Spencer	1.72

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 12-12'; CS-8; non-circular search; bedding plane; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t12s1a.slmd
		Scale:	1:1000
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 17

Slide Analysis Information

t12s1a

Project Summary

File Name:	t12s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:05.205s
Project Title:	VTTM 60257
Analysis:	Section 12-12'; CS-8; non-circular search; bedding plane; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Alluvium	Bedrock
Color		
Strength Type	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	120	130
Cohesion [psf]	200	
Friction Angle [°]	27	
Cohesion 1 [psf]		300
Cohesion 2 [psf]		300
Friction Angle 1 [°]		18
Friction Angle 2 [°]		32
A [°]		1
B [°]		1
Anisotropic Definition		Surface
Angle from 1 [°]		
Anisotropic Surface		Anisotropic Surface 1
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.715290
Axis Location:	471.616, 1508.693
Left Slip Surface Endpoint:	298.640, 1361.553
Right Slip Surface Endpoint:	485.543, 1282.028
Resisting Moment:	6.49416e+07 lb-ft
Driving Moment:	3.78603e+07 lb-ft
Resisting Horizontal Force:	260693 lb
Driving Horizontal Force:	151981 lb
Total Slice Area:	3541.99 ft2
Surface Horizontal Width:	186.902 ft
Surface Average Height:	18.951 ft

Global Minimum Coordinates

Method: spencer

X	Y
298.64	1361.55
304.804	1352.99
308.559	1348.51
312.315	1344.99
316.603	1340.9
320.891	1337.13
325.308	1333.57
329.724	1330.04
337.12	1326.13
344.516	1322.23
352.09	1318.41
359.663	1314.59
367.237	1310.74
374.811	1306.88
382.603	1302.92
390.396	1298.96
398.188	1294.99
405.98	1291.03
413.772	1287.07
421.565	1283.1
430.491	1282.61
439.418	1282.04
446.867	1281.32
454.316	1280.33
459.441	1279.86
466.481	1280.05
473.521	1280.63
479.923	1281.36
485.543	1282.03

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 8203
Number of Invalid Surfaces: 1855

Error Codes:

Error Code -106 reported for 13 surfaces
Error Code -108 reported for 218 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 17 surfaces
Error Code -112 reported for 52 surfaces
Error Code -114 reported for 32 surfaces
Error Code -121 reported for 510 surfaces
Error Code -124 reported for 7 surfaces
Error Code -1000 reported for 1005 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.

-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.71529

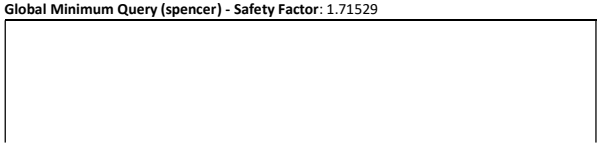
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.08178	858.073	-54.2674	Bedrock	300	32	193.971	332.716	52.3571	0	52.3571	321.972	321.972
2	3.08178	2574.22	-54.2674	Bedrock	300	32	302.2	518.36	349.449	0	349.449	769.5	769.5
3	3.75572	5135.9	-50.02	Bedrock	300	32	431.919	740.867	705.535	0	705.535	1220.64	1220.64
4	3.75573	6259.65	-43.1279	Bedrock	300	32	543.694	932.593	1012.36	0	1012.36	1521.64	1521.64
5	4.28815	8169.16	-43.6279	Bedrock	300	32	595.911	1022.16	1155.7	0	1155.7	1723.73	1723.73
6	4.28815	9191.85	-41.3589	Bedrock	300	32	671.424	1151.69	1362.98	0	1362.98	1954.07	1954.07
7	4.4165	10348.7	-38.8147	Bedrock	300	32	743.664	1275.6	1561.29	0	1561.29	2159.52	2159.52
8	4.4165	11143.3	-38.6647	Bedrock	300	32	790.344	1355.67	1689.42	0	1689.42	2321.81	2321.81
9	3.69778	9679.62	-27.8403	Bedrock	300	32	928.449	1592.56	2068.53	0	2068.53	2558.88	2558.88
10	3.69778	9713.45	-27.8403	Bedrock	300	32	931.114	1597.13	2075.84	0	2075.84	2567.6	2567.6
11	3.69778	9747.21	-27.8417	Bedrock	300	32	933.755	1601.66	2083.09	0	2083.09	2576.27	2576.27
12	3.69778	9780.99	-27.8417	Bedrock	300	32	936.413	1606.22	2090.39	0	2090.39	2584.98	2584.98
13	3.78695	10029.6	-26.7588	Bedrock	300	32	949.321	1628.36	2125.82	0	2125.82	2604.5	2604.5
14	3.78695	10020.4	-26.7588	Bedrock	300	32	948.603	1627.13	2123.85	0	2123.85	2602.17	2602.17
15	3.78695	10011.2	-26.7589	Bedrock	300	32	947.886	1625.9	2121.88	0	2121.88	2599.84	2599.84
16	3.78695	10002	-26.7589	Bedrock	300	32	947.175	1624.68	2119.92	0	2119.92	2597.52	2597.52
17	3.78695	10016.3	-26.9696	Bedrock	300	18	584.538	1002.65	2162.54	0	2162.54	2459.99	2459.99
18	3.78695	10210.1	-26.9696	Bedrock	300	18	592.542	1016.38	2204.79	0	2204.79	2506.31	2506.31
19	3.78695	11082.2	-26.9696	Bedrock	300	18	628.567	1078.17	2394.98	0	2394.98	2714.84	2714.84
20	3.78695	12030.8	-26.9696	Bedrock	300	18	667.755	1145.39	2601.85	0	2601.85	2941.65	2941.65
21	3.89611	12889.4	-26.9565	Bedrock	300	18	688.378	1180.77	2710.72	0	2710.72	3060.8	3060.8
22	3.89611	12864.4	-26.9565	Bedrock	300	18	687.371	1179.04	2705.41	0	2705.41	3054.98	3054.98
23	3.89611	12882.1	-26.9565	Bedrock	300	18	688.084	1180.26	2709.16	0	2709.16	3059.1	3059.1
24	3.89611	12900.7	-26.9565	Bedrock	300	18	688.831	1181.55	2713.12	0	2713.12	3063.44	3063.44
25	3.89611	12921.5	-26.9565	Bedrock	300	18	689.666	1182.98	2717.53	0	2717.53	3068.28	3068.28
26	3.89611	12943.1	-26.9565	Bedrock	300	18	690.532	1184.46	2722.11	0	2722.11	3073.29	3073.29
27	3.89611	12965.5	-26.9565	Bedrock	300	18	691.434	1186.01	2726.85	0	2726.85	3078.49	3078.49
28	3.89611	12990.4	-26.9565	Bedrock	300	18	692.432	1187.72	2732.13	0	2732.13	3084.28	3084.28
29	3.89611	13015.4	-26.9565	Bedrock	300	18	693.436	1189.44	2737.42	0	2737.42	3090.08	3090.08
30	3.89611	13040.4	-26.9565	Bedrock	300	18	694.44	1191.17	2742.72	0	2742.72	3095.89	3095.89
31	3.89611	13065.4	-26.9565	Bedrock	300	18	695.444	1192.89	2748.03	0	2748.03	3101.71	3101.71
32	3.89611	13090.4	-26.9565	Bedrock	300	18	696.448	1194.61	2753.34	0	2753.34	3107.53	3107.53
33	2.97562	9753.93	-3.1952	Bedrock	300	32	1508.71	2587.88	3661.37	0	3661.37	3745.6	3745.6
34	2.97562	9247.38	-3.1952	Bedrock	300	32	1440.54	2470.95	3474.24	0	3474.24	3554.66	3554.66
35	2.97562	8738.57	-3.1952	Bedrock	300	32	1372.07	2353.5	3286.29	0	3286.29	3362.89	3362.89
36	4.46342	12233.9	-3.59473	Bedrock	300	32	1287	2207.57	3052.76	0	3052.76	3133.61	3133.61
37	4.46342	12184.1	-3.59473	Bedrock	300	32	1282.55	2199.95	3040.57	0	3040.57	3121.14	3121.14
38	3.72435	10322.6	-5.58019	Bedrock	300	32	1266.71	2172.78	2997.08	0	2997.08	3120.84	3120.84
39	3.72435	10098.9	-5.58019	Bedrock	300	32	1243.43	2132.85	2933.15	0	2933.15	3054.64	3054.64
40	3.72435	9367.49	-7.5539	Bedrock	300	32	1139.08	1953.85	2646.71	0	2646.71	2797.77	2797.77
41	3.72435	8725.33	-7.5539	Bedrock	300	32	1074	1842.23	2468.08	0	2468.08	2610.5	2610.5
42	5.1249	10921.5	-5.2098	Bedrock	300	32	1023.15	1755	2328.49	0	2328.49	2421.78	2421.78
43	3.52023	6630.44	1.56934	Bedrock	300	32	1011.47	1734.97	2296.44	0	2296.44	2268.73	2268.73
44	3.52023	5781.3	1.56934	Bedrock	300	32	908.045	1557.56	2012.52	0	2012.52	1987.64	1987.64
45	3.52023	4887.79	4.68219	Bedrock	300	32	833.847	1430.29	1808.84	0	1808.84	1740.55	1740.55
46	3.52023	3950.36	4.68219	Bedrock	300	32	714.111	1224.91	1480.16	0	1480.16	1421.67	1421.67
47	3.2008	2757.1	6.48193	Bedrock	300	32	611.688	1049.22	1199.01	0	1199.01	1129.51	1129.51
48	3.2008	1939.85	6.48193	Bedrock	300	32	493.542	846.567	874.689	0	874.689	818.615	818.615
49	2.80978	1008.87	6.78927	Bedrock	300	32	380.718	653.042	564.986	0	564.986	519.661	519.661
50	2.80978	336.295	6.78927	Bedrock	300	32	269.427	462.146	259.488	0	259.488	227.412	227.412

Query 1 (spencer) - Safety Factor: 1.71529

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.08178	858.073	-54.2674	Bedrock	300	32	193.971	332.716	52.3571	0	52.3571	321.972	321.972
2	3.08178	2574.22	-54.2674	Bedrock	300	32	302.2	518.36	349.449	0	349.449	769.5	769.5
3	3.75572	5135.9	-50.02	Bedrock	300	32	431.919	740.867	705.535	0	705.535	1220.64	1220.64
4	3.75573	6259.65	-43.1279	Bedrock	300	32	543.694	932.593	1012.36	0	1012.36	1521.64	1521.64
5	4.28815	8169.16	-43.6279	Bedrock	300	32	595.911	1022.16	1155.7	0	1155.7	1723.73	1723.73
6	4.28815	9191.85	-41.3589	Bedrock	300	32	671.424	1151.69	1362.98	0	1362.98	1954.07	1954.07
7	4.4165	10348.7	-38.8147	Bedrock	300	32	743.664	1275.6	1561.29	0	1561.29	2159.52	2159.52
8	4.4165	11143.3	-38.6647	Bedrock	300	32	790.344	1355.67	1689.42	0	1689.42	2321.81	2321.81
9	3.69778	9679.62	-27.8403	Bedrock	300	32	928.449	1592.56	2068.53	0	2068.53	2558.88	2558.88
10	3.69778	9713.45	-27.8403	Bedrock	300	32	931.114	1597.13	2075.84	0	2075.84	2567.6	2567.6
11	3.69778	9747.21	-27.8417	Bedrock	300	32	933.755	1601.66	2083.09	0	2083.09	2576.27	2576.27
12	3.69778	9780.99	-27.8417	Bedrock	300	32	936.413	1606.22	2090.39	0	2090.39	2584.98	2584.98
13	3.78695	10029.6	-26.7588	Bedrock	300	32	949.321	1628.36	2125.82	0	2125.82	2604.5	2604.5
14	3.78695	10020.4	-26.7588	Bedrock	300	32	948.603	1627.13	2123.85	0	2123.85	2602.17	2602.17
15	3.78695	10011.2	-26.7589	Bedrock	300	32	947.886	1625.9	2121.88	0	2121.88	2599.84	2599.84
16	3.78695	10002	-26.7589	Bedrock	300	32	947.175	1624.68	2119.92	0	2119.92	2597.52	2597.52
17	3.78695	10016.3	-26.9696	Bedrock	300	18	584.538	1002.65	2162.54	0	2162.54	2459.99	2459.99
18	3.78695	10210.1	-26.9696	Bedrock	300	18	592.542	1016.38	2204.79	0	2204.79	2506.31	2506.31
19	3.78695	11082.2	-26.9696	Bedrock	300	18	628.567	1078.17	2394.98	0	2394.98	2714.84	2714.84
20	3.78695	12030.8	-26.9696	Bedrock	300	18	667.755	1145.39	2601.85	0	2601.85	2941.65	2941.65
21	3.89611	12889.4	-26.9565	Bedrock	300	18	688.378	1180.77	2710.72	0	2710.72	3060.8	3060.8
22	3.89611	12864.4	-26.9565	Bedrock	300	18	687.371	1179.04	2705.41	0	2705.41	3054.98	3054.98
23	3.89611	12882.1	-26.9565	Bedrock	300	18	688.084	1180.26	2709.16	0	2709.16	3059.1	3059.1
24	3.89611	12900.7	-26.9565	Bedrock	300	18	688.831	1181.55	2713.12	0	2713.12	3063.44	3063.44
25	3.89611	12921.5	-26.9565	Bedrock	300	18	689.666	1182.98	2717.53	0	2717.53	3068.28	3068.28
26	3.89611	12943.1	-26.9565	Bedrock	300	18	690.532	1184.46	2722.11	0	2722.11	3073.29	3073.29
27	3.89611	12965.5	-26.9565	Bedrock	300	18	691.434	1186.01	2726.85	0	2726.85	3078.49	3078.49
28	3.89611	12990.4	-26.9565	Bedrock	300	18	692.432	1187.72	2732.13	0	2732.13	3084.28	3084.28
29	3.89611	13015.4	-26.9565	Bedrock	300	18	693.436	1189.44	2737.42	0	2737.42	3090.08	3090.08
30	3.89611	13040.4	-26.9565	Bedrock	300	18	694.44	1191.17	2742.72	0	2742.72	3095.89	3095.89
31	3.89611	13065.4	-26.9565	Bedrock	300	18	695.444	1192.89	2748.03	0	2748.03	3101.71	3101.71
32	3.89611	13090.4	-26.9565	Bedrock	300	18	696.448	1194.61	2753.34	0	2753.34	3107.53	3107.53
33	2.97562	9753.93	-3.1952	Bedrock	300	32	1508.71	2587.88	3661.37	0	3661.37	3745.6	3745.6
34	2.97562	9247.38	-3.1952	Bedrock	300	32	1440.54	2470.95	3474.24	0	3474.24	3554.66	3554.66
35	2.97562	8738.57	-3.1952	Bedrock	300	32	1372.07	2353.5	3286.29	0	3286.29	3362.89	3362.89
36	4.46342	12233.9	-3.59473	Bedrock	300	32	1287	2207.57	3052.76	0	3052.76	3133.61	3133.61
37	4.46342	12184.1	-3.59473	Bedrock	300	32	1282.55	2199.95	3040.57	0	3040.57	3121.14	3121.14
38	3.72435	10322.6	-5.58019	Bedrock	300	32	1266.71	2172.78	2997.08	0	2997.08	3120.84	3120.84
39	3.72435	10098.9	-5.58019	Bedrock	300	32	1243.43	2132.85	2933.15	0	2933.15	3054.64	3054.64
40	3.72435	9367.49	-7.5539	Bedrock	300	32	1139.08	1953.85	2646.71	0	2646.71	2797.77	2797.77
41	3.72435	8725.33	-7.5539	Bedrock	300	32	1074	1842.23	2468.08	0	2468.08	2610.5	2610.5
42	5.1249	10921.5	-5.2098	Bedrock	300	32	1023.15	1755	2328.49	0	2328.49	2421.78	2421.78
43	3.52023	6630.44	1.56934	Bedrock	300	32	1011.47	1734.97	2296.44	0	2296.44	2268.73	2268.73
44	3.52023	5781.3	1.56934	Bedrock	300	32	908.045	1557.56	2012.52	0	2012.52	1987.64	1987.64
45	3.52023	4887.79	4.68219	Bedrock	300	32	833.847	1430.29	1808.84	0	1808.84	1740.55	1740.55
46	3.52023	3950.36	4.68219	Bedrock	300	32	714.111	1224.91	1480.16	0	1480.16	1421.67	1421.67
47	3.2008	2757.1	6.48193	Bedrock	300	32	611.688	1049.22	1199.01	0	1199.01	1129.51	1129.51
48	3.2008	1939.85	6.48193	Bedrock	300	32	493.542	846.567	874.689	0	874.689	818.615	818.615
49	2.80978	1008.87	6.78927	Bedrock	300	32	380.718	653.042	564.986	0	564.986	519.661	519.661
50	2.80978	336.295	6.78927	Bedrock	300	32	269.427	462.146	259.488	0	259.488	227.412	227.412

Interslice Data

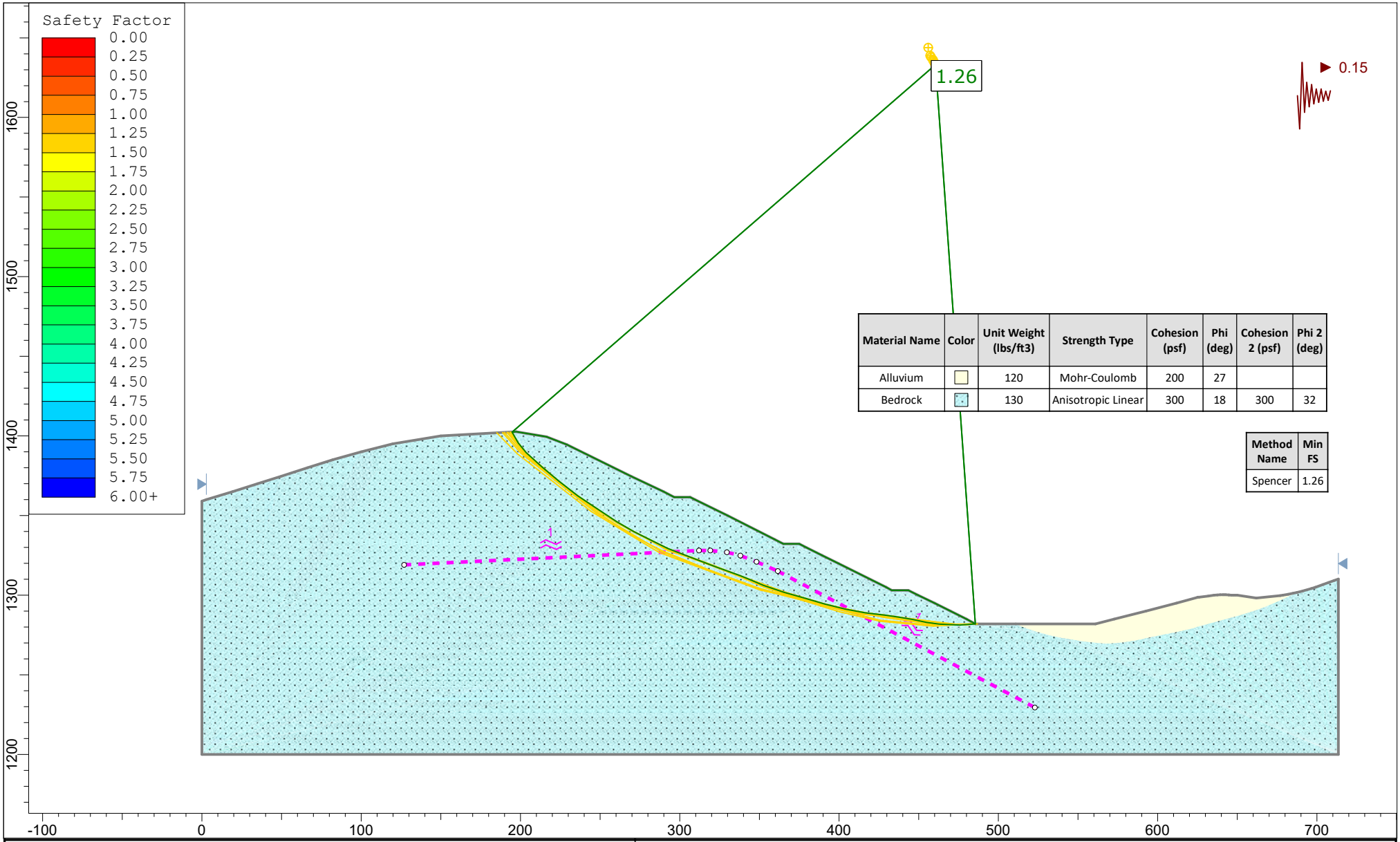
Global Minimum Query (spencer) - Safety Factor: 1.71529



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	298.64	1361.55	0	0	0
2	301.722	1357.27	-373.499	-133.912	19.7245
3	304.804	1352.99	192.087	68.8694	19.7244
4	308.559	1348.51	1730.06	620.284	19.7244
5	312.315	1344.99	3249.55	1165.07	19.7244
6	316.603	1340.9	5418.15	1942.59	19.7245
7	320.891	1337.13	7684.3	2755.08	19.7245
8	325.308	1333.57	9946.88	3566.29	19.7245
9	329.724	1330.04	12426.4	4455.29	19.7245
10	333.422	1328.09	13032.9	4672.74	19.7245
11	337.12	1326.13	13643.9	4891.79	19.7244
12	340.818	1324.18	14259.5	5112.49	19.7244
13	344.516	1322.23	14879.5	5334.78	19.7244
14	348.303	1320.32	15343.7	5501.23	19.7245
15	352.09	1318.41	15806.9	5667.3	19.7244
16	355.876	1316.5	16269.1	5833	19.7244
17	359.663	1314.59	16730.2	5998.33	19.7244
18	363.45	1312.66	18683.8	6698.78	19.7245
19	367.237	1310.74	20688.6	7417.55	19.7244
20	371.024	1308.81	22923.4	8218.8	19.7244
21	374.811	1306.88	25408.4	9109.77	19.7245
22	378.707	1304.9	28097.6	10073.9	19.7244
23	382.603	1302.92	30780.1	11035.7	19.7245
24	386.5	1300.94	33467.3	11999.2	19.7245
25	390.396	1298.96	36159.5	12964.4	19.7245
26	394.292	1296.97	38857.1	13931.5	19.7244
27	398.188	1294.99	41560.3	14900.8	19.7245
28	402.084	1293.01	44269.5	15872.1	19.7245
29	405.98	1291.03	46985.3	16845.8	19.7245
30	409.876	1289.05	49707.6	17821.8	19.7244
31	413.772	1287.07	52436.6	18800.3	19.7245
32	417.668	1285.09	55172.1	19781	19.7244
33	421.565	1283.1	57914.2	20764.2	19.7245
34	424.54	1282.94	54033.1	19372.7	19.7245
35	427.516	1282.77	50323.7	18042.7	19.7244
36	430.491	1282.61	46786.8	16774.6	19.7244
37	434.955	1282.32	41898.4	15022	19.7245
38	439.418	1282.04	37026.4	13275.2	19.7245
39	443.143	1281.68	33399.3	11974.7	19.7244
40	446.867	1281.32	29835.6	10697.1	19.7245
41	450.591	1280.82	26900.4	9644.7	19.7245
42	454.316	1280.33	24119.4	8647.61	19.7245
43	459.441	1279.86	19963.9	7157.74	19.7245
44	462.961	1279.96	16181.8	5801.72	19.7245
45	466.481	1280.05	12791.2	4586.08	19.7245
46	470.001	1280.34	9334.36	3346.68	19.7245
47	473.521	1280.63	6393.78	2292.38	19.7244
48	476.722	1280.99	3999.85	1434.08	19.7245
49	479.923	1281.36	2102.02	753.646	19.7245
50	482.733	1281.69	843.294	302.349	19.7244
51	485.543	1282.03	0	0	0

Query 1 (spencer) - Safety Factor: 1.71529

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	298.64	1361.55	0	0	0
2	301.722	1357.27	-373.499	-133.912	19.7245
3	304.804	1352.99	192.087	68.8694	19.7244
4	308.559	1348.51	1730.06	620.284	19.7244
5	312.315	1344.99	3249.55	1165.07	19.7244
6	316.603	1340.9	5418.15	1942.59	19.7245
7	320.891	1337.13	7684.3	2755.08	19.7245
8	325.308	1333.57	9946.88	3566.29	19.7245
9	329.724	1330.04	12426.4	4455.29	19.7245
10	333.422	1328.09	13032.9	4672.74	19.7245
11	337.12	1326.13	13643.9	4891.79	19.7244
12	340.818	1324.18	14259.5	5112.49	19.7244
13	344.516	1322.23	14879.5	5334.78	19.7244
14	348.303	1320.32	15343.7	5501.23	19.7245
15	352.09	1318.41	15806.9	5667.3	19.7244
16	355.876	1316.5	16269.1	5833	19.7244
17	359.663	1314.59	16730.2	5998.33	19.7244
18	363.45	1312.66	18683.8	6698.78	19.7245
19	367.237	1310.74	20688.6	7417.55	19.7244
20	371.024	1308.81	22923.4	8218.8	19.7244
21	374.811	1306.88	25408.4	9109.77	19.7245
22	378.707	1304.9	28097.6	10073.9	19.7244
23	382.603	1302.92	30780.1	11035.7	19.7245
24	386.5	1300.94	33467.3	11999.2	19.7245
25	390.396	1298.96	36159.5	12964.4	19.7245
26	394.292	1296.97	38857.1	13931.5	19.7244
27	398.188	1294.99	41560.3	14900.8	19.7245
28	402.084	1293.01	44269.5	15872.1	19.7245
29	405.98	1291.03	46985.3	16845.8	19.7245
30	409.876	1289.05	49707.6	17821.8	19.7244
31	413.772	1287.07	52436.6	18800.3	19.7245
32	417.668	1285.09	55172.1	19781	19.7244
33	421.565	1283.1	57914.2	20764.2	19.7245
34	424.54	1282.94	54033.1	19372.7	19.7245
35	427.516	1282.77	50323.7	18042.7	19.7244
36	430.491	1282.61	46786.8	16774.6	19.7244
37	434.955	1282.32	41898.4	15022	19.7245
38	439.418	1282.04	37026.4	13275.2	19.7245
39	443.143	1281.68	33399.3	11974.7	19.7244
40	446.867	1281.32	29835.6	10697.1	19.7245
41	450.591	1280.82	26900.4	9644.7	19.7245
42	454.316	1280.33	24119.4	8647.61	19.7245
43	459.441	1279.86	19963.9	7157.74	19.7245
44	462.961	1279.96	16181.8	5801.72	19.7245
45	466.481	1280.05	12791.2	4586.08	19.7245
46	470.001	1280.34	9334.36	3346.68	19.7245
47	473.521	1280.63	6393.78	2292.38	19.7244
48	476.722	1280.99	3999.85	1434.08	19.7245
49	479.923	1281.36	2102.02	753.646	19.7245
50	482.733	1281.69	843.294	302.349	19.7244
51	485.543	1282.03	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 12-12'; CS-8; non-circular search; bedding plane; pseudo		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t12ps1a.slmd
		Scale:	1:1000
Project No.:	18-1245A-4	*Date:* 6/7/2018	*Figure No.:* Run No. 18

Slide Analysis Information

t12ps1a

Project Summary

File Name:	t12ps1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:04.455s
Project Title:	VTTM 60257
Analysis:	Section 12-12'; CS-8; non-circular search; bedding plane; pseudo
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Alluvium	Bedrock
Color		
Strength Type	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	120	130
Cohesion [psf]	200	
Friction Angle [°]	27	
Cohesion 1 [psf]		300
Cohesion 2 [psf]		300
Friction Angle 1 [°]		18
Friction Angle 2 [°]		32
A [°]		1
B [°]		1
Anisotropic Definition		Surface
Angle from 1 [°]		
Anisotropic Surface		Anisotropic Surface 1
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	1.260800
Axis Location:	460.544, 1633.180
Left Slip Surface Endpoint:	194.621, 1402.490
Right Slip Surface Endpoint:	485.543, 1282.028
Resisting Moment:	2.1525e+08 lb-ft
Driving Moment:	1.70725e+08 lb-ft
Resisting Horizontal Force:	569821 lb
Driving Horizontal Force:	451954 lb
Total Slice Area:	7526.64 ft2
Surface Horizontal Width:	290.921 ft
Surface Average Height:	25.8717 ft

Global Minimum Coordinates

Method: spencer

X	Y
194.621	1402.49
198.609	1395.65
203.588	1389.51
213.511	1380.49
223.978	1371.68
235.969	1362.41
248.843	1353.75
260.319	1346.21
271.202	1339.97
281.775	1334.58
292.494	1329.34
307.527	1323.5
322.56	1317.86
337.593	1312.35
345.11	1309.41
352.626	1306.22
365.385	1301.86
378.143	1298.29
390.902	1294.44
403.763	1291.38
416.656	1288.95
429.549	1287.44
437.955	1286.22
446.369	1284.73
454.78	1282.94
463.192	1281.88
475.788	1281.29
485.543	1282.03

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 7522
Number of Invalid Surfaces: 2536

Error Codes:

Error Code -106 reported for 13 surfaces
Error Code -108 reported for 237 surfaces
Error Code -111 reported for 30 surfaces
Error Code -112 reported for 93 surfaces
Error Code -114 reported for 40 surfaces
Error Code -121 reported for 576 surfaces
Error Code -124 reported for 8 surfaces
Error Code -1000 reported for 1539 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

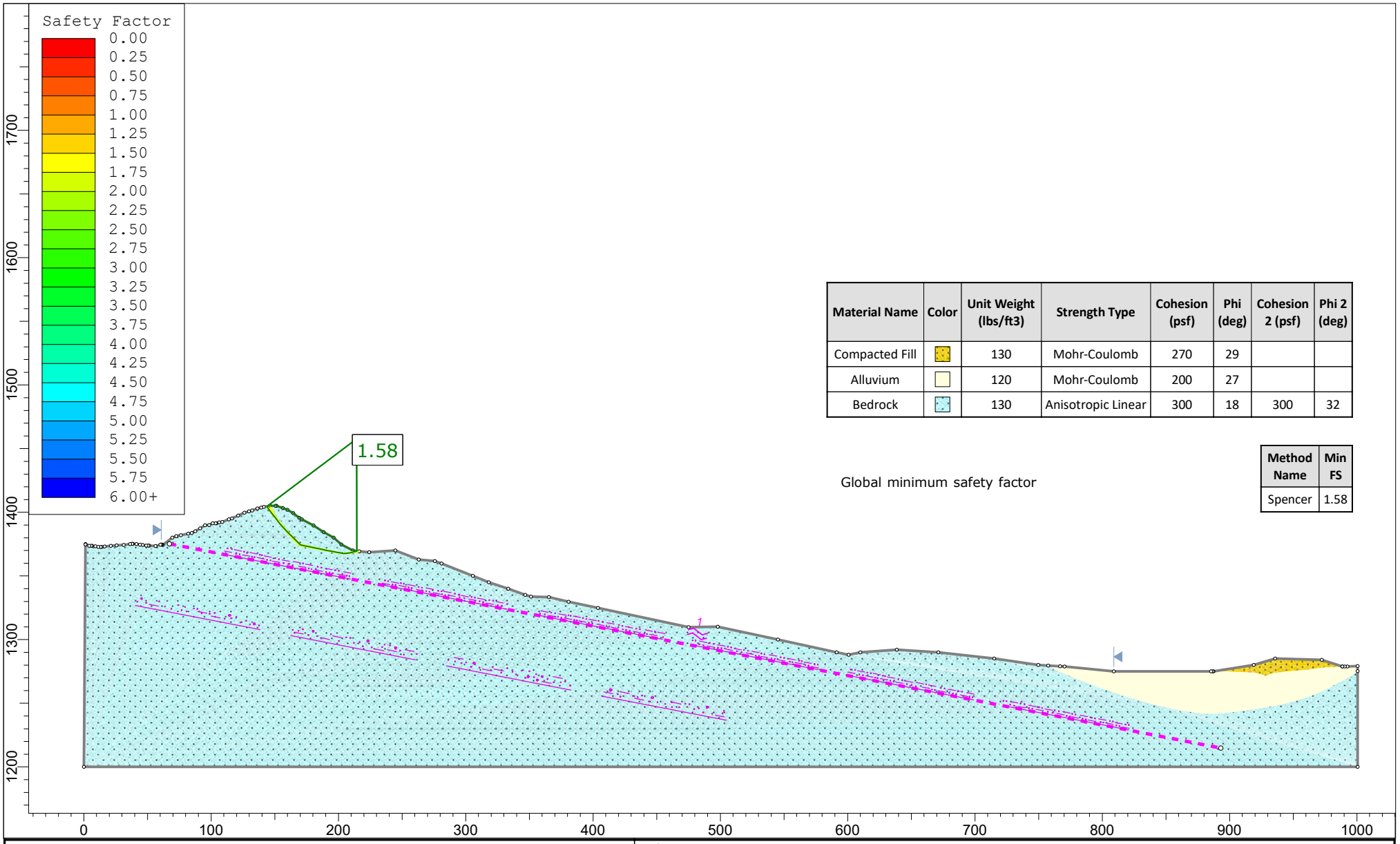
Global Minimum Query (spencer) - Safety Factor: 1.2608

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.9881	1807.89	-59.7626	Bedrock	300	32	264.926	334.019	54.4417	0	54.4417	508.948	508.948
2	4.97828	6107.72	-50.9406	Bedrock	300	32	475.765	599.844	479.85	0	479.85	1066.13	1066.13
3	4.96196	8990.57	-42.2754	Bedrock	300	32	705.391	889.357	943.168	0	943.168	1584.47	1584.47
4	4.96196	11370.7	-42.2754	Bedrock	300	32	836.096	1054.15	1206.89	0	1206.89	1967.03	1967.03
5	5.23303	14365.2	-40.0953	Bedrock	300	32	995.853	1255.57	1529.24	0	1529.24	2367.68	2367.68
6	5.23303	16093.6	-40.0953	Bedrock	300	32	1089.74	1373.95	1718.69	0	1718.69	2636.19	2636.19
7	5.99554	20255.6	-37.7066	Bedrock	300	32	1224.71	1544.12	1991.02	0	1991.02	2937.81	2937.81
8	5.99554	21743.5	-37.7066	Bedrock	300	32	1298.53	1637.19	2139.96	0	2139.96	3143.82	3143.82
9	6.4372	24552.1	-33.9206	Bedrock	300	32	1443.76	1820.29	2432.98	0	2432.98	3403.9	3403.9
10	6.4372	25540.7	-33.9206	Bedrock	300	32	1492.76	1882.07	2531.84	0	2531.84	3535.72	3535.72
11	5.73791	23566.9	-33.3171	Bedrock	300	32	1552.98	1958	2653.36	0	2653.36	3674.15	3674.15
12	5.73791	24287.3	-33.3171	Bedrock	300	32	1593.49	2009.07	2735.09	0	2735.09	3782.5	3782.5
13	5.44182	23537	-29.8063	Bedrock	300	32	1721.95	2171.03	2994.28	0	2994.28	3980.7	3980.7
14	5.44182	23861.1	-29.8063	Bedrock	300	32	1742.43	2196.85	3035.59	0	3035.59	4033.74	4033.74
15	5.2863	23395	-27.0213	Bedrock	300	32	1840.51	2320.51	3233.48	0	3233.48	4172.13	4172.13
16	5.2863	23498.7	-27.0213	Bedrock	300	32	1847.6	2329.45	3247.8	0	3247.8	4190.07	4190.07
17	5.35929	23889.1	-26.0406	Bedrock	300	32	1882.84	2373.89	3318.93	0	3318.93	4238.91	4238.91
18	5.35929	23899.1	-26.0406	Bedrock	300	32	1883.53	2374.76	3320.32	0	3320.32	4240.63	4240.63
19	5.01098	22141.5	-21.2402	Bedrock	300	32	2027.05	2555.7	3609.88	0	3609.88	4397.76	4397.76
20	5.01098	22884.6	-21.2402	Bedrock	300	32	2086.58	2630.76	3730.01	0	3730.01	4541.02	4541.02
21	5.01098	24118.5	-21.2402	Bedrock	300	32	2185.43	2755.39	3929.44	0	3929.44	4778.88	4778.88
22	5.01103	24239.9	-20.5528	Bedrock	300	32	2221.36	2800.69	4001.93	0	4001.93	4834.8	4834.8
23	5.01103	23862.3	-20.5528	Bedrock	300	32	2190.72	2762.06	3940.12	0	3940.12	4761.5	4761.5
24	5.01103	23490.1	-20.5528	Bedrock	300	32	2160.53	2723.99	3879.21	0	3879.21	4689.26	4689.26
25	5.01108	23104.4	-20.1304	Bedrock	300	32	2144.82	2704.19	3847.51	0	3847.51	4633.69	4633.69
26	5.01108	22696.1	-20.1304	Bedrock	300	32	2111.44	2662.1	3780.15	0	3780.15	4554.1	4554.1
27	5.01108	22238.3	-20.1304	Bedrock	300	18	1159.17	1461.48	3574.68	0	3574.68	3999.58	3999.58
28	7.51669	32575.1	-21.3623	Bedrock	300	18	1121.49	1413.98	3428.48	0	3428.48	3867.14	3867.14
29	7.51666	31834.3	-23.0507	Bedrock	300	18	1080.16	1361.87	3268.1	0	3268.1	3727.73	3727.73
30	6.37936	26313.5	-18.8571	Bedrock	300	32	1989.06	2507.81	3533.22	0	3533.22	4212.57	4212.57
31	6.37936	25473.9	-18.8571	Bedrock	300	32	1933.86	2438.21	3421.85	0	3421.85	4082.34	4082.34
32	6.37923	25971.6	-15.644	Bedrock	300	32	2080.96	2623.68	3718.67	0	3718.67	4301.41	4301.41
33	6.37923	27109.4	-15.644	Bedrock	300	32	2160.41	2723.85	3878.98	0	3878.98	4483.97	4483.97
34	6.37932	26245.6	-16.773	Bedrock	300	32	2058.37	2595.19	3673.07	0	3673.07	4293.47	4293.47
35	6.37932	25196.5	-16.773	Bedrock	300	32	1986.66	2504.78	3528.39	0	3528.39	4127.18	4127.18
36	6.43058	24175.6	-13.3873	Bedrock	300	32	2022.6	2550.1	3600.92	0	3600.92	4082.3	4082.3
37	6.43058	22782	-13.3873	Bedrock	300	32	1921.8	2423.01	3397.54	0	3397.54	3854.93	3854.93
38	6.44644	21313.2	-10.69	Bedrock	300	32	1904.11	2400.7	3361.82	0	3361.82	3721.26	3721.26
39	6.44644	19654	-10.69	Bedrock	300	32	1777.84	2241.5	3107.04	0	3107.04	3442.65	3442.65
40	4.29749	12094.5	-6.67633	Bedrock	300	32	1796.05	2264.46	3143.8	0	3143.8	3354.04	3354.04
41	4.29749	11184.9	-6.67633	Bedrock	300	32	1683.22	2122.21	2916.15	0	2916.15	3113.18	3113.18
42	4.29749	10275.3	-6.67633	Bedrock	300	32	1570.4	1979.96	2688.5	0	2688.5	2872.33	2872.33
43	8.40632	18277.5	-8.2093	Bedrock	300	32	1412.51	1780.89	2369.93	0	2369.93	2573.71	2573.71
44	8.41447	19077.7	-10.0751	Bedrock	300	32	1410.26	1778.05	2365.37	0	2365.37	2615.95	2615.95
45	8.41113	17152.3	-11.9965	Bedrock	300	32	1252.78	1579.5	2047.64	0	2047.64	2313.85	2313.85
46	8.41116	14279.6	-7.19243	Bedrock	300	32	1189.05	1499.16	1919.05	0	1919.05	2069.11	2069.11
47	6.29831	8267.59	-2.67536	Bedrock	300	32	1076.46	1357.2	1691.86	0	1691.86	1742.16	1742.16
48	6.29831	5930.1	-2.67536	Bedrock	300	32	860.259	1084.62	1255.65	0	1255.65	1295.84	1295.84
49	4.8772	2796.1	4.32018	Bedrock	300	32	746.117	940.704	1025.34	0	1025.34	968.975	968.975
50	4.8772	945.978	4.32018	Bedrock	300	32	482.652	608.528	493.748	0	493.748	457.286	457.286

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.2608

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	194.621	1402.49	0	0	0
2	198.609	1395.65	-412.883	-221.531	28.2156
3	203.588	1389.51	1078.49	578.66	28.2156
4	208.55	1385	3181.71	1707.13	28.2156
5	213.511	1380.49	6183.09	3317.51	28.2156
6	218.744	1376.08	9864.14	5292.56	28.2156
7	223.978	1371.68	14147.8	7590.93	28.2156
8	229.973	1367.04	19071.6	10232.8	28.2156
9	235.969	1362.41	24466.3	13127.3	28.2156
10	242.406	1358.08	29387.6	15767.8	28.2156
11	248.843	1353.75	34569.8	18548.3	28.2156
12	254.581	1349.98	39201.2	21033.2	28.2156
13	260.319	1346.21	44016.5	23616.8	28.2155
14	265.761	1343.09	47510.7	25491.6	28.2155
15	271.202	1339.97	51070.9	27401.8	28.2155
16	276.489	1337.28	53568	28741.7	28.2156
17	281.775	1334.58	56081.8	30090.4	28.2156
18	287.134	1331.96	58265.4	31262	28.2156
19	292.494	1329.34	60450.4	32434.4	28.2156
20	297.505	1327.4	60644.9	32538.7	28.2155
21	302.516	1325.45	60886.6	32668.4	28.2156
22	307.527	1323.5	61206.5	32840	28.2155
23	312.538	1321.62	61230	32852.7	28.2156
24	317.549	1319.74	61234.3	32855	28.2156
25	322.56	1317.86	61219.6	32847.1	28.2156
26	327.571	1316.03	61004.4	32731.6	28.2156
27	332.582	1314.19	60771.6	32606.7	28.2156
28	337.593	1312.35	64864.7	34802.8	28.2155
29	345.11	1309.41	71400.9	38309.8	28.2156
30	352.626	1306.22	78509.7	42124	28.2156
31	359.006	1304.04	77466	41564	28.2156
32	365.385	1301.86	76405.8	40995.1	28.2155
33	371.764	1300.07	73669.5	39527	28.2156
34	378.143	1298.29	70883.5	38032.2	28.2156
35	384.523	1296.36	68751.7	36888.4	28.2156
36	390.902	1294.44	66641.8	35756.3	28.2155
37	397.333	1292.91	62772.6	33680.3	28.2155
38	403.763	1291.38	59031.4	31673	28.2156
39	410.21	1290.16	54044.6	28997.4	28.2156
40	416.656	1288.95	49313	26458.6	28.2155
41	420.954	1288.44	44990	24139.2	28.2156
42	425.251	1287.94	40901	21945.2	28.2155
43	429.549	1287.44	37045.9	19876.8	28.2156
44	437.955	1286.22	30787.7	16519	28.2156
45	446.369	1284.73	25319.1	13584.9	28.2157
46	454.78	1282.94	21014.4	11275.2	28.2156
47	463.192	1281.88	15192	8151.17	28.2155
48	469.49	1281.59	10150.1	5446	28.2156
49	475.788	1281.29	5990.98	3214.43	28.2156
50	480.665	1281.66	2393.64	1284.3	28.2156
51	485.543	1282.03	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Bedrock		130	Anisotropic Linear	300	18	300	32

Global minimum safety factor

Method Name	Min FS
Spencer	1.58

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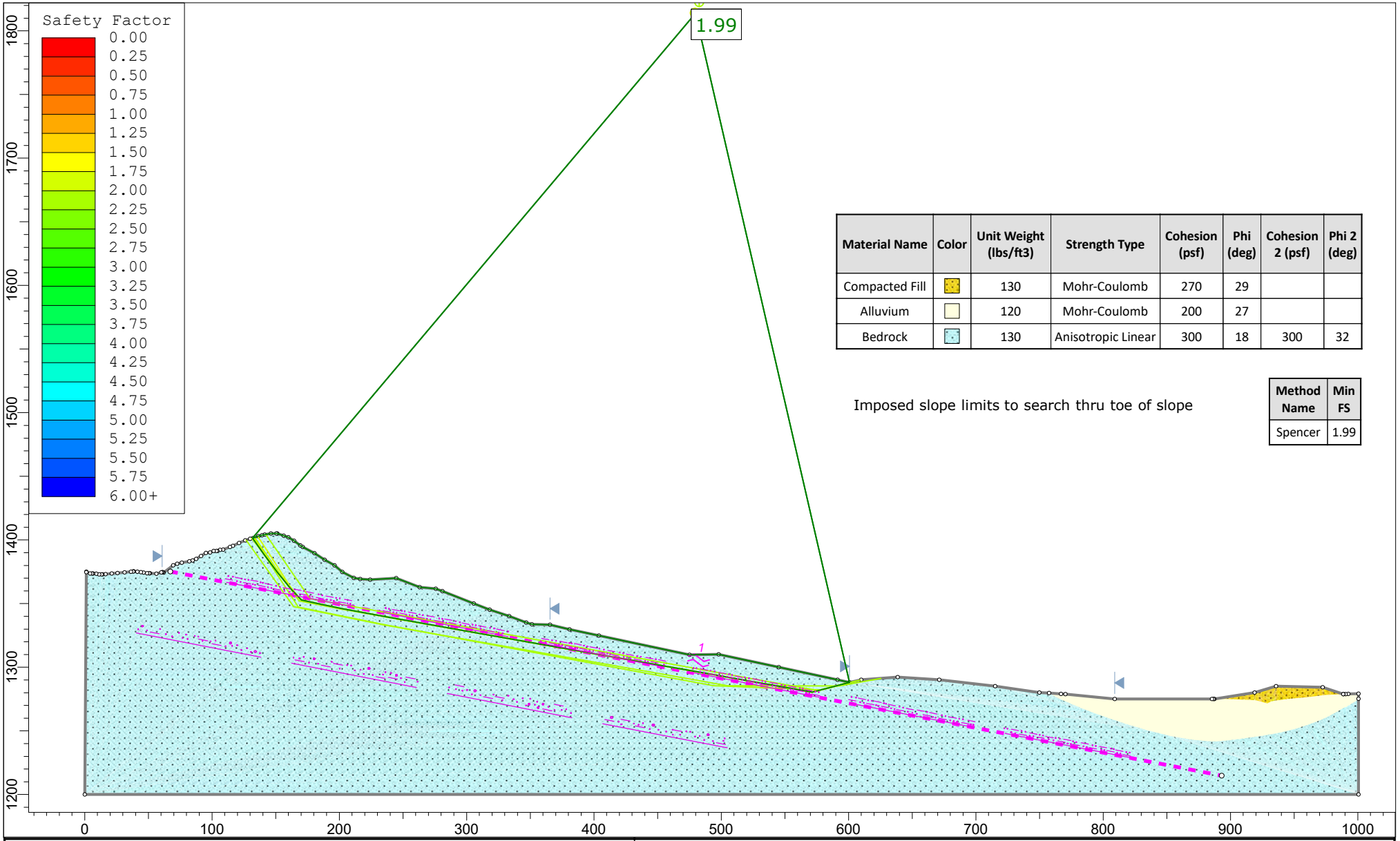
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 13-13'; CS-8; non-circular search; anticline plunge; static		
Client:	Sterling Gateway	Drawn By:	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	File Name:	t13s1a.slmd
		Scale:	1:1250
Project No.:	18-1245A-4	Date: 6/8/2018	Figure No.: Run No. 19



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Bedrock		130	Anisotropic Linear	300	18	300	32

Imposed slope limits to search thru toe of slope

Method Name	Min FS
Spencer	1.99

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ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 13-13'; CS-8; non-circular search; anticline plunge; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t13s1a.slmd
		Scale:	1:1250
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 20

Slide Analysis Information

t13s1a

Project Summary

File Name:	t13s1a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257
Analysis:	Section 13-13'; CS-8; non-circular search; anticline plunge; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Non-circular search, static	Cuckoo search - min FS	Spencer: 1.584210	00h:00m:12.450s
	Cuckoo search	Spencer: 1.985360	00h:00m:09.617s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

All Open Scenarios

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

All Open Scenarios	
Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

All Open Scenarios	
Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Bedrock
Color			
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	130
Cohesion [psf]	270	200	
Friction Angle [°]	29	27	
Cohesion 1 [psf]			300
Cohesion 2 [psf]			300
Friction Angle 1 [°]			18
Friction Angle 2 [°]			32
A [°]			1
B [°]			1
Anisotropic Definition			Surface
Angle from 1 [°]			
Anisotropic Surface			Assigned per scenario
Tensile Strength [psf]			0
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario
Ru Value	0	0	0

Materials In Use

Material	Cuckoo search - min FS	Cuckoo search
Compacted Fill	✓	✓
Alluvium	✓	✓
Bedrock	✓	✓

Global Minimums

Non-circular search, static - Cuckoo search - min FS

Method: spencer

FS	1.584210
Axis Location:	214.254, 1457.606
Left Slip Surface Endpoint:	143.876, 1404.561
Right Slip Surface Endpoint:	214.463, 1369.477
Resisting Moment:	6.6241e+06 lb-ft
Driving Moment:	4.18133e+06 lb-ft
Resisting Horizontal Force:	61578.7 lb
Driving Horizontal Force:	38870.3 lb
Total Slice Area:	875.234 ft2
Surface Horizontal Width:	70.5871 ft
Surface Average Height:	12.3993 ft

Non-circular search, static - Cuckoo search

Method: spencer

FS	1.985360
Axis Location:	479.685, 1813.601
Left Slip Surface Endpoint:	131.827, 1401.325
Right Slip Surface Endpoint:	600.791, 1287.949
Resisting Moment:	3.0465e+08 lb-ft
Driving Moment:	1.53448e+08 lb-ft
Resisting Horizontal Force:	546827 lb
Driving Horizontal Force:	275430 lb
Total Slice Area:	9365.92 ft2
Surface Horizontal Width:	468.964 ft
Surface Average Height:	19.9715 ft

Global Minimum Coordinates

Non-circular search, static - Cuckoo search - min FS

Method: spencer

X	Y
143.876	1404.56
146.135	1401.22
148.523	1398.1
150.911	1395.04
152.632	1392.77
154.353	1390.45
156.254	1388.39
158.662	1385.75
161.032	1383.28
163.4	1381.04
165.687	1378.83
167.973	1376.56
170.149	1374.34
173.437	1373.64
176.888	1372.92
180.339	1372.19
183.79	1371.46
187.24	1370.73
190.691	1370.01
194.142	1369.35
196.668	1368.88
199.177	1368.42
201.66	1367.96
203.816	1367.57
206.327	1367.69
208.837	1368
211.001	1368.48
214.463	1369.48

Non-circular search, static - Cuckoo search

Method: spencer

X	Y
131.827	1401.33
140.913	1388.49
151.299	1374.57
161.685	1361.77
170.22	1352.65
186.092	1349.28
201.967	1345.92
218.047	1342.99
234.129	1340.06
247.802	1337.58
261.476	1335.09
275.353	1332.57
289.23	1330.07
307.885	1326.79
326.541	1323.5
345.196	1320.21
363.852	1316.93
382.508	1313.64
401.163	1310.36
419.819	1307.07
438.474	1303.78
451.424	1301.5
464.374	1299.22
477.324	1296.94
490.273	1294.66
510.567	1291.09
530.86	1287.51
551.153	1283.94
571.447	1280.36
586.128	1284.15
600.791	1287.95

Valid/Invalid Surfaces

Non-circular search, static - Cuckoo search - min FS	Non-circular search, static - Cuckoo search
Method: spencer	**Method: spencer**
Number of Valid Surfaces: 8919	Number of Valid Surfaces: 7012
Number of Invalid Surfaces: 1143	Number of Invalid Surfaces: 3045
Error Codes:	**Error Codes:**
Error Code -106 reported for 5 surfaces	Error Code -108 reported for 16 surfaces
Error Code -108 reported for 77 surfaces	Error Code -112 reported for 23 surfaces
Error Code -111 reported for 19 surfaces	Error Code -114 reported for 28 surfaces
Error Code -112 reported for 107 surfaces	Error Code -121 reported for 835 surfaces
Error Code -114 reported for 54 surfaces	Error Code -124 reported for 9 surfaces
Error Code -121 reported for 262 surfaces	Error Code -1000 reported for 2134 surfaces
Error Code -124 reported for 9 surfaces	
Error Code -600 reported for 3 surfaces	
Error Code -1000 reported for 607 surfaces	

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

Non-circular search, static - Cuckoo search - min FS

Global Minimum Query (spencer) - Safety Factor: 1.58421

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.12913	137.891	-55.9826	Bedrock	300	32	111.488	176.621	0	0	0	165.18	165.18
2	1.12913	413.672	-55.9826	Bedrock	300	32	220.649	349.555	79.304	0	79.304	406.215	406.215
3	1.19444	708.505	-52.5478	Bedrock	300	32	277.919	440.282	224.499	0	224.499	587.316	587.316
4	1.19444	950.899	-52.5478	Bedrock	300	32	320.796	508.209	333.205	0	333.205	751.997	751.997
5	1.19387	1190.2	-52.0397	Bedrock	300	32	365.927	579.705	447.622	0	447.622	916.657	916.657
6	1.19387	1427.71	-52.0397	Bedrock	300	32	408.38	646.96	555.254	0	555.254	1078.7	1078.7
7	1.72108	2441.08	-52.7415	Bedrock	300	32	450.897	714.316	663.042	0	663.042	1255.82	1255.82
8	1.72117	2822.26	-53.4513	Bedrock	300	32	491.796	779.108	766.732	0	766.732	1430.18	1430.18
9	1.90097	3501.22	-47.2561	Bedrock	300	32	587.926	931.399	1010.45	0	1010.45	1646.6	1646.6
10	1.20383	2396.34	-47.6544	Bedrock	300	32	618.922	980.502	1089.03	0	1089.03	1768.13	1768.13
11	1.20383	2537	-47.6544	Bedrock	300	32	645.964	1023.34	1157.59	0	1157.59	1866.36	1866.36
12	1.18472	2629.16	-46.223	Bedrock	300	32	686.39	1087.39	1260.08	0	1260.08	1976.42	1976.42
13	1.18472	2735.6	-46.223	Bedrock	300	32	707.707	1121.16	1314.12	0	1314.12	2052.71	2052.71
14	1.1841	2807.45	-43.4009	Bedrock	300	32	752.7	1192.43	1428.19	0	1428.19	2140.01	2140.01
15	1.1841	2871.71	-43.4009	Bedrock	300	32	766.198	1213.82	1462.41	0	1462.41	2186.99	2186.99
16	1.14348	2835.79	-43.9719	Bedrock	300	32	773.438	1225.29	1480.77	0	1480.77	2226.94	2226.94
17	1.14348	2883.21	-43.9719	Bedrock	300	32	783.656	1241.48	1506.68	0	1506.68	2262.7	2262.7
18	1.14334	2918.19	-44.8565	Bedrock	300	32	781.123	1237.46	1500.25	0	1500.25	2277.47	2277.47
19	1.14334	2956.09	-44.8565	Bedrock	300	32	789.171	1250.21	1520.66	0	1520.66	2305.89	2305.89
20	1.08765	2849.17	-45.557	Bedrock	300	32	789.212	1250.28	1520.76	0	1520.76	2325.47	2325.47
21	1.08765	2896.24	-45.557	Bedrock	300	32	799.598	1266.73	1547.09	0	1547.09	2362.39	2362.39
22	1.64421	4357.54	-11.9877	Bedrock	300	18	715.308	1133.2	2564.32	0	2564.32	2716.2	2716.2
23	1.64421	4239.6	-11.9877	Bedrock	300	18	701.248	1110.92	2495.77	0	2495.77	2644.66	2644.66
24	1.72541	4328.88	-11.8891	Bedrock	300	18	688.178	1090.22	2432.04	0	2432.04	2576.93	2576.93
25	1.72541	4205.55	-11.8891	Bedrock	300	18	674.154	1068	2363.66	0	2363.66	2505.6	2505.6
26	1.72542	4082.18	-11.8684	Bedrock	300	18	660.236	1045.95	2295.81	0	2295.81	2434.56	2434.56
27	1.72542	3958.71	-11.8684	Bedrock	300	18	646.191	1023.7	2227.33	0	2227.33	2363.13	2363.13
28	1.72542	3817.32	-11.9328	Bedrock	300	18	629.774	997.694	2147.28	0	2147.28	2280.37	2280.37
29	1.72542	3650.58	-11.9328	Bedrock	300	18	610.821	967.668	2054.87	0	2054.87	2183.96	2183.96
30	1.72541	3483.6	-11.9258	Bedrock	300	18	591.877	937.657	1962.5	0	1962.5	2087.51	2087.51
31	1.72541	3316.63	-11.9258	Bedrock	300	18	572.896	907.587	1869.96	0	1869.96	1990.96	1990.96
32	1.72541	3150.82	-11.8575	Bedrock	300	18	554.35	878.207	1779.54	0	1779.54	1895.93	1895.93
33	1.72541	3008.04	-11.8575	Bedrock	300	18	538.108	852.476	1700.34	0	1700.34	1813.32	1813.32
34	1.72524	2869.62	-10.8364	Bedrock	300	18	526.622	834.28	1644.34	0	1644.34	1745.15	1745.15
35	1.72524	2727.93	-10.8364	Bedrock	300	18	510.331	808.471	1564.91	0	1564.91	1662.6	1662.6
36	1.26321	1906.76	-10.4326	Bedrock	300	18	497.663	788.403	1503.15	0	1503.15	1594.78	1594.78
37	1.26321	1826.12	-10.4326	Bedrock	300	18	484.946	768.257	1441.15	0	1441.15	1530.44	1530.44
38	1.25435	1685.11	-10.354	Bedrock	300	18	464.866	736.446	1343.24	0	1343.24	1428.18	1428.18
39	1.25435	1540.76	-10.354	Bedrock	300	18	441.924	700.1	1231.38	0	1231.38	1312.12	1312.12
40	1.24132	1383	-10.5525	Bedrock	300	18	418.551	663.073	1117.42	0	1117.42	1195.39	1195.39
41	1.24132	1242.34	-10.5525	Bedrock	300	18	396.009	627.362	1007.52	0	1007.52	1081.29	1081.29
42	1.07816	970.14	-10.385	Bedrock	300	18	376.352	596.22	911.67	0	911.67	980.641	980.641
43	1.07816	910.628	-10.385	Bedrock	300	18	365.351	578.793	858.037	0	858.037	924.992	924.992
44	2.5107	1828.58	2.76692	Bedrock	300	32	584.14	925.401	1000.85	0	1000.85	972.62	972.62
45	1.25508	731.843	7.0527	Bedrock	300	32	546.311	865.471	904.944	0	904.944	837.355	837.355
46	1.25508	600.064	7.0527	Bedrock	300	32	491.171	778.118	765.149	0	765.149	704.382	704.382
47	1.08195	403.926	12.6028	Bedrock	300	32	475.804	753.773	726.189	0	726.189	619.81	619.81
48	1.08195	290.799	12.6028	Bedrock	300	32	414.535	656.71	570.856	0	570.856	478.175	478.175
49	1.73143	265.968	16.0295	Bedrock	300	32	367.264	581.824	451.013	0	451.013	345.497	345.497
50	1.73143	88.0357	16.0295	Bedrock	300	32	302.259	478.842	286.207	0	286.207	199.367	199.367

Non-circular search, static - Cuckoo search

Global Minimum Query (spencer) - Safety Factor: 1.98536

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	9.08551	9319.53	-54.7025	Bedrock	300	32	308.927	613.331	501.434	0	501.434	937.787	937.787
2	10.3862	31343.2	-53.2699	Bedrock	300	32	695.239	1380.3	1728.84	0	1728.84	2660.55	2660.55
3	10.3862	47211.3	-50.9522	Bedrock	300	32	1020.48	2026.02	2762.2	0	2762.2	4020.24	4020.24
4	8.53467	45322.8	-46.8915	Bedrock	300	32	1236.86	2455.62	3449.71	0	3449.71	4771.05	4771.05
5	7.9362	42316.1	-11.9835	Bedrock	300	18	985.992	1957.55	5101.43	0	5101.43	5310.71	5310.71
6	7.9362	39484.3	-11.9835	Bedrock	300	18	930.139	1846.66	4760.13	0	4760.13	4957.55	4957.55
7	7.93733	36176.3	-11.974	Bedrock	300	18	864.836	1717.01	4361.1	0	4361.1	4544.52	4544.52
8	7.93733	32621	-11.974	Bedrock	300	18	794.707	1577.78	3932.61	0	3932.61	4101.16	4101.16
9	8.04001	28817.5	-10.3106	Bedrock	300	18	719.436	1428.34	3472.69	0	3472.69	3603.57	3603.57
10	8.04001	27051.3	-10.3106	Bedrock	300	18	684.662	1359.3	3260.19	0	3260.19	3384.75	3384.75
11	8.04091	27746.8	-10.3106	Bedrock	300	18	698.297	1386.37	3343.49	0	3343.49	3470.53	3470.53
12	8.04091	29479.1	-10.3106	Bedrock	300	18	732.401	1454.08	3551.89	0	3551.89	3685.13	3685.13
13	13.6736	54539.6	-10.3106	Bedrock	300	18	783.46	1555.45	3863.88	0	3863.88	4006.41	4006.41
14	6.83681	27036.9	-10.3106	Bedrock	300	18	778.07	1544.75	3830.94	0	3830.94	3972.49	3972.49
15	6.83681	25835.5	-10.3106	Bedrock	300	18	750.252	1489.52	3660.96	0	3660.96	3797.45	3797.45
16	6.93848	25488.7	-10.3106	Bedrock	300	18	733.57	1456.4	3559.05	0	3559.05	3692.5	3692.5
17	6.93848	25922	-10.3106	Bedrock	300	18	743.457	1476.03	3619.45	0	3619.45	3754.7	3754.7
18	6.93848	25726.6	-10.1877	Bedrock	300	18	739.533	1468.24	3595.49	0	3595.49	3728.39	3728.39
19	6.93848	24492	-10.1877	Bedrock	300	18	711.342	1412.27	3423.23	0	3423.23	3551.06	3551.06
20	9.32777	30790.7	-9.98936	Bedrock	300	18	675.857	1341.82	3206.4	0	3206.4	3325.44	3325.44
21	9.32777	28321.5	-9.98936	Bedrock	300	18	633.862	1258.44	2949.79	0	2949.79	3061.44	3061.44
22	9.32777	25775.5	-9.98936	Bedrock	300	18	590.56	1172.47	2685.2	0	2685.2	2789.22	2789.22
23	9.32777	23557.1	-9.98936	Bedrock	300	18	552.829	1097.57	2454.65	0	2454.65	2552.03	2552.03
24	9.32777	21824.7	-9.98936	Bedrock	300	18	523.363	1039.06	2274.61	0	2274.61	2366.79	2366.79
25	9.32777	19747	-9.98936	Bedrock	300	18	488.026	968.907	2058.68	0	2058.68	2144.64	2144.64
26	9.32777	18039.2	-9.98936	Bedrock	300	18	458.979	911.239	1881.2	0	1881.2	1962.04	1962.04
27	9.32777	19043.1	-9.98936	Bedrock	300	18	476.053	945.136	1985.52	0	1985.52	2069.37	2069.37
28	9.32777	19884.9	-9.98917	Bedrock	300	18	490.372	973.564	2073.02	0	2073.02	2159.39	2159.39
29	9.32777	19271.2	-9.98917	Bedrock	300	18	479.933	952.839	2009.23	0	2009.23	2093.76	2093.76
30	9.32777	18787.9	-9.98917	Bedrock	300	18	471.713	936.52	1959	0	1959	2042.09	2042.09
31	9.32777	18389.1	-9.98917	Bedrock	300	18	464.93	923.053	1917.56	0	1917.56	1999.45	1999.45
32	9.32777	17990.2	-9.98917	Bedrock	300	18	458.146	909.584	1876.11	0	1876.11	1956.8	1956.8
33	9.32777	17591.2	-9.98917	Bedrock	300	18	451.359	896.11	1834.64	0	1834.64	1914.14	1914.14
34	9.32777	17192.1	-9.98917	Bedrock	300	18	444.572	882.636	1793.17	0	1793.17	1871.47	1871.47
35	9.32777	16793.1	-9.98917	Bedrock	300	18	437.786	869.162	1751.7	0	1751.7	1828.81	1828.81
36	12.9501	22652.9	-9.98917	Bedrock	300	18	429.681	853.071	1702.18	0	1702.18	1777.86	1777.86
37	12.9501	21883.7	-9.98917	Bedrock	300	18	420.258	834.364	1644.6	0	1644.6	1718.62	1718.62
38	12.9496	21185.6	-9.98917	Bedrock	300	18	411.714	817.4	1592.39	0	1592.39	1664.91	1664.91
39	12.9492	23614.5	-9.98917	Bedrock	300	18	441.481	876.498	1774.28	0	1774.28	1852.04	1852.04
40	10.1467	21286.2	-9.98917	Bedrock	300	18	484.985	962.87	2040.11	0	2040.11	2125.53	2125.53
41	10.1467	21680.4	-9.98917	Bedrock	300	18	491.148	975.105	2077.77	0	2077.77	2164.27	2164.27
42	20.2934	41914.1	-9.98917	Bedrock	300	18	479.839	952.653	2008.66	0	2008.66	2093.17	2093.17
43	10.1467	20233.8	-9.98917	Bedrock	300	18	468.53	930.2	1939.55	0	1939.55	2022.08	2022.08
44	10.1467	19740.7	-9.98917	Bedrock	300	18	460.82	914.894	1892.45	0	1892.45	1973.61	1973.61
45	10.1467	19201.4	-9.98917	Bedrock	300	18	452.387	898.152	1840.92	0	1840.92	1920.6	1920.6
46	10.1467	18656.8	-9.98917	Bedrock	300	18	443.873	881.248	1788.9	0	1788.9	1867.08	1867.08
47	7.34054	11637.8	14.4556	Bedrock	300	32	809.239	1606.63	2091.05	0	2091.05	1882.44	1882.44
48	7.34054	8313.27	14.4556	Bedrock	300	32	629.425	1249.64	1519.74	0	1519.74	1357.48	1357.48
49	7.33158	4980.01	14.5317	Bedrock	300	32	449.84	893.095	949.151	0	949.151	832.549	832.549
50	7.33158	1659.38	14.5317	Bedrock	300	32	269.848	535.745	377.271	0	377.271	307.324	307.324

Interslice Data

Non-circular search, static - Cuckoo search - min FS

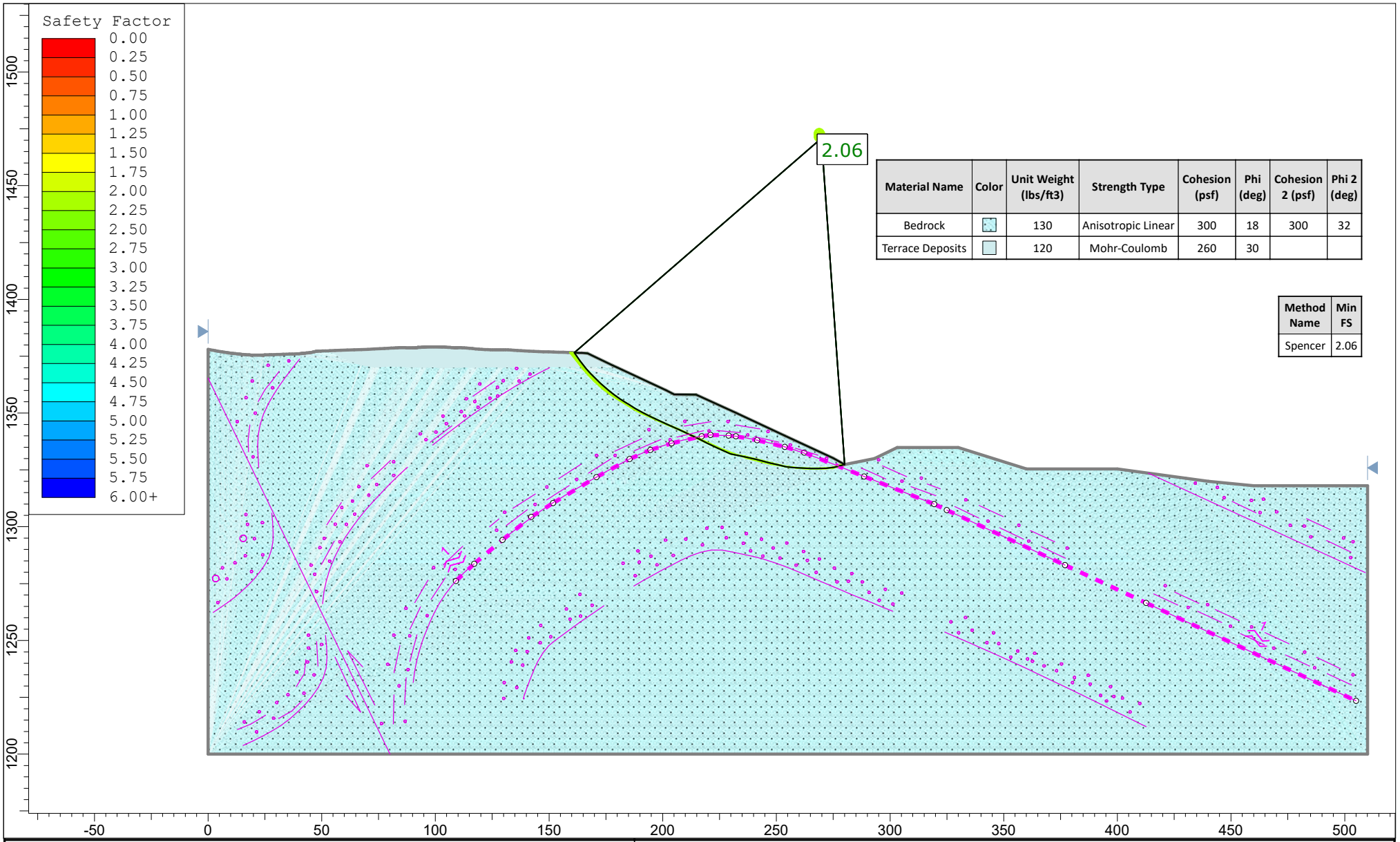
Global Minimum Query (spencer) - Safety Factor: 1.58421

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	143.876	1404.56	0	0	0
2	145.005	1402.89	-125.885	-48.6222	21.1187
3	146.135	1401.22	-242.359	-93.6094	21.1187
4	147.329	1399.66	-224.252	-86.6158	21.1187
5	148.523	1398.1	-87.8532	-33.9327	21.1187
6	149.717	1396.57	160.26	61.8994	21.1187
7	150.911	1395.04	522.395	201.771	21.1187
8	152.632	1392.77	1246.59	481.487	21.1187
9	154.353	1390.45	2180.4	842.165	21.1187
10	156.254	1388.39	3141.16	1213.25	21.1187
11	157.458	1387.07	3834.56	1481.07	21.1187
12	158.662	1385.75	4585.97	1771.3	21.1187
13	159.847	1384.52	5330.76	2058.97	21.1187
14	161.032	1383.28	6117.12	2362.69	21.1187
15	162.216	1382.16	6825.12	2636.15	21.1187
16	163.4	1381.04	7555.45	2918.24	21.1187
17	164.543	1379.94	8304.57	3207.58	21.1187
18	165.687	1378.83	9070.58	3503.44	21.1187
19	166.83	1377.7	9884.22	3817.71	21.1187
20	167.973	1376.56	10711.9	4137.38	21.1186
21	169.061	1375.45	11540	4457.25	21.1187
22	170.149	1374.34	12386.1	4784.03	21.1186
23	171.793	1373.99	12105.2	4675.55	21.1187
24	173.437	1373.64	11823.5	4566.76	21.1188
25	175.163	1373.28	11519.6	4449.37	21.1187
26	176.888	1372.92	11215	4331.73	21.1188
27	178.613	1372.55	10908.3	4213.27	21.1188
28	180.339	1372.19	10601	4094.58	21.1188
29	182.064	1371.83	10297.4	3977.29	21.1187
30	183.79	1371.46	9992.74	3859.62	21.1187
31	185.515	1371.1	9686.67	3741.41	21.1187
32	187.24	1370.73	9379.62	3622.81	21.1187
33	188.966	1370.37	9067.8	3502.37	21.1187
34	190.691	1370.01	8755.32	3381.68	21.1187
35	192.417	1369.68	8389.81	3240.5	21.1187
36	194.142	1369.35	8026.17	3100.05	21.1187
37	195.405	1369.12	7747.12	2992.27	21.1187
38	196.668	1368.88	7469.72	2885.13	21.1187
39	197.923	1368.65	7194.46	2778.81	21.1187
40	199.177	1368.42	6922.33	2673.7	21.1187
41	200.418	1368.19	6661.17	2572.83	21.1187
42	201.66	1367.96	6402.58	2472.95	21.1187
43	202.738	1367.76	6176.95	2385.8	21.1187
44	203.816	1367.57	5952.58	2299.14	21.1187
45	206.327	1367.69	4364.53	1685.77	21.1187
46	207.582	1367.84	3538.35	1366.66	21.1187
47	208.837	1368	2803.08	1082.67	21.1187
48	209.919	1368.24	2112.62	815.984	21.1187
49	211.001	1368.48	1526.02	589.415	21.1187
50	212.732	1368.98	665.777	257.151	21.1187
51	214.463	1369.48	0	0	0

Non-circular search, static - Cuckoo search

Global Minimum Query (spencer) - Safety Factor: 1.98536

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	131.827	1401.33	0	0	0
2	140.913	1388.49	3628.19	799.253	12.4233
3	151.299	1374.57	20470.8	4509.5	12.4232
4	161.685	1361.77	45239.3	9965.74	12.4232
5	170.22	1352.65	66136.2	14569.1	12.4232
6	178.156	1350.97	66904.5	14738.4	12.4233
7	186.092	1349.28	67541.2	14878.6	12.4232
8	194.029	1347.6	68018	14983.7	12.4233
9	201.967	1345.92	68330.2	15052.4	12.4232
10	210.007	1344.45	67625.3	14897.1	12.4232
11	218.047	1342.99	66889.1	14735	12.4233
12	226.088	1341.53	66165.1	14575.5	12.4233
13	234.129	1340.06	65471.7	14422.7	12.4232
14	247.802	1337.58	64370.5	14180.2	12.4233
15	254.639	1336.33	63815.8	14058	12.4233
16	261.476	1335.09	63239.9	13931.1	12.4233
17	268.414	1333.83	62642.5	13799.5	12.4233
18	275.353	1332.57	62052.7	13669.6	12.4233
19	282.291	1331.32	61404.6	13526.8	12.4232
20	289.23	1330.07	60737.4	13379.8	12.4232
21	298.558	1328.43	59701.1	13151.5	12.4232
22	307.885	1326.79	58634.9	12916.7	12.4233
23	317.213	1325.14	57537.9	12675	12.4232
24	326.541	1323.5	56414.1	12427.5	12.4233
25	335.869	1321.86	55269.4	12175.3	12.4233
26	345.196	1320.21	54099.5	11917.6	12.4233
27	354.524	1318.57	52909	11655.3	12.4232
28	363.852	1316.93	51730.6	11395.7	12.4232
29	373.18	1315.28	50562.3	11138.3	12.4232
30	382.508	1313.64	49386.6	10879.4	12.4233
31	391.835	1312	48205	10619.1	12.4233
32	401.163	1310.36	47018.7	10357.7	12.4232
33	410.491	1308.71	45827.5	10095.3	12.4232
34	419.819	1307.07	44631.5	9831.85	12.4232
35	429.146	1305.43	43430.6	9567.32	12.4233
36	438.474	1303.78	42224.9	9301.72	12.4233
37	451.424	1301.5	40543.1	8931.22	12.4232
38	464.374	1299.22	38851.9	8558.68	12.4233
39	477.324	1296.94	37152.4	8184.28	12.4232
40	490.273	1294.66	35482.3	7816.38	12.4232
41	500.42	1292.87	34207.2	7535.5	12.4233
42	510.567	1291.09	32937	7255.68	12.4232
43	530.86	1287.51	30379	6692.18	12.4232
44	541.007	1285.73	29091.3	6408.51	12.4232
45	551.153	1283.94	27797.6	6123.52	12.4232
46	561.3	1282.15	26497.3	5837.09	12.4233
47	571.447	1280.36	25190.5	5549.21	12.4233
48	578.787	1282.26	15293.3	3368.95	12.4232
49	586.128	1284.15	7797.13	1717.63	12.4233
50	593.459	1286.05	2695.31	593.748	12.4232
51	600.791	1287.95	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Bedrock		130	Anisotropic Linear	300	18	300	32
Terrace Deposits		120	Mohr-Coulomb	260	30		

Method Name	Min FS
Spencer	2.06

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 15-15'; CS-10; non-circular search; bedding plane; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t15s1a.slmd
		Scale:	1:700
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 21

Slide Analysis Information

t15s1a

Project Summary

File Name:	t15s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:01m:32.943s
Project Title:	VTTM 60257
Analysis:	Section 15-15'; CS-10; non-circular search; bedding plane; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Bedrock	Terrace Deposits
Color		
Strength Type	Anisotropic Linear	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	120
Cohesion [psf]		260
Friction Angle [°]		30
Cohesion 1 [psf]	300	
Cohesion 2 [psf]	300	
Friction Angle 1 [°]	18	
Friction Angle 2 [°]	32	
A [°]	1	
B [°]	1	
Anisotropic Definition	Surface	
Angle from 1 [°]		
Anisotropic Surface	Anisotropic Surface 1	
Tensile Strength [psf]	0	0
Water Surface	None	None
Ru Value	0	0

Global Minimums

Method: spencer

FS	2.060970
Axis Location:	269.778, 1470.847
Left Slip Surface Endpoint:	161.116, 1376.574
Right Slip Surface Endpoint:	280.000, 1327.354
Resisting Moment:	2.13541e+07 lb-ft
Driving Moment:	1.03612e+07 lb-ft
Resisting Horizontal Force:	134514 lb
Driving Horizontal Force:	65267.3 lb
Total Slice Area:	1566.12 ft2
Surface Horizontal Width:	118.884 ft
Surface Average Height:	13.1735 ft

Global Minimum Coordinates

Method: spencer

X	Y
161.116	1376.57
163.535	1373.03
166.303	1369.52
169.071	1366.54
171.837	1363.84
175.246	1360.79
178.244	1358.35
181.453	1356.06
184.9	1353.86
187.937	1351.98
191.099	1350.25
194.493	1348.52
197.886	1346.88
202.264	1344.88
206.641	1342.99
211.004	1340.97
215.328	1338.8
219.652	1336.69
224.181	1334.56
229.799	1332.03
235.512	1330.9
241.231	1329.57
247.061	1328.07
250.56	1327.26
254.127	1326.43
257.693	1326.03
261.317	1325.75
264.942	1325.64
268.459	1325.62
271.976	1325.73
275.664	1326.21
280	1327.35

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 7198
Number of Invalid Surfaces: 2864

Error Codes:

Error Code -106 reported for 11 surfaces
Error Code -108 reported for 318 surfaces
Error Code -111 reported for 5 surfaces
Error Code -112 reported for 57 surfaces
Error Code -114 reported for 65 surfaces
Error Code -121 reported for 695 surfaces
Error Code -124 reported for 17 surfaces
Error Code -600 reported for 2 surfaces
Error Code -1000 reported for 1694 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.06097

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.41878	499.782	-55.7083	Terrace Deposits	260	30	136.196	280.695	35.8449	0	35.8449	235.563	235.563
2	2.29017	1325.31	-51.7058	Terrace Deposits	260	30	202.548	417.445	272.704	0	272.704	529.228	529.228
3	0.477472	373.269	-51.7058	Bedrock	300	32	259.915	535.678	377.163	0	377.163	706.342	706.342
4	2.76774	2659.81	-47.1587	Bedrock	300	32	307.94	634.656	535.562	0	535.562	867.627	867.627
5	2.76602	3257.15	-44.3275	Bedrock	300	32	360.8	743.599	709.908	0	709.908	1062.34	1062.34
6	3.40979	4697.72	-41.7832	Bedrock	300	32	412.307	849.752	879.788	0	879.788	1248.22	1248.22
7	2.99759	4653.78	-39.0862	Bedrock	300	32	461.983	952.133	1043.63	0	1043.63	1418.89	1418.89
8	3.20922	5368.4	-35.5033	Bedrock	300	32	507.011	1044.93	1192.14	0	1192.14	1553.83	1553.83
9	1.72349	3004.16	-32.5379	Bedrock	300	32	539.336	1111.56	1298.76	0	1298.76	1642.86	1642.86
10	1.72349	3070.76	-32.5379	Bedrock	300	32	548.284	1130	1328.27	0	1328.27	1678.08	1678.08
11	3.03691	5563.17	-31.8678	Bedrock	300	32	563.835	1162.05	1379.56	0	1379.56	1730.08	1730.08
12	3.1616	5941.95	-28.6778	Bedrock	300	32	594.234	1224.7	1479.83	0	1479.83	1804.86	1804.86
13	3.39379	6466.63	-26.9122	Bedrock	300	32	611.468	1260.22	1536.67	0	1536.67	1847.05	1847.05
14	3.39375	6511.25	-25.7892	Bedrock	300	32	621.775	1281.46	1570.66	0	1570.66	1871.09	1871.09
15	2.1888	4205.85	-24.6429	Bedrock	300	32	629.762	1297.92	1597.01	0	1597.01	1885.91	1885.91
16	2.1888	4200.06	-24.6429	Bedrock	300	32	629.089	1296.53	1594.79	0	1594.79	1883.38	1883.38
17	2.18879	4167.43	-23.2715	Bedrock	300	32	633.988	1306.63	1610.94	0	1610.94	1883.6	1883.6
18	2.18879	4198.69	-23.2715	Bedrock	300	32	637.675	1314.23	1623.1	0	1623.1	1897.35	1897.35
19	2.18122	4444.34	-24.9384	Bedrock	300	32	657.273	1354.62	1687.74	0	1687.74	1993.37	1993.37
20	2.18122	4728.05	-24.9384	Bedrock	300	32	690.219	1422.52	1796.4	0	1796.4	2117.35	2117.35
21	2.16196	4976.86	-26.5614	Bedrock	300	32	712.233	1467.89	1869.01	0	1869.01	2225.07	2225.07
22	2.16196	5265.6	-26.5614	Bedrock	300	32	745.431	1536.31	1978.51	0	1978.51	2351.16	2351.16
23	2.16191	5357	-26.0349	Bedrock	300	32	760.108	1566.56	2026.92	0	2026.92	2398.22	2398.22
24	2.16191	5374.75	-26.0349	Bedrock	300	32	762.161	1570.79	2033.69	0	2033.69	2406	2406
25	2.2649	5643.75	-25.1832	Bedrock	300	32	770.375	1587.72	2060.79	0	2060.79	2423.02	2423.02
26	2.2649	5651.04	-25.1832	Bedrock	300	32	771.19	1589.4	2063.47	0	2063.47	2426.09	2426.09
27	2.80894	7008.9	-24.2926	Bedrock	300	32	778.376	1604.21	2087.17	0	2087.17	2438.5	2438.5
28	2.80894	7000.78	-24.2926	Bedrock	300	32	777.639	1602.69	2084.74	0	2084.74	2435.74	2435.74
29	2.85638	6976.13	-11.1845	Bedrock	300	18	517.267	1066.07	2357.72	0	2357.72	2460	2460
30	2.85638	6693.22	-11.1845	Bedrock	300	18	502.325	1035.28	2262.95	0	2262.95	2362.27	2362.27
31	2.85933	6431.23	-13.0635	Bedrock	300	32	802.525	1653.98	2166.82	0	2166.82	2353.04	2353.04
32	2.85933	6180.39	-13.0635	Bedrock	300	18	468.799	966.181	2050.3	0	2050.3	2159.07	2159.07
33	2.91504	6056.78	-14.4526	Bedrock	300	18	452.083	931.73	1944.27	0	1944.27	2060.78	2060.78
34	2.91504	5824.46	-14.4526	Bedrock	300	18	440.399	907.649	1870.15	0	1870.15	1983.66	1983.66
35	1.74953	3378.92	-13.037	Bedrock	300	18	434.722	895.949	1834.14	0	1834.14	1934.8	1934.8
36	1.74953	3284.82	-13.037	Bedrock	300	18	426.738	879.494	1783.5	0	1783.5	1882.31	1882.31
37	1.78346	3251.75	-13.0615	Bedrock	300	18	418.616	862.755	1731.98	0	1731.98	1829.1	1829.1
38	1.78346	3154.2	-13.0615	Bedrock	300	32	663.188	1366.81	1707.26	0	1707.26	1861.11	1861.11
39	1.78301	3032.82	-6.42211	Bedrock	300	32	688.938	1419.88	1792.18	0	1792.18	1869.73	1869.73
40	1.78301	2888.32	-6.42211	Bedrock	300	32	663.556	1367.57	1708.47	0	1708.47	1783.16	1783.16
41	1.81209	2779.47	-4.32049	Bedrock	300	32	650.839	1341.36	1666.52	0	1666.52	1715.69	1715.69
42	1.81209	2614.42	-4.32049	Bedrock	300	32	621.585	1281.07	1570.04	0	1570.04	1617	1617
43	3.62462	4697.15	-1.83969	Bedrock	300	32	589.721	1215.4	1464.94	0	1464.94	1483.88	1483.88
44	3.51737	3833.34	-0.232694	Bedrock	300	32	530.514	1093.37	1269.66	0	1269.66	1271.82	1271.82
45	1.75858	1633.5	1.69462	Bedrock	300	32	486.092	1001.82	1123.15	0	1123.15	1108.77	1108.77
46	1.75858	1435.78	1.69462	Bedrock	300	32	447.169	921.601	994.771	0	994.771	981.542	981.542
47	1.84384	1270.52	7.49823	Bedrock	300	32	429.716	885.631	937.204	0	937.204	880.644	880.644
48	1.84384	1004.78	7.49823	Bedrock	300	32	375.734	774.377	759.163	0	759.163	709.709	709.709
49	2.16807	758.107	14.743	Bedrock	300	32	329.139	678.345	605.479	0	605.479	518.867	518.867
50	2.16807	252.702	14.743	Bedrock	300	32	231.53	477.177	283.542	0	283.542	222.615	222.615

Query 1 (spencer) - Safety Factor: 2.06097

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.41878	499.782	-55.7083	Terrace Deposits	260	30	136.196	280.695	35.8449	0	35.8449	235.563	235.563
2	2.29017	1325.31	-51.7058	Terrace Deposits	260	30	202.548	417.445	272.704	0	272.704	529.228	529.228
3	0.477472	373.269	-51.7058	Bedrock	300	32	259.915	535.678	377.163	0	377.163	706.342	706.342
4	2.76774	2659.81	-47.1587	Bedrock	300	32	307.94	634.656	535.562	0	535.562	867.627	867.627
5	2.76602	3257.15	-44.3275	Bedrock	300	32	360.8	743.599	709.908	0	709.908	1062.34	1062.34
6	3.40979	4697.72	-41.7832	Bedrock	300	32	412.307	849.752	879.788	0	879.788	1248.22	1248.22
7	2.99759	4653.78	-39.0862	Bedrock	300	32	461.983	952.133	1043.63	0	1043.63	1418.89	1418.89
8	3.20922	5368.4	-35.5033	Bedrock	300	32	507.011	1044.93	1192.14	0	1192.14	1553.83	1553.83
9	1.72349	3004.16	-32.5379	Bedrock	300	32	539.336	1111.56	1298.76	0	1298.76	1642.86	1642.86
10	1.72349	3070.76	-32.5379	Bedrock	300	32	548.284	1130	1328.27	0	1328.27	1678.08	1678.08
11	3.03691	5563.17	-31.8678	Bedrock	300	32	563.835	1162.05	1379.56	0	1379.56	1730.08	1730.08
12	3.1616	5941.95	-28.6778	Bedrock	300	32	594.234	1224.7	1479.83	0	1479.83	1804.86	1804.86
13	3.39379	6466.63	-26.9122	Bedrock	300	32	611.468	1260.22	1536.67	0	1536.67	1847.05	1847.05
14	3.39375	6511.25	-25.7892	Bedrock	300	32	621.775	1281.46	1570.66	0	1570.66	1871.09	1871.09
15	2.1888	4205.85	-24.6429	Bedrock	300	32	629.762	1297.92	1597.01	0	1597.01	1885.91	1885.91
16	2.1888	4200.06	-24.6429	Bedrock	300	32	629.089	1296.53	1594.79	0	1594.79	1883.38	1883.38
17	2.18879	4167.43	-23.2715	Bedrock	300	32	633.988	1306.63	1610.94	0	1610.94	1883.6	1883.6
18	2.18879	4198.69	-23.2715	Bedrock	300	32	637.675	1314.23	1623.1	0	1623.1	1897.35	1897.35
19	2.18122	4444.34	-24.9384	Bedrock	300	32	657.273	1354.62	1687.74	0	1687.74	1993.37	1993.37
20	2.18122	4728.05	-24.9384	Bedrock	300	32	690.219	1422.52	1796.4	0	1796.4	2117.35	2117.35
21	2.16196	4976.86	-26.5614	Bedrock	300	32	712.233	1467.89	1869.01	0	1869.01	2225.07	2225.07
22	2.16196	5265.6	-26.5614	Bedrock	300	32	745.431	1536.31	1978.51	0	1978.51	2351.16	2351.16
23	2.16191	5357	-26.0349	Bedrock	300	32	760.108	1566.56	2026.92	0	2026.92	2398.22	2398.22
24	2.16191	5374.75	-26.0349	Bedrock	300	32	762.161	1570.79	2033.69	0	2033.69	2406	2406
25	2.2649	5643.75	-25.1832	Bedrock	300	32	770.375	1587.72	2060.79	0	2060.79	2423.02	2423.02
26	2.2649	5651.04	-25.1832	Bedrock	300	32	771.19	1589.4	2063.47	0	2063.47	2426.09	2426.09
27	2.80894	7008.9	-24.2926	Bedrock	300	32	778.376	1604.21	2087.17	0	2087.17	2438.5	2438.5
28	2.80894	7000.78	-24.2926	Bedrock	300	32	777.639	1602.69	2084.74	0	2084.74	2435.74	2435.74
29	2.85638	6976.13	-11.1845	Bedrock	300	18	517.267	1066.07	2357.72	0	2357.72	2460	2460
30	2.85638	6693.22	-11.1845	Bedrock	300	18	502.325	1035.28	2262.95	0	2262.95	2362.27	2362.27
31	2.85933	6431.23	-13.0635	Bedrock	300	32	802.525	1653.98	2166.82	0	2166.82	2353.04	2353.04
32	2.85933	6180.39	-13.0635	Bedrock	300	18	468.799	966.181	2050.3	0	2050.3	2159.07	2159.07
33	2.91504	6056.78	-14.4526	Bedrock	300	18	452.083	931.73	1944.27	0	1944.27	2060.78	2060.78
34	2.91504	5824.46	-14.4526	Bedrock	300	18	440.399	907.649	1870.15	0	1870.15	1983.66	1983.66
35	1.74953	3378.92	-13.037	Bedrock	300	18	434.722	895.949	1834.14	0	1834.14	1934.8	1934.8
36	1.74953	3284.82	-13.037	Bedrock	300	18	426.738	879.494	1783.5	0	1783.5	1882.31	1882.31
37	1.78346	3251.75	-13.0615	Bedrock	300	18	418.616	862.755	1731.98	0	1731.98	1829.1	1829.1
38	1.78346	3154.2	-13.0615	Bedrock	300	32	663.188	1366.81	1707.26	0	1707.26	1861.11	1861.11
39	1.78301	3032.82	-6.42211	Bedrock	300	32	688.938	1419.88	1792.18	0	1792.18	1869.73	1869.73
40	1.78301	2888.32	-6.42211	Bedrock	300	32	663.556	1367.57	1708.47	0	1708.47	1783.16	1783.16
41	1.81209	2779.47	-4.32049	Bedrock	300	32	650.839	1341.36	1666.52	0	1666.52	1715.69	1715.69
42	1.81209	2614.42	-4.32049	Bedrock	300	32	621.585	1281.07	1570.04	0	1570.04	1617	1617
43	3.62462	4697.15	-1.83969	Bedrock	300	32	589.721	1215.4	1464.94	0	1464.94	1483.88	1483.88
44	3.51737	3833.34	-0.232694	Bedrock	300	32	530.514	1093.37	1269.66	0	1269.66	1271.82	1271.82
45	1.75858	1633.5	1.69462	Bedrock	300	32	486.092	1001.82	1123.15	0	1123.15	1108.77	1108.77
46	1.75858	1435.78	1.69462	Bedrock	300	32	447.169	921.601	994.771	0	994.771	981.542	981.542
47	1.84384	1270.52	7.49823	Bedrock	300	32	429.716	885.631	937.204	0	937.204	880.644	880.644
48	1.84384	1004.78	7.49823	Bedrock	300	32	375.734	774.377	759.163	0	759.163	709.709	709.709
49	2.16807	758.107	14.743	Bedrock	300	32	329.139	678.345	605.479	0	605.479	518.867	518.867
50	2.16807	252.702	14.743	Bedrock	300	32	231.53	477.177	283.542	0	283.542	222.615	222.615

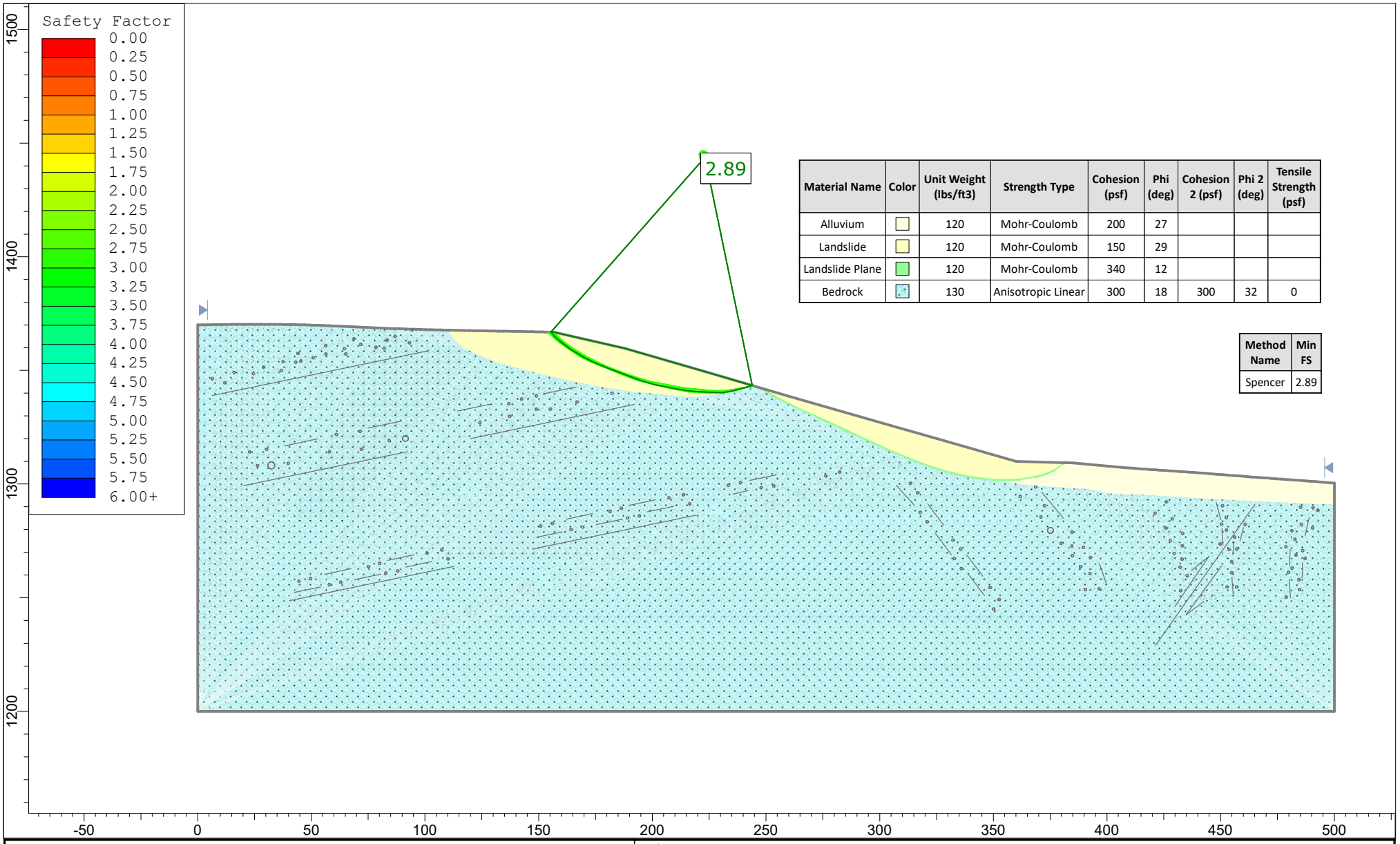
Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.06097

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	161.116	1376.57	0	0	0
2	163.535	1373.03	-202.289	-70.0736	19.1063
3	165.825	1370.13	124.806	43.2332	19.1063
4	166.303	1369.52	228.778	79.2494	19.1062
5	169.071	1366.54	974.896	337.706	19.1062
6	171.837	1363.84	1894.97	656.421	19.1062
7	175.246	1360.79	3169.71	1098	19.1063
8	178.244	1358.35	4325.98	1498.53	19.1062
9	181.453	1356.06	5428.15	1880.32	19.1062
10	183.177	1354.96	5926.71	2053.03	19.1062
11	184.9	1353.86	6442.3	2231.63	19.1062
12	187.937	1351.98	7334.52	2540.7	19.1062
13	191.099	1350.25	8014.91	2776.38	19.1062
14	194.493	1348.52	8586.89	2974.52	19.1062
15	197.886	1346.88	9052.32	3135.75	19.1062
16	200.075	1345.88	9277.45	3213.73	19.1062
17	202.264	1344.88	9501.81	3291.45	19.1062
18	204.453	1343.94	9630.61	3336.06	19.1062
19	206.641	1342.99	9762.78	3381.85	19.1062
20	208.823	1341.98	10040.9	3478.2	19.1062
21	211.004	1340.97	10357.4	3587.84	19.1063
22	213.166	1339.88	10837.7	3754.19	19.1061
23	215.328	1338.8	11364.5	3936.67	19.1061
24	217.49	1337.75	11861.7	4108.93	19.1062
25	219.652	1336.69	12361.7	4282.13	19.1062
26	221.917	1335.63	12811.6	4437.95	19.1061
27	224.181	1334.56	13262.4	4594.13	19.1062
28	226.99	1333.29	13722.2	4753.41	19.1062
29	229.799	1332.03	14181	4912.34	19.1062
30	232.656	1331.46	14035.1	4861.79	19.1062
31	235.512	1330.9	13878.3	4807.48	19.1062
32	238.371	1330.23	13021.2	4510.59	19.1063
33	241.231	1329.57	13041.1	4517.46	19.1062
34	244.146	1328.82	13184	4566.97	19.1062
35	247.061	1328.07	13305.3	4608.98	19.1062
36	248.81	1327.66	13287.7	4602.9	19.1062
37	250.56	1327.26	13263.6	4594.56	19.1063
38	252.343	1326.84	13233.7	4584.18	19.1062
39	254.127	1326.43	12757.3	4419.16	19.1062
40	255.91	1326.23	11888.6	4118.24	19.1062
41	257.693	1326.03	11048.3	3827.17	19.1063
42	259.505	1325.89	10097.1	3497.66	19.1062
43	261.317	1325.75	9185.69	3181.94	19.1062
44	264.942	1325.64	7218.72	2500.58	19.1062
45	268.459	1325.62	5370.84	1860.47	19.1062
46	270.218	1325.68	4457.57	1544.11	19.1062
47	271.976	1325.73	3619.43	1253.78	19.1062
48	273.82	1325.97	2599.65	900.526	19.1062
49	275.664	1326.21	1722.62	596.719	19.1062
50	277.832	1326.78	663.582	229.866	19.1062
51	280	1327.35	0	0	0

Query 1 (spencer) - Safety Factor: 2.06097

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	161.116	1376.57	0	0	0
2	163.535	1373.03	-202.289	-70.0736	19.1063
3	165.825	1370.13	124.806	43.2332	19.1063
4	166.303	1369.52	228.778	79.2494	19.1062
5	169.071	1366.54	974.896	337.706	19.1062
6	171.837	1363.84	1894.97	656.421	19.1062
7	175.246	1360.79	3169.71	1098	19.1063
8	178.244	1358.35	4325.98	1498.53	19.1062
9	181.453	1356.06	5428.15	1880.32	19.1062
10	183.177	1354.96	5926.71	2053.03	19.1062
11	184.9	1353.86	6442.3	2231.63	19.1062
12	187.937	1351.98	7334.52	2540.7	19.1062
13	191.099	1350.25	8014.91	2776.38	19.1062
14	194.493	1348.52	8586.89	2974.52	19.1062
15	197.886	1346.88	9052.32	3135.75	19.1062
16	200.075	1345.88	9277.45	3213.73	19.1062
17	202.264	1344.88	9501.81	3291.45	19.1062
18	204.453	1343.94	9630.61	3336.06	19.1062
19	206.641	1342.99	9762.78	3381.85	19.1062
20	208.823	1341.98	10040.9	3478.2	19.1062
21	211.004	1340.97	10357.4	3587.84	19.1063
22	213.166	1339.88	10837.7	3754.19	19.1061
23	215.328	1338.8	11364.5	3936.67	19.1061
24	217.49	1337.75	11861.7	4108.93	19.1062
25	219.652	1336.69	12361.7	4282.13	19.1062
26	221.917	1335.63	12811.6	4437.95	19.1061
27	224.181	1334.56	13262.4	4594.13	19.1062
28	226.99	1333.29	13722.2	4753.41	19.1062
29	229.799	1332.03	14181	4912.34	19.1062
30	232.656	1331.46	14035.1	4861.79	19.1062
31	235.512	1330.9	13878.3	4807.48	19.1062
32	238.371	1330.23	13021.2	4510.59	19.1063
33	241.231	1329.57	13041.1	4517.46	19.1062
34	244.146	1328.82	13184	4566.97	19.1062
35	247.061	1328.07	13305.3	4608.98	19.1062
36	248.81	1327.66	13287.7	4602.9	19.1062
37	250.56	1327.26	13263.6	4594.56	19.1063
38	252.343	1326.84	13233.7	4584.18	19.1062
39	254.127	1326.43	12757.3	4419.16	19.1062
40	255.91	1326.23	11888.6	4118.24	19.1062
41	257.693	1326.03	11048.3	3827.17	19.1063
42	259.505	1325.89	10097.1	3497.66	19.1062
43	261.317	1325.75	9185.69	3181.94	19.1062
44	264.942	1325.64	7218.72	2500.58	19.1062
45	268.459	1325.62	5370.84	1860.47	19.1062
46	270.218	1325.68	4457.57	1544.11	19.1062
47	271.976	1325.73	3619.43	1253.78	19.1062
48	273.82	1325.97	2599.65	900.526	19.1062
49	275.664	1326.21	1722.62	596.719	19.1062
50	277.832	1326.78	663.582	229.866	19.1062
51	280	1327.35	0	0	0



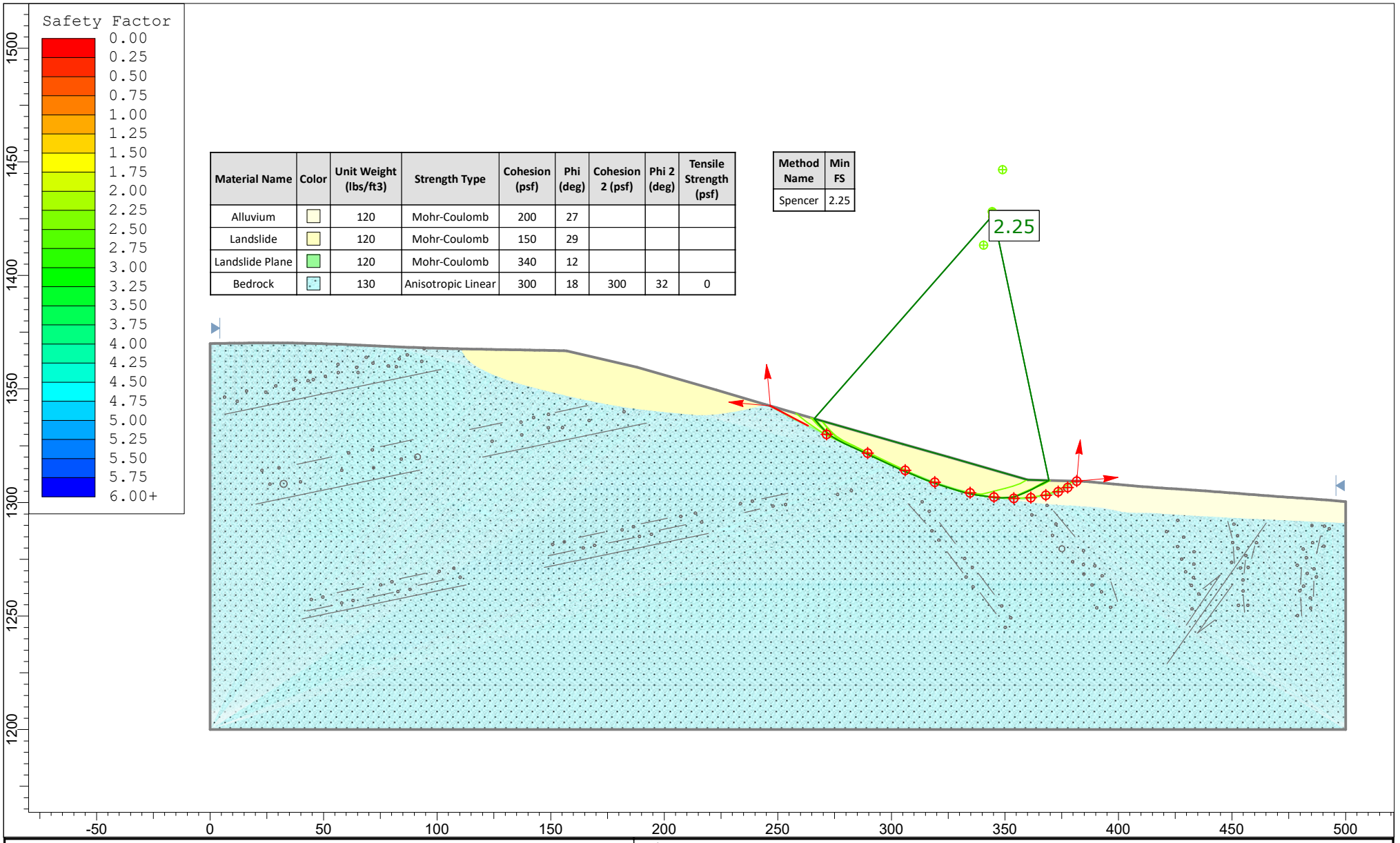
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Tensile Strength (psf)
Alluvium		120	Mohr-Coulomb	200	27			
Landslide		120	Mohr-Coulomb	150	29			
Landslide Plane		120	Mohr-Coulomb	340	12			
Bedrock		130	Anisotropic Linear	300	18	300	32	0

Method Name	Min FS
Spencer	2.89

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 16-16'; CS-11 / Qls-C; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t16s1a.slmd
		Scale:	1:700
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 22



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Tensile Strength (psf)
Alluvium		120	Mohr-Coulomb	200	27			
Landslide		120	Mohr-Coulomb	150	29			
Landslide Plane		120	Mohr-Coulomb	340	12			
Bedrock		130	Anisotropic Linear	300	18	300	32	0

Method Name	Min FS
Spencer	2.25

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 16-16'; CS-11 / Qls-C; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t16s1a.slmd
		Scale:	1:700
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 23

Slide Analysis Information

t16s1a

Project Summary

File Name:	t16s1a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257
Analysis:	Section 16-16'; CS-11 / Qls-C; non-circular search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Non-circular; static	Cuckoo search - global min FS	Spencer: 2.893920	00h:00m:23.645s
	Qls plane	Spencer: 2.253710	00h:00m:16.988s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

All Open Scenarios

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Non-circular; static - Cuckoo search - global min FS		Non-circular; static - Qls plane	
Search Method:	Cuckoo Search	Surface Type:	Non-Circular Block Search
Initial # of Surface Vertices:	8	Number of Surfaces:	5000
Maximum Iterations:	200	Multiple Groups:	Disabled
Number of Nests:	50	Pseudo-Random Surfaces:	Enabled
Minimum Elevation:	Not Defined	Convex Surfaces Only:	Disabled
Minimum Depth:	Not Defined	Left Projection Angle (Start Angle) [°]:	95
Minimum Area:	Not Defined	Left Projection Angle (End Angle) [°]:	175
Minimum Weight:	Not Defined	Right Projection Angle (Start Angle) [°]:	5
Convex Surfaces Only:	Enabled	Right Projection Angle (End Angle) [°]:	85
		Minimum Elevation:	Not Defined
		Minimum Depth:	Not Defined
		Minimum Area:	Not Defined
		Minimum Weight:	Not Defined

Seismic Loading

All Open Scenarios	
Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Alluvium	Landslide	Landslide Plane	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	120	120	120	130
Cohesion [psf]	200	150	340	
Friction Angle [°]	27	29	12	
Cohesion 1 [psf]				300
Cohesion 2 [psf]				300
Friction Angle 1 [°]				18
Friction Angle 2 [°]				32
A [°]				1
B [°]				1
Anisotropic Definition				Surface
Angle from 1 [°]				
Anisotropic Surface				Assigned per scenario
Tensile Strength [psf]				0
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Ru Value	0	0	0	0

Materials In Use

Material	Cuckoo search - global min FS	Qls plane
Alluvium	✓	✓
Landslide	✓	✓
Landslide Plane	✓	✓
Bedrock	✓	✓

Global Minimums

Non-circular; static - Cuckoo search - global min FS

Method: spencer

FS	2.893920
Axis Location:	223.097, 1443.810
Left Slip Surface Endpoint:	155.245, 1366.817
Right Slip Surface Endpoint:	243.980, 1343.333
Resisting Moment:	6.55786e+06 lb-ft
Driving Moment:	2.26608e+06 lb-ft
Resisting Horizontal Force:	60511 lb
Driving Horizontal Force:	20909.7 lb
Total Slice Area:	753.123 ft2
Surface Horizontal Width:	88.7347 ft
Surface Average Height:	8.48736 ft

Non-circular; static - Qls plane

Method: spencer

FS	2.253710
Axis Location:	344.894, 1426.713
Left Slip Surface Endpoint:	266.008, 1336.910
Right Slip Surface Endpoint:	369.404, 1309.723
Resisting Moment:	7.70114e+06 lb-ft
Driving Moment:	3.41709e+06 lb-ft
Resisting Horizontal Force:	59339.5 lb
Driving Horizontal Force:	26329.7 lb
Total Slice Area:	984.22 ft2
Surface Horizontal Width:	103.396 ft
Surface Average Height:	9.51893 ft

Global Minimum Coordinates

Non-circular; static - Cuckoo search - global min FS

Method: spencer

X	Y
155.245	1366.82
157.284	1364.6
159.329	1363
161.35	1361.36
165	1358.78
167.471	1357.32
170.29	1355.68
172.597	1354.53
174.904	1353.39
178.484	1351.88
181.024	1350.88
183.803	1349.82
186.863	1348.63
190.656	1347.16
194.667	1345.67
197.746	1344.68
201.387	1343.62
205.033	1342.88
208.305	1342.28
211.578	1341.66
214.843	1341.11
218.113	1340.81
220.462	1340.62
222.811	1340.51
225.222	1340.33
227.553	1340.26
230.456	1340.24
233.298	1340.62
236.125	1341.15
238.952	1341.95
241.234	1342.55
243.98	1343.33

Non-circular; static - Qls plane

Method: spencer

X	Y
266.008	1336.91
268.631	1333.83
270.896	1331.44
273.16	1329.48
276.409	1327.43
279.658	1325.84
282.121	1324.73
284.586	1323.62
288.674	1321.68
292.851	1319.72
297.006	1317.78
301.127	1315.86
305.237	1314
308.458	1312.68
311.68	1311.37
314.8	1310.11
317.914	1308.87
321.615	1307.64
325.316	1306.48
329.017	1305.32
332.718	1304.24
337.665	1303.24
342.612	1302.54
345.657	1302.2
348.714	1301.96
353.97	1302.36
358.134	1304.01
361.768	1305.74
365.647	1307.81
369.404	1309.72

Valid/Invalid Surfaces

Non-circular; static - Cuckoo search - global min FS	Non-circular; static - Qls plane
Method: spencer	**Method: spencer**
Number of Valid Surfaces: 6897	Number of Valid Surfaces: 3724
Number of Invalid Surfaces: 3168	Number of Invalid Surfaces: 1287
Error Codes:	**Error Codes:**
Error Code -106 reported for 17 surfaces	Error Code -108 reported for 20 surfaces
Error Code -108 reported for 109 surfaces	Error Code -112 reported for 72 surfaces
Error Code -109 reported for 1 surface	Error Code -124 reported for 57 surfaces
Error Code -111 reported for 9 surfaces	Error Code -129 reported for 1138 surfaces
Error Code -112 reported for 33 surfaces	
Error Code -114 reported for 52 surfaces	
Error Code -121 reported for 82 surfaces	
Error Code -124 reported for 11 surfaces	
Error Code -129 reported for 2693 surfaces	
Error Code -1000 reported for 161 surfaces	

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-129 = Can not compute anisotropic angle along slip surface.
-1000 = No valid slip surface is generated

Slice Data

Non-circular; static - Cuckoo search - global min FS	Non-circular; static - Qls plane
Global Minimum Query (spencer) - Safety Factor: 2.89392	**Global Minimum Query (spencer) - Safety Factor**: 2.25371

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.03912	264.504	-47.4442	Landslide	150	29	63.3615	183.363	60.1888	0	60.1888	129.201	129.201
2	2.0448	656.235	-38.0032	Landslide	150	29	95.3413	275.91	227.147	0	227.147	301.644	301.644
3	2.02102	926.979	-39.0221	Landslide	150	29	114.992	332.777	329.739	0	329.739	422.931	422.931
4	1.82479	1060.25	-35.2679	Landslide	150	29	136.671	395.516	442.923	0	442.923	539.577	539.577
5	1.82479	1250.46	-35.2679	Landslide	150	29	152.561	441.499	525.879	0	525.879	633.77	633.77
6	2.47112	1953.9	-30.5746	Landslide	150	29	174.394	504.681	639.859	0	639.859	742.891	742.891
7	1.40946	1231.5	-30.2279	Landslide	150	29	188.031	544.147	711.063	0	711.063	820.623	820.623
8	1.40946	1315.29	-30.2279	Landslide	150	29	197.493	571.529	760.461	0	760.461	875.533	875.533
9	2.30726	2306.02	-26.3452	Landslide	150	29	213.78	618.663	845.49	0	845.49	951.356	951.356
10	2.30726	2474.68	-26.3452	Landslide	150	29	225.788	653.411	908.177	0	908.177	1019.99	1019.99
11	1.78979	2021.73	-22.8747	Landslide	150	29	240.845	696.986	986.788	0	986.788	1088.4	1088.4
12	1.78979	2095.04	-22.8747	Landslide	150	29	247.758	716.992	1022.88	0	1022.88	1127.41	1127.41
13	1.26989	1528.17	-21.4738	Landslide	150	29	255.734	740.073	1064.52	0	1064.52	1165.12	1165.12
14	1.26989	1559.56	-21.4738	Landslide	150	29	259.951	752.276	1086.54	0	1086.54	1188.8	1188.8
15	1.38944	1741.13	-20.9546	Landslide	150	29	265.154	767.335	1113.7	0	1113.7	1215.24	1215.24
16	1.38944	1776.29	-20.9546	Landslide	150	29	269.488	779.878	1136.33	0	1136.33	1239.53	1239.53
17	1.53002	1997.37	-21.1976	Landslide	150	29	273.663	791.96	1158.13	0	1158.13	1264.26	1264.26
18	1.53002	2041.38	-21.1976	Landslide	150	29	278.58	806.189	1183.8	0	1183.8	1291.84	1291.84
19	3.79296	5227.62	-21.2331	Landslide	150	29	286.037	827.769	1222.73	0	1222.73	1333.86	1333.86
20	2.00543	2831.62	-20.3577	Landslide	150	29	293.565	849.555	1262.03	0	1262.03	1370.96	1370.96
21	2.00543	2871.04	-20.3577	Landslide	150	29	296.947	859.342	1279.69	0	1279.69	1389.87	1389.87
22	1.53953	2223.54	-17.7484	Landslide	150	29	304.514	881.24	1319.19	0	1319.19	1416.65	1416.65
23	1.53953	2232.27	-17.7484	Landslide	150	29	305.509	884.119	1324.38	0	1324.38	1422.17	1422.17
24	1.82056	2645.63	-16.3344	Landslide	150	29	309.035	894.323	1342.8	0	1342.8	1433.37	1433.37
25	1.82056	2647.1	-16.3344	Landslide	150	29	309.178	894.737	1343.54	0	1343.54	1434.15	1434.15
26	1.82317	2634.14	-11.4007	Landslide	150	29	317.993	920.247	1389.56	0	1389.56	1453.68	1453.68
27	1.82317	2599.15	-11.4007	Landslide	150	29	314.462	910.027	1371.13	0	1371.13	1434.54	1434.54
28	1.63622	2299.98	-10.4216	Landslide	150	29	312.855	905.376	1362.73	0	1362.73	1420.28	1420.28
29	1.63622	2266.1	-10.4216	Landslide	150	29	309.016	894.269	1342.69	0	1342.69	1399.53	1399.53
30	1.63607	2232.99	-10.7539	Landslide	150	29	304.605	881.502	1319.67	0	1319.67	1377.52	1377.52
31	1.63607	2201.05	-10.7539	Landslide	150	29	300.995	871.055	1300.82	0	1300.82	1357.98	1357.98
32	1.6329	2161.48	-9.56161	Landslide	150	29	299.393	866.419	1292.45	0	1292.45	1342.88	1342.88
33	1.6329	2122.79	-9.56161	Landslide	150	29	294.973	853.627	1269.38	0	1269.38	1319.06	1319.06
34	1.63471	2074.19	-5.27779	Landslide	150	29	297.657	861.396	1283.39	0	1283.39	1310.89	1310.89
35	1.63471	2011.02	-5.27779	Landslide	150	29	290.213	839.854	1244.53	0	1244.53	1271.34	1271.34
36	2.34884	2774.25	-4.47159	Landslide	150	29	282.3	816.955	1203.22	0	1203.22	1225.29	1225.29
37	2.34897	2623.93	-2.63544	Landslide	150	29	273.282	790.857	1156.14	0	1156.14	1168.72	1168.72
38	2.4112	2534.73	-4.27981	Landslide	150	29	257.463	745.076	1073.54	0	1073.54	1092.81	1092.81
39	2.33135	2291.59	-1.75929	Landslide	150	29	248.4	718.849	1026.23	0	1026.23	1033.86	1033.86
40	1.45123	1337.32	-0.519661	Landslide	150	29	238.243	689.455	973.206	0	973.206	975.367	975.367
41	1.45123	1265.53	-0.519661	Landslide	150	29	228.362	660.86	921.617	0	921.617	923.688	923.688
42	1.42098	1152.05	7.73025	Landslide	150	29	229.024	662.776	925.074	0	925.074	893.986	893.986
43	1.42098	1048.14	7.73025	Landslide	150	29	213.411	617.594	843.561	0	843.561	814.592	814.592
44	1.4138	933.416	10.6583	Landslide	150	29	201.19	582.229	779.762	0	779.762	741.899	741.899
45	1.4138	817.966	10.6583	Landslide	150	29	183.311	530.487	686.416	0	686.416	651.917	651.917
46	1.41362	691.248	15.7217	Landslide	150	29	170.137	492.362	617.637	0	617.637	569.745	569.745
47	1.41362	553.455	15.7217	Landslide	150	29	147.778	427.657	500.906	0	500.906	459.308	459.308
48	2.28117	607.862	14.811	Landslide	150	29	118.311	342.383	347.069	0	347.069	315.785	315.785
49	1.37324	195.849	15.8466	Landslide	150	29	90.7596	262.651	203.228	0	203.228	177.466	177.466
50	1.37324	65.2831	15.8466	Landslide	150	29	68.9244	199.462	89.2315	0	89.2315	69.6672	69.6672

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.6228	365.886	-49.5808	Landslide	150	29	79.0434	178.141	50.7676	0	50.7676	143.58	143.58
2	2.26463	868.055	-46.5431	Landslide	150	29	122.827	276.817	228.783	0	228.783	358.412	358.412
3	1.42814	767.299	-40.9329	Landslide	150	29	156.892	353.59	367.285	0	367.285	503.348	503.348
4	0.836494	515.293	-40.9329	Landslide Plane	340	12	190.047	428.31	415.464	0	415.464	580.279	580.279
5	1.62454	1101.98	-32.1559	Landslide Plane	340	12	200.389	451.619	525.127	0	525.127	651.103	651.103
6	1.62454	1209.95	-32.1559	Landslide Plane	340	12	205.74	463.678	581.863	0	581.863	711.203	711.203
7	1.62454	1295.88	-26.0815	Landslide Plane	340	12	213.97	482.226	669.119	0	669.119	773.856	773.856
8	1.62454	1359.78	-26.0815	Landslide Plane	340	12	217.256	489.631	703.956	0	703.956	810.301	810.301
9	2.46307	2169.48	-24.2689	Landslide Plane	340	12	222.141	500.641	755.755	0	755.755	855.91	855.91
10	2.46405	2289.17	-24.2671	Landslide Plane	340	12	226.212	509.817	798.926	0	798.926	900.908	900.908
11	2.04403	1995.4	-25.4455	Landslide Plane	340	12	229.343	516.872	832.119	0	832.119	941.242	941.242
12	2.04403	2089.7	-25.4455	Landslide Plane	340	12	233.211	525.589	873.129	0	873.129	984.092	984.092
13	2.08892	2231.19	-25.1197	Landslide Plane	340	12	237.298	534.802	916.468	0	916.468	1027.73	1027.73
14	2.08892	2326.04	-25.1197	Landslide Plane	340	12	241.112	543.397	956.904	0	956.904	1069.95	1069.95
15	2.07715	2406.37	-25.0081	Landslide Plane	340	12	244.981	552.116	997.925	0	997.925	1112.2	1112.2
16	2.07715	2498.92	-25.0081	Landslide Plane	340	12	248.726	560.556	1037.63	0	1037.63	1153.66	1153.66
17	2.06063	2570.39	-24.9884	Landslide Plane	340	12	252.468	568.99	1077.32	0	1077.32	1194.98	1194.98
18	2.06063	2661.26	-24.9884	Landslide Plane	340	12	256.175	577.345	1116.62	0	1116.62	1236.01	1236.01
19	2.03036	2707.41	-24.295	Landslide Plane	340	12	260.325	586.698	1160.62	0	1160.62	1278.14	1278.14
20	2.03036	2788.4	-24.295	Landslide Plane	340	12	263.692	594.285	1196.32	0	1196.32	1315.35	1315.35
21	0.0495729	69.1024	-24.295	Landslide Plane	340	12	265.431	598.204	1214.75	0	1214.75	1334.57	1334.57
22	0.0236597	32.9969	-22.2789	Landslide Plane	340	12	267.343	602.513	1235.03	0	1235.03	1344.56	1344.56
23	3.19723	4538.7	-22.2789	Landslide Plane	340	12	269.47	607.308	1257.59	0	1257.59	1367.99	1367.99
24	1.61106	2346.61	-22.1666	Landslide Plane	340	12	272.734	614.664	1292.19	0	1292.19	1403.31	1403.31
25	1.61106	2386.07	-22.1666	Landslide Plane	340	12	274.827	619.38	1314.38	0	1314.38	1426.35	1426.35
26	3.11959	4731.21	-22.0588	Landslide Plane	340	12	277.969	626.461	1347.69	0	1347.69	1460.33	1460.33
27	3.11405	4863.19	-21.6646	Landslide Plane	340	12	282.214	636.028	1392.7	0	1392.7	1504.81	1504.81
28	1.8505	2940.79	-18.3782	Landslide Plane	340	12	287.869	648.774	1452.67	0	1452.67	1548.31	1548.31
29	1.8505	2961.97	-18.3782	Landslide Plane	340	12	288.868	651.024	1463.25	0	1463.25	1559.22	1559.22
30	1.8505	2979.39	-17.4295	Landslide Plane	340	12	290.648	655.037	1482.13	0	1482.13	1573.38	1573.38
31	1.8505	2993.04	-17.4295	Landslide Plane	340	12	291.296	656.496	1489	0	1489	1580.45	1580.45
32	1.8505	3004.98	-17.3881	Landslide Plane	340	12	291.903	657.865	1495.44	0	1495.44	1586.85	1586.85
33	1.8505	3015.33	-17.3881	Landslide Plane	340	12	292.393	658.97	1500.64	0	1500.64	1592.2	1592.2
34	1.85076	3021.45	-16.2021	Landslide Plane	340	12	293.876	662.312	1516.36	0	1516.36	1601.75	1601.75
35	1.85076	3022.51	-16.2021	Landslide Plane	340	12	293.927	662.426	1516.9	0	1516.9	1602.3	1602.3
36	2.4734	4009.26	-11.533	Landslide Plane	340	12	297.619	670.748	1556.05	0	1556.05	1616.78	1616.78
37	2.4734	3947.65	-11.533	Landslide Plane	340	12	295.365	665.668	1532.15	0	1532.15	1592.42	1592.42
38	4.9468	7616.79	-7.98353	Landslide Plane	340	12	293.804	662.148	1515.59	0	1515.59	1556.79	1556.79
39	3.04493	4457.86	-6.47918	Landslide Plane	340	12	288.284	649.709	1457.07	0	1457.07	1489.81	1489.81
40	3.05734	4259.85	-4.35827	Landslide Plane	340	12	283.724	639.431	1408.71	0	1408.71	1430.33	1430.33

Interslice Data

Non-circular; static - Cuckoo search - global min FS

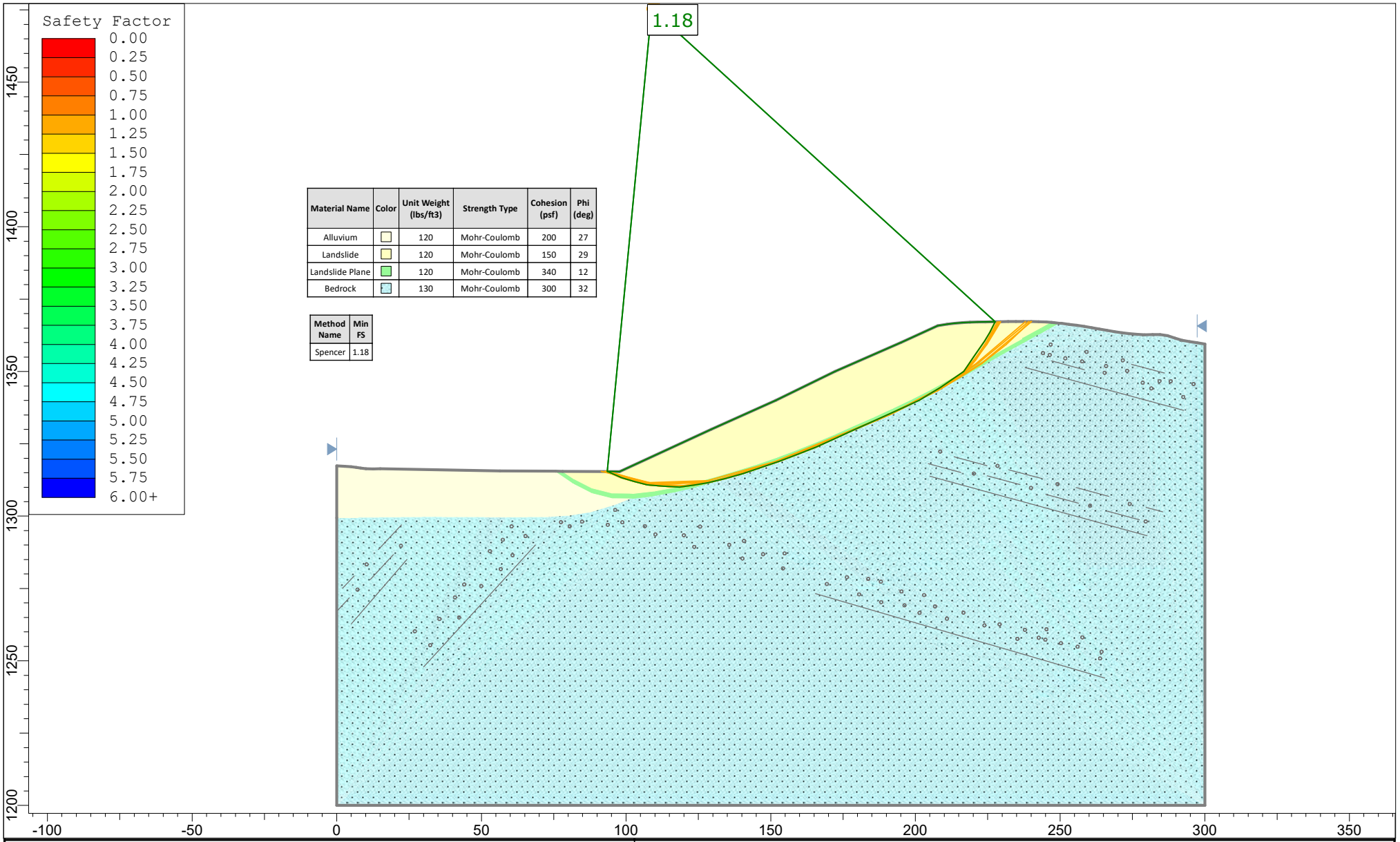
Global Minimum Query (spencer) - Safety Factor: 2.89392

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	155.245	1366.82	0	0	0
2	157.284	1364.6	4.47504	1.05051	13.2109
3	159.329	1363	172.447	40.4818	13.2109
4	161.35	1361.36	480.118	112.707	13.2109
5	163.175	1360.07	802.308	188.341	13.2109
6	165	1358.78	1202.56	282.3	13.2109
7	167.471	1357.32	1705.77	400.428	13.2109
8	168.88	1356.5	2024.7	475.297	13.2109
9	170.29	1355.68	2370.86	556.559	13.211
10	172.597	1354.53	2843.66	667.547	13.2109
11	174.904	1353.39	3360.37	788.846	13.211
12	176.694	1352.64	3674.44	862.574	13.211
13	178.484	1351.88	4003.39	939.794	13.211
14	179.754	1351.38	4210.42	988.393	13.2109
15	181.024	1350.88	4423.09	1038.32	13.211
16	182.413	1350.35	4647.26	1090.94	13.2109
17	183.803	1349.82	4877.46	1144.98	13.2109
18	185.333	1349.23	5145.95	1208.01	13.211
19	186.863	1348.63	5422.16	1272.85	13.211
20	190.656	1347.16	6139.19	1441.17	13.2109
21	192.661	1346.41	6489.57	1523.42	13.2109
22	194.667	1345.67	6846.31	1607.17	13.211
23	196.206	1345.18	7027.55	1649.71	13.2109
24	197.746	1344.68	7209.81	1692.5	13.211
25	199.566	1344.15	7363.65	1728.61	13.2109
26	201.387	1343.62	7517.63	1764.76	13.2109
27	203.21	1343.25	7448.73	1748.59	13.211
28	205.033	1342.88	7379.49	1732.33	13.2109
29	206.669	1342.58	7277.7	1708.44	13.211
30	208.305	1342.28	7176.15	1684.6	13.211
31	209.942	1341.97	7087.85	1663.87	13.211
32	211.578	1341.66	6999.61	1643.16	13.211
33	213.211	1341.38	6866.23	1611.84	13.2109
34	214.843	1341.11	6733.72	1580.74	13.211
35	216.478	1340.96	6440.94	1512.01	13.211
36	218.113	1340.81	6154.46	1444.76	13.211
37	220.462	1340.62	5712.4	1340.98	13.2109
38	222.811	1340.51	5195.47	1219.63	13.2109
39	225.222	1340.33	4768.39	1119.38	13.211
40	227.553	1340.26	4262.77	1000.68	13.2109
41	229.004	1340.25	3929.83	922.526	13.211
42	230.456	1340.24	3610.56	847.576	13.2109
43	231.877	1340.43	3106.68	729.292	13.211
44	233.298	1340.62	2640.71	619.906	13.211
45	234.711	1340.89	2148.8	504.429	13.2109
46	236.125	1341.15	1706.99	400.716	13.211
47	237.539	1341.55	1220.71	286.561	13.2109
48	238.952	1341.95	812.485	190.73	13.2109
49	241.234	1342.55	333.251	78.2305	13.2109
50	242.607	1342.94	129.399	30.3763	13.2109
51	243.98	1343.33	0	0	0

Non-circular; static - Qls plane

Global Minimum Query (spencer) - Safety Factor: 2.25371

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	266.008	1336.91	0	0	0
2	268.631	1333.83	-50.9673	-10.6976	11.8538
3	270.896	1331.44	217.671	45.6872	11.8538
4	272.324	1330.2	448.501	94.1361	11.8538
5	273.16	1329.48	590.92	124.029	11.8538
6	274.785	1328.46	801.679	168.265	11.8538
7	276.409	1327.43	1061.69	222.839	11.8538
8	278.034	1326.64	1246.17	261.56	11.8538
9	279.658	1325.84	1453.02	304.975	11.8538
10	282.121	1324.73	1745.14	366.289	11.8538
11	284.586	1323.62	2075.24	435.573	11.8538
12	286.63	1322.65	2415.74	507.042	11.8538
13	288.674	1321.68	2788.23	585.224	11.8538
14	290.763	1320.7	3190.12	669.577	11.8538
15	292.851	1319.72	3623.65	760.57	11.8538
16	294.929	1318.75	4081.72	856.716	11.8538
17	297.006	1317.78	4570.49	959.304	11.8538
18	299.066	1316.82	5084.88	1067.27	11.8538
19	301.127	1315.86	5629.38	1181.55	11.8537
20	303.157	1314.94	6164.57	1293.89	11.8538
21	305.188	1314.03	6725.64	1411.65	11.8538
22	305.237	1314	6739.66	1414.59	11.8538
23	305.261	1313.99	6745.31	1415.78	11.8538
24	308.458	1312.68	7531.07	1580.7	11.8538
25	310.069	1312.03	7939.82	1666.5	11.8538
26	311.68	1311.37	8359.77	1754.64	11.8538
27	314.8	1310.11	9196.27	1930.21	11.8538
28	317.914	1308.87	10040.2	2107.35	11.8538
29	319.764	1308.26	10400.6	2182.99	11.8538
30	321.615	1307.64	10765.7	2259.62	11.8538
31	323.465	1307.06	11088.9	2327.46	11.8538
32	325.316	1306.48	11414.9	2395.88	11.8538
33	327.166	1305.9	11741.3	2464.39	11.8538
34	329.017	1305.32	12069.8	2533.35	11.8538
35	330.868	1304.78	12341.4	2590.35	11.8538
36	332.718	1304.24	12613.1	2647.38	11.8538
37	335.192	1303.74	12662.4	2657.71	11.8537
38	337.665	1303.24	12705.1	2666.68	11.8538
39	342.612	1302.54	12303.2	2582.32	11.8537
40	345.657	1302.2	11929.2	2503.83	11.8538
41	348.714	1301.96	11390	2390.66	11.8538
42	351.342	1302.16	10372.2	2177.03	11.8538
43	353.97	1302.36	9407.35	1974.52	11.8538
44	353.994	1302.36	9387.13	1970.27	11.8538
45	358.134	1304.01	5657.48	1187.45	11.8538
46	359.951	1304.87	4203.01	882.173	11.8538
47	361.768	1305.74	2998.27	629.309	11.8538
48	363.708	1306.77	1819.09	381.81	11.8538
49	365.647	1307.81	921.41	193.396	11.8538
50	367.526	1308.77	340.251	71.4156	11.8538
51	369.404	1309.72	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvium		120	Mohr-Coulomb	200	27
Landslide		120	Mohr-Coulomb	150	29
Landslide Plane		120	Mohr-Coulomb	340	12
Bedrock		130	Mohr-Coulomb	300	32

Method Name	Min FS
Spencer	1.18

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 18-18'; CS-11 / Qls-B; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t18s1a.slmd
		Scale:	1:550
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 24

Slide Analysis Information

t18s1a

Project Summary

File Name:	t18s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:05.28s
Project Title:	VTTM 60257
Analysis:	Section 18-18'; CS-11 / Qls-B; non-circular search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Alluvium	Landslide	Landslide Plane	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	120	120	130
Cohesion [psf]	200	150	340	300
Friction Angle [°]	27	29	12	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

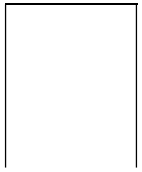
Global Minimums

Method: spencer

FS	1.180710
Axis Location:	108.806, 1475.361
Left Slip Surface Endpoint:	93.511, 1315.427
Right Slip Surface Endpoint:	227.576, 1367.165
Resisting Moment:	1.88604e+07 lb-ft
Driving Moment:	1.59738e+07 lb-ft
Resisting Horizontal Force:	105434 lb
Driving Horizontal Force:	89297.7 lb
Total Slice Area:	2366.44 ft2
Surface Horizontal Width:	134.065 ft
Surface Average Height:	17.6514 ft

Global Minimum Coordinates

Method: spencer



X	Y
93.511	1315.43
98.5419	1313.25
102.904	1311.95
107.267	1310.82
112.866	1310.34
118.466	1310.02
123.443	1310.69
128.421	1311.56
134.4	1313.04
140.38	1314.71
146.571	1316.81
152.762	1318.9
159.206	1321.32
165.65	1323.9
172.115	1326.8
178.579	1329.71
185.038	1332.62
191.497	1335.53
196.41	1337.75
201.323	1340.09
204.883	1342.21
208.442	1344.32
212.562	1347.13
216.681	1349.99
220.089	1354.97
221.964	1357.71
223.839	1360.45
225.715	1363.54
227.576	1367.16

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9003
Number of Invalid Surfaces: 1054

Error Codes:

Error Code -106 reported for 1 surface
Error Code -108 reported for 245 surfaces
Error Code -111 reported for 44 surfaces
Error Code -112 reported for 74 surfaces
Error Code -114 reported for 35 surfaces
Error Code -121 reported for 174 surfaces
Error Code -124 reported for 26 surfaces
Error Code -1000 reported for 455 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

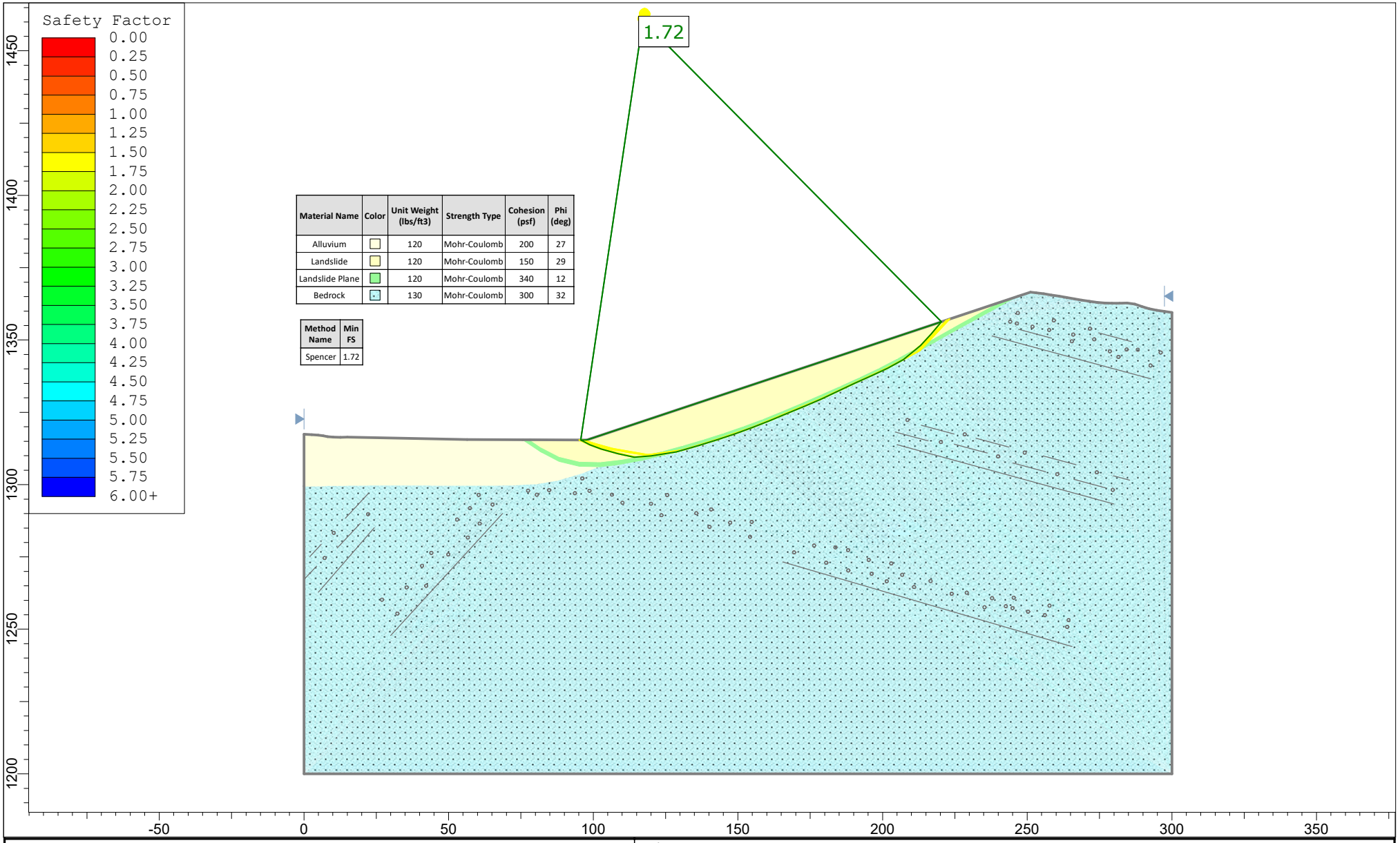
Global Minimum Query (spencer) - Safety Factor: 1.18071

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.51548	162.931	-23.4422	Landslide	150	29	274.297	323.865	313.66	0	313.66	194.721	194.721
2	2.51548	506.864	-23.4422	Landslide	150	29	400.055	472.349	581.535	0	581.535	408.066	408.066
3	2.18126	879.665	-16.5252	Landslide	150	29	492.584	581.599	778.626	0	778.626	632.481	632.481
4	2.18126	1312.6	-16.5252	Landslide	150	29	643.352	759.612	1099.77	0	1099.77	908.894	908.894
5	2.18126	1734.59	-14.4865	Landslide	150	29	755.951	892.559	1339.61	0	1339.61	1144.3	1144.3
6	2.18126	2145.64	-14.4865	Landslide	150	29	892.445	1053.72	1630.35	0	1630.35	1399.77	1399.77
7	2.79972	3275.21	-4.90169	Landslide	150	29	858.301	1013.4	1557.62	0	1557.62	1484.01	1484.01
8	2.79972	3790.04	-4.90169	Landslide	150	29	968.433	1143.44	1792.21	0	1792.21	1709.16	1709.16
9	2.2594	3425.56	-3.33535	Landslide	150	29	1038.49	1226.16	1941.44	0	1941.44	1880.92	1880.92
10	2.2594	3744.01	-3.33535	Landslide	150	29	1120.65	1323.16	2116.43	0	2116.43	2051.12	2051.12
11	1.08064	1903.3	-3.33535	Landslide Plane	340	12	656.127	774.696	2045.08	0	2045.08	2006.84	2006.84
12	2.48878	4588.27	7.74623	Landslide Plane	340	12	625.658	738.721	1875.83	0	1875.83	1960.94	1960.94
13	2.48878	4830.25	7.74623	Landslide Plane	340	12	642.978	759.171	1972.04	0	1972.04	2059.5	2059.5
14	2.48878	5057.81	9.91577	Landslide Plane	340	12	650.368	767.896	2013.09	0	2013.09	2126.78	2126.78
15	2.48878	5270.96	9.91577	Landslide Plane	340	12	665.339	785.573	2096.26	0	2096.26	2212.57	2212.57
16	2.98966	6571.27	13.8647	Landslide Plane	340	12	662.7	782.457	2081.6	0	2081.6	2245.17	2245.17
17	2.98966	6786.76	13.8647	Landslide Plane	340	12	674.877	796.834	2149.24	0	2149.24	2315.81	2315.81
18	2.98967	6983.99	15.6137	Landslide Plane	340	12	678.492	801.102	2169.31	0	2169.31	2358.93	2358.93
19	2.98967	7163.71	15.6137	Landslide Plane	340	12	688.496	812.914	2224.88	0	2224.88	2417.29	2417.29
20	3.09568	7573.3	18.6905	Landslide Plane	340	12	683.357	806.846	2196.34	0	2196.34	2427.51	2427.51
21	3.09568	7698.34	18.6905	Landslide Plane	340	12	689.901	814.573	2232.69	0	2232.69	2466.08	2466.08
22	3.09568	7823.38	18.6905	Landslide Plane	340	12	696.445	822.3	2269.04	0	2269.04	2504.65	2504.65
23	3.09568	7951.13	18.6905	Landslide Plane	340	12	703.132	830.195	2306.19	0	2306.19	2544.06	2544.06
24	3.22203	8425.64	20.5459	Landslide Plane	340	12	702.211	829.107	2301.07	0	2301.07	2564.26	2564.26
25	3.22203	8567.54	20.5459	Landslide Plane	340	12	709.233	837.398	2340.07	0	2340.07	2605.89	2605.89
26	3.22203	8693.47	21.8241	Landslide Plane	340	12	709.526	837.745	2341.7	0	2341.7	2625.84	2625.84
27	3.22203	8803.41	21.8241	Landslide Plane	340	12	714.905	844.096	2371.59	0	2371.59	2657.88	2657.88
28	3.23208	8910.5	24.2101	Landslide Plane	340	12	707.581	835.448	2330.9	0	2330.9	2649.05	2649.05
29	3.23208	8959.49	24.2101	Landslide Plane	340	12	709.92	838.21	2343.89	0	2343.89	2663.1	2663.1
30	2.15472	5986.81	24.2476	Landslide Plane	340	12	710.734	839.171	2348.41	0	2348.41	2668.54	2668.54
31	2.15472	5980.06	24.2476	Landslide Plane	340	12	710.251	838.6	2345.73	0	2345.73	2665.63	2665.63
32	2.15472	5973.29	24.2476	Landslide Plane	340	12	709.765	838.027	2343.03	0	2343.03	2662.72	2662.72
33	3.22956	8940.27	24.2476	Landslide Plane	340	12	709.16	837.312	2339.67	0	2339.67	2659.09	2659.09
34	3.22956	8925.06	24.2476	Landslide Plane	340	12	708.433	836.454	2335.63	0	2335.63	2654.72	2654.72
35	3.22956	8909.85	24.2476	Landslide Plane	340	12	707.706	835.596	2331.6	0	2331.6	2650.36	2650.36
36	3.22956	8894.64	24.2476	Landslide Plane	340	12	706.98	834.738	2327.56	0	2327.56	2645.99	2645.99
37	2.45639	6755.04	24.2476	Landslide Plane	340	12	706.34	833.983	2324.01	0	2324.01	2642.15	2642.15
38	2.45639	6748.47	24.2476	Landslide Plane	340	12	705.927	833.495	2321.71	0	2321.71	2639.67	2639.67
39	2.45639	6742.06	25.5378	Landslide Plane	340	12	699.513	825.922	2286.08	0	2286.08	2620.3	2620.3
40	2.45639	6726.97	25.5378	Landslide Plane	340	12	698.576	824.816	2280.88	0	2280.88	2614.65	2614.65
41	3.55996	9634.64	30.6761	Landslide Plane	340	12	670.042	791.125	2122.38	0	2122.38	2519.84	2519.84
42	3.55996	9416.73	30.6761	Landslide Plane	340	12	661.139	780.613	2072.92	0	2072.92	2465.1	2465.1
43	4.11916	10135.7	34.3428	Landslide Plane	340	12	618.57	730.352	1836.46	0	1836.46	2259.1	2259.1
44	4.11916	8967.81	34.7561	Landslide Plane	340	12	577.148	681.445	1606.37	0	1606.37	2006.85	2006.85
45	0.0595725	120.343	55.6183	Landslide Plane	340	12	470.307	555.296	1012.89	0	1012.89	1700.22	1700.22
46	3.34897	5800.14	55.6183	Landslide	150	29	499.386	589.63	793.114	0	793.114	1522.95	1522.95
47	1.87471	2411.14	55.6183	Landslide	150	29	394.763	466.101	570.261	0	570.261	1147.19	1147.19
48	1.87471	1804.73	55.6183	Landslide	150	29	318.847	376.466	408.556	0	408.556	874.539	874.539
49	1.8764	1156.81	58.7483	Landslide	150	29	224.877	265.515	208.395	0	208.395	578.957	578.957
50	1.86117	402.367	62.804	Landslide	150	29	128.854	152.14	3.86023	0	3.86023	254.627	254.627

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.18071

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	93.511	1315.43	0	0	0
2	96.0264	1314.34	1032.11	326.919	17.5755
3	98.5419	1313.25	2672.76	846.586	17.5754
4	100.723	1312.6	4251.11	1346.53	17.5755
5	102.904	1311.95	6366.17	2016.46	17.5754
6	105.086	1311.39	8770.07	2777.89	17.5754
7	107.267	1310.82	11635.5	3685.52	17.5755
8	110.067	1310.58	14412.6	4565.13	17.5754
9	112.866	1310.34	17554.2	5560.24	17.5754
10	115.126	1310.21	20156.3	6384.43	17.5754
11	117.385	1310.08	22966.9	7274.7	17.5754
12	118.466	1310.02	23804.8	7540.08	17.5754
13	120.955	1310.36	24726.9	7832.15	17.5754
14	123.443	1310.69	25659.5	8127.56	17.5754
15	125.932	1311.13	26402.3	8362.84	17.5754
16	128.421	1311.56	27146.2	8598.46	17.5754
17	131.411	1312.3	27591.4	8739.48	17.5754
18	134.4	1313.04	28023.1	8876.23	17.5754
19	137.39	1313.88	28239.1	8944.65	17.5754
20	140.38	1314.71	28438.7	9007.85	17.5754
21	143.475	1315.76	28254	8949.35	17.5754
22	146.571	1316.81	28051.5	8885.22	17.5754
23	149.667	1317.85	27831.2	8815.45	17.5754
24	152.762	1318.9	27592.7	8739.9	17.5754
25	155.984	1320.11	27076.5	8576.39	17.5754
26	159.206	1321.32	26535.8	8405.12	17.5754
27	162.428	1322.61	25800.4	8172.2	17.5754
28	165.65	1323.9	25043.8	7932.55	17.5754
29	168.883	1325.35	23943.5	7584.01	17.5754
30	172.115	1326.8	22831.8	7231.88	17.5754
31	174.269	1327.77	22084	6995.04	17.5754
32	176.424	1328.74	21337.8	6758.69	17.5755
33	178.579	1329.71	20593.2	6522.84	17.5755
34	181.808	1331.17	19480.1	6170.26	17.5754
35	185.038	1332.62	18370.6	5818.81	17.5754
36	188.267	1334.08	17264.5	5468.47	17.5754
37	191.497	1335.53	16162	5119.25	17.5754
38	193.953	1336.64	15325.8	4854.38	17.5754
39	196.41	1337.75	14491.1	4590	17.5754
40	198.866	1338.92	13526.3	4284.42	17.5755
41	201.323	1340.09	12565.4	3980.05	17.5754
42	204.883	1342.21	10468.8	3315.97	17.5755
43	208.442	1344.32	8445.02	2674.93	17.5754
44	212.562	1347.13	5824.47	1844.88	17.5754
45	216.681	1349.99	3610.5	1143.61	17.5754
46	216.74	1350.08	3550.33	1124.55	17.5753
47	220.089	1354.97	1340.96	424.744	17.5754
48	221.964	1357.71	518.618	164.271	17.5755
49	223.839	1360.45	-2.9988	-0.949858	17.5754
50	225.715	1363.54	-225.395	-71.393	17.5754
51	227.576	1367.16	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvium		120	Mohr-Coulomb	200	27
Landslide		120	Mohr-Coulomb	150	29
Landslide Plane		120	Mohr-Coulomb	340	12
Bedrock		130	Mohr-Coulomb	300	32

Method Name	Min FS
Spencer	1.72

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SLIDEINTERPRET 8.014

Analysis:	Section 18-18'; CS-11 / Qls-B; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t18s2a.slmd
		Scale:	1:550
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 25

Slide Analysis Information

t18s2a

Project Summary

File Name:	t18s2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:05.526s
Project Title:	VTTM 60257
Analysis:	Section 18-18'; CS-11 / Qls-B; non-circular search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Alluvium	Landslide	Landslide Plane	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	120	120	130
Cohesion [psf]	200	150	340	300
Friction Angle [°]	27	29	12	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

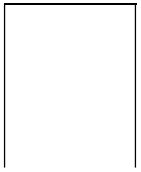
Global Minimums

Method: spencer

FS	1.720820
Axis Location:	117.145, 1460.490
Left Slip Surface Endpoint:	95.678, 1315.418
Right Slip Surface Endpoint:	220.323, 1356.273
Resisting Moment:	1.22104e+07 lb-ft
Driving Moment:	7.09572e+06 lb-ft
Resisting Horizontal Force:	77268.3 lb
Driving Horizontal Force:	44902.1 lb
Total Slice Area:	1395.4 ft2
Surface Horizontal Width:	124.645 ft
Surface Average Height:	11.195 ft

Global Minimum Coordinates

Method: spencer



X	Y
95.6776	1315.42
98.8765	1313.7
102.736	1312.28
108.502	1310.65
114.152	1309.44
119.931	1309.88
124.318	1310.56
128.674	1311.3
132.7	1312.44
136.703	1313.6
142.791	1315.47
148.832	1317.47
154.873	1319.68
160.888	1322.04
166.904	1324.59
172.919	1327.03
178.934	1329.64
184.867	1332.42
190.554	1335.12
196.231	1337.65
201.748	1340.23
207.163	1343.22
210.155	1345.68
213.146	1348.13
216.758	1351.97
220.323	1356.27

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9349
Number of Invalid Surfaces: 711

Error Codes:

Error Code -106 reported for 1 surface
Error Code -108 reported for 181 surfaces
Error Code -111 reported for 37 surfaces
Error Code -112 reported for 50 surfaces
Error Code -114 reported for 24 surfaces
Error Code -121 reported for 74 surfaces
Error Code -124 reported for 18 surfaces
Error Code -600 reported for 2 surfaces
Error Code -1000 reported for 324 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

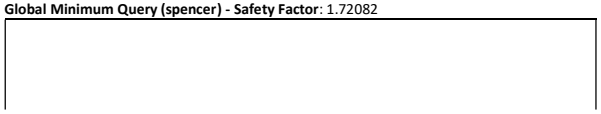
Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.72082

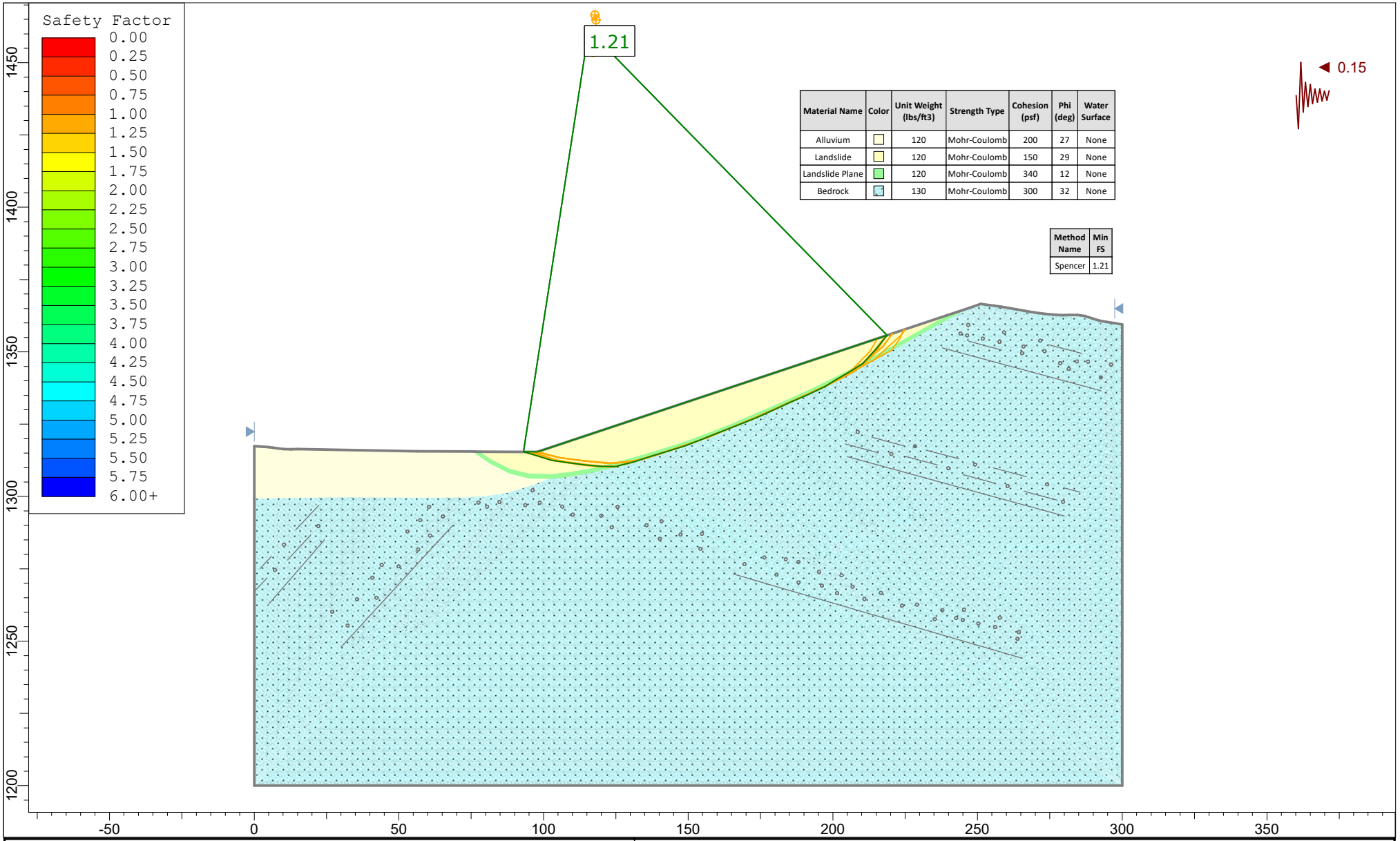
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.19896	352.539	-28.1839	Landslide	150	29	184.361	317.252	301.731	0	301.731	202.944	202.944
2	1.92983	639.381	-20.1896	Landslide	150	29	265.982	457.708	555.118	0	555.118	457.311	457.311
3	1.92983	952.701	-20.1896	Landslide	150	29	341.052	586.889	788.167	0	788.167	662.755	662.755
4	2.88289	1964.6	-15.8046	Landslide	150	29	401.903	691.602	977.076	0	977.076	863.314	863.314
5	2.88289	2579.37	-15.8046	Landslide	150	29	493.905	849.921	1262.69	0	1262.69	1122.89	1122.89
6	2.79853	3059.6	-12.0919	Landslide	150	29	551.716	949.404	1442.16	0	1442.16	1323.96	1323.96
7	2.79853	3574.23	-12.0919	Landslide	150	29	626.961	1078.89	1675.76	0	1675.76	1541.44	1541.44
8	0.0533374	73.1193	-12.0919	Landslide Plane	340	12	402.675	692.931	1660.41	0	1660.41	1574.14	1574.14
9	2.88953	4095.1	4.35603	Landslide Plane	340	12	377.91	650.315	1459.92	0	1459.92	1488.7	1488.7
10	2.88953	4352.78	4.35603	Landslide Plane	340	12	388.961	669.332	1549.39	0	1549.39	1579.02	1579.02
11	2.19307	3452.83	8.82393	Landslide Plane	340	12	389.495	670.251	1553.71	0	1553.71	1614.17	1614.17
12	2.19307	3555.63	8.82393	Landslide Plane	340	12	395.13	679.947	1599.32	0	1599.32	1660.66	1660.66
13	2.17802	3629.17	9.57117	Landslide Plane	340	12	399.188	686.931	1632.18	0	1632.18	1699.5	1699.5
14	2.17802	3722.95	9.57117	Landslide Plane	340	12	404.337	695.791	1673.87	0	1673.87	1742.05	1742.05
15	2.01301	3496.22	15.8546	Landslide Plane	340	12	396.211	681.807	1608.08	0	1608.08	1720.6	1720.6
16	2.01301	3520.22	15.8546	Landslide Plane	340	12	397.577	684.158	1619.14	0	1619.14	1732.05	1732.05
17	2.00186	3523.24	16.137	Landslide Plane	340	12	398.356	685.499	1625.44	0	1625.44	1740.7	1740.7
18	2.00186	3544.41	16.137	Landslide Plane	340	12	399.565	687.58	1635.23	0	1635.23	1750.84	1750.84
19	2.02933	3610.08	17.1119	Landslide Plane	340	12	398.755	686.185	1628.67	0	1628.67	1751.44	1751.44
20	2.02933	3622.67	17.1119	Landslide Plane	340	12	399.46	687.398	1634.38	0	1634.38	1757.36	1757.36
21	2.02933	3635.27	17.1119	Landslide Plane	340	12	400.164	688.611	1640.09	0	1640.09	1763.29	1763.29
22	2.01362	3613.96	18.311	Landslide Plane	340	12	398.365	685.515	1625.52	0	1625.52	1757.35	1757.35
23	2.01362	3615.14	18.311	Landslide Plane	340	12	398.432	685.629	1626.06	0	1626.06	1757.91	1757.91
24	2.01362	3616.32	18.311	Landslide Plane	340	12	398.497	685.742	1626.59	0	1626.59	1758.46	1758.46
25	3.02045	5408.04	20.0565	Landslide Plane	340	12	394.718	679.239	1595.99	0	1595.99	1740.1	1740.1
26	3.02045	5373.3	20.0565	Landslide Plane	340	12	393.438	677.036	1585.63	0	1585.63	1729.27	1729.27
27	3.00761	5301.15	21.4218	Landslide Plane	340	12	389.173	669.696	1551.1	0	1551.1	1703.78	1703.78
28	3.00761	5237.14	21.4218	Landslide Plane	340	12	386.826	665.658	1532.1	0	1532.1	1683.87	1683.87
29	2.00508	3448.25	22.974	Landslide Plane	340	12	381.73	656.888	1490.84	0	1490.84	1652.67	1652.67
30	2.00508	3404.55	22.974	Landslide Plane	340	12	379.353	652.799	1471.6	0	1471.6	1632.42	1632.42
31	2.00508	3360.84	22.974	Landslide Plane	340	12	376.977	648.709	1452.37	0	1452.37	1612.18	1612.18
32	3.00762	4969.1	22.0938	Landslide Plane	340	12	375.858	646.784	1443.31	0	1443.31	1595.88	1595.88
33	3.00762	4890.32	22.0938	Landslide Plane	340	12	372.984	641.839	1420.04	0	1420.04	1571.45	1571.45
34	3.00762	4796.55	23.4402	Landslide Plane	340	12	367.332	632.113	1374.28	0	1374.28	1533.55	1533.55
35	3.00762	4687.77	23.4402	Landslide Plane	340	12	363.402	625.35	1342.46	0	1342.46	1500.03	1500.03
36	2.96629	4498.09	25.1264	Landslide Plane	340	12	356.118	612.815	1283.5	0	1283.5	1450.51	1450.51
37	2.96629	4354.87	25.1264	Landslide Plane	340	12	350.935	603.896	1241.53	0	1241.53	1406.12	1406.12
38	2.84355	4037.8	25.3607	Landslide Plane	340	12	345.41	594.388	1196.8	0	1196.8	1360.52	1360.52
39	2.84355	3901.34	25.3607	Landslide Plane	340	12	340.266	585.537	1155.16	0	1155.16	1316.45	1316.45
40	2.83856	3771.46	24.0843	Landslide Plane	340	12	337.475	580.734	1132.56	0	1132.56	1283.41	1283.41
41	2.83856	3661.58	24.0843	Landslide Plane	340	12	333.288	573.529	1098.67	0	1098.67	1247.65	1247.65
42	2.75867	3444.46	24.9965	Landslide Plane	340	12	327.547	563.65	1052.19	0	1052.19	1204.9	1204.9
43	2.75867	3323.11	24.9965	Landslide Plane	340	12	322.821	555.516	1013.92	0	1013.92	1164.43	1164.43
44	2.70762	3105.24	28.9636	Landslide Plane	340	12	311.379	535.828	921.298	0	921.298	1093.64	1093.64
45	2.70762	2911.59	28.9636	Landslide Plane	340	12	303.916	522.984	860.872	0	860.872	1029.08	1029.08
46	2.99121	2847.88	39.3804	Landslide Plane	340	12	278.393	479.065	654.249	0	654.249	882.764	882.764
47	2.71269	2130.15	39.3804	Landslide Plane	340	12	262.398	451.539	524.748	0	524.748	740.134	740.134
48	0.278514	194.337	39.3804	Landslide	150	29	236.831	407.544	464.621	0	464.621	659.02	659.02
49	3.61251	1921.25	46.7037	Landslide	150	29	183.947	316.54	300.446	0	300.446	495.671	495.671
50	3.56437	666.625	50.3784	Landslide	150	29	107.983	185.819	64.6185	0	64.6185	195.047	195.047

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.72082



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	95.6776	1315.42	0	0	0
2	98.8765	1313.7	1106.97	296.687	15.0036
3	100.806	1312.99	2014.21	539.844	15.0037
4	102.736	1312.28	3231.7	866.154	15.0037
5	105.619	1311.47	5187.66	1390.39	15.0037
6	108.502	1310.65	7641.93	2048.17	15.0036
7	111.301	1310.05	10050.6	2693.73	15.0036
8	114.099	1309.45	12809.8	3433.26	15.0037
9	114.152	1309.44	12850.3	3444.1	15.0036
10	117.042	1309.66	13620.9	3650.65	15.0037
11	119.931	1309.88	14403.8	3860.48	15.0037
12	122.125	1310.22	14729.1	3947.65	15.0036
13	124.318	1310.56	15051.1	4033.97	15.0037
14	126.496	1310.93	15321.1	4106.34	15.0037
15	128.674	1311.3	15587.1	4177.61	15.0036
16	130.687	1311.87	15465.3	4144.98	15.0037
17	132.7	1312.44	15340	4111.39	15.0037
18	134.701	1313.02	15196	4072.79	15.0036
19	136.703	1313.6	15048.7	4033.32	15.0037
20	138.733	1314.22	14840.4	3977.49	15.0037
21	140.762	1314.85	14629.9	3921.08	15.0037
22	142.791	1315.47	14417.3	3864.1	15.0037
23	144.805	1316.14	14136.3	3788.77	15.0036
24	146.819	1316.81	13855	3713.39	15.0037
25	148.832	1317.47	13573.5	3637.95	15.0037
26	151.853	1318.58	13005.8	3485.79	15.0037
27	154.873	1319.68	12445.6	3335.66	15.0037
28	157.881	1320.86	11785.9	3158.82	15.0036
29	160.888	1322.04	11141.4	2986.1	15.0037
30	162.893	1322.89	10639.6	2851.59	15.0036
31	164.898	1323.74	10149.3	2720.19	15.0037
32	166.904	1324.59	9670.6	2591.89	15.0037
33	169.911	1325.81	9038.92	2422.59	15.0037
34	172.919	1327.03	8427.01	2258.59	15.0037
35	175.926	1328.33	7739.72	2074.38	15.0036
36	178.934	1329.64	7082.1	1898.13	15.0037
37	181.9	1331.03	6352.88	1702.69	15.0037
38	184.867	1332.42	5666.67	1518.77	15.0037
39	187.71	1333.77	5035.78	1349.68	15.0037
40	190.554	1335.12	4446.4	1191.71	15.0036
41	193.392	1336.38	3967.33	1063.31	15.0036
42	196.231	1337.65	3519.38	943.257	15.0037
43	198.989	1338.94	3069.67	822.727	15.0037
44	201.748	1340.23	2656.14	711.894	15.0037
45	204.456	1341.72	2118.58	567.817	15.0037
46	207.163	1343.22	1651.36	442.593	15.0036
47	210.155	1345.68	877.722	235.245	15.0037
48	212.867	1347.9	421.082	112.857	15.0036
49	213.146	1348.13	380.823	102.068	15.0038
50	216.758	1351.97	-106.572	-28.5631	15.0036
51	220.323	1356.27	0	0	0



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SLIDEINTERPRET 8.014

Analysis:	Section 18-18'; CS-11 / Qls-B; non-circular search; pseudo w/ remedial 3:1		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t18ps2a.slmd
		Scale:	1:550
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 26

Slide Analysis Information

t18ps2a

Project Summary

File Name:	t18ps2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:06.817s
Project Title:	VTTM 60257
Analysis:	Section 18-18'; CS-11 / Qls-B; non-circular search; pseudo w/ remedial 3:1
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Alluvium	Landslide	Landslide Plane	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	120	120	130
Cohesion [psf]	200	150	340	300
Friction Angle [°]	27	29	12	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

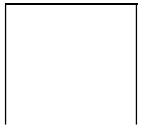
Global Minimums

Method: spencer

FS	1.205030
Axis Location:	115.566, 1461.287
Left Slip Surface Endpoint:	93.028, 1315.429
Right Slip Surface Endpoint:	218.729, 1355.742
Resisting Moment:	1.22647e+07 lb-ft
Driving Moment:	1.01779e+07 lb-ft
Resisting Horizontal Force:	77455 lb
Driving Horizontal Force:	64276.2 lb
Total Slice Area:	1364.91 ft2
Surface Horizontal Width:	125.701 ft
Surface Average Height:	10.8584 ft

Global Minimum Coordinates

Method: spencer



X	Y
93.0277	1315.43
97.9324	1313.97
102.837	1312.51
108.666	1311.64
114.495	1310.89
119.658	1310.43
124.836	1310.34
131.213	1311.96
136.977	1313.85
142.553	1315.55
148.954	1317.51
155.245	1319.99
161.222	1322.35
167.199	1324.72
173.176	1327.09
179.132	1329.78
185.106	1332.48
191.119	1335.11
197.14	1337.91
201.496	1340.59
205.934	1343.19
210.372	1346
214.81	1350.85
218.729	1355.74

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9027
Number of Invalid Surfaces: 1038

Error Codes:

Error Code -106 reported for 4 surfaces
Error Code -108 reported for 230 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 66 surfaces
Error Code -112 reported for 85 surfaces
Error Code -114 reported for 37 surfaces
Error Code -121 reported for 86 surfaces
Error Code -124 reported for 27 surfaces
Error Code -600 reported for 2 surfaces
Error Code -1000 reported for 499 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

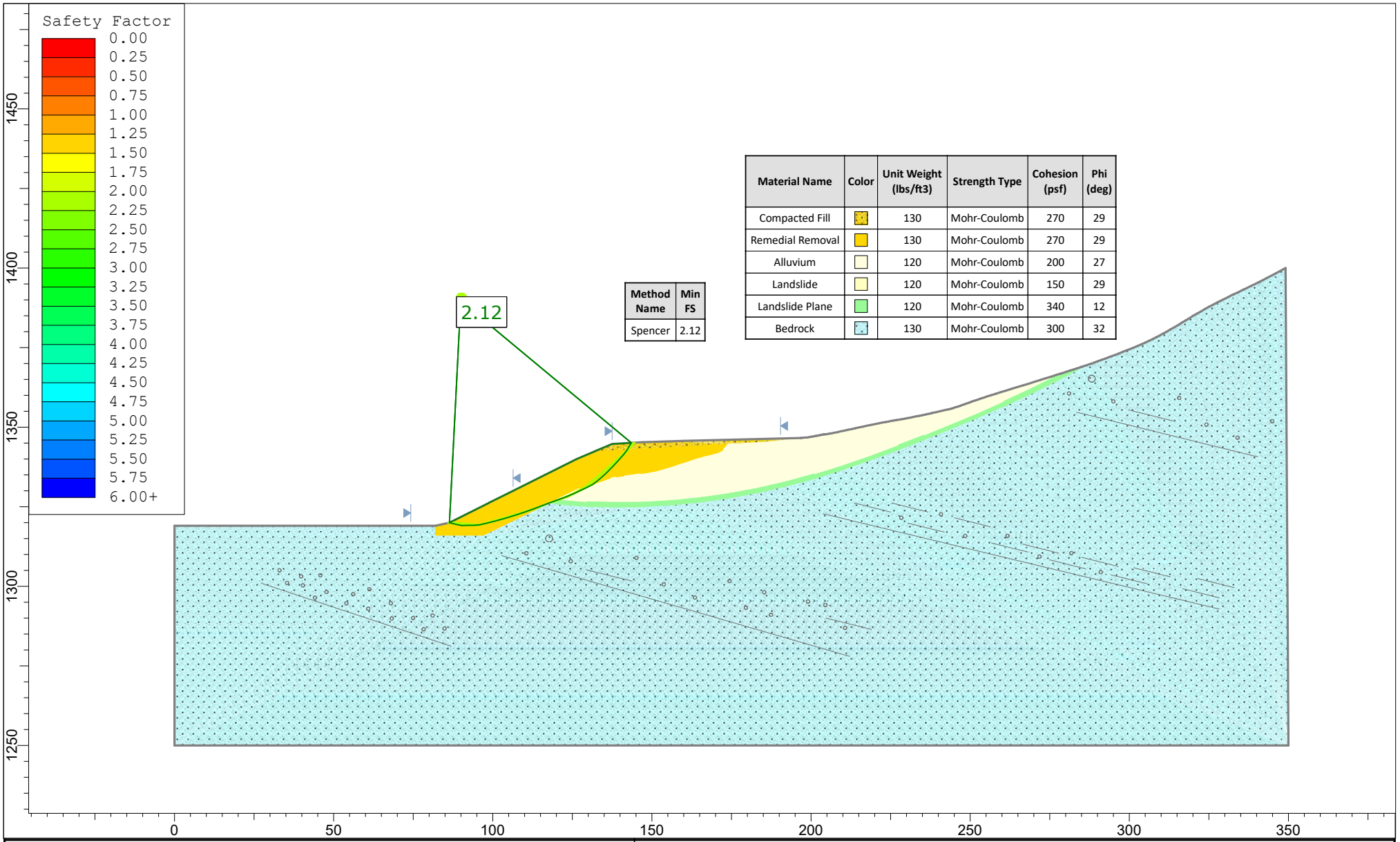
Global Minimum Query (spencer) - Safety Factor: 1.20503

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.45234	105.704	-16.5624	Landslide	150	29	223.278	269.057	214.785	0	214.785	148.383	148.383
2	2.45234	317.876	-16.5624	Landslide	150	29	288.133	347.209	355.775	0	355.775	270.085	270.085
3	2.45234	669.767	-16.5666	Landslide	150	29	395.735	476.873	589.693	0	589.693	471.97	471.97
4	2.45234	1125.03	-16.5666	Landslide	150	29	534.911	644.584	892.251	0	892.251	733.126	733.126
5	2.91439	1853.88	-8.53468	Landslide	150	29	560.611	675.553	948.122	0	948.122	863.991	863.991
6	2.91439	2346.61	-8.53468	Landslide	150	29	665.144	801.519	1175.37	0	1175.37	1075.55	1075.55
7	2.91439	2828.59	-7.3497	Landslide	150	29	749.991	903.762	1359.82	0	1359.82	1263.09	1263.09
8	2.91439	3299.83	-7.3497	Landslide	150	29	847.519	1021.29	1571.84	0	1571.84	1462.52	1462.52
9	2.28312	2901.48	-5.03845	Landslide	150	29	891.534	1074.33	1667.53	0	1667.53	1588.93	1588.93
10	2.28312	3165.15	-5.03845	Landslide	150	29	958.043	1154.47	1812.11	0	1812.11	1727.64	1727.64
11	0.596904	870.983	-5.03845	Landslide Plane	340	12	582.599	702.049	1703.32	0	1703.32	1651.95	1651.95
12	2.58921	3958.34	-1.00515	Landslide Plane	340	12	578.673	697.318	1681.05	0	1681.05	1670.89	1670.89
13	2.58921	4240.63	-1.00515	Landslide Plane	340	12	598.311	720.983	1792.38	0	1792.38	1781.89	1781.89
14	3.1884	5444.08	14.2614	Landslide Plane	340	12	552.402	665.661	1532.12	0	1532.12	1672.52	1672.52
15	3.1884	5540.67	14.2614	Landslide Plane	340	12	557.097	671.319	1558.73	0	1558.73	1700.34	1700.34
16	2.88191	5054.3	18.1684	Landslide Plane	340	12	546.126	658.098	1496.53	0	1496.53	1675.76	1675.76
17	2.88191	5059.47	18.1684	Landslide Plane	340	12	546.393	658.42	1498.05	0	1498.05	1677.36	1677.36
18	2.78823	4911.14	16.9168	Landslide Plane	340	12	551.531	664.612	1527.18	0	1527.18	1694.92	1694.92
19	2.78823	4938.39	16.9168	Landslide Plane	340	12	553.009	666.392	1535.56	0	1535.56	1703.75	1703.75
20	2.1335	3796.38	17.0681	Landslide Plane	340	12	553.734	667.266	1539.67	0	1539.67	1709.68	1709.68
21	2.1335	3810.76	17.0681	Landslide Plane	340	12	554.751	668.491	1545.43	0	1545.43	1715.76	1715.76
22	2.1335	3825.14	17.0681	Landslide Plane	340	12	555.768	669.717	1551.19	0	1551.19	1721.83	1721.83
23	2.09722	3751.26	21.4844	Landslide Plane	340	12	540.065	650.795	1462.18	0	1462.18	1674.74	1674.74
24	2.09722	3719.46	21.4844	Landslide Plane	340	12	537.873	648.153	1449.74	0	1449.74	1661.45	1661.45
25	2.09722	3687.67	21.4844	Landslide Plane	340	12	535.68	645.51	1437.31	0	1437.31	1648.15	1648.15
26	2.98837	5198.54	21.5922	Landslide Plane	340	12	532.61	641.811	1419.91	0	1419.91	1630.7	1630.7
27	2.98837	5131.65	21.5922	Landslide Plane	340	12	529.376	637.914	1401.58	0	1401.58	1611.09	1611.09
28	2.98837	5064.77	21.5922	Landslide Plane	340	12	526.142	634.017	1383.24	0	1383.24	1591.47	1591.47
29	2.98837	4997.88	21.5922	Landslide Plane	340	12	522.908	630.12	1364.91	0	1364.91	1571.86	1571.86
30	2.98837	4931	21.5922	Landslide Plane	340	12	519.674	626.223	1346.57	0	1346.57	1552.25	1552.25
31	2.98837	4864.12	21.5922	Landslide Plane	340	12	516.44	622.326	1328.24	0	1328.24	1532.63	1532.63
32	2.97821	4751.16	24.32	Landslide Plane	340	12	503.387	606.597	1254.24	0	1254.24	1481.74	1481.74
33	2.97821	4624.94	24.32	Landslide Plane	340	12	497.424	599.411	1220.43	0	1220.43	1445.24	1445.24
34	2.98709	4512.13	24.3032	Landslide Plane	340	12	491.511	592.285	1186.91	0	1186.91	1408.87	1408.87
35	2.98709	4385.54	24.3032	Landslide Plane	340	12	485.546	585.098	1153.1	0	1153.1	1372.36	1372.36
36	2.00442	2875.14	23.6508	Landslide Plane	340	12	482.644	581.6	1136.64	0	1136.64	1348.01	1348.01
37	2.00442	2824.71	23.6508	Landslide Plane	340	12	479.08	577.306	1116.44	0	1116.44	1326.25	1326.25
38	2.00442	2774.29	23.6508	Landslide Plane	340	12	475.518	573.013	1096.24	0	1096.24	1304.49	1304.49
39	3.01023	4056.81	24.9537	Landslide Plane	340	12	466.829	562.543	1046.98	0	1046.98	1264.21	1264.21
40	3.01023	3913.31	24.9537	Landslide Plane	340	12	460.163	554.51	1009.19	0	1009.19	1223.32	1223.32
41	2.1778	2699.08	31.5922	Landslide Plane	340	12	434.836	523.991	865.611	0	865.611	1133.04	1133.04
42	2.1778	2538.78	31.5922	Landslide Plane	340	12	425.212	512.393	811.044	0	811.044	1072.56	1072.56
43	2.21906	2430.77	30.3424	Landslide Plane	340	12	418.93	504.823	775.43	0	775.43	1020.65	1020.65
44	2.21906	2281.87	30.3424	Landslide Plane	340	12	410.041	494.112	725.038	0	725.038	965.054	965.054
45	2.21906	2118.56	32.3787	Landslide Plane	340	12	395.927	477.104	645.027	0	645.027	896.083	896.083
46	2.21906	1940.85	32.3787	Landslide Plane	340	12	385.541	464.589	586.144	0	586.144	830.615	830.615
47	0.95581	756.102	47.5259	Landslide Plane	340	12	344.635	415.295	354.236	0	354.236	730.68	730.68
48	3.48233	2050.96	47.5259	Landslide	150	29	247.843	298.658	268.186	0	268.186	538.905	538.905
49	1.95945	632.494	51.3078	Landslide	150	29	172.665	208.067	104.755	0	104.755	320.336	320.336
50	1.95945	210.831	51.3078	Landslide	150	29	122.725	147.887	-3.81188	0	-3.81188	149.417	149.417

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.20503

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	93.0277	1315.43	0	0	0
2	95.48	1314.7	688.346	258.214	20.5622
3	97.9324	1313.97	1606.74	602.723	20.5622
4	100.385	1313.24	2906.94	1090.46	20.5622
5	102.837	1312.51	4700.88	1763.41	20.5622
6	105.751	1312.07	6471.31	2427.53	20.5622
7	108.666	1311.64	8571.86	3215.5	20.5622
8	111.58	1311.26	10844.5	4068.02	20.5622
9	114.495	1310.89	13410.4	5030.54	20.5622
10	116.778	1310.68	15346.3	5756.74	20.5622
11	119.061	1310.48	17423.6	6535.98	20.5622
12	119.658	1310.43	17730.3	6651.05	20.5622
13	122.247	1310.38	18711.3	7019.01	20.5621
14	124.836	1310.34	19705.7	7392.06	20.5622
15	128.025	1311.15	19408.7	7280.65	20.5622
16	131.213	1311.96	19090.6	7161.32	20.5622
17	134.095	1312.91	18491	6936.39	20.5622
18	136.977	1313.85	17889.9	6710.91	20.5622
19	139.765	1314.7	17396	6525.62	20.5622
20	142.553	1315.55	16895	6337.67	20.5621
21	144.687	1316.2	16498.3	6188.89	20.5622
22	146.82	1316.86	16097.9	6038.69	20.5622
23	148.954	1317.51	15693.8	5887.08	20.5621
24	151.051	1318.34	15056.8	5648.12	20.5621
25	153.148	1319.16	14430.2	5413.07	20.5621
26	155.245	1319.99	13814	5181.94	20.5622
27	158.234	1321.17	12946.5	4856.52	20.5622
28	161.222	1322.35	12101.1	4539.38	20.5621
29	164.211	1323.54	11277.7	4230.51	20.5622
30	167.199	1324.72	10476.4	3929.92	20.5621
31	170.187	1325.9	9697.08	3637.59	20.5622
32	173.176	1327.09	8939.85	3353.54	20.5622
33	176.154	1328.43	8038.21	3015.31	20.5622
34	179.132	1329.78	7183.23	2694.59	20.5622
35	182.119	1331.13	6373.54	2390.86	20.5622
36	185.106	1332.48	5610.64	2104.67	20.5621
37	187.111	1333.35	5149.01	1931.51	20.5622
38	189.115	1334.23	4705.54	1765.15	20.5622
39	191.119	1335.11	4280.22	1605.61	20.5622
40	194.13	1336.51	3610.42	1354.35	20.5622
41	197.14	1337.91	2995.01	1123.5	20.5623
42	199.318	1339.25	2377.75	891.946	20.5622
43	201.496	1340.59	1836.66	688.97	20.5621
44	203.715	1341.89	1394.44	523.087	20.5622
45	205.934	1343.19	1020.3	382.737	20.5622
46	208.153	1344.59	673.484	252.639	20.5622
47	210.372	1346	413.129	154.974	20.5622
48	211.328	1347.04	259.285	97.2635	20.5622
49	214.81	1350.85	-205.405	-77.0521	20.5622
50	216.769	1353.3	-218.233	-81.864	20.5622
51	218.729	1355.74	0	0	0



Method Name	Min FS
Spencer	2.12

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Compacted Fill		130	Mohr-Coulomb	270	29
Remedial Removal		130	Mohr-Coulomb	270	29
Alluvium		120	Mohr-Coulomb	200	27
Landslide		120	Mohr-Coulomb	150	29
Landslide Plane		120	Mohr-Coulomb	340	12
Bedrock		130	Mohr-Coulomb	300	32

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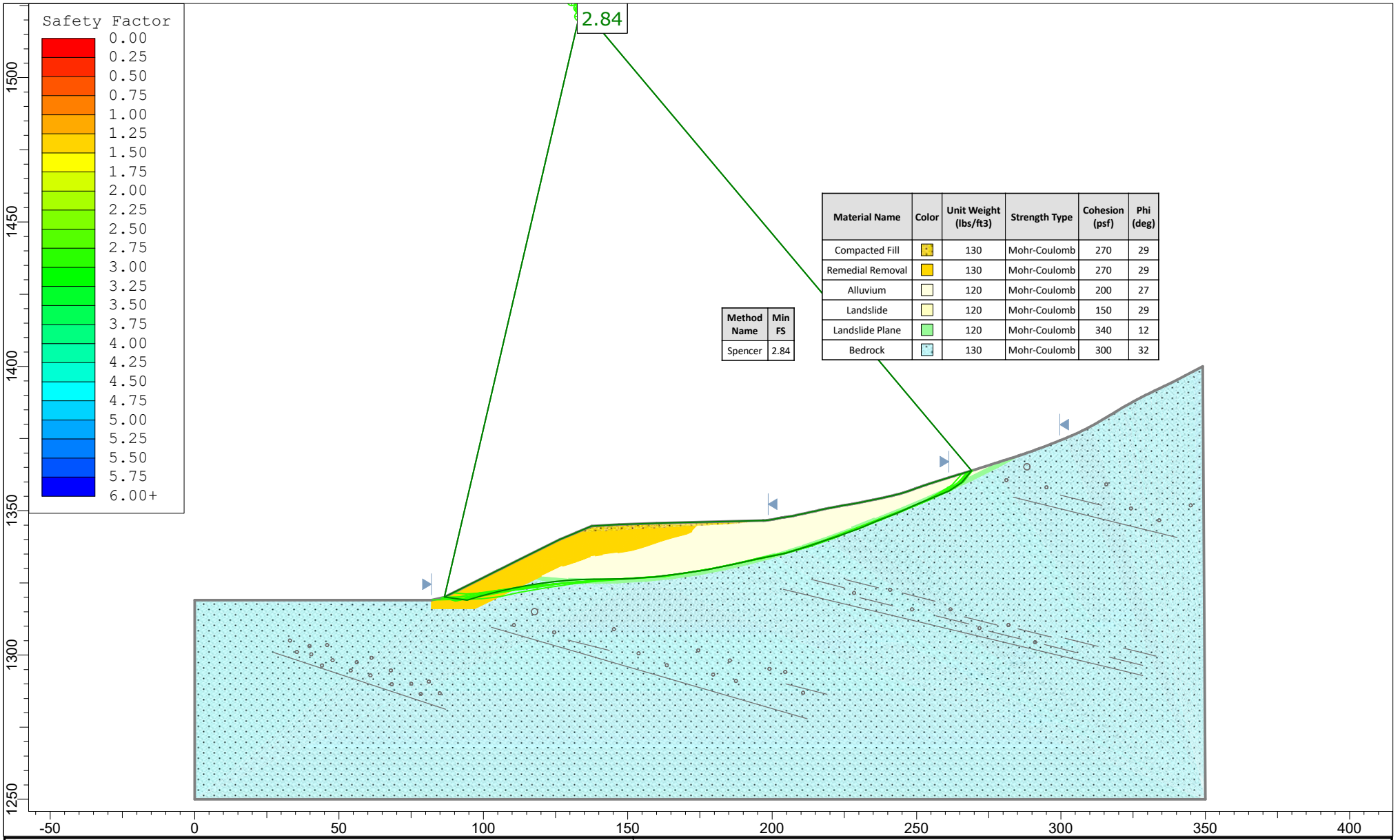
SLIDEINTERPRET 8.014

Analysis:	Section 19-19'; CS-11 / Qls-B; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t19s1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 27



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Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 19-19'; CS-11 / Qls-B; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t19s1a.slmd
		Scale:	1:550
Project No.: 18-1245A-4	*Date:* 6/8/2018	*Figure No.:*	Run No. 28

Slide Analysis Information

t19s1a

Project Summary

File Name:	t19s1a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257
Analysis:	Section 19-19'; CS-11 / Qls-B; non-circular search; static
Author:	K. Callahan
Comments	
	Sterling Gateway
	Sterling Ranch Estates
	18-1245A-4

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Non-circular; static	Cuckoo search, static along Qls plane	Spencer: 2.838220	00h:00m:42.750s
	Cuckoo search thru slope toe	Spencer: 2.115550	00h:00m:10.392s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

All Open Scenarios	
Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

All Open Scenarios	
Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Remedial Removal	Alluvium	Landslide	Landslide Plane	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	130	120	120	120	130
Cohesion [psf]	270	270	200	150	340	300
Friction Angle [°]	29	29	27	29	12	32
Tensile Strength [psf]						0
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Ru Value	0	0	0	0	0	0

Materials In Use

Material	Cuckoo search, static along Qls plane	Cuckoo search thru slope toe
Compacted Fill	✓	✓
Remedial Removal	✓	✓
Alluvium	✓	✓
Landslide	✓	✓
Landslide Plane	✓	✓
Bedrock	✓	✓

Global Minimums

Non-circular; static - Cuckoo search, static along Qls plane		Non-circular; static - Cuckoo search thru slope toe	
Method: spencer		**Method: spencer**	
FS	**2.838220**	**FS**	**2.115550**
Axis Location:	133.963, 1524.453	Axis Location:	89.971, 1389.652
Left Slip Surface Endpoint:	86.516, 1320.039	Left Slip Surface Endpoint:	86.438, 1320.000
Right Slip Surface Endpoint:	269.026, 1363.847	Right Slip Surface Endpoint:	143.573, 1345.035
Resisting Moment:	2.59837e+07 lb-ft	Resisting Moment:	3.04806e+06 lb-ft
Driving Moment:	9.15508e+06 lb-ft	Driving Moment:	1.44079e+06 lb-ft
Resisting Horizontal Force:	126376 lb	Resisting Horizontal Force:	39058.8 lb
Driving Horizontal Force:	44527.2 lb	Driving Horizontal Force:	18462.8 lb
Total Slice Area:	2105.21 ft2	Total Slice Area:	415.91 ft2
Surface Horizontal Width:	182.511 ft	Surface Horizontal Width:	57.1348 ft
Surface Average Height:	11.5347 ft	Surface Average Height:	7.27945 ft

Global Minimum Coordinates

Non-circular; static - Cuckoo search, static along Qls plane

Method: spencer

X	Y
86.5156	1320.04
94.3732	1319.02
99.4581	1320.51
104	1321.7
110.441	1323.16
114.773	1324
120.107	1324.84
125.198	1325.46
130.417	1325.92
135.621	1326.2
140.642	1326.29
149.889	1326.4
159.141	1327.04
168.166	1328.17
177.192	1329.45
186.13	1331.29
195.315	1333.34
204.5	1335.17
213.605	1337.98
218.378	1339.66
223.213	1341.27
230.142	1343.8
236.455	1346.47
243.671	1349.35
250.349	1352.33
256.793	1354.98
261.217	1356.81
265.642	1359.72
269.026	1363.85

Non-circular; static - Cuckoo search thru slope toe

Method: spencer

X	Y
86.4384	1320
88.2616	1319.5
90.2136	1319.09
92.1712	1319.1
94.1289	1319.11
95.7788	1319.24
98.3233	1319.84
100.868	1320.53
103.717	1321.32
106.566	1322.11
109.492	1323.13
112.418	1324.15
114.483	1324.92
116.547	1325.7
118.612	1326.47
120.837	1327.28
123.062	1328.1
125.287	1328.96
127.335	1329.96
129.383	1330.97
131.426	1331.97
133.145	1333.29
135.402	1335.23
137.681	1337.54
139.473	1339.47
141.071	1341.29
142.049	1342.57
142.811	1343.8
143.573	1345.04

Valid/Invalid Surfaces

Non-circular; static - Cuckoo search, static along Qls plane

Method: spencer

Number of Valid Surfaces: 6054
Number of Invalid Surfaces: 4026

Error Codes:

Error Code -108 reported for 71 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 86 surfaces
Error Code -112 reported for 52 surfaces
Error Code -114 reported for 53 surfaces
Error Code -121 reported for 1113 surfaces
Error Code -124 reported for 144 surfaces
Error Code -1000 reported for 2506 surfaces

Non-circular; static - Cuckoo search thru slope toe

Method: spencer

Number of Valid Surfaces: 9460
Number of Invalid Surfaces: 599

Error Codes:

Error Code -108 reported for 89 surfaces
Error Code -111 reported for 90 surfaces
Error Code -112 reported for 43 surfaces
Error Code -114 reported for 48 surfaces
Error Code -121 reported for 86 surfaces
Error Code -124 reported for 8 surfaces
Error Code -1000 reported for 235 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

Non-circular; static - Cuckoo search, static along Qls plane

Global Minimum Query (spencer) - Safety Factor: 2.83822

Slice	Width	Weight	Angle	Base	Base	Base	Shear	Shear	Base	Pore	Effective	Base	Effective

Non-circular; static - Cuckoo search thru slope toe

Global Minimum Query (spencer) - Safety Factor: 2.11555

Slice	Width	Weight	Angle	Base	Base	Base	Shear	Shear	Base	Pore	Effective	Base	Effective

Number	[ft]	[lbs]	of Slice Base [degrees]	Material	Cohesion [psf]	Friction Angle [degrees]	Stress [psf]	Strength [psf]	Normal Stress [psf]	Pressure [psf]	Normal Stress [psf]	Vertical Stress [psf]	Vertical Stress [psf]
				Removal									
				Removal									
				Removal									
				Removal									
				Removal									
				Removal									
				Removal									
				Plane									
				Plane									
				Plane

Interslice Data

Non-circular; static - Cuckoo search, static along Qls plane

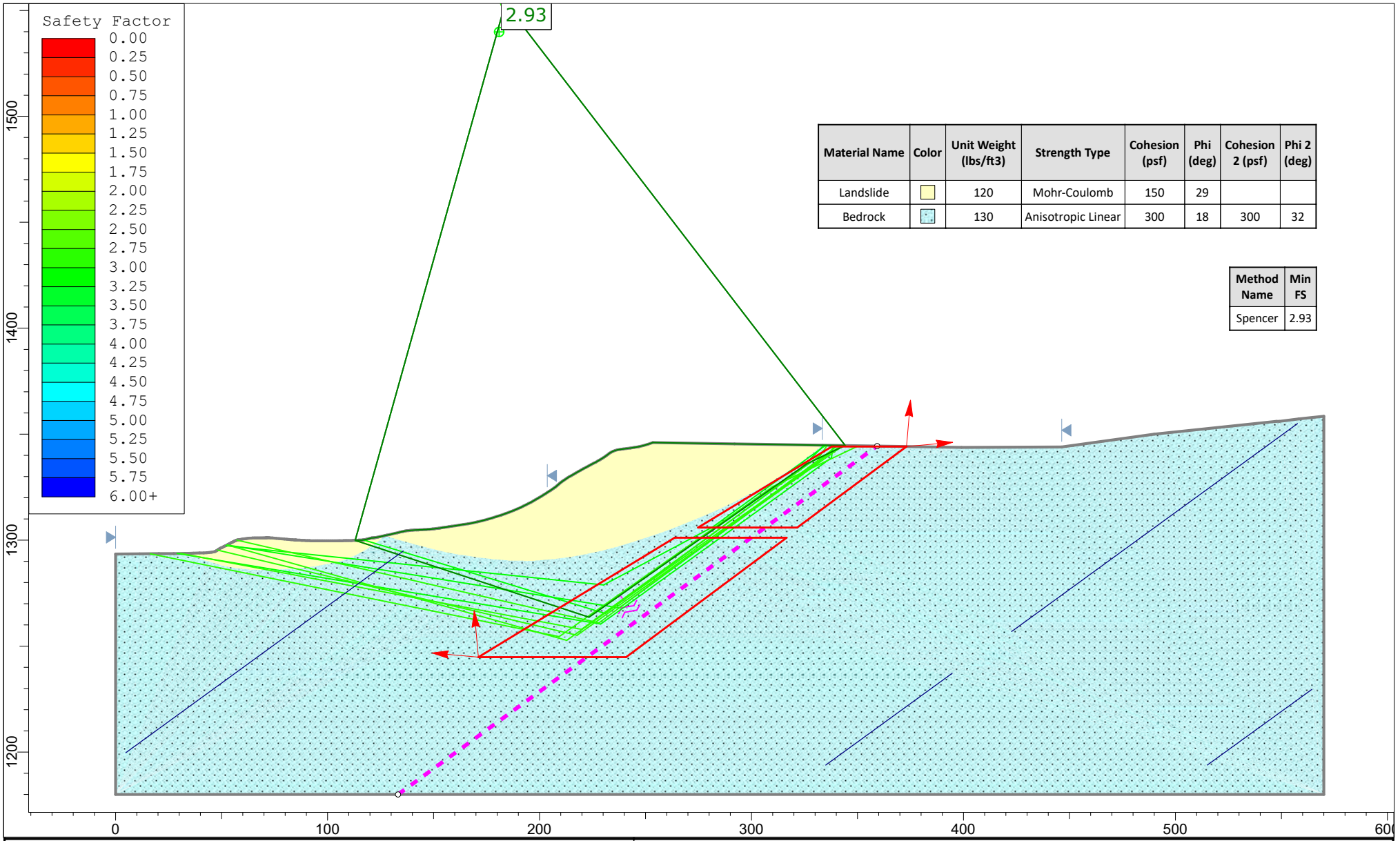
Global Minimum Query (spencer) - Safety Factor: 2.83822

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	86.5156	1320.04	0	0	0
2	90.4444	1319.53	637.443	112.597	10.0173
3	94.3732	1319.02	1721.41	304.066	10.0173
4	99.4581	1320.51	1885.84	333.111	10.0173
5	104	1321.7	2076.36	366.764	10.0173
6	107.221	1322.43	2286.64	403.908	10.0173
7	110.441	1323.16	2485.71	439.071	10.0173
8	112.571	1323.57	2694.99	476.037	10.0173
9	114.773	1324	3002.35	530.33	10.0173
10	120.107	1324.84	4034.36	712.621	10.0173
11	124.754	1325.41	5264.21	929.859	10.0173
12	125.198	1325.46	5280.66	932.764	10.0173
13	130.417	1325.92	5779.53	1020.88	10.0172
14	135.621	1326.2	6645.64	1173.87	10.0173
15	140.642	1326.29	7917.69	1398.56	10.0172
16	145.265	1326.34	9167	1619.24	10.0173
17	149.889	1326.4	10421.6	1840.85	10.0173
18	152.973	1326.61	10830.5	1913.08	10.0173
19	156.057	1326.83	11239.1	1985.25	10.0173
20	159.141	1327.04	11647.2	2057.35	10.0173
21	162.149	1327.42	11665.9	2060.65	10.0173
22	165.158	1327.8	11691.4	2065.14	10.0173
23	168.166	1328.17	11723.4	2070.81	10.0173
24	172.679	1328.81	11640.9	2056.23	10.0173
25	177.192	1329.45	11584.1	2046.2	10.0173
26	181.661	1330.37	11016.9	1946	10.0173
27	186.13	1331.29	10505.1	1855.61	10.0173
28	190.723	1332.32	9910.34	1750.54	10.0173
29	195.315	1333.34	9390.68	1658.75	10.0173
30	198.377	1333.95	9188.64	1623.06	10.0173
31	201.438	1334.56	8998.3	1589.44	10.0173
32	204.5	1335.17	8809.54	1556.1	10.0173
33	207.535	1336.11	8198.91	1448.24	10.0173
34	210.57	1337.05	7614.97	1345.09	10.0173
35	213.605	1337.98	7053.32	1245.88	10.0172
36	218.378	1339.66	5986.92	1057.52	10.0173
37	223.213	1341.27	5107.97	902.261	10.0173
38	226.678	1342.53	4432.69	782.982	10.0173
39	230.142	1343.8	3831.25	676.744	10.0173
40	233.299	1345.13	3197.15	564.738	10.0173
41	236.455	1346.47	2646.49	467.471	10.0173
42	240.063	1347.91	2170.17	383.334	10.0173
43	243.671	1349.35	1775.13	313.554	10.0172
44	247.01	1350.84	1387.98	245.17	10.0173
45	250.349	1352.33	1049.78	185.431	10.0173
46	253.571	1353.65	809.516	142.991	10.0173
47	256.793	1354.98	598.918	105.792	10.0173
48	261.217	1356.81	363.257	64.165	10.0173
49	265.642	1359.72	-14.4841	-2.55844	10.0173
50	266.594	1360.88	-63.7034	-11.2524	10.0172
51	269.026	1363.85	0	0	0

Non-circular; static - Cuckoo search thru slope toe

Global Minimum Query (spencer) - Safety Factor: 2.11555

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	86.4384	1320	0	0	0
2	87.35	1319.75	200.872	71.8388	19.6788
3	88.2616	1319.5	463.022	165.593	19.6788
4	89.2376	1319.3	764.45	273.394	19.6788
5	90.2136	1319.09	1118.62	400.057	19.6788
6	91.1924	1319.1	1366.34	488.651	19.6788
7	92.1712	1319.1	1631.7	583.554	19.6789
8	93.15	1319.11	1912.11	683.836	19.6788
9	94.1289	1319.11	2209.76	790.289	19.6789
10	95.7788	1319.24	2639.54	943.992	19.6788
11	97.051	1319.54	2825.17	1010.38	19.6788
12	98.3233	1319.84	3012.16	1077.25	19.6788
13	99.5956	1320.19	3167.76	1132.9	19.6788
14	100.868	1320.53	3323.05	1188.44	19.6788
15	102.292	1320.92	3486.96	1247.06	19.6788
16	103.717	1321.32	3650.05	1305.39	19.6789
17	105.141	1321.71	3811.11	1362.99	19.6789
18	106.566	1322.11	3971.31	1420.28	19.6788
19	109.492	1323.13	4108.05	1469.18	19.6788
20	110.955	1323.64	4169.61	1491.2	19.6788
21	112.418	1324.15	4227.96	1512.07	19.6789
22	113.451	1324.53	4241.76	1517	19.6788
23	114.483	1324.92	4253.86	1521.33	19.6788
24	115.515	1325.31	4263.45	1524.76	19.6788
25	116.547	1325.7	4271.35	1527.58	19.6788
26	118.236	1326.33	4281.54	1531.23	19.6788
27	118.612	1326.47	4229.16	1512.5	19.6789
28	119.696	1326.87	4085.93	1461.27	19.6788
29	120.781	1327.26	3938.27	1408.46	19.6788
30	120.837	1327.28	3935.74	1407.56	19.6788
31	121.949	1327.69	3877.46	1386.72	19.6789
32	123.062	1328.1	3817	1365.09	19.6788
33	124.174	1328.53	3735.32	1335.88	19.6788
34	125.287	1328.96	3651.51	1305.91	19.6789
35	126.311	1329.46	3467.95	1240.26	19.6788
36	127.335	1329.96	3284.86	1174.78	19.6788
37	128.359	1330.46	3101.91	1109.35	19.6788
38	129.383	1330.97	2920.29	1044.4	19.6789
39	130.404	1331.47	2739.67	979.802	19.6788
40	131.426	1331.97	2560.5	915.723	19.6788
41	131.498	1332.02	2532.14	905.58	19.6788
42	133.145	1333.29	2003.56	716.543	19.6788
43	135.402	1335.23	1247.67	446.211	19.6789
44	136.542	1336.39	842.764	301.402	19.6788
45	137.681	1337.54	486.795	174.095	19.6788
46	139.473	1339.47	47.4116	16.956	19.6788
47	141.071	1341.29	-166.657	-59.6025	19.6789
48	142.049	1342.57	-201.189	-71.9523	19.6788
49	142.291	1342.96	-191.647	-68.5397	19.6788
50	142.811	1343.8	-142.491	-50.9596	19.6788
51	143.573	1345.04	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Landslide		120	Mohr-Coulomb	150	29		
Bedrock		130	Anisotropic Linear	300	18	300	32

Method Name	Min FS
Spencer	2.93

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 23-23'; non-circular search; bedding plane behind Qls; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t23s1a.slmd
		Scale:	1:750
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 29

Slide Analysis Information

t23s1a

Project Summary

File Name:	t23s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:02.168s
Project Title:	VTTM 60257
Analysis:	Section 23-23'; non-circular search; bedding plane behind Qls; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	95
Left Projection Angle (End Angle) [°]:	175
Right Projection Angle (Start Angle) [°]:	5
Right Projection Angle (End Angle) [°]:	85
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Landslide	Bedrock
Color		
Strength Type	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	120	130
Cohesion [psf]	150	
Friction Angle [°]	29	
Cohesion 1 [psf]		300
Cohesion 2 [psf]		300
Friction Angle 1 [°]		18
Friction Angle 2 [°]		32
A [°]		1
B [°]		1
Anisotropic Definition		Surface
Angle from 1 [°]		
Anisotropic Surface		Anisotropic Surface 1
Tensile Strength [psf]		0
Water Surface	None	None
Ru Value	0	0.1

Global Minimums

Method: spencer

FS	2.929300
Axis Location:	183.816, 1553.457
Left Slip Surface Endpoint:	112.984, 1299.893
Right Slip Surface Endpoint:	344.167, 1344.652
Resisting Moment:	1.4347e+08 lb-ft
Driving Moment:	4.89776e+07 lb-ft
Resisting Horizontal Force:	494560 lb
Driving Horizontal Force:	168832 lb
Total Slice Area:	7971.43 ft2
Surface Horizontal Width:	231.184 ft
Surface Average Height:	34.4809 ft

Global Minimum Coordinates

Method: spencer

X	Y
112.984	1299.89
223.352	1263.64
326.134	1336.07
344.167	1344.65

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 3692
Number of Invalid Surfaces: 1308

Error Codes:

Error Code -108 reported for 856 surfaces
Error Code -111 reported for 126 surfaces
Error Code -112 reported for 323 surfaces
Error Code -124 reported for 3 surfaces

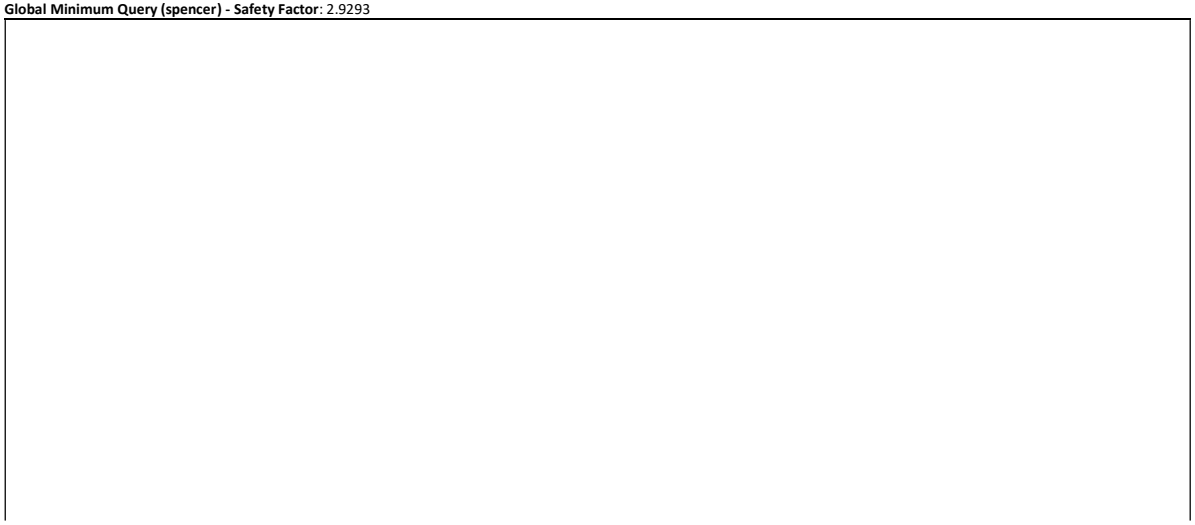
Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-124 = A slice has a width less than the minimum acceptable value.

Slice Data

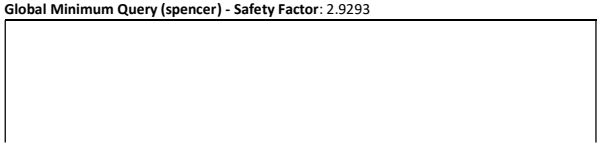
Global Minimum Query (spencer) - Safety Factor: 2.9293



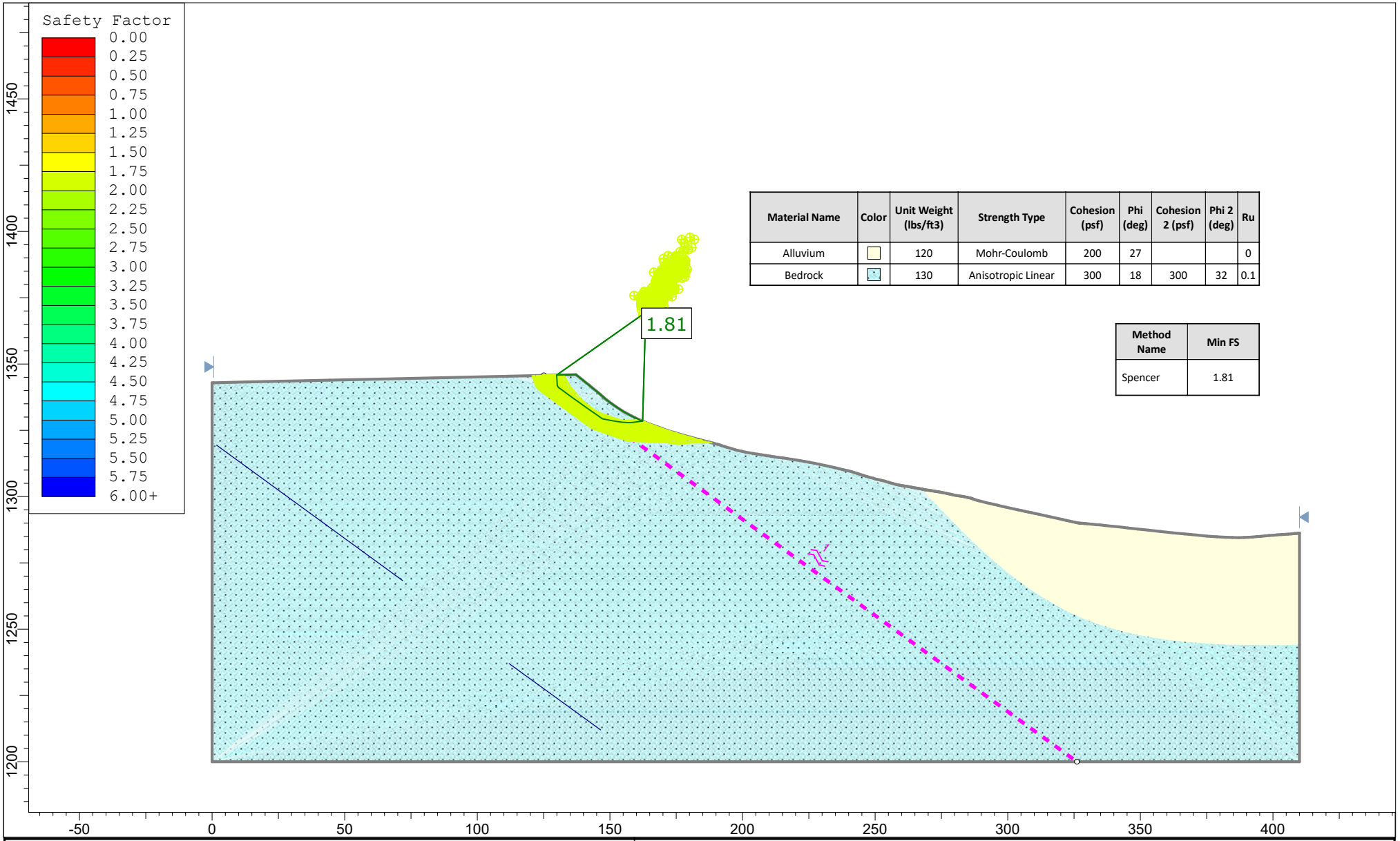
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.77221	319.711	-18.1826	Landslide	150	29	76.5765	224.316	134.069	0	134.069	108.918	108.918
2	3.77221	1125.77	-18.1826	Landslide	150	29	125.044	366.292	390.203	0	390.203	349.133	349.133
3	4.67384	2729.74	-18.1826	Bedrock	300	32	253.967	743.946	768.867	58.4046	710.462	685.452	627.048
4	4.67384	4326.96	-18.1826	Bedrock	300	32	334.41	979.588	1180.15	92.5783	1087.57	1070.31	977.731
5	4.67384	5809.06	-18.1826	Bedrock	300	32	409.055	1198.24	1561.78	124.289	1437.49	1427.43	1303.14
6	4.67384	7230.06	-18.1826	Bedrock	300	32	480.623	1407.89	1927.68	154.692	1772.99	1769.82	1615.13
7	4.67384	8358.73	-18.1826	Bedrock	300	32	537.466	1574.4	2218.32	178.841	2039.48	2041.79	1862.95
8	4.67384	9368.49	-18.1826	Bedrock	300	32	588.321	1723.37	2478.33	200.445	2277.88	2285.1	2084.65
9	4.67384	10486.9	-18.1826	Bedrock	300	32	644.652	1888.38	2766.3	224.375	2541.93	2554.57	2330.2
10	4.67384	11736.8	-18.1826	Bedrock	300	32	707.599	2072.77	3088.15	251.116	2837.03	2855.74	2604.62
11	4.67384	13007.4	-18.1826	Bedrock	300	32	771.594	2260.23	3415.34	278.303	3137.03	3161.91	2883.61
12	4.67384	14324.1	-18.1826	Bedrock	300	32	837.907	2454.48	3754.38	306.474	3447.9	3479.17	3172.69
13	4.67384	15727.2	-18.1826	Bedrock	300	32	908.575	2661.49	4115.67	336.495	3779.18	3817.25	3480.76
14	4.67384	17251.3	-18.1826	Bedrock	300	32	985.334	2886.34	4508.11	369.103	4139.01	4184.48	3815.38
15	4.67384	18916	-18.1826	Bedrock	300	32	1069.18	3131.94	4936.77	404.721	4532.05	4585.61	4180.89
16	4.67384	20716.9	-18.1826	Bedrock	300	32	1159.87	3397.62	5400.48	443.251	4957.23	5019.53	4576.27
17	4.67384	22655	-18.1826	Bedrock	300	32	1257.49	3683.57	5899.56	484.72	5414.84	5486.54	5001.82
18	4.67384	24760.5	-18.1826	Bedrock	300	32	1363.53	3994.19	6441.71	529.768	5911.94	5993.86	5464.09
19	4.67384	27094.5	-18.1826	Bedrock	300	32	1481.08	4338.53	7042.71	579.705	6463	6556.25	5976.55
20	4.67384	29601.9	-18.1826	Bedrock	300	32	1607.36	4708.45	7688.34	633.353	7054.99	7160.41	6527.06
21	4.67384	32310.8	-18.1826	Bedrock	300	32	1743.8	5108.1	8385.87	691.311	7694.56	7813.13	7121.82
22	4.67384	35281.3	-18.1826	Bedrock	300	32	1893.4	5546.34	9150.77	754.866	8395.91	8528.89	7774.02
23	4.67384	37871.9	-18.1826	Bedrock	300	32	2023.88	5928.55	9817.85	810.295	9007.56	9153.12	8342.82
24	4.67384	40318.9	-18.1826	Bedrock	300	32	2147.12	6289.55	10447.9	862.65	9585.29	9742.73	8880.08
25	4.67191	41210.7	35.1726	Bedrock	300	18	821.824	2407.37	7367.92	882.095	6485.82	7947.06	7064.97
26	4.67191	40817.3	35.1726	Bedrock	300	18	814.911	2387.12	7297.18	873.676	6423.5	7871.45	6997.78
27	4.67191	40450.7	35.1726	Bedrock	300	18	808.47	2368.25	7231.25	865.828	6365.42	7800.99	6935.16
28	4.67191	39122.5	35.1726	Bedrock	300	18	785.13	2299.88	6992.39	837.398	6154.99	7545.68	6708.28
29	4.67191	37559.3	35.1726	Bedrock	300	18	757.659	2219.41	6711.29	803.94	5907.35	7245.22	6441.28
30	4.67191	36178.7	35.1726	Bedrock	300	18	733.4	2148.35	6463.01	774.388	5688.63	6979.85	6205.46
31	4.67191	34925.7	35.1726	Bedrock	300	18	711.382	2083.85	6237.68	747.568	5490.11	6738.99	5991.43
32	4.67191	33051.1	35.1726	Bedrock	300	18	678.439	1987.35	5900.57	707.443	5193.13	6378.67	5671.23
33	4.67191	31091.2	35.1726	Bedrock	300	18	643.997	1886.46	5548.12	665.492	4882.63	6001.95	5336.46
34	4.67191	29134.6	35.1726	Bedrock	300	18	609.617	1785.75	5196.27	623.613	4572.65	5625.87	5002.26
35	4.67191	27181.1	35.1726	Bedrock	300	18	575.288	1685.19	4844.97	581.8	4263.17	5250.38	4668.58
36	4.67191	25231.9	35.1726	Bedrock	300	18	541.034	1584.85	4494.45	540.078	3954.37	4875.72	4335.64
37	4.67191	23287	35.1726	Bedrock	300	18	506.858	1484.74	4144.69	498.449	3646.24	4501.88	4003.43
38	4.67191	21346.2	35.1726	Bedrock	300	18	472.751	1384.83	3795.67	456.905	3338.77	4128.82	3671.92
39	4.67191	19410.6	35.1726	Bedrock	300	18	438.739	1285.2	3447.6	415.476	3032.12	3756.78	3341.3
40	4.67191	17480.9	35.1726	Bedrock	300	18	404.828	1185.86	3100.57	374.17	2726.4	3385.86	3011.69
41	4.67191	15556.4	35.1726	Bedrock	300	18	371.01	1086.8	2754.51	332.978	2421.53	3015.96	2682.98
42	4.67191	13638.5	35.1726	Bedrock	300	18	337.308	988.076	2409.6	291.927	2117.67	2647.3	2355.38
43	4.67191	11728.1	35.1726	Bedrock	300	18	303.736	889.735	2066.06	251.035	1815.02	2280.1	2029.07
44	4.67191	9825.53	35.1726	Bedrock	300	18	270.303	791.799	1723.91	210.311	1513.6	1914.4	1704.08
45	4.67191	7930.92	35.1726	Bedrock	300	18	237.01	694.272	1383.2	169.758	1213.45	1550.23	1380.47
46	4.67191	6045.86	35.1726	Bedrock	300	18	203.884	597.237	1044.21	129.409	914.803	1187.89	1058.48
47	4.50821	4358.8	25.4402	Bedrock	300	32	256.377	751.004	818.443	96.6857	721.757	940.4	843.714
48	4.50821	3213.72	25.4402	Bedrock	300	32	214.561	628.514	597.018	71.2858	525.732	699.084	627.798
49	4.50821	1946.81	25.4402	Bedrock	300	32	168.297	492.991	352.034	43.1835	308.851	432.092	388.909
50	4.50821	648.935	25.4402	Bedrock	300	32	118.895	348.278	91.6552	14.3945	77.2607	148.213	133.818

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.9293



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	112.984	1299.89	0	0	0
2	116.756	1298.65	454.961	90.9923	11.3099
3	120.528	1297.42	1410.09	282.018	11.3099
4	125.202	1295.88	3777.34	755.469	11.3099
5	129.876	1294.35	7151.93	1430.39	11.31
6	134.549	1292.81	11461.2	2292.24	11.3099
7	139.223	1291.27	16666.7	3333.34	11.3099
8	143.897	1289.74	22584	4516.8	11.3099
9	148.571	1288.2	29138.1	5827.63	11.31
10	153.245	1286.67	36397.6	7279.52	11.3099
11	157.919	1285.13	44445.4	8889.07	11.3099
12	162.593	1283.6	53294.5	10658.9	11.3099
13	167.266	1282.06	62973.9	12594.8	11.3099
14	171.94	1280.53	73538.4	14707.7	11.3099
15	176.614	1278.99	85063.9	17012.8	11.3099
16	181.288	1277.46	97639.4	19527.9	11.3099
17	185.962	1275.92	111351	22270.1	11.3099
18	190.636	1274.39	126284	25256.8	11.3099
19	195.309	1272.85	142546	28509.1	11.3099
20	199.983	1271.32	160279	32055.8	11.3099
21	204.657	1269.78	179594	35918.8	11.3099
22	209.331	1268.25	200617	40123.4	11.3099
23	214.005	1266.71	223514	44702.7	11.3099
24	218.679	1265.18	248044	49608.8	11.3099
25	223.352	1263.64	274118	54823.5	11.3099
26	228.024	1266.94	253699	50739.9	11.31
27	232.696	1270.23	233482	46696.4	11.3099
28	237.368	1273.52	213451	42690.2	11.3099
29	242.04	1276.81	194098	38819.6	11.3099
30	246.712	1280.1	175542	35108.3	11.3099
31	251.384	1283.4	157690	31537.9	11.3099
32	256.056	1286.69	140477	28095.3	11.3099
33	260.728	1289.98	124219	24843.9	11.31
34	265.4	1293.27	108962	21792.4	11.3099
35	270.072	1296.57	94701.9	18940.4	11.3099
36	274.743	1299.86	81438.3	16287.7	11.31
37	279.415	1303.15	69168.7	13833.7	11.3099
38	284.087	1306.44	57890.9	11578.2	11.31
39	288.759	1309.74	47602.9	9520.57	11.3099
40	293.431	1313.03	38301.9	7660.38	11.3099
41	298.103	1316.32	29985	5997.01	11.31
42	302.775	1319.61	22649.6	4529.92	11.3099
43	307.447	1322.9	16292.2	3258.44	11.3099
44	312.119	1326.2	10909	2181.81	11.31
45	316.791	1329.49	6496.16	1299.23	11.3099
46	321.462	1332.78	3049.45	609.89	11.3099
47	326.134	1336.07	564.061	112.812	11.3099
48	330.643	1338.22	-35.355	-7.07101	11.3099
49	335.151	1340.36	-348.425	-69.685	11.3099
50	339.659	1342.51	-344.682	-68.9363	11.3099
51	344.167	1344.65	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Ru
Alluvium		120	Mohr-Coulomb	200	27			0
Bedrock		130	Anisotropic Linear	300	18	300	32	0.1

Method Name	Min FS
Spencer	1.81

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 24-24'; NS-2; static; cuckoo search; min FS		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t24s1a.slmd
		Scale:	1:600
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 30

Slide Analysis Information

t24s1a

Project Summary

File Name:	t24s1a.slmd
Slide Modeler Version:	8.01
Compute Time:	00h:00m:18.145s
Project Title:	VTTM 60257
Analysis:	Section 24-24'; NS-2; static; cuckoo search; min FS
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Alluvium	Bedrock
Color		
Strength Type	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	120	130
Cohesion [psf]	200	
Friction Angle [°]	27	
Cohesion 1 [psf]		300
Cohesion 2 [psf]		300
Friction Angle 1 [°]		18
Friction Angle 2 [°]		32
A [°]		1
B [°]		1
Anisotropic Definition		Surface
Angle from 1 [°]		
Anisotropic Surface		Anisotropic Surface 1
Tensile Strength [psf]		0
Water Surface	None	None
Ru Value	0	0.1

Global Minimums

Method: spencer

FS	1.814500
Axis Location:	163.495, 1369.541
Left Slip Surface Endpoint:	129.940, 1345.855
Right Slip Surface Endpoint:	162.311, 1328.485
Resisting Moment:	888955 lb-ft
Driving Moment:	489919 lb-ft
Resisting Horizontal Force:	18865.9 lb
Driving Horizontal Force:	10397.3 lb
Total Slice Area:	205.074 ft2
Surface Horizontal Width:	32.3702 ft
Surface Average Height:	6.33526 ft

Global Minimum Coordinates

Method: spencer

X	Y
129.94	1345.86
130.023	1344.44
130.106	1343.13
130.189	1341.82
130.702	1341.14
131.969	1340.19
133.235	1339.24
134.516	1338.31
135.803	1337.39
137.09	1336.46
138.381	1335.53
139.689	1334.6
140.998	1333.66
142.536	1332.57
144.074	1331.5
145.606	1330.42
147.139	1329.35
148.882	1328.99
150.626	1328.68
152.117	1328.42
153.609	1328.17
155.091	1327.99
156.574	1327.96
157.59	1327.94
158.807	1328.04
160.025	1328.17
161.206	1328.31
162.311	1328.49

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9550
Number of Invalid Surfaces: 512

Error Codes:

Error Code -106 reported for 8 surfaces
Error Code -108 reported for 43 surfaces
Error Code -111 reported for 50 surfaces
Error Code -112 reported for 23 surfaces
Error Code -114 reported for 38 surfaces
Error Code -121 reported for 33 surfaces
Error Code -124 reported for 10 surfaces
Error Code -600 reported for 8 surfaces
Error Code -1000 reported for 299 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

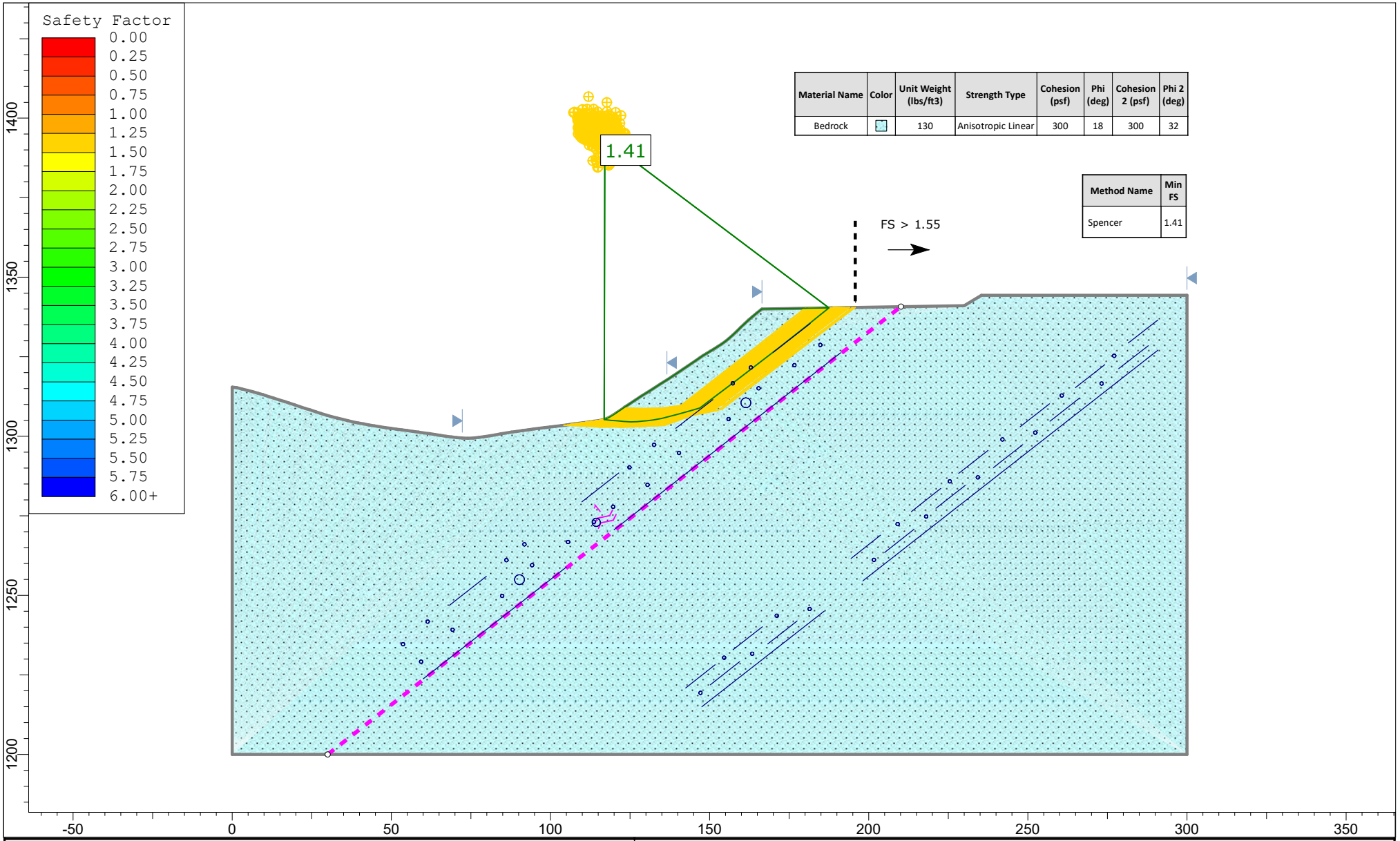
Global Minimum Query (spencer) - Safety Factor: 1.8145

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.0830042	7.64148	-86.6413	Bedrock	300	32	1.00538	1.82427	9.20613	9.20613	-2.83188e-06	26.3374	17.1313
2	0.0829961	22.3462	-86.3681	Bedrock	300	32	4.13814	7.50865	26.9243	26.9243	3.74528e-05	92.1192	65.1949
3	0.0829964	36.4913	-86.3761	Bedrock	300	32	6.70008	12.1573	43.9673	43.9674	-6.44836e-05	149.759	105.791
4	0.512802	292.386	-53.1019	Bedrock	300	32	226.05	410.168	233.323	57.0174	176.305	534.414	477.397
5	0.633423	409.969	-36.8713	Bedrock	300	18	231.455	419.975	433.968	64.7228	369.245	607.568	542.845
6	0.633423	450.333	-36.8713	Bedrock	300	18	238.661	433.051	480.583	71.0951	409.488	659.589	588.494
7	0.632912	490.305	-36.8997	Bedrock	300	18	245.821	446.042	526.939	77.4681	449.47	711.504	634.036
8	0.632912	530.644	-36.8997	Bedrock	300	18	253.026	459.115	573.548	83.8416	489.706	763.523	679.681
9	0.640476	577.274	-35.8177	Bedrock	300	18	262.138	475.65	630.728	90.1321	540.596	819.912	729.78
10	0.640476	617.03	-35.8177	Bedrock	300	18	269.256	488.565	676.681	96.3393	580.342	871.002	774.662
11	0.643507	659.975	-35.7974	Bedrock	300	18	276.429	501.58	722.958	102.559	620.399	922.306	819.747
12	0.643507	700.079	-35.7974	Bedrock	300	18	283.576	514.549	769.105	108.791	660.314	973.608	864.817
13	0.643507	740.179	-35.7917	Bedrock	300	18	290.736	527.54	815.321	115.023	700.298	1024.94	909.919
14	0.643507	780.276	-35.7917	Bedrock	300	18	297.883	540.508	861.462	121.254	740.208	1076.24	954.982
15	0.645433	805.958	-35.8134	Bedrock	300	18	301.981	547.944	887.962	124.871	763.091	1105.87	980.994
16	0.645433	802.272	-35.8134	Bedrock	300	18	301.325	546.755	883.735	124.3	759.435	1101.16	976.865
17	0.654432	809.046	-35.4482	Bedrock	300	18	301.41	546.908	883.531	123.626	759.905	1098.11	974.487
18	0.654432	804.269	-35.4482	Bedrock	300	18	300.569	545.382	878.105	122.896	755.209	1092.09	969.193
19	0.654432	799.455	-35.4482	Bedrock	300	18	299.722	543.845	872.636	122.16	750.476	1086.02	963.857
20	0.654432	794.539	-35.4482	Bedrock	300	18	298.856	542.274	867.052	121.409	745.643	1079.82	958.408
21	0.768822	926.943	-35.367	Bedrock	300	18	298.073	540.853	861.834	120.567	741.267	1073.41	952.838
22	0.768822	919.663	-35.367	Bedrock	300	18	296.98	538.871	854.79	119.62	735.17	1065.58	945.965
23	0.768822	911.7	-35.0108	Bedrock	300	18	296.595	538.171	851.6	118.584	733.016	1059.36	940.777
24	0.768822	902.911	-35.0108	Bedrock	300	18	295.27	535.768	843.059	117.441	725.618	1049.89	932.451
25	0.76643	890.659	-34.9757	Bedrock	300	18	293.921	533.32	834.294	116.209	718.085	1039.91	923.705
26	0.76643	880.266	-34.9757	Bedrock	300	18	292.349	530.468	824.16	114.853	709.307	1028.68	913.828
27	0.76643	868.635	-34.9757	Bedrock	300	18	290.59	527.276	812.819	113.335	699.484	1016.11	902.774
28	0.76643	855.538	-34.9757	Bedrock	300	18	288.61	523.682	800.049	111.626	688.423	1001.95	890.327
29	0.58103	628.574	-11.6909	Bedrock	300	32	505.092	916.49	1094.77	108.183	986.59	1199.29	1091.11
30	0.58103	599.598	-11.6909	Bedrock	300	32	489.986	889.08	1045.92	103.196	942.725	1147.31	1044.12
31	0.58103	571.962	-11.6909	Bedrock	300	32	475.579	862.938	999.329	98.4392	900.889	1097.74	999.299
32	0.871545	808.15	-10.2034	Bedrock	300	32	466.273	846.052	966.593	92.7262	873.867	1050.52	957.791
33	0.871545	751.256	-10.2034	Bedrock	300	32	446.063	809.381	901.378	86.1982	815.18	981.665	895.467
34	0.745822	600.047	-9.8358	Bedrock	300	32	430.09	780.398	849.251	80.4544	768.796	923.817	843.362
35	0.745822	561.972	-9.8358	Bedrock	300	32	414.198	751.563	798.001	75.3493	722.652	869.813	794.463
36	0.745822	525.09	-9.35999	Bedrock	300	32	400.947	727.519	754.578	70.4043	684.174	820.667	750.263
37	0.745822	489.443	-9.35999	Bedrock	300	32	385.964	700.332	706.289	65.6246	640.665	769.908	704.284
38	0.741298	451.123	-7.05685	Bedrock	300	32	380.666	690.719	686.137	60.8557	625.282	733.261	672.405
39	0.741298	415.854	-7.05685	Bedrock	300	32	365.228	662.707	636.55	56.0981	580.452	681.762	625.664
40	0.741293	378.474	-1.21426	Bedrock	300	32	373.007	676.822	654.098	51.0559	603.042	662.004	610.948
41	0.741293	338.883	-1.21426	Bedrock	300	32	354.022	642.373	593.627	45.7151	547.911	601.13	555.415
42	1.01603	402.105	-0.842009	Bedrock	300	32	333.629	605.369	528.269	39.5761	488.693	533.172	493.596
43	0.608618	205.258	4.5852	Bedrock	300	32	333.603	605.323	522.344	33.7252	488.619	495.59	461.865
44	0.608618	176.687	4.5852	Bedrock	300	32	315.195	571.921	464.195	29.0308	435.165	438.917	409.887
45	0.608617	148.262	6.01001	Bedrock	300	32	302.105	548.169	421.513	24.3605	397.153	389.707	365.347
46	0.608617	119.833	6.01001	Bedrock	300	32	283.311	514.067	362.269	19.6894	342.58	332.442	312.753
47	0.590663	89.6799	6.90694	Bedrock	300	32	268.001	486.288	313.306	15.1829	298.123	280.841	265.658
48	0.590663	63.3011	6.90694	Bedrock	300	32	249.733	453.14	255.793	10.717	245.076	225.541	214.824
49	0.552342	35.4291	8.99602	Bedrock	300	32	237.658	431.23	216.428	6.41434	210.013	178.803	172.389
50	0.552342	11.8097	8.99602	Bedrock	300	32	219.459	398.209	159.306	2.13811	157.168	124.562	122.424

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.8145

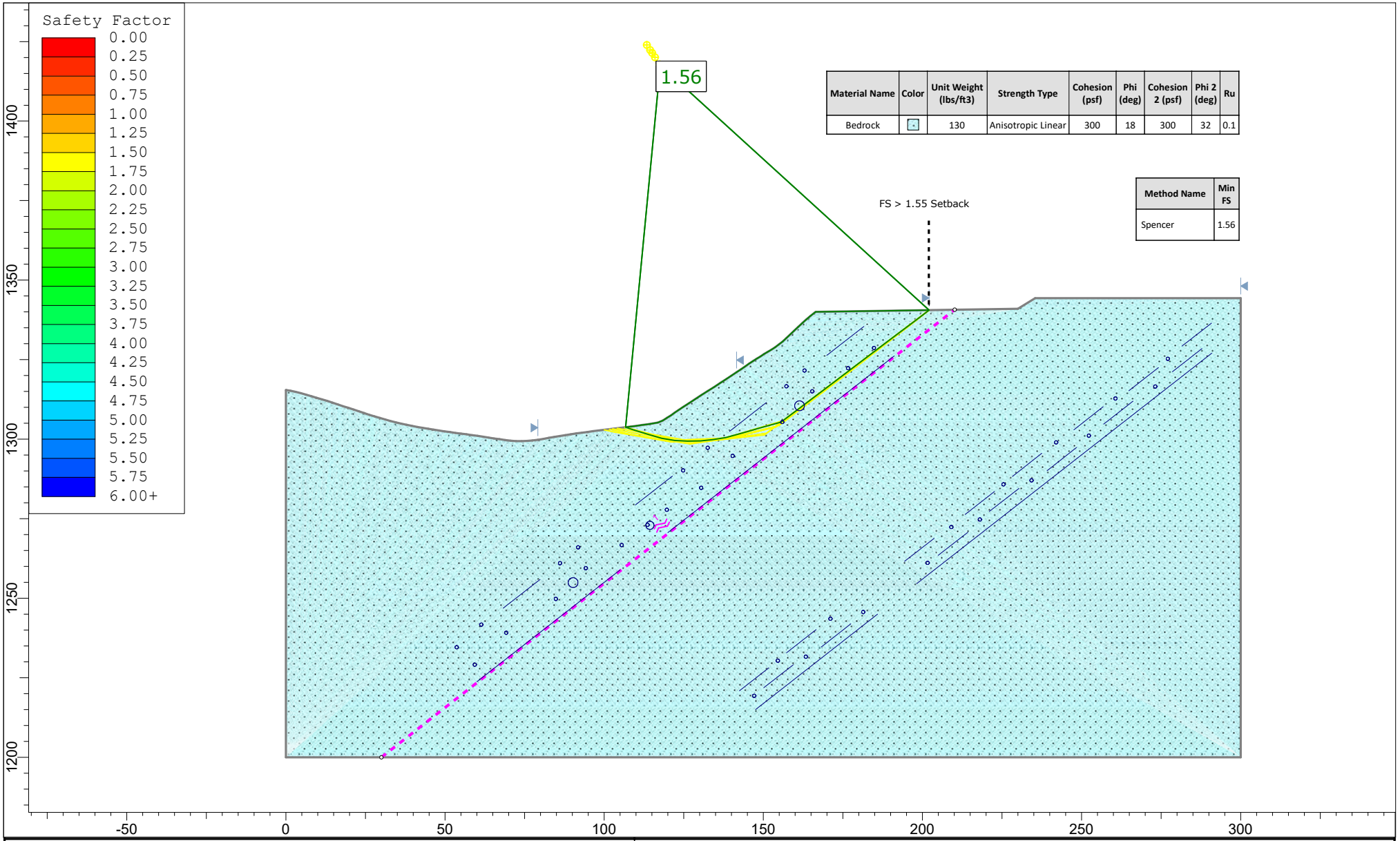
Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	129.94	1345.86	0	0	0
2	130.023	1344.44	12.9373	5.45536	22.864
3	130.106	1343.13	47.7994	20.156	22.8641
4	130.189	1341.82	104.861	44.2178	22.8642
5	130.702	1341.14	148.309	62.5388	22.8641
6	131.336	1340.66	207.874	87.656	22.8641
7	131.969	1340.19	285.021	120.187	22.8641
8	132.602	1339.71	379.837	160.169	22.8641
9	133.235	1339.24	492.242	207.568	22.8641
10	133.875	1338.78	615.887	259.706	22.8641
11	134.516	1338.31	756.215	318.879	22.8641
12	135.159	1337.85	913.831	385.343	22.8641
13	135.803	1337.39	1088.26	458.897	22.8642
14	136.446	1336.92	1279.46	539.519	22.864
15	137.09	1336.46	1487.46	627.229	22.8641
16	137.735	1335.99	1706.1	719.426	22.8641
17	138.381	1335.53	1923.2	810.97	22.8641
18	139.035	1335.06	2137.59	901.374	22.8641
19	139.689	1334.6	2350	990.945	22.8641
20	140.344	1334.13	2560.42	1079.67	22.864
21	140.998	1333.66	2768.81	1167.55	22.8641
22	141.767	1333.12	3009.95	1269.23	22.8641
23	142.536	1332.57	3248.09	1369.65	22.8641
24	143.305	1332.03	3478.69	1466.89	22.8641
25	144.074	1331.5	3705.71	1562.62	22.8641
26	144.84	1330.96	3927.76	1656.25	22.8641
27	145.606	1330.42	4145.59	1748.11	22.8642
28	146.373	1329.89	4358.69	1837.96	22.864
29	147.139	1329.35	4566.45	1925.57	22.8641
30	147.72	1329.23	4404.6	1857.32	22.8641
31	148.301	1329.11	4245.65	1790.3	22.8641
32	148.882	1328.99	4089.47	1724.44	22.8641
33	149.754	1328.83	3834.72	1617.02	22.8641
34	150.626	1328.68	3587.35	1512.71	22.8641
35	151.371	1328.55	3376.39	1423.75	22.8641
36	152.117	1328.42	3170.66	1337	22.8641
37	152.863	1328.29	2964.38	1250.02	22.8642
38	153.609	1328.17	2763.35	1165.24	22.864
39	154.35	1328.08	2544.12	1072.8	22.8641
40	155.091	1327.99	2331.79	983.266	22.8641
41	155.833	1327.97	2065.56	871.002	22.8641
42	156.574	1327.96	1812.45	764.272	22.8641
43	157.59	1327.94	1481.36	624.658	22.8641
44	158.199	1327.99	1252.83	528.29	22.864
45	158.807	1328.04	1038.33	437.843	22.8642
46	159.416	1328.1	827.458	348.921	22.8641
47	160.025	1328.17	631.816	266.423	22.8641
48	160.615	1328.24	451.1	190.219	22.8641
49	161.206	1328.31	285.288	120.3	22.8641
50	161.758	1328.4	135.094	56.9661	22.8641
51	162.311	1328.49	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 25-25'; NS-2; static; cuckoo search		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t25s1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 31



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SLIDEINTERPRET 8.010

Analysis:	Section 25-25'; NS-2; static; cuckoo search		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t25s1a.slmd
		Scale:	1:500
Project No.: 18-1245A-4	*Date:* 6/6/2018	*Figure No.:*	Run No. 32

Slide Analysis Information

t25s1a

Project Summary

File Name:	t25s1a.slmd
Slide Modeler Version:	8.01
Project Title:	VTTM 60257
Analysis:	Section 25-25'; NS-2; static; cuckoo search
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Cuckoo search - min FS < 1.5	Master Scenario	Spencer: 1.407790	00h:00m:05.306s
Cuckoo search, static - 1.5 setback	Master Scenario	Spencer: 1.559250	00h:00m:05.99s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

All Open Scenarios	
Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

All Open Scenarios	
Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Bedrock
Color	
Strength Type	Anisotropic Linear
Unit Weight [lbs/ft3]	130
Cohesion 1 [psf]	300
Cohesion 2 [psf]	300
Friction Angle 1 [°]	18
Friction Angle 2 [°]	32
A [°]	1
B [°]	1
Anisotropic Definition	Surface
Angle from 1 [°]	
Anisotropic Surface	Assigned per scenario
Tensile Strength [psf]	0
Water Surface	Assigned per scenario
Ru Value	0.1

Materials In Use

Material	Master Scenario	Master Scenario
Bedrock	✓	✓

Global Minimums

Cuckoo search - min FS < 1.5		Cuckoo search, static - 1.5 setback	
Method: spencer		**Method: spencer**	
FS	**1.407790**	**FS**	**1.559250**
Axis Location:	117.066, 1393.393	Axis Location:	117.599, 1417.535
Left Slip Surface Endpoint:	116.847, 1305.248	Left Slip Surface Endpoint:	106.712, 1303.760
Right Slip Surface Endpoint:	187.450, 1340.331	Right Slip Surface Endpoint:	202.087, 1340.561
Resisting Moment:	5.32908e+06 lb-ft	Resisting Moment:	1.27469e+07 lb-ft
Driving Moment:	3.82185e+06 lb-ft	Driving Moment:	8.21255e+06 lb-ft
Resisting Horizontal Force:	54329.4 lb	Resisting Horizontal Force:	100388 lb
Driving Horizontal Force:	38963.2 lb	Driving Horizontal Force:	64678.3 lb
Total Slice Area:	744.457 ft2	Total Slice Area:	1408.01 ft2
Surface Horizontal Width:	70.6032 ft	Surface Horizontal Width:	95.3748 ft
Surface Average Height:	10.5442 ft	Surface Average Height:	14.763 ft

Global Minimum Coordinates

Cuckoo search - min FS < 1.5 **Cuckoo search, static - 1.5 setback**

Method: spencer

X	Y
116.847	1305.25
118.784	1304.97
120.917	1304.81
123.05	1304.64
125.183	1304.49
127.183	1304.55
129.231	1304.75
131.278	1304.99
134.635	1305.51
138.41	1306.45
141.25	1307.23
144.09	1308.05
146.93	1308.88
149.285	1310.65
151.586	1312.39
153.886	1314.13
156.239	1315.91
159.04	1318.03
161.841	1320.16
164.641	1322.32
167.468	1324.5
170.294	1326.69
173.099	1328.85
174.821	1330.18
176.528	1331.5
179.259	1333.7
181.989	1335.91
184.72	1338.12
187.45	1340.33

Method: spencer

X	Y
106.712	1303.76
108.944	1302.99
111.435	1302.21
113.926	1301.44
118.049	1300.29
122.172	1299.61
126.206	1299.37
130.24	1299.42
134.211	1299.87
138.181	1300.48
141.704	1301.47
145.226	1302.46
148.748	1303.46
152.27	1304.45
155.575	1305.38
158.881	1307.87
162.187	1310.37
165.492	1312.86
168.174	1314.89
170.855	1316.92
173.724	1319.09
176.594	1321.26
179.651	1323.58
182.8	1325.96
186.037	1328.41
189.323	1330.9
192.608	1333.39
195.894	1335.87
198.991	1338.22
202.087	1340.56

Valid/Invalid Surfaces

Cuckoo search - min FS < 1.5

Method: spencer

Number of Valid Surfaces: 9260
Number of Invalid Surfaces: 796

Error Codes:

Error Code -108 reported for 114 surfaces
Error Code -111 reported for 98 surfaces
Error Code -112 reported for 91 surfaces
Error Code -114 reported for 52 surfaces
Error Code -121 reported for 12 surfaces
Error Code -124 reported for 22 surfaces
Error Code -600 reported for 4 surfaces
Error Code -1000 reported for 403 surfaces

Cuckoo search, static - 1.5 setback

Method: spencer

Number of Valid Surfaces: 9449
Number of Invalid Surfaces: 610

Error Codes:

Error Code -108 reported for 46 surfaces
Error Code -111 reported for 19 surfaces
Error Code -112 reported for 85 surfaces
Error Code -114 reported for 57 surfaces
Error Code -121 reported for 42 surfaces
Error Code -124 reported for 26 surfaces
Error Code -1000 reported for 335 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

Cuckoo search - min FS < 1.5

Global Minimum Query (spencer) - Safety Factor: 1.40779

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.93748	131.436	-8.18205	Bedrock	300	32	330.389	465.118	271.029	6.78388	264.245	223.525	216.741
2	1.06638	206.831	-4.35622	Bedrock	300	32	381.232	536.695	398.188	19.3957	378.792	369.146	349.751
3	1.06638	313.96	-4.35622	Bedrock	300	32	435.257	612.751	529.948	29.4417	500.507	496.792	467.35
4	1.06638	425.525	-4.35622	Bedrock	300	32	491.519	691.955	667.164	39.9036	627.26	629.721	589.818
5	1.06638	539.03	-4.35622	Bedrock	300	32	548.759	772.537	806.765	50.5476	756.218	764.963	714.415
6	1.06638	651.451	-4.02949	Bedrock	300	32	602.193	847.761	937.692	61.0901	876.602	895.271	834.181
7	1.06638	761.306	-4.02949	Bedrock	300	32	657.228	925.239	1071.98	71.3919	1000.59	1025.69	954.293
8	2.00078	1693.7	1.46127	Bedrock	300	32	665.773	937.268	1104.49	84.6517	1019.84	1121.48	1036.83
9	1.02374	986.915	5.6476	Bedrock	300	32	677.343	953.556	1142.31	96.4029	1045.9	1209.29	1112.89
10	1.02374	1061.12	5.6476	Bedrock	300	32	709.592	998.956	1222.21	103.651	1118.56	1292.38	1188.73
11	2.04746	2338.6	6.62533	Bedrock	300	32	745.52	1049.54	1313.73	114.22	1199.51	1400.32	1286.1
12	1.67859	2122.27	8.91389	Bedrock	300	32	771.945	1086.74	1385.47	126.431	1259.04	1506.55	1380.12
13	1.67859	2299.07	8.91389	Bedrock	300	32	816.19	1149.02	1495.69	136.964	1358.72	1623.7	1486.74
14	1.8871	2775.95	13.9522	Bedrock	300	32	797.272	1122.39	1463.2	147.101	1316.1	1661.28	1514.18
15	1.8871	2961.5	13.9522	Bedrock	300	32	835.176	1175.75	1558.43	156.934	1401.5	1765.92	1608.99
16	2.84009	4803.66	15.3339	Bedrock	300	32	864.573	1217.14	1636.86	169.138	1467.73	1873.94	1704.8
17	1.42001	2556.09	16.1613	Bedrock	300	32	894.615	1259.43	1715.41	180.005	1535.41	1974.67	1794.66
18	1.42001	2658.08	16.1613	Bedrock	300	32	921.296	1296.99	1782.71	187.187	1595.52	2049.69	1862.51
19	1.42001	2760.22	16.1785	Bedrock	300	32	947.776	1334.27	1849.56	194.38	1655.18	2124.52	1930.14
20	1.42001	2860.95	16.1785	Bedrock	300	32	974.115	1371.35	1916	201.473	1714.53	2198.61	1997.13
21	1.17766	2404.72	37.0628	Bedrock	300	18	493.64	694.942	1419.7	204.195	1215.51	1792.53	1588.34
22	1.17766	2384.65	37.0628	Bedrock	300	18	491.193	691.496	1407.39	202.491	1204.9	1778.37	1575.88
23	1.15023	2305.91	37.0628	Bedrock	300	18	488.296	687.418	1392.83	200.474	1192.35	1761.62	1561.15
24	1.15023	2280.36	37.0628	Bedrock	300	18	485.106	682.928	1376.79	198.253	1178.53	1743.17	1544.92
25	1.15023	2255.76	37.0628	Bedrock	300	18	482.035	678.604	1361.34	196.115	1165.22	1725.4	1529.29
26	1.15023	2236.32	37.0628	Bedrock	300	18	479.608	675.187	1349.13	194.425	1154.71	1711.37	1516.94
27	1.17652	2277	37.0628	Bedrock	300	18	478.333	673.392	1342.72	193.537	1149.18	1703.99	1510.46
28	1.17652	2280.54	37.0628	Bedrock	300	18	478.765	674	1344.89	193.838	1151.05	1706.49	1512.65
29	1.40037	2740.07	37.1558	Bedrock	300	18	480.957	677.087	1356.22	195.668	1160.55	1720.71	1525.04
30	1.40037	2785.55	37.1558	Bedrock	300	18	485.616	683.645	1379.65	198.916	1180.74	1747.67	1548.75
31	1.40037	2838.6	37.2231	Bedrock	300	18	490.724	690.837	1405.58	202.704	1202.87	1778.37	1575.66
32	1.40037	2888.51	37.2231	Bedrock	300	18	495.832	698.028	1431.27	206.268	1225	1807.94	1601.68
33	1.40037	2925.93	37.6817	Bedrock	300	18	497.399	700.234	1440.73	208.94	1231.79	1824.91	1615.97
34	1.40037	2949.3	37.6817	Bedrock	300	18	499.776	703.579	1452.7	210.609	1242.09	1838.71	1628.1
35	1.4133	2990.04	37.6817	Bedrock	300	18	501.137	705.495	1459.55	211.564	1247.98	1846.62	1635.05
36	1.4133	2941.75	37.6817	Bedrock	300	18	496.269	698.642	1435.04	208.147	1226.9	1818.35	1610.2
37	1.4133	2752.01	37.6817	Bedrock	300	18	477.146	671.722	1338.76	194.722	1144.04	1707.3	1512.58
38	1.4133	2555.53	37.6817	Bedrock	300	18	457.344	643.845	1239.07	180.82	1058.25	1592.31	1411.49
39	1.40212	2341.15	37.6817	Bedrock	300	18	437.621	616.079	1139.76	166.973	972.791	1477.77	1310.8
40	1.40212	2147.78	37.6817	Bedrock	300	18	417.976	588.423	1040.86	153.181	887.675	1363.69	1210.51
41	1.72254	2373.89	37.6817	Bedrock	300	18	396.087	557.607	930.645	137.813	792.832	1236.57	1098.76
42	1.70688	2064.42	37.6817	Bedrock	300	18	372.063	523.786	809.686	120.947	688.739	1097.06	976.112
43	1.36524	1440.91	38.8544	Bedrock	300	18	346.661	488.026	684.227	105.543	578.684	963.492	857.949
44	1.36524	1249.52	38.8544	Bedrock	300	18	327.007	460.357	585.05	91.5241	493.526	848.482	756.958
45	1.36524	1057.68	38.986	Bedrock	300	18	306.988	432.174	484.262	77.4719	406.791	732.732	655.26
46	1.36524	865.372	38.986	Bedrock	300	18	287.274	404.422	384.764	63.3861	321.378	617.279	553.893
47	1.36524	673.067	38.986	Bedrock	300	18	267.561	376.67	285.266	49.3003	235.966	501.825	452.525
48	1.36524	480.762	38.986	Bedrock	300	18	247.848	348.918	185.768	35.2145	150.554	386.372	351.157
49	1.36524	288.457	38.986	Bedrock	300	18	228.3	321.398	86.9854	21.1287	65.8567	271.767	250.638
50	1.36524	96.1524	38.986	Bedrock	300	18	149.442	210.383	7.04293	7.0429	2.57454e-05	127.998	120.955

Cuckoo search, static - 1.5 setback

Global Minimum Query (spencer) - Safety Factor: 1.55925

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.23215	152.903	-19.019	Bedrock	300	32	321.675	501.571	329.431	6.85002	322.581	218.55	211.7
2	2.49095	520.591	-17.3404	Bedrock	300	32	394.523	615.16	525.262	20.8992	504.363	402.076	381.177
3	2.49096	882.021	-17.3404	Bedrock	300	32	478.517	746.127	749.361	35.4089	713.952	599.949	564.54
4	4.12282	2281.25	-15.4818	Bedrock	300	32	574.339	895.538	1008.39	55.3321	953.059	849.31	793.978
5	2.06148	1650.61	-9.47008	Bedrock	300	32	643.443	1003.29	1205.56	80.069	1125.5	1098.23	1018.17
6	2.06148	2103.54	-9.47008	Bedrock	300	32	752.149	1172.79	1498.79	102.04	1396.75	1373.33	1271.29
7	2.01692	2486.49	-3.34908	Bedrock	300	32	780.135	1216.43	1589.87	123.282	1466.59	1544.22	1420.93
8	2.01692	2872.86	-3.34908	Bedrock	300	32	865.326	1349.26	1821.6	142.438	1679.16	1770.96	1628.53
9	4.03374	6792.8	0.753549	Bedrock	300	32	924.047	1440.82	1994.1	168.399	1825.7	2006.25	1837.85
10	1.9854	3805.55	6.36899	Bedrock	300	32	944.826	1473.22	2069.22	191.677	1877.54	2174.68	1983
11	1.9854	4075.76	6.36899	Bedrock	300	32	996.806	1554.27	2212.54	205.287	2007.25	2323.8	2118.52
12	1.98543	4336.55	8.75049	Bedrock	300	32	1014.09	1581.22	2268.81	218.419	2050.39	2424.9	2206.48
13	1.98543	4589.66	8.75049	Bedrock	300	32	1061.1	1654.52	2398.86	231.167	2167.69	2562.18	2331.02
14	1.76106	4261.17	15.7448	Bedrock	300	32	1004.64	1566.48	2268.76	241.966	2026.79	2551.99	2310.03
15	1.76106	4416.75	15.7448	Bedrock	300	32	1034.09	1612.41	2351.09	250.8	2100.29	2642.63	2391.83
16	1.76106	4575.6	15.7448	Bedrock	300	32	1064.17	1659.3	2435.15	259.821	2175.33	2735.17	2475.35
17	1.76106	4735.94	15.7448	Bedrock	300	32	1094.52	1706.63	2520	268.925	2251.08	2828.58	2559.66
18	1.76106	4894.69	15.7448	Bedrock	300	32	1124.57	1753.49	2604.01	277.94	2326.07	2921.06	2643.12
19	1.76106	5047.06	15.7448	Bedrock	300	32	1153.42	1798.47	2684.64	286.592	2398.05	3009.83	2723.23
20	3.52212	10508.5	15.7448	Bedrock	300	32	1192.64	1859.63	2794.29	298.357	2495.94	3130.53	2832.18
21	1.65258	5119.36	15.7448	Bedrock	300	32	1230.73	1919.01	2900.74	309.78	2590.96	3247.72	2937.94
22	1.65258	5268.17	15.7448	Bedrock	300	32	1260.75	1965.82	2984.66	318.785	2665.87	3340.1	3021.31
23	1.65289	5373.73	37.0119	Bedrock	300	18	618.537	964.454	2370.09	325.11	2044.98	2836.39	2511.28
24	1.65289	5431.57	37.0119	Bedrock	300	18	623.259	971.817	2396.25	328.609	2067.64	2866.11	2537.5
25	1.65289	5506.38	37.0119	Bedrock	300	18	629.367	981.34	2430.09	333.135	2096.95	2904.55	2571.42
26	1.65289	5576.93	37.0119	Bedrock	300	18	635.127	990.322	2462	337.404	2124.6	2940.81	2603.4
27	1.65289	5628.98	37.0119	Bedrock	300	18	639.377	996.948	2485.54	340.553	2144.98	2967.55	2627
28	1.65289	5661.65	37.0119	Bedrock	300	18	642.044	1001.11	2500.31	342.529	2157.78	2984.34	2641.81
29	2.6814	9066.15	37.1273	Bedrock	300	18	635.366	990.695	2463.85	338.112	2125.74	2944.85	2606.74
30	2.6814	8417.05	37.1273	Bedrock	300	18	602.744	939.829	2283.09	313.905	1969.19	2739.4	2425.49
31	1.43458	4218.69	37.1273	Bedrock	300	18	576.017	898.154	2135	294.072	1840.93	2571.07	2277
32	1.43458	4020.36	37.1273	Bedrock	300	18	557.386	869.104	2031.77	280.246	1751.52	2453.73	2173.49
33	1.43458	3822.02	37.1273	Bedrock	300	18	538.755	840.054	1928.53	266.421	1662.11	2336.39	2069.97
34	1.43458	3623.69	37.1273	Bedrock	300	18	520.124	811.003	1825.31	252.596	1572.71	2219.06	1966.47
35	1.52865	3643.04	37.1273	Bedrock	300	18	500.882	781.001	1718.68	238.318	1480.37	2097.87	1859.56
36	1.52865	3417.85	37.1273	Bedrock	300	18	481.03	750.046	1608.69	223.586	1385.1	1972.85	1749.26
37	1.57477	3285.48	37.1273	Bedrock	300	18	460.877	718.623	1497.02	208.632	1288.39	1845.93	1637.29
38	1.57477	3046.49	37.1273	Bedrock	300	18	440.426	686.734	1383.7	193.456	1190.24	1717.12	1523.66
39	1.61833	2881.75	37.1273	Bedrock	300	18	419.692	654.404	1268.81	178.07	1090.74	1586.54	1408.47
40	1.61833	2629.36	37.1273	Bedrock	300	18	398.674	621.633	1152.36	162.474	989.882	1454.17	1291.7
41	1.64285	2411.04	37.1273	Bedrock	300	18	377.498	588.613	1035.02	146.759	888.259	1320.8	1174.04
42	1.64285	2150.93	37.1273	Bedrock	300	18	356.162	555.345	916.801	130.927	785.874	1186.43	1055.5
43	1.64285	1890.83	37.1273	Bedrock	300	18	334.826	522.078	798.578	115.095	683.483	1052.06	936.962
44	1.64285	1630.73	37.1273	Bedrock	300	18	313.49	488.81	680.361	99.2626	581.098	917.687	818.424
45	1.64285	1370.64	37.1273	Bedrock	300	18	292.155	455.542	562.138	83.4303	478.708	783.312	699.881
46	1.64285	1110.53	37.1273	Bedrock	300	18	270.819	422.274	443.92	67.598	376.322	648.941	581.343
47	1.54823	808.513	37.1273	Bedrock	300	18	250.098	389.965	329.105	52.2216	276.883	518.439	466.218
48	1.54823	577.509	37.1273	Bedrock	300	18	229.991	358.613	217.693	37.3012	180.392	391.806	354.505
49	1.54823	346.506	37.1273	Bedrock	300	18	209.884	327.261	106.282	22.3807	83.9011	265.173	242.792
50	1.54823	115.502	37.1273	Bedrock	300	18	173.318	270.246	7.46024	7.46024	-4.40984e-06	138.669	131.209

Interslice Data

Cuckoo search - min FS < 1.5

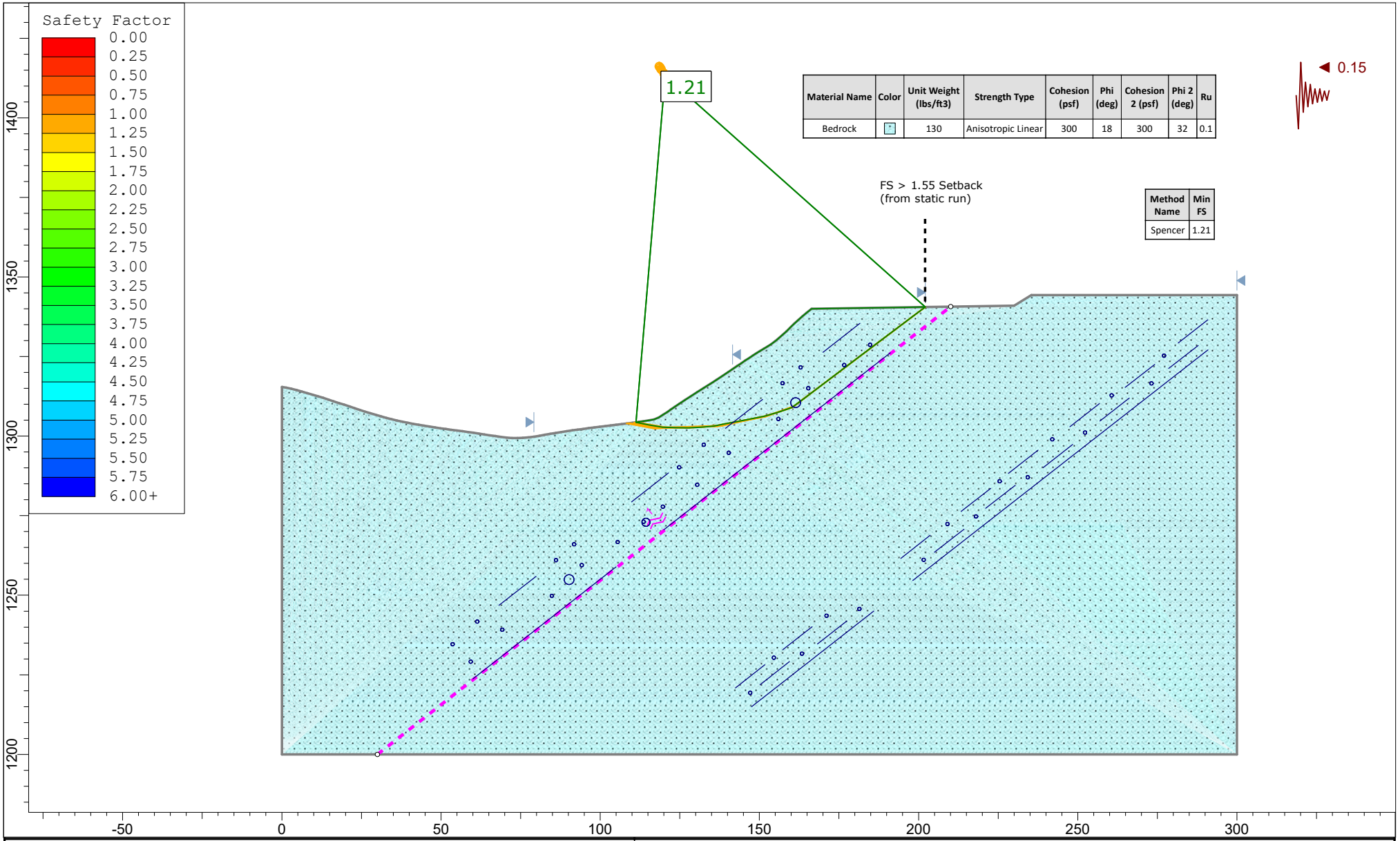
Global Minimum Query (spencer) - Safety Factor: 1.40779

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	116.847	1305.25	0	0	0
2	118.784	1304.97	723.46	312.004	23.3289
3	119.851	1304.89	1167.32	503.426	23.3289
4	120.917	1304.81	1680.2	724.614	23.3289
5	121.983	1304.73	2264.96	976.801	23.3289
6	123.05	1304.64	2922.85	1260.52	23.3288
7	124.116	1304.57	3643.31	1571.24	23.329
8	125.183	1304.49	4433.27	1911.92	23.3289
9	127.183	1304.55	5725.27	2469.11	23.3289
10	128.207	1304.65	6311.54	2721.95	23.3289
11	129.231	1304.75	6923.13	2985.71	23.3289
12	131.278	1304.99	8155.81	3517.33	23.3289
13	132.957	1305.25	9102.69	3925.68	23.3289
14	134.635	1305.51	10095.7	4353.95	23.329
15	136.523	1305.98	10932.7	4714.89	23.3288
16	138.41	1306.45	11797.4	5087.81	23.3289
17	141.25	1307.23	13008.2	5609.98	23.3288
18	142.67	1307.64	13588.2	5860.12	23.3289
19	144.09	1308.05	14178.8	6114.85	23.3289
20	145.51	1308.46	14779.2	6373.77	23.3289
21	146.93	1308.88	15390.1	6637.21	23.3288
22	148.107	1309.77	14715.8	6346.4	23.3288
23	149.285	1310.65	14049.5	6059.07	23.3289
24	150.435	1311.52	13408	5782.42	23.3289
25	151.586	1312.39	12776.8	5510.19	23.3289
26	152.736	1313.26	12155.4	5242.2	23.3289
27	153.886	1314.13	11541.7	4977.56	23.329
28	155.063	1315.02	10918.3	4708.68	23.3288
29	156.239	1315.91	10293.4	4439.18	23.3288
30	157.639	1316.97	9535.86	4112.49	23.3289
31	159.04	1318.03	8760.09	3777.93	23.3289
32	160.44	1319.09	7960.4	3433.05	23.3289
33	161.841	1320.16	7140.62	3079.51	23.3289
34	163.241	1321.24	6287.38	2711.53	23.3289
35	164.641	1322.32	5424.56	2339.43	23.3289
36	166.055	1323.41	4548.24	1961.5	23.3289
37	167.468	1324.5	3691.7	1592.11	23.329
38	168.881	1325.59	2912.91	1256.24	23.3289
39	170.294	1326.69	2214.62	955.091	23.3289
40	171.697	1327.77	1601.41	690.632	23.3288
41	173.099	1328.85	1067.42	460.344	23.329
42	174.821	1330.18	519.871	224.203	23.3289
43	176.528	1331.5	95.2536	41.0797	23.3289
44	177.893	1332.6	-178.202	-76.8525	23.3289
45	179.259	1333.7	-369.745	-159.459	23.329
46	180.624	1334.81	-480.612	-207.272	23.3289
47	181.989	1335.91	-508.776	-219.418	23.3289
48	183.354	1337.02	-454.239	-195.898	23.3289
49	184.72	1338.12	-316.998	-136.711	23.329
50	186.085	1339.23	-97.6181	-42.0994	23.3289
51	187.45	1340.33	0	0	0

Cuckoo search, static - 1.5 setback

Global Minimum Query (spencer) - Safety Factor: 1.55925

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	106.712	1303.76	0	0	0
2	108.944	1302.99	976.28	348.763	19.6586
3	111.435	1302.21	2374.1	848.115	19.6586
4	113.926	1301.44	4156.84	1484.98	19.6586
5	118.049	1300.29	7692.04	2747.88	19.6586
6	120.111	1299.95	9441.89	3372.99	19.6586
7	122.172	1299.61	11518.1	4114.7	19.6586
8	124.189	1299.49	13289.8	4747.59	19.6585
9	126.206	1299.37	15261.7	5452.03	19.6586
10	130.24	1299.42	18908.1	6754.66	19.6586
11	132.225	1299.64	20337.9	7265.44	19.6586
12	134.211	1299.87	21839.8	7801.98	19.6586
13	136.196	1300.17	23173.3	8278.34	19.6586
14	138.181	1300.48	24561	8774.07	19.6585
15	139.942	1300.97	25215.5	9007.91	19.6586
16	141.704	1301.47	25881.5	9245.81	19.6586
17	143.465	1301.97	26559	9487.83	19.6586
18	145.226	1302.46	27248.2	9734.04	19.6586
19	146.987	1302.96	27948.9	9984.37	19.6586
20	148.748	1303.46	28660.8	10238.7	19.6586
21	152.27	1304.45	30114.7	10758.1	19.6586
22	153.923	1304.91	30810.6	11006.7	19.6586
23	155.575	1305.38	31517.4	11259.2	19.6586
24	157.228	1306.63	29593.3	10571.8	19.6586
25	158.881	1307.87	27644.4	9875.58	19.6586
26	160.534	1309.12	25663.5	9167.94	19.6586
27	162.187	1310.37	23652.4	8449.51	19.6586
28	163.84	1311.61	21619.1	7723.14	19.6586
29	165.492	1312.86	19571.8	6991.77	19.6586
30	168.174	1314.89	16285.4	5817.73	19.6586
31	170.855	1316.92	13277.8	4743.31	19.6586
32	172.29	1318	11790.9	4212.16	19.6587
33	173.724	1319.09	10389.3	3711.44	19.6586
34	175.159	1320.18	9072.88	3241.17	19.6586
35	176.594	1321.26	7841.66	2801.33	19.6586
36	178.122	1322.42	6623.48	2366.15	19.6586
37	179.651	1323.58	5502.05	1965.53	19.6586
38	181.226	1324.77	4447.96	1588.97	19.6585
39	182.8	1325.96	3496.54	1249.09	19.6586
40	184.419	1327.19	2625.79	938.027	19.6586
41	186.037	1328.41	1863.47	665.698	19.6585
42	187.68	1329.65	1200.51	428.865	19.6585
43	189.323	1330.9	649.296	231.952	19.6586
44	190.966	1332.14	209.83	74.959	19.6586
45	192.608	1333.39	-117.89	-42.1146	19.6586
46	194.251	1334.63	-333.864	-119.268	19.6585
47	195.894	1335.87	-438.092	-156.502	19.6585
48	197.442	1337.04	-434.039	-155.055	19.6586
49	198.991	1338.22	-330.742	-118.153	19.6586
50	200.539	1339.39	-128.198	-45.7971	19.6586
51	202.087	1340.56	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 25-25'; NS-2; pseudo; cuckoo search		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t25ps1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 33

Slide Analysis Information

t25ps1a

Project Summary

File Name:	t25ps1a.slmd
Slide Modeler Version:	8.01
Compute Time:	00h:00m:03.706s
Project Title:	VTTM 60257
Analysis:	Section 25-25'; NS-2; pseudo; cuckoo search
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Bedrock
Color	
Strength Type	Anisotropic Linear
Unit Weight [lbs/ft3]	130
Cohesion 1 [psf]	300
Cohesion 2 [psf]	300
Friction Angle 1 [°]	18
Friction Angle 2 [°]	32
A [°]	1
B [°]	1
Anisotropic Definition	Surface
Angle from 1 [°]	
Anisotropic Surface	Anisotropic Surface 1
Tensile Strength [psf]	0
Water Surface	None
Ru Value	0.1

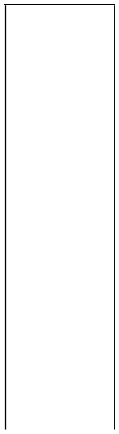
Global Minimums

Method: spencer

FS	1.206890
Axis Location:	120.435, 1413.328
Left Slip Surface Endpoint:	111.213, 1304.346
Right Slip Surface Endpoint:	202.087, 1340.561
Resisting Moment:	1.107e+07 lb-ft
Driving Moment:	9.17234e+06 lb-ft
Resisting Horizontal Force:	92878.8 lb
Driving Horizontal Force:	76957.3 lb
Total Slice Area:	1275.33 ft2
Surface Horizontal Width:	90.8743 ft
Surface Average Height:	14.0341 ft

Global Minimum Coordinates

Method: spencer



X	Y
111.213	1304.35
115.382	1303.46
119.551	1302.76
123.581	1302.61
127.611	1302.57
131.643	1302.78
135.664	1303.13
139.085	1303.79
143.194	1304.59
147.742	1305.46
151.653	1306.28
155.974	1307.5
160.214	1308.97
163.555	1311.49
166.896	1314.02
170.238	1316.54
173.579	1319.06
176.92	1321.58
180.261	1324.1
183.697	1326.69
187.133	1329.28
190.568	1331.87
194.003	1334.46
198.045	1337.51
202.087	1340.56

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9277
Number of Invalid Surfaces: 778

Error Codes:

Error Code -108 reported for 50 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 98 surfaces
Error Code -112 reported for 124 surfaces
Error Code -114 reported for 92 surfaces
Error Code -121 reported for 35 surfaces
Error Code -124 reported for 78 surfaces
Error Code -1000 reported for 300 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

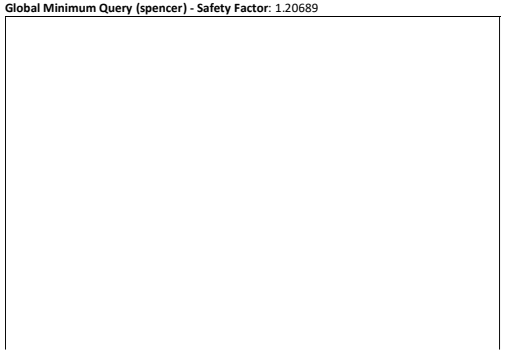
Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.20689

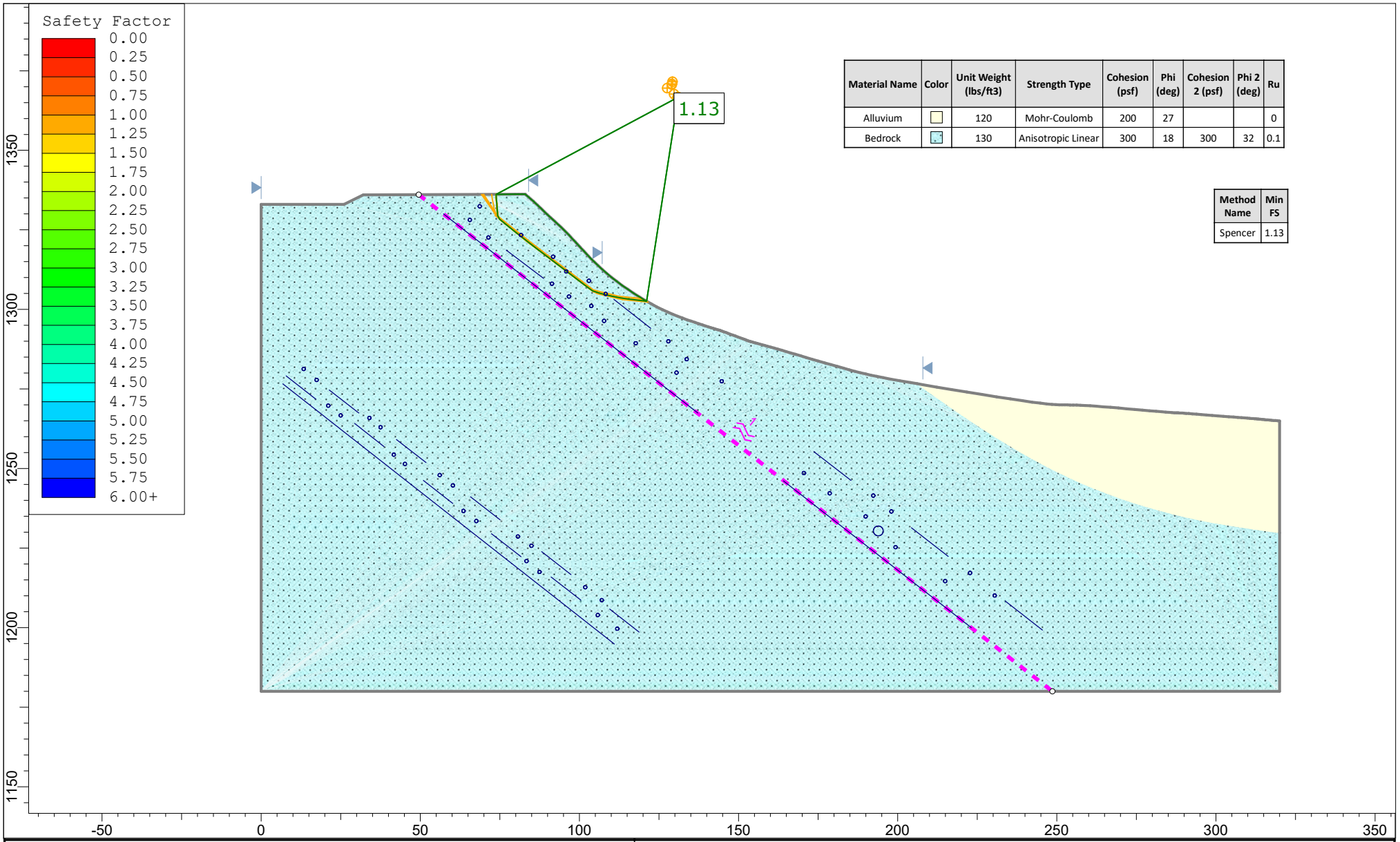
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.08454	98.4387	-11.9539	Bedrock	300	32	489.929	591.29	470.883	4.72233	466.16	367.157	362.435
2	2.08454	300.294	-11.9539	Bedrock	300	32	574.818	693.742	644.526	14.4058	630.121	522.828	508.422
3	2.08454	513.323	-9.53556	Bedrock	300	32	617.195	744.887	736.594	24.6253	711.969	632.917	608.292
4	2.08454	820.381	-9.53556	Bedrock	300	32	734.758	886.772	978.388	39.3555	939.032	854.963	815.607
5	2.015	1180.34	-2.10567	Bedrock	300	32	727.597	878.129	983.778	58.5775	925.2	957.026	898.448
6	2.015	1561.48	-2.10567	Bedrock	300	32	846.273	1021.36	1231.91	77.493	1154.41	1200.79	1123.3
7	2.015	1932.41	-0.594568	Bedrock	300	32	927.422	1119.3	1407.05	95.9015	1311.15	1397.42	1301.52
8	2.015	2284.72	-0.594568	Bedrock	300	32	1032.55	1246.17	1627.58	113.386	1514.19	1616.86	1503.47
9	2.01598	2615.64	2.98215	Bedrock	300	32	1041.23	1256.65	1660.71	129.745	1530.96	1714.95	1585.21
10	2.01598	2926.3	2.98215	Bedrock	300	32	1125.52	1358.38	1838.91	145.155	1693.75	1897.54	1752.39
11	2.01072	3218.27	4.96003	Bedrock	300	32	1155.65	1394.74	1912.01	160.056	1751.95	2012.3	1852.25
12	2.01072	3509.29	4.96003	Bedrock	300	32	1231.02	1485.7	2072.05	174.529	1897.52	2178.88	2004.36
13	1.71012	3195.44	10.9313	Bedrock	300	32	1145.36	1382.32	1918.93	186.855	1732.07	2140.14	1953.28
14	1.71012	3370.48	10.9313	Bedrock	300	32	1191.76	1438.32	2018.78	197.09	1821.69	2248.95	2051.86
15	2.05483	4286.56	10.9313	Bedrock	300	32	1243.97	1501.34	2131.15	208.609	1922.54	2371.41	2162.8
16	2.05483	4550.21	10.9313	Bedrock	300	32	1302.14	1571.54	2256.33	221.44	2034.89	2507.82	2286.38
17	1.51593	3527.93	10.9313	Bedrock	300	32	1353.29	1633.27	2366.41	232.724	2133.68	2627.78	2395.05
18	1.51593	3672.78	10.9313	Bedrock	300	32	1396.61	1685.55	2459.62	242.279	2217.34	2729.35	2487.08
19	1.51593	3814.83	10.9313	Bedrock	300	32	1439.09	1736.82	2551.04	251.649	2299.39	2828.98	2577.33
20	1.95522	5116.63	11.807	Bedrock	300	32	1458.82	1760.64	2599.2	261.691	2337.51	2904.15	2642.46
21	1.95522	5319.28	11.807	Bedrock	300	32	1504.91	1816.26	2698.57	272.056	2426.52	3013.16	2741.1
22	2.16081	6093.43	15.7512	Bedrock	300	32	1434.45	1731.22	2572.42	281.998	2290.42	2977.01	2695.01
23	2.16081	6345.43	15.7512	Bedrock	300	32	1482.09	1788.72	2676.11	293.66	2382.45	3094.13	2800.47
24	1.41325	4319.17	19.1653	Bedrock	300	32	1435.45	1732.43	2597.98	305.62	2292.36	3096.88	2791.26
25	1.41325	4469.45	19.1653	Bedrock	300	32	1475.92	1781.27	2686.78	316.254	2370.52	3199.74	2883.49
26	1.41325	4629.73	19.1653	Bedrock	300	32	1519.07	1833.35	2781.47	327.595	2453.88	3309.44	2981.84
27	1.67063	5603.35	37.0287	Bedrock	300	18	716.166	864.333	2072.24	335.404	1736.84	2612.47	2277.07
28	1.67063	5660.36	37.0287	Bedrock	300	18	721.018	870.189	2093.68	338.816	1754.86	2637.57	2298.75
29	1.67063	5696.7	37.0287	Bedrock	300	18	724.111	873.922	2107.34	340.992	1766.35	2653.57	2312.57
30	1.67063	5706.32	37.0287	Bedrock	300	18	724.93	874.911	2110.96	341.568	1769.4	2657.81	2316.24
31	1.67063	5511.04	37.0287	Bedrock	300	18	708.309	854.851	2037.53	329.879	1707.66	2571.84	2241.96
32	1.67063	5243.05	37.0287	Bedrock	300	18	685.498	827.321	1936.77	313.837	1622.93	2453.87	2140.03
33	1.67063	4975.06	37.0287	Bedrock	300	18	662.688	799.792	1836	297.796	1538.2	2335.89	2038.1
34	1.67063	4707.07	37.0287	Bedrock	300	18	639.879	772.263	1735.23	281.755	1453.48	2217.92	1936.16
35	1.6705	4438.75	37.0287	Bedrock	300	18	617.069	744.735	1634.47	265.714	1368.75	2099.95	1834.23
36	1.6705	4170.8	37.0287	Bedrock	300	18	594.26	717.207	1533.71	249.674	1284.03	1981.98	1732.31
37	1.6705	3902.85	37.0287	Bedrock	300	18	571.452	689.68	1432.95	233.634	1199.31	1864.01	1630.38
38	1.6705	3634.9	37.0287	Bedrock	300	18	548.644	662.153	1332.18	217.594	1114.59	1746.05	1528.45
39	1.71787	3458.53	37.0287	Bedrock	300	18	525.513	634.236	1230	201.326	1028.67	1626.41	1425.09
40	1.71787	3175.17	37.0287	Bedrock	300	18	502.057	605.928	1126.38	184.832	941.549	1505.1	1320.27
41	1.71793	2891.91	37.0287	Bedrock	300	18	478.602	577.62	1022.76	168.336	854.426	1383.79	1215.45
42	1.71793	2608.53	37.0287	Bedrock	300	18	455.146	549.311	919.142	151.841	767.301	1262.48	1110.64
43	1.7177	2324.84	37.0287	Bedrock	300	18	431.691	521.004	815.528	135.347	680.181	1141.17	1005.82
44	1.7177	2041.54	37.0287	Bedrock	300	18	408.239	492.699	711.921	118.853	593.068	1019.87	901.019
45	1.7177	1758.24	37.0287	Bedrock	300	18	384.786	464.394	608.314	102.36	505.954	898.574	796.214
46	1.7177	1474.93	37.0287	Bedrock	300	18	361.333	436.089	504.708	85.8669	418.841	777.276	691.409
47	2.02095	1372.58	37.0287	Bedrock	300	18	335.81	405.286	391.954	67.9177	324.036	645.269	577.351
48	2.02095	980.417	37.0287	Bedrock	300	18	308.217	371.984	270.056	48.5127	221.543	502.556	454.043
49	2.02095	588.25	37.0287	Bedrock	300	18	280.624	338.682	148.158	29.1076	119.05	359.843	330.735
50	2.02095	196.083	37.0287	Bedrock	300	18	253.033	305.382	26.2681	9.70253	16.5655	217.141	207.438

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.20689



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	111.213	1304.35	0	0	0
2	113.297	1303.9	1214.33	666.982	28.7782
3	115.382	1303.46	2651.97	1456.62	28.7782
4	117.466	1303.11	4119.47	2262.66	28.7782
5	119.551	1302.76	5870.65	3224.51	28.7782
6	121.566	1302.69	7232.6	3972.57	28.7782
7	123.581	1302.61	8794.89	4830.68	28.7782
8	125.596	1302.59	10403.2	5714.07	28.7783
9	127.611	1302.57	12175.1	6687.31	28.7783
10	129.627	1302.68	13707.5	7528.97	28.7782
11	131.643	1302.78	15344.5	8428.09	28.7781
12	133.654	1302.96	16851.8	9256	28.7782
13	135.664	1303.13	18439.1	10127.8	28.7781
14	137.375	1303.46	19284.6	10592.3	28.7783
15	139.085	1303.79	20150.4	11067.8	28.7782
16	141.139	1304.19	21217.8	11654.1	28.7783
17	143.194	1304.59	22315.5	12257	28.7782
18	144.71	1304.88	23144.9	12712.6	28.7783
19	146.226	1305.17	23991.1	13177.3	28.7781
20	147.742	1305.46	24853.5	13651	28.7782
21	149.697	1305.87	25876	14212.6	28.7781
22	151.653	1306.28	26917.6	14784.7	28.7781
23	153.813	1306.89	27535.4	15124.1	28.7782
24	155.974	1307.5	28155.1	15464.5	28.7783
25	157.387	1307.99	28259.8	15522	28.7783
26	158.801	1308.48	28355.5	15574.5	28.7782
27	160.214	1308.97	28441.7	15621.9	28.7783
28	161.885	1310.23	26186.2	14383	28.7782
29	163.555	1311.49	23903.2	13129	28.7781
30	165.226	1312.76	21602.7	11865.5	28.7782
31	166.896	1314.02	19297.6	10599.4	28.7782
32	168.567	1315.28	17086.5	9384.92	28.7782
33	170.238	1316.54	15004.5	8241.37	28.7782
34	171.908	1317.8	13051.6	7168.71	28.7782
35	173.579	1319.06	11227.8	6166.96	28.7781
36	175.249	1320.32	9533.15	5236.17	28.7782
37	176.92	1321.58	7967.59	4376.27	28.7782
38	178.59	1322.84	6531.09	3587.26	28.7782
39	180.261	1324.1	5223.65	2869.14	28.7782
40	181.979	1325.39	4013.73	2204.58	28.7782
41	183.697	1326.69	2940.3	1614.99	28.7782
42	185.415	1327.98	2003.33	1100.35	28.7783
43	187.133	1329.28	1202.84	660.674	28.7783
44	188.85	1330.58	538.938	296.017	28.7782
45	190.568	1331.87	11.4888	6.31035	28.7783
46	192.286	1333.17	-379.504	-208.446	28.7782
47	194.003	1334.46	-634.041	-348.253	28.7782
48	196.024	1335.99	-758.796	-416.776	28.7782
49	198.045	1337.51	-694.659	-381.548	28.7782
50	200.066	1339.04	-441.63	-242.569	28.7782
51	202.087	1340.56	0	0	0



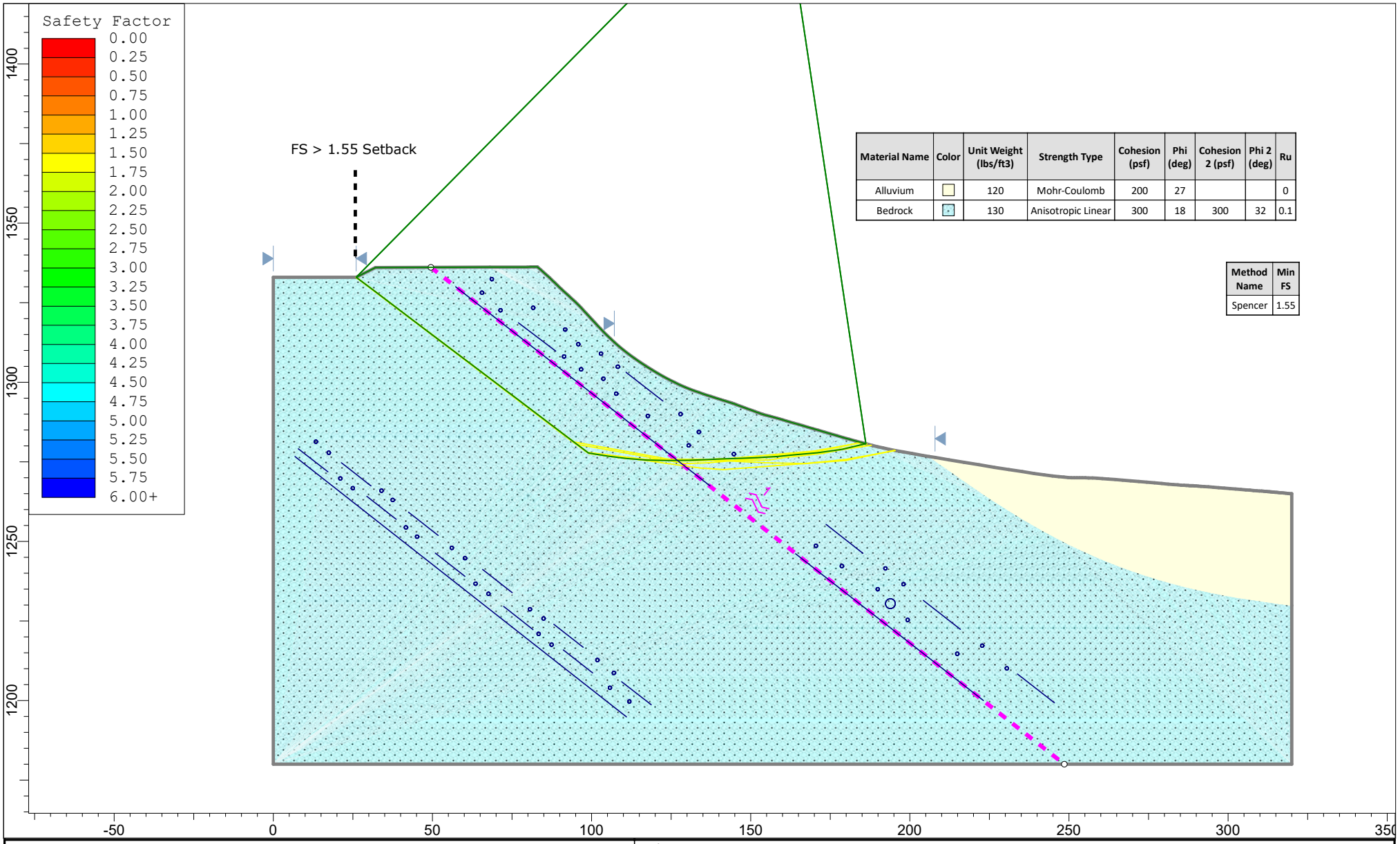
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Ru
Alluvium		120	Mohr-Coulomb	200	27			0
Bedrock		130	Anisotropic Linear	300	18	300	32	0.1

Method Name	Min FS
Spencer	1.13

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 26-26'; NS-2; static; cuckoo search; setback analysis		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t26s1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 34



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Ru
Alluvium		120	Mohr-Coulomb	200	27			0
Bedrock		130	Anisotropic Linear	300	18	300	32	0.1

Method Name	Min FS
Spencer	1.55

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 26-26'; NS-2; static; cuckoo search; setback analysis		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t26s1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 35

Slide Analysis Information

t26s1a

Project Summary

File Name:	t26s1a.slmd
Slide Modeler Version:	8.01
Project Title:	VTTM 60257
Analysis:	Section 26-26'; NS-2; static; cuckoo search; setback analysis
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Cuckoo search, static - min FS	Master Scenario	Spencer: 1.130010	00h:00m:11.1s
Cuckoo search, static - 1.55 setback	Master Scenario	Spencer: 1.554940	00h:00m:10.420s

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

All Open Scenarios

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

All Open Scenarios	
Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

All Open Scenarios	
Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Alluvium	Bedrock
Color		
Strength Type	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	120	130
Cohesion [psf]	200	
Friction Angle [°]	27	
Cohesion 1 [psf]		300
Cohesion 2 [psf]		300
Friction Angle 1 [°]		18
Friction Angle 2 [°]		32
A [°]		1
B [°]		1
Anisotropic Definition		Surface
Angle from 1 [°]		
Anisotropic Surface		Assigned per scenario
Tensile Strength [psf]		0
Water Surface	Assigned per scenario	Assigned per scenario
Ru Value	0	0.1

Materials In Use

Material	Master Scenario	Master Scenario
Alluvium	✓	✓
Bedrock	✓	✓

Global Minimums

Cuckoo search, static - min FS		Cuckoo search, static - 1.55 setback	
Method: spencer		**Method: spencer**	
FS	**1.130010**	**FS**	**1.554940**
Axis Location:	131.070, 1366.689	Axis Location:	158.444, 1466.942
Left Slip Surface Endpoint:	73.825, 1336.175	Left Slip Surface Endpoint:	26.068, 1333.000
Right Slip Surface Endpoint:	121.134, 1302.585	Right Slip Surface Endpoint:	186.172, 1280.676
Resisting Moment:	2.24312e+06 lb-ft	Resisting Moment:	5.05575e+07 lb-ft
Driving Moment:	1.98909e+06 lb-ft	Driving Moment:	3.26105e+07 lb-ft
Resisting Horizontal Force:	29461.7 lb	Resisting Horizontal Force:	245509 lb
Driving Horizontal Force:	26125.3 lb	Driving Horizontal Force:	158358 lb
Total Slice Area:	435.081 ft2	Total Slice Area:	3762.21 ft2
Surface Horizontal Width:	47.3088 ft	Surface Horizontal Width:	160.104 ft
Surface Average Height:	9.19662 ft	Surface Average Height:	23.4986 ft

Global Minimum Coordinates

Cuckoo search, static - min FS

Method: spencer

X	Y
73.8251	1336.18
73.9254	1334.76
74.0257	1333.34
74.1634	1331.4
74.3012	1329.45
74.9613	1328.33
76.5334	1327.06
78.1055	1325.79
79.7363	1324.48
81.367	1323.17
83.167	1321.72
85.4502	1319.97
87.5026	1318.41
89.5549	1316.85
91.4247	1315.43
93.2805	1314.03
95.3398	1312.47
97.3991	1310.91
99.4584	1309.35
101.766	1307.61
104.106	1305.84
106.196	1305.17
108.347	1304.62
110.499	1304.12
112.74	1303.62
114.838	1303.35
116.937	1303.09
119.035	1302.84
121.134	1302.59

Cuckoo search, static - 1.55 setback

Method: spencer

X	Y
26.068	1333
31.2697	1329.05
36.4716	1325.11
42.1887	1320.78
47.9058	1316.45
53.6258	1312.13
59.3445	1307.8
65.0587	1303.48
70.7728	1299.16
77.8413	1293.81
84.9131	1288.47
91.9842	1283.12
99.0552	1277.77
105.002	1276.77
111.106	1276.03
117.21	1275.51
123.957	1275.39
130.704	1275.51
137.548	1275.75
142.495	1275.93
147.072	1276.1
152.159	1276.28
158.241	1276.66
164.59	1277.25
170.939	1277.84
178.556	1278.91
186.172	1280.68

Valid/Invalid Surfaces

Cuckoo search, static - min FS

Method: spencer

Number of Valid Surfaces: 9311
Number of Invalid Surfaces: 746

Error Codes:

Error Code -108 reported for 28 surfaces
Error Code -111 reported for 61 surfaces
Error Code -112 reported for 37 surfaces
Error Code -114 reported for 46 surfaces
Error Code -121 reported for 17 surfaces
Error Code -124 reported for 5 surfaces
Error Code -600 reported for 33 surfaces
Error Code -1000 reported for 519 surfaces

Cuckoo search, static - 1.55 setback

Method: spencer

Number of Valid Surfaces: 9467
Number of Invalid Surfaces: 590

Error Codes:

Error Code -108 reported for 6 surfaces
Error Code -111 reported for 1 surface
Error Code -112 reported for 17 surfaces
Error Code -114 reported for 107 surfaces
Error Code -121 reported for 21 surfaces
Error Code -124 reported for 11 surfaces
Error Code -1000 reported for 427 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-600 = Nonconvergence due to tension
-1000 = No valid slip surface is generated

Slice Data

Cuckoo search, static - min FS

Global Minimum Query (spencer) - Safety Factor: 1.13001

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.100256	9.22662	-85.9485	Bedrock	300	32	0.613327	0.693066	9.20306	9.20309	-3.21521e-05	17.8622	8.65909
2	0.100254	27.6792	-85.9485	Bedrock	300	32	1.83997	2.07918	27.6091	27.6091	3.14564e-06	53.5863	25.9772
3	0.137773	68.141	-85.9485	Bedrock	300	32	3.29613	3.72466	49.459	49.459	-1.04093e-05	95.9947	46.5357
4	0.137777	102.993	-85.9485	Bedrock	300	32	4.98184	5.62953	74.7536	74.7534	0.000173949	145.089	70.3352
5	0.660071	625.235	-59.5677	Bedrock	300	32	363.467	410.721	271.914	94.7223	177.191	890.628	795.905
6	0.786043	834.852	-39.0463	Bedrock	300	18	423.595	478.667	656.09	106.209	549.881	999.678	893.469
7	0.786043	900.34	-39.0463	Bedrock	300	18	436.88	493.679	710.622	114.541	596.081	1064.99	950.445
8	0.786047	965.586	-38.8334	Bedrock	300	18	451.147	509.801	768.543	122.841	645.702	1131.71	1008.87
9	0.786047	1030.58	-38.8334	Bedrock	300	18	464.385	524.76	822.85	131.109	691.741	1196.67	1065.56
10	0.815397	1137.66	-38.7675	Bedrock	300	18	478.207	540.379	879.332	139.522	739.81	1263.37	1123.85
11	0.815397	1207.44	-38.7675	Bedrock	300	18	491.924	555.879	935.593	148.08	787.513	1330.65	1182.57
12	0.815397	1277.21	-38.7675	Bedrock	300	18	505.641	571.379	991.851	156.637	835.214	1397.92	1241.29
13	0.815397	1346.99	-38.7675	Bedrock	300	18	519.356	586.878	1048.12	165.194	882.921	1465.2	1300.01
14	0.899978	1567.72	-38.7675	Bedrock	300	18	533.785	603.182	1107.3	174.195	933.101	1535.97	1361.78
15	0.899978	1651.21	-38.7675	Bedrock	300	18	548.655	619.986	1168.29	183.473	984.814	1608.9	1425.43
16	1.14162	2120.72	-37.5853	Bedrock	300	18	560.322	633.169	1211.16	185.764	1025.39	1642.43	1456.67
17	1.14162	2102.07	-37.5853	Bedrock	300	18	557.645	630.144	1200.21	184.13	1016.08	1629.42	1445.29
18	1.02617	1869.74	-37.2411	Bedrock	300	18	556.785	629.173	1195.29	182.206	1013.09	1618.55	1436.34
19	1.02617	1845.87	-37.2411	Bedrock	300	18	552.948	624.837	1179.62	179.879	999.742	1599.96	1420.08
20	1.02617	1818.09	-37.2411	Bedrock	300	18	548.485	619.794	1161.4	177.172	984.226	1578.34	1401.17
21	1.02617	1789.21	-37.2411	Bedrock	300	18	543.845	614.55	1142.45	174.358	968.087	1555.86	1381.5
22	0.934909	1607.2	-37.1329	Bedrock	300	18	540.496	610.766	1128.35	171.909	956.441	1537.61	1365.7
23	0.934909	1588.49	-37.1329	Bedrock	300	18	537.19	607.03	1114.85	169.908	944.943	1521.61	1351.7
24	0.927894	1559.51	-37.1194	Bedrock	300	18	534.236	603.692	1102.73	168.069	934.666	1507.06	1338.99
25	0.927894	1542.21	-37.1194	Bedrock	300	18	531.155	600.211	1090.16	166.205	923.957	1492.16	1325.95
26	1.02964	1689.11	-37.1194	Bedrock	300	18	527.593	596.185	1075.62	164.049	911.568	1474.91	1310.86
27	1.02964	1661.8	-37.1194	Bedrock	300	18	523.208	591.23	1057.71	161.396	896.316	1453.69	1292.29
28	1.02964	1629.2	-37.1194	Bedrock	300	18	517.976	585.318	1036.35	158.23	878.116	1428.36	1270.13
29	1.02964	1591.61	-37.1194	Bedrock	300	18	511.942	578.5	1011.72	154.579	857.14	1399.17	1244.59
30	1.02964	1549.98	-37.1194	Bedrock	300	18	505.262	570.951	984.436	150.537	833.899	1366.83	1216.29
31	1.02964	1505.26	-37.1194	Bedrock	300	18	498.083	562.839	955.124	146.193	808.931	1332.09	1185.89
32	2.30782	3208.92	-37.1044	Bedrock	300	18	486.352	549.583	907.185	139.046	768.139	1275.07	1136.02
33	1.1701	1542.35	-37.1044	Bedrock	300	18	474.398	536.074	858.376	131.813	726.563	1217.22	1085.4
34	1.1701	1491.41	-37.1044	Bedrock	300	18	467.201	527.942	828.992	127.46	701.532	1182.39	1054.93
35	1.04486	1263.32	-17.6599	Bedrock	300	32	867.786	980.607	1210.11	120.908	1089.2	1486.39	1365.48
36	1.04486	1171.25	-17.6599	Bedrock	300	32	826.512	933.967	1126.65	112.096	1014.56	1389.79	1277.7
37	1.07546	1110.27	-14.4525	Bedrock	300	32	832.724	940.986	1129.03	103.237	1025.79	1343.65	1240.41
38	1.07546	1014.62	-14.4525	Bedrock	300	32	787.961	890.404	1039.19	94.3434	944.842	1242.27	1147.93
39	1.07597	922.285	-12.9246	Bedrock	300	32	765.92	865.497	990.697	85.7165	904.981	1166.46	1080.75
40	1.07597	832.62	-12.9246	Bedrock	300	32	722.482	816.412	903.815	77.3831	826.432	1069.61	992.229
41	1.1203	776.928	-12.536	Bedrock	300	32	685.452	774.568	828.817	69.3498	759.467	981.23	911.88
42	1.1203	688.934	-12.536	Bedrock	300	32	644.14	727.885	746.254	61.4953	684.759	889.482	827.986
43	1.04929	562.866	-7.4603	Bedrock	300	32	662.086	748.164	770.855	53.6424	717.212	857.553	803.911
44	1.04929	480.317	-7.4603	Bedrock	300	32	615.341	695.341	678.453	45.7752	632.678	759.03	713.255
45	1.04929	399.256	-6.91821	Bedrock	300	32	575.212	649.995	598.158	38.05	560.108	667.952	629.902
46	1.04929	321.043	-6.91821	Bedrock	300	32	530.317	599.264	509.519	30.5961	478.923	573.865	543.269
47	1.04929	245.059	-6.91821	Bedrock	300	32	486.703	549.979	423.404	23.3546	400.049	482.458	459.103
48	1.04929	171.784	-6.91821	Bedrock	300	32	444.643	502.451	340.36	16.3714	323.989	394.311	377.94
49	1.04929	101.383	-6.91821	Bedrock	300	32	404.233	456.787	260.573	9.66204	250.911	309.621	299.959
50	1.04929	32.944	-6.91821	Bedrock	300	32	377.288	426.339	205.324	3.13964	202.184	251.102	247.963

Cuckoo search, static - 1.55 setback

Global Minimum Query (spencer) - Safety Factor: 1.55494

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.60087	553.38	-37.1822	Bedrock	300	18	208.132	323.633	94.0126	21.2767	72.7359	251.892	230.615
2	2.60087	1660.14	-37.1822	Bedrock	300	18	266.625	414.586	416.488	63.8301	352.658	618.737	554.907
3	2.60092	2662.23	-37.1817	Bedrock	300	18	319.585	496.935	708.459	102.357	606.102	950.875	848.518
4	2.60092	3353.53	-37.1817	Bedrock	300	18	356.119	553.744	909.882	128.936	780.946	1180.01	1051.08
5	2.85854	4458.51	-37.1201	Bedrock	300	18	393.478	611.835	1115.7	155.971	959.73	1413.5	1257.53
6	2.85854	5266.94	-37.1201	Bedrock	300	18	432.38	672.325	1330.15	184.253	1145.9	1657.4	1473.15
7	2.85854	6075.36	-37.1197	Bedrock	300	18	471.284	732.818	1544.61	212.533	1332.08	1901.29	1688.76
8	2.85854	6883.77	-37.1197	Bedrock	300	18	510.186	793.308	1759.06	240.814	1518.24	2145.18	1904.37
9	2.85999	7696.02	-37.1009	Bedrock	300	18	549.177	853.938	1973.94	269.092	1704.85	2389.29	2120.2
10	2.85999	8504.71	-37.1009	Bedrock	300	18	588.081	914.431	2188.39	297.368	1891.02	2633.17	2335.8
11	2.85939	9311.33	-37.1007	Bedrock	300	18	626.981	974.918	2402.82	325.641	2077.18	2877.02	2551.38
12	2.85939	10119.7	-37.1007	Bedrock	300	18	665.876	1035.4	2617.23	353.911	2263.32	3120.84	2766.93
13	2.85708	10918.9	-37.1007	Bedrock	300	18	704.755	1095.85	2831.56	382.169	2449.39	3364.57	2982.4
14	2.85708	11725.9	-37.1007	Bedrock	300	18	743.619	1156.28	3045.78	410.416	2635.37	3608.19	3197.78
15	2.85708	12532.9	-37.1007	Bedrock	300	18	782.482	1216.71	3260.01	438.662	2821.35	3851.81	3413.15
16	2.85708	13340	-37.1007	Bedrock	300	18	821.346	1277.14	3474.24	466.909	3007.33	4095.43	3628.52
17	3.53423	17618.3	-37.1007	Bedrock	300	18	864.818	1344.74	3713.88	498.504	3215.37	4367.95	3869.45
18	3.53423	18853.2	-37.1007	Bedrock	300	18	912.891	1419.49	3978.88	533.445	3445.44	4669.31	4135.87
19	3.53588	20097.7	-37.1007	Bedrock	300	18	960.976	1494.26	4243.95	568.395	3675.55	4970.75	4402.35
20	3.53588	21126.2	-37.1007	Bedrock	300	18	1001	1556.49	4464.55	597.482	3867.07	5221.62	4624.14
21	3.53556	21043.2	-37.1007	Bedrock	300	18	997.839	1551.58	4447.15	595.187	3851.97	5201.83	4606.65
22	3.53556	20726.6	-37.1007	Bedrock	300	18	985.517	1532.42	4379.23	586.232	3793	5124.59	4538.36
23	3.53553	20454.7	-37.1007	Bedrock	300	18	974.938	1515.97	4320.93	578.545	3742.38	5058.28	4479.74
24	3.53553	20061.3	-37.1007	Bedrock	300	18	959.632	1492.17	4236.53	567.419	3669.11	4962.32	4394.9
25	2.97349	16131.7	-9.56667	Bedrock	300	32	2169.13	3372.86	5460.13	542.519	4917.61	5825.71	5283.19
26	2.97349	15107	-9.56667	Bedrock	300	32	2044.34	3178.82	5115.14	508.057	4607.08	5459.69	4951.63
27	3.0519	14517.1	-6.89246	Bedrock	300	32	1996.12	3103.84	4962.77	475.675	4487.09	5204.06	4728.38
28	3.0519	13610.8	-6.89246	Bedrock	300	32	1884.54	2930.35	4655.43	445.978	4209.45	4883.23	4437.25
29	3.05185	12795.3	-4.84679	Bedrock	300	32	1833.49	2850.96	4501.66	419.263	4082.4	4657.13	4237.87
30	3.05185	12045.6	-4.84679	Bedrock	300	32	1738.51	2703.28	4240.76	394.7	3846.06	4388.17	3993.47
31	3.37353	12477.6	-1.0734	Bedrock	300	32	1729.17	2688.75	4192.68	369.869	3822.81	4225.08	3855.21
32	3.37353	11635.2	-1.0734	Bedrock	300	32	1627.23	2530.24	3914.03	344.898	3569.13	3944.52	3599.62
33	3.37348	10858	1.03091	Bedrock	300	32	1579.01	2455.27	3771.01	321.864	3449.15	3742.6	3420.74
34	3.37348	10152.1	1.03091	Bedrock	300	32	1490.88	2318.23	3530.8	300.94	3229.86	3503.97	3203.03
35	3.42227	9655.83	2.05937	Bedrock	300	32	1432.47	2227.4	3366.64	282.147	3084.49	3315.13	3032.98
36	3.42227	9066.25	2.05937	Bedrock	300	32	1358.77	2112.8	3165.99	264.919	2901.08	3117.14	2852.22
37	2.4736	6208.32	2.05937	Bedrock	300	32	1299.15	2020.1	3003.71	250.984	2752.73	2957	2706.01
38	2.4736	5928.9	2.05937	Bedrock	300	32	1250.82	1944.95	2872.15	239.688	2632.47	2827.18	2587.49
39	4.57613	10220.5	2.05937	Bedrock	300	32	1180.89	1836.22	2681.82	223.344	2458.48	2639.36	2416.01
40	2.54359	5209.44	2.05937	Bedrock	300	32	1101.59	1712.91	2465.93	204.806	2261.12	2426.32	2221.51
41	2.54359	4865.34	2.05937	Bedrock	300	32	1043.71	1622.91	2308.38	191.278	2117.1	2270.85	2079.57
42	3.04136	5372.01	3.6375	Bedrock	300	32	1002.99	1559.59	2192.39	176.632	2015.76	2128.63	1952
43	3.04136	4958.82	3.6375	Bedrock	300	32	943.432	1466.98	2030.61	163.046	1867.56	1970.64	1807.59
44	3.17436	4716.38	5.29938	Bedrock	300	32	900.999	1401	1910.54	148.577	1761.96	1826.96	1678.39
45	3.17436	4217.05	5.29938	Bedrock	300	32	830.213	1290.93	1718.67	132.847	1585.82	1641.66	1508.81
46	3.1744	3712.52	5.29938	Bedrock	300	32	758.685	1179.71	1524.78	116.952	1407.83	1454.41	1337.46
47	3.1744	3206.92	5.29938	Bedrock	300	32	687.012	1068.26	1330.5	101.024	1229.48	1266.78	1165.75
48	3.80832	3137.08	7.96355	Bedrock	300	32	625.915	973.26	1159.82	82.3744	1077.44	1072.26	989.881
49	3.80832	2326.2	7.96355	Bedrock	300	32	525.844	817.656	889.503	61.0821	828.421	815.942	754.86
50	7.61616	1910.86	13.0661	Bedrock	300	32	384.15	597.33	500.917	25.0896	475.827	411.762	386.673

Interslice Data

Cuckoo search, static - min FS

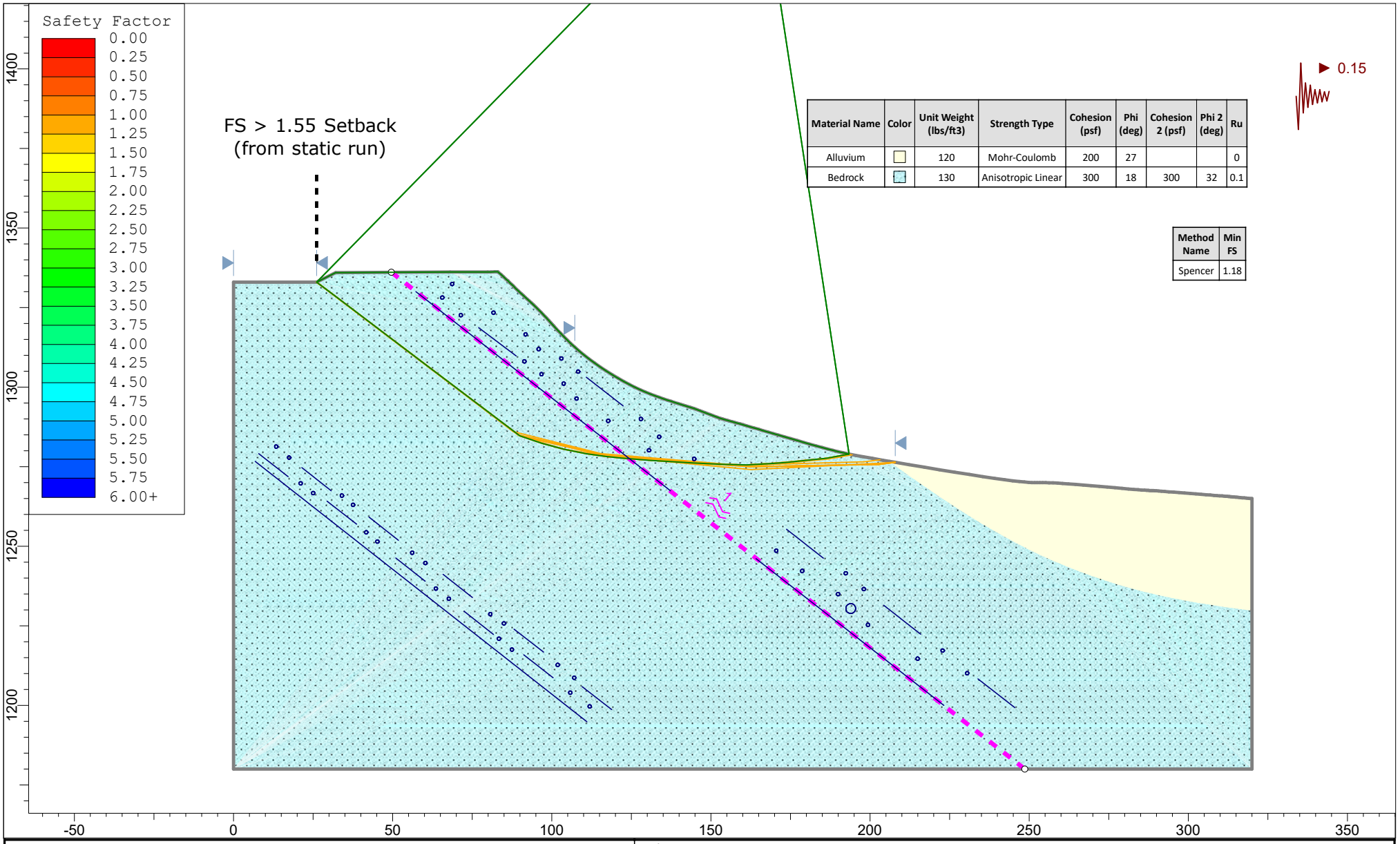
Global Minimum Query (spencer) - Safety Factor: 1.13001

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	73.8251	1336.18	0	0	0
2	73.9254	1334.76	12.9647	7.43325	29.8276
3	74.0257	1333.34	51.8579	29.7324	29.8275
4	74.1634	1331.4	147.606	84.6289	29.8275
5	74.3012	1329.45	292.325	167.603	29.8276
6	74.9613	1328.33	357.089	204.735	29.8276
7	75.7473	1327.69	441.257	252.992	29.8275
8	76.5334	1327.06	549.714	315.176	29.8276
9	77.3194	1326.42	680.135	389.952	29.8276
10	78.1055	1325.79	834.477	478.443	29.8276
11	78.9209	1325.13	1018.99	584.232	29.8276
12	79.7363	1324.48	1229.12	704.708	29.8275
13	80.5516	1323.83	1464.86	839.872	29.8276
14	81.367	1323.17	1726.23	989.723	29.8275
15	82.267	1322.45	2044.44	1172.17	29.8276
16	83.167	1321.72	2393.31	1372.19	29.8275
17	84.3086	1320.85	2815.62	1614.32	29.8276
18	85.4502	1319.97	3231.37	1852.69	29.8276
19	86.4764	1319.19	3590.41	2058.54	29.8275
20	87.5026	1318.41	3941.17	2259.65	29.8276
21	88.5288	1317.63	4282.32	2455.24	29.8275
22	89.5549	1316.85	4613.45	2645.1	29.8276
23	90.4898	1316.14	4905.12	2812.33	29.8276
24	91.4247	1315.43	5190.34	2975.85	29.8275
25	92.3526	1314.73	5467.28	3134.64	29.8276
26	93.2805	1314.03	5738.25	3290	29.8276
27	94.3102	1313.25	6031.28	3458.01	29.8276
28	95.3398	1312.47	6314.89	3620.61	29.8276
29	96.3694	1311.69	6587.26	3776.77	29.8276
30	97.3991	1310.91	6846.67	3925.51	29.8276
31	98.4287	1310.13	7091.73	4066.01	29.8276
32	99.4584	1309.35	7321.36	4197.67	29.8276
33	101.766	1307.61	7778.62	4459.84	29.8276
34	102.936	1306.72	7981.3	4576.04	29.8276
35	104.106	1305.84	8166.43	4682.18	29.8276
36	105.151	1305.5	7659.05	4391.28	29.8276
37	106.196	1305.17	7167.19	4109.27	29.8276
38	107.272	1304.89	6581.42	3773.42	29.8276
39	108.347	1304.62	6019.05	3450.99	29.8276
40	109.423	1304.37	5436.65	3117.08	29.8276
41	110.499	1304.12	4879.7	2797.75	29.8276
42	111.619	1303.87	4315.54	2474.29	29.8276
43	112.74	1303.62	3777.25	2165.67	29.8276
44	113.789	1303.49	3185.99	1826.67	29.8276
45	114.838	1303.35	2631.26	1508.62	29.8276
46	115.887	1303.22	2101.72	1205.01	29.8276
47	116.937	1303.09	1608.17	922.034	29.8275
48	117.986	1302.97	1149.57	659.103	29.8277
49	119.035	1302.84	724.699	415.503	29.8276
50	120.085	1302.71	332.217	190.475	29.8276
51	121.134	1302.59	0	0	0

Cuckoo search, static - 1.55 setback

Global Minimum Query (spencer) - Safety Factor: 1.55494

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	26.068	1333	0	0	0
2	28.6689	1331.03	-357.686	-113.7	17.6342
3	31.2697	1329.05	-231.806	-73.6854	17.6342
4	33.8707	1327.08	331.875	105.495	17.6342
5	36.4716	1325.11	1197.59	380.686	17.6342
6	39.3301	1322.94	2482.8	789.221	17.6342
7	42.1887	1320.78	4120.38	1309.77	17.6342
8	45.0472	1318.62	6110.3	1942.32	17.6342
9	47.9058	1316.45	8452.6	2686.88	17.6342
10	50.7658	1314.29	11146.4	3543.17	17.6342
11	53.6258	1312.13	14192.4	4511.42	17.6342
12	56.4851	1309.97	17589.9	5591.4	17.6342
13	59.3445	1307.8	21339.4	6783.29	17.6342
14	62.2016	1305.64	25437.6	8086	17.6342
15	65.0587	1303.48	29887.3	9500.45	17.6342
16	67.9158	1301.32	34688.5	11026.6	17.6341
17	70.7728	1299.16	39841.2	12664.6	17.6343
18	74.3071	1296.49	46701.5	14845.3	17.6342
19	77.8413	1293.81	54099.7	17197	17.6342
20	81.3772	1291.14	62039.5	19720.9	17.6342
21	84.9131	1288.47	70427.4	22387.2	17.6342
22	88.4486	1285.79	78779.1	25042	17.6342
23	91.9842	1283.12	86993	27653	17.6342
24	95.5197	1280.44	95088.4	30226.3	17.6342
25	99.0552	1277.77	103012	32745.2	17.6343
26	102.029	1277.27	99277	31557.8	17.6342
27	105.002	1276.77	95741	30433.8	17.6342
28	108.054	1276.4	91459.3	29072.7	17.6342
29	111.106	1276.03	87405.8	27784.2	17.6342
30	114.158	1275.77	82956.2	26369.8	17.6342
31	117.21	1275.51	78729.9	25026.4	17.6342
32	120.583	1275.45	73141.7	23250	17.6342
33	123.957	1275.39	67881	21577.8	17.6343
34	127.33	1275.45	62307.2	19806	17.6342
35	130.704	1275.51	57046.4	18133.7	17.6342
36	134.126	1275.63	51713.2	16438.4	17.6342
37	137.548	1275.75	46657.7	14831.4	17.6343
38	140.022	1275.84	43166.1	13721.5	17.6343
39	142.495	1275.93	39806.1	12653.4	17.6342
40	147.072	1276.1	33942.5	10789.5	17.6342
41	149.615	1276.19	30905.5	9824.11	17.6342
42	152.159	1276.28	28030.5	8910.24	17.6342
43	155.2	1276.47	24545.9	7802.54	17.6342
44	158.241	1276.66	21274.2	6762.56	17.6342
45	161.416	1276.96	17841.9	5671.5	17.6342
46	164.59	1277.25	14691.5	4670.07	17.6342
47	167.765	1277.55	11826	3759.19	17.6342
48	170.939	1277.84	9245.95	2939.07	17.6342
49	174.747	1278.38	6236.28	1982.36	17.6342
50	178.556	1278.91	3753.02	1192.99	17.6341
51	186.172	1280.68	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 26-26'; NS-2; pseudo; cuckoo search		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t26ps1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 36

Slide Analysis Information

t26ps1a

Project Summary

File Name:	t26ps1a.slmd
Slide Modeler Version:	8.01
Compute Time:	00h:00m:10.114s
Project Title:	VTTM 60257
Analysis:	Section 26-26'; NS-2; pseudo; cuckoo search
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Alluvium	Bedrock
Color		
Strength Type	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	120	130
Cohesion [psf]	200	
Friction Angle [°]	27	
Cohesion 1 [psf]		300
Cohesion 2 [psf]		300
Friction Angle 1 [°]		18
Friction Angle 2 [°]		32
A [°]		1
B [°]		1
Anisotropic Definition		Surface
Angle from 1 [°]		
Anisotropic Surface		Anisotropic Surface 1
Tensile Strength [psf]		0
Water Surface	None	None
Ru Value	0	0.1

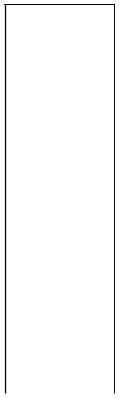
Global Minimums

Method: spencer

FS	1.179150
Axis Location:	163.780, 1473.315
Left Slip Surface Endpoint:	26.068, 1333.000
Right Slip Surface Endpoint:	193.405, 1278.956
Resisting Moment:	5.32823e+07 lb-ft
Driving Moment:	4.51869e+07 lb-ft
Resisting Horizontal Force:	251563 lb
Driving Horizontal Force:	213342 lb
Total Slice Area:	3713.13 ft2
Surface Horizontal Width:	167.337 ft
Surface Average Height:	22.1895 ft

Global Minimum Coordinates

Method: spencer



X	Y
26.068	1333
33.0087	1327.75
39.9494	1322.5
46.8901	1317.24
53.8309	1311.99
60.2768	1307.11
66.7227	1302.24
73.1608	1297.37
79.5973	1292.5
84.737	1288.61
89.8765	1284.73
96.8313	1282.39
103.786	1280.48
110.741	1279.09
117.175	1278.21
124.201	1277.48
131.834	1276.96
139.467	1276.48
147.093	1276.04
153.004	1275.78
161.191	1275.56
168.555	1275.96
173.474	1276.34
178.071	1276.78
182.155	1277.21
186.24	1277.63
193.405	1278.96

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9578
Number of Invalid Surfaces: 478

Error Codes:

Error Code -108 reported for 20 surfaces
Error Code -111 reported for 70 surfaces
Error Code -112 reported for 21 surfaces
Error Code -114 reported for 35 surfaces
Error Code -121 reported for 15 surfaces
Error Code -124 reported for 5 surfaces
Error Code -1000 reported for 312 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

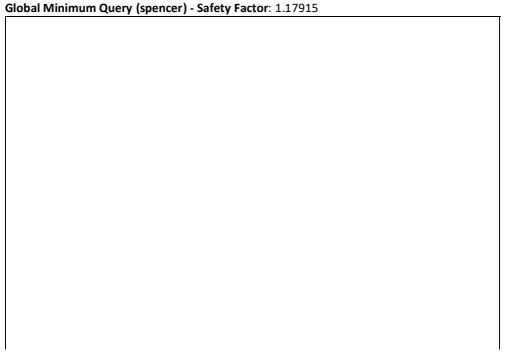
Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.17915

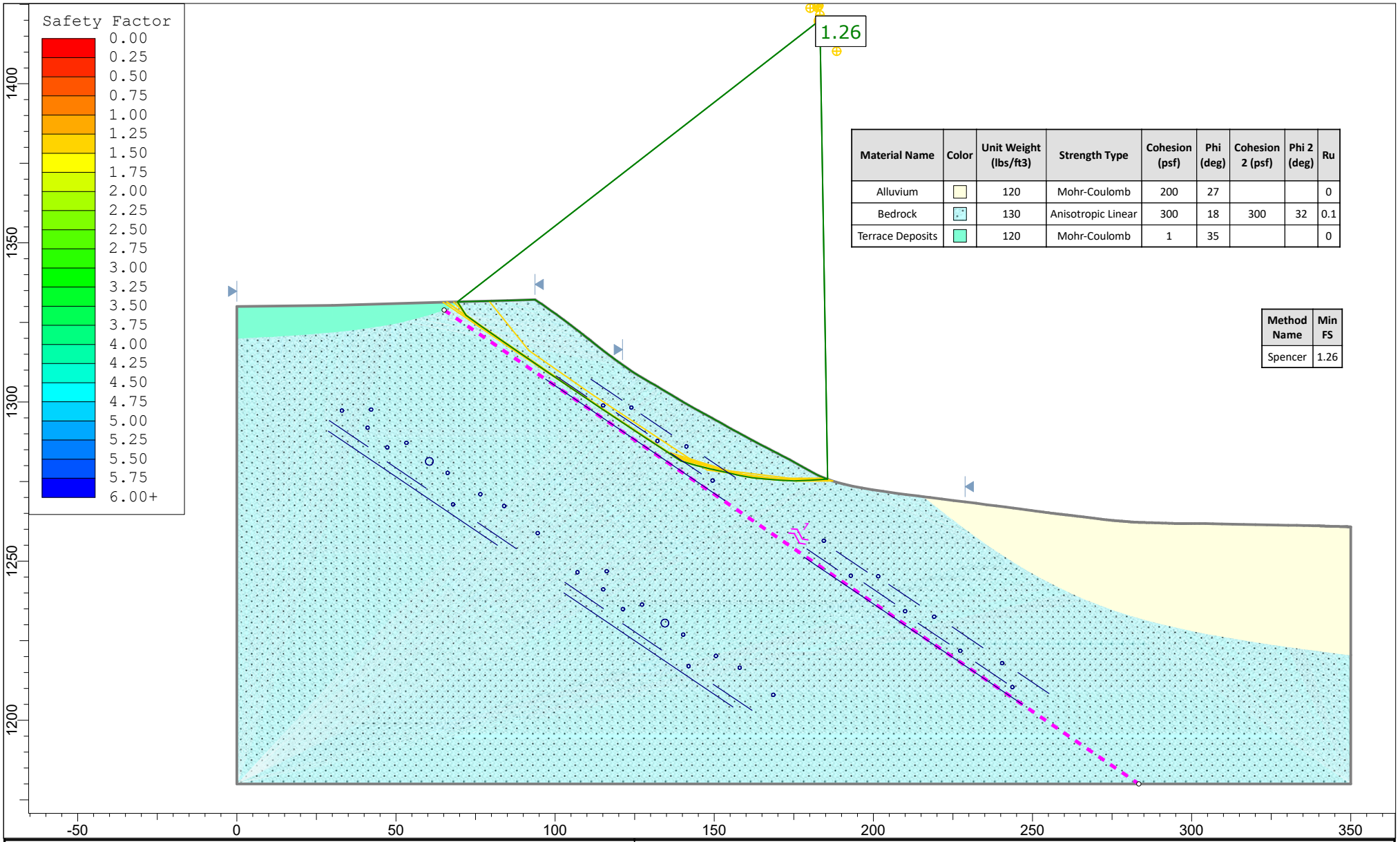
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.47036	983.788	-37.1156	Bedrock	300	18	283.385	334.153	133.461	28.3483	105.113	347.905	319.557
2	3.47036	2922.84	-37.1156	Bedrock	300	18	369.087	435.209	500.353	84.2231	416.13	779.65	695.427
3	3.47036	4320.39	-37.1156	Bedrock	300	18	430.856	508.044	764.786	124.494	640.292	1090.83	966.331
4	3.47036	5511.72	-37.1156	Bedrock	300	18	483.51	570.131	990.199	158.823	831.376	1356.08	1197.26
5	3.47036	6703.04	-37.1156	Bedrock	300	18	536.164	632.218	1215.61	193.151	1022.46	1621.34	1428.19
6	3.47036	7894.36	-37.1156	Bedrock	300	18	588.818	694.305	1441.02	227.48	1213.54	1886.6	1659.12
7	3.47036	9085.69	-37.1156	Bedrock	300	18	641.472	756.392	1666.44	261.808	1404.63	2151.85	1890.05
8	3.47036	10277	-37.1156	Bedrock	300	18	694.126	818.479	1891.85	296.137	1595.71	2417.11	2120.98
9	3.22298	10611.3	-37.1123	Bedrock	300	18	744.932	878.386	2109.33	329.24	1780.09	2672.97	2343.73
10	3.22298	11638.8	-37.1123	Bedrock	300	18	793.829	936.043	2318.66	361.118	1957.54	2919.29	2558.17
11	3.22294	12665.8	-37.1006	Bedrock	300	18	842.839	993.834	2528.39	392.988	2135.4	3165.84	2772.85
12	3.22294	13692.7	-37.1006	Bedrock	300	18	891.725	1051.48	2737.65	424.852	2312.8	3412.07	2987.22
13	3.21907	14701.4	-37.1006	Bedrock	300	18	940.58	1109.09	2946.81	456.697	2490.11	3658.18	3201.48
14	3.21907	15725.9	-37.1006	Bedrock	300	18	989.407	1166.66	3155.82	488.523	2667.3	3904.12	3415.6
15	3.21822	16745.8	-37.1006	Bedrock	300	18	1038.23	1224.22	3364.82	520.344	2844.47	4150.04	3629.7
16	3.21822	17769.7	-37.1006	Bedrock	300	18	1087.04	1281.78	3573.79	552.161	3021.63	4395.93	3843.77
17	2.56987	14925.1	-37.1006	Bedrock	300	18	1130.93	1333.54	3761.68	580.773	3180.91	4617.02	4036.25
18	2.56987	15407.1	-37.1006	Bedrock	300	18	1159.71	1367.47	3884.86	599.528	3285.34	4761.96	4162.44
19	2.56975	15330.2	-37.1006	Bedrock	300	18	1155.16	1362.11	3865.4	596.562	3268.84	4739.06	4142.5
20	2.56975	15162.8	-37.1006	Bedrock	300	18	1145.17	1350.33	3822.63	590.051	3232.58	4688.73	4098.68
21	3.4774	19942.9	-18.599	Bedrock	300	32	2544.91	3000.83	4895.73	573.502	4322.23	5752.14	5178.63
22	3.4774	18996.5	-18.599	Bedrock	300	32	2436.93	2873.51	4664.77	546.285	4118.48	5484.84	4938.55
23	3.47743	17845.3	-15.298	Bedrock	300	32	2446.16	2884.39	4649.06	513.175	4135.89	5318.16	4804.99
24	3.47743	16579.8	-15.298	Bedrock	300	32	2292.47	2703.17	4322.67	476.784	3845.89	4949.73	4472.95
25	3.47757	15361.7	-11.3076	Bedrock	300	32	2307.58	2720.98	4316.11	441.738	3874.37	4777.53	4335.79
26	3.47757	14268.1	-11.3076	Bedrock	300	32	2164.02	2551.71	4013.78	410.289	3603.49	4446.49	4036.2
27	3.21679	12331.5	-7.82923	Bedrock	300	32	2180.93	2571.64	4018.72	383.347	3635.37	4318.6	3935.25
28	3.21679	11563.7	-7.82923	Bedrock	300	32	2064.03	2433.8	3774.28	359.481	3414.8	4058.09	3698.61
29	3.51329	11821.8	-5.92946	Bedrock	300	32	2025.76	2388.67	3679.05	336.488	3342.57	3889.45	3552.96
30	3.51329	11047.8	-5.92946	Bedrock	300	32	1913.45	2256.25	3445.12	314.459	3130.66	3643.85	3329.39
31	2.54429	7561.52	-3.89981	Bedrock	300	32	1901.88	2242.6	3406.01	297.195	3108.81	3535.66	3238.47
32	2.54429	7223.36	-3.89981	Bedrock	300	32	1831.08	2159.12	3259.11	283.904	2975.21	3383.94	3100.04
33	2.54429	6925.15	-3.89981	Bedrock	300	32	1768.64	2085.49	3129.57	272.184	2857.39	3250.14	2977.96
34	3.81646	9899.51	-3.61803	Bedrock	300	32	1710.33	2016.73	3006.74	259.39	2747.35	3114.88	2855.49
35	3.81646	9379.23	-3.61803	Bedrock	300	32	1637.25	1930.56	2855.2	245.757	2609.44	2958.72	2712.97
36	3.81272	8883.62	-3.30193	Bedrock	300	32	1579.03	1861.91	2732.58	232.999	2499.58	2823.68	2590.68
37	3.81272	8382.82	-3.30193	Bedrock	300	32	1508.13	1778.31	2585.65	219.864	2365.78	2672.66	2452.79
38	2.95548	6084.94	-2.45323	Bedrock	300	32	1457.82	1718.99	2476.74	205.886	2270.85	2539.2	2333.31
39	2.95548	5709.98	-2.45323	Bedrock	300	32	1388.01	1636.67	2332.32	193.199	2139.12	2391.79	2198.59
40	2.729	4969.5	-1.5814	Bedrock	300	32	1351.08	1593.13	2251.54	182.099	2069.44	2288.84	2106.74
41	2.729	4731.48	-1.5814	Bedrock	300	32	1302.13	1535.41	2150.44	173.378	1977.06	2186.39	2013.01
42	2.729	4486.87	-1.5814	Bedrock	300	32	1251.82	1476.08	2046.54	164.414	1882.12	2081.1	1916.68
43	3.68193	5580.85	3.11838	Bedrock	300	32	1307.01	1541.16	2137.84	151.574	1986.26	2066.63	1915.06
44	3.68193	4969.32	3.11838	Bedrock	300	32	1202.51	1417.94	1924.04	134.965	1789.08	1858.53	1723.56
45	4.91928	5648.42	4.39568	Bedrock	300	32	1107.93	1306.41	1725.41	114.822	1610.59	1640.25	1525.43
46	4.59687	4203.76	5.55608	Bedrock	300	32	982.229	1158.2	1464.85	91.4484	1373.4	1369.3	1277.85
47	4.08454	2843.44	5.91688	Bedrock	300	32	842.766	993.747	1179.84	69.6146	1110.23	1092.5	1022.89
48	4.08454	2013.83	5.91688	Bedrock	300	32	705.079	831.394	899.713	49.3036	850.409	826.64	777.336
49	3.58259	1039.97	10.483	Bedrock	300	32	631.823	745.014	741.198	29.0284	712.17	624.291	595.263
50	3.58259	334.759	10.483	Bedrock	300	32	478.981	564.791	433.098	9.34407	423.754	344.472	335.128

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.17915



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	26.068	1333	0	0	0
2	29.5384	1330.37	-485.4	-223.563	24.7296
3	33.0087	1327.75	-13.8621	-6.38452	24.7296
4	36.4791	1325.12	1147.38	528.453	24.7296
5	39.9494	1322.5	2896.54	1334.07	24.7296
6	43.4198	1319.87	5233.63	2410.48	24.7296
7	46.8901	1317.24	8158.64	3757.67	24.7296
8	50.3605	1314.62	11671.6	5375.65	24.7296
9	53.8309	1311.99	15772.5	7264.41	24.7296
10	57.0538	1309.55	20107.1	9260.82	24.7296
11	60.2768	1307.11	24948.7	11490.7	24.7295
12	63.4998	1304.68	30295.2	13953.2	24.7296
13	66.7227	1302.24	36148.3	16649	24.7296
14	69.9418	1299.8	42500	19574.5	24.7297
15	73.1608	1297.37	49357.1	22732.7	24.7297
16	76.3791	1294.94	56717.6	26122.8	24.7297
17	79.5973	1292.5	64583.2	29745.5	24.7297
18	82.1671	1290.56	71226.9	32805.4	24.7297
19	84.737	1288.61	78108.4	35974.8	24.7296
20	87.3068	1286.67	84951.9	39126.8	24.7297
21	89.8765	1284.73	91712.9	42240.7	24.7296
22	93.3539	1283.56	91583.7	42181.2	24.7296
23	96.8313	1282.39	91417.7	42104.7	24.7296
24	100.309	1281.44	90010.2	41456.5	24.7296
25	103.786	1280.48	88636.9	40824	24.7296
26	107.264	1279.79	85917.6	39571.5	24.7296
27	110.741	1279.09	83323.3	38376.7	24.7297
28	113.958	1278.65	79935	36816.1	24.7296
29	117.175	1278.21	76699.4	35325.9	24.7297
30	120.688	1277.84	72698	33482.9	24.7296
31	124.201	1277.48	68889.7	31728.9	24.7296
32	126.746	1277.31	65775.8	30294.7	24.7296
33	129.29	1277.13	62765.7	28908.4	24.7297
34	131.834	1276.96	59847.3	27564.2	24.7296
35	135.651	1276.72	55530.4	25576	24.7297
36	139.467	1276.48	51377.8	23663.4	24.7297
37	143.28	1276.26	47291	21781.1	24.7297
38	147.093	1276.04	43367.1	19973.8	24.7296
39	150.048	1275.91	40284.9	18554.2	24.7296
40	153.004	1275.78	37334.5	17195.3	24.7296
41	155.733	1275.71	34562.4	15918.6	24.7296
42	158.462	1275.63	31880.6	14683.4	24.7296
43	161.191	1275.56	29291.6	13491	24.7297
44	164.873	1275.76	24887.6	11462.6	24.7296
45	168.555	1275.96	20819.5	9588.94	24.7296
46	173.474	1276.34	15564.1	7168.42	24.7296
47	178.071	1276.78	11024.4	5077.57	24.7296
48	182.155	1277.21	7509.15	3458.53	24.7296
49	186.24	1277.63	4550.43	2095.81	24.7296
50	189.822	1278.29	1951.52	898.822	24.7296
51	193.405	1278.96	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Ru
Alluvium		120	Mohr-Coulomb	200	27			0
Bedrock		130	Anisotropic Linear	300	18	300	32	0.1
Terrace Deposits		120	Mohr-Coulomb	1	35			0

Method Name	Min FS
Spencer	1.26

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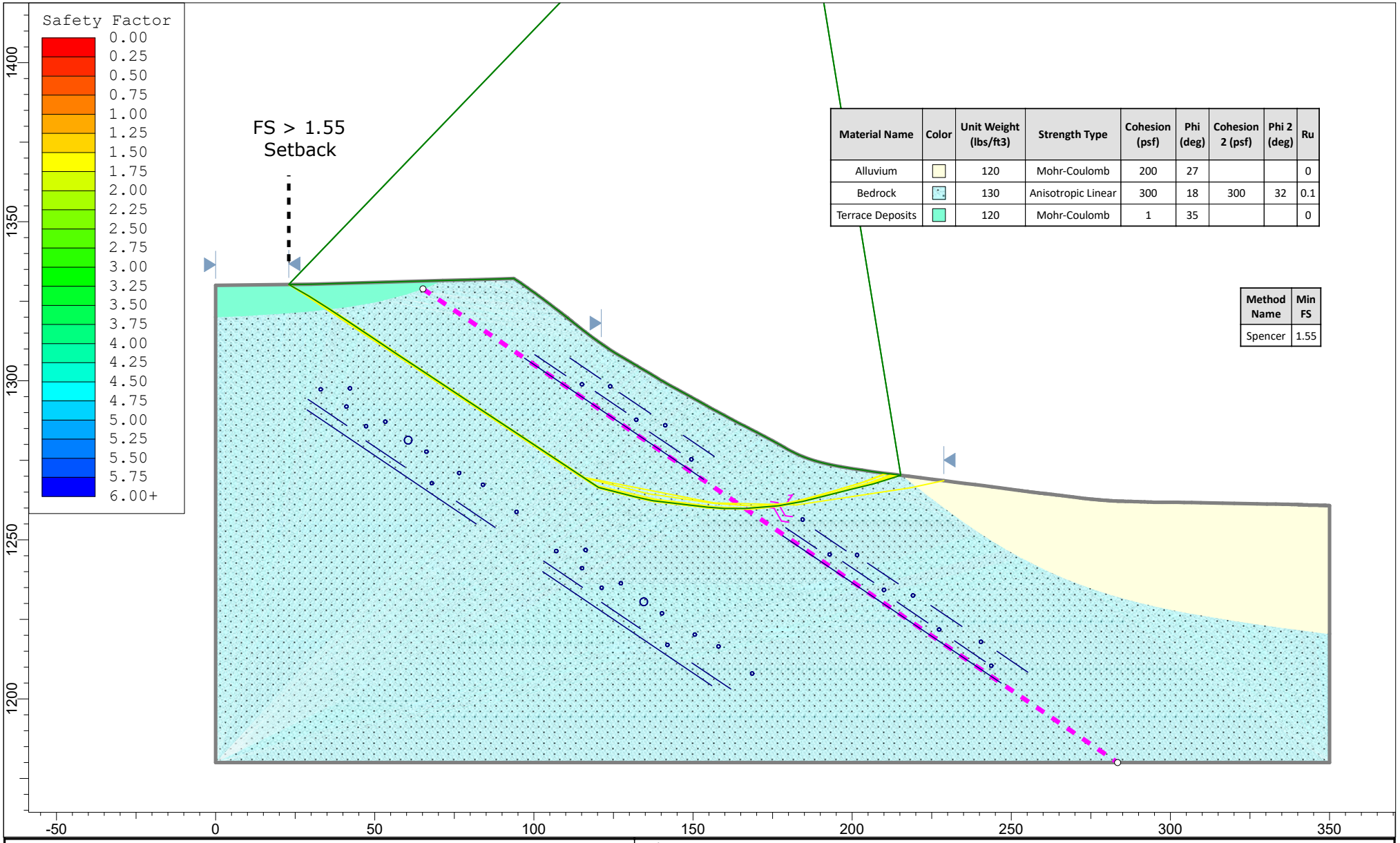
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 27-27'; NS-2; static; cuckoo search; setback analysis		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t27s1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 37



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Ru
Alluvium		120	Mohr-Coulomb	200	27			0
Bedrock		130	Anisotropic Linear	300	18	300	32	0.1
Terrace Deposits		120	Mohr-Coulomb	1	35			0

Method Name	Min FS
Spencer	1.55

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Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 27-27'; NS-2; static; cuckoo search; setback analysis		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t27s1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 38

Slide Analysis Information

t27s1a

Project Summary

File Name: t27s1a.slmd
Slide Modeler Version: 8.01

Currently Open Scenarios

Group Name	Scenario Name	Global Minimum	Compute Time
Cuckoo search, static - min FS	Master Scenario	Spencer: 1.258760	00h:00m:11.253s
Cuckoo search, static - setback	Master Scenario	Spencer: 1.552720	00h:00m:17.865s

General Settings

Units of Measurement: Imperial Units
Time Units: days
Permeability Units: feet/second
Data Output: Standard
Failure Direction: Left to Right

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

All Open Scenarios	
Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

All Open Scenarios	
Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Alluvium	Bedrock	Terrace Deposits
Color			
Strength Type	Mohr-Coulomb	Anisotropic Linear	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	130	120
Cohesion [psf]	200		1
Friction Angle [°]	27		35
Cohesion 1 [psf]		300	
Cohesion 2 [psf]		300	
Friction Angle 1 [°]		18	
Friction Angle 2 [°]		32	
A [°]		1	
B [°]		1	
Anisotropic Definition		Surface	
Angle from 1 [°]			
Anisotropic Surface		Assigned per scenario	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario
Ru Value	0	0.1	0

Materials In Use

Material	Master Scenario	Master Scenario
Alluvium	✓	✓
Bedrock	✓	✓
Terrace Deposits	✓	✓

Global Minimums

Cuckoo search, static - min FS	Cuckoo search, static - setback
Method: spencer	**Method: spencer**
FS 1.258760	**FS** 1.552720
Axis Location: 183.226, 1419.915	Axis Location: 179.110, 1492.571
Left Slip Surface Endpoint: 69.355, 1331.447	Left Slip Surface Endpoint: 23.000, 1330.281
Right Slip Surface Endpoint: 185.678, 1275.737	Right Slip Surface Endpoint: 215.276, 1270.308
Resisting Moment: 1.66793e+07 lb-ft	Resisting Moment: 7.91877e+07 lb-ft
Driving Moment: 1.32506e+07 lb-ft	Driving Moment: 5.13111e+07 lb-ft
Resisting Horizontal Force: 105385 lb	Resisting Horizontal Force: 323582 lb
Driving Horizontal Force: 83721.2 lb	Driving Horizontal Force: 209671 lb
Total Slice Area: 1634.65 ft2	Total Slice Area: 5174.05 ft2
Surface Horizontal Width: 116.323 ft	Surface Horizontal Width: 192.276 ft
Surface Average Height: 14.0527 ft	Surface Average Height: 26.9095 ft

Global Minimum Coordinates

Cuckoo search, static - min FS

Method: spencer

X	Y
69.355	1331.45
72.0625	1327.21
76.5141	1324.06
80.9657	1320.91
84.6558	1318.3
88.436	1315.7
93.6449	1312.14
98.8696	1308.58
104.094	1305.01
109.378	1301.43
114.689	1297.86
119.999	1294.3
125.473	1290.71
130.946	1287.11
135.25	1284.29
139.553	1281.46
144.311	1280.04
148.849	1278.96
153.338	1277.96
157.827	1276.96
162.047	1276.19
166.422	1275.76
170.797	1275.43
175.172	1275.22
180.455	1275.45
185.678	1275.74

Cuckoo search, static - setback

Method: spencer

X	Y
22.9996	1330.28
29.2643	1326.68
35.5288	1322.68
41.7932	1318.56
49.4942	1313.39
57.1952	1308.25
64.4469	1303.46
71.6913	1298.68
78.9245	1293.91
86.1578	1289.13
93.801	1284.06
101.444	1278.98
106.188	1275.84
110.932	1272.7
115.628	1269.59
120.325	1266.48
126.033	1264.99
131.74	1263.53
137.448	1262.29
145.713	1261.3
154.525	1260.27
159.9	1259.9
166.375	1259.84
176.757	1260.73
184.521	1262.09
192.285	1264.01
199.438	1265.8
206.591	1267.54
215.276	1270.31

Valid/Invalid Surfaces

Cuckoo search, static - min FS

Method: spencer

Number of Valid Surfaces: 9190
Number of Invalid Surfaces: 867

Error Codes:

Error Code -108 reported for 55 surfaces
Error Code -111 reported for 30 surfaces
Error Code -112 reported for 22 surfaces
Error Code -114 reported for 64 surfaces
Error Code -121 reported for 7 surfaces
Error Code -124 reported for 19 surfaces
Error Code -1000 reported for 670 surfaces

Cuckoo search, static - setback

Method: spencer

Number of Valid Surfaces: 9382
Number of Invalid Surfaces: 680

Error Codes:

Error Code -108 reported for 11 surfaces
Error Code -112 reported for 24 surfaces
Error Code -114 reported for 73 surfaces
Error Code -121 reported for 40 surfaces
Error Code -124 reported for 9 surfaces
Error Code -1000 reported for 523 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

Cuckoo search, static - min FS

Global Minimum Query (spencer) - Safety Factor: 1.25876

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.418993	16.7826	-57.4361	Terrace Deposits	1	35	10.129	12.75	16.7808	0	16.7808	32.6411	32.6411
2	2.28849	735.713	-57.4361	Bedrock	300	32	238.873	300.684	33.2435	32.1484	1.09514	407.278	375.13
3	2.2258	1484.97	-35.2896	Bedrock	300	18	334.864	421.514	440.697	66.7163	373.981	677.703	610.987
4	2.2258	1958.49	-35.2896	Bedrock	300	18	369.158	464.681	594.826	87.9903	506.836	856.103	768.113
5	2.2258	2431.87	-35.2736	Bedrock	300	18	403.499	507.909	749.135	109.258	639.877	1034.55	925.292
6	2.2258	2905.11	-35.2736	Bedrock	300	18	437.781	551.061	903.209	130.52	772.689	1212.87	1082.35
7	1.84504	2766.87	-35.272	Bedrock	300	18	469.138	590.532	1044.13	149.963	894.166	1375.95	1225.99
8	1.84504	3092.03	-35.272	Bedrock	300	18	497.554	626.301	1171.84	167.586	1004.25	1523.76	1356.17
9	1.89008	3500.62	-34.4561	Bedrock	300	18	530.432	667.687	1316.84	185.21	1131.63	1680.79	1495.58
10	1.89008	3834.52	-34.4561	Bedrock	300	18	559.264	703.979	1446.2	202.876	1243.32	1829.94	1627.06
11	2.60445	5830.04	-34.3792	Bedrock	300	18	593.987	747.687	1601.69	223.85	1377.84	2008.08	1784.23
12	2.60445	6462.38	-34.3792	Bedrock	300	18	633.656	797.621	1779.65	248.128	1531.52	2213.19	1965.06
13	2.61236	6820.65	-34.299	Bedrock	300	18	655.423	825.02	1876.94	261.092	1615.85	2324.02	2062.93
14	2.61236	6818.21	-34.299	Bedrock	300	18	655.269	824.827	1876.25	260.998	1615.25	2323.23	2062.23
15	2.61236	6787.04	-34.299	Bedrock	300	18	653.318	822.37	1867.49	259.805	1607.69	2313.14	2053.34
16	2.61236	6736.3	-34.299	Bedrock	300	18	650.141	818.371	1853.24	257.863	1595.38	2296.72	2038.86
17	2.6421	6746.73	-34.1197	Bedrock	300	18	647.324	814.825	1839.83	255.355	1584.47	2278.42	2023.07
18	2.6421	6668.22	-34.1197	Bedrock	300	18	642.451	808.691	1817.97	252.384	1565.59	2253.27	2000.88
19	2.65514	6600.48	-33.9429	Bedrock	300	18	637.473	802.425	1794.9	248.593	1546.3	2223.95	1975.36
20	2.65514	6488.21	-33.9429	Bedrock	300	18	630.519	793.672	1763.73	244.364	1519.36	2188.11	1943.74
21	2.65514	6387.44	-33.7899	Bedrock	300	18	625.322	787.13	1739.8	240.569	1499.23	2158.26	1917.69
22	2.65514	6315.88	-33.7899	Bedrock	300	18	620.88	781.539	1719.9	237.874	1482.02	2135.38	1897.51
23	2.73685	6455.79	-33.3044	Bedrock	300	18	620.861	781.515	1717.83	235.884	1481.95	2125.73	1889.85
24	2.73685	6428.75	-33.3044	Bedrock	300	18	619.221	779.451	1710.49	234.896	1475.6	2117.32	1882.42
25	2.73685	6455.97	-33.2961	Bedrock	300	18	620.928	781.599	1718.1	235.891	1482.21	2125.91	1890.02
26	2.73685	6520.14	-33.2961	Bedrock	300	18	624.82	786.499	1735.52	238.236	1497.29	2145.89	1907.66
27	2.15163	5176.75	-33.2961	Bedrock	300	18	628.739	791.432	1753.07	240.597	1512.47	2166.01	1925.42
28	2.15163	5220.28	-33.2961	Bedrock	300	18	632.098	795.66	1768.1	242.62	1525.48	2183.25	1940.63
29	2.15163	5257.59	-33.2961	Bedrock	300	18	634.976	799.283	1780.99	244.354	1536.64	2198.03	1953.67
30	2.15163	5283.46	-33.2961	Bedrock	300	18	636.972	801.795	1789.92	245.556	1544.37	2208.27	1962.72
31	2.37896	5749.21	-16.5765	Bedrock	300	32	1262.85	1589.63	2305.5	241.669	2063.83	2681.41	2439.74
32	2.37896	5552.9	-16.5765	Bedrock	300	32	1228.49	1546.37	2228.02	233.418	1994.61	2593.7	2360.29
33	2.26906	5103.81	-13.3846	Bedrock	300	32	1257.79	1583.25	2278.56	224.931	2053.63	2577.85	2352.92
34	2.26906	4897	-13.3846	Bedrock	300	32	1217.54	1532.59	2188.37	215.817	1972.56	2478.09	2262.27
35	2.24459	4633.04	-12.5687	Bedrock	300	32	1192.16	1500.64	2127.83	206.41	1921.42	2393.63	2187.22
36	2.24459	4413.24	-12.5687	Bedrock	300	32	1148.25	1445.37	2029.59	196.617	1832.98	2285.6	2088.98
37	2.24459	4192.12	-12.5687	Bedrock	300	32	1104.08	1389.77	1930.76	186.766	1744	2176.92	1990.15
38	2.24459	3974.89	-12.5687	Bedrock	300	32	1060.69	1335.15	1833.68	177.088	1656.59	2070.16	1893.07
39	2.10971	3532.09	-10.3298	Bedrock	300	32	1056.08	1329.35	1814.72	167.421	1647.3	2007.21	1839.79
40	2.10971	3327.18	-10.3298	Bedrock	300	32	1010.65	1272.16	1713.49	157.708	1555.78	1897.7	1739.99
41	2.18754	3211.44	-5.67355	Bedrock	300	32	1040.09	1309.22	1761.89	146.806	1615.08	1865.22	1718.41
42	2.18754	2946.4	-5.67355	Bedrock	300	32	977.966	1231.03	1624.64	134.69	1489.95	1721.8	1587.11
43	2.18754	2676.23	-4.23843	Bedrock	300	32	938.376	1181.19	1532.54	122.34	1410.2	1602.08	1479.74
44	2.18754	2399.91	-4.23843	Bedrock	300	32	871.675	1097.23	1385.54	109.708	1275.83	1450.14	1340.43
45	2.18754	2114.13	-2.76753	Bedrock	300	32	824.094	1037.34	1276.63	96.6443	1179.99	1316.47	1219.82
46	2.18754	1814.61	-2.76753	Bedrock	300	32	749.519	943.465	1112.71	82.9521	1029.76	1148.94	1065.99
47	2.64142	1736.15	2.41138	Bedrock	300	32	721.468	908.155	1038.98	65.7278	973.25	1008.6	942.868
48	2.64142	1185.01	2.41138	Bedrock	300	32	593.819	747.476	760.972	44.8627	716.11	735.966	691.103
49	2.61153	651.615	3.19647	Bedrock	300	32	478.641	602.494	509.043	24.9515	484.091	482.312	457.361
50	2.61153	199.831	3.19647	Bedrock	300	32	370.809	466.76	274.523	7.6519	266.871	253.815	246.163

Cuckoo search, static - setback

Global Minimum Query (spencer) - Safety Factor: 1.55272

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.13232	345.754	-29.9044	Terrace Deposits	1	35	38.8946	60.3924	84.8211	0	84.8211	107.19	107.19
2	3.13232	1037.26	-29.9044	Terrace Deposits	1	35	115.517	179.366	254.732	0	254.732	321.17	321.17
3	3.13224	1771.39	-32.5661	Terrace Deposits	1	35	189.752	294.631	419.349	0	419.349	540.542	540.542
4	3.13224	2555.16	-32.5661	Terrace Deposits	1	35	273.456	424.601	604.965	0	604.965	779.619	779.619
5	0.163138	154.599	-33.3212	Terrace Deposits	1	35	314.234	487.918	695.391	0	695.391	901.971	901.971
6	3.05068	3329.95	-33.3212	Bedrock	300	18	339.221	526.715	806.911	109.154	697.757	1029.92	920.763
7	3.05068	4167.96	-33.3212	Bedrock	300	18	378.875	588.287	1023.88	136.624	887.255	1272.95	1136.33
8	3.85047	6472.55	-33.8696	Bedrock	300	18	422.475	655.985	1263.71	168.097	1095.61	1547.27	1379.18
9	3.85047	7839.82	-33.8696	Bedrock	300	18	473.43	735.105	1542.72	203.607	1339.11	1860.49	1656.88
10	3.85048	9207.54	-33.7195	Bedrock	300	18	525.07	815.287	1825.02	239.127	1585.89	2175.45	1936.33
11	3.85048	10576.4	-33.7195	Bedrock	300	18	576.168	894.627	2104.75	274.677	1830.08	2489.29	2214.62
12	3.62588	11209.6	-33.4229	Bedrock	300	18	627.367	974.125	2383.9	309.154	2074.74	2797.93	2488.78
13	3.62588	12421.1	-33.4229	Bedrock	300	18	675.547	1048.94	2647.55	342.567	2304.99	3093.38	2750.82
14	3.62217	13624.2	-33.4132	Bedrock	300	18	724.014	1124.19	2912.74	376.134	2536.61	3390.38	3014.25
15	3.62217	14848.4	-33.4132	Bedrock	300	18	772.754	1199.87	3179.44	409.931	2769.51	3689.23	3279.3
16	3.61663	16018.5	-33.4464	Bedrock	300	18	820.064	1273.33	3438.52	442.913	2995.6	3980.2	3537.29
17	3.61663	17188.4	-33.4464	Bedrock	300	18	866.692	1345.73	3693.71	475.26	3218.45	4266.19	3790.93
18	3.61663	18358.3	-33.4464	Bedrock	300	18	913.326	1418.14	3948.9	507.607	3441.29	4552.19	4044.58
19	3.61663	19528.6	-33.4464	Bedrock	300	18	959.98	1490.58	4204.18	539.967	3664.22	4838.29	4298.32
20	3.82159	21917.3	-33.5694	Bedrock	300	18	1007.14	1563.81	4463.13	573.511	3889.62	5131.5	4557.99
21	3.82159	23239.3	-33.5694	Bedrock	300	18	1056.95	1641.14	4735.73	608.105	4127.63	5437.15	4829.05
22	3.82159	23861.4	-33.5901	Bedrock	300	18	1080.17	1677.2	4862.96	624.384	4238.58	5580.36	4955.97
23	3.82159	23789.5	-33.5901	Bedrock	300	18	1077.46	1673	4848.14	622.503	4225.64	5563.74	4941.23
24	4.74389	29326.9	-33.493	Bedrock	300	18	1072.28	1664.95	4819.09	618.204	4200.89	5528.63	4910.43
25	4.74389	29030	-33.5264	Bedrock	300	18	1062.92	1650.42	4768.1	611.946	4156.15	5472.34	4860.39
26	4.69641	28374.5	-33.5264	Bedrock	300	18	1051.73	1633.04	4706.83	604.175	4102.66	5403.65	4799.48
27	4.69641	28071.1	-33.5264	Bedrock	300	18	1042.42	1618.58	4655.91	597.713	4058.19	5346.56	4748.84
28	5.70779	33079.5	-14.5581	Bedrock	300	32	2159.84	3353.62	5466.36	579.549	4886.81	6027.27	5447.72
29	2.85391	15937.7	-14.3943	Bedrock	300	32	2092.71	3249.4	5278.48	558.451	4720.03	5815.57	5257.12
30	2.85391	15587.7	-14.3943	Bedrock	300	32	2051.1	3184.78	5162.81	546.19	4616.62	5689.22	5143.03
31	5.70783	30047.5	-12.2607	Bedrock	300	32	2038.5	3165.22	5111.74	526.426	4585.32	5554.75	5028.32
32	4.1322	20622.5	-6.8012	Bedrock	300	32	2084.93	3237.31	5199.75	499.068	4700.68	5448.41	4949.34
33	4.1322	19616.5	-6.8012	Bedrock	300	32	1993.4	3095.19	4947.94	474.722	4473.22	5185.68	4710.96
34	4.40603	19864.2	-6.67811	Bedrock	300	32	1906.69	2960.55	4708.61	450.841	4257.77	4931.86	4481.01
35	4.40603	18758.8	-6.67811	Bedrock	300	32	1812.21	2813.85	4448.77	425.752	4023.01	4660.95	4235.2
36	5.37496	21296.1	-3.96786	Bedrock	300	32	1762.83	2737.18	4296.51	396.208	3900.31	4418.79	4022.58
37	3.23778	11935.1	-0.539849	Bedrock	300	32	1733.62	2691.83	4196.34	368.62	3827.72	4212.67	3844.05
38	3.23778	11228.5	-0.539849	Bedrock	300	32	1643.99	2552.66	3951.83	346.796	3605.03	3967.32	3620.52
39	5.19086	16381.3	4.90037	Bedrock	300	32	1637.74	2542.95	3905.04	315.581	3589.46	3764.63	3449.05
40	5.19086	14239.4	4.90037	Bedrock	300	32	1453.8	2257.34	3406.72	274.317	3132.41	3282.08	3007.76
41	3.88198	9094.99	9.97133	Bedrock	300	32	1377.8	2139.33	3177.83	234.287	2943.55	2935.6	2701.31
42	3.88198	7722.69	9.97133	Bedrock	300	32	1206.62	1873.55	2717.15	198.937	2518.21	2505.01	2306.07
43	3.88209	6509.67	13.9087	Bedrock	300	32	1125.42	1747.46	2484.11	167.685	2316.43	2205.42	2037.73
44	3.88209	5435.76	13.9087	Bedrock	300	32	981.78	1524.43	2099.52	140.022	1959.5	1856.39	1716.37
45	3.57658	4180.53	14.0487	Bedrock	300	32	863.665	1341.03	1782.88	116.886	1666	1566.77	1449.88
46	3.57658	3453.7	14.0487	Bedrock	300	32	757.869	1176.76	1499.67	96.5642	1403.11	1310.03	1213.46
47	3.57658	2774.03	13.63	Bedrock	300	32	654.526	1016.29	1223.87	77.561	1146.31	1065.16	987.602
48	3.57658	2127.01	13.63	Bedrock	300	32	561.072	871.188	973.561	59.4706	914.091	837.513	778.042
49	4.34217	1643.09	17.6902	Bedrock	300	32	478.965	743.699	747.909	37.8402	710.068	595.142	557.302
50	4.34217	545.481	17.6902	Bedrock	300	32	342.048	531.104	382.405	12.5624	369.842	273.308	260.746

Interslice Data

Cuckoo search, static - min FS

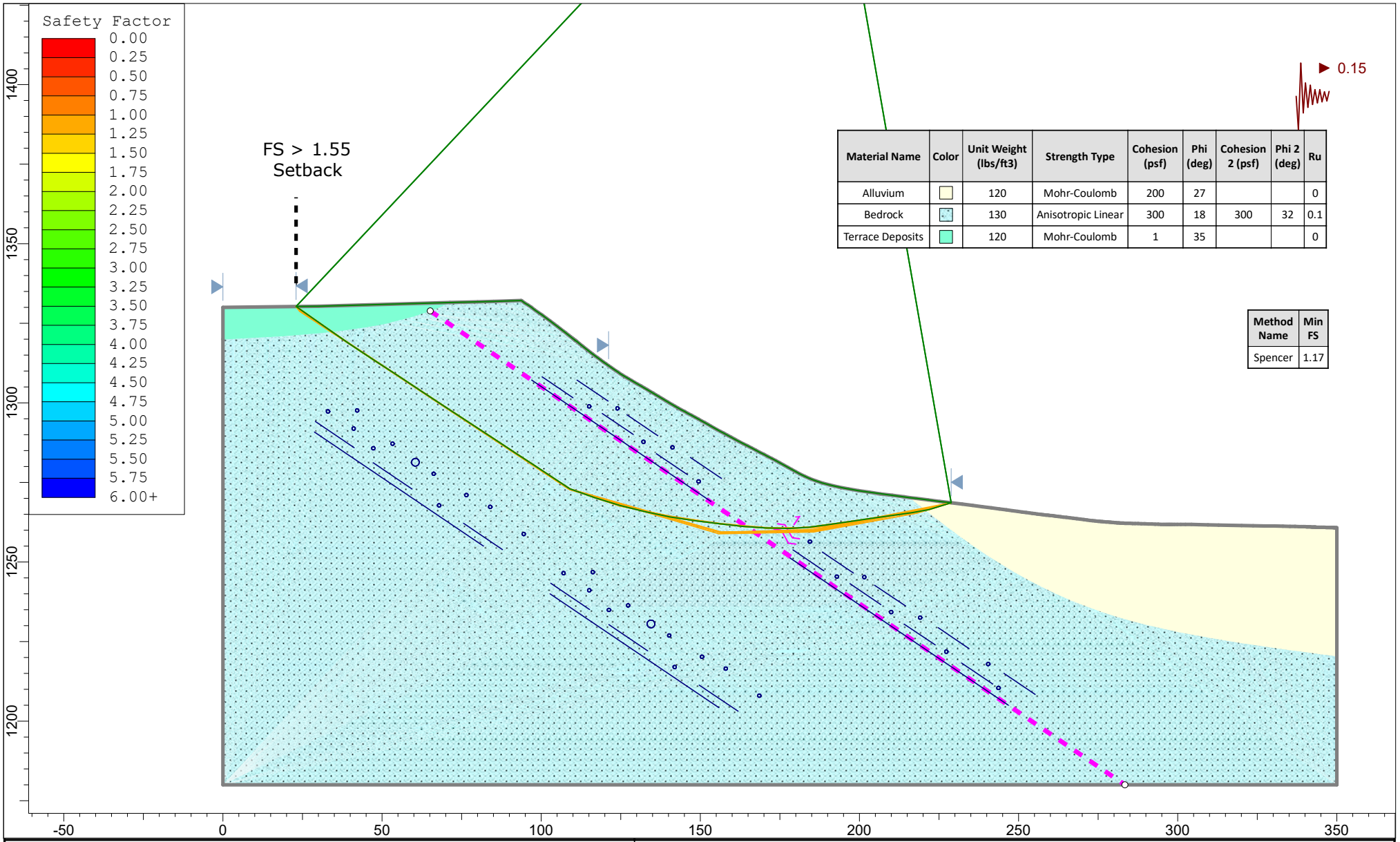
Global Minimum Query (spencer) - Safety Factor: 1.25876

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	69.355	1331.45	0	0	0
2	69.774	1330.79	6.76536	3.1061	24.6607
3	72.0625	1327.21	-420.771	-193.183	24.6606
4	74.2883	1325.63	-471.863	-216.641	24.6607
5	76.5141	1324.06	-356.479	-163.666	24.6607
6	78.7399	1322.48	-75.1394	-34.4978	24.6607
7	80.9657	1320.91	372.47	171.007	24.6606
8	82.8108	1319.6	869.483	399.195	24.6607
9	84.6558	1318.3	1480.73	679.83	24.6607
10	86.5459	1317	2185.96	1003.61	24.6606
11	88.436	1315.7	3004.46	1379.4	24.6607
12	91.0404	1313.92	4311.51	1979.49	24.6607
13	93.6449	1312.14	5832.36	2677.74	24.6607
14	96.2572	1310.36	7464.8	3427.22	24.6607
15	98.8696	1308.58	9096.41	4176.32	24.6607
16	101.482	1306.79	10717.5	4920.6	24.6607
17	104.094	1305.01	12321.5	5657.03	24.6607
18	106.736	1303.22	13904.8	6383.95	24.6607
19	109.378	1301.43	15461.9	7098.81	24.6606
20	112.034	1299.64	16976.9	7794.39	24.6607
21	114.689	1297.86	18454.7	8472.87	24.6607
22	117.344	1296.08	19885.6	9129.83	24.6607
23	119.999	1294.3	21293	9775.98	24.6607
24	122.736	1292.51	22682.6	10414	24.6607
25	125.473	1290.71	24063.4	11047.9	24.6606
26	128.21	1288.91	25452.3	11685.6	24.6607
27	130.946	1287.11	26861.9	12332.8	24.6607
28	133.098	1285.7	27986.4	12849.1	24.6608
29	135.25	1284.29	29125	13371.8	24.6607
30	137.401	1282.87	30275.5	13900	24.6607
31	139.553	1281.46	31434.4	14432.1	24.6607
32	141.932	1280.75	30062.8	13802.4	24.6608
33	144.311	1280.04	28718	13184.9	24.6606
34	146.58	1279.5	27094.3	12439.5	24.6607
35	148.849	1278.96	25513.1	11713.5	24.6607
36	151.094	1278.46	23902.1	10973.9	24.6607
37	153.338	1277.96	22340.4	10256.9	24.6607
38	155.583	1277.46	20828.4	9562.71	24.6607
39	157.827	1276.96	19365.3	8890.94	24.6607
40	159.937	1276.58	17835.1	8188.4	24.6607
41	162.047	1276.19	16361.8	7511.99	24.6607
42	164.234	1275.98	14469.5	6643.19	24.6606
43	166.422	1275.76	12683.2	5823.08	24.6607
44	168.609	1275.6	10878.9	4994.71	24.6608
45	170.797	1275.43	9196.72	4222.38	24.6607
46	172.984	1275.33	7528.98	3456.69	24.6607
47	175.172	1275.22	6007.04	2757.94	24.6607
48	177.813	1275.33	3985.77	1829.94	24.6607
49	180.455	1275.45	2332.59	1070.94	24.6608
50	183.066	1275.59	1008.37	462.959	24.6606
51	185.678	1275.74	0	0	0

Cuckoo search, static - setback

Global Minimum Query (spencer) - Safety Factor: 1.55272

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	22.9996	1330.28	0	0	0
2	26.132	1328.48	29.9014	9.20776	17.1156
3	29.2643	1326.68	123.777	38.1156	17.1156
4	32.3965	1324.68	363.122	111.819	17.1156
5	35.5288	1322.68	709.311	218.424	17.1156
6	35.6919	1322.57	732.175	225.465	17.1156
7	38.7426	1320.56	1306.5	402.322	17.1156
8	41.7932	1318.56	2193.93	675.595	17.1156
9	45.6437	1315.97	3818.87	1175.97	17.1155
10	49.4942	1313.39	5966.97	1837.46	17.1156
11	53.3447	1310.82	8617.42	2653.63	17.1156
12	57.1952	1308.25	11788.3	3630.05	17.1155
13	60.821	1305.86	15197.9	4680.02	17.1156
14	64.4469	1303.46	19062.3	5870.01	17.1156
15	68.0691	1301.07	23376.9	7198.64	17.1156
16	71.6913	1298.68	28150.8	8668.69	17.1156
17	75.3079	1296.3	33373.2	10276.9	17.1156
18	78.9245	1293.91	39035.1	12020.4	17.1156
19	82.5412	1291.52	45136.5	13899.2	17.1155
20	86.1578	1289.13	51677.5	15913.5	17.1156
21	89.9794	1286.59	59113.8	18203.4	17.1156
22	93.801	1284.06	67049.4	20647	17.1155
23	97.6226	1281.52	75227.9	23165.5	17.1156
24	101.444	1278.98	83379.1	25675.6	17.1156
25	106.188	1275.84	93375.1	28753.7	17.1156
26	110.932	1272.7	103275	31802.2	17.1155
27	115.628	1269.59	112938	34777.8	17.1155
28	120.325	1266.48	122486	37718.2	17.1156
29	126.033	1264.99	118153	36383.8	17.1156
30	128.886	1264.26	115994	35719	17.1156
31	131.74	1263.53	113871	35065.1	17.1155
32	137.448	1262.29	108473	33403.1	17.1157
33	141.58	1261.79	102345	31515.8	17.1155
34	145.713	1261.3	96473.6	29707.9	17.1156
35	150.119	1260.79	90427.9	27846.2	17.1156
36	154.525	1260.27	84668	26072.5	17.1156
37	159.9	1259.9	76711.3	23622.3	17.1156
38	163.137	1259.87	71176.9	21918.1	17.1156
39	166.375	1259.84	65927.7	20301.6	17.1156
40	171.566	1260.28	55613.7	17125.6	17.1156
41	176.757	1260.73	46484.7	14314.4	17.1156
42	180.639	1261.41	38920.2	11985	17.1156
43	184.521	1262.09	32340.4	9958.85	17.1156
44	188.403	1263.05	25544.9	7866.25	17.1156
45	192.285	1264.01	19681.7	6060.73	17.1156
46	195.862	1264.91	14969.9	4609.79	17.1155
47	199.438	1265.8	10893.3	3354.45	17.1155
48	203.015	1266.67	7470.31	2300.39	17.1156
49	206.591	1267.54	4601.61	1417.01	17.1156
50	210.934	1268.92	1467.75	451.976	17.1156
51	215.276	1270.31	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)	Ru
Alluvium		120	Mohr-Coulomb	200	27			0
Bedrock		130	Anisotropic Linear	300	18	300	32	0.1
Terrace Deposits		120	Mohr-Coulomb	1	35			0

Method Name	Min FS
Spencer	1.17

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.010

Analysis:	Section 27-27'; NS-2; pseudo; cuckoo search; setback analysis		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t27ps1a.slmd
		Scale:	1:500
Project No.:	18-1245A-4	*Date:* 6/6/2018	*Figure No.:* Run No. 39

Slide Analysis Information

t27ps1a

Project Summary

File Name:	t27ps1a.slmd
Slide Modeler Version:	8.01
Compute Time:	00h:00m:13.296s
Project Title:	VTTM 60257
Analysis:	Section 27-27'; NS-2; pseudo; cuckoo search; setback analysis
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis: No
Staged pseudostatic analysis: No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Alluvium	Bedrock	Terrace Deposits
Color			
Strength Type	Mohr-Coulomb	Anisotropic Linear	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	130	120
Cohesion [psf]	200		1
Friction Angle [°]	27		35
Cohesion 1 [psf]		300	
Cohesion 2 [psf]		300	
Friction Angle 1 [°]		18	
Friction Angle 2 [°]		32	
A [°]		1	
B [°]		1	
Anisotropic Definition		Surface	
Angle from 1 [°]			
Anisotropic Surface		Anisotropic Surface 1	
Water Surface	None	None	None
Ru Value	0	0.1	0

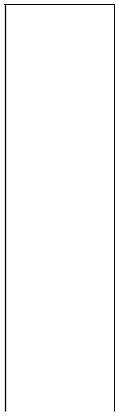
Global Minimums

Method: spencer

FS	1.168850
Axis Location:	187.601, 1505.283
Left Slip Surface Endpoint:	23.000, 1330.281
Right Slip Surface Endpoint:	228.842, 1268.601
Resisting Moment:	8.84212e+07 lb-ft
Driving Moment:	7.56481e+07 lb-ft
Resisting Horizontal Force:	342808 lb
Driving Horizontal Force:	293287 lb
Total Slice Area:	5283.45 ft2
Surface Horizontal Width:	205.843 ft
Surface Average Height:	25.6674 ft

Global Minimum Coordinates

Method: spencer



X	Y
22.9996	1330.28
31.2348	1324.52
39.47	1318.75
47.1403	1313.7
54.8106	1308.65
62.4809	1303.61
70.1541	1298.57
77.8021	1293.55
85.4616	1288.52
91.4319	1284.59
97.4207	1280.66
103.247	1276.83
109.073	1273.01
116.921	1270.22
124.77	1267.75
132.61	1265.8
140.449	1264.2
148.288	1262.97
156.127	1262.01
163.429	1261.21
170.731	1260.7
178.008	1260.58
183.918	1260.92
189.829	1261.67
197.683	1262.8
205.538	1263.93
210.972	1264.72
216.406	1265.5
221.84	1266.46
228.842	1268.6

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9337
Number of Invalid Surfaces: 719

Error Codes:

Error Code -108 reported for 34 surfaces
Error Code -111 reported for 30 surfaces
Error Code -112 reported for 30 surfaces
Error Code -114 reported for 92 surfaces
Error Code -121 reported for 44 surfaces
Error Code -124 reported for 14 surfaces
Error Code -1000 reported for 475 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

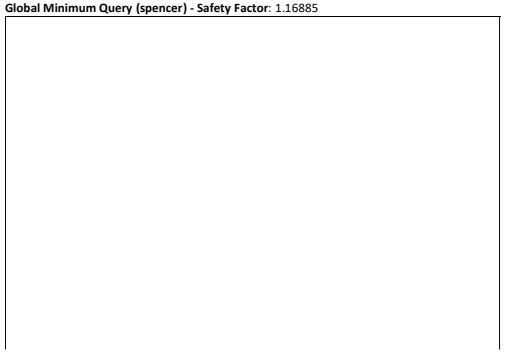
Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.16885

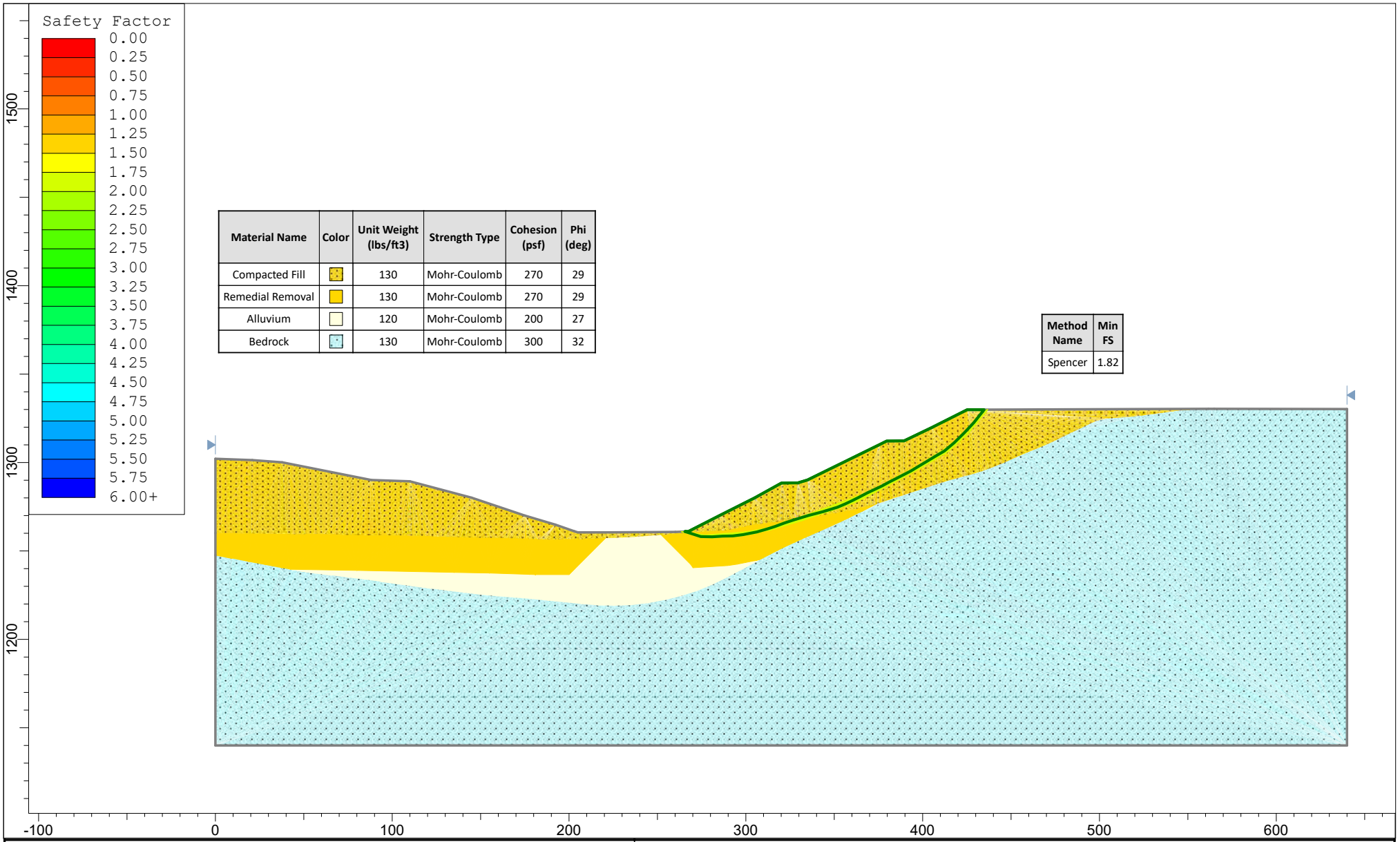
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.11758	724.337	-34.9858	Terrace Deposits	1	35	67.887	79.3497	111.895	0	111.895	159.405	159.405
2	4.11758	2174.41	-34.9858	Terrace Deposits	1	35	202.255	236.406	336.194	0	336.194	477.739	477.739
3	3.02116	2530.97	-34.9858	Terrace Deposits	1	35	320.41	374.511	533.428	0	533.428	757.662	757.662
4	5.214	6352.88	-34.9858	Bedrock	300	18	439.848	514.116	780.824	121.843	658.981	1088.65	966.803
5	3.83516	6292.25	-33.3842	Bedrock	300	18	516.098	603.241	1097.35	164.067	933.279	1437.45	1273.38
6	3.83516	7623.18	-33.3842	Bedrock	300	18	573.319	670.124	1337.9	198.771	1139.13	1715.7	1516.93
7	3.83516	8957.45	-33.3721	Bedrock	300	18	630.767	737.272	1579.35	233.561	1345.79	1994.82	1761.26
8	3.83516	10295.7	-33.3721	Bedrock	300	18	688.315	804.537	1821.26	268.456	1552.8	2274.64	2006.18
9	3.83516	11637.3	-33.3007	Bedrock	300	18	746.619	872.686	2065.98	303.438	1762.54	2556.43	2252.99
10	3.83516	12983.1	-33.3007	Bedrock	300	18	804.551	940.4	2309.48	338.529	1970.95	2837.99	2499.46
11	3.83657	14341.2	-33.296	Bedrock	300	18	862.834	1008.52	2554.42	373.803	2180.61	3121.11	2747.3
12	3.83657	15703.9	-33.296	Bedrock	300	18	921.475	1077.07	2800.88	409.321	2391.56	3406.09	2996.77
13	3.82404	17002.5	-33.296	Bedrock	300	18	979.758	1145.19	3045.85	444.622	2601.22	3689.33	3244.71
14	3.82404	18306.3	-33.296	Bedrock	300	18	1036.05	1210.99	3282.45	478.717	2803.74	3962.91	3484.19
15	3.82973	19637.2	-33.296	Bedrock	300	18	1092.25	1276.68	3518.66	512.757	3005.9	4236.02	3723.27
16	3.82973	20941.9	-33.296	Bedrock	300	18	1148.5	1342.42	3755.07	546.825	3208.24	4509.38	3962.55
17	2.98516	17232.4	-33.296	Bedrock	300	18	1198.77	1401.18	3966.34	577.27	3389.07	4753.67	4176.4
18	2.98516	18031.4	-33.296	Bedrock	300	18	1242.96	1452.83	4152.07	604.035	3548.03	4968.41	4364.38
19	5.9888	37953.3	-33.296	Bedrock	300	18	1292	1510.15	4358.18	633.737	3724.44	5206.73	4573
20	5.82591	36958	-33.296	Bedrock	300	18	1293.04	1511.37	4362.59	634.373	3728.22	5211.83	4577.46
21	5.82591	36556.8	-33.296	Bedrock	300	18	1281.67	1498.08	4314.8	627.487	3687.32	5156.58	4529.09
22	3.92448	24023.5	-19.5371	Bedrock	300	32	2678.39	3130.64	5142.12	612.146	4529.98	6092.55	5480.4
23	3.92448	23149.2	-19.5371	Bedrock	300	32	2590.68	3028.12	4955.78	589.868	4365.91	5875.07	5285.2
24	3.92448	22312.6	-17.5097	Bedrock	300	32	2598.14	3036.84	4948.43	568.548	4379.88	5768.1	5199.55
25	3.92448	21523.2	-17.5097	Bedrock	300	32	2515.92	2940.73	4774.48	548.435	4226.05	5568.21	5019.78
26	3.9196	20773	-13.9798	Bedrock	300	32	2600.08	3039.1	4913.45	529.978	4383.47	5560.75	5030.77
27	3.9196	20091.4	-13.9798	Bedrock	300	32	2524.08	2950.27	4753.91	512.588	4241.32	5382.29	4869.7
28	3.9196	19375.9	-11.5333	Bedrock	300	32	2556.74	2988.45	4796.75	494.334	4302.42	5318.47	4824.14
29	3.9196	18576	-11.5333	Bedrock	300	32	2463.23	2879.15	4601.42	473.926	4127.49	5104.06	4630.13
30	3.91958	17764.2	-8.85376	Bedrock	300	32	2491.08	2911.7	4632.82	453.216	4179.61	5020.86	4567.64
31	3.91958	16975	-8.85376	Bedrock	300	32	2393.78	2797.97	4430.67	433.083	3997.59	4803.55	4370.47
32	3.91958	16153.8	-6.98971	Bedrock	300	32	2376.77	2778.09	4377.9	412.13	3965.77	4669.3	4257.17
33	3.91958	15281.8	-6.98971	Bedrock	300	32	2265.06	2647.52	4146.7	389.883	3756.81	4424.4	4034.51
34	3.65103	13452.4	-6.31127	Bedrock	300	32	2186.4	2555.57	3978.12	368.455	3609.67	4219.94	3851.48
35	3.65103	12712.9	-6.31127	Bedrock	300	32	2083.25	2435.01	3764.93	348.201	3416.73	3995.34	3647.14
36	3.65099	11954.7	-3.9438	Bedrock	300	32	2073.48	2423.59	3725.9	327.437	3398.46	3868.85	3541.41
37	3.65099	11172.6	-3.9438	Bedrock	300	32	1958.74	2289.47	3489.84	306.016	3183.82	3624.87	3318.86
38	3.63828	10308.3	-0.928142	Bedrock	300	32	1956.74	2287.13	3463.41	283.328	3180.08	3495.11	3211.78
39	3.63828	9406.37	-0.928142	Bedrock	300	32	1814.68	2121.09	3172.89	258.539	2914.35	3202.29	2943.75
40	5.91045	13157.8	3.27299	Bedrock	300	32	1767.28	2065.68	3048.29	222.619	2825.67	2947.22	2724.6
41	5.91045	10800.1	7.19752	Bedrock	300	32	1668.2	1949.88	2823.1	182.728	2640.37	2612.43	2429.7
42	3.92738	6125.15	8.19968	Bedrock	300	32	1519.23	1775.75	2517.65	155.96	2361.69	2298.73	2142.77
43	3.92738	5419.4	8.19968	Bedrock	300	32	1388.9	1623.41	2255.89	137.99	2117.9	2055.76	1917.77
44	7.85476	8973.03	8.19968	Bedrock	300	32	1216.62	1422.05	1909.89	114.237	1795.66	1734.58	1620.35
45	5.43388	4864	8.19968	Bedrock	300	32	1037.31	1212.45	1549.74	89.5124	1460.23	1400.27	1310.76
46	5.43387	3814.73	8.19968	Bedrock	300	32	897.261	1048.76	1268.47	70.2028	1198.27	1139.18	1068.98
47	4.48454	2243.25	10.0812	Bedrock	300	32	787.429	920.386	1042.85	50.0218	992.826	902.852	852.83
48	0.949329	360.577	10.0812	Alluvium	200	27	481.88	563.245	712.909	0	712.909	627.236	627.236
49	3.50124	952.228	16.9624	Alluvium	200	27	482.973	564.523	715.415	0	715.415	568.102	568.102
50	3.50124	317.557	16.9624	Alluvium	200	27	345.2	403.487	399.365	0	399.365	294.074	294.074

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.16885



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	22.9996	1330.28	0	0	0
2	27.1172	1327.4	151.56	67.9734	24.1558
3	31.2348	1324.52	613.705	275.242	24.1559
4	34.2559	1322.4	1153.18	517.191	24.1558
5	39.47	1318.75	2661.92	1193.85	24.1559
6	43.3051	1316.23	4399.77	1973.26	24.1558
7	47.1403	1313.7	6725.73	3016.44	24.1559
8	50.9754	1311.17	9639.9	4323.42	24.1559
9	54.8106	1308.65	13145.2	5895.52	24.1559
10	58.6458	1306.13	17232.2	7728.51	24.1559
11	62.4809	1303.61	21912.3	9827.52	24.1559
12	66.3175	1301.09	27189.7	12194.4	24.1559
13	70.1541	1298.57	33067.6	14830.6	24.1559
14	73.9781	1296.06	39521.1	17724.9	24.1559
15	77.8021	1293.55	46549.1	20876.9	24.1559
16	81.6319	1291.03	54162.1	24291.3	24.1559
17	85.4616	1288.52	62350	27963.5	24.1559
18	88.4468	1286.55	69132.7	31005.5	24.1559
19	91.4319	1284.59	76267.4	34205.3	24.1558
20	97.4207	1280.66	91365	40976.5	24.1559
21	103.247	1276.83	106068	47570.8	24.1559
22	109.073	1273.01	120595	54085.7	24.1558
23	112.997	1271.62	120848	54199.2	24.1558
24	116.921	1270.22	121054	54291.9	24.1559
25	120.846	1268.99	120331	53967.7	24.1559
26	124.77	1267.75	119598	53638.6	24.1558
27	128.69	1266.77	117317	52615.6	24.1558
28	132.61	1265.8	115076	51610.6	24.1558
29	136.529	1265	111797	50140.3	24.156
30	140.449	1264.2	108609	48710.4	24.1559
31	144.368	1263.59	104338	46794.9	24.1559
32	148.288	1262.97	100207	44942.1	24.1559
33	152.208	1262.49	95417.9	42794.2	24.1559
34	156.127	1262.01	90824.8	40734.2	24.1559
35	159.778	1261.61	86466.4	38779.5	24.1559
36	163.429	1261.21	82287.5	36905.3	24.1559
37	167.08	1260.95	77448.3	34734.9	24.1558
38	170.731	1260.7	72851.2	32673.2	24.1559
39	174.369	1260.64	67482.4	30265.3	24.1558
40	178.008	1260.58	62478	28020.9	24.1559
41	183.918	1260.92	52975.9	23759.3	24.1559
42	189.829	1261.67	42628.9	19118.7	24.1558
43	193.756	1262.23	36156.3	16215.8	24.1558
44	197.683	1262.8	30237.8	13561.4	24.1558
45	205.538	1263.93	19865.7	8909.62	24.1559
46	210.972	1264.72	13745.2	6164.63	24.1559
47	216.406	1265.5	8448.62	3789.14	24.1559
48	220.89	1266.3	4422.37	1983.4	24.1559
49	221.84	1266.46	3898.67	1748.52	24.1558
50	225.341	1267.53	1586.47	711.521	24.1559
51	228.842	1268.6	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Compacted Fill		130	Mohr-Coulomb	270	29
Remedial Removal		130	Mohr-Coulomb	270	29
Alluvium		120	Mohr-Coulomb	200	27
Bedrock		130	Mohr-Coulomb	300	32

Method Name	Min FS
Spencer	1.82

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 31-31'; 70' high fill slope; cuckoo search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t31s1a.slmd
		Scale:	1:900
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 40

Slide Analysis Information

t31s1a

Project Summary

File Name:	t31s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:15.121s
Project Title:	VTTM 60257
Analysis:	Section 31-31'; 70' high fill slope; cuckoo search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Remedial Removal	Alluvium	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	130	120	130
Cohesion [psf]	270	270	200	300
Friction Angle [°]	29	29	27	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

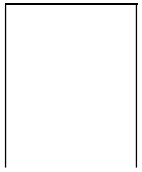
Global Minimums

Method: spencer

FS	1.823480
Axis Location:	281.152, 1464.605
Left Slip Surface Endpoint:	265.537, 1260.912
Right Slip Surface Endpoint:	434.737, 1329.897
Resisting Moment:	5.19109e+07 lb-ft
Driving Moment:	2.84877e+07 lb-ft
Resisting Horizontal Force:	233301 lb
Driving Horizontal Force:	128031 lb
Total Slice Area:	2982.12 ft2
Surface Horizontal Width:	169.2 ft
Surface Average Height:	17.6248 ft

Global Minimum Coordinates

Method: spencer



X	Y
265.537	1260.91
274.481	1258.06
280.997	1258.01
286.826	1258.31
292.656	1258.52
298.524	1259.17
306.255	1260.77
311.862	1262.31
316.655	1263.81
322.053	1265.8
327.451	1267.61
335.595	1270.05
343.74	1272.21
351.886	1274.68
355.959	1276.49
360.032	1278.29
364.266	1280.49
368.5	1282.67
372.734	1284.72
376.968	1286.78
381.202	1288.98
385.392	1291.15
393.352	1295.19
398.109	1298.12
402.757	1300.89
407.511	1303.72
412.302	1306.44
417.766	1311.06
423.422	1316.62
429.078	1322.65
434.737	1329.9

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 8670
Number of Invalid Surfaces: 1391

Error Codes:

Error Code -106 reported for 6 surfaces
Error Code -108 reported for 225 surfaces
Error Code -111 reported for 73 surfaces
Error Code -112 reported for 65 surfaces
Error Code -114 reported for 80 surfaces
Error Code -121 reported for 194 surfaces
Error Code -124 reported for 55 surfaces
Error Code -1000 reported for 693 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

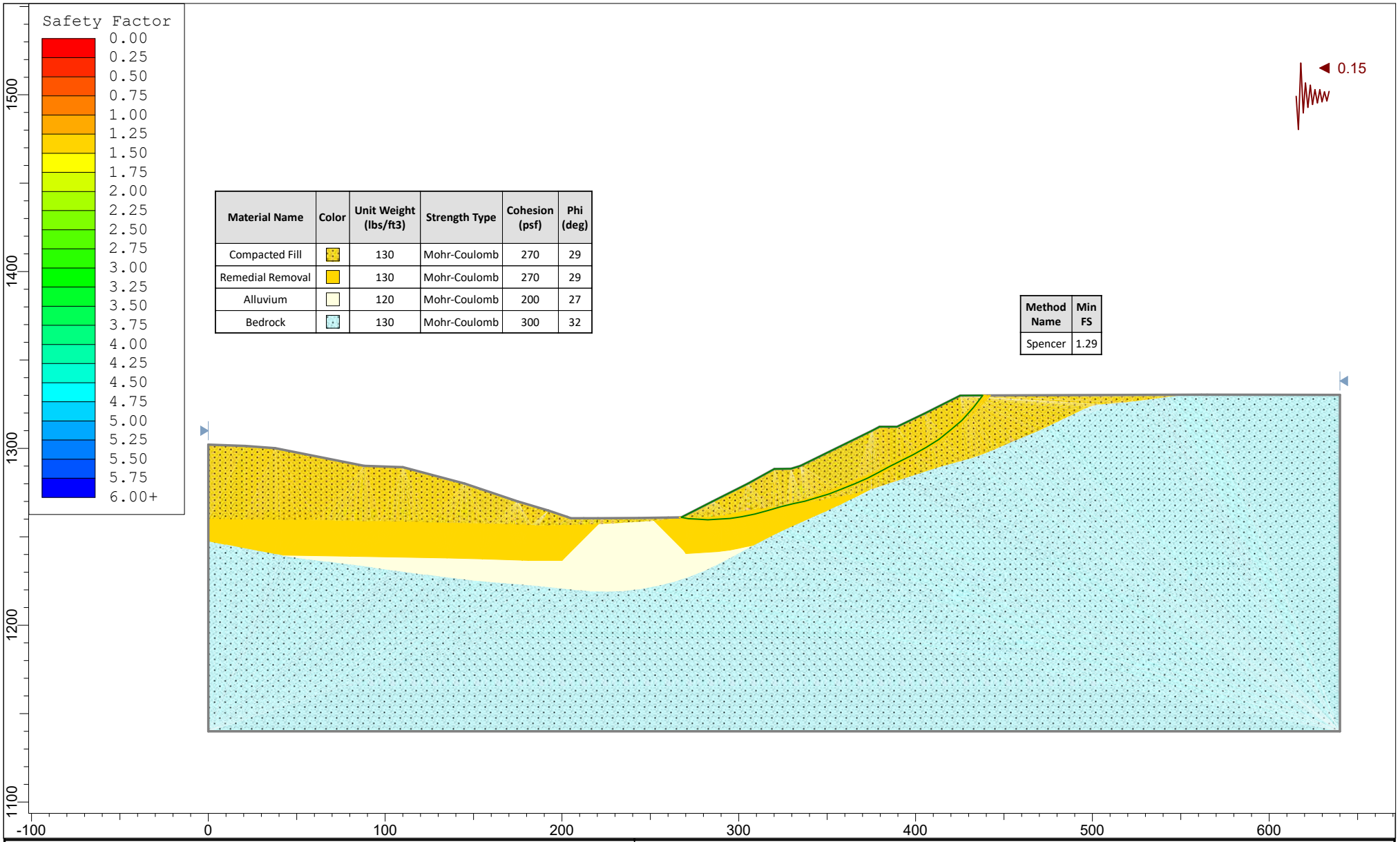
Global Minimum Query (spencer) - Safety Factor: 1.82348

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	1.98391	88.3079	-17.6998	Compacted Fill	270	29	212.597	387.666	212.275	0	212.275	144.428	144.428
2	3.48047	969.817	-17.6998	Remedial Removal	270	29	317.002	578.046	555.73	0	555.73	454.563	454.563
3	3.48047	2271.48	-17.6998	Remedial Removal	270	29	483.772	882.149	1104.35	0	1104.35	949.956	949.956
4	3.25764	3090.39	-0.427741	Remedial Removal	270	29	493.976	900.756	1137.92	0	1137.92	1134.23	1134.23
5	3.25764	3800.73	-0.427741	Remedial Removal	270	29	569.07	1037.69	1384.94	0	1384.94	1380.7	1380.7
6	2.91482	3970.05	2.97901	Remedial Removal	270	29	612.49	1116.86	1527.78	0	1527.78	1559.66	1559.66
7	2.91482	4472.75	2.97901	Remedial Removal	270	29	669.328	1220.51	1714.76	0	1714.76	1749.59	1749.59
8	2.91481	4982.97	2.05976	Remedial Removal	270	29	734.617	1339.56	1929.54	0	1929.54	1955.96	1955.96
9	2.91481	5501.92	2.05976	Remedial Removal	270	29	793.987	1447.82	2124.84	0	2124.84	2153.4	2153.4
10	2.93395	6020.75	6.2725	Remedial Removal	270	29	809.304	1475.75	2175.24	0	2175.24	2264.19	2264.19
11	2.93395	6463.78	6.2725	Remedial Removal	270	29	857.065	1562.84	2332.33	0	2332.33	2426.54	2426.54
12	3.86547	9098.01	11.6977	Remedial Removal	270	29	852.162	1553.9	2316.22	0	2316.22	2492.66	2492.66
13	3.86547	9683.32	11.6977	Remedial Removal	270	29	896.994	1635.65	2463.7	0	2463.7	2649.42	2649.42
14	2.80362	7396.25	15.3556	Remedial Removal	270	29	899.911	1640.97	2473.3	0	2473.3	2720.43	2720.43
15	2.80362	7683.46	15.3556	Remedial Removal	270	29	928.949	1693.92	2568.82	0	2568.82	2823.92	2823.92
16	4.79258	13740.5	17.4376	Remedial Removal	270	29	943.284	1720.06	2615.98	0	2615.98	2912.26	2912.26
17	2.69906	8030.45	20.1857	Remedial Removal	270	29	944.71	1722.66	2620.66	0	2620.66	2967.98	2967.98
18	2.69906	8080.87	20.1857	Remedial Removal	270	29	949.712	1731.78	2637.11	0	2637.11	2986.27	2986.27
19	2.69904	7775.55	18.5298	Remedial Removal	270	29	936.001	1706.78	2592.02	0	2592.02	2905.74	2905.74
20	2.69904	7462.02	18.5298	Remedial Removal	270	29	904.287	1648.95	2487.7	0	2487.7	2790.79	2790.79
21	2.50261	6656.08	16.7126	Remedial Removal	270	29	892.87	1628.13	2450.12	0	2450.12	2718.21	2718.21
22	2.82093	7409.47	16.7126	Compacted Fill	270	29	883.651	1611.32	2419.8	0	2419.8	2685.12	2685.12
23	2.82093	7420.38	16.7126	Compacted Fill	270	29	884.731	1613.29	2423.35	0	2423.35	2689	2689
24	4.07239	11020.3	14.8601	Compacted Fill	270	29	924.123	1685.12	2552.96	0	2552.96	2798.16	2798.16
25	4.07239	11509.8	14.8601	Compacted Fill	270	29	958.393	1747.61	2665.68	0	2665.68	2919.97	2919.97
26	4.07271	11959.5	16.8627	Compacted Fill	270	29	968.511	1766.06	2698.95	0	2698.95	2992.51	2992.51
27	4.07271	12367.6	16.8627	Compacted Fill	270	29	996.408	1816.93	2790.73	0	2790.73	3092.75	3092.75
28	4.07349	12626.9	23.9106	Compacted Fill	270	29	939.286	1712.77	2602.82	0	2602.82	3019.26	3019.26
29	4.07349	12732.6	23.9106	Compacted Fill	270	29	945.933	1724.89	2624.7	0	2624.7	3044.09	3044.09
30	4.23392	13259.1	27.3842	Compacted Fill	270	29	912.141	1663.27	2513.53	0	2513.53	2986.02	2986.02
31	4.2339	13201	27.3226	Compacted Fill	270	29	909.382	1658.24	2504.47	0	2504.47	2974.29	2974.29
32	4.23368	13182.2	25.8058	Compacted Fill	270	29	923.558	1684.09	2551.09	0	2551.09	2997.67	2997.67
33	4.23369	13201.9	25.8881	Compacted Fill	270	29	923.887	1684.69	2552.18	0	2552.18	3000.56	3000.56
34	4.23393	13120.3	27.4469	Compacted Fill	270	29	903.459	1647.44	2484.98	0	2484.98	2954.22	2954.22
35	4.18997	12046	27.4284	Compacted Fill	270	29	848.663	1547.52	2304.69	0	2304.69	2745.13	2745.13
36	3.98007	10374	26.9004	Compacted Fill	270	29	787.204	1435.45	2102.53	0	2102.53	2501.91	2501.91
37	3.98007	9784.34	26.9004	Compacted Fill	270	29	750.587	1368.68	1982.08	0	1982.08	2362.88	2362.88
38	4.7576	11469.3	31.6293	Compacted Fill	270	29	701.949	1279.99	1822.06	0	1822.06	2254.39	2254.39
39	4.64745	10855.2	30.7815	Compacted Fill	270	29	690.798	1259.66	1785.39	0	1785.39	2196.89	2196.89
40	4.75471	10787.1	30.7562	Compacted Fill	270	29	675.183	1231.18	1734.02	0	1734.02	2135.81	2135.81
41	2.39519	5337.73	29.6578	Compacted Fill	270	29	673.633	1228.36	1728.92	0	1728.92	2112.5	2112.5
42	2.39519	5288.51	29.6578	Compacted Fill	270	29	668.721	1219.4	1712.76	0	1712.76	2093.54	2093.54
43	2.73214	5839.02	40.174	Compacted Fill	270	29	580.013	1057.64	1420.94	0	1420.94	1910.64	1910.64
44	2.73214	5508.24	40.174	Compacted Fill	270	29	554.688	1011.46	1337.63	0	1337.63	1805.95	1805.95
45	2.82782	5280.31	44.5297	Compacted Fill	270	29	497.499	907.179	1149.5	0	1149.5	1638.9	1638.9
46	2.82782	4781.01	44.5297	Compacted Fill	270	29	462.707	843.737	1035.05	0	1035.05	1490.22	1490.22
47	2.82797	4206.27	46.8272	Compacted Fill	270	29	411.275	749.952	865.858	0	865.858	1304.24	1304.24
48	2.82797	3209.47	46.8272	Compacted Fill	270	29	344.073	627.411	644.787	0	644.787	1011.54	1011.54
49	2.82951	1993.96	52.0145	Compacted Fill	270	29	247.408	451.144	326.792	0	326.792	643.626	643.626
50	2.82951	664.652	52.0145	Compacted Fill	270	29	164.944	300.772	55.5138	0	55.5138	266.743	266.743

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.82348

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	265.537	1260.91	0	0	0
2	267.521	1260.28	556.786	207.017	20.3955
3	271.001	1259.17	2278.98	847.343	20.3955
4	274.481	1258.06	5191.83	1930.36	20.3955
5	277.739	1258.03	6831.04	2539.84	20.3956
6	280.997	1258.01	8721.24	3242.63	20.3956
7	283.912	1258.16	10277.4	3821.21	20.3955
8	286.826	1258.31	11971.1	4450.94	20.3955
9	289.741	1258.42	13913.2	5173.04	20.3955
10	292.656	1258.52	16008.1	5951.95	20.3956
11	295.59	1258.84	17684.6	6575.26	20.3955
12	298.524	1259.17	19450.6	7231.91	20.3956
13	302.389	1259.97	20895.7	7769.19	20.3955
14	306.255	1260.77	22396.2	8327.1	20.3956
15	309.058	1261.54	23018.7	8558.54	20.3955
16	311.862	1262.31	23649.2	8792.95	20.3955
17	316.655	1263.81	24238.5	9012.07	20.3955
18	319.354	1264.8	24191.6	8994.62	20.3955
19	322.053	1265.8	24141.8	8976.13	20.3956
20	324.752	1266.7	24326.9	9044.95	20.3956
21	327.451	1267.61	24520.7	9117	20.3956
22	329.953	1268.36	24917.4	9264.49	20.3955
23	332.774	1269.2	25364.2	9430.6	20.3955
24	335.595	1270.05	25811	9596.73	20.3955
25	339.668	1271.13	26821.3	9972.37	20.3955
26	343.74	1272.21	27849.5	10354.7	20.3956
27	347.813	1273.45	28467.9	10584.6	20.3955
28	351.886	1274.68	29086.8	10814.7	20.3955
29	355.959	1276.49	28217.7	10491.6	20.3956
30	360.032	1278.29	27336.3	10163.9	20.3956
31	364.266	1280.49	25691.3	9552.22	20.3955
32	368.5	1282.67	24068.9	8949	20.3955
33	372.734	1284.72	22762.1	8463.13	20.3955
34	376.968	1286.78	21435.3	7969.83	20.3956
35	381.202	1288.98	19801.5	7362.34	20.3955
36	385.392	1291.15	18350.9	6823.02	20.3956
37	389.372	1293.17	17243.1	6411.11	20.3955
38	393.352	1295.19	16232.5	6035.38	20.3956
39	398.109	1298.12	14237.9	5293.75	20.3955
40	402.757	1300.89	12510.3	4651.43	20.3955
41	407.511	1303.72	10818.9	4022.57	20.3956
42	409.907	1305.08	10076.8	3746.62	20.3955
43	412.302	1306.44	9344.85	3474.49	20.3955
44	415.034	1308.75	7654.12	2845.86	20.3955
45	417.766	1311.06	6086.27	2262.92	20.3955
46	420.594	1313.84	4297.5	1597.84	20.3955
47	423.422	1316.62	2728.58	1014.51	20.3956
48	426.25	1319.64	1283.35	477.161	20.3956
49	429.078	1322.65	314.183	116.816	20.3956
50	431.907	1326.27	-168.889	-62.7943	20.3955
51	434.737	1329.9	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Compacted Fill		130	Mohr-Coulomb	270	29
Remedial Removal		130	Mohr-Coulomb	270	29
Alluvium		120	Mohr-Coulomb	200	27
Bedrock		130	Mohr-Coulomb	300	32

Method Name	Min FS
Spencer	1.29

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 31-31'; 70' fill slope; non-circular internal search; pseudo		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t31ps1a.slmd
		Scale:	1:900
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* Run No. 41

Slide Analysis Information

t31ps1a

Project Summary

File Name:	t31ps1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:12.777s
Project Title:	VTTM 60257
Analysis:	Section 31-31'; 70' fill slope; non-circular internal search; pseudo
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Remedial Removal	Alluvium	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	130	120	130
Cohesion [psf]	270	270	200	300
Friction Angle [°]	29	29	27	32
Tensile Strength [psf]				0
Water Surface	None	None	None	None
Ru Value	0	0	0	0

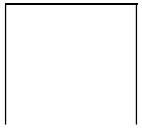
Global Minimums

Method: spencer

FS	1.285470
Axis Location:	283.788, 1465.948
Left Slip Surface Endpoint:	267.478, 1260.962
Right Slip Surface Endpoint:	437.990, 1329.908
Resisting Moment:	5.12146e+07 lb-ft
Driving Moment:	3.98411e+07 lb-ft
Resisting Horizontal Force:	230797 lb
Driving Horizontal Force:	179543 lb
Total Slice Area:	3072.17 ft2
Surface Horizontal Width:	170.513 ft
Surface Average Height:	18.0173 ft

Global Minimum Coordinates

Method: spencer



X	Y
267.478	1260.96
271.484	1260.2
276.482	1259.97
282.537	1259.62
288.593	1259.94
295.154	1260.32
301.749	1261.29
309.107	1262.88
316.465	1264.84
323.817	1266.95
330.858	1268.72
337.433	1270.15
344.009	1272.04
351.103	1274.25
358.197	1276.91
365.627	1279.94
373.057	1283.18
379.001	1286.38
385.54	1289.88
392.019	1293.14
398.497	1296.33
405.955	1300.42
413.265	1305.06
419.902	1310.4
426.286	1315.88
432.672	1322.93
437.99	1329.91

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 8404
Number of Invalid Surfaces: 1655

Error Codes:

Error Code -106 reported for 10 surfaces
Error Code -108 reported for 287 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 74 surfaces
Error Code -112 reported for 112 surfaces
Error Code -114 reported for 60 surfaces
Error Code -121 reported for 229 surfaces
Error Code -124 reported for 31 surfaces
Error Code -1000 reported for 851 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

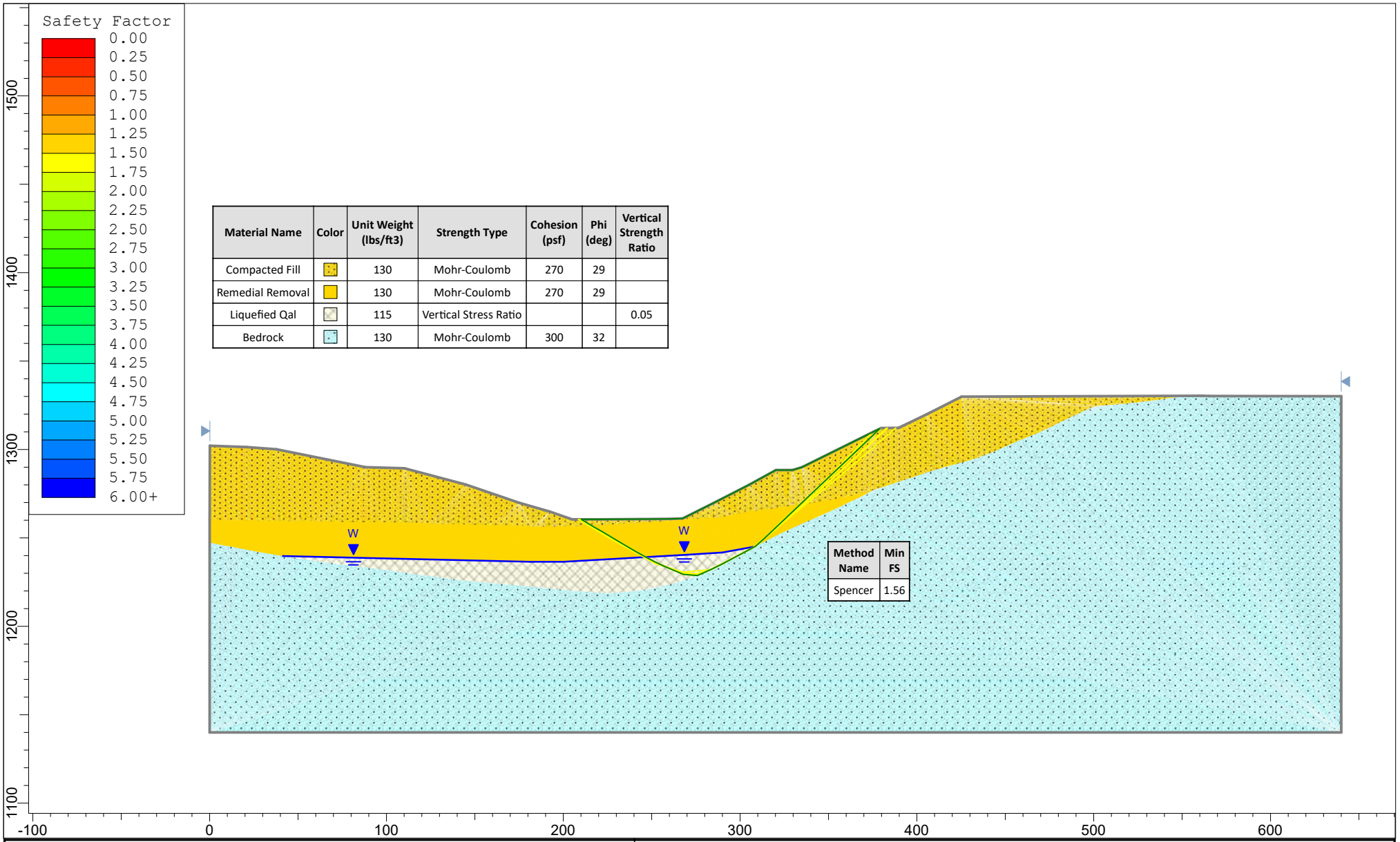
Global Minimum Query (spencer) - Safety Factor: 1.28547

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.49896	283.363	-10.7942	Compacted Fill	270	29	400.837	515.264	442.469	0	442.469	366.047	366.047
2	1.50717	444.877	-10.7942	Remedial Removal	270	29	524.575	674.326	729.425	0	729.425	629.412	629.412
3	4.99823	2715.64	-2.62611	Remedial Removal	270	29	581.397	747.368	861.195	0	861.195	834.528	834.528
4	3.02755	2525.73	-3.2894	Remedial Removal	270	29	750.822	965.159	1254.1	0	1254.1	1210.95	1210.95
5	3.02755	3198.87	-3.2894	Remedial Removal	270	29	874.679	1124.37	1541.33	0	1541.33	1491.06	1491.06
6	3.02787	3806.7	3.02398	Remedial Removal	270	29	872.646	1121.76	1536.61	0	1536.61	1582.71	1582.71
7	3.02787	4347.32	3.02398	Remedial Removal	270	29	959.094	1232.89	1737.09	0	1737.09	1787.76	1787.76
8	3.28056	5316.09	3.30142	Remedial Removal	270	29	1043.19	1340.99	1932.11	0	1932.11	1992.28	1992.28
9	3.28056	5943.05	3.30142	Remedial Removal	270	29	1135.19	1459.25	2145.47	0	2145.47	2210.95	2210.95
10	3.29759	6542.37	8.38287	Remedial Removal	270	29	1112.81	1430.48	2093.57	0	2093.57	2257.55	2257.55
11	3.29759	7049.1	8.38287	Remedial Removal	270	29	1179.71	1516.48	2248.7	0	2248.7	2422.55	2422.55
12	3.6788	8402.7	12.1534	Remedial Removal	270	29	1167.25	1500.47	2219.83	0	2219.83	2471.21	2471.21
13	3.6788	8966.84	12.1534	Remedial Removal	270	29	1229.5	1580.49	2364.18	0	2364.18	2628.96	2628.96
14	3.679	9520.27	14.9747	Remedial Removal	270	29	1232.66	1584.55	2371.5	0	2371.5	2701.21	2701.21
15	3.679	10027.4	14.9747	Remedial Removal	270	29	1285.85	1652.92	2494.86	0	2494.86	2838.79	2838.79
16	3.67626	10509.8	15.9854	Remedial Removal	270	29	1315.74	1691.34	2564.17	0	2564.17	2941.09	2941.09
17	3.67626	10504.7	15.9854	Remedial Removal	270	29	1315.22	1690.67	2562.96	0	2562.96	2939.73	2939.73
18	4.81305	13055.8	14.1197	Remedial Removal	270	29	1298.64	1669.36	2524.51	0	2524.51	2851.18	2851.18
19	2.22755	5823.14	14.1197	Compacted Fill	270	29	1260.07	1619.78	2435.08	0	2435.08	2752.04	2752.04
20	3.28768	8657.42	12.223	Compacted Fill	270	29	1307.49	1680.74	2545.05	0	2545.05	2828.29	2828.29
21	3.28768	8859.33	12.223	Compacted Fill	270	29	1332.39	1712.75	2602.79	0	2602.79	2891.42	2891.42
22	3.28798	9189.91	16.1001	Compacted Fill	270	29	1289.18	1657.2	2502.58	0	2502.58	2874.69	2874.69
23	3.28798	9476.23	16.1001	Compacted Fill	270	29	1322.12	1699.55	2578.98	0	2578.98	2960.6	2960.6
24	3.54698	10525.1	17.2964	Compacted Fill	270	29	1328.81	1708.15	2594.48	0	2594.48	3008.27	3008.27
25	3.54698	10821.1	17.2964	Compacted Fill	270	29	1359.73	1747.89	2666.18	0	2666.18	3089.6	3089.6
26	3.54717	11065.8	20.5489	Compacted Fill	270	29	1316.13	1691.84	2565.06	0	2565.06	3058.42	3058.42
27	3.54717	11258	20.5489	Compacted Fill	270	29	1335.11	1716.24	2609.08	0	2609.08	3109.56	3109.56
28	3.71484	11967.3	22.1498	Compacted Fill	270	29	1318.58	1694.99	2570.76	0	2570.76	3107.51	3107.51
29	3.71484	12120.3	22.1498	Compacted Fill	270	29	1332.62	1713.04	2603.32	0	2603.32	3145.79	3145.79
30	7.42987	24593	23.6054	Compacted Fill	270	29	1318.7	1695.15	2571.04	0	2571.04	3147.32	3147.32
31	2.97209	9891.64	28.2387	Compacted Fill	270	29	1233.67	1585.84	2373.83	0	2373.83	3036.39	3036.39
32	2.97209	9846.04	28.2387	Compacted Fill	270	29	1228.94	1579.77	2362.89	0	2362.89	3022.91	3022.91
33	3.26944	10570.6	28.1558	Compacted Fill	270	29	1205.97	1550.24	2309.61	0	2309.61	2955.05	2955.05
34	3.26944	9852.98	28.1558	Compacted Fill	270	29	1138.39	1463.36	2152.87	0	2152.87	2762.14	2762.14
35	3.23931	9060.26	26.7725	Compacted Fill	270	29	1094.28	1406.66	2050.59	0	2050.59	2602.69	2602.69
36	3.23931	8566.09	26.7725	Compacted Fill	270	29	1046.19	1344.84	1939.06	0	1939.06	2466.9	2466.9
37	3.23927	8525.75	26.1853	Compacted Fill	270	29	1051.51	1351.68	1951.41	0	1951.41	2468.47	2468.47
38	3.23927	8514.15	26.1853	Compacted Fill	270	29	1050.37	1350.22	1948.76	0	1948.76	2465.27	2465.27
39	3.72875	9734.79	28.7569	Compacted Fill	270	29	1005.2	1292.16	1844.03	0	1844.03	2395.66	2395.66
40	3.72875	9617.16	28.7569	Compacted Fill	270	29	995.589	1279.8	1821.73	0	1821.73	2368.09	2368.09
41	3.65521	9262.88	32.3714	Compacted Fill	270	29	930.137	1195.66	1669.94	0	1669.94	2259.57	2259.57
42	3.65521	9036.21	32.3714	Compacted Fill	270	29	912.365	1172.82	1628.73	0	1628.73	2207.09	2207.09
43	3.31851	7885.26	38.8249	Compacted Fill	270	29	802.583	1031.7	1374.13	0	1374.13	2020	2020
44	3.31851	7453.89	38.8249	Compacted Fill	270	29	769.319	988.936	1297	0	1297	1916.09	1916.09
45	3.19176	6726.08	40.6721	Compacted Fill	270	29	713.386	917.036	1167.28	0	1167.28	1780.29	1780.29
46	3.19176	6219.46	40.6721	Compacted Fill	270	29	674.112	866.551	1076.21	0	1076.21	1655.46	1655.46
47	3.19303	5076.36	47.8081	Compacted Fill	270	29	524.98	674.846	730.361	0	730.361	1309.5	1309.5
48	3.19303	3618.75	47.8081	Compacted Fill	270	29	426.582	548.358	502.172	0	502.172	972.76	972.76
49	2.65925	1805.13	52.6951	Compacted Fill	270	29	307.522	395.31	226.066	0	226.066	629.674	629.674
50	2.65925	601.708	52.6951	Compacted Fill	270	29	219.698	282.415	22.3974	0	22.3974	310.741	310.741

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.28547

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	267.478	1260.96	0	0	0
2	269.977	1260.49	1169.99	631.661	28.364
3	271.484	1260.2	2103.48	1135.64	28.364
4	276.482	1259.97	4799.53	2591.21	28.3641
5	279.51	1259.8	6912.06	3731.73	28.364
6	282.537	1259.62	9348.58	5047.18	28.364
7	285.565	1259.78	11174.1	6032.73	28.3639
8	288.593	1259.94	13148.1	7098.51	28.3641
9	291.873	1260.13	15407.3	8318.23	28.3641
10	295.154	1260.32	17834	9628.33	28.364
11	298.452	1260.81	19504.9	10530.4	28.3639
12	301.749	1261.29	21245	11469.9	28.364
13	305.428	1262.08	22520	12158.3	28.3641
14	309.107	1262.88	23825.1	12862.9	28.3641
15	312.786	1263.86	24598.3	13280.3	28.364
16	316.465	1264.84	25369.9	13696.9	28.3641
17	320.141	1265.9	25930	13999.3	28.3641
18	323.817	1266.95	26490.2	14301.7	28.364
19	328.63	1268.16	27725.9	14968.8	28.3639
20	330.858	1268.72	28294.8	15276	28.364
21	334.146	1269.43	29482.2	15917.1	28.3641
22	337.433	1270.15	30680.1	16563.8	28.3641
23	340.721	1271.09	31165.4	16825.8	28.364
24	344.009	1272.04	31643.6	17084	28.3641
25	347.556	1273.15	31912.5	17229.1	28.364
26	351.103	1274.25	32167.4	17366.8	28.3641
27	354.65	1275.58	31765.4	17149.7	28.364
28	358.197	1276.91	31343.3	16921.9	28.3641
29	361.912	1278.42	30559	16498.4	28.364
30	365.627	1279.94	29754.7	16064.2	28.3641
31	373.057	1283.18	27515.8	14855.4	28.364
32	376.029	1284.78	25909.5	13988.2	28.364
33	379.001	1286.38	24313.5	13126.5	28.364
34	382.271	1288.13	22629.4	12217.3	28.364
35	385.54	1289.88	21106.2	11395	28.3641
36	388.779	1291.51	19940.5	10765.6	28.364
37	392.019	1293.14	18875.5	10190.6	28.3639
38	395.258	1294.74	17894.4	9660.95	28.364
39	398.497	1296.33	16915.6	9132.49	28.364
40	402.226	1298.38	15430.2	8330.55	28.364
41	405.955	1300.42	13972.2	7543.42	28.3641
42	409.61	1302.74	12113.2	6539.76	28.364
43	413.265	1305.06	10318.7	5570.95	28.3641
44	416.584	1307.73	8129.68	4389.11	28.364
45	419.902	1310.4	6100.94	3293.82	28.364
46	423.094	1313.14	4167.56	2250.01	28.364
47	426.286	1315.88	2434.6	1314.41	28.3641
48	429.479	1319.41	776.791	419.379	28.364
49	432.672	1322.93	-172.787	-93.2853	28.364
50	435.331	1326.42	-414.776	-223.932	28.364
51	437.99	1329.91	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Strength Ratio
Compacted Fill		130	Mohr-Coulomb	270	29	
Remedial Removal		130	Mohr-Coulomb	270	29	
Liquefied Qal		115	Vertical Stress Ratio			0.05
Bedrock		130	Mohr-Coulomb	300	32	

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 31-1'; non-circular search; fill slope over liquefied Qal		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t31s2a.slmd
		Scale:	1:900
Project No.:	18-1245A-4	*Date:* 6/28/2018	*Figure No.:* Run No. 42

Slide Analysis Information

t31s2a

Project Summary

File Name:	t31s2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:21.266s
Project Title:	VTTM 60257
Analysis:	Section 31-1'; non-circular search; fill slope over liquefied Qal
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Remedial Removal	Liquefied Qal	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Vertical Stress Ratio	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	130	115	130
Cohesion [psf]	270	270		300
Friction Angle [°]	29	29		32
Tau/Sigma Ratio			0.05	
Min. Strength [psf]			0	
Water Surface	None	None	Water Table	None
Hu Value			1	
Ru Value	0	0		0

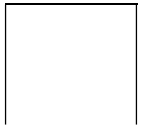
Global Minimums

Method: spencer

FS	1.558710
Axis Location:	243.228, 1455.234
Left Slip Surface Endpoint:	210.055, 1260.503
Right Slip Surface Endpoint:	379.109, 1311.857
Resisting Moment:	3.55318e+07 lb-ft
Driving Moment:	2.27956e+07 lb-ft
Resisting Horizontal Force:	143604 lb
Driving Horizontal Force:	92129.8 lb
Total Slice Area:	3669.24 ft2
Surface Horizontal Width:	169.054 ft
Surface Average Height:	21.7046 ft

Global Minimum Coordinates

Method: spencer



X	Y
210.055	1260.5
216.381	1256.77
222.707	1253.04
230.881	1248.22
235.355	1245.62
239.829	1243.01
246.137	1239.37
252.424	1236.09
260.186	1232.6
267.948	1229.44
275.826	1228.82
283.967	1232.35
290.105	1235.38
296.243	1238.63
302.381	1241.91
308.519	1245.18
313.458	1249.5
318.397	1254.19
322.999	1258.56
327.313	1262.66
333.673	1268.7
337.542	1272.38
341.411	1276.05
345.233	1279.68
349.055	1283.31
354.857	1288.82
360.66	1294.33
366.463	1299.85
372.786	1305.85
379.109	1311.86

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 8457
Number of Invalid Surfaces: 1603

Error Codes:

Error Code -106 reported for 6 surfaces
Error Code -108 reported for 205 surfaces
Error Code -109 reported for 2 surfaces
Error Code -111 reported for 72 surfaces
Error Code -112 reported for 140 surfaces
Error Code -114 reported for 55 surfaces
Error Code -121 reported for 209 surfaces
Error Code -124 reported for 53 surfaces
Error Code -1000 reported for 861 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.

-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.55871

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	2.97141	339.015	-30.5278	Compacted Fill	270	29	288.725	450.039	324.799	0	324.799	154.538	154.538
2	2.97141	1017.05	-30.5278	Compacted Fill	270	29	402.908	628.016	645.878	0	645.878	408.284	408.284
3	0.382986	180.415	-30.5278	Remedial Removal	270	29	467.357	728.474	827.108	0	827.108	551.508	551.508
4	3.1629	1920.6	-30.5278	Remedial Removal	270	29	535.485	834.666	1018.69	0	1018.69	702.91	702.91
5	3.1629	2689.88	-30.5278	Remedial Removal	270	29	657.191	1024.37	1360.92	0	1360.92	973.373	973.373
6	4.08712	4619.31	-30.5278	Remedial Removal	270	29	797.184	1242.58	1754.58	0	1754.58	1284.48	1284.48
7	4.08712	5908.74	-30.5278	Remedial Removal	270	29	955.046	1488.64	2198.49	0	2198.49	1635.3	1635.3
8	4.47382	7936.36	-30.2125	Remedial Removal	270	29	1114.36	1736.96	2646.47	0	2646.47	1997.57	1997.57
9	4.47383	9462.09	-30.2125	Remedial Removal	270	29	1284.24	2001.75	3124.15	0	3124.15	2376.34	2376.34
10	3.15426	7585.19	-30.0081	Remedial Removal	270	29	1424.48	2220.35	3518.53	0	3518.53	2695.83	2695.83
11	3.15426	8339.99	-30.0081	Remedial Removal	270	29	1543.33	2405.6	3852.72	0	3852.72	2961.39	2961.39
12	0.423147	1175.96	-27.5598	Remedial Removal	270	29	1558.26	2428.88	3894.72	0	3894.72	3081.47	3081.47
13	2.9317	8449.65	-27.5598	Liquefied Qal	141.468	0	90.7597	141.468	3072.2	52.8044	3019.4	3024.83	2972.03
14	2.9317	8969.52	-27.5598	Liquefied Qal	145.053	0	93.0596	145.053	3259.14	158.438	3100.7	3210.57	3052.13
15	3.88105	12610.9	-24.2013	Liquefied Qal	148.848	0	95.4944	148.848	3430.16	272.402	3157.76	3387.24	3114.84
16	3.88105	13396.5	-24.2013	Liquefied Qal	152.854	0	98.0644	152.854	3641.96	394.697	3247.26	3597.88	3203.18
17	3.88105	14161.7	-22.168	Liquefied Qal	156.851	0	100.629	156.851	3829.81	511.905	3317.91	3788.81	3276.91
18	3.88105	14912.5	-22.168	Liquefied Qal	160.918	0	103.238	160.918	4031.47	624.028	3407.44	3989.4	3365.37
19	3.93913	16197	-4.45732	Liquefied Qal	170.766	0	109.556	170.766	4156.86	696.494	3460.37	4148.32	3451.83
20	3.93913	17345.3	-4.45732	Liquefied Qal	183.578	0	117.776	183.578	4451.67	731.768	3719.9	4442.49	3710.72
21	8.14023	37531.3	23.4574	Liquefied Qal	197.724	0	126.851	197.724	4405.26	656.123	3749.14	4460.3	3804.18
22	3.06906	14378.2	26.2192	Liquefied Qal	208.147	0	133.538	208.147	4445.97	521.941	3924.03	4511.73	3989.79
23	3.06906	14454.3	26.2192	Liquefied Qal	213.468	0	136.952	213.468	4468.45	440.322	4028.13	4535.89	4095.57
24	3.06906	14503	27.9518	Liquefied Qal	217.925	0	139.811	217.925	4463.65	367.029	4096.62	4537.84	4170.81
25	3.06906	14527.3	27.9518	Liquefied Qal	221.646	0	142.198	221.646	4470.21	300.532	4169.68	4545.67	4245.14
26	3.0691	14544.6	28.0706	Liquefied Qal	225.263	0	144.519	225.263	4473.25	233.78	4239.47	4550.33	4316.55
27	3.0691	14557.8	28.0706	Liquefied Qal	228.829	0	146.807	228.829	4476.39	166.772	4309.62	4554.68	4387.91
28	3.0691	14569.5	28.0706	Liquefied Qal	232.369	0	149.078	232.369	4479.05	99.7642	4379.29	4558.55	4458.79
29	3.0691	14622.2	28.0706	Liquefied Qal	236.577	0	151.777	236.577	4494.32	32.7564	4461.56	4575.26	4542.5
30	4.93874	23084.2	41.1923	Remedial Removal	270	29	1363.99	2126.06	3348.43	0	3348.43	4542.19	4542.19
31	4.93895	21953.8	43.5241	Remedial Removal	270	29	1273.84	1985.54	3094.92	0	3094.92	4304.76	4304.76
32	4.6017	19042.3	43.5241	Remedial Removal	270	29	1195.19	1862.95	2873.76	0	2873.76	4008.9	4008.9
33	4.3138	15592.1	43.5241	Remedial Removal	270	29	1061.01	1653.8	2496.44	0	2496.44	3504.15	3504.15
34	3.1801	10046.5	43.5241	Remedial Removal	270	29	944.339	1471.95	2168.38	0	2168.38	3065.28	3065.28
35	3.1801	9100.41	43.5241	Remedial Removal	270	29	868.102	1353.12	1954	0	1954	2778.49	2778.49
36	0.185053	503.476	43.5241	Remedial Removal	270	29	831.983	1296.82	1852.42	0	1852.42	2642.61	2642.61
37	3.68436	9511	43.5241	Compacted Fill	270	29	796.296	1241.19	1752.08	0	1752.08	2508.38	2508.38
38	3.86922	9105.1	43.5241	Compacted Fill	270	29	737.809	1150.03	1587.62	0	1587.62	2288.36	2288.36
39	3.82205	8120.11	43.5241	Compacted Fill	270	29	679.213	1058.7	1422.85	0	1422.85	2067.94	2067.94
40	3.82167	7250.8	43.5246	Compacted Fill	270	29	620.975	967.92	1259.08	0	1259.08	1848.87	1848.87
41	2.90119	4924.49	43.5247	Compacted Fill	270	29	569.754	888.082	1115.05	0	1115.05	1656.19	1656.19
42	2.90119	4423.98	43.5247	Compacted Fill	270	29	525.547	819.176	990.74	0	990.74	1489.9	1489.9
43	2.90135	3923.67	43.5247	Compacted Fill	270	29	481.339	750.268	866.427	0	866.427	1323.6	1323.6
44	2.90135	3423.11	43.5247	Compacted Fill	270	29	437.129	681.358	742.109	0	742.109	1157.29	1157.29
45	2.90135	2922.55	43.5247	Compacted Fill	270	29	392.92	612.448	617.794	0	617.794	990.983	990.983
46	2.90135	2421.99	43.5247	Compacted Fill	270	29	348.711	543.539	493.476	0	493.476	824.676	824.676
47	3.16158	2069.31	43.5247	Compacted Fill	270	29	302.518	471.538	363.584	0	363.584	650.911	650.911
48	3.16158	1474.93	43.5247	Compacted Fill	270	29	254.344	396.448	228.118	0	228.118	469.689	469.689
49	3.16158	880.689	43.5247	Compacted Fill	270	29	206.18	321.375	92.6825	0	92.6825	288.509	288.509
50	3.16158	292.49	43.5247	Compacted Fill	270	29	158.506	247.065	-41.3759	0	-41.3759	109.171	109.171

Interslice Data

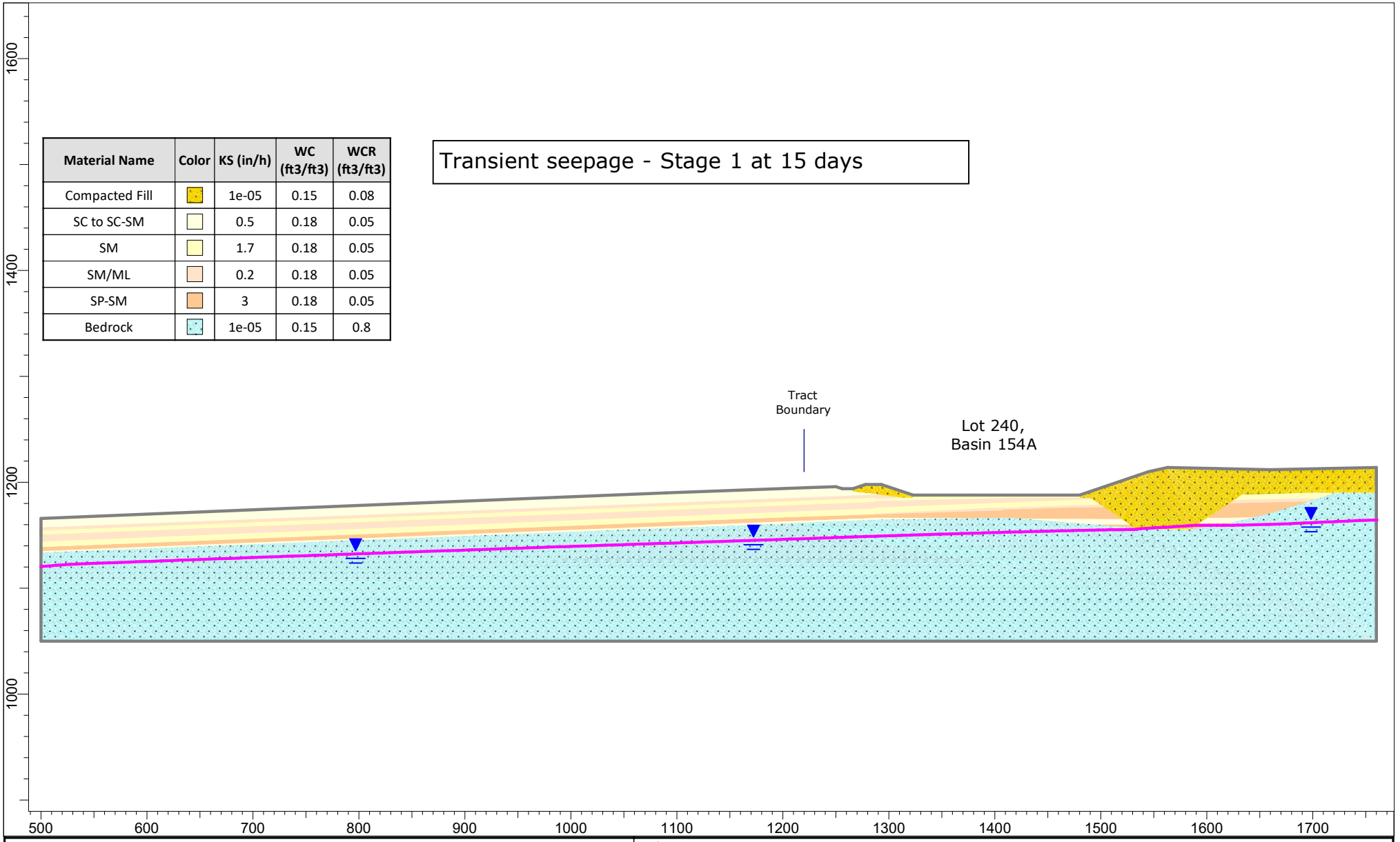
Global Minimum Query (spencer) - Safety Factor: 1.55871

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	210.055	1260.5	0	0	0
2	213.027	1258.75	1427.05	120.176	4.81369
3	215.998	1257	3755.98	316.302	4.81369
4	216.381	1256.77	4121.78	347.107	4.81369
5	219.544	1254.91	7715.48	649.743	4.81369
6	222.707	1253.04	12332.4	1038.55	4.8137
7	226.794	1250.63	19819.5	1669.06	4.81369
8	230.881	1248.22	29021.6	2444	4.8137
9	235.355	1245.62	40901.5	3444.44	4.81369
10	239.829	1243.01	54785.8	4613.67	4.81368
11	242.983	1241.19	65688.7	5531.84	4.81369
12	246.137	1239.37	77575.3	6532.84	4.81369
13	246.561	1239.15	79094.8	6660.8	4.81368
14	249.492	1237.62	84061.4	7079.06	4.81369
15	252.424	1236.09	89320.9	7521.97	4.81368
16	256.305	1234.34	95674.8	8057.06	4.81369
17	260.186	1232.6	102408	8624.09	4.81369
18	264.067	1231.02	108855	9166.98	4.81368
19	267.948	1229.44	115630	9737.58	4.81371
20	271.887	1229.13	117338	9881.41	4.8137
21	275.826	1228.82	119169	10035.6	4.8137
22	283.967	1232.35	104641	8812.15	4.8137
23	287.036	1233.87	98331.2	8280.76	4.81369
24	290.105	1235.38	91997.7	7747.4	4.81369
25	293.174	1237.01	85157.6	7171.37	4.81369
26	296.243	1238.63	78314.1	6595.06	4.81369
27	299.312	1240.27	71436.2	6015.85	4.81369
28	302.381	1241.91	64560.1	5436.8	4.81369
29	305.45	1243.54	57686.7	4857.96	4.81368
30	308.519	1245.18	50796.5	4277.73	4.8137
31	313.458	1249.5	43059.8	3626.19	4.81369
32	318.397	1254.19	34833.4	2933.43	4.8137
33	322.999	1258.56	27773.5	2338.89	4.81369
34	327.313	1262.66	22122.3	1862.98	4.81368
35	330.493	1265.68	18576.1	1564.35	4.81369
36	333.673	1268.7	15435	1299.83	4.8137
37	333.858	1268.88	15263.4	1285.38	4.8137
38	337.542	1272.38	12066.2	1016.13	4.81369
39	341.411	1276.05	9086.71	765.219	4.81369
40	345.233	1279.68	6517.7	548.875	4.81369
41	349.055	1283.31	4320.72	363.86	4.81368
42	351.956	1286.07	2901.16	244.315	4.81368
43	354.857	1288.82	1695.88	142.815	4.81369
44	357.759	1291.58	704.84	59.3566	4.81368
45	360.66	1294.33	-71.8932	-6.05434	4.81369
46	363.562	1297.09	-634.32	-53.4179	4.81368
47	366.463	1299.85	-982.44	-82.7342	4.81369
48	369.624	1302.85	-1117.78	-94.1318	4.8137
49	372.786	1305.85	-998.651	-84.0994	4.81369
50	375.948	1308.85	-625.104	-52.6419	4.81369
51	379.109	1311.86	0	0	0

Appendix F

Material Name	Color	KS (in/h)	WC (ft3/ft3)	WCR (ft3/ft3)
Compacted Fill		1e-05	0.15	0.08
SC to SC-SM		0.5	0.18	0.05
SM		1.7	0.18	0.05
SM/ML		0.2	0.18	0.05
SP-SM		3	0.18	0.05
Bedrock		1e-05	0.15	0.8

Transient seepage - Stage 1 at 15 days



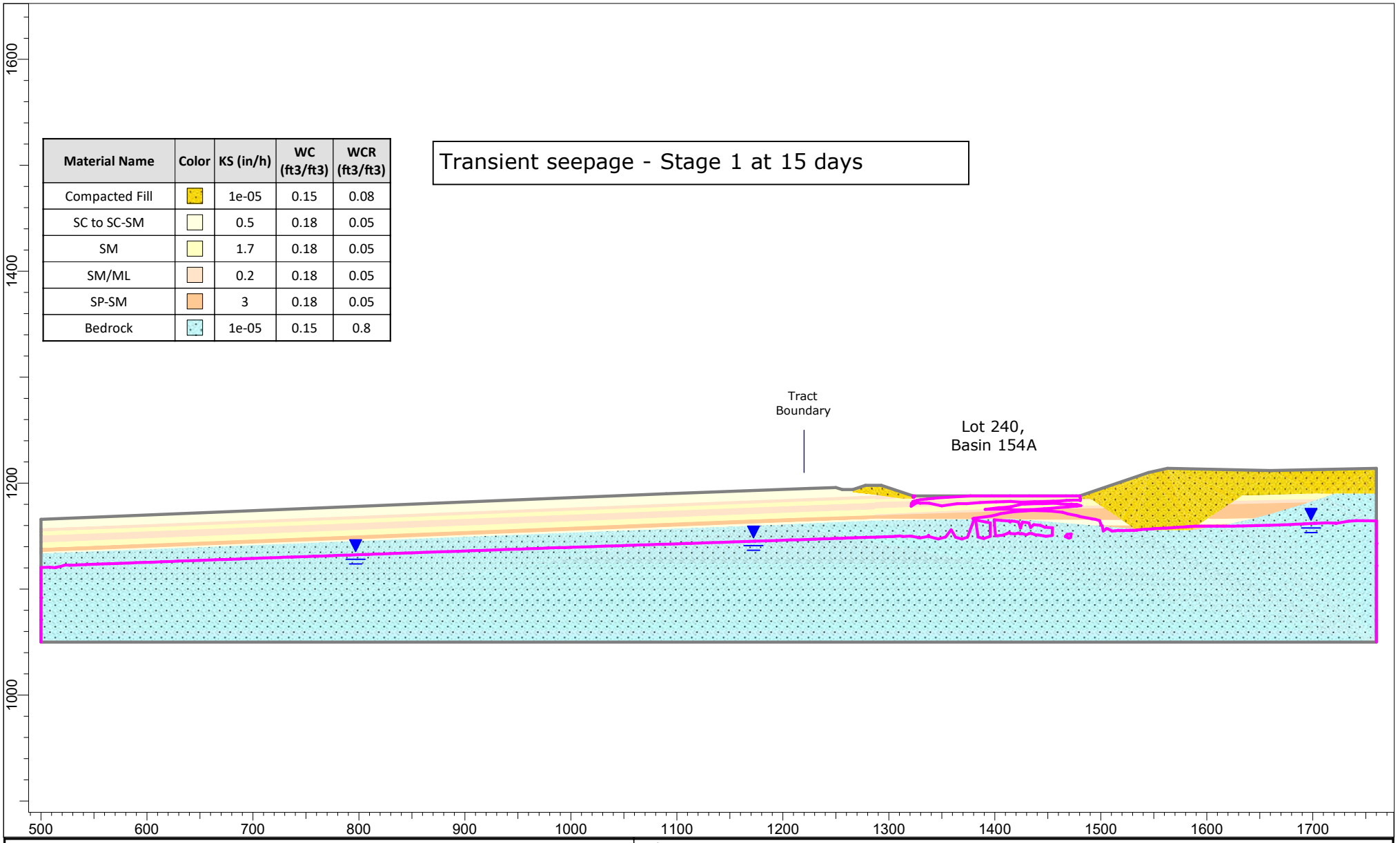
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 - Sterling Ranch Estates LID Stormwater Infiltration	*File Name:*	t30s4a.slmd
		Scale:	1:1500
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* F1

Material Name	Color	KS (in/h)	WC (ft3/ft3)	WCR (ft3/ft3)
Compacted Fill		1e-05	0.15	0.08
SC to SC-SM		0.5	0.18	0.05
SM		1.7	0.18	0.05
SM/ML		0.2	0.18	0.05
SP-SM		3	0.18	0.05
Bedrock		1e-05	0.15	0.8

Transient seepage - Stage 1 at 15 days



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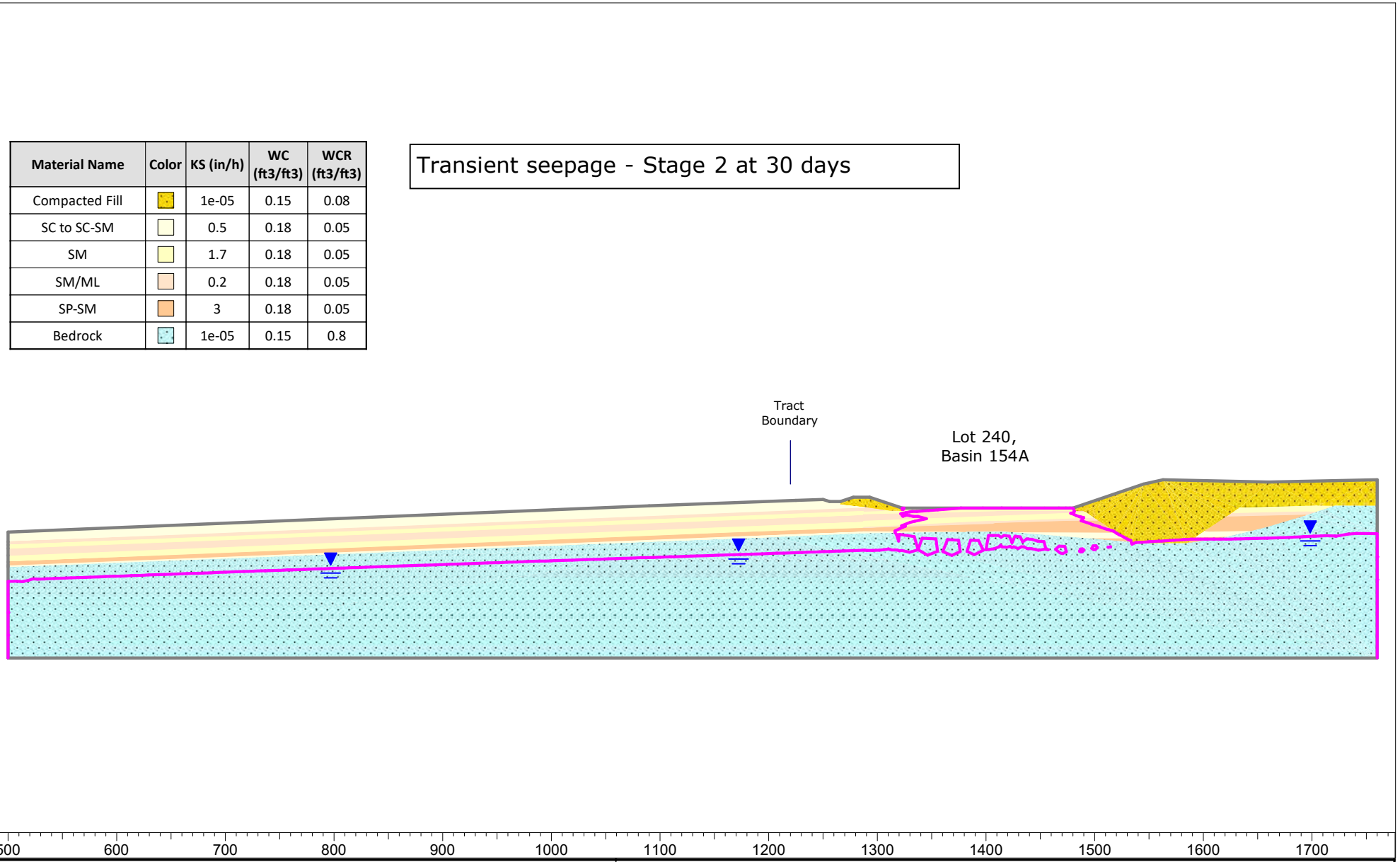
SLIDEINTERPRET 8.014

Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 - Sterling Ranch Estates LID Stormwater Infiltration	*File Name:*	t30s4a.slmd
		Scale:	1:1500
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* F2

Material Name	Color	KS (in/h)	WC (ft3/ft3)	WCR (ft3/ft3)
Compacted Fill		1e-05	0.15	0.08
SC to SC-SM		0.5	0.18	0.05
SM		1.7	0.18	0.05
SM/ML		0.2	0.18	0.05
SP-SM		3	0.18	0.05
Bedrock		1e-05	0.15	0.8

Transient seepage - Stage 2 at 30 days



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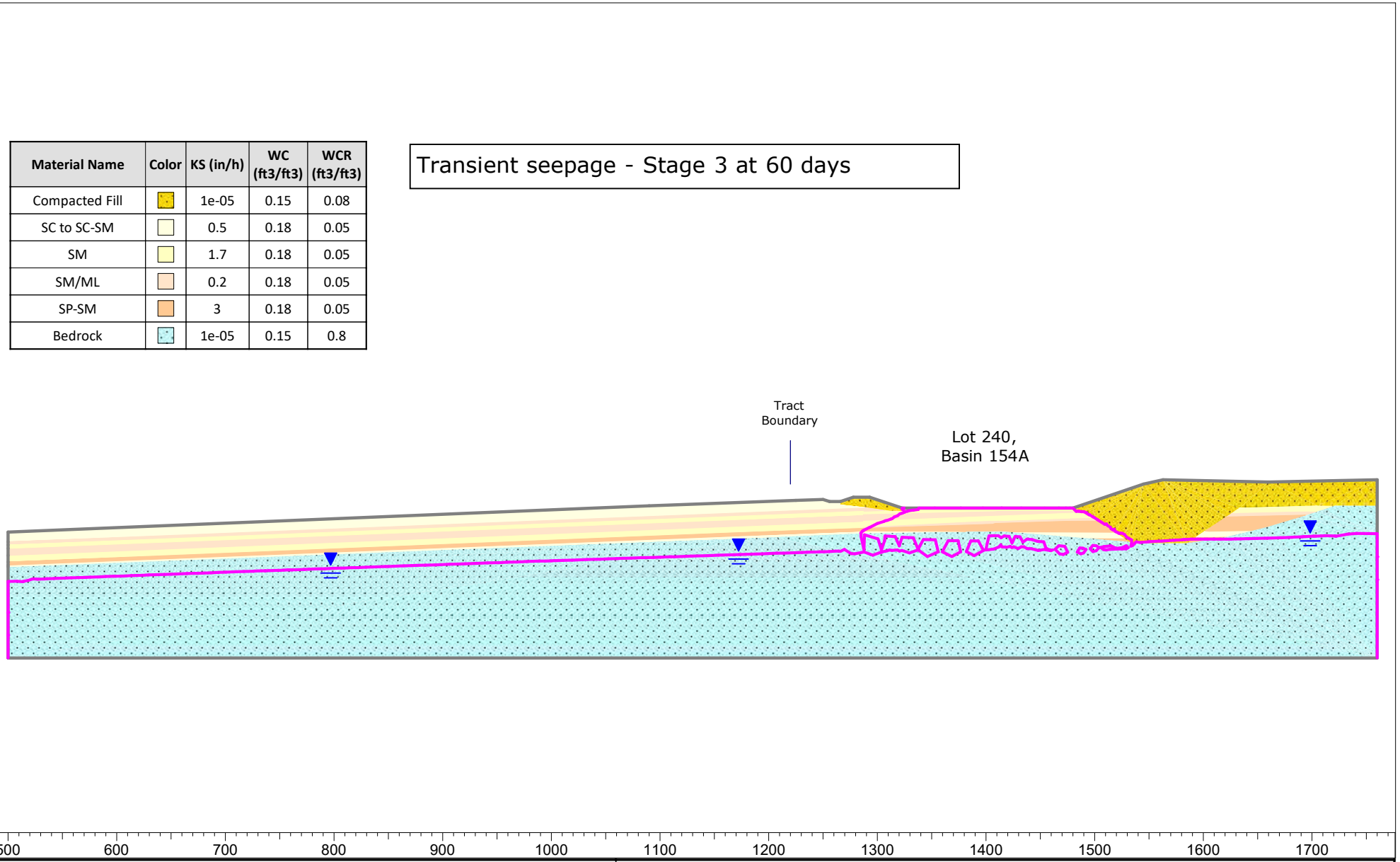
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 - Sterling Ranch Estates LID Stormwater Infiltration	*File Name:*	t30s4a.slmd
		Scale:	1:1500
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* F3

Material Name	Color	KS (in/h)	WC (ft3/ft3)	WCR (ft3/ft3)
Compacted Fill		1e-05	0.15	0.08
SC to SC-SM		0.5	0.18	0.05
SM		1.7	0.18	0.05
SM/ML		0.2	0.18	0.05
SP-SM		3	0.18	0.05
Bedrock		1e-05	0.15	0.8

Transient seepage - Stage 3 at 60 days



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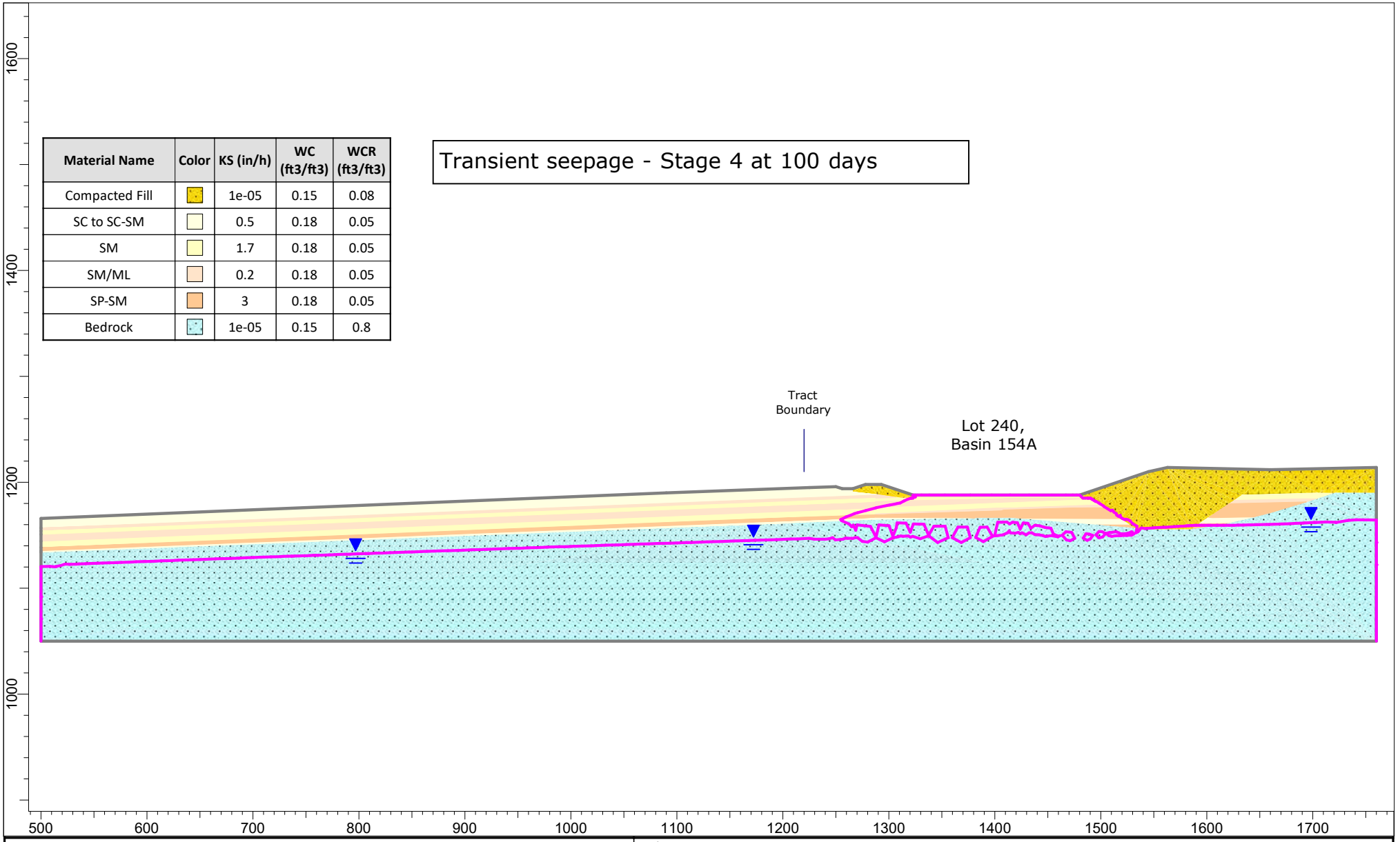
SLIDEINTERPRET 8.014

Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 - Sterling Ranch Estates LID Stormwater Infiltration	*File Name:*	t30s4a.slmd
		Scale:	1:1500
Project No.: 18-1245A-4	*Date:* 6/8/2018	*Figure No.:*	F4

Material Name	Color	KS (in/h)	WC (ft3/ft3)	WCR (ft3/ft3)
Compacted Fill		1e-05	0.15	0.08
SC to SC-SM		0.5	0.18	0.05
SM		1.7	0.18	0.05
SM/ML		0.2	0.18	0.05
SP-SM		3	0.18	0.05
Bedrock		1e-05	0.15	0.8

Transient seepage - Stage 4 at 100 days



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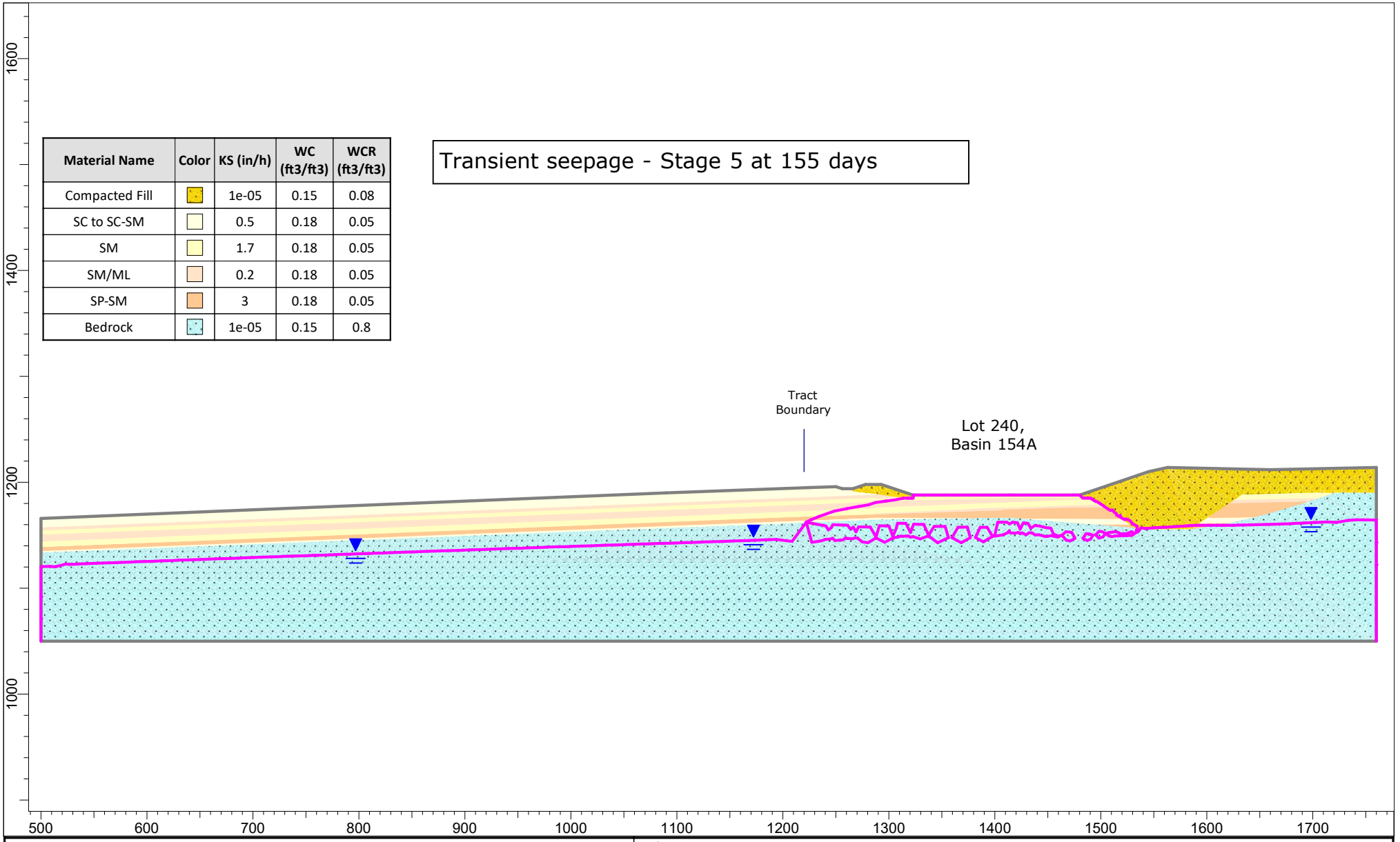
SLIDEINTERPRET 8.014

Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 - Sterling Ranch Estates LID Stormwater Infiltration	*File Name:*	t30s4a.slmd
		Scale:	1:1500
Project No.:	18-1245A-4	*Date:* 6/8/2018	*Figure No.:* F5

Material Name	Color	KS (in/h)	WC (ft3/ft3)	WCR (ft3/ft3)
Compacted Fill		1e-05	0.15	0.08
SC to SC-SM		0.5	0.18	0.05
SM		1.7	0.18	0.05
SM/ML		0.2	0.18	0.05
SP-SM		3	0.18	0.05
Bedrock		1e-05	0.15	0.8

Transient seepage - Stage 5 at 155 days



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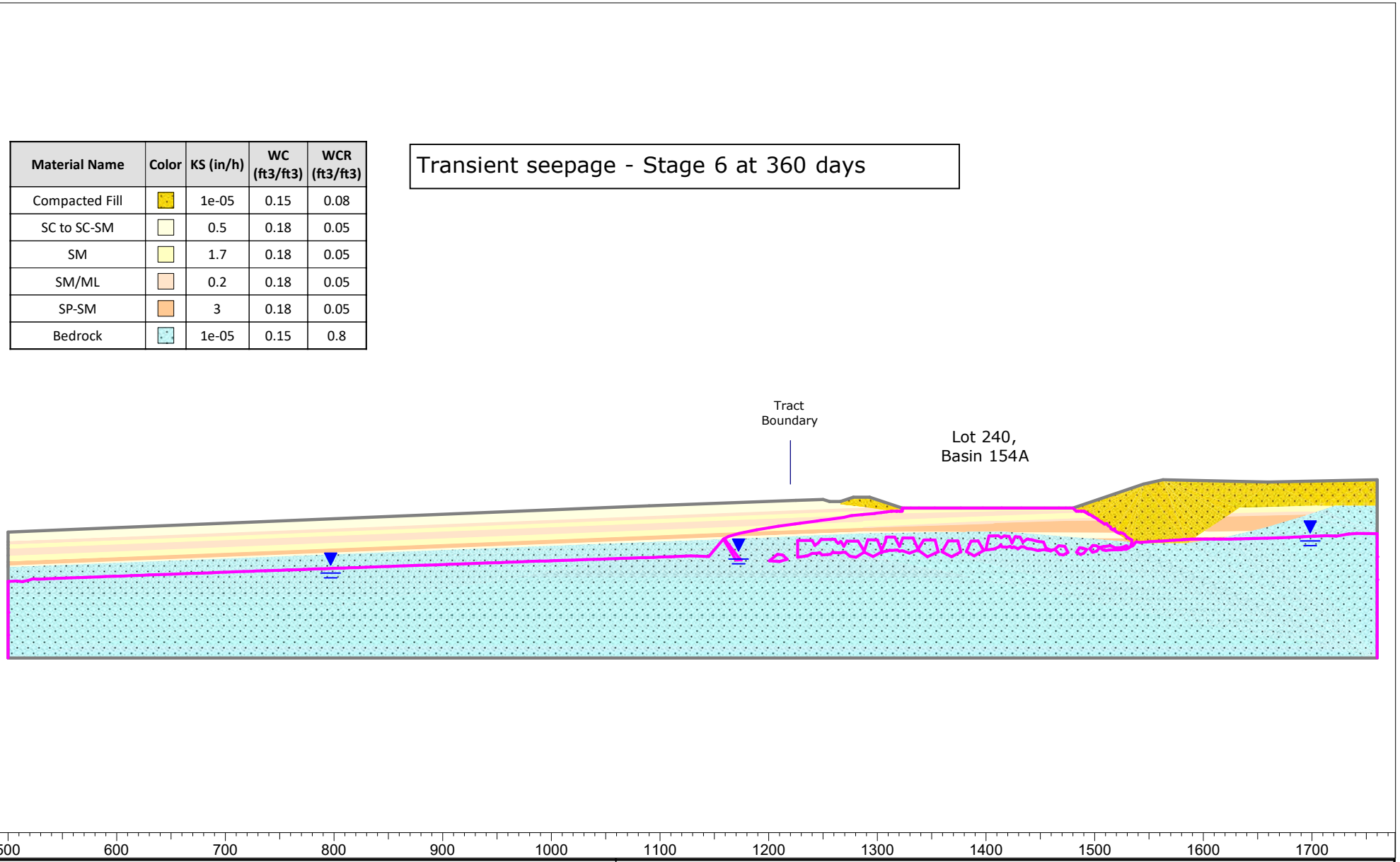
SLIDEINTERPRET 8.014

Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 - Sterling Ranch Estates LID Stormwater Infiltration	*File Name:*	t30s4a.slmd
		Scale:	1:1500
Project No.: 18-1245A-4	*Date:* 6/8/2018	*Figure No.:*	F6

Material Name	Color	KS (in/h)	WC (ft3/ft3)	WCR (ft3/ft3)
Compacted Fill		1e-05	0.15	0.08
SC to SC-SM		0.5	0.18	0.05
SM		1.7	0.18	0.05
SM/ML		0.2	0.18	0.05
SP-SM		3	0.18	0.05
Bedrock		1e-05	0.15	0.8

Transient seepage - Stage 6 at 360 days



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SLIDEINTERPRET 8.014

Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 - Sterling Ranch Estates LID Stormwater Infiltration	*File Name:*	t30s4a.slmd
		Scale:	1:1500
Project No.: 18-1245A-4	*Date:* 6/8/2018	*Figure No.:*	F7

Slide Analysis Information

t30s4a

Results at Stage 6, 360 days

Project Summary

File Name:	t30s4a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257 - Sterling Ranch Estates
Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis
Author:	K. Callahan
Date Created:	5/11/2018

Comments

Sterling Gateway, L.P.
LID Stormwater Infiltration
18-1245A-4
C1

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	inches/hour
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-06
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	Transient FEA

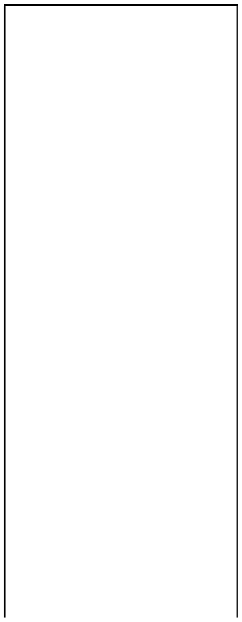
Transient Settings

Stage Name	Time [d]	Calculate Safety Factor
Stage 1	15	No
Stage 2	30	No
Stage 3	60	No
Stage 4	100	No
Stage 5	155	No
Stage 6	360	No
Stage 7	1000	No

Tolerance (Transient):	1e-06
Maximum number of iterations (Transient):	500
Time Steps (Transient):	Automatic
Mesh Element Type:	3 noded triangles
Number of Elements:	2476
Number of Nodes:	1324

Transient Boundary Conditions

Basin Infiltration - Multiple



Time [d]	Pressure Head [ft]
0	4.2
1	0
10	0
10.01	4.2
11	0
20	0
20.01	4.2
21	0
30	0
30.01	4.2
31	0
40	0
40.01	4.2
41	0
50	0
50.01	4.2
51	0
60	0
60.01	4.2
61	0
70	0
70.01	4.2
71	0
80	0
80.01	4.2
81	0
90	0
90.01	8
91.75	0
100	0
100.01	4.2
101	0
110	0
110.01	4.2
111	0
120	0
120.01	4.2
121	0
130	0
130.01	4.2
131	0
140	0
140.01	4.2
141	0
150	0
150.01	4.2
151	0
1000	0

Seepage Face Condition: Yes

Infiltration with Time

Time [d]	Normal Infiltration [ft/d]
0	4.2
1	4.2
1.01	0
10	0
10.01	4.2
11	4.2
11.01	0
20	0
20.01	4.2
21	4.2
21.01	0
30	0
30.01	4.2
31	4.2
31.01	0
40	0
40.01	4.2
41	4.2
41.01	0
50	0
50.01	4.2
51	4.2
51.01	0
60	0
60.01	4.2
61	4.2
61.01	0
70	0
70.01	4.2
71	4.2
71.01	0
80	0
80.01	4.2
81	4.2
81.01	0
90	0
90.01	4.2
91.8	4.2
91.81	0
100	0
100.01	4.2
101	4.2
101.01	0
110	0
110.01	4.2
111	4.2
111.01	0
120	0
120.01	4.2
121	4.2
121.01	0
130	0
130.01	4.2

131	4.2
131.01	0
140	0
140.01	4.2
141	4.2
141.01	0
150	0
150.01	4.2
151	4.2
151.01	0

Seepage Face Condition: No

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	SC to SC-SM	SM	SM/ML	SP-SM	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	115	115	115	115	130
Cohesion [psf]	270	200	200	200	200	300
Friction Angle [°]	29	29	29	29	29	32
Unsaturated Shear Strength Angle [°]	0	0	0	0	0	0
Air Entry Value [psf]	0	0	0	0	0	0
Ks [inches/hour]	1e-05	0.5	1.7	0.2	3	1e-05
K2/K1	1	1	1	1	1	1
K Angle [°]	0	0	0	0	0	0
WC	0.15	0.18	0.18	0.18	0.18	0.15
WCR	0.08	0.05	0.05	0.05	0.05	0.8
MV	N/A	5e-07	5e-07	5e-07	5e-07	N/A
Groundwater Model	Simple	Simple	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: General	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: General
Unsat. Shear Strength Phi b [°]	0	0	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0	0	0
Use water content function to determine Phi b	No	No	No	No	No	No

Entity Information

Group: Extende Section

Shared Entities

Type	Coordinates
External Boundary	

X	Y
500	1050
1760	1050
1760	1164.5
1760	1190
1760	1214
1660	1212
1563	1214
1545	1210
1480	1188
1376.88	1188
1323	1188
1293	1198
1278	1198
1266	1194
1256	1194
1250	1196
1225	1195
1090	1190
500	1166
500	1157
500	1154
500	1151
500	1144.5
500	1138.5
500	1135.5
500	1134
500	1120.5

Material Boundary

X	Y
1266	1194
1266	1191
1290.56	1188.12
1308.17	1185.67
1313	1185
1323	1185
1323	1186.14
1323	1188

Material Boundary

X	Y
1480	1188
1480	1185
1490	1185

Material Boundary

	X	Y
	500	1134
	1200.9	1161.61
	1287	1165
	1381.24	1166.47
	1415	1167
	1424.36	1166.23
	1494.13	1160.5
	1531.33	1157.44
	1534.39	1155.5
	1584.63	1155.5
	1585.63	1156.17
	1589.39	1156.25

	X	Y
Material Boundary	500	1157
	1290.56	1188.12

	X	Y
Material Boundary	500	1154
	1287	1185
	1308.17	1185.67

	X	Y
Material Boundary	500	1135.5
	1287	1167

	X	Y
Material Boundary	500	1138.5
	1287	1170

	X	Y
Material Boundary	500	1144.5
	1287	1176

	X	Y
Material Boundary	500	1151
	1287	1182

	X	Y
Material Boundary	1625.96	1183.06
	1704.44	1184.78

	X	Y
Material Boundary	1601.14	1166.51
	1644.62	1167.47

	X	Y
Material Boundary	1323	1186.14
	1376.88	1188

	X	Y
	1287	1170
	1405.8	1173.77
	1502.26	1176.83

	X	Y
Material Boundary	1494.13	1160.5
	1526.75	1160.5
	1531.33	1157.44

	X	Y
Material Boundary	1424.36	1166.23
	1518.94	1165.7

	X	Y
Material Boundary	1287	1167
	1381.24	1166.47

	X	Y
Material Boundary	1287	1182
	1414.95	1184.81

	X	Y
Material Boundary	1415	1176.5
	1498.29	1179.47

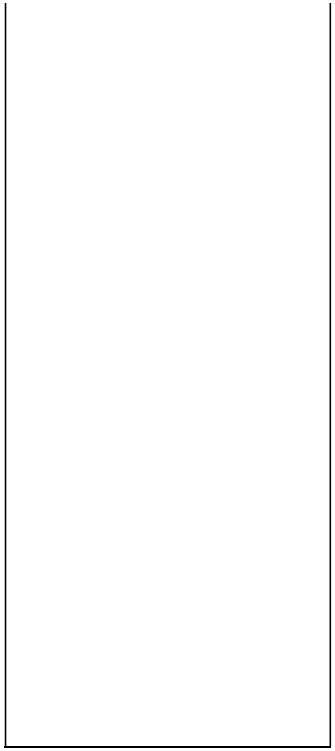
	X	Y
Material Boundary	1621.3	1179.96
	1693.9	1181.55

	X	Y
Material Boundary	1287	1170
	1415	1176.5

	X	Y
Material Boundary	1287	1176
	1491.79	1183.8

	X	Y
Material Boundary	1414.95	1184.81
	1480	1185

	X	Y
Material Boundary	1490	1185
	1491.79	1183.8
	1498.29	1179.47
	1502.26	1176.83
	1517.45	1166.7
	1518.94	1165.7
	1526.75	1160.5



Material Boundary

X	Y
1589.39	1156.25
1609.81	1159.48
1621.09	1161.95
1635	1165
1644.62	1167.47
1660	1171.41
1685	1178.82
1693.9	1181.55
1704.44	1184.78
1710.13	1186.53
1720.33	1190
1760	1190

Material Boundary

X	Y
1585.63	1156.17
1593.38	1161.34
1601.14	1166.51
1602.63	1167.51
1621.3	1179.96
1625.96	1183.06
1633.37	1188
1705	1190
1720.33	1190

Material Boundary

X	Y
1593.38	1161.34
1621.09	1161.95

Slide Analysis Information

t30s4a

Results at Initial Stage

Project Summary

File Name:	t30s4a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257 - Sterling Ranch Estates
Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis
Author:	K. Callahan
Date Created:	5/11/2018
Comments	
	Sterling Gateway, L.P.
	LID Stormwater Infiltration
	18-1245A-4
	C1

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	inches/hour
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-06
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	Transient FEA

Transient Settings

Stage Name	Time [d]	Calculate Safety Factor
Stage 1	15	No
Stage 2	30	No
Stage 3	60	No
Stage 4	100	No
Stage 5	155	No
Stage 6	360	No
Stage 7	1000	No

Tolerance (Transient):	1e-06
Maximum number of iterations (Transient):	500
Time Steps (Transient):	Automatic
Mesh Element Type:	3 noded triangles
Number of Elements:	2476
Number of Nodes:	1324

Transient Boundary Conditions

Basin Infiltration - Multiple

Time [d]	Pressure Head [ft]
0	4.2
1	0
10	0
10.01	4.2
11	0
20	0
20.01	4.2
21	0
30	0
30.01	4.2
31	0
40	0
40.01	4.2
41	0
50	0
50.01	4.2
51	0
60	0
60.01	4.2
61	0
70	0
70.01	4.2
71	0
80	0
80.01	4.2
81	0
90	0
90.01	8
91.75	0
100	0
100.01	4.2
101	0
110	0
110.01	4.2
111	0
120	0
120.01	4.2
121	0
130	0
130.01	4.2
131	0
140	0
140.01	4.2
141	0
150	0
150.01	4.2
151	0
1000	0

Seepage Face Condition: Yes

Infiltration with Time

Time [d]	Normal Infiltration [ft/d]
0	4.2
1	4.2
1.01	0
10	0
10.01	4.2
11	4.2
11.01	0
20	0
20.01	4.2
21	4.2
21.01	0
30	0
30.01	4.2
31	4.2
31.01	0
40	0
40.01	4.2
41	4.2
41.01	0
50	0
50.01	4.2
51	4.2
51.01	0
60	0
60.01	4.2
61	4.2
61.01	0
70	0
70.01	4.2
71	4.2
71.01	0
80	0
80.01	4.2
81	4.2
81.01	0
90	0
90.01	4.2
91.8	4.2
91.81	0
100	0
100.01	4.2
101	4.2
101.01	0
110	0
110.01	4.2
111	4.2
111.01	0
120	0
120.01	4.2
121	4.2
121.01	0
130	0
130.01	4.2
131	4.2
131.01	0
140	0
140.01	4.2
141	4.2
141.01	0
150	0
150.01	4.2
151	4.2
151.01	0

Seepage Face Condition: No

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	SC to SC-SM	SM	SM/ML	SP-SM	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	115	115	115	115	130
Cohesion [psf]	270	200	200	200	200	300
Friction Angle [°]	29	29	29	29	29	32
Unsaturated Shear Strength Angle [°]	0	0	0	0	0	0
Air Entry Value [psf]	0	0	0	0	0	0
Ks [inches/hour]	1e-05	0.5	1.7	0.2	3	1e-05
K2/K1	1	1	1	1	1	1
K Angle [°]	0	0	0	0	0	0
WC	0.15	0.18	0.18	0.18	0.18	0.15
WCR	0.08	0.05	0.05	0.05	0.05	0.8
MV	N/A	5e-07	5e-07	5e-07	5e-07	N/A
Groundwater Model	Simple	Simple	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: General	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: General
Unsat. Shear Strength Phi b [°]	0	0	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0	0	0
Use water content function to determine Phi b	No	No	No	No	No	No

Entity Information

Group: Extende Section

Shared Entities

Type	Coordinates
External Boundary	

X	Y
500	1050
1760	1050
1760	1164.5
1760	1190
1760	1214
1660	1212
1563	1214
1545	1210
1480	1188
1376.88	1188
1323	1188
1293	1198
1278	1198
1266	1194
1256	1194
1250	1196
1225	1195
1090	1190
500	1166
500	1157
500	1154
500	1151
500	1144.5
500	1138.5
500	1135.5
500	1134
500	1120.5

Material Boundary

X	Y
1266	1194
1266	1191
1290.56	1188.12
1308.17	1185.67
1313	1185
1323	1185
1323	1186.14
1323	1188

Material Boundary

X	Y
1480	1188
1480	1185
1490	1185

Material Boundary

X	Y
500	1134
1200.9	1161.61
1287	1165
1381.24	1166.47
1415	1167
1424.36	1166.23
1494.13	1160.5
1531.33	1157.44
1534.39	1155.5
1584.63	1155.5
1585.63	1156.17
1589.39	1156.25

Material Boundary

X	Y
500	1157
1290.56	1188.12

Material Boundary

X	Y
500	1154
1287	1185
1308.17	1185.67

Material Boundary

X	Y
500	1135.5
1287	1167

Material Boundary

X	Y
500	1138.5
1287	1170

Material Boundary

X	Y
500	1144.5
1287	1176

Material Boundary

X	Y
500	1151
1287	1182

Material Boundary

X	Y
1625.96	1183.06
1704.44	1184.78

Material Boundary

X	Y
1601.14	1166.51
1644.62	1167.47

Material Boundary

X	Y
1323	1186.14
1376.88	1188

Material Boundary

X	Y
1287	1170
1405.8	1173.77
1502.26	1176.83

Material Boundary

X	Y
1494.13	1160.5
1526.75	1160.5
1531.33	1157.44

Material Boundary

X	Y
1424.36	1166.23
1518.94	1165.7

Material Boundary

X	Y
1287	1167
1381.24	1166.47

Material Boundary

X	Y
1287	1182
1414.95	1184.81

Material Boundary

X	Y
1415	1176.5
1498.29	1179.47

Material Boundary

X	Y
1621.3	1179.96
1693.9	1181.55

Material Boundary

X	Y
1287	1170
1415	1176.5

Material Boundary

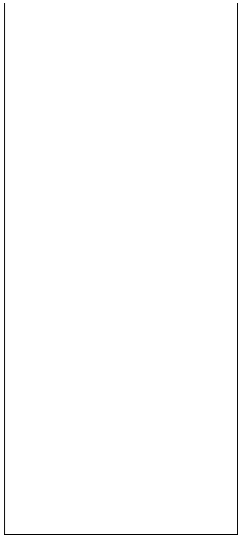
X	Y
1287	1176
1491.79	1183.8

Material Boundary

X	Y
1414.95	1184.81
1480	1185

Material Boundary

X	Y
1490	1185
1491.79	1183.8
1498.29	1179.47
1502.26	1176.83
1517.45	1166.7
1518.94	1165.7
1526.75	1160.5



	X	Y
Material Boundary	1589.39	1156.25
	1609.81	1159.48
	1621.09	1161.95
	1635	1165
	1644.62	1167.47
	1660	1171.41
	1685	1178.82
	1693.9	1181.55
	1704.44	1184.78
	1710.13	1186.53
	1720.33	1190
	1760	1190

	X	Y
Material Boundary	1585.63	1156.17
	1593.38	1161.34
	1601.14	1166.51
	1602.63	1167.51
	1621.3	1179.96
	1625.96	1183.06
	1633.37	1188
	1705	1190
	1720.33	1190

	X	Y
Material Boundary	1593.38	1161.34
	1621.09	1161.95

Slide Analysis Information

t30s4a

Results at Stage 1, 15 days

Project Summary

File Name:	t30s4a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257 - Sterling Ranch Estates
Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis
Author:	K. Callahan
Date Created:	5/11/2018

Comments

Sterling Gateway, L.P.
LID Stormwater Infiltration
18-1245A-4
C1

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	inches/hour
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-06
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	Transient FEA

Transient Settings

Stage Name	Time [d]	Calculate Safety Factor
Stage 1	15	No
Stage 2	30	No
Stage 3	60	No
Stage 4	100	No
Stage 5	155	No
Stage 6	360	No
Stage 7	1000	No

Tolerance (Transient):	1e-06
Maximum number of iterations (Transient):	500
Time Steps (Transient):	Automatic
Mesh Element Type:	3 noded triangles
Number of Elements:	2476
Number of Nodes:	1324

Transient Boundary Conditions

Basin Infiltration - Multiple

Time [d]	Pressure Head [ft]
0	4.2
1	0
10	0
10.01	4.2
11	0
20	0
20.01	4.2
21	0
30	0
30.01	4.2
31	0
40	0
40.01	4.2
41	0
50	0
50.01	4.2
51	0
60	0
60.01	4.2
61	0
70	0
70.01	4.2
71	0
80	0
80.01	4.2
81	0
90	0
90.01	8
91.75	0
100	0
100.01	4.2
101	0
110	0
110.01	4.2
111	0
120	0
120.01	4.2
121	0
130	0
130.01	4.2
131	0
140	0
140.01	4.2
141	0
150	0
150.01	4.2
151	0
1000	0

Seepage Face Condition: Yes

Infiltration with Time

Time [d]	Normal Infiltration [ft/d]
0	4.2
1	4.2
1.01	0
10	0
10.01	4.2
11	4.2
11.01	0
20	0
20.01	4.2
21	4.2
21.01	0
30	0
30.01	4.2
31	4.2
31.01	0
40	0
40.01	4.2
41	4.2
41.01	0
50	0
50.01	4.2
51	4.2
51.01	0
60	0
60.01	4.2
61	4.2
61.01	0
70	0
70.01	4.2
71	4.2
71.01	0
80	0
80.01	4.2
81	4.2
81.01	0
90	0
90.01	4.2
91.8	4.2
91.81	0
100	0
100.01	4.2
101	4.2
101.01	0
110	0
110.01	4.2
111	4.2
111.01	0
120	0
120.01	4.2
121	4.2
121.01	0
130	0
130.01	4.2
131	4.2
131.01	0
140	0
140.01	4.2
141	4.2
141.01	0
150	0
150.01	4.2
151	4.2
151.01	0

Seepage Face Condition: No

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	SC to SC-SM	SM	SM/ML	SP-SM	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	115	115	115	115	130
Cohesion [psf]	270	200	200	200	200	300
Friction Angle [°]	29	29	29	29	29	32
Unsaturated Shear Strength Angle [°]	0	0	0	0	0	0
Air Entry Value [psf]	0	0	0	0	0	0
Ks [inches/hour]	1e-05	0.5	1.7	0.2	3	1e-05
K2/K1	1	1	1	1	1	1
K Angle [°]	0	0	0	0	0	0
WC	0.15	0.18	0.18	0.18	0.18	0.15
WCR	0.08	0.05	0.05	0.05	0.05	0.8
MV	N/A	5e-07	5e-07	5e-07	5e-07	N/A
Groundwater Model	Simple	Simple	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: General	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: General
Unsat. Shear Strength Phi b [°]	0	0	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0	0	0
Use water content function to determine Phi b	No	No	No	No	No	No

Entity Information

Group: Extende Section

Shared Entities

Type	Coordinates
External Boundary	

X	Y
500	1050
1760	1050
1760	1164.5
1760	1190
1760	1214
1660	1212
1563	1214
1545	1210
1480	1188
1376.88	1188
1323	1188
1293	1198
1278	1198
1266	1194
1256	1194
1250	1196
1225	1195
1090	1190
500	1166
500	1157
500	1154
500	1151
500	1144.5
500	1138.5
500	1135.5
500	1134
500	1120.5

Material Boundary

X	Y
1266	1194
1266	1191
1290.56	1188.12
1308.17	1185.67
1313	1185
1323	1185
1323	1186.14
1323	1188

Material Boundary

X	Y
1480	1188
1480	1185
1490	1185

Material Boundary

X	Y
500	1134
1200.9	1161.61
1287	1165
1381.24	1166.47
1415	1167
1424.36	1166.23
1494.13	1160.5
1531.33	1157.44
1534.39	1155.5
1584.63	1155.5
1585.63	1156.17
1589.39	1156.25

Material Boundary

X	Y
500	1157
1290.56	1188.12

Material Boundary

X	Y
500	1154
1287	1185
1308.17	1185.67

Material Boundary

X	Y
500	1135.5
1287	1167

Material Boundary

X	Y
500	1138.5
1287	1170

Material Boundary

X	Y
500	1144.5
1287	1176

Material Boundary

X	Y
500	1151
1287	1182

Material Boundary

X	Y
1625.96	1183.06
1704.44	1184.78

Material Boundary

X	Y
1601.14	1166.51
1644.62	1167.47

Material Boundary

X	Y
1323	1186.14
1376.88	1188

Material Boundary

X	Y
1287	1170
1405.8	1173.77
1502.26	1176.83

Material Boundary

X	Y
1494.13	1160.5
1526.75	1160.5
1531.33	1157.44

Material Boundary

X	Y
1424.36	1166.23
1518.94	1165.7

Material Boundary

X	Y
1287	1167
1381.24	1166.47

Material Boundary

X	Y
1287	1182
1414.95	1184.81

Material Boundary

X	Y
1415	1176.5
1498.29	1179.47

Material Boundary

X	Y
1621.3	1179.96
1693.9	1181.55

Material Boundary

X	Y
1287	1170
1415	1176.5

Material Boundary

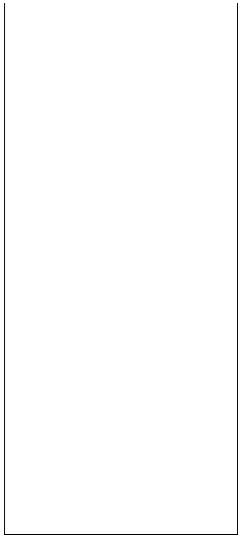
X	Y
1287	1176
1491.79	1183.8

Material Boundary

X	Y
1414.95	1184.81
1480	1185

Material Boundary

X	Y
1490	1185
1491.79	1183.8
1498.29	1179.47
1502.26	1176.83
1517.45	1166.7
1518.94	1165.7
1526.75	1160.5



	X	Y
Material Boundary	1589.39	1156.25
	1609.81	1159.48
	1621.09	1161.95
	1635	1165
	1644.62	1167.47
	1660	1171.41
	1685	1178.82
	1693.9	1181.55
	1704.44	1184.78
	1710.13	1186.53
	1720.33	1190
	1760	1190

	X	Y
Material Boundary	1585.63	1156.17
	1593.38	1161.34
	1601.14	1166.51
	1602.63	1167.51
	1621.3	1179.96
	1625.96	1183.06
	1633.37	1188
	1705	1190
	1720.33	1190

	X	Y
Material Boundary	1593.38	1161.34
	1621.09	1161.95

Slide Analysis Information

t30s4a

Results at Stage 2, 30 days

Project Summary

File Name:	t30s4a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257 - Sterling Ranch Estates
Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis
Author:	K. Callahan
Date Created:	5/11/2018

Comments

Sterling Gateway, L.P.
LID Stormwater Infiltration
18-1245A-4
C1

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	inches/hour
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-06
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	Transient FEA

Transient Settings

Stage Name	Time [d]	Calculate Safety Factor
Stage 1	15	No
Stage 2	30	No
Stage 3	60	No
Stage 4	100	No
Stage 5	155	No
Stage 6	360	No
Stage 7	1000	No

Tolerance (Transient):	1e-06
Maximum number of iterations (Transient):	500
Time Steps (Transient):	Automatic
Mesh Element Type:	3 noded triangles
Number of Elements:	2476
Number of Nodes:	1324

Transient Boundary Conditions

Basin Infiltration - Multiple

Time [d]	Pressure Head [ft]
0	4.2
1	0
10	0
10.01	4.2
11	0
20	0
20.01	4.2
21	0
30	0
30.01	4.2
31	0
40	0
40.01	4.2
41	0
50	0
50.01	4.2
51	0
60	0
60.01	4.2
61	0
70	0
70.01	4.2
71	0
80	0
80.01	4.2
81	0
90	0
90.01	8
91.75	0
100	0
100.01	4.2
101	0
110	0
110.01	4.2
111	0
120	0
120.01	4.2
121	0
130	0
130.01	4.2
131	0
140	0
140.01	4.2
141	0
150	0
150.01	4.2
151	0
1000	0

Seepage Face Condition: Yes

Infiltration with Time

Time [d]	Normal Infiltration [ft/d]
0	4.2
1	4.2
1.01	0
10	0
10.01	4.2
11	4.2
11.01	0
20	0
20.01	4.2
21	4.2
21.01	0
30	0
30.01	4.2
31	4.2
31.01	0
40	0
40.01	4.2
41	4.2
41.01	0
50	0
50.01	4.2
51	4.2
51.01	0
60	0
60.01	4.2
61	4.2
61.01	0
70	0
70.01	4.2
71	4.2
71.01	0
80	0
80.01	4.2
81	4.2
81.01	0
90	0
90.01	4.2
91.8	4.2
91.81	0
100	0
100.01	4.2
101	4.2
101.01	0
110	0
110.01	4.2
111	4.2
111.01	0
120	0
120.01	4.2
121	4.2
121.01	0
130	0
130.01	4.2
131	4.2
131.01	0
140	0
140.01	4.2
141	4.2
141.01	0
150	0
150.01	4.2
151	4.2
151.01	0

Seepage Face Condition: No

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	SC to SC-SM	SM	SM/ML	SP-SM	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	115	115	115	115	130
Cohesion [psf]	270	200	200	200	200	300
Friction Angle [°]	29	29	29	29	29	32
Unsaturated Shear Strength Angle [°]	0	0	0	0	0	0
Air Entry Value [psf]	0	0	0	0	0	0
Ks [inches/hour]	1e-05	0.5	1.7	0.2	3	1e-05
K2/K1	1	1	1	1	1	1
K Angle [°]	0	0	0	0	0	0
WC	0.15	0.18	0.18	0.18	0.18	0.15
WCR	0.08	0.05	0.05	0.05	0.05	0.8
MV	N/A	5e-07	5e-07	5e-07	5e-07	N/A
Groundwater Model	Simple	Simple	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: General	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: General
Unsat. Shear Strength Phi b [°]	0	0	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0	0	0
Use water content function to determine Phi b	No	No	No	No	No	No

Entity Information

Group: Extende Section

Shared Entities

Type	Coordinates
External Boundary	

X	Y
500	1050
1760	1050
1760	1164.5
1760	1190
1760	1214
1660	1212
1563	1214
1545	1210
1480	1188
1376.88	1188
1323	1188
1293	1198
1278	1198
1266	1194
1256	1194
1250	1196
1225	1195
1090	1190
500	1166
500	1157
500	1154
500	1151
500	1144.5
500	1138.5
500	1135.5
500	1134
500	1120.5

Material Boundary

X	Y
1266	1194
1266	1191
1290.56	1188.12
1308.17	1185.67
1313	1185
1323	1185
1323	1186.14
1323	1188

Material Boundary

X	Y
1480	1188
1480	1185
1490	1185

Material Boundary

X	Y
500	1134
1200.9	1161.61
1287	1165
1381.24	1166.47
1415	1167
1424.36	1166.23
1494.13	1160.5
1531.33	1157.44
1534.39	1155.5
1584.63	1155.5
1585.63	1156.17
1589.39	1156.25

Material Boundary

X	Y
500	1157
1290.56	1188.12

Material Boundary

X	Y
500	1154
1287	1185
1308.17	1185.67

Material Boundary

X	Y
500	1135.5
1287	1167

Material Boundary

X	Y
500	1138.5
1287	1170

Material Boundary

X	Y
500	1144.5
1287	1176

Material Boundary

X	Y
500	1151
1287	1182

Material Boundary

X	Y
1625.96	1183.06
1704.44	1184.78

Material Boundary

X	Y
1601.14	1166.51
1644.62	1167.47

Material Boundary

X	Y
1323	1186.14
1376.88	1188

Material Boundary

X	Y
1287	1170
1405.8	1173.77
1502.26	1176.83

Material Boundary

X	Y
1494.13	1160.5
1526.75	1160.5
1531.33	1157.44

Material Boundary

X	Y
1424.36	1166.23
1518.94	1165.7

Material Boundary

X	Y
1287	1167
1381.24	1166.47

Material Boundary

X	Y
1287	1182
1414.95	1184.81

Material Boundary

X	Y
1415	1176.5
1498.29	1179.47

Material Boundary

X	Y
1621.3	1179.96
1693.9	1181.55

Material Boundary

X	Y
1287	1170
1415	1176.5

Material Boundary

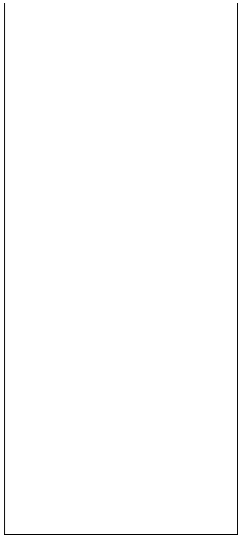
X	Y
1287	1176
1491.79	1183.8

Material Boundary

X	Y
1414.95	1184.81
1480	1185

Material Boundary

X	Y
1490	1185
1491.79	1183.8
1498.29	1179.47
1502.26	1176.83
1517.45	1166.7
1518.94	1165.7
1526.75	1160.5



	X	Y
Material Boundary	1589.39	1156.25
	1609.81	1159.48
	1621.09	1161.95
	1635	1165
	1644.62	1167.47
	1660	1171.41
	1685	1178.82
	1693.9	1181.55
	1704.44	1184.78
	1710.13	1186.53
	1720.33	1190
	1760	1190

	X	Y
Material Boundary	1585.63	1156.17
	1593.38	1161.34
	1601.14	1166.51
	1602.63	1167.51
	1621.3	1179.96
	1625.96	1183.06
	1633.37	1188
	1705	1190
	1720.33	1190

	X	Y
Material Boundary	1593.38	1161.34
	1621.09	1161.95

Slide Analysis Information

t30s4a

Results at Stage 3, 60 days

Project Summary

File Name:	t30s4a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257 - Sterling Ranch Estates
Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis
Author:	K. Callahan
Date Created:	5/11/2018

Comments

Sterling Gateway, L.P.
LID Stormwater Infiltration
18-1245A-4
C1

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	inches/hour
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-06
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	Transient FEA

Transient Settings

Stage Name	Time [d]	Calculate Safety Factor
Stage 1	15	No
Stage 2	30	No
Stage 3	60	No
Stage 4	100	No
Stage 5	155	No
Stage 6	360	No
Stage 7	1000	No

Tolerance (Transient):	1e-06
Maximum number of iterations (Transient):	500
Time Steps (Transient):	Automatic
Mesh Element Type:	3 noded triangles
Number of Elements:	2476
Number of Nodes:	1324

Transient Boundary Conditions

Basin Infiltration - Multiple

Time [d]	Pressure Head [ft]
0	4.2
1	0
10	0
10.01	4.2
11	0
20	0
20.01	4.2
21	0
30	0
30.01	4.2
31	0
40	0
40.01	4.2
41	0
50	0
50.01	4.2
51	0
60	0
60.01	4.2
61	0
70	0
70.01	4.2
71	0
80	0
80.01	4.2
81	0
90	0
90.01	8
91.75	0
100	0
100.01	4.2
101	0
110	0
110.01	4.2
111	0
120	0
120.01	4.2
121	0
130	0
130.01	4.2
131	0
140	0
140.01	4.2
141	0
150	0
150.01	4.2
151	0
1000	0

Seepage Face Condition: Yes

Infiltration with Time

Time [d]	Normal Infiltration [ft/d]
0	4.2
1	4.2
1.01	0
10	0
10.01	4.2
11	4.2
11.01	0
20	0
20.01	4.2
21	4.2
21.01	0
30	0
30.01	4.2
31	4.2
31.01	0
40	0
40.01	4.2
41	4.2
41.01	0
50	0
50.01	4.2
51	4.2
51.01	0
60	0
60.01	4.2
61	4.2
61.01	0
70	0
70.01	4.2
71	4.2
71.01	0
80	0
80.01	4.2
81	4.2
81.01	0
90	0
90.01	4.2
91.8	4.2
91.81	0
100	0
100.01	4.2
101	4.2
101.01	0
110	0
110.01	4.2
111	4.2
111.01	0
120	0
120.01	4.2
121	4.2
121.01	0
130	0
130.01	4.2
131	4.2
131.01	0
140	0
140.01	4.2
141	4.2
141.01	0
150	0
150.01	4.2
151	4.2
151.01	0

Seepage Face Condition: No

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	SC to SC-SM	SM	SM/ML	SP-SM	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	115	115	115	115	130
Cohesion [psf]	270	200	200	200	200	300
Friction Angle [°]	29	29	29	29	29	32
Unsaturated Shear Strength Angle [°]	0	0	0	0	0	0
Air Entry Value [psf]	0	0	0	0	0	0
Ks [inches/hour]	1e-05	0.5	1.7	0.2	3	1e-05
K2/K1	1	1	1	1	1	1
K Angle [°]	0	0	0	0	0	0
WC	0.15	0.18	0.18	0.18	0.18	0.15
WCR	0.08	0.05	0.05	0.05	0.05	0.8
MV	N/A	5e-07	5e-07	5e-07	5e-07	N/A
Groundwater Model	Simple	Simple	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: General	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: General
Unsat. Shear Strength Phi b [°]	0	0	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0	0	0
Use water content function to determine Phi b	No	No	No	No	No	No

Entity Information

Group: Extende Section

Shared Entities

Type	Coordinates
External Boundary	

X	Y
500	1050
1760	1050
1760	1164.5
1760	1190
1760	1214
1660	1212
1563	1214
1545	1210
1480	1188
1376.88	1188
1323	1188
1293	1198
1278	1198
1266	1194
1256	1194
1250	1196
1225	1195
1090	1190
500	1166
500	1157
500	1154
500	1151
500	1144.5
500	1138.5
500	1135.5
500	1134
500	1120.5

Material Boundary

X	Y
1266	1194
1266	1191
1290.56	1188.12
1308.17	1185.67
1313	1185
1323	1185
1323	1186.14
1323	1188

Material Boundary

X	Y
1480	1188
1480	1185
1490	1185

Material Boundary

X	Y
500	1134
1200.9	1161.61
1287	1165
1381.24	1166.47
1415	1167
1424.36	1166.23
1494.13	1160.5
1531.33	1157.44
1534.39	1155.5
1584.63	1155.5
1585.63	1156.17
1589.39	1156.25

Material Boundary

X	Y
500	1157
1290.56	1188.12

Material Boundary

X	Y
500	1154
1287	1185
1308.17	1185.67

Material Boundary

X	Y
500	1135.5
1287	1167

Material Boundary

X	Y
500	1138.5
1287	1170

Material Boundary

X	Y
500	1144.5
1287	1176

Material Boundary

X	Y
500	1151
1287	1182

Material Boundary

X	Y
1625.96	1183.06
1704.44	1184.78

Material Boundary

X	Y
1601.14	1166.51
1644.62	1167.47

Material Boundary

X	Y
1323	1186.14
1376.88	1188

Material Boundary

X	Y
1287	1170
1405.8	1173.77
1502.26	1176.83

Material Boundary

X	Y
1494.13	1160.5
1526.75	1160.5
1531.33	1157.44

Material Boundary

X	Y
1424.36	1166.23
1518.94	1165.7

Material Boundary

X	Y
1287	1167
1381.24	1166.47

Material Boundary

X	Y
1287	1182
1414.95	1184.81

Material Boundary

X	Y
1415	1176.5
1498.29	1179.47

Material Boundary

X	Y
1621.3	1179.96
1693.9	1181.55

Material Boundary

X	Y
1287	1170
1415	1176.5

Material Boundary

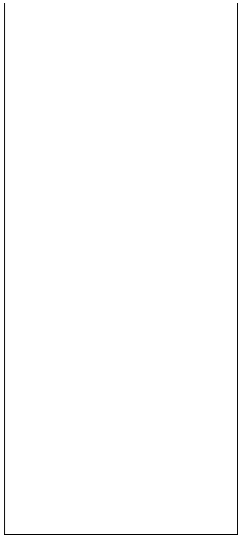
X	Y
1287	1176
1491.79	1183.8

Material Boundary

X	Y
1414.95	1184.81
1480	1185

Material Boundary

X	Y
1490	1185
1491.79	1183.8
1498.29	1179.47
1502.26	1176.83
1517.45	1166.7
1518.94	1165.7
1526.75	1160.5



	X	Y
Material Boundary	1589.39	1156.25
	1609.81	1159.48
	1621.09	1161.95
	1635	1165
	1644.62	1167.47
	1660	1171.41
	1685	1178.82
	1693.9	1181.55
	1704.44	1184.78
	1710.13	1186.53
	1720.33	1190
	1760	1190

	X	Y
Material Boundary	1585.63	1156.17
	1593.38	1161.34
	1601.14	1166.51
	1602.63	1167.51
	1621.3	1179.96
	1625.96	1183.06
	1633.37	1188
	1705	1190
	1720.33	1190

	X	Y
Material Boundary	1593.38	1161.34
	1621.09	1161.95

Slide Analysis Information

t30s4a

Results at Stage 4, 100 days

Project Summary

File Name:	t30s4a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257 - Sterling Ranch Estates
Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis
Author:	K. Callahan
Date Created:	5/11/2018

Comments

Sterling Gateway, L.P.
LID Stormwater Infiltration
18-1245A-4
C1

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	inches/hour
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-06
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	Transient FEA

Transient Settings

Stage Name	Time [d]	Calculate Safety Factor
Stage 1	15	No
Stage 2	30	No
Stage 3	60	No
Stage 4	100	No
Stage 5	155	No
Stage 6	360	No
Stage 7	1000	No

Tolerance (Transient):	1e-06
Maximum number of iterations (Transient):	500
Time Steps (Transient):	Automatic
Mesh Element Type:	3 noded triangles
Number of Elements:	2476
Number of Nodes:	1324

Transient Boundary Conditions

Basin Infiltration - Multiple

Time [d]	Pressure Head [ft]
0	4.2
1	0
10	0
10.01	4.2
11	0
20	0
20.01	4.2
21	0
30	0
30.01	4.2
31	0
40	0
40.01	4.2
41	0
50	0
50.01	4.2
51	0
60	0
60.01	4.2
61	0
70	0
70.01	4.2
71	0
80	0
80.01	4.2
81	0
90	0
90.01	8
91.75	0
100	0
100.01	4.2
101	0
110	0
110.01	4.2
111	0
120	0
120.01	4.2
121	0
130	0
130.01	4.2
131	0
140	0
140.01	4.2
141	0
150	0
150.01	4.2
151	0
1000	0

Seepage Face Condition: Yes

Infiltration with Time

Time [d]	Normal Infiltration [ft/d]
0	4.2
1	4.2
1.01	0
10	0
10.01	4.2
11	4.2
11.01	0
20	0
20.01	4.2
21	4.2
21.01	0
30	0
30.01	4.2
31	4.2
31.01	0
40	0
40.01	4.2
41	4.2
41.01	0
50	0
50.01	4.2
51	4.2
51.01	0
60	0
60.01	4.2
61	4.2
61.01	0
70	0
70.01	4.2
71	4.2
71.01	0
80	0
80.01	4.2
81	4.2
81.01	0
90	0
90.01	4.2
91.8	4.2
91.81	0
100	0
100.01	4.2
101	4.2
101.01	0
110	0
110.01	4.2
111	4.2
111.01	0
120	0
120.01	4.2
121	4.2
121.01	0
130	0
130.01	4.2
131	4.2
131.01	0
140	0
140.01	4.2
141	4.2
141.01	0
150	0
150.01	4.2
151	4.2
151.01	0

Seepage Face Condition: No

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	SC to SC-SM	SM	SM/ML	SP-SM	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	115	115	115	115	130
Cohesion [psf]	270	200	200	200	200	300
Friction Angle [°]	29	29	29	29	29	32
Unsaturated Shear Strength Angle [°]	0	0	0	0	0	0
Air Entry Value [psf]	0	0	0	0	0	0
Ks [inches/hour]	1e-05	0.5	1.7	0.2	3	1e-05
K2/K1	1	1	1	1	1	1
K Angle [°]	0	0	0	0	0	0
WC	0.15	0.18	0.18	0.18	0.18	0.15
WCR	0.08	0.05	0.05	0.05	0.05	0.8
MV	N/A	5e-07	5e-07	5e-07	5e-07	N/A
Groundwater Model	Simple	Simple	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: General	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: General
Unsat. Shear Strength Phi b [°]	0	0	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0	0	0
Use water content function to determine Phi b	No	No	No	No	No	No

Entity Information

Group: Extende Section

Shared Entities

Type	Coordinates
External Boundary	

X	Y
500	1050
1760	1050
1760	1164.5
1760	1190
1760	1214
1660	1212
1563	1214
1545	1210
1480	1188
1376.88	1188
1323	1188
1293	1198
1278	1198
1266	1194
1256	1194
1250	1196
1225	1195
1090	1190
500	1166
500	1157
500	1154
500	1151
500	1144.5
500	1138.5
500	1135.5
500	1134
500	1120.5

Material Boundary

X	Y
1266	1194
1266	1191
1290.56	1188.12
1308.17	1185.67
1313	1185
1323	1185
1323	1186.14
1323	1188

Material Boundary

X	Y
1480	1188
1480	1185
1490	1185

Material Boundary

X	Y
500	1134
1200.9	1161.61
1287	1165
1381.24	1166.47
1415	1167
1424.36	1166.23
1494.13	1160.5
1531.33	1157.44
1534.39	1155.5
1584.63	1155.5
1585.63	1156.17
1589.39	1156.25

Material Boundary

X	Y
500	1157
1290.56	1188.12

Material Boundary

X	Y
500	1154
1287	1185
1308.17	1185.67

Material Boundary

X	Y
500	1135.5
1287	1167

Material Boundary

X	Y
500	1138.5
1287	1170

Material Boundary

X	Y
500	1144.5
1287	1176

Material Boundary

X	Y
500	1151
1287	1182

Material Boundary

X	Y
1625.96	1183.06
1704.44	1184.78

Material Boundary

X	Y
1601.14	1166.51
1644.62	1167.47

Material Boundary

X	Y
1323	1186.14
1376.88	1188

Material Boundary

X	Y
1287	1170
1405.8	1173.77
1502.26	1176.83

Material Boundary

X	Y
1494.13	1160.5
1526.75	1160.5
1531.33	1157.44

Material Boundary

X	Y
1424.36	1166.23
1518.94	1165.7

Material Boundary

X	Y
1287	1167
1381.24	1166.47

Material Boundary

X	Y
1287	1182
1414.95	1184.81

Material Boundary

X	Y
1415	1176.5
1498.29	1179.47

Material Boundary

X	Y
1621.3	1179.96
1693.9	1181.55

Material Boundary

X	Y
1287	1170
1415	1176.5

Material Boundary

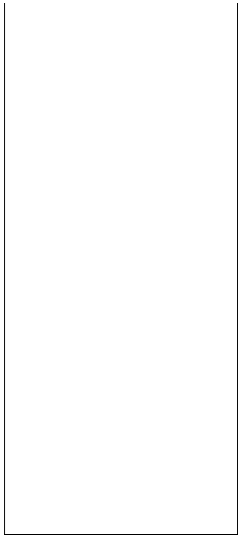
X	Y
1287	1176
1491.79	1183.8

Material Boundary

X	Y
1414.95	1184.81
1480	1185

Material Boundary

X	Y
1490	1185
1491.79	1183.8
1498.29	1179.47
1502.26	1176.83
1517.45	1166.7
1518.94	1165.7
1526.75	1160.5



	X	Y
Material Boundary	1589.39	1156.25
	1609.81	1159.48
	1621.09	1161.95
	1635	1165
	1644.62	1167.47
	1660	1171.41
	1685	1178.82
	1693.9	1181.55
	1704.44	1184.78
	1710.13	1186.53
	1720.33	1190
	1760	1190

	X	Y
Material Boundary	1585.63	1156.17
	1593.38	1161.34
	1601.14	1166.51
	1602.63	1167.51
	1621.3	1179.96
	1625.96	1183.06
	1633.37	1188
	1705	1190
	1720.33	1190

	X	Y
Material Boundary	1593.38	1161.34
	1621.09	1161.95

Slide Analysis Information

t30s4a

Results at Stage 5, 155 days

Project Summary

File Name:	t30s4a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257 - Sterling Ranch Estates
Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis
Author:	K. Callahan
Date Created:	5/11/2018

Comments

Sterling Gateway, L.P.
LID Stormwater Infiltration
18-1245A-4
C1

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	inches/hour
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-06
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	Transient FEA

Transient Settings

Stage Name	Time [d]	Calculate Safety Factor
Stage 1	15	No
Stage 2	30	No
Stage 3	60	No
Stage 4	100	No
Stage 5	155	No
Stage 6	360	No
Stage 7	1000	No

Tolerance (Transient):	1e-06
Maximum number of iterations (Transient):	500
Time Steps (Transient):	Automatic
Mesh Element Type:	3 noded triangles
Number of Elements:	2476
Number of Nodes:	1324

Transient Boundary Conditions

Basin Infiltration - Multiple

Time [d]	Pressure Head [ft]
0	4.2
1	0
10	0
10.01	4.2
11	0
20	0
20.01	4.2
21	0
30	0
30.01	4.2
31	0
40	0
40.01	4.2
41	0
50	0
50.01	4.2
51	0
60	0
60.01	4.2
61	0
70	0
70.01	4.2
71	0
80	0
80.01	4.2
81	0
90	0
90.01	8
91.75	0
100	0
100.01	4.2
101	0
110	0
110.01	4.2
111	0
120	0
120.01	4.2
121	0
130	0
130.01	4.2
131	0
140	0
140.01	4.2
141	0
150	0
150.01	4.2
151	0
1000	0

Seepage Face Condition: Yes

Infiltration with Time

Time [d]	Normal Infiltration [ft/d]
0	4.2
1	4.2
1.01	0
10	0
10.01	4.2
11	4.2
11.01	0
20	0
20.01	4.2
21	4.2
21.01	0
30	0
30.01	4.2
31	4.2
31.01	0
40	0
40.01	4.2
41	4.2
41.01	0
50	0
50.01	4.2
51	4.2
51.01	0
60	0
60.01	4.2
61	4.2
61.01	0
70	0
70.01	4.2
71	4.2
71.01	0
80	0
80.01	4.2
81	4.2
81.01	0
90	0
90.01	4.2
91.8	4.2
91.81	0
100	0
100.01	4.2
101	4.2
101.01	0
110	0
110.01	4.2
111	4.2
111.01	0
120	0
120.01	4.2
121	4.2
121.01	0
130	0
130.01	4.2
131	4.2
131.01	0
140	0
140.01	4.2
141	4.2
141.01	0
150	0
150.01	4.2
151	4.2
151.01	0

Seepage Face Condition: No

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	SC to SC-SM	SM	SM/ML	SP-SM	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	115	115	115	115	130
Cohesion [psf]	270	200	200	200	200	300
Friction Angle [°]	29	29	29	29	29	32
Unsaturated Shear Strength Angle [°]	0	0	0	0	0	0
Air Entry Value [psf]	0	0	0	0	0	0
Ks [inches/hour]	1e-05	0.5	1.7	0.2	3	1e-05
K2/K1	1	1	1	1	1	1
K Angle [°]	0	0	0	0	0	0
WC	0.15	0.18	0.18	0.18	0.18	0.15
WCR	0.08	0.05	0.05	0.05	0.05	0.8
MV	N/A	5e-07	5e-07	5e-07	5e-07	N/A
Groundwater Model	Simple	Simple	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: General	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: General
Unsat. Shear Strength Phi b [°]	0	0	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0	0	0
Use water content function to determine Phi b	No	No	No	No	No	No

Entity Information

Group: Extende Section

Shared Entities

Type	Coordinates
External Boundary	

X	Y
500	1050
1760	1050
1760	1164.5
1760	1190
1760	1214
1660	1212
1563	1214
1545	1210
1480	1188
1376.88	1188
1323	1188
1293	1198
1278	1198
1266	1194
1256	1194
1250	1196
1225	1195
1090	1190
500	1166
500	1157
500	1154
500	1151
500	1144.5
500	1138.5
500	1135.5
500	1134
500	1120.5

Material Boundary

X	Y
1266	1194
1266	1191
1290.56	1188.12
1308.17	1185.67
1313	1185
1323	1185
1323	1186.14
1323	1188

Material Boundary

X	Y
1480	1188
1480	1185
1490	1185

Material Boundary

X	Y
500	1134
1200.9	1161.61
1287	1165
1381.24	1166.47
1415	1167
1424.36	1166.23
1494.13	1160.5
1531.33	1157.44
1534.39	1155.5
1584.63	1155.5
1585.63	1156.17
1589.39	1156.25

Material Boundary

X	Y
500	1157
1290.56	1188.12

Material Boundary

X	Y
500	1154
1287	1185
1308.17	1185.67

Material Boundary

X	Y
500	1135.5
1287	1167

Material Boundary

X	Y
500	1138.5
1287	1170

Material Boundary

X	Y
500	1144.5
1287	1176

Material Boundary

X	Y
500	1151
1287	1182

Material Boundary

X	Y
1625.96	1183.06
1704.44	1184.78

Material Boundary

X	Y
1601.14	1166.51
1644.62	1167.47

Material Boundary

X	Y
1323	1186.14
1376.88	1188

Material Boundary

X	Y
1287	1170
1405.8	1173.77
1502.26	1176.83

Material Boundary

X	Y
1494.13	1160.5
1526.75	1160.5
1531.33	1157.44

Material Boundary

X	Y
1424.36	1166.23
1518.94	1165.7

Material Boundary

X	Y
1287	1167
1381.24	1166.47

Material Boundary

X	Y
1287	1182
1414.95	1184.81

Material Boundary

X	Y
1415	1176.5
1498.29	1179.47

Material Boundary

X	Y
1621.3	1179.96
1693.9	1181.55

Material Boundary

X	Y
1287	1170
1415	1176.5

Material Boundary

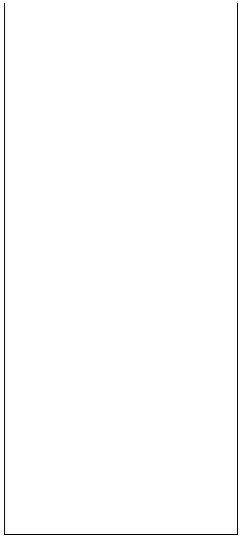
X	Y
1287	1176
1491.79	1183.8

Material Boundary

X	Y
1414.95	1184.81
1480	1185

Material Boundary

X	Y
1490	1185
1491.79	1183.8
1498.29	1179.47
1502.26	1176.83
1517.45	1166.7
1518.94	1165.7
1526.75	1160.5



	X	Y
Material Boundary	1589.39	1156.25
	1609.81	1159.48
	1621.09	1161.95
	1635	1165
	1644.62	1167.47
	1660	1171.41
	1685	1178.82
	1693.9	1181.55
	1704.44	1184.78
	1710.13	1186.53
	1720.33	1190
	1760	1190

	X	Y
Material Boundary	1585.63	1156.17
	1593.38	1161.34
	1601.14	1166.51
	1602.63	1167.51
	1621.3	1179.96
	1625.96	1183.06
	1633.37	1188
	1705	1190
	1720.33	1190

	X	Y
Material Boundary	1593.38	1161.34
	1621.09	1161.95

Slide Analysis Information

t30s4a

Results at Stage 6, 360 days

Project Summary

File Name:	t30s4a.slmd
Slide Modeler Version:	8.014
Project Title:	VTTM 60257 - Sterling Ranch Estates
Analysis:	Section 30-30'; Infiltration Basin Seepage Analysis
Author:	K. Callahan
Date Created:	5/11/2018

Comments

Sterling Gateway, L.P.
LID Stormwater Infiltration
18-1245A-4
C1

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	inches/hour
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Steady State FEA
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Tolerance:	1e-06
Maximum number of iterations:	500
Use negative pore pressure cutoff:	No
Advanced Groundwater Method:	Transient FEA

Transient Settings

Stage Name	Time [d]	Calculate Safety Factor
Stage 1	15	No
Stage 2	30	No
Stage 3	60	No
Stage 4	100	No
Stage 5	155	No
Stage 6	360	No
Stage 7	1000	No

Tolerance (Transient):	1e-06
Maximum number of iterations (Transient):	500
Time Steps (Transient):	Automatic
Mesh Element Type:	3 noded triangles
Number of Elements:	2476
Number of Nodes:	1324

Transient Boundary Conditions

Basin Infiltration - Multiple

Time [d]	Pressure Head [ft]
0	4.2
1	0
10	0
10.01	4.2
11	0
20	0
20.01	4.2
21	0
30	0
30.01	4.2
31	0
40	0
40.01	4.2
41	0
50	0
50.01	4.2
51	0
60	0
60.01	4.2
61	0
70	0
70.01	4.2
71	0
80	0
80.01	4.2
81	0
90	0
90.01	8
91.75	0
100	0
100.01	4.2
101	0
110	0
110.01	4.2
111	0
120	0
120.01	4.2
121	0
130	0
130.01	4.2
131	0
140	0
140.01	4.2
141	0
150	0
150.01	4.2
151	0
1000	0

Seepage Face Condition: Yes

Infiltration with Time

Time [d]	Normal Infiltration [ft/d]
0	4.2
1	4.2
1.01	0
10	0
10.01	4.2
11	4.2
11.01	0
20	0
20.01	4.2
21	4.2
21.01	0
30	0
30.01	4.2
31	4.2
31.01	0
40	0
40.01	4.2
41	4.2
41.01	0
50	0
50.01	4.2
51	4.2
51.01	0
60	0
60.01	4.2
61	4.2
61.01	0
70	0
70.01	4.2
71	4.2
71.01	0
80	0
80.01	4.2
81	4.2
81.01	0
90	0
90.01	4.2
91.8	4.2
91.81	0
100	0
100.01	4.2
101	4.2
101.01	0
110	0
110.01	4.2
111	4.2
111.01	0
120	0
120.01	4.2
121	4.2
121.01	0
130	0
130.01	4.2
131	4.2
131.01	0
140	0
140.01	4.2
141	4.2
141.01	0
150	0
150.01	4.2
151	4.2
151.01	0

Seepage Face Condition: No

Random Numbers

Pseudo-random Seed: 10116
Random Number Generation Method: Park and Miller v.3

Surface Options

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	SC to SC-SM	SM	SM/ML	SP-SM	Bedrock
Color						
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	130	115	115	115	115	130
Cohesion [psf]	270	200	200	200	200	300
Friction Angle [°]	29	29	29	29	29	32
Unsaturated Shear Strength Angle [°]	0	0	0	0	0	0
Air Entry Value [psf]	0	0	0	0	0	0
Ks [inches/hour]	1e-05	0.5	1.7	0.2	3	1e-05
K2/K1	1	1	1	1	1	1
K Angle [°]	0	0	0	0	0	0
WC	0.15	0.18	0.18	0.18	0.18	0.15
WCR	0.08	0.05	0.05	0.05	0.05	0.8
MV	N/A	5e-07	5e-07	5e-07	5e-07	N/A
Groundwater Model	Simple	Simple	Simple	Simple	Simple	Simple
GW Model Properties	Soil Type: General	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: Sand	Soil Type: General
Unsat. Shear Strength Phi b [°]	0	0	0	0	0	0
Unsat. Shear Strength Air Entry Value [psf]	0	0	0	0	0	0
Use water content function to determine Phi b	No	No	No	No	No	No

Entity Information

Group: Extende Section

Shared Entities

Type	Coordinates
External Boundary	

X	Y
500	1050
1760	1050
1760	1164.5
1760	1190
1760	1214
1660	1212
1563	1214
1545	1210
1480	1188
1376.88	1188
1323	1188
1293	1198
1278	1198
1266	1194
1256	1194
1250	1196
1225	1195
1090	1190
500	1166
500	1157
500	1154
500	1151
500	1144.5
500	1138.5
500	1135.5
500	1134
500	1120.5

Material Boundary

X	Y
1266	1194
1266	1191
1290.56	1188.12
1308.17	1185.67
1313	1185
1323	1185
1323	1186.14
1323	1188

Material Boundary

X	Y
1480	1188
1480	1185
1490	1185

Material Boundary

X	Y
500	1134
1200.9	1161.61
1287	1165
1381.24	1166.47
1415	1167
1424.36	1166.23
1494.13	1160.5
1531.33	1157.44
1534.39	1155.5
1584.63	1155.5
1585.63	1156.17
1589.39	1156.25

Material Boundary

X	Y
500	1157
1290.56	1188.12

Material Boundary

X	Y
500	1154
1287	1185
1308.17	1185.67

Material Boundary

X	Y
500	1135.5
1287	1167

Material Boundary

X	Y
500	1138.5
1287	1170

Material Boundary

X	Y
500	1144.5
1287	1176

Material Boundary

X	Y
500	1151
1287	1182

Material Boundary

X	Y
1625.96	1183.06
1704.44	1184.78

Material Boundary

X	Y
1601.14	1166.51
1644.62	1167.47

Material Boundary

X	Y
1323	1186.14
1376.88	1188

Material Boundary

X	Y
1287	1170
1405.8	1173.77
1502.26	1176.83

Material Boundary

X	Y
1494.13	1160.5
1526.75	1160.5
1531.33	1157.44

Material Boundary

X	Y
1424.36	1166.23
1518.94	1165.7

Material Boundary

X	Y
1287	1167
1381.24	1166.47

Material Boundary

X	Y
1287	1182
1414.95	1184.81

Material Boundary

X	Y
1415	1176.5
1498.29	1179.47

Material Boundary

X	Y
1621.3	1179.96
1693.9	1181.55

Material Boundary

X	Y
1287	1170
1415	1176.5

Material Boundary

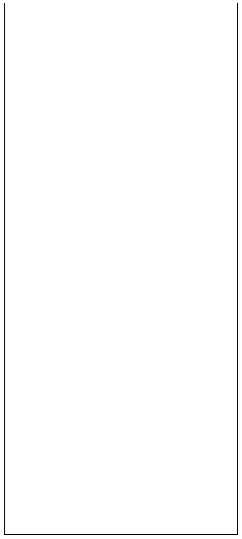
X	Y
1287	1176
1491.79	1183.8

Material Boundary

X	Y
1414.95	1184.81
1480	1185

Material Boundary

X	Y
1490	1185
1491.79	1183.8
1498.29	1179.47
1502.26	1176.83
1517.45	1166.7
1518.94	1165.7
1526.75	1160.5

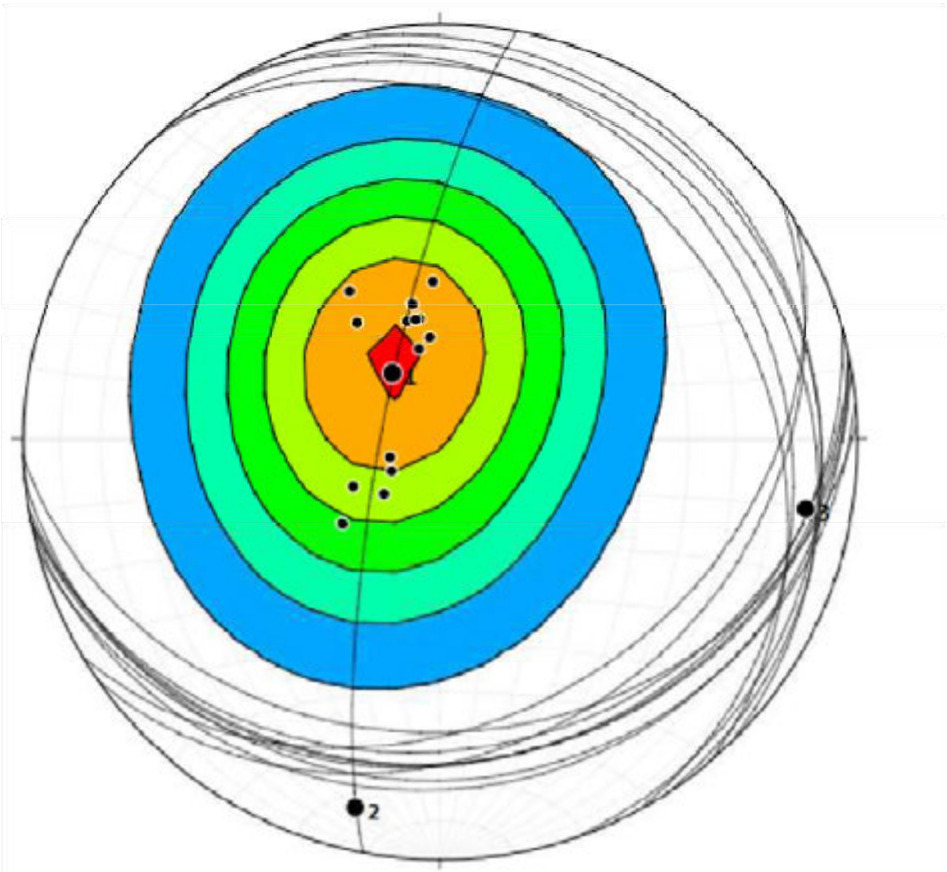


	X	Y
Material Boundary	1589.39	1156.25
	1609.81	1159.48
	1621.09	1161.95
	1635	1165
	1644.62	1167.47
	1660	1171.41
	1685	1178.82
	1693.9	1181.55
	1704.44	1184.78
	1710.13	1186.53
	1720.33	1190
	1760	1190

	X	Y
Material Boundary	1585.63	1156.17
	1593.38	1161.34
	1601.14	1166.51
	1602.63	1167.51
	1621.3	1179.96
	1625.96	1183.06
	1633.37	1188
	1705	1190
	1720.33	1190

	X	Y
Material Boundary	1593.38	1161.34
	1621.09	1161.95

Appendix G



NORTH LIMB	SOUTH LIMB
N41W, 25NE	N81E, 24SE
N29W, 19NE	N88E, 31SE
N74W, 35NE	N78E, 18SE
N45W, 15NE	N59E, 34SE
N34W, 11NE	N55E, 28SE
N20W, 10NE	N75E, 24SE
	N85E, 20SE
	N79E, 27SE
	N79E, 24SE

REFERENCE

STEREONET 10.0 - STEREONET COMPUTER PLOTTING PROGRAM FOR WINDOWS BY ALLMENDINGER, R. W., 2011-2018

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

STEREONET PLOT
OAK CANYON ANTICLINE

JOB NO.: 18-1245A-4

DATE: 6/8/18 | FIGURE: 1

APPENDIX G

Table G1 - Minimum Foundation and Slab Recommendations for Expansive Soils

Minimum Design Parameters for Footing Foundations						
Expansion Potential Classification (ASTM D4829)	Expansion Index (ASTM D4829)	Footing Embedment (inches)				Reinforcement Of Continuous Footings
		One-story and Two-Story structures		Three-Story structures		
		Perimeter locations	Interior locations	Perimeter locations	Interior locations	
Very Low	0 to 20	18	12	24	18	Per structural requirements
Low	21 to 50	18	12	24	18	One # 4 Rebar, top and bottom
Medium	51 to 90	24	18	30	24	One # 4 Rebar, top and bottom
High	91 to 130	30	18	36	30	Two # 4 Rebars, top and bottom

- Width of continuous footings shall be at least 12 inches (one-story structures); 15 inches (two-story structures); 18 inches (three-story structures). Width of isolated footings that support individual columns shall be at least 24 inches.
- Isolated footings that support exterior structural columns shall be structurally connected to the main foundation system in at least two orthogonal horizontal directions.
- The sides of footings that support interior columns should be connected to the closest adjacent (isolated spread footing and/or continuous footing) foundations using reinforced concrete tie beams. The tie beams should be at least 12 inches wide and should be embedded at least 12 inches beneath pad grade. Reinforcement of the tie beams should be at least ρ_{min} $(200/f_y)$.
- Foundation excavations should be observed by a representative of this firm to verify that the excavations are embedded to the recommended depth into the recommended material, prior to placement of forms, reinforcement, or concrete in the excavations. The excavations should be moisture-conditioned and free of all loose or sloughed material prior to casting of concrete.
- Footing foundations to be underlain by soils with an Expansion Index higher than 130 should be individually designed by the Structural Engineer, based on consultation with the Geotechnical Engineer. Proposed buildings that will be underlain by soils with an Expansion Index higher than 130 may also be supported on post-tensioned slabs or on structural mats, to be designed on a case by case basis by a structural engineer in consultation with the geotechnical engineer. General recommendations for design of post-tensioned slabs and structural mats for soil subgrades with an Expansion Index higher than 130 are provided after the following table.

APPENDIX G

Table G1 - Minimum Foundation and Slab Recommendations for Expansive Soils

Minimum Design Parameters For Concrete Slab-On-Grade Floors					
Expansion Potential Classification (ASTM D 4829)	Expansion Index	Moisture Conditioning of Slab Subgrade	Slab Reinforcement	Minimum Slab Thickness	Thickness of Compacted Granular Material over subgrade and beneath slab
Very Low	0 to 20	None	#3 Rebar at 24", each way	4 inches	2 inches of sand[1] plus 2 inches of sand over vapor retarder
Low	21 to 50	120 percent of Optimum Moisture Content[2] to 18 inches depth	#3 Rebar at 18", each way		
Medium	51 to 90	130 percent of Optimum Moisture Content to 24 inches depth	#4 Rebar at 16", each way	5 inches	4 inches of aggregate base plus 2 inches of sand over vapor retarder
High	91 to 130	140 percent of Optimum Moisture Content to 36 inches depth	#4 Rebar at 14", each way	6 inches	6 inches of aggregate base plus 2 inches of sand over vapor retarder

- Slabs should be constructed using low-slump concrete and with crack control joints spaced 8 ft apart, or closer, in both horizontal directions. In any case, concrete used in slabs-on-grade should satisfy the requirements of Chapter 19 of the California Building Code.
- Interior floor slabs should be structurally tied to continuous footing foundations as directed by the Structural Engineer. As a minimum, slabs constructed over subgrades with medium or high expansion potential should be structurally tied to continuous footing foundations using No. 3 rebars on 36-inch horizontal spacings and to interior column footing foundations by bending No. 3 rebars into the slab on alternating 24-inch and 36-inch horizontal lengths.
- Welded wire mesh should not be substituted for the steel rebar reinforcement recommended in the preceding table because sagging of welded wire mesh between support points during casting of floor slabs typically results in insufficient concrete cover beneath the mesh, even if extra measures are used to keep the mesh at slab mid-height.
- If buildup of water vapor beneath interior floor slabs is acceptable, the floor slabs may be cast directly on the recommended surficial lift of compacted granular material. Otherwise, a membrane vapor retarder with a thickness of at least 10 mils should be placed over the lift of compacted granular material, a 2-inch thick protective cushion of compacted well-graded clean sand should be placed over the membrane, and the floor slab should be cast

[1] Sand "base" should have a Sand Equivalent of at least 30 (e.g., washed concrete sand).
[2] Optimum Moisture Content of subgrade soils, per ASTM D1557.

APPENDIX G

Table G1 - Minimum Foundation and Slab Recommendations for Expansive Soils

on the sand cushion. The membrane should be lapped and/or sealed, and sealed around all plumbing structures and other openings. Care should be taken to avoid puncturing the membrane during placement/compaction of the sand cushion and during casting of the slab. Suitability of materials that will be placed directly above and below the membrane should be evaluated in our geotechnical laboratory prior to transporting them to the project site.

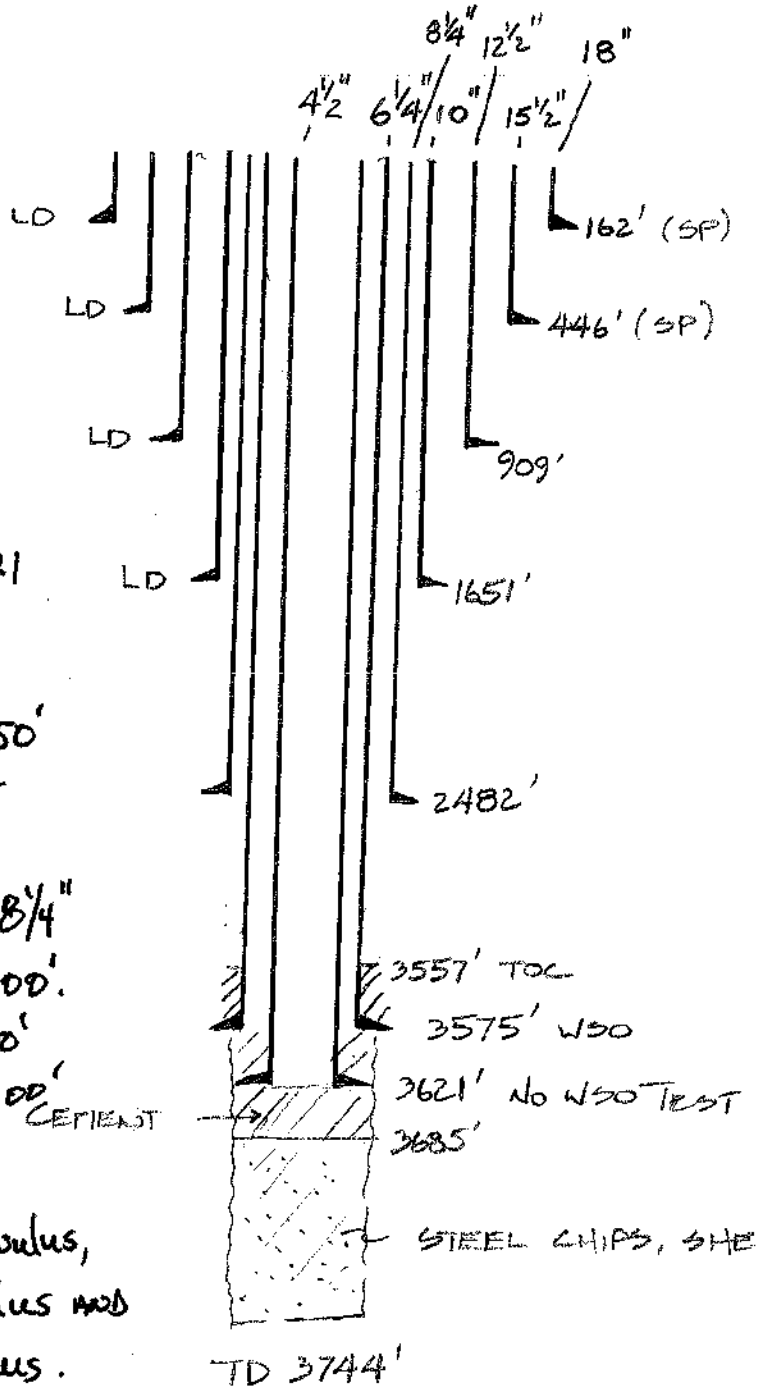
- In order to minimize entry of water beneath interior slab-on-grade floors, utility trenches that cross perimeter footing foundations should be backfilled with lean concrete or with concrete slurry. The slurry plug should extend under the full width of the footing and along the trench for at least 24 inches in the direction of the slab.
- Materials from foundation and/or utility trench excavations should not be spread on areas where concrete slabs will be cast unless the materials are compacted and tested.
- Floor slabs underlain by soils with an Expansion Index greater than 130 should be individually designed by the Structural Engineer based on consultation with the Geotechnical Engineer.

Post-Tensioned Slabs

The following general geotechnical recommendations may be used for design of post-tensioned floors slabs that will be constructed over subgrades with VERY HIGH expansion potential (i.e., Expansion Index higher than 130).

- The upper 3 ft of the subgrade beneath post-tensioned slabs should be water conditioned to at least 130 percent of Optimum Moisture Content and compacted to between 90 and 93 of Maximum Dry Density, per ASTM D1557.
- A vapor barrier between two 2-inch thick layers of compacted sand should be placed on the subgrade of post-tensioned slabs.
- Post-tensioned slabs should be designed to accommodate a vertical deflection as great as 1.0 inch (up or down) over a horizontal distance of 30 feet, as a result of potential swelling/shrinking of the underlying subgrade.

WELL No. 1



Abandonment Requirements

1. c/o to 3617
2. plug with cement 3617-3521
3. Fill hole with 72# mud
4. Cavity shot at 3150'
5. Plug with cement 3150-3050'
6. Pull 4½", 6¼" & 8¼" casing from 1400'.
7. Cavity shot at 1400'
8. Plug from 1400'-1300'
9. Plug from 30'-sfc in 10", 10"x12½ Annulus, 12½"x15½ Annulus and 15½"x18" Annulus.

2006

Summary of Plugging Janes ..ell #1

Filled up with wire drilling line from 3744 ft. to 3730 feet. Dumped bailer of lime and also bailer of cement at 3730.

Plugged hole with steel chips and wire line from 3730 to 3722. Put in one-half bailer of lime and one bailer of cement at 3722.

Plugged hole with steel chips and also put in wire cable and finished up from 3722 to 3714 with wire line and steel chips.

Plugged hole with lead wool from 3714 to 3710.

3710 to 3708 plugged with steel chips. Dumped one-half bailer of lime at 3708.

3708 to 3704 plugged with cement and rock. Put in two sacks cement and one-half bailer of lime.

In running in casing it went to 3708' 8".

3708'8" to 3685 Plugged with shells containing cement and rock and dumped two sacks pure cement.

3685 to 3557filled up with 132 sacks of cement.

Cleaned out and recemented six inch casing. Got seven sacks back of casing. Cementing done by Perkins method using Chemical Cement

Drilled out to 3620. Casing went to 3627. Bridged back to 3617' 9". Dumped in one sack cement.

Cemented 4½ inch casing at 3621 feet. Eleven sacks cement. Cementing done by Perkins using Chemical Cement

Quote.

CALIFORNIA STATE MINING BUREAU

DEPARTMENT OF PETROLEUM AND GAS

Report on Proposed Operations

No. P-1-5788.

Los Angeles, Cal. April 17, 1925.

Mr. E. B. Stout,

Newhall, Cal.

Agent for FERNANDO OIL Company

DEAR SIR:

Your proposal to abandon Well No. 1, Section 10, T. 4N., R. 17W., S.B. B. & M.

Newhall Oil Field, Los Angeles County, dated April 15, 1925,

has been examined in conjunction with records filed in this office.

Present conditions as shown by the records and the proposal are as follows:

RECORDS:

Casing: 18" landed 162'.
15½" " 446'.
12⅝" " 909', not tested.
10" " 1651'2", " "
8¼" " 2482'2", " "
6¼" cemented 3575' (water shut off, P-1-2231. Water broke in and recemented, not tested).
4½" cemented 3621', not tested.
Total depth 3744'.

Oil and gas showings:

Small gas showing in sand 3149'-3167'.
Small gas showing in shale at 3355'.
Oil and gas showing in sand 3584'-3690'.

Plugging:

A summary of the plugging done was reported by Mr. O. B. Johnson, Secretary of the Fernando Oil Company, as follows:

"Filled up with wire drilling line from 3744 ft. to 3730 feet. Dumped bailer of lime and also bailer of cement at 3730.

"Plugged hole with steel chips and wire line from 3730 to 3722. Put in one-half bailer of lime and one bailer of cement at 3722.

"Plugged hole with steel chips and also put in wire cable and finished up from 3722 to 3714 with wire line and steel chips.

"Plugged hole with lead wool from 3714 to 3710.

"3710 to 3708 plugged with steel chips. Dumped one-half bailer of lime at 3708.

"3708 to 3704 plugged with cement and rock. Put in two sacks cement and one-half bailer of lime.

"In running in casing it went to 3708'8".

"3708'8" to 3685 plugged with shells containing cement and rock and dumped two sacks pure cement.

"3685 to 3557 filled up with 132 sacks of cement.

"Cleaned out and recemented six inch casing. Got seven sacks back of casing. Cementing done by Perkins with tubing method using chemical cement.

"Drilled out to 3680. Casing went to 3627. Bridged back to 3617'9". Dumped in one sack cement.

cc - Fernando Oil Co.

BB-v.

R. E. COLLOM
State Oil and Gas Supervisor

By L. C. Thomas Deputy

Form 111, 92418 11-22 10M

(CONTINUED ON PAGE TWO)

CALIFORNIA STATE MINING BUREAU

DEPARTMENT OF PETROLEUM AND GAS

Report on Proposed Operations

No. P-1-5788.

FERNANDO OIL Company

Well No. 1 Sec. 10, T. 4N., R. 17W., S.B. B. & M.

"Cemented 4½ inch casing at 3621 feet. Eleven sacks cement. Cementing done by Perkins using chemical cement."

THE NOTICE STATES AND PROPOSES:

"The present condition of the well is as follows: The 6¼" casing was landed and cemented at3575' and shut-off of upper water was approved by the Mining Bureau. The well was drilled to 3744' and when tested, flowing water developed. An effort was made to shut off this water in accordance with statement attached. Then the 6¼" casing was recemented by Perkins using tubing and chemical cement. Then the 4½" casing was landed at 3617'6" and cemented by Perkins using chemical cement. As the water is still not shut off, it is the intention to abandon. The open hole below the shoe of the 4½" casing will be filled with cement. This is the only part of the sand that is not already plugged with cement."

RECOMMENDATION:

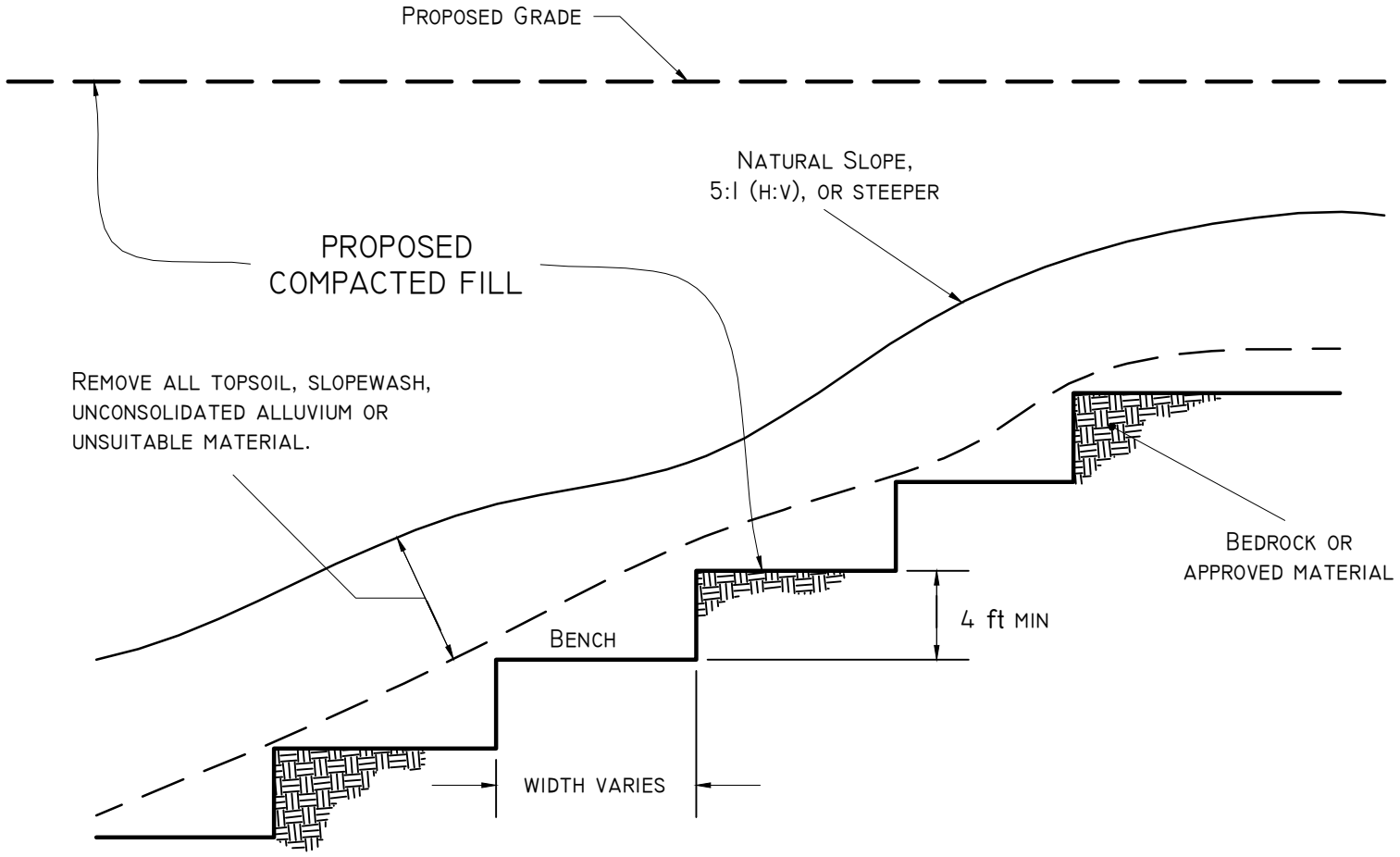
The proposal is approved subject to the following recommendations:

1. In addition to the plug proposed by you, the following plugging should be done:
   (a) If the 4½" casing is pulled from below the shoe of the 6¼" casing, the top of the 4½" casing left in the well should be plugged with cement, and the plug carried up into the 6¼" casing at least 20'.
   (b) If the 4½" casing cannot be pulled from below the shoe of the 6¼" casing, the top of the 4½" should be plugged with cement inside the 6¼" casing.
   (b) The top of the 6¼" casing left in the well should be plugged with cement.
2. Upon completion of the work of abandonment, please file with this Department a report in duplicate on our form 102, giving in detail the following information:
   (a) Names of all workmen employed.
   (b) Dates of commencement and completion of the work.
   (c) Depths at which casing was cut or shot, with amounts of casing removed from the well.
   (d) Record of all plugging operations.

R. E. COLLOM
State Oil and Gas Supervisor

By _____ Deputy

Form 111-x. 22419 11-22 5M



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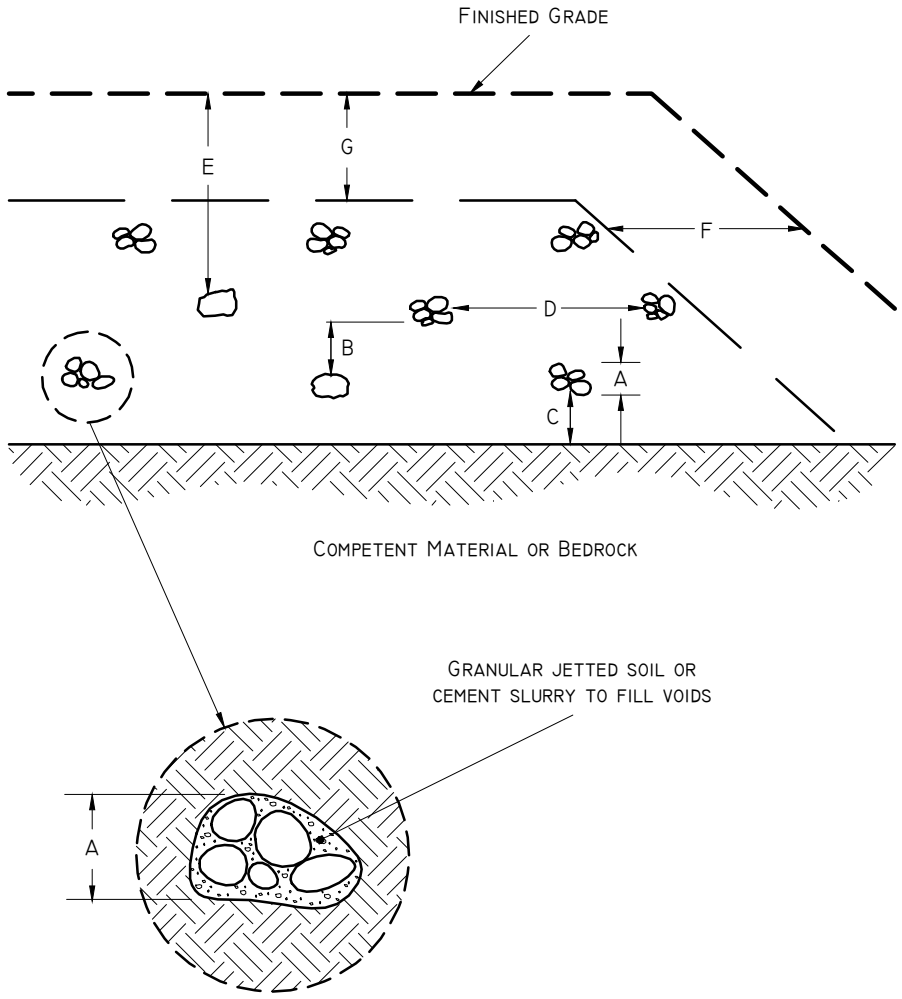
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

FILL OVER NATURAL SLOPE
5:1 OR STEEPER



EXPLANATION

A) ± 4 FT, HEIGHT AND WIDTH MAY VARY DEPENDING ON ROCK SIZE

B) MINIMUM OF 4 FT FROM STAGGER WINDROW

C) MINIMUM OF 5 FT FROM FIRST SET OF WINDROW TO COMPETENT MATERIAL OR BEDROCK

D) MINIMUM OF 15 FT BETWEEN WINDROWS

E) MINIMUM OF 23 FT FROM OVERSIZED ROCKS (LARGEST DIMENSION ≥ 4 FT) TO FINISHED SUBGRADE. ALL OVERSIZED ROCKS MUST BE INDIVIDUALLY PLACED.

F) MINIMUM OF 25 FT FROM PROJECTED WINDROW AREA TO FINISHED SLOPE SURFACE.

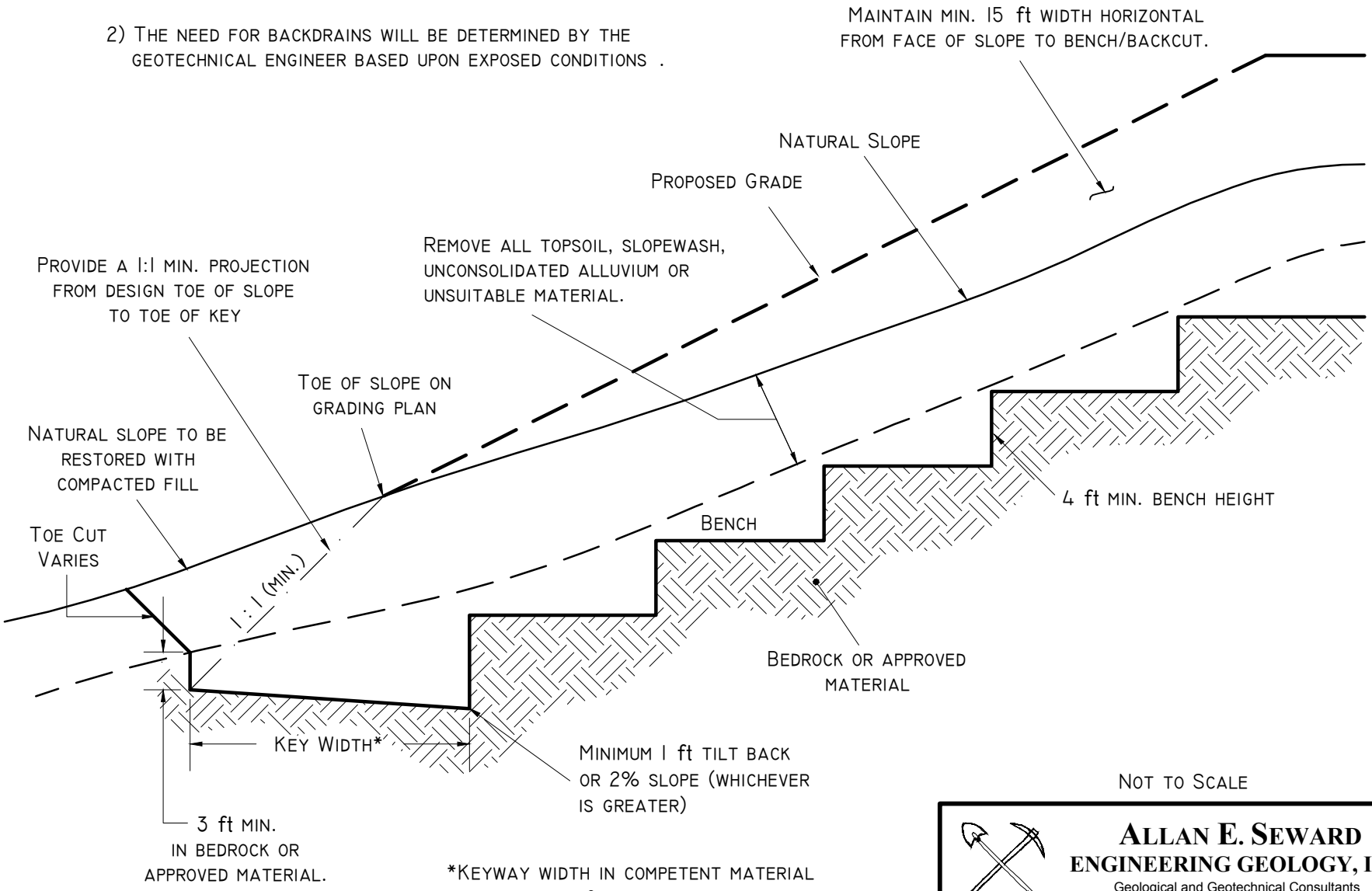
G) MINIMUM OF 15 FT BENEATH FINISHED GRADE TO PROVIDE CLEARANCE FOR FOUNDATIONS AND POOLS, OR 5 FT BELOW THE DEEPEST ADJACENT UTILITY TRENCH, WHICHEVER IS DEEPEST.

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

ROCK DISPOSAL (WINDROWS)

NOTE: 1) WHERE THE NATURAL SLOPE APPROACHES OR EXCEEDS THE DESIGN SLOPE RATIO, SPECIAL RECOMMENDATIONS WILL BE PROVIDED BY THE GEOTECHNICAL ENGINEER.

2) THE NEED FOR BACKDRAINS WILL BE DETERMINED BY THE GEOTECHNICAL ENGINEER BASED UPON EXPOSED CONDITIONS .



*KEYWAY WIDTH IN COMPETENT MATERIAL MINIMUM OF 15 ft OR AS RECOMMENDED BY THE GEOTECHNICAL ENGINEER.

NOT TO SCALE

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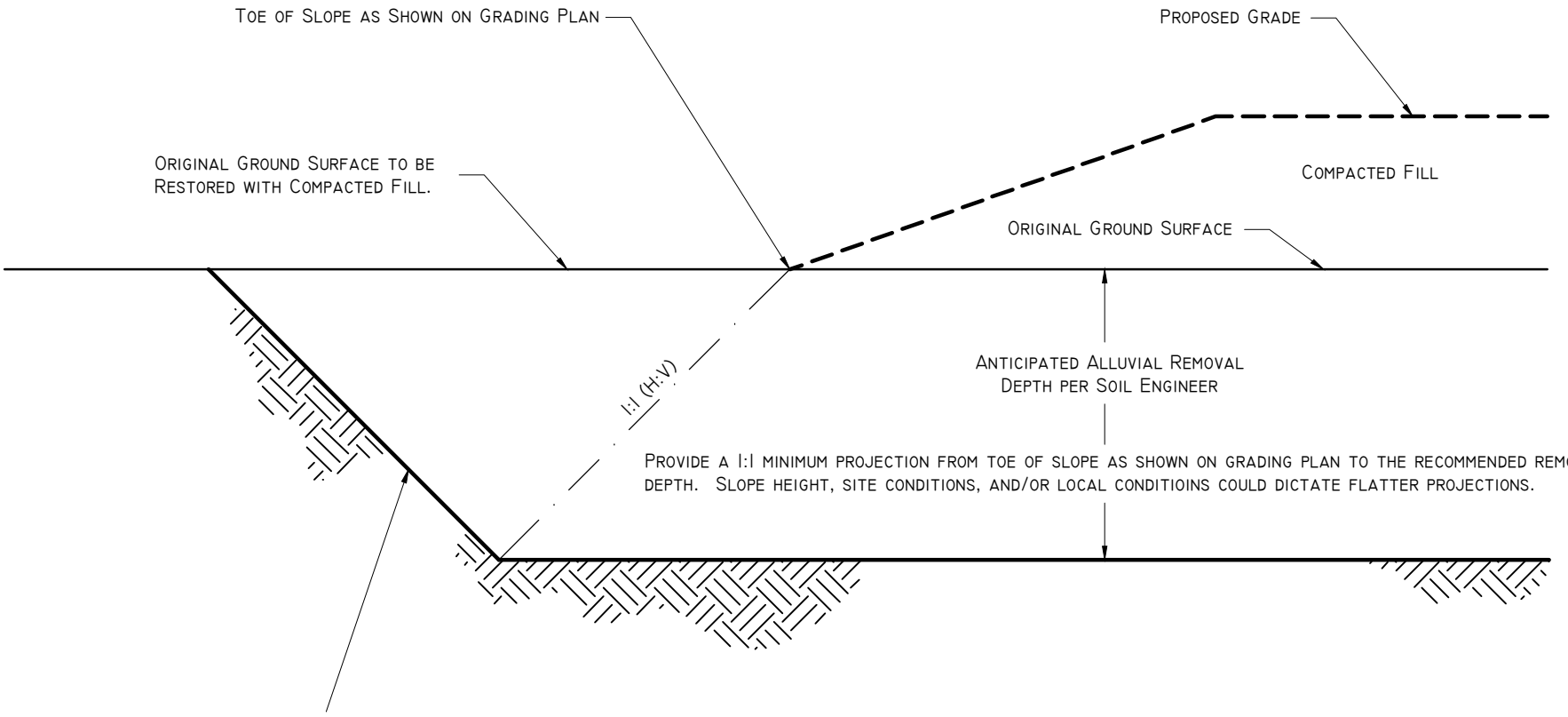
Geological and Geotechnical Consultants

FILL SLOPE OVER NATURAL SLOPE
5:1 OR STEEPER



BACKCUT VARIES. BACKCUT SHOULD BE EXCAVATED AS APPROPRIATE TO PROVIDE SAFE CONDITIONS PER CAL OSHA. ALTERNATIVELY, THE SLOT-CUT METHOD CAN BE USED (SEE TEXT), OR TEMPORARY SHORING CAN BE UTILIZED.

NOT TO SCALE

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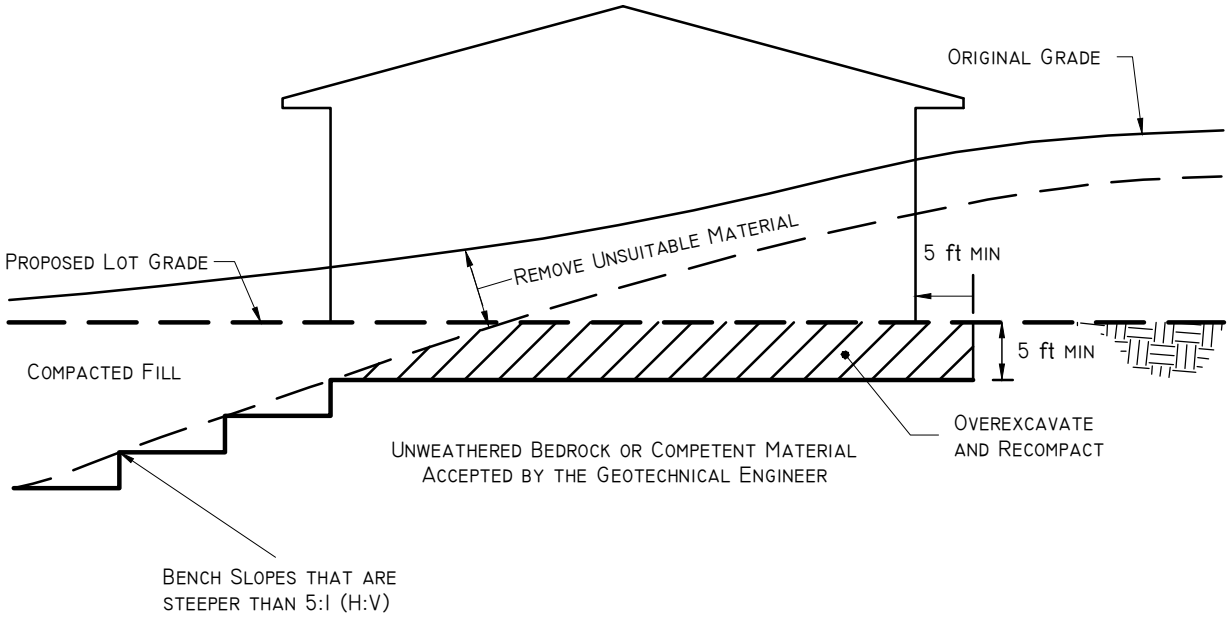
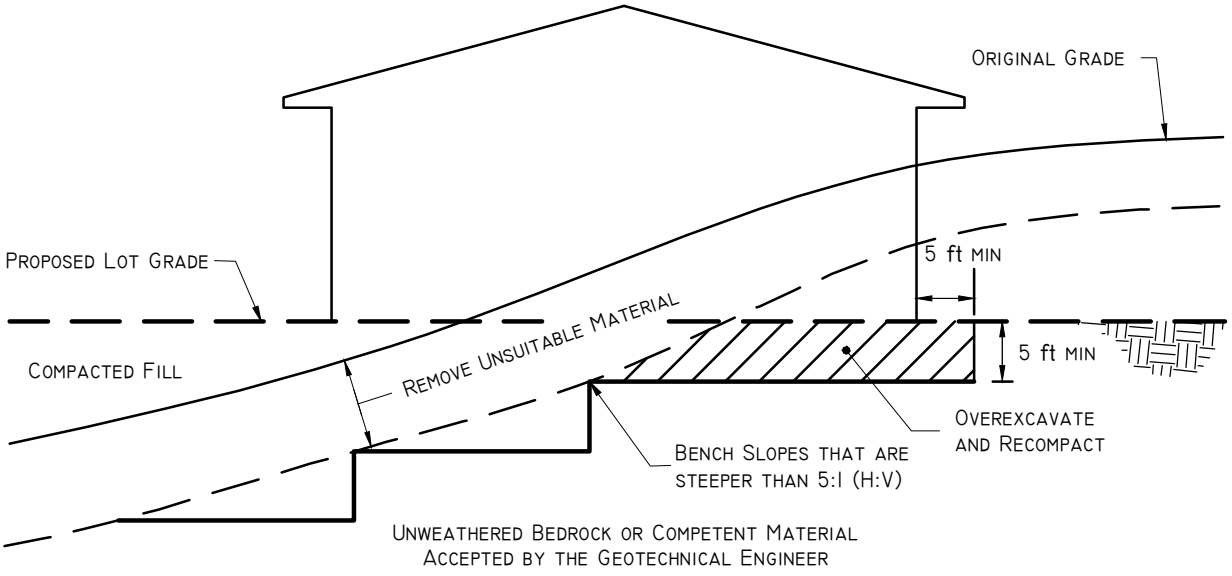
Geological and Geotechnical Consultants

FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON

Cut Lot



Cut-Fill Lot



NOTE: If the maximum depth of fill exceeds 15 ft on a cut/fill transition lot then the minimum thickness of the fill cap should be one-third of the deepest fill thickness below any proposed structure.

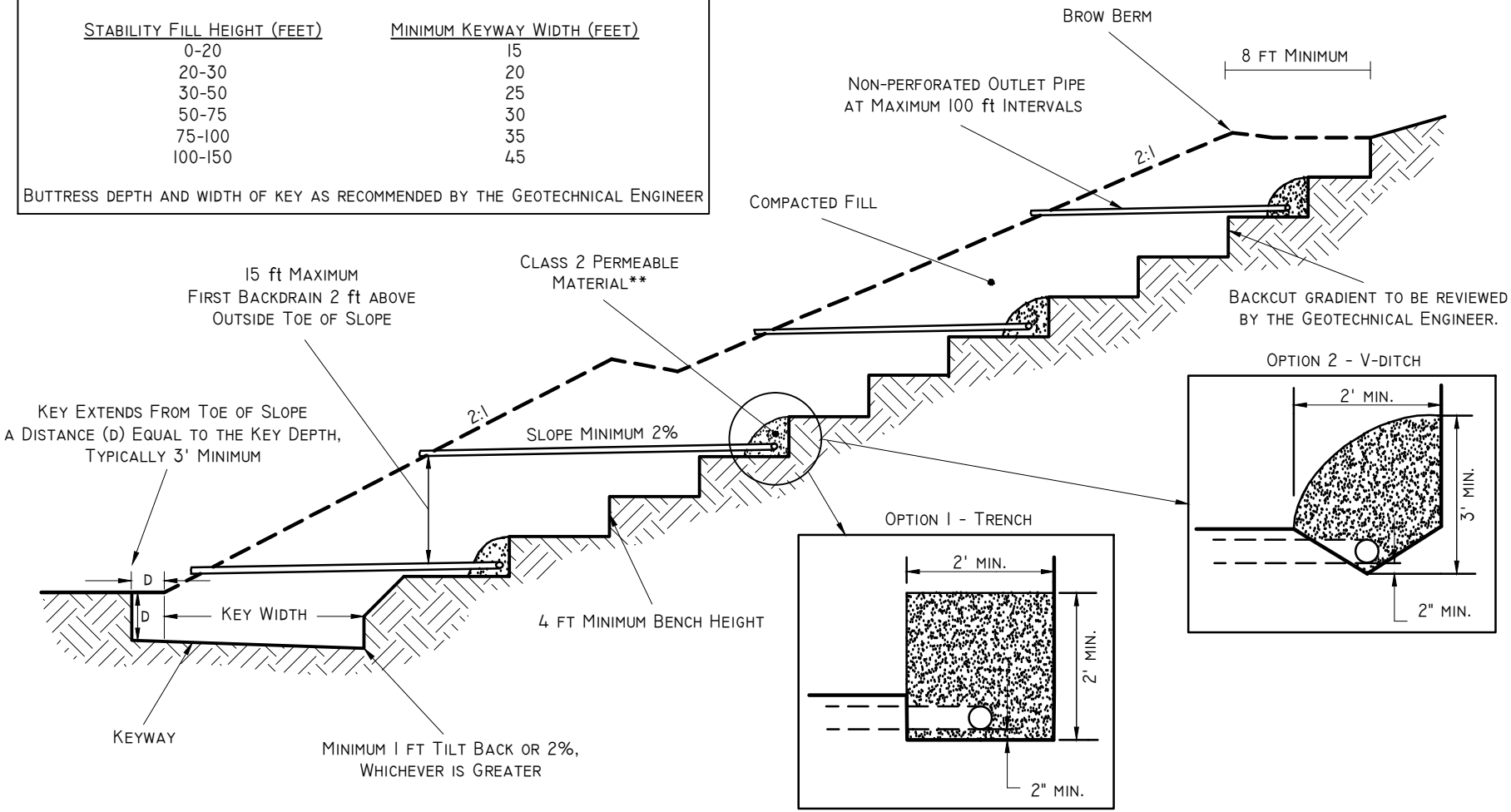
Allan E. Seward
Engineering Geology, Inc.
Geological and Geotechnical Consultants

Over-Excavation for Transitional Cut and Cut-Fill Lots

Standard Keyway Width vs. Slope Height for Stability Fill

Stability Fill Height (feet)	Minimum Keyway Width (feet)
0-20	15
20-30	20
30-50	25
50-75	30
75-100	35
100-150	45

Buttress depth and width of key as recommended by the Geotechnical Engineer



**Specifications for CalTrans Class 2 Permeable Material

U.S. Standard Sieve Size	% Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

Sand Equivalent >75

All backdrains and outlet pipes to be 4" diameter PVC pipe (SDR 35 or Schedule 40); Backdrain Perforations positioned down; Upper ends of backdrains to be sealed with an approved cap.

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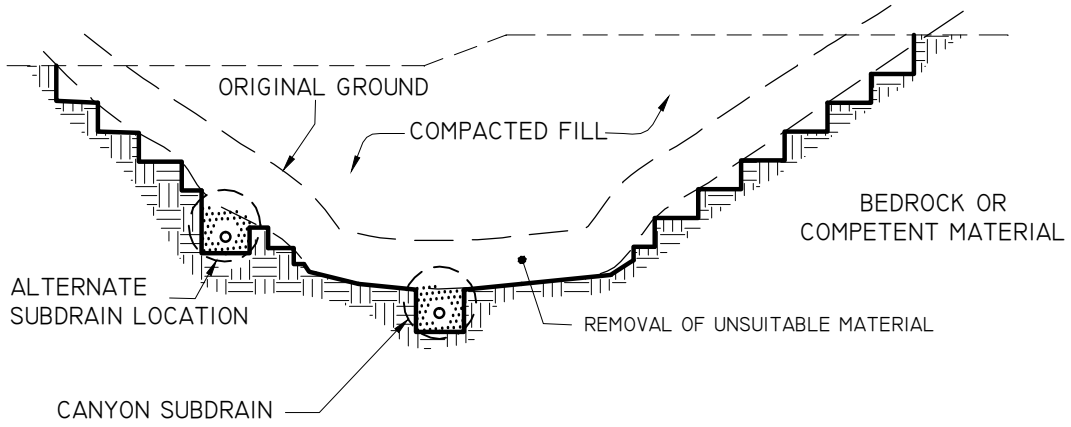
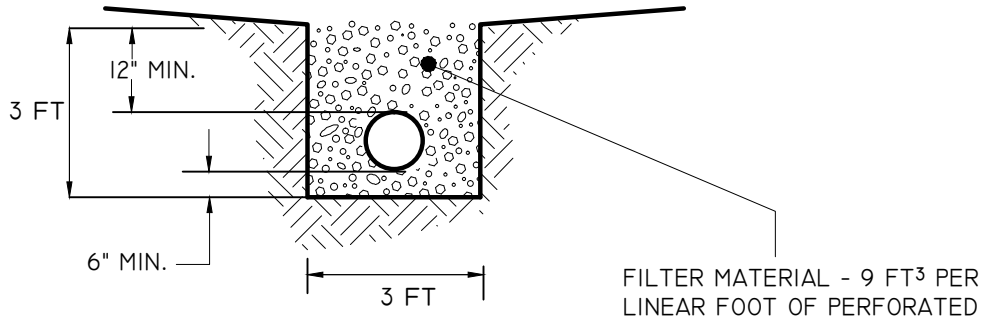
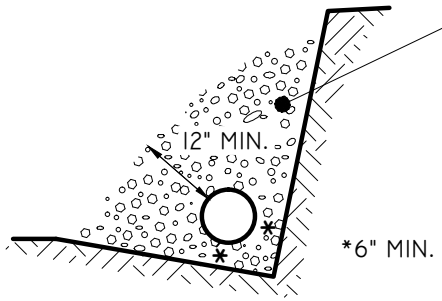
Stability/Buttress Fill and Backdrains



BACKHOE TRENCH



DOZER TRENCH



NOT TO SCALE

NOTES:

1. ALL SUBDRAINS TO BE 6" MIN. DIAMETER PVC PIPE (SDR 35 OR SCHEDULE 40), 8" MIN DIAMETER FOR PORTION OF CONTINUOUS RUNS IN EXCESS OF 500 FT, AND 10" MIN. DIAMETER FOR PORTION OF CONTINUOUS RUNS IN EXCESS OF 1500 FT.
2. DRAIN PIPE SHOULD HAVE 2 ROWS OF 1/2-INCH DIAMETER PERFORATIONS PLACED AT 90° OFFSET ON UNDERSIDE OF PIPE. CENTER TO CENTER SPACING BETWEEN PERFORATIONS IN EACH ROW SHOULD NOT EXCEED 12 INCHES.
3. A MINIMUM OF 20 FEET OF DRAIN PIPE AT DOWNSTREAM OUTLET SHOULD BE NON-PERFORATED. UPSTREAM END SHOULD BE CAPPED.
4. DRAIN PIPE SHOULD HAVE A MINIMUM 2% GRADIENT UNLESS OTHERWISE SPECIFIED.
5. SUBDRAIN ENDPOINTS AND LONG RUNS SHOULD BE SURVEYED.
6. FILTER MATERIAL SHOULD BE CLASS 2 PERMEABLE MATERIAL, AS SPECIFIED IN SECTION 68 OF THE STATE OF CALIFORNIA, DEPT. OF TRANSPORTATION STANDARD SPECS.

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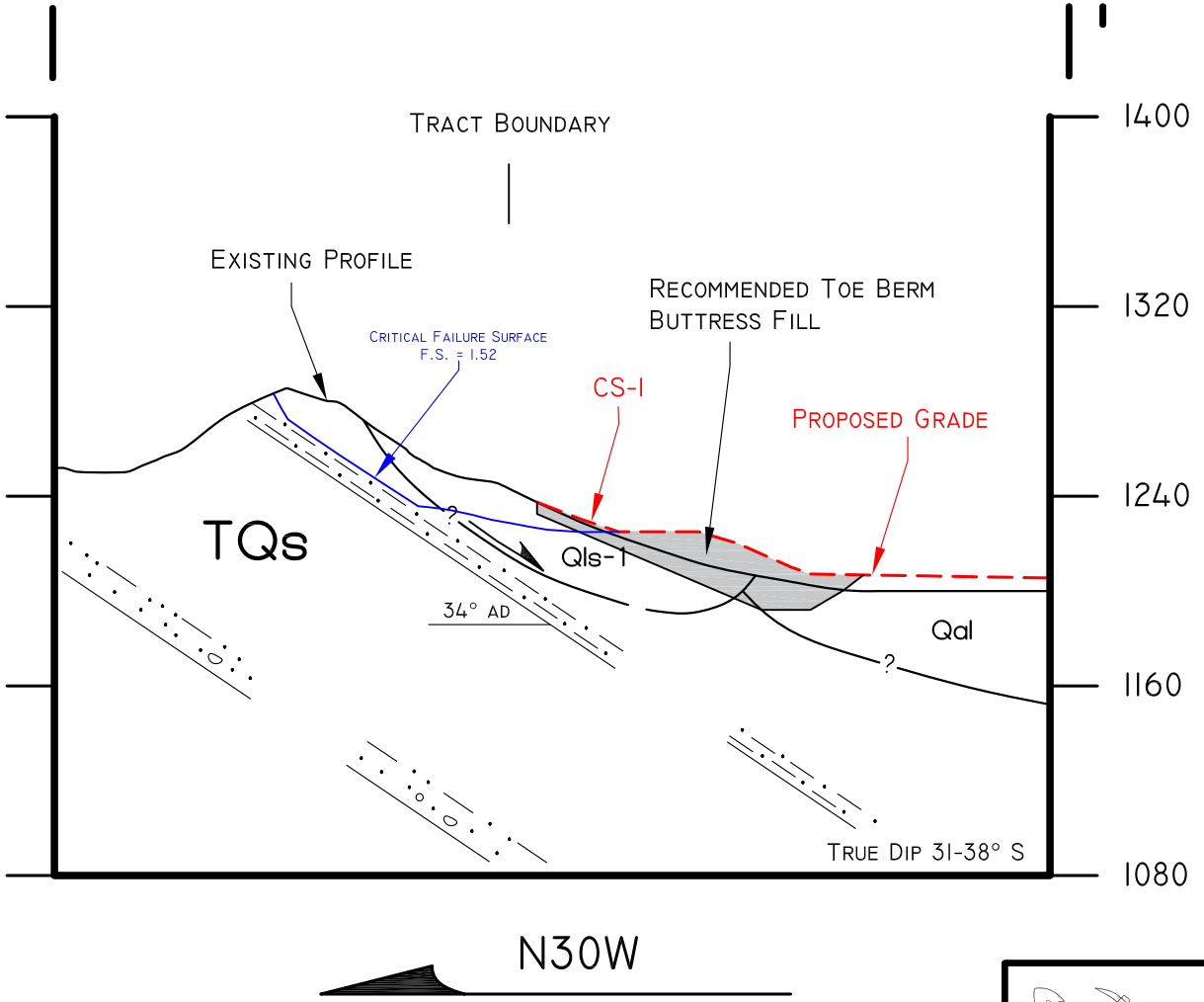
CANYON SUBDRAIN DETAIL

Appendix H



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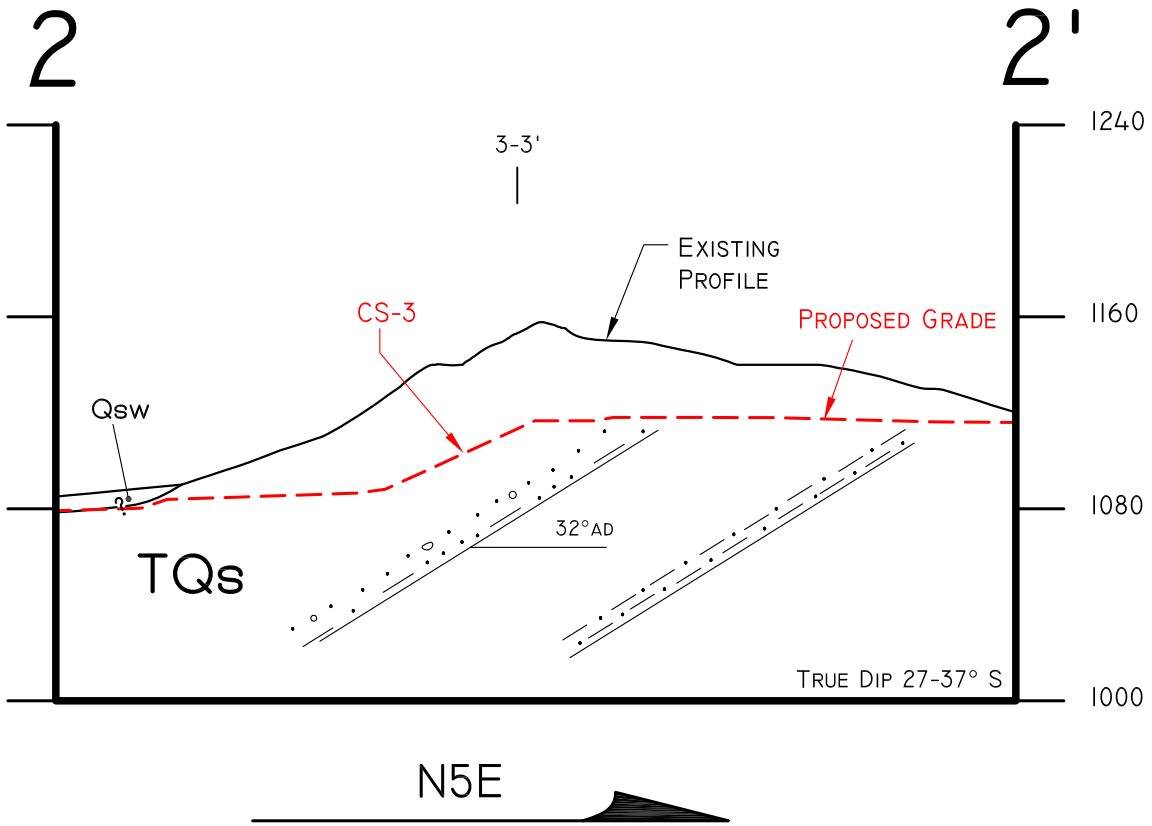
CROSS SECTION 1-1'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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CROSS SECTION 2-2'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

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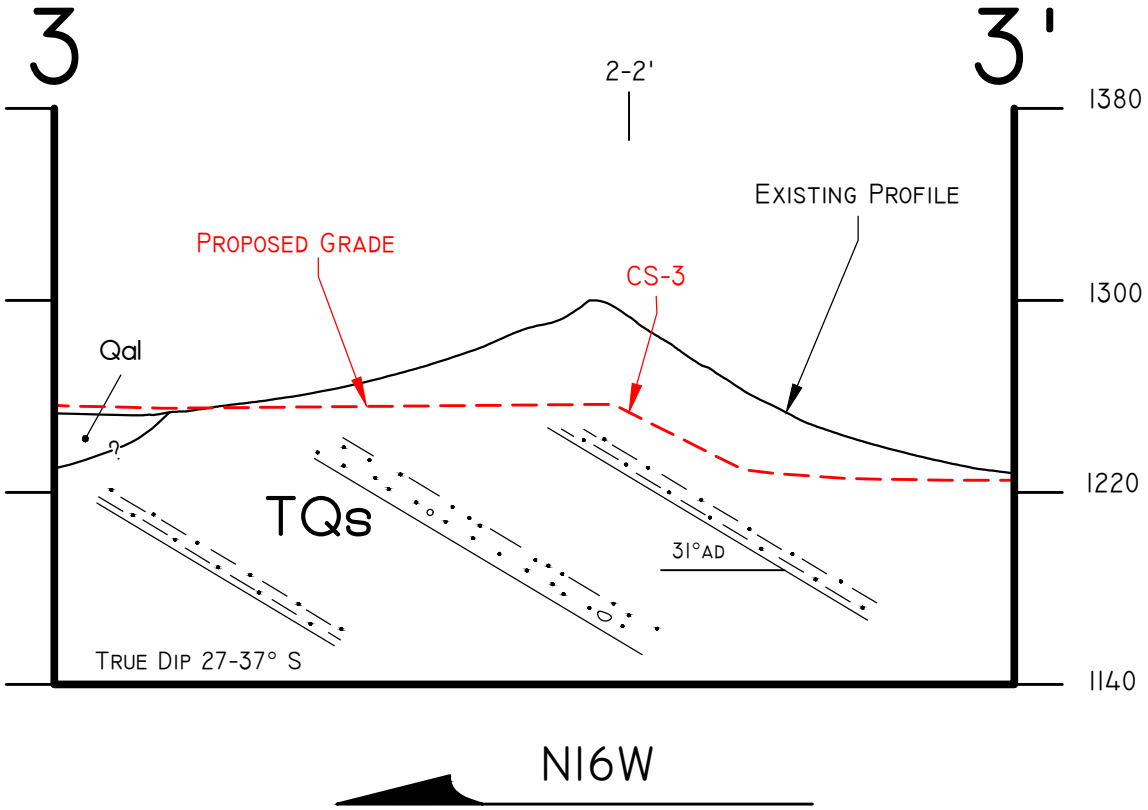

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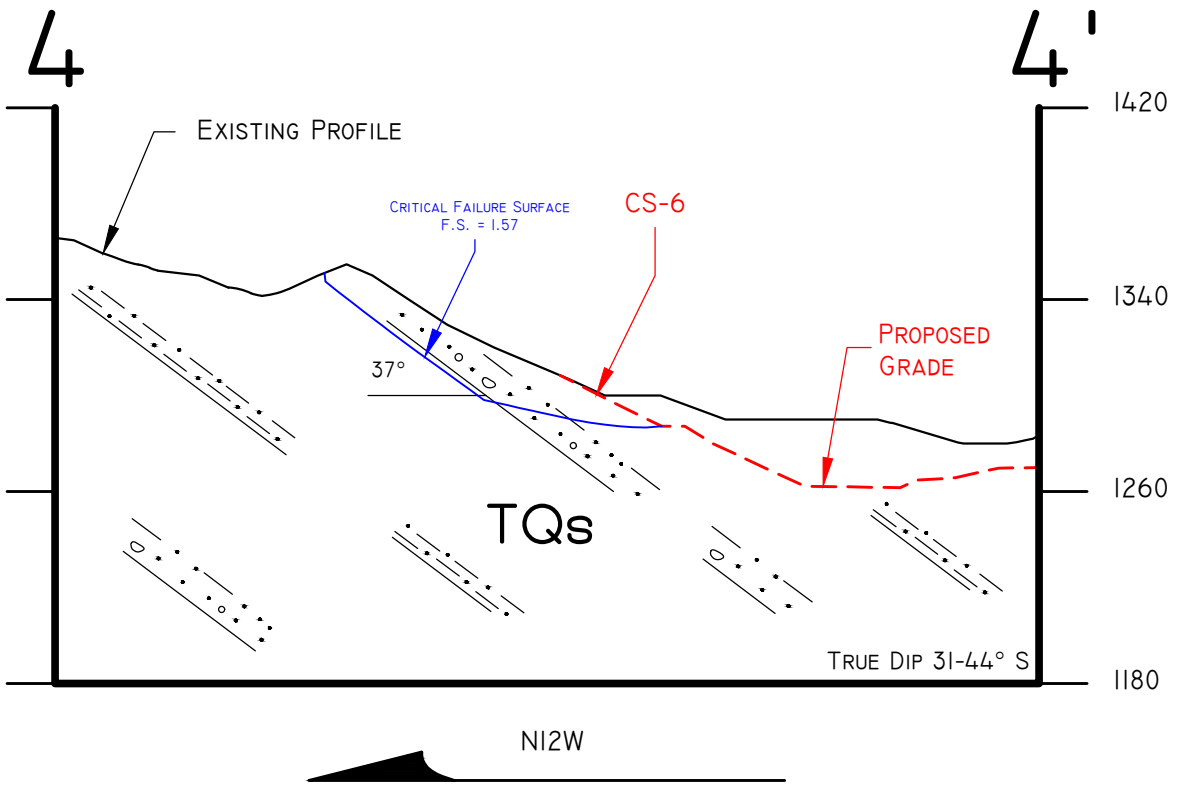
CROSS SECTION 3-3'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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CROSS SECTION 4-4'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

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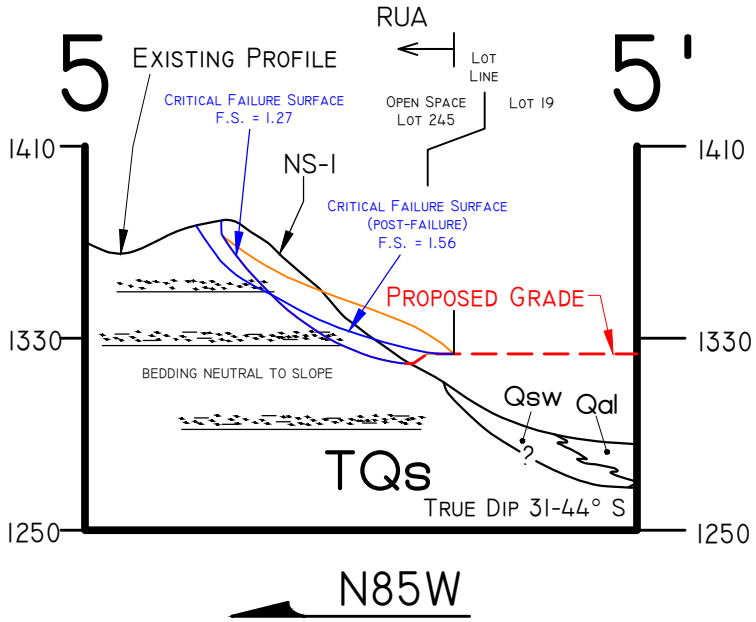

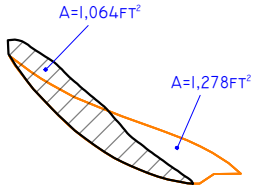

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CROSS SECTION 5-5'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

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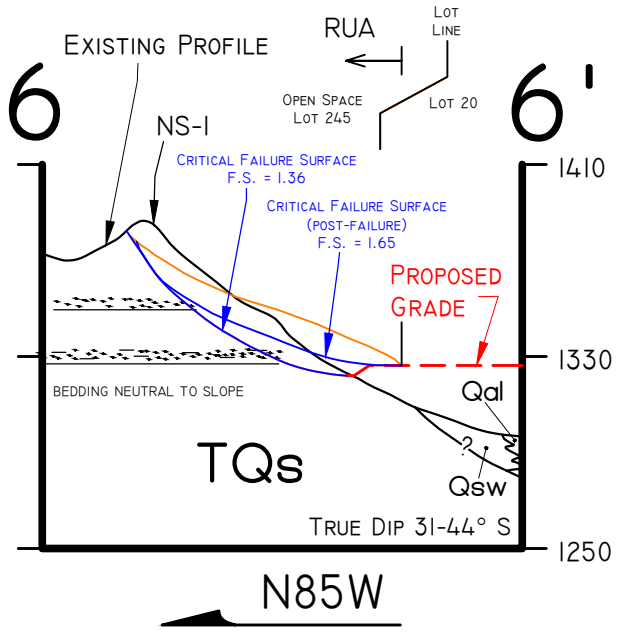

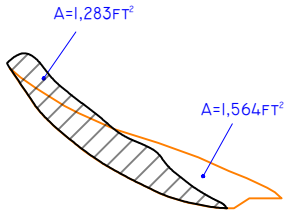

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CROSS SECTION 6-6'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

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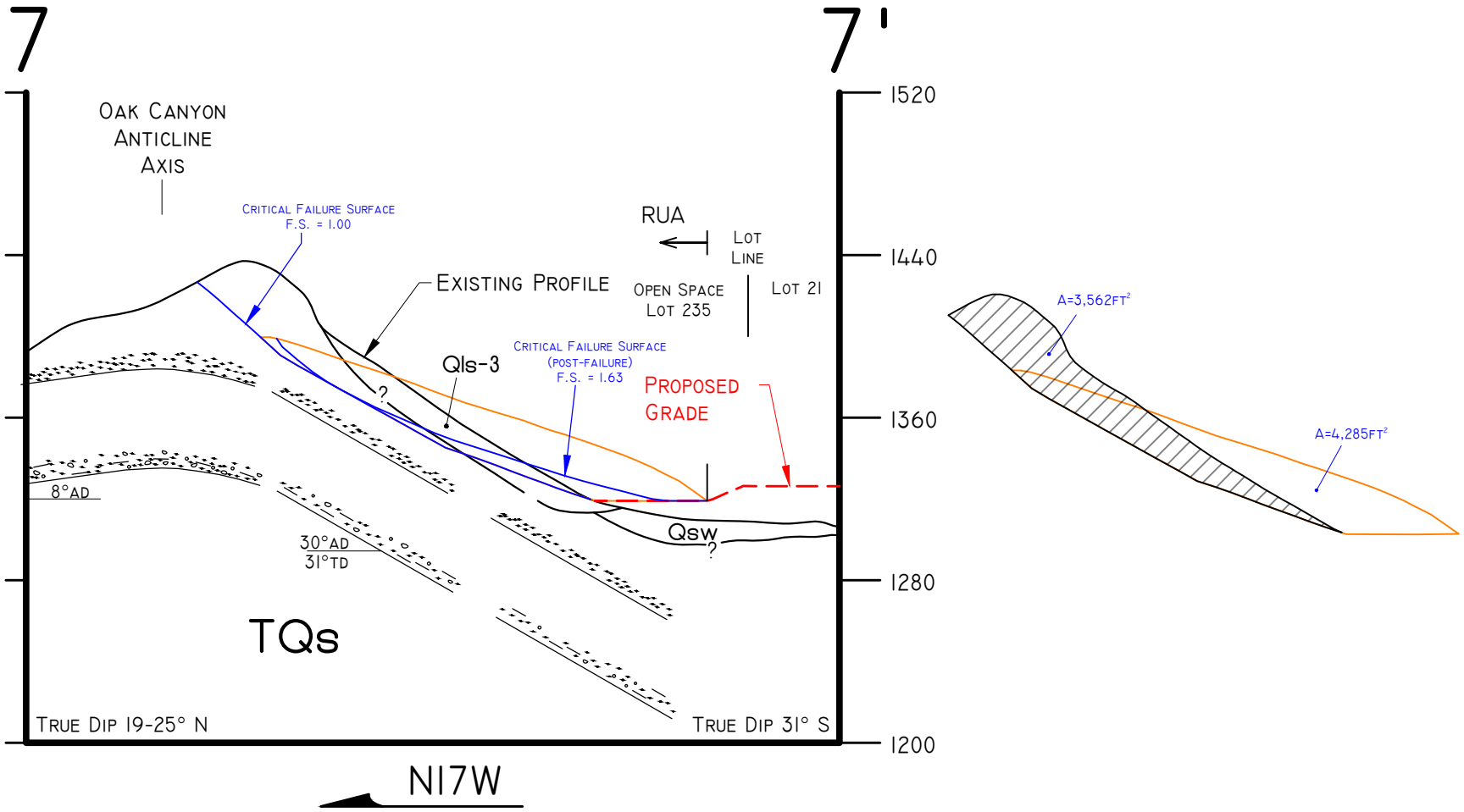

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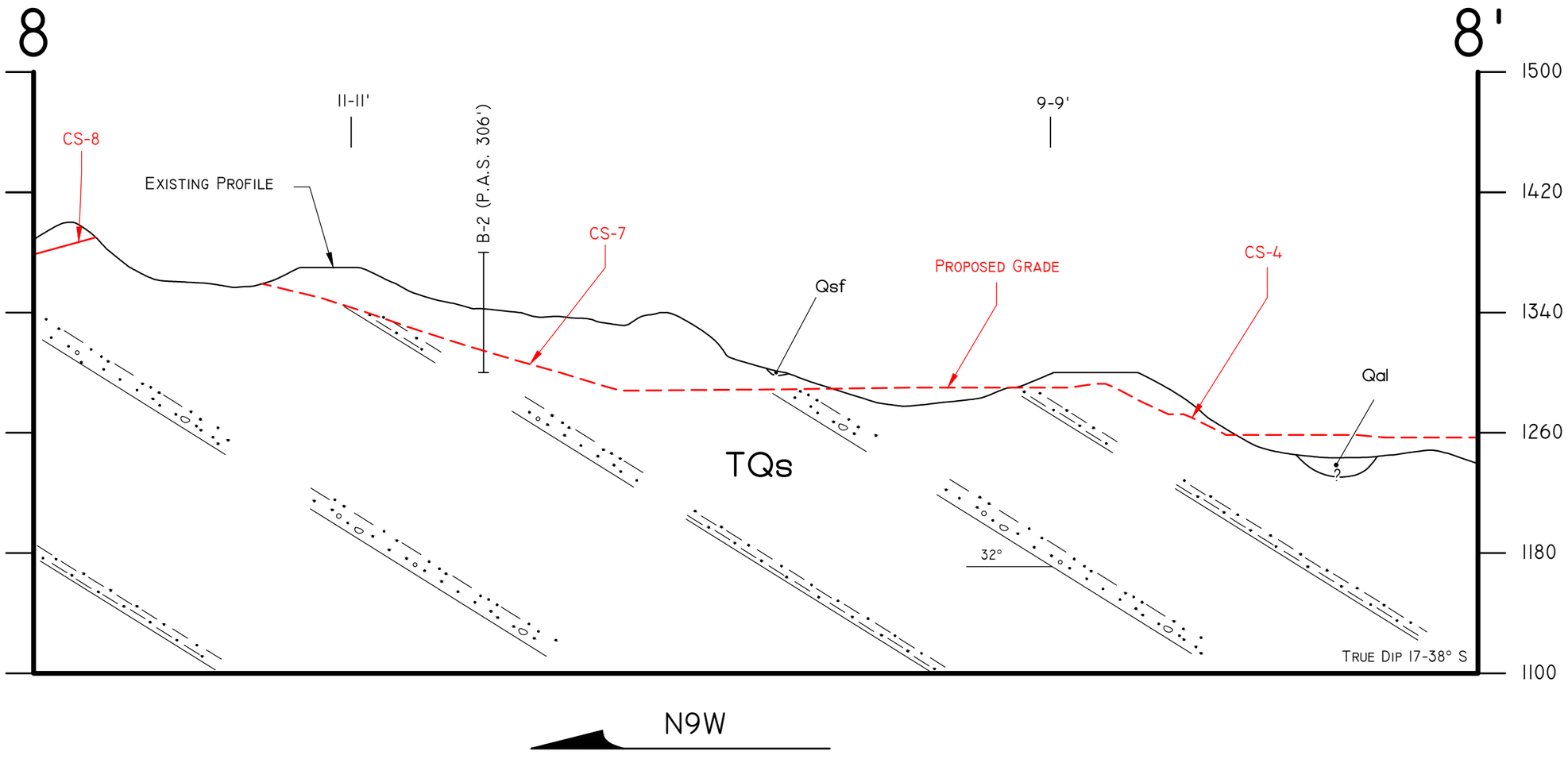
CROSS SECTION 7-7'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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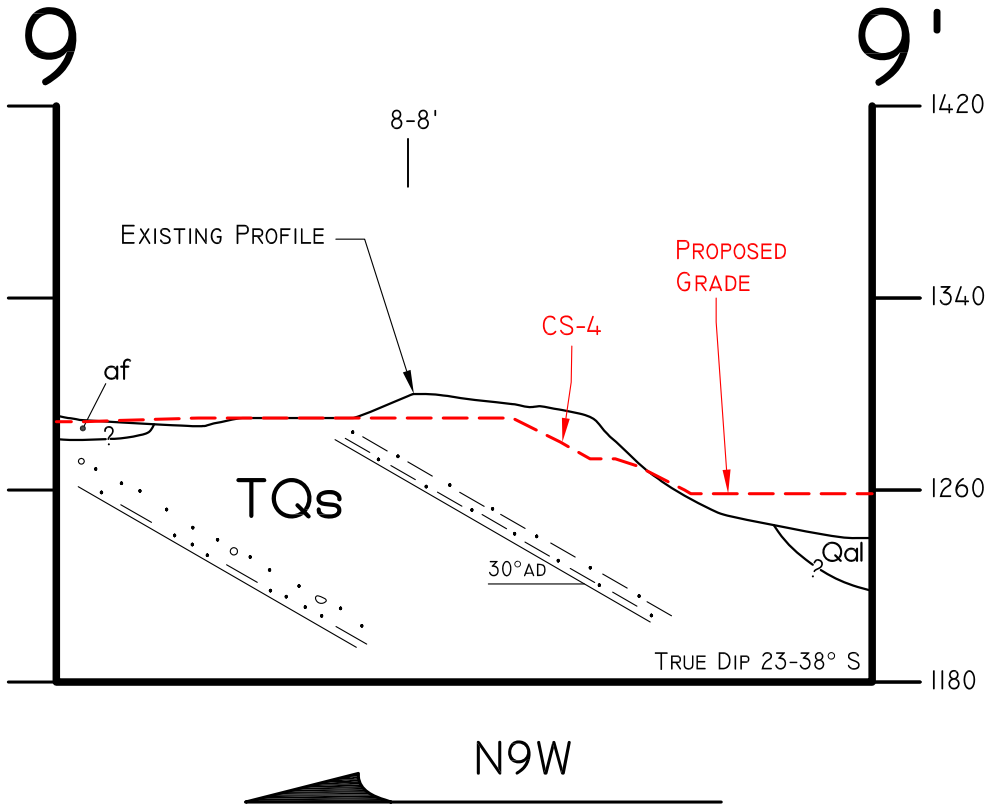
CROSS SECTION 8-8'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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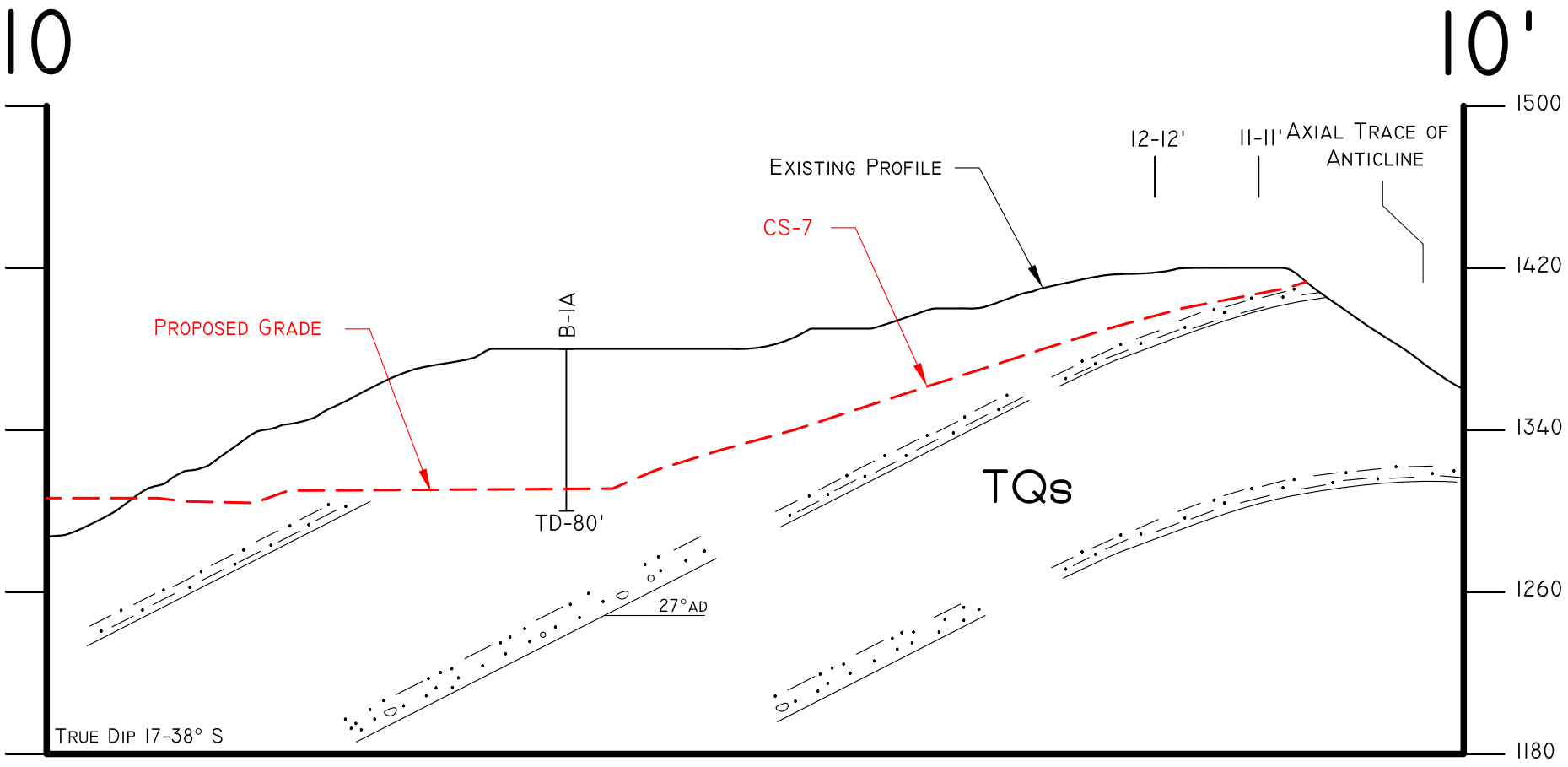
CROSS SECTION 9-9'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



N32E

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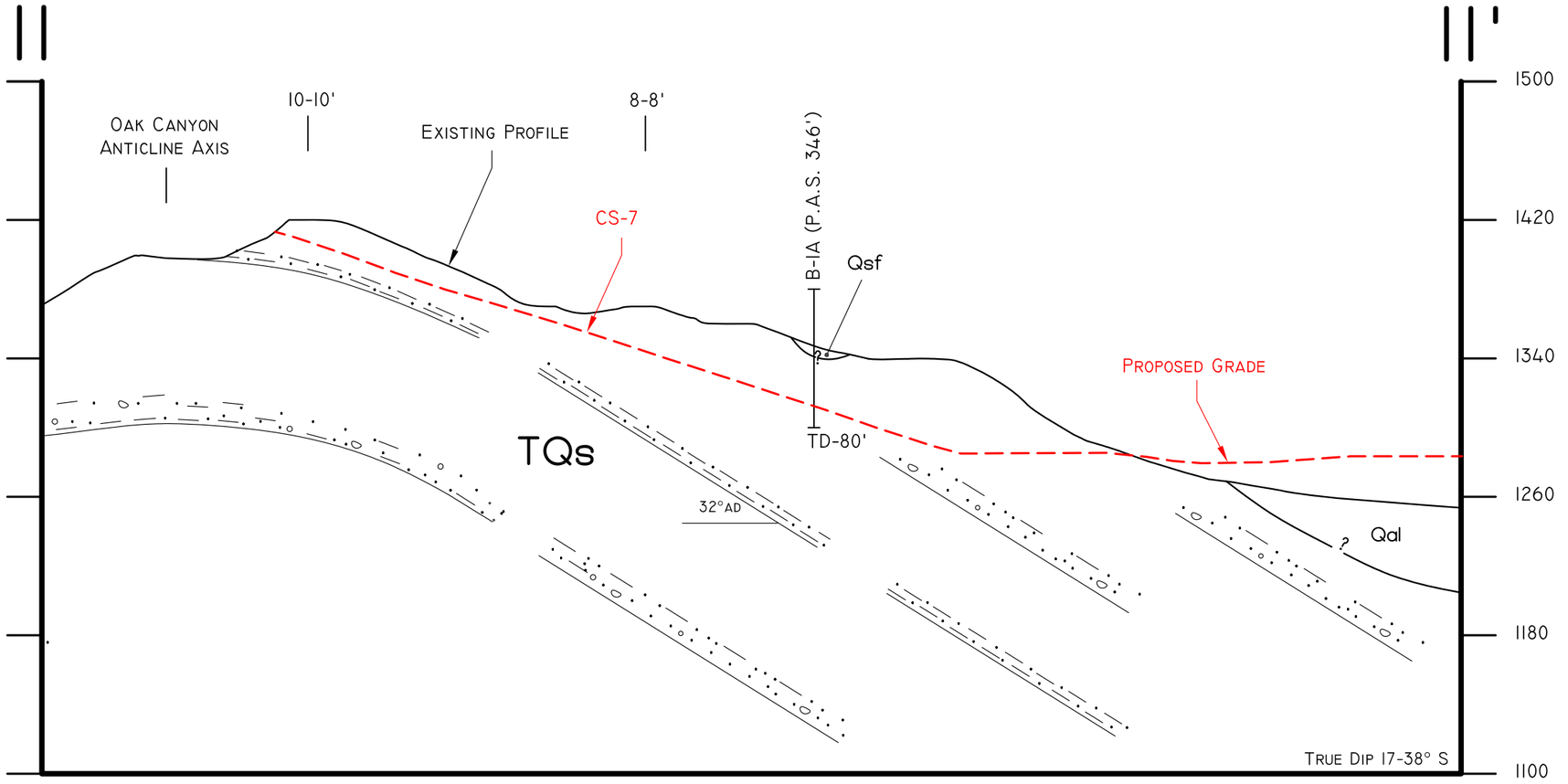
CROSS SECTION 10-10'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



N33W

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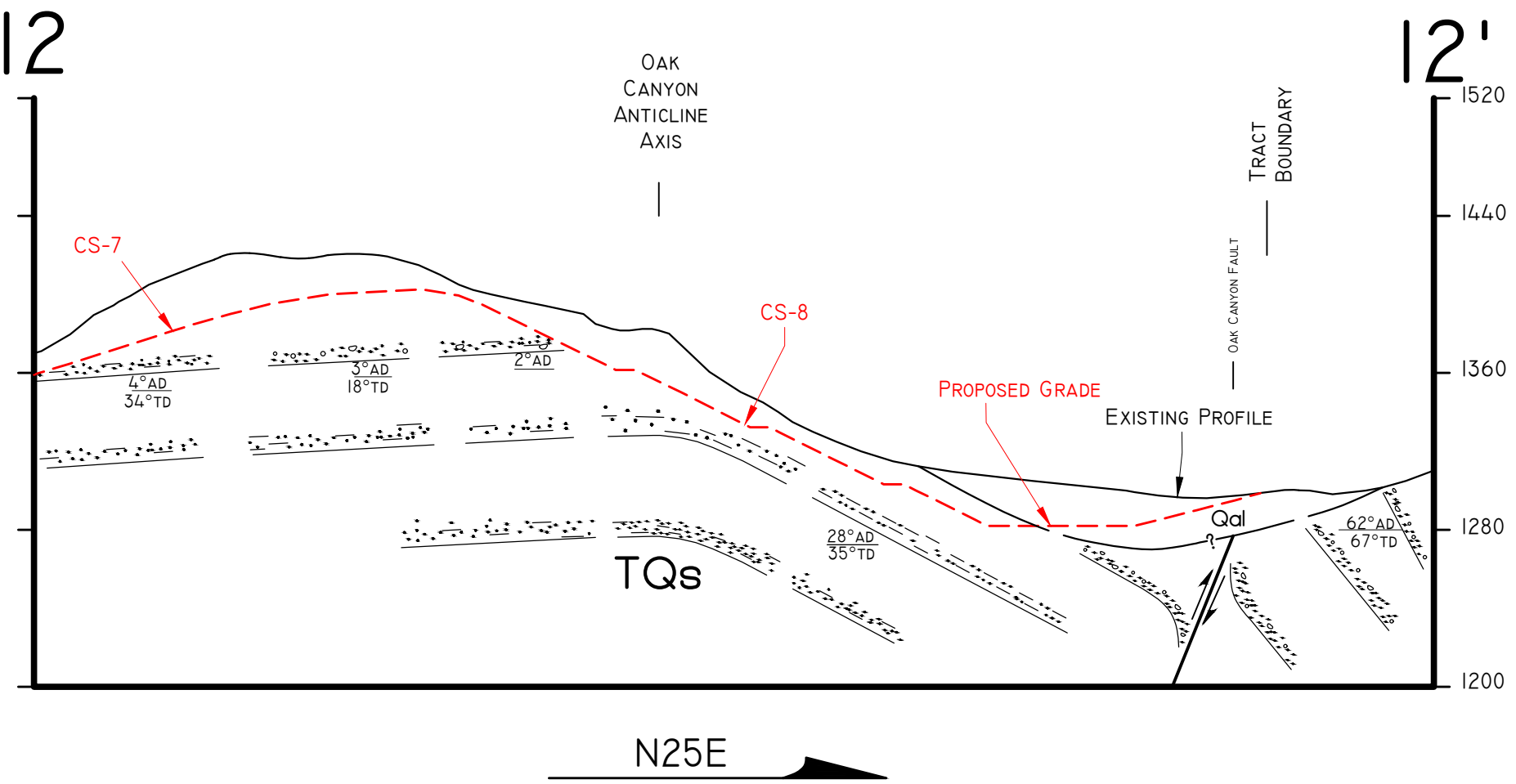
CROSS SECTION II-II'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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CROSS SECTION 12-12'

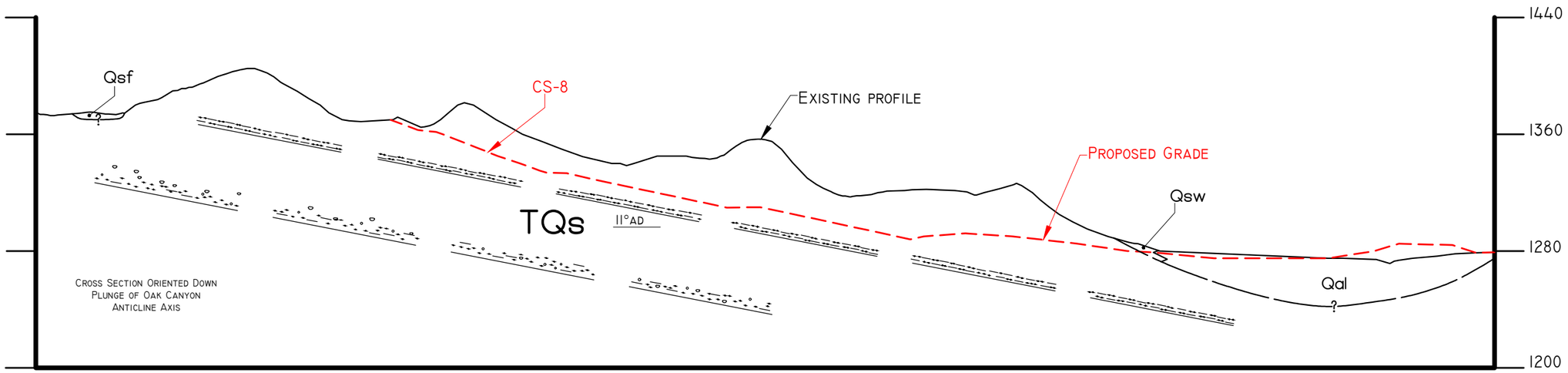
JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)

13

13'



DUE EAST

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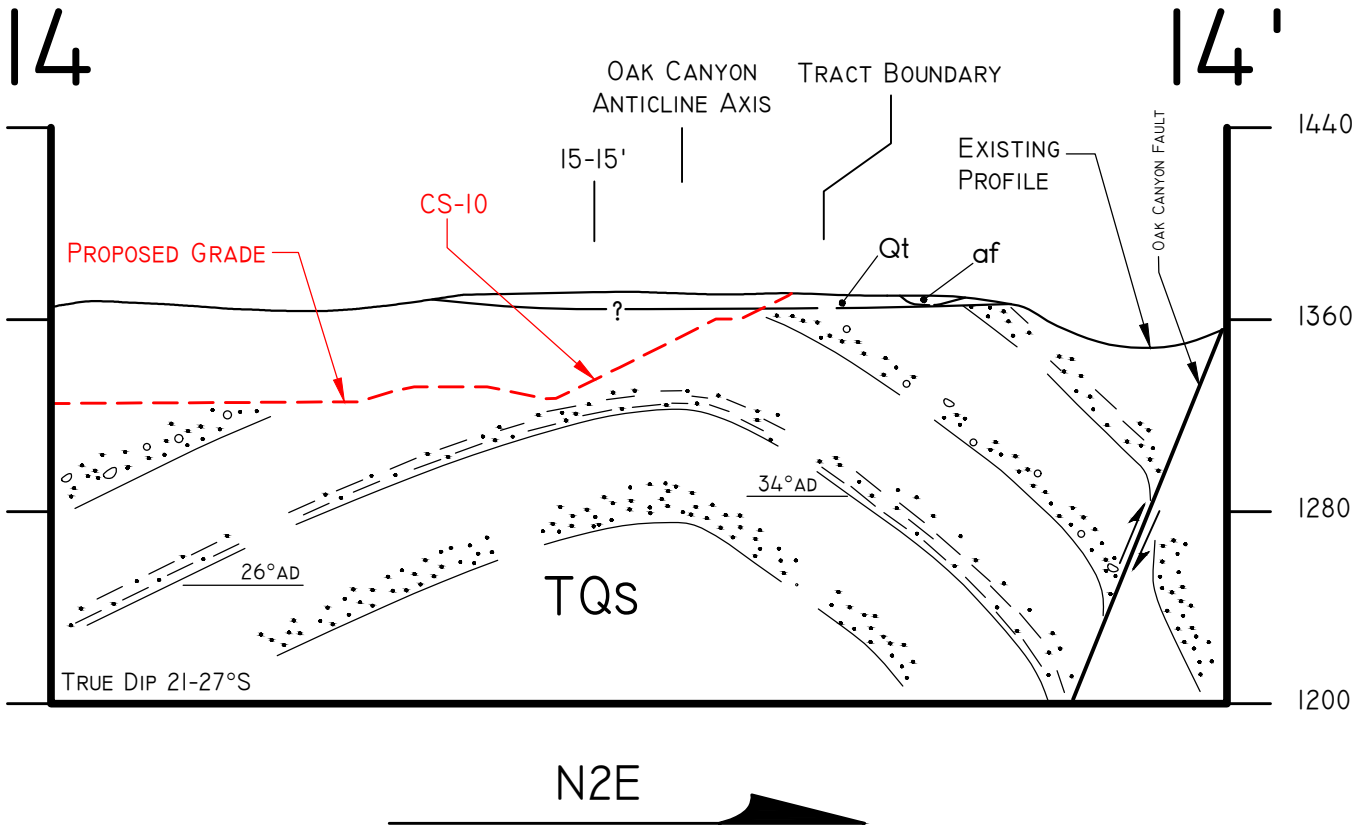
CROSS SECTION 13-13'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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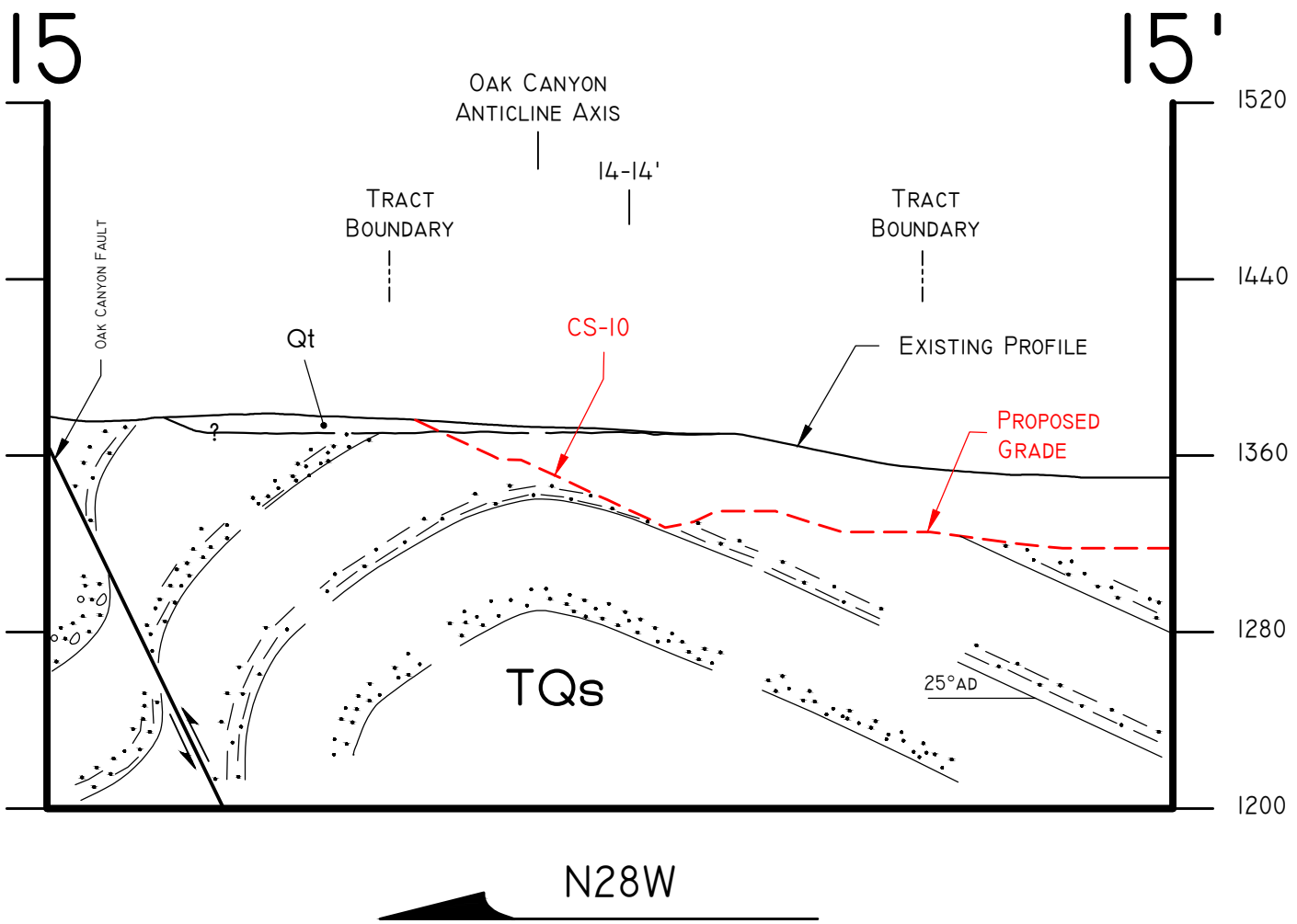
CROSS SECTION 14-14'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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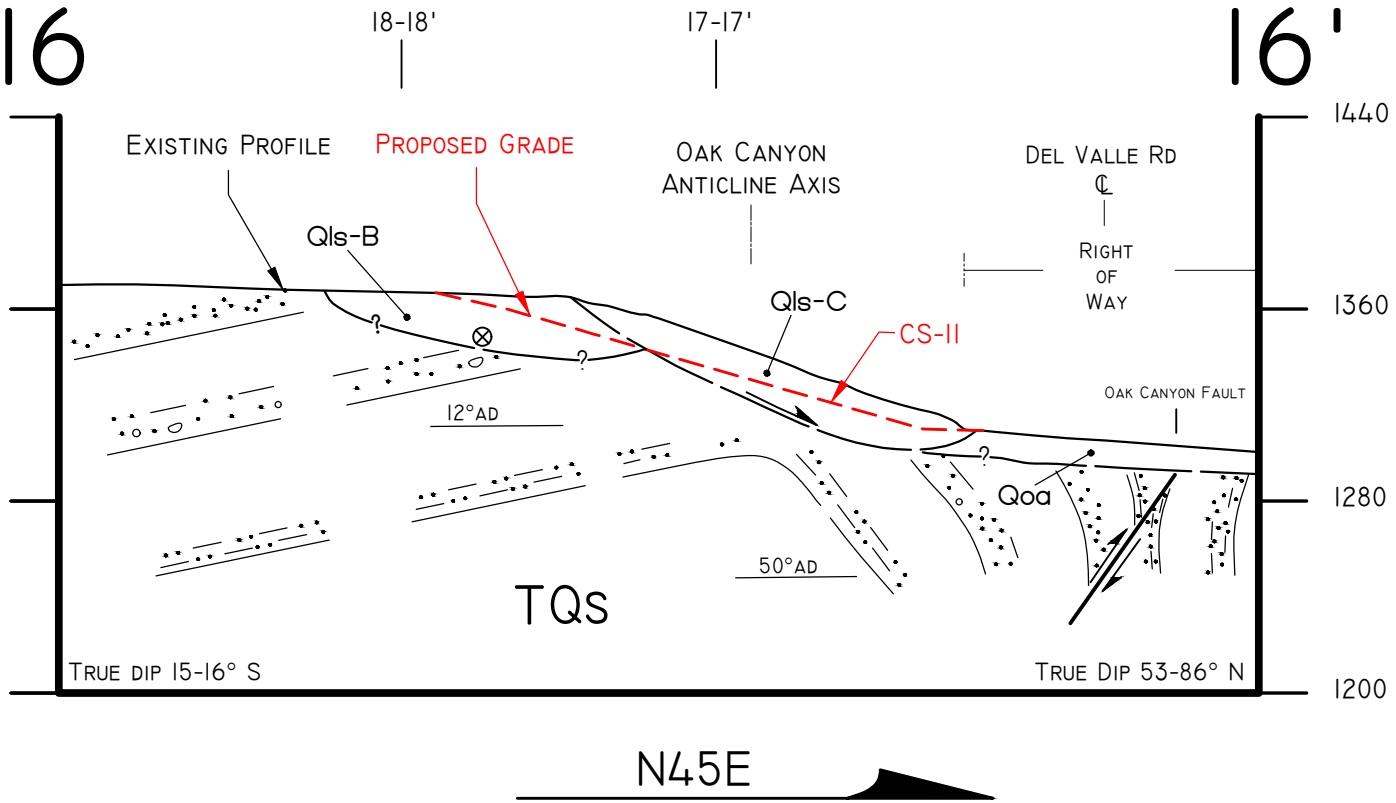
CROSS SECTION 15-15'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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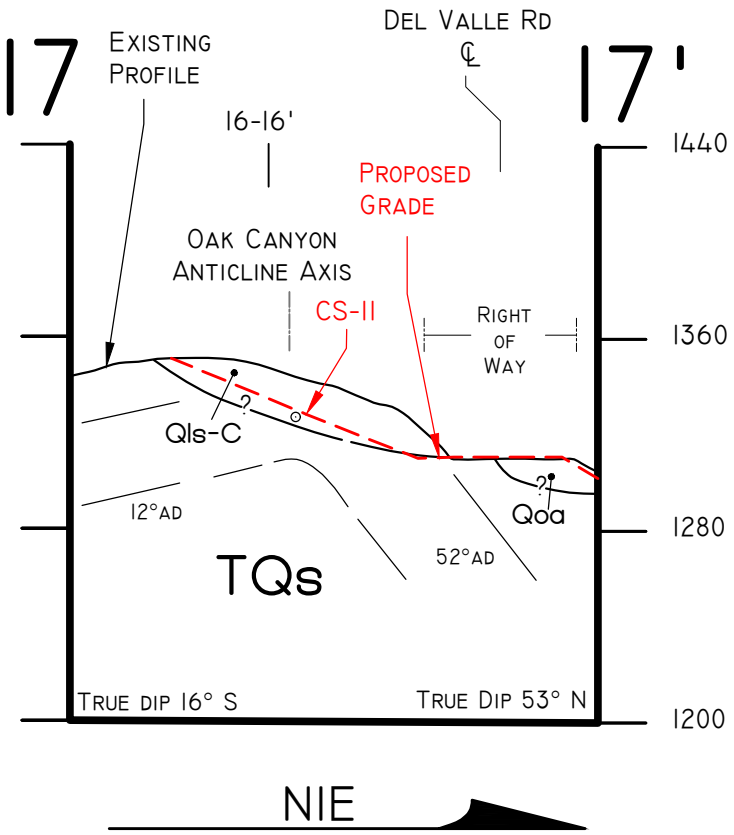
CROSS SECTION 16-16'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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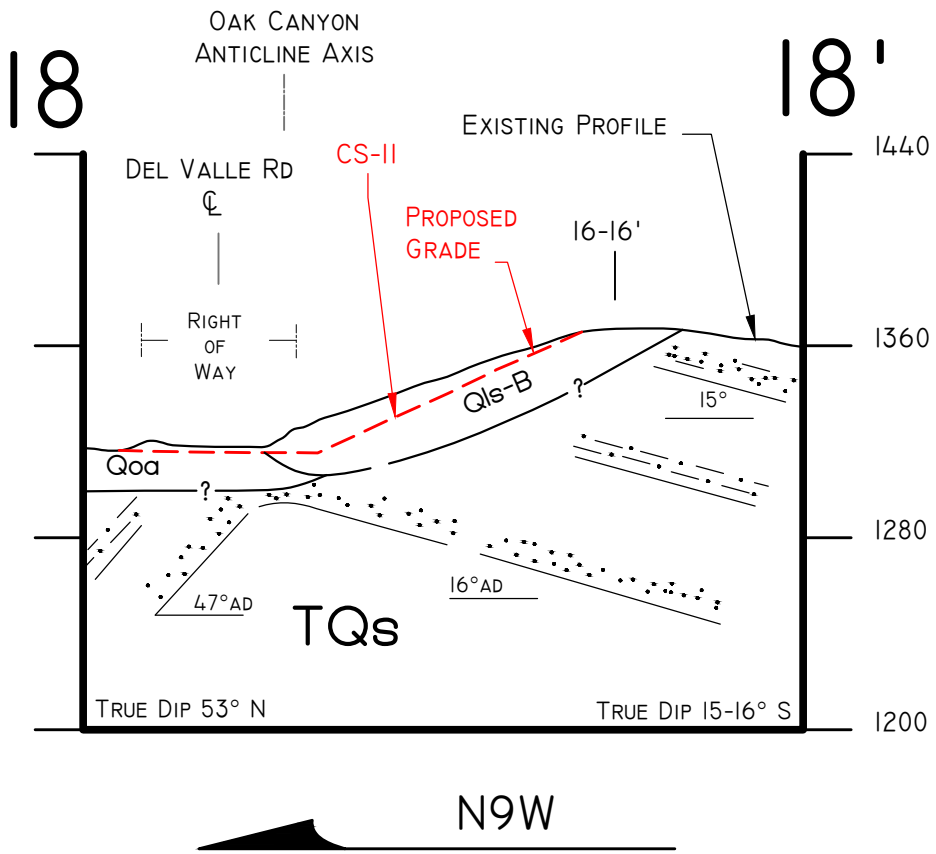
CROSS SECTION 17-17'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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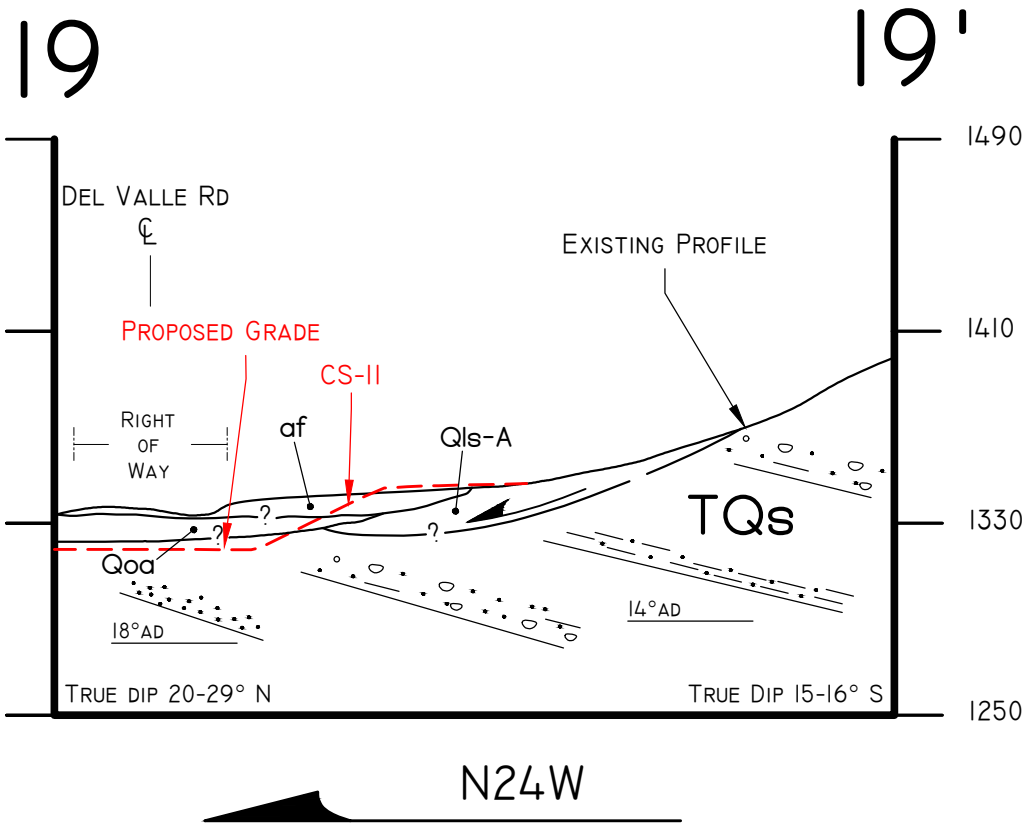
CROSS SECTION 18-18'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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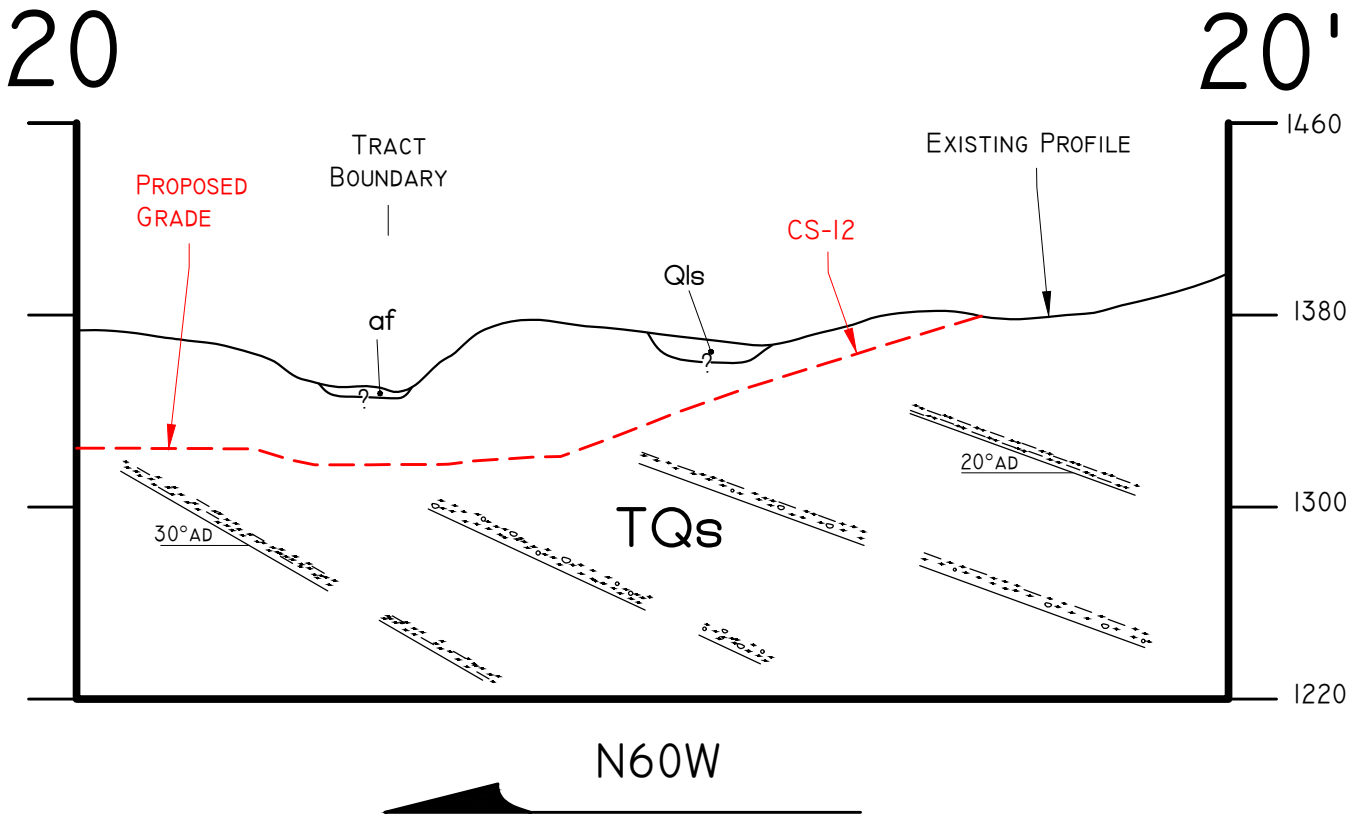
CROSS SECTION 19-19'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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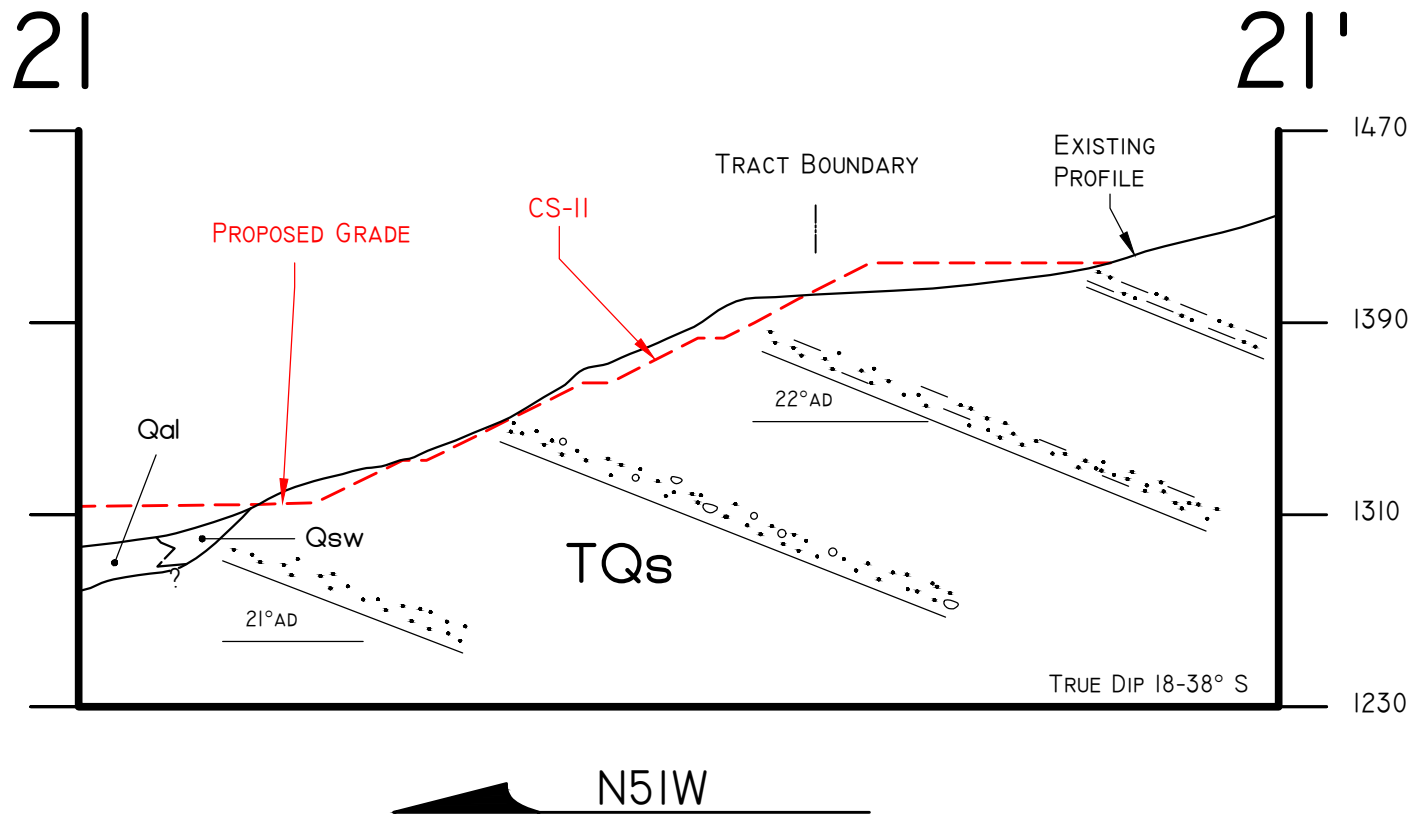
Cross Section 20-20'

Job No.: *18-1245A-4*

Date: *6/08/18*

Scale: 1"=80' (H=V)



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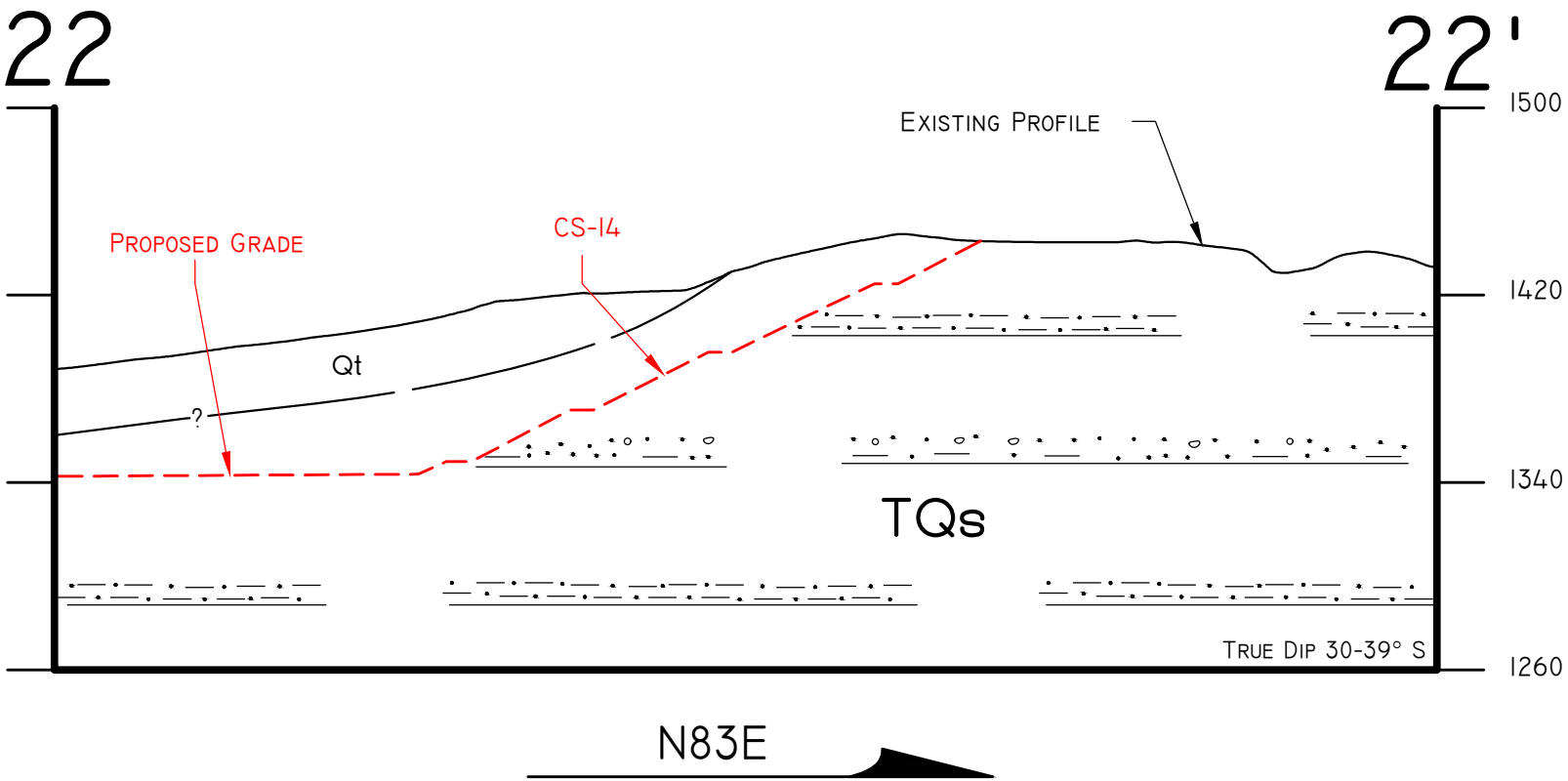
CROSS SECTION 21-21'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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CROSS SECTION 22-22'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

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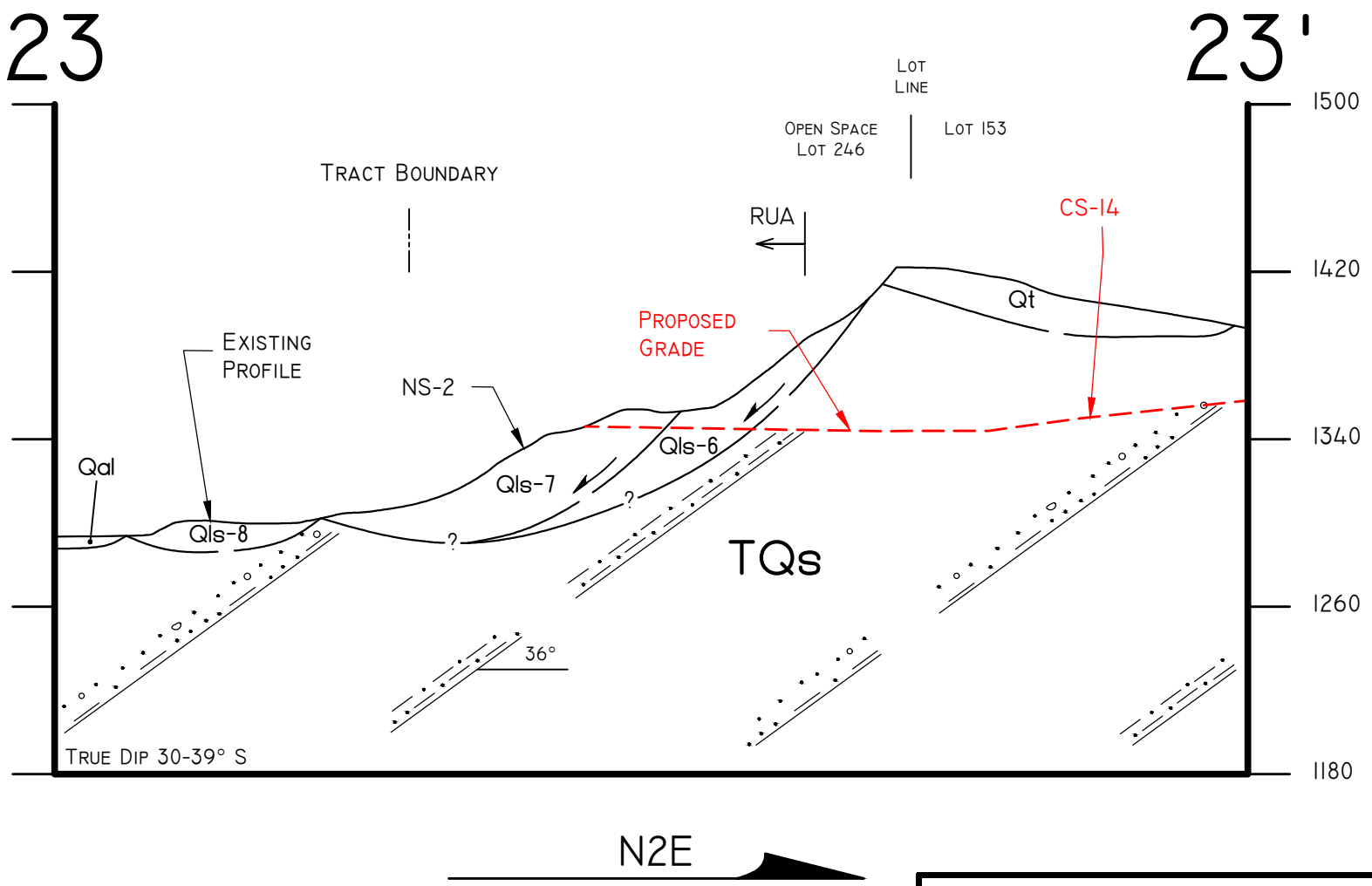

N2E

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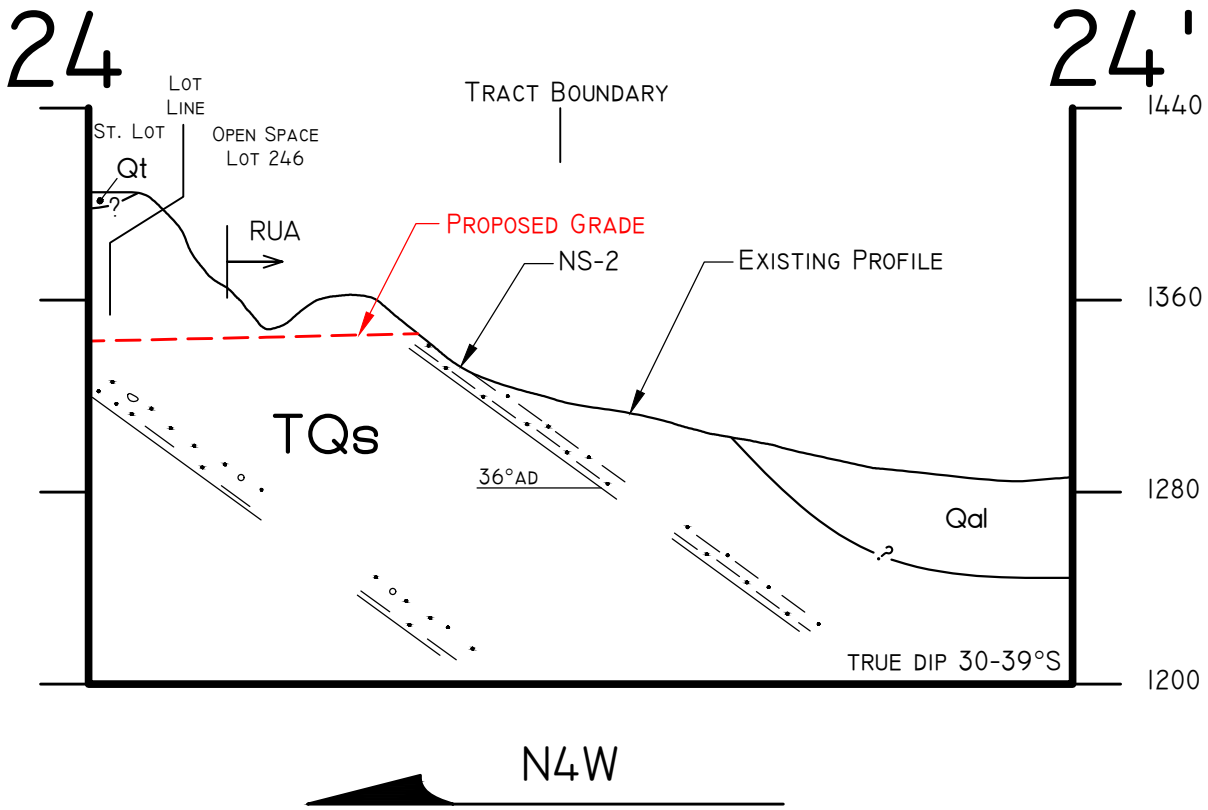
CROSS SECTION 23-23'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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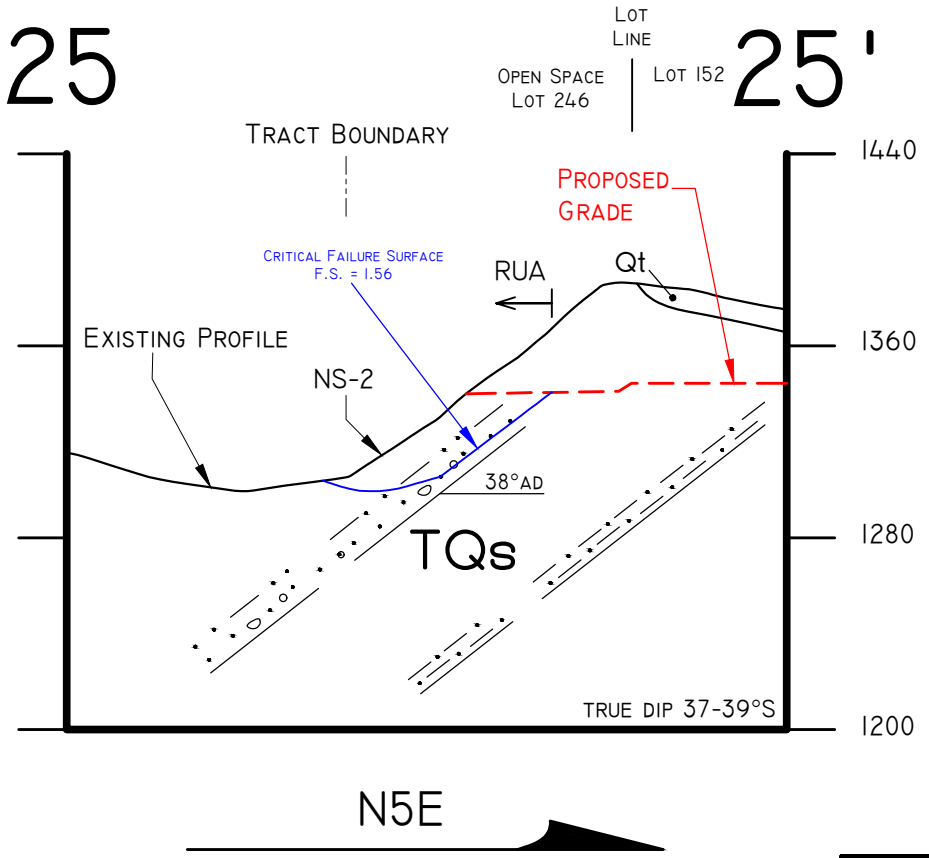
CROSS SECTION 24-24'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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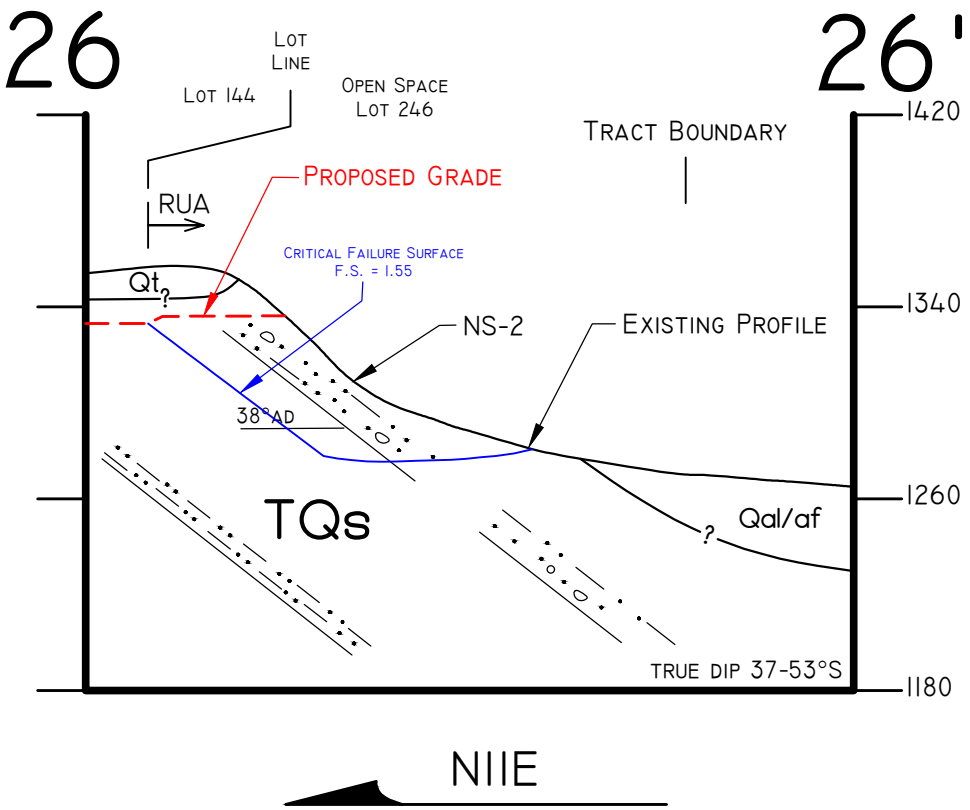
CROSS SECTION 25-25'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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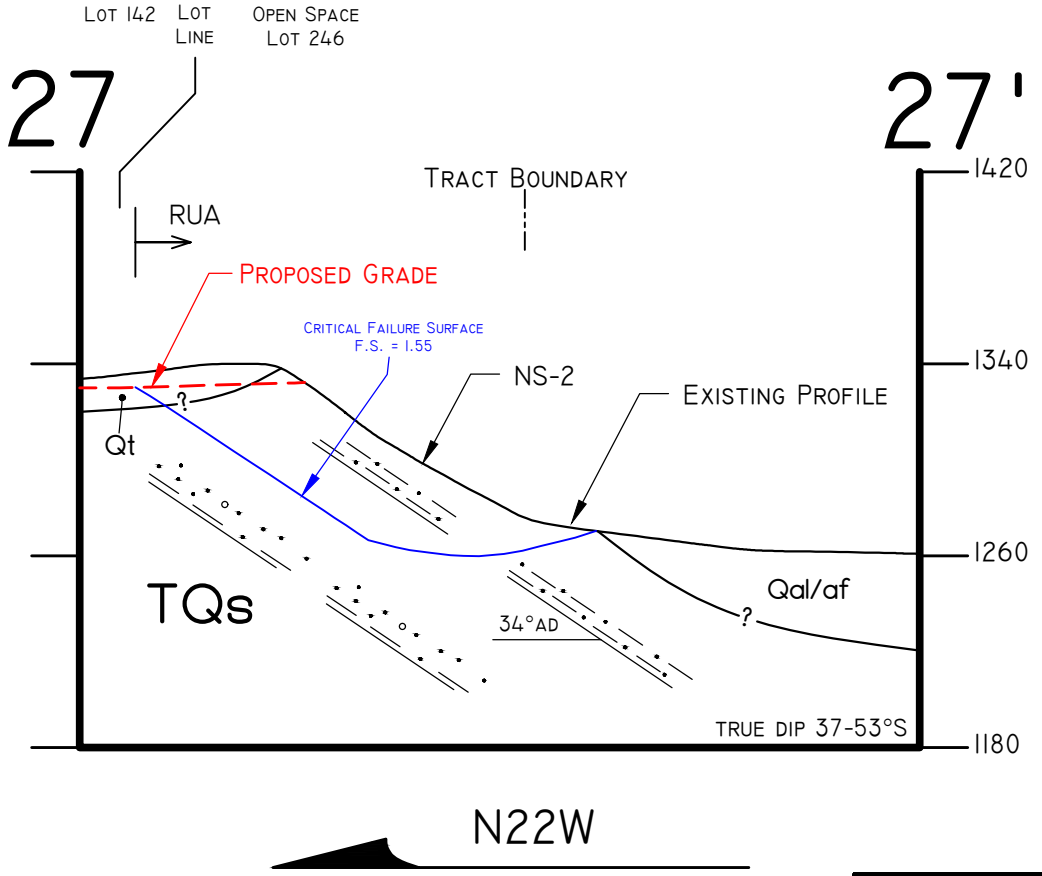
CROSS SECTION 26-26'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



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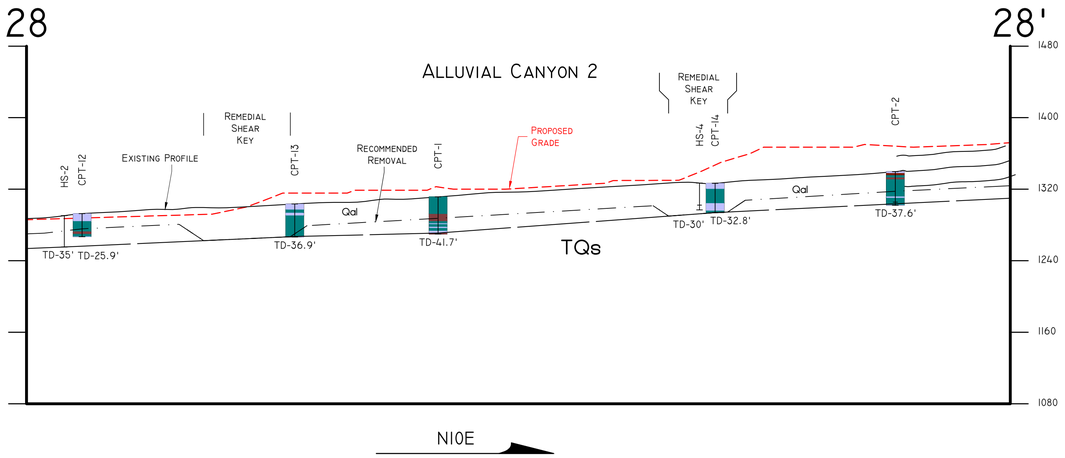
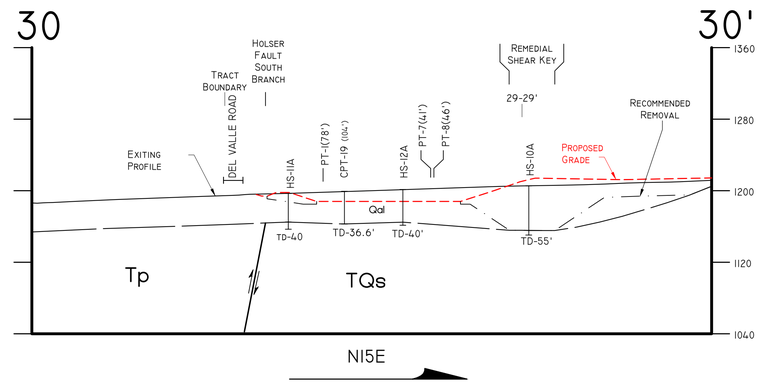
CROSS SECTION 27-27'

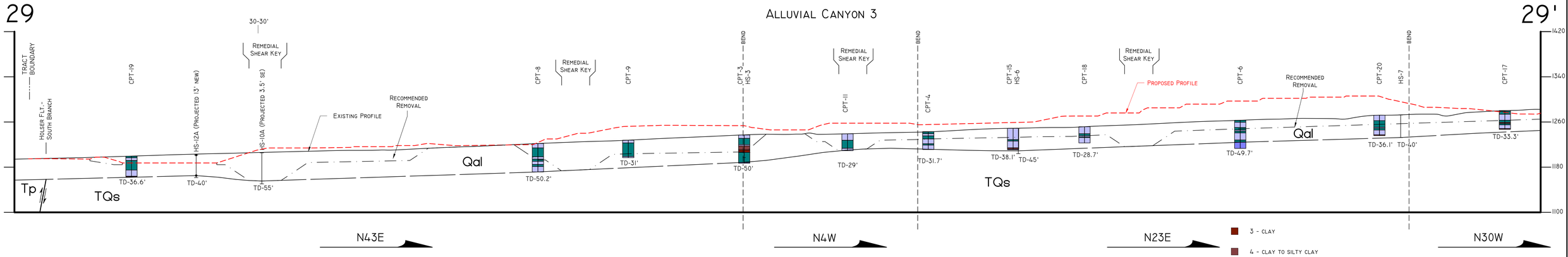
JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)







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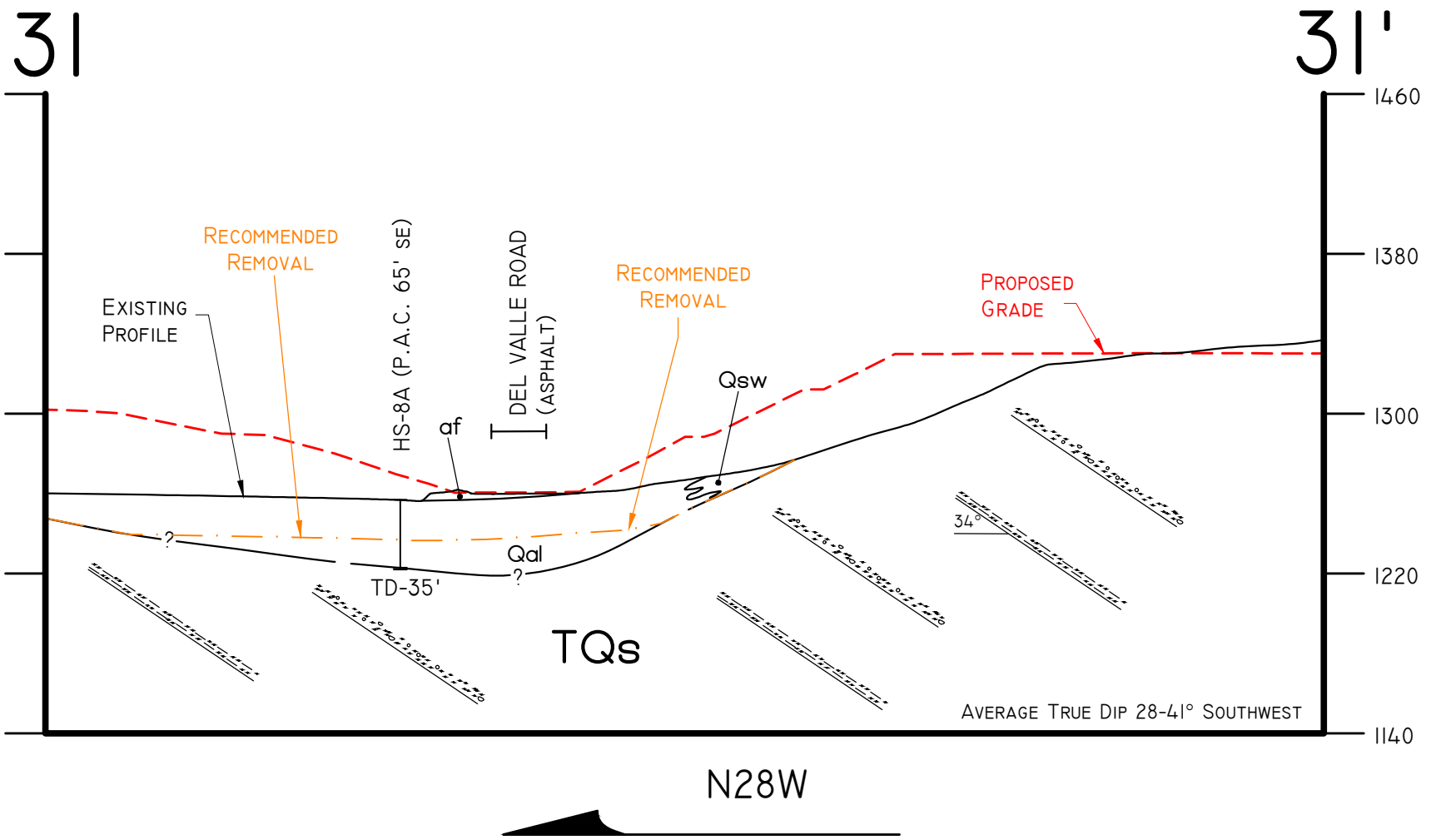
CROSS SECTIONS
28-28', 29-29' AND 30-30'

DATE: 06/08/18 | JOB NO.: 18-1245A-4
SCALE: 1" = 80' | FILE NAME: XS-PLATE 1-80 SCALE
PLATE 1 | GEOLOGY BY: VCG | DRAWN BY: GR | REVISED:



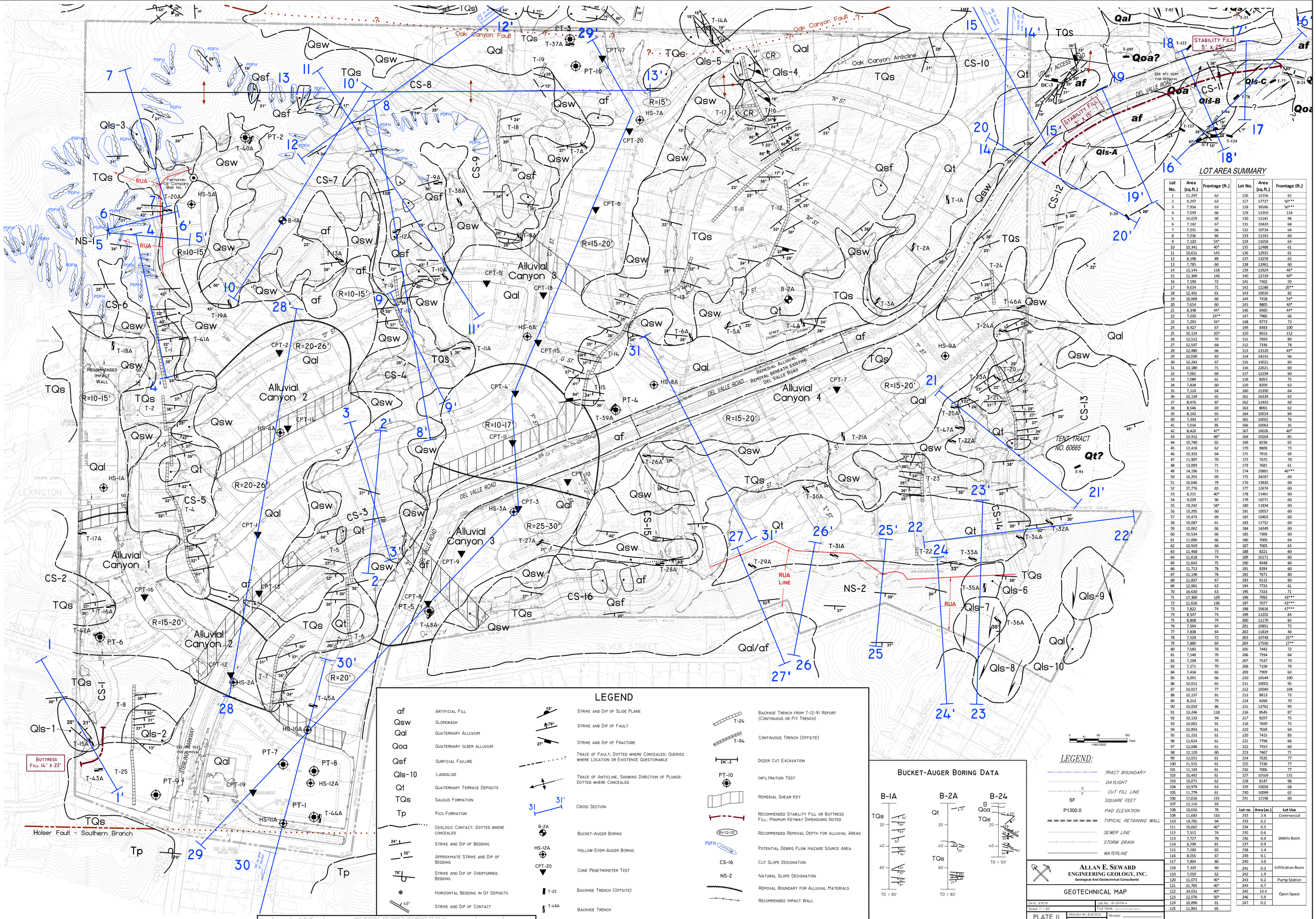
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CROSS SECTION 31-31'

JOB NO.: *18-1245A-4*

DATE: *6/08/18*

SCALE: 1"=80' (H=V)



LOT AREA SUMMARY

Lot No.	Area (sq.ft.)	Frontage (ft.)	Lot No.	Area (sq.ft.)	Frontage (ft.)
1	11,297	62	126	12156	62
2	9,297	63	127	57727	50***
3	7,956	63	128	38586	50***
4	7,039	66	129	51359	114
5	10,029	90	130	12541	96
6	7,142	67	131	10420	68
7	7,031	66	132	10734	64
8	7,036	66	133	11343	60
9	7,120	54*	134	11658	64
10	10,341	40*	135	12488	61
11	10,651	145	136	12935	61
12	8,198	89	137	13259	62
13	7,785	60	138	13961	60
14	13,144	118	139	21924	40*
15	11,369	146	140	12519	40*
16	7,190	72	141	7402	59
17	9,634	71	142	11588	20**
18	12,461	61	143	10010	82
19	10,009	60	144	7458	54*
20	7,654	60	145	9805	40*
21	8,348	44*	146	8400	44*
22	7,030	24**	147	7966	66
23	7,293	54*	148	9773	73
24	8,427	67	149	8483	100
25	10,134	107	150	8653	112
26	12,512	70	151	7693	80
27	12,597	68	152	7336	78
28	12,480	66	153	13120	40*
29	10,030	83	154	14235	66
30	10,243	67	155	19021	69
31	10,180	71	156	22625	60
32	7,065	60	157	12196	60
33	7,084	61	158	8263	75
34	7,434	60	159	8209	63
35	7,118	64	160	15390	64
36	10,134	65	161	16834	63
37	8,476	87	162	12493	60
38	8,546	69	163	8065	62
39	8,142	65	164	10014	84
40	7,343	67	165	10092	76
41	7,056	85	166	10063	35
42	8,428	47*	167	28026	40*
43	10,952	48*	168	10264	85
44	10,740	65	169	8238	65
45	12,418	67	170	8808	73
46	10,333	64	171	7916	69
47	11,907	70	172	7675	70
48	13,093	71	173	7681	61
49	14,196	72	174	20881	46****
50	16,201	69	175	34287	69
51	16,646	79	176	13826	60
52	37,776	65	177	12674	60
53	8,251	40*	178	11461	60
54	9,039	96	179	10271	60
55	19,242	58*	180	11834	60
56	10,295	60	181	10057	60
57	10,473	69	182	10403	60
58	10,087	61	183	11752	60
59	10,062	66	184	14349	60
60	10,534	66	185	7306	60
61	11,006	66	186	7006	64
62	10,919	66	187	7005	63
63	11,468	73	188	8221	60
64	11,618	74	189	10171	60
65	11,643	75	190	9448	60
66	11,713	78	191	8394	60
67	11,146	76	192	7671	60
68	11,837	67	193	9115	60
69	12,901	63	194	7724	61
70	16,630	63	195	7333	71
71	17,360	129	196	7092	43****
72	11,616	136	197	7077	43****
73	7,822	74	198	15616	47****
74	8,547	74	199	11202	64
75	8,808	74	200	11170	65
76	7,594	64	201	10851	72
77	7,838	64	202	11819	40
78	7,529	72	203	10748	15**
79	7,880	84	204	17550	17**
80	7,583	78	205	7442	72
81	7,148	70	206	7934	84
82	7,104	70	207	7537	70
83	7,271	70	208	7158	70
84	7,456	65	209	7309	63
85	9,091	66	210	10544	100
86	10,051	65	211	10002	95
87	10,017	77	212	10049	104
88	10,137	81	213	8813	73
89	8,253	79	214	8268	70
90	10,059	86	215	13761	99
91	13,246	118	216	8545	87
92	10,133	94	217	8297	75
93	10,001	91	218	7699	75
94	10,893	61	219	7028	64
95	11,232	61	220	7415	89
96	11,624	61	221	7796	66
97	12,046	61	222	7919	60
98	12,120	60	223	7467	71
99	12,051	61	224	7635	77
100	11,555	61	225	7236	77
101	11,143	61	226	7006	77
102	10,492	61	227	10169	131
103	10,071	62	228	8147	98
104	10,979	63	229	10058	68
105	11,779	61	230	10099	62
106	12,656	131	231	12196	60
107	12,116	93			
108	10,656	78			
109	11,692	133			
110	14,785	94			
111	10,662	46*			
112	7,315	74			
113	7,727	70			
114	8,299	81			
115	7,290	65			
116	8,055	67			
117	7,804	80			
118	7,339	60			
119	7,059	62			
120	11,073	40*			
121	21,765	40*			
122	34,031	40*			
123	12,076	50*			
124	10,890	61			
125	11,801	65			

Lot no.	Area (ac.)	Lot Use
232	2.4	Commercial
233	0.2	Debris Basin
234	0.3	
235	0.6	
236	0.4	
237	0.9	
238	1.4	
239	0.1	
240	3.0	
241	0.3	Infiltration Basin
242	1.9	
243	0.2	Pump Station
244	0.7	
245	14.4	Open Space
246	5.9	
247	0.2	

LEGEND

af	Artificial Fill	15°	Strike and Dip of Slide Plane
Qsw	Slopewash	79°	Strike and Dip of Fault
Qal	Quaternary Alluvium	27°	Strike and Dip of Fracture
Qoa	Quaternary older alluvium		Trace of Fault; Dotted where Concealed; Queried where Location or Existence Questionable
Qsf	Surficial Failure		Trace of Anticline, Showing Direction of Plunge; Dotted where Concealed
Qls-10	Landslide		
Qt	Quaternary Terrace Deposits		
TQs	Saugus Formation		
Tp	Pico Formation	31'	Cross Section
	Geologic Contact; Dotted where concealed	B-2A	Bucket-Auger Boring
24°	Strike and Dip of Bedding	HS-12A	Hollow-Stem-Auger Boring
32°	Approximate Strike and Dip of Bedding	CPT-20	Cone Penetrometer Test
78°	Strike and Dip of Overturned Bedding	T-22	Backhoe Trench (Offsite)
	Horizontal Bedding in Qt Deposits	T-48A	Backhoe Trench
40°	Strike and Dip of Contact	T-24	Backhoe Trench from 7-12-91 Report (Continuous or Pit Trench)
		T-94	Continuous Trench (Offsite)
		DC-3	Dozer Cut Excavation
		PT-10	Infiltration Test
			Remedial Shear Key
			Recommended Stability Fill or Buttress Fill; Minimum Keyway Dimensions Noted
		R=12-15'	Recommended Removal Depth for alluvial Areas
		PDFH	Potential Debris Flow Hazard Source Area
		CS-16	Cut Slope Designation
		NS-2	Natural Slope Designation
			Removal Boundary for Alluvial Materials
			Recommended Impact Wall

BUCKET-AUGER BORING DATA

0 40 80 160 Feet
1:960.0022

LEGEND:

- TRACT BOUNDARY
- DAYLIGHT
- C / F — CUT FILL LINE
- SF — SQUARE FEET
- P1300.0 — PAD ELEVATION
- TYPICAL RETAINING WALL
- SEWER LINE
- STORM DRAIN
- WATERLINE

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOTECHNICAL MAP

DATE: 6/18/18 | JOB NO.: 18-U454-G
SCALE: 1" = 80' | FILE NAME: [illegible]
PLATE II | GEOLOGY BY: BJS/VCG | DRAWN BY: VCG | Revised: _____

PREPARED FOR:
Sterling Ranch ESTATES

STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

	DATE	REVISION	BY	APP
6	7-5-18	MISC REVISIONS, ADD SHEET 3, AND REDUCE TO 22X 36		
5	7-13-16	MISC ADJUSTMENTS & ADDED ALT. A TO SHEET 2		
4	2-12-16	MISC LOT ADJUSTMENTS		
3	9-5-12	DEL ROUNDABOUTS, SHOW PHASING, LARGE LOTS, SEPTIC OPTION & CORRECT ST SECTIONS		
2	7-17-07	REVISED HUNSTOCK INTERSECTION		
1	3-27-05	REVISED LAYOUT TO MEET CASTAIC C.S.D. STANDARDS		

SCALE: AS SHOWN | DWG'S BY: | APPROVED BY: | DATE: 08-18-06 | DWG. NO.: 5100-056-01 | SHEET 2 OF 3

LEGAL DESCRIPTION
PORTION OF LOT A OF TRACT NO. 8599 M.B. 101-87-88

N

REGISTERED PROFESSIONAL ENGINEER — MARK R. SIKAND — No. 35453 — Exp. 09-30-19 — CIVIL — STATE OF CALIFORNIA

SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd.,
Van Nuys, CA 91411
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info@sikand.com

A MAJOR LAND DIVISION
VESTING TENTATIVE TRACT MAP NO. 60257
IN THE UNINCORPORATED TERRITORY OF
COUNTY OF LOS ANGELES

APPENDIX F.2

Response to County of Los Angeles Geologic and Soils Engineering Review Sheet dated 10/17/18 and Geologic and Geotechnical Report, Review of Revised Vesting Tentative Tract Map dated February 27, 2019, Geotechnical Report – Addendum No. 1 dated April 3, 2019.

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ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

April 3, 2019 Job No.: 19-1245A-4

Sterling Gateway, L.P.
1887 Gold Dust Lane, #303
P.O. Box 681007
Park City, UT 84068

Attention: Mr. Hunt Williams

Subject: **GEOTECHNICAL REPORT – Addendum No. 1**
Response to County of Los Angeles Geologic and Soils Engineering Review Sheet dated 10/17/18

GEOLOGIC AND GEOTECHNICAL REPORT
Review of Revised Vesting Tentative Tract Map dated February 27, 2019

Project: Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California

References: At end of text

Dear Mr. Williams:

This report is divided into two parts. The first part presents our response to the Geologic and Soils Engineering Review Sheet dated 10/17/18 for Vesting Tentative Tract Map 60257 issued by the Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division (GMED). The second part of the report presents our opinions on the existing geologic and geotechnical conditions and their effects on the proposed development shown on the Vesting Tentative Tract Map 60257 dated 2/27/19. This report is supplementary to our previous report dated 6/8/18 (see ref. 5), hereinafter called "previous report", and the conclusions and recommendations presented therein are still applicable except where they are superseded in this report. The results of supplemental subsurface exploration, laboratory testing, and analyses that was performed for this study are included in the second part.

PART I

GEOLOGIC AND GEOTECHNICAL REPORT – Addendum No. 1

In order to facilitate the review process, we have listed the County of Los Angeles review sheets comments in **bold** in the order in which they appear on the original review sheet. Each comment is followed by our response. A copy of the review sheet is attached after the references.

Comment G1

The toe of landslide Qls-3 is showing crossing a proposed lot boundary. Adjust lot lines to constrain the landslide on one lot or provide remediation of the landslide. The landslide hazard may not be subdivided. If complete removal is proposed, depict the proposed final topography in the area of landslide removal.

Response

The 2/27/19 Vesting Tentative Tract Map (VTTM) adjusted the lot boundary for Lot 228 (Debris Basin). The mapped limits of Landslide Qls-3 is contained entirely in Lot 239 (Open Space). See the attached Geotechnical Map (Plate II) which used the 2/27/19 VTTM as the base map.

Comment G2

The toe of landslide Qls-3 is shown encroaching into the debris cone of a proposed debris basin. Determine that the landslide is stable, recommend mitigation, or increase the basin capacity by an equivalent volume.

Response

The previous report concluded that Landslide Qls-3 and the ascending natural slope do not meet the minimum County factor of safety requirements for gross stability. A stable post-failure geometry was predicted based on the pre-failure critical surface. The post-failure geometry was modeled on Cross Section 7-7' assuming bulking of the failure mass by approximately 20 percent and a runout of the failure mass that yielded a stable condition (i.e. where potential failure surfaces meet or exceed minimum County requirements). The predicted post-failure geometry (see Figure 1) was provided to the Supervising Civil Engineer. It is our understanding that the Supervising Civil Engineer increased the proposed debris basin to account for the potential reduction in the debris cone based on the post-failure geometry. The 2/27/19 VTTM illustrates the revised configuration of the western debris basin on Lot 228,

which provides a debris potential volume (DPV) of 848 cubic yards (cy) versus the required DPV of 278 cy. Revised Cross Section 7-7' illustrates the 2/27/19 VTTM design.

Comment S1

Provide data to substantiate the shear strengths used in the slope stability analyses for the bedrock (cross bedding), post-failure mass, and terrace deposits (see slope stability analyses for cross section 27-27'). Provide revised slope stability analyses and recommend mitigation measures if factors of safety are below the County's minimum standard.

Response

Additional subsurface exploration and six laboratory shear tests of the Saugus Formation (TQs) bedrock was performed to substantiate the cross bedding shear strength. Representative samples of Saugus Formation (TQs) bedrock were obtained from two 24-inch diameter bucket-auger borings (B-3A and B-4A) for laboratory direct shear testing. The 24-inch diameter borings are located at the vicinity of Lots 136 and 97, respectively, and were drilled to a maximum depth of 55 feet on 11/20/18 by Alroy Drilling. The borings were sampled and logged by a Certified Engineering Geologist from this firm. The drill hole logs are presented in **Appendix A** and the locations of the drill holes are shown on the Geotechnical Map (**Plate II**).

A modified California-drive sampler (fitted with 2.42-inch inner diameter by 1-inch-tall brass rings) was used to obtain samples in the exploratory drill holes at various depths (see logs in **Appendix A**). Recovered ring samples were sealed in plastic containers to preserve the in-situ moisture and brought to our geotechnical laboratory for further classification and direct shear testing.

Direct shear testing (ASTM D3080) was performed on intact bedrock samples collected from Boring B-3A at a depth of 39 ft, and from Boring B-4A at depths of 10 ft, 14 ft, 17 ft, 27.5 ft, and 28 ft. Additional laboratory testing performed on the bedrock samples included the following: moisture content (ASTM D2216), dry density (ASTM D7263), Amount of Materials in Soils Finer than No. 200 Sieve (ASTM D1140), and Particle-Size Analysis of Soils (ASTM D422). The results of this testing are presented on the drill logs (**Appendix A**) or laboratory test reports within **Appendix B**.

The test data was used in conjunction with existing on-site shear test data to assess the shear strength parameters previously presented and used for slope stability analyses. The Direct Shear Test Reports presented in **Appendix B** illustrate obtained peak and residual shear stress

values in comparison to the design peak and residual shear strength parameters (i.e. the Mohr-Coulomb failure envelope) established for the prior report. Based on the direct shear test results the across-bedding shear strength parameters for bedrock presented in the previous report remain applicable. Therefore, revised slope stability analysis is not warranted.

The shear strength parameters used in the slope stability analysis for a hypothetical post-failure configuration were selected using professional judgement based on the source bedrock material classification, potential bulking during failure, and ultimately our experience with landslides and landslide mitigation in the vicinity of the project site. The selected values are considered conservative and appropriate for the evaluation method.

The shear strength for the terrace deposits has been corrected for the slope stability analysis performed on Cross Section 27-27'. The updated results of the analysis are provided in **Appendix C**. Based on the results, the previously recommended slope setback at this cross section location remains applicable.

Comment S2

The Soils Engineer showed that a slope graded at 2.4:1 (H:V) on cross section 18-18' will not meet the minimum required factors of safety; however, the proposed slope gradient of CS-11 was between 2:1 and 2.4:1. Verify and provide revised geotechnical map as necessary.

Response

The 5/8/18 VTTM slope contours at the location of Cross Section 18-18' indicate slope gradients of 2:1 (H:V) for the lower portion of the slope and 2.2:1 (H:V) for the upper portion of the slope. This orientation of the Cross Section 18-18' is parallel to the interpreted direction of the landslide movement which orientation is slightly skewed from perpendicular to the proposed slope contours. Therefore, Cross Section 18-18' illustrated a 2.18:1 (H:V) slope gradient based on the proposed slope contours.

Irrespective, the previous report recommended that the eastern portion of proposed Cut-slope CS-11 be re-designed to a 3:1 slope gradient. The eastern portion of Cut-slope CS-11 is designed as a 3:1 slope gradient on the 2/27/19 VTTM. Cross Sections 16-16', 17-17' and 18-18' have been revised to illustrate the 2/27/19 design. Cross Section 18-18' illustrates a 3:1 (H:V) fill slope.

Based on the results of the prior analysis, Cut-slope CS-11 complies with County minimum factor of safety requirements. However, the previous report recommendation that this slope

be constructed as a Stability Fill utilizing a 25 ft wide by 5 ft deep keyway to mitigate surficial stability of the landslide debris anticipated to be exposed in the slope face is still applicable.

Comment S3

Provide temporary slope stability analysis for the proposed backcut shown on cross section 1-1'. Recommend mitigation if factor of safety is below the County's minimum standard.

Response

The configuration of the backcut and keyway of the recommended toe berm buttress has been reconfigured as illustrated on Cross Section 1-1'. Slope stability analysis on the reconfigured toe berm buttress illustrated on Cross Section 1-1' indicates this slope satisfies the Los Angeles County minimum safety factor requirements (see Table C1 in Appendix C).

The new configuration of the toe berm buttress eliminates the requirement of a temporary backcut in the landslide debris and potentially undercutting the slide plane. Temporary slope stability analysis of a backcut is no longer applicable.

Comment S4

Provide chemical test results (sulfate, chloride, resistivity, etc.) for the on-site soils to address the presence of chemicals deleterious to construction materials and utility lines. The chemical tests must be in accordance with California Test Methods, Department of Transportation, or equivalent (aqueous solution tests, such as EPA Tests or similar methods are not acceptable for determination of resistivity). Resistivity tests must be performed on soils in a saturated condition. Recommend mitigation as necessary.

Response

Results of corrosivity testing (soluble sulfate content, chloride content, and resistivity & pH) of on-site soils was provided in the referenced report. The tests were conducted in accordance with applicable California Test Methods on a mixture of bulk soil samples collected from Trenches T-5A and T-17A. The test results indicated that the tested samples did not classify as being corrosive to concrete or buried metal based on criteria presented in the current GMED Manual for Preparation of Geotechnical Reports, dated December 2014. However, standard precautionary measures were recommended to mitigate a less significant corrosion potential. It was also recommended that additional testing be conducted at the completion of grading operations to either confirm or revise the precautionary recommendations.

Comment S5

Show all revised, recommended mitigation measures on the geotechnical map as necessary.

Response

All of the recommended mitigation measures, where appropriate, have been shown on the attached Geotechnical Map (Plate II).

PART II

GEOLOGIC AND GEOTECHNICAL REPORT

Review of Vesting Tentative Tract Map, dated February 27, 2019

Our Geologic and Geotechnical Report dated June 8, 2018 (see ref. 5) addressed the Vesting Tentative Tract Map dated May 8, 2018, prepared by Sikand Engineering. Our response to Geologic and Soils Engineering Review Sheet comments issued by the Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division, is presented in the first part of this report. This portion of the report addresses revisions to the proposed development that are shown on the Vesting Tentative Tract Map dated February 27, 2019 (prepared by Sikand Engineering) from a geologic and geotechnical standpoint.

1.0 PROPOSED DEVELOPMENT

The 2/27/19 Vesting Tentative Tract Map (VTTM) 60257 reduces the number of residential lots from 231 to 222. The number of debris basin lots has been reduced from 7 to 6. The commercial lot, 3 infiltration basin lots, and the pump station lot have remained the same as the 5/8/18 VTTM. The open space lots have been increased from 3 to 5. In addition, 3 access road lots, 6 HOA lots, and 2 park site lots have been added. The general layout of the residential lots is the same as the 5/8/19 design with minor changes to the lot lines. The residential lots between proposed Sterling Parkway and Del Valle Road and north of the infiltration basin (Lot 240 on the 5/8/19 VTTM) have been replaced with a 3.4-acre park site.

The majority of lot numbers on the 2/27/19 VTTM have changed from the 5/8/18 VTTM. The table below presents the 5/8/18 VTTM lot numbers and the equivalent 2/27/19 VTTM lot numbers for select lots that are relevant to specific discussion in the June 8, 2018 Geologic and Geotechnical Report.

Discussion Points in 6/8/18 Report Specific to Lot Numbers	Lot Number	
	5/8/18 VTTM	2/27/19 VTTM
Highest 2:1 Fill slope	Vicinity of 140	Vicinity of 131
Maximum depth of cut	Vicinity of 223	Vicinity of 215
Maximum depth of fill	135	127
Landslide Qls-3	245	238
Landslide Qls-4 & Qls-5	185	176
Natural Slope NS-2	142, 144, 145 & 152	134, 136, 137 & 144
Debris Flow Hazard	10	10
Debris Flow Hazard	18 thru 22	18 thru 22
Debris Flow Hazard	35	35
Debris Flow Hazard	234 (Debris Basin)	227 (Debris Basin)
Debris Flow Hazard	235 (Debris Basin)	228 (Debris Basin)
Debris Flow Hazard	236 (Debris Basin)	eliminated

The 2/27/19 VTTM proposed elevations of the residential pads have minor grade changes of plus or minus 1 ft versus the 5/8/19 VTTM. A canyon fill with a 3:1 gradient fill slope is proposed between Cut-slopes CS-7 and CS-9, which is the maximum proposed fill slope height of 115 ft. The eastern portion of Cut-slope CS-11 is designed at a 3:1 slope gradient. The 2/27/19 VTTM is at a scale of 1-inch equals 100 ft.

2.0 SCOPE OF WORK

Our scope of work included the following tasks:

1. Coordination with the client and the supervising civil engineer regarding the grading concept.
2. Review of the 1-inch equals 100 ft Vesting Tentative Tract Map 60257 prepared by Sikand Engineering, dated 2/27/19.
3. Site reconnaissance and mapping of existing rock exposures.
4. Coordination with Underground Service Alert prior to our subsurface investigation.
5. Excavation, sampling, and logging of two 24-inch diameter bucket-auger borings to a maximum depth of 55 ft.
6. Laboratory testing of selected samples obtained from the borings to help define the engineering characteristics of the bedrock underlying the site.
7. Preparation of a Geotechnical Map (Plate II) using the 2/27/19 Vesting Tentative Tract Map as the base map. We make no representation regarding the accuracy of this base map.
8. Revisions to Cross Sections 1-1', 7-7', 12-12', 16-16, 17-17', 18-18' and 26-26' illustrating existing and proposed grades relative to the underlying geologic conditions.
9. Preparation of the attached drill hole logs, laboratory test results and this report.

3.0 FIELD EXPLORATION, SAMPLING, AND LABORATORY TESTING

3.1 SUBSURFACE EXPLORATIONS

Our subsurface investigation consisted of the excavation, logging and sampling of two 24-inch diameter bucket-auger borings to a maximum depth of 55 ft. The bucket-auger borings were excavated by Alroy Drilling. The bucket-auger borings were logged and sampled by a Certified Engineering Geologist from this firm. The drill hole logs are presented in **Appendix A**. The locations of the drill holes are shown on the Geotechnical Map (**Plate II**).

The drill hole logs included in **Appendix A** represent our interpretation of field data prepared for each boring by our geologic/engineering staff at the time of drilling, along with refinements based on observations and laboratory test results. The distribution and engineering characteristics of materials in adjacent areas may vary from those observed in the explorations.

3.2 SAMPLING PROCEDURES

A modified California-drive sampler (fitted with 2.42-inch inner diameter by 1-inch-tall brass rings) was used to obtain samples in the exploratory drill holes at various depths (see logs in **Appendix A**). Blow counts to drive the sampler were recorded in 6-inch intervals during soil sampling. The blow count values shown on the drill hole logs represent the 12-inch blow count (or fraction of) following an initial 6-inch seating interval. The blow counts are raw values and have not been corrected to account for sampler size/type, overburden pressure, hammer type and efficiency, or rod length. Recovered ring samples were sealed in plastic containers to preserve the in-situ moisture and brought to our geotechnical laboratory for further classification and testing.

Bulk soil samples were obtained from cuttings generated during the excavation of the trenches and drill holes. Materials in these bulk samples represent a mixture of soils within the noted depth range.

3.3 LABORATORY TESTING

Soils encountered in the drill holes were visually classified in the field using visual-manual procedures in accordance with applicable portions of the Unified Soil Classification System (ASTM D2488). Recovered soil samples were brought to our geotechnical laboratory, the visual soil classifications were checked, and the drill hole logs were reviewed in order to select soil samples for testing. The laboratory testing program performed on the on-site soils to evaluate engineering characteristics pertinent to the proposed improvements included the following tests: moisture content (ASTM D2216), dry density (ASTM D7263), Amount of Materials in Soils Finer than No. 200 Sieve (ASTM D1140), Particle-Size Analysis of Soils (ASTM D422), and Direct Shear (ASTM D3080).

The results of the field investigation and the laboratory tests were used as the basis for our analyses and recommendations presented in this report. Laboratory test results are discussed in the applicable sections of this report with graphical results presented in **Appendix B**.

5.0 REVISIONS TO THE TENTATIVE TRACT MAP

Based on our review of the Vesting Tentative Tract Map February 27, 2019, specific revisions to the proposed grading that are pertinent to geology and soils engineering are discussed below.

5.1 PROPOSED FILL SLOPES

A 115 ft high 3:1 gradient (h:v) fill slope is proposed between Cut-slopes CS-7, CS-8 and CS-9. Slope stability analyses performed on a schematic 3:1 fill slope indicates that the internal stability of this proposed fill slope satisfies the Los Angeles County factor of safety requirements for slope stability under static and pseudostatic loading conditions.

5.2 PROPOSED CUT-SLOPES

5.2.1 Cut-slope CS-8

Cut-slope CS-8 has been revised to include a 25-ft wide bench. Cross section 12-12' illustrates the geologic structure and proposed grades for this cut-slope. The toe of the slope is at the same location and the overall height of the slope is 5 ft lower than the previous design evaluated within our 6/8/18 report. Slope stability evaluation of the 5/8/19 VTTM design indicated that Cut-slope CS-8 satisfies the Los Angeles County factor of safety requirements for slope stability under static and pseudostatic loading conditions. This revised design of Cut-slope CS-8 is considered less critical than the previously evaluated design and is anticipated to meet the factor of safety requirement for slope stability.

5.2.2 Cut-slope CS-11

The eastern portion of Cut-slope CS-11 has been revised to a 45 ft high 3:1 (h:v) gradient cut-slope. Cross sections 16-16', 17-17' and 18-18' illustrate the geologic structure and proposed grades for this cut-slope. Cut-slope CS-11 was addressed in the first part of this report. Slope stability evaluation of Cut-slope CS-11 at a 3:1 gradient slope was presented in the previous report indicated that Cut-slope CS-11 satisfies the Los Angeles County factor of safety requirements for slope stability under static and pseudostatic loading conditions.

5.3 NATURAL SLOPES

A 24-inch diameter bucket-auger boring (B-3A) was drilled on Lot 136, which is in the vicinity of natural slope NS-2. Based on the observations in the boring, the terrace deposits / Saugus Formation bedrock contact was revised on Cross Section 26-26'. In addition, the proposed elevation for Lot 136 is 1,332.2, which is 2.2 ft higher than the 5/8/18 VTTM design. The proposed elevation of flat area on Lot 240 south of Lot 136 on 2/27/19 VTTM is the same as the 5/8/18 VTTM. The revised contact for the terrace deposits and the minor

change in the pad elevations do not impact the slope stability analyses previously used to determine the recommended RUA at the top of the descending natural slope. The recommendations and conclusions in the previous report remain applicable.

5.4 LANDSLIDE QLS-3

The proposed lot lines have been adjusted so that Landslide Qls-3 is completely contained within Open Space Lot 238. In addition, the debris basin has been increased in size to account for the potential reduction in the debris cone based on the post-failure geometry as discussed in the first part of this report.

5.5 DEBRIS FLOW HAZARDS

5.5.1 Lot 20

The proposed elevation for Lot 20 is 1,325.2, which is 1 ft lower than the 5/8/18 VTTM design. A debris conveyance channel is illustrated along the toe of the natural slope located west of Lots 18 through 20. The intent of this channel is to direct debris material to the debris basin (Lot 245) located east of Lot 10 and provides for mitigation for potential impact from debris flow by providing an up-slope from the channel bottom up to the proposed pad. Calculated debris volume from the mapped debris flow source areas located directly adjacent to Lot 20 (see Geotechnical Map) where potential impact could occur is 35 cubic yards. At the location of potential impact from debris flow adjacent to Lot 20, the up-slope height ranges from 1.5 to 5.0 feet with an average of about 3.0 feet. Due to insufficient height of this upslope on Lot 20 an impact wall with a minimum freeboard height of 4.0 feet is recommended at the top of the slope to mitigate the debris flow hazard from the west to Lot 20 (see Geotechnical Map). Based on volume calculations it is determined that the impact wall will provide a containment volume of at least 45 cubic yards, which is greater than the calculated debris volume (35 cubic yards) from the mapped source area.

5.5.2 Lot 35

Fill is proposed in the natural area located north of Lot 35 which eliminates the potential debris flow hazard from the ascending natural slopes.

7.0 GEOLOGIST AND GEOTECHNICAL ENGINEER OF RECORD

This report has been prepared assuming that all required geologic and geotechnical field inspections and observations will be performed by Allan E. Seward Engineering Geology, Inc. If these tasks are performed by another party, that party must review this report, assume full responsibility for the recommendations contained herein, and assume the title of responsibility of "Geologist/Geotechnical Engineer of Record" for the specific work.

A representative of the Geologist/Geotechnical Engineer of Record shall be present to observe all grading operations. A report that presents the results of these observations and related testing shall be issued at the end of grading operations using an As-Built Map as a base. All footing excavations shall be observed by a representative of the Geologist/Geotechnical Engineer of Record prior to placing steel or casting concrete in the excavations.

8.0 LIMITATIONS

This report has been prepared for the exclusive use of Sterling Gateway, L.P. and its design consultants for the specific site discussed herein. This report should not be considered transferable. Prior to use by others, we should be notified, as additional work may be required to update this report.

In the event that any modifications in the design or location of the proposed development, as discussed herein, are planned, the conclusions and recommendations contained in this report will require a written review by this firm with respect to the planned modifications.

The proposed development is located in southern California, a geologically and tectonically active region, where large magnitude, potentially destructive earthquakes are common. Therefore, ground motions from moderate or large magnitude earthquakes could affect the site during the life of the proposed structure(s).

Typically, faulting is confined to the area adjacent to a known fault. However, absolute assurance against future fault displacement is not possible in tectonically active regions because new faults can form over time as the orientation and magnitude of deformational forces change in the earth's crust. Therefore, the location and magnitude of new ground surface ruptures during a seismic event cannot be anticipated.

In performing these professional services, this firm has used the degree of care and skill ordinarily exercised under similar circumstances by reputable geologists and geotechnical engineers practicing in this or similar localities. The data presented in this report are based on the results of pertinent field and laboratory testing. It should be recognized that subsurface conditions can vary in time, and laterally, and with depth at a given site and that the conclusions and recommendations presented in this report are based on our observations and testing.

Therefore, our **conclusions** and **recommendations** are **professional opinions** and are **not meant** to be a control of nature. We make no other **warranty**, either **expressed** or **implied**.

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This opportunity to be of service is appreciated. Please contact us if you would like to discuss this report further.

Respectfully submitted,

Eric J. Seward, CEG 2110
Principal Engineering Geologist
Vice President

Kevin P. Callahan, MS, GE 2989
Geotechnical Engineer

The following attachments and appendices complete this report.

References
Geologic and Soils Engineering Review Sheet dated 10/17/2018

APPENDIX A – Subsurface Logs
Bucket-Auger Boring Logs (B-3A and B-4A) & Key to Symbols

APPENDIX B – Laboratory Test Results

APPENDIX C – Slope Stability Analysis
- Slope Stability Analysis Results **Table C1**
- Gross Slope Stability Analyses Computer Output
  - Slope Stability Diagrams and Data Sheets for Run No. 1 through 7

APPENDIX D – Maps and Cross Sections
- Cross Sections 1-1, 7-7', 12-12', 16-16', 17-17', 18-18', and 26-26'
- Landslide Qls-3 / Basin Volume Evaluation Figure 1
- Geotechnical Map **Plate II**

Distribution:

Sterling Gateway, L.P. (1 hard copy and electronic in PDF format)
Attn: Mr. Hunt Williams

Sikand Engineering (PDF format)
Attn: Mr. Doug Farmer

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division (PDF format via EpicLA)

REFERENCES

By: Allan E. Seward Engineering Geology, Inc.

(1) **Geologic Feasibility Report**
Tentative Tract _____
Castaic, California
Dated July 12, 1991 – JN: 91-1245-1

(2) **Geologic and Geotechnical Report**
Review of Rough Grading Plan for Parcel Map 60030 (Dated 6/6/2012)
Rough Grading Plan
Parcel Map 60030
Castaic, County of Los Angeles, California
Dated September 28, 2012 – JN: 12-1132-5

(3) **Geologic and Geotechnical Report**
Review of Vesting Tentative Tract Map, dated 8/18/2015
Vesting Tentative Tract Map 60665
Hasley Canyon Area
Castaic, County of Los Angeles, California
Dated February 9, 2016 - JN: 16-1257C-4

(4) **Geotechnical Report**
Results of Preliminary Infiltration Testing
Vesting Tentative Tract Map No. 60257
Green Valley Ranch
Val Verde, County of Los Angeles, California
Dated May 9, 2018 - JN: 18-1245A-4

(5) **Geologic and Geotechnical Report**
Review of Vesting Tentative Tract Map 60257 (Dated May 8, 2018)
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated June 8, 2018 – JN: 18-1245A-4

PCA GMTR/A867
EPICLA ESTU2018000207
Telephone: (626) 458-4925

County of Los Angeles Department of Public Works
Geotechnical and Materials Engineering Division
GEOLOGIC AND SOILS ENGINEERING REVIEW SHEET
900 S. Fremont Avenue, Alhambra, CA 91803

Tentative Tract Map	60257	**Tentative Map Dated**	5/8/18 (Map/Exhibit)	**Parent Tract**	
Grading By Subdivider? [Y] (Y or N)	1.5 M yd³	**Location**	Val Verde	**APN**	
Geologist	A.E. Seward Engineering Geology, Inc.	**Subdivider**	Sterling Gateway LP		
Soils Engineer	A.E. Seward Engineering Geology, Inc.	**Engineer/Arch.**	Sikand Engineering		

Review of:
Geologic Report(s) Dated:
Soils Engineering Report(s) Dated:
Geotechnical Report(s) Dated: **6/8/18**
References:

TENTATIVE MAP FEASIBILITY IS NOT RECOMMENDED FOR APPROVAL. PRIOR TO RECOMMENDING APPROVAL OF THE TENTATIVE TRACT OR PARCEL MAP:

G1. The toe of landslide Qls-3 is showing crossing a proposed lot boundary. Adjust lot lines to constrain the landslide on one lot or provide remediation of the landslide. The landslide hazard may not be subdivided. If complete removal is proposed, depict the proposed final topography in the area of landslide removal.

G2. The toe of landslide Qls-3 is shown encroaching into the debris cone of a proposed debris basin. Determine that the landslide is stable, recommend mitigation, or increase the basin capacity by an equivalent volume.

S1. Provide data to substantiate the shear strengths used in the slope stability analyses for the bedrock (cross bedding), post-failure mass, and terrace deposits (see slope stability analyses for cross section 27-27'). Provide revised slope stability analyses and recommend mitigation measures if factors of safety are below the County's minimum standards.

S2. The Soils Engineer showed that a slope graded at 2.4:1 (H:V) on cross section 18-18' will not meet the minimum required factors of safety; however, the proposed slope gradient of CS-11 was between 2:1 and 2.4:1. Verify and provide revised geotechnical map as necessary.

S3. Provide temporary slope stability analysis for the proposed backcut shown on cross section 1-1'. Recommend mitigation if factor of safety is below the County's minimum standard.

S4. Provide chemical test results (sulfate, chloride, resistivity, etc.) for the on-site soils to address the presence of chemicals deleterious to construction materials and utility lines. The chemical tests must be in accordance with California Test Methods, Department of Transportation, or equivalent (aqueous solution tests, such as EPA Tests or similar methods are not acceptable for determination of resistivity). Resistivity tests must be performed on soils in a saturated condition. Recommend mitigation as necessary.

S5. Show all revised, recommended mitigation measures on the geotechnical map as necessary.

NOTE: Provide a copy of this review sheet with your resubmittal.

NOTE(S) TO THE PLAN CHECKER/BUILDING AND SAFETY DISTRICT ENGINEER:
OFFSITE GRADING IS PROPOSED.

Prepared by

REGISTERED PROFESSIONAL ENGINEER
JEREMY CHUN YIN WAN
No. GE 2849
GEOTECHNICAL
STATE OF CALIFORNIA

Jeremy Wan
Soils Section

PROFESSIONAL GEOLOGIST
Geir R. Mathisen
No. 2376
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Geir Mathisen
Geology Section

Date 10/17/18

Please complete a Customer Service Survey at http://dpw.lacounty.gov/go/gmedsurvey
NOTICE: Public safety, relative to geotechnical subsurface exploration, shall be provided in accordance with current codes for excavations, inclusive of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.

Appendix A

CLIENT: Sterling Gateway, L.P.	JOB NO.: 19-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: April 3, 2019		
	LOGGED BY: VCG		
DRILLING COMPANY: Alroy Drilling	DRILLED: 11/20/18		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-3A	
DRIVING WEIGHTS: 0-24'=2400 lbs, 24-44'=1500 lbs, 44-60'=850 lbs	ELEVATION: 1,353'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
			Qsw			**SLOPEWASH; Qsw (0 - 5')** @ 0' Medium to dark brown silty clayey sand with pebbles; loose; damp; voids; roots to 3'	
5		4 5	Qt	120 / 10.8		**TERRACE DEPOSITS; Qt (5 - 23')** @ 6' Grades to medium brown silty sand with pebbles; loose; damp	
10		2 3		113 / 7.4		@ 9' - light to medium brown @ 10' - interbedded sands with pebbles; dense	@ 10' interbeds horizontal to sub horizontal
15						@ 16' - clayey silt interbeds	
20		15 15/2.5"		128 / 1.6		@ 20' Bedrock clasts consisting of sandstone; 6" maximum dimension in clayey sand matrix; contact with underlying TQs irregular dipping northerly	
25				B: N83E, 39SE		**BEDROCK; TQs (23 - 55')** @ 23' Light yellowish- to pale-brown silty sandstone; dense; damp @ 25' Medium to light reddish brown clayey sandy siltstone @ 26' Tan sandstone interbed; 1 ft thick	
30		45/5"	TQs	B: N80E, 41SE			@ 30' no sample recovery
35		45/4"					@ 35' no sample recovery

CLIENT: Sterling Gateway, L.P.	JOB NO.: 19-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: April 3, 2019		
	LOGGED BY: VCG		
DRILLING COMPANY: Alroy Drilling	DRILLED: 11/20/18		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-3A	
DRIVING WEIGHTS: 0-24'=2400 lbs, 24-44'=1500 lbs, 44-60'=850 lbs	ELEVATION: 1,353'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
				B: N87E, 36SE		@ 37' Grades to silty sandstone with isolated pebbles; mottled	
40	■	35/6"		124 / 6.6	SM		% fines = 36 Shear Test
				Apx B: N87W, 39-43SW		@ 42' Grades to reddish-brown clayey silty sandstone/clayey sandy siltstone with isolated pebbles	
45	■	50/4"		121 / 7.8			
	⊠	50/4"		B: N83E, 43SE		@ 47' Grades to gray sandstone and silty sandstone with isolated pebbles	@ 48' sample disturbed
50				B: N82E, 37SE		@ 50' Grades to reddish brown sandy siltstone	
55						TOTAL DEPTH 55' (Elev. 1,298') No Ground water No Caving	
60							
65							
70							

CLIENT: Sterling Gateway, L.P.	JOB NO.: 19-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: April 3, 2019		
	LOGGED BY: VCG		
DRILLING COMPANY: Alroy Drilling	DRILLED: 11/20/18		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-4A	
DRIVING WEIGHTS: 0-24'=2400 lbs, 24-44'=1500 lbs, 44-60'=850 lbs	ELEVATION: 1,251'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
			Qsw			**SLOPEWASH; Qsw (0 - 7.5')** @ 0' Medium to light reddish brown silty sand with pebbles; loose; damp; roots and voids to 6'	
5		2 3		120 / 7.0			
				B: N85W, 32SW		**BEDROCK; TQs (7.5 - 35')** @ 7.5' Pale yellowish brown sandstone and pebbly sandstone; dense; damp; bedded and cross bedded laminations some pebble lines; minor rust color staining	
10		10 6/2"		126 / 5.2 Apx B: N88W, 33SW	SM	@ 10.5' Reddish brown silty sandstone/sandy siltstone with clay	Bulk sample @ 10 - 15' % fines = 27 Shear Test
			TQs				
15		12 16/1"		124 / 8.6	CL-ML	@ 15' Grades to gray sandstone and pale yellowish brown silty sandstone to sandy siltstone	% fines = 66 Shear Test
		11 16/1"		125 / 8.6 Apx B: N69E, 33SE	CL-ML	@ 18' Reddish brown silty sandstone/sandy siltstone with clay; grades to	% fines = 56 Shear Test @ 18' Difficult drilling
20						@ 20.5' Pale yellowish to light rusty brown sandstone and pebbly sandstone	
25		40					@ 25' sample disturbed
		30/5" 27/5"		115 / 5.9 B: N70W, 34SW 113 / 6.9 B: N85E, 33SE	SM SM	@ 29 - 35' massive (structureless)	% fines = 27 Shear Test % fines = 34 Shear Test
30							
		39/4"					@ 32' no sample recovery
35						TOTAL DEPTH 35' (Elev. 1,216') No Ground water, No Caving	

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE SIZE)	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	Well-graded gravels, gravel-sand mixtures, little or no fines
				GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	Silty gravels, gravel-sand-silt mixtures
				GC	Clayey gravels, gravel-sand-clay mixtures
	SAND AND SANDY SOILS (MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE SIZE)	CLEAN SANDS (LITTLE OR NO FINES)		SW	Well-graded sands, gravelly sands, little or no fines
				SP	Poorly-graded sands, gravelly sands, little or no fines
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	Silty sands, sand-silt mixtures
				SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE)	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	Inorganic silts and very fine sands, clayey silts with slight plasticity
				CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
				OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	Inorganic silts, micaceous or diatomaceous fine, sandy or silty soils, elastic silts
				CH	Inorganic clays of high plasticity, fat clays
				OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS				PT	Peat and other highly organic soils

Notes:
(1) Dual USCS symbols, such as SP-SM, denote 5 to 12% of minor constituent.
(2) Dual USCS symbols, such as SM/ML, denote borderline soil classifications.
(3) Subsurface information from boring and test pit logs depict conditions only at the specific locations. and dates indicated. Soil conditions and water levels at other locations may differ from conditions at these locations. Also, the conditions at these locations may change with time.
(4) Blow counts on logs are the number of blows to drive the sampler with the weight and drop height indicated on each log.
(5) These logs are subject to the limitations, conclusions, and recommendations in this report.

HS: Hollow-stem-auger boring
RW: Rotary-wash boring
B: Bucket-auger boring

SAMPLE TYPE

STANDARD PENETRATION TEST
Split-barrel sampler in accordance with ASTM D-1586 Test Method

CALIFORNIA DRIVE
Split-barrel sampler in accordance with ASTM D-3550 Test Method

DISTURBED CALIFORNIA DRIVE

SHELBY TUBE
Thin-walled sampler in accordance with ASTM D-1587 Test Method

BULK SAMPLE

NO RECOVERY

GROUND WATER DATA

GROUND WATER WHILE DRILLING

GROUND WATER AFTER DRILLING

DENSITY OF GRANULAR SOILS	
DESCRIPTION	SPT BLOWS PER FOOT
Very Loose	< 4
Loose	4 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	> 50

STRENGTH OF COHESIVE SOILS	
CONSISTENCY	SPT BLOWS PER FOOT
Very Soft	< 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	> 30

SPLIT-BARREL SAMPLER DRIVING RECORD	
BLOW COUNT	DESCRIPTION
25	25 blows drove the sampler 6 inches
50/3"	50 blows drove the sampler 3 inches

LABORATORY TESTING ABBREVIATIONS			
Plasticity Index	PI	Compaction Curve	Curve=A
Liquid Limit	LL	Consolidation / Collapse	Consol
Hydrometer	%-5 micron	Direct Shear / Reshear / Remold	Shear Test
Expansion Index	EI		
Corrosivity Analysis	Cor		

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

USCS Soil Classification and Key to Boring Log Symbols

Appendix B

APPENDIX B

GEOTECHNICAL LABORATORY INVESTIGATION

1. General

   a. The laboratory investigation used current, accepted test procedures of the American Society of Testing and Materials (ASTM).

   b. Bulk samples and ring samples were obtained during the investigation. Laboratory sample identification is by project name and number, boring number, and sample depth.

2. Index Parameters Tests

   The following Index Parameters tests were performed on soil and bedrock materials collected during grading operations.

Test Type	Number of Tests	Testing Standard
In-situ Moisture Content	13	ASTM D2216
In-Situ Dry Density	13	ASTM D7263
Percent-Finer Than #200 Sieve	6	ASTM D1140
Particle-Size Analysis of Soils	6	ASTM D6913

   The purpose of each test is briefly described below:

   a. In-Situ Moisture Content (ASTM D2216) and Dry Density (ASTM D7263) testing of soils provide an indication of the strength and compressibility of in-situ soils. These data, in conjunction with sampler blow count data, aid in evaluation of soil consistency and in selection of samples for additional laboratory testing. Results of Moisture Content and Dry Density testing are recorded on the Drill Hole Logs within **Appendix A**.

   b. Percent Finer than #200 Sieve (ASTM D1140) testing was performed on soil samples to aid in classification of the samples in accordance with the Unified Soil Classification System (USCS). Results of Percent Finer than #200 Sieve testing are recorded on the Drill Hole Logs within **Appendix A** and on applicable laboratory test reports in this Appendix.

   c. Mechanical particle-size analyses of soil fractions larger than 75 microns (No. 200 sieve) were conducted to aid in classification of soils in accordance with the Unified Soil Classification System (USCS). Results of the particle size analyses are presented on **Figures B1.1** and **B1.2** in this Appendix.

APPENDIX B

3. Geotechnical Engineering Parameters Tests

The following Geotechnical Engineering Parameter tests were performed on ring samples of soil collected during the investigation.

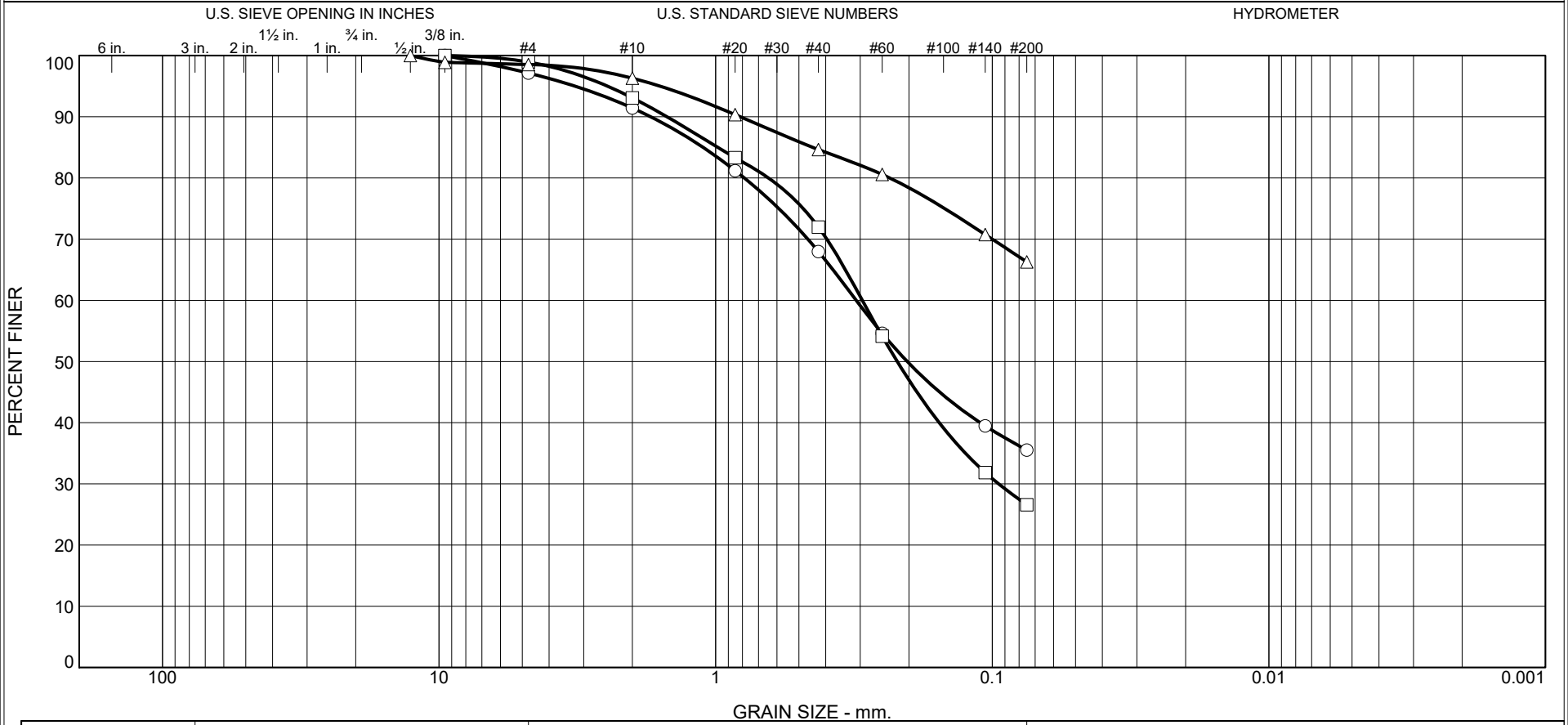
TEST TYPE	NUMBER OF TESTS	TESTING STANDARD
Direct Shear	6	ASTM D3080

Direct Shear (ASTM D3080) testing was performed on California drive ring samples of bedrock using a displacement-controlled Direct Shear machine. Prior to shearing, the samples were inundated and consolidated under normal pressures ranging from 1,800 psf to 7,500 psf. Thereafter, the samples were sheared horizontally at a controlled displacement rate until the horizontal shear force reduced to a stable value. Results of the Direct Shear testing, including interpreted peak strength and residual shear strength parameters, are presented on **Figures B2.1** to **B2.6** within this Appendix.

The following attachments complete this Appendix.

- Particle Size Distribution Test Reports Figures B1.1 & B1.2
- Direct Shear Test Reports Figures B2.1 to B2.6

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	2.9	5.7	23.4	32.5	35.5	
□	0.0	0.0	1.0	5.9	21.1	45.4	26.6	
△	0.0	0.0	1.5	2.2	11.7	18.3	66.3	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	B-3A		39'	11/20/18	SM	Silty, clayey, fine- to medium-grained sandstone			
□	B-4A		10'	11/20/18	SM	Silty, fine- to medium-grained sandstone			
△	B-4A		14'	11/20/18	CL-ML	Reddish-brown mudstone			

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.1

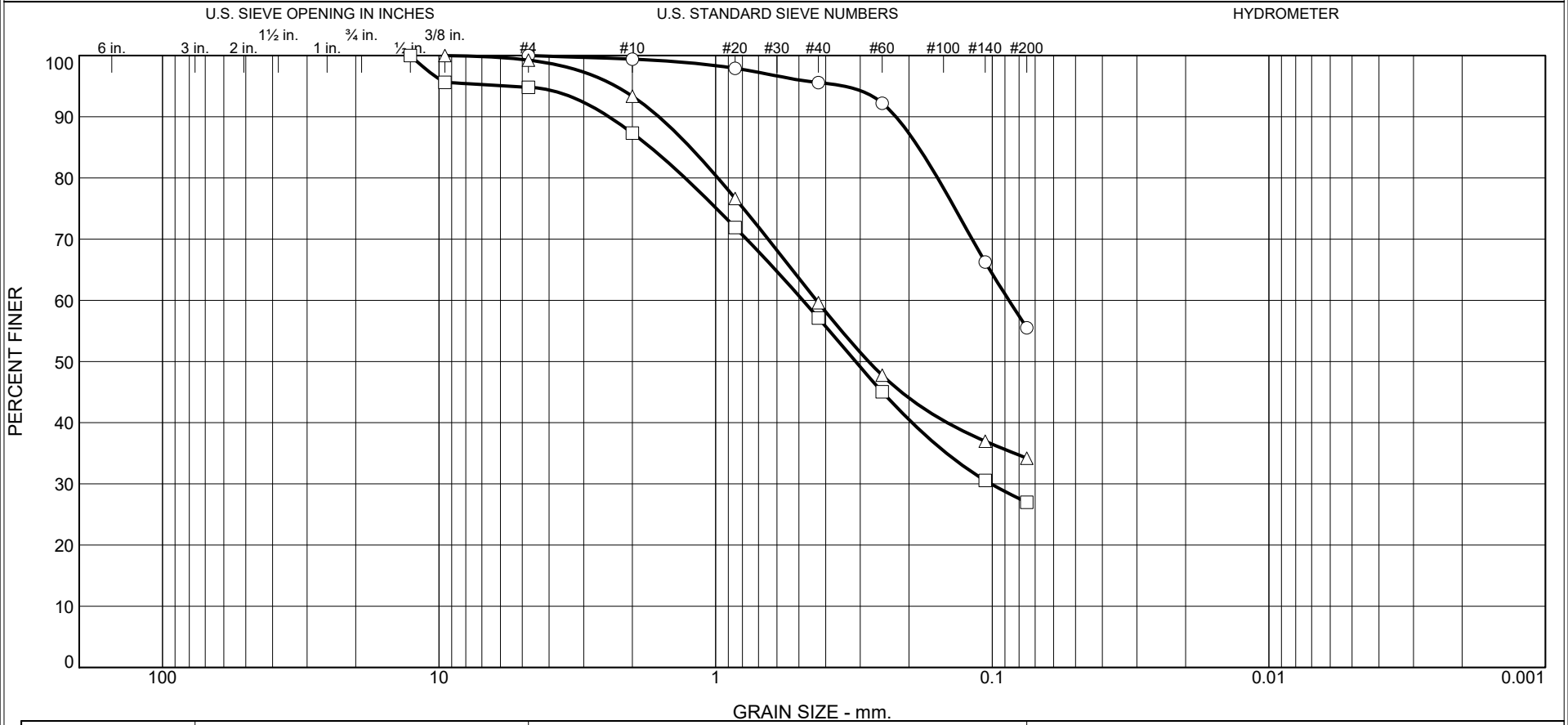
ALLAN E. SEWARD

ENGINEERING GEOLOGY, INC.

Valencia, California

○ Bedrock (TQs)
□ Bedrock (TQs)
△ Bedrock (TQs)

Particle Size Distribution Test Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.6	3.8	40.1	55.5	
□	0.0	0.0	5.2	7.5	30.2	30.1	27.0	
△	0.0	0.0	0.7	5.9	33.8	25.4	34.2	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	B-4A		17'	11/20/18	CL-ML	Sandy siltstone			
□	B-4A		27.5'	11/20/18	SM	Silty, fine- to medium-grained sandstone			
△	B-4A		28'	11/20/18	SM	Silty, fine- to medium-grained sandstone			

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 18-1245A-4 Figure B1.2

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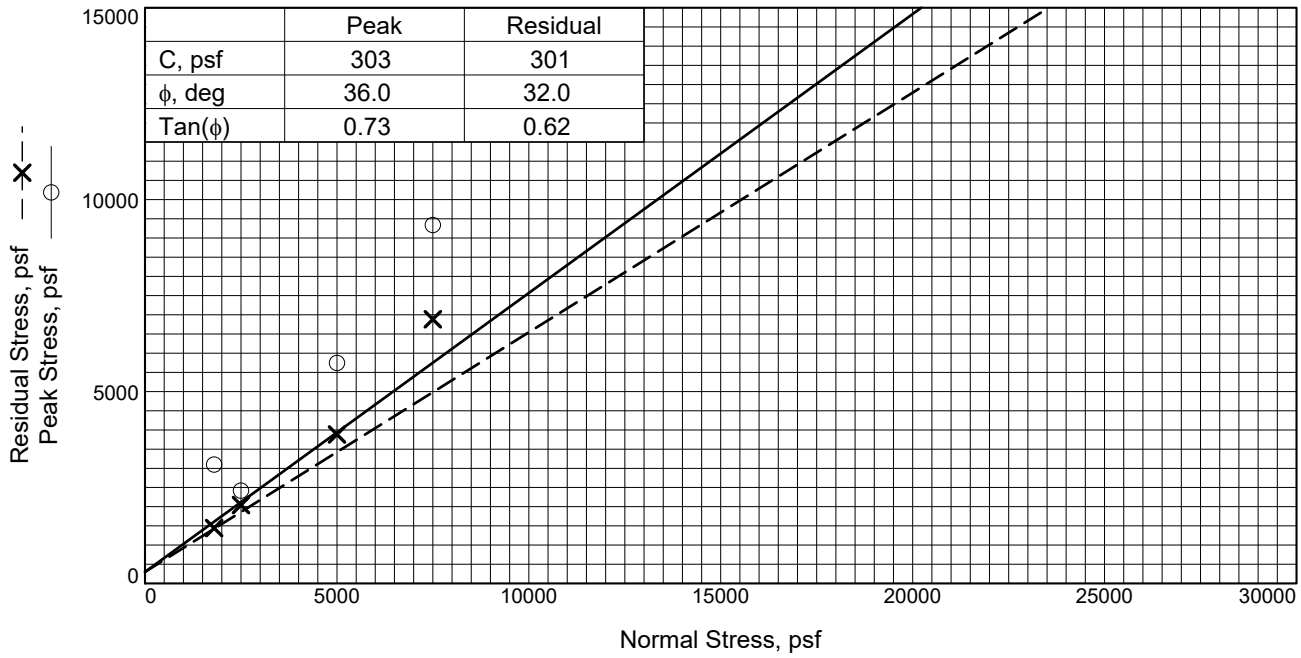
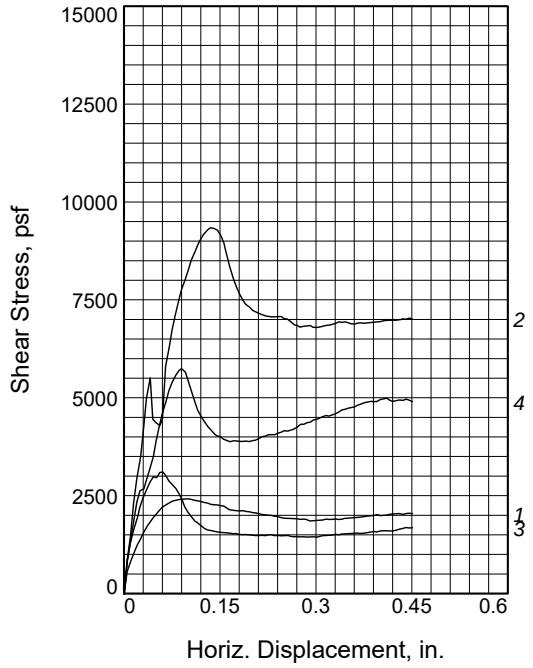
○ Bedrock (TQs)
□ Bedrock (TQs)
△ Bedrock (TQs)





Sample No.		1	2	3	4
Initial	Water Content, %	7.6	6.4	6.7	6.3
	Dry Density, pcf	119.4	133.3	127.7	128.0
	Saturation, %	52.2	70.2	60.4	57.0
	Void Ratio	0.3857	0.2410	0.2952	0.2924
	Diameter, in.	2.42	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00	1.00
At Test	Water Content, %	13.4	8.0	10.2	9.9
	Dry Density, pcf	122.1	136.5	130.2	131.1
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.3553	0.2121	0.2708	0.2619
	Diameter, in.	2.42	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.98	0.98
Normal Stress, psf		2500	7500	1800	5000
Peak Stress, psf		2419	9339	3100	5744
Displacement, in.		0.10	0.14	0.06	0.09
Residual Stress, psf		2043	6885	1445	3880
Displacement, in.		0.45	0.36	0.28	0.20
Strain rate, %/min.		0.01	0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Silty, clayey, fine- to medium-grained sandstone

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 35.5

Figure B2.1

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-3A **Depth:** 39'

Proj. No.: 18-1245A-4 **Date Sampled:** 11/20/18

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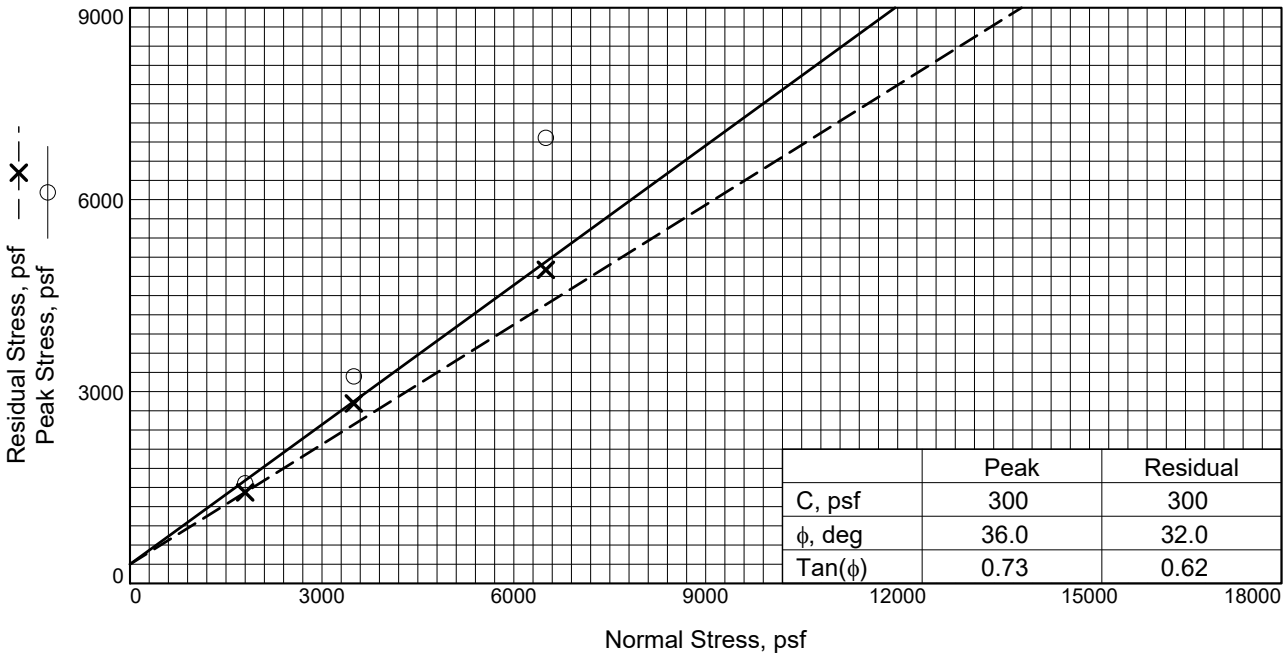

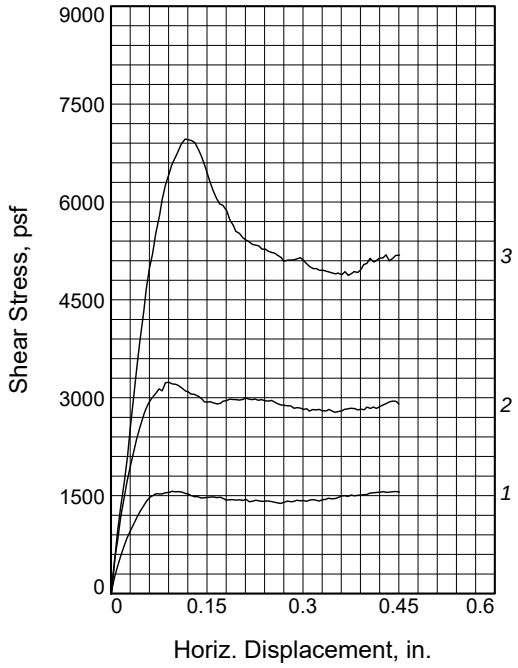

Sample No.		1	2	3
Initial	Water Content, %	5.4	5.0	6.9
	Dry Density, pcf	111.2	116.7	120.8
	Saturation, %	29.4	32.0	49.7
	Void Ratio	0.4878	0.4178	0.3695
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	17.2	14.6	12.4
	Dry Density, pcf	113.7	119.3	124.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4554	0.3867	0.3280
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.97
Normal Stress, psf		1800	3500	6500
Peak Stress, psf		1566	3238	6966
Displacement, in.		0.10	0.09	0.12
Residual Stress, psf		1425	2814	4904
Displacement, in.		0.30	0.39	0.38
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Silty, fine- to medium-grained sandstone

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 26.6

Figure B2.2

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-4A **Depth:** 10'

Proj. No.: 18-1245A-4 **Date Sampled:** 11/20/18

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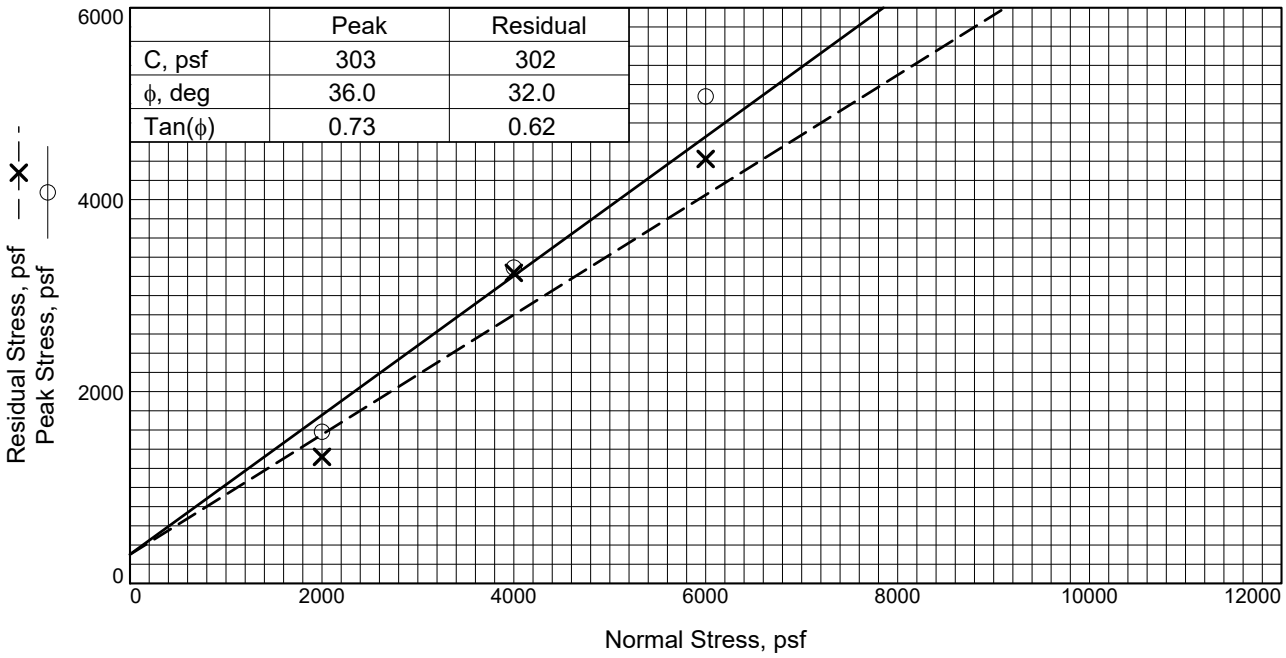

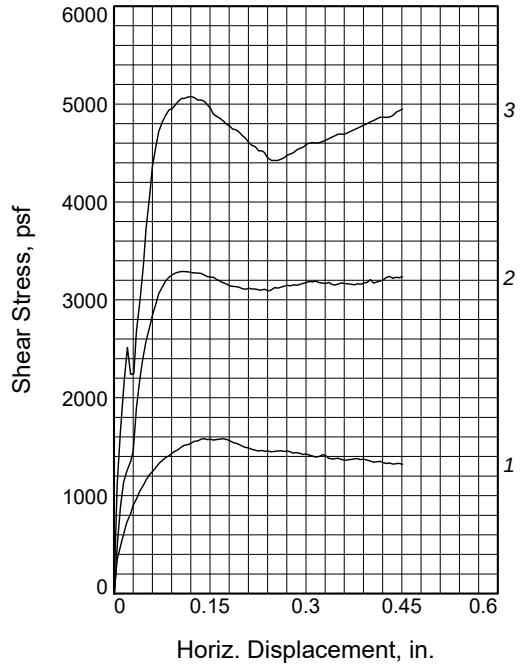

Sample No.		1	2	3
Initial	Water Content, %	8.5	8.9	9.1
	Dry Density, pcf	108.7	117.0	126.2
	Saturation, %	43.0	56.7	77.2
	Void Ratio	0.5213	0.4134	0.3113
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	17.5	14.0	10.8
	Dry Density, pcf	113.1	120.6	128.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4631	0.3722	0.2866
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.96	0.97	0.98
Normal Stress, psf		2000	4000	6000
Peak Stress, psf		1581	3292	5076
Displacement, in.		0.14	0.11	0.12
Residual Stress, psf		1320	3237	4424
Displacement, in.		0.45	0.45	0.25
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Reddish-brown mudstone

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross Bedding
% Fines = 66.3

Figure B2.3

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-4A **Depth:** 14'

Proj. No.: 18-1245A-4 **Date Sampled:** 11/20/18

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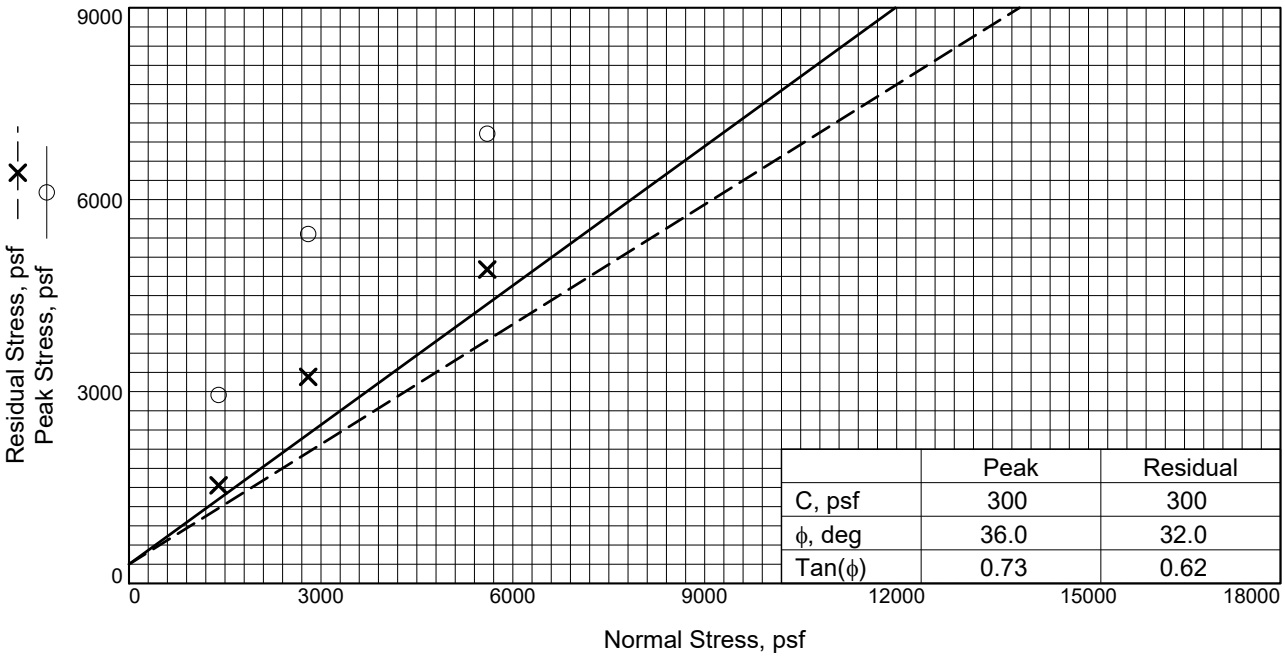
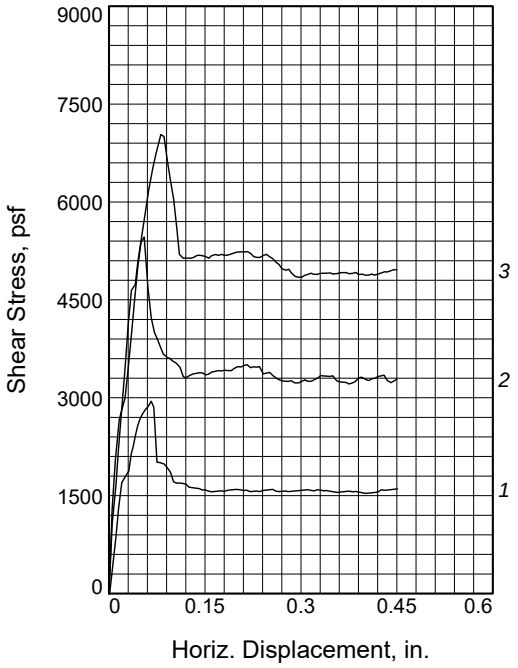
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	9.4	9.2	9.8
	Dry Density, pcf	127.9	128.6	123.5
	Saturation, %	85.2	85.4	76.1
	Void Ratio	0.2933	0.2861	0.3401
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	10.9	10.5	10.4
	Dry Density, pcf	128.3	129.4	129.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.2897	0.2783	0.2763
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	0.99	0.95
Normal Stress, psf		1400	2800	5600
Peak Stress, psf		2946	5462	7032
Displacement, in.		0.07	0.06	0.08
Residual Stress, psf		1535	3231	4907
Displacement, in.		0.40	0.44	0.32
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Sandy siltstone

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 55.5

Figure B2.4

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-4A **Depth:** 17'

Proj. No.: 18-1245A-4 **Date Sampled:** 11/20/18

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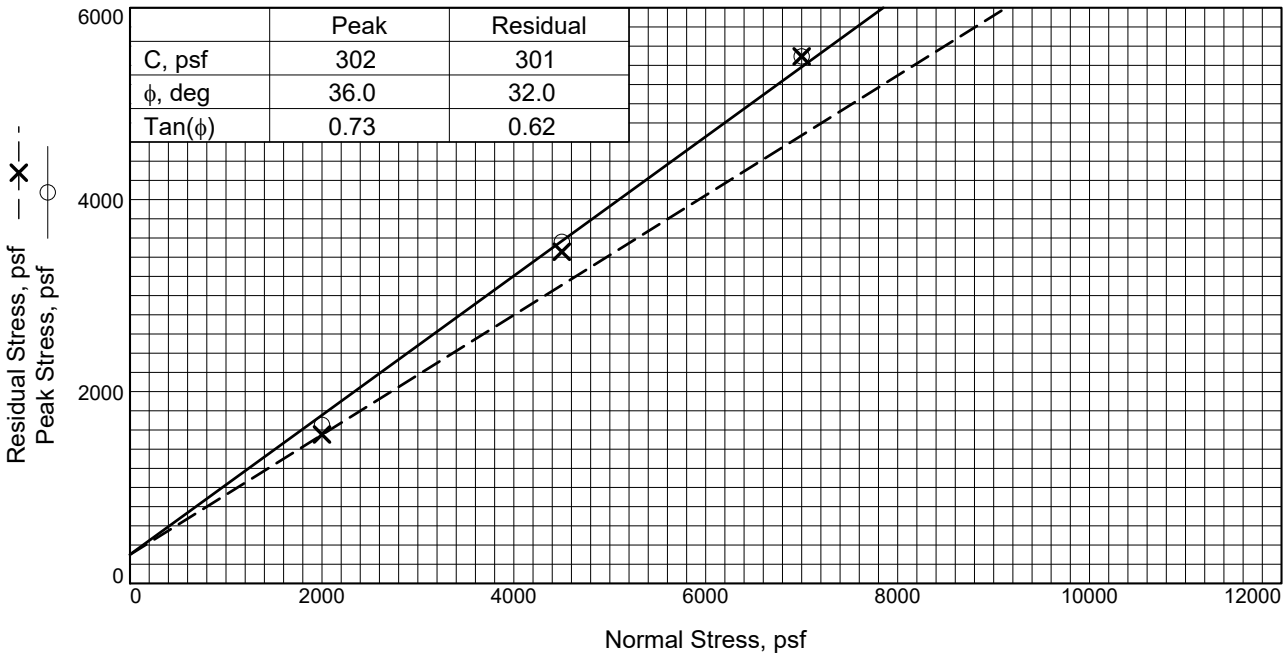

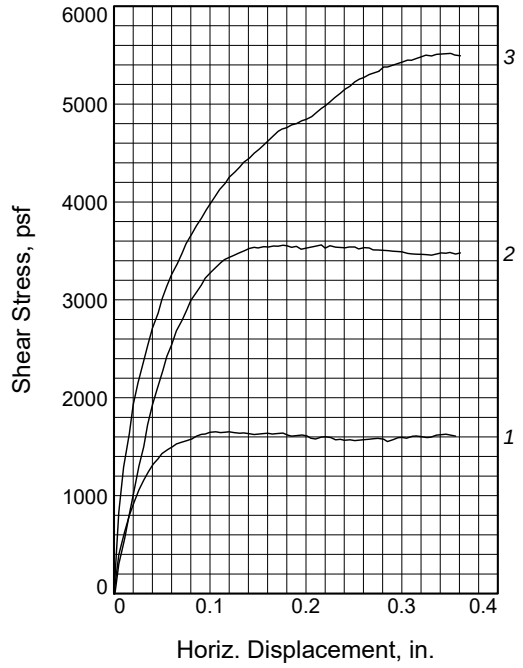

Sample No.		1	2	3
Initial	Water Content, %	5.6	5.7	6.2
	Dry Density, pcf	115.2	110.4	108.1
	Saturation, %	34.3	30.3	31.2
	Void Ratio	0.4362	0.4991	0.5307
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	16.1	17.1	12.5
	Dry Density, pcf	115.9	113.9	115.6
	Saturation, %	100.0	100.0	76.6
	Void Ratio	0.4275	0.4526	0.4313
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.97	0.94
Normal Stress, psf		2000	4500	7000
Peak Stress, psf		1652	3561	5493
Displacement, in.		0.11	0.22	0.36
Residual Stress, psf		1553	3457	5493
Displacement, in.		0.28	0.33	0.36
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Silty, fine- to medium-grained sandstone

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 27.0

Figure B2.5

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-4A **Depth:** 27.5'

Proj. No.: 18-1245A-4 **Date Sampled:** 11/20/18

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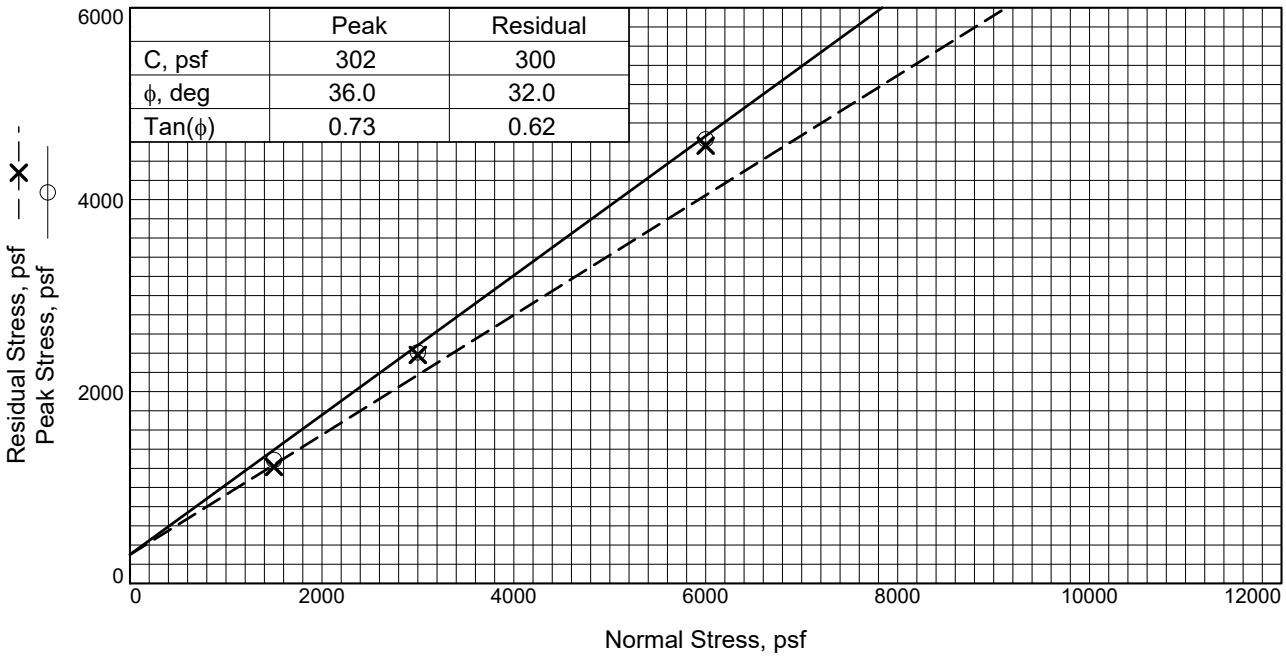

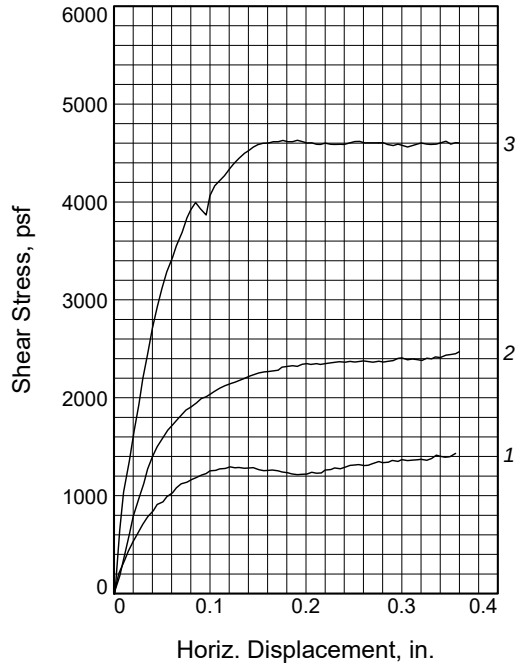

Sample No.		1	2	3
Initial	Water Content, %	6.0	7.1	7.7
	Dry Density, pcf	113.4	113.8	114.8
	Saturation, %	34.7	41.7	46.1
	Void Ratio	0.4590	0.4535	0.4407
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	16.0	15.8	14.4
	Dry Density, pcf	116.2	116.7	119.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4241	0.4181	0.3811
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.98	0.96
Normal Stress, psf		1500	3000	6000
Peak Stress, psf		1288	2408	4629
Displacement, in.		0.13	0.30	0.18
Residual Stress, psf		1214	2382	4562
Displacement, in.		0.19	0.32	0.31
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Silty, fine- to medium-grained sandstone

Assumed Specific Gravity= 2.65
Remarks: Bedrock (TQs)
Cross bedding
% Fines = 34.2

Figure B2.6

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-4A **Depth:** 28'

Proj. No.: 18-1245A-4 **Date Sampled:** 11/20/18

DIRECT SHEAR TEST REPORT
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Valencia, California

Appendix C

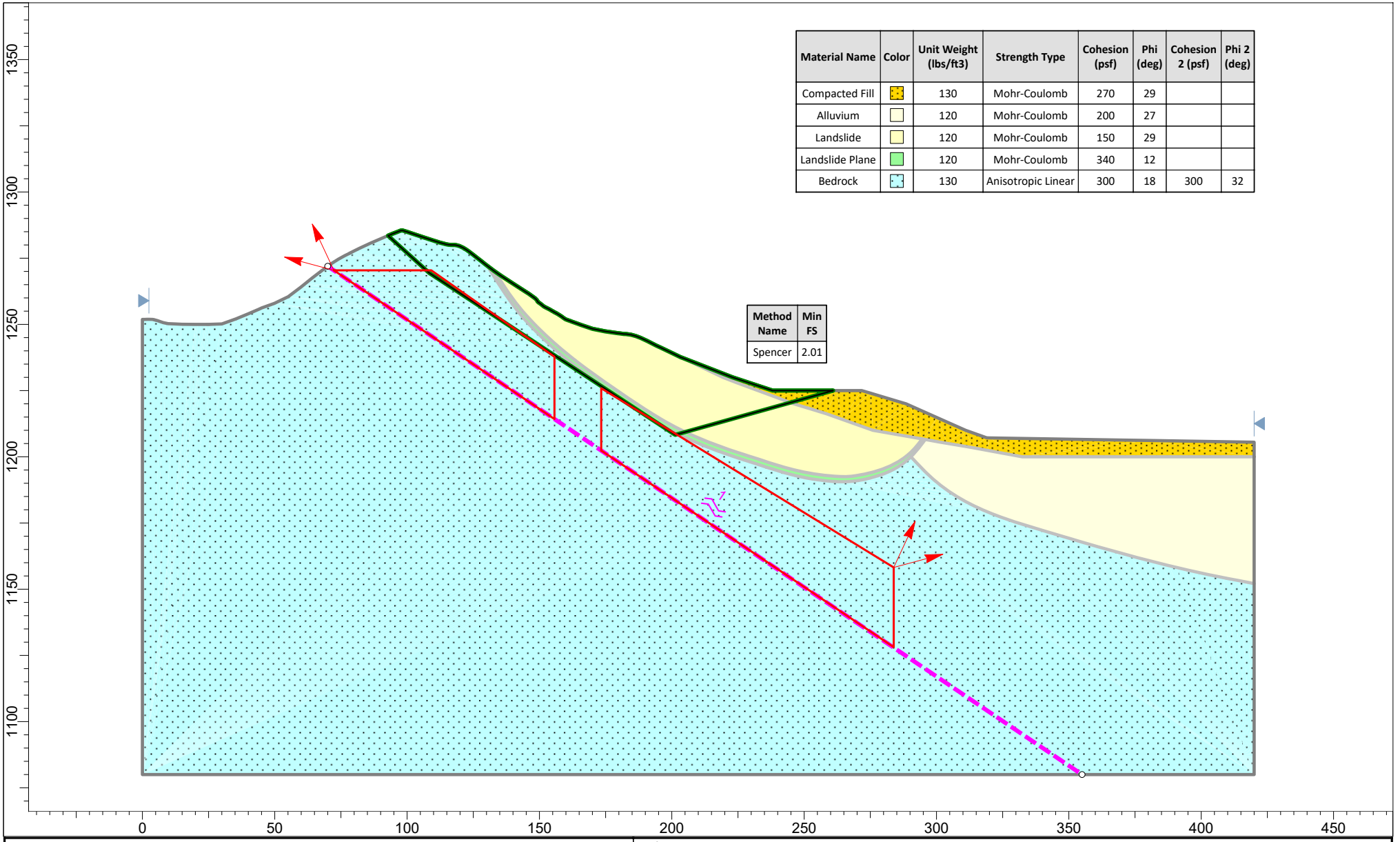
Table C1 – SLOPE STABILITY ANALYSES RESULTS

Cross Section	File Name	Slope Designation	Analyzed Plane	Method	Factor of Safety		Comments	Run No.
					Static	Pseudostatic[1] (Coeff = 0.15)		
1-1′	T1S1A	Landslide Qls-1	Bedding Plane	Spencer	2.01	--	Planar search along-bedding, below Qls, with exit through toe berm.	1
1-1′	T1S2A	Landslide Qls-1	Landslide Plane	Spencer	1.87	1.19	Non-circular path search along Qls plane; run represents min FS achieved along Qls plane with any combination of entry and exit points on slip surface.	2 3
1-1′	T1S2A	Landslide Qls-1	Landslide Mass	Spencer	1.87	1.29	Non-circular cuckoo search limiting entry and exit points to within the landslide mass.	4 5
27-27′	T27S1A	Natural Slope NS-2	Bedding Plane	Spencer	1.58	--	Updated analysis with corrected Qt shear strength; min FS > 1.55 at previously established FS > 1.55 setback line.	6
SCHEMATIC	--	Fill Slope	Non-circular	Spencer	2.05	--	Non-circular (cuckoo) search for minimum safety factor for 115-ft high 3:1 fill slope.	7

[1] Peak shear strength values were not utilized.

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Landslide		120	Mohr-Coulomb	150	29		
Landslide Plane		120	Mohr-Coulomb	340	12		
Bedrock		130	Anisotropic Linear	300	18	300	32

Method Name	Min FS
Spencer	2.01



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Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; bedding plane; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1s1a.slmd
		Scale:	1:600
Project No.:	18-1245A-4	*Date:* 4/3/2019	*Figure No.:* Run No. 1

Slide Analysis Information

t1s1a

Project Summary

File Name:	t1s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:02.784s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; bedding plane; static
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Surface Options

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	115
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	65
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Landslide	Landslide Plane	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	120	130
Cohesion [psf]	270	200	150	340	
Friction Angle [°]	29	27	29	12	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

Global Minimums

Method: spencer

FS	2.006930
Axis Location:	235.340, 1422.383
Left Slip Surface Endpoint:	92.784, 1283.486
Right Slip Surface Endpoint:	260.924, 1225.000
Resisting Moment:	3.89331e+07 lb-ft
Driving Moment:	1.93993e+07 lb-ft
Resisting Horizontal Force:	173660 lb
Driving Horizontal Force:	86530.3 lb
Total Slice Area:	2697.83 ft2
Surface Horizontal Width:	168.14 ft
Surface Average Height:	16.0451 ft

Global Minimum Coordinates

Method: spencer

X	Y
92.7839	1283.49
108.322	1269.43
201.271	1208.3
260.924	1225

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.00693

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.10754	824.415	-42.128	Bedrock	300	32	188	377.303	123.711	0	123.711	293.749	293.749
2	3.10754	2402.74	-42.128	Bedrock	300	32	293.384	588.801	462.178	0	462.178	727.532	727.532
3	3.10754	3350.58	-42.128	Bedrock	300	32	356.671	715.813	665.44	0	665.44	988.034	988.034
4	3.10754	4064.14	-42.128	Bedrock	300	32	404.315	811.431	818.46	0	818.46	1184.15	1184.15
5	3.10754	4779.07	-42.128	Bedrock	300	32	452.051	907.234	971.778	0	971.778	1380.64	1380.64
6	3.44258	5952.58	-33.3312	Bedrock	300	18	361.184	724.872	1307.62	0	1307.62	1545.16	1545.16
7	3.44258	6511.98	-33.3312	Bedrock	300	18	381.583	765.811	1433.62	0	1433.62	1684.57	1684.57
8	3.44258	7267.17	-33.3312	Bedrock	300	18	409.122	821.08	1603.72	0	1603.72	1872.78	1872.78
9	3.44258	7936.68	-33.3312	Bedrock	300	18	433.537	870.078	1754.52	0	1754.52	2039.64	2039.64
10	3.44258	7998.77	-33.3312	Bedrock	300	18	435.801	874.622	1768.51	0	1768.51	2055.11	2055.11
11	3.44258	7824.33	-33.3312	Bedrock	300	18	429.44	861.856	1729.21	0	1729.21	2011.64	2011.64
12	3.44258	7623.3	-33.3312	Bedrock	300	18	422.109	847.143	1683.93	0	1683.93	1961.53	1961.53

13	3.44258	7417.92	-33.3312	Bedrock	300	18	414.62	832.113	1637.67	0	1637.67	1910.35	1910.35
14	3.44258	7289.05	-33.3312	Bedrock	300	18	409.92	822.681	1608.65	0	1608.65	1878.23	1878.23
15	3.44258	7215.79	-33.3312	Bedrock	300	18	407.249	817.32	1592.15	0	1592.15	1859.98	1859.98
16	3.44258	7168.27	-33.3312	Bedrock	300	18	405.515	813.841	1581.44	0	1581.44	1848.13	1848.13
17	3.44258	7035.28	-33.3312	Bedrock	300	18	400.666	804.109	1551.49	0	1551.49	1814.99	1814.99
18	3.44258	6702.02	-33.3312	Bedrock	300	18	388.514	779.72	1476.43	0	1476.43	1731.93	1731.93
19	3.44258	6781.85	-33.3312	Bedrock	300	18	391.424	785.561	1494.4	0	1494.4	1751.83	1751.83
20	3.44258	6840.95	-33.3312	Bedrock	300	18	393.58	789.887	1507.72	0	1507.72	1766.56	1766.56
21	3.44258	7024.72	-33.3312	Bedrock	300	18	400.281	803.336	1549.11	0	1549.11	1812.36	1812.36
22	3.44258	7432.79	-33.3312	Bedrock	300	18	415.161	833.2	1641.02	0	1641.02	1914.05	1914.05
23	3.44258	7871.52	-33.3312	Bedrock	300	18	431.161	865.309	1739.84	0	1739.84	2023.4	2023.4
24	3.44258	8433.7	-33.3312	Bedrock	300	18	451.661	906.453	1866.47	0	1866.47	2163.51	2163.51
25	3.44258	9097.71	-33.3312	Bedrock	300	18	475.875	955.048	2016.03	0	2016.03	2328.99	2328.99
26	3.44258	9818.61	-33.3312	Bedrock	300	18	502.164	1007.81	2178.41	0	2178.41	2508.66	2508.66
27	3.44258	10561	-33.3312	Bedrock	300	18	529.236	1062.14	2345.62	0	2345.62	2693.68	2693.68
28	3.44258	11250.4	-33.3312	Bedrock	300	18	554.375	1112.59	2500.91	0	2500.91	2865.5	2865.5
29	3.44258	11637.1	-33.3312	Bedrock	300	18	568.479	1140.9	2588.02	0	2588.02	2961.88	2961.88
30	3.44258	11889.4	-33.3312	Bedrock	300	18	577.678	1159.36	2644.83	0	2644.83	3024.74	3024.74
31	3.44258	12140.2	-33.3312	Bedrock	300	18	586.824	1177.72	2701.33	0	2701.33	3087.26	3087.26
32	3.44258	12406.6	-33.3312	Bedrock	300	18	596.538	1197.21	2761.33	0	2761.33	3153.64	3153.64
33	1.10544	3967.03	15.6367	Bedrock	300	32	1800.31	3613.09	5302.06	0	5302.06	4798.17	4798.17
34	2.69944	9222.6	15.6367	Landslide Plane	340	12	620.423	1245.15	4258.38	0	4258.38	4084.72	4084.72
35	3.60858	11417.2	15.6367	Landslide	150	29	1310.76	2630.6	4475.11	0	4475.11	4108.23	4108.23
36	3.60858	10386.6	15.6367	Landslide	150	29	1200.88	2410.08	4077.3	0	4077.3	3741.18	3741.18
37	3.60858	9355.99	15.6367	Landslide	150	29	1091	2189.56	3679.46	0	3679.46	3374.09	3374.09
38	3.60858	8325.38	15.6367	Landslide	150	29	981.12	1969.04	3281.62	0	3281.62	3007.01	3007.01
39	3.60858	7288.33	15.6367	Landslide	150	29	870.554	1747.14	2881.3	0	2881.3	2637.64	2637.64
40	3.60858	6298.61	15.6367	Landslide	150	29	765.029	1535.36	2499.26	0	2499.26	2285.13	2285.13
41	3.60858	5350.58	15.6367	Landslide	150	29	663.954	1332.51	2133.3	0	2133.3	1947.46	1947.46
42	3.60858	4402.41	15.6367	Landslide	150	29	562.861	1129.62	1767.28	0	1767.28	1609.74	1609.74
43	3.60858	3454.23	15.6367	Landslide	150	29	461.768	926.737	1401.27	0	1401.27	1272.02	1272.02
44	3.60858	2712.69	15.6367	Landslide	150	29	382.708	768.068	1115.02	0	1115.02	1007.91	1007.91
45	3.60858	2317.75	15.6367	Landslide	150	29	340.599	683.559	962.567	0	962.567	867.235	867.235
46	3.23075	1710.71	15.6367	Compacted Fill	270	29	371.999	746.575	859.765	0	859.765	755.644	755.644
47	3.23075	1330.58	15.6367	Compacted Fill	270	29	326.731	655.726	695.868	0	695.868	604.418	604.418
48	3.23075	950.417	15.6367	Compacted Fill	270	29	281.458	564.867	531.953	0	531.953	453.175	453.175
49	3.23075	570.25	15.6367	Compacted Fill	270	29	236.186	474.009	368.042	0	368.042	301.935	301.935
50	3.23075	190.083	15.6367	Compacted Fill	270	29	190.245	381.808	201.707	0	201.707	148.458	148.458

Query 1 (spencer) - Safety Factor: 2.00693

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.10754	824.415	-42.128	Bedrock	300	32	188	377.303	123.711	0	123.711	293.749	293.749
2	3.10754	2402.74	-42.128	Bedrock	300	32	293.384	588.801	462.178	0	462.178	727.532	727.532
3	3.10754	3350.58	-42.128	Bedrock	300	32	356.671	715.813	665.44	0	665.44	988.034	988.034
4	3.10754	4064.14	-42.128	Bedrock	300	32	404.315	811.431	818.46	0	818.46	1184.15	1184.15
5	3.10754	4779.07	-42.128	Bedrock	300	32	452.051	907.234	971.778	0	971.778	1380.64	1380.64

6	3.44258	5952.58	-33.3312	Bedrock	300	18	361.184	724.872	1307.62	0	1307.62	1545.16	1545.16
7	3.44258	6511.98	-33.3312	Bedrock	300	18	381.583	765.811	1433.62	0	1433.62	1684.57	1684.57
8	3.44258	7267.17	-33.3312	Bedrock	300	18	409.122	821.08	1603.72	0	1603.72	1872.78	1872.78
9	3.44258	7936.68	-33.3312	Bedrock	300	18	433.537	870.078	1754.52	0	1754.52	2039.64	2039.64
10	3.44258	7998.77	-33.3312	Bedrock	300	18	435.801	874.622	1768.51	0	1768.51	2055.11	2055.11
11	3.44258	7824.33	-33.3312	Bedrock	300	18	429.44	861.856	1729.21	0	1729.21	2011.64	2011.64
12	3.44258	7623.3	-33.3312	Bedrock	300	18	422.109	847.143	1683.93	0	1683.93	1961.53	1961.53
13	3.44258	7417.92	-33.3312	Bedrock	300	18	414.62	832.113	1637.67	0	1637.67	1910.35	1910.35
14	3.44258	7289.05	-33.3312	Bedrock	300	18	409.92	822.681	1608.65	0	1608.65	1878.23	1878.23
15	3.44258	7215.79	-33.3312	Bedrock	300	18	407.249	817.32	1592.15	0	1592.15	1859.98	1859.98
16	3.44258	7168.27	-33.3312	Bedrock	300	18	405.515	813.841	1581.44	0	1581.44	1848.13	1848.13
17	3.44258	7035.28	-33.3312	Bedrock	300	18	400.666	804.109	1551.49	0	1551.49	1814.99	1814.99
18	3.44258	6702.02	-33.3312	Bedrock	300	18	388.514	779.72	1476.43	0	1476.43	1731.93	1731.93
19	3.44258	6781.85	-33.3312	Bedrock	300	18	391.424	785.561	1494.4	0	1494.4	1751.83	1751.83
20	3.44258	6840.95	-33.3312	Bedrock	300	18	393.58	789.887	1507.72	0	1507.72	1766.56	1766.56
21	3.44258	7024.72	-33.3312	Bedrock	300	18	400.281	803.336	1549.11	0	1549.11	1812.36	1812.36
22	3.44258	7432.79	-33.3312	Bedrock	300	18	415.161	833.2	1641.02	0	1641.02	1914.05	1914.05
23	3.44258	7871.52	-33.3312	Bedrock	300	18	431.161	865.309	1739.84	0	1739.84	2023.4	2023.4
24	3.44258	8433.7	-33.3312	Bedrock	300	18	451.661	906.453	1866.47	0	1866.47	2163.51	2163.51
25	3.44258	9097.71	-33.3312	Bedrock	300	18	475.875	955.048	2016.03	0	2016.03	2328.99	2328.99
26	3.44258	9818.61	-33.3312	Bedrock	300	18	502.164	1007.81	2178.41	0	2178.41	2508.66	2508.66
27	3.44258	10561	-33.3312	Bedrock	300	18	529.236	1062.14	2345.62	0	2345.62	2693.68	2693.68
28	3.44258	11250.4	-33.3312	Bedrock	300	18	554.375	1112.59	2500.91	0	2500.91	2865.5	2865.5
29	3.44258	11637.1	-33.3312	Bedrock	300	18	568.479	1140.9	2588.02	0	2588.02	2961.88	2961.88
30	3.44258	11889.4	-33.3312	Bedrock	300	18	577.678	1159.36	2644.83	0	2644.83	3024.74	3024.74
31	3.44258	12140.2	-33.3312	Bedrock	300	18	586.824	1177.72	2701.33	0	2701.33	3087.26	3087.26
32	3.44258	12406.6	-33.3312	Bedrock	300	18	596.538	1197.21	2761.33	0	2761.33	3153.64	3153.64
33	1.10544	3967.03	15.6367	Bedrock	300	32	1800.31	3613.09	5302.06	0	5302.06	4798.17	4798.17
34	2.69944	9222.6	15.6367	Landslide Plane	340	12	620.423	1245.15	4258.38	0	4258.38	4084.72	4084.72
35	3.60858	11417.2	15.6367	Landslide	150	29	1310.76	2630.6	4475.11	0	4475.11	4108.23	4108.23
36	3.60858	10386.6	15.6367	Landslide	150	29	1200.88	2410.08	4077.3	0	4077.3	3741.18	3741.18
37	3.60858	9355.99	15.6367	Landslide	150	29	1091	2189.56	3679.46	0	3679.46	3374.09	3374.09
38	3.60858	8325.38	15.6367	Landslide	150	29	981.12	1969.04	3281.62	0	3281.62	3007.01	3007.01
39	3.60858	7288.33	15.6367	Landslide	150	29	870.554	1747.14	2881.3	0	2881.3	2637.64	2637.64
40	3.60858	6298.61	15.6367	Landslide	150	29	765.029	1535.36	2499.26	0	2499.26	2285.13	2285.13
41	3.60858	5350.58	15.6367	Landslide	150	29	663.954	1332.51	2133.3	0	2133.3	1947.46	1947.46
42	3.60858	4402.41	15.6367	Landslide	150	29	562.861	1129.62	1767.28	0	1767.28	1609.74	1609.74
43	3.60858	3454.23	15.6367	Landslide	150	29	461.768	926.737	1401.27	0	1401.27	1272.02	1272.02
44	3.60858	2712.69	15.6367	Landslide	150	29	382.708	768.068	1115.02	0	1115.02	1007.91	1007.91
45	3.60858	2317.75	15.6367	Landslide	150	29	340.599	683.559	962.567	0	962.567	867.235	867.235
46	3.23075	1710.71	15.6367	Compacted Fill	270	29	371.999	746.575	859.765	0	859.765	755.644	755.644
47	3.23075	1330.58	15.6367	Compacted Fill	270	29	326.731	655.726	695.868	0	695.868	604.418	604.418
48	3.23075	950.417	15.6367	Compacted Fill	270	29	281.458	564.867	531.953	0	531.953	453.175	453.175
49	3.23075	570.25	15.6367	Compacted Fill	270	29	236.186	474.009	368.042	0	368.042	301.935	301.935
50	3.23075	190.083	15.6367	Compacted Fill	270	29	190.245	381.808	201.707	0	201.707	148.458	148.458

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.00693

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	92.7839	1283.49	0	0	0
2	95.8914	1280.68	-237.482	-87.4743	20.2208
3	98.999	1277.86	148.321	54.6328	20.2209
4	102.107	1275.05	908.428	334.611	20.2208
5	105.214	1272.24	1950.32	718.383	20.2208
6	108.322	1269.43	3274.54	1206.15	20.2209
7	111.764	1267.17	4989.57	1837.86	20.2208
8	115.207	1264.9	6919.52	2548.74	20.2208
9	118.649	1262.64	9139.61	3366.5	20.2209
10	122.092	1260.38	11616.9	4279	20.2209
11	125.534	1258.11	14118.1	5200.28	20.2208
12	128.977	1255.85	16552.3	6096.89	20.2208
13	132.42	1253.58	18909.2	6965.04	20.2208
14	135.862	1251.32	21187.2	7804.12	20.2208
15	139.305	1249.06	23415.7	8624.97	20.2208
16	142.747	1246.79	25616.1	9435.46	20.2208
17	146.19	1244.53	27798.2	10239.2	20.2208
18	149.633	1242.26	29929.2	11024.1	20.2207
19	153.075	1240	31932.1	11761.9	20.2208
20	156.518	1237.74	33965.8	12511	20.2208
21	159.96	1235.47	36022.1	13268.4	20.2208
22	163.403	1233.21	38149.1	14051.9	20.2209
23	166.845	1230.94	40432.8	14893.1	20.2209
24	170.288	1228.68	42885.1	15796.3	20.2208
25	173.731	1226.42	45553.4	16779.2	20.2208
26	177.173	1224.15	48476.8	17856	20.2208
27	180.616	1221.89	51677.1	19034.8	20.2208
28	184.058	1219.62	55162.7	20318.7	20.2208
29	187.501	1217.36	58913.2	21700.2	20.2209
30	190.943	1215.1	62812.3	23136.3	20.2208
31	194.386	1212.83	66808.3	24608.2	20.2208
32	197.829	1210.57	70900.6	26115.6	20.2208
33	201.271	1208.3	75095.3	27660.7	20.2208
34	202.377	1208.61	71461.4	26322.2	20.2208
35	205.076	1209.37	66566.4	24519.1	20.2208
36	208.685	1210.38	57308.6	21109.1	20.2208
37	212.293	1211.39	48849.8	17993.4	20.2208
38	215.902	1212.4	41189.9	15171.9	20.2208
39	219.51	1213.41	34329.1	12644.8	20.2208
40	223.119	1214.42	28272.2	10413.8	20.2208
41	226.728	1215.43	22982.7	8465.47	20.2208
42	230.336	1216.44	18428.1	6787.83	20.2208

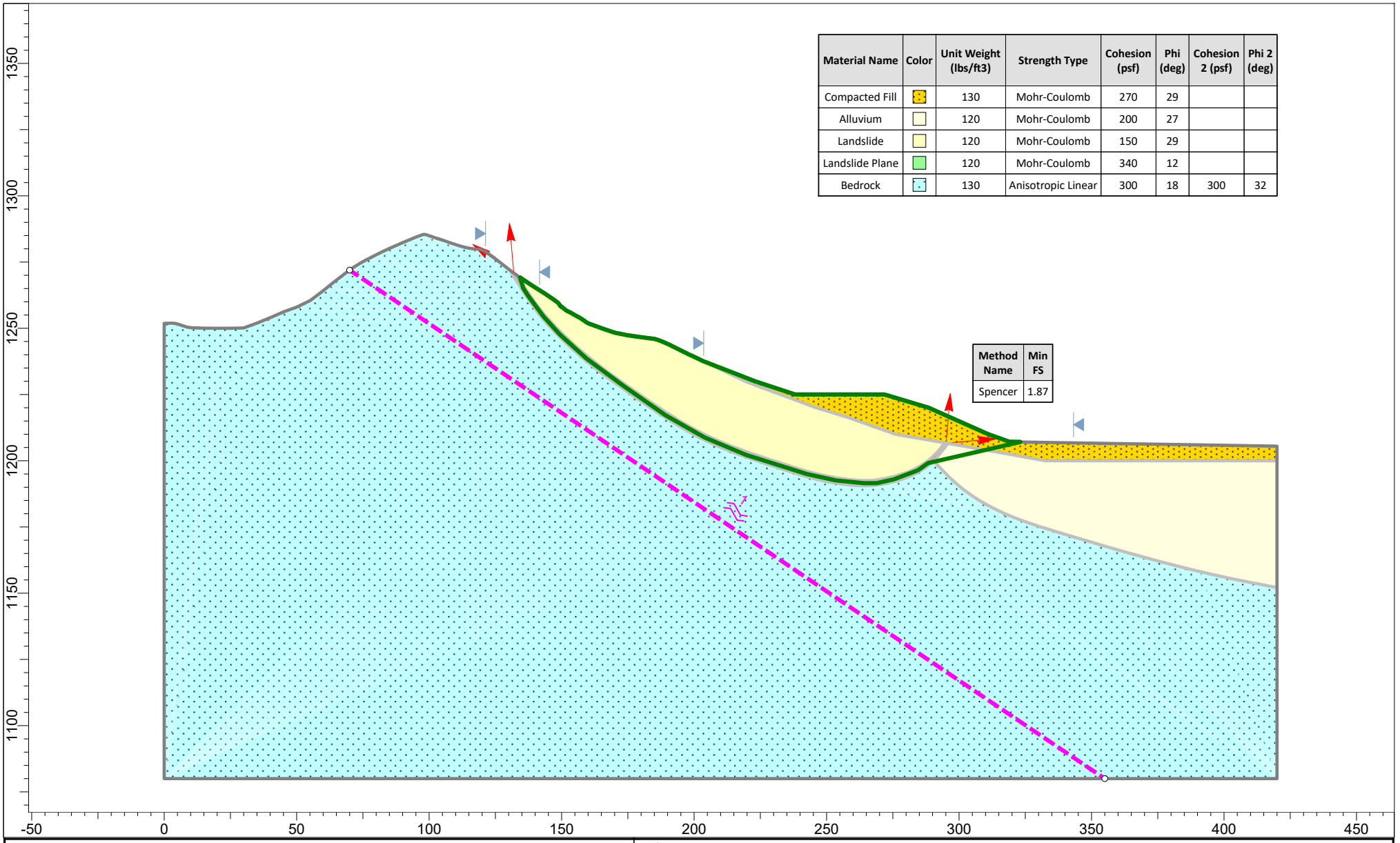
43	233.945	1217.45	14608.6	5380.95	20.2208
44	237.553	1218.46	11524.2	4244.83	20.2208
45	241.162	1219.47	9014.67	3320.47	20.2208
46	244.77	1220.48	6811.33	2508.89	20.2208
47	248.001	1221.38	4830.04	1779.1	20.2208
48	251.232	1222.29	3143.45	1157.86	20.2208
49	254.463	1223.19	1751.58	645.18	20.2209
50	257.693	1224.1	654.447	241.06	20.2208
51	260.924	1225	0	0	0

Query 1 (spencer) - Safety Factor: 2.00693

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	92.7839	1283.49	0	0	0
2	95.8914	1280.68	-237.482	-87.4743	20.2208
3	98.999	1277.86	148.321	54.6328	20.2209
4	102.107	1275.05	908.428	334.611	20.2208
5	105.214	1272.24	1950.32	718.383	20.2208
6	108.322	1269.43	3274.54	1206.15	20.2209
7	111.764	1267.17	4989.57	1837.86	20.2208
8	115.207	1264.9	6919.52	2548.74	20.2208
9	118.649	1262.64	9139.61	3366.5	20.2209
10	122.092	1260.38	11616.9	4279	20.2209
11	125.534	1258.11	14118.1	5200.28	20.2208
12	128.977	1255.85	16552.3	6096.89	20.2208
13	132.42	1253.58	18909.2	6965.04	20.2208
14	135.862	1251.32	21187.2	7804.12	20.2208
15	139.305	1249.06	23415.7	8624.97	20.2208
16	142.747	1246.79	25616.1	9435.46	20.2208
17	146.19	1244.53	27798.2	10239.2	20.2208
18	149.633	1242.26	29929.2	11024.1	20.2207
19	153.075	1240	31932.1	11761.9	20.2208
20	156.518	1237.74	33965.8	12511	20.2208
21	159.96	1235.47	36022.1	13268.4	20.2208
22	163.403	1233.21	38149.1	14051.9	20.2209
23	166.845	1230.94	40432.8	14893.1	20.2209
24	170.288	1228.68	42885.1	15796.3	20.2208
25	173.731	1226.42	45553.4	16779.2	20.2208
26	177.173	1224.15	48476.8	17856	20.2208
27	180.616	1221.89	51677.1	19034.8	20.2208
28	184.058	1219.62	55162.7	20318.7	20.2208
29	187.501	1217.36	58913.2	21700.2	20.2209
30	190.943	1215.1	62812.3	23136.3	20.2208
31	194.386	1212.83	66808.3	24608.2	20.2208
32	197.829	1210.57	70900.6	26115.6	20.2208
33	201.271	1208.3	75095.3	27660.7	20.2208
34	202.377	1208.61	71461.4	26322.2	20.2208

35	205.076	1209.37	66566.4	24519.1	20.2208
36	208.685	1210.38	57308.6	21109.1	20.2208
37	212.293	1211.39	48849.8	17993.4	20.2208
38	215.902	1212.4	41189.9	15171.9	20.2208
39	219.51	1213.41	34329.1	12644.8	20.2208
40	223.119	1214.42	28272.2	10413.8	20.2208
41	226.728	1215.43	22982.7	8465.47	20.2208
42	230.336	1216.44	18428.1	6787.83	20.2208
43	233.945	1217.45	14608.6	5380.95	20.2208
44	237.553	1218.46	11524.2	4244.83	20.2208
45	241.162	1219.47	9014.67	3320.47	20.2208
46	244.77	1220.48	6811.33	2508.89	20.2208
47	248.001	1221.38	4830.04	1779.1	20.2208
48	251.232	1222.29	3143.45	1157.86	20.2208
49	254.463	1223.19	1751.58	645.18	20.2209
50	257.693	1224.1	654.447	241.06	20.2208
51	260.924	1225	0	0	0

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Landslide		120	Mohr-Coulomb	150	29		
Landslide Plane		120	Mohr-Coulomb	340	12		
Bedrock		130	Anisotropic Linear	300	18	300	32



Method Name	Min FS
Spencer	1.87

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; Qls plane; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1s2a.slmd
		Scale:	1:600
Project No.:	18-1245A-4	*Date:* 4/3/2019	*Figure No.:* Run No. 2

Slide Analysis Information

t1s2a

Project Summary

File Name:	t1s2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:02.547s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; Qls plane; static
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

Analysis Options

Slices Type:	Vertical

Analysis Methods Used
Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Surface Options

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	95
Left Projection Angle (End Angle) [°]:	145
Right Projection Angle (Start Angle) [°]:	5
Right Projection Angle (End Angle) [°]:	85
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Landslide	Landslide Plane	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	120	130
Cohesion [psf]	270	200	150	340	
Friction Angle [°]	29	27	29	12	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.866270
Axis Location:	290.784, 1426.952
Left Slip Surface Endpoint:	134.278, 1269.179
Right Slip Surface Endpoint:	323.099, 1207.083
Resisting Moment:	4.46751e+07 lb-ft
Driving Moment:	2.39382e+07 lb-ft
Resisting Horizontal Force:	177364 lb
Driving Horizontal Force:	95036.6 lb
Total Slice Area:	4096.57 ft2
Surface Horizontal Width:	188.821 ft
Surface Average Height:	21.6955 ft

Global Minimum Coordinates

Method: spencer

X	Y
134.278	1269.18
135.478	1265.17
137.132	1262.54
143.05	1254.52
149.272	1247.72
159.344	1238.59
173.264	1228.3
189.177	1217.17
203.922	1208.79
219.485	1202.24
242.476	1195
253.418	1192.57
263.994	1191.55
268.914	1191.55
275.45	1193.01
284.41	1196.39
288.31	1199.12
323.099	1207.08

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 2880
Number of Invalid Surfaces: 2120

Error Codes:

Error Code -108 reported for 1080 surfaces
Error Code -111 reported for 50 surfaces
Error Code -112 reported for 942 surfaces
Error Code -124 reported for 48 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-124 = A slice has a width less than the minimum acceptable value.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.86627

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.615538	60.0331	-73.3211	Landslide	150	29	63.6966	118.875	-56.1509	0	-56.1509	156.445	156.445
2	0.584446	168.36	-73.3211	Landslide Plane	340	12	169.217	315.805	-113.829	0	-113.829	450.955	450.955
3	1.65421	781.68	-57.8375	Landslide Plane	340	12	199.117	371.606	148.696	0	148.696	465.348	465.348
4	5.918	4824.68	-53.5898	Landslide Plane	340	12	230.692	430.534	425.931	0	425.931	738.719	738.719
5	3.111	3580.27	-47.5289	Landslide Plane	340	12	266.483	497.33	740.181	0	740.181	1031.29	1031.29
6	3.111	4035.22	-47.5289	Landslide Plane	340	12	278.908	520.518	849.269	0	849.269	1153.95	1153.95
7	5.036	6878.51	-42.1852	Landslide Plane	340	12	292.796	546.437	971.209	0	971.209	1236.56	1236.56
8	5.036	7852.39	-42.1852	Landslide Plane	340	12	310.034	578.608	1122.57	0	1122.57	1403.54	1403.54
9	4.64	7998.75	-36.4754	Landslide Plane	340	12	334.067	623.46	1333.58	0	1333.58	1580.55	1580.55
10	4.64	8981.85	-36.4754	Landslide Plane	340	12	353.821	660.325	1507.01	0	1507.01	1768.59	1768.59
11	4.64	10103.9	-36.4754	Landslide Plane	340	12	376.365	702.398	1704.95	0	1704.95	1983.19	1983.19
12	3.97825	9741.47	-34.9676	Landslide Plane	340	12	404.752	755.377	1954.19	0	1954.19	2237.26	2237.26
13	3.97825	10786.9	-34.9676	Landslide Plane	340	12	429.523	801.605	2171.68	0	2171.68	2472.07	2472.07
14	3.97825	11865	-34.9676	Landslide Plane	340	12	455.067	849.278	2395.96	0	2395.96	2714.22	2714.22
15	3.97825	12741	-34.9676	Landslide Plane	340	12	475.824	888.016	2578.2	0	2578.2	2910.98	2910.98
16	3.68625	12123.8	-29.6255	Landslide Plane	340	12	497.592	928.641	2769.35	0	2769.35	3052.31	3052.31
17	3.68625	12257.3	-29.6255	Landslide Plane	340	12	501.134	935.252	2800.43	0	2800.43	3085.41	3085.41
18	3.68625	12400.3	-29.6255	Landslide Plane	340	12	504.929	942.333	2833.75	0	2833.75	3120.89	3120.89
19	3.68625	12549.8	-29.6255	Landslide Plane	340	12	508.894	949.734	2868.58	0	2868.58	3157.97	3157.97
20	3.89075	13378.4	-22.8341	Landslide Plane	340	12	529.532	988.25	3049.78	0	3049.78	3272.74	3272.74
21	3.89075	13453.6	-22.8341	Landslide Plane	340	12	531.508	991.937	3067.12	0	3067.12	3290.91	3290.91

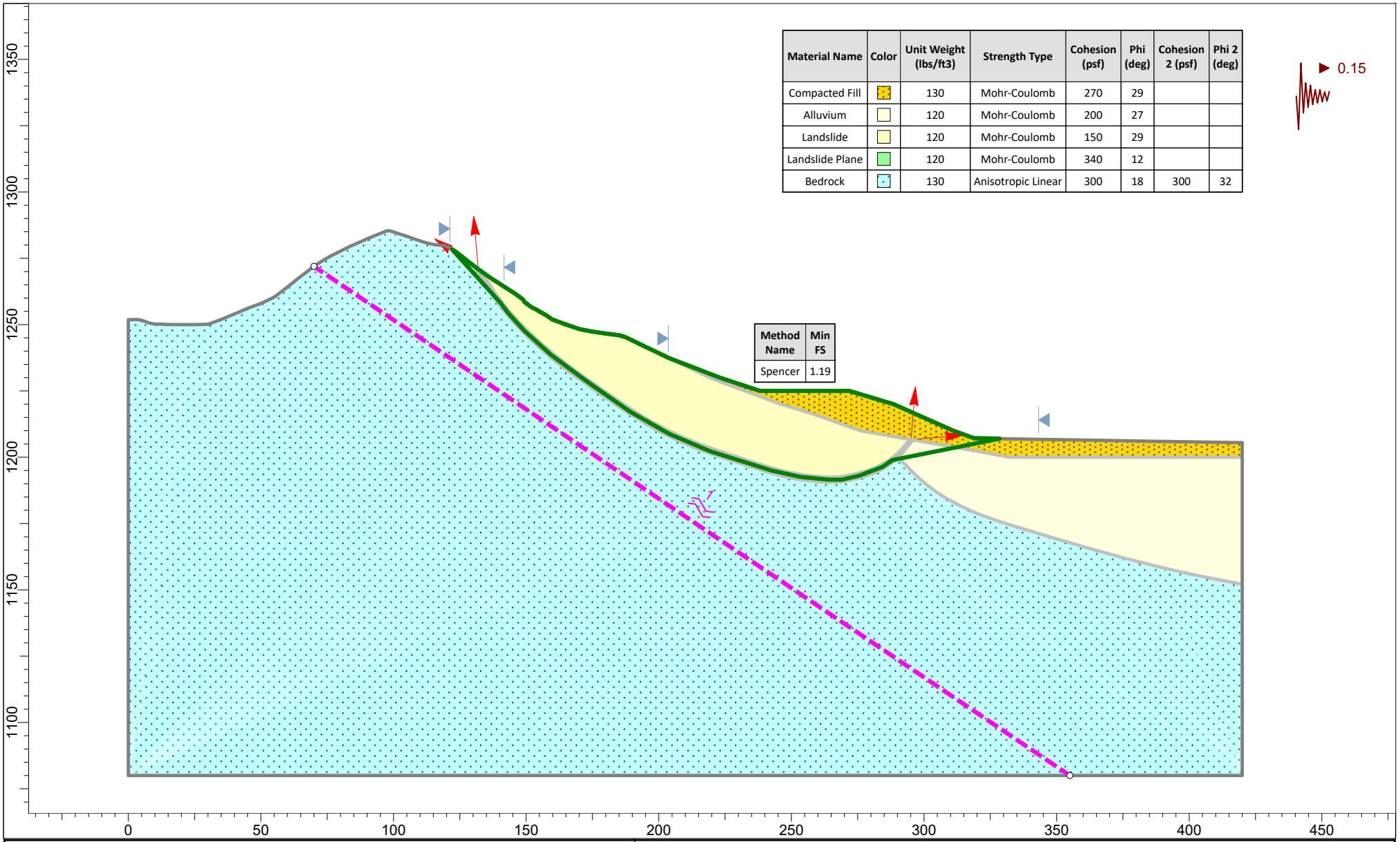
22	3.89075	13528.9	-22.8341	Landslide Plane	340	12	533.483	995.623	3084.46	0	3084.46	3309.09	3309.09
23	3.89075	13604.1	-22.8341	Landslide Plane	340	12	535.458	999.309	3101.8	0	3101.8	3327.26	3327.26
24	4.5982	16034.6	-17.4773	Landslide Plane	340	12	548.087	1022.88	3212.68	0	3212.68	3385.25	3385.25
25	4.5982	15962.2	-17.4773	Landslide Plane	340	12	546.426	1019.78	3198.12	0	3198.12	3370.17	3370.17
26	4.5982	15931.7	-17.4773	Landslide Plane	340	12	545.727	1018.47	3191.96	0	3191.96	3363.78	3363.78
27	4.5982	15901.2	-17.4773	Landslide Plane	340	12	545.026	1017.17	3185.82	0	3185.82	3357.42	3357.42
28	4.5982	16289.3	-17.4773	Landslide Plane	340	12	553.929	1033.78	3263.98	0	3263.98	3438.39	3438.39
29	3.64733	13469.2	-12.4911	Landslide Plane	340	12	583.122	1088.26	3520.3	0	3520.3	3649.48	3649.48
30	3.64733	13866.3	-12.4911	Landslide Plane	340	12	594.945	1110.33	3624.11	0	3624.11	3755.91	3755.91
31	3.64733	14260.2	-12.4911	Landslide Plane	340	12	606.673	1132.22	3727.09	0	3727.09	3861.48	3861.48
32	3.52533	14064.9	-5.55178	Landslide Plane	340	12	635.724	1186.43	3982.16	0	3982.16	4043.95	4043.95
33	3.52533	14248.5	-5.55178	Landslide Plane	340	12	641.613	1197.42	4033.85	0	4033.85	4096.22	4096.22
34	3.52533	14436.8	-5.55178	Landslide Plane	340	12	647.651	1208.69	4086.88	0	4086.88	4149.83	4149.83
35	4.92	20323.1	0	Landslide Plane	340	12	669.338	1249.16	4277.28	0	4277.28	4277.28	4277.28
36	3.268	13399.2	12.667	Landslide Plane	340	12	711.174	1327.24	4644.6	0	4644.6	4484.76	4484.76
37	3.268	12890.7	12.667	Landslide Plane	340	12	691.487	1290.5	4471.74	0	4471.74	4316.32	4316.32
38	4.48	16393.2	20.6569	Landslide Plane	340	12	687.323	1282.73	4435.2	0	4435.2	4176.07	4176.07
39	4.48	14740.7	20.6569	Landslide Plane	340	12	637.871	1190.44	4000.99	0	4000.99	3760.51	3760.51
40	3.89958	11190.6	34.999	Landslide Plane	340	12	647.981	1209.31	4089.76	0	4089.76	3636.06	3636.06
41	1.37583	3548.39	12.8887	Landslide Plane	340	12	519.332	969.213	2960.21	0	2960.21	2841.38	2841.38
42	0.949418	2358.71	12.8887	Bedrock	300	32	1230.79	2296.99	3195.86	0	3195.86	2914.23	2914.23
43	3.85764	8801.74	12.8887	Alluvium	200	27	875.725	1634.34	2815.07	0	2815.07	2614.68	2614.68
44	3.85764	7559.64	12.8887	Alluvium	200	27	769.503	1436.1	2425.98	0	2425.98	2249.9	2249.9
45	3.85764	6317.53	12.8887	Alluvium	200	27	663.28	1237.86	2036.91	0	2036.91	1885.14	1885.14
46	3.85764	5075.33	12.8887	Alluvium	200	27	557.047	1039.6	1647.81	0	1647.81	1520.34	1520.34
47	3.85764	3832.64	12.8887	Alluvium	200	27	450.773	841.264	1258.55	0	1258.55	1155.4	1155.4
48	4.39196	2874.66	12.8887	Compacted Fill	270	29	406.245	758.162	880.666	0	880.666	787.707	787.707
49	4.39196	1398.02	12.8887	Compacted Fill	270	29	283.991	530.003	469.058	0	469.058	404.074	404.074
50	4.39196	308.788	12.8887	Compacted Fill	270	29	196.97	367.599	176.074	0	176.074	131.002	131.002

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.86627

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	134.278	1269.18	0	0	0
2	134.893	1267.12	-154.583	-33.8908	12.3659
3	135.478	1265.17	-475.566	-104.263	12.3659
4	137.132	1262.54	-413.919	-90.7475	12.3659
5	143.05	1254.52	1637.93	359.1	12.3659
6	146.161	1251.12	3324.05	728.766	12.3659
7	149.272	1247.72	5342.24	1171.23	12.3658
8	154.308	1243.16	8299.69	1819.62	12.3659
9	159.344	1238.59	11861.1	2600.42	12.3658
10	163.984	1235.16	14884.9	3263.38	12.3659

11	168.624	1231.73	18412.1	4036.66	12.3659
12	173.264	1228.3	22513.5	4935.87	12.3659
13	177.242	1225.52	26339.7	5774.72	12.3659
14	181.22	1222.74	30672.4	6724.61	12.3659
15	185.199	1219.96	35527.4	7789.03	12.3659
16	189.177	1217.17	40806.9	8946.5	12.3659
17	192.863	1215.08	44777.1	9816.93	12.3659
18	196.549	1212.98	48799.4	10698.8	12.3659
19	200.236	1210.89	52877.6	11592.9	12.3659
20	203.922	1208.79	57014.1	12499.8	12.3659
21	207.813	1207.15	59949.3	13143.3	12.3659
22	211.703	1205.51	62905.1	13791.3	12.3659
23	215.594	1203.87	65881.7	14443.9	12.3659
24	219.485	1202.24	68879	15101	12.3659
25	224.083	1200.79	71009.1	15568	12.3659
26	228.681	1199.34	73125.6	16032.1	12.3659
27	233.28	1197.89	75236.5	16494.9	12.3659
28	237.878	1196.44	77341.8	16956.4	12.3659
29	242.476	1195	79519.2	17433.8	12.3659
30	246.123	1194.19	80235.8	17590.9	12.3659
31	249.771	1193.38	80993.2	17757	12.3659
32	253.418	1192.57	81791	17931.9	12.3659
33	256.943	1192.23	80913.5	17739.5	12.3659
34	260.469	1191.89	80032.9	17546.4	12.3659
35	263.994	1191.55	79149.2	17352.7	12.3659
36	268.914	1191.55	75854.6	16630.4	12.3659
37	272.182	1192.28	70118.1	15372.7	12.3659
38	275.45	1193.01	64572.8	14156.9	12.3658
39	279.93	1194.7	54001.2	11839.2	12.3659
40	284.41	1196.39	44384.7	9730.9	12.3659
41	288.31	1199.12	30690	6728.48	12.3659
42	289.685	1199.44	29043.2	6367.44	12.3659
43	290.635	1199.65	27179.9	5958.92	12.3659
44	294.492	1200.54	21315.3	4673.17	12.3659
45	298.35	1201.42	16204.1	3552.59	12.3659
46	302.208	1202.3	11846.3	2597.19	12.3659
47	306.065	1203.19	8241.97	1806.97	12.3659
48	309.923	1204.07	5391.36	1182	12.3659
49	314.315	1205.07	2721.33	596.625	12.3659
50	318.707	1206.08	1002.13	219.707	12.3659
51	323.099	1207.08	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; Qls plane; seismic		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1ps2a.slmd
		Scale:	1:600
Project No.:	18-1245A-4	*Date:* 4/3/2019	*Figure No.:* Run No. 3

Slide Analysis Information

t1ps2a

Project Summary

File Name:	t1ps2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:02.599s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; Qls plane; seismic
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Surface Options

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	95
Left Projection Angle (End Angle) [°]:	145
Right Projection Angle (Start Angle) [°]:	5
Right Projection Angle (End Angle) [°]:	85
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Alluvium	Landslide	Landslide Plane	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	120	130
Cohesion [psf]	270	200	150	340	
Friction Angle [°]	29	27	29	12	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.194140
Axis Location:	296.617, 1449.060
Left Slip Surface Endpoint:	122.073, 1278.344
Right Slip Surface Endpoint:	328.463, 1206.995
Resisting Moment:	5.09465e+07 lb-ft
Driving Moment:	4.26636e+07 lb-ft
Resisting Horizontal Force:	185508 lb
Driving Horizontal Force:	155348 lb
Total Slice Area:	4155.37 ft2
Surface Horizontal Width:	206.39 ft
Surface Average Height:	20.1336 ft

Global Minimum Coordinates

Method: spencer

X	Y
122.073	1278.34
140.29	1258.26
143.05	1254.52
149.272	1247.72
159.344	1238.59
173.264	1228.3
189.177	1217.17
203.922	1208.79
219.485	1202.24
242.476	1195
253.418	1192.57
263.994	1191.55
268.914	1191.55
275.45	1193.01
284.41	1196.39
288.015	1198.92
328.463	1207

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 2611
Number of Invalid Surfaces: 2389

Error Codes:

Error Code -108 reported for 957 surfaces
Error Code -111 reported for 73 surfaces
Error Code -112 reported for 1311 surfaces
Error Code -124 reported for 48 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-124 = A slice has a width less than the minimum acceptable value.

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.19414

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.73319	556.777	-47.7892	Bedrock	300	32	138.315	165.167	0	0	0	152.482	152.482
2	4.73319	1500.25	-47.7892	Bedrock	300	32	280.97	335.517	56.8397	0	56.8397	366.589	366.589
3	4.73319	2410.71	-47.7892	Bedrock	300	32	335.93	401.148	161.872	0	161.872	532.211	532.211
4	4.01723	2902.66	-47.7892	Landslide Plane	340	12	340.462	406.56	313.139	0	313.139	688.474	688.474
5	2.75998	2621.43	-53.5898	Landslide Plane	340	12	352.376	420.786	380.069	0	380.069	857.842	857.842
6	6.222	7615.49	-47.5289	Landslide Plane	340	12	399.022	476.488	642.126	0	642.126	1078.02	1078.02
7	5.036	6878.51	-42.1852	Landslide Plane	340	12	430.784	514.416	820.565	0	820.565	1210.97	1210.97
8	5.036	7852.39	-42.1852	Landslide Plane	340	12	454.638	542.901	954.572	0	954.572	1366.6	1366.6
9	4.64	7998.75	-36.4754	Landslide Plane	340	12	493.171	588.915	1171.05	0	1171.05	1535.65	1535.65
10	4.64	8981.85	-36.4754	Landslide Plane	340	12	520.921	622.053	1326.95	0	1326.95	1712.07	1712.07
11	4.64	10103.9	-36.4754	Landslide Plane	340	12	552.592	659.872	1504.88	0	1504.88	1913.41	1913.41
12	3.97825	9741.47	-34.9676	Landslide Plane	340	12	594.206	709.565	1738.67	0	1738.67	2154.23	2154.23
13	3.97825	10786.9	-34.9676	Landslide Plane	340	12	629.137	751.278	1934.91	0	1934.91	2374.91	2374.91
14	3.97825	11865	-34.9676	Landslide Plane	340	12	665.161	794.295	2137.28	0	2137.28	2602.47	2602.47
15	3.97825	12741	-34.9676	Landslide Plane	340	12	694.432	829.249	2301.74	0	2301.74	2787.4	2787.4
16	4.915	16194.8	-29.6255	Landslide Plane	340	12	733.74	876.188	2522.56	0	2522.56	2939.81	2939.81
17	4.915	16436.6	-29.6255	Landslide Plane	340	12	740.616	884.399	2561.19	0	2561.19	2982.35	2982.35
18	4.915	16699.7	-29.6255	Landslide Plane	340	12	748.097	893.332	2603.23	0	2603.23	3028.65	3028.65
19	3.89075	13378.4	-22.8341	Landslide Plane	340	12	789.016	942.196	2833.11	0	2833.11	3165.33	3165.33
20	3.89075	13453.6	-22.8341	Landslide Plane	340	12	791.885	945.621	2849.21	0	2849.21	3182.65	3182.65
21	3.89075	13528.9	-22.8341	Landslide Plane	340	12	794.754	949.047	2865.34	0	2865.34	3199.99	3199.99
22	3.89075	13604.1	-22.8341	Landslide Plane	340	12	797.621	952.471	2881.45	0	2881.45	3217.3	3217.3
23	4.5982	16034.6	-17.4773	Landslide Plane	340	12	824.665	984.766	3033.39	0	3033.39	3293.05	3293.05
24	4.5982	15962.2	-17.4773	Landslide Plane	340	12	822.223	981.849	3019.66	0	3019.66	3278.55	3278.55
25	4.5982	15931.7	-17.4773	Landslide Plane	340	12	821.193	980.62	3013.87	0	3013.87	3272.43	3272.43
26	4.5982	15901.2	-17.4773	Landslide Plane	340	12	820.164	979.391	3008.1	0	3008.1	3266.34	3266.34
27	4.5982	16289.3	-17.4773	Landslide Plane	340	12	833.257	995.025	3081.66	0	3081.66	3344.02	3344.02
28	3.64733	13469.2	-12.4911	Landslide Plane	340	12	885.153	1057	3373.21	0	3373.21	3569.3	3569.3
29	3.64733	13866.3	-12.4911	Landslide Plane	340	12	902.752	1078.01	3472.06	0	3472.06	3672.05	3672.05
30	3.64733	14260.2	-12.4911	Landslide Plane	340	12	920.208	1098.86	3570.14	0	3570.14	3774	3774
31	3.52533	14064.9	-5.55178	Landslide Plane	340	12	978.013	1167.88	3894.89	0	3894.89	3989.95	3989.95
32	3.52533	14248.5	-5.55178	Landslide Plane	340	12	986.934	1178.54	3945	0	3945	4040.94	4040.94
33	3.52533	14436.8	-5.55178	Landslide Plane	340	12	996.078	1189.46	3996.39	0	3996.39	4093.21	4093.21
34	4.92	20323.1	0	Landslide Plane	340	12	1042.34	1244.7	4256.3	0	4256.3	4256.3	4256.3

35	3.268	13399.2	12.667	Landslide Plane	340	12	1145.85	1368.31	4837.82	0	4837.82	4580.28	4580.28
36	3.268	12890.7	12.667	Landslide Plane	340	12	1114.37	1330.71	4660.93	0	4660.93	4410.47	4410.47
37	4.48	16393.2	20.6569	Landslide Plane	340	12	1138.92	1360.03	4798.88	0	4798.88	4369.49	4369.49
38	4.48	14740.7	20.6569	Landslide Plane	340	12	1057.3	1262.56	4340.31	0	4340.31	3941.7	3941.7
39	3.60478	10409	34.999	Landslide Plane	340	12	1160.47	1385.76	4919.91	0	4919.91	4107.37	4107.37
40	1.40828	3690.01	11.2956	Landslide Plane	340	12	837.099	999.613	3103.24	0	3103.24	2936.04	2936.04
41	1.38302	3475.81	11.2956	Bedrock	300	32	2190.41	2615.66	3705.82	0	3705.82	3268.31	3268.31
42	4.24195	9693.39	11.2956	Alluvium	200	27	1493.9	1783.92	3108.62	0	3108.62	2810.23	2810.23
43	4.24195	8254.27	11.2956	Alluvium	200	27	1304.19	1557.39	2664.03	0	2664.03	2403.53	2403.53
44	4.24195	6815.15	11.2956	Alluvium	200	27	1114.49	1330.86	2219.44	0	2219.44	1996.83	1996.83
45	4.24195	5375.73	11.2956	Alluvium	200	27	924.748	1104.28	1774.75	0	1774.75	1590.04	1590.04
46	4.24195	3941.83	11.2956	Alluvium	200	27	735.735	878.57	1331.77	0	1331.77	1184.81	1184.81
47	4.11184	2552.71	11.2956	Compacted Fill	270	29	686.852	820.198	992.584	0	992.584	855.392	855.392
48	4.11184	1364.6	11.2956	Compacted Fill	270	29	506.508	604.842	604.072	0	604.072	502.902	502.902
49	4.11184	712.537	11.2956	Compacted Fill	270	29	407.532	486.65	390.846	0	390.846	309.446	309.446
50	4.11184	237.512	11.2956	Compacted Fill	270	29	350.493	418.538	267.969	0	267.969	197.962	197.962

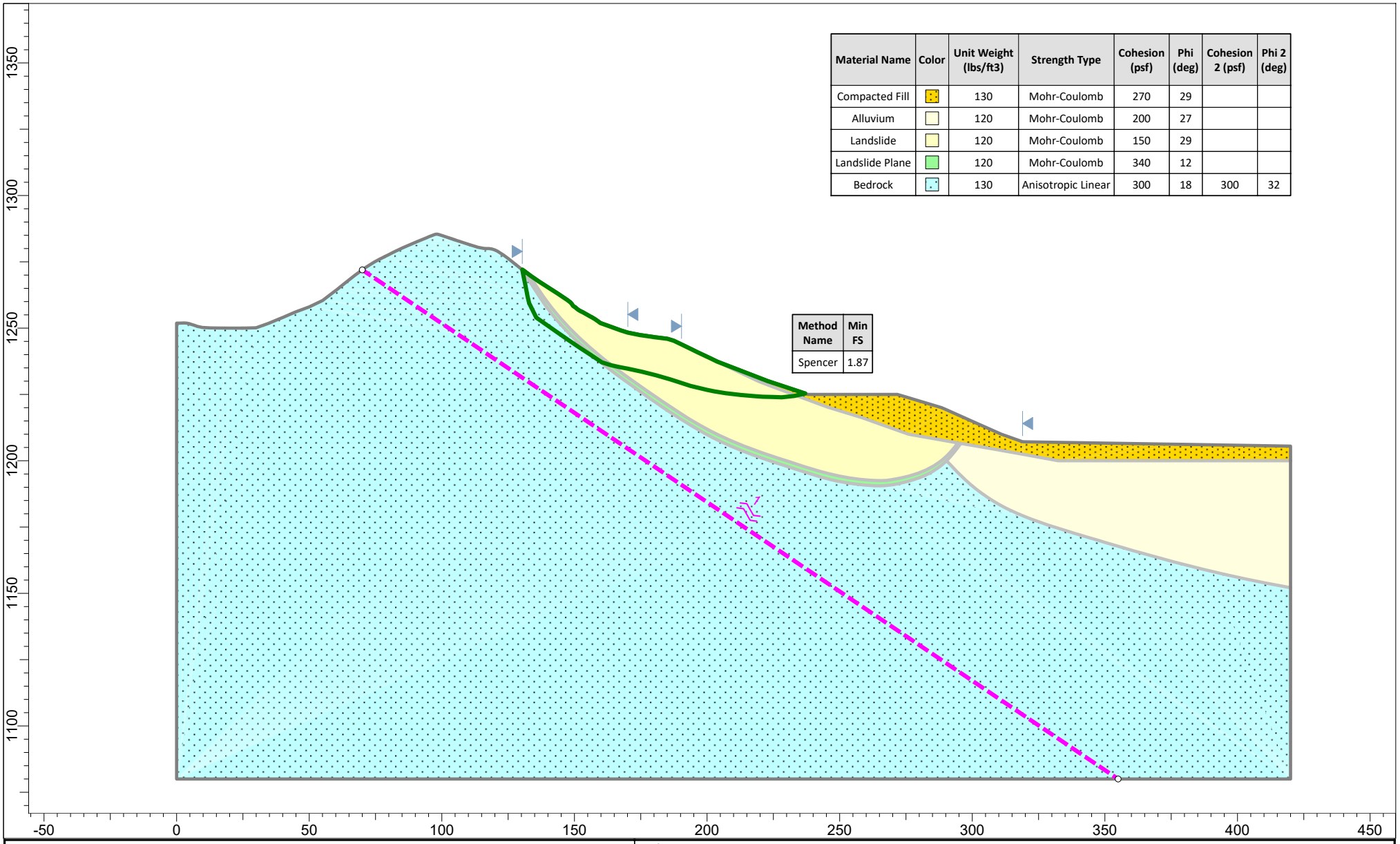
Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.19414

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	122.073	1278.34	0	0	0
2	126.806	1273.13	-573.18	-169.596	16.4828
3	131.54	1267.91	-1385.56	-409.966	16.4827
4	136.273	1262.69	-1774.26	-524.978	16.4827
5	140.29	1258.26	-1324.01	-391.756	16.4827
6	143.05	1254.52	-484.087	-143.234	16.4827
7	149.272	1247.72	2532.36	749.288	16.4827
8	154.308	1243.16	5133.05	1518.79	16.4827
9	159.344	1238.59	8370.92	2476.83	16.4827
10	163.984	1235.16	11292.4	3341.27	16.4828
11	168.624	1231.73	14767	4369.35	16.4828
12	173.264	1228.3	18872.9	5584.21	16.4827
13	177.242	1225.52	22800.3	6746.27	16.4827
14	181.22	1222.74	27291.1	8075.04	16.4827
15	185.199	1219.96	32362.9	9575.72	16.4827
16	189.177	1217.17	37906.9	11216.1	16.4827
17	194.092	1214.38	43769.2	12950.7	16.4828
18	199.007	1211.58	49741.8	14717.9	16.4827

19	203.922	1208.79	55834.5	16520.6	16.4827
20	207.813	1207.15	59403.2	17576.5	16.4827
21	211.703	1205.51	62998.4	18640.3	16.4827
22	215.594	1203.87	66620.2	19711.9	16.4827
23	219.485	1202.24	70268.4	20791.4	16.4827
24	224.083	1200.79	73261.6	21677	16.4827
25	228.681	1199.34	76235.3	22556.9	16.4827
26	233.28	1197.89	79200.8	23434.4	16.4827
27	237.878	1196.44	82158.2	24309.4	16.4827
28	242.476	1195	85219.8	25215.3	16.4827
29	246.123	1194.19	86727.3	25661.3	16.4827
30	249.771	1193.38	88309.8	26129.6	16.4827
31	253.418	1192.57	89966.8	26619.9	16.4827
32	256.943	1192.23	89952.7	26615.7	16.4827
33	260.469	1191.89	89951.8	26615.4	16.4827
34	263.994	1191.55	89964.3	26619.1	16.4827
35	268.914	1191.55	87868.6	25999	16.4827
36	272.182	1192.28	82568.8	24430.9	16.4827
37	275.45	1193.01	77426	22909.2	16.4827
38	279.93	1194.7	66661.5	19724.2	16.4827
39	284.41	1196.39	56790.4	16803.5	16.4828
40	288.015	1198.92	41737.7	12349.6	16.4827
41	289.423	1199.2	40235.8	11905.2	16.4827
42	290.806	1199.47	36694.7	10857.4	16.4827
43	295.048	1200.32	29158.1	8627.47	16.4827
44	299.29	1201.17	22589.6	6683.94	16.4827
45	303.532	1202.02	16989.1	5026.83	16.4827
46	307.774	1202.86	12356.9	3656.22	16.4827
47	312.016	1203.71	8689.13	2570.99	16.4827
48	316.128	1204.53	5423.86	1604.84	16.4827
49	320.24	1205.35	3043.29	900.465	16.4827
50	324.351	1206.17	1148.27	339.757	16.4827
51	328.463	1207	0	0	0

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Cohesion 2 (psf)	Phi 2 (deg)
Compacted Fill		130	Mohr-Coulomb	270	29		
Alluvium		120	Mohr-Coulomb	200	27		
Landslide		120	Mohr-Coulomb	150	29		
Landslide Plane		120	Mohr-Coulomb	340	12		
Bedrock		130	Anisotropic Linear	300	18	300	32



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; Qls mass; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1s2a.slmd
		Scale:	1:600
Project No.:	18-1245A-4	*Date:* 4/3/2019	*Figure No.:* Run No. 4

Slide Analysis Information

t1s2a

Project Summary

File Name:	t1s2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:22.904s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; Qls mass; static
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Landslide	Landslide Plane	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	120	130
Cohesion [psf]	270	200	150	340	
Friction Angle [°]	29	27	29	12	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

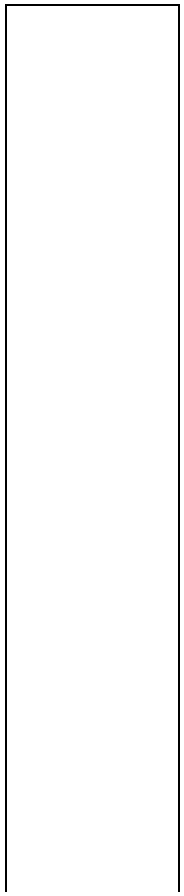
Global Minimums

Method: spencer

FS	1.865540
Axis Location:	230.372, 1355.379
Left Slip Surface Endpoint:	130.333, 1272.055
Right Slip Surface Endpoint:	237.008, 1225.352
Resisting Moment:	1.25641e+07 lb-ft
Driving Moment:	6.7348e+06 lb-ft
Resisting Horizontal Force:	84897.3 lb
Driving Horizontal Force:	45508.1 lb
Total Slice Area:	1225.3 ft2
Surface Horizontal Width:	106.675 ft
Surface Average Height:	11.4863 ft

Global Minimum Coordinates

Method: spencer



X	Y
130.333	1272.05
130.981	1268.84
131.629	1265.58
132.278	1262.3
132.928	1259.43
135.615	1253.96
139.67	1251.12
143.724	1248.29
147.784	1245.46
151.862	1242.7
156.149	1239.92
160.404	1237.1
163.825	1236
167.25	1235.27
170.485	1234.62
173.719	1233.96
178.734	1232.76
183.746	1231.39
188.756	1229.85
193.764	1228.21
198.817	1226.99
203.621	1225.98
208.797	1225.28
213.904	1224.66
217.496	1224.39
221.048	1224.13
224.603	1224.03
228.158	1223.94
232.873	1224.42
237.008	1225.35

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 8949
Number of Invalid Surfaces: 1111

Error Codes:

Error Code -108 reported for 76 surfaces
Error Code -111 reported for 36 surfaces
Error Code -112 reported for 47 surfaces
Error Code -114 reported for 68 surfaces
Error Code -121 reported for 118 surfaces
Error Code -124 reported for 23 surfaces

Error Code -1000 reported for 743 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.86554

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.648014	113.345	-78.6038	Bedrock	300	32	37.7806	70.4812	0	0	0	187.435	187.435
2	0.648333	342.169	-78.758	Bedrock	300	32	112.302	209.504	0	0	0	564.993	564.993
3	0.648857	573.95	-78.7959	Bedrock	300	32	170.719	318.483	29.5792	0	29.5792	891.453	891.453
4	0.650064	790.263	-77.2286	Bedrock	300	32	209.76	391.317	146.137	0	146.137	1071.54	1071.54
5	2.68757	4272.25	-63.8606	Bedrock	300	32	356.873	665.761	585.339	0	585.339	1312.54	1312.54
6	2.02726	3666.8	-34.9563	Bedrock	300	18	395.988	738.732	1350.28	0	1350.28	1627.1	1627.1
7	2.02726	3656.72	-34.9563	Bedrock	300	18	395.32	737.486	1346.44	0	1346.44	1622.8	1622.8
8	2.02721	3654.99	-34.9486	Bedrock	300	18	395.233	737.323	1345.94	0	1345.94	1622.16	1622.16
9	2.02721	3659.36	-34.9486	Bedrock	300	18	395.524	737.865	1347.61	0	1347.61	1624.03	1624.03
10	2.03007	3671.39	-34.8813	Bedrock	300	18	396.176	739.083	1351.36	0	1351.36	1627.54	1627.54
11	2.03007	3666.87	-34.8813	Bedrock	300	18	395.876	738.523	1349.64	0	1349.64	1625.61	1625.61
12	2.03881	3594.29	-34.1135	Bedrock	300	18	392.256	731.769	1328.85	0	1328.85	1594.56	1594.56
13	2.03881	3462.12	-34.1135	Bedrock	300	18	383.469	715.376	1278.4	0	1278.4	1538.16	1538.16
14	2.14329	3647.59	-32.9727	Bedrock	300	18	387.156	722.255	1299.57	0	1299.57	1550.73	1550.73
15	2.14329	3689.27	-32.9727	Bedrock	300	18	389.822	727.229	1314.88	0	1314.88	1567.77	1567.77
16	2.16222	3759.79	-33.5183	Bedrock	300	18	390.682	728.833	1319.81	0	1319.81	1578.58	1578.58
17	2.09321	3634.67	-33.5183	Landslide Plane	340	12	334.149	623.368	1333.14	0	1333.14	1554.46	1554.46
18	1.71062	2987.95	-17.7218	Landslide Plane	340	12	362.653	676.544	1583.31	0	1583.31	1699.2	1699.2
19	1.71062	2972.59	-17.7218	Landslide Plane	340	12	361.726	674.815	1575.18	0	1575.18	1690.78	1690.78
20	0.320477	554.539	-12.0366	Landslide Plane	340	12	371.061	692.23	1657.11	0	1657.11	1736.23	1736.23
21	3.10447	5282.69	-12.0366	Landslide	150	29	571.391	1065.95	1652.42	0	1652.42	1774.25	1774.25
22	3.23449	5342.84	-11.4677	Landslide	150	29	560.357	1045.37	1615.29	0	1615.29	1728.97	1728.97
23	3.23444	5285.84	-11.5374	Landslide	150	29	554.88	1035.15	1596.85	0	1596.85	1710.12	1710.12
24	2.50726	4120.86	-13.4157	Landslide	150	29	546.979	1020.41	1570.27	0	1570.27	1700.73	1700.73
25	2.50726	4186.5	-13.4157	Landslide	150	29	554.378	1034.21	1595.16	0	1595.16	1727.4	1727.4
26	2.50608	4269.75	-15.2666	Landslide	150	29	553.471	1032.52	1592.11	0	1592.11	1743.18	1743.18

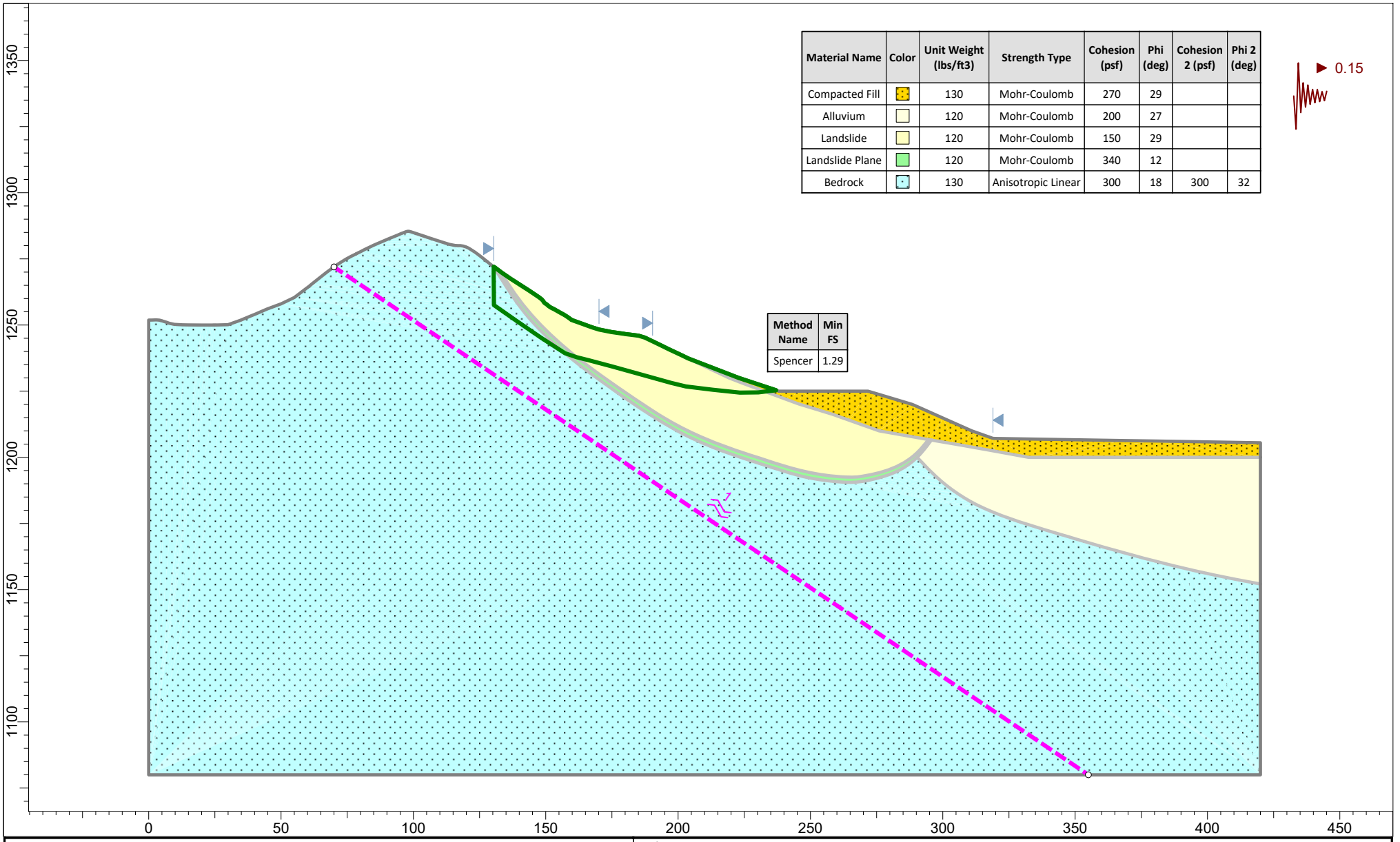
27	2.50608	4377.7	-15.2666	Landslide	150	29	565.398	1054.77	1632.25	0	1632.25	1786.57	1786.57
28	2.50491	4483.75	-17.0868	Landslide	150	29	566.766	1057.33	1636.86	0	1636.86	1811.07	1811.07
29	2.50491	4485.91	-17.0868	Landslide	150	29	567	1057.76	1637.65	0	1637.65	1811.94	1811.94
30	2.50414	4381.33	-18.2124	Landslide	150	29	549.514	1025.14	1578.79	0	1578.79	1759.6	1759.6
31	2.50414	4264.33	-18.2124	Landslide	150	29	536.988	1001.77	1536.64	0	1536.64	1713.32	1713.32
32	2.52664	4147.52	-13.4891	Landslide	150	29	545.992	1018.57	1566.94	0	1566.94	1697.91	1697.91
33	2.52664	3962.69	-13.4891	Landslide	150	29	525.336	980.036	1497.42	0	1497.42	1623.44	1623.44
34	2.40193	3588.32	-11.9122	Landslide	150	29	512.44	955.977	1454.02	0	1454.02	1562.12	1562.12
35	2.40193	3403.83	-11.9122	Landslide	150	29	490.37	914.804	1379.74	0	1379.74	1483.19	1483.19
36	2.58806	3471.9	-7.662	Landslide	150	29	489.41	913.014	1376.51	0	1376.51	1442.35	1442.35
37	2.58806	3274.89	-7.662	Landslide	150	29	466.473	870.224	1299.32	0	1299.32	1362.08	1362.08
38	5.10642	5864.84	-6.98039	Landslide	150	29	434.281	810.169	1190.98	0	1190.98	1244.15	1244.15
39	1.79601	1862.11	-4.23816	Landslide	150	29	411.826	768.277	1115.4	0	1115.4	1145.92	1145.92
40	1.79601	1743.84	-4.23816	Landslide	150	29	391.189	729.778	1045.95	0	1045.95	1074.94	1074.94
41	1.77633	1608.46	-4.25443	Landslide	150	29	370.613	691.393	976.701	0	976.701	1004.27	1004.27
42	1.77633	1491.47	-4.25443	Landslide	150	29	349.976	652.895	907.249	0	907.249	933.284	933.284
43	1.77747	1365.01	-1.57224	Landslide	150	29	336.67	628.072	862.467	0	862.467	871.708	871.708
44	1.77747	1238.97	-1.57224	Landslide	150	29	313.738	585.291	785.285	0	785.285	793.897	793.897
45	1.77749	1125.46	-1.5204	Landslide	150	29	293.239	547.049	716.296	0	716.296	724.079	724.079
46	1.77749	1011.59	-1.5204	Landslide	150	29	272.508	508.374	646.526	0	646.526	653.759	653.759
47	2.35744	1123.03	5.83763	Landslide	150	29	261.848	488.487	610.648	0	610.648	583.877	583.877
48	2.35744	836.838	5.83763	Landslide	150	29	218.763	408.112	465.649	0	465.649	443.282	443.282
49	0.774623	208.054	12.7279	Landslide	150	29	203.014	378.73	412.64	0	412.64	366.785	366.785
50	3.36004	408.072	12.7279	Compacted Fill	270	29	223.8	417.508	266.112	0	266.112	215.562	215.562

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.86554

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	130.333	1272.05	0	0	0
2	130.981	1268.84	-24.4824	-8.11597	18.3405
3	131.629	1265.58	-97.2918	-32.2524	18.3404
4	132.278	1262.3	-111.17	-36.8531	18.3405
5	132.928	1259.43	171.578	56.8784	18.3404
6	135.615	1253.96	2418.05	801.587	18.3404
7	137.643	1252.54	3528.89	1169.83	18.3404
8	139.67	1251.12	4635.64	1536.72	18.3404
9	141.697	1249.71	5741.3	1903.25	18.3404
10	143.724	1248.29	6848.72	2270.36	18.3404
11	145.754	1246.87	7956.91	2637.73	18.3405
12	147.784	1245.46	9063.27	3004.49	18.3404
13	149.823	1244.08	10098.8	3347.76	18.3404
14	151.862	1242.7	11082.5	3673.88	18.3405
15	154.005	1241.31	12059.7	3997.8	18.3404

16	156.149	1239.92	13052.4	4326.89	18.3404
17	158.311	1238.48	14097.8	4673.45	18.3405
18	160.404	1237.1	15246.7	5054.29	18.3404
19	162.115	1236.55	15491.8	5135.56	18.3405
20	163.825	1236	15734.1	5215.88	18.3404
21	164.146	1235.94	15728.4	5213.99	18.3404
22	167.25	1235.27	15048.4	4988.55	18.3404
23	170.485	1234.62	14295.8	4739.07	18.3404
24	173.719	1233.96	13555.4	4493.63	18.3404
25	176.226	1233.36	13123	4350.31	18.3405
26	178.734	1232.76	12687	4205.77	18.3405
27	181.24	1232.08	12389	4106.98	18.3405
28	183.746	1231.39	12088.6	4007.38	18.3404
29	186.251	1230.62	11929.2	3954.55	18.3404
30	188.756	1229.85	11769.9	3901.73	18.3404
31	191.26	1229.03	11694.6	3876.78	18.3404
32	193.764	1228.21	11616	3850.71	18.3404
33	196.291	1227.6	11186.1	3708.22	18.3405
34	198.817	1226.99	10766.4	3569.07	18.3404
35	201.219	1226.49	10272.3	3405.27	18.3404
36	203.621	1225.98	9793.55	3246.58	18.3405
37	206.209	1225.63	9006.18	2985.56	18.3404
38	208.797	1225.28	8251.3	2735.32	18.3404
39	213.904	1224.66	6778.29	2247.01	18.3404
40	215.7	1224.53	6187.1	2051.03	18.3404
41	217.496	1224.39	5623.72	1864.27	18.3404
42	219.272	1224.26	5094.45	1688.82	18.3405
43	221.048	1224.13	4592.66	1522.47	18.3404
44	222.826	1224.08	4036.31	1338.04	18.3404
45	224.603	1224.03	3516.96	1165.88	18.3405
46	226.381	1223.98	3029.52	1004.29	18.3404
47	228.158	1223.94	2575.64	853.83	18.3405
48	230.516	1224.18	1811.17	600.406	18.3404
49	232.873	1224.42	1183.21	392.237	18.3405
50	233.648	1224.59	953.756	316.172	18.3405
51	237.008	1225.35	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; Qls; seismic		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1ps2a.slmd
		Scale:	1:600
Project No.:	18-1245A-4	*Date:* 4/3/2019	*Figure No.:* Run No. 5

Slide Analysis Information

t1ps2a

Project Summary

File Name:	t1ps2a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:12.826s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; Qls; seismic
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Alluvium	Landslide	Landslide Plane	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	120	130
Cohesion [psf]	270	200	150	340	
Friction Angle [°]	29	27	29	12	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.293090
Axis Location:	230.408, 1355.415
Left Slip Surface Endpoint:	130.333, 1272.055
Right Slip Surface Endpoint:	237.051, 1225.338
Resisting Moment:	1.15839e+07 lb-ft
Driving Moment:	8.95829e+06 lb-ft
Resisting Horizontal Force:	81662.2 lb
Driving Horizontal Force:	63152.8 lb
Total Slice Area:	1194.35 ft2
Surface Horizontal Width:	106.719 ft
Surface Average Height:	11.1916 ft

Global Minimum Coordinates

Method: spencer

X	Y
130.333	1272.05
130.359	1268.23
130.385	1264.41
130.411	1260.59
130.437	1257.53
134.879	1254.43
139.32	1251.32
143.816	1248.24
148.311	1245.19
152.807	1242.26
157.305	1239.33
161.715	1237.85
166.124	1236.67
170.533	1235.54
174.972	1234.41
180.583	1232.83
186.193	1231.26
191.804	1229.69
197.414	1228.12
202.911	1226.78
207.98	1226.16
213.077	1225.54
218.208	1225.01
223.362	1224.47
226.857	1224.52
230.353	1224.56
233.702	1224.95
237.051	1225.34

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6265
Number of Invalid Surfaces: 3791

Error Codes:

Error Code -108 reported for 366 surfaces
Error Code -111 reported for 86 surfaces
Error Code -112 reported for 692 surfaces
Error Code -114 reported for 810 surfaces
Error Code -121 reported for 257 surfaces
Error Code -124 reported for 484 surfaces
Error Code -1000 reported for 1096 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.29309

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	0.0261467	6.45786	-89.6079	Bedrock	300	32	1.5795	2.04243	0	0	0	230.819	230.819
2	0.0261467	19.3767	-89.6081	Bedrock	300	32	4.73696	6.12532	0	0	0	692.564	692.564
3	0.0261458	32.2982	-89.6082	Bedrock	300	32	7.89512	10.2091	0	0	0	1154.44	1154.44
4	0.0261458	43.9172	-89.5098	Bedrock	300	32	13.4404	17.3797	0	0	0	1570.98	1570.98
5	2.22074	4133.25	-34.9606	Bedrock	300	18	537.478	695.007	1215.71	0	1215.71	1591.5	1591.5
6	2.22074	4072.41	-34.9606	Bedrock	300	18	532.83	688.997	1197.21	0	1197.21	1569.76	1569.76
7	2.22074	4036.94	-34.9606	Bedrock	300	18	530.12	685.493	1186.43	0	1186.43	1557.08	1557.08
8	2.22074	4020.69	-34.9606	Bedrock	300	18	528.879	683.888	1181.48	0	1181.48	1551.27	1551.27
9	2.24782	4061.8	-34.4193	Bedrock	300	18	531.013	686.647	1189.98	0	1189.98	1553.83	1553.83
10	2.24782	4057.82	-34.4193	Bedrock	300	18	530.71	686.256	1188.77	0	1188.77	1552.42	1552.42

11	2.24783	4055.44	-34.1884	Bedrock	300	18	531.693	687.527	1192.68	0	1192.68	1553.86	1553.86
12	2.24783	4033.07	-34.1884	Bedrock	300	18	529.988	685.322	1185.9	0	1185.9	1545.92	1545.92
13	2.24758	3871.27	-33.0716	Bedrock	300	18	523.119	676.44	1158.56	0	1158.56	1499.21	1499.21
14	2.24758	3755.53	-33.0716	Bedrock	300	18	514.162	664.858	1122.92	0	1122.92	1457.73	1457.73
15	2.2494	3802.58	-33.0796	Bedrock	300	18	517.528	669.21	1136.31	0	1136.31	1473.42	1473.42
16	2.2494	3845.16	-33.0796	Bedrock	300	18	520.82	673.467	1149.41	0	1149.41	1488.67	1488.67
17	2.20477	3686.07	-18.5075	Landslide Plane	340	12	493.594	638.262	1403.22	0	1403.22	1568.44	1568.44
18	2.20477	3547.04	-18.5075	Landslide Plane	340	12	485.069	627.238	1351.35	0	1351.35	1513.72	1513.72
19	2.20477	3507.85	-15.0763	Landslide	150	29	734.168	949.345	1442.06	0	1442.06	1639.82	1639.82
20	2.20477	3454.55	-15.0763	Landslide	150	29	724.909	937.373	1420.46	0	1420.46	1615.73	1615.73
21	2.20434	3406.81	-14.3003	Landslide	150	29	724.898	937.359	1420.43	0	1420.43	1605.21	1605.21
22	2.20434	3359.96	-14.3003	Landslide	150	29	716.659	926.704	1401.21	0	1401.21	1583.89	1583.89
23	2.21949	3393.03	-14.3279	Landslide	150	29	718.112	928.584	1404.6	0	1404.6	1588.02	1588.02
24	2.21949	3427.21	-14.3279	Landslide	150	29	724.08	936.301	1418.52	0	1418.52	1603.47	1603.47
25	2.80526	4417	-15.6683	Landslide	150	29	721.616	933.115	1412.78	0	1412.78	1615.18	1615.18
26	2.80526	4545.61	-15.6683	Landslide	150	29	739.009	955.605	1453.35	0	1453.35	1660.63	1660.63
27	1.87018	3107.18	-15.6683	Landslide	150	29	754.582	975.743	1489.68	0	1489.68	1701.33	1701.33
28	1.87018	3171.48	-15.6683	Landslide	150	29	767.626	992.61	1520.11	0	1520.11	1735.42	1735.42
29	1.87018	3222.63	-15.6683	Landslide	150	29	778.002	1006.03	1544.31	0	1544.31	1762.53	1762.53
30	1.87017	3213.59	-15.6133	Landslide	150	29	776.796	1004.47	1541.5	0	1541.5	1758.58	1758.58
31	1.87017	3147.52	-15.6133	Landslide	150	29	763.381	987.12	1510.2	0	1510.2	1723.53	1723.53
32	1.87017	3064.7	-15.6133	Landslide	150	29	746.565	965.376	1470.98	0	1470.98	1679.61	1679.61
33	2.80525	4433.39	-15.6133	Landslide	150	29	724.414	936.733	1419.3	0	1419.3	1621.75	1621.75
34	2.80525	4238.1	-15.6133	Landslide	150	29	697.98	902.551	1357.64	0	1357.64	1552.69	1552.69
35	2.74846	3954.47	-13.7847	Landslide	150	29	688.692	890.541	1335.97	0	1335.97	1504.93	1504.93
36	2.74846	3744.02	-13.7847	Landslide	150	29	658.761	851.837	1266.15	0	1266.15	1427.77	1427.77
37	2.53473	3239.67	-6.91309	Landslide	150	29	694.022	897.433	1348.4	0	1348.4	1432.55	1432.55
38	2.53473	3038.09	-6.91309	Landslide	150	29	659.19	852.392	1267.15	0	1267.15	1347.07	1347.07
39	2.54807	2853.73	-6.97565	Landslide	150	29	624.146	807.077	1185.4	0	1185.4	1261.77	1261.77
40	2.54807	2653.28	-6.97565	Landslide	150	29	589.729	762.573	1105.11	0	1105.11	1177.26	1177.26
41	2.56582	2461.56	-5.88123	Landslide	150	29	563.328	728.434	1043.52	0	1043.52	1101.55	1101.55
42	2.56582	2243.03	-5.88123	Landslide	150	29	525.354	679.33	954.938	0	954.938	1009.05	1009.05
43	2.57667	2031.96	-5.93551	Landslide	150	29	486.785	629.457	864.963	0	864.963	915.572	915.572
44	2.57667	1807.56	-5.93551	Landslide	150	29	447.992	579.294	774.469	0	774.469	821.045	821.045
45	3.49569	2060.89	0.733769	Landslide	150	29	442.171	571.767	760.888	0	760.888	755.225	755.225
46	1.74785	843.695	0.733769	Landslide	150	29	388.383	502.214	635.41	0	635.41	630.436	630.436
47	1.74785	719.162	0.733769	Landslide	150	29	352.514	455.832	551.735	0	551.735	547.22	547.22
48	2.57278	791.128	6.60356	Landslide	150	29	331.34	428.453	502.344	0	502.344	463.986	463.986

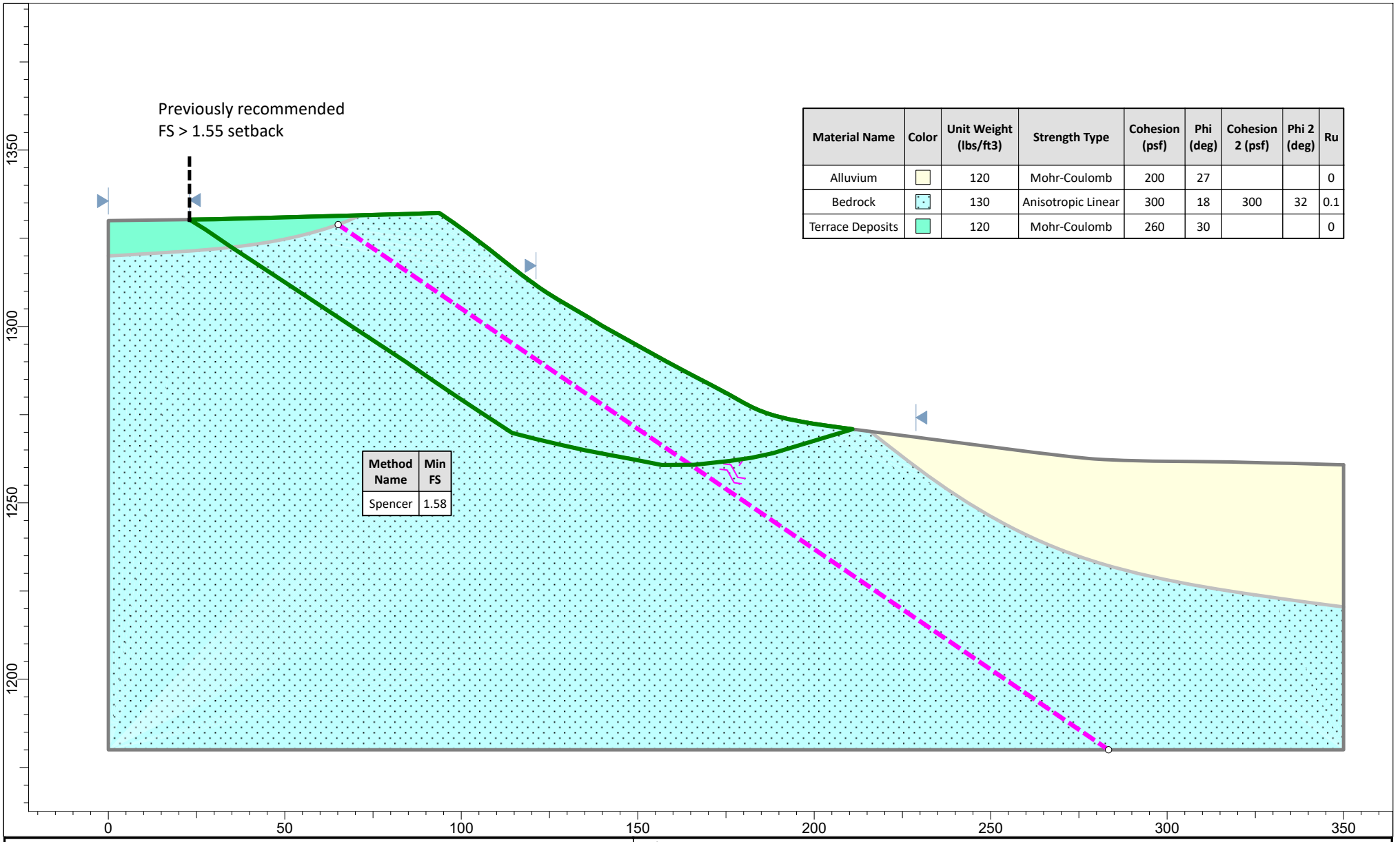
49	0.776257	168.188	6.60356	Compacted Fill	270	29	404.859	523.519	457.361	0	457.361	410.492	410.492
50	3.34903	325.13	6.60356	Compacted Fill	270	29	336.859	435.589	298.73	0	298.73	259.733	259.733

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.29309

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	130.333	1272.05	0	0	0
2	130.359	1268.23	0.92738	0.422702	24.5036
3	130.385	1264.41	3.71002	1.69104	24.5037
4	130.411	1260.59	8.34832	3.80519	24.5036
5	130.437	1257.53	14.5845	6.64766	24.5036
6	132.658	1255.98	1328.6	605.58	24.5036
7	134.879	1254.43	2615.09	1191.97	24.5037
8	137.099	1252.87	3885.54	1771.04	24.5036
9	139.32	1251.32	5148.63	2346.76	24.5036
10	141.568	1249.78	6397.1	2915.82	24.5037
11	143.816	1248.24	7643.81	3484.07	24.5036
12	146.064	1246.71	8878.14	4046.68	24.5036
13	148.311	1245.19	10102.6	4604.79	24.5036
14	150.559	1243.72	11203.2	5106.44	24.5036
15	152.807	1242.26	12254.4	5585.58	24.5036
16	155.056	1240.79	13325.6	6073.84	24.5036
17	157.305	1239.33	14415	6570.38	24.5036
18	159.51	1238.59	14915.2	6798.4	24.5037
19	161.715	1237.85	15375.1	7008.03	24.5037
20	163.92	1237.26	15139.1	6900.44	24.5036
21	166.124	1236.67	14902.6	6792.66	24.5037
22	168.329	1236.1	14613.8	6661.03	24.5037
23	170.533	1235.54	14325.4	6529.56	24.5036
24	172.753	1234.97	14036.8	6398	24.5036
25	174.972	1234.41	13747.9	6266.33	24.5036
26	177.777	1233.62	13497.8	6152.32	24.5036
27	180.583	1232.83	13250	6039.41	24.5037
28	182.453	1232.31	13086.3	5964.79	24.5037

29	184.323	1231.78	12923.9	5890.73	24.5036
30	186.193	1231.26	12762.3	5817.11	24.5037
31	188.063	1230.74	12597.3	5741.87	24.5036
32	189.933	1230.21	12431	5666.09	24.5037
33	191.804	1229.69	12263.3	5589.63	24.5036
34	194.609	1228.91	12008.8	5473.62	24.5035
35	197.414	1228.12	11750.8	5356.03	24.5036
36	200.163	1227.45	11351.9	5174.24	24.5037
37	202.911	1226.78	10956.7	4994.1	24.5037
38	205.446	1226.47	10097.9	4602.65	24.5036
39	207.98	1226.16	9272.16	4226.28	24.5036
40	210.529	1225.85	8479.4	3864.94	24.5037
41	213.077	1225.54	7719.25	3518.46	24.5037
42	215.642	1225.27	6918.88	3153.65	24.5037
43	218.208	1225.01	6159.76	2807.64	24.5037
44	220.785	1224.74	5441.97	2480.47	24.5037
45	223.362	1224.47	4766.24	2172.47	24.5037
46	226.857	1224.52	3495.6	1593.31	24.5037
47	228.605	1224.54	2929.1	1335.09	24.5036
48	230.353	1224.56	2408.48	1097.79	24.5036
49	232.926	1224.86	1525.06	695.125	24.5036
50	233.702	1224.95	1194.91	544.642	24.5036
51	237.051	1225.34	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 27-27'; NS-2; static; cuckoo search; setback analysis		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t27s1a.slmd
		Scale:	1:450
Project No.:	18-1245A-4	*Date:* 4/3/2019	*Figure No.:* Run No. 6

Slide Analysis Information

t27s1a

Project Summary

File Name:	t27s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:16.399s
Project Title:	VTTM 60257
Analysis:	Section 27-27'; NS-2; static; cuckoo search; setback analysis
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Alluvium	Bedrock	Terrace Deposits
Color			
Strength Type	Mohr-Coulomb	Anisotropic Linear	Mohr-Coulomb
Unit Weight [lbs/ft3]	120	130	120
Cohesion [psf]	200		260
Friction Angle [°]	27		30
Cohesion 1 [psf]		300	
Cohesion 2 [psf]		300	
Friction Angle 1 [°]		18	
Friction Angle 2 [°]		32	
A [°]		1	
B [°]		1	
Anisotropic Definition		Surface	
Angle from 1 [°]			
Anisotropic Surface		Anisotropic Surface 1	
Water Surface	None	None	None
Ru Value	0	0.1	0

Global Minimums

Method: spencer

FS	1.577430
Axis Location:	176.344, 1488.436
Left Slip Surface Endpoint:	23.000, 1330.281
Right Slip Surface Endpoint:	210.862, 1270.867
Resisting Moment:	7.74143e+07 lb-ft
Driving Moment:	4.92481e+07 lb-ft
Resisting Horizontal Force:	323354 lb
Driving Horizontal Force:	205706 lb
Total Slice Area:	5079.92 ft2
Surface Horizontal Width:	187.862 ft
Surface Average Height:	27.0407 ft

Global Minimum Coordinates

Method: spencer

X	Y
22.9996	1330.28
27.5237	1327.49
34.6108	1322.65
41.6979	1318
48.785	1313.34
55.8721	1308.69
62.9593	1304.02
70.0446	1299.34
77.1327	1294.69
84.2209	1290.03
91.779	1284.8
99.3371	1279.72
106.895	1274.75
114.453	1269.79
121.283	1268.04
128.112	1266.44
134.942	1264.91
141.771	1263.62
149.31	1262.2
156.848	1260.71
165.95	1260.78
176.27	1261.88
182.267	1262.78
188.265	1264.06
196.565	1266.56
204.865	1269.05
210.862	1270.87

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9595
Number of Invalid Surfaces: 465

Error Codes:

Error Code -108 reported for 21 surfaces
Error Code -111 reported for 4 surfaces
Error Code -112 reported for 25 surfaces
Error Code -114 reported for 29 surfaces
Error Code -121 reported for 277 surfaces
Error Code -124 reported for 2 surfaces
Error Code -1000 reported for 107 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.57743

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	4.52405	772.312	-31.6623	Terrace Deposits	260	30	198.285	312.781	91.4195	0	91.4195	213.703	213.703
2	3.54355	1734.41	-34.3195	Terrace Deposits	260	30	280.551	442.55	316.185	0	316.185	507.704	507.704
3	3.54355	2798.8	-34.3195	Terrace Deposits	260	30	361.985	571.006	538.679	0	538.679	785.789	785.789
4	0.269818	256.836	-33.2974	Terrace Deposits	260	30	410.304	647.226	670.696	0	670.696	940.188	940.188
5	3.40865	3804.35	-33.2974	Bedrock	300	18	337.754	532.783	828.039	111.609	716.43	1049.88	938.271
6	3.40865	4849.43	-33.2974	Bedrock	300	18	381.332	601.524	1070.26	142.268	927.996	1320.73	1178.46
7	3.54356	6151.41	-33.2974	Bedrock	300	18	425.857	671.759	1317.75	173.594	1144.16	1597.46	1423.86
8	3.54356	7285.59	-33.2974	Bedrock	300	18	471.35	743.521	1570.62	205.601	1365.02	1880.2	1674.6
9	3.54356	8422.86	-33.2974	Bedrock	300	18	516.966	815.478	1824.17	237.695	1586.48	2163.72	1926.03
10	3.54356	9563.74	-33.2974	Bedrock	300	18	562.728	887.664	2078.53	269.891	1808.64	2448.14	2178.25
11	3.54358	10709.9	-33.347	Bedrock	300	18	608.434	959.762	2332.77	302.234	2030.54	2733.16	2430.92

12	3.54358	11861.8	-33.347	Bedrock	300	18	654.614	1032.61	2589.49	334.741	2254.74	3020.26	2685.51
13	3.54263	13017.9	-33.4593	Bedrock	300	18	700.391	1104.82	2844.45	367.465	2476.98	3307.31	2939.85
14	3.54263	14186.9	-33.4593	Bedrock	300	18	747.211	1178.67	3104.74	400.463	2704.28	3598.55	3198.09
15	3.54408	15355.5	-33.2973	Bedrock	300	18	794.949	1253.98	3369.32	433.271	2936.05	3891.45	3458.18
16	3.54408	16476.4	-33.2973	Bedrock	300	18	839.904	1324.89	3619.19	464.899	3154.29	4170.85	3705.95
17	3.54408	17593.7	-33.2973	Bedrock	300	18	884.711	1395.57	3868.26	496.425	3371.83	4449.34	3952.92
18	3.54408	18711	-33.2973	Bedrock	300	18	929.525	1466.26	4117.33	527.952	3589.38	4727.85	4199.9
19	3.77905	21218	-34.6727	Bedrock	300	18	964.366	1521.22	4319.99	561.465	3758.52	4987.07	4425.6
20	3.77905	22563.1	-34.6727	Bedrock	300	18	1014.21	1599.84	4597.57	597.059	4000.51	5299.12	4702.06
21	3.77908	23735.6	-33.9289	Bedrock	300	18	1065.32	1680.47	4876.73	628.08	4248.65	5593.38	4965.3
22	3.77908	23891.9	-33.9289	Bedrock	300	18	1071.16	1689.68	4909.22	632.216	4277.01	5629.8	4997.58
23	3.77909	23787.6	-33.2977	Bedrock	300	18	1073.79	1693.83	4919.21	629.453	4289.75	5624.49	4995.04
24	3.77909	23618	-33.2977	Bedrock	300	18	1067.41	1683.76	4883.75	624.965	4258.79	5584.85	4959.88
25	7.55817	46579.7	-33.2977	Bedrock	300	18	1055.07	1664.3	4815.15	616.282	4198.87	5508.15	4891.86
26	3.41469	20426.4	-14.3549	Bedrock	300	32	2193.71	3460.43	5655.94	598.191	5057.75	6217.35	5619.16
27	3.41469	19689.6	-14.3549	Bedrock	300	32	2121.6	3346.67	5452.32	576.616	4875.71	5995.27	5418.66
28	3.41471	18992.5	-13.1738	Bedrock	300	32	2084.19	3287.66	5337.44	556.196	4781.24	5825.28	5269.08
29	3.41471	18368.9	-13.1738	Bedrock	300	32	2022.18	3189.85	5162.65	537.934	4624.71	5635.97	5098.04
30	3.41473	17817.3	-12.6402	Bedrock	300	32	1980.63	3124.31	5041.62	521.778	4519.84	5485.8	4964.03
31	3.41473	17273.5	-12.6402	Bedrock	300	32	1926.18	3038.42	4888.23	505.853	4382.38	5320.2	4814.35
32	3.41474	16685.9	-10.6874	Bedrock	300	32	1914.08	3019.32	4840.47	488.643	4351.83	5201.7	4713.06
33	3.41474	16049.5	-10.6874	Bedrock	300	32	1848.68	2916.17	4656.76	470.007	4186.75	5005.65	4535.64
34	3.76925	17049	-10.7124	Bedrock	300	32	1786.04	2817.36	4480.93	452.318	4028.61	4818.8	4366.49
35	3.76925	16385.9	-10.7124	Bedrock	300	32	1724.34	2720.02	4307.57	434.726	3872.85	4633.78	4199.05
36	3.76924	15721.2	-11.1421	Bedrock	300	32	1653.49	2608.27	4111.1	417.092	3694	4436.76	4019.67
37	3.76924	15051.6	-11.1421	Bedrock	300	32	1591.53	2510.53	3936.93	399.327	3537.6	4250.39	3851.06
38	4.55076	17033.9	0.413529	Bedrock	300	32	1749.94	2760.4	4311.78	374.308	3937.47	4299.15	3924.84
39	4.55076	15580.8	0.413529	Bedrock	300	32	1619.24	2554.23	3949.89	342.377	3607.52	3938.21	3595.83
40	5.16001	15770.1	6.11318	Bedrock	300	32	1593.47	2513.58	3848.1	305.622	3542.48	3677.44	3371.82
41	5.16001	13585.2	6.11318	Bedrock	300	32	1404.5	2215.5	3328.73	263.279	3065.45	3178.3	2915.02
42	2.99887	6825.03	8.53416	Bedrock	300	32	1291.29	2036.92	3007.24	227.586	2779.65	2813.47	2585.88
43	2.99887	6000.77	8.53416	Bedrock	300	32	1163.74	1835.72	2657.77	200.101	2457.67	2483.14	2283.04
44	2.99889	5226.49	12.0602	Bedrock	300	32	1103.08	1740.03	2478.81	174.281	2304.53	2243.13	2068.85
45	2.99889	4528.54	12.0602	Bedrock	300	32	988.399	1559.13	2166.04	151.007	2015.03	1954.87	1803.86
46	8.30005	9201.49	16.7196	Bedrock	300	32	854.117	1347.31	1786.92	110.861	1676.06	1530.35	1419.49
47	4.15003	2933.26	16.7196	Bedrock	300	32	638.284	1006.85	1201.87	70.6806	1131.19	1010.14	939.461
48	4.15003	1911.32	16.7196	Bedrock	300	32	506.006	798.189	843.325	46.0556	797.27	691.328	645.272
49	2.99821	763.106	16.8522	Bedrock	300	32	396.136	624.877	545.362	25.4521	519.91	425.368	399.916
50	2.99821	253.203	16.8522	Bedrock	300	32	310.2	489.318	311.417	8.44515	302.972	217.454	209.009

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.57743

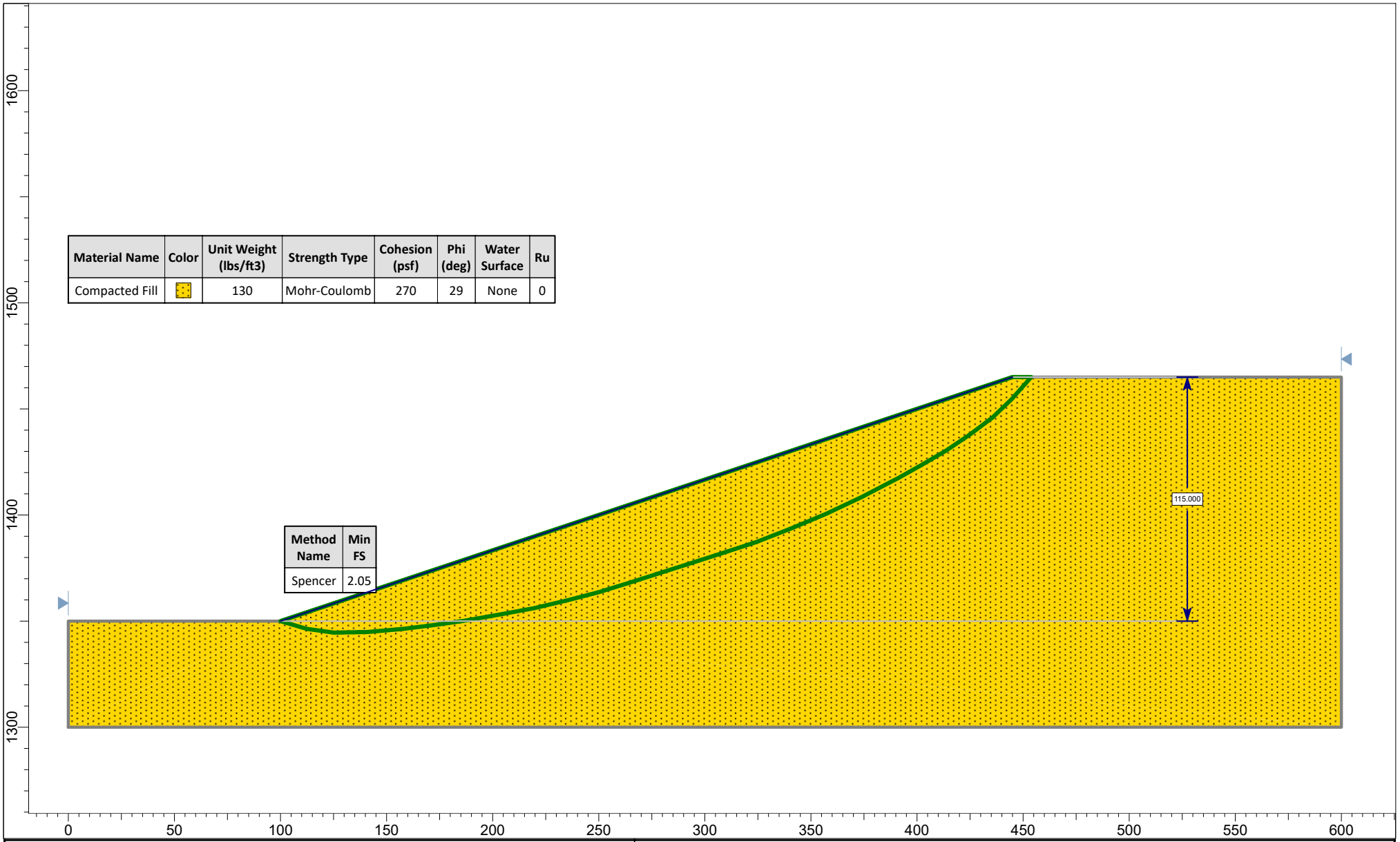
Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]

1	22.9996	1330.28	0	0	0
2	27.5237	1327.49	-647.077	-201.138	17.2674
3	31.0672	1325.07	-882.001	-274.162	17.2674
4	34.6108	1322.65	-868.912	-270.094	17.2674
5	34.8806	1322.48	-861.386	-267.754	17.2674
6	38.2892	1320.24	-165.345	-51.396	17.2674
7	41.6979	1318	923.615	287.098	17.2674
8	45.2415	1315.67	2473.02	768.715	17.2674
9	48.785	1313.34	4448.83	1382.88	17.2674
10	52.3286	1311.02	6852.22	2129.95	17.2674
11	55.8721	1308.69	9684.55	3010.36	17.2674
12	59.4157	1306.36	12956	4027.26	17.2674
13	62.9593	1304.02	16661.5	5179.07	17.2674
14	66.5019	1301.68	20825.6	6473.45	17.2674
15	70.0446	1299.34	25432.3	7905.4	17.2674
16	73.5886	1297.01	30442	9462.62	17.2674
17	77.1327	1294.69	35873.1	11150.8	17.2673
18	80.6768	1292.36	41724.3	12969.6	17.2674
19	84.2209	1290.03	47995.6	14919	17.2674
20	87.9999	1287.42	55623.3	17290	17.2674
21	91.779	1284.8	63787.2	19827.7	17.2674
22	95.5581	1282.26	72136.1	22422.9	17.2674
23	99.3371	1279.72	80545.4	25036.8	17.2674
24	103.116	1277.24	88674.9	27563.8	17.2674
25	106.895	1274.75	96740.5	30070.9	17.2674
26	114.453	1269.79	112625	35008.5	17.2674
27	117.868	1268.92	110034	34203.2	17.2674
28	121.283	1268.04	107513	33419.6	17.2675
29	124.698	1267.24	104622	32520.9	17.2674
30	128.112	1266.44	101804	31644.9	17.2674
31	131.527	1265.68	98863.4	30730.8	17.2674
32	134.942	1264.91	95992.1	29838.3	17.2674
33	138.356	1264.27	92538.4	28764.8	17.2674
34	141.771	1263.62	89190.9	27724.2	17.2674
35	145.54	1262.91	85615.8	26612.9	17.2674
36	149.31	1262.2	82151.1	25535.9	17.2674
37	153.079	1261.45	78935.3	24536.3	17.2674
38	156.848	1260.71	75825.1	23569.6	17.2674
39	161.399	1260.74	67674.8	21036.1	17.2674
40	165.95	1260.78	60134.5	18692.3	17.2674
41	171.11	1261.33	49738.9	15460.9	17.2674
42	176.27	1261.88	40611	12623.6	17.2674
43	179.269	1262.33	35363.4	10992.4	17.2674
44	182.267	1262.78	30657.7	9529.66	17.2674
45	185.266	1263.42	25742.7	8001.88	17.2674
46	188.265	1264.06	21373.9	6643.89	17.2674
47	196.565	1266.56	9789.31	3042.92	17.2674
48	200.715	1267.8	5627.13	1749.14	17.2674

49	204.865	1269.05	2463.99	765.908	17.2674
50	207.864	1269.96	774.261	240.672	17.2674
51	210.862	1270.87	0	0	0

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Ru
Compacted Fill		130	Mohr-Coulomb	270	29	None	0

Method Name	Min FS
Spencer	2.05



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Schematic 115' High 3:1 fill slope; non-circular search; static		
Client:	Sterling Gateway	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	schematic 3 to 1.slmd
		Scale:	1:750
Project No.:	18-1245A-4	*Date:* 4/3/2019	*Figure No.:* Run No. 7

Slide Analysis Information

schematic 3 to 1

Project Summary

File Name:	schematic 3 to 1.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:01.879s
Project Title:	VTTM 60257
Analysis:	Schematic 115' High 3:1 fill slope; non-circular search; static
Author:	K. Callahan

Comments

Sterling Gateway
Sterling Ranch Estates
18-1245A-4

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	130
Cohesion [psf]	270
Friction Angle [°]	29
Water Surface	None
Ru Value	0

Global Minimums

Method: spencer

FS	2.049060
Axis Location:	161.889, 1761.279
Left Slip Surface Endpoint:	100.000, 1350.000
Right Slip Surface Endpoint:	453.779, 1465.000
Resisting Moment:	3.25748e+08 lb-ft
Driving Moment:	1.58975e+08 lb-ft
Resisting Horizontal Force:	747275 lb
Driving Horizontal Force:	364692 lb
Total Slice Area:	9920.23 ft2
Surface Horizontal Width:	353.779 ft
Surface Average Height:	28.0408 ft

Global Minimum Coordinates

Method: spencer

X	Y
100	1350
112.39	1346.31
125.139	1344.56
141.259	1344.9
157.379	1346.29
171.696	1348.05
186.189	1350.07
202.829	1353
219.463	1356.08
234.664	1359.69
249.853	1363.56
265.042	1368.26
280.232	1373.1
291.398	1376.66
307.844	1381.9
324.29	1387.28
340.736	1393.68
357.182	1400.53
374.173	1408.56
382.668	1412.99
391.164	1417.42
402.349	1423.67
413.509	1430.25
424.527	1437.64
435.545	1445.9
444.662	1454.65
453.779	1465

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 9289
Number of Invalid Surfaces: 766

Error Codes:

Error Code -106 reported for 5 surfaces
Error Code -108 reported for 72 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 41 surfaces
Error Code -112 reported for 52 surfaces
Error Code -114 reported for 42 surfaces
Error Code -121 reported for 60 surfaces
Error Code -124 reported for 6 surfaces
Error Code -1000 reported for 487 surfaces

Error Codes

The following errors were encountered during the computation:

-106 = Average slice width is less than 0.0001 * (maximum horizontal extent of soil region). This limitation is imposed to avoid numerical errors which may result from too many slices, or too small a slip region.
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 2.04906

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	6.19482	1574.26	-16.5824	Compacted Fill	270	29	252.122	516.613	444.901	0	444.901	369.825	369.825
2	6.19482	4722.78	-16.5824	Compacted Fill	270	29	435.781	892.942	1123.82	0	1123.82	994.052	994.052
3	6.37484	7723.67	-7.82754	Compacted Fill	270	29	541.556	1109.68	1514.82	0	1514.82	1440.37	1440.37
4	6.37484	10210.9	-7.82754	Compacted Fill	270	29	667.457	1367.66	1980.23	0	1980.23	1888.48	1888.48
5	8.05985	15800.7	1.20867	Compacted Fill	270	29	713.683	1462.38	2151.11	0	2151.11	2166.17	2166.17
6	8.05985	18437.5	1.20867	Compacted Fill	270	29	808.956	1657.6	2503.3	0	2503.3	2520.37	2520.37
7	8.05986	20798.6	4.93798	Compacted Fill	270	29	862.176	1766.65	2700.03	0	2700.03	2774.52	2774.52

8	8.05986	22884	4.93798	Compacted Fill	270	29	934.59	1915.03	2967.72	0	2967.72	3048.46	3048.46
9	7.15881	21953.8	6.98833	Compacted Fill	270	29	978.585	2005.18	3130.35	0	3130.35	3250.3	3250.3
10	7.15881	23357.9	6.98833	Compacted Fill	270	29	1032.32	2115.28	3328.98	0	3328.98	3455.52	3455.52
11	7.24636	25015.7	7.94466	Compacted Fill	270	29	1074.19	2201.09	3483.78	0	3483.78	3633.69	3633.69
12	7.24636	26338.4	7.94466	Compacted Fill	270	29	1123.71	2302.55	3666.82	0	3666.82	3823.64	3823.64
13	8.32002	31707.5	9.98982	Compacted Fill	270	29	1148.6	2353.56	3758.83	0	3758.83	3961.15	3961.15
14	8.32002	33122.1	9.98982	Compacted Fill	270	29	1193.76	2446.08	3925.75	0	3925.75	4136.03	4136.03
15	5.54457	22840	10.5013	Compacted Fill	270	29	1224.44	2508.96	4039.18	0	4039.18	4266.15	4266.15
16	5.54457	23431.3	10.5013	Compacted Fill	270	29	1252.62	2566.7	4143.37	0	4143.37	4375.55	4375.55
17	5.54457	24022.7	10.5013	Compacted Fill	270	29	1280.8	2624.44	4247.53	0	4247.53	4484.94	4484.94
18	7.60055	33696.7	13.3464	Compacted Fill	270	29	1272.1	2606.6	4215.35	0	4215.35	4517.15	4517.15
19	7.60055	34418.3	13.3464	Compacted Fill	270	29	1296.47	2656.54	4305.42	0	4305.42	4613	4613
20	7.5946	35045.5	14.3067	Compacted Fill	270	29	1306.47	2677.03	4342.4	0	4342.4	4675.58	4675.58
21	7.5946	35632.7	14.3067	Compacted Fill	270	29	1326.12	2717.3	4415.05	0	4415.05	4753.24	4753.24
22	7.5946	36017.8	17.1679	Compacted Fill	270	29	1302.75	2669.42	4328.66	0	4328.66	4731.13	4731.13
23	7.5946	36200.7	17.1679	Compacted Fill	270	29	1308.7	2681.6	4350.65	0	4350.65	4754.95	4754.95
24	7.59461	36347	17.6779	Compacted Fill	270	29	1307.04	2678.21	4344.53	0	4344.53	4761.1	4761.1
25	7.59461	36456.6	17.6779	Compacted Fill	270	29	1310.59	2685.48	4357.64	0	4357.64	4775.34	4775.34
26	5.58339	26872	17.6779	Compacted Fill	270	29	1313.67	2691.78	4369.01	0	4369.01	4787.7	4787.7
27	5.58339	26931.2	17.6779	Compacted Fill	270	29	1316.27	2697.12	4378.63	0	4378.63	4798.15	4798.15
28	8.2229	39770.7	17.6779	Compacted Fill	270	29	1319.49	2703.72	4390.55	0	4390.55	4811.09	4811.09
29	8.2229	39899.2	17.6779	Compacted Fill	270	29	1323.33	2711.59	4404.74	0	4404.74	4826.51	4826.51
30	8.22292	39990.3	18.1192	Compacted Fill	270	29	1320.45	2705.68	4394.07	0	4394.07	4826.15	4826.15
31	8.22292	40044	18.1192	Compacted Fill	270	29	1322.05	2708.95	4399.98	0	4399.98	4832.58	4832.58
32	8.22292	39824.5	21.2759	Compacted Fill	270	29	1276.18	2614.97	4230.44	0	4230.44	4727.38	4727.38
33	8.22292	39331.7	21.2759	Compacted Fill	270	29	1261.99	2585.89	4177.97	0	4177.97	4669.39	4669.39
34	8.22295	38721.1	22.5979	Compacted Fill	270	29	1228.63	2517.54	4054.67	0	4054.67	4566.04	4566.04
35	8.22295	37992.6	22.5979	Compacted Fill	270	29	1207.93	2475.12	3978.14	0	3978.14	4480.9	4480.9
36	5.66364	25626	25.3072	Compacted Fill	270	29	1154.86	2366.37	3781.95	0	3781.95	4328.03	4328.03
37	5.66364	25044.2	25.3072	Compacted Fill	270	29	1131.52	2318.55	3695.68	0	3695.68	4230.72	4230.72
38	5.66364	24462.4	25.3072	Compacted Fill	270	29	1108.18	2270.72	3609.4	0	3609.4	4133.41	4133.41
39	8.4955	35374.7	27.5416	Compacted Fill	270	29	1049.77	2151.05	3393.52	0	3393.52	3940.96	3940.96
40	8.4955	33609.4	27.5416	Compacted Fill	270	29	1003.65	2056.54	3223	0	3223	3746.39	3746.39
41	5.59266	21087	29.1715	Compacted Fill	270	29	947.19	1940.85	3014.3	0	3014.3	3543.04	3543.04
42	5.59266	20172.5	29.1715	Compacted Fill	270	29	911.516	1867.75	2882.42	0	2882.42	3391.25	3391.25
43	5.5799	19151.4	30.5297	Compacted Fill	270	29	861.8	1765.88	2698.64	0	2698.64	3206.88	3206.88
44	5.5799	18113.6	30.5297	Compacted Fill	270	29	821.801	1683.92	2550.79	0	2550.79	3035.44	3035.44
45	5.50904	16705	33.8629	Compacted Fill	270	29	750.564	1537.95	2287.44	0	2287.44	2791.09	2791.09
46	5.50904	15372.7	33.8629	Compacted Fill	270	29	700.409	1435.18	2102.04	0	2102.04	2572.04	2572.04
47	5.50909	13885.5	36.8532	Compacted Fill	270	29	625.34	1281.36	1824.54	0	1824.54	2293.26	2293.26
48	5.50909	12243.4	36.8532	Compacted Fill	270	29	565.57	1158.89	1603.59	0	1603.59	2027.51	2027.51
49	9.11683	15516.9	43.8302	Compacted Fill	270	29	429.494	880.06	1100.58	0	1100.58	1512.89	1512.89
50	9.11702	6130.16	48.6203	Compacted Fill	270	29	231.663	474.691	369.272	0	369.272	632.229	632.229

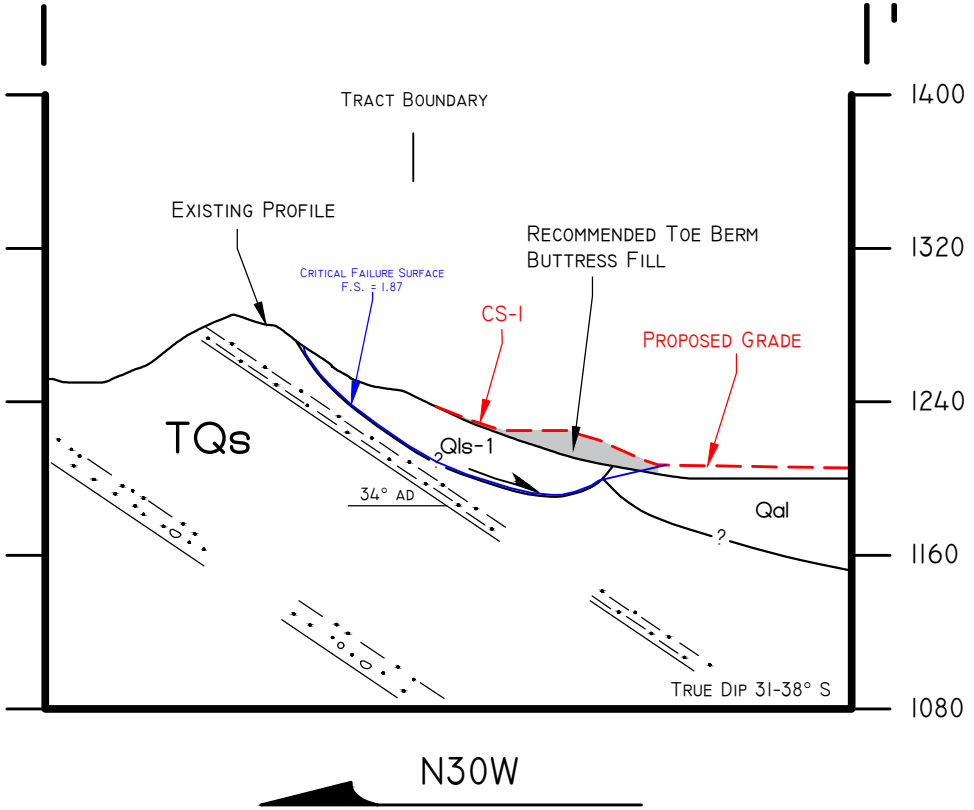
Interslice Data

Global Minimum Query (spencer) - Safety Factor: 2.04906

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	100	1350	0	0	0
2	106.195	1348.16	2382.88	737.055	17.1875
3	112.39	1346.31	7156.12	2213.48	17.1875
4	118.764	1345.43	11936.7	3692.18	17.1875
5	125.139	1344.56	17928	5545.35	17.1875
6	133.199	1344.73	23315.5	7211.8	17.1875
7	141.259	1344.9	29411.3	9097.3	17.1875
8	149.319	1345.59	34481.6	10665.6	17.1875
9	157.379	1346.29	39949.3	12356.8	17.1875
10	164.538	1347.17	44209.3	13674.5	17.1875
11	171.696	1348.05	48679.8	15057.3	17.1875
12	178.943	1349.06	52942.4	16375.8	17.1875
13	186.189	1350.07	57378.8	17748	17.1875
14	194.509	1351.53	61428.6	19000.7	17.1875
15	202.829	1353	65609.5	20293.9	17.1875
16	208.374	1354.03	68248.7	21110.2	17.1875
17	213.918	1355.05	70937	21941.7	17.1875
18	219.463	1356.08	73674.6	22788.5	17.1875
19	227.063	1357.89	75744.2	23428.7	17.1875
20	234.664	1359.69	77836.6	24075.9	17.1875
21	242.259	1361.63	79350.5	24544.2	17.1876
22	249.853	1363.56	80873	25015.1	17.1875
23	257.448	1365.91	80612.8	24934.6	17.1875
24	265.042	1368.26	80346.2	24852.1	17.1875
25	272.637	1370.68	79758.8	24670.4	17.1875
26	280.232	1373.1	79166.5	24487.2	17.1875
27	285.815	1374.88	78728.1	24351.6	17.1875
28	291.398	1376.66	78287	24215.2	17.1875
29	299.621	1379.28	77632.7	24012.8	17.1875
30	307.844	1381.9	76972.9	23808.7	17.1875
31	316.067	1384.59	76009.8	23510.8	17.1875
32	324.29	1387.28	75044.1	23212.1	17.1875
33	332.513	1390.48	71994.4	22268.8	17.1875
34	340.736	1393.68	68995.9	21341.3	17.1875
35	348.959	1397.1	65223.8	20174.6	17.1875
36	357.182	1400.53	61543.3	19036.2	17.1876
37	362.845	1403.21	57957.1	17926.9	17.1875
38	368.509	1405.88	54469.7	16848.2	17.1875
39	374.173	1408.56	51081.2	15800.1	17.1875
40	382.668	1412.99	44967.1	13908.9	17.1875
41	391.164	1417.42	39216.5	12130.2	17.1876
42	396.756	1420.54	35104.3	10858.2	17.1875
43	402.349	1423.67	31204.4	9651.92	17.1875
44	407.929	1426.96	27133.7	8392.81	17.1875

45	413.509	1430.25	23326.4	7215.16	17.1875
46	419.018	1433.94	19006.1	5878.82	17.1875
47	424.527	1437.64	15094.8	4669.01	17.1875
48	430.036	1441.77	11006.5	3404.44	17.1875
49	435.545	1445.9	7501.16	2320.21	17.1875
50	444.662	1454.65	1785.4	552.249	17.1876
51	453.779	1465	0	0	0

Appendix D



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CROSS SECTION I-I'

JOB NO.: *19-1245A-4*

DATE: *4/3/19*

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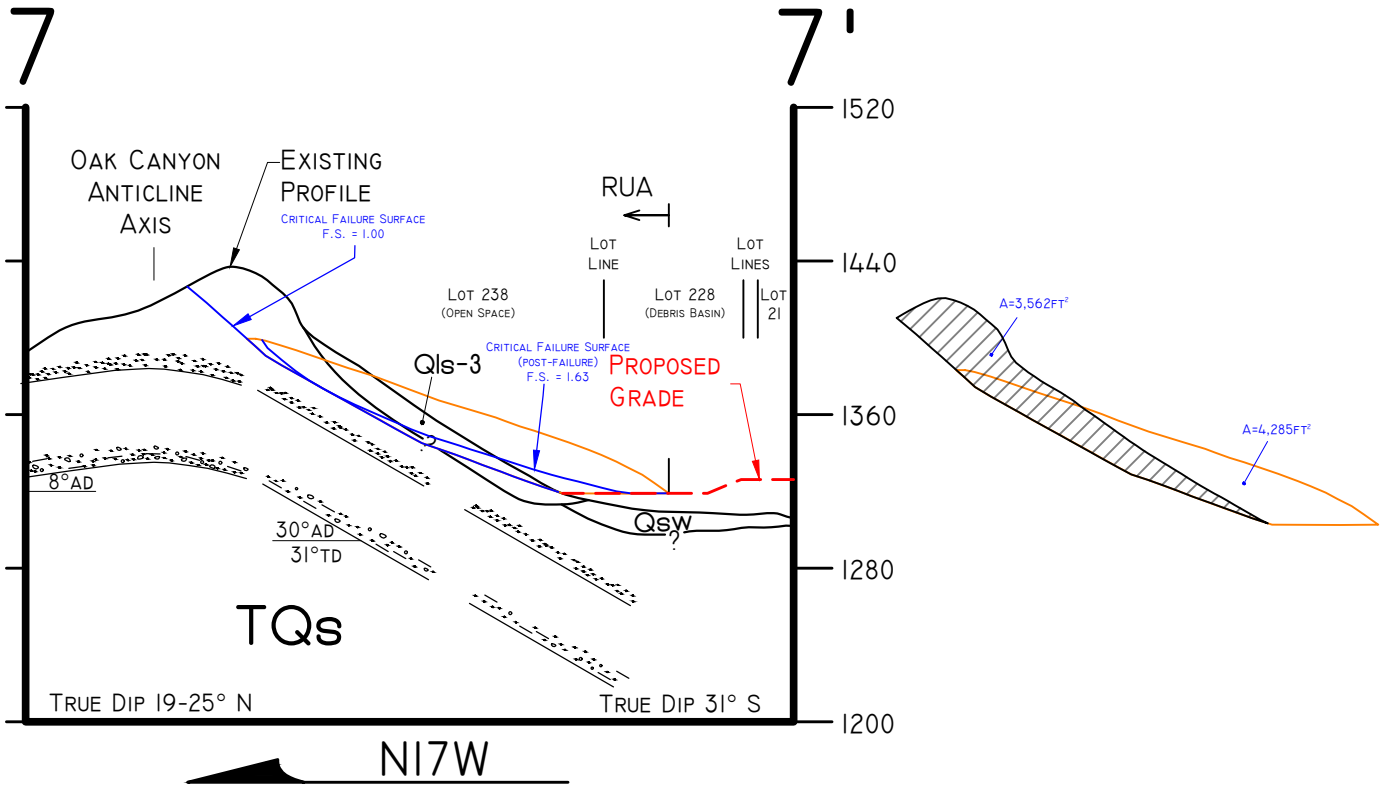


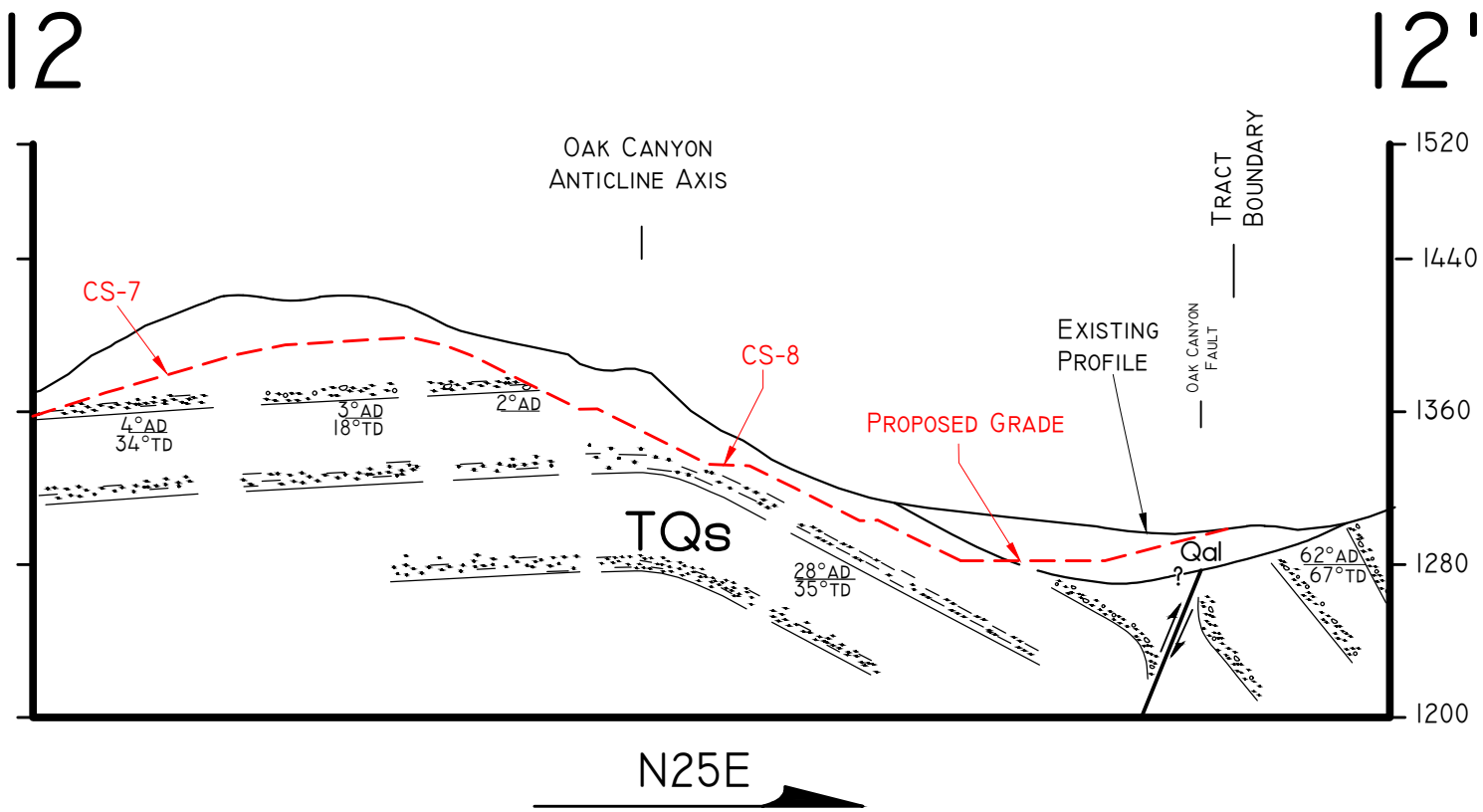
Allan E. Seward
Engineering Geology, Inc.
Geological and Geotechnical Consultants

Cross Section 7-7'

Job No.: 19-1245A-4

Date: 4/3/19

Scale: 1"=100' (H=V)



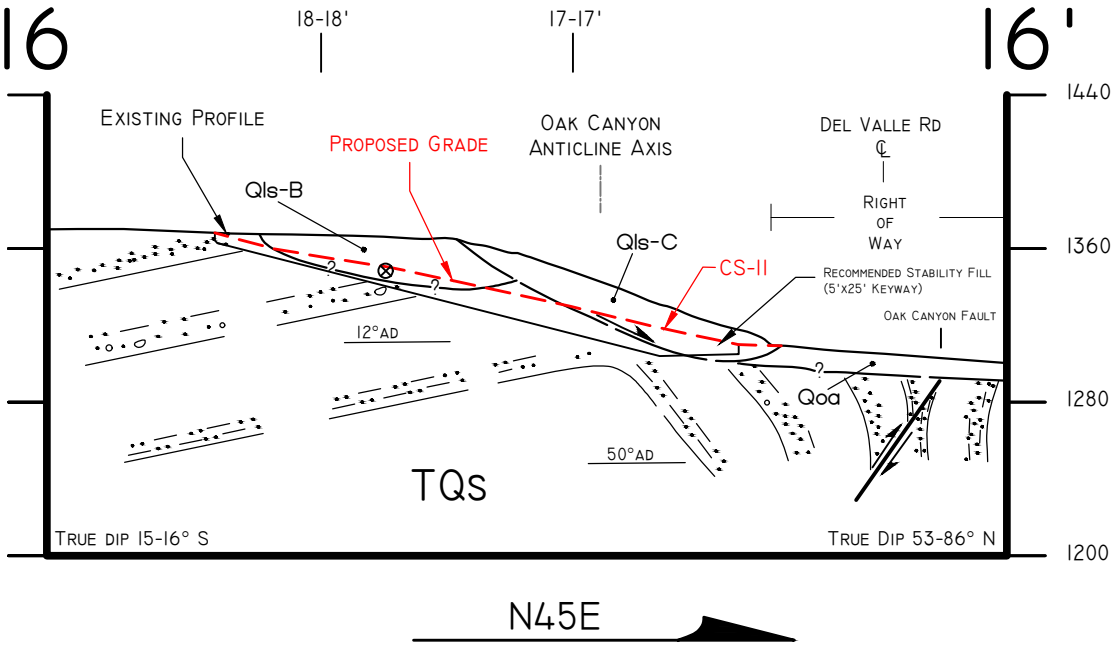
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CROSS SECTION 12-12'

JOB NO.: 19-1245A-4

DATE: 4/3/19

SCALE: 1"=100' (H=V)



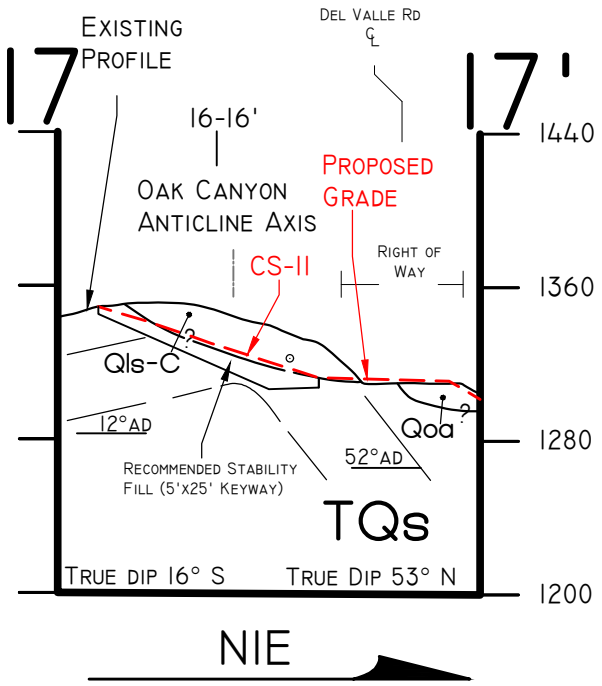
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CROSS SECTION 16-16'

JOB NO.: *19-1245A-4*

DATE: *4/3/19*

SCALE: 1"=100' (H=V)



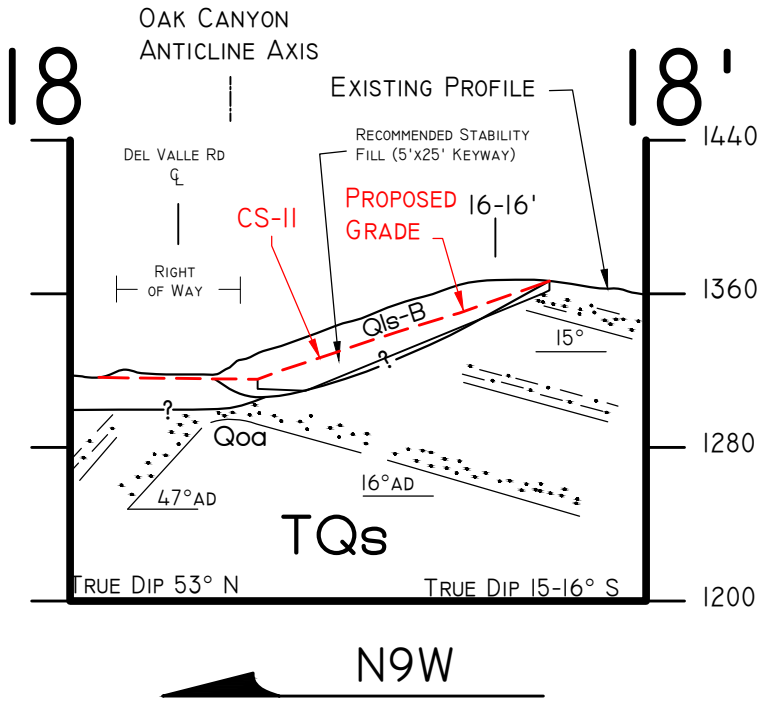
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CROSS SECTION 17-17'

JOB NO.: *19-1245A-4*

DATE: *4/3/19*

SCALE: 1"=100' (H=V)



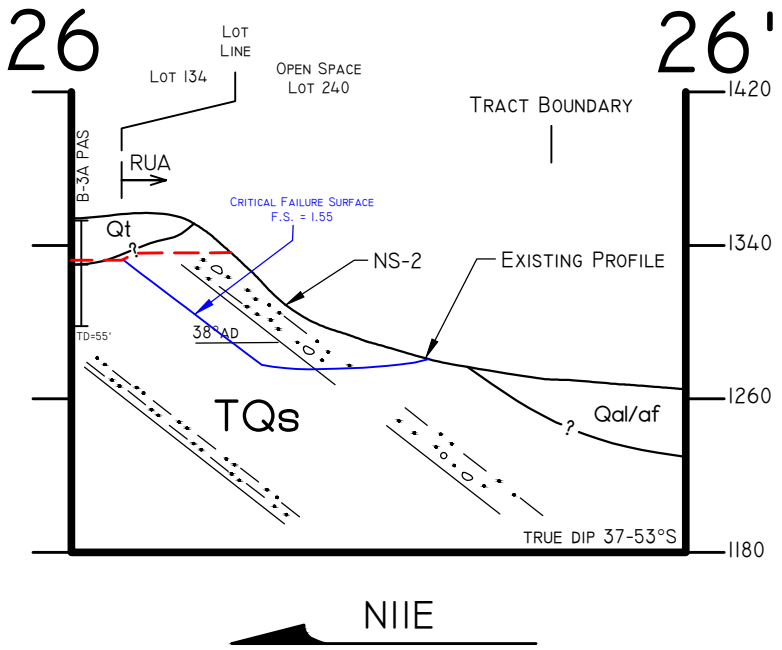
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CROSS SECTION 18-18'

JOB NO.: *19-1245A-4*

DATE: *4/3/19*

SCALE: 1"=100' (H=V)



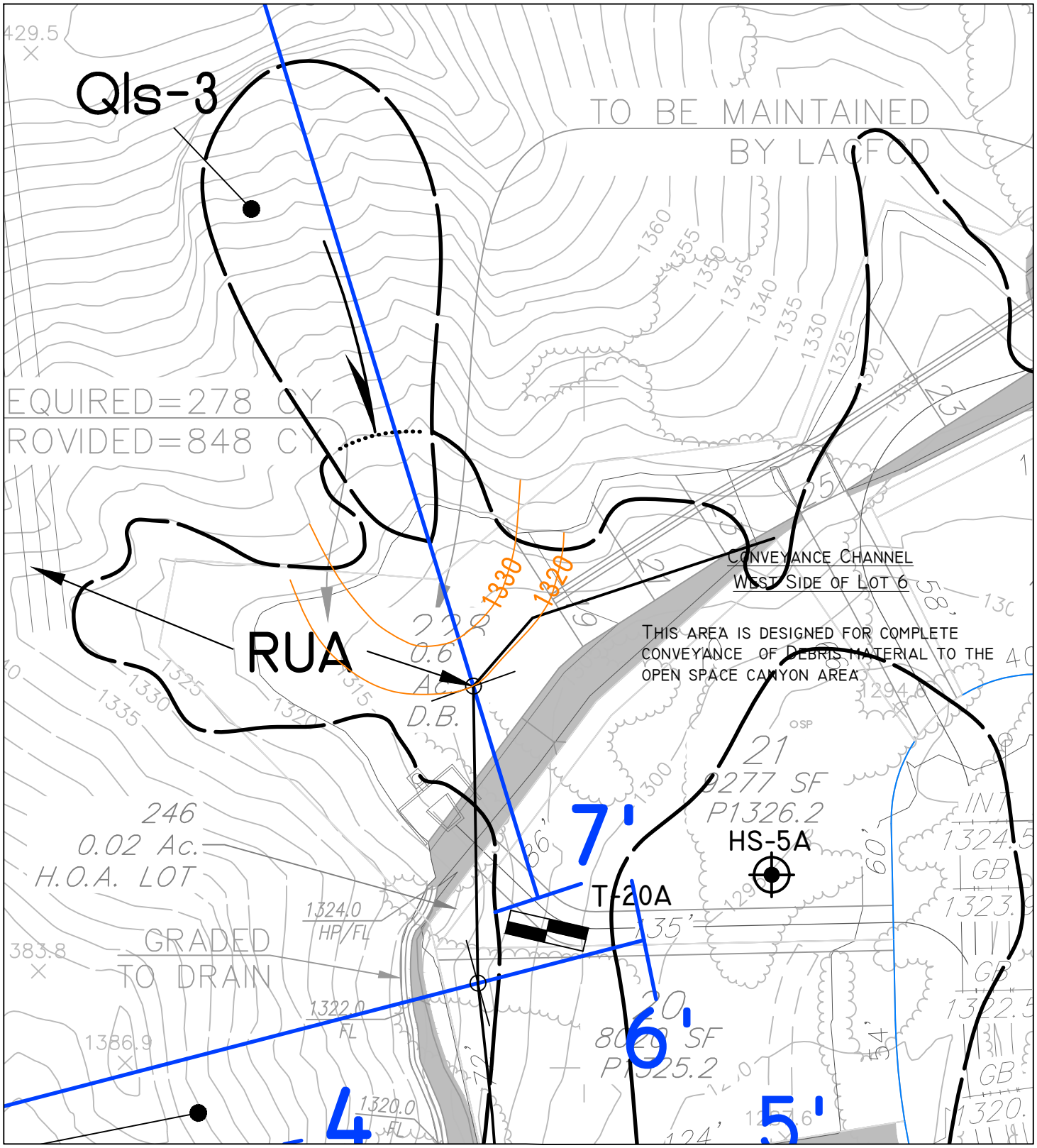
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CROSS SECTION 26-26'

JOB NO.: 19-1245A-4

DATE: 4/3/19

SCALE: 1"=100' (H=V)



LEGEND

1330
1320

POST FAILURE DESIGN CONTOURS

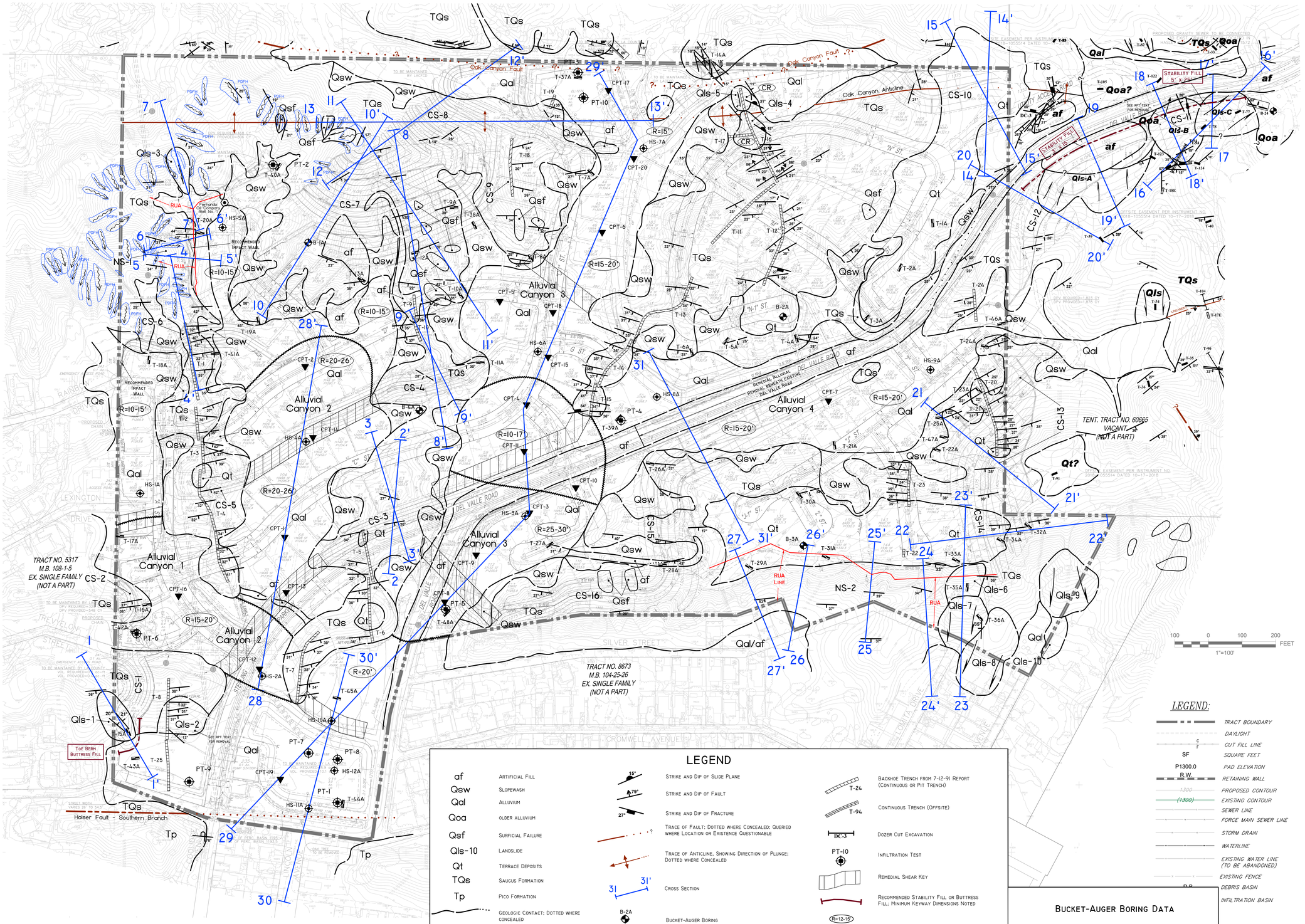
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

LANDSLIDE QLS-3/BASIN VOLUME EVALUATION

DATE: 4/3/19	JOB NO.: 19-1245A-4
SCALE: 1" = 40'	FILE NAME: AES TTM 3.07.19 SHEET 2 & 3

FIGURE 1

GEOLOGY BY: VCG
DRAWN BY: VCG
REVISED: _____



LOT AREA SUMMARY

Lot No.	Gross Area (sq.ft.)	Frontage (ft.)
1	11172	60
2	8889	60
3	7680	60
4	7022	66
5	9050	85
6	7142	67
7	7027	66
8	7034	66
9	7195	54*
10	10558	44*
11	10452	145
12	7972	89
13	7837	63
14	11999	107
15	10117	111
16	7371	71
17	7527	63
18	12819	61
19	11621	62
20	8020	54*
21	9277	60
22	7076	40*
23	7160	68
24	9209	66
25	11023	86
26	11666	65
27	11581	60
28	11569	60
29	9330	63
30	9740	67
31	10180	71
32	7065	60
33	7084	61
34	7274	60
35	8073	60
36	10260	65
37	11918	87
38	11991	68
39	13872	69
40	11640	61
41	10025	67
42	10502	53*
43	10330	57*
44	9848	60
45	11857	60
46	10664	66
47	12055	71
48	13187	71
49	14393	71
50	19423	70
51	37426	111
52	10230	77
53	10577	81
54	10981	60
55	10158	62
56	8249	65
57	13426	72
58	11467	60
59	10246	60
60	10067	63
61	10936	65
62	11395	65
63	11088	64
64	11915	73
65	12073	74
66	12107	75
67	12196	78
68	11628	76
69	12532	67
70	13689	63
71	17593	63
72	17458	129
73	11654	136
74	7822	74
75	8547	74
76	8837	74
77	7594	64
78	7838	64
79	7529	72
80	7880	84
81	7583	78
82	7148	70
83	7104	70
84	7271	70
85	7456	65
86	9091	66
87	10051	65
88	10017	77
89	10137	81
90	8253	79
91	10092	81
92	13246	118
93	10026	93
94	10382	93
95	10888	61
96	11149	61
97	11537	60
98	11947	61
99	12120	60
100	12051	61
101	11740	62
102	11602	63
103	11024	64
104	10498	65
105	11576	65
106	11869	61
107	15368	157
108	10942	64
109	7769	60
110	8240	61
111	19182	40*
112	37132	40*
113	23602	40*
114	11081	60
115	14477	61
116	13603	72
117	21183	54**
118	56261	44**
119	35729	43**
120	18859	53**
121	21584	78
122	13775	81
123	10479	68
124	10735	64
125	11343	60
126	11204	62

Lot No.	Gross Area (sq.ft.)	Frontage (ft.)
127	12263	60
128	12627	61
129	12842	61
130	13323	60
131	21490	46*
132	14218	40*
133	7935	40*
134	11925	40*
135	9398	73
136	8124	54*
137	10451	40*
138	8400	44*
139	7966	66
140	9773	73
141	8483	100
142	8653	112
143	7693	80
144	7336	78
145	13120	49*
146	14235	66
147	19021	69
148	22625	60
149	12194	60
150	8263	75
151	8209	63
152	15390	64
153	16334	63
154	12493	60
155	8103	62
156	11224	75
157	9286	66
158	14532	50*
159	25178	47*
160	9606	76
161	8888	77
162	7961	69
163	7890	70
164	7870	70
165	12162	67
166	17136	41**
167	34287	69
168	13826	60
169	12674	60
170	11461	60
171	10271	60
172	11834	60
173	10057	60
174	10403	60
175	11752	60
176	14349	60
177	7399	60
178	7202	64
179	7031	63
180	8197	60
181	10171	60
182	9448	60
183	8394	60
184	7671	60
185	9115	60
186	7724	61
187	7221	71
188	7201	44**
189	7196	44**
190	15411	47**
191	10588	64
192	10352	60
193	9990	61
194	10241	81
195	13159	88
196	14945	165
197	10830	65
198	10680	96
199	10571	107
200	8210	78
201	7084	70
202	8617	70
203	7432	70
204	7919	76
205	8519	94
206	7822	70
207	13075	85
208	8219	71
209	8092	80
210	7558	75
211	7018	64
212	7415	89
213	7834	66
214	7919	60
215	7467	71
216	7630	77
217	7229	77
218	7080	77
219	10140	131
220	10600	70
221	10390	63
222	11989	60

Lot No.	Area (ac.)	Lot Use
223	2.5	COMMERICAL
224	3.4	PARK
225	0.2	
226	0.2	
227	0.3	DEBRIS BASIN
228	0.6	
229	0.9	
230	1.5	
231	0.1	
232	3.0	INFILTRATION BASIN
233	0.4	
234	1.8	
235	0.1	PUMP STATION
236	0.1	
237	0.7	
238	14.2	OPEN SPACE
239	0.2	
240	5.9	
241	0.1	
242	0.1	ACCESS ROAD
243	0.1	
244	0.01	
245	0.03	
246	0.02	H.O.A LOT
247	0.03	
248	0.02	
249	0.02	

*CUL-DE-SAC
**KNUCKLE

NOTE:
- THE GROSS AREA OF LOT 21 (1235 SQ.FT), LOT 180 (1390 SQ.FT) AND 194 (2475 SQ.FT.) SQUARE FOOTAGES ARE INCLUDING THE SQUARE FOOTAGES FOR SD AND SEWER EASEMENT.
- AVERAGE LOT SIZE IS 11,634 SQ.FT.

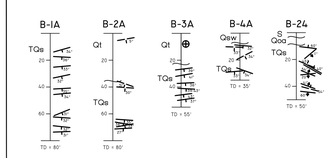
LEGEND:

- TRACT BOUNDARY
- DAYLIGHT
- C / F — CUT FILL LINE
- SF — SQUARE FEET
- P1300.0 — PAD ELEVATION
- R.W. — RETAINING WALL
- 1300 — PROPOSED CONTOUR
- (1300) — EXISTING CONTOUR
- SEWER LINE
- FORCE MAIN SEWER LINE
- STORM DRAIN
- WATERLINE
- EXISTING WATER LINE (TO BE ABANDONED)
- EXISTING FENCE
- DEBRIS BASIN
- INFILTRATION BASIN

LEGEND

af	Artificial Fill
Qsw	Slopewash
Qal	Alluvium
Qoa	older alluvium
Qsf	Surficial Failure
Qls-10	Landslide
Qt	Terrace Deposits
TQs	Saugus Formation
Tp	Pico Formation
	Geologic Contact; Dotted where concealed
24°	Strike and Dip of Bedding
32°	Approximate Strike and Dip of Bedding
78°	Strike and Dip of Overturned Bedding
	Horizontal Bedding in Qt Deposits
40°	Strike and Dip of Contact
15°	Strike and Dip of Slide Plane
79°	Strike and Dip of Fault
27°	Strike and Dip of Fracture
	Trace of Fault; Dotted where Concealed; Queried where Location or Existence Questionable
	Trace of Anticline, Showing Direction of Plunge; Dotted where Concealed
31 31'	Cross Section
B-2A	Bucket-Auger Boring
HS-12A	Hollow-Stem-Auger Boring
CPT-20	Cone Penetrometer Test
T-22	Backhoe Trench (Offsite)
T-48A	Backhoe Trench
T-24	Backhoe Trench from 7-12-91 Report (Continuous or Pit Trench)
T-94	Continuous Trench (Offsite)
DC-3	Dozer Cut Excavation
PT-10	Infiltration Test
	Remedial Shear Key
	Recommended Stability Fill or Buttress Fill; Minimum Keyway Dimensions Noted
R=12-15'	
PDFH	Potential Debris Flow Hazard Source Area
CS-16	Cut Slope Designation
NS-2	Natural Slope Designation
	Removal Boundary for Alluvial Materials
	Recommended Impact Wall

BUCKET-AUGER BORING DATA



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOTECHNICAL MAP

DATE: 4/3/19 | JOB NO.: 19-124.5A-G
SCALE: 1" = 100' | FILE NAME:
PLATE II | GEOLOGY BY: BJS/VCG | DRAWN BY: VCG | REVISED:

	DATE	REVISION	BY	APP
7	02-27-19	MISC REVISIONS PER SCM DATED 06-17-18 & CASTAIC TOWN COUNCIL		
6	5-8-18	MISC REVISIONS, ADD SHEET 3, AND REDUCE TO 231 DU		
5	7-13-16	MISC ADJUSTMENTS & ADDED ALT. A TO SHEET 2		
4	2-12-16	MISC LOT ADJUSTMENTS		
3	9-5-12	DEL ROUNDABOUTS, SHOW PHASING, LARGE LOTS, SEPTIC OPTION & CORRECT ST. SECTIONS		
2	7-17-07	REVISED HUNSTOCK INTERSECTION		
1	3-27-05	REVISED LAYOUT TO MEET CASTAIC C.S.D. STANDARDS		

SCALE: AS SHOWN | DWG BY: | APPROVED BY: | DATE: 08-18-06 | DWG. NO. 5100-056-01 | SHEET 2 OF 4

PREPARED FOR:
Sterling Ranch ESTATES

STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

LEGAL DESCRIPTION

LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031

N

SIKAND
Engineering | Planning | Surveying

15230 Burbank Blvd.,
Van Nuys, CA 91411
Tel: (818) 787-8550
Fax: (818) 901-7451
info@sikand.com

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT NO. 60257

LOCATED IN THE UNINCORPORATED TERRITORY OF
THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

APPENDIX F.3

Response to County of Los Angeles Geologic and Soils Engineering Review Sheet dated 11/01/18, Geotechnical Report – Addendum No. 1 dated May 2, 2019.

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

May 2, 2019 Job No.: 19-1245A-4

Sterling Gateway, L.P.
1887 Gold Dust Lane, #303
P.O. Box 681007
Park City, UT 84068

Attention: Mr. Hunt Williams

Subject: **GEOTECHNICAL REPORT – Addendum No. 1**
Response to County of Los Angeles Geologic and Soils Engineering Review Sheet dated 11/1/18

Project: Low Impact Development
Vesting Tentative Tract Map No. 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California

References: At end of text

Dear Mr. Williams:

This report presents our response to the Geologic and Soils Engineering Review Sheet dated 11/1/18 for Vesting Tentative Tract Map 60257 issued by the Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division (GMED). This report is supplementary to our previous report dated 5/9/18 (see ref. 4) and the conclusions and recommendations presented therein are still applicable.

In order to facilitate the review process, we have listed the County of Los Angeles review sheets comments in **bold** in the order in which they appear on the original review sheet. Each comment is followed by our response. A copy of the review sheet is attached after the references.

Comment 1

Based on the log for Boring HS-2A, the elevation of the proposed infiltration basin at Lot 240 appears to be within 10 feet of the groundwater level. Verify and indicate whether this lot is suitable for stormwater infiltration.

Response

In accordance with Administrative Manual GS200.2 (dated 6/30/17), *Guidelines for Geotechnical Investigation and Reporting, Low Impact Development Stormwater Infiltration*, prepared by the County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division (GMED), the seasonal high groundwater elevation beneath the proposed infiltration basin at Lot 240 was established based on site-specific exploration due to the following:

- Review of the Seismic Hazard Zone report for the Val Verde Quadrangle indicates a historic high groundwater depth of 10 feet. However, this groundwater depth is considered arbitrary based on the lack of existing and historic water well data at the project site. Review of the Los Angeles County Flood Control District (LACFCD) web site and the California Department of Water Resources Groundwater Monitoring website indicates that no existing or historic water wells are located within 1,000 feet of the subject site.
- Existing groundwater data was collected over 10 years ago. Boring HS-2A, located to the north (upstream) of the infiltration basin at Lot 240, was drilled in November 2006. Additionally, the location of this boring is located where Alluvial Canyons 1 and 2 merge and the canyon significantly narrows between bedrock spur ridges to the east and west. Groundwater conditions at the location of Boring HS-2A are not considered representative of conditions beneath the proposed infiltration basin.

The site-specific exploration included Hollow-stem auger Borings HS-10A, HS-11A and HS-12A that were drilled at the basin location in January 2018 to depths ranging from 40 to 55 feet. Groundwater was only encountered in HS-10A at a depth of 45.5 ft (elev. 1160) following a 24-hour monitoring period. The proposed basin invert is at an elevation of 1188 ft, which is 28 feet above the groundwater elevation in HS-10A. Therefore, seasonal high groundwater is not expected within 10 feet of the proposed basin bottom elevations.

Comment S2

The lot numbers shown on Page 2 of the 5/9/18 report do not appear to match the lot numbers shown on the latest tentative map. Verify and provide revised data and/or geotechnical map as necessary.

Response

Infiltration basin lot numbers shown on Page 2 of the 5/9/18 report were based on a previous undated VTTM and are not consistent with the associated Geotechnical Map included in the 5/9/18 report, which was based on the 5/8/18 VTTM. Furthermore, the lot designations have

been revised on the most current VTTM dated 2/27/19 that was addressed in our 4/3/19 addendum report (see ref. 6). Correlation of the lot number designations are tabulated below. The Geotechnical Map prepared for the 4/13/19 addendum report is appended to this report for reference purposes only.

INFILTRATION BASIN	LOT NUMBER DESIGNATION		
	UNDATED VTTM (Page 2 of 5/9/18 Report)	5/8/18 VTTM (Map in 5/9/18 Report and 6/8/18 VTTM Report)	2/27/19 VTTM 4/3/19 Addendum Report
Basin located at northeast corner of Sterling Parkway (proposed) and Hunstock Avenue (existing)	236	240	232
Basin located at the western property boundary, just north of the proposed commercial site	237	241	233
Basin located at the northern property line	241	242	234

This opportunity to be of service is appreciated. Please contact us if you would like to discuss this report further.

Respectfully submitted,

Eric J. Seward, CEG 2110
Principal Engineering Geologist
Vice President

Kevin P. Callahan, MS, GE 2989
Geotechnical Engineer

The following attachments complete this report.

References
Geologic and Soils Engineering Review Sheet dated 11/1/2018

Geotechnical Map (**Plate II**) dated 4/3/19

Distribution:

Sterling Gateway, L.P. (1 hard copy and electronic in PDF format)
Attn: Mr. Hunt Williams

Sikand Engineering (PDF format)
Attn: Mr. Doug Farmer

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division (PDF format via EpicLA)

REFERENCES

By: Allan E. Seward Engineering Geology, Inc.

(1) **Geologic Feasibility Report**
Tentative Tract _____
Castaic, California
Dated July 12, 1991 – JN: 91-1245-1

(2) **Geologic and Geotechnical Report**
Review of Rough Grading Plan for Parcel Map 60030 (Dated 6/6/2012)
Rough Grading Plan
Parcel Map 60030
Castaic, County of Los Angeles, California
Dated September 28, 2012 – JN: 12-1132-5

(3) **Geologic and Geotechnical Report**
Review of Vesting Tentative Tract Map, dated 8/18/2015
Vesting Tentative Tract Map 60665
Hasley Canyon Area
Castaic, County of Los Angeles, California
Dated February 9, 2016 - JN: 16-1257C-4

(4) **Geotechnical Report**
Results of Preliminary Infiltration Testing
Vesting Tentative Tract Map No. 60257
Green Valley Ranch
Val Verde, County of Los Angeles, California
Dated May 9, 2018 - JN: 18-1245A-4

(5) **Geologic and Geotechnical Report**
Review of Vesting Tentative Tract Map 60257 (Dated May 8, 2018)
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated June 8, 2018 – JN: 18-1245A-4

(6) **Geotechnical Report – Addendum No. 1**
Response to County of Los Angeles Geologic and Soils Engineering Review Sheet dated 10/17/18
Geologic and Geotechnical Report
Review of Revised Vesting Tentative Tract Map 60257 (Dated February 27, 2018)
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated April 3, 2019 – JN: 19-1245A-4

Dist. Office
PCA LHYCHECK
EPIC LA ESTU2018000244
Telephone: (626) 458-4925

County of Los Angeles Department of Public Works
Geotechnical and Materials Engineering Division
GEOLOGIC AND SOILS ENGINEERING REVIEW SHEET
900 S. Fremont Avenue, Alhambra, CA 91803

Tract / Parcel Map	60257	**Lot(s)**	**Parent Tract**
Site Address		**Location** Val Verde	**APN**
Geologist	Allan E. Seward Engineering Geology, Inc.	**Developer/Owner**	Sterling Gateway LP
Soils Engineer	Allan E. Seward Engineering Geology, Inc.	**Engineer/Arch.**	Sikand Engineering

Review of:

Grading P.C. No.: ---
For: Low Impact Development (LID)
Submittal Received by GMED: **7/25/18**

Geologic Report(s) Dated: ---
Soils Engineering Report(s) Dated: ---
Geotechnical Report(s) Dated: **5/9/18**
References:

Remarks:

1. Based on the log for Boring HS-2A, the elevation of the proposed infiltration basin at Lot 240 appears to be within 10 feet of the groundwater level. Verify and indicate whether this lot is suitable for stormwater infiltration.

2. The lot numbers shown on Page 2 of the 5/9/18 report do not appear to match the lot numbers shown on the latest tentative map. Verify and provide revised data and/or geotechnical map as necessary.

NOTES TO LAND DEVELOPMENT DIVISION PLAN CHECKER:
PER THE SOILS ENGINEER:

A. A FUTURE GEOTECHNICAL REPORT PRESENTING A MORE COMPREHENSIVE EVALUATION OF INFILTRATION BASIN LOCATIONS WILL BE PREPARED.
B. THE RECOMMENDED DESIGN INFILTRATION RATES FOR LOTS 240, 241, AND 242 ARE 2.3, 2.3, AND 1.7 INCHES PER HOUR, RESPECTIVELY.

Prepared by

REGISTERED PROFESSIONAL ENGINEER JEREMY CHUN YIN WAN No. GE 2849 GEOTECHNICAL STATE OF CALIFORNIA

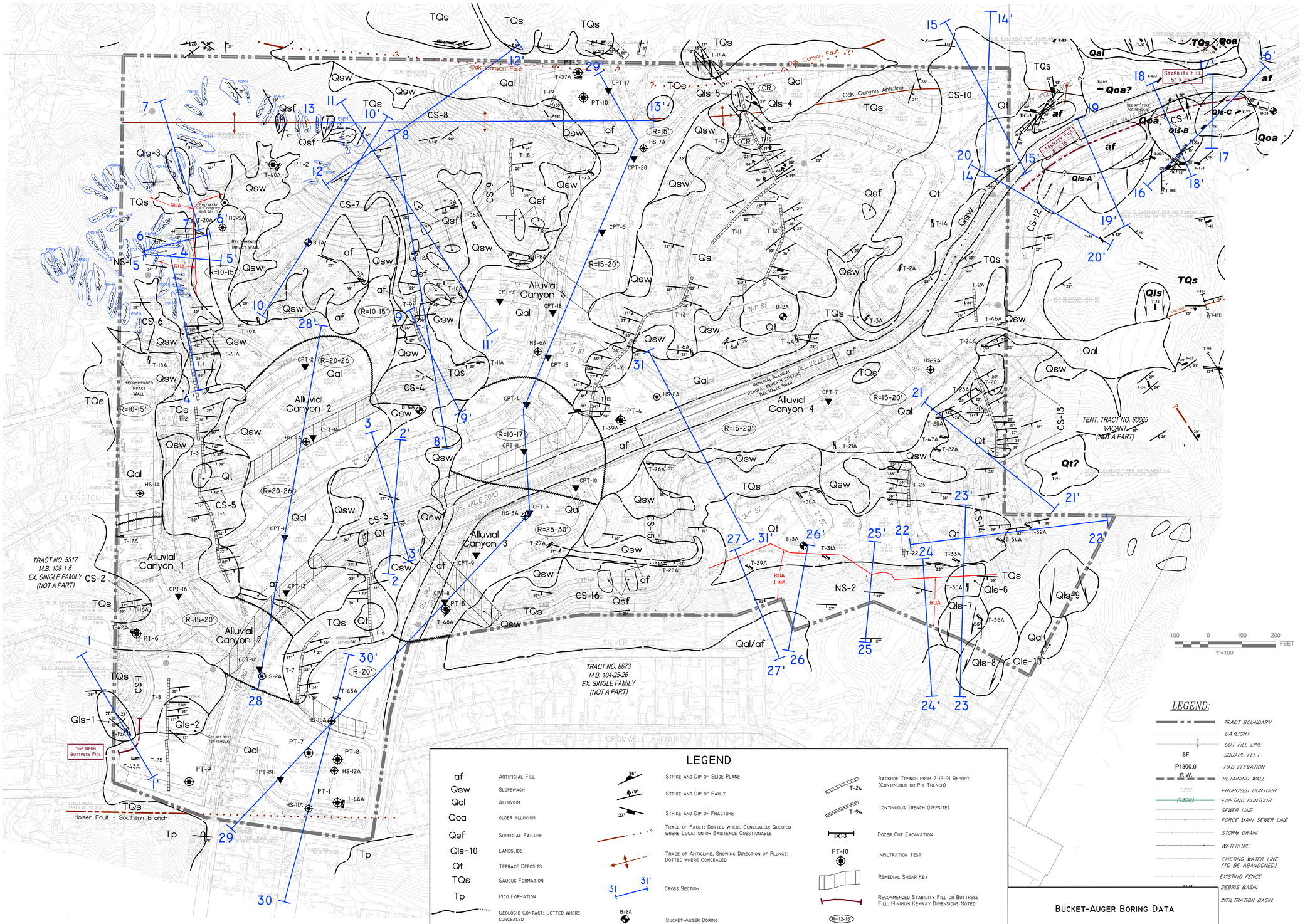
Jeremy Wan
Soils Section

--
Geology Section

Date 11/1/18

Please complete a Customer Service Survey at http://dpw.lacounty.gov/go/gmedsurvey

NOTICE: Public safety, relative to geotechnical subsurface exploration, shall be provided in accordance with current codes for excavations, inclusive of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.



LOT AREA SUMMARY

Lot No.	Gross Area (sq.ft.)	Frontage (ft.)
1	11172	60
2	8889	60
3	7680	60
4	7022	66
5	9050	85
6	7142	67
7	7027	66
8	7034	66
9	7195	54*
10	10558	44*
11	10452	145
12	7972	89
13	7837	63
14	11999	107
15	10117	111
16	7371	71
17	7527	63
18	12819	61
19	11621	62
20	8020	54*
21	9277	60
22	7076	40*
23	7160	68
24	9209	66
25	11023	86
26	11666	65
27	11581	60
28	11569	60
29	9330	63
30	9740	67
31	10180	71
32	7065	60
33	7084	61
34	7274	60
35	8073	60
36	10260	65
37	11918	87
38	11991	68
39	13872	69
40	11640	61
41	10025	67
42	10502	53*
43	10330	57*
44	9848	60
45	11857	60
46	10664	66
47	12055	71
48	13187	71
49	14393	71
50	19423	70
51	37426	111
52	10230	77
53	10577	81
54	10981	60
55	10158	62
56	8249	65
57	13426	72
58	11467	60
59	10246	60
60	10067	63
61	10936	65
62	11395	65
63	11088	64
64	11915	73
65	12073	74
66	12107	75
67	12196	78
68	11628	76
69	12532	67
70	13689	63
71	17593	63
72	17458	129
73	11654	136
74	7822	74
75	8547	74
76	8837	74
77	7594	64
78	7838	64
79	7529	72
80	7880	84
81	7583	78
82	7148	70
83	7104	70
84	7271	70
85	7456	65
86	9091	66
87	10051	65
88	10017	77
89	10137	81
90	8253	79
91	10092	81
92	13246	118
93	10026	93
94	10382	93
95	10888	61
96	11149	61
97	11537	60
98	11947	61
99	12120	60
100	12051	61
101	11740	62
102	11602	63
103	11024	64
104	10498	65
105	11576	65
106	11869	61
107	15368	157
108	10942	64
109	7769	60
110	8240	61
111	19182	40*
112	37132	40*
113	23602	40*
114	11081	60
115	14477	61
116	13603	72
117	21183	54**
118	56261	44**
119	35729	43**
120	18859	53**
121	21584	78
122	13775	81
123	10479	68
124	10735	64
125	11343	60
126	11204	62

Lot No.	Gross Area (sq.ft.)	Frontage (ft.)
127	12263	60
128	12627	61
129	12842	61
130	13323	60
131	21490	46*
132	14218	40*
133	7935	40*
134	11925	40*
135	9398	73
136	8124	54*
137	10451	40*
138	8400	44*
139	7966	66
140	9773	73
141	8483	100
142	8653	112
143	7693	80
144	7336	78
145	13120	49*
146	14235	66
147	19021	69
148	22625	60
149	12194	60
150	8263	75
151	8209	63
152	15390	64
153	16334	63
154	12493	60
155	8103	62
156	11224	75
157	9286	66
158	14532	50*
159	25178	47*
160	9606	76
161	8888	77
162	7961	69
163	7890	70
164	7870	70
165	12162	67
166	17136	41**
167	34287	69
168	13826	60
169	12674	60
170	11461	60
171	10271	60
172	11834	60
173	10057	60
174	10403	60
175	11752	60
176	14349	60
177	7399	60
178	7202	64
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181	10171	60
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204	7919	76
205	8519	94
206	7822	70
207	13075	85
208	8219	71
209	8092	80
210	7558	75
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234	1.8	
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236	0.1	
237	0.7	
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239	0.2	
240	5.9	
241	0.1	
242	0.1	ACCESS ROAD
243	0.1	
244	0.01	
245	0.03	
246	0.02	H.O.A LOT
247	0.03	
248	0.02	
249	0.02	

*CUL-DE-SAC
**KNUCKLE

NOTE:
- THE GROSS AREA OF LOT 21 (1235 SQ.FT), LOT 180 (1390 SQ.FT) AND 194 (2475 SQ.FT.) SQUARE FOOTAGES ARE INCLUDING THE SQUARE FOOTAGES FOR SD AND SEWER EASEMENT.
- AVERAGE LOT SIZE IS 11,634 SQ.FT.

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CS-16	Cut Slope Designation
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	Removal Boundary for Alluvial Materials
	Recommended Impact Wall

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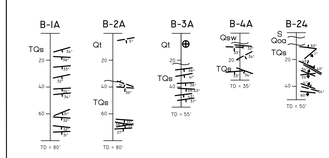

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOTECHNICAL MAP

DATE: 4/3/19 | JOB NO.: 19-124.5A-G
SCALE: 1" = 100' | FILE NAME:
PLATE II | GEOLOGY BY: BJS/VCG | DRAWN BY: VCG | REVISED:

	DATE	REVISION	BY	APP
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6	5-8-18	MISC REVISIONS, ADD SHEET 3, AND REDUCE TO 231 DU		
5	7-13-16	MISC ADJUSTMENTS & ADDED ALT. A TO SHEET 2		
4	2-12-16	MISC LOT ADJUSTMENTS		
3	9-5-12	DEL ROUNDABOUTS, SHOW PHASING, LARGE LOTS, SEPTIC OPTION & CORRECT ST. SECTIONS		
2	7-17-07	REVISED HUNSTOCK INTERSECTION		
1	3-27-05	REVISED LAYOUT TO MEET CASTAIC C.S.D. STANDARDS		

SCALE: AS SHOWN | DWG BY: | APPROVED BY: | DATE: 08-18-06 | DWG. NO. 5100-056-01 | SHEET 2 OF 4

PREPARED FOR:
Sterling Ranch ESTATES

STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

LEGAL DESCRIPTION

LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031

N

SIKAND
Engineering | Planning | Surveying

15230 Burbank Blvd.,
Van Nuys, CA 91411
Tel: (818) 787-8550
Fax: (818) 901-7451
info@sikand.com

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT NO. 60257

LOCATED IN THE UNINCORPORATED TERRITORY OF
THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

APPENDIX F.4

Geologic and Soils Engineering Review Sheet for Low Impact Development (LID), dated May 17, 2019.

Dist. Office
PCA LHYCHECK
EPIC LA ESTU2018000244
Telephone: (626) 458-4925

County of Los Angeles Department of Public Works
Geotechnical and Materials Engineering Division
GEOLOGIC AND SOILS ENGINEERING REVIEW SHEET
900 S. Fremont Avenue, Alhambra, CA 91803

Tract / Parcel Map	60257	**Lot(s)**		**Parent Tract**	
Site Address		**Location**	Val Verde	**APN**	
Geologist	Allan E. Seward Engineering Geology, Inc.	**Developer/Owner**	Sterling Gateway LP		
Soils Engineer	Allan E. Seward Engineering Geology, Inc.	**Engineer/Arch.**	Sikand Engineering		

Review of:

Grading P.C. No.: --- For: Low Impact Development (LID)
Submittal Received by GMED: **5/6/19**

Geologic Report(s) Dated: ---
Soils Engineering Report(s) Dated: **---**
Geotechnical Report(s) Dated: **5/2/19**, 5/9/18
References:

Remarks:

GMED has no further comment at this time.

NOTES TO LAND DEVELOPMENT DIVISION PLAN CHECKER:
PER THE SOILS ENGINEER:

A. A FUTURE GEOTECHNICAL REPORT PRESENTING A MORE COMPREHENSIVE EVALUATION OF INFILTRATION BASIN LOCATIONS WILL BE PREPARED.
B. THE RECOMMENDED DESIGN INFILTRATION RATES FOR LOTS 232, 233, AND 234 ARE 2.3, 2.3, AND 1.7 INCHES PER HOUR, RESPECTIVELY.

Prepared by

REGISTERED PROFESSIONAL ENGINEER
JEREMY CHUN YIN WAN
No. GE 2849
GEOTECHNICAL
STATE OF CALIFORNIA

Jeremy Wan
Soils Section

--
Geology Section

Date 5/17/19

Please complete a Customer Service Survey at http://dpw.lacounty.gov/go/gmedsurvey

NOTICE: Public safety, relative to geotechnical subsurface exploration, shall be provided in accordance with current codes for excavations, inclusive of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.

APPENDIX F.5

Response to County of Los Angeles Verbal Review Comment issued on 05/17/19, Geotechnical Report – Addendum No. 2 dated May 21, 2019.

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

May 21, 2019 Job No.: 19-1245A-4

Sterling Gateway, L.P.
1887 Gold Dust Lane, #303
P.O. Box 681007
Park City, UT 84068

Attention: Mr. Hunt Williams

Subject: **GEOTECHNICAL REPORT – Addendum No. 2**
Response to County of Los Angeles Verbal Review Comment

Project: Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California

References: At end of text

Dear Mr. Williams:

This addendum report has been prepared in response to a verbal review comment issued on 5/17/19 by Mr. Jeremy Wan, geotechnical reviewer at the Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division (GMED).

Our prior Geotechnical Report dated April 3, 2019 (Ref. 2) presented our response to the Geologic and Soils Engineering Review Sheet dated 10/17/18 for Vesting Tentative Tract Map 60257 issued by GMED. Based on our response provided for *Comment S3* in that review sheet, Mr. Wan requested additional analyses to support our conclusions. The subject comment is summarized below and is immediately followed by our response.

Comment

Critical slip surfaces presented for Cross Section 1-1' in the original Geotechnical Report addressing VTTM 60257, dated June 8, 2018 (see Ref. 1), were not addressed in the addendum response report. The consultant shall evaluate the prior critical slip surface under static and pseudostatic loading conditions based on the revised configuration of the backcut and keyway of the recommended toe berm buttress, as illustrated on Cross Section 1-1' in the addendum report. Recommend mitigation if factor of safety is below the County's minimum standard.

Response

Static and seismic slope stability analyses were previously performed for the requested case using Cross Section 1-1'. However, the results of those analyses were not included in our addendum report dated April 3, 2019. Slope stability diagrams graphically illustrating the results of our analyses are attached herein as requested. Based on the results, the analyzed slope complies with Los Angeles County minimum requirements for gross stability under static and seismic loading conditions (see appended Table C1 from April 3, 2019 report updated with the additional analyses).

This opportunity to be of service is appreciated. If you have any questions regarding this report, please contact us.

Respectfully submitted,

Eric J. Seward, CEG 2110
Principal Engineering Geologist
Vice President

Kevin P. Callahan, MS, GE 2989
Geotechnical Engineer

The following attachment and appendix complete this report.

References

APPENDIX

- Slope Stability Analysis Results (updated) **Table C1**
- Gross Slope Stability Analyses Computer Output

Distribution:

Sterling Gateway, L.P. (1 hard copy and electronic in PDF format)
Attn: Mr. Hunt Williams

Sikand Engineering (PDF format)
Attn: Mr. Doug Farmer

Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division (via email in PDF format)
Attn: Mr. Jeremy Wan

REFERENCES

By: Allan E. Seward Engineering Geology, Inc.

(1) **Geologic and Geotechnical Report**
Review of Vesting Tentative Tract Map 60257 (Dated May 8, 2018)
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated June 8, 2018 – JN: 18-1245A-4

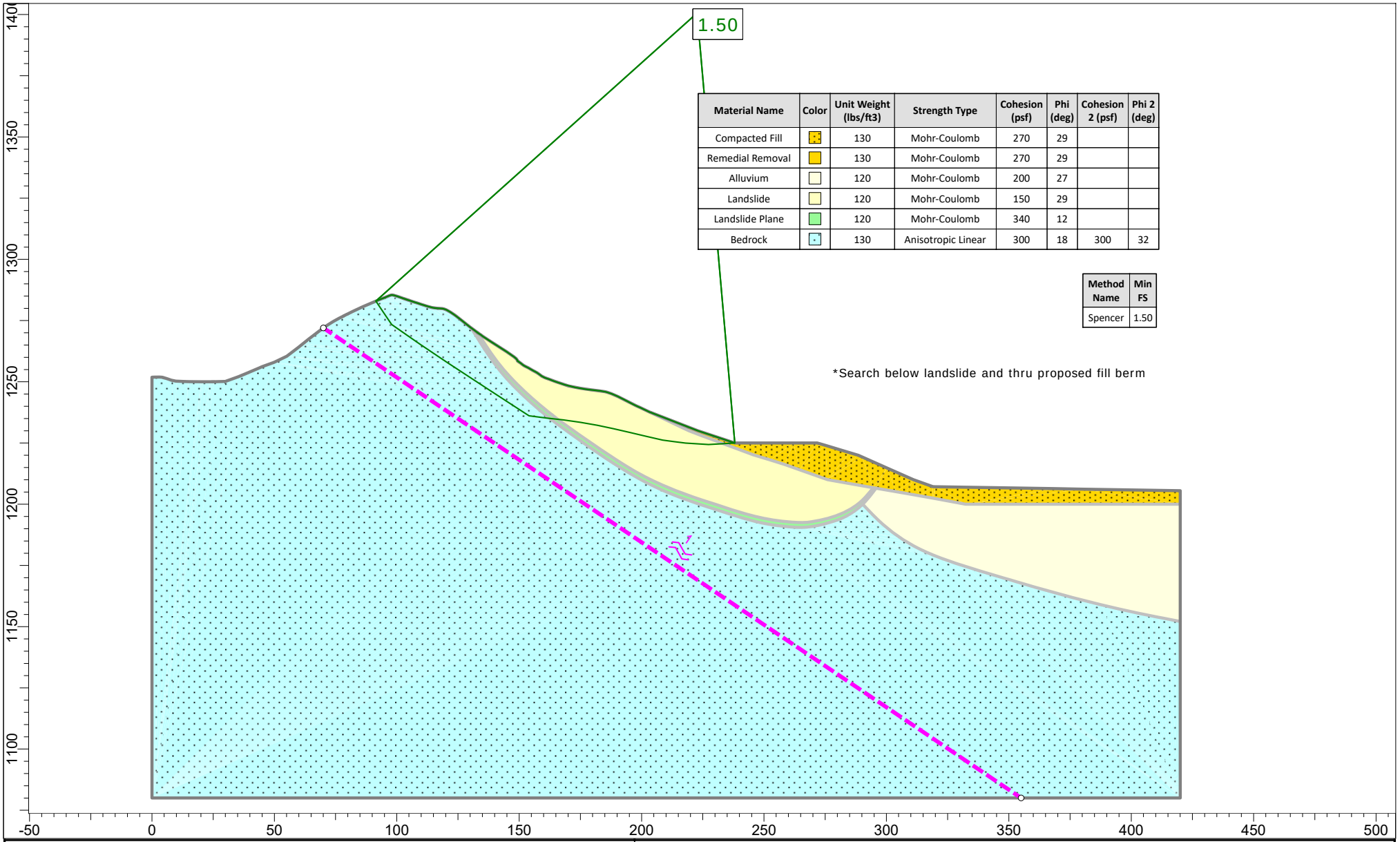
(2) **Geotechnical Report – Addendum No. 1**
Response to County of Los Angeles Geologic and Soils Engineering Review Sheet dated 10/17/18
Geologic and Geotechnical Report
Review of Revised Vesting Tentative Tract Map dated February 27, 2019
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated April 3, 2019 – JN: 19-1245A-4

Appendix

Table C1 – SLOPE STABILITY ANALYSES RESULTS (UPDATED)

Cross Section	File Name	Slope Designation	Analyzed Plane	Method	Factor of Safety		Comments	Run No.
					Static	Pseudostatic[1] (Coeff = 0.15)		
1-1′	T1S1A	Landslide Qls-1	Bedding Plane	Spencer	2.01	--	Planar search along-bedding, below Qls, with exit through toe berm.	1
1-1′	**T1S1A**	**Landslide Qls-1**	**Bedding Plane**	**Spencer**	**1.50**	**1.10**	**Non-circular (cuckoo) search with bedding plane component; critical surface behind Qls-1 that extends thru planned fill berm.**	**1b**
1-1′	T1S2A	Landslide Qls-1	Landslide Plane	Spencer	1.87	1.19	Non-circular path search along Qls plane; run represents min FS achieved along Qls plane with any combination of entry and exit points on slip surface.	2 3
1-1′	T1S2A	Landslide Qls-1	Landslide Mass	Spencer	1.87	1.29	Non-circular cuckoo search limiting entry and exit points to within the landslide mass.	4 5
27-27′	T27S1A	Natural Slope NS-2	Bedding Plane	Spencer	1.58	--	Updated analysis with corrected Qt shear strength; min FS > 1.55 at previously established FS > 1.55 setback line.	6
SCHEMATIC	--	Fill Slope	Non-circular	Spencer	2.05	--	Non-circular (cuckoo) search for minimum safety factor for 115-ft high 3:1 fill slope.	7

[1] Peak shear strength values were not utilized.



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; bedding plane; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1s1a.slmd
		Scale:	1:650
Project No.:	18-1245A-4	*Date:* 5/21/2019	*Figure No.:*

Slide Analysis Information

t1s1a

Project Summary

File Name:	t1s1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:14.841s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; bedding plane; static
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Materials

Property	Compacted Fill	Alluvium	Landslide	Landslide Plane	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	120	130
Cohesion [psf]	270	200	150	340	
Friction Angle [°]	29	27	29	12	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.497440
Axis Location:	222.685, 1400.574
Left Slip Surface Endpoint:	91.454, 1282.935
Right Slip Surface Endpoint:	238.058, 1225.006
Resisting Moment:	2.49401e+07 lb-ft
Driving Moment:	1.67045e+07 lb-ft
Resisting Horizontal Force:	130106 lb
Driving Horizontal Force:	87143.2 lb
Total Slice Area:	1997.32 ft2
Surface Horizontal Width:	146.604 ft
Surface Average Height:	13.6239 ft

Global Minimum Coordinates

Method: spencer

X	Y
91.4542	1282.93
94.6487	1278.15
97.8989	1273.4
103.844	1269.24
109.789	1265.09
115.747	1261.13
121.705	1257.18
127.664	1253.2
133.622	1249.34
138.717	1246.03
143.812	1242.72
148.906	1239.42
154.001	1236.12
160.986	1235.2
167.971	1234.45
174.956	1233.45
181.941	1232.21
188.557	1230.8
195.23	1229.29
201.903	1227.72
208.576	1226.16
213.267	1225.56
217.958	1224.95
222.648	1224.65
227.338	1224.35
232.915	1224.68
238.058	1225.01

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6359
Number of Invalid Surfaces: 3697

Error Codes:

Error Code -108 reported for 18 surfaces
Error Code -111 reported for 5 surfaces
Error Code -112 reported for 19 surfaces
Error Code -114 reported for 23 surfaces
Error Code -121 reported for 1160 surfaces
Error Code -124 reported for 6 surfaces
Error Code -1000 reported for 2466 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

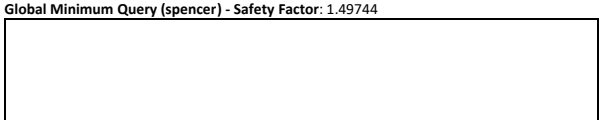
Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.49744

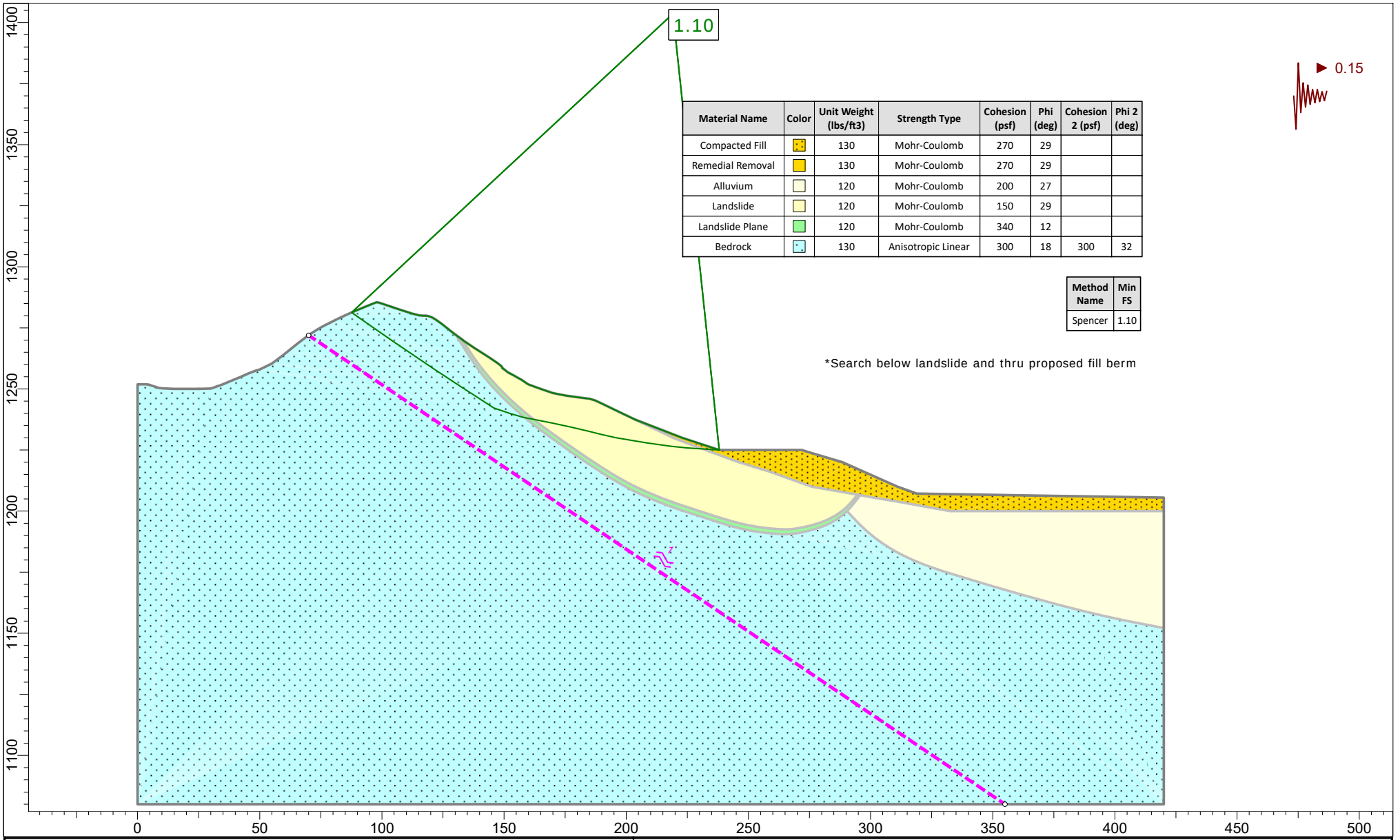
Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	3.19449	1266.71	-56.245	Bedrock	300	32	233.943	350.315	80.5209	0	80.5209	430.574	430.574
2	3.25028	3848.77	-55.6359	Bedrock	300	32	402.434	602.621	484.294	0	484.294	1072.83	1072.83
3	2.97256	4928.51	-34.9595	Bedrock	300	18	460.485	689.548	1198.91	0	1198.91	1520.86	1520.86
4	2.97256	5357.56	-34.9595	Bedrock	300	18	484.138	724.967	1307.91	0	1307.91	1646.4	1646.4
5	2.97236	5773.43	-34.9613	Bedrock	300	18	507.078	759.319	1413.64	0	1413.64	1768.19	1768.19
6	2.97236	6196.14	-34.9613	Bedrock	300	18	530.383	794.217	1521.04	0	1521.04	1891.89	1891.89
7	2.97908	6627.63	-33.5784	Bedrock	300	18	559.944	838.482	1657.28	0	1657.28	2029	2029
8	2.97908	7075.96	-33.5784	Bedrock	300	18	584.979	875.971	1772.65	0	1772.65	2161	2161
9	2.97908	7685.67	-33.5827	Bedrock	300	18	619.003	926.92	1929.46	0	1929.46	2340.46	2340.46
10	2.97908	8195.99	-33.5827	Bedrock	300	18	647.498	969.59	2060.79	0	2060.79	2490.7	2490.7
11	2.97934	8281.52	-33.6929	Bedrock	300	18	651.597	975.727	2079.67	0	2079.67	2514.12	2514.12
12	2.97934	8180.05	-33.6929	Bedrock	300	18	645.938	967.254	2053.6	0	2053.6	2484.27	2484.27
13	2.97934	8030.66	-32.9793	Bedrock	300	18	641.62	960.788	2033.7	0	2033.7	2450.04	2450.04
14	2.97934	7861.43	-32.9793	Bedrock	300	18	632.109	946.546	1989.86	0	1989.86	2400.04	2400.04
15	2.54728	6603.09	-32.9857	Bedrock	300	18	624.301	934.853	1953.88	0	1953.88	2359.08	2359.08
16	2.54728	6528.86	-32.9857	Bedrock	300	18	619.422	927.547	1931.39	0	1931.39	2333.43	2333.43
17	2.54728	6478.43	-32.9857	Bedrock	300	18	616.107	922.584	1916.11	0	1916.11	2316	2316
18	2.54728	6441.49	-32.9857	Bedrock	300	18	613.679	918.948	1904.93	0	1904.93	2303.24	2303.24
19	2.54728	6409.37	-32.9629	Bedrock	300	18	611.689	915.967	1895.75	0	1895.75	2292.43	2292.43
20	2.54728	6344.52	-32.9629	Bedrock	300	18	607.425	909.583	1876.1	0	1876.1	2270.01	2270.01
21	2.54728	6095.03	-32.9629	Bedrock	300	18	591.023	885.022	1800.51	0	1800.51	2183.78	2183.78
22	2.54728	6049.13	-32.9629	Bedrock	300	18	588.006	880.503	1786.61	0	1786.61	2167.92	2167.92
23	3.49255	7980.75	-7.49493	Bedrock	300	32	1223.47	1832.07	2451.82	0	2451.82	2612.78	2612.78
24	3.49255	7184.76	-7.49493	Bedrock	300	32	1123.45	1682.3	2212.14	0	2212.14	2359.94	2359.94
25	1.58275	3062.62	-6.14685	Bedrock	300	32	1089.16	1630.95	2129.96	0	2129.96	2247.26	2247.26
26	3.21961	5976.06	-6.14685	Landslide Plane	340	12	498.045	745.792	1909.1	0	1909.1	1962.74	1962.74
27	2.18273	3881.29	-6.14685	Landslide	150	29	807.278	1208.85	1910.21	0	1910.21	1997.15	1997.15
28	6.98508	11841.7	-8.11662	Landslide	150	29	755.735	1131.67	1770.98	0	1770.98	1878.76	1878.76
29	3.49254	5845.97	-10.0673	Landslide	150	29	729.645	1092.6	1700.5	0	1700.5	1830.04	1830.04
30	3.49254	5897.86	-10.0673	Landslide	150	29	735.171	1100.87	1715.42	0	1715.42	1845.94	1845.94
31	3.30794	5674.04	-11.9946	Landslide	150	29	727.617	1089.56	1695.02	0	1695.02	1849.6	1849.6
32	3.30794	5644.03	-11.9946	Landslide	150	29	724.328	1084.64	1686.13	0	1686.13	1840.02	1840.02
33	3.33665	5402.1	-12.7935	Landslide	150	29	686.025	1027.28	1582.66	0	1582.66	1738.43	1738.43
34	3.33665	5056.9	-12.7935	Landslide	150	29	648.902	971.692	1482.37	0	1482.37	1629.72	1629.72
35	3.33646	4717.59	-13.186	Landslide	150	29	609.564	912.786	1376.1	0	1376.1	1518.92	1518.92
36	3.33646	4392.44	-13.186	Landslide	150	29	574.775	860.691	1282.12	0	1282.12	1416.78	1416.78
37	3.33646	4084.38	-13.186	Landslide	150	29	541.815	811.335	1193.08	0	1193.08	1320.02	1320.02
38	3.33646	3874.36	-13.186	Landslide	150	29	519.343	777.685	1132.37	0	1132.37	1254.05	1254.05
39	2.34525	2572.43	-7.35601	Landslide	150	29	532.222	796.97	1167.17	0	1167.17	1235.87	1235.87
40	2.34525	2407.08	-7.35601	Landslide	150	29	505.031	756.253	1093.71	0	1093.71	1158.91	1158.91
41	2.34555	2241.99	-7.35508	Landslide	150	29	477.842	715.54	1020.26	0	1020.26	1081.94	1081.94
42	2.34555	2076.58	-7.35508	Landslide	150	29	450.646	674.815	946.791	0	946.791	1004.96	1004.96
43	2.34518	1889.03	-3.67923	Landslide	150	29	438.962	657.319	915.227	0	915.227	943.454	943.454
44	2.34518	1676.76	-3.67923	Landslide	150	29	402.252	602.348	816.058	0	816.058	841.924	841.924
45	2.34518	1479.38	-3.67923	Landslide	150	29	368.119	551.236	723.851	0	723.851	747.522	747.522
46	2.34518	1306.05	-3.67923	Landslide	150	29	338.145	506.352	642.873	0	642.873	664.617	664.617
47	2.78817	1269.73	3.37857	Landslide	150	29	323.592	484.56	603.561	0	603.561	584.457	584.457
48	2.78817	909.706	3.37857	Landslide	150	29	265.587	397.7	446.863	0	446.863	431.184	431.184
49	0.434012	109.168	3.66299	Landslide	150	29	232.8	348.604	358.291	0	358.291	343.388	343.388
50	4.70943	568.316	3.66299	Compacted Fill	270	29	269.953	404.238	242.173	0	242.173	224.891	224.891

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.49744



Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	91.4542	1282.93	0	0	0
2	94.6487	1278.15	-363.407	-132.072	19.9725
3	97.8989	1273.4	628.872	228.549	19.9725
4	100.872	1271.32	1749.94	635.974	19.9725
5	103.844	1269.24	3027.15	1100.15	19.9725
6	106.816	1267.17	4455.91	1619.4	19.9725
7	109.789	1265.09	6038.52	2194.56	19.9725
8	112.768	1263.11	7645.8	2778.69	19.9725
9	115.747	1261.13	9406.58	3418.6	19.9725
10	118.726	1259.15	11376.6	4134.56	19.9725
11	121.705	1257.18	13521.4	4914.03	19.9725
12	124.684	1255.19	15708.7	5708.95	19.9725
13	127.664	1253.2	17861.1	6491.19	19.9725
14	130.643	1251.27	19878.7	7224.44	19.9725
15	133.622	1249.34	21839.9	7937.22	19.9725
16	136.17	1247.68	23478	8532.53	19.9725
17	138.717	1246.03	25091.3	9118.85	19.9725
18	141.264	1244.38	26687.8	9699.07	19.9725
19	143.812	1242.72	28272.1	10274.8	19.9724
20	146.359	1241.07	29843.4	10845.9	19.9725
21	148.906	1239.42	31393.3	11409.1	19.9724
22	151.453	1237.77	32860	11942.2	19.9725
23	154.001	1236.12	34311.5	12469.7	19.9725
24	157.493	1235.66	31159.6	11324.2	19.9724
25	160.986	1235.2	28247.2	10265.8	19.9725
26	162.569	1235.03	26884.2	9770.43	19.9725
27	165.788	1234.68	25940.6	9427.5	19.9725
28	167.971	1234.45	24625.3	8949.48	19.9725
29	174.956	1233.45	21103.8	7669.68	19.9725
30	178.449	1232.83	19606.6	7125.55	19.9725
31	181.941	1232.21	18099.3	6577.76	19.9725
32	185.249	1231.51	16880.5	6134.83	19.9725
33	188.557	1230.8	15666.4	5693.58	19.9725
34	191.894	1230.05	14573.5	5296.41	19.9725
35	195.23	1229.29	13528.7	4916.69	19.9725
36	198.567	1228.51	12568	4567.54	19.9725
37	201.903	1227.72	11650	4233.93	19.9725
38	205.24	1226.94	10772.6	3915.04	19.9724
39	208.576	1226.16	9922.73	3606.18	19.9725
40	210.921	1225.86	9026.3	3280.39	19.9724
41	213.267	1225.56	8171.47	2969.73	19.9725
42	215.612	1225.25	7358.11	2674.13	19.9725
43	217.958	1224.95	6586.39	2393.67	19.9725
44	220.303	1224.8	5693.62	2069.21	19.9725
45	222.648	1224.65	4872.11	1770.65	19.9724
46	224.993	1224.5	4116.84	1496.17	19.9725
47	227.338	1224.35	3419.75	1242.83	19.9725
48	230.127	1224.51	2417	878.402	19.9725
49	232.915	1224.68	1601.99	582.204	19.9724
50	233.349	1224.7	1490.86	541.819	19.9725
51	238.058	1225.01	0	0	0



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geologic and Geotechnical Consultants

SLIDEINTERPRET 8.014

Analysis:	Section 1-1'; non-circular search; bedding plane; static		
Client:	Sterling Gateway, L.P.	*Drawn By:*	K. Callahan
Project:	VTTM 60257 Sterling Ranch Estates	*File Name:*	t1ps1a.slmd
		Scale:	1:650
Project No.:	18-1245A-4	*Date:* 5/21/2019	*Figure No.:*

Slide Analysis Information

t1ps1a

Project Summary

File Name:	t1ps1a.slmd
Slide Modeler Version:	8.014
Compute Time:	00h:00m:12.886s
Project Title:	VTTM 60257
Analysis:	Section 1-1'; non-circular search; bedding plane; static
Author:	K. Callahan

Comments

Sterling Gateway, L.P.
Sterling Ranch Estates
18-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Left to Right

Analysis Options

Slices Type:	Vertical

Analysis Methods Used

Spencer

Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No

Seismic Load Coefficient (Horizontal): 0.15

Materials

Property	Compacted Fill	Alluvium	Landslide	Landslide Plane	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Anisotropic Linear
Unit Weight [lbs/ft3]	130	120	120	120	130
Cohesion [psf]	270	200	150	340	
Friction Angle [°]	29	27	29	12	
Cohesion 1 [psf]					300
Cohesion 2 [psf]					300
Friction Angle 1 [°]					18
Friction Angle 2 [°]					32
A [°]					1
B [°]					1
Anisotropic Definition					Surface
Angle from 1 [°]					
Anisotropic Surface					Anisotropic Surface 1
Tensile Strength [psf]					0
Water Surface	None	None	None	None	None
Ru Value	0	0	0	0	0

Global Minimums

Method: spencer

FS	1.104330
Axis Location:	219.123, 1403.609
Left Slip Surface Endpoint:	87.601, 1281.299
Right Slip Surface Endpoint:	238.058, 1225.006
Resisting Moment:	2.31543e+07 lb-ft
Driving Moment:	2.09668e+07 lb-ft
Resisting Horizontal Force:	121525 lb
Driving Horizontal Force:	110044 lb
Total Slice Area:	1841.51 ft2
Surface Horizontal Width:	150.457 ft
Surface Average Height:	12.2395 ft

Global Minimum Coordinates

Method: spencer

X	Y
87.6013	1281.3
94.097	1276.76
100.593	1272.22
105.626	1268.79
110.66	1265.35
115.694	1261.92
120.729	1258.5
125.904	1255.14
131.08	1251.78
134.757	1249.39
138.435	1247
142.119	1244.61
145.802	1242.22
151.891	1240.12
157.979	1238.33
164.067	1237.09
170.156	1235.96
176.519	1234.57
182.882	1233.05
189.231	1231.52
195.581	1230.07
201.931	1228.98
208.28	1227.94
213.237	1227.22
218.193	1226.51
223.149	1226.07
228.105	1225.63
233.082	1225.32
238.058	1225.01

Valid/Invalid Surfaces

Method: spencer

Number of Valid Surfaces: 6348
Number of Invalid Surfaces: 3707

Error Codes:

Error Code -108 reported for 19 surfaces
Error Code -109 reported for 1 surface
Error Code -111 reported for 15 surfaces
Error Code -112 reported for 24 surfaces
Error Code -114 reported for 17 surfaces
Error Code -121 reported for 1085 surfaces
Error Code -124 reported for 5 surfaces
Error Code -1000 reported for 2541 surfaces

Error Codes

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-109 = Soiltype for slice base not located. This error should occur very rarely, if at all. It may occur if a very low number of slices is combined with certain soil geometries, such that the midpoint of a slice base is actually outside the soil region,even though the slip surface is wholly within the soil region.
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.

-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.10433

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [degrees]	Base Material	Base Cohesion [psf]	Base Friction Angle [degrees]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	6.49565	3077.04	-34.9353	Bedrock	300	18	351.862	388.572	272.598	0	272.598	518.383	518.383
2	3.24783	3820.12	-34.9353	Bedrock	300	18	488.046	538.964	735.456	0	735.456	1076.37	1076.37
3	3.24783	4998.43	-34.9353	Bedrock	300	18	558.377	616.632	974.492	0	974.492	1364.53	1364.53
4	2.51683	4238.12	-34.3107	Bedrock	300	18	590.259	651.841	1082.85	0	1082.85	1485.66	1485.66
5	2.51683	4522.43	-34.3107	Bedrock	300	18	612.358	676.245	1157.96	0	1157.96	1575.85	1575.85
6	2.51693	4809.2	-34.309	Bedrock	300	18	634.644	700.856	1233.71	0	1233.71	1666.78	1666.78
7	2.51693	5101.66	-34.309	Bedrock	300	18	657.375	725.959	1310.97	0	1310.97	1759.55	1759.55
8	2.51693	5406.48	-34.3052	Bedrock	300	18	681.094	752.153	1391.59	0	1391.59	1856.29	1856.29
9	2.51693	5748.36	-34.3052	Bedrock	300	18	707.669	781.5	1481.9	0	1481.9	1964.74	1964.74
10	5.03503	12835.2	-34.2118	Bedrock	300	18	760.371	839.701	1661.03	0	1661.03	2178.01	2178.01
11	2.58769	6964.33	-32.9751	Bedrock	300	18	799.314	882.706	1793.38	0	1793.38	2311.97	2311.97
12	2.58769	6912.97	-32.9751	Bedrock	300	18	795.356	878.335	1779.93	0	1779.93	2295.95	2295.95
13	2.58771	6798.57	-32.9727	Bedrock	300	18	786.556	868.617	1750.02	0	1750.02	2260.29	2260.29
14	2.58771	6679.25	-32.9727	Bedrock	300	18	777.36	858.462	1718.77	0	1718.77	2223.07	2223.07
15	3.67746	9272.57	-33.0517	Bedrock	300	18	764.784	844.574	1676.03	0	1676.03	2173.67	2173.67
16	3.67762	9083.26	-33.0297	Bedrock	300	18	754.693	833.43	1641.73	0	1641.73	2132.39	2132.39
17	3.68363	8986.92	-32.9628	Bedrock	300	18	749.233	827.4	1623.17	0	1623.17	2109.04	2109.04
18	3.68363	8913.25	-32.9628	Bedrock	300	18	745.244	822.995	1609.61	0	1609.61	2092.89	2092.89
19	3.04421	7100.96	-19.06	Bedrock	300	32	1417.29	1565.16	2024.68	0	2024.68	2514.35	2514.35
20	3.04421	6416.25	-19.06	Bedrock	300	32	1308.85	1445.4	1833.03	0	1833.03	2285.23	2285.23
21	3.04421	5995.8	-16.3734	Bedrock	300	32	1301.49	1437.27	1820.02	0	1820.02	2202.41	2202.41
22	3.04421	5645.69	-16.3734	Bedrock	300	32	1243.1	1372.79	1716.82	0	1716.82	2082.06	2082.06
23	0.69	1218.67	-11.4964	Bedrock	300	32	1307.94	1444.4	1831.42	0	1831.42	2097.44	2097.44
24	3.51521	5871.79	-11.4964	Landslide Plane	340	12	609.36	672.935	1566.34	0	1566.34	1690.27	1690.27
25	1.8833	3033.25	-11.4964	Landslide	150	29	940.712	1038.86	1603.54	0	1603.54	1794.87	1794.87
26	3.04425	4754.54	-10.4645	Landslide	150	29	933.849	1031.28	1589.87	0	1589.87	1762.35	1762.35
27	3.04425	4581.17	-10.4645	Landslide	150	29	905.572	1000.05	1533.53	0	1533.53	1700.79	1700.79
28	3.1815	4719.42	-12.3866	Landslide	150	29	865.265	955.538	1453.23	0	1453.23	1643.26	1643.26
29	3.1815	4753.5	-12.3866	Landslide	150	29	870.395	961.203	1463.45	0	1463.45	1654.6	1654.6
30	6.363	9815.65	-13.3856	Landslide	150	29	878.35	969.988	1479.3	0	1479.3	1688.32	1688.32
31	3.17475	5084.15	-13.5878	Landslide	150	29	902.85	997.044	1528.11	0	1528.11	1746.32	1746.32
32	3.17475	5025.27	-13.5878	Landslide	150	29	894.168	987.456	1510.81	0	1510.81	1726.93	1726.93
33	3.17481	4752.97	-12.8672	Landslide	150	29	864.617	954.822	1451.94	0	1451.94	1649.44	1649.44
34	3.17481	4440.51	-12.8672	Landslide	150	29	817.921	903.255	1358.91	0	1358.91	1545.75	1545.75
35	3.17484	4097.1	-9.69612	Landslide	150	29	810.064	894.578	1343.25	0	1343.25	1481.66	1481.66
36	3.17484	3726.16	-9.69612	Landslide	150	29	751.183	829.554	1225.95	0	1225.95	1354.3	1354.3
37	3.1748	3365.83	-9.35767	Landslide	150	29	698.129	770.965	1120.25	0	1120.25	1235.29	1235.29
38	3.1748	3090.63	-9.35767	Landslide	150	29	654.158	722.406	1032.65	0	1032.65	1140.45	1140.45
39	2.47823	2224.39	-8.2109	Landslide	150	29	628.137	693.671	980.811	0	980.811	1071.45	1071.45
40	2.47823	2050.95	-8.2109	Landslide	150	29	591.827	653.572	908.468	0	908.468	993.866	993.866
41	2.47809	1877.39	-8.20889	Landslide	150	29	555.533	613.492	836.164	0	836.164	916.306	916.306
42	2.47809	1703.95	-8.20889	Landslide	150	29	519.218	573.388	763.813	0	763.813	838.715	838.715
43	2.47811	1509.13	-5.06406	Landslide	150	29	505.527	558.269	736.537	0	736.537	781.335	781.335
44	2.47811	1289.86	-5.06406	Landslide	150	29	456.588	504.224	639.038	0	639.038	679.499	679.499
45	2.47811	1096.28	-5.06406	Landslide	150	29	413.385	456.514	552.967	0	552.967	589.599	589.599
46	2.47811	920.831	-5.06406	Landslide	150	29	374.228	413.271	474.955	0	474.955	508.117	508.117
47	3.30427	937.58	-3.57859	Landslide	150	29	333.878	368.711	394.567	0	394.567	415.447	415.447
48	1.67224	338.203	-3.57859	Compacted Fill	270	29	424.917	469.249	359.455	0	359.455	386.029	386.029
49	2.48811	323.114	-3.5788	Compacted Fill	270	29	383.608	423.63	277.155	0	277.155	301.147	301.147
50	2.48811	107.705	-3.5788	Compacted Fill	270	29	334.212	369.081	178.746	0	178.746	199.649	199.649

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.10433

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [degrees]
1	87.6013	1281.3	0	0	0
2	94.097	1276.76	-587.149	-290.056	26.2897
3	97.3448	1274.49	69.2959	34.2327	26.2897
4	100.593	1272.22	1216.37	600.895	26.2897
5	103.109	1270.51	2226.36	1099.84	26.2897
6	105.626	1268.79	3352.39	1656.11	26.2898
7	108.143	1267.07	4595.32	2270.12	26.2897
8	110.66	1265.35	5957.6	2943.1	26.2897
9	113.177	1263.64	7444.03	3677.41	26.2897
10	115.694	1261.92	9069.96	4480.63	26.2897
11	120.729	1258.5	12853	6349.46	26.2897
12	123.317	1256.82	14840.1	7331.11	26.2897
13	125.904	1255.14	16807.2	8302.86	26.2897
14	128.492	1253.46	18729.4	9252.45	26.2897
15	131.08	1251.78	20605	10179	26.2897
16	134.757	1249.39	23194	11458	26.2897
17	138.435	1247	25706.3	12699.1	26.2897
18	142.119	1244.61	28171.9	13917.1	26.2897
19	145.802	1242.22	30608.7	15120.9	26.2897
20	148.846	1241.17	29488.8	14567.7	26.2897
21	151.891	1240.12	28394.7	14027.2	26.2897
22	154.935	1239.22	26959.9	13318.4	26.2897
23	157.979	1238.33	25558.1	12625.9	26.2897
24	158.669	1238.19	25095.4	12397.3	26.2897
25	162.184	1237.47	24954	12327.5	26.2898
26	164.067	1237.09	24251.6	11980.5	26.2898
27	167.112	1236.53	23015.8	11370	26.2898
28	170.156	1235.96	21808.4	10773.5	26.2897
29	173.337	1235.27	20778.9	10264.9	26.2896
30	176.519	1234.57	19745.3	9754.32	26.2897
31	182.882	1233.05	17868.6	8827.23	26.2897
32	186.057	1232.29	16937.5	8367.24	26.2897
33	189.231	1231.52	16011.8	7909.95	26.2897
34	192.406	1230.79	15032.7	7426.27	26.2897
35	195.581	1230.07	14087.5	6959.35	26.2898
36	198.756	1229.53	12858.9	6352.41	26.2898
37	201.931	1228.98	11698	5778.9	26.2897
38	205.106	1228.46	10572.5	5222.91	26.2898
39	208.28	1227.94	9499.56	4692.85	26.2897
40	210.759	1227.58	8627.28	4261.94	26.2897
41	213.237	1227.22	7793.1	3849.85	26.2897
42	215.715	1226.86	6996.97	3456.55	26.2897
43	218.193	1226.51	6238.94	3082.08	26.2897
44	220.671	1226.29	5374.3	2654.95	26.2898
45	223.149	1226.07	4576.63	2260.89	26.2897
46	225.627	1225.85	3838.09	1896.05	26.2898
47	228.105	1225.63	3153.14	1557.67	26.2896
48	231.41	1225.42	2272.09	1122.43	26.2897
49	233.082	1225.32	1649.84	815.034	26.2897
50	235.57	1225.16	786.977	388.772	26.2897
51	238.058	1225.01	0	0	0

APPENDIX F.6

Response to County of Los Angeles Review Comments, Geotechnical Report – Addendum No. 3 dated May 23, 2019.

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

May 23, 2019 Job No.: 19-1245A-4

Sterling Gateway, L.P.
1887 Gold Dust Lane, #303
P.O. Box 681007
Park City, UT 84068

Attention: Mr. Hunt Williams

Subject: **GEOTECHNICAL REPORT – Addendum No. 3**
Response to County of Los Angeles Review Comments

Project: Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California

References: At end of text

Dear Mr. Williams:

This addendum report has been prepared in response to review comments by Mr. Geir Mathisen received via email on 5/22/19, geologic reviewer at the Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division (GMED).

Our prior Geotechnical Report dated April 3, 2019 (Ref. 2) presented our response to the Geologic and Soils Engineering Review Sheet dated 10/17/18 for Vesting Tentative Tract Map (VTTM) 60257 issued by GMED. Based on our response provided for *Comment G2* in that review sheet, Mr. Geir requested additional information regarding Landslide Qls-3 and the proposed debris basin located at the western portion of Lot 228. The reviewer's comments are summarized below and is immediately followed by our responses.

Comment 1

Provided a calculation of the volume of landslide debris that could enter the basin.

Response

The volume of landslide debris that could enter the debris basin proposed on the western portion of Lot 228 is 337 cy. Sikand Engineering provided this calculation (see Figure 2), which is based on the proposed debris basin bottom elevation of 1,319, a debris cone limit at elevation of 1,323, and the predicted post-failure topography for Landslide Qls-3.

It is our understanding that the Supervising Civil Engineer will need to include the calculated Landslide Qls-3 post-failure volume of 337 cy that could potentially enter the debris basin to the calculated 278 cy debris production volume and bulking.

Comment 2

Demonstrate that failure of the slope will not adversely impact the ability of the basin to perform its primary function.

Response

The predicted post-failure topography for Landslide Qls-3 and the ascending natural slope is illustrated on Figure 1 – Landslide Qls-3/Basin Volume Evaluation. The predicted toe of the post-failure configuration in the debris basin is represented by the 1,320 elevation contour.

Based on the exhibit provided by Sikand Engineering the proposed debris basin provides a capacity of 1,110 cy and the debris production volume requirement is 278 cy. The debris capacity of the debris basin in a post failure condition is 773 cy (i.e., 1,110 cy minus 337 cy) which exceeds the debris production volume requirement for the basin of 278 cy. In addition, the debris basin maintenance access road down into the basin is outside of the predicted toe of the post failure configuration and the inlet structure for storm water is at least 20 ft from the predicted toe of the post-failure condition.

It is opined that the potential failure of the Landslide Qls-3 and the ascending slope will not adversely impact the ability of the debris basin to perform its primary function, which is to collect debris before entering the storm drain system and to convey stormwater into the storm drain system.

Comment 3

Include a 111-statement that indicates the design of the basin is safe and that there will be no adverse impact on adjacent and office properties.

Response

In compliance with Section 111 of the Los Angeles County Building Code, it is the finding of this firm that the proposed debris basin on the western portion of Lot 228, and the adjacent grading and residential lots designated on the Vesting Tentative Tract Map dated 2/27/19, will be safe from the hazard of landslide, settlement, or slippage, and will not adversely affect property outside of the development area, provided that all of our recommendations are incorporated in the plans and implemented during construction.

This opportunity to be of service is appreciated. If you have any questions regarding this report, please contact us.

Respectfully submitted,

Eric J. Seward, CEG 2110
Principal Engineering Geologist
Vice President

Kevin P. Callahan, MS, GE 2989
Geotechnical Engineer

The following attachment and appendix complete this report.

References

APPENDIX

Figure 1 – Landslide Qls-3/Basin Volume Evaluation (4/3/19)

Figure 2 – Sikand Engineering exhibit presenting debris basin calculations

Distribution:

Sterling Gateway, L.P. (1 hard copy and electronic in PDF format)
Attn: Mr. Hunt Williams

Sikand Engineering (PDF format)
Attn: Mr. Doug Farmer

Los Angeles County Department of Public Works Geotechnical and Materials Engineering Division (via email in PDF format)
Attn: Mr. Geir Mathisen

REFERENCES

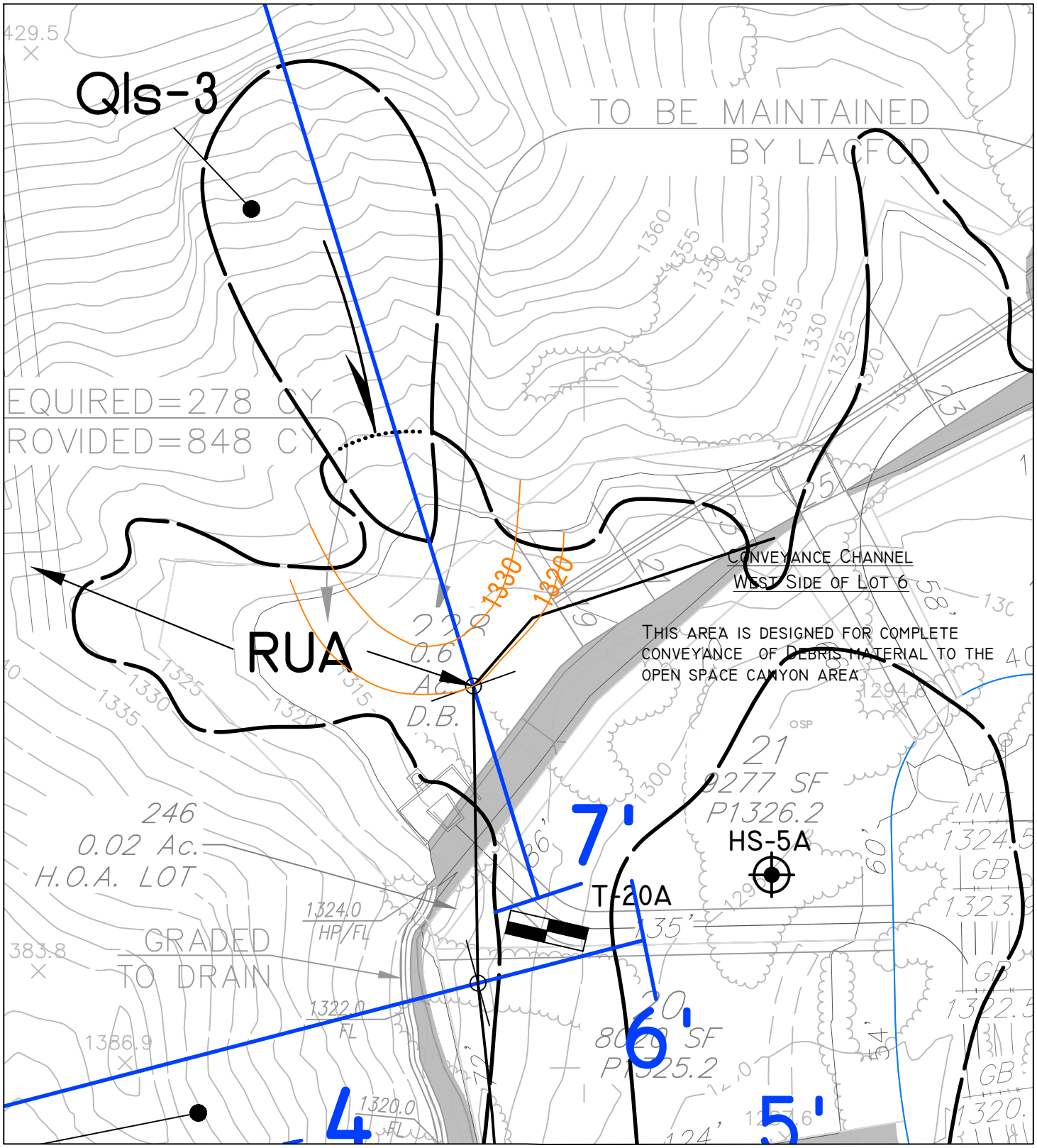
By: Allan E. Seward Engineering Geology, Inc.

(1) **Geologic and Geotechnical Report**
Review of Vesting Tentative Tract Map 60257 (Dated May 8, 2018)
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated June 8, 2018 – JN: 18-1245A-4

(2) **Geotechnical Report – Addendum No. 1**
Response to County of Los Angeles Geologic and Soils Engineering Review Sheet dated 10/17/18
Geologic and Geotechnical Report
Review of Revised Vesting Tentative Tract Map dated February 27, 2019
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated April 3, 2019 – JN: 19-1245A-4

(3) **Geotechnical Report – Addendum No. 2**
Response to County of Los Angeles Verbal Review Comment
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated May 21, 2019 – JN: 19-1245A-4

Appendix A



LEGEND

1330
1320

POST FAILURE DESIGN CONTOURS

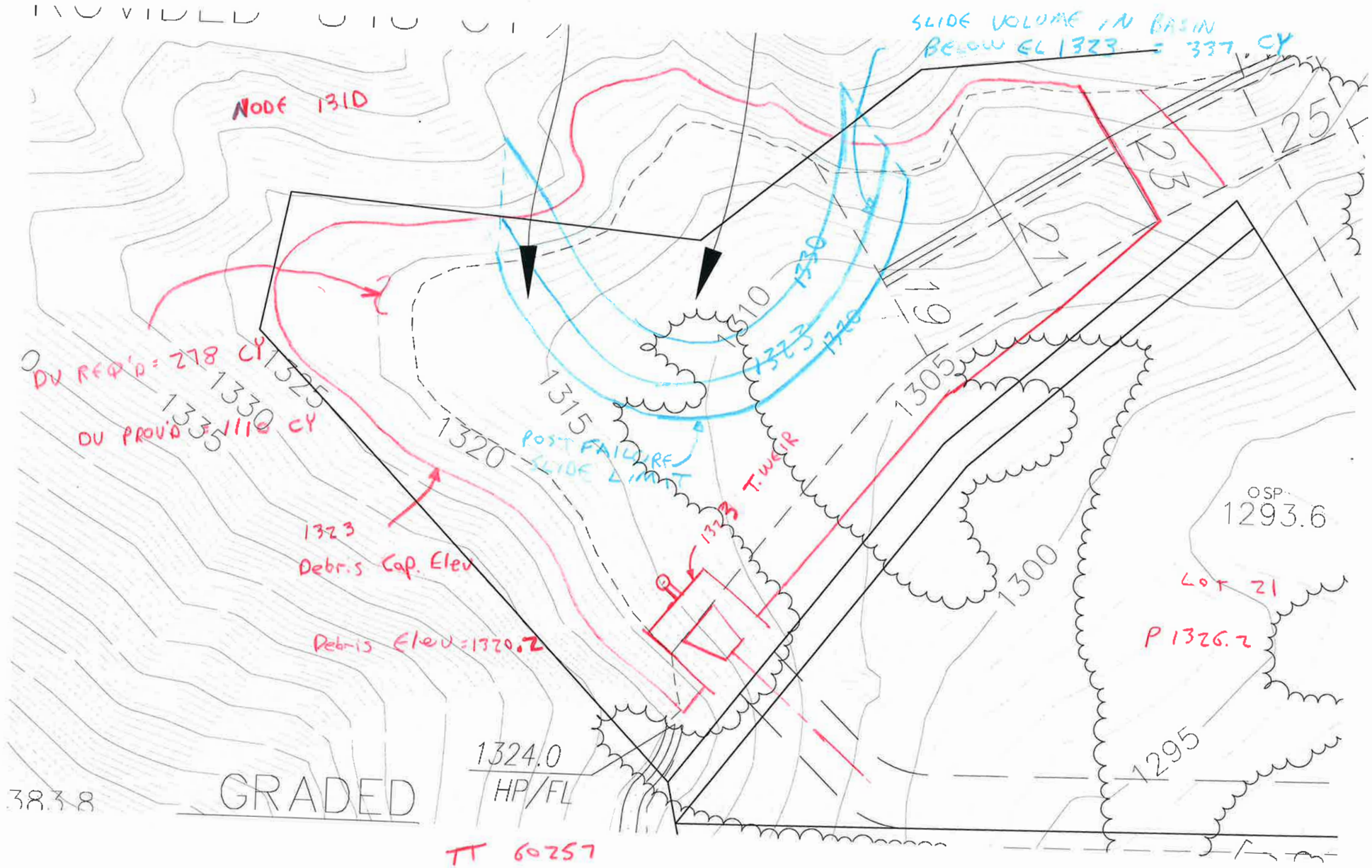
ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

LANDSLIDE QLS-3/BASIN VOLUME EVALUATION

DATE: 4/3/19	JOB NO.: 19-1245A-4
SCALE: 1" = 40'	FILE NAME: AES TTM 3.07.19 SHEET 2 & 3

FIGURE 1

GEOLOGY BY: VCG
DRAWN BY: VCG
REVISED: _____



Allan E. Seward Engineering Geology, Inc.
Job No.: 19-1245a-4
Submitted with report dated 5/23/19

Figure 2

APPENDIX F.7

Geologic and Geotechnical Report dated July 20, 2020

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOLOGIC AND GEOTECHNICAL REPORT
Review of Vesting Tentative Tract Map dated 6/29/20

Vesting Tentative Tract No. 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California

Prepared for:

Sterling Gateway, L.P.
1887 Gold Dust Lane, #303
P.O. Box 681007
Park City, UT 84068

Job No.: 20-1245A-4
Dated July 20, 2020

27825 Smyth Drive, Valencia, California 91355 661-294-0065 FAX 661-294-0833

TABLE OF CONTENTS

1.0 BACKGROUND 1
2.0 SCOPE OF WORK 2
3.0 REVISIONS TO THE VTTM 4
4.0 OFF-SITE WATER TANK SITE DESCRIPTION 4
5.0 OFF-SITE WATER TANK FIELD EXPLORATION, SAMPLING, AND LABORATORY TESTING 5
5.1 Surface Mapping 5
5.2 Subsurface Explorations 5
5.3 Sampling Procedures 6
5.4 Laboratory Testing 6
6.0 OFF-SITE WATER TANK GENERALIZED GEOLOGIC/GEOTECHNICAL SUBSURFACE CONDITIONS AND SOIL PROPERTIES 7
6.1 Regional Geologic 7
6.2 Geologic Structure 7
6.3 Geologic Units 7
6.3.1 Pico Formation (Tp) 7
6.3.2 Quaternary Colluvium (Qcol) 7
6.3.3 Quaternary Alluvium (Qal) 8
6.3.4 Artificial Fill (af) 8
6.4 Ground Water 8
6.5 Soil Compressibility 8
6.6 Potential Expansion of Soils 9
6.7 Potential Corrosivity of Soils 9
6.8 Erosion Potential 9
6.9 Debris Flow Hazard 9
7.0 OFF-SITE WATER TANK SEISMIC CONSIDERATIONS 10
7.1 Introduction 10
7.2 Ground Rupture 11
7.3 Ground Failure 11
7.3.1 Liquefaction Potential 11
7.3.2 Potential for Other Modes of Ground Failure 12
7.4 Ground Motion 12
7.4.1 General 12
7.4.2 Earthquake Magnitude 13
7.4.3 Peak Ground Acceleration 14
7.4.4 California Building Code Response Spectrum 14
8.0 OFF-SITE WATER TANK GENERAL CONCLUSIONS AND RECOMMENDATIONS 15
8.1 Feasibility of Development 15
8.2 Earthworks and Grading Recommendations 15

TABLE OF CONTENTS

8.2.1 Removals and Benching 15
8.2.2 Over-Excavation of Water Tank Pad and Access Road 15
8.2.3 Rippability 16
8.2.4 Fill Materials 16
8.3 Shrinkage, Bulking and Subsidence 16
8.4 Proposed Fill Slope 17
8.5 Proposed Cut-Slope 17
8.6 Landslides 17
8.7 Water Wells 17
8.8 Oil Wells 17
8.9 Water Tank Subdrain System 18
8.10 Foundation Considerations 18
8.11 Building Setbacks 18
8.12 Soil Compressibility Considerations 18
8.13 Expansive Soil Considerations 19
8.14 Corrosive Soil Considerations 19

9.0 GEOLOGIST/GEOTECHNICAL ENGINEER OF RECORD 20

10.0 LIMITATIONS 20

References

APPENDIX A – Subsurface Logs
- Test Pits (TP-1 thru TP-4)
- Bucket Auger Boring (BA-1WT)
- Hollow-stem Auger Borings (HS-1WT and HS-2WT)

APPENDIX B – Laboratory Test Results

APPENDIX C – Slope Stability Analyses

APPENDIX D – Maps and Cross Section
- Regional Geologic Map Plate I
- Geotechnical Map Plate II
- Cross Section 32-32’

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

July 20, 2020 Job No.: 20-1245A-4

Sterling Gateway, L.P.
1887 Gold Dust Lane, #303
P.O. Box 681007
Park City, UT 84068

Attention: Mr. Hunt Williams

Subject: **GEOLOGIC AND GEOTECHNICAL REPORT**
Review of Vesting Tentative Tract Map dated 6/29/20

Project: Vesting Tentative Tract No. 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California

References: See end of text

Dear Mr. Williams:

This report presents our opinions on the existing geologic and geotechnical conditions on Vesting Tentative Tract 60257 relative to the current design that is shown on the Map dated 6/29/20 and their effects on the proposed development. This report is supplementary to our previous reports (see references), hereinafter called "previous report", and the conclusions and recommendations presented therein are still applicable except where they are superseded in this report.

1.0 BACKGROUND

This firm previously prepared a Geologic and Geotechnical report dated 6/8/18 addressing the Vesting Tentative Tract Map (VTTM) dated 5/8/18. Subsequent addendum reports dated 4/3/19, 5/21/19 and 5/23/19 were prepared to address a VTTM dated 2/27/19 and in response to County of Los Angeles Department of Public Works, Geotechnical and Materials Engineering Division (GMED) Geologic and Soils Engineering review sheet comments. Feasibility of the 2/27/19 VTTM was subsequently recommended for approval from a geotechnical standpoint in the GMED review sheet dated May 23, 2019.

This report has been prepared to address revisions to the VTTM dated 6/29/20, specifically the addition of a proposed off-site water tank, as shown on Sheet 4, located approximately 1.8

miles to the west of the VTTM 60257 project site. No additional map revisions have been made that are pertinent to geology and geotechnical engineering.

2.0 SCOPE OF WORK

The scope of work performed for this study included the following tasks:

1. Review of the site topography and the Vesting Tentative Tract Map design, dated 6/29/20, provided to our office in computerized format (AutoCAD), prepared by Sikand Engineering.
2. Coordination with the project Supervising Civil Engineer, Sikand Engineering.
3. Review of previous reports by this firm in the vicinity of the subject site.
4. Review of published reports and maps listed in the References section.
5. Review of the referenced consultant report and the 1970 Grading Plan for the existing Los Angeles County Waterworks District 36 water tanks located adjacent to the proposed new off-site water tank.
6. Review of the 2003 Munger Map Book, California-Alaska Oil & Gas Field and review of records on the Division of Oil, Gas, and Geothermal Resources (DOGGR) website.
7. Review of Alquist-Priolo Fault Rupture Hazard Zones in California (CDMG Special Publication 42).
8. Review of the following aerial photographs:

9. YEAR	PHOTO	SCALE	AGENCY
1/1/1928	E-31 & E32	1" = 1,800'±	Fairchild
7/18/30	A-7 & A-8	1" = 1,800'±	Fairchild
10/24/45	12-1332 & 12-1333	1" = 1,400'±	Fairchild
11/3/52	20K-52, 20K-53 & 20K-54	1" = 20,000'±	USDA
1/1/59	12W-165	1" = 20,000'±	USDA
5/31/94	-	-	Google Earth Web Image
11/12/2004	-	-	Google Earth Web Image
8/26/12	-	-	Google Earth Web Image
8/19/19	-	-	Google Earth Web Image

10. Coordination with Underground Service Alert to obtain clearance from potentially impacted utilities prior to the subsurface exploration.

11. Coordination with Los Angeles County Public Works personnel regarding access to the Los Angeles County Waterworks District 36 water tank site.

12. Geologic field mapping of the water tank site and adjacent areas for assessment of potential debris flow hazard source material.

13. Excavation, sampling and logging of 2 hollow-stem-auger borings (HS-1WT and HS-2WT) drilled to a maximum depth of 29 feet, and 1 bucket-auger borings (B-1WT) drilled to a maximum depth of 55 feet.

14. Excavation and logging of 4 hand-dug test pits (TP-1 through TP-4).

15. Laboratory testing of samples obtained during our subsurface investigations for the off-site water tank. Testing included dry density and moisture content of in-situ soils, percent finer than the #200 sieve size, grain-size analysis, compaction (modified proctor), direct shear, hydro-compression (collapse), and corrosivity (soluble sulfate and chloride chloride content, pH and soil resistivity).

16. Performed general earthquake ground motion characterization for the water tank site in accordance with the 2016 California Building Code (CBC), ASCE 7-10, and Special Publication 117A (Guidelines for Evaluating and Mitigating Seismic Hazards in California), dated September 11, 2008. Our evaluation included calculation of CBC response spectrum parameters and potential ground accelerations that could be generated at the water tank site during future earthquakes on nearby faults.

17. Geotechnical evaluation of soil density, shear strength, compressibility, corrosion potential, expansion potential, and shrinkage and bulking factors.

18. Assessment of recommended grading removal depths based on weak soils, calculated static settlements, and proposed fill heights above the existing ground surface.

19. Preparation of a cross section illustrating anticipated geologic conditions for the proposed cut slope and perform slope stability analyses.

20. Preparation of a Regional Geologic Map (**Plate I**). The base map is the topographic contour map generated using the GIS-Net Public web tool provided by Los Angeles County Department of Regional Planning. We make no representation as to the accuracy of this base map.

21. Preparation of a Geotechnical Map (**Plate II**) illustrating our geologic data and recommended mitigation measures in relation to the proposed grading design for the off-site water tank using the Vesting Tentative Tract Map dated 6/29/20, Sheet 4 of 4 at a

scale of 1 inch equals 50 feet, as the base map. We make no representation as to the accuracy of the base map.

22. Preparation of figures and illustrations, including drill hole logs, test pit logs, laboratory test reports, slope stability graphical results and data output for inclusion in this report.

23. Preparation of this Geologic and Geotechnical report for submittal to the Los Angeles County Department of Public Works, Geotechnical and Materials Engineering Division.

3.0 REVISIONS TO THE VTTM

Revisions to the VTTM include the addition of a proposed off-site water tank on sheet 4 of 4. The tank site is located approximately 1.8 miles to the west of the project site and is adjacent to two existing and operational Los Angeles County Waterworks District No. 36 water tanks at 31632 W. Cuyama Road. Access to the proposed water tank site is via the partially paved W. Cuyama Road located at the westerly end of San Martinez Road.

The proposed water tank site will be graded using cuts and fills to construct a tank pad at an elevation of 1,571 feet above mean sea level (msl). The pad will support a water tank approximately 80 feet in diameter. A 2:1 (h:v) gradient cut slope approximately 230 feet in height is proposed that will ascend from the south to southeast side of the tank pad. A 20-ft high 2:1 fill slope is proposed that will descend from the north side of the tank pad. The access road to the existing water tanks will be used for the proposed water tank pad. A reinforced concrete channel between the proposed and existing water tank pads is shown for conveyance of potential debris flow material from the adjacent natural slope to the canyon bottom.

4.0 OFF-SITE WATER TANK SITE DESCRIPTION

The proposed water tank site is located within a side canyon tributary to the main drainage of San Martinez Canyon. The grading design footprint is on four parcels (APN: 3272-029-022, -023, -902 and 3247-035-900). These parcels are shown on sheet 4 of 4 of the VTTM. Assessor parcel number 3272-029-902 contains two existing Los Angeles County Waterworks water tanks and 3247-035-900 contains the existing access road (W. Cuyama Road). The site appears to be in a relatively natural state with the exception of the existing two water tanks and associated access road. A house structure previously existed at the location of the proposed tank site. However, per the original grading plan for the existing water tanks, this house was proposed to be removed during the grading construction.

Topography of the site consists of a relatively gentle narrow side canyon with moderate to steep slopes along the southerly portion of the site. The slopes are covered by annual grasses and sparse to thick chaparral vegetation with scattered oak trees. Elevations at the site range

from 1,550 in the drainage to 1,800 feet up along the ridgeline located southwest of the existing tanks. The site topography is shown on the Regional Geologic Map and Geotechnical Map that accompany this report. A small 8 ft high 2:1 (h:v) gradient fill slope is present directly adjacent to the existing tanks and a small up to 15 ft high 2:1 (h:v) gradient cut slope is present along the northerly side of the existing access road. These slopes are opined to have been constructed during the original grading for the existing water tanks.

5.0 OFF-SITE WATER TANK FIELD EXPLORATION, SAMPLING, AND LABORATORY TESTING

5.1 Surface Mapping

For this report, surface geologic mapping in conjunction with aerial photo interpretations was undertaken by personnel from Allan E. Seward Engineering Geology Inc. (AESEGI) using the proposed 50-scale VTTM as the base map and topography from Los Angeles County GIS website.

5.2 Subsurface Explorations

Our subsurface investigation consisted of the excavation, logging and sampling of four hand-dug test pits (TP-1 through TP-4), one 24-inch diameter bucket-auger boring (B-1WT) drilled to a maximum depth of 55 ft, and two 8-inch diameter hollow-stem auger borings (HS-1WT and HS-2WT) drilled to maximum depth of 29 ft. The bucket-auger and hollow-stem auger borings were excavated by Tri-Valley Drilling and Choice Drilling, respectively. The excavations and bucket-auger borings were logged and sampled by a Certified Engineering Geologist from this firm. The hollow-stem auger borings were logged and sampled by a Geotechnical Engineer from this firm. Our test pit and drill hole logs are presented in **Appendix A**. The locations of the test pits and drill holes are shown on the Geotechnical Map (**Plate II**).

The test pit logs included in **Appendix A** represent our interpretation of field data encountered at each location by our geologist at the time of excavation, along with refinements based on observations and laboratory test results. The drill hole logs included in **Appendix A** represent our interpretation of field data prepared for each boring by our geologic/engineering staff at the time of drilling, along with refinements based on observations and laboratory test results. Unit boundaries shown in the graphic log column of our hollow-stem-auger drill hole logs are approximate and may represent gradual transitions. The distribution and engineering characteristics of materials in adjacent areas may vary from those observed in the explorations.

5.3 Sampling Procedures

A modified California-drive sampler (fitted with 2.42-inch inner diameter by 1-inch-tall brass rings) was used to obtain samples in the exploratory drill holes at various depths (see logs in **Appendix A**). Blow counts to drive the sampler were recorded in 6-inch intervals during soil sampling. The blow count values shown on the drill hole logs represent the 12-inch blow count (or fraction of) following an initial 6-inch seating interval (hollow-stem auger boring only). The blow counts are raw values and have not been corrected to account for sampler size/type, overburden pressure, hammer type and efficiency, or rod length. Ring samples were sealed in plastic containers to preserve the in-situ moisture and brought to our geotechnical laboratory for further classification and testing.

Bulk soil samples were obtained from the test pits and from cuttings generated during the excavation of the drill holes. Materials in these bulk samples represent a mixture of soils within the noted depth range.

5.4 Laboratory Testing

Bedrock encountered in the bucket-auger boring was visually classified based the Wentworth size scale. Soils encountered in the test pits and hollow-stem auger drill holes were visually classified in the field using visual-manual procedures in accordance with applicable portions of the Unified Soil Classification System (ASTM D2488). Recovered soil samples were brought to our geotechnical laboratory, the visual soil classifications were checked, and the subsurface logs were reviewed in order to select soil samples for testing. The laboratory testing program performed on the on-site soils to evaluate engineering characteristics pertinent to the proposed improvements included the following tests: moisture content (ASTM D2216), dry density (ASTM D7263), Amount of Materials in Soils Finer than No. 200 Sieve (ASTM D1140), Particle-Size Analysis of Soils (ASTM D422), Modified Proctor (ASTM D1557), Collapse of Soils (ASTM D4546), Direct Shear (ASTM D3080), sulfate content (CT417), chloride content (CT422) and pH & resistivity (CT643).

The results of the field investigation and the laboratory tests were used as the basis for our analyses and recommendations presented in this report. Laboratory test results are discussed in the applicable sections of this report with graphical results presented in **Appendix B**.

6.0 OFF-SITE WATER TANK GENERALIZED GEOLOGIC/GEOTECHNICAL SUBSURFACE CONDITIONS AND SOIL PROPERTIES

6.1 Regional Geologic

The water tank site is located in the Transverse Ranges geomorphic province of Southern California in the eastern portion of the Ventura Basin. The Ventura Basin is a west-trending depositional basin produced by tectonic down-warping initiated during the early Miocene geologic epoch (5 to 24 million years ago). This depositional basin has developed a thick accumulation of Cenozoic sediments. The Holser fault is located 0.5 miles to the south of the proposed tank and the active San Gabriel is located 4.3 miles to the northeast of the site.

The proposed grading envelope for the water tank site is generally underlain by sedimentary rock of the Pico Formation (Dibblee, 1993). Alluvium and artificial fill are present in the canyon drainage area and soil and colluvium mantle most of the site.

6.2 Geologic Structure

Bedrock at the off-site tank site has been uplifted and tilted by north-south compressional tectonic forces producing geologic structures which trend east-west. The Pico Formation bedding generally strikes northeast and dips about 39° to the south. The three-dimensional geometry of the subsurface geologic structure is illustrated on the Geotechnical Map and Cross Section 32-32'.

6.3 Geologic Units

A general description of geologic units, including bedrock, surficial deposits, alluvium, and artificial fill are presented below. Distribution of these units is shown on the Geotechnical Map.

6.3.1 Pico Formation (Tp)

The Pliocene, shallow to deep marine Pico Formation in the subsurface borings and outcrop exposers in the vicinity of the off-site tank site consists dominantly of moderately indurated, fine-grained sandstone to coarse-grained pebbly sandstone. The sandstone is pale yellow and tan to light olive green and light brown. Dibblee (1993) mapped a light grey claystone and siltstone unit of Pico Formation beneath the off-site tank site. However, our investigation indicates that the Pico Formation unit beneath the site is more consistent with Dibblee's tan, semi friable sandstone, locally pebbly unit.

6.3.2 Quaternary Colluvium (Qcol)

Colluvium is a non-bedded, heterogeneous accumulation of soil and weathered bedrock deposited by gravity on slopes. Colluvium has been mapped within the narrow canyon

bottom both westerly and south of the existing two tanks. The observed colluvium consists of light brown to medium brown to tan silty sand with pebbles.

6.3.3 Quaternary Alluvium (Qal)

Quaternary alluvium is present within the canyon bottom areas adjacent to the tank site. The proposed fill slope that will descend from the tank pad will toe out into the alluviated canyon. The alluvium generally consists of yellowish-brown to brown, medium dense silty, fine-grained sand, stiff sandy silt, and soft sandy, silty clay where exposed near the ground surface. Measured dry densities ranged from 105 to113 pcf at moisture contents that varied from 3.7 to 13.6 percent.

6.3.4 Artificial Fill (af)

Artificial fill was encountered in Boring HS-2WT up to a depth of 6 feet. The fill presumably was placed during grading and construction of the existing water tanks and access road. The fill consists of very loose silty sands and firm sandy, silty clays.

6.4 Ground Water

Due to the elevated nature of the site ground water is not expected to pose a hazard to the proposed development or grading operations at the proposed water tank Site. Ground water or seepage was not observed during the subsurface investigation. Field reconnaissance mapping at the vicinity of the tank site also did not reveal evidence of ground water or seepage.

6.5 Soil Compressibility

Data from hollow-stem auger borings and results of hydro-compression testing performed on soil samples from the borings were used to evaluate compressibility of alluvial soils under static loading conditions. Based on this evaluation, potentially compressible layers exist within the upper 6 to 8 ft of the alluvium. The recommended removal depths provided in the Earthworks Recommendations section of this report consider these data.

Generally, soils at the site that have an in-situ dry density of 108 pcf or less and in-situ moisture content of 8 percent or less are considered potentially susceptible to hydro-compression. Review of the results of consolidation and density testing of samples from our borings indicates on-site alluvium materials display a minor potential for hydro-compression due to water incursion. Test results of five samples of the alluvium show negligible amounts (< 0.5%) of hydro-compression (see **Appendix B** for lab test data). No significant hydro-compression effects due to water incursion are expected at the site after the removals recommended in the Earthwork and Grading section of this report are performed.

6.6 Potential Expansion of Soils

The bedrock beneath the tank pad is anticipated to consist of fine- to coarse-grained sandstone with some fine-grained siltstone beds. The sandstone and siltstone beds are anticipated to have a very low to low expansion potential; however, fine-grained claystone beds of the Pico formation (which are not anticipated based on our subsurface exploration) may have higher expansion potential.

Compacted fills for the proposed grading will likely be generated from excavation in alluvium, colluvium and bedrock. The on-site soils when excavated, mixed and placed as a compacted fill are anticipated to have a very low to low expansion potential.

6.7 Potential Corrosivity of Soils

The Geotechnical and Materials Engineering Division (GMED) of the Los Angeles County Department of Public Works regards soil at a site to be corrosive to concrete and/or steel if the measured resistivity is 1,000 ohm-cm or less, and/or if the sulfate concentration is 2000 ppm (0.20%) or greater, and/or if the pH is 5.5 or less. Also, a soil with a chloride concentration greater than or equal to 500 ppm is considered deleterious to ferrous metals.

Compacted fills for the proposed tank pad will be generated from bedrock over-excavation. The on-site soils when excavated, mixed and placed as a compacted fill are not anticipated to exhibit corrosive characteristics to concrete or ferrous metals.

6.8 Erosion Potential

The existing provisions in the Grading Ordinance for planting and irrigation of constructed slopes in conjunction with drainage recommendations provided in the section "Surface Drainage and Erosion Control," will be sufficient mitigation against potential erosion within the subject site.

6.9 Debris Flow Hazard

Debris flows typically require a combination of loose colluvial soil, steep slopes and be exposed to period(s) of intense rainfall. Destructive debris flows originate on slopes with gradients between 26 to 56 degrees (Campbell 1975). Debris flows on slopes of 27 degrees or less do not tend to accelerate and are not considered a hazard.

Potential debris flow hazard on the north-east facing natural slope south of the existing water tanks has been evaluated. Methodology used to assess the site and identify the potential debris source areas are outlined below:

- Review of historic aerial photographs covering the site and adjacent areas for evidence of debris flow in the form of scars, bare rock, variation of vegetation densities that might

indicate locations where older debris source areas might be present and geomorphic lobes that might represent accumulation for a debris flow.

- Review of the topographic base map to determine areas that are steeper than approximately 26 degrees or approximately 2:1 horizontal to vertical.
- Field mapping by an engineering geologist to determine locations and general composition of loose colluvial soil. The lateral limits of the debris flow source areas were mapped using the VTTM as a base map.
- Excavation and sampling of 4 hand excavated test pits.

Review of the off-site water tank design, the topographic base map, field mapping of the site and excavation of 4 hand dug test pits indicates that there is a potential debris flow hazard to the access point to the proposed water tank pad from the natural slope south of the existing water tanks. The source of the potential debris flow hazard is noted on the attached Geotechnical Map with the abbreviation "PDFH". Based on the potential debris source area and an average depth of 12 inches, the calculated volume of debris is 1,322 cubic yards.

Based on our geotechnical recommendations, the supervising civil engineer incorporated an 8 ft wide by 4 ft wide reinforced concrete conveyance channel for potential debris flow into the water tank site design. Debris flow hazard is mitigated by this reinforced concrete conveyance channel located between the existing water tank and the proposed water tank pad.

7.0 OFF-SITE WATER TANK SEISMIC CONSIDERATIONS

7.1 Introduction

The off-site water tank is within the Transverse Ranges Geomorphic Province of southern California. The Transverse Ranges consist of a series of west-trending mountains and intervening valleys. These ranges largely resulted from north-south compression, ultimately causing east-west-trending folds and thrust faults. Associated faults in the vicinity of the tank site include the Holser, Santa Susana, Northridge (East Oakridge), Del Valle and Sierra Madre (San Fernando) reverse/thrust faults. The January 17, 1994 Northridge (M6.8) Earthquake occurred on a south-dipping thrust fault which uplifted the Santa Susana Mountains at least 40 cm.

The southern California region is traversed by the San Andreas Fault, which is a transform boundary between the Pacific Plate and the North American Plate. The San Andreas Fault is part of the San Andreas system of northwest-striking, right-lateral faults. The faults of

this system are generally historically active, as evidenced by the June 28, 1992 Landers (M7.6).

The southern California region is seismically active and commonly experiences strong ground shaking resulting from earthquakes along active faults. Earthquakes along these faults are part of a continuous, naturally occurring process, which has contributed to the characteristic landscape of the region.

Three common types of geologic hazards may be produced during a seismic event (earthquake). These include:

a. Ground Rupture;
b. Ground Failure; and
c. Ground Motion.

7.2 Ground Rupture

There are no visible signs of ground rupture across the water tank site nor in the aerial photographs reviewed. Regional geology maps do not show any active or potentially active faults as defined by the California Geological Survey (CGS, 1998) with a ground surface trace located on or trending towards the water tank site. The water tank site does not lie within any of the California Alquist-Priolo Earthquake Fault Zones (Hart, 1999 revision). Therefore, the possibility of fault-related ground rupture at the water tank site is believed to be very low.

7.3 Ground Failure

Ground failure is a general term that refers to permanent ground deformation caused by strong earthquake shaking. This includes liquefaction, lateral spreading, ground lurching, seismic settlement of poorly consolidated materials (dynamic densification), differential materials response, slope failure, sympathetic movement on weak bedding planes or non-causative faults, and shattered ridge effects.

Earthquake-induced slope failures include activation and reactivation of landslides, rock falls, debris flows, and surficial slide failures. Provided that the recommendations presented in this report are followed, the potential for earthquake related slope failure at the water tank site is considered to be very low.

7.3.1 Liquefaction Potential

Review of the State of California Seismic Hazard Zones Map for the Val Verde Quadrangle indicates that the tank site pad is not located in a zone of required liquefaction investigation.

7.3.2 Potential for Other Modes of Ground Failure

Earthquake-induced slope failures include activation and reactivation of landslides, rock falls, debris flows and surficial failures. Review of the Seismic Hazard Map for the Val Verde Quadrangle indicates that the project site is within a designated area requiring investigation to evaluate potential earthquake-induced landslides. The stability of constructed slopes which could potentially affect the proposed water tank site has been evaluated and appropriate mitigation recommended, if required. The potential for earthquake-induced slope failures to adversely impact the proposed water tank site is considered negligible, provided that our Recommendations and those of the Supervising Civil Engineer are incorporated into the proposed design and implemented during construction.

7.4 Ground Motion

7.4.1 General

The proposed tank site is located in southern California, which is in a geologically and seismically active region where large magnitude, potentially destructive earthquakes are common. Therefore, it is reasonable to assume that moderate or large magnitude earthquakes will affect the water tank site during the life of a given structure. The Holser fault, which has a surface trace located less than 1 mile to the south of the water tank site, is the closest significant fault. The active **San Andreas fault** is located about 20 miles north of the project site. Large earthquakes along these, or along any of the other numerous faults in the region, are expected to produce strong ground shaking at the project site in the future.

The current standards for construction provided in the 2019 California Building Code are designed to safeguard against major failures and loss of life, but are not intended to limit damage, maintain functions or provide for easy repair. Per Structural Engineers Association of California (SEAOC), conformance to these recommendations does not constitute any kind of guarantee or assurance that significant structural damage will not occur in the event of a maximum level of earthquake ground motion. However, it is reasonable to expect that a well-planned and constructed structure will not collapse in a major earthquake and that protection of life is reasonably provided, but not with complete assurance.

Although research on earthquakes during the last fifty years has greatly enhanced the level of understanding of earthquake faulting in California, the record is much too short to constrain behavior of all faults in southern California and the attenuation characteristics of all areas relative to each future potential earthquakes. Predicted accelerations should,

therefore, be considered **rough estimates** rather than precise facts and ground motions from future earthquakes may exceed the predicted accelerations. Neither the **Time, Location, nor Magnitude** of an earthquake can be accurately predicted at this time.

7.4.2 Earthquake Magnitude

Earthquake **magnitude** is a quantitative measure of the strength of an earthquake or the strain energy released by it, as determined by seismographic or geologic observations. It does not vary with distance or the underlying earth material. This differs from **intensity**, which is a qualitative measure of the effects a given earthquake has on people, structures, loose objects, and the ground at a specific location. Intensity generally increases with increasing magnitude and in areas underlain by unconsolidated materials and decreases with distance from the epicenter. The approximate magnitude necessary to generate these effects is shown on the 1956 version of the Modified Mercalli intensity scale. The table below presents the distances to nearby significant faults located within about 20 miles of the water tank site. The site-to-source distances were obtained from the USGS fault parameters online database (based on 2008 National Seismic Hazards Map). The maximum earthquake magnitudes (M_W) were calculated using the magnitude-area relationships recommended for large magnitudes in the Uniform California Earthquake Rupture Forecast Version 3 (UCERF3) prepared by the Working Group for California Earthquake Probabilities (USGS Open-File Report 2013-1165).

Distance (Miles)	Fault Name	Dip (Degrees)	Slip Sense	Magnitude, Mw
0.84	Northridge	35	thrust	6.86
1.46	Holser, alt 1	58	reverse	6.77
2.74	Oak Ridge Connected	53	reverse	7.35
2.74	Oak Ridge (Onshore)	65	reverse	7.11
4.26	San Cayetano	42	thrust	7.12
5.29	Santa Susana, alt 1	55	reverse	6.84
5.95	San Gabriel	61	strike slip	7.21
8.41	Simi-Santa Rosa	60	strike slip	6.81
14.73	Sierra Madre (San Fernando)	45	thrust	6.63
14.73	Sierra Madre Connected	51	reverse	7.26
16.44	Santa Ynez Connected	70	strike slip	7.31
16.44	Santa Ynez (East)	70	strike slip	7.09
19.06	Verdugo	55	reverse	6.84

7.4.3 Peak Ground Acceleration

The mapped peak ground acceleration (PGA) consistent with maximum considered earthquake geometric mean (MCE_G) ground motions was determined based on Figure 22-9 of ASCE 7-16 using the OSHPD Seismic Design Maps web tool by the Structural Engineers Association of California (SEAOC). The water tank location was identified using site coordinates of 34.4527°N and 118.6894°E. The mapped PGA incorporates a probability of ground motion exceedance equal to 2% in 50 years (i.e. 2,475-year return period) with a deterministic upper limit imposed near large, active faults. The mapped PGA was adjusted for site class effects (PGA_M) based on "very dense soil and soft rock conditions" (Site Class C) in accordance with ASCE 7-16. Based on this evaluation, a site-modified PGA_M of 1.07g would be produced by the maximum considered earthquake.

7.4.4 California Building Code Response Spectrum

The following seismic ground motion parameters should be used for calculation of the 2019 California Building Code (CBC) response spectrum:

FACTOR	VALUE
Site Class	C
Site Coefficient, F_a	1.2
Site Coefficient, F_v	1.4
Mapped Spectral Response Acceleration at Short Period, S_S	2.098
Mapped Spectral Response Acceleration 1-Second Period, S_1	0.741
Short Period Spectral Response Acceleration Adjusted for Site Class, S_{MS}	2.518
1-Second Period Spectral Response Acceleration Adjusted for Site Class, S_{M1}	1.038
Design Spectral Response Acceleration at Short Period, S_{DS}	1.678
Design Spectral Response Acceleration 1-Second Period, S_{D1}	0.692
Peak Ground Acceleration, PGA_M	1.07

8.0 OFF-SITE WATER TANK GENERAL CONCLUSIONS AND RECOMMENDATIONS

8.1 Feasibility of Development

The Vesting Tentative Tract Map No. 60257 dated 6/29/20 is feasible for development from a geologic and geotechnical standpoint provided our recommendations are followed and implemented during design and construction.

8.2 Earthworks and Grading Recommendations[1]

8.2.1 Removals and Benching

In order to provide a uniform firm bottom prior to placing fill soil, unconsolidated alluvium, artificial fill, colluvium, and severely weathered bedrock should be removed from areas to receive fill. The estimated depths of removals range from 6 to 10 feet in the alluvium, as shown on the **Geotechnical Map**. The excavated soils may be used as fill material.

Removal depths for these areas are based on our subsurface investigations, laboratory testing, proposed fill heights, intended use, and analysis results, as well as geologic and geotechnical judgment. The exact depth and extent of necessary removals will be determined in the field during the grading operations when observations and more location-specific evaluations can be performed.

In areas to receive compacted fill where the surface gradient is steeper than 5:1 (H:V) the soil mantle, colluvium and unsuitable material should be removed and such areas benched horizontally into competent material prior to our in conjunction with fill placement (See detail, Fill Over Natural Slope).

8.2.2 Over-Excavation of Water Tank Pad and Access Road

A transition between bedrock and compacted fill is anticipated beneath the water tank footprint. It is recommended that the bedrock be over-excavation to provide a minimum 5-foot thick fill cap extending at least 5 feet outside of the footprint of the proposed water tank. This over-excavation will provide attenuation of potential differential settlements or differential material response to seismic events and provide a uniform base for structural support. If the maximum depth of fill exceeds 15 feet, then the thickness of the fill cap should be one-third of the deepest fill thickness below the water tank (see detail, Over-excavation for Transitional Cut and Cut-Fill Lot). It is also recommended that

[1] Construction details are presented in the 6/8/19 report (see ref. 1).

bedrock beneath the proposed water tank access road be removed and replaced with compacted fill to a depth of at least three feet beneath the pavement subgrade elevation.

The bedrock of the Pico Formation may contain expansive claystone beds that could cause differential expansion. If excavation of the bedrock exposes expansive materials below the water tank footprint, then the bedrock should be over-excavated to provide a minimum 8-foot thick fill cap extending at least 8 feet outside of the footprint of the proposed water tank to provide a surcharge of sufficient overburden pressure to limit bedrock expansion to acceptable levels for proposed structures. The fill cap thickness required to provide a surcharge of sufficient overburden pressure to limit expansion should be confirmed during the grading operations based on swell testing of potentially expansive beds.

8.2.3 Rippability

Grading operations within the granular and poorly cemented surficial deposits can be performed with conventional equipment. Heavy, single-shank ripping may be required within the more indurated portions of the Pico Formation bedrock.

8.2.4 Fill Materials

Onsite soils that are free of debris, over-size rocks, topsoil and organic matter may be used as sources for compacted fills. Rock or similar irreducible material with a maximum dimension greater than eight (8) inches may not be placed in the fill. Rocks or hard fragments larger than four (4) inches shall not compose more than 25 percent of the fill and/or lift. Any large rock fragments over eight (8) inches in size, may be incorporated into the fill as rockfill in windrows after being reduced to the specific maximum rock fill size (see detail, Rock Disposal). Where fill depths are too shallow to allow large rock disposal, special handling or removal may be required.

8.3 Shrinkage, Bulking and Subsidence

The following bulking and shrinkage factors are based on and in-situ densities compared to average of 92 percent relative to the maximum dry density as determined per the ASTM D 1557 test, judgment, and our past experience. For the materials encountered at the site, shrinkage (decrease in volume) or bulking of those materials, when excavated, placed and compacted as controlled fill is estimated to be as follows:

MATERIAL TYPE	SHRINKAGE (%)	BULKING (%)
Artificial Fill (af)	15 – 20	
Alluvium/colluvium (Qal/Qcol)	12 – 18	
Bedrock (Tp) 0-3′ depth[1]	4	
Bedrock (Tp) >3′ depth		0 – 6

[1] Denotes typical upper weathered zones in Pico Formation (Tp) that are prone to shrinkage.

The above shrinkage, bulking and subsidence factors are only approximations. The actual volume changes from cut to fill depend on the quality or degree of compaction and mixing. The Supervising Civil Engineer should design pad grades with sufficient flexibility to accommodate a possible shortage or excess of fill of up to 10 percent of the total yardage graded.

8.4 Proposed Fill Slope

A north-facing fill slope is proposed at a 2:1 (h:v) gradient that descends from the north side of the water tank pad. The maximum proposed fill slope height is about 20 feet. By inspection, this fill slope is anticipated to be grossly stable provided our recommendations are followed and implemented during design and construction.

8.5 Proposed Cut-Slope

Cut-slope CS-1WT is an approximately 230 ft high northwest to northeast-facing 2:1 (h:v) gradient cut-slope. This cut-slope is anticipated to expose bedrock of the Pico Formation striking northeast and dipping 34 to 45° south. This structural configuration is anti-dip to the slope face and is considered grossly stable from a geologic standpoint. Anticipated geologic conditions are illustrated on Cross Section 32-32', which is oriented perpendicular to the slope face. Slope stability analyses performed on Cross Section 32-32' indicates this slope satisfies the Los Angeles County minimum factor of safety requirements for static and seismic loading (see **Appendix C**). Cut-slope CS-1WT is considered grossly stable as designed.

8.6 Landslides

No landslides have been identified beneath the water tank site or the access road.

8.7 Water Wells

Water wells do not currently exist on or in close proximity to the proposed water tank site grading. If water wells are discovered during the future grading operations they should be evaluated relative to the proposed improvements.

8.8 Oil Wells

Review of the California Department of Conservation, Geologic Energy Management Division records (CalGEM website) indicates that oil wells do not currently exist on or in close proximity to the proposed water tank site. If undocumented oil wells are encountered during grading operations, their locations should be surveyed and the current well conditions evaluated immediately.

8.9 Water Tank Subdrain System

A subdrain system should be installed under the proposed water tank to prevent water from infiltrating into descending slopes below the tank in the event of a leak or spill. A synthetic geomembrane (such as high-density polyethylene HDPE) with a coefficient of permeability of 10^{-6} cm/sec or less should be placed beneath the proposed water tank. A leakage collection and discharge system should be provided between the tank bottom and the geomembrane.

8.10 Foundation Considerations

No specific tank foundation designs have been provided at this time. The following general foundation criteria are provided for future design and planning consideration.

Conventional shallow spread footings are considered adequate for the support of the proposed Water Tank, provided footings are supported entirely on a compacted fill cap. Minimum recommended continuous foundation dimensions are 15 inches width and 24 inches depth below lowest adjacent grade. Tentatively, an allowable bearing capacity of **2,000 psf** can be used for (minimum-sized) shallow foundations constructed in compacted fill. This tentative allowable bearing value should be confirmed by further field and laboratory testing of the site soils before use in design. Lateral resistance of footing walls should be provided at the Grading Plan stage.

8.11 Building Setbacks

The standard setbacks from ascending and descending slopes provided in the Los Angeles County/California Building Code shall be followed.

8.12 Soil Compressibility Considerations

Based on consolidation testing performed for the water tank site and estimated static settlements under future fill and structural loads, **compressibility** and hydro-compression (collapse) settlement potential of subsurface soils below the recommended removal depths are considered to be **low**. Proposed grades are not expected to be adversely affected by soil compressibility or by hydro-compression (collapse) settlement, provided that our recommendations are incorporated into project design and construction.

Due to the predominantly coarse-grained nature of the alluvial soils, it is anticipated that potential static settlement of alluvial soils beneath planned fills will generally occur during grading.

8.13 Expansive Soil Considerations

Soil expansion has been found to be a significant consideration for design and construction of foundations and concrete slabs-on-grade. Based on visual and tactile classification of the bulk mix of soil considered representative of future fill it is anticipated that compacted fill from the onsite materials will have a very low to low expansion potential. The expansion potential of the site soils exposed at rough grade should be tested again after site grading is complete and the final foundation design should be based on those expansion test results.

8.14 Corrosive Soil Considerations

The tested soil does not classify as corrosive to concrete. Pending additional testing, either Type I or II cement may be considered for use in concrete placed in contact with the ground.

The tested soil does not classify as corrosive to ferrous metals. However, it is recommended that the following precautionary measures be implemented to mitigate a less significant corrosion potential as indicated by the measured resistivity value:

- Steel and wire reinforcement in concrete structures cast against site soils should have at least 3 inches of concrete cover.
- Buried utilities made of ferrous metals should be protected with polyethylene extruded coating, or with tape over primer per AWWA Standard C209 or C203, or with hot-applied coal tar enamel, or as recommended by manufacturers of the utility conduits.
- Metallic pipes that penetrate concrete structures should be surrounded by plastic sleeves, rubber seals, boots, or other dielectric material in order to prevent contact between the pipe and the concrete structure.
- Below-grade ferrous metals should be electrically insulated (isolated) from above-grade metals.

Mitigating recommendations against soil corrosivity should be revised/expanded based on additional confirmatory tests that should be performed at the completion of the grading operations. Final recommendations for concrete will be in accordance with the latest CBC requirements, and a corrosion specialist should provide mitigating recommendations for potential corrosion of metals in contact with on-site soils.

9.0 GEOLOGIST/GEOTECHNICAL ENGINEER OF RECORD

This report has been prepared assuming that Allan E. Seward Engineering Geology, Inc. will refine all geology and geotechnically-related data for the Grading Plan stage of this project. If the recommendations contained in this report are to be utilized and expansion of the geology/geotechnical work is performed by others, the party performing the work must review this report and assume full responsibility for recommendations contained herein. That party would then assume the title of responsibility as "Geologist/Geotechnical Engineer of Record" for the specific work.

10.0 LIMITATIONS

This report has been prepared for the exclusive use of Sterling Gateway, L.P. and their design consultants for the specific site discussed herein. This report should not be considered transferable. Prior to use by others, we should be notified, as additional work may be required to update this report.

In the event that any modifications in the design or location of the proposed development, as discussed herein, are planned, the conclusions and recommendations contained in this report will require a written review by this firm with respect to the planned modifications.

The proposed development is located in southern California, a geologically and tectonically active region, where large magnitude, potentially destructive earthquakes are common. Therefore, ground motions from moderate or large magnitude earthquakes could affect the site during the life of the proposed structure(s).

Typically, faulting is confined to the area adjacent to a known fault. However, absolute assurance against future fault displacement is not possible in tectonically active regions because new faults can form over time as the orientation and magnitude of deformational forces change in the earth's crust. Therefore, the location and magnitude of new ground surface ruptures during a seismic event cannot be anticipated.

In performing these professional services, this firm has used the degree of care and skill ordinarily exercised under similar circumstances by reputable geologists and geotechnical engineers practicing in this or similar localities. The data presented in this report are based on the results of pertinent field and laboratory testing. It should be recognized that subsurface conditions can vary in time, and laterally, and with depth at a given site and that the conclusions and recommendations presented in this report are based on our observations and testing. Therefore, our **conclusions** and **recommendations** are **professional opinions** and are **not meant** to be a control of nature. We make no other **warranty**, either **expressed** or **implied**.

This opportunity to be of service is greatly appreciated. If you have any questions regarding this report please give us a call.

Respectfully submitted,

Eric J. Seward, CEG 2110
Certified Engineering Geologist
Vice President

Kevin P. Callahan, MS, GE 2989
Geotechnical Engineer

The following attachments and appendices complete this report.

References

APPENDIX A – Subsurface Logs
- Test Pits (TP-1 thru TP-4)
- Bucket Auger Boring (BA-1WT)
- Hollow-stem Auger Borings (HS-1WT and HS-2WT)

APPENDIX B – Laboratory Test Results

APPENDIX C – Slope Stability Analyses

APPENDIX D – Maps and Cross Section
- Regional Geologic Map — Plate I
- Geotechnical Map — Plate II
- Cross Section 32-32'

Distribution:

Sterling Gateway, L.P. (1 hard copy and electronic in PDF format)
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Sikand Engineering (PDF format)
Attn: Mr. Doug Farmer

Los Angeles County Department of Public Works
Geotechnical and Materials Engineering Division (PDF format via EpicLA)

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(1) **Geologic and Geotechnical Report**
Review of Vesting Tentative Tract Map 60257 (Dated May 8, 2018)
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated June 8, 2018 – JN: 18-1245A-4

(2) **Geotechnical Report – Addendum No. 1**
Response to County of Los Angeles Geologic and Soils Engineering Review Sheet dated 10/17/18
Geologic and Geotechnical Report
Review of Revised Vesting Tentative Tract Map dated February 27, 2019
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated April 3, 2019 – JN: 19-1245A-4

(3) **Geotechnical Report – Addendum No. 2**
Response to County of Los Angeles Verbal Review Comment
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated May 21, 2019 – JN: 19-1245A-4

(4) **Geotechnical Report – Addendum No. 3**
Response to County of Los Angeles Review Comments
Vesting Tentative Tract Map 60257
Sterling Ranch Estates
Val Verde, County of Los Angeles, California
Dated May 23, 2019 – JN: 19-1245A-4

Appendix A

CLIENT: Sterling Gateway, L.P.	JOB NO: 20-1245A-4	**TRENCH LOG NO.** TP-1
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 7/20/20	
	LOGGED BY: VCG	
	EXCAVATED: 5/11/20	
EXCAVATION METHOD: Hand excavated	ELEVATION: see map	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**<u>SOIL/COLLUVIUM</u>; s/Qcol (0 - 12")** @ 0' Light brown sand with pebbles; loose; dry; abundant roolets; very little silt; @ 6" Light brown to light yellowish-brown pebbly sand; loose; damp; very little silt				@ 6-12" Bulk Sample
1					**<u>WEATHERED BEDROCK</u>; Tp (12 - 20")** @ 12" Light grayish brown to tan pebbly sandstone; dense; damp; slighlty friable; crude bedding	Apx. B: N55E, 43S			
2									
3									
4									

TOTAL DEPTH: 1.7 feet

SCALE: 1 inch = 5 feet

No Ground Water
No Caving

CLIENT: Sterling Gateway, L.P.		JOB NO: 20-1245A-4	**TRENCH LOG NO.** TP-2
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 7/20/20	
		LOGGED BY: VCG	
		EXCAVATED: 5/11/20	
EXCAVATION METHOD: Hand excavated		ELEVATION: see map	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SOIL/COLLUVIUM; s/Qcol (0 - 13")** @ 0' Light brown silty sand with scattered pebbles; loose; dry; abundant roolets; very little silt;				@ 6-12" Bulk Sample
1					@ 10" - cobble size clast of sandstone @ 12" - damp **WEATHERED BEDROCK; Tp (13 - 24")** @ 13" Tan and light rusty brown sandstone with pebbles; dense; damp				
2									
3									
4									

TOTAL DEPTH: 2 feet

SCALE: 1 inch = 5 feet

No Ground Water
No Caving

CLIENT: Sterling Gateway, L.P.		JOB NO: 20-1245A-4	**TRENCH LOG NO.** TP-3
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 7/20/20	
		LOGGED BY: VCG	
		EXCAVATED: 5/11/20	
EXCAVATION METHOD: Hand excavated		ELEVATION: see map	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SOIL/COLLUVIUM; s/Qcol (0 - 11")** @ 0' Light grayish-brown silty sand with scattered pebbles and minor amounts of silt; loose; dry; abundant roolets @ 8" - damp @ 10" - clasts of tan sandstone **WEATHERED BEDROCK; Tp (11 - 24")** @ 11" Tan sandstone; dense; damp				@ 11-20" bulk sample
1									
2									
3									
4									

TOTAL DEPTH: 2 feet

SCALE: 1 inch = 5 feet

No Ground Water
No Caving

CLIENT: Sterling Gateway, L.P.		JOB NO: 20-1245A-4	**TRENCH LOG NO.** TP-4
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 7/20/20	
		LOGGED BY: VCG	
		EXCAVATED: 5/11/20	
EXCAVATION METHOD: Hand excavated		ELEVATION: see map	

DEPTH (feet)	SAMPLE TYPE	SAMPLE NUMBER	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	ATTITUDES	LABORATORY TESTS: Moisture Content (%)	LABORATORY TESTS: Dry Density (pcf)	LABORATORY TESTS: Other Tests
0					**SOIL/COLLUVIUM; s/Qcol (0 - 13")** @ 0' Light brown silty sand with pebbles; loose; dry				@ 6-13" bulk sample
1					@ 8" - cobble size clast of sandstone @ 10" - light yellowish brown; damp; some clasts of sandstone; clam shell fragments **WEATHERED BEDROCK; Tp (13 - 24")** @ 13" grey with rust colored mottling sandstone and pebbly sandstone; dense; damp				
2									
3									
4									

TOTAL DEPTH: 2 feet

SCALE: 1 inch = 5 feet

No Ground Water
No Caving

CLIENT: Sterling Gateway, L.P.	JOB NO.: 20-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 7/20/20		
	LOGGED BY: VCG		
DRILLING COMPANY: Tri-Valley Drilling	DRILLED: 4/23/20		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-1WT	
DRIVING WEIGHTS: 0-28' = 5,952 lbs, 28-56' = 3,921 lbs, 56-86' = 2,531 lbs	ELEVATION: 1568'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES; DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
						SOIL/COLLUVIUM; s/Qcol (0 - 9.5') @ 0' Medium brown, sand and silty sand with scattered pebbles; loose; moist; roots to 9 ft.	
5		push	s/Qcol			@ 5.4' - grades to light brown with scatttered sandstone clasts up to 4" in diameter	
						@ 9.5 - sharp contact with underlying bedrock	Bulk sample @ 8-9'
10		2 2		Ctc: N55E, 41NW		**BEDROCK; Tp (9.5 - 55')** @ 9.5' Pale yellow to tan fine- to coarse-grained sandstone with scattered sub-rounded pebbles and gravel; dense; damp; laminations generally crude and indistinct	
				B: N38E, 35SE			
15		2 3	Tp		SP-SM	@ 14' fine- to coarse-grained sandstone with pebbles and gravel	Bulk sample @ 15-18' % fines = 12 Shear Test
				B: N44E, 43SE			
20		2 2					
				B: N45E, 37SE		@ 21.5' - grades to fine-grained sandstone @ 22' - some laminations	
				B: N47E, 45SE			
25		3 5			SM		% fines = 18 Shear Test
				f: N69E, 49SE		@ 29' - minor hairline fracture lined with rusty brown staining @ 29.5' - color change to rusty brown	
30		4 9					
				B: N50E, 40SE			
35		9 17/5"			SM		% fines = 19 Shear Test

CLIENT: Sterling Gateway, L.P.	JOB NO.: 20-1245A-4	**DRILL HOLE LOG**	
PROJECT: VTTM 60257 Sterling Ranch Estates	DATE: 7/20/20		
	LOGGED BY: VCG		
DRILLING COMPANY: Tri-Valley Drilling	DRILLED: 4/23/20		
DRILLING METHOD: Bucket Auger	HOLE DIA: 24"		
HAMMER TYPE: Telescoping Kelly Bar	AVERAGE DROP: 12"	**BORING NO.** B-1WT	
DRIVING WEIGHTS: 0-28' = 5,952 lbs, 28-56' = 3,921 lbs, 56-86' = 2,531 lbs	ELEVATION: 1568'		

DEPTH (feet)	SAMPLE TYPE	BLOWS / 6"	GRAPHIC LOG	ATTITUDES, DRY DENSITY (pcf)/ MOISTURE CONTENT (%)	USCS SYMBOL	DESCRIPTION	Remarks
40				B: N39E, 43SE B: N64E, 38SE		@ 38' - pebble and cobble lense @ 39' Light olive-green to light brown micaceous very fine- to fine-grained sandstone	
	■	3 4					Bulk sample @ 41-45'
				B: N69E, 43SE			
45						@ 44' - some rusty brown mottling	
	■	2 4			SM		% fines = 37 Shear Test
				B: N50E, 40SE			
50							
	■	3 12				@ 50' - color change to light rusty brown	
55							
						TOTAL DEPTH 55' (Elev. 1513') No Ground Water No Caving	
60							
65							
70							

CLIENT: Sterling Gateway, L.P.		JOB NO.: 20-1245A-4	**DRILL HOLE LOG**
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 7/20/20	
		LOGGED BY: KPC	
DRILLING COMPANY: Choice Drilling		DRILLED: 4/22/20	
DRILLING METHOD: Hollow-stem auger (Limited Access Rig)		HOLE DIA: 6"	**BORING NO.** HS-1WT
HAMMER TYPE: Automatic		AVERAGE DROP: 30"	
DRIVING WEIGHTS: 140 lbs		ELEVATION: 1565'	

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ALLUVIUM; Qal (0 - 23.5')**				
		7		CL-ML	@ 2' Sandy, silty CLAY; soft; damp; medium brown	13.6	103		
		20			@ 4' - firm to stiff	10.8	108		
5		21		SM	@ 6' Silty, fine-grained SAND; medium dense; damp; light yellowish brown	3.7	107		
10		25		ML	@ 10' Sandy SILT; stiff; damp; light yellowish brown	4.5	105	54	Swell/Consol
		25		SM	@ 14' Silty, fine-grained SAND; medium dense; damp; light yellowish brown	5.2	109	37	Shear Test
15		27			@ 18.5' - trace of clay	5.4	107	50	Swell/Consol
20		30				9.3	117		
					WEATHERED BEDROCK; Tp (23.5 - 29')				
25		44			@ 26' Sandy siltstone; hard; damp; light to pale yellowish brown; caliche- and FeO_2-lined fractures; trace clay	10.1	116		
		40			@ 27.5' - damp to moist; yellowish brown	14.7	108		
30					TOTAL DEPTH 29' (Elev. 1536') No Groundwater				
35									

CLIENT: Sterling Gateway, L.P.		JOB NO.: 20-1245A-4	**DRILL HOLE LOG**
PROJECT: VTTM 60257 Sterling Ranch Estates		DATE: 7/20/20	
		LOGGED BY: KPC	
DRILLING COMPANY: Choice Drilling		DRILLED: 4/22/20	
DRILLING METHOD: Hollow-stem auger (Limited Access Rig)		HOLE DIA: 6"	**BORING NO.** HS-2WT
HAMMER TYPE: Automatic		AVERAGE DROP: 30"	
DRIVING WEIGHTS: 140 lbs		ELEVATION: 1568'	

DEPTH (feet)	SAMPLE TYPE	BLOWS / 12"	GRAPHIC LOG	USCS SYMBOL	DESCRIPTION	LABORATORY TESTS: Moisture Content (%)	Dry Density (pcf)	% Fines	Other Tests
0					**ARTIFICIAL FILL; af (0 - 6')**				
		7		SM	@ 2' Silty, fine- to medium-grained SAND; very loose; moist; yellowish brown	9.8	107		
5		8		CL-ML	@ 4' Sandy, silty CLAY; firm; moist; mottled light to dark brown; roots	11.1	111		
		33		SM	**ALLUVIUM; Qal (6 - 16')** @ 6' Silty, fine-grained SAND; medium dense; damp; yellowish brown; trace clay	3.2	113		
		43			@ 8' - minor gravel	4.9	109	42	Swell/Consol
10									
		36		ML	@ 12' Interbedded sandy SILT and fine- to coarse-grained silty SAND; stiff/medium dense; damp; yellowish brown	4.2	108	51	Swell/Consol
15									
		58		ML	**WEATHERED BEDROCK; Tp (16 - 23')** @ 16' Sandy siltstone; very stiff; damp; light yellowish brown; caliche-lined fractures	5.7	113	53	Swell/Consol
20		50/4"							
		50/6"			@ 22' Silty, medium- to coarse-grained sandstone with gravel; very dense; dry to damp; pale yellow	2.6	120		
25					TOTAL DEPTH 23' (Elev. 1545') No Groundwater				
30									
35									

Appendix B

APPENDIX B

GEOTECHNICAL LABORATORY INVESTIGATION

1. General

   a. The laboratory investigation used current, accepted test procedures of the American Society of Testing and Materials (ASTM).

   b. Bulk samples and ring samples were obtained during the investigation. Laboratory sample identification is by project name and number, boring number, and sample depth.

2. Index Parameters Tests

   The following Index Parameters tests were performed on soil and bedrock materials collected during grading operations.

TEST TYPE	NUMBER OF TESTS	TESTING STANDARD
In-situ Moisture Content	26	ASTM D2216
In-Situ Dry Density	26	ASTM D7263
Percent-Finer Than #200 Sieve	11	ASTM D1140
Particle-Size Analysis of Soils	4	ASTM D6913

   The purpose of each test is briefly described below:

   a. In-Situ Moisture Content (ASTM D2216) and Dry Density (ASTM D7263) testing of soils provide an indication of the strength and compressibility of in-situ soils. These data, in conjunction with sampler blow count data, aid in evaluation of soil consistency and in selection of samples for additional laboratory testing. Results of Moisture Content and Dry Density testing are recorded on the Drill Hole Logs within **Appendix A**.

   b. Percent Finer than #200 Sieve (ASTM D1140) testing was performed on soil samples to aid in classification of the samples in accordance with the Unified Soil Classification System (USCS). Results of Percent Finer than #200 Sieve testing are recorded on the Drill Hole Logs within **Appendix A** and on applicable laboratory test reports in this Appendix.

   c. Mechanical particle-size analyses of soil fractions larger than 75 microns (No. 200 sieve) were conducted to aid in classification of soils in accordance with the Unified Soil Classification System (USCS). Results of the particle size analyses are presented on **Figures B1.1** and **B1.2** in this Appendix.

APPENDIX B

3. Geotechnical Engineering Parameters Tests

The following Geotechnical Engineering Parameter tests were performed on ring samples of soil collected during the investigation.

TEST TYPE	NUMBER OF TESTS	TESTING STANDARD
Modified Proctor	1	ASTM D1557
Collapse of Soils	5	ASTM D4546
Direct Shear	6	ASTM D3080

The purpose of each test type is briefly described below.

a. Modified Proctor (ASTM D1557) tests were performed on selected bulk samples to assess their compacted moisture-density relationship for future use during grading operations. Results of the Modified Proctor tests are presented on **Figure B2** in this Appendix.

b. One-dimensional Collapse of Soils (ASTM D4546) testing was performed on California drive ring samples to assess the hydro-compression potential of alluvial soils when inundated with water under future loading conditions. The samples were incrementally loaded to normal pressures ranging from 1,000 to 2,000 psf in accordance with Procedure B. The "hydro-compression" was taken as the percent strain when inundated with water under an applied pressure approximately equal to the existing overburden pressure plus future applied foundation bearing pressure at that depth. Results of collapse testing are presented on **Figures B3.1** through **B3.5** in this Appendix.

c. Direct Shear (ASTM D3080) testing was performed on a mixture of soil from Borings B-1WT and HS-1WT (remolded to approximately 90 percent of maximum dry density) and on California drive ring samples of bedrock and alluvium using a displacement-controlled Direct Shear machine. Prior to shearing, the samples were inundated and consolidated under normal pressures ranging from 1,000 psf to 9,000 psf. Thereafter, the samples were sheared horizontally at a controlled displacement rate until the horizontal shear force reduced to a stable value. For remolded specimens, material passing the No. 4 sieve was used. Results of the Direct Shear testing, including interpreted peak strength and residual shear strength parameters, are presented on **Figures B4.1** through **B4.6** within this Appendix.

APPENDIX B

4. Corrosion Tests

The following corrosivity tests were performed on a mixture of bulk samples of bedrock and alluvial soil obtained at the project site.

TEST TYPE	NUMBER OF TESTS PERFORMED	TESTING STANDARD
Sulfate-Content	1	California Test Method 417
Chloride-Content	1	California Test Method 422
Resistivity and pH	1	California Test 643

Soluble Sulfates Content, Chloride Content, Resistivity, and pH tests were performed to evaluate corrosivity of soil/rock material from the project site to concrete, ferrous metals, and non-ferrous metals. Results of the testing are presented in the following table.

LOCATION	USCS	RESISTIVITY	CHEMICAL ANALYSES		
		SATURATED (OHM-CM)	pH	CHLORIDE Cl (PPM)	SULFATE SO_4 (%)
HS-1WT & B-1WT	SM	3808	7.8	408	0.00

The following attachments complete this Appendix.

LABORATORY TEST RESULTS

- Particle Size Distribution Test Reports Figures B1.1 and B1.2
- Compaction Test Report Figure B2
- Swell/Consolidation Test Reports Figures B3.1 thru B3.5
- Direct Shear Test Reports Figures B4.1 thru B4.6

Particle Size Distribution Test Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	3.4	11.1	48.3	25.5	11.7	
□	0.0	0.0	0.0	1.1	42.2	38.8	17.9	
△	0.0	0.0	0.0	2.3	43.4	35.1	19.2	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	B-1WT		15'	4/23/20	SP-SM	poorly graded sand with silt			
□	B-1WT		25'	4/23/20	SM	silty sand			
△	B-1WT		35'	4/23/20	SM	silty sand			

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 20-1245A-4 Figure B1.1

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Valencia, California

○ Bedrock (Tp), Sandstone
□ Bedrock (Tp), Sandstone
△ Bedrock (Tp), Sandstone

Particle Size Distribution Test Report

	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.1	62.8	37.1	

	Source	Sample #	Depth/Elev.	Date Sampled	USCS	Material Description	NM %	LL	PL
○	B-1WT		45'	4/23/20	SM	silty sand			

Client Sterling Gateway, L.P.

Project VTTM 60257

Sterling Ranch Estates

Project No. 20-1245A-4 Figure B1.2

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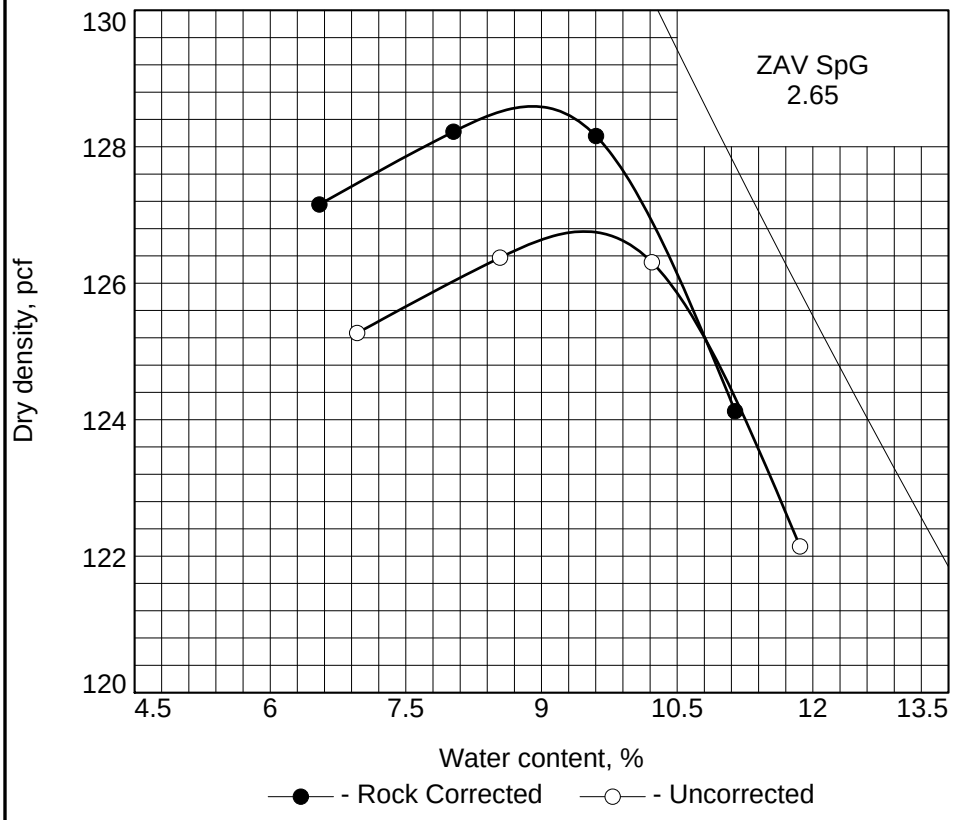
ENGINEERING GEOLOGY, INC.

Valencia, California

○ Bedrock (Tp), Sandstone

COMPACTION TEST REPORT



Curve No.
C

Test Specification:
ASTM D 1557-12 Method A Modified
ASTM D4718-15 Oversize Corr. Applied to

Hammer Wt.: 10 lb.
Hammer Drop: 18 in.
Number of Layers: five
Blows per Layer: 25
Mold Size: 0.03333 cu. ft.

Test Performed on Material Passing #4 **Sieve**

Soil Data

NM		**Sp.G.**	2.65
LL		**PI**	
%>#4	6.1	**%<#200**	28.3
USCS	SM	**AASHTO**	

TESTING DATA

	1	2	3	4	5	6
WM + WS	8.82	8.92	8.99	8.90		
WM	4.37	4.37	4.37	4.37		
WW + T #1	872.6	955.7	1019.8	1005.7		
WD + T #1	818.0	884.0	929.4	902.5		
TARE #1	32.5	44.1	44.7	32.1		
WW + T #2						
WD + T #2						
TARE #2						
MOISTURE	6.5	8.0	9.6	11.1		
DRY DENSITY	127.2	128.2	128.2	124.1		

ROCK CORRECTED TEST RESULTS

Maximum dry density = 128.6 pcf

Optimum moisture = 8.9 %

Material Description

Dark yellowish-brown (10YR 4/4) silty SAND

Project No. 20-1245A-4 **Client:** Sterling Gateway, L.P.
Project: VTTM 60257
Sterling Ranch Estates
○ **Location:** HS-1WT @ 0-10', B-1WT @ 8', and B-1WT @ 15-18' 1:1:1 mix

Remarks:
Mixture of on-site alluvial, slopewash, and bedrock materials

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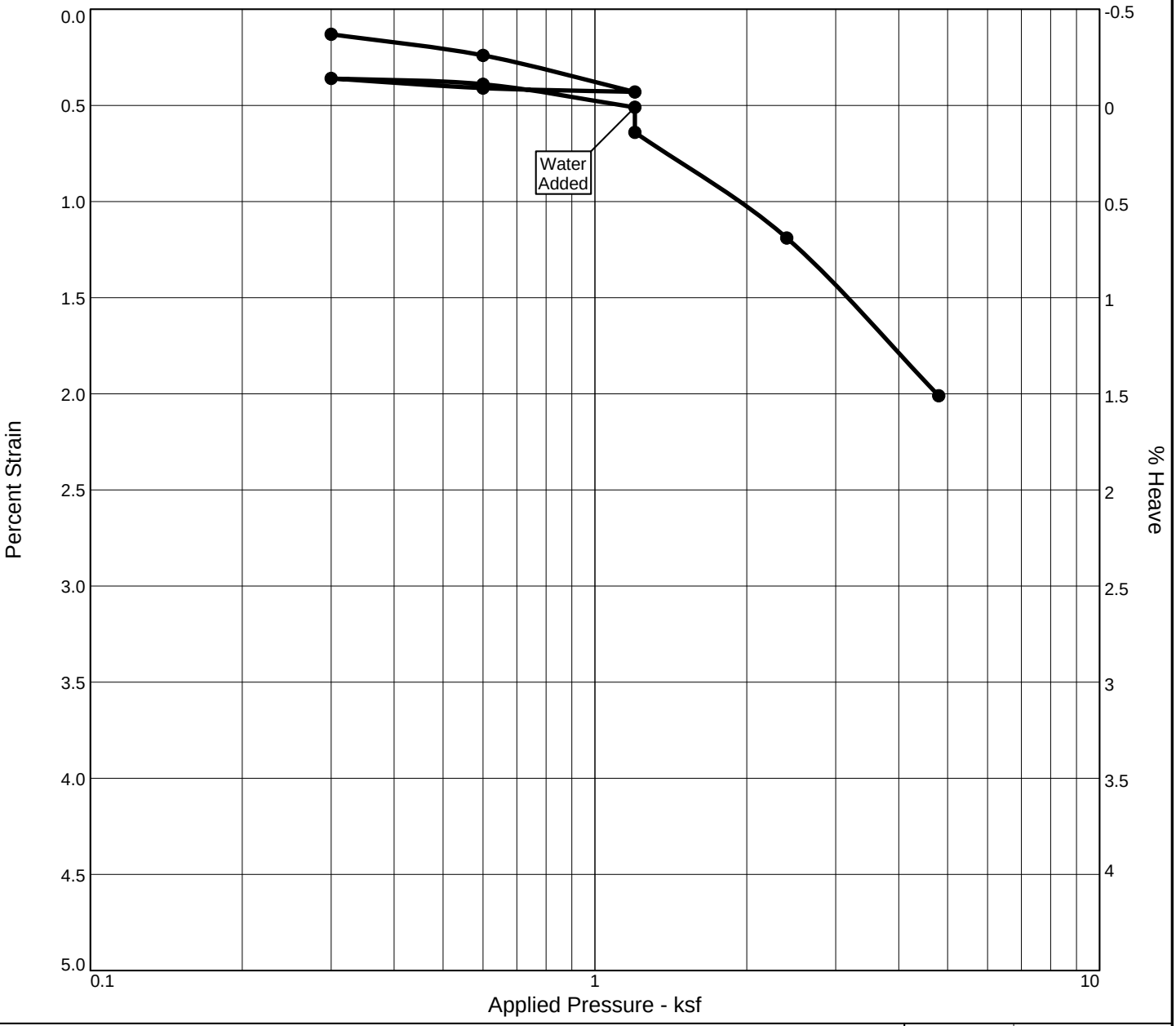
Valencia, California

Figure B2

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Sandy SILT	ML	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	1.2	110.8	112.8	5.9 %	17.5	31.7 %	100.0	0.494	0.464	2.5	0.04

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Inundated with distilled water at overburden pressure

D2435 Method	C_s	Swell Press. (ksf)	Heave %
D4546	0.00		-0.1

Project No. 20-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-1WT **Depth:** 10'

Remarks:
Alluvium (Qal)
% Fines = 54.0

Checked By: K. Callahan

Title: Geotechnical Engineer

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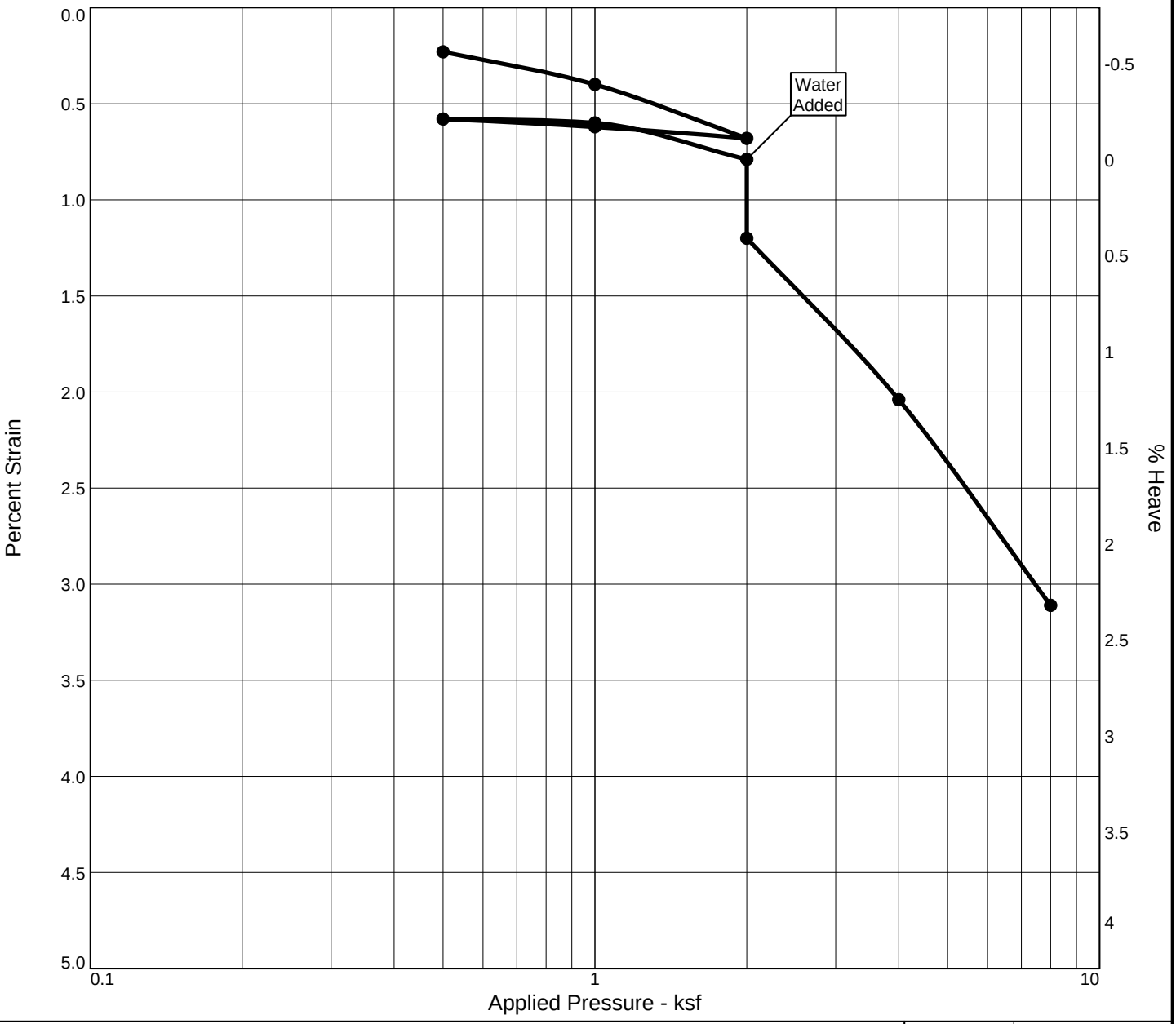
Valencia, California

Figure B3.1

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Silty, fine-grained SAND	SM	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	2.0	111.9	115.5	6.5 %	16.4	36.0 %	100.0	0.479	0.433	4.1	0.05

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Inundated with distilled water at overburden pressure

D2435 Method	C_s	Swell Press. (ksf)	Heave %
D4546	0.00		-0.4

Project No. 20-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-1WT **Depth:** 18.5'

Remarks:
Alluvium (Qal)
% Fines = 49.8

Checked By: K. Callahan

Title: Geotechnical Engineer

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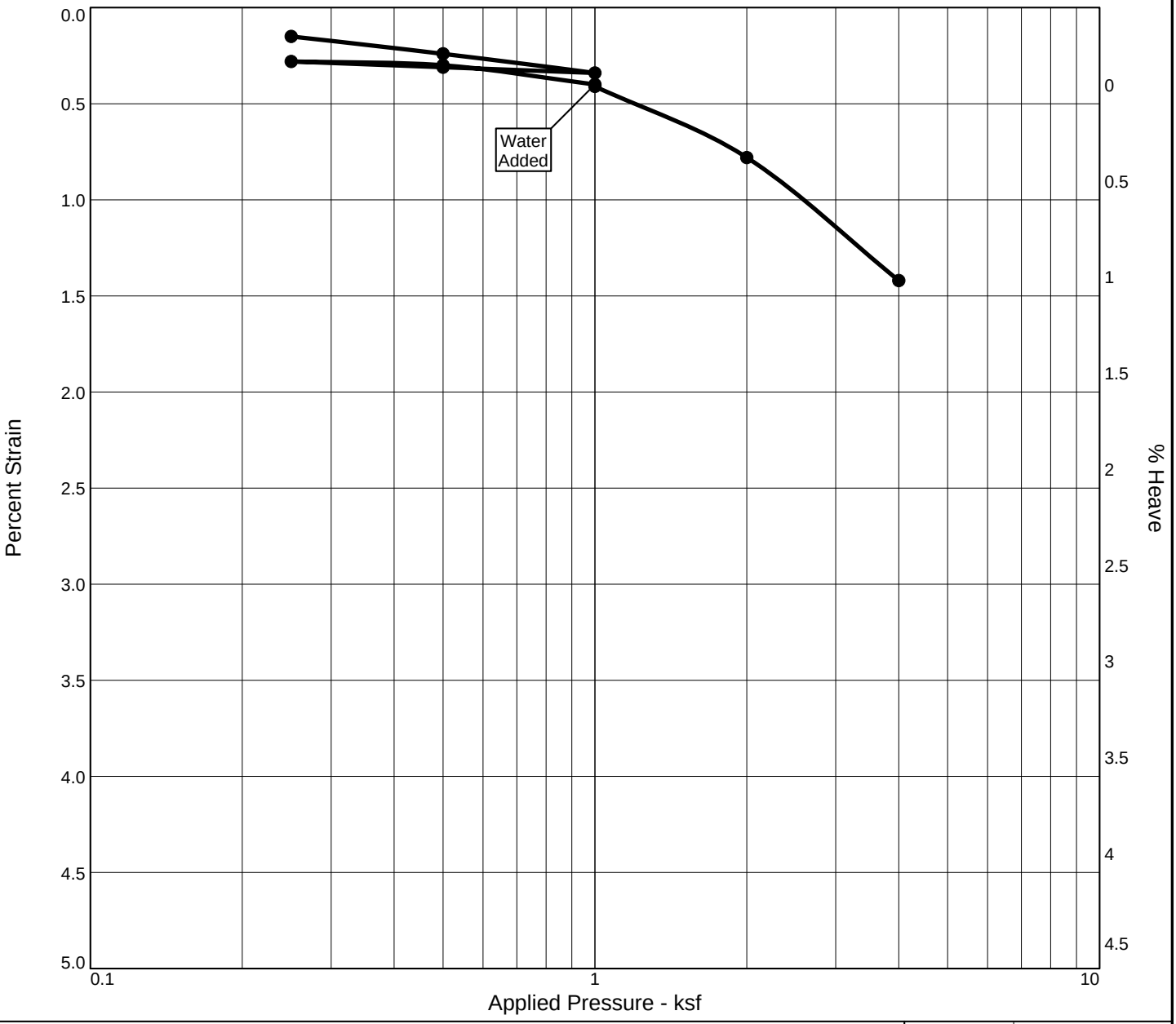
Valencia, California

Figure B3.2

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Silty, fine-grained SAND	SM	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	1.0	113.3	114.9	4.9 %	16.6	28.2 %	100.0	0.460	0.439	2.0	0.03

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Inundated with distilled water at overburden pressure

D2435 Method	C_s	Swell Press. (ksf)	Heave %
D4546	0.00		0.0

Project No. 20-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-2WT **Depth:** 8'

Remarks:
Alluvium (Qal)
% Fines = 42.2

Checked By: K. Callahan

Title: Geotechnical Engineer

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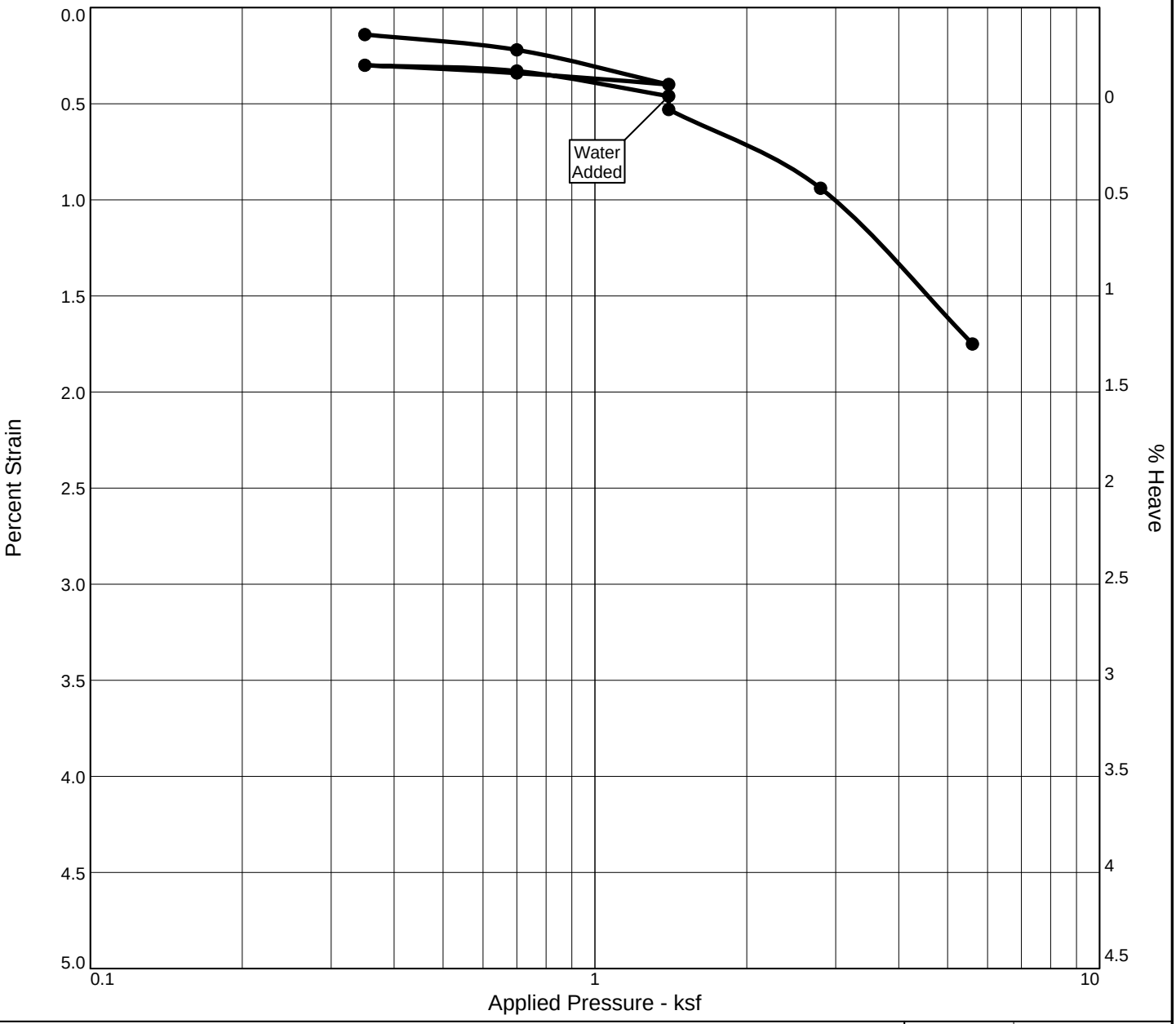
Figure B3.3

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Sandy SILT	ML	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	1.4	112.6	114.6	5.4 %	16.9	30.6 %	100.0	0.469	0.444	2.7	0.04

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Inundated with distilled water at overburden pressure

D2435 Method	C_s	Swell Press. (ksf)	Heave %
	0.00		-0.1

Project No. 20-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-2WT **Depth:** 12'

Remarks:
Alluvium (Qal)
% Fines = 51.1

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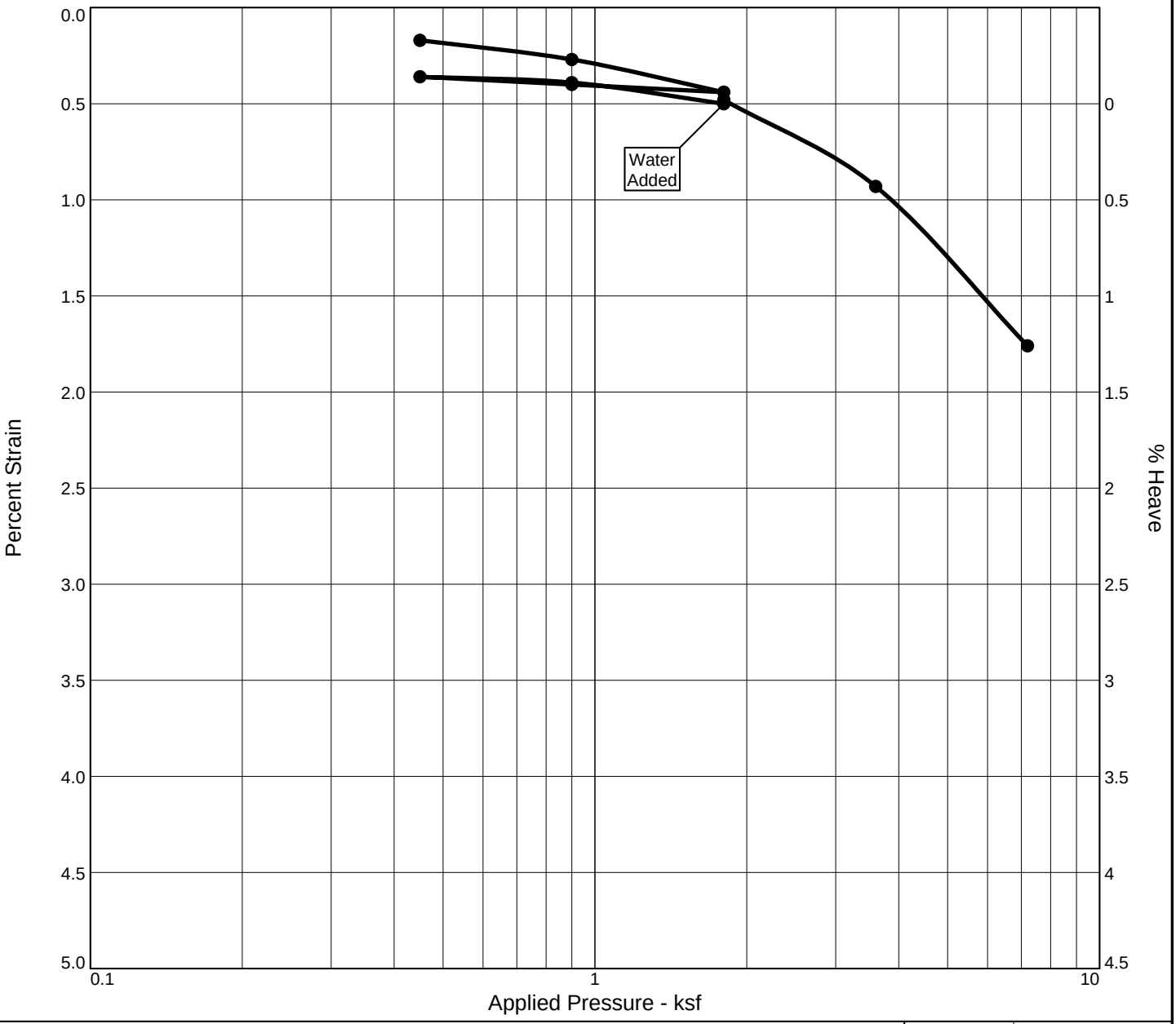
Valencia, California

Checked By: K. Callahan

Title: Geotechnical Engineer

Figure B3.4

SWELL/CONSOLIDATION TEST REPORT



MATERIAL DESCRIPTION	USCS	AASHTO
Sandy siltstone	ML	

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P_c (ksf)	C_c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
		2.65	1.8	116.7	118.8	5.8 %	15.4	36.7 %	100.0	0.418	0.393	3.6	0.04

Preparation Process: Tested directly in a ring from a ring lined sampler

Condition of Test: Inundated with distilled water at overburden pressure

D2435 Method	C_s	Swell Press. (ksf)	Heave %
D4546	0.00		0.0

Project No. 20-1245A-4 **Client:** Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates

Source of Sample: HS-2WT **Depth:** 16'

Remarks:
Weathered bedrock
% Fines = 53.2

Checked By: K. Callahan

Title: Geotechnical Engineer

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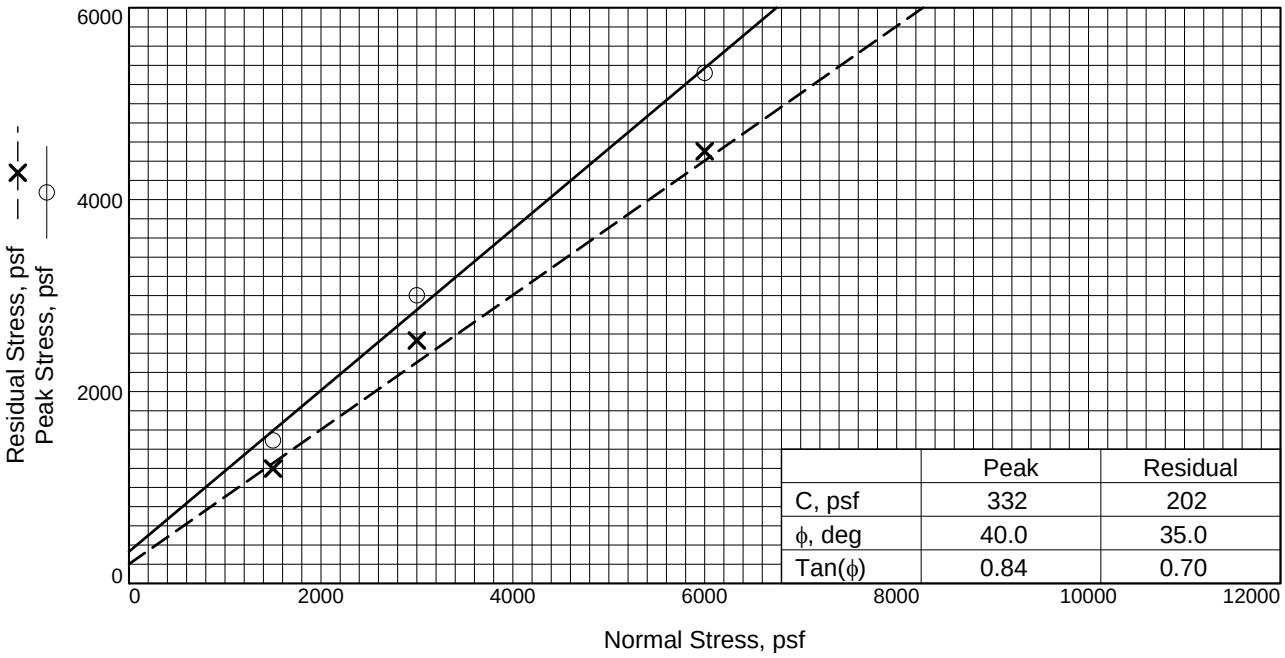
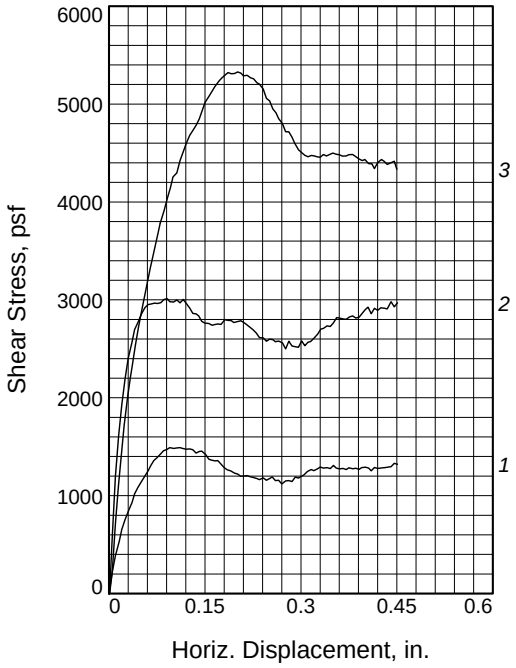
Valencia, California

Figure B3.5





Sample No.		1	2	3
Initial	Water Content, %	5.3	6.1	5.3
	Dry Density, pcf	116.6	116.4	110.5
	Saturation, %	33.7	38.6	28.1
	Void Ratio	0.4192	0.4211	0.4971
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	14.9	15.1	16.0
	Dry Density, pcf	118.6	118.0	116.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3943	0.4015	0.4234
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.98	0.99	0.95
Normal Stress, psf		1500	3000	6000
Peak Stress, psf		1491	3004	5321
Displacement, in.		0.10	0.09	0.19
Residual Stress, psf		1197	2531	4505
Displacement, in.		0.30	0.31	0.30
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: poorly graded sand with silt

Assumed Specific Gravity= 2.65
Remarks: Pico Formation (Tp) Bedrock
Cross Bedding
% Fines = 11.7

Figure B4.1

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1WT **Depth:** 15'

Proj. No.: 20-1245A-4 **Date Sampled:** 4/23/20

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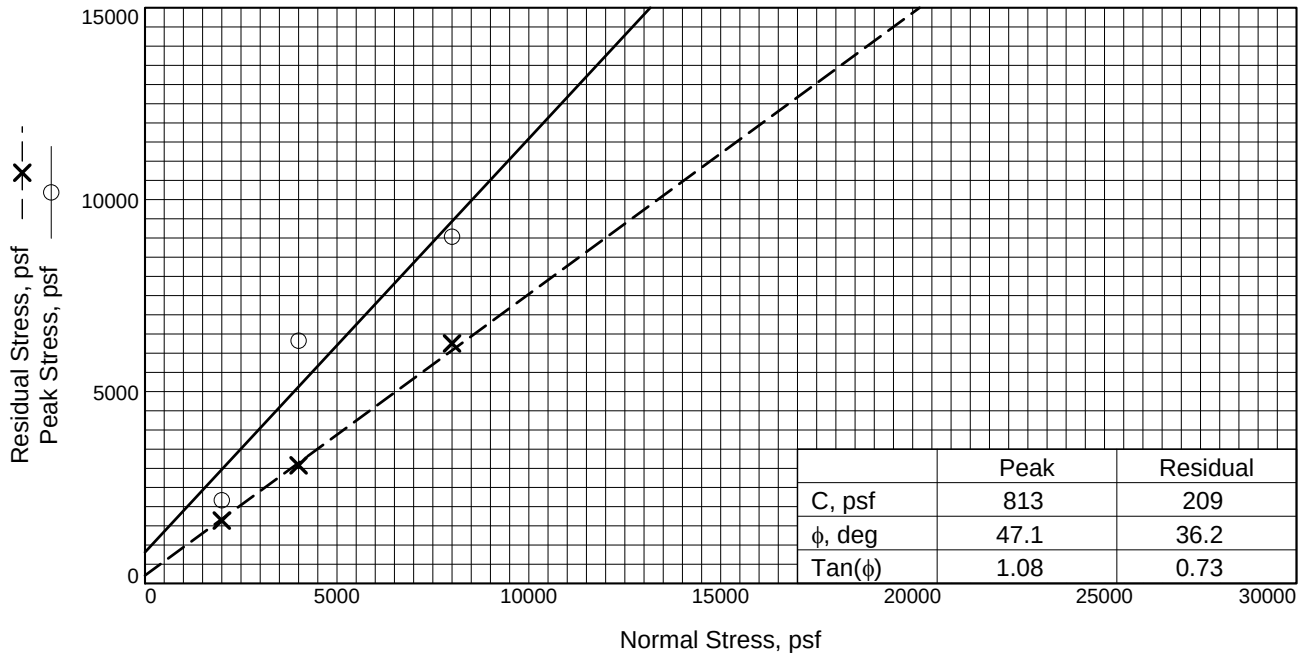

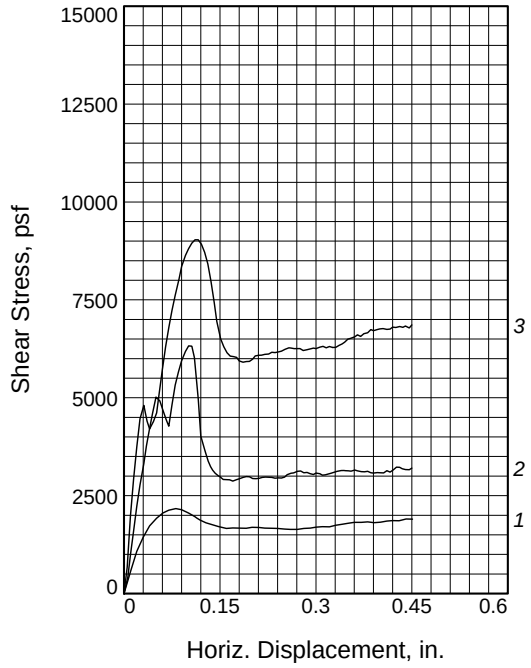

Sample No.		1	2	3
Initial	Water Content, %	6.8	7.4	7.3
	Dry Density, pcf	114.6	123.4	122.0
	Saturation, %	40.7	58.0	54.5
	Void Ratio	0.4439	0.3403	0.3560
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	16.2	12.4	9.0
	Dry Density, pcf	115.6	124.6	123.4
	Saturation, %	100.0	100.0	70.0
	Void Ratio	0.4306	0.3277	0.3409
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.99
Normal Stress, psf		2000	4000	8000
Peak Stress, psf		2169	6325	9035
Displacement, in.		0.08	0.10	0.11
Residual Stress, psf		1637	3077	6254
Displacement, in.		0.27	0.30	0.30
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: silty sand

Assumed Specific Gravity= 2.65
Remarks: Pico Formation (Tp) Bedrock
Cross Bedding
% Fines = 17.9

Figure B4.2

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1WT **Depth:** 25'

Proj. No.: 20-1245A-4 **Date Sampled:** 4/23/20

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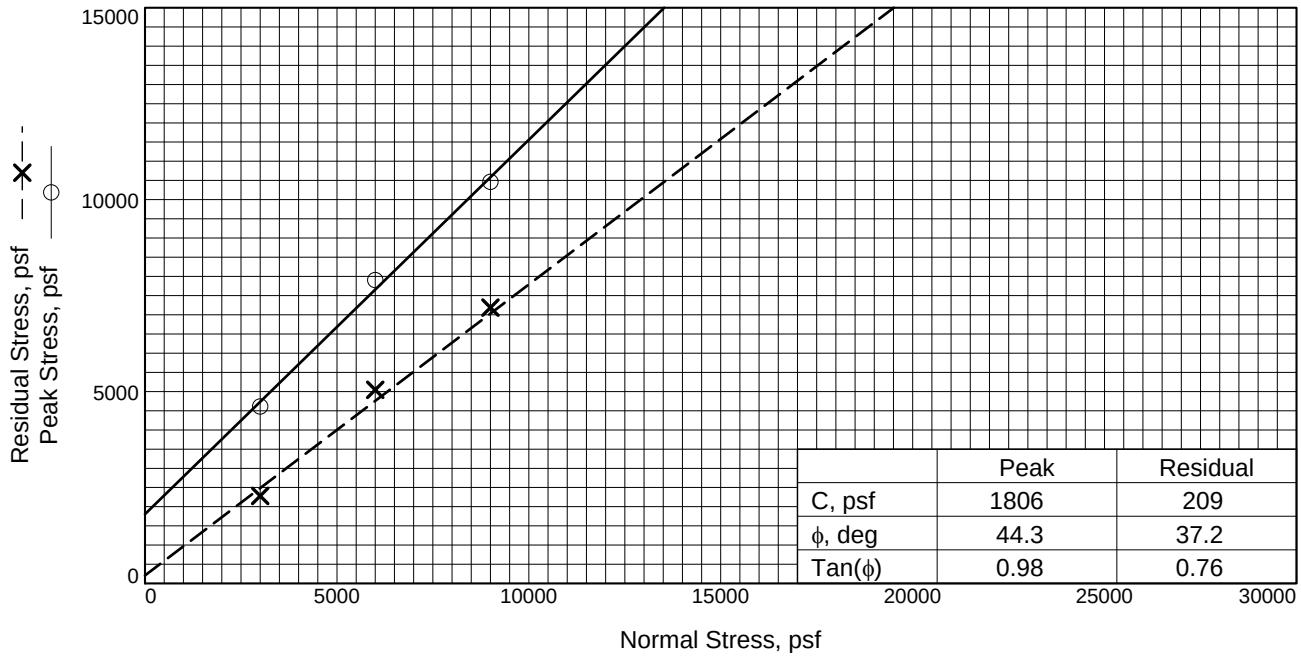
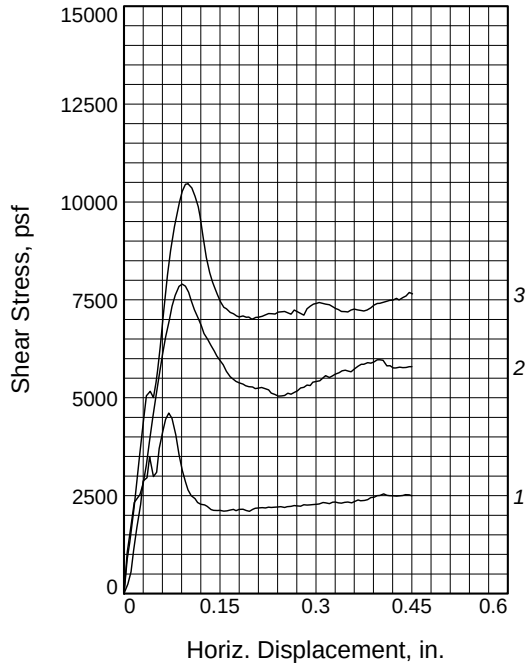
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	7.5	7.4	7.1
	Dry Density, pcf	124.2	127.8	122.9
	Saturation, %	60.1	66.6	54.1
	Void Ratio	0.3317	0.2948	0.3461
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	10.9	10.0	12.1
	Dry Density, pcf	128.4	130.8	125.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.2889	0.2652	0.3210
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.97	0.98	0.98
Normal Stress, psf		3000	6000	9000
Peak Stress, psf		4610	7903	10462
Displacement, in.		0.07	0.09	0.10
Residual Stress, psf		2281	5043	7189
Displacement, in.		0.30	0.24	0.35
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: silty sand

Assumed Specific Gravity= 2.65
Remarks: Pico Formation (Tp) Bedrock
Cross Bedding
% Fines = 14.2

Figure B4.3

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1WT **Depth:** 35'

Proj. No.: 20-1245A-4 **Date Sampled:** 4/23/20

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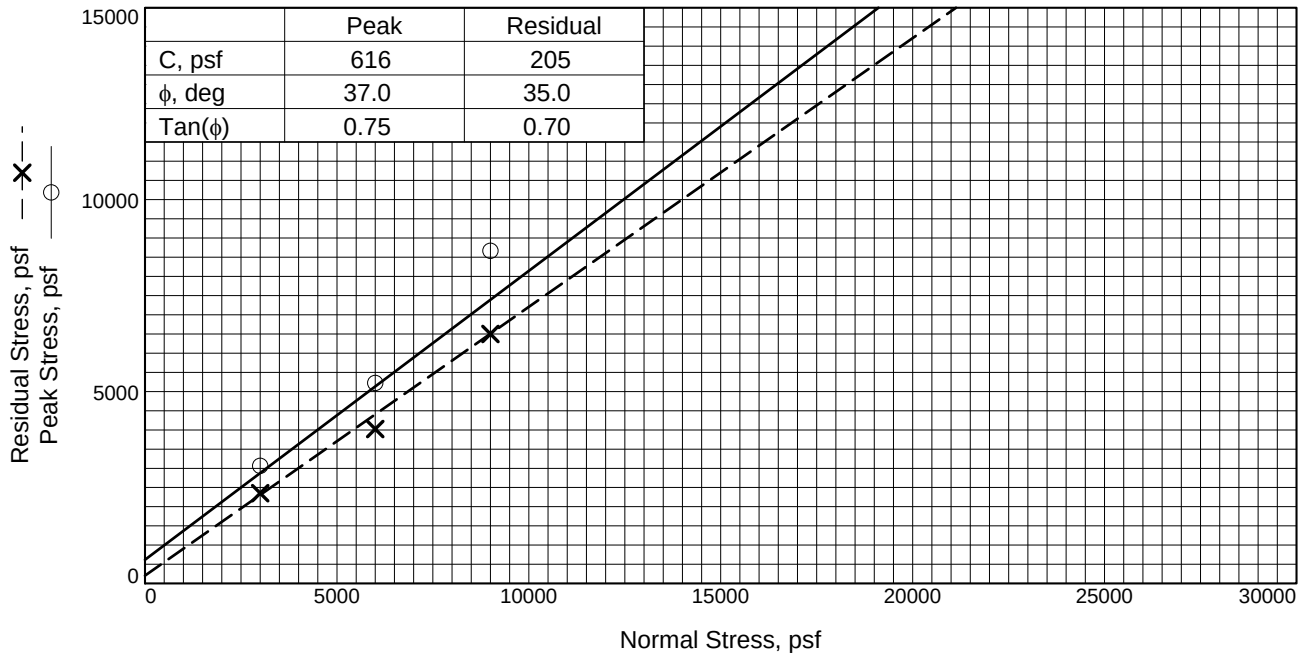

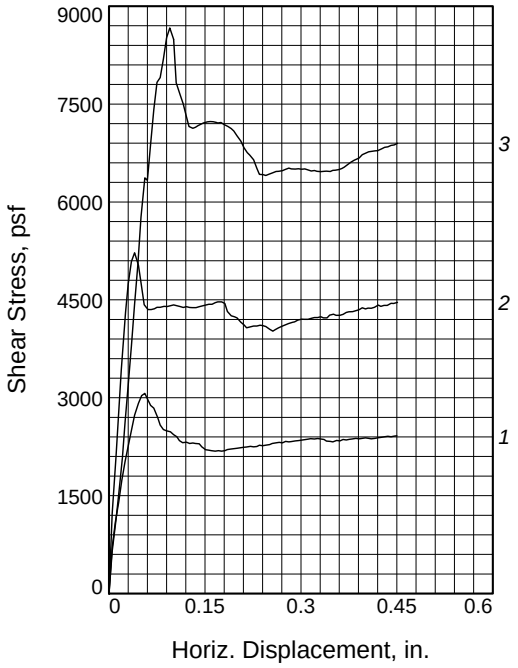

Sample No.		1	2	3
Initial	Water Content, %	13.3	12.7	12.0
	Dry Density, pcf	111.5	117.4	116.3
	Saturation, %	72.6	82.2	75.2
	Void Ratio	0.4836	0.4091	0.4221
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	17.8	14.9	14.7
	Dry Density, pcf	112.5	118.6	118.9
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4707	0.3946	0.3908
	Diameter, in.	2.42	2.42	2.42
	Height, in.	0.99	0.99	0.98
Normal Stress, psf		3000	6000	9000
Peak Stress, psf		3066	5222	8666
Displacement, in.		0.06	0.04	0.10
Residual Stress, psf		2352	4022	6500
Displacement, in.		0.30	0.26	0.30
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: silty sand

Assumed Specific Gravity= 2.65
Remarks: Pico formation (Tp) Bedrock
Cross Bedding
% Fines = 37.1

Figure B4.4

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: B-1WT **Depth:** 45'

Proj. No.: 20-1245A-4 **Date Sampled:** 4/23/20

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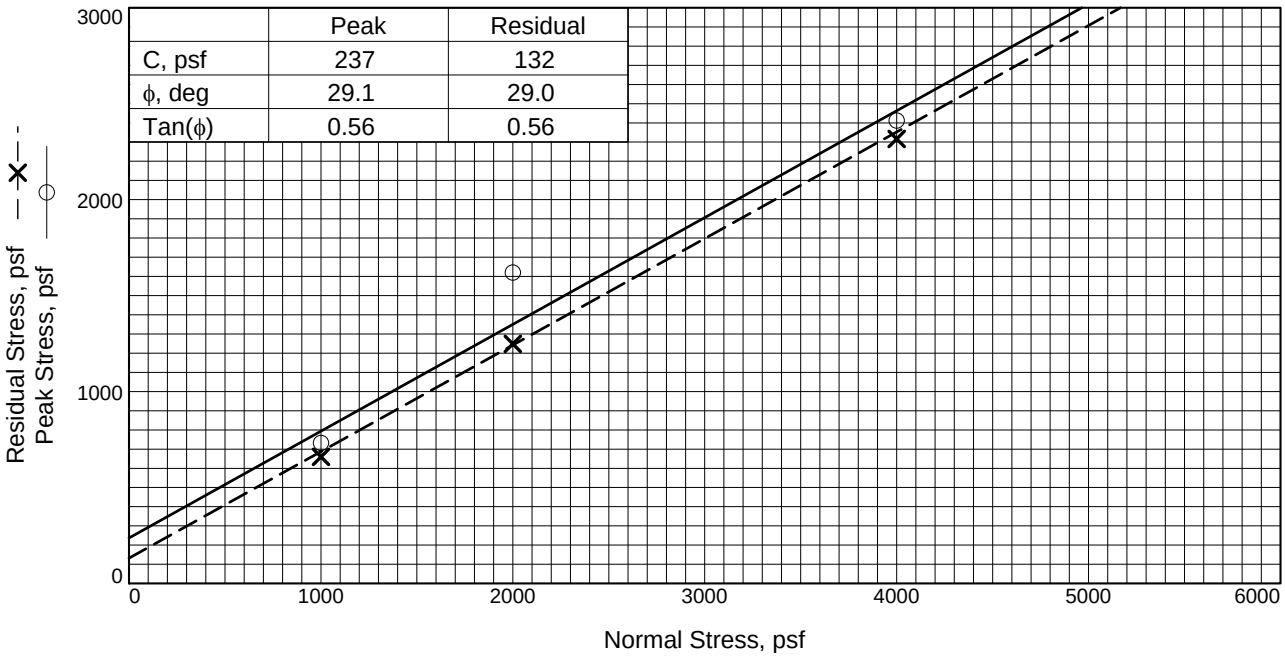
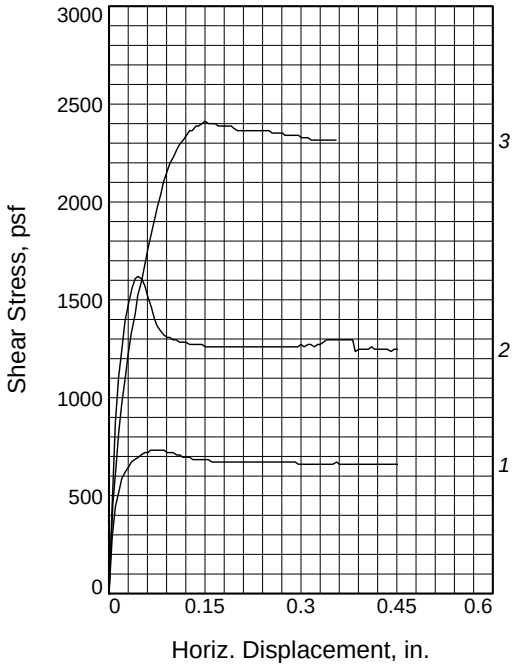
Valencia, California





Sample No.		1	2	3
Initial	Water Content, %	4.6	5.5	5.1
	Dry Density, pcf	109.9	114.9	108.0
	Saturation, %	24.2	33.4	25.6
	Void Ratio	0.5050	0.4397	0.5321
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	18.8	16.4	18.9
	Dry Density, pcf	110.5	115.4	110.1
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4975	0.4334	0.5022
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	0.98
Normal Stress, psf		1000	2000	4000
Peak Stress, psf		732	1620	2412
Displacement, in.		0.07	0.05	0.15
Residual Stress, psf		660	1248	2316
Displacement, in.		0.45	0.45	0.35
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Modified California Drive
Description: Silty, fine-grained SAND

Assumed Specific Gravity= 2.65
Remarks: Alluvium (Qal)
% Fines = 37.4

Figure B4.5

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Source of Sample: HS-1WT **Depth:** 14'

Proj. No.: 20-1245A-4 **Date Sampled:** 4/22/20

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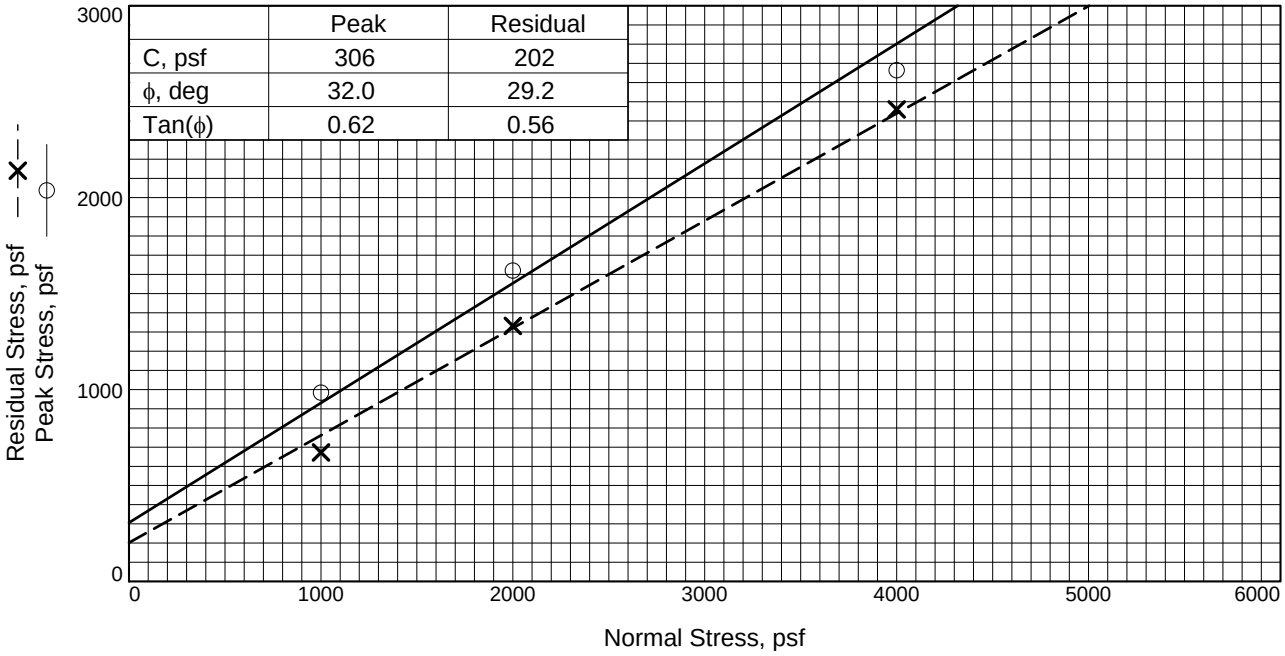
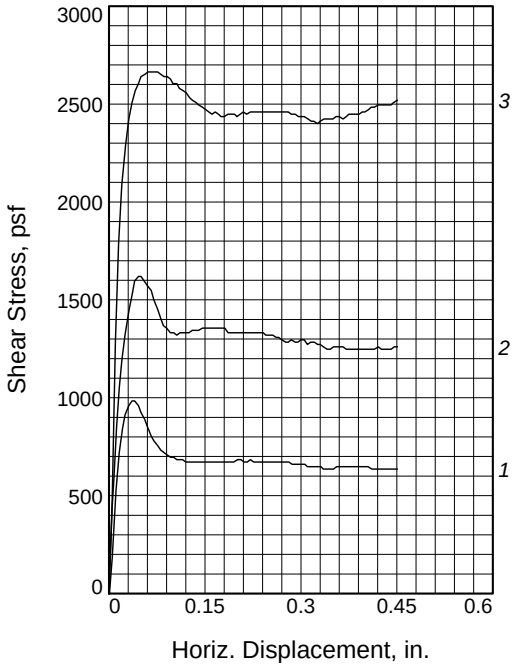




Sample No.		1	2	3
Initial	Water Content, %	9.0	8.9	8.8
	Dry Density, pcf	117.2	117.4	117.6
	Saturation, %	58.2	57.7	57.0
	Void Ratio	0.4115	0.4095	0.4072
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	1.00	1.00
At Test	Water Content, %	15.7	15.1	14.9
	Dry Density, pcf	116.9	118.1	118.6
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.4156	0.4012	0.3954
	Diameter, in.	2.42	2.42	2.42
	Height, in.	1.00	0.99	0.99
Normal Stress, psf		1000	2000	4000
Peak Stress, psf		984	1620	2664
Displacement, in.		0.04	0.05	0.06
Residual Stress, psf		672	1332	2460
Displacement, in.		0.28	0.24	0.24
Strain rate, %/min.		0.01	0.01	0.01

Sample Type: Remold
Description: Dark yellowish-brown (10YR 4/4) silty SAND

Assumed Specific Gravity= 2.65
Remarks: Remolded to about 90% of MDD
Bulk mix of Tp/Qsw/Qal
% Fines = 28.3

Figure B4.6

Client: Sterling Gateway, L.P.

Project: VTTM 60257
Sterling Ranch Estates
Location: HS-1WT @ 0-10', B-1WT @ 8', and B-1WT @ 15-18' 1:1:1 mix

Proj. No.: 20-1245A-4 **Date Sampled:** 4/22-23/20

DIRECT SHEAR TEST REPORT
ALLAN E. SEWARD ENGINEERING GEOLOGY, INC.
Valencia, California

Appendix C

APPENDIX C

SLOPE STABILITY

General

Analyses were performed to evaluate stability of the proposed cut slope which may impact the proposed tank site. The stability analyses utilized Cross Section 32-32' which was constructed to illustrate critical structural geometry and maximum slope height. Our evaluation included gross stability under static and pseudo-static (i.e. earthquake loading simulated by static force) conditions. The results of our stability analyses are summarized in **Table C1**, along with slope parameters, and represent the lowest factors of safety obtained. Slope stability diagrams graphically illustrating the results of the analyzed cross section are attached for review.

Geometry and Groundwater

As shown on the cross section, the analyzed geometry of the cut-slope included removal of vegetation, topsoil, slopewash, and bedrock materials and adding compacted fill to achieve the proposed grades. Based on favorable bedrock structure relative to the slope face, analyses were limited to across-bedding (anti-dip).

Review of ground water data in the vicinity and trench and boring log data indicates that the proposed cut slope in bedrock is above historic high ground water levels.

Shear Strength Parameters

Direct shear tests were performed on site materials as part of our investigation of the water tank site. Recommended shear strength parameters for the water tank site are summarized below and were used for the static and seismic slope stability analyses presented in this report. Associated direct shear test reports are presented in **Appendix B**.

Summary of Design Shear Strength Values

Geologic Unit	Moist Unit Weight, pcf	Residual Shear Strength	
		Phi, degrees	Cohesion, psf
Pico Formation Bedrock (Tp) across bedding	130	35	200
Alluvium (Qal)	120	29	130
Proposed Compacted Fill (Cf)	130	29	200

Methods of Analysis

The slope stability analyses performed for this study used the 2D limit equilibrium software, Slide 2018, by RocScience. This software utilizes robust search methods to locate critical circular and non-circular slip surfaces and computes associated minimum factors of safety.

APPENDIX C

The analyses used Spencer's complete equilibrium procedure to evaluate critical potential failure surfaces under static and pseudostatic loading conditions. In general, the Cuckoo search method was employed to determine either the critical circular or non-circular failure surface, which was further optimized using the Surface Altering optimization option to assess potential surfaces with lower safety factors.

Analysis for seismic slope stability was performed using the pseudostatic procedure. In this procedure the seismic loading is introduced into the conventional limit equilibrium analysis as a static horizontal force equal to the soil weight multiplied by a seismic coefficient, *k*. The seismic coefficient is an empirical value which in no way models actual seismic forces. However, the pseudostatic procedure does provide some indication of slope stability or instability during seismic loading. In accordance with Los Angeles County Guidelines, we selected a seismic coefficient value of $k = 0.15$ for our analyses.

Surficial Stability Evaluation

Surficial stability of fill and cut slopes was analyzed using the "Infinite Slope" method since the cohesion of each material was less than 250 psf. Based on the results, safety factors of at least 1.5 were achieved for the manufactured slopes constructed at a 2:1 (h:v) gradient (see **Figures C1** and **C2**).

Conclusions

The analyzed cut slope and compacted fill slopes comply with County of Los Angeles minimum requirements for gross stability under static and pseudo-static loading conditions and for surficial stability, as applicable, provided our recommendations are followed and incorporated into project construction. The results of the stability analyses are summarized in **Table C1**.

The following attachments complete this Appendix.

Infinite Slope Stability Analysis	Figures C1 and C2
Summary of Slope Stability Runs	Table C1
Slope Stability Diagrams and Data Sheets	

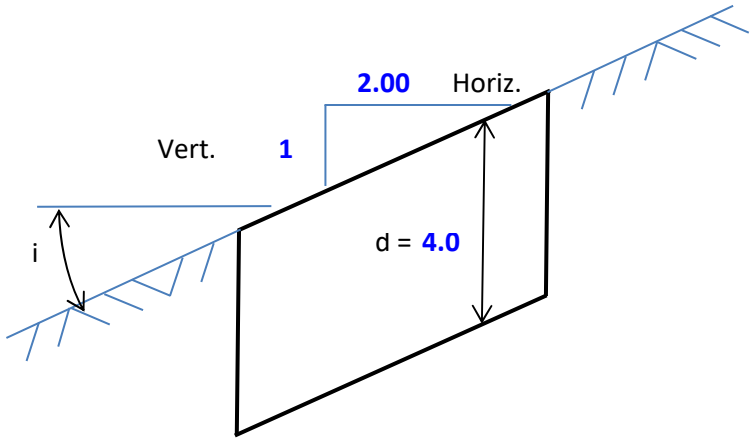
SOIL DESCRIPTION: Silty, fine-grained sand

SOIL PROPERTIES: Proposed compacted fill

Φ' =	**29.0**	Drained friction angle [degrees]
c' =	**200**	Drained cohesion [psf]
γ_t =	**130**	Total density [pcf]
γ_b =	**67.6**	Buoyant density [pcf]

SLOPE CONDITIONS: Steady-state seepage parallel to ground surface

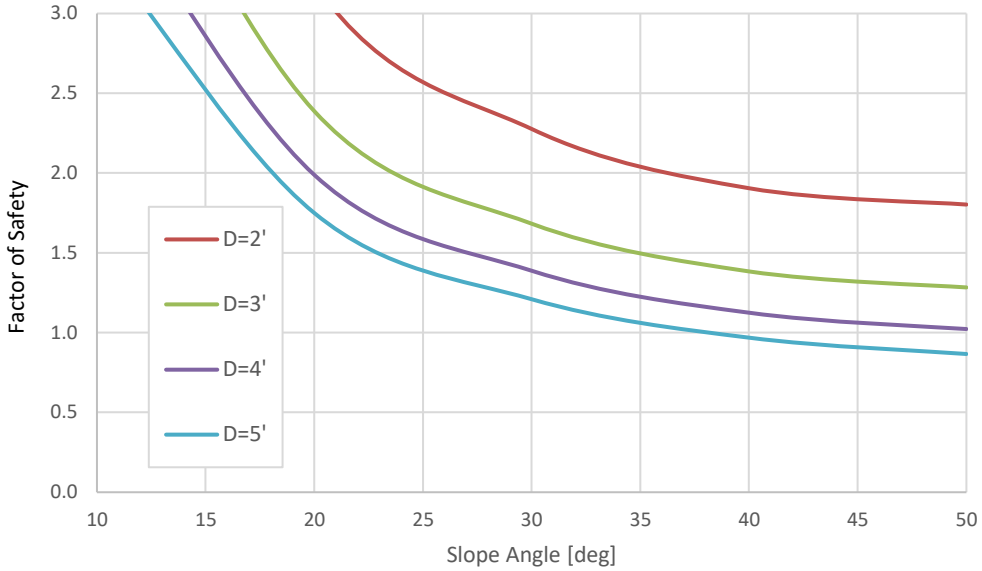
i =	**26.6**	Slope inclination [degrees]
d =	**4**	Depth of interest [feet]



CALCULATIONS:

$$FS = \frac{c' + \gamma_b d \cos^2(i) \tan(\Phi')}{\gamma_t d \sin(i) \cos(i)}$$

FS = 1.54



Reference: Lambe and Whitman, *Soil Mechanics* , John Wiley and Sons, Inc., 1969

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Infinite Slope Stability Analysis

Client:	Sterling Gateway, LP	Project No.:	20-2572
Project:	Sterling Ranch Estates	Date:	7/20/2020
	Revised Vesting Tentative Tract Map	Figure No:	C1

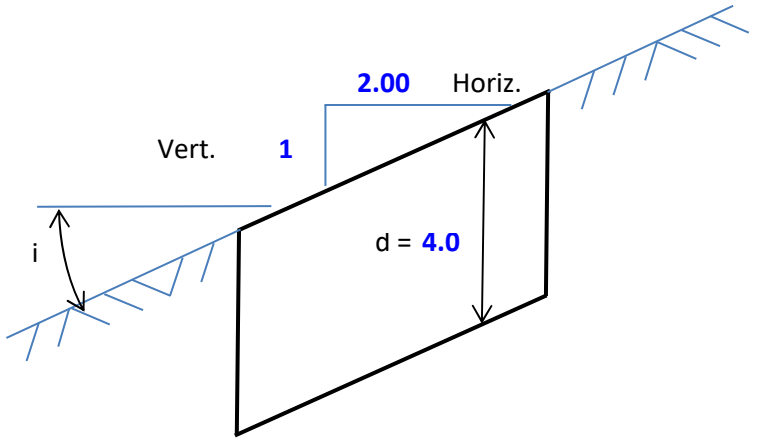
SOIL DESCRIPTION: Silty sandstone

SOIL PROPERTIES: Pico Formation (Tp) Bedrock

Φ' =	**35.0**	Drained friction angle [degrees]
c' =	**200**	Drained cohesion [psf]
γ_t =	**130**	Total density [pcf]
γ_b =	**67.6**	Buoyant density [pcf]

SLOPE CONDITIONS: Steady-state seepage parallel to ground surface

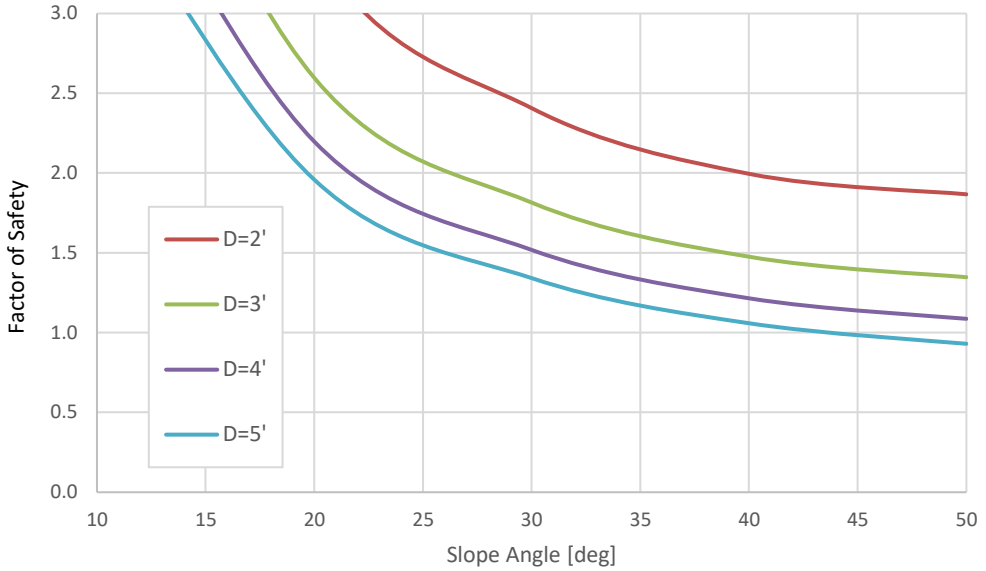
i =	**26.6**	Slope inclination [degrees]
d =	**4**	Depth of interest [feet]



CALCULATIONS:

$$FS = \frac{c' + \gamma_b d \cos^2(i) \tan(\Phi')}{\gamma_t d \sin(i) \cos(i)}$$

FS = 1.69



Reference: Lambe and Whitman, *Soil Mechanics* , John Wiley and Sons, Inc., 1969

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Infinite Slope Stability Analysis

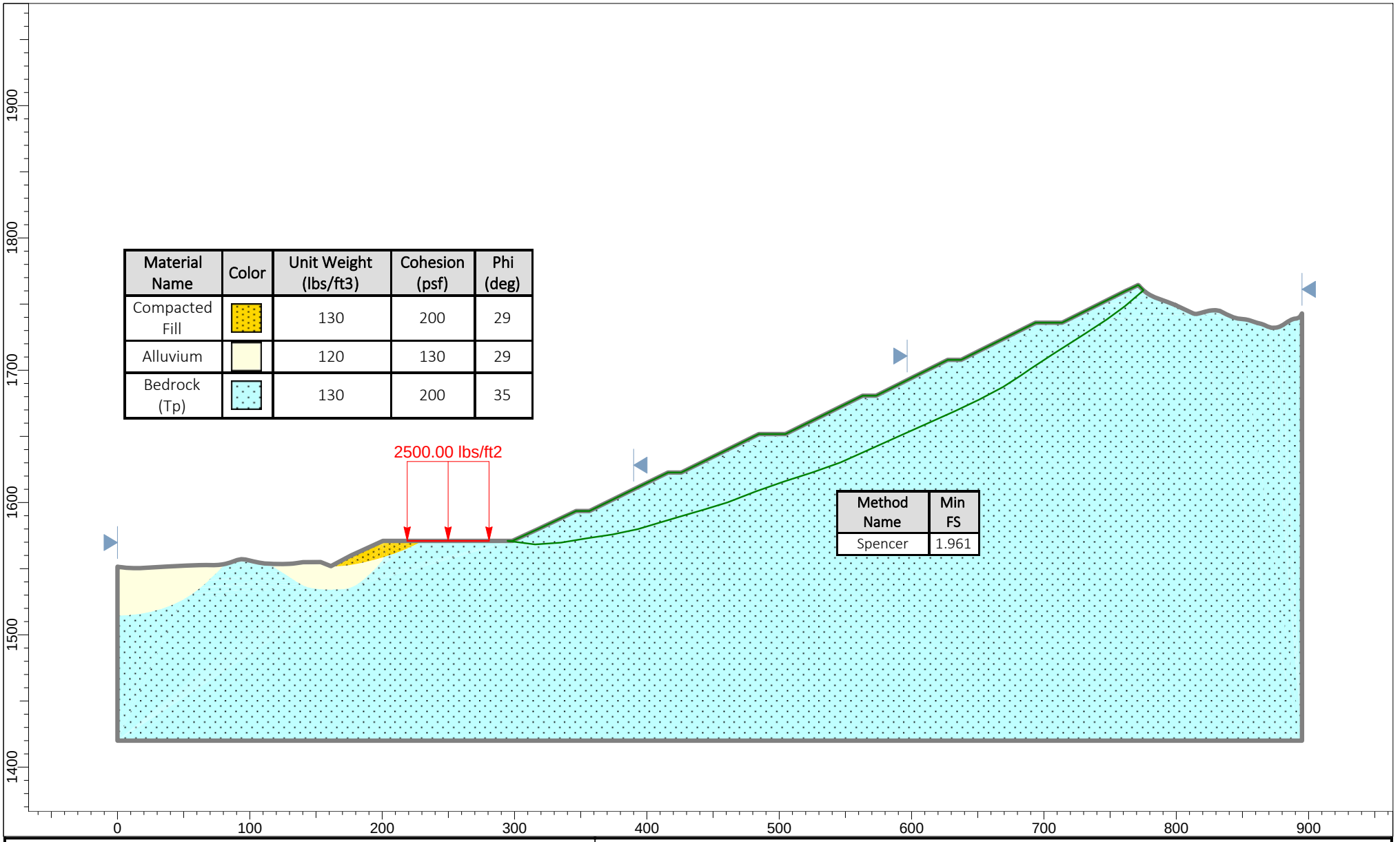
Client:	Sterling Gateway, LP	Project No.:	20-2572
Project:	Sterling Ranch Estates	Date:	7/20/2020
	Revised Vesting Tentative Tract Map	Figure No:	C2

APPENDIX C

Table C1 – SUMMARY OF SLOPE STABILITY RUNS

Cross Section	File Name	Slope Designation	Analyzed Plane	Method	Factor of Safety		Comments	Run No.
					Static	Pseudostatic[1] (Coeff = 0.15)		
32-32′	T32S1A T32PS1A	Cut-slope CS-1WT	Circular / Non-Circular	Spencer	1.96	1.36	Cuckoo search through cut-slope ascending from tank pad; min FS achieved.	1 2

[1] Peak shear strength values were not utilized.



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Compacted Fill		130	200	29
Alluvium		120	130	29
Bedrock (Tp)		130	200	35

Method Name	Min FS
Spencer	1.961

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SLIDEINTERPRET 9.008

Analysis Description	Section 32-32'; Water Tank Site; Static; Cuckoo Search		
Client	Sterling Gateway	Drawn By	K. Callahan
Project	VTTM 60257 Sterling Ranch Estates	File Name	t32s1a.slmd
		Scale	1:1200
Project No.:	20-1245A-4	Date: 7/20/2020	Run Number

Project Summary

File Name:	t32s1a.slmd
Slide Modeler Version:	9.008
Compute Time:	00h:00m:04.1s
Project Title:	VTTM 60257
Analysis:	Section 32-32'; Water Tank Site; Static; Cuckoo Search
Author:	K. Callahan
Comments	
	Sterling Gateway Sterling Ranch Estates 20-1245A-4

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Loading

1 Distributed Load present

Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2500
Orientation:	Vertical

Materials

Compacted Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	130
Cohesion [psf]	200
Friction Angle [deg]	29
Water Surface	None
Ru Value	0
Alluvium	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	130
Friction Angle [deg]	29
Water Surface	None
Ru Value	0
Bedrock (Tp)	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	130
Cohesion [psf]	200
Friction Angle [deg]	35
Tensile Strength [psf]	0
Water Surface	None
Ru Value	0

Global Minimums

Method: spencer

FS	1.960760
Axis Location:	345.526, 2146.287
Left Slip Surface Endpoint:	294.724, 1571.000
Right Slip Surface Endpoint:	775.274, 1760.473
Resisting Moment:	7.54281e+08 lb-ft
Driving Moment:	3.85207e+08 lb-ft
Resisting Horizontal Force:	1.25182e+06 lb
Driving Horizontal Force:	639295 lb
Total Slice Area:	14604.3 ft2
Surface Horizontal Width:	480.551 ft
Surface Average Height:	30.3907 ft

Global Minimum Coordinates

Method: spencer

X	Y
294.724	1571
315.571	1568.34
335.019	1569.74
354.469	1572.99
373.918	1575.91
393.368	1579.99
410.004	1584.94
426.64	1589.9
443.777	1594.84
460.915	1600.14
482.236	1608.4
503.556	1615.91
524.877	1622.68
546.198	1630.3
567.81	1639.99
589.421	1649.68
611.033	1659.36
632.645	1669.07
650.997	1677.78
669.311	1687.49
682.2	1695.77
694.775	1704.34
707.402	1712.52
719.555	1720.22
733.47	1729.26
747.384	1738.32
761.328	1748.51
775.274	1760.47

Global Minimum Support Data

No Supports Present

Valid and Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	7601
Number of Invalid Surfaces:	2455

Error Codes

Error Code -108 reported for 28 surfaces
Error Code -111 reported for 124 surfaces
Error Code -112 reported for 94 surfaces
Error Code -114 reported for 21 surfaces
Error Code -121 reported for 102 surfaces
Error Code -124 reported for 14 surfaces
Error Code -1000 reported for 2072 surfaces

Error Code Descriptions

The following errors were encountered during the computation:
-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).
-111 = safety factor equation did not converge
-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.
-114 = Surface with Reverse Curvature.
-121 = Concave failure surface, only convex surfaces have been defined as being allowed.
-124 = A slice has a width less than the minimum acceptable value.
-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.96076

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	10.4237	2271.56	-7.25865	Bedrock (Tp)	200	35	223.784	438.786	341.022	0	341.022	312.519	312.519
2	10.4237	10155.2	-7.25865	Bedrock (Tp)	200	35	568.684	1115.05	1306.83	0	1306.83	1234.4	1234.4
3	9.72393	15772.7	4.11097	Bedrock (Tp)	200	35	741.08	1453.08	1789.59	0	1789.59	1842.85	1842.85
4	9.72393	20734.2	4.11097	Bedrock (Tp)	200	35	938.529	1840.23	2342.49	0	2342.49	2409.95	2409.95
5	9.72504	25121.6	9.47143	Bedrock (Tp)	200	35	1040.38	2039.94	2627.7	0	2627.7	2801.27	2801.27
6	9.72504	26977.7	9.47143	Bedrock (Tp)	200	35	1109.19	2174.85	2820.37	0	2820.37	3005.42	3005.42

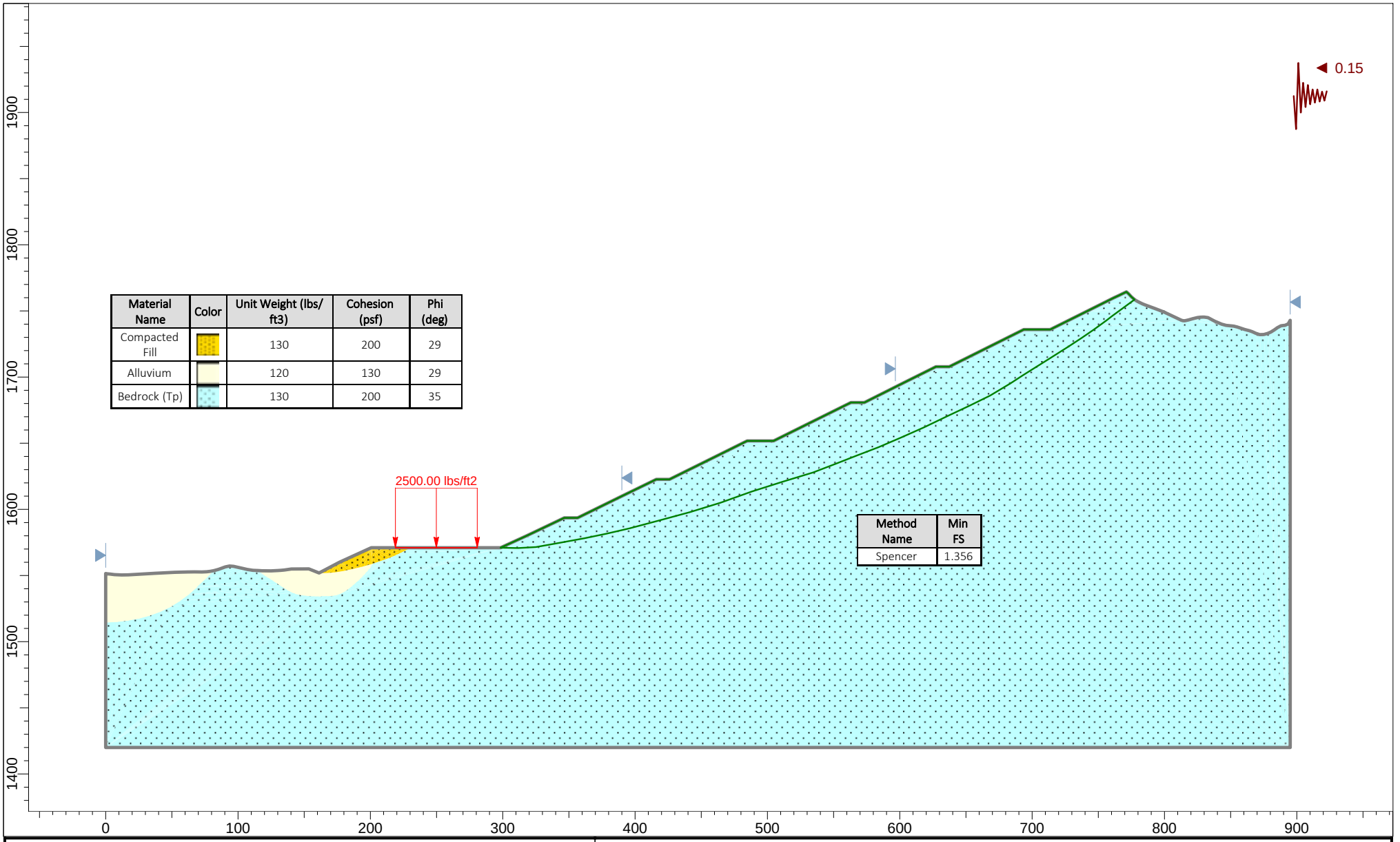
7	9.72463	26978.2	8.54493	Bedrock (Tp)	200	35	1122.08	2200.12	2856.47	0	2856.47	3025.06	3025.06
8	9.72463	31023.8	8.54493	Bedrock (Tp)	200	35	1273.86	2497.74	3281.51	0	3281.51	3472.91	3472.91
9	9.72472	34847	11.8362	Bedrock (Tp)	200	35	1360.4	2667.42	3523.84	0	3523.84	3808.94	3808.94
10	9.72472	38303	11.8362	Bedrock (Tp)	200	35	1484.66	2911.07	3871.81	0	3871.81	4182.95	4182.95
11	8.31801	35086.2	16.5888	Bedrock (Tp)	200	35	1492.63	2926.69	3894.11	0	3894.11	4338.77	4338.77
12	8.31801	36794.3	16.5888	Bedrock (Tp)	200	35	1560.22	3059.22	4083.39	0	4083.39	4548.18	4548.18
13	8.31801	38330.7	16.5872	Bedrock (Tp)	200	35	1621.05	3178.49	4253.73	0	4253.73	4736.59	4736.59
14	8.31801	36802.4	16.5872	Bedrock (Tp)	200	35	1560.57	3059.91	4084.38	0	4084.38	4549.23	4549.23
15	8.56875	37860.4	16.0977	Bedrock (Tp)	200	35	1567.95	3074.37	4105.02	0	4105.02	4557.52	4557.52
16	8.56875	39829.3	16.0977	Bedrock (Tp)	200	35	1644.05	3223.59	4318.14	0	4318.14	4792.6	4792.6
17	8.56881	41699.7	17.1892	Bedrock (Tp)	200	35	1693.56	3320.66	4456.76	0	4456.76	4980.65	4980.65
18	8.56881	43481.2	17.1892	Bedrock (Tp)	200	35	1761.48	3453.83	4646.95	0	4646.95	5191.85	5191.85
19	10.6605	56014.3	21.1694	Bedrock (Tp)	200	35	1733.79	3399.55	4569.42	0	4569.42	5240.85	5240.85
20	10.6605	57629.3	21.1694	Bedrock (Tp)	200	35	1780.86	3491.84	4701.23	0	4701.23	5390.89	5390.89
21	10.6602	57318.6	19.4094	Bedrock (Tp)	200	35	1810.41	3549.77	4783.97	0	4783.97	5421.84	5421.84
22	10.6602	52305.3	19.4094	Bedrock (Tp)	200	35	1661.01	3256.85	4365.63	0	4365.63	4950.87	4950.87
23	10.6603	50280.6	17.6104	Bedrock (Tp)	200	35	1636.17	3208.13	4296.05	0	4296.05	4815.39	4815.39
24	10.6603	52874.7	17.6104	Bedrock (Tp)	200	35	1715.24	3363.17	4517.48	0	4517.48	5061.93	5061.93
25	10.6605	55220.5	19.6551	Bedrock (Tp)	200	35	1742.59	3416.81	4594.08	0	4594.08	5216.49	5216.49
26	10.6605	57298	19.6551	Bedrock (Tp)	200	35	1804.31	3537.82	4766.9	0	4766.9	5411.35	5411.35
27	10.8059	59511.1	24.1694	Bedrock (Tp)	200	35	1746.92	3425.29	4606.18	0	4606.18	5390.16	5390.16
28	10.8059	59541.3	24.1694	Bedrock (Tp)	200	35	1747.75	3426.92	4608.52	0	4608.52	5392.87	5392.87
29	7.20394	36816	24.1495	Bedrock (Tp)	200	35	1628.63	3193.35	4274.94	0	4274.94	5005.15	5005.15
30	7.20394	36216.9	24.1495	Bedrock (Tp)	200	35	1603.75	3144.56	4205.27	0	4205.27	4924.32	4924.32
31	7.20394	36571.7	24.1495	Bedrock (Tp)	200	35	1618.48	3173.45	4246.53	0	4246.53	4972.19	4972.19
32	10.8059	55514.7	24.1197	Bedrock (Tp)	200	35	1637.28	3210.31	4299.17	0	4299.17	5032.23	5032.23
33	10.8059	56292.4	24.1197	Bedrock (Tp)	200	35	1658.82	3252.55	4359.49	0	4359.49	5102.2	5102.2
34	7.20395	37953.8	24.1911	Bedrock (Tp)	200	35	1675.03	3284.33	4404.88	0	4404.88	5157.35	5157.35
35	7.20395	38288	24.1911	Bedrock (Tp)	200	35	1688.91	3311.54	4443.74	0	4443.74	5202.45	5202.45
36	7.20395	37724.3	24.1911	Bedrock (Tp)	200	35	1665.5	3265.65	4378.2	0	4378.2	5126.39	5126.39
37	9.17623	44298.1	25.391	Bedrock (Tp)	200	35	1520.61	2981.55	3972.47	0	3972.47	4694.21	4694.21
38	9.17623	43819.5	25.391	Bedrock (Tp)	200	35	1505.25	2951.43	3929.45	0	3929.45	4643.9	4643.9
39	9.15686	43696.7	27.9348	Bedrock (Tp)	200	35	1457.84	2858.48	3796.7	0	3796.7	4569.72	4569.72
40	9.15686	43363.1	27.9348	Bedrock (Tp)	200	35	1447.45	2838.11	3767.61	0	3767.61	4535.13	4535.13
41	12.8892	59265	32.7044	Bedrock (Tp)	200	35	1326.57	2601.09	3429.12	0	3429.12	4280.9	4280.9
42	12.5748	54403.9	34.2979	Bedrock (Tp)	200	35	1228.56	2408.91	3154.64	0	3154.64	3992.64	3992.64
43	12.6268	45174.6	32.919	Bedrock (Tp)	200	35	1050.27	2059.32	2655.39	0	2655.39	3335.33	3335.33

44	12.1532	32049.1	32.3553	Bedrock (Tp)	200	35	804.489	1577.41	1967.14	0	1967.14	2476.81	2476.81
45	13.9145	31822.4	33.0274	Bedrock (Tp)	200	35	704.39	1381.14	1686.85	0	1686.85	2144.76	2144.76
46	6.95725	14475.8	33.0505	Bedrock (Tp)	200	35	649.151	1272.83	1532.16	0	1532.16	1954.54	1954.54
47	6.95725	13520	33.0505	Bedrock (Tp)	200	35	612.497	1200.96	1429.51	0	1429.51	1828.04	1828.04
48	13.9441	23232	36.1532	Bedrock (Tp)	200	35	518.609	1016.87	1166.61	0	1166.61	1545.52	1545.52
49	6.9731	8964.55	40.6339	Bedrock (Tp)	200	35	398.708	781.77	830.853	0	830.853	1173	1173
50	6.9731	5031.83	40.6339	Bedrock (Tp)	200	35	267.639	524.775	463.826	0	463.826	693.495	693.495

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.96076

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	294.724	1571	0	0	0
2	305.147	1569.67	2789.33	1012.12	19.9435
3	315.571	1568.34	10462.1	3796.23	19.9436
4	325.295	1569.04	16429.7	5961.59	19.9435
5	335.019	1569.74	23934	8684.57	19.9436
6	344.744	1571.36	29805.4	10815.1	19.9437
7	354.469	1572.99	36034.5	13075.3	19.9436
8	364.194	1574.45	42790.7	15526.9	19.9437
9	373.918	1575.91	50404.5	18289.6	19.9436
10	383.643	1577.95	56474.5	20492.1	19.9436
11	393.368	1579.99	63045.8	22876.5	19.9436
12	401.686	1582.46	65832.9	23887.9	19.9436
13	410.004	1584.94	68714.2	24933.3	19.9436
14	418.322	1587.42	71681.4	26010	19.9436
15	426.64	1589.9	74564.2	27056	19.9436
16	435.208	1592.37	77870.8	28255.8	19.9436
17	443.777	1594.84	81303.6	29501.5	19.9436
18	452.346	1597.49	84026.1	30489.3	19.9436
19	460.915	1600.14	86827.3	31505.8	19.9436
20	471.575	1604.27	86477	31378.7	19.9436
21	482.236	1608.4	86085.1	31236.5	19.9436
22	492.896	1612.16	87448.1	31731	19.9436
23	503.556	1615.91	88787.1	32216.9	19.9436
24	514.216	1619.3	91721.5	33281.6	19.9436
25	524.877	1622.68	94750.9	34380.9	19.9436
26	535.537	1626.49	95866.5	34785.7	19.9436
27	546.198	1630.3	96983.1	35190.9	19.9436
28	557.004	1635.14	93554.3	33946.7	19.9436
29	567.81	1639.99	90123.2	32701.7	19.9436
30	575.014	1643.22	88067.5	31955.8	19.9436
31	582.217	1646.45	86057.4	31226.4	19.9436
32	589.421	1649.68	84020.3	30487.2	19.9436
33	600.227	1654.52	80942	29370.3	19.9436
34	611.033	1659.36	77805.1	28232	19.9436
35	618.237	1662.6	75636.9	27445.3	19.9436
36	625.441	1665.83	73443	26649.2	19.9436
37	632.645	1669.07	71292.4	25868.8	19.9436
38	641.821	1673.42	67967.4	24662.4	19.9436
39	650.997	1677.78	64688.6	23472.6	19.9436
40	660.154	1682.64	59625.6	21635.5	19.9436
41	669.311	1687.49	54608.6	19815	19.9436
42	682.2	1695.77	43355.9	15731.9	19.9436
43	694.775	1704.34	31772.4	11528.8	19.9436
44	707.402	1712.52	23349.5	8472.5	19.9436
45	719.555	1720.22	17997.2	6530.39	19.9436
46	733.47	1729.26	12556.3	4556.11	19.9435
47	740.427	1733.79	10144.4	3680.94	19.9435
48	747.384	1738.32	7941.63	2881.67	19.9436
49	761.328	1748.51	3299.83	1197.36	19.9436
50	768.301	1754.49	1113.03	403.87	19.9436
51	775.274	1760.47	0	0	0



Material Name	Color	Unit Weight (lbs/ft3)	Cohesion (psf)	Phi (deg)
Compacted Fill		130	200	29
Alluvium		120	130	29
Bedrock (Tp)		130	200	35

Method Name	Min FS
Spencer	1.356

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

SLIDEINTERPRET 9.008

Analysis Description	Section 32-32'; Water Tank Site; Seismic; Cuckoo Search		
Client	Sterling Gateway	Drawn By	K. Callahan
Project	VTTM 60257 Sterling Ranch Estates	File Name	t32ps1a.slmd
		Scale	1:1200
Project No.:	20-1245A-4	Date: 7/20/2020	Run Number

Slide Analysis Information

t32ps1a

Project Summary

File Name:	t32ps1a.slmd
Slide Modeler Version:	9.008
Compute Time:	00h:00m:04.89s
Project Title:	VTTM 60257
Analysis:	Section 32-32'; Water Tank Site; Seismic; Cuckoo Search
Author:	K. Callahan
Comments	
	Sterling Gateway Sterling Ranch Estates 20-1245A-4

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Search Method:	Cuckoo Search
Initial # of Surface Vertices:	8
Maximum Iterations:	200
Number of Nests:	50
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined
Convex Surfaces Only:	Enabled

Seismic Loading

Advanced seismic analysis:	No
Staged pseudostatic analysis:	No
Seismic Load Coefficient (Horizontal):	0.15

Loading

1 Distributed Load present

Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2500
Orientation:	Vertical

Materials

Compacted Fill	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	130
Cohesion [psf]	200
Friction Angle [deg]	29
Water Surface	None
Ru Value	0
Alluvium	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	120
Cohesion [psf]	130
Friction Angle [deg]	29
Water Surface	None
Ru Value	0
Bedrock (Tp)	
Color	
Strength Type	Mohr-Coulomb
Unit Weight [lbs/ft3]	130
Cohesion [psf]	200
Friction Angle [deg]	35
Tensile Strength [psf]	0
Water Surface	None
Ru Value	0

Global Minimums

Method: spencer

FS	1.356190
Axis Location:	350.276, 2143.917
Left Slip Surface Endpoint:	298.364, 1571.000
Right Slip Surface Endpoint:	777.463, 1758.637
Resisting Moment:	6.80274e+08 lb-ft
Driving Moment:	5.01608e+08 lb-ft
Resisting Horizontal Force:	1.14283e+06 lb
Driving Horizontal Force:	842679 lb
Total Slice Area:	13979.2 ft2
Surface Horizontal Width:	479.099 ft
Surface Average Height:	29.1781 ft

Global Minimum Coordinates

Method: spencer

X	Y
298.364	1571
311.632	1570.79
325.12	1571.5
343.283	1574.73
361.446	1578.08
378.716	1581.71
395.92	1585.71
418.733	1591.75
441.476	1597.98
464.777	1605.1
488.049	1613.4
511.322	1620.88
534.595	1627.98
551.06	1634.31
567.525	1640.69
583.99	1647.04
601.09	1654.32
618.19	1661.96
635.526	1670.29
652.874	1678.44
668.251	1686.05
683.68	1695.27
696.578	1703.61
709.476	1711.68
726.498	1722.5
743.521	1733.67
760.52	1746.2
777.463	1758.64

Global Minimum Support Data

No Supports Present

Valid and Invalid Surfaces

Method: spencer

Number of Valid Surfaces:	6986
Number of Invalid Surfaces:	3069

Error Codes
Error Code -108 reported for 18 surfaces
Error Code -111 reported for 120 surfaces
Error Code -112 reported for 121 surfaces
Error Code -114 reported for 21 surfaces
Error Code -121 reported for 121 surfaces
Error Code -124 reported for 11 surfaces
Error Code -1000 reported for 2657 surfaces

Error Code Descriptions

The following errors were encountered during the computation:

-108 = Total driving moment or total driving force < 0.1. This is to limit the calculation of extremely high safety factors if the driving force is very small (0.1 is an arbitrary number).

-111 = safety factor equation did not converge

-112 = The coefficient M-Alpha = cos(alpha)(1+tan(alpha)tan(phi)/F) < 0.2 for the final iteration of the safety factor calculation. This screens out some slip surfaces which may not be valid in the context of the analysis, in particular, deep seated slip surfaces with many high negative base angle slices in the passive zone.

-114 = Surface with Reverse Curvature.

-121 = Concave failure surface, only convex surfaces have been defined as being allowed.

-124 = A slice has a width less than the minimum acceptable value.

-1000 = No valid slip surface is generated

Slice Data

Global Minimum Query (spencer) - Safety Factor: 1.35619

Slice Number	Width [ft]	Weight [lbs]	Angle of Slice Base [deg]	Base Material	Base Cohesion [psf]	Base Friction Angle [deg]	Shear Stress [psf]	Shear Strength [psf]	Base Normal Stress [psf]	Pore Pressure [psf]	Effective Normal Stress [psf]	Base Vertical Stress [psf]	Effective Vertical Stress [psf]
1	13.2679	5434.26	-0.927215	Bedrock (Tp)	200	35	484.622	657.239	653.004	0	653.004	645.161	645.161
2	13.4879	15904.5	3.03068	Bedrock (Tp)	200	35	916.59	1243.07	1489.65	0	1489.65	1538.18	1538.18
3	9.08166	15644.4	10.0956	Bedrock (Tp)	200	35	1077.65	1461.5	1801.6	0	1801.6	1993.47	1993.47
4	9.08166	18839.3	10.0956	Bedrock (Tp)	200	35	1261.36	1710.64	2157.42	0	2157.42	2382	2382
5	9.08165	20952.5	10.4255	Bedrock (Tp)	200	35	1373.86	1863.21	2375.32	0	2375.32	2628.1	2628.1
6	9.08165	20064.4	10.4255	Bedrock (Tp)	200	35	1323.15	1794.44	2277.09	0	2277.09	2520.54	2520.54
7	8.6348	21462.4	11.8806	Bedrock (Tp)	200	35	1425.14	1932.76	2474.63	0	2474.63	2774.45	2774.45
8	8.6348	24181	11.8806	Bedrock (Tp)	200	35	1583.58	2147.63	2781.5	0	2781.5	3114.65	3114.65
9	8.60181	26684.4	13.0995	Bedrock (Tp)	200	35	1694.8	2298.47	2996.92	0	2996.92	3391.3	3391.3
10	8.60181	29160.7	13.0995	Bedrock (Tp)	200	35	1836.11	2490.12	3270.63	0	3270.63	3697.89	3697.89
11	11.4067	42184.9	14.8294	Bedrock (Tp)	200	35	1922.44	2607.2	3437.83	0	3437.83	3946.82	3946.82
12	11.4067	45719.6	14.8294	Bedrock (Tp)	200	35	2069.39	2806.49	3722.45	0	3722.45	4270.34	4270.34
13	11.3717	43964.7	15.3099	Bedrock (Tp)	200	35	1983.88	2690.52	3556.83	0	3556.83	4099.93	4099.93
14	11.3717	45987.9	15.3099	Bedrock (Tp)	200	35	2067.45	2803.86	3718.7	0	3718.7	4284.67	4284.67
15	11.6501	50685.7	17.0074	Bedrock (Tp)	200	35	2141.82	2904.72	3862.75	0	3862.75	4517.87	4517.87
16	11.6501	54040.7	17.0074	Bedrock (Tp)	200	35	2272.69	3082.2	4116.21	0	4116.21	4811.36	4811.36
17	11.6363	56889.9	19.6204	Bedrock (Tp)	200	35	2273.5	3083.3	4117.78	0	4117.78	4928.25	4928.25
18	11.6363	58988.1	19.6204	Bedrock (Tp)	200	35	2351.43	3188.99	4268.72	0	4268.72	5106.97	5106.97
19	11.6363	55223.4	17.826	Bedrock (Tp)	200	35	2286.14	3100.44	4142.26	0	4142.26	4877.4	4877.4
20	11.6363	50978.4	17.826	Bedrock (Tp)	200	35	2122.97	2879.15	3826.22	0	3826.22	4508.89	4508.89
21	11.6363	53383.6	16.9587	Bedrock (Tp)	200	35	2251.57	3053.56	4075.31	0	4075.31	4761.91	4761.91

22	11.6363	56745.5	16.9587	Bedrock (Tp)	200	35	2382.98	3231.78	4329.84	0	4329.84	5056.51	5056.51
23	8.23252	41844.1	21.0228	Bedrock (Tp)	200	35	2297.52	3115.88	4164.31	0	4164.31	5047.29	5047.29
24	8.23252	42847.6	21.0228	Bedrock (Tp)	200	35	2348.83	3185.46	4263.68	0	4263.68	5166.38	5166.38
25	8.23252	43836.4	21.1908	Bedrock (Tp)	200	35	2392.04	3244.06	4347.37	0	4347.37	5274.74	5274.74
26	8.23252	44174.2	21.1908	Bedrock (Tp)	200	35	2409.26	3267.41	4380.72	0	4380.72	5314.76	5314.76
27	8.23252	41444.1	21.0936	Bedrock (Tp)	200	35	2274.14	3084.17	4119.02	0	4119.02	4996.25	4996.25
28	8.23252	41402.2	21.0936	Bedrock (Tp)	200	35	2272	3081.27	4114.88	0	4114.88	4991.28	4991.28
29	8.55009	43885.1	23.0403	Bedrock (Tp)	200	35	2235.29	3031.48	4043.77	0	4043.77	4994.45	4994.45
30	8.55009	44590.5	23.0403	Bedrock (Tp)	200	35	2268.73	3076.83	4108.54	0	4108.54	5073.44	5073.44
31	8.55009	45187.5	24.0817	Bedrock (Tp)	200	35	2254.34	3057.32	4080.67	0	4080.67	5088.23	5088.23
32	8.55009	45680.2	24.0817	Bedrock (Tp)	200	35	2277.25	3088.38	4125.04	0	4125.04	5142.83	5142.83
33	8.6681	46649.6	25.6655	Bedrock (Tp)	200	35	2228.57	3022.36	4030.75	0	4030.75	5101.63	5101.63
34	8.6681	44677.5	25.6655	Bedrock (Tp)	200	35	2140.75	2903.26	3860.66	0	3860.66	4889.35	4889.35
35	8.67382	41545	25.1762	Bedrock (Tp)	200	35	2017.58	2736.22	3622.1	0	3622.1	4570.48	4570.48
36	8.67382	41713.1	25.1762	Bedrock (Tp)	200	35	2025.14	2746.47	3636.73	0	3636.73	4588.66	4588.66
37	7.68867	37122.1	26.33	Bedrock (Tp)	200	35	1991.17	2700.41	3570.95	0	3570.95	4556.35	4556.35
38	7.68867	37158.7	26.33	Bedrock (Tp)	200	35	1992.99	2702.87	3574.47	0	3574.47	4560.76	4560.76
39	7.71441	36922.6	30.8613	Bedrock (Tp)	200	35	1822.37	2471.48	3244.01	0	3244.01	4333	4333
40	7.71441	36165	30.8613	Bedrock (Tp)	200	35	1787.94	2424.78	3177.32	0	3177.32	4245.74	4245.74
41	12.8977	57973.6	32.8676	Bedrock (Tp)	200	35	1659.97	2251.24	2929.47	0	2929.47	4002.02	4002.02
42	12.8981	47466.4	32.0392	Bedrock (Tp)	200	35	1405.17	1905.68	2435.97	0	2435.97	3315.35	3315.35
43	8.51132	24459.2	32.431	Bedrock (Tp)	200	35	1120.93	1520.2	1885.44	0	1885.44	2597.66	2597.66
44	8.51132	22588.4	32.431	Bedrock (Tp)	200	35	1046.09	1418.7	1740.48	0	1740.48	2405.15	2405.15
45	8.51131	21197.4	33.2812	Bedrock (Tp)	200	35	976.043	1323.7	1604.81	0	1604.81	2245.49	2245.49
46	8.51131	19707.8	33.2812	Bedrock (Tp)	200	35	917.386	1244.15	1491.21	0	1491.21	2093.39	2093.39
47	8.49923	17825.2	36.3967	Bedrock (Tp)	200	35	800.42	1085.52	1264.66	0	1264.66	1854.71	1854.71
48	8.49923	15598	36.3967	Bedrock (Tp)	200	35	717.605	973.209	1104.26	0	1104.26	1633.26	1633.26
49	8.47158	13267.3	36.2798	Bedrock (Tp)	200	35	633.796	859.548	941.932	0	941.932	1407.16	1407.16
50	8.47158	7247.61	36.2798	Bedrock (Tp)	200	35	408.734	554.321	506.022	0	506.022	806.046	806.046

Interslice Data

Global Minimum Query (spencer) - Safety Factor: 1.35619

Slice Number	X coordinate [ft]	Y coordinate - Bottom [ft]	Interslice Normal Force [lbs]	Interslice Shear Force [lbs]	Interslice Force Angle [deg]
1	298.364	1571	0	0	0
2	311.632	1570.79	5755.02	3126.88	28.5166
3	325.12	1571.5	14668.4	7969.8	28.5166
4	334.201	1573.12	19195.5	10429.5	28.5166
5	343.283	1574.73	24336.4	13222.7	28.5166
6	352.365	1576.4	29701.4	16137.7	28.5166
7	361.446	1578.08	34903.2	18964	28.5166
8	370.081	1579.89	39494.3	21458.5	28.5166
9	378.716	1581.71	44488.2	24171.8	28.5166
10	387.318	1583.71	49065.3	26658.7	28.5166
11	395.92	1585.71	53938.6	29306.5	28.5166
12	407.326	1588.73	59157.3	32142	28.5166
13	418.733	1591.75	64662.5	35133.1	28.5166
14	430.105	1594.86	69555.4	37791.6	28.5166
15	441.476	1597.98	74591.4	40527.8	28.5166
16	453.127	1601.54	78176.5	42475.7	28.5166
17	464.777	1605.1	81879.8	44487.8	28.5166
18	476.413	1609.25	82720.3	44944.5	28.5166
19	488.049	1613.4	83526.8	45382.7	28.5166
20	499.686	1617.14	86346.1	46914.5	28.5166
21	511.322	1620.88	89085.9	48403.1	28.5166
22	522.958	1624.43	92817.7	50430.7	28.5166
23	534.595	1627.98	96671.3	52524.5	28.5166
24	542.827	1631.15	96133.6	52232.3	28.5166
25	551.06	1634.31	95553.4	51917.1	28.5166
26	559.292	1637.5	94795.2	51505.1	28.5166
27	567.525	1640.69	94021.6	51084.8	28.5166
28	575.757	1643.87	93446.6	50772.4	28.5166
29	583.99	1647.04	92873.4	50461	28.5166
30	592.54	1650.68	90698	49279	28.5166
31	601.09	1654.32	88467.1	48066.9	28.5166
32	609.64	1658.14	85370.2	46384.3	28.5166
33	618.19	1661.96	82225.7	44675.8	28.5166
34	626.858	1666.12	77756.8	42247.6	28.5166
35	635.526	1670.29	73530.9	39951.6	28.5166
36	644.2	1674.37	70031.3	38050.2	28.5166
37	652.874	1678.44	66512.4	36138.2	28.5166
38	660.563	1682.25	62666.3	34048.5	28.5166
39	668.251	1686.05	58815.2	31956.1	28.5166
40	675.966	1690.66	52380.8	28460.1	28.5166
41	683.68	1695.27	46101.8	25048.5	28.5166
42	696.578	1703.61	34402.8	18692.1	28.5166
43	709.476	1711.68	25744.1	13987.6	28.5167
44	717.987	1717.09	21419.6	11637.9	28.5165
45	726.498	1722.5	17522.6	9520.59	28.5167
46	735.01	1728.08	13684.6	7435.25	28.5165
47	743.521	1733.67	10205.4	5544.91	28.5166
48	752.02	1739.93	6411.01	3483.3	28.5166
49	760.52	1746.2	3251.81	1766.81	28.5166
50	768.991	1752.42	773.68	420.364	28.5166
51	777.463	1758.64	0	0	0

Appendix D

LEGEND

AREA OF MAPPED PICO FORMATION SANDSTONE

39° STRIKE AND DIP OF BEDDING

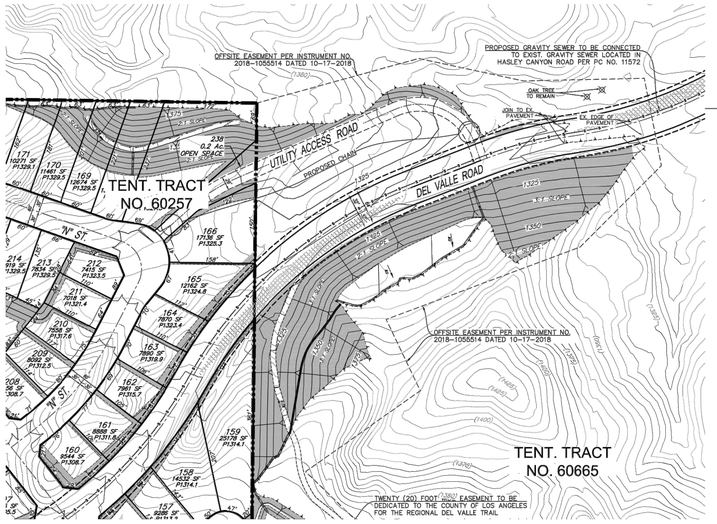
39° STRIKE AND DIP OF REGIONAL BEDDING

40° STRIKE AND DIP OF CONTACT

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

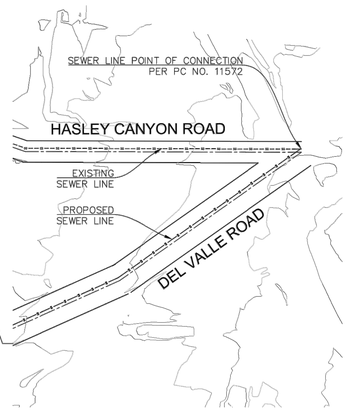
REGIONAL GEOLOGIC MAP

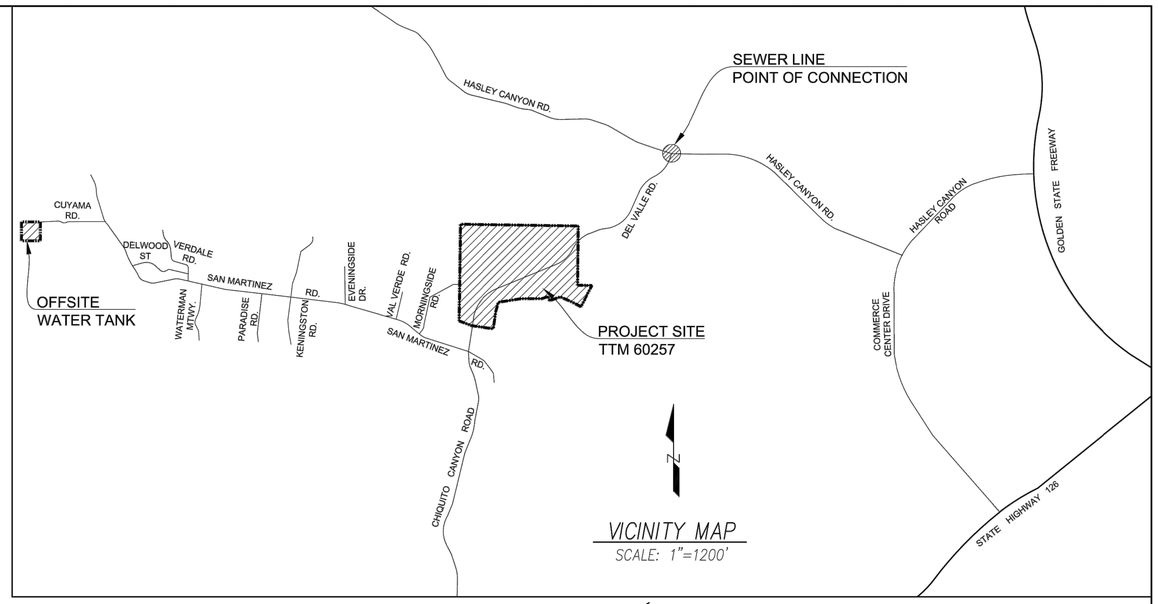
DATE: 7/20/20	JOB NO.: 20-1245A-4
SCALE: 1" = 100'	FILE NAME: AES CUYAMA WT 06.29.20.DWG
PLATE 1	GEOLOGY BY: VCG
	DRAWN BY: VCG
	REVISED:

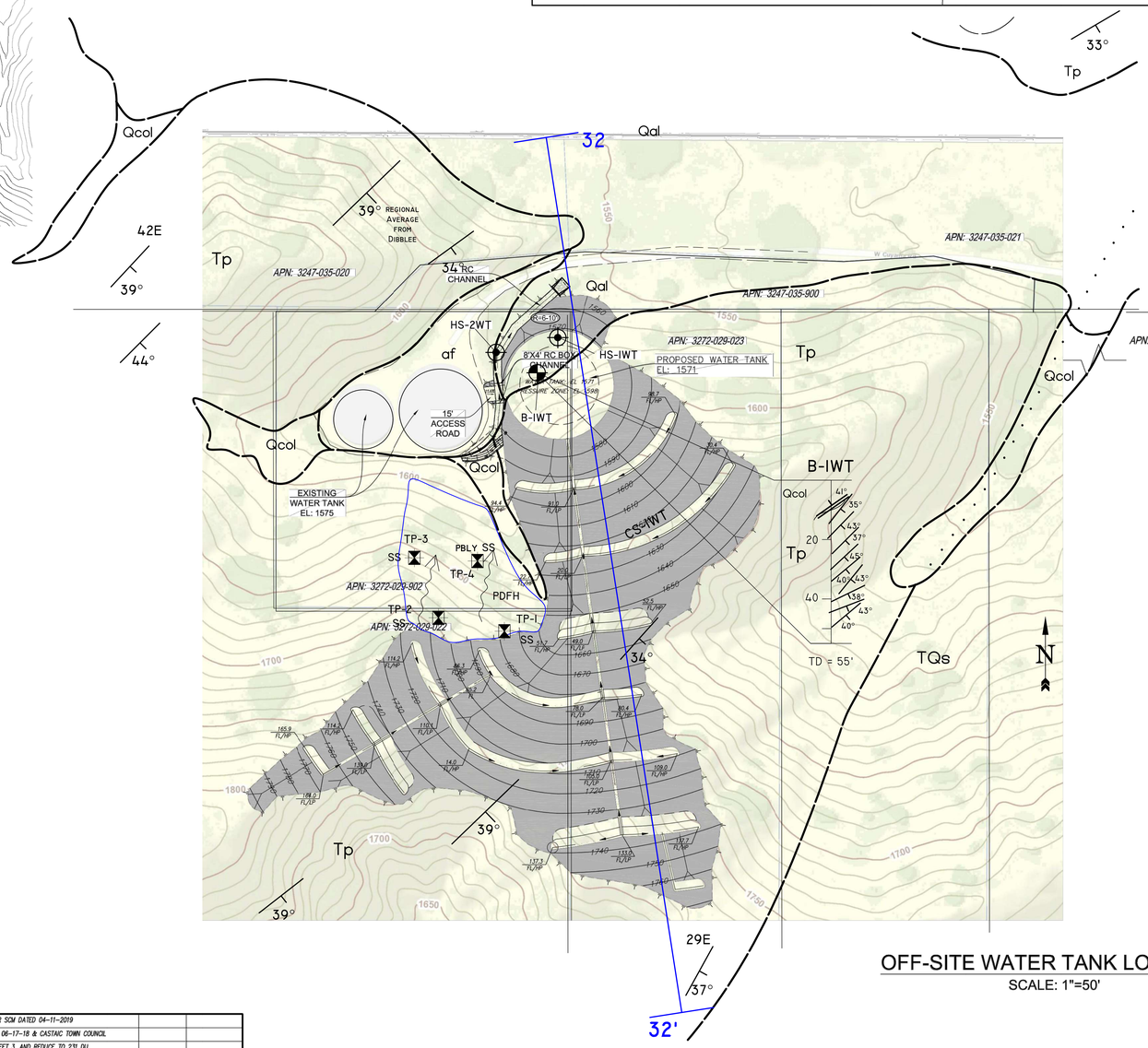


APPROXIMATE OFFSITE SEWER LENGTH (TRACT BOUNDARY TO POINT OF CONNECTION) IS 3422 LINEAR FEET.

SEWER LINE POINT OF CONNECTION
SCALE: 1"=100'







OFF-SITE WATER TANK LOCATION
SCALE: 1"=50'

LEGEND

af	ARTIFICIAL FILL
Qcol	QUATERNARY COLLUVIUM
Qal	QUATERNARY ALLUVIUM
TQs	SAUGUS FORMATION
Tp	PICO FORMATION
B-IWT	BUCKET-AUGER BORING
HS-2WT	HOLLOW-STEM-AUGER BORING
TP-4	HAND EXCAVATED TEST PIT
	GEOLOGIC CONTACT; DOTTED WHERE CONCEALED
39°	STRIKE AND DIP OF BEDDING
39°	STRIKE AND DIP OF REGIONAL BEDDING
40°	STRIKE AND DIP OF CONTACT
PDFH	POTENTIAL DEBRIS FLOW SOURCE AREA
R=6-8'	RECOMMENDED REMOVAL DEPTH FOR ALLUVIAL AREAS
CS-IWT	CUT SLOPE DESIGNATION
32 / 32'	CROSS SECTION

8	06-29-20	MISC REVISIONS PER SCM DATED 04-11-2019		
7	02-27-19	MISC REVISIONS PER SCM DATED 06-17-18 & CASTAIC TOWN COUNCIL		
6	5-8-18	MISC REVISIONS, ADD SHEET 3, AND REDUCE TO 231 DU		
5	7-13-16	MISC ADJUSTMENTS & ADDED ALT. A TO SHEET 2		
4	2-12-16	MISC LOT ADJUSTMENTS		
3	9-5-12	DEL ROUNDABOUTS, SHOW PHASING, LARGE LOTS, SEPTIC OPTION & CORRECT ST SECTIONS		
2	7-17-07	REVISED HUNSTOCK INTERSECTION		
1	3-27-05	REVISED LAYOUT TO MEET CASTAIC C.S.D. STANDARDS		
	DATE	REVISION	BY	APP

SCALE: AS SHOWN | DWN'D BY: | APPROVED BY: | DATE: 08-18-06 | DWG. NO. 5100-056-01 | SHEET 4 OF 4

PREPARED FOR:
Sterling Ranch ESTATES
STERLING GATEWAY
5018 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

LEGAL DESCRIPTION

LOTS 1 OF 2 OF LLA 2013-00002 PER RECORDED 2013-082031

N

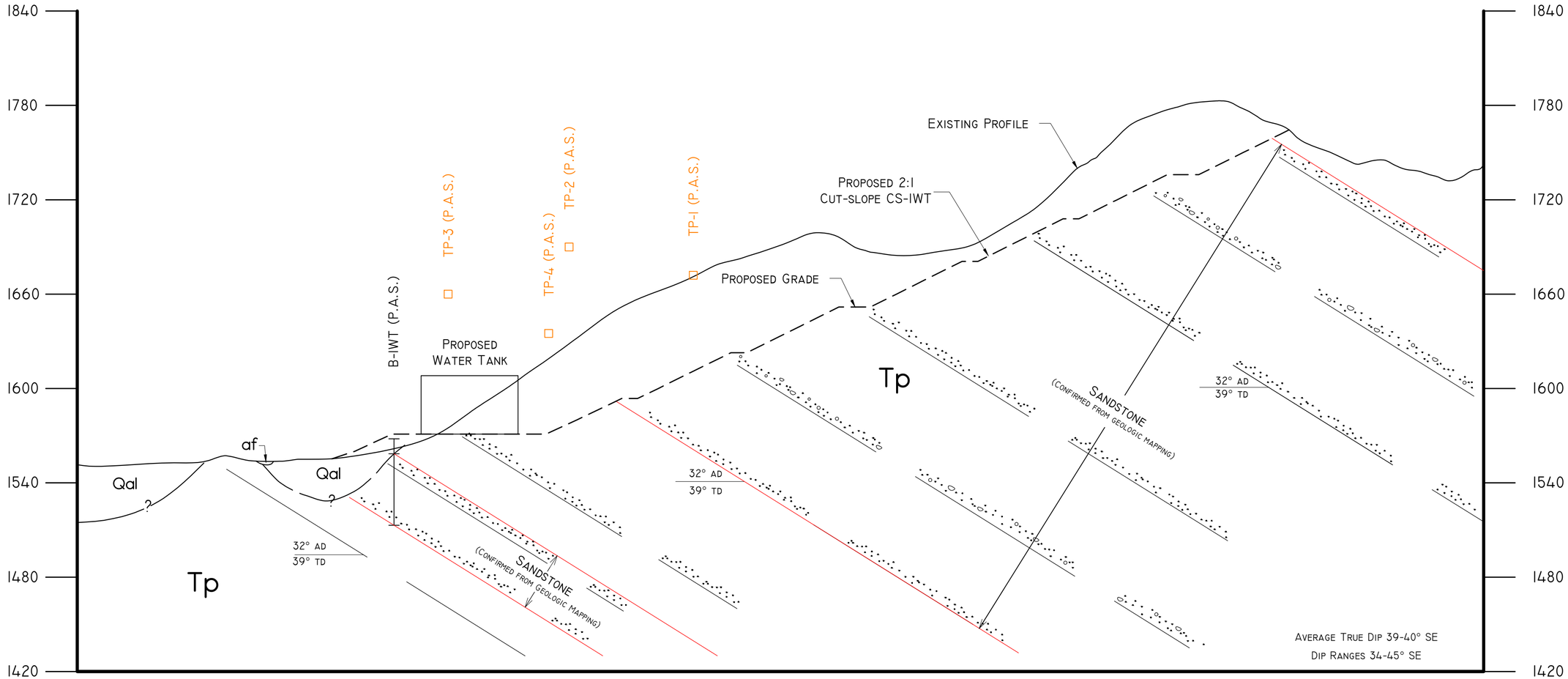
REGISTERED PROFESSIONAL ENGINEER MARK R. SIKAND No. 35453 Exp. 09-30-19 CIVIL STATE OF CALIFORNIA

SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd.,
Van Nuys, CA 91411
Tel: (818) 787-8550
Fax: (818) 901-7451
info@sikand.com

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT NO. 60257
LOCATED IN THE UNINCORPORATED TERRITORY OF THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological And Geotechnical Consultants

GEOTECHNICAL MAP
DATE: 7/20/20 | JOB NO.: 20-12454-4
SCALE: 1" = 50' | FILE NAME: AES Cyrano WT 06.29.20.DWG
PLATE II | GEOLOGY BY: VCC | DRAWN BY: VCC | REVISED:



ALLAN E. SEWARD
ENGINEERING GEOLOGY, INC.
Geological and Geotechnical Consultants

CROSS SECTION 32-32'

JOB NO.: 20-1245A-4

DATE: 7/20/20 | SCALE: 1"=50' (H=V)

APPENDIX F.8

Geotechnical and Materials Engineering Division (GMED) Approval

PCA GMTR/A867
EPICLA ESTU2018000207
Telephone: (626) 458-4925

County of Los Angeles Department of Public Works
Geotechnical and Materials Engineering Division
GEOLOGIC AND SOILS ENGINEERING REVIEW SHEET
900 S. Fremont Avenue, Alhambra, CA 91803

Tentative Tract Map	60257	**Tentative Map Dated**	2/27/19 (Map/Exhibit)	**Parent Tract**	
Grading By Subdivider? [Y] (Y or N)	1.5 M yd^3	**Location**	Val Verde	**APN**	
Geologist	A.E. Seward Engineering Geology, Inc.	**Subdivider**	Sterling Gateway LP		
Soils Engineer	A.E. Seward Engineering Geology, Inc.	**Engineer/Arch.**	Sikand Engineering		

Review of:
Geologic Report(s) Dated:
Soils Engineering Report(s) Dated:
Geotechnical Report(s) Dated: **7/20/20 (offsite water tank)**, 5/23/19, 5/21/19, 4/3/19, 6/8/18
References:

TENTATIVE MAP FEASIBILITY IS RECOMMENDED FOR APPROVAL FROM A GEOTECHNICAL STANDPOINT

PRIOR TO FILING THE FINAL LAND DIVISION MAP THE FOLLOWING CONDITIONS MUST BE FULFILLED:

G1. The final map must be approved by the Geotechnical and Materials Engineering Division (GMED) to assure that all geotechnical requirements have been properly depicted. For Final Map clearance guidelines refer to policy memo GS051.0 in the County of Los Angeles Department of Public Works *Manual for Preparation of Geotechnical Reports.* The Manual is available at: ***http://dpw.lacounty.gov/gmed/permits/docs/manual.pdf***.

G2. A grading plan must be geotechnically approved by the GMED prior to Final Map approval. The grading depicted on the plan must agree with the grading depicted on the tentative tract or parcel map and the conditions approved by the Planning Commission. If the subdivision is to be recorded prior to the completion and acceptance of grading, corrective geologic bonds may be required.

G3. Prior to grading plan approval, a detailed geotechnical report must be submitted that addresses the proposed grading. All recommendations of the geotechnical consultant(s) must be incorporated into the plan. The report must comply with the provisions of the County of Los Angeles Department of Public Works *Manual for Preparation of Geotechnical Reports*. The Manual is available at: ***http://dpw.lacounty.gov/gmed/permits/docs/manual.pdf***.

G4. All geologic hazards associated with this proposed development must be eliminated. Alternatively, the geologic hazards may be designated as restricted use areas (RUA), and their boundaries delineated on the Final Map. These RUAs must be approved by the GMED, and the subdivider must dedicate to the County the right to prohibit the erection of buildings or other structures within the restricted use areas. For information on the RUA policy refer to policy memo GS063.0 in the County of Los Angeles Department of Public Works *Manual for Preparation of Geotechnical Reports.* The Manual is available at: ***http://dpw.lacounty.gov/gmed/permits/docs/manual.pdf***..

S1. At the grading plan stage, submit grading plans to the GMED for verification of compliance with County Codes and policies.

S2. At the rough grading stage, provide data from the recommended settlement monitoring program to verify that settlements will comply with County codes and policies.

NOTE: Provide a copy of this review sheet with your resubmittal.

NOTE(S) TO THE PLAN CHECKER/BUILDING AND SAFETY DISTRICT ENGINEER:
OFFSITE GRADING IS PROPOSED.

Prepared by

REGISTERED PROFESSIONAL ENGINEER JEREMY CHUN YIN WAN No. GE 2849 GEOTECHNICAL STATE OF CALIFORNIA

Jeremy Wan
Soils Section

PROFESSIONAL GEOLOGIST Geir R. Mathisen No. 2376 CERTIFIED ENGINEERING GEOLOGIST STATE OF CALIFORNIA

Geir Mathisen
Geology Section

Date 08/27/2020

Please complete a Customer Service Survey at http://dpw.lacounty.gov/go/gmedsurvey
NOTICE: Public safety, relative to geotechnical subsurface exploration, shall be provided in accordance with current codes for excavations, inclusive of the Los Angeles County Code, Chapter 11.48, and the State of California, Title 8, Construction Safety Orders.

APPENDIX G

Greenhouse Gas Emissions Model Outputs

Sterling Ranch Project

Los Angeles-South Coast County, Annual

1.0 Project Characteristics

1.1 Land Usage

Land Uses	Size	Metric	Lot Acreage	Floor Surface Area	Population
Other Asphalt Surfaces	19.70	Acre	19.70	858,132.00	0
City Park	12.80	Acre	12.80	557,568.00	0
Single Family Housing	222.00	Dwelling Unit	57.90	399,600.00	635
Regional Shopping Center	21.00	1000sqft	2.50	21,000.00	0

1.2 Other Project Characteristics

Urbanization	Urban	**Wind Speed (m/s)**	2.2	**Precipitation Freq (Days)**	33
Climate Zone	8			**Operational Year**	2027
Utility Company	Southern California Edison				
CO2 Intensity (lb/MWhr)	702.44	**CH4 Intensity (lb/MWhr)**	0.029	**N2O Intensity (lb/MWhr)**	0.006

1.3 User Entered Comments & Non-Default Data

Project Characteristics -

Land Use - Park acreage includes passive park and shade structures and debris and pump stations
Asphalt surfaces include public right-of-way and private and future streets

Construction Phase - Construction to begin August 2021

Off-road Equipment -

Off-road Equipment -

Off-road Equipment - Grading equipment per applicant.

Off-road Equipment -

Grading -

Vehicle Trips - Weekday trip rates adjusted per traffic study. Weekend trip rates adjusted per CalEEMod default weekday/weekend ratios.

Woodstoves - No woodstoves.

Construction Off-road Equipment Mitigation - 25 percent of equipment fleet would meet Tier 4 Final specifications. Remaining 75 percent would meet Tier 3/Tier 4 Interim requirements.

Area Mitigation - Compliant with SCAQMD Rule 1113 - Architectural Coating (<50gms/liter).

Energy Mitigation -

Water Mitigation -

Mobile Land Use Mitigation -

Table Name	Column Name	Default Value	New Value
tblAreaMitigation	UseLowVOCPaintParkingCheck	False	True
tblConstDustMitigation	CleanPavedRoadPercentReduction	0	20
tblConstDustMitigation	WaterUnpavedRoadVehicleSpeed	0	15
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
tblConstEquipMitigation	DPF	No Change	Level 3
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tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	1.00

tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
tblConstEquipMitigation	NumberOfEquipmentMitigated	0.00	2.00
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tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Interim
tblConstEquipMitigation	Tier	No Change	Tier 4 Final
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstEquipMitigation	Tier	No Change	Tier 3
tblConstructionPhase	NumDays	110.00	130.00
tblConstructionPhase	NumDays	1,550.00	783.00
tblConstructionPhase	NumDays	110.00	132.00
tblFireplaces	FireplaceWoodMass	1,019.20	0.00
tblFireplaces	NumberWood	11.10	0.00
tblLandUse	LotAcreage	72.08	57.90
tblLandUse	LotAcreage	0.48	2.50
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	2.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	1.00	10.00
tblOffRoadEquipment	OffRoadEquipmentUnitAmount	2.00	8.00

tblVehicleTrips	CC_TL	8.40	0.00
tblVehicleTrips	CC_TTP	48.00	0.00
tblVehicleTrips	CC_TTP	64.70	64.40
tblVehicleTrips	CNW_TL	6.90	0.00
tblVehicleTrips	CNW_TTP	19.00	0.00
tblVehicleTrips	CW_TL	16.60	0.00
tblVehicleTrips	CW_TTP	33.00	0.00
tblVehicleTrips	CW_TTP	16.30	16.60
tblVehicleTrips	DV_TP	28.00	0.00
tblVehicleTrips	DV_TP	35.00	40.00
tblVehicleTrips	HO_TL	8.70	13.00
tblVehicleTrips	HS_TL	5.90	13.30
tblVehicleTrips	HW_TL	14.70	24.20
tblVehicleTrips	PB_TP	6.00	0.00
tblVehicleTrips	PB_TP	11.00	15.00
tblVehicleTrips	PR_TP	66.00	0.00
tblVehicleTrips	PR_TP	54.00	45.00
tblVehicleTrips	ST_TR	22.75	0.00
tblVehicleTrips	ST_TR	49.97	42.04
tblVehicleTrips	SU_TR	16.74	0.00
tblVehicleTrips	SU_TR	25.24	20.43
tblVehicleTrips	WD_TR	1.89	0.00
tblVehicleTrips	WD_TR	42.70	44.32
tblWoodstoves	NumberCatalytic	11.10	0.00
tblWoodstoves	NumberNoncatalytic	11.10	0.00
tblWoodstoves	WoodstoveDayYear	25.00	0.00
tblWoodstoves	WoodstoveWoodMass	999.60	0.00

2.0 Emissions Summary

2.1 Overall Construction

Unmitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	1.0679	11.6138	5.8603	0.0128	4.0850	0.5093	4.5943	1.9093	0.4685	2.3778	0.0000	1,122.7177	1,122.7177	0.3543	0.0000	1,131.5756
2022	0.9268	8.4149	7.1896	0.0229	3.0858	0.2667	3.3525	1.0920	0.2474	1.3393	0.0000	2,087.0826	2,087.0826	0.2646	0.0000	2,093.6967
2023	0.6132	4.4975	5.7130	0.0207	1.1822	0.1013	1.2835	0.3189	0.0952	0.4141	0.0000	1,912.0587	1,912.0587	0.1361	0.0000	1,915.4601
2024	0.5850	4.3783	5.5267	0.0205	1.1913	0.0906	1.2819	0.3213	0.0851	0.4064	0.0000	1,898.1988	1,898.1988	0.1343	0.0000	1,901.5559
2025	1.1497	1.3684	2.1524	5.7900e-003	0.2819	0.0442	0.3261	0.0757	0.0411	0.1168	0.0000	526.6469	526.6469	0.0677	0.0000	528.3398
2026	0.5448	0.0336	0.1252	3.6000e-004	0.0350	1.4600e-003	0.0365	9.3000e-003	1.4400e-003	0.0108	0.0000	32.4153	32.4153	9.1000e-004	0.0000	32.4380
Maximum	**1.1497**	**11.6138**	**7.1896**	**0.0229**	**4.0850**	**0.5093**	**4.5943**	**1.9093**	**0.4685**	**2.3778**	**0.0000**	**2,087.0826**	**2,087.0826**	**0.3543**	**0.0000**	**2,093.6967**

Mitigated Construction

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Year	tons/yr										MT/yr					
2021	0.2548	3.8135	6.4215	0.0128	1.2916	0.0217	1.3132	0.6004	0.0216	0.6220	0.0000	1,122.7164	1,122.7164	0.3543	0.0000	1,131.5742
2022	0.5463	5.6751	7.8004	0.0229	1.4785	0.0274	1.5058	0.4838	0.0266	0.5104	0.0000	2,087.0818	2,087.0818	0.2646	0.0000	2,093.6959
2023	0.4883	4.1794	5.9249	0.0207	0.9840	0.0190	1.0030	0.2702	0.0183	0.2885	0.0000	1,912.0583	1,912.0583	0.1361	0.0000	1,915.4598
2024	0.4724	4.1810	5.7503	0.0205	0.9916	0.0190	1.0106	0.2723	0.0183	0.2906	0.0000	1,898.1985	1,898.1985	0.1343	0.0000	1,901.5555
2025	1.0892	1.4489	2.3739	5.7900e-003	0.2342	4.2400e-003	0.2384	0.0640	4.0700e-003	0.0681	0.0000	526.6466	526.6466	0.0677	0.0000	528.3395

2026	0.5420	0.0316	0.1258	3.6000e-004	0.0290	2.7000e-004	0.0292	7.8100e-003	2.5000e-004	8.0600e-003	0.0000	32.4153	32.4153	9.1000e-004	0.0000	32.4380
Maximum	**1.0892**	**5.6751**	**7.8004**	**0.0229**	**1.4785**	**0.0274**	**1.5058**	**0.6004**	**0.0266**	**0.6220**	**0.0000**	**2,087.0818**	**2,087.0818**	**0.3543**	**0.0000**	**2,093.6959**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	**30.58**	**36.22**	**-6.89**	**0.00**	**49.21**	**90.97**	**53.10**	**54.42**	**90.51**	**61.68**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**

Quarter	Start Date	End Date	Maximum Unmitigated ROG + NOX (tons/quarter)	Maximum Mitigated ROG + NOX (tons/quarter)
1	8-1-2021	10-31-2021	7.5758	2.4302
2	11-1-2021	1-31-2022	7.1256	2.4308
3	2-1-2022	4-30-2022	3.1213	1.6998
4	5-1-2022	7-31-2022	1.5285	1.3718
5	8-1-2022	10-31-2022	1.5339	1.3771
6	11-1-2022	1-31-2023	1.4589	1.3172
7	2-1-2023	4-30-2023	1.2441	1.1358
8	5-1-2023	7-31-2023	1.2768	1.1648
9	8-1-2023	10-31-2023	1.2815	1.1695
10	11-1-2023	1-31-2024	1.2749	1.1745
11	2-1-2024	4-30-2024	1.2124	1.1364
12	5-1-2024	7-31-2024	1.2305	1.1528
13	8-1-2024	10-31-2024	1.2350	1.1573
14	11-1-2024	1-31-2025	1.2270	1.1613
15	2-1-2025	4-30-2025	0.6278	0.6301
16	5-1-2025	7-31-2025	0.3275	0.3564
17	8-1-2025	10-31-2025	0.6162	0.6239
18	11-1-2025	1-31-2026	0.8112	0.8046
19	2-1-2026	4-30-2026	0.3082	0.3057
		Highest	7.5758	2.4308

2.2 Overall Operational

Unmitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.8006	0.0655	2.3046	3.7000e-004		0.0159	0.0159		0.0159	0.0159	0.0000	49.0549	49.0549	4.4500e-003	8.3000e-004	49.4138
Energy	0.0311	0.2660	0.1141	1.7000e-003		0.0215	0.0215		0.0215	0.0215	0.0000	951.6747	951.6747	0.0325	0.0111	955.8076
Mobile	0.8032	4.0116	12.0322	0.0533	5.1302	0.0387	5.1688	1.3747	0.0359	1.4106	0.0000	4,942.5702	4,942.5702	0.2138	0.0000	4,947.9150
Waste						0.0000	0.0000		0.0000	0.0000	57.5479	0.0000	57.5479	3.4010	0.0000	142.5726
Water						0.0000	0.0000		0.0000	0.0000	5.0823	156.1029	161.1852	0.5285	0.0137	178.4668
Total	**2.6349**	**4.3432**	**14.4508**	**0.0554**	**5.1302**	**0.0760**	**5.2062**	**1.3747**	**0.0733**	**1.4480**	**62.6303**	**6,099.4027**	**6,162.0329**	**4.1802**	**0.0256**	**6,274.1757**

Mitigated Operational

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Area	1.8006	0.0655	2.3046	3.7000e-004		0.0159	0.0159		0.0159	0.0159	0.0000	49.0549	49.0549	4.4500e-003	8.3000e-004	49.4138
Energy	0.0311	0.2660	0.1141	1.7000e-003		0.0215	0.0215		0.0215	0.0215	0.0000	939.7835	939.7835	0.0320	0.0110	943.8739
Mobile	0.7381	3.6713	10.4919	0.0459	4.3825	0.0334	4.4159	1.1744	0.0310	1.2054	0.0000	4,253.5428	4,253.5428	0.1861	0.0000	4,258.1962
Waste						0.0000	0.0000		0.0000	0.0000	57.5479	0.0000	57.5479	3.4010	0.0000	142.5726
Water						0.0000	0.0000		0.0000	0.0000	4.0659	137.3424	141.4082	0.4233	0.0110	155.2780
Total	**2.5697**	**4.0029**	**12.9105**	**0.0480**	**4.3825**	**0.0708**	**4.4532**	**1.1744**	**0.0684**	**1.2427**	**61.6138**	**5,379.7236**	**5,441.3374**	**4.0468**	**0.0229**	**5,549.3345**

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio-CO2	Total CO2	CH4	N20	CO2e
Percent Reduction	2.47	7.84	10.66	13.43	14.58	6.89	14.46	14.57	6.63	14.17	1.62	11.80	11.70	3.19	10.65	11.55

3.0 Construction Detail

Construction Phase

Phase Number	Phase Name	Phase Type	Start Date	End Date	Num Days Week	Num Days	Phase Description
1	Grading	Grading	8/1/2021	3/4/2022	5	155	
2	Building Construction	Building Construction	3/5/2022	3/5/2025	5	783	
3	Paving	Paving	3/6/2025	9/6/2025	5	132	
4	Architectural Coating	Architectural Coating	9/7/2025	3/7/2026	5	130	

Acres of Grading (Site Preparation Phase): 0

Acres of Grading (Grading Phase): 1395

Acres of Paving: 19.7

Residential Indoor: 809,190; Residential Outdoor: 269,730; Non-Residential Indoor: 31,500; Non-Residential Outdoor: 10,500; Striped

OffRoad Equipment

Phase Name	Offroad Equipment Type	Amount	Usage Hours	Horse Power	Load Factor
Grading	Graders	2	8.00	187	0.41
Grading	Rubber Tired Dozers	10	8.00	247	0.40
Grading	Scrapers	8	8.00	367	0.48
Grading	Tractors/Loaders/Backhoes	2	8.00	97	0.37
Building Construction	Cranes	1	7.00	231	0.29
Building Construction	Forklifts	3	8.00	89	0.20
Building Construction	Generator Sets	1	8.00	84	0.74
Building Construction	Tractors/Loaders/Backhoes	3	7.00	97	0.37
Building Construction	Welders	1	8.00	46	0.45
Paving	Pavers	2	8.00	130	0.42

Paving	Paving Equipment	2	8.00	132	0.36
Paving	Rollers	2	8.00	80	0.38
Architectural Coating	Air Compressors	1	6.00	78	0.48

Trips and VMT

Phase Name	Offroad Equipment Count	Worker Trip Number	Vendor Trip Number	Hauling Trip Number	Worker Trip Length	Vendor Trip Length	Hauling Trip Length	Worker Vehicle Class	Vendor Vehicle Class	Hauling Vehicle Class
Grading	22	55.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Building Construction	9	681.00	259.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Paving	6	15.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT
Architectural Coating	1	136.00	0.00	0.00	14.70	6.90	20.00	LD_Mix	HDT_Mix	HHDT

3.1 Mitigation Measures Construction

Use Cleaner Engines for Construction Equipment

Use DPF for Construction Equipment

Use Soil Stabilizer

Replace Ground Cover

Water Exposed Area

Reduce Vehicle Speed on Unpaved Roads

Clean Paved Roads

3.2 Grading - 2021

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					4.0519	0.0000	4.0519	1.9005	0.0000	1.9005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Off-Road	1.0549	11.6037	5.7459	0.0124		0.5090	0.5090		0.4683	0.4683	0.0000	1,092.8029	1,092.8029	0.3534	0.0000	1,101.6388
Total	**1.0549**	**11.6037**	**5.7459**	**0.0124**	**4.0519**	**0.5090**	**4.5609**	**1.9005**	**0.4683**	**2.3688**	**0.0000**	**1,092.8029**	**1,092.8029**	**0.3534**	**0.0000**	**1,101.6388**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0130	0.0101	0.1144	3.3000e-004	0.0332	2.7000e-004	0.0334	8.8000e-003	2.5000e-004	9.0600e-003	0.0000	29.9147	29.9147	8.8000e-004	0.0000	29.9368
Total	**0.0130**	**0.0101**	**0.1144**	**3.3000e-004**	**0.0332**	**2.7000e-004**	**0.0334**	**8.8000e-003**	**2.5000e-004**	**9.0600e-003**	**0.0000**	**29.9147**	**29.9147**	**8.8000e-004**	**0.0000**	**29.9368**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					1.2642	0.0000	1.2642	0.5930	0.0000	0.5930	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.2418	3.8034	6.3072	0.0124		0.0214	0.0214		0.0214	0.0214	0.0000	1,092.8016	1,092.8016	0.3534	0.0000	1,101.6375
Total	**0.2418**	**3.8034**	**6.3072**	**0.0124**	**1.2642**	**0.0214**	**1.2856**	**0.5930**	**0.0214**	**0.6143**	**0.0000**	**1,092.8016**	**1,092.8016**	**0.3534**	**0.0000**	**1,101.6375**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0130	0.0101	0.1144	3.3000e-004	0.0274	2.7000e-004	0.0277	7.3900e-003	2.5000e-004	7.6500e-003	0.0000	29.9147	29.9147	8.8000e-004	0.0000	29.9368
Total	**0.0130**	**0.0101**	**0.1144**	**3.3000e-004**	**0.0274**	**2.7000e-004**	**0.0277**	**7.3900e-003**	**2.5000e-004**	**7.6500e-003**	**0.0000**	**29.9147**	**29.9147**	**8.8000e-004**	**0.0000**	**29.9368**

3.2 Grading - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					2.0947	0.0000	2.0947	0.8247	0.0000	0.8247	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.3619	3.9004	2.1318	5.0900e-003		0.1683	0.1683		0.1549	0.1549	0.0000	447.3774	447.3774	0.1447	0.0000	450.9947
Total	**0.3619**	**3.9004**	**2.1318**	**5.0900e-003**	**2.0947**	**0.1683**	**2.2630**	**0.8247**	**0.1549**	**0.9795**	**0.0000**	**447.3774**	**447.3774**	**0.1447**	**0.0000**	**450.9947**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.9900e-003	3.7400e-003	0.0431	1.3000e-004	0.0136	1.1000e-004	0.0137	3.6000e-003	1.0000e-004	3.7000e-003	0.0000	11.8077	11.8077	3.3000e-004	0.0000	11.8158
Total	**4.9900e-003**	**3.7400e-003**	**0.0431**	**1.3000e-004**	**0.0136**	**1.1000e-004**	**0.0137**	**3.6000e-003**	**1.0000e-004**	**3.7000e-003**	**0.0000**	**11.8077**	**11.8077**	**3.3000e-004**	**0.0000**	**11.8158**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Fugitive Dust					0.6535	0.0000	0.6535	0.2573	0.0000	0.2573	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	0.0989	1.5559	2.5802	5.0900e-003		8.7500e-003	8.7500e-003		8.7500e-003	8.7500e-003	0.0000	447.3769	447.3769	0.1447	0.0000	450.9941
Total	**0.0989**	**1.5559**	**2.5802**	**5.0900e-003**	**0.6535**	**8.7500e-003**	**0.6623**	**0.2573**	**8.7500e-003**	**0.2661**	**0.0000**	**447.3769**	**447.3769**	**0.1447**	**0.0000**	**450.9941**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	4.9900e-003	3.7400e-003	0.0431	1.3000e-004	0.0112	1.1000e-004	0.0113	3.0200e-003	1.0000e-004	3.1200e-003	0.0000	11.8077	11.8077	3.3000e-004	0.0000	11.8158
Total	**4.9900e-003**	**3.7400e-003**	**0.0431**	**1.3000e-004**	**0.0112**	**1.1000e-004**	**0.0113**	**3.0200e-003**	**1.0000e-004**	**3.1200e-003**	**0.0000**	**11.8077**	**11.8077**	**3.3000e-004**	**0.0000**	**11.8158**

3.3 Building Construction - 2022

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1834	1.6787	1.7591	2.9000e-003		0.0870	0.0870		0.0818	0.0818	0.0000	249.1046	249.1046	0.0597	0.0000	250.5966
Total	**0.1834**	**1.6787**	**1.7591**	**2.9000e-003**		**0.0870**	**0.0870**		**0.0818**	**0.0818**	**0.0000**	**249.1046**	**249.1046**	**0.0597**	**0.0000**	**250.5966**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0812	2.6106	0.7049	7.0100e-003	0.1754	4.9000e-003	0.1803	0.0506	4.6800e-003	0.0553	0.0000	680.2801	680.2801	0.0406	0.0000	681.2959
Worker	0.2954	0.2215	2.5508	7.7300e-003	0.8022	6.4100e-003	0.8086	0.2131	5.9000e-003	0.2190	0.0000	698.5129	698.5129	0.0192	0.0000	698.9938
Total	**0.3765**	**2.8321**	**3.2557**	**0.0147**	**0.9776**	**0.0113**	**0.9889**	**0.2637**	**0.0106**	**0.2743**	**0.0000**	**1,378.7929**	**1,378.7929**	**0.0599**	**0.0000**	**1,380.2897**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0658	1.2834	1.9214	2.9000e-003		7.1900e-003	7.1900e-003		7.1900e-003	7.1900e-003	0.0000	249.1043	249.1043	0.0597	0.0000	250.5963
Total	**0.0658**	**1.2834**	**1.9214**	**2.9000e-003**		**7.1900e-003**	**7.1900e-003**		**7.1900e-003**	**7.1900e-003**	**0.0000**	**249.1043**	**249.1043**	**0.0597**	**0.0000**	**250.5963**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0812	2.6106	0.7049	7.0100e-003	0.1506	4.9000e-003	0.1555	0.0445	4.6800e-003	0.0492	0.0000	680.2801	680.2801	0.0406	0.0000	681.2959
Worker	0.2954	0.2215	2.5508	7.7300e-003	0.6631	6.4100e-003	0.6696	0.1789	5.9000e-003	0.1848	0.0000	698.5129	698.5129	0.0192	0.0000	698.9938
Total	**0.3765**	**2.8321**	**3.2557**	**0.0147**	**0.8137**	**0.0113**	**0.8250**	**0.2235**	**0.0106**	**0.2340**	**0.0000**	**1,378.7929**	**1,378.7929**	**0.0599**	**0.0000**	**1,380.2897**

3.3 Building Construction - 2023

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.2045	1.8700	2.1117	3.5000e-003		0.0910	0.0910		0.0856	0.0856	0.0000	301.3462	301.3462	0.0717	0.0000	303.1383

Total	**0.2045**	**1.8700**	**2.1117**	**3.5000e-003**		**0.0910**	**0.0910**		**0.0856**	**0.0856**	**0.0000**	**301.3462**	**301.3462**	**0.0717**	**0.0000**	**303.1383**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0729	2.3852	0.7648	8.2000e-003	0.2121	2.7800e-003	0.2149	0.0612	2.6600e-003	0.0639	0.0000	796.9098	796.9098	0.0434	0.0000	797.9953
Worker	0.3359	0.2423	2.8365	9.0000e-003	0.9701	7.5300e-003	0.9776	0.2577	6.9300e-003	0.2646	0.0000	813.8027	813.8027	0.0210	0.0000	814.3265
Total	**0.4087**	**2.6275**	**3.6013**	**0.0172**	**1.1822**	**0.0103**	**1.1925**	**0.3189**	**9.5900e-003**	**0.3285**	**0.0000**	**1,610.7125**	**1,610.7125**	**0.0644**	**0.0000**	**1,612.3218**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0796	1.5520	2.3236	3.5000e-003		8.6900e-003	8.6900e-003		8.6900e-003	8.6900e-003	0.0000	301.3458	301.3458	0.0717	0.0000	303.1380
Total	**0.0796**	**1.5520**	**2.3236**	**3.5000e-003**		**8.6900e-003**	**8.6900e-003**		**8.6900e-003**	**8.6900e-003**	**0.0000**	**301.3458**	**301.3458**	**0.0717**	**0.0000**	**303.1380**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0729	2.3852	0.7648	8.2000e-003	0.1821	2.7800e-003	0.1849	0.0539	2.6600e-003	0.0565	0.0000	796.9098	796.9098	0.0434	0.0000	797.9953
Worker	0.3359	0.2423	2.8365	9.0000e-003	0.8019	7.5300e-003	0.8095	0.2164	6.9300e-003	0.2233	0.0000	813.8027	813.8027	0.0210	0.0000	814.3265
Total	**0.4087**	**2.6275**	**3.6013**	**0.0172**	**0.9840**	**0.0103**	**0.9943**	**0.2702**	**9.5900e-003**	**0.2798**	**0.0000**	**1,610.7125**	**1,610.7125**	**0.0644**	**0.0000**	**1,612.3218**

3.3 Building Construction - 2024

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.1928	1.7611	2.1179	3.5300e-003		0.0803	0.0803		0.0756	0.0756	0.0000	303.7223	303.7223	0.0718	0.0000	305.5179
Total	**0.1928**	**1.7611**	**2.1179**	**3.5300e-003**		**0.0803**	**0.0803**		**0.0756**	**0.0756**	**0.0000**	**303.7223**	**303.7223**	**0.0718**	**0.0000**	**305.5179**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0716	2.3945	0.7470	8.2300e-003	0.2137	2.7600e-003	0.2165	0.0617	2.6400e-003	0.0643	0.0000	799.8406	799.8406	0.0431	0.0000	800.9184
Worker	0.3206	0.2226	2.6618	8.7900e-003	0.9776	7.4700e-003	0.9851	0.2596	6.8800e-003	0.2665	0.0000	794.6359	794.6359	0.0194	0.0000	795.1196
Total	**0.3922**	**2.6171**	**3.4088**	**0.0170**	**1.1913**	**0.0102**	**1.2016**	**0.3213**	**9.5200e-003**	**0.3309**	**0.0000**	**1,594.4765**	**1,594.4765**	**0.0625**	**0.0000**	**1,596.0380**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0802	1.5639	2.3415	3.5300e-003		8.7600e-003	8.7600e-003		8.7600e-003	8.7600e-003	0.0000	303.7220	303.7220	0.0718	0.0000	305.5175
Total	**0.0802**	**1.5639**	**2.3415**	**3.5300e-003**		**8.7600e-003**	**8.7600e-003**		**8.7600e-003**	**8.7600e-003**	**0.0000**	**303.7220**	**303.7220**	**0.0718**	**0.0000**	**305.5175**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0716	2.3945	0.7470	8.2300e-003	0.1835	2.7600e-003	0.1863	0.0543	2.6400e-003	0.0569	0.0000	799.8406	799.8406	0.0431	0.0000	800.9184
Worker	0.3206	0.2226	2.6618	8.7900e-003	0.8081	7.4700e-003	0.8156	0.2181	6.8800e-003	0.2249	0.0000	794.6359	794.6359	0.0194	0.0000	795.1196
Total	**0.3922**	**2.6171**	**3.4088**	**0.0170**	**0.9916**	**0.0102**	**1.0018**	**0.2723**	**9.5200e-003**	**0.2818**	**0.0000**	**1,594.4765**	**1,594.4765**	**0.0625**	**0.0000**	**1,596.0380**

3.3 Building Construction - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0315	0.2868	0.3700	6.2000e-004		0.0121	0.0121		0.0114	0.0114	0.0000	53.3415	53.3415	0.0125	0.0000	53.6550
Total	**0.0315**	**0.2868**	**0.3700**	**6.2000e-004**		**0.0121**	**0.0121**		**0.0114**	**0.0114**	**0.0000**	**53.3415**	**53.3415**	**0.0125**	**0.0000**	**53.6550**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0123	0.4168	0.1278	1.4400e-003	0.0375	4.8000e-004	0.0380	0.0108	4.6000e-004	0.0113	0.0000	139.6648	139.6648	7.4600e-003	0.0000	139.8513
Worker	0.0535	0.0358	0.4337	1.4800e-003	0.1716	1.2900e-003	0.1729	0.0456	1.1800e-003	0.0468	0.0000	134.1140	134.1140	3.1000e-003	0.0000	134.1914
Total	**0.0658**	**0.4525**	**0.5615**	**2.9200e-003**	**0.2092**	**1.7700e-003**	**0.2109**	**0.0564**	**1.6400e-003**	**0.0581**	**0.0000**	**273.7788**	**273.7788**	**0.0106**	**0.0000**	**274.0428**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0141	0.2746	0.4111	6.2000e-004		1.5400e-003	1.5400e-003		1.5400e-003	1.5400e-003	0.0000	53.3414	53.3414	0.0125	0.0000	53.6549
Total	**0.0141**	**0.2746**	**0.4111**	**6.2000e-004**		**1.5400e-003**	**1.5400e-003**		**1.5400e-003**	**1.5400e-003**	**0.0000**	**53.3414**	**53.3414**	**0.0125**	**0.0000**	**53.6549**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0123	0.4168	0.1278	1.4400e-003	0.0322	4.8000e-004	0.0327	9.5300e-003	4.6000e-004	9.9800e-003	0.0000	139.6648	139.6648	7.4600e-003	0.0000	139.8513
Worker	0.0535	0.0358	0.4337	1.4800e-003	0.1419	1.2900e-003	0.1432	0.0383	1.1800e-003	0.0395	0.0000	134.1140	134.1140	3.1000e-003	0.0000	134.1914
Total	**0.0658**	**0.4525**	**0.5615**	**2.9200e-003**	**0.1741**	**1.7700e-003**	**0.1759**	**0.0478**	**1.6400e-003**	**0.0495**	**0.0000**	**273.7788**	**273.7788**	**0.0106**	**0.0000**	**274.0428**

3.4 Paving - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0604	0.5664	0.9622	1.5000e-003		0.0276	0.0276		0.0254	0.0254	0.0000	132.1271	132.1271	0.0427	0.0000	133.1954

Paving	0.0258					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0862**	**0.5664**	**0.9622**	**1.5000e-003**		**0.0276**	**0.0276**		**0.0254**	**0.0254**	**0.0000**	**132.1271**	**132.1271**	**0.0427**	**0.0000**	**133.1954**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.3800e-003	2.2600e-003	0.0274	9.0000e-005	0.0109	8.0000e-005	0.0109	2.8800e-003	7.0000e-005	2.9600e-003	0.0000	8.4769	8.4769	2.0000e-004	0.0000	8.4817
Total	**3.3800e-003**	**2.2600e-003**	**0.0274**	**9.0000e-005**	**0.0109**	**8.0000e-005**	**0.0109**	**2.8800e-003**	**7.0000e-005**	**2.9600e-003**	**0.0000**	**8.4769**	**8.4769**	**2.0000e-004**	**0.0000**	**8.4817**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Off-Road	0.0221	0.6626	1.1415	1.5000e-003		3.7000e-004	3.7000e-004		3.7000e-004	3.7000e-004	0.0000	132.1269	132.1269	0.0427	0.0000	133.1952
Paving	0.0258					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	**0.0479**	**0.6626**	**1.1415**	**1.5000e-003**		**3.7000e-004**	**3.7000e-004**		**3.7000e-004**	**3.7000e-004**	**0.0000**	**132.1269**	**132.1269**	**0.0427**	**0.0000**	**133.1952**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	3.3800e-003	2.2600e-003	0.0274	9.0000e-005	8.9700e-003	8.0000e-005	9.0500e-003	2.4200e-003	7.0000e-005	2.4900e-003	0.0000	8.4769	8.4769	2.0000e-004	0.0000	8.4817
Total	**3.3800e-003**	**2.2600e-003**	**0.0274**	**9.0000e-005**	**8.9700e-003**	**8.0000e-005**	**9.0500e-003**	**2.4200e-003**	**7.0000e-005**	**2.4900e-003**	**0.0000**	**8.4769**	**8.4769**	**2.0000e-004**	**0.0000**	**8.4817**

3.5 Architectural Coating - 2025

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.9365					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	7.0900e-003	0.0475	0.0751	1.2000e-004		2.1400e-003	2.1400e-003		2.1400e-003	2.1400e-003	0.0000	10.5960	10.5960	5.8000e-004	0.0000	10.6105
Total	**0.9436**	**0.0475**	**0.0751**	**1.2000e-004**		**2.1400e-003**	**2.1400e-003**		**2.1400e-003**	**2.1400e-003**	**0.0000**	**10.5960**	**10.5960**	**5.8000e-004**	**0.0000**	**10.6105**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					

Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0193	0.0129	0.1563	5.3000e-004	0.0619	4.6000e-004	0.0623	0.0164	4.3000e-004	0.0169	0.0000	48.3266	48.3266	1.1200e-003	0.0000	48.3545
Total	**0.0193**	**0.0129**	**0.1563**	**5.3000e-004**	**0.0619**	**4.6000e-004**	**0.0623**	**0.0164**	**4.3000e-004**	**0.0169**	**0.0000**	**48.3266**	**48.3266**	**1.1200e-003**	**0.0000**	**48.3545**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.9365					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	2.2600e-003	0.0440	0.0760	1.2000e-004		2.0000e-005	2.0000e-005		2.0000e-005	2.0000e-005	0.0000	10.5960	10.5960	5.8000e-004	0.0000	10.6104
Total	**0.9388**	**0.0440**	**0.0760**	**1.2000e-004**		**2.0000e-005**	**2.0000e-005**		**2.0000e-005**	**2.0000e-005**	**0.0000**	**10.5960**	**10.5960**	**5.8000e-004**	**0.0000**	**10.6104**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0193	0.0129	0.1563	5.3000e-004	0.0511	4.6000e-004	0.0516	0.0138	4.3000e-004	0.0142	0.0000	48.3266	48.3266	1.1200e-003	0.0000	48.3545
Total	**0.0193**	**0.0129**	**0.1563**	**5.3000e-004**	**0.0511**	**4.6000e-004**	**0.0516**	**0.0138**	**4.3000e-004**	**0.0142**	**0.0000**	**48.3266**	**48.3266**	**1.1200e-003**	**0.0000**	**48.3545**

3.5 Architectural Coating - 2026

Unmitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.5303					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	4.0200e-003	0.0269	0.0425	7.0000e-005		1.2100e-003	1.2100e-003		1.2100e-003	1.2100e-003	0.0000	6.0002	6.0002	3.3000e-004	0.0000	6.0083
Total	**0.5344**	**0.0269**	**0.0425**	**7.0000e-005**		**1.2100e-003**	**1.2100e-003**		**1.2100e-003**	**1.2100e-003**	**0.0000**	**6.0002**	**6.0002**	**3.3000e-004**	**0.0000**	**6.0083**

Unmitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0104	6.7200e-003	0.0827	2.9000e-004	0.0350	2.5000e-004	0.0353	9.3000e-003	2.3000e-004	9.5300e-003	0.0000	26.4152	26.4152	5.8000e-004	0.0000	26.4296
Total	**0.0104**	**6.7200e-003**	**0.0827**	**2.9000e-004**	**0.0350**	**2.5000e-004**	**0.0353**	**9.3000e-003**	**2.3000e-004**	**9.5300e-003**	**0.0000**	**26.4152**	**26.4152**	**5.8000e-004**	**0.0000**	**26.4296**

Mitigated Construction On-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Archit. Coating	0.5303					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Off-Road	1.2800e-003	0.0249	0.0431	7.0000e-005		1.0000e-005	1.0000e-005		1.0000e-005	1.0000e-005	0.0000	6.0001	6.0001	3.3000e-004	0.0000	6.0083
Total	**0.5316**	**0.0249**	**0.0431**	**7.0000e-005**		**1.0000e-005**	**1.0000e-005**		**1.0000e-005**	**1.0000e-005**	**0.0000**	**6.0001**	**6.0001**	**3.3000e-004**	**0.0000**	**6.0083**

Mitigated Construction Off-Site

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Hauling	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Vendor	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Worker	0.0104	6.7200e-003	0.0827	2.9000e-004	0.0290	2.5000e-004	0.0292	7.8100e-003	2.3000e-004	8.0400e-003	0.0000	26.4152	26.4152	5.8000e-004	0.0000	26.4296
Total	**0.0104**	**6.7200e-003**	**0.0827**	**2.9000e-004**	**0.0290**	**2.5000e-004**	**0.0292**	**7.8100e-003**	**2.3000e-004**	**8.0400e-003**	**0.0000**	**26.4152**	**26.4152**	**5.8000e-004**	**0.0000**	**26.4296**

4.0 Operational Detail - Mobile

4.1 Mitigation Measures Mobile

Increase Diversity

Improve Destination Accessibility

Increase Transit Accessibility

Improve Pedestrian Network

Provide Traffic Calming Measures

Expand Transit Network

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	0.7381	3.6713	10.4919	0.0459	4.3825	0.0334	4.4159	1.1744	0.0310	1.2054	0.0000	4,253.5428	4,253.5428	0.1861	0.0000	4,258.1962
Unmitigated	0.8032	4.0116	12.0322	0.0533	5.1302	0.0387	5.1688	1.3747	0.0359	1.4106	0.0000	4,942.5702	4,942.5702	0.2138	0.0000	4,947.9150

4.2 Trip Summary Information

	Average Daily Trip Rate			Unmitigated	Mitigated
Land Use	Weekday	Saturday	Sunday	Annual VMT	Annual VMT
City Park	0.00	0.00	0.00		
Other Asphalt Surfaces	0.00	0.00	0.00		
Regional Shopping Center	930.72	882.84	429.03	1,621,411	1,385,087
Single Family Housing	2,113.44	2,200.02	1913.64	11,899,571	10,165,183
Total	3,044.16	3,082.86	2,342.67	13,520,982	11,550,270

4.3 Trip Type Information

	Miles			Trip %			Trip Purpose %		
Land Use	H-W or C-W	H-S or C-C	H-O or C-NW	H-W or C-W	H-S or C-C	H-O or C-NW	Primary	Diverted	Pass-by
City Park	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0
Other Asphalt Surfaces	16.60	8.40	6.90	0.00	0.00	0.00	0	0	0
Regional Shopping Center	16.60	8.40	6.90	16.60	64.40	19.00	45	40	15
Single Family Housing	24.20	13.30	13.00	40.20	19.20	40.60	86	11	3

4.4 Fleet Mix

Land Use	LDA	LDT1	LDT2	MDV	LHD1	LHD2	MHD	HHD	OBUS	UBUS	MCY	SBUS	MH
City Park	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827
Other Asphalt Surfaces	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827

Regional Shopping Center	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827
Single Family Housing	0.543646	0.044284	0.209381	0.116714	0.014227	0.006316	0.021040	0.033117	0.002601	0.001862	0.005277	0.000709	0.000827

5.0 Energy Detail

Historical Energy Use: N

5.1 Mitigation Measures Energy

Install Energy Efficient Appliances

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Electricity Mitigated						0.0000	0.0000		0.0000	0.0000	0.0000	631.8375	631.8375	0.0261	5.4000e-003	634.0979
Electricity Unmitigated						0.0000	0.0000		0.0000	0.0000	0.0000	643.7287	643.7287	0.0266	5.5000e-003	646.0316
NaturalGas Mitigated	0.0311	0.2660	0.1141	1.7000e-003		0.0215	0.0215		0.0215	0.0215	0.0000	307.9460	307.9460	5.9000e-003	5.6500e-003	309.7760
NaturalGas Unmitigated	0.0311	0.2660	0.1141	1.7000e-003		0.0215	0.0215		0.0215	0.0215	0.0000	307.9460	307.9460	5.9000e-003	5.6500e-003	309.7760

5.2 Energy by Land Use - NaturalGas

Unmitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	42000	2.3000e-004	2.0600e-003	1.7300e-003	1.0000e-005		1.6000e-004	1.6000e-004		1.6000e-004	1.6000e-004	0.0000	2.2413	2.2413	4.0000e-005	4.0000e-005	2.2546
Single Family Housing	5.72869e+006	0.0309	0.2640	0.1123	1.6800e-003		0.0213	0.0213		0.0213	0.0213	0.0000	305.7047	305.7047	5.8600e-003	5.6000e-003	307.5214
Total		**0.0311**	**0.2660**	**0.1141**	**1.6900e-003**		**0.0215**	**0.0215**		**0.0215**	**0.0215**	**0.0000**	**307.9460**	**307.9460**	**5.9000e-003**	**5.6400e-003**	**309.7760**

Mitigated

	NaturalGas Use	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Land Use	kBTU/yr	tons/yr										MT/yr					
City Park	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	42000	2.3000e-004	2.0600e-003	1.7300e-003	1.0000e-005		1.6000e-004	1.6000e-004		1.6000e-004	1.6000e-004	0.0000	2.2413	2.2413	4.0000e-005	4.0000e-005	2.2546
Single Family Housing	5.72869e+006	0.0309	0.2640	0.1123	1.6800e-003		0.0213	0.0213		0.0213	0.0213	0.0000	305.7047	305.7047	5.8600e-003	5.6000e-003	307.5214
Total		**0.0311**	**0.2660**	**0.1141**	**1.6900e-003**		**0.0215**	**0.0215**		**0.0215**	**0.0215**	**0.0000**	**307.9460**	**307.9460**	**5.9000e-003**	**5.6400e-003**	**309.7760**

5.3 Energy by Land Use - Electricity

Unmitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000

Regional Shopping Center	240240	76.5456	3.1600e-003	6.5000e-004	76.8195
Single Family Housing	1.78012e+006	567.1831	0.0234	4.8400e-003	569.2122
Total		**643.7287**	**0.0266**	**5.4900e-003**	**646.0316**

Mitigated

	Electricity Use	Total CO2	CH4	N2O	CO2e
Land Use	kWh/yr	MT/yr			
City Park	0	0.0000	0.0000	0.0000	0.0000
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	240240	76.5456	3.1600e-003	6.5000e-004	76.8195
Single Family Housing	1.7428e+006	555.2919	0.0229	4.7400e-003	557.2785
Total		**631.8375**	**0.0261**	**5.3900e-003**	**634.0979**

6.0 Area Detail

6.1 Mitigation Measures Area

Use Low VOC Paint - Residential Interior

Use Low VOC Paint - Residential Exterior

Use Low VOC Paint - Non-Residential Interior

Use Low VOC Paint - Non-Residential Exterior

Use Low VOC Cleaning Supplies

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
Category	tons/yr										MT/yr					
Mitigated	1.8006	0.0655	2.3046	3.7000e-004		0.0159	0.0159		0.0159	0.0159	0.0000	49.0549	49.0549	4.4500e-003	8.3000e-004	49.4138
Unmitigated	1.8006	0.0655	2.3046	3.7000e-004		0.0159	0.0159		0.0159	0.0159	0.0000	49.0549	49.0549	4.4500e-003	8.3000e-004	49.4138

6.2 Area by SubCategory

Unmitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1467					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.5806					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	4.5800e-003	0.0391	0.0167	2.5000e-004		3.1600e-003	3.1600e-003		3.1600e-003	3.1600e-003	0.0000	45.3139	45.3139	8.7000e-004	8.3000e-004	45.5832
Landscaping	0.0687	0.0264	2.2879	1.2000e-004		0.0127	0.0127		0.0127	0.0127	0.0000	3.7410	3.7410	3.5800e-003	0.0000	3.8307
Total	**1.8006**	**0.0655**	**2.3046**	**3.7000e-004**		**0.0159**	**0.0159**		**0.0159**	**0.0159**	**0.0000**	**49.0549**	**49.0549**	**4.4500e-003**	**8.3000e-004**	**49.4138**

Mitigated

	ROG	NOx	CO	SO2	Fugitive PM10	Exhaust PM10	PM10 Total	Fugitive PM2.5	Exhaust PM2.5	PM2.5 Total	Bio- CO2	NBio- CO2	Total CO2	CH4	N2O	CO2e
SubCategory	tons/yr										MT/yr					
Architectural Coating	0.1467					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Consumer Products	1.5806					0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Hearth	4.5800e-003	0.0391	0.0167	2.5000e-004		3.1600e-003	3.1600e-003		3.1600e-003	3.1600e-003	0.0000	45.3139	45.3139	8.7000e-004	8.3000e-004	45.5832
Landscaping	0.0687	0.0264	2.2879	1.2000e-004		0.0127	0.0127		0.0127	0.0127	0.0000	3.7410	3.7410	3.5800e-003	0.0000	3.8307
Total	**1.8006**	**0.0655**	**2.3046**	**3.7000e-004**		**0.0159**	**0.0159**		**0.0159**	**0.0159**	**0.0000**	**49.0549**	**49.0549**	**4.4500e-003**	**8.3000e-004**	**49.4138**

7.0 Water Detail

7.1 Mitigation Measures Water

Install Low Flow Bathroom Faucet

Install Low Flow Kitchen Faucet

Install Low Flow Toilet

Install Low Flow Shower

Use Water Efficient Irrigation System

	Total CO2	CH4	N2O	CO2e
Category	MT/yr			
Mitigated	141.4082	0.4233	0.0110	155.2780
Unmitigated	161.1852	0.5285	0.0137	178.4668

7.2 Water by Land Use

Unmitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 15.251	53.9866	2.2300e-003	4.6000e-004	54.1798
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	1.55552 / 0.953385	10.3219	0.0511	1.2800e-003	11.9809
Single Family Housing	14.4642 / 9.11873	96.8767	0.4751	0.0119	112.3061
Total		**161.1852**	**0.5285**	**0.0137**	**178.4668**

Mitigated

	Indoor/Outdoor Use	Total CO2	CH4	N2O	CO2e
Land Use	Mgal	MT/yr			
City Park	0 / 14.3207	50.6935	2.0900e-003	4.3000e-004	50.8748
Other Asphalt Surfaces	0 / 0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	1.24442 / 0.895229	8.7266	0.0409	1.0300e-003	10.0555
Single Family Housing	11.5714 / 8.56249	81.9882	0.3803	9.5700e-003	94.3478
Total		**141.4082**	**0.4233**	**0.0110**	**155.2780**

8.0 Waste Detail

8.1 Mitigation Measures Waste

Category/Year

	Total CO2	CH4	N2O	CO2e
	MT/yr			
Mitigated	57.5479	3.4010	0.0000	142.5726
Unmitigated	57.5479	3.4010	0.0000	142.5726

8.2 Waste by Land Use

Unmitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	1.1	0.2233	0.0132	0.0000	0.5532
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	22.05	4.4760	0.2645	0.0000	11.0890
Single Family Housing	260.35	52.8487	3.1233	0.0000	130.9304
Total		**57.5479**	**3.4010**	**0.0000**	**142.5726**

Mitigated

	Waste Disposed	Total CO2	CH4	N2O	CO2e
Land Use	tons	MT/yr			
City Park	1.1	0.2233	0.0132	0.0000	0.5532
Other Asphalt Surfaces	0	0.0000	0.0000	0.0000	0.0000
Regional Shopping Center	22.05	4.4760	0.2645	0.0000	11.0890
Single Family Housing	260.35	52.8487	3.1233	0.0000	130.9304
Total		**57.5479**	**3.4010**	**0.0000**	**142.5726**

9.0 Operational Offroad

Equipment Type	Number	Hours/Day	Days/Year	Horse Power	Load Factor	Fuel Type

10.0 Stationary Equipment

Fire Pumps and Emergency Generators

Equipment Type	Number	Hours/Day	Hours/Year	Horse Power	Load Factor	Fuel Type

Boilers

Equipment Type	Number	Heat Input/Day	Heat Input/Year	Boiler Rating	Fuel Type

User Defined Equipment

Equipment Type	Number

11.0 Vegetation

APPENDIX H

Hazards

CITADEL ENVIRONMENTAL SERVICES, INC.

assess
resolve
strengthen

PRIVILEGED AND CONFIDENTIAL

September 13, 2017

Hunt Williams
STERLING GATEWAY, L.P.
5018 East Meadows Drive
Park City, Utah 84098

Re: CITADEL Project No. 1158.1001.0
Phase I Environmental Site Assessment Report
Sterling Ranch Estates
APNs 3271-012-012, 3271-004-013, 3271-005-032, and 3271-005-038
Val Verde, California 91384

Dear Mr. Williams:

Enclosed please find Citadel Environmental Services, Inc.'s Phase I Environmental Site Assessment Report for the above-referenced location.

The Phase I Environmental Site Assessment Report was conducted for Sterling Gateway, L.P., in accordance with Citadel's Proposal 1158.1001.P, dated August 23, 2017, and a mutually agreed upon scope of work.

If after your review, you have any questions or require additional information, please do not hesitate to telephone me at the Citadel Office in Glendale at (818) 246-2707.

Sincerely,
CITADEL ENVIRONMENTAL SERVICES, INC.

Mark Drollinger, M.Eng., CSP, CHMM, EiT
Director, Engineering and Environmental Sciences

Enclosure

CITADEL ENVIRONMENTAL SERVICES, INC.

assess
resolve
strengthen

Sterling Gateway, L.P.
5018 East Meadows Drive
Park City, Utah 84098

Phase I Environmental Site Assessment Report

September 13, 2017

Citadel Project Number 1158.1001.0

Sterling Ranch Estates
APNs 3271-004-012, 3271-004-013, 3271-005-032, and 3271-005-038
Val Verde, California 91384

www.citadelenvironmental.com

Table of Contents

EXECUTIVE SUMMARY i
1.0 INTRODUCTION 1
1.1 PURPOSE 1
1.2 INVOLVED PARTIES 1
1.3 SCOPE OF SERVICES 1
2.0 GENERAL SITE CHARACTERISTICS 2
2.1 LOCATION 2
2.2 SITE DESCRIPTION 2
2.3 ADJACENT PROPERTIES 3
2.4 UTILITIES 3
3.0 ENVIRONMENTAL SETTING 3
3.1 PHYSICAL SITE CHARACTERISTICS 3
4.0 SITE RECONNAISSANCE 4
4.1 SITE RECONNAISSANCE FINDINGS 4
4.2 NON-ASTM SERVICES 5
5.0 SITE HISTORY 7
5.1 HISTORICAL AERIAL PHOTOGRAPHS 7
5.2 HISTORIC BUILDING PERMITS 8
5.3 HISTORICAL FIRE INSURANCE MAPS 8
5.4 CITY PARCEL PROFILE REPORT 8
5.5 HISTORICAL CITY DIRECTORIES 9
5.6 CLIENT-SUPPLIED ENVIRONMENTAL INFORMATION 9
5.7 HISTORICAL TOPOGRAPHIC MAPS 9
5.8 HISTORIC OIL AND GAS MAPS 10
5.9 INTERVIEWS 10
5.10 ENVIRONMENTAL LIEN 11
5.11 SUMMARY OF SITE HISTORY 11
6.0 REGULATORY AGENCY REVIEW 11
6.1 DATABASE REVIEW 11
6.2 VAPOR ENCROACHMENT CONDITION 14
6.3 REGULATORY AGENCIES 15
7.0 DATA GAPS 16
8.0 FINDINGS 17
9.0 CONCLUSIONS AND RECOMMENDATIONS 18
10.0 LIMITATIONS 19
11.0 REFERENCES 19
12.0 PROFESSIONAL CERTIFICATION 22

APPENDICES:

A Figures
B Photographs
C EDR Aerial Photographs
D EDR Building Permit Report and Select Building Permits
E EDR Sanborn Map Report
F EDR City Directory Abstract
G Client-Supplied Documents
H EDR Historical Topo Map Report
I User Questionnaire
J EDR Environmental Lien and AUL Search
K EDR Radius Map Report
L EDR Vapor Encroachment Screen

EXECUTIVE SUMMARY

Project Summary

Client Name/User:	Sterling Gateway, L.P.	**Property Visit Date:**	August 28, 2017
Client Contact:	Hunt Williams	**Construction Date:**	1936
Phone Number:	(435) 901-3488	**No. Buildings/No. Units:**	One
Email Address:	Huntwilliams2002@yahoo.com	**No. of Stories:**	One
Property Name:	Sterling Ranch Estates	**Bldg. Square Footage:**	1,106 SF
Property Address:	29053 Coolidge Avenue	**Property Acreage:**	262.6 acres
Property City, State, Zip:	Val Verde, California 91384	**Property Use:**	Western Parcel – Residential and undeveloped land; Eastern Parcel – Undeveloped land
Property Identification:	3271-004-012, 3271-004-013, and 3271-005-032	**Property History:**	Western Parcel – Residential and undeveloped land; Eastern Parcel – Undeveloped land
Other Improvements:	Natural vegetated landscaping		

SUMMARY OF FINDINGS

Report Section		No Further Action	REC	HREC	CREC	Non-ASTM Scope	Recommended Action
2.2	Site Description	X					
2.3	Adjacent Properties	X					
5.0	Historical Review			X			Re-abandonment of oil well prior to development
5.6	Previous Reports	X					
6.1	Regulatory Review	X					
6.2	Vapor Encroachment	X					
4.1	USTs/ASTs	X					
4.1	PCBs	X					
4.1	Chemicals/Hazardous Materials/Raw Materials	X					
4.2	ACMs/ACCMs					X	ACM Survey
4.2	Lead-Based Paint					X	Lead-Based Paints Survey
4.2	Lead in Drinking Water	X					
4.2	Radon	X					
4.2	Methane					X	Methane Testing prior to development
4.1	Other	X					

Citadel Environmental Services, Inc. (Citadel) was contracted by Sterling Gateway, L.P. (Client) to perform a Phase I Environmental Site Assessment (Phase I ESA) of the Sterling Ranch Estates, located in Val Verde, a census-designated place within Los Angeles County, California; hereinafter referred to as the "Site."

The Site is generally undeveloped with the exception of a single-family residential structure of approximately 1,106 square feet (SF) at 29053 Coolidge Avenue in the southwest corner of the Western Parcel that is reportedly used as an office and living space for the Site caretaker. The remaining portions of the Western Parcel and the entire Eastern Parcel is undeveloped land comprised of valleys and ridges. Dell Valle Road traverses the southeast portion of the Western Parcel, and Coolidge Avenue traverses the south-southwest portion of the Western Parcel. Huntsock Street traverses the north portion of the Eastern Parcel. Several unimproved roads traverse both the Western and Eastern Parcels of the Site. Access to the Western and Eastern Parcels of the Site is along Del Valle Road and Windsor Road, respectively.

Equipment observed at the Site includes a propane tank, and a leach field and septic tank associated with a wastewater treatment system near the residential structure on the Western Parcel. A large storage container was present near the residential structure; Citadel was not provided with access to the container during the Site reconnaissance. A concrete pad was also observed in the southwest corner of the Western Parcel. No stationary equipment was observed on the Eastern parcel of the Site.

A review of historical sources showed that the Western parcel of the Site was undeveloped from at least 1903. Del Valle Road and Coolidge Avenue that traverse the Western Parcel, and a concrete pad in the southwest portion of the Western Parcel, were developed by 1928. The current residential structure at the Western Parcel was constructed in 1936. City directory listings indicate the structure was used as a residence at least until 2013. The Eastern parcel of the Site has been undeveloped since at least 1903.

Converse Consultants (Converse) performed a Phase I ESA for the Western Parcel of the Site in February 2004. Converse identified a plugged and abandoned dry-hole on the Western Parcel. According to Converse, this well never produced oil or gas and was abandoned in 1923. No other information regarding the well was included in the Converse Phase I ESA. Converse recommended that the plugged and abandoned dry-hole be located and re-abandoned to current Division of Oil, Gas, and Geothermal Resources (DOGGR) requirements. As per the Converse Phase I ESA, the property in the Western Parcel with street address 29053½ Coolidge Avenue was listed on the HAZNET database as a clandestine drug lab. Converse recommended that the residential dwelling and associated structures be accessed and assessed; and asbestos and lead-based paint surveys be conducted prior to demolishing the structures.

The address 29053½ Coolidge Avenue, similar to the address associated with the residential structure on the Western Parcel, was identified on the Clandestine Drug Lab (CDL) database in 1995 as a location where an illegal drug lab was operated or drug lab equipment and/or materials were stored. The address was also identified on the HAZNET database for generating 1.16 tons of laboratory waste chemicals in 1995. The disposal method was listed as transfer station. The waste likely resulted from the identification of the Site as a CDL and the cleanup process. However, it appears that the drug lab may not have taken place at the current residential structure. According to the 1994 Aerial Photograph, several structures appeared developed along Coolidge Avenue, further north of the current residential structure. These structures appeared removed in the 2002 Aerial Photograph. Based on the identified address and its proximity to the current water tank, these structures may have been associated with the drug lab. However, the owner of the Subject Property, Mr. Hunt Williams, stated that this area was once leased to a local resident to keep a number of horses. The location of the CDL could not be discerned and was likely cleaned up to the satisfaction of the regulatory agency.

Citadel reviewed information provided by Environmental Data Resources (EDR) regarding nearby properties to evaluate for potential on-Site vapor encroachment concerns from off-site sources. According to EDR, no historical releases of petroleum products from a leaking underground storage tank (LUST) have occurred within 0.25-mile and upgradient of the Site.

One property was identified as within 0.125-mile and upgradient of the Site on the Historical Gas Station database. This property, located 377 feet east-southeast of the Site, is not likely to have adversely affected the Site. No properties were identified as within 0.125-mile and upgradient of the Site on the Historical Dry Cleaners database.

RECOGNIZED ENVIRONMENTAL CONDITIONS

According to American Society for Testing and Materials (ASTM) Standard of Practice E1527-13, recognized environmental conditions (REC) fall under three specific categories when evaluating a site or properties within the site vicinity. These categories are defined below.

A recognized environmental condition, or REC, means the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions.

A controlled recognized environmental condition, or CREC, is a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).

An historical recognized environmental condition, or HREC, is a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).

According to ASTM E2600-15, the goal of conducting a vapor encroachment screening on a parcel of property is to identify a vapor encroachment condition (VEC), which is the presence or likely presence of chemicals of concern vapors in the subsurface of the target property (TP) caused by the release of vapors from contaminated soil or groundwater or both either on or near the target property as identified by Tier 1 or Tier 2 procedures. The purpose of Tier 1 is to conduct a screen using Phase I ESA-type information to determine if a VEC exists at the target property. If the Tier 1 screen cannot rule out the possibility of a VEC existing at the target property, then a Tier 2 screen can be conducted. Tier 2 applies numeric screening criteria to existing or newly collected soil, soil gas, and/or groundwater testing results to evaluate whether or not a VEC can be ruled out. Tier 2 has two data collective components: non-invasive and invasive.

Based on our review, the former oil well located on the Western of the Site represents a HREC. The plugged and abandoned well should be located and re-abandoned as per current regulatory requirements. A methane survey should be completed as per Los Angeles County requirements if any development is planned within 300 feet of the former oil well.

The Site was identified on the Clandestine Drug Lab (CDL) listing for an illegal drug lab. The Site was also identified on the HAZNET database for waste likely resulted from the identification of the Site as a CDL and the cleanup process. The location of the CDL could not be discerned and was likely cleaned up to the satisfaction of the regulatory agency.

NON-ASTM SCOPE CONSIDERATIONS

The current Site building was constructed prior to bans using asbestos-containing building materials (ACBMs), lead-based paint (LBP), and polychlorinated biphenyls (PCBs) in electrical equipment came into effect in 1989, 1978, and 1978, respectively. No testing is known to have been performed to evaluate for the presence of ACBMs, LBP, or PCBs at the Site.

The California Bureau of Mines and Geology and California Department of Public Health (CADPH) participated in the United States EPA's State Radon Survey, a Federal survey to measure levels of indoor radon in all states. Based on the results of this survey, CADPH predicted that approximately 0.5% of homes in Region 9 would have radon concentrations over the EPA action level of 4.0 picoCuries per liter (pCi/L).

The Federal EPA Radon Zone for Los Angeles County is Zone 2, which indicates an average indoor concentration greater than or equal to 2.0 pCi/L of air and less than or equal to 4.0 pCi/L. In a survey, 23 tests were performed within the 91384 zip code for the presence of radon. Of these, no tests were found to contain radon in excess of 4.0 pCi/L. Site-specific radon values were not available and were not a part of this ASTM Phase I ESA.

A potable well was not observed on-Site and the Site does not lie within a known or potential flood zone or wetlands.

1.0 INTRODUCTION

Citadel Environmental Services, Inc. (Citadel) was contracted by Sterling Gateway, L.P. (Client) to perform a Phase I Environmental Site Assessment (Phase I ESA) of the Sterling Ranch Estates, located in Val Verde, a census-designated place within Los Angeles County, California; hereinafter referred to as the "Site."

1.1 PURPOSE

The purpose of the Phase I ESA was to review past and present land use practices and to evaluate the presence, or likely presence, of any hazardous substances or petroleum products that have been discharged into the property's structure, ground, groundwater, or surface water. This qualitative assessment was accomplished by review of current and readily available information regarding past and current land use for indications of the manufacture, generation, use, storage and/or disposal of hazardous substances at the Site. A Site visit was also conducted to observe existing Site conditions. This report provides the results of the Phase I ESA performed.

1.2 INVOLVED PARTIES

The involved party(s) in this study, to the best of our knowledge, is Sterling Gateway, L.P.

Citadel understands that this Phase I ESA is being requested in conjunction with due diligence activities by Sterling Gateway, L.P. Citadel recognizes that this report is to be used exclusively by Sterling Gateway, L.P. and its successors, lenders, and assigns. It is a report upon which Sterling Gateway, L.P. and its successors, lenders, and assigns, can rely.

This assessment and report were prepared on behalf of and for the exclusive use of Sterling Gateway, L.P., their lenders and assigns (Client) solely for its use and reliance, subject to the terms and conditions agreed upon between Citadel and the Client.

1.3 SCOPE OF SERVICES

This Phase I ESA was conducted in accordance with the American Society for Testing and Materials (ASTM) Standard of Practice E1527-13 and the standards of care and diligence normally practiced by recognized consulting firms in performing services of a similar nature.

The scope of services for this assessment consisted of the following:

- Performed a Site inspection to verify current Site conditions, and check for visible evidence of previously disposed and/or currently present hazardous waste, surface contamination, underground and above ground storage tanks (USTs/ASTs), suspect polychlorinated biphenyls (PCBs), and other potential environmental hazards.

- Conducted a visual survey of the adjacent properties and the immediate vicinity to determine if any nearby sites posed a significant environmental threat to the Site.

- Reviewed currently and readily available documents, including maps, aerial photographs, governmental databases of known hazardous waste sites and underground tanks, other consultant reports (if any), fire insurance maps, and other accessible records.

- Reviewed results from a search of available current land title records for environmental cleanup liens and other activity and use limitations, such as engineering controls and institutional controls.

- Consulted with appropriate governmental agencies having jurisdiction relative to past history of the property, complaints or incidents in the immediate area, and permits that may have been issued.

- Prepared a Phase I report, inclusive of our findings and recommendations, with applicable illustrations and documentation.

The scope of services outlined above is generally considered sufficient to properly assess the Site based on the data search, reasonably ascertainable documents, and Site inspection.

2.0 GENERAL SITE CHARACTERISTICS

2.1 LOCATION

The irregular -shaped Site is located approximately two miles west of the Interstate 5 Freeway, locally referred to as the Golden State Freeway. The Site is comprised of Tentative Tract Map (TTM) Nos. 062000 and 060257. TTM No. 060257 is located directly northwest and southeast of Del Valle Road and will be referred to as the Western Parcel. TTM No. 062000 is located southeast of the Western Parcel and will be referred to as the Eastern Parcel. The Western Parcel is bounded by undeveloped land to the north and east; and single-family residential properties to the south and west. The Eastern Parcel is bounded by undeveloped land to the north; graded land and commercial properties to the east; the Chiquita Canyon sanitary landfill to the south; and residential properties to the west.

According to the U.S. Geological Survey (USGS) Val Verde Quadrangle (7.5 Minute Series), dated 2012, the Site is at an elevation of approximately 1,270 feet above mean sea level (AMSL) and appears to slope to the south. The Site is located at approximate coordinates of 34° 27' 1.87" North Latitude and 118° 39' 26.04" West Longitude.

A Site Location Map identified as Figure 1 is included in Appendix A.

2.2 SITE DESCRIPTION

According to the County of Los Angeles' Assessor's Parcel Maps, the Site is comprised of three parcels. The Western Parcel includes Assessor's Parcel Numbers (APNs) 3271-004-012 and 3271-004-013, and the Eastern Parcel includes APN 3271-005-032. The Site encompasses approximately 262.6 acres of land.

The Site is generally undeveloped with the exception of a single-family residential structure of approximately 1,106 square feet (SF) at 29053 Coolidge Avenue in the southwest corner of the Western Parcel that is reportedly used as an office. The remaining portions of the Western Parcel and the entire Eastern Parcel is undeveloped land comprised of valleys and ridges. Dell Valle Road traverses the southeast portion of the Western Parcel, and Coolidge Avenue traverses the south-southwest portion of the Western Parcel. Huntsock Street traverses the north portion of the Eastern Parcel. Several unimproved roads traverse both the Western and Eastern Parcels of the Site. Access to the Western and Eastern Parcels of the Site is along Del Valle Road and Windsor Road, respectively.

Equipment observed at the Site includes a propane tank, and a leach field and septic tank associated with a wastewater treatment system near the residential structure on the Western Parcel. A large storage container was present near the residential structure; Citadel was not provided with access to the container during the Site reconnaissance. A concrete pad was also observed in the southwest corner of the Western Parcel. No stationary equipment was observed on the Eastern parcel of the Site.

In general, the Site appeared to be well maintained and the observed ground conditions were good.

A Site Plan is included as Figure 2 in Appendix A. Select photographs of the Site and vicinity are included as Appendix B.

2.3 ADJACENT PROPERTIES

The immediately surrounding properties of the Site consist of the following:

Western Parcel

Direction from Site	Address – Tenant/Use
North	Undeveloped land
East	Undeveloped land
South	Residential properties
West	Residential properties

Eastern Parcel

Direction from Site	Address – Tenant/Use
North	Undeveloped land
East	Graded land and commercial properties
South	Chiquito Canyon sanitary landfill
West	Residential properties

2.4 UTILITIES

Electrical service is supplied to the Site by Southern California Edison (SCE). Gas service is provided by AmeriGas Propane. General rubbish (non-hazardous) is removed from the Site on a regular basis by a Waste Management, Inc.

3.0 ENVIRONMENTAL SETTING

3.1 PHYSICAL SITE CHARACTERISTICS

Based upon the National American Datum (NAD) of 1983, the Site is at an elevation of approximately 1,270 feet AMSL.

The Site is identified on the geologic map of the Val Verde quadrangle, California (Dibblee and Ehrenspeck, 1993) as being slightly indurated, light gray, pebble conglomerate, sandstone and claystone of the Saugus formation (Qts). In addition, alluvial gravel, sand, and silt (Qa) are also identified in the Western Parcel.

The United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) National Cooperative Soil Survey identifies the Site soils as Saugus loam and yolo loam, which has moderate infiltration rates with deep and moderately deep, moderately well and well drained soils with moderately coarse textures; and Castaic loam, which has slow infiltration rates and may have soil layers that impede downward movement of water, or soils with moderately fine or fine textures.

USGS Topographic Map	Val Verde Quadrangle
Groundwater Basin	Santa Clara River Valley – Santa Clara River Valley East
Nearest Surface Water to Site	Santa Clara River, approximately 2.15 miles south of Site
Gradient Direction (Source)	South (topographic maps)
Estimated Depth to Groundwater (Source)	Approximately 23 feet below ground surface, approximately 1.3 miles southeast of Site (LADPW Groundwater Well Database)
Nearest Wetland to Site (Source)	Santa Clara River, approximately 2.15 miles south of Site (National Wetlands Inventory)
Nearest 100 or 500-year Flood Zone	Santa Clara River, approximately 2.15 miles south of Site (Federal Emergency Management Agency)

4.0 SITE RECONNAISSANCE

Citadel representative Mr. Mark Drollinger conducted the Phase I ESA reconnaissance on August 28, 2017. Mr. Drollinger was accompanied by Mr. Hunt Williams, Partner, Sterling Gateway, L.P. The Site reconnaissance consisted of an inspection of the Site and a perimeter survey of the surrounding properties. The report was completed by Ms. Roopal Jani. Ms. Shirley Lee served as the Project Manager and reviewed this Phase I ESA. Findings from the Site inspection, research and perimeter survey are presented below.

4.1 SITE RECONNAISSANCE FINDINGS

Yes	No	Observation
X		Aboveground Storage Tanks (ASTs) and Underground Storage Tanks (USTs)
X		Identified Hazardous Materials
	X	Polychlorinated Biphenyls (PCBs) – Electric or Mechanical Equipment Likely to Contain Fluids
	X	Radioactive Man-Made Materials
	X	Pits, Ponds, and Lagoons
X		Septic Tanks and Cesspools
	X	Wells, Cisterns, Sumps, and Drains
	X	Wastewater or Grease Interceptors
	X	Interior Stains or Corrosion
	X	Strong, Pungent, or Noxious Odors
	X	Pools of Liquid
	X	Stained Soil or Pavement

Yes	No	Observation
	X	Stressed Vegetation
	X	Other

The above-identified observed items are further discussed below.

ABOVEGROUND STORAGE TANKS (ASTs) AND UNDERGROUND STORAGE TANKS (USTs)

A 500-gallon water tank was observed along the west boundary of the Western Parcel. No signs of leaks or spills were observed. The water tank is not expected to represent a significant environmental concern.

IDENTIFIED HAZARDOUS MATERIALS

The following hazardous materials were identified at the Site:

Hazardous Material (size/quantity)	Location	Secondary Containment	Staining/Leaks	MSDS
Propane tank (one 500-gallon)	Near residential structure on Western Parcel of Site	No	None identified	No

The hazardous materials observed are not expected to represent a significant environmental concern.

POLYCHLORINATED BIPHENYLS (PCBs)

Typical sources of polychlorinated biphenyls (PCBs) include electrical transformer cooling oils, fluorescent light fixture ballasts and hydraulic oil. In 1976, the U.S. EPA banned the manufacture and sale of PCB-containing transformers. Prior to this date, transformers were frequently filled with a dielectric fluid containing PCB-laden oil. By 1985, the US EPA required that commercial property owners with transformers containing more than 500 parts per million (ppm) PCBs must register the transformer with the local fire department, provide exterior labeling, and remove combustible materials within 16 feet (40 Code of Federal Regulations 761.30: "Fire Rule").

A pole-mounted transformer was observed near the residential structure at 29053 Coolidge Avenue in the southwest portion of the Western Parcel. No significant environmental impacts to the Site are anticipated from the transformer located at the Site.

SEPTIC TANKS AND CESSPOOLS

A septic tank and leach field were observed near the residential structure on the Western Parcel of the Site; no signs of leaks or spills were observed. The septic tank and leach field are not expected to represent a significant environmental concern based on the residential use.

4.2 NON-ASTM SERVICES

ASBESTOS CONTAINING MATERIALS

The EPA issued a final rule under Section 6 of Toxic Substances Control Act (TSCA) banning most asbestos-containing building materials (ACBMs) in 1989. The ban on ACBMs was vacated in 1991 allowing some building materials to continue to contain asbestos. The applicability of the EPA's

National Emission Standards for Hazardous Air Pollutants (NESHAP, 40 CFR Chapter 61, Subpart M) apply to the owner or operator of a facility where an inspection for the presence of asbestos-containing materials (ACM), including Category I (asbestos containing packings, gaskets, resilient floor coverings and asphalt roofing products), and Category II (all remaining types of non-friable asbestos containing material not included in Category I that when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure), non-friable ACM must occur prior to the commencement of demolition or renovation activities.

Based on the construction date for the Site building, asbestos-containing building materials (ACBMs) were likely used in the construction of the residential structure in the Western Parcel of the Site. A survey for ACBMs was not requested or conducted as part of this Phase I ESA.

LEAD-BASED PAINTS

Lead-based paint (LBP) is defined as any paint, varnish, stain, or other applied coating that has greater than or equal to one milligram per square centimeter (mg/cm^2) (5,000 microgram per gram (µg/g) or 5,000 parts per million (ppm)) of lead by federal guidelines; state and local definitions may differ from the federal definitions in amounts ranging from 0.5 mg/cm^2 to 2.0 mg/cm^2. The US Consumer Product Safety Commission (16 Code of Federal Regulations CFR 1303) banned paint containing more than 0.06% lead for residential use in 1978. Buildings built before 1978 are much more likely to have LBP.

Based on the construction date for the Site building, lead-based paints were likely used within the residential structure in the Western Parcel of the Site. A survey for lead containing materials was not requested or conducted as part of this Phase I ESA.

DRINKING WATER

The residential structure on the Western Parcel of the Site is supplied with municipal drinking water by Los Angeles County Waterworks District No. 36. An assessment of lead in drinking water was not requested or conducted as part of this Phase I ESA.

RADON

The California Bureau of Mines and Geology and California Department of Public Health (CADPH) participated in the United States EPA's State Radon Survey, a Federal survey to measure levels of indoor radon in all states. Based on the results of this survey, CADPH predicted that approximately 0.5% of homes in Region 9 would have radon concentrations over the EPA action level of 4.0 picoCuries per liter (pCi/L).

The Federal EPA Radon Zone for Los Angeles County is Zone 2, which indicates an average indoor concentration greater than or equal to 2.0 pCi/L of air and less than or equal to 4.0 pCi/L. In a survey, 23 tests were performed within the 91384 zip code for the presence of radon. Of these, no tests were found to contain radon in excess of 4.0 pCi/L. Site-specific radon values were not available and were not a part of this ASTM Phase I ESA.

METHANE

The Site is located within Val Verde, in unincorporated Los Angeles County. As such, the County of Los Angeles regulates and oversees the management of methane gas generated from landfills

and oil wells.[1] Based on information from prior consultants and Mr. Williams, an abandoned oil well is present on the Site. This former oil well was previously a part of the Halsey Canyon Oil Field and was installed to a depth of approximately 3,600 feet in 1920. From records obtained from the Division of Oil, Gas and Geothermal Resources (DOGGR), this abandoned oil well was identified as Fernando Oil Well Company No. 1. This oil well was abandoned in 1923.

From Title 26 of the California Building Code, no new building permits are approved for structures within 300 feet of an abandoned oil well. There are exceptions, which are addressed in Title 26. The most effective means of limiting any future concerns with methane is to conduct a methane survey. This would only be required if development was to occur. In the oil well's present state, no actions are required.

5.0 SITE HISTORY

The purpose of the records review is to obtain and review reasonably ascertainable/standard sources that will help identify recognized environmental conditions in connection with the property. Reasonably ascertainable records from standard sources is (1) information that is publicly available, (2) information that is obtainable from its source within reasonable time and cost constraints, and (3) information that is practically reviewable.

Reasonable time and cost means that the information will be provided by the source within 20 calendar days of receiving a written, telephone, or in-person request at no more than a nominal cost intended to cover the source's cost of retrieving and duplicating the information. Information that can only be reviewed by a visit to the source is reasonably ascertainable if the visit is permitted by the source within 20 days of request.

To investigate the history of the Site, Citadel reviewed select historic aerial photographs, building permits, city directories, and Sanborn Fire Insurance Maps provided by Environmental Data Resources Inc. (EDR). In addition, Citadel reviewed client-supplied information, and oil and gas maps, and Citadel interviewed selected individuals regarding historic Site use. Citadel's reviews of these reports and interviews are discussed below.

5.1 HISTORICAL AERIAL PHOTOGRAPHS

Historical aerial photographs of the Site and vicinity were obtained from EDR to ascertain historical land uses and to identify any evidence of hazardous material generation or storage. Below are brief descriptions of observations made from the aerial photographs of the Site and vicinity.

Dates(s)	Site Description	Surrounding Area Descriptions
1928	Western Parcel: Del Valle Road and Coolidge Avenue appear developed; the existing concrete pad is observed in the southwest corner Eastern Parcel: Undeveloped land; several unimproved roads appear developed	**North:** Undeveloped land **East:** Undeveloped land **South:** Undeveloped land with a few residential structures and several streets **West:** Undeveloped land with several streets

[1] County of Los Angeles Building Code, Title 26, Landfill Gas Assessment and Management, Los Angeles County Department of Public Works, Landfill Gas Protection Policy, 2008.

Dates(s)	Site Description	Surrounding Area Descriptions
1940	Western Parcel: Relatively unchanged with the exception of the development of the current residential structure in the southwest corner of the Western Parcel; Eastern Parcel: Relatively unchanged	**North:** Area north of Site not visible on this map **East:** Relatively unchanged **South:** Relatively unchanged **West:** Relatively unchanged
1947	Grading activities appear ongoing in the north portion of the Western Parcel and the south portion of the Eastern Parcel	**North:** Relatively unchanged **East:** Relatively unchanged **South:** Relatively unchanged **West:** A few residential structures appear developed
1947, 1952, 1969, 1972, 1978, 1983, 1989	Relatively unchanged	**North:** Relatively unchanged **East:** Relatively unchanged **South:** Relatively unchanged **West:** Relatively unchanged
1994	A few structures appear developed along Coolidge Avenue north of the residential structure at the Western Parcel.	**North:** Relatively unchanged **East:** Relatively unchanged **South:** Relatively unchanged **West:** Additional residential structures appear developed
2002, 2005, 2009, 2010, 2012	Relatively unchanged	**North:** Relatively unchanged **East:** Relatively unchanged **South:** The Chiquito Canyon sanitary landfill appears developed to the south of the Eastern Parcel **West:** Relatively unchanged

Copies of the Aerial Photographs provided by EDR can be found in Appendix C.

5.2 HISTORIC BUILDING PERMITS

EDR provides a listing of building permits for the Site and adjoining properties, if available. In addition, Citadel reviewed building permits with the County of Los Angeles Building Department.

Permits reviewed indicated that the residential structure on the Western Parcel was constructed in 1936. A stop work notice was issued for this property on April 2, 1992, for Los Angeles County plumbing and electrical code violations. A miscellaneous permit for lot line adjustment was issued for the property on January 29, 2013. No other permits were on file for the Site.

A copy of the EDR Building Permit Report is included as Appendix D.

5.3 HISTORICAL FIRE INSURANCE MAPS

Citadel requested that EDR review its collection of Sanborn Fire Insurance Maps for potential coverage of the Site and vicinity. Sanborn Map coverage was not available for the Site.

A copy of the EDR Sanborn Map Report is included as Appendix E.

5.4 CITY PARCEL PROFILE REPORT

A parcel profile report was not available for the Site.

5.5 HISTORICAL CITY DIRECTORIES

City directories were researched by EDR in order to identify previous Site tenants and/or neighboring properties with a potential for hazardous materials generation and/or storage. EDR researched city directory listings from 1971 through 2013 (non-inclusive) and provided their search results to Citadel for review. The following table summarizes information provided by the city directory search.

Dates(s)	Occupant Listed
1975, 1980, 1985, 1992, 1995	Ruth Castle
1999	Hunt Williams
2003	Occupant unknown
2008, 2013	Hunt Williams

A copy of the EDR City Directory Abstract is included as Appendix F.

5.6 CLIENT-SUPPLIED ENVIRONMENTAL INFORMATION

Citadel reviewed the *Phase I Environmental Site Assessment Report for the Sterling Gateway Property, Western Parcel, Approximate 118.4 acres, Val Verde Park, California, Converse Project No. 04-41-125-01,* prepared by Converse Consultants, dated February18, 2004.

> Converse Consultants (Converse) performed a Phase I ESA for the Western Parcel of the Site in February 2004. Converse identified a plugged and abandoned dry-hole on the Western Parcel. According to Converse, this well never produced oil or gas and was abandoned in 1923. No other information regarding the well was included in the Converse Phase I ESA. Converse recommended that the plugged and abandoned dry-hole be located and reabandoned to current Division of Oil, Gas, and Geothermal Resources (DOGGR) requirements. As per the Converse Phase I ESA, the Site building in the Western Parcel with street address 29053½ Coolidge Avenue was listed on the HAZNET database as a clandestine drug lab. The current owner of the Site, Mr. Hunt Williams was not aware that this address was listed as a drug lab operator site and stated that no such activity took place on the Property under his ownership. Converse recommended the residential dwelling and associated structures be accessed and assessed.

A copy of the reviewed report can be found in Appendix G.

5.7 HISTORICAL TOPOGRAPHIC MAPS

Historical topographic maps were provided by EDR in order to identify natural features and changes in development over a long period of time. The topographic maps provide the user with a regional view of changes to the Site and vicinity that other historical databases such as aerial photographs may not provide. Below are brief descriptions of observations made from the topographic maps of the Site and vicinity.

Dates(s)	Site Description	Surrounding Area Descriptions
1903	Undeveloped, with an unimproved street in the Western Parcel	**North:** Undeveloped with an unimproved road in the current configuration of Hasley Canyon Road further north **East:** Undeveloped **South:** Undeveloped **West:** Undeveloped with an unimproved street in the current configuration of Chiquito Canyon Road further west
1931	An unimproved road appears developed in the current configuration of Del Valle Road in the Western Parcel	**North:** Relatively unchanged **East:** Relatively unchanged **South:** Relatively unchanged **West:** Several streets appear developed; San Martinez Road appears developed further west
1940	Coolidge Avenue appears as an unimproved street in the Western Parcel	**North:** Relatively unchanged **East:** Relatively unchanged **South:** Relatively unchanged **West:** Several streets appear developed; San Martinez Road appears renamed as San Martinez Chiquito Road
1941, 1943, 1947,	The current residential structure and Del Valle Road in its current configuration appear developed in the Western Parcel	**North:** Hasley Canyon Road appears developed in its current configuration **East:** Relatively unchanged **South:** Relatively unchanged **West:** Chiquito Canyon Road appears developed in its current configuration; a few residential structures appear developed
1952, 1969, 1974, 1988, 1991, 1995	Relatively unchanged	**North:** Relatively unchanged **East:** Relatively unchanged **South:** Relatively unchanged **West:** Additional residential structures appear developed
2012	Structures not depicted	Structures not depicted

Copies of the historical topographic maps provided by EDR are included as Appendix H.

5.8 HISTORIC OIL AND GAS MAPS

Citadel reviewed information available on-line through the California Department of Conservation's website. DOGGR's Online Mapping System (DOMS) shows that there is an oil well in the northwest portion of the Western Parcel of the Site. The oil well is identified by American Petroleum Institute (API) number 03705395. According to DOMS, the well operator for the well is listed as Fernando Oil Company and the status for the well is plugged. The well was drilled to a depth of 3,744 feet in July 1920 and was abandoned in April 1923. An additional oil well, identified by API 03706091, is present in the southwest portion of the Eastern Parcel of the Site. According to DOMS, the well operator for the well is listed as Chevron USA Inc., and the status for the well is plugged and abandoned. The well was drilled to a depth of 8,411 feet between August 1947 and January 1948, and was abandoned in February 1948. According to the Client, no redevelopment is planned in the vicinity of the former oil well in the Eastern Parcel of the Site.

5.9 INTERVIEWS

Citadel interviewed Mr. Hunt Williams during the Site reconnaissance. Mr. Williams was not aware of any historic or current environmental concerns or hazards at the Site. Citadel also submitted a User Questionnaire to Sterling Gateway, L.P. The completed User Questionnaire can be found in Appendix I.

5.10 ENVIRONMENTAL LIEN

Citadel contracted with EDR to perform an Environmental Lien Search for the Site. The Environmental Lien Search report reviewed did not identify any current environmental liens or other activity and use limitations (AUL) for the Site. The following grant deeds were included in the EDR report:

- The deeds for APNs 3271-004-012 and 3271-004-013, dated July 24, 2013, granted the title from Sterling Gateway, L.P. to Sterling Gateway, L.P. There was no change in ownership of the Site, as the deeds were recorded as part of an APN change,
- The deed for APN 3271-005-032, dated April 29, 2014, granted the title from Sterling Gateway L.P. to Catellus Valencia LLC.

A copy of the environmental lien and AUL search can be found in Appendix J.

5.11 SUMMARY OF SITE HISTORY

A review of historical sources showed that the Western parcel of the Site was undeveloped from at least 1903. Del Valle Road and Coolidge Avenue that traverse the Western Parcel, and a concrete pad in the southwest portion of the Western Parcel, were developed by 1928. The current residential structure at the Western Parcel was constructed in 1936. City directory listings indicate the structure was used as a residence at least until 2013. The Eastern parcel of the Site has been undeveloped since at least 1903.

Converse performed a Phase I ESA for the Western Parcel of the Site in February 2004. Converse identified a plugged and abandoned dry-hole on the Western Parcel. According to Converse, this well never produced oil or gas and was abandoned in 1923. No other information regarding the well was included in the Converse Phase I ESA. Converse recommended that the plugged and abandoned dry-hole be located and re-abandoned to current DOGGR requirements. As per the Converse Phase I ESA, the property in the Western Parcel with street address 29053½ Coolidge Avenue was listed on the HAZNET database as a clandestine drug lab. Converse recommended that the residential dwelling and associated structures be accessed and assessed; and asbestos and lead-based paint surveys be conducted prior to demolishing the structures.

6.0 REGULATORY AGENCY REVIEW

6.1 DATABASE REVIEW

As part of the Phase I ESA, Citadel utilized EDR of Milford, Connecticut, as an information source for regulatory agency database records.

The following summary of the database information is divided into five columns. The first column identifies the environmental database researched; the second column indicates the distance from the Site that was used for the research; the third column indicates if the Site was identified in

the specified database; the fourth column lists the number of listings identified on the database within the specified distance of the Site; and the fifth column indicates if the sites identified are potential environmental concerns to the Site.

Although locations of the orphan sites are frequently unknown, Citadel attempts to evaluate the potential adverse environmental impact that these facilities may have on the Site. This evaluation consists of reviewing street names in an effort to learn whether the street on which the Site is located lies within the search distance of the subject property, a drive-by view of surrounding properties during the Site visit, and evaluating the Site type and information provided by government agencies. The orphan sites included in the following table are those Citadel identified as potentially located within the identified search distance.

Database	Radius	Site Identified	No. of Listings Identified	Potential Environmental Concern to the Site
National Priorities List	1 mile	No	0	
RCRA Corrective Action Treatment/Storage/Disposal (TSD) Facilities (CORRACTS)	1 mile	No	0	
Delisted National Priorities List	1 mile	No	0	
CERCLIS Sites	½ mile	No	0	
CERCLIS No Further Remedial Action Planned (NFRAP) Sites	½ mile	No	0	
RCRA Non-Corrective Action TSD Facilities	½ mile	No	0	
State/Tribal Voluntary Cleanup Sites	½ mile	No	0	
State/Tribal Leaking Registered Storage Tank Sites	½ mile	No	1	No
State/Tribal Brownfield Sites/CERCLIS Equivalent	1 mile	No	3	No
Historic CORTESE List	½ mile	No	0	
State/Tribal Solid Waste Landfill Sites/Facilities	½ mile	No	0	
Federal/State/Tribal Engineering Controls Registries	½ mile	No	0	
Federal/State/Tribal Institutional Controls Registries	½ mile	No	0	
RCRA Large Quantity Generators	¼ mile	No	1	No
RCRA Small Quantity Generators	¼ mile	No	0	
RCRA Non Generators	¼ mile	No	0	
State/Tribal Registered Storage Tank Sites	¼ mile	No	1	No
HIST UST	¼ mile	No	0	
CA FID UST	¼ mile	No	0	
SWEEPS UST	¼ mile	No	0	
Facility Index System (FINDS)	Site	No	0	

Database	Radius	Site Identified	No. of Listings Identified	Potential Environmental Concern to the Site
HAZNET	Site	Yes	1	No, see discussion below
Clandestine Drug Laboratory	Site	Yes	1	No, see discussion below
Orphan	N/A	No	1	No

A brief discussion of select facilities and their database listings are included following the table. The full report provided by EDR and reviewed by Citadel can be found in Appendix K.

Site Name	Clandestine Drug Lab Operator Unknown
Database(s)	HAZNET, CDL
Address	29053½ Coolidge Avenue
Distance/Direction	Target Property
Comments	The address 29053½ Coolidge Avenue, similar to the address associated with the residential structure on the Western Parcel, was identified on the Clandestine Drug Lab (CDL) database in 1995 as a location where an illegal drug lab was operated or drug lab equipment and/or materials were stored. The address was also identified on the HAZNET database for generating 1.16 tons of laboratory waste chemicals in 1995. The disposal method was listed as transfer station. The waste likely resulted from the identification of the Site as a CDL and the cleanup process. However, it appears that the drug lab may not have taken place at the current residential structure. According to the 1994 Aerial Photograph, several structures appeared developed along Coolidge Avenue, further north of the current residential structure. These structures appeared removed in the 2002 Aerial Photograph. Based on the identified address and its proximity to the current water tank, these structures may have been associated with the drug lab. However, the owner of the Subject Property, Mr. Hunt Williams, stated that this area was once leased to a local resident to keep a number of horses. The location of the CDL could not be discerned and was likely cleaned up to the satisfaction of the regulatory agency.

Site Name	Unocal – Del Valle
Database(s)	SLIC
Address	Del Valle Road
Distance/Direction	312 feet east-northeast of the Site
Comments	Unocal – Del Valle was identified on the SLIC database as a Cleanup Program Site as of 1965; no information was available regarding potential media affected of or contaminants of concern associated with the facility. Based on the historical nature of this listing and crossgradient location from the Site, this facility is not considered to represent a significant environmental concern.

Site Name	DD Diesel
Database(s)	UST
Address	28915 Avenue Penn
Distance/Direction	377 feet east-southeast

Comments	DD Diesel was identified on the Los Angeles County Fire Department UST database; no other information about this listing was included in the EDR report. As per documents available through the Los Angeles County Department of Public Works (LADPW) online file review, a 15,000-gallon diesel UST was installed at the Site in January 2002. While an inspection report dated November 21, 2016, indicated that the facility was in violation for failing to conduct secondary containment testing every 36 months, the violation was addressed satisfactorily. Based on a lack of reported spill or leaks, this facility is not expected to represent a significant environmental concern.

Maps showing the location of these facilities and additional information are provided in the Government Records Report in Appendix K.

6.2 VAPOR ENCROACHMENT CONDITION

According to ASTM E2600-15, the goal of conducting a vapor encroachment screening on a parcel of property is to identify a vapor encroachment condition (VEC), which is the presence or likely presence of chemicals of concern vapors in the subsurface of the target property (TP) caused by the release of vapors from contaminated soil or groundwater or both either on or near the target property as identified by Tier 1 or Tier 2 procedures. The purpose of Tier 1 is to conduct a screen using Phase I ESA-type information to determine if a VEC exists at the target property. If the Tier 1 screen cannot rule out the possibility of a VEC existing at the target property, then a Tier 2 screen can be conducted. Tier 2 applies numeric screening criteria to existing or newly collected soil, soil gas, and/or groundwater testing results to evaluate whether or not a VEC can be ruled out. Tier 2 has two data collective components: non-invasive and invasive.

Tier 1 screening begins with the default area of concern (AOC) defined by the approximate minimum search distances adjusted as appropriate for local conditions, and then determining if known or suspected contaminated properties with contaminants of concern (COCs) exist within the established AOC. The default AOC is one third of a mile around the TP for COCs and one-tenth of a mile for petroleum hydrocarbon COCs. The AOC is measured from the TP boundary to a contaminated property with known or suspected COC contamination of soil or groundwater or both. The default AOC may be expanded or reduced by the environmental professional (adjusted AOC) using experience and professional judgment, based on factors like groundwater flow direction, subsurface characteristics, surficial features and man-made features.

If groundwater flow direction is known or can be inferred from the Phase I ESA investigation of the TP, the default AOC in the down-gradient direction may be reduced to the area within the critical distance of 100 feet. The AOC in the cross-gradient direction may also be reduced, depending upon the critical distance and the width of the COC-contaminated plume associated with a known or likely COC-contaminated property located in a cross-gradient direction from the TP. The critical distance is the lineal distance in any direction between the nearest edge of the contaminated plume and the nearest TP boundary, and is equal to 100 feet for COCs or 30 feet for dissolved petroleum hydrocarbon COCs.

For a COC-contaminated property identified in Tier 1 located down-gradient from the TP, it is not necessary to have information on migrating groundwater contaminated plume dimensions as the critical distance is measured from the nearest TP boundary to the source of contamination at the off-site down-gradient property. In this case, the AOC may be reduced to the area within the critical distance.

For a contaminated property identified in Tier 1 located crossgradient from the TP, the AOC will be the area within the critical distance plus one half of a reasonable estimation of the contaminated plume width (at the point nearest the closest TP boundary) that might be associated with the nearby known or suspected COC-contaminated property (that is, the COC-contaminated property where the groundwater contamination originated). The environmental professional's judgment and experience can be used to estimate the width of the COC-contaminated plume that might be associated with the nearby known or suspected COC-contaminated property. If it is not possible to estimate the contaminated plume width, then the AOC cannot be reduced in the cross-gradient direction.

Citadel reviewed information provided by EDR regarding nearby properties to evaluate for potential on-Site vapor encroachment concerns from off-site sources. According to EDR, no historical releases of petroleum products from a leaking underground storage tank (LUST) have occurred within 0.25-mile and upgradient of the Site.

EDR also provided the following listings on the Historical Gas Station database as within 0.125-mile of the Site.

Historical Gas Stations	
Site Name	B & M Truck Repair
Address	28915 Avenue Penn
Distance/Direction	377 feet east-southeast of the Site
Comments	The property was occupied as an automobile repair shop by B & M Truck Repair from 2004 to 2008. As per documents available through the LADPW online file review, a 15,000-gallon diesel UST was installed at the Site in January 2002. While an inspection report dated November 21, 2016, indicated that the facility was in violation for failing to conduct secondary containment testing every 36 months, the violation was addressed satisfactorily. Based on a lack of reported spill or leaks, and crossgradient location from the Site, this listing is not likely to have adversely affected the Site.

EDR did not identify any listings on the Dry Cleaners database as within 0.125-mile of the Site.

A copy of the vapor encroachment screen provided by EDR is included as Appendix L.

6.3 REGULATORY AGENCIES

Local and state agencies, such as environmental health departments, fire prevention bureaus, and building and planning departments are contacted to identify any current or previous reports of hazardous materials use, storage, and/or unauthorized releases that may have impacted the Site.

BUILDING DEPARTMENT

Citadel reviewed permit documents with the County of Los Angeles Department of Public Works for information regarding the Site in order to identify historical tenants and property use. Please see Section 5.2 for further discussion.

FIRE DEPARTMENT

Citadel contacted the County of Los Angeles Fire Department for information regarding the Site in order to identify historical tenants and property use. The agency has not yet responded at the time of this report. However, this limitation is not expected to significantly alter the findings of this assessment.

HEALTH DEPARTMENT

Citadel contacted the Los Angeles County Public Health for information regarding the Site in order to identify historical tenants and property use. The agency has not yet responded at the time of this report. However, this limitation is not expected to significantly alter the findings of this assessment.

AIR QUALITY MANAGEMENT DISTRICT

Citadel reviewed information available on-line through the South Coast Air Quality Management District's Facility Information Detail (FIND) database. The Site was not identified on the FIND database.

REGIONAL WATER QUALITY CONTROL BOARD

The GeoTracker Database is the California State Water Resources Control Board's (SWRCB) Internet-accessible database system used by the SWRCB, regional boards, and local agencies to track and archive compliance data from authorized or unauthorized discharges of waste to land, or unauthorized releases of hazardous substances from underground storage tanks. According to Geotracker, the Del Valle Oil Field located approximately 1.16 miles southwest of the south boundary of the Eastern Parcel of the Site in Valencia, California, is listed as a LUST Cleanup Site. According to information provided by Geotracker, a gasoline leak was discovered in May 1985. The case was completed and closed by the Los Angeles Regional Water Quality Control Board (LARWQCB) on August 17, 1999.

The Chiquita Canyon Sanitary Landfill is located immediately south of the Eastern Parcel. As per a 2014 Master Plan Revision for the landfill, environmental monitoring at the landfill includes groundwater sampling on a quarterly basis and analysis for constituents of concern (COCs) every five years. The closest monitoring wells to the Site are DW-28 (existing) and DW-33 and DW-34 (proposed), located in the north portion of the landfill. Due to its downgradient location from the Site, this facility is not expected to represent a significant environmental concern.

7.0 DATA GAPS

A data gap is a lack of or inability to obtain information despite good faith efforts to gather such information. A data failure is a failure to achieve the historical research objectives even after reviewing the standard historical sources that are reasonably ascertainable and likely to be useful.

The following data gaps have been identified during the course of this investigation:

- Additional governmental agencies that are not included in the Government Records report may maintain information regarding environmental conditions at the Site and nearby facilities. Requests have been sent to the County of Los Angeles Fire Department and Public Health. At the time of this report, these agencies have not yet responded.

With regard to these data gaps, Citadel believes that the most significant potential sources for on-site contamination have been identified during the current investigation.

8.0 FINDINGS

Citadel Environmental Services, Inc. (Citadel) was contracted by Sterling Gateway, L.P. (Client) to perform a Phase I Environmental Site Assessment (Phase I ESA) of the Sterling Ranch Estates, located in Val Verde, a census-designated place within Los Angeles County, California; hereinafter referred to as the "Site."

The Site is generally undeveloped with the exception of a single-family residential structure of approximately 1,106 square feet (SF) at 29053 Coolidge Avenue in the southwest corner of the Western Parcel that is reportedly used as an office. The remaining portions of the Western Parcel and the entire Eastern Parcel is undeveloped land comprised of valleys and ridges. Dell Valle Road traverses the southeast portion of the Western Parcel, and Coolidge Avenue traverses the south-southwest portion of the Western Parcel. Huntsock Street traverses the north portion of the Eastern Parcel. Several unimproved roads traverse both the Western and Eastern Parcels of the Site. Access to the Western and Eastern Parcels of the Site is along Del Valle Road and Windsor Road, respectively.

Equipment observed at the Site include a propane tank, and a leach field and septic tank associated with a wastewater treatment system near the residential structure on the Western Parcel. A large storage container was present near the residential structure; Citadel was not provided with access to the container during the Site reconnaissance. A concrete pad was also observed in the southwest corner of the Western Parcel. No stationary equipment was observed on the Eastern parcel of the Site.

A review of historical sources showed that the Western parcel of the Site was undeveloped from at least 1903. Del Valle Road and Coolidge Avenue that traverse the Western Parcel, and a concrete pad in the southwest portion of the Western Parcel, were developed by 1928. The current residential structure at the Western Parcel was constructed in 1936. City directory listings indicate the structure was used as a residence at least until 2013. The Eastern parcel of the Site has been undeveloped since at least 1903.

Converse Consultants (Converse) performed a Phase I ESA for the Western Parcel of the Site in February 2004. Converse identified a plugged and abandoned dry-hole on the Western Parcel. According to Converse, this well never produced oil or gas and was abandoned in 1923. No other information regarding the well was included in the Converse Phase I ESA. Converse recommended that the plugged and abandoned dry-hole be located and reabandoned to current Division of Oil, Gas, and Geothermal Resources (DOGGR) requirements. As per the Converse Phase I ESA, the property in the Western Parcel with street address 29053½ Coolidge Avenue was listed on the HAZNET database as a clandestine drug lab. Converse recommended that the residential dwelling and associated structures be accessed and assessed; and asbestos and lead-based paint surveys be conducted prior to demolishing the structures.

The address 29053½ Coolidge Avenue, similar to the address associated with the residential structure on the Western Parcel, was identified on the Clandestine Drug Lab (CDL) database in 1995 as a location where an illegal drug lab was operated or drug lab equipment and/or materials were stored. The address was also identified on the HAZNET database for generating 1.16 tons of laboratory waste chemicals in 1995. The disposal method was listed as transfer station. The waste likely resulted from the identification of the Site as a CDL and the cleanup process. However, it

appears that the drug lab may not have taken place at the current residential structure. According to the 1994 Aerial Photograph, several structures appeared developed along Coolidge Avenue, further north of the current residential structure. These structures appeared removed in the 2002 Aerial Photograph. Based on the identified address and its proximity to the current water tank, these structures were likely associated with the drug lab. However, the owner of the Subject Property, Mr. Hunt Williams, stated that this area was once leased to a local resident to keep a number of horses. The location of the CDL could not be discerned and was likely cleaned up to the satisfaction of the regulatory agency.

Citadel reviewed information provided by Environmental Data Resources (EDR) regarding nearby properties to evaluate for potential on-Site vapor encroachment concerns from off-site sources. According to EDR, no historical releases of petroleum products from a leaking underground storage tank (LUST) have occurred within 0.25-mile and upgradient of the Site.

One property was identified as within 0.125-mile and upgradient of the Site on the Historical Gas Station database. This property, located 377 feet east-southeast of the Site, is not likely to have adversely affected the Site. No properties were identified as within 0.125-mile and upgradient of the Site on the Historical Dry Cleaners database.

9.0 CONCLUSIONS AND RECOMMENDATIONS

According to ASTM Standard of Practice E1527-13, recognized environmental conditions (REC) fall under three specific categories when evaluating a site or properties within the site vicinity. These categories are defined below.

A recognized environmental condition, or REC, means the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions.

A controlled recognized environmental condition, or CREC, is a recognized environmental condition resulting from a past release of hazardous substances or petroleum products that has been addressed to the satisfaction of the applicable regulatory authority (for example, as evidenced by the issuance of a no further action letter or equivalent, or meeting risk-based criteria established by regulatory authority), with hazardous substances or petroleum products allowed to remain in place subject to the implementation of required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).

An historical recognized environmental condition, or HREC, is a past release of any hazardous substances or petroleum products that has occurred in connection with the property and has been addressed to the satisfaction of the applicable regulatory authority or meeting unrestricted use criteria established by a regulatory authority, without subjecting the property to any required controls (for example, property use restrictions, activity and use limitations, institutional controls, or engineering controls).

According to ASTM E2600-10, the goal of conducting a vapor encroachment screening on a parcel of property is to identify a vapor encroachment condition (VEC), which is the presence or likely presence of chemicals of concern vapors in the subsurface of the target property caused by the release of vapors from contaminated soil or groundwater or both either on or near the target property as identified by Tier 1 or Tier 2 procedures. The purpose of Tier 1 is to conduct a

screen using Phase I ESA-type information to determine if a VEC exists at the target property. If the Tier 1 screen cannot rule out the possibility of a VEC existing at the target property, then a Tier 2 screen can be conducted. Tier 2 applies numeric screening criteria to existing or newly collected soil, soil gas, and/or groundwater testing results to evaluate whether or not a VEC can be rules out. Tier 2 has two data collective components: non-invasive and invasive.

Based on our review, the former oil well located on the Western of the Site represents a HREC. The plugged and abandoned wells should be located and re-abandoned per current regulatory requirements. A methane survey should be completed as per Los Angeles County requirements if any development is planned within 300 feet of the former oil well.

The Site was identified on the Clandestine Drug Lab (CDL) listing for an illegal drug lab. The Site was also identified on the HAZNET database for waste likely resulted from the identification of the Site as a CDL and the cleanup process. The location of the CDL could not be discerned and was likely cleaned up to the satisfaction of the regulatory agency.

The current Site building was constructed prior to bans using ACBMs, LBP, and PCBs in electrical equipment came into effect in 1989, 1978, and 1978, respectively. No testing is known to have been performed to evaluate for the presence of ACBMs, LBP, or PCBs at the Site.

Prior to renovation or demolition of building components, particularly roofing materials, Citadel recommends that the Client perform a survey for ACBMs and LBP prior to renovation or demolition activities. Such surveys should be performed to identify if ACBMs or LBP are present and to ensure proper handling and disposal and to allow for measures to protect both worker and building occupant safety during routine building maintenance, renovation or demolition.

10.0 LIMITATIONS

The information and opinions rendered in this report are exclusively for use by the Client. Citadel Environmental Services, Inc. will not distribute this report without the Client's written consent, except as may be required by law or court order. The recommendations expressed in this report took into consideration the purpose and scope of this limited assignment. We accept responsibility for the competent performance of our duties in executing the assignment and preparing this report in accordance with the normal standards of our profession, but disclaim any responsibility for consequential damages resulting from inaccuracies in information provided by the Client, federal, state, county, or local regulatory agencies.

11.0 REFERENCES

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12.0 PROFESSIONAL CERTIFICATION

Citadel has completed a Phase I ESA of the Sterling Ranch Estates located at 29053 Coolidge Avenue, in Val Verde, Los Angeles County, California. The Phase I ESA was performed at the Clients request in accordance with the American Society for Testing and Materials (ASTM) Standard of Practice E1527-2013 and the standards of care and diligence normally practiced by recognized consulting firms in performing services of a similar nature.

The independent conclusions represent our professional judgment based on information and data available to Citadel during the course of this project. Information regarding historical and present operations, conditions and test data provided by the Client or their representative, is assumed to be correct and complete. The conclusions presented by this Phase I ESA are based on information provided to Citadel and from observations and perceived conditions existing on the date of the site reconnaissance.

In expressing the opinions stated in this report, Citadel has exercised the degree of skill and care ordinarily exercised by a reasonable prudent environmental professional. Documentation provided by the Client, Client-designated representatives, interested third-parties, or from the public domain, and referenced in preparation of the Phase I ESA report, have been assimilated with the understanding that Citadel assumes no responsibility or liability for their accuracy.

Report Prepared by:

Roopal Jani
Staff Geologist

Report Reviewed By:

Shirley Lee
Senior Environmental Specialist

I declare that to the best of my professional knowledge and belief, I meet the definition of Environmental Professional as defined by the final All Appropriate Inquiry (AAI) Rule published in 40 CFR Part 312.10 (November 1, 2013). I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting described in this Phase I ESA. I have developed and performed the AAI in conformance with the standard and care of this Rule.

Mark Drollinger, M. Eng., CSP, CHMM, EiT
Director, Engineering and Environmental Sciences

Citadel Employee Since:
2015

Entered the Industry:
2010

Education
University of Wyoming
Laramie, Wyoming
Master of Science
Geology
2010

University of Pune
Pune, India
Bachelor & Master of Science
Geology
2004, 2006

Professional Certifications & Affiliations
OSHA 40 Hour HAZWOPER
NSC's First Aid/Adult CPR/ARD

Roopal Jani

Staff Geologist, Environmental Geology and Engineering

EXPERIENCE

Ms. Jani's experience is in the fields of environmental remediation, geology, and geochemistry. She has previously worked at the Pacific Northwest National Laboratory (PNNL), as a Research Associate, and at Louis Berger NY, as a Junior Hydrogeologist. At PNNL, Ms. Jani was involved in the development of reactive gas-based remediation methods for contaminated soils at the Hanford Site in Washington. While at Louis Berger, Ms. Jani was involved in groundwater remediation and monitoring projects for Superfund sites in New York (Newtown Creek) and New Jersey (Cornell-Dubilier Electronics). Ms. Jani has experience working with geochemical analysis techniques like Inductively Coupled Plasma Mass Spectrometry (ICP-MS), and X-Ray Diffraction (XRD), sampling techniques for groundwater, soil and soil vapor, designing laboratory scale experiments, and preparing technical documents and proposals. Ms. Jani's graduate thesis research focused on the electrochemical and biochemical characterization of the microbial species Shewanella oneidensis, with applications in bioremediation and fundamental evolutionary geology.

ROLE

As Staff Geologist, Ms. Jani's primary responsibility is to assist Senior Operations in the direction, organization, control, and completion of Environmental Geology and Engineering-related projects awarded to Citadel. Her unique experience and skills will significantly enhance the capabilities of the Environmental Geology and Engineering group at Citadel.

EDUCATION

Ms. Jani holds a Master of Science degree in Geology from the University of Wyoming, as well as Bachelor and Master of Science degrees in Geology from the University of Pune (India). Her professional certifications include OSHA's 40 Hour HAZWOPER and NSC's First Aid/Adult CPR/AED.

Citadel Employee Since:
2007

Entered the Industry:
2007

Education
University of California, Irvine
Irvine, California
Bachelor of Arts, Environmental Analysis and Design, 2006

Professional Certifications & Affiliations

40-hour HAZWOPER General Site Worker

EMS Safety CRP and First Aid

EPA / AHERA Accredited Asbestos Contractor Supervisor / Building Inspector

University of California, Irvine, Environmental Management Certifcation

Shirley Lee

Environmental Specialist, Environmental Geology and Engineering

EXPERIENCE

Ms. Lee has **ten years** of experience as an Environmental Specialist. Her responsibilities includes performing Phase I and Phase II Environmental Site Assessments, NPDES monitoring and permitting, groundwater monitoring, indoor air quality inspections, hazardous materials inventory, and preparation of health and safety plans and hazardous materials business and contingency plans.

ROLE

As an Environmental Specialist, Ms. Lee provides on-site organization, direction, control, and coordination necessary for the successful implementation, execution, and completion of environmental geology and environmental compliance-related projects awarded to Citadel. She also assists the Director of Environmental Geology and Engineering in the completion of all assigned projects so that the client is satisfied with the finished work product and the working relationship. Her assignments include a combination of field-based activities in a number of varying environments and office-based activities.

EDUCATION

Ms. Lee holds a Bachelor of Arts in Environmental Analysis and Design from the University of California, Irvine; with a minor in Urban and Regional Planning. Ms. Lee also holds a 40-hour HAZWOPER General Site Worker Certification. She has recently received her Environmental Management Certification from the University of California, Irvine.

Citadel Employee Since:
2011

Entered the Industry:
1985

Education
University of Alabama
Tuscaloosa, Alabama
Bachelor of Science,
Applied and Natural Sciences
1995

University of Alabama
Birmingham, Alabama
Masters Degree,
Advanced Safety Engineering and Management
2013

Professional Certifications & Affiliations

Certified Asbestos Consultant (CAC) No. 08-4459

Certified Environmental Manager, Nevada EM-1573

Certified Hazardous Material Manager, No. 14793

Certified Microbial Consultant, No. 0612024

Certified Professional in Erosion and Sediment Control No. 6349

Certified Safety Professional No. 21635

California Department of Public Health (CDPH), Lead Related Construction No. 19805

Engineer-In-Training, No. XEO93314

OSHA 8-Hour Supervisor Hazardous Waste Operations (HAZWOPER)

OSHA 30-Hour Safety for Construction

OSHA 40-Hour Hazardous Waste Operations (HAZWOPER)

Qualified Storm Water Developer, No. 682

Radon Measurement Specialist, No. 11SS027

USACE/NavFac Construction Quality Management for Contractors

Mark Drollinger, MEng, CSP, CHMM, EiT

Director, Engineering and Environmental Sciences

EXPERIENCE

With over **30 years** of experience in environmental engineering, compliance, permitting and management projects, Mr. Drollinger has a strong working knowledge of EPA, DTSC, AQMD/APCD, OSHA and DOT regulations; and with local agencies, fire departments and public works. Mr. Drollinger has provided environmental engineering, assessment and compliance, safety management, and engineering construction management services on numerous projects for the US Navy, Veterans Administration, US Department of Agriculture, Cal Trans, EPA and numerous private projects throughout the western United States. In addition, Mr. Drollinger has developed and implemented programs to train managers and staff in storm water and NPDES compliance, soil and groundwater sample collection and data interpretation, Hazcomm, IIPP, and safe-work practices such as identifying and handling hazardous materials, fall protection, confined space, traffic control, LO/TO and ergonomics; and has conducted environmental and permitting audits of facilities including health and safety assessments.

ROLE

As Director of Environmental Geology & Engineering, Mr. Drollinger's primary responsibility includes developing and implementing health and safety protocols; safety training of management, staff and subcontractor personnel; establishing and managing budgets and personnel; negotiating with local, regional, state, and federal agencies; litigation support; and coordinating tasks with multi-discipline project teams.

Mr. Drollinger works closely with, and often develops protocols for conducting assessments related to Environmentally Regulated Materials Management (ERM), Industrial Hygiene (IH), and Occupational Safety and Training (OST) departments.

EDUCATION

Mr. Drollinger has a B.S. in Applied and Natural Sciences from the University of Alabama, and a M.Eng. in Advanced Safety Engineering and Management, University of Alabama, Birmingham.

Mr. Drollinger is also a certifying board member of the American Council of Accredited Certifications (formerly known as the American Indoor Air Quality Council), and is a member of the American Society of Safety Engineers, Board of Certified Safety Professionals, Institute of Hazardous Materials Management, Institute of Industrial Engineers and International Facilities Management Association.

CITADEL
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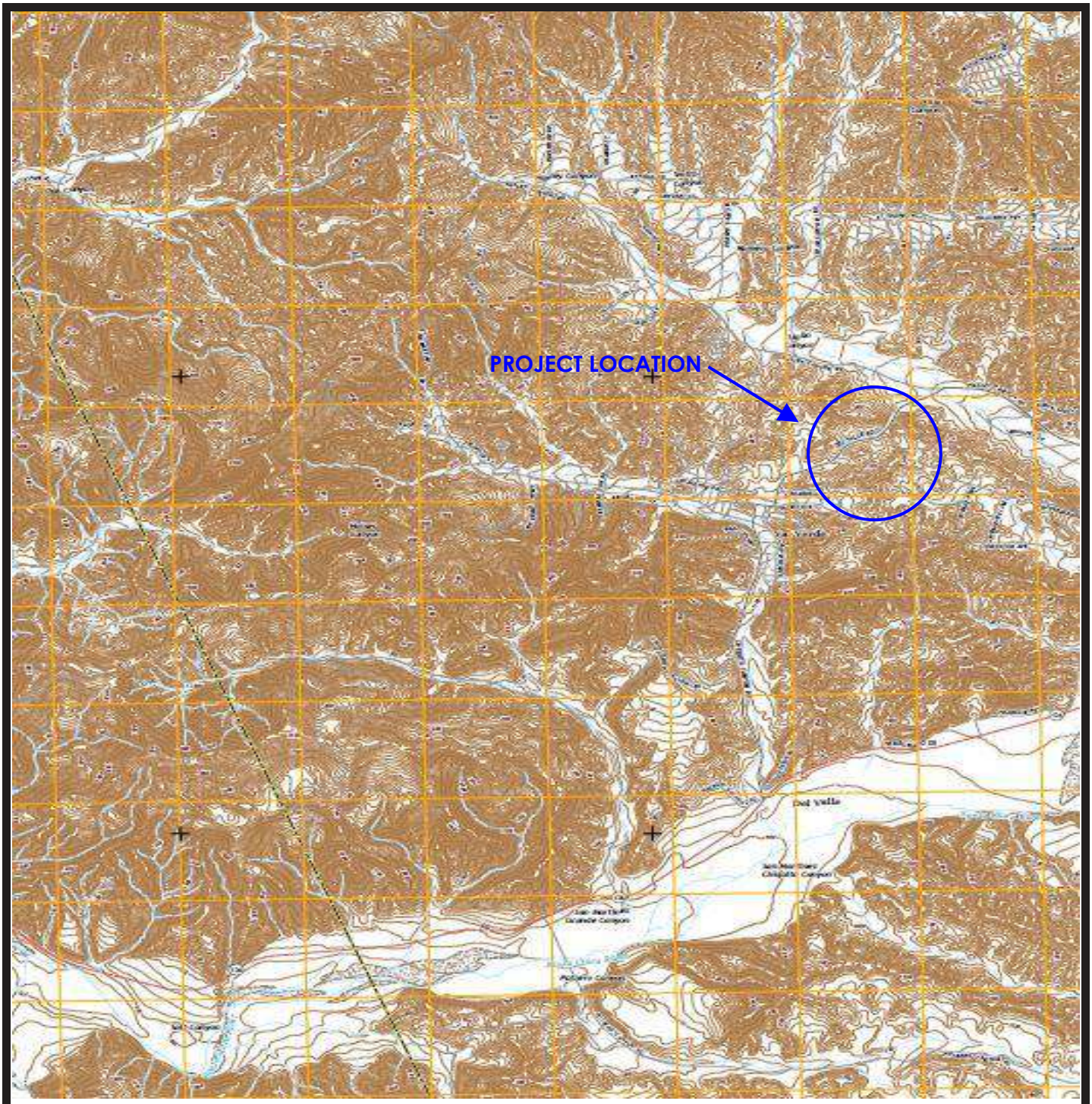
Appendix A
Figures



N

Not to Scale

Source: USGS, Val Verde Quadrangle, 2015, 7.5 Minute Series

CITADEL
ENVIRONMENTAL SERVICES, INC.

STERLING GATEWAY, L.P.

Sterling Ranch Estates
Val Verde, California

Figure 1

PROJECT NO.: 1158.1001.0

DATE: AUGUST 2017

Location Map

N

Not to Scale

Source: Google Earth

CITADEL ENVIRONMENTAL SERVICES, INC.

STERLING GATEWAY, L.P.

Sterling Ranch Estates
Val Verde, California

Figure 2

PROJECT NO.: 1158.1001.0

DATE: AUGUST 2017

Site Map

CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix B
Photographs

PHOTO LOG

PHOTO 1: Partial view of the Western Parcel of the Site, looking south.

PHOTO 2: Partial view of Western Parcel of Site, looking southwest.

CITADEL ENVIRONMENTAL SERVICES, INC.
assess resolve strengthen

Sterling Gateway, L.P.

Sterling Ranch Estates
Val Verde, California

Citadel Project No. 1158.1001.0

PHOTO LOG

PHOTO 3: Partial view of Western Parcel of the Site, looking east.

PHOTO 4: View of propane tank near residential structure on Western Parcel

PHOTO LOG

PHOTO 5: View of storage trailer and miscellaneous vehicles near residential structure on Western Parcel.

PHOTO 6: Partial view of the Western Parcel of the Site looking southeast along Coolidge Road and the southeast portion of the Site.

PHOTO LOG

PHOTO 7: Partial view of the Western Parcel of the Site looking west from Del Valle Road.

PHOTO 8: Partial view of the Western Parcel of the Site looking east from Del Valle Road.

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ENVIRONMENTAL SERVICES, INC.

Appendix C
EDR Aerial Photographs

29053 Coolidge Ave

29053 Coolidge Ave

Castaic, CA 91384

Inquiry Number: 5037804.12

August 31, 2017

The EDR Aerial Photo Decade Package

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

08/31/17

Site Name:

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384
EDR Inquiry # 5037804.12

Client Name:

Citadel Environmental Services
111 North Market Street
San Jose, CA 95110-0000
Contact: Roopal Jani

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

Search Results:

Year	Scale	Details	Source
2012	1"=750'	Flight Year: 2012	USDA/NAIP
2010	1"=750'	Flight Year: 2010	USDA/NAIP
2009	1"=750'	Flight Year: 2009	USDA/NAIP
2005	1"=750'	Flight Year: 2005	USDA/NAIP
2002	1"=750'	Flight Date: June 11, 2002	USDA
1994	1"=750'	Acquisition Date: June 01, 1994	USGS/DOQQ
1989	1"=750'	Flight Date: July 03, 1989	USDA
1983	1"=750'	Flight Date: November 03, 1983	EDR Proprietary Brewster Pacific
1978	1"=750'	Flight Date: September 21, 1978	USDA
1972	1"=750'	Flight Date: October 11, 1972	EDR Proprietary Brewster Pacific
1969	1"=750'	Flight Date: July 25, 1969	USGS
1952	1"=750'	Flight Date: March 11, 1952	USDA
1947	1"=750'	Flight Date: August 16, 1947	USGS
1940	1"=750'	Flight Date: May 13, 1940	USDA
1928	1"=750'	Flight Date: January 01, 1928	USGS

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

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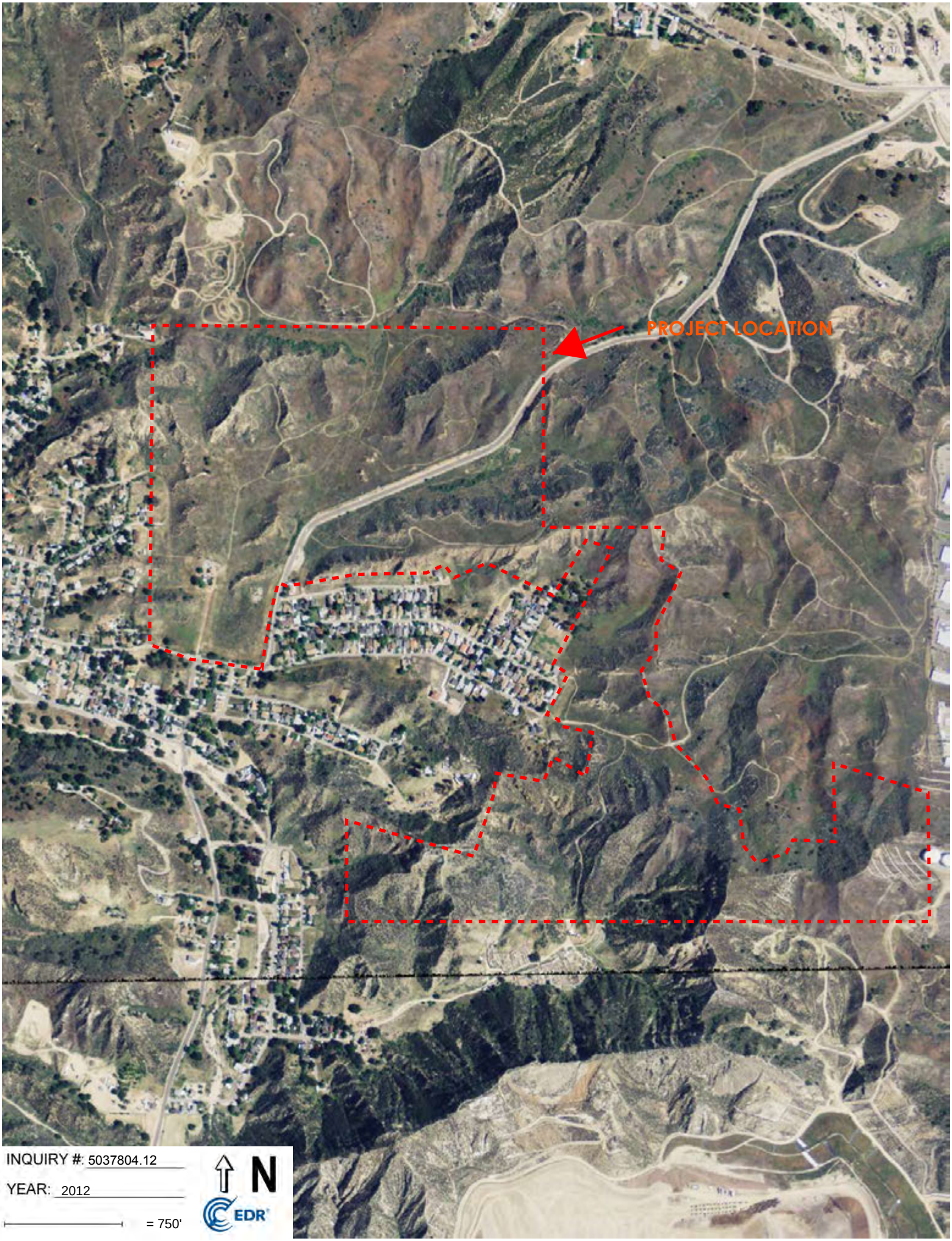
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EDR

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YEAR: 2010
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EDR

PROJECT LOCATION
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EDR

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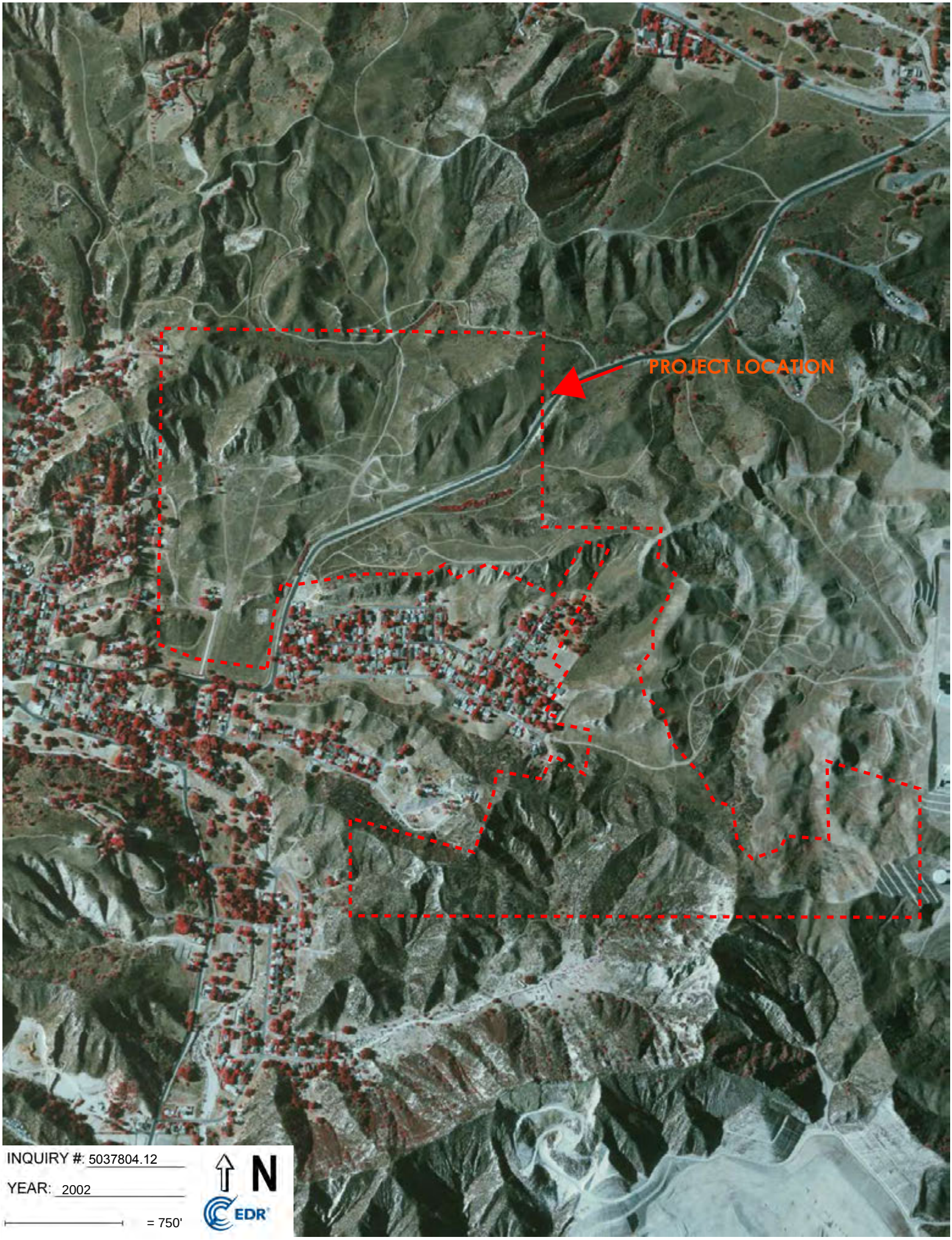
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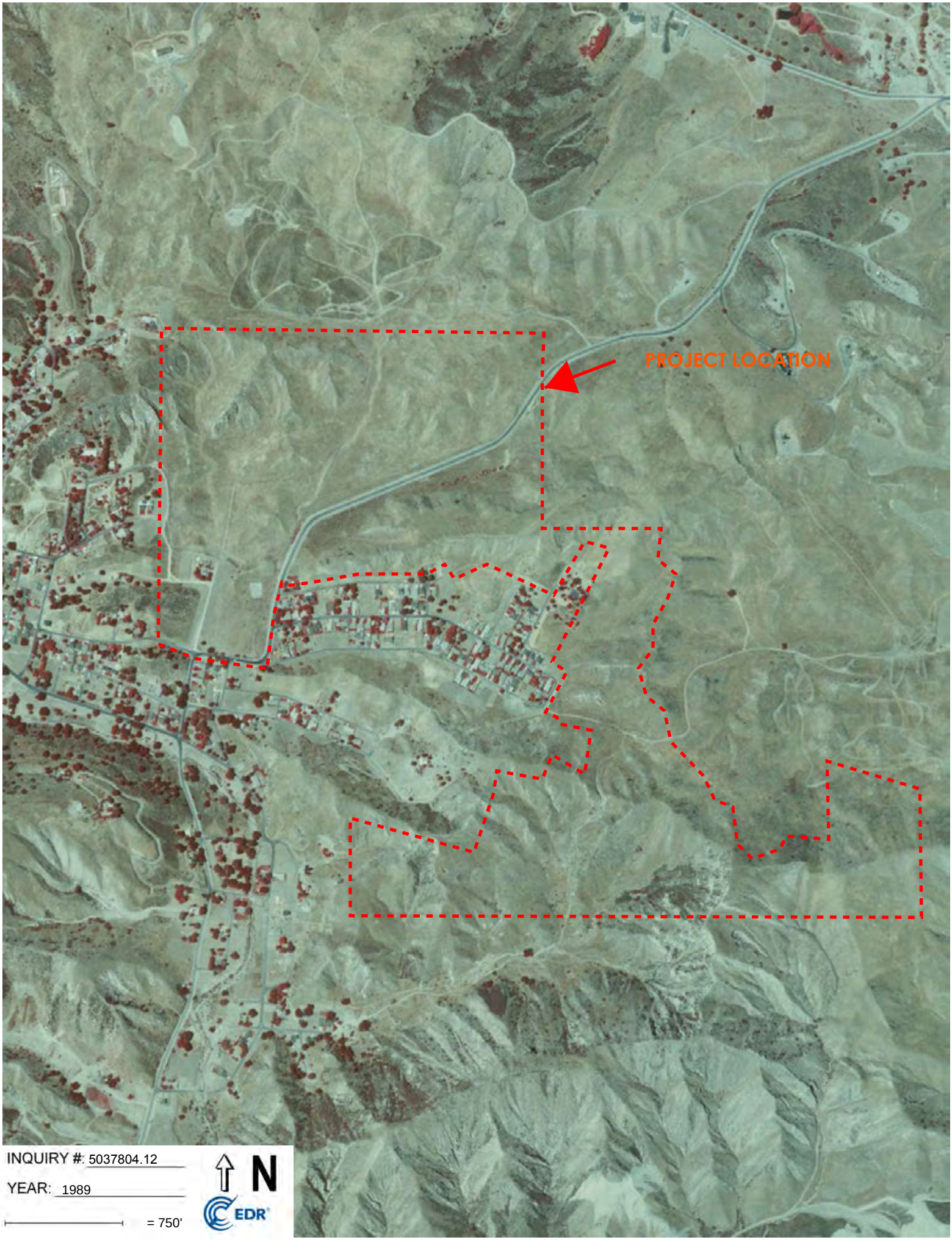
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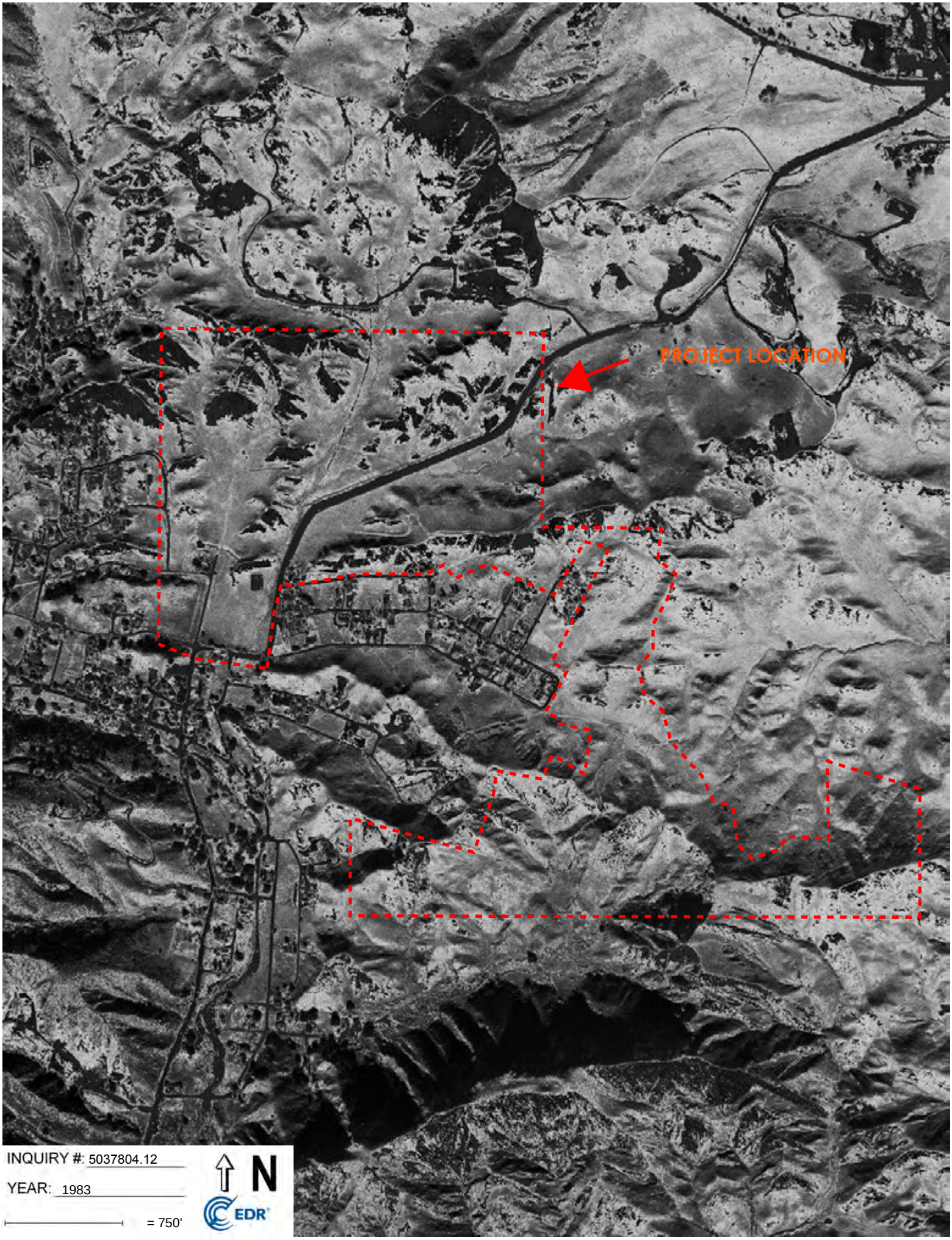
EDR



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EDR

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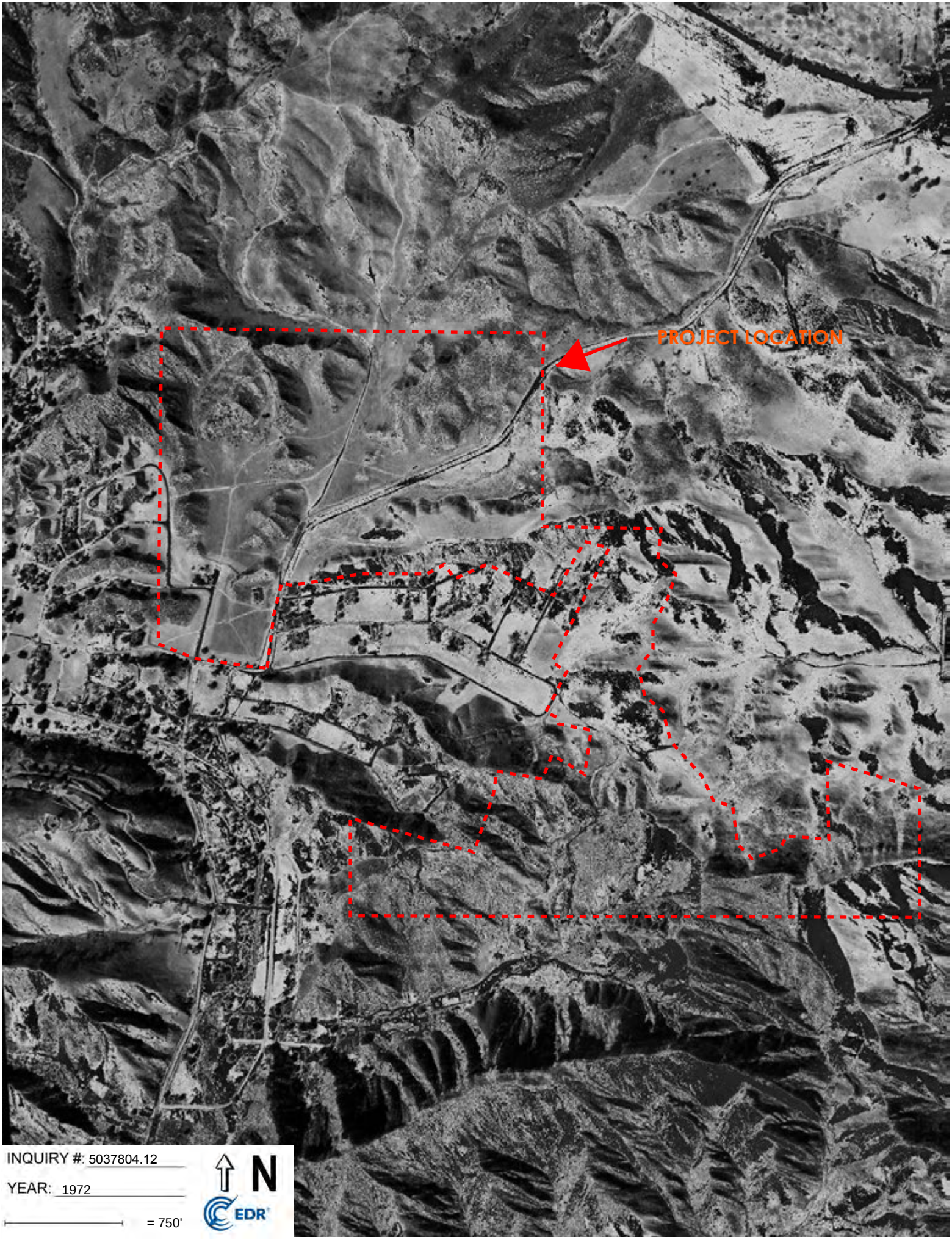
EDR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EDR

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YEAR: 1969

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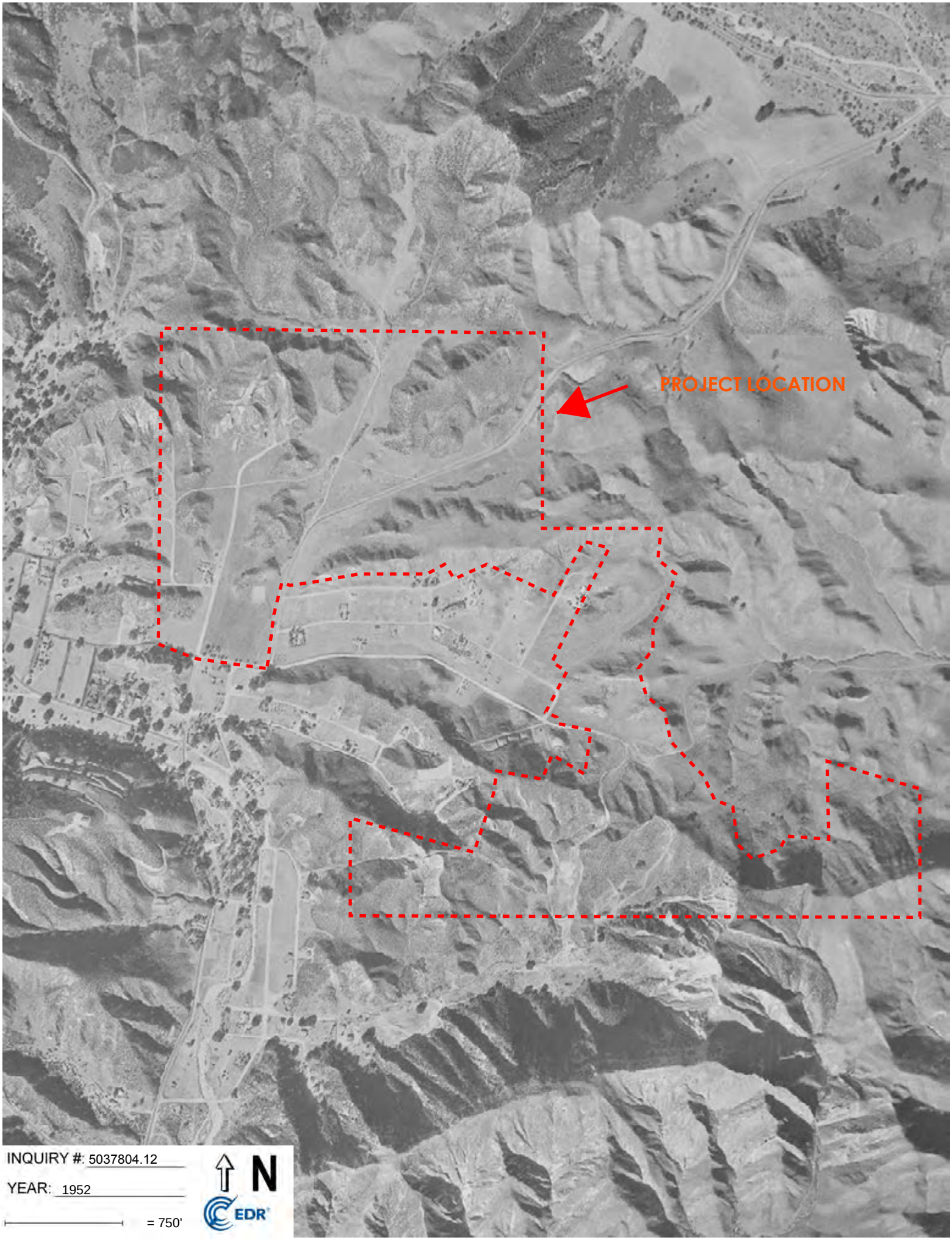
N

EDR



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EDR

INQUIRY #: 5037804.12

YEAR: 1947

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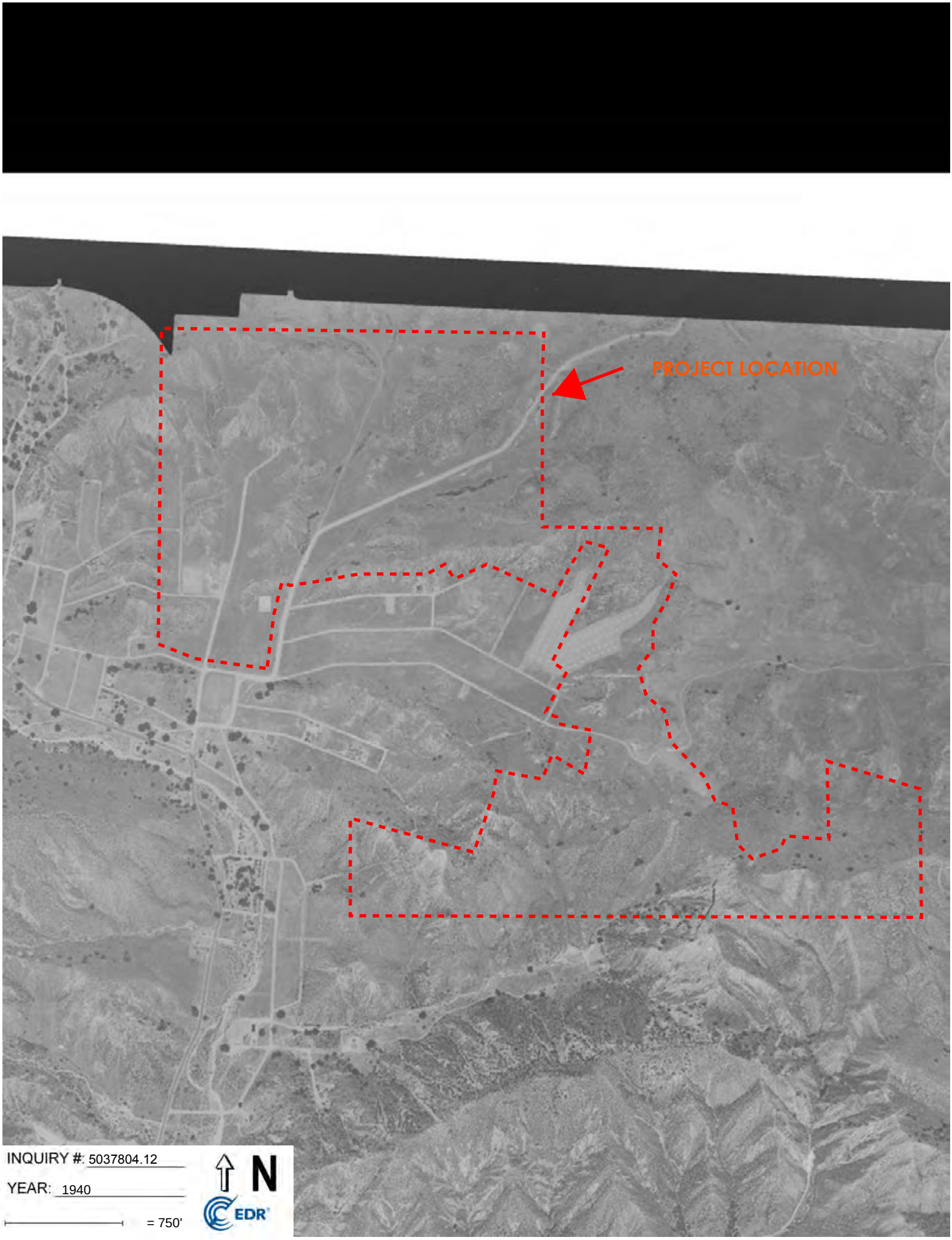
EDR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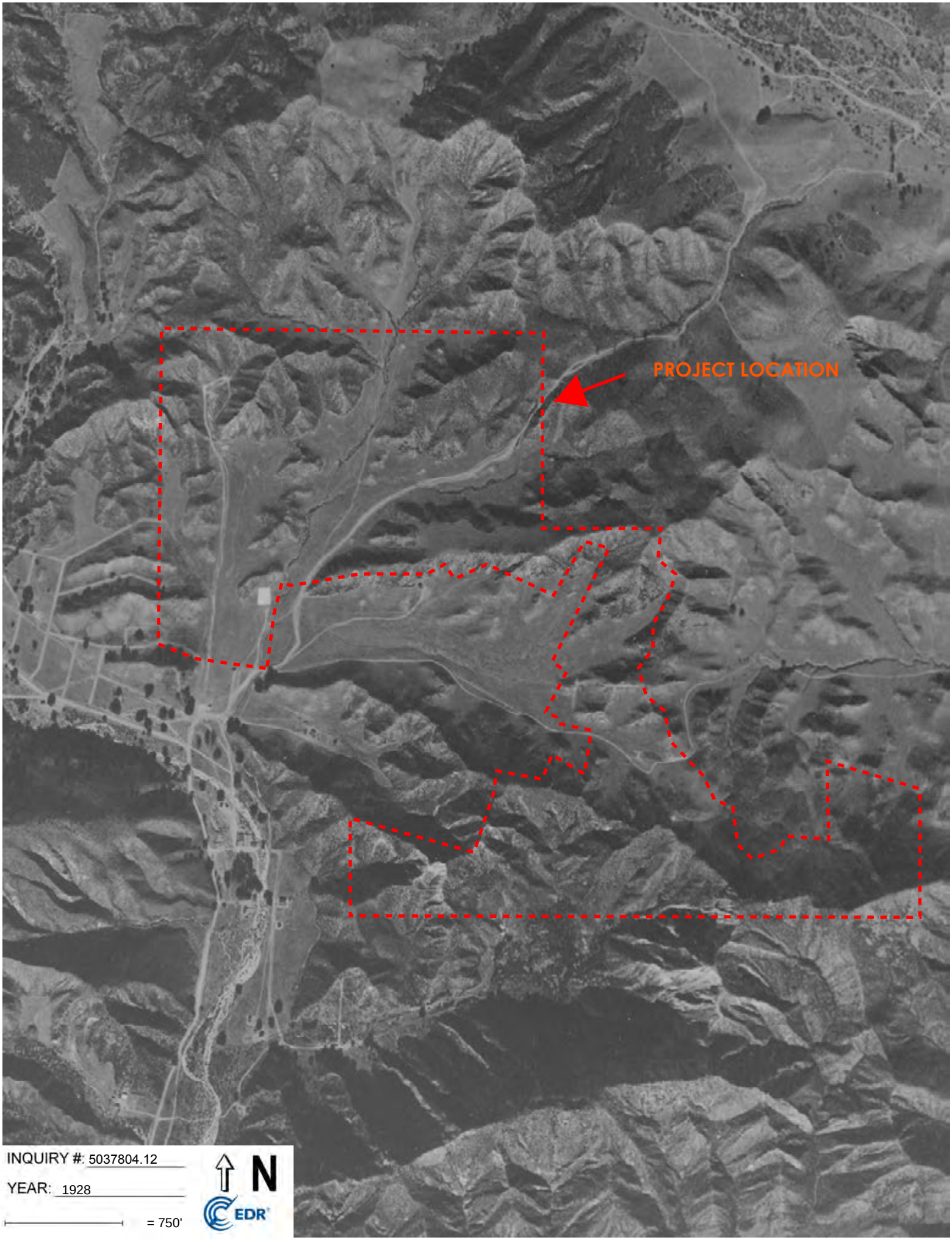
EDR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YEAR: 1928
= 750'
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EDR

CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix D
EDR Building Permit Report and Select Building Permits

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384

Inquiry Number: 5037804.8
August 30, 2017

EDR Building Permit Report

Target Property and Adjoining Properties

Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION

About This Report

Executive Summary

Findings

Glossary

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Disclaimer - Copyright and Trademark Notice

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EDR BUILDING PERMIT REPORT

About This Report

The EDR Building Permit Report provides a practical and efficient method to search building department records for indications of environmental conditions. Generated via a search of municipal building permit records gathered from more than 1,600 cities nationwide, this report will assist you in meeting the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13), or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

Building permit data can be used to identify current and/or former operations and structures/features of environmental concern. The data can provide information on a target property and adjoining properties such as the presence of underground storage tanks, pump islands, sumps, drywells, etc., as well as information regarding water, sewer, natural gas, electrical connection dates, and current/former septic tanks.

ASTM and EPA Requirements

ASTM E 1527-13 lists building department records as a "standard historical source," as detailed in § 8.3.4.7: "Building Department Records - The term building department records means those records of the local government in which the property is located indicating permission of the local government to construct, alter, or demolish improvements on the property." ASTM also states that "Uses in the area surrounding the property shall be identified in the report, but this task is required only to the extent that this information is revealed in the course of researching the property itself."

EPA's Standards and Practices for All Appropriate Inquires (AAI) states: "§312.24: Reviews of historical sources of information. (a) Historical documents and records must be reviewed for the purposes of achieving the objectives and performance factors of §312.20(e) and (f). Historical documents and records may include, but are not limited to, aerial photographs, fire insurance maps, building department records, chain of title documents, and land use records."

Methodology

EDR has developed the EDR Building Permit Report through our partnership with BuildFax, the nation's largest repository of building department records. BuildFax collects, updates, and manages building department records from local municipal governments. The database now includes 30 million permits, on more than 10 million properties across 1,600 cities in the United States.

The EDR Building Permit Report comprises local municipal building permit records, gathered directly from local jurisdictions, including both target property and adjoining properties. Years of coverage vary by municipality. Data reported includes (where available): date of permit, permit type, permit number, status, valuation, contractor company, contractor name, and description.

Incoming permit data is checked at seven stages in a regimented quality control process, from initial data source interview, to data preparation, through final auditing. To ensure the building department is accurate, each of the seven quality control stages contains, on average, 15 additional quality checks, resulting in a process of approximately 105 quality control "touch points."

For more information about the EDR Building Permit Report, please contact your EDR Account Executive at (800) 352-0050.

EDR® Environmental Data Resources Inc

BUILD FAX PROPERTY HISTORY

EXECUTIVE SUMMARY: SEARCH DOCUMENTATION

A search of building department records was conducted by Environmental Data Resources, Inc (EDR) on behalf of Citadel Environmental Services on Aug 30, 2017.

TARGET PROPERTY

29053 Coolidge Ave
Castaic, CA 91384

SEARCH METHODS

EDR searches available lists for both the Target Property and Surrounding Properties.

RESEARCH SUMMARY

Building permits identified: **YES**

The following research sources were consulted in the preparation of this report. An "X" indicates where information was identified in the source and provided in this report.

Los Angeles County

Year	*Source*	*TP*	*Adjoining*
2017	Los Angeles County, Building and Safety		
2016	Los Angeles County, Building and Safety		X
2015	Los Angeles County, Building and Safety		
2014	Los Angeles County, Building and Safety		X
2013	Los Angeles County, Building and Safety	X	
2012	Los Angeles County, Building and Safety		
2011	Los Angeles County, Building and Safety		
2010	Los Angeles County, Building and Safety		
2009	Los Angeles County, Building and Safety		X
2008	Los Angeles County, Building and Safety		X
2007	Los Angeles County, Building and Safety		X
2006	Los Angeles County, Building and Safety		
2005	Los Angeles County, Building and Safety		X
2004	Los Angeles County, Building and Safety		X
2003	Los Angeles County, Building and Safety		X
2002	Los Angeles County, Building and Safety		X
2001	Los Angeles County, Building and Safety		
2000	Los Angeles County, Building and Safety		X
1999	Los Angeles County, Building and Safety		
1998	Los Angeles County, Building and Safety		
1997	Los Angeles County, Building and Safety		
1996	Los Angeles County, Building and Safety		
1995	Los Angeles County, Building and Safety		X
1994	Los Angeles County, Building and Safety		X
1993	Los Angeles County, Building and Safety		
1992	Los Angeles County, Building and Safety		
1991	Los Angeles County, Building and Safety		
1990	Los Angeles County, Building and Safety		

EXECUTIVE SUMMARY: SEARCH DOCUMENTATION

Year	Source	TP	Adjoining
1989	Los Angeles County, Building and Safety		
1988	Los Angeles County, Building and Safety		

BUILDING DEPARTMENT RECORDS SEARCHED

Name: Los Angeles County
Years: 1988-2017
Source: Los Angeles County, Building and Safety, Alhambra, CA
Phone: (626) 458-6368

Name: Riverside County
Years: 1973-2017
Source: Riverside County, Building and Safety, MIRA LOMA, CA
Phone: (951) 955-6742

Name: San Bernardino County
Years: 2002-2017
Source: San Bernardino County, Land Use, Building & Safety, FONTANA, CA
Phone: (909) 387-8311

TARGET PROPERTY FINDINGS

TARGET PROPERTY DETAIL

29053 Coolidge Ave
Castaic, CA 91384

29053 COOLIDGE AVE

Date:	**1/29/2013**
Permit Type:	**MP**
Description:	**LOT LINE ADJUSTMENT BETWEEN 3271-004-003 AND 3271-004-004**
Permit Description:	**MISCELLANEOUS PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	1301290006
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	SAME AS OWNER

ADJOINING PROPERTY FINDINGS

ADJOINING PROPERTY DETAIL

The following Adjoining Property addresses were researched for this report. Detailed findings are provided for each address.

CROMWELL AVE

29764 CROMWELL AVE

Date:	**7/1/2004**
Permit Type:	**BL**
Description:	**SHADEBAR PATIO COVER 121 SQ FT**
Permit Description:	**BUILDING PERMIT**
Work Class:	RESIDENTIAL ADDITION
Proposed Use:	
Permit Number:	0407010014
Status:	PERMISUD
Valuation:	$2,000.00
Contractor Company:	
Contractor Name:	EVANS, DEVON

HUNSTOCK ST

30009 HUNSTOCK ST

Date:	**12/23/2009**
Permit Type:	**PL**
Description:	**COPPER REPIPE FOR BATHROOM & KITCHEN - 2 FIXTURES, REPLACE WATER HEATER AND NEW GAS LINE**
Permit Description:	**PLUMBING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0912230015
Status:	PERMISUD
Valuation:	$0.00
Contractor Company:	
Contractor Name:	

ADJOINING PROPERTY FINDINGS

Date:	**10/22/2009**
Permit Type:	**EL**
Description:	**REPLACE ELECTRIC OUTLET WIRING AND FAU ELECTRIC, REPLACE 200 AMP PANEL WITH SAME**
Permit Description:	**ELECTRICAL PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0910220016
Status:	PERMISUD
Valuation:	$0.00
Contractor Company:	
Contractor Name:	

30055 HUNSTOCK ST

Date:	**5/11/2004**
Permit Type:	**PL**
Description:	**NEW WATER SERVICE**
Permit Description:	**PLUMBING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0405110043
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	BERNSON, STEVEN

ADJOINING PROPERTY FINDINGS

Date: **5/11/2004**
Permit Type: **PL**
Description: **NEW GAS SYSTEM**

Permit Description: **PLUMBING PERMIT**
Work Class:
Proposed Use:
Permit Number: 0405110047
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name: BERNSON, STEVEN

Date: **5/11/2004**
Permit Type: **EL**
Description: **NEW 200 AMP SERVICE FOR MANUFACTURER HOME**

Permit Description: **ELECTRICAL PERMIT**
Work Class:
Proposed Use:
Permit Number: 0405110051
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name: BERNSON, STEVEN

Date: **9/15/2003**
Permit Type: **BL**
Description: **NEW DETACHED GARAGE 540 SQ FT**

Permit Description: **BUILDING PERMIT**
Work Class: NEW RESIDENTIAL
Proposed Use:
Permit Number: 0307110056
Status: FINALED
Valuation: $16,000.00
Contractor Company:
Contractor Name: BERNSON, STEVEN

ADJOINING PROPERTY FINDINGS

Date:	**9/15/2003**
Permit Type:	**BL**
Description:	**FOUNDATION FOR MANUFACTURED HOME 1980 SQ FT MODEL # KS66001Z**
Permit Description:	**BUILDING PERMIT**
Work Class:	NEW RESIDENTIAL
Proposed Use:	
Permit Number:	0307110055
Status:	FINALED
Valuation:	$15,000.00
Contractor Company:	
Contractor Name:	BERNSON, STEVEN

Date:	**9/15/2003**
Permit Type:	**SE**
Description:	**NEW SEPTIC FOR MANUFACTURED HOME 1980 SQ FT**
Permit Description:	**SEWER PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0309150027
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	BERNSON, STEVEN

ADJOINING PROPERTY FINDINGS

LEXINGTON DR

30003 LEXINGTON DR

Date:	**2/23/2007**
Permit Type:	**SE**
Description:	**REPLACE EXISTING 1000 GAL STEEL SEPTIC TANK WITH A 1000 GAL CONCRETE JENSE PRE CAST SEPTIC TANK.**
Permit Description:	**SEWER PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0702230010
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	KURT BOHMERS PLUMBING

Date:	**1/12/2007**
Permit Type:	**BL**
Description:	**NEW SOLID ROOF PATIO COVER 210 SQ FT**
Permit Description:	**BUILDING PERMIT**
Work Class:	RESIDENTIAL ADDITION
Proposed Use:	
Permit Number:	0701090051
Status:	FINALED
Valuation:	$5,300.00
Contractor Company:	
Contractor Name:	BELNAP, BRAD R

ADJOINING PROPERTY FINDINGS

Date:	**1/10/2007**
Permit Type:	**PL**
Description:	**TO FINAL PLUM PERMIT 2048A FOR 3 BDRM SFD 1332 SQ FT CODE ENFORCEMENT CASE**
Permit Description:	**PLUMBING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0701090015
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	BELNAP, BRAD R

Date:	**1/10/2007**
Permit Type:	**EL**
Description:	**TO FINAL ELEC PERMIT 2050A FOR 3 BDRM SFD & DETACHED GARAGE 1332/440 SQ FT CODE ENFORCEMENT CASE**
Permit Description:	**ELECTRICAL PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0701090016
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	BELNAP, BRAD R

ADJOINING PROPERTY FINDINGS

Date:	**1/10/2007**
Permit Type:	**BL**
Description:	**TO FINAL BLDG PERMIT 2045A FOR 3 BDRM SFD & DETACHED GARAGE 1332/440 SQ FT**
Permit Description:	**BUILDING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0701090042
Status:	FINALED
Valuation:	$1,000.00
Contractor Company:	
Contractor Name:	BELNAP, BRAD R

30014 LEXINGTON DR

Date:	**11/24/2003**
Permit Type:	**SE**
Description:	**SEPTIC FOR NEW SFD**
Permit Description:	**SEWER PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0311240002
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	MISCIONE, FRANK

ADJOINING PROPERTY FINDINGS

Date: **8/5/2003**
Permit Type: **PL**
Description: **PLUMBING FOR NEW SFD**

Permit Description: **PLUMBING PERMIT**
Work Class:
Proposed Use:
Permit Number: 0308050003
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name: MISCIONE, FRANK

Date: **8/5/2003**
Permit Type: **ME**
Description: **MECHANICAL FOR NEW SFD**

Permit Description: **MECHANICAL PERMIT**
Work Class:
Proposed Use:
Permit Number: 0308050005
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name: MISCIONE, FRANK

Date: **8/5/2003**
Permit Type: **EL**
Description: **ELECTRICAL FOR NEW SFD**

Permit Description: **ELECTRICAL PERMIT**
Work Class:
Proposed Use:
Permit Number: 0308050011
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name: MISCIONE, FRANK

ADJOINING PROPERTY FINDINGS

Date:	**5/19/2003**
Permit Type:	**BL**
Description:	**NEW SFD/GAR 1434/575 SQ FT**
Permit Description:	**BUILDING PERMIT**
Work Class:	NEW RESIDENTIAL
Proposed Use:	
Permit Number:	0302060007
Status:	FINALED
Valuation:	$136,000.00
Contractor Company:	
Contractor Name:	MISCIONE, FRANK

Date:	**5/9/2003**
Permit Type:	**BL**
Description:	**RETAINING WALL 45' X 4'**
Permit Description:	**BUILDING PERMIT**
Work Class:	RETAINING WALL
Proposed Use:	
Permit Number:	0305090006
Status:	FINALED
Valuation:	$2,000.00
Contractor Company:	
Contractor Name:	MISCIONE, FRANK

Date:	**6/5/2002**
Permit Type:	**GR**
Description:	**GRADING FOR SFD PAD 2123 CU. YDS**
Permit Description:	**GRADING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0110040001
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	MISCIONE, FRANK

ADJOINING PROPERTY FINDINGS

30019 LEXINGTON DR

Date:	**3/4/2014**
Permit Type:	**SE**
Description:	**ABANDON (E) SEEPAGE PIT. INSTALL NEW SEPTIC TANK, LEACH LINES.**
Permit Description:	**SEWER PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	1403040010
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	KURT BOHMER PLUMBING

Date:	**5/21/2009**
Permit Type:	**ME**
Description:	**MECHANICAL FOR PERMIT NO. BL 0711160014 TO UPGRADE AND PERMIT AS REQ'D EXISTING LAUNDRY ROOM AND BDR**
Permit Description:	**MECHANICAL PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0905210008
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	

ADJOINING PROPERTY FINDINGS

Date: **12/12/2008**
Permit Type: **EL**
Description: **ELECT SERVICE UPGRADE FOR REMODEL**

Permit Description: **ELECTRICAL PERMIT**
Work Class:
Proposed Use:
Permit Number: 0812120010
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name:

Date: **12/12/2008**
Permit Type: **PL**
Description: **PLUMBING FOR (1) NEW AND (1) EXIST BATHROOM**

Permit Description: **PLUMBING PERMIT**
Work Class:
Proposed Use:
Permit Number: 0812120010
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name:

Date: **11/3/2008**
Permit Type: **BL**
Description: **UPGRADE AND PERMIT AS REQ'D EXISTING LAUNDRY ROOM AND BDR (BEDROOM); 76/149 SQ FT. EGRESS WINDOW CHANGE OUT IN MSTR BD REMODEL EXIST BATHROOM (49 SQ FT), AND CONVERT CLOSET TO**

Permit Description: **BUILDING PERMIT**
Work Class: RESIDENTIAL ADD/ALT
Proposed Use:
Permit Number: 0711160014
Status: FINALED
Valuation: $38,000.00
Contractor Company:
Contractor Name:

ADJOINING PROPERTY FINDINGS

Date:	**2/15/2008**
Permit Type:	**BL**
Description:	**NEW RETAINING WALL 5'H X 50'L**
Permit Description:	**BUILDING PERMIT**
Work Class:	RETAINING WALL
Proposed Use:	
Permit Number:	0802150003
Status:	FINALED
Valuation:	$8,000.00
Contractor Company:	
Contractor Name:	BAKER, SYRRIL

Date:	**5/9/2007**
Permit Type:	**BL**
Description:	**DEMO UNPERMITTED METAL CARPORT & ATTACHED ENCLOSED PATIO COVER. CODE ENFORCEMENT CASE. 120/336 SQ FT**
Permit Description:	**BUILDING PERMIT**
Work Class:	DEMOLITION
Proposed Use:	
Permit Number:	0704270034
Status:	FINALED
Valuation:	$2,000.00
Contractor Company:	
Contractor Name:	KAPAC;BAKER, JAY;SYRRIL

Date:	**2/17/2005**
Permit Type:	**SE**
Description:	**REPLACE SEPTIC TANK ONLY AND PLUMB WASHER TO BLDG SEWER PIPE**
Permit Description:	**SEWER PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0502170008
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	KAPAC, JOSEPH C

ADJOINING PROPERTY FINDINGS

Date:	**8/22/2000**
Permit Type:	**BL**
Description:	**TEAR OFF AND REROOF W COMP**
Permit Description:	**BUILDING PERMIT**
Work Class:	RESIDENTIAL ADD/ALT
Proposed Use:	
Permit Number:	0008220081
Status:	FINALED
Valuation:	$1,200.00
Contractor Company:	
Contractor Name:	OLYMPIC ROOFING CO.

30024 LEXINGTON DR

Date:	**6/1/2004**
Permit Type:	**EL**
Description:	**ELECTRICAL FOR REMODEL/REPAIR TO EXISTING HOUSE**
Permit Description:	**ELECTRICAL PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0406010007
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	NORDENSTROM, DANIEL

ADJOINING PROPERTY FINDINGS

Date:	**6/1/2004**
Permit Type:	**PL**
Description:	**PLUMBING FOR COPPER REPIPE-7 FIXTURES AND ADD NEW FIXTURES FOR REMODEL**
Permit Description:	**PLUMBING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0406010009
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	NORDENSTROM, DANIEL

Date:	**6/1/2004**
Permit Type:	**BL**
Description:	**REPAIR EXISTING HOUSE/ADD BATHROOM AND ENCLOSE PATIO**
Permit Description:	**BUILDING PERMIT**
Work Class:	RESIDENTIAL ADD/ALT
Proposed Use:	
Permit Number:	0406010022
Status:	FINALED
Valuation:	$9,000.00
Contractor Company:	
Contractor Name:	NORDENSTROM, DANIEL

ADJOINING PROPERTY FINDINGS

30038 LEXINGTON DR

Date:	**9/8/2016**
Permit Type:	**EL**
Description:	**UPGRADE (E) MAIN PANEL 100A TO (N) 200A PANEL**
Permit Description:	**ELECTRICAL PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	1609080005
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	ECOWORX ENTERPRISES

Date:	**9/7/2016**
Permit Type:	**CB**
Description:	**(N) ROOF-MOUNTED PV SYS 5.76 KW, 18 PANELS, 318 S.F.**
Permit Description:	**BUILDING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	1608290015
Status:	FINALED
Valuation:	$11,700.00
Contractor Company:	
Contractor Name:	THE GREEN STORE, INC.

ADJOINING PROPERTY FINDINGS

Date:	**8/4/2016**
Permit Type:	**BL**
Description:	**RE-ROOF - REMOVE (1) LAYER COMP SHINGLES. INSTALL (1) NEW LAYER UNDERLAYMENT AND (1) NEW LAYER CLASS A COMP SHINGLES. 2,167 SQ FT PITCH 5:12**
Permit Description:	**BUILDING PERMIT**
Work Class:	ALTERATION/REPAIR
Proposed Use:	
Permit Number:	1608040039
Status:	FINALED
Valuation:	$3,000.00
Contractor Company:	
Contractor Name:	PETERSEN-DEAN INC.

Date:	**5/18/2005**
Permit Type:	**SE**
Description:	**REPLACE EXISTING SEPTIC TANK WITH NEW 1200 GAL TANK**
Permit Description:	**SEWER PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0505180006
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	A AND SUPERIOR SANITATION, INC.

ADJOINING PROPERTY FINDINGS

MAYFARE ST

30043 MAYFARE ST

Date:	**10/20/2004**
Permit Type:	**BL**
Description:	**NEW ROOF STRUCTION ON MAIN RESIDENCE 1136 SQ FT**
Permit Description:	**BUILDING PERMIT**
Work Class:	RESIDENTIAL ADD/ALT
Proposed Use:	
Permit Number:	0407260076
Status:	FINALED
Valuation:	$20,000.00
Contractor Company:	
Contractor Name:	MELQUIADES/CARDENAS, ANA

Date:	**10/20/2004**
Permit Type:	**BL**
Description:	**NEW SOLID ROOF PATIO COVER IN REAR YARD 223 SQ FT**
Permit Description:	**BUILDING PERMIT**
Work Class:	RESIDENTIAL ADDITION
Proposed Use:	
Permit Number:	0410200078
Status:	FINALED
Valuation:	$6,000.00
Contractor Company:	
Contractor Name:	MELQUIADES/CARDENAS, ANA

ADJOINING PROPERTY FINDINGS

Date:	**7/26/2004**
Permit Type:	**BL**
Description:	**NEW SOLID ROOF PATIO COVER 260 SQ FT**
Permit Description:	**BUILDING PERMIT**
Work Class:	RESIDENTIAL ADDITION
Proposed Use:	
Permit Number:	0407260075
Status:	FINALED
Valuation:	$6,000.00
Contractor Company:	
Contractor Name:	MELQUIADES/CARDENAS, ANA

Date:	**5/26/2004**
Permit Type:	**PL**
Description:	**COPPER REPIPE 6 FIXTURES**
Permit Description:	**PLUMBING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0405260013
Status:	PERMISUD
Valuation:	$0.00
Contractor Company:	
Contractor Name:	MELQUIADES/CARDENAS, ANA

Date:	**5/26/2004**
Permit Type:	**EL**
Description:	**ELECTRICAL FOR NEW LIGHTING FIXTURES AND OUTLETS/SWITCHES AND UPGRADE EXISTING PANEL TO 200 AMP**
Permit Description:	**ELECTRICAL PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0405260019
Status:	PERMISUD
Valuation:	$0.00
Contractor Company:	
Contractor Name:	MELQUIADES/CARDENAS, ANA

ADJOINING PROPERTY FINDINGS

Date:	**5/11/2004**
Permit Type:	**BL**
Description:	**RE-ROOF RESIDENCE W/ASPHALT SHINGLES (CLASS A) OVER 1/2 OSB PLYWOOD. REPLACE EXISTING STUCCO ON RESIDENCE AND RESIDENCE REMODEL WITH NEW WINDOWS**
Permit Description:	**BUILDING PERMIT**
Work Class:	ALTERATION/REPAIR
Proposed Use:	
Permit Number:	0405110060
Status:	FINALED
Valuation:	$4,000.00
Contractor Company:	
Contractor Name:	MELQUIADES/CARDENAS, ANA

TREVYELON ST

30055 TREVYELON ST

Date:	**12/3/2009**
Permit Type:	**PL**
Description:	**REPLACE WATER HEATER**
Permit Description:	**PLUMBING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	0912030016
Status:	PERMISUD
Valuation:	$0.00
Contractor Company:	
Contractor Name:	

ADJOINING PROPERTY FINDINGS

Date: **7/19/2000**
Permit Type: **BL**
Description: **ADD 100 SQ FT ROOM ADDITION (LAUNDRY ROOM)**

Permit Description: **BUILDING PERMIT**
Work Class: RESIDENTIAL ADDITION
Proposed Use:
Permit Number: 0007190005
Status: FINALED
Valuation: $6,000.00
Contractor Company:
Contractor Name: MALIN, STEPHEN C

Date: **10/20/1995**
Permit Type: **SE**
Description: **SEPTIC**

Permit Description: **SEWER PERMIT**
Work Class:
Proposed Use:
Permit Number: 9510200006
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name: ROBERT COOK

Date: **10/20/1995**
Permit Type: **ME**
Description: **MECH FOR NEW SFD**

Permit Description: **MECHANICAL PERMIT**
Work Class:
Proposed Use:
Permit Number: 9510200007
Status: FINALED
Valuation: $0.00
Contractor Company:
Contractor Name: ROBERT COOK

ADJOINING PROPERTY FINDINGS

Date:	**10/20/1995**
Permit Type:	**EL**
Description:	**NEW SFD**
Permit Description:	**ELECTRICAL PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	9510200017
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	ROBERT COOK

Date:	**10/31/1994**
Permit Type:	**PL**
Description:	**NEW SFD**
Permit Description:	**PLUMBING PERMIT**
Work Class:	
Proposed Use:	
Permit Number:	9410310002
Status:	FINALED
Valuation:	$0.00
Contractor Company:	
Contractor Name:	ROBERT COOK

GLOSSARY

General Building Department concepts

- **ICC:** The International Code Council. The governing body for the building/development codes used by all jurisdictions who've adopted the ICC guidelines. MOST of the US has done this. Canada, Mexico, and other countries use ICC codes books and guides as well. There are a few states who have added guidelines to the ICC codes to better fit their needs. For example, California has added seismic retrofit requirements for most commercial structures.
- **Building Department (Permitting Authority, Building Codes, Inspections Department, Building and Inspections):** This is the department in a jurisdiction where an owner or contractor goes to obtain permits and inspections for building, tearing down, remodeling, adding to, re-roofing, moving or otherwise making changes to any structure, Residential or Commercial.
- **Jurisdiction:** This is the geographic area representing the properties over which a Permitting Authority has responsibility.
- **GC:** General Contractor. Usually the primary contractor hired for any Residential or Commercial construction work.
- **Sub:** Subordinate contracting companies or subcontractors. Usually a "trades" contractor working for the GC. These contractors generally have an area of expertise in which they are licensed like Plumbing, Electrical, Heating and Air systems, Gas Systems, Pools etc. (called "trades").
- **Journeymen:** Sub contractors who have their own personal licenses in one or more trades and work for different contracting companies, wherever they are needed or there is work.
- **HVAC (Mechanical, Heating & Air companies):** HVAC = Heating, Ventilation, and Air Conditioning.
- **ELEC (Electrical, TempPole, TPole, TPower, Temporary Power, Panel, AMP Change, Power Release):** Electrical permits can be pulled for many reasons. The most common reason is to increase the AMPs of power in an electrical power panel. This requires a permit in almost every jurisdiction. Other commons reason for Electrical permits is to insert a temporary power pole at a new construction site. Construction requires electricity, and in a new development, power has yet to be run to the lot. The temporary power pole is usually the very first permit pulled for new development. The power is released to the home owner when construction is complete and this sometimes takes the form of a Power Release permit or inspection.
- **"Pull" a permit:** To obtain and pay for a building permit.
- **CBO:** Chief Building Official
- **Planning Department:** The department in the development process where the building /structural plans are reviewed for their completeness and compliance with building codes
- **Zoning Department:** The department in the development process where the site plans are reviewed for their compliance with the regulations associated with the zoning district in which they are situated.
- **Zoning District:** A pre-determined geographic boundary within a jurisdiction where certain types of structures are permitted / prohibited. Examples are Residential structure, Commercial/Retail structures, Industrial/Manufacturing structures etc. Each zoning district has regulations associated with it like the sizes of the lots, the density of the structures on the lots, the number of parking spaces required for certain types of structures on the lots etc.
- **PIN (TMS, GIS ID, Parcel#):** Property Identification Number and Tax Map System number.
- **State Card (Business license):** A license card issued to a contractor to conduct business.
- **Building Inspector (Inspector):** The inspector is a building department employee that inspects building construction for compliance to codes.
- **C.O.:** Certificate of Occupancy. This is the end of the construction process and designates that the owners now have permission to occupy a structure after its building is complete. Sometimes also referred to as a Certificate of Compliance.

GLOSSARY

Permit Content Definitions

- Permit Number: The alphanumerical designation assigned to a permit for tracking within the building department system. Sometimes the permit number gives clues to its role, e.g. a "PL" prefix may designate a plumbing permit.
- Description: A field on the permit form that allows the building department to give a brief description of the work being done. More often than not, this is the most important field for EP's to find clues to the prior use(s) of the property.
- Permit Type: Generally a brief designation of the type of job being done. For example BLDG-RES, BLDG-COM, ELEC, MECH etc.

Sample Building Permit Data

Date: Nov 09, 2000
Permit Type: Bldg -
New Permit Number: 101000000405
Status: Valuation: $1,000,000.00
Contractor Company: OWNER-BUILDER
Contractor Name:

Description: New one store retail (SAV-ON) with drive-thru pharmacy. Certificate of Occupancy.

JOB ADDRESS 29053 Coolidge

OWNER Ruth Castle

STOP ALL WORK

You are in violation with the provisions of the County Ordinance as indicated below:

	Building Code
X	Plumbing Code
	Mechanical Code
X	Electrical Code
	Zoning Ordinances
	Grading Code

DESCRIPTION:

	Submit plans for the work within 10 days to the office listed above and apply for a plan check for the required Permit.
X	Obtain a Permit within 10 days for the work at the office listed above.
X	A referral has been made to the Enforcement Section of the Department of Regional Planning.

4-2-92 Laura Lynn

DATE INSPECTOR'S SIGNATURE

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
BUILDING AND SAFETY / LAND DEVELOPMENT

SANTA CLARITA
23757 VALENCIA
VALENCIA CA 91355
PHONE: (661) 222-2940 EXT:

0820

MISCELLANEOUS PERMIT
MP 0820 1301290006

LEGAL ID:
TR: 8599

ASSESSOR INFORMATION NUMBER:
3271-004-004

TENANT:

OWNER: TEL. NO:
STERLING GATEWAY, L.P. (435) 655-0890-
P.O. BOX 681007
PARK CITY, UT 84068

APPLICANT: TEL. NO:
MAY, DAN (818) 267-6121-
15230 BURBANK BLVD
VAN NUYS CA 91411

CONTRACTOR: TEL. NO:
SAME AS OWNER -
LIC. NO
NONE

ARCHITECT OR ENGINEER: TEL. NO:
SIKAND ENG ASSOCIATES (818) 787-8550-
15230 BURBANK BLVD STE 100 LIC. NO:
VAN NUYS, CA 91411 49041

MAP NO: SEWER MAP BOOK: PAGE: FIRE ZONE: CMP:

NO. OF FAMILIES: DWELLING UNITS: APT/COND: STAT CLASS:
NO

AIR QUALITY:	SCHOOL WITHIN 1000 FEET	HAZARDOUS MATERIALS
NO	NO	NO

	SQ. FT	NO. OF STORIES	CONST TYPE	NEW OCCUP GROUP
STRUCTURE:		0	V-B	B

EXIST BLDG USE:
EXIST OCC GRP: USE ZONE:

BLDGS. NOW ON LOT: VALUATION:
0

LIST ITEMS:

OCCUP LOAD EXIST:
OCCUP LOAD NEW:

PARKING SPACES REQUIRED:
PARKING SPACES PROVIDED:

EXIT HARDWARE:

NBR OF EXITS:

FEES PAID

FEE DESCRIPTION:	QUANTITY: UOM:	AMOUNT:
0A PERMIT ISSUANCE		27.90
04 LOT LINE ADJUSTMENT		220.50
	TOTAL FEES	248.40

REPORT ID: DPR267 ROUTE TO: BS0820

BUILDING ADDRESS:
29053 COOLIDGE AV
CAST CA 913842457
NEAREST CROSS STREET: DEL VALLE RD/CHIQUITO CYN
THOMAS PAGE: 4459 GRID: D6 LOCALITY: VAL VERDE

ISSUED ON: PROCESSED BY:
01/29/13 DM

FINAL DATE 2/14/13 PENAL EX: CODE:

DESCRIPTION OF WORK
LOT LINE ADJUSTMENT BETWEEN 3271-004-003 AND 3271-004-004

SPECIAL CONDITIONS:

LIMITED TIME USE
FROM TO

APPROVALS	DATE	INSPECTOR SIGNATURE
TRAILER USE		
SAFETY PERMIT		
TEMP. STRUCT. APPROVED		
TEMP. STRUCT. REMOVED		

OWNER-BUILDER DECLARATION

I hereby affirm under penalty of perjury that I am exempt from the Contractors' State License Law for the reason(s) indicated below by the checkmark(s) I have placed next to the applicable item(s) (Section 7031.5, Business and Professions Code): Any city or county that requires a permit to construct, alter, improve, demolish, or repair any structure, prior to its issuance, also requires the applicant for the permit to file a signed statement that he or she is licensed pursuant to the provisions of the Contractors' State License Law (Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code) or that he or she is exempt from licensure and the basis for the alleged exemption. Any violation of Section 7031.5 by any applicant for a permit subjects the applicant to a civil penalty of not more than five hundred dollars ($500).):

(_) I, as owner of the property, or my employees with wages as their sole compensation, will do (✓) all of or (_) portions of the work, and the structure is not intended or offered for sale (Section 7044, Business and Professions Code: The Contractors' State License Law does not apply to an owner of property who, through employees' or personal effort, builds or improves the property, provided that the improvements are not intended or offered for sale. If, however, the building or improvement is sold within one year of completion, the Owner-Builder will have the burden of proving that it was not built or improved for the purpose of sale.).

(_) I, as owner of the property, am exclusively contracting with licensed Contractors to construct the project (Section 7044, Business and Professions Code: The Contractors' State License Law does not apply to an owner of property who builds or improves thereon, and who contracts for the projects with a licensed Contractor pursuant to the Contractors' State License Law).

(_) I am exempt from licensure under the Contractors' State License Law for the following reason:

_____

By my signature below I acknowledge that, except for my personal residence in which I must have resided for at least one year prior to completion of the improvements covered by this permit, I cannot legally sell a structure that I have built as an owner-builder if it has not been constructed in its entirety by licensed contractors. I understand that a copy of the applicable law, Section 7044 of the Business and Professions Code, is available upon request when this application is submitted or at the following Web site: http://www.leginfo.ca.gov/calaw.html.

Date: 1-29-13

Signature of Property Owner or Authorized Agent

Dan May

LICENSED CONTRACTOR'S DECLARATION

I hereby affirm under penalty of perjury that I am licensed under provisions of Chapter 9 (commencing with Section 7000) of Division 3 of the Business and Professions Code, and my license is in full force and effect.

License Class _____ License No._____

Date _____ Contractor Signature_____

WORKERS' COMPENSATION DECLARATION

WARNING: FAILURE TO SECURE WORKERS' COMPENSATION COVERAGE IS UNLAWFUL, AND SHALL SUBJECT AN EMPLOYER TO CRIMINAL PENALTIES AND CIVIL FINES UP TO ONE HUNDRED THOUSAND DOLLARS ($100,000), IN ADDITION TO THE COST OF COMPENSATION, DAMAGES AS PROVIDED FOR IN SECTION 3706 OF THE LABOR CODE, INTEREST, AND ATTORNEY'S FEES.

I hereby affirm under penalty of perjury one of the following declarations:

____I have and will maintain a certificate of consent to self-insure for workers' compensation, issued by the Director of Industrial Relations as provided for by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued.

Policy No. _____

____ I have and will maintain workers' compensation insurance, as required by Section 3700 of the Labor Code, for the performance of the work for which this permit is issued. My workers' compensation insurance carrier and policy number are:

Carrier	Policy Number	Expiration Date

Name of Agent _____ Phone Number _____

___ I certify that, in the performance of the work for which this permit is issued, I shall not employ any person in any manner so as to become subject to the workers' compensation laws of California, and agree that, if I should become subject to the workers' compensation provisions of Section 3700 of the Labor Code, I shall forthwith comply with those provisions.

_____ _____

Signature of Applicant Date

LOBBYIST ORDINANCE CERTIFICATION

Complete this section for permits in Unincorporated Los Angeles County only

This is to certify that I, as permit applicant, am familiar with the requirements of Los Angeles County Code Chapter 2.160 et seq., (relating to the Los Angeles County Lobbyist Ordinance) and that all persons acting on behalf of myself complied and will continue to comply therewith through the application process.

DAN MAY Dan May

Applicant (Print Name) Applicant Signature

_____ _____

Company Name Date

JOB ADDRESS

LOCALITY

HAZARDOUS MATERIAL DECLARATION

Will the applicant or future building occupant handle a hazardous material or a mixture containing a hazardous material equal to or greater than the amount specified on the hazardous materials information guide?

Yes ☐ No ☐

Will the intended use of the building by the applicant or future building occupant require a permit for construction or modification from the South Coast Air Quality Management District (SCAQMD)? See permitting checklist for guidelines.

Yes ☐ No ☐

I have read the hazardous materials information guide and the SCAQMD permitting checklist, I understand my requirements under the Los Angeles County Code Title 2, Chapter 220 Sections 220.100 through 220.140 concerning hazardous material reporting and for obtaining a permit from the SCAQMD.

ASBESTOS NOTIFICATION

☐ Notification letter sent to AQMD and/or EPA

☐ I declare that notification of asbestos removal is not applicable to addressed project.

DECLARATION REGARDING CONSTRUCTION LENDING AGENCY

I hereby affirm under penalty of perjury that there is a Construction lending agency for the performance of the work for which this permit is issued (Section 3097, Civil Code).

Lender's Name

_____

Lender's Address

_____

By my signature below, I certify to each of the following:
I am the property owner or authorized to act on the property owner's behalf.
I have read this application and the information I have provided is correct.
I agree to comply with all applicable city and county ordinances and state laws relating to building construction.
I authorize representatives of this county to enter the above-identified property for inspection purposes.

Signature of Property Owner or Authorized Agent

Dan May

Date 1-29-13

CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix E
EDR Sanborn Map Report

29053 Coolidge Ave

29053 Coolidge Ave

Castaic, CA 91384

Inquiry Number: 5037804.3

August 30, 2017

Certified Sanborn® Map Report

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

Certified Sanborn® Map Report

08/30/17

Site Name:

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384
EDR Inquiry # 5037804.3

Client Name:

Citadel Environmental Services
111 North Market Street
San Jose, CA 95110-0000
Contact: Roopal Jani

The Sanborn Library has been searched by EDR and maps covering the target property location as provided by Citadel Environmental Services were identified for the years listed below. The Sanborn Library is the largest, most complete collection of fire insurance maps. The collection includes maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow, and others. Only Environmental Data Resources Inc. (EDR) is authorized to grant rights for commercial reproduction of maps by the Sanborn Library LLC, the copyright holder for the collection. Results can be authenticated by visiting www.edrnet.com/sanborn.

The Sanborn Library is continually enhanced with newly identified map archives. This report accesses all maps in the collection as of the day this report was generated.

Certified Sanborn Results:

Certification # 1E4E-40BB-8375

PO # 1158.1001

Project Phase I ESA

UNMAPPED PROPERTY

This report certifies that the complete holdings of the Sanborn Library, LLC collection have been searched based on client supplied target property information, and fire insurance maps covering the target property were not found.

Sanborn® Library search results

Certification #: 1E4E-40BB-8375

The Sanborn Library includes more than 1.2 million fire insurance maps from Sanborn, Bromley, Perris & Browne, Hopkins, Barlow and others which track historical property usage in approximately 12,000 American cities and towns. Collections searched:

- ☑ Library of Congress
- ☑ University Publications of America
- ☑ EDR Private Collection

The Sanborn Library LLC Since 1866™

Limited Permission To Make Copies

Citadel Environmental Services (the client) is permitted to make up to FIVE photocopies of this Sanborn Map transmittal and each fire insurance map accompanying this report solely for the limited use of its customer. No one other than the client is authorized to make copies. Upon request made directly to an EDR Account Executive, the client may be permitted to make a limited number of additional photocopies. This permission is conditioned upon compliance by the client, its customer and their agents with EDR's copyright policy; a copy of which is available upon request.

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CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix F
EDR City Directory Abstract

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384

Inquiry Number: 5037804.5
September 05, 2017

The EDR-City Directory Image Report

Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION

Executive Summary

Findings

City Directory Images

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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This Report contains certain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, Inc. It cannot be concluded from this Report that coverage information for the target and surrounding properties does not exist from other sources. **NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL ENVIRONMENTAL DATA RESOURCES, INC. BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OR DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES. ANY LIABILITY ON THE PART OF ENVIRONMENTAL DATA RESOURCES, INC. IS STRICTLY LIMITED TO A REFUND OF THE AMOUNT PAID FOR THIS REPORT.** Purchaser accepts this Report "AS IS". Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction orforecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. Additionally, the information provided in this Report is not to be construed as legal advice.

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EXECUTIVE SUMMARY

DESCRIPTION

Environmental Data Resources, Inc.'s (EDR) City Directory Report is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDR's City Directory Report includes a search of available city directory data at 5 year intervals.

RESEARCH SUMMARY

The following research sources were consulted in the preparation of this report. A check mark indicates where information was identified in the source and provided in this report.

Year	*Target Street*	*Cross Street*	*Source*
2013	☑	☑	Cole Information Services
2008	☑	☑	Cole Information Services
2003	☑	☐	Cole Information Services
1999	☑	☐	Cole Information Services
1995	☑	☐	Cole Information Services
1992	☑	☐	Cole Information Services
1985	☑	☐	Haines Criss-Cross Directory
1980	☑	☐	Haines Criss-Cross Directory
1975	☑	☐	Haines Criss-Cross Directory
1971	☐	☐	Haines Criss-Cross Directory

RECORD SOURCES

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FINDINGS

TARGET PROPERTY STREET

29053 Coolidge Ave
Castaic, CA 91384

Year	*CD Image*	*Source*	
COOLIDGE AVE			
2013	pg A2	Cole Information Services	
2008	pg A4	Cole Information Services	
2003	pg A5	Cole Information Services	
1999	pg A6	Cole Information Services	
1995	pg A7	Cole Information Services	
1992	pg A8	Cole Information Services	
1985	pg A9	Haines Criss-Cross Directory	
1980	pg A10	Haines Criss-Cross Directory	
1975	pg A11	Haines Criss-Cross Directory	
1971	-	Haines Criss-Cross Directory	Street not listed in Source

FINDINGS

CROSS STREETS

Year	*CD Image*	*Source*	
AVENUE PENN			
2013	pg. A1	Cole Information Services	
2008	pg. A3	Cole Information Services	
2003	-	Cole Information Services	Street not listed in Source
1999	-	Cole Information Services	Street not listed in Source
1995	-	Cole Information Services	Street not listed in Source
1992	-	Cole Information Services	Street not listed in Source
1985	-	Haines Criss-Cross Directory	Street not listed in Source
1980	-	Haines Criss-Cross Directory	Street not listed in Source
1975	-	Haines Criss-Cross Directory	Street not listed in Source
1971	-	Haines Criss-Cross Directory	Street not listed in Source

City Directory Images

Target Street	Cross Street	Source
-	✓	Cole Information Services

AVENUE PENN 2013

28910	DCE ELECTRICAL CONTRACTORS
	ELVIN ROSS STUDIO
	GEO X CONSULTANTS INC
	SUNMED USA LLC
	TEA GARDENS THE
28920	SYSTEMS PERFORMANCE GROUP INC
28965	CURTISS WRIGHT CONTROLS ELECTRONIC S
	VISTA CONTROLS
29005	IMAGE FACTOR
29009	K C B
29013	LIEF ORGANICS
29017	MOTRAN INDUSTRIES INC
29025	LORAC COSMETICS INC
29045	PENN ENGINEERING COMPONENTS
29057	M & J PRODUCTS
29069	KOITO AVIATION LLC
29089	SERENGETI ENTERPRISES INC
29095	HOT RODS BY TRI C
29151	LA TURBINE
29170	H & H MACHINE CENTER INC
	JRL ELECTRIC SUPPLY INC

Target Street	Cross Street	Source
✓	-	Cole Information Services

COOLIDGE AVE 2013

29053 HUNT WILLIAMS

Target Street	Cross Street	Source
-	✓	Cole Information Services

AVENUE PENN 2008

28915 B & M TRUCK REPAIR
28965 VISTA CONTROLS INC
29005 IMAGE FACTOR
29009 K C B PRECISION
29013 ECOXERRA
29021 ME BENITES INTERNATIONAL INC
SANCHEZ BENITES ASSOCIATES LLC
29045 STELLAR MICROELECTRONICS INC
29077 POSTAGE ONE

Target Street	Cross Street	Source
✓	-	Cole Information Services

COOLIDGE AVE 2008

29053 HUNT WILLIAMS

Target Street	Cross Street	Source
✓	-	Cole Information Services

COOLIDGE AVE 2003

29053 OCCUPANT UNKNOWN

Target Street	Cross Street	Source
✓	-	Cole Information Services

COOLIDGE AVE 1999

29053 HUNT WILLIAMS

Target Street	Cross Street	Source
✓	-	Cole Information Services

COOLIDGE AVE 1995

29053 CASTLE, RUTH D

Target Street	Cross Street	Source
✓	-	Cole Information Services

COOLIDGE AVE 1992

29053 CASTLE, RUTH D

Target Street	Cross Street	Source
✓	-	Haines Criss-Cross Directory

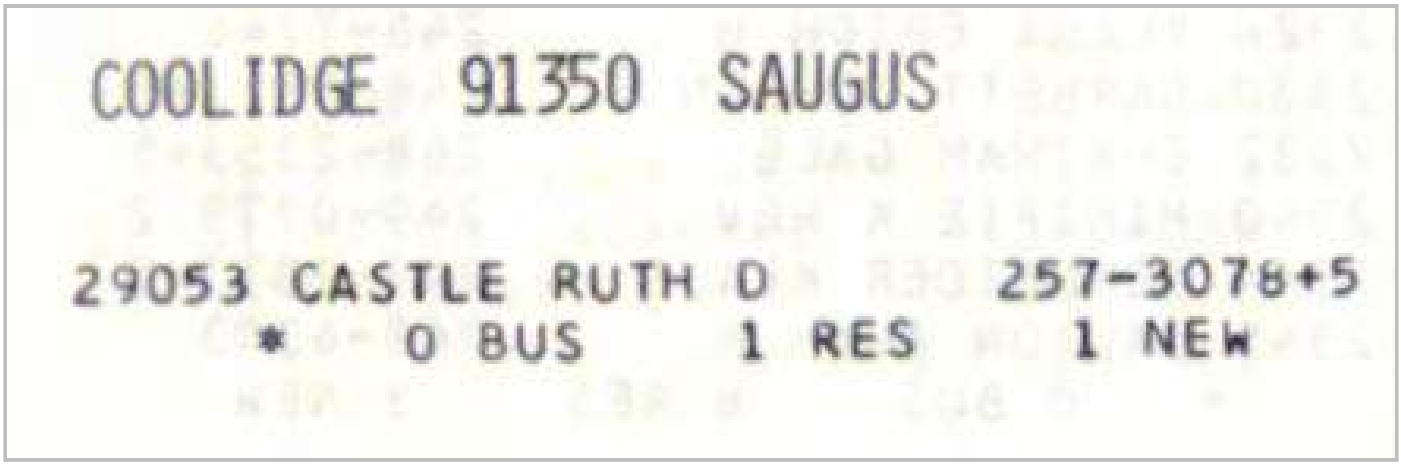
COOLIDGE AVE 1985

Target Street	Cross Street	Source
✓	-	Haines Criss-Cross Directory

COOLIDGE AVE 1980

Target Street	Cross Street	Source
✓	-	Haines Criss-Cross Directory

COOLIDGE AVE 1975



COOLIDGE 91350 SAUGUS

29053 CASTLE RUTH D 257-3078+5
* 0 BUS 1 RES 1 NEW

CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix G
Client-Supplied Documents

Converse Consultants
Over 50 Years of Dedication in Geotechnical Engineering and Environmental Sciences

Phase I Environmental Site Assessment Report

Sterling Gateway Property
Western Parcel
Approximate 118.4-Acres
Val Verde Park, California

PREPARED FOR

East West Bank
407 West Valley Boulevard
Alhambra, California 91803

Converse Project No. 04-41-125-01
February 18, 2004

222 East Huntington Drive, Suite 211, Monrovia, California 91016-3500
Telephone: (626) 930-1200 ♦ Facsimile: (626) 930-1212 ♦ e-mail: converse@converseconsultants.com

Converse Consultants
Over 50 Years of Dedication in Geotechnical Engineering and Environmental Sciences

February 18, 2004

Mr. Robert Bihr
East West Bank
407 West Valley Boulevard
Alhambra, California 91803

Subject: **PHASE I ENVIRONMENTAL SITE ASSESSMENT REPORT**
Sterling Gateway Property
Western Parcel
Approximate 118.4-Acres
Val Verde Park, California
Converse Project No. 04-41-125-01

Mr. Bihr:

Converse Consultants (Converse) is pleased to submit the attached report that summarizes the activities and the results of a Phase I Environmental Site Assessment (Phase I ESA) that was conducted at the referenced property (Property).

We appreciate the opportunity to be of service to you. If you should have any questions or comments regarding this report, please contact either Laura Tanaka at (626)-930-1261 or Norman Eke at (626) 930-1260.

CONVERSE CONSULTANTS

Maggie Tymkow
Sr. Staff Environmental Scientist

Laura Tanaka
Senior Environmental Scientist

Norman S. Eke
Managing Officer

Dist.: email

222 East Huntington Drive, Suite 211, Monrovia, California 91016-3500
Telephone: (626) 930-1200 ♦ Facsimile: (626) 930-1212 ♦ e-mail: converse@converseconsultants.com

Table of Contents

Page

EXECUTIVE SUMMARY III

1.0 INTRODUCTION 1

1.1 Purpose and Scope of Work 1

1.2 Non-Scope Considerations 1

1.3 Significant Assumptions 1

1.4 Limitations and Exceptions 2

1.5 Reliance 2

2.0 PROPERTY DESCRIPTION 3

2.1 Current Uses of the Property and General Characteristics 3

2.2 Location and Legal Description 3

2.3 Description of Property Structure(s) 3

2.4 Current Uses of Adjoining Properties 3

2.5 General Vicinity Description 4

3.0 USER/OWNER PROVIDED INFORMATION 5

3.1 Requested Documents and Information 5

3.2 User Provided Information 5

4.0 RECORDS REVIEW 7

4.1 Physical Setting 7

4.1.1 Geology 7

4.1.2 Groundwater 7

4.1.3 Potable Water Supplier 7

4.2 Historical Review 7

4.2.1. Aerial Photograph and Map Review 7

4.2.2 Building Permit Review 9

4.2.3 Zoning and Land Use Records 9

4.3 Environmental Database Review 9

4.4 Additional Environmental Record Sources 12

4.4.1 Division of Oil and Gas (DOG) 12

4.4.2 California State Fire Marshall (CSFM), Pipeline Safety Division 13
4.4.3 South Coast Air Quality Management District (SCAQMD) 13
4.4.4 Los Angeles Regional Water Quality Control Board (RWQCB), Underground Storage Tank (UST) and Well Investigation Program (WIP) . 13
4.4.5 Los Angeles County, Department of Health Services (DHS), Public Health Investigation 13
4.4.6 Los Angeles City County Department of Public Works (DPW), Environmental Programs 13
4.4.7 Los Angeles County, Sanitation Districts (LACSD) 13

5.0 SITE RECONNAISSANCE 14
5.1 Methodology 14
5.2 Limiting Conditions 14
5.3 Interior Observations 14
5.4 Exterior Observations 14

6.0 INTERVIEWS 16

7.0 FINDINGS 17

8.0 OPINIONS AND CONCLUSIONS 18

9.0 DEVIATIONS 19

10.0 ADDITIONAL NON-SCOPE SERVICES 20

11.0 REFERENCES 21

12.0 LIST OF PREPARERS 22

APPENDIX A – Property Plan
APPENDIX B – Pertinent Property Photographs
APPENDIX C – EDR-Radius Map Report
APPENDIX D– DOG Documents

Table 1 – Development of Adjoining Properties
Table 2 – Historical Aerial Photograph and Map Review Summary
Table 3 – Exterior Observations

Executive Summary

The following is an Executive Summary of the Phase I Environmental Site Assessment (Phase I ESA) that was conducted by Converse Consultants (Converse). Please refer to the appropriate sections of the report for a complete discussion of these issues. In the event of a conflict between this Executive Summary and the report, or an omission in the Executive Summary, the report shall prevail.

This report presents the results of the Converse Consultants (Converse) Phase I Environmental Site Assessment (ESA) performed at the approximate 118.4-acre Sterling Gateway Property/Western Parcel located adjacent to the City of Santa Clarita, Los Angeles County, California, referred to as the Property in this report. Converse was retained by East West Bank to conduct this Phase I ESA. Our study has been conducted in order to identify, to the extent feasible, Recognized Environmental Conditions (RECs) in connection with the Property.

Converse has compiled and reviewed information that was obtained from interviews, document research, and on-site and area reconnaissance to identify potential environmental conditions at the Property, in conformance with *the American Society of Testing and Materials (ASTM) Standard E: 1527-00 Environmental Site Assessment Standard Practice* (*ASTM Standard: E 1527-00*). This Phase I ESA was conducted during the period of February 4 through February 18, 2003.

The subject Property (herein referred to as Property) is located southwest of the Hasley Canyon Road and Del Valle Road intersection, adjacent to the City of Santa Clarita, Los Angeles County, California. The Property is located approximately 2-miles west of Interstate 5 (Santa Ana Freeway). The Property is an irregular-shaped parcel at approximately 118.4-acres. A single-family residential dwelling (29053 Coolidge Avenue) is located on the southwestern portion of the Property. The remaining of the Property is compromised of valleys and ridges covered with low-lying natural vegetation. Several unimproved roads cross the Property.

The general vicinity is characterized by oil production, residential properties, and undeveloped land.

- According to the DOGGR, Map 253, Hasley Canyon Field, one (1) plugged and abandoned dry-hole is located on the Property. This well never produced oil or gas and was abandoned in 1923. No other information regarding the well was available at DOGGR.

  The plugged and abandoned dry-hole should located and reabandoned to current DOGGR requirements. Assessment for historic sumps, boneyards, etc. should be completed.

- The Property (29053 ½ Coolidge Avenue) was listed on the HAZNET database in the EDR report as a Clandestine drug lab. Mr. Williams was not aware that this address was listed as a drug lab operator site and stated that no such activity took place on the Property under his ownership.

  Converse recommends the residential dwelling and associated structures be accessed and assessed. If the structures are to be demolished, asbestos and lead-base paint surveys should be conducted.

Based on the above information, there appears to be a potential for environmental impact to the Property from historical use. Further assessment as noted above appears warranted.

Information has been requested from the CSFM and LACSD. Upon receipt and review, an addendum will be issued if items of concern are noted. In addition, any conclusions and recommendations will be modified accordingly.

1.0 Introduction

1.1 Purpose and Scope of Work

This report presents the results of the Converse Consultants (Converse) Phase I Environmental Site Assessment (ESA) performed at the approximate 118.4-acre Sterling Gateway Property/Western Parcel located adjacent to the City of Santa Clarita, Los Angeles County, California, referred to as the Property in this report. Converse was retained by East West Bank to conduct this Phase I ESA. Our study has been conducted in order to identify, to the extent feasible, Recognized Environmental Conditions (RECs) in connection with the Property. The term Recognized Environmental Conditions is defined in section 1.1.1 of the ASTM Standard Practice as the *presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, past release, or material threat of a release into structures on the property or into the ground, ground water or surface water of the property.*

The work was completed by environmental professionals and has been performed in accordance with our Confirmation of Services dated January 27, 2004. Our work consisted of the following and was completed in general conformance with the scope and limitations of the ASTM Practice E 1527-00:

- Interviews with the property owner representatives
- Property and vicinity reconnaissance
- Review of regulatory agency records
- Description of physical setting
- Historical review
- Interviews with public agency personnel
- Preparation of this report

1.2 Non-Scope Considerations

Business Environmental Risk (BER) considerations, aside from the Innocent Landowners Defense issues, which are addressed by ASTM 1527-00, are considered non-scope considerations (ASTM 1527-00, Section 12). Non-scope issues are not addressed in this report.

1.3 Significant Assumptions

No significant assumptions were made during this assessment.

1.4 Limitations and Exceptions

The residential dwelling and associated structures on the Property were not accessed during this assessment.

1.5 Reliance

This report is for the sole benefit and exclusive use of East West Bank, in accordance with the terms and conditions attached to our proposal under which these services have been provided. Its preparation has been in accordance with generally accepted environmental practices. No other warranty, either expressed or implied, is made. This report should not be regarded as a guarantee that no further contamination beyond that which could be detected within the scope of this assessment is present at the Property.

The conclusions and recommendations presented in this report are based on the agreed upon scope of work. Converse makes no warranties or guarantees as to the accuracy or completeness of information provided or compiled by others. It is possible that information exists beyond the scope of this assessment. It is not possible to absolutely confirm that no hazardous materials and/or substances exist at the subject site. If none are identified as part of a limited scope of work, such a conclusion should not be construed as a guaranteed absence of such materials, but merely the results of the evaluation. Also, events may occur after the Property visit, which may result in contamination of the Property. Additional information, which was not found or available to Converse at the time of report preparation, may result in a modification of the conclusions and recommendations presented. Any reliance on this report by Third Parties shall be at the Third Party's sole risk.

2.0 Property Description

2.1 Current Uses of the Property and General Characteristics

The subject Property (herein referred to as Property) is an irregular-shaped parcel consisting of approximate 118.4-acres. A single-family residential dwelling (29053 Coolidge Avenue) is located on the southwestern portion of the Property. The remaining areas of the Property are compromised of valleys and ridges covered with low-lying natural vegetation. Several unimproved roads cross the Property.

A Property location map and a field generated Property plan are provided in Appendix A. Pertinent Property photographs are provided in Appendix B.

2.2 Location and Legal Description

The Property is located southwest of the Hasley Canyon Road and Del Valle Road intersection, adjacent to the City of Santa Clarita, Los Angeles County, California. The Property is located approximately 2-miles west of Interstate 5 (Santa Ana Freeway).

The Assessor's Parcel Number (APN) for the Property is 3271-004-003 and 3271-004-004. The legal description for the Property is: Tract 8599, Lot A, at the Recorder of Los Angeles County.

2.3 Description of Property Structure(s)

A single-family residential dwelling (29053 Coolidge Avenue) with an associated garage and shed were observed in the southwestern portion of the Property. Access to these structures was not gained during the Property reconnaissance.

2.4 Current Uses of Adjoining Properties

Based on our research and observations during our Property visit, the Property is bordered by the following:

Table 1 – Development of Adjoining Properties

Direction	Current Development
North:	Undeveloped land

Direction	Current Development
Northeast:	Undeveloped land
Northwest:	Undeveloped land
South:	Residential properties
Southeast:	Undeveloped land
Southwest:	Residential properties
East:	Undeveloped land
West:	Undeveloped land and residential properties

2.5 General Vicinity Description

The general vicinity is characterized by oil production, residential properties, and undeveloped land.

3.0 User/Owner Provided Information

3.1 Requested Documents and Information

The ASTM E1527 specifies that the Property owner, key site manager and the User provide any helpful documents that may be available. In order to facilitate, and document, the collection of this information, Converse has prepared a form titled Client/User/Owner Provided Information. Converse requested that the User complete the form and requested the assistance of the Property owner, Mr. Hunt Williams, in completing the form.

The following documents and information were requested from East West Bank, and from Mr. Hunt Williams. Both parties had no information regarding the following:

- Environmental site assessment or audit reports
- Environmental permits or hazardous waste generator notices/reports
- Registrations for Aboveground and underground storage tanks
- Septic systems, oil wells, or water wells
- Community Right to Know Plans; or Safety, Preparedness and prevention Plans; Spill Protection Countermeasures and Control Plans
- Reports regarding Hydrologic conditions on the Property or surrounding area
- Notices or Other Correspondence form any government agency relating to past or current violations of environmental laws with respect to the property or relating to environmental liens encumbering the property.
- Hazardous waste generator notices or reports
- Geotechnical Studies
- Proceedings regarding hazardous substances and petroleum products including any pending, threatened or past: litigation; administrative proceedings; or notices form any governmental entity regarding possible violations of environmental laws or other possible liability related to hazardous substances or petroleum products.

3.2 User Provided Information

The ASTM E1527 outlines specific User responsibilities. This information will help identify the possibility of RECs in connection with the Property. These tasks do not require the technical expertise of an Environmental Professional and are generally not performed by environmental professionals performing a Phase I ESA. The User may perform them. In general, the User should make Converse aware of information they have regarding the following:

- Checking title records for environmental liens

- Specialized knowledge or experience of the User
- Reason for significantly lower purchase price
- Purpose of Phase I ESA if other than to qualify for Innocent Landowner Defense

No specific information regarding the above issues was provided to Converse by the User.

4.0 Records Review

4.1 Physical Setting

4.1.1 Geology

The Property is located between 1,300 and 1,380 feet above mean sea level with surface topography sloping to the southwest (United States Geological Survey [USGS] Topographic Map, Val Verde Quadrangle, 1965 photorevised 1981, California,). The Property is underlain by unconsolidated and semi-consolidated alluvium, lake, playa, and terrace deposits (Division of Mines and Geology, Geologic Map of California, 1991).

4.1.2 Groundwater

The nearest groundwater well to the Property is located approximately 2.5-miles southeast of the Property, at the intersection of Old Road and Henry Mayo Drive. Los Angeles County, Department of Public Works (DPW) well number 4459 was last measured on November 10, 2003. At that time, the depth to groundwater was recorded at 26.1-feet below ground surface. The surface elevation was recorded at 985.8-feet above mean sea level.

According to the DPW Santa Clarita Valley Groundwater Contours Map for Fall 1998, the groundwater level at the Property is 335-feet below mean sea level. The groundwater flow direction is to the southwest.

4.1.3 Potable Water Supplier

There is currently no potable water supplied to the Property.

4.2 Historical Review

4.2.1. Aerial Photograph and Map Review

Available historical aerial photographs from the Fairchild Aerial Photography Collection were reviewed at Whittier College. The years of the photographs reviewed are as follows: 1928-29, 1930, 6-25-40, 5-1952, 2-1956, and 1957.

Historical Sanborn Fire Insurance (Sanborn) map coverage of the Property was requested from Environmental Data Resources (EDR), Inc. According to EDR, there is no Sanborn coverage of the Property.

Topographic maps of the Val Verde Quadrangle, which are published by the USGS, were reviewed. The topographic maps were dated 1916, 1947, 1952, 1969, 1988, 1991, and 1995.

A chronological summary of the aerial photographs and map review is provided in Table 2.

Table 2 – Historical Aerial Photograph and Map Review Summary

Date	Reference	Observations
1916 1928-29 Flight # C-300 : 48 1930 Flight # C-101 : 77	Topographic Map Aerial Photographs	The Property appeared to be undeveloped land with a few unimproved roads and a square concrete pad on the southwestern portion. Del Valle Road appeared to be crossing the eastern portion of the Property. The adjacent properties appeared to be undeveloped land. The general vicinity appeared to be undeveloped land.
6-25-40 Flight # C-6500 : 10 1947	Aerial Photograph Topographic Map	The Property appeared to be improved with a small structure and a concrete pad on the southwestern portion. The remaining areas of the Property appeared to be undeveloped land with a few unimproved roads. Del Valle Road appeared to be crossing the eastern portion of the Property. The north and east adjacent properties appeared to be undeveloped land. The south and west adjacent properties appeared to be improved with scattered residential properties. The general vicinity appeared to be undeveloped land, and scattered structures.
1952 5-1952 Flight # C-17727 : 59 2-1956 Flight # C-22402 : 21 1957 Flight # C-22926 : 101 1969 1988 1991 1995	Topographic Map Aerial Photographs Topographic Maps	The Property appeared to be improved with a two (2) small structures and a concrete pad on the southwestern portion. The remaining of the Property appeared to be undeveloped land with a few unimproved roads. Del Valle Road appeared to be crossing the eastern portion of the Property. The north and east adjacent properties appeared to be undeveloped land. The south and west adjacent properties appeared to be improved with residential properties. The general vicinity appeared to be land covered with shrubs, undeveloped land, and scattered structures.

4.2.2 Building Permit Review

Building permits for 29053 Coolidge Avenue were requested from the County of Los Angeles, Department of Public Works (DPW), Building and Safety Department, Santa Clarita Division. Only one permit was on file. According to the County information, a building permit to remove two (2) rooms and roof repair was issued to R. T. G. Dow on May 6, 1954.

4.2.3 Zoning and Land Use Records

The Property is currently zoned as agricultural (A-1).

4.3 Environmental Database Review

An Environmental Data Resources (EDR) report of Standard Environmental Record Sources (Records) was prepared specifically for the Property. The search radii were expanded by ½ or 1-mile. The complete EDR report is provided in Appendix C, EDR-Radius Map Report.

The Property, identified as Clandestine Drug Lab Operator, 29053 ½ Coolidge Avenue (Map ID No. 1), was reported to be in the California Environmental Protection Agency (Cal EPA), Hazardous Waste Information System (HAZNET) – Database of sites, which submit a hazardous waste manifest to the DTSC. The Property generated laboratory waste chemicals. The disposal method was identified as transfer station.

Other off-site locations of concern identified by EDR within a maximum 1/2-mile radius from the Property are as follows:

- Environmental Protection Agency (EPA), National Priority List (NPL) – The NPL is a listing of uncontrolled or abandoned hazardous waste sites that have been targeted for possible long-term remedial action under the Superfund Act. No NPL sites were identified within a 2-mile radius of the Property.

- EPA, Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) – A list of sites that are either proposed or on the NPL, and sites that are in the screening and assessment phase for possible inclusion on the NPL. No CERCLIS sites were identified within a 2-mile radius of the Property.

- EPA, Corrective Action Report (CORRACTS) – List of facilities undergoing "corrective action." Corrective actions may be required beyond the facility's boundary and can be required regardless of when the release

occurred. No CORRACTS sites were identified within a 2-mile radius of the Property:

- EPA, Resource Conservation and Recovery Information System (RCRIS) Transport, Store, Treat (TSD) Facilities – Information on sites that generate, transport, store, treat and/or dispose of hazardous waste. No sites were identified within a 2-mile radius of the Property.

- EPA, RCRIS Small and Large Quantity Generators – Database that lists facilities that generate, store, transport, treat, or dispose of hazardous waste. Large quantity facilities generated at least 1,000 kilograms per month of non-acutely hazardous waste or one kilogram per month of acutely hazardous waste. No large quantity generator sites were identified within a 3/4-mile radius of the Property.

  Small quantity facilities generate less than 1,000 kilograms per month of non-acutely hazardous waste. The following small quantity generator was identified within a 3/4-mile radius of the Property:

  - Kimball Microelectronics, 28575 Livingston Avenue (Map ID No. 2)

  The potential for impact to the Property from the RCRIS-SQG site appears to be low due to type of regulatory listing.

- Cal EPA, Annual Workplan (AWP) – Identifies known hazardous substance sites targeted for cleanup. No sites were identified within a 2-mile radius of the Property.

- Department of Toxic Substances Control (DTSC) Cal-Sites - Database of potential or confirmed hazardous substance release properties. No sites were identified within a 2-mile radius of the Property.

- State Water Quality Control Board, CORTESE - Database of sites that have been identified as LUST, landfills, or Cal-Sites. The following CORTESE sites were identified within a 1-mile radius of the Property.

  - LA County Fire Department, 28101 Chiquito Canyon Road (Map ID No. B6)
  - Newhall Land & Farming, 3003 Walnut Orchard Road (Map ID No. 13)

  The potential for environmental impact from the CORTESE sites appears to be low due one or more of the following: status of case, involvement of a regulatory agency, type of resource affected, identification of the responsible party, location with respect to the direction of regional groundwater flow, and/or distance.

- State Water Resources Control Board, Toxic Pits – Identifies sites suspected of containing hazardous substances where cleanup has not yet been completed. No sites were identified within a 2-mile radius of the Property.

- Solid Waste Facilities/Landfill Sites (SWF/LF) records from the Integrated Waste Management Board, Solid Waste Information System (SWIS) – Database of active and inactive landfills, incinerators, transfer stations, and disposal facilities. The following SWF/LF sites were identified within a 2-mile radius of the Property.

  - Laidlaw Waste Systems, 29201 Henry Mayo Drive (Map ID No. C8, C9)

  The potential for environmental impact to the Property from the SWF/LF sites appears to be low due to one or more of the following: status assigned to the case, type of resource affected, responsible party has been identified, regulatory agency is involved in remedial efforts, location with respect to the direction of regional groundwater flow, and/or distance from the Property.

- State Water Resources Control Board, Waste Management Unit Database (WMUDS/SWAT) – List which tracks and inventories waste management units. The following WMUDS/SWAT sites were identified within a 2-mile radius of the Property.

  - Universal By-Products-Valencia, 29201 Saugus-Ventura Road (Map ID No. 3, C10)

  The potential for environmental impact to the Property from the WMUDS/SWAT sites appears to be low due to one or more of the following: status assigned to the case, type of resource affected, responsible party has been identified, regulatory agency is involved in remedial efforts, location with respect to the direction of regional groundwater flow, and/or distance from the Property.

- State Water Resources Control Board (RWQCB), Leaking Underground Storage Tank (LUST) – An inventory of reported leaking underground storage tank incidents. The following LUST sites were identified within a 2-mile radius of the Property.

  - LA County Fire Department, 28101 Chiquito Canyon Road (Map ID No. B7)
  - Newhall Land & Farming, 3003 Walnut Orchard Road (Map ID No. 13)

  The potential for environmental impact to the Property from the LUST sites appears to be low due to one or more of the following: status assigned to

the case, responsible party has been identified, regulatory agency is involved in remedial efforts, type of resource affected, location with respect to the direction of regional groundwater flow, and/or distance from the Property.

- State Water Resources Control Board, Underground Storage Tanks (UST) –There are no UST sites identified within a 3/4-mile radius of the Property.

- California Facility Information Database (CA FID) – The CA FID contains active and inactive UST locations. There are no CA FID sites identified within a 3/4-mile radius of the Property.

- California Environmental Protection Agency (Cal EPA), Hazardous Waste Information System (HAZNET) – Database of sites, which submit a hazardous waste manifest to the DTSC. The following HAZNET sites are located within a 3/4-mile radius of the Property:

  - Kimball Microelectronics, 28575 Livingston Avenue (Map ID No. 2)
  - 28201 Franklin Parkway (Map ID No. A5)
  - Laidlaw Waste Systems, 29201 Henry Mayo Drive (Map ID No. C8, C9)

  The potential for environmental impact to the Property from the HAZNET sites is low due to type of regulatory listing.

4.4 Additional Environmental Record Sources

4.4.1 Division of Oil, Gas, and Geothermal Resources (DOGGR)

According to the California Department of Conservation, DOGGR, Wildcat Map W1-2, Los Angeles County, August 17, 2002, the Property is covered by Map 253.

According to California Department of Conservation, DOGGR, Map 253, Hasley Canyon Field, Los Angeles County, February 14, 2002, one (1) plugged and abandoned dry-hole is located on the Property. The DOGGR documents are provided in Appendix D. The Property is located on the edge of the Hasley Canyon Oil Field.

- Fernando Oil Company, well number 1 is located on the northwestern portion of the Property in Section 10, Township 4 North, and Range 17 West. This well was advanced in 1920 to a depth of 3,744-feet below ground surface (bgs). Small amounts of gas were visible in sand between 3,149 and 3,355-feet bgs. Small amounts of oil were visible in sand between 3,584 and 3, 690-feet

bgs. However, there was no indication that the well produced any oil or gas. In 1922, a notice of intention to abandon the well was issued. Fernando Oil Company, well number 1 was plugged with cement, steal chips, and lead wool.

4.4.2 California State Fire Marshall (CSFM), Pipeline Safety Division

Information was requested from CSFM. Upon receipt and review of the information, an addendum will be issued if items of concern are noted. In addition, any conclusions and recommendations will be modified accordingly.

4.4.3 South Coast Air Quality Management District (SCAQMD)

Information was requested from SCAQMD. Upon receipt and review of the information, an addendum will be issued if items of concern are noted. In addition, any conclusions and recommendations will be modified accordingly.

4.4.4 Los Angeles Regional Water Quality Control Board (RWQCB), Underground Storage Tank (UST) and Well Investigation Program (WIP)

There is no information on file with RWQCB regarding the Property.

4.4.5 Los Angeles County, Department of Health Services (DHS), Public Health Investigation

There is no information on file with DHS regarding the Property.

4.4.6 Los Angeles City County Department of Public Works (DPW), Environmental Programs

There is no information on file with DPW regarding the Property.

4.4.7 Los Angeles County Sanitation Districts

Information was requested from Sanitation Districts. Upon receipt and review of the information, an addendum will be issued if items of concern are noted. In addition, any conclusions and recommendations will be modified accordingly.

5.0 Property Reconnaissance

5.1 Methodology

On Tuesday, January 10, 2004, Converse visited the Property to evaluate present use and environmental conditions at the Property. Our methodology involved walking and driving the perimeter while noting observed evidence of present and potential environmental concerns. A field-generated map is provided in Appendix A. Pertinent property photographs are provided in Appendix B.

5.2 Limiting Conditions

Converse's findings are based on the Property conditions observed on Tuesday, January 10, 2004.

The residential dwelling and associated structures on the Property were not accessed during this assessment.

5.3 Interior Observations

No interior observations were made of the residential dwelling or the associated structures.

5.4 Exterior Observations

During our Property visit, Converse made the following observations of the exterior of the Property:

Table 3 – Exterior Observations

Item or Condition	Observed Evidence	No Evidence Observed	Comments
Hazardous Substances & Petroleum Products:	☐	☒	
Storage Tanks & Related Equipment:	☐	☒	
Odors:	☐	☒	
Standing Surface Water	☐	☒	

Item or Condition	Observed Evidence	No Evidence Observed	Comments
or Other Pools of Liquid:			
Drums & Other Containers of Hazardous Substances, Petroleum Products, or Other Unidentified Contents:	☐	☒	
Transformers or Equipment containing Polychlorinated Biphenyls (PCBs):	☐	☒	
Pits, Ponds, or Lagoons:	☐	☒	
Stained Soil or Pavement:	☐	☒	
Stressed Vegetation (other than from insufficient water):	☐	☒	
Evidence of Mounds, Depressions or Filled or Graded Areas Suggesting Trash or Other Solid Waste Disposal:	☐	☒	
Waste Water or any discharge (including storm water) into a Drain, Ditch, or Stream on or Adjacent to the Property:	☐	☒	
Wells (active, inactive, or abandoned):	☐	☒	
Septic Systems or Cesspools:	☐	☒	
Drains and Sumps:	☐	☒	
Prior Structures:	☐	☒	
Roads, Tracks, Railroad Tracks or Spurs:	☐	☒	

6.0 Interviews

During the interviews, the owner was asked if he had any available documents that would be helpful. The documents that were requested are detailed in Section 3.1, Requested Documents and Information.

On February 16, 2004, Mr. Hunt Williams was interviewed regarding his knowledge of past and present uses and/or problems at the Property. Mr. Williams was unaware or had no information regarding the items identified in Section 3.1, Requested Documents and Information. According to Mr. Williams, his family has owned the Property since the early 1950s and to the best of his knowledge the Property was undeveloped. The Property is proposed to be developed as single-family residential dwellings. Mr. Williams stated that the 29053 Coolidge Avenue, single-family residential dwelling was purchased by him eight years ago, remodeled, and is used as a rental property. Mr. Williams was not aware that this address was listed as a drug lab operator site and stated that no such activity took place on the Property under his ownership.

7.0 Findings

A cursory summary of findings is provided below. Details are not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein.

- According to the DOGGR, Wildcat Map W1-2, Los Angeles County, August 17, 2002, one (1) plugged and abandoned dry-hole is located on the Property. This well never produced oil or gas and was abandoned in 1923. No other information regarding the well was available at DOGGR.

- The Property was listed on the HAZNET database in the EDR report as a Clandestine drug lab.

8.0 Opinions and Conclusions

Converse has performed a Phase I Environmental Site Assessment in general conformance with the scope and limitations of ASTM Practice E 1527 for the approximate 118.4-acre Sterling Gateway Property/Western Parcel located adjacent to the City of Santa Clarita, Los Angeles County, California. Any exceptions to or deletions from this practice are described in the Limitations and Exceptions of Assessment section of this report. This assessment has revealed no evidence of recognized environmental conditions in connection with the Property except for the following:

- According to the DOGGR, Map 253, Hasley Canyon Field, one (1) plugged and abandoned dry-hole is located on the Property. This well never produced oil or gas and was abandoned in 1923. No other information regarding the well was available at DOGGR.

  The plugged and abandoned dry-hole should located and reabandoned to current DOGGR requirements. Assessment for historic sumps, boneyards, etc. should be completed.

- The Property (29053 ½ Coolidge Avenue) was listed on the HAZNET database in the EDR report as a Clandestine drug lab. Mr. Williams was not aware that this address was listed as a drug lab operator site and stated that no such activity took place on the Property under his ownership.

  Converse recommends the residential dwelling and associated structures be accessed and assessed. If the structures are to be demolished, asbestos and lead-base paint surveys should be conducted.

Based on the above information, there appears to be a potential for environmental impact to the Property from historical use. Further assessment as noted above appears warranted.

Information has been requested from the CSFM and LACSD. Upon receipt and review, an addendum will be issued if items of concern are noted. In addition, any conclusions and recommendations will be modified accordingly.

9.0 Deviations

No deviations or deletions from the ASTM standard Practice were addressed in this report.

10.0 Additional Non-Scope Services

There are environmental issues outside the scope of the ASTM E1527-00 that can be assessed in connection with a commercial real estate transaction. These are dealt with as non-scope considerations since they do not typically present a Superfund Liability. The specific level of inquiry (if any) is defined in the proposal, which contains a Scope of Work. These non-scope services are very client specific and not covered by the ASTM standard. They are frequently related to the business environmental risk which is defined in the ASTM standard as “risk which can have a material environmental or environmentally-driven impact on the business associated with the current or planned use of a parcel of commercial real estate’’

No non-scope issues were addressed in this report.

11.0 References

California Department of Conservation, Division of Mines and Geology, Geologic Map of California, 1991.

California Department of Conservation, Division of Oil and Gas, Wildcat Map W1-2, Los Angeles County, August 17, 2002.

California Department of Conservation, DOG, Map 253, Hasley Canyon Field, Los Angeles County, February 14, 2002.

California State Fire Marshall, Request For Information, February 2004.

County of Los Angeles, Department of Public Works, Building and Safety Department, Building Permit Review, February 2004.

Environmental Data Resources (EDR), Inc., EDR-Radius Map Report, , February 2004.

Environmental Data Resources (EDR), Inc., Sanborn Map Request, , February 2004.

Fairchild Aerial Photograph Collection, Whittier College, Aerial Photograph Review, , February 2004.

Los Angeles County, Department of Health Services, Public Health Investigation, Request for Information, , February 2004.

Los Angeles County, Department of Public Works, Environmental Programs, Information Request, , February 2004.

Los Angeles County, Department of Public Works, Hydrologic Records, Personal Communication, , February 2004.

Regional Water Quality Control Board, Los Angeles Region, Request For Information, , February 2004.

South Coast Air Quality Management District, Request for Information, , February 2004.

United States Geological Survey, 7.5-Minute Topographic Quadrangle, Val Verde Quadrangle, 1965 Photorevised 1981.

Williams, Hunt, Personal Communication, February 2004.

12.0 List of Preparers

Norman S. Eke
Senior Vice President/Managing Officer

B.A., Liberal Studies, Environmental Studies Emphasis, University of California, Santa Barbara, 1988.
Cal-EPA Registered Environmental Assessor, #05654
Cal-OSHA Certified Asbestos Consultant, #96-2093

Managing Officer of the southern California environmental offices of Converse Consultants. Mr. Eke has 14 years of experience of conducting Phase I & II Environmental Site Assessments, asbestos surveys, emergency response, hazardous waste transportation, and hazardous materials management. Current duties include technical review and approval of reports.

Principal area of responsibility for this ESA report: Quality Control and Technical Review.

Laura Tanaka
Senior Environmental Scientist

B.S., Biology, California State Polytechnic university, Pomona, 1987
Cal-EPA Registered Environmental Assessor, #06283
Cal-OSHA Site Surveillance Technician, #94-1388
DHS Certified Lead Inspector/Assessor, #I-3086
DHS Certified Project Designer, D-3086
DHS Certified Project Monitor, M-3086

Manager of the Phase I Environmental Site Assessment department. Ms. Tanaka has 13 years experience in the conducting Phase I ESAs, asbestos surveys, lead-based paint surveys, as well as hazardous material audits, completing business plans, and AQMD permitting. Current duties at Converse include project management, business development, and conducting/managing ESAs.

Principal area of responsibility for this ESA report: Project Management, Client Point of Contact, Report Review.

Maggie Tymkow

Senior Staff Environmental Scientist

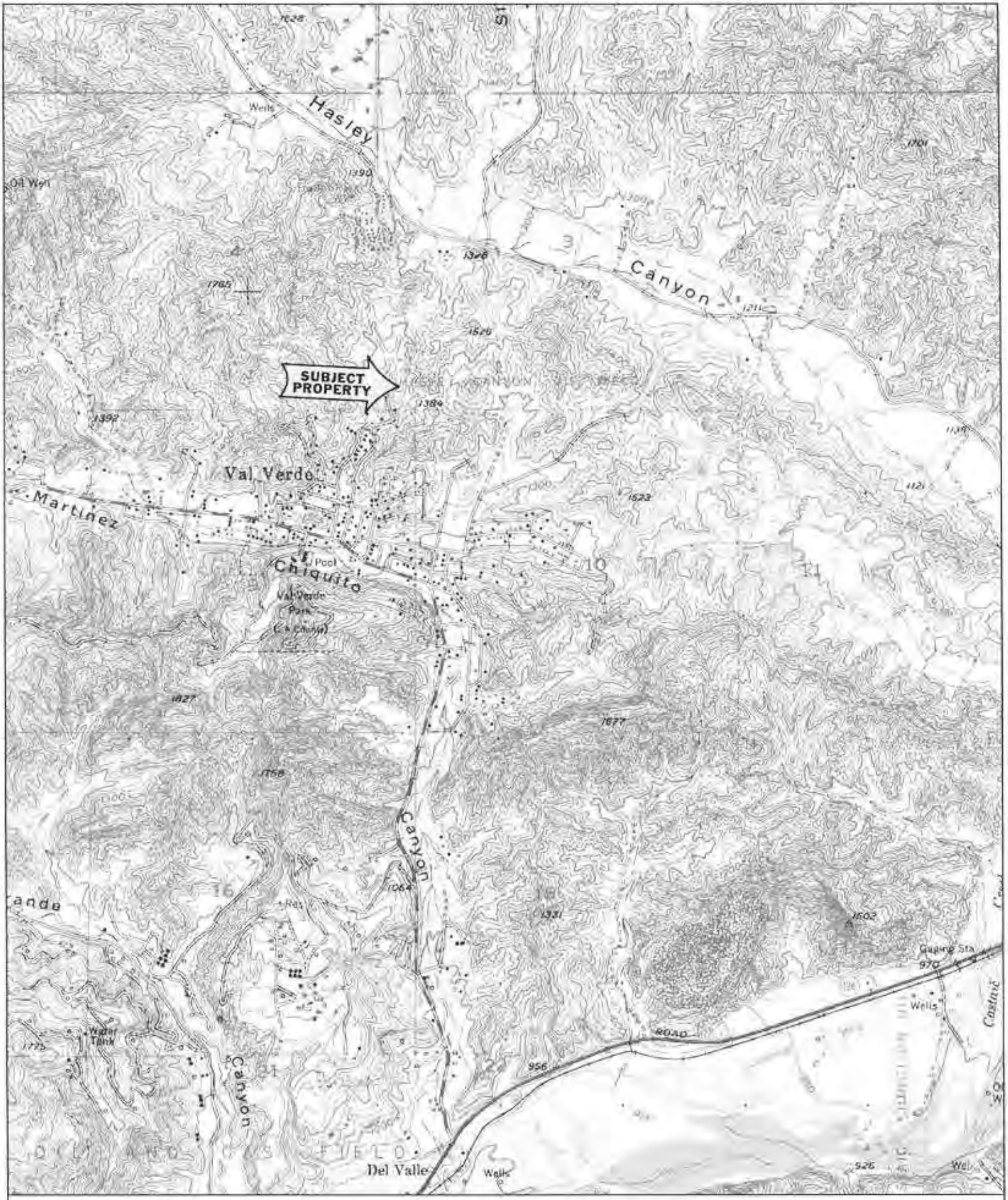
B.S, Sociology
Minor in Environmental Science
Drexel University, Philadelphia, PA, 2001

Ms. Tymkow has over two years of experience within the environmental field. Ms. Tymkow has conducted Phase I Environmental Site Assessments and Transaction Screens, managed and performed Phase II Soil Investigations for properties throughout Southern California, performed water sampling, air monitoring, and walk-through building inspections.

Principal area of responsibility for this ESA report: Project Management, Research, Property Reconnaissance, and Report Generation.

Property Plan

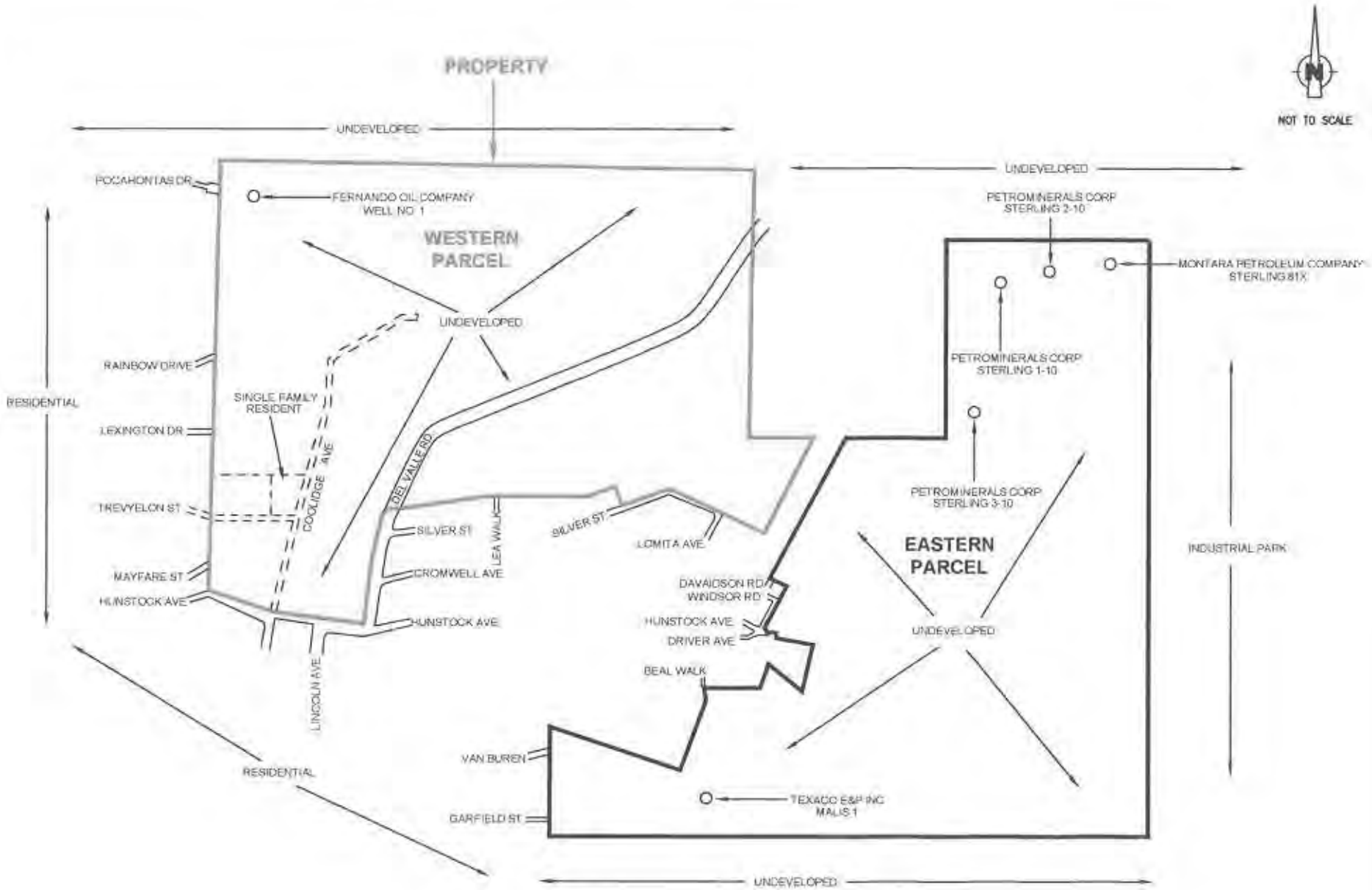
Appendix A



Name: VAL VERDE
Date: 2/18/104
Scale: 1 inch equals 2000 feet

Location: 034° 26' 39.9" N 118° 39' 10.3" W
Caption: USGS 1965 Photorevised 1981

Copyright (C) 1997, Maptech, Inc.



PROPERTY MAP

Converse Consultants

EAST WEST BANK
WESTERN PARCEL

Project No. 04-41-125-01

Drawing No. 1

Pertinent Property Photographs

Appendix B

1. Looking north at the Property.

2. Looking east at the Property.

3. Looking at the residential dwelling on the Property.

4. Looking south at the Property.

EDR Radius Map Report

Appendix C

"Linking Technology with Tradition"

Sanborn® Map Report

Ship To: Maggie Tymkow
Converse Consultants
222 East Huntington Drive
Monrovia, CA 91016

Order Date: 2/5/2004 **Completion Date:** 2/5/2004
Inquiry #: 1124078.3s
P.O. #: NA
Site Name: East West/Sterling Gateway
Address: Del Valle Road
City/State: Val Verde, CA 91384
Cross Streets:

Customer Project: NA
1012129JIM 626-930-1200

This document reports that the largest and most complete collection of Sanborn fire insurance maps has been reviewed based on client supplied information, and fire insurance maps depicting the target property at the specified address were not identified.

NO COVERAGE

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The EDR Radius Map
with GeoCheck®

East West/Sterling Gateway
Del Valle Road
Val Verde, CA 91384

Inquiry Number: 1124078.2s

February 05, 2004

Environmental Data Resources, Inc.

***The* Source For Environmental Risk Management Data**

3530 Post Road
Southport, Connecticut 06890

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

TABLE OF CONTENTS

SECTION	PAGE
Executive Summary	ES1
Overview Map	2
Detail Map	3
Map Findings Summary	4
Map Findings	6
EDR Proprietary Historical Map Findings	29
Orphan Summary	30
Government Records Searched/Data Currency Tracking	GR-1

GEOCHECK ADDENDUM

Physical Setting Source Addendum	A-1
Physical Setting Source Summary	A-2
Physical Setting Source Map	A-7
Physical Setting Source Map Findings	A-8
Physical Setting Source Records Searched	A-18

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc. (EDR). The report meets the government records search requirements of ASTM Standard Practice for Environmental Site Assessments, E 1527-00. Search distances are per ASTM standard or custom distances requested by the user.

TARGET PROPERTY INFORMATION

ADDRESS

DEL VALLE ROAD
VAL VERDE, CA 91384

COORDINATES

Latitude (North):	34.447900 - 34° 26' 52.4''
Longitude (West):	118.649600 - 118° 38' 58.6''
Universal Tranverse Mercator:	Zone 11
UTM X (Meters):	348456.2
UTM Y (Meters):	3812858.5
Elevation:	1310 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property:	34118-D6 VAL VERDE, CA
Source:	USGS 7.5 min quad index

TARGET PROPERTY SEARCH RESULTS

The target property was not listed in any of the databases searched by EDR.

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the ASTM E 1527-00 search radius around the target property for the following databases:

FEDERAL ASTM STANDARD

NPL ---- National Priority List
Proposed NPL ---- Proposed National Priority List Sites
CERCLIS ---- Comprehensive Environmental Response, Compensation, and Liability Information System
CERC-NFRAP ---- CERCLIS No Further Remedial Action Planned
CORRACTS ---- Corrective Action Report
RCRIS-TSD ---- Resource Conservation and Recovery Information System
RCRIS-LQG ---- Resource Conservation and Recovery Information System
ERNS ---- Emergency Response Notification System

STATE ASTM STANDARD

AWP ---- Annual Workplan Sites

EXECUTIVE SUMMARY

Cal-Sites Calsites Database
Notify 65 Proposition 65 Records
Toxic Pits Toxic Pits Cleanup Act Sites
CA BOND EXP. PLAN Bond Expenditure Plan
UST List of Underground Storage Tank Facilities
VCP Voluntary Cleanup Program Properties
INDIAN UST Underground Storage Tanks on Indian Land
CA FID UST Facility Inventory Database
HIST UST Hazardous Substance Storage Container Database

FEDERAL ASTM SUPPLEMENTAL

CONSENT Superfund (CERCLA) Consent Decrees
ROD Records Of Decision
Delisted NPL National Priority List Deletions
FINDS Facility Index System/Facility Identification Initiative Program Summary Report
HMIRS Hazardous Materials Information Reporting System
MLTS Material Licensing Tracking System
MINES Mines Master Index File
NPL Liens Federal Superfund Liens
PADS PCB Activity Database System
DOD Department of Defense Sites
US BROWNFIELDS A Listing of Brownfields Sites
RAATS RCRA Administrative Action Tracking System
TRIS Toxic Chemical Release Inventory System
TSCA Toxic Substances Control Act
SSTS Section 7 Tracking Systems
FTTS INSP FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

STATE OR LOCAL ASTM SUPPLEMENTAL

AST Aboveground Petroleum Storage Tank Facilities
CLEANERS Cleaner Facilities
CA WDS Waste Discharge System
DEED List of Deed Restrictions
SCH School Property Evaluation Program
NFA No Further Action Determination
EMI Emissions Inventory Data
REF Unconfirmed Properties Referred to Another Agency
NFE Properties Needing Further Evaluation
CA SLIC Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
LOS ANGELES CO. HMS HMS: Street Number List
LA Co. Site Mitigation Site Mitigation List
AOCONCERN San Gabriel Valley Areas of Concern

BROWNFIELDS DATABASES

US BROWNFIELDS A Listing of Brownfields Sites
VCP Voluntary Cleanup Program Properties

EDR PROPRIETARY HISTORICAL DATABASES

See the EDR Proprietary Historical Database Section for details

EXECUTIVE SUMMARY

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

FEDERAL ASTM STANDARD

RCRIS: Resource Conservation and Recovery Information System. RCRIS includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs): generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. Small quantity generators (SQGs): generate between 100 kg and 1,000 kg of hazardous waste per month. Large quantity generators (LQGs): generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste from the generator off-site to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

A review of the RCRIS-SQG list, as provided by EDR, and dated 12/10/2003 has revealed that there is 1 RCRIS-SQG site within approximately 0.75 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
KIMBALL MICROELECTRONICS	***28575 LIVINGSTON AVE***	***1/2 - 1 ESE***	***2***	***6***

STATE ASTM STANDARD

CHMIRS: The California Hazardous Material Incident Report System contains information on reported hazardous material incidents, i.e., accidental releases or spills. The source is the California Office of Emergency Services.

A review of the CHMIRS list, as provided by EDR, and dated 12/31/2002 has revealed that there are 5 CHMIRS sites within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
Not reported	***28201 FRANKLIN PKWY, B***	***1 - 2 ESE***	***A4***	***8***
Not reported	***28201 FRANKLIN PARKWAY***	***1 - 2 ESE***	***A5***	***9***
Not reported	27900 CHIQUITO CANYON R	1 - 2 SSW	11	23
Not reported	HASELY CYN 1MI NORTH OF	1 - 2 ENE	12	24
Not reported	27353 SAN MARTINEZ GRAN	1 - 2 SW	14	27

EXECUTIVE SUMMARY

CORTESE: This database identifies public drinking water wells with detectable levels of contamination, hazardous substance sites selected for remedial action, sites with known toxic material identified through the abandoned site assessment program, sites with USTs having a reportable release and all solid waste disposal facilities from which there is known migration. The source is the California Environmental Protection Agency/Office of Emergency Information.

A review of the Cortese list, as provided by EDR, has revealed that there are 2 Cortese sites within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
LA CO FD FIRE TRAINING CN	28101 CHIQUITO CNYN	1 - 2	SSW	B6	12
NEWHALL LAND & FARMING	***3003 WALNUT ORCHARD RD***	***1 - 2***	***SSW***	***13***	***25***

SWF/LF: The Solid Waste Facilities/Landfill Sites records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. The data come from the Integrated Waste Management Board's Solid Waste Information System (SWIS) database.

A review of the SWF/LF list, as provided by EDR, has revealed that there are 2 SWF/LF sites within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
LAIDLAW WASTE SYSTEMS INC,CHIQ	***29201 HENRY MAYO DR***	***1 - 2***	***S***	***C8***	***14***
CHIQUITA CANYON LANDFILL INC	***29201 HENRY MAYO DRIVE***	***1 - 2***	***S***	***C9***	***19***

WMUDS/SWAT: The Waste Management Unit Database System is used for program tracking and inventory of waste management units. The source is the State Water Resources Control Board.

A review of the WMUDS/SWAT list, as provided by EDR, has revealed that there are 2 WMUDS/SWAT sites within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
UNIVERSAL BY-PRODUCTS-VALENCIA	29201 SAUGUS-VENTURA RO	1 - 2	SSE	3	7
CHIQUITA CANYON LANDFILL	29201 HENRY MAYO DR	1 - 2	S	C10	21

LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the State Water Resources Control Board Leaking Underground Storage Tank Information System.

A review of the LUST list, as provided by EDR, and dated 04/02/2003 has revealed that there are 2 LUST sites within approximately 2 miles of the target property.

Lower Elevation	Address	Dist / Dir		Map ID	Page
L A COUNTY FIRE DEPT	***28101 N CHIQUITO CANYON***	***1 - 2***	***SSW***	***B7***	***12***
NEWHALL LAND & FARMING	***3003 WALNUT ORCHARD RD***	***1 - 2***	***SSW***	***13***	***25***

STATE OR LOCAL ASTM SUPPLEMENTAL

EXECUTIVE SUMMARY

HAZNET: The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000-1,000,000 annually, representing approximately 350,000-500,000 shipments. Data from non-California manifests & continuation sheets are not included at the present time. Data are from the manifests submitted without correction, and therefore many contain some invalid values for data elements such as generator ID, TSD ID, waste category, & disposal method. The source is the Department of Toxic Substance Control is the agency

A review of the HAZNET list, as provided by EDR, has revealed that there are 2 HAZNET sites within approximately 0.75 miles of the target property.

Lower Elevation	Address	Dist / Dir	Map ID	Page
CLANDESTINE DRUG LAB OPERATOR	29053 1/2 COOLIDGE AVE	1/4 - 1/2 W	1	6
KIMBALL MICROELECTRONICS	***28575 LIVINGSTON AVE***	***1/2 - 1 ESE***	***2***	***6***

EDR PROPRIETARY HISTORICAL DATABASES

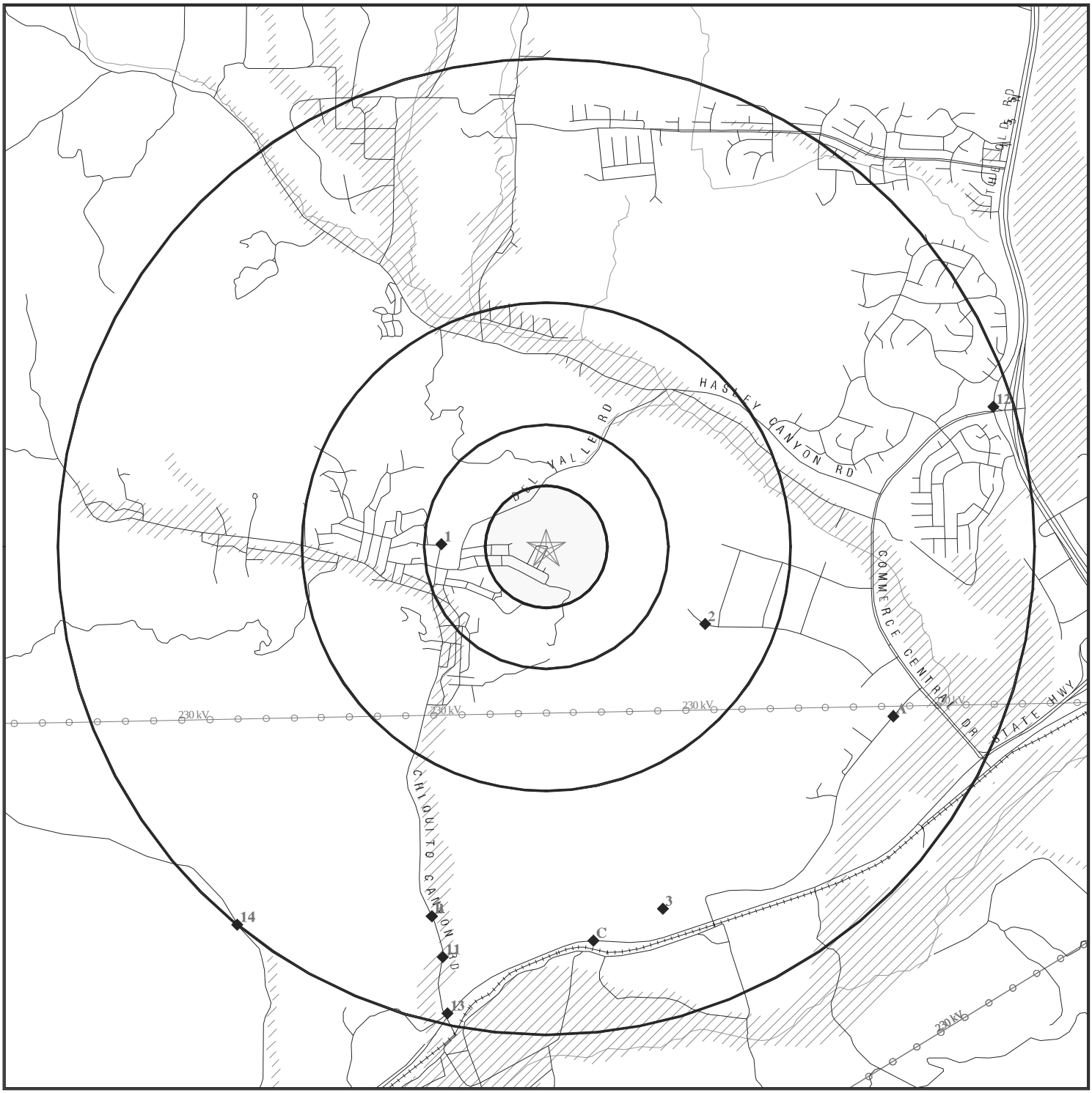
See the EDR Proprietary Historical Database Section for details

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped:

Site Name	Database(s)
PPG INDUSTRIES INC WORKS 24	RCRIS-SQG, RCRIS-TSD, FINDS, CORRACTS, CERC-NFRAP, LOS ANGELES CO. HMS
BERTH 70, LONG BEACH HARBOUR	CHMIRS, HAZNET
BERTH 30 LONG BEACH HARBOUR	CHMIRS, HAZNET
FLORENCE AVE / TELEGRAPH RD WHITTIER	CHMIRS, LUST
ADVANCED WALK-IN CHIROPRACTIC	HAZNET
CSI CRIME SCENE INVESTIGATION	HAZNET
CALIFORNIA INSTITUTE OF THE ARTS	HAZNET
L AND M OPTICAL DISC WEST	RCRIS-SQG, FINDS, HAZNET
DEPARTMENT OF TRANSPORTATION	RCRIS-SQG, FINDS
PETROMINERALS CORP (CASTAIC HI	FINDS, EMI
UNOCAL - DEL VALLE	CA SLIC
SCHOOL ON 18 ACRE SITE	SCH

OVERVIEW MAP - 1124078.2s - Converse Consultants



Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Coal Gasification Sites

National Priority List Sites

Landfill Sites

Dept. Defense Sites

0 1/2 1 2 Miles

Power transmission lines

Oil & Gas pipelines

100-year flood zone

500-year flood zone

Areas of Concern

N

TARGET PROPERTY:	East West/Sterling Gateway	CUSTOMER:	Converse Consultants
ADDRESS:	Del Valle Road	CONTACT:	Maggie Tymkow
CITY/STATE/ZIP:	Val Verde CA 91384	INQUIRY #:	1124078.2s
LAT/LONG:	34.4479 / 118.6496	DATE:	February 05, 2004 1:09 pm

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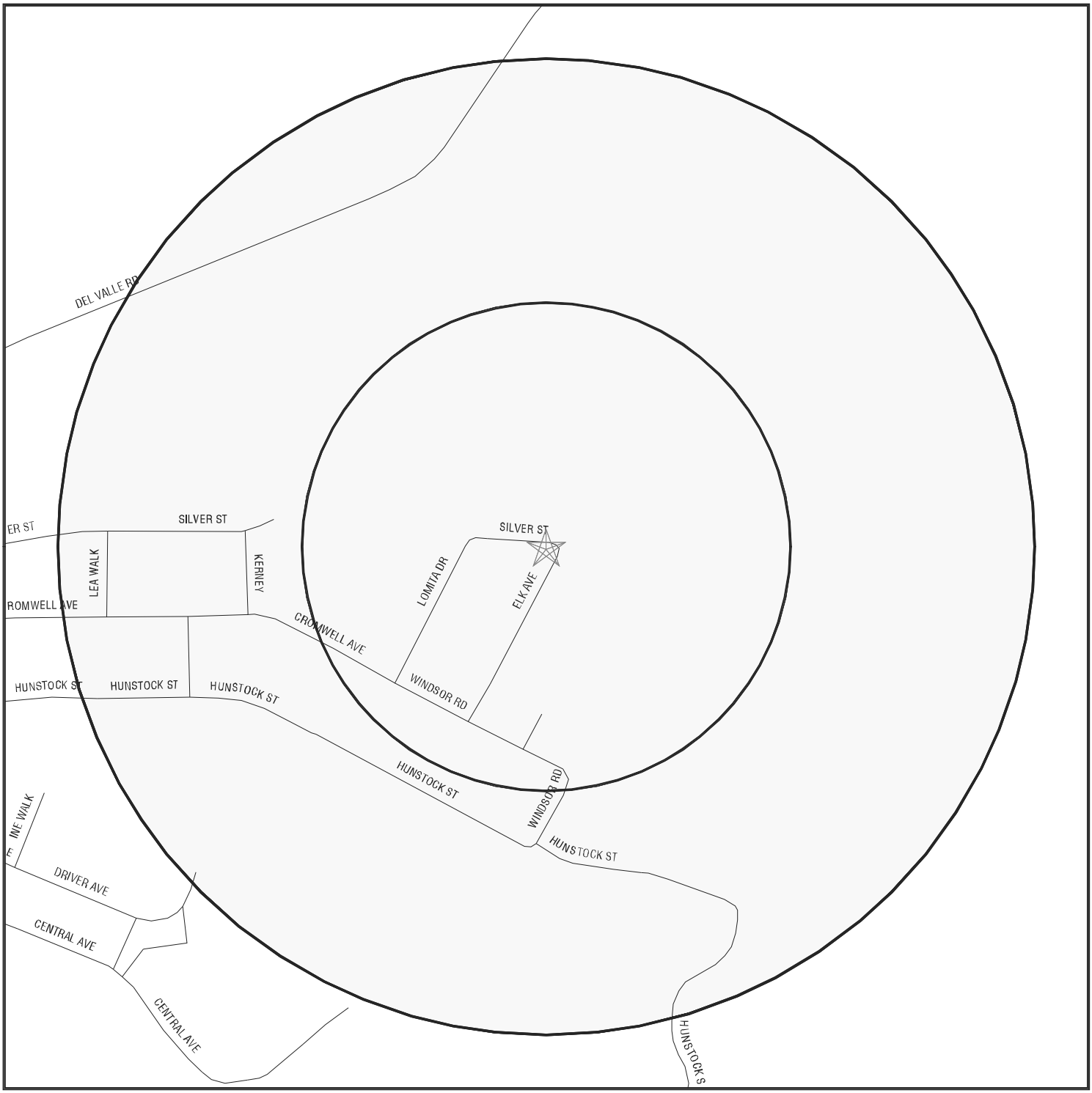
DETAIL MAP - 1124078.2s - Converse Consultants



0 1/16 1/8 1/4 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Coal Gasification Sites
- Historical Gas Stations / Historical Dry Cleaners See the EDR Proprietary Historical Map Findings
- Sensitive Receptors
- National Priority List Sites
- Landfill Sites
- Dept. Defense Sites
- Oil & Gas pipelines
- 100-year flood zone
- 500-year flood zone
- Areas of Concern

TARGET PROPERTY:	East West/Sterling Gateway	CUSTOMER:	Converse Consultants
ADDRESS:	Del Valle Road	CONTACT:	Maggie Tymkow
CITY/STATE/ZIP:	Val Verde CA 91384	INQUIRY #:	1124078.2s
LAT/LONG:	34.4479 / 118.6496	DATE:	February 05, 2004 1:10 pm

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MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
FEDERAL ASTM STANDARD								
NPL		2.000	0	0	0	0	0	0
Proposed NPL		2.000	0	0	0	0	0	0
CERCLIS		2.000	0	0	0	0	0	0
CERC-NFRAP		2.000	0	0	0	0	0	0
CORRACTS		2.000	0	0	0	0	0	0
RCRIS-TSD		2.000	0	0	0	0	0	0
RCRIS Lg. Quan. Gen.		0.750	0	0	0	0	NR	0
RCRIS Sm. Quan. Gen.		0.750	0	0	0	1	NR	1
ERNS		0.500	0	0	0	NR	NR	0
STATE ASTM STANDARD								
AWP		2.000	0	0	0	0	0	0
Cal-Sites		2.000	0	0	0	0	0	0
CHMIRS		2.000	0	0	0	0	5	5
Cortese		2.000	0	0	0	0	2	2
Notify 65		2.000	0	0	0	0	0	0
Toxic Pits		2.000	0	0	0	0	0	0
State Landfill		2.000	0	0	0	0	2	2
WMUDS/SWAT		2.000	0	0	0	0	2	2
LUST		2.000	0	0	0	0	2	2
CA Bond Exp. Plan		2.000	0	0	0	0	0	0
UST		0.750	0	0	0	0	NR	0
VCP		2.000	0	0	0	0	0	0
INDIAN UST		0.750	0	0	0	0	NR	0
CA FID UST		0.750	0	0	0	0	NR	0
HIST UST		0.750	0	0	0	0	NR	0
FEDERAL ASTM SUPPLEMENTAL								
CONSENT		1.500	0	0	0	0	0	0
ROD		1.500	0	0	0	0	0	0
Delisted NPL		1.500	0	0	0	0	0	0
FINDS		0.500	0	0	0	NR	NR	0
HMIRS		0.500	0	0	0	NR	NR	0
MLTS		0.500	0	0	0	NR	NR	0
MINES		0.750	0	0	0	0	NR	0
NPL Liens		0.500	0	0	0	NR	NR	0
PADS		0.500	0	0	0	NR	NR	0
DOD		1.500	0	0	0	0	0	0
US BROWNFIELDS		1.000	0	0	0	0	NR	0
RAATS		0.500	0	0	0	NR	NR	0
TRIS		0.500	0	0	0	NR	NR	0
TSCA		0.500	0	0	0	NR	NR	0
SSTS		0.500	0	0	0	NR	NR	0
FTTS		0.500	0	0	0	NR	NR	0
STATE OR LOCAL ASTM SUPPLEMENTAL								
AST		0.500	0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Target Property	Search Distance (Miles)	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
CLEANERS		0.750	0	0	0	0	NR	0
CA WDS		0.500	0	0	0	NR	NR	0
DEED		0.500	0	0	0	NR	NR	0
SCH		0.750	0	0	0	0	NR	0
NFA		0.750	0	0	0	0	NR	0
EMI		TP	NR	NR	NR	NR	NR	0
REF		0.750	0	0	0	0	NR	0
NFE		0.750	0	0	0	0	NR	0
CA SLIC		1.000	0	0	0	0	NR	0
HAZNET		0.750	0	0	1	1	NR	2
Los Angeles Co. HMS		0.500	0	0	0	NR	NR	0
LA Co. Site Mitigation		0.500	0	0	0	NR	NR	0
AOCONCERN		1.500	0	0	0	0	0	0
EDR PROPRIETARY HISTORICAL DATABASES								
Gas Stations/Dry Cleaners		0.250	0	0	NR	NR	NR	0
Coal Gas		1.500	0	0	0	0	0	0
BROWNFIELDS DATABASES								
US BROWNFIELDS		1.000	0	0	0	0	NR	0
VCP		2.000	0	0	0	0	0	0

NOTES:

See the EDR Proprietary Historical Database Section for details

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

1
West
1/4-1/2
2268 ft.

Relative:
Lower

Actual:
1219 ft.

CLANDESTINE DRUG LAB OPERATOR UNKNOWN
29053 1/2 COOLIDGE AVE
VAL VERDE, CA 91384

HAZNET **S102827731**
N/A

HAZNET:
Gepaid: CLU950002192
TSD EPA ID: AZD049318009
Gen County: Los Angeles
Tsd County: 99
Tons: 1.1600
Waste Category: Laboratory waste chemicals
Disposal Method: Transfer Station
Contact: UNKNOWN
Telephone: (000) 000-0000
Mailing Address: DTSC CLU/ERU
SACRAMENTO, CA 95812 - 0806
County Los Angeles

2
ESE
1/2-1
3819 ft.

Relative:
Lower

Actual:
1252 ft.

KIMBALL MICROELECTRONICS
28575 LIVINGSTON AVE
VALENCIA, CA 91355

RCRIS-SQG **1004677121**
FINDS **CAR000093468**
HAZNET

RCRIS:
Owner: KIMBALL INTL INC
(812) 482-1600
EPA ID: CAR000093468
Contact: FRANK FABIANO
(661) 775-3500
Classification: Small Quantity Generator
TSDF Activities: Not reported

Violation Status: No violations found

FINDS:
Other Pertinent Environmental Activity Identified at Site:
Resource Conservation and Recovery Act Information system (RCRAINFO)

HAZNET:
Gepaid: CAR000093468
TSD EPA ID: Not reported
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: 0.44
Waste Category: Oxygenated solvents (acetone, butanol, ethyl acetate, etc.)
Disposal Method: Recycler
Contact: KENT DAVIS
Telephone: (661) 775-3500
Mailing Address: 28575 LIVINGSTON AVE
VALENCIA, CA 91355
County Not reported

KIMBALL MICROELECTRONICS (Continued) **1004677121**

Gepaid:	CAR000093468
TSD EPA ID:	Not reported
Gen County:	Los Angeles
Tsd County:	Los Angeles
Tons:	0.67
Waste Category:	Oxygenated solvents (acetone, butanol, ethyl acetate, etc.)
Disposal Method:	Recycler
Contact:	KENT DAVIS
Telephone:	(661) 775-3500
Mailing Address:	28575 LIVINGSTON AVE VALENCIA, CA 91355
County	Not reported

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3 **UNIVERSAL BY-PRODUCTS-VALENCIA** **WMUDS/SWAT** **S103441396**
SSE **29201 SAUGUS-VENTURA ROAD** **N/A**
> 1 **VALENCIA, CA**
8229 ft.

Relative:
Lower

Actual:
1034 ft.

WMUDS:

Region:	4
Date of Last Facility Edit:	Not reported
Last Facility Editors:	Not reported
Waste Discharge System ID:	4 190133NUR
Solid Waste Information ID:	Not reported
Waste Discharge System:	False
Solid Waste Assessment Test Program:	True
Facility Name:	Not reported
Toxic Pits Cleanup Act Program:	False
Resource Conservation Recovery Act Program:	False
Department of Defense:	False
Open to Public:	False
Number of WMUDS at Facility:	1
Facility Telephone:	Not reported
Primary Standard Industrial Classification:	Not reported
Secondary Standard Industrial Classification:	Not reported
Solid Waste Assessment Test Program Name:	UNIVERSAL BY-PRODUCTS
NPID:	Not reported
Tonnage:	0
Regional Board ID:	Not reported
Municipal Solid Waste:	False
Superorder:	False
Sub Chapter 15:	False
Reg. Board Project Officer:	LT
Section Range:	Not reported
RCRA Facility:	Not reported
Waste Discharge Requirements:	Not reported
Base Meridian:	Not reported
Waste List:	False
Facility Description:	Not reported
Self-Monitoring Rept. Frequency:	Not reported

Threat to Water Quality:Not reported

Agency:	UNIVERSAL BY-PRODUCTS
Address:	Not reported
Department:	Not reported
Contact:	Not reported
Telephone:	Not reported

UNIVERSAL BY-PRODUCTS-VALENCIA (Continued) **S103441396**

Landowner: Not reported
Address: CA
Telephone: Not reported
Contact: Not reported

A4 **CHMIRS** **S105882989**
ESE **28201 FRANKLIN PKWY, BMF** **CA WDS** **N/A**
> 1 **SANTA CLARITA, CA 91387**
8358 ft.

Site 1 of 2 in cluster A

Relative:
Lower

Actual:
1022 ft.

CHMIRS:

OES Control Number:	02-1417
Chemical Name:	Motor Oil
Extent of Release:	Not reported
Property Use:	Not reported
Incident Date:	Not reported
Date Completed:	Not reported
Time Completed :	Not reported
Agency Id Number :	Not reported
Agency Incident Number :	Not reported
OES Incident Number :	02-1417
Time Notified :	Not reported
Surrounding Area :	Not reported
Estimated Temperature :	Not reported
Property Management :	Not reported
More Than Two Substances Involved? :	Not reported
Special Studies 1 :	Not reported
Special Studies 2 :	Not reported
Special Studies 3 :	Not reported
Special Studies 4 :	Not reported
Special Studies 5 :	Not reported
Special Studies 6 :	Not reported
Responding Agency Personel # Of Injuries :	0
Responding Agency Personel # Of Fatalities :	0
Resp Agncy Personel # Of Decontaminated :	Not reported
Others Number Of Decontaminated :	Not reported
Others Number Of Injuries :	Not reported
Others Number Of Fatalities :	Not reported
Vehicle Make/year :	Not reported
Vehicle License Number :	Not reported
Vehicle State :	Not reported
Vehicle Id Number :	Not reported
CA/DOT/PUC/ICC Number :	Not reported
Company Name :	Not reported
Reporting Officer Name/ID :	Not reported
Report Date :	Not reported
Comments :	Not reported
Facility Telephone Number :	Not reported
Waterway Involved :	Yes
Waterway :	storm drain
Spill Site :	Other
Cleanup By :	Reporting Party
Containment :	Unknown
What Happened :	A vehicle leaked oil into a storm drain
Type :	Qt.(s)
Other :	Not reported
Chemical 1 :	Not Reported
Chemical 2 :	Not Reported

(Continued) **S105882989**

Chemical 3 : Not Reported
Date/Time : 3/14/2002 1330
Evacuations : 0

WDS:

Facility ID:	4 19I012059		
Facility Contact	Not reported	Facility Telephone	0
SIC Code:	0	SIC Code 2:	Not reported
Agency Name:	U.S. POSTAL SERVICE		
Agency Address:	0		
Agency Contact:	Not reported	Agency Phone:	Not reported
Design Flow:	Not reported	Baseline Flow:	Not reported

Facility Type: Other - Does not fall into the category of Municipal/Domestic, Industrial, Agricultural or Solid Waste (Class I, II or III)
Facility Status: Active - Any facility with a continuous or seasonal discharge that is under Waste Discharge Requirements.
Agency Type: Federal
Waste Type: Not reported
Threat to Water: Minor Threat to Water Quality. A violation of a regional board order should cause a relatively minor impairment of beneficial uses compared to a major or minor threat. Not: All nurds without a TTWQ will be considered a minor threat to water quality unless coded at a higher Level. A Zero (0) may be used to code those NURDS that are found to represent no threat to water quality.
Complexity: Category C - Facilities having no waste treatment systems, such as cooling water dischargers or thosewho must comply through best management practices, facilities with passive waste treatment and disposal systems, such as septic systems with subsurface disposal, or dischargers having waste storage systems with land disposal such as dairy waste ponds.
Reclamation: Not reported
POTW: Not reported
NPDES Number: CAS000001 The 1st 2 characters designate the state. The remaining 7 are assigned by the Regional Board
Subregion: 4

A5 **CHMIRS** **S103993337**
ESE **28201 FRANKLIN PARKWAY** **HAZNET** **N/A**
> 1 **SANTA CLARITA, CA 02584**
8358 ft.

Site 2 of 2 in cluster A

Relative:
Lower

Actual:
1022 ft.

HAZNET:

Gepaid:	CAL000157107
TSD EPA ID:	Not reported
Gen County:	Los Angeles
Tsd County:	Not reported
Tons:	0.33
Waste Category:	Polychlorinated biphenyls and material containing PCB’s
Disposal Method:	Recycler
Contact:	KEN GONZALES/MAINT ENG SP
Telephone:	(661) 775-7975
Mailing Address:	28201 FRANKLIN PKWY SANTA CLARITA, CA 91383 - 9735
County	Not reported

(Continued) **S103993337**

Gepaid: CAL000157107
TSD EPA ID: Not reported
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: 0.04
Waste Category: Unspecified organic liquid mixture
Disposal Method: Recycler
Contact: KEN GONZALES/MAINT ENG SP
Telephone: (661) 775-7975
Mailing Address: 28201 FRANKLIN PKWY
SANTA CLARITA, CA 91383 - 9735
County Not reported

Gepaid: CAL000157107
TSD EPA ID: Not reported
Gen County: Los Angeles
Tsd County: San Bernardino
Tons: 3.28
Waste Category: Aqueous solution with less than 10% total organic residues
Disposal Method: Transfer Station
Contact: KEN GONZALES/MAINT ENG SP
Telephone: (661) 775-7975
Mailing Address: 28201 FRANKLIN PKWY
SANTA CLARITA, CA 91383 - 9735
County Not reported

Gepaid: CAL000157107
TSD EPA ID: Not reported
Gen County: Los Angeles
Tsd County: San Bernardino
Tons: 0.22
Waste Category: Waste oil and mixed oil
Disposal Method: Transfer Station
Contact: KEN GONZALES/MAINT ENG SP
Telephone: (661) 775-7975
Mailing Address: 28201 FRANKLIN PKWY
SANTA CLARITA, CA 91383 - 9735
County Not reported

Gepaid: CAL000157107
TSD EPA ID: Not reported
Gen County: Los Angeles
Tsd County: San Bernardino
Tons: 0.20
Waste Category: Unspecified oil-containing waste
Disposal Method: Transfer Station
Contact: KEN GONZALES/MAINT ENG SP
Telephone: (661) 775-7975
Mailing Address: 28201 FRANKLIN PKWY
SANTA CLARITA, CA 91383 - 9735
County Not reported

The CA HAZNET database contains 39 additional records for this site.
Please click here or contact your EDR Account Executive for more information.

CHMIRS:
OES Control Number: 97-2033
Chemical Name: Ink
Extent of Release: Not reported

(Continued) **S103993337**

Property Use:	Not reported
Incident Date:	Not reported
Date Completed:	Not reported
Time Completed :	Not reported
Agency Id Number :	Not reported
Agency Incident Number :	Not reported
OES Incident Number :	97-2033
Time Notified :	Not reported
Surrounding Area :	Not reported
Estimated Temperature :	Not reported
Property Management :	Not reported
More Than Two Substances Involved? :	Not reported
Special Studies 1 :	Not reported
Special Studies 2 :	Not reported
Special Studies 3 :	Not reported
Special Studies 4 :	Not reported
Special Studies 5 :	Not reported
Special Studies 6 :	Not reported
Responding Agency Personel # Of Injuries :	0
Responding Agency Personel # Of Fatalities :	0
Resp Agncy Personel # Of Decontaminated :	Not reported
Others Number Of Decontaminated :	Not reported
Others Number Of Injuries :	Not reported
Others Number Of Fatalities :	Not reported
Vehicle Make/year :	Not reported
Vehicle License Number :	Not reported
Vehicle State :	Not reported
Vehicle Id Number :	Not reported
CA/DOT/PUC/ICC Number :	Not reported
Company Name :	Not reported
Reporting Officer Name/ID :	Not reported
Report Date :	Not reported
Comments :	Not reported
Facility Telephone Number :	Not reported
Waterway Involved :	Yes
Waterway :	Drain
Spill Site :	Other
Cleanup By :	Not being accomplished
Containment :	Unknown
What Happened :	Dumped by employees, weekley into drain
Type :	OTHER, CHEMICAL
Other :	Ink
Chemical 1 :	Solvent
Quantity Released :	15 Gal(s)
Chemical 2 :	Not Reported
Chemical 3 :	Not Reported
Date/Time :	5/21/97
Evacuations :	0

B6
SSW
> 1
8364 ft.

LA CO FD FIRE TRAINING CN — **Cortese** — **S105023127**
28101 CHIQUITO CNYN — **N/A**
CASTAIC, CA 91384

Site 1 of 2 in cluster B

Relative: Lower

Actual: 994 ft.

CORTESE:
Region: CORTESE
Fac Address 2: Not reported

B7
SSW
> 1
8372 ft.

L A COUNTY FIRE DEPT — **LOS ANGELES CO. HMS** — **S102064540**
28101 N CHIQUITO CANYON RD — **LUST** — **N/A**
CASTAIC, CA 91384

Site 2 of 2 in cluster B

Relative: Lower

Actual: 994 ft.

State LUST:

Cross Street:	SAN MARTINEZ CYN RD		
Qty Leaked:	Not reported		
Case Number	R-00003		
Reg Board:	4		
Chemical:	Hydrocarbons		
Lead Agency:	Local Agency		
Local Agency :	19000		
Case Type:	Soil only		
Status:	Leak being confirmed		
Abate Method:	Excavate and Dispose - remove contaminated soil and dispose in approved site		
Review Date:	04/10/1991	Confirm Leak:	04/10/1991
Workplan:	Not reported	Prelim Assess:	Not reported
Pollution Char:	Not reported	Remed Plan:	Not reported
Remed Action:	Not reported		
Monitoring:	Not reported		
Close Date:	Not reported		
Release Date:	12/03/1997		
Cleanup Fund Id :	Not reported		
Discover Date :	04/10/1991		
Enforcement Dt :	Not reported		
Enf Type:	Not reported		
Enter Date :	02/18/1998		
Funding:	Not reported		
Staff Initials:	Not reported		
How Discovered:	OM		
How Stopped:	Not reported		
Interim :	Not reported		
Leak Cause:	Not reported		
Leak Source:	Tank		
MTBE Date :	/ /		
Max MTBE GW :	0 Parts per Billion		
MTBE Tested:	Not Required to be Tested.		
Priority:	Not reported		
Local Case # :	Not reported		
Beneficial:	Not reported		
Staff :	JLC		
GW Qualifier :	Not reported		
Max MTBE Soil :	Not reported		
Soil Qualifier :	Not reported		
Hydr Basin #:	Not reported		
Operator :	Not reported		
Oversight Prgm:	Local Implementing Agency UST (includes non-LOP cases within LOP jurisdiction)		

L A COUNTY FIRE DEPT (Continued) **S102064540**

Oversight Prgm : LIA
Review Date : 12/03/1997
Stop Date : / /
Work Suspended : Not reported
Responsible Party UNOCAL CORP
RP Address: 2125 KNOLL DR., P.O. BOX 6176, VENTURA, CA 93003
Global Id: T0603704507
Org Name: Not reported
Contact Person: Not reported
MTBE Conc: 0
Mtbe Fuel: 0
Water System Name: Not reported
Well Name: Not reported
Distance To Lust: 0
Waste Discharge Global ID: Not reported
Waste Disch Assigned Name: Not reported

LUST Region 4:
Report Date: 12/3/1997
Lead Agency: Local Agency
Local Agency: 19000
Case Number: R-00003
Substance: Hydrocarbons
Case Type: Soil
Status: Leak being confirmed
Region: 4
Staff: Not reported

Source of Cleanup Funding:	Not reported
Date the Leak was Discovered:	4/10/1991
How the Leak was Discovered:	Other Means
How the Leak was Stopped:	Close Tank
Cause of Leak:	Not reported
Leak Source:	Tank
Date The Leak was Stopped:	Not reported
Date Confirmation Leak Began:	4/10/1991
Preliminary Site Assessment Workplan Submitted:	Not reported
Preliminary Site Assessment Began:	Not reported
Pollution Characterization Began:	Not reported
Remediation Plan Submitted:	Not reported
Remedial Action Underway:	Not reported
Post Remedial Action Monitoring Began:	Not reported
Date the Case was Closed:	Not reported
Date Case Last Changed on Database:	12/3/1997
Enforcement Action Date:	Not reported
Date Leak First Reported:	12/3/1997
Enforcement Type:	Not reported
Global ID :	T0603704507
Organization :	Not reported
Historical Max MTBE Date:	Not reported
GW Qualifier:	Not reported
Soil Qualifier:	Not reported
Hist Max MTBE Conc in Groundwater:	Not reported
Hist Max MTBE Conc in Soil :	Not reported
County:	Los Angeles
Regional Board:	04

Owner Contact: Not reported

Responsible Party:	UNOCAL CORP
RP Address:	2125 KNOLL DR., P.O. BOX 6176, VENTURA, CA 93003

L A COUNTY FIRE DEPT (Continued) **S102064540**

Significant Interim Remedial Action Taken:	Not reported
Program :	LIA
Lat / Long :	34.4358266 / -118.6591324
MTBE Counts :	0
MTBE Fuel :	0
MTBE Tested :	NRQ
Local Agency Staff:	UNK
Summary :	TPH 17000 PPM, 36000 PPM & 20000 PPM IN SOIL DEPTH TO GW 300 FT BGS.
Hydrologic Basin # :	Not reported
Beneficial Use :	Not reported
Priority :	Not reported
Cleanup Fund Id :	Not reported
Suspended :	Not reported
Local Case No :	Not reported
Substance Quantity :	Not reported
Abatement Method Used at the Site:	Excavate and Dispose
Operator :	Not reported
Water System :	WALNUT HILL
Well Name :	WELL C-6
Approx. Dist To Production Well (ft) :	9199.3148241037374240915100 48
W Global ID :	W0603709014
Assigned Name :	04N/17W-14Q07 S
MTBE Class :	Not reported

HMS:

Facility Id:	000003-I00003		
Area:	7		
Facility Type:	I09		
Permit Number:	174	Permit Status:	Removed
Facility Status:	Removed		
Region:	Los Angeles County:		

Facility Id:	000003-000003		
Area:	7		
Facility Type:	T0		
Permit Number:	174	Permit Status:	Removed
Facility Status:	Removed		
Region:	Los Angeles County:		

C8 **LAIDLAW WASTE SYSTEMS INC,CHIQ** **EMI** **1002687338**
South **29201 HENRY MAYO DR** **HAZNET** **N/A**
> 1 **VALENCIA, CA 91355** **SWF/LF**
8579 ft. **CA WDS**

Site 1 of 3 in cluster C

Relative: Lower

Actual: 974 ft.

LF:

Facility ID:	Not reported
Operator:	Not reported
Operator Phone:	Not reported
Operator Addr:	
Owner:	Not reported
Owner Address:	Not reported
	Not reported
Owner Telephone:	Not reported
Activity:	Not reported
Operator's Status:	Not reported
Regulation Status:	Not reported
Region:	LOS ANGELES

LAIDLAW WASTE SYSTEMS INC,CHIQ (Continued) **1002687338**

Lat/Long: Not reported
Permit Date: Not reported
Accepted Waste:
Restrictions:
Status : Not reported
Swisnumber : Not reported
Site Type : Not reported
Aka : Not reported
Type Of Waste : Not reported
Disposal Area : Not reported
SWFP Date : Not reported
WDR Number : Not reported
Dates Of Operation : Not reported
Closure Approved : Not reported
Date Of Field Units : Not reported
Surface Condition : Not reported
Landfill Gas : Not reported
Leachate : Not reported
Emergency Response : Not reported
Other Recommendation : Not reported
Reassess Site : Not reported
Priority For Site Assessment : Not reported
Lea Date : Not reported
Explanation: Not Reported
No Further Action: Not Reported
Permitted Throughput with Units: Not reported
Permitted Throughput with Units: Not reported
Permitted Throughput with Units: Not reported
Actual Throughput with Units: Not reported
Actual Capacity with Units: Not reported
Permitted Capacity with Units: Not reported
Remaining Capacity with Units: Not reported
Permitted Total Acreage: Not reported
Inspection Frequency: Not reported
Landuse Name: Not reported
GIS Source: Not reported
Permit Status: Not reported
Category: Not reported
Unit Number: Not reported
Last Waste Tire Inspection Count : Not reported
Last Waste Tire Inspection Date: Not reported
Original Waste Tire Count: Not reported
Original Waste Tire Count Date: Not reported
Closure Date: / /
Closure Type: Not reported
Disposal Acreage: Not reported
Remaining Capacity: Not reported

HAZNET:
Gepaid: CAL000196316
TSD EPA ID: Not reported
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: 0.00
Waste Category: Off-specification, aged, or surplus organics
Disposal Method: Transfer Station
Contact: MATT TERRELL
Telephone: (661) 257-3655

LAIDLAW WASTE SYSTEMS INC,CHIQ (Continued) **1002687338**

Mailing Address: 29201 HENRY MAYO DR
VALENCIA, CA 91355
County Not reported

Gepaid: CAL000196316
TSD EPA ID: Not reported
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: 0.14
Waste Category: Off-specification, aged, or surplus organics
Disposal Method: Recycler
Contact: MATT TERRELL
Telephone: (661) 257-3655
Mailing Address: 29201 HENRY MAYO DR
VALENCIA, CA 91355
County Not reported

Gepaid: CAL000196316
TSD EPA ID: Not reported
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: 1.66
Waste Category: Waste oil and mixed oil
Disposal Method: Recycler
Contact: MATT TERRELL
Telephone: (661) 257-3655
Mailing Address: 29201 HENRY MAYO DR
VALENCIA, CA 91355
County Not reported

Gepaid: CAL000196316
TSD EPA ID: CAD008252405
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: 0.0166
Waste Category: Off-specification, aged, or surplus organics
Disposal Method: Recycler
Contact: REPUBLIC SERVICES OF CA I LLC
Telephone: (661) 257-3655
Mailing Address: 29201 HENRY MAYO DR
VALENCIA, CA 91355
County Los Angeles

Gepaid: CAL000196316
TSD EPA ID: CAT000613893
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: 0.0625
Waste Category: Aqueous solution with less than 10% total organic residues
Disposal Method: Not reported
Contact: REPUBLIC SERVICES OF CA I LLC
Telephone: (661) 257-3655
Mailing Address: 29201 HENRY MAYO DR
VALENCIA, CA 91355
County Los Angeles

The CA HAZNET database contains 8 additional records for this site.
Please click here or contact your EDR Account Executive for more information.

LAIDLAW WASTE SYSTEMS INC,CHIQ (Continued) **1002687338**

WDS:

Facility ID:	4 19I013363		
Facility Contact	Not reported	Facility Telephone	0
SIC Code:	0	SIC Code 2:	Not reported
Agency Name:	CHIQUITA CANYON LANDFILL		
Agency Address:	0		
Agency Contact:	Not reported	Agency Phone:	Not reported
Design Flow:	Not reported	Baseline Flow:	Not reported
Facility Type:	Industrial - Facility that treats and/or disposes of liquid or semisolid wastes from any servicing, producing, manufacturing or processing operation of whatever nature, including mining, gravel washing, geothermal operations, air conditioning, ship building and repairing, oil production, storage and disposal operations, water pumping.		
Facility Status:	Active - Any facility with a continuous or seasonal discharge that is under Waste Discharge Requirements.		
Agency Type:	Government Agency Combination (City-County, County-State, etc.)		
Waste Type:	Not reported		
Threat to Water:	Minor Threat to Water Quality. A violation of a regional board order should cause a relatively minor impairment of beneficial uses compared to a major or minor threat. Not: All nurds without a TTWQ will be considered a minor threat to water quality unless coded at a higher Level. A Zero (0) may be used to code those NURDS that are found to represent no threat to water quality.		
Complexity:	Category C - Facilities having no waste treatment systems, such as cooling water dischargers or thosewho must comply through best management practices, facilities with passive waste treatment and disposal systems, such as septic systems with subsurface disposal, or dischargers having waste storage systems with land disposal such as dairy waste ponds.		
Reclamation:	Not reported		
POTW:	Not reported		
NPDES Number:	CAS000001 The 1st 2 characters designate the state. The remaining 7 are assigned by the Regional Board		
Subregion:	4		

Facility ID:	4 19I015206		
Facility Contact	Samuel Rojas	Facility Telephone	(661) 257-3655
SIC Code:	4953	SIC Code 2:	Not reported
Agency Name:	REPUBLIC SERVICES OF CA		
Agency Address:	0		
Agency Contact:	Not reported	Agency Phone:	Not reported
Design Flow:	Not reported	Baseline Flow:	Not reported
Facility Type:	Other - Does not fall into the category of Municipal/Domestic, Industrial, Agricultural or Solid Waste (Class I, II or III)		
Facility Status:	Active - Any facility with a continuous or seasonal discharge that is under Waste Discharge Requirements.		
Agency Type:	Private		
Waste Type:	Stormwater Runoff - Inert/Influent or Solid Wastes that do not contain soluble pollutants or organic wastes and have little adverse impact on water quality. Such wastes could cause turbidity and siltation. Uncontaminated soils, rubble and concrete are examples of this category.		
Threat to Water:	Minor Threat to Water Quality. A violation of a regional board order should cause a relatively minor impairment of beneficial uses compared to a major or minor threat. Not: All nurds without a TTWQ will be considered a minor threat to water quality unless coded at a higher Level. A Zero (0) may be used to code those NURDS that are found to represent no threat to water quality.		
Complexity:	Category C - Facilities having no waste treatment systems, such as cooling water dischargers or thosewho must comply through best management practices, facilities with passive waste treatment and disposal systems, such as septic systems with subsurface disposal, or dischargers having waste storage systems with land disposal such as dairy		

LAIDLAW WASTE SYSTEMS INC,CHIQ (Continued) **1002687338**

waste ponds.
Reclamation: No reclamation requirements associated with this facility.
POTW: The POTW Does not have an approved pretreatment program. Some POTWs may have local pretreatment programs that have not been approved by the regional board and/or EPA.
NPDES Number: CAS000001 The 1st 2 characters designate the state. The remaining 7 are assigned by the Regional Board
Subregion: 4

Facility ID: Santa Clara River 190359001
Facility Contact: Mike Dean (General manager) Facility Telephone: (661) 257-3655
SIC Code: 4953 SIC Code 2: Not reported
Agency Name: A REPUBLIC WASTE SERVICES CO.
Agency Address: 0
Agency Contact: Not reported Agency Phone: Not reported
Design Flow: 0 Million Gal/Day Baseline Flow: 0 Million Gal/Day
Facility Type: Solid Waste Site-Class III - Landfills for non hazardous solid wastes.
Facility Status: Active - Any facility with a continuous or seasonal discharge that is under Waste Discharge Requirements.
Agency Type: Private
Waste Type: Solid Wastes - Nonhazardous Solid Wastes/Influent or Solid Wastes that contain nonhazardous putrescible and non putrescible solid, semisolid, and liquid wastes (E.G., garbage, trash, refuse, paper, demolition and construction wastes, manure, vegetable or animal solid and semisolid waste).
Threat to Water: Major Threat to Water Quality. A violation could render unusable a ground water or surface water resource used as a significant drink water supply, require closure of an area used for contact recreation, result in long-term deleterious effects on shell fish spawning or growth areas of aquatic resources, or directly expose the public to toxic substances.
Complexity: Category B - Any facility having a physical, chemical, or biological waste treatment system (except for septic systems with subsurface disposal), or any Class II or III disposal site, or facilities without treatment systems that are complex, such as marinas with petroleum products, solid wastes, and sewage pump out facilities.
Reclamation: No reclamation requirements associated with this facility.
POTW: The facility is not a POTW.
NPDES Number: Not reported
Subregion: 4

EMISSIONS :
Facility ID : 61029
Air District Code : SC
SIC Code : 4959
Total Priority Score : Not reported
Health Risk Assessment : Not reported
Non-cancer Chronic Haz Index : Not reported
Non-cancer Acute Haz Index : Not reported
Air Basin : SC
Air District Name : SOUTH COAST AQMD
Community Health Air Pollution Info System : Not reported
Consolidated Emission Reporting Rule : Not reported
Total Organic Hydrocarbon Gases : 2
Reactive Organic Gases : 1
Carbon Monoxide Emissions : 6
NOX Gas Emissions (Nitrogen - Oxygen) : 5
SOX Gas Emissions (Sulphur - Oxygen) : 3

Facility ID : 61029
Air District Code : SC
SIC Code : 4959
Total Priority Score : Not reported

LAIDLAW WASTE SYSTEMS INC,CHIQ (Continued) **1002687338**

Health Risk Assessment :	Not reported
Non-cancer Chronic Haz Index :	Not reported
Non-cancer Acute Haz Index :	Not reported
Air Basin :	SC
Air District Name :	SOUTH COAST AQMD
Community Health Air Pollution Info System :	Not reported
Consolidated Emission Reporting Rule :	Not reported
Total Organic Hydrocarbon Gases :	Not reported
Reactive Organic Gases :	Not reported
Carbon Monoxide Emissions :	Not reported
NOX Gas Emissions (Nitrogen - Oxygen) :	Not reported
SOX Gas Emissions (Sulphur - Oxygen) :	Not reported

C9 **CHIQUITA CANYON LANDFILL INC** **HAZNET** **S100932492**
South **29201 HENRY MAYO DRIVE** **SWF/LF** **N/A**
> 1 **VALENCIA, CA 91355**
8579 ft.

Site 2 of 3 in cluster C

Relative:
Lower

Actual:
974 ft.

LF:

Facility ID:	19-AA-0052
Operator:	Republic Services Of California I, L.L.C
Operator Phone:	(661) 257-3655
Operator Addr:	29201 Henry Mayo Drive Valencia, CA 91355
Owner:	Republic Services Of California I, L.L.C
Owner Address:	Not reported 29201 Henry Mayo Drive Valencia, CA 91355
Owner Telephone:	(661) 257-3655
Activity:	Solid Waste Landfill
Operator's Status:	Active
Regulation Status:	Permitted
Region:	STATE
Lat/Long:	34 / -119
Permit Date:	Not reported
Accepted Waste:	Construction/demolition,Green Materials,Industrial,Inert,Mixed municipal
Restrictions:	

Status :	Not reported
Swisnumber :	Not reported
Site Type :	Not reported
Aka :	Not reported
Type Of Waste :	Not reported
Disposal Area :	Not reported
SWFP Date :	Not reported
WDR Number :	Not reported
Dates Of Operation :	Not reported
Closure Approved :	Not reported
Date Of Field Units :	Not reported
Surface Condition :	Not reported
Landfill Gas :	Not reported
Leachate :	Not reported
Emergency Response :	Not reported
Other Recommendation :	Not reported
Reassess Site :	Not reported
Priority For Site Assessment :	Not reported
Lea Date :	Not reported
Explanation:	Not Reported
No Further Action:	Not Reported

CHIQUITA CANYON LANDFILL INC (Continued) **S100932492**

Permitted Throughput with Units:	6000
Permitted Throughput with Units:	6000
Permitted Throughput with Units:	6000
Actual Throughput with Units:	Tons/day
Actual Capacity with Units:	45889550
Permitted Capacity with Units:	45889550
Remaining Capacity with Units:	Cubic Yards
Permitted Total Acreage:	592
Inspection Frequency:	Monthly
Landuse Name:	Residential,Recreational,Industrial,Agricultural
GIS Source:	Map
Permit Status:	Permitted
Category:	Disposal
Unit Number:	01
Last Waste Tire Inspection Count :	Not reported
Last Waste Tire Inspection Date:	Not reported
Original Waste Tire Count:	Not reported
Original Waste Tire Count Date:	Not reported
Closure Date:	11/24/2019
Closure Type:	Estimated
Disposal Acreage:	257
Remaining Capacity:	26024360

HAZNET:

Gepaid:	CAL000035857
TSD EPA ID:	AZD049318009
Gen County:	Los Angeles
Tsd County:	99
Tons:	.4250
Waste Category:	Laboratory waste chemicals
Disposal Method:	Transfer Station
Contact:	CHIQUITA CANYON LANDFILL INC
Telephone:	(805) 257-3655
Mailing Address:	29201 HENRY MAYO DR
	VALENCIA, CA 91355
County	Los Angeles

Gepaid:	CAL000035857
TSD EPA ID:	AZD049318009
Gen County:	Los Angeles
Tsd County:	99
Tons:	.5000
Waste Category:	Unspecified organic liquid mixture
Disposal Method:	Transfer Station
Contact:	CHIQUITA CANYON LANDFILL INC
Telephone:	(805) 257-3655
Mailing Address:	29201 HENRY MAYO DR
	VALENCIA, CA 91355
County	Los Angeles

CHIQUITA CANYON LANDFILL INC (Continued) **S100932492**

Gepaid: CAL000035857
TSD EPA ID: CAT000613893
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: .2400
Waste Category: Unspecified organic liquid mixture
Disposal Method: Transfer Station
Contact: CHIQUITA CANYON LANDFILL INC
Telephone: (805) 257-3655
Mailing Address: 29201 HENRY MAYO DR
VALENCIA, CA 91355
County Los Angeles

Gepaid: CAL000035857
TSD EPA ID: CAT000613893
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: .1542
Waste Category: Aqueous solution with less than 10% total organic residues
Disposal Method: Transfer Station
Contact: CHIQUITA CANYON LANDFILL INC
Telephone: (805) 257-3655
Mailing Address: 29201 HENRY MAYO DR
VALENCIA, CA 91355
County Los Angeles

Gepaid: CAL000035857
TSD EPA ID: CAD099452708
Gen County: Los Angeles
Tsd County: Los Angeles
Tons: 2.0850
Waste Category: Waste oil and mixed oil
Disposal Method: Recycler
Contact: CHIQUITA CANYON LANDFILL INC
Telephone: (805) 257-3655
Mailing Address: 29201 HENRY MAYO DR
VALENCIA, CA 91355
County Los Angeles

The CA HAZNET database contains 16 additional records for this site.
Please click here or contact your EDR Account Executive for more information.

C10 **CHIQUITA CANYON LANDFILL** **WMUDS/SWAT** **1001526767**
South **29201 HENRY MAYO DR** **N/A**
> 1 **VALENCIA CA, CA 91310**
8579 ft.

Site 3 of 3 in cluster C

Relative: Lower

Actual: 974 ft.

WMUDS:
Region: 4
Date of Last Facility Edit: 11/22/1996
Last Facility Editors: JHM, JHM, JHM
Waste Discharge System ID: 4A190359001
Solid Waste Information ID: 19-AA-0052
Waste Discharge System: True
Solid Waste Assessment Test Program: True
Facility Name: LAIDLAW WASTE SYSTEMS CHIQUITA, INC.
Toxic Pits Cleanup Act Program: False
Resource Conservation Recovery Act Program: False

CHIQUITA CANYON LANDFILL (Continued) **1001526767**

Department of Defense:	False
Open to Public:	False
Number of WMUDS at Facility:	5
Facility Telephone:	(805) 257-3655
Primary Standard Industrial Classification:	4953
Secondary Standard Industrial Classification:	Not reported
Solid Waste Assessment Test Program Name:	LAIDLAW WASTE SYSTEMS CHIQUITA, INC
NPID:	Not reported
Tonnage:	5000
Regional Board ID:	67-20
Municipal Solid Waste:	True
Superorder:	True
Sub Chapter 15:	True
Reg. Board Project Officer:	Not reported
Section Range:	04N17W14
RCRA Facility:	No
Waste Discharge Requirements:	A
Base Meridian:	SB
Waste List:	True
Facility Description:	Not reported
Self-Monitoring Rept. Frequency:	Quarterly Submittal

Threat to Water Quality:
Major Threat to Water Quality. A violation could render unusable a ground water or surface water resource used as a significant drink water supply, require closure of an area used for contact recreation, result in long-term deleterious effects on shell fish spawning or growth areas of aquatic resources, or directly expose the public to toxic substances.

Facility Type: Solid Waste Site-Class III - Landfills for non hazardous solid wastes.

Complexity: Category B - Any facility having a physical, chemical, or biological waste treatment system (except for septic systems with subsurface disposal), or any Class II or III disposal site, or facilities without treatment systems that are complex, such as marinas with petroleum products, solid wastes, and sewage pump out facilities.

Prime Waste: Solid Wastes - Nonhazardous Solid Wastes/Influent or Solid Wastes that contain nonhazardous putrescible and non putrescible solid, semisolid, and liquid wastes (E.G., garbage, trash, refuse, paper, demolition and construction wastes, manure, vegetable or animal solid and semisolid waste).

Agency: USA WASTE
Address: 29201 HENRY MAYO DRIVE
VALENCIA CA 91310
Department: REGIONAL ENGINEER
Contact: RYAN WURGLER
Telephone: (805) 257-3655
Type: Private
Landowner: NEWHALL LAND & FARMING
Address: 27050 HENRY MAYO DR.
CASTAIC, CA 91310
Telephone: (805) 255-4000
Contact: Not reported
Comments: REGIONAL BOARD SAYS 3500 TONS PER DAY...

CHIQUITA CANYON LANDFILL (Continued) **1001526767**

11
SSW
> 1
9150 ft.

Relative:
Lower

Actual:
962 ft.

27900 CHIQUITO CANYON ROAD
UNINC, CA

CHMIRS **S100216887**
N/A

CHMIRS:

OES Control Number:	8904996
Chemical Name:	Not reported
Extent of Release:	Not reported
Property Use:	Petroleum Refinery
Incident Date:	23-FEB-89
Date Completed:	23-FEB-89
Time Completed :	2035
Agency Id Number :	19110
Agency Incident Number :	52
OES Incident Number :	8904996
Time Notified :	1915
Surrounding Area :	946
Estimated Temperature :	Not reported
Property Management :	P
More Than Two Substances Involved? :	N
Special Studies 1 :	Not reported
Special Studies 2 :	Not reported
Special Studies 3 :	Not reported
Special Studies 4 :	Not reported
Special Studies 5 :	Not reported
Special Studies 6 :	Not reported
Responding Agency Personel # Of Injuries :	0
Responding Agency Personel # Of Fatalities :	0
Resp Agncy Personel # Of Decontaminated :	0
Others Number Of Decontaminated :	0
Others Number Of Injuries :	0
Others Number Of Fatalities :	0
Vehicle Make/year :	Not reported
Vehicle License Number :	Not reported
Vehicle State :	Not reported
Vehicle Id Number :	Not reported
CA/DOT/PUC/ICC Number :	Not reported
Company Name :	Not reported
Reporting Officer Name/ID :	CAPT. JOHN W. EVERETT
Report Date :	26-FEB-89
Comments :	Not reported
Facility Telephone Number :	213 267-2485
Waterway Involved :	Not reported
Waterway :	Not reported
Spill Site :	Not reported
Cleanup By :	Not reported
Containment :	Not reported
What Happened :	Not reported
Type :	Not reported
Other :	Not reported
Chemical 1 :	Not Reported
Chemical 2 :	Not Reported
Chemical 3 :	Not Reported
Date/Time :	Not reported
Evacuations :	Not reported

(Continued) **S100216887**

12
ENE
> 1
10134 ft.

Relative:
Lower

Actual:
1047 ft.

HASELY CYN 1MI NORTH OF THE OLD ROAD
CASTAIC, CA 91355

CHMIRS **S100275931**
N/A

CHMIRS:

OES Control Number:	9012379
Chemical Name:	Not reported
Extent of Release:	Not reported
Property Use:	Vacant Lot
Incident Date:	13-AUG-90
Date Completed:	13-AUG-90
Time Completed :	2115
Agency Id Number :	19110
Agency Incident Number :	A-65
OES Incident Number :	9012379
Time Notified :	1956
Surrounding Area :	936
Estimated Temperature :	80
Property Management :	P
More Than Two Substances Involved? :	Y
Special Studies 1 :	Not reported
Special Studies 2 :	Not reported
Special Studies 3 :	Not reported
Special Studies 4 :	Y
Special Studies 5 :	Not reported
Special Studies 6 :	Not reported
Responding Agency Personel # Of Injuries :	0
Responding Agency Personel # Of Fatalities :	0
Resp Agncy Personel # Of Decontaminated :	0
Others Number Of Decontaminated :	0
Others Number Of Injuries :	0
Others Number Of Fatalities :	0
Vehicle Make/year :	Not reported
Vehicle License Number :	Not reported
Vehicle State :	Not reported
Vehicle Id Number :	Not reported
CA/DOT/PUC/ICC Number :	Not reported
Company Name :	Not reported
Reporting Officer Name/ID :	MARTIN L. SCOTT #081235
Report Date :	13-AUG-90
Comments :	Yes
Facility Telephone Number :	213 267-2401
Waterway Involved :	Not reported
Waterway :	Not reported
Spill Site :	Not reported
Cleanup By :	Not reported
Containment :	Not reported
What Happened :	Not reported
Type :	Not reported
Other :	Not reported
Chemical 1 :	Not Reported
Chemical 2 :	Not Reported
Chemical 3 :	Not Reported
Date/Time :	Not reported
Evacuations :	Not reported

(Continued) **S100275931**

13
SSW
> 1
10314 ft.

NEWHALL LAND & FARMING
3003 WALNUT ORCHARD RD
VALENCIA, CA 91350

Cortese **S102434348**
LUST **N/A**

Relative:
Lower

Actual:
949 ft.

State LUST:

Cross Street:	HENRY MAYO DRIVE		
Qty Leaked:	Not reported		
Case Number	I-14101		
Reg Board:	4		
Chemical:	Gasoline		
Lead Agency:	Regional Board		
Local Agency :	19000		
Case Type:	Soil only		
Status:	Case Closed		
Review Date:	Not reported	Confirm Leak:	Not reported
Workplan:	3/9/90	Prelim Assess:	3/9/90
Pollution Char:	Not reported	Remed Plan:	Not reported
Remed Action:	Not reported		
Monitoring:	Not reported		
Close Date:	06/27/1996		
Release Date:	03/09/1990		
Cleanup Fund Id :	Not reported		
Discover Date :	01/25/1989		
Enforcement Dt :	Not reported		
Enf Type:	Not reported		
Enter Date :	03/05/1990		
Funding:	Federal Funds		
Staff Initials:	Not reported		
How Discovered:	Tank Closure		
How Stopped:	Not reported		
Interim :	Not reported		
Leak Cause:	UNK		
Leak Source:	UNK		
MTBE Date :	/ /		
Max MTBE GW :	0 Parts per Billion		
MTBE Tested:	Site NOT Tested for MTBE.Includes Unknown and Not Analyzed.		
Priority:	Not reported		
Local Case # :	Not reported		
Beneficial:	Not reported		
Staff :	JLC		
GW Qualifier :	Not reported		
Max MTBE Soil :	Not reported		
Soil Qualifier :	Not reported		
Hydr Basin #:	Not reported		
Operator :	JONES, ROGER ALSO SEE I-14100		
Oversight Prgm:	RB Lead Underground Storage Tank		
Oversight Prgm :	UST		
Review Date :	07/22/1998		
Stop Date :	01/25/1989		
Work Suspended :	Not reported		
Responsible Party	NEWHALL LAND AND FARM		
RP Address:	23823 VALENCIA BLVD., VAKENCIA, 91355	C	
Global Id:	T0603704137		
Org Name:	Not reported		
Contact Person:	Not reported		
MTBE Conc:	0		
Mtbe Fuel:	1		

NEWHALL LAND & FARMING (Continued) **S102434348**

Water System Name: Not reported
Well Name: Not reported
Distance To Lust: 0
Waste Discharge Global ID: Not reported
Waste Disch Assigned Name: Not reported

LUST Region 4:
Report Date: 3/9/1990
Lead Agency: Regional Board
Local Agency: 19000
Case Number: I-14101
Substance: Gasoline
Case Type: Soil
Status: Case Closed
Region: 4
Staff: Not reported

Source of Cleanup Funding:	Federal Funds
Date the Leak was Discovered:	1/25/1989
How the Leak was Discovered:	Tank Closure
How the Leak was Stopped:	Close Tank
Cause of Leak:	Unknown
Leak Source:	Unknown
Date The Leak was Stopped:	1/25/1989
Date Confirmation Leak Began:	Not reported
Preliminary Site Assessment Workplan Submitted:	Not reported
Preliminary Site Assessment Began:	3/9/1990
Pollution Characterization Began:	Not reported
Remediation Plan Submitted:	Not reported
Remedial Action Underway:	Not reported
Post Remedial Action Monitoring Began:	Not reported
Date the Case was Closed:	6/27/1996
Date Case Last Changed on Database:	7/22/1998
Enforcement Action Date:	Not reported
Date Leak First Reported:	3/9/1990
Enforcement Type:	Not reported
Global ID :	T0603704137
Organization :	Not reported
Historical Max MTBE Date:	Not reported
GW Qualifier:	Not reported
Soil Qualifier:	Not reported
Hist Max MTBE Conc in Groundwater:	Not reported
Hist Max MTBE Conc in Soil :	Not reported
County:	Los Angeles
Regional Board:	04

Owner Contact: Not reported

Responsible Party:	NEWHALL LAND AND FARM	
RP Address:	23823 VALENCIA BLVD., VAKENCIA, 91355	C
Significant Interim Remedial Action Taken:	Not reported	
Program :	UST	
Lat / Long :	34.4200613 / -118.6567124	
MTBE Counts :	0	
MTBE Fuel :	1	
MTBE Tested :	NT	
Local Agency Staff:	UNK	
Summary :	Not reported	
Hydrologic Basin # :	Not reported	
Beneficial Use :	Not reported	
Priority :	Not reported	

NEWHALL LAND & FARMING (Continued) **S102434348**

Cleanup Fund Id :	Not reported
Suspended :	Not reported
Local Case No :	Not reported
Substance Quantity :	Not reported
Abatement Method Used at the Site:	Not reported
Operator :	JONES, ROGER ALSO SEE I-14100
Water System :	WALNUT HILL
Well Name :	WELL C-6
Approx. Dist To Production Well (ft) :	8339.414175664259907788982 95
W Global ID :	W0603709014
Assigned Name :	04N/17W-14Q07 S
MTBE Class :	Not reported

CORTESE:

Region:	CORTESE
Fac Address 2:	3003 WALNUT ORCHARD RD

14
SW
> 1
10553 ft.

Relative:
Lower

Actual:
1030 ft.

27353 SAN MARTINEZ GRANDE CANYON **CHMIRS** **S105648719**
SANTA CLARITA, CA 0 **N/A**

CHMIRS:

OES Control Number:	97-4284
Chemical Name:	crude oil
Extent of Release:	Not reported
Property Use:	Not reported
Incident Date:	Not reported
Date Completed:	Not reported
Time Completed :	Not reported
Agency Id Number :	Not reported
Agency Incident Number :	Not reported
OES Incident Number :	97-4284
Time Notified :	Not reported
Surrounding Area :	Not reported
Estimated Temperature :	Not reported
Property Management :	Not reported
More Than Two Substances Involved? :	Not reported
Special Studies 1 :	Not reported
Special Studies 2 :	Not reported
Special Studies 3 :	Not reported
Special Studies 4 :	Not reported
Special Studies 5 :	Not reported
Special Studies 6 :	Not reported
Responding Agency Personel # Of Injuries :	0
Responding Agency Personel # Of Fatalities :	0
Resp Agncy Personel # Of Decontaminated :	Not reported
Others Number Of Decontaminated :	Not reported
Others Number Of Injuries :	Not reported
Others Number Of Fatalities :	Not reported
Vehicle Make/year :	Not reported
Vehicle License Number :	Not reported
Vehicle State :	Not reported
Vehicle Id Number :	Not reported
CA/DOT/PUC/ICC Number :	Not reported
Company Name :	Not reported
Reporting Officer Name/ID :	Not reported
Report Date :	Not reported
Comments :	Not reported

(Continued) **S105648719**

Facility Telephone Number :	Not reported
Waterway Involved :	Yes
Waterway :	River Bed
Spill Site :	Road
Cleanup By :	To be determined
Containment :	No
What Happened :	A tanker truck loaded with 1,000 gals of crude oil was involved in a traffic accident an unknown amount of the crude oil was released. The release is ongoing. The substance going into the Santa Clarita River Bed, No flowing water in the riverbed at this
Type :	PETROLEUM
Other :	1,000 Potential
Chemical 1 :	Not Reported
Chemical 2 :	Not Reported
Chemical 3 :	Not Reported
Date/Time :	10/27/97
Evacuations :	0

MAP FINDINGS - EDR PROPRIETARY HISTORICAL DATABASES

YEAR	NAME	ADDRESS	CITY	ST	DIR.	DIST.	ELEV.	TYPE

Coal Gas Site Search: No site was found in a search of Real Property Scan's ENVIROHAZ database.

EDR Historical Gas Station & Dry Cleaner Search: No mapped sites were found in EDR's search of the EDR Historical Gas Station & Dry Cleaner Database within 0.250 mile of the Target Property.

ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
CASTAIC	S103648602	ADVANCED WALK-IN CHIROPRACTIC	27305 HASLEY CANYON ROAD	91384	HAZNET
CASTAIC	1006249398	PETROMINERALS CORP (CASTAIC HI	OLD RD BET PARKER&HASLEY CYN R	91384	FINDS, EMI
CASTAIC	S105628449	SCHOOL ON 18 ACRE SITE	RIDGE ROUTE ROAD	91384	SCH
LOS ANGELES CO.	S103878697	UNOCAL - DEL VALLE	DEL VALLE	91384	CA SLIC
LOS ANGELES COUNTY	S105637568		BERTH 70, LONG BEACH HARBOUR		CHMIRS, HAZNET
LOS ANGELES COUNTY	S105641187		BERTH 30 LONG BEACH HARBOUR		CHMIRS, HAZNET
LOS ANGELES COUNTY	S105630661		FLORENCE AVE / TELEGRAPH RD WHITTIER		CHMIRS, LUST
SANTA CLARITA	1005441285	DEPARTMENT OF TRANSPORTATION	RTE 5 MAGIC MOUNTAIN PKWY EXIT	91355	RCRIS-SQG, FINDS
SANTA CLARITA	S106085278	CSI CRIME SCENE INVESTIGATION	3 MILES N OF TEMPLIN HWY ON	91355	HAZNET
VALENCIA	S106089351	CALIFORNIA INSTITUTE OF THE ARTS	VY #147 MCBEAN PRKWY / HWY 5	91355	HAZNET
VALENCIA	1004677300	L AND M OPTICAL DISC WEST	24836 AVE ROCKEFELLER	91355	RCRIS-SQG, FINDS, HAZNET
VALENCIA	1000119892	PPG INDUSTRIES INC WORKS 24	25663 W AVE STANFORD	91355	RCRIS-SQG, RCRIS-TSD, FINDS, CORRACTS, CERC-NFRAP, LOS ANGELES CO. HMS

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Elapsed ASTM days: Provides confirmation that this EDR report meets or exceeds the 90-day updating requirement of the ASTM standard.

FEDERAL ASTM STANDARD RECORDS

NPL: National Priority List
Source: EPA
Telephone: N/A
National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 10/21/03
Date Made Active at EDR: 12/08/03
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 11/03/03
Elapsed ASTM days: 35
Date of Last EDR Contact: 11/03/03

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 3
Telephone 215-814-5418

EPA Region 4
Telephone 404-562-8033

EPA Region 6
Telephone: 214-655-6659

EPA Region 8
Telephone: 303-312-6774

Proposed NPL: Proposed National Priority List Sites
Source: EPA
Telephone: N/A

Date of Government Version: 10/14/03
Date Made Active at EDR: 12/08/03
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 12/01/03
Elapsed ASTM days: 7
Date of Last EDR Contact: 11/03/03

CERCLIS: Comprehensive Environmental Response, Compensation, and Liability Information System
Source: EPA
Telephone: 703-413-0223
CERCLIS contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites which are either proposed to or on the National Priorities List (NPL) and sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 11/17/03
Date Made Active at EDR: 02/02/04
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 12/22/03
Elapsed ASTM days: 42
Date of Last EDR Contact: 12/22/03

CERCLIS-NFRAP: CERCLIS No Further Remedial Action Planned
Source: EPA
Telephone: 703-413-0223
As of February 1995, CERCLIS sites designated "No Further Remedial Action Planned" (NFRAP) have been removed from CERCLIS. NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration. EPA has removed approximately 25,000 NFRAP sites to lift the unintended barriers to the redevelopment of these properties and has archived them as historical records so EPA does not needlessly repeat the investigations in the future. This policy change is part of the EPA's Brownfields Redevelopment Program to help cities, states, private investors and affected citizens to promote economic redevelopment of unproductive urban sites.

Date of Government Version: 11/17/03
Date Made Active at EDR: 02/02/04
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 12/22/03
Elapsed ASTM days: 42
Date of Last EDR Contact: 12/22/03

CORRACTS: Corrective Action Report
Source: EPA
Telephone: 800-424-9346
CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 12/18/03
Date Made Active at EDR: 02/02/04
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 12/26/03
Elapsed ASTM days: 38
Date of Last EDR Contact: 12/08/03

RCRIS: Resource Conservation and Recovery Information System
Source: EPA
Telephone: 800-424-9346
Resource Conservation and Recovery Information System. RCRIS includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs): generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month. Small quantity generators (SQGs): generate between 100 kg and 1,000 kg of hazardous waste per month. Large quantity generators (LQGs): generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month. Transporters are individuals or entities that move hazardous waste from the generator off-site to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 12/10/03
Date Made Active at EDR: 01/16/04
Database Release Frequency: Varies
Date of Data Arrival at EDR: 12/12/03
Elapsed ASTM days: 35
Date of Last EDR Contact: 01/19/04

ERNS: Emergency Response Notification System
Source: National Response Center, United States Coast Guard
Telephone: 202-260-2342
Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 12/31/02
Date Made Active at EDR: 02/03/03
Database Release Frequency: Annually
Date of Data Arrival at EDR: 01/27/03
Elapsed ASTM days: 7
Date of Last EDR Contact: 10/27/03

FEDERAL ASTM SUPPLEMENTAL RECORDS

BRS: Biennial Reporting System
Source: EPA/NTIS
Telephone: 800-424-9346
The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/01/01
Database Release Frequency: Biennially
Date of Last EDR Contact: 12/16/03
Date of Next Scheduled EDR Contact: 03/15/04

CONSENT: Superfund (CERCLA) Consent Decrees
Source: EPA Regional Offices
Telephone: Varies
Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: N/A
Database Release Frequency: Varies
Date of Last EDR Contact: N/A
Date of Next Scheduled EDR Contact: N/A

ROD: Records Of Decision
Source: EPA
Telephone: 703-416-0223
Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 07/09/03
Database Release Frequency: Annually
Date of Last EDR Contact: 01/06/04
Date of Next Scheduled EDR Contact: 04/05/04

DELISTED NPL: National Priority List Deletions
Source: EPA
Telephone: N/A
The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 10/21/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 11/03/03
Date of Next Scheduled EDR Contact: 02/02/04

FINDS: Facility Index System/Facility Identification Initiative Program Summary Report
Source: EPA
Telephone: N/A
Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 10/23/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 01/06/04
Date of Next Scheduled EDR Contact: 04/05/04

HMIRS: Hazardous Materials Information Reporting System
Source: U.S. Department of Transportation
Telephone: 202-366-4555
Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 08/11/03
Database Release Frequency: Annually
Date of Last EDR Contact: 01/19/04
Date of Next Scheduled EDR Contact: 04/19/04

MLTS: Material Licensing Tracking System
Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 10/16/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 01/06/04
Date of Next Scheduled EDR Contact: 04/05/04

MINES: Mines Master Index File
Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959

Date of Government Version: 11/25/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 12/29/03
Date of Next Scheduled EDR Contact: 03/29/04

NPL LIENS: Federal Superfund Liens
Source: EPA
Telephone: 202-564-4267
Federal Superfund Liens. Under the authority granted the USEPA by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner receives notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/91
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 11/21/03
Date of Next Scheduled EDR Contact: 02/23/04

PADS: PCB Activity Database System
Source: EPA
Telephone: 202-564-3887
PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 09/30/03
Database Release Frequency: Annually
Date of Last EDR Contact: 11/12/03
Date of Next Scheduled EDR Contact: 02/09/04

DOD: Department of Defense Sites
Source: USGS
Telephone: 703-648-5920
This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 10/01/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/12/03
Date of Next Scheduled EDR Contact: 02/09/04

STORMWATER: Storm Water General Permits
Source: Environmental Protection Agency
Telephone: 202 564-0746
A listing of all facilities with Storm Water General Permits.

Date of Government Version: N/A
Database Release Frequency: Quarterly
Date of Last EDR Contact: N/A
Date of Next Scheduled EDR Contact: N/A

US BROWNFIELDS: A Listing of Brownfields Sites
Source: Environmental Protection Agency
Telephone: 202-566-2777
Included in the listing are brownfields properties addresses by Cooperative Agreement Recipients and brownfields properties addressed by Targeted Brownfields Assessments. Targeted Brownfields Assessments-EPA's Targeted Brownfields Assessments (TBA) program is designed to help states, tribes, and municipalities--especially those without EPA Brownfields Assessment Demonstration Pilots--minimize the uncertainties of contamination often associated with brownfields. Under the TBA program, EPA provides funding and/or technical assistance for environmental assessments at brownfields sites throughout the country. Targeted Brownfields Assessments supplement and work with other efforts under EPA's Brownfields Initiative to promote cleanup and redevelopment of brownfields. Cooperative Agreement Recipients-States, political subdivisions, territories, and Indian tribes become BCRLF cooperative agreement recipients when they enter into BCRLF cooperative agreements with the U.S. EPA. EPA selects BCRLF cooperative agreement recipients based on a proposal and application process. BCRLF cooperative agreement recipients must use EPA funds provided through BCRLF cooperative agreement for specified brownfields-related cleanup activities.

Date of Government Version: 07/15/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 12/17/03
Date of Next Scheduled EDR Contact: 03/15/04

RMP: Risk Management Plans
Source: Environmental Protection Agency
Telephone: 202-564-8600
When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: N/A
Database Release Frequency: N/A

Date of Last EDR Contact: N/A
Date of Next Scheduled EDR Contact: N/A

RAATS: RCRA Administrative Action Tracking System
Source: EPA
Telephone: 202-564-4104
RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/95
Database Release Frequency: No Update Planned

Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

TRIS: Toxic Chemical Release Inventory System
Source: EPA
Telephone: 202-566-0250
Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/01
Database Release Frequency: Annually

Date of Last EDR Contact: 12/22/03
Date of Next Scheduled EDR Contact: 03/22/04

TSCA: Toxic Substances Control Act
Source: EPA
Telephone: 202-260-5521
Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/02
Database Release Frequency: Every 4 Years

Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
Source: EPA
Telephone: 202-564-2501

Date of Government Version: 10/16/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 12/22/03
Date of Next Scheduled EDR Contact: 03/22/04

SSTS: Section 7 Tracking Systems
Source: EPA
Telephone: 202-564-5008
Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/01
Database Release Frequency: Annually

Date of Last EDR Contact: 01/19/04
Date of Next Scheduled EDR Contact: 04/19/04

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-564-2501
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 10/16/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/22/03
Date of Next Scheduled EDR Contact: 03/22/04

STATE OF CALIFORNIA ASTM STANDARD RECORDS

AWP: Annual Workplan Sites
Source: California Environmental Protection Agency
Telephone: 916-323-3400
Known Hazardous Waste Sites. California DTSC's Annual Workplan (AWP), formerly BEP, identifies known hazardous substance sites targeted for cleanup.

Date of Government Version: 11/30/03
Date Made Active at EDR: 01/08/04
Database Release Frequency: Annually
Date of Data Arrival at EDR: 12/01/03
Elapsed ASTM days: 38
Date of Last EDR Contact: 12/01/03

CAL-SITES: Calsites Database
Source: Department of Toxic Substance Control
Telephone: 916-323-3400
The Calsites database contains potential or confirmed hazardous substance release properties. In 1996, California EPA reevaluated and significantly reduced the number of sites in the Calsites database.

Date of Government Version: 11/30/03
Date Made Active at EDR: 01/08/04
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 12/01/03
Elapsed ASTM days: 38
Date of Last EDR Contact: 12/01/03

CHMIRS: California Hazardous Material Incident Report System
Source: Office of Emergency Services
Telephone: 916-845-8400
California Hazardous Material Incident Reporting System. CHMIRS contains information on reported hazardous material incidents (accidental releases or spills).

Date of Government Version: 12/31/02
Date Made Active at EDR: 08/07/03
Database Release Frequency: Varies
Date of Data Arrival at EDR: 07/11/03
Elapsed ASTM days: 27
Date of Last EDR Contact: 11/24/03

CORTESE: "Cortese" Hazardous Waste & Substances Sites List
Source: CAL EPA/Office of Emergency Information
Telephone: 916-323-9100
The sites for the list are designated by the State Water Resource Control Board (LUST), the Integrated Waste Board (SWF/LS), and the Department of Toxic Substances Control (Cal-Sites).

Date of Government Version: 04/01/01
Date Made Active at EDR: 07/26/01
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 05/29/01
Elapsed ASTM days: 58
Date of Last EDR Contact: 10/27/03

NOTIFY 65: Proposition 65 Records
Source: State Water Resources Control Board
Telephone: 916-445-3846
Proposition 65 Notification Records. NOTIFY 65 contains facility notifications about any release which could impact drinking water and thereby expose the public to a potential health risk.

Date of Government Version: 10/21/93
Date Made Active at EDR: 11/19/93
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 11/01/93
Elapsed ASTM days: 18
Date of Last EDR Contact: 01/19/04

TOXIC PITS: Toxic Pits Cleanup Act Sites
Source: State Water Resources Control Board
Telephone: 916-227-4364
Toxic PITS Cleanup Act Sites. TOXIC PITS identifies sites suspected of containing hazardous substances where cleanup has not yet been completed.

Date of Government Version: 07/01/95
Date Made Active at EDR: 09/26/95
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 08/30/95
Elapsed ASTM days: 27
Date of Last EDR Contact: 11/03/03

SWF/LF (SWIS): Solid Waste Information System
Source: Integrated Waste Management Board
Telephone: 916-341-6320
Active, Closed and Inactive Landfills. SWF/LF records typically contain an inve ntory of solid waste disposal facilities or landfills. These may be active or i nactive facilities or open dumps that failed to meet RCRA Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 11/14/03
Date Made Active at EDR: 01/08/04
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 12/16/03
Elapsed ASTM days: 23
Date of Last EDR Contact: 12/16/03

WMUDS/SWAT: Waste Management Unit Database
Source: State Water Resources Control Board
Telephone: 916-227-4448
Waste Management Unit Database System. WMUDS is used by the State Water Resources Control Board staff and the Regional Water Quality Control Boards for program tracking and inventory of waste management units. WMUDS is composed of the following databases: Facility Information, Scheduled Inspections Information, Waste Management Unit Information, SWAT Program Information, SWAT Report Summary Information, SWAT Report Summary Data, Chapter 15 (formerly Subchapter 15) Information, Chapter 15 Monitoring Parameters, TPCA Program Information, RCRA Program Information, Closure Information, and Interested Parties Information.

Date of Government Version: 04/01/00
Date Made Active at EDR: 05/10/00
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 04/10/00
Elapsed ASTM days: 30
Date of Last EDR Contact: 12/09/03

LUST: Leaking Underground Storage Tank Information System
Source: State Water Resources Control Board
Telephone: 916-341-5740
Leaking Underground Storage Tank Incident Reports. LUST records contain an inventory of reported leaking underground storage tank incidents. Not all states maintain these records, and the information stored varies by state.

Date of Government Version: 04/02/03
Date Made Active at EDR: 04/25/03
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 04/16/03
Elapsed ASTM days: 9
Date of Last EDR Contact: 01/12/04

CA BOND EXP. PLAN: Bond Expenditure Plan
Source: Department of Health Services
Telephone: 916-255-2118
Department of Health Services developed a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Act funds. It is not updated.

Date of Government Version: 01/01/89
Date Made Active at EDR: 08/02/94
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 07/27/94
Elapsed ASTM days: 6
Date of Last EDR Contact: 05/31/94

CA UST:

UST: Active UST Facilities
Source: SWRCB
Telephone: 916-341-5700
Active UST facilities gathered from the local regulatory agencies

Date of Government Version: 04/02/03
Date Made Active at EDR: 04/30/03
Database Release Frequency: Semi-Annually
Date of Data Arrival at EDR: 04/16/03
Elapsed ASTM days: 14
Date of Last EDR Contact: 01/12/04

VCP: Voluntary Cleanup Program Properties
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC's costs.

Date of Government Version: 11/30/03
Date Made Active at EDR: 12/23/03
Database Release Frequency: Quarterly
Date of Data Arrival at EDR: 12/01/03
Elapsed ASTM days: 22
Date of Last EDR Contact: 12/01/03

INDIAN UST: Underground Storage Tanks on Indian Land
Source: EPA Region 9
Telephone: 415-972-3368

Date of Government Version: 12/05/03
Date Made Active at EDR: 01/08/04
Database Release Frequency: Varies
Date of Data Arrival at EDR: 12/05/03
Elapsed ASTM days: 34
Date of Last EDR Contact: 11/24/03

CA FID UST: Facility Inventory Database
Source: California Environmental Protection Agency
Telephone: 916-445-6532
The Facility Inventory Database (FID) contains a historical listing of active and inactive underground storage tank locations from the State Water Resource Control Board. Refer to local/county source for current data.

Date of Government Version: 10/31/94
Date Made Active at EDR: 09/29/95
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 09/05/95
Elapsed ASTM days: 24
Date of Last EDR Contact: 12/28/98

HIST UST: Hazardous Substance Storage Container Database
Source: State Water Resources Control Board
Telephone: 916-341-5700
The Hazardous Substance Storage Container Database is a historical listing of UST sites. Refer to local/county source for current data.

Date of Government Version: 10/15/90
Date Made Active at EDR: 02/12/91
Database Release Frequency: No Update Planned
Date of Data Arrival at EDR: 01/25/91
Elapsed ASTM days: 18
Date of Last EDR Contact: 07/26/01

STATE OF CALIFORNIA ASTM SUPPLEMENTAL RECORDS

AST: Aboveground Petroleum Storage Tank Facilities
Source: State Water Resources Control Board
Telephone: 916-341-5712
Registered Aboveground Storage Tanks.

Date of Government Version: 12/01/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 11/03/03
Date of Next Scheduled EDR Contact: 02/02/04

CLEANERS: Cleaner Facilities
Source: Department of Toxic Substance Control
Telephone: 916-225-0873
A list of drycleaner related facilities that have EPA ID numbers. These are facilities with certain SIC codes: power laundries, family and commercial; garment pressing and cleaner's agents; linen supply; coin-operated laundries and cleaning; drycleaning plants, except rugs; carpet and upholster cleaning; industrial launderers; laundry and garment services.

Date of Government Version: 11/26/03
Database Release Frequency: Annually
Date of Last EDR Contact: 01/07/04
Date of Next Scheduled EDR Contact: 04/05/04

CA WDS: Waste Discharge System
Source: State Water Resources Control Board
Telephone: 916-657-1571
Sites which have been issued waste discharge requirements.

Date of Government Version: 12/15/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/22/03
Date of Next Scheduled EDR Contact: 03/22/04

DEED: List of Deed Restrictions
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
The use of recorded land use restrictions is one of the methods the DTSC uses to protect the public from unsafe exposures to hazardous substances and wastes.

Date of Government Version: 01/05/04
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 01/06/04
Date of Next Scheduled EDR Contact: 04/05/04

NFA: No Further Action Determination
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
This category contains properties at which DTSC has made a clear determination that the property does not pose a problem to the environment or to public health.

Date of Government Version: 11/30/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/01/03
Date of Next Scheduled EDR Contact: 03/01/04

EMI: Emissions Inventory Data
Source: California Air Resources Board
Telephone: 916-322-2990
Toxics and criteria pollutant emissions data collected by the ARB and local air pollution agencies.

Date of Government Version: 12/31/01
Database Release Frequency: Varies
Date of Last EDR Contact: 10/20/03
Date of Next Scheduled EDR Contact: 01/19/04

REF: Unconfirmed Properties Referred to Another Agency
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
This category contains properties where contamination has not been confirmed and which were determined as not requiring direct DTSC Site Mitigation Program action or oversight. Accordingly, these sites have been referred to another state or local regulatory agency.

Date of Government Version: 11/30/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/01/03
Date of Next Scheduled EDR Contact: 03/01/04

SCH: School Property Evaluation Program
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
This category contains proposed and existing school sites that are being evaluated by DTSC for possible hazardous materials contamination. In some cases, these properties may be listed in the CalSites category depending on the level of threat to public health and safety or the environment they pose.

Date of Government Version: 11/30/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/01/03
Date of Next Scheduled EDR Contact: 03/01/04

NFE: Properties Needing Further Evaluation
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
This category contains properties that are suspected of being contaminated. These are unconfirmed contaminated properties that need to be assessed using the PEA process. PEA in Progress indicates properties where DTSC is currently conducting a PEA. PEA Required indicates properties where DTSC has determined a PEA is required, but not currently underway.

Date of Government Version: 11/30/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/01/03
Date of Next Scheduled EDR Contact: 03/01/04

HAZNET: Hazardous Waste Information System
Source: California Environmental Protection Agency
Telephone: 916-255-1136
Facility and Manifest Data. The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000 - 1,000,000 annually, representing approximately 350,000 - 500,000 shipments. Data are from the manifests submitted without correction, and therefore many contain some invalid values for data elements such as generator ID, TSD ID, waste category, and disposal method.

Date of Government Version: 12/31/02
Database Release Frequency: Annually
Date of Last EDR Contact: 11/11/03
Date of Next Scheduled EDR Contact: 02/09/04

LOCAL RECORDS

ALAMEDA COUNTY:

Local Oversight Program Listing of UGT Cleanup Sites
Source: Alameda County Environmental Health Services
Telephone: 510-567-6700

Date of Government Version: 12/09/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 10/27/03
Date of Next Scheduled EDR Contact: 01/26/04

Underground Tanks
Source: Alameda County Environmental Health Services
Telephone: 510-567-6700

Date of Government Version: 12/09/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 10/27/03
Date of Next Scheduled EDR Contact: 01/26/04

CONTRA COSTA COUNTY:

Site List
Source: Contra Costa Health Services Department
Telephone: 925-646-2286
List includes sites from the underground tank, hazardous waste generator and business plan/2185 programs.

Date of Government Version: 12/01/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 12/01/03
Date of Next Scheduled EDR Contact: 03/01/04

FRESNO COUNTY:

CUPA Resources List
Source: Dept. of Community Health
Telephone: 559-445-3271
Certified Unified Program Agency. CUPA's are responsible for implementing a unified hazardous materials and hazardous waste management regulatory program. The agency provides oversight of businesses that deal with hazardous materials, operate underground storage tanks or aboveground storage tanks.

Date of Government Version: 01/14/04
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 10/08/03
Date of Next Scheduled EDR Contact: 02/09/04

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

KERN COUNTY:

Underground Storage Tank Sites & Tank Listing
Source: Kern County Environment Health Services Department
Telephone: 661-862-8700
Kern County Sites and Tanks Listing.

Date of Government Version: 07/25/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/22/03
Date of Next Scheduled EDR Contact: 03/08/04

LOS ANGELES COUNTY:

List of Solid Waste Facilities
Source: La County Department of Public Works
Telephone: 818-458-5185

Date of Government Version: 06/03/03
Database Release Frequency: Varies
Date of Last EDR Contact: 11/21/03
Date of Next Scheduled EDR Contact: 02/16/04

City of El Segundo Underground Storage Tank
Source: City of El Segundo Fire Department
Telephone: 310-524-2236

Date of Government Version: 09/11/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/17/03
Date of Next Scheduled EDR Contact: 02/16/04

City of Long Beach Underground Storage Tank
Source: City of Long Beach Fire Department
Telephone: 562-570-2543

Date of Government Version: 03/28/03
Database Release Frequency: Annually
Date of Last EDR Contact: 11/24/03
Date of Next Scheduled EDR Contact: 02/23/04

City of Torrance Underground Storage Tank
Source: City of Torrance Fire Department
Telephone: 310-618-2973

Date of Government Version: 09/03/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/17/03
Date of Next Scheduled EDR Contact: 02/16/04

City of Los Angeles Landfills
Source: Engineering & Construction Division
Telephone: 213-473-7869

Date of Government Version: 03/01/02
Database Release Frequency: Varies
Date of Last EDR Contact: 12/16/03
Date of Next Scheduled EDR Contact: 03/15/04

HMS: Street Number List
Source: Department of Public Works
Telephone: 626-458-3517
Industrial Waste and Underground Storage Tank Sites.

Date of Government Version: 09/30/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/17/03
Date of Next Scheduled EDR Contact: 02/16/04

Site Mitigation List
Source: Community Health Services
Telephone: 323-890-7806
Industrial sites that have had some sort of spill or complaint.

Date of Government Version: 01/07/03
Database Release Frequency: Annually
Date of Last EDR Contact: 11/17/03
Date of Next Scheduled EDR Contact: 02/16/04

San Gabriel Valley Areas of Concern
Source: EPA Region 9
Telephone: 415-972-3178
San Gabriel Valley areas where VOC contamination is at or above the MCL as designated by region 9 EPA office.

Date of Government Version: 12/31/98
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 07/06/99
Date of Next Scheduled EDR Contact: N/A

MARIN COUNTY:

Underground Storage Tank Sites
Source: Public Works Department Waste Management
Telephone: 415-499-6647
Currently permitted USTs in Marin County.

Date of Government Version: 08/19/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/03/03
Date of Next Scheduled EDR Contact: 02/02/04

NAPA COUNTY:

Sites With Reported Contamination
Source: Napa County Department of Environmental Management
Telephone: 707-253-4269

Date of Government Version: 10/02/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 12/29/03
Date of Next Scheduled EDR Contact: 03/29/04

Closed and Operating Underground Storage Tank Sites
Source: Napa County Department of Environmental Management
Telephone: 707-253-4269

Date of Government Version: 10/02/03
Database Release Frequency: Annually
Date of Last EDR Contact: 12/29/03
Date of Next Scheduled EDR Contact: 03/29/04

ORANGE COUNTY:

List of Underground Storage Tank Cleanups
Source: Health Care Agency
Telephone: 714-834-3446
Orange County Underground Storage Tank Cleanups (LUST).

Date of Government Version: 07/01/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 11/25/03
Date of Next Scheduled EDR Contact: 03/08/04

List of Underground Storage Tank Facilities
Source: Health Care Agency
Telephone: 714-834-3446
Orange County Underground Storage Tank Facilities (UST).

Date of Government Version: 09/02/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/19/03
Date of Next Scheduled EDR Contact: 03/08/04

List of Industrial Site Cleanups
Source: Health Care Agency
Telephone: 714-834-3446
Petroleum and non-petroleum spills.

Date of Government Version: 10/24/00
Database Release Frequency: Annually

Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

PLACER COUNTY:

Master List of Facilities
Source: Placer County Health and Human Services
Telephone: 530-889-7312
List includes aboveground tanks, underground tanks and cleanup sites.

Date of Government Version: 10/16/03
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 12/22/03
Date of Next Scheduled EDR Contact: 03/22/04

RIVERSIDE COUNTY:

Listing of Underground Tank Cleanup Sites
Source: Department of Public Health
Telephone: 909-358-5055
Riverside County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 12/01/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 01/19/04
Date of Next Scheduled EDR Contact: 04/19/04

Underground Storage Tank Tank List
Source: Health Services Agency
Telephone: 909-358-5055

Date of Government Version: 12/01/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 01/19/04
Date of Next Scheduled EDR Contact: 04/19/04

SACRAMENTO COUNTY:

CS - Contaminated Sites
Source: Sacramento County Environmental Management
Telephone: 916-875-8406

Date of Government Version: 07/17/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 11/03/03
Date of Next Scheduled EDR Contact: 02/02/04

ML - Regulatory Compliance Master List
Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Any business that has hazardous materials on site - hazardous material storage sites, underground storage tanks, waste generators.

Date of Government Version: 07/17/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 11/03/03
Date of Next Scheduled EDR Contact: 02/02/04

SAN BERNARDINO COUNTY:

Hazardous Material Permits
Source: San Bernardino County Fire Department Hazardous Materials Division
Telephone: 909-387-3041
This listing includes underground storage tanks, medical waste handlers/generators, hazardous materials handlers, hazardous waste generators, and waste oil generators/handlers.

Date of Government Version: 01/08/04
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

SAN DIEGO COUNTY:

Solid Waste Facilities
Source: Department of Health Services
Telephone: 619-338-2209
San Diego County Solid Waste Facilities.

Date of Government Version: 08/01/00
Database Release Frequency: Varies
Date of Last EDR Contact: 11/21/03
Date of Next Scheduled EDR Contact: 02/23/04

Hazardous Materials Management Division Database
Source: Hazardous Materials Management Division
Telephone: 619-338-2268
The database includes: HE58 - This report contains the business name, site address, business phone number, establishment 'H' permit number, type of permit, and the business status. HE17 - In addition to providing the same information provided in the HE58 listing, HE17 provides inspection dates, violations received by the establishment, hazardous waste generated, the quantity, method of storage, treatment/disposal of waste and the hauler, and information on underground storage tanks. Unauthorized Release List - Includes a summary of environmental contamination cases in San Diego County (underground tank cases, non-tank cases, groundwater contamination, and soil contamination are included.)

Date of Government Version: 10/31/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 01/09/04
Date of Next Scheduled EDR Contact: 04/05/04

SAN FRANCISCO COUNTY:

Local Oversite Facilities
Source: Department Of Public Health San Francisco County
Telephone: 415-252-3920

Date of Government Version: 12/09/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

Underground Storage Tank Information
Source: Department of Public Health
Telephone: 415-252-3920

Date of Government Version: 12/09/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

SAN MATEO COUNTY:

Fuel Leak List
Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921

Date of Government Version: 11/24/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 10/27/03
Date of Next Scheduled EDR Contact: 01/26/04

Business Inventory
Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
List includes Hazardous Materials Business Plan, hazardous waste generators, and underground storage tanks.

Date of Government Version: 11/13/03
Database Release Frequency: Annually

Date of Last EDR Contact: 01/12/04
Date of Next Scheduled EDR Contact: 04/12/04

SANTA CLARA COUNTY:

Fuel Leak Site Activity Report
Source: Santa Clara Valley Water District
Telephone: 408-265-2600

Date of Government Version: 12/31/03
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 12/29/03
Date of Next Scheduled EDR Contact: 03/29/04

Hazardous Material Facilities
Source: City of San Jose Fire Department
Telephone: 408-277-4659

Date of Government Version: 10/01/03
Database Release Frequency: Annually

Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

SOLANO COUNTY:

Leaking Underground Storage Tanks
Source: Solano County Department of Environmental Management
Telephone: 707-421-6770

Date of Government Version: 12/16/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 12/16/03
Date of Next Scheduled EDR Contact: 03/15/04

Underground Storage Tanks
Source: Solano County Department of Environmental Management
Telephone: 707-421-6770

Date of Government Version: 12/16/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 12/16/03
Date of Next Scheduled EDR Contact: 03/15/04

SONOMA COUNTY:

Leaking Underground Storage Tank Sites
Source: Department of Health Services
Telephone: 707-565-6565

Date of Government Version: 10/01/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 10/27/03
Date of Next Scheduled EDR Contact: 01/26/04

SUTTER COUNTY:

Underground Storage Tanks
Source: Sutter County Department of Agriculture
Telephone: 530-822-7500

Date of Government Version: 07/01/01
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 01/09/04
Date of Next Scheduled EDR Contact: 04/05/04

VENTURA COUNTY:

Inventory of Illegal Abandoned and Inactive Sites
Source: Environmental Health Division
Telephone: 805-654-2813
Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites.

Date of Government Version: 09/01/02
Database Release Frequency: Annually
Date of Last EDR Contact: 11/26/03
Date of Next Scheduled EDR Contact: 02/23/04

Listing of Underground Tank Cleanup Sites
Source: Environmental Health Division
Telephone: 805-654-2813
Ventura County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 12/01/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/16/03
Date of Next Scheduled EDR Contact: 03/15/04

Underground Tank Closed Sites List
Source: Environmental Health Division
Telephone: 805-654-2813
Ventura County Operating Underground Storage Tank Sites (UST)/Underground Tank Closed Sites List.

Date of Government Version: 07/30/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 01/12/04
Date of Next Scheduled EDR Contact: 04/12/04

Business Plan, Hazardous Waste Producers, and Operating Underground Tanks
Source: Ventura County Environmental Health Division
Telephone: 805-654-2813
The BWT list indicates by site address whether the Environmental Health Division has Business Plan (B), Waste Producer (W), and/or Underground Tank (T) information.

Date of Government Version: 12/01/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 12/16/03
Date of Next Scheduled EDR Contact: 03/15/04

YOLO COUNTY:

Underground Storage Tank Comprehensive Facility Report
Source: Yolo County Department of Health
Telephone: 530-666-8646

Date of Government Version: 10/29/03
Database Release Frequency: Annually
Date of Last EDR Contact: 01/19/04
Date of Next Scheduled EDR Contact: 04/19/04

California Regional Water Quality Control Board (RWQCB) LUST Records

LUST REG 1: Active Toxic Site Investigation
Source: California Regional Water Quality Control Board North Coast (1)
Telephone: 707-576-2220
Del Norte, Humboldt, Lake, Mendocino, Modoc, Siskiyou, Sonoma, Trinity counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/01/01
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 11/21/03
Date of Next Scheduled EDR Contact: 02/23/04

LUST REG 2: Fuel Leak List
Source: California Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-286-0457

Date of Government Version: 03/28/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 01/14/04
Date of Next Scheduled EDR Contact: 04/12/04

LUST REG 3: Leaking Underground Storage Tank Database
Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-549-3147

Date of Government Version: 05/19/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 11/17/03
Date of Next Scheduled EDR Contact: 02/16/04

LUST REG 4: Underground Storage Tank Leak List
Source: California Regional Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6600
Los Angeles, Ventura counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 08/09/01
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 12/31/03
Date of Next Scheduled EDR Contact: 03/29/04

LUST REG 5: Leaking Underground Storage Tank Database
Source: California Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-255-3125

Date of Government Version: 07/01/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 01/06/04
Date of Next Scheduled EDR Contact: 04/05/04

LUST REG 6L: Leaking Underground Storage Tank Case Listing
Source: California Regional Water Quality Control Board Lahontan Region (6)
Telephone: 916-542-5424
For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/09/03
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

LUST REG 6V: Leaking Underground Storage Tank Case Listing
Source: California Regional Water Quality Control Board Victorville Branch Office (6)
Telephone: 760-346-7491

Date of Government Version: 11/13/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 01/06/04
Date of Next Scheduled EDR Contact: 04/05/04

LUST REG 7: Leaking Underground Storage Tank Case Listing
Source: California Regional Water Quality Control Board Colorado River Basin Region (7)
Telephone: 760-346-7491

Date of Government Version: 07/02/02
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 12/29/03
Date of Next Scheduled EDR Contact: 03/29/04

LUST REG 8: Leaking Underground Storage Tanks
Source: California Regional Water Quality Control Board Santa Ana Region (8)
Telephone: 909-782-4498
California Regional Water Quality Control Board Santa Ana Region (8). For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 01/12/04
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 11/12/03
Date of Next Scheduled EDR Contact: 02/09/04

LUST REG 9: Leaking Underground Storage Tank Report
Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-467-2980
Orange, Riverside, San Diego counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 03/01/01
Database Release Frequency: No Update Planned
Date of Last EDR Contact: 01/19/04
Date of Next Scheduled EDR Contact: 04/19/04

California Regional Water Quality Control Board (RWQCB) SLIC Records

SLIC REG 1: Active Toxic Site Investigations
Source: California Regional Water Quality Control Board, North Coast Region (1)
Telephone: 707-576-2220

Date of Government Version: 04/03/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/21/03
Date of Next Scheduled EDR Contact: 02/23/04

SLIC REG 2: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-286-0457
Any contaminated site that impacts groundwater or has the potential to impact groundwater.

Date of Government Version: 03/28/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 01/14/04
Date of Next Scheduled EDR Contact: 04/12/04

SLIC REG 3: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-549-3147
Any contaminated site that impacts groundwater or has the potential to impact groundwater.

Date of Government Version: 09/16/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 11/17/03
Date of Next Scheduled EDR Contact: 02/16/04

SLIC REG 4: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: Region Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6600
Any contaminated site that impacts groundwater or has the potential to impact groundwater.

Date of Government Version: 10/01/03
Database Release Frequency: Quarterly
Date of Last EDR Contact: 10/27/03
Date of Next Scheduled EDR Contact: 01/26/04

SLIC REG 5: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-855-3075
Unregulated sites that impact groundwater or have the potential to impact groundwater.

Date of Government Version: 01/08/04
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 01/06/04
Date of Next Scheduled EDR Contact: 04/05/04

SLIC REG 6L: SLIC Sites
Source: California Regional Water Quality Control Board, Lahontan Region
Telephone: 530-542-5574

Date of Government Version: 09/09/03
Database Release Frequency: Varies
Date of Last EDR Contact: 12/08/03
Date of Next Scheduled EDR Contact: 03/08/04

SLIC REG 6V: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: Regional Water Quality Control Board, Victorville Branch
Telephone: 619-241-6583

Date of Government Version: 05/08/03
Database Release Frequency: Semi-Annually
Date of Last EDR Contact: 01/09/04
Date of Next Scheduled EDR Contact: 04/05/04

SLIC REG 7: SLIC List
Source: California Regional Quality Control Board, Colorado River Basin Region
Telephone: 760-346-7491

Date of Government Version: 12/19/03
Database Release Frequency: Varies

Date of Last EDR Contact: 12/01/03
Date of Next Scheduled EDR Contact: 02/23/04

SLIC REG 8: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: California Region Water Quality Control Board Santa Ana Region (8)
Telephone: 909-782-3298

Date of Government Version: 04/01/03
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: 01/07/04
Date of Next Scheduled EDR Contact: 04/05/04

SLIC REG 9: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-467-2980

Date of Government Version: 12/01/03
Database Release Frequency: Annually

Date of Last EDR Contact: 12/01/03
Date of Next Scheduled EDR Contact: 03/04/04

EDR PROPRIETARY HISTORICAL DATABASES

EDR Historical Gas Station and Dry Cleaners: EDR has searched select national collections of business directories and has collected listings of potential dry cleaner and gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning and gas station/filling station/service station establishments. The categories reviewed included, but were not limited to: *gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, dry cleaner, cleaners, laundry, laundromat, cleaning/laundry, wash & dry, etc.*

This information is meant to assist and complement environmental professionals in their conduct of environmental site assessments, and is not meant to be a substitute for a full historical investigation as defined in ASTM E1527. The information provided in this proprietary database may or may not be complete; i.e., the absence of a dry cleaner or gas station/filling station/service station site does not necessarily mean that such a site did not exist in the area covered by this report.

(A note on "dry cleaning" sites: it is not possible for EDR to differentiate between establishments that use PERC on-site as a cleaning solvent and sites that function simply as drop-off and pick-up locations or that are traditional wet cleaning/laundry facilities. Therefore, it is essential for environmental professionals to incorporate professional judgment in the evaluation of each site.)

Former Manufactured Gas (Coal Gas) Sites: The existence and location of Coal Gas sites is provided exclusively to EDR by Real Property Scan, Inc. ©Copyright 1993 Real Property Scan, Inc. For a technical description of the types of hazards which may be found at such sites, contact your EDR customer service representative.

Disclaimer Provided by Real Property Scan, Inc.

The information contained in this report has predominantly been obtained from publicly available sources produced by entities other than Real Property Scan. While reasonable steps have been taken to insure the accuracy of this report, Real Property Scan does not guarantee the accuracy of this report. Any liability on the part of Real Property Scan is strictly limited to a refund of the amount paid. No claim is made for the actual existence of toxins at any site. This report does not constitute a legal opinion.

BROWNFIELDS DATABASES

VCP: Voluntary Cleanup Program Properties
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC's costs.

Date of Government Version: 11/30/03
Database Release Frequency: Quarterly

Date of Last EDR Contact: 12/01/03
Date of Next Scheduled EDR Contact: 03/01/04

US BROWNFIELDS: A Listing of Brownfields Sites
Source: Environmental Protection Agency
Telephone: 202-566-2777
Included in the listing are brownfields properties addresses by Cooperative Agreement Recipients and brownfields properties addressed by Targeted Brownfields Assessments. Targeted Brownfields Assessments-EPA's Targeted Brownfields Assessments (TBA) program is designed to help states, tribes, and municipalities--especially those without EPA Brownfields Assessment Demonstration Pilots--minimize the uncertainties of contamination often associated with brownfields. Under the TBA program, EPA provides funding and/or technical assistance for environmental assessments at brownfields sites throughout the country. Targeted Brownfields Assessments supplement and work with other efforts under EPA's Brownfields Initiative to promote cleanup and redevelopment of brownfields. Cooperative Agreement Recipients-States, political subdivisions, territories, and Indian tribes become BCRLF cooperative agreement recipients when they enter into BCRLF cooperative agreements with the U.S. EPA. EPA selects BCRLF cooperative agreement recipients based on a proposal and application process. BCRLF cooperative agreement recipients must use EPA funds provided through BCRLF cooperative agreement for specified brownfields-related cleanup activities.

Date of Government Version: N/A
Database Release Frequency: Semi-Annually

Date of Last EDR Contact: N/A
Date of Next Scheduled EDR Contact: N/A

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

Oil/Gas Pipelines: This data was obtained by EDR from the USGS in 1994. It is referred to by USGS as GeoData Digital Line Graphs from 1:100,000-Scale Maps. It was extracted from the transportation category including some oil, but primarily gas pipelines.

Electric Power Transmission Line Data
Source: PennWell Corporation
Telephone: (800) 823-6277
This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:
Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing
Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.

Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.

Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.

Daycare Centers: Licensed Facilities
Source: Department of Social Services
Telephone: 916-657-4041

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1999 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 from the U.S. Fish and Wildlife Service.

STREET AND ADDRESS INFORMATION

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GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

EAST WEST/STERLING GATEWAY
DEL VALLE ROAD
VAL VERDE, CA 91384

TARGET PROPERTY COORDINATES

Latitude (North):	34.447899 - 34° 26' 52.4''
Longitude (West):	118.649597 - 118° 38' 58.5''
Universal Tranverse Mercator:	Zone 11
UTM X (Meters):	348456.2
UTM Y (Meters):	3812858.5
Elevation:	1310 ft. above sea level

EDR's GeoCheck Physical Setting Source Addendum has been developed to assist the environmental professional with the collection of physical setting source information in accordance with ASTM 1527-00, Section 7.2.3. Section 7.2.3 requires that a current USGS 7.5 Minute Topographic Map (or equivalent, such as the USGS Digital Elevation Model) be reviewed. It also requires that one or more additional physical setting sources be sought when (1) conditions have been identified in which hazardous substances or petroleum products are likely to migrate to or from the property, and (2) more information than is provided in the current USGS 7.5 Minute Topographic Map (or equivalent) is generally obtained, pursuant to local good commercial or customary practice, to assess the impact of migration of recognized environmental conditions in connection with the property. Such additional physical setting sources generally include information about the topographic, hydrologic, hydrogeologic, and geologic characteristics of a site, and wells in the area.

Assessment of the impact of contaminant migration generally has two principle investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata. EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

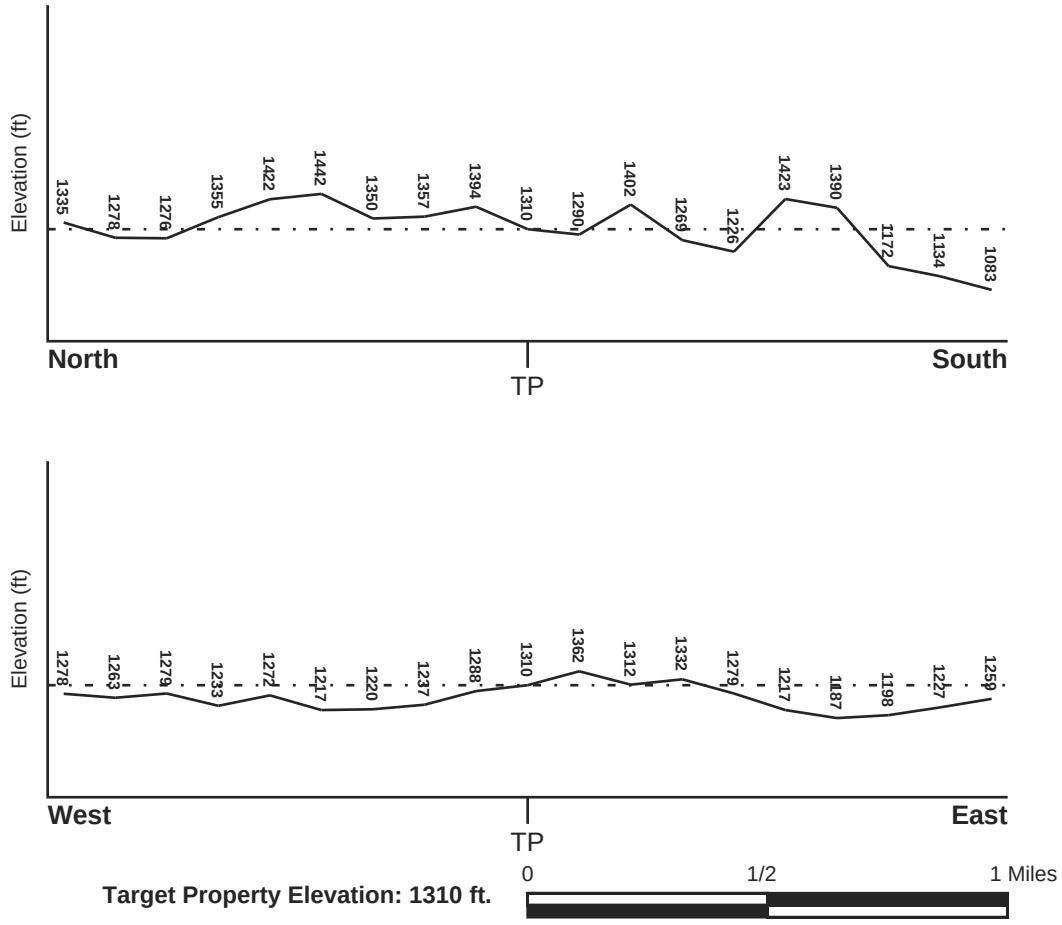
TOPOGRAPHIC INFORMATION

Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

USGS Topographic Map:	34118-D6 VAL VERDE, CA
General Topographic Gradient:	General WNW
Source:	USGS 7.5 min quad index

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Target Property Elevation: 1310 ft.

Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Target Property County	FEMA Flood Electronic Data
LOS ANGELES, CA	YES - refer to the Overview Map and Detail Map

Flood Plain Panel at Target Property: 0650430340B

Additional Panels in search area: Not Reported

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
VAL VERDE	Not Available

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius:	1.25 miles
Status:	Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

* ©1996 Site−specific hydrogeological data gathered by CERCLIS Alerts, Inc., Bainbridge Island, WA. All rights reserved. All of the information and opinions presented are those of the cited EPA report(s), which were completed under a Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) investigation.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

Era:	Cenozoic
System:	Tertiary
Series:	Pliocene
Code:	Tpc *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Continental Deposits

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps. The following information is based on Soil Conservation Service STATSGO data.

Soil Component Name:	CIENEBA
Soil Surface Texture:	loam
Hydrologic Group:	Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.
Soil Drainage Class:	Somewhat excessive. Soils have high hydraulic conductivity and low water holding capacity. Depth to water table is more than 6 feet.

Hydric Status: Soil does not meet the requirements for a hydric soil.

Corrosion Potential - Uncoated Steel:	MODERATE
Depth to Bedrock Min:	> 4 inches
Depth to Bedrock Max:	> 20 inches

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Soil Layer Information							
	Boundary			Classification			
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil	Permeability Rate (in/hr)	Soil Reaction (pH)
1	0 inches	10 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 6.00 Min: 2.00	Max: 7.30 Min: 5.10
2	10 inches	14 inches	weathered bedrock	Not reported	Not reported	Max: 0.00 Min: 0.00	Max: 0.00 Min: 0.00

OTHER SOIL TYPES IN AREA

Based on Soil Conservation Service STATSGO data, the following additional subordinant soil types may appear within the general area of target property.

Soil Surface Textures: gravelly - sandy loam
silty clay loam
unweathered bedrock
very gravelly - sandy loam
gravelly - loam
very gravelly - silt loam
very fine sandy loam
sandy loam

Surficial Soil Types: gravelly - sandy loam
silty clay loam
unweathered bedrock
very gravelly - sandy loam
gravelly - loam
very gravelly - silt loam
very fine sandy loam
sandy loam

Shallow Soil Types: very gravelly - silt loam

Deeper Soil Types: unweathered bedrock

ADDITIONAL ENVIRONMENTAL RECORD SOURCES

According to ASTM E 1527-00, Section 7.2.2, "one or more additional state or local sources of environmental records may be checked, in the discretion of the environmental professional, to enhance and supplement federal and state sources... Factors to consider in determining which local or additional state records, if any, should be checked include (1) whether they are reasonably ascertainable, (2) whether they are sufficiently useful, accurate, and complete in light of the objective of the records review (see 7.1.1), and (3) whether they are obtained, pursuant to local, good commercial or customary practice." One of the record sources listed in Section 7.2.2 is water well information. Water well information can be used to assist the environmental professional in assessing sources that may impact groundwater flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 1 mile
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

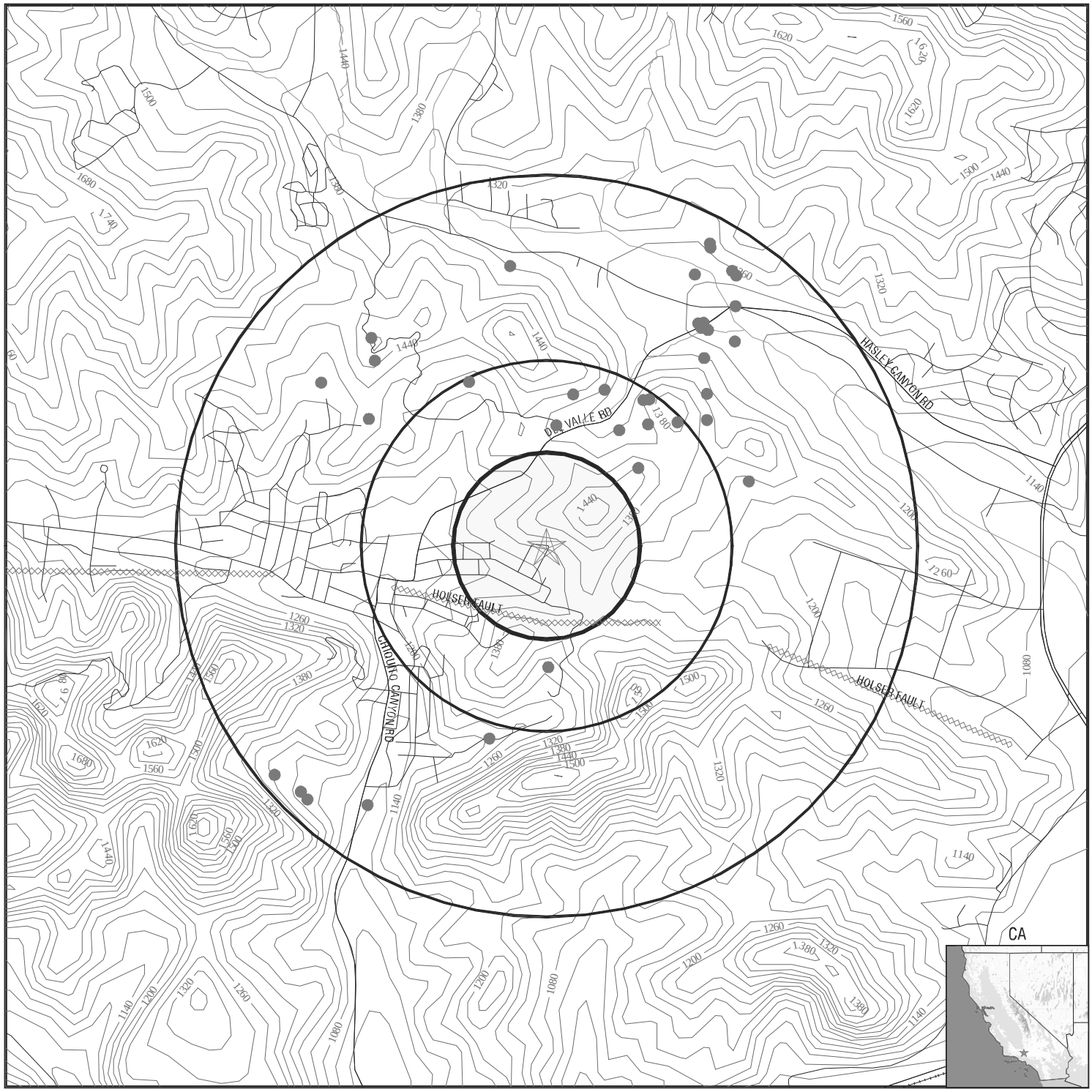
STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

STATE OIL/GAS WELL INFORMATION

DISTANCE FROM TP (Miles)	DISTANCE FROM TP (Miles)
1/2 - 1 Mile NNE	1/2 - 1 Mile NNE
1/2 - 1 Mile North	1/2 - 1 Mile NE
1/2 - 1 Mile NNE	1/2 - 1 Mile NE
1/2 - 1 Mile NE	1/2 - 1 Mile NE
1/2 - 1 Mile NE	1/2 - 1 Mile NE
1/2 - 1 Mile NE	1/2 - 1 Mile NW
1/2 - 1 Mile NE	1/2 - 1 Mile NE
1/2 - 1 Mile NW	1/4 - 1/2 Mile NNW
1/2 - 1 Mile NW	1/4 - 1/2 Mile NNE
1/2 - 1 Mile NE	1/4 - 1/2 Mile North
1/4 - 1/2 Mile NE	1/4 - 1/2 Mile NNE
1/2 - 1 Mile NW	1/2 - 1 Mile NE
1/4 - 1/2 Mile NE	1/4 - 1/2 Mile NE
1/4 - 1/2 Mile North	1/4 - 1/2 Mile NNE
1/4 - 1/2 Mile NE	1/2 - 1 Mile ENE
1/4 - 1/2 Mile South	1/2 - 1 Mile SSW
1/2 - 1 Mile SW	1/2 - 1 Mile SW
1/2 - 1 Mile SW	1/2 - 1 Mile SW

PHYSICAL SETTING SOURCE MAP - 1124078.2s



- County Boundary
- Major Roads
- Contour Lines
- Earthquake Fault Lines
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons
- Groundwater Flow Direction
- GI Indeterminate Groundwater Flow at Location
- GV Groundwater Flow Varies at Location
- HD Closest Hydrogeological Data
- Oil, gas or related wells

TARGET PROPERTY:	East West/Sterling Gateway	CUSTOMER:	Converse Consultants
ADDRESS:	Del Valle Road	CONTACT:	Maggie Tymkow
CITY/STATE/ZIP:	Val Verde CA 91384	INQUIRY #:	1124078.2s
LAT/LONG:	34.4479 / 118.6496	DATE:	February 05, 2004 1:10 pm

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction
Distance | Database | EDR ID Number

NNE
1/2 - 1 Mile | **OIL_GAS** | **CA00011006**

Well Number:	7	Status:	Completed oil
API Number:	03722750	Operator:	Petrominerals Corporation
Latitude:	34.459727	Longitude:	-118.640970
Region:	2	Lease:	Burns Crist
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NNE
1/2 - 1 Mile | **OIL_GAS** | **CA00011004**

Well Number:	5	Status:	001
API Number:	03724193	Operator:	Petrominerals Corporation
Latitude:	34.459573	Longitude:	-118.640939
Region:	2	Lease:	Burns Crist
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

North
1/2 - 1 Mile | **OIL_GAS** | **CA00008835**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03706126	Operator:	Texaco E & P Inc
Latitude:	34.458850	Longitude:	-118.650399
Region:	2	Lease:	Towle
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile | **OIL_GAS** | **CA00010953**

Well Number:	1	Status:	Completed oil- directional
API Number:	03722739	Operator:	Petrominerals Corporation
Latitude:	34.458657	Longitude:	-118.639917
Region:	2	Lease:	Sadd
Section:	02	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction Distance	Database	EDR ID Number

NNE
1/2 - 1 Mile **OIL_GAS** **CA00011005**

Well Number:	6	Status:	Completed oil
API Number:	03722740	Operator:	Petrominerals Corporation
Latitude:	34.458523	Longitude:	-118.641679
Region:	2	Lease:	Burns Crist
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile **OIL_GAS** **CA00010925**

Well Number:	2	Status:	Completed oil
API Number:	03722940	Operator:	Petrominerals Corporation
Latitude:	34.458479	Longitude:	-118.639731
Region:	2	Lease:	Sadd
Section:	02	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile **OIL_GAS** **CA00010950**

Well Number:	3	Status:	Completed oil- directional
API Number:	03722747	Operator:	Petrominerals Corporation
Latitude:	34.457277	Longitude:	-118.639759
Region:	2	Lease:	McGillivrae
Section:	02	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile **OIL_GAS** **CA00010948**

Well Number:	9	Status:	001
API Number:	03724195	Operator:	Petrominerals Corporation
Latitude:	34.456633	Longitude:	-118.641273
Region:	2	Lease:	Mabel Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction Distance	Database	EDR ID Number

NE
1/2 - 1 Mile **OIL_GAS** **CA00010941**

Well Number:	10	Status:	001
API Number:	03724196	Operator:	Petrominerals Corporation
Latitude:	34.456607	Longitude:	-118.641520
Region:	2	Lease:	Mabel Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile **OIL_GAS** **CA00010946**

Well Number:	7	Status:	Completed oil
API Number:	03722727	Operator:	Petrominerals Corporation
Latitude:	34.456428	Longitude:	-118.641365
Region:	2	Lease:	Mabel Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile **OIL_GAS** **CA00010947**

Well Number:	8	Status:	001
API Number:	03724194	Operator:	Petrominerals Corporation
Latitude:	34.456353	Longitude:	-118.641056
Region:	2	Lease:	Mabel Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NW
1/2 - 1 Mile **OIL_GAS** **CA00013454**

Well Number:	17	Status:	Plugged and abandoned oil
API Number:	03707260	Operator:	G. R. Nance Co., Inc
Latitude:	34.456041	Longitude:	-118.656948
Region:	2	Lease:	Towle
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction Distance	Database	EDR ID Number

NE
1/2 - 1 Mile **OIL_GAS** **CA00010949**

Well Number:	2	Status:	Completed oil
API Number:	03722349	Operator:	Petrominerals Corporation
Latitude:	34.455897	Longitude:	-118.639788
Region:	2	Lease:	McGillivrae
Section:	02	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile **OIL_GAS** **CA00010945**

Well Number:	6	Status:	Completed oil
API Number:	03722340	Operator:	Petrominerals Corporation
Latitude:	34.455253	Longitude:	-118.641239
Region:	2	Lease:	Mabel Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NW
1/2 - 1 Mile **OIL_GAS** **CA00010966**

Well Number:	1	Status:	Plugged and abandoned oil
API Number:	03721689	Operator:	Petrominerals Corporation
Latitude:	34.455147	Longitude:	-118.656791
Region:	2	Lease:	Hilgenfeld
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NNW
1/4 - 1/2 Mile **OIL_GAS** **CA00013495**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03707259	Operator:	Federal Oil Company
Latitude:	34.454320	Longitude:	-118.652337
Region:	2	Lease:	Federal-Towle
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction
Distance | Database | EDR ID Number

NW
1/2 - 1 Mile | **OIL_GAS** | **CA00010784**

Well Number:	88-4	Status:	Plugged and abandoned oil
API Number:	03707261	Operator:	Porsco Operating Company
Latitude:	34.454295	Longitude:	-118.659325
Region:	2	Lease:	Claiborne
Section:	04	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NNE
1/4 - 1/2 Mile | **OIL_GAS** | **CA00010943**

Well Number:	4	Status:	Completed oil
API Number:	03722060	Operator:	Petrominerals Corporation
Latitude:	34.454010	Longitude:	-118.645937
Region:	2	Lease:	Mabel Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile | **OIL_GAS** | **CA00010967**

Well Number:	1	Status:	Completed oil
API Number:	03707258	Operator:	Petrominerals Corporation
Latitude:	34.453848	Longitude:	-118.641113
Region:	2	Lease:	Mabel E. Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

North
1/4 - 1/2 Mile | **OIL_GAS** | **CA00010944**

Well Number:	5	Status:	Plugged and abandoned-dry hole
API Number:	03722072	Operator:	Petrominerals Corporation
Latitude:	34.453826	Longitude:	-118.647420
Region:	2	Lease:	Mabel Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction
Distance | Database | EDR ID Number

NE
1/4 - 1/2 Mile | **OIL_GAS** | **CA00010940**

Well Number:	2	Status:	Completed oil
API Number:	03721715	Operator:	Petrominerals Corporation
Latitude:	34.453634	Longitude:	-118.643833
Region:	2	Lease:	Mabel E. Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NNE
1/4 - 1/2 Mile | **OIL_GAS** | **CA00010942**

Well Number:	3	Status:	Completed oil- directional
API Number:	03721805	Operator:	Petrominerals Corporation
Latitude:	34.453607	Longitude:	-118.644112
Region:	2	Lease:	Mabel Strawn
Section:	03	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NW
1/2 - 1 Mile | **OIL_GAS** | **CA00013497**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03705395	Operator:	Fernando Oil Company
Latitude:	34.452872	Longitude:	-118.657065
Region:	2	Lease:	Wel No.
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/2 - 1 Mile | **OIL_GAS** | **CA00012074**

Well Number:	81X	Status:	Plugged and abandoned-dry hole
API Number:	03721466	Operator:	Montara Petroleum Company
Latitude:	34.452826	Longitude:	-118.641111
Region:	2	Lease:	Sterling
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction
Distance | Database | EDR ID Number

NE
1/4 - 1/2 Mile | **OIL_GAS** | **CA00010933**

Well Number:	2-10	Status:	Completed oil
API Number:	03721816	Operator:	Petrominerals Corporation
Latitude:	34.452744	Longitude:	-118.642502
Region:	2	Lease:	Sterling
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NE
1/4 - 1/2 Mile | **OIL_GAS** | **CA00010932**

Well Number:	1-10	Status:	Completed oil
API Number:	03721801	Operator:	Petrominerals Corporation
Latitude:	34.452663	Longitude:	-118.643893
Region:	2	Lease:	Sterling
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

North
1/4 - 1/2 Mile | **OIL_GAS** | **CA00008486**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03706205	Operator:	U. S. Natural Gas C & Manning
Latitude:	34.452622	Longitude:	-118.648222
Region:	2	Lease:	Strawn
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

NNE
1/4 - 1/2 Mile | **OIL_GAS** | **CA00015649**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03705148	Operator:	Atlantic Oil Company
Latitude:	34.452428	Longitude:	-118.645253
Region:	2	Lease:	Strawn
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction
Distance | Database | EDR ID Number

NE
1/4 - 1/2 Mile | **OIL_GAS** | **CA00013952**

Well Number:	3-10	Status:	Plugged and abandoned oil
API Number:	03721871	Operator:	Decalta International Corp
Latitude:	34.450949	Longitude:	-118.644354
Region:	2	Lease:	Sterling
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

ENE
1/2 - 1 Mile | **OIL_GAS** | **CA00009001**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03706082	Operator:	Texaco E & P Inc
Latitude:	34.450430	Longitude:	-118.639127
Region:	2	Lease:	Fernando
Section:	11	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

South
1/4 - 1/2 Mile | **OIL_GAS** | **CA00008973**

Well Number:	1	Status:	Plugged and abandoned-dry hole-directional
API Number:	03706091	Operator:	Texaco E & P Inc
Latitude:	34.443164	Longitude:	-118.648605
Region:	2	Lease:	Malis
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

SSW
1/2 - 1 Mile | **OIL_GAS** | **CA00012519**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03705621	Operator:	Marathon Oil Co
Latitude:	34.440369	Longitude:	-118.651382
Region:	2	Lease:	Mabel S. Henderson
Section:	10	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Direction
Distance | Database | EDR ID Number

SW
1/2 - 1 Mile | **OIL_GAS** | **CA00008923**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03706117	Operator:	Texaco E & P Inc
Latitude:	34.438953	Longitude:	-118.661520
Region:	2	Lease:	Seaboard-So Cal Pet. Daugherty
Section:	09	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

SW
1/2 - 1 Mile | **OIL_GAS** | **CA00010509**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03706664	Operator:	Rothschild Oil Company
Latitude:	34.438293	Longitude:	-118.660282
Region:	2	Lease:	Barbour
Section:	16	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

SW
1/2 - 1 Mile | **OIL_GAS** | **CA00011095**

Well Number:	1-16	Status:	Plugged and abandoned-dry hole-directional
API Number:	03722947	Operator:	Pancandian Petroleum Co
Latitude:	34.437987	Longitude:	-118.659972
Region:	2	Lease:	N. L. & F.
Section:	16	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

SW
1/2 - 1 Mile | **OIL_GAS** | **CA00014987**

Well Number:	1	Status:	Plugged and abandoned-dry hole
API Number:	03706671	Operator:	Chevron USA, Inc.
Latitude:	34.437767	Longitude:	-118.657127
Region:	2	Lease:	Boobier
Section:	15	Township:	04N
Range:	17W	Map Number:	253
Base and Meridian:	San Bernardino	Total Depth:	Not Reported
Spud Date:	Not Reported	Abandonment Date:	Not Reported

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

State Database: CA Radon

Radon Test Results

Zip	Total Sites	> 4 Pci/L	Pct. > 4 Pci/L
91384	5	0	0.00

Federal EPA Radon Zone for LOS ANGELES County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for LOS ANGELES COUNTY, CA

Number of sites tested: 63

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.711 pCi/L	98%	2%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	0.933 pCi/L	100%	0%	0%

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002. 7.5-Minute DEMs correspond to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps.

HYDROLOGIC INFORMATION

Flood Zone Data: This data, available in select counties across the country, was obtained by EDR in 1999 from the Federal Emergency Management Agency (FEMA). Data depicts 100-year and 500-year flood zones as defined by FEMA.

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002 from the U.S. Fish and Wildlife Service.

HYDROGEOLOGIC INFORMATION

AQUIFLOW^{R} Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Services
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

ADDITIONAL ENVIRONMENTAL RECORD SOURCES

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

STATE RECORDS

California Drinking Water Quality Database
Source: Department of Health Services
Telephone: 916-324-2319
The database includes all drinking water compliance and special studies monitoring for the state of California since 1984. It consists of over 3,200,000 individual analyses along with well and water system information.

California Oil and Gas Well Locations for District 2, 3, 5 and 6
Source: Department of Conservation
Telephone: 916-323-1779

RADON

State Database: CA Radon
Source: Department of Health Services
Telephone: 916-324-2208
Radon Database for California

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

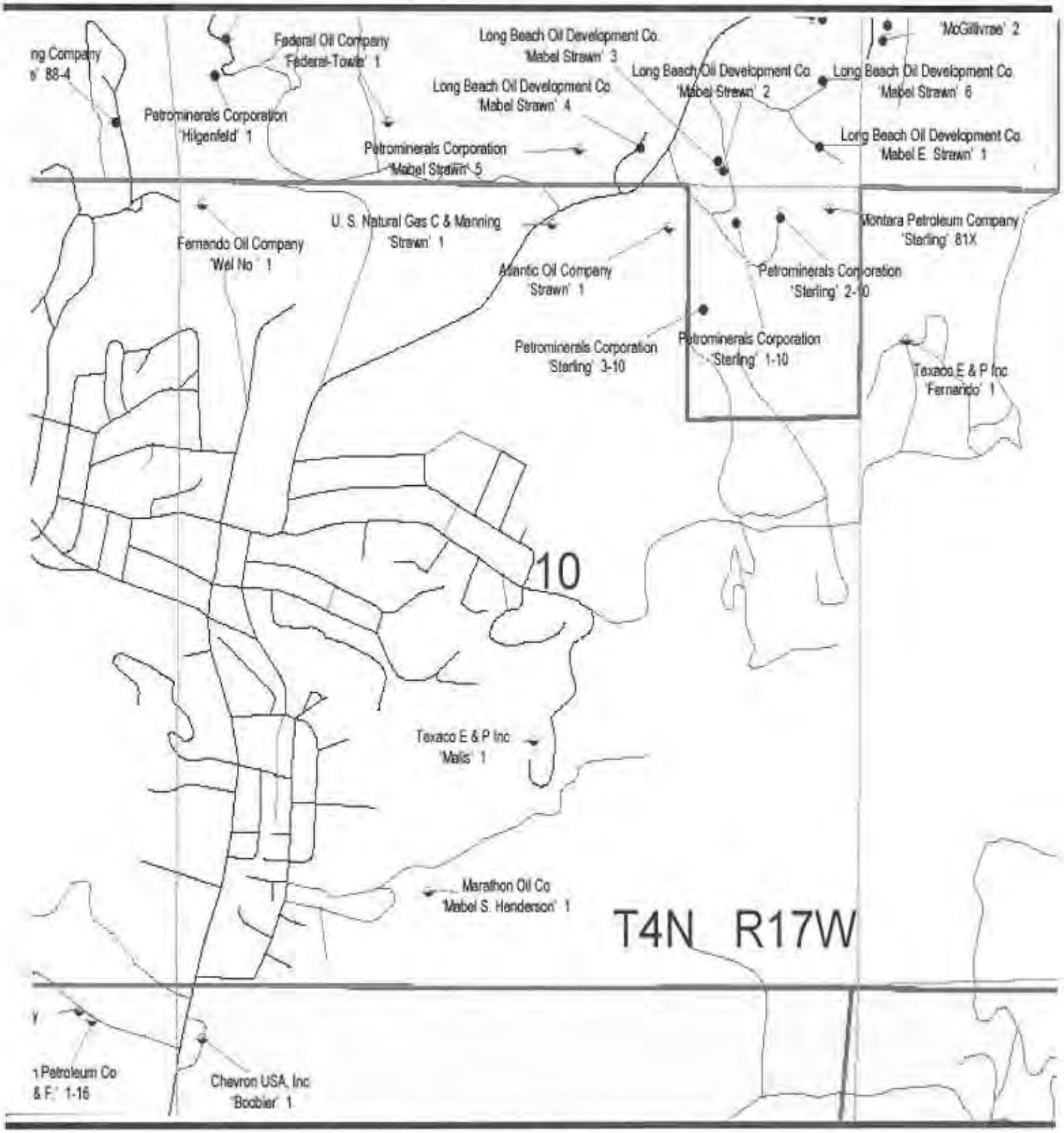
OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

California Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary fault lines, prepared in 1975 by the United State Geological Survey. Additional information (also from 1975) regarding activity at specific fault lines comes from California's Preliminary Fault Activity Map prepared by the California Division of Mines and Geology.

Appendix D



Portion of 253 DOGGR Map

East West Bank
Sterling Gateway Property
Val Verde Park, California

Project No.
04-41-125-01

Converse Consultants

Figure
1

-m 105. 47750 8-19 10M

037- 05395

CALIFORNIA STATE MINING BUREAU

4

Department of Petroleum and Gas

STATE MINING BUREAU
RECEIVED
SEP 13 1920
LOS ANGELES OFFICE

Notice of Intention to Drill New Well

This notice must be given before drilling begins

Los Angeles, Cal. 7/27 1920

Mr. I. V. Augur,

Deputy State Oil and Gas Supervisor

Union League Bldg., Los Angeles, Cal.

DEAR SIR:

In compliance with Section 17, Chapter 718, Statutes of 1915, notice is hereby given that it is our intention to commence the work of drilling well number 1 Section 10 T. 4 R. 17 West SB B. & M., Ventura Newhall HB7 Oil Field, Los Angeles County.

The well is 150 feet X. or S., and 150 feet E. or X W. from North West Cor. Sec. 10
(Give location in distance from section corners or other corners of legal subdivision)

The elevation of the derrick floor above sea level is 1400 Topo feet.

We propose to use the following strings of casing either cementing or landing them as here indicated:

Size of Casing, Inches	Weight, Lbs. Per Foot	New or Second Hand	Depth	Landed or Cemented
18" Stove pipe		New	200	Landed
14" " "				
12½" Marks	40#	New	1000	

It is understood that if changes in this plan become necessary we are to notify you if possible before cementing or landing the casing.

We estimate that productive oil or gas formation should be encountered at a depth of about _____ feet, more or less.

Respectfully yours,

Reference to file of data

Maps	[illegible]	[illegible]	Cards	Forms 174	Forms 131
✓				✓	✓

FERNANDO OIL COMPANY.
(Name of Company or Operator)

By [signature]

Address notice to Deputy State Oil and Gas Supervisor in charge of district where well is located

Topo. Sh. # 6
E.J.K.

Box 71.
Newhall Calif

FERNANDO OIL COMPANY
716 PHELAN BUILDING
SAN FRANCISCO

Sup to drill

March 8th 1923

STATE MINING BUREAU
RECEIVED
MAR 9 1923
LOS ANGELES OFFICE

10 4n
17W
Newhall

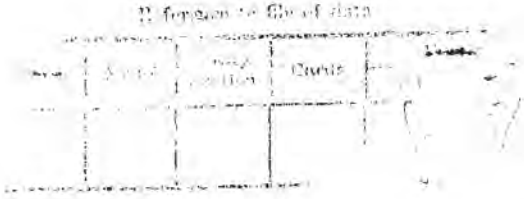
Mr. C.C. Thoms
1126 Pacific Finance Bldg
Los angeles Calif

Dear Sir
the notice states
"our last water cement job was a failure
We Put cement in hole clean up in to our 6¼ casing Put it in a gainst 1000 lb Presure Perkins Sistum. With 2" tubing (With chemicals) our object was to Recement our 6¼
We tested out our 6¼ casing found no leak in casing drilled 6 inches below 6¼ Shoe got some water. Drilled on down and water came in Stronger. We think now our water is Comeing Right under our 6¼"
Proposal
We Propose now going to 3620 ft and Seting our 4½ casing and cementing it there, there is 3575 ft 8" of 6¼ casing in hole

Yours Truly

Fernando Oil Co

By R. B. Stout



Reference to file of data

08. 36129—2-5-18—10M

CALIFORNIA STATE MINING BUREAU

Department of Petroleum and Gas

STATE MINING BUREAU
RECEIVED
APR 14 1923
LOS ANGELES OFFICE

Notice of Intention to Abandon Well

This notice must be given at least five days before work is to begin

Newhall, Cal. April 13 1923

Mr.

Deputy State Oil and Gas Supervisor

Los Angeles, Cal.

DEAR SIR:

In compliance with Section 16, Chapter 718, Statutes of 1915, notice is hereby given that it is our intention to abandon well number 1 Section 10 T. 4 N R. 17 W, S. B. B. & M., Oil Field Los Angeles County, commencing work on the 18th day of April 1923

The present condition of the well is as follows:

The 6¼" Casing was landed and Cemented at 3575 and shut off of upper water was approved by the Mining Bureau x The well was drilled to 3744' and when tested flowing water developed an effort was made to shut off this water in accordance with statement attached x The ~~The proposed work is as follows~~: the 6¼" Casing was recemented by Perkins using tubing and Chemical Cement x Then the 4½" Casing was land at 3617'-6" and Cemented by Perkins using Chemical Cement x as the water is still not shut off, it is the intention to abandon x The open hole below the shoe of the 4½" Casing will be filled with Cement x This is the only part of the sand that is not already plugged with Cement

Respectfully yours,

Fernando Oil Company
(Name of Company or Operator)

By [illegible]
Sec.

Address notice to Deputy State Oil and Gas Supervisor in charge of district where well is located

CALIFORNIA STATE MINING BUREAU

DEPARTMENT OF PETROLEUM AND GAS

Report on Proposed Operations

No. P -1-5788.

Los Angeles, Cal. April 17, 1923.

Mr. R. B. Stout,

Newhall, Cal.

Agent for FERNANDO OIL Company

DEAR SIR:

Your proposal to abandon Well No. 1, Section 10, T. 4N., R. 17W., S.B. B. & M.,

Newhall Oil Field, Los Angeles County, dated April 13, 1923,

has been examined in conjunction with records filed in this office.

Present conditions as shown by the records and the proposal are as follows:

RECORDS:

Casing: 18" landed 162'.
15⅝" " 446'.
12¼" " 909', not tested.
10" " 1651'2", " "
8¼" " 2482'2", " "
6¼" cemented 3575' (water shut off, T-1-2231. Water broke in and recemented, not tested).
4½" cemented 3621', not tested.
Total depth 3744'.

Oil and gas showings:

Small gas showing in sand 3149'-3167'.
Small gas showing in shale at 3355'.
Oil and gas showing in sand 3584'-3690'.

Plugging:

A summary of the plugging done was reported by Mr. O. B. Johnson, Secretary of the Fernando Oil Company, as follows:

"Filled up with wire drilling line from 3744 ft. to 3730 feet. Dumped bailer of lime and also bailer of cement at 3730.

"Plugged hole with steel chips and wire line from 3730 to 3722. Put in one-half bailer of lime and one bailer of cement at 3722.

"Plugged hole with steel chips and also put in wire cable and finished up from 3722 to 3714 with wire line and steel chips.

"Plugged hole with lead wool from 3714 to 3710.

"3710 to 3708 plugged with steel chips. Dumped one-half bailer of lime at 3708.

"3708 to 3704 plugged with cement and rock. Put in two sacks cement and one-half bailer lime.

"In running in casing it went to 3708'8".

"3708'8" to 3685 Plugged with shells containing cement and rock and dumped two sacks pur cement.

"3685 to 3557 filled up with 132 sacks of cement.

"Cleaned out and recemented six inch casing. Got seven sacks back of casing. Cementing done by Perkins with tubing method using chemical cement.

"Drilled out to 3620. Casing went to 3627. Bridged back to 3617'9". Dumped in one sack cement.

cc - Fernando Oil Co.

BB-v.

R. E. COLLOM
State Oil and Gas Supervisor

By C. C. Thomas Deputy

Form 111. 22418 11-22 10M

(CONTINUED ON PAGE TWO)

CALIFORNIA STATE MINING BUREAU

DEPARTMENT OF PETROLEUM AND GAS

Report on Proposed Operations

No. P-1-5788.

Page -2-

FERNANDO OIL Company

Well No. 1 Sec. 10, T. 4N., R. 17W., S.B. B. & M.

"Cemented 4½ inch casing at 3621 feet. Eleven sacks cement. Cementing done by Perkins using chemical cement."

THE NOTICE STATES AND PROPOSES:

"The present condition of the well is as follows: The 6¼" casing was landed and cemented at 3575' and shut-off of upper water was approved by the Mining Bureau. The well was drilled to 3744' and whmh tested, flowing water developed. An effort was made to shut off this water in accordance with statement attached. Then the 6¼" casing was recemented by Perkins using tubing and chemical cement. Then the 4½" casing was landed at 3617'6" and cemented by Perkins using chemical cement. As the water is still not shut off, it is the intention to abandon. The open hole below the shoe of the 4½" casing will be filled with cement. This is the only part of the sand that is not already plugged with cement."

RECOMMENDATION:

The proposal is approved subject to the following recommendations:

1. In addition to the plug proposed by you, the following plugging should be done:
   (a) If the 4½" casing is pulled from below the shoe of the 6¼" casing, the top of the 4½" casing left in the well should be plugged with cement, and the plug carried up into the 6¼" casing at least 20'.
   (b) If the 4½" casing cannot be pulled from below the shoe of the 6¼" casing, the top of the 4½" should be plugged with cement inside the 6¼" casing.
   (b) The top of the 6¼" casing left in the well should be plugged with cement.
2. Upon completion of the work of abandonment, please file with this Department a report in duplicate on our form 102, giving in detail the following information:
   (a) Names of all workmen employed.
   (b) Dates of commencement and completion of the work.
   (c) Depths at which casing was cut or shot, with amounts of casing removed from the well.
   (d) Record of all plugging operations.

R. E. COLLOM
State Oil and Gas Supervisor

By _____ Deputy

Form 111-x. 22419 11-22 5M

Fill this ...nk in with typewriter. Write on one side of pa... only

CALIFORNIA STATE MINING BUREAU

FERRY BUILDING, SAN FRANCISCO

RECEIVED APR 14 1923 LOS ANGELES OFFICE

LOG OF OIL OR GAS WELL

FIELD Ventura-Newhall COMPANY Fernando Oil Company

Township 4 Range 17 Section 10 Elevation _____ Number of Well 1

In compliance with the provisions of Chapter 718, Statutes 1915, the information given herewith is a complete and correct record of the present condition of the well and all work done thereon, so far as can be determined from all available records.

Signed [signature]

Date April 13, 1923

Title Secretary.
(President, Secretary or Agent)

The summary on this page is for the ORIGINAL condition of the well

OIL SANDS

1st sand from 3584 to 3690
2d sand from 3720 to 3741
3d sand from _____ to _____
4th sand from _____ to _____
5th sand from _____ to _____
6th sand from _____ to _____

IMPORTANT WATER SANDS

1st sand from 302 to 356
2d sand from 888 to 890
1361 to 1367
3d sand from 1451 to 1457
4th sand from 2028 to 2040
2660 2690

CASING RECORD

Size of Casing	Where Landed	Where Cut	Weight Per Foot	Threads Per Inch	Kind of Shoe	Make of Casing	Cemented Yes	Cemented No	Number Sacks
18	162'								
15½	446'								
12½	909'								
10	1651'2"								
8¼	2482'2"								
6¼	3575'8"						Yes		
4½	3621'						Yes		

CEMENTING OR OTHER SHUT-OFF RECORD

Casing, Size	Sacks	Time Set	Method	Test and Result (Give water level and bailing results)
6 1/4			Perkins and Drumb Bailer	See records on file your office

PLUGS AND ADAPTERS

Heaving Plug—Material _____ Length _____ Where set _____

Adapters —Material _____ Size _____

TOOLS

Rotary Tools were used from _____ ft. to _____ ft.

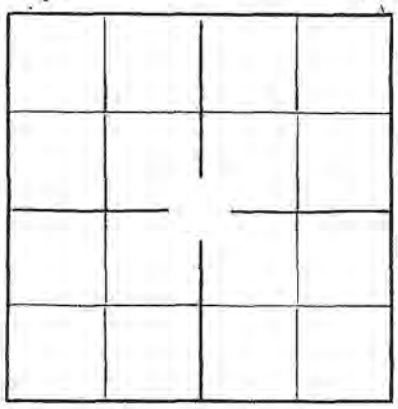
Cable Tools were used from Surface ft. to _____ ft. bottom

PERFORATIONS

State clearly whether a machine was used or casing was drilled in shop

From	To	Size of Holes	Number of Rows	Holes Per Foot	Machine—Shop
ft.	ft.				
ft.	ft.				
ft.	ft.				
ft.	ft.				
ft.	ft.				

Form 67—6-26—500



State CALIFORNIA County LOS ANGELES

Section 10 T 4 N. R 17 W.

Name of Well JANES Well No. 1.

Operator FERNANDO OIL COMPANY Acres

Lessor

Location NW¼ of NW¼ of Sec. 10-4N-17W.

Elevation Total Depth Type of Rig

Method of Drilling Drilling Commenced July 28,192(

Completed I. P. Be. Gravity

Deepened I. P. Be. Gravity

Average daily production after 1 week 3 mo. 6 mo. 1 year

Kind of fuel No. days used Amount Furnished by

No. days water used Amount Furnished by

CASING RECORD

Length	Size	Wt. per Foot	Make	Landed at	Cemented at	Formation	Pulled
162'	18" SP			162'			
446'	15½"SP			446'			
909'	12½"			909'			
1651'2"	10"			1651'2"			
2482"	8¼"			2482'2"			
3575'8"	6½"			3575'8"			

TEST WATER Shut off

Date	Result

Water Sands	Oil Sands	Key Horizons	Miscellaneous

Pump Tubing

Sucker Rods Feet of Anchor Fluid Level

Gas I. P. per 24 hr. cu. ft. Rock Pressure lbs. sq. in.

Date Connected to Line Line Pressure at Well lb.

ANALYSES

Oil	Gas	Water

Driller Foreman Superintendent

Others

REMARKS

(Give additional details of drilling, and, if hole is dry or abandoned, final condition of hole.)

Note: Bottom water was encountered in a sand between 3720' and 3740', or about 30 feet below the 106 foot oil sand between 3584' and 3690'. The gas showing in this oil sand was strong enough to keep the water flowing over the casinghead continuously for nearly a year while an unsuccessful attempt was being made to cut off the bottom water. When the well was abandoned, it was plugged from the bottom with several hundred feet of cement.

Summary of Plugging Janes Well #1

Filled up with wire drilling line from 3744 ft. to 3730 feet. Dumped bailer of lime and also bailer of cement at 3730.

Plugged hole with steel chips and wire line from 3730 to 3722. Put in one-half bailer of lime and one bailer of cement at 3722.

Plugged hole with steel chips and also put in wire cable and finished up from 3722 to 3714 with wire line and steel chips.

Plugged hole with lead wool from 3714 to 3710.

3710 to 3708 plugged with steel chips. Dumped one-half bailer of lime at 3708.

3708 to 3704 plugged with cement and rock. Put in two sacks cement and one-half bailer of lime.

In running in casing it went to 3708' 8".

3708'8" to 3685 Plugged with shells containing cement and rock and dumped two sacks pure cement.

3685 to 3557filled up with 132 sacks of cement.

Cleaned out and recemented six inch casing. Got seven sacks back of casing. Cementing done by Perkins with the method using Chemical Cement.
Drilled out to 3620. Casing went to 3627. Bridged back to 3617' 9". Dumped in one sack cement.

Cemented 4½ inch casing at 3621 feet. Eleven sacks cement. Cementing done by Perkins using Chemical Cement.

Quote.

CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix H
EDR Historical Topo Map Report

29053 Coolidge Ave

29053 Coolidge Ave

Castaic, CA 91384

Inquiry Number: 5037804.4

August 30, 2017

EDR Historical Topo Map Report

with QuadMatch™

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

EDR Historical Topo Map Report

08/30/17

Site Name:

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384
EDR Inquiry # 5037804.4

Client Name:

Citadel Environmental Services
111 North Market Street
San Jose, CA 95110-0000
Contact: Roopal Jani

EDR Topographic Map Library has been searched by EDR and maps covering the target property location as provided by Citadel Environmental Services were identified for the years listed below. EDR's Historical Topo Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topo Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the late 1800s.

Search Results:

P.O.# 1158.1001
Project: Phase I ESA

Coordinates:

Latitude:	34.45052 34° 27' 2" North
Longitude:	-118.657236 -118° 39' 26" West
UTM Zone:	Zone 11 North
UTM X Meters:	347762.82
UTM Y Meters:	3813356.26
Elevation:	1271.48' above sea level

Maps Provided:

2012	1943
1995	1941
1991	1940
1988	1931
1974	1903
1969	
1952	
1947	

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Topo Sheet Key

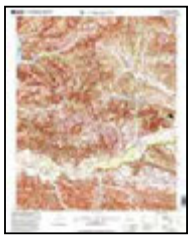
This EDR Topo Map Report is based upon the following USGS topographic map sheets.

2012 Source Sheets

Newhall
2012
7.5-minute, 24000

Val Verde
2012
7.5-minute, 24000

1995 Source Sheets



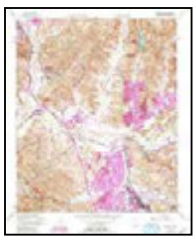
Val Verde
1995
7.5-minute, 24000
Aerial Photo Revised 1994

Newhall
1995
7.5-minute, 24000
Aerial Photo Revised 1995

1991 Source Sheets

Val Verde
1991
7.5-minute, 24000
Aerial Photo Revised 1991

1988 Source Sheets



Newhall
1988
7.5-minute, 24000
Aerial Photo Revised 1985

Val Verde
1988
7.5-minute, 24000
Aerial Photo Revised 1985

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1974 Source Sheets

Val Verde
1974
7.5-minute, 24000
Aerial Photo Revised 1969

1969 Source Sheets

Val Verde
1969
7.5-minute, 24000
Aerial Photo Revised 1969

Newhall
1969
7.5-minute, 24000
Aerial Photo Revised 1969

1952 Source Sheets

Val Verde
1952
7.5-minute, 24000
Aerial Photo Revised 1947

Newhall
1952
7.5-minute, 24000
Aerial Photo Revised 1947

1947 Source Sheets

SANTA SUSANA
1947
15-minute, 50000

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1943 Source Sheets

Santa Susana
1943
15-minute, 62500
Aerial Photo Revised 1938

1941 Source Sheets

Santa Susana
1941
15-minute, 62500
Aerial Photo Revised 1938

1940 Source Sheets

Castaic
1940
7.5-minute, 24000

1931 Source Sheets

Castaic
1931
7.5-minute, 24000

Topo Sheet Key

This EDR Topo Map Report is based upon the following USGS topographic map sheets.

1903 Source Sheets

Santa Susana
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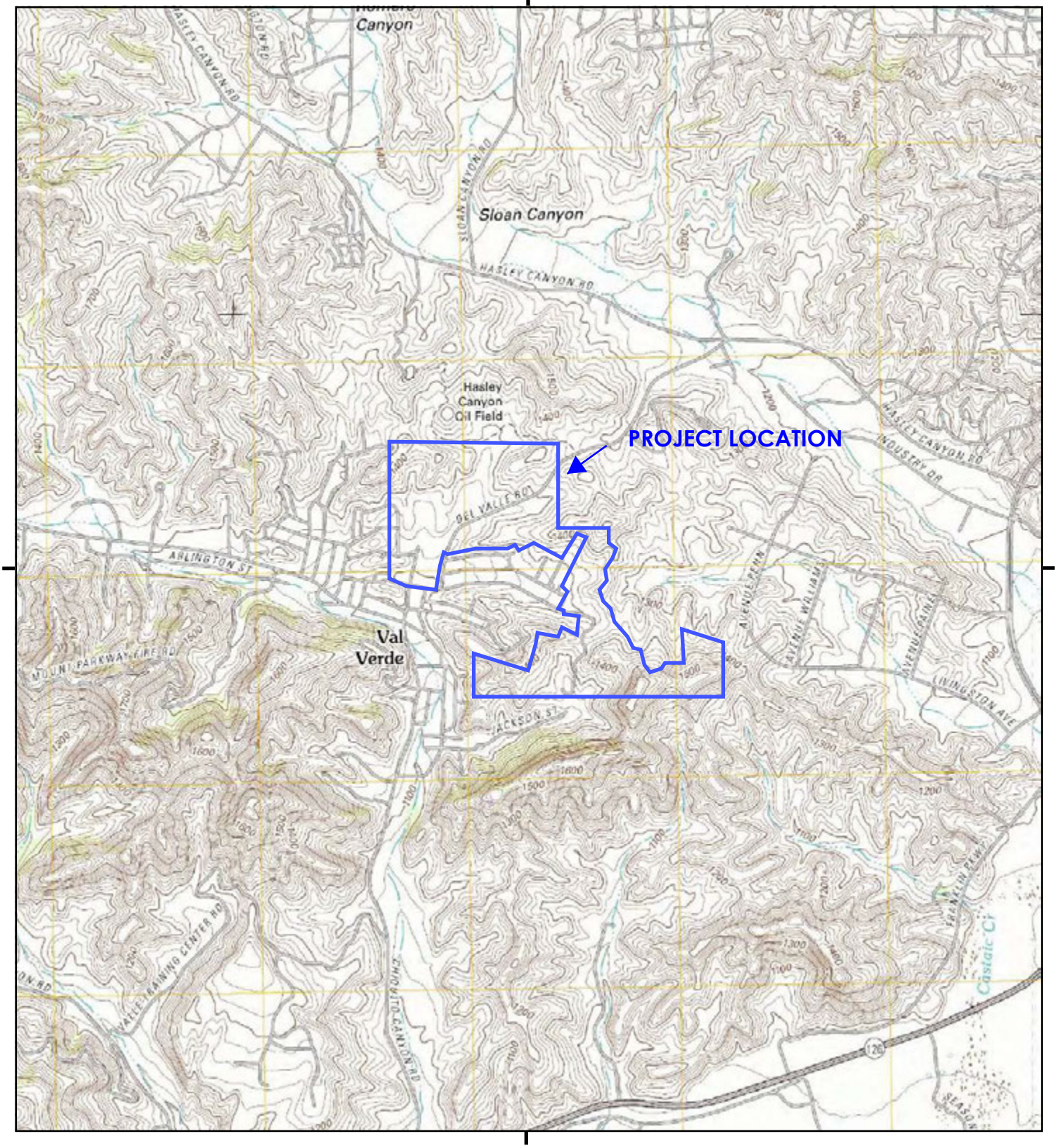
15-minute, 62500

Historical Topo Map

2012



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W E
SW S SE

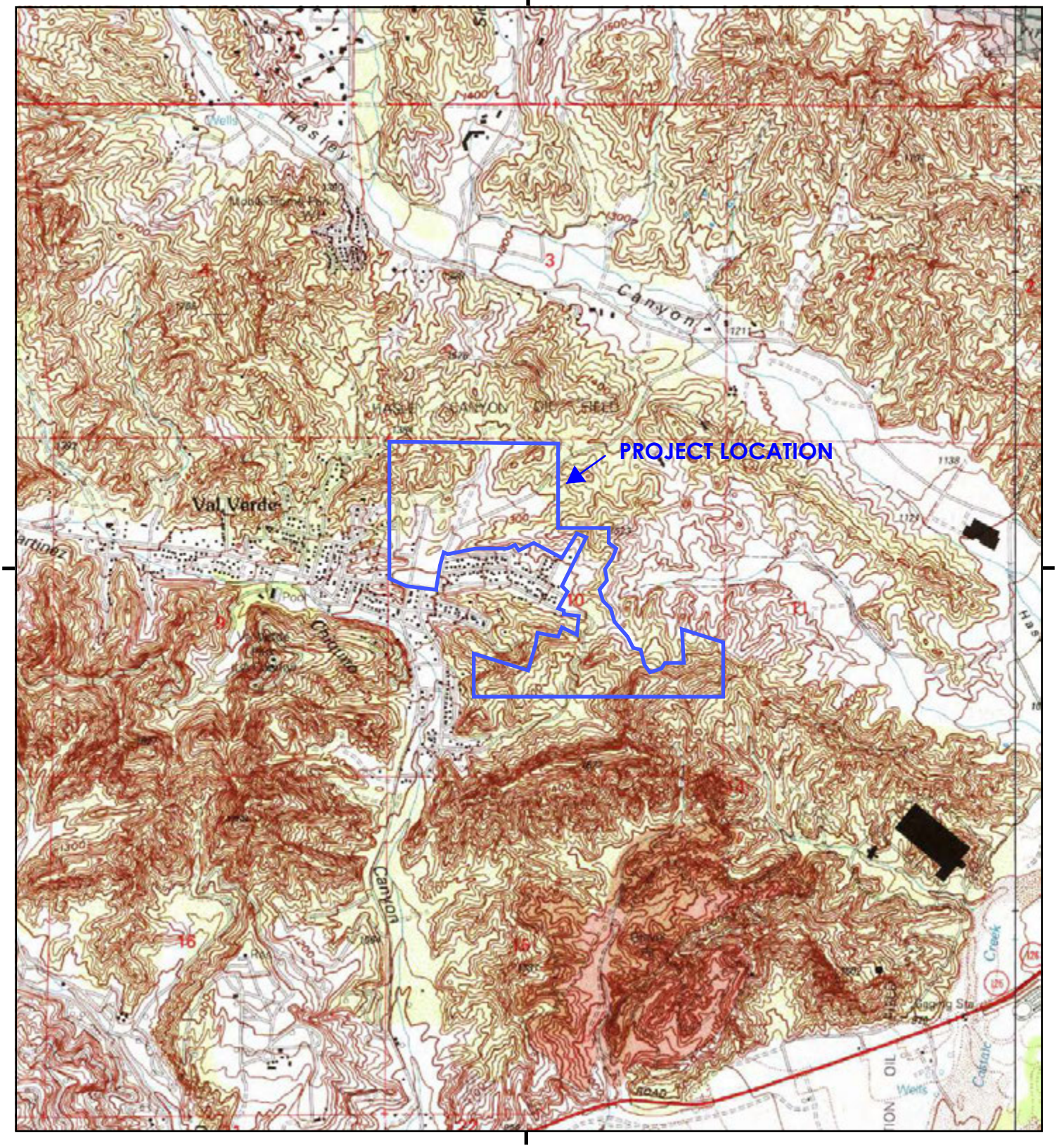
TP, Val Verde, 2012, 7.5-minute
E, Newhall, 2012, 7.5-minute

SITE NAME: 29053 Coolidge Ave
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N

Historical Topo Map

1995



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E, Newhall, 1995, 7.5-minute

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ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

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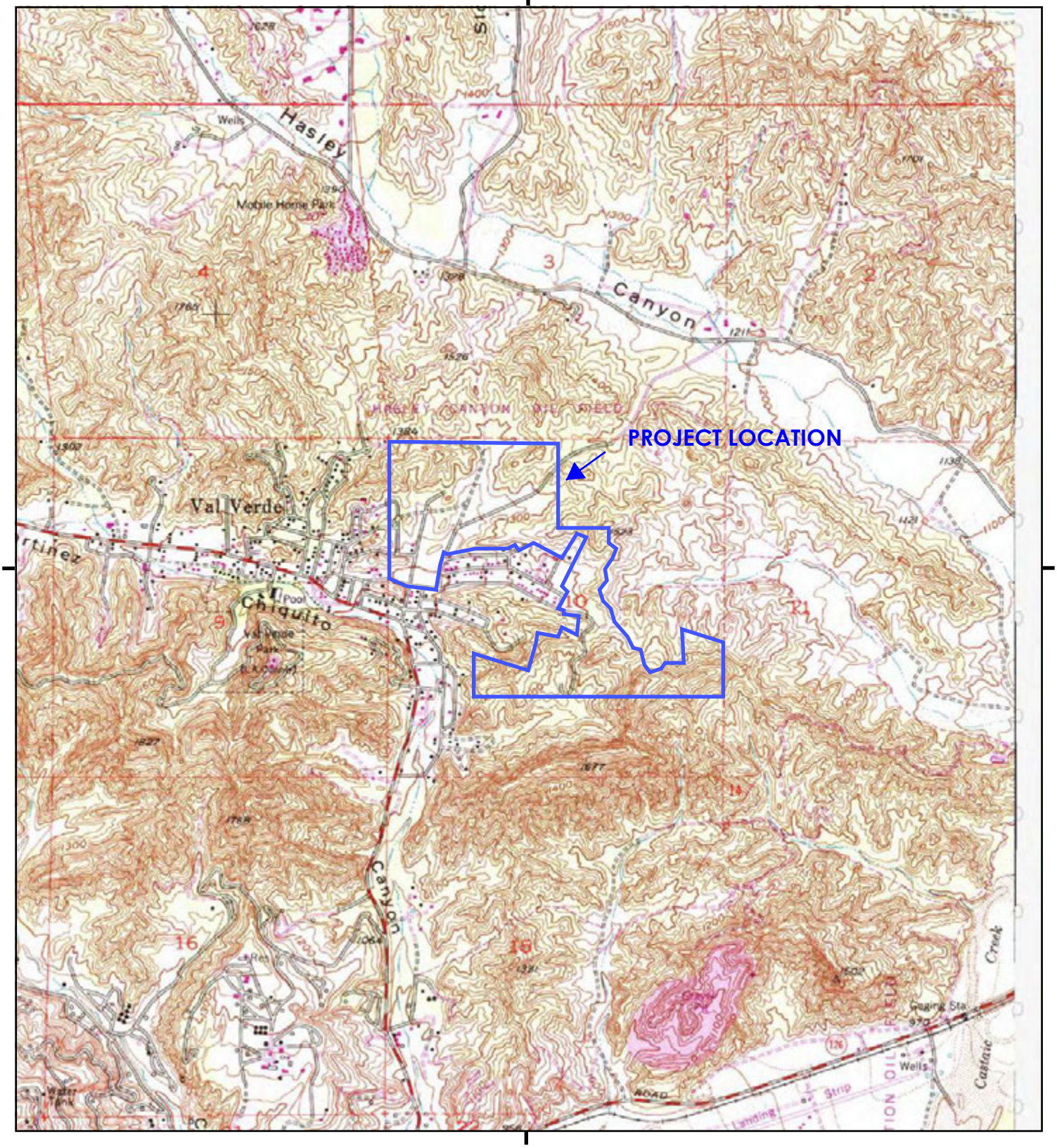
Historical Topo Map

1991



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W E
SW S SE

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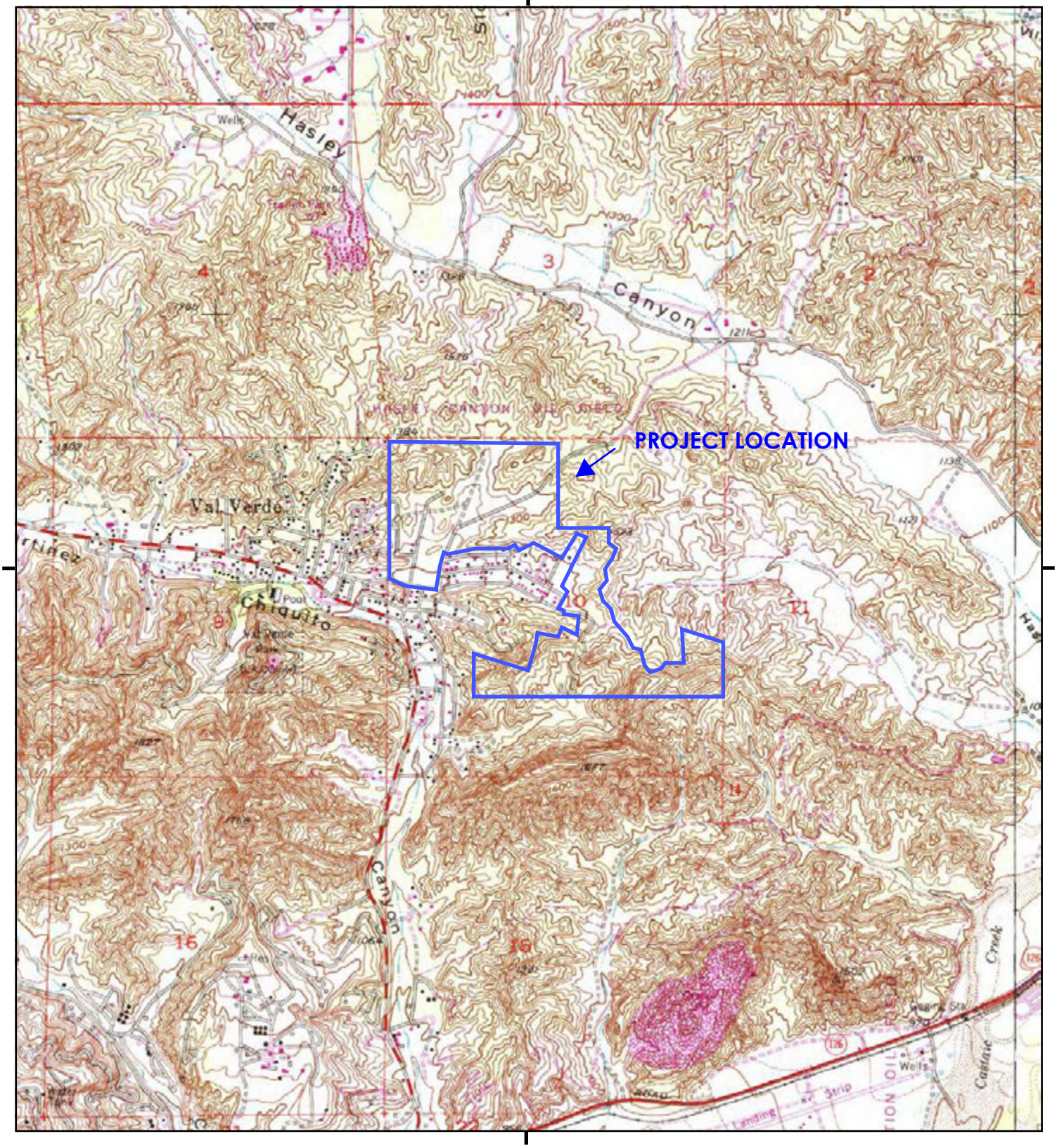
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N

Historical Topo Map

1988



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SW S SE

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Castaic, CA 91384
CLIENT: Citadel Environmental Services

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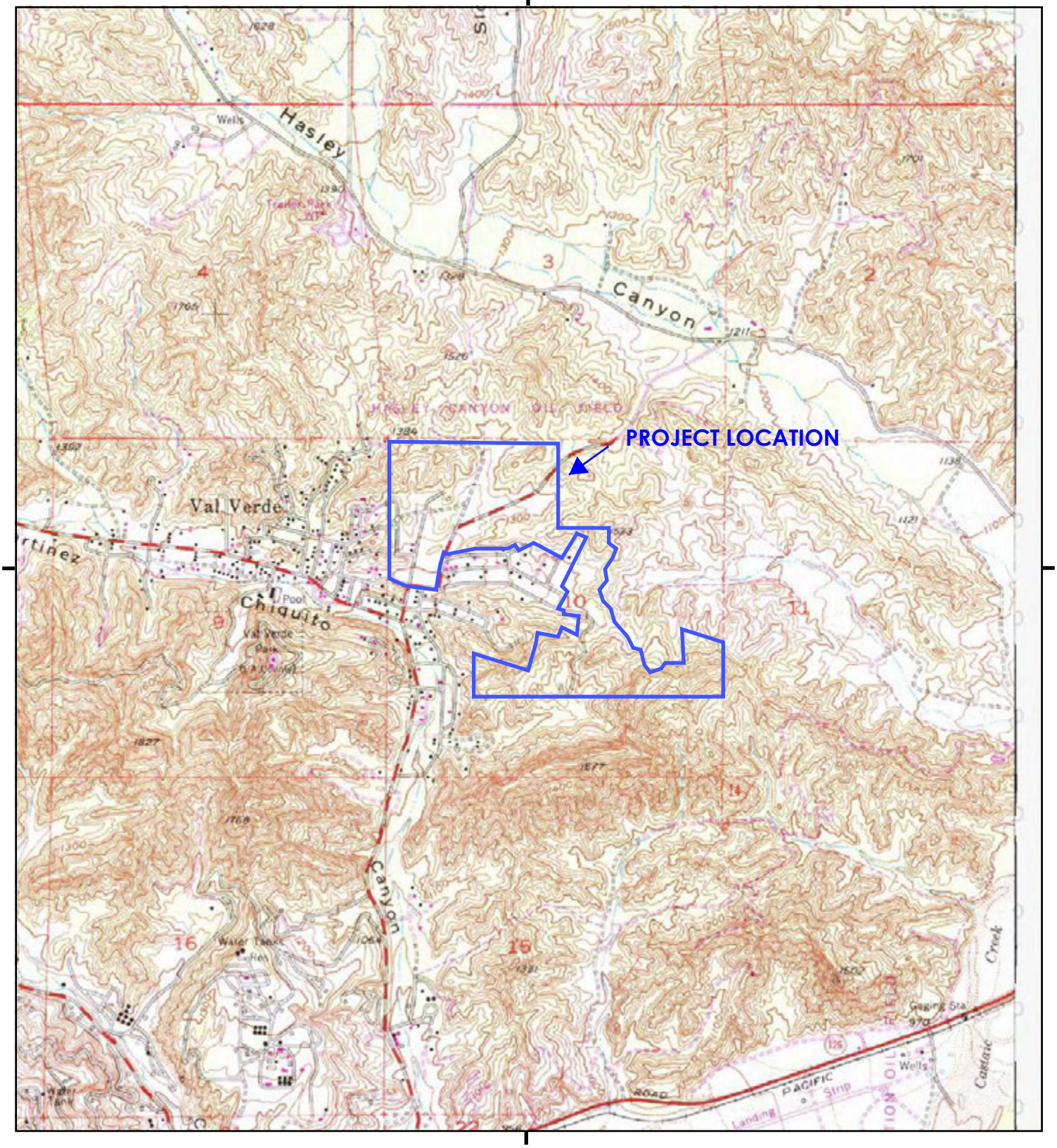

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W E
SW S SE

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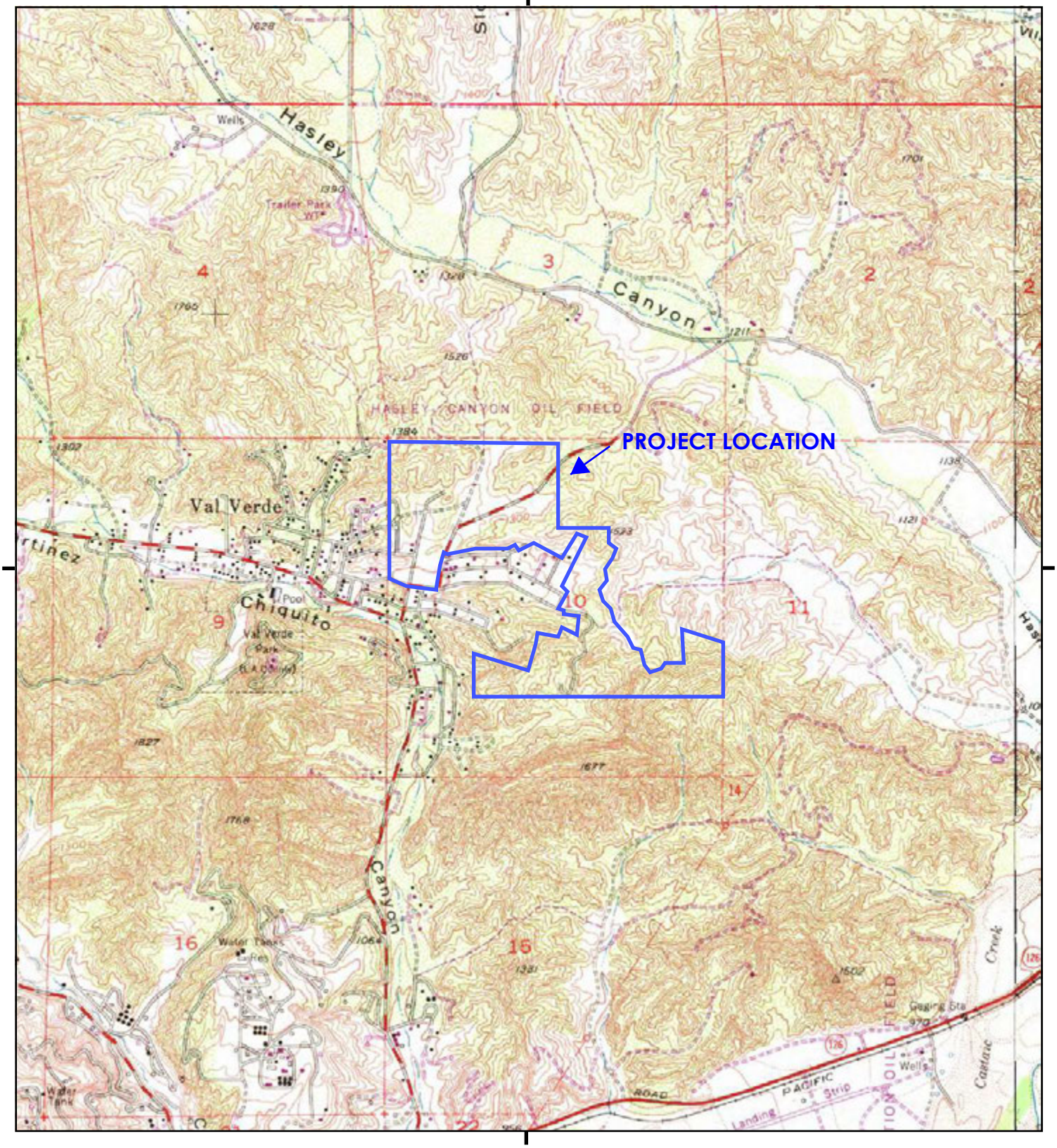
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N



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W E
SW S SE

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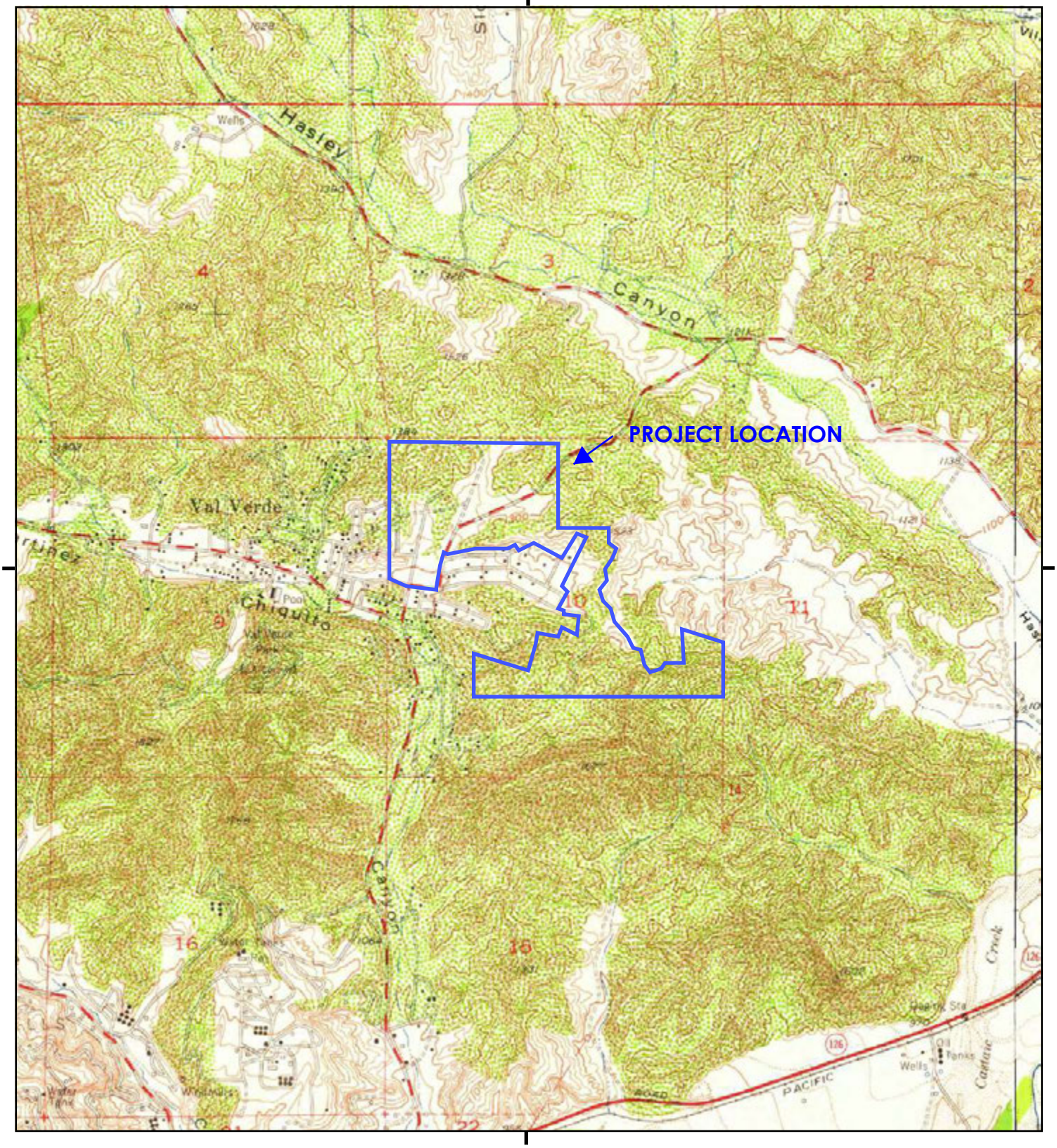
E, Newhall, 1969, 7.5-minute

SITE NAME: 29053 Coolidge Ave
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N

Historical Topo Map

1952



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W E
SW S SE

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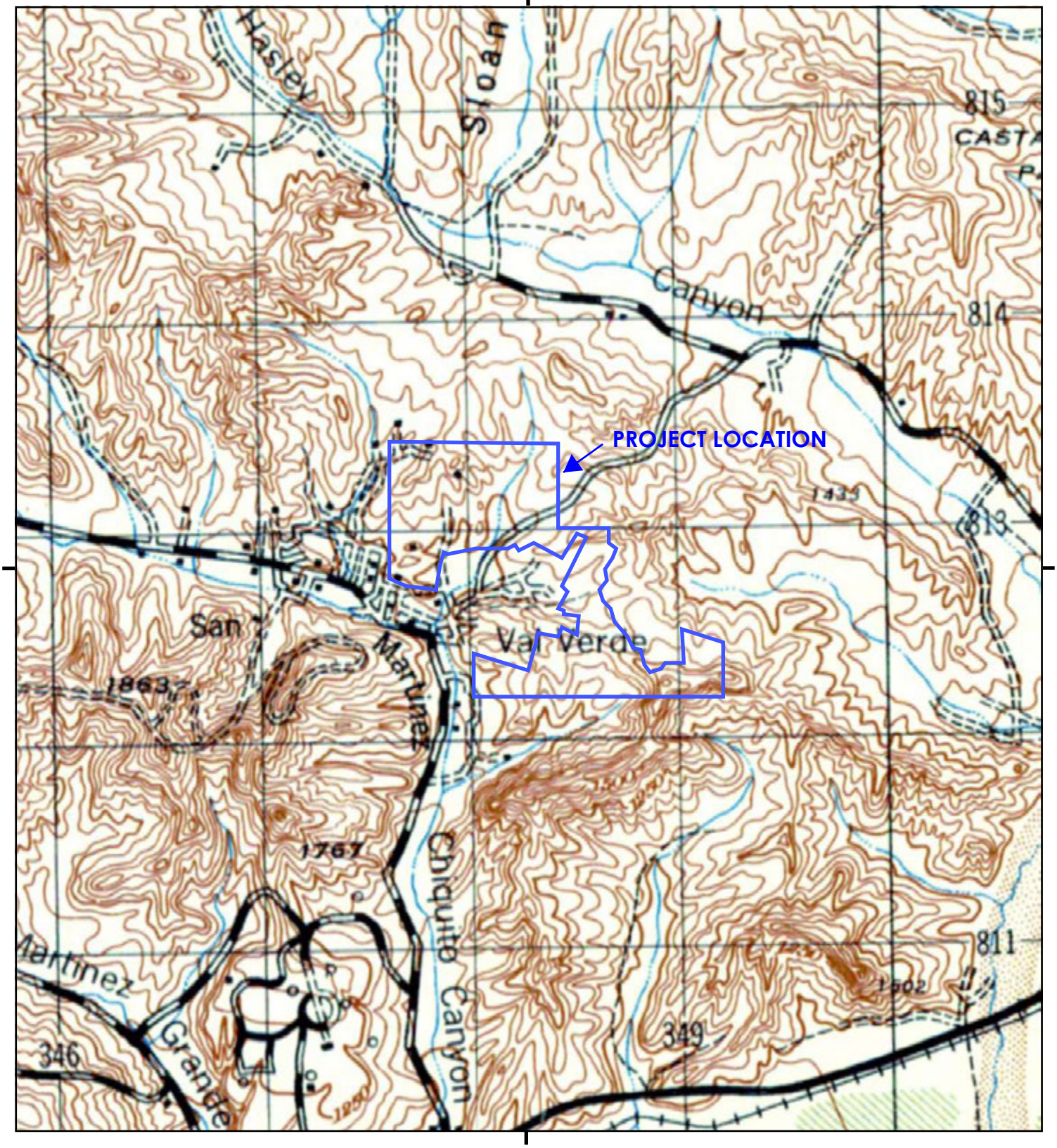
E, Newhall, 1952, 7.5-minute

SITE NAME: 29053 Coolidge Ave
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N

Historical Topo Map

1947



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W E
SW S SE

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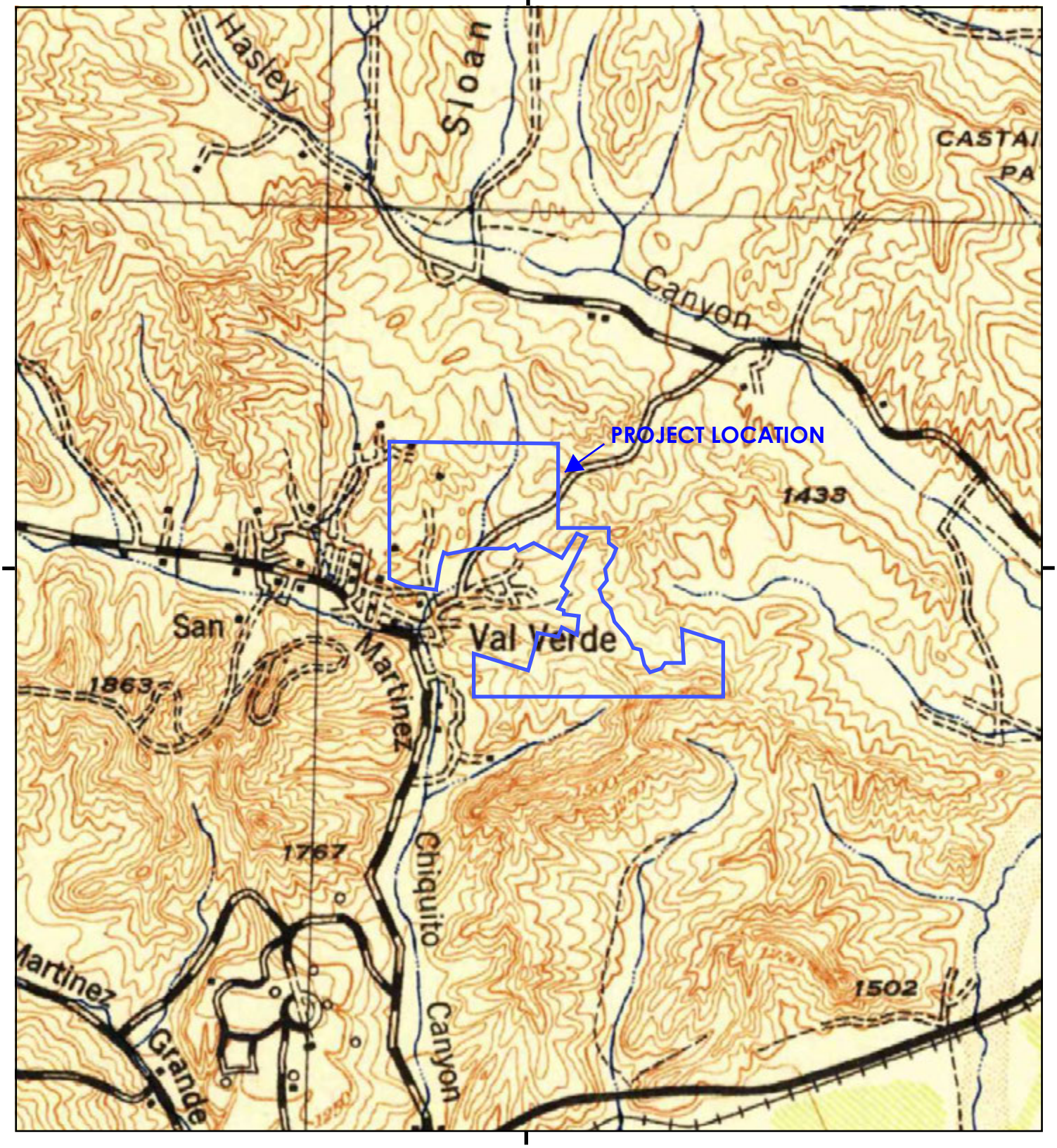
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N

Historical Topo Map

1943



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W E
SW S SE

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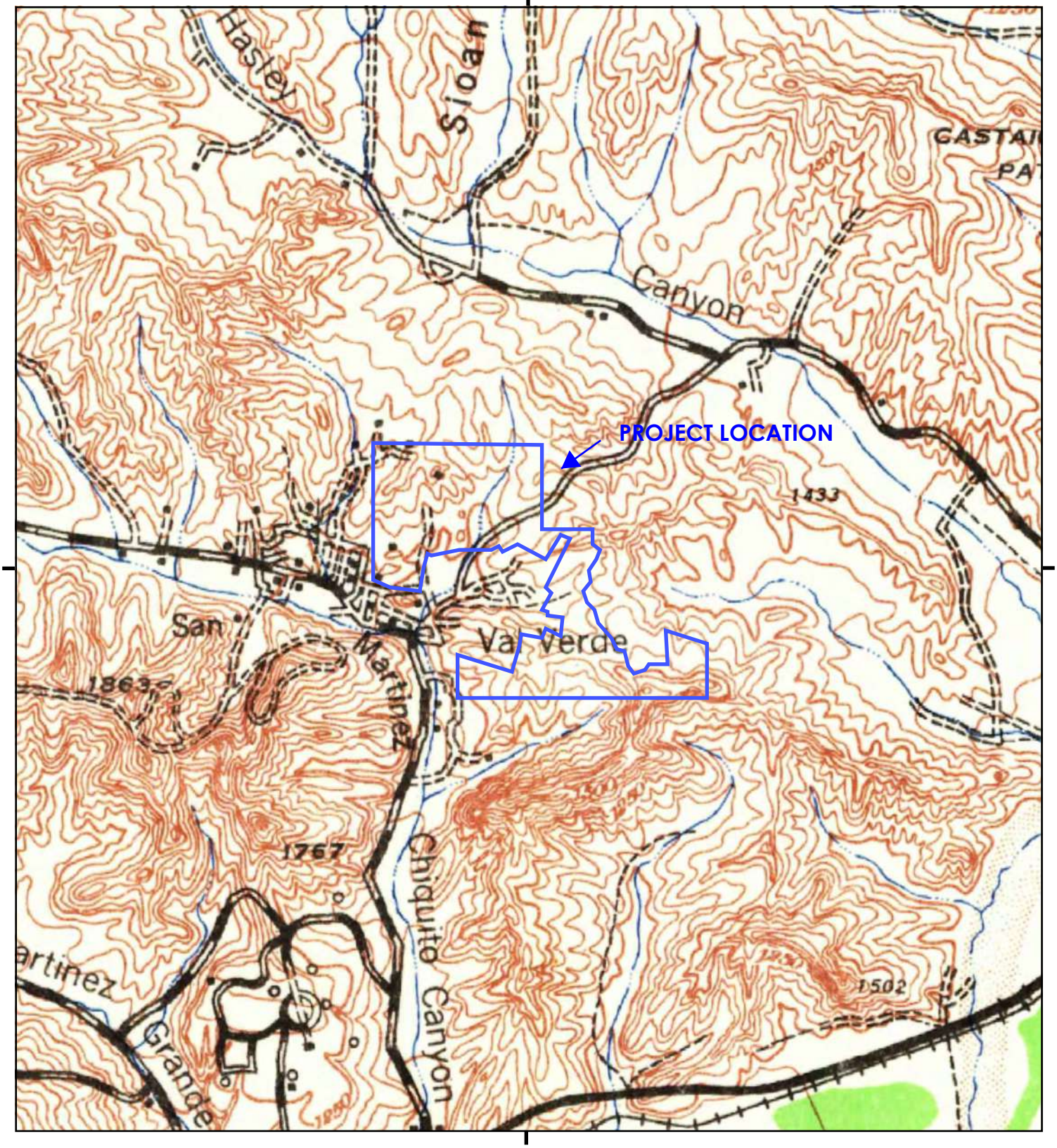
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N



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W E
SW S SE

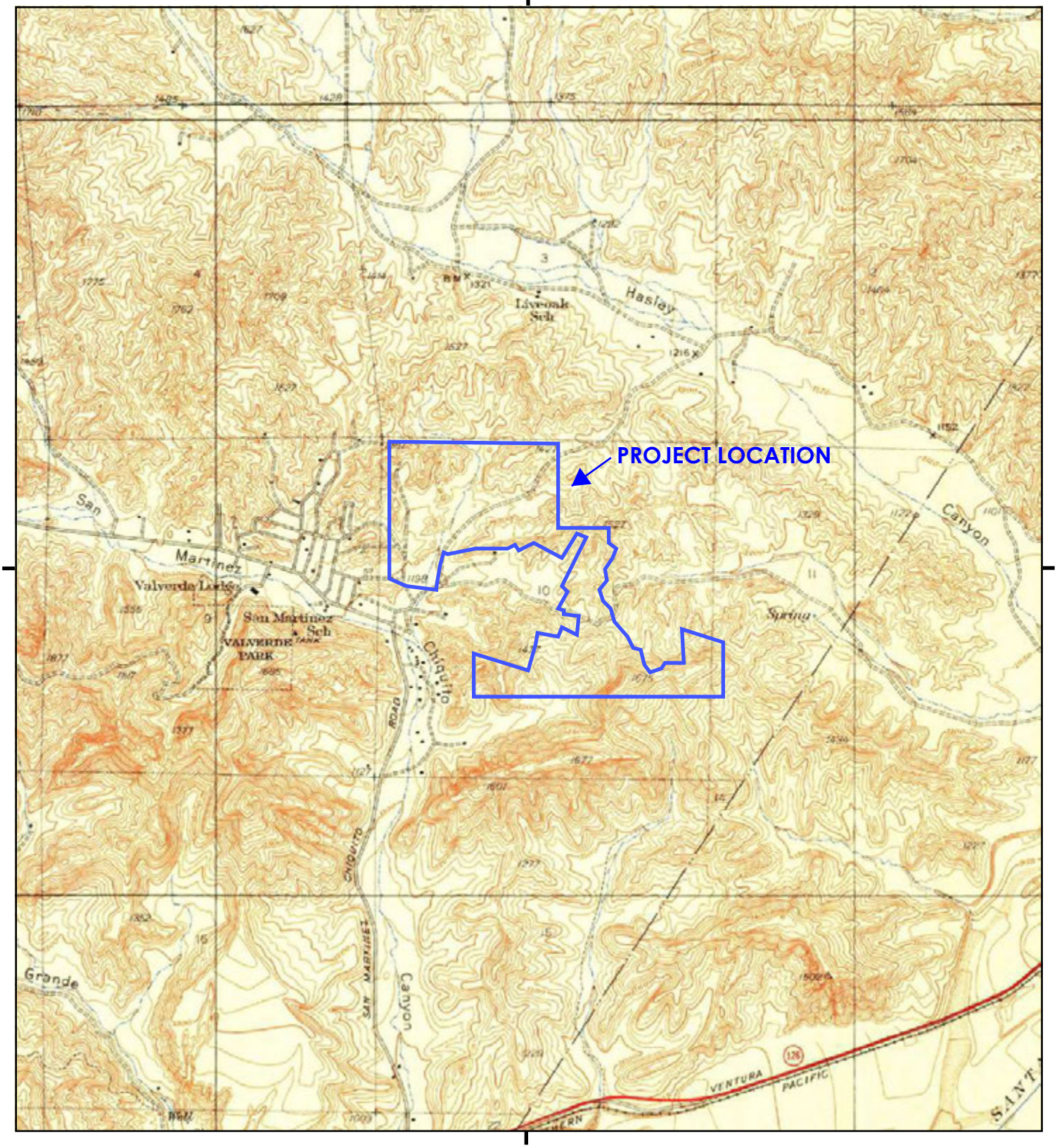
TP, Santa Susana, 1941, 15-minute

SITE NAME: 29053 Coolidge Ave
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N

Historical Topo Map

1940



This report includes information from the following map sheet(s).

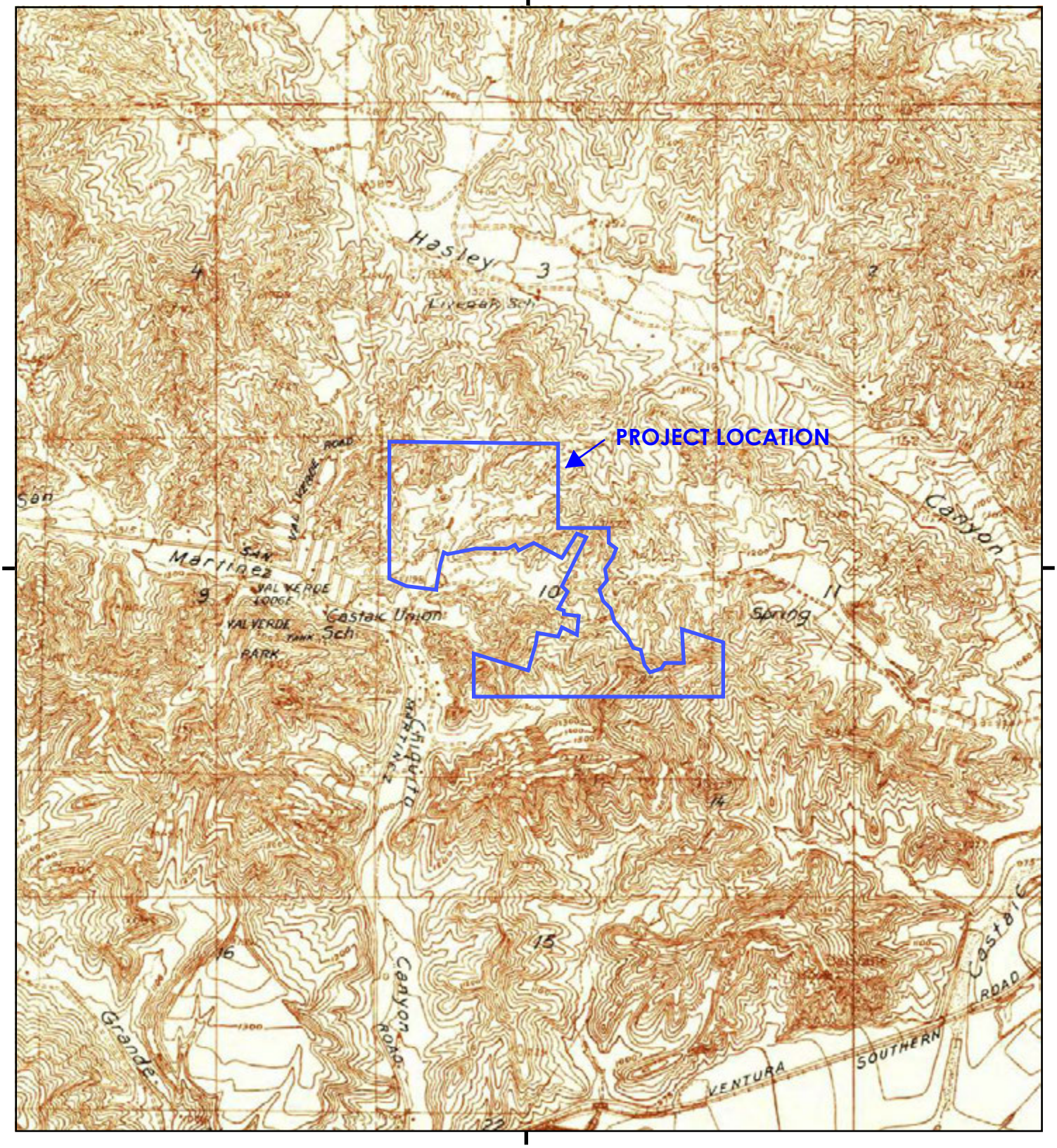
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Castaic, 1940, 7.5-minute

SITE NAME: 29053 Coolidge Ave
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N



This report includes information from the following map sheet(s).

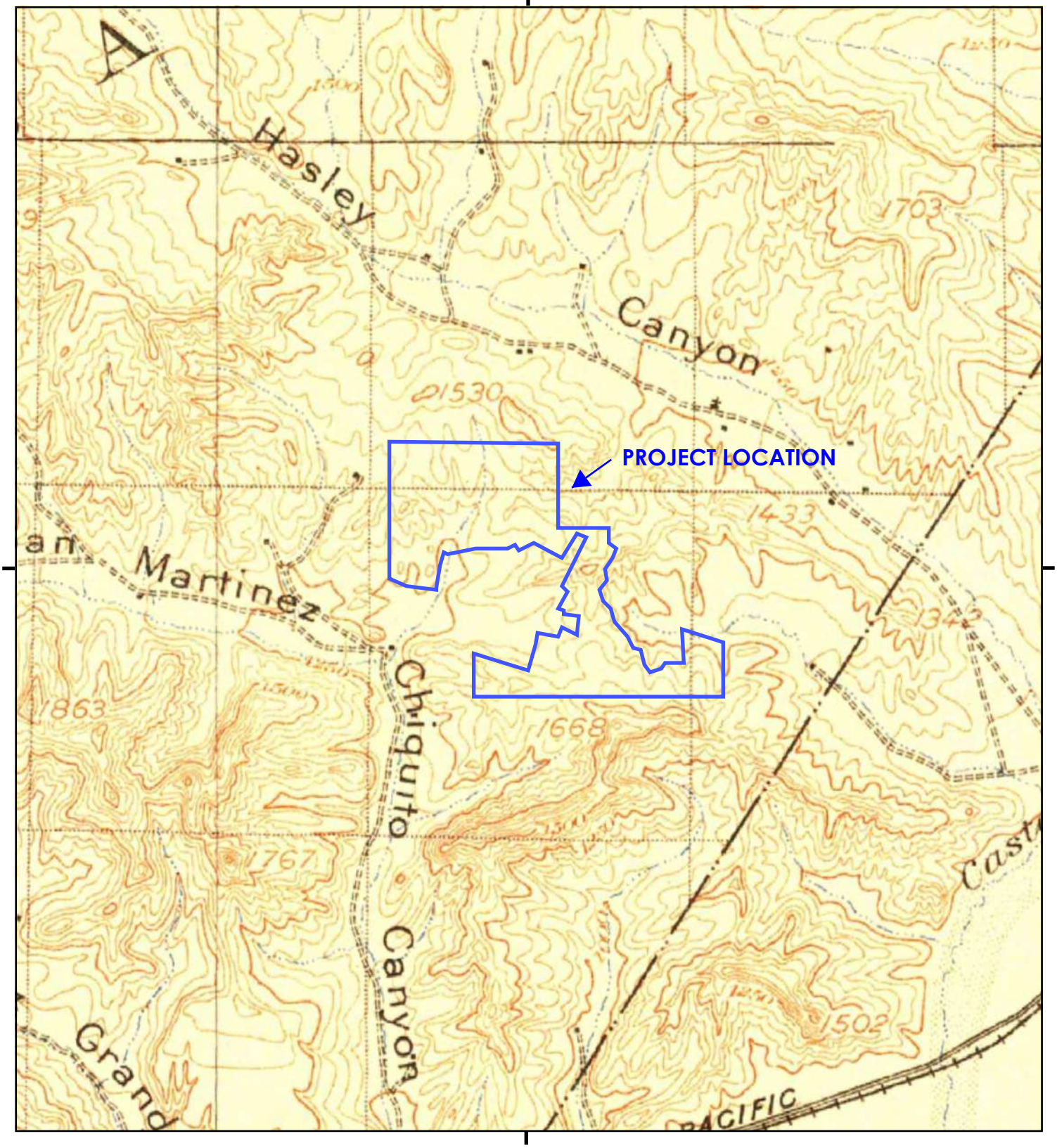
0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Castaic, 1931, 7.5-minute

SITE NAME: 29053 Coolidge Ave
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N



This report includes information from the following map sheet(s).

0 Miles 0.25 0.5 1 1.5

NW N NE
W E
SW S SE

TP, Santa Susana, 1903, 15-minute

SITE NAME: 29053 Coolidge Ave
ADDRESS: 29053 Coolidge Ave
Castaic, CA 91384
CLIENT: Citadel Environmental Services

N

CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix I
User Questionnaire

DATE SENT: 9/05/2017 DATE DUE: _____

HOW SENT (Circle): Fax / (Email) FAX / EMAIL: www.citadelenvironmental.com

User Questionnaire	
Client	Sterling Gateway, L.P.
Contact Name	Robert H. Williams
Contact Title	General Partner
Phone/Fax/Email	(435)901-3488, (866)902-2758, huntwilliams2002@yahoo.com
Completed by?	Robert H. Williams
Response Date	
Form of Response	
Current Use of the Property	Vacant land, 1 Single family Home (Rental)
Reason for Performing Phase I	Processing tentative tract map - LA County

Please include the name of the Companies who provide your utilities, so we can contact each agency:

Utilities	
Electricity	Southern California Edison
Natural Gas / Propane	Amerigas
Sewage	non-septic system
Sanitary Sewerage	none
Solid Waste Removal	Waste Management
Fuel Oil	none
Steam	none

Please include the Name and Company of Each of the following individuals:

User	Name	Company
Key Site Manager	Robert H Williams	Sterling Gateway, L.P.
Current Property Owner	Sterling Gateway, L.P.	
Current Property Owner Representative	Robert H. Williams	
Occupants		
Major Occupants	none	
Current Operator Name	none	
Past Property Owner(s)	N/A	
Past Property Owner Representative(s)	N/A	
Other Past Property Owner(s)	N/A	
Past Operator Name(s)	N/A	
Past Occupant(s)	N/A	
Past Major Occupant(s)	N/A	
Broker(s)	N/A	
Property Manager	Robert H. Williams	Sterling Gateway, L.P.
Building Engineer	N/A	
Other		

TITLE & JUDICIAL RECORDS

Per ASTM E 1527-13 Section 6.2, the User is required to provide and/or report to the environmental professional any title and/or judicial records so identified for the subject property.

Please provide any information on title and/or judicial records:

N/A

ENVIRONMENTAL LIENS OR ACTIVITY AND USE LIMITATIONS

Per ASTM E 1527-13 the User is required to provide and/or report to the environmental professional any environmental liens or AULs so identified for the subject property. The environmental professional per the ASTM practice is not responsible to undertake a review of information to identify environmental liens or AULs.

Please provide any information on environmental liens or activity and use limitations (AULs):

SPECIALIZED OR ACTUAL KNOWLEDGE OF USER

Per the ASTM standard, it is the User's responsibility to communicate to the environmental professional any information that is material to recognized environmental conditions in connection with the subject property based on such specialized knowledge, actual knowledge, experience, or commonly known and reasonably ascertainable information within the local community.

Please provide any information of the following items:

ASTM Scope Item	Property Contact Aware of them (Y/N)	Comment
USTs	No	
ASTs	No	
PCB Electrical Equipment	No	
Hydraulic Equipment	No	
Chemicals, Hazardous Materials, and Raw Materials Storage and Usage	No	
Waste Generation, Storage and Disposal	No	
Wells, Sumps, Pits, and Floor Drains	No	
Stormwater Runoff and Surface Water	No	
Lagoons, Septic Systems, Wastewater Treatment, and Separators	No	
Stressed Vegetation, Staining and Odors	No	
Surficial Disturbances	No	
On-Property Dry Cleaners	No	

NON-ASTM Scope Item	Property Contact Aware of them (Y/N)	Comment
Asbestos Containing Materials	NO	
Radon	NO	
Lead-Based Paint	No	
Lead in Drinking Water	No	
Potable Well	No	
Potential Wetlands	NO	
Air Emissions	NO	
Mold/Water Intrusion	No	

Please refer to "Helpful Documents" section below to provide any relevant reports associated with the above items.

VALUATION REDUCTION FOR ENVIRONMENTAL ISSUES

(For Property Owner) Per the ASTM standard, in a transaction involving the purchase of a parcel of commercial real estate, the user shall consider the relationship of the purchase price of the property to the fair market value of the property if the property was not affected by hazardous substances or petroleum products. The User should try to identify an explanation for a significantly lower price which does not reasonably reflect fair market value if the property was not contaminated, and make a written record of such explanation. The ASTM standard does not require that a real estate appraisal be obtained in order to ascertain fair market value of the property.

PROCEEDINGS INVOLVING THE PROPERTY

Per the ASTM standard, prior to the site visit, the User (if different from the property owner), Key site manager (if any is identified), and property owner shall be asked whether they know of (1) any pending, threatened, or past litigation relevant to hazardous substances or petroleum products in, on, or from the property; (2) any notices from any governmental entity regarding any possible violation of environmental laws or possible liability relating to hazardous substances or petroleum products.

- **Do you know of any pending, threatened, or past litigation relevant to hazardous substances or petroleum products in, or from the property? Y / (N)**
  If yes, please explain:

- **Do you know of any notices from any governmental entity regarding any possible violation of environmental laws or possible liability relating to hazardous substances or petroleum products? Y / N**
  If yes, please explain:

HELPFUL DOCUMENTS

Per the ASTM Standard, Prior to the property visit, the Property owner, key site manager (if any is identified), and User (if different from the property owner) shall be asked if they know whether any of the documents below exist and if so, whether copies can and will be provided within reasonable time and cost constraints:

	User		Key Site Manager		Property Owner	
	Exist	Provided	Exist	Provided	Exist	Provided
ESA Reports	YES	2/18/04	Compliance Biology			
Environmental Compliance Audit Reports	N/A					
Environmental Permits UST/AST Registrations	N/A					
Underground Injection Permits	N/A					
MSDS's	N/A					
Community Right-to-know plan	N/A					
Safety Plans	N/A					
SPCC Plans	N/A					
Emergency Preparedness and prevention plans	N/A					
Hydrogeologic reports	N/A					
Government Agency Correspondence and violations	N/A					
Hazardous Waste Generator Notices or reports	N/A					
Geotechnical studies	N/A					
Risk Assessments	N/A					
Recorded AULs	N/A					
Environmental Liens	N/A					
Other						

CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix J
EDR Environmental Lien and AUL Search

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384

Inquiry Number: 5037804.7
September 06, 2017

EDR Environmental Lien and AUL Search

Environmental Data Resources Inc

6 Armstrong Road
Shelton, CT 06484
800.352.0050
www.edrnet.com

EDR Environmental Lien and AUL Search

The EDR Environmental Lien and AUL Search Report provides results from a search of available current land title records for environmental cleanup liens and other activity and use limitations, such as engineering controls and institutional controls.

A network of professional, trained researchers, following established procedures, uses client supplied address information to:

- search for parcel information and/or legal description;
- search for ownership information;
- research official land title documents recorded at jurisdictional agencies such as recorders' offices, registries of deeds, county clerks' offices, etc.;
- access a copy of the deed;
- search for environmental encumbering instrument(s) associated with the deed;
- provide a copy of any environmental encumbrance(s) based upon a review of key words in the instrument(s) (title, parties involved, and description); and
- provide a copy of the deed or cite documents reviewed.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Disclaimer - Copyright and Trademark Notice

This Report contains certain information obtained from a variety of public and other sources reasonably available to Environmental Data Resources, Inc. It cannot be concluded from this Report that coverage information for the target and surrounding properties does not exist from other sources. **NO WARRANTY EXPRESSED OR IMPLIED, IS MADE WHATSOEVER IN CONNECTION WITH THIS REPORT. ENVIRONMENTAL DATA RESOURCES, INC. SPECIFICALLY DISCLAIMS THE MAKING OF ANY SUCH WARRANTIES, INCLUDING WITHOUT LIMITATION, MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE OR PURPOSE. ALL RISK IS ASSUMED BY THE USER. IN NO EVENT SHALL ENVIRONMENTAL DATA RESOURCES, INC. BE LIABLE TO ANYONE, WHETHER ARISING OUT OF ERRORS OR OMISSIONS, NEGLIGENCE, ACCIDENT OR ANY OTHER CAUSE, FOR ANY LOSS OR DAMAGE, INCLUDING, WITHOUT LIMITATION, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES. ANY LIABILITY ON THE PART OF ENVIRONMENTAL DATA RESOURCES, INC. IS STRICTLY LIMITED TO A REFUND OF THE AMOUNT PAID FOR THIS REPORT.** Purchaser accepts this Report "AS IS". Any analyses, estimates, ratings, environmental risk levels or risk codes provided in this Report are provided for illustrative purposes only, and are not intended to provide, nor should they be interpreted as providing any facts regarding, or prediction orforecast of, any environmental risk for any property. Only a Phase I Environmental Site Assessment performed by an environmental professional can provide information regarding the environmental risk for any property. Additionally, the information provided in this Report is not to be construed as legal advice.

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EDR Environmental Lien and AUL Search

TARGET PROPERTY INFORMATION

ADDRESS

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384

RESEARCH SOURCE

Source 1:

LA Recorder
Los Angeles, CA

PROPERTY INFORMATION

Deed 1:

Type of Deed:	deed
Title is vested in:	Sterling Gateway LP
Title received from:	Sterling Gateway LP
Deed Dated	7/24/2013
Deed Recorded:	7/25/2013
Book:	NA
Page:	na
Volume:	na
Instrument:	na
Docket:	NA
Land Record Comments:	apn chg
Miscellaneous Comments:	
Legal Description:	See Exhibit
Legal Current Owner:	Sterling Gateway LP
Parcel # / Property Identifier:	3271004012
Comments:	See Exhibit

Deed 2:

Type of Deed:	deed
Title is vested in:	Sterling Gateway LP
Title received from:	Sterling Gateway LP
Deed Dated	7/24/2013
Deed Recorded:	7/25/2013
Book:	NA
Page:	na
Volume:	na
Instrument:	na
Docket:	NA
Land Record Comments:	

apn chg

Miscellaneous Comments:

Legal Description: See Exhibit

Legal Current Owner: Sterling Gateway LP

Parcel # / Property Identifier: 3271004013

Comments: See Exhibit

Deed 3:

Type of Deed:	deed
Title is vested in:	Catellus Valencia LLC
Title received from:	Sterling Gateway LP
Deed Dated	4/29/2014
Deed Recorded:	5/2/2014
Book:	NA
Page:	na
Volume:	na
Instrument:	na
Docket:	NA
Land Record Comments:	
Miscellaneous Comments:	

Legal Description: See Exhibit

Legal Current Owner: Catellus Valencia LLC

Parcel # / Property Identifier: 3271005032

Comments: See Exhibit

ENVIRONMENTAL LIEN

Environmental Lien: Found ☐ Not Found ☒

OTHER ACTIVITY AND USE LIMITATIONS (AULs)

AULs: Found ☐ Not Found ☒

Deed Exhibit 1

This page is part of your document - DO NOT DISCARD

20131095295

Recorded/Filed in Official Records
Recorder's Office, Los Angeles County,
California

07/25/13 AT 11:12AM

Pages:
0005

FEES:	44.00
TAXES:	0.00
OTHER:	0.00
PAID:	44.00

PCOR SURCHARGE $20.00

LEADSHEET

201307250720026

00008065813

005025364

SEQ:
01

DAR - Counter (Upfront Scan)

THIS FORM IS NOT TO BE DUPLICATED

E521057

RECORDING REQUESTED BY:

Sterling Gateway, L.P.

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

Sterling Gateway, L.P.
P.O. Box 681007
Park City, UT 84068-1007

Space Above This Line For Recorder's Use

GRANT DEED

THE UNDERSIGNED GRANTOR(s) DECLARE(s): Value and Consideration is Less than $100.00 Revenue and Taxation Code Sec. 11911.
DOCUMENTARY TRANSFER TAX is $ -0-
The grantors and the grantees in this conveyance are comprised of the same parties who continue to hold the same proportionate interest in the property. Revenue and Taxation Code Sec. 11925(b).

☒ Unincorporated area: and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

STERLING GATEWAY, LP, a California Limited Partnership

hereby GRANT(s) to

STERLING GATEWAY, LP, a California Limited Partnership

the following described real property in the unincorporated territory of the County of Los Angeles, State of California: (Assessor's Parcel No. 3271-004-003 & 3271-004-004):

Dated: 7/24/2013

SEE ATTACHED EXHIBIT "A" LEGAL DESCRIPTION

STERLING GATEWAY, LP, a California Limited Partnership

By: Robt H. Williams

Name: Robert H. Williams

Its: General partner

PURSUANT TO CALIFORNIA GOVERNMENT CODE SECTION 66412(d), THIS DOCUMENT IS RECORDED IN CONFORMANCE WITH CERTIFICATE OF COMPLIANCE LOT LINE ADJUSTMENT NO. 2013-00002 RECORDED JUNE 18, 2013 AS INSTRUMENT NO. 20130905366, O.R.

(Pcl 1)

NOTARY ACKNOWLEDGEMENT

STATE OF CALIFORNIA
COUNTY OF LOS ANGELES

On JULY 24, 2013 before me, DAN MAY

_____, a Notary Public in and for said County and State,

personally appeared, ROBERT H. WILLIAMS,
who proved to me on the basis of satisfactory evidence to be the person(~~s~~) whose name(~~s~~) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(~~s~~) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature: Dan May

(Notary Seal)

EXHIBIT "A"

LEGAL DESCRIPTION

ADJUSTED PARCEL 1 (COMMERCIAL PARCEL)

THAT PORTION OF TRACT NO. 8599 IN THE UNINCORPORATED TERRITORY OF THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA AS SHOWN ON MAP RECORDED IN BOOK 101 PAGES 87 AND 88 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWESTERLY CORNER OF TRACT NO. 8672 AS SHOWN ON MAP RECORDED IN BOOK 101 PAGES 5 AND 6 OF SAID MAPS BEING A POINT ON THE WESTERLY BOUNDARY OF SAID TRACT NO. 8599; THENCE

1. ALONG SAID WESTERLY BOUNDARY NORTH 00°32'45" EAST 382.87 FEET; THENCE
2. LEAVING SAID WESTERLY BOUNDARY NORTH 87°29'40" EAST 80.61 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE NORTHWESTERLY HAVING A RADIUS OF 110.00 FEET; THENCE
3. NORTHEASTERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 66°57'12" AN ARC DISTANCE OF 128.54 FEET TO THE BEGINNING OF A TANGENT REVERSE CURVE CONCAVE SOUTHEASTERLY HAVING A RADIUS OF 25.00 FEET; THENCE
4. NORTHEASTERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 32°53'19" AN ARC DISTANCE OF 14.35 FEET; THENCE
5. TANGENT TO LAST SAID CURVE NORTH 53°25'47" EAST 10.19 FEET TO A POINT AT THE BEGINNING OF A NON-TANGENT CURVE CONCAVE NORTHEASTERLY HAVING A RADIUS OF 284.47 FEET, A RADIAL LINE THROUGH SAID POINT BEARS NORTH 52°03'35" EAST; THENCE
6. SOUTHEASTERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE

OF 9°51'00" AN ARC DISTANCE OF 48.90 FEET TO A POINT AT THE BEGINNING OF A NON-TANGENT COMPOUND CURVE CONCAVE NORTHEASTERLY HAVING A RADIUS OF 382.00 FEET, A RADIAL LINE TO LAST SAID CURVE THROUGH LAST SAID POINT BEARS NORTH 43°52'11" EAST; THENCE

7. SOUTHEASTERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 11°13'37" AN ARC DISTANCE OF 74.85 FEET; THENCE
8. TANGENT TO LAST SAID CURVE SOUTH 57°21'26" EAST 68.66 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE WESTERLY HAVING A RADIUS OF 27.00 FEET; THENCE
9. SOUTHERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 82°15'26" AN ARC DISTANCE OF 38.76 FEET TO THE BEGINNING OF A TANGENT REVERSE CURVE CONCAVE EASTERLY HAVING A RADIUS OF 890.00 FEET; THENCE
10. SOUTHERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 17°04'10" AN ARC DISTANCE OF 265.15 FEET; THENCE
11. TANGENT TO LAST SAID CURVE SOUTH 7°49'50" WEST 180.47 FEET TO A POINT ON THE NORTHERLY BOUNDARY OF SAID TRACT NO. 8672; THENCE
12. ALONG SAID NORTHERLY BOUNDARY NORTH 66°58'07" WEST 282.20 FEET TO THE POINT OF BEGINNING.

PARCEL 1 CONTAINS 3.28 ACRES, MORE OR LESS.

7-25-13

Deed Exhibit 2

This page is part of your document - DO NOT DISCARD

20131095296

Recorded/Filed in Official Records
Recorder's Office, Los Angeles County,
California

07/25/13 AT 11:12AM

Pages:
0006

FEES:	47.00
TAXES:	0.00
OTHER:	0.00
PAID:	47.00

PCOR SURCHARGE $20.00

LEADSHEET

201307250720026

00008065814

005025364

SEQ:
02

DAR - Counter (Upfront Scan)

THIS FORM IS NOT TO BE DUPLICATED

E521057

RECORDING REQUESTED BY:

Sterling Gateway, L.P.

WHEN RECORDED MAIL TO
AND MAIL TAX STATEMENTS TO:

Sterling Gateway, L.P.
P.O. Box 681007
Park City, UT 84068-1007

Space Above This Line For Recorder's Use

GRANT DEED

THE UNDERSIGNED GRANTOR(s) DECLARE(s): Value and Consideration is Less than $100.00 Revenue and Taxation Code Sec. 11911.
DOCUMENTARY TRANSFER TAX is $ -0-
The grantors and the grantees in this conveyance are comprised of the same parties who continue to hold the same proportionate interest in the property. Revenue and Taxation Code Sec. 11925(b).

☒ Unincorporated area: and

FOR A VALUABLE CONSIDERATION, receipt of which is hereby acknowledged,

STERLING GATEWAY, LP, a California Limited Partnership

hereby GRANT(s) to

STERLING GATEWAY, LP, a California Limited Partnership

the following described real property in the unincorporated territory of the County of Los Angeles, State of California: (Assessor's Parcel No. 3271-004-003 & 3271-004-004):

Dated: 7/24/2013

SEE ATTACHED EXHIBIT "A" LEGAL DESCRIPTION

STERLING GATEWAY, LP, a California Limited Partnership

By: Robt H. Williams

Name: Robert H. Williams

Its: General Partner

PURSUANT TO CALIFORNIA GOVERNMENT CODE SECTION 66412(d), THIS DOCUMENT IS RECORDED IN CONFORMANCE WITH CERTIFICATE OF COMPLIANCE LOT LINE ADJUSTMENT NO. 2013-0002 RECORDED JUNE 18, 2013 AS INSTRUMENT NO. 20130905366, O.R.

(Pcl 2)

NOTARY ACKNOWLEDGEMENT

STATE OF CALIFORNIA
COUNTY OF LOS ANGELES

On JULY 24, 2013 before me, DAN MAY

_____, a Notary Public in and for said County and State,

personally appeared, ROBERT H. WILLIAMS,
who proved to me on the basis of satisfactory evidence to be the person(~~s~~) whose name(~~s~~) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she/they~~ executed the same in his/~~her/their~~ authorized capacity(~~ies~~), and that by his/~~her/their~~ signature(~~s~~) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature: Dan May

DAN MAY
COMM. # 1967721
NOTARY PUBLIC - CALIFORNIA
LOS ANGELES COUNTY
COMM. EXPIRES FEB. 24, 2016

(Notary Seal)

EXHIBIT "A"

LEGAL DESCRIPTION

ADJUSTED PARCEL 2: (Residential Parcel)

ALL OF TRACT NO. 8599, SHEETS 1 AND 2, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 101 PAGES 87 AND 88 OF MAPS, RECORDS OF SAID COUNTY.

EXCEPT FROM SAID TRACT NO. 8599 THAT PORTION INCLUDED WITHIN THE LINES OF TRACT NO. 8600, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS SHOWN ON MAP RECORDED IN BOOK 102 PAGES 95 AND 96 OF SAID MAPS.

ALSO EXCEPT FROM SAID TRACT NO. 8599 THAT PORTION INCLUDED WITHIN THE LINES OF TRACT NO. 8672, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS SHOWN ON MAP RECORDED IN BOOK 104 PAGES 5 AND 6 OF SAID MAPS.

ALSO EXCEPT FROM SAID TRACT NO. 8599 THAT PORTION INCLUDED WITHIN THE LINES OF TRACT NO. 8673, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA, AS SHOWN ON MAP RECORDED IN BOOK 104 PAGES 25 AND 26 OF SAID MAPS.

ALSO EXCEPT FROM SAID TRACT NO. 8599 THAT PORTION LYING SOUTHEASTERLY OF THE NORTHWESTERLY LINE OF THE FOLLOWING DESCRIBED LAND:

BEGINNING AT THE MOST NORTH CORNER OF LOT 6 OF TRACT NO. 8673 AS SHOWN ON MAP RECORDED IN BOOK 104 PAGES 25 AND 26 OF MAPS RECORDS OF SAID COUNTY; THENCE

1. SOUTH 62°13'02" EAST ALONG THE NORTHEAST LINES OF LOTS 6, 5, 4, AND 3, OF SAID TRACT NO. 8673, A DISTANCE OF 200 FEET TO THE MOST EAST CORNER OF SAID LOT 3; THENCE

2. NORTH 27°46'58" EAST, PARALLEL WITH THE SOUTHEAST LINE OF ELK AVENUE, AS SHOWN ON SAID LAST MENTIONED MAP, AND THE NORTHEAST PROLONGATION THEREOF 1042.27 FEET, MORE OR LESS, TO THE SOUTH LINE OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 10, TOWNSHIP 4 NORTH, RANGE 17 WEST, SAN BERNARDINO MERIDIAN; THENCE
3. NORTH 89°31'11" WEST ALONG SAID SOUTH LINE, 225.07 FEET, MORE OR LESS, TO THE INTERSECTION OF THEREOF, WITH THE NORTHEAST PROLONGATION OF THE SOUTHEAST LINE OF SAID ELK AVENUE; THENCE
4. SOUTH 27°46'58" WEST ALONG SAID NORTHEAST PROLONGATION AND SOUTHEAST LINE 939.03 FEET, MORE OR LESS, TO THE POINT OF BEGINNING.

ALSO EXCEPT THEREFROM THAT PORTION OF SAID TRACT NO. 8599 DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWESTERLY CORNER OF SAID TRACT NO. 8672 BEING A POINT ON THE WESTERLY BOUNDARY OF SAID TRACT NO. 8599; THENCE

1. ALONG SAID WESTERLY BOUNDARY NORTH 00°32'45" EAST 382.87 FEET; THENCE
2. LEAVING SAID WESTERLY BOUNDARY NORTH 87°29'40" EAST 80.61 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE NORTHWESTERLY HAVING A RADIUS OF 110.00 FEET; THENCE
3. NORTHEASTERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 66°57'12" AN ARC DISTANCE OF 128.54 FEET TO THE BEGINNING OF A TANGENT REVERSE CURVE CONCAVE SOUTHEASTERLY HAVING A RADIUS OF 25.00 FEET; THENCE
4. NORTHEASTERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 32°53'19" AN ARC DISTANCE OF 14.35 FEET; THENCE
5. TANGENT TO LAST SAID CURVE NORTH 53°25'47" EAST 10.19 FEET TO A POINT AT THE BEGINNING OF A NON-TANGENT CURVE CONCAVE NORTHEASTERLY HAVING A RADIUS OF 284.47 FEET, A RADIAL LINE

THROUGH SAID POINT BEARS NORTH 52°03'35" EAST; THENCE

6. SOUTHEASTERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 9°51'00" AN ARC DISTANCE OF 48.90 FEET TO A POINT AT THE BEGINNING OF A NON-TANGENT COMPOUND CURVE CONCAVE NORTHEASTERLY HAVING A RADIUS OF 382.00 FEET, A RADIAL LINE TO LAST SAID CURVE THROUGH LAST SAID POINT BEARS NORTH 43°52'11" EAST; THENCE
7. SOUTHEASTERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 11°13'37" AN ARC DISTANCE OF 74.85 FEET; THENCE
8. TANGENT TO LAST SAID CURVE SOUTH 57°21'26" EAST 68.66 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE WESTERLY HAVING A RADIUS OF 27.00 FEET; THENCE
9. SOUTHERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 82°15'26" AN ARC DISTANCE OF 38.76 FEET TO THE BEGINNING OF A TANGENT REVERSE CURVE CONCAVE EASTERLY HAVING A RADIUS OF 890.00 FEET; THENCE
10. SOUTHERLY ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 17°04'10" AN ARC DISTANCE OF 265.15 FEET; THENCE
11. TANGENT TO LAST SAID CURVE SOUTH 7°49'50" WEST 180.47 FEET TO A POINT ON THE NORTHERLY BOUNDARY OF SAID TRACT NO. 8672; THENCE
12. ALONG SAID NORTHERLY BOUNDARY NORTH 66°58'07" WEST 282.20 FEET TO THE POINT OF BEGINNING.

PARCEL 2 CONTAINS 110.62 ACRES, MORE OR LESS.

7-25-13

Deed Exhibit 3

This page is part of your document - DO NOT DISCARD

20140458186

Recorded/Filed in Official Records
Recorder's Office, Los Angeles County,
California

05/02/14 AT 08:00AM

Pages:
0009

FEES:	63.00
TAXES:	NFPR
OTHER:	0.00
PAID:	NFPR

PCOR SURCHARGE $20.00

LEADSHEET

201405020300014

00009141181

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SEQ:
01

DAR - Title Company (Hard Copy)

THIS FORM IS NOT TO BE DUPLICATED

r09

E312049

2

Old Republic Title Company
Commercial Division

06/02/2014
20140458186

RECORDING REQUESTED BY:

Sterling Gateway, L.P.

WHEN RECORDED MAIL
TO AND MAIL TAX STATEMENTS TO:

Allen Matkins Leck Gamble Mallory
Natsis LLP
1900 Main Street, 5th Floor
Irvine, California 92614-7321
Attn: Gary S. McKitterick, Esq.

3271-005-032

(Above Space for Recorder's Use Only)

GRANT DEED

The undersigned grantor declares:

Documentary Transfer Tax not shown pursuant to Section 11932 of the Revenue and Taxation Code, as amended

TRANSFER TAX
NOT A PUBLIC RECORD

County of Los Angeles

FOR VALUABLE CONSIDERATION, receipt of which is hereby acknowledged, STERLING GATEWAY, L.P., a California limited partnership, hereby Grants to CATELLUS VALENCIA, LLC, a Delaware limited liability company, that certain real property in the County of Los Angeles, State of California, which is more particularly described on Schedule "1" ("**Property**") which is attached hereto, subject to:

(a) all matters of title or of record or any matters that would be disclosed by an accurate survey, including, without limitation, the matters set forth on Schedule "2" attached hereto;

(b) a reservation to the Grantor (and/or its successors and assigns) of all oil, oil rights, minerals, mineral rights, natural gas rights and other hydrocarbons by whatsoever name known, geothermal steam and all products derived from any of the foregoing, that may be within or under the Property, together with the perpetual right of drilling, mining, exploring and operating therefor and storing in and removing the same from such Property or any other property, including the right to whipstock or directionally drill and mine from properties other than the Property, oil or gas wells, tunnels and shafts into, through or across the subsurface of the Property, and to the bottom such whipstocked or directionally drilled wells, tunnels and shafts under and beneath or beyond the exterior limits thereof, and to redrill, retunnel, equip, maintain, repair, deepen and operate any such wells or mines without, however, the right to drill, mine,

1012129.02/OC
371357-00002/mm

Mail Tax Statements to Return Address Above

1a

2476010985 (1)

store, explore or operate through the surface of the Property or the upper 500 feet of the subsurface of such Property; and

(c) a reservation to the Grantor (and/or its successors and assigns) of all water and water rights now or in the future owned by Grantor appurtenant to or related in any way to the Property or used by Grantor in connection with or related to such Property (no matter how acquired by Grantor) together with the right and power to explore, drill, redrill, remove and store the same from, under or in the Property or to divert or otherwise utilize such water, rights or interests on any other property owned or leased by Grantor (and/or its successors and assigns) and the right and power to conduct water over or to store water underneath the Property as Grantor deems reasonable. The water and water rights excepted and reserved to Grantor include, but are not limited to, all riparian water rights, all appropriative water rights, all water rights and rights to store water in subsurface reservoirs based on overlying land ownership, all littoral water rights, all rights to percolating water, all prescriptive water rights, all adjudicated, statutory or contractual water rights, all rights to aquifers, reservoirs, subsurface and surface waters, and all rights to take, use and develop for use any and all water that may now exist or may in the future exist upon, in or under the Property, without, however, the right to drill, mine, store, explore or operate through the surface of the Property or the upper 100 feet of the subsurface of such Property.

[END OF TEXT; SIGNATURES ON FOLLOWING PAGE]

IN WITNESS WHEREOF, the Grantor has caused this Deed to be executed as of the 29th day of April, 2014.

"Grantor"

STERLING GATEWAY, L.P.,
a California limited partnership

By: IRHW, LLC,
a Delaware limited liability company
Its: General Partner

By: Robert H. Williams
Robert H. Williams, its sole member

5

CALIFORNIA ALL PURPOSE ACKNOWLEDGMENT

STATE OF CALIFORNIA

COUNTY OF LOS ANGELES

On April 29, 2014, before me, Rebecca Monzon, a Notary Public, personally appeared Robert H. Williams, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ties), and that by his/her/their signature(s) on the instrument, the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

REBECCA MONZON
Commission # 1972812
Notary Public - California
Los Angeles County
My Comm. Expires Apr 16, 2016

Signature of Notary Public

SCHEDULE "1"

LEGAL DESCRIPTION OF PROPERTY

The land situated in the unincorporated area of the County of Los Angeles, State of California, described as follows:

THAT PORTION OF LOT A OF TRACT NO. 8599, IN THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA PER MAP RECORDED IN BOOK 101 PAGES 87 AND 88, OF MAPS, TOGETHER WITH A PORTION OF PARCELS 10 AND 11 OF PARCEL MAP NO. 19784 AS SHOWN ON MAP FILED IN BOOK 298 PAGES 61 TO 67, INCLUSIVE OF PARCEL MAPS, BOTH RECORDS OF SAID COUNTY DESCRIBED AS A WHOLE AS FOLLOWS:

BEGINNING AT THE WEST QUARTER CORNER OF SECTION 11, TOWNSHIP 4 NORTH, RANGE 17 WEST, SAN BERNARDINO MERIDIAN, AS SHOWN ON SAID MAP OF PARCEL MAP NO. 19784, SAID QUARTER CORNER BEING AN ANGLE POINT ON THE WESTERLY LINE OF SAID PARCEL 10; THENCE

1. ALONG SAID WESTERLY LINE NORTH 00° 32' 20" EAST 181.65 FEET; THENCE

2. LEAVING SAID WESTERLY LINE SOUTH 73° 31' 42" EAST 304.56 FEET TO THE BEGINNING OF A TANGENT CURVE CONCAVE SOUTHWESTERLY HAVING A RADIUS OF 25.00 FEET, TANGENT AT ITS SOUTHEASTERLY TERMINUS TO THAT CERTAIN CURVE IN THE EASTERLY LINE OF SAID PARCEL 10 CONCAVE EASTERLY HAVING A RADIUS OF 842.00 FEET; THENCE

3. SOUTHEASTERLY ALONG SAID CURVE HAVING A RADIUS OF 25.00 FEET THROUGH A CENTRAL ANGLE OF 80° 38' 09" AN ARC DISTANCE OF 35.18 FEET TO A POINT OF CUSP ON SAID CURVE HAVING A RADIUS OF 842.00 FEET; THENCE

4. NORTHERLY ALONG SAID EASTERLY LINE AND ALONG LAST SAID CURVE THROUGH A CENTRAL ANGLE OF 08° 20' 45" AN ARC DISTANCE OF 122.65 FEET TO THE POINT OF INTERSECTION WITH A LINE 208.50 FEET SOUTHWESTERLY OF AND PARALLEL WITH, MEASURED AT RIGHT ANGLE TO, THE NORTHEASTERLY LINE OF PARCEL 11 OF SAID PARCEL MAP NO. 19784; THENCE

5. ALONG SAID PARALLEL LINE NORTH 70° 01' 02" WEST 353.85 FEET TO ITS POINT OF INTERSECTION WITH THE WESTERLY BOUNDARY OF SAID PARCEL MAP NO. 19784, ALSO BEING THE EASTERLY BOUNDARY OF SAID TRACT NO. 8599; THENCE

6. ALONG SAID EASTERLY BOUNDARY OF TRACT NO. 8599 NORTH 00° 32' 20" EAST 2333.12 FEET TO THE NORTHEASTERLY CORNER OF SAID LOT A, ALSO BEING THE NORTHEASTERLY CORNER OF SECTION 10, TOWNSHIP 4 NORTH, RANGE 17 WEST, SAN BERNARDINO MERIDIAN; THENCE

7. ALONG THE NORTHERLY LINE OF SAID LOT A NORTH 89° 09' 40" WEST 1315.89 FEET TO THE NORTHEASTERLY CORNER OF THE NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SAID SECTION 10; THENCE

8. ALONG THE EASTERLY LINE OF SAID NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 10 SOUTH 00° 36' 20" WEST 1323.13 FEET TO THE SOUTHEASTERLY CORNER OF SAID NORTHWEST QUARTER OF THE NORTHEAST QUARTER OF SECTION 10; THENCE

9. ALONG THE SOUTHERLY LINE OF SAID NORTHWEST QUARTER OF THE NORTHEAST QUARTER AND THE NORTHERLY LINE OF SAID LOT A NORTH 89° 15' 36" WEST 477.85 FEET; THENCE

10. LEAVING LAST SAID NORTHERLY LINE SOUTH 10° 51' 02" WEST 205.36 FEET; THENCE

11. SOUTH 50° 00' 56" EAST 159.09 FEET; THENCE

12. SOUTH 17° 37' 14" WEST 168.72 FEET; THENCE

13. SOUTH 32° 06' 31" WEST 218.32 FEET; THENCE

14. SOUTH 02° 04' 35" EAST 156.83 FEET; THENCE

15. SOUTH 30° 26' 19" WEST 179.12 FEET; THENCE

16. SOUTH 14° 39' 30" EAST 174.20 FEET; THENCE

17. SOUTH 48° 33' 27" EAST 159.68 FEET TO THE NORTHERLY TERMINUS OF THAT CERTAIN COURSE DESCRIBED AS SOUTH 13° 26' 09" EAST 207.00 FEET IN THE WESTERLY LINE OF THE LAND DESCRIBED IN DEED TO STERLING GATEWAY, L.P., A CALIFORNIA LIMITED PARTNERSHIP, RECORDED SEPTEMBER 23, 2005 AS INSTRUMENT NO. 05-2300450, OF OFFICIAL RECORDS, RECORDS OF SAID COUNTY; THENCE

18. ALONG LAST SAID WESTERLY LINE SOUTH 13° 26' 09" EAST 207.00 FEET TO THE SOUTHERLY TERMINUS THEREOF; THENCE

19. LEAVING LAST SAID WESTERLY LINE SOUTH 43° 05' 19" EAST 340.00 FEET; THENCE

20. SOUTH 23° 16' 08" EAST 176.79 FEET; THENCE

21. SOUTH 72° 04' 52" EAST 126.95 FEET; THENCE

22. SOUTH 09° 39' 14" EAST 262.57 FEET; THENCE

23. SOUTH 42° 16' 48" EAST 130.98 FEET; THENCE

24. NORTH 72° 28' 41" EAST 203.24 FEET; THENCE

25. NORTH 08° 07' 55" EAST 53.23 FEET; THENCE

26. NORTH 45° 00' 23" EAST 46.14 FEET; THENCE

27. SOUTH 66° 48' 21" EAST 38.23 FEET; THENCE

28. NORTH 85° 43' 30" EAST 254.34 FEET TO THE SOUTHERLY PROLONGATION OF THAT CERTAIN COURSE DESCRIBED AS NORTH 00° 07' 53" WEST 55.00 FEET IN THE EASTERLY LINE OF SAID LAND OF STERLING GATEWAY, L.P.; THENCE

29. ALONG SAID SOUTHERLY PROLONGATION AND LAST SAID EASTERLY LINE NORTH 00° 07' 53" WEST 489.03 FEET TO THE NORTHERLY TERMINUS THEREOF; THENCE

30. ALONG THE SOUTHERLY LINE OF SAID LAND OF STERLING GATEWAY, L.P. SOUTH 74° 07' 53" EAST 685.09 FEET TO A POINT ON THE EASTERLY BOUNDARY OF SAID TRACT NO. 8599, ALSO BEING A POINT ON SAID WESTERLY BOUNDARY OF PARCEL MAP NO. 19784, DISTANT SOUTHERLY THEREON 445.08 FEET FROM SAID WEST QUARTER CORNER OF SECTION 11; THENCE

31. ALONG SAID WESTERLY BOUNDARY OF PARCEL MAP NO. 19784 AND THE EASTERLY BOUNDARY OF SAID TRACT NO. 8599 NORTH 00° 31' 38" EAST 445.08 FEET TO THE POINT OF BEGINNING.

ALSO EXCEPT THEREFROM AN UNDIVIDED ONE-THIRD INTEREST IN AND TO ALL OIL, GAS AND OTHER MINERALS BELOW A DEPTH OF 500 FEET FROM THE SURFACE OF SAID PROPERTY BUT WITHOUT ANY RIGHT TO ENTER IN OR UPON THE SURFACE OF SAID PROPERTY, AS RECORDED BY A. E. WRIGHT AND CORA WRIGHT, HIS WIFE, IN DEED RECORDED MARCH 16, 1964 IN BOOK D2396 PAGE 635, OFFICIAL RECORDS.

ALSO EXCEPT THEREFROM ANY AND ALL OIL, GAS AND OTHER MINERALS BELOW A DEPTH OF 500 FEET FROM THE SURFACE BUT WITH NO RIGHT OF SURFACE ENTRY UNDER ALL OF THE ABOVE DESCRIBED LANDS EXCLUSIVE OF ALL OIL, GAS AND OTHER MINERALS LEGALLY VESTED IN THIRD PARTIES, AS RESERVED IN THE DEED FROM THEODORE E. STERLING AND EVELYN H. STERLING, RECORDED FEBRUARY 6, 1991 AS INSTRUMENT NO. 91-182928, OFFICIAL RECORDS.

ALSO EXCEPT 30 PERCENT OF ALL OIL, NAPHTHA, GAS, PETROLEUM OR OTHER HYDROCARBON SUBSTANCES, DEPOSITED IN, LYING UNDER, OR FLOWING THROUGH SAID LAND, BUT WITH NO RIGHT OF SURFACE OF SUBSURFACE ENTRY ABOVE A DEPTH OF 500 FEET FROM THE PRESENT SURFACE OF SAID LAND FOR THE EXTRACTION OF SAME, AS RESERVED IN DEED RECORDED APRIL 27, 1960 AS INSTRUMENT NO. 1288, IN BOOK D826, PAGE 836, OFFICIAL RECORDS.

SCHEDULE "2"

EXCEPTIONS TO TITLE

1. Taxes and assessments, general and special, for the fiscal year 2014 - 2015, a lien, but not yet due or payable.

2. The lien of supplemental taxes, if any, assessed pursuant to the provisions of Section 75, et seq., of the Revenue and Taxation Code of the State of California.

3. An easement for pipes, conduits, poles and wires recorded May 8, 1933 in Book 12117 of Official Records, Page 278.

4. An easement for roadway and public right of way recorded in Book 17612, both of Official Records, Page 14 and in Book 17574, Page(s) 132.

5. Subsurface Oil and Gas Lease of that portion of said land lying more than 500 feet below the surface (without the right of surface entry), for and upon the terms, covenants and conditions contained or referred to therein, recorded December 15, 1986 in Official Records as Instrument No. 86-1734748.

6. An easement granted to Los Angeles County Flood Control District, a body, corporate and politic for flood control purposes recorded October 31, 2000 in Official Records as Instrument No. 00-1709412.

7. Release and relinquishment of abutter's or access rights to Avenue Penn, over the adjacent boundary line of premises, as set forth on the Owner's Statement on Parcel Map 19784, Book 298 page 61-67.

8. Maintenance Covenant for Standard Urban Stormwater Mitigation (SUSMP) Requirements recorded July 21, 2004 in Official Records as Instrument No. 04-1861340.

9. Covenant and Agreement by Offsite Property Owner Regarding Offsite Improvements, Drainage Acceptance from PM 60030 and Release of Liability recorded December 5, 2007 in Official Records as Instrument No. 20072670889.

10. Covenant and Agreement by Owner Regarding Offsite Improvements, Drainage Alterations from PM 60030 and Indemnification recorded December 5, 2007 in Official Records As Instrument No. 20072670890.

11. The terms, conditions and provisions of that certain Amended and Restated Declaration of Use Restrictions recorded June 8, 2012 as Instrument No. 20120857152, Official Records.

12. The terms, conditions and provisions of that certain Grant of Easement Agreement Slopes and Debris Maintenance) recorded June 8, 2012 as Instrument No. 20120857153, Official Records.

CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix K
EDR Radius Map Report

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384

Inquiry Number: 5037804.2s
August 31, 2017

The EDR Radius Map™ Report with GeoCheck®

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION	PAGE
Executive Summary	ES1
Overview Map	2
Detail Map	3
Map Findings Summary	4
Map Findings	8
Orphan Summary	28
Government Records Searched/Data Currency Tracking	GR-1

GEOCHECK ADDENDUM

Physical Setting Source Addendum	A-1
Physical Setting Source Summary	A-2
Physical Setting SSURGO Soil Map	A-5
Physical Setting Source Map	A-12
Physical Setting Source Map Findings	A-14
Physical Setting Source Records Searched	PSGR-1

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by Environmental Data Resources, Inc (EDR). The report was designed to assist parties seeking to meet the search requirements of EPA's Standards and Practices for All Appropriate Inquiries (40 CFR Part 312), the ASTM Standard Practice for Environmental Site Assessments (E 1527-13) or custom requirements developed for the evaluation of environmental risk associated with a parcel of real estate.

TARGET PROPERTY INFORMATION

ADDRESS

29053 COOLIDGE AVE
CASTAIC, CA 91384

COORDINATES

Latitude (North):	34.4505200 - 34° 27' 1.87''
Longitude (West):	118.6572360 - 118° 39' 26.04''
Universal Tranverse Mercator:	Zone 11
UTM X (Meters):	347759.3
UTM Y (Meters):	3813160.5
Elevation:	1270 ft. above sea level

USGS TOPOGRAPHIC MAP ASSOCIATED WITH TARGET PROPERTY

Target Property Map:	5636837 VAL VERDE, CA
Version Date:	2012
East Map:	5636847 NEWHALL, CA
Version Date:	2012

AERIAL PHOTOGRAPHY IN THIS REPORT

Portions of Photo from:	20140531
Source:	USDA

MAPPED SITES SUMMARY

Target Property Address:
29053 COOLIDGE AVE
CASTAIC, CA 91384

Click on Map ID to see full detail.

MAP ID	SITE NAME	ADDRESS	DATABASE ACRONYMS	RELATIVE ELEVATION	DIST (ft. & mi.) DIRECTION
A1	CLANDESTINE DRUG LAB	29053 1/2 COOLIDGE A	HAZNET		TP
A2		29053 1/2 COOLIDGE A	CDL		TP
3	UNOCAL - DEL VALLE	DEL VALLE RD	SLIC	Higher	312, 0.059, ENE
B4	B & M TRUCK REPAIR	28915 AVENUE PENN	EDR Hist Auto	Higher	377, 0.071, ESE
B5	DD DIESEL	28915 N AVENUE PENN	UST	Higher	377, 0.071, ESE
6	CRISSAIR INC	28909 AVENUE WILLIAM	RCRA-LQG, FINDS, ECHO	Lower	1106, 0.209, ESE
7	HANSLEY CANYON SCHOO	SLOAN CANYON/HASLEY	ENVIROSTOR, SCH	Higher	2755, 0.522, NNE
8	FORMER SADD NORTH &	28801 HASLEY CANYON	ENVIROSTOR, LA Co. Site Mitigation	Lower	3480, 0.659, ENE
9	ITT AEROSPACE CONTRO	28150 INDUSTRY DR	RCRA-SQG, ENVIROSTOR, AST, TRIS, FINDS, ECHO, EMI,...	Lower	4576, 0.867, East

EXECUTIVE SUMMARY

TARGET PROPERTY SEARCH RESULTS

The target property was identified in the following records. For more information on this property see page 8 of the attached EDR Radius Map report:

Site	Database(s)	EPA ID
CLANDESTINE DRUG LAB 29053 1/2 COOLIDGE A VAL VERDE, CA 91384	HAZNET GEPAID: CLU950002192	N/A
29053 1/2 COOLIDGE A 29053 1/2 COOLIDGE A VAL VERDE, CA 91384	CDL Facility Id: 1995-11-046	N/A

DATABASES WITH NO MAPPED SITES

No mapped sites were found in EDR's search of available ("reasonably ascertainable ") government records either on the target property or within the search radius around the target property for the following databases:

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL ---------- National Priority List
Proposed NPL ---------- Proposed National Priority List Sites
NPL LIENS ---------- Federal Superfund Liens

Federal Delisted NPL site list

Delisted NPL ---------- National Priority List Deletions

Federal CERCLIS list

FEDERAL FACILITY ---------- Federal Facility Site Information listing
SEMS ---------- Superfund Enterprise Management System

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE ---------- Superfund Enterprise Management System Archive

Federal RCRA CORRACTS facilities list

CORRACTS ---------- Corrective Action Report

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF ---------- RCRA - Treatment, Storage and Disposal

EXECUTIVE SUMMARY

Federal RCRA generators list

RCRA-SQG ---------- RCRA - Small Quantity Generators
RCRA-CESQG ---------- RCRA - Conditionally Exempt Small Quantity Generator

Federal institutional controls / engineering controls registries

LUCIS ---------- Land Use Control Information System
US ENG CONTROLS ---------- Engineering Controls Sites List
US INST CONTROL ---------- Sites with Institutional Controls

Federal ERNS list

ERNS ---------- Emergency Response Notification System

State- and tribal - equivalent NPL

RESPONSE ---------- State Response Sites

State and tribal landfill and/or solid waste disposal site lists

SWF/LF ---------- Solid Waste Information System

State and tribal leaking storage tank lists

LUST ---------- Geotracker's Leaking Underground Fuel Tank Report
INDIAN LUST ---------- Leaking Underground Storage Tanks on Indian Land

State and tribal registered storage tank lists

FEMA UST ---------- Underground Storage Tank Listing
AST ---------- Aboveground Petroleum Storage Tank Facilities
INDIAN UST ---------- Underground Storage Tanks on Indian Land

State and tribal voluntary cleanup sites

VCP ---------- Voluntary Cleanup Program Properties
INDIAN VCP ---------- Voluntary Cleanup Priority Listing

State and tribal Brownfields sites

BROWNFIELDS ---------- Considered Brownfieds Sites Listing

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS ---------- A Listing of Brownfields Sites

Local Lists of Landfill / Solid Waste Disposal Sites

WMUDS/SWAT ---------- Waste Management Unit Database
SWRCY ---------- Recycler Database

HAULERS Registered Waste Tire Haulers Listing
INDIAN ODI Report on the Status of Open Dumps on Indian Lands
DEBRIS REGION 9 Torres Martinez Reservation Illegal Dump Site Locations
ODI Open Dump Inventory
IHS OPEN DUMPS Open Dumps on Indian Land

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL Delisted National Clandestine Laboratory Register
AOCONCERN San Gabriel Valley Areas of Concern
HIST Cal-Sites Historical Calsites Database
SCH School Property Evaluation Program
Toxic Pits Toxic Pits Cleanup Act Sites
US CDL National Clandestine Laboratory Register

Local Lists of Registered Storage Tanks

SWEEPS UST SWEEPS UST Listing
HIST UST Hazardous Substance Storage Container Database
CA FID UST Facility Inventory Database

Local Land Records

LIENS Environmental Liens Listing
LIENS 2 CERCLA Lien Information
DEED Deed Restriction Listing

Records of Emergency Release Reports

HMIRS Hazardous Materials Information Reporting System
CHMIRS California Hazardous Material Incident Report System
LDS Land Disposal Sites Listing
MCS Military Cleanup Sites Listing
SPILLS 90 SPILLS 90 data from FirstSearch

Other Ascertainable Records

RCRA NonGen / NLR RCRA - Non Generators / No Longer Regulated
FUDS Formerly Used Defense Sites
DOD Department of Defense Sites
SCRD DRYCLEANERS State Coalition for Remediation of Drycleaners Listing
US FIN ASSUR Financial Assurance Information
EPA WATCH LIST EPA WATCH LIST
2020 COR ACTION 2020 Corrective Action Program List
TSCA Toxic Substances Control Act
TRIS Toxic Chemical Release Inventory System
SSTS Section 7 Tracking Systems
ROD Records Of Decision
RMP Risk Management Plans
RAATS RCRA Administrative Action Tracking System
PRP Potentially Responsible Parties
PADS PCB Activity Database System
ICIS Integrated Compliance Information System
FTTS FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)

MLTS ---- Material Licensing Tracking System
COAL ASH DOE ---- Steam-Electric Plant Operation Data
COAL ASH EPA ---- Coal Combustion Residues Surface Impoundments List
PCB TRANSFORMER ---- PCB Transformer Registration Database
RADINFO ---- Radiation Information Database
HIST FTTS ---- FIFRA/TSCA Tracking System Administrative Case Listing
DOT OPS ---- Incident and Accident Data
CONSENT ---- Superfund (CERCLA) Consent Decrees
INDIAN RESERV ---- Indian Reservations
FUSRAP ---- Formerly Utilized Sites Remedial Action Program
UMTRA ---- Uranium Mill Tailings Sites
LEAD SMELTERS ---- Lead Smelter Sites
US AIRS ---- Aerometric Information Retrieval System Facility Subsystem
US MINES ---- Mines Master Index File
ABANDONED MINES ---- Abandoned Mines
FINDS ---- Facility Index System/Facility Registry System
UXO ---- Unexploded Ordnance Sites
DOCKET HWC ---- Hazardous Waste Compliance Docket Listing
ECHO ---- Enforcement & Compliance History Information
FUELS PROGRAM ---- EPA Fuels Program Registered Listing
CA BOND EXP. PLAN ---- Bond Expenditure Plan
Cortese ---- "Cortese" Hazardous Waste & Substances Sites List
CUPA Listings ---- CUPA Resources List
DRYCLEANERS ---- Cleaner Facilities
EMI ---- Emissions Inventory Data
ENF ---- Enforcement Action Listing
Financial Assurance ---- Financial Assurance Information Listing
ICE ---- ICE
HIST CORTESE ---- Hazardous Waste & Substance Site List
LOS ANGELES CO. HMS ---- HMS: Street Number List
HWP ---- EnviroStor Permitted Facilities Listing
HWT ---- Registered Hazardous Waste Transporter Database
MINES ---- Mines Site Location Listing
MWMP ---- Medical Waste Management Program Listing
NPDES ---- NPDES Permits Listing
PEST LIC ---- Pesticide Regulation Licenses Listing
PROC ---- Certified Processors Database
Notify 65 ---- Proposition 65 Records
LA Co. Site Mitigation ---- Site Mitigation List
UIC ---- UIC Listing
WASTEWATER PITS ---- Oil Wastewater Pits Listing
WDS ---- Waste Discharge System
WIP ---- Well Investigation Program Case List

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP ---- EDR Proprietary Manufactured Gas Plants
EDR Hist Cleaner ---- EDR Exclusive Historic Dry Cleaners

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF ---- Recovered Government Archive Solid Waste Facilities List

EXECUTIVE SUMMARY

RGA LUST ---------- Recovered Government Archive Leaking Underground Storage Tank

SURROUNDING SITES: SEARCH RESULTS

Surrounding sites were identified in the following databases.

Elevations have been determined from the USGS Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified. Sites with an elevation equal to or higher than the target property have been differentiated below from sites with an elevation lower than the target property.
Page numbers and map identification numbers refer to the EDR Radius Map report where detailed data on individual sites can be reviewed.

Sites listed in ***bold italics*** are in multiple databases.

Unmappable (orphan) sites are not considered in the foregoing analysis.

STANDARD ENVIRONMENTAL RECORDS

Federal RCRA generators list

RCRA-LQG: RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

A review of the RCRA-LQG list, as provided by EDR, and dated 12/12/2016 has revealed that there is 1 RCRA-LQG site within approximately 0.25 miles of the target property.

Lower Elevation	Address	Direction / Distance	Map ID	Page
CRISSAIR INC	***28909 AVENUE WILLIAM***	***ESE 1/8 - 1/4 (0.209 mi.)***	***6***	***9***

State- and tribal - equivalent CERCLIS

ENVIROSTOR: The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites.

A review of the ENVIROSTOR list, as provided by EDR, and dated 07/31/2017 has revealed that there are 3 ENVIROSTOR sites within approximately 1 mile of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
HANSLEY CANYON SCHOO	***SLOAN CANYON/HASLEY***	***NNE 1/2 - 1 (0.522 mi.)***	***7***	***12***

Facility Id: 19650028
Status: No Action Required

Lower Elevation	Address	Direction / Distance	Map ID	Page
FORMER SADD NORTH &	***28801 HASLEY CANYON***	***ENE 1/2 - 1 (0.659 mi.)***	***8***	***15***
Facility Id: 19000025				
Status: Refer: 1248 Local Agency				
ITT AEROSPACE CONTRO	***28150 INDUSTRY DR***	***E 1/2 - 1 (0.867 mi.)***	***9***	***16***
Facility Id: 71003567				
Status: Refer: Other Agency				

State and tribal leaking storage tank lists

SLIC: Cleanup Program Sites (CPS; also known as Site Cleanups [SC] and formerly known as Spills, Leaks, Investigations, and Cleanups [SLIC] sites) included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

A review of the SLIC list, as provided by EDR, has revealed that there is 1 SLIC site within approximately 0.5 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
UNOCAL - DEL VALLE	DEL VALLE RD	ENE 0 - 1/8 (0.059 mi.)	3	8
Database: SLIC, Date of Government Version: 06/12/2017				
Facility Status: Open - Inactive				
Global Id: SLT43335333				

State and tribal registered storage tank lists

UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA). The data come from the State Water Resources Control Board's Hazardous Substance Storage Container Database.

A review of the UST list, as provided by EDR, has revealed that there is 1 UST site within approximately 0.25 miles of the target property.

Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
DD DIESEL	28915 N AVENUE PENN	ESE 0 - 1/8 (0.071 mi.)	B5	9
Database: UST, Date of Government Version: 06/12/2017				
Facility Id: LACoFA0033896				

EXECUTIVE SUMMARY

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR Hist Auto: EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

A review of the EDR Hist Auto list, as provided by EDR, has revealed that there is 1 EDR Hist Auto site within approximately 0.125 miles of the target property.

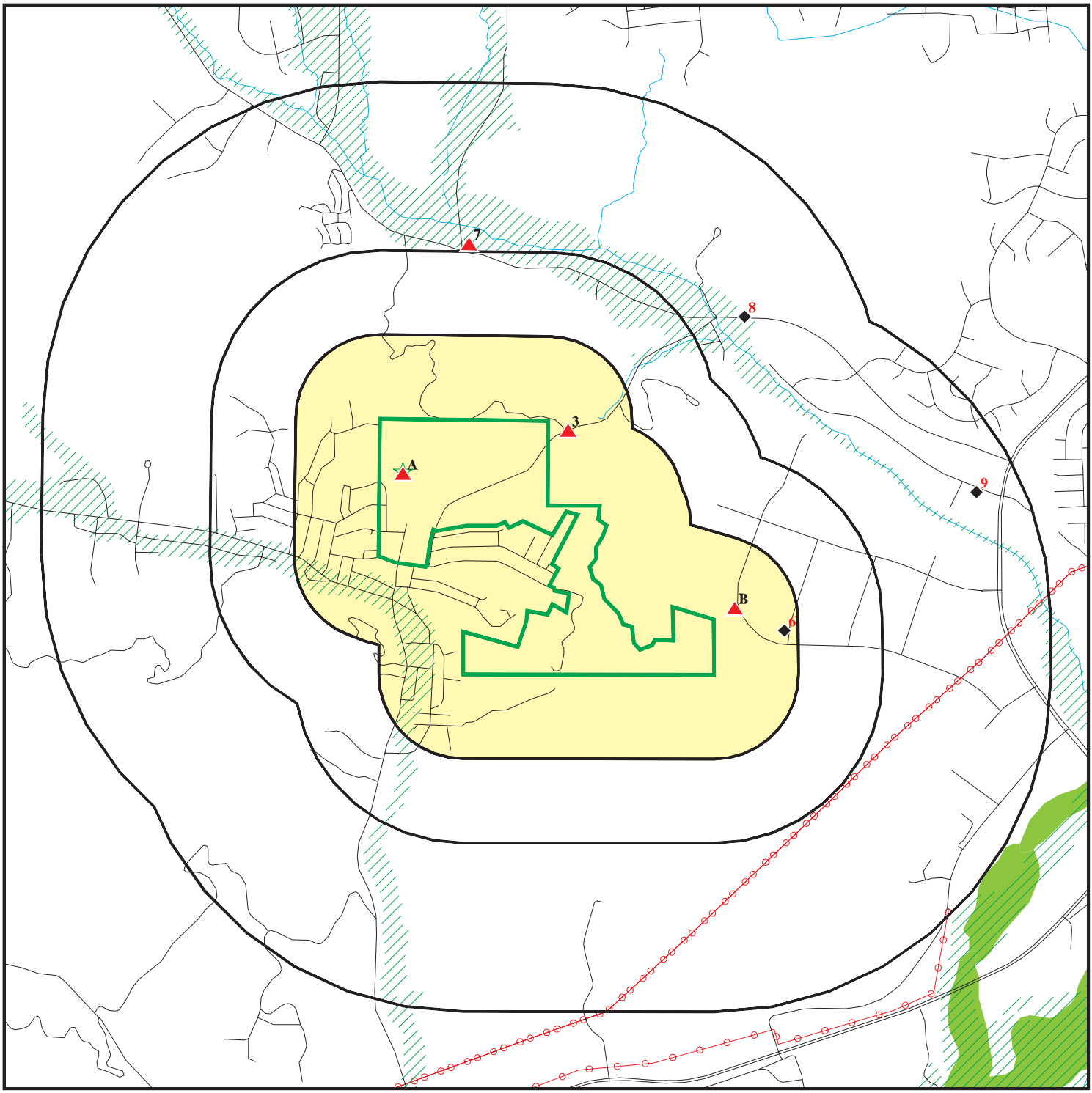
Equal/Higher Elevation	Address	Direction / Distance	Map ID	Page
B & M TRUCK REPAIR	28915 AVENUE PENN	ESE 0 - 1/8 (0.071 mi.)	B4	9

EXECUTIVE SUMMARY

Due to poor or inadequate address information, the following sites were not mapped. Count: 1 records.

Site Name	Database(s)
UNOCAL - DEL VALLE	SLIC

OVERVIEW MAP - 5037804.2S



- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Upgradient Area
- Areas of Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: 29053 Coolidge Ave ADDRESS: 29053 Coolidge Ave Castaic CA 91384 LAT/LONG: 34.45052 / 118.657236	CLIENT: Citadel Environmental Services CONTACT: Roopal Jani INQUIRY #: 5037804.2s DATE: August 31, 2017 7:29 am

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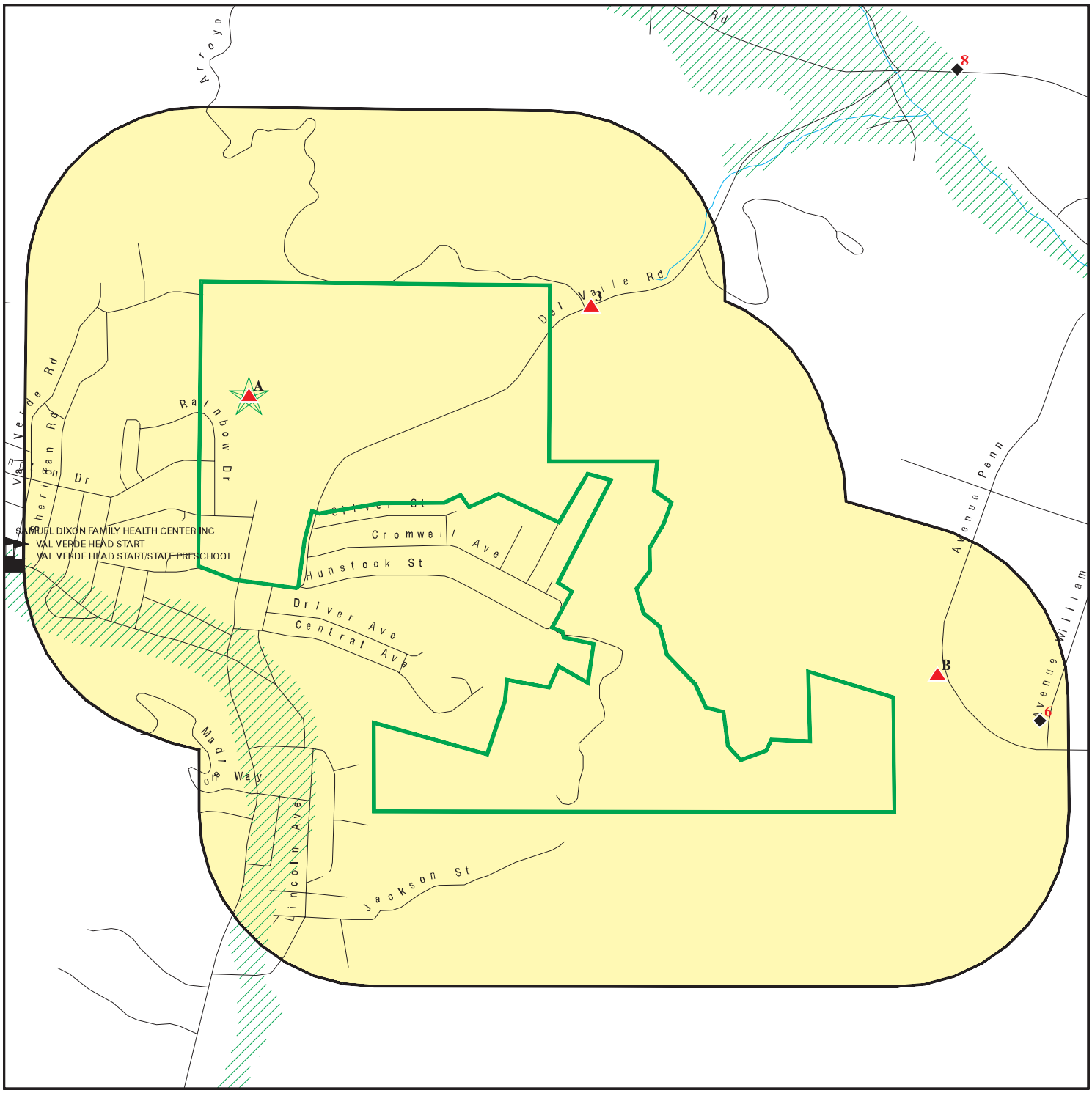
DETAIL MAP - 5037804.2S



Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

Sensitive Receptors

National Priority List Sites

Dept. Defense Sites

0 1/8 1/4 1/2 Miles

Indian Reservations BIA

100-year flood zone

500-year flood zone

Areas of Concern

N

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: 29053 Coolidge Ave	CLIENT: Citadel Environmental Services
ADDRESS: 29053 Coolidge Ave Castaic CA 91384	CONTACT: Roopal Jani
LAT/LONG: 34.45052 / 118.657236	INQUIRY #: 5037804.2s DATE: August 31, 2017 7:30 am

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MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
STANDARD ENVIRONMENTAL RECORDS								
Federal NPL site list								
NPL	1.000		0	0	0	0	NR	0
Proposed NPL	1.000		0	0	0	0	NR	0
NPL LIENS	0.001		0	NR	NR	NR	NR	0
Federal Delisted NPL site list								
Delisted NPL	1.000		0	0	0	0	NR	0
Federal CERCLIS list								
FEDERAL FACILITY	0.500		0	0	0	NR	NR	0
SEMS	0.500		0	0	0	NR	NR	0
Federal CERCLIS NFRAP site list								
SEMS-ARCHIVE	0.500		0	0	0	NR	NR	0
Federal RCRA CORRACTS facilities list								
CORRACTS	1.000		0	0	0	0	NR	0
Federal RCRA non-CORRACTS TSD facilities list								
RCRA-TSDF	0.500		0	0	0	NR	NR	0
Federal RCRA generators list								
RCRA-LQG	0.250		0	1	NR	NR	NR	1
RCRA-SQG	0.250		0	0	NR	NR	NR	0
RCRA-CESQG	0.250		0	0	NR	NR	NR	0
Federal institutional controls / engineering controls registries								
LUCIS	0.500		0	0	0	NR	NR	0
US ENG CONTROLS	0.500		0	0	0	NR	NR	0
US INST CONTROL	0.500		0	0	0	NR	NR	0
Federal ERNS list								
ERNS	0.001		0	NR	NR	NR	NR	0
State- and tribal - equivalent NPL								
RESPONSE	1.000		0	0	0	0	NR	0
State- and tribal - equivalent CERCLIS								
ENVIROSTOR	1.000		0	0	0	3	NR	3
State and tribal landfill and/or solid waste disposal site lists								
SWF/LF	0.500		0	0	0	NR	NR	0
State and tribal leaking storage tank lists								
LUST	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
INDIAN LUST	0.500		0	0	0	NR	NR	0
SLIC	0.500		1	0	0	NR	NR	1
State and tribal registered storage tank lists								
FEMA UST	0.250		0	0	NR	NR	NR	0
UST	0.250		1	0	NR	NR	NR	1
AST	0.250		0	0	NR	NR	NR	0
INDIAN UST	0.250		0	0	NR	NR	NR	0
State and tribal voluntary cleanup sites								
VCP	0.500		0	0	0	NR	NR	0
INDIAN VCP	0.500		0	0	0	NR	NR	0
State and tribal Brownfields sites								
BROWNFIELDS	0.500		0	0	0	NR	NR	0
ADDITIONAL ENVIRONMENTAL RECORDS								
Local Brownfield lists								
US BROWNFIELDS	0.500		0	0	0	NR	NR	0
Local Lists of Landfill / Solid Waste Disposal Sites								
WMUDS/SWAT	0.500		0	0	0	NR	NR	0
SWRCY	0.500		0	0	0	NR	NR	0
HAULERS	0.001		0	NR	NR	NR	NR	0
INDIAN ODI	0.500		0	0	0	NR	NR	0
DEBRIS REGION 9	0.500		0	0	0	NR	NR	0
ODI	0.500		0	0	0	NR	NR	0
IHS OPEN DUMPS	0.500		0	0	0	NR	NR	0
Local Lists of Hazardous waste / Contaminated Sites								
US HIST CDL	0.001		0	NR	NR	NR	NR	0
AOCONCERN	1.000		0	0	0	0	NR	0
HIST Cal-Sites	1.000		0	0	0	0	NR	0
SCH	0.250		0	0	NR	NR	NR	0
CDL	0.001	1	0	NR	NR	NR	NR	1
Toxic Pits	1.000		0	0	0	0	NR	0
US CDL	0.001		0	NR	NR	NR	NR	0
Local Lists of Registered Storage Tanks								
SWEEPS UST	0.250		0	0	NR	NR	NR	0
HIST UST	0.250		0	0	NR	NR	NR	0
CA FID UST	0.250		0	0	NR	NR	NR	0
Local Land Records								
LIENS	0.001		0	NR	NR	NR	NR	0
LIENS 2	0.001		0	NR	NR	NR	NR	0
DEED	0.500		0	0	0	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
Records of Emergency Release Reports								
HMIRS	0.001		0	NR	NR	NR	NR	0
CHMIRS	0.001		0	NR	NR	NR	NR	0
LDS	0.001		0	NR	NR	NR	NR	0
MCS	0.001		0	NR	NR	NR	NR	0
SPILLS 90	0.001		0	NR	NR	NR	NR	0
Other Ascertainable Records								
RCRA NonGen / NLR	0.250		0	0	NR	NR	NR	0
FUDS	1.000		0	0	0	0	NR	0
DOD	1.000		0	0	0	0	NR	0
SCRD DRYCLEANERS	0.500		0	0	0	NR	NR	0
US FIN ASSUR	0.001		0	NR	NR	NR	NR	0
EPA WATCH LIST	0.001		0	NR	NR	NR	NR	0
2020 COR ACTION	0.250		0	0	NR	NR	NR	0
TSCA	0.001		0	NR	NR	NR	NR	0
TRIS	0.001		0	NR	NR	NR	NR	0
SSTS	0.001		0	NR	NR	NR	NR	0
ROD	1.000		0	0	0	0	NR	0
RMP	0.001		0	NR	NR	NR	NR	0
RAATS	0.001		0	NR	NR	NR	NR	0
PRP	0.001		0	NR	NR	NR	NR	0
PADS	0.001		0	NR	NR	NR	NR	0
ICIS	0.001		0	NR	NR	NR	NR	0
FTTS	0.001		0	NR	NR	NR	NR	0
MLTS	0.001		0	NR	NR	NR	NR	0
COAL ASH DOE	0.001		0	NR	NR	NR	NR	0
COAL ASH EPA	0.500		0	0	0	NR	NR	0
PCB TRANSFORMER	0.001		0	NR	NR	NR	NR	0
RADINFO	0.001		0	NR	NR	NR	NR	0
HIST FTTS	0.001		0	NR	NR	NR	NR	0
DOT OPS	0.001		0	NR	NR	NR	NR	0
CONSENT	1.000		0	0	0	0	NR	0
INDIAN RESERV	0.001		0	NR	NR	NR	NR	0
FUSRAP	1.000		0	0	0	0	NR	0
UMTRA	0.500		0	0	0	NR	NR	0
LEAD SMELTERS	0.001		0	NR	NR	NR	NR	0
US AIRS	0.001		0	NR	NR	NR	NR	0
US MINES	0.250		0	0	NR	NR	NR	0
ABANDONED MINES	0.001		0	NR	NR	NR	NR	0
FINDS	0.001		0	NR	NR	NR	NR	0
UXO	1.000		0	0	0	0	NR	0
DOCKET HWC	0.001		0	NR	NR	NR	NR	0
ECHO	0.001		0	NR	NR	NR	NR	0
FUELS PROGRAM	0.250		0	0	NR	NR	NR	0
CA BOND EXP. PLAN	1.000		0	0	0	0	NR	0
Cortese	0.500		0	0	0	NR	NR	0
CUPA Listings	0.250		0	0	NR	NR	NR	0
DRYCLEANERS	0.250		0	0	NR	NR	NR	0
EMI	0.001		0	NR	NR	NR	NR	0

MAP FINDINGS SUMMARY

Database	Search Distance (Miles)	Target Property	< 1/8	1/8 - 1/4	1/4 - 1/2	1/2 - 1	> 1	Total Plotted
ENF	0.001		0	NR	NR	NR	NR	0
Financial Assurance	0.001		0	NR	NR	NR	NR	0
HAZNET	0.001	1	0	NR	NR	NR	NR	1
ICE	0.001		0	NR	NR	NR	NR	0
HIST CORTESE	0.500		0	0	0	NR	NR	0
LOS ANGELES CO. HMS	0.001		0	NR	NR	NR	NR	0
HWP	1.000		0	0	0	0	NR	0
HWT	0.250		0	0	NR	NR	NR	0
MINES	0.001		0	NR	NR	NR	NR	0
MWMP	0.250		0	0	NR	NR	NR	0
NPDES	0.001		0	NR	NR	NR	NR	0
PEST LIC	0.001		0	NR	NR	NR	NR	0
PROC	0.500		0	0	0	NR	NR	0
Notify 65	1.000		0	0	0	0	NR	0
LA Co. Site Mitigation	0.001		0	NR	NR	NR	NR	0
UIC	0.001		0	NR	NR	NR	NR	0
WASTEWATER PITS	0.500		0	0	0	NR	NR	0
WDS	0.001		0	NR	NR	NR	NR	0
WIP	0.250		0	0	NR	NR	NR	0
EDR HIGH RISK HISTORICAL RECORDS								
EDR Exclusive Records								
EDR MGP	1.000		0	0	0	0	NR	0
EDR Hist Auto	0.125		1	NR	NR	NR	NR	1
EDR Hist Cleaner	0.125		0	NR	NR	NR	NR	0
EDR RECOVERED GOVERNMENT ARCHIVES								
Exclusive Recovered Govt. Archives								
RGA LF	0.001		0	NR	NR	NR	NR	0
RGA LUST	0.001		0	NR	NR	NR	NR	0
- Totals --		2	3	1	0	3	0	9

NOTES:

TP = Target Property

NR = Not Requested at this Search Distance

Sites may be listed in more than one database

A1
Target Property
Actual: 1270 ft.

CLANDESTINE DRUG LAB OPERATOR UNKNOWN
29053 1/2 COOLIDGE AVE
VAL VERDE, CA 91384

HAZNET **S113180778**
N/A

Site 1 of 2 in cluster A

HAZNET:

envid:	S113180778
Year:	1995
GEPAID:	CLU950002192
Contact:	UNKNOWN
Telephone:	0000000000
Mailing Name:	Not reported
Mailing Address:	DTSC CLU/ERU
Mailing City,St,Zip:	SACRAMENTO, CA 958120806
Gen County:	Not reported
TSD EPA ID:	AZD049318009
TSD County:	Not reported
Waste Category:	Laboratory waste chemicals
Disposal Method:	Transfer Station
Tons:	1.1600
Cat Decode:	Not reported
Method Decode:	Not reported
Facility County:	Los Angeles

A2
Target Property
Actual: 1270 ft.

29053 1/2 COOLIDGE AVE
VAL VERDE, CA 91384

CDL **S107532350**
N/A

Site 2 of 2 in cluster A

CDL:

Facility ID:	1995-11-046
Date:	11/18/1995
Labtype:	Illegal Drug lab
Lab Type:	Illegal Drug Lab (L) - location where an illegal drug lab was operated or drug lab equipment and/or materials were stored.

3
ENE
< 1/8
0.059 mi.
312 ft.

Relative: Higher

Actual: 1324 ft.

UNOCAL - DEL VALLE
DEL VALLE RD
LOS ANGELES, CA 91384

SLIC **S106485610**
N/A

SLIC:

Region:	STATE
Facility Status:	**Open - Inactive**
Status Date:	01/01/1965
Global Id:	SLT43335333
Lead Agency:	LOS ANGELES RWQCB (REGION 4)
Lead Agency Case Number:	Not reported
Latitude:	34.452377
Longitude:	-118.648665
Case Type:	Cleanup Program Site
Case Worker:	Not reported
Local Agency:	Not reported
RB Case Number:	0520A
File Location:	Not reported

UNOCAL - DEL VALLE (Continued) **S106485610**

Potential Media Affected: Not reported
Potential Contaminants of Concern: Not reported
Site History: Not reported

Click here to access the California GeoTracker records for this facility:

B4 **B & M TRUCK REPAIR** **EDR Hist Auto** **1020622129**
ESE **28915 AVENUE PENN** **N/A**
< 1/8 **SANTA CLARITA, CA 91355**
0.071 mi.
377 ft. **Site 1 of 2 in cluster B**

Relative:
Higher

Actual:
1306 ft.

EDR Hist Auto

Year:	Name:	Type:
2004	B & M TRUCK REPAIR	General Automotive Repair Shops
2005	B & M TRUCK REPAIR	General Automotive Repair Shops
2006	B & M TRUCK REPAIR	General Automotive Repair Shops
2007	B & M TRUCK REPAIR	General Automotive Repair Shops
2008	B & M TRUCK REPAIR	General Automotive Repair Shops

B5 **DD DIESEL** **UST** **U004265730**
ESE **28915 N AVENUE PENN** **N/A**
< 1/8 **VALENCIA, CA 91355**
0.071 mi.
377 ft. **Site 2 of 2 in cluster B**

Relative:
Higher

Actual:
1306 ft.

UST:
Facility ID: LACoFA0033896
Permitting Agency: Los Angeles County Fire Department
Latitude: 34.44453
Longitude: -118.64051

---

6 **CRISSAIR INC** **RCRA-LQG** **1016452990**
ESE **28909 AVENUE WILLIAMS** **FINDS** **CAR000243816**
1/8-1/4 **VALENCIA, CA 91355** **ECHO**
0.209 mi.
1106 ft.

Relative:
Lower

Actual:
1251 ft.

RCRA-LQG:
Date form received by agency: 02/24/2016
Facility name: CRISSAIR INC
Facility address: 28909 AVENUE WILLIAMS
VALENCIA, CA 91355
EPA ID: CAR000243816
Mailing address: AVENUE WILLIAMS
VALENCIA, CA 91355
Contact: BRANDON ALEXANDER
Contact address: AVENUE WILLIAMS
VALENCIA, CA 91355
Contact country: US
Contact telephone: (661) 367-3335
Contact email: BALEXANDER@CRISSAIR.COM
EPA Region: 09
Classification: Large Quantity Generator

CRISSAIR INC (Continued) **1016452990**

Description: Handler: generates 1,000 kg or more of hazardous waste during any calendar month; or generates more than 1 kg of acutely hazardous waste during any calendar month; or generates more than 100 kg of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month; or generates 1 kg or less of acutely hazardous waste during any calendar month, and accumulates more than 1 kg of acutely hazardous waste at any time; or generates 100 kg or less of any residue or contaminated soil, waste or other debris resulting from the cleanup of a spill, into or on any land or water, of acutely hazardous waste during any calendar month, and accumulates more than 100 kg of that material at any time

Owner/Operator Summary:

Owner/operator name: ESCO TECHNOLOGY
Owner/operator address: CLAYTON RD
SAINT LOUIS, MO 63124
Owner/operator country: US
Owner/operator telephone: (661) 367-3300
Legal status: Other
Owner/Operator Type: Owner
Owner/Op start date: 01/01/2014
Owner/Op end date: Not reported

Owner/operator name: CRISSAIR INC
Owner/operator address: Not reported
Not reported
Owner/operator country: Not reported
Owner/operator telephone: Not reported
Legal status: Private
Owner/Operator Type: Operator
Owner/Op start date: 01/01/2014
Owner/Op end date: Not reported

Owner/operator name: ESCO TECHNOLOGIES INC
Owner/operator address: 9900A CLAYTON RD
ST LOUIS, MO 63124
Owner/operator country: US
Owner/operator telephone: 314-213-7277
Legal status: Other
Owner/Operator Type: Owner
Owner/Op start date: 06/26/2013
Owner/Op end date: Not reported

Owner/operator name: CRISSAIR INC
Owner/operator address: Not reported
Not reported
Owner/operator country: US
Owner/operator telephone: Not reported
Legal status: Private
Owner/Operator Type: Operator
Owner/Op start date: 01/01/2014
Owner/Op end date: Not reported

Handler Activities Summary:

U.S. importer of hazardous waste: No

CRISSAIR INC (Continued) **1016452990**

Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

. Waste code: 135
. Waste name: 135

. Waste code: 221
. Waste name: 221

. Waste code: 223
. Waste name: 223

. Waste code: 352
. Waste name: 352

. Waste code: 551
. Waste name: 551

. Waste code: D001
. Waste name: IGNITABLE WASTE

Historical Generators:
Date form received by agency: 01/27/2014
Site name: CRISSAIR INC
Classification: Small Quantity Generator

. Waste code: 214
. Waste name: 214

. Waste code: 221
. Waste name: 221

. Waste code: 223
. Waste name: 223

. Waste code: D001
. Waste name: IGNITABLE WASTE

. Waste code: F003
. Waste name: THE FOLLOWING SPENT NONHALOGENATED SOLVENTS: XYLENE, ACETONE, ETHYL ACETATE, ETHYL BENZENE, ETHYL ETHER, METHYL ISOBUTYL KETONE, N-BUTYL ALCOHOL, CYCLOHEXANONE, AND METHANOL; ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONLY THE ABOVE SPENT NONHALOGENATED SOLVENTS; AND ALL SPENT SOLVENT MIXTURES/BLENDS CONTAINING, BEFORE USE, ONE OR MORE OF THE ABOVE NONHALOGENATED

CRISSAIR INC (Continued) **1016452990**

SOLVENTS, AND A TOTAL OF TEN PERCENT OR MORE (BY VOLUME) OF ONE OR MORE OF THOSE SOLVENTS LISTED IN F001, F002, F004, AND F005; AND STILL BOTTOMS FROM THE RECOVERY OF THESE SPENT SOLVENTS AND SPENT SOLVENT MIXTURES.

Violation Status: No violations found

FINDS:

Registry ID: 110057071546

Environmental Interest/Information System
RCRAInfo is a national information system that supports the Resource Conservation and Recovery Act (RCRA) program through the tracking of events and activities related to facilities that generate, transport, and treat, store, or dispose of hazardous waste. RCRAInfo allows RCRA program staff to track the notification, permit, compliance, and corrective action activities required under RCRA.

STATE MASTER

Click this hyperlink while viewing on your computer to access additional FINDS: detail in the EDR Site Report.

ECHO:

Envid:	1016452990
Registry ID:	110057071546
DFR URL:	http://echo.epa.gov/detailed-facility-report?fid=110057071546

---

7 NNE 1/2-1 0.522 mi. 2755 ft.

Relative: Higher

Actual: 1309 ft.

HANSLEY CANYON SCHOOL SITE **ENVIROSTOR S118756538**
SLOAN CANYON/HASLEY CANYON **SCH N/A**
SANTA CLARITA, CA 91384

ENVIROSTOR:

Facility ID:	19650028
Status:	No Action Required
Status Date:	08/01/2002
Site Code:	304380
Site Type:	School Investigation
Site Type Detailed:	School
Acres:	70
NPL:	NO
Regulatory Agencies:	DTSC
Lead Agency:	DTSC
Program Manager:	Not reported
Supervisor:	Javier Hinojosa
Division Branch:	Southern California Schools & Brownfields Outreach
Assembly:	38
Senate:	21
Special Program:	Not reported
Restricted Use:	NO
Site Mgmt Req:	NONE SPECIFIED
Funding:	School District
Latitude:	34.4604
Longitude:	-118.6538

HANSLEY CANYON SCHOOL SITE (Continued) **S118756538**

APN: NONE SPECIFIED
Past Use: NONE
Potential COC: NONE SPECIFIED No Contaminants found
Confirmed COC: NONE SPECIFIED
Potential Description: NMA
Alias Name: HANSLEY CANYON SCHOOL SITE
Alias Type: Alternate Name
Alias Name: WILLIAM S HART USD-70 AC IN HASLEY CANYN
Alias Type: Alternate Name
Alias Name: 304380
Alias Type: Project Code (Site Code)
Alias Name: 19650028
Alias Type: Envirostor ID Number

Completed Info:
Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Phase 1
Completed Date: 08/01/2002
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Site Inspections/Visit (Non LUR)
Completed Date: 07/24/2002
Comments: Not reported

Completed Area Name: PROJECT WIDE
Completed Sub Area Name: Not reported
Completed Document Type: Cost Recovery Closeout Memo
Completed Date: 08/16/2002
Comments: Not reported

Future Area Name: Not reported
Future Sub Area Name: Not reported
Future Document Type: Not reported
Future Due Date: Not reported
Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

SCH:

Facility ID: 19650028
Site Type: School Investigation
Site Type Detail: School
Site Mgmt. Req.: NONE SPECIFIED
Acres: 70
National Priorities List: NO
Cleanup Oversight Agencies: DTSC
Lead Agency: DTSC
Lead Agency Description: * DTSC
Project Manager: Not reported
Supervisor: Javier Hinojosa
Division Branch: Southern California Schools & Brownfields Outreach

HANSLEY CANYON SCHOOL SITE (Continued) **S118756538**

Site Code:	304380
Assembly:	38
Senate:	21
Special Program Status:	Not reported
Status:	No Action Required
Status Date:	08/01/2002
Restricted Use:	NO
Funding:	School District
Latitude:	34.4604
Longitude:	-118.6538
APN:	NONE SPECIFIED
Past Use:	NONE
Potential COC:	NONE SPECIFIED, No Contaminants found
Confirmed COC:	NONE SPECIFIED
Potential Description:	NMA
Alias Name:	HANSLEY CANYON SCHOOL SITE
Alias Type:	Alternate Name
Alias Name:	WILLIAM S HART USD-70 AC IN HASLEY CANYN
Alias Type:	Alternate Name
Alias Name:	304380
Alias Type:	Project Code (Site Code)
Alias Name:	19650028
Alias Type:	Envirostor ID Number

Completed Info:

Completed Area Name:	PROJECT WIDE
Completed Sub Area Name:	Not reported
Completed Document Type:	Phase 1
Completed Date:	08/01/2002
Comments:	Not reported
Completed Area Name:	PROJECT WIDE
Completed Sub Area Name:	Not reported
Completed Document Type:	Site Inspections/Visit (Non LUR)
Completed Date:	07/24/2002
Comments:	Not reported
Completed Area Name:	PROJECT WIDE
Completed Sub Area Name:	Not reported
Completed Document Type:	Cost Recovery Closeout Memo
Completed Date:	08/16/2002
Comments:	Not reported
Future Area Name:	Not reported
Future Sub Area Name:	Not reported
Future Document Type:	Not reported
Future Due Date:	Not reported
Schedule Area Name:	Not reported
Schedule Sub Area Name:	Not reported
Schedule Document Type:	Not reported
Schedule Due Date:	Not reported
Schedule Revised Date:	Not reported

8
ENE
1/2-1
0.659 mi.
3480 ft.

FORMER SADD NORTH & SOUTH/AEO LEASES
28801 HASLEY CANYON RD
CASTAIC, CA 91384

ENVIROSTOR
LA Co. Site Mitigation

S106843152
N/A

Relative:
Lower

Actual:
1204 ft.

ENVIROSTOR:

Facility ID:	19000025
Status:	Refer: 1248 Local Agency
Status Date:	04/14/2004
Site Code:	Not reported
Site Type:	Evaluation
Site Type Detailed:	Evaluation
Acres:	0.1
NPL:	NO
Regulatory Agencies:	LOS ANGELES COUNTY
Lead Agency:	LOS ANGELES COUNTY
Program Manager:	Not reported
Supervisor:	Referred - Not Assigned
Division Branch:	Cleanup Cypress
Assembly:	38
Senate:	21
Special Program:	Not reported
Restricted Use:	NO
Site Mgmt Req:	NONE SPECIFIED
Funding:	Not Applicable
Latitude:	34.46538
Longitude:	-118.6342
APN:	2866001015, 2866001016, 2866001017, 2866001027, 2866001028, 2866001029, 2866001069, 2866001071, 2866001074, 2866052001, 3247032001
	Not reported
Past Use:	NONE SPECIFIED
Potential COC:	NONE SPECIFIED
Confirmed COC:	NONE SPECIFIED
Potential Description:	NONE SPECIFIED
Alias Name:	2866001015
Alias Type:	APN
Alias Name:	2866001016
Alias Type:	APN
Alias Name:	2866001017
Alias Type:	APN
Alias Name:	2866001027
Alias Type:	APN
Alias Name:	2866001028
Alias Type:	APN
Alias Name:	2866001029
Alias Type:	APN
Alias Name:	2866001069
Alias Type:	APN
Alias Name:	2866001071
Alias Type:	APN
Alias Name:	2866001074
Alias Type:	APN
Alias Name:	2866052001
Alias Type:	APN
Alias Name:	3247032001
Alias Type:	APN
Alias Name:	19000025
Alias Type:	Envirostor ID Number

FORMER SADD NORTH & SOUTH/AEO LEASES (Continued) **S106843152**

Completed Info:

Completed Area Name:	Not reported
Completed Sub Area Name:	Not reported
Completed Document Type:	Not reported
Completed Date:	Not reported
Comments:	Not reported
Future Area Name:	Not reported
Future Sub Area Name:	Not reported
Future Document Type:	Not reported
Future Due Date:	Not reported
Schedule Area Name:	Not reported
Schedule Sub Area Name:	Not reported
Schedule Document Type:	Not reported
Schedule Due Date:	Not reported
Schedule Revised Date:	Not reported

LA Co. Site Mitigation:

Facility ID:	Not reported
Site ID:	SD0000099
Jurisdiction:	State
Case ID:	RO0000103
Abated:	Yes
Assigned To:	Kim Clark
Entered Date:	04/06/2004
Abated Date:	04/21/2010

9
East
1/2-1
0.867 mi.
4576 ft.

Relative:
Lower

Actual:
1112 ft.

ITT AEROSPACE CONTROLS
28150 INDUSTRY DR
VALENCIA, CA 91355

RCRA-SQG **1000904860**
ENVIROSTOR **91355TTRSP28150**
AST
TRIS
FINDS
ECHO
EMI
HAZNET
LOS ANGELES CO. HMS
NPDES
LA Co. Site Mitigation

RCRA-SQG:

Date form received by agency:	04/15/1999
Facility name:	ITT AEROSPACE CONTROLS
Facility address:	28150 INDUSTRY DR VALENCIA, CA 91355
EPA ID:	CA0000138537
Contact:	JON HILLNER
Contact address:	Not reported Not reported
Contact country:	US
Contact telephone:	(805) 295-4148
Contact email:	Not reported
EPA Region:	09
Classification:	Small Small Quantity Generator
Description:	Handler: generates more than 100 and less than 1000 kg of hazardous waste during any calendar month and accumulates less than 6000 kg of hazardous waste at any time; or generates 100 kg or less of hazardous waste during any calendar month, and accumulates more than 1000 kg of

ITT AEROSPACE CONTROLS (Continued) **1000904860**

hazardous waste at any time

Owner/Operator Summary:
Owner/operator name: NEWHALL LAND AND FARM
Owner/operator address: 23823 VALENCIA BLVD
VALENCIA, CA 91355
Owner/operator country: Not reported
Owner/operator telephone: (805) 255-4000
Legal status: Private
Owner/Operator Type: Owner
Owner/Op start date: Not reported
Owner/Op end date: Not reported

Handler Activities Summary:
U.S. importer of hazardous waste: No
Mixed waste (haz. and radioactive): No
Recycler of hazardous waste: No
Transporter of hazardous waste: No
Treater, storer or disposer of HW: No
Underground injection activity: No
On-site burner exemption: No
Furnace exemption: No
Used oil fuel burner: No
Used oil processor: No
User oil refiner: No
Used oil fuel marketer to burner: No
Used oil Specification marketer: No
Used oil transfer facility: No
Used oil transporter: No

Historical Generators:
Date form received by agency: 09/01/1996
Site name: ITT AEROSPACE CONTROLS
Classification: Small Quantity Generator

Date form received by agency: 07/17/1996
Site name: ITT AEROSPACE CONTROLS
Classification: Large Quantity Generator

Date form received by agency: 05/16/1994
Site name: ITT AEROSPACE CONTROLS
Classification: Large Quantity Generator

Date form received by agency: 05/16/1994
Site name: ITT AEROSPACE CONTROLS
Classification: Large Quantity Generator

Violation Status: No violations found

ENVIROSTOR:
Facility ID: 71003567
Status: Refer: Other Agency
Status Date: Not reported
Site Code: Not reported
Site Type: Tiered Permit
Site Type Detailed: Tiered Permit

ITT AEROSPACE CONTROLS (Continued) **1000904860**

Acres: Not reported
NPL: NO
Regulatory Agencies: NONE SPECIFIED
Lead Agency: NONE SPECIFIED
Program Manager: Not reported
Supervisor: Not reported
Division Branch: Cleanup Chatsworth
Assembly: 38
Senate: 21
Special Program: Not reported
Restricted Use: NO
Site Mgmt Req: NONE SPECIFIED
Funding: Not reported
Latitude: 34.44958
Longitude: -118.6268
APN: NONE SPECIFIED
Past Use: NONE SPECIFIED
Potential COC: NONE SPECIFIED
Confirmed COC: NONE SPECIFIED
Potential Description: NONE SPECIFIED
Alias Name: CA0000138537
Alias Type: EPA Identification Number
Alias Name: 110000886257
Alias Type: EPA (FRS #)
Alias Name: 71003567
Alias Type: Envirostor ID Number

Completed Info:
Completed Area Name: Not reported
Completed Sub Area Name: Not reported
Completed Document Type: Not reported
Completed Date: Not reported
Comments: Not reported

Future Area Name: Not reported
Future Sub Area Name: Not reported
Future Document Type: Not reported
Future Due Date: Not reported
Schedule Area Name: Not reported
Schedule Sub Area Name: Not reported
Schedule Document Type: Not reported
Schedule Due Date: Not reported
Schedule Revised Date: Not reported

AST:
Certified Unified Program Agencies: Not reported
Owner: ITT AEROSPACE CONTROLS
Total Gallons: Not reported
CERSID: 10266580
Facility ID: LACoFA0014510
Business Name: ITT AEROSPACE CONTROLS
Phone: (661) 295-4000
Fax: Not reported
Mailing Address: 28150 INDUSTRY DR
Mailing Address City: VALENCIA
Mailing Address State: CA
Mailing Address Zip Code: 91355

ITT AEROSPACE CONTROLS (Continued) **1000904860**

Operator Name:	Steve Gedalje
Operator Phone:	661-295-4148
Owner Phone:	(661) 295-4000
Owner Mail Address:	28150 INDUSTRY DR
Owner State:	CA
Owner Zip Code:	91355
Owner Country:	United States
Property Owner Name:	Not reported
Property Owner Phone:	Not reported
Property Owner Mailing Address:	Not reported
Property Owner City:	Not reported
Property Owner Stat :	Not reported
Property Owner Zip Code:	Not reported
Property Owner Country:	Not reported
EPAID:	CA0000138837

TRIS:

Click this hyperlink while viewing on your computer to access
1 additional US_TRIS: record(s) in the EDR Site Report.

FINDS:

Registry ID: 110041064111

Environmental Interest/Information System
AIR EMISSIONS CLASSIFICATION UNKNOWN

US EPA TRIS (Toxics Release Inventory System) contains information from facilities on the amounts of over 300 listed toxic chemicals that these facilities release directly to air, water, land, or that are transported off-site.

California Hazardous Waste Tracking System - Datamart (HWTS-DATAMART) provides California with information on hazardous waste shipments for generators, transporters, and treatment, storage, and disposal facilities.

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STATE MASTER

Click this hyperlink while viewing on your computer to access
additional FINDS: detail in the EDR Site Report.

ECHO:

Envid:	1000904860
Registry ID:	110041064111
DFR URL:	http://echo.epa.gov/detailed-facility-report?fid=110041064111

ITT AEROSPACE CONTROLS (Continued) **1000904860**

EMI:

Year:	1997
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC
SIC Code:	3471
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	Not reported
Total Organic Hydrocarbon Gases Tons/Yr:	12
Reactive Organic Gases Tons/Yr:	10
Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

Year:	1998
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC
SIC Code:	3471
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	Not reported
Total Organic Hydrocarbon Gases Tons/Yr:	11
Reactive Organic Gases Tons/Yr:	10
Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

Year:	1999
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC
SIC Code:	3471
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	Not reported
Total Organic Hydrocarbon Gases Tons/Yr:	12
Reactive Organic Gases Tons/Yr:	10
Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

Year:	2000
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC

ITT AEROSPACE CONTROLS (Continued) **1000904860**

SIC Code:	3471
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	Not reported
Total Organic Hydrocarbon Gases Tons/Yr:	12
Reactive Organic Gases Tons/Yr:	10
Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

Year:	2001
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC
SIC Code:	3471
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	B
Total Organic Hydrocarbon Gases Tons/Yr:	13
Reactive Organic Gases Tons/Yr:	10
Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

Year:	2002
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC
SIC Code:	3499
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	Not reported
Total Organic Hydrocarbon Gases Tons/Yr:	3
Reactive Organic Gases Tons/Yr:	3
Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

Year:	2003
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC
SIC Code:	3499
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	Not reported
Total Organic Hydrocarbon Gases Tons/Yr:	3
Reactive Organic Gases Tons/Yr:	3

ITT AEROSPACE CONTROLS (Continued) **1000904860**

Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

Year:	2004
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC
SIC Code:	3499
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	Not reported
Total Organic Hydrocarbon Gases Tons/Yr:	2.79504751
Reactive Organic Gases Tons/Yr:	2.71
Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0.0000114
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

Year:	2005
County Code:	19
Air Basin:	SC
Facility ID:	103617
Air District Name:	SC
SIC Code:	3499
Air District Name:	SOUTH COAST AQMD
Community Health Air Pollution Info System:	Not reported
Consolidated Emission Reporting Rule:	Not reported
Total Organic Hydrocarbon Gases Tons/Yr:	1.75423
Reactive Organic Gases Tons/Yr:	1.711111231
Carbon Monoxide Emissions Tons/Yr:	0
NOX - Oxides of Nitrogen Tons/Yr:	0
SOX - Oxides of Sulphur Tons/Yr:	0
Particulate Matter Tons/Yr:	0
Part. Matter 10 Micrometers and Smllr Tons/Yr:	0

HAZNET:

envid:	1000904860
Year:	2015
GEPAID:	CA0000138537
Contact:	RYAN RIETZEL
Telephone:	6612954146
Mailing Name:	Not reported
Mailing Address:	28150 INDUSTRY DR
Mailing City,St,Zip:	VALENCIA, CA 913554100
Gen County:	Los Angeles
TSD EPA ID:	ARD981057870
TSD County:	99
Waste Category:	Other organic solids
Disposal Method:	Not reported
Tons:	Not reported
Cat Decode:	Other organic solids
Method Decode:	Not reported

ITT AEROSPACE CONTROLS (Continued) **1000904860**

Facility County:	Los Angeles
envid:	1000904860
Year:	2015
GEPAID:	CA0000138537
Contact:	RYAN RIETZEL
Telephone:	6612954146
Mailing Name:	Not reported
Mailing Address:	28150 INDUSTRY DR
Mailing City,St,Zip:	VALENCIA, CA 913554100
Gen County:	Los Angeles
TSD EPA ID:	NVT330010000
TSD County:	99
Waste Category:	Other inorganic solid waste
Disposal Method:	Landfill Or Surface Impoundment That Will Be Closed As Landfill(To Include On-Site Treatment And/Or Stabilization)
Tons:	0.025
Cat Decode:	Other inorganic solid waste
Method Decode:	Landfill Or Surface Impoundment That Will Be Closed As Landfill(To Include On-Site Treatment And/Or Stabilization)
Facility County:	Los Angeles
envid:	1000904860
Year:	2015
GEPAID:	CA0000138537
Contact:	RYAN RIETZEL
Telephone:	6612954146
Mailing Name:	Not reported
Mailing Address:	28150 INDUSTRY DR
Mailing City,St,Zip:	VALENCIA, CA 913554100
Gen County:	Los Angeles
TSD EPA ID:	TND000772186
TSD County:	99
Waste Category:	Off-specification, aged or surplus organics
Disposal Method:	Storage, Bulking, And/Or Transfer Off Site--No Treatment/Reovery (H010-H129) Or (H131-H135)
Tons:	0.412
Cat Decode:	Off-specification, aged or surplus organics
Method Decode:	Storage, Bulking, And/Or Transfer Off Site--No Treatment/Reovery (H010-H129) Or (H131-H135)
Facility County:	Los Angeles
envid:	1000904860
Year:	2015
GEPAID:	CA0000138537
Contact:	RYAN RIETZEL
Telephone:	6612954146
Mailing Name:	Not reported
Mailing Address:	28150 INDUSTRY DR
Mailing City,St,Zip:	VALENCIA, CA 913554100
Gen County:	Los Angeles
TSD EPA ID:	ARD981057870
TSD County:	99
Waste Category:	Other organic solids
Disposal Method:	Fuel Blending Prior To Energy Recovery At Another Site
Tons:	4.88125
Cat Decode:	Other organic solids

ITT AEROSPACE CONTROLS (Continued) **1000904860**

Method Decode: Fuel Blending Prior To Energy Recovery At Another Site
Facility County: Los Angeles

envid: 1000904860
Year: 2015
GEPAID: CA0000138537
Contact: RYAN RIETZEL
Telephone: 6612954146
Mailing Name: Not reported
Mailing Address: 28150 INDUSTRY DR
Mailing City,St,Zip: VALENCIA, CA 913554100
Gen County: Los Angeles
TSD EPA ID: CAT080013352
TSD County: Los Angeles
Waste Category: Waste oil and mixed oil
Disposal Method: Other Recovery Of Reclamation For Reuse Including Acid Regeneration, Organics Recovery Ect
Tons: 73.568
Cat Decode: Waste oil and mixed oil
Method Decode: Other Recovery Of Reclamation For Reuse Including Acid Regeneration, Organics Recovery Ect
Facility County: Los Angeles

Click this hyperlink while viewing on your computer to access
209 additional CA_HAZNET: record(s) in the EDR Site Report.

LOS ANGELES CO. HMS:
Region: LA
Permit Category: I
Facility Id: 016445-021745
Facility Type: 09
Facility Status: Permit
Area: 7
Permit Number: 000098170
Permit Status: Permit

Region: LA
Permit Category: I
Facility Id: 016445-021745
Facility Type: 01
Facility Status: Permit
Area: 7
Permit Number: 000098171
Permit Status: Closed

Region: LA
Permit Category: I
Facility Id: 016445-021745
Facility Type: S4
Facility Status: Permit
Area: 7
Permit Number: 000467725
Permit Status: Permit

Region: LA
Permit Category: S
Facility Id: 016445-043908

ITT AEROSPACE CONTROLS (Continued) **1000904860**

Facility Type: S6
Facility Status: Permit
Area: 7
Permit Number: CGI014586
Permit Status: Permit

NPDES:

Npdes Number:	CAS000001
Facility Status:	Active
Agency Id:	0
Region:	4
Regulatory Measure Id:	190722
Order No:	97-03-DWQ
Regulatory Measure Type:	Enrollee
Place Id:	Not reported
WDID:	4 19I014586
Program Type:	Industrial
Adoption Date Of Regulatory Measure:	Not reported
Effective Date Of Regulatory Measure:	09/16/1998
Expiration Date Of Regulatory Measure:	Not reported
Termination Date Of Regulatory Measure:	Not reported
Discharge Name:	ITT Aerospace Controls
Discharge Address:	28150 Industry Dr
Discharge City:	Valencia
Discharge State:	California
Discharge Zip:	91355
RECEIVED DATE:	Not reported
PROCESSED DATE:	Not reported
STATUS CODE NAME:	Not reported
STATUS DATE:	Not reported
PLACE SIZE:	Not reported
PLACE SIZE UNIT:	Not reported
FACILITY CONTACT NAME:	Not reported
FACILITY CONTACT TITLE:	Not reported
FACILITY CONTACT PHONE:	Not reported
FACILITY CONTACT PHONE EXT:	Not reported
FACILITY CONTACT EMAIL:	Not reported
OPERATOR NAME:	Not reported
OPERATOR ADDRESS:	Not reported
OPERATOR CITY:	Not reported
OPERATOR STATE:	Not reported
OPERATOR ZIP:	Not reported
OPERATOR CONTACT NAME:	Not reported
OPERATOR CONTACT TITLE:	Not reported
OPERATOR CONTACT PHONE:	Not reported
OPERATOR CONTACT PHONE EXT:	Not reported
OPERATOR CONTACT EMAIL:	Not reported
OPERATOR TYPE:	Not reported
DEVELOPER NAME:	Not reported
DEVELOPER ADDRESS:	Not reported
DEVELOPER CITY:	Not reported
DEVELOPER STATE:	Not reported
DEVELOPER ZIP:	Not reported
DEVELOPER CONTACT NAME:	Not reported
DEVELOPER CONTACT TITLE:	Not reported
CONSTYPE LINEAR UTILITY IND:	Not reported
EMERGENCY PHONE NO:	Not reported

ITT AEROSPACE CONTROLS (Continued) **1000904860**

EMERGENCY PHONE EXT:	Not reported
CONSTYPE ABOVE GROUND IND:	Not reported
CONSTYPE BELOW GROUND IND:	Not reported
CONSTYPE CABLE LINE IND:	Not reported
CONSTYPE COMM LINE IND:	Not reported
CONSTYPE COMMERTIAL IND:	Not reported
CONSTYPE ELECTRICAL LINE IND:	Not reported
CONSTYPE GAS LINE IND:	Not reported
CONSTYPE INDUSTRIAL IND:	Not reported
CONSTYPE OTHER DESRIPTION:	Not reported
CONSTYPE OTHER IND:	Not reported
CONSTYPE RECONS IND:	Not reported
CONSTYPE RESIDENTIAL IND:	Not reported
CONSTYPE TRANSPORT IND:	Not reported
CONSTYPE UTILITY DESCRIPTION:	Not reported
CONSTYPE UTILITY IND:	Not reported
CONSTYPE WATER SEWER IND:	Not reported
DIR DISCHARGE USWATER IND:	Not reported
RECEIVING WATER NAME:	Not reported
CERTIFIER NAME:	Not reported
CERTIFIER TITLE:	Not reported
CERTIFICATION DATE:	Not reported
PRIMARY SIC:	Not reported
SECONDARY SIC:	Not reported
TERTIARY SIC:	Not reported
Npdes Number:	Not reported
Facility Status:	Not reported
Agency Id:	Not reported
Region:	4
Regulatory Measure Id:	190722
Order No:	Not reported
Regulatory Measure Type:	Industrial
Place Id:	Not reported
WDID:	4 19I014586
Program Type:	Not reported
Adoption Date Of Regulatory Measure:	Not reported
Effective Date Of Regulatory Measure:	Not reported
Expiration Date Of Regulatory Measure:	Not reported
Termination Date Of Regulatory Measure:	Not reported
Discharge Name:	Not reported
Discharge Address:	Not reported
Discharge City:	Not reported
Discharge State:	Not reported
Discharge Zip:	Not reported
RECEIVED DATE:	5/9/2008
PROCESSED DATE:	9/16/1998
STATUS CODE NAME:	Active
STATUS DATE:	9/16/1998
PLACE SIZE:	250000
PLACE SIZE UNIT:	SqFt
FACILITY CONTACT NAME:	Ryan Rietzel
FACILITY CONTACT TITLE:	ESH Manager
FACILITY CONTACT PHONE:	661-295-4146
FACILITY CONTACT PHONE EXT:	Not reported
FACILITY CONTACT EMAIL:	ryan.rietzel@itt.com
OPERATOR NAME:	ITT Aerospace Controls

ITT AEROSPACE CONTROLS (Continued) **1000904860**

OPERATOR ADDRESS:	28150 Industry Dr
OPERATOR CITY:	Valencia
OPERATOR STATE:	California
OPERATOR ZIP:	91355
OPERATOR CONTACT NAME:	Ryan Rietzel
OPERATOR CONTACT TITLE:	ESH Manager
OPERATOR CONTACT PHONE:	661-295-4146
OPERATOR CONTACT PHONE EXT:	Not reported
OPERATOR CONTACT EMAIL:	ryan.rietzel@itt.com
OPERATOR TYPE:	Private Business
DEVELOPER NAME:	Not reported
DEVELOPER ADDRESS:	Not reported
DEVELOPER CITY:	Not reported
DEVELOPER STATE:	California
DEVELOPER ZIP:	Not reported
DEVELOPER CONTACT NAME:	Not reported
DEVELOPER CONTACT TITLE:	Not reported
CONSTYPE LINEAR UTILITY IND:	Not reported
EMERGENCY PHONE NO:	661-295-4000
EMERGENCY PHONE EXT:	Not reported
CONSTYPE ABOVE GROUND IND:	Not reported
CONSTYPE BELOW GROUND IND:	Not reported
CONSTYPE CABLE LINE IND:	Not reported
CONSTYPE COMM LINE IND:	Not reported
CONSTYPE COMMERTIAL IND:	Not reported
CONSTYPE ELECTRICAL LINE IND:	Not reported
CONSTYPE GAS LINE IND:	Not reported
CONSTYPE INDUSTRIAL IND:	Not reported
CONSTYPE OTHER DESRIPTION:	Not reported
CONSTYPE OTHER IND:	Not reported
CONSTYPE RECONS IND:	Not reported
CONSTYPE RESIDENTIAL IND:	Not reported
CONSTYPE TRANSPORT IND:	Not reported
CONSTYPE UTILITY DESCRIPTION:	Not reported
CONSTYPE UTILITY IND:	Not reported
CONSTYPE WATER SEWER IND:	Not reported
DIR DISCHARGE USWATER IND:	N
RECEIVING WATER NAME:	Santa Clara River
CERTIFIER NAME:	Steve Gedalje
CERTIFIER TITLE:	Director
CERTIFICATION DATE:	10-JUN-15
PRIMARY SIC:	3728-Aircraft Parts and Auxiliary Equipment, NEC
SECONDARY SIC:	Not reported
TERTIARY SIC:	Not reported

LA Co. Site Mitigation:

Facility ID:	Not reported
Site ID:	SD0000415
Jurisdiction:	State
Case ID:	RO0001416
Abated:	Yes
Assigned To:	Kim Clark
Entered Date:	10/11/2011
Abated Date:	Not reported

Count: 1 records. ORPHAN SUMMARY

City	EDR ID	Site Name	Site Address	Zip	Database(s)
LOS ANGELES CO.	S103878697	UNOCAL - DEL VALLE	DEL VALLE	91384	SLIC

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

To maintain currency of the following federal and state databases, EDR contacts the appropriate governmental agency on a monthly or quarterly basis, as required.

Number of Days to Update: Provides confirmation that EDR is reporting records that have been updated within 90 days from the date the government agency made the information available to the public.

STANDARD ENVIRONMENTAL RECORDS

Federal NPL site list

NPL: National Priority List

National Priorities List (Superfund). The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. NPL sites may encompass relatively large areas. As such, EDR provides polygon coverage for over 1,000 NPL site boundaries produced by EPA's Environmental Photographic Interpretation Center (EPIC) and regional EPA offices.

Date of Government Version: 04/05/2017
Date Data Arrived at EDR: 04/21/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 21

Source: EPA
Telephone: N/A
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

NPL Site Boundaries

Sources:

EPA's Environmental Photographic Interpretation Center (EPIC)
Telephone: 202-564-7333

EPA Region 1
Telephone 617-918-1143

EPA Region 6
Telephone: 214-655-6659

EPA Region 3
Telephone 215-814-5418

EPA Region 7
Telephone: 913-551-7247

EPA Region 4
Telephone 404-562-8033

EPA Region 8
Telephone: 303-312-6774

EPA Region 5
Telephone 312-886-6686

EPA Region 9
Telephone: 415-947-4246

EPA Region 10
Telephone 206-553-8665

Proposed NPL: Proposed National Priority List Sites

A site that has been proposed for listing on the National Priorities List through the issuance of a proposed rule in the Federal Register. EPA then accepts public comments on the site, responds to the comments, and places on the NPL those sites that continue to meet the requirements for listing.

Date of Government Version: 04/05/2017
Date Data Arrived at EDR: 04/21/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 21

Source: EPA
Telephone: N/A
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

NPL LIENS: Federal Superfund Liens

Federal Superfund Liens. Under the authority granted the USEPA by CERCLA of 1980, the USEPA has the authority to file liens against real property in order to recover remedial action expenditures or when the property owner received notification of potential liability. USEPA compiles a listing of filed notices of Superfund Liens.

Date of Government Version: 10/15/1991
Date Data Arrived at EDR: 02/02/1994
Date Made Active in Reports: 03/30/1994
Number of Days to Update: 56

Source: EPA
Telephone: 202-564-4267
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Federal Delisted NPL site list

Delisted NPL: National Priority List Deletions

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425.(e), sites may be deleted from the NPL where no further response is appropriate.

Date of Government Version: 04/05/2017
Date Data Arrived at EDR: 04/21/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 21

Source: EPA
Telephone: N/A
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

Federal CERCLIS list

FEDERAL FACILITY: Federal Facility Site Information listing

A listing of National Priority List (NPL) and Base Realignment and Closure (BRAC) sites found in the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Database where EPA Federal Facilities Restoration and Reuse Office is involved in cleanup activities.

Date of Government Version: 11/07/2016
Date Data Arrived at EDR: 01/05/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 92

Source: Environmental Protection Agency
Telephone: 703-603-8704
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Varies

SEMS: Superfund Enterprise Management System

SEMS (Superfund Enterprise Management System) tracks hazardous waste sites, potentially hazardous waste sites, and remedial activities performed in support of EPA's Superfund Program across the United States. The list was formerly know as CERCLIS, renamed to SEMS by the EPA in 2015. The list contains data on potentially hazardous waste sites that have been reported to the USEPA by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This dataset also contains sites which are either proposed to or on the National Priorities List (NPL) and the sites which are in the screening and assessment phase for possible inclusion on the NPL.

Date of Government Version: 02/07/2017
Date Data Arrived at EDR: 04/19/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 16

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Quarterly

Federal CERCLIS NFRAP site list

SEMS-ARCHIVE: Superfund Enterprise Management System Archive

SEMS-ARCHIVE (Superfund Enterprise Management System Archive) tracks sites that have no further interest under the Federal Superfund Program based on available information. The list was formerly known as the CERCLIS-NFRAP, renamed to SEMS ARCHIVE by the EPA in 2015. EPA may perform a minimal level of assessment work at a site while it is archived if site conditions change and/or new information becomes available. Archived sites have been removed and archived from the inventory of SEMS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list the site on the National Priorities List (NPL), unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. The decision does not necessarily mean that there is no hazard associated with a given site; it only means that. based upon available information, the location is not judged to be potential NPL site.

Date of Government Version: 02/07/2017
Date Data Arrived at EDR: 04/19/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 16

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Quarterly

Federal RCRA CORRACTS facilities list

CORRACTS: Corrective Action Report

CORRACTS identifies hazardous waste handlers with RCRA corrective action activity.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: EPA
Telephone: 800-424-9346
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

Federal RCRA non-CORRACTS TSD facilities list

RCRA-TSDF: RCRA - Treatment, Storage and Disposal

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Transporters are individuals or entities that move hazardous waste from the generator offsite to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

Federal RCRA generators list

RCRA-LQG: RCRA - Large Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

RCRA-SQG: RCRA - Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

RCRA-CESQG: RCRA - Conditionally Exempt Small Quantity Generators

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kg of hazardous waste, or less than 1 kg of acutely hazardous waste per month.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Varies

Federal institutional controls / engineering controls registries

LUCIS: Land Use Control Information System

LUCIS contains records of land use control information pertaining to the former Navy Base Realignment and Closure properties.

Date of Government Version: 12/28/2016
Date Data Arrived at EDR: 01/04/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 93

Source: Department of the Navy
Telephone: 843-820-7326
Last EDR Contact: 08/10/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: Varies

US ENG CONTROLS: Engineering Controls Sites List

A listing of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health.

Date of Government Version: 02/13/2017
Date Data Arrived at EDR: 02/28/2017
Date Made Active in Reports: 06/09/2017
Number of Days to Update: 101

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

US INST CONTROL: Sites with Institutional Controls

A listing of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls.

Date of Government Version: 02/13/2017
Date Data Arrived at EDR: 02/28/2017
Date Made Active in Reports: 06/09/2017
Number of Days to Update: 101

Source: Environmental Protection Agency
Telephone: 703-603-0695
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

Federal ERNS list

ERNS: Emergency Response Notification System

Emergency Response Notification System. ERNS records and stores information on reported releases of oil and hazardous substances.

Date of Government Version: 09/26/2016
Date Data Arrived at EDR: 09/29/2016
Date Made Active in Reports: 11/11/2016
Number of Days to Update: 43

Source: National Response Center, United States Coast Guard
Telephone: 202-267-2180
Last EDR Contact: 06/28/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Annually

State- and tribal - equivalent NPL

RESPONSE: State Response Sites

Identifies confirmed release sites where DTSC is involved in remediation, either in a lead or oversight capacity. These confirmed release sites are generally high-priority and high potential risk.

Date of Government Version: 07/31/2017
Date Data Arrived at EDR: 08/01/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 14

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Quarterly

State- and tribal - equivalent CERCLIS

ENVIROSTOR: EnviroStor Database

The Department of Toxic Substances Control's (DTSC's) Site Mitigation and Brownfields Reuse Program's (SMBRP's) EnviroStor database identifes sites that have known contamination or sites for which there may be reasons to investigate further. The database includes the following site types: Federal Superfund sites (National Priorities List (NPL)); State Response, including Military Facilities and State Superfund; Voluntary Cleanup; and School sites. EnviroStor provides similar information to the information that was available in CalSites, and provides additional site information, including, but not limited to, identification of formerly-contaminated properties that have been released for reuse, properties where environmental deed restrictions have been recorded to prevent inappropriate land uses, and risk characterization information that is used to assess potential impacts to public health and the environment at contaminated sites.

Date of Government Version: 07/31/2017
Date Data Arrived at EDR: 08/01/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 14

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Quarterly

State and tribal landfill and/or solid waste disposal site lists

SWF/LF (SWIS): Solid Waste Information System

Active, Closed and Inactive Landfills. SWF/LF records typically contain an inve ntory of solid waste disposal facilities or landfills. These may be active or i nactive facilities or open dumps that failed to meet RCRA Section 4004 criteria for solid waste landfills or disposal sites.

Date of Government Version: 02/13/2017
Date Data Arrived at EDR: 02/15/2017
Date Made Active in Reports: 05/02/2017
Number of Days to Update: 76

Source: Department of Resources Recycling and Recovery
Telephone: 916-341-6320
Last EDR Contact: 08/17/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: Quarterly

State and tribal leaking storage tank lists

LUST REG 7: Leaking Underground Storage Tank Case Listing
Leaking Underground Storage Tank locations. Imperial, Riverside, San Diego, Santa Barbara counties.

Date of Government Version: 02/26/2004
Date Data Arrived at EDR: 02/26/2004
Date Made Active in Reports: 03/24/2004
Number of Days to Update: 27

Source: California Regional Water Quality Control Board Colorado River Basin Region (7)
Telephone: 760-776-8943
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

LUST: Leaking Underground Fuel Tank Report (GEOTRACKER)
Leaking Underground Storage Tank (LUST) Sites included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

Date of Government Version: 06/12/2017
Date Data Arrived at EDR: 06/14/2017
Date Made Active in Reports: 08/22/2017
Number of Days to Update: 69

Source: State Water Resources Control Board
Telephone: see region list
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

LUST REG 9: Leaking Underground Storage Tank Report
Orange, Riverside, San Diego counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 03/01/2001
Date Data Arrived at EDR: 04/23/2001
Date Made Active in Reports: 05/21/2001
Number of Days to Update: 28

Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-637-5595
Last EDR Contact: 09/26/2011
Next Scheduled EDR Contact: 01/09/2012
Data Release Frequency: No Update Planned

LUST REG 8: Leaking Underground Storage Tanks
California Regional Water Quality Control Board Santa Ana Region (8). For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/14/2005
Date Data Arrived at EDR: 02/15/2005
Date Made Active in Reports: 03/28/2005
Number of Days to Update: 41

Source: California Regional Water Quality Control Board Santa Ana Region (8)
Telephone: 909-782-4496
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: Varies

LUST REG 6V: Leaking Underground Storage Tank Case Listing
Leaking Underground Storage Tank locations. Inyo, Kern, Los Angeles, Mono, San Bernardino counties.

Date of Government Version: 06/07/2005
Date Data Arrived at EDR: 06/07/2005
Date Made Active in Reports: 06/29/2005
Number of Days to Update: 22

Source: California Regional Water Quality Control Board Victorville Branch Office (6)
Telephone: 760-241-7365
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: No Update Planned

LUST REG 6L: Leaking Underground Storage Tank Case Listing
For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/09/2003
Date Data Arrived at EDR: 09/10/2003
Date Made Active in Reports: 10/07/2003
Number of Days to Update: 27

Source: California Regional Water Quality Control Board Lahontan Region (6)
Telephone: 530-542-5572
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: No Update Planned

LUST REG 5: Leaking Underground Storage Tank Database
Leaking Underground Storage Tank locations. Alameda, Alpine, Amador, Butte, Colusa, Contra Costa, Calveras, El Dorado, Fresno, Glenn, Kern, Kings, Lake, Lassen, Madera, Mariposa, Merced, Modoc, Napa, Nevada, Placer, Plumas, Sacramento, San Joaquin, Shasta, Solano, Stanislaus, Sutter, Tehama, Tulare, Tuolumne, Yolo, Yuba counties.

Date of Government Version: 07/01/2008
Date Data Arrived at EDR: 07/22/2008
Date Made Active in Reports: 07/31/2008
Number of Days to Update: 9

Source: California Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-4834
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: No Update Planned

LUST REG 4: Underground Storage Tank Leak List

Los Angeles, Ventura counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 09/07/2004
Date Data Arrived at EDR: 09/07/2004
Date Made Active in Reports: 10/12/2004
Number of Days to Update: 35

Source: California Regional Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6710
Last EDR Contact: 09/06/2011
Next Scheduled EDR Contact: 12/19/2011
Data Release Frequency: No Update Planned

LUST REG 3: Leaking Underground Storage Tank Database

Leaking Underground Storage Tank locations. Monterey, San Benito, San Luis Obispo, Santa Barbara, Santa Cruz counties.

Date of Government Version: 05/19/2003
Date Data Arrived at EDR: 05/19/2003
Date Made Active in Reports: 06/02/2003
Number of Days to Update: 14

Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-542-4786
Last EDR Contact: 07/18/2011
Next Scheduled EDR Contact: 10/31/2011
Data Release Frequency: No Update Planned

LUST REG 2: Fuel Leak List

Leaking Underground Storage Tank locations. Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma counties.

Date of Government Version: 09/30/2004
Date Data Arrived at EDR: 10/20/2004
Date Made Active in Reports: 11/19/2004
Number of Days to Update: 30

Source: California Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-622-2433
Last EDR Contact: 09/19/2011
Next Scheduled EDR Contact: 01/02/2012
Data Release Frequency: Quarterly

LUST REG 1: Active Toxic Site Investigation

Del Norte, Humboldt, Lake, Mendocino, Modoc, Siskiyou, Sonoma, Trinity counties. For more current information, please refer to the State Water Resources Control Board's LUST database.

Date of Government Version: 02/01/2001
Date Data Arrived at EDR: 02/28/2001
Date Made Active in Reports: 03/29/2001
Number of Days to Update: 29

Source: California Regional Water Quality Control Board North Coast (1)
Telephone: 707-570-3769
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

INDIAN LUST R6: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in New Mexico and Oklahoma.

Date of Government Version: 10/01/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 6
Telephone: 214-665-6597
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN LUST R4: Leaking Underground Storage Tanks on Indian Land

LUSTs on Indian land in Florida, Mississippi and North Carolina.

Date of Government Version: 10/14/2016
Date Data Arrived at EDR: 01/27/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 98

Source: EPA Region 4
Telephone: 404-562-8677
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Semi-Annually

INDIAN LUST R7: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Iowa, Kansas, and Nebraska

Date of Government Version: 09/01/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN LUST R5: Leaking Underground Storage Tanks on Indian Land
Leaking underground storage tanks located on Indian Land in Michigan, Minnesota and Wisconsin.

Date of Government Version: 11/14/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA, Region 5
Telephone: 312-886-7439
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN LUST R8: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Colorado, Montana, North Dakota, South Dakota, Utah and Wyoming.

Date of Government Version: 10/17/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA Region 8
Telephone: 303-312-6271
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN LUST R9: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Arizona, California, New Mexico and Nevada

Date of Government Version: 10/06/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: Environmental Protection Agency
Telephone: 415-972-3372
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN LUST R10: Leaking Underground Storage Tanks on Indian Land
LUSTs on Indian land in Alaska, Idaho, Oregon and Washington.

Date of Government Version: 10/07/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN LUST R1: Leaking Underground Storage Tanks on Indian Land
A listing of leaking underground storage tank locations on Indian Land.

Date of Government Version: 11/14/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA Region 1
Telephone: 617-918-1313
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

SLIC: Statewide SLIC Cases (GEOTRACKER)
Cleanup Program Sites (CPS; also known as Site Cleanups [SC] and formerly known as Spills, Leaks, Investigations, and Cleanups [SLIC] sites) included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

Date of Government Version: 06/12/2017
Date Data Arrived at EDR: 06/14/2017
Date Made Active in Reports: 08/23/2017
Number of Days to Update: 70
Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Varies

SLIC REG 1: Active Toxic Site Investigations
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/03/2003
Date Data Arrived at EDR: 04/07/2003
Date Made Active in Reports: 04/25/2003
Number of Days to Update: 18

Source: California Regional Water Quality Control Board, North Coast Region (1)
Telephone: 707-576-2220
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

SLIC REG 2: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/30/2004
Date Data Arrived at EDR: 10/20/2004
Date Made Active in Reports: 11/19/2004
Number of Days to Update: 30

Source: Regional Water Quality Control Board San Francisco Bay Region (2)
Telephone: 510-286-0457
Last EDR Contact: 09/19/2011
Next Scheduled EDR Contact: 01/02/2012
Data Release Frequency: Quarterly

SLIC REG 3: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 05/18/2006
Date Data Arrived at EDR: 05/18/2006
Date Made Active in Reports: 06/15/2006
Number of Days to Update: 28

Source: California Regional Water Quality Control Board Central Coast Region (3)
Telephone: 805-549-3147
Last EDR Contact: 07/18/2011
Next Scheduled EDR Contact: 10/31/2011
Data Release Frequency: Semi-Annually

SLIC REG 4: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 11/17/2004
Date Data Arrived at EDR: 11/18/2004
Date Made Active in Reports: 01/04/2005
Number of Days to Update: 47

Source: Region Water Quality Control Board Los Angeles Region (4)
Telephone: 213-576-6600
Last EDR Contact: 07/01/2011
Next Scheduled EDR Contact: 10/17/2011
Data Release Frequency: Varies

SLIC REG 5: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/01/2005
Date Data Arrived at EDR: 04/05/2005
Date Made Active in Reports: 04/21/2005
Number of Days to Update: 16

Source: Regional Water Quality Control Board Central Valley Region (5)
Telephone: 916-464-3291
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: Semi-Annually

SLIC REG 6V: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 05/24/2005
Date Data Arrived at EDR: 05/25/2005
Date Made Active in Reports: 06/16/2005
Number of Days to Update: 22

Source: Regional Water Quality Control Board, Victorville Branch
Telephone: 619-241-6583
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: Semi-Annually

SLIC REG 6L: SLIC Sites
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/07/2004
Date Data Arrived at EDR: 09/07/2004
Date Made Active in Reports: 10/12/2004
Number of Days to Update: 35
Source: California Regional Water Quality Control Board, Lahontan Region
Telephone: 530-542-5574
Last EDR Contact: 08/15/2011
Next Scheduled EDR Contact: 11/28/2011
Data Release Frequency: No Update Planned

SLIC REG 7: SLIC List
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 11/24/2004
Date Data Arrived at EDR: 11/29/2004
Date Made Active in Reports: 01/04/2005
Number of Days to Update: 36
Source: California Regional Quality Control Board, Colorado River Basin Region
Telephone: 760-346-7491
Last EDR Contact: 08/01/2011
Next Scheduled EDR Contact: 11/14/2011
Data Release Frequency: No Update Planned

SLIC REG 8: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 04/03/2008
Date Data Arrived at EDR: 04/03/2008
Date Made Active in Reports: 04/14/2008
Number of Days to Update: 11
Source: California Region Water Quality Control Board Santa Ana Region (8)
Telephone: 951-782-3298
Last EDR Contact: 09/12/2011
Next Scheduled EDR Contact: 12/26/2011
Data Release Frequency: Semi-Annually

SLIC REG 9: Spills, Leaks, Investigation & Cleanup Cost Recovery Listing
The SLIC (Spills, Leaks, Investigations and Cleanup) program is designed to protect and restore water quality from spills, leaks, and similar discharges.

Date of Government Version: 09/10/2007
Date Data Arrived at EDR: 09/11/2007
Date Made Active in Reports: 09/28/2007
Number of Days to Update: 17
Source: California Regional Water Quality Control Board San Diego Region (9)
Telephone: 858-467-2980
Last EDR Contact: 08/08/2011
Next Scheduled EDR Contact: 11/21/2011
Data Release Frequency: Annually

State and tribal registered storage tank lists

FEMA UST: Underground Storage Tank Listing
A listing of all FEMA owned underground storage tanks.

Date of Government Version: 01/01/2010
Date Data Arrived at EDR: 02/16/2010
Date Made Active in Reports: 04/12/2010
Number of Days to Update: 55
Source: FEMA
Telephone: 202-646-5797
Last EDR Contact: 07/14/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Varies

UST: Active UST Facilities
Active UST facilities gathered from the local regulatory agencies

Date of Government Version: 06/12/2017
Date Data Arrived at EDR: 06/14/2017
Date Made Active in Reports: 08/23/2017
Number of Days to Update: 70
Source: SWRCB
Telephone: 916-341-5851
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Semi-Annually

AST: Aboveground Petroleum Storage Tank Facilities
A listing of aboveground storage tank petroleum storage tank locations.

Date of Government Version: 07/06/2016
Date Data Arrived at EDR: 07/12/2016
Date Made Active in Reports: 09/19/2016
Number of Days to Update: 69
Source: California Environmental Protection Agency
Telephone: 916-327-5092
Last EDR Contact: 06/21/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

INDIAN UST R5: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 5 (Michigan, Minnesota and Wisconsin and Tribal Nations).

Date of Government Version: 01/14/2017
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA Region 5
Telephone: 312-886-6136
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN UST R7: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 7 (Iowa, Kansas, Missouri, Nebraska, and 9 Tribal Nations).

Date of Government Version: 09/01/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA Region 7
Telephone: 913-551-7003
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN UST R4: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee and Tribal Nations)

Date of Government Version: 10/14/2016
Date Data Arrived at EDR: 01/27/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 98
Source: EPA Region 4
Telephone: 404-562-9424
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Semi-Annually

INDIAN UST R1: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont and ten Tribal Nations).

Date of Government Version: 11/14/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA, Region 1
Telephone: 617-918-1313
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INDIAN UST R10: Underground Storage Tanks on Indian Land
The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 10 (Alaska, Idaho, Oregon, Washington, and Tribal Nations).

Date of Government Version: 10/07/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99
Source: EPA Region 10
Telephone: 206-553-2857
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN UST R9: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 9 (Arizona, California, Hawaii, Nevada, the Pacific Islands, and Tribal Nations).

Date of Government Version: 10/06/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 9
Telephone: 415-972-3368
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN UST R8: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 8 (Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming and 27 Tribal Nations).

Date of Government Version: 10/17/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 8
Telephone: 303-312-6137
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

INDIAN UST R6: Underground Storage Tanks on Indian Land

The Indian Underground Storage Tank (UST) database provides information about underground storage tanks on Indian land in EPA Region 6 (Louisiana, Arkansas, Oklahoma, New Mexico, Texas and 65 Tribes).

Date of Government Version: 10/01/2016
Date Data Arrived at EDR: 01/26/2017
Date Made Active in Reports: 05/05/2017
Number of Days to Update: 99

Source: EPA Region 6
Telephone: 214-665-7591
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Semi-Annually

State and tribal voluntary cleanup sites

INDIAN VCP R1: Voluntary Cleanup Priority Listing

A listing of voluntary cleanup priority sites located on Indian Land located in Region 1.

Date of Government Version: 07/27/2015
Date Data Arrived at EDR: 09/29/2015
Date Made Active in Reports: 02/18/2016
Number of Days to Update: 142

Source: EPA, Region 1
Telephone: 617-918-1102
Last EDR Contact: 06/27/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Varies

INDIAN VCP R7: Voluntary Cleanup Priority Lisitng

A listing of voluntary cleanup priority sites located on Indian Land located in Region 7.

Date of Government Version: 03/20/2008
Date Data Arrived at EDR: 04/22/2008
Date Made Active in Reports: 05/19/2008
Number of Days to Update: 27

Source: EPA, Region 7
Telephone: 913-551-7365
Last EDR Contact: 04/20/2009
Next Scheduled EDR Contact: 07/20/2009
Data Release Frequency: Varies

VCP: Voluntary Cleanup Program Properties

Contains low threat level properties with either confirmed or unconfirmed releases and the project proponents have request that DTSC oversee investigation and/or cleanup activities and have agreed to provide coverage for DTSC's costs.

Date of Government Version: 07/31/2017
Date Data Arrived at EDR: 08/01/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 14

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Quarterly

State and tribal Brownfields sites

BROWNFIELDS: Considered Brownfieds Sites Listing
A listing of sites the SWRCB considers to be Brownfields since these are sites have come to them through the MOA Process.

Date of Government Version: 01/03/2017
Date Data Arrived at EDR: 01/04/2017
Date Made Active in Reports: 03/02/2017
Number of Days to Update: 57
Source: State Water Resources Control Board
Telephone: 916-323-7905
Last EDR Contact: 06/28/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Varies

ADDITIONAL ENVIRONMENTAL RECORDS

Local Brownfield lists

US BROWNFIELDS: A Listing of Brownfields Sites
Brownfields are real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Cleaning up and reinvesting in these properties takes development pressures off of undeveloped, open land, and both improves and protects the environment. Assessment, Cleanup and Redevelopment Exchange System (ACRES) stores information reported by EPA Brownfields grant recipients on brownfields properties assessed or cleaned up with grant funding as well as information on Targeted Brownfields Assessments performed by EPA Regions. A listing of ACRES Brownfield sites is obtained from Cleanups in My Community. Cleanups in My Community provides information on Brownfields properties for which information is reported back to EPA, as well as areas served by Brownfields grant programs.

Date of Government Version: 03/02/2017
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 36
Source: Environmental Protection Agency
Telephone: 202-566-2777
Last EDR Contact: 06/20/2017
Next Scheduled EDR Contact: 10/02/2017
Data Release Frequency: Semi-Annually

Local Lists of Landfill / Solid Waste Disposal Sites

WMUDS/SWAT: Waste Management Unit Database
Waste Management Unit Database System. WMUDS is used by the State Water Resources Control Board staff and the Regional Water Quality Control Boards for program tracking and inventory of waste management units. WMUDS is composed of the following databases: Facility Information, Scheduled Inspections Information, Waste Management Unit Information, SWAT Program Information, SWAT Report Summary Information, SWAT Report Summary Data, Chapter 15 (formerly Subchapter 15) Information, Chapter 15 Monitoring Parameters, TPCA Program Information, RCRA Program Information, Closure Information, and Interested Parties Information.

Date of Government Version: 04/01/2000
Date Data Arrived at EDR: 04/10/2000
Date Made Active in Reports: 05/10/2000
Number of Days to Update: 30
Source: State Water Resources Control Board
Telephone: 916-227-4448
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: No Update Planned

SWRCY: Recycler Database
A listing of recycling facilities in California.

Date of Government Version: 03/13/2017
Date Data Arrived at EDR: 03/14/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 50
Source: Department of Conservation
Telephone: 916-323-3836
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

HAULERS: Registered Waste Tire Haulers Listing
A listing of registered waste tire haulers.

Date of Government Version: 05/30/2017
Date Data Arrived at EDR: 05/31/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 76

Source: Integrated Waste Management Board
Telephone: 916-341-6422
Last EDR Contact: 08/10/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: Varies

INDIAN ODI: Report on the Status of Open Dumps on Indian Lands

Location of open dumps on Indian land.

Date of Government Version: 12/31/1998
Date Data Arrived at EDR: 12/03/2007
Date Made Active in Reports: 01/24/2008
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 703-308-8245
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

DEBRIS REGION 9: Torres Martinez Reservation Illegal Dump Site Locations

A listing of illegal dump sites location on the Torres Martinez Indian Reservation located in eastern Riverside County and northern Imperial County, California.

Date of Government Version: 01/12/2009
Date Data Arrived at EDR: 05/07/2009
Date Made Active in Reports: 09/21/2009
Number of Days to Update: 137

Source: EPA, Region 9
Telephone: 415-947-4219
Last EDR Contact: 07/24/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: No Update Planned

ODI: Open Dump Inventory

An open dump is defined as a disposal facility that does not comply with one or more of the Part 257 or Part 258 Subtitle D Criteria.

Date of Government Version: 06/30/1985
Date Data Arrived at EDR: 08/09/2004
Date Made Active in Reports: 09/17/2004
Number of Days to Update: 39

Source: Environmental Protection Agency
Telephone: 800-424-9346
Last EDR Contact: 06/09/2004
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

IHS OPEN DUMPS: Open Dumps on Indian Land

A listing of all open dumps located on Indian Land in the United States.

Date of Government Version: 04/01/2014
Date Data Arrived at EDR: 08/06/2014
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 176

Source: Department of Health & Human Serivces, Indian Health Service
Telephone: 301-443-1452
Last EDR Contact: 08/29/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

Local Lists of Hazardous waste / Contaminated Sites

US HIST CDL: National Clandestine Laboratory Register

A listing of clandestine drug lab locations that have been removed from the DEAs National Clandestine Laboratory Register.

Date of Government Version: 02/09/2017
Date Data Arrived at EDR: 03/08/2017
Date Made Active in Reports: 06/09/2017
Number of Days to Update: 93

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: No Update Planned

HIST CAL-SITES: Calsites Database

The Calsites database contains potential or confirmed hazardous substance release properties. In 1996, California EPA reevaluated and significantly reduced the number of sites in the Calsites database. No longer updated by the state agency. It has been replaced by ENVIROSTOR.

Date of Government Version: 08/08/2005
Date Data Arrived at EDR: 08/03/2006
Date Made Active in Reports: 08/24/2006
Number of Days to Update: 21

Source: Department of Toxic Substance Control
Telephone: 916-323-3400
Last EDR Contact: 02/23/2009
Next Scheduled EDR Contact: 05/25/2009
Data Release Frequency: No Update Planned

SCH: School Property Evaluation Program

This category contains proposed and existing school sites that are being evaluated by DTSC for possible hazardous materials contamination. In some cases, these properties may be listed in the CalSites category depending on the level of threat to public health and safety or the environment they pose.

Date of Government Version: 07/31/2017
Date Data Arrived at EDR: 08/01/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 14

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Quarterly

CDL: Clandestine Drug Labs

A listing of drug lab locations. Listing of a location in this database does not indicate that any illegal drug lab materials were or were not present there, and does not constitute a determination that the location either requires or does not require additional cleanup work.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 05/10/2017
Number of Days to Update: 54

Source: Department of Toxic Substances Control
Telephone: 916-255-6504
Last EDR Contact: 08/14/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Varies

TOXIC PITS: Toxic Pits Cleanup Act Sites

Toxic PITS Cleanup Act Sites. TOXIC PITS identifies sites suspected of containing hazardous substances where cleanup has not yet been completed.

Date of Government Version: 07/01/1995
Date Data Arrived at EDR: 08/30/1995
Date Made Active in Reports: 09/26/1995
Number of Days to Update: 27

Source: State Water Resources Control Board
Telephone: 916-227-4364
Last EDR Contact: 01/26/2009
Next Scheduled EDR Contact: 04/27/2009
Data Release Frequency: No Update Planned

US CDL: Clandestine Drug Labs

A listing of clandestine drug lab locations. The U.S. Department of Justice ("the Department") provides this web site as a public service. It contains addresses of some locations where law enforcement agencies reported they found chemicals or other items that indicated the presence of either clandestine drug laboratories or dumpsites. In most cases, the source of the entries is not the Department, and the Department has not verified the entry and does not guarantee its accuracy. Members of the public must verify the accuracy of all entries by, for example, contacting local law enforcement and local health departments.

Date of Government Version: 02/09/2017
Date Data Arrived at EDR: 03/08/2017
Date Made Active in Reports: 06/09/2017
Number of Days to Update: 93

Source: Drug Enforcement Administration
Telephone: 202-307-1000
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Quarterly

Local Lists of Registered Storage Tanks

SWEEPS UST: SWEEPS UST Listing

Statewide Environmental Evaluation and Planning System. This underground storage tank listing was updated and maintained by a company contacted by the SWRCB in the early 1990's. The listing is no longer updated or maintained. The local agency is the contact for more information on a site on the SWEEPS list.

Date of Government Version: 06/01/1994
Date Data Arrived at EDR: 07/07/2005
Date Made Active in Reports: 08/11/2005
Number of Days to Update: 35

Source: State Water Resources Control Board
Telephone: N/A
Last EDR Contact: 06/03/2005
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

UST MENDOCINO: Mendocino County UST Database
A listing of underground storage tank locations in Mendocino County.

Date of Government Version: 06/02/2017
Date Data Arrived at EDR: 06/06/2017
Date Made Active in Reports: 08/25/2017
Number of Days to Update: 80

Source: Department of Public Health
Telephone: 707-463-4466
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Annually

HIST UST: Hazardous Substance Storage Container Database
The Hazardous Substance Storage Container Database is a historical listing of UST sites. Refer to local/county source for current data.

Date of Government Version: 10/15/1990
Date Data Arrived at EDR: 01/25/1991
Date Made Active in Reports: 02/12/1991
Number of Days to Update: 18

Source: State Water Resources Control Board
Telephone: 916-341-5851
Last EDR Contact: 07/26/2001
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CA FID UST: Facility Inventory Database
The Facility Inventory Database (FID) contains a historical listing of active and inactive underground storage tank locations from the State Water Resource Control Board. Refer to local/county source for current data.

Date of Government Version: 10/31/1994
Date Data Arrived at EDR: 09/05/1995
Date Made Active in Reports: 09/29/1995
Number of Days to Update: 24

Source: California Environmental Protection Agency
Telephone: 916-341-5851
Last EDR Contact: 12/28/1998
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Local Land Records

LIENS: Environmental Liens Listing
A listing of property locations with environmental liens for California where DTSC is a lien holder.

Date of Government Version: 06/02/2017
Date Data Arrived at EDR: 06/06/2017
Date Made Active in Reports: 08/22/2017
Number of Days to Update: 77

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 06/02/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Varies

LIENS 2: CERCLA Lien Information
A Federal CERCLA ('Superfund') lien can exist by operation of law at any site or property at which EPA has spent Superfund monies. These monies are spent to investigate and address releases and threatened releases of contamination. CERCLIS provides information as to the identity of these sites and properties.

Date of Government Version: 02/18/2014
Date Data Arrived at EDR: 03/18/2014
Date Made Active in Reports: 04/24/2014
Number of Days to Update: 37

Source: Environmental Protection Agency
Telephone: 202-564-6023
Last EDR Contact: 07/26/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

DEED: Deed Restriction Listing

Site Mitigation and Brownfields Reuse Program Facility Sites with Deed Restrictions & Hazardous Waste Management Program Facility Sites with Deed / Land Use Restriction. The DTSC Site Mitigation and Brownfields Reuse Program (SMBRP) list includes sites cleaned up under the program's oversight and generally does not include current or former hazardous waste facilities that required a hazardous waste facility permit. The list represents deed restrictions that are active. Some sites have multiple deed restrictions. The DTSC Hazardous Waste Management Program (HWMP) has developed a list of current or former hazardous waste facilities that have a recorded land use restriction at the local county recorder's office. The land use restrictions on this list were required by the DTSC HWMP as a result of the presence of hazardous substances that remain on site after the facility (or part of the facility) has been closed or cleaned up. The types of land use restriction include deed notice, deed restriction, or a land use restriction that binds current and future owners.

Date of Government Version: 06/05/2017
Date Data Arrived at EDR: 06/06/2017
Date Made Active in Reports: 08/10/2017
Number of Days to Update: 65

Source: DTSC and SWRCB
Telephone: 916-323-3400
Last EDR Contact: 06/06/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Semi-Annually

Records of Emergency Release Reports

HMIRS: Hazardous Materials Information Reporting System

Hazardous Materials Incident Report System. HMIRS contains hazardous material spill incidents reported to DOT.

Date of Government Version: 12/28/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 37

Source: U.S. Department of Transportation
Telephone: 202-366-4555
Last EDR Contact: 06/28/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Annually

CHMIRS: California Hazardous Material Incident Report System

California Hazardous Material Incident Reporting System. CHMIRS contains information on reported hazardous material incidents (accidental releases or spills).

Date of Government Version: 12/06/2016
Date Data Arrived at EDR: 01/25/2017
Date Made Active in Reports: 05/10/2017
Number of Days to Update: 105

Source: Office of Emergency Services
Telephone: 916-845-8400
Last EDR Contact: 07/26/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

LDS: Land Disposal Sites Listing (GEOTRACKER)

Land Disposal sites (Landfills) included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

Date of Government Version: 06/12/2017
Date Data Arrived at EDR: 06/14/2017
Date Made Active in Reports: 08/18/2017
Number of Days to Update: 65

Source: State Water Qualilty Control Board
Telephone: 866-480-1028
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

MCS: Military Cleanup Sites Listing (GEOTRACKER)

Military sites (consisting of: Military UST sites; Military Privatized sites; and Military Cleanup sites [formerly known as DoD non UST]) included in GeoTracker. GeoTracker is the Water Boards data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater.

Date of Government Version: 06/12/2017
Date Data Arrived at EDR: 06/14/2017
Date Made Active in Reports: 08/22/2017
Number of Days to Update: 69

Source: State Water Resources Control Board
Telephone: 866-480-1028
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

SPILLS 90: SPILLS90 data from FirstSearch

Spills 90 includes those spill and release records available exclusively from FirstSearch databases. Typically, they may include chemical, oil and/or hazardous substance spills recorded after 1990. Duplicate records that are already included in EDR incident and release records are not included in Spills 90.

Date of Government Version: 06/06/2012
Date Data Arrived at EDR: 01/03/2013
Date Made Active in Reports: 02/22/2013
Number of Days to Update: 50

Source: FirstSearch
Telephone: N/A
Last EDR Contact: 01/03/2013
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

Other Ascertainable Records

RCRA NonGen / NLR: RCRA - Non Generators / No Longer Regulated

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Non-Generators do not presently generate hazardous waste.

Date of Government Version: 12/12/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 44

Source: Environmental Protection Agency
Telephone: (415) 495-8895
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Varies

FUDS: Formerly Used Defense Sites

The listing includes locations of Formerly Used Defense Sites properties where the US Army Corps of Engineers is actively working or will take necessary cleanup actions.

Date of Government Version: 01/31/2015
Date Data Arrived at EDR: 07/08/2015
Date Made Active in Reports: 10/13/2015
Number of Days to Update: 97

Source: U.S. Army Corps of Engineers
Telephone: 202-528-4285
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

DOD: Department of Defense Sites

This data set consists of federally owned or administered lands, administered by the Department of Defense, that have any area equal to or greater than 640 acres of the United States, Puerto Rico, and the U.S. Virgin Islands.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 11/10/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 62

Source: USGS
Telephone: 888-275-8747
Last EDR Contact: 07/12/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Semi-Annually

FEDLAND: Federal and Indian Lands

Federally and Indian administrated lands of the United States. Lands included are administrated by: Army Corps of Engineers, Bureau of Reclamation, National Wild and Scenic River, National Wildlife Refuge, Public Domain Land, Wilderness, Wilderness Study Area, Wildlife Management Area, Bureau of Indian Affairs, Bureau of Land Management, Department of Justice, Forest Service, Fish and Wildlife Service, National Park Service.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 02/06/2006
Date Made Active in Reports: 01/11/2007
Number of Days to Update: 339

Source: U.S. Geological Survey
Telephone: 888-275-8747
Last EDR Contact: 07/14/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: N/A

SCRD DRYCLEANERS: State Coalition for Remediation of Drycleaners Listing

The State Coalition for Remediation of Drycleaners was established in 1998, with support from the U.S. EPA Office of Superfund Remediation and Technology Innovation. It is comprised of representatives of states with established drycleaner remediation programs. Currently the member states are Alabama, Connecticut, Florida, Illinois, Kansas, Minnesota, Missouri, North Carolina, Oregon, South Carolina, Tennessee, Texas, and Wisconsin.

Date of Government Version: 01/01/2017
Date Data Arrived at EDR: 02/03/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 63
Source: Environmental Protection Agency
Telephone: 615-532-8599
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: Varies

US FIN ASSUR: Financial Assurance Information

All owners and operators of facilities that treat, store, or dispose of hazardous waste are required to provide proof that they will have sufficient funds to pay for the clean up, closure, and post-closure care of their facilities.

Date of Government Version: 02/13/2017
Date Data Arrived at EDR: 02/15/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 86
Source: Environmental Protection Agency
Telephone: 202-566-1917
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

EPA WATCH LIST: EPA WATCH LIST

EPA maintains a "Watch List" to facilitate dialogue between EPA, state and local environmental agencies on enforcement matters relating to facilities with alleged violations identified as either significant or high priority. Being on the Watch List does not mean that the facility has actually violated the law only that an investigation by EPA or a state or local environmental agency has led those organizations to allege that an unproven violation has in fact occurred. Being on the Watch List does not represent a higher level of concern regarding the alleged violations that were detected, but instead indicates cases requiring additional dialogue between EPA, state and local agencies - primarily because of the length of time the alleged violation has gone unaddressed or unresolved.

Date of Government Version: 08/30/2013
Date Data Arrived at EDR: 03/21/2014
Date Made Active in Reports: 06/17/2014
Number of Days to Update: 88
Source: Environmental Protection Agency
Telephone: 617-520-3000
Last EDR Contact: 08/07/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

2020 COR ACTION: 2020 Corrective Action Program List

The EPA has set ambitious goals for the RCRA Corrective Action program by creating the 2020 Corrective Action Universe. This RCRA cleanup baseline includes facilities expected to need corrective action. The 2020 universe contains a wide variety of sites. Some properties are heavily contaminated while others were contaminated but have since been cleaned up. Still others have not been fully investigated yet, and may require little or no remediation. Inclusion in the 2020 Universe does not necessarily imply failure on the part of a facility to meet its RCRA obligations.

Date of Government Version: 04/22/2013
Date Data Arrived at EDR: 03/03/2015
Date Made Active in Reports: 03/09/2015
Number of Days to Update: 6
Source: Environmental Protection Agency
Telephone: 703-308-4044
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Varies

TSCA: Toxic Substances Control Act

Toxic Substances Control Act. TSCA identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list. It includes data on the production volume of these substances by plant site.

Date of Government Version: 12/31/2012
Date Data Arrived at EDR: 01/15/2015
Date Made Active in Reports: 01/29/2015
Number of Days to Update: 14
Source: EPA
Telephone: 202-260-5521
Last EDR Contact: 06/21/2017
Next Scheduled EDR Contact: 10/02/2017
Data Release Frequency: Every 4 Years

TRIS: Toxic Chemical Release Inventory System

Toxic Release Inventory System. TRIS identifies facilities which release toxic chemicals to the air, water and land in reportable quantities under SARA Title III Section 313.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 11/24/2015
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 133
Source: EPA
Telephone: 202-566-0250
Last EDR Contact: 08/23/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Annually

SSTS: Section 7 Tracking Systems

Section 7 of the Federal Insecticide, Fungicide and Rodenticide Act, as amended (92 Stat. 829) requires all registered pesticide-producing establishments to submit a report to the Environmental Protection Agency by March 1st each year. Each establishment must report the types and amounts of pesticides, active ingredients and devices being produced, and those having been produced and sold or distributed in the past year.

Date of Government Version: 12/31/2009
Date Data Arrived at EDR: 12/10/2010
Date Made Active in Reports: 02/25/2011
Number of Days to Update: 77
Source: EPA
Telephone: 202-564-4203
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Annually

ROD: Records Of Decision

Record of Decision. ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

Date of Government Version: 11/25/2013
Date Data Arrived at EDR: 12/12/2013
Date Made Active in Reports: 02/24/2014
Number of Days to Update: 74
Source: EPA
Telephone: 703-416-0223
Last EDR Contact: 06/09/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Annually

RMP: Risk Management Plans

When Congress passed the Clean Air Act Amendments of 1990, it required EPA to publish regulations and guidance for chemical accident prevention at facilities using extremely hazardous substances. The Risk Management Program Rule (RMP Rule) was written to implement Section 112(r) of these amendments. The rule, which built upon existing industry codes and standards, requires companies of all sizes that use certain flammable and toxic substances to develop a Risk Management Program, which includes a(n): Hazard assessment that details the potential effects of an accidental release, an accident history of the last five years, and an evaluation of worst-case and alternative accidental releases; Prevention program that includes safety precautions and maintenance, monitoring, and employee training measures; and Emergency response program that spells out emergency health care, employee training measures and procedures for informing the public and response agencies (e.g the fire department) should an accident occur.

Date of Government Version: 02/01/2017
Date Data Arrived at EDR: 02/09/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 57
Source: Environmental Protection Agency
Telephone: 202-564-8600
Last EDR Contact: 07/24/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

RAATS: RCRA Administrative Action Tracking System

RCRA Administration Action Tracking System. RAATS contains records based on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by the EPA. For administration actions after September 30, 1995, data entry in the RAATS database was discontinued. EPA will retain a copy of the database for historical records. It was necessary to terminate RAATS because a decrease in agency resources made it impossible to continue to update the information contained in the database.

Date of Government Version: 04/17/1995
Date Data Arrived at EDR: 07/03/1995
Date Made Active in Reports: 08/07/1995
Number of Days to Update: 35
Source: EPA
Telephone: 202-564-4104
Last EDR Contact: 06/02/2008
Next Scheduled EDR Contact: 09/01/2008
Data Release Frequency: No Update Planned

PRP: Potentially Responsible Parties
A listing of verified Potentially Responsible Parties

Date of Government Version: 10/25/2013
Date Data Arrived at EDR: 10/17/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 3
Source: EPA
Telephone: 202-564-6023
Last EDR Contact: 08/08/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

PADS: PCB Activity Database System
PCB Activity Database. PADS Identifies generators, transporters, commercial storers and/or brokers and disposers of PCB's who are required to notify the EPA of such activities.

Date of Government Version: 01/20/2016
Date Data Arrived at EDR: 04/28/2016
Date Made Active in Reports: 09/02/2016
Number of Days to Update: 127
Source: EPA
Telephone: 202-566-0500
Last EDR Contact: 04/10/2017
Next Scheduled EDR Contact: 07/24/2017
Data Release Frequency: Annually

ICIS: Integrated Compliance Information System
The Integrated Compliance Information System (ICIS) supports the information needs of the national enforcement and compliance program as well as the unique needs of the National Pollutant Discharge Elimination System (NPDES) program.

Date of Government Version: 11/18/2016
Date Data Arrived at EDR: 11/23/2016
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 79
Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Quarterly

FTTS: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
FTTS tracks administrative cases and pesticide enforcement actions and compliance activities related to FIFRA, TSCA and EPCRA (Emergency Planning and Community Right-to-Know Act). To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25
Source: EPA/Office of Prevention, Pesticides and Toxic Substances
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

FTTS INSP: FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fungicide, & Rodenticide Act)/TSCA (Toxic Substances Control Act)
A listing of FIFRA/TSCA Tracking System (FTTS) inspections and enforcements.

Date of Government Version: 04/09/2009
Date Data Arrived at EDR: 04/16/2009
Date Made Active in Reports: 05/11/2009
Number of Days to Update: 25
Source: EPA
Telephone: 202-566-1667
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

MLTS: Material Licensing Tracking System
MLTS is maintained by the Nuclear Regulatory Commission and contains a list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements. To maintain currency, EDR contacts the Agency on a quarterly basis.

Date of Government Version: 08/30/2016
Date Data Arrived at EDR: 09/08/2016
Date Made Active in Reports: 10/21/2016
Number of Days to Update: 43
Source: Nuclear Regulatory Commission
Telephone: 301-415-7169
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

COAL ASH DOE: Steam-Electric Plant Operation Data
A listing of power plants that store ash in surface ponds.

Date of Government Version: 12/31/2005
Date Data Arrived at EDR: 08/07/2009
Date Made Active in Reports: 10/22/2009
Number of Days to Update: 76
Source: Department of Energy
Telephone: 202-586-8719
Last EDR Contact: 06/05/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Varies

COAL ASH EPA: Coal Combustion Residues Surface Impoundments List
A listing of coal combustion residues surface impoundments with high hazard potential ratings.

Date of Government Version: 07/01/2014
Date Data Arrived at EDR: 09/10/2014
Date Made Active in Reports: 10/20/2014
Number of Days to Update: 40
Source: Environmental Protection Agency
Telephone: N/A
Last EDR Contact: 06/05/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Varies

PCB TRANSFORMER: PCB Transformer Registration Database
The database of PCB transformer registrations that includes all PCB registration submittals.

Date of Government Version: 02/01/2011
Date Data Arrived at EDR: 10/19/2011
Date Made Active in Reports: 01/10/2012
Number of Days to Update: 83
Source: Environmental Protection Agency
Telephone: 202-566-0517
Last EDR Contact: 07/28/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

RADINFO: Radiation Information Database
The Radiation Information Database (RADINFO) contains information about facilities that are regulated by U.S. Environmental Protection Agency (EPA) regulations for radiation and radioactivity.

Date of Government Version: 01/04/2017
Date Data Arrived at EDR: 01/06/2017
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 35
Source: Environmental Protection Agency
Telephone: 202-343-9775
Last EDR Contact: 07/12/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

HIST FTTS: FIFRA/TSCA Tracking System Administrative Case Listing
A complete administrative case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40
Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2007
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

HIST FTTS INSP: FIFRA/TSCA Tracking System Inspection & Enforcement Case Listing
A complete inspection and enforcement case listing from the FIFRA/TSCA Tracking System (FTTS) for all ten EPA regions. The information was obtained from the National Compliance Database (NCDB). NCDB supports the implementation of FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) and TSCA (Toxic Substances Control Act). Some EPA regions are now closing out records. Because of that, and the fact that some EPA regions are not providing EPA Headquarters with updated records, it was decided to create a HIST FTTS database. It included records that may not be included in the newer FTTS database updates. This database is no longer updated.

Date of Government Version: 10/19/2006
Date Data Arrived at EDR: 03/01/2007
Date Made Active in Reports: 04/10/2007
Number of Days to Update: 40

Source: Environmental Protection Agency
Telephone: 202-564-2501
Last EDR Contact: 12/17/2008
Next Scheduled EDR Contact: 03/17/2008
Data Release Frequency: No Update Planned

DOT OPS: Incident and Accident Data

Department of Transporation, Office of Pipeline Safety Incident and Accident data.

Date of Government Version: 07/31/2012
Date Data Arrived at EDR: 08/07/2012
Date Made Active in Reports: 09/18/2012
Number of Days to Update: 42

Source: Department of Transporation, Office of Pipeline Safety
Telephone: 202-366-4595
Last EDR Contact: 08/01/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

CONSENT: Superfund (CERCLA) Consent Decrees

Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites. Released periodically by United States District Courts after settlement by parties to litigation matters.

Date of Government Version: 09/30/2016
Date Data Arrived at EDR: 11/18/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 77

Source: Department of Justice, Consent Decree Library
Telephone: Varies
Last EDR Contact: 06/21/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Varies

BRS: Biennial Reporting System

The Biennial Reporting System is a national system administered by the EPA that collects data on the generation and management of hazardous waste. BRS captures detailed data from two groups: Large Quantity Generators (LQG) and Treatment, Storage, and Disposal Facilities.

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 02/24/2015
Date Made Active in Reports: 09/30/2015
Number of Days to Update: 218

Source: EPA/NTIS
Telephone: 800-424-9346
Last EDR Contact: 08/25/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Biennially

INDIAN RESERV: Indian Reservations

This map layer portrays Indian administered lands of the United States that have any area equal to or greater than 640 acres.

Date of Government Version: 12/31/2014
Date Data Arrived at EDR: 07/14/2015
Date Made Active in Reports: 01/10/2017
Number of Days to Update: 546

Source: USGS
Telephone: 202-208-3710
Last EDR Contact: 07/11/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Semi-Annually

FUSRAP: Formerly Utilized Sites Remedial Action Program

DOE established the Formerly Utilized Sites Remedial Action Program (FUSRAP) in 1974 to remediate sites where radioactive contamination remained from Manhattan Project and early U.S. Atomic Energy Commission (AEC) operations.

Date of Government Version: 12/23/2016
Date Data Arrived at EDR: 12/27/2016
Date Made Active in Reports: 02/17/2017
Number of Days to Update: 52

Source: Department of Energy
Telephone: 202-586-3559
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Varies

UMTRA: Uranium Mill Tailings Sites

Uranium ore was mined by private companies for federal government use in national defense programs. When the mills shut down, large piles of the sand-like material (mill tailings) remain after uranium has been extracted from the ore. Levels of human exposure to radioactive materials from the piles are low; however, in some cases tailings were used as construction materials before the potential health hazards of the tailings were recognized.

Date of Government Version: 09/14/2010
Date Data Arrived at EDR: 10/07/2011
Date Made Active in Reports: 03/01/2012
Number of Days to Update: 146

Source: Department of Energy
Telephone: 505-845-0011
Last EDR Contact: 08/22/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

LEAD SMELTER 1: Lead Smelter Sites

A listing of former lead smelter site locations.

Date of Government Version: 12/05/2016
Date Data Arrived at EDR: 01/05/2017
Date Made Active in Reports: 02/10/2017
Number of Days to Update: 36

Source: Environmental Protection Agency
Telephone: 703-603-8787
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Varies

LEAD SMELTER 2: Lead Smelter Sites

A list of several hundred sites in the U.S. where secondary lead smelting was done from 1931and 1964. These sites may pose a threat to public health through ingestion or inhalation of contaminated soil or dust

Date of Government Version: 04/05/2001
Date Data Arrived at EDR: 10/27/2010
Date Made Active in Reports: 12/02/2010
Number of Days to Update: 36

Source: American Journal of Public Health
Telephone: 703-305-6451
Last EDR Contact: 12/02/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

US AIRS (AFS): Aerometric Information Retrieval System Facility Subsystem (AFS)

The database is a sub-system of Aerometric Information Retrieval System (AIRS). AFS contains compliance data on air pollution point sources regulated by the U.S. EPA and/or state and local air regulatory agencies. This information comes from source reports by various stationary sources of air pollution, such as electric power plants, steel mills, factories, and universities, and provides information about the air pollutants they produce. Action, air program, air program pollutant, and general level plant data. It is used to track emissions and compliance data from industrial plants.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Annually

US AIRS MINOR: Air Facility System Data

A listing of minor source facilities.

Date of Government Version: 10/12/2016
Date Data Arrived at EDR: 10/26/2016
Date Made Active in Reports: 02/03/2017
Number of Days to Update: 100

Source: EPA
Telephone: 202-564-2496
Last EDR Contact: 08/11/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Annually

US MINES: Mines Master Index File

Contains all mine identification numbers issued for mines active or opened since 1971. The data also includes violation information.

Date of Government Version: 02/08/2017
Date Data Arrived at EDR: 02/28/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 38

Source: Department of Labor, Mine Safety and Health Administration
Telephone: 303-231-5959
Last EDR Contact: 08/30/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Semi-Annually

US MINES 2: Ferrous and Nonferrous Metal Mines Database Listing

This map layer includes ferrous (ferrous metal mines are facilities that extract ferrous metals, such as iron ore or molybdenum) and nonferrous (Nonferrous metal mines are facilities that extract nonferrous metals, such as gold, silver, copper, zinc, and lead) metal mines in the United States.

Date of Government Version: 12/05/2005
Date Data Arrived at EDR: 02/29/2008
Date Made Active in Reports: 04/18/2008
Number of Days to Update: 49

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 05/31/2017
Next Scheduled EDR Contact: 09/11/2017
Data Release Frequency: Varies

US MINES 3: Active Mines & Mineral Plants Database Listing

Active Mines and Mineral Processing Plant operations for commodities monitored by the Minerals Information Team of the USGS.

Date of Government Version: 04/14/2011
Date Data Arrived at EDR: 06/08/2011
Date Made Active in Reports: 09/13/2011
Number of Days to Update: 97

Source: USGS
Telephone: 703-648-7709
Last EDR Contact: 06/02/2017
Next Scheduled EDR Contact: 09/11/2017
Data Release Frequency: Varies

ABANDONED MINES: Abandoned Mines

An inventory of land and water impacted by past mining (primarily coal mining) is maintained by OSMRE to provide information needed to implement the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The inventory contains information on the location, type, and extent of AML impacts, as well as, information on the cost associated with the reclamation of those problems. The inventory is based upon field surveys by State, Tribal, and OSMRE program officials. It is dynamic to the extent that it is modified as new problems are identified and existing problems are reclaimed.

Date of Government Version: 03/14/2017
Date Data Arrived at EDR: 03/17/2017
Date Made Active in Reports: 04/07/2017
Number of Days to Update: 21

Source: Department of Interior
Telephone: 202-208-2609
Last EDR Contact: 06/09/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

FINDS: Facility Index System/Facility Registry System

Facility Index System. FINDS contains both facility information and 'pointers' to other sources that contain more detail. EDR includes the following FINDS databases in this report: PCS (Permit Compliance System), AIRS (Aerometric Information Retrieval System), DOCKET (Enforcement Docket used to manage and track information on civil judicial enforcement cases for all environmental statutes), FURS (Federal Underground Injection Control), C-DOCKET (Criminal Docket System used to track criminal enforcement actions for all environmental statutes), FFIS (Federal Facilities Information System), STATE (State Environmental Laws and Statutes), and PADS (PCB Activity Data System).

Date of Government Version: 04/04/2017
Date Data Arrived at EDR: 04/07/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 35

Source: EPA
Telephone: (415) 947-8000
Last EDR Contact: 06/07/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Quarterly

DOCKET HWC: Hazardous Waste Compliance Docket Listing

A complete list of the Federal Agency Hazardous Waste Compliance Docket Facilities.

Date of Government Version: 06/02/2016
Date Data Arrived at EDR: 06/03/2016
Date Made Active in Reports: 09/02/2016
Number of Days to Update: 91

Source: Environmental Protection Agency
Telephone: 202-564-0527
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

UXO: Unexploded Ordnance Sites

A listing of unexploded ordnance site locations

Date of Government Version: 10/25/2015
Date Data Arrived at EDR: 01/29/2016
Date Made Active in Reports: 04/05/2016
Number of Days to Update: 67

Source: Department of Defense
Telephone: 571-373-0407
Last EDR Contact: 07/17/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

ECHO: Enforcement & Compliance History Information

ECHO provides integrated compliance and enforcement information for about 800,000 regulated facilities nationwide.

Date of Government Version: 03/19/2017
Date Data Arrived at EDR: 03/21/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 52

Source: Environmental Protection Agency
Telephone: 202-564-2280
Last EDR Contact: 06/07/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Quarterly

FUELS PROGRAM: EPA Fuels Program Registered Listing

This listing includes facilities that are registered under the Part 80 (Code of Federal Regulations) EPA Fuels Programs. All companies now are required to submit new and updated registrations.

Date of Government Version: 02/22/2017
Date Data Arrived at EDR: 02/22/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 79

Source: EPA
Telephone: 800-385-6164
Last EDR Contact: 08/17/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

CA BOND EXP. PLAN: Bond Expenditure Plan

Department of Health Services developed a site-specific expenditure plan as the basis for an appropriation of Hazardous Substance Cleanup Bond Act funds. It is not updated.

Date of Government Version: 01/01/1989
Date Data Arrived at EDR: 07/27/1994
Date Made Active in Reports: 08/02/1994
Number of Days to Update: 6

Source: Department of Health Services
Telephone: 916-255-2118
Last EDR Contact: 05/31/1994
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

CORTESE: "Cortese" Hazardous Waste & Substances Sites List

The sites for the list are designated by the State Water Resource Control Board (LUST), the Integrated Waste Board (SWF/LS), and the Department of Toxic Substances Control (Cal-Sites).

Date of Government Version: 12/28/2016
Date Data Arrived at EDR: 12/28/2016
Date Made Active in Reports: 03/02/2017
Number of Days to Update: 64

Source: CAL EPA/Office of Emergency Information
Telephone: 916-323-3400
Last EDR Contact: 06/28/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

DRYCLEANERS: Cleaner Facilities

A list of drycleaner related facilities that have EPA ID numbers. These are facilities with certain SIC codes: power laundries, family and commercial; garment pressing and cleaner's agents; linen supply; coin-operated laundries and cleaning; drycleaning plants, except rugs; carpet and upholster cleaning; industrial launderers; laundry and garment services.

Date of Government Version: 03/09/2017
Date Data Arrived at EDR: 04/11/2017
Date Made Active in Reports: 05/23/2017
Number of Days to Update: 42

Source: Department of Toxic Substance Control
Telephone: 916-327-4498
Last EDR Contact: 07/13/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Annually

EMI: Emissions Inventory Data

Toxics and criteria pollutant emissions data collected by the ARB and local air pollution agencies.

Date of Government Version: 12/31/2015
Date Data Arrived at EDR: 03/21/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 147

Source: California Air Resources Board
Telephone: 916-322-2990
Last EDR Contact: 06/23/2017
Next Scheduled EDR Contact: 10/02/2017
Data Release Frequency: Varies

ENF: Enforcement Action Listing

A listing of Water Board Enforcement Actions. Formal is everything except Oral/Verbal Communication, Notice of Violation, Expedited Payment Letter, and Staff Enforcement Letter.

Date of Government Version: 05/01/2017
Date Data Arrived at EDR: 05/03/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 104

Source: State Water Resoruces Control Board
Telephone: 916-445-9379
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

Financial Assurance 1: Financial Assurance Information Listing

Financial Assurance information

Date of Government Version: 06/05/2017
Date Data Arrived at EDR: 06/09/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 67

Source: Department of Toxic Substances Control
Telephone: 916-255-3628
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Varies

Financial Assurance 2: Financial Assurance Information Listing

A listing of financial assurance information for solid waste facilities. Financial assurance is intended to ensure that resources are available to pay for the cost of closure, post-closure care, and corrective measures if the owner or operator of a regulated facility is unable or unwilling to pay.

Date of Government Version: 05/16/2017
Date Data Arrived at EDR: 05/19/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 88

Source: California Integrated Waste Management Board
Telephone: 916-341-6066
Last EDR Contact: 08/10/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: Varies

HAZNET: Facility and Manifest Data

Facility and Manifest Data. The data is extracted from the copies of hazardous waste manifests received each year by the DTSC. The annual volume of manifests is typically 700,000 - 1,000,000 annually, representing approximately 350,000 - 500,000 shipments. Data are from the manifests submitted without correction, and therefore many contain some invalid values for data elements such as generator ID, TSD ID, waste category, and disposal method. This database begins with calendar year 1993.

Date of Government Version: 12/31/2015
Date Data Arrived at EDR: 10/12/2016
Date Made Active in Reports: 12/15/2016
Number of Days to Update: 64

Source: California Environmental Protection Agency
Telephone: 916-255-1136
Last EDR Contact: 07/12/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Annually

ICE: ICE

Contains data pertaining to the Permitted Facilities with Inspections / Enforcements sites tracked in Envirostor.

Date of Government Version: 05/22/2017
Date Data Arrived at EDR: 05/24/2017
Date Made Active in Reports: 08/18/2017
Number of Days to Update: 86

Source: Department of Toxic Subsances Control
Telephone: 877-786-9427
Last EDR Contact: 08/22/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

HIST CORTESE: Hazardous Waste & Substance Site List

The sites for the list are designated by the State Water Resource Control Board [LUST], the Integrated Waste Board [SWF/LS], and the Department of Toxic Substances Control [CALSITES]. This listing is no longer updated by the state agency.

Date of Government Version: 04/01/2001
Date Data Arrived at EDR: 01/22/2009
Date Made Active in Reports: 04/08/2009
Number of Days to Update: 76

Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 01/22/2009
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

HWP: EnviroStor Permitted Facilities Listing
Detailed information on permitted hazardous waste facilities and corrective action ("cleanups") tracked in EnviroStor.

Date of Government Version: 05/22/2017
Date Data Arrived at EDR: 05/24/2017
Date Made Active in Reports: 08/18/2017
Number of Days to Update: 86
Source: Department of Toxic Substances Control
Telephone: 916-323-3400
Last EDR Contact: 08/22/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

HWT: Registered Hazardous Waste Transporter Database
A listing of hazardous waste transporters. In California, unless specifically exempted, it is unlawful for any person to transport hazardous wastes unless the person holds a valid registration issued by DTSC. A hazardous waste transporter registration is valid for one year and is assigned a unique registration number.

Date of Government Version: 04/11/2017
Date Data Arrived at EDR: 04/13/2017
Date Made Active in Reports: 04/26/2017
Number of Days to Update: 13
Source: Department of Toxic Substances Control
Telephone: 916-440-7145
Last EDR Contact: 07/12/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Quarterly

MINES: Mines Site Location Listing
A listing of mine site locations from the Office of Mine Reclamation.

Date of Government Version: 09/12/2016
Date Data Arrived at EDR: 09/14/2016
Date Made Active in Reports: 10/14/2016
Number of Days to Update: 30
Source: Department of Conservation
Telephone: 916-322-1080
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Varies

MWMP: Medical Waste Management Program Listing
The Medical Waste Management Program (MWMP) ensures the proper handling and disposal of medical waste by permitting and inspecting medical waste Offsite Treatment Facilities (PDF) and Transfer Stations (PDF) throughout the state. MWMP also oversees all Medical Waste Transporters.

Date of Government Version: 05/25/2017
Date Data Arrived at EDR: 06/06/2017
Date Made Active in Reports: 08/23/2017
Number of Days to Update: 78
Source: Department of Public Health
Telephone: 916-558-1784
Last EDR Contact: 06/06/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Varies

NPDES: NPDES Permits Listing
A listing of NPDES permits, including stormwater.

Date of Government Version: 11/14/2016
Date Data Arrived at EDR: 11/15/2016
Date Made Active in Reports: 03/02/2017
Number of Days to Update: 107
Source: State Water Resources Control Board
Telephone: 916-445-9379
Last EDR Contact: 08/17/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: Quarterly

PEST LIC: Pesticide Regulation Licenses Listing
A listing of licenses and certificates issued by the Department of Pesticide Regulation. The DPR issues licenses and/or certificates to: Persons and businesses that apply or sell pesticides; Pest control dealers and brokers; Persons who advise on agricultural pesticide applications.

Date of Government Version: 06/05/2017
Date Data Arrived at EDR: 06/07/2017
Date Made Active in Reports: 08/25/2017
Number of Days to Update: 79
Source: Department of Pesticide Regulation
Telephone: 916-445-4038
Last EDR Contact: 06/07/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Quarterly

PROC: Certified Processors Database
A listing of certified processors.

Date of Government Version: 03/13/2017
Date Data Arrived at EDR: 03/14/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 50
Source: Department of Conservation
Telephone: 916-323-3836
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

NOTIFY 65: Proposition 65 Records
Listings of all Proposition 65 incidents reported to counties by the State Water Resources Control Board and the Regional Water Quality Control Board. This database is no longer updated by the reporting agency.

Date of Government Version: 12/16/2016
Date Data Arrived at EDR: 12/22/2016
Date Made Active in Reports: 03/02/2017
Number of Days to Update: 70
Source: State Water Resources Control Board
Telephone: 916-445-3846
Last EDR Contact: 06/16/2017
Next Scheduled EDR Contact: 10/02/2017
Data Release Frequency: No Update Planned

UIC: UIC Listing
A listing of wells identified as underground injection wells, in the California Oil and Gas Wells database.

Date of Government Version: 01/20/2017
Date Data Arrived at EDR: 03/14/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 50
Source: Deaprtment of Conservation
Telephone: 916-445-2408
Last EDR Contact: 06/14/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Varies

WASTEWATER PITS: Oil Wastewater Pits Listing
Water officials discovered that oil producers have been dumping chemical-laden wastewater into hundreds of unlined pits that are operating without proper permits. Inspections completed by the Central Valley Regional Water Quality Control Board revealed the existence of previously unidentified waste sites. The water board?s review found that more than one-third of the region?s active disposal pits are operating without permission.

Date of Government Version: 04/15/2015
Date Data Arrived at EDR: 04/17/2015
Date Made Active in Reports: 06/23/2015
Number of Days to Update: 67
Source: RWQCB, Central Valley Region
Telephone: 559-445-5577
Last EDR Contact: 07/14/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Varies

WDS: Waste Discharge System
Sites which have been issued waste discharge requirements.

Date of Government Version: 06/19/2007
Date Data Arrived at EDR: 06/20/2007
Date Made Active in Reports: 06/29/2007
Number of Days to Update: 9
Source: State Water Resources Control Board
Telephone: 916-341-5227
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Quarterly

WIP: Well Investigation Program Case List
Well Investigation Program case in the San Gabriel and San Fernando Valley area.

Date of Government Version: 07/03/2009
Date Data Arrived at EDR: 07/21/2009
Date Made Active in Reports: 08/03/2009
Number of Days to Update: 13
Source: Los Angeles Water Quality Control Board
Telephone: 213-576-6726
Last EDR Contact: 06/27/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Varies

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

EDR HIGH RISK HISTORICAL RECORDS

EDR Exclusive Records

EDR MGP: EDR Proprietary Manufactured Gas Plants

The EDR Proprietary Manufactured Gas Plant Database includes records of coal gas plants (manufactured gas plants) compiled by EDR's researchers. Manufactured gas sites were used in the United States from the 1800's to 1950's to produce a gas that could be distributed and used as fuel. These plants used whale oil, rosin, coal, or a mixture of coal, oil, and water that also produced a significant amount of waste. Many of the byproducts of the gas production, such as coal tar (oily waste containing volatile and non-volatile chemicals), sludges, oils and other compounds are potentially hazardous to human health and the environment. The byproduct from this process was frequently disposed of directly at the plant site and can remain or spread slowly, serving as a continuous source of soil and groundwater contamination.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: No Update Planned

EDR Hist Auto: EDR Exclusive Historic Gas Stations

EDR has searched selected national collections of business directories and has collected listings of potential gas station/filling station/service station sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include gas station/filling station/service station establishments. The categories reviewed included, but were not limited to gas, gas station, gasoline station, filling station, auto, automobile repair, auto service station, service station, etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR Hist Cleaner: EDR Exclusive Historic Dry Cleaners

EDR has searched selected national collections of business directories and has collected listings of potential dry cleaner sites that were available to EDR researchers. EDR's review was limited to those categories of sources that might, in EDR's opinion, include dry cleaning establishments. The categories reviewed included, but were not limited to dry cleaners, cleaners, laundry, laundromat, cleaning/laundry, wash & dry etc. This database falls within a category of information EDR classifies as "High Risk Historical Records", or HRHR. EDR's HRHR effort presents unique and sometimes proprietary data about past sites and operations that typically create environmental concerns, but may not show up in current government records searches.

Date of Government Version: N/A
Date Data Arrived at EDR: N/A
Date Made Active in Reports: N/A
Number of Days to Update: N/A

Source: EDR, Inc.
Telephone: N/A
Last EDR Contact: N/A
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

EDR RECOVERED GOVERNMENT ARCHIVES

Exclusive Recovered Govt. Archives

RGA LF: Recovered Government Archive Solid Waste Facilities List

The EDR Recovered Government Archive Landfill database provides a list of landfills derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the Department of Resources Recycling and Recovery in California.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 01/13/2014
Number of Days to Update: 196

Source: Department of Resources Recycling and Recovery
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

RGA LUST: Recovered Government Archive Leaking Underground Storage Tank

The EDR Recovered Government Archive Leaking Underground Storage Tank database provides a list of LUST incidents derived from historical databases and includes many records that no longer appear in current government lists. Compiled from Records formerly available from the State Water Resources Control Board in California.

Date of Government Version: N/A
Date Data Arrived at EDR: 07/01/2013
Date Made Active in Reports: 12/30/2013
Number of Days to Update: 182

Source: State Water Resources Control Board
Telephone: N/A
Last EDR Contact: 06/01/2012
Next Scheduled EDR Contact: N/A
Data Release Frequency: Varies

COUNTY RECORDS

ALAMEDA COUNTY:

Contaminated Sites

A listing of contaminated sites overseen by the Toxic Release Program (oil and groundwater contamination from chemical releases and spills) and the Leaking Underground Storage Tank Program (soil and ground water contamination from leaking petroleum USTs).

Date of Government Version: 04/10/2017
Date Data Arrived at EDR: 04/11/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 31

Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Semi-Annually

Underground Tanks

Underground storage tank sites located in Alameda county.

Date of Government Version: 07/07/2017
Date Data Arrived at EDR: 07/11/2017
Date Made Active in Reports: 08/23/2017
Number of Days to Update: 43

Source: Alameda County Environmental Health Services
Telephone: 510-567-6700
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 04/24/2047
Data Release Frequency: Semi-Annually

AMADOR COUNTY:

CUPA Facility List

Cupa Facility List

Date of Government Version: 06/20/2017
Date Data Arrived at EDR: 06/21/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 49

Source: Amador County Environmental Health
Telephone: 209-223-6439
Last EDR Contact: 06/16/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Varies

BUTTE COUNTY:

CUPA Facility Listing

Cupa facility list.

Date of Government Version: 04/21/2017
Date Data Arrived at EDR: 04/25/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 106

Source: Public Health Department
Telephone: 530-538-7149
Last EDR Contact: 08/21/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: No Update Planned

CALVERAS COUNTY:

CUPA Facility Listing
Cupa Facility Listing

Date of Government Version: 04/25/2017
Date Data Arrived at EDR: 04/27/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 104

Source: Calveras County Environmental Health
Telephone: 209-754-6399
Last EDR Contact: 06/27/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

COLUSA COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 02/23/2017
Date Data Arrived at EDR: 02/24/2017
Date Made Active in Reports: 05/12/2017
Number of Days to Update: 77

Source: Health & Human Services
Telephone: 530-458-0396
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Varies

CONTRA COSTA COUNTY:

Site List
List includes sites from the underground tank, hazardous waste generator and business plan/2185 programs.

Date of Government Version: 05/26/2017
Date Data Arrived at EDR: 05/30/2017
Date Made Active in Reports: 07/27/2017
Number of Days to Update: 58

Source: Contra Costa Health Services Department
Telephone: 925-646-2286
Last EDR Contact: 07/31/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Semi-Annually

DEL NORTE COUNTY:

CUPA Facility List
Cupa Facility list

Date of Government Version: 05/02/2017
Date Data Arrived at EDR: 05/04/2017
Date Made Active in Reports: 08/04/2017
Number of Days to Update: 92

Source: Del Norte County Environmental Health Division
Telephone: 707-465-0426
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

EL DORADO COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 06/19/2017
Date Data Arrived at EDR: 06/20/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 50

Source: El Dorado County Environmental Management Department
Telephone: 530-621-6623
Last EDR Contact: 07/31/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

FRESNO COUNTY:

CUPA Resources List

Certified Unified Program Agency. CUPA's are responsible for implementing a unified hazardous materials and hazardous waste management regulatory program. The agency provides oversight of businesses that deal with hazardous materials, operate underground storage tanks or aboveground storage tanks.

Date of Government Version: 06/30/2017
Date Data Arrived at EDR: 07/05/2017
Date Made Active in Reports: 08/04/2017
Number of Days to Update: 30

Source: Dept. of Community Health
Telephone: 559-445-3271
Last EDR Contact: 06/29/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Semi-Annually

GLENN COUNTY:

CUPA Facility List

Cupa facility list

Date of Government Version: 12/02/2016
Date Data Arrived at EDR: 02/03/2017
Date Made Active in Reports: 05/25/2017
Number of Days to Update: 111

Source: Glenn County Air Pollution Control District
Telephone: 830-934-6500
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

HUMBOLDT COUNTY:

CUPA Facility List

CUPA facility list.

Date of Government Version: 03/20/2017
Date Data Arrived at EDR: 03/21/2017
Date Made Active in Reports: 05/17/2017
Number of Days to Update: 57

Source: Humboldt County Environmental Health
Telephone: N/A
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

IMPERIAL COUNTY:

CUPA Facility List

Cupa facility list.

Date of Government Version: 04/24/2017
Date Data Arrived at EDR: 04/25/2017
Date Made Active in Reports: 08/04/2017
Number of Days to Update: 101

Source: San Diego Border Field Office
Telephone: 760-339-2777
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

INYO COUNTY:

CUPA Facility List
Cupa facility list.

Date of Government Version: 06/08/2017
Date Data Arrived at EDR: 06/09/2017
Date Made Active in Reports: 08/04/2017
Number of Days to Update: 56

Source: Inyo County Environmental Health Services
Telephone: 760-878-0238
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

KERN COUNTY:

Underground Storage Tank Sites & Tank Listing
Kern County Sites and Tanks Listing.

Date of Government Version: 02/07/2017
Date Data Arrived at EDR: 02/10/2017
Date Made Active in Reports: 05/02/2017
Number of Days to Update: 81

Source: Kern County Environment Health Services Department
Telephone: 661-862-8700
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

KINGS COUNTY:

CUPA Facility List
A listing of sites included in the county's Certified Unified Program Agency database. California's Secretary for Environmental Protection established the unified hazardous materials and hazardous waste regulatory program as required by chapter 6.11 of the California Health and Safety Code. The Unified Program consolidates the administration, permits, inspections, and enforcement activities.

Date of Government Version: 03/06/2017
Date Data Arrived at EDR: 03/07/2017
Date Made Active in Reports: 05/17/2017
Number of Days to Update: 71

Source: Kings County Department of Public Health
Telephone: 559-584-1411
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

LAKE COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 05/09/2017
Date Data Arrived at EDR: 05/11/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 90

Source: Lake County Environmental Health
Telephone: 707-263-1164
Last EDR Contact: 07/17/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Varies

LASSEN COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 01/13/2017
Date Data Arrived at EDR: 04/25/2017
Date Made Active in Reports: 08/04/2017
Number of Days to Update: 101

Source: Lassen County Environmental Health
Telephone: 530-251-8528
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

LOS ANGELES COUNTY:

San Gabriel Valley Areas of Concern
San Gabriel Valley areas where VOC contamination is at or above the MCL as designated by region 9 EPA office.

Date of Government Version: 03/30/2009
Date Data Arrived at EDR: 03/31/2009
Date Made Active in Reports: 10/23/2009
Number of Days to Update: 206
Source: EPA Region 9
Telephone: 415-972-3178
Last EDR Contact: 06/16/2017
Next Scheduled EDR Contact: 10/02/2017
Data Release Frequency: No Update Planned

HMS: Street Number List
Industrial Waste and Underground Storage Tank Sites.

Date of Government Version: 04/18/2017
Date Data Arrived at EDR: 04/25/2017
Date Made Active in Reports: 08/18/2017
Number of Days to Update: 115
Source: Department of Public Works
Telephone: 626-458-3517
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Semi-Annually

List of Solid Waste Facilities
Solid Waste Facilities in Los Angeles County.

Date of Government Version: 04/17/2017
Date Data Arrived at EDR: 04/18/2017
Date Made Active in Reports: 05/02/2017
Number of Days to Update: 14
Source: La County Department of Public Works
Telephone: 818-458-5185
Last EDR Contact: 07/18/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Varies

City of Los Angeles Landfills
Landfills owned and maintained by the City of Los Angeles.

Date of Government Version: 01/01/2016
Date Data Arrived at EDR: 01/26/2016
Date Made Active in Reports: 03/22/2016
Number of Days to Update: 56
Source: Engineering & Construction Division
Telephone: 213-473-7869
Last EDR Contact: 07/13/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Varies

Site Mitigation List
Industrial sites that have had some sort of spill or complaint.

Date of Government Version: 03/29/2016
Date Data Arrived at EDR: 04/06/2016
Date Made Active in Reports: 06/13/2016
Number of Days to Update: 68
Source: Community Health Services
Telephone: 323-890-7806
Last EDR Contact: 07/17/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Annually

City of El Segundo Underground Storage Tank
Underground storage tank sites located in El Segundo city.

Date of Government Version: 01/17/2017
Date Data Arrived at EDR: 01/18/2017
Date Made Active in Reports: 05/10/2017
Number of Days to Update: 112
Source: City of El Segundo Fire Department
Telephone: 310-524-2236
Last EDR Contact: 07/13/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Semi-Annually

City of Long Beach Underground Storage Tank
Underground storage tank sites located in the city of Long Beach.

Date of Government Version: 03/09/2017
Date Data Arrived at EDR: 03/10/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 54
Source: City of Long Beach Fire Department
Telephone: 562-570-2563
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Annually

City of Torrance Underground Storage Tank
Underground storage tank sites located in the city of Torrance.

Date of Government Version: 01/10/2017
Date Data Arrived at EDR: 01/13/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 110

Source: City of Torrance Fire Department
Telephone: 310-618-2973
Last EDR Contact: 07/07/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Semi-Annually

MADERA COUNTY:

CUPA Facility List
A listing of sites included in the county's Certified Unified Program Agency database. California's Secretary for Environmental Protection established the unified hazardous materials and hazardous waste regulatory program as required by chapter 6.11 of the California Health and Safety Code. The Unified Program consolidates the administration, permits, inspections, and enforcement activities.

Date of Government Version: 06/01/2017
Date Data Arrived at EDR: 06/02/2017
Date Made Active in Reports: 08/04/2017
Number of Days to Update: 63

Source: Madera County Environmental Health
Telephone: 559-675-7823
Last EDR Contact: 08/21/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

MARIN COUNTY:

Underground Storage Tank Sites
Currently permitted USTs in Marin County.

Date of Government Version: 03/31/2017
Date Data Arrived at EDR: 04/06/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 27

Source: Public Works Department Waste Management
Telephone: 415-473-6647
Last EDR Contact: 06/29/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Semi-Annually

MERCED COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 02/22/2017
Date Data Arrived at EDR: 02/23/2017
Date Made Active in Reports: 05/17/2017
Number of Days to Update: 83

Source: Merced County Environmental Health
Telephone: 209-381-1094
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

MONO COUNTY:

CUPA Facility List
CUPA Facility List

Date of Government Version: 02/21/2017
Date Data Arrived at EDR: 03/02/2017
Date Made Active in Reports: 05/17/2017
Number of Days to Update: 76

Source: Mono County Health Department
Telephone: 760-932-5580
Last EDR Contact: 08/08/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Varies

MONTEREY COUNTY:

CUPA Facility Listing
CUPA Program listing from the Environmental Health Division.

Date of Government Version: 06/22/2017
Date Data Arrived at EDR: 06/23/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 47
Source: Monterey County Health Department
Telephone: 831-796-1297
Last EDR Contact: 08/21/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

NAPA COUNTY:

Sites With Reported Contamination
A listing of leaking underground storage tank sites located in Napa county.

Date of Government Version: 01/09/2017
Date Data Arrived at EDR: 01/11/2017
Date Made Active in Reports: 03/02/2017
Number of Days to Update: 50
Source: Napa County Department of Environmental Management
Telephone: 707-253-4269
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: No Update Planned

Closed and Operating Underground Storage Tank Sites
Underground storage tank sites located in Napa county.

Date of Government Version: 05/31/2017
Date Data Arrived at EDR: 06/01/2017
Date Made Active in Reports: 08/25/2017
Number of Days to Update: 85
Source: Napa County Department of Environmental Management
Telephone: 707-253-4269
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: No Update Planned

NEVADA COUNTY:

CUPA Facility List
CUPA facility list.

Date of Government Version: 05/08/2017
Date Data Arrived at EDR: 05/09/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 92
Source: Community Development Agency
Telephone: 530-265-1467
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

ORANGE COUNTY:

List of Industrial Site Cleanups
Petroleum and non-petroleum spills.

Date of Government Version: 05/03/2017
Date Data Arrived at EDR: 05/11/2017
Date Made Active in Reports: 08/18/2017
Number of Days to Update: 99
Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 08/07/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Annually

List of Underground Storage Tank Cleanups
Orange County Underground Storage Tank Cleanups (LUST).

Date of Government Version: 11/04/2016
Date Data Arrived at EDR: 11/11/2016
Date Made Active in Reports: 01/23/2017
Number of Days to Update: 73
Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 08/07/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

List of Underground Storage Tank Facilities
Orange County Underground Storage Tank Facilities (UST).

Date of Government Version: 02/06/2017
Date Data Arrived at EDR: 02/07/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 85
Source: Health Care Agency
Telephone: 714-834-3446
Last EDR Contact: 08/09/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

PLACER COUNTY:

Master List of Facilities
List includes aboveground tanks, underground tanks and cleanup sites.

Date of Government Version: 06/02/2017
Date Data Arrived at EDR: 06/06/2017
Date Made Active in Reports: 08/22/2017
Number of Days to Update: 77
Source: Placer County Health and Human Services
Telephone: 530-745-2363
Last EDR Contact: 06/02/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Semi-Annually

PLUMAS COUNTY:

CUPA Facility List
Plumas County CUPA Program facilities.

Date of Government Version: 06/19/2017
Date Data Arrived at EDR: 07/05/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 35
Source: Plumas County Environmental Health
Telephone: 530-283-6355
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

RIVERSIDE COUNTY:

Listing of Underground Tank Cleanup Sites
Riverside County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 04/18/2017
Date Data Arrived at EDR: 04/20/2017
Date Made Active in Reports: 04/21/2017
Number of Days to Update: 1
Source: Department of Environmental Health
Telephone: 951-358-5055
Last EDR Contact: 06/19/2017
Next Scheduled EDR Contact: 10/02/2017
Data Release Frequency: Quarterly

Underground Storage Tank Tank List
Underground storage tank sites located in Riverside county.

Date of Government Version: 01/19/2017
Date Data Arrived at EDR: 01/25/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 98
Source: Department of Environmental Health
Telephone: 951-358-5055
Last EDR Contact: 06/19/2017
Next Scheduled EDR Contact: 10/02/2017
Data Release Frequency: Quarterly

SACRAMENTO COUNTY:

Toxic Site Clean-Up List
List of sites where unauthorized releases of potentially hazardous materials have occurred.

Date of Government Version: 02/06/2017
Date Data Arrived at EDR: 04/04/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 127

Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Last EDR Contact: 07/06/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

Master Hazardous Materials Facility List

Any business that has hazardous materials on site - hazardous material storage sites, underground storage tanks, waste generators.

Date of Government Version: 05/03/2017
Date Data Arrived at EDR: 07/06/2017
Date Made Active in Reports: 08/22/2017
Number of Days to Update: 47

Source: Sacramento County Environmental Management
Telephone: 916-875-8406
Last EDR Contact: 07/06/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Quarterly

SAN BENITO COUNTY:

CUPA Facility List

Cupa facility list

Date of Government Version: 11/30/2016
Date Data Arrived at EDR: 02/09/2017
Date Made Active in Reports: 05/25/2017
Number of Days to Update: 105

Source: San Benito County Environmental Health
Telephone: N/A
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Varies

SAN BERNARDINO COUNTY:

Hazardous Material Permits

This listing includes underground storage tanks, medical waste handlers/generators, hazardous materials handlers, hazardous waste generators, and waste oil generators/handlers.

Date of Government Version: 05/30/2017
Date Data Arrived at EDR: 06/01/2017
Date Made Active in Reports: 08/25/2017
Number of Days to Update: 85

Source: San Bernardino County Fire Department Hazardous Materials Division
Telephone: 909-387-3041
Last EDR Contact: 08/07/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

SAN DIEGO COUNTY:

Hazardous Materials Management Division Database

The database includes: HE58 - This report contains the business name, site address, business phone number, establishment 'H' permit number, type of permit, and the business status. HE17 - In addition to providing the same information provided in the HE58 listing, HE17 provides inspection dates, violations received by the establishment, hazardous waste generated, the quantity, method of storage, treatment/disposal of waste and the hauler, and information on underground storage tanks. Unauthorized Release List - Includes a summary of environmental contamination cases in San Diego County (underground tank cases, non-tank cases, groundwater contamination, and soil contamination are included.)

Date of Government Version: 06/05/2017
Date Data Arrived at EDR: 06/07/2017
Date Made Active in Reports: 08/15/2017
Number of Days to Update: 69

Source: Hazardous Materials Management Division
Telephone: 619-338-2268
Last EDR Contact: 06/07/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Quarterly

Solid Waste Facilities
San Diego County Solid Waste Facilities.

Date of Government Version: 10/31/2015
Date Data Arrived at EDR: 11/07/2015
Date Made Active in Reports: 01/04/2016
Number of Days to Update: 58
Source: Department of Health Services
Telephone: 619-338-2209
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

Environmental Case Listing
The listing contains all underground tank release cases and projects pertaining to properties contaminated with hazardous substances that are actively under review by the Site Assessment and Mitigation Program.

Date of Government Version: 03/23/2010
Date Data Arrived at EDR: 06/15/2010
Date Made Active in Reports: 07/09/2010
Number of Days to Update: 24
Source: San Diego County Department of Environmental Health
Telephone: 619-338-2371
Last EDR Contact: 06/05/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: No Update Planned

SAN FRANCISCO COUNTY:

Local Oversite Facilities
A listing of leaking underground storage tank sites located in San Francisco county.

Date of Government Version: 09/19/2008
Date Data Arrived at EDR: 09/19/2008
Date Made Active in Reports: 09/29/2008
Number of Days to Update: 10
Source: Department Of Public Health San Francisco County
Telephone: 415-252-3920
Last EDR Contact: 08/07/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

Underground Storage Tank Information
Underground storage tank sites located in San Francisco county.

Date of Government Version: 05/03/2017
Date Data Arrived at EDR: 05/08/2017
Date Made Active in Reports: 08/25/2017
Number of Days to Update: 109
Source: Department of Public Health
Telephone: 415-252-3920
Last EDR Contact: 08/21/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Quarterly

SAN JOAQUIN COUNTY:

San Joaquin Co. UST
A listing of underground storage tank locations in San Joaquin county.

Date of Government Version: 03/21/2017
Date Data Arrived at EDR: 03/23/2017
Date Made Active in Reports: 05/09/2017
Number of Days to Update: 47
Source: Environmental Health Department
Telephone: N/A
Last EDR Contact: 08/28/2017
Next Scheduled EDR Contact: 10/02/2017
Data Release Frequency: Semi-Annually

SAN LUIS OBISPO COUNTY:

CUPA Facility List
Cupa Facility List.

Date of Government Version: 06/05/2017
Date Data Arrived at EDR: 06/16/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 54
Source: San Luis Obispo County Public Health Department
Telephone: 805-781-5596
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

SAN MATEO COUNTY:

Business Inventory
List includes Hazardous Materials Business Plan, hazardous waste generators, and underground storage tanks.

Date of Government Version: 03/15/2017
Date Data Arrived at EDR: 04/07/2017
Date Made Active in Reports: 05/10/2017
Number of Days to Update: 33
Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
Last EDR Contact: 06/09/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Annually

Fuel Leak List
A listing of leaking underground storage tank sites located in San Mateo county.

Date of Government Version: 06/15/2017
Date Data Arrived at EDR: 06/19/2017
Date Made Active in Reports: 08/22/2017
Number of Days to Update: 64
Source: San Mateo County Environmental Health Services Division
Telephone: 650-363-1921
Last EDR Contact: 06/09/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Semi-Annually

SANTA BARBARA COUNTY:

CUPA Facility Listing
CUPA Program Listing from the Environmental Health Services division.

Date of Government Version: 09/08/2011
Date Data Arrived at EDR: 09/09/2011
Date Made Active in Reports: 10/07/2011
Number of Days to Update: 28
Source: Santa Barbara County Public Health Department
Telephone: 805-686-8167
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

SANTA CLARA COUNTY:

Cupa Facility List
Cupa facility list

Date of Government Version: 02/22/2017
Date Data Arrived at EDR: 02/23/2017
Date Made Active in Reports: 05/23/2017
Number of Days to Update: 89
Source: Department of Environmental Health
Telephone: 408-918-1973
Last EDR Contact: 08/07/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

HIST LUST - Fuel Leak Site Activity Report
A listing of open and closed leaking underground storage tanks. This listing is no longer updated by the county. Leaking underground storage tanks are now handled by the Department of Environmental Health.

Date of Government Version: 03/29/2005
Date Data Arrived at EDR: 03/30/2005
Date Made Active in Reports: 04/21/2005
Number of Days to Update: 22
Source: Santa Clara Valley Water District
Telephone: 408-265-2600
Last EDR Contact: 03/23/2009
Next Scheduled EDR Contact: 06/22/2009
Data Release Frequency: No Update Planned

LOP Listing
A listing of leaking underground storage tanks located in Santa Clara county.

Date of Government Version: 03/03/2014
Date Data Arrived at EDR: 03/05/2014
Date Made Active in Reports: 03/18/2014
Number of Days to Update: 13
Source: Department of Environmental Health
Telephone: 408-918-3417
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 12/11/2017
Data Release Frequency: Annually

Hazardous Material Facilities
Hazardous material facilities, including underground storage tank sites.

Date of Government Version: 05/04/2017
Date Data Arrived at EDR: 05/08/2017
Date Made Active in Reports: 07/27/2017
Number of Days to Update: 80

Source: City of San Jose Fire Department
Telephone: 408-535-7694
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Annually

SANTA CRUZ COUNTY:

CUPA Facility List
CUPA facility listing.

Date of Government Version: 01/21/2017
Date Data Arrived at EDR: 02/22/2017
Date Made Active in Reports: 05/23/2017
Number of Days to Update: 90

Source: Santa Cruz County Environmental Health
Telephone: 831-464-2761
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

SHASTA COUNTY:

CUPA Facility List
Cupa Facility List.

Date of Government Version: 06/15/2017
Date Data Arrived at EDR: 06/19/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 51

Source: Shasta County Department of Resource Management
Telephone: 530-225-5789
Last EDR Contact: 08/21/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Varies

SOLANO COUNTY:

Leaking Underground Storage Tanks
A listing of leaking underground storage tank sites located in Solano county.

Date of Government Version: 06/15/2017
Date Data Arrived at EDR: 06/20/2017
Date Made Active in Reports: 08/22/2017
Number of Days to Update: 63

Source: Solano County Department of Environmental Management
Telephone: 707-784-6770
Last EDR Contact: 06/09/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

Underground Storage Tanks
Underground storage tank sites located in Solano county.

Date of Government Version: 06/15/2017
Date Data Arrived at EDR: 06/21/2017
Date Made Active in Reports: 08/29/2017
Number of Days to Update: 69

Source: Solano County Department of Environmental Management
Telephone: 707-784-6770
Last EDR Contact: 06/09/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

SONOMA COUNTY:

Cupa Facility List
Cupa Facility list

Date of Government Version: 06/23/2017
Date Data Arrived at EDR: 06/27/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 43

Source: County of Sonoma Fire & Emergency Services Department
Telephone: 707-565-1174
Last EDR Contact: 06/21/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Varies

Leaking Underground Storage Tank Sites

A listing of leaking underground storage tank sites located in Sonoma county.

Date of Government Version: 07/05/2017
Date Data Arrived at EDR: 07/06/2017
Date Made Active in Reports: 08/22/2017
Number of Days to Update: 47

Source: Department of Health Services
Telephone: 707-565-6565
Last EDR Contact: 06/21/2017
Next Scheduled EDR Contact: 10/09/2017
Data Release Frequency: Quarterly

STANISLAUS COUNTY:

CUPA Facility List

Cupa facility list

Date of Government Version: 05/10/2017
Date Data Arrived at EDR: 05/16/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 85

Source: Stanislaus County Department of Ennvironmental Protection
Telephone: 209-525-6751
Last EDR Contact: 07/17/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Varies

SUTTER COUNTY:

Underground Storage Tanks

Underground storage tank sites located in Sutter county.

Date of Government Version: 06/02/2017
Date Data Arrived at EDR: 06/06/2017
Date Made Active in Reports: 08/25/2017
Number of Days to Update: 80

Source: Sutter County Department of Agriculture
Telephone: 530-822-7500
Last EDR Contact: 06/02/2017
Next Scheduled EDR Contact: 09/18/2017
Data Release Frequency: Semi-Annually

TEHAMA COUNTY:

CUPA Facility List

Cupa facilities

Date of Government Version: 05/01/2017
Date Data Arrived at EDR: 05/08/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 93

Source: Tehama County Department of Environmental Health
Telephone: 530-527-8020
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Varies

TRINITY COUNTY:

CUPA Facility List

Cupa facility list

Date of Government Version: 04/24/2017
Date Data Arrived at EDR: 04/25/2017
Date Made Active in Reports: 08/09/2017
Number of Days to Update: 106

Source: Department of Toxic Substances Control
Telephone: 760-352-0381
Last EDR Contact: 07/21/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

TULARE COUNTY:

CUPA Facility List
Cupa program facilities

Date of Government Version: 01/05/2017
Date Data Arrived at EDR: 02/10/2017
Date Made Active in Reports: 05/25/2017
Number of Days to Update: 104

Source: Tulare County Environmental Health Services Division
Telephone: 559-624-7400
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 11/20/2017
Data Release Frequency: Varies

TUOLUMNE COUNTY:

CUPA Facility List
Cupa facility list

Date of Government Version: 04/27/2017
Date Data Arrived at EDR: 04/27/2017
Date Made Active in Reports: 08/10/2017
Number of Days to Update: 105

Source: Divison of Environmental Health
Telephone: 209-533-5633
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Varies

VENTURA COUNTY:

Business Plan, Hazardous Waste Producers, and Operating Underground Tanks
The BWT list indicates by site address whether the Environmental Health Division has Business Plan (B), Waste Producer (W), and/or Underground Tank (T) information.

Date of Government Version: 12/27/2016
Date Data Arrived at EDR: 01/27/2017
Date Made Active in Reports: 05/10/2017
Number of Days to Update: 103

Source: Ventura County Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 07/24/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

Inventory of Illegal Abandoned and Inactive Sites
Ventura County Inventory of Closed, Illegal Abandoned, and Inactive Sites.

Date of Government Version: 12/01/2011
Date Data Arrived at EDR: 12/01/2011
Date Made Active in Reports: 01/19/2012
Number of Days to Update: 49

Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 06/29/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Annually

Listing of Underground Tank Cleanup Sites
Ventura County Underground Storage Tank Cleanup Sites (LUST).

Date of Government Version: 05/29/2008
Date Data Arrived at EDR: 06/24/2008
Date Made Active in Reports: 07/31/2008
Number of Days to Update: 37

Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 08/10/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: Quarterly

Medical Waste Program List
To protect public health and safety and the environment from potential exposure to disease causing agents, the Environmental Health Division Medical Waste Program regulates the generation, handling, storage, treatment and disposal of medical waste throughout the County.

Date of Government Version: 09/26/2016
Date Data Arrived at EDR: 10/27/2016
Date Made Active in Reports: 01/24/2017
Number of Days to Update: 89

Source: Ventura County Resource Management Agency
Telephone: 805-654-2813
Last EDR Contact: 07/24/2017
Next Scheduled EDR Contact: 11/08/2017
Data Release Frequency: Quarterly

Underground Tank Closed Sites List
Ventura County Operating Underground Storage Tank Sites (UST)/Underground Tank Closed Sites List.

Date of Government Version: 02/27/2017
Date Data Arrived at EDR: 03/15/2017
Date Made Active in Reports: 05/03/2017
Number of Days to Update: 49
Source: Environmental Health Division
Telephone: 805-654-2813
Last EDR Contact: 08/24/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Quarterly

YOLO COUNTY:

Underground Storage Tank Comprehensive Facility Report
Underground storage tank sites located in Yolo county.

Date of Government Version: 06/29/2017
Date Data Arrived at EDR: 07/05/2017
Date Made Active in Reports: 08/25/2017
Number of Days to Update: 51
Source: Yolo County Department of Health
Telephone: 530-666-8646
Last EDR Contact: 06/29/2017
Next Scheduled EDR Contact: 10/16/2017
Data Release Frequency: Annually

YUBA COUNTY:

CUPA Facility List
CUPA facility listing for Yuba County.

Date of Government Version: 01/30/2017
Date Data Arrived at EDR: 01/31/2017
Date Made Active in Reports: 05/23/2017
Number of Days to Update: 112
Source: Yuba County Environmental Health Department
Telephone: 530-749-7523
Last EDR Contact: 07/27/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Varies

OTHER DATABASE(S)

Depending on the geographic area covered by this report, the data provided in these specialty databases may or may not be complete. For example, the existence of wetlands information data in a specific report does not mean that all wetlands in the area covered by the report are included. Moreover, the absence of any reported wetlands information does not necessarily mean that wetlands do not exist in the area covered by the report.

CT MANIFEST: Hazardous Waste Manifest Data
Facility and manifest data. Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a tsd facility.

Date of Government Version: 07/30/2013
Date Data Arrived at EDR: 08/19/2013
Date Made Active in Reports: 10/03/2013
Number of Days to Update: 45
Source: Department of Energy & Environmental Protection
Telephone: 860-424-3375
Last EDR Contact: 08/18/2017
Next Scheduled EDR Contact: 11/27/2017
Data Release Frequency: No Update Planned

NJ MANIFEST: Manifest Information
Hazardous waste manifest information.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 04/11/2017
Date Made Active in Reports: 07/27/2017
Number of Days to Update: 107
Source: Department of Environmental Protection
Telephone: N/A
Last EDR Contact: 07/10/2017
Next Scheduled EDR Contact: 10/23/2017
Data Release Frequency: Annually

NY MANIFEST: Facility and Manifest Data

Manifest is a document that lists and tracks hazardous waste from the generator through transporters to a TSD facility.

Date of Government Version: 01/30/2017
Date Data Arrived at EDR: 02/01/2017
Date Made Active in Reports: 02/13/2017
Number of Days to Update: 12

Source: Department of Environmental Conservation
Telephone: 518-402-8651
Last EDR Contact: 08/03/2017
Next Scheduled EDR Contact: 11/13/2017
Data Release Frequency: Annually

PA MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2015
Date Data Arrived at EDR: 07/22/2016
Date Made Active in Reports: 11/22/2016
Number of Days to Update: 123

Source: Department of Environmental Protection
Telephone: 717-783-8990
Last EDR Contact: 07/17/2017
Next Scheduled EDR Contact: 10/30/2017
Data Release Frequency: Annually

RI MANIFEST: Manifest information

Hazardous waste manifest information

Date of Government Version: 12/31/2013
Date Data Arrived at EDR: 06/19/2015
Date Made Active in Reports: 07/15/2015
Number of Days to Update: 26

Source: Department of Environmental Management
Telephone: 401-222-2797
Last EDR Contact: 08/21/2017
Next Scheduled EDR Contact: 12/04/2017
Data Release Frequency: Annually

WI MANIFEST: Manifest Information

Hazardous waste manifest information.

Date of Government Version: 12/31/2016
Date Data Arrived at EDR: 04/13/2017
Date Made Active in Reports: 07/14/2017
Number of Days to Update: 92

Source: Department of Natural Resources
Telephone: N/A
Last EDR Contact: 06/12/2017
Next Scheduled EDR Contact: 09/25/2017
Data Release Frequency: Annually

Oil/Gas Pipelines

Source: PennWell Corporation

Petroleum Bundle (Crude Oil, Refined Products, Petrochemicals, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)) N = Natural Gas Bundle (Natural Gas, Gas Liquids (LPG/NGL), and Specialty Gases (Miscellaneous)). This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Electric Power Transmission Line Data

Source: PennWell Corporation

This map includes information copyrighted by PennWell Corporation. This information is provided on a best effort basis and PennWell Corporation does not guarantee its accuracy nor warrant its fitness for any particular purpose. Such information has been reprinted with the permission of PennWell.

Sensitive Receptors: There are individuals deemed sensitive receptors due to their fragile immune systems and special sensitivity to environmental discharges. These sensitive receptors typically include the elderly, the sick, and children. While the location of all sensitive receptors cannot be determined, EDR indicates those buildings and facilities - schools, daycares, hospitals, medical centers, and nursing homes - where individuals who are sensitive receptors are likely to be located.

AHA Hospitals:

Source: American Hospital Association, Inc.
Telephone: 312-280-5991
The database includes a listing of hospitals based on the American Hospital Association's annual survey of hospitals.

Medical Centers: Provider of Services Listing

Source: Centers for Medicare & Medicaid Services
Telephone: 410-786-3000
A listing of hospitals with Medicare provider number, produced by Centers of Medicare & Medicaid Services, a federal agency within the U.S. Department of Health and Human Services.

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

Nursing Homes
Source: National Institutes of Health
Telephone: 301-594-6248
Information on Medicare and Medicaid certified nursing homes in the United States.
Public Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on elementary and secondary public education in the United States. It is a comprehensive, annual, national statistical database of all public elementary and secondary schools and school districts, which contains data that are comparable across all states.
Private Schools
Source: National Center for Education Statistics
Telephone: 202-502-7300
The National Center for Education Statistics' primary database on private school locations in the United States.
Daycare Centers: Licensed Facilities
Source: Department of Social Services
Telephone: 916-657-4041

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetland Inventory
Source: Department of Fish & Game
Telephone: 916-445-0411

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

STREET AND ADDRESS INFORMATION

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GEOCHECK ®- PHYSICAL SETTING SOURCE ADDENDUM

TARGET PROPERTY ADDRESS

29053 COOLIDGE AVE
29053 COOLIDGE AVE
CASTAIC, CA 91384

TARGET PROPERTY COORDINATES

Latitude (North):	34.45052 - 34° 27' 1.87''
Longitude (West):	118.657236 - 118° 39' 26.05''
Universal Tranverse Mercator:	Zone 11
UTM X (Meters):	347759.3
UTM Y (Meters):	3813160.5
Elevation:	1270 ft. above sea level

USGS TOPOGRAPHIC MAP

Target Property Map:	5636837 VAL VERDE, CA
Version Date:	2012
East Map:	5636847 NEWHALL, CA
Version Date:	2012

EDR's GeoCheck Physical Setting Source Addendum is provided to assist the environmental professional in forming an opinion about the impact of potential contaminant migration.

Assessment of the impact of contaminant migration generally has two principal investigative components:

1. Groundwater flow direction, and
2. Groundwater flow velocity.

Groundwater flow direction may be impacted by surface topography, hydrology, hydrogeology, characteristics of the soil, and nearby wells. Groundwater flow velocity is generally impacted by the nature of the geologic strata.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW DIRECTION INFORMATION

Groundwater flow direction for a particular site is best determined by a qualified environmental professional using site-specific well data. If such data is not reasonably ascertainable, it may be necessary to rely on other sources of information, such as surface topographic information, hydrologic information, hydrogeologic data collected on nearby properties, and regional groundwater flow information (from deep aquifers).

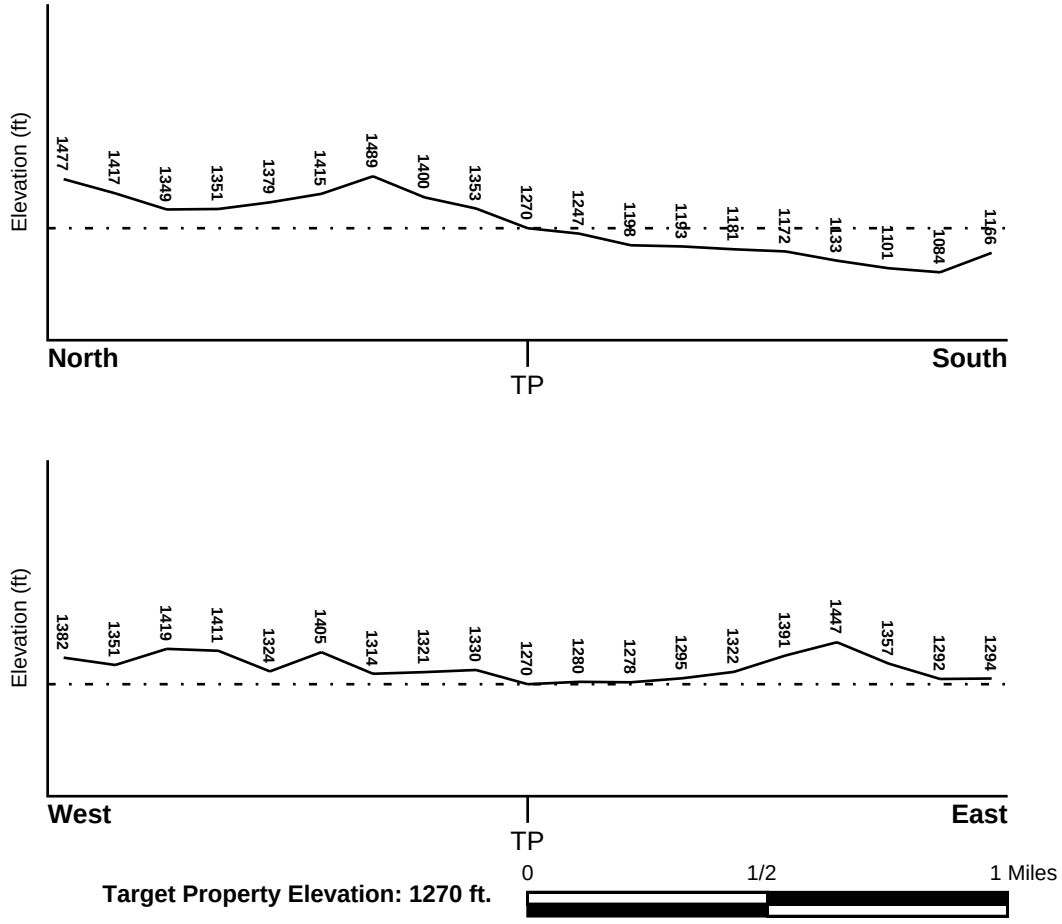
TOPOGRAPHIC INFORMATION

Surface topography may be indicative of the direction of surficial groundwater flow. This information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

TARGET PROPERTY TOPOGRAPHY

General Topographic Gradient: General South

SURROUNDING TOPOGRAPHY: ELEVATION PROFILES



Source: Topography has been determined from the USGS 7.5' Digital Elevation Model and should be evaluated on a relative (not an absolute) basis. Relative elevation information between sites of close proximity should be field verified.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

HYDROLOGIC INFORMATION

Surface water can act as a hydrologic barrier to groundwater flow. Such hydrologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Refer to the Physical Setting Source Map following this summary for hydrologic information (major waterways and bodies of water).

FEMA FLOOD ZONE

Flood Plain Panel at Target Property	FEMA Source Type
06037C0800F	FEMA FIRM Flood data

Additional Panels in search area:	FEMA Source Type
Not Reported	

NATIONAL WETLAND INVENTORY

NWI Quad at Target Property	NWI Electronic Data Coverage
VAL VERDE	YES - refer to the Overview Map and Detail Map

HYDROGEOLOGIC INFORMATION

Hydrogeologic information obtained by installation of wells on a specific site can often be an indicator of groundwater flow direction in the immediate area. Such hydrogeologic information can be used to assist the environmental professional in forming an opinion about the impact of nearby contaminated properties or, should contamination exist on the target property, what downgradient sites might be impacted.

Site-Specific Hydrogeological Data*:

Search Radius:	1.25 miles
Status:	Not found

AQUIFLOW®

Search Radius: 1.000 Mile.

EDR has developed the AQUIFLOW Information System to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted by environmental professionals to regulatory authorities at select sites and has extracted the date of the report, groundwater flow direction as determined hydrogeologically, and the depth to water table.

MAP ID	LOCATION FROM TP	GENERAL DIRECTION GROUNDWATER FLOW
Not Reported		

* ©1996 Site−specific hydrogeological data gathered by CERCLIS Alerts, Inc., Bainbridge Island, WA. All rights reserved. All of the information and opinions presented are those of the cited EPA report(s), which were completed under a Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) investigation.

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

GROUNDWATER FLOW VELOCITY INFORMATION

Groundwater flow velocity information for a particular site is best determined by a qualified environmental professional using site specific geologic and soil strata data. If such data are not reasonably ascertainable, it may be necessary to rely on other sources of information, including geologic age identification, rock stratigraphic unit and soil characteristics data collected on nearby properties and regional soil information. In general, contaminant plumes move more quickly through sandy-gravelly types of soils than silty-clayey types of soils.

GEOLOGIC INFORMATION IN GENERAL AREA OF TARGET PROPERTY

Geologic information can be used by the environmental professional in forming an opinion about the relative speed at which contaminant migration may be occurring.

ROCK STRATIGRAPHIC UNIT

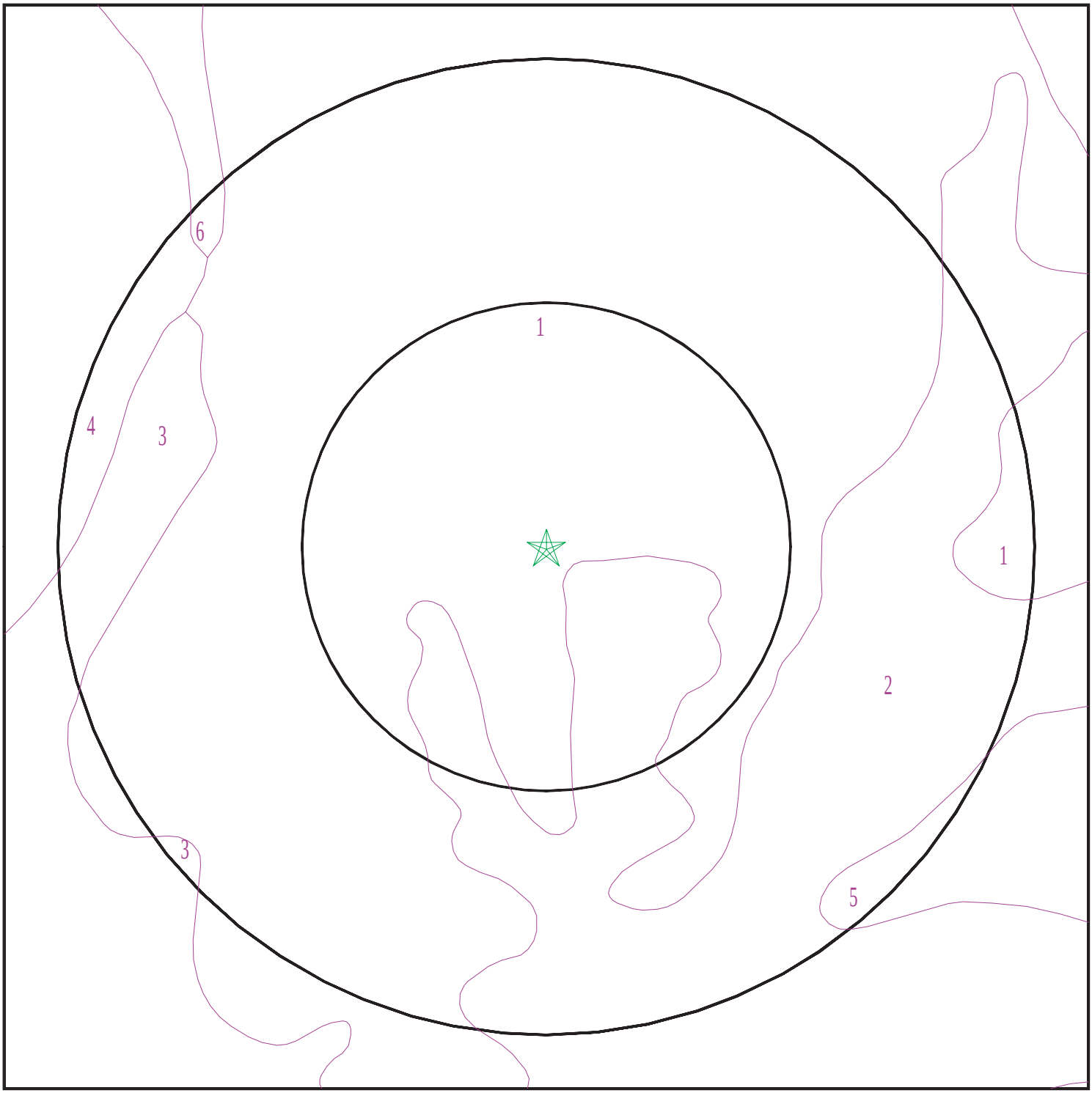
Era:	Cenozoic
System:	Tertiary
Series:	Pliocene
Code:	Tp *(decoded above as Era, System & Series)*

GEOLOGIC AGE IDENTIFICATION

Category: Stratified Sequence

Geologic Age and Rock Stratigraphic Unit Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - a digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

SSURGO SOIL MAP - 5037804.2s



SITE NAME:	29053 Coolidge Ave	CLIENT:	Citadel Environmental Services
ADDRESS:	29053 Coolidge Ave Castaic CA 91384	CONTACT:	Roopal Jani
LAT/LONG:	34.45052 / 118.657236	INQUIRY #:	5037804.2s
		DATE:	August 31, 2017 7:31 am

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GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

DOMINANT SOIL COMPOSITION IN GENERAL AREA OF TARGET PROPERTY

The U.S. Department of Agriculture's (USDA) Soil Conservation Service (SCS) leads the National Cooperative Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. The following information is based on Soil Conservation Service SSURGO data.

Soil Map ID: 1

Soil Component Name: Saugus

Soil Surface Texture: loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information

	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	14 inches	loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 14 Min: 4	Max: 7.3 Min: 6.1
2	14 inches	42 inches	loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 14 Min: 4	Max: 7.3 Min: 6.1
3	42 inches	46 inches	weathered bedrock	Not reported	Not reported	Max: 0 Min: 0	Max: Min:

Soil Map ID: 2

Soil Component Name: Yolo

Soil Surface Texture: loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	18 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 7.3 Min: 5.6
2	18 inches	72 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 14 Min: 4	Max: 7.3 Min: 5.6

Soil Map ID: 3

Soil Component Name: Hanford

Soil Surface Texture: sandy loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: Low

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	7 inches	sandy loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 42 Min: 14	Max: 7.3 Min: 6.1
2	7 inches	70 inches	fine sandy loam	Granular materials (35 pct. or less passing No. 200), Silty, or Clayey Gravel and Sand.	COARSE-GRAINED SOILS, Sands, Sands with fines, Silty Sand.	Max: 42 Min: 14	Max: 7.8 Min: 6.1

Soil Map ID: 4

Soil Component Name: Castaic

Soil Surface Texture: silty clay loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	9 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 4 Min: 1.4	Max: 7.3 Min: 6.1
2	9 inches	25 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 4 Min: 1.4	Max: 7.8 Min: 6.6
3	25 inches	29 inches	weathered bedrock	Not reported	Not reported	Max: 1.4 Min: 0.42	Max: Min:

Soil Map ID: 5

Soil Component Name: Castaic

Soil Surface Texture: silty clay loam

Hydrologic Group: Class C - Slow infiltration rates. Soils with layers impeding downward movement of water, or soils with moderately fine or fine textures.

Soil Drainage Class: Well drained

Hydric Status: Partially hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	9 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 4 Min: 1.4	Max: 7.3 Min: 6.1

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
2	9 inches	25 inches	silty clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 4 Min: 1.4	Max: 7.8 Min: 6.6
3	25 inches	29 inches	weathered bedrock	Not reported	Not reported	Max: 1.4 Min: 0.42	Max: Min:

Soil Map ID: 6

Soil Component Name: Zamora

Soil Surface Texture: loam

Hydrologic Group: Class B - Moderate infiltration rates. Deep and moderately deep, moderately well and well drained soils with moderately coarse textures.

Soil Drainage Class: Well drained

Hydric Status: Not hydric

Corrosion Potential - Uncoated Steel: High

Depth to Bedrock Min: > 0 inches

Depth to Watertable Min: > 0 inches

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
1	0 inches	11 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 6.5 Min: 6.1
2	11 inches	35 inches	clay loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Clayey Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay	Max: 4 Min: 1.4	Max: 7.3 Min: 6.1

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

Soil Layer Information							
	Boundary			Classification		Saturated hydraulic conductivity micro m/sec	Soil Reaction (pH)
Layer	Upper	Lower	Soil Texture Class	AASHTO Group	Unified Soil		
3	35 inches	83 inches	loam	Silt-Clay Materials (more than 35 pct. passing No. 200), Silty Soils.	FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), Lean Clay. FINE-GRAINED SOILS, Silts and Clays (liquid limit less than 50%), silt.	Max: 14 Min: 4	Max: 8.4 Min: 7.4

LOCAL / REGIONAL WATER AGENCY RECORDS

EDR Local/Regional Water Agency records provide water well information to assist the environmental professional in assessing sources that may impact ground water flow direction, and in forming an opinion about the impact of contaminant migration on nearby drinking water wells.

WELL SEARCH DISTANCE INFORMATION

DATABASE	SEARCH DISTANCE (miles)
Federal USGS	1.000
Federal FRDS PWS	Nearest PWS within 0.001 miles
State Database	1.000

FEDERAL USGS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

FEDERAL FRDS PUBLIC WATER SUPPLY SYSTEM INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
No PWS System Found		

Note: PWS System location is not always the same as well location.

STATE DATABASE WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP

GEOCHECK® - PHYSICAL SETTING SOURCE SUMMARY

STATE DATABASE WELL INFORMATION

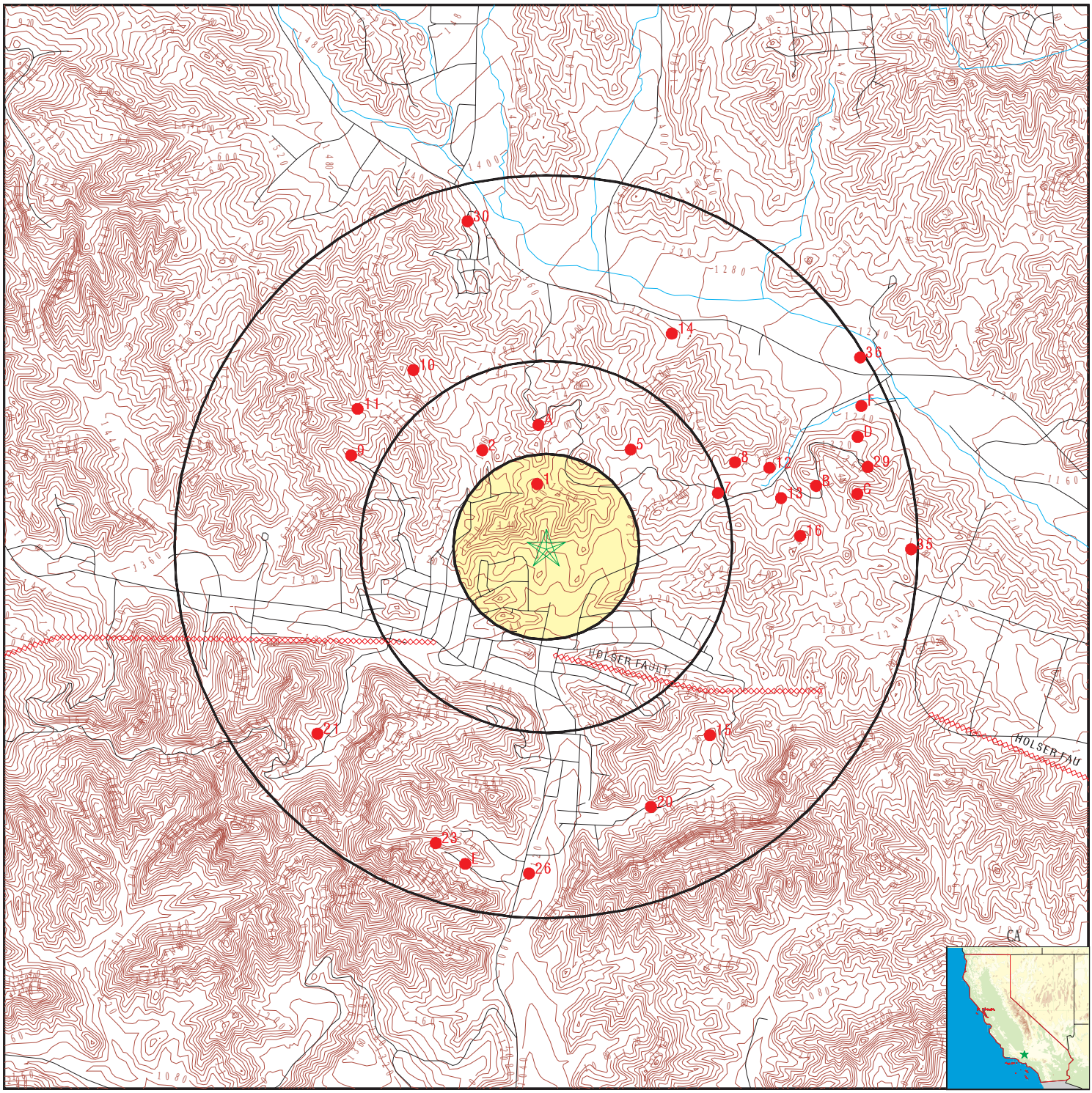
MAP ID	WELL ID	LOCATION FROM TP
No Wells Found		

OTHER STATE DATABASE INFORMATION

STATE OIL/GAS WELL INFORMATION

MAP ID	WELL ID	LOCATION FROM TP
1	CAOG11000294432	1/8 - 1/4 Mile North
2	CAOG11000281177	1/4 - 1/2 Mile NNW
A4	CAOG11000282976	1/4 - 1/2 Mile North
A3	CAOG11000282975	1/4 - 1/2 Mile North
5	CAOG11000281175	1/4 - 1/2 Mile NE
A6	CAOG11000281176	1/4 - 1/2 Mile North
7	CAOG11000280985	1/4 - 1/2 Mile ENE
8	CAOG11000283219	1/2 - 1 Mile ENE
9	CAOG11000280901	1/2 - 1 Mile WNW
10	CAOG11000280710	1/2 - 1 Mile NW
11	CAOG11000283192	1/2 - 1 Mile NW
12	CAOG11000283201	1/2 - 1 Mile ENE
13	CAOG11000280642	1/2 - 1 Mile ENE
14	CAOG11000280967	1/2 - 1 Mile NNE
15	CAOG11000280947	1/2 - 1 Mile SE
16	CAOG11000283108	1/2 - 1 Mile East
B17	CAOG11000283072	1/2 - 1 Mile ENE
B18	CAOG11000283051	1/2 - 1 Mile ENE
B19	CAOG11000283069	1/2 - 1 Mile East
20	CAOG11000280795	1/2 - 1 Mile SSE
21	CAOG11000280868	1/2 - 1 Mile SW
C22	CAOG11000283083	1/2 - 1 Mile East
23	CAOG11000280962	1/2 - 1 Mile SSW
D24	CAOG11000284017	1/2 - 1 Mile ENE
E25	CAOG11000281093	1/2 - 1 Mile SSW
26	CAOG11000281100	1/2 - 1 Mile South
C27	CAOG11000282945	1/2 - 1 Mile East
E28	CAOG11000283405	1/2 - 1 Mile SSW
29	CAOG11000281174	1/2 - 1 Mile ENE
30	CAOG11000280791	1/2 - 1 Mile NNW
F31	CAOG11000284018	1/2 - 1 Mile ENE
D32	CAOG11000283284	1/2 - 1 Mile ENE
F33	CAOG11000283882	1/2 - 1 Mile ENE
F34	CAOG11000283026	1/2 - 1 Mile ENE
35	CAOG11000280944	1/2 - 1 Mile East
36	CAOG11000283036	1/2 - 1 Mile ENE

PHYSICAL SETTING SOURCE MAP - 5037804.2s



- County Boundary
- Major Roads
- Contour Lines
- Earthquake Fault Lines
- Earthquake epicenter, Richter 5 or greater
- Water Wells
- Public Water Supply Wells
- Cluster of Multiple Icons
- Groundwater Flow Direction
- Indeterminate Groundwater Flow at Location
- Groundwater Flow Varies at Location
- Closest Hydrogeological Data
- Oil, gas or related wells

SITE NAME:	29053 Coolidge Ave	CLIENT:	Citadel Environmental Services
ADDRESS:	29053 Coolidge Ave Castaic CA 91384	CONTACT:	Roopal Jani
		INQUIRY #:	5037804.2s
LAT/LONG:	34.45052 / 118.657236	DATE:	August 31, 2017 7:31 am

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GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

1
North **OIL_GAS** **CAOG11000294432**
1/8 - 1/4 Mile

District nun:	2	Api number:	03705395
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Fernando Oil Co.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Well No.	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000294432		

2
NNW **OIL_GAS** **CAOG11000281177**
1/4 - 1/2 Mile

District nun:	2	Api number:	03707261
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	P
Operator name:	Porsco Operating Co.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	4
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Claiborne	Wellnumber:	88-4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	POG
Site id:	CAOG11000281177		

A4
North **OIL_GAS** **CAOG11000282976**
1/4 - 1/2 Mile

District nun:	2	Api number:	03721689
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	P
Operator name:	Petrominerals Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Hilgenfeld	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	POG
Site id:	CAOG11000282976		

A3
North **OIL_GAS** **CAOG11000282975**
1/4 - 1/2 Mile

District nun:	2	Api number:	03721689
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	P
Operator name:	Petrominerals Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Hilgenfeld	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	POG
Site id:	CAOG11000282975		

5
NE **OIL_GAS** **CAOG11000281175**
1/4 - 1/2 Mile

District nun:	2	Api number:	03707259
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Federal Oil Company		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Federal-Towle	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000281175		

A6
North **OIL_GAS** **CAOG11000281176**
1/4 - 1/2 Mile

District nun:	2	Api number:	03707260
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	G. R. Nance Co., Inc.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Towle	Wellnumber:	17
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000281176		

7
ENE **OIL_GAS** **CAOG11000280985**
1/4 - 1/2 Mile

District nun:	2	Api number:	03706205
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	U. S. Natural Gas Corp. & Fred Manning		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Strawn	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280985		

Map ID
Direction
Distance

Database EDR ID Number

8
ENE **OIL_GAS** **CAOG11000283219**
1/2 - 1 Mile

District nun:	2	Api number:	03722072
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Petrominerals Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	5
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000283219		

9
WNW **OIL_GAS** **CAOG11000280901**
1/2 - 1 Mile

District nun:	2	Api number:	03706002
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Any Field
Area name:	Any Area	Section:	4
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Viregain	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280901		

10
NW **OIL_GAS** **CAOG11000280710**
1/2 - 1 Mile

District nun:	2	Api number:	03705361
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Douglas Oil Company of California		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	4
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Oak Canyon	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280710		

11
NW **OIL_GAS** **CAOG11000283192**
1/2 - 1 Mile

District nun:	2	Api number:	03722053
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Blackfoot-Cherokee Energy Inc.		
County name:	Los Angeles	Fieldname:	Any Field
Area name:	Any Area	Section:	4
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Donchin	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000283192		

12
ENE **OIL_GAS** **CAOG11000283201**
1/2 - 1 Mile

District nun:	2	Api number:	03722060
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	FR S/4 COR 308N 899E		
Gissourcec:	gps		

Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	4
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000283201		

13
ENE **OIL_GAS** **CAOG11000280642**
1/2 - 1 Mile

District nun:	2	Api number:	03705148
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Atlantic Oil Company		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Strawn	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280642		

14
NNE **OIL_GAS** **CAOG11000280967**
1/2 - 1 Mile

District nun:	2	Api number:	03706126
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Any Field
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Towle	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280967		

Map ID
Direction
Distance

Database EDR ID Number

15
SE
1/2 - 1 Mile

OIL_GAS **CAOG11000280947**

District nun:	2	Api number:	03706091
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Any Field
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Malis	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280947		

16
East
1/2 - 1 Mile

OIL_GAS **CAOG11000283108**

District nun:	2	Api number:	03721871
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	P
Operator name:	Petrominerals Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	FR NE COR 810S 1120W		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Sterling	Wellnumber:	3-10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	POG
Site id:	CAOG11000283108		

B17
ENE
1/2 - 1 Mile

OIL_GAS **CAOG11000283072**

District nun:	2	Api number:	03721805
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	3
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	15-SEP-77
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000283072		

B18
ENE **OIL_GAS** **CAOG11000283051**
1/2 - 1 Mile

District nun:	2	Api number:	03721715
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	2
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	11-JAN-76
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000283051		

B19
East **OIL_GAS** **CAOG11000283069**
1/2 - 1 Mile

District nun:	2	Api number:	03721801
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	P
Operator name:	Petrominerals Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		

Comments:	Not Reported		
Leasename:	Sterling	Wellnumber:	1-10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	POG
Site id:	CAOG11000283069		

20
SSE **OIL_GAS** **CAOG11000280795**
1/2 - 1 Mile

District nun:	2	Api number:	03705621
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Marathon Oil Company		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Mabel S. Henderson	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280795		

21
SW **OIL_GAS** **CAOG11000280868**
1/2 - 1 Mile

District nun:	2	Api number:	03705882
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Shell Western Exploration & Production Inc.		
County name:	Los Angeles	Fieldname:	Any Field
Area name:	Any Area	Section:	9
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Daugherty	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280868		

Map ID
Direction
Distance

Database EDR ID Number

C22
East
1/2 - 1 Mile

OIL_GAS **CAOG11000283083**

District nun:	2	Api number:	03721816
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	P
Operator name:	Petrominerals Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Sterling	Wellnumber:	2-10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	POG
Site id:	CAOG11000283083		

23
SSW
1/2 - 1 Mile

OIL_GAS **CAOG11000280962**

District nun:	2	Api number:	03706117
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Any Field
Area name:	Any Area	Section:	9
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Seaboard-So Cal Pet. Daugherty	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280962		

D24
ENE
1/2 - 1 Mile

OIL_GAS **CAOG11000284017**

District nun:	2	Api number:	03724290
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	11
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	29-JUL-05
Welldeptha:	0		
Redrillfoo:	5900		
Abandonedd:	Not Reported	Completion:	01-SEP-05
Directiona:	Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000284017		

E25
SSW **OIL_GAS** **CAOG11000281093**
1/2 - 1 Mile

District nun:	2	Api number:	03706664
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Rothschild Oil Company		
County name:	Los Angeles	Fieldname:	Del Valle
Area name:	Kinler (ABD)	Section:	16
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Barbour	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	03-DEC-52
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000281093		

26
South **OIL_GAS** **CAOG11000281100**
1/2 - 1 Mile

District nun:	2	Api number:	03706671
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Del Valle
Area name:	Kinler (ABD)	Section:	15
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		

Comments:	Not Reported		
Leasename:	Boobier	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	13-JAN-47
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000281100		

C27
East
1/2 - 1 Mile

OIL_GAS **CAOG11000282945**

District nun:	2	Api number:	03721466
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Montara Petroleum Co.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	10
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Sterling	Wellnumber:	81X
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000282945		

E28
SSW
1/2 - 1 Mile

OIL_GAS **CAOG11000283405**

District nun:	2	Api number:	03722947
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	P
Operator name:	PanCanadian Petroleum Company		
County name:	Los Angeles	Fieldname:	Del Valle
Area name:	Kinler (ABD)	Section:	16
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	N. L. & F.	Wellnumber:	1-16
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Directionally drilled	Gissymbol:	POG
Site id:	CAOG11000283405		

Map ID
Direction
Distance

Database EDR ID Number

29
ENE
1/2 - 1 Mile

OIL_GAS **CAOG11000281174**

District nun:	2	Api number:	03707258
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Mabel E. Strawn	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	09-AUG-58
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000281174		

30
NNW
1/2 - 1 Mile

OIL_GAS **CAOG11000280791**

District nun:	2	Api number:	03705614
Blm well:	Y	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Marathon Oil Company		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	4
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Douglas	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280791		

F31
ENE
1/2 - 1 Mile

OIL_GAS **CAOG11000284018**

District nun:	2	Api number:	03724291
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	14
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	11-JUL-05
Welldeptha:	0		
Redrillfoo:	5900		
Abandonedd:	Not Reported	Completion:	01-SEP-05
Directiona:	Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000284018		

D32
ENE **OIL_GAS** **CAOG11000283284**
1/2 - 1 Mile

District nun:	2	Api number:	03722340
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	FR SE COR 775N 317W		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	04-NOV-81
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000283284		

F33
ENE **OIL_GAS** **CAOG11000283882**
1/2 - 1 Mile

District nun:	2	Api number:	03724196
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	gps		

Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	10
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000283882		

F34
ENE **OIL_GAS** **CAOG11000283026**
1/2 - 1 Mile

District nun:	2	Api number:	03722727
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	I
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	FR SE COR 1178N 317W		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Mabel Strawn	Wellnumber:	7
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	07-DEC-82
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000283026		

35
East **OIL_GAS** **CAOG11000280944**
1/2 - 1 Mile

District nun:	2	Api number:	03706082
Blm well:	N	Redrill can:	No
Dryhole:	Y	Well status:	P
Operator name:	Chevron U.S.A. Inc.		
County name:	Los Angeles	Fieldname:	Any Field
Area name:	Any Area	Section:	11
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	Not Reported		
Gissourcec:	hud		
Comments:	Not Reported		
Leasename:	Fernando	Wellnumber:	1
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	Not Reported
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Not Directionally drilled	Gissymbol:	PDH
Site id:	CAOG11000280944		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS

Map ID
Direction
Distance

Database EDR ID Number

36
ENE
1/2 - 1 Mile

OIL_GAS **CAOG11000283036**

District nun:	2	Api number:	03722740
Blm well:	N	Redrill can:	No
Dryhole:	N	Well status:	A
Operator name:	Crimson Resource Management Corp.		
County name:	Los Angeles	Fieldname:	Hasley Canyon
Area name:	Any Area	Section:	3
Township:	04N	Range:	17W
Base meridian:	SB	Elevation:	Not Reported
Locationde:	FR SE COR 1900 N 440 W		
Gissourcec:	gps		
Comments:	Not Reported		
Leasename:	Burns Crist	Wellnumber:	6
Epawell:	N	Hydraulica:	N
Confidenti:	N	Spuddate:	12-MAY-83
Welldeptha:	0		
Redrillfoo:	0		
Abandonedd:	Not Reported	Completion:	Not Reported
Directiona:	Directionally drilled	Gissymbol:	AOG
Site id:	CAOG11000283036		

GEOCHECK® - PHYSICAL SETTING SOURCE MAP FINDINGS
RADON

AREA RADON INFORMATION

State Database: CA Radon

Radon Test Results

Zipcode	Num Tests	> 4 pCi/L
91384	23	0

Federal EPA Radon Zone for LOS ANGELES County: 2

Note: Zone 1 indoor average level > 4 pCi/L.
: Zone 2 indoor average level >= 2 pCi/L and <= 4 pCi/L.
: Zone 3 indoor average level < 2 pCi/L.

Federal Area Radon Information for LOS ANGELES COUNTY, CA

Number of sites tested: 63

Area	Average Activity	% <4 pCi/L	% 4-20 pCi/L	% >20 pCi/L
Living Area - 1st Floor	0.711 pCi/L	98%	2%	0%
Living Area - 2nd Floor	Not Reported	Not Reported	Not Reported	Not Reported
Basement	0.933 pCi/L	100%	0%	0%

PHYSICAL SETTING SOURCE RECORDS SEARCHED

TOPOGRAPHIC INFORMATION

USGS 7.5' Digital Elevation Model (DEM)
Source: United States Geologic Survey
EDR acquired the USGS 7.5' Digital Elevation Model in 2002 and updated it in 2006. The 7.5 minute DEM corresponds to the USGS 1:24,000- and 1:25,000-scale topographic quadrangle maps. The DEM provides elevation data with consistent elevation units and projection.

Current USGS 7.5 Minute Topographic Map
Source: U.S. Geological Survey

HYDROLOGIC INFORMATION

Flood Zone Data: This data was obtained from the Federal Emergency Management Agency (FEMA). It depicts 100-year and 500-year flood zones as defined by FEMA. It includes the National Flood Hazard Layer (NFHL) which incorporates Flood Insurance Rate Map (FIRM) data and Q3 data from FEMA in areas not covered by NFHL.
Source: FEMA
Telephone: 877-336-2627
Date of Government Version: 2003, 2015

NWI: National Wetlands Inventory. This data, available in select counties across the country, was obtained by EDR in 2002, 2005 and 2010 from the U.S. Fish and Wildlife Service.

State Wetlands Data: Wetland Inventory
Source: Department of Fish & Game
Telephone: 916-445-0411

HYDROGEOLOGIC INFORMATION

AQUIFLOW^{R} Information System
Source: EDR proprietary database of groundwater flow information
EDR has developed the AQUIFLOW Information System (AIS) to provide data on the general direction of groundwater flow at specific points. EDR has reviewed reports submitted to regulatory authorities at select sites and has extracted the date of the report, hydrogeologically determined groundwater flow direction and depth to water table information.

GEOLOGIC INFORMATION

Geologic Age and Rock Stratigraphic Unit
Source: P.G. Schruben, R.E. Arndt and W.J. Bawiec, Geology of the Conterminous U.S. at 1:2,500,000 Scale - A digital representation of the 1974 P.B. King and H.M. Beikman Map, USGS Digital Data Series DDS - 11 (1994).

STATSGO: State Soil Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) leads the national Conservation Soil Survey (NCSS) and is responsible for collecting, storing, maintaining and distributing soil survey information for privately owned lands in the United States. A soil map in a soil survey is a representation of soil patterns in a landscape. Soil maps for STATSGO are compiled by generalizing more detailed (SSURGO) soil survey maps.

SSURGO: Soil Survey Geographic Database
Source: Department of Agriculture, Natural Resources Conservation Service (NRCS)
Telephone: 800-672-5559
SSURGO is the most detailed level of mapping done by the Natural Resources Conservation Service, mapping scales generally range from 1:12,000 to 1:63,360. Field mapping methods using national standards are used to construct the soil maps in the Soil Survey Geographic (SSURGO) database. SSURGO digitizing duplicates the original soil survey maps. This level of mapping is designed for use by landowners, townships and county natural resource planning and management.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

LOCAL / REGIONAL WATER AGENCY RECORDS

FEDERAL WATER WELLS

PWS: Public Water Systems
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Public Water System data from the Federal Reporting Data System. A PWS is any water system which provides water to at least 25 people for at least 60 days annually. PWSs provide water from wells, rivers and other sources.

PWS ENF: Public Water Systems Violation and Enforcement Data
Source: EPA/Office of Drinking Water
Telephone: 202-564-3750
Violation and Enforcement data for Public Water Systems from the Safe Drinking Water Information System (SDWIS) after August 1995. Prior to August 1995, the data came from the Federal Reporting Data System (FRDS).

USGS Water Wells: USGS National Water Inventory System (NWIS)
This database contains descriptive information on sites where the USGS collects or has collected data on surface water and/or groundwater. The groundwater data includes information on wells, springs, and other sources of groundwater.

STATE RECORDS

Water Well Database
Source: Department of Water Resources
Telephone: 916-651-9648

California Drinking Water Quality Database
Source: Department of Public Health
Telephone: 916-324-2319
The database includes all drinking water compliance and special studies monitoring for the state of California since 1984. It consists of over 3,200,000 individual analyses along with well and water system information.

OTHER STATE DATABASE INFORMATION

California Oil and Gas Well Locations
Source: Department of Conservation
Telephone: 916-323-1779
Oil and Gas well locations in the state.

RADON

State Database: CA Radon
Source: Department of Health Services
Telephone: 916-324-2208
Radon Database for California

Area Radon Information
Source: USGS
Telephone: 703-356-4020
The National Radon Database has been developed by the U.S. Environmental Protection Agency (USEPA) and is a compilation of the EPA/State Residential Radon Survey and the National Residential Radon Survey. The study covers the years 1986 - 1992. Where necessary data has been supplemented by information collected at private sources such as universities and research institutions.

EPA Radon Zones
Source: EPA
Telephone: 703-356-4020
Sections 307 & 309 of IRAA directed EPA to list and identify areas of U.S. with the potential for elevated indoor radon levels.

PHYSICAL SETTING SOURCE RECORDS SEARCHED

OTHER

Airport Landing Facilities: Private and public use landing facilities
Source: Federal Aviation Administration, 800-457-6656

Epicenters: World earthquake epicenters, Richter 5 or greater
Source: Department of Commerce, National Oceanic and Atmospheric Administration

California Earthquake Fault Lines: The fault lines displayed on EDR's Topographic map are digitized quaternary fault lines, prepared in 1975 by the United State Geological Survey. Additional information (also from 1975) regarding activity at specific fault lines comes from California's Preliminary Fault Activity Map prepared by the California Division of Mines and Geology.

STREET AND ADDRESS INFORMATION

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CITADEL
ENVIRONMENTAL SERVICES, INC.

Appendix L
EDR Vapor Encroachment Screen

29053 Coolidge Ave
29053 Coolidge Ave
Castaic, CA 91384

Inquiry Number: 5037804.2s
August 31, 2017

EDR Vapor Encroachment Screen

Prepared using EDR's Vapor Encroachment Worksheet

EDR® Environmental Data Resources Inc

6 Armstrong Road, 4th floor
Shelton, CT 06484
Toll Free: 800.352.0050
www.edrnet.com

TABLE OF CONTENTS

SECTION	PAGE
Executive Summary	**ES1**
Primary Map	**2**
Secondary Map	**3**
Map Findings	**4**
Record Sources and Currency	**GR-1**

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

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EXECUTIVE SUMMARY

A search of available environmental records was conducted by EDR. The report was designed to assist parties seeking to meet the search requirements of the ASTM Standard Practice for Assessment of Vapor Encroachment into Structures on Property Involved in Real Estate Transactions (E 2600).

STANDARD ENVIRONMENTAL RECORDS	Default Area of Concern (Miles)*	property	1/10	> 1/10
Federal NPL site list	1.0	0	0	0
Federal Delisted NPL site list	1.0	0	0	0
Federal CERCLIS list	0.5	0	0	0
Federal CERCLIS NFRAP site list	0.5	0	0	0
Federal RCRA CORRACTS facilities list	1.0	0	0	0
Federal RCRA non-CORRACTS TSD facilities list	0.5	0	0	0
Federal RCRA generators list	0.25	0	0	0
Federal institutional controls / engineering controls registries	0.5	0	0	0
Federal ERNS list	0.001	0	0	-
State- and tribal - equivalent NPL	1.0	0	0	0
State- and tribal - equivalent CERCLIS	1.0	0	0	0
State and tribal landfill and/or solid waste disposal site lists	0.5	0	0	0
State and tribal leaking storage tank lists	0.5	0	1	1
State and tribal registered storage tank lists	0.25	0	1	1
State and tribal institutional control / engineering control registries	not searched	-	-	-
State and tribal voluntary cleanup sites	0.5	0	0	0
State and tribal Brownfields sites	0.5	0	0	0

ADDITIONAL ENVIRONMENTAL RECORDS				
Local Brownfield lists	0.5	0	0	0
Local Lists of Landfill / Solid Waste Disposal Sites	0.5	0	0	0
Local Lists of Hazardous waste / Contaminated Sites	1.0	1	0	1
Local Lists of Registered Storage Tanks	0.25	0	0	0
Local Land Records	0.5	0	0	0
Records of Emergency Release Reports	0.5	0	0	0
Other Ascertainable Records	1.0	1	0	1
EDR Exclusive Records	1.0	0	1	1
Exclusive Recovered Govt. Archives	0.001	0	0	-

*The Default Area of Concern may be adjusted by the environmental professional using experience and professional judgement. Each category may include several databases, and each database may have a different distance. A list of individual databases is provided at the back of this report.

EXECUTIVE SUMMARY

TARGET PROPERTY INFORMATION

ADDRESS

29053 COOLIDGE AVE
29053 COOLIDGE AVE
CASTAIC, CA 91384

COORDINATES

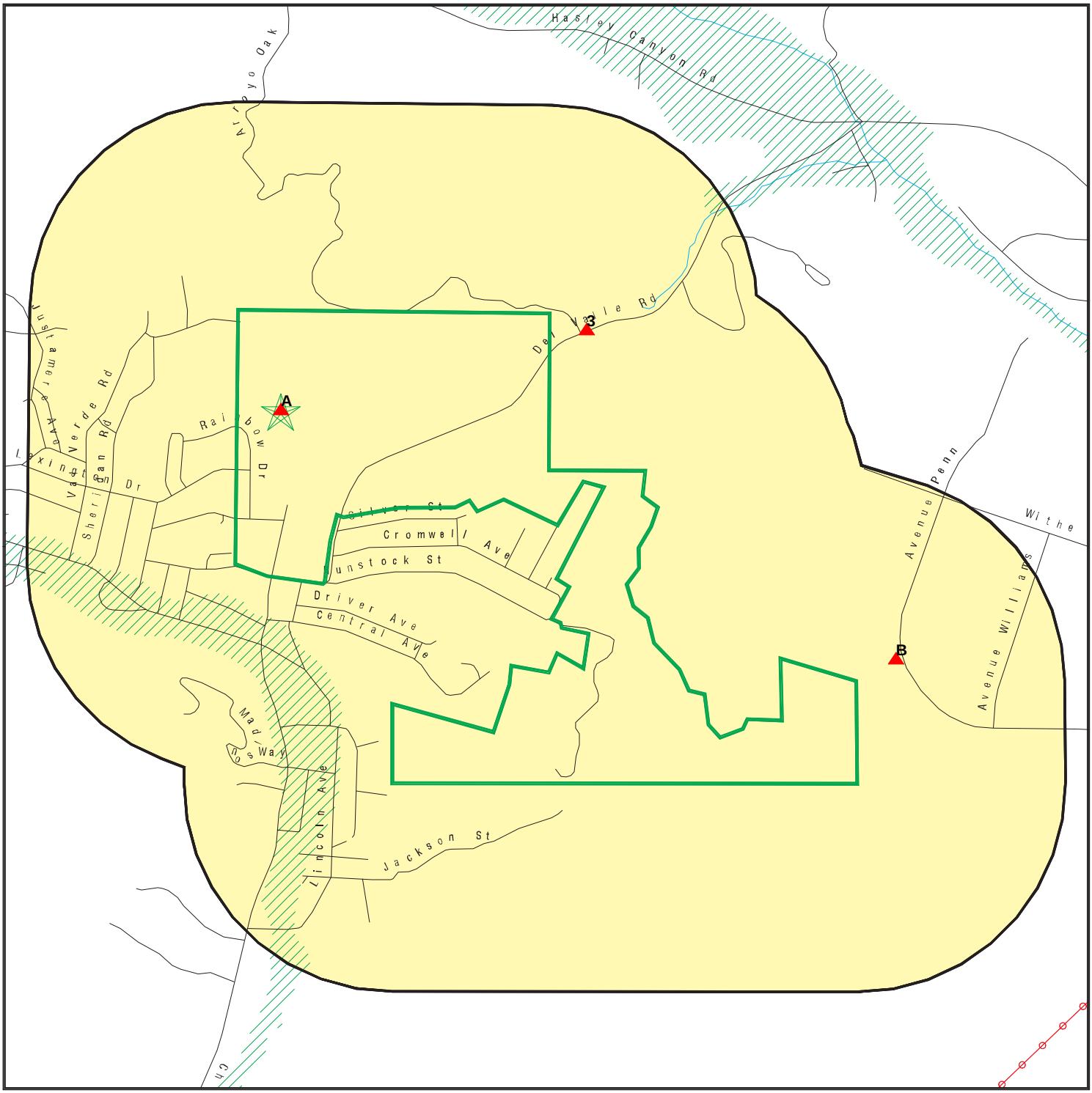
Latitude (North):	34.45052 - 34° 27′ 1.8704224″
Longitude (West):	118.657236 - 118° 39′ 26.04309″
Elevation:	1270 ft. above sea level

SEARCH RESULTS

Unmappable (orphan) sites are not considered in the foregoing analysis.

Name	Address	Dist/Dir	Map ID	Page
CLANDESTINE DRUG LAB OPERATOR UNKNOWN HAZNET	29053 1/2 COOLIDGE AVE	Property	▲ A1	6
29053 1/2 COOLIDGE AVE CDL	29053 1/2 COOLIDGE AVE	Property	▲ A2	6
UNOCAL - DEL VALLE SLIC	DEL VALLE RD	<1/10 ENE	▲ 3	7
B & M TRUCK REPAIR EDR Hist Auto	28915 AVENUE PENN	<1/10 ESE	▲ B4	7
DD DIESEL UST	28915 N AVENUE PENN	<1/10 ESE	▲ B5	8

PRIMARY MAP - 5037804.2S



Target Property

Sites at elevations higher than or equal to the target property

Sites at elevations lower than the target property

Manufactured Gas Plants

Sensitive Receptors

National Priority List Sites

Dept. Defense Sites

0 300 1/3 1/2 Miles

Indian Reservations BIA

Power transmission lines

100-year flood zone

500-year flood zone

Areas of Concern

N

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: 29053 Coolidge Ave ADDRESS: 29053 Coolidge Ave Castaic CA 91384 LAT/LONG: 34.45052 / 118.657236	CLIENT: Citadel Environmental Services CONTACT: Roopal Jani INQUIRY #: 5037804.2s DATE: August 31, 2017 7:29 am

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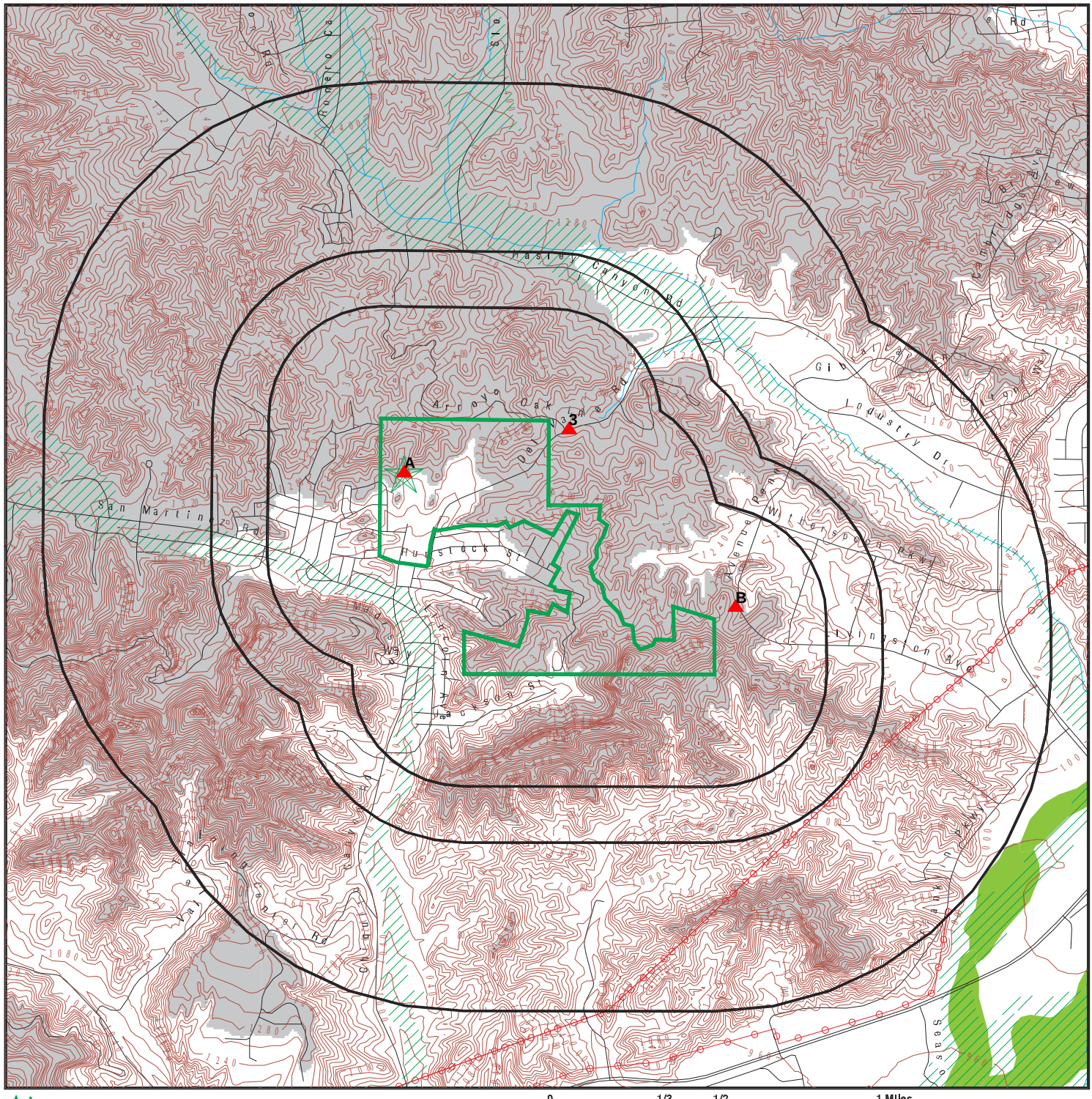
SECONDARY MAP - 5037804.2S



0 1/3 1/2 1 Miles

- Target Property
- Sites at elevations higher than or equal to the target property
- Sites at elevations lower than the target property
- Manufactured Gas Plants
- National Priority List Sites
- Dept. Defense Sites
- Indian Reservations BIA
- Power transmission lines
- 100-year flood zone
- 500-year flood zone
- National Wetland Inventory
- State Wetlands
- Upgradient Area
- Areas of Concern

This report includes Interactive Map Layers to display and/or hide map information. The legend includes only those icons for the default map view.

SITE NAME: 29053 Coolidge Ave ADDRESS: 29053 Coolidge Ave Castaic CA 91384 LAT/LONG: 34.45052 / 118.657236	CLIENT: Citadel Environmental Services CONTACT: Roopal Jani INQUIRY #: 5037804.2s DATE: August 31, 2017 7:28 am

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MAP FINDINGS

LEGEND

FACILITY NAME **FACILITY ADDRESS, CITY, ST, ZIP**		EDR SITE ID NUMBER
◆ **MAP ID#**	Direction Distance Range (Distance feet / miles) Relative Elevation Feet Above Sea Level	ASTM 2600 Record Sources found in this report. Each database searched has been assigned to one or more categories. For detailed information about categorization, see the section of the report Records Searched and Currency.

Worksheet:

Comments:
Comments may be added on the online Vapor Encroachment Worksheet.

DATABASE ACRONYM: Applicable categories (A hoverbox with database description).

CLANDESTINE DRUG LAB OPERATOR UNKNOWN 29053 1/2 COOLIDGE AVE, VAL VERDE, CA, 913840000		S113180778
▲ A1	Target Property 1270 ft. Above Sea Level	Other Ascertainable Records

Worksheet:

HAZNET: Other Ascertainable Records

envid:	S113180778
Year:	1995
GEPAID:	CLU950002192
Contact:	UNKNOWN
Telephone:	0000000000
Mailing Name:	Not Reported
Mailing Address:	DTSC CLU/ERU
Mailing City,St,Zip:	SACRAMENTO, CA 958120806
Gen County:	Not Reported
TSD EPA ID:	AZD049318009
TSD County:	Not Reported
Waste Category:	Laboratory waste chemicals
Disposal Method:	Transfer Station
Tons:	1.1600
Cat Decode:	Not Reported
Method Decode:	Not Reported
Facility County:	Los Angeles

29053 1/2 COOLIDGE AVE 29053 1/2 COOLIDGE AVE, VAL VERDE, CA, 91384		S107532350
▲ A2	Target Property 1270 ft. Above Sea Level	Local Lists of Hazardous waste / Contaminated Sites

MAP FINDINGS

Worksheet:

CDL: Local Lists of Hazardous waste / Contaminated Sites

Facility ID:	1995-11-046
Date:	11/18/1995
Labtype:	Illegal Drug lab
Lab Type:	Illegal Drug Lab (L) - location where an illegal drug lab was operated or drug lab equipment and/or materials were stored.

UNOCAL - DEL VALLE DEL VALLE RD, LOS ANGELES, CA, 91384		S106485610
▲ 3	ENE <1/10 (312 ft. / 0.059 mi.)	State and tribal leaking storage tank lists
	54 ft. Higher Elevation 1324 ft. Above Sea Level	

Worksheet:

SLIC: State and tribal leaking storage tank lists

Region:	STATE
Facility Status:	**Open - Inactive**
Status Date:	01/01/1965
Global Id:	SLT43335333
Lead Agency:	LOS ANGELES RWQCB (REGION 4)
Lead Agency Case Number:	Not Reported
Latitude:	34.452377
Longitude:	-118.648665
Case Type:	Cleanup Program Site
Case Worker:	Not Reported
Local Agency:	Not Reported
RB Case Number:	0520A
File Location:	Not Reported
Potential Media Affected:	Not Reported
Potential Contaminants of Concern:	Not Reported
Site History:	Not Reported
Click here to access the California GeoTracker records for this facility:	http://www.web.edrnet.com/ordering/switchboard/redirect.aspx?s=GRR_CA_SLIC_ST&global_id=SLT43335333

B & M TRUCK REPAIR 28915 AVENUE PENN, SANTA CLARITA, CA, 91355		1020622129
▲ B4	ESE <1/10 (377 ft. / 0.071 mi.)	EDR Exclusive Records
	36 ft. Higher Elevation 1306 ft. Above Sea Level	

Worksheet:

EDR Hist Auto: EDR Exclusive Records

Year:	Name: / Type:
2004:	B & M TRUCK REPAIR / General Automotive Repair Shops

B & M TRUCK REPAIR, 28915 AVENUE PENN, SANTA CLARITA, CA 91355 (Continued)

2005:	B & M TRUCK REPAIR / General Automotive Repair Shops
2006:	B & M TRUCK REPAIR / General Automotive Repair Shops
2007:	B & M TRUCK REPAIR / General Automotive Repair Shops
2008:	B & M TRUCK REPAIR / General Automotive Repair Shops

DD DIESEL 28915 N AVENUE PENN, VALENCIA, CA, 91355			U004265730
▲ B5	ESE <1/10	(377 ft. / 0.071 mi.)	State and tribal registered storage tank lists
	36 ft. Higher Elevation	1306 ft. Above Sea Level	

Worksheet:

UST: State and tribal registered storage tank lists

Facility ID:	LACoFA0033896
Permitting Agency:	Los Angeles County Fire Department
Latitude:	34.44453
Longitude:	-118.64051

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
ENVIRONMENTAL RECORDS						
Federal NPL site list						
US	NPL	National Priority List	EPA	04/05/2017	04/21/2017	05/12/2017
US	Proposed NPL	Proposed National Priority List Sites	EPA	04/05/2017	04/21/2017	05/12/2017
US	NPL LIENS	Federal Superfund Liens	EPA	10/15/1991	02/02/1994	03/30/1994
Federal CERCLIS list						
US	SEMS	Superfund Enterprise Management System	EPA	02/07/2017	04/19/2017	05/05/2017
Federal RCRA CORRACTS facilities list						
US	CORRACTS	Corrective Action Report	EPA	12/12/2016	12/28/2016	02/10/2017
Federal RCRA TSD facilities list						
US	RCRA-TSDF	RCRA - Treatment, Storage and Disposal	Environmental Protection Agency	12/12/2016	12/28/2016	02/10/2017
Federal RCRA generators list						
US	RCRA-LQG	RCRA - Large Quantity Generators	Environmental Protection Agency	12/12/2016	12/28/2016	02/10/2017
US	RCRA-SQG	RCRA - Small Quantity Generators	Environmental Protection Agency	12/12/2016	12/28/2016	02/10/2017
US	RCRA-CESQG	RCRA - Conditionally Exempt Small Quantity Generators	Environmental Protection Agency	12/12/2016	12/28/2016	02/10/2017
Federal institutional controls / engineering controls registries						
US	LUCIS	Land Use Control Information System	Department of the Navy	12/28/2016	01/04/2017	04/07/2017
US	US ENG CONTROLS	Engineering Controls Sites List	Environmental Protection Agency	02/13/2017	02/28/2017	06/09/2017
US	US INST CONTROL	Sites with Institutional Controls	Environmental Protection Agency	02/13/2017	02/28/2017	06/09/2017
Federal ERNS list						
US	ERNS	Emergency Response Notification System	National Response Center, United States Coast	09/26/2016	09/29/2016	11/11/2016
State and tribal - equivalent NPL						
CA	RESPONSE	State Response Sites	Department of Toxic Substances Control	07/31/2017	08/01/2017	08/15/2017
State and tribal - equivalent CERCLIS						
CA	ENVIROSTOR	EnviroStor Database	Department of Toxic Substances Control	07/31/2017	08/01/2017	08/15/2017
State and tribal landfill / solid waste disposal						
CA	SWF/LF (SWIS)	Solid Waste Information System	Department of Resources Recycling and Recover	02/13/2017	02/15/2017	05/02/2017
State and tribal leaking storage tank lists						
CA	LUST REG 4	Underground Storage Tank Leak List	California Regional Water Quality Control Boa	09/07/2004	09/07/2004	10/12/2004
CA	LUST	Leaking Underground Fuel Tank Report (GEOTRACKER)	State Water Resources Control Board	06/12/2017	06/14/2017	08/22/2017
CA	LUST REG 9	Leaking Underground Storage Tank Report	California Regional Water Quality Control Boa	03/01/2001	04/23/2001	05/21/2001
CA	LUST REG 8	Leaking Underground Storage Tanks	California Regional Water Quality Control Boa	02/14/2005	02/15/2005	03/28/2005
CA	LUST REG 7	Leaking Underground Storage Tank Case Listing	California Regional Water Quality Control Boa	02/26/2004	02/26/2004	03/24/2004
CA	LUST REG 6V	Leaking Underground Storage Tank Case Listing	California Regional Water Quality Control Boa	06/07/2005	06/07/2005	06/29/2005
CA	LUST REG 6L	Leaking Underground Storage Tank Case Listing	California Regional Water Quality Control Boa	09/09/2003	09/10/2003	10/07/2003

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
CA	LUST REG 5	Leaking Underground Storage Tank Database	California Regional Water Quality Control Boa	07/01/2008	07/22/2008	07/31/2008
CA	LUST REG 3	Leaking Underground Storage Tank Database	California Regional Water Quality Control Boa	05/19/2003	05/19/2003	06/02/2003
CA	LUST REG 2	Fuel Leak List	California Regional Water Quality Control Boa	09/30/2004	10/20/2004	11/19/2004
CA	LUST REG 1	Active Toxic Site Investigation	California Regional Water Quality Control Boa	02/01/2001	02/28/2001	03/29/2001
US	INDIAN LUST R4	Leaking Underground Storage Tanks on Indian Land	EPA Region 4	10/14/2016	01/27/2017	05/05/2017
US	INDIAN LUST R1	Leaking Underground Storage Tanks on Indian Land	EPA Region 1	11/14/2016	01/26/2017	05/05/2017
US	INDIAN LUST R7	Leaking Underground Storage Tanks on Indian Land	EPA Region 7	09/01/2016	01/26/2017	05/05/2017
US	INDIAN LUST R8	Leaking Underground Storage Tanks on Indian Land	EPA Region 8	10/17/2016	01/26/2017	05/05/2017
US	INDIAN LUST R9	Leaking Underground Storage Tanks on Indian Land	Environmental Protection Agency	10/06/2016	01/26/2017	05/05/2017
US	INDIAN LUST R10	Leaking Underground Storage Tanks on Indian Land	EPA Region 10	10/07/2016	01/26/2017	05/05/2017
US	INDIAN LUST R6	Leaking Underground Storage Tanks on Indian Land	EPA Region 6	10/01/2016	01/26/2017	05/05/2017
US	INDIAN LUST R5	Leaking Underground Storage Tanks on Indian Land	EPA, Region 5	11/14/2016	01/26/2017	05/05/2017
CA	SLIC	Statewide SLIC Cases (GEOTRACKER)	State Water Resources Control Board	06/12/2017	06/14/2017	08/23/2017
CA	SLIC REG 1	Active Toxic Site Investigations	California Regional Water Quality Control Boa	04/03/2003	04/07/2003	04/25/2003
CA	SLIC REG 2	Spills, Leaks, Investigation & Cleanup Cost Recovery Listing	Regional Water Quality Control Board San Fran	09/30/2004	10/20/2004	11/19/2004
CA	SLIC REG 3	Spills, Leaks, Investigation & Cleanup Cost Recovery Listing	California Regional Water Quality Control Boa	05/18/2006	05/18/2006	06/15/2006
CA	SLIC REG 4	Spills, Leaks, Investigation & Cleanup Cost Recovery Listing	Region Water Quality Control Board Los Angele	11/17/2004	11/18/2004	01/04/2005
CA	SLIC REG 5	Spills, Leaks, Investigation & Cleanup Cost Recovery Listing	Regional Water Quality Control Board Central	04/01/2005	04/05/2005	04/21/2005
CA	SLIC REG 6V	Spills, Leaks, Investigation & Cleanup Cost Recovery Listing	Regional Water Quality Control Board, Victorv	05/24/2005	05/25/2005	06/16/2005
CA	SLIC REG 6L	SLIC Sites	California Regional Water Quality Control Boa	09/07/2004	09/07/2004	10/12/2004
CA	SLIC REG 7	SLIC List	California Regional Quality Control Board, Co	11/24/2004	11/29/2004	01/04/2005
CA	SLIC REG 8	Spills, Leaks, Investigation & Cleanup Cost Recovery Listing	California Region Water Quality Control Board	04/03/2008	04/03/2008	04/14/2008
CA	SLIC REG 9	Spills, Leaks, Investigation & Cleanup Cost Recovery Listing	California Regional Water Quality Control Boa	09/10/2007	09/11/2007	09/28/2007
State and tribal registered storage tank lists						
CA	UST	Active UST Facilities	SWRCB	06/12/2017	06/14/2017	08/23/2017
CA	UST MENDOCINO	Mendocino County UST Database	Department of Public Health	06/02/2017	06/06/2017	08/25/2017
CA	AST	Aboveground Petroleum Storage Tank Facilities	California Environmental Protection Agency	07/06/2016	07/12/2016	09/19/2016
US	INDIAN UST R9	Underground Storage Tanks on Indian Land	EPA Region 9	10/06/2016	01/26/2017	05/05/2017
US	INDIAN UST R10	Underground Storage Tanks on Indian Land	EPA Region 10	10/07/2016	01/26/2017	05/05/2017
US	INDIAN UST R6	Underground Storage Tanks on Indian Land	EPA Region 6	10/01/2016	01/26/2017	05/05/2017
US	INDIAN UST R7	Underground Storage Tanks on Indian Land	EPA Region 7	09/01/2016	01/26/2017	05/05/2017
US	INDIAN UST R4	Underground Storage Tanks on Indian Land	EPA Region 4	10/14/2016	01/27/2017	05/05/2017
US	INDIAN UST R5	Underground Storage Tanks on Indian Land	EPA Region 5	01/14/2017	01/26/2017	05/05/2017
US	INDIAN UST R1	Underground Storage Tanks on Indian Land	EPA, Region 1	11/14/2016	01/26/2017	05/05/2017
US	INDIAN UST R8	Underground Storage Tanks on Indian Land	EPA Region 8	10/17/2016	01/26/2017	05/05/2017
US	FEMA UST	Underground Storage Tank Listing	FEMA	01/01/2010	02/16/2010	04/12/2010
State and tribal voluntary cleanup sites						
US	INDIAN VCP R1	Voluntary Cleanup Priority Listing	EPA, Region 1	07/27/2015	09/29/2015	02/18/2016
US	INDIAN VCP R7	Voluntary Cleanup Priority Lisitng	EPA, Region 7	03/20/2008	04/22/2008	05/19/2008
CA	VCP	Voluntary Cleanup Program Properties	Department of Toxic Substances Control	07/31/2017	08/01/2017	08/15/2017

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
State and tribal Brownfields sites						
CA	BROWNFIELDS	Considered Brownfieds Sites Listing	State Water Resources Control Board	01/03/2017	01/04/2017	03/02/2017
Other Records						
US	CONSENT	Superfund (CERCLA) Consent Decrees	Department of Justice, Consent Decree Library	09/30/2016	11/18/2016	02/03/2017
US	ROD	Records Of Decision	EPA	11/25/2013	12/12/2013	02/24/2014
US	LIENS 2	CERCLA Lien Information	Environmental Protection Agency	02/18/2014	03/18/2014	04/24/2014
CA	HIST CAL-SITES	Calsites Database	Department of Toxic Substance Control	08/08/2005	08/03/2006	08/24/2006
US	DEBRIS REGION 9	Torres Martinez Reservation Illegal Dump Site Locations	EPA, Region 9	01/12/2009	05/07/2009	09/21/2009
CA	SWRCY	Recycler Database	Department of Conservation	03/13/2017	03/14/2017	05/03/2017
CA	CA FID UST	Facility Inventory Database	California Environmental Protection Agency	10/31/1994	09/05/1995	09/29/1995
CA	HIST UST	Hazardous Substance Storage Container Database	State Water Resources Control Board	10/15/1990	01/25/1991	02/12/1991
CA	SWEEPS UST	SWEEPS UST Listing	State Water Resources Control Board	06/01/1994	07/07/2005	08/11/2005
US	PCB TRANSFORMER	PCB Transformer Registration Database	Environmental Protection Agency	02/01/2011	10/19/2011	01/10/2012
US	FUSRAP	Formerly Utilized Sites Remedial Action Program	Department of Energy	12/23/2016	12/27/2016	02/17/2017
US	EPA WATCH LIST	EPA WATCH LIST	Environmental Protection Agency	08/30/2013	03/21/2014	06/17/2014
US	US FIN ASSUR	Financial Assurance Information	Environmental Protection Agency	02/13/2017	02/15/2017	05/12/2017
US	US HIST CDL	National Clandestine Laboratory Register	Drug Enforcement Administration	02/09/2017	03/08/2017	06/09/2017
US	US AIRS MINOR	Air Facility System Data	EPA	10/12/2016	10/26/2016	02/03/2017
US	US AIRS (AFS)	Aerometric Information Retrieval System Facility Subsystem (	EPA	10/12/2016	10/26/2016	02/03/2017
US	COAL ASH DOE	Steam-Electric Plant Operation Data	Department of Energy	12/31/2005	08/07/2009	10/22/2009
US	COAL ASH EPA	Coal Combustion Residues Surface Impoundments List	Environmental Protection Agency	07/01/2014	09/10/2014	10/20/2014
US	2020 COR ACTION	2020 Corrective Action Program List	Environmental Protection Agency	04/22/2013	03/03/2015	03/09/2015
US	SCRD DRYCLEANERS	State Coalition for Remediation of Drycleaners Listing	Environmental Protection Agency	01/01/2017	02/03/2017	04/07/2017
US	LEAD SMELTER 1	Lead Smelter Sites	Environmental Protection Agency	12/05/2016	01/05/2017	02/10/2017
US	LEAD SMELTER 2	Lead Smelter Sites	American Journal of Public Health	04/05/2001	10/27/2010	12/02/2010
US	Delisted NPL	National Priority List Deletions	EPA	04/05/2017	04/21/2017	05/12/2017
US	SEMS-ARCHIVE	Superfund Enterprise Management System Archive	EPA	02/07/2017	04/19/2017	05/05/2017
US	RCRA NonGen / NLR	RCRA - Non Generators / No Longer Regulated	Environmental Protection Agency	12/12/2016	12/28/2016	02/10/2017
US	HMIRS	Hazardous Materials Information Reporting System	U.S. Department of Transportation	12/28/2016	12/28/2016	02/03/2017
US	DOT OPS	Incident and Accident Data	Department of Transporation, Office of Pipeli	07/31/2012	08/07/2012	09/18/2012
US	US CDL	Clandestine Drug Labs	Drug Enforcement Administration	02/09/2017	03/08/2017	06/09/2017
US	US BROWNFIELDS	A Listing of Brownfields Sites	Environmental Protection Agency	03/02/2017	03/02/2017	04/07/2017
US	DOD	Department of Defense Sites	USGS	12/31/2005	11/10/2006	01/11/2007
US	FEDLAND	Federal and Indian Lands	U.S. Geological Survey	12/31/2005	02/06/2006	01/11/2007
US	FUDS	Formerly Used Defense Sites	U.S. Army Corps of Engineers	01/31/2015	07/08/2015	10/13/2015
US	UMTRA	Uranium Mill Tailings Sites	Department of Energy	09/14/2010	10/07/2011	03/01/2012
US	ODI	Open Dump Inventory	Environmental Protection Agency	06/30/1985	08/09/2004	09/17/2004
US	US MINES	Mines Master Index File	Department of Labor, Mine Safety and Health A	02/08/2017	02/28/2017	04/07/2017
US	US MINES 2	Ferrous and Nonferrous Metal Mines Database Listing	USGS	12/05/2005	02/29/2008	04/18/2008
US	US MINES 3	Active Mines & Mineral Plants Database Listing	USGS	04/14/2011	06/08/2011	09/13/2011
US	PRP	Potentially Responsible Parties	EPA	10/25/2013	10/17/2014	10/20/2014
US	TRIS	Toxic Chemical Release Inventory System	EPA	12/31/2014	11/24/2015	04/05/2016
US	TSCA	Toxic Substances Control Act	EPA	12/31/2012	01/15/2015	01/29/2015
US	FTTS	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA/Office of Prevention, Pesticides and Toxi	04/09/2009	04/16/2009	05/11/2009
US	FTTS INSP	FIFRA/ TSCA Tracking System - FIFRA (Federal Insecticide, Fu	EPA	04/09/2009	04/16/2009	05/11/2009

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	HIST FTTS	FIFRA/TSCA Tracking System Administrative Case Listing	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	HIST FTTS INSP	FIFRA/TSCA Tracking System Inspection & Enforcement Case Lis	Environmental Protection Agency	10/19/2006	03/01/2007	04/10/2007
US	SSTS	Section 7 Tracking Systems	EPA	12/31/2009	12/10/2010	02/25/2011
US	ICIS	Integrated Compliance Information System	Environmental Protection Agency	11/18/2016	11/23/2016	02/10/2017
US	PADS	PCB Activity Database System	EPA	01/20/2016	04/28/2016	09/02/2016
US	MLTS	Material Licensing Tracking System	Nuclear Regulatory Commission	08/30/2016	09/08/2016	10/21/2016
US	RADINFO	Radiation Information Database	Environmental Protection Agency	01/04/2017	01/06/2017	02/10/2017
US	FINDS	Facility Index System/Facility Registry System	EPA	04/04/2017	04/07/2017	05/12/2017
US	RAATS	RCRA Administrative Action Tracking System	EPA	04/17/1995	07/03/1995	08/07/1995
US	RMP	Risk Management Plans	Environmental Protection Agency	02/01/2017	02/09/2017	04/07/2017
US	BRS	Biennial Reporting System	EPA/NTIS	12/31/2013	02/24/2015	09/30/2015
US	PWS	Public Water System Data	EPA	12/17/2013	01/09/2014	10/15/2014
US	INDIAN RESERV	Indian Reservations	USGS	12/31/2014	07/14/2015	01/10/2017
US	INDIAN ODI	Report on the Status of Open Dumps on Indian Lands	Environmental Protection Agency	12/31/1998	12/03/2007	01/24/2008
CA	CA BOND EXP. PLAN	Bond Expenditure Plan	Department of Health Services	01/01/1989	07/27/1994	08/02/1994
CA	CDL	Clandestine Drug Labs	Department of Toxic Substances Control	12/31/2016	03/17/2017	05/10/2017
CA	CHMIRS	California Hazardous Material Incident Report System	Office of Emergency Services	12/06/2016	01/25/2017	05/10/2017
CA	CORTESE	"Cortese" Hazardous Waste & Substances Sites List	CAL EPA/Office of Emergency Information	12/28/2016	12/28/2016	03/02/2017
CA	DEED	Deed Restriction Listing	DTSC and SWRCB	06/05/2017	06/06/2017	08/10/2017
CA	DRYCLEANERS	Cleaner Facilities	Department of Toxic Substance Control	03/09/2017	04/11/2017	05/23/2017
CA	EMI	Emissions Inventory Data	California Air Resources Board	12/31/2015	03/21/2017	08/15/2017
CA	ENF	Enforcement Action Listing	State Water Resoruces Control Board	05/01/2017	05/03/2017	08/15/2017
CA	Financial Assurance 1	Financial Assurance Information Listing	Department of Toxic Substances Control	06/05/2017	06/09/2017	08/15/2017
CA	Financial Assurance 2	Financial Assurance Information Listing	California Integrated Waste Management Board	05/16/2017	05/19/2017	08/15/2017
CA	HAULERS	Registered Waste Tire Haulers Listing	Integrated Waste Management Board	05/30/2017	05/31/2017	08/15/2017
CA	HAZNET	Facility and Manifest Data	California Environmental Protection Agency	12/31/2015	10/12/2016	12/15/2016
CA	HIST CORTESE	Hazardous Waste & Substance Site List	Department of Toxic Substances Control	04/01/2001	01/22/2009	04/08/2009
CA	HWP	EnviroStor Permitted Facilities Listing	Department of Toxic Substances Control	05/22/2017	05/24/2017	08/18/2017
CA	HWT	Registered Hazardous Waste Transporter Database	Department of Toxic Substances Control	04/11/2017	04/13/2017	04/26/2017
CA	ICE	ICE	Department of Toxic Subsances Control	05/22/2017	05/24/2017	08/18/2017
CA	LDS	Land Disposal Sites Listing (GEOTRACKER)	State Water Qualilty Control Board	06/12/2017	06/14/2017	08/18/2017
CA	LIENS	Environmental Liens Listing	Department of Toxic Substances Control	06/02/2017	06/06/2017	08/22/2017
CA	MCS	Military Cleanup Sites Listing (GEOTRACKER)	State Water Resources Control Board	06/12/2017	06/14/2017	08/22/2017
CA	MINES	Mines Site Location Listing	Department of Conservation	09/12/2016	09/14/2016	10/14/2016
CA	MWMP	Medical Waste Management Program Listing	Department of Public Health	05/25/2017	06/06/2017	08/23/2017
CA	NPDES	NPDES Permits Listing	State Water Resources Control Board	11/14/2016	11/15/2016	03/02/2017
CA	PEST LIC	Pesticide Regulation Licenses Listing	Department of Pesticide Regulation	06/05/2017	06/07/2017	08/25/2017
CA	PROC	Certified Processors Database	Department of Conservation	03/13/2017	03/14/2017	05/03/2017
CA	NOTIFY 65	Proposition 65 Records	State Water Resources Control Board	12/16/2016	12/22/2016	03/02/2017
CA	SCH	School Property Evaluation Program	Department of Toxic Substances Control	07/31/2017	08/01/2017	08/15/2017
CA	SPILLS 90	SPILLS90 data from FirstSearch	FirstSearch	06/06/2012	01/03/2013	02/22/2013
CA	TOXIC PITS	Toxic Pits Cleanup Act Sites	State Water Resources Control Board	07/01/1995	08/30/1995	09/26/1995
CA	UIC	UIC Listing	Deaprtment of Conservation	01/20/2017	03/14/2017	05/03/2017
CA	WASTEWATER PITS	Oil Wastewater Pits Listing	RWQCB, Central Valley Region	04/15/2015	04/17/2015	06/23/2015
CA	WDS	Waste Discharge System	State Water Resources Control Board	06/19/2007	06/20/2007	06/29/2007
CA	WIP	Well Investigation Program Case List	Los Angeles Water Quality Control Board	07/03/2009	07/21/2009	08/03/2009
CA	WMUDS/SWAT	Waste Management Unit Database	State Water Resources Control Board	04/01/2000	04/10/2000	05/10/2000

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
US	ECHO	Enforcement & Compliance History Information	Environmental Protection Agency	03/19/2017	03/21/2017	05/12/2017
US	ABANDONED MINES	Abandoned Mines	Department of Interior	03/14/2017	03/17/2017	04/07/2017
US	IHS OPEN DUMPS	Open Dumps on Indian Land	Department of Health & Human Serivces, Indian	04/01/2014	08/06/2014	01/29/2015
US	DOCKET HWC	Hazardous Waste Compliance Docket Listing	Environmental Protection Agency	06/02/2016	06/03/2016	09/02/2016
US	FUELS PROGRAM	EPA Fuels Program Registered Listing	EPA	02/22/2017	02/22/2017	05/12/2017
US	UXO	Unexploded Ordnance Sites	Department of Defense	10/25/2015	01/29/2016	04/05/2016
HISTORICAL USE RECORDS						
US	EDR MGP	EDR Proprietary Manufactured Gas Plants	EDR, Inc.			
US	EDR Hist Auto	EDR Exclusive Historic Gas Stations	EDR, Inc.			
US	EDR Hist Cleaner	EDR Exclusive Historic Dry Cleaners	EDR, Inc.			
CA	RGA LF	Recovered Government Archive Solid Waste Facilities List	Department of Resources Recycling and Recover		07/01/2013	01/13/2014
CA	RGA LUST	Recovered Government Archive Leaking Underground Storage Tan	State Water Resources Control Board		07/01/2013	12/30/2013
COUNTY RECORDS						
CA	CS ALAMEDA	Contaminated Sites	Alameda County Environmental Health Services	04/10/2017	04/11/2017	05/12/2017
CA	UST ALAMEDA	Underground Tanks	Alameda County Environmental Health Services	07/07/2017	07/11/2017	08/23/2017
CA	CUPA AMADOR	CUPA Facility List	Amador County Environmental Health	06/20/2017	06/21/2017	08/09/2017
CA	CUPA BUTTE	CUPA Facility Listing	Public Health Department	04/21/2017	04/25/2017	08/09/2017
CA	CUPA CALVERAS	CUPA Facility Listing	Calveras County Environmental Health	04/25/2017	04/27/2017	08/09/2017
CA	CUPA COLUSA	CUPA Facility List	Health & Human Services	02/23/2017	02/24/2017	05/12/2017
CA	SL CONTRA COSTA	Site List	Contra Costa Health Services Department	05/26/2017	05/30/2017	07/27/2017
CA	CUPA DEL NORTE	CUPA Facility List	Del Norte County Environmental Health Divisio	05/02/2017	05/04/2017	08/04/2017
CA	CUPA EL DORADO	CUPA Facility List	El Dorado County Environmental Management Dep	06/19/2017	06/20/2017	08/09/2017
CA	CUPA FRESNO	CUPA Resources List	Dept. of Community Health	06/30/2017	07/05/2017	08/04/2017
CA	CUPA GLENN	CUPA Facility List	Glenn County Air Pollution Control District	12/02/2016	02/03/2017	05/25/2017
CA	CUPA HUMBOLDT	CUPA Facility List	Humboldt County Environmental Health	03/20/2017	03/21/2017	05/17/2017
CA	CUPA IMPERIAL	CUPA Facility List	San Diego Border Field Office	04/24/2017	04/25/2017	08/04/2017
CA	CUPA INYO	CUPA Facility List	Inyo County Environmental Health Services	06/08/2017	06/09/2017	08/04/2017
CA	UST KERN	Underground Storage Tank Sites & Tank Listing	Kern County Environment Health Services Depar	02/07/2017	02/10/2017	05/02/2017
CA	CUPA KINGS	CUPA Facility List	Kings County Department of Public Health	03/06/2017	03/07/2017	05/17/2017
CA	CUPA LAKE	CUPA Facility List	Lake County Environmental Health	05/09/2017	05/11/2017	08/09/2017
CA	CUPA LASSEN	CUPA Facility List	Lassen County Environmental Health	01/13/2017	04/25/2017	08/04/2017
CA	AOCONCERN	San Gabriel Valley Areas of Concern	EPA Region 9	03/30/2009	03/31/2009	10/23/2009
CA	HMS LOS ANGELES	HMS: Street Number List	Department of Public Works	04/18/2017	04/25/2017	08/18/2017
CA	LF LOS ANGELES	List of Solid Waste Facilities	La County Department of Public Works	04/17/2017	04/18/2017	05/02/2017
CA	LF LOS ANGELES CITY	City of Los Angeles Landfills	Engineering & Construction Division	01/01/2016	01/26/2016	03/22/2016
CA	SITE MIT LOS ANGELES	Site Mitigation List	Community Health Services	03/29/2016	04/06/2016	06/13/2016
CA	UST EL SEGUNDO	City of El Segundo Underground Storage Tank	City of El Segundo Fire Department	01/17/2017	01/18/2017	05/10/2017
CA	UST LONG BEACH	City of Long Beach Underground Storage Tank	City of Long Beach Fire Department	03/09/2017	03/10/2017	05/03/2017
CA	UST TORRANCE	City of Torrance Underground Storage Tank	City of Torrance Fire Department	01/10/2017	01/13/2017	05/03/2017
CA	CUPA MADERA	CUPA Facility List	Madera County Environmental Health	06/01/2017	06/02/2017	08/04/2017
CA	UST MARIN	Underground Storage Tank Sites	Public Works Department Waste Management	03/31/2017	04/06/2017	05/03/2017
CA	CUPA MERCED	CUPA Facility List	Merced County Environmental Health	02/22/2017	02/23/2017	05/17/2017
CA	CUPA MONO	CUPA Facility List	Mono County Health Department	02/21/2017	03/02/2017	05/17/2017
CA	CUPA MONTEREY	CUPA Facility Listing	Monterey County Health Department	06/22/2017	06/23/2017	08/09/2017
CA	LUST NAPA	Sites With Reported Contamination	Napa County Department of Environmental Manag	01/09/2017	01/11/2017	03/02/2017

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date
CA	UST NAPA	Closed and Operating Underground Storage Tank Sites	Napa County Department of Environmental Manag	05/31/2017	06/01/2017	08/25/2017
CA	CUPA NEVADA	CUPA Facility List	Community Development Agency	05/08/2017	05/09/2017	08/09/2017
CA	IND_SITE ORANGE	List of Industrial Site Cleanups	Health Care Agency	05/03/2017	05/11/2017	08/18/2017
CA	LUST ORANGE	List of Underground Storage Tank Cleanups	Health Care Agency	11/04/2016	11/11/2016	01/23/2017
CA	UST ORANGE	List of Underground Storage Tank Facilities	Health Care Agency	02/06/2017	02/07/2017	05/03/2017
CA	MS PLACER	Master List of Facilities	Placer County Health and Human Services	06/02/2017	06/06/2017	08/22/2017
CA	CUPA PLUMAS	CUPA Facility List	Plumas County Environmental Health	06/19/2017	07/05/2017	08/09/2017
CA	LUST RIVERSIDE	Listing of Underground Tank Cleanup Sites	Department of Environmental Health	04/18/2017	04/20/2017	04/21/2017
CA	UST RIVERSIDE	Underground Storage Tank Tank List	Department of Environmental Health	01/19/2017	01/25/2017	05/03/2017
CA	CS SACRAMENTO	Toxic Site Clean-Up List	Sacramento County Environmental Management	02/06/2017	04/04/2017	08/09/2017
CA	ML SACRAMENTO	Master Hazardous Materials Facility List	Sacramento County Environmental Management	05/03/2017	07/06/2017	08/22/2017
CA	CUPA SAN BENITO	CUPA Facility List	San Benito County Environmental Health	11/30/2016	02/09/2017	05/25/2017
CA	PERMITS SAN BERNARDINO	Hazardous Material Permits	San Bernardino County Fire Department Hazardo	05/30/2017	06/01/2017	08/25/2017
CA	HMMD SAN DIEGO	Hazardous Materials Management Division Database	Hazardous Materials Management Division	06/05/2017	06/07/2017	08/15/2017
CA	LF SAN DIEGO	Solid Waste Facilities	Department of Health Services	10/31/2015	11/07/2015	01/04/2016
CA	SAN DIEGO CO. SAM	Environmental Case Listing	San Diego County Department of Environmental	03/23/2010	06/15/2010	07/09/2010
CA	LUST SAN FRANCISCO	Local Oversite Facilities	Department Of Public Health San Francisco Cou	09/19/2008	09/19/2008	09/29/2008
CA	UST SAN FRANCISCO	Underground Storage Tank Information	Department of Public Health	05/03/2017	05/08/2017	08/25/2017
CA	UST SAN JOAQUIN	San Joaquin Co. UST	Environmental Health Department	03/21/2017	03/23/2017	05/09/2017
CA	CUPA SAN LUIS OBISPO	CUPA Facility List	San Luis Obispo County Public Health Departme	06/05/2017	06/16/2017	08/09/2017
CA	BI SAN MATEO	Business Inventory	San Mateo County Environmental Health Service	03/15/2017	04/07/2017	05/10/2017
CA	LUST SAN MATEO	Fuel Leak List	San Mateo County Environmental Health Service	06/15/2017	06/19/2017	08/22/2017
CA	CUPA SANTA BARBARA	CUPA Facility Listing	Santa Barbara County Public Health Department	09/08/2011	09/09/2011	10/07/2011
CA	CUPA SANTA CLARA	Cupa Facility List	Department of Environmental Health	02/22/2017	02/23/2017	05/23/2017
CA	HIST LUST SANTA CLARA	HIST LUST - Fuel Leak Site Activity Report	Santa Clara Valley Water District	03/29/2005	03/30/2005	04/21/2005
CA	LUST SANTA CLARA	LOP Listing	Department of Environmental Health	03/03/2014	03/05/2014	03/18/2014
CA	SAN JOSE HAZMAT	Hazardous Material Facilities	City of San Jose Fire Department	05/04/2017	05/08/2017	07/27/2017
CA	CUPA SANTA CRUZ	CUPA Facility List	Santa Cruz County Environmental Health	01/21/2017	02/22/2017	05/23/2017
CA	CUPA SHASTA	CUPA Facility List	Shasta County Department of Resource Manageme	06/15/2017	06/19/2017	08/09/2017
CA	LUST SOLANO	Leaking Underground Storage Tanks	Solano County Department of Environmental Man	06/15/2017	06/20/2017	08/22/2017
CA	UST SOLANO	Underground Storage Tanks	Solano County Department of Environmental Man	06/15/2017	06/21/2017	08/29/2017
CA	CUPA SONOMA	Cupa Facility List	County of Sonoma Fire & Emergency Services De	06/23/2017	06/27/2017	08/09/2017
CA	LUST SONOMA	Leaking Underground Storage Tank Sites	Department of Health Services	07/05/2017	07/06/2017	08/22/2017
CA	CUPA STANISLAUS	CUPA Facility List	Stanislaus County Department of Ennvironmenta	05/10/2017	05/16/2017	08/09/2017
CA	UST SUTTER	Underground Storage Tanks	Sutter County Department of Agriculture	06/02/2017	06/06/2017	08/25/2017
CA	CUPA TEHAMA	CUPA Facility List	Tehama County Department of Environmental Hea	05/01/2017	05/08/2017	08/09/2017
CA	CUPA TRINITY	CUPA Facility List	Department of Toxic Substances Control	04/24/2017	04/25/2017	08/09/2017
CA	CUPA TULARE	CUPA Facility List	Tulare County Environmental Health Services D	01/05/2017	02/10/2017	05/25/2017
CA	CUPA TUOLUMNE	CUPA Facility List	Divison of Environmental Health	04/27/2017	04/27/2017	08/10/2017
CA	BWT VENTURA	Business Plan, Hazardous Waste Producers, and Operating Unde	Ventura County Environmental Health Division	12/27/2016	01/27/2017	05/10/2017
CA	LF VENTURA	Inventory of Illegal Abandoned and Inactive Sites	Environmental Health Division	12/01/2011	12/01/2011	01/19/2012
CA	LUST VENTURA	Listing of Underground Tank Cleanup Sites	Environmental Health Division	05/29/2008	06/24/2008	07/31/2008
CA	MED WASTE VENTURA	Medical Waste Program List	Ventura County Resource Management Agency	09/26/2016	10/27/2016	01/24/2017
CA	UST VENTURA	Underground Tank Closed Sites List	Environmental Health Division	02/27/2017	03/15/2017	05/03/2017
CA	UST YOLO	Underground Storage Tank Comprehensive Facility Report	Yolo County Department of Health	06/29/2017	07/05/2017	08/25/2017
CA	CUPA YUBA	CUPA Facility List	Yuba County Environmental Health Department	01/30/2017	01/31/2017	05/23/2017

GOVERNMENT RECORDS SEARCHED / DATA CURRENCY TRACKING

St	Acronym	Full Name	Government Agency	Gov Date	Arvl. Date	Active Date

STREET AND ADDRESS INFORMATION

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APPENDIX I

Hydrology Study (2020)

APPENDIX I.1

Approval of Hydrology Study

LAND DEVELOPMENT DIVISION
HYDROLOGY UNIT

TO:	SIKAND ENGINEERING	Date:	February 20, 2020
	15230 Burbank Blvd. Ste 100		
	Van Nuys, CA 91411		
ATTN:	Raman Gaur / Doug Farmer		

REVIEW OF HYDROLOGY STUDY

PD. NO.	**Not Assigned**	**DATE OF REPORT**	**January 20, 2020**
TR NO.	**TR 60257**	**PLAN CHECK NO.**	**4**
		PLAN CASE NO.	**ESTU2018000137**

We have reviewed your Hydrology Study.

[X] The Hydrology Study has been approved.

[X] Refer to comments below:

COMMENTS:

1. Work within soft bottom drainage areas (which may include but is not limited to soft bottom basins, channels, watercourses, grade to drain) will require maintenance permits from Fish and Game, Army Corps of Engineers, and RWQCB prior to approval of the storm drain, and the permits must be still active prior to acceptance.

REVIEWED BY _____
VILONG TRUONG (626) 458-4921

REGISTERED PROFESSIONAL ENGINEER
VILONG TRUONG
NO. C82680
CIVIL
STATE OF CALIFORNIA

APPROVED BY: _____

APPENDIX I.2

Approved Hydrology Study

HYDROLOGY STUDY

FOR:

Tentative Tract No. 060257
ESTU 2018000137

FOR OWNER:

Sterling Gateway, L.P.
P.O. Box 681007
Park City, UT 84068
Attention: Hunt Williams
Phone (435) 655-0890

PREPARED BY:

SIKAND ENGINEERING ASSOCIATES
15230 Burbank Boulevard, Suite 100
Van Nuys, California 91411
818-787-8550

Doug Farmer, Civil Engineer

Submittal Date: January 20th , 2020.

HYDROLOGY STUDY APPROVED

CHECKED BY: _____ RCE NO. 82680 DATE 2/20/2020

APPROVED BY: Gracely C. Lasso DATE 2/20/2020

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
LAND DEVELOPMENT DIVISION

W.O. 5100-056-01

TABLE OF CONTENTS

SECTION 1 **INTRODUCTION**
- Purpose of The Study
- Project Description
- Hydrologic Criteria & Methodology
- LID Discussion and Summary
- Hydrology Summary

SECTION 2 **HYDROLOGIC INFORMATION**

SECTION 3 **EXISTING CONDITION**
- HydroCalc & MODRAT Calculations
  - Design Frequency (Q_B and Q_{B+D})
  - Clear Frequency (50, 25, 10, 5, 2-yr, and LID)
- Existing Hydrology Map

SECTION 4 **PROPOSED CONDITION**
- HydroCalc, MODRAT, and RETARD Calculations
  - Design Frequency (Q_B and Q_{B+D})
  - Clear Frequency (50, 25, 10, 5, and 2-yr)
- Impervious Calculations
- Diversion Structures- Hydraulic Calculations
- Infiltration Basin Capacity Calculations
- Drawdown Calculations
- Proposed Hydrology Map

SECTION 5 **DEBRIS PRODUCTION AND BULKING ANALYSIS**
- Subarea: Debris Production and Bulking Calculations
- Outlet: Debris Production and Bulking Calculations
- Debris Basin Capacity Calculations

SECTION 6 **WATER QUALITY**
- HydroCalc Calculations- LID Storm
- Water Quality Map

APPENDIX A **REFERENCES:**
- HydroCalc Output: Existing Condition- Design Storm
- HydroCalc Output: Proposed Condition-Design Storm

APPENDIX B CDS Unit's – Preliminary Details

Section 1

Purpose of the Study

The purpose of this study is to analyze the Design and Clear Frequency storm hydrological impacts of the proposed site development against its pre-development receiving outlet conditions, to comply with the requirements established by the County of Los Angeles, and, to provide the criteria for the design of the on-site storm drain systems and other drainage devices.

Project Description

The site is located approximately 1 mile southwest of the intersection of Hasley Canyon and Del Valle Road, in the unincorporated area of Los Angeles County, State of California. The project is bounded to the south by Hunstock Avenue and is situated adjacent to existing residential homes in the Val Verde community.

EXISTING CONDITION:
The project lies entirely within one drainage tributary area. The natural drainage pattern starts from the north and conveys south, as it outlets at the tract boundary on Hunstock Avenue. The project is not located within a FEMA flood zone.

PROPOSED CONDITION: The proposed development is mostly residential, consisting of single-family residential homes and associated streets improvements, utilities and landscaping. The project is also comprised of a commercial site, open spaces, debris basins, and infiltration basins.

All natural areas, primarily located on the northern and eastern areas surrounding the project site, are collected in debris basins before entering the proposed storm drain system. Additionally, all developed area flows are collected within the storm drain system, downstream of the debris basin locations. The system enters a series of infiltration basins to mitigate the peak flow and volume for the project site. Ultimately, the remaining stormwater is conveyed within the system and discharges to a longitudinal perc basin along Hunstock Avenue, where stormwater is discharged to match existing drainage conditions. See Section 4 for Proposed Conditions Map.

Hydrologic Criteria & Methodology

This report follows the hydrologic criteria and methodology set forth by Los Angeles County Department of Public Works, as explained in its "Hydrology Manual", "Sedimentation Manual".

The following are the criteria used in the calculations:

- Design Storm Frequency:
  50-yr for undeveloped areas and developed sump areas,
  25-yr for developed areas.
- Soil Type Number = 097
- Basin Name = Santa Clara
- DPA Zone = 5
- Peak Bulking Factor
  - DPA Zone 5 = 1.465 (for areas ≤ 0.1 sq mi.)
- Debris Production:
  - DPA Zone 5 = 81,000 cy/sq mi. (for areas ≤ 0.1 sq mi.)
- Isohyet = 5.8" (50-yr, 24-hr)
  1.05" (85th Percentile, 24-hr)
- % Imperviousness:
  1% for undeveloped / natural areas,
  10% for developed slope areas
  10% for water quality areas
  42% for single-family residential areas,
  90% for commercial areas,
  91% for paved street areas.

Time of Concentration (TC) and design Peak Flow (Q) for each subarea are calculated using Hydrocalc. Burning of flows, flood routing and confluence Peak Qs are calculated using F0601M program, also know as the Modified Rational Method program (MODRAT).
See Sections 3 & 4, TC and MODRAT Calculations.

Hydraulic calculations for the diversion structures were based on flowrates determined by weir and orifice equations. In order to discharge flow and volume lower than the existing conditions, four diversion structures have been located on the project site to divert stormwater to the proposed infiltration basins. These design features result in an outlet discharge to Hunstock Avenue lower than the existing discharge flow and stormwater volume. See Section 4 for Diversion Structure Hydraulic Calculations.

Debris Production Volumes are calculated using the DPR Chart for undeveloped areas under single DPA Zone; and bulking of the flows are obtained using the Peak Bulk Factors Chart for undeveloped areas under single DPA Zone.
See Section 2 for Charts; Section 5 for Calculations.

LID Discussion and Summary

PROJECT DESIGNATION:
This report follows the LID criteria and methodology set forth by the Los Angeles County Department of Public Works, as explained in the Low Impact Development Manual. Tentative Map 60257 is subject to the stormwater management requirements for Designated Projects under the following category:

- Development project equal to one acre or greater of disturbed area and adding more than 10,000 square feet of impervious surface area.

PERCOLATION REPORT SUMMARY:
The percolation report "Geotechnical Report, Results of Preliminary Infiltration Testing" was prepared by Allan E. Seward Engineering Geology, Inc., dated November 6, 2017. The Conclusions and Recommendations for infiltration feasibility have been summarized within the report, that include infiltration rates specified for the project.

PROJECT LID SUMMARY:
LID implementation for the project site follows the criteria and guidelines provided in the 2014 Los Angeles County Department of Public Works Low Impact Development Manual.

The project site has been designed to infiltrate the Stormwater Quality Design Volume (SWQDv), through the use of proposed infiltration basins. Offsite improvements within Del Valle Road north of the project site include replacement of existing pavement, and therefore does not require treatment.

STORMWATER QUALITY CONTROL MEASURES:
The Stormwater Quality Control Measures chosen to provide treatment for the project include four infiltration basins at the following locations:

- Perc. Basin - 1 (Node 154A)
- Perc. Basin – 2 (Node 203A)
- Perc. Basin – 3 (Node 306A)
- Perc. Basin – 4 (Node 406A)

Infiltration Basin locations have been identified on the Water Quality Map, located in Section 6 of the report.

The On-Site Stormwater Quality Control Measures have been incorporated into the site to provide the required treatment for the LID storm event. The infiltration facilities have been designed to treat the SWQDv, Water Quality Volumes are calculated per the Hydrocalc program, using the Isohyet associated with the 85th percentile, 24 hour rainfall. See Section 6 for LID Calculations.

Hydrology Summary

Comparing the design storm frequency between the Pre-Development and Post-Development conditions at the project outlet point and off-site point, the proposed condition discharges and volumes do not exceed their respective existing condition discharges and volumes, as shown in the Design Frequency Summary Table below. This means that for the design frequency storm, there is no need for any mitigation, as negative impacts to offsite properties are not present for these areas.

Design Frequency Summary Table:

	PRE-DEVELOPMENT				**POST-DEVELOPMENT**			
	Area (ac)	**Q**b (cfs)	**Q**bb (cfs)	**DPV** (cy)	**Area** (ac)	**Q**b+d (cfs)	**Q**bb (cfs)	**DPV** (cy)
PROJECT OUTLET	267.9	427.5	574.1	18,582	271.1	336.7	376.8	8789
OFFSITE	4.3	10.8	15.4	494	4.4	10.7	12.2	165

Additionally, the project is required to compare the clear storm frequency analysis between the Pre-Development and Post-Development conditions at the outlet point to demonstrate the proposed condition Q and Volume do not exceed their respective existing conditions. The results indicate that for the Clear Frequency storm events, there is no need for any mitigation, as negative impacts to offsite properties are not present for these areas.

Hydromodification Clear Frequency Summary Tables:

	Pre-Development		**Post-Development**	
Freq.	**Q** (cfs)	**Vol** (ac-ft)	**Q** (cfs)	**Vol** (ac-ft)
50	404.5	38.4	350.5	33.0
25	326.5	33.3	286.4	27.8
10	228.0	27.2	209.3	21.1
5	152.7	22.8	145.7	16.2
2	61.78	17.2	53.9	9.22
LID	6.4	3.5	3.7	1.7

The proposed project outlet consists of a longitudinal percolation basin that discharges to Hunstock Avenue, designed to match existing drainage conditions. Since the outlet for the project discharges to paved conditions, Hungry Water is not applicable.

Looking at the results of this analysis, the project has demonstrated that proposed development is not contributing negative impacts to the downstream properties.
Preliminary alignments and layouts of the drainage devices, swales, debris basins, infiltration basins, access roads, and storm drain system are shown on the Proposed Conditions Map.

Section 2

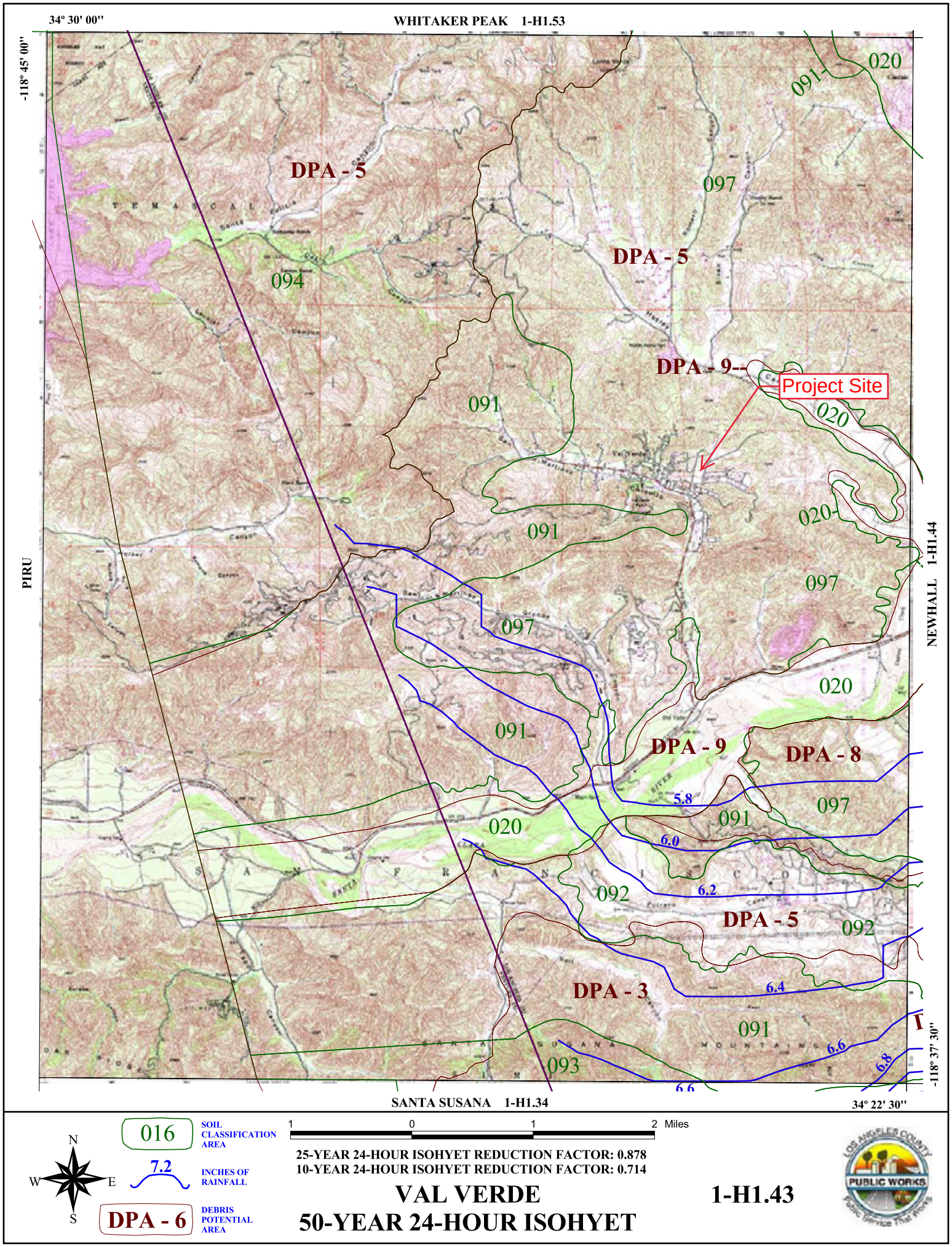
Proportion Impervious Data

Code	Land Use Description	% Impervious
1111	High-Density Single Family Residential	42
1112	Low-Density Single Family Residential	21
1121	Mixed Multi-Family Residential	74
1122	Duplexes, Triplexes and 2-or 3-Unit Condominiums and Townhouses	55
1123	Low-Rise Apartments, Condominiums, and Townhouses	86
1124	Medium-Rise Apartments and Condominiums	86
1125	High-Rise Apartments and Condominiums	90
1131	Trailer Parks and Mobile Home Courts, High-Density	91
1132	Mobile Home Courts and Subdivisions, Low-Density	42
1140	Mixed Residential	59
1151	Rural Residential, High-Density	15
1152	Rural Residential, Low-Density	10
1211	Low- and Medium-Rise Major Office Use	91
1212	High-Rise Major Office Use	91
1213	Skyscrapers	91
1221	Regional Shopping Center	95
1222	Retail Centers (Non-Strip With Contiguous Interconnected Off-Street	96
1223	Modern Strip Development	96
1224	Older Strip Development	97
1231	Commercial Storage	90
1232	Commercial Recreation	90
1233	Hotels and Motels	96
1234	Attended Pay Public Parking Facilities	91
1241	Government Offices	91
1242	Police and Sheriff Stations	91
1243	Fire Stations	91
1244	Major Medical Health Care Facilities	74
1245	Religious Facilities	82
1246	Other Public Facilities	91
1247	Non-Attended Public Parking Facilities	91
1251	Correctional Facilities	91
1252	Special Care Facilities	74
1253	Other Special Use Facilities	86
1261	Pre-Schools/Day Care Centers	68
1262	Elementary Schools	82
1263	Junior or Intermediate High Schools	82
1264	Senior High Schools	82
1265	Colleges and Universities	47
1266	Trade Schools and Professional Training Facilities	91
1271	Base (Built-up Area)	65
1271.01	Base High-Density Single Family Residential	42
1271.02	Base Duplexes, Triplexes and 2-or 3-Unit Condominiums and T	55

Code	Land Use Description	% Impervious
1271.03	Base Government Offices	91
1271.04	Base Fire Stations	91
1271.05	Base Non-Attended Public Parking Facilities	91
1271.06	Base Air Field	45
1271.07	Base Petroleum Refining and Processing	91
1271.08	Base Mineral Extraction - Oil and Gas	10
1271.09	Base Harbor Facilities	91
1271.10	Base Navigation Aids	47
1271.11	Base Developed Local Parks and Recreation	10
1271.12	Base Vacant Undifferentiated	1
1272	Vacant Area	2
1273	Air Field	45
1274	Former Base (Built-up Area)	65
1275	Former Base Vacant Area	2
1276	Former Base Air Field	91
1311	Manufacturing, Assembly, and Industrial Services	91
1312	Motion Picture and Television Studio Lots	82
1313	Packing Houses and Grain Elevators	96
1314	Research and Development	91
1321	Manufacturing	91
1322	Petroleum Refining and Processing	91
1323	Open Storage	66
1324	Major Metal Processing	91
1325	Chemical Processing	91
1331	Mineral Extraction - Other Than Oil and Gas	10
1332	Mineral Extraction - Oil and Gas	10
1340	Wholesaling and Warehousing	91
1411	Airports	91
1411.01	Airstrip	10
1412	Railroads	15
1412.01	Railroads-Attended Pay Public Parking Facilities	91
1412.02	Railroads-Non-Attended Public Parking Facilities	91
1412.03	Railroads-Manufacturing, Assembly, and Industrial Services	91
1412.04	Railroads-Petroleum Refining and Processing	91
1412.05	Railroads-Open Storage	66
1412.06	Railroads-Truck Terminals	91
1413	Freeways and Major Roads	91
1414	Park-and-Ride Lots	91
1415	Bus Terminals and Yards	91
1416	Truck Terminals	91
1417	Harbor Facilities	91
1418	Navigation Aids	47
1420	Communication Facilities	82
1420.01	Communication Facilities-Antenna	2

Code	Land Use Description	% Impervious
1431	Electrical Power Facilities	47
1431.01	Electrical Power Facilities-Powerlines (Urban)	2
1431.02	Electrical Power Facilities-Powerlines (Rural)	1
1432	Solid Waste Disposal Facilities	15
1433	Liquid Waste Disposal Facilities	96
1434	Water Storage Facilities	91
1435	Natural Gas and Petroleum Facilities	91
1435.01	Natural Gas and Petroleum Facilities-Manufacturing, Assembly, and In	91
1435.02	Natural Gas and Petroleum Facilities-Petroleum Refining and Processing	91
1435.03	Natural Gas and Petroleum Facilities-Mineral Extraction – Oil and Gas	10
1435.04	Natural Gas and Petroleum Facilities-Vacant Undifferentiated	1
1436	Water Transfer Facilities	96
1437	Improved Flood Waterways and Structures	100
1440	Maintenance Yards	91
1450	Mixed Transportation	90
1460	Mixed Transportation and Utility	91
1460.01	Mixed Utility and Transportation-Improved Flood Waterways and Structures	100
1460.02	Mixed Utility and Transportation-Railroads	15
1460.03	Mixed Utility and Transportation-Freeways and Major Roads	91
1500	Mixed Commercial and Industrial	91
1600	Mixed Urban	89
1700	Under Construction (Use appropriate value)	91
1810	Golf Courses	3
1821	Developed Local Parks and Recreation	10
1822	Undeveloped Local Parks and Recreation	2
1831	Developed Regional Parks and Recreation	2
1832	Undeveloped Regional Parks and Recreation	1
1840	Cemeteries	10
1850	Wildlife Preserves and Sanctuaries	2
1850.01	Wildlife-Commercial Recreation	90
1850.02	Wildlife-Other Special Use Facilities	86
1850.03	Wildlife-Developed Local Parks and Recreation	10
1860	Specimen Gardens and Arboreta	15
1870	Beach Parks	10
1880	Other Open Space and Recreation	10
2110	Irrigated Cropland and Improved Pasture Land	2
2120	Non-Irrigated Cropland and Improved Pasture Land	2
2200	Orchards and Vineyards	2
2300	Nurseries	15
2400	Dairy, Intensive Livestock, and Associated Facilities	42
2500	Poultry Operations	62
2600	Other Agriculture	42
2700	Horse Ranches	42

Code	Land Use Description	% Impervious
3100	Vacant Undifferentiated	1
3200	Abandoned Orchards and Vineyards	2
3300	Vacant With Limited Improvements (Use appropriate value)	42
3400	Beaches (Vacant)	1
4100	Water, Undifferentiated	100
4200	Harbor Water Facilities	100
4300	Marina Water Facilities	100
4400	Water Within a Military Installation	100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34° 22' 30"
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DPA - 5
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VAL VERDE
50-YEAR 24-HOUR ISOHYET
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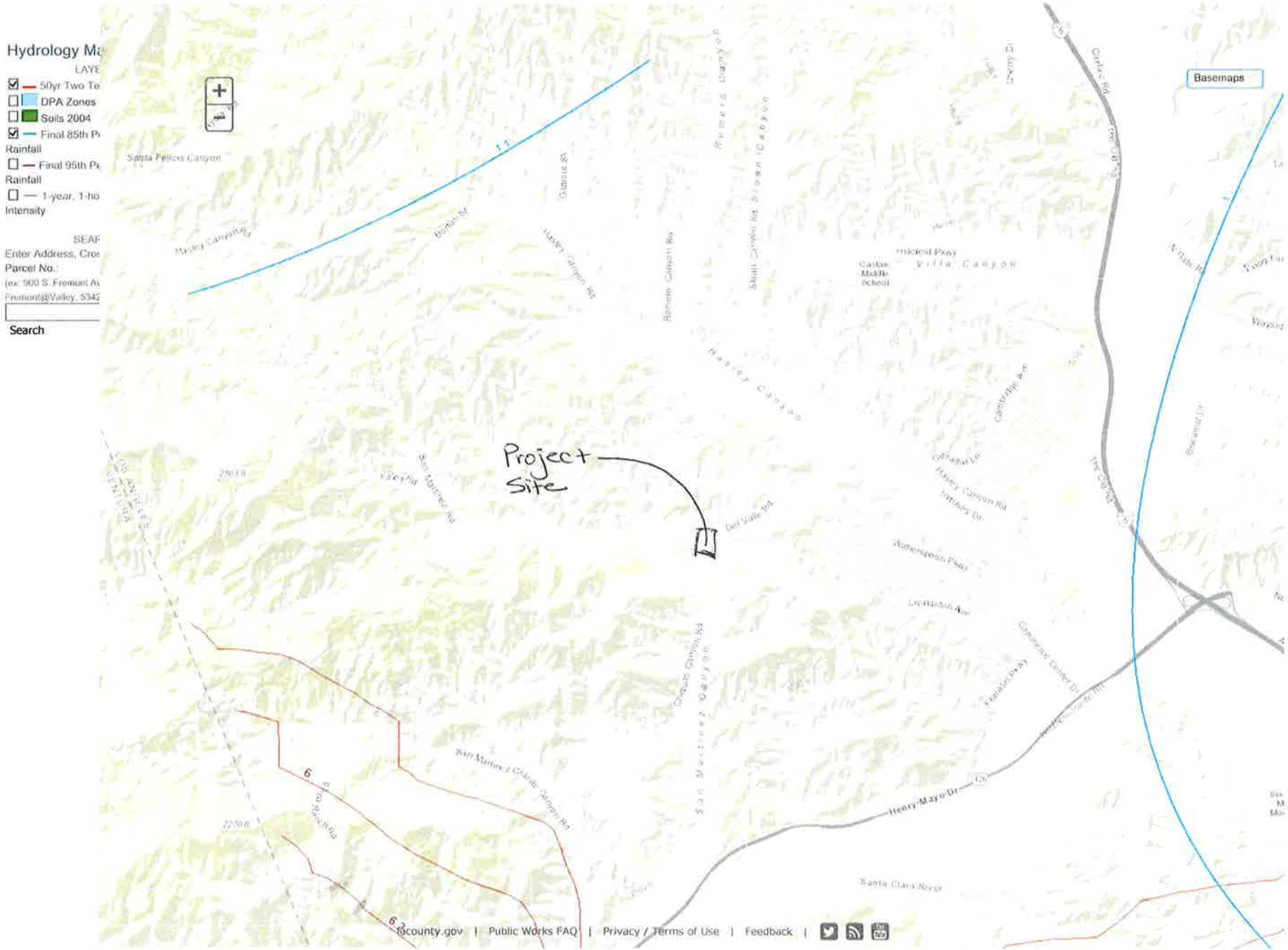
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Del Valle Rd
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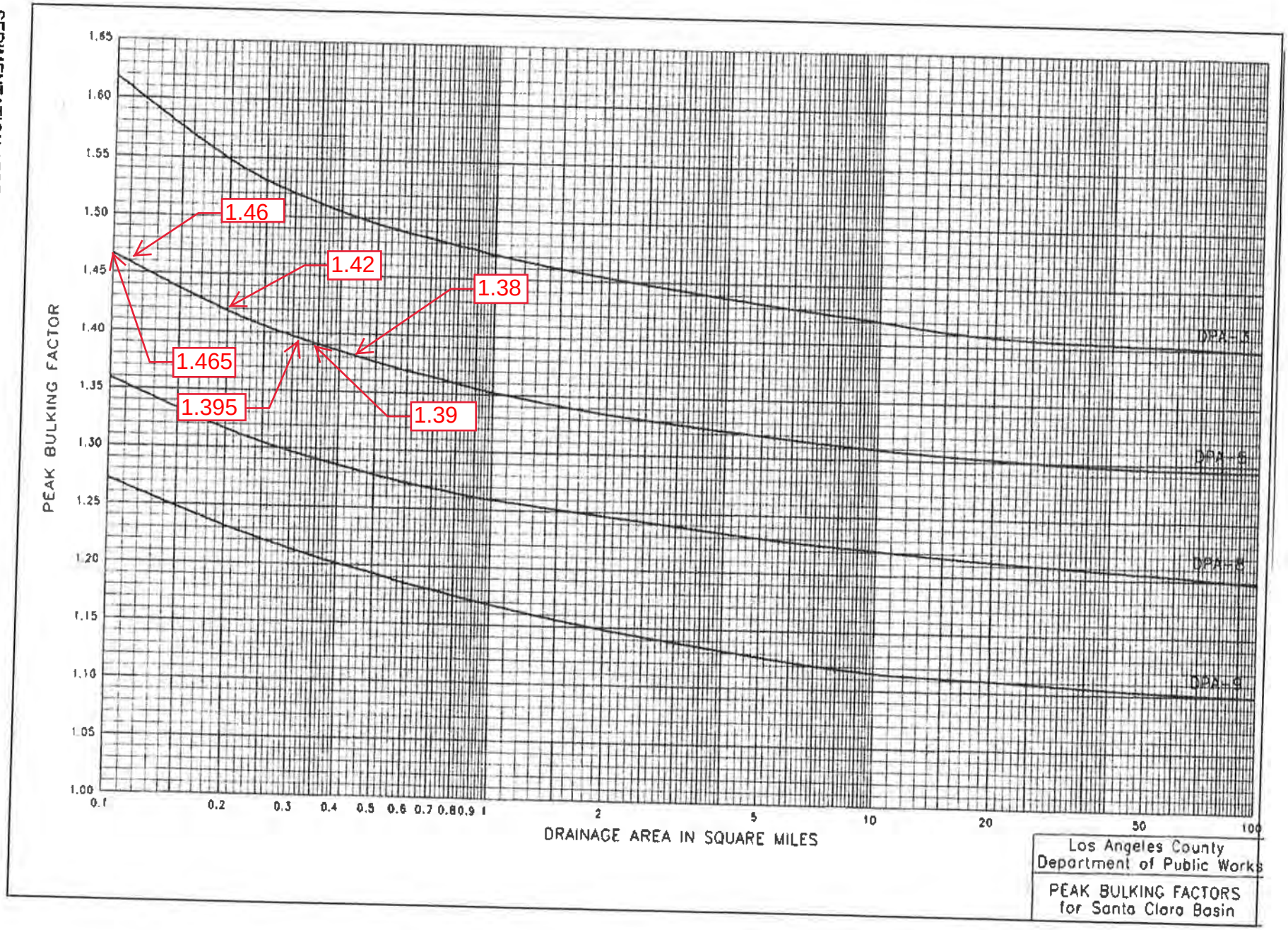
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DRAINAGE AREA IN SQUARE MILES
1.46
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1.465
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DPA-3
DPA-6
DPA-8
DPA-9
Los Angeles County
Department of Public Works
PEAK BULKING FACTORS
for Santa Clara Basin

DPA-3

DPA-5

DPA-8

DPA9

Section 3

HYDROCALC Results

TTM 060257, Sterling
Existing Condition

50-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	3A	7.2	1097	0.237	5.8	1	97	50-yr		8	2.77	0.72	0.72	14.40
TM 60257	5A	17.3	1361	0.1124	5.8	1	97	50-yr		10	2.50	0.71	0.71	30.59
TM 60257	7A	19.9	1893	0.1273	5.8	1	97	50-yr		12	2.29	0.69	0.69	31.61
TM 60257	9B	10.6	829	0.1942	5.8	1	97	50-yr		7	2.95	0.73	0.73	22.84
TM 60257	11B	7.0	541	0.122	5.8	1	97	50-yr		5	3.46	0.75	0.75	18.24
TM 60257	13B	10.6	1299	0.137	5.8	1	97	50-yr		9	2.63	0.71	0.71	19.86
TM 60257	15A	27.7	1926	0.1023	5.8	1	97	50-yr		13	2.21	0.68	0.69	41.99
TM 60257	16C	25.8	1864	0.1369	5.8	5	97	50-yr		12	2.29	0.69	0.70	41.47
TM 60257	19C	8.9	1241	0.12	5.8	10	97	50-yr		9	2.63	0.71	0.73	17.07
TM 60257	22A	7.2	733	0.0314	5.8	10	97	50-yr		8	2.77	0.72	0.74	14.73
TM 60257	26B	24.4	1708	0.1546	5.8	10	97	50-yr		11	2.39	0.70	0.72	41.85
TM 60257	32C	8.6	707	0.1938	5.8	1	97	50-yr		6	3.18	0.74	0.74	20.21
TM 60257	33C	15.1	1504	0.0894	5.8	15	97	50-yr		11	2.39	0.70	0.73	26.26
TM 60257	35B	29.1	1808	0.1217	5.8	25	97	50-yr		12	2.29	0.69	0.74	49.57
TM 60257	38A	3.3	654	0.1437	5.8	25	97	50-yr		6	3.18	0.74	0.78	8.16
TM 60257	42B	24.3	1927	0.123	5.8	1	97	50-yr		13	2.21	0.68	0.69	36.83
TM 60257	44C	14.9	1533	0.1709	5.8	42	97	50-yr		9	2.62	0.71	0.79	30.93
TM 60257	46B	6.0	734	0.1349	5.8	6	97	50-yr		6	3.18	0.74	0.75	14.25
TM 60257	Offsite	4.3	750	0.1627	5.8	0.1	97	50-yr		6	3.18	0.74	0.75	10.30

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Existing 50-yr Burned STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	2A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	3A	7.2	15.00	7.2	15.00	0	0.	.00000	.00	.00	0.	297	8	A29	.01
1	4A	.0	.00	7.2	15.00	2	305.	.06230	.00	.00	0.	97	99	A29	.00
1	5A	17.3	32.18	24.5	46.70	0	0.	.00000	.00	.00	0.	297	10	A29	.01
1	6A	.0	.00	24.5	46.70	2	300.	.03990	.00	.00	0.	97	99	A29	.00
1	7A	19.9	33.26	44.4	79.59	0	0.	.00000	.00	.00	0.	297	12	A29	.01
1	8A	.0	.00	44.4	79.59	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	9B	10.6	23.69	10.6	23.69	0	0.	.00000	.00	.00	0.	297	7	A29	.01
1	10B	.0	.00	10.6	23.69	2	563.	.07100	.00	.00	0.	97	99	A29	.00
1	11B	7.0	19.11	17.6	38.40	0	0.	.00000	.00	.00	0.	297	5	A29	.01
1	12B	.0	.00	17.6	38.40	2	966.	.05800	.00	.00	0.	97	99	A29	.00
1	13B	10.6	20.77	28.2	55.56	0	0.	.00000	.00	.00	0.	297	9	A29	.01
1	14AB	28.2	55.56	72.6	134.88	2	1228.	.03420	.00	.00	0.	97	0	A29	.00
1	15A	27.7	44.27	100.3	170.10	0	0.	.00000	.00	.00	0.	297	13	A29	.01
1	16C	25.8	43.51	25.8	43.51	0	0.	.00000	.00	.00	0.	297	12	A29	.05
1	17C	.0	.00	25.8	43.51	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	18C	.0	.00	25.8	43.51	2	846.	.04370	.00	.00	0.	97	99	A29	.00
1	19C	8.9	17.75	34.7	59.01	0	0.	.00000	.00	.00	0.	297	9	A29	.10
1	20AC	34.7	59.01	135.0	226.90	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	21A	.0	.00	135.0	226.90	2	684.	.03360	.00	.00	0.	97	99	A29	.00
1	22A	7.2	15.25	142.2	232.81	0	0.	.00000	.00	.00	0.	297	8	A29	.10
1	23A	.0	.00	142.2	232.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	24A	.0	.00	142.2	232.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	25A	.0	.00	142.2	232.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	26B	24.4	43.72	24.4	43.72	0	0.	.00000	.00	.00	0.	297	11	A29	.10
1	27B	.0	.00	24.4	43.72	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	28B	.0	.00	24.4	43.72	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	29B	.0	.00	24.4	43.72	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	30B	.0	.00	24.4	43.72	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	31B	.0	.00	24.4	43.72	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	32C	8.6	20.95	8.6	20.95	2	1114.	.03590	.00	.00	0.	297	6	A29	.01
1	33C	15.1	27.35	23.7	43.32	0	0.	.00000	.00	.00	0.	297	11	A29	.15
1	34BC	23.7	43.32	48.1	85.69	2	1300.	.04230	.00	.00	0.	97	0	A29	.00
1	35B	29.1	51.32	77.2	129.83	0	0.	.00000	.00	.00	0.	297	12	A29	.25
1	36AB	77.2	129.83	219.4	362.28	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	37A	.0	.00	219.4	362.28	2	514.	.01950	.00	.00	0.	97	99	A29	.00
1	38A	3.3	8.35	222.7	361.92	0	0.	.00000	.00	.00	0.	297	6	A29	.25
1	39A	.0	.00	222.7	361.92	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	40A	.0	.00	222.7	361.92	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	41A	.0	.00	222.7	361.92	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	42B	24.3	38.84	24.3	38.84	0	0.	.00000	.00	.00	0.	297	13	A29	.01
1	43B	.0	.00	24.3	38.84	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	44C	14.9	31.58	14.9	31.58	0	0.	.00000	.00	.00	0.	297	9	A29	.42
1	45BC	14.9	31.58	39.2	70.42	2	592.	.02700	.00	.00	0.	97	0	A29	.00
1	46B	6.0	14.74	45.2	80.17	0	0.	.00000	.00	.00	0.	297	6	A29	.06
1	47AB	45.2	80.17	267.9	427.47	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	48A	.0	.00	267.9	427.47	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
TM 60275 Area 100, Existing 50-yr Burned, OUTLET HYD.
HYDROGRAPH AT 1 48A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	1.20	100	10.91	200	11.20	300	11.59	400	12.00
500	12.52	600	13.17	700	14.02	800	15.21	900	16.99
1000	19.89	1050	27.66	1100	45.83	1110	56.77	1120	72.94
1130	92.04	1131	94.20	1132	96.41	1133	98.87	1134	101.41
1135	104.07	1136	106.80	1137	109.63	1138	112.66	1139	115.94
1140	119.49	1141	123.50	1142	128.00	1143	132.97	1144	138.44
1145	144.76	1146	151.99	1147	160.09	1148	169.01	1149	181.78
1150	199.29	1151	223.01	1152	252.39	1153	287.33	1154	323.88
1155	356.10	1156	383.50	1157	405.89	1158	421.15	1159	427.47
1160	426.89	1161	417.57	1162	399.38	1163	373.27	1164	341.06
1165	305.47	1166	268.87	1167	234.06	1168	202.72	1169	175.72
1170	153.52	1171	135.44	1172	120.71	1173	108.85	1174	98.97
1175	90.81	1176	84.01	1177	78.10	1178	72.88	1179	68.27
1180	64.36	1181	60.85	1182	57.59	1183	54.66	1184	52.13
1185	49.70	1186	47.47	1187	45.34	1188	43.41	1189	41.77
1190	40.15	1191	38.58	1192	37.10	1193	35.72	1194	34.40
1195	33.11	1196	31.94	1197	30.83	1198	29.81	1199	28.82
1200	27.89	1201	27.02	1202	26.25	1203	25.55	1204	24.91
1205	24.31	1206	23.75	1207	23.23	1208	22.77	1209	22.37
1210	21.96	1211	21.63	1212	21.29	1213	21.04	1214	20.76
1215	20.51	1216	20.33	1217	20.10	1218	19.92	1219	19.74
1220	19.58	1221	19.44	1222	19.28	1223	19.14	1224	19.00
1225	18.83	1226	18.72	1227	18.59	1228	18.49	1229	18.40
1230	18.27	1231	18.17	1232	18.02	1233	17.89	1234	17.78
1235	17.68	1236	17.62	1237	17.53	1238	17.42	1239	17.34
1240	17.24	1241	17.14	1242	17.04	1243	16.97	1244	16.92
1245	16.82	1246	16.75	1247	16.65	1248	16.59	1249	16.50
1250	16.40	1251	16.36	1252	16.27	1253	16.22	1254	16.13
1255	16.05	1256	15.99	1257	15.92	1258	15.86	1259	15.78
1260	15.74	1261	15.65	1262	15.58	1263	15.51	1264	15.44
1265	15.38	1266	15.32	1267	15.25	1268	15.20	1269	15.14
1270	15.08	1271	15.04	1272	14.97	1273	14.95	1274	14.89
1275	14.83	1276	14.80	1277	14.75	1278	14.70	1279	14.65
1280	14.59	1281	14.55	1282	14.52	1283	14.48	1284	14.44
1285	14.36	1286	14.32	1287	14.26	1288	14.21	1289	14.16
1290	14.11	1291	14.06	1292	14.01	1293	13.96	1294	13.90
1295	13.86	1296	13.82	1297	13.78	1298	13.75	1299	13.72
1300	13.70	1310	13.46	1320	13.19	1330	12.89	1340	12.57
1350	12.36	1360	12.17	1370	12.02	1380	11.85	1390	11.58
1400	11.50	1420	11.31	1440	10.95	1460	10.59	1500	10.59

TOTAL VOLUME THIS HYDROGRAPH = 44.96(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Existing Condition

50-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	3A	7.2	1097	0.237	5.8	1	97	50-yr		8	2.77	0.72	0.72	14.40
TM 60257	5A	17.3	1361	0.1124	5.8	1	97	50-yr		10	2.50	0.71	0.71	30.59
TM 60257	7A	19.9	1893	0.1273	5.8	1	97	50-yr		12	2.29	0.69	0.69	31.61
TM 60257	9B	10.6	829	0.1942	5.8	1	97	50-yr		7	2.95	0.73	0.73	22.84
TM 60257	11B	7.0	541	0.122	5.8	1	97	50-yr		5	3.46	0.75	0.75	18.24
TM 60257	13B	10.6	1299	0.137	5.8	1	97	50-yr		9	2.63	0.71	0.71	19.86
TM 60257	15A	27.7	1926	0.1023	5.8	1	97	50-yr		13	2.21	0.68	0.69	41.99
TM 60257	16C	25.8	1864	0.1369	5.8	5	97	50-yr		12	2.29	0.69	0.70	41.47
TM 60257	19C	8.9	1241	0.12	5.8	10	97	50-yr		9	2.63	0.71	0.73	17.07
TM 60257	22A	7.2	733	0.0314	5.8	10	97	50-yr		8	2.77	0.72	0.74	14.73
TM 60257	26B	24.4	1708	0.1546	5.8	10	97	50-yr		11	2.39	0.70	0.72	41.85
TM 60257	32C	8.6	707	0.1938	5.8	1	97	50-yr		6	3.18	0.74	0.74	20.21
TM 60257	33C	15.1	1504	0.0894	5.8	15	97	50-yr		11	2.39	0.70	0.73	26.26
TM 60257	35B	29.1	1808	0.1217	5.8	25	97	50-yr		12	2.29	0.69	0.74	49.57
TM 60257	38A	3.3	654	0.1437	5.8	25	97	50-yr		6	3.18	0.74	0.78	8.16
TM 60257	42B	24.3	1927	0.123	5.8	1	97	50-yr		13	2.21	0.68	0.69	36.83
TM 60257	44C	14.9	1533	0.1709	5.8	42	97	50-yr		9	2.62	0.71	0.79	30.93
TM 60257	46B	6.0	734	0.1349	5.8	6	97	50-yr		6	3.18	0.74	0.75	14.25

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Existing 50-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	2A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	3A	7.2	14.28	7.2	14.28	0	0.	.00000	.00	.00	0.	97	8	A29	.01
1	4A	.0	.00	7.2	14.28	2	305.	.06230	.00	.00	0.	97	99	A29	.00
1	5A	17.3	30.56	24.5	44.35	0	0.	.00000	.00	.00	0.	97	10	A29	.01
1	6A	.0	.00	24.5	44.35	2	300.	.03990	.00	.00	0.	97	99	A29	.00
1	7A	19.9	31.48	44.4	75.45	0	0.	.00000	.00	.00	0.	97	12	A29	.01
1	8A	.0	.00	44.4	75.45	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	9B	10.6	22.58	10.6	22.58	0	0.	.00000	.00	.00	0.	97	7	A29	.01
1	10B	.0	.00	10.6	22.58	2	563.	.07100	.00	.00	0.	97	99	A29	.00
1	11B	7.0	18.29	17.6	36.54	0	0.	.00000	.00	.00	0.	97	5	A29	.01
1	12B	.0	.00	17.6	36.54	2	966.	.05800	.00	.00	0.	97	99	A29	.00
1	13B	10.6	19.75	28.2	52.64	0	0.	.00000	.00	.00	0.	97	9	A29	.01
1	14AB	28.2	52.64	72.6	127.87	2	1228.	.03420	.00	.00	0.	97	0	A29	.00
1	15A	27.7	41.85	100.3	160.77	0	0.	.00000	.00	.00	0.	97	13	A29	.01
1	16C	25.8	41.30	25.8	41.30	0	0.	.00000	.00	.00	0.	97	12	A29	.05
1	17C	.0	.00	25.8	41.30	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	18C	.0	.00	25.8	41.30	2	846.	.04370	.00	.00	0.	97	99	A29	.00
1	19C	8.9	16.97	34.7	56.01	0	0.	.00000	.00	.00	0.	97	9	A29	.10
1	20AC	34.7	56.01	135.0	214.34	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	21A	.0	.00	135.0	214.34	2	684.	.03360	.00	.00	0.	97	99	A29	.00
1	22A	7.2	14.60	142.2	219.62	0	0.	.00000	.00	.00	0.	97	8	A29	.10
1	23A	.0	.00	142.2	219.62	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	24A	.0	.00	142.2	219.62	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	25A	.0	.00	142.2	219.62	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	26B	24.4	41.70	24.4	41.70	0	0.	.00000	.00	.00	0.	97	11	A29	.10
1	27B	.0	.00	24.4	41.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	28B	.0	.00	24.4	41.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	29B	.0	.00	24.4	41.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	30B	.0	.00	24.4	41.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	31B	.0	.00	24.4	41.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	32C	8.6	20.01	8.6	20.01	2	1114.	.03590	.00	.00	0.	97	6	A29	.01
1	33C	15.1	26.17	23.7	41.21	0	0.	.00000	.00	.00	0.	97	11	A29	.15
1	34BC	23.7	41.21	48.1	81.54	2	1300.	.04230	.00	.00	0.	97	0	A29	.00
1	35B	29.1	49.35	77.2	123.69	0	0.	.00000	.00	.00	0.	97	12	A29	.25
1	36AB	77.2	123.69	219.4	343.06	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	37A	.0	.00	219.4	343.06	2	514.	.01950	.00	.00	0.	97	99	A29	.00
1	38A	3.3	8.08	222.7	342.49	0	0.	.00000	.00	.00	0.	97	6	A29	.25
1	39A	.0	.00	222.7	342.49	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	40A	.0	.00	222.7	342.49	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	41A	.0	.00	222.7	342.49	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	42B	24.3	36.71	24.3	36.71	0	0.	.00000	.00	.00	0.	97	13	A29	.01
1	43B	.0	.00	24.3	36.71	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	44C	14.9	30.74	14.9	30.74	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1	45BC	14.9	30.74	39.2	67.45	2	592.	.02700	.00	.00	0.	97	0	A29	.00
1	46B	6.0	14.11	45.2	76.57	0	0.	.00000	.00	.00	0.	97	6	A29	.06
1	47AB	45.2	76.57	267.9	404.46	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	48A	.0	.00	267.9	404.46	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
TM 60275 Area 100, Existing 50-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 48A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	1.20	100	9.13	200	9.34	300	9.63	400	9.93
500	10.31	600	10.78	700	11.39	800	12.19	900	13.37
1000	15.34	1050	22.19	1100	38.82	1110	48.85	1120	63.90
1130	81.97	1131	84.02	1132	86.11	1133	88.43	1134	90.84
1135	93.36	1136	95.95	1137	98.63	1138	101.50	1139	104.61
1140	107.97	1141	111.77	1142	116.02	1143	120.71	1144	125.87
1145	131.85	1146	138.70	1147	146.39	1148	154.88	1149	167.07
1150	183.73	1151	206.34	1152	234.41	1153	267.86	1154	302.96
1155	334.00	1156	360.51	1157	382.40	1158	397.62	1159	404.35
1160	404.46	1161	396.15	1162	379.21	1163	354.59	1164	324.04
1165	290.13	1166	255.15	1167	221.83	1168	191.77	1169	165.68
1170	144.31	1171	126.76	1172	112.45	1173	100.88	1174	91.22
1175	83.24	1176	76.54	1177	70.85	1178	65.80	1179	61.27
1180	57.41	1181	54.04	1182	50.90	1183	48.05	1184	45.54
1185	43.23	1186	41.11	1187	39.07	1188	37.20	1189	35.63
1190	34.13	1191	32.65	1192	31.27	1193	29.99	1194	28.75
1195	27.54	1196	26.45	1197	25.41	1198	24.45	1199	23.53
1200	22.66	1201	21.85	1202	21.11	1203	20.48	1204	19.90
1205	19.35	1206	18.85	1207	18.37	1208	17.96	1209	17.59
1210	17.22	1211	16.92	1212	16.62	1213	16.39	1214	16.15
1215	15.94	1216	15.77	1217	15.58	1218	15.44	1219	15.29
1220	15.16	1221	15.05	1222	14.92	1223	14.81	1224	14.71
1225	14.58	1226	14.50	1227	14.41	1228	14.33	1229	14.28
1230	14.19	1231	14.12	1232	14.02	1233	13.93	1234	13.85
1235	13.79	1236	13.75	1237	13.69	1238	13.62	1239	13.56
1240	13.50	1241	13.43	1242	13.36	1243	13.32	1244	13.29
1245	13.23	1246	13.18	1247	13.11	1248	13.07	1249	13.01
1250	12.94	1251	12.91	1252	12.85	1253	12.83	1254	12.76
1255	12.71	1256	12.67	1257	12.63	1258	12.59	1259	12.53
1260	12.51	1261	12.45	1262	12.40	1263	12.36	1264	12.31
1265	12.27	1266	12.23	1267	12.18	1268	12.15	1269	12.11
1270	12.07	1271	12.04	1272	12.00	1273	11.99	1274	11.95
1275	11.91	1276	11.89	1277	11.87	1278	11.83	1279	11.79
1280	11.75	1281	11.73	1282	11.71	1283	11.68	1284	11.65
1285	11.60	1286	11.57	1287	11.53	1288	11.50	1289	11.46
1290	11.43	1291	11.40	1292	11.37	1293	11.33	1294	11.29
1295	11.26	1296	11.24	1297	11.21	1298	11.19	1299	11.18
1300	11.16	1310	10.99	1320	10.80	1330	10.57	1340	10.34
1350	10.19	1360	10.05	1370	9.94	1380	9.82	1390	9.62
1400	9.57	1420	9.43	1440	9.16	1460	8.89	1500	8.89

TOTAL VOLUME THIS HYDROGRAPH = 38.41(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Existing Condition

25-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	3A	7.2	1097	0.237	5.1	1	97	25-yr		9	2.30	0.69	0.69	11.51
TM 60257	5A	17.3	1361	0.1124	5.1	1	97	25-yr		11	2.10	0.68	0.68	24.60
TM 60257	7A	19.9	1893	0.1273	5.1	1	97	25-yr		14	1.87	0.65	0.66	24.48
TM 60257	9B	10.6	829	0.1942	5.1	1	97	25-yr		7	2.59	0.71	0.71	19.59
TM 60257	11B	7.0	541	0.122	5.1	1	97	25-yr		6	2.79	0.72	0.72	14.09
TM 60257	13B	10.6	1299	0.137	5.1	1	97	25-yr		11	2.10	0.68	0.68	15.08
TM 60257	15A	27.7	1926	0.1023	5.1	1	97	25-yr		15	1.81	0.65	0.65	32.65
TM 60257	16C	25.8	1864	0.1369	5.1	5	97	25-yr		14	1.87	0.65	0.67	32.21
TM 60257	19C	8.9	1241	0.12	5.1	10	97	25-yr		10	2.19	0.68	0.70	13.76
TM 60257	22A	7.2	733	0.0314	5.1	10	97	25-yr		9	2.30	0.69	0.71	11.82
TM 60257	26B	24.4	1708	0.1546	5.1	10	97	25-yr		12	2.01	0.67	0.69	34.02
TM 60257	32C	8.6	707	0.1938	5.1	1	97	25-yr		7	2.59	0.71	0.71	15.89
TM 60257	33C	15.1	1504	0.0894	5.1	15	97	25-yr		12	2.01	0.67	0.70	21.41
TM 60257	35B	29.1	1808	0.1217	5.1	25	97	25-yr		13	1.94	0.66	0.72	40.70
TM 60257	38A	3.3	654	0.1437	5.1	25	97	25-yr		6	2.79	0.72	0.76	7.04
TM 60257	42B	24.3	1927	0.123	5.1	1	97	25-yr		14	1.87	0.65	0.66	29.89
TM 60257	44C	14.9	1533	0.1709	5.1	42	97	25-yr		10	2.19	0.68	0.77	25.30
TM 60257	46B	6.0	734	0.1349	5.1	6	97	25-yr		7	2.59	0.71	0.72	11.23

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Existing 25-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	2A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	3A	7.2	11.44	7.2	11.44	0	0.	.00000	.00	.00	0.	97	9	A29	.01
1	4A	.0	.00	7.2	11.44	2	305.	.06230	.00	.00	0.	97	99	A29	.00
1	5A	17.3	24.53	24.5	35.88	0	0.	.00000	.00	.00	0.	97	11	A29	.01
1	6A	.0	.00	24.5	35.88	2	300.	.03990	.00	.00	0.	97	99	A29	.00
1	7A	19.9	24.49	44.4	59.90	0	0.	.00000	.00	.00	0.	97	14	A29	.01
1	8A	.0	.00	44.4	59.90	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	9B	10.6	19.30	10.6	19.30	0	0.	.00000	.00	.00	0.	97	7	A29	.01
1	10B	.0	.00	10.6	19.30	2	563.	.07100	.00	.00	0.	97	99	A29	.00
1	11B	7.0	13.96	17.6	31.43	0	0.	.00000	.00	.00	0.	97	6	A29	.01
1	12B	.0	.00	17.6	31.43	2	966.	.05800	.00	.00	0.	97	99	A29	.00
1	13B	10.6	15.03	28.2	43.19	0	0.	.00000	.00	.00	0.	97	11	A29	.01
1	14AB	28.2	43.19	72.6	102.43	2	1228.	.03420	.00	.00	0.	97	0	A29	.00
1	15A	27.7	32.83	100.3	128.85	0	0.	.00000	.00	.00	0.	97	15	A29	.01
1	16C	25.8	32.22	25.8	32.22	0	0.	.00000	.00	.00	0.	97	14	A29	.05
1	17C	.0	.00	25.8	32.22	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	18C	.0	.00	25.8	32.22	2	846.	.04370	.00	.00	0.	97	99	A29	.00
1	19C	8.9	13.78	34.7	43.95	0	0.	.00000	.00	.00	0.	97	10	A29	.10
1	20AC	34.7	43.95	135.0	170.91	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	21A	.0	.00	135.0	170.91	2	684.	.03360	.00	.00	0.	97	99	A29	.00
1	22A	7.2	11.75	142.2	175.35	0	0.	.00000	.00	.00	0.	97	9	A29	.10
1	23A	.0	.00	142.2	175.35	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	24A	.0	.00	142.2	175.35	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	25A	.0	.00	142.2	175.35	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	26B	24.4	33.81	24.4	33.81	0	0.	.00000	.00	.00	0.	97	12	A29	.10
1	27B	.0	.00	24.4	33.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	28B	.0	.00	24.4	33.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	29B	.0	.00	24.4	33.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	30B	.0	.00	24.4	33.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	31B	.0	.00	24.4	33.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	32C	8.6	15.66	8.6	15.66	2	1114.	.03590	.00	.00	0.	97	7	A29	.01
1	33C	15.1	21.27	23.7	33.20	0	0.	.00000	.00	.00	0.	97	12	A29	.15
1	34BC	23.7	33.20	48.1	66.05	2	1300.	.04230	.00	.00	0.	97	0	A29	.00
1	35B	29.1	40.53	77.2	100.81	0	0.	.00000	.00	.00	0.	97	13	A29	.25
1	36AB	77.2	100.81	219.4	275.31	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	37A	.0	.00	219.4	275.31	2	514.	.01950	.00	.00	0.	97	99	A29	.00
1	38A	3.3	6.97	222.7	275.17	0	0.	.00000	.00	.00	0.	97	6	A29	.25
1	39A	.0	.00	222.7	275.17	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	40A	.0	.00	222.7	275.17	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	41A	.0	.00	222.7	275.17	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	42B	24.3	29.91	24.3	29.91	0	0.	.00000	.00	.00	0.	97	14	A29	.01
1	43B	.0	.00	24.3	29.91	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	44C	14.9	25.32	14.9	25.32	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1	45BC	14.9	25.32	39.2	55.22	2	592.	.02700	.00	.00	0.	97	0	A29	.00
1	46B	6.0	11.07	45.2	63.15	0	0.	.00000	.00	.00	0.	97	7	A29	.06
1	47AB	45.2	63.15	267.9	326.45	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	48A	.0	.00	267.9	326.45	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE:
TM 60275 Area 100, Existing 25-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 48A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	1.20	100	8.51	200	8.69	300	8.95	400	9.20
500	9.54	600	9.96	700	10.49	800	11.19	900	12.22
1000	13.92	1050	16.17	1100	28.56	1110	36.87	1120	49.02
1130	64.47	1131	66.19	1132	67.94	1133	69.85	1134	71.86
1135	73.97	1136	76.12	1137	78.41	1138	80.80	1139	83.39
1140	86.13	1141	89.19	1142	92.55	1143	96.29	1144	100.33
1145	104.98	1146	110.30	1147	116.41	1148	123.07	1149	132.53
1150	145.31	1151	162.79	1152	184.17	1153	209.46	1154	236.08
1155	261.21	1156	281.84	1157	299.60	1158	313.61	1159	322.69
1160	326.45	1161	325.13	1162	318.02	1163	305.02	1164	286.69
1165	264.64	1166	240.06	1167	214.21	1168	189.04	1169	165.48
1170	144.17	1171	125.77	1172	110.12	1173	97.20	1174	86.45
1175	77.52	1176	70.08	1177	63.82	1178	58.53	1179	53.99
1180	49.84	1181	46.23	1182	43.13	1183	40.37	1184	37.85
1185	35.53	1186	33.46	1187	31.62	1188	29.88	1189	28.30
1190	26.83	1191	25.56	1192	24.38	1193	23.29	1194	22.28
1195	21.35	1196	20.52	1197	19.76	1198	19.09	1199	18.49
1200	17.94	1201	17.46	1202	17.02	1203	16.63	1204	16.30
1205	16.00	1206	15.74	1207	15.51	1208	15.31	1209	15.14
1210	14.95	1211	14.80	1212	14.64	1213	14.51	1214	14.38
1215	14.25	1216	14.15	1217	14.03	1218	13.93	1219	13.85
1220	13.75	1221	13.66	1222	13.58	1223	13.49	1224	13.41
1225	13.31	1226	13.24	1227	13.17	1228	13.10	1229	13.05
1230	12.98	1231	12.92	1232	12.84	1233	12.76	1234	12.69
1235	12.63	1236	12.59	1237	12.55	1238	12.49	1239	12.44
1240	12.38	1241	12.32	1242	12.26	1243	12.22	1244	12.18
1245	12.13	1246	12.10	1247	12.04	1248	12.00	1249	11.95
1250	11.89	1251	11.86	1252	11.81	1253	11.78	1254	11.73
1255	11.69	1256	11.64	1257	11.61	1258	11.57	1259	11.52
1260	11.50	1261	11.45	1262	11.40	1263	11.37	1264	11.32
1265	11.28	1266	11.26	1267	11.21	1268	11.18	1269	11.15
1270	11.11	1271	11.08	1272	11.05	1273	11.03	1274	11.00
1275	10.97	1276	10.94	1277	10.92	1278	10.89	1279	10.87
1280	10.83	1281	10.80	1282	10.79	1283	10.76	1284	10.74
1285	10.70	1286	10.66	1287	10.63	1288	10.60	1289	10.57
1290	10.54	1291	10.52	1292	10.49	1293	10.46	1294	10.43
1295	10.40	1296	10.37	1297	10.35	1298	10.33	1299	10.32
1300	10.30	1310	10.15	1320	9.98	1330	9.78	1340	9.58
1350	9.44	1360	9.32	1370	9.22	1380	9.12	1390	8.95
1400	8.89	1420	8.76	1440	8.53	1460	8.29	1500	8.29

TOTAL VOLUME THIS HYDROGRAPH = 33.28(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Existing Condition

10-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	3A	7.2	1097	0.237	4.1	1	97	10-yr		10	1.78	0.64	0.65	8.31
TM 60257	5A	17.3	1361	0.1124	4.1	1	97	10-yr		14	1.52	0.62	0.62	16.29
TM 60257	7A	19.9	1893	0.1273	4.1	1	97	10-yr		17	1.39	0.59	0.60	16.47
TM 60257	9B	10.6	829	0.1942	4.1	1	97	10-yr		9	1.87	0.65	0.66	13.05
TM 60257	11B	7.0	541	0.122	4.1	1	97	10-yr		7	2.11	0.68	0.68	10.03
TM 60257	13B	10.6	1299	0.137	4.1	1	97	10-yr		13	1.58	0.62	0.62	10.43
TM 60257	15A	27.7	1926	0.1023	4.1	1	97	10-yr		18	1.35	0.59	0.59	22.06
TM 60257	16C	25.8	1864	0.1369	4.1	5	97	10-yr		17	1.39	0.59	0.61	21.79
TM 60257	19C	8.9	1241	0.12	4.1	10	97	10-yr		13	1.58	0.62	0.65	9.11
TM 60257	22A	7.2	733	0.0314	4.1	10	97	10-yr		11	1.71	0.64	0.66	8.13
TM 60257	26B	24.4	1708	0.1546	4.1	10	97	10-yr		15	1.47	0.61	0.64	22.92
TM 60257	32C	8.6	707	0.1938	4.1	1	97	10-yr		8	1.98	0.67	0.67	11.39
TM 60257	33C	15.1	1504	0.0894	4.1	15	97	10-yr		15	1.47	0.61	0.65	14.51
TM 60257	35B	29.1	1808	0.1217	4.1	25	97	10-yr		16	1.43	0.60	0.67	28.09
TM 60257	38A	3.3	654	0.1437	4.1	25	97	10-yr		8	1.98	0.67	0.72	4.74
TM 60257	42B	24.3	1927	0.123	4.1	1	97	10-yr		18	1.35	0.59	0.59	19.35
TM 60257	44C	14.9	1533	0.1709	4.1	42	97	10-yr		12	1.64	0.63	0.74	18.10
TM 60257	46B	6.0	734	0.1349	4.1	6	97	10-yr		9	1.87	0.65	0.67	7.53

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Existing 10-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	2A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	3A	7.2	8.35	7.2	8.35	0	0.	.00000	.00	.00	0.	97	10	A29	.01
1	4A	.0	.00	7.2	8.35	2	305.	.06230	.00	.00	0.	97	99	A29	.00
1	5A	17.3	16.24	24.5	24.47	0	0.	.00000	.00	.00	0.	97	14	A29	.01
1	6A	.0	.00	24.5	24.47	2	300.	.03990	.00	.00	0.	97	99	A29	.00
1	7A	19.9	16.56	44.4	40.85	0	0.	.00000	.00	.00	0.	97	17	A29	.01
1	8A	.0	.00	44.4	40.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	9B	10.6	14.96	10.6	14.96	0	0.	.00000	.00	.00	0.	97	7	A29	.01
1	10B	.0	.00	10.6	14.96	2	563.	.07100	.00	.00	0.	97	99	A29	.00
1	11B	7.0	9.88	17.6	24.06	0	0.	.00000	.00	.00	0.	97	7	A29	.01
1	12B	.0	.00	17.6	24.06	2	966.	.05800	.00	.00	0.	97	99	A29	.00
1	13B	10.6	10.40	28.2	31.80	0	0.	.00000	.00	.00	0.	97	13	A29	.01
1	14AB	28.2	31.80	72.6	72.53	2	1228.	.03420	.00	.00	0.	97	0	A29	.00
1	15A	27.7	22.25	100.3	90.07	0	0.	.00000	.00	.00	0.	97	18	A29	.01
1	16C	25.8	21.91	25.8	21.91	0	0.	.00000	.00	.00	0.	97	17	A29	.05
1	17C	.0	.00	25.8	21.91	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	18C	.0	.00	25.8	21.91	2	846.	.04370	.00	.00	0.	97	99	A29	.00
1	19C	8.9	9.08	34.7	29.92	0	0.	.00000	.00	.00	0.	97	13	A29	.10
1	20AC	34.7	29.92	135.0	119.41	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	21A	.0	.00	135.0	119.41	2	684.	.03360	.00	.00	0.	97	99	A29	.00
1	22A	7.2	8.13	142.2	122.65	0	0.	.00000	.00	.00	0.	97	11	A29	.10
1	23A	.0	.00	142.2	122.65	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	24A	.0	.00	142.2	122.65	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	25A	.0	.00	142.2	122.65	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	26B	24.4	22.97	24.4	22.97	0	0.	.00000	.00	.00	0.	97	15	A29	.10
1	27B	.0	.00	24.4	22.97	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	28B	.0	.00	24.4	22.97	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	29B	.0	.00	24.4	22.97	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	30B	.0	.00	24.4	22.97	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	31B	.0	.00	24.4	22.97	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	32C	8.6	11.26	8.6	11.26	2	1114.	.03590	.00	.00	0.	97	8	A29	.01
1	33C	15.1	14.54	23.7	23.42	0	0.	.00000	.00	.00	0.	97	15	A29	.15
1	34BC	23.7	23.42	48.1	45.50	2	1300.	.04230	.00	.00	0.	97	0	A29	.00
1	35B	29.1	28.14	77.2	70.11	0	0.	.00000	.00	.00	0.	97	16	A29	.25
1	36AB	77.2	70.11	219.4	192.50	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	37A	.0	.00	219.4	192.50	2	514.	.01950	.00	.00	0.	97	99	A29	.00
1	38A	3.3	4.68	222.7	192.06	0	0.	.00000	.00	.00	0.	97	8	A29	.25
1	39A	.0	.00	222.7	192.06	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	40A	.0	.00	222.7	192.06	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	41A	.0	.00	222.7	192.06	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	42B	24.3	19.51	24.3	19.51	0	0.	.00000	.00	.00	0.	97	18	A29	.01
1	43B	.0	.00	24.3	19.51	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	44C	14.9	18.04	14.9	18.04	0	0.	.00000	.00	.00	0.	97	12	A29	.42
1	45BC	14.9	18.04	39.2	37.56	2	592.	.02700	.00	.00	0.	97	0	A29	.00
1	46B	6.0	7.49	45.2	43.81	0	0.	.00000	.00	.00	0.	97	9	A29	.06
1	47AB	45.2	43.81	267.9	227.98	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	48A	.0	.00	267.9	227.98	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE:
TM 60275 Area 100, Existing 10-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 48A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	1.20	100	7.81	200	7.93	300	8.09	400	8.25
500	8.50	600	8.84	700	9.28	800	9.85	900	10.68
1000	12.06	1050	13.81	1100	17.74	1110	21.94	1120	30.11
1130	41.50	1131	42.73	1132	43.99	1133	45.36	1134	46.80
1135	48.32	1136	49.90	1137	51.61	1138	53.42	1139	55.35
1140	57.39	1141	59.62	1142	61.99	1143	64.59	1144	67.41
1145	70.53	1146	73.97	1147	77.96	1148	82.42	1149	88.50
1150	96.32	1151	107.04	1152	120.40	1153	136.07	1154	152.44
1155	168.80	1156	183.82	1157	197.14	1158	208.08	1159	217.12
1160	223.75	1161	227.40	1162	227.98	1163	225.80	1164	220.65
1165	212.74	1166	202.04	1167	189.28	1168	175.15	1169	159.72
1170	143.55	1171	127.78	1172	112.88	1173	98.98	1174	86.51
1175	75.87	1176	66.81	1177	59.13	1178	52.67	1179	47.19
1180	42.50	1181	38.54	1182	35.20	1183	32.23	1184	29.61
1185	27.35	1186	25.50	1187	23.85	1188	22.39	1189	21.12
1190	20.04	1191	19.12	1192	18.31	1193	17.61	1194	16.98
1195	16.46	1196	16.01	1197	15.61	1198	15.25	1199	14.94
1200	14.66	1201	14.41	1202	14.18	1203	13.98	1204	13.79
1205	13.61	1206	13.46	1207	13.32	1208	13.19	1209	13.07
1210	12.95	1211	12.84	1212	12.74	1213	12.64	1214	12.54
1215	12.44	1216	12.36	1217	12.27	1218	12.19	1219	12.11
1220	12.03	1221	11.96	1222	11.90	1223	11.83	1224	11.75
1225	11.68	1226	11.63	1227	11.56	1228	11.50	1229	11.45
1230	11.39	1231	11.34	1232	11.29	1233	11.23	1234	11.16
1235	11.11	1236	11.06	1237	11.02	1238	10.97	1239	10.94
1240	10.90	1241	10.85	1242	10.80	1243	10.76	1244	10.72
1245	10.67	1246	10.64	1247	10.60	1248	10.56	1249	10.52
1250	10.48	1251	10.45	1252	10.41	1253	10.38	1254	10.34
1255	10.31	1256	10.27	1257	10.24	1258	10.21	1259	10.17
1260	10.15	1261	10.11	1262	10.07	1263	10.05	1264	10.01
1265	9.97	1266	9.95	1267	9.92	1268	9.88	1269	9.86
1270	9.84	1271	9.81	1272	9.78	1273	9.76	1274	9.73
1275	9.71	1276	9.69	1277	9.66	1278	9.63	1279	9.62
1280	9.59	1281	9.57	1282	9.55	1283	9.53	1284	9.51
1285	9.49	1286	9.47	1287	9.44	1288	9.40	1289	9.38
1290	9.36	1291	9.34	1292	9.31	1293	9.29	1294	9.27
1295	9.25	1296	9.23	1297	9.20	1298	9.18	1299	9.17
1300	9.15	1310	9.02	1320	8.88	1330	8.73	1340	8.57
1350	8.45	1360	8.35	1370	8.28	1380	8.21	1390	8.12
1400	8.07	1420	7.97	1440	7.84	1460	7.64	1500	7.64

TOTAL VOLUME THIS HYDROGRAPH = 27.15(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Existing Condition

5-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	3A	7.2	1097	0.237	3.4	1	97	5-yr		13	1.29	0.57	0.58	5.36
TM 60257	5A	17.3	1361	0.1124	3.4	1	97	5-yr		18	1.11	0.54	0.54	10.40
TM 60257	7A	19.9	1893	0.1273	3.4	1	97	5-yr		22	1.01	0.52	0.52	10.52
TM 60257	9B	10.6	829	0.1942	3.4	1	97	5-yr		11	1.40	0.59	0.60	8.82
TM 60257	11B	7.0	541	0.122	3.4	1	97	5-yr		9	1.53	0.62	0.62	6.65
TM 60257	13B	10.6	1299	0.137	3.4	1	97	5-yr		16	1.17	0.55	0.55	6.88
TM 60257	15A	27.7	1926	0.1023	3.4	1	97	5-yr		23	0.99	0.52	0.52	14.18
TM 60257	16C	25.8	1864	0.1369	3.4	5	97	5-yr		21	1.03	0.52	0.54	14.44
TM 60257	19C	8.9	1241	0.12	3.4	10	97	5-yr		16	1.17	0.55	0.59	6.10
TM 60257	22A	7.2	733	0.0314	3.4	10	97	5-yr		14	1.25	0.57	0.60	5.37
TM 60257	26B	24.4	1708	0.1546	3.4	10	97	5-yr		19	1.08	0.53	0.57	15.03
TM 60257	32C	8.6	707	0.1938	3.4	1	97	5-yr		10	1.46	0.61	0.61	7.63
TM 60257	33C	15.1	1504	0.0894	3.4	15	97	5-yr		18	1.11	0.54	0.59	9.92
TM 60257	35B	29.1	1808	0.1217	3.4	25	97	5-yr		19	1.08	0.53	0.63	19.65
TM 60257	38A	3.3	654	0.1437	3.4	25	97	5-yr		9	1.53	0.62	0.69	3.48
TM 60257	42B	24.3	1927	0.123	3.4	1	97	5-yr		22	1.01	0.52	0.52	12.84
TM 60257	44C	14.9	1533	0.1709	3.4	42	97	5-yr		15	1.20	0.56	0.70	12.60
TM 60257	46B	6.0	734	0.1349	3.4	6	97	5-yr		11	1.40	0.59	0.61	5.12

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Existing 5-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	2A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	3A	7.2	5.40	7.2	5.40	0	0.	.00000	.00	.00	0.	97	13	A29	.01
1	4A	.0	.00	7.2	5.40	2	305.	.06230	.00	.00	0.	97	99	A29	.00
1	5A	17.3	10.48	24.5	15.86	0	0.	.00000	.00	.00	0.	97	18	A29	.01
1	6A	.0	.00	24.5	15.86	2	300.	.03990	.00	.00	0.	97	99	A29	.00
1	7A	19.9	10.48	44.4	26.27	0	0.	.00000	.00	.00	0.	97	22	A29	.01
1	8A	.0	.00	44.4	26.27	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	9B	10.6	8.85	10.6	8.85	0	0.	.00000	.00	.00	0.	97	11	A29	.01
1	10B	.0	.00	10.6	8.85	2	563.	.07100	.00	.00	0.	97	99	A29	.00
1	11B	7.0	6.60	17.6	14.89	0	0.	.00000	.00	.00	0.	97	9	A29	.01
1	12B	.0	.00	17.6	14.89	2	966.	.05800	.00	.00	0.	97	99	A29	.00
1	13B	10.6	6.96	28.2	20.67	0	0.	.00000	.00	.00	0.	97	16	A29	.01
1	14AB	28.2	20.67	72.6	46.67	2	1228.	.03420	.00	.00	0.	97	0	A29	.00
1	15A	27.7	14.15	100.3	58.37	0	0.	.00000	.00	.00	0.	97	23	A29	.01
1	16C	25.8	14.46	25.8	14.46	0	0.	.00000	.00	.00	0.	97	21	A29	.05
1	17C	.0	.00	25.8	14.46	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	18C	.0	.00	25.8	14.46	2	846.	.04370	.00	.00	0.	97	99	A29	.00
1	19C	8.9	6.17	34.7	19.95	0	0.	.00000	.00	.00	0.	97	16	A29	.10
1	20AC	34.7	19.95	135.0	77.80	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	21A	.0	.00	135.0	77.80	2	684.	.03360	.00	.00	0.	97	99	A29	.00
1	22A	7.2	5.42	142.2	80.74	0	0.	.00000	.00	.00	0.	97	14	A29	.10
1	23A	.0	.00	142.2	80.74	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	24A	.0	.00	142.2	80.74	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	25A	.0	.00	142.2	80.74	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	26B	24.4	15.12	24.4	15.12	0	0.	.00000	.00	.00	0.	97	19	A29	.10
1	27B	.0	.00	24.4	15.12	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	28B	.0	.00	24.4	15.12	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	29B	.0	.00	24.4	15.12	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	30B	.0	.00	24.4	15.12	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	31B	.0	.00	24.4	15.12	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	32C	8.6	7.65	8.6	7.65	2	1114.	.03590	.00	.00	0.	97	10	A29	.01
1	33C	15.1	9.98	23.7	16.03	0	0.	.00000	.00	.00	0.	97	18	A29	.15
1	34BC	23.7	16.03	48.1	30.80	2	1300.	.04230	.00	.00	0.	97	0	A29	.00
1	35B	29.1	19.73	77.2	47.93	0	0.	.00000	.00	.00	0.	97	19	A29	.25
1	36AB	77.2	47.93	219.4	128.47	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	37A	.0	.00	219.4	128.47	2	514.	.01950	.00	.00	0.	97	99	A29	.00
1	38A	3.3	3.45	222.7	128.35	0	0.	.00000	.00	.00	0.	97	9	A29	.25
1	39A	.0	.00	222.7	128.35	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	40A	.0	.00	222.7	128.35	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	41A	.0	.00	222.7	128.35	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	42B	24.3	12.80	24.3	12.80	0	0.	.00000	.00	.00	0.	97	22	A29	.01
1	43B	.0	.00	24.3	12.80	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	44C	14.9	12.70	14.9	12.70	0	0.	.00000	.00	.00	0.	97	15	A29	.42
1	45BC	14.9	12.70	39.2	25.44	2	592.	.02700	.00	.00	0.	97	0	A29	.00
1	46B	6.0	5.13	45.2	29.70	0	0.	.00000	.00	.00	0.	97	11	A29	.06
1	47AB	45.2	29.70	267.9	152.70	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	48A	.0	.00	267.9	152.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE:
TM 60275 Area 100, Existing 5-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 48A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	1.20	100	7.30	200	7.39	300	7.52	400	7.66
500	7.82	600	8.04	700	8.32	800	8.78	900	9.47
1000	10.59	1050	12.01	1100	14.26	1110	15.27	1120	18.40
1130	25.12	1131	25.95	1132	26.77	1133	27.67	1134	28.64
1135	29.69	1136	30.79	1137	31.98	1138	33.22	1139	34.54
1140	35.94	1141	37.48	1142	39.07	1143	40.82	1144	42.72
1145	44.86	1146	47.20	1147	49.85	1148	52.76	1149	56.72
1150	61.59	1151	68.18	1152	76.28	1153	85.76	1154	95.75
1155	105.92	1156	115.29	1157	124.01	1158	131.71	1159	138.66
1160	144.12	1161	148.28	1162	151.04	1163	152.65	1164	152.70
1165	151.51	1166	148.74	1167	144.64	1168	139.34	1169	132.72
1170	125.11	1171	117.03	1172	108.55	1173	99.68	1174	90.89
1175	82.40	1176	74.00	1177	65.86	1178	58.31	1179	51.57
1180	45.59	1181	40.42	1182	36.00	1183	32.27	1184	29.12
1185	26.48	1186	24.25	1187	22.42	1188	20.86	1189	19.52
1190	18.35	1191	17.36	1192	16.55	1193	15.86	1194	15.26
1195	14.75	1196	14.31	1197	13.94	1198	13.61	1199	13.33
1200	13.08	1201	12.85	1202	12.65	1203	12.46	1204	12.29
1205	12.14	1206	11.99	1207	11.85	1208	11.74	1209	11.63
1210	11.52	1211	11.42	1212	11.33	1213	11.25	1214	11.16
1215	11.07	1216	11.00	1217	10.92	1218	10.84	1219	10.78
1220	10.71	1221	10.65	1222	10.58	1223	10.52	1224	10.46
1225	10.40	1226	10.35	1227	10.29	1228	10.24	1229	10.20
1230	10.14	1231	10.10	1232	10.05	1233	10.00	1234	9.95
1235	9.91	1236	9.87	1237	9.82	1238	9.78	1239	9.75
1240	9.71	1241	9.68	1242	9.64	1243	9.60	1244	9.57
1245	9.53	1246	9.50	1247	9.46	1248	9.43	1249	9.40
1250	9.36	1251	9.34	1252	9.31	1253	9.28	1254	9.25
1255	9.22	1256	9.19	1257	9.16	1258	9.13	1259	9.10
1260	9.08	1261	9.05	1262	9.02	1263	9.00	1264	8.96
1265	8.94	1266	8.91	1267	8.89	1268	8.86	1269	8.85
1270	8.82	1271	8.80	1272	8.77	1273	8.76	1274	8.73
1275	8.71	1276	8.69	1277	8.67	1278	8.65	1279	8.63
1280	8.61	1281	8.59	1282	8.57	1283	8.56	1284	8.54
1285	8.52	1286	8.50	1287	8.48	1288	8.46	1289	8.44
1290	8.42	1291	8.40	1292	8.39	1293	8.37	1294	8.36
1295	8.34	1296	8.32	1297	8.31	1298	8.30	1299	8.29
1300	8.28	1310	8.17	1320	8.09	1330	7.99	1340	7.89
1350	7.81	1360	7.74	1370	7.69	1380	7.63	1390	7.56
1400	7.51	1420	7.43	1440	7.32	1460	7.16	1500	7.16

TOTAL VOLUME THIS HYDROGRAPH = 22.84(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Existing Condition

2-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	3A	7.2	1097	0.237	2.2	1	97	2-yr		22	0.67	0.40	0.40	1.94
TM 60257	5A	17.3	1361	0.1124	2.2	1	97	2-yr		30	0.58	0.35	0.36	3.57
TM 60257	7A	19.9	1893	0.1273	2.2	1	97	2-yr		30	0.58	0.35	0.36	4.11
TM 60257	9B	10.6	829	0.1942	2.2	1	97	2-yr		18	0.73	0.43	0.44	3.41
TM 60257	11B	7.0	541	0.122	2.2	1	97	2-yr		14	0.83	0.47	0.47	2.71
TM 60257	13B	10.6	1299	0.137	2.2	1	97	2-yr		29	0.59	0.36	0.36	2.25
TM 60257	15A	27.7	1926	0.1023	2.2	1	97	2-yr		30	0.58	0.35	0.36	5.72
TM 60257	16C	25.8	1864	0.1369	2.2	5	97	2-yr		30	0.58	0.35	0.38	5.65
TM 60257	19C	8.9	1241	0.12	2.2	10	97	2-yr		26	0.62	0.37	0.43	2.34
TM 60257	22A	7.2	733	0.0314	2.2	10	97	2-yr		23	0.65	0.39	0.44	2.08
TM 60257	26B	24.4	1708	0.1546	2.2	10	97	2-yr		30	0.58	0.35	0.41	5.73
TM 60257	32C	8.6	707	0.1938	2.2	1	97	2-yr		16	0.78	0.45	0.45	3.03
TM 60257	33C	15.1	1504	0.0894	2.2	15	97	2-yr		30	0.58	0.35	0.43	3.78
TM 60257	35B	29.1	1808	0.1217	2.2	25	97	2-yr		30	0.58	0.35	0.49	8.21
TM 60257	38A	3.3	654	0.1437	2.2	25	97	2-yr		13	0.85	0.47	0.58	1.64
TM 60257	42B	24.3	1927	0.123	2.2	1	97	2-yr		30	0.58	0.35	0.36	5.01
TM 60257	44C	14.9	1533	0.1709	2.2	42	97	2-yr		22	0.66	0.40	0.61	6.06
TM 60257	46B	6.0	734	0.1349	2.2	6	97	2-yr		17	0.75	0.44	0.47	2.13

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Existing 2-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	1A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	2A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	3A	7.2	1.99	7.2	1.99	0	0.	.00000	.00	.00	0.	97	22	A29	.01
1	4A	.0	.00	7.2	1.99	2	305.	.06230	.00	.00	0.	97	99	A29	.00
1	5A	17.3	3.67	24.5	5.65	0	0.	.00000	.00	.00	0.	97	30	A29	.01
1	6A	.0	.00	24.5	5.65	2	300.	.03990	.00	.00	0.	97	99	A29	.00
1	7A	19.9	4.22	44.4	9.85	0	0.	.00000	.00	.00	0.	97	30	A29	.01
1	8A	.0	.00	44.4	9.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	9B	10.6	3.41	10.6	3.41	0	0.	.00000	.00	.00	0.	97	18	A29	.01
1	10B	.0	.00	10.6	3.41	2	563.	.07100	.00	.00	0.	97	99	A29	.00
1	11B	7.0	2.73	17.6	5.95	0	0.	.00000	.00	.00	0.	97	14	A29	.01
1	12B	.0	.00	17.6	5.95	2	966.	.05800	.00	.00	0.	97	99	A29	.00
1	13B	10.6	2.32	28.2	7.92	0	0.	.00000	.00	.00	0.	97	29	A29	.01
1	14AB	28.2	7.92	72.6	17.69	2	1228.	.03420	.00	.00	0.	97	0	A29	.00
1	15A	27.7	5.88	100.3	22.38	0	0.	.00000	.00	.00	0.	97	30	A29	.01
1	16C	25.8	5.79	25.8	5.79	0	0.	.00000	.00	.00	0.	97	30	A29	.05
1	17C	.0	.00	25.8	5.79	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	18C	.0	.00	25.8	5.79	2	846.	.04370	.00	.00	0.	97	99	A29	.00
1	19C	8.9	2.40	34.7	7.96	0	0.	.00000	.00	.00	0.	97	26	A29	.10
1	20AC	34.7	7.96	135.0	30.18	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	21A	.0	.00	135.0	30.18	2	684.	.03360	.00	.00	0.	97	99	A29	.00
1	22A	7.2	2.13	142.2	31.62	0	0.	.00000	.00	.00	0.	97	23	A29	.10
1	23A	.0	.00	142.2	31.62	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	24A	.0	.00	142.2	31.62	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	25A	.0	.00	142.2	31.62	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	26B	24.4	5.85	24.4	5.85	0	0.	.00000	.00	.00	0.	97	30	A29	.10
1	27B	.0	.00	24.4	5.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	28B	.0	.00	24.4	5.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	29B	.0	.00	24.4	5.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	30B	.0	.00	24.4	5.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	31B	.0	.00	24.4	5.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	32C	8.6	3.03	8.6	3.03	2	1114.	.03590	.00	.00	0.	97	16	A29	.01
1	33C	15.1	3.86	23.7	6.42	0	0.	.00000	.00	.00	0.	97	30	A29	.15
1	34BC	23.7	6.42	48.1	12.15	2	1300.	.04230	.00	.00	0.	97	0	A29	.00
1	35B	29.1	8.33	77.2	19.61	0	0.	.00000	.00	.00	0.	97	30	A29	.25
1	36AB	77.2	19.61	219.4	51.03	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	37A	.0	.00	219.4	51.03	2	514.	.01950	.00	.00	0.	97	99	A29	.00
1	38A	3.3	1.64	222.7	51.10	0	0.	.00000	.00	.00	0.	97	13	A29	.25
1	39A	.0	.00	222.7	51.10	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	40A	.0	.00	222.7	51.10	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	41A	.0	.00	222.7	51.10	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	42B	24.3	5.15	24.3	5.15	0	0.	.00000	.00	.00	0.	97	30	A29	.01
1	43B	.0	.00	24.3	5.15	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	44C	14.9	6.11	14.9	6.11	0	0.	.00000	.00	.00	0.	97	22	A29	.42
1	45BC	14.9	6.11	39.2	11.24	2	592.	.02700	.00	.00	0.	97	0	A29	.00
1	46B	6.0	2.12	45.2	13.06	0	0.	.00000	.00	.00	0.	97	17	A29	.06
1	47AB	45.2	13.06	267.9	61.78	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1	48A	.0	.00	267.9	61.78	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE:
TM 60275 Area 100, Existing 2-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 48A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	1.20	100	6.53	200	6.59	300	6.67	400	6.76
500	6.87	600	7.01	700	7.19	800	7.43	900	7.78
1000	8.37	1050	9.30	1100	10.79	1110	11.25	1120	12.00
1130	13.12	1131	13.25	1132	13.39	1133	13.52	1134	13.66
1135	13.81	1136	13.96	1137	14.12	1138	14.30	1139	14.50
1140	14.71	1141	14.97	1142	15.23	1143	15.52	1144	15.85
1145	16.28	1146	16.80	1147	17.44	1148	18.22	1149	19.46
1150	20.93	1151	22.92	1152	25.58	1153	28.76	1154	32.08
1155	35.64	1156	39.09	1157	42.34	1158	45.41	1159	48.33
1160	51.08	1161	53.65	1162	55.79	1163	57.66	1164	59.22
1165	60.44	1166	61.11	1167	61.61	1168	61.78	1169	61.59
1170	61.19	1171	60.66	1172	59.84	1173	58.63	1174	57.04
1175	55.16	1176	53.09	1177	50.90	1178	48.72	1179	46.52
1180	44.17	1181	41.52	1182	38.66	1183	35.78	1184	33.03
1185	30.45	1186	28.08	1187	25.89	1188	23.86	1189	22.02
1190	20.34	1191	18.84	1192	17.52	1193	16.37	1194	15.37
1195	14.50	1196	13.76	1197	13.12	1198	12.56	1199	12.09
1200	11.68	1201	11.32	1202	11.01	1203	10.74	1204	10.50
1205	10.30	1206	10.11	1207	9.94	1208	9.80	1209	9.67
1210	9.54	1211	9.43	1212	9.33	1213	9.24	1214	9.15
1215	9.07	1216	9.00	1217	8.93	1218	8.86	1219	8.80
1220	8.75	1221	8.69	1222	8.64	1223	8.59	1224	8.54
1225	8.50	1226	8.46	1227	8.43	1228	8.39	1229	8.36
1230	8.32	1231	8.29	1232	8.26	1233	8.23	1234	8.20
1235	8.18	1236	8.15	1237	8.13	1238	8.10	1239	8.08
1240	8.06	1241	8.03	1242	8.01	1243	7.99	1244	7.97
1245	7.94	1246	7.92	1247	7.90	1248	7.89	1249	7.87
1250	7.85	1251	7.83	1252	7.81	1253	7.79	1254	7.77
1255	7.76	1256	7.74	1257	7.73	1258	7.71	1259	7.69
1260	7.68	1261	7.66	1262	7.65	1263	7.64	1264	7.62
1265	7.61	1266	7.59	1267	7.58	1268	7.56	1269	7.55
1270	7.54	1271	7.52	1272	7.51	1273	7.50	1274	7.49
1275	7.47	1276	7.46	1277	7.45	1278	7.44	1279	7.43
1280	7.42	1281	7.41	1282	7.40	1283	7.38	1284	7.37
1285	7.36	1286	7.35	1287	7.34	1288	7.33	1289	7.32
1290	7.31	1291	7.30	1292	7.29	1293	7.28	1294	7.27
1295	7.26	1296	7.25	1297	7.24	1298	7.24	1299	7.23
1300	7.22	1310	7.14	1320	7.08	1330	7.02	1340	6.95
1350	6.89	1360	6.84	1370	6.80	1380	6.76	1390	6.72
1400	6.69	1420	6.63	1440	6.56	1460	6.43	1500	6.43

TOTAL VOLUME THIS HYDROGRAPH = 17.18(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Existing Condition

LID Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Volume (ac-ft)
TM 60257	3A	7.2	1097	0.237	1.05	1	97	85th Percentile		91	0.16	0.10	0.11	0.12	0.07
TM 60257	5A	17.3	1361	0.1124	1.05	1	97	85th Percentile		119	0.14	0.10	0.11	0.26	0.16
TM 60257	7A	19.9	1893	0.1273	1.05	1	97	85th Percentile		144	0.13	0.10	0.11	0.28	0.19
TM 60257	9B	10.6	829	0.1942	1.05	1	97	85th Percentile		79	0.17	0.10	0.11	0.20	0.10
TM 60257	11B	7.0	541	0.122	1.05	1	97	85th Percentile		65	0.19	0.10	0.11	0.14	0.07
TM 60257	13B	10.6	1299	0.137	1.05	1	97	85th Percentile		112	0.15	0.10	0.11	0.17	0.10
TM 60257	15A	27.7	1926	0.1023	1.05	1	97	85th Percentile		151	0.13	0.10	0.11	0.38	0.26
TM 60257	16C	25.8	1864	0.1369	1.05	5	97	85th Percentile		118	0.14	0.10	0.14	0.51	0.31
TM 60257	19C	8.9	1241	0.12	1.05	10	97	85th Percentile		78	0.17	0.10	0.18	0.28	0.14
TM 60257	22A	7.2	733	0.0314	1.05	10	97	85th Percentile		71	0.18	0.10	0.18	0.23	0.11
TM 60257	26B	24.4	1708	0.1546	1.05	10	97	85th Percentile		92	0.16	0.10	0.18	0.70	0.38
TM 60257	32C	8.6	707	0.1938	1.05	1	97	85th Percentile		71	0.18	0.10	0.11	0.17	0.08
TM 60257	33C	15.1	1504	0.0894	1.05	15	97	85th Percentile		81	0.17	0.10	0.22	0.56	0.29
TM 60257	35B	29.1	1808	0.1217	1.05	25	97	85th Percentile		70	0.18	0.10	0.30	1.58	0.76
TM 60257	38A	3.3	654	0.1437	1.05	25	97	85th Percentile		35	0.25	0.10	0.30	0.25	0.09
TM 60257	42B	24.3	1927	0.123	1.05	1	97	85th Percentile		146	0.13	0.10	0.11	0.34	0.23
TM 60257	44C	14.9	1533	0.1709	1.05	42	97	85th Percentile		46	0.22	0.10	0.44	1.43	0.56
TM 60257	46B	6.0	734	0.1349	1.05	6	97	85th Percentile		63	0.19	0.10	0.15	0.17	0.08
														7.64	3.90

Impervious Calculation

TM 060257, Sterling
Existing Condition

		Road		Single Family		Natural		
Subarea	Total Area (Ac)	Area (Ac)	% Imp	Area	% Imp	Area (Ac)	% Imp	Total %
16C	25.8	0.8	1.0	0	0.42	25	0.01	0.04
19C	8.9	0.5	1.0	0	0.42	8.4	0.01	0.07
22A	7.2	0.5	1.0	0.3	0.42	6.4	0.01	0.10
26B	24.4	1	1.0	2.8	0.42	20.6	0.01	0.10
33C	15.1	0.6	1.0	2.5	0.42	12	0.01	0.12
35B	29.1	2.2	1.0	10.2	0.42	16.7	0.01	0.23
38A	3.3	0.5	1.0	0.5	0.42	2.3	0.01	0.22
46B	6	0.3	1.0	0	0.42	5.7	0.01	0.06

Section 4

HYDROCALC Results

TTM 060257, Sterling
Proposed Condition

Mixed 50 & 25-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	101A	40.6	1736	0.13	5.8	0.01	97	50-yr		12	2.29	0.69	0.69	64.48
TM 60257	102A	4.8	783	0.014	5.8	0.42	97	50-yr		10	2.50	0.71	0.79	9.44
TM 60257	105B	28.4	1840	0.13	5.8	0.01	97	50-yr		12	2.29	0.69	0.69	45.11
TM 60257	110B	3.3	704	0.166	5.1	0.42	97	25-yr		6	2.80	0.72	0.80	7.32
TM 60257	111B	5.1	606	0.036	5.1	0.42	97	25-yr		8	2.43	0.70	0.78	9.74
TM 60257	113A	7.9	995	0.058	5.1	0.42	97	25-yr		10	2.19	0.68	0.77	13.42
TM 60257	115C	14.4	910	0.24	5.8	0.01	97	50-yr		7	2.95	0.73	0.73	31.03
TM 60257	116C	10.1	875	0.027	5.8	0.42	97	50-yr		9	2.63	0.71	0.79	20.97
TM 60257	117C	10	572	0.026	5.1	0.42	97	25-yr		8	2.44	0.70	0.78	19.12
TM 60257	119C	5.3	787	0.024	5.8	0.42	97	50-yr		9	2.63	0.71	0.79	11.00
TM 60257	121C	4.7	1009	0.056	5.1	0.5	97	25-yr		10	2.19	0.68	0.79	8.16
TM 60257	123C	5.8	456	0.015	5.1	0.42	97	25-yr		7	2.59	0.71	0.79	11.89
TM 60257	126A	0.7	487	0.037	5.1	0.91	97	25-yr		6	2.79	0.72	0.88	1.73
TM 60257	127A	2.3	1099	0.035	5.1	0.5	97	25-yr		11	2.10	0.68	0.79	3.80
TM 60257	130D	3.7	480	0.27	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	9.64
TM 60257	131D	2.2	344	0.35	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	5.73
TM 60257	133D	7.4	989	0.058	5.1	0.42	97	25-yr		10	2.19	0.68	0.77	12.57
TM 60257	135D	2.8	498	0.4	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	7.30
TM 60257	138D	7.6	920	0.039	5.1	0.42	97	25-yr		10	2.19	0.68	0.77	12.91
TM 60257	146D	2.5	910	0.067	5.1	0.42	97	25-yr		9	2.30	0.69	0.78	4.49
TM 60257	150A	4	864	0.021	5.1	0.6	97	25-yr		10	2.19	0.68	0.81	7.14
TM 60257	154A	1.8	100	0.1	5.8	0.1	97	50-yr		5	3.46	0.75	0.77	4.77
TM 60257	203A	1.6	125	0.09	5.8	0.1	97	50-yr		5	3.46	0.75	0.77	4.24
TM 60257	301A	2.6	490	0.41	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	6.78
TM 60257	302A	4.6	835	0.063	5.8	0.01	97	50-yr		8	2.77	0.72	0.72	9.20
TM 60257	306A	0.3	50	0.2	5.8	0.1	97	50-yr		5	3.46	0.75	0.77	0.80
TM 60257	402B	1.1	240	0.4	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	2.87
TM 60257	403B	2.1	450	0.047	5.1	0.9	97	25-yr		5	3.04	0.73	0.88	5.63
TM 60257	406A	2	476	0.032	5.8	0.4	97	50-yr		6	3.18	0.74	0.80	5.10
TM 60257	408C	23.4	1708	0.155	5.8	0.1	97	50-yr		11	2.39	0.70	0.72	40.13
TM 60257	409D	8.7	707	0.194	5.8	0.01	97	50-yr		6	3.18	0.74	0.74	20.44
TM 60257	410D	15.1	1544	0.089	5.8	0.15	97	50-yr		11	2.39	0.70	0.73	26.26
TM 60257	413C	27.8	1604	0.084	5.8	0.25	97	50-yr		11	2.39	0.70	0.75	49.69
TM 60257	414C	4.2	1248	0.03	5.1	0.6	97	25-yr		12	2.01	0.67	0.81	6.83
TM 60257	417A	1.4	576	0.04	5.1	0.5	97	25-yr		7	2.59	0.71	0.81	2.92

Off-site

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	Offsite	4.4	754	0.1618	5.8	0.16	97	50-yr		6	3.18	0.74	0.76	10.68

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Proposed 50 & 25-yr Mixed, BURNED STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 101A	40.6	67.85	40.6	67.85	0	0.	.00000	.00	.00	0.	297	12	A29	.01
1 102A	4.8	9.43	45.4	77.28	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1 103AF	.0	76.28	45.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 104F	.0	.00	.0	76.28	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 105B	28.4	47.46	28.4	47.46	0	0.	.00000	.00	.00	0.	297	12	A29	.01
1 106BF	.0	46.46	28.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 107F	.0	.00	.0	46.46	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 108B	.0	3.00	28.4	4.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 109AB	28.4	4.00	73.8	5.00	4	410.	.09000	2.00	.00	0.	97	0	A29	.00
1 110B	3.3	7.11	3.3	7.11	4	95.	.05800	2.00	.00	0.	97	6	A25	.42
1 111B	5.1	9.43	8.4	16.54	0	0.	.00000	.00	.00	0.	97	8	A25	.42
1 112AB	8.4	16.54	82.2	18.54	4	495.	.03000	2.00	.00	0.	97	0	A29	.00
1 113A	7.9	13.17	90.1	31.23	0	0.	.00000	.00	.00	0.	97	10	A25	.42
1 114A	.0	.00	90.1	31.23	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 115C	14.4	32.18	14.4	32.18	4	350.	.02000	2.00	.00	0.	297	7	A29	.01
1 116C	10.1	20.84	24.5	52.45	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 117C	10.0	18.49	34.5	70.72	0	0.	.00000	.00	.00	0.	97	8	A25	.42
1 118C	.0	.00	34.5	70.72	4	276.	.06000	2.25	.00	0.	97	99	A29	.00
1 119C	5.3	10.93	39.8	81.38	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 120C	.0	.00	39.8	81.38	4	650.	.06000	2.25	.00	0.	97	99	A29	.00
1 121C	4.7	8.01	44.5	88.25	0	0.	.00000	.00	.00	0.	97	10	A25	.50
1 122C	.0	.00	44.5	88.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 123C	5.8	11.48	50.3	98.68	0	0.	.00000	.00	.00	0.	97	7	A25	.42
1 124AC	50.3	98.68	140.4	129.91	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 125A	.0	.00	140.4	129.91	4	400.	.03500	3.00	.00	0.	97	99	A25	.00
1 126A	.7	1.68	141.1	130.03	4	600.	.03000	3.25	.00	0.	97	6	A25	.91
1 127A	2.3	3.71	143.4	132.59	0	0.	.00000	.00	.00	0.	97	11	A25	.50
1 128A	.0	.00	143.4	132.59	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 129A	.0	.00	143.4	132.59	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 130D	3.7	10.10	3.7	10.10	0	0.	.00000	.00	.00	0.	297	5	A29	.01
1 131D	2.2	6.01	5.9	16.11	0	0.	.00000	.00	.00	0.	297	5	A29	.01
1 132D	.0	.00	5.9	16.11	4	970.	.08000	2.00	.00	0.	97	99	A29	.00
1 133D	7.4	12.33	13.3	27.03	0	0.	.00000	.00	.00	0.	97	10	A25	.42
1 134D	.0	.00	13.3	27.03	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 135D	2.8	7.64	16.1	33.68	4	235.	.02000	2.00	.00	0.	297	5	A29	.01
1 136D	.0	.00	16.1	33.04	4	500.	.09600	2.00	.00	0.	97	99	A29	.00
1 137D	.0	.00	16.1	32.87	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 138D	7.6	12.67	23.7	45.34	4	160.	.09600	2.00	.00	0.	97	10	A25	.42
1 139D	.0	.00	23.7	45.13	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 140D	.0	.00	23.7	45.13	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 141D	.0	.00	23.7	45.13	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 142D	.0	.00	23.7	45.13	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 143D	.0	1.00	23.7	45.13	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 144D	.0	14.00	23.7	59.13	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 145D	.0	.00	23.7	59.13	4	200.	.02700	2.50	.00	0.	97	99	A29	.00
1 146D	2.5	4.37	26.2	62.85	0	0.	.00000	.00	.00	0.	97	9	A25	.42
1 147D	.0	.00	26.2	62.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 148AD	26.2	62.85	169.6	194.36	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 149A	.0	.00	169.6	194.36	4	195.	.03000	3.75	.00	0.	97	99	A29	.00
1 150A	4.0	7.00	173.6	200.10	0	0.	.00000	.00	.00	0.	97	10	A25	.60
1 151A	.0	.00	173.6	200.10	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 152AF	.0	178.10	173.6	22.00	4	175.	.02000	2.00	.00	22.	97	0	A29	.00
1 153F	.0	.00	.0	178.10	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 154A	1.8	4.79	175.4	26.79	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 155A	.0	.00	175.4	26.79	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 156A	.0	.00	175.4	26.79	0	0.	.00000	.00	.00	0.	97	99	A29	.00

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Study Date : 11/12/18 Input hydrograph file name : 154A.hyd
Output hydrograph file name: STERLING.hin

User entry of depth-outflow-storage data

Hydrograph time unit varies
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data @ 1 Min. Intervals:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.001	0.001	0.001	0.001
2.000	1.790	0.001	1.790	1.790
4.000	3.850	0.001	3.850	3.850
6.000	6.200	0.001	6.200	6.200
7.000	7.500	0.001	7.500	7.500
7.500	8.160	0.001	8.160	8.160
7.600	8.300	5.900	8.296	8.304
7.800	8.580	30.500	8.559	8.601
8.000	8.850	65.700	8.805	8.895

Hydrograph Detention Basin Routing
Hydrograph at 1 154 A Storm Day: 4 Drainage Area = 176.20
Total flood hydrograph volume this storm day = 19.06 Ac. Ft.

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Min)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0 6.8 13.5 20.3 27.0	Depth (Ft.)
0	0.0	0.0	0.001	O	0.0
100	6.0	0.0	0.418	IO	0.5
200	6.0	0.0	1.244	IO	1.4
300	7.0	0.0	2.140	I O	2.3
400	7.0	0.0	3.104	I O	3.3
500	7.0	0.0	4.068	I O	4.2
600	8.0	0.0	5.102	I O	5.1
700	9.0	0.0	6.273	I O	6.1
800	9.0	0.0	7.513	I O	7.0
900	10.0	9.9	8.345	O	7.6
1000	12.0	11.8	8.368	O	7.6
1050	15.0	14.5	8.398	O	7.7
1100	22.0	20.9	8.471	O I	7.7
1110	22.0	21.7	8.480	OI	7.7
1120	23.0	22.4	8.487	OI	7.7
1130	23.0	22.8	8.492	O	7.7
1131	23.0	22.8	8.493	O	7.7
1132	23.0	22.9	8.493	O	7.7
1133	23.0	22.9	8.493	O	7.7
1134	23.0	22.9	8.493	O	7.7
1135	23.0	22.9	8.493	O	7.7
1136	23.0	22.9	8.494	O	7.7
1137	23.0	22.9	8.494	O	7.7
1138	23.0	22.9	8.494	O	7.7
1139	23.0	22.9	8.494	O	7.7
1140	23.0	22.9	8.494	O	7.7
1141	23.0	22.9	8.494	O	7.7
1142	23.0	23.0	8.494	O	7.7
1143	23.0	23.0	8.494	O	7.7
1144	23.0	23.0	8.494	O	7.7
1145	23.0	23.0	8.494	O	7.7
1146	23.0	23.0	8.494	O	7.7
1147	24.0	23.1	8.496	OI	7.7
1148	24.0	23.2	8.497	OI	7.7
1149	24.0	23.3	8.498	OI	7.7
1150	25.0	23.5	8.500	O I	7.7
1151	26.0	23.8	8.503	O I	7.7
1152	26.0	24.0	8.506	O I	7.7
1153	27.0	24.4	8.510	O I	7.8
1154	26.0	24.5	8.512	OI	7.8
1155	25.0	24.6	8.513	O	7.8
1156	25.0	24.6	8.513	O	7.8
1157	24.0	24.6	8.513	IO	7.8
1158	23.0	24.4	8.510	IO	7.8
1159	23.0	24.2	8.509	IO	7.7
1160	23.0	24.1	8.507	IO	7.7
1161	23.0	24.0	8.506	IO	7.7
1162	23.0	23.9	8.504	IO	7.7
1163	23.0	23.8	8.503	IO	7.7
1164	23.0	23.7	8.502	IO	7.7
1165	22.0	23.5	8.500	IO	7.7
1166	22.0	23.3	8.498	IO	7.7

1167	22.0	23.2	8.496				IO		7.7
1168	22.0	23.0	8.495				IO		7.7
1169	22.0	22.9	8.494				IO		7.7
1170	22.0	22.8	8.492				IO		7.7
1171	22.0	22.7	8.491				O		7.7
1172	22.0	22.6	8.490				O		7.7
1173	22.0	22.6	8.490				O		7.7
1174	22.0	22.5	8.489				O		7.7
1175	22.0	22.4	8.488				O		7.7
1176	22.0	22.4	8.488				O		7.7
1177	22.0	22.3	8.487				O		7.7
1178	22.0	22.3	8.487				O		7.7
1179	22.0	22.3	8.486				O		7.7
1180	22.0	22.2	8.486				O		7.7
1181	21.0	22.1	8.484			I	O		7.7
1182	21.0	22.0	8.483			I	O		7.7
1183	20.0	21.7	8.480			I	O		7.7
1184	19.0	21.4	8.477			I	O		7.7
1185	19.0	21.2	8.474			I	O		7.7
1186	18.0	20.8	8.470			I	O		7.7
1187	18.0	20.5	8.466			I	O		7.7
1188	17.0	20.1	8.461			I	O		7.7
1189	17.0	19.7	8.457			I	O		7.7
1190	16.0	19.3	8.453		I		O		7.7
1191	16.0	18.9	8.448		I		O		7.7
1192	16.0	18.6	8.444		I		O		7.7
1193	16.0	18.3	8.441		I		O		7.7
1194	17.0	18.1	8.439				IO		7.7
1195	17.0	18.0	8.438				IO		7.7
1196	17.0	17.9	8.437				IO		7.7
1197	16.0	17.7	8.434		I		O		7.7
1198	16.0	17.5	8.432		I		O		7.7
1199	16.0	17.3	8.430		I		O		7.7
1200	16.0	17.2	8.428		I		O		7.7
1201	16.0	17.0	8.427		I		O		7.7
1202	16.0	16.9	8.425		I		O		7.7
1203	16.0	16.8	8.424		IO				7.7
1204	16.0	16.7	8.423		IO				7.7
1205	16.0	16.6	8.422		IO				7.7
1206	16.0	16.6	8.421		IO				7.7
1207	16.0	16.5	8.421		IO				7.7
1208	15.0	16.3	8.419	I	O				7.7
1209	15.0	16.2	8.417	I	O				7.7
1210	15.0	16.0	8.415	I	O				7.7
1211	15.0	15.9	8.414	IO					7.7
1212	15.0	15.8	8.413	IO					7.7
1213	15.0	15.7	8.412	IO					7.7
1214	15.0	15.6	8.411	IO					7.7
1215	15.0	15.6	8.410	IO					7.7
1216	14.0	15.4	8.408	I	O				7.7
1217	14.0	15.2	8.406	I	O				7.7
1218	14.0	15.1	8.405	IO					7.7
1219	14.0	15.0	8.403	IO					7.7
1220	13.0	14.7	8.401	I	O				7.7
1221	13.0	14.5	8.398	I	O				7.7
1222	13.0	14.4	8.396	I	O				7.7
1223	13.0	14.2	8.395	IO					7.7
1224	13.0	14.1	8.393	IO					7.7
1225	13.0	14.0	8.392	IO					7.7
1226	13.0	13.8	8.390	IO					7.7
1227	13.0	13.7	8.389	IO					7.7
1228	13.0	13.7	8.388	IO					7.7
1229	13.0	13.6	8.387	IO					7.7
1230	13.0	13.5	8.387	IO					7.7
1231	13.0	13.5	8.386	O					7.7
1232	12.0	13.3	8.384	IO					7.7
1233	12.0	13.1	8.382	IO					7.7
1234	12.0	13.0	8.381	IO					7.7
1235	12.0	12.9	8.380	IO					7.7
1236	11.0	12.7	8.377	I	O				7.7
1237	11.0	12.5	8.375	IO					7.7
1238	11.0	12.3	8.373	IO					7.7
1239	11.0	12.2	8.371	IO					7.7
1240	11.0	12.0	8.370	IO					7.6
1241	11.0	11.9	8.368	IO					7.6
1242	11.0	11.8	8.367	IO					7.6
1243	11.0	11.7	8.366	O					7.6
1244	11.0	11.6	8.365	O					7.6
1245	11.0	11.6	8.364	O					7.6
1246	11.0	11.5	8.364	O					7.6
1247	11.0	11.4	8.363	O					7.6
1248	11.0	11.4	8.363	O					7.6
1249	11.0	11.3	8.362	O					7.6
1250	11.0	11.3	8.362	O					7.6
1251	11.0	11.3	8.361	O					7.6
1252	11.0	11.2	8.361	O					7.6
1253	11.0	11.2	8.360	O					7.6
1254	11.0	11.2	8.360	O					7.6
1255	11.0	11.2	8.360	O					7.6
1256	11.0	11.1	8.360	O					7.6
1257	11.0	11.1	8.360	O					7.6
1258	10.0	11.0	8.358	I	O				7.6
1259	10.0	10.9	8.357	IO					7.6
1260	10.0	10.8	8.356	IO					7.6

1261	10.0	10.7	8.355	|	IO	|	|	7.6
1262	10.0	10.6	8.354	|	IO	|	|	7.6
1263	10.0	10.5	8.353	|	IO	|	|	7.6
1264	10.0	10.5	8.352	|	IO	|	|	7.6
1265	10.0	10.4	8.352	|	IO	|	|	7.6
1266	10.0	10.4	8.351	|	IO	|	|	7.6
1267	10.0	10.3	8.351	|	IO	|	|	7.6
1268	10.0	10.3	8.350	|	IO	|	|	7.6
1269	10.0	10.3	8.350	|	IO	|	|	7.6
1270	10.0	10.2	8.349	|	IO	|	|	7.6
1271	10.0	10.2	8.349	|	IO	|	|	7.6
1272	10.0	10.2	8.349	|	IO	|	|	7.6
1273	10.0	10.2	8.349	|	IO	|	|	7.6
1274	10.0	10.1	8.348	|	IO	|	|	7.6
1275	10.0	10.1	8.348	|	IO	|	|	7.6
1276	10.0	10.1	8.348	|	O	|	|	7.6
1277	10.0	10.1	8.348	|	O	|	|	7.6
1278	10.0	10.1	8.348	|	O	|	|	7.6
1279	10.0	10.1	8.348	|	O	|	|	7.6
1280	10.0	10.1	8.347	|	O	|	|	7.6
1281	10.0	10.1	8.347	|	O	|	|	7.6
1282	10.0	10.1	8.347	|	O	|	|	7.6
1283	10.0	10.0	8.347	|	O	|	|	7.6
1284	10.0	10.0	8.347	|	O	|	|	7.6
1285	10.0	10.0	8.347	|	O	|	|	7.6
1286	10.0	10.0	8.347	|	O	|	|	7.6
1287	10.0	10.0	8.347	|	O	|	|	7.6
1288	10.0	10.0	8.347	|	O	|	|	7.6
1289	9.0	9.9	8.346	|	IO	|	|	7.6
1290	9.0	9.8	8.344	|	IO	|	|	7.6
1291	9.0	9.7	8.343	|	IO	|	|	7.6
1292	9.0	9.6	8.342	|	IO	|	|	7.6
1293	9.0	9.6	8.342	|	IO	|	|	7.6
1294	9.0	9.5	8.341	|	IO	|	|	7.6
1295	9.0	9.4	8.340	|	IO	|	|	7.6
1296	9.0	9.4	8.340	|	IO	|	|	7.6
1297	9.0	9.3	8.339	|	IO	|	|	7.6
1298	9.0	9.3	8.339	|	IO	|	|	7.6
1299	9.0	9.3	8.338	|	O	|	|	7.6
1300	9.0	9.2	8.338	|	O	|	|	7.6
1310	9.0	9.1	8.336	|	O	|	|	7.6
1320	9.0	9.0	8.336	|	O	|	|	7.6
1330	9.0	9.0	8.335	|	O	|	|	7.6
1340	8.0	8.5	8.330	|	IO	|	|	7.6
1350	8.0	8.2	8.326	|	O	|	|	7.6
1360	7.0	7.6	8.319	O		|	|	7.6
1370	7.0	7.2	8.315	O		|	|	7.6
1380	7.0	7.1	8.313	O		|	|	7.6
1390	7.0	7.0	8.313	O		|	|	7.6
1400	7.0	7.0	8.313	O		|	|	7.6
1420	6.0	6.4	8.305	O|		|	|	7.6
1440	6.0	6.0	8.301	O|		|	|	7.6
1460	6.0	6.0	8.301	O|		|	|	7.6
1500	6.0	5.6	8.293	OI|		|	|	7.6

Remaining water in basin = 8.29 (Ac.Ft)
Peak flow out of basin = 24.65(CFS)
Peak flow time = 1156 Min., time interval # = 42
Maximum depth in basin = 7.75(Ft.)

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\civild\scr_soilx_34.dat
TM 60257 Area 200, Prop. 50 & 25-yr Mixed, BURNED   STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 200A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 201A	.0	76.00	.0	76.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 202A	.0	46.00	.0	122.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 203A	1.6	4.25	1.6	125.70	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 204A	.0	.00	1.6	125.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00

Program Package Serial Number: 2083
11/11/18 FILE: 200 INPUT DATA: English Units RAINFALL SOIL FILE: English (In) OUTPUT DATA: English Units PAGE 4
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG F0601M

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
TM 60257 Area 200, Prop. 50 & 25-yr Mixed, BURNED , OUTLET HYD.
HYDROGRAPH AT 1 204A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.04	200	.04	300	.04	400	.04
500	1.05	600	1.05	700	1.05	800	1.06	900	1.07
1000	2.08	1050	5.14	1100	11.25	1110	16.38	1120	20.46
1130	25.59	1131	27.61	1132	27.63	1133	28.67	1134	29.70
1135	30.74	1136	30.75	1137	32.80	1138	33.83	1139	35.86
1140	35.89	1141	38.96	1142	41.01	1143	43.06	1144	44.10
1145	47.23	1146	51.32	1147	54.42	1148	57.49	1149	71.11
1150	84.65	1151	98.16	1152	112.70	1153	125.25	1154	125.70
1155	125.06	1156	123.40	1157	119.70	1158	115.01	1159	109.83
1160	104.71	1161	89.62	1162	73.55	1163	59.51	1164	44.45
1165	31.43	1166	27.40	1167	24.37	1168	21.34	1169	19.33
1170	17.30	1171	16.29	1172	14.27	1173	14.26	1174	13.25
1175	12.23	1176	11.22	1177	11.22	1178	9.19	1179	9.19
1180	9.18	1181	9.18	1182	8.16	1183	7.16	1184	7.15
1185	6.15	1186	6.14	1187	6.14	1188	6.12	1189	6.12
1190	6.12	1191	4.11	1192	4.10	1193	4.11	1194	4.10
1195	3.09	1196	3.10	1197	3.10	1198	3.09	1199	3.09
1200	3.09	1201	3.09	1202	3.09	1203	3.08	1204	3.08
1205	3.08	1206	3.08	1207	3.08	1208	2.08	1209	2.08
1210	2.08	1211	2.08	1212	2.08	1213	2.08	1214	2.08
1215	2.08	1216	2.08	1217	2.08	1218	1.07	1219	2.08
1220	1.08	1221	1.07	1222	1.07	1223	1.07	1224	1.07
1225	1.07	1226	1.07	1227	1.07	1228	1.07	1229	1.07
1230	1.07	1231	1.07	1232	1.07	1233	1.07	1234	1.07
1235	1.07	1236	1.07	1237	1.07	1238	1.07	1239	1.07
1240	1.07	1241	1.07	1242	1.06	1243	1.07	1244	1.07
1245	1.06	1246	1.06	1247	1.06	1248	1.06	1249	1.06
1250	1.06	1251	1.06	1252	1.06	1253	1.06	1254	1.06
1255	1.06	1256	1.06	1257	1.06	1258	1.06	1259	1.06
1260	1.06	1261	1.06	1262	1.06	1263	1.06	1264	1.06
1265	1.06	1266	1.06	1267	1.06	1268	1.06	1269	1.06
1270	1.06	1271	1.06	1272	1.06	1273	1.06	1274	1.06
1275	1.06	1276	1.06	1277	1.06	1278	1.05	1279	1.06
1280	1.06	1281	1.06	1282	1.06	1283	1.06	1284	1.05
1285	1.05	1286	1.05	1287	1.05	1288	1.05	1289	1.05
1290	1.05	1291	1.05	1292	1.05	1293	1.05	1294	1.05
1295	1.05	1296	1.05	1297	1.05	1298	1.05	1299	1.05
1300	1.05	1310	1.05	1320	1.05	1330	1.05	1340	.04
1350	.04	1360	.04	1370	.04	1380	.04	1390	.04
1400	.04	1420	.04	1440	.04	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = 6.36(Ac.Ft)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1997-2004 Version 6.4

Study Date : 11/12/18 Input hydrograph file name : 204A.hyd
Output hydrograph file name: BASIN203.hin

User entry of depth-outflow-storage data

Hydrograph time unit varies
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data @ 1 Min. Intervals:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.001	0.001	0.001	0.001
2.000	1.060	0.001	1.060	1.060
4.000	2.340	0.001	2.340	2.340
6.000	3.830	0.001	3.830	3.830
8.000	5.560	0.001	5.560	5.560
8.400	5.940	0.001	5.940	5.940
8.500	6.030	5.900	6.026	6.034
9.000	6.520	60.000	6.479	6.561

Hydrograph Detention Basin Routing
Hydrograph at 1 204 A Storm Day: 4 Drainage Area = 1.60
Total flood hydrograph volume this storm day = 6.23 Ac. Ft.

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Min)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0 31.5 63.0 94.5 126.0	Depth (Ft.)
0	0.0	0.0	0.001	O	0.0
100	0.0	0.0	0.001	O	0.0
200	0.0	0.0	0.001	O	0.0
300	0.0	0.0	0.001	O	0.0
400	0.0	0.0	0.000	O	0.0
500	1.0	0.0	0.070	O	0.1
600	1.0	0.0	0.207	O	0.4
700	1.0	0.0	0.345	O	0.6
800	1.0	0.0	0.483	O	0.9
900	1.0	0.0	0.620	O	1.2
1000	2.0	0.0	0.827	O	1.6
1050	5.0	0.0	1.070	OI	2.0
1100	11.0	0.0	1.626	O I	2.9
1110	16.0	0.0	1.815	O I	3.2
1120	20.0	0.0	2.066	O I	3.6
1130	26.0	0.0	2.386	O I	4.1
1131	28.0	0.0	2.425	O I	4.1
1132	28.0	0.0	2.464	O I	4.2
1133	29.0	0.0	2.504	O I	4.2
1134	30.0	0.0	2.545	O I	4.3
1135	31.0	0.0	2.588	O I	4.3
1136	31.0	0.0	2.630	O I	4.4
1137	33.0	0.0	2.676	O I	4.5
1138	34.0	0.0	2.723	O I	4.5
1139	36.0	0.0	2.772	O I	4.6
1140	36.0	0.0	2.822	O I	4.6
1141	39.0	0.0	2.875	O I	4.7
1142	41.0	0.0	2.932	O I	4.8
1143	43.0	0.0	2.991	O I	4.9
1144	44.0	0.0	3.052	O I	5.0
1145	47.0	0.0	3.117	O I	5.0
1146	51.0	0.0	3.187	O I	5.1
1147	54.0	0.0	3.261	O I	5.2
1148	57.0	0.0	3.340	O I	5.3
1149	71.0	0.0	3.437	O I	5.5
1150	85.0	0.0	3.555	O I	5.6
1151	98.0	0.0	3.689	O I	5.8
1152	113.0	0.0	3.845	O I	6.0
1153	125.0	0.0	4.017	O I	6.2
1154	126.0	0.0	4.191	O I	6.4
1155	125.0	0.0	4.363	O I	6.6
1156	123.0	0.0	4.532	O I	6.8
1157	120.0	0.0	4.698	O I	7.0
1158	115.0	0.0	4.856	O I	7.2
1159	110.0	0.0	5.008	O I	7.4
1160	105.0	0.0	5.152	O I	7.5
1161	90.0	0.0	5.276	O I	7.7
1162	74.0	0.0	5.378	O I	7.8
1163	60.0	0.0	5.461	O I	7.9
1164	44.0	0.0	5.521	O I	8.0
1165	31.0	0.0	5.564	O I	8.0
1166	27.0	0.0	5.601	O I	8.0
1167	24.0	0.0	5.634	O I	8.1

1168	21.0	0.0	5.663	O	I				8.1
1169	19.0	0.0	5.689	O	I				8.1
1170	17.0	0.0	5.713	O	I				8.2
1171	16.0	0.0	5.735	O	I				8.2
1172	14.0	0.0	5.754	O	I				8.2
1173	14.0	0.0	5.773	O	I				8.2
1174	13.0	0.0	5.791	O	I				8.2
1175	12.0	0.0	5.808	O	I				8.3
1176	11.0	0.0	5.823	O	I				8.3
1177	11.0	0.0	5.838	O	I				8.3
1178	9.0	0.0	5.851	O	I				8.3
1179	9.0	0.0	5.863	O	I				8.3
1180	9.0	0.0	5.875	O	I				8.3
1181	9.0	0.0	5.888	O	I				8.3
1182	8.0	0.0	5.899	O	I				8.4
1183	7.0	0.0	5.908	OI					8.4
1184	7.0	0.0	5.918	OI					8.4
1185	6.0	0.0	5.926	OI					8.4
1186	6.0	0.0	5.935	OI					8.4
1187	6.0	0.2	5.943	OI					8.4
1188	6.0	0.7	5.950	OI					8.4
1189	6.0	1.1	5.957	OI					8.4
1190	6.0	1.6	5.964	OI					8.4
1191	4.0	1.8	5.967	OI					8.4
1192	4.0	2.0	5.970	OI					8.4
1193	4.0	2.1	5.973	OI					8.4
1194	4.0	2.3	5.975	OI					8.4
1195	3.0	2.4	5.976	O					8.4
1196	3.0	2.4	5.977	O					8.4
1197	3.0	2.5	5.978	O					8.4
1198	3.0	2.5	5.978	O					8.4
1199	3.0	2.6	5.979	O					8.4
1200	3.0	2.6	5.980	O					8.4
1201	3.0	2.6	5.980	O					8.4
1202	3.0	2.7	5.981	O					8.4
1203	3.0	2.7	5.981	O					8.4
1204	3.0	2.7	5.981	O					8.4
1205	3.0	2.7	5.982	O					8.4
1206	3.0	2.8	5.982	O					8.4
1207	3.0	2.8	5.982	O					8.4
1208	2.0	2.7	5.981	O					8.4
1209	2.0	2.7	5.980	O					8.4
1210	2.0	2.6	5.980	O					8.4
1211	2.0	2.5	5.979	O					8.4
1212	2.0	2.5	5.978	O					8.4
1213	2.0	2.5	5.977	O					8.4
1214	2.0	2.4	5.977	O					8.4
1215	2.0	2.4	5.976	O					8.4
1216	2.0	2.3	5.976	O					8.4
1217	2.0	2.3	5.975	O					8.4
1218	1.0	2.2	5.974	O					8.4
1219	2.0	2.2	5.973	O					8.4
1220	1.0	2.1	5.972	O					8.4
1221	1.0	2.0	5.970	O					8.4
1222	1.0	1.9	5.969	O					8.4
1223	1.0	1.8	5.968	O					8.4
1224	1.0	1.8	5.967	O					8.4
1225	1.0	1.7	5.966	O					8.4
1226	1.0	1.6	5.965	O					8.4
1227	1.0	1.6	5.964	O					8.4
1228	1.0	1.5	5.963	O					8.4
1229	1.0	1.5	5.963	O					8.4
1230	1.0	1.4	5.962	O					8.4
1231	1.0	1.4	5.961	O					8.4
1232	1.0	1.4	5.961	O					8.4
1233	1.0	1.3	5.960	O					8.4
1234	1.0	1.3	5.960	O					8.4
1235	1.0	1.3	5.960	O					8.4
1236	1.0	1.3	5.959	O					8.4
1237	1.0	1.2	5.959	O					8.4
1238	1.0	1.2	5.958	O					8.4
1239	1.0	1.2	5.958	O					8.4
1240	1.0	1.2	5.958	O					8.4
1241	1.0	1.2	5.958	O					8.4
1242	1.0	1.1	5.958	O					8.4
1243	1.0	1.1	5.957	O					8.4
1244	1.0	1.1	5.957	O					8.4
1245	1.0	1.1	5.957	O					8.4
1246	1.0	1.1	5.957	O					8.4
1247	1.0	1.1	5.957	O					8.4
1248	1.0	1.1	5.957	O					8.4
1249	1.0	1.1	5.956	O					8.4
1250	1.0	1.1	5.956	O					8.4
1251	1.0	1.1	5.956	O					8.4
1252	1.0	1.1	5.956	O					8.4
1253	1.0	1.1	5.956	O					8.4
1254	1.0	1.1	5.956	O					8.4
1255	1.0	1.0	5.956	O					8.4
1256	1.0	1.0	5.956	O					8.4
1257	1.0	1.0	5.956	O					8.4
1258	1.0	1.0	5.956	O					8.4
1259	1.0	1.0	5.956	O					8.4
1260	1.0	1.0	5.956	O					8.4
1261	1.0	1.0	5.956	O					8.4

1262	1.0	1.0	5.956	o	|	|	|	|	8.4
1263	1.0	1.0	5.956	o	|	|	|	|	8.4
1264	1.0	1.0	5.956	o	|	|	|	|	8.4
1265	1.0	1.0	5.956	o	|	|	|	|	8.4
1266	1.0	1.0	5.956	o	|	|	|	|	8.4
1267	1.0	1.0	5.955	o	|	|	|	|	8.4
1268	1.0	1.0	5.955	o	|	|	|	|	8.4
1269	1.0	1.0	5.955	o	|	|	|	|	8.4
1270	1.0	1.0	5.955	o	|	|	|	|	8.4
1271	1.0	1.0	5.955	o	|	|	|	|	8.4
1272	1.0	1.0	5.955	o	|	|	|	|	8.4
1273	1.0	1.0	5.955	o	|	|	|	|	8.4
1274	1.0	1.0	5.955	o	|	|	|	|	8.4
1275	1.0	1.0	5.955	o	|	|	|	|	8.4
1276	1.0	1.0	5.955	o	|	|	|	|	8.4
1277	1.0	1.0	5.955	o	|	|	|	|	8.4
1278	1.0	1.0	5.955	o	|	|	|	|	8.4
1279	1.0	1.0	5.955	o	|	|	|	|	8.4
1280	1.0	1.0	5.955	o	|	|	|	|	8.4
1281	1.0	1.0	5.955	o	|	|	|	|	8.4
1282	1.0	1.0	5.955	o	|	|	|	|	8.4
1283	1.0	1.0	5.955	o	|	|	|	|	8.4
1284	1.0	1.0	5.955	o	|	|	|	|	8.4
1285	1.0	1.0	5.955	o	|	|	|	|	8.4
1286	1.0	1.0	5.955	o	|	|	|	|	8.4
1287	1.0	1.0	5.955	o	|	|	|	|	8.4
1288	1.0	1.0	5.955	o	|	|	|	|	8.4
1289	1.0	1.0	5.955	o	|	|	|	|	8.4
1290	1.0	1.0	5.955	o	|	|	|	|	8.4
1291	1.0	1.0	5.955	o	|	|	|	|	8.4
1292	1.0	1.0	5.955	o	|	|	|	|	8.4
1293	1.0	1.0	5.955	o	|	|	|	|	8.4
1294	1.0	1.0	5.955	o	|	|	|	|	8.4
1295	1.0	1.0	5.955	o	|	|	|	|	8.4
1296	1.0	1.0	5.955	o	|	|	|	|	8.4
1297	1.0	1.0	5.955	o	|	|	|	|	8.4
1298	1.0	1.0	5.955	o	|	|	|	|	8.4
1299	1.0	1.0	5.955	o	|	|	|	|	8.4
1300	1.0	1.0	5.955	o	|	|	|	|	8.4
1310	1.0	1.0	5.955	o	|	|	|	|	8.4
1320	1.0	1.0	5.955	o	|	|	|	|	8.4
1330	1.0	1.0	5.955	o	|	|	|	|	8.4
1340	0.0	0.6	5.950	o	|	|	|	|	8.4
1350	0.0	0.3	5.944	o	|	|	|	|	8.4
1360	0.0	0.1	5.942	o	|	|	|	|	8.4
1370	0.0	0.0	5.941	o	|	|	|	|	8.4
1380	0.0	0.0	5.940	o	|	|	|	|	8.4
1390	0.0	0.0	5.940	o	|	|	|	|	8.4
1400	0.0	0.0	5.940	o	|	|	|	|	8.4
1420	0.0	0.0	5.940	o	|	|	|	|	8.4
1440	0.0	0.0	5.940	o	|	|	|	|	8.4
1460	0.0	0.0	5.940	o	|	|	|	|	8.4
1500	0.0	0.0	5.940	o	|	|	|	|	8.4

Remaining water in basin = 5.94 (Ac.Ft)
Peak flow out of basin = 2.78(CFS)
Peak flow time = 1207 Min., time interval # = 93
Maximum depth in basin = 8.45(Ft.)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: X:\engineering\Programs\CIVILD\scr_soilx_34.dat

TM 60257 Area 300, Prop. 50 & 25-yr Mixed, BURNED STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 301A	2.6	7.10	2.6	7.10	2	700.	.02600	.00	.00	0.	297	5	A29	.01
1 302A	4.6	10.30	7.2	15.12	0	0.	.00000	.00	.00	0.	297	8	A29	.41
1 303AF	.0	14.12	7.2	1.00	4	50.	.02000	2.00	.00	1.	97	0	A29	.00
1 304F	.0	.00	.0	14.12	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 305A	.0	.00	7.2	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 306A	.3	.80	7.5	1.80	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 307A	.0	.00	7.5	1.80	0	0.	.00000	.00	.00	0.	97	99	A29	.00

Program Package Serial Number: 2083
04/10/18 FILE: 300 INPUT DATA: English Units RAINFALL SOIL FILE: English (In) OUTPUT DATA: English Units PAGE 4
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG F0601M

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
TM 60257 Area 300, Prop. 50 & 25-yr Mixed, BURNED , OUTLET HYD.
HYDROGRAPH AT 1 307A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.01	200	.01	300	.01	400	.01
500	.01	600	.01	700	.01	800	.12	900	.24
1000	.30	1050	.53	1100	1.05	1110	1.07	1120	1.09
1130	1.11	1131	1.11	1132	1.12	1133	1.13	1134	1.13
1135	1.14	1136	1.14	1137	1.15	1138	1.16	1139	1.16
1140	1.17	1141	1.18	1142	1.19	1143	1.20	1144	1.21
1145	1.23	1146	1.25	1147	1.27	1148	1.28	1149	1.40
1150	1.50	1151	1.59	1152	1.69	1153	1.80	1154	1.69
1155	1.57	1156	1.45	1157	1.32	1158	1.19	1159	1.16
1160	1.13	1161	1.12	1162	1.10	1163	1.10	1164	1.09
1165	1.08	1166	1.07	1167	1.07	1168	1.06	1169	1.06
1170	1.06	1171	1.05	1172	1.05	1173	1.05	1174	1.05
1175	1.04	1176	1.04	1177	1.04	1178	1.04	1179	1.04
1180	1.00	1181	.94	1182	.89	1183	.84	1184	.80
1185	.75	1186	.72	1187	.69	1188	.65	1189	.61
1190	.59	1191	.56	1192	.52	1193	.50	1194	.47
1195	.44	1196	.43	1197	.42	1198	.39	1199	.38
1200	.37	1201	.36	1202	.35	1203	.34	1204	.33
1205	.33	1206	.32	1207	.32	1208	.31	1209	.31
1210	.30	1211	.30	1212	.30	1213	.29	1214	.29
1215	.29	1216	.29	1217	.28	1218	.28	1219	.28
1220	.28	1221	.27	1222	.27	1223	.27	1224	.26
1225	.26	1226	.26	1227	.26	1228	.26	1229	.26
1230	.25	1231	.25	1232	.25	1233	.25	1234	.25
1235	.25	1236	.25	1237	.24	1238	.24	1239	.24
1240	.24	1241	.24	1242	.24	1243	.24	1244	.23
1245	.23	1246	.23	1247	.23	1248	.23	1249	.23
1250	.23	1251	.23	1252	.22	1253	.22	1254	.22
1255	.22	1256	.22	1257	.22	1258	.22	1259	.22
1260	.22	1261	.22	1262	.21	1263	.21	1264	.21
1265	.21	1266	.21	1267	.21	1268	.21	1269	.21
1270	.21	1271	.21	1272	.21	1273	.21	1274	.21
1275	.21	1276	.21	1277	.21	1278	.20	1279	.21
1280	.21	1281	.21	1282	.20	1283	.20	1284	.20
1285	.20	1286	.20	1287	.20	1288	.20	1289	.20
1290	.20	1291	.20	1292	.20	1293	.20	1294	.20
1295	.20	1296	.20	1297	.20	1298	.20	1299	.20
1300	.20	1310	.20	1320	.11	1330	.01	1340	.01
1350	.01	1360	.01	1370	.01	1380	.01	1390	.01
1400	.01	1420	.01	1440	.01	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = .34(Ac.Ft)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1997-2004 Version 6.4

Study Date : 04/10/18 Input hydrograph file name : 307A.hyd
Output hydrograph file name: basin306.hin

User entry of depth-outflow-storage data

Hydrograph time unit varies
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data @ 1 Min. Intervals:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.001	0.001	0.001	0.001
2.000	0.170	0.001	0.170	0.170
3.000	0.290	0.001	0.290	0.290
3.100	0.300	5.900	0.296	0.304
3.500	0.360	65.700	0.315	0.405

Hydrograph Detention Basin Routing
Hydrograph at 1 307 A Storm Day: 4 Drainage Area = 7.50
Total flood hydrograph volume this storm day = 0.32 Ac. Ft.

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Min)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0 0.5 1.0 1.5 2.0	Depth (Ft.)
0	0.0	0.0	0.001	O	0.0
100	0.0	0.0	0.001	O	0.0
200	0.0	0.0	0.001	O	0.0
300	0.0	0.0	0.001	O	0.0
400	0.0	0.0	0.000	O	0.0
500	0.0	0.0	0.000	O	0.0
600	0.0	0.0	0.000	O	0.0
700	0.0	0.0	0.000	O	0.0
800	0.1	0.0	0.007	OI	0.1
900	0.2	0.0	0.027	O I	0.3
1000	0.3	0.0	0.062	O I	0.7
1050	0.5	0.0	0.089	O I	1.0
1100	1.1	0.0	0.145	O I	1.7
1110	1.1	0.0	0.160	O I	1.9
1120	1.1	0.0	0.175	O I	2.0
1130	1.1	0.0	0.190	O I	2.2
1131	1.1	0.0	0.192	O I	2.2
1132	1.1	0.0	0.193	O I	2.2
1133	1.1	0.0	0.195	O I	2.2
1134	1.1	0.0	0.196	O I	2.2
1135	1.1	0.0	0.198	O I	2.2
1136	1.1	0.0	0.199	O I	2.2
1137	1.2	0.0	0.201	O I	2.3
1138	1.2	0.0	0.203	O I	2.3
1139	1.2	0.0	0.204	O I	2.3
1140	1.2	0.0	0.206	O I	2.3
1141	1.2	0.0	0.208	O I	2.3
1142	1.2	0.0	0.209	O I	2.3
1143	1.2	0.0	0.211	O I	2.3
1144	1.2	0.0	0.213	O I	2.4
1145	1.2	0.0	0.214	O I	2.4
1146	1.3	0.0	0.216	O I	2.4
1147	1.3	0.0	0.218	O I	2.4
1148	1.3	0.0	0.220	O I	2.4
1149	1.4	0.0	0.222	O I	2.4
1150	1.5	0.0	0.224	O I	2.4
1151	1.6	0.0	0.226	O I	2.5
1152	1.7	0.0	0.228	O I	2.5
1153	1.8	0.0	0.231	O I	2.5
1154	2.0	0.0	0.233	O I	2.5
1155	1.6	0.0	0.236	O I	2.5
1156	1.5	0.0	0.238	O I	2.6
1157	1.3	0.0	0.239	O I	2.6
1158	1.2	0.0	0.241	O I	2.6

1159	1.2	0.0	0.243	O			I		2.6
1160	1.1	0.0	0.244	O			I		2.6
1161	1.1	0.0	0.246	O			I		2.6
1162	1.1	0.0	0.247	O			I		2.6
1163	1.1	0.0	0.249	O			I		2.7
1164	1.1	0.0	0.250	O			I		2.7
1165	1.1	0.0	0.252	O			I		2.7
1166	1.1	0.0	0.253	O			I		2.7
1167	1.1	0.0	0.255	O			I		2.7
1168	1.1	0.0	0.256	O			I		2.7
1169	1.1	0.0	0.258	O			I		2.7
1170	1.0	0.0	0.259	O			I		2.7
1171	1.1	0.0	0.261	O			I		2.8
1172	1.1	0.0	0.262	O			I		2.8
1173	1.1	0.0	0.264	O			I		2.8
1174	1.1	0.0	0.265	O			I		2.8
1175	1.0	0.0	0.267	O			I		2.8
1176	1.0	0.0	0.268	O			I		2.8
1177	1.1	0.0	0.270	O			I		2.8
1178	1.1	0.0	0.271	O			I		2.8
1179	1.0	0.0	0.272	O			I		2.9
1180	1.0	0.0	0.274	O			I		2.9
1181	1.0	0.0	0.275	O			I		2.9
1182	1.0	0.0	0.277	O			I		2.9
1183	1.0	0.0	0.278	O			I		2.9
1184	1.0	0.0	0.279	O			I		2.9
1185	1.0	0.0	0.281	O			I		2.9
1186	1.0	0.0	0.282	O			I		2.9
1187	1.0	0.0	0.283	O			I		2.9
1188	1.0	0.0	0.285	O			I		3.0
1189	1.0	0.0	0.286	O			I		3.0
1190	1.0	0.0	0.288	O			I		3.0
1191	1.0	0.0	0.289	O			I		3.0
1192	1.0	0.1	0.290	O			I		3.0
1193	1.0	0.6	0.291	O			I		3.0
1194	0.5	0.6	0.291	O					3.0
1195	0.4	0.5	0.291	IO					3.0
1196	0.4	0.4	0.291	O					3.0
1197	0.4	0.4	0.291	O					3.0
1198	0.4	0.4	0.291	O					3.0
1199	0.4	0.4	0.291	O					3.0
1200	0.4	0.4	0.291	O					3.0
1201	0.4	0.4	0.291	O					3.0
1202	0.4	0.4	0.291	O					3.0
1203	0.4	0.4	0.291	O					3.0
1204	0.3	0.3	0.291	IO					3.0
1205	0.3	0.3	0.291	IO					3.0
1206	0.3	0.3	0.291	O					3.0
1207	0.3	0.3	0.291	O					3.0
1208	0.3	0.3	0.291	O					3.0
1209	0.3	0.3	0.291	O					3.0
1210	0.3	0.3	0.291	O					3.0
1211	0.3	0.3	0.291	O					3.0
1212	0.3	0.3	0.291	O					3.0
1213	0.3	0.3	0.291	O					3.0
1214	0.3	0.3	0.291	O					3.0
1215	0.3	0.3	0.291	O					3.0
1216	0.3	0.3	0.291	O					3.0
1217	0.3	0.3	0.291	O					3.0
1218	0.3	0.3	0.291	O					3.0
1219	0.3	0.3	0.291	O					3.0
1220	0.3	0.3	0.291	O					3.0
1221	0.3	0.3	0.291	O					3.0
1222	0.3	0.3	0.291	O					3.0
1223	0.3	0.3	0.291	O					3.0
1224	0.3	0.3	0.291	O					3.0
1225	0.3	0.3	0.291	O					3.0
1226	0.3	0.3	0.291	O					3.0
1227	0.3	0.3	0.291	O					3.0
1228	0.3	0.3	0.291	O					3.0
1229	0.3	0.3	0.291	O					3.0
1230	0.3	0.3	0.291	O					3.0
1231	0.3	0.3	0.291	O					3.0
1232	0.3	0.3	0.291	O					3.0
1233	0.3	0.3	0.291	O					3.0
1234	0.3	0.3	0.291	O					3.0
1235	0.3	0.3	0.291	O					3.0
1236	0.3	0.3	0.291	O					3.0
1237	0.3	0.3	0.291	O					3.0
1238	0.3	0.3	0.291	O					3.0
1239	0.2	0.2	0.290	O					3.0
1240	0.2	0.2	0.290	O					3.0

1241	0.2	0.2	0.290	| o	|	|	|	|	3.0
1242	0.2	0.2	0.290	| o	|	|	|	|	3.0
1243	0.2	0.2	0.290	| o	|	|	|	|	3.0
1244	0.2	0.2	0.290	| o	|	|	|	|	3.0
1245	0.2	0.2	0.290	| o	|	|	|	|	3.0
1246	0.2	0.2	0.290	| o	|	|	|	|	3.0
1247	0.2	0.2	0.290	| o	|	|	|	|	3.0
1248	0.2	0.2	0.290	| o	|	|	|	|	3.0
1249	0.2	0.2	0.290	| o	|	|	|	|	3.0
1250	0.2	0.2	0.290	| o	|	|	|	|	3.0
1251	0.2	0.2	0.290	| o	|	|	|	|	3.0
1252	0.2	0.2	0.290	| o	|	|	|	|	3.0
1253	0.2	0.2	0.290	| o	|	|	|	|	3.0
1254	0.2	0.2	0.290	| o	|	|	|	|	3.0
1255	0.2	0.2	0.290	| o	|	|	|	|	3.0
1256	0.2	0.2	0.290	| o	|	|	|	|	3.0
1257	0.2	0.2	0.290	| o	|	|	|	|	3.0
1258	0.2	0.2	0.290	| o	|	|	|	|	3.0
1259	0.2	0.2	0.290	| o	|	|	|	|	3.0
1260	0.2	0.2	0.290	| o	|	|	|	|	3.0
1261	0.2	0.2	0.290	| o	|	|	|	|	3.0
1262	0.2	0.2	0.290	| o	|	|	|	|	3.0
1263	0.2	0.2	0.290	| o	|	|	|	|	3.0
1264	0.2	0.2	0.290	| o	|	|	|	|	3.0
1265	0.0	0.1	0.290	IO	|	|	|	|	3.0
1266	0.0	0.0	0.290	o	|	|	|	|	3.0
1267	0.0	0.0	0.290	o	|	|	|	|	3.0
1268	0.0	0.0	0.290	o	|	|	|	|	3.0
1269	0.0	0.0	0.290	o	|	|	|	|	3.0
1270	0.0	0.0	0.290	o	|	|	|	|	3.0
1271	0.0	0.0	0.290	o	|	|	|	|	3.0
1272	0.0	0.0	0.290	o	|	|	|	|	3.0
1273	0.0	0.0	0.290	o	|	|	|	|	3.0
1274	0.0	0.0	0.290	o	|	|	|	|	3.0
1275	0.0	0.0	0.290	o	|	|	|	|	3.0
1276	0.0	0.0	0.290	o	|	|	|	|	3.0
1277	0.0	0.0	0.290	o	|	|	|	|	3.0
1278	0.0	0.0	0.290	o	|	|	|	|	3.0
1279	0.0	0.0	0.290	o	|	|	|	|	3.0
1280	0.0	0.0	0.290	o	|	|	|	|	3.0
1281	0.0	0.0	0.290	o	|	|	|	|	3.0
1282	0.0	0.0	0.290	o	|	|	|	|	3.0
1283	0.0	0.0	0.290	o	|	|	|	|	3.0
1284	0.0	0.0	0.290	o	|	|	|	|	3.0
1285	0.0	0.0	0.290	o	|	|	|	|	3.0
1286	0.0	0.0	0.290	o	|	|	|	|	3.0
1287	0.0	0.0	0.290	o	|	|	|	|	3.0
1288	0.0	0.0	0.290	o	|	|	|	|	3.0
1289	0.0	0.0	0.290	o	|	|	|	|	3.0
1290	0.0	0.0	0.290	o	|	|	|	|	3.0
1291	0.0	0.0	0.290	o	|	|	|	|	3.0
1292	0.0	0.0	0.290	o	|	|	|	|	3.0
1293	0.0	0.0	0.290	o	|	|	|	|	3.0
1294	0.0	0.0	0.290	o	|	|	|	|	3.0
1295	0.0	0.0	0.290	o	|	|	|	|	3.0
1296	0.0	0.0	0.290	o	|	|	|	|	3.0
1297	0.0	0.0	0.290	o	|	|	|	|	3.0
1298	0.0	0.0	0.290	o	|	|	|	|	3.0
1299	0.0	0.0	0.290	o	|	|	|	|	3.0
1300	0.0	0.0	0.290	o	|	|	|	|	3.0
1310	0.0	0.0	0.290	o	|	|	|	|	3.0
1320	0.0	0.0	0.290	o	|	|	|	|	3.0
1330	0.0	0.0	0.290	o	|	|	|	|	3.0
1340	0.0	0.0	0.290	o	|	|	|	|	3.0
1350	0.0	0.0	0.290	o	|	|	|	|	3.0
1360	0.0	0.0	0.290	o	|	|	|	|	3.0
1370	0.0	0.0	0.290	o	|	|	|	|	3.0
1380	0.0	0.0	0.290	o	|	|	|	|	3.0
1390	0.0	0.0	0.290	o	|	|	|	|	3.0
1400	0.0	0.0	0.290	o	|	|	|	|	3.0
1420	0.0	0.0	0.290	o	|	|	|	|	3.0
1440	0.0	0.0	0.290	o	|	|	|	|	3.0
1460	0.0	0.0	0.290	o	|	|	|	|	3.0
1500	0.0	0.0	0.290	o	|	|	|	|	3.0

Remaining water in basin = 0.29 (Ac.Ft)
Peak flow out of basin = 0.64(CFS)
Peak flow time = 1193 Min., time interval # = 79
Maximum depth in basin = 3.01(Ft.)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 400, Proposed 50 & 25-yr Mixed, BURNED STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 400A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 401A	.0	178.00	.0	178.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 402B	1.1	2.87	1.1	2.87	4	195.	.02000	2.00	.00	0.	97	5	A29	.01
1 403B	2.1	5.54	3.2	8.14	0	0.	.00000	.00	.00	0.	97	5	A25	.90
1 404B	.0	.00	3.2	8.14	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 405AB	3.2	8.14	3.2	183.36	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 406A	2.0	5.05	5.2	187.01	0	0.	.00000	.00	.00	0.	97	6	A29	.40
1 407A	.0	25.00	5.2	212.01	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 408C	23.4	41.93	23.4	41.93	0	0.	.00000	.00	.00	0.	297	11	A29	.10
1 409D	8.7	21.20	8.7	21.20	2	1114.	.03590	.00	.00	0.	297	6	A29	.01
1 410D	15.1	27.35	23.8	43.55	0	0.	.00000	.00	.00	0.	297	11	A29	.15
1 411D	.0	.00	23.8	43.55	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 412CD	23.8	43.55	47.2	84.16	2	1355.	.04100	.00	.00	0.	97	0	A29	.00
1 413C	27.8	51.43	75.0	126.76	2	400.	.01000	.00	.00	0.	297	11	A29	.25
1 414C	4.2	6.67	79.2	131.62	0	0.	.00000	.00	.00	0.	97	12	A25	.60
1 415AC	79.2	131.62	84.4	331.69	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 416A	.0	.00	84.4	331.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 417A	1.4	2.82	85.8	333.71	0	0.	.00000	.00	.00	0.	97	7	A25	.50
1 418A	.0	.00	85.8	333.71	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
TM 60275 Area 400, Proposed 50 & 25-yr Mixed, BURNED , OUTLET HY
HYDROGRAPH AT 1 418A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.40	100	5.24	200	5.37	300	5.55	400	5.74
500	5.99	600	6.29	700	6.68	800	7.19	900	16.94
1000	21.18	1050	27.82	1100	39.63	1110	51.40	1120	62.47
1130	75.62	1131	77.29	1132	79.04	1133	80.85	1134	82.65
1135	85.48	1136	87.34	1137	89.29	1138	92.29	1139	95.32
1140	97.48	1141	101.85	1142	105.34	1143	110.04	1144	114.79
1145	119.93	1146	125.27	1147	132.92	1148	139.80	1149	151.90
1150	170.39	1151	194.91	1152	224.87	1153	258.36	1154	289.65
1155	313.52	1156	328.44	1157	333.71	1158	328.88	1159	315.58
1160	293.96	1161	265.76	1162	235.17	1163	205.36	1164	178.55
1165	153.22	1166	133.80	1167	119.00	1168	105.25	1169	95.60
1170	86.25	1171	80.03	1172	73.66	1173	68.16	1174	62.17
1175	58.68	1176	55.54	1177	52.68	1178	50.02	1179	48.57
1180	46.33	1181	44.17	1182	43.15	1183	42.21	1184	41.40
1185	40.58	1186	39.87	1187	38.17	1188	37.60	1189	37.06
1190	35.55	1191	35.07	1192	34.58	1193	33.16	1194	32.69
1195	32.29	1196	30.91	1197	30.59	1198	29.25	1199	28.98
1200	28.65	1201	27.40	1202	27.14	1203	26.95	1204	26.73
1205	25.55	1206	25.37	1207	25.20	1208	25.05	1209	23.92
1210	23.78	1211	23.66	1212	23.52	1213	23.45	1214	22.36
1215	22.26	1216	22.20	1217	22.12	1218	22.05	1219	22.00
1220	21.91	1221	21.86	1222	20.83	1223	20.74	1224	20.71
1225	20.63	1226	20.59	1227	20.51	1228	20.50	1229	20.44
1230	20.39	1231	19.35	1232	19.30	1233	19.24	1234	19.19
1235	19.16	1236	19.11	1237	19.12	1238	19.05	1239	19.02
1240	18.95	1241	18.95	1242	18.89	1243	18.86	1244	17.85
1245	17.80	1246	17.76	1247	17.76	1248	17.73	1249	17.68
1250	17.64	1251	17.63	1252	17.59	1253	17.56	1254	17.51
1255	17.48	1256	17.46	1257	17.44	1258	17.42	1259	17.38
1260	17.37	1261	17.34	1262	17.27	1263	17.25	1264	16.22
1265	16.20	1266	16.18	1267	16.18	1268	16.16	1269	16.10
1270	16.08	1271	16.06	1272	16.04	1273	16.03	1274	16.01
1275	15.99	1276	15.98	1277	15.97	1278	15.91	1279	15.91
1280	15.89	1281	15.86	1282	15.85	1283	15.85	1284	15.80
1285	15.78	1286	15.80	1287	15.74	1288	15.72	1289	15.73
1290	14.69	1291	14.68	1292	14.64	1293	14.63	1294	14.58
1295	14.58	1296	14.58	1297	14.56	1298	14.54	1299	14.53
1300	14.52	1310	14.38	1320	14.30	1330	14.13	1340	13.00
1350	12.90	1360	12.82	1370	12.73	1380	12.67	1390	12.54
1400	11.50	1420	11.41	1440	11.25	1460	10.58	1500	10.58

TOTAL VOLUME THIS HYDROGRAPH = 33.79(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Proposed Condition

50-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	101A	40.6	1736	0.13	5.8	0.01	97	50-yr		12	2.29	0.69	0.69	64.48
TM 60257	102A	4.8	783	0.014	5.8	0.42	97	50-yr		10	2.50	0.71	0.79	9.44
TM 60257	105B	28.4	1840	0.13	5.8	0.01	97	50-yr		12	2.29	0.69	0.69	45.11
TM 60257	110B	3.3	704	0.166	5.8	0.42	97	50-yr		6	3.20	0.74	0.80	8.50
TM 60257	111B	5.1	606	0.036	5.8	0.42	97	50-yr		7	2.95	0.73	0.80	12.10
TM 60257	113A	7.9	995	0.058	5.8	0.42	97	50-yr		9	2.63	0.71	0.79	16.40
TM 60257	115C	14.4	910	0.24	5.8	0.01	97	50-yr		7	2.95	0.73	0.73	31.03
TM 60257	116C	10.1	875	0.027	5.8	0.42	97	50-yr		9	2.63	0.71	0.79	20.97
TM 60257	117C	10	572	0.026	5.8	0.42	97	50-yr		7	2.95	0.73	0.80	23.63
TM 60257	119C	5.3	787	0.024	5.8	0.42	97	50-yr		9	2.63	0.71	0.79	11.00
TM 60257	121C	4.7	1009	0.056	5.8	0.5	97	50-yr		9	2.63	0.71	0.81	9.94
TM 60257	123C	5.8	456	0.015	5.8	0.42	97	50-yr		7	2.95	0.73	0.80	13.71
TM 60257	126A	0.7	487	0.037	5.8	0.91	97	50-yr		5	3.46	0.75	0.89	2.15
TM 60257	127A	2.3	1099	0.035	5.8	0.5	97	50-yr		10	2.50	0.71	0.80	4.61
TM 60257	130D	3.7	480	0.27	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	9.64
TM 60257	131D	2.2	344	0.35	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	5.73
TM 60257	133D	7.4	989	0.058	5.8	0.42	97	50-yr		9	2.63	0.71	0.79	15.36
TM 60257	135D	2.8	498	0.4	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	7.30
TM 60257	138D	7.6	920	0.039	5.8	0.42	97	50-yr		9	2.63	0.71	0.79	15.78
TM 60257	146D	2.5	910	0.067	5.8	0.42	97	50-yr		8	2.77	0.72	0.80	5.51
TM 60257	150A	4	864	0.021	5.8	0.6	97	50-yr		9	2.63	0.71	0.82	8.67
TM 60257	154A	1.8	100	0.1	5.8	0.1	97	50-yr		5	3.46	0.75	0.77	4.77
TM 60257	203A	1.6	125	0.09	5.8	0.1	97	50-yr		5	3.46	0.75	0.77	4.24
TM 60257	301A	2.6	490	0.41	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	6.78
TM 60257	302A	4.6	835	0.063	5.8	0.01	97	50-yr		8	2.77	0.72	0.72	9.20
TM 60257	306A	0.3	50	0.2	5.8	0.1	97	50-yr		5	3.46	0.75	0.77	0.80
TM 60257	402B	1.1	240	0.4	5.8	0.01	97	50-yr		5	3.46	0.75	0.75	2.87
TM 60257	403B	2.1	450	0.047	5.8	0.9	97	50-yr		5	3.46	0.75	0.89	6.43
TM 60257	406A	2	476	0.032	5.8	0.4	97	50-yr		6	3.18	0.74	0.80	5.10
TM 60257	408C	23.4	1708	0.1546	5.8	0.1	97	50-yr		11	2.39	0.70	0.72	40.13
TM 60257	409D	8.7	707	0.1938	5.8	0.01	97	50-yr		6	3.18	0.74	0.74	20.44
TM 60257	410D	15.1	1544	0.0894	5.8	0.15	97	50-yr		11	2.39	0.70	0.73	26.26
TM 60257	413C	27.8	1604	0.084	5.8	0.25	97	50-yr		11	2.39	0.70	0.75	49.69
TM 60257	414C	4.2	1248	0.03	5.8	0.6	97	50-yr		11	2.39	0.70	0.82	8.22
TM 60257	417A	1.4	576	0.04	5.8	0.5	97	50-yr		6	3.18	0.74	0.82	3.64

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Proposed DESIGN 50-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 101A	40.6	64.22	40.6	64.22	0	0.	.00000	.00	.00	0.	97	12	A29	.01
1 102A	4.8	9.43	45.4	73.66	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1 103AF	.0	72.66	45.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 104F	.0	.00	.0	72.66	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 105B	28.4	44.93	28.4	44.93	0	0.	.00000	.00	.00	0.	97	12	A29	.01
1 106BF	.0	43.93	28.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 107F	.0	.00	.0	43.93	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 108B	.0	.00	28.4	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 109AB	28.4	1.00	73.8	2.00	4	410.	.09000	2.00	.00	0.	97	0	A29	.00
1 110B	3.3	8.36	3.3	8.36	4	370.	.02000	2.00	.00	0.	97	6	A29	.42
1 111B	5.1	11.91	8.4	19.96	0	0.	.00000	.00	.00	0.	97	7	A29	.42
1 112AB	8.4	19.96	82.2	21.96	4	495.	.03000	2.00	.00	0.	97	0	A29	.00
1 113A	7.9	16.30	90.1	37.76	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 114A	.0	.00	90.1	37.76	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 115C	14.4	30.68	14.4	30.68	4	350.	.02000	2.00	.00	0.	97	7	A29	.01
1 116C	10.1	20.84	24.5	50.96	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 117C	10.0	23.34	34.5	74.10	0	0.	.00000	.00	.00	0.	97	7	A29	.42
1 118C	.0	.00	34.5	74.10	4	276.	.06000	2.25	.00	0.	97	99	A29	.00
1 119C	5.3	10.93	39.8	84.65	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 120C	.0	.00	39.8	84.65	4	650.	.06000	2.50	.00	0.	97	99	A29	.00
1 121C	4.7	9.88	44.5	93.61	0	0.	.00000	.00	.00	0.	97	9	A29	.50
1 122C	.0	.00	44.5	93.61	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 123C	5.8	13.54	50.3	106.89	0	0.	.00000	.00	.00	0.	97	7	A29	.42
1 124AC	50.3	106.89	140.4	144.65	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 125A	.0	.00	140.4	144.65	4	400.	.03500	3.25	.00	0.	97	99	A29	.00
1 126A	.7	2.15	141.1	144.34	4	600.	.03000	3.25	.00	0.	97	5	A29	.91
1 127A	2.3	4.61	143.4	147.03	0	0.	.00000	.00	.00	0.	97	10	A29	.50
1 128A	.0	.00	143.4	147.03	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 129A	.0	.00	143.4	147.03	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 130D	3.7	9.67	3.7	9.67	0	0.	.00000	.00	.00	0.	97	5	A29	.01
1 131D	2.2	5.75	5.9	15.42	0	0.	.00000	.00	.00	0.	97	5	A29	.01
1 132D	.0	.00	5.9	15.42	4	970.	.08000	2.00	.00	0.	97	99	A29	.00
1 133D	7.4	15.27	13.3	29.29	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 134D	.0	.00	13.3	29.29	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 135D	2.8	7.32	16.1	35.64	4	235.	.02000	2.25	.00	0.	97	5	A29	.01
1 136D	.0	.00	16.1	35.26	4	500.	.09600	2.00	.00	0.	97	99	A29	.00
1 137D	.0	.00	16.1	34.99	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 138D	7.6	15.68	23.7	50.40	4	160.	.09600	2.00	.00	0.	97	9	A29	.42
1 139D	.0	.00	23.7	50.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 140D	.0	.00	23.7	50.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 141D	.0	.00	23.7	50.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 142D	.0	.00	23.7	50.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 143D	.0	.00	23.7	50.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 144D	.0	14.00	23.7	63.25	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 145D	.0	.00	23.7	63.25	4	200.	.02700	2.50	.00	0.	97	99	A29	.00
1 146D	2.5	5.46	26.2	68.42	0	0.	.00000	.00	.00	0.	97	8	A29	.42
1 147D	.0	.00	26.2	68.42	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 148AD	26.2	68.42	169.6	215.40	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 149A	.0	.00	169.6	215.40	4	195.	.03000	3.75	.00	0.	97	99	A29	.00
1 150A	4.0	8.60	173.6	221.89	0	0.	.00000	.00	.00	0.	97	9	A29	.60
1 151A	.0	.00	173.6	221.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 152AF	.0	199.89	173.6	22.00	4	175.	.02000	2.00	.00	22.	97	0	A29	.00
1 153F	.0	.00	.0	199.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 154A	1.8	4.79	175.4	26.79	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 155A	.0	.00	175.4	26.79	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 156A	.0	.00	175.4	26.79	0	0.	.00000	.00	.00	0.	97	99	A29	.00

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1997-2004 Version 6.4

Study Date : 11/12/18 Input hydrograph file name : 154A.hyd
Output hydrograph file name: STERLING.hin

User entry of depth-outflow-storage data

Hydrograph time unit varies
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data @ 1 Min. Intervals:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.001	0.001	0.001	0.001
2.000	1.790	0.001	1.790	1.790
4.000	3.850	0.001	3.850	3.850
6.000	6.200	0.001	6.200	6.200
7.000	7.500	0.001	7.500	7.500
7.500	8.160	0.001	8.160	8.160
7.600	8.300	5.900	8.296	8.304
7.800	8.580	30.500	8.559	8.601
8.000	8.850	65.700	8.805	8.895

Hydrograph Detention Basin Routing
Hydrograph at 1 154 A Storm Day: 4 Drainage Area = 176.20
Total flood hydrograph volume this storm day = 18.62 Ac. Ft.

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Min)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0 6.8 13.5 20.3 27.0	Depth (Ft.)
0	0.0	0.0	0.001	O	0.0
100	6.0	0.0	0.418	I O	0.5
200	6.0	0.0	1.244	I O	1.4
300	6.0	0.0	2.071	I O	2.3
400	7.0	0.0	2.967	I O	3.1
500	7.0	0.0	3.931	I O	4.1
600	8.0	0.0	4.964	I O	4.9
700	8.0	0.0	6.066	I O	5.9
800	9.0	0.0	7.237	I O	6.8
900	10.0	9.1	8.336	I O	7.6
1000	12.0	11.8	8.368	O	7.6
1050	17.0	16.2	8.418	OI	7.7
1100	22.0	21.2	8.474	OI	7.7
1110	22.0	21.8	8.481	OI	7.7
1120	23.0	22.4	8.488	OI	7.7
1130	23.0	22.8	8.493	O	7.7
1131	23.0	22.8	8.493	O	7.7
1132	23.0	22.9	8.493	O	7.7
1133	23.0	22.9	8.493	O	7.7
1134	23.0	22.9	8.493	O	7.7
1135	23.0	22.9	8.493	O	7.7
1136	23.0	22.9	8.494	O	7.7
1137	23.0	22.9	8.494	O	7.7
1138	23.0	22.9	8.494	O	7.7
1139	23.0	22.9	8.494	O	7.7
1140	23.0	22.9	8.494	O	7.7
1141	23.0	23.0	8.494	O	7.7
1142	23.0	23.0	8.494	O	7.7
1143	23.0	23.0	8.494	O	7.7
1144	23.0	23.0	8.494	O	7.7
1145	23.0	23.0	8.494	O	7.7
1146	23.0	23.0	8.494	O	7.7
1147	24.0	23.1	8.496	OI	7.7
1148	24.0	23.2	8.497	OI	7.7
1149	24.0	23.3	8.498	OI	7.7
1150	25.0	23.5	8.500	O I	7.7
1151	26.0	23.8	8.503	O I	7.7
1152	26.0	24.0	8.506	O I	7.7
1153	27.0	24.4	8.510	O I	7.8
1154	26.0	24.6	8.512	OI	7.8
1155	25.0	24.6	8.513	O	7.8
1156	25.0	24.6	8.513	O	7.8
1157	24.0	24.6	8.513	IO	7.8
1158	23.0	24.4	8.510	IO	7.8
1159	23.0	24.2	8.509	IO	7.7
1160	23.0	24.1	8.507	IO	7.7
1161	23.0	24.0	8.506	IO	7.7
1162	23.0	23.9	8.504	IO	7.7
1163	23.0	23.8	8.503	IO	7.7
1164	23.0	23.7	8.502	IO	7.7
1165	22.0	23.5	8.500	IO	7.7
1166	22.0	23.3	8.498	IO	7.7

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1261	9.0	9.7	8.343		IO			7.6
1262	9.0	9.6	8.342		IO			7.6
1263	9.0	9.5	8.341		IO			7.6
1264	9.0	9.5	8.341		IO			7.6
1265	9.0	9.4	8.340		IO			7.6
1266	9.0	9.4	8.339		IO			7.6
1267	9.0	9.3	8.339		IO			7.6
1268	9.0	9.3	8.339		IO			7.6
1269	9.0	9.3	8.338		O			7.6
1270	9.0	9.2	8.338		O			7.6
1271	9.0	9.2	8.338		O			7.6
1272	9.0	9.2	8.337		O			7.6
1273	9.0	9.2	8.337		O			7.6
1274	9.0	9.1	8.337		O			7.6
1275	9.0	9.1	8.337		O			7.6
1276	9.0	9.1	8.337		O			7.6
1277	9.0	9.1	8.336		O			7.6
1278	9.0	9.1	8.336		O			7.6
1279	9.0	9.1	8.336		O			7.6
1280	9.0	9.1	8.336		O			7.6
1281	9.0	9.1	8.336		O			7.6
1282	9.0	9.1	8.336		O			7.6
1283	9.0	9.0	8.336		O			7.6
1284	8.0	8.9	8.334		IO			7.6
1285	8.0	8.8	8.333		IO			7.6
1286	8.0	8.7	8.332		IO			7.6
1287	8.0	8.6	8.331		IO			7.6
1288	8.0	8.6	8.330		IO			7.6
1289	8.0	8.5	8.330		IO			7.6
1290	8.0	8.4	8.329		IO			7.6
1291	8.0	8.4	8.328		O			7.6
1292	8.0	8.4	8.328		O			7.6
1293	8.0	8.3	8.327		O			7.6
1294	8.0	8.3	8.327		O			7.6
1295	8.0	8.2	8.327		O			7.6
1296	8.0	8.2	8.326		O			7.6
1297	8.0	8.2	8.326		O			7.6
1298	8.0	8.2	8.326		O			7.6
1299	8.0	8.2	8.326		O			7.6
1300	8.0	8.1	8.325		O			7.6
1310	8.0	8.0	8.324		O			7.6
1320	8.0	8.0	8.324		O			7.6
1330	7.0	7.5	8.319		O			7.6
1340	7.0	7.2	8.314		O			7.6
1350	7.0	7.0	8.313		O			7.6
1360	7.0	7.0	8.313		O			7.6
1370	7.0	7.0	8.313		O			7.6
1380	7.0	7.0	8.313		O			7.6
1390	6.0	6.5	8.307		O			7.6
1400	6.0	6.2	8.303		O			7.6
1420	6.0	6.0	8.301		O			7.6
1440	6.0	6.0	8.301		O			7.6
1460	6.0	6.0	8.301		O			7.6
1500	6.0	5.6	8.293		OI			7.6

Remaining water in basin = 8.29 (Ac.Ft)
Peak flow out of basin = 24.65(CFS)
Peak flow time = 1156 Min., time interval # = 42
Maximum depth in basin = 7.75(Ft.)

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\civild\scr_soilx_34.dat
TM 60257 Area 200, Prop. DESIGN 50-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 200A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 201A	.0	73.00	.0	73.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 202A	.0	44.00	.0	117.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 203A	1.6	4.25	1.6	120.70	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 204A	.0	.00	1.6	120.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00

Program Package Serial Number: 2083
11/12/18 FILE: 200 INPUT DATA: English Units RAINFALL SOIL FILE: English (In) OUTPUT DATA: English Units PAGE 4
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG F0601M

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
TM 60257 Area 200, Prop. DESIGN 50-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 204A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.04	200	.04	300	.04	400	.04
500	.05	600	.05	700	.05	800	.06	900	1.07
1000	1.08	1050	3.14	1100	9.25	1110	14.38	1120	17.46
1130	23.59	1131	24.61	1132	25.63	1133	25.67	1134	25.70
1135	27.74	1136	27.75	1137	28.80	1138	30.83	1139	31.86
1140	32.89	1141	35.96	1142	37.01	1143	39.06	1144	41.10
1145	44.23	1146	47.32	1147	50.42	1148	54.49	1149	66.11
1150	79.65	1151	93.16	1152	106.70	1153	119.25	1154	120.70
1155	120.06	1156	118.40	1157	113.70	1158	109.01	1159	103.83
1160	99.71	1161	83.62	1162	68.55	1163	54.51	1164	41.45
1165	27.43	1166	24.40	1167	20.37	1168	19.34	1169	17.33
1170	15.30	1171	14.29	1172	12.27	1173	12.26	1174	11.25
1175	9.23	1176	9.22	1177	9.22	1178	8.19	1179	7.19
1180	7.18	1181	6.18	1182	6.16	1183	6.16	1184	6.15
1185	4.15	1186	4.14	1187	4.14	1188	4.12	1189	3.12
1190	3.12	1191	3.11	1192	3.10	1193	2.11	1194	2.10
1195	2.09	1196	2.10	1197	1.10	1198	1.09	1199	1.09
1200	1.09	1201	1.09	1202	1.09	1203	1.08	1204	1.08
1205	1.08	1206	1.08	1207	1.08	1208	1.08	1209	1.08
1210	1.08	1211	1.08	1212	1.08	1213	1.08	1214	1.08
1215	1.08	1216	1.08	1217	1.08	1218	1.07	1219	1.08
1220	1.08	1221	1.07	1222	1.07	1223	1.07	1224	1.07
1225	1.07	1226	1.07	1227	1.07	1228	1.07	1229	1.07
1230	1.07	1231	1.07	1232	1.07	1233	1.07	1234	1.07
1235	1.07	1236	1.07	1237	1.07	1238	.07	1239	.07
1240	.07	1241	.07	1242	.06	1243	.07	1244	.07
1245	.06	1246	.06	1247	.06	1248	.06	1249	.06
1250	.06	1251	.06	1252	.06	1253	.06	1254	.06
1255	.06	1256	.06	1257	.06	1258	.06	1259	.06
1260	.06	1261	.06	1262	.06	1263	.06	1264	.06
1265	.06	1266	.06	1267	.06	1268	.06	1269	.06
1270	.06	1271	.06	1272	.06	1273	.06	1274	.06
1275	.06	1276	.06	1277	.06	1278	.05	1279	.06
1280	.06	1281	.06	1282	.06	1283	.06	1284	.05
1285	.05	1286	.05	1287	.05	1288	.05	1289	.05
1290	.05	1291	.05	1292	.05	1293	.05	1294	.05
1295	.05	1296	.05	1297	.05	1298	.05	1299	.05
1300	.05	1310	.05	1320	.05	1330	.05	1340	.04
1350	.04	1360	.04	1370	.04	1380	.04	1390	.04
1400	.04	1420	.04	1440	.04	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = 4.93(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60257 Area 300, Prop. DESIGN 50-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	301A	2.6	6.79	2.6	6.79	2	700.	.02600	.00	.00	0.	97	5	A29	.01
1	302A	4.6	10.03	7.2	14.55	0	0.	.00000	.00	.00	0.	97	8	A29	.41
1	303AF	.0	13.55	7.2	1.00	4	50.	.02000	2.00	.00	1.	97	0	A29	.00
1	304F	.0	.00	.0	13.55	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	305A	.0	.00	7.2	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	306A	.3	.80	7.5	1.80	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1	307A	.0	.00	7.5	1.80	0	0.	.00000	.00	.00	0.	97	99	A29	.00

Program Package Serial Number: 2083
04/03/18 FILE: 300 INPUT DATA: English Units RAINFALL SOIL FILE: English (In) OUTPUT DATA: English Units PAGE 4
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG F0601M

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
TM 60257 Area 300, Prop. DESIGN 50-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 307A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.01	200	.01	300	.01	400	.01
500	.01	600	.01	700	.01	800	.12	900	.13
1000	.16	1050	.47	1100	.97	1110	1.07	1120	1.09
1130	1.11	1131	1.11	1132	1.12	1133	1.13	1134	1.13
1135	1.14	1136	1.14	1137	1.15	1138	1.16	1139	1.16
1140	1.17	1141	1.18	1142	1.19	1143	1.20	1144	1.21
1145	1.23	1146	1.25	1147	1.27	1148	1.28	1149	1.40
1150	1.50	1151	1.59	1152	1.69	1153	1.80	1154	1.69
1155	1.57	1156	1.45	1157	1.32	1158	1.19	1159	1.16
1160	1.13	1161	1.12	1162	1.10	1163	1.10	1164	1.09
1165	1.08	1166	1.07	1167	1.07	1168	1.06	1169	1.06
1170	1.06	1171	1.05	1172	1.05	1173	1.05	1174	1.05
1175	1.04	1176	1.04	1177	1.04	1178	1.02	1179	.98
1180	.92	1181	.87	1182	.82	1183	.77	1184	.73
1185	.68	1186	.66	1187	.63	1188	.58	1189	.55
1190	.53	1191	.50	1192	.46	1193	.44	1194	.41
1195	.37	1196	.37	1197	.36	1198	.33	1199	.32
1200	.31	1201	.30	1202	.30	1203	.29	1204	.28
1205	.28	1206	.27	1207	.27	1208	.27	1209	.27
1210	.26	1211	.26	1212	.26	1213	.26	1214	.25
1215	.25	1216	.25	1217	.25	1218	.25	1219	.25
1220	.25	1221	.24	1222	.24	1223	.24	1224	.24
1225	.24	1226	.24	1227	.24	1228	.24	1229	.24
1230	.23	1231	.23	1232	.23	1233	.23	1234	.23
1235	.23	1236	.23	1237	.23	1238	.23	1239	.23
1240	.23	1241	.23	1242	.22	1243	.22	1244	.22
1245	.22	1246	.22	1247	.22	1248	.22	1249	.22
1250	.22	1251	.22	1252	.22	1253	.22	1254	.22
1255	.22	1256	.22	1257	.22	1258	.22	1259	.21
1260	.21	1261	.21	1262	.21	1263	.21	1264	.21
1265	.21	1266	.21	1267	.21	1268	.21	1269	.15
1270	.12	1271	.01	1272	.11	1273	.11	1274	.11
1275	.11	1276	.01	1277	.01	1278	.01	1279	.01
1280	.01	1281	.01	1282	.01	1283	.01	1284	.01
1285	.01	1286	.01	1287	.01	1288	.01	1289	.01
1290	.01	1291	.01	1292	.01	1293	.01	1294	.01
1295	.01	1296	.01	1297	.01	1298	.01	1299	.01
1300	.01	1310	.01	1320	.01	1330	.01	1340	.01
1350	.01	1360	.01	1370	.01	1380	.01	1390	.01
1400	.01	1420	.01	1440	.01	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = .29(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 400, Proposed DESIGN 50-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 400A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 401A	.0	200.00	.0	200.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 402B	1.1	2.87	1.1	2.87	4	195.	.02000	2.00	.00	0.	97	5	A29	.01
1 403B	2.1	6.45	3.2	9.04	0	0.	.00000	.00	.00	0.	97	5	A29	.90
1 404B	.0	.00	3.2	9.04	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 405AB	3.2	9.04	3.2	205.90	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 406A	2.0	5.05	5.2	209.55	0	0.	.00000	.00	.00	0.	97	6	A29	.40
1 407A	.0	25.00	5.2	234.55	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 408C	23.4	39.99	23.4	39.99	0	0.	.00000	.00	.00	0.	97	11	A29	.10
1 409D	8.7	20.25	8.7	20.25	2	1114.	.03590	.00	.00	0.	97	6	A29	.01
1 410D	15.1	26.17	23.8	41.43	0	0.	.00000	.00	.00	0.	97	11	A29	.15
1 411D	.0	.00	23.8	41.43	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 412CD	23.8	41.43	47.2	80.08	2	1355.	.04100	.00	.00	0.	97	0	A29	.00
1 413C	27.8	49.51	75.0	120.84	2	400.	.01000	.00	.00	0.	97	11	A29	.25
1 414C	4.2	8.18	79.2	126.19	0	0.	.00000	.00	.00	0.	97	11	A29	.60
1 415AC	79.2	126.19	84.4	348.39	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 416A	.0	.00	84.4	348.39	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 417A	1.4	3.60	85.8	350.50	0	0.	.00000	.00	.00	0.	97	6	A29	.50
1 418A	.0	.00	85.8	350.50	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 50 SOIL DATA FILE:
TM 60275 Area 400, Proposed DESIGN 50-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 418A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.40	100	4.82	200	4.94	300	5.10	400	5.26
500	5.47	600	5.73	700	6.07	800	6.51	900	16.16
1000	20.23	1050	26.76	1100	41.24	1110	51.89	1120	63.73
1130	77.70	1131	79.42	1132	81.12	1133	82.92	1134	84.72
1135	87.54	1136	89.35	1137	92.29	1138	95.25	1139	98.29
1140	101.42	1141	104.82	1142	109.29	1143	113.89	1144	118.59
1145	124.74	1146	130.10	1147	137.72	1148	146.51	1149	159.92
1150	179.65	1151	207.21	1152	239.19	1153	275.68	1154	308.45
1155	332.46	1156	346.71	1157	350.50	1158	340.28	1159	320.85
1160	293.81	1161	261.67	1162	229.20	1163	199.61	1164	173.97
1165	150.62	1166	132.70	1167	118.25	1168	105.86	1169	95.46
1170	87.28	1171	80.14	1172	72.89	1173	68.44	1174	62.48
1175	59.04	1176	55.96	1177	53.14	1178	50.48	1179	49.07
1180	46.83	1181	44.75	1182	43.70	1183	41.81	1184	39.99
1185	39.24	1186	38.53	1187	36.86	1188	36.25	1189	35.76
1190	34.26	1191	33.75	1192	33.27	1193	31.90	1194	31.47
1195	31.05	1196	29.75	1197	29.42	1198	28.09	1199	27.81
1200	27.53	1201	26.27	1202	26.06	1203	25.82	1204	25.63
1205	24.47	1206	24.31	1207	24.11	1208	24.01	1209	22.91
1210	22.75	1211	22.65	1212	22.54	1213	22.48	1214	21.37
1215	21.28	1216	21.24	1217	21.16	1218	21.08	1219	21.06
1220	21.00	1221	20.94	1222	19.87	1223	19.83	1224	19.76
1225	19.70	1226	19.71	1227	19.66	1228	19.63	1229	19.61
1230	19.52	1231	18.47	1232	18.42	1233	18.37	1234	18.34
1235	18.34	1236	18.33	1237	18.30	1238	18.23	1239	18.20
1240	18.17	1241	18.15	1242	18.07	1243	18.08	1244	17.08
1245	17.01	1246	16.99	1247	16.94	1248	16.93	1249	16.92
1250	16.86	1251	16.86	1252	16.82	1253	16.83	1254	16.76
1255	16.76	1256	16.72	1257	16.72	1258	16.68	1259	16.64
1260	16.64	1261	16.61	1262	16.55	1263	16.57	1264	15.53
1265	15.49	1266	15.50	1267	15.48	1268	15.43	1269	15.45
1270	15.43	1271	15.38	1272	15.36	1273	15.39	1274	15.34
1275	15.32	1276	15.31	1277	15.28	1278	15.25	1279	15.27
1280	15.24	1281	15.23	1282	15.22	1283	15.21	1284	15.16
1285	15.14	1286	15.12	1287	15.10	1288	15.09	1289	15.07
1290	14.05	1291	14.04	1292	14.02	1293	14.00	1294	13.99
1295	13.97	1296	13.96	1297	13.95	1298	13.94	1299	13.94
1300	13.93	1310	13.83	1320	13.72	1330	13.59	1340	12.46
1350	12.40	1360	12.31	1370	12.26	1380	12.18	1390	12.07
1400	11.07	1420	10.97	1440	10.83	1460	10.08	1500	10.08

TOTAL VOLUME THIS HYDROGRAPH = 33.04(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Proposed Condition

25-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	101A	40.6	1736	0.13	5.1	0.01	97	25-yr		13	1.94	0.66	0.66	52.28
TM 60257	102A	4.8	783	0.014	5.1	0.42	97	25-yr		11	2.10	0.68	0.77	7.75
TM 60257	105B	28.4	1840	0.13	5.1	0.01	97	25-yr		14	1.87	0.65	0.66	34.93
TM 60257	110B	3.3	704	0.166	5.1	0.42	97	25-yr		6	2.80	0.72	0.80	7.32
TM 60257	111B	5.1	606	0.036	5.1	0.42	97	25-yr		8	2.43	0.70	0.78	9.74
TM 60257	113A	7.9	995	0.058	5.1	0.42	97	25-yr		10	2.19	0.68	0.77	13.42
TM 60257	115C	14.4	910	0.24	5.1	0.01	97	25-yr		7	2.59	0.71	0.71	26.61
TM 60257	116C	10.1	875	0.027	5.1	0.42	97	25-yr		10	2.19	0.68	0.77	17.15
TM 60257	117C	10	572	0.026	5.1	0.42	97	25-yr		8	2.44	0.70	0.78	19.12
TM 60257	119C	5.3	787	0.024	5.1	0.42	97	25-yr		10	2.19	0.68	0.77	9.00
TM 60257	121C	4.7	1009	0.056	5.1	0.5	97	25-yr		10	2.19	0.68	0.79	8.16
TM 60257	123C	5.8	456	0.015	5.1	0.42	97	25-yr		7	2.59	0.71	0.79	11.89
TM 60257	126A	0.7	487	0.037	5.1	0.91	97	25-yr		6	2.79	0.72	0.88	1.73
TM 60257	127A	2.3	1099	0.035	5.1	0.5	97	25-yr		11	2.10	0.68	0.79	3.80
TM 60257	130D	3.7	480	0.27	5.1	0.01	97	25-yr		5	3.04	0.73	0.73	8.24
TM 60257	131D	2.2	344	0.35	5.1	0.01	97	25-yr		5	3.04	0.73	0.73	4.90
TM 60257	133D	7.4	989	0.058	5.1	0.42	97	25-yr		10	2.19	0.68	0.77	12.57
TM 60257	135D	2.8	498	0.4	5.1	0.01	97	25-yr		5	3.04	0.73	0.73	6.24
TM 60257	138D	7.6	920	0.039	5.1	0.42	97	25-yr		10	2.19	0.68	0.77	12.91
TM 60257	146D	2.5	910	0.067	5.1	0.42	97	25-yr		9	2.30	0.69	0.78	4.49
TM 60257	150A	4	864	0.021	5.1	0.6	97	25-yr		10	2.19	0.68	0.81	7.14
TM 60257	154A	1.8	100	0.1	5.1	0.1	97	25-yr		5	3.04	0.73	0.75	4.09
TM 60257	203A	1.6	125	0.09	5.1	0.1	97	25-yr		5	3.04	0.73	0.75	3.64
TM 60257	301A	2.6	490	0.41	5.1	0.01	97	25-yr		5	3.04	0.73	0.73	5.79
TM 60257	302A	4.6	835	0.063	5.1	0.01	97	25-yr		9	2.30	0.69	0.69	7.35
TM 60257	306A	0.3	50	0.2	5.1	0.1	97	25-yr		5	3.04	0.73	0.75	0.68
TM 60257	402B	1.1	240	0.4	5.1	0.01	97	25-yr		5	3.04	0.73	0.73	2.45
TM 60257	403B	2.1	450	0.047	5.1	0.9	97	25-yr		5	3.04	0.73	0.88	5.63
TM 60257	406A	2	476	0.032	5.1	0.4	97	25-yr		7	2.59	0.71	0.79	4.08
TM 60257	408C	23.4	1708	0.1546	5.1	0.1	97	25-yr		12	2.01	0.67	0.69	32.63
TM 60257	409D	8.7	707	0.1938	5.1	0.01	97	25-yr		7	2.59	0.71	0.71	16.08
TM 60257	410D	15.1	1544	0.0894	5.1	0.15	97	25-yr		13	1.94	0.66	0.70	20.42
TM 60257	413C	27.8	1604	0.084	5.1	0.25	97	25-yr		13	1.94	0.66	0.72	38.88
TM 60257	414C	4.2	1248	0.03	5.1	0.6	97	25-yr		12	2.01	0.67	0.81	6.83
TM 60257	417A	1.4	576	0.04	5.1	0.5	97	25-yr		7	2.59	0.71	0.81	2.92

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Proposed DESIGN 25-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 101A	40.6	52.09	40.6	52.09	0	0.	.00000	.00	.00	0.	97	13	A29	.01
1 102A	4.8	7.72	45.4	59.82	0	0.	.00000	.00	.00	0.	97	11	A29	.42
1 103AF	.0	58.82	45.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 104F	.0	.00	.0	58.82	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 105B	28.4	34.95	28.4	34.95	0	0.	.00000	.00	.00	0.	97	14	A29	.01
1 106BF	.0	33.95	28.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 107F	.0	.00	.0	33.95	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 108B	.0	.00	28.4	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 109AB	28.4	1.00	73.8	2.00	4	410.	.09000	2.00	.00	0.	97	0	A29	.00
1 110B	3.3	7.25	3.3	7.25	4	370.	.02000	2.00	.00	0.	97	6	A29	.42
1 111B	5.1	9.64	8.4	16.59	0	0.	.00000	.00	.00	0.	97	8	A29	.42
1 112AB	8.4	16.59	82.2	18.59	4	495.	.03000	2.00	.00	0.	97	0	A29	.00
1 113A	7.9	13.42	90.1	31.64	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1 114A	.0	.00	90.1	31.64	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 115C	14.4	26.22	14.4	26.22	4	350.	.02000	2.00	.00	0.	97	7	A29	.01
1 116C	10.1	17.16	24.5	42.97	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1 117C	10.0	18.90	34.5	61.73	0	0.	.00000	.00	.00	0.	97	8	A29	.42
1 118C	.0	.00	34.5	61.73	4	276.	.06000	2.25	.00	0.	97	99	A29	.00
1 119C	5.3	9.01	39.8	70.40	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1 120C	.0	.00	39.8	70.40	4	650.	.06000	2.25	.00	0.	97	99	A29	.00
1 121C	4.7	8.16	44.5	77.75	0	0.	.00000	.00	.00	0.	97	10	A29	.50
1 122C	.0	.00	44.5	77.75	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 123C	5.8	11.72	50.3	89.07	0	0.	.00000	.00	.00	0.	97	7	A29	.42
1 124AC	50.3	89.07	140.4	120.71	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 125A	.0	.00	140.4	120.71	4	400.	.03500	3.00	.00	0.	97	99	A29	.00
1 126A	.7	1.71	141.1	120.79	4	600.	.03000	3.00	.00	0.	97	6	A29	.91
1 127A	2.3	3.79	143.4	123.25	0	0.	.00000	.00	.00	0.	97	11	A29	.50
1 128A	.0	.00	143.4	123.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 129A	.0	.00	143.4	123.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 130D	3.7	8.30	3.7	8.30	0	0.	.00000	.00	.00	0.	97	5	A29	.01
1 131D	2.2	4.94	5.9	13.24	0	0.	.00000	.00	.00	0.	97	5	A29	.01
1 132D	.0	.00	5.9	13.24	4	970.	.08000	2.00	.00	0.	97	99	A29	.00
1 133D	7.4	12.57	13.3	24.52	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1 134D	.0	.00	13.3	24.52	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 135D	2.8	6.28	16.1	29.96	4	235.	.02000	2.00	.00	0.	97	5	A29	.01
1 136D	.0	.00	16.1	29.43	4	500.	.09600	2.00	.00	0.	97	99	A29	.00
1 137D	.0	.00	16.1	29.34	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 138D	7.6	12.91	23.7	42.08	4	160.	.09600	2.00	.00	0.	97	10	A29	.42
1 139D	.0	.00	23.7	41.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 140D	.0	.00	23.7	41.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 141D	.0	.00	23.7	41.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 142D	.0	.00	23.7	41.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 143D	.0	.00	23.7	41.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 144D	.0	11.00	23.7	52.89	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 145D	.0	.00	23.7	52.89	4	200.	.02700	2.25	.00	0.	97	99	A29	.00
1 146D	2.5	4.46	26.2	56.70	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 147D	.0	.00	26.2	56.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 148AD	26.2	56.70	169.6	178.50	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 149A	.0	.00	169.6	178.50	4	195.	.03000	3.50	.00	0.	97	99	A29	.00
1 150A	4.0	7.14	173.6	185.11	0	0.	.00000	.00	.00	0.	97	10	A29	.60
1 151A	.0	.00	173.6	185.11	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 152AF	.0	164.11	173.6	21.00	4	175.	.02000	2.00	.00	21.	97	0	A29	.00
1 153F	.0	.00	.0	164.11	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 154A	1.8	4.12	175.4	25.12	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 155A	.0	.00	175.4	25.12	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 156A	.0	.00	175.4	25.12	0	0.	.00000	.00	.00	0.	97	99	A29	.00

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Study Date : 11/12/18 Input hydrograph file name : 154A.hyd
Output hydrograph file name: STERLING.hin

User entry of depth-outflow-storage data

Hydrograph time unit varies
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data @ 1 Min. Intervals:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.001	0.001	0.001	0.001
2.000	1.790	0.001	1.790	1.790
4.000	3.850	0.001	3.850	3.850
6.000	6.200	0.001	6.200	6.200
7.000	7.500	0.001	7.500	7.500
7.500	8.160	0.001	8.160	8.160
7.600	8.300	5.900	8.296	8.304
7.800	8.580	30.500	8.559	8.601
8.000	8.850	65.700	8.805	8.895

Hydrograph Detention Basin Routing
Hydrograph at 1 154 A Storm Day: 4 Drainage Area = 176.20
Total flood hydrograph volume this storm day = 16.47 Ac. Ft.

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Min)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0 6.3 12.5 18.8 25.0	Depth (Ft.)
0	0.0	0.0	0.001	O	0.0
100	5.0	0.0	0.349	I O	0.4
200	5.0	0.0	1.037	I O	1.2
300	6.0	0.0	1.795	I O	2.0
400	6.0	0.0	2.622	I O	2.8
500	6.0	0.0	3.448	I O	3.6
600	7.0	0.0	4.344	I O	4.4
700	7.0	0.0	5.308	I O	5.2
800	8.0	0.0	6.341	I O	6.1
900	9.0	0.0	7.513	I O	7.0
1000	11.0	10.8	8.356	OI	7.6
1050	13.0	12.7	8.377	O	7.7
1100	20.0	18.9	8.448	OI	7.7
1110	21.0	20.1	8.462	OI	7.7
1120	21.0	20.7	8.469	O	7.7
1130	22.0	21.4	8.476	OI	7.7
1131	22.0	21.4	8.477	OI	7.7
1132	22.0	21.5	8.478	OI	7.7
1133	22.0	21.6	8.478	OI	7.7
1134	22.0	21.6	8.479	OI	7.7
1135	22.0	21.7	8.479	OI	7.7
1136	22.0	21.7	8.480	OI	7.7
1137	22.0	21.7	8.480	OI	7.7
1138	22.0	21.8	8.481	OI	7.7
1139	22.0	21.8	8.481	OI	7.7
1140	22.0	21.8	8.481	OI	7.7
1141	22.0	21.8	8.481	OI	7.7
1142	22.0	21.9	8.482	OI	7.7
1143	22.0	21.9	8.482	OI	7.7
1144	22.0	21.9	8.482	O	7.7
1145	22.0	21.9	8.482	O	7.7
1146	22.0	21.9	8.482	O	7.7
1147	22.0	21.9	8.482	O	7.7
1148	22.0	21.9	8.482	O	7.7
1149	23.0	22.1	8.484	OI	7.7
1150	24.0	22.3	8.486	O I	7.7
1151	24.0	22.5	8.489	O I	7.7
1152	25.0	22.8	8.492	O I	7.7
1153	25.0	23.0	8.495	O I	7.7
1154	25.0	23.2	8.497	O I	7.7
1155	24.0	23.3	8.498	OI	7.7
1156	23.0	23.3	8.498	O	7.7
1157	23.0	23.3	8.498	O	7.7
1158	22.0	23.1	8.496	IO	7.7
1159	22.0	23.0	8.494	IO	7.7
1160	22.0	22.9	8.493	IO	7.7
1161	22.0	22.8	8.492	IO	7.7
1162	22.0	22.7	8.491	IO	7.7
1163	21.0	22.5	8.489	I O	7.7
1164	21.0	22.3	8.487	I O	7.7
1165	21.0	22.2	8.485	I O	7.7
1166	21.0	22.0	8.484	I O	7.7

1167	21.0	21.9	8.482					I O		7.7
1168	21.0	21.8	8.481					IO		7.7
1169	21.0	21.7	8.480					IO		7.7
1170	21.0	21.6	8.479					IO		7.7
1171	21.0	21.6	8.478					IO		7.7
1172	21.0	21.5	8.478					IO		7.7
1173	21.0	21.4	8.477					IO		7.7
1174	21.0	21.4	8.476					IO		7.7
1175	21.0	21.3	8.476					IO		7.7
1176	21.0	21.3	8.475					IO		7.7
1177	21.0	21.3	8.475					IO		7.7
1178	21.0	21.2	8.475					IO		7.7
1179	21.0	21.2	8.474					IO		7.7
1180	20.0	21.1	8.473					IO		7.7
1181	19.0	20.8	8.470					I O		7.7
1182	19.0	20.6	8.468					I O		7.7
1183	18.0	20.3	8.464					I O		7.7
1184	17.0	19.9	8.460				I	O		7.7
1185	17.0	19.6	8.456				I	O		7.7
1186	16.0	19.2	8.451				I	O		7.7
1187	16.0	18.8	8.447				I	O		7.7
1188	15.0	18.4	8.442				I	O		7.7
1189	15.0	18.0	8.438				I	O		7.7
1190	15.0	17.7	8.434				I	O		7.7
1191	14.0	17.2	8.429			I		O		7.7
1192	14.0	16.9	8.425			I		O		7.7
1193	14.0	16.5	8.421			I		O		7.7
1194	13.0	16.1	8.417			I		O		7.7
1195	13.0	15.8	8.413			I		O		7.7
1196	13.0	15.5	8.409			I		O		7.7
1197	13.0	15.2	8.406			I		O		7.7
1198	13.0	14.9	8.403			I		O		7.7
1199	13.0	14.7	8.400			I	O			7.7
1200	12.0	14.4	8.397		I		O			7.7
1201	12.0	14.1	8.394		I		O			7.7
1202	12.0	13.9	8.391		I	O				7.7
1203	12.0	13.7	8.388		I	O				7.7
1204	12.0	13.5	8.386		I	O				7.7
1205	12.0	13.3	8.384		I	O				7.7
1206	12.0	13.2	8.383		IO					7.7
1207	12.0	13.0	8.381		IO					7.7
1208	11.0	12.8	8.379	I	O					7.7
1209	11.0	12.6	8.376	I	O					7.7
1210	11.0	12.4	8.374	IO						7.7
1211	11.0	12.3	8.372	IO						7.7
1212	11.0	12.1	8.371	IO						7.7
1213	11.0	12.0	8.369	IO						7.6
1214	11.0	11.9	8.368	IO						7.6
1215	11.0	11.8	8.367	IO						7.6
1216	11.0	11.7	8.366	O						7.6
1217	11.0	11.6	8.365	O						7.6
1218	11.0	11.5	8.364	O						7.6
1219	10.0	11.4	8.362	I	O					7.6
1220	10.0	11.2	8.360	I	O					7.6
1221	10.0	11.1	8.359	I	O					7.6
1222	10.0	10.9	8.357	I	O					7.6
1223	10.0	10.8	8.356	IO						7.6
1224	10.0	10.7	8.355	IO						7.6
1225	10.0	10.7	8.354	IO						7.6
1226	10.0	10.6	8.353	IO						7.6
1227	10.0	10.5	8.353	IO						7.6
1228	10.0	10.5	8.352	IO						7.6
1229	10.0	10.4	8.351	IO						7.6
1230	10.0	10.4	8.351	IO						7.6
1231	10.0	10.3	8.350	IO						7.6
1232	10.0	10.3	8.350	IO						7.6
1233	10.0	10.2	8.350	IO						7.6
1234	10.0	10.2	8.349	IO						7.6
1235	9.0	10.1	8.348	IO						7.6
1236	9.0	10.0	8.346	IO						7.6
1237	9.0	9.8	8.345	IO						7.6
1238	9.0	9.8	8.344	IO						7.6
1239	9.0	9.7	8.343	IO						7.6
1240	9.0	9.6	8.342	IO						7.6
1241	9.0	9.5	8.341	IO						7.6
1242	9.0	9.5	8.341	IO						7.6
1243	9.0	9.4	8.340	IO						7.6
1244	9.0	9.4	8.339	O						7.6
1245	9.0	9.3	8.339	O						7.6
1246	9.0	9.3	8.339	O						7.6
1247	9.0	9.3	8.338	O						7.6
1248	9.0	9.2	8.338	O						7.6
1249	9.0	9.2	8.338	O						7.6
1250	9.0	9.2	8.337	O						7.6
1251	9.0	9.2	8.337	O						7.6
1252	9.0	9.1	8.337	O						7.6
1253	9.0	9.1	8.337	O						7.6
1254	9.0	9.1	8.337	O						7.6
1255	8.0	9.0	8.335	IO						7.6
1256	8.0	8.9	8.334	IO						7.6
1257	8.0	8.8	8.333	IO						7.6
1258	8.0	8.7	8.332	IO						7.6
1259	8.0	8.6	8.331	IO						7.6
1260	8.0	8.5	8.330	O						7.6

1261	8.0	8.5	8.329	|	O |	|	|	7.6
1262	8.0	8.4	8.329	|	O |	|	|	7.6
1263	8.0	8.4	8.328	|	O |	|	|	7.6
1264	8.0	8.3	8.328	|	O |	|	|	7.6
1265	8.0	8.3	8.327	|	O |	|	|	7.6
1266	8.0	8.3	8.327	|	O |	|	|	7.6
1267	8.0	8.2	8.327	|	O |	|	|	7.6
1268	8.0	8.2	8.326	|	O |	|	|	7.6
1269	8.0	8.2	8.326	|	O |	|	|	7.6
1270	8.0	8.2	8.326	|	O |	|	|	7.6
1271	8.0	8.1	8.326	|	O |	|	|	7.6
1272	8.0	8.1	8.325	|	O |	|	|	7.6
1273	8.0	8.1	8.325	|	O |	|	|	7.6
1274	8.0	8.1	8.325	|	O |	|	|	7.6
1275	8.0	8.1	8.325	|	O |	|	|	7.6
1276	8.0	8.1	8.325	|	O |	|	|	7.6
1277	8.0	8.1	8.325	|	O |	|	|	7.6
1278	8.0	8.1	8.325	|	O |	|	|	7.6
1279	8.0	8.1	8.325	|	O |	|	|	7.6
1280	8.0	8.0	8.324	|	O |	|	|	7.6
1281	8.0	8.0	8.324	|	O |	|	|	7.6
1282	8.0	8.0	8.324	|	O |	|	|	7.6
1283	8.0	8.0	8.324	|	O |	|	|	7.6
1284	8.0	8.0	8.324	|	O |	|	|	7.6
1285	8.0	8.0	8.324	|	O |	|	|	7.6
1286	8.0	8.0	8.324	|	O |	|	|	7.6
1287	8.0	8.0	8.324	|	O |	|	|	7.6
1288	7.0	7.9	8.323	|	I O |	|	|	7.6
1289	7.0	7.8	8.322	|	IO |	|	|	7.6
1290	7.0	7.7	8.321	|	IO |	|	|	7.6
1291	7.0	7.6	8.320	|	IO |	|	|	7.6
1292	7.0	7.6	8.319	|	IO |	|	|	7.6
1293	7.0	7.5	8.318	|	IO |	|	|	7.6
1294	7.0	7.4	8.317	|	IO |	|	|	7.6
1295	7.0	7.4	8.317	|	IO |	|	|	7.6
1296	7.0	7.3	8.316	|	IO |	|	|	7.6
1297	7.0	7.3	8.316	|	IO |	|	|	7.6
1298	7.0	7.3	8.316	|	IO |	|	|	7.6
1299	7.0	7.2	8.315	|	IO |	|	|	7.6
1300	7.0	7.2	8.315	|	IO |	|	|	7.6
1310	7.0	7.1	8.313	|	IO |	|	|	7.6
1320	7.0	7.0	8.313	|	O |	|	|	7.6
1330	7.0	7.0	8.313	|	O |	|	|	7.6
1340	6.0	6.5	8.307	|	IO |	|	|	7.6
1350	6.0	6.2	8.303	|	O|	|	|	7.6
1360	6.0	6.0	8.302	|	O|	|	|	7.6
1370	6.0	6.0	8.301	|	O|	|	|	7.6
1380	6.0	6.0	8.301	|	O|	|	|	7.6
1390	6.0	6.0	8.301	|	O|	|	|	7.6
1400	6.0	6.0	8.301	|	O|	|	|	7.6
1420	5.0	5.6	8.292	|	IO|	|	|	7.6
1440	5.0	5.2	8.283	|	O |	|	|	7.6
1460	5.0	5.1	8.280	|	O |	|	|	7.6
1500	5.0	4.7	8.272	|	O |	|	|	7.6

Remaining water in basin = 8.27 (Ac.Ft)
Peak flow out of basin = 23.33(CFS)
Peak flow time = 1155 Min., time interval # = 41
Maximum depth in basin = 7.74(Ft.)

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE: C:\civild\scr_soilx_34.dat
TM 60257 Area 200, Prop. DESIGN 25-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 200A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 201A	.0	59.00	.0	59.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 202A	.0	34.00	.0	93.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 203A	1.6	3.66	1.6	96.18	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 204A	.0	.00	1.6	96.18	0	0.	.00000	.00	.00	0.	97	99	A29	.00

Program Package Serial Number: 2083
11/12/18 FILE: 200 INPUT DATA: English Units RAINFALL SOIL FILE: English (In) OUTPUT DATA: English Units PAGE 4
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG F0601M

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE:
TM 60257 Area 200, Prop. DESIGN 25-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 204A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.03	200	.03	300	.04	400	.04
500	.04	600	.04	700	.05	800	.05	900	.06
1000	1.07	1050	1.09	1100	6.19	1110	9.30	1120	12.37
1130	17.49	1131	18.50	1132	19.52	1133	20.55	1134	20.58
1135	21.61	1136	22.62	1137	22.66	1138	23.69	1139	25.71
1140	25.74	1141	27.80	1142	28.84	1143	30.88	1144	31.92
1145	35.03	1146	37.11	1147	40.19	1148	42.26	1149	53.79
1150	63.26	1151	73.71	1152	85.18	1153	94.66	1154	96.18
1155	95.62	1156	94.05	1157	91.44	1158	89.84	1159	86.69
1160	81.58	1161	77.51	1162	68.45	1163	57.41	1164	45.36
1165	35.34	1166	24.32	1167	18.29	1168	16.27	1169	14.26
1170	13.23	1171	11.22	1172	10.21	1173	9.20	1174	8.18
1175	7.17	1176	6.16	1177	6.16	1178	6.14	1179	5.14
1180	4.12	1181	4.12	1182	4.11	1183	3.11	1184	3.10
1185	3.10	1186	2.09	1187	2.09	1188	1.09	1189	1.09
1190	1.09	1191	1.08	1192	1.08	1193	1.08	1194	1.08
1195	1.08	1196	1.08	1197	1.08	1198	1.08	1199	1.08
1200	1.08	1201	1.08	1202	1.08	1203	1.07	1204	1.07
1205	1.07	1206	1.07	1207	1.07	1208	1.07	1209	1.07
1210	1.07	1211	1.07	1212	1.07	1213	1.07	1214	1.07
1215	1.07	1216	1.07	1217	1.07	1218	1.06	1219	1.07
1220	1.07	1221	.06	1222	.06	1223	.06	1224	.06
1225	.06	1226	.06	1227	.06	1228	.06	1229	.06
1230	.06	1231	.06	1232	.06	1233	.06	1234	.06
1235	.06	1236	.06	1237	.06	1238	.06	1239	.06
1240	.06	1241	.06	1242	.05	1243	.06	1244	.06
1245	.05	1246	.05	1247	.05	1248	.05	1249	.05
1250	.05	1251	.05	1252	.05	1253	.05	1254	.05
1255	.05	1256	.05	1257	.05	1258	.05	1259	.05
1260	.05	1261	.05	1262	.05	1263	.05	1264	.05
1265	.05	1266	.05	1267	.05	1268	.05	1269	.05
1270	.05	1271	.05	1272	.05	1273	.05	1274	.05
1275	.05	1276	.05	1277	.05	1278	.05	1279	.05
1280	.05	1281	.05	1282	.05	1283	.05	1284	.05
1285	.05	1286	.05	1287	.05	1288	.05	1289	.05
1290	.05	1291	.05	1292	.05	1293	.05	1294	.05
1295	.05	1296	.05	1297	.05	1298	.05	1299	.05
1300	.05	1310	.04	1320	.04	1330	.04	1340	.04
1350	.04	1360	.04	1370	.04	1380	.04	1390	.03
1400	.04	1420	.03	1440	.03	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = 3.70(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60257 Area 300, Prop. DESIGN 25-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	301A	2.6	5.84	2.6	5.84	2	700.	.02600	.00	.00	0.	97	5	A29	.01
1	302A	4.6	8.19	7.2	11.98	0	0.	.00000	.00	.00	0.	97	9	A29	.41
1	303AF	.0	10.98	7.2	1.00	4	50.	.02000	2.00	.00	1.	97	0	A29	.00
1	304F	.0	.00	.0	10.98	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	305A	.0	.00	7.2	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	306A	.3	.69	7.5	1.69	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1	307A	.0	.00	7.5	1.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE:
TM 60257 Area 300, Prop. DESIGN 25-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 307A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.60	100	1.01	200	1.01	300	1.01	400	1.01
500	1.01	600	1.01	700	1.01	800	1.01	900	1.01
1000	1.01	1050	1.02	1100	1.04	1110	1.06	1120	1.07
1130	1.09	1131	1.09	1132	1.10	1133	1.10	1134	1.11
1135	1.11	1136	1.12	1137	1.12	1138	1.13	1139	1.13
1140	1.14	1141	1.15	1142	1.16	1143	1.16	1144	1.17
1145	1.19	1146	1.21	1147	1.22	1148	1.24	1149	1.34
1150	1.42	1151	1.51	1152	1.60	1153	1.69	1154	1.60
1155	1.49	1156	1.38	1157	1.27	1158	1.16	1159	1.13
1160	1.11	1161	1.10	1162	1.08	1163	1.08	1164	1.07
1165	1.06	1166	1.06	1167	1.05	1168	1.05	1169	1.05
1170	1.04	1171	1.04	1172	1.04	1173	1.04	1174	1.03
1175	1.03	1176	1.03	1177	1.03	1178	1.03	1179	1.03
1180	1.02	1181	1.02	1182	1.02	1183	1.02	1184	1.02
1185	1.02	1186	1.02	1187	1.02	1188	1.02	1189	1.02
1190	1.02	1191	1.02	1192	1.02	1193	1.02	1194	1.02
1195	1.01	1196	1.02	1197	1.02	1198	1.01	1199	1.01
1200	1.01	1201	1.01	1202	1.01	1203	1.01	1204	1.01
1205	1.01	1206	1.01	1207	1.01	1208	1.01	1209	1.01
1210	1.01	1211	1.01	1212	1.01	1213	1.01	1214	1.01
1215	1.01	1216	1.01	1217	1.01	1218	1.01	1219	1.01
1220	1.01	1221	1.01	1222	1.01	1223	1.01	1224	1.01
1225	1.01	1226	1.01	1227	1.01	1228	1.01	1229	1.01
1230	1.01	1231	1.01	1232	1.01	1233	1.01	1234	1.01
1235	1.01	1236	1.01	1237	1.01	1238	1.01	1239	1.01
1240	1.01	1241	1.01	1242	1.01	1243	1.01	1244	1.01
1245	1.01	1246	1.01	1247	1.01	1248	1.01	1249	1.01
1250	1.01	1251	1.01	1252	1.01	1253	1.01	1254	1.01
1255	1.01	1256	1.01	1257	1.01	1258	1.01	1259	1.01
1260	1.01	1261	1.01	1262	1.01	1263	1.01	1264	1.01
1265	1.01	1266	1.01	1267	1.01	1268	1.01	1269	1.01
1270	1.01	1271	1.01	1272	1.01	1273	1.01	1274	1.01
1275	1.01	1276	1.01	1277	1.01	1278	1.01	1279	1.01
1280	1.01	1281	1.01	1282	1.01	1283	1.01	1284	1.01
1285	1.01	1286	1.01	1287	1.01	1288	1.01	1289	1.01
1290	1.01	1291	1.01	1292	1.01	1293	1.01	1294	1.01
1295	1.01	1296	1.01	1297	1.01	1298	1.01	1299	1.01
1300	1.01	1310	1.01	1320	1.01	1330	1.01	1340	1.01
1350	1.01	1360	1.01	1370	1.01	1380	1.01	1390	1.01
1400	1.01	1420	1.01	1440	1.01	1460	1.00	1500	1.00

TOTAL VOLUME THIS HYDROGRAPH = 2.07(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE:
C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 400, Proposed DESIGN 25-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 400A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 401A	.0	164.00	.0	164.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 402B	1.1	2.47	1.1	2.47	4	195.	.02000	2.00	.00	0.	97	5	A29	.01
1 403B	2.1	5.65	3.2	7.86	0	0.	.00000	.00	.00	0.	97	5	A29	.90
1 404B	.0	.00	3.2	7.86	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 405AB	3.2	7.86	3.2	167.93	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 406A	2.0	4.02	5.2	170.77	0	0.	.00000	.00	.00	0.	97	7	A29	.40
1 407A	.0	23.00	5.2	193.77	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 408C	23.4	32.43	23.4	32.43	0	0.	.00000	.00	.00	0.	97	12	A29	.10
1 409D	8.7	15.84	8.7	15.84	2	1114.	.03590	.00	.00	0.	97	7	A29	.01
1 410D	15.1	20.34	23.8	32.81	0	0.	.00000	.00	.00	0.	97	13	A29	.15
1 411D	.0	.00	23.8	32.81	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 412CD	23.8	32.81	47.2	64.05	2	1355.	.04100	.00	.00	0.	97	0	A29	.00
1 413C	27.8	38.72	75.0	96.59	2	400.	.01000	.00	.00	0.	97	13	A29	.25
1 414C	4.2	6.79	79.2	101.15	0	0.	.00000	.00	.00	0.	97	12	A29	.60
1 415AC	79.2	101.15	84.4	284.39	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 416A	.0	.00	84.4	284.39	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 417A	1.4	2.88	85.8	286.44	0	0.	.00000	.00	.00	0.	97	7	A29	.50
1 418A	.0	.00	85.8	286.44	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 25 SOIL DATA FILE:
TM 60275 Area 400, Proposed DESIGN 25-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 418A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.40	100	4.48	200	4.58	300	4.72	400	4.86
500	5.04	600	5.28	700	5.57	800	5.96	900	6.53
1000	18.47	1050	21.68	1100	32.93	1110	41.83	1120	52.74
1130	64.82	1131	65.41	1132	68.00	1133	69.66	1134	71.37
1135	73.10	1136	74.81	1137	76.62	1138	78.42	1139	81.27
1140	84.16	1141	87.25	1142	91.39	1143	94.65	1144	98.00
1145	102.70	1146	107.55	1147	113.65	1148	120.82	1149	131.05
1150	146.18	1151	166.74	1152	193.28	1153	221.88	1154	248.01
1155	267.65	1156	280.45	1157	286.44	1158	284.41	1159	273.60
1160	255.41	1161	232.07	1162	208.57	1163	184.08	1164	163.18
1165	143.80	1166	127.65	1167	112.83	1168	101.44	1169	90.18
1170	81.84	1171	74.39	1172	67.75	1173	61.93	1174	56.72
1175	53.00	1176	49.75	1177	47.83	1178	45.13	1179	42.71
1180	40.35	1181	39.24	1182	38.23	1183	36.32	1184	35.48
1185	34.75	1186	33.06	1187	32.46	1188	30.85	1189	30.34
1190	29.91	1191	28.45	1192	28.04	1193	27.71	1194	26.35
1195	26.04	1196	24.80	1197	24.54	1198	24.31	1199	24.12
1200	22.94	1201	22.76	1202	22.62	1203	22.46	1204	21.36
1205	21.26	1206	21.17	1207	21.06	1208	21.01	1209	20.94
1210	19.85	1211	19.80	1212	19.72	1213	19.67	1214	19.59
1215	19.53	1216	19.49	1217	19.43	1218	19.35	1219	18.36
1220	18.30	1221	18.23	1222	18.20	1223	18.15	1224	18.09
1225	18.05	1226	18.04	1227	18.01	1228	16.97	1229	16.94
1230	16.88	1231	16.83	1232	16.80	1233	16.75	1234	16.72
1235	16.71	1236	16.69	1237	16.68	1238	16.61	1239	16.60
1240	16.58	1241	16.55	1242	15.49	1243	15.49	1244	15.47
1245	15.42	1246	15.41	1247	15.37	1248	15.35	1249	15.34
1250	15.31	1251	15.29	1252	15.26	1253	15.24	1254	15.21
1255	15.21	1256	15.15	1257	15.17	1258	15.12	1259	15.10
1260	15.09	1261	14.06	1262	14.01	1263	14.03	1264	14.00
1265	13.95	1266	13.98	1267	13.94	1268	13.91	1269	13.93
1270	13.90	1271	13.87	1272	13.85	1273	13.86	1274	13.83
1275	13.81	1276	13.79	1277	13.78	1278	13.74	1279	13.76
1280	13.74	1281	13.72	1282	13.71	1283	13.70	1284	13.68
1285	13.65	1286	13.63	1287	13.62	1288	13.60	1289	13.59
1290	13.57	1291	13.55	1292	13.54	1293	12.53	1294	12.52
1295	12.51	1296	12.49	1297	12.48	1298	12.47	1299	12.47
1300	12.46	1310	12.37	1320	12.27	1330	12.17	1340	12.05
1350	10.99	1360	10.91	1370	10.87	1380	10.80	1390	10.71
1400	10.70	1420	10.60	1440	9.48	1460	8.82	1500	8.82

TOTAL VOLUME THIS HYDROGRAPH = 27.78(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Proposed Condition

10-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	101A	40.6	1736	0.13	4.1	0.01	97	10-yr		16	1.43	0.60	0.60	35.00
TM 60257	102A	4.8	783	0.014	4.1	0.42	97	10-yr		13	1.58	0.62	0.74	5.59
TM 60257	105B	28.4	1840	0.13	4.1	0.01	97	10-yr		17	1.39	0.59	0.60	23.50
TM 60257	110B	3.3	704	0.166	4.1	0.42	97	10-yr		7	2.10	0.67	0.77	5.36
TM 60257	111B	5.1	606	0.036	4.1	0.42	97	10-yr		9	1.87	0.65	0.76	7.24
TM 60257	113A	7.9	995	0.058	4.1	0.42	97	10-yr		11	1.71	0.64	0.75	10.06
TM 60257	115C	14.4	910	0.24	4.1	0.01	97	10-yr		9	1.87	0.65	0.66	17.73
TM 60257	116C	10.1	875	0.027	4.1	0.42	97	10-yr		12	1.64	0.63	0.74	12.28
TM 60257	117C	10	572	0.026	4.1	0.42	97	10-yr		9	1.87	0.65	0.76	14.20
TM 60257	119C	5.3	787	0.024	4.1	0.42	97	10-yr		11	1.71	0.64	0.75	6.75
TM 60257	121C	4.7	1009	0.056	4.1	0.5	97	10-yr		11	1.71	0.64	0.77	6.16
TM 60257	123C	5.8	456	0.015	4.1	0.42	97	10-yr		9	1.87	0.65	0.76	8.24
TM 60257	126A	0.7	487	0.037	4.1	0.91	97	10-yr		7	2.11	0.68	0.88	1.30
TM 60257	127A	2.3	1099	0.035	4.1	0.5	97	10-yr		13	1.58	0.62	0.76	2.76
TM 60257	130D	3.7	480	0.27	4.1	0.01	97	10-yr		6	2.27	0.69	0.69	5.80
TM 60257	131D	2.2	344	0.35	4.1	0.01	97	10-yr		5	2.47	0.70	0.71	3.84
TM 60257	133D	7.4	989	0.058	4.1	0.42	97	10-yr		11	1.71	0.64	0.75	9.43
TM 60257	135D	2.8	498	0.4	4.1	0.01	97	10-yr		5	2.47	0.70	0.71	4.88
TM 60257	138D	7.6	920	0.039	4.1	0.42	97	10-yr		12	1.64	0.63	0.74	9.24
TM 60257	146D	2.5	910	0.067	4.1	0.42	97	10-yr		10	1.78	0.64	0.75	3.35
TM 60257	150A	4	864	0.021	4.1	0.6	97	10-yr		12	1.64	0.63	0.79	5.18
TM 60257	154A	1.8	100	0.1	4.1	0.1	97	10-yr		5	2.47	0.70	0.72	3.22
TM 60257	203A	1.6	125	0.09	4.1	0.1	97	10-yr		5	2.47	0.70	0.72	2.86
TM 60257	301A	2.6	490	0.41	4.1	0.01	97	10-yr		5	2.47	0.70	0.71	4.53
TM 60257	302A	4.6	835	0.063	4.1	0.01	97	10-yr		11	1.71	0.64	0.64	5.01
TM 60257	306A	0.3	50	0.2	4.1	0.1	97	10-yr		5	2.47	0.70	0.72	0.54
TM 60257	402B	1.1	240	0.4	4.1	0.01	97	10-yr		5	2.47	0.70	0.71	1.92
TM 60257	403B	2.1	450	0.047	4.1	0.9	97	10-yr		6	2.27	0.69	0.88	4.19
TM 60257	406A	2	476	0.032	4.1	0.4	97	10-yr		8	1.98	0.67	0.76	3.01
TM 60257	408C	23.4	1708	0.1546	4.1	0.1	97	10-yr		15	1.47	0.61	0.64	21.98
TM 60257	409D	8.7	707	0.1938	4.1	0.01	97	10-yr		8	1.98	0.67	0.67	11.53
TM 60257	410D	15.1	1544	0.0894	4.1	0.15	97	10-yr		15	1.47	0.61	0.65	14.51
TM 60257	413C	27.8	1604	0.084	4.1	0.25	97	10-yr		15	1.47	0.61	0.68	27.91
TM 60257	414C	4.2	1248	0.03	4.1	0.6	97	10-yr		14	1.52	0.62	0.79	5.03
TM 60257	417A	1.4	576	0.04	4.1	0.5	97	10-yr		8	1.98	0.67	0.78	2.17

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Proposed DESIGN 10-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 101A	40.6	35.13	40.6	35.13	0	0.	.00000	.00	.00	0.	97	16	A29	.01
1 102A	4.8	5.57	45.4	40.70	0	0.	.00000	.00	.00	0.	97	13	A29	.42
1 103AF	.0	39.70	45.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 104F	.0	.00	.0	39.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 105B	28.4	23.64	28.4	23.64	0	0.	.00000	.00	.00	0.	97	17	A29	.01
1 106BF	.0	22.64	28.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 107F	.0	.00	.0	22.64	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 108B	.0	.00	28.4	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 109AB	28.4	1.00	73.8	2.00	4	410.	.09000	2.00	.00	0.	97	0	A29	.00
1 110B	3.3	5.29	3.3	5.29	4	370.	.02000	2.00	.00	0.	97	7	A29	.42
1 111B	5.1	7.20	8.4	12.32	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 112AB	8.4	12.32	82.2	14.32	4	495.	.03000	2.00	.00	0.	97	0	A29	.00
1 113A	7.9	10.04	90.1	24.18	0	0.	.00000	.00	.00	0.	97	11	A29	.42
1 114A	.0	.00	90.1	24.18	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 115C	14.4	17.66	14.4	17.66	4	350.	.02000	2.00	.00	0.	97	9	A29	.01
1 116C	10.1	12.23	24.5	29.81	0	0.	.00000	.00	.00	0.	97	12	A29	.42
1 117C	10.0	14.12	34.5	43.68	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 118C	.0	.00	34.5	43.68	4	276.	.06000	2.00	.00	0.	97	99	A29	.00
1 119C	5.3	6.74	39.8	50.41	0	0.	.00000	.00	.00	0.	97	11	A29	.42
1 120C	.0	.00	39.8	50.41	4	650.	.06000	2.00	.00	0.	97	99	A29	.00
1 121C	4.7	6.14	44.5	56.15	0	0.	.00000	.00	.00	0.	97	11	A29	.50
1 122C	.0	.00	44.5	56.15	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 123C	5.8	8.19	50.3	63.98	0	0.	.00000	.00	.00	0.	97	9	A29	.42
1 124AC	50.3	63.98	140.4	88.04	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 125A	.0	.00	140.4	88.04	4	400.	.03500	2.75	.00	0.	97	99	A29	.00
1 126A	.7	1.28	141.1	88.84	4	600.	.03000	2.75	.00	0.	97	7	A29	.91
1 127A	2.3	2.75	143.4	90.80	0	0.	.00000	.00	.00	0.	97	13	A29	.50
1 128A	.0	.00	143.4	90.80	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 129A	.0	.00	143.4	90.80	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 130D	3.7	5.73	3.7	5.73	0	0.	.00000	.00	.00	0.	97	6	A29	.01
1 131D	2.2	3.85	5.9	9.58	0	0.	.00000	.00	.00	0.	97	5	A29	.01
1 132D	.0	.00	5.9	9.58	4	970.	.08000	2.00	.00	0.	97	99	A29	.00
1 133D	7.4	9.41	13.3	18.41	0	0.	.00000	.00	.00	0.	97	11	A29	.42
1 134D	.0	.00	13.3	18.41	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 135D	2.8	4.90	16.1	22.25	4	235.	.02000	2.00	.00	0.	97	5	A29	.01
1 136D	.0	.00	16.1	22.06	4	500.	.09600	2.00	.00	0.	97	99	A29	.00
1 137D	.0	.00	16.1	21.85	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 138D	7.6	9.20	23.7	31.06	4	160.	.09600	2.00	.00	0.	97	12	A29	.42
1 139D	.0	.00	23.7	30.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 140D	.0	.00	23.7	30.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 141D	.0	.00	23.7	30.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 142D	.0	.00	23.7	30.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 143D	.0	.00	23.7	30.89	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 144D	.0	8.00	23.7	38.89	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 145D	.0	.00	23.7	38.89	4	200.	.02700	2.00	.00	0.	97	99	A29	.00
1 146D	2.5	3.36	26.2	41.56	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1 147D	.0	.00	26.2	41.56	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 148AD	26.2	41.56	169.6	132.15	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 149A	.0	.00	169.6	132.15	4	195.	.03000	3.25	.00	0.	97	99	A29	.00
1 150A	4.0	5.16	173.6	136.69	0	0.	.00000	.00	.00	0.	97	12	A29	.60
1 151A	.0	.00	173.6	136.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 152AF	.0	117.69	173.6	19.00	4	175.	.02000	2.00	.00	19.	97	0	A29	.00
1 153F	.0	.00	.0	117.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 154A	1.8	3.23	175.4	22.23	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 155A	.0	.00	175.4	22.23	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 156A	.0	.00	175.4	22.23	0	0.	.00000	.00	.00	0.	97	99	A29	.00

10 YEAR

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1997-2004 Version 6.4

Study Date : 11/13/18 Input hydrograph file name : 154A.hyd
Output hydrograph file name: STERLING.hin

User entry of depth-outflow-storage data

Hydrograph time unit varies
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data @ 1 Min. Intervals:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.001	0.001	0.001	0.001
2.000	1.790	0.001	1.790	1.790
4.000	3.850	0.001	3.850	3.850
6.000	6.200	0.001	6.200	6.200
7.000	7.500	0.001	7.500	7.500
7.500	8.160	0.001	8.160	8.160
7.600	8.300	5.900	8.296	8.304
7.800	8.580	30.500	8.559	8.601
8.000	8.850	65.700	8.805	8.895

Hydrograph Detention Basin Routing
Hydrograph at 1 154 A Storm Day: 4 Drainage Area = 176.20
Total flood hydrograph volume this storm day = 13.79 Ac. Ft.

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Min)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0 5.5 11.0 16.5 22.0	Depth (Ft.)
0	0.0	0.0	0.001	o	0.0
100	4.0	0.0	0.279	o I	0.3
200	4.0	0.0	0.830	o I	0.9
300	5.0	0.0	1.450	o I	1.6
400	5.0	0.0	2.139	o I	2.3
500	5.0	0.0	2.827	o I	3.0
600	6.0	0.0	3.586	o I	3.7
700	6.0	0.0	4.412	o I	4.5
800	7.0	0.0	5.308	o I	5.2
900	8.0	0.0	6.341	o I	6.1
1000	9.0	0.0	7.513	o I	7.0
1050	11.0	1.7	8.199	o I	7.5
1100	14.0	13.5	8.386	OI	7.7
1110	18.0	15.7	8.411	o I	7.7
1120	19.0	17.8	8.435	o I	7.7
1130	19.0	18.6	8.445	o	7.7
1131	19.0	18.7	8.445	o	7.7
1132	19.0	18.7	8.446	o	7.7
1133	19.0	18.7	8.446	o	7.7
1134	19.0	18.8	8.447	o	7.7
1135	19.0	18.8	8.447	o	7.7
1136	20.0	18.9	8.448	o I	7.7
1137	20.0	19.1	8.450	o I	7.7
1138	20.0	19.2	8.451	o I	7.7
1139	20.0	19.3	8.452	OI	7.7
1140	20.0	19.3	8.453	OI	7.7
1141	20.0	19.4	8.454	OI	7.7
1142	20.0	19.5	8.455	OI	7.7
1143	20.0	19.5	8.455	OI	7.7
1144	20.0	19.6	8.456	OI	7.7
1145	20.0	19.6	8.456	OI	7.7
1146	20.0	19.7	8.457	OI	7.7
1147	20.0	19.7	8.457	OI	7.7
1148	20.0	19.8	8.458	OI	7.7
1149	21.0	19.9	8.459	o I	7.7
1150	21.0	20.0	8.461	OI	7.7
1151	21.0	20.1	8.462	OI	7.7
1152	22.0	20.3	8.464	o I	7.7
1153	22.0	20.5	8.467	o I	7.7
1154	22.0	20.7	8.468	o I	7.7
1155	21.0	20.7	8.469	o	7.7
1156	21.0	20.8	8.469	o	7.7
1157	20.0	20.7	8.468	IO	7.7
1158	20.0	20.6	8.467	O	7.7
1159	20.0	20.5	8.467	O	7.7
1160	19.0	20.4	8.465	I O	7.7
1161	19.0	20.2	8.463	I O	7.7
1162	19.0	20.1	8.461	I O	7.7
1163	19.0	19.9	8.460	I O	7.7
1164	19.0	19.8	8.459	IO	7.7
1165	19.0	19.7	8.458	IO	7.7
1166	19.0	19.7	8.457	IO	7.7

10 YEAR

1167	19.0	19.6	8.456			IO	7.7
1168	19.0	19.5	8.455			IO	7.7
1169	19.0	19.5	8.454			IO	7.7
1170	19.0	19.4	8.454			IO	7.7
1171	19.0	19.4	8.453			IO	7.7
1172	19.0	19.3	8.453			IO	7.7
1173	19.0	19.3	8.452			IO	7.7
1174	19.0	19.2	8.452			O	7.7
1175	19.0	19.2	8.452			O	7.7
1176	18.0	19.1	8.450			IO	7.7
1177	17.0	18.8	8.447		I	O	7.7
1178	16.0	18.5	8.444		I	O	7.7
1179	16.0	18.2	8.440		I	O	7.7
1180	15.0	17.9	8.436		I	O	7.7
1181	14.0	17.4	8.431		I	O	7.7
1182	14.0	17.0	8.427		I	O	7.7
1183	14.0	16.7	8.423		I	O	7.7
1184	13.0	16.3	8.418		I	O	7.7
1185	13.0	15.9	8.414		I	O	7.7
1186	13.0	15.6	8.410		I	O	7.7
1187	12.0	15.2	8.405		I	O	7.7
1188	12.0	14.8	8.401		I	O	7.7
1189	12.0	14.5	8.398		I	O	7.7
1190	12.0	14.2	8.394		I	O	7.7
1191	12.0	13.9	8.392		I	O	7.7
1192	12.0	13.7	8.389		I	O	7.7
1193	11.0	13.4	8.385		I	O	7.7
1194	11.0	13.1	8.382		I	O	7.7
1195	11.0	12.9	8.380		I	O	7.7
1196	11.0	12.7	8.377		I	O	7.7
1197	11.0	12.5	8.375		I	O	7.7
1198	11.0	12.3	8.373			IO	7.7
1199	11.0	12.2	8.371			IO	7.7
1200	10.0	11.9	8.369		I	O	7.6
1201	10.0	11.7	8.366		I	O	7.6
1202	10.0	11.5	8.364		I	O	7.6
1203	10.0	11.3	8.362		I	O	7.6
1204	10.0	11.2	8.360		I	O	7.6
1205	10.0	11.0	8.359		I	O	7.6
1206	10.0	10.9	8.357			IO	7.6
1207	10.0	10.8	8.356			IO	7.6
1208	10.0	10.7	8.355			IO	7.6
1209	10.0	10.6	8.354			IO	7.6
1210	9.0	10.5	8.352		I	O	7.6
1211	9.0	10.3	8.350			IO	7.6
1212	9.0	10.1	8.348			IO	7.6
1213	9.0	10.0	8.347			IO	7.6
1214	9.0	9.9	8.345			IO	7.6
1215	9.0	9.8	8.344			IO	7.6
1216	9.0	9.7	8.343			IO	7.6
1217	9.0	9.6	8.342			O	7.6
1218	9.0	9.6	8.342			O	7.6
1219	9.0	9.5	8.341			O	7.6
1220	9.0	9.4	8.340			O	7.6
1221	9.0	9.4	8.340			O	7.6
1222	9.0	9.3	8.339			O	7.6
1223	9.0	9.3	8.339			O	7.6
1224	8.0	9.2	8.337		I	O	7.6
1225	8.0	9.0	8.336		I	O	7.6
1226	8.0	8.9	8.334			IO	7.6
1227	8.0	8.8	8.333			IO	7.6
1228	8.0	8.7	8.332			IO	7.6
1229	8.0	8.6	8.331			IO	7.6
1230	8.0	8.6	8.330			IO	7.6
1231	8.0	8.5	8.330			IO	7.6
1232	8.0	8.4	8.329			IO	7.6
1233	8.0	8.4	8.328			IO	7.6
1234	8.0	8.3	8.328			IO	7.6
1235	8.0	8.3	8.327			IO	7.6
1236	8.0	8.3	8.327			IO	7.6
1237	8.0	8.2	8.327			O	7.6
1238	8.0	8.2	8.326			O	7.6
1239	8.0	8.2	8.326			O	7.6
1240	8.0	8.2	8.326			O	7.6
1241	8.0	8.1	8.326			O	7.6
1242	8.0	8.1	8.325			O	7.6
1243	8.0	8.1	8.325			O	7.6
1244	7.0	8.0	8.324			IO	7.6
1245	7.0	7.9	8.322			IO	7.6
1246	7.0	7.8	8.321			IO	7.6
1247	7.0	7.7	8.320			IO	7.6
1248	7.0	7.6	8.319			IO	7.6
1249	7.0	7.5	8.319			O	7.6
1250	7.0	7.5	8.318			O	7.6
1251	7.0	7.4	8.317			O	7.6
1252	7.0	7.4	8.317			O	7.6
1253	7.0	7.3	8.316			O	7.6
1254	7.0	7.3	8.316			O	7.6
1255	7.0	7.3	8.315			O	7.6
1256	7.0	7.2	8.315			O	7.6
1257	7.0	7.2	8.315			O	7.6
1258	7.0	7.2	8.315			O	7.6
1259	7.0	7.2	8.314			O	7.6
1260	7.0	7.1	8.314			O	7.6

10 YEAR

1261	7.0	7.1	8.314		O			7.6
1262	7.0	7.1	8.314		O			7.6
1263	7.0	7.1	8.314		O			7.6
1264	7.0	7.1	8.314		O			7.6
1265	7.0	7.1	8.313		O			7.6
1266	7.0	7.1	8.313		O			7.6
1267	7.0	7.1	8.313		O			7.6
1268	7.0	7.1	8.313		O			7.6
1269	7.0	7.0	8.313		O			7.6
1270	7.0	7.0	8.313		O			7.6
1271	7.0	7.0	8.313		O			7.6
1272	7.0	7.0	8.313		O			7.6
1273	7.0	7.0	8.313		O			7.6
1274	7.0	7.0	8.313		O			7.6
1275	6.0	6.9	8.311		I O			7.6
1276	6.0	6.8	8.310		IO			7.6
1277	6.0	6.7	8.309		IO			7.6
1278	6.0	6.6	8.308		IO			7.6
1279	6.0	6.6	8.308		IO			7.6
1280	6.0	6.5	8.307		IO			7.6
1281	6.0	6.4	8.306		IO			7.6
1282	6.0	6.4	8.306		IO			7.6
1283	6.0	6.3	8.305		IO			7.6
1284	6.0	6.3	8.305		IO			7.6
1285	6.0	6.3	8.304		IO			7.6
1286	6.0	6.2	8.304		IO			7.6
1287	6.0	6.2	8.304		IO			7.6
1288	6.0	6.2	8.303		IO			7.6
1289	6.0	6.2	8.303		O			7.6
1290	6.0	6.1	8.303		O			7.6
1291	6.0	6.1	8.303		O			7.6
1292	6.0	6.1	8.302		O			7.6
1293	6.0	6.1	8.302		O			7.6
1294	6.0	6.1	8.302		O			7.6
1295	6.0	6.1	8.302		O			7.6
1296	6.0	6.1	8.302		O			7.6
1297	6.0	6.1	8.302		O			7.6
1298	6.0	6.1	8.302		O			7.6
1299	6.0	6.0	8.302		O			7.6
1300	6.0	6.0	8.302		O			7.6
1310	6.0	6.0	8.301		O			7.6
1320	6.0	6.0	8.301		O			7.6
1330	5.0	5.7	8.295		IO			7.6
1340	5.0	5.4	8.288		O			7.6
1350	5.0	5.2	8.284		O			7.6
1360	5.0	5.1	8.282		O			7.6
1370	5.0	5.1	8.280		O			7.6
1380	5.0	5.0	8.280		O			7.6
1390	5.0	5.0	8.279		O			7.6
1400	5.0	5.0	8.279		O			7.6
1420	4.0	4.6	8.269	IO				7.6
1440	4.0	4.2	8.259	IO				7.6
1460	4.0	4.1	8.256	O				7.6
1500	4.0	3.8	8.250	O				7.6

Remaining water in basin = 8.25 (Ac.Ft)
Peak flow out of basin = 20.77(CFS)
Peak flow time = 1156 Min., time interval # = 42
Maximum depth in basin = 7.72(Ft.)

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE: C:\civild\scr_soilx_34.dat
TM 60257 Area 200, Prop. DESIGN 10-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 200A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 201A	.0	40.00	.0	40.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 202A	.0	23.00	.0	63.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 203A	1.6	2.87	1.6	65.04	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 204A	.0	.00	1.6	65.04	0	0.	.00000	.00	.00	0.	97	99	A29	.00

Program Package Serial Number: 2083
11/14/18 FILE: 200 INPUT DATA: English Units RAINFALL SOIL FILE: English (In) OUTPUT DATA: English Units PAGE 4
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG F0601M

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE:
TM 60257 Area 200, Prop. DESIGN 10-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 204A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.03	200	.03	300	.03	400	.03
500	.03	600	.04	700	.04	800	.04	900	.05
1000	.06	1050	1.07	1100	1.10	1110	4.20	1120	7.25
1130	11.34	1131	11.36	1132	12.37	1133	12.39	1134	12.42
1135	14.44	1136	14.45	1137	15.48	1138	15.50	1139	16.52
1140	17.54	1141	17.59	1142	19.62	1143	20.65	1144	20.68
1145	22.77	1146	25.83	1147	26.89	1148	28.95	1149	35.37
1150	42.75	1151	49.11	1152	57.48	1153	63.87	1154	63.48
1155	65.04	1156	64.57	1157	63.09	1158	60.62	1159	60.50
1160	58.42	1161	56.36	1162	53.31	1163	50.28	1164	47.24
1165	42.23	1166	34.21	1167	28.19	1168	21.17	1169	15.16
1170	10.14	1171	8.13	1172	8.12	1173	6.11	1174	5.10
1175	4.09	1176	3.09	1177	3.09	1178	3.08	1179	1.08
1180	1.08	1181	1.08	1182	1.08	1183	1.08	1184	1.08
1185	1.08	1186	1.07	1187	1.07	1188	1.07	1189	1.07
1190	1.07	1191	1.07	1192	1.07	1193	1.07	1194	1.07
1195	1.06	1196	1.07	1197	1.07	1198	1.06	1199	1.06
1200	.06	1201	.06	1202	.06	1203	.06	1204	.06
1205	.06	1206	.06	1207	.06	1208	.06	1209	.06
1210	.06	1211	.06	1212	.06	1213	.06	1214	.05
1215	.05	1216	.05	1217	.05	1218	.05	1219	.05
1220	.05	1221	.05	1222	.05	1223	.05	1224	.05
1225	.05	1226	.05	1227	.05	1228	.05	1229	.05
1230	.05	1231	.05	1232	.05	1233	.05	1234	.05
1235	.05	1236	.05	1237	.05	1238	.05	1239	.05
1240	.05	1241	.05	1242	.04	1243	.05	1244	.05
1245	.04	1246	.04	1247	.04	1248	.04	1249	.04
1250	.04	1251	.04	1252	.04	1253	.04	1254	.04
1255	.04	1256	.04	1257	.04	1258	.04	1259	.04
1260	.04	1261	.04	1262	.04	1263	.04	1264	.04
1265	.04	1266	.04	1267	.04	1268	.04	1269	.04
1270	.04	1271	.04	1272	.04	1273	.04	1274	.04
1275	.04	1276	.04	1277	.04	1278	.04	1279	.04
1280	.04	1281	.04	1282	.04	1283	.04	1284	.04
1285	.04	1286	.04	1287	.04	1288	.04	1289	.04
1290	.04	1291	.04	1292	.04	1293	.04	1294	.04
1295	.04	1296	.04	1297	.04	1298	.04	1299	.04
1300	.04	1310	.04	1320	.03	1330	.03	1340	.03
1350	.03	1360	.03	1370	.03	1380	.03	1390	.03
1400	.03	1420	.03	1440	.03	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = 2.40(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60257 Area 300, Prop. DESIGN 10-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	301A	2.6	4.55	2.6	4.55	2	700.	.02600	.00	.00	0.	97	5	A29	.01
1	302A	4.6	5.83	7.2	8.83	0	0.	.00000	.00	.00	0.	97	11	A29	.41
1	303AF	.0	7.83	7.2	1.00	4	50.	.02000	2.00	.00	1.	97	0	A29	.00
1	304F	.0	.00	.0	7.83	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	305A	.0	.00	7.2	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	306A	.3	.60	7.5	1.54	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1	307A	.0	.00	7.5	1.54	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE:
TM 60257 Area 300, Prop. DESIGN 10-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 307A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.60	100	1.01	200	1.01	300	1.01	400	1.01
500	1.01	600	1.01	700	1.01	800	1.01	900	1.01
1000	1.01	1050	1.01	1100	1.02	1110	1.04	1120	1.05
1130	1.06	1131	1.07	1132	1.07	1133	1.07	1134	1.08
1135	1.08	1136	1.08	1137	1.09	1138	1.09	1139	1.10
1140	1.10	1141	1.11	1142	1.12	1143	1.12	1144	1.13
1145	1.14	1146	1.16	1147	1.17	1148	1.18	1149	1.26
1150	1.33	1151	1.39	1152	1.47	1153	1.54	1154	1.47
1155	1.38	1156	1.30	1157	1.21	1158	1.12	1159	1.09
1160	1.08	1161	1.07	1162	1.06	1163	1.05	1164	1.05
1165	1.04	1166	1.04	1167	1.03	1168	1.03	1169	1.03
1170	1.03	1171	1.02	1172	1.02	1173	1.02	1174	1.02
1175	1.02	1176	1.02	1177	1.02	1178	1.02	1179	1.02
1180	1.02	1181	1.02	1182	1.01	1183	1.01	1184	1.01
1185	1.01	1186	1.01	1187	1.01	1188	1.01	1189	1.01
1190	1.01	1191	1.01	1192	1.01	1193	1.01	1194	1.01
1195	1.01	1196	1.01	1197	1.01	1198	1.01	1199	1.01
1200	1.01	1201	1.01	1202	1.01	1203	1.01	1204	1.01
1205	1.01	1206	1.01	1207	1.01	1208	1.01	1209	1.01
1210	1.01	1211	1.01	1212	1.01	1213	1.01	1214	1.01
1215	1.01	1216	1.01	1217	1.01	1218	1.01	1219	1.01
1220	1.01	1221	1.01	1222	1.01	1223	1.01	1224	1.01
1225	1.01	1226	1.01	1227	1.01	1228	1.01	1229	1.01
1230	1.01	1231	1.01	1232	1.01	1233	1.01	1234	1.01
1235	1.01	1236	1.01	1237	1.01	1238	1.01	1239	1.01
1240	1.01	1241	1.01	1242	1.01	1243	1.01	1244	1.01
1245	1.01	1246	1.01	1247	1.01	1248	1.01	1249	1.01
1250	1.01	1251	1.01	1252	1.01	1253	1.01	1254	1.01
1255	1.01	1256	1.01	1257	1.01	1258	1.01	1259	1.01
1260	1.01	1261	1.01	1262	1.01	1263	1.01	1264	1.01
1265	1.01	1266	1.01	1267	1.01	1268	1.01	1269	1.01
1270	1.01	1271	1.01	1272	1.01	1273	1.01	1274	1.01
1275	1.01	1276	1.01	1277	1.01	1278	1.01	1279	1.01
1280	1.01	1281	1.01	1282	1.01	1283	1.01	1284	1.01
1285	1.01	1286	1.01	1287	1.01	1288	1.01	1289	1.01
1290	1.01	1291	1.01	1292	1.01	1293	1.01	1294	1.01
1295	1.01	1296	1.01	1297	1.01	1298	1.01	1299	1.01
1300	1.01	1310	1.01	1320	1.01	1330	1.01	1340	1.01
1350	1.01	1360	1.01	1370	1.01	1380	1.01	1390	1.01
1400	1.01	1420	1.01	1440	1.00	1460	1.00	1500	1.00

TOTAL VOLUME THIS HYDROGRAPH = 2.06(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE:
C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 400, Proposed DESIGN 10-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 400A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 401A	.0	118.00	.0	118.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 402B	1.1	1.92	1.1	1.92	4	195.	.02000	2.00	.00	0.	97	5	A29	.01
1 403B	2.1	4.14	3.2	5.94	0	0.	.00000	.00	.00	0.	97	6	A29	.90
1 404B	.0	.00	3.2	5.94	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 405AB	3.2	5.94	3.2	121.62	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 406A	2.0	2.98	5.2	124.06	0	0.	.00000	.00	.00	0.	97	8	A29	.40
1 407A	.0	21.00	5.2	145.06	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 408C	23.4	22.02	23.4	22.02	0	0.	.00000	.00	.00	0.	97	15	A29	.10
1 409D	8.7	11.39	8.7	11.39	2	1114.	.03590	.00	.00	0.	97	8	A29	.01
1 410D	15.1	14.54	23.8	23.54	0	0.	.00000	.00	.00	0.	97	15	A29	.15
1 411D	.0	.00	23.8	23.54	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 412CD	23.8	23.54	47.2	44.72	2	1355.	.04100	.00	.00	0.	97	0	A29	.00
1 413C	27.8	27.95	75.0	68.17	2	400.	.01000	.00	.00	0.	97	15	A29	.25
1 414C	4.2	5.01	79.2	71.88	0	0.	.00000	.00	.00	0.	97	14	A29	.60
1 415AC	79.2	71.88	84.4	207.84	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 416A	.0	.00	84.4	207.84	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 417A	1.4	2.15	85.8	209.33	0	0.	.00000	.00	.00	0.	97	8	A29	.50
1 418A	.0	.00	85.8	209.33	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 10 SOIL DATA FILE:
TM 60275 Area 400, Proposed DESIGN 10-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 418A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.40	100	4.01	200	4.10	300	4.21	400	4.33
500	4.48	600	4.66	700	4.90	800	5.22	900	5.68
1000	6.44	1050	9.42	1100	22.23	1110	27.92	1120	37.66
1130	46.44	1131	47.87	1132	49.29	1133	49.77	1134	51.29
1135	52.82	1136	54.37	1137	56.00	1138	57.63	1139	59.26
1140	60.94	1141	63.74	1142	65.58	1143	69.47	1144	72.44
1145	75.60	1146	78.91	1147	83.32	1148	87.85	1149	95.75
1150	105.13	1151	119.38	1152	137.53	1153	158.25	1154	176.20
1155	191.43	1156	202.10	1157	207.94	1158	209.33	1159	205.00
1160	197.30	1161	185.85	1162	172.07	1163	157.33	1164	140.93
1165	126.41	1166	113.48	1167	100.77	1168	90.80	1169	81.30
1170	72.88	1171	66.00	1172	60.59	1173	55.61	1174	50.03
1175	46.99	1176	43.38	1177	40.17	1178	38.30	1179	35.71
1180	34.34	1181	32.19	1182	31.13	1183	30.20	1184	28.44
1185	27.78	1186	27.20	1187	25.66	1188	25.18	1189	23.80
1190	23.46	1191	23.14	1192	22.86	1193	21.64	1194	21.44
1195	21.24	1196	21.11	1197	19.96	1198	19.82	1199	19.70
1200	19.59	1201	19.49	1202	19.40	1203	18.29	1204	18.20
1205	18.14	1206	18.08	1207	17.98	1208	17.93	1209	17.90
1210	16.81	1211	16.78	1212	16.71	1213	16.68	1214	16.61
1215	16.55	1216	16.53	1217	16.47	1218	16.42	1219	15.39
1220	15.35	1221	15.32	1222	15.27	1223	15.23	1224	15.20
1225	15.15	1226	15.15	1227	15.10	1228	15.08	1229	15.06
1230	15.00	1231	13.98	1232	13.95	1233	13.91	1234	13.88
1235	13.86	1236	13.85	1237	13.83	1238	13.79	1239	13.77
1240	13.75	1241	13.73	1242	13.69	1243	13.67	1244	13.67
1245	13.62	1246	13.61	1247	13.57	1248	13.57	1249	13.56
1250	12.52	1251	12.52	1252	12.48	1253	12.49	1254	12.44
1255	12.44	1256	12.42	1257	12.40	1258	12.38	1259	12.35
1260	12.36	1261	12.32	1262	12.30	1263	12.29	1264	12.27
1265	12.25	1266	12.25	1267	12.23	1268	12.21	1269	12.20
1270	12.19	1271	12.17	1272	12.14	1273	12.16	1274	12.13
1275	12.11	1276	12.10	1277	12.08	1278	12.07	1279	12.07
1280	11.06	1281	11.04	1282	11.03	1283	11.02	1284	11.01
1285	10.99	1286	10.98	1287	10.95	1288	10.94	1289	10.93
1290	10.92	1291	10.91	1292	10.90	1293	10.88	1294	10.88
1295	10.87	1296	10.86	1297	10.85	1298	10.84	1299	10.83
1300	10.82	1310	10.75	1320	10.67	1330	10.59	1340	9.49
1350	9.44	1360	9.38	1370	9.34	1380	9.28	1390	9.21
1400	9.20	1420	9.11	1440	8.02	1460	7.48	1500	7.48

TOTAL VOLUME THIS HYDROGRAPH = 21.07(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Proposed Condition

5-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	101A	40.6	1736	0.13	3.4	0.01	97	5-yr		20	1.05	0.53	0.53	22.80
TM 60257	102A	4.8	783	0.014	3.4	0.42	97	5-yr		15	1.21	0.56	0.70	4.06
TM 60257	105B	28.4	1840	0.13	3.4	0.01	97	5-yr		21	1.03	0.52	0.53	15.46
TM 60257	110B	3.3	704	0.166	3.4	0.42	97	5-yr		9	1.53	0.61	0.74	3.72
TM 60257	111B	5.1	606	0.036	3.4	0.42	97	5-yr		11	1.39	0.59	0.72	5.13
TM 60257	113A	7.9	995	0.058	3.4	0.42	97	5-yr		14	1.25	0.57	0.71	6.95
TM 60257	115C	14.4	910	0.24	3.4	0.01	97	5-yr		11	1.40	0.59	0.60	11.98
TM 60257	116C	10.1	875	0.027	3.4	0.42	97	5-yr		14	1.25	0.57	0.71	8.88
TM 60257	117C	10	572	0.026	3.4	0.42	97	5-yr		11	1.40	0.59	0.72	10.07
TM 60257	119C	5.3	787	0.024	3.4	0.42	97	5-yr		14	1.25	0.57	0.71	4.66
TM 60257	121C	4.7	1009	0.056	3.4	0.5	97	5-yr		13	1.29	0.57	0.74	4.47
TM 60257	123C	5.8	456	0.015	3.4	0.42	97	5-yr		10	1.46	0.61	0.73	6.17
TM 60257	126A	0.7	487	0.037	3.4	0.91	97	5-yr		8	1.62	0.63	0.88	0.99
TM 60257	127A	2.3	1099	0.035	3.4	0.5	97	5-yr		15	1.21	0.56	0.73	2.02
TM 60257	130D	3.7	480	0.27	3.4	0.01	97	5-yr		7	1.73	0.64	0.64	4.09
TM 60257	131D	2.2	344	0.35	3.4	0.01	97	5-yr		5	2.02	0.67	0.67	2.99
TM 60257	133D	7.4	989	0.058	3.4	0.42	97	5-yr		13	1.29	0.57	0.71	6.78
TM 60257	135D	2.8	498	0.4	3.4	0.01	97	5-yr		7	1.73	0.64	0.64	3.09
TM 60257	138D	7.6	920	0.039	3.4	0.42	97	5-yr		14	1.25	0.57	0.71	6.68
TM 60257	146D	2.5	910	0.067	3.4	0.42	97	5-yr		12	1.34	0.58	0.72	2.40
TM 60257	150A	4	864	0.021	3.4	0.6	97	5-yr		14	1.25	0.57	0.77	3.81
TM 60257	154A	1.8	100	0.1	3.4	0.1	97	5-yr		5	2.02	0.67	0.69	2.52
TM 60257	203A	1.6	125	0.09	3.4	0.1	97	5-yr		5	2.02	0.67	0.69	2.24
TM 60257	301A	2.6	490	0.41	3.4	0.01	97	5-yr		6	1.85	0.65	0.65	3.16
TM 60257	302A	4.6	835	0.063	3.4	0.01	97	5-yr		14	1.25	0.57	0.57	3.26
TM 60257	306A	0.3	50	0.2	3.4	0.1	97	5-yr		5	2.02	0.67	0.69	0.42
TM 60257	402B	1.1	240	0.4	3.4	0.01	97	5-yr		5	2.02	0.67	0.67	1.49
TM 60257	403B	2.1	450	0.047	3.4	0.9	97	5-yr		7	1.73	0.64	0.87	3.17
TM 60257	406A	2	476	0.032	3.4	0.4	97	5-yr		9	1.53	0.62	0.73	2.24
TM 60257	408C	23.4	1708	0.1546	3.4	0.1	97	5-yr		19	1.08	0.53	0.57	14.41
TM 60257	409D	8.7	707	0.1938	3.4	0.01	97	5-yr		10	1.46	0.61	0.61	7.72
TM 60257	410D	15.1	1544	0.0894	3.4	0.15	97	5-yr		19	1.08	0.53	0.59	9.60
TM 60257	413C	27.8	1604	0.084	3.4	0.25	97	5-yr		19	1.08	0.53	0.63	18.77
TM 60257	414C	4.2	1248	0.03	3.4	0.6	97	5-yr		17	1.14	0.55	0.76	3.62
TM 60257	417A	1.4	576	0.04	3.4	0.5	97	5-yr		10	1.46	0.61	0.75	1.54

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Proposed DESIGN 5-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 101A	40.6	22.95	40.6	22.95	0	0.	.00000	.00	.00	0.	97	20	A29	.01
1 102A	4.8	4.09	45.4	27.01	0	0.	.00000	.00	.00	0.	97	15	A29	.42
1 103AF	.0	26.01	45.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 104F	.0	.00	.0	26.01	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 105B	28.4	15.48	28.4	15.48	0	0.	.00000	.00	.00	0.	97	21	A29	.01
1 106BF	.0	14.48	28.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 107F	.0	.00	.0	14.48	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 108B	.0	.00	28.4	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 109AB	28.4	1.00	73.8	2.00	4	410.	.09000	2.00	.00	0.	97	0	A29	.00
1 110B	3.3	3.69	3.3	3.69	4	370.	.02000	2.00	.00	0.	97	9	A29	.42
1 111B	5.1	5.13	8.4	8.79	0	0.	.00000	.00	.00	0.	97	11	A29	.42
1 112AB	8.4	8.79	82.2	10.79	4	495.	.03000	2.00	.00	0.	97	0	A29	.00
1 113A	7.9	6.97	90.1	17.62	0	0.	.00000	.00	.00	0.	97	14	A29	.42
1 114A	.0	.00	90.1	17.62	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 115C	14.4	12.02	14.4	12.02	4	350.	.02000	2.00	.00	0.	97	11	A29	.01
1 116C	10.1	8.91	24.5	20.91	0	0.	.00000	.00	.00	0.	97	14	A29	.42
1 117C	10.0	10.07	34.5	30.97	0	0.	.00000	.00	.00	0.	97	11	A29	.42
1 118C	.0	.00	34.5	30.97	4	276.	.06000	2.00	.00	0.	97	99	A29	.00
1 119C	5.3	4.68	39.8	35.50	0	0.	.00000	.00	.00	0.	97	14	A29	.42
1 120C	.0	.00	39.8	35.50	4	650.	.06000	2.00	.00	0.	97	99	A29	.00
1 121C	4.7	4.47	44.5	39.79	0	0.	.00000	.00	.00	0.	97	13	A29	.50
1 122C	.0	.00	44.5	39.79	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 123C	5.8	6.17	50.3	45.73	0	0.	.00000	.00	.00	0.	97	10	A29	.42
1 124AC	50.3	45.73	140.4	63.35	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 125A	.0	.00	140.4	63.35	4	400.	.03500	2.50	.00	0.	97	99	A29	.00
1 126A	.7	.98	141.1	63.93	4	600.	.03000	2.50	.00	0.	97	8	A29	.91
1 127A	2.3	2.03	143.4	65.65	0	0.	.00000	.00	.00	0.	97	15	A29	.50
1 128A	.0	.00	143.4	65.65	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 129A	.0	.00	143.4	65.65	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 130D	3.7	4.04	3.7	4.04	0	0.	.00000	.00	.00	0.	97	7	A29	.01
1 131D	2.2	3.00	5.9	7.05	0	0.	.00000	.00	.00	0.	97	5	A29	.01
1 132D	.0	.00	5.9	7.05	4	970.	.08000	2.00	.00	0.	97	99	A29	.00
1 133D	7.4	6.79	13.3	13.39	0	0.	.00000	.00	.00	0.	97	13	A29	.42
1 134D	.0	.00	13.3	13.39	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 135D	2.8	3.06	16.1	16.38	4	235.	.02000	2.00	.00	0.	97	7	A29	.01
1 136D	.0	.00	16.1	16.18	4	500.	.09600	2.00	.00	0.	97	99	A29	.00
1 137D	.0	.00	16.1	16.07	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 138D	7.6	6.71	23.7	22.73	4	160.	.09600	2.00	.00	0.	97	14	A29	.42
1 139D	.0	.00	23.7	22.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 140D	.0	.00	23.7	22.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 141D	.0	.00	23.7	22.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 142D	.0	.00	23.7	22.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 143D	.0	.00	23.7	22.69	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 144D	.0	5.00	23.7	27.69	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 145D	.0	.00	23.7	27.69	4	200.	.02700	2.00	.00	0.	97	99	A29	.00
1 146D	2.5	2.40	26.2	29.87	0	0.	.00000	.00	.00	0.	97	12	A29	.42
1 147D	.0	.00	26.2	29.87	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 148AD	26.2	29.87	169.6	95.02	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 149A	.0	.00	169.6	95.02	4	195.	.03000	2.75	.00	0.	97	99	A29	.00
1 150A	4.0	3.82	173.6	98.43	0	0.	.00000	.00	.00	0.	97	14	A29	.60
1 151A	.0	.00	173.6	98.43	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 152AF	.0	80.43	173.6	18.00	4	175.	.02000	2.00	.00	18.	97	0	A29	.00
1 153F	.0	.00	.0	80.43	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 154A	1.8	2.53	175.4	20.53	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 155A	.0	.00	175.4	20.53	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 156A	.0	.00	175.4	20.53	0	0.	.00000	.00	.00	0.	97	99	A29	.00

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Study Date : 11/13/18 Input hydrograph file name : 154A.hyd
Output hydrograph file name: STERLING.hin

User entry of depth-outflow-storage data

Hydrograph time unit varies
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data @ 1 Min. Intervals:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.001	0.001	0.001	0.001
2.000	1.790	0.001	1.790	1.790
4.000	3.850	0.001	3.850	3.850
6.000	6.200	0.001	6.200	6.200
7.000	7.500	0.001	7.500	7.500
7.500	8.160	0.001	8.160	8.160
7.600	8.300	5.900	8.296	8.304
7.800	8.580	30.500	8.559	8.601
8.000	8.850	65.700	8.805	8.895

Hydrograph Detention Basin Routing
Hydrograph at 1 154 A Storm Day: 4 Drainage Area = 176.20
Total flood hydrograph volume this storm day = 11.53 Ac. Ft.

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Min)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	Depth (Ft.)
0	0.0	0.0	0.001	0.0
100	3.0	0.0	0.210	0.2
200	4.0	0.0	0.692	0.8
300	4.0	0.0	1.243	1.4
400	4.0	0.0	1.794	2.0
500	4.0	0.0	2.345	2.5
600	5.0	0.0	2.965	3.1
700	5.0	0.0	3.654	3.8
800	6.0	0.0	4.412	4.5
900	6.0	0.0	5.238	5.2
1000	8.0	0.0	6.203	6.0
1050	9.0	0.0	6.789	6.5
1100	12.0	0.0	7.515	7.0
1110	13.0	0.0	7.687	7.1
1120	16.0	0.0	7.889	7.3
1130	18.0	0.0	8.125	7.5
1131	18.0	0.0	8.150	7.5
1132	18.0	0.6	8.174	7.5
1133	18.0	1.6	8.197	7.5
1134	18.0	2.5	8.219	7.5
1135	18.0	3.4	8.240	7.6
1136	18.0	4.2	8.260	7.6
1137	18.0	5.0	8.278	7.6
1138	18.0	5.7	8.295	7.6
1139	18.0	6.9	8.312	7.6
1140	18.0	8.2	8.326	7.6
1141	18.0	9.3	8.339	7.6
1142	19.0	10.4	8.351	7.6
1143	19.0	11.4	8.362	7.6
1144	19.0	12.3	8.372	7.7
1145	19.0	13.0	8.381	7.7
1146	19.0	13.7	8.389	7.7
1147	19.0	14.3	8.396	7.7
1148	19.0	14.8	8.402	7.7
1149	19.0	15.3	8.407	7.7
1150	20.0	15.9	8.413	7.7
1151	20.0	16.3	8.419	7.7
1152	20.0	16.7	8.423	7.7
1153	21.0	17.2	8.429	7.7
1154	20.0	17.5	8.433	7.7
1155	20.0	17.8	8.436	7.7
1156	19.0	18.0	8.437	7.7
1157	19.0	18.1	8.439	7.7
1158	19.0	18.2	8.440	7.7
1159	18.0	18.2	8.440	7.7
1160	18.0	18.1	8.439	7.7
1161	18.0	18.1	8.439	7.7
1162	18.0	18.1	8.439	7.7
1163	18.0	18.1	8.439	7.7
1164	18.0	18.1	8.439	7.7
1165	18.0	18.1	8.439	7.7
1166	18.0	18.1	8.439	7.7

1167	18.0	18.1	8.438				O	7.7
1168	18.0	18.1	8.438				O	7.7
1169	18.0	18.0	8.438				O	7.7
1170	18.0	18.0	8.438				O	7.7
1171	18.0	18.0	8.438				O	7.7
1172	18.0	18.0	8.438				O	7.7
1173	17.0	17.9	8.437				I O	7.7
1174	16.0	17.7	8.434				I O	7.7
1175	15.0	17.4	8.431				I O	7.7
1176	14.0	17.0	8.426				I O	7.7
1177	14.0	16.7	8.422				I O	7.7
1178	13.0	16.2	8.418				I O	7.7
1179	13.0	15.9	8.414				I O	7.7
1180	12.0	15.4	8.408				I O	7.7
1181	12.0	15.0	8.404				I O	7.7
1182	12.0	14.7	8.400				I O	7.7
1183	12.0	14.4	8.397				I O	7.7
1184	11.0	14.0	8.392				I O	7.7
1185	11.0	13.7	8.388				I O	7.7
1186	11.0	13.4	8.385				I O	7.7
1187	11.0	13.1	8.382				I O	7.7
1188	10.0	12.7	8.378				I O	7.7
1189	10.0	12.4	8.374				I O	7.7
1190	10.0	12.1	8.371				I O	7.7
1191	10.0	11.9	8.368				I O	7.6
1192	10.0	11.7	8.366				I O	7.6
1193	10.0	11.5	8.364				I O	7.6
1194	10.0	11.3	8.362				I O	7.6
1195	9.0	11.1	8.359				I O	7.6
1196	9.0	10.8	8.356				I O	7.6
1197	9.0	10.6	8.354				I O	7.6
1198	9.0	10.4	8.352				I O	7.6
1199	9.0	10.3	8.350				I O	7.6
1200	9.0	10.1	8.348				I O	7.6
1201	9.0	10.0	8.347				I O	7.6
1202	9.0	9.9	8.345				I O	7.6
1203	9.0	9.8	8.344				IO	7.6
1204	8.0	9.6	8.342				I O	7.6
1205	8.0	9.4	8.340				I O	7.6
1206	8.0	9.2	8.338				I O	7.6
1207	8.0	9.1	8.336				IO	7.6
1208	8.0	9.0	8.335				IO	7.6
1209	8.0	8.9	8.334				IO	7.6
1210	8.0	8.8	8.333				IO	7.6
1211	8.0	8.7	8.332				IO	7.6
1212	8.0	8.6	8.331				IO	7.6
1213	8.0	8.5	8.330				O	7.6
1214	8.0	8.5	8.329				O	7.6
1215	8.0	8.4	8.329				O	7.6
1216	8.0	8.4	8.328				O	7.6
1217	8.0	8.3	8.328				O	7.6
1218	7.0	8.2	8.326			I O		7.6
1219	7.0	8.0	8.324			I O		7.6
1220	7.0	7.9	8.323			I O		7.6
1221	7.0	7.8	8.322			IO		7.6
1222	7.0	7.7	8.321			IO		7.6
1223	7.0	7.6	8.320			IO		7.6
1224	7.0	7.6	8.319			IO		7.6
1225	7.0	7.5	8.318			IO		7.6
1226	7.0	7.4	8.318			IO		7.6
1227	7.0	7.4	8.317			IO		7.6
1228	7.0	7.3	8.317			IO		7.6
1229	7.0	7.3	8.316			IO		7.6
1230	7.0	7.3	8.316			IO		7.6
1231	7.0	7.2	8.315			IO		7.6
1232	7.0	7.2	8.315			O		7.6
1233	7.0	7.2	8.315			O		7.6
1234	7.0	7.2	8.314			O		7.6
1235	7.0	7.1	8.314			O		7.6
1236	7.0	7.1	8.314			O		7.6
1237	7.0	7.1	8.314			O		7.6
1238	6.0	7.0	8.312			IO		7.6
1239	6.0	6.9	8.311			IO		7.6
1240	6.0	6.8	8.310			IO		7.6
1241	6.0	6.7	8.309			IO		7.6
1242	6.0	6.6	8.308			IO		7.6
1243	6.0	6.5	8.307			O		7.6
1244	6.0	6.5	8.307			O		7.6
1245	6.0	6.4	8.306			O		7.6
1246	6.0	6.4	8.305			O		7.6
1247	6.0	6.3	8.305			O		7.6
1248	6.0	6.3	8.304			O		7.6
1249	6.0	6.3	8.304			O		7.6
1250	6.0	6.2	8.304			O		7.6
1251	6.0	6.2	8.303			O		7.6
1252	6.0	6.2	8.303			O		7.6
1253	6.0	6.2	8.303			O		7.6
1254	6.0	6.1	8.303			O		7.6
1255	6.0	6.1	8.303			O		7.6
1256	6.0	6.1	8.302			O		7.6
1257	6.0	6.1	8.302			O		7.6
1258	6.0	6.1	8.302			O		7.6
1259	6.0	6.1	8.302			O		7.6
1260	6.0	6.1	8.302			O		7.6

1261	6.0	6.1	8.302	|O	|	|	|	7.6
1262	6.0	6.1	8.302	|O	|	|	|	7.6
1263	6.0	6.0	8.302	|O	|	|	|	7.6
1264	6.0	6.0	8.302	|O	|	|	|	7.6
1265	6.0	6.0	8.302	|O	|	|	|	7.6
1266	5.0	5.9	8.300	I|O	|	|	|	7.6
1267	5.0	5.9	8.299	IO	|	|	|	7.6
1268	5.0	5.8	8.298	IO	|	|	|	7.6
1269	5.0	5.8	8.297	IO	|	|	|	7.6
1270	5.0	5.7	8.296	IO	|	|	|	7.6
1271	5.0	5.7	8.295	IO	|	|	|	7.6
1272	5.0	5.6	8.294	IO	|	|	|	7.6
1273	5.0	5.6	8.293	IO	|	|	|	7.6
1274	5.0	5.6	8.292	IO	|	|	|	7.6
1275	5.0	5.5	8.291	IO	|	|	|	7.6
1276	5.0	5.5	8.291	IO	|	|	|	7.6
1277	5.0	5.5	8.290	IO	|	|	|	7.6
1278	5.0	5.5	8.289	IO	|	|	|	7.6
1279	5.0	5.4	8.289	IO	|	|	|	7.6
1280	5.0	5.4	8.288	IO	|	|	|	7.6
1281	5.0	5.4	8.288	IO	|	|	|	7.6
1282	5.0	5.4	8.287	IO	|	|	|	7.6
1283	5.0	5.3	8.287	IO	|	|	|	7.6
1284	5.0	5.3	8.286	IO	|	|	|	7.6
1285	5.0	5.3	8.286	IO	|	|	|	7.6
1286	5.0	5.3	8.285	IO	|	|	|	7.6
1287	5.0	5.3	8.285	IO	|	|	|	7.6
1288	5.0	5.3	8.285	IO	|	|	|	7.6
1289	5.0	5.2	8.284	O|	|	|	|	7.6
1290	5.0	5.2	8.284	O|	|	|	|	7.6
1291	5.0	5.2	8.284	O|	|	|	|	7.6
1292	5.0	5.2	8.283	O|	|	|	|	7.6
1293	5.0	5.2	8.283	O|	|	|	|	7.6
1294	5.0	5.2	8.283	O|	|	|	|	7.6
1295	5.0	5.2	8.283	O|	|	|	|	7.6
1296	5.0	5.2	8.282	O|	|	|	|	7.6
1297	5.0	5.2	8.282	O|	|	|	|	7.6
1298	5.0	5.1	8.282	O|	|	|	|	7.6
1299	5.0	5.1	8.282	O|	|	|	|	7.6
1300	5.0	5.1	8.282	O|	|	|	|	7.6
1310	5.0	5.1	8.280	O|	|	|	|	7.6
1320	5.0	5.0	8.280	O|	|	|	|	7.6
1330	4.0	4.8	8.273	IO|	|	|	|	7.6
1340	4.0	4.4	8.265	O |	|	|	|	7.6
1350	4.0	4.2	8.261	O |	|	|	|	7.6
1360	4.0	4.1	8.258	O |	|	|	|	7.6
1370	4.0	4.1	8.257	O |	|	|	|	7.6
1380	4.0	4.0	8.256	O |	|	|	|	7.6
1390	4.0	4.0	8.255	O |	|	|	|	7.6
1400	4.0	4.0	8.255	O |	|	|	|	7.6
1420	4.0	4.0	8.255	O |	|	|	|	7.6
1440	3.0	3.6	8.245	IO |	|	|	|	7.6
1460	3.0	3.2	8.235	O |	|	|	|	7.6
1500	3.0	2.8	8.228	O |	|	|	|	7.5

Remaining water in basin = 8.23 (Ac.Ft)
Peak flow out of basin = 18.19(CFS)
Peak flow time = 1158 Min., time interval # = 44
Maximum depth in basin = 7.70(Ft.)

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE: C:\civild\scr_soilx_34.dat
TM 60257 Area 200, Prop. DESIGN 5-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 200A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 201A	.0	26.00	.0	26.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 202A	.0	14.00	.0	40.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 203A	1.6	2.25	1.6	41.94	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 204A	.0	.00	1.6	41.94	0	0.	.00000	.00	.00	0.	97	99	A29	.00

Program Package Serial Number: 2083
11/13/18 FILE: 200 INPUT DATA: English Units RAINFALL SOIL FILE: English (In) OUTPUT DATA: English Units PAGE 4
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG F0601M

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE:
TM 60257 Area 200, Prop. DESIGN 5-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 204A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.02	200	.02	300	.02	400	.03
500	.03	600	.03	700	.03	800	.04	900	.04
1000	.05	1050	.06	1100	1.08	1110	1.11	1120	3.15
1130	6.23	1131	6.24	1132	6.25	1133	7.27	1134	7.29
1135	7.31	1136	7.32	1137	9.34	1138	9.36	1139	9.37
1140	10.39	1141	11.43	1142	12.46	1143	12.48	1144	12.50
1145	14.57	1146	15.62	1147	17.67	1148	17.71	1149	23.05
1150	27.35	1151	31.63	1152	35.94	1153	41.25	1154	41.94
1155	41.58	1156	41.21	1157	40.83	1158	40.46	1159	39.36
1160	39.29	1161	38.25	1162	37.21	1163	36.18	1164	35.15
1165	33.13	1166	31.12	1167	29.10	1168	28.09	1169	24.09
1170	19.08	1171	16.08	1172	11.08	1173	7.08	1174	5.08
1175	3.07	1176	2.07	1177	1.07	1178	1.07	1179	1.07
1180	1.07	1181	1.07	1182	1.06	1183	1.06	1184	1.06
1185	1.06	1186	1.06	1187	1.06	1188	.06	1189	.06
1190	.06	1191	.06	1192	.05	1193	.06	1194	.05
1195	.05	1196	.05	1197	.05	1198	.05	1199	.05
1200	.05	1201	.05	1202	.05	1203	.05	1204	.05
1205	.05	1206	.05	1207	.05	1208	.05	1209	.05
1210	.05	1211	.05	1212	.05	1213	.05	1214	.04
1215	.04	1216	.04	1217	.04	1218	.04	1219	.04
1220	.04	1221	.04	1222	.04	1223	.04	1224	.04
1225	.04	1226	.04	1227	.04	1228	.04	1229	.04
1230	.04	1231	.04	1232	.04	1233	.04	1234	.04
1235	.04	1236	.04	1237	.04	1238	.04	1239	.04
1240	.04	1241	.04	1242	.04	1243	.04	1244	.04
1245	.04	1246	.04	1247	.04	1248	.04	1249	.04
1250	.04	1251	.04	1252	.04	1253	.04	1254	.03
1255	.04	1256	.03	1257	.04	1258	.03	1259	.03
1260	.03	1261	.03	1262	.03	1263	.03	1264	.03
1265	.03	1266	.03	1267	.03	1268	.03	1269	.03
1270	.03	1271	.03	1272	.03	1273	.03	1274	.03
1275	.03	1276	.03	1277	.03	1278	.03	1279	.03
1280	.03	1281	.03	1282	.03	1283	.03	1284	.03
1285	.03	1286	.03	1287	.03	1288	.03	1289	.03
1290	.03	1291	.03	1292	.03	1293	.03	1294	.03
1295	.03	1296	.03	1297	.03	1298	.03	1299	.03
1300	.03	1310	.03	1320	.03	1330	.03	1340	.03
1350	.03	1360	.03	1370	.03	1380	.02	1390	.02
1400	.02	1420	.02	1440	.02	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = 1.59(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60257 Area 300, Prop. DESIGN 5-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	301A	2.6	3.13	2.6	3.13	2	700.	.02600	.00	.00	0.	97	6	A29	.01
1	302A	4.6	4.04	7.2	6.34	0	0.	.00000	.00	.00	0.	97	14	A29	.41
1	303AF	.0	5.34	7.2	1.00	4	50.	.02000	2.00	.00	1.	97	0	A29	.00
1	304F	.0	.00	.0	5.34	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	305A	.0	.00	7.2	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	306A	.3	.60	7.5	1.42	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1	307A	.0	.00	7.5	1.42	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE:
TM 60257 Area 300, Prop. DESIGN 5-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 307A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.60	100	1.00	200	1.00	300	1.00	400	1.00
500	1.01	600	1.01	700	1.01	800	1.01	900	1.01
1000	1.01	1050	1.01	1100	1.01	1110	1.02	1120	1.03
1130	1.04	1131	1.05	1132	1.05	1133	1.05	1134	1.05
1135	1.06	1136	1.06	1137	1.06	1138	1.07	1139	1.07
1140	1.07	1141	1.08	1142	1.09	1143	1.09	1144	1.09
1145	1.11	1146	1.12	1147	1.13	1148	1.13	1149	1.20
1150	1.25	1151	1.31	1152	1.36	1153	1.42	1154	1.36
1155	1.30	1156	1.23	1157	1.15	1158	1.09	1159	1.07
1160	1.06	1161	1.05	1162	1.04	1163	1.03	1164	1.03
1165	1.03	1166	1.02	1167	1.02	1168	1.02	1169	1.02
1170	1.02	1171	1.02	1172	1.02	1173	1.01	1174	1.01
1175	1.01	1176	1.01	1177	1.01	1178	1.01	1179	1.01
1180	1.01	1181	1.01	1182	1.01	1183	1.01	1184	1.01
1185	1.01	1186	1.01	1187	1.01	1188	1.01	1189	1.01
1190	1.01	1191	1.01	1192	1.01	1193	1.01	1194	1.01
1195	1.01	1196	1.01	1197	1.01	1198	1.01	1199	1.01
1200	1.01	1201	1.01	1202	1.01	1203	1.01	1204	1.01
1205	1.01	1206	1.01	1207	1.01	1208	1.01	1209	1.01
1210	1.01	1211	1.01	1212	1.01	1213	1.01	1214	1.01
1215	1.01	1216	1.01	1217	1.01	1218	1.01	1219	1.01
1220	1.01	1221	1.01	1222	1.01	1223	1.01	1224	1.01
1225	1.01	1226	1.01	1227	1.01	1228	1.01	1229	1.01
1230	1.01	1231	1.01	1232	1.01	1233	1.01	1234	1.01
1235	1.01	1236	1.01	1237	1.01	1238	1.01	1239	1.01
1240	1.01	1241	1.01	1242	1.01	1243	1.01	1244	1.01
1245	1.01	1246	1.01	1247	1.01	1248	1.01	1249	1.01
1250	1.01	1251	1.01	1252	1.01	1253	1.01	1254	1.01
1255	1.01	1256	1.01	1257	1.01	1258	1.01	1259	1.01
1260	1.01	1261	1.01	1262	1.01	1263	1.01	1264	1.01
1265	1.01	1266	1.01	1267	1.01	1268	1.01	1269	1.01
1270	1.01	1271	1.01	1272	1.01	1273	1.01	1274	1.01
1275	1.01	1276	1.01	1277	1.01	1278	1.01	1279	1.01
1280	1.01	1281	1.01	1282	1.01	1283	1.01	1284	1.01
1285	1.01	1286	1.01	1287	1.01	1288	1.01	1289	1.01
1290	1.01	1291	1.01	1292	1.01	1293	1.01	1294	1.01
1295	1.01	1296	1.01	1297	1.01	1298	1.01	1299	1.01
1300	1.01	1310	1.01	1320	1.01	1330	1.01	1340	1.00
1350	1.00	1360	1.00	1370	1.00	1380	1.00	1390	1.00
1400	1.00	1420	1.00	1440	1.00	1460	1.00	1500	1.00

TOTAL VOLUME THIS HYDROGRAPH = 2.06(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE:
C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 400, Proposed DESIGN 5-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 400A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 401A	.0	80.00	.0	80.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 402B	1.1	1.50	1.1	1.50	4	195.	.02000	2.00	.00	0.	97	5	A29	.01
1 403B	2.1	3.12	3.2	4.51	0	0.	.00000	.00	.00	0.	97	7	A29	.90
1 404B	.0	.00	3.2	4.51	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 405AB	3.2	4.51	3.2	83.29	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 406A	2.0	2.22	5.2	85.35	0	0.	.00000	.00	.00	0.	97	9	A29	.40
1 407A	.0	18.00	5.2	103.35	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 408C	23.4	14.50	23.4	14.50	0	0.	.00000	.00	.00	0.	97	19	A29	.10
1 409D	8.7	7.74	8.7	7.74	2	1114.	.03590	.00	.00	0.	97	10	A29	.01
1 410D	15.1	9.65	23.8	15.88	0	0.	.00000	.00	.00	0.	97	19	A29	.15
1 411D	.0	.00	23.8	15.88	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 412CD	23.8	15.88	47.2	30.03	2	1355.	.04100	.00	.00	0.	97	0	A29	.00
1 413C	27.8	18.84	75.0	46.05	2	400.	.01000	.00	.00	0.	97	19	A29	.25
1 414C	4.2	3.62	79.2	48.76	0	0.	.00000	.00	.00	0.	97	17	A29	.60
1 415AC	79.2	48.76	84.4	144.50	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 416A	.0	.00	84.4	144.50	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 417A	1.4	1.54	85.8	145.70	0	0.	.00000	.00	.00	0.	97	10	A29	.50
1 418A	.0	.00	85.8	145.70	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 5 SOIL DATA FILE:
TM 60275 Area 400, Proposed DESIGN 5-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 418A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.40	100	3.65	200	3.72	300	3.81	400	3.90
500	4.02	600	4.18	700	4.37	800	4.63	900	5.01
1000	5.63	1050	6.43	1100	7.67	1110	8.33	1120	10.64
1130	16.09	1131	17.37	1132	18.66	1133	20.98	1134	21.31
1135	23.67	1136	25.05	1137	27.49	1138	29.92	1139	31.38
1140	33.85	1141	36.43	1142	39.01	1143	41.62	1144	45.26
1145	49.07	1146	52.94	1147	54.89	1148	59.88	1149	63.83
1150	71.99	1151	80.62	1152	92.78	1153	106.39	1154	119.36
1155	130.16	1156	138.41	1157	143.57	1158	145.37	1159	145.70
1160	143.67	1161	139.52	1162	133.93	1163	127.22	1164	118.29
1165	109.07	1166	99.23	1167	90.06	1168	81.65	1169	74.69
1170	68.06	1171	63.28	1172	58.22	1173	52.94	1174	48.63
1175	44.59	1176	41.87	1177	39.36	1178	36.06	1179	34.07
1180	31.33	1181	29.88	1182	28.63	1183	26.57	1184	25.68
1185	24.95	1186	23.31	1187	22.77	1188	22.27	1189	20.89
1190	20.56	1191	20.25	1192	19.99	1193	18.77	1194	18.57
1195	18.39	1196	18.25	1197	18.11	1198	16.98	1199	16.87
1200	16.77	1201	16.68	1202	16.59	1203	16.48	1204	16.41
1205	15.35	1206	15.28	1207	15.20	1208	15.16	1209	15.11
1210	15.05	1211	15.01	1212	14.95	1213	14.91	1214	13.87
1215	13.81	1216	13.79	1217	13.74	1218	13.69	1219	13.67
1220	13.63	1221	13.60	1222	13.56	1223	13.52	1224	13.50
1225	13.47	1226	12.45	1227	12.42	1228	12.39	1229	12.37
1230	12.33	1231	12.31	1232	12.29	1233	12.25	1234	12.23
1235	12.21	1236	12.18	1237	12.18	1238	12.14	1239	12.13
1240	12.11	1241	12.10	1242	12.06	1243	12.04	1244	11.03
1245	11.00	1246	10.99	1247	10.97	1248	10.95	1249	10.95
1250	10.91	1251	10.90	1252	10.88	1253	10.87	1254	10.86
1255	10.85	1256	10.82	1257	10.82	1258	10.79	1259	10.77
1260	10.77	1261	10.75	1262	10.72	1263	10.73	1264	10.70
1265	10.68	1266	10.68	1267	10.66	1268	10.65	1269	10.66
1270	10.63	1271	10.62	1272	10.60	1273	10.60	1274	10.59
1275	10.57	1276	10.56	1277	9.54	1278	9.53	1279	9.54
1280	9.51	1281	9.51	1282	9.50	1283	9.48	1284	9.48
1285	9.47	1286	9.45	1287	9.44	1288	9.43	1289	9.42
1290	9.41	1291	9.40	1292	9.39	1293	9.38	1294	9.38
1295	9.37	1296	9.35	1297	9.35	1298	9.34	1299	9.34
1300	9.33	1310	9.26	1320	9.20	1330	9.12	1340	8.05
1350	8.00	1360	7.95	1370	7.92	1380	7.87	1390	7.82
1400	7.80	1420	7.73	1440	7.65	1460	6.21	1500	6.21

TOTAL VOLUME THIS HYDROGRAPH = 16.16(Ac.Ft)

HYDROCALC Results

TTM 060257, Sterling
Proposed Condition

2-yr Design Frequency

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)
TM 60257	101A	40.6	1736	0.13	2.2	0.01	97	2-yr	30	0.58	0.35	0.36	8.38
TM 60257	102A	4.8	783	0.014	2.2	0.42	97	2-yr	22	0.67	0.40	0.61	1.95
TM 60257	105B	28.4	1840	0.13	2.2	0.01	97	2-yr	30	0.58	0.35	0.36	5.86
TM 60257	110B	3.3	704	0.166	2.2	0.42	97	2-yr	13	0.85	0.47	0.65	1.84
TM 60257	111B	5.1	606	0.036	2.2	0.42	97	2-yr	15	0.80	0.46	0.64	2.62
TM 60257	113A	7.9	995	0.058	2.2	0.42	97	2-yr	20	0.70	0.42	0.62	3.41
TM 60257	115C	14.4	910	0.24	2.2	0.01	97	2-yr	18	0.73	0.43	0.44	4.63
TM 60257	116C	10.1	875	0.027	2.2	0.42	97	2-yr	21	0.68	0.41	0.61	4.23
TM 60257	117C	10	572	0.026	2.2	0.42	97	2-yr	16	0.78	0.45	0.64	4.95
TM 60257	119C	5.3	787	0.024	2.2	0.42	97	2-yr	20	0.70	0.42	0.62	2.29
TM 60257	121C	4.7	1009	0.056	2.2	0.5	97	2-yr	19	0.72	0.42	0.66	2.22
TM 60257	123C	5.8	456	0.015	2.2	0.42	97	2-yr	15	0.80	0.46	0.64	2.98
TM 60257	126A	0.7	487	0.037	2.2	0.91	97	2-yr	11	0.92	0.50	0.86	0.56
TM 60257	127A	2.3	1099	0.035	2.2	0.5	97	2-yr	22	0.67	0.40	0.65	1.00
TM 60257	130D	3.7	480	0.27	2.2	0.01	97	2-yr	11	0.92	0.50	0.50	1.71
TM 60257	131D	2.2	344	0.35	2.2	0.01	97	2-yr	8	1.07	0.53	0.54	1.27
TM 60257	133D	7.4	989	0.058	2.2	0.42	97	2-yr	20	0.70	0.42	0.62	3.20
TM 60257	135D	2.8	498	0.4	2.2	0.01	97	2-yr	10	0.97	0.51	0.51	1.39
TM 60257	138D	7.6	920	0.039	2.2	0.42	97	2-yr	20	0.70	0.42	0.62	3.28
TM 60257	146D	2.5	910	0.067	2.2	0.42	97	2-yr	18	0.73	0.43	0.63	1.15
TM 60257	150A	4	864	0.021	2.2	0.6	97	2-yr	20	0.70	0.42	0.71	1.97
TM 60257	154A	1.8	100	0.1	2.2	0.1	97	2-yr	5	1.34	0.58	0.61	1.48
TM 60257	203A	1.6	125	0.09	2.2	0.1	97	2-yr	5	1.34	0.58	0.61	1.32
TM 60257	301A	2.6	490	0.41	2.2	0.01	97	2-yr	10	0.97	0.51	0.51	1.29
TM 60257	302A	4.6	835	0.063	2.2	0.01	97	2-yr	24	0.64	0.39	0.39	1.15
TM 60257	306A	0.3	50	0.2	2.2	0.1	97	2-yr	5	1.34	0.58	0.61	0.25
TM 60257	402B	1.1	240	0.4	2.2	0.01	97	2-yr	6	1.23	0.56	0.57	0.76
TM 60257	403B	2.1	450	0.047	2.2	0.9	97	2-yr	10	0.97	0.51	0.86	1.75
TM 60257	406A	2	476	0.032	2.2	0.4	97	2-yr	13	0.85	0.47	0.64	1.10
TM 60257	408C	23.4	1708	0.1546	2.2	0.1	97	2-yr	30	0.58	0.35	0.41	5.49
TM 60257	409D	8.7	707	0.1938	2.2	0.01	97	2-yr	16	0.78	0.45	0.45	3.06
TM 60257	410D	15.1	1544	0.0894	2.2	0.15	97	2-yr	30	0.58	0.35	0.43	3.78
TM 60257	413C	27.8	1604	0.084	2.2	0.25	97	2-yr	29	0.59	0.36	0.49	8.03
TM 60257	414C	4.2	1248	0.03	2.2	0.6	97	2-yr	24	0.64	0.39	0.69	1.87
TM 60257	417A	1.4	576	0.04	2.2	0.5	97	2-yr	14	0.83	0.47	0.68	0.79

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 100, Proposed DESIGN 2-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 101A	40.6	8.61	40.6	8.61	0	0.	.00000	.00	.00	0.	97	30	A29	.01
1 102A	4.8	1.97	45.4	10.57	0	0.	.00000	.00	.00	0.	97	22	A29	.42
1 103AF	.0	9.57	45.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 104F	.0	.00	.0	9.57	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 105B	28.4	6.02	28.4	6.02	0	0.	.00000	.00	.00	0.	97	30	A29	.01
1 106BF	.0	5.02	28.4	1.00	0	0.	.00000	.00	.00	1.	97	0	A29	.00
1 107F	.0	.00	.0	5.02	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 108B	.0	.00	28.4	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 109AB	28.4	1.00	73.8	2.00	4	410.	.09000	2.00	.00	0.	97	0	A29	.00
1 110B	3.3	1.84	3.3	1.84	4	370.	.02000	2.00	.00	0.	97	13	A29	.42
1 111B	5.1	2.63	8.4	4.44	0	0.	.00000	.00	.00	0.	97	15	A29	.42
1 112AB	8.4	4.44	82.2	6.44	4	495.	.03000	2.00	.00	0.	97	0	A29	.00
1 113A	7.9	3.43	90.1	9.84	0	0.	.00000	.00	.00	0.	97	20	A29	.42
1 114A	.0	.00	90.1	9.84	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 115C	14.4	4.63	14.4	4.63	4	350.	.02000	2.00	.00	0.	97	18	A29	.01
1 116C	10.1	4.26	24.5	8.89	0	0.	.00000	.00	.00	0.	97	21	A29	.42
1 117C	10.0	4.95	34.5	13.83	0	0.	.00000	.00	.00	0.	97	16	A29	.42
1 118C	.0	.00	34.5	13.83	4	276.	.06000	2.00	.00	0.	97	99	A29	.00
1 119C	5.3	2.30	39.8	16.10	0	0.	.00000	.00	.00	0.	97	20	A29	.42
1 120C	.0	.00	39.8	16.10	4	650.	.06000	2.00	.00	0.	97	99	A29	.00
1 121C	4.7	2.23	44.5	18.27	0	0.	.00000	.00	.00	0.	97	19	A29	.50
1 122C	.0	.00	44.5	18.27	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 123C	5.8	2.99	50.3	21.18	0	0.	.00000	.00	.00	0.	97	15	A29	.42
1 124AC	50.3	21.18	140.4	31.02	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 125A	.0	.00	140.4	31.02	4	400.	.03500	2.00	.00	0.	97	99	A29	.00
1 126A	.7	.60	141.1	31.50	4	600.	.03000	2.00	.00	0.	97	11	A29	.91
1 127A	2.3	1.00	143.4	32.39	0	0.	.00000	.00	.00	0.	97	22	A29	.50
1 128A	.0	.00	143.4	32.39	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 129A	.0	.00	143.4	32.39	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 130D	3.7	1.71	3.7	1.71	0	0.	.00000	.00	.00	0.	97	11	A29	.01
1 131D	2.2	1.26	5.9	2.97	0	0.	.00000	.00	.00	0.	97	8	A29	.01
1 132D	.0	.00	5.9	2.97	4	970.	.08000	2.00	.00	0.	97	99	A29	.00
1 133D	7.4	3.22	13.3	6.09	0	0.	.00000	.00	.00	0.	97	20	A29	.42
1 134D	.0	.00	13.3	6.09	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 135D	2.8	1.39	16.1	7.40	4	235.	.02000	2.00	.00	0.	97	10	A29	.01
1 136D	.0	.00	16.1	7.37	4	500.	.09600	2.00	.00	0.	97	99	A29	.00
1 137D	.0	.00	16.1	7.34	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 138D	7.6	3.30	23.7	10.61	4	160.	.09600	2.00	.00	0.	97	20	A29	.42
1 139D	.0	.00	23.7	10.60	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 140D	.0	.00	23.7	10.60	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 141D	.0	.00	23.7	10.60	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 142D	.0	.00	23.7	10.60	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 143D	.0	.00	23.7	10.60	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 144D	.0	2.00	23.7	12.60	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 145D	.0	.00	23.7	12.60	4	200.	.02700	2.00	.00	0.	97	99	A29	.00
1 146D	2.5	1.15	26.2	13.71	0	0.	.00000	.00	.00	0.	97	18	A29	.42
1 147D	.0	.00	26.2	13.71	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 148AD	26.2	13.71	169.6	46.07	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 149A	.0	.00	169.6	46.07	4	195.	.03000	2.25	.00	0.	97	99	A29	.00
1 150A	4.0	1.98	173.6	47.93	0	0.	.00000	.00	.00	0.	97	20	A29	.60
1 151A	.0	.00	173.6	47.93	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 152AF	.0	32.93	173.6	15.00	4	175.	.02000	2.00	.00	15.	97	0	A29	.00
1 153F	.0	.00	.0	32.93	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 154A	1.8	1.50	175.4	16.50	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 155A	.0	.00	175.4	16.50	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 156A	.0	.00	175.4	16.50	0	0.	.00000	.00	.00	0.	97	99	A29	.00

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1997-2004 Version 6.4

Study Date : 11/12/18 Input hydrograph file name : 154A.hyd
Output hydrograph file name: STERLING.hin

User entry of depth-outflow-storage data

Hydrograph time unit varies
Initial depth in storage basin = 0.00(Ft.)

Initial basin depth = 0.00 (Ft.)
Initial basin storage = 0.00 (Ac.Ft)
Initial basin outflow = 0.00 (CFS)

Depth vs. Storage and Depth vs. Discharge data @ 1 Min. Intervals:

Basin Depth (Ft.)	Storage (Ac.Ft)	Outflow (CFS)	(S-O*dt/2) (Ac.Ft)	(S+O*dt/2) (Ac.Ft)
0.000	0.001	0.001	0.001	0.001
2.000	1.790	0.001	1.790	1.790
4.000	3.850	0.001	3.850	3.850
6.000	6.200	0.001	6.200	6.200
7.000	7.500	0.001	7.500	7.500
7.500	8.160	0.001	8.160	8.160
7.600	8.300	5.900	8.296	8.304
7.800	8.580	30.500	8.559	8.601
8.000	8.850	65.700	8.805	8.895

Hydrograph Detention Basin Routing
Hydrograph at 1 154 A Storm Day: 4 Drainage Area = 176.20
Total flood hydrograph volume this storm day = 7.63 Ac. Ft.

Graph values: 'I'= unit inflow; 'O'=outflow at time shown

Time (Min)	Inflow (CFS)	Outflow (CFS)	Storage (Ac.Ft)	.0 4.3 8.5 12.8 17.0	Depth (Ft.)
0	0.0	0.0	0.001	O	0.0
100	2.0	0.0	0.140	I O	0.2
200	2.0	0.0	0.415	I O	0.5
300	2.0	0.0	0.691	I O	0.8
400	3.0	0.0	1.036	I O	1.2
500	3.0	0.0	1.449	I O	1.6
600	3.0	0.0	1.862	I O	2.1
700	3.0	0.0	2.275	I O	2.5
800	4.0	0.0	2.757	I O	2.9
900	4.0	0.0	3.308	I O	3.5
1000	5.0	0.0	3.929	I O	4.1
1050	6.0	0.0	4.308	I O	4.4
1100	8.0	0.0	4.791	I O	4.8
1110	9.0	0.0	4.909	I O	4.9
1120	10.0	0.0	5.041	I O	5.0
1130	11.0	0.0	5.186	I O	5.1
1131	11.0	0.0	5.201	I O	5.1
1132	11.0	0.0	5.216	I O	5.2
1133	12.0	0.0	5.233	I O	5.2
1134	12.0	0.0	5.249	I O	5.2
1135	12.0	0.0	5.266	I O	5.2
1136	12.0	0.0	5.282	I O	5.2
1137	12.0	0.0	5.299	I O	5.2
1138	13.0	0.0	5.317	I O	5.2
1139	13.0	0.0	5.335	I O	5.3
1140	13.0	0.0	5.353	I O	5.3
1141	13.0	0.0	5.371	I O	5.3
1142	14.0	0.0	5.390	I O	5.3
1143	14.0	0.0	5.409	I O	5.3
1144	15.0	0.0	5.430	I O	5.3
1145	15.0	0.0	5.450	I O	5.4
1146	15.0	0.0	5.471	I O	5.4
1147	15.0	0.0	5.492	I O	5.4
1148	15.0	0.0	5.512	I O	5.4
1149	16.0	0.0	5.535	I O	5.4
1150	16.0	0.0	5.557	I O	5.5
1151	16.0	0.0	5.579	I O	5.5
1152	16.0	0.0	5.601	I O	5.5
1153	17.0	0.0	5.624	I O	5.5
1154	16.0	0.0	5.646	I O	5.5
1155	16.0	0.0	5.668	I O	5.5
1156	16.0	0.0	5.690	I O	5.6
1157	15.0	0.0	5.711	I O	5.6
1158	15.0	0.0	5.731	I O	5.6
1159	15.0	0.0	5.752	I O	5.6
1160	15.0	0.0	5.773	I O	5.6
1161	15.0	0.0	5.793	I O	5.7
1162	15.0	0.0	5.814	I O	5.7
1163	15.0	0.0	5.835	I O	5.7
1164	15.0	0.0	5.855	I O	5.7
1165	15.0	0.0	5.876	I O	5.7
1166	15.0	0.0	5.897	I O	5.7

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1261	4.0	0.0	6.778	o		I				6.4
1262	4.0	0.0	6.784	o		I				6.4
1263	4.0	0.0	6.789	o		I				6.5
1264	4.0	0.0	6.795	o		I				6.5
1265	4.0	0.0	6.800	o		I				6.5
1266	4.0	0.0	6.806	o		I				6.5
1267	4.0	0.0	6.811	o		I				6.5
1268	4.0	0.0	6.817	o		I				6.5
1269	4.0	0.0	6.822	o		I				6.5
1270	4.0	0.0	6.828	o		I				6.5
1271	4.0	0.0	6.833	o		I				6.5
1272	4.0	0.0	6.839	o		I				6.5
1273	4.0	0.0	6.844	o		I				6.5
1274	4.0	0.0	6.850	o		I				6.5
1275	4.0	0.0	6.855	o		I				6.5
1276	4.0	0.0	6.861	o		I				6.5
1277	4.0	0.0	6.866	o		I				6.5
1278	4.0	0.0	6.872	o		I				6.5
1279	3.0	0.0	6.876	o	I					6.5
1280	3.0	0.0	6.880	o	I					6.5
1281	3.0	0.0	6.884	o	I					6.5
1282	3.0	0.0	6.888	o	I					6.5
1283	3.0	0.0	6.892	o	I					6.5
1284	3.0	0.0	6.897	o	I					6.5
1285	3.0	0.0	6.901	o	I					6.5
1286	3.0	0.0	6.905	o	I					6.5
1287	3.0	0.0	6.909	o	I					6.5
1288	3.0	0.0	6.913	o	I					6.5
1289	3.0	0.0	6.917	o	I					6.6
1290	3.0	0.0	6.921	o	I					6.6
1291	3.0	0.0	6.926	o	I					6.6
1292	3.0	0.0	6.930	o	I					6.6
1293	3.0	0.0	6.934	o	I					6.6
1294	3.0	0.0	6.938	o	I					6.6
1295	3.0	0.0	6.942	o	I					6.6
1296	3.0	0.0	6.946	o	I					6.6
1297	3.0	0.0	6.950	o	I					6.6
1298	3.0	0.0	6.954	o	I					6.6
1299	3.0	0.0	6.959	o	I					6.6
1300	3.0	0.0	6.963	o	I					6.6
1310	3.0	0.0	7.004	o	I					6.6
1320	3.0	0.0	7.045	o	I					6.7
1330	3.0	0.0	7.087	o	I					6.7
1340	3.0	0.0	7.128	o	I					6.7
1350	3.0	0.0	7.169	o	I					6.7
1360	3.0	0.0	7.211	o	I					6.8
1370	3.0	0.0	7.252	o	I					6.8
1380	3.0	0.0	7.293	o	I					6.8
1390	2.0	0.0	7.327	o	I					6.9
1400	2.0	0.0	7.354	o	I					6.9
1420	2.0	0.0	7.409	o	I					6.9
1440	2.0	0.0	7.465	o	I					7.0
1460	2.0	0.0	7.520	o	I					7.0
1500	2.0	0.0	7.627	o	I					7.1

Remaining water in basin = 7.63 (Ac.Ft)
Peak flow out of basin = 0.00(CFS)
Peak flow time = 0 Min., time interval # = 1
Maximum depth in basin = 7.10(Ft.)

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE: C:\civild\scr_soilx_34.dat
TM 60257 Area 200, Prop. DESIGN 2-yr CLEAR

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	STORM DAY 4 RAIN ZONE	PCT IMPV
1 200A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 201A	.0	10.00	.0	10.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 202A	.0	5.00	.0	15.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 203A	1.6	1.34	1.6	15.44	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1 204A	.0	.00	1.6	15.44	0	0.	.00000	.00	.00	0.	97	99	A29	.00

Program Package Serial Number: 2083
11/12/18 FILE: 200 INPUT DATA: English Units RAINFALL SOIL FILE: English (In) OUTPUT DATA: English Units PAGE 4
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT PROG F0601M

Version 11, MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE:
TM 60257 Area 200, Prop. DESIGN 2-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 204A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.00	100	.01	200	.02	300	.02	400	.02
500	.02	600	.02	700	.02	800	.02	900	.03
1000	.03	1050	.04	1100	.05	1110	.06	1120	.07
1130	1.08	1131	1.09	1132	1.09	1133	1.09	1134	1.10
1135	1.11	1136	1.12	1137	1.13	1138	1.15	1139	1.16
1140	1.17	1141	1.19	1142	1.21	1143	1.22	1144	1.24
1145	2.28	1146	3.31	1147	4.35	1148	4.37	1149	6.58
1150	8.76	1151	10.94	1152	13.14	1153	15.34	1154	15.14
1155	14.91	1156	14.68	1157	15.44	1158	15.21	1159	15.15
1160	15.10	1161	14.09	1162	14.08	1163	14.08	1164	14.07
1165	14.07	1166	14.07	1167	12.06	1168	12.06	1169	12.06
1170	12.06	1171	11.05	1172	11.05	1173	9.05	1174	9.05
1175	8.05	1176	8.05	1177	6.05	1178	6.05	1179	4.05
1180	3.04	1181	1.04	1182	1.04	1183	.04	1184	.04
1185	.04	1186	.04	1187	.04	1188	.04	1189	.04
1190	.04	1191	.04	1192	.04	1193	.04	1194	.04
1195	.03	1196	.04	1197	.04	1198	.03	1199	.03
1200	.03	1201	.03	1202	.03	1203	.03	1204	.03
1205	.03	1206	.03	1207	.03	1208	.03	1209	.03
1210	.03	1211	.03	1212	.03	1213	.03	1214	.03
1215	.03	1216	.03	1217	.03	1218	.03	1219	.03
1220	.03	1221	.03	1222	.03	1223	.03	1224	.03
1225	.03	1226	.03	1227	.03	1228	.03	1229	.03
1230	.03	1231	.03	1232	.03	1233	.03	1234	.03
1235	.03	1236	.03	1237	.03	1238	.03	1239	.03
1240	.03	1241	.03	1242	.02	1243	.03	1244	.03
1245	.02	1246	.02	1247	.02	1248	.02	1249	.02
1250	.02	1251	.02	1252	.02	1253	.02	1254	.02
1255	.02	1256	.02	1257	.02	1258	.02	1259	.02
1260	.02	1261	.02	1262	.02	1263	.02	1264	.02
1265	.02	1266	.02	1267	.02	1268	.02	1269	.02
1270	.02	1271	.02	1272	.02	1273	.02	1274	.02
1275	.02	1276	.02	1277	.02	1278	.02	1279	.02
1280	.02	1281	.02	1282	.02	1283	.02	1284	.02
1285	.02	1286	.02	1287	.02	1288	.02	1289	.02
1290	.02	1291	.02	1292	.02	1293	.02	1294	.02
1295	.02	1296	.02	1297	.02	1298	.02	1299	.02
1300	.02	1310	.02	1320	.02	1330	.02	1340	.02
1350	.02	1360	.02	1370	.02	1380	.02	1390	.02
1400	.02	1420	.02	1440	.01	1460	.00	1500	.00

TOTAL VOLUME THIS HYDROGRAPH = .60(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE: C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60257 Area 300, Prop. DESIGN 2-yr CLEAR STORM DAY 4

LOCATION		SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1	301A	2.6	1.29	2.6	1.29	2	700.	.02600	.00	.00	0.	97	10	A29	.01
1	302A	4.6	1.77	7.2	2.93	0	0.	.00000	.00	.00	0.	97	24	A29	.41
1	303AF	.0	1.93	7.2	1.00	4	50.	.02000	2.00	.00	1.	97	0	A29	.00
1	304F	.0	.00	.0	1.93	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	305A	.0	.00	7.2	1.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1	306A	.3	.60	7.5	1.25	0	0.	.00000	.00	.00	0.	97	5	A29	.10
1	307A	.0	.00	7.5	1.25	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE:
TM 60257 Area 300, Prop. DESIGN 2-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 307A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	.60	100	1.00	200	1.00	300	1.00	400	1.00
500	1.00	600	1.00	700	1.00	800	1.00	900	1.01
1000	1.01	1050	1.01	1100	1.01	1110	1.01	1120	1.01
1130	1.02	1131	1.02	1132	1.02	1133	1.02	1134	1.02
1135	1.02	1136	1.02	1137	1.03	1138	1.03	1139	1.03
1140	1.03	1141	1.04	1142	1.04	1143	1.04	1144	1.05
1145	1.05	1146	1.06	1147	1.07	1148	1.07	1149	1.11
1150	1.14	1151	1.18	1152	1.21	1153	1.25	1154	1.21
1155	1.17	1156	1.13	1157	1.08	1158	1.04	1159	1.03
1160	1.02	1161	1.02	1162	1.02	1163	1.01	1164	1.01
1165	1.01	1166	1.01	1167	1.01	1168	1.01	1169	1.01
1170	1.01	1171	1.01	1172	1.01	1173	1.01	1174	1.01
1175	1.01	1176	1.01	1177	1.01	1178	1.01	1179	1.01
1180	1.01	1181	1.01	1182	1.01	1183	1.01	1184	1.01
1185	1.01	1186	1.01	1187	1.01	1188	1.01	1189	1.01
1190	1.01	1191	1.01	1192	1.01	1193	1.01	1194	1.01
1195	1.01	1196	1.01	1197	1.01	1198	1.01	1199	1.01
1200	1.01	1201	1.01	1202	1.01	1203	1.01	1204	1.01
1205	1.01	1206	1.01	1207	1.01	1208	1.01	1209	1.01
1210	1.01	1211	1.01	1212	1.01	1213	1.01	1214	1.01
1215	1.01	1216	1.01	1217	1.01	1218	1.01	1219	1.01
1220	1.01	1221	1.01	1222	1.01	1223	1.01	1224	1.01
1225	1.01	1226	1.01	1227	1.01	1228	1.01	1229	1.01
1230	1.01	1231	1.00	1232	1.00	1233	1.00	1234	1.00
1235	1.01	1236	1.01	1237	1.01	1238	1.00	1239	1.00
1240	1.00	1241	1.00	1242	1.00	1243	1.00	1244	1.00
1245	1.00	1246	1.00	1247	1.00	1248	1.00	1249	1.00
1250	1.00	1251	1.00	1252	1.00	1253	1.00	1254	1.00
1255	1.00	1256	1.00	1257	1.00	1258	1.00	1259	1.00
1260	1.00	1261	1.00	1262	1.00	1263	1.00	1264	1.00
1265	1.00	1266	1.00	1267	1.00	1268	1.00	1269	1.00
1270	1.00	1271	1.00	1272	1.00	1273	1.00	1274	1.00
1275	1.00	1276	1.00	1277	1.00	1278	1.00	1279	1.00
1280	1.00	1281	1.00	1282	1.00	1283	1.00	1284	1.00
1285	1.00	1286	1.00	1287	1.00	1288	1.00	1289	1.00
1290	1.00	1291	1.00	1292	1.00	1293	1.00	1294	1.00
1295	1.00	1296	1.00	1297	1.00	1298	1.00	1299	1.00
1300	1.00	1310	1.00	1320	1.00	1330	1.00	1340	1.00
1350	1.00	1360	1.00	1370	1.00	1380	1.00	1390	1.00
1400	1.00	1420	1.00	1440	1.00	1460	1.00	1500	1.00

TOTAL VOLUME THIS HYDROGRAPH = 2.05(Ac.Ft)

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE:
C:\Users\bhanu\Desktop\CIVILD\scr_soilx_34.dat

TM 60275 Area 400, Proposed DESIGN 2-yr CLEAR STORM DAY 4

LOCATION	SUBAREA AREA(Ac)	SUBAREA Q(CFS)	TOTAL AREA(Ac)	TOTAL Q(CFS)	CONV TYPE	CONV LNGTH(Ft)	CONV SLOPE	CONV SIZE(Ft)	CONV Z	CONTROL Q(CFS)	SOIL NAME	TC	RAIN ZONE	PCT IMPV
1 400A	.0	.00	.0	.00	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 401A	.0	33.00	.0	33.00	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 402B	1.1	.76	1.1	.76	4	195.	.02000	2.00	.00	0.	97	6	A29	.01
1 403B	2.1	1.75	3.2	2.75	0	0.	.00000	.00	.00	0.	97	10	A29	.90
1 404B	.0	.00	3.2	2.75	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 405AB	3.2	2.75	3.2	35.40	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 406A	2.0	1.10	5.2	36.40	0	0.	.00000	.00	.00	0.	97	13	A29	.40
1 407A	.0	.00	5.2	36.40	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 408C	23.4	5.61	23.4	5.61	0	0.	.00000	.00	.00	0.	97	30	A29	.10
1 409D	8.7	3.07	8.7	3.07	2	1114.	.03590	.00	.00	0.	97	16	A29	.01
1 410D	15.1	3.86	23.8	6.45	0	0.	.00000	.00	.00	0.	97	30	A29	.15
1 411D	.0	.00	23.8	6.45	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 412CD	23.8	6.45	47.2	11.94	2	1355.	.04100	.00	.00	0.	97	0	A29	.00
1 413C	27.8	8.16	75.0	19.08	2	400.	.01000	.00	.00	0.	97	29	A29	.25
1 414C	4.2	1.88	79.2	20.52	0	0.	.00000	.00	.00	0.	97	24	A29	.60
1 415AC	79.2	20.52	84.4	53.19	0	0.	.00000	.00	.00	0.	97	0	A29	.00
1 416A	.0	.00	84.4	53.19	0	0.	.00000	.00	.00	0.	97	99	A29	.00
1 417A	1.4	.79	85.8	53.90	0	0.	.00000	.00	.00	0.	97	14	A29	.50
1 418A	.0	.00	85.8	53.90	0	0.	.00000	.00	.00	0.	97	99	A29	.00

MODIFIED RATIONAL METHOD HYDROLOGY - STORM YEAR = 2 SOIL DATA FILE:
TM 60275 Area 400, Proposed DESIGN 2-yr CLEAR, OUTLET HYD.
HYDROGRAPH AT 1 418A STORM DAY 4 REDUCTION FACTOR = 1.000

TIME	Q	TIME	Q	TIME	Q	TIME	Q	TIME	Q
0	2.40	100	3.09	200	3.14	300	3.20	400	3.26
500	3.34	600	3.44	700	3.57	800	3.74	900	3.99
1000	4.40	1050	4.93	1100	5.75	1110	6.09	1120	6.51
1130	7.16	1131	7.24	1132	7.31	1133	7.40	1134	7.48
1135	7.56	1136	7.65	1137	8.76	1138	8.87	1139	8.99
1140	9.11	1141	10.27	1142	10.43	1143	10.60	1144	11.76
1145	13.00	1146	13.27	1147	14.57	1148	15.91	1149	17.68
1150	20.49	1151	23.41	1152	27.56	1153	32.85	1154	37.85
1155	42.87	1156	46.84	1157	49.75	1158	51.61	1159	53.29
1160	53.90	1161	53.42	1162	52.73	1163	51.89	1164	51.08
1165	49.20	1166	47.23	1167	45.29	1168	43.34	1169	41.30
1170	37.19	1171	34.01	1172	31.76	1173	28.34	1174	24.86
1175	22.32	1176	20.73	1177	19.09	1178	18.47	1179	17.79
1180	16.95	1181	15.96	1182	14.93	1183	13.96	1184	13.10
1185	12.30	1186	11.56	1187	10.84	1188	10.14	1189	9.50
1190	8.91	1191	8.37	1192	7.91	1193	7.52	1194	7.16
1195	6.86	1196	6.60	1197	6.37	1198	6.18	1199	6.00
1200	5.84	1201	5.71	1202	5.59	1203	5.47	1204	5.38
1205	5.30	1206	5.22	1207	5.14	1208	5.08	1209	5.02
1210	4.96	1211	4.91	1212	4.86	1213	4.82	1214	4.77
1215	4.73	1216	4.70	1217	4.66	1218	4.62	1219	4.60
1220	4.57	1221	4.53	1222	4.51	1223	4.48	1224	4.45
1225	4.43	1226	4.41	1227	4.39	1228	4.37	1229	4.34
1230	4.31	1231	4.30	1232	4.28	1233	4.26	1234	4.24
1235	4.22	1236	4.21	1237	4.19	1238	4.17	1239	4.15
1240	4.14	1241	4.13	1242	4.11	1243	4.09	1244	4.08
1245	4.06	1246	4.05	1247	4.03	1248	4.03	1249	4.02
1250	3.99	1251	3.99	1252	3.97	1253	3.96	1254	3.95
1255	3.95	1256	3.93	1257	3.92	1258	3.91	1259	3.89
1260	3.89	1261	3.87	1262	3.86	1263	3.86	1264	3.84
1265	3.83	1266	3.83	1267	3.81	1268	3.80	1269	3.80
1270	3.79	1271	3.78	1272	3.77	1273	3.77	1274	3.76
1275	3.75	1276	3.74	1277	3.73	1278	3.72	1279	3.72
1280	3.71	1281	3.70	1282	3.69	1283	3.68	1284	3.68
1285	3.67	1286	3.66	1287	3.65	1288	3.65	1289	3.64
1290	3.63	1291	3.62	1292	3.62	1293	3.61	1294	3.60
1295	3.60	1296	3.59	1297	3.59	1298	3.58	1299	3.58
1300	3.57	1310	3.52	1320	3.47	1330	3.43	1340	3.38
1350	3.34	1360	3.31	1370	3.28	1380	3.25	1390	3.22
1400	3.20	1420	3.16	1440	3.11	1460	2.82	1500	2.80

TOTAL VOLUME THIS HYDROGRAPH = 9.22(Ac.Ft)

Impervious Calculation

TM 060257, Sterling
Proposed Condition

		Single Family		Road		WQ Area		Natural		Slope		
Subarea	Total Area	Area	% Imp	Area	% Imp	Area	% Imp	Area	% Imp	Area	% Imp	Total %
121C	4.7			2.1	0.91					2.6	0.1	0.46
127C	2.3			1.1	0.91					1.2	0.1	0.49
150A	4	3.1	0.42	0.9	0.91							0.53
407A	2			0.7	0.91	1.1	0.1			0.2	0.1	0.38
414C	4.2	1.1	0.42	1.9	0.91			0.6	0.01	0.6	0.1	0.54
417A	1.4	0.1	0.42	0.5	0.91			0.8	0.01		0	0.36

Hydraulic Calculations

Proposed Condition

NODE 104F

Qdesign

Weir			
Hw (ft)	C	L	Qout (cfs)
1.02	3.32	22.5	77.0

Q50

Weir			
Hw (ft)	C	L	Qout (cfs)
0.98	3.32	22.5	72.5

Q25

Weir			
Hw (ft)	C	L	Qout (cfs)
0.85	3.32	22.5	58.5

Q10

Weir			
Hw (ft)	C	L	Qout (cfs)
0.655	3.32	22.5	39.6

Q5

Weir			
Hw (ft)	C	L	Qout (cfs)
0.495	3.32	22.5	26.0

Q2

Weir			
Hw (ft)	C	L	Qout (cfs)
0.260	3.32	22.5	9.9

LID

Weir			
Hw (ft)	C	L	Qout (cfs)
0.02	3.32	22.5	0.2

$Q=CLH^{\wedge 1.5}$

C=Broad Crested Weir Coefficient

Based on Weir Breadth and Head

Hydraulic Calculations

Proposed Condition

NODE 106 BF

Qdesign

Orifice			
H (ft)	C	A	Qout (cfs)
1.68	0.65	0.20	1.3

Q50

Orifice			
H (ft)	C	A	Qout (cfs)
1.64	0.65	0.20	1.3

Q25

Orifice			
H (ft)	C	A	Qout (cfs)
1.48	0.65	0.20	1.2

Q10

Orifice			
H (ft)	C	A	Qout (cfs)
1.29	0.65	0.20	1.2

Q5

Orifice			
H (ft)	C	A	Qout (cfs)
1.12	0.65	0.20	1.1

Q2

Orifice			
H (ft)	C	A	Qout (cfs)
0.88	0.65	0.20	1.0

LID

Orifice			
H (ft)	C	A	Qout (cfs)
0.15	0.65	0.20	0.4

Hydraulic Calculations

Proposed Condition

NODE 107F

Qdesign

Weir			
Hw (ft)	C	L	Qout (cfs)
1.03	3.32	13.5	46.5

Q50

Weir			
Hw (ft)	C	L	Qout (cfs)
0.99	3.32	13.5	44.1

Q25

Weir			
Hw (ft)	C	L	Qout (cfs)
0.83	3.32	13.5	33.9

Q10

Weir			
Hw (ft)	C	L	Qout (cfs)
0.635	3.32	13.5	22.7

Q5

Weir			
Hw (ft)	C	L	Qout (cfs)
0.47	3.32	13.5	14.4

Q2

Weir			
Hw (ft)	C	L	Qout (cfs)
0.23	3.32	13.5	4.9

LID

Weir			
Hw (ft)	C	L	Qout (cfs)
0	3.32	13.5	0.0

$Q=CLH^{\wedge 1.5}$

C=Broad Crested Weir Coefficient

Based on Weir Breadth and Head

Hydraulic Calculations

Proposed Condition

NODE 152 AF

Qdesign

Orifice			
H (ft)	C	A	Qout (cfs)
1.78	0.65	3.14	21.9

Q50

Orifice			
H (ft)	C	A	Qout (cfs)
1.88	0.65	3.14	22.5

Q25

Orifice			
H (ft)	C	A	Qout (cfs)
1.69	0.65	3.14	21.3

Q10

Orifice			
H (ft)	C	A	Qout (cfs)
1.43	0.65	3.14	19.6

Q5

Orifice			
H (ft)	C	A	Qout (cfs)
1.19	0.65	3.14	17.9

Q2

Orifice			
H (ft)	C	A	Qout (cfs)
0.80	0.65	3.14	14.6

LID

Orifice			
H (ft)	C	A	Qout (cfs)
0.38	0.65	3.14	10.1

Hydraulic Calculations

Proposed Condition

NODE 153F

Qdesign

Weir			
Hw (ft)	C	L	Qout (cfs)
1.43	3.32	32.0	181.7

Q50

Weir			
Hw (ft)	C	L	Qout (cfs)
1.53	3.32	32.0	201.1

Q25

Weir			
Hw (ft)	C	L	Qout (cfs)
1.34	3.32	32.0	164.8

Q10

Weir			
Hw (ft)	C	L	Qout (cfs)
1.075	3.32	32.0	118.4

Q5

Weir			
Hw (ft)	C	L	Qout (cfs)
0.84	3.32	32.0	81.8

Q2

Weir			
Hw (ft)	C	L	Qout (cfs)
0.45	3.32	32.0	32.1

LID

Weir			
Hw (ft)	C	L	Qout (cfs)
0	3.32	32.0	0.0

$Q=CLH^{1.5}$

C=Broad Crested Weir Coefficient

Based on Weir Breadth and Head

Hydraulic Calculations

Proposed Condition

NODE 303 AF

Qdesign

Orifice			
H (ft)	C	A	Qout (cfs)
1.09	0.65	0.20	1.1

Q50

Orifice			
H (ft)	C	A	Qout (cfs)
1.08	0.65	0.20	1.1

Q25

Orifice			
H (ft)	C	A	Qout (cfs)
1.03	0.65	0.20	1.0

Q10

Orifice			
H (ft)	C	A	Qout (cfs)
0.96	0.65	0.20	1.0

Q5

Orifice			
H (ft)	C	A	Qout (cfs)
0.90	0.65	0.20	1.0

Q2

Orifice			
H (ft)	C	A	Qout (cfs)
0.80	0.65	0.20	0.9

LID

Orifice			
H (ft)	C	A	Qout (cfs)
0.05	0.65	0.20	0.2

Hydraulic Calculations

Proposed Condition

NODE 304F

Qdesign

Weir			
Hw (ft)	C	L	Qout (cfs)
0.39	3.32	16.0	12.9

Q50

Weir			
Hw (ft)	C	L	Qout (cfs)
0.38	3.32	16.0	12.4

Q25

Weir			
Hw (ft)	C	L	Qout (cfs)
0.33	3.32	16.0	10.1

Q10

Weir			
Hw (ft)	C	L	Qout (cfs)
0.26	3.32	16.0	7.0

Q5

Weir			
Hw (ft)	C	L	Qout (cfs)
0.2	3.32	16.0	4.8

Q2

Weir			
Hw (ft)	C	L	Qout (cfs)
0.09	3.32	16.0	1.4

LID

Weir			
Hw (ft)	C	L	Qout (cfs)
0	3.32	16.0	0.0

$Q=CLH^{1.5}$

C=Broad Crested Weir Coefficient

Based on Weir Breadth and Head

Perc Basin Volume Calculation

VTM 060257, Sterling
Proposed Condition

Node 203A- Q50 Clear WSE

Elevation	Area (ft^2)	Volume (ft^3)	Volume (ac-ft)	Capacity (ac-ft)
1274	20,995	-	-	-
1276	25,277	46,272	1.06	1.06
1278	30,172	55,449	1.27	2.34
1280	35,052	65,224	1.50	3.83
1282	40,237	75,289	1.73	5.56
1282.5	42,073	20,578	0.47	6.03
1283	43,478	21,388	0.49	6.52

Perc Basin **Hydromod** Volume Required (ac-ft) = **4.93**
Basin Capacity Provided (ac-ft) = **6.52**
WS Elevation = **1,281.3**

Elevation	Volume
1282.0	5.56
X	4.93
1283.0	6.52

X= **1281.3**

Node 203A- Design Storm WSE

Elevation	Area (ft^2)	Volume (ft^3)	Volume (ac-ft)	Capacity (ac-ft)
1274	20,995	-	-	-
1276	25,277	46,272	1.06	1.06
1278	30,172	55,449	1.27	2.34
1280	35,052	65,224	1.50	3.83
1282	40,237	75,289	1.73	5.56
1282.5	42,073	20,578	0.47	6.03
1283	43,478	21,388	0.49	6.52

Perc Basin **Design** Volume Required (ac-ft) = **5.98**
Basin Capacity Provided (ac-ft) = **6.52**
WS Elevation = **6.0**

Volume	Elevation
5.6	1282.00
5.98	X
6.0	1282.50

X= **1282.45**

Node 307A-Q50 Clear WSE

Elevation	Area (ft^2)	Volume (ft^3)	Volume (ac-ft)	Capacity (ac-ft)
1210	2,881	-	-	-
1212	4,660	7,541	0.17	0.17
1213	5,525	5,093	0.12	0.29
1213.5	5,980	2,876	0.07	0.36
1214	6,573	3,138	0.07	0.43

Perc Basin **Hydromod** Volume Required (ac-ft) = **0.29**
Basin Capacity Provided (ac-ft) = **0.43**
WS Elevation = **1,212.9**

Elevation	Volume
1212.0	0.17
X	0.29
1214.0	0.43

X= **1212.9**

Node 307A- Design Storm WSE

Elevation	Area (ft^2)	Volume (ft^3)	Volume (ac-ft)	Capacity (ac-ft)
1210	2,881	-	-	-
1212	4,660	7,541	0.17	0.17
1213	5,525	5,093	0.12	0.29
1213.5	5,980	2,876	0.07	0.36
1214	6,573	3,138	0.07	0.43

Perc Basin **Design** Volume Required (ac-ft) = **0.30**
Basin Capacity Provided (ac-ft) = **0.43**
WS Elevation = **1,213.1**

Elevation	Volume
1213.0	0.29
1213.1	X
1213.5	0.36

X= **0.30**

Node 154A- Q50 Clear WSE

Elevation	Area (ft^2)	Volume (ft^3)	Volume (ac-ft)	Capacity (ac-ft)
1188	42,210	-	-	-
1190	48,228	90,438	2.08	2.08
1192	54,721	102,949	2.36	4.44
1194	61,304	116,025	2.66	7.10
1195.50	66,411	95,786	2.20	9.30
1196	68,151	33,641	0.77	10.07

Perc Basin **Hydromod** Volume Required (ac-ft) = **8.51**

Basin Capacity Provided (ac-ft) = **10.07**

WS Elevation = **1,194.9**

Elevation	Volume
1194.0	7.10
X	8.51
1196.0	10.07

X= **1194.9**

Node 406A- LID WSE

Elevation	Area (ft^2)	Volume (ft^3)	Volume (ac-ft)	Capacity (ac-ft)
1193.5	6,972	-	-	-
1194	8,300	3,818	0.09	0.09
1195	11,008	9,654	0.22	0.31

Perc Basin **LID** Volume Required (ac-ft) = **0.23**

Basin Capacity Provided (ac-ft) = **0.31**

WS Elevation = **1,194.6**

Elevation	Volume
1194.0	0.09
X	0.23
1195.0	0.31

X= **1194.6**

Drawdown Calculation

TM 060257, Sterling
Proposed Condition

PERC. BASIN -1 (Node 154A)

$d=t_p \times f_{design}/12$

Known:
d= 8' Storage
F_{design}= 1.7 in/hr
t_p= detention time

$8' = t_p * (1.7/12)$

t_p= 56.5 hours
t_p < 96 hours Max drawdown allowed

PERC. BASIN -2 (Node 203A)

$d=t_p \times f_{design}/12$

Known:
d= 9' Storage
F_{design}= 1.7 in/hr
t_p= detention time

$9' = t_p * (1.7/12)$

t_p= 63.5 hours
t_p < 96 hours Max drawdown allowed

PERC. BASIN -3 (Node 307A)

$d=t_p \times f_{design}/12$

Known:
d= 3' Storage
F_{design}= 1.7 in/hr
t_p= detention time

$3' = t_p * (1.7/12)$

t_p= 21.2 hours
t_p < 96 hours Max drawdown allowed

PERC. BASIN -4 (Node 406A)

$d=t_p \times f_{design}/12$

Known:
d= 1.5' Storage
F_{design}= 1.7 in/hr
t_p= detention time

$1.5' = t_p * (1.7/12)$

t_p= 10.6 hours
t_p < 96 hours Max drawdown allowed

Section 5

DPV & Bulking Calculation (Subarea)

TTM No. 060257

Existing Condition, Design Frequency (50-yr)

AREA 100

Node Number	DPA Zone	Total Area (ac)	$DP_{Tributary\ Area}$ (ac)	$DP_{Tributary\ Area}$ (mi^2)	Bulking Rate	Qb (cfs)	Qbb (cfs)	DP Rate (cy/mi^2)	Subarea DPV (cy)
3A	5	7.2	7.2	0.011	1.465	15.0	22.0	81,000	911
5A	5	17.3	17.3	0.027	1.465	32.2	47.2	81,000	2,190
7A	5	19.9	19.9	0.031	1.465	33.3	48.8	81,000	2,519
9B	5	10.6	10.6	0.017	1.465	23.7	34.7	81,000	1,342
11B	5	7.0	7.0	0.011	1.465	19.1	28.0	81,000	886
13B	5	10.6	10.6	0.017	1.465	20.8	30.5	81,000	1,342
15A	5	27.7	27.7	0.043	1.465	44.3	64.9	81,000	3,506
16C	5	25.8	25.8	0.040	1.465	43.5	63.7	81,000	3,265
19C	5	8.9	8.9	0.014	1.465	17.8	26.1	81,000	1,126
22A	5	7.2	6.4	0.010	1.465	15.3	21.6	81,000	810
26B	5	24.4	20.6	0.032	1.465	43.7	60.9	81,000	2,607
32C	5	8.6	8.6	0.013	1.465	21.0	30.8	81,000	1,088
33C	5	15.1	12	0.019	1.465	27.4	37.5	81,000	1,519
35B	5	29.1	16.7	0.026	1.465	51.3	65.0	81,000	2,114
38A	5	3.3	2.3	0.004	1.465	8.4	11.1	81,000	291
42B	5	24.3	24.3	0.038	1.465	38.8	56.8	81,000	3,075
44C	5	14.9	8.64	0.014	1.465	27.7	35.2	81,000	1,094
46B	5	6.0	6.0	0.009	1.465	14.7	21.5	81,000	759
								Total	30,443

OFF-SITE

Node Number	DPA Zone	Total Area (ac)	$DP_{Tributary\ Area}$ (ac)	$DP_{Tributary\ Area}$ (mi^2)	Bulking Rate	Qb (cfs)	Qbb (cfs)	DP Rate (cy/mi^2)	Subarea DPV (cy)
Offsite	5	4.3	3.9	0.006	1.465	10.8	15.4	81,000	494

DPV & Bulking Calculations (Junction & Outlet)

VTM No. 060257, Sterling

Proposed Condition, Design Frequency (Mixed 50-& 25-yr)

Junction Number	ΣQ_{BURN} (cfs)	ΣA (ac)	ΣA (mi^2)	Au (ac)	Au (mi^2)	Ad (ac)	Ad (mi^2)	$BF1_A$	$BF1_{Au}$	ΣQbb (cfs)	DP Rate (cy/mi^2)	DPV (cy)
112AB	18.5	84.6	0.132	0.0	0.000	84.6	0.132	0.000	0.000	18.5	-	-
124AC	129.9	142.8	0.223	0.0	0.000	142.8	0.223	0.000	0.000	129.9	-	-
148AD	194.4	150.3	0.235	0.0	0.000	150.3	0.235	0.000	0.000	194.4	-	-
302A	15.2	7.2	0.011	5.3	0.008	1.9	0.003	1.465	1.465	20.4	81,000	671
405AB	183.4	188.5	0.295	0.0	0.000	188.5	0.295	0.000	0.000	183.4	-	-
412CD	84.2	47.2	0.074	47.2	0.074	0.0	0.000	1.465	1.465	123.3	81,000	5,974
415AC	331.7	269.7	0.421	75.0	0.117	194.7	0.304	1.380	1.450	371.4	75,000	8,789
Outlet	333.7	271.1	0.424	75.0	0.117	196.1	0.306	1.380	1.450	373.5	75,000	8,789
											Total	24,223

Legend:

ΣQ_{BURN}	---	Burned Flow Rate, cfs
A	---	Total Area, ac
Au	---	Undeveloped Area, ac
Ad	---	Developed Area, ac
$BF1_A$	---	Bulking Factor for **A** (See Chart P-5)
$BF1_{Au}$	---	Bulking Factor for **Au** (See Chart P-5)
Qbb	---	Burned & Bulked Flow Rate, cfs (for DPA Zone 5)
		Qbb = $BF1_A$ x [QaxAu/A][Au/A)] + $BF1_{Au}$ x [QaxAu/A)][Ad/A] + [QaxAd/A]
DP Rate	---	Debris Production Rate for **Au**, cy/mi^2 (See Chart P-2)
DPV	---	Debris Production Volume, cy
		DPV = Au x DP Rate

DPV & Bulking Calculation (Subarea)

VTM No. 060257

Proposed Condition, Design Frequency (50-yr)

Node Number	DPA Zone	Total Area (ac)	$DP_{Tributary\ Area}$ (ac)	$DP_{Tributary\ Area}$ (mi^2)	Bulking Rate	Qb (cfs)	Qbb (cfs)	DP Rate (cy/mi^2)	Subarea DPV (cy)
101A	5	40.6	40.6	0.063	1.465	67.9	99.5	81,000	5,138
105B	5	28.4	28.4	0.044	1.465	47.5	69.6	81,000	3,594
115C	5	14.4	14.4	0.023	1.465	32.2	47.2	81,000	1,823
130D	5	3.7	3.7	0.006	1.465	10.1	14.8	81,000	468
131D	5	2.2	2.2	0.003	1.465	6.0	8.8	81,000	278
135D	5	2.8	2.8	0.004	1.465	7.6	11.1	81,000	354
301A	5	2.6	2.6	0.004	1.465	7.1	10.4	81,000	329
302A	5	4.6	2.7	0.004	1.465	10.3	13.1	81,000	342
408C	5	23.4	23.4	0.037	1.465	41.9	61.4	81,000	2,962
409D	5	8.7	8.7	0.014	1.465	21.2	31.1	81,000	1,101
410D	5	15.1	15.1	0.024	1.465	27.4	40.1	81,000	1,911
413C	5	27.8	27.8	0.043	1.465	51.4	75.3	81,000	3,518
								Total	21,819

OFF-SITE

Node Number	DPA Zone	Total Area (ac)	$DP_{Tributary\ Area}$ (ac)	$DP_{Tributary\ Area}$ (mi^2)	Bulking Rate	Qb (cfs)	Qbb (cfs)	DP Rate (cy/mi^2)	Subarea DPV (cy)
Offsite	5	4.4	1.3	0.002	1.465	10.7	12.2	81,000	165

DPV & Bulking Calculations (Junction & Outlet)

VTM No. 060257, Sterling

Proposed Condition, Design Frequency (Mixed 50-& 25-yr)

Junction Number	ΣQ_{BURN} (cfs)	ΣA (ac)	ΣA (mi^2)	Au (ac)	Au (mi^2)	Ad (ac)	Ad (mi^2)	$BF1_A$	$BF1_{Au}$	ΣQbb (cfs)	DP Rate (cy/mi^2)	DPV (cy)
112AB	23.5	84.6	0.132	0.0	0.000	84.6	0.132	0.000	0.000	23.5	-	-
124AC	134.3	142.8	0.223	0.0	0.000	142.8	0.223	0.000	0.000	134.3	-	-
148AD	198.1	150.3	0.235	0.0	0.000	150.3	0.235	0.000	0.000	198.1	-	-
302A	15.2	7.2	0.011	5.3	0.008	1.9	0.003	1.465	1.465	20.4	81,000	671
405AB	186.4	188.5	0.295	0.0	0.000	188.5	0.295	0.000	0.000	186.4	-	-
412CD	85.2	47.2	0.074	47.2	0.074	0.0	0.000	1.465	1.465	124.8	81,000	5,974
415AC	334.7	269.7	0.421	75.0	0.117	194.7	0.304	1.380	1.450	374.8	75,000	8,789
Outlet	336.7	271.1	0.424	75.0	0.117	196.1	0.306	1.380	1.450	376.8	75,000	8,789
											Total	24,223

Legend:

ΣQ_{BURN}	---	Burned Flow Rate, cfs
A	---	Total Area, ac
Au	---	Undeveloped Area, ac
Ad	---	Developed Area, ac
$BF1_A$	---	Bulking Factor for **A** (See Chart P-5)
$BF1_{Au}$	---	Bulking Factor for **Au** (See Chart P-5)
Qbb	---	Burned & Bulked Flow Rate, cfs (for DPA Zone 5)
		Qbb = $BF1_A$ x [QaxAu/A][Au/A)] + $BF1_{Au}$ x [QaxAu/A)][Ad/A] + [QaxAd/A]
DP Rate	---	Debris Production Rate for **Au**, cy/mi^2 (See Chart P-2)
DPV	---	Debris Production Volume, cy
		DPV = Au x DP Rate

Debris Basin Volume Calculation

VTM 060257, Sterling
Proposed Condition

Node 101A

Elevation	Area (ft^2)	Volume (ft^3)	Volume (cy)	Capacity (cy)
1277	19,478	-	-	-
1278	20,767	20,122.50	745	745
1280	23,437	44,204.00	1,637	2,382
1282	26,205	49,642.00	1,839	4,221
1283	27,646	26,925.50	997	5,218

Debris Production Volume Required (c.y.) = **5,138**
Basin Capacity Provided (c.y.) = **5,218**
Debris Cone Elevation = **1,283.4**

Elevation	Volume
1278.0	745
X	5138
1280.0	2382
X=	**1283.4**

Node 105B

Elevation	Area (ft^2)	Volume (ft^3)	Volume (cy)	Capacity (cy)
1282	13,321	-	-	-
1284	15,441	28,762.00	1,065	1,065
1286	17,696	33,137.00	1,227	2,293
1288	20,086	37,782.00	1,399	3,692

Debris Production Volume Required (c.y.) = **3,594**
Basin Capacity Provided (c.y.) = **3,692**
Debris Cone Elevation = **1,287.9**

Elevation	Volume
1284.0	1065
X	3594
1288.0	3692
X=	**1287.9**

Node 110B

Elevation	Area (ft^2)	Volume (ft^3)	Volume (cy)	Capacity (cy)
1277	2,708	-	-	-
1278	3,518	3,113.00	115	115
1280	5,013	8,531.00	316	431
1281	5,706	3,573.00	132	564

Debris Production Volume Required (c.y.) = **519**
Basin Capacity Provided (c.y.) = **564**
Debris Cone Elevation = **1,280.7**

Elevation	Volume
1280.0	431
X	519
1281.0	564
X=	**1280.7**

Node 115C

Elevation	Area (ft^2)	Volume (ft^3)	Volume (cy)	Capacity (cy)
1305	5,842	-	-	-
1306	6,543	6,192.50	229	229
1308	8,432	14,975.00	555	784
1310	10,328	18,760.00	695	1,479
1311	11,235	10,781.50	399	1,878

Debris Production Volume Required (c.y.) = **1,823**
Basin Capacity Provided (c.y.) = **1,878**
Debris Cone Elevation = **1,310.9**

Elevation	Volume
1310.0	1479
X	1823
1311.0	1878
X=	**1310.9**

Node 130D

Elevation	Area (ft^2)	Volume (ft^3)	Volume (cy)	Capacity (cy)
1319	3,778	-	-	-
1320	5,078	4,428.00	164	164
1322	7,097	12,175.00	451	615
1323	8,353	5,150.00	191	806

Debris Production Volume Required (c.y.) = **468**
Basin Capacity Provided (c.y.) = **806**
Debris Cone Elevation = **1,321.3**

Elevation	Volume
1320.0	164
X	468
1322.0	615
X=	**1321.3**

Node 131D

Elevation	Area (ft^2)	Volume (ft^3)	Volume (cy)	Capacity (cy)
1319	2,646	-	-	-
1320	3,673	3,159.50	117	117
1322	6,136	9,809.00	363	480
1323	7,408	6,772.00	251	731

Debris Production Volume Required (c.y.) = **278**
Basin Capacity Provided (c.y.) = **731**
Debris Cone Elevation = **1,320.9**

Elevation	Volume
1320.0	117
X	278
1322.0	480
X=	**1320.9**

Node 135D

Elevation	Area (ft^2)	Volume (ft^3)	Volume (cy)	Capacity (cy)
1262	3,356	-	-	-
1264	4,678	8,034.00	298	298
1266	6,083	10,761.00	399	696

Debris Production Volume Required (c.y.) = **354**
Basin Capacity Provided (c.y.) = **696**
Debris Cone Elevation = **1,264.3**

Elevation	Volume
1264.0	298
X	354
1266.0	696
X=	**1264.3**

Node 305A

Elevation	Area (ft^2)	Volume (ft^3)	Volume (cy)	Capacity (cy)
1215	2,046	-	-	-
1217	3,625	5,671.00	210	210
1219	5,493	9,118.00	338	548
1220	7,625	6,559.00	243	791

Debris Production Volume Required (c.y.) = **671**
Basin Capacity Provided (c.y.) = **791**
Debris Cone Elevation = **1,219.4**

Elevation	Volume
1217.0	210
X	671
1220.0	791
X=	**1219.4**

Section 6

WATER QUALITY SUMMARY

TTM 060257, Sterling
Proposed Condition

LID Design Frequency
Basin 203A (6.5 ac-ft volume provided)

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Vol (ac-ft)
TM 60257	101A	40.6	1736	0.13	1.05	0.01	97	85th Percentile		136	0.13	0.10	0.11	0.58	0.38
TM 60257	102A	4.8	783	0.014	1.05	0.42	97	85th Percentile		47	0.22	0.10	0.44	0.46	0.18
TM 60257	105B	28.4	1840	0.13	1.05	0.01	97	85th Percentile		141	0.13	0.10	0.11	0.40	0.27
TM 60257	203A	1.6	125	0.09	1.05	0.1	97	85th Percentile		17	0.35	0.14	0.21	0.1	0.03
TOTAL		75.4											Σ=	1.54	0.86

Basin 154A (10.1 ac-ft volume provided)

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency		Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Vol (ac-ft)
TM 60257	110B	3.3	704	0.166	1.05	0.42	97	85th Percentile		28	0.28	0.10	0.44	0.40	0.12
TM 60257	111B	5.1	606	0.036	1.05	0.42	97	85th Percentile		33	0.26	0.10	0.44	0.57	0.19
TM 60257	113A	7.9	995	0.058	1.05	0.42	97	85th Percentile		42	0.23	0.10	0.44	0.79	0.30
TM 60257	115C	14.4	910	0.24	1.05	0.01	97	85th Percentile		80	0.17	0.10	0.11	0.26	0.13
TM 60257	116C	10.1	875	0.027	1.05	0.42	97	85th Percentile		44	0.23	0.10	0.44	0.99	0.38
TM 60257	117C	10	572	0.026	1.05	0.42	97	85th Percentile		34	0.25	0.10	0.44	1.11	0.38
TM 60257	119C	5.3	787	0.024	1.05	0.42	97	85th Percentile		42	0.23	0.10	0.44	0.53	0.20
TM 60257	121C	4.7	1009	0.056	1.05	0.5	97	85th Percentile		39	0.24	0.10	0.50	0.56	0.20
TM 60257	123C	5.8	456	0.015	1.05	0.42	97	85th Percentile		33	0.26	0.10	0.44	0.65	0.22
TM 60257	126A	0.7	487	0.037	1.05	0.91	97	85th Percentile		19	0.33	0.12	0.83	0.19	0.05
TM 60257	127A	2.3	1099	0.035	1.05	0.5	97	85th Percentile		45	0.22	0.10	0.50	0.26	0.10
TM 60257	130D	3.7	480	0.27	1.05	0.01	97	85th Percentile		52	0.21	0.10	0.11	0.08	0.03
TM 60257	131D	2.2	344	0.35	1.05	0.01	97	85th Percentile		40	0.24	0.10	0.11	0.06	0.02
TM 60257	133D	7.4	989	0.058	1.05	0.42	97	85th Percentile		42	0.23	0.10	0.44	0.74	0.28
TM 60257	135D	2.8	498	0.4	1.05	0.01	97	85th Percentile		50	0.21	0.10	0.11	0.06	0.03
TM 60257	138D	7.6	920	0.039	1.05	0.42	97	85th Percentile		43	0.23	0.10	0.44	0.76	0.29
TM 60257	146D	2.5	910	0.067	1.05	0.42	97	85th Percentile		39	0.24	0.10	0.44	0.26	0.09
TM 60257	150A	4	864	0.021	1.05	0.6	97	85th Percentile		38	0.24	0.10	0.58	0.84	0.30
													Σ=	9.1	3.33
TM 60257	154A	1.8	100	0.1	1.05	0.1	97	85th Percentile		12	0.42	0.21	0.28	0.21	0.03
TOTAL AREA		101.6											Σ=	9.3	3.36
													Total Volume	9.3	3.36

Main Line (152AF)		Bypass (153F)	
Q	Vol	Q	Vol
10.4	3.99	0.0	0

WATER QUALITY SUMMARY

TTM 060257, Sterling
Proposed Condition

Basin 306A (0.4 ac-ft volume provided)

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Vol (ac-ft)
TM 60257	301A	2.6	490	0.41	1.05	0.01	97	85th Percentile	49	0.21	0.10	0.11	0.06	0.02
TM 60257	302A	4.6	835	0.063	1.05	0.41	97	85th Percentile	38	0.24	0.10	0.43	0.48	0.17
TOTAL		7.5										Σ=	0.5	0.20
												Total Volume	0.1	0.07

Main Line (305F)		Perc Basin(304AF)	
Q	Vol	Q	Vol
0.0	0.00	0.5	0.20

Basin 406A

Project	Subarea	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Vol (ac-ft)
TM 60257	402B	1.1	240	0.4	1.05	0.01	97	85th Percentile	31	0.27	0.10	0.11	0.03	0.01
TM 60257	403B	2.1	450	0.047	1.05	0.9	97	85th Percentile	17	0.35	0.14	0.82	0.61	0.15
TM 60257	406A	2	476	0.032	1.05	0.4	97	85th Percentile	30	0.27	0.10	0.42	0.23	0.07
TOTAL		5.2										Σ=	0.9	0.23

OUTLET

TM 60257	408C	23.4	1708	0.1546	1.05	0.1	97	85th Percentile	92	0.16	0.10	0.18	0.67	0.37
TM 60257	409D	8.7	707	0.1938	1.05	0.01	97	85th Percentile	71	0.18	0.10	0.11	0.17	0.08
TM 60257	410D	15.1	1544	0.0894	1.05	0.15	97	85th Percentile	83	0.17	0.10	0.22	0.56	0.29
TM 60257	413C	27.8	1604	0.084	1.05	0.25	97	85th Percentile	69	0.18	0.10	0.30	1.52	0.72
TM 60257	414C	4.2	1248	0.03	1.05	0.6	97	85th Percentile	45	0.22	0.10	0.58	0.54	0.21
TM 60257	417A	1.4	576	0.04	1.05	0.5	97	85th Percentile	29	0.27	0.10	0.50	0.19	0.06
												Σ=	3.7	1.73

Appendix A

Peak Flow Hydrologic Analysis

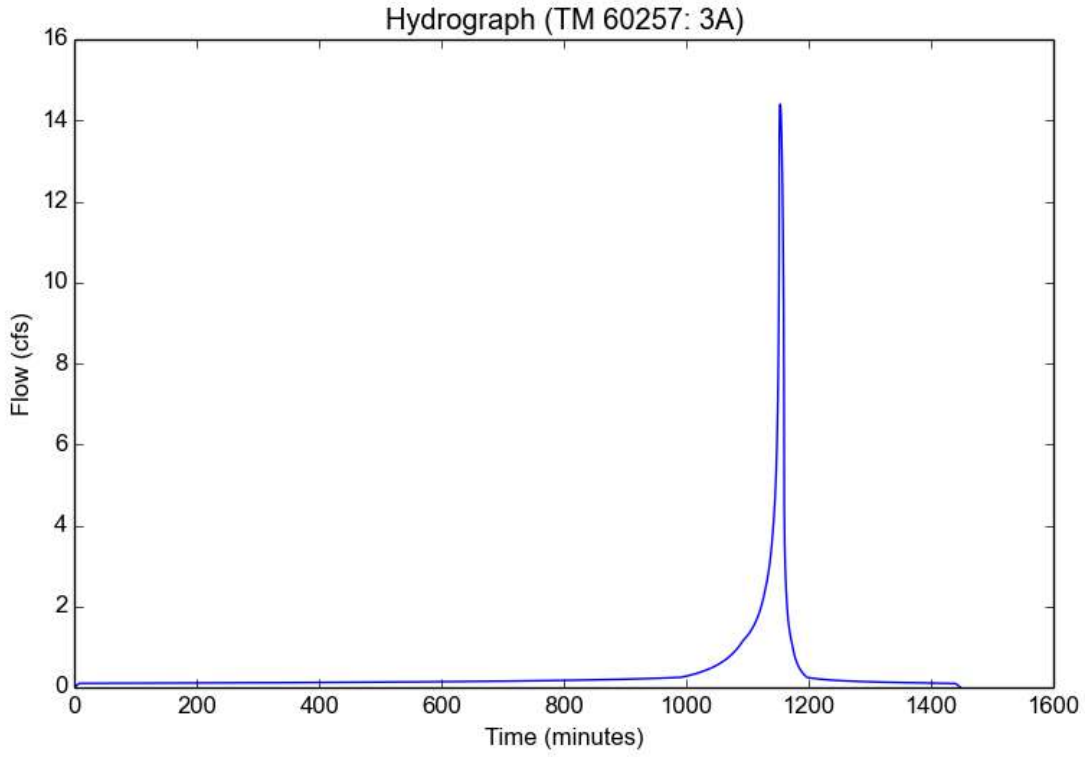
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	3A
Area (ac)	7.2
Flow Path Length (ft)	1097.0
Flow Path Slope (vft/hft)	0.237
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.7746
Undeveloped Runoff Coefficient (Cu)	0.7191
Developed Runoff Coefficient (Cd)	0.7209
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	14.4006
Burned Peak Flow Rate (cfs)	14.4006
24-Hr Clear Runoff Volume (ac-ft)	0.7248
24-Hr Clear Runoff Volume (cu-ft)	31572.0109



Peak Flow Hydrologic Analysis

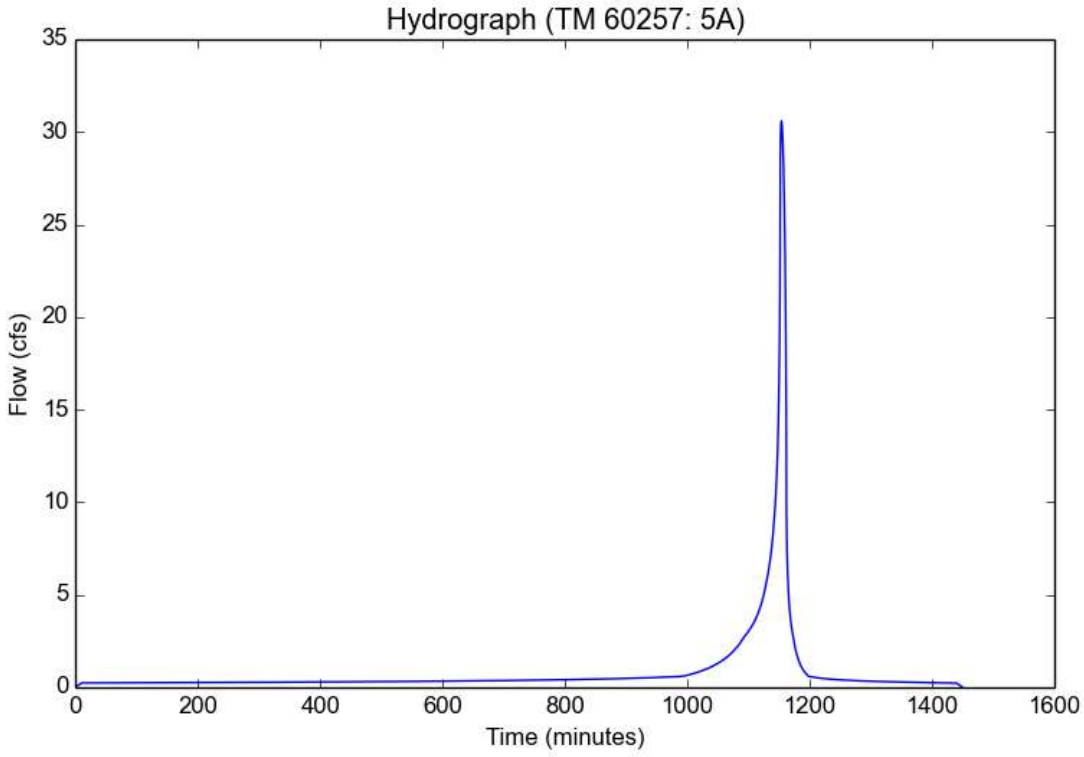
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	5A
Area (ac)	17.3
Flow Path Length (ft)	1361.0
Flow Path Slope (vft/hft)	0.1124
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.4983
Undeveloped Runoff Coefficient (Cu)	0.7059
Developed Runoff Coefficient (Cd)	0.7078
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	30.593
Burned Peak Flow Rate (cfs)	30.593
24-Hr Clear Runoff Volume (ac-ft)	1.7401
24-Hr Clear Runoff Volume (cu-ft)	75796.6311



Peak Flow Hydrologic Analysis

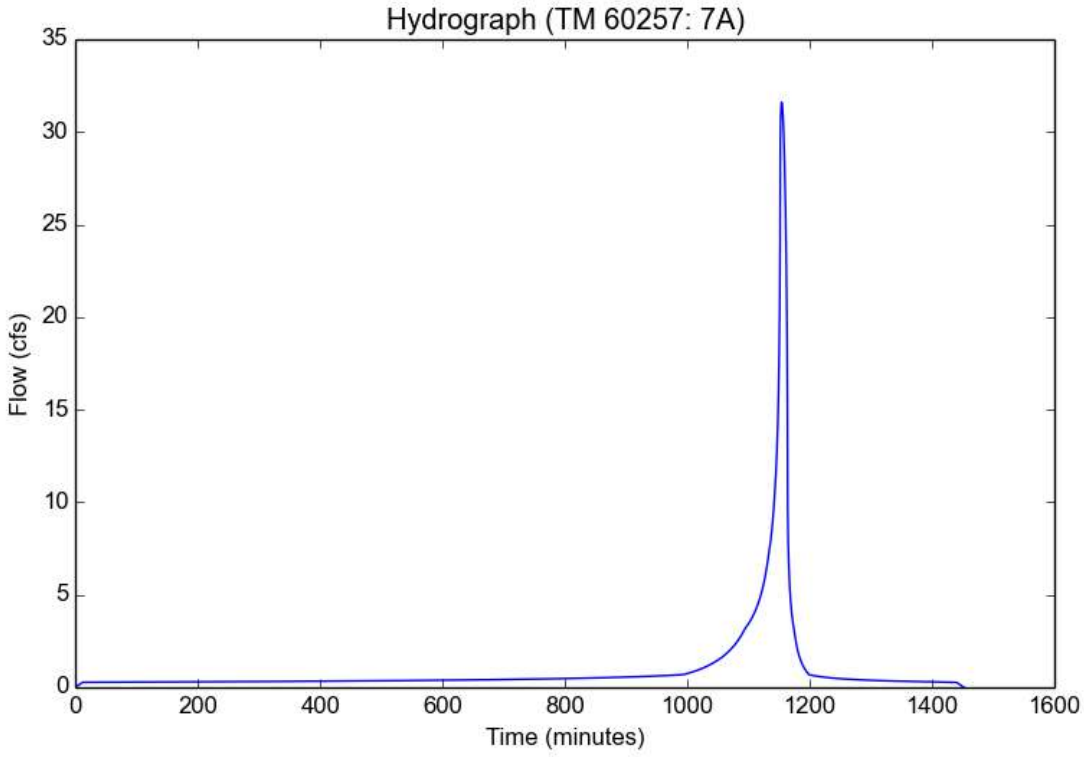
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	7A
Area (ac)	19.9
Flow Path Length (ft)	1893.0
Flow Path Slope (vft/hft)	0.1273
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.2931
Undeveloped Runoff Coefficient (Cu)	0.6905
Developed Runoff Coefficient (Cd)	0.6926
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	31.6063
Burned Peak Flow Rate (cfs)	31.6063
24-Hr Clear Runoff Volume (ac-ft)	1.999
24-Hr Clear Runoff Volume (cu-ft)	87074.5667



Peak Flow Hydrologic Analysis

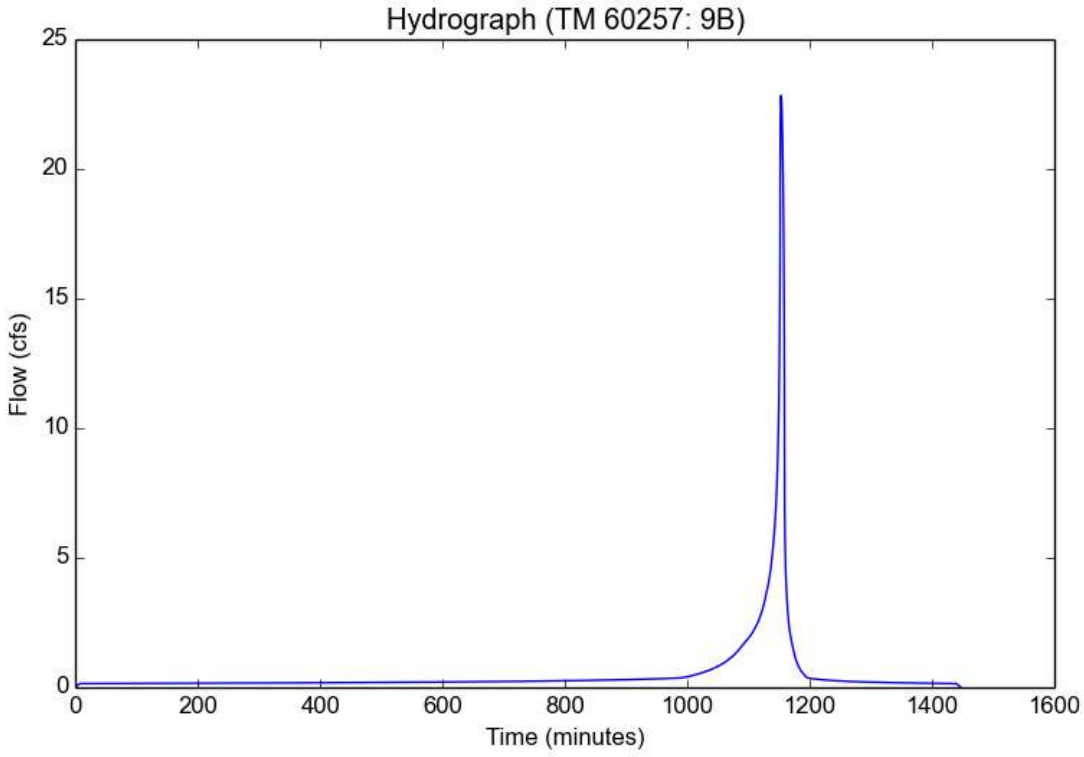
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	9B
Area (ac)	10.6
Flow Path Length (ft)	829.0
Flow Path Slope (vft/hft)	0.1942
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.9543
Undeveloped Runoff Coefficient (Cu)	0.7276
Developed Runoff Coefficient (Cd)	0.7293
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	22.8386
Burned Peak Flow Rate (cfs)	22.8386
24-Hr Clear Runoff Volume (ac-ft)	1.0675
24-Hr Clear Runoff Volume (cu-ft)	46499.7336



Peak Flow Hydrologic Analysis

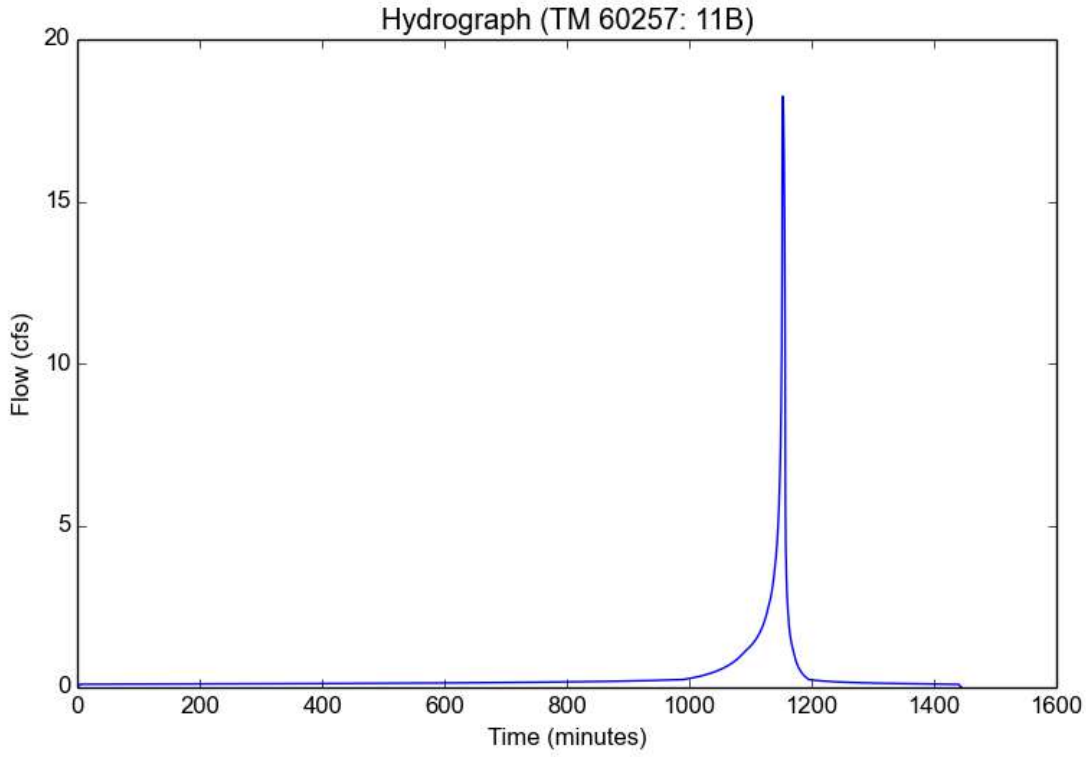
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	11B
Area (ac)	7.0
Flow Path Length (ft)	541.0
Flow Path Slope (vft/hft)	0.122
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7531
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	18.2425
Burned Peak Flow Rate (cfs)	18.2425
24-Hr Clear Runoff Volume (ac-ft)	0.7059
24-Hr Clear Runoff Volume (cu-ft)	30747.7207



Peak Flow Hydrologic Analysis

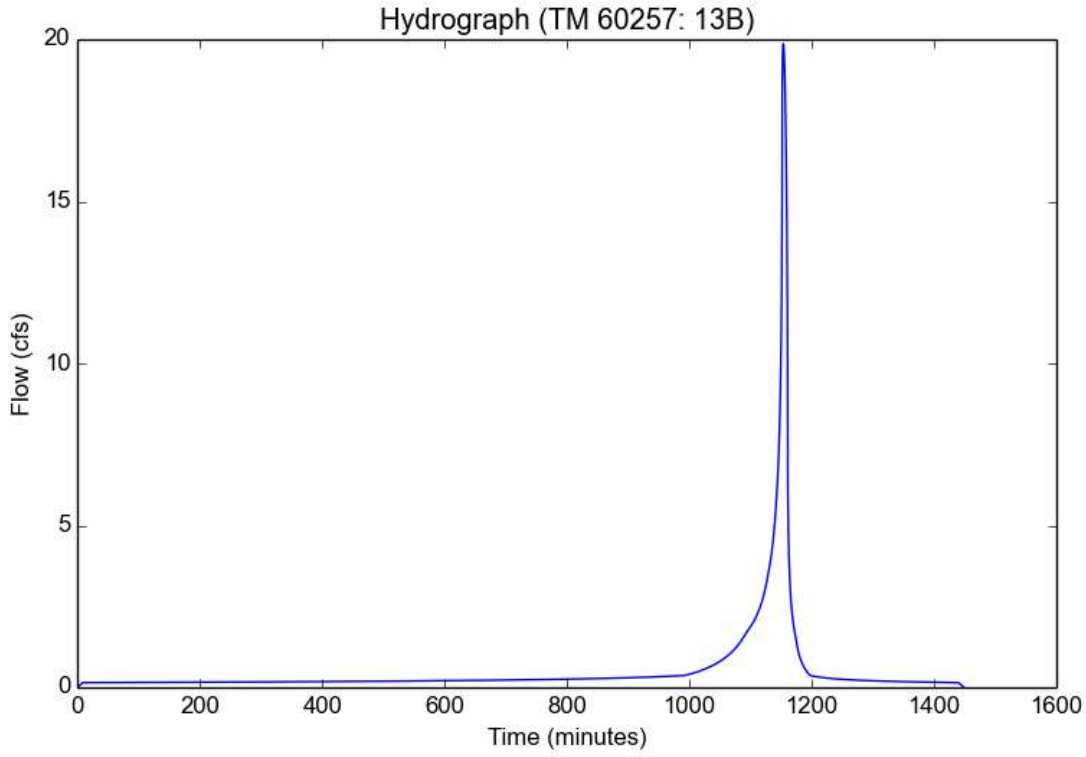
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	13B
Area (ac)	10.6
Flow Path Length (ft)	1299.0
Flow Path Slope (vft/hft)	0.137
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.6251
Undeveloped Runoff Coefficient (Cu)	0.712
Developed Runoff Coefficient (Cd)	0.7138
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	19.8636
Burned Peak Flow Rate (cfs)	19.8636
24-Hr Clear Runoff Volume (ac-ft)	1.0667
24-Hr Clear Runoff Volume (cu-ft)	46464.1336



Peak Flow Hydrologic Analysis

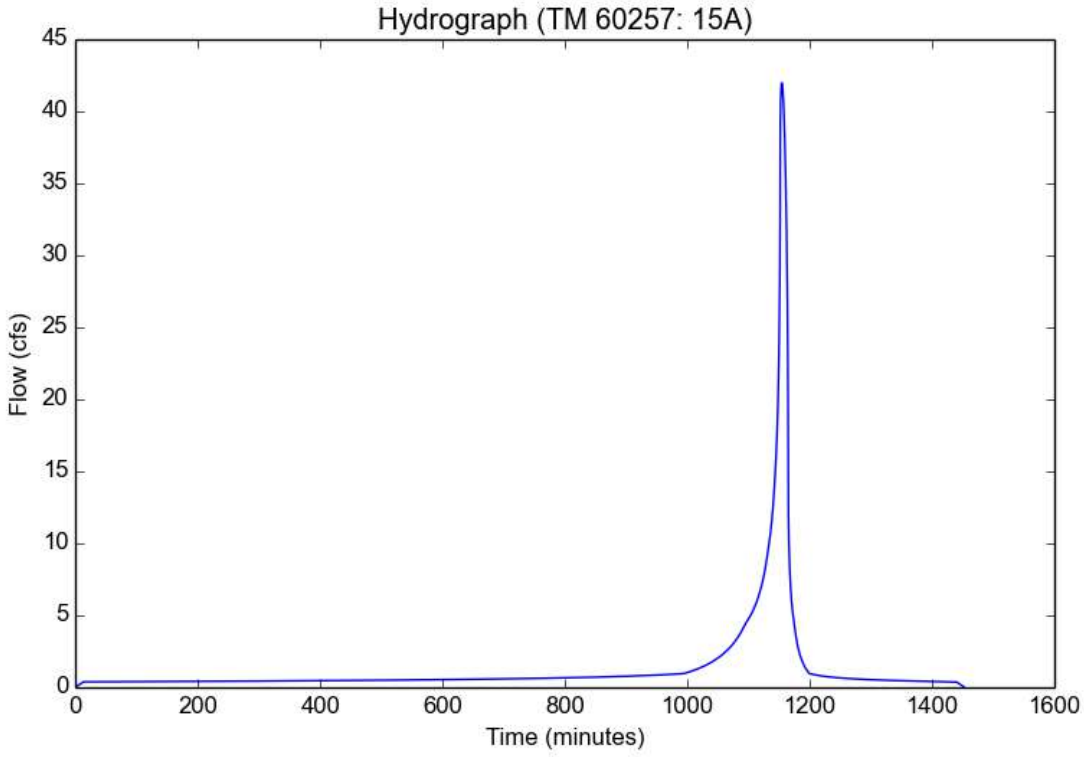
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	15A
Area (ac)	27.7
Flow Path Length (ft)	1926.0
Flow Path Slope (vft/hft)	0.1023
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.2085
Undeveloped Runoff Coefficient (Cu)	0.6842
Developed Runoff Coefficient (Cd)	0.6863
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	41.9862
Burned Peak Flow Rate (cfs)	41.9862
24-Hr Clear Runoff Volume (ac-ft)	2.781
24-Hr Clear Runoff Volume (cu-ft)	121140.1231



Peak Flow Hydrologic Analysis

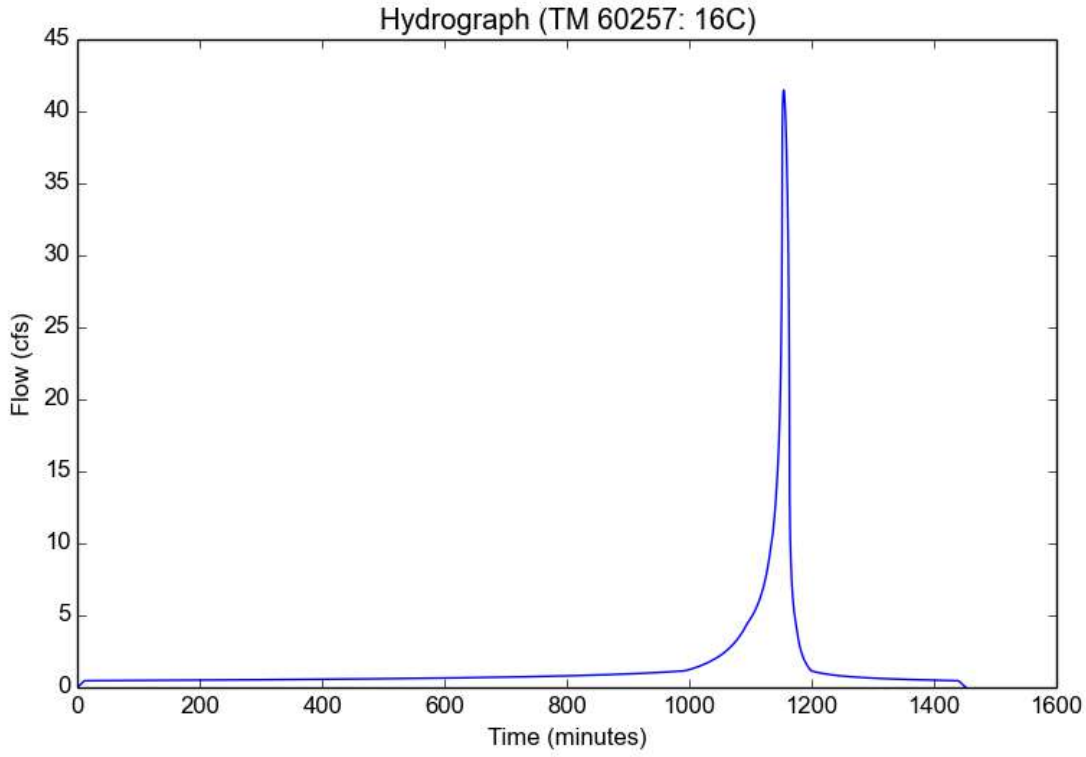
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	16C
Area (ac)	25.8
Flow Path Length (ft)	1864.0
Flow Path Slope (vft/hft)	0.1369
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.05
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.2931
Undeveloped Runoff Coefficient (Cu)	0.6905
Developed Runoff Coefficient (Cd)	0.701
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	41.4728
Burned Peak Flow Rate (cfs)	41.4728
24-Hr Clear Runoff Volume (ac-ft)	2.9366
24-Hr Clear Runoff Volume (cu-ft)	127918.678



Peak Flow Hydrologic Analysis

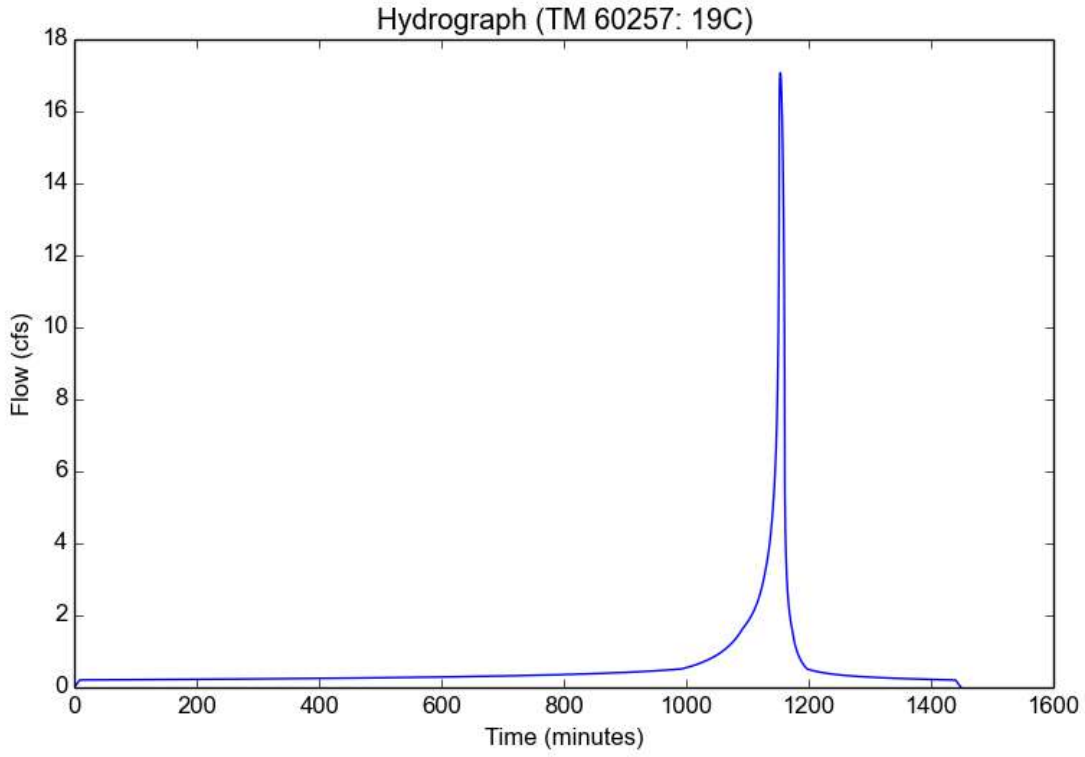
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	19C
Area (ac)	8.9
Flow Path Length (ft)	1241.0
Flow Path Slope (vft/hft)	0.12
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.1
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.6251
Undeveloped Runoff Coefficient (Cu)	0.712
Developed Runoff Coefficient (Cd)	0.7308
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	17.0734
Burned Peak Flow Rate (cfs)	17.0734
24-Hr Clear Runoff Volume (ac-ft)	1.1632
24-Hr Clear Runoff Volume (cu-ft)	50670.2142



Peak Flow Hydrologic Analysis

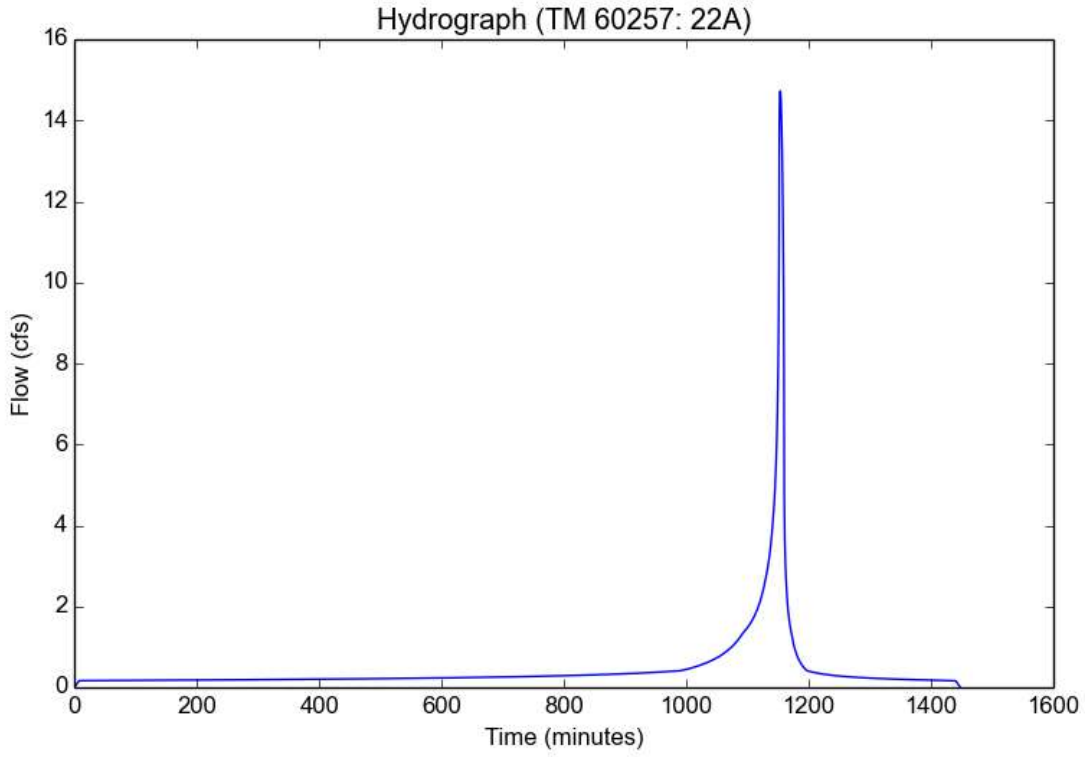
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	22A
Area (ac)	7.2
Flow Path Length (ft)	733.0
Flow Path Slope (vft/hft)	0.0314
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.1
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.7746
Undeveloped Runoff Coefficient (Cu)	0.7191
Developed Runoff Coefficient (Cd)	0.7371
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	14.7259
Burned Peak Flow Rate (cfs)	14.7259
24-Hr Clear Runoff Volume (ac-ft)	0.9413
24-Hr Clear Runoff Volume (cu-ft)	41002.0562



Peak Flow Hydrologic Analysis

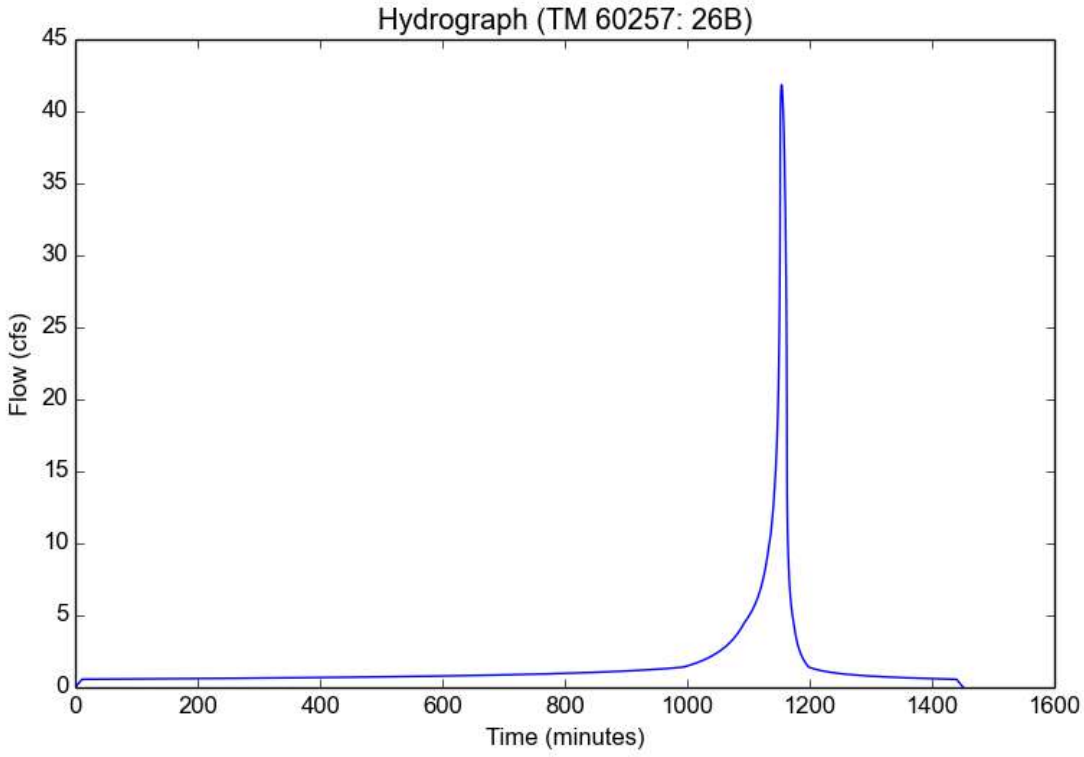
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	26B
Area (ac)	24.4
Flow Path Length (ft)	1708.0
Flow Path Slope (vft/hft)	0.1546
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.1
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.3889
Undeveloped Runoff Coefficient (Cu)	0.6977
Developed Runoff Coefficient (Cd)	0.7179
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	41.8464
Burned Peak Flow Rate (cfs)	41.8464
24-Hr Clear Runoff Volume (ac-ft)	3.1864
24-Hr Clear Runoff Volume (cu-ft)	138801.5482



Peak Flow Hydrologic Analysis

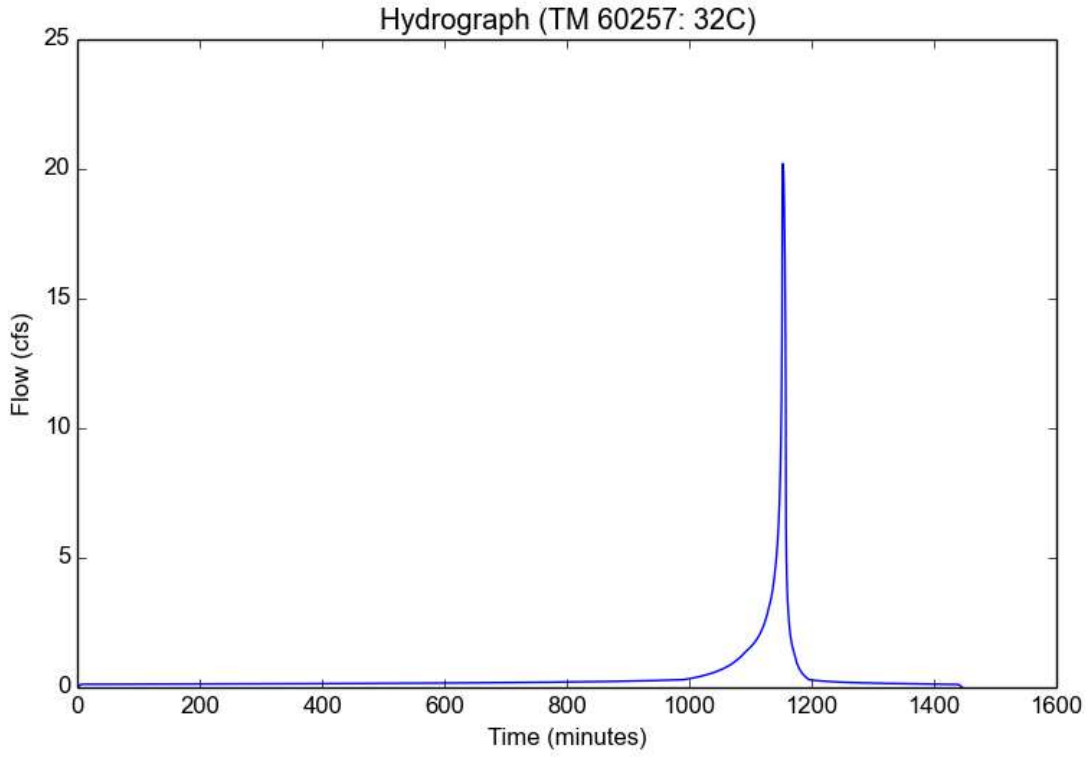
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	32C
Area (ac)	8.6
Flow Path Length (ft)	707.0
Flow Path Slope (vft/hft)	0.1938
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.1763
Undeveloped Runoff Coefficient (Cu)	0.7381
Developed Runoff Coefficient (Cd)	0.7397
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	20.2068
Burned Peak Flow Rate (cfs)	20.2068
24-Hr Clear Runoff Volume (ac-ft)	0.8666
24-Hr Clear Runoff Volume (cu-ft)	37747.1745



Peak Flow Hydrologic Analysis

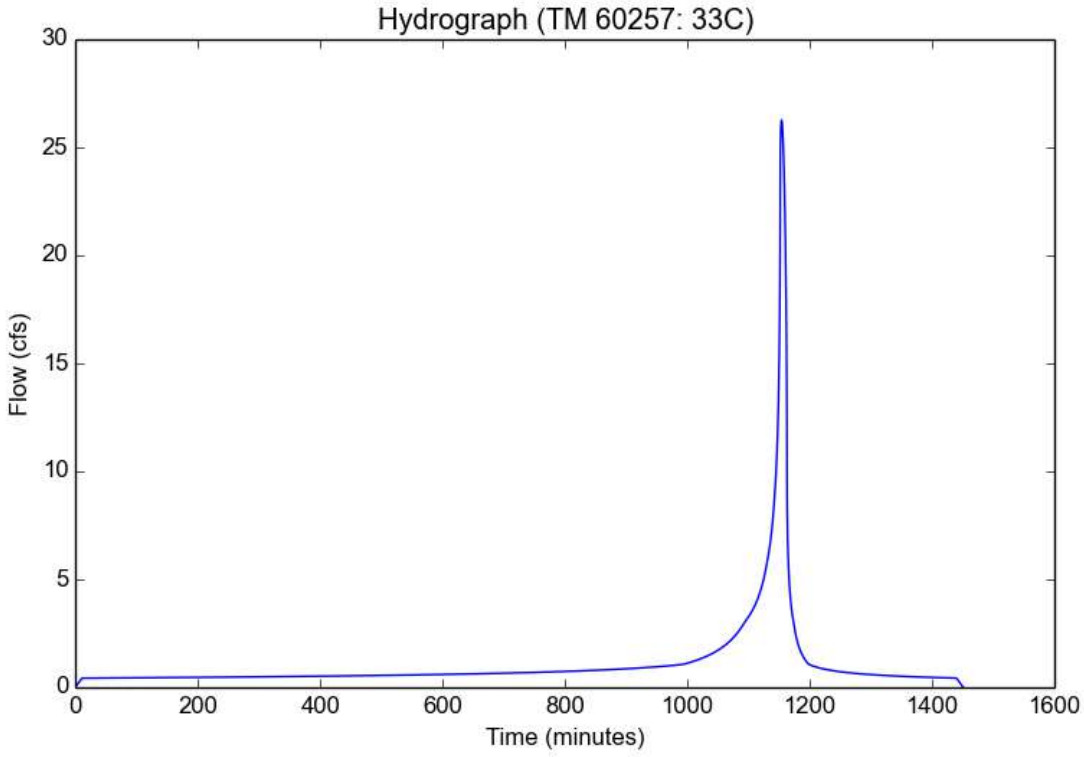
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	33C
Area (ac)	15.1
Flow Path Length (ft)	1504.0
Flow Path Slope (vft/hft)	0.0894
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.15
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.3889
Undeveloped Runoff Coefficient (Cu)	0.6977
Developed Runoff Coefficient (Cd)	0.728
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	26.2616
Burned Peak Flow Rate (cfs)	26.2616
24-Hr Clear Runoff Volume (ac-ft)	2.2243
24-Hr Clear Runoff Volume (cu-ft)	96890.0102



Peak Flow Hydrologic Analysis

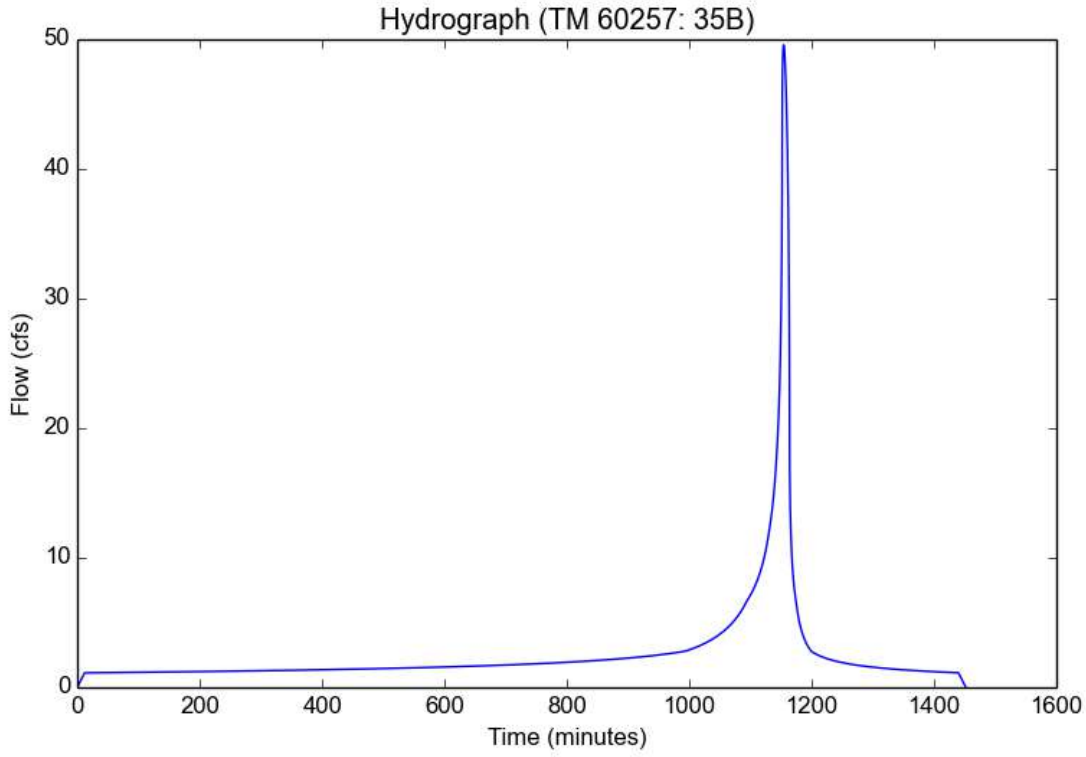
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	35B
Area (ac)	29.1
Flow Path Length (ft)	1808.0
Flow Path Slope (vft/hft)	0.1217
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.25
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.2931
Undeveloped Runoff Coefficient (Cu)	0.6905
Developed Runoff Coefficient (Cd)	0.7429
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	49.5733
Burned Peak Flow Rate (cfs)	49.5733
24-Hr Clear Runoff Volume (ac-ft)	5.2578
24-Hr Clear Runoff Volume (cu-ft)	229031.4901



Peak Flow Hydrologic Analysis

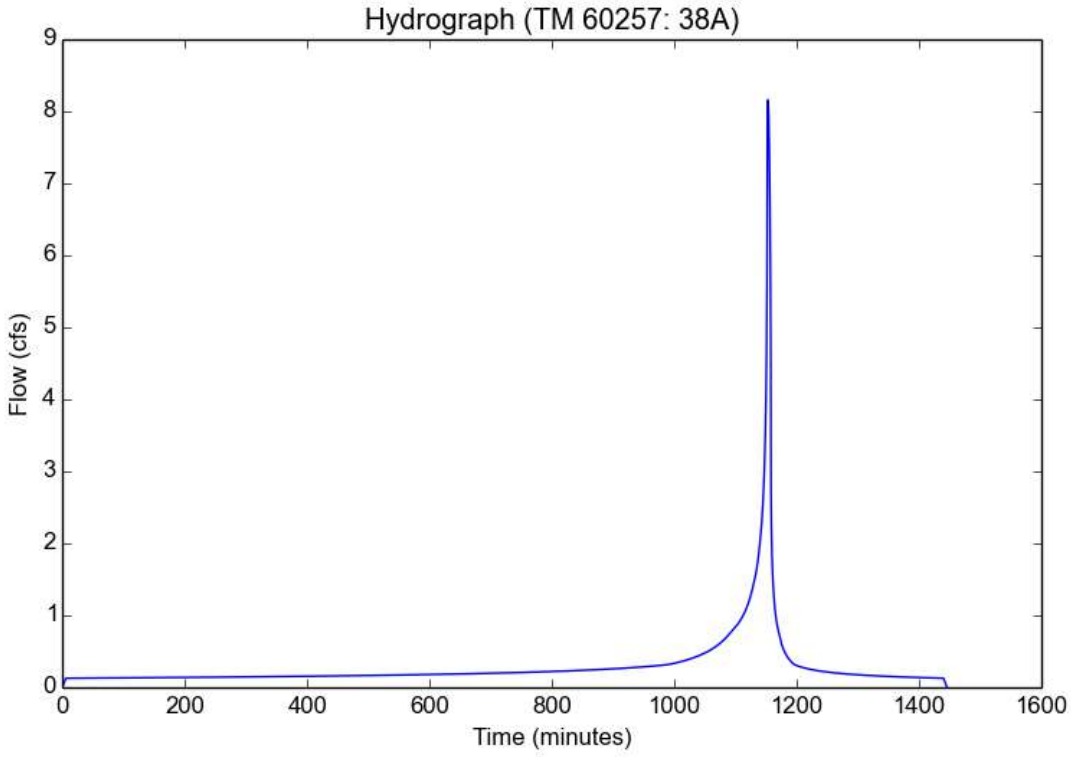
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	38A
Area (ac)	3.3
Flow Path Length (ft)	654.0
Flow Path Slope (vft/hft)	0.1437
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.25
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.1763
Undeveloped Runoff Coefficient (Cu)	0.7381
Developed Runoff Coefficient (Cd)	0.7786
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	8.161
Burned Peak Flow Rate (cfs)	8.161
24-Hr Clear Runoff Volume (ac-ft)	0.597
24-Hr Clear Runoff Volume (cu-ft)	26006.6226



Peak Flow Hydrologic Analysis

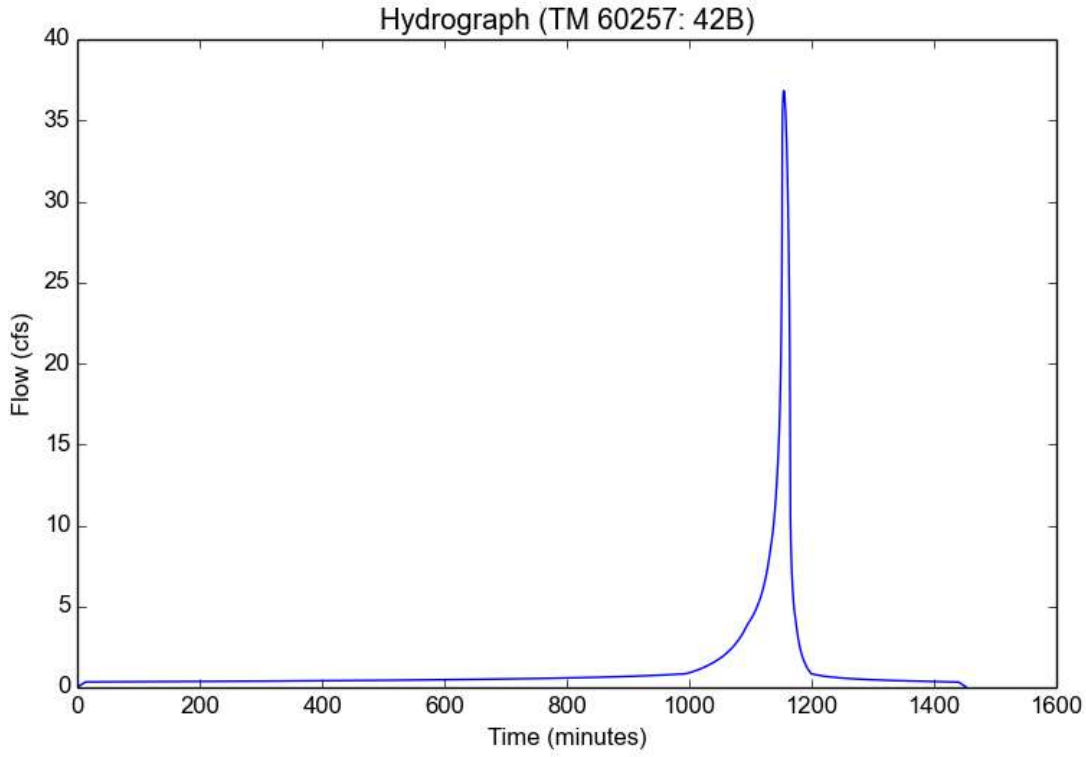
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	42B
Area (ac)	24.3
Flow Path Length (ft)	1927.0
Flow Path Slope (vft/hft)	0.123
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.2085
Undeveloped Runoff Coefficient (Cu)	0.6842
Developed Runoff Coefficient (Cd)	0.6863
Time of Concentration (min)	13.0
Clear Peak Flow Rate (cfs)	36.8326
Burned Peak Flow Rate (cfs)	36.8326
24-Hr Clear Runoff Volume (ac-ft)	2.4396
24-Hr Clear Runoff Volume (cu-ft)	106270.9384



Peak Flow Hydrologic Analysis

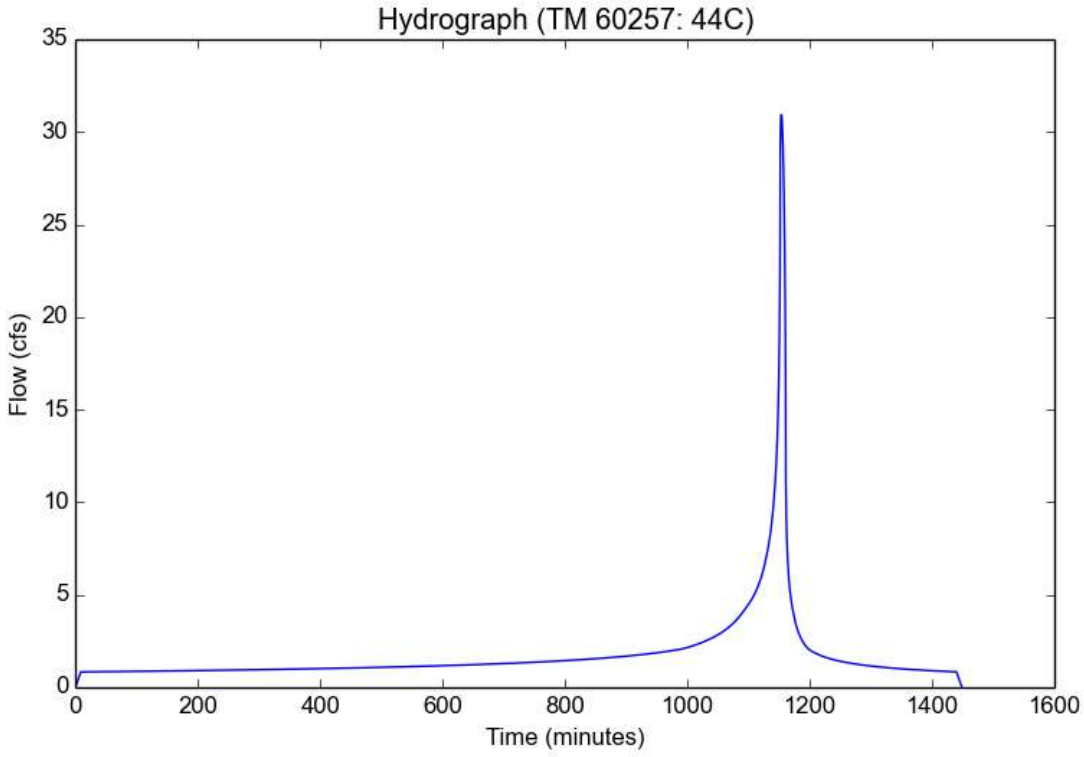
File location: C:/Users/bhanu/Desktop/TM 60257 - 44c.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	44C
Area (ac)	14.9
Flow Path Length (ft)	1533.0
Flow Path Slope (vft/hft)	0.1709
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.6251
Undeveloped Runoff Coefficient (Cu)	0.712
Developed Runoff Coefficient (Cd)	0.7909
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	30.9372
Burned Peak Flow Rate (cfs)	30.9372
24-Hr Clear Runoff Volume (ac-ft)	3.5405
24-Hr Clear Runoff Volume (cu-ft)	154224.1051



Peak Flow Hydrologic Analysis

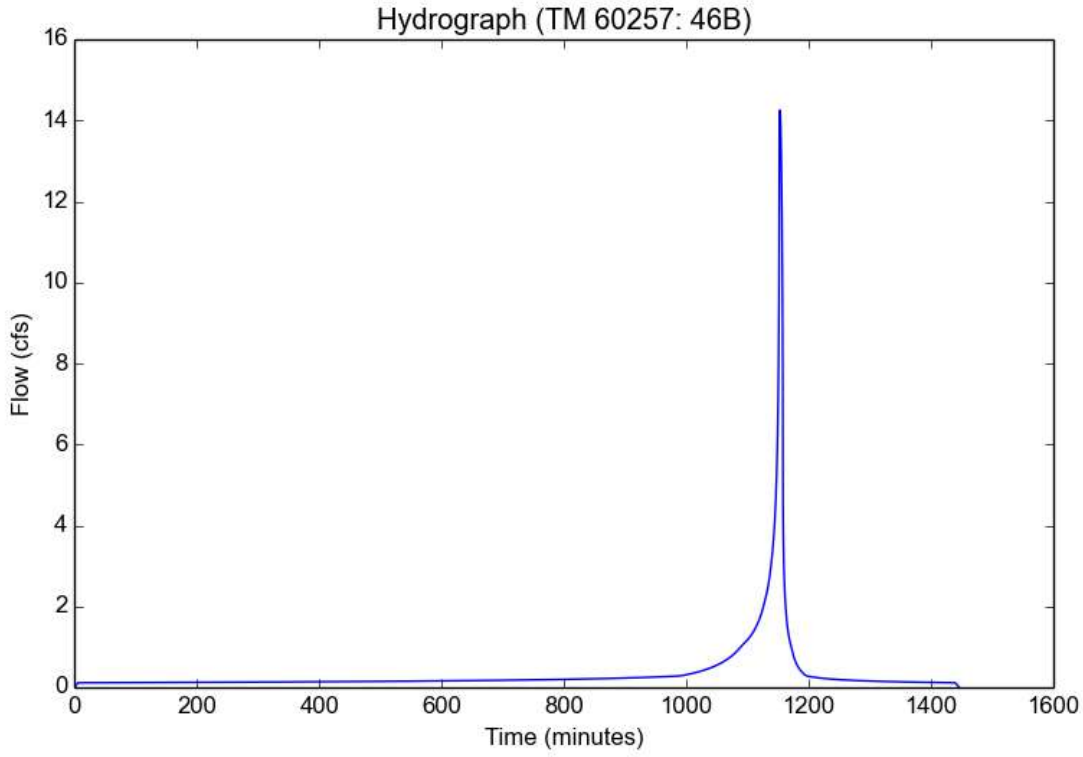
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	46B
Area (ac)	6.0
Flow Path Length (ft)	734.0
Flow Path Slope (vft/hft)	0.1349
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.06
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.1763
Undeveloped Runoff Coefficient (Cu)	0.7381
Developed Runoff Coefficient (Cd)	0.7478
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	14.252
Burned Peak Flow Rate (cfs)	14.252
24-Hr Clear Runoff Volume (ac-ft)	0.7048
24-Hr Clear Runoff Volume (cu-ft)	30699.7235



Peak Flow Hydrologic Analysis

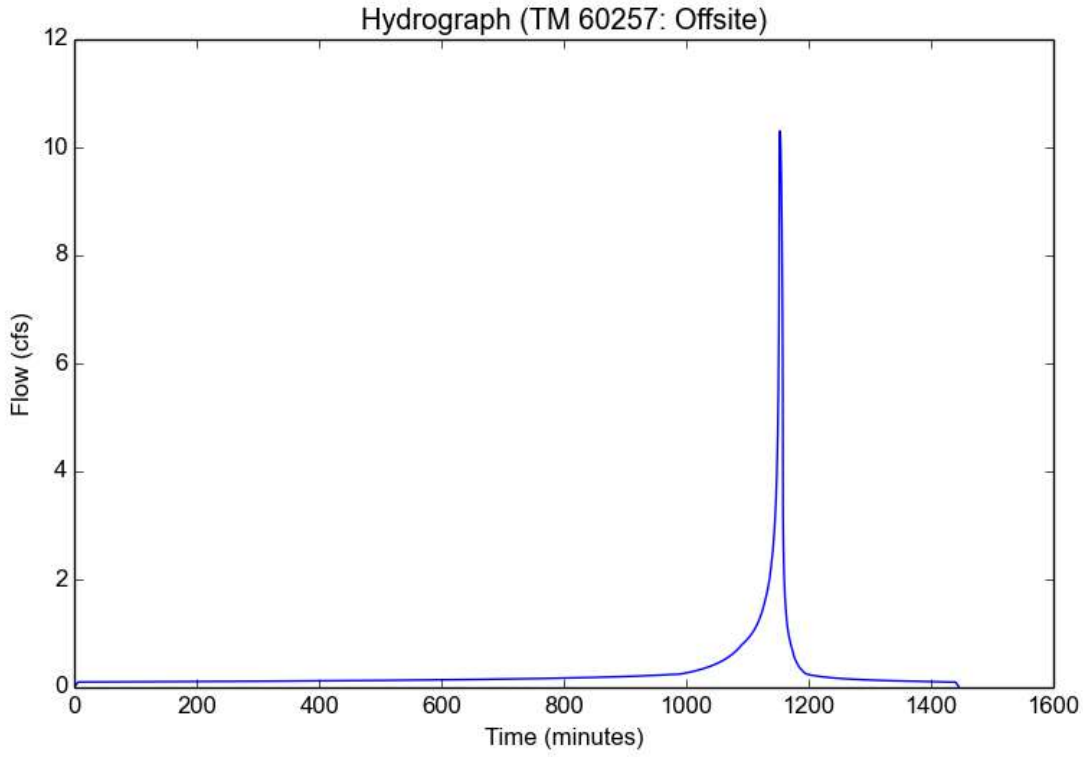
File location: X:/sikand/5100-056/01/Engineering/Hydrology/CALCULATIONS/HYDROCALC/EX/Q50/Off-site/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	Offsite
Area (ac)	4.3
Flow Path Length (ft)	750.0
Flow Path Slope (vft/hft)	0.1627
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.1
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0.34
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.1763
Undeveloped Runoff Coefficient (Cu)	0.7381
Developed Runoff Coefficient (Cd)	0.7543
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	10.3024
Burned Peak Flow Rate (cfs)	10.7567
24-Hr Clear Runoff Volume (ac-ft)	0.5625
24-Hr Clear Runoff Volume (cu-ft)	24503.7735



Peak Flow Hydrologic Analysis

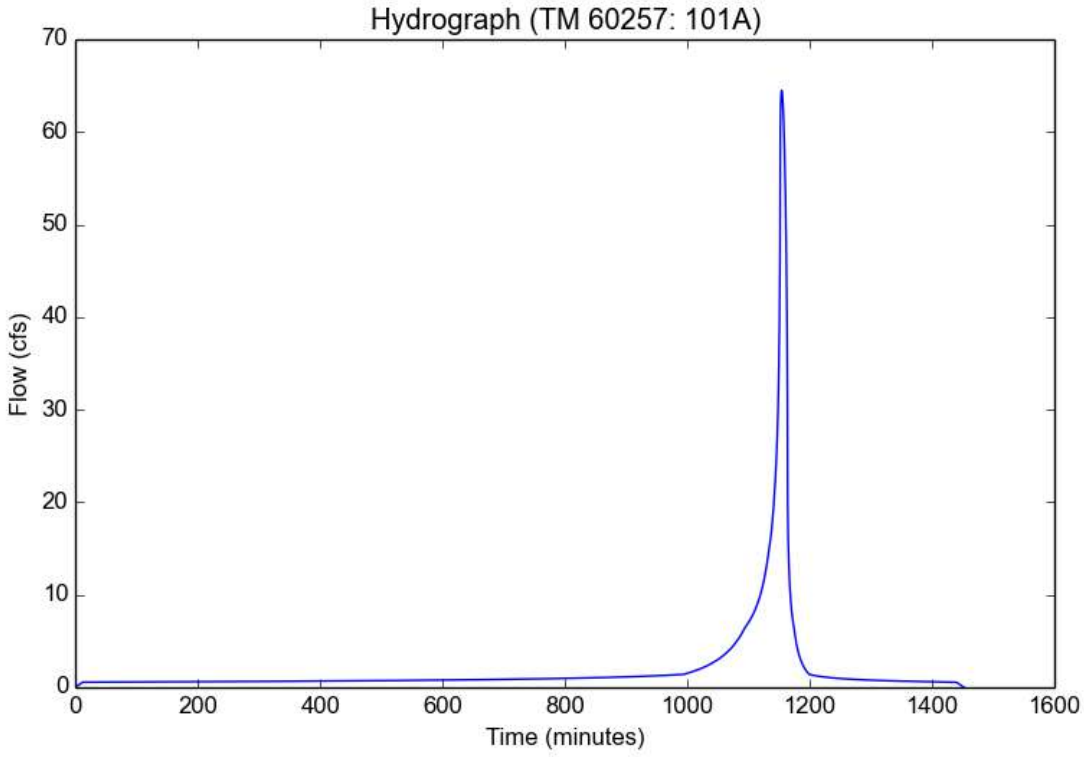
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	101A
Area (ac)	40.6
Flow Path Length (ft)	1736.0
Flow Path Slope (vft/hft)	0.13
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.2931
Undeveloped Runoff Coefficient (Cu)	0.6905
Developed Runoff Coefficient (Cd)	0.6926
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	64.4832
Burned Peak Flow Rate (cfs)	64.4832
24-Hr Clear Runoff Volume (ac-ft)	4.0783
24-Hr Clear Runoff Volume (cu-ft)	177649.6185



Peak Flow Hydrologic Analysis

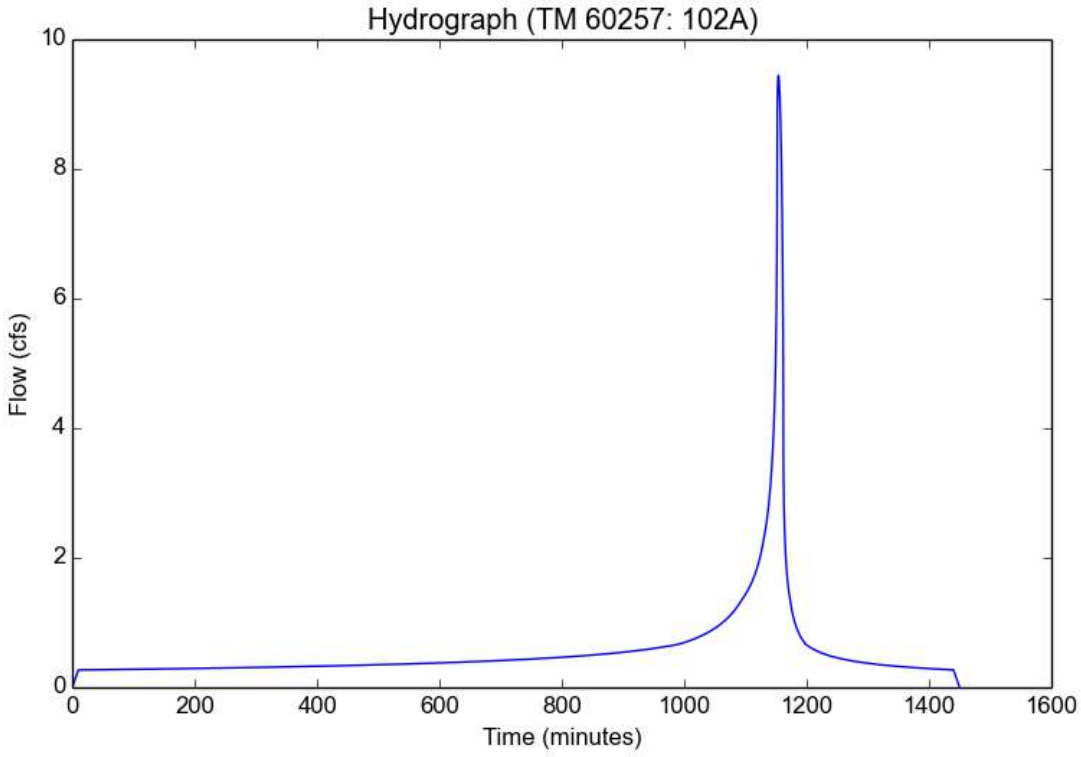
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	102A
Area (ac)	4.8
Flow Path Length (ft)	783.0
Flow Path Slope (vft/hft)	0.014
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.4983
Undeveloped Runoff Coefficient (Cu)	0.7059
Developed Runoff Coefficient (Cd)	0.7874
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	9.4426
Burned Peak Flow Rate (cfs)	9.4426
24-Hr Clear Runoff Volume (ac-ft)	1.1404
24-Hr Clear Runoff Volume (cu-ft)	49677.0348



Peak Flow Hydrologic Analysis

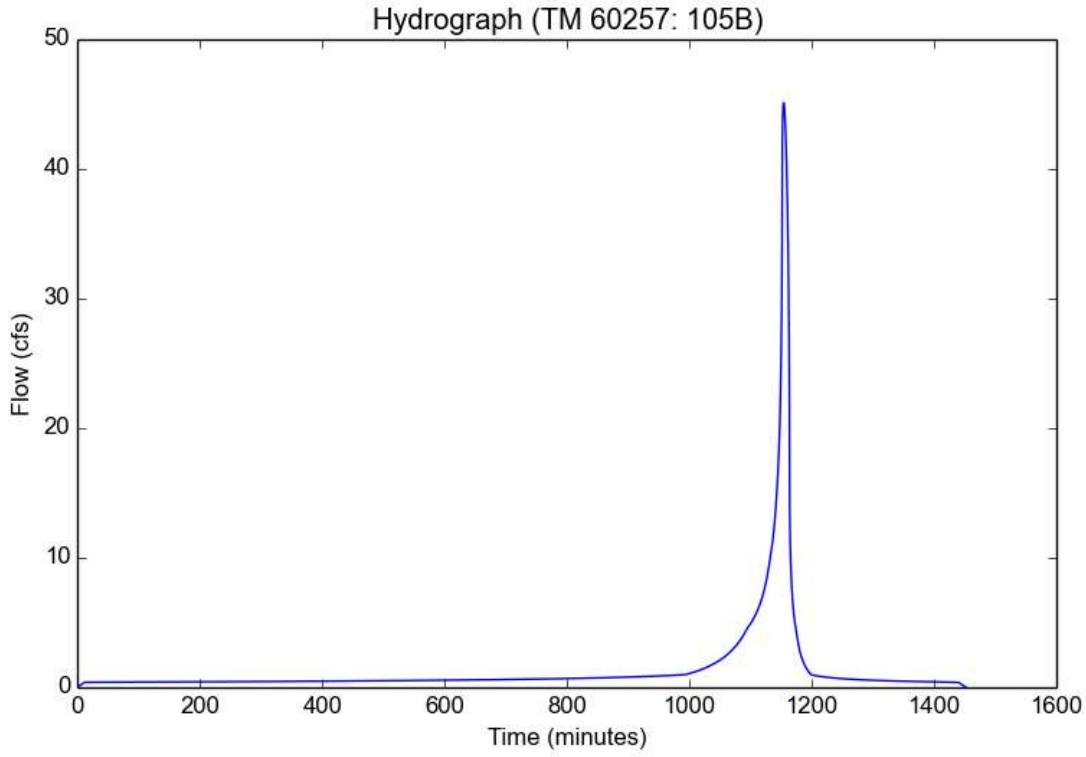
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	105B
Area (ac)	28.4
Flow Path Length (ft)	1840.0
Flow Path Slope (vft/hft)	0.13
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.2931
Undeveloped Runoff Coefficient (Cu)	0.6905
Developed Runoff Coefficient (Cd)	0.6926
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	45.1065
Burned Peak Flow Rate (cfs)	45.1065
24-Hr Clear Runoff Volume (ac-ft)	2.8528
24-Hr Clear Runoff Volume (cu-ft)	124267.2208



Peak Flow Hydrologic Analysis

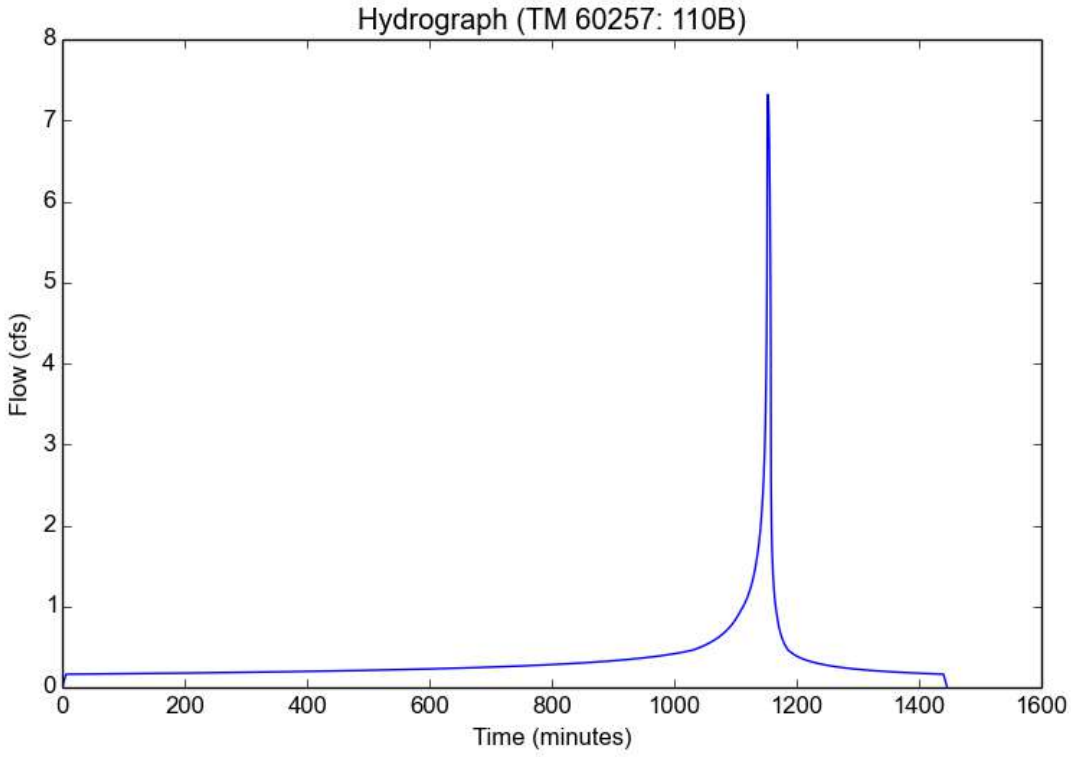
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	110B
Area (ac)	3.3
Flow Path Length (ft)	704.0
Flow Path Slope (vft/hft)	0.166
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.7888
Undeveloped Runoff Coefficient (Cu)	0.7197
Developed Runoff Coefficient (Cd)	0.7954
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	7.3204
Burned Peak Flow Rate (cfs)	7.3204
24-Hr Clear Runoff Volume (ac-ft)	0.6772
24-Hr Clear Runoff Volume (cu-ft)	29499.4022



Peak Flow Hydrologic Analysis

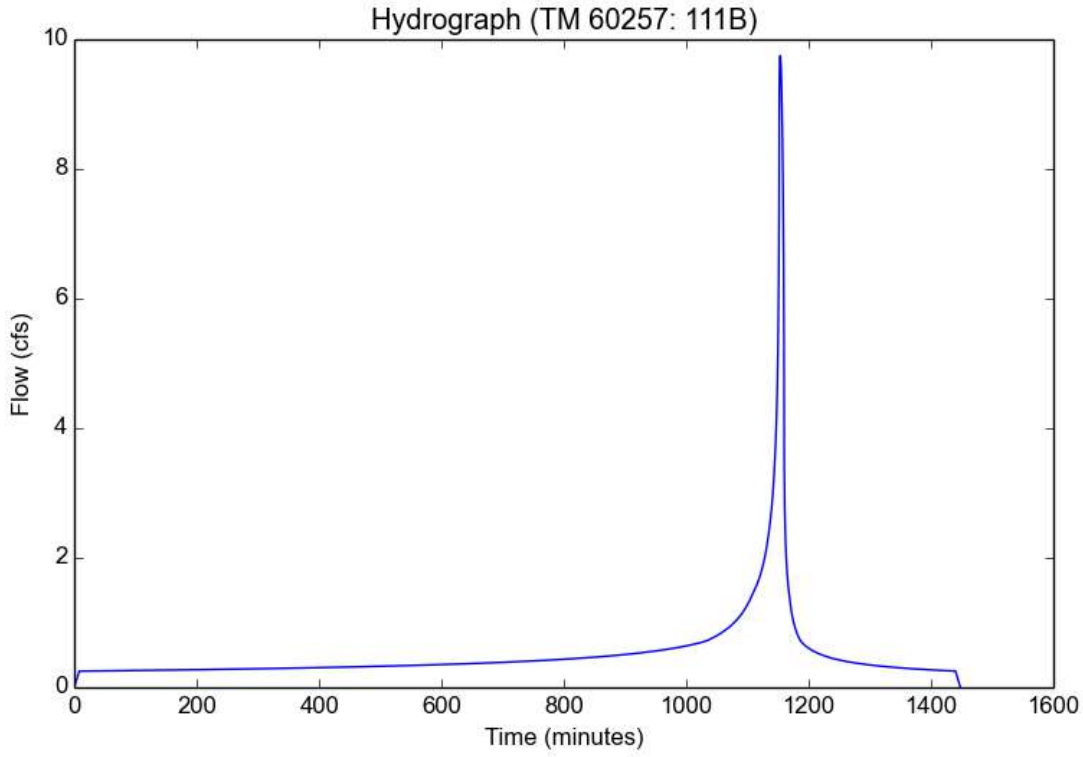
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	111B
Area (ac)	5.1
Flow Path Length (ft)	606.0
Flow Path Slope (vft/hft)	0.036
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.4361
Undeveloped Runoff Coefficient (Cu)	0.7012
Developed Runoff Coefficient (Cd)	0.7847
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	9.7492
Burned Peak Flow Rate (cfs)	9.7492
24-Hr Clear Runoff Volume (ac-ft)	1.0463
24-Hr Clear Runoff Volume (cu-ft)	45577.2744



Peak Flow Hydrologic Analysis

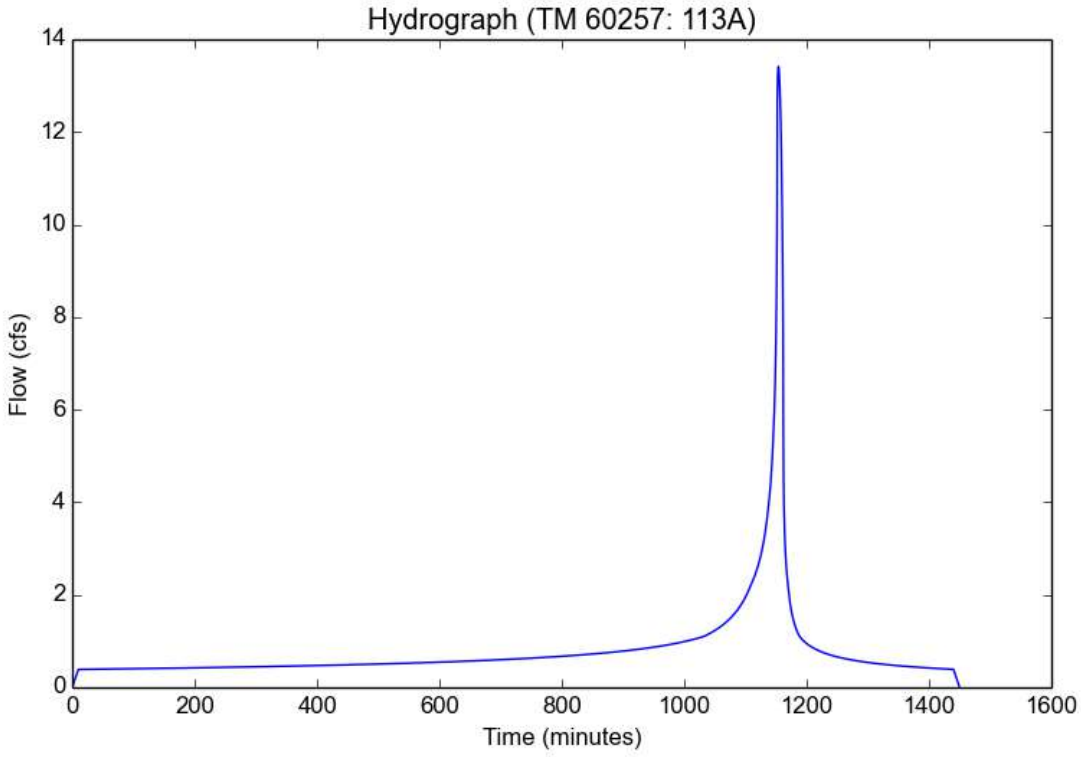
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	113A
Area (ac)	7.9
Flow Path Length (ft)	995.0
Flow Path Slope (vft/hft)	0.058
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.1935
Undeveloped Runoff Coefficient (Cu)	0.6831
Developed Runoff Coefficient (Cd)	0.7742
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	13.4154
Burned Peak Flow Rate (cfs)	13.4154
24-Hr Clear Runoff Volume (ac-ft)	1.6202
24-Hr Clear Runoff Volume (cu-ft)	70576.78



Peak Flow Hydrologic Analysis

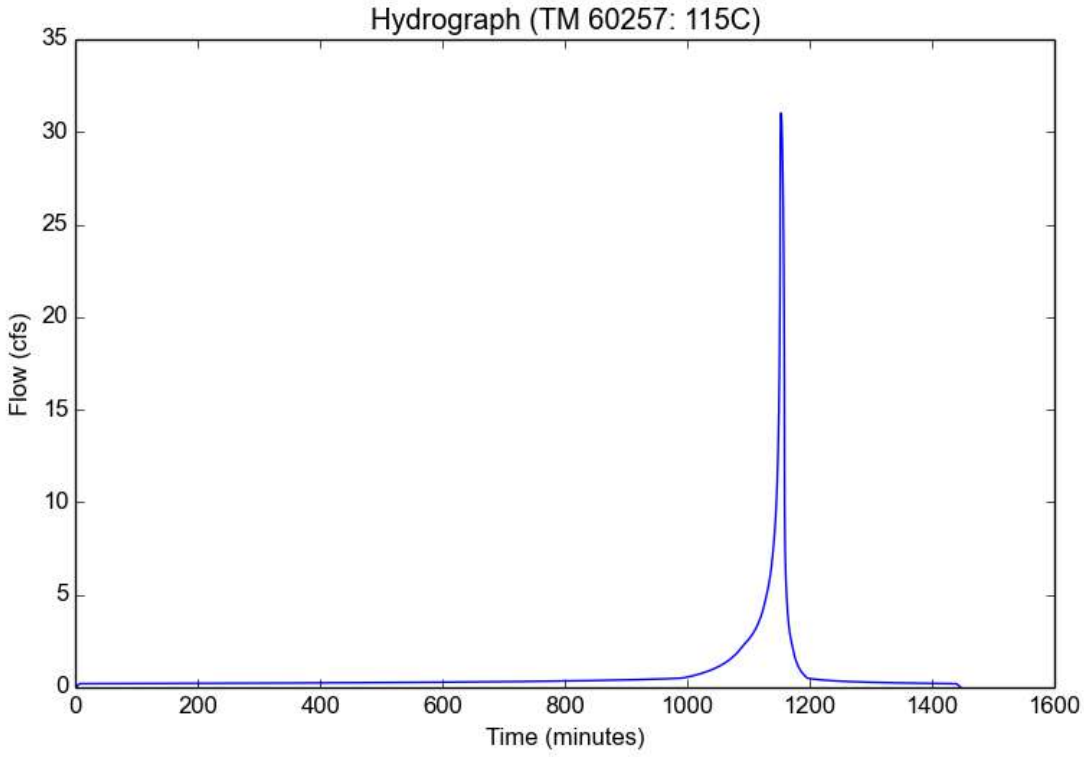
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	115C
Area (ac)	14.4
Flow Path Length (ft)	910.0
Flow Path Slope (vft/hft)	0.24
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.9543
Undeveloped Runoff Coefficient (Cu)	0.7276
Developed Runoff Coefficient (Cd)	0.7293
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	31.026
Burned Peak Flow Rate (cfs)	31.026
24-Hr Clear Runoff Volume (ac-ft)	1.4502
24-Hr Clear Runoff Volume (cu-ft)	63169.4494



Peak Flow Hydrologic Analysis

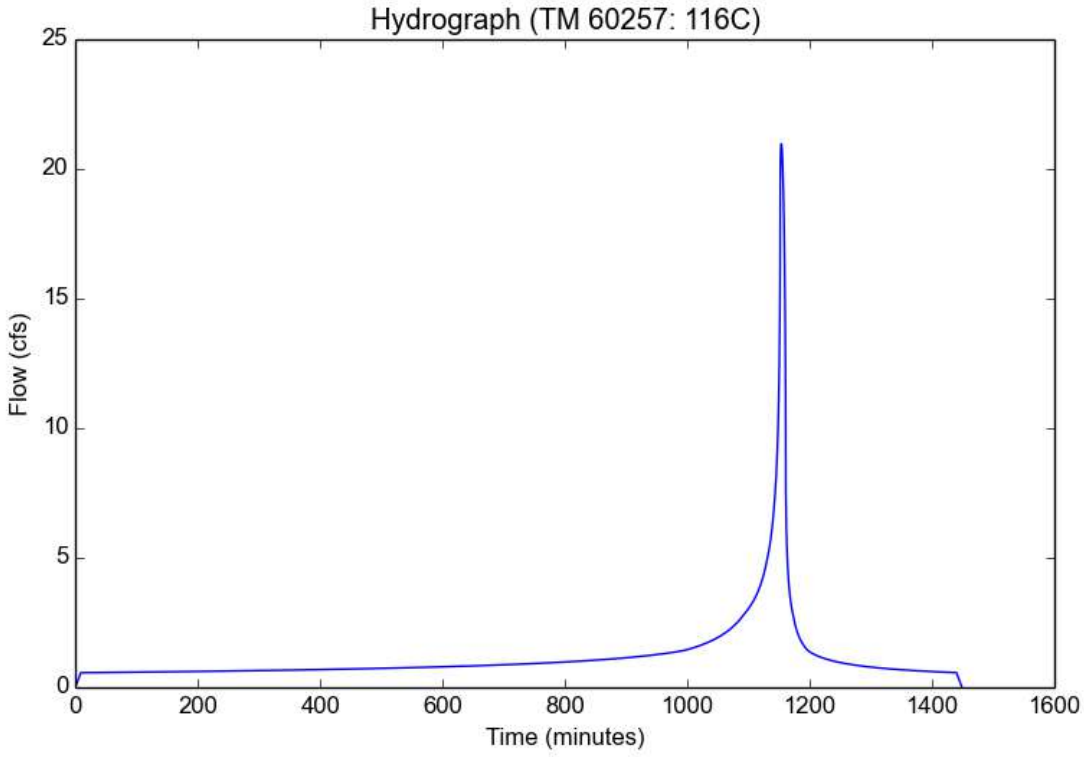
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	116C
Area (ac)	10.1
Flow Path Length (ft)	875.0
Flow Path Slope (vft/hft)	0.027
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.6251
Undeveloped Runoff Coefficient (Cu)	0.712
Developed Runoff Coefficient (Cd)	0.7909
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	20.9708
Burned Peak Flow Rate (cfs)	20.9708
24-Hr Clear Runoff Volume (ac-ft)	2.3999
24-Hr Clear Runoff Volume (cu-ft)	104541.1719



Peak Flow Hydrologic Analysis

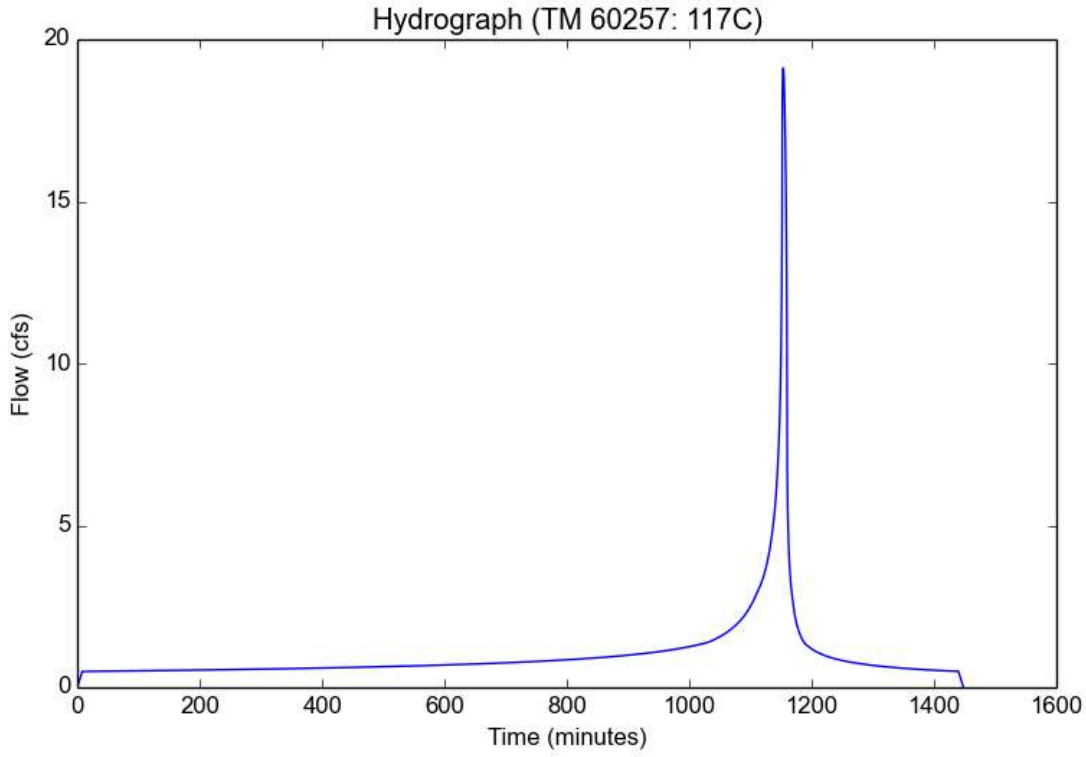
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	117C
Area (ac)	10.0
Flow Path Length (ft)	572.0
Flow Path Slope (vft/hft)	0.026
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.4361
Undeveloped Runoff Coefficient (Cu)	0.7012
Developed Runoff Coefficient (Cd)	0.7847
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	19.1161
Burned Peak Flow Rate (cfs)	19.1161
24-Hr Clear Runoff Volume (ac-ft)	2.0516
24-Hr Clear Runoff Volume (cu-ft)	89367.2048



Peak Flow Hydrologic Analysis

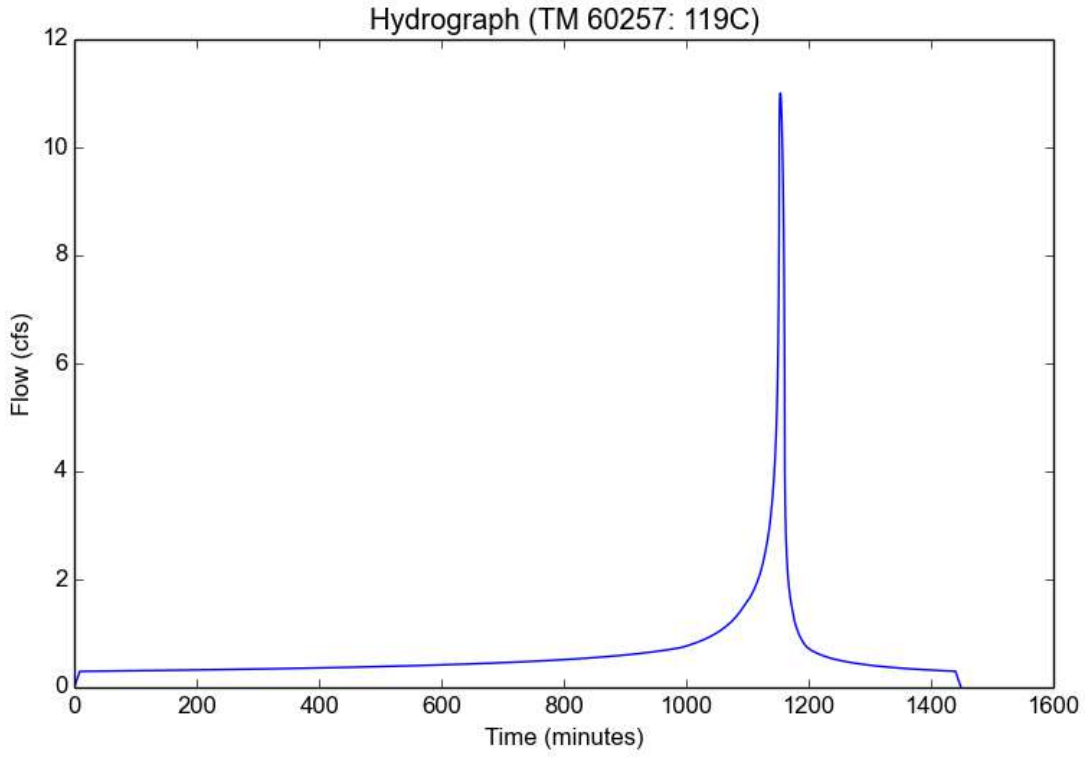
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	119C
Area (ac)	5.3
Flow Path Length (ft)	787.0
Flow Path Slope (vft/hft)	0.024
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.6251
Undeveloped Runoff Coefficient (Cu)	0.712
Developed Runoff Coefficient (Cd)	0.7909
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	11.0045
Burned Peak Flow Rate (cfs)	11.0045
24-Hr Clear Runoff Volume (ac-ft)	1.2594
24-Hr Clear Runoff Volume (cu-ft)	54858.2387



Peak Flow Hydrologic Analysis

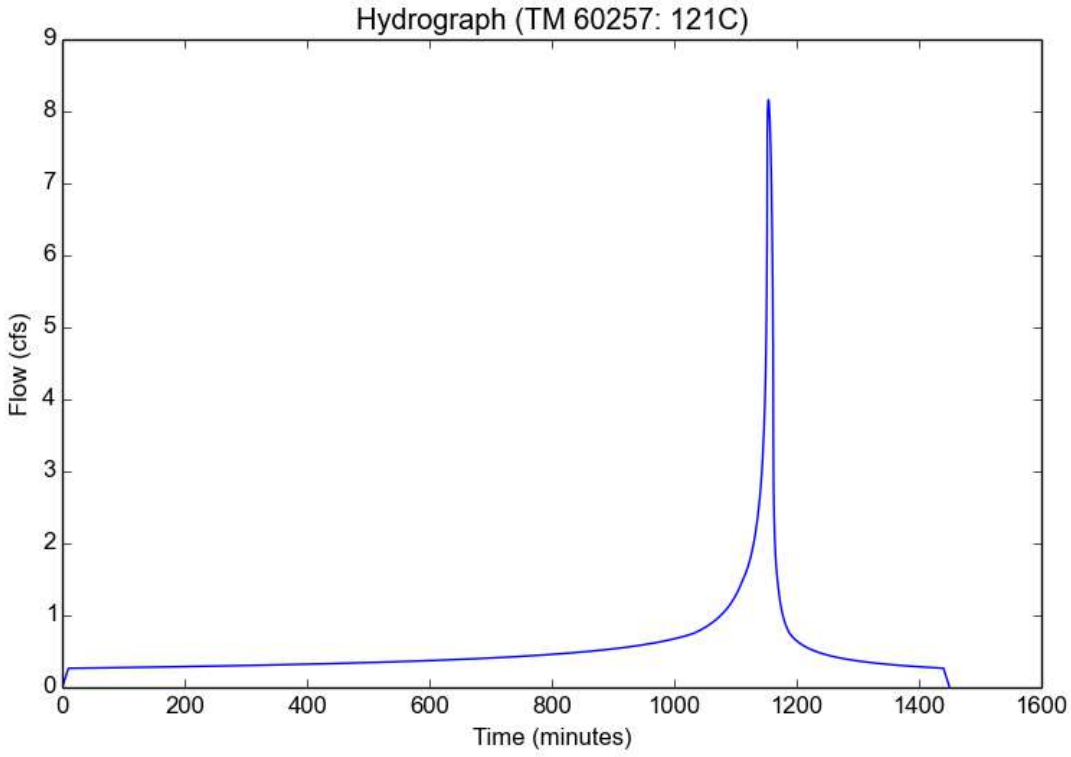
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	121C
Area (ac)	4.7
Flow Path Length (ft)	1009.0
Flow Path Slope (vft/hft)	0.056
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.5
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.1935
Undeveloped Runoff Coefficient (Cu)	0.6831
Developed Runoff Coefficient (Cd)	0.7915
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	8.1603
Burned Peak Flow Rate (cfs)	8.1603
24-Hr Clear Runoff Volume (ac-ft)	1.0765
24-Hr Clear Runoff Volume (cu-ft)	46893.3307



Peak Flow Hydrologic Analysis

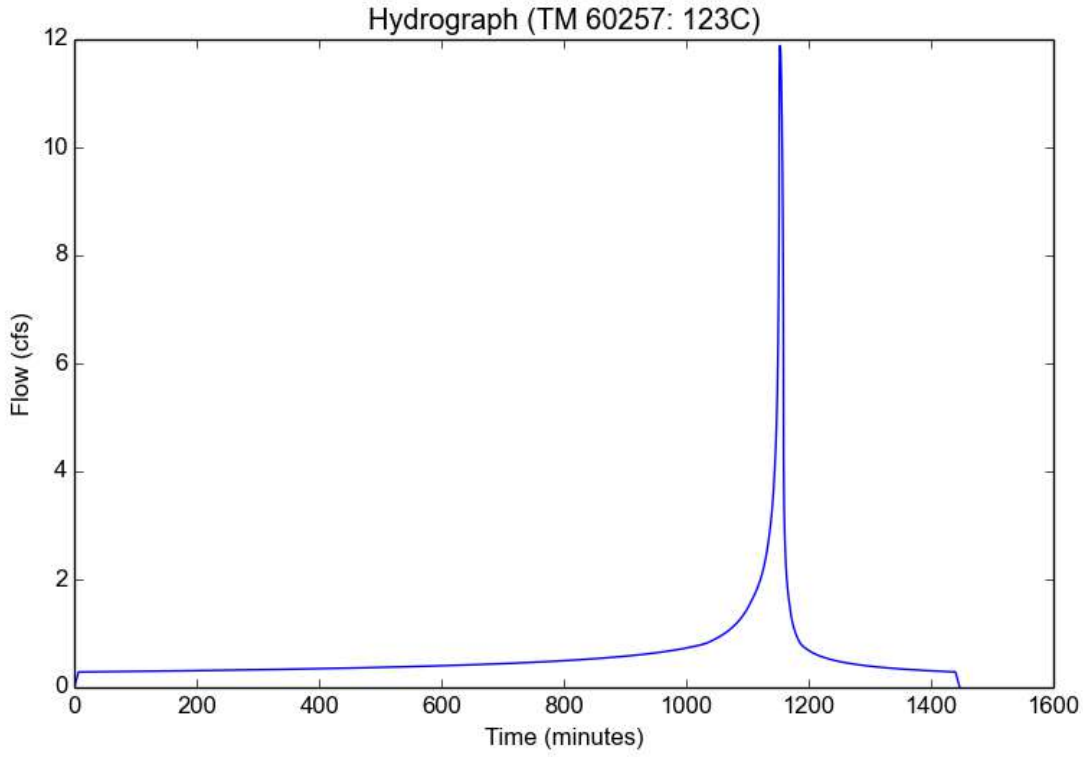
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	123C
Area (ac)	5.8
Flow Path Length (ft)	456.0
Flow Path Slope (vft/hft)	0.015
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.5939
Undeveloped Runoff Coefficient (Cu)	0.7105
Developed Runoff Coefficient (Cd)	0.7901
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	11.8861
Burned Peak Flow Rate (cfs)	11.8861
24-Hr Clear Runoff Volume (ac-ft)	1.1901
24-Hr Clear Runoff Volume (cu-ft)	51841.8891



Peak Flow Hydrologic Analysis

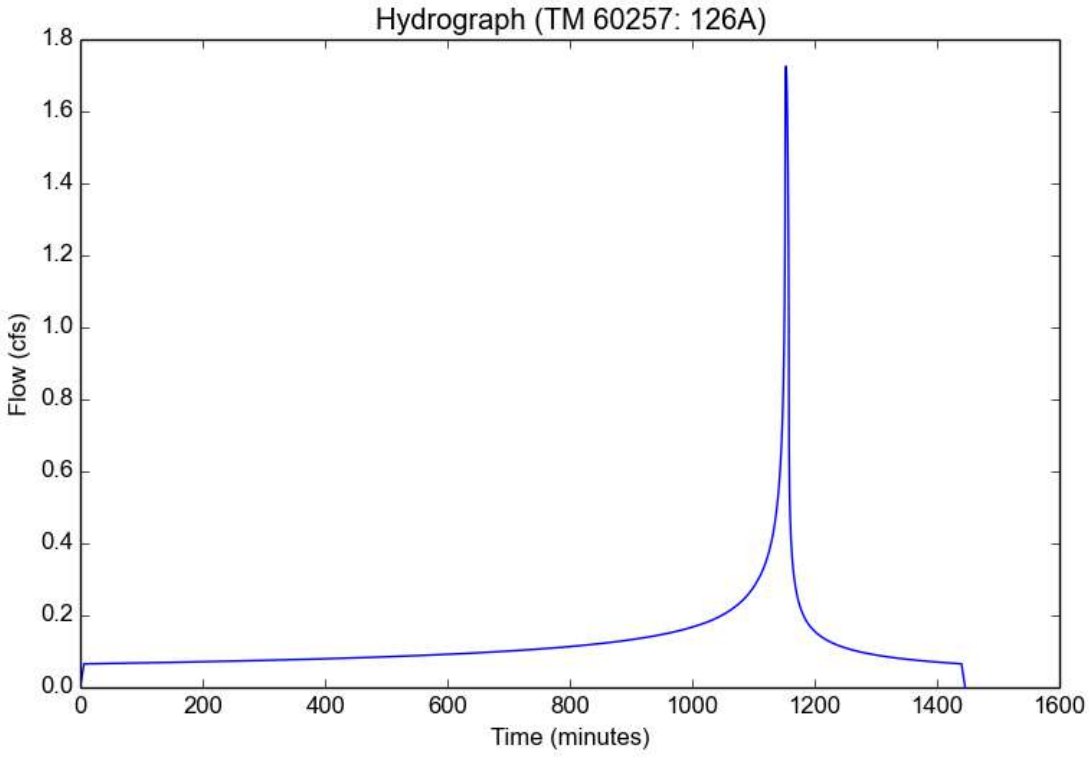
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	126A
Area (ac)	0.7
Flow Path Length (ft)	487.0
Flow Path Slope (vft/hft)	0.037
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.91
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.7888
Undeveloped Runoff Coefficient (Cu)	0.7197
Developed Runoff Coefficient (Cd)	0.8838
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	1.7252
Burned Peak Flow Rate (cfs)	1.7252
24-Hr Clear Runoff Volume (ac-ft)	0.2463
24-Hr Clear Runoff Volume (cu-ft)	10728.3775



Peak Flow Hydrologic Analysis

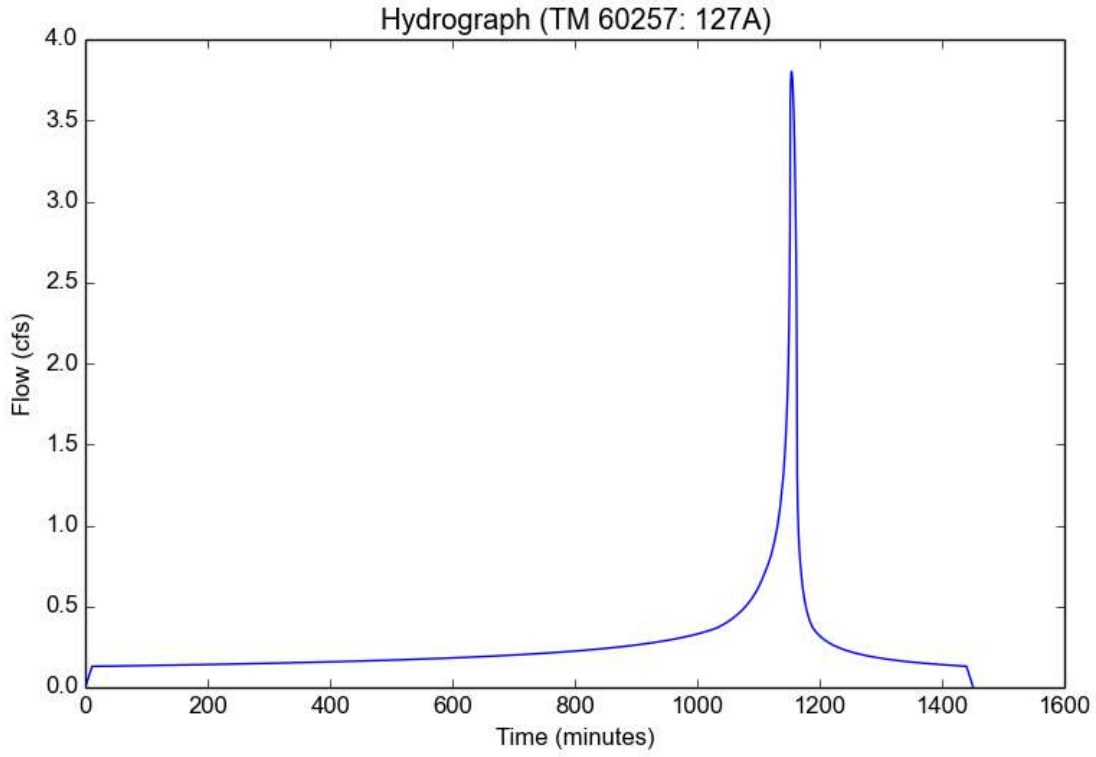
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	127A
Area (ac)	2.3
Flow Path Length (ft)	1099.0
Flow Path Slope (vft/hft)	0.035
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.5
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.0974
Undeveloped Runoff Coefficient (Cu)	0.6759
Developed Runoff Coefficient (Cd)	0.7879
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	3.801
Burned Peak Flow Rate (cfs)	3.801
24-Hr Clear Runoff Volume (ac-ft)	0.5268
24-Hr Clear Runoff Volume (cu-ft)	22945.2771



Peak Flow Hydrologic Analysis

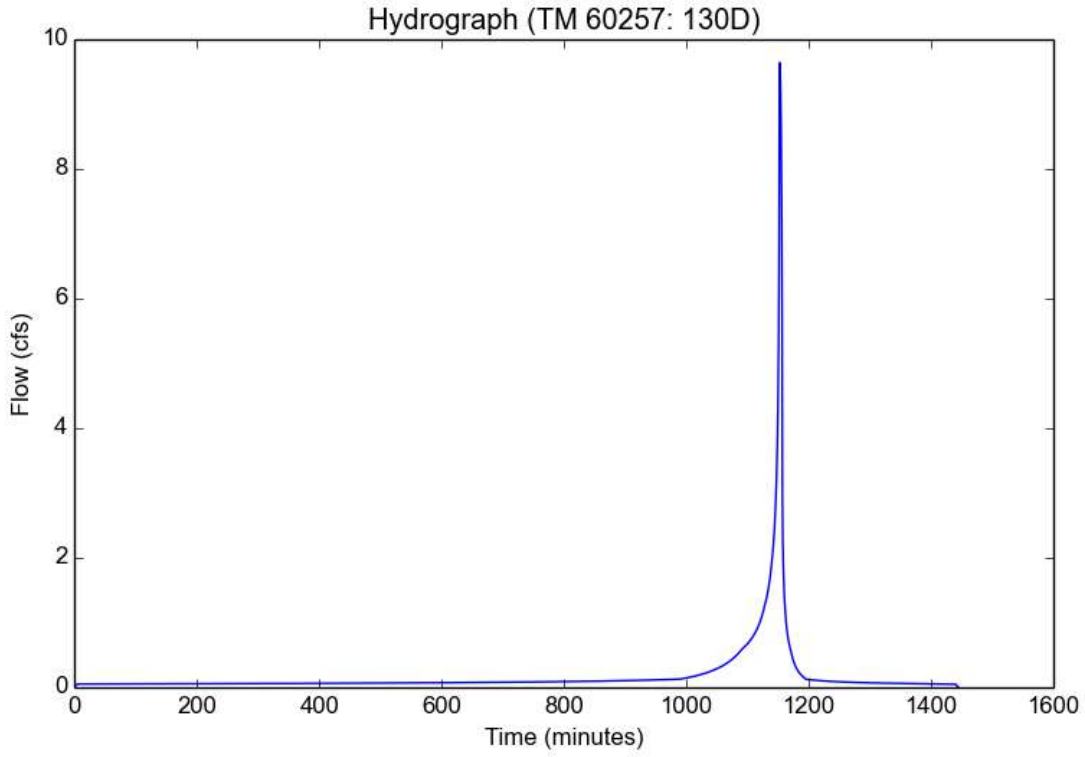
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	130D
Area (ac)	3.7
Flow Path Length (ft)	480.0
Flow Path Slope (vft/hft)	0.27
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7531
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	9.6425
Burned Peak Flow Rate (cfs)	9.6425
24-Hr Clear Runoff Volume (ac-ft)	0.3731
24-Hr Clear Runoff Volume (cu-ft)	16252.3666



Peak Flow Hydrologic Analysis

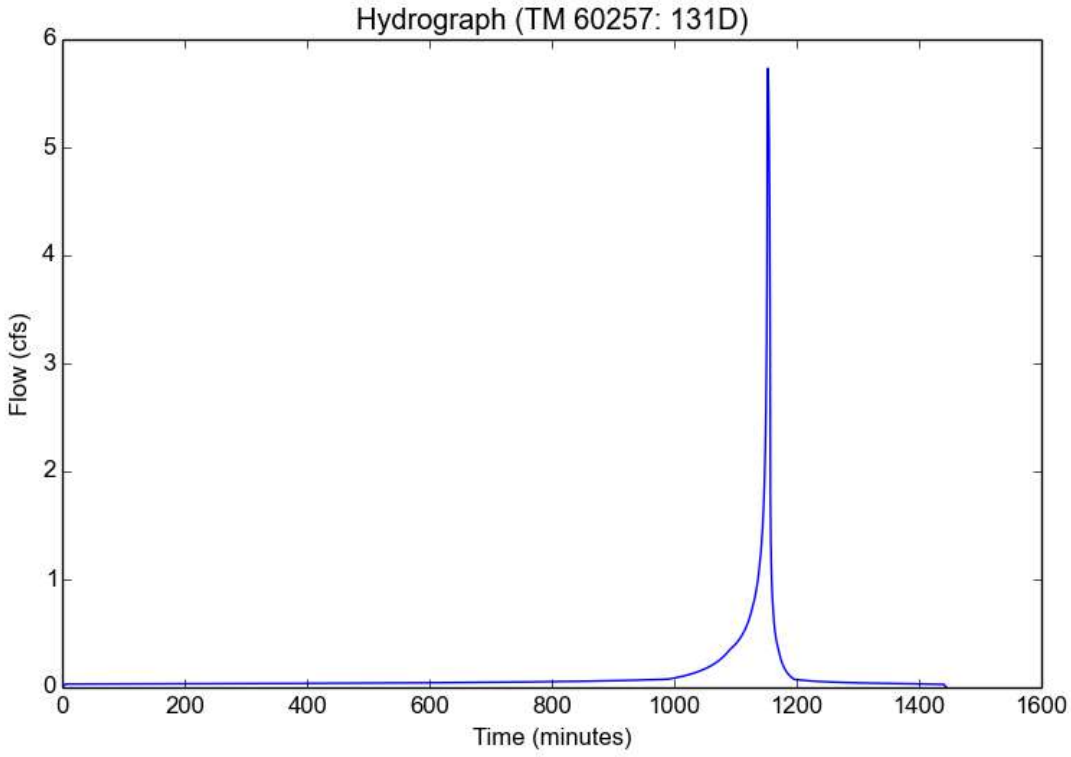
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	131D
Area (ac)	2.2
Flow Path Length (ft)	344.0
Flow Path Slope (vft/hft)	0.35
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7531
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.7334
Burned Peak Flow Rate (cfs)	5.7334
24-Hr Clear Runoff Volume (ac-ft)	0.2218
24-Hr Clear Runoff Volume (cu-ft)	9663.5694



Peak Flow Hydrologic Analysis

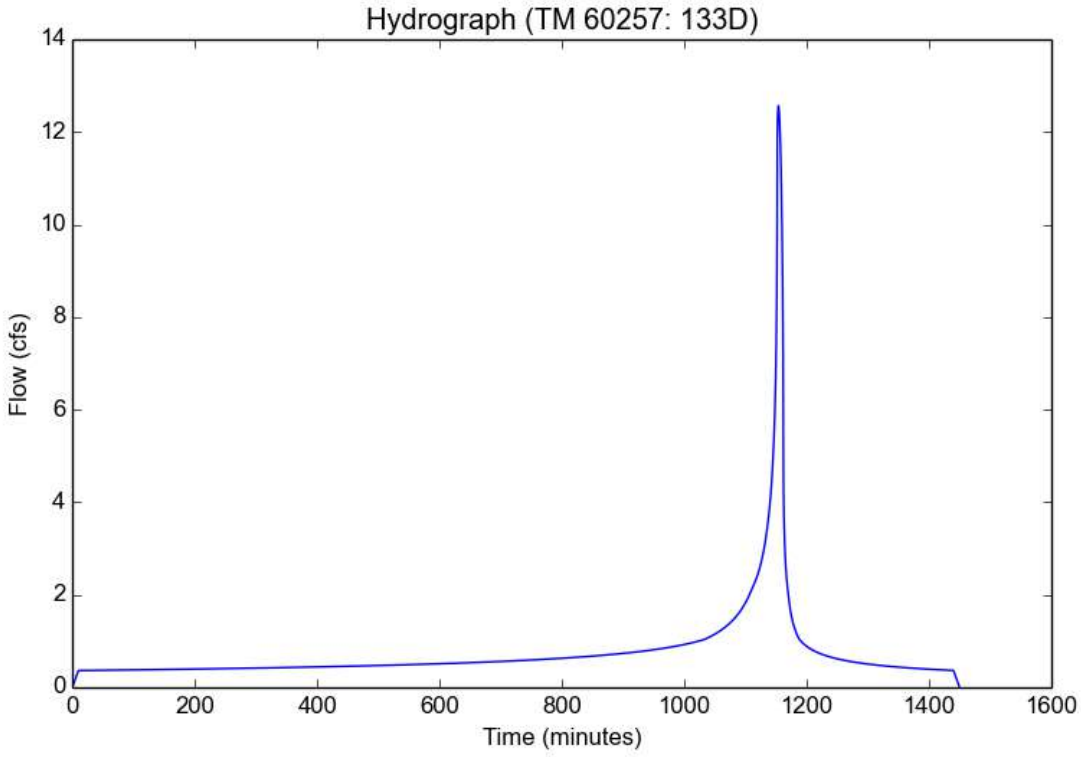
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	133D
Area (ac)	7.4
Flow Path Length (ft)	989.0
Flow Path Slope (vft/hft)	0.058
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.1935
Undeveloped Runoff Coefficient (Cu)	0.6831
Developed Runoff Coefficient (Cd)	0.7742
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	12.5664
Burned Peak Flow Rate (cfs)	12.5664
24-Hr Clear Runoff Volume (ac-ft)	1.5177
24-Hr Clear Runoff Volume (cu-ft)	66109.8952



Peak Flow Hydrologic Analysis

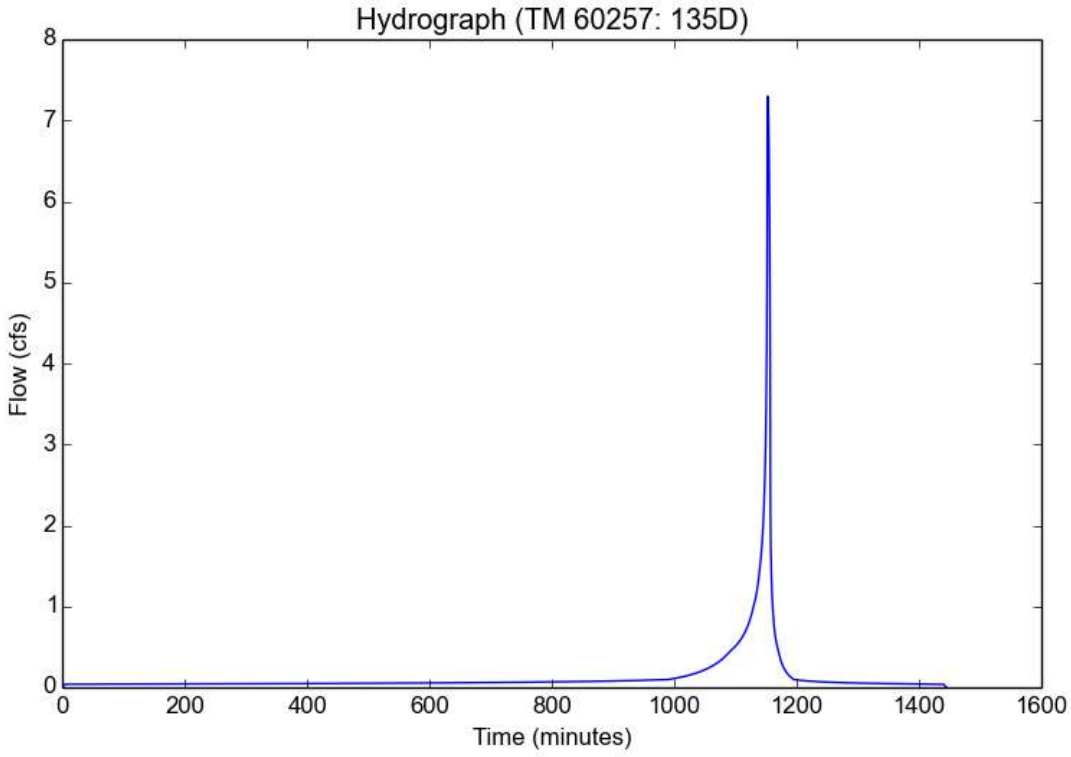
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	135D
Area (ac)	2.8
Flow Path Length (ft)	498.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7531
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	7.297
Burned Peak Flow Rate (cfs)	7.297
24-Hr Clear Runoff Volume (ac-ft)	0.2823
24-Hr Clear Runoff Volume (cu-ft)	12299.0883



Peak Flow Hydrologic Analysis

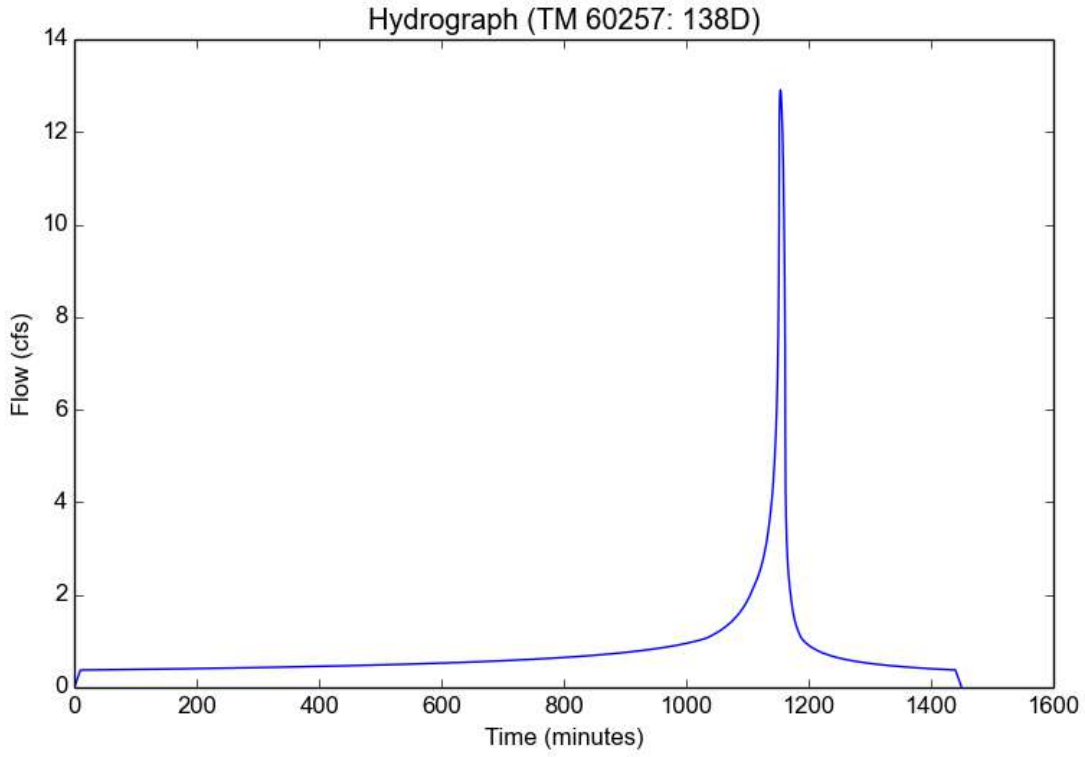
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	138D
Area (ac)	7.6
Flow Path Length (ft)	920.0
Flow Path Slope (vft/hft)	0.039
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.1935
Undeveloped Runoff Coefficient (Cu)	0.6831
Developed Runoff Coefficient (Cd)	0.7742
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	12.906
Burned Peak Flow Rate (cfs)	12.906
24-Hr Clear Runoff Volume (ac-ft)	1.5587
24-Hr Clear Runoff Volume (cu-ft)	67896.6491



Peak Flow Hydrologic Analysis

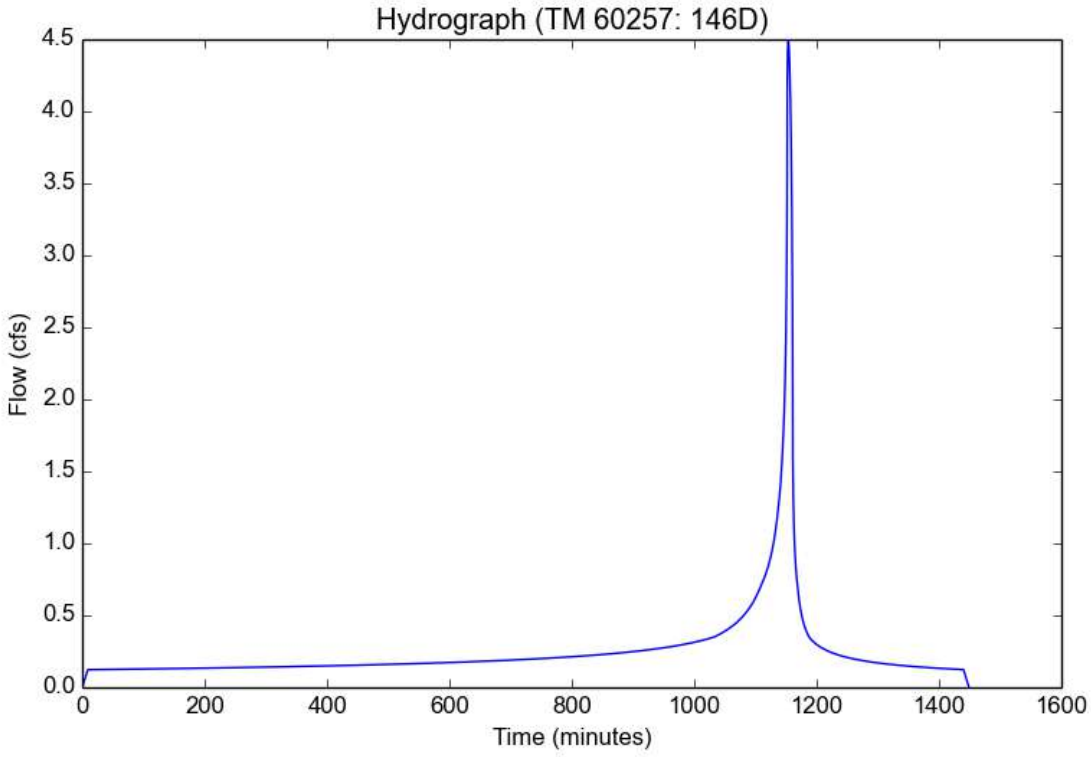
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	146D
Area (ac)	2.5
Flow Path Length (ft)	910.0
Flow Path Slope (vft/hft)	0.067
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.42
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.3049
Undeveloped Runoff Coefficient (Cu)	0.6914
Developed Runoff Coefficient (Cd)	0.779
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	4.4888
Burned Peak Flow Rate (cfs)	4.4888
24-Hr Clear Runoff Volume (ac-ft)	0.5128
24-Hr Clear Runoff Volume (cu-ft)	22337.7912



Peak Flow Hydrologic Analysis

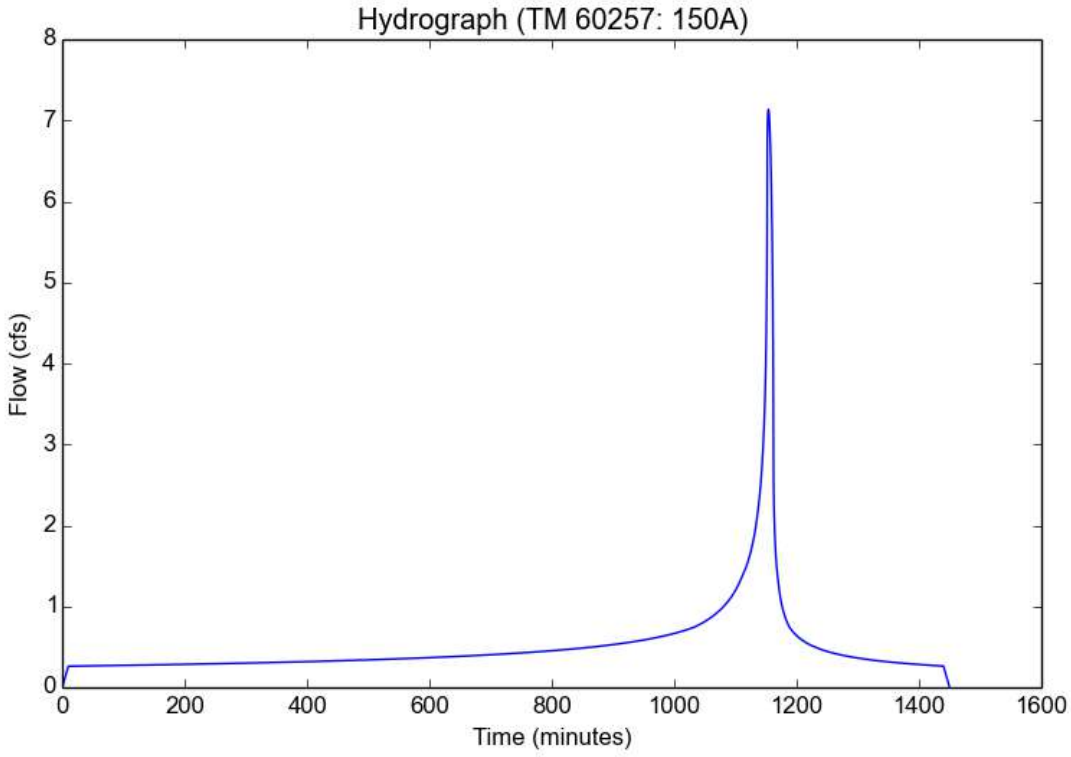
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	150A
Area (ac)	4.0
Flow Path Length (ft)	864.0
Flow Path Slope (vft/hft)	0.021
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.6
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.1935
Undeveloped Runoff Coefficient (Cu)	0.6831
Developed Runoff Coefficient (Cd)	0.8132
Time of Concentration (min)	10.0
Clear Peak Flow Rate (cfs)	7.1353
Burned Peak Flow Rate (cfs)	7.1353
24-Hr Clear Runoff Volume (ac-ft)	1.036
24-Hr Clear Runoff Volume (cu-ft)	45126.8915



Peak Flow Hydrologic Analysis

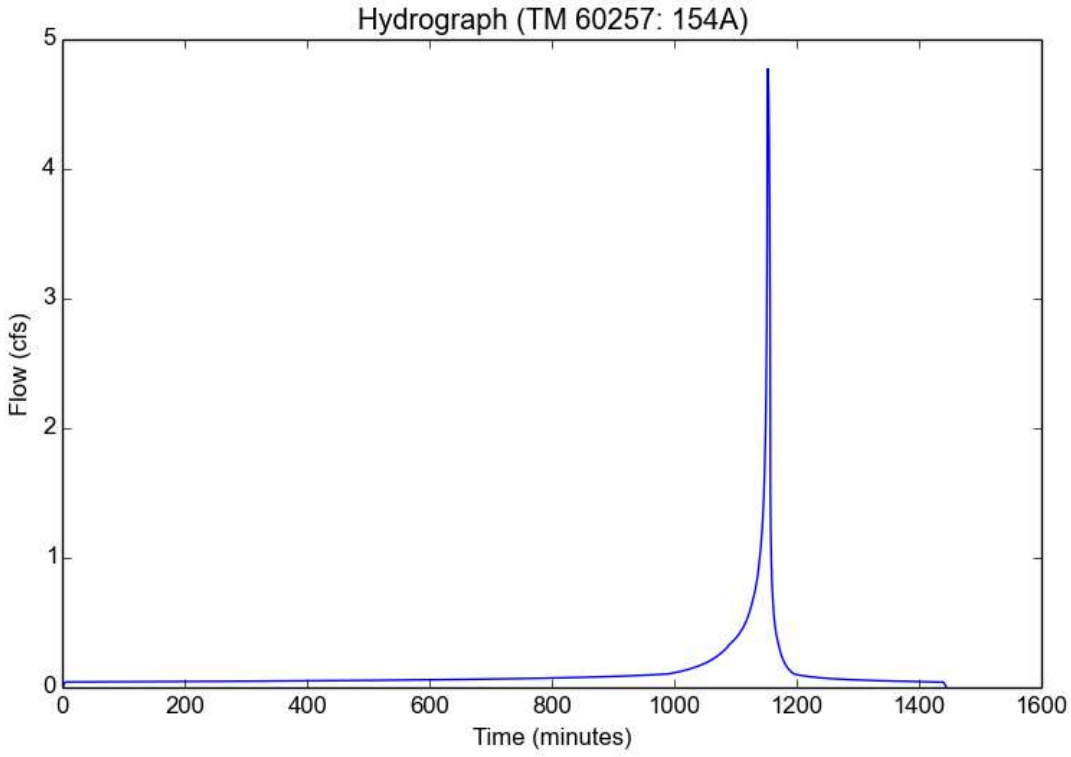
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	154A
Area (ac)	1.8
Flow Path Length (ft)	100.0
Flow Path Slope (vft/hft)	0.1
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.1
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7665
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.7741
Burned Peak Flow Rate (cfs)	4.7741
24-Hr Clear Runoff Volume (ac-ft)	0.2356
24-Hr Clear Runoff Volume (cu-ft)	10262.8344



Peak Flow Hydrologic Analysis

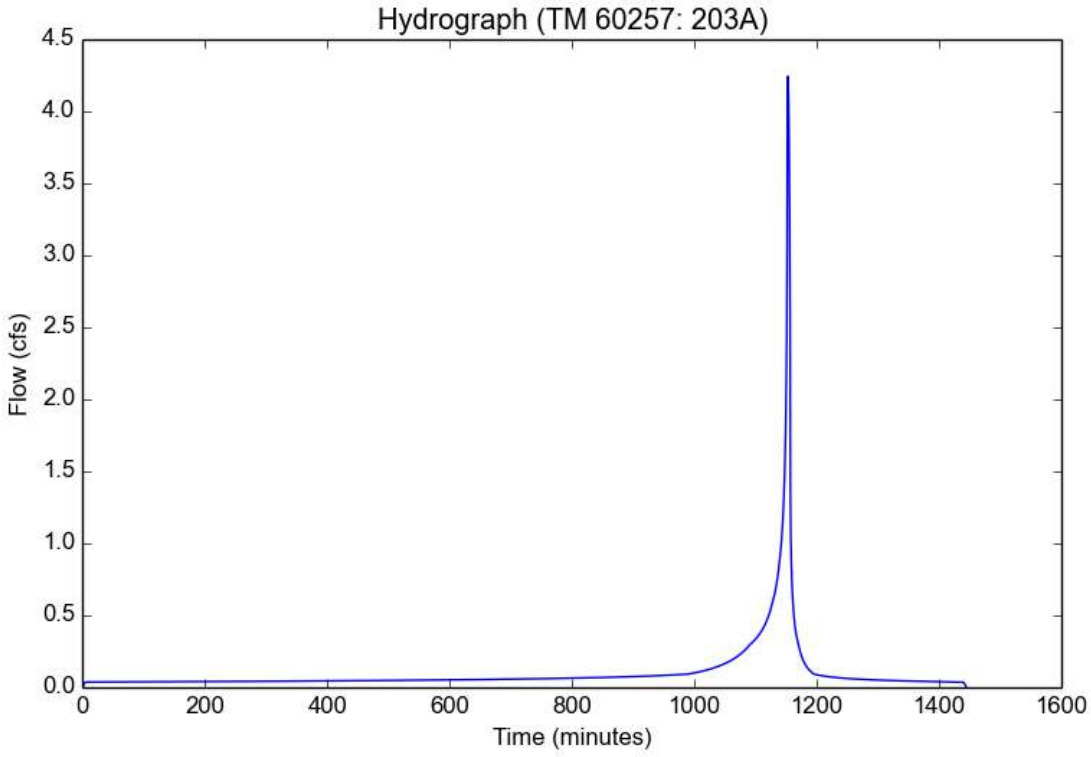
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	203A
Area (ac)	1.6
Flow Path Length (ft)	125.0
Flow Path Slope (vft/hft)	0.09
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.1
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7665
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	4.2437
Burned Peak Flow Rate (cfs)	4.2437
24-Hr Clear Runoff Volume (ac-ft)	0.2094
24-Hr Clear Runoff Volume (cu-ft)	9122.5194



Peak Flow Hydrologic Analysis

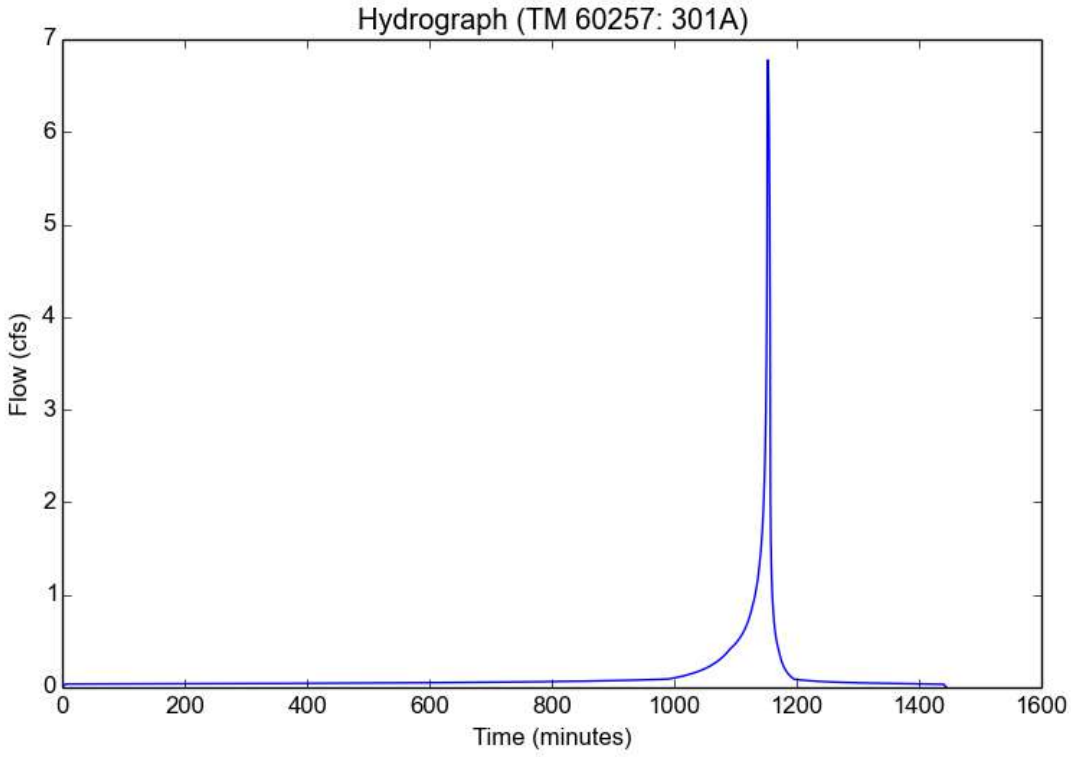
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	301A
Area (ac)	2.6
Flow Path Length (ft)	490.0
Flow Path Slope (vft/hft)	0.41
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7531
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	6.7758
Burned Peak Flow Rate (cfs)	6.7758
24-Hr Clear Runoff Volume (ac-ft)	0.2622
24-Hr Clear Runoff Volume (cu-ft)	11420.582



Peak Flow Hydrologic Analysis

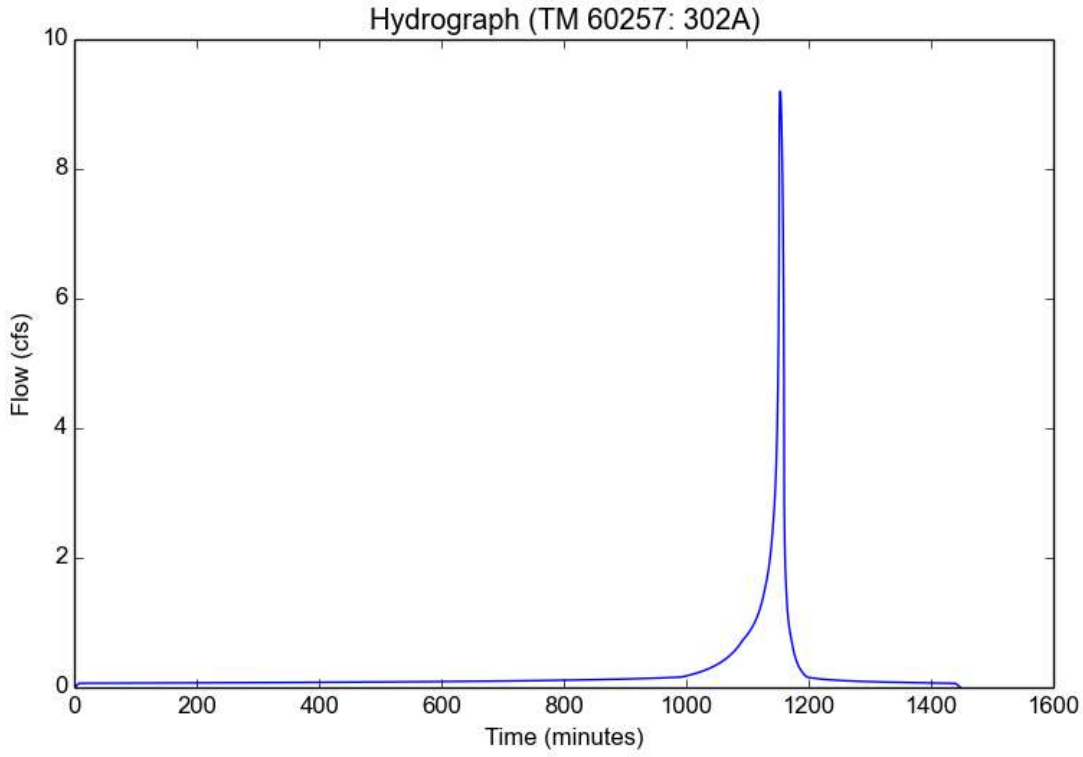
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	302A
Area (ac)	4.6
Flow Path Length (ft)	835.0
Flow Path Slope (vft/hft)	0.063
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.7746
Undeveloped Runoff Coefficient (Cu)	0.7191
Developed Runoff Coefficient (Cd)	0.7209
Time of Concentration (min)	8.0
Clear Peak Flow Rate (cfs)	9.2004
Burned Peak Flow Rate (cfs)	9.2004
24-Hr Clear Runoff Volume (ac-ft)	0.4631
24-Hr Clear Runoff Volume (cu-ft)	20171.007



Peak Flow Hydrologic Analysis

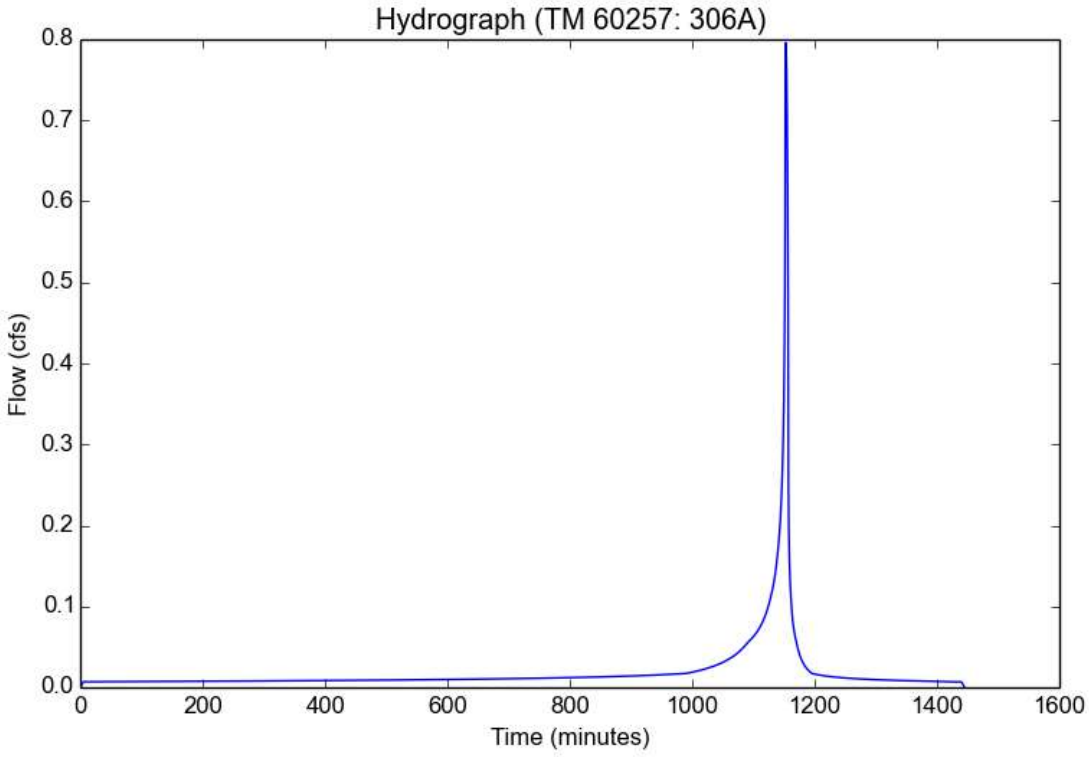
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	306A
Area (ac)	0.3
Flow Path Length (ft)	50.0
Flow Path Slope (vft/hft)	0.2
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.1
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7665
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	0.7957
Burned Peak Flow Rate (cfs)	0.7957
24-Hr Clear Runoff Volume (ac-ft)	0.0393
24-Hr Clear Runoff Volume (cu-ft)	1710.4724



Peak Flow Hydrologic Analysis

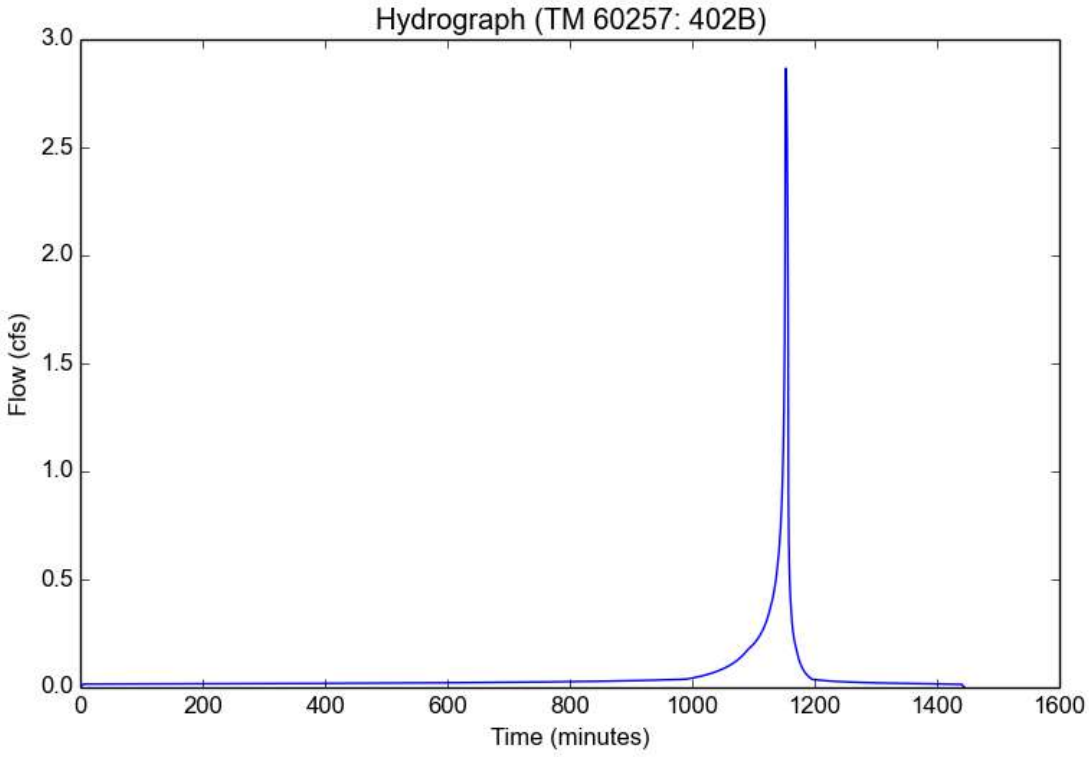
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	402B
Area (ac)	1.1
Flow Path Length (ft)	240.0
Flow Path Slope (vft/hft)	0.4
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.4604
Undeveloped Runoff Coefficient (Cu)	0.7516
Developed Runoff Coefficient (Cd)	0.7531
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	2.8667
Burned Peak Flow Rate (cfs)	2.8667
24-Hr Clear Runoff Volume (ac-ft)	0.1109
24-Hr Clear Runoff Volume (cu-ft)	4831.7847



Peak Flow Hydrologic Analysis

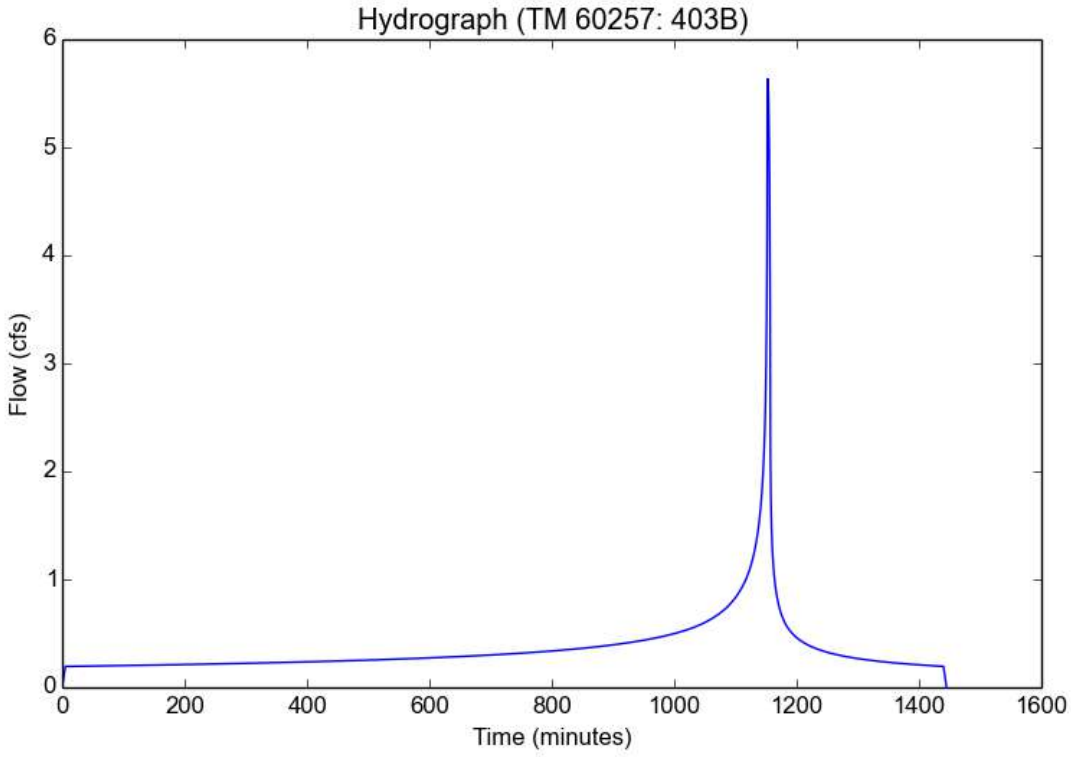
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	403B
Area (ac)	2.1
Flow Path Length (ft)	450.0
Flow Path Slope (vft/hft)	0.047
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.9
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	3.0383
Undeveloped Runoff Coefficient (Cu)	0.7316
Developed Runoff Coefficient (Cd)	0.8832
Time of Concentration (min)	5.0
Clear Peak Flow Rate (cfs)	5.6349
Burned Peak Flow Rate (cfs)	5.6349
24-Hr Clear Runoff Volume (ac-ft)	0.7326
24-Hr Clear Runoff Volume (cu-ft)	31911.7993



Peak Flow Hydrologic Analysis

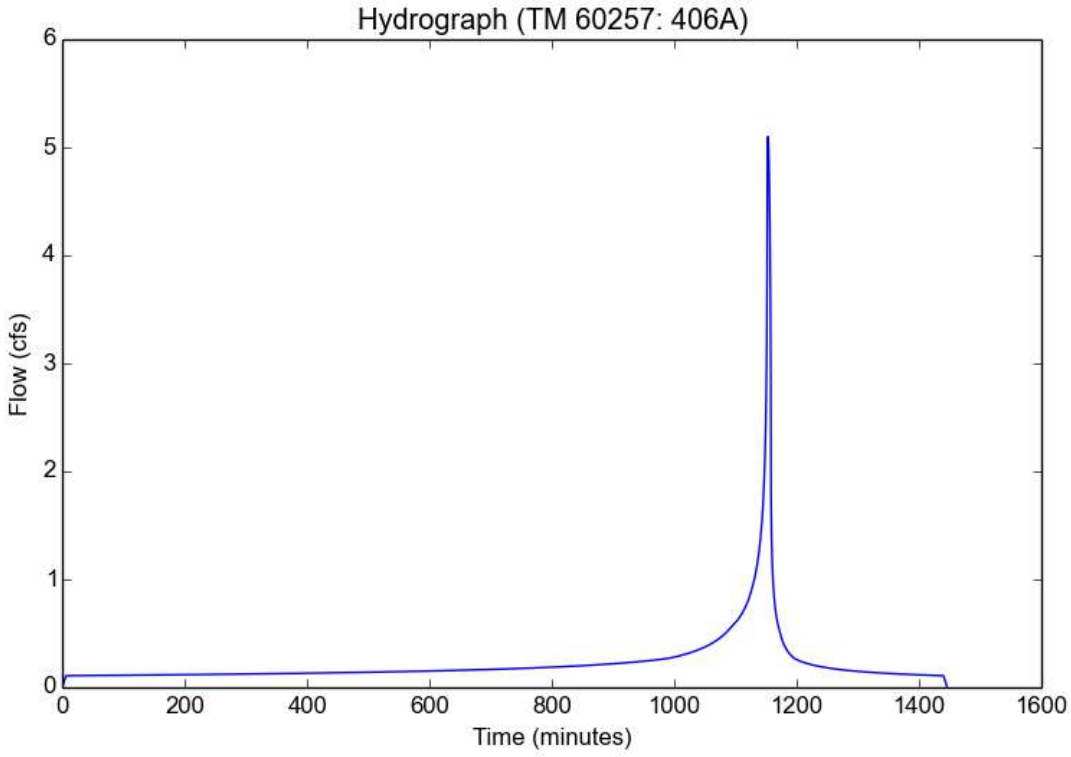
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	406A
Area (ac)	2.0
Flow Path Length (ft)	476.0
Flow Path Slope (vft/hft)	0.032
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.4
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.1763
Undeveloped Runoff Coefficient (Cu)	0.7381
Developed Runoff Coefficient (Cd)	0.8029
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	5.1003
Burned Peak Flow Rate (cfs)	5.1003
24-Hr Clear Runoff Volume (ac-ft)	0.462
24-Hr Clear Runoff Volume (cu-ft)	20126.075



Peak Flow Hydrologic Analysis

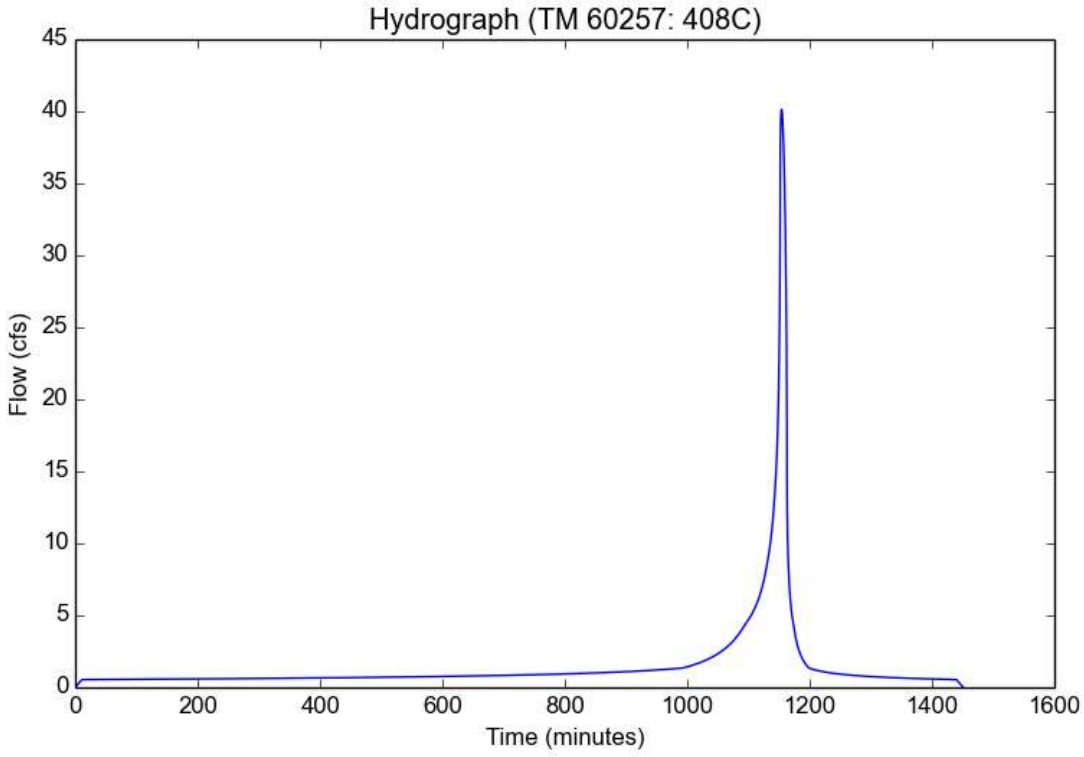
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	408C
Area (ac)	23.4
Flow Path Length (ft)	1708.0
Flow Path Slope (vft/hft)	0.1546
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.1
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.3889
Undeveloped Runoff Coefficient (Cu)	0.6977
Developed Runoff Coefficient (Cd)	0.7179
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	40.1314
Burned Peak Flow Rate (cfs)	40.1314
24-Hr Clear Runoff Volume (ac-ft)	3.0559
24-Hr Clear Runoff Volume (cu-ft)	133112.9602



Peak Flow Hydrologic Analysis

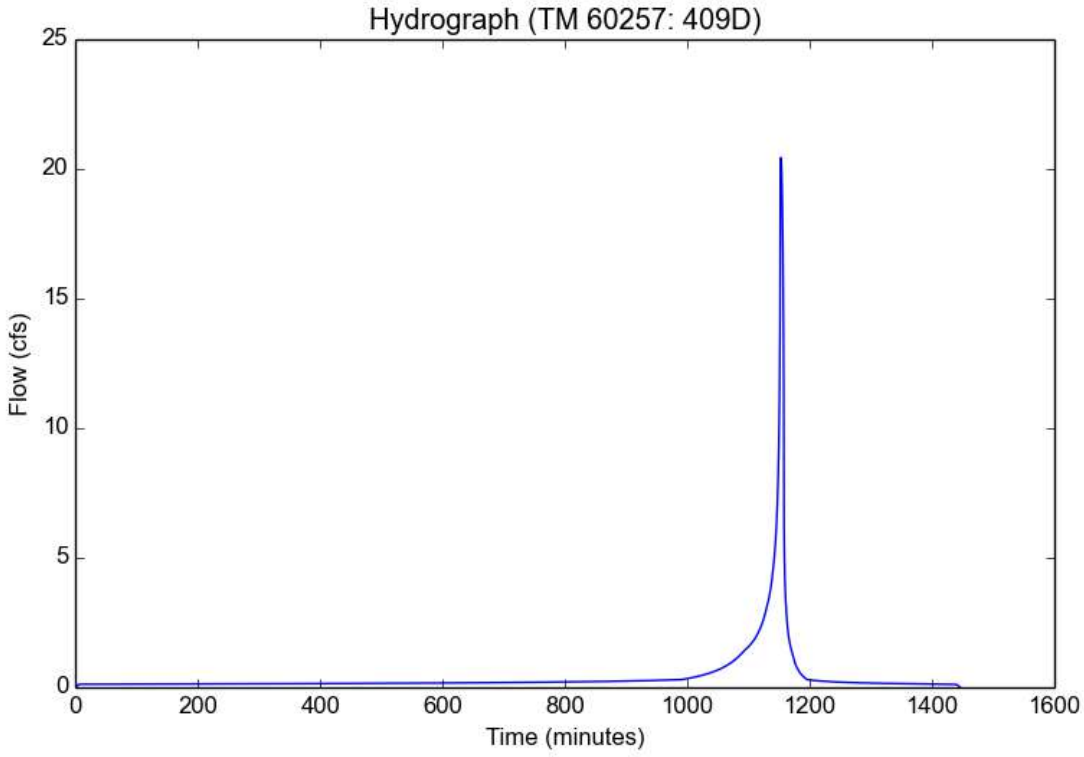
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	409D
Area (ac)	8.7
Flow Path Length (ft)	707.0
Flow Path Slope (vft/hft)	0.1938
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.01
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	3.1763
Undeveloped Runoff Coefficient (Cu)	0.7381
Developed Runoff Coefficient (Cd)	0.7397
Time of Concentration (min)	6.0
Clear Peak Flow Rate (cfs)	20.4417
Burned Peak Flow Rate (cfs)	20.4417
24-Hr Clear Runoff Volume (ac-ft)	0.8766
24-Hr Clear Runoff Volume (cu-ft)	38186.0951



Peak Flow Hydrologic Analysis

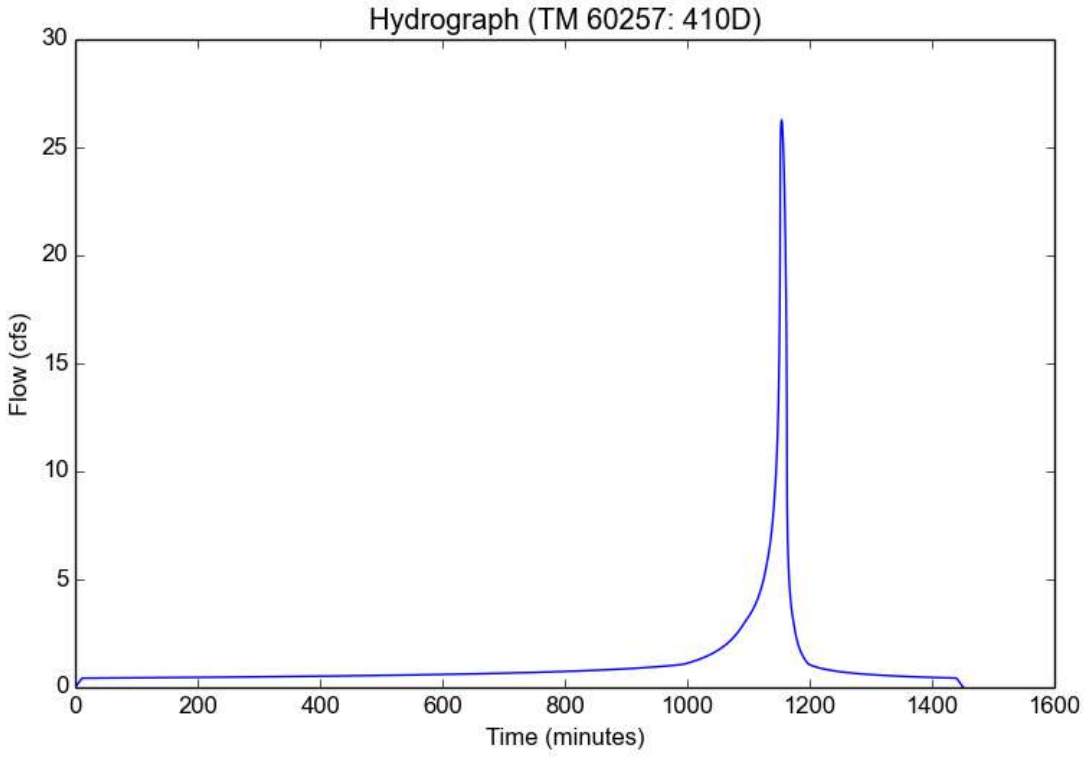
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	410D
Area (ac)	15.1
Flow Path Length (ft)	1544.0
Flow Path Slope (vft/hft)	0.0894
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.15
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.3889
Undeveloped Runoff Coefficient (Cu)	0.6977
Developed Runoff Coefficient (Cd)	0.728
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	26.2616
Burned Peak Flow Rate (cfs)	26.2616
24-Hr Clear Runoff Volume (ac-ft)	2.2243
24-Hr Clear Runoff Volume (cu-ft)	96890.0102



Peak Flow Hydrologic Analysis

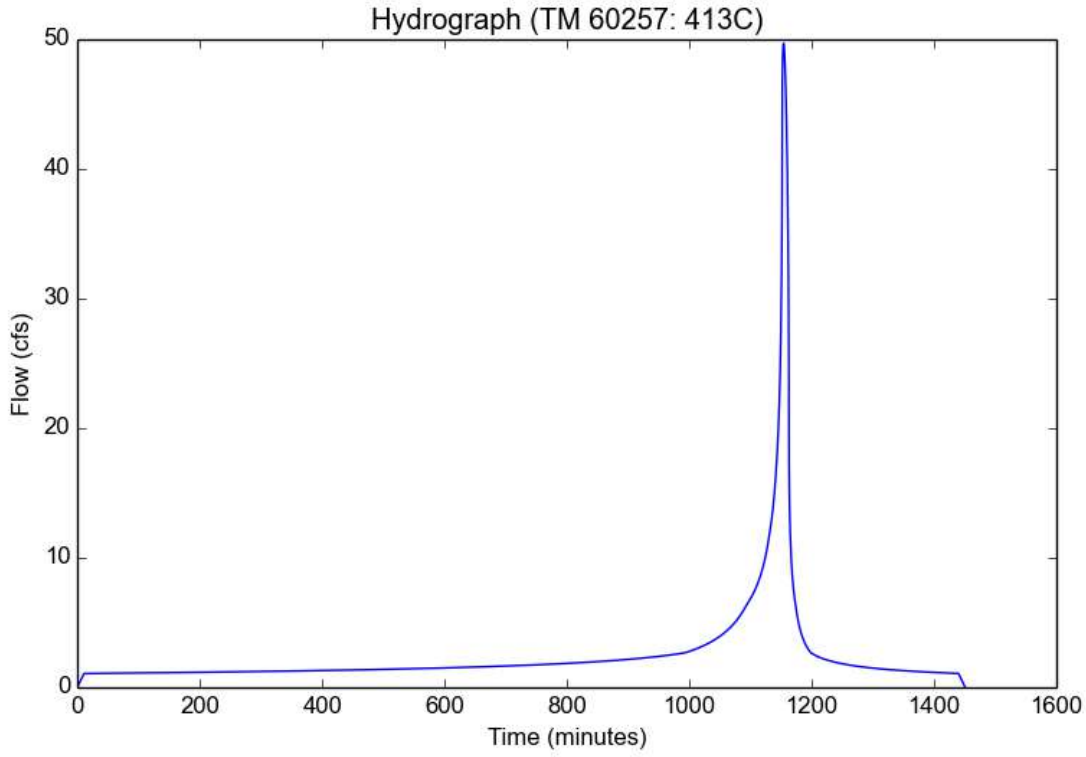
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	413C
Area (ac)	27.8
Flow Path Length (ft)	1604.0
Flow Path Slope (vft/hft)	0.084
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.25
Soil Type	97
Design Storm Frequency	50-yr
Fire Factor	0
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	5.8
Peak Intensity (in/hr)	2.3889
Undeveloped Runoff Coefficient (Cu)	0.6977
Developed Runoff Coefficient (Cd)	0.7483
Time of Concentration (min)	11.0
Clear Peak Flow Rate (cfs)	49.6928
Burned Peak Flow Rate (cfs)	49.6928
24-Hr Clear Runoff Volume (ac-ft)	5.0242
24-Hr Clear Runoff Volume (cu-ft)	218855.3557



Peak Flow Hydrologic Analysis

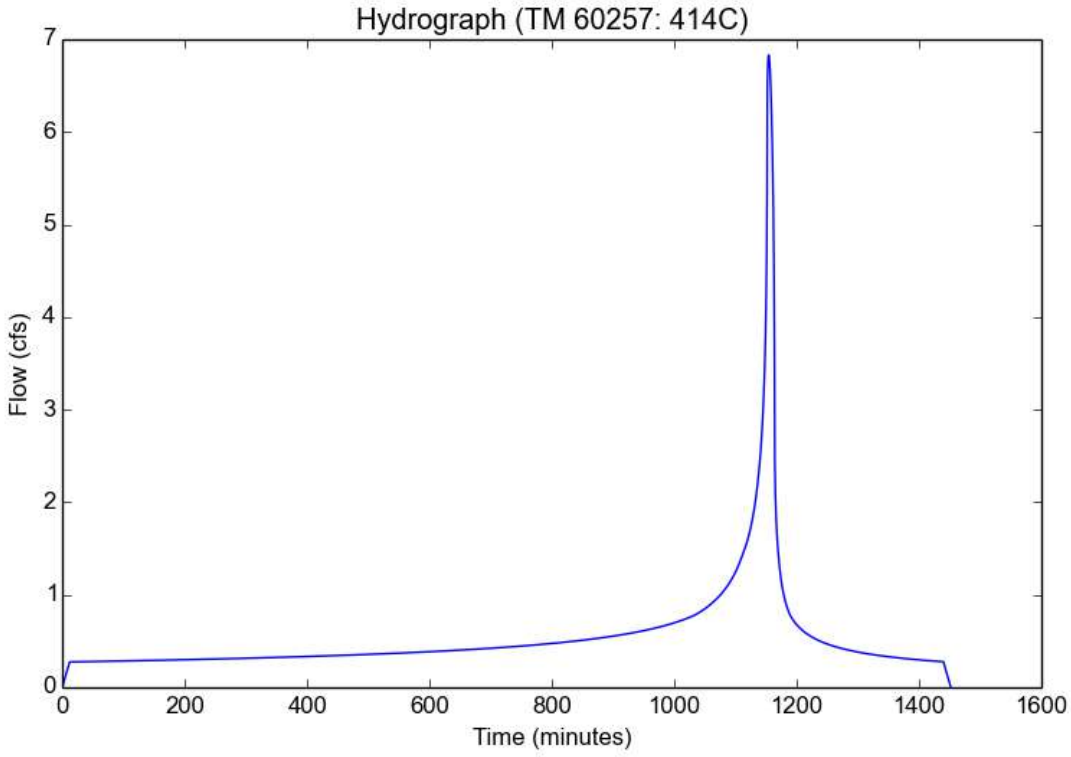
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	414C
Area (ac)	4.2
Flow Path Length (ft)	1248.0
Flow Path Slope (vft/hft)	0.03
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.6
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.0134
Undeveloped Runoff Coefficient (Cu)	0.6696
Developed Runoff Coefficient (Cd)	0.8078
Time of Concentration (min)	12.0
Clear Peak Flow Rate (cfs)	6.8311
Burned Peak Flow Rate (cfs)	6.8311
24-Hr Clear Runoff Volume (ac-ft)	1.0876
24-Hr Clear Runoff Volume (cu-ft)	47375.4582



Peak Flow Hydrologic Analysis

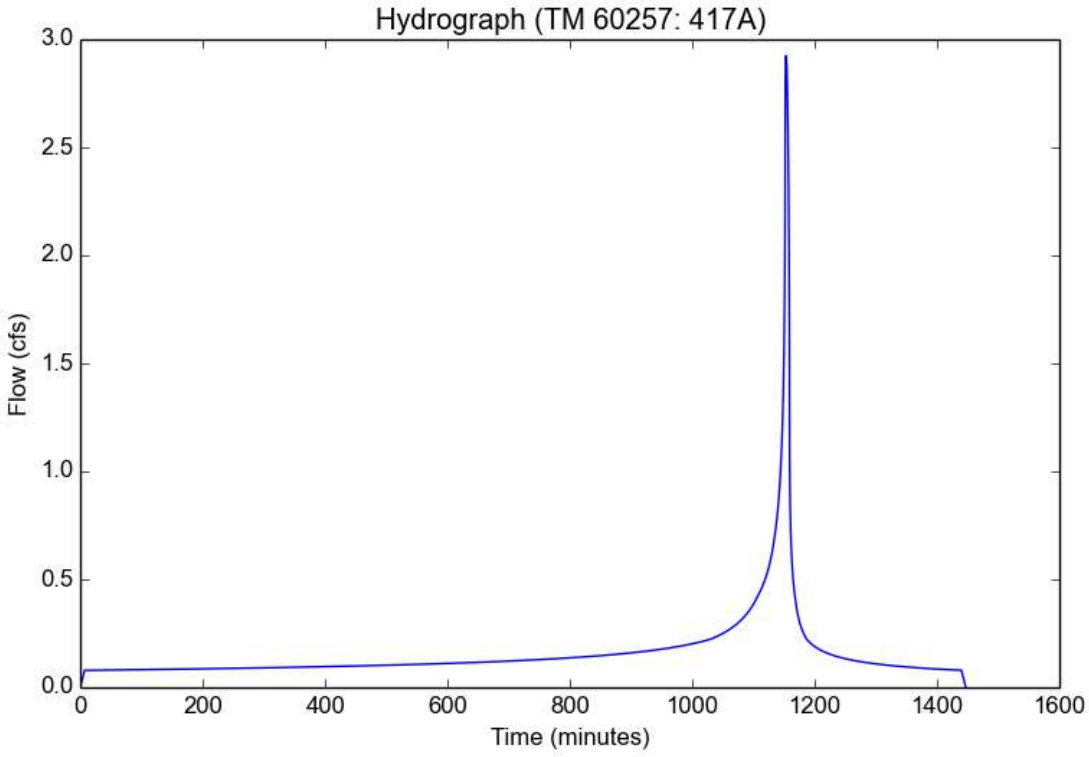
File location: C:/Users/bhanu/Desktop/TM 60257 Report.pdf
Version: HydroCalc 1.0.2

Input Parameters

Project Name	TM 60257
Subarea ID	417A
Area (ac)	1.4
Flow Path Length (ft)	576.0
Flow Path Slope (vft/hft)	0.04
50-yr Rainfall Depth (in)	5.8
Percent Impervious	0.5
Soil Type	97
Design Storm Frequency	25-yr
Fire Factor	0
LID	False

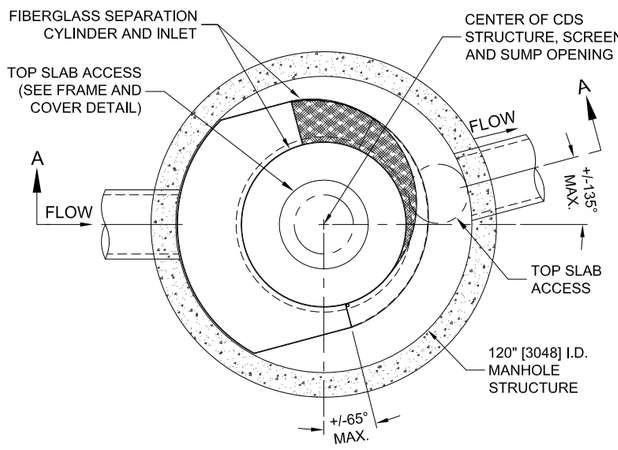
Output Results

Modeled (25-yr) Rainfall Depth (in)	5.0924
Peak Intensity (in/hr)	2.5939
Undeveloped Runoff Coefficient (Cu)	0.7105
Developed Runoff Coefficient (Cd)	0.8052
Time of Concentration (min)	7.0
Clear Peak Flow Rate (cfs)	2.9241
Burned Peak Flow Rate (cfs)	2.9241
24-Hr Clear Runoff Volume (ac-ft)	0.3208
24-Hr Clear Runoff Volume (cu-ft)	13973.6396

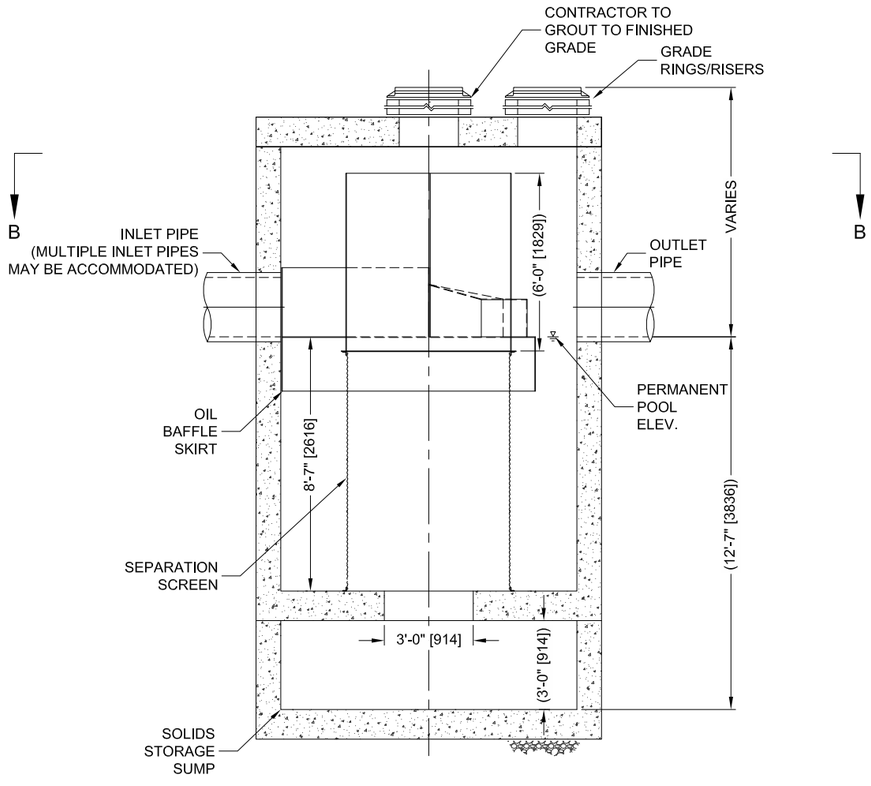


APPENDIX B

CDS UNIT SIZING			
TENTATIVE TRACT 60257			
Subarea	**Purpose**	**Flow Rate (CDS)**	**CDS Unit Number**
101A	Fines Removal	67.9	CDS5678-10
102A	Water Quality	0.2	CDS2015-4
105B	Fines Removal	47.5	CDS5678-10/CDS9280-12
115C	Fines Removal	32.2	CDS5678-10
130D/131D	Fines Removal	16.1	CDS5653-10
135D	Fines Removal	7.6	CDS4040-8
350A	Fines Removal	15.1	CDS5653-10
406A	Water Quality	0.9	CDS2015-4



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

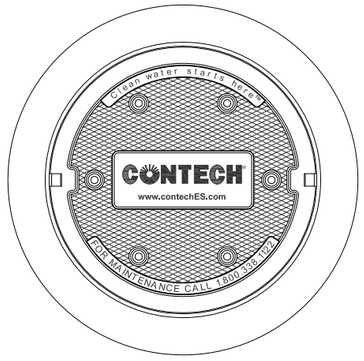
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS5678-10-C DESIGN NOTES

CDS5678-10-C RATED TREATMENT CAPACITY IS 25.0 CFS [708.0 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 50.0 CFS [1416 L/s]. IF THE SITE CONDITIONS EXCEED 50.0 CFS [1416 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS5678-10-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

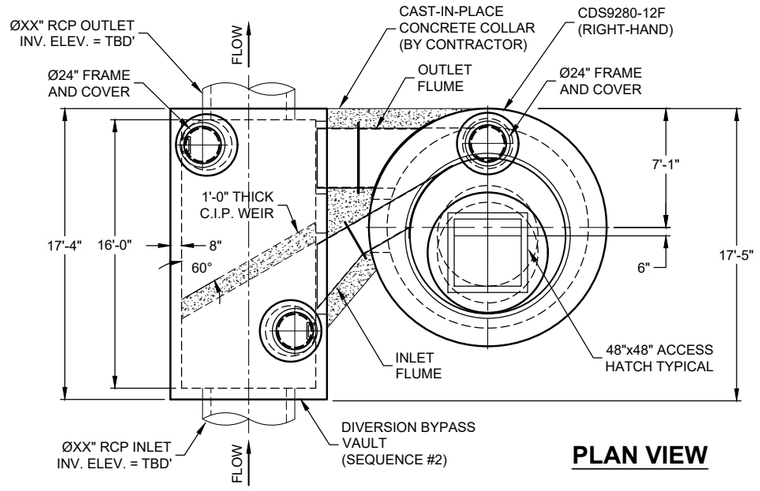
GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECHENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

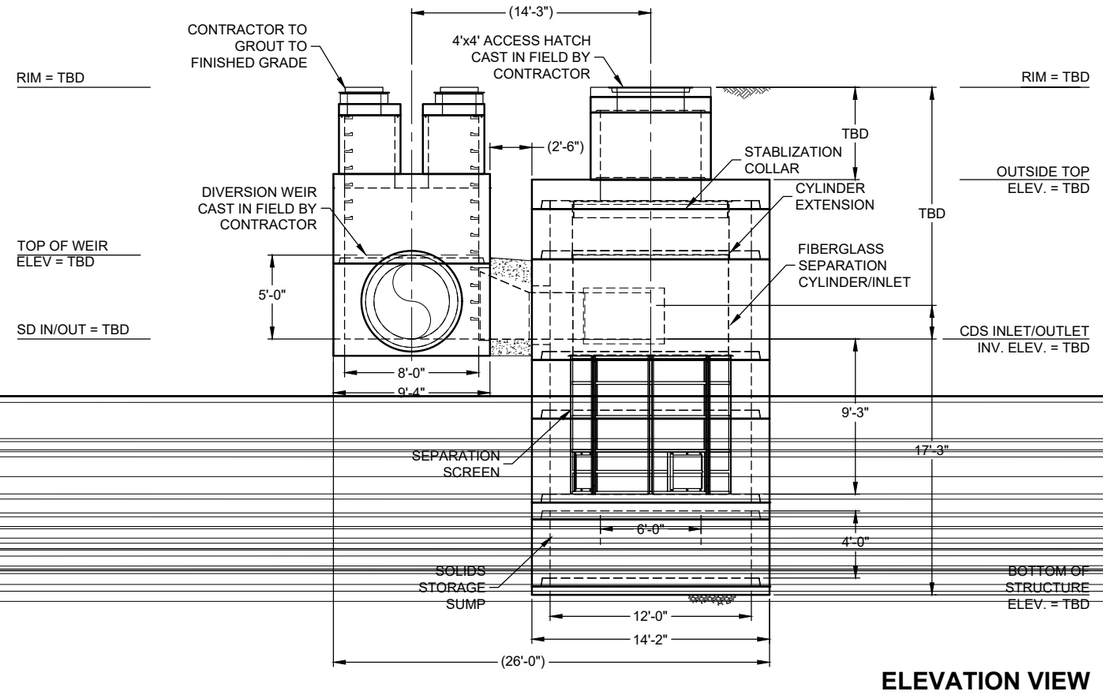
CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS5678-10-C ONLINE CDS STANDARD DETAIL

\\AD.CONTECH-CPI.COM\ROOT\COMMON\CAD\TREATMENT\22 CDS\40 STANDARD DRAWINGS\ONLINE (CDS-C)\DWG\CDS5678-10-C-DTL.DWG 9/25/2015 9:24 AM



PLAN VIEW



ELEVATION VIEW

MATERIALS LIST

COUNT	DESCRIPTION	INSTALLED BY
1	FIBERGLASS INLET FLUME AND CYLINDER	CONTRACTOR
1	FIBERGLASS OUTLET FLUME	CONTRACTOR
1	4700 MICRON SEPARATION SCREEN	CONTRACTOR
1	FIBERGLASS STABILIZATION COLLAR	CONTRACTOR
-	SEALANT FOR JOINTS	CONTRACTOR
4 PLCS	GRADE RINGS/RISERS	CONTRACTOR
3	Ø24" x 4" EJ #41600389, OR EQUIVALENT	CONTRACTOR
1	Ø30" x 4" EJ #41600484, OR EQUIVALENT	CONTRACTOR
0	Ø24" x 4" EJ #41600374B01, BOLT-DOWN OR EQUIV.	CONTRACTOR
0	Ø30" x 4" EJ #180782B01, OR BOLT-DOWN OR EQIV.	CONTRACTOR

SITE DESIGN DATA

WATER QUALITY FLOW RATE	TBD
PEAK FLOW RATE	TBD
RETURN PERIOD OF PEAK FLOW	TBD

GENERAL NOTES
1. DIMENSIONS IN ( ) MAY VARY FROM THOSE SHOWN.
2. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. CDS WATER QUALITY STRUCTURE AND DIVERSION BYPASS VAULT SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
5. STRUCTURES SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 20', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
6. CDS STRUCTURES AND DIVERSION BYPASS VAULT SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE'S SECTIONS AND ASSEMBLE STRUCTURES.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT DIVERSION BYPASS VAULT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO INSTALL FIBERGLASS INLET AND OUTLET FLUMES AND SHALL INSTALL CAST-IN-PLACE CONCRETE COLLARS ACCORDING TO DETAILS SHOWN ON SHEET 2 OF 2.
F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNITS ARE WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.
G. THE DIVERSION BYPASS WEIR WALL SHALL BE CAST-IN-PLACE. SEE SECTION B-B ON SHEET 2 OF 2.

~~STRUCTURE WEIGHT~~
APPROXIMATE CDS RISER SECTION WEIGHT PER VERTICAL FOOT = 6900 LBS

~~APPROXIMATE HEAVIEST PICK CDS (RIGHT) = 42000 LBS., DELIVERED IN 8 PIECES~~

APPROXIMATE HEAVIEST PICK DIVERSION BYPASS VAULT = 43000 LBS., DELIVERED IN 2 PIECES

~~APPROXIMATE FOOTPRINT = 26' x 18' (RECTANGLE ENCOMPASSING SYSTEM EXTREMITIES)~~

INDICATES CAST-IN-PLACE ITEMS

CONTECH
PROPOSAL
DRAWING

PRECN / PR80127
LAYOUT 1B
CDS92100-12-F_FGIS

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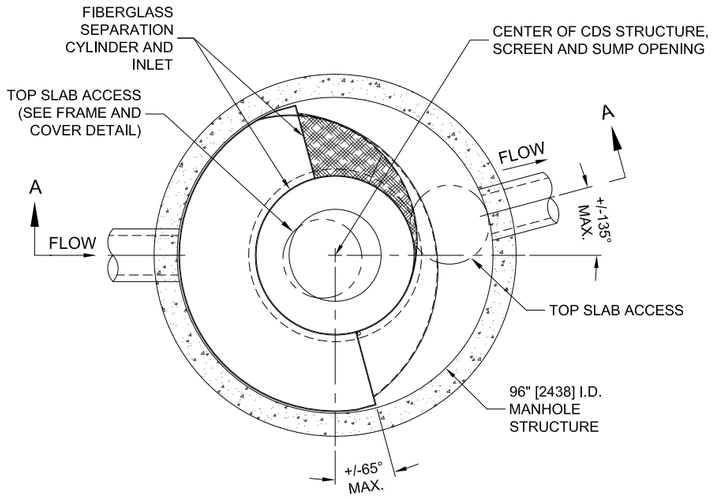
MARK	DATE	REVISION DESCRIPTION	BY
2			
1			

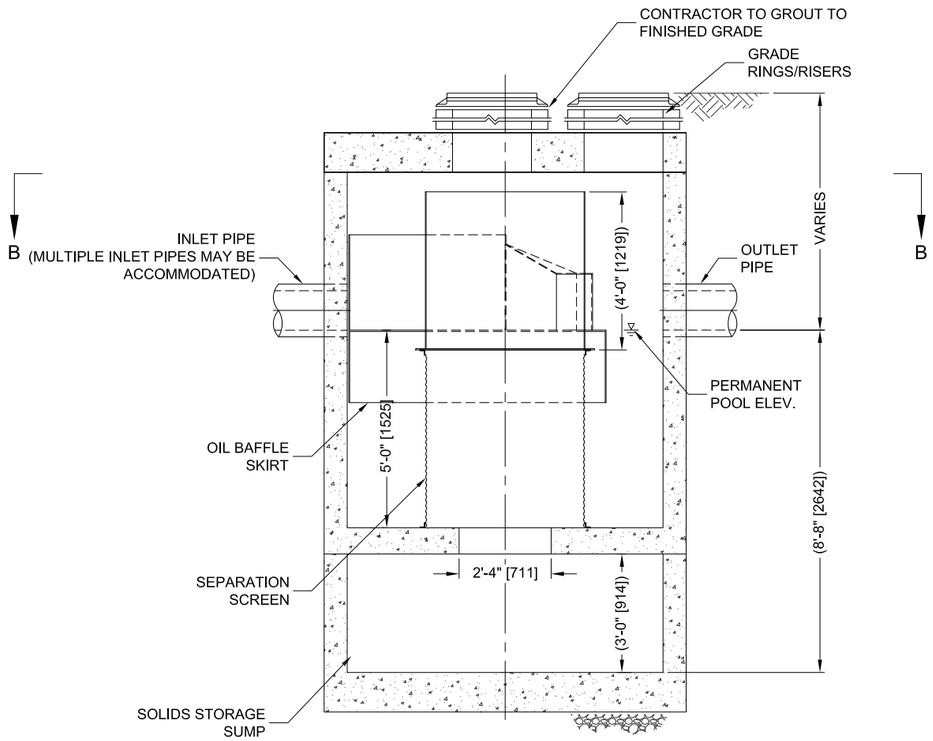
CDS9280-12F - PN-SEQ #
PROJECT NAME
PROJECT LOCATION
SITE DESIGNATION:

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
11835 NE Glenn Widing Drive • Portland, OR 97220
800-548-4667 503-240-3393 800-561-1271 FAX

THE PRODUCT DISCLOSED ON THIS DRAWING IS COVERED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 7,704,393; 8,147,267; 8,513,595; 8,801,931; 9,027,762; 9,039,897; 9,352,256; 9,795,899; 9,861,923; 9,861,924; 9,861,925; 9,861,926; 9,861,927; 9,861,928; 9,861,929; 9,861,930; 9,861,931; 9,861,932; 9,861,933; 9,861,934; 9,861,935; 9,861,936; 9,861,937; 9,861,938; 9,861,939; 9,861,940; 9,861,941; 9,861,942; 9,861,943; 9,861,944; 9,861,945; 9,861,946; 9,861,947; 9,861,948; 9,861,949; 9,861,950; 9,861,951; 9,861,952; 9,861,953; 9,861,954; 9,861,955; 9,861,956; 9,861,957; 9,861,958; 9,861,959; 9,861,960; 9,861,961; 9,861,962;



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

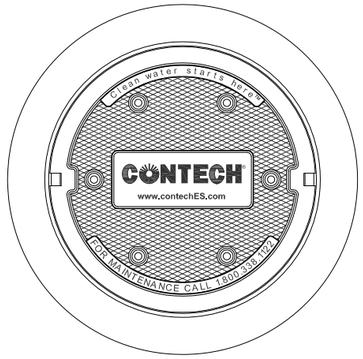
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS; OR OTHER PATENTS PENDING.

CDS4045-8-C DESIGN NOTES

CDS4045-8-C RATED TREATMENT CAPACITY IS 7.5 CFS [212.4 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 30.0 CFS [850 L/s]. IF THE SITE CONDITIONS EXCEED 30.0 CFS [850 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS4045-8-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
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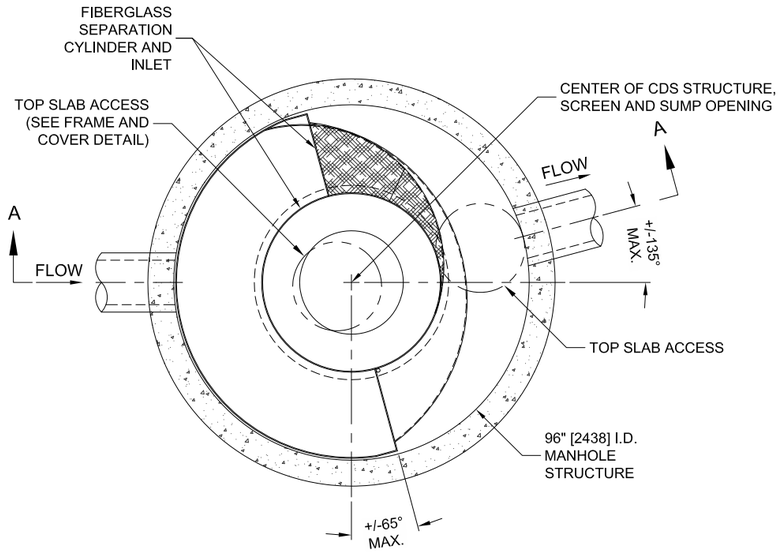
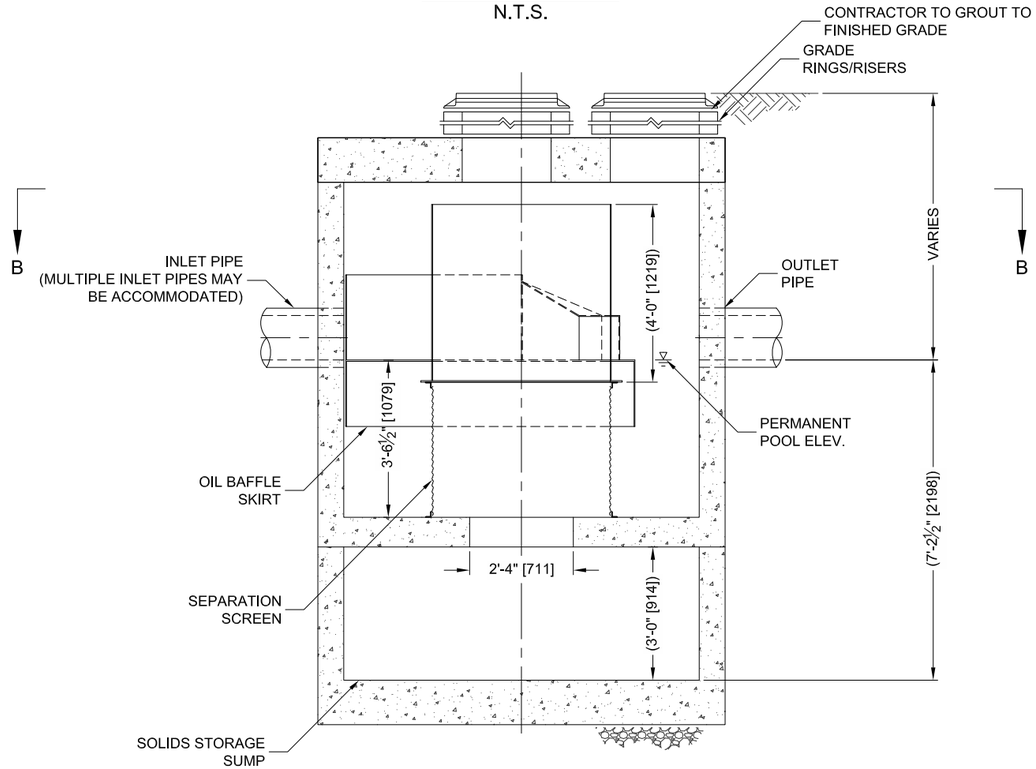
CDS4045-8-C
ONLINE CDS
STANDARD DETAIL

\\AD.CONTECH-CPI.COM\ROOT\COMMON\CAD\TREATMENT\22 CDS\40 STANDARD DRAWINGS\ONLINE (CDS-C)\DWG\CDS4045-8-C-DTL.DWG 9/25/2015 8:43 AM



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

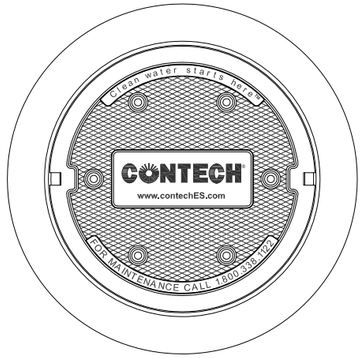
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,849; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS4030-8-C DESIGN NOTES

CDS4030-8-C RATED TREATMENT CAPACITY IS 4.5 CFS [127.4 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 30.0 CFS [850 L/s]. IF THE SITE CONDITIONS EXCEED 30.0 CFS [850 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS4030-8-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECHENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
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CDS4030-8-C
ONLINE CDS
STANDARD DETAIL

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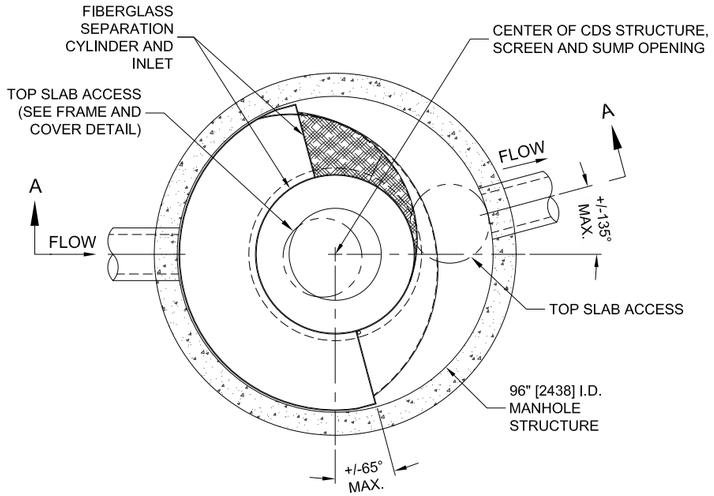
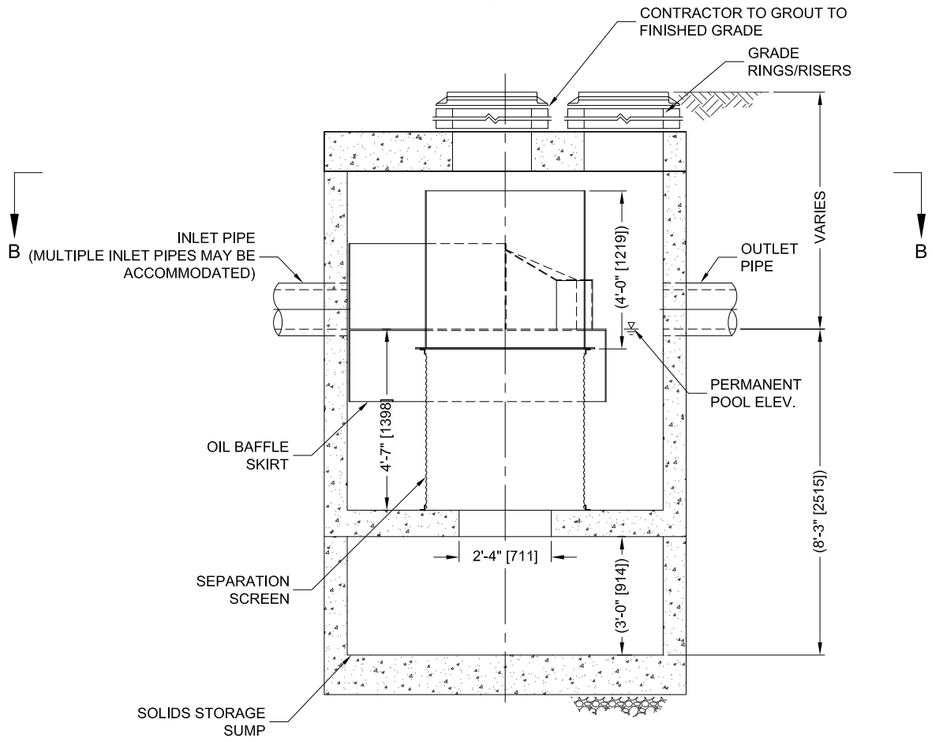


PLAN VIEW B-B
N.T.S.



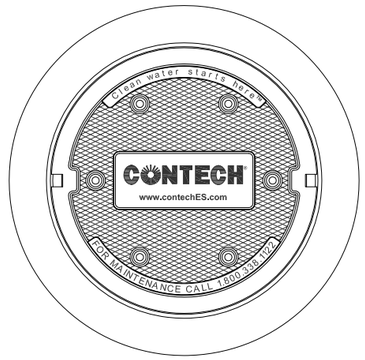
ELEVATION A-A
N.T.S.

CDS4040-8-C DESIGN NOTES

CDS4040-8-C RATED TREATMENT CAPACITY IS 6.0 CFS [169.9 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 30.0 CFS [850 L/s]. IF THE SITE CONDITIONS EXCEED 30.0 CFS [850 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS4040-8-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,847; 6,641,720; 6,511,595; 6,581,782; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

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CDS4040-8-C
ONLINE CDS
STANDARD DETAIL

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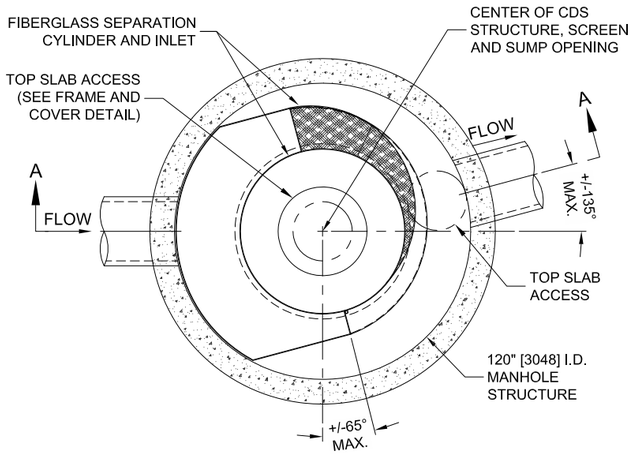
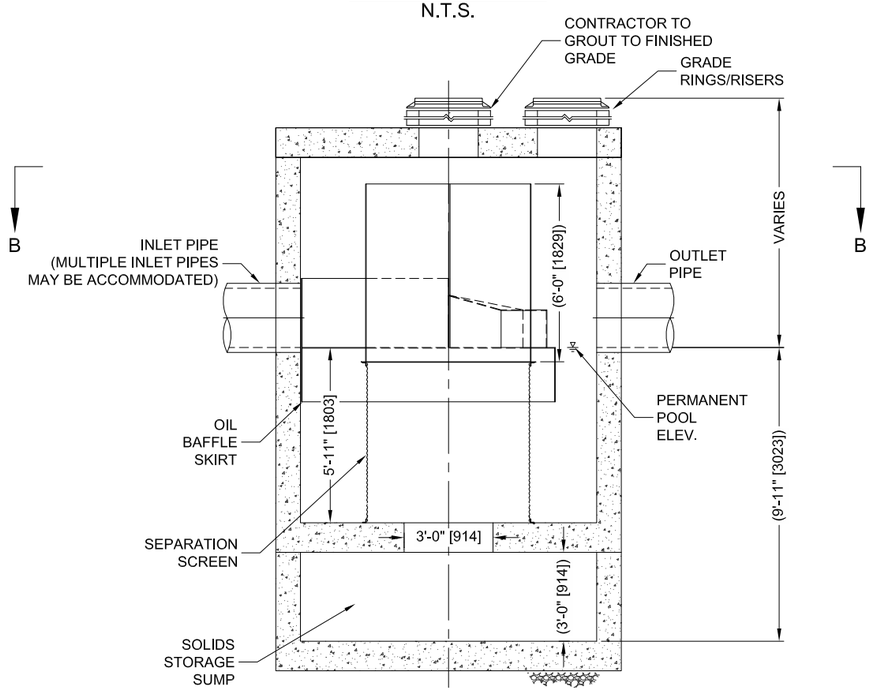


PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

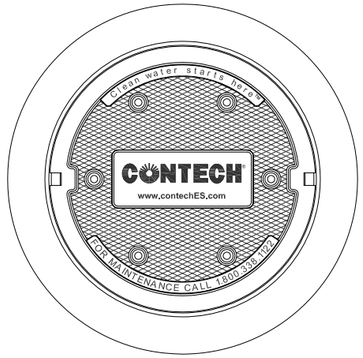
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,782; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS5653-10-C DESIGN NOTES

CDS5653-10-C RATED TREATMENT CAPACITY IS 14.0 CFS [396.5 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 50.0 CFS [1416 L/s]. IF THE SITE CONDITIONS EXCEED 50.0 CFS [1416 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS5653-10-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechEScom
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET HS20 (AASHTO M 306) AND BE CAST WITH THE CONTECH LOGO.
6. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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800-338-1122 513-645-7000 513-645-7993 FAX

CDS5653-10-C ONLINE CDS STANDARD DETAIL

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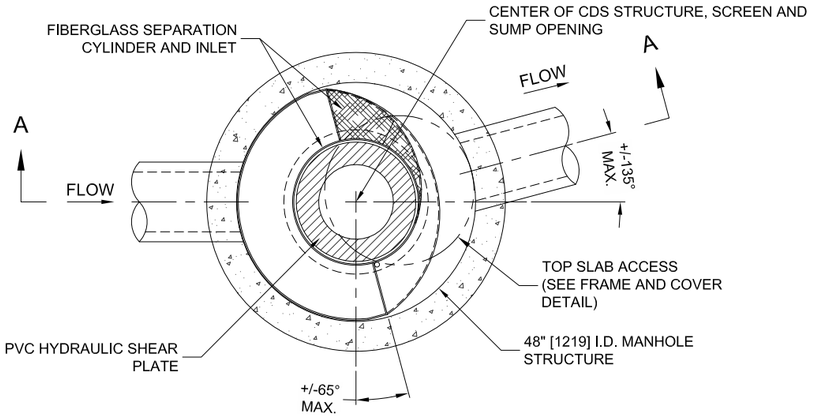
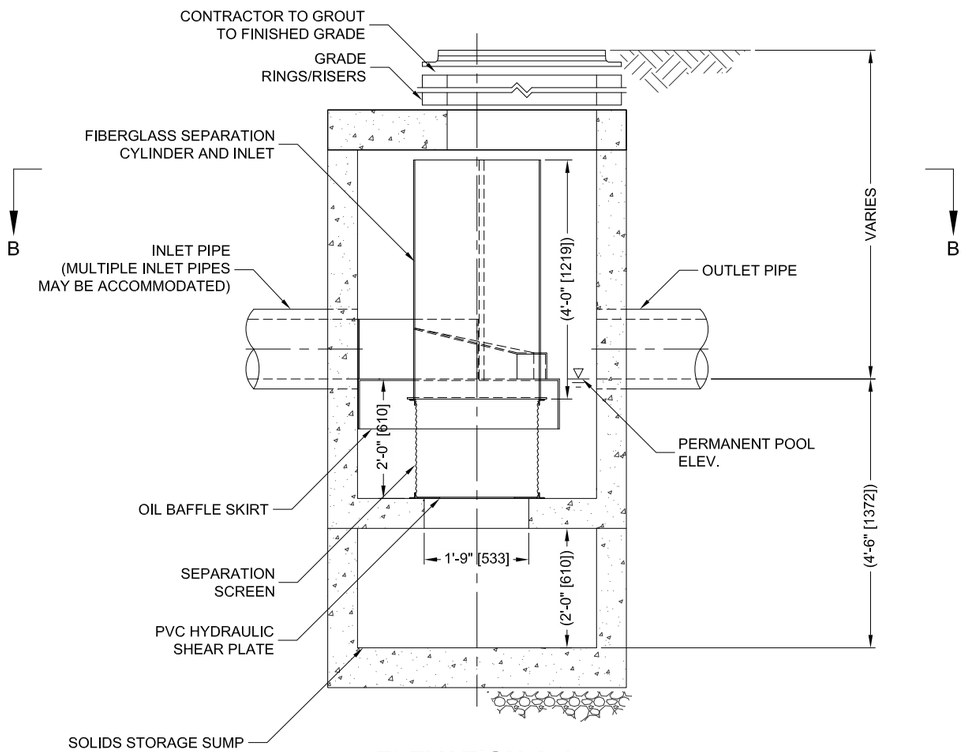


PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

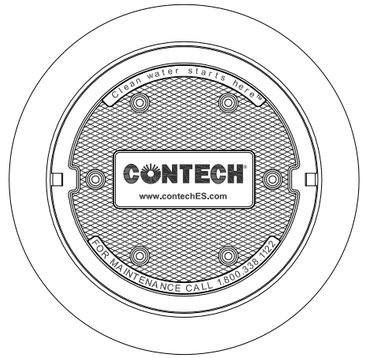
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,590; 6,581,783; RELATED FOREIGN PATENTS; OR OTHER PATENTS PENDING.

CDS2015-4-C DESIGN NOTES

CDS2015-4-C RATED TREATMENT CAPACITY IS 0.7 CFS [19.8 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 10.0 CFS [283 L/s]. IF THE SITE CONDITIONS EXCEED 10.0 [283 L/s] CFS, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS2015-4-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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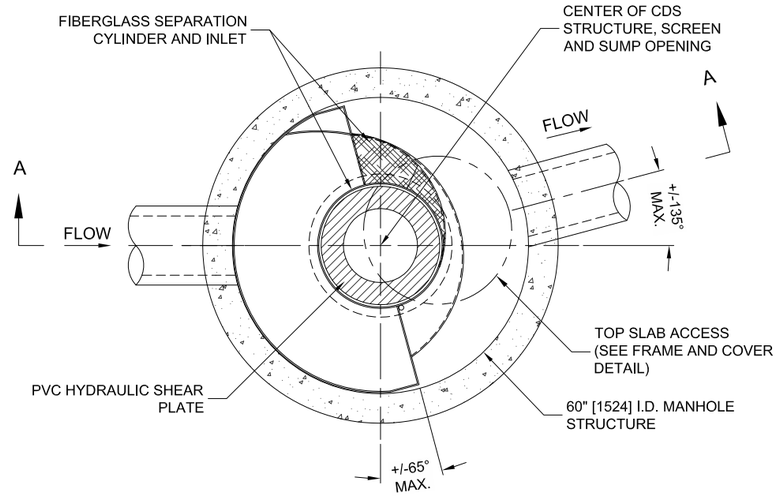
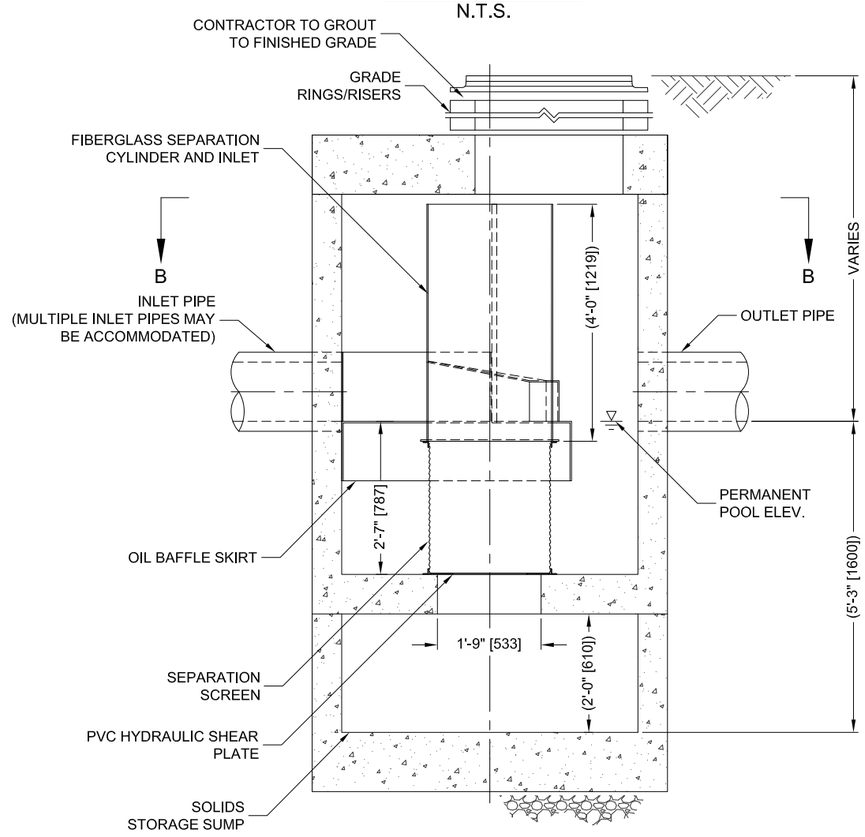
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS2015-4-C ONLINE CDS STANDARD DETAIL

\\AD.CONTECH-CPI.COM\ROOT\COMMON\CAD\TREATMENT\22 CDS\40 STANDARD DRAWINGS\ONLINE (CDS-C)\DWG\CDS2015-4-C-DTL.DWG 9/25/2015 8:05 AM



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

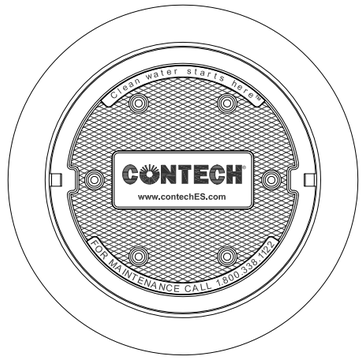
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS2020-5-C DESIGN NOTES

CDS2020-5-C RATED TREATMENT CAPACITY IS 1.1 CFS [31.2 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 14.0 CFS [396 L/s]. IF THE SITE CONDITIONS EXCEED 14.0 CFS [396 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS2020-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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CDS2020-5-C
ONLINE CDS
STANDARD DETAIL

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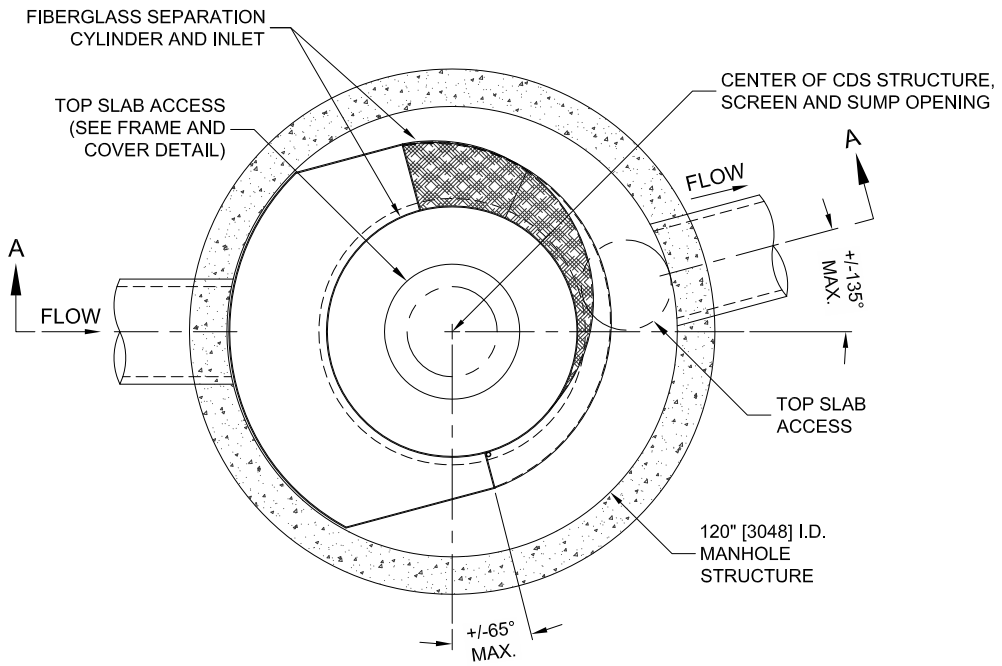
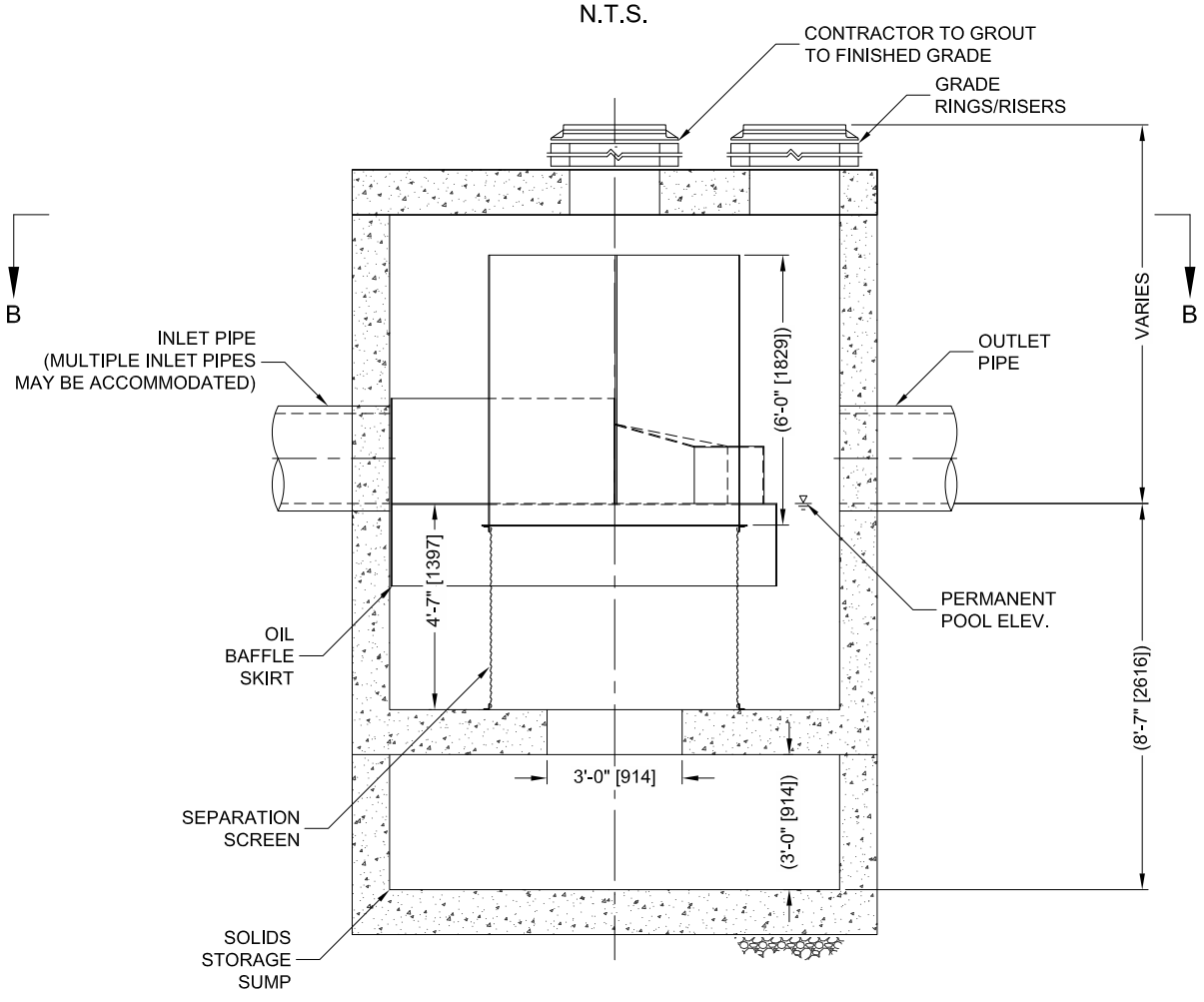


PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

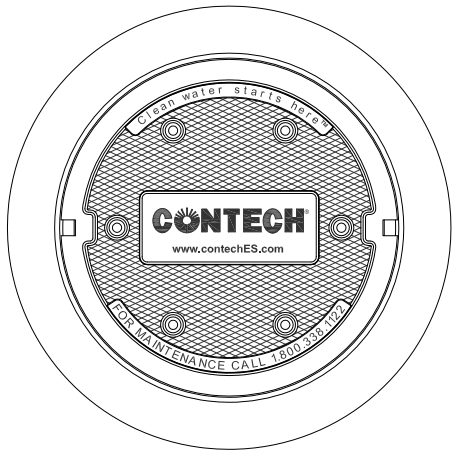
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS5640-10-C DESIGN NOTES

CDS5640-10-C RATED TREATMENT CAPACITY IS 9.0 CFS [254.9 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 50.0 CFS [1416 L/s]. IF THE SITE CONDITIONS EXCEED 50.0 CFS [1416 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS5640-10-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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CDS5640-10-C
ONLINE CDS
STANDARD DETAIL

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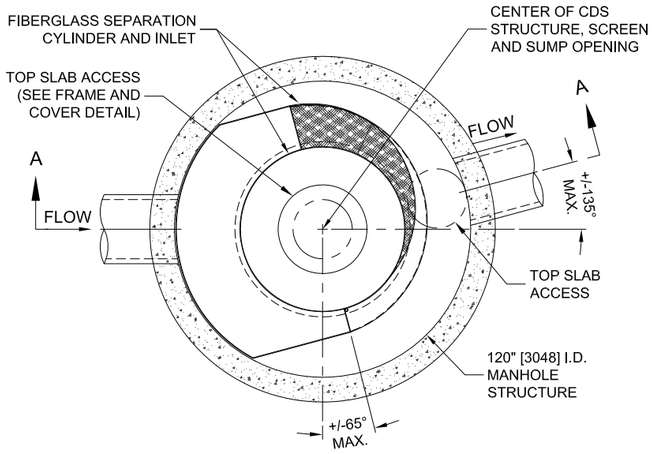
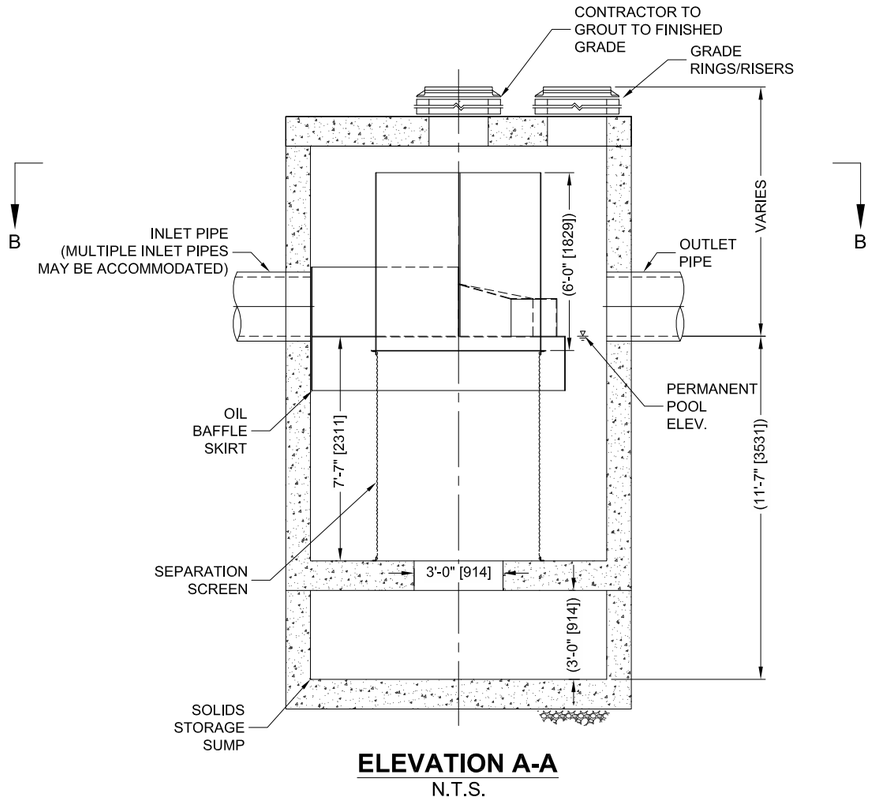


PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.

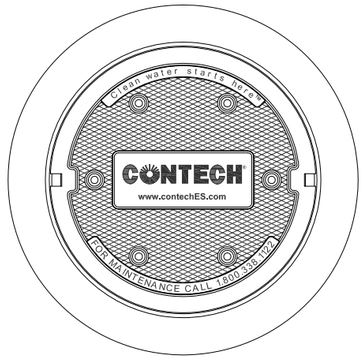
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,788,848; 6,641,720; 6,511,595; 6,581,783; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS5668-10-C DESIGN NOTES

CDS5668-10-C RATED TREATMENT CAPACITY IS 19.0 CFS [538.0 L/s], OR PER LOCAL REGULATIONS. MAXIMUM HYDRAULIC INTERNAL BYPASS CAPACITY IS 50.0 CFS [1416 L/s]. IF THE SITE CONDITIONS EXCEED 50.0 CFS [1416 L/s], AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD CDS5668-10-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400 OR 4700)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

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CDS5668-10-C
ONLINE CDS
STANDARD DETAIL

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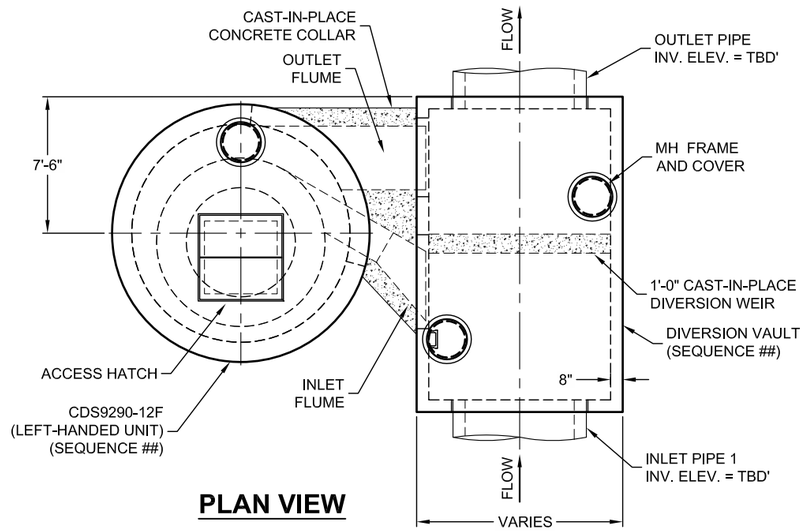
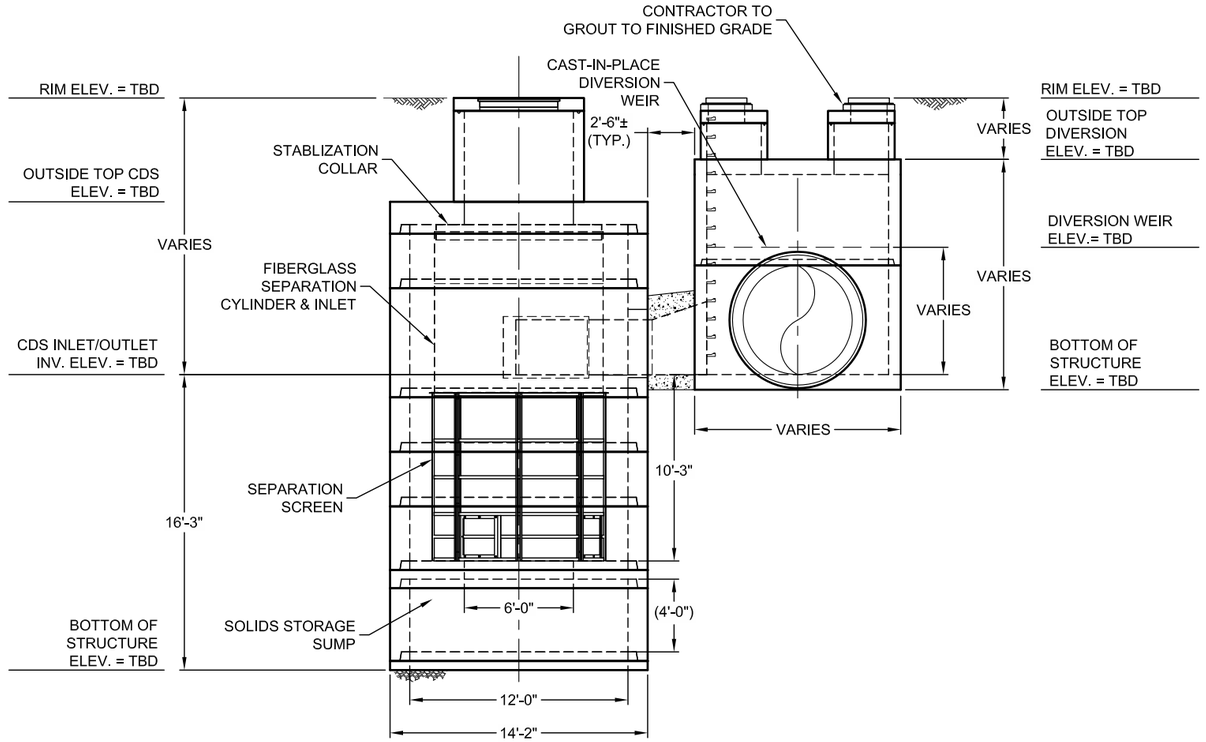


PLAN VIEW



ELEVATION VIEW

INDICATES CAST-IN-PLACE ITEMS

MATERIALS LIST

COUNT	DESCRIPTION	INSTALLED BY
1	FIBERGLASS INLET FLUME AND CYLINDER	CONTRACTOR
1	FIBERGLASS OUTLET FLUME	CONTRACTOR
1	4700 MICRON SEPARATION SCREEN	CONTRACTOR
1	FIBERGLASS STABILIZATION COLLAR	CONTRACTOR
-	SEALANT FOR JOINTS	CONTRACTOR
TBD	RISERS	CONTRACTOR
TBD	GRADE RINGS	CONTRACTOR
3	Ø24" x 4" EJ #41600389, OR EQUIVALENT	CONTRACTOR
1	4' x 4' HATCH, OR SIMILAR	CONTRACTOR
TBD	STEPS, OR SIMILAR	CONTECH

SITE DESIGN DATA

WATER QUALITY FLOW RATE	TBD CFS
PEAK FLOW RATE	TBD CFS
RETURN PERIOD OF PEAK FLOW	TBD YRS

GENERAL NOTES
1. DIMENSIONS IN ( ) MAY VARY FROM THOSE SHOWN.
2. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. CDS WATER QUALITY STRUCTURE AND DIVERSION BYPASS VAULT SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
5. STRUCTURES SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 20', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
6. CDS STRUCTURES AND DIVERSION BYPASS VAULT SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE'S SECTIONS AND ASSEMBLE STRUCTURES.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT DIVERSION BYPASS VAULT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO INSTALL FIBERGLASS INLET AND OUTLET FLUMES AND SHALL INSTALL CAST-IN-PLACE CONCRETE COLLARS ACCORDING TO DETAILS SHOWN ON SHEET 2 OF 2.
F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNITS ARE WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.
G. THE DIVERSION BYPASS WEIR WALL SHALL BE CAST-IN-PLACE. SEE SECTION B-B ON SHEET 2 OF 2.

STRUCTURE WEIGHT
APPROXIMATE CDS RISER SECTION WEIGHT PER VERTICAL FOOT = 6900 LBS

APPROXIMATE HEAVIEST PICK CDS (RIGHT) = TBD LBS., DELIVERED IN X PIECES
APPROXIMATE HEAVIEST PICK DIVERSION BYPASS VAULT = TBD LBS., DELIVERED IN X PIECES

APPROXIMATE FOOTPRINT = TBD (RECTANGLE ENCOMPASSING SYSTEM EXTREMITIES)

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If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to CONTECH immediately for re-evaluation of the design. CONTECH accepts no liability for design changes made by others. Incomplete or inaccurate information supplied by others,

MARK	DATE	REVISION DESCRIPTION	BY
4	08/02/16	DIVERSION BYPASS HEAVY PICK WEIGHT	NLE
3	03/29/16	SYSTEM CONFIGURATION	CLB
2	02/29/16	REVISED CDS STRUCTURE	CLB
1	02/15/16	REVISED STRUCTURE	CLB

CDS9290-12F- PROJ. NO.- SEQ. NO.
PROJECT NAME
PROJECT LOCATION
SITE DESIGNATION: (IF APPLICABLE)

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 7,186,041; 7,296,874; 7,297,258; 7,530,762; RELATED FOREIGN PATENTS; OR OTHER PATENTS PENDING.

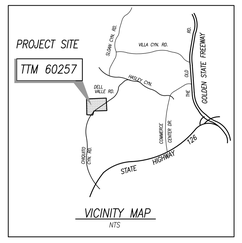
DATE: DES. DATE

DESIGNED:	DRAWN:
JSF	JSF
CHECKED:	APPROVED:
PROJECT No.: XXXXXX	SEQUENCE No.: XX
SHEET: 1 OF X	

CONTECH
PROPOSAL
DRAWING

PRECN / PR80127
LAYOUT 1A
CDS9290-12-F_FGIS

C:\USERS\FRANCIS\DOCUMENTS\CONTECH\COMMOPS\STORMWATER\HDS & OWS\CDS\NEW CDS\CDS92XX-12F\CDS9290-12F-LH-PRO.DWG 2/26/2019 1:43 PM



HYDROLOGIC SUMMARY

PROJECT SITE

Node Number	Area (ac)	ΣArea (ac)	% Imp	Frequency	Isohyet (in.)	Soil Type	Tc (min)	Qb (cfs)	ΣQb (cfs)	Peak Bulking Factor	DPA-5 Qbb (cfs)	DPA-5 ΣQbb (cfs)	DPA-5 DPB (cy/sq mi)	DPV (cy)	ΣDPV (cy)
3A	7.2		0.01	50-yr	5.8	97	8	15.0		1.465	22.0		81,000	911	
5A	17.3		0.01	50-yr	5.8	97	10	32.2		1.465	47.2		81,000	2,160	
7A	10.0		0.01	50-yr	5.8	97	12	33.3		1.465	48.8		81,000	2,519	
9B	10.6		0.01	50-yr	5.8	97	7	23.7		1.465	34.7		81,000	1,342	
11B	7.0		0.01	50-yr	5.8	97	5	19.1		1.465	28.0		81,000	986	
13B	10.8		0.01	50-yr	5.8	97	9	20.8		1.465	30.5		81,000	1,342	
14AB		72.6							134.9	1.465		197.6	81,000		9,198
15A	27.7		0.01	50-yr	5.8	97	13	44.3		1.465	64.9		81,000	3,366	
16C	25.8		0.05	50-yr	5.8	97	12	43.5		1.465	63.7		81,000	3,265	
19C	8.9		0.10	50-yr	5.8	97	9	17.8		1.465	26.1		81,000	1,156	
36AC		135.6							226.9	1.43		322.2	60,000		12,456
20A	7.2		0.10	50-yr	5.8	97	8	15.3		1.465	21.6		81,000	853	
20B	24.4		0.10	50-yr	5.8	97	11	43.7		1.465	60.9		81,000	2,067	
20C	6.6		0.01	50-yr	5.8	97	6	21.0		1.465	30.8		81,000	1,065	
20C	16.1		0.15	50-yr	5.8	97	11	27.4		1.465	37.5		81,000	1,519	
34AC		48.1							85.7	1.465		118.6	81,000		5,234
20B	26.1		0.25	50-yr	5.8	97	12	51.3		1.465	65.3		81,000	2,114	
36AB		219.4							362.3	1.39		490.8	48,000		31,256
38A	3.3		0.25	50-yr	5.8	97	6	8.4		1.465	11.1		81,000	291	
43B	24.3		0.01	50-yr	5.8	97	13	38.8		1.465	56.8		81,000	3,055	
44C	14.9		0.42	50-yr	5.8	97	9	27.7		1.465	35.2		81,000	1,586	
49BC		39.2							66.6	1.465		97.6	81,000		4,967
46B	9.0		0.06	50-yr	5.8	97	6	14.7		1.465	21.5		81,000	759	
OUTLET		287.9							425.9	1.390		574.1	46,000		18,252

OFFSITE

Node Number	Area (ac)	ΣArea (ac)	% Imp	Frequency	Isohyet (in.)	Soil Type	Tc (min)	Qb (cfs)	ΣQb (cfs)	Peak Bulking Factor	DPA-5 Qbb (cfs)	DPA-5 ΣQbb (cfs)	DPA-5 DPB (cy/sq mi)	DPV (cy)
Offsite	4.3		0.1	50-yr	5.8	97	6	10.8		1.465	15.4		81,000	494

LEGEND

- MAIN DRAINAGE BOUNDARY
- SUB-AREA BOUNDARY
- FLOW LINE

3A & 13AC — LOCATION NAMES

A — AREA IN ACRES, Ac

Qb — 50-YR. BURNED DESIGN FLOW IN CUBIC FEET PER SECOND, cfs

Qbb — 50-YR. BURNED & BULKED DESIGN FLOW IN CUBIC FEET PER SECOND, cfs

Qd — 50-YR OR 25-YR. DESIGN FLOW IN CUBIC FEET PER SECOND, cfs

DPv — DEBRIS PRODUCTION VOLUME IN CUBIC YARDS, cy

HYDROLOGY CRITERIA

- DESIGN STORM FREQUENCY:
  50-YR FOR DEVELOPED SUMP & UNDEVELOPED NATURAL AREAS
- DPA ZONE = 5
- BASIN NAME = SANTA CLARA
- SOIL TYPE NUMBER = 097
- PEAK BULKING FACTOR = 1.465 (FOR AREAS 64 Ac. OR UNDER)

DEBRIS PRODUCTION RATE = 81,000 Cy / SQ MI. (FOR AREAS 64 Ac. OR UNDER)

- ISOHYET = 5.8" (50-YR, 24-HOUR)
- % IMPERVIOUSNESS:
  1% FOR UNDEVELOPED / NATURAL AREAS
  42% RESIDENTIAL
  91% ROADS

HYDROLOGY STUDY APPROVED

CHECKED BY: _____ RCE NO. 82680 DATE: 2/20/2020

APPROVED BY: Arnold C. Lerma DATE: 2/20/2020

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
LAND DEVELOPMENT DIVISION

EXISTING CONDITION

HYDROLOGY

TENTATIVE TRACT NO. 060257 (STERLING)

IN THE UNINCORPORATED TERRITORY OF LOS ANGELES COUNTY

NORTH

SCALE: 1"=100'

PREPARED FOR:
Sterling Gateway, L.P.
P.O. Box 681007
PARK CITY, UT 84068

DATE: 11/05/2019

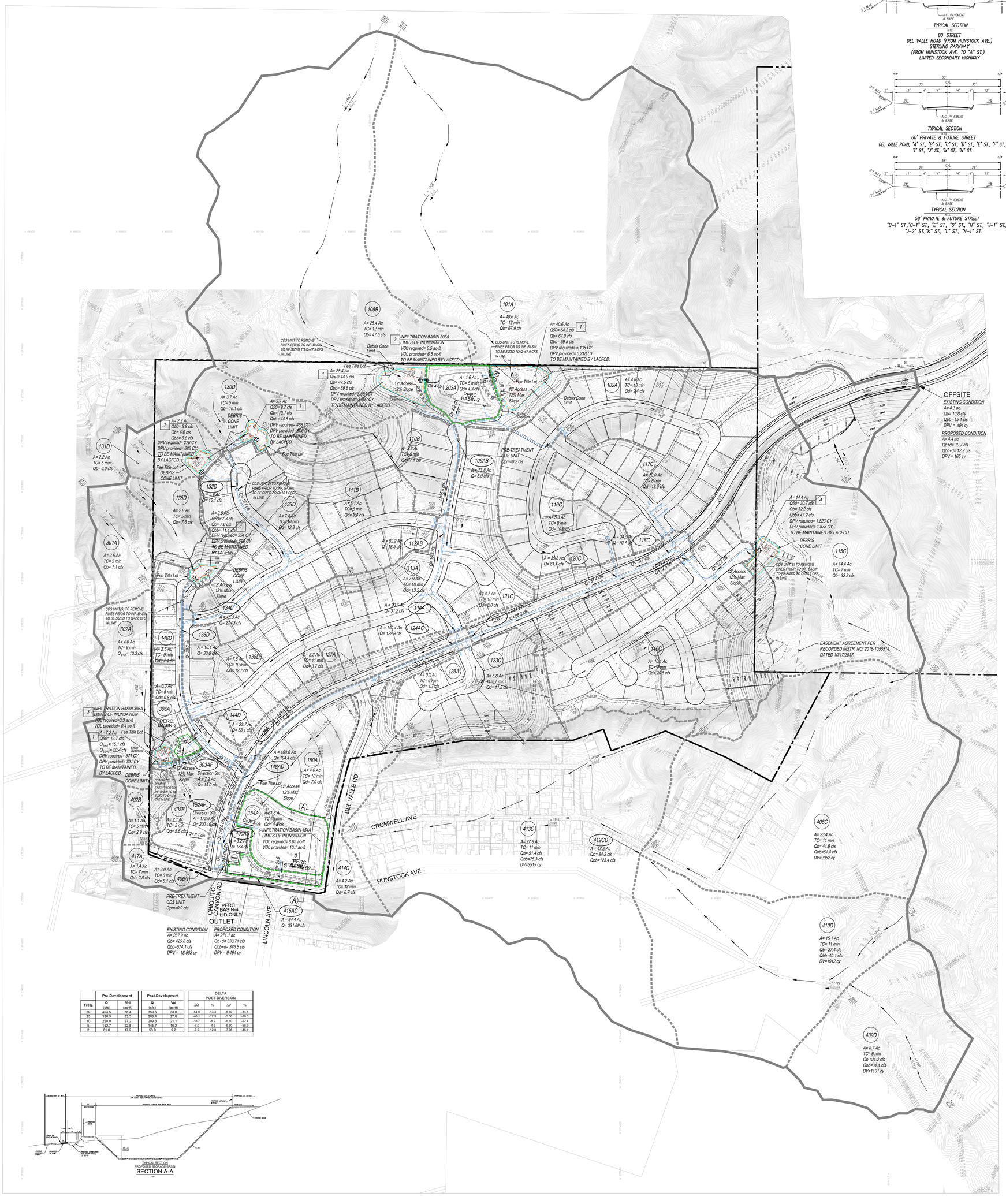
W.O. NO.: 5100-056-01

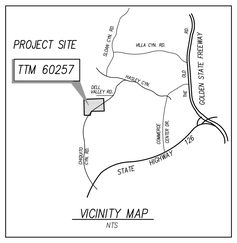
PREPARED BY:
SIKAND
Engineering | Planning | Surveying
15230 Burbank Blvd. #100, Van Nuys, CA 91411
Phone : (818) 997- 8550, Fax : (818) 901-7451
www.sikand.com, E-mail: info@sikand.com

REGISTERED PROFESSIONAL ENGINEER — No. 49041 — (ex. 06-30-2020) — CIVIL — STATE OF CALIFORNIA

SHEET 1 OF 1 SHEETS

X:\sikand\5100-056\01\Engineering\Hydrology\HYDRO_EX.dwg


PROJECT SITE
TTM 60257
VILLA CYN. RD.
MORAN CYN.
DEL VALLE RD.
SUNSET CANYON DR.
COMMERCE CENTER DR.
STATE HIGHWAY 126
GOLDEN STATE FREEWAY
5
VICINITY MAP
NTS
80' R/W
64'
C/A
8' R/W
14'
32'
22%
2% MAX
3'
5'
A.C. PAVEMENT & BASE
TYPICAL SECTION
80' STREET
DEL VALLE ROAD (FROM HUNSTOCK AVE.)
STERLING PARKWAY
(FROM HUNSTOCK AVE. TO "A" ST.)
LIMITED SECONDARY HIGHWAY
60'
30'
12'
4'
15'
TYPICAL SECTION
60' PRIVATE & FUTURE STREET
DEL VALLE ROAD, "A" ST., "B" ST., "C" ST., "D" ST., "E" ST., "F" ST., "I" ST., "J" ST., "M" ST., "N" ST.
58'
29'
11'
TYPICAL SECTION
58' PRIVATE & FUTURE STREET
"B-1" ST.,"C-1" ST., "E" ST., "G" ST., "H" ST., "J-1" ST., "J-2" ST.,"K" ST., "L" ST., "N-1" ST.
105B
A= 28.4 Ac
TC= 12 min
Qb= 47.5 cfs
3 INFILTRATION BASIN 203A
LIMITS OF INUNDATION
VOL required= 6.5 ac-ft
VOL provided= 6.5 ac-ft
TO BE MAINTAINED BY LACFCD
CDS UNIT TO REMOVE FINES PRIOR TO INF. BASIN TO BE SIZED TO Q=47.5 CFS IN LINE
Debris Cone Limit
101A
A= 40.6 Ac
TC= 12 min
Qb= 67.9 cfs
CDS UNIT TO REMOVE FINES PRIOR TO INF. BASIN TO BE SIZED TO Q=67.9 CFS IN LINE
A= 40.6 Ac
Q50= 64.2 cfs
Qb= 67.9 cfs
Qbb= 99.5 cfs
DPV required= 5,138 CY
DPV provided= 5,218 CY
TO BE MAINTAINED BY LACFCD.
1
7
A= 28.4 Ac
Q50= 44.9 cfs
Qb= 47.5 cfs
Qbb= 69.6 cfs
DPV required= 4,354 CY
DPV provided= 4,362 CY
TO BE MAINTAINED BY LACFCD.
Fee Title Lot
12' Access
12% Slope
Q= 47.5
203A
A= 1.6 Ac
TC= 5 min
Qb= 4.3 cfs
PERC. BASIN-2
Q=9.9
Q=14.6 cfs
12' Access
12% Max Slope
Fee Title Lot
Debris Cone Limit
102A
A= 4.8 Ac
TC= 10 min
Qb= 9.4 cfs
130D
A= 3.7 Ac
TC= 5 min
Qb= 10.1 cfs
DEBRIS CONE LIMIT
A= 3.7 Ac
Q50= 9.7 cfs
Qb= 10.1 cfs
Qbb= 14.8 cfs
DPV required= 468 CY
DPV provided= 508 CY
TO BE MAINTAINED BY LACFCD
Fee Title Lot
1
A= 2.2 Ac
Q50= 5.9 cfs
Qb= 6.0 cfs
Qbb= 8.8 cfs
DPV required= 279 CY
DPV provided= 685 CY
TO BE MAINTAINED BY LACFCD
Fee Title Lot
DEBRIS CONE LIMIT
131D
A= 2.2 Ac
TC= 5 min
Qb= 6.0 cfs
10B
A= 7.3 Ac
TC= 6 min
Qb= 7.1 cfs
109AB
PRE-TREATMENT CDS UNIT
Qpm=2.0 cfs
A= 5.0 cfs
OFFSITE
EXISTING CONDITION
A= 4.3 ac
Qb= 10.8 cfs
Qbb= 15.4 cfs
DPV = 494 cy
PROPOSED CONDITION
A= 4.4 ac
Qb+d= 10.7 cfs
Qbb+d= 12.2 cfs
DPV = 165 cy
117C
A= 10.0 Ac
TC= 9 min
Qb= 18.5 cfs
132D
A = 5.9 Ac
Q= 16.1 cfs
CDS UNIT SHALL REMOVE FINES PRIOR TO INF. BASIN TO BE SIZED TO Q=16.1 CFS IN LINE
Q=16.1 cfs
111B
A= 5.1 Ac
TC= 8 min
Qb= 9.4 cfs
133D
A= 7.4 Ac
TC= 10 min
Qb= 12.3 cfs
119C
A= 3.3 Ac
TC= 9 min
Qb= 10.8 cfs
135D
A= 2.8 Ac
TC= 5 min
Qb= 7.6 cfs
A= 2.8 Ac
Q50= 7.3 cfs
Qb= 7.6 cfs
Qbb= 11.1 cfs
DPV required= 354 CY
DPV provided= 596 CY
TO BE MAINTAINED BY LACFCD
1
DEBRIS CONE LIMIT
Fee Title Lot
12' Access
12% Max Slope
112AB
A= 82.2 Ac
Q=18.5 cfs
Q=18.5 cfs
118C
= 34.9Ac
Q= 70.7 cfs
A= 14.4 Ac
Q50= 30.7 cfs
Qb= 32.2 cfs
Qbb= 47.2 cfs
DPV required= 1,823 CY
DPV provided= 1,878 CY
TO BE MAINTAINED BY LACFCD.
4
DEBRIS CONE LIMIT
CDS UNIT(S) TO REMOVE FINES PRIOR TO INF. BASIN TO BE SIZED TO Q=32.2 CFS IN LINE
115C
A= 14.4 Ac
TC= 7 min
Qb= 32.2 cfs
12' Access
12% Max Slope
113A
A= 7.9 Ac
TC= 10 min
Qb= 13.2 cfs
120C
A= 39.6 Ac
Q= 81.4 cfs
Q= 81.4 cfs
Q= 39.2 cfs
A= 4.7 Ac
TC= 10 min
Qb= 8.0 cfs
121C
A = 50.1 Ac
Q= 31.2 cfs
114A
A = 140.4 Ac
Q= 129.9 cfs
124AC
120C
Q= 68.2 cfs
134D
A = 24.3 Ac
Q= 27.0 cfs
136D
A = 16.1 Ac
Q= 33.0 cfs
146D
A= 2.5 Ac
TC= 9 min
Qb= 4.4 cfs
138D
A= 7.6 Ac
TC= 10 min
Qb= 12.7 cfs
127A
A= 2.3 Ac
TC= 11 min
Qb= 3.7 cfs
123C
A= 5.8 Ac
TC= 7 min
Qb= 11.5 cfs
126A
A= 0.7 Ac
TC= 6 min
Qb= 1.7 cfs
146C
A= 10.1 Ac
TC= 9 min
Qb= 20.8 cfs
EASEMENT AGREEMENT PER RECORDED INSTR. NO. 2018-1055514 DATED 10/17/2017.
301A
A= 2.6 Ac
TC= 5 min
Qb= 7.1 cfs
Fee Title Lot
DEBRIS CONE LIMIT
12' Access
12% Max Slope
CDS UNIT(S) TO REMOVE FINES PRIOR TO INF. BASIN TO BE SIZED TO Q=7.6 CFS IN LINE
302A
A= 4.6 Ac
TC= 8 min
Q 10=6.1 cfs
Q=6.1 cfs
144D
A = 23.7 Ac
Q= 58.1 cfs
Q=58.1 cfs
148AD
A = 169.6 Ac
Q= 194.4 cfs
150A
A= 4.0 Ac
TC= 10 min
Qb= 7.0 cfs
3 INFILTRATION BASIN 306A
LIMITS OF INUNDATION
VOL required=0.3 ac-ft
VOL provided= 0.4 ac-ft
306A
PERC. BASIN-3
A= 0.3 Ac
TC= 5 min
Qb= 0.8 cfs
1
A= 7.2 Ac
Q50= 13.7 cfs
Q 10=7.1 cfs
Q 100=20.4 cfs
DPV required= 671 CY
DPV provided= 791 CY
TO BE MAINTAINED BY LACFCD.
Fee Title Lot
DEBRIS CONE LIMIT
12' Access
12% Max Slope
303AF
Diversion Str.
A = 7.2 Ac
Q= 14.0 cfs
152AF
Diversion Str.
A = 173.6 Ac
Q= 200.1 cfs
154A
A= 1.8 Ac
TC= 5 min
Qb= 3.4 cfs
3 INFILTRATION BASIN, 154A
LIMITS OF INUNDATION
VOL required= 8.85 ac-ft
VOL provided= 10.1 ac-ft
PERC. BASIN-1
Q=8.1 cfs
Q=183.3
Q=183.3 cfs
Q=178.1 cfs
Q=178.1 cfs
Q=183.3 cfs
Q=183.3 cfs
Q=183.3



WATER QUALITY SUMMARY

BASIN 154A

Project	Subares	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Vol (ac-ft)
TM 60257	110B	3.3	704	0.106	1.05	0.42	97	85th Percentile	28	0.26	0.10	0.44	0.40	0.12
TM 60257	111B	5.1	806	0.036	1.05	0.42	97	85th Percentile	33	0.26	0.10	0.44	0.57	0.19
TM 60257	113A	7.9	995	0.058	1.05	0.42	97	85th Percentile	42	0.23	0.10	0.44	0.79	0.30
TM 60257	113C	14.4	910	0.34	1.05	0.01	97	85th Percentile	80	0.17	0.10	0.11	0.26	0.13
TM 60257	116C	10.1	875	0.027	1.05	0.42	97	85th Percentile	44	0.23	0.10	0.44	0.99	0.38
TM 60257	117C	10	572	0.026	1.05	0.42	97	85th Percentile	34	0.25	0.10	0.44	1.11	0.38
TM 60257	119C	5.3	797	0.024	1.05	0.42	97	85th Percentile	42	0.23	0.10	0.44	0.53	0.20
TM 60257	121C	4.7	1009	0.056	1.05	0.3	97	85th Percentile	39	0.24	0.10	0.50	0.56	0.20
TM 60257	123C	5.8	406	0.015	1.05	0.42	97	85th Percentile	33	0.26	0.10	0.44	0.66	0.22
TM 60257	126A	0.7	467	0.037	1.05	0.91	97	85th Percentile	19	0.33	0.12	0.83	0.19	0.05
TM 60257	127A	2.3	1099	0.035	1.05	0.3	97	85th Percentile	45	0.22	0.10	0.50	0.26	0.10
TM 60257	130D	3.7	480	0.27	1.05	0.01	97	85th Percentile	52	0.21	0.10	0.11	0.08	0.03
TM 60257	131D	2.2	344	0.55	1.05	0.01	97	85th Percentile	45	0.24	0.10	0.11	0.06	0.02
TM 60257	133D	7.4	989	0.058	1.05	0.42	97	85th Percentile	42	0.23	0.10	0.44	0.74	0.28
TM 60257	135D	2.8	408	0.4	1.05	0.01	97	85th Percentile	50	0.21	0.10	0.11	0.06	0.03
TM 60257	138D	7.6	500	0.039	1.05	0.42	97	85th Percentile	43	0.23	0.10	0.44	0.76	0.29
TM 60257	146D	2.5	910	0.067	1.05	0.42	97	85th Percentile	39	0.24	0.10	0.44	0.26	0.09
TM 60257	150A	4	964	0.021	1.05	0.6	97	85th Percentile	38	0.24	0.10	0.58	0.94	0.30
												Σ=	8.1	3.33
TM 60257	154A	1.8	100	0.1	1.05	0.1	97	85th Percentile	12	0.42	0.21	0.28	0.21	0.03
TOTAL AREA		101.6										Σ=	9.3	3.36

Main Line (152AF)		Bypass (153F)	
Qi	Voi	Qi	Voi
10.4	3.99	0.0	0

BASIN 203A

Project	Subares	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Vol (ac-ft)
TM 60257	101A	40.6	1736	0.13	1.05	0.01	97	85th Percentile	136	0.13	0.10	0.11	0.56	0.38
TM 60257	102A	4.8	783	0.014	1.05	0.42	97	85th Percentile	47	0.22	0.10	0.44	0.46	0.18
TM 60257	105B	28.4	1043	0.13	1.05	0.01	97	85th Percentile	141	0.13	0.10	0.11	0.41	0.27
TM 60257	203A	1.6	125	0.09	1.05	0.1	97	85th Percentile	17	0.35	0.14	0.21	0.1	0.03
TOTAL		75.4										Σ=	1.54	0.86

BASIN 306A

Project	Subares	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Vol (ac-ft)
TM 60257	301A	2.6	490	0.41	1.05	0.01	97	85th Percentile	49	0.21	0.10	0.11	0.06	0.02
TM 60257	303A	4.6	635	0.063	1.05	0.01	97	85th Percentile	67	0.18	0.10	0.11	0.08	0.04
													0.1	0.07
TM 60257	306A	0.3	50	0.2	1.05	0.1	97	85th Percentile	5	0.63	0.38	0.43	0.08	0.00
TOTAL		7.5										Σ=	0.2	0.07

Main Line (305F)		Perc Basin(304AF)	
Qi	Voi	Qi	Voi
0.0	0.00	0.1	0.07

BASIN 406A

Project	Subares	Area (acres)	Length (ft)	Slope (ft/ft)	Isohyet (in.)	% Imp	Soil Type	Frequency	Tc-calculated (min.)	Intensity (in./hr)	Cu	Cd	Flowrate (cfs)	Vol (ac-ft)
TM 60257	402B	1.1	240	0.4	1.05	0.01	97	85th Percentile	31	0.27	0.10	0.11	0.03	0.01
TM 60257	403B	2.1	450	0.067	1.05	0.9	97	85th Percentile	17	0.35	0.14	0.62	0.61	0.15
TM 60257	406A	2	476	0.052	1.05	0.4	97	85th Percentile	30	0.27	0.10	0.42	0.23	0.07
TOTAL		5.2										Σ=	0.9	0.23

WATER QUALITY CHART

INFILTRATION BASIN	85th Percentile Storm Size (in)	Hydromod Design Criteria	Project Design Storm	Project Design Storm Volume (CF)	BMP Design Volume (ac-ft)	BMP Design Volume (CF)	% Design Storm Infiltrated Onsite
154A	1.05	Clear Frequency	85th Percentile	171191	12.1	438649	100%
203A	1.05	Clear Frequency	85th Percentile	8276	6.5	284011	100%
306A	1.05	Clear Frequency	85th Percentile	3049	0.4	16731	100%
406A	1.05	Clear Frequency	85th Percentile	10019	0.3	13004	100%

LEGEND

- MAIN DRAINAGE BOUNDARY
- SUB-AREA BOUNDARY
- FLOW LINE
- TRACT BOUNDARY
- PROPOSED STORM DRAIN PIPE
- WATER QUALITY BASIN
- DEBRIS BASIN

34 & 134C — LOCATION NAMES
A — AREA IN ACRES, Ac
Qpm — PEAK MITIGATED FLOWRATE, cfs
SWQDv — STORMWATER QUALITY DESIGN VOLUME, ac-ft
3 — INFILTRATION BASIN. FEE TITLE LOT TO BE MAINTAINED BY LA COUNTY.

HYDROLOGY STUDY APPROVED

CHECKED BY: _____ RCE NO. 82680 DATE 2/20/2020

APPROVED BY: Timothy C. Tosdevin DATE 2/20/2020

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC WORKS
LAND DEVELOPMENT DIVISION

WATER QUALITY MAP

TENTATIVE TRACT NO. 060257 (STERLING)
IN THE UNINCORPORATED TERRITORY OF LOS ANGELES COUNTY

NORTH
SCALE: 1"=100'

PREPARED FOR:
Sterling Gateway, L.P.
P.O. Box 681007
PARK CITY, UT 84068

DATE: 01/16/2020 W.O. NO.: 5100-056-01

PREPARED BY:
SIKAND Engineering | Planning | Surveying
15230 Burbank Blvd. #150, Van Nuys, CA 91411
Phone : (818) 787- 8580, Fax : (818) 901-7451
www.sikand.com, E-mail: info@sikand.com

REGISTERED PROFESSIONAL ENGINEER No.49041 Exp. 09-30-2020 CIVIL

SHEET 1 OF 1 SHEETS

K:\sikand\5100--056\01\Engineering\Hydrology\HYDRO_PROP.dwg, Sheet: WQ Map

APPENDIX J

Noise Calculations

APPENDIX J.1

Noise Monitoring Data

Sterling Ranch Residential Project

NOISE MONITORING

Project and Task Number: 185-001-17	Date: 6/4/19
Project Name: Sterling Ranch Residential Project	Field Activity: Noise Monitoring
Location: Castaic, CA	Weather: Clear, Calm

PERSONNEL: Name	Company	Time In	Time Out
Gavin Heller	Meridian Consultants	6:45	9:00

PERSONAL SAFETY CHECKLIST

X	Protective Footwear	X	Hard Hat	X	Safety Vest
X	Safety Goggles	X			

TIME	DESCRIPTION OF WORK PERFORMED
7:18 AM	Site 1: Meter_1.009, GPS: 34.4477 N, 118.6557 W
	Location: Del Valle Road and Silver Street
	N: Vacant Land
	S: Residential
	E: Residential
	W: Vacant Land
	Activity: Light traffic, buses, distant planes, ~7 truck
8:35 AM	Site 2: Meter_1.013, GPS: 34.4492 N, 118.6585 W
	Location: End of Elk Avenue
	N: Vacant Land
	S: Residential
	E: Residential
	W: Residential
	Activity: <1 door slam, nature, distant fireworks, trunk slamming, pedestrian activity
7:00 AM	Site 3: Meter_1.008, GPS: 34.4524 N, 118.6489 W
	Location: North of Project Site
	N: Vacant Land
	S: Vacant Land
	E: Vacant Land
	W: Vacant Land
	Activity: Light traffic, pedestrian activity, ~8 bus, ~12 truck

NOISE MONITORING (continued)

Project and Task Number: 185-001-17	Date: 6/4/19

TIME	DESCRIPTION OF WORK PERFORMED
7:36 AM	Site 4: Meter_1.010, GPS: 34.4466 N, 118.6574 W
	Location: Coolidge Avenue and Hunstock Street
	N: Vacant Land
	S: Residential
	E: Residential/Vacant Land
	W: Residential/Vacant Land
	Activity: Light traffic, nature, dogs barking, pedestrian activity, distant planes, ~12 bus
	~14 car muffler
7:56 AM	Site 5: Meter_1.011, GPS: 34.4466 N, 118.6574 W
	Location: End of Lexington Drive
	N: Residential
	S: Vacant Land
	E: Vacant Land
	W: Vacant Land
	Activity: Dogs barking, nature, distant “fireworks”, distant planes
8:14 AM	Site 6: Meter_1.012, GPS: 34.4527 N, 118.6592 W
	Location: End of Pocahontas Drive
	N: Vacant Land
	S: Residential
	E: Residential
	W: Residential
	Activity: nature, dogs barking, one car, distant planes, light pedestrian activity
	-

Record #	Date	Time	Run Duration	Run Time	Pause	LAeq	LAE	LASmin	LASmin Time	LASmax
1	2019-06-04	07:18:17	00:15:00.0	00:15:00.0	00:00:00.0	67.6	97.2	40.3	07:30:55	82.7

LASmax Time	Apeak (max	LApeak (max) Time	LAS0.00	LAS1.70	LAS8.30	LAS25.0	LAS50.00	LAS90.00	LCeq
07:25:38	96.5	07:25:38	-99.9	75.9	72.8	68.2	61.6	45.2	74.8

LCeq - LAeq	LAIeq	LAeq	LAIeq - LAeq	LAeq
7.1	69.9	67.6	2.2	67.6

Record #	Date	Time	Run Duration	Run Time	Pause	LAeq	LAE	LASmin	LASmin Time	LASmax
2	2019-06-04	08:35:49	00:15:00.0	00:15:00.0	00:00:00.0	55.8	85.3	34.8	08:41:17	84.5

ASmax Tim	LApeak (max)	eak (max) T	LAS0.00	LAS1.70	LAS8.30	AS25.0	AS50.0	LAS90.00	LCeq	LAeq
08:35:52	110.5	08:35:51	-99.9	54.5	48.9	45.8	43.6	39.3	69.0	55.8

LCeq - LAeq	LAIeq	LAeq	LAIeq - LAeq
13.2	69.1	55.8	13.3

Record #	Date	Time	Run Duration	Run Time	Pause	LAeq	LAE	LASmin	LASmin Time	LASmax
3	2019-06-04	07:00:39	00:15:00.0	00:15:00.0	00:00:00.0	66.7	96.3	34.6	07:03:14	84.2

LASmax Tim	LApeak (max)	LApeak (max) Time	LAS0.00	LAS1.70	LAS8.3	LAS25.00	LAS50.00	LAS90.00
07:12:37	100.3	07:12:37	-99.9	76.8	71.5	64.8	54.2	37.3

LCeq	LAeq	LCeq - LAeq	LAleq	LAeq	eq - LAeq
74.6	66.7	7.9	69.8	66.7	3.1

Record #	Date	Time	Run Duration	Run Time	Pause	LAeq	LAE	LASmin	LASmin Time	LASmax
4	2019-06-04	07:36:50	00:15:00.0	00:15:00.0	00:00:00.0	63.1	92.6	42.0	07:43:00	82.2

LASmax Time	Apeak (max	LApeak (max) Time	LAS0.00	LAS1.70	LAS8.30	LAS25.0	LAS50.00	LAS90.00	LCeq
07:50:43	96.3	07:50:43	-99.9	72.9	65.9	60.6	56.1	46.9	73.2

LAeq	LCeq - LAeq	LAleq	LAeq	ALeq - LAeq
63.1	10.1	65.0	63.1	1.9

Record #	Date	Time	Run Duration	Run Time	Pause	LAeq	LAE	LASmin	LASmin Time	LASmax
5	2019-06-04	07:56:03	00:15:00.0	00:15:00.0	00:00:00.0	48.1	77.7	39.7	07:59:53	72.9

LASmax Time	Apeak (max)	LApeak (max) Time	LAS0.00	LAS1.70	LAS8.30	LAS25.0	LAS50.00	LAS90.00	LCeq
07:56:05	95.9	07:56:05	-99.9	53.8	48.6	46.3	44.7	41.6	62.1

LAeq	LCeq - LAeq	LAIeq	LAeq	LAIeq - LAeq
48.1	14.0	58.7	48.1	10.6

Record #	Date	Time	Run Duration	Run Time	Pause	LAeq	LAE	LASmin	LASmin Time	LASmax
6	2019-06-04	08:14:56	00:15:00.0	00:15:00.0	00:00:00.0	56.2	85.7	30.9	08:21:06	76.0

LASmax Time	Apeak (max	LApeak (max) Time	LAS0.00	LAS1.70	LAS8.30	LAS25.0	LAS50.00	LAS90.00	LCeq
08:14:59	103.7	08:14:59	-99.9	68.5	59.2	43.5	39.4	34.2	63.5

LAeq	LCeq - LAeq	LAIeq	LAeq	LAIeq - LAeq
56.2	7.4	65.9	56.2	9.7

APPENDIX J.2

Roadway Noise Worksheets

1

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	Vehicle Mix Heavy Trucks	dB(A) CNEL
Chiquito Canyon n/o SR											
Existing (AM)		2	0	992	30	75	0	0	1.8%	0.7%	50.4
Existing (PM)		2	0	976	30	75	0	0	1.8%	0.7%	50.3
Existing plus Project (AM)		2	0	1,272	30	75	0	0	1.8%	0.7%	51.4
Existing plus Project (PM)		2	0	1,360	30	75	0	0	1.8%	0.7%	51.7
Cumulative without Project (AM)		2	0	10,680	30	75	0	0	1.8%	0.7%	60.7
Cumulative without Project (PM)		2	0	12,520	30	75	0	0	1.8%	0.7%	61.4
Cumulative with Project (AM)		2	0	10,960	30	75	0	0	1.8%	0.7%	60.8
Cumulative with Project (PM)		2	0	12,800	30	75	0	0	1.8%	0.7%	61.5
Chiquito Canyon s/o SR											
Existing (AM)		2	0	0	30	75	0	0	1.8%	0.7%	#NUM!
Existing (PM)		2	0	0	30	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (AM)		2	0	0	30	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (PM)		2	0	0	30	75	0	0	1.8%	0.7%	#NUM!
Cumulative without Project (AM)		2	0	15,840	30	75	0	0	1.8%	0.7%	62.4
Cumulative without Project (PM)		2	0	17,040	30	75	0	0	1.8%	0.7%	62.7
Cumulative with Project (AM)		2	0	15,840	30	75	0	0	1.8%	0.7%	62.4
Cumulative with Project (PM)		2	0	17,040	30	75	0	0	1.8%	0.7%	62.7
SR 126/Henry Mayo e/o Chiquito											
Existing (AM)		4	15	13,312	55	75	0	0	1.8%	0.7%	67.7
Existing (PM)		4	15	15,080	55	75	0	0	1.8%	0.7%	68.2
Existing plus Project (AM)		4	15	13,544	55	75	0	0	1.8%	0.7%	67.8
Existing plus Project (PM)		4	15	15,400	55	75	0	0	1.8%	0.7%	68.3
Cumulative without Project (AM)		4	15	33,608	55	75	0	0	1.8%	0.7%	71.7
Cumulative without Project (PM)		4	15	36,328	55	75	0	0	1.8%	0.7%	72.0
Cumulative with Project (AM)		4	15	33,840	55	75	0	0	1.8%	0.7%	71.7
Cumulative with Project (PM)		4	15	36,560	55	75	0	0	1.8%	0.7%	72.1
SR 126/Henry Mayo w/o											
Existing (AM)		4	15	12,784	55	75	0	0	1.8%	0.7%	67.5
Existing (PM)		4	15	14,552	55	75	0	0	1.8%	0.7%	68.1
Existing plus Project (AM)		4	15	12,832	55	75	0	0	1.8%	0.7%	67.5
Existing plus Project (PM)		4	15	14,616	55	75	0	0	1.8%	0.7%	68.1
Cumulative without Project (AM)		4	15	20,112	55	75	0	0	1.8%	0.7%	69.5
Cumulative without Project (PM)		4	15	22,992	55	75	0	0	1.8%	0.7%	70.1
Cumulative with Project (AM)		4	15	20,160	55	75	0	0	1.8%	0.7%	69.5
Cumulative with Project (PM)		4	15	23,040	55	75	0	0	1.8%	0.7%	70.1

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

2

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
Chiquito Canyon n/o San											
Existing (AM)		2	0	1,384	35	75	0	0	1.8%	0.7%	52.9
Existing (PM)		2	0	1,656	35	75	0	0	1.8%	0.7%	53.6
Existing plus Project (AM)		2	0	1,664	35	75	0	0	1.8%	0.7%	53.7
Existing plus Project (PM)		2	0	2,048	35	75	0	0	1.8%	0.7%	54.6
Cumulative without Project (AM)		2	0	3,960.0	35	75	0	0	1.8%	0.7%	57.4
Cumulative without Project (PM)		2	0	4,648.0	35	75	0	0	1.8%	0.7%	58.1
Cumulative with Project (AM)		2	0	4,240	35	75	0	0	1.8%	0.7%	57.7
Cumulative with Project (PM)		2	0	5,040	35	75	0	0	1.8%	0.7%	58.5
Chiquito Canyon s/o San											
Existing (AM)		2	0	712	35	75	0	0	1.8%	0.7%	50.0
Existing (PM)		2	0	944	35	75	0	0	1.8%	0.7%	51.2
Existing plus Project (AM)		2	0	992	35	75	0	0	1.8%	0.7%	51.4
Existing plus Project (PM)		2	0	1,336	35	75	0	0	1.8%	0.7%	52.7
Cumulative without Project (AM)		2	0	3,320.0	35	75	0	0	1.8%	0.7%	56.7
Cumulative without Project (PM)		2	0	3,848.0	35	75	0	0	1.8%	0.7%	57.3
Cumulative with Project (AM)		2	0	3,600	35	75	0	0	1.8%	0.7%	57.0
Cumulative with Project (PM)		2	0	4,240	35	75	0	0	1.8%	0.7%	57.7
San Martinez e/o Chiquito											
Existing (AM)		2	0	416	25	75	0	0	1.8%	0.7%	45.0
Existing (PM)		2	0	128	25	75	0	0	1.8%	0.7%	39.9
Existing plus Project (AM)		2	0	72	25	75	0	0	1.8%	0.7%	37.4
Existing plus Project (PM)		2	0	128	25	75	0	0	1.8%	0.7%	39.9
Cumulative without Project (AM)		2	0	480.0	25	75	0	0	1.8%	0.7%	45.6
Cumulative without Project (PM)		2	0	480.0	25	75	0	0	1.8%	0.7%	45.6
Cumulative with Project (AM)		2	0	480	25	75	0	0	1.8%	0.7%	45.6
Cumulative with Project (PM)		2	0	480	25	75	0	0	1.8%	0.7%	45.6
San Martinez w/o Chiquito											
Existing (AM)		2	0	1,280	25	75	0	0	1.8%	0.7%	49.9
Existing (PM)		2	0	2,200	25	75	0	0	1.8%	0.7%	52.3
Existing plus Project (AM)		2	0	1,624	25	75	0	0	1.8%	0.7%	50.9
Existing plus Project (PM)		2	0	2,200	25	75	0	0	1.8%	0.7%	52.3
Cumulative without Project (AM)		2	0	2,856.0	25	75	0	0	1.8%	0.7%	53.4
Cumulative without Project (PM)		2	0	4,480.0	25	75	0	0	1.8%	0.7%	55.3
Cumulative with Project (AM)		2	0	3,200	25	75	0	0	1.8%	0.7%	53.9
Cumulative with Project (PM)		2	0	4,480	25	75	0	0	1.8%	0.7%	55.3

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

3

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
Chiquito Canyon n/o Hunstock											
Existing (AM)		2	0	32	35	75	0	0	1.8%	0.7%	36.5
Existing (PM)		2	0	0	35	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (AM)		2	0	2,336	35	75	0	0	1.8%	0.7%	55.1
Existing plus Project (PM)		2	0	2,856	35	75	0	0	1.8%	0.7%	56.0
Cumulative Without Project (AM)		2	0	2,336	35	75	0	0	1.8%	0.7%	55.1
Cumulative Without Project (PM)		2	0	2,824	35	75	0	0	1.8%	0.7%	56.0
Cumulative with Project (AM)		2	0	4,640	35	75	0	0	1.8%	0.7%	58.1
Cumulative with Project (PM)		2	0	5,680	35	75	0	0	1.8%	0.7%	59.0
Chiquito Canyon s/o Hunstock											
Existing (AM)		2	0	1,456	35	75	0	0	1.8%	0.7%	53.1
Existing (PM)		2	0	1,624	35	75	0	0	1.8%	0.7%	53.6
Existing plus Project (AM)		2	0	1,736	35	75	0	0	1.8%	0.7%	53.8
Existing plus Project (PM)		2	0	2,016	35	75	0	0	1.8%	0.7%	54.5
Cumulative Without Project (AM)		2	0	4,040.0	35	75	0	0	1.8%	0.7%	57.5
Cumulative Without Project (PM)		2	0	3,024.0	35	75	0	0	1.8%	0.7%	56.3
Cumulative with Project (AM)		2	0	4,320	35	75	0	0	1.8%	0.7%	57.8
Cumulative with Project (PM)		2	0	5,040	35	75	0	0	1.8%	0.7%	58.5
Hunstock e/o Chiquito Canyon											
Existing (AM)		2	0	1,888	25	75	0	0	1.8%	0.7%	51.6
Existing (PM)		2	0	2,000	25	75	0	0	1.8%	0.7%	51.8
Existing plus Project (AM)		2	0	16	25	75	0	0	1.8%	0.7%	30.9
Existing plus Project (PM)		2	0	0	25	75	0	0	1.8%	0.7%	#NUM!
Cumulative Without Project (AM)		2	0	2,352.0	25	75	0	0	1.8%	0.7%	52.6
Cumulative Without Project (PM)		2	0	480.0	25	75	0	0	1.8%	0.7%	45.6
Cumulative with Project (AM)		2	0	480	25	75	0	0	1.8%	0.7%	45.6
Cumulative with Project (PM)		2	0	480	25	75	0	0	1.8%	0.7%	45.6
Hunstock w/o Chiquito Canyon											
Existing (AM)		2	0	416	25	75	0	0	1.8%	0.7%	45.0
Existing (PM)		2	0	424	25	75	0	0	1.8%	0.7%	45.1
Existing plus Project (AM)		2	0	600	25	75	0	0	1.8%	0.7%	46.6
Existing plus Project (PM)		2	0	888	25	75	0	0	1.8%	0.7%	48.3
Cumulative Without Project (AM)		2	0	616.0	25	75	0	0	1.8%	0.7%	46.7
Cumulative Without Project (PM)		2	0	712.0	25	75	0	0	1.8%	0.7%	47.4
Cumulative with Project (AM)		2	0	800	25	75	0	0	1.8%	0.7%	47.9
Cumulative with Project (PM)		2	0	1,600	25	75	0	0	1.8%	0.7%	50.9

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

4

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
Del Valle n/o Hasley Canyon											
Existing (AM)		4	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Existing (PM)		4	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (AM)		4	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (PM)		4	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Cumulative without Project (AM)		4	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Cumulative without Project (PM)		4	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Cumulative with Project (AM)		4	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Cumulative with Project (PM)		4	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Del Valle s/o Hasley Canyon											
Existing (AM)		2	0	2,680	45	75	0	0	1.8%	0.7%	58.3
Existing (PM)		2	0	2,752	45	75	0	0	1.8%	0.7%	58.4
Existing plus Project (AM)		2	0	3,880	45	75	0	0	1.8%	0.7%	59.9
Existing plus Project (PM)		2	0	4,512	45	75	0	0	1.8%	0.7%	60.6
Cumulative without Project (AM)		2	0	5,760.0	45	75	0	0	1.8%	0.7%	61.6
Cumulative without Project (PM)		2	0	5,840.0	45	75	0	0	1.8%	0.7%	61.7
Cumulative with Project (AM)		2	0	6,960	45	75	0	0	1.8%	0.7%	62.4
Cumulative with Project (PM)		2	0	7,600	45	75	0	0	1.8%	0.7%	62.8
Hasley Canyon e/o Del Valle											
Existing (AM)		2	0	4,592	45	75	0	0	1.8%	0.7%	60.6
Existing (PM)		2	0	4,504	45	75	0	0	1.8%	0.7%	60.6
Existing plus Project (AM)		2	0	5,584	45	75	0	0	1.8%	0.7%	61.5
Existing plus Project (PM)		2	0	5,832	45	75	0	0	1.8%	0.7%	61.7
Cumulative without Project (AM)		2	0	9,648.0	45	75	0	0	1.8%	0.7%	63.9
Cumulative without Project (PM)		2	0	9,552.0	45	75	0	0	1.8%	0.7%	63.8
Cumulative with Project (AM)		2	0	10,640	45	75	0	0	1.8%	0.7%	64.3
Cumulative with Project (PM)		2	0	10,880	45	75	0	0	1.8%	0.7%	64.4
Hasley Canyon w/o Del Valle											
Existing (AM)		2	0	1,960	45	75	0	0	1.8%	0.7%	56.9
Existing (PM)		2	0	1,832	45	75	0	0	1.8%	0.7%	56.7
Existing plus Project (AM)		2	0	2,168	45	75	0	0	1.8%	0.7%	57.4
Existing plus Project (PM)		2	0	2,264	45	75	0	0	1.8%	0.7%	57.6
Cumulative without Project (AM)		2	0	6,672.0	45	75	0	0	1.8%	0.7%	62.3
Cumulative without Project (PM)		2	0	4,928.0	45	75	0	0	1.8%	0.7%	60.9
Cumulative with Project (AM)		2	0	6,880	45	75	0	0	1.8%	0.7%	62.4
Cumulative with Project (PM)		2	0	5,360	45	75	0	0	1.8%	0.7%	61.3

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

5

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	Vehicle Mix Heavy Trucks	dB(A) CNEL
Commerce Center n/o Hasley											
Existing (AM)		6	10	12,384	45	75	0	0	1.8%	0.7%	65.5
Existing (PM)		6	10	10,824	45	75	0	0	1.8%	0.7%	64.9
Existing plus Project (AM)		6	10	13,112	45	75	0	0	1.8%	0.7%	65.7
Existing plus Project (PM)		6	10	11,784	45	75	0	0	1.8%	0.7%	65.3
Cumulative without Project (AM)		6	10	21,352.0	45	75	0	0	1.8%	0.7%	67.8
Cumulative without Project (PM)		6	10	15,280.0	45	75	0	0	1.8%	0.7%	66.4
Cumulative with Project (AM)		6	10	22,080	45	75	0	0	1.8%	0.7%	68.0
Cumulative with Project (PM)		6	10	16,240	45	75	0	0	1.8%	0.7%	66.6
Commerce Center s/o Hasley											
Existing (AM)		6	10	6,872	45	75	0	0	1.8%	0.7%	62.9
Existing (PM)		6	10	6,432	45	75	0	0	1.8%	0.7%	62.6
Existing plus Project (AM)		6	10	7,080	45	75	0	0	1.8%	0.7%	63.0
Existing plus Project (PM)		6	10	6,728	45	75	0	0	1.8%	0.7%	62.8
Cumulative without Project (AM)		6	10	18,752.0	45	75	0	0	1.8%	0.7%	67.3
Cumulative without Project (PM)		6	10	11,864.0	45	75	0	0	1.8%	0.7%	65.3
Cumulative with Project (AM)		6	10	18,960	45	75	0	0	1.8%	0.7%	67.3
Cumulative with Project (PM)		6	10	12,160	45	75	0	0	1.8%	0.7%	65.4
Hasley Canyon e/o Commerce											
Existing (AM)		2	10	3,416	45	75	0	0	1.8%	0.7%	59.4
Existing (PM)		2	10	720	45	75	0	0	1.8%	0.7%	52.6
Existing plus Project (AM)		2	10	3,416	45	75	0	0	1.8%	0.7%	59.4
Existing plus Project (PM)		2	10	720	45	75	0	0	1.8%	0.7%	52.6
Cumulative without Project (AM)		2	10	3,920.0	45	75	0	0	1.8%	0.7%	60.0
Cumulative without Project (PM)		2	10	1,280.0	45	75	0	0	1.8%	0.7%	55.1
Cumulative with Project (AM)		2	10	3,920	45	75	0	0	1.8%	0.7%	60.0
Cumulative with Project (PM)		2	10	1,280	45	75	0	0	1.8%	0.7%	55.1
Hasley Canyon w/o Commerce											
Existing (AM)		2	0	5,312	25	75	0	0	1.8%	0.7%	56.1
Existing (PM)		2	0	5,464	25	75	0	0	1.8%	0.7%	56.2
Existing plus Project (AM)		2	0	6,248	25	75	0	0	1.8%	0.7%	56.8
Existing plus Project (PM)		2	0	6,720	25	75	0	0	1.8%	0.7%	57.1
Cumulative without Project (AM)		2	0	8,664.0	25	75	0	0	1.8%	0.7%	58.2
Cumulative without Project (PM)		2	0	7,624.0	25	75	0	0	1.8%	0.7%	57.7
Cumulative with Project (AM)		2	0	9,600	25	75	0	0	1.8%	0.7%	58.7
Cumulative with Project (PM)		2	0	8,880	25	75	0	0	1.8%	0.7%	58.3

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

6

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
The Old Road n/o I-5 SB Ramp											
Existing (AM)		2	0	10,616	40	75	0	0	1.8%	0.7%	63.1
Existing (PM)		2	0	8,912	40	75	0	0	1.8%	0.7%	62.3
Existing plus Project (AM)		2	0	10,616	40	75	0	0	1.8%	0.7%	63.1
Existing plus Project (PM)		2	0	8,912	40	75	0	0	1.8%	0.7%	62.3
Cumulative without Project (AM)		2	0	17,920.0	40	75	0	0	1.8%	0.7%	65.3
Cumulative without Project (PM)		2	0	13,360.0	40	75	0	0	1.8%	0.7%	64.1
Cumulative with Project (AM)		2	0	17,920	40	75	0	0	1.8%	0.7%	65.3
Cumulative with Project (PM)		2	0	13,360	40	75	0	0	1.8%	0.7%	64.1
The Old Road s/o I-5 SB Ramp											
Existing (AM)		2	0	7,960	40	75	0	0	1.8%	0.7%	61.8
Existing (PM)		2	0	9,016	40	75	0	0	1.8%	0.7%	62.3
Existing plus Project (AM)		2	0	7,984	40	75	0	0	1.8%	0.7%	61.8
Existing plus Project (PM)		2	0	9,096	40	75	0	0	1.8%	0.7%	62.4
Cumulative without Project (AM)		2	0	17,256.0	40	75	0	0	1.8%	0.7%	65.2
Cumulative without Project (PM)		2	0	13,440.0	40	75	0	0	1.8%	0.7%	64.1
Cumulative with Project (AM)		2	0	17,280	40	75	0	0	1.8%	0.7%	65.2
Cumulative with Project (PM)		2	0	13,520	40	75	0	0	1.8%	0.7%	64.1
I-5 SB Ramp (at Sedona Way) e/o											
Existing (AM)		2	0	5,800	30	75	0	0	1.8%	0.7%	58.0
Existing (PM)		2	0	3,040	30	75	0	0	1.8%	0.7%	55.2
Existing plus Project (AM)		2	0	5,824	30	75	0	0	1.8%	0.7%	58.0
Existing plus Project (PM)		2	0	3,120	30	75	0	0	1.8%	0.7%	55.3
Cumulative without Project (AM)		2	0	10,216.0	30	75	0	0	1.8%	0.7%	60.5
Cumulative without Project (PM)		2	0	5,120.0	30	75	0	0	1.8%	0.7%	57.5
Cumulative with Project (AM)		2	0	10,240	30	75	0	0	1.8%	0.7%	60.5
Cumulative with Project (PM)		2	0	5,200	30	75	0	0	1.8%	0.7%	57.6
I-5 SB Ramp (at Sedona Way) e/o											
Existing (AM)		2	0	3,224	30	75	0	0	1.8%	0.7%	55.5
Existing (PM)		2	0	2,808	30	75	0	0	1.8%	0.7%	54.9
Existing plus Project (AM)		2	0	3,224	30	75	0	0	1.8%	0.7%	55.5
Existing plus Project (PM)		2	0	2,808	30	75	0	0	1.8%	0.7%	54.9
Cumulative without Project (AM)		2	0	4,320.0	30	75	0	0	1.8%	0.7%	56.8
Cumulative without Project (PM)		2	0	3,600.0	30	75	0	0	1.8%	0.7%	56.0
Cumulative with Project (AM)		2	0	4,320	30	75	0	0	1.8%	0.7%	56.8
Cumulative with Project (PM)		2	0	3,600	30	75	0	0	1.8%	0.7%	56.0

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

7

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
The Old Road n/o Hasley Canyon											
Existing (AM)		4	15	7,640	45	75	0	0	1.8%	0.7%	63.1
Existing (PM)		4	15	9,208	45	75	0	0	1.8%	0.7%	63.9
Existing plus Project (AM)		4	15	7,664	45	75	0	0	1.8%	0.7%	63.1
Existing plus Project (PM)		4	15	9,288	45	75	0	0	1.8%	0.7%	64.0
Cumulative without Project (AM)		4	15	14,456	45	75	0	0	1.8%	0.7%	65.9
Cumulative without Project (PM)		4	15	12,560	45	75	0	0	1.8%	0.7%	65.3
Cumulative with Project (AM)		4	15	14,480	45	75	0	0	1.8%	0.7%	65.9
Cumulative with Project (PM)		4	15	12,640	45	75	0	0	1.8%	0.7%	65.3
The Old Road s/o Hasley Canyon											
Existing (AM)		4	15	10,752	45	75	0	0	1.8%	0.7%	64.6
Existing (PM)		4	15	10,936	45	75	0	0	1.8%	0.7%	64.7
Existing plus Project (AM)		4	15	11,192	45	75	0	0	1.8%	0.7%	64.8
Existing plus Project (PM)		4	15	11,264	45	75	0	0	1.8%	0.7%	64.8
Cumulative without Project (AM)		4	15	13,720	45	75	0	0	1.8%	0.7%	65.6
Cumulative without Project (PM)		4	15	13,272	45	75	0	0	1.8%	0.7%	65.5
Cumulative with Project (AM)		4	15	14,160	45	75	0	0	1.8%	0.7%	65.8
Cumulative with Project (PM)		4	15	13,600	45	75	0	0	1.8%	0.7%	65.6
Hasley Canyon e/o The Old Road											
Existing (AM)		2	0	11,800	10	75	0	0	1.8%	0.7%	53.3
Existing (PM)		2	0	12,800	10	75	0	0	1.8%	0.7%	53.7
Existing plus Project (AM)		2	0	12,000	10	75	0	0	1.8%	0.7%	53.4
Existing plus Project (PM)		2	0	13,256	10	75	0	0	1.8%	0.7%	53.8
Cumulative without Project (AM)		2	0	16,280	10	75	0	0	1.8%	0.7%	54.7
Cumulative without Project (PM)		2	0	16,264	10	75	0	0	1.8%	0.7%	54.7
Cumulative with Project (AM)		2	0	16,480	10	75	0	0	1.8%	0.7%	54.8
Cumulative with Project (PM)		2	0	16,720	10	75	0	0	1.8%	0.7%	54.9
Hasley Canyon w/o The Old Road											
Existing (AM)		4	15	14,976	45	75	0	0	1.8%	0.7%	66.0
Existing (PM)		4	15	14,448	45	75	0	0	1.8%	0.7%	65.9
Existing plus Project (AM)		4	15	15,640	45	75	0	0	1.8%	0.7%	66.2
Existing plus Project (PM)		4	15	15,312	45	75	0	0	1.8%	0.7%	66.1
Cumulative without Project (AM)		4	15	19,816.0	45	75	0	0	1.8%	0.7%	67.2
Cumulative without Project (PM)		4	15	16,176.0	45	75	0	0	1.8%	0.7%	66.4
Cumulative with Project (AM)		4	15	20,480	45	75	0	0	1.8%	0.7%	67.4
Cumulative with Project (PM)		4	15	17,040	45	75	0	0	1.8%	0.7%	66.6

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

8

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
I-5 SB Ramps n/o Hasley Canyon											
Existing (AM)		2	0	792	30	75	0	0	1.8%	0.7%	49.4
Existing (PM)		2	0	1,488	30	75	0	0	1.8%	0.7%	52.1
Existing plus Project (AM)		2	0	872	30	75	0	0	1.8%	0.7%	49.8
Existing plus Project (PM)		2	0	1,536	30	75	0	0	1.8%	0.7%	52.3
Cumulative without Project (AM)		2	0	3,040.0	30	75	0	0	1.8%	0.7%	55.2
Cumulative without Project (PM)		2	0	4,192.0	30	75	0	0	1.8%	0.7%	56.6
Cumulative with Project (AM)		2	0	3,120	30	75	0	0	1.8%	0.7%	55.3
Cumulative with Project (PM)		2	0	4,240	30	75	0	0	1.8%	0.7%	56.7
I-5 SB Ramps s/o Hasley Canyon											
Existing (AM)		2	0	9,048	30	75	0	0	1.8%	0.7%	60.0
Existing (PM)		2	0	9,928	30	75	0	0	1.8%	0.7%	60.4
Existing plus Project (AM)		2	0	9,168	30	75	0	0	1.8%	0.7%	60.0
Existing plus Project (PM)		2	0	10,336	30	75	0	0	1.8%	0.7%	60.5
Cumulative without Project (AM)		2	0	11,080.0	30	75	0	0	1.8%	0.7%	60.8
Cumulative without Project (PM)		2	0	10,312.0	30	75	0	0	1.8%	0.7%	60.5
Cumulative with Project (AM)		2	0	11,200	30	75	0	0	1.8%	0.7%	60.9
Cumulative with Project (PM)		2	0	10,720	30	75	0	0	1.8%	0.7%	60.7
Hasley Canyon e/o I-5 SB Ramps											
Existing (AM)		2	0	0	15	75	0	0	1.8%	0.7%	#NUM!
Existing (PM)		2	0	0	15	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (AM)		2	0	0	15	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (PM)		2	0	0	15	75	0	0	1.8%	0.7%	#NUM!
Cumulative without Project (AM)		2	0	0.0	15	75	0	0	1.8%	0.7%	#NUM!
Cumulative without Project (PM)		2	0	0.0	15	75	0	0	1.8%	0.7%	#NUM!
Cumulative with Project (AM)		2	0	0	15	75	0	0	1.8%	0.7%	#NUM!
Cumulative with Project (PM)		2	0	0	15	75	0	0	1.8%	0.7%	#NUM!
Hasley Canyon w/o I-5 SB Ramps											
Existing (AM)		4	0	9,824	30	75	0	0	1.8%	0.7%	60.4
Existing (PM)		4	0	11,384	30	75	0	0	1.8%	0.7%	61.1
Existing plus Project (AM)		4	0	10,024	30	75	0	0	1.8%	0.7%	60.5
Existing plus Project (PM)		4	0	11,840	30	75	0	0	1.8%	0.7%	61.2
Cumulative without Project (AM)		4	0	14,120.0	30	75	0	0	1.8%	0.7%	62.0
Cumulative without Project (PM)		4	0	14,504.0	30	75	0	0	1.8%	0.7%	62.1
Cumulative with Project (AM)		4	0	14,320	30	75	0	0	1.8%	0.7%	62.1
Cumulative with Project (PM)		4	0	14,960	30	75	0	0	1.8%	0.7%	62.3

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

9

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
I-5 SB Off-Ramps n/o Newhall											
Existing (AM)		2	0	8,984	30	75	0	0	1.8%	0.7%	59.9
Existing (PM)		2	0	11,168	30	75	0	0	1.8%	0.7%	60.9
Existing plus Project (AM)		2	0	9,080	30	75	0	0	1.8%	0.7%	60.0
Existing plus Project (PM)		2	0	11,224	30	75	0	0	1.8%	0.7%	60.9
Cumulative without Project (AM)		2	0	15,424.0	30	75	0	0	1.8%	0.7%	62.3
Cumulative without Project (PM)		2	0	12,584.0	30	75	0	0	1.8%	0.7%	61.4
Cumulative with Project (AM)		2	0	15,520	30	75	0	0	1.8%	0.7%	62.3
Cumulative with Project (PM)		2	0	12,640	30	75	0	0	1.8%	0.7%	61.4
I-5 SB Off-Ramps s/o Newhall											
Existing (AM)		2	0	3,696	30	75	0	0	1.8%	0.7%	56.1
Existing (PM)		2	0	8,624	30	75	0	0	1.8%	0.7%	59.8
Existing plus Project (AM)		2	0	3,696	30	75	0	0	1.8%	0.7%	56.1
Existing plus Project (PM)		2	0	8,624	30	75	0	0	1.8%	0.7%	59.8
Cumulative without Project (AM)		2	0	6,880.0	30	75	0	0	1.8%	0.7%	58.8
Cumulative without Project (PM)		2	0	16,720.0	30	75	0	0	1.8%	0.7%	62.6
Cumulative with Project (AM)		2	0	6,880	30	75	0	0	1.8%	0.7%	58.8
Cumulative with Project (PM)		2	0	16,720	30	75	0	0	1.8%	0.7%	62.6
Newhall Ranch e/o I-5 SB Off-											
Existing (AM)		6	15	24,128	45	75	0	0	1.8%	0.7%	68.5
Existing (PM)		6	15	25,600	45	75	0	0	1.8%	0.7%	68.7
Existing plus Project (AM)		6	15	24,376	45	75	0	0	1.8%	0.7%	68.5
Existing plus Project (PM)		6	15	25,856	45	75	0	0	1.8%	0.7%	68.8
Cumulative without Project (AM)		6	15	41,112.0	45	75	0	0	1.8%	0.7%	70.8
Cumulative without Project (PM)		6	15	36,144.0	45	75	0	0	1.8%	0.7%	70.2
Cumulative with Project (AM)		6	15	41,360	45	75	0	0	1.8%	0.7%	70.8
Cumulative with Project (PM)		6	15	36,400	45	75	0	0	1.8%	0.7%	70.2
Newhall Ranch w/o I-5 SB Off-											
Existing (AM)		2	0	21,192	15	75	0	0	1.8%	0.7%	58.3
Existing (PM)		2	0	25,632	15	75	0	0	1.8%	0.7%	59.2
Existing plus Project (AM)		2	0	21,344	15	75	0	0	1.8%	0.7%	58.4
Existing plus Project (PM)		2	0	25,832	15	75	0	0	1.8%	0.7%	59.2
Cumulative without Project (AM)		2	0	41,688.0	15	75	0	0	1.8%	0.7%	61.3
Cumulative without Project (PM)		2	0	43,160.0	15	75	0	0	1.8%	0.7%	61.4
Cumulative with Project (AM)		2	0	41,840	15	75	0	0	1.8%	0.7%	61.3
Cumulative with Project (PM)		2	0	43,360	15	75	0	0	1.8%	0.7%	61.4

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

10

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
I-5 NB Off-Ramps n/o Newhall											
Existing (AM)		6	10	5,280	30	75	0	0	1.8%	0.7%	58.1
Existing (PM)		6	10	7,040	30	75	0	0	1.8%	0.7%	59.4
Existing plus Project (AM)		6	10	5,312	30	75	0	0	1.8%	0.7%	58.2
Existing plus Project (PM)		6	10	7,144	30	75	0	0	1.8%	0.7%	59.5
Cumulative without Project (AM)		6	10	6,368.0	30	75	0	0	1.8%	0.7%	59.0
Cumulative without Project (PM)		6	10	8,616.0	30	75	0	0	1.8%	0.7%	60.3
Cumulative with Project (AM)		6	10	6,400	30	75	0	0	1.8%	0.7%	59.0
Cumulative with Project (PM)		6	10	8,720	30	75	0	0	1.8%	0.7%	60.3
I-5 NB Off-Ramps s/o Newhall											
Existing (AM)		6	10	12,584	30	75	0	0	1.8%	0.7%	61.9
Existing (PM)		6	10	8,112	30	75	0	0	1.8%	0.7%	60.0
Existing plus Project (AM)		6	10	12,584	30	75	0	0	1.8%	0.7%	61.9
Existing plus Project (PM)		6	10	8,112	30	75	0	0	1.8%	0.7%	60.0
Cumulative without Project (AM)		6	10	17,600.0	30	75	0	0	1.8%	0.7%	63.4
Cumulative without Project (PM)		6	10	17,600.0	30	75	0	0	1.8%	0.7%	63.4
Cumulative with Project (AM)		6	10	17,600	30	75	0	0	1.8%	0.7%	63.4
Cumulative with Project (PM)		6	10	17,600	30	75	0	0	1.8%	0.7%	63.4
Newhall Ranch e/o I-5 NB Off-											
Existing (AM)		6	15	27,304	45	75	0	0	1.8%	0.7%	69.0
Existing (PM)		6	15	31,840	45	75	0	0	1.8%	0.7%	69.7
Existing plus Project (AM)		6	15	27,584	45	75	0	0	1.8%	0.7%	69.0
Existing plus Project (PM)		6	15	32,200	45	75	0	0	1.8%	0.7%	69.7
Cumulative without Project (AM)		6	15	42,360.0	45	75	0	0	1.8%	0.7%	70.9
Cumulative without Project (PM)		6	15	45,400.0	45	75	0	0	1.8%	0.7%	71.2
Cumulative with Project (AM)		6	15	42,640	45	75	0	0	1.8%	0.7%	70.9
Cumulative with Project (PM)		6	15	45,760	45	75	0	0	1.8%	0.7%	71.2
Newhall Ranch w/o I-5 NB Off-											
Existing (AM)		6	15	24,128	45	75	0	0	1.8%	0.7%	68.5
Existing (PM)		6	15	25,600	45	75	0	0	1.8%	0.7%	68.7
Existing plus Project (AM)		6	15	24,376	45	75	0	0	1.8%	0.7%	68.5
Existing plus Project (PM)		6	15	25,856	45	75	0	0	1.8%	0.7%	68.8
Cumulative without Project (AM)		6	15	41,272.0	45	75	0	0	1.8%	0.7%	70.8
Cumulative without Project (PM)		6	15	40,784.0	45	75	0	0	1.8%	0.7%	70.7
Cumulative with Project (AM)		6	15	41,520	45	75	0	0	1.8%	0.7%	70.8
Cumulative with Project (PM)		6	15	41,040	45	75	0	0	1.8%	0.7%	70.8

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

11

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
Commerce Center n/o SR 126 WB											
Existing (AM)		6	15	10,968	45	75	0	0	1.8%	0.7%	65.0
Existing (PM)		6	15	12,504	45	75	0	0	1.8%	0.7%	65.6
Existing plus Project (AM)		6	15	10,992	45	75	0	0	1.8%	0.7%	65.0
Existing plus Project (PM)		6	15	12,528	45	75	0	0	1.8%	0.7%	65.6
Cumulative without Project (AM)		6	15	27,976.0	45	75	0	0	1.8%	0.7%	69.1
Cumulative without Project (PM)		6	15	31,416.0	45	75	0	0	1.8%	0.7%	69.6
Cumulative with Project (AM)		6	15	28,000	45	75	0	0	1.8%	0.7%	69.1
Cumulative with Project (PM)		6	15	31,440	45	75	0	0	1.8%	0.7%	69.6
Commerce Center s/o SR 126 WB											
Existing (AM)		6	15	2,848	45	75	0	0	1.8%	0.7%	59.2
Existing (PM)		6	15	11,128	45	75	0	0	1.8%	0.7%	65.1
Existing plus Project (AM)		6	15	2,872	45	75	0	0	1.8%	0.7%	59.2
Existing plus Project (PM)		6	15	11,160	45	75	0	0	1.8%	0.7%	65.1
Cumulative without Project (AM)		6	15	19,896.0	45	75	0	0	1.8%	0.7%	67.6
Cumulative without Project (PM)		6	15	30,688.0	45	75	0	0	1.8%	0.7%	69.5
Cumulative with Project (AM)		6	15	19,920	45	75	0	0	1.8%	0.7%	67.6
Cumulative with Project (PM)		6	15	30,720	45	75	0	0	1.8%	0.7%	69.5
SR 126 WB Ramps e/o Commerce											
Existing (AM)		2	0	8,392	30	75	0	0	1.8%	0.7%	59.6
Existing (PM)		2	0	1,744	30	75	0	0	1.8%	0.7%	52.8
Existing plus Project (AM)		2	0	8,392	30	75	0	0	1.8%	0.7%	59.6
Existing plus Project (PM)		2	0	1,744	30	75	0	0	1.8%	0.7%	52.8
Cumulative without Project (AM)		2	0	13,920.0	30	75	0	0	1.8%	0.7%	61.8
Cumulative without Project (PM)		2	0	7,120.0	30	75	0	0	1.8%	0.7%	58.9
Cumulative with Project (AM)		2	0	13,920	30	75	0	0	1.8%	0.7%	61.8
Cumulative with Project (PM)		2	0	7,120	30	75	0	0	1.8%	0.7%	58.9
SR 126 WB Ramps w/o Commerce											
Existing (AM)		2	0	480	30	75	0	0	1.8%	0.7%	47.2
Existing (PM)		2	0	832	30	75	0	0	1.8%	0.7%	49.6
Existing plus Project (AM)		2	0	496	30	75	0	0	1.8%	0.7%	47.4
Existing plus Project (PM)		2	0	872	30	75	0	0	1.8%	0.7%	49.8
Cumulative without Project (AM)		2	0	2,464.0	30	75	0	0	1.8%	0.7%	54.3
Cumulative without Project (PM)		2	0	8,600.0	30	75	0	0	1.8%	0.7%	59.7
Cumulative with Project (AM)		2	0	2,480	30	75	0	0	1.8%	0.7%	54.3
Cumulative with Project (PM)		2	0	8,640	30	75	0	0	1.8%	0.7%	59.8

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

12

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
Commerce Center n/o SR 126 EB											
Existing (AM)		6	15	2,896	45	75	0	0	1.8%	0.7%	59.3
Existing (PM)		6	15	10,872	45	75	0	0	1.8%	0.7%	65.0
Existing plus Project (AM)		6	15	2,920	45	75	0	0	1.8%	0.7%	59.3
Existing plus Project (PM)		6	15	10,904	45	75	0	0	1.8%	0.7%	65.0
Cumulative without Project (AM)		6	15	19,976.0	45	75	0	0	1.8%	0.7%	67.6
Cumulative without Project (PM)		6	15	30,688.0	45	75	0	0	1.8%	0.7%	69.5
Cumulative with Project (AM)		6	15	20,000	45	75	0	0	1.8%	0.7%	67.6
Cumulative with Project (PM)		6	15	30,720	45	75	0	0	1.8%	0.7%	69.5
Commerce Center s/o SR 126 EB											
Existing (AM)		6	15	1,600	45	75	0	0	1.8%	0.7%	56.7
Existing (PM)		6	15	3,344	45	75	0	0	1.8%	0.7%	59.9
Existing plus Project (AM)		6	15	1,624	45	75	0	0	1.8%	0.7%	56.7
Existing plus Project (PM)		6	15	3,376	45	75	0	0	1.8%	0.7%	59.9
Cumulative without Project (AM)		6	15	19,176.0	45	75	0	0	1.8%	0.7%	67.5
Cumulative without Project (PM)		6	15	21,408.0	45	75	0	0	1.8%	0.7%	67.9
Cumulative with Project (AM)		6	15	19,200	45	75	0	0	1.8%	0.7%	67.5
Cumulative with Project (PM)		6	15	21,440	45	75	0	0	1.8%	0.7%	67.9
SR 126 EB Ramps e/o Commerce											
Existing (AM)		2	0	104	30	75	0	0	1.8%	0.7%	40.6
Existing (PM)		2	0	496	30	75	0	0	1.8%	0.7%	47.4
Existing plus Project (AM)		2	0	104	30	75	0	0	1.8%	0.7%	40.6
Existing plus Project (PM)		2	0	496	30	75	0	0	1.8%	0.7%	47.4
Cumulative without Project (AM)		2	0	2,160.0	30	75	0	0	1.8%	0.7%	53.7
Cumulative without Project (PM)		2	0	4,000.0	30	75	0	0	1.8%	0.7%	56.4
Cumulative with Project (AM)		2	0	2,160	30	75	0	0	1.8%	0.7%	53.7
Cumulative with Project (PM)		2	0	4,000	30	75	0	0	1.8%	0.7%	56.4
SR 126 EB Ramps w/o Commerce											
Existing (AM)		2	0	1,400	30	75	0	0	1.8%	0.7%	51.9
Existing (PM)		2	0	8,024	30	75	0	0	1.8%	0.7%	59.4
Existing plus Project (AM)		2	0	1,400	30	75	0	0	1.8%	0.7%	51.9
Existing plus Project (PM)		2	0	8,024	30	75	0	0	1.8%	0.7%	59.4
Cumulative without Project (AM)		2	0	2,960.0	30	75	0	0	1.8%	0.7%	55.1
Cumulative without Project (PM)		2	0	13,280.0	30	75	0	0	1.8%	0.7%	61.6
Cumulative with Project (AM)		2	0	2,960	30	75	0	0	1.8%	0.7%	55.1
Cumulative with Project (PM)		2	0	13,280	30	75	0	0	1.8%	0.7%	61.6

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

13

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
Commerce Center n/o Henry											
Existing (AM)		6	15	1,552	45	75	0	0	1.8%	0.7%	56.5
Existing (PM)		6	15	3,024	45	75	0	0	1.8%	0.7%	59.4
Existing plus Project (AM)		6	15	1,576	45	75	0	0	1.8%	0.7%	56.6
Existing plus Project (PM)		6	15	3,056	45	75	0	0	1.8%	0.7%	59.5
Cumulative without Project (AM)		6	15	19,576.0	45	75	0	0	1.8%	0.7%	67.6
Cumulative without Project (PM)		6	15	22,768.0	45	75	0	0	1.8%	0.7%	68.2
Cumulative with Project (AM)		6	15	19,600	45	75	0	0	1.8%	0.7%	67.6
Cumulative with Project (PM)		6	15	22,800	45	75	0	0	1.8%	0.7%	68.2
Commerce Center s/o Henry											
Existing (AM)		6	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Existing (PM)		6	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (AM)		6	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (PM)		6	15	0	45	75	0	0	1.8%	0.7%	#NUM!
Cumulative without Project (AM)		6	15	18,320.0	45	75	0	0	1.8%	0.7%	67.3
Cumulative without Project (PM)		6	15	20,320.0	45	75	0	0	1.8%	0.7%	67.7
Cumulative with Project (AM)		6	15	18,320	45	75	0	0	1.8%	0.7%	67.3
Cumulative with Project (PM)		6	15	20,320	45	75	0	0	1.8%	0.7%	67.7
Henry Mayo e/o Commerce											
Existing (AM)		2	0	1,688	30	75	0	0	1.8%	0.7%	52.7
Existing (PM)		2	0	3,184	30	75	0	0	1.8%	0.7%	55.4
Existing plus Project (AM)		2	0	1,720	30	75	0	0	1.8%	0.7%	52.8
Existing plus Project (PM)		2	0	3,224	30	75	0	0	1.8%	0.7%	55.5
Cumulative without Project (AM)		2	0	4,128.0	30	75	0	0	1.8%	0.7%	56.6
Cumulative without Project (PM)		2	0	8,520.0	30	75	0	0	1.8%	0.7%	59.7
Cumulative with Project (AM)		2	0	4,160	30	75	0	0	1.8%	0.7%	56.6
Cumulative with Project (PM)		2	0	8,560	30	75	0	0	1.8%	0.7%	59.7
Henry Mayo w/o Commerce											
Existing (AM)		2	0	680	30	75	0	0	1.8%	0.7%	48.7
Existing (PM)		2	0	384	30	75	0	0	1.8%	0.7%	46.2
Existing plus Project (AM)		2	0	720	30	75	0	0	1.8%	0.7%	49.0
Existing plus Project (PM)		2	0	408	30	75	0	0	1.8%	0.7%	46.5
Cumulative without Project (AM)		2	0	6,680.0	30	75	0	0	1.8%	0.7%	58.6
Cumulative without Project (PM)		2	0	5,576.0	30	75	0	0	1.8%	0.7%	57.9
Cumulative with Project (AM)		2	0	6,720	30	75	0	0	1.8%	0.7%	58.7
Cumulative with Project (PM)		2	0	5,600	30	75	0	0	1.8%	0.7%	57.9

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

14

NOISE LEVEL CONTOURS - Existing Plus Project Weekday Off-Site ADT Volumes

ROADWAY NAME Segment	Land Use	Lanes	Median Width	ADT Volume	Design Speed (mph)	Dist. from Center to Receptor	Alpha Factor (1)	Barrier Attn. dB(A)	Vehicle Mix Medium Trucks	 Heavy Trucks	dB(A) CNEL
Wolcott n/o SR-126											
Existing (AM)		2	0	568	30	75	0	0	1.8%	0.7%	47.9
Existing (PM)		2	0	792	30	75	0	0	1.8%	0.7%	49.4
Existing plus Project (AM)		2	0	600	30	75	0	0	1.8%	0.7%	48.2
Existing plus Project (PM)		2	0	848	30	75	0	0	1.8%	0.7%	49.7
Cumulative without Project (AM)		2	0	7,088.0	30	75	0	0	1.8%	0.7%	58.9
Cumulative without Project (PM)		2	0	6,824.0	30	75	0	0	1.8%	0.7%	58.7
Cumulative with Project (AM)		2	0	7,120	30	75	0	0	1.8%	0.7%	58.9
Cumulative with Project (PM)		2	0	6,880	30	75	0	0	1.8%	0.7%	58.8
Wolcott s/o SR-126											
Existing (AM)		2	0	0	30	75	0	0	1.8%	0.7%	#NUM!
Existing (PM)		2	0	0	30	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (AM)		2	0	0	30	75	0	0	1.8%	0.7%	#NUM!
Existing plus Project (PM)		2	0	0	30	75	0	0	1.8%	0.7%	#NUM!
Cumulative without Project (AM)		2	0	7,840.0	30	75	0	0	1.8%	0.7%	59.3
Cumulative without Project (PM)		2	0	9,520.0	30	75	0	0	1.8%	0.7%	60.2
Cumulative with Project (AM)		2	0	7,840	30	75	0	0	1.8%	0.7%	59.3
Cumulative with Project (PM)		2	0	9,520	30	75	0	0	1.8%	0.7%	60.2
SR-126 e/o Wolcott											
Existing (AM)		4	15	12,848	45	75	0	0	1.8%	0.7%	65.4
Existing (PM)		4	15	14,592	45	75	0	0	1.8%	0.7%	65.9
Existing plus Project (AM)		4	15	13,048	45	75	0	0	1.8%	0.7%	65.4
Existing plus Project (PM)		4	15	14,856	45	75	0	0	1.8%	0.7%	66.0
Cumulative without Project (AM)		4	15	37,080.0	45	75	0	0	1.8%	0.7%	70.0
Cumulative without Project (PM)		4	15	42,216.0	45	75	0	0	1.8%	0.7%	70.5
Cumulative with Project (AM)		4	15	37,280	45	75	0	0	1.8%	0.7%	70.0
Cumulative with Project (PM)		4	15	42,480	45	75	0	0	1.8%	0.7%	70.6
SR-126 w/o Wolcott											
Existing (AM)		4	15	13,304	45	75	0	0	1.8%	0.7%	65.5
Existing (PM)		4	15	15,080	45	75	0	0	1.8%	0.7%	66.1
Existing plus Project (AM)		4	15	13,536	45	75	0	0	1.8%	0.7%	65.6
Existing plus Project (PM)		4	15	15,400	45	75	0	0	1.8%	0.7%	66.1
Cumulative without Project (AM)		4	15	33,608.0	45	75	0	0	1.8%	0.7%	69.5
Cumulative without Project (PM)		4	15	36,320.0	45	75	0	0	1.8%	0.7%	69.9
Cumulative with Project (AM)		4	15	33,840	45	75	0	0	1.8%	0.7%	69.6
Cumulative with Project (PM)		4	15	36,640	45	75	0	0	1.8%	0.7%	69.9

(1) Alpha Factor: Coefficient of absorption relating to the effects of the ground surface. An alpha factor of 0 indicates that the site is an acoustically "hard" site such as aspalt. An alpha factor of 0.5 indicates that the site is an acoustically "soft" site such as vegetative ground cover.

Assumed 24-Hour Traffic Distribution:	Day	Evening	Night
Total ADT Volumes	77.70%	12.70%	9.60%
Medium-Duty Trucks	87.43%	5.05%	7.52%
Heavy-Duty Trucks	89.10%	2.84%	8.06%

APPENDIX J.3

Construction Noise Worksheets

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/6/2020
Case Description: Grading

		Baselines (dBA)		---- Receptor #1 ----
Description	Land Use	Daytime	Evening	Night
Site 1	Residential	67.9	67.9	67.9

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		50	0
Grader	No	40	85		50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0

Results

	Calculated (dBA)	
Equipment	*Lmax	Leq
Grader	85	81
Grader	85	81
Dozer	81.7	77.7
Dozer	81.7	77.7
Dozer	81.7	77.7
Dozer	81.7	77.7
Dozer	81.7	77.7
Dozer	81.7	77.7

Dozer		81.7	77.7
Dozer		81.7	77.7
Dozer		81.7	77.7
Dozer		81.7	77.7
Scraper		83.6	79.6
Scraper		83.6	79.6
Scraper		83.6	79.6
Scraper		83.6	79.6
Scraper		83.6	79.6
Scraper		83.6	79.6
Scraper		83.6	79.6
Scraper		83.6	79.6
	Total	85	92

*Calculated Lmax is the Loudest value.

		Baselines (dBA)		---- Receptor #2 ----
Description	Land Use	Daytime	Evening	Night
Site 2	Residential	55.8	55.8	55.8

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		300	0
Grader	No	40	85		300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Dozer	No	40		81.7	300	0
Scraper	No	40		83.6	300	0
Scraper	No	40		83.6	300	0
Scraper	No	40		83.6	300	0
Scraper	No	40		83.6	300	0
Scraper	No	40		83.6	300	0
Scraper	No	40		83.6	300	0
Scraper	No	40		83.6	300	0
Scraper	No	40		83.6	300	0

	Results
	Calculated (dBA)

Equipment		*Lmax	Leq
Grader		69.4	65.5
Grader		69.4	65.5
Dozer		66.1	62.1
Dozer		66.1	62.1
Dozer		66.1	62.1
Dozer		66.1	62.1
Dozer		66.1	62.1
Dozer		66.1	62.1
Dozer		66.1	62.1
Dozer		66.1	62.1
Dozer		66.1	62.1
Scraper		68	64
Scraper		68	64
Scraper		68	64
Scraper		68	64
Scraper		68	64
Scraper		68	64
Scraper		68	64
Scraper		68	64
	Total	69.4	76.4

*Calculated Lmax is the Loudest value.

				---- Receptor #3 ----
		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Site 3	Residential	66.7	66.7	66.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		1350	0
Grader	No	40	85		1350	0
Dozer	No	40		81.7	1350	0
Dozer	No	40		81.7	1350	0
Dozer	No	40		81.7	1350	0
Dozer	No	40		81.7	1350	0
Dozer	No	40		81.7	1350	0
Dozer	No	40		81.7	1350	0
Dozer	No	40		81.7	1350	0
Dozer	No	40		81.7	1350	0
Dozer	No	40		81.7	1350	0
Scraper	No	40		83.6	1350	0

Scraper	No	40	83.6	1350	0
Scraper	No	40	83.6	1350	0
Scraper	No	40	83.6	1350	0
Scraper	No	40	83.6	1350	0
Scraper	No	40	83.6	1350	0
Scraper	No	40	83.6	1350	0
Scraper	No	40	83.6	1350	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq	Day Lmax
Grader	56.4	52.4	N/A
Grader	56.4	52.4	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Dozer	53	49.1	N/A
Scraper	55	51	N/A
Scraper	55	51	N/A
Scraper	55	51	N/A
Scraper	55	51	N/A
Scraper	55	51	N/A
Scraper	55	51	N/A
Scraper	55	51	N/A
Scraper	55	51	N/A
Scraper	55	51	N/A
Total	56.4	63.3	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 4	Residential	63.1	63.1	63.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		60	0
Grader	No	40	85		60	0
Dozer	No	40		81.7	60	0

Dozer	No	40	81.7	60	0
Dozer	No	40	81.7	60	0
Dozer	No	40	81.7	60	0
Dozer	No	40	81.7	60	0
Dozer	No	40	81.7	60	0
Dozer	No	40	81.7	60	0
Dozer	No	40	81.7	60	0
Dozer	No	40	81.7	60	0
Dozer	No	40	81.7	60	0
Scraper	No	40	83.6	60	0
Scraper	No	40	83.6	60	0
Scraper	No	40	83.6	60	0
Scraper	No	40	83.6	60	0
Scraper	No	40	83.6	60	0
Scraper	No	40	83.6	60	0
Scraper	No	40	83.6	60	0
Scraper	No	40	83.6	60	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq	Day Lmax
Grader	83.4	79.4	N/A
Grader	83.4	79.4	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Dozer	80.1	76.1	N/A
Scraper	82	78	N/A
Scraper	82	78	N/A
Scraper	82	78	N/A
Scraper	82	78	N/A
Scraper	82	78	N/A
Scraper	82	78	N/A
Scraper	82	78	N/A
Scraper	82	78	N/A
Total	83.4	90.4	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #5 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 5	Residential	48.1	48.1	48.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		50	0
Grader	No	40	85		50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Dozer	No	40		81.7	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0
Scraper	No	40		83.6	50	0

	Calculated (dBA)		Results
Equipment	*Lmax	Leq	Day Lmax
Grader	85	81	N/A
Grader	85	81	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Dozer	81.7	77.7	N/A
Scraper	83.6	79.6	N/A
Scraper	83.6	79.6	N/A
Scraper	83.6	79.6	N/A

Scraper		83.6	79.6	N/A
Scraper		83.6	79.6	N/A
Scraper		83.6	79.6	N/A
Scraper		83.6	79.6	N/A
Scraper		83.6	79.6	N/A
	Total	85	92	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #6 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Site 6	Residential	56.1	56.1	56.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		400	0
Grader	No	40	85		400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Dozer	No	40		81.7	400	0
Scraper	No	40		83.6	400	0
Scraper	No	40		83.6	400	0
Scraper	No	40		83.6	400	0
Scraper	No	40		83.6	400	0
Scraper	No	40		83.6	400	0
Scraper	No	40		83.6	400	0
Scraper	No	40		83.6	400	0

	Calculated (dBA)		Results
Equipment	*Lmax	Leq	Day Lmax
Grader	66.9	63	N/A
Grader	66.9	63	N/A
Dozer	63.6	59.6	N/A
Dozer	63.6	59.6	N/A
Dozer	63.6	59.6	N/A

Dozer		63.6	59.6	N/A
Dozer		63.6	59.6	N/A
Dozer		63.6	59.6	N/A
Dozer		63.6	59.6	N/A
Dozer		63.6	59.6	N/A
Dozer		63.6	59.6	N/A
Dozer		63.6	59.6	N/A
Scraper		65.5	61.5	N/A
Scraper		65.5	61.5	N/A
Scraper		65.5	61.5	N/A
Scraper		65.5	61.5	N/A
Scraper		65.5	61.5	N/A
Scraper		65.5	61.5	N/A
Scraper		65.5	61.5	N/A
Scraper		65.5	61.5	N/A
	Total	66.9	73.9	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/6/2020
Case Description: Building Construction

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Site 1	Residential	67.9	67.9	67.9

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	50	0
Forklift	No	40		85	50	0
Forklift	No	40		85	50	0
Forklift	No	40		85	50	0
Generator	No	50		80.6	50	0
Backhoe	No	40		77.6	50	0
Front End Loader	No	40		79.1	50	0
Tractor	No	40	84		50	0
Welder / Torch	No	40		74	50	0

Results

Equipment		Calculated (dBA) *Lmax	Leq
Crane		80.6	72.6
Forklift		85	81
Forklift		85	81
Forklift		85	81
Generator		80.6	77.6
Backhoe		77.6	73.6
Front End Loader		79.1	75.1
Tractor		84	80
Welder / Torch		74	70
	Total	85	87.9

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Site 2	Residential	55.8	55.8	55.8

			Equipment Spec	Actual	Receptor	Estimated

Description	Impact Device	Usage(%)	Lmax (dBA)	Lmax (dBA)	Distance (feet)	Shielding (dBA)	
Crane	No	16		80.6	300		0
Forklift	No	40		85	300		0
Forklift	No	40		85	300		0
Forklift	No	40		85	300		0
Generator	No	50		80.6	300		0
Backhoe	No	40		77.6	300		0
Front End Loader	No	40		79.1	300		0
Tractor	No	40	84		300		0
Welder / Torch	No	40		74	300		0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Crane	65	57
Forklift	69.4	65.5
Forklift	69.4	65.5
Forklift	69.4	65.5
Generator	65.1	62.1
Backhoe	62	58
Front End Loader	63.5	59.6
Tractor	68.4	64.5
Welder / Torch	58.4	54.5
Total	69.4	72.4

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 3	Residential	66.7	66.7	66.7

Equipment

Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)	
Crane	No	16		80.6	1350		0
Forklift	No	40		85	1350		0
Forklift	No	40		85	1350		0
Forklift	No	40		85	1350		0
Generator	No	50		80.6	1350		0
Backhoe	No	40		77.6	1350		0
Front End Loader	No	40		79.1	1350		0
Tractor	No	40	84		1350		0
Welder / Torch	No	40		74	1350		0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Crane	51.9	44
Forklift	56.4	52.4
Forklift	56.4	52.4
Forklift	56.4	52.4
Generator	52	49
Backhoe	48.9	45
Front End Loader	50.5	46.5
Tractor	55.4	51.4
Welder / Torch	45.4	41.4
Total	56.4	59.3

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 4	Residential	63.1	63.1	63.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	60	0
Forklift	No	40		85	60	0
Forklift	No	40		85	60	0
Forklift	No	40		85	60	0
Generator	No	50		80.6	60	0
Backhoe	No	40		77.6	60	0
Front End Loader	No	40		79.1	60	0
Tractor	No	40	84		60	0
Welder / Torch	No	40		74	60	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Crane	79	71
Forklift	83.4	79.4
Forklift	83.4	79.4
Forklift	83.4	79.4
Generator	79	76
Backhoe	76	72
Front End Loader	77.5	73.5
Tractor	82.4	78.4

Welder / Torch		72.4	68.4
	Total	83.4	86.3

*Calculated Lmax is the Loudest value.

---- Receptor #5 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Site 5	Residential	48.1	48.1	48.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Crane	No	16		80.6	50	0
Forklift	No	40		85	50	0
Forklift	No	40		85	50	0
Forklift	No	40		85	50	0
Generator	No	50		80.6	50	0
Backhoe	No	40		77.6	50	0
Front End Loader	No	40		79.1	50	0
Tractor	No	40	84		50	0
Welder / Torch	No	40		74	50	0

Results

	Calculated (dBA)	
Equipment	*Lmax	Leq
Crane	80.6	72.6
Forklift	85	81
Forklift	85	81
Forklift	85	81
Generator	80.6	77.6
Backhoe	77.6	73.6
Front End Loader	79.1	75.1
Tractor	84	80
Welder / Torch	74	70
Total	85	87.9

*Calculated Lmax is the Loudest value.

---- Receptor #6 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Site 6	Residential	56.1	56.1	56.1

		Equipment			
	Impact	Spec Lmax	Actual Lmax	Receptor Distance	Estimated Shielding

Description	Device	Usage(%)	(dBA)	(dBA)	(feet)	(dBA)	
Crane	No	16		80.6	400		0
Forklift	No	40		85	400		0
Forklift	No	40		85	400		0
Forklift	No	40		85	400		0
Generator	No	50		80.6	400		0
Backhoe	No	40		77.6	400		0
Front End Loader	No	40		79.1	400		0
Tractor	No	40	84		400		0
Welder / Torch	No	40		74	400		0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Crane	62.5	54.5
Forklift	66.9	63
Forklift	66.9	63
Forklift	66.9	63
Generator	62.6	59.6
Backhoe	59.5	55.5
Front End Loader	61	57.1
Tractor	65.9	62
Welder / Torch	55.9	52
Total	66.9	69.9

*Calculated Lmax is the Loudest value.

Report date: 7/6/2020
Case Description: Paving

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Site 1	Residential	67.9	67.9	67.9

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	50	0
Roller	No	20		80	50	0
Paver	No	50		77.2	50	0
Paver	No	50		77.2	50	0
All Other Equipment > 5 HP	No	50	85		50	0
All Other Equipment > 5 HP	No	50	85		50	0

Results

Equipment		Calculated (dBA) *Lmax	Leq
Roller		80	73
Roller		80	73
Paver		77.2	74.2
Paver		77.2	74.2
All Other Equipment > 5 HP		85	82
All Other Equipment > 5 HP		85	82
	Total	85	86.1

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Site 2	Residential	55.8	55.8	55.8

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	300	0
Roller	No	20		80	300	0
Paver	No	50		77.2	300	0
Paver	No	50		77.2	300	0

All Other Equipment > 5 HP		No	50	85	300	0
All Other Equipment > 5 HP		No	50	85	300	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Roller	64.4	57.4
Roller	64.4	57.4
Paver	61.7	58.6
Paver	61.7	58.6
All Other Equipment > 5 HP	69.4	66.4
All Other Equipment > 5 HP	69.4	66.4
Total	69.4	70.6

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 3	Residential	66.7	66.7	66.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	1350	0
Roller	No	20		80	1350	0
Paver	No	50		77.2	1350	0
Paver	No	50		77.2	1350	0
All Other Equipment > 5 HP	No	50	85		1350	0
All Other Equipment > 5 HP	No	50	85		1350	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Roller	51.4	44.4
Roller	51.4	44.4
Paver	48.6	45.6
Paver	48.6	45.6
All Other Equipment > 5 HP	56.4	53.4
All Other Equipment > 5 HP	56.4	53.4
Total	56.4	57.5

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 4	Residential	63.1	63.1	63.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	60	0
Roller	No	20		80	60	0
Paver	No	50		77.2	60	0
Paver	No	50		77.2	60	0
All Other Equipment > 5 HP	No	50	85		60	0
All Other Equipment > 5 HP	No	50	85		60	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq
Roller	78.4	71.4
Roller	78.4	71.4
Paver	75.6	72.6
Paver	75.6	72.6
All Other Equipment > 5 HP	83.4	80.4
All Other Equipment > 5 HP	83.4	80.4
Total	83.4	84.5

*Calculated Lmax is the Loudest value.

---- Receptor #5 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 5	Residential	48.1	48.1	48.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	150	0
Roller	No	20		80	50	0
Paver	No	50		77.2	50	0
Paver	No	50		77.2	50	0
All Other Equipment > 5 HP	No	50	85		50	0
All Other Equipment > 5 HP	No	50	85		50	0

Results

Calculated (dBA)

Equipment	*Lmax	Leq

Roller		70.5	63.5
Roller		80	73
Paver		77.2	74.2
Paver		77.2	74.2
All Other Equipment > 5 HP		85	82
All Other Equipment > 5 HP		85	82
	Total	85	85.9

*Calculated Lmax is the Loudest value.

---- Receptor #6 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Site 6	Residential	56.1	56.1	56.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Roller	No	20		80	400	0
Roller	No	20		80	400	0
Paver	No	50		77.2	400	0
Paver	No	50		77.2	400	0
All Other Equipment > 5 HP	No	50	85		400	0
All Other Equipment > 5 HP	No	50	85		400	0

Results

	Calculated (dBA)	
Equipment	*Lmax	Leq
Roller	61.9	54.9
Roller	61.9	54.9
Paver	59.2	56.1
Paver	59.2	56.1
All Other Equipment > 5 HP	66.9	63.9
All Other Equipment > 5 HP	66.9	63.9
Total	66.9	68.1

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 7/6/2020
Case Description: Architectural Coating

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Site 1	Residential	67.9	67.9	67.9

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50	0

Results

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		77.7	73.7
	Total	77.7	73.7

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Site 2	Residential	55.8	55.8	55.8

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	300	0

Results

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		62.1	58.1
	Total	62.1	58.1

*Calculated Lmax is the Loudest value.

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
Site 3	Residential	66.7	66.7	66.7

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	1350	0

Results

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		49	45.1
	Total	49	45.1

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 4	Residential	63.1	63.1	63.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	60	0

Results

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		76.1	72.1
	Total	76.1	72.1

*Calculated Lmax is the Loudest value.

---- Receptor #5 ----

Baselines (dBA)

Description	Land Use	Daytime	Evening	Night
Site 5	Residential	48.1	48.1	48.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50	0

Results

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		77.7	73.7
	Total	77.7	73.7

*Calculated Lmax is the Loudest value.

---- Receptor #6 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
Site 6	Residential	56.1	56.1	56.1

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	400	0

Results

Calculated (dBA)

Equipment		*Lmax	Leq
Compressor (air)		59.6	55.6
	Total	59.6	55.6

*Calculated Lmax is the Loudest value.

APPENDIX J.4

Construction Vibraiton Worksheets

Meridian Consultants LLC

Sterling Ranch
Construction Vibration Model
(50 feet)

Rev: 11-12-2012

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	50	0.031	0.008	78
Jackhammer		1	0.035	50	0.012	0.003	70
Large bulldozer		1	0.089	50	0.031	0.008	78
Loaded trucks		1	0.076	50	0.027	0.007	77
Pile Drive (impact)		0	0.644	50	0.000	0.000	0
Vibratory Roller		1	0.210	50	0.074	0.019	85
Small bulldozer		1	0.003	50	0.001	0.000	48

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

-Fragile Buildings- 0.20 in/sec

Meridian Consultants LLC

Sterling Ranch
Construction Vibration Model
(300 feet)

Rev: 11/12/2012

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	300	0.002	0.001	55
Jackhammer		1	0.035	300	0.001	0.000	46
Large bulldozer		1	0.089	300	0.002	0.001	55
Loaded trucks		1	0.076	300	0.002	0.000	53
Pile Drive (impact)		0	0.644	300	0.000	0.000	0
Vibratory Roller		1	0.210	300	0.005	0.001	62
Small bulldozer		1	0.003	300	0.000	0.000	25

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

-Fragile Buildings- 0.20 in/sec

Meridian Consultants LLC

Sterling Ranch
Construction Vibration Model
(1,350 feet)

Rev: 11-12-2012

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	1350	0.000	0.000	35
Jackhammer		1	0.035	1350	0.000	0.000	27
Large bulldozer		1	0.089	1350	0.000	0.000	35
Loaded trucks		1	0.076	1350	0.000	0.000	34
Pile Drive (impact)		0	0.644	1350	0.000	0.000	0
Vibratory Roller		1	0.210	1350	0.001	0.000	42
Small bulldozer		1	0.003	1350	0.000	0.000	6

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

-Fragile Buildings- 0.20 in/sec

Meridian Consultants LLC

Sterling Ranch
Construction Vibration Model
(60 feet)

Rev: 11-12-2012

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	60	0.024	0.006	76
Jackhammer		1	0.035	60	0.009	0.002	67
Large bulldozer		1	0.089	60	0.024	0.006	76
Loaded trucks		1	0.076	60	0.020	0.005	74
Pile Drive (impact)		0	0.644	60	0.000	0.000	0
Vibratory Roller		1	0.210	60	0.056	0.014	83
Small bulldozer		1	0.003	60	0.001	0.000	46

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

-Fragile Buildings- 0.20 in/sec

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	50	0.031	0.008	78
Jackhammer		1	0.035	50	0.012	0.003	70
Large bulldozer		1	0.089	50	0.031	0.008	78
Loaded trucks		1	0.076	50	0.027	0.007	77
Pile Drive (impact)		0	0.644	50	0.000	0.000	0
Vibratory Roller		1	0.210	50	0.074	0.019	85
Small bulldozer		1	0.003	50	0.001	0.000	48

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

-Fragile Buildings- 0.20 in/sec

Meridian Consultants LLC

Sterling Ranch
Construction Vibration Model
(400 feet)

Rev: 11-12-2012

Equipment		Pieces of Equipment	PPV at 25 feet (in/sec)	Distance from Equipment	PPV at adjusted distance	RMS velocity amplitude in in/sec at adjusted distance[a]	RMS Vibration level in VdB at adjusted distance
Caisson drilling		1	0.089	400	0.001	0.000	51
Jackhammer		1	0.035	400	0.001	0.000	43
Large bulldozer		1	0.089	400	0.001	0.000	51
Loaded trucks		1	0.076	400	0.001	0.000	49
Pile Drive (impact)		0	0.644	400	0.000	0.000	0
Vibratory Roller		1	0.210	400	0.003	0.001	58
Small bulldozer		1	0.003	400	0.000	0.000	21

*** Suggested Vibration Thresholds per the Federal Transit Administration, United States Department of Transportation, Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06), May 2006, pg. 12-12.**

-Fragile Buildings- 0.20 in/sec

APPENDIX K

Public Services

From: Bagwell, Loretta
Sent: Tuesday, July 21, 2020 12:51 PM
To: Zulema Renteria
Subject: RE: Fire Services Request Update

As requested.

Loretta

From: Zulema Renteria [mailto:zrenteria@meridianconsultantsllc.com]
Sent: Friday, July 17, 2020 3:59 PM
To: Bagwell, Loretta
Subject: Fire Services Request Update

CAUTION: External Email. Proceed Responsibly.

Happy Friday! I wanted to touch base with you before the end of the day and inquire about any updates on the information request for fire services? If you're open to phone correspondence next week, it would be greatly appreciated. I look forward to connecting with you.

Have a great weekend.

Thanks,

Zulema Renteria
Staff Planner

Promoting sustainable stewardship of our communities and natural resources by providing strategic and innovative consulting services and solutions.

706 South Hill Street, 11th Floor
Los Angeles, California 90014

Office – (213) 335-3434
Direct – (213) 335-5303

Website: www.meridianconsultantsllc.com

1. Which fire stations serve the Project site?

   Fire Station 143 located at 28580 Hasley Canyon Road, Castaic, CA 91355, is the jurisdictional station 1st-due for the Project site, approximately 1.1 miles east of the project. It is staffed with a 3-person engine company which consists of 1 fire captain, 1 fire fighter specialist, and 1 fire fighter on duty for each 24-hour shift.

   Fire Station 76 located at 27223 Henry Mayo Drive, Valencia, CA 91355, is the 2nd-due station for the Project site, approximately 3.5 miles southeast of the project. It is staffed with a 4-person engine company which consists of 1 fire captain, 1 fire fighter specialist, and 2 fire fighters on duty for each 24-hour shift.

   - Distance from each station(s) to the Project.

     See response above.

   - Identification of the first-in and backup stations.

     See response above.

   - Existing staffing levels (i.e. Captains, Lieutenants, firefighters, paramedics, EMT's, Haz Mat-Trained personnel, etc.) for each station serving the Project site.

     See response above.

   - Existing equipment (i.e. number of engines, trucks, ambulances, etc.) for each station serving the Project site.

     See response above.

   - Average response times for each station serving the Project site.

     During the year 2019, Fire Station 143 had an average emergency response time for 1st arriving units of 6:26 minutes, and Fire Station 76 had an average emergency response time for 1st arriving units of 7:03 minutes.

   - Total number of incidents (per year) for each station serving the Project site.

     During the year 2019, Fire Station 143 responded to 537 incidents, and Fire Station 76 responded to 704 incidents.

2. Do the response times and distances for each station serving the Project site meet the performance standards of the LACoFD?

   The primary jurisdictions for Stations 143 and 76 contain a mix of urban, suburban and rural areas, The Fire Department uses national guidelines of a 5-minute response time for the 1st-arriving unit for fire and EMS responses and 8 minutes for the advanced life support (paramedic) unit in urban areas, and 8-minute response time for the 1st-arriving unit and 12 minutes for advanced life support (paramedic) unit in suburban areas.

3. Does LACoFD have any plans to construct new or expand existing fire stations that would serve the Project?

   Currently, there are no plans for facility expansion or new facilities in the project area.

4. Please summarize any plans for Fire Department's service improvements plans or expanded capacity (personnel, equipment), if any, that would serve the project area.

   Currently, there are no plans for additional personnel and equipment in the project area.

5. Will LACoFD be able to serve any known cumulative developments in addition to the proposed Project?

   The effects of cumulative impact by new development are evaluated on a case by case basis. However, this project is expected to have a less than significant impact. Cumulative impacts are mitigated by the Fire Department's developer mitigation fees in effect in the Santa Clarita Valley.

6. How would the proposed Project affect LACoFD's ability to provide services? Please comment on any area of specific concern.

   While each additional development creates greater demands on existing resources, the project would have a negligible effect on service standards and will mitigate any impacts by the payment of the Fire Department's developer mitigation fees.

7. Please provide any additional comments and/or information.

We have no further comments.

Zulema Renteria

From: Campomanes, Rochelle E. <RECampom@lasd.org>
Sent: Thursday, May 21, 2020 2:41 PM
To: Zulema Renteria
Subject: RE: Sterling Ranch Project - Request for Information

Hi Zulema,

Just as I thought we are done, there was a change. we just want to inform you that the Ordinance referenced in our letter should be replaced. We are not going to pull the letter out, but the Los Angeles County Code 22.246.070 shall be referred to for the Law Enforcement Facilities Fee in which this Project falls within the Newhall Zone.

Thank you,

Rochelle Campomanes, LEED AP
Departmental Facilities Planner I
Facilities Planning Bureau
Tel: 323-526-5614

Los Angeles County Sheriff's Department

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From: Campomanes, Rochelle E.
Sent: Thursday, May 21, 2020 9:13 AM
To: Zulema Renteria <zrenteria@meridianconsultantsllc.com>
Subject: RE: Sterling Ranch Project - Request for Information

Hi Zulema,

Just want to reach out. I was informed by my Management yesterday that we will not be revising our comment letter. I hope you are doing well.

Thank you,

Rochelle Campomanes, LEED AP
Departmental Facilities Planner I
Facilities Planning Bureau
Tel: 323-526-5614

Los Angeles County Sheriff's Department

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From: Zulema Renteria [mailto:zrenteria@meridianconsultantsllc.com]
Sent: Thursday, April 30, 2020 11:05 AM
To: Campomanes, Rochelle E. <RECampom@lasd.org>
Subject: RE: Sterling Ranch Project - Request for Information

Hello Rochelle,

We are currently in the admin stages of the EIR. We have not yet moved into the "Draft EIR" stages. We are still in the process of submitting all the section to the county and waiting for feedback. I will keep you updated, but feel free to send updates if need be.

I hope this answers your question. If you have anymore, please feel free to reach out.

Thanks,

Zulema Renteria
Staff Planner

Meridian Consultants

Promoting sustainable stewardship of our communities and natural resources by providing strategic and innovative consulting services and solutions.

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Los Angeles, California 90014

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Direct – (213) 335-5303

Website: www.meridianconsultantsllc.com

From: Campomanes, Rochelle E.
Sent: Thursday, April 30, 2020 8:30 AM
To: Zulema Renteria
Subject: Re: Sterling Ranch Project - Request for Information

Hi Zulema,

When you will be drafting the EIR for this project? Just want to check if there's a bit more time because we may need to revise the letter. Just want to check with you.

Thank you,

Rochelle Campomanes, LEED AP

Departmental Facilities Planner I

Facilities Planning Bureau

Tel: 323-526-5614

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From: Zulema Renteria <zrenteria@meridianconsultantsllc.com>
Sent: Friday, April 24, 2020 1:01 PM
To: Ung Fang, Jennifer L <jlfang@lasd.org>
Cc: Campomanes, Rochelle E. <RECampom@lasd.org>; Wang, Meghan Y. <m2ywang@lasd.org>; Mora, Maria # 442877 <mmora@lasd.org>
Subject: RE: Sterling Ranch Project - Request for Information

Good Afternoon Ms. Fang,

Thank you so much for getting back to me. In light of the current circumstances, I appreciate you all's diligent response time. I will be sure to contact the appropriate people should I have any questions.

Have a great weekend!

Thanks,

Zulema Renteria
Staff Planner

Promoting sustainable stewardship of our communities and natural resources by providing strategic and innovative consulting services and solutions.

706 South Hill Street, 11th Floor
Los Angeles, California 90014

Office – (213) 335-3434
Direct – (213) 335-5303

Website: www.meridianconsultantsllc.com

From: Ung Fang, Jennifer L
Sent: Friday, April 24, 2020 11:28 AM
To: Zulema Renteria
Cc: Campomanes, Rochelle E.; Wang, Meghan Y.; Mora, Maria # 442877
Subject: Sterling Ranch Project - Request for Information

Hi Ms. Renteria-

Please see the attached letter responding to your request for information. We apologize for the delay in responding to your request. Due to the recent COVID 19 events, other tasks have taken priority. Should you have any questions regarding our response, please contact Ms. Rochelle Campomanes, or her Supervisor Meghan Wang via email as we have an intermittent telecommuting schedule. I have cc'd them on this email response for your convenience. Thank you!

Jennifer Fang
ADMINISTRATIVE SERVICES DIVISION
Assistant Director, Facilities Planning Bureau
4700 Ramona Blvd. 4th Floor
Monterey Park, CA 91754
Phone: 323-526-5756
Mobile: 213-276-9234
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Monday - RDO

FPB Mainline: (323) 526-5194

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OFFICE OF THE SHERIFF

COUNTY OF LOS ANGELES

HALL OF JUSTICE

ALEX VILLANUEVA, SHERIFF

April 24, 2020

Zulema Renteria, Staff Planner
Meridian Consultants
706 S. Hill Street, 11th Floor
Los Angeles, California 90014

Dear Ms. Renteria:

REQUEST FOR SHERIFF'S DEPARTMENT SERVICE INFORMATION IN PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT STERLING RANCH RESIDENTIAL PROJECT

Thank you for inviting the Los Angeles County Sheriff's Department (Department) to provide information and responses to specific questions to be addressed under the California Environmental Quality Act (CEQA) in preparing a Draft Environmental Impact Report (Draft EIR), for the Sterling Ranch Residential Project (Project). The proposed Project, located at 29053 Coolidge Avenue, Val Verde, CA 91384, involves the development of 222 detached single-family residential units, approximately thirty acres of amenities including landscaped/open space HOA lots, strip lots, infiltration and debris basins, a pump station; and 19.7 acres for public and private streets for the community.

The proposed Project is located within the service area of the Department's Santa Clarita Valley Station (Station). It may impact the current level of service provided by the Station due to the potential increase in resident population and developed land proposed by the Project. In addition, the Project Applicant will be required to pay all required development fees associated with the project, including those referenced in Ordinance No. 2008-0033 Law Enforcement Mitigation Fee effective August 23, 2008, in which this Project falls within the Newhall Zone. The Department will provide further comments for the Draft EIR during the public review period. The Department also recommends that we have the opportunity to review the design plans to ensure that the principles of Crime Prevention Through Environmental Design have been implemented as stated in the attached response (see correspondence dated April 2, 2020, from Captain Justin Diez).

Should you have any questions regarding this matter, please contact me, at (323) 526-5657, or your staff may contact Ms. Rochelle Campomanes, at (323) 526-5614.

Sincerely,

ALEX VILLANUEVA, SHERIFF

Tracey Jue, Director
Facilities Planning Bureau

SH-AD-32A (8/17)

COUNTY OF LOS ANGELES

SHERIFF'S DEPARTMENT

"A Tradition of Service Since 1850"

DATE: April 2, 2020
FILE NO:

OFFICE CORRESPONDENCE

FROM: JUSTIN R. DIEZ, CAPTAIN
SANTA CLARITA VALLEY STATION

TO: TRACY JUE, DIRECTOR
FACILITIES PLANNING BUREAU

SUBJECT: ENVIRONMENTAL IMPACT REPORT – STERLING RANCH PROJECT

The purpose of this memorandum is to provide a response requested by Facilities Planning Bureau with respect to an environmental impact report of the proposed Sterling Ranch Project. The project, as described below, encompasses a geographic area currently patrolled by the Santa Clarita Valley Sheriff's Station.

The operations staff of the Santa Clarita Valley Station has reviewed the August 2019 Notice of Preparation of a Draft Environmental Impact Report for the Sterling Ranch Residential Project located at 29053 Coolidge Avenue, Val Verde, California 91384. The proposed project is a 113.9-acre residential community, and would contain 222 detached single family residential lots, a pocket park, a pocket park with tot lot, a shade structure and tables, in addition to five undisturbed open space lots, six landscaped open space HOA lots, access strip lots, three infiltration basins, six debris basins, a pump station, and acres of public right of way and future streets.

The proposed project is within the service area of the Santa Clarita Valley Sheriff's Station, which is approximately eight miles from the project site.

The Santa Clarita Valley Sheriff's Station service area encompasses approximately 649 square miles with an estimated resident population of 280,000 persons. The station is currently staffed by 209 sworn personnel and 47 civilian employees. However, with the completion of the project, the station will be understaffed. Assigning additional personnel to the station as a result of this project to meet an acceptable service ratio will exacerbate the current shortage of space and attendant assets. Any expansion of the station, or construction of new facilities, should not only account for the current shortage, but should also accommodate additional personnel and assets that will become necessary as our service area continues to experience growth and intensification of land uses.

- The current Santa Clarita Valley Sheriff's Station service area ratio for every 10,000 residents is 0.74.
- The number of crimes per 1,000 residents is approximately 14.18.

The Uniform Crime Reporting (UCR) Program collects statistics on the number of offenses known to law enforcement. In the traditional Summary Reporting System (SRS), there are eight crimes, or Part I offenses, (murder and non-negligent homicide, rape (legacy & revised), robbery, aggravated assault, burglary, motor vehicle theft, larceny-theft, and arson) to be reported to the UCR Program. These offenses were chosen because they are serious crimes, they occur with regularity in all areas of the country, and they are likely to be reported to the Station.

- The Station receives approximately 4.5 calls per 1,000 residents.

There are no other adjacent stations that could respond to the project area, other than our patrol station. The proposed Project is approximately 8.1 miles from the current patrol station. Our average or anticipated response times for emergent, priority, and routine calls for service received from the proposed project would be 5.03, 12.99, and 65.52 minutes, respectively. However, these are approximate time ranges only and could be affected by traffic conditions. Additionally, these response times are variable because the responding unit may be elsewhere within the station's service area and not necessarily dispatched from the station itself. As a point of reference, the Department generally adheres to the following, widely-accepted industry standard among law enforcement agencies for responding to emergent, priority, and routine calls for service: 10 minutes, 20 minutes, and 60 minutes, respectively.

A proposed new facility to replace the Santa Clarita Valley Sheriff's Station is currently in the construction stage, and will be located at 26201 Golden Valley Road in Santa Clarita.

I also recommend an analysis and impact of the proposed project to the local transportation and circulation system be included in the EIR. Traffic levels at intersections must be identified, studied and analyzed. Preparation of a Construction Mitigation Plan would also help in reducing impacts to traffic levels. A Construction Traffic Management Plan should also be implemented as part of the proposed project to address construction-related traffic congestion and emergency access issues. If temporary lane closures are necessary for the installation of utilities, emergency access should be maintained at all times. Flag persons and/or detours should also be provided as needed to ensure safe traffic operations, and construction signs should be posted to advice of reduced construction zone speed limits.

Finally, the proposed project will increase the employees and daytime population of the station's service area, which, in turn, will generate an increased demand for law enforcement services we provide. I expect the EIR to quantify the population increases, describe potential impacts to our resources and operations, and identify measures that will mitigate these impacts to a level of insignificance.

The Department generally prescribes to the principles of Crime Prevention Thru Environmental Design (CPTED). The goal of CPTED is to reduce opportunities for criminal activities by employing physical design features that discourage anti-social behavior, while encouraging the legitimate use of the site. The overall tenets of CPTED include defensible space, territoriality, surveillance, lighting, landscaping, and physical security. With advanced notice, Station personnel can be available to discuss CPTED with the project developer.

Thank you for including our team in the environmental review process for the project. Should you have any questions regarding this matter, please contact me at (661) 799-5101, or Operations Lieutenant Joseph Fender at (661) 799-5102.

JRD:JFF:jf

SKYE PATRICK
Library Director

LA COUNTY LIBRARY

October 13, 2020

Zulema Renteria, Staff Planner
Meridian Consultants, LLC
706 S. Hill Street, 11th Floor
Los Angeles, CA 90014

STERLING RANCH RESIDENTIAL ESTATES PROJECT
REQUEST FOR LIBRARY SERVICE INFORMATION

Dear Ms. Renteria:

This is in response to your request for library service information for the Sterling Ranch Residential Estates Project which proposes the development of 222 detached single-family residential lots, 21,000 square feet of commercial use, and associated infrastructure. Attached is a report of LA County Library's analysis of the development and the projected impact to services.

If you have any questions or need additional information, please contact Elsa Muñoz at (562) 940-8450 or EMunoz@library.lacounty.gov.

Very best,

Skye Patrick
Library Director

SP:YDR:GR:EM

c: Jesse Walker-Lanz, Assistant Director, Public Services, LA County Library
Ting Fanti, Departmental Finance Manager, Budget and Fiscal Services, LA County Library

https://lacounty.sharepoint.com/sites/publiclibrary/docs/staffservices/Documents/EIR/Sterling Ranch/Sterling Ranch response.doc

LA COUNTY LIBRARY

STERLING RANCH RESIDENTIAL ESTATES PROJECT
REQUEST FOR LIBRARY SERVICES INFORMATION

1. **Which LA County Library facilities serve the Project site?** (Facility size, staffing levels, collection/inventory size, special facilities, service population, current demand for library services)

   The proposed Project will be served by Castaic Library, located at 27971 Sloan Canyon Rd., Castaic, CA 91384, which is 6.1 miles from the project site. Stevenson Ranch Library, located at 25950 The Old Rd., Stevenson Ranch, CA 91381, is 8.7 miles from the project site and is the next closest library.

   Castaic Library has a facility size of 12,232 square feet, a collection of 48,319 books and other library materials, and 26 public access computers. Castaic Library serves the residents of unincorporated Castaic area of the County of Los Angeles (County), a population of 29,500. Castaic Library staffing includes 4 full time staff (2 Librarians, 1 Library Assistant, and 1 Library Aide) and 5 part-time staff (3 Library Aides and 2 Library Pages).

   Stevenson Ranch Library has a facility size of 11,551 square feet, a collection of 51,328 books and other library materials, and 21 public access computers. The Stevenson Ranch Library serves the residents of unincorporated Stevenson Ranch area of the County of Los Angeles (County), a population of 21,641. Stevenson Ranch Library staffing includes 6 full time staff (3 Librarians, 2 Library Assistants, and 1 Library Aide) and 10 part-time staff (5 Library Aides and 5 Library Pages).

   Also, the Library's Santa Clarita Valley Bookmobile presently serves the residents of Val Verde, an unincorporated community in Los Angeles County.

   LA County Library service level guidelines entail a minimum of 0.50 gross square foot of library facility space per capita, 3.0 items (books and other library materials) per capita for regional libraries and 2.75 items per capita for community libraries, and 1.0 public access computer per 1,000 people served.

2. **Are there any other service standards/goals to meet the County's library service demands?**

   Castaic Library and Stevenson Ranch Library are community libraries and based on the guidelines they do not currently meet the minimum requirements for the population of the service area.

   The libraries will not be able to meet the Project's demand for library facilities. In order to meet the Project's demand for library services Castaic Library will need 2,518 square feet of facility space, 40,181 collection materials, and 4 public access computers; and Stevenson Ranch Library will need 16,604 collection materials.

3. Please provide any current development fees related to library facilities.

To mitigate the impact of residential projects on library services, developers or its successors in interest, are required to pay a Library Facilities Mitigation Fee (Library Fee) at the time building permits are requested for new residential dwellings in the unincorporated areas of the County of Los Angeles (except for Altadena and Palos Verdes). The Library Fees are as follows, by Library Planning Area:

FY 2019-2020 Library Facilities Mitigation Fee Schedule

Planning Area	Fee per Dwelling Unit
Area 1 - Santa Clarita Valley	$969
Area 2 - Antelope Valley	$939
Area 3 - West San Gabriel Valley	$980
Area 4 - East San Gabriel Valley	$967
Area 5 - Southeast	$970
Area 6 - Southwest	$977
Area 7 - Santa Monica Mountains	$972

The proposed project is within the Library's Planning Area 1 – Santa Clarita Valley, with a Library Fee of $969 per dwelling unit or $215,118 ($969 x 222 dwelling units). Library Fees are assessed on residential projects only and there are no fees for commercial, hotel, or office space.

4. Would payment of these fees reduce the proposed Project's potential impacts on the County's library facilities?

We estimate the total increased service cost related to the proposed project to be approximately $434,784 which is illustrated by the following chart:

Sterling Ranch Residential Estates Project	Impact Per Capita (population of 697)	Cost	Total Cost
a. Building	349	$1,000 sq. ft	$ 349,000
b. Land (4:1 land to building ratio)	1,396	$23 (Library Planning Area 1)	$ 32,108
c. Collections	1,917	$28	$ 53,676
d. Computer	0	$1,800	$ 0
Total			$434,784

The Library Facilities Mitigation Fees of $215,118 will reduce the proposed Project's potential impact on the County's library facilities; however, service level guidelines would not be met.

5. **Are there any plans to develop new library facilities or expand existing library facilities within a 10-mile radius of the Project site?**

   There are plans to build a new library facility under the Newhall Ranch development, which is located in the northern portion of unincorporated Los Angeles County in the Santa Clara River Valley, approximately 3.4 miles from the Project site.

6. **Please provide any additional recommendations to reduce the proposed Project's potential impacts on the County's library facilities.**

   The Library is open to discuss options regarding mitigation efforts and supporting the continued enhancement and delivery of library services to the residents of Val Verde.

Education

William S. Hart Union High School District

June 26, 2020

Meridian Consultants
Attention: Zulema Renteria

Re: Sterling Ranch Residential Project

Thank you for your Request for School Facility Information for the Sterling Ranch Residential Project. Here is the information that you requested:

1. The high school designated to serve the students generated from your project are assigned to the Castaic High School. Please see the attached Student Generation Rates Chart. You can use these generation rates to calculate your generation based on your production schedule. We opened that site in August 2019 and are adding a grade level yearly until it will be a 9-12 school. We are also adding programs at that site.

2. I have searched District Policy for the word "overcrowding" have printed the attached policies. In light of the current Covid-19 situation, our policies and standards may change as directed by state officials. Please obtain current information regarding District policy on our website, Hartdistrict.org, Board, Board Policies and Administrative Regulations.

3. See the attached Student Generation Rates Chart.

4. See the attached Developer Fee Rate Schedule.

5. With Covid-19, we are still formalizing our plans for the coming school year on how we will implement the guidelines issued by the state for opening, operating and maintaining schools. We are always looking at improving and expanding our facilities to meet the requirements of our students. We want to provide the best educational programs and facilities to the students that we serve.

6. The District would like to discuss entering into possible mitigation agreements to offset the impacts of large developments.

If you have any questions, or need further information, please feel free to contact me at 661-259-0033 extension 286.

Sincerely,

Karen M. Bladen

Karen M. Bladen
Facility Construction
Accounting Supervisor

21380 Centre Pointe Parkway
Santa Clarita, CA 91350
661-259-0033 X 286
Fax 661-287-1984

Student Generation Rates[1]

School Level	Single Family Detached (SFD) SGR	Single Family Attached (SFA) SGR	Multifamily (MF) SGR
Junior High School	N/A	N/A	N/A
High School	0.1662	0.1552	0.3667
Total	**0.1662**	**0.1552**	**0.3667**

[1] Student generation rates calculated by Cooperative Strategies, LLC for WSHUHSD in March 2020.

Sterling Ranch Development

Home Type	Units	SGR Classification	Junior High School Students Generated	High School Students Generated
Sterling Ranch	101	SFA	N/A	16
Total	**101**	**N/A**	**N/A**	**16**

Impacted Schools

Students	Castaic USD	Castaic High School
Current Enrollment[1]	N/A	313
Sterling Ranch	N/A	16
Total	**N/A**	**329**
Current Capacity	N/A	2,600
Surplus/(Shortage) of Capacity	**N/A**	**2,271**
Unhoused Sterling Ranch[2]	N/A	0
Classroom Capacity[3]	N/A	27
Additional Classrooms Needed	**N/A**	**0.0**

[1] Castaic High School opened in School Year 2019/2020 to 9th grade students only.

[2] Represents the number of unhoused students from Sterling Ranch development only.

[3] Based on State loading standards for High School classrooms.

WILLIAM S. HART UNION HIGH SCHOOL DISTRICT - DEVELOPER FEE RATE SCHEDULE

FEEDER DISTRICT	Effective Date	Residential Development	Comm'l/ Hospital/ Hotel / Senior
CASTAIC USD **35% Split**	7/19/20	1.43	0.231
SAUGUS OR NEWHALL **55% Split**	7/19/20	2.24	0.363
SULPHUR SPRINGS **50% Split**	7/19/20	2.04	0.330

2020 FAIR SHARE PAYMENT AMOUNTS *WITH* NOTICE OF ASSIGNMENT			
Location	**SFD Unit**	**DC Unit**	**MFA Unit**
Outside Castaic USD	$12,581.83	$10,837.12	$7,490.10
Inside Castaic USD	$8,845.87	$7,598.84	$5,030.08

All rates listed here are subject to change.

School Attendance Boundaries

When establishing or changing school attendance boundaries, the Governing Board shall take into account racial and ethnic balance, educational programs, school capacities, geographic features, student safety, and transportation considerations. Students shall attend school in their attendance area unless otherwise authorized by the Superintendent or designee.

Demographic changes may result in overcrowded schools or in declining enrollment. Fiscal limitations may prevent the district from opening new schools or maintaining facilities that are unused. Changes in student population cannot always be remedied by a change in school attendance boundaries. The Board shall regularly review school and district enrollments and projected enrollments and will make every effort to ensure that students will be able to attend neighborhood schools. The Board shall hold a public hearing to secure community input before approving any boundary change.

The Superintendent or designee may place some students in a school outside of their attendance area in order to alleviate overcrowding. When possible, siblings will be allowed to attend the same school.

(cf. 5116.1 - Intradistrict Attendance)

(cf. 5116.2 - Open Enrollment)

Legal Reference:

EDUCATION CODE

35160 Authority of governing boards

35160.1 Broad authority of school districts

35291 Rules

35350 Transportation of students

35351 Assignment of students to particular schools

29 Ops. Atty. Gen. 63

Policy WILLIAM S. HART UNION HIGH SCHOOL DISTRICT

adopted: 08/11/93 Santa Clarita, California

Interdistrict Attendance

Interdistrict Attendance Permits

The Superintendent or designee may approve an interdistrict attendance permit for a student for any of the following reasons:

1. When the student has been determined by staff of either the district of residence or district of proposed attendance to be a victim of an act of bullying as defined in Education Code 48900(r).

(cf. 5131.2 - Bullying)

2. To meet the student's special mental or physical health needs as certified by a physician, school psychologist, or other appropriate school personnel.

(cf. 6159 - Individualized Education Program)

3. When the student has a sibling attending school in the receiving district, to avoid splitting the family's attendance.

4. To allow the student to complete a school year when his/her parents/guardians have moved out of the District during that year.

5. To allow the student to remain with a class graduating that year from junior or senior high school.

6. To allow a high school senior to attend the same school he/she attended as a junior, even if his/her family moved out of the District during the junior year.

7. When the parent/guardian provides written evidence that the family will be moving into the District in the immediate future and would like the student to start the year in the district.

8. When the student will be living out of the District for one year or less.

9. When recommended by the school attendance review board or by county child welfare, probation, or social service agency staff in documented cases of serious home or community problems which make it inadvisable for the student to attend the school of residence.

(cf. 5113.1 - Chronic Absence and Truancy)

10. When there is valid interest in a particular educational program not offered in the district of residence.

11. To provide a change in school environment for reasons of personal and social adjustment.

12. When the student's parent/guardian is an employee who is eligible for membership in a District bargaining unit, is a confidential employee, or is part of District management.

The Superintendent or designee may deny initial requests for interdistrict attendance permits due to limited district resources, overcrowding of school facilities at the relevant grade level, or other considerations that are not arbitrary. However, once a student is admitted, the district may not deny him/her continued attendance because of overcrowded facilities at the relevant grade level.

(cf. 0410 - Nondiscrimination in District Programs and Activities)

Within 30 days of a request for an interdistrict permit, the Superintendent or designee shall notify the parents/guardians of a student who is denied interdistrict attendance regarding the process for appeal to the County Board of Education as specified in Education Code 46601. (Education Code 46601)

(cf. 5145.6 - Parental Notifications)

Students who are under consideration for expulsion or who have been expelled may not appeal interdistrict attendance denials or decisions while expulsion proceedings are pending or during the term of the expulsion. (Education Code 46601)

(cf. 5119 - Students Expelled from Other Districts)

(cf. 5144.1 - Suspension and Expulsion/Due Process)

Once a student is admitted to a school on the basis of an interdistrict attendance permit, he/she shall not be required to reapply for an interdistrict transfer and shall be allowed to continue to attend the school in which he/she is enrolled. Reapplication is required when a student requests attendance at a school other than one for which he/she is currently approved. Existing interdistrict attendance permits shall not be rescinded for students entering grade 11 or 12 in the subsequent school year. (Education Code 46600)

The District may revoke a student's enrollment if he/she is recommended for expulsion pursuant to Education Code 48918. (Education Code 48309)

Date WILLIAM S. HART UNION HIGH SCHOOL DISTRICT

Issued: September 11, 2013 Santa Clarita, California

Relations With Local Agencies

The Governing Board recognizes the importance of two-way communication with other local agencies in order to provide the best possible school facilities and make the best use of school construction funds. The Board shall consult and coordinate with local agencies as required by law and whenever the expertise of these agencies can assist the district in the planning, design, and construction of facilities. The Board and superintendent or designee shall also work with local agencies to ensure that they are informed about the potential impact of proposed land developments on school facilities.

(cf. 7150 - Site Selection and Development)

City/County General Plan

The superintendent or designee shall monitor land development proposals within district boundaries and shall maintain procedures that ensure an exchange of accurate information with city/county planning staff regarding the impact of land development on the district's educational programs and facility needs.

Recognizing that developer fees, other local revenues, and state bond funds may not suffice to eliminate the overcrowding in district schools caused by new development, the Board urges the city/county to adopt in its general plan or other appropriate planning documents a provision which ensures that adequate school facilities and service will be available concurrent with need.

(cf. 7210 - Methods of Financing)

To help the city/county determine whether a proposed development is consistent with such a general plan, the superintendent or designee shall regularly provide the city/county with information about current and projected enrollment and school capacity. When developmental approvals are proposed, including but not limited to annexations, rezonings, general plan, or specific plan amendments or approvals, the superintendent or designee shall report to the city/county on the adequacy of developer and state monies in meeting school facility needs. If the superintendent or designee determines that a particular proposed development project or projects will have an adverse impact on district facilities and that no funds are currently available to fully mitigate this impact, he/she shall so advise the city/county and request that approval of the project(s) be conditioned on the provision of adequate mitigation of school facility impacts.

Impact Ordinances

The Board shall notify the city council or county board of supervisors whenever it finds, based on clear and convincing evidence: (Government Code 65971)

1. That conditions of overcrowding exist in one or more attendance areas within the district which will impair the normal functioning of the educational programs, and the reason for the existence of those conditions.

2. That all reasonable methods of mitigating conditions of overcrowding have been evaluated and no feasible method for reducing those conditions exist.

The above notice shall specify the mitigation measures considered by the district and shall include a completed application to the Office of Public School Construction for preliminary determination of eligibility for school construction under applicable state law. (Government Code 65971)

Legal Reference:

EDUCATION CODE

35275 New school planning: cooperative relations with recreation and park authorities

17280-17316 Approval of plans and supervision of construction

GOVERNMENT CODE

53090-53097.5 Compliance with city or county regulations

65300-65307 Authority for and scope of general plans

65850-65863.11 Adoption of regulations, especially

65860 Consistency of zoning ordinances with general plan

65970-65981 School facilities, especially:

65971 Findings by school district

65972 Findings by city council or board of supervisors

PUBLIC RESOURCES CODE

21000-21177 California Environmental Quality Act of 1970

CODE OF REGULATIONS, TITLE 5

14010 Procedure for site acquisition

CODE OF REGULATIONS, TITLE 14

15000 et seq. Implementation of California Environmental Quality Act of 1970

Mira Development Corporation v. City of San Diego, 252 Cal. Reporter 825 (205 Cal.App. 3d 1201, 1988)

William S. Hart Union High School District v. Regional Planning Commission of the County of Riverside (226 Cal.App. 3d 1612, 1991)

Murrieta Valley Unified School District v. County of Riverside (228 Cal.App. 3d 1212, 1991)

Policy WILLIAM S. HART UNION HIGH SCHOOL DISTRICT

Adopted: 08/11/93 Santa Clarita, California

Revised: 05/29/96

Safety

Supervision

The principal of each school shall ensure that certificated employees, teacher aides or yard aides supervise the conduct and safety, and direct the play, of students of the school who are on playgrounds before and after school, during recess, and during other intermissions.

Teachers shall be present at their respective rooms and open them to admit students not less than 30 minutes before the time when school starts, or as specified in the collective bargaining agreement.

Safety rules for the use of facilities and equipment shall include as appropriate:

1. Rules on acceptable playgrounds behavior.

2. Rules relating to gymnasium and field areas in high schools.

3. Safety rules clearly posted in chemistry classes.

4. Shop class rules, including the requirement that power equipment never be used without the teacher's presence in the shop. Students must pass safety tests at mastery level before using such equipment, and test results must be kept on record.

School staff shall train students on the above rules and include safety instruction in their lesson plans when appropriate. Copies of the rules shall be sent to parents/guardians and be readily available at the school at all times.

The principal or designee shall:

1. Clearly identify supervision zones on the playgrounds and require that supervisors remain outside at a location from which they can observe their entire zone of supervision.

2. Require that all individuals supervising students remain alert in spotting dangerous conditions and report any such conditions to the principal or designee promptly and in writing.

3. Establish emergency procedures that ensure swift response to accidents, fighting, and situations that could become dangerous, such as overcrowding or unusual gatherings of students.

The Superintendent or designee shall ensure that teachers, teacher aides, yard aides and volunteers who supervise students receive training in the above safety practices and in supervisory techniques which will help them to forestall problems and resolve conflicts.

When determining the ratio of school ground supervisors to students, the Superintendent or designee shall consider the size of the playground area, the number of blind spots that are not immediately visible, the age and gender of the students, and the general nature of their behavior.

Release of Student to Adult

Students shall be released during the school day in the custody of an adult only if:

1. The adult is the student's parent/legal guardian with custody.

(cf. 5021 - Noncustodial Parents)

2. The adult has appropriate identification and the verified authorization of the student's parent/legal guardian with custody.

3. The adult is a properly authorized law officer acting in accordance with law.

(cf. 5145.11 - Questioning and Apprehension)

4. The adult is taking the student to emergency medical care, at the request of the principal or designee.

(cf. 5141.4 - Child Abuse and Neglect (Reporting Procedures))

Eye Protection Devices

The district shall provide eye protection devices in accordance with law.

Staff shall ensure that all students, teachers and visitors wear eye protective devices when they are engaged in or observing an activity or using hazardous substances likely to cause injury to the eyes. (Education Code 32030, 32031)

The Board shall provide a first pair of the eye safety devices required by law at district expense. If these devices are lost or damaged, students and teachers may obtain replacements for an amount not exceeding their actual cost to the district.

Missing Children

In order to enable district staff to assist in locating missing children, the Superintendent or designee shall ensure that Department of Justice information on missing children is posted at every school.

Laboratory Safety

The principal of each school offering laboratory work to students shall designate a trained certificated employee as "building laboratory consultant" responsible for reviewing, updating and carrying out the school's procedures for laboratory safety.

Date WILLIAM S. HART UNION HIGH SCHOOL DISTRICT

Issued: 08/11/93 Santa Clarita, California

MUNICIPALITIES | SCHOOL DISTRICTS | CITIES | COUNTIES | PARK & RECREATION | WATER DISTRICTS | MUNICIPALITIES | SCHOOL DISTRICTS | COMMUNITIES

SCHOOL FEE JUSTIFICATION STUDY

APRIL 30, 2020

CASTAIC UNION SCHOOL DISTRICT
28131 LIVINGSTON AVENUE, VALENCIA, CA 91355
T. (661) 257-4500

KOPPEL & GRUBER
PUBLIC FINANCE

334 VIA VERA CRUZ, SUITE 256
SAN MARCOS
CALIFORNIA 92078

T. 760.510.0290
F. 760.510.0288

TABLE OF CONTENTS

EXECUTIVE SUMMARY **1**

SECTION I. LEGISLATION AND LEGAL REQUIREMENTS **4**

SECTION II. PROJECTED UNHOUSED STUDENTS AND ESTIMATED FACILITY AND PER STUDENT COSTS **6**
- A. SCHOOL DISTRICT CAPACITY AND STUDENT ENROLLMENT 6
- B. PROJECTED UNHOUSED STUDENTS 7
- C. FACILITY NEEDS AND ESTIMATED PER STUDENT COST 9

SECTION III. PROJECTED IMPACT OF RESIDENTIAL DEVELOPMENT **11**

SECTION IV. COMMERCIAL/INDUSTRIAL SCHOOL IMPACT ANALYSIS **13**
- A. EMPLOYEE GENERATION 13
- B. RESIDENTIAL IMPACT 14
- C. NET IMPACT PER COMMERCIAL/INDUSTRIAL SQUARE FOOT 15
- D. COMMERCIAL/INDUSTRIAL DEVELOPMENT NOT IN PRESCRIBED CATEGORIES 19
- E. AGE-RESTRICTED (SENIOR) HOUSING 19

SECTION V. REDEVELOPMENT **20**

SECTION VI. GOVERNMENT CODE SECTION 66000 ..... **21**

APPENDICES

APPENDIX A – COMMERCIAL/INDUSTRIAL DEVELOPMENT DESCRIPTIONS
APPENDIX B – FACILITIES CAPACITY UPDATE

EXECUTIVE SUMMARY

Education Code Section 17620 authorizes the governing board of a school district to levy school fees to offset the impacts to school facilities from new residential and commercial/industrial construction and reconstruction. In order to levy Level I fees (statutory fees), a school district must prepare and adopt a school fee justification study pursuant to the provisions of Education Code Section 17620 and Sections 65995 and 66001 of the Government Code. The school fee justification study serves as the basis for justifying the levy of Level I fees and presents and documents the nexus findings required by State law.

This School Fee Justification Study ("Study") has been prepared for the Castaic Union School District ("School District") to demonstrate the relationship between new residential and commercial/industrial development and the School District's need for the construction of school facilities, the cost of the school facilities, and the per square foot amount of Level I fees ("School Fees") that may be levied by the School District on residential and commercial/industrial development in accordance with applicable law.

The State Allocation Board ("SAB") reviews and may adjust the maximum authorized School Fees every January in even-numbered years. The SAB increased the Level I fee on January 22, 2020 and the maximum School Fees authorized by Education Code Section 17620 are currently $4.08 per square foot for residential construction/reconstruction and $0.66 per square foot for commercial/industrial construction for unified school districts.

The School District provides education for transitional kindergarten (TK) through 8th grade. Pursuant to Education Code Section 17623(a), the School District, as a nonunified school district sharing common jurisdiction with other nonunified school district(s), entered into a school facilities fee allocation agreement with the William S. Hart Union High School District. The agreement specifies the percentage of the maximum School Fees that may be levied and collected by each school district. According to the agreement, approximately two-thirds (65%) of the maximum School Fees may be charged and collected by the School District, or $2.65 and $0.43 for residential and commercial/industrial development, respectively ("Applicable School Fees"). Based on the findings presented in this Study, the School District is justified in collecting its portion of the maximum residential and commercial/industrial School Fees[1]. The findings are summarized as follows:

Residential Development

New residential development in the School District is projected over the next ten (10) years and beyond. Based on student generation rates determined for the School District, such development could generate an estimated 2,068 new students over the next ten (10) years. The projected student enrollment supports expansion and/or reconstruction of existing school facilities. The school facilities cost impact per residential square foot as determined in this Study are shown in Table E-1.

[1] Except for the new commercial/industrial development categorized as Rental Self-storage facilities, as further described in this Study.

TABLE E-1
RESIDENTIAL SCHOOL FACILITIES COST IMPACT/
APPLICABLE RESIDENTIAL SCHOOL FEE PER SQUARE FOOT

IMPACT PER SQUARE FOOT	APPLICABLE RESIDENTIAL SCHOOL FEE PER SQUARE FOOT
$6.88	$2.65

The cost impact per square foot of residential construction/reconstruction shown in Table E-1 are greater than to the School District's share of the current maximum authorized residential School Fee, which is $2.65 per square foot; therefore, the School District is reasonably justified in levying statutory Level I school fees in an amount up to but not exceeding $2.65 per square foot (the "Applicable Residential School Fee").

Commercial/Industrial Development

As commercial/industrial properties develop new jobs are created. Many of the employees working at the new jobs will move into the School District boundaries, thereby increasing the need for new residential development and further impacting the School District's facilities. Additionally, many employees living outside of but working at new jobs within the School District boundaries will enroll students on an inter-district basis. School Fees may be imposed on commercial/industrial development if the school fees collected on residential development are insufficient to provide adequate school facilities for students generated as a result of new development and nexus findings are presented that justify the imposition of the commercial/industrial school fee.

Section 17621(e)(1)(B) of the Education Code requires that the Study determine the impact of the increased number of employees anticipated to result from commercial/industrial development upon the cost of providing school facilities within the School District. This code section further adds that employee generation estimates shall be based on the applicable employee generation estimates set forth in the January 1990 edition of "San Diego Traffic Generator Study" ("Traffic Study"), a report by San Diego Association of Governments ("SANDAG"). The school facilities cost impacts per commercial/industrial square foot as determined in this Study are shown in Table E-2 by commercial/industrial land use type (each commercial/industrial category is further described in Appendix "A").

The cost impacts per square foot for each category of commercial/industrial construction are equal to or exceed $0.43 per square foot, the School District's maximum authorized School Fee per square foot applicable to new commercial/industrial development; except for Rental Self-Storage development, which may be charged at $0.03 per square foot ("Applicable Com/Ind School Fees"). Therefore, except for Rental Self-Storage development, the School District is fully justified in levying commercial/industrial School Fees on new commercial/industrial development in an amount up to but not exceeding the Applicable Com/Ind School Fees. The

Applicable Com/Ind School Fees that may be charged by the School District are summarized in Table E-2.

TABLE E-2
COMMERCIAL/INDUSTRIAL SCHOOL FACILITIES COST IMPACTS/
APPLICABLE SCHOOL FEES

COMMERCIAL/INDUSTRIAL CATEGORY	IMPACT PER SQUARE FOOT	MAXIMUM APPLICABLE SCHOOL FEES
Banks	$1.45	$0.43
Community Shopping Center	$0.79	$0.43
Neighborhood Shopping Center	$1.43	$0.43
Industrial Business Parks	$1.80	$0.43
Industrial Parks/Warehousing/Manufacturing	$0.69	$0.43
Rental Self-Storage	$0.03	$0.03
Research & Development	$1.56	$0.43
Hospitality(Lodging)	$0.58	$0.43
Commercial Offices (Standard)	$2.45	$0.43
Commercial Offices (Large High Rise)	$2.33	$0.43
Corporate Offices	$1.38	$0.43
Medical Offices	$2.19	$0.43

SECTION I. LEGISLATION AND LEGAL REQUIREMENTS

This section discusses the legislative history of the Level I Fee.

Assembly Bill ("AB") 2926 enacted by the State in 1986, also known as the "1986 School Facilities Legislation" granted school districts the right to levy fees in order to offset the impacts to school facilities from new residential and commercial development. Originally set forth in Sections 53080 and 65995 of the Government Code, AB 2926 authorized statutory school fees to be levied, commencing January 1, 1987, in the amount of $1.50 per square foot of new residential assessable space and $0.25 per square foot of enclosed commercial or industrial assessable space. AB 2926 also provided for an annual increase of the statutory fees based on the Statewide cost index for Class B construction, as determined by the SAB. The provisions of AB 2926 have since been amended and expanded.

AB 1600 was enacted by the State legislature in 1987 and created Government Code Sections 66000 et seq. These sections require a public agency to satisfy the following requirements when establishing, increasing or imposing a fee as a condition of approval for a development project:

1. Determine the purpose of the fee;

2. Identify the use to which the fee is to be put;

3. Determine how there is a reasonable relationship between the fee's use and the type of development project on which the fee is imposed;

4. Determine that there is a reasonable relationship between the need for the public facilities and the type of development project on which the fee is imposed;

5. Determine that there is a reasonable relationship between the amount of the fee and the cost, or portion of the cost of the public facility attributable to the development on which the fee is imposed; and

6. Provide an annual accounting of any portion of the fee remaining unspent or held for projects for more than five (5) years after collection.

AB 181, enacted in 1989, established new requirements for school districts levying school fees and also re-codified Government Code Section 53080 *et seq.* as Education Code Section 17620 *et seq.* The additional provisions established by AB 181 imposed more stringent nexus requirements which must be satisfied by school districts prior to levying school fees, especially with respect to commercial/industrial school fees. Additionally, AB 181 provided that the maximum school fees for residential and commercial/industrial development be subject to an increase every two (2) years rather than annually.

In 1998, Governor Wilson signed into law Senate Bill 50 ("SB 50"), the Leroy F. Greene School Facilities Act of 1998, which reformed State's School Building Program and developer school fee legislation. A significant provision of SB 50 provides school districts the option of adopting

alternative school fees (also known as Level II and Level III fees) in excess of the Level I fee upon meeting certain requirements. SB 50 also placed a $9.2 billion State Bond measure on the November 3, 1998 ballot (Proposition 1A). With the passage of Proposition 1A in November 1998, SB 50 became operative.

SB 50 also limited the power of cities and counties to require mitigation of school facilities impacts as a condition of approving new development and suspended the court cases known as Mira-Hart-Murrieta. The Mira-Hart-Murrieta cases previously permitted school districts to collect mitigation fees in excess of school fees under certain circumstances.

On November 5, 2002, California voters passed Proposition 47, which authorized the issuance of $13.05 billion in State bonds and also enacted AB 16, which provided for additional reformation of the School Building Program. AB 16, among other items, clarified that if the SAB is no longer approving apportionments for new construction due to the lack of funds available for new school facilities construction, a school district may increase its Level II Fee to the Level III Fee. With the issuance of the State bonds authorized by the passage of Proposition 47, this section of AB 16 became inoperable.

Furthermore, Proposition 55 was approved on March 2, 2004, which authorized the sale of $12.3 billion in State bonds. In addition, California voters approved Proposition 1D in the general election held on November 7, 2006. Proposition 1D authorized the issuance of $10.4 billion in State bonds.

Most recently, California voters approved Proposition 51 (the California Public School Facility Bonds Initiative) in the general election held on November 8, 2016, authorizing the issuance of $9 billion in bonds to fund the improvement and construction of school facilities for K-12 schools and community colleges.

SECTION II. PROJECTED UNHOUSED STUDENTS AND ESTIMATED FACILITY AND PER STUDENT COSTS

The objective of this Study is to determine if a nexus exists between future residential and commercial/industrial development and the need for school facilities. In addition, the Study aims to identify the costs of such required school facilities and determine the amount of School Fees that can be justifiably levied on residential and commercial/industrial development according to the estimated impacts caused by such development. This section evaluates whether existing school facilities can accommodate students generated from future residential development, projects student enrollment based on anticipated residential growth, and estimates the costs of school facilities required to accommodate new residential growth. The findings determined in this section are used in following sections to evaluate the cost impact per square foot for new residential and commercial/industrial property. Although many of the figures in this section are primarily derived from residential development projections and impacts, they are adjusted in Section IV. to evaluate the impact of commercial/industrial development.

A. SCHOOL DISTRICT CAPACITY AND STUDENT ENROLLMENT

The School District's existing school facilities capacity and student enrollment were evaluated in order to determine if there is excess capacity to house students generated by new residential and commercial/industrial development.

The School District currently operates three (3) Elementary schools and one (1) Middle school. Per Education Code Section 17071.10, these facilities have a capacity to accommodate 3,842 students. Pursuant to Education Code Section 17071.30 and SAB Regulation 1859.51, portable classrooms were not included in the calculation to the extent they are (i) leased through the State Relocatable Classroom Program, (ii) leased for a period of less than five (5) years, (iii) leased when needed as interim housing (project basis), or (iv) represent the number of portables that exceed 25% of the School District's permanent classrooms. Appendix "B" provides a calculation of the updated facility capacity. It should be noted these capacities are driven by State loading standards and do not necessarily reflect the School District's program goals or the condition of such facilities.

Based on October 2019 Student Enrollment Data provided by the District, the student enrollment of the School District is 2,020 students. Current available capacity is calculated by subtracting current student enrollment from existing school facilities capacity for each school level. This operation results in 1,822 available seats. The available capacity calculation is shown in Table 1.

TABLE 1
FACILITIES CAPACITY AND STUDENT ENROLLMENT

SCHOOL LEVEL	EXISTING PERMANENT FACILITIES CAPACITY	STUDENT ENROLLMENT (OCTOBER 2019)	AVAILABLE/ (DEFICIT) CAPACITY
Elementary School (TK-6)	2,536	1,484	1,052
Middle School (7-8)	1,306	536	770
TOTAL	**3,842**	**2,020**	**1,822**

B. PROJECTED UNHOUSED STUDENTS

1. Projected Residential Units

Based on information published by the City of Santa Clarita ("City") Planning Division, the County of Los Angeles and the information provided in the Student Population Projections by Residence report completed by the School District's demographer, Davis Demographics & Planning, Inc. ("DDP") dated March 2020 (the "Enrollment Report"), Koppel & Gruber Public Finance ("K&G Public Finance") estimated that the School District could experience the development of 7,191 residential units over the next ten (10) years. The projected residential units ("Projected Units") are summarized by residential category in Table 2 below. Units classified as single family detached ("SFD") are those units with no common walls; single family attached ("SFA") are those units sharing a common wall each on a separate and unique assessor's parcel (e.g. townhouses, condominiums, etc.); and multi-family units ("MF") are those units which share a single assessor's parcel and share a common wall (e.g. apartments, duplexes, etc.).

The School District has entered into mitigation agreements with certain property owners and/or developers, whereby the terms of the mitigation agreements require mitigation payments in lieu of paying School Fees. Many of the Projected Units are located within areas subject to mitigation agreements ("Projected Mitigated Units"). Those mitigated Projected Units have been identified and/or estimated and excluded from the calculation.

Currently, 2,805 of the Total Projected Units are within areas subject to mitigation agreements and are thus subtracted from the Total Projected Units, resulting in 4,386 Projected Unmitigated Units.

TABLE 2
PROJECTED UNITS BY RESIDENTIAL CATEGORY

RESIDENTIAL CATEGORY	PROJECTED TOTAL UNITS	PROJECTED UNMITIGATED UNITS	PROJECTED MITIGATED UNITS
Single-Family Detached (SFD)	2,202	1,914	288
Single-Family Attached (SFA)	4,183	1,666	2,517
Multi-Family Attached (MF)	806	806	0
TOTAL	**7,191**	**4,386**	**2,805**

2. Student Generation Rates

In order to calculate student generation rates ("SGR's"), K&G Public Finance utilized information in the Enrollment Report. The Enrollment Report prepared by DDP evaluated residential parcels within the School District, classified by unit type (SFD, SFA MF), and built within the past five (5) years (Calendar Years 2014 through 2018). DDP also matched students, linked by address, to the units built. While this methodology is the most accurate way to estimate the number of students new housing would yield, due to low residential development numbers built within the School District in the last five (5) years, DDP opted to utilize Student Generation Rates based on a Santa Clarita Valley-wide calculation. Table 3 below summarizes the Santa Clarita Valley-wide SGRs by residential type and school level.

TABLE 3
STUDENT GENERATION RATES

SCHOOL LEVEL	SFD UNITS	SFA UNITS	MFA UNITS
Elementary School (TK-6)	0.5010	0.3070	0.2040
Middle School (7-8)	0.1250	0.0730	0.0910
TOTAL	**0.6260**	**0.3800**	**0.2950**

3. Projected Student Enrollment

Projected student enrollment was determined by multiplying the SGRs in Table 3 by the number of Projected Unmitigated Units as shown in Table 2. A total of 2,068 students are estimated to be generated from Projected Units. The projected student enrollment is summarized by school level in Table 4.

TABLE 4
PROJECTED STUDENT ENROLLMENT BY SCHOOL LEVEL

SCHOOL LEVEL	PROJECTED TOTAL STUDENT ENROLLMENT	PROJECTED UNMITIGATED STUDENT ENROLLMENT	PROJECTED MITIGATED STUDENT ENROLLMENT
Elementary School (TK-6)	2,551	1,634	917
Middle School (7-8)	654	434	220
TOTAL	**3,205**	**2,068**	**1,137**

4. Projected Unhoused Students

As shown in Table 1, the School District currently has available facilities capacity of 1,822 seats. However, students generated from Projected Mitigated Units are entitled to any available capacity that exists. Therefore, capacity has been adjusted to reflect current capacity net Projected Mitigated Students, resulting in 135 available seats at the Elementary School level and 550 available seats at the Middle School. Therefore, the projected unhoused students generated by Projected Unmitigated Units ("Projected Unhoused Students") is equal to the Projected Student Enrollment net the adjusted capacity figure. Table 5 shows the number of Projected Unhoused Students.

TABLE 5
PROJECTED UNHOUSED STUDENTS

SCHOOL LEVEL	PROJECTED STUDENT ENROLLMENT	AVAILABLE SEATS	PROJECTED UNHOUSED STUDENTS
Elementary School (K-6)	1,634	135	1,499
Middle School (7-8)	434	550	0
TOTAL	**2,068**	**685**	**1,499**

C. FACILITY NEEDS AND ESTIMATED PER STUDENT COST

1. Facilities Needs

In 2011, the School District conducted and finalized a Facilities Master Plan Assessment ("2011 Plan"). The 2011 Plan identifies both the short-range and long-range facility needs of the School District and focuses on repairs, major maintenance, upgrades, modernization and construction of new facilities that are necessary for the continued use of the School District's existing facilities and to meet educational program needs. In November of 2012, Measure QS provided the School District the authorization to issue up to $51 million in general obligation bonds. To date,

$10,535,000 has been issued. The 2011 Plan does not address strategies to mitigate facilities impacts as a result of student growth generated from new development.

The determination of projected unhoused students shown in Table 5 demonstrates that adequate permanent facilities capacity does not exist to house Projected Student Enrollment at the elementary level and permanent facilities capacity does exist to house Projected Student Enrollment at the middle school level. The capital improvement projects outlined in the 2011 Plan and those projects described in the previous paragraph are necessary for the long-term use to adequately house the existing student population and future enrollment growth at all school levels. The facilities needs exist regardless of the availability of capacity to house student enrollment, inclusive of student enrollment generated from new development; therefore without implementation of the capital improvement projects capacity available for Projected Student Enrollment is deemed inadequate.

Revenues from the imposition of the applicable school fees are intended to help bridge the funding gap between (i) monies available from general obligation bond proceeds, including funding from the Measure QS authorization, or other sources, and (ii) the estimated costs of the capital improvement projects, including the remaining Measure QS capital improvement projects as well as future new construction projects.

2. Estimated Cost Per Student

The estimated cost per student to provide adequate school facilities to house Projected Unhoused Students for each school level was determined based on estimated new school construction costs from a School Fee Justification Study and dated March 31, 2020 prepared by the Newhall School District, which is also located in Los Angeles County. Based on these findings, a reasonable cost per square foot for new classroom construction is estimated $450, excluding costs for interim housing administrative facilities and soft costs. Based on this information, K&G Public Finance determined that $450 per square foot was an appropriate and conservative cost estimate for all school levels. The estimated cost per square foot was then multiplied by the square footage per student as determined by the California Department of Education, which results in the Total Facilities Cost Impact per Seat/Student, which is shown in Table 6.

TABLE 6
TOTAL FACILITIES COST IMPACT PER STUDENT

SCHOOL LEVEL	SQUARE FEET PER STUDENT[1]	COST PER SQUARE FOOT[2]	ESTIMATED TOTAL FACILITIES COST IMPACT PER SEAT/STUDENT
Elementary School (TK-6)	73	$450	$32,850
Middle School (7-8)	80	$450	$36,000

1 Source: California Department of Education Report on Complete Schools, dated May 23, 2007.
2 Source: The average cost of portable replacement for portables in the Newhall Unified School District determined in the 2020 Fee Justification Study.

SECTION III. PROJECTED IMPACT OF RESIDENTIAL DEVELOPMENT

The following sections present the school facility impact analysis for new residential development and provides step-by-step calculations of the estimated per residential square foot cost impact.

To determine the school facilities cost impact per square foot of residential development, first the Facilities Cost Impact per Seat/Student determined in Table 6 is multiplied by the Projected Unhoused Students as shown in Table 5 for each school level. The result of this computation is shown in Table 7 and reflects the estimated school facilities cost impact to house Projected Unhoused Students.

TABLE 7
TOTAL FACILITIES COST IMPACT

SCHOOL LEVEL	FACILITIES COST IMPACT PER SEAT/STUDENT	PROJECTED UNHOUSED STUDENTS	FACILITIES COST IMPACT
Elementary School (TK-6)	$32,850	1,499	$49,242,150
Middle School (7-8)	$36,000	0	$0
TOTAL			**$49,242,150**

The total school facilities impact shown in Table 7 above was then divided by the number of Projected Unmitigated Units shown in Table 2 to determine the school facilities cost per residential unit. The cost per residential unit is shown in Table 8.

TABLE 8
SCHOOL FACILITIES COST PER RESIDENTIAL UNIT

TOTAL FACILITIES COST IMPACT	PROJECTED UNMITIGATED UNITS	FACILITIES COST IMPACT PER RESIDENTIAL UNIT
$49,242,150	4,386	$11,227

The school facilities cost impact per residential square foot is calculated by dividing the school facilities cost per residential unit determined in Table 8 by the weighted average square footage of each residential unit type. This calculation is shown in Table 9. The weighted average square footage square footage of the Projected Unmitigated Units is estimated based on information obtained through the City of Santa Clarita and Los Angeles County project plan information found from other sources.

TABLE 9
SCHOOL FACILITIES COST PER RESIDENTIAL SQUARE FOOT

FACILITIES COST IMPACT PER RESIDENTIAL UNIT	WEIGHTED AVERAGE SQUARE FOOTAGE	FACILITIES COST PER RESIDENTIAL SQUARE FOOT
$11,227	1,631	$6.88

The school facilities impact per residential square foot determined in Table 9 is greater than the School District's share of the current maximum authorized residential School Fees of $2.65 per square foot; therefore, the School District is justified in levying up to but not exceeding the maximum authorized amount for residential construction and reconstruction.

SECTION IV. COMMERCIAL/INDUSTRIAL SCHOOL IMPACT ANALYSIS

The following section presents the school facilities impact analysis for new commercial/industrial development and provides a step-by-step calculation of the estimated per commercial/industrial square foot cost impacts.

A. EMPLOYEE GENERATION

In the course of making the nexus findings to justify School Fees levied on commercial/industrial development, Education Code Section 17621(e)(1)(B) requires that the Study determine the impact of the increased number of employees anticipated to result from commercial/industrial development upon the cost of providing school facilities within the School District. As mentioned in the Executive Summary, for purposes of making such determination this code section further sets out that the employee generation estimates be based on the applicable estimates set forth in the Traffic Study published by SANDAG.

The employee generation estimates per 1,000 square feet of development derived from the Traffic Study are listed by commercial/industrial land use category in Table 10. The land use categories listed are based on those categories described in the Traffic Study and include all land uses recommended by the provisions of Education Code Section 17621(e)(1)(B).

TABLE 10
EMPLOYEE GENERATION PER 1,000 SQUARE FEET OF COMMERCIAL/INDUSTRIAL DEVELOPMENT

COMMERCIAL/INDUSTRIAL CATEGORY	AVERAGE SQUARE FOOTAGE PER EMPLOYEE	EMPLOYEES PER 1,000 SQUARE FEET
Banks	354	2.8253
Community Shopping Center	652	1.5348
Neighborhood Shopping Center	357	2.7985
Industrial Business Parks	284	3.5156
Industrial Parks/Warehousing/Manufacturing	742	1.3473
Rental Self-Storage	15,541	0.0643
Research & Development	329	3.0408
Hospitality(Lodging)	883	1.1325
Commercial Offices (Standard)	209	4.7897
Commercial Offices (Large High Rise)	220	4.5442
Corporate Offices	372	2.6848
Medical Offices	234	4.2654

Source: San Diego Traffic Generator Study, January 1990 Edition; SANDAG.

B. RESIDENTIAL IMPACT

1. Households

To evaluate the impact of commercial/industrial development on School District facilities, the employee generation estimates listed in Table 10 were first used to determine the impact of commercial/industrial development on a per household basis. Based on information derived from U.S. Census Bureau data[2], there are approximately 1.59 employed persons per household on average for households located within the School District. Dividing the employee generation estimates listed in Table 9 by 1.59 results in the estimated number of households per 1,000 square feet of commercial/industrial development ("Total Household Impact").

The Total Household Impact determined in the preceding paragraph takes into consideration all employees generated from commercial/industrial development. Since some of those employees will live outside the School District and will therefore have no impact on the School District, the figures are adjusted to reflect only those households within the School District occupied by employees generated from commercial/industrial development built within the School District. Based on information derived from U.S. Census Bureau data[3], it is estimated that approximately 11.80 percent (11.80%) of employees both live and work within the School District. Multiplying the Total Household Impact by 11.80 percent (11.80%) results in the households within the School District impacted per 1,000 square feet commercial/industrial development. The results of these computations are shown in Table 11.

[2] 2018 American Community Survey 5-Year Estimates; DP04-Selected Housing; S0801-Commuting Characteristics (workers 16 years and over).
[3] 2018 American Community Survey 5-Year Estimates; S0801-Commuting Characteristics (Work in place of residence).

TABLE 11
IMPACT OF COMMERCIAL/INDUSTRIAL DEVELOPMENT ON HOUSEHOLDS WITHIN THE SCHOOL DISTRICT

COMMERCIAL/INDUSTRIAL CATEGORY	SCHOOL DISTRICT HOUSEHOLDS PER 1,000 SQUARE FEET COM./IND.
Banks	0.2097
Community Shopping Center	0.1139
Neighborhood Shopping Center	0.2077
Industrial Business Parks	0.2609
Industrial Parks/Warehousing/Manufacturing	0.1000
Rental Self-Storage	0.0048
Research & Development	0.2257
Hospitality(Lodging)	0.0840
Commercial Offices (Standard)	0.3555
Commercial Offices (Large High Rise)	0.3372
Corporate Offices	0.1992
Medical Offices	0.3166

C. NET IMPACT PER COMMERCIAL/INDUSTRIAL SQUARE FOOT

1. Cost Impact

To estimate the school facilities costs required to house new students as a result of additional commercial/industrial development, the Facilities Cost Impact per Residential Unit determined in Table 8 is multiplied by the household impacts calculated in Table 11, resulting in the total school facilities cost impact per 1,000 square feet of commercial/industrial development. The total school facilities cost impacts are shown in Table 12 by commercial/industrial development category.

TABLE 12
SCHOOL FACILITIES COSTS PER 1,000 SQUARE FEET OF COMMERCIAL/INDUSTRIAL DEVELOPMENT

COMMERCIAL/INDUSTRIAL CATEGORY	SCHOOL DISTRICT HOUSEHOLDS PER 1,000 SQUARE FEET COM./IND.	FACILITIES COST IMPACT PER RESIDENTIAL UNIT (HOUSEHOLD)	TOTAL COST IMPACT
Banks	0.2097	$11,227	$2,354
Community Shopping Center	0.1139	$11,227	$1,279
Neighborhood Shopping Center	0.2077	$11,227	$2,332
Industrial Business Parks	0.2609	$11,227	$2,929
Industrial Parks/Warehousing/Manufacturing	0.1000	$11,227	$1,123
Rental Self-Storage	0.0048	$11,227	$54
Research & Development	0.2257	$11,227	$2,534
Hospitality(Lodging)	0.0840	$11,227	$943
Commercial Offices (Standard)	0.3555	$11,227	$3,991
Commercial Offices (Large High Rise)	0.3372	$11,227	$3,786
Corporate Offices	0.1992	$11,227	$2,236
Medical Offices	0.3166	$11,227	$3,554

2. Residential Fee Offsets

The total cost impacts determined in Table 12 represent the amounts required to fully mitigate the impact on school facilities, as a result of new commercial/industrial development within the School District. Many employees as result of new commercial/industrial development will commute from areas outside of the School District boundaries or will reside in existing homes, from which no mitigation will be received from the housing in which they reside. However, new commercial/industrial development, and thereby new employee generation, will also increase the need for new residential development to house those employees living in the School District. Applicable Residential School Fees adopted by the School District under applicable law will also be imposed by the School District on such new residential development. To prevent new commercial/industrial development from paying the portion of impact that is mitigated by the Applicable Residential School Fees, this amount has been calculated and deducted from the school facilities impact costs calculated in Table 12.

The residential fee offsets are first calculated by using the Applicable Residential School Fee of $2.65 per square foot and multiplying that amount by the weighted average square footage of a residential unit in the School District, which is 1,631 square feet. This calculation provides the average residential revenues from a residential unit of $4,322 ($2.65 x 1,631). The average residential revenues from a residential unit

multiplied by the Household Impacts per 1,000 square feet of commercial/industrial development, as shown in Table 8, results in the residential school fee revenues per 1,000 square feet of commercial/industrial development ("Residential Fee Offset"). This computation is shown in Table 13.

TABLE 13
RESIDENTIAL FEE OFFSETS

COMMERCIAL/INDUSTRIAL CATEGORY	SCHOOL DISTRICT HOUSEHOLDS PER 1,000 SQUARE FEET COM./IND.	RESIDENTIAL FEE PER UNIT	RESIDENTIAL FEE OFFSET PER 1,000 SQUARE FEET COM./IND.
Banks	0.2097	$4,322	$906
Community Shopping Center	0.1139	$4,322	$492
Neighborhood Shopping Center	0.2077	$4,322	$898
Industrial Business Parks	0.2609	$4,322	$1,128
Industrial Parks/Warehousing/Manufacturing	0.1000	$4,322	$432
Rental Self-Storage	0.0048	$4,322	$21
Research & Development	0.2257	$4,322	$976
Hospitality(Lodging)	0.0840	$4,322	$363
Commercial Offices (Standard)	0.3555	$4,322	$1,537
Commercial Offices (Large High Rise)	0.3372	$4,322	$1,457
Corporate Offices	0.1992	$4,322	$861
Medical Offices	0.3166	$4,322	$1,368

3. Net School Facilities Costs

Subtracting the Residential Fee Offset determined in Table 13 from the total school facilities costs listed in Table 12 results in the net school facilities costs per 1,000 square feet of commercial/industrial development ("Net School Facilities Costs"). The Net School Facilities Costs are listed in Table 14.

TABLE 14
NET SCHOOL FACILITIES COSTS
PER 1,000 SQUARE FEET COMMERCIAL/INDUSTRIAL DEVELOPMENT

COMMERCIAL/INDUSTRIAL CATEGORY	TOTAL SCHOOL FACILITIES COSTS	RESIDENTIAL FEE OFFSET	NET SCHOOL FACILITIES COSTS
Banks	$2,354	$906	$1,448
Community Shopping Center	$1,279	$492	$787
Neighborhood Shopping Center	$2,332	$898	$1,434
Industrial Business Parks	$2,929	$1,128	$1,801
Industrial Parks/Warehousing/Manufacturing	$1,123	$432	$691
Rental Self-Storage	$54	$21	$33
Research & Development	$2,534	$976	$1,558
Hospitality(Lodging)	$943	$363	$580
Commercial Offices (Standard)	$3,991	$1,537	$2,454
Commercial Offices (Large High Rise)	$3,786	$1,457	$2,329
Corporate Offices	$2,236	$861	$1,375
Medical Offices	$3,554	$1,368	$2,186

The Net School Facilities Costs determined in Table 14 were then divided by 1,000[4] to provide the cost impact on a square foot basis. These cost impacts are listed in Table 15.

TABLE 15
NET COST IMPACTS
PER SQUARE FOOT OF COMMERCIAL/INDUSTRIAL DEVELOPMENT

COMMERCIAL/INDUSTRIAL CATEGORY	NET IMPACTS
Banks	**$1.45**
Community Shopping Center	**$0.79**
Neighborhood Shopping Center	**$1.43**
Industrial Business Parks	**$1.80**
Industrial Parks/Warehousing/Manufacturing	**$0.69**
Rental Self-Storage	**$0.03**
Research & Development	**$1.56**
Hospitality(Lodging)	**$0.58**
Commercial Offices (Standard)	**$2.45**
Commercial Offices (Large High Rise)	**$2.33**
Corporate Offices	**$1.38**
Medical Offices	**$2.19**

[4] The Employee Generation rates derived from the SANDAG study are estimated per 1,000 square feet of development.

The net cost impacts shown in Table 15 are greater than the School District's share of the current maximum authorized commercial/industrial School Fees of $0.43 per square foot, except for the category of Rental Self-Storage development. Therefore, the School District is justified in levying school fees on commercial/industrial in amount up to but not exceeding the School District's share of the maximum authorized statutory fee. For Rental Self-Storage businesses, which typically have extremely low numbers of employees, the School District is justified in collecting $0.03 per square foot.

D. COMMERCIAL/INDUSTRIAL DEVELOPMENT NOT IN PRESCRIBED CATEGORIES

In cases where new commercial/industrial development does not fit within the prescribed categories shown in Table 10, the School District shall evaluate such development on a case-by-case basis to determine if the imposition of the School Fees on the development meets the nexus requirements set forth under Government Code Section 66000 et seq. The School District may levy School Fees on such development in an amount up to but not exceeding the cost per square foot impact determined through such evaluation.

E. AGE-RESTRICTED (SENIOR) HOUSING

Government Code Sections 65995.1 and 65995.2 provides school districts may only charge the fees applicable for commercial/industrial development for qualified age-restricted (senior citizen) housing. Qualified age-restricted housing generates employees resulting in school facility impacts similar to those impacts from other commercial/industrial categories specified herein.

SECTION V. REDEVELOPMENT

Government Code Section 66001, subdivision (a)(3) and (4) requires that a school district, in imposing school-impact fees, establish a reasonable relationship between the fee's use, the need for the public facility and the type of development project on which the fee is imposed. This section addresses and sets forth general policy when considering the levy of school fees on new construction resulting from redevelopment projects within the School District.

Redevelopment means voluntarily demolishing existing residential, commercial, and/or industrial structures and subsequently replacing them with new construction ("Redevelopment"). The School District is aware of Redevelopment projects completed within the School District boundaries and anticipates similar Redevelopment projects may be completed in the next ten (10) years and beyond. School fees authorized pursuant to Education Code Section 17620 and Government Code Sections 65995 et seq. shall be levied by the School District on new construction resulting from Redevelopment projects, if there is a nexus between the School Fees being imposed and the impact of new construction on school facilities, after the impact of pre-existing development has been taken into consideration. In determining such nexus, the School District shall review, evaluate and determine on a case-by-case basis, the additional impact of the proposed new development by comparing the projected square footage, student generation and cost impacts of the proposed new units and the pre-existing residential, commercial and/or industrial development. Such analysis shall utilize the student generation rates identified in Table 5 of this Study, as applicable.

Redevelopment projects featuring a transition in commercial/industrial categorical classification (e.g. a project redeveloping a Hospitality (lodging) into Commercial office (standard) space) should be assessed based on the Applicable School Fee for the new commercial/industrial category multiplied by the total assessable space of the new commercial/industrial project in the case of a complete site redevelopment. In the case where there is a partial redevelopment, or an addition to an existing development, the Applicable School Fee should be calculated on a basis of the marginal assessable space increase multiplied by the maximum Applicable School Fee for the for the assessable space.

The School District may levy school fees, authorized under applicable law, on new units resulting from construction projects in an amount up to the additional impact cost per square foot as determined in accordance with the preceding paragraphs, but not exceeding the applicable school fees.

SECTION VI. GOVERNMENT CODE SECTION 66000

Government Code Sections 66000 *et seq*. were enacted by State Legislature in 1987. In any action establishing, increasing, or imposing a fee as a condition of approval of a development project, such as the Applicable School Fees described herein, these Government Code sections require the public agency to satisfy the following requirements:

1. Determine the purpose of the fee;

2. Identify the use to which the fee is to be put;

3. Determine how there is a reasonable relationship between the fee's use and the type of development project on which the fee is imposed;

4. Determine that there is a reasonable relationship between the need for the public facilities and the type of development project on which the fee is imposed;

5. Determine that there is a reasonable relationship between the amount of the fee and the cost, or portion of the cost of the public facility attributable to the development on which the fee is imposed; and

6. Provide an annual accounting of any portion of the fee remaining unspent or held for projects for more than five (5) years after collection.

The information set forth herein, including the information contained in the Appendices attached hereto, provide factual evidence establishing a nexus between the type of development projected to be built within the School District and the amount of Applicable School Fees levied upon such development based on the need for such Applicable School Fees. The determinations made in this Study meet the requirements of Government Code Section 66000. The findings are summarized as follows:

Purpose of the School Fee

The Board of the School District will levy and collect school fees on new residential and commercial/industrial development to obtain funds for the construction and/or reconstruction of school facilities to accommodate students generated as a result of such development. In accordance with Education Code Section 17620, "construction or reconstruction of school facilities" ***does not*** include any item of expenditure for any of the following:

(i). Regular maintenance or routine repair of school buildings and facilities;
(ii). Inspection, sampling, analysis, encapsulation or removal of asbestos-containing material, except where incidental to school facilities construction or reconstruction for which the expenditure of fees or other consideration collected pursuant to Education Code Section 17620 is not prohibited; and,
(iii). Deferred maintenance as described in Education Code Section 17582.

Identify the Use of the School Fee

The School District has determined that revenues collected from Applicable School Fees imposed on residential and commercial/industrial developments will be used for the following purposes:

(i). Construction or reconstruction of school facilities required to accommodate students generated by new residential and commercial/industrial development in areas of the School District where school facilities are needed;
(ii). Construction or reconstruction of administrative and operations facilities required in response to new student growth from new development;
(iii). Acquisition or lease of property for unhoused students generated from new development;
(iv). Purchase or lease of interim and/or temporary school facilities in order to accommodate student capacity demands;
(v). Furniture for use in new school facilities;
(vi). Costs associated with the administration, collection, and justification for the Applicable School Fees;
(vii). Provide local funding that may be required if the School District applies for State funding through SB 50.

Relationship between the Use of the Fee, the Need for School Facilities and the Type of Development on which the Fee is Imposed

As determined in the preceding sections, adequate school facilities do not exist to accommodate students generated from new residential and commercial/industrial development in the areas of the School District where new development is anticipated. The fees imposed on such new development will be used to finance the acquisition of property and the construction and/or reconstruction of school facilities required to accommodate student enrollment growth generated by new residential and commercial/industrial development.

Determination of the Relationship between the Fee Amount and the School Facilities Costs Attributable to Type of Development on which the Fee is Imposed

The imposition of the Applicable Residential School Fee of $2.65 per square foot of residential development is justified as the fee is equal to or below the per square foot cost impacts to provide adequate school facilities required as a result of such new residential development.

Similarly, the imposition of the Applicable Com/Ind. School Fees of $0.43 per square foot of commercial/industrial development is justified as the fee is equal to or below the estimated per square foot net cost impact to provide adequate school facilities required as a result of such new commercial/industrial development, except for Rental Self-Storage development, where a School Fee of $0.03 per square foot is justified.

Accounting Procedures for the Fees

The School District will deposit, invest, and expend the school fees imposed and collected on residential and commercial/industrial development in accordance with the provision of Government Code Section 66006.

Appendix A
Commercial/Industrial Development Descriptions

Banks	Include small branch offices to regional offices used for banking. Properties under this category allow customers to conduct banking on-site.
Shopping Center	Broadly include regional, community and neighborhood shopping centers which sell merchandise and services to consumers. Include grocery stores, restaurants, retail centers, automotive sales.
Industrial Business Parks	Include any combination of facilities engaged in manufacturing/assembly, warehousing, and/or storage with 15% or more of the total area designated for commercial use.
Industrial Parks/Warehousing/Manufacturing	Include any combination of facilities engaged in manufacturing/assembly, warehousing, and/or storage with limited or no commercial use (less than 15% of the total area designated for commercial use).
Rental Self-Storage	Include warehouse developments which rent small storage vaults and often termed "mini-storage".
Research & Development	Include scientific research and development laboratories, office and/or their supporting facilities.
Hospitality (Lodging)	Include establishments which provide lodging to the general public. Lodging types include hotels, motels, resort hotels and inns. The maximum term of occupancy for establishment within this category shall not exceed 30 days.
Commercial Offices (Standard)[1]	Include general office space occupying less than 100,000 square feet with multiple tenants.
Commercial Offices (Large High Rise)[1]	Include general office space occupying 100,000 square feet and greater with multiple tenants.
Corporate Offices	An office or office building with a single tenant.
Medical Offices	Include medical offices that serve a wide range of medical needs and may include a pharmacy. Medical offices are generally operated by one or more physicians.

[1] Office space used for activities described under banks, research and development, or medical offices should be classified under those categories.

Appendix B
Facilities Capacity Update

STUDENT CAPACITY (In accordance with California Code of Regulation, Title II, Section 1859.35)

Description	General Education		Non-Instructional	Total
	K-6	7-8		
I. Total Classroom Inventory	115	46	10	171
II. Permanent Classrooms				120
III. Portable Classrooms				51
IV. 25% of Permanent Classrooms				30
V. Adjustment (III. Minus IV.)	20	0	1	21
IV. Total (I. minus V.)	95	46	9	150
Student Capacity[1]	2,375	1,242	225	3,842

1.Per Education Code Section 17071.10, school capacities are determined based on loading factors of 25 students per classroom for grades kindergarten through 6 and 27 students per classroom for grades 7 and 8. Also per OPSC, capacity is loaded at 13 students per classroom for special day classes and 25 students per classroom for non-instructional classrooms.

Description	K-6	7-8	Total
General Education	2,375	1,242	3,617
Proration of Non Instructional	161	64	225
Total	**2,536**	**1,306**	**3,842**

Zulema Renteria

From: Jaime Garcia <jgarcia@castaicusd.com>
Sent: Friday, May 15, 2020 10:40 AM
To: Zulema Renteria
Cc: Linette Hodson; Steve Doyle
Subject: EIR response Sterling Ranch
Attachments: Castaic Fee Justification Study 2020.pdf; sterling ranch.docx

Hello Zulema,

As discussed, I am providing you with the district response regarding the RFI for the Sterling Ranch development. This project has been on the district development tracking for some time. Could you provide an up date with time line for this development. Any other information you could share would be helpful.

I am also enclosing the most recent fee study for your records.

Thank you,

Jaime Garcia
Director Facilities
Castaic Union School District
661-257-4500 x1546

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CASTAIC UNION SCHOOL DISTRICT

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Fred Malcomb • Mayreen Burk • Stacy Dobbs • Laura Pearson • John Richard
President *Clerk* *Member* *Member* *Member*

May 15, 2020

Meridian Consultants
Westlake Village Office
920 Hampshire Road, Suite A5
Westlake Village, CA 91361

RE: RFI Draft EIR Sterling Ranch Residential Project – VTTM 60251

Dear Ms. Zulema Renteria:

This letter is in response to your request for information regarding the impact of the proposed project on educational services. The Castaic Union School District serves PreK and Kindergarten through Eighth grade in the north western portion of Los Angeles County. The area specified will be in the Live Oak Elementary School attendance boundary for K-5 grades and Castaic Middle School for grades 6, 7, and 8. There are several projects in the Castaic area that will require further study with regard to available seats at each of our schools.

I have prepared the following information as requested in your letter for VTTM 60251.

1. The project is within the Live Oak Elementary School and the Castaic Middle School attendance boundaries. Current enrollment for Live Oak is 538 and 526 for Castaic Middle. With the addition of portable classrooms, the capacity of Live Oak Elementary is 750. However, the infrastructure is a design capacity of 500 and is under review for modernization. The Castaic Middle School design capacity is 1200. It currently is serving our 7th and 8th grade middle school children.
2. Overcrowding standards used by the district will follow CDE guidelines.
3. Current student generations rates were completed and submitted to the school board on May 14, 2020 and as follows:

Table 4 – Student Yield Factors

(from a large sample of units built between 2013-2018)

Table 2

Student Yield Factors

for the Castaic Union SD*

	SFD** Units	**MFA Units	**APT Units
K-6	.501	.307	.204
7-8	.125	.073	.091
K-8	.626	.380	.295

** = Used a District-wide, 5-year sample*

*** = Sample size for the Castaic District was too small, therefore, used a Santa Clarita Valley-wide sample.*

SFD = Single Family Detached units

MFA = Multi-Family Attached units

APT = Apartment units

4. As of May 14, 2020 the district adopted the SAB statutory rate for Level 1 fees. The residential rate for Castaic Union School district will be $2.65 and $0.43 for industrial/commercial development.
5. The district does not currently have any plan for increasing student housing.
6. The district does have two CFD's that were formed in the 90's. It would be difficult to provide a lead role in the formation of CFD's, but the district would consider options under the right conditions.

The proposed development is located in a rural area that does not provide safe routes to school. Please feel free to contact me if you have any further questions. I can be reached at 661-257-4500 x 1546.

Sincerely,

Jaime Garcia
Director of Facilities

Cc Steve Doyle, Superintendent
Linette Hodson, Chief Business Official
files

APPENDIX L

Recreation

APPENDIX L.1

Park Obligation Report

LOS ANGELES COUNTY
DEPARTMENT OF PARKS AND RECREATION

PARK OBLIGATION REPORT

Tentative Map # **60257**	DRP Map Date: **05/08/2018**	SCM Date: **06/14/2018**	Report Date: **06/11/2018**
Park Planning Area # **35B**	CSD: **CASTAIC AREA CSD**		Map Type: **Tentative Map - Tract**

Total Units	= Proposed Units	+ Exempt Units
231	**231**	**0**

Park land obligation in acres or in-lieu fees:

ACRES:	**2.38**
IN-LIEU FEES:	**$485,395**

Sections 21.24.340, 21.24.350, 21.28.120, 21.28.130, and 21.28.140, the County of Los Angeles Code, Title 21, Subdivision Ordinance provide that the County will determine whether the development's park obligation is to be met by:

1) the dedication of land for public or private park purpose or,
2) the payment of in-lieu fees or,
3) the provision of amenities or any combination of the above.

The specific determination of how the park obligation will be satisfied will be based on the conditions of approval by the advisory agency as recommended by the Department of Parks and Recreation.

The Representative Land Value (RLVs) in Los Angeles County Code (LACC) Section 21.28.140 are used to calculate park fees and are adjusted annually, based on changes in the Consumer Price Index. The new RLVs become effective July 1st of each year and may apply to this subdivision map if first advertised for hearing before either a hearing officer or the Regional Planning Commission on or after July 1st pursuant to LACC Section 21.28.140, subsection 3. Accordingly, the park fee in this report is subject to change depending upon when the subdivision is first advertised for public hearing.

The park obligation for this development will be met by:

Trails:

See also attached Trail Report

Comments:

90 percent of all residential lots within the proposed project are within one-half mile of Val Verde Community Regional Park which is approximately 58 acres in size. Thus this project is not required to provide a public park onsite and its Quimby obligation will be satisfied with the payment of in-lieu fees.

For further information or to schedule an appointment to make an in-lieu fee payment:
Please contact Clement Lau at (626) 588-5301 or Loretta Quach at (626) 588-5305
Department of Parks and Recreation, 1000 S. Fremont Avenue, Unit #40. Building A-9 West, 3rd Floor. Alhambra, California 91803.

By: Kathline King

Kathline J. King, Chief of Planning

LOS ANGELES COUNTY
DEPARTMENT OF PARKS AND RECREATION

PARK OBLIGATION WORKSHEET

Tentative Map # **60257** DRP Map Date: **05/08/2018** SCM Date: **06/14/2018** Report Date: **06/11/2018**
Park Planning Area # **35B** CSD: **CASTAIC AREA CSD** Map Type: **Tentative Map - Tract**

The formula for calculating the acreage obligation and or in-lieu fee is as follows:

(P)eople x (0.0030) Ratio x (U)nits = (X) acres obligation
(X) acres obligation x RLV/Acre = In-Lieu Base Fee

Where: P = Estimate of number of People per dwelling unit according to the type of dwelling unit as determined by the U.S. Census
Ratio = The subdivision ordinance provides a ratio of 3.0 acres of park land for each 1,000 people generated by the development. This ratio is calculated as "0.0030" in the formula.
U = Total approved number of Dwelling Units.
X = Local park space obligation expressed in terms of acres.
RLV/Acre = Representative Land Value per Acre by Park Planning Area.

Total Units **231** = Proposed Units **231** + Exempt Units **0**

Park Planning Area = **35B**

Type of dwelling unit	People *	Ratio 3.0 Acres/ 1000 People	Number of Units	Acre Obligation
Detached S.F. Units	**3.44**	**0.0030**	**231**	**2.38**
M.F. < 5 Units	**3.12**	**0.0030**	**0**	**0.00**
M.F. >= 5 Units	**2.65**	**0.0030**	**0**	**0.00**
Mobile Units	**2.78**	**0.0030**	**0**	**0.00**
Exempt Units			**0**	**0.00**
TOTAL			**231**	**2.38**

Ratio	Acre Obligation	RLV / Acre	In-Lieu Base Fee
@ (0.0030)	2.38	$203,614	**$485,395.41**

Lot #	Provided Space	Provided Acres	Credit (%)	Acre Credit
0		0.00	100.00%	0.00
			Total Provided Acre Credit:	**0.00**

Acre Obligation	Public Park Credit	Net Obligation	RLV / Acre	**In-Lieu Fee Due**
2.38	0.00	2.38	$203,614	**$485,395.41**

APPENDIX L.2

Trail Report

COUNTY OF LOS ANGELES
DEPARTMENT OF PARKS AND RECREATION
"Parks Make Life Better!"
John Wicker, Director
Norma E. Garcia, Chief Deputy Director

June 14, 2018

TO: Diane Aranda, Principal Regional Planning Assistant
Department of Regional Planning
Land Divisions Section

FROM: Kathline J. King, Chief of Planning
Department of Parks and Recreation
Planning Division

SUBJECT: **NOTICE OF TRAIL CONDITIONS FOR VESTING TENTATIVE TRACT MAP (VTTM) #60257**
(RECEIVED BY REGIONAL PLANNING ON MAY 2, 2018)

The Department of Parks and Recreation (Department) has completed the trail review of VTTM No. 60257. The proposed "Del Valle Trail" alignment, as shown on subject tract map sheet two (2) of three (3) is approved. Due to offsite grading for VTTM No. 60257 within VTTM 60665, the Department is requiring the Subdivider to dedicate a twenty-foot (20') wide trail easement and construct a variable-width five-foot (5') to eight-foot (8') wide multi-use (hiking, mountain biking, and equestrian) trail within the sphere of the offsite grading area.

Trail Conditions of Map Approval:

1. Subdivider shall dedicate a twenty-foot (20') wide multi-use easement to the County for the "Del Valle Trail" and construct, a variable-width five foot (5') to eight foot (8') wide natural soil surface trail within the proposed trail alignment, as shown on subject tract map sheet two (2) of three (3).

   Note:

   - The proposed "Ron Horn Memorial Trail" within the sphere of this subdivision is planned as a private trail to be maintained by the Home Owners Association with connectivity east to the proposed County "Del Valle Regional Trail".

   - The County "Del Valle Regional Trail" is to be constructed within the offsite grading area (VTTM#60665) east of map boundary and South of Del Valle Road right-of-way.

2. The required multi-use trail easement, shall be recorded via separate instrument, prior to final map recordation. Trail easement recordation document number to be inserted, as a note along the trail alignment within final map.

    - Upon request the Department will provide the multi-use trail easement recordation template and coordinate the recordation process.

3. Full public access shall be provided in perpetuity for the multi-use trail.

4. Easement dedication(s) must be outside the public road right-of-way unless approved by the Department of Public Works, Traffic and Lighting Division (DPW).

5. Subdivider shall include the Department in the transmittal of the project grading plan to the Department of Regional Planning. The project grading plan, including trail grading information, shall be submitted simultaneously to the Department for review and approval. The trail grading information shall conform to the County of Los Angeles Trails Manual (Trails Manual) and any applicable County codes, including, but not limited to the following:

    - Cross slope gradients on natural soil not to exceed four percent (4%) with two percent (2%) preferred, and longitudinal (running) slope gradients not to exceed twelve percent (12%) for more than fifty feet (50').

    - Cross slope gradients above four percent (4%) on paved surfaces, such as roadway trail crossings will be evaluated by the Department on a case by case basis.

    - Typical trail section and details to include:

        - Width and name of trail
        - Longitudinal (running) gradients
        - Cross slope gradients

    - Bush hammer (or equivalent rough finish) at minimum width of eight feet (8') for roadway (if concrete surface) trail surface crossings to provide for traction and increase safety.

    - Appropriate retaining walls as needed.

    - Lodgepole fencing required (see condition 7 fencing specifications) on each side of trail with minimum distance of twelve feet within the twenty-

foot (20') wide multi-use trail easement for full length of trail adjacent to Del Valle Road.

  - Rural style fencing is needed to delineate the trail and keep trail users within the authorized trail alignment.

- Eight-foot (8') minimum width of trail is recommended when lodgepole fencing is installed on each side of trail.

- All street trail crossings must be approved by DPW:

  - If needed, Subdivider is responsible to install appropriate curb-cuts and painted crosswalk utilizing DPW specifications.
  - Subdivider is responsible to contact DPW for trail street-crossing signage specifications. Per DPW specifications the trail crossing signage to be installed at five-hundred (500) feet in either direction from each street trail crossing to warn vehicle drivers of trail crossing.

6. After project trail grading plan approvals, but prior to building permit issuance, the Subdivider shall:

   - Submit a preliminary construction schedule showing milestones for completing the trail. As needed, provide the Department updated trail construction schedule(s).

   - Stake/flag the centerline of the proposed trail alignment and then schedule a site meeting with the Trail Planner for trail inspection and approval.

     - Contact Trail Planner if construction is not completed within ninety (90) days of staking/flagging, as trail staking/flagging is only valid for up to a ninety (90) day span.

7. Construction of trail and installation of lodgepole fencing:

   - Trail: Construct a variable-width five-foot (5') to eight-foot (8') wide Natural Trail 2 within the twenty-foot (20') wide dedicated easement in a manner consistent with Section 4.0 Trail Design of the Trails Manual. The Trails Manual is available at http://trails.lacounty.gov.

     - Subdivider must utilize a professional trail contractor approved by the Department.

- Deviation from the proposed regional trail alignment, as shown on sheet two (2) of sheet three (3) is permitted, if due to unforeseen obstacles, such as but not limited to: reduction of trail grade, increase trail width, and/or to provide a safe trail passing area.

Out-slope of trail tread is 2% to 4% with trail running grade at 5%, or up to 8% for <100' or 12% for <50'. Significant deviation from the design guidelines in the Trails Manual must be reviewed and approved by the Department. See Section 4: "Trail Design," for trail construction guidelines and/or contact Trails Section Planner.

- Lodgepole Fencing: Pine posts treated with Alkaline Copper Quaternary (ACQ) wood preservative. Vertical posts are seven feet (7') in height by seven inch (7") diameter. The posts have two (2) holes at eighteen inches (18") on center and top rail is six inches (6") from post top to the centerline of rail hole. The rails are also ACQ treated and they are eight feet (8') in length by four and one-half inches (4½") in diameter with beveled ends. The posts are installed fifty-four inches (54") above grade and thirty inches (30") below grade. Posts are set in three quarter inch (¾") aggregate base layer at eighteen inches (18") deep with four inches (4") of compacted earth as top layer.

8. Notify the Trail Planner within five (5) business days of trail construction completion, including installation of all required lodgepole fencing for a "Final Trail Inspection". The Final Trail Inspection is required to obtain the Department approval and ensure the trail and fencing utilize the trail conditions of approval within this report and also follow the trail construction guidelines within the Trails Manual. Any portions of the constructed trail and fencing not approved, shall be corrected and brought into compliance within thirty (30) calendar days. The Subdivider shall then contact the Department to schedule another site inspection.

9. Prior to the Departments final acceptance of the constructed "Del Valle Trail" alignment, the Subdivider shall:

   - Submit electronic copies on CD (AutoCAD) of the as-built trail grading/construction drawings, and specification sheets for any installed trail infrastructure, such as lodgepole fencing, etc. to the Department's Trails Planning Section.

   - Submit a letter to the Department Trail Planner requesting acceptance of the dedicated constructed trail and lodgepole fencing. The Department will then issue an acceptance letter only after receiving a written request for final trail approval, and copy of the as-built trail drawings.

Note: The Department is responsible to install appropriate trail signage, and trail maintenance after final trail acceptance.

For any questions or concerns, please contact Trail Planner Robert Ettleman, at (626) 588-5323 or by email at rettleman@parks.lacounty.gov.

KK:MO:RLE:nr Del Valle Trail

c: Sterling Ranch Estates (H. Williams)
Sikand (R. Gaur)
Parks and Recreation (K. King, M. O'Connor, C. Lau, R. Ettleman)

APPENDIX L.3

Correspondence

Zulema Renteria

From: Loretta Quach <LQuach@parks.lacounty.gov>
Sent: Thursday, April 9, 2020 2:55 PM
To: Zulema Renteria
Cc: Clement Lau
Subject: Re: New submission from Contact Form
Attachments: StudyArea_091.pdf

Good afternoon Zulema,

Thank you for your patience. Below are some answers (green) to your questions. I'm still waiting to hear back from a couple people so I'll send those when I get them. Please feel free to let me know if you have any questions.

1. Which parks and recreational facilities are within a 5-mile radius, currently serve the Project site? Val Verde Community Regional Park

- In addition, for each park facility please identify the acreage of the park 57.92 acres, the facilities found within each park (see list below), the areas of the County each park is intended to serve (Park Planning Area 35B – Castaic/Val Verde), the service population under existing conditions, and each park's service population capacity (Community Parks serve several neighborhoods within a 1 to 2 mile radius of the park – General Plan – Parks and Recreation Element).
    - Community Recreation Center
    - Playground
    - Swimming Pool
    - 2 Restrooms
    - Softball Field
    - Multipurpose Fields
    - Tennis Court
    - Full Size Basketball Court
    - Hiking Trail
    - 2 Horseshoe Pits
    - Camping Site
    - BBQs
    - Picnic Tables
    - Parking
- Are these parks and recreational facilities adequately meeting the Project site's current demand for parks and recreational facilities?
    - Information Pending
- Would these parks and recreational facilities meet the proposed Project's demand for parks and recreational facilities?
    - No. According to the Quimby Obligation calculation, in order for Val Verde Community Regional Park to adequately serve the new population, the Department would require an in-lieu fee of $485,396 (for park upgrades/renovation) or provide a 2.28 acre public park.

2. Does the Department have any plans to develop new parks or recreational facilities or expand existing parks or recreational facilities within a 10-mile radius of the Project site?

- Information Pending

3. Please provide existing ratios of neighborhood and community parkland per resident on a countywide basis and within the Project site.

- LA County Needs Assessment
    - Countywide average of parkland per resident: 3.3 acres per 1,000 residents

- Project site average parkland per resident (Study Area 91): 4.1 acres per 1,000 residents

Thank you,

Loretta Quach
Tel. (626) 588-5305 | Fax (626) 458-8346
lquach@parks.lacounty.gov

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From: Clement Lau <clau@parks.lacounty.gov>
Date: Monday, April 6, 2020 at 1:38 PM
To: Zulema Renteria <zrenteria@meridianconsultantsllc.com>
Cc: Loretta Quach <LQuach@parks.lacounty.gov>
Subject: Re: New submission from Contact Form

Hi Zulema,

Thank you for the letter. Loretta of my staff is compiling the information. We will get our responses to you this week.

Thanks,

Clement

_____

Clement Lau, AICP
County of Los Angeles
Department of Parks and Recreation
Planning & CEQA Section
1000 S. Fremont Ave, Unit #40
Building A-9 West, 3rd Floor
Alhambra, CA 91803
Tel: (626) 588-5301
Fax: (626) 458-8346
E-mail: clau@parks.lacounty.gov
Please note that our office is closed on Fridays.

From: Zulema Renteria <zrenteria@meridianconsultantsllc.com>
Sent: Monday, April 6, 2020 10:19 AM
To: Clement Lau <clau@parks.lacounty.gov>
Subject: RE: New submission from Contact Form

CAUTION: External Email. Proceed Responsibly.

Hello Clement,

Thank you for getting back to me. I know we find ourselves in unusual circumstances, during this time, so I appreciate you reaching out. Yes, I spoke with Julie about the Sterling Ranch Residential Project, last month. We were hoping to get some information regarding parks and recreational facilities in the area.

I have attached the letter that I had sent to Julie. In the interest of saving time, I haven't changed the addressee of the letter, but I can, if you'd like me to. Otherwise, these are the questions we are interested in having answered. Thank you, again, Clement for getting back to me. I look forward to connecting with you.

Zulema Renteria

Sent from Mail for Windows 10

From: Clement Lau
Sent: Monday, April 6, 2020 8:24 AM
To: Zulema Renteria
Subject: Fw: New submission from Contact Form

Hi Zulema,

I understand that you have been trying to reach Julie Yom of my staff. Julie has been temporarily re-assigned as a disaster service worker in response to the COVID-19 pandemic.

I am Julie's supervisor and oversee our Planning & CEQA Section. Please let me know what you need assistance with.

Thank you,

Clement

_____

Clement Lau, AICP
Departmental Facilities Planner
County of Los Angeles
Department of Parks and Recreation
Planning & CEQA Section
1000 S. Fremont Ave, Unit #40
Building A-9 West, 3rd Floor
Alhambra, CA 91803
Tel: (626) 588-5301
Fax: (626) 458-8346
E-mail: clau@parks.lacounty.gov
Please note that our office is closed on Fridays.

From: Sara Keating <SKeating@rposd.lacounty.gov>
Sent: Monday, April 6, 2020 8:15 AM
To: Alina Bokde <ABokde@parks.lacounty.gov>; Clement Lau <clau@parks.lacounty.gov>; Julie Yom <jyom@parks.lacounty.gov>
Subject: FW: New submission from Contact Form

Good morning,

We received this request for some information through our website email. Please see below.

I am forwarding to you as one of your staff may be able to assist.

Thank you,
Sara

Sara C. Keating
Assistant Manager,
Administration Section
1000 S. Fremont Ave, Unit #40
Building A-9 East, Ground Floor
Alhambra, CA 91803
(626) 588-5146 | SKeating@RPOSD.LACounty.gov
(626) 588-5060 | Main Line
NOTE: OFFICE IS CLOSED FRIDAYS

LOS ANGELES COUNTY
REGIONAL PARK AND
OPEN SPACE DISTRICT

RPOSD.LACounty.gov | ParksProjects.LACounty.gov
Facebook.com/RPOSD | Twitter.com/RPOSD | Instagram.com/RPOSD

From: RPOSD Website <skeating@parks.lacounty.gov>
Sent: Friday, April 3, 2020 1:49 PM
To: EDL-DPR-OSDInfo <Info@RPOSD.lacounty.gov>
Subject: New submission from Contact Form

Name
Zulema Renteria
Email
zrenteria@meridianconsultantsllc.com
Message
Hello, I'd like to get in touch with Julie Yom requesting recreational information for a project in the Santa Clarita Valley. For some reason, my emails keep bouncing back. Please feel free to contact me on my personal line: (323) 362-3115. Thank you!

Email Attachment: Study Area Profile

we all need PARKS
for healthy, thriving and engaged LA communities

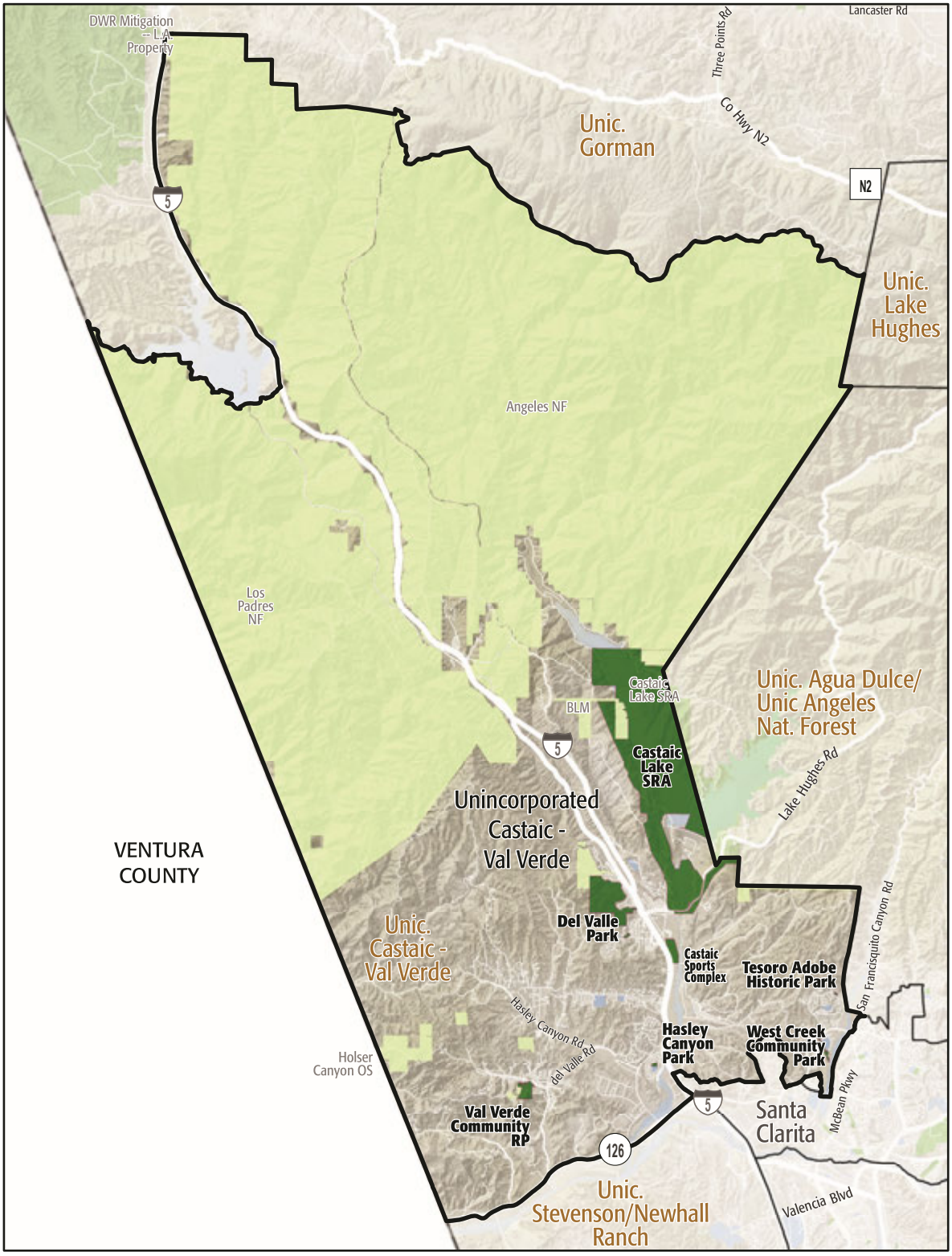
Unincorporated Castaic - Val Verde

STUDY AREA PROFILE

STUDY AREA ID #91

- BASE MAP
- PARK METRICS
- WHERE ARE PARKS MOST NEEDED
- AMENITY QUANTITIES AND CONDITIONS
- PARK NEEDS FRAMEWORK
- PROJECT COST ESTIMATES
- PROJECT REPORTING FORM
- COMMUNITY ENGAGEMENT FORM

STUDY AREA BASE MAP



Unincorporated Castaic - Val Verde

Existing Park
Existing School
Existing Park Outside Study Area
Other Open Space

PARK METRICS

PARK LAND: Is there enough park land for the population?

146.2 PARK ACRES within study area | **35,705** POPULATION | **4.1** PARK ACRES PER 1,000

5,261.10 REGIONAL PARK ACRES within study area | **259.7** REGIONAL PARK ACRES PER 1,000

The county average is 3.3 park acres per 1,000

*This section does not include the 881.8 acres of regional open space, nature preserves, or State and National Forest land in this Study Area.

PARK ACCESSIBILITY: Is park land located where everyone can access it?

13% of population living WITHIN 1/2 MILE of a park

The county average is 49% of the population living within 1/2 mile of a park

PARK PRESSURE

How much park land is available to residents in the area around each park?

Castaic Lake State Recreation Area (5,261.08 Acres)
16851.14 park acres per 1,000

Castaic Regional Sports Complex (58 Acres)
19.68 park acres per 1,000

Del Valle Park (5.45 Acres)
1.03 park acres per 1,000

Hasley Canyon Park (5.37 Acres)
0.63 park acres per 1,000

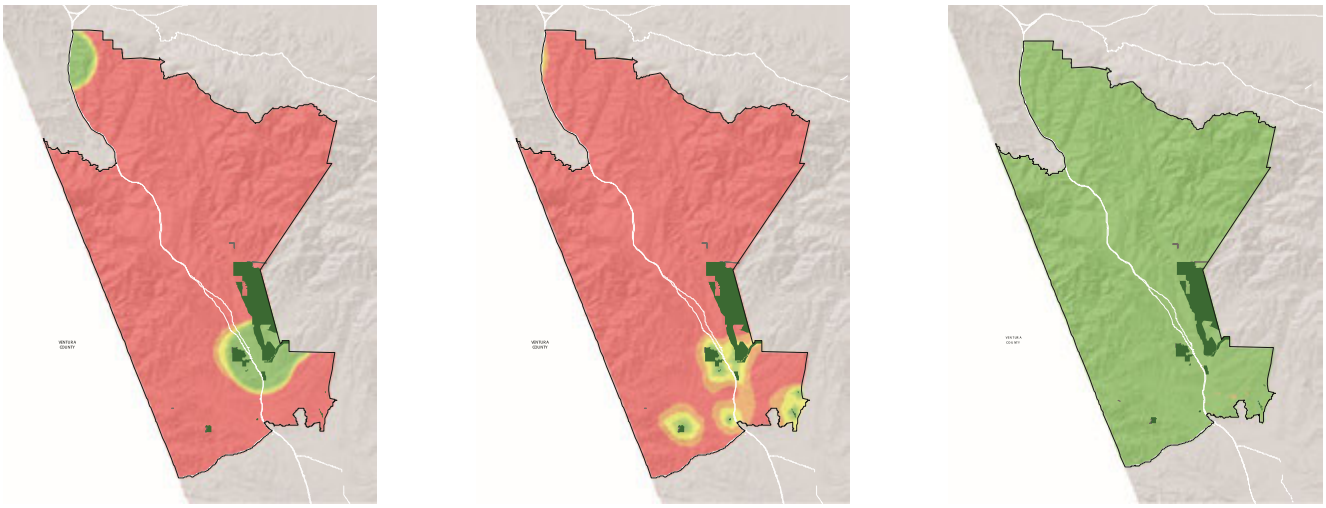
Tesoro Adobe Historic Park (2.25 Acres)
0.68 park acres per 1,000

Val Verde Community Regional Park (57.4 Acres)
10.07 park acres per 1,000

West Creek Park (17.68 Acres)
2.33 park acres per 1,000

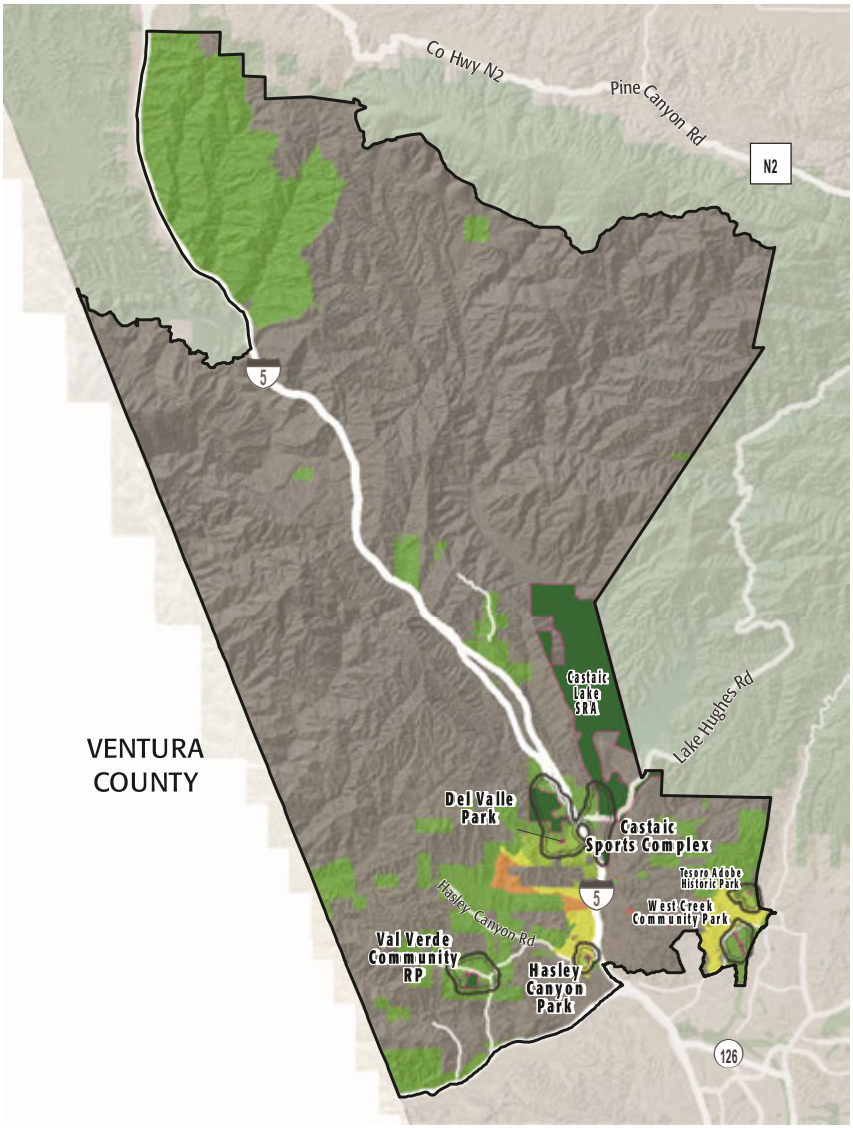
WHERE ARE PARKS MOST NEEDED?

PARK ACRE NEED + DISTANCE TO PARKS + POPULATION DENSITY



= PARK NEED

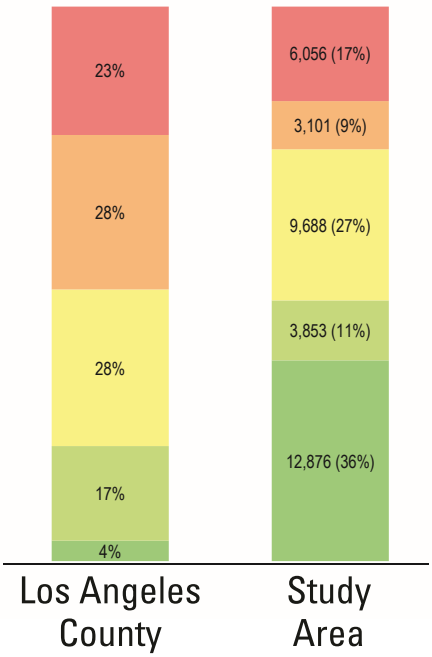
*Calculated using the following weighting: (20% x Park Acre Need) + (20% x Distance to Parks) + (60% x Population Density)



PARK NEED CATEGORY

- Very High
- High
- Moderate
- Low
- Very Low
- No Population
- Area within 1/2 mile walk of a park

HOW MANY PEOPLE NEED PARKS?



AMENITY QUANTITIES AND CONDITIONS

Park Name	Condition	General Infrastructure Condition	Open Lawn/ Turf Area	Amenities															
				Tennis Courts	Basketball Courts	Baseball Fields	Soccer Fields	Mulitpurpose Fields	Fitness Zones	Skate Parks	Picnic Shelters	Playgrounds	Swimming Pools	Splash Pads	Dog Parks	Gymnasiums	Community/Rec Centers	Senior Centers	Restrooms	Total
Castaic Lake State Recreation Area	Good										4	1					1		2	8
	Fair										12	3							8	23
	Poor										45	3							13	61
Castaic Regional Sports Complex	Good				2							1	2	1			1			7
	Fair					3			1			1				1			2	8
	Poor									1										1
Del Valle Park	Good										1									1
	Fair											1							1	2
	Poor																			0
Hasley Canyon Park	Good											2								2
	Fair																		2	2
	Poor																			0
Tesoro Adobe Historic Park	Good																			0
	Fair																		3	3
	Poor																			0
Val Verde Community Regional Park	Good											2								2
	Fair			1	1	1		1					1				1		2	8
	Poor																			0

AMENITY CONDITIONS SUMMARY

Castaic Lake State Recreation Area

Castaic Regional Sports Complex

Del Valle Park

Hasley Canyon Park

Tesoro Adobe Historic Park

Val Verde Community Regional Park

AMENITY QUANTITIES AND CONDITIONS

Park Name	Condition	General Infrastructure Condition	Open Lawn/ Turf Area	Amenities																
				Tennis Courts	Basketball Courts	Baseball Fields	Soccer Fields	Mulitpurpose Fields	Fitness Zones	Skate Parks	Picnic Shelters	Playgrounds	Swimming Pools	Splash Pads	Dog Parks	Gymnasiums	Community/Rec Centers	Senior Centers	Restrooms	Total
West Creek Park	Good										2	2							1	5
	Fair				1				1											2
	Poor																			0
Totals:	Good			0	2	0	0	0	0	0	7	8	2	1	0	0	2	0	3	25
	Fair			1	2	4	0	1	2	0	12	5	1	0	0	1	1	0	18	48
	Poor			0	0	0	0	0	0	1	45	3	0	0	0	0	0	0	13	62

AMENITY CONDITIONS SUMMARY

West Creek Park

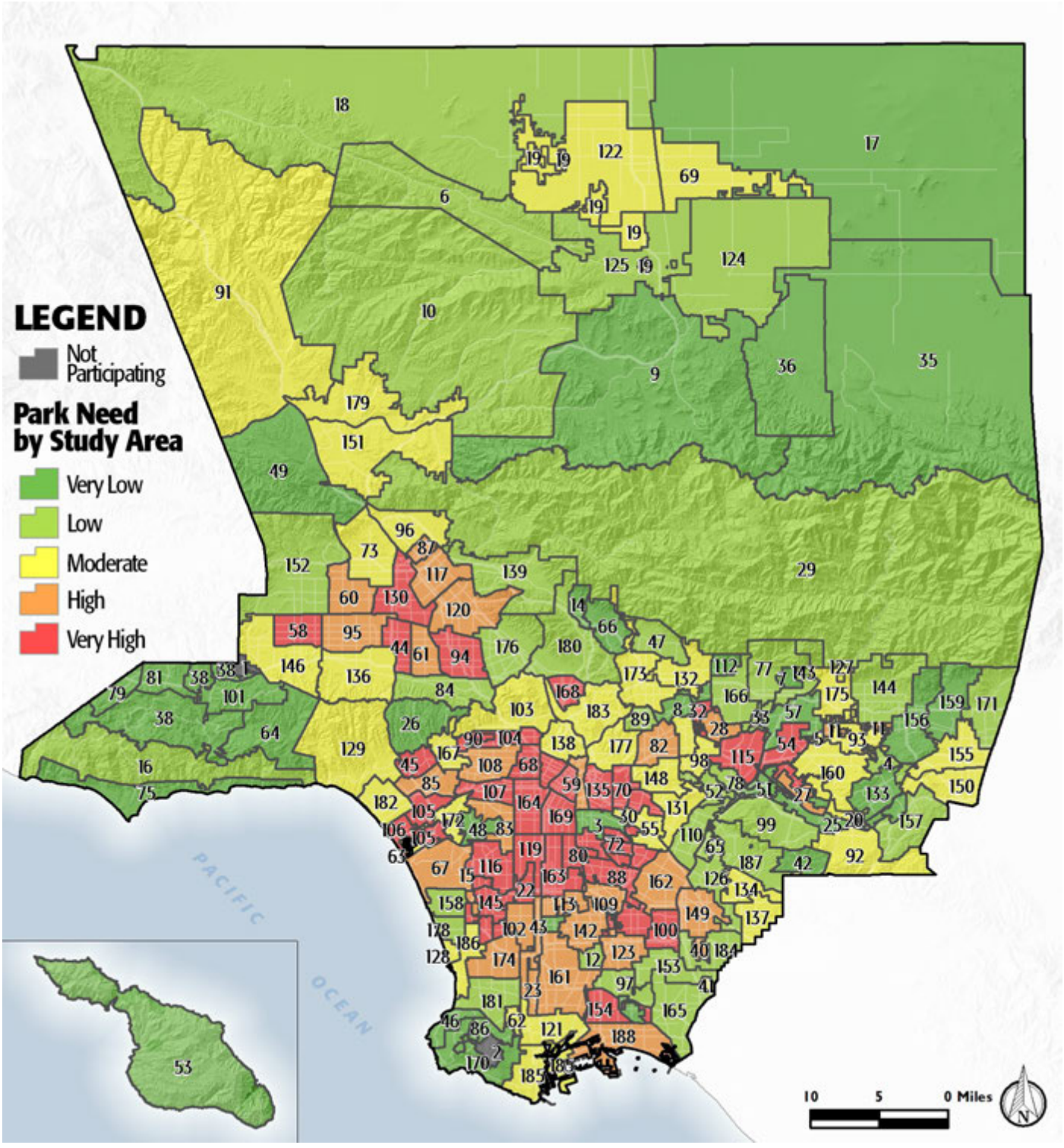
Miles of trails inside parks: 11.5

Miles of trails outside of parks: 4.5

PARK NEEDS FRAMEWORK: COUNTYWIDE ASSESSMENT OF NEED

The results of the analysis of the park metrics were used to determine an overall park need level for each Study Area. Please refer to Section 3.0 Park Needs Framework of the main report for additional information.

Unincorporated Castaic - Val Verde (#91) has a moderate park need.



PROJECT COST ESTIMATES

Study Area:

Unincorporated Castaic - Val Verde

Study Area ID

91

Prioritized Projects

Project Number	Project Description		Cost
1-3	Build New Community Park in the General Vicinity of Val Verde		$12,650,371
	New Park Tasks:		
	Land Acquisition	$138,371	
	Infrastructure/General	$5,280,000	
	Community/Recreation Center	$6,300,000	
	Multipurpose Field- Grass	$932,000	
4	Replace Fitness Zones at Castaic Regional Sports Complex		$70,000
5	Add Tennis Courts at Castaic Regional Sports Complex		$570,000
6-8	Build New regional Park		$15,006,743
	New Park Tasks:		
	Land Acquisition	$276,743	
	Infrastructure/General	$5,280,000	
	Equestrian Park	$9,100,000	
	Trails	$350,000	
9	Add Dog Parks at TBD Existing Park		$695,200
10	Repair Infrastructure/General at Castaic Regional Sports Complex		$5,828,200

Study Area Total Costs

TOTAL COST FOR PRIORITIZED PROJECTS		$34,820,514
TOTAL DEFERRED MAINTENANCE*		$2,954,639,450
Replace amenities in "poor" condition	$2,944,022,178	
Repair amenities in "fair" condition	$10,617,272	
GRAND TOTAL		$2,989,459,964

Each Study Area prioritized 10 projects. These project lists are not intended to supersede or replace any planning documents, nor to obligate the lead agency to implement these projects. For further discussion of projects, please refer to the "Potential Park Projects and Cost Estimates" section of the report.

**Does not include repairs or replacement projects listed as prioritized projects.*

Study Area Name:

Unincorporated
Castaic - Val Verde
3006

Prioritized Project Reporting Form

Please provide descriptions of the park projects prioritized during your Study Area's community engagement workshop. The details you provide will contribute to cost estimates that will be included with your projects in the final report of the LA Countywide Park Needs Assessment. Please be as specific as possible by providing all details that may have an impact on cost estimates (including quantities and acres where appropriate). Along with this form, please attach copies or scans of all voting forms presented at your engagement workshop.

Please return this form to rrobinson@parks.lacounty.gov **no later than February 29, 2016**

1. Project Name: New Park

   Project Location (address, assessor's parcel number, or nearest intersection):

   Val Verde

   Project Type (choose one):

   - ☐ Repairs to Existing Amenities
   - ☐ Add/Replace Amenities in Existing
   - ☑ Park Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

   Build new park with community building with gymnasium and multipurpose fields

2. Project Name: Fitness equipment

   Project Location (address, assessor's parcel number, or nearest intersection):

   Castaic sports complex

   Project Type (choose one):

   - [ ] Repairs to Existing Amenities
   - [x] Add/Replace Amenities in Existing Park
   - [ ] Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

   Replace outdoor fitness equipment

3. Project Name: Tennis courts

   Project Location (address, assessor's parcel number, or nearest intersection):

   Castaic Sports Complex

   Project Type (choose one):

   - [ ] Repairs to Existing Amenities
   - [x] Add/Replace Amenities in Existing Park
   - [ ] Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

4. Project Name: Equestrian arena

   Project Location (address, assessor's parcel number, or nearest intersection):

   TBD

   Project Type (choose one):

   ☐ Repairs to Existing Amenities

   ☐ Add/Replace Amenities in Existing Park

   ☑ Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

   Build new equestrian park with arena and trail connectivity

5. Project Name: Dog park

   Project Location (address, assessor's parcel number, or nearest intersection):

   Existing Park-TBD

   Project Type (choose one):

   ☐ Repairs to Existing Amenities

   ☑ Add/Replace Amenities in Existing Park

   ☐ Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

   Add dog park

6. Project Name: General park infrastructure

   Project Location (address, assessor's parcel number, or nearest intersection):

   Castaic Sports Complex

   Project Type (choose one):

   - [x] Repairs to Existing Amenities
   - [ ] Add/Replace Amenities in Existing Park
   - [ ] Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

   Repair all general park infrastructure

7. Project Name:

   Project Location (address, assessor's parcel number, or nearest intersection):

   Project Type (choose one):

   - [ ] Repairs to Existing Amenities
   - [ ] Add/Replace Amenities in Existing Park
   - [ ] Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

8. Project Name:

   Project Location (address, assessor's parcel number, or nearest intersection):

   Project Type (choose one):

   - ☐ Repairs to Existing Amenities
   - ☐ Add/Replace Amenities in Existing Park
   - ☐ Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

9. Project Name:

   Project Location (address, assessor's parcel number, or nearest intersection):

   Project Type (choose one):

   - ☐ Repairs to Existing Amenities
   - ☐ Add/Replace Amenities in Existing Park
   - ☐ Build New Park or Specialty Facility (include acreage in description)

   Brief Description of Project:

10. Project Name:

Project Location (address, assessor's parcel number, or nearest intersection):

Project Type (choose one):

- ☐ Repairs to Existing Amenities
- ☐ Add/Replace Amenities in Existing Park
- ☐ Build New Park or Specialty Facility (include acreage in description)

Brief Description of Project:

If the projects reported on this form were subject to any type review process, please give a brief description of that process:

Please return this form to rrobinson@parks.lacounty.gov no later than February 29, 2016

Study Area:

We all need PARKS

Community Engagement Plan

A Community Engagement Meeting must be held in each Study Area between December 1, 2015 and February 15, 2016. The meeting can be run by city staff or by a community-based organization of your choice. The meeting facilitator must attend one of three trainings. At the training, facilitators will receive all information needed to hold the meeting. To offset the cost of the Community Engagement Meeting, a $2,500 stipend is available for each Study Area.

Please answer the questions below and return this form to Rita Robinson
rrobinson@parks.lacounty.gov by **October 15, 2015**

Please tell us about your community engagement meeting:
Date: 01/28/2016
Time: 7:00pm
Location: Castaic Union School District Offices

☑ Parking provided
☑ Accessible by public transportation

What translation services (if any) will be provided? Languages: Spanish and others if requested.

Who will be facilitating your community engagement event(s)?

☐ City Staff
☑ Community-Based Organization. Name of CBO: Castaic Area Town Council

Please provide the contact information for the primary facilitator **and** any secondary facilitator (if applicable) that will be attending the mandatory training. You may have a **maximum** of 2 people.

Name: Sandia Ennis
Title: Vice President
Address: PO Box 325, Castaic, CA 91384
Phone: 661-414-4412
Email: 661-414-4412

Name: Bonnie Nikolai
Title: Event Committee Chair
Address: 661-775-8915
Phone: 661-775-8915
Email: 661-775-8915

Please rank your preference for a mandatory facilitator training date. Space is limited at each training and spaces will be reserved based on the timely return of this form.

3	Monday--November 16, 2015	10:00am-12:00pm	Roy Anderson Recreation Center
2	Tuesday--November 17, 2015	6:30pm-8:30pm	Los Angeles County Arboretum
1	Saturday--November 21, 2015	10:00am-12:00pm	San Fernando Park

Please describe how you will promote your engagement meeting (select all that apply):

☑ Publicly posted notice
☐ Mailers
☑ Website
☑ Social Media
☑ Canvassing
☑ Television/Radio
☐ Other

Please describe your attendance goal (# of attendees): 100+

Please provide any additional details related to your action plan for engaging the community:

Will be attending the webinar training and will provide contract. Thank you.

The list of prioritized parks projects generated at the community engagement meeting is due to the County by **February 29, 2016**.

Zulema Renteria

From: Loretta Quach <LQuach@parks.lacounty.gov>
Sent: Wednesday, April 29, 2020 4:17 PM
To: Zulema Renteria
Subject: Re: Follow Up on Remaining Parks Information

I'm so sorry for the delay!

I had sent Hunt some information of other projects in the area. I don't know if he forwarded it to you. It's just the Los Valles Project:

iStar/Los Valles is providing a 5.28 net-acre Public Park. They are not providing any other public parks for their project, but they are also providing a Trail Rest Area. The park will contain the following improvements:

- Parking Lot
- Restroom Building
- Children's Play Areas (Ages 2-5 and 5-12)
- Group Picnic Shelter
- Basketball Court
- Walking Path
- Benches
- Open Turf Play Area
- Landscaping
- Signage

The Tentative Tract Map was approved February 5, 2019. They need to record their final map by October 31, 2020, so they should be working with us soon for the Park Development Agreement and then we can start working on the Design Development and Construction Documents. I don't have a timeline for construction, but it will probably be a while.

I asked our team about any other projects nearby and they're just deferred maintenance projects. Nothing big.

I'm still waiting for information about our parks adequately meeting the project site's current demand. I'll check in with the Parks staff again.

Thanks,

Loretta Quach
Tel. (626) 588-5305 | Fax (626) 458-8346
lquach@parks.lacounty.gov

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From: Zulema Renteria <zrenteria@meridianconsultantsllc.com>
Date: Wednesday, April 29, 2020 at 4:10 PM
To: Loretta Quach <LQuach@parks.lacounty.gov>
Subject: Follow Up on Remaining Parks Information

CAUTION: External Email. Proceed Responsibly.

I hope you are doing well. Excuse my email so late in the afternoon, but I wanted to touch base and see if you had heard back about the remaining parks information? I know it is an uncertain time, so I understand the wait in response time. Please get back to me whenever time permits. As always, I look forward to connecting with you.

Happy Wednesday!

Thanks,

Zulema Renteria
Staff Planner

Promoting sustainable stewardship of our communities and natural resources by providing strategic and innovative consulting services and solutions.

706 South Hill Street, 11th Floor
Los Angeles, California 90014

Office – (213) 335-3434
Direct – (213) 335-5303

Website: www.meridianconsultantsllc.com

Zulema Renteria

From: Loretta Quach <LQuach@parks.lacounty.gov>
Sent: Wednesday, May 20, 2020 2:10 PM
To: Zulema Renteria
Subject: Re: Follow Up on Remaining Parks Information
Attachments: StudyArea_091.pdf

Hi Zulema,

Apologies for the delay. Below are the answers to the remaining questions

- Are these parks and recreational facilities adequately meeting the Project site's current demand for parks and recreational facilities?
    - Our North Agency Deputy Director said to refer to the Park Needs Assessment (Attached)
- Does the Department have any plans to develop new parks or recreational facilities or expand existing parks or recreational facilities within a 10-mile radius of the Project site?
    - The Department has just been working on deferred maintenance for existing parks/recreational facilities
    - iStar/Los Valles is providing a 5.28 net-acre Public Park. This is currently proposed on their Tentative Tract Map and Final Map. The Department has not started on Construction Documents and we have not received a tentativee timeline for construction. The park will contain the following improvements:
        - Parking Lot
        - Restroom Building
        - Children's Play Areas (Ages 2-5 and 5-12)
        - Group Picnic Shelter
        - Basketball Court
        - Walking Path
        - Benches
        - Open Turf Play Area
        - Landscaping
        - Signage

I hope this is enough information for you to use. Feel free to let me know if you have any other questions.

Thank you,

Loretta Quach
Tel. (626) 588-5305 | Fax (626) 458-8346
lquach@parks.lacounty.gov

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From: Zulema Renteria <zrenteria@meridianconsultantsllc.com>
Date: Wednesday, April 29, 2020 at 4:20 PM
To: Loretta Quach <LQuach@parks.lacounty.gov>
Subject: RE: Follow Up on Remaining Parks Information

CAUTION: External Email. Proceed Responsibly.

Great! No worries! I'm glad that you were able to get some more information. Please keep me updated about the remaining information. Have a great rest of your week, Loretta!

Thanks,

Zulema Renteria
Staff Planner

Meridian Consultants

Promoting sustainable stewardship of our communities and natural resources by providing strategic and innovative consulting services and solutions.

706 South Hill Street, 11th Floor
Los Angeles, California 90014

Office – (213) 335-3434
Direct – (213) 335-5303

Website: www.meridianconsultantsllc.com

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Sent: Wednesday, April 29, 2020 4:17 PM
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I'm still waiting for information about our parks adequately meeting the project site's current demand. I'll check in with the Parks staff again.

Thanks,

Loretta Quach
Tel. (626) 588-5305 | Fax (626) 458-8346
lquach@parks.lacounty.gov

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From: Zulema Renteria <zrenteria@meridianconsultantsllc.com>
Date: Wednesday, April 29, 2020 at 4:10 PM
To: Loretta Quach <LQuach@parks.lacounty.gov>
Subject: Follow Up on Remaining Parks Information

CAUTION: External Email. Proceed Responsibly.

I hope you are doing well. Excuse my email so late in the afternoon, but I wanted to touch base and see if you had heard back about the remaining parks information? I know it is an uncertain time, so I understand the wait in response time. Please get back to me whenever time permits. As always, I look forward to connecting with you.

Happy Wednesday!

Thanks,

Zulema Renteria
Staff Planner

Meridian Consultants

Promoting sustainable stewardship of our communities and natural resources by providing strategic and innovative consulting services and solutions.

706 South Hill Street, 11th Floor
Los Angeles, California 90014

Office – (213) 335-3434

APPENDIX M

Traffic Study

APPENDIX M.1

VMT Impact Analysis Memo

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

MARK PESTRELLA, Director

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100
http://dpw.lacounty.gov

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

REPLY PLEASE
REFER TO FILE: T-4

February 11, 2021

Mr. Daryl Zerfass
Stantec Consulting Services, Inc.
38 Technology Drive, Suite 100
Irvine, CA 92618-5312

Dear Mr. Zerfass:

STERLING RANCH ESTATES (VTTM 60257)
SUPPLEMENTAL VMT INFORMATION (DECEMBER 8, 2020)
UNINCORPORATED CASTAIC/VAL VERDE AREA

We reviewed the Supplemental VMT Information memo dated December 8, 2020, for the proposed Sterling Ranch Estates project (VTTM 60257). The project site is located in the unincorporated Castaic/Val Verde area.

Project Description

The project includes the construction of 222 single-family residential dwelling units, an approximately 21,000- square foot neighborhood retail commercial center, a 3.4-acre neighborhood park, and a smaller (0.2 acre) pocket park.

Supplemental VMT Information

The memo states the project elements described above will be developed according to the following groupings:

- First group of development includes 115 residential units identified in the project's site plan as Unit Phases 1 and 2.

- Second group of development includes the following:

    - 107 residential units identified in the project's site plan as Unit Phases 3 through 6.
    - 3.4-acre neighborhood park and 0.2-acre pocket park as part of the Unit Phase 3 development.

- 21,000-square-foot retail commercial center as part of the Unit Phase 6 development.

According to the memo, the development of the project elements under the groupings described above will reduce the project's Vehicle Miles Travelled as described in the VMT Impact Analysis dated November 23, 2020.

We generally agree with the findings in the Supplemental VMT Information memo. Consequently, the project's MM-1 described in the letter dated December 2, 2020, (copy enclosed) shall be revised as listed below:

MM-1: The project shall provide community wireless internet connection at the commercial retail and park sites to promote telecommuting.

The retail and community park components shall be developed as listed below.

- 3.4-acre neighborhood park and 0.2-acre pocket park as part of the Unit Phase 3 development.
- 21,000-square-foot retail commercial center as part of the Unit Phase 6 development.

The project applicant shall provide a Covenant and Agreement to Public Works for maintaining the community wireless internet connection prior to final map recordation.

The project applicant shall submit an Exhibit depicting location and function of wireless internet components to Public Works for review and approval prior to final map recordation.

Please note the revisions to MM-1 do not fully mitigate the impact of the residential component of the project. The project's Environmental Impact Report shall describe this significant and unavoidable transportation impact.

If you have any questions regarding the review of this document, please contact Mr. Jeffrey Pletyak of Traffic Safety and Mobility Division, at (626) 300-4776 or jplety@pw.lacounty.gov.

Very truly yours,

MARK PESTRELLA
Director of Public Works

for EMIKO THOMPSON
Assistant Deputy Director
Traffic Safety and Mobility Division

JFP:gg
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Enc.

bc: Land Development (Lasso, Suarez)

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

"To Enrich Lives Through Effective and Caring Service"

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
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MARK PESTRELLA, Director

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

December 2, 2020

REPLY PLEASE
REFER TO FILE: T-4

Mr. Daryl Zerfass
Stantec Consulting Services, Inc.
38 Technology Drive, Suite 100
Irvine, CA 92618-5312

Dear Mr. Zerfass:

STERLING RANCH ESTATES (VTTM 60257)
VEHICLE MILES TRAVELED (VMT) IMPACT ANALYSIS (NOVEMBER 23, 2020)
UNINCORPORATED CASTAIC/VAL VERDE AREA

We reviewed the Vehicle Miles Traveled (VMT) Impact Analysis dated November 23, 2020, for the proposed Sterling Ranch Estates project (VTTM 60257). The project site is located in the unincorporated Castaic/Val Verde area.

Project Description

The project includes the construction of 222 single-family residential dwelling units, an approximately 21,000 square foot neighborhood retail commercial center, a 3.4 acre neighborhood park, and a 0.2 acre pocket park.

Project Components

According to the VMT Impact Analysis, the project proposed the following improvements and/or programs, or equally beneficial and financially equivalent improvements and/or programs, approved by the Director of Public Works as part of the project features.

1) PC-1 & PC-2: The project shall include 222 single-family residential dwelling units, 21,000 square feet of locally serving retail, and community parks (3.4-acre neighborhood park, and a 0.2-acre pocket park) which shall be publicly accessible to the neighboring communities.

2) PC-3: The project shall construct a minimum 12 foot graded shoulders on all on-site public roadways which connect to existing public roadways.

3) PC-4: The project shall provide a private trail, the Sterling Horn Memorial Trail, which connect to the County's Del Valle Trail.

4) PC-5: The project shall dedicate a multiuse trail easement to the County, upon County's request, for the future off-site Del Valle Trail.

The above improvements and/or programs shall be shown on the tentative tract map.

Project's Transportation Impact

According to the VMT Impact Analysis, the residential component of the project will have a significant transportation impact in the North County area. The retail component of the project is less than 50,000 square feet and therefore is presumed to have a less than significant transportation impact. The community park component of the project generates less than 110 trips per day and therefore is presumed to have a less than significant transportation impact. We generally agree with the findings in the VMT impact analysis.

Mitigation of Project's Transportation Impact

According to the VMT Impact Analysis, the projects proposed the following improvement and/or programs to address the projects transportation impacts. However, the proposed improvements and/or programs do not fully mitigate the impact of the residential component of the project. Since the project's transportation impact is not fully mitigated, the project's applicant shall appropriately describe this significant and unavoidable transportation impact in the project's Environmental Impact Report (EIR).

1) MM-1: The project shall provide community wireless internet connection at the commercial retail and park sites to promote telecommuting. The retail and community park components shall be developed prior to the first residential unit. The project applicant shall provide a Covenant and Agreement to Public Works for maintaining the community wireless internet connection prior to final map recordation.
    - The project applicant shall submit building plans depicting location and function of wireless internet components to Public Works for review and approval prior to final map recordation.

2) MM-2: The project shall implement traffic calming measures at appropriate locations to develop low speed roadways for on-site streets and intersections, and encourage bicycle and pedestrian trips, prior to final map recordation.
    - The project applicant shall submit signing and striping plans and bonds for the improvements to Public Works for review and approval prior to final map recordation.

3) MM-3: The project shall implement a Class III bicycle facility on Del Valle Road from Hunstock Street to the project boundaries prior to final map recordation.
    - The project applicant shall submit signing and striping plans and bonds for the improvements to Public Works for review and approval prior to final map recordation.

4) MM-4: The project shall provide amenities to support the use Neighborhood Electric Vehicles (NEV) within the project boundaries prior to final map recordation. The NEV-related amenities shall include NEV parking and charging stations at the commercial retail center and community park. The project applicant shall provide a Covenant and Agreement to Public Works for maintaining the NEV amenities prior to final map recordation.
    - The project applicant shall submit signing and striping plans and bonds for the improvements related to NEV parking located within the public right of way to Public Works for review and approval prior to final map recordation.
    - The project applicant shall submit site plans for the improvements related to NEV parking and charging stations located within privately maintained areas to Public Works for review and approval prior to final map recordation.

5) MM-5: The project shall relocate an existing bus stop to a central location adjacent to retail and park use to increase transit coverage. The new bus stop shall include amenities to facilitate transit use such as shade structures, benches and bike racks.
    - The project applicant shall submit signing and striping plans and bonds for the improvements to Public Works for review and approval prior to final map recordation. Signing and striping plans shall also be approved by the City of Santa Clarita prior to final map recordation.

Project's Cumulative Transportation Impact

According to the VMT Impact Analysis, the project will not have a significant cumulative transportation impact in the North County area. We generally agree with these findings in the TIA.

Site Access Requirements

The project shall provide ingress and egress access for all driveways within the project boundaries.

Other Jurisdictions

We recommend the project applicant consult with the City of Santa Clarita and the California Department of Transportation regarding any potential transportation impacts within their jurisdictions.

If you have any questions regarding the review of this document, please contact Mr. Kent Tsujii of Traffic Safety and Mobility Division, at (626) 300-4776 or ktsujii@pw.lacounty.gov.

Very truly yours,

MARK PESTRELLA
Director of Public Works

EMIKO THOMPSON
Assistant Deputy Director
Traffic Safety and Mobility Division

EWI:la
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bc: Land Development (Lasso, Narag, Suarez)

Stantec Consulting Services Inc.
38 Technology Drive, Irvine CA 92618-5312

December 8, 2020
File: 2042570300

Attention: Mr. Jeff Pletyak
County of Los Angeles Department of Public Works
Traffic Safety and Mobility Division
900 South Fremont Avenue
Alhambra, CA 91803-1331

Dear Mr. Pletyak,

Reference: Supplemental VMT Information for Sterling Ranch Estates (VTTM 60257) Project

This memorandum addresses the implementation and timing of a VMT reduction mitigation measure to be implemented by the Sterling Ranch Estates (VTTM 60257) development (Project). This specific mitigation measure consists of providing free neighborhood Wi-Fi service within the publicly accessible spaces of the Project's community park and commercial retail center areas. As described in Mitigation Measure 1 (MM-1) of the Project's VMT Impact Analysis (Stantec, November 2020), this Wi-Fi will be available to residents of the Project as well as the residents of the greater community to facilitate the ability of residents to work remotely, thereby reducing commuter vehicle-miles.

As we discussed on December 3, 2020, the Project will be developed in unit phases, with the community park and the commercial retail center being constructed in the later unit phases of the development timeline when there would be a sufficient number of new residential units to support the community park and commercial uses. It is anticipated that the unit phasing would occur in two groupings, with the first grouping consisting of approximately 115 units (Unit Phases 1 and 2) and the second grouping consisting of the remaining 107 units (Unit Phases 3 through 6).

Construction of the community park represents an important step to provide a community where residents are able to work and play close to home without the need to drive a vehicle to leave the community. Construction of the community park will occur in the third unit phase of the residential development, which is expected to occur after completion of approximately the first 115 residential units. Therefore, a condition of approval is recommended to require rough grading of the community park prior to occupancy of the 116th residential unit, which is the start of Unit Phase 3. With this timing, the park can be constructed during Unit Phase 3 and the neighborhood Wi-Fi will be accessible to over one-half of Project residents when implemented, positively effecting the reduction of VMT.

Construction of the commercial retail center is anticipated to occur in Unit Phase 5 of Project development. While construction of the center is dependent on the purchase of the commercial lot by a commercial developer, and occupancy of the individual retail stores are dependent on the leasing of units to individual proprietors, the Project can facilitate the eventual occupancy of the commercial center by grading and preparing the lot such that it is ready for sale and development. Therefore, a condition of approval is recommended to require grading of the commercial lot prior to occupancy of the 194th residential unit, which

Reference: **Supplemental VMT Information for Sterling Ranch Estates (VTTM 60257) Project**

is the start of Unit Phase 6. With this timing, additional neighborhood Wi-Fi will be accessible to the community concurrent with the occupancy of the commercial retail center.

With the implementation of free neighborhood Wi-Fi concurrent with construction of the community park and commercial retail center in accordance with the recommended timing of development noted above, a long-term reduction in Project and community-wide VMT will occur as described in the Project's VMT Impact Analysis.

Regards,

Stantec Consulting Services Inc.

Daryl Zerfass PE, PTP
Principal, Transportation Planning & Traffic Engineering
Phone: 949 923 6058
Daryl.Zerfass@stantec.com

c. Kent Tsujii, LA Co. DPW Traffic Safety and Mobility Division
Raman Gaur, Sikand

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Stantec

Memo

To:	Hunt Williams Sterling Ranch Estates	From:	Daryl Zerfass and Sandhya Perumalla Stantec
File:	2042570300	Date:	November 23, 2020

Reference: Sterling Ranch Estates VMT Impact Analysis

Stantec Consulting Service Inc. (Stantec) has prepared a vehicle miles of travel (VMT) impact analysis for the proposed Sterling Ranch Estates (Project) located in unincorporated Los Angeles County within the Santa Clarita Valley. The Project is located west of the City of Santa Clarita within the Val Verde community (part of the Castaic Area Community Standards District (CSD)). See **Figure 1** for the Project location.

The Project includes the construction of 222 single-family residential dwelling units, an approximately 21,000-square foot neighborhood retail commercial center on 2.04 acres at the northwest corner of Chiquito Canyon Road and Hunstock Street, a 3.4 acre neighborhood park, and a smaller (0.2 acre) pocket park. While the Project is located within a suburban setting, the General Plan designation and zoning for the Project site is Urban. The purpose of this memo is to document the findings of the VMT impact analysis for use in the Project's environmental impact report (EIR).

This VMT analysis complies with the updated California Environmental Quality Act (CEQA) guidelines that incorporate the requirements of Senate Bill 743 (SB 743). SB 743 required the Governor's Office of Planning and Research (OPR) to establish guidelines under CEQA for identifying and mitigating VMT transportation impacts. Generally, SB 743 moves away from using delay-based level of service (LOS) as the metric for identifying a significant impact and instead uses VMT.

The analysis has been prepared in accordance with draft Transportation Impact Analysis (TIA) guidelines from the Los Angeles County Department of Public Works[1], information provided in the LA County Public Works Senate Bill 743 Vehicle Miles Traveled Metric Issue Briefing Sheet[2], and information from the LA County's SB 743 FAQ Brochure[3]. The final Technical Advisory released by OPR in December 2018[4] also provides guidance for evaluating transportation impacts and is also used as the basis for this assessment.

Project Screening

Per OPR's Technical Advisory recommendations, local agencies have the option to utilize screening criteria prior to conducting a full VMT analysis, to determine if a project will have a less-than-significant impact on VMT. The screening criteria utilized in this analysis is consistent with the screening criteria shown in the draft LA County TIA guidelines. OPR's Technical Advisory's recommended screening criteria is also utilized.

The screening criteria is based on factors that include project size, areas of low VMT, locally serving retail, transit proximity and affordable housing, as shown in **Table 1**.

[1] Draft Transportation Impact Analysis Guidelines, Los Angeles County Public Works, July 23, 2020.
[2] Senate Bill 743 – Vehicle Miles Traveled Metric Issue Briefing Sheet, Los Angeles County Public Works, March 10. 2020.
[3] Update to the County's Transportation Impact Analysis Guidelines in Compliance with Senate Bill 743, Los Angeles Public Works and Department of Regional Planning.
[4] Technical Advisory on Evaluating Transportation Impacts in CEQA, Governor's Office of Planning and Research, State of California, December 2018.

Table 1 Project Screening Criteria and Threshold

Category	Criteria/Screening	Threshold
Non-Retail Trip Generation Screening	Small non-retail projects can be screened out from completing a full VMT analysis.	If the Project generates less than 110 trips per day, which allows up to 11 single family units, 16 multi-family condo/apartment units, 10,000 square feet of office, or 15,000 square feet of industrial, is assumed to have a less than significant impact.
Retail Project Site Plan Screening	Retail projects that are locally serving can be screened out from completing a full VMT analysis.	A project that proposes locally serving retail uses that are 50,000 square feet or less.
Transit Proximity Screening	Projects within ½ mile of a major transit stop or a stop located along a high-quality transit corridor generally reduce VMT and therefore can be screened out from completing a full VMT analysis.	If the Project is within ½ mile of a major or high-quality transit stop/corridor, the Project is assumed to have a less than significant impact. The project should generally also meet the following criteria: - FAR >= 0.75 - Not provide more parking than required by Count - Be consistent with the regional SCS - Not replace existing affordable units with a smaller number of moderate to high-income units
Residential Land Use Based Screening	Affordable housing in infill locations can be screened out from completing a full VMT analysis.	If the Project is comprised 100% of affordable units and is located in an infill location, then the Project is assumed to have a less than significant impact.

Non-Retail Project Trip Generation Screening – The Los Angeles County Public Works Traffic Safety and Mobility Division approved the Sterling Ranch Estates Traffic Impact Analysis that showed the volume of new daily trips generated by the Project is approximately 3,309 ADT[5]. Of the 3,309 ADT, the park use would generate a nominal volume of daily trips. Since the park use would generate less than 110 trips per day, the park use can be presumed to have a less than significant impact under this threshold. The residential and commercial uses would generate more than 110 trips per day and, therefore, those uses do not qualify as a small project.

Retail Project Site Plan Screening – A project that proposes locally serving retail uses that are 50,000 square feet or less is eligible to be screened out. The Project includes 21,000 square feet of retail uses that would be locally serving. For example, the commercial center would include businesses such as a small restaurant or cafe, a coffee shop, a small market or deli, mail services and/or a laundromat. Since the retail uses would be locally serving, the retail component of the Project can be presumed to have a less than significant impact under this threshold.

Transit Proximity Screening – A project can be screened out as having a less than significant impact on VMT if the project is within ½ mile of a rail station or bus stop that provides service at least every 15 minutes

[5] Sterling Ranch Estates (VTTM 60257) Traffic Impact Analysis, Stantec Consulting Services Inc., July 18, 2019.

during peak commute periods. Based on this definition, the Project would not be eligible to be screened out under this threshold since it is not within a half-mile of either type of transit facility.

Residential Land Use Based Screening – The Project is not comprised 100% of affordable housing in an infill area, so this screening threshold does not apply.

VMT Analysis Performance Criteria

At the time of analysis, Los Angeles County has not adopted a formal methodology but has released draft significance criteria for use in VMT analyses of this type. The County is also in the process of developing a VMT tool and preliminary data from that tool was obtained from County staff and is included in this analysis. This analysis utilizes the County's draft significance thresholds and VMT metrics as shown in Table 2 and Table 3. Specifically, the residential component of the Project is evaluated based on household VMT per capita and a threshold of significance of 16.8 percent lower than the regional average household VMT per capita. The Department of Public Works has divided the County into a North region and a South region for the purpose of VMT analysis and the Project is located within the North region. The retail portion of the Project is evaluated based on it being locally serving retail and has been screened out from further analysis as noted above. The park portion of the Project is similarly locally serving.

This VMT analysis utilizes VMT data from the Southern California Association of Governments (SCAG) travel demand model, as well as refinements made using data from the California State Transportation Demand Model (CSTDM). The County is in the process of developing detailed SCAG model data suitable for analyses of this type, however, the final VMT statistics from the SCAG model are not available at the time of this analysis. The CSTDM is maintained by Caltrans and is an alternative source of travel demand model data with published and available VMT statistics for the Project area. The CSTDM is a traditional travel demand forecasting model in the same general category of traffic forecasting models as is the SCAG travel demand model. Both models were developed for the primary purpose of forecasting roadway volumes. The CSTDM was determined to the be the most appropriate model to use for this analysis since the final VMT statistics from the County's refined SCAG model are not yet available at this time. Caltrans has made VMT data from the CSTDM readily available for use in SB 743 VMT impact assessments, and case studies from OPR utilized CSTDM VMT data for SB 743 VMT impact analysis[6]. Preliminary VMT data from the County's SCAG model-based VMT tool is also included in this analysis for comparative purposes.

Quantification methodologies from California Air Pollution Control Officers Association (CAPCOA) are utilized to estimate VMT reductions from project components and mitigation measures.

For a residential development, the metric used by the County is residential VMT per capita and the County's draft recommended threshold of significance is 16.8% less than existing regional average household VMT per capita. The County has established baseline VMT metrics by region, North County and South County. Since the Project is in the Santa Clarita Valley, the North County threshold is applicable to this analysis. Detailed zonal VMT estimates from the CSTDM were refined for consistency with the version of the SCAG traffic model that the County used to develop these numerical thresholds of significance, and the refined CSTDM

[6] Revised Proposal on Updates to the CEQA Guidelines on Evaluating Transportation Impact in CEQA, Governor's Office of Planning and Research, January 20, 2016.

zonal data is referred to herein as Adjusted CSTDM. **Table 2** summarizes the VMT metrics for the North County area.

Table 2 VMT Metrics for North County Area

Region	2020 Baseline Residential VMT/ Capita	2020 Baseline Employment VMT/ Employee
North County Baseline	20.9	16.4
North County Threshold (with 16.8% reduction)	17.4	13.7
Source: LA County Department Public Works TSM		

If a significant impact is identified utilizing the significance thresholds, mitigation must be identified.

VMT Analysis

As noted above, at the time of this analysis the County is still in the process of developing detailed VMT estimates by TAZ. Therefore, detailed zonal VMT estimates from the CSTDM have been calibrated to match SCAG model data (referred to herein as Adjusted CSTDM data) to allow for comparison to the County's established thresholds of significance, which were derived using the SCAG model. The Project is located in CSTDM TAZ 3614, and while CSTDM TAZ 3614 covers a large area, most of the land in TAZ 3614 is undeveloped and existing residential areas are generally located near each other, particularly within the Val Verde community. The specific area covered by CSTDM TAZ 3614 is covered by three smaller SCAG TAZs. The Project is located within the existing Val Verde residential community and would exhibit the same trip-making characteristics as does the existing residential community.

To adjust the CSTDM zonal VMT estimates for consistency with the SCAG traffic model's VMT estimates for the Santa Clarita Planning Area, VMT data from CSTDM was tabulated for the entire Santa Clarita Planning Area. Next, the CSTDM home-based (HB) VMT per capita data for the Santa Clarita Planning Area was compared to the SCAG HB VMT per capita for this same area. The comparison indicates that the SCAG VMT per capita for the Santa Clarita Planning area is 28% higher than the CSTDM data. Therefore, a factor representing a 28% increase was applied to each CSTDM zone, which results in a CSTDM VMT total for the planning area that is equal to the SCAG VMT total. With this method of factoring, specific adjustments to trip generation or trip lengths are not applicable. **Table 3** shows the Adjusted CSTDM VMT estimates.

Table 3 Adjusted CSTDM Calculations

Description	CSTDM HB VMT per capita[1]	SCAG HB VMT per capita[2]	Adjusted CSTDM HB VMT per capita
CSTDM TAZ 3614	26.8	NA	34.2
Santa Clarita Planning Area	18.9	24.1	24.1
Sources: [1]Caltrans VMT Impact Assessment [2]LA County Department of Public Works Notes: SCAG 24.1 HB VMT per capita / CSTDM 18.9 HB VMT per capita = 1.28 CSTDM 26.8 HB VMT per capita x 1.28 = 34.2 Adjusted CSTDM HB VMT per capita HB = Home-based; NA = Not applicable			

Reference: **Sterling Ranch Estates VMT Impact Analysis**

The Project is located in CSTDM traffic analysis zone (TAZ) 3614 (see attached **Figure 1**) and would generally exhibit the same VMT characteristics as existing neighboring communities, particularly the Val Verde community. For the residential portion of the Project, the adjusted HB VMT per capita for TAZ 3614 is compared against the North County Baseline average HB VMT per capita. The North County 2020 baseline HB VMT per capita is 20.9 VMT per capita, as indicated in **Table 2**. A 16.8% reduction is applied to existing baseline conditions resulting in a regional threshold of significance of 17.4 VMT per capita. The results are summarized in **Table 4** and is referred to as Method 1. As previously discussed, the County is in the process of developing a VMT tool. Preliminary data was obtained from County staff and is shown in **Table 4** as Method 2 and is provided for comparative purposes (See **Attachment B** for preliminary tool output sheet).

Table 4 VMT Analysis Summary

Description	Method 1 Home-Based VMT per capita	Method 2 Home-Based VMT per capita
Project		
Residential VMT	34.2[1]	24.4[2]
Regional Threshold		
North County Existing Baseline	20.9	20.9
North County Threshold of Significance (Existing Baseline with 16.8% reduction)	17.4	17.4
Difference (Project minus Regional Threshold of Significance)	+16.8	+7.0
Is Project above or below Regional Threshold of Significance?	Above	Above
Potential Significant Transportation Impact	Yes	Yes

[1] Adjusted CSTDM TAZ 3614
[2] Parcel number: 3271004013 SCAG TAZ 20224100
Method 1 based on Adjusted CSTDM data
Method 2 based on Preliminary County of Los Angeles VMT Tool data

Under Method 1, the adjusted existing average HB VMT per capita for CSTDM TAZ 3614 is 34.2 VMT per capita. Since 34.2 HB VMT per capita is more than the regional baseline with 16.8% reduction (17.4 VMT per capita), the Project has a potentially significant impact on VMT, and mitigation is required.

Under Method 2, the existing average HB VMT per capita for SCAG TAZ 20224100 is 24.4 VMT per capita. Since 24.4 HB VMT per capita is more than the regional baseline with 16.8% reduction (17.4 VMT per capita), the Project has potentially significant impact on VMT, and mitigation would be required similar to Method 1.

Cumulative Analysis

This cumulative analysis evaluates the long-term project effects on VMT. As noted in the County Guidelines, cumulative effects are determined through consistency with the SCAG Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS). Projects that are consistent with the RTP/SCS in terms of location, density and intensity would have a less than significant cumulative impact on VMT. The Project site is in the Santa Clarita Valley. The Santa Clarita Valley Area Plan was approved in 2012 and contains focused goals, policies, and maps to guide the regulation of development within the Santa Clarita Valley. The Project land use is consistent with the Land Use Policy Map from the Santa Clarita Valley Area Plan and

would therefore be consistent with the RTP/SCS. Since the Project is consistent with the RTP/SCS, the Project has a less than significant cumulative impact.

Project Components and Mitigation

As shown in the previously referenced **Table 4**, the Project's baseline VMT per capita is above the existing regional threshold of significance. Therefore, certain VMT reducing project components and mitigation measures to decrease the Project's VMT per capita to below the existing regional threshold are evaluated. To estimate the effectiveness of project components and mitigation measures that would reduce the Project's VMT, quantification methodologies from CAPCOA are utilized.

The Project has several project components that reduce VMT:

> **PC-1: The Project will include a mix of uses, including on-site locally serving commercial uses and a community park**. The inclusion of locally serving commercial retail and park uses increases diversity within this suburban setting. To quantify the Project's VMT reductions related to providing a mix of uses, CAPCOA LUT-3 Increase Diversity strategy was utilized. CAPCOA describes that "having different types of land uses near one another can decrease VMT since trips between land use types are shorter and may be accommodated by non-auto modes of transport."[7] The Project qualifies for this reduction as it is a project that has residential, commercial retail, and a park within a quarter mile of each other. Based on site acreage, the Project is approximately 90% residential, 4% commercial retail, and 6% park, which results in a Project VMT reduction calculation of 9.0% (See **Attachment A** for calculations). However, research utilized by CAPCOA identifies limitations to the total VMT reductions achievable for a Project by location. The maximum reduction for a project in a suburban setting is 5%. Therefore, the adjusted VMT reduction applicable to the Project is **5.0**%.
>
> **PC-2: The Project's commercial and park uses would divert trips made by the existing residential communities (i.e., Val Verde) and result in an external capture in which existing vehicle trips to farther commercial and parks will be replaced by shorter vehicle trips to the Project's commercial uses and community park**. The existing residential uses adjacent to the Project site currently must drive outside of the Val Verde community to obtain most services. Locating commercial retail and community park uses closer to existing residential uses would reduce neighborhood VMT. VMT reductions are calculated using CAPCOA's LUT-3 Increase Diversity quantification methodology for the Val Verde community since the Project will be increasing land use diversity. This analysis is based on approximately 700 residential units in the existing Val Verde community that will utilize the Project's commercial retail and park components, resulting in an overall community mix of 97% residential, 1% commercial, and 2% park, resulting in a neighborhood VMT reduction of 1.0% (See **Attachment A** for calculations). Based on this reduction in community VMT an equivalency to Project generated VMT can be estimated. The Val Verde community consists of approximately 700 existing residential units, which is approximately 3.15 times greater in size than the Project (222 units). The difference in population can also be considered similar in proportion, so on a per capita basis the reduction in Val Verde VMT is equivalent to 3.15 times less Project VMT on a per capita basis[8]. Therefore, an equivalent reduction to Project VMT is **3.2**% (1% x 3.15 = 3.2%).

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[7] Page 162 from Quantifying Greenhouse Gas Emissions, California Air Pollution Control Officers Association, August 2010.
[8] The existing Val Verde community is approximately 3.15 times larger than the Project (approximately 700 housing units vs. 222 units). If Val Verde VMT reduces by 1% (from 34.20 VMT/capita to 33.86 VMT/capita) that equates to 0.34 less VMT per capita. That VMT reduction is equivalent to reducing Project VMT by 1.07 per capita (3.15 x 0.34) since the Project is smaller than the

PC-3: The Project will improve pedestrian connectivity by constructing an on-site pedestrian network. The Project will also improve the existing off-site pedestrian network by filling in gaps for pedestrian connectivity. The Project will construct pedestrian improvements that are consistent with the Castaic Area CSD. The Project will construct graded shoulders that will facilitate pedestrian movements throughout the Project and connect to pedestrian improvements while still complying with CSD design requirements. The graded shoulders will link areas within the Project site and encourage residents to walk to the commercial retail center, the community park or walk for exercise around the existing community. The Project's pedestrian facilities will connect the existing communities where there is currently a gap. **Figure 4** shows where the Project will be providing linkages to the existing community and the cross sections show the graded shoulders. The Project will not build walls, landscaping, or slopes that impede pedestrian circulation. The Project will also fill in gaps, such as extending Del Valle Road to Chinquito Canyon Road and improvements along the Project frontage on Hunstock Avenue, that will aid in pedestrian circulation. To quantify the VMT reductions related to this site design feature, SDT-1 Improve Pedestrian Network from CAPCOA is utilized[9]. CAPCOA defines a suburban area as characterized by dispersed, low-density, single-use, automobile dependent land use patterns, usually outside of the central city, is typically 20 miles or more from a central business district and has limited bus service. Based on CAPCOA's definition of a suburban setting, the Project is considered to be in a suburban setting for the purpose of these calculations. Therefore, this measure would result in a Project VMT reduction of **2.0**%.

PC-4: The Project will provide a private trail, the Sterling Horn Memorial Trail, that will connect with the County's Del Valle Trail, as identified in the County's Regional Trail Plan. The Project's proposed Sterling Horn Memorial Trail will be ten feet in width along the southern portion of the Project site. The trail will provide a pedestrian connection between the Project site and off-site communities as well as attract people outside of the Project to utilize the trail, as opposed to driving to a further trail. CAPCOA has not quantified the VMT benefits of providing trails as a standalone measure. Therefore, this would result in a nominal Project VMT reduction.

PC-5: The Project will dedicate a multiuse trail easement to the County, upon request, for the future off-site Del Valle Trail. The Project's proposed multi-use trail would be a twenty-foot wide, located offsite, on a third party's property. The off-site trail would be a variable-width (five-foot to eight-foot wide), a natural soil surface trail within a twenty-foot dedication. An easement for the off-site grading from the adjacent owner has been obtained for this work, including the agreement to dedicate easements to the County upon request. CAPCOA has not quantified the VMT benefits for land dedication as a standalone measure. Therefore, this would result in a nominal Project VMT reduction.

The following mitigation measures would be applicable to this Project:

MM-1: The Project will provide community wireless internet (Wi-Fi) connection at the commercial retail and park sites to promote tele-commuting (tele-work). Statistics from the American Community Survey 2018 5-year Estimates "Means of Transportation Table" was used to estimate the number of employees that currently 'worked at home' in this area. The 'worked at home' category includes self-employed (home-based business owners) and those that are wage and salary

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existing Val Verde community. This can be demonstrated as follows: 700 DU x 3 persons/DU x -0.34 VMT/person = -714 VMT (Val Verde), and 222 DU x 3 persons/DU x -1.07 VMT/person = -713 VMT (Project).

[9] Page 186 from Quantifying Greenhouse Gas Emissions, California Air Pollution Control Officers Association, August 2010.

employees that telecommute/telework (employees that conduct some or all of their work from home or remotely). The Project is located in Census Tract 9201.06, which includes the existing Val Verde Community and a portion of the Hasley Canyon Community. Approximately 2.4% of survey respondents reported that they worked at home[10]. This means that under existing conditions, 2.4% of households do not drive to get to work. As a conservative estimate, when the self-employed are separated out, it is assumed for the purpose of this analysis that approximately 1.0% telecommute. In comparison, SCAG Connect SoCal (2020 RTP/SCS) reports that 5.67% of employees in the SCAG region 'worked at home'. Of those, it is estimated that 2.9% telecommute (excluding self-employed)[11]. The Project will provide free wi-fi connectivity at community areas, specifically the neighborhood commercial center and parks as shown in **Figure 5**. Residents of the Project and the local community would be able to utilize the free internet connection and shared spaces (i.e., benches, seating, tables) to conduct work-related activities. The Wi-Fi connectivity would be made available at central gathering areas and would be properly signed. A notice of availability (i.e., maps of Wi-Fi hot spots and how to connect using personal devices) would also be made available to the local community. The goal of this measure would be to increase the existing rate of 1% telecommuter/teleworkers to that of the SCAG regional rate of 2.9%. The increase in telecommuters would reduce commute trips and VMT. As shown in Appendix A, with the increased ability to telecommute, this measure would result in a Project VMT reduction of approximately **2.0**%.

MM-2: The Project will provide traffic calming measures such as marked crosswalks at appropriate locations for on-site streets and intersections. The Project roadways will be designed consistent with the Castaic Area CSD but in such a way to reduce motor vehicle speeds and encourage bicycle and pedestrian trips with traffic calming features such as low speed roadways, crosswalks at commercial and park areas, and graded shoulders that will allow pedestrian movements throughout the Project site. To quantify the VMT reductions related to providing traffic calming features, SDT-2 Provide Traffic Calming Measures from CAPCOA was utilized[12]. This would result in a nominal Project VMT reduction.

MM-3: The Project will not block or impede the future planned Class III bicycle facility on Del Valle Road. The County has identified Del Valle Road for a proposed Class III bicycle facility that will span from the proposed Class I (off-road) facility just south of the SR-126 Expressway (Santa Clara River) to Hasley Canyon Road[13]. The Class III facility will connect the existing Val Verde, Sloan Canyon, Hasley Canyon and proposed Sterling Ranch residential communities to the regional Los Angeles County bicycle network. The proposed Class III facility will run through the Project site and will encourage residents to ride their bikes to close destinations. CAPCOA has not quantified the VMT benefits for bicycle connectivity as a standalone measure (Existing and Future bicycle facilities are shown in **Figure 2**). Therefore, this would result in a nominal Project VMT reduction.

MM-4: The Project will provide amenities for neighborhood electric vehicles (NEV) at community locations (commercial and park). NEVs are classified in the California Vehicle Code as

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[10] Commuting Characteristics for Census Tract 9201.06 Los Angeles County, California, American Community Survey, United States Census Bureau, 2020.
[11] The share of telecommuters (not self-employed) is calculated using the same proportion of teleworkers per 2016 RTP/SCS that reported 5% 'worked at home' and, of those, 2.6% telecommuted.
[12] Page 190 from Quantifying Greenhouse Gas Emissions, California Air Pollution Control Officers Association, August 2010.
[13] Figure A-3 Los Angeles County Existing and Proposed Regional Trail Network, County of Los Angeles Trails Manual, County of Los Angeles, June 2013

a “low speed vehicle” and are ideal for short trips. NEVs would be allowed on the neighborhood streets where the posted speed limit is less than 35 mph (i.e., would not be allowed on Sterling Parkway/Del Valle Road). **Figure 5** shows the routes that the NEVs would be able to utilize to get around the neighborhood and where additional signage would be provided where crossing Sterling Parkway/Del Valle Road. The Project will provide designated NEV parking, charging stations, signage, at the commercial and park areas. The Project will also provide educational tools. CAPCOA quantifies VMT reductions for implementation of a NEV network. Since the Project is providing amenities to encourage NEV usage, the Project is assigned the lowest penetration rate of 0.04 per household. This results in a Project VMT reduction of **0.5**%

MM-5: The Project will increase transit coverage and relocate an existing bus stop to a central location adjacent to retail and park uses. The Project will increase transit coverage since existing buses will benefit from the new roadway alignment, which is more direct and will reduce transit travel time. A nearby existing bus stop on Del Valle Road will be relocated to the proposed Sterling Ranch Parkway at a location in direct proximity to the proposed commercial retail and park uses. The new bus stop will be constructed with amenities to facilitate transit use such as shade structures, benches, and bike racks. CAPCOA has not quantified the VMT benefits for transit access improvement (as a standalone measure) and suggests that this measure be grouped with the Expand Transit Coverage (TST-3) measure. It is estimated that the Project will increase transit coverage by a conservative 10% increase, which results in a nominal Project VMT reduction. (Existing Transit facilities are shown in **Figure 3**).

As shown in **Table 5,** the combination of project components and mitigation measures would achieve an approximately 12.1% reduction in Project VMT. The 12.1% reduction in VMT includes project components and mitigation measures related to land use, neighborhood and site enhancements, and commute trip reduction. This reduction is consistent with the maximum reduction that generally can be achieved for a project located in a suburban setting, which is typically 15%[14].

Table 5 VMT Reductions Summary

Description	CAPCOA Category	Calculated Reduction
Project Components		
1. The Project will increase diversity and include a mix of uses	Land Use	5.0%
2. The Project’s retail and park uses would serve the existing residential communities resulting in an external capture	na	3.2%
3. The Project will construct an on-site pedestrian network and connect to off-site	Neighborhood/ Site Enhancement SDT-1	2.0%
4. The Project will provide a private trail	Neighborhood/ Site Enhancement	nom.
5. The Project will dedicate a multiuse trail easement to the County	Neighborhood/ Site Enhancement	nom.
Mitigation Measures		
1. The Project will provide community wireless internet (Wi-Fi) connection	na	2.0%

[14] Chart 6-2 Transportation Strategies Organization, Quantifying Greenhouse Gas Emissions, California Air Pollution Control Officers Association, August 2010.

2. The Project will provide traffic calming measures	Neighborhood/ Site Enhancement SDT-2	nom.
3. The Project will not block or impede the future planned bicycle facilities	Neighborhood/ Site Enhancement	nom.
4. The Project will provide amenities for NEVs	Neighborhood/ Site Enhancement SDT-3	0.5%
5. The Project will increase transit coverage	Transit System Improvements TST-3	nom.
Total		**12.1**[1]

na – not applicable
nom. – nominal
[1] The calculated reductions do not sum up total since each strategy are multiplicative and not additive.
Overall % VMT Reduction = 1-(1-A)*(1-B)*(1-C) where A, B, C equals reductions for individual strategies

Table 6 summarizes the resulting VMT per capita when the VMT reduction is applied.

Table 6 Project Level VMT Analysis Summary

Description	Method 1 Home-Based VMT per Capita	Method 2 Home-Based VMT per Capita
Regional Threshold		
North County Existing Baseline with 16.8% reduction	17.4	17.4
Project		
Residential VMT	34.2	24.4
Residential with Project Components and Mitigation (-12.1%)	30.1	21.4
Difference (Project minus Regional Threshold)	12.7	4.0
Is Project above or below Regional Threshold?	Above	Above
Significant Transportation Impact	Yes	Yes

As shown in **Table 6**, under Method 1, without consideration of the project components and proposed mitigation measures, the residential portion of the Project would generate approximately 34.2 VMT per capita. With consideration of the project components and proposed mitigation measures, the residential portion of the Project would generate approximately 30.1 VMT per capita.

The regional threshold for the North County area is 17.4 VMT per capita. As shown in **Table 6,** the Project's residential HB VMT per capita would be above the regional threshold even with implementation of all feasible mitigation measures.

Under Method 2, without consideration of the project components and proposed mitigation measures, the residential portion of the Project would generate approximately 24.4 VMT per capita. The Project's residential With consideration of the project components and proposed mitigation measures, the residential portion of the Project would generate approximately 21.4 VMT per capita. The Project's residential HB VMT per capita

Reference: **Sterling Ranch Estates VMT Impact Analysis**

would be above the regional threshold of 17.4 VMT per capita even with implementation of all feasibility mitigation measures.

Conclusion

A VMT impact analysis was conducted for the proposed Project. Based on the County's Draft TIA Guidelines, the Project would not meet the screening criteria and a VMT analysis is required. The VMT analysis under Method 1 showed that the Project would result in an average HB VMT per capita of 34.2. The regional threshold for the North County area is 17.4 HB VMT per capita. Therefore, since the Project would be above the regional threshold, the Project would result in a significant impact. Under Method 2, the Project would result in an average HB VMT per capita of 24.4 and would be above the regional threshold for the North County area of 17.4 HB VMT per capita.

Project components and mitigation measures are identified that would result in VMT reductions. The combination of project components and mitigation measures would result in an overall VMT reduction of 12.1 percent. With the VMT reduction, under Method 1, the Project would result in an average HB VMT per capita of 30.1. When compared to the regional threshold of 17.4 HB VMT per capita, the Project would be above the regional threshold even with implementation of all feasible mitigation measures. Under Method 2, the Project would result in an average HB VMT per capita of 21.4, which would be above the regional threshold of 17.4 HB VMT per capita even with implementation of all feasible mitigation measures.

While the Project is located within a suburban setting, the General Plan designation and zoning of the Project site is Urban. A 15% reduction is generally considered the maximum VMT reduction for a project in a suburban setting. In order to reduce the Project's VMT per capita to below the North County VMT threshold, more than a 15% reduction would be required, which according to CAPCOA, generally cannot be achieved. Nonetheless, all feasible Mitigation Measures have been identified for the Project. Therefore, the residential portion of the Project would have a significant and unavoidable impact on VMT.

The commercial retail component of the Project would be locally-serving retail, as it will serve the residential population of the Project and would provide local commercial retail services to the Val Verde community, which would otherwise need to travel further. Therefore, the commercial/retail portion of the Project would reduce existing VMT from the Val Verde community. Additionally, the size (21,000 square feet) is less than 50,000 square feet, which per OPR's Technical Advisory guidelines, is generally representative of locally serving. Therefore, per the screening criteria, the retail portion of the Project is presumed to have a less than significant impact on VMT. Similarly, the Project's community park would be locally serving, and would similarly result in a less than significant impact on VMT.

If you have any questions on the above material, please feel free to contact Daryl or Sandhya to discuss.

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Reference: **Sterling Ranch Estates VMT Impact Analysis**

Attachment:
Figure 1 Project Location Map
Figure 3 Existing and Future Bicycle Infrastructure
Figure 2 Transit Routes and Facilities
Figure 4 Pedestrian Connections
Figure 5 NEV Routes and WIFI Locations
Attachment A VMT Reduction Calculations
Attachment B TR 60257 Preliminary VMT Score from County VMT ToolFigure 4

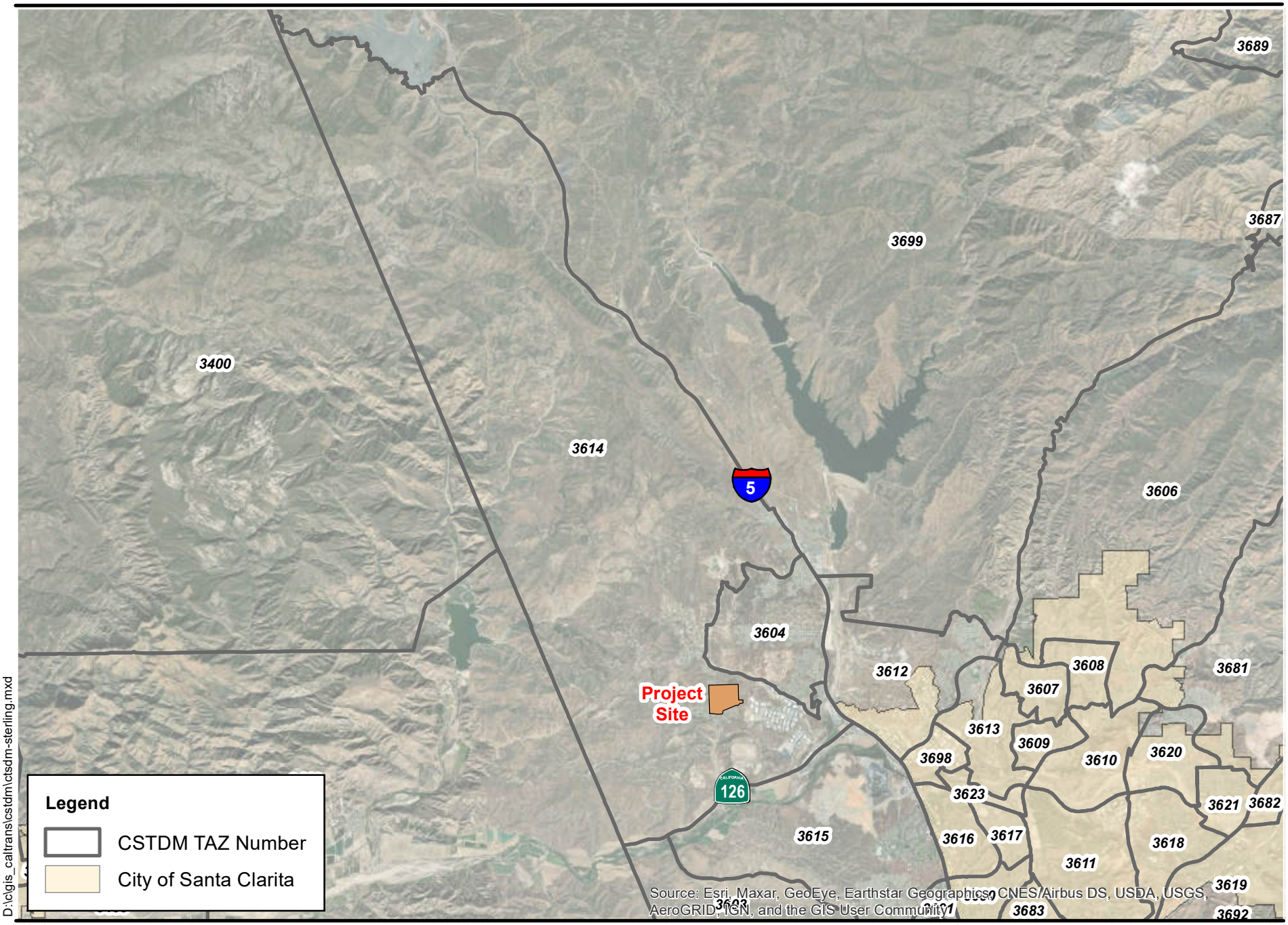

Figure 1
Project Location Map

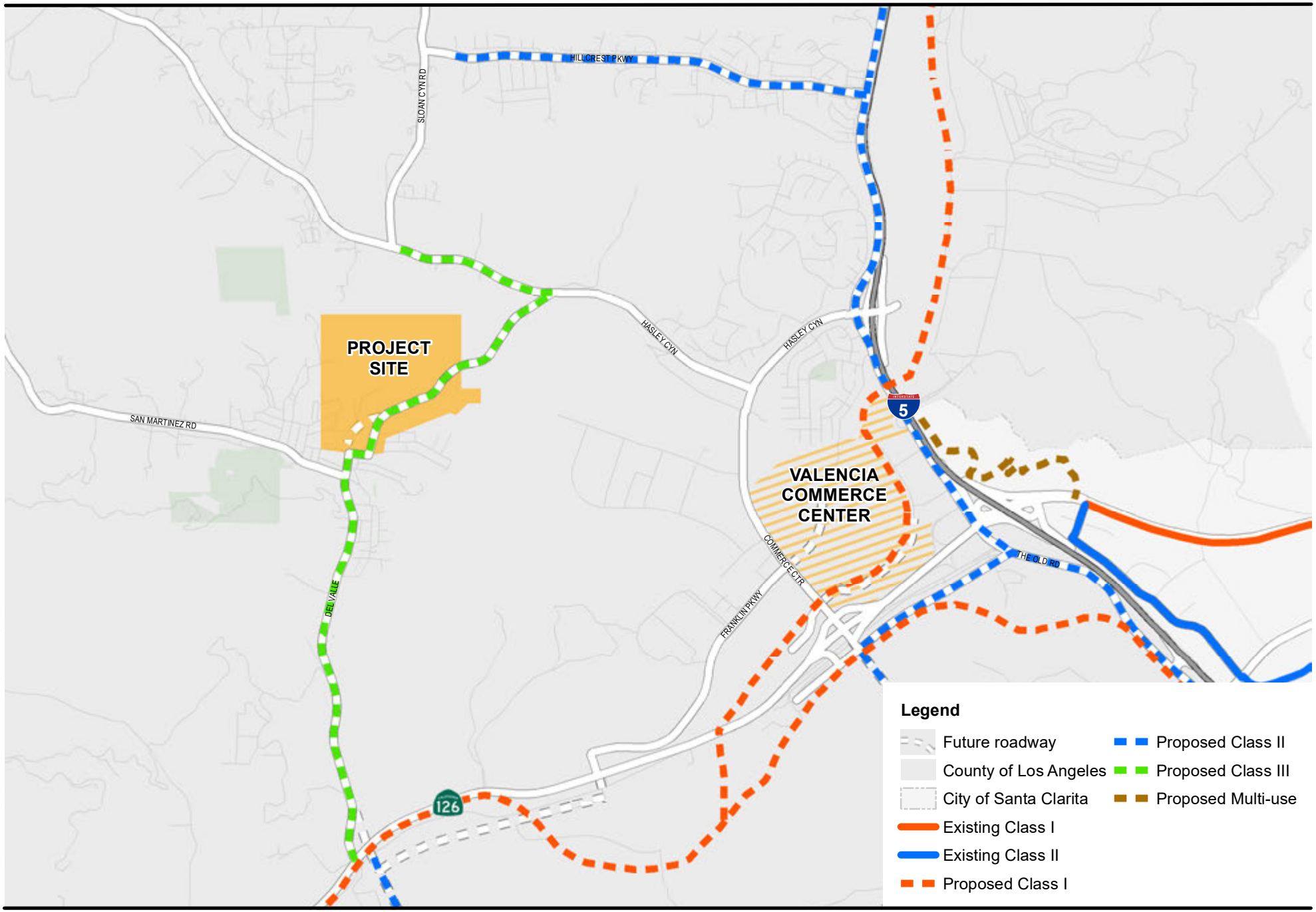

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Figure 2

Existing and Future Bicycle Infrastructure

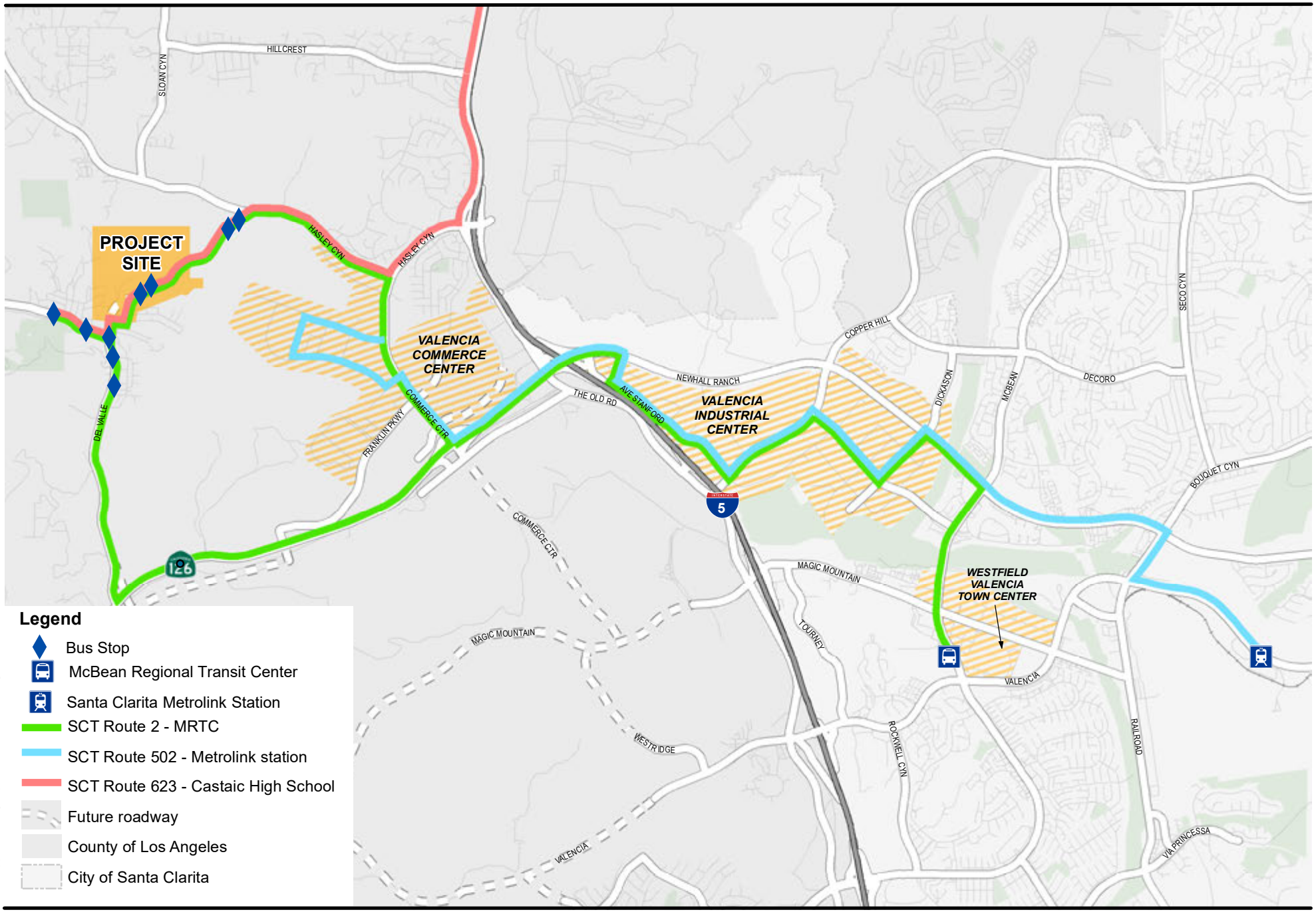

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Figure 3

Transit Routes and Facilities

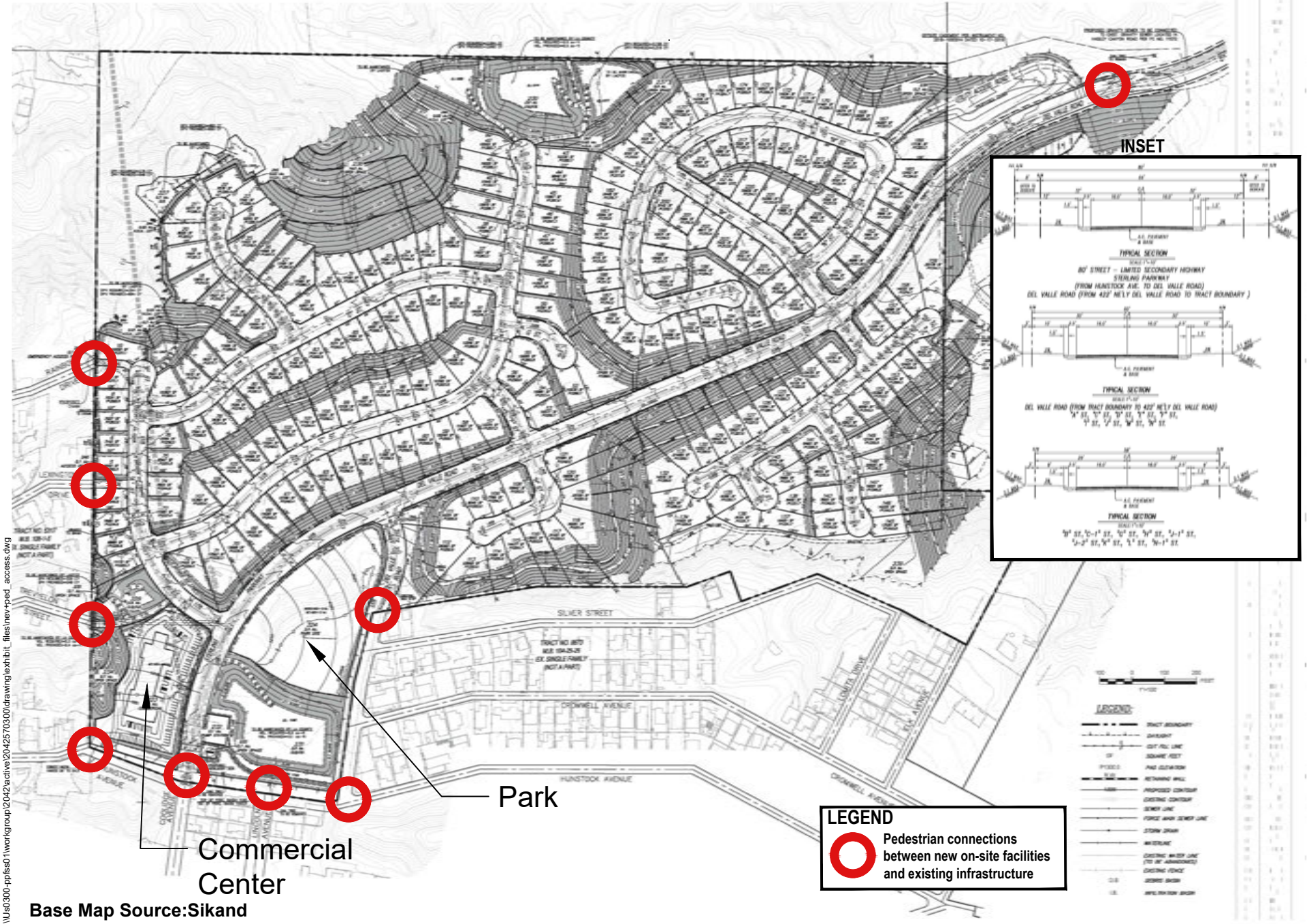
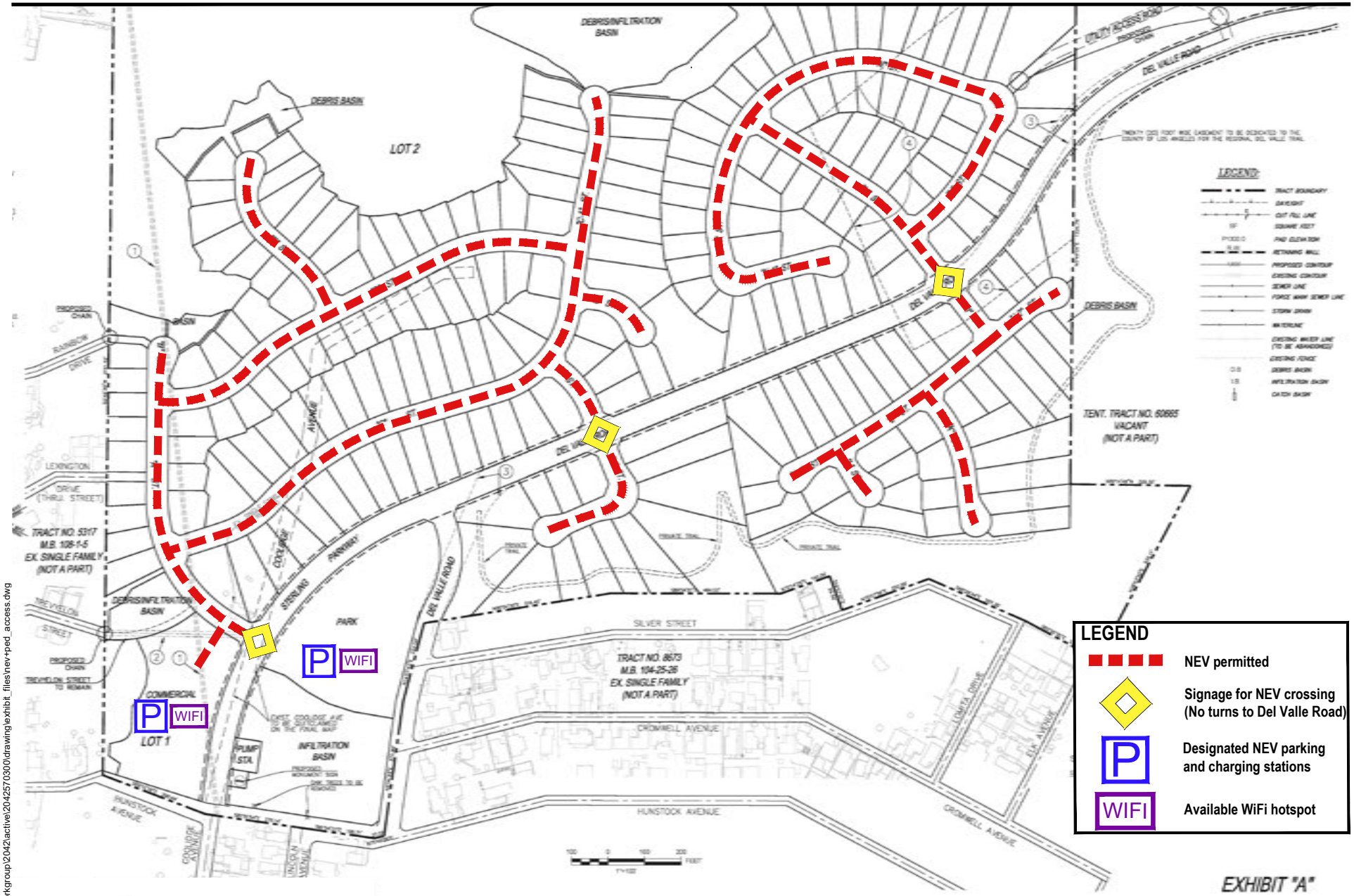


Figure 4

Pedestrian Connections to Existing Infrastructure



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Base Map Source: Sikand Engineering

Figure 5

NEV Routes and WiFi Locations

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Attachment A: VMT Reduction Calculations

Project Component #1: LUT-3 Increase Diversity (Project Only)

Inputs:
The following information needs to be provided by the Project Applicant:

- Percentage of each land use type in the project (to calculate land use index)

Mitigation Method:

% VMT Reduction = Land Use * B [not to exceed 30%]

Where

Land Use = Percentage increase in land use index versus single use development = (land use index – 0.15)/0.15 (see Appendix C for detail)

Land use index = -a / ln(6) (from [2])

$$a = \sum_{i=1}^{6} a_i \times \ln(a_i)$$

a_i = building floor area of land use i / total square feet of area considered

- a_1 = single family residential
- a_2 = multifamily residential
- a_3 = commercial
- a_4 = industrial
- a_5 = institutional
- a_6 = park

if land use is not present and a_i is equal to 0, set a_i equal to 0.01

B = elasticity of VMT with respect to land use index (0.09 from [1])

not to exceed 500% increase

Source: CAPCOA

Project = 90% Residential, 4% Commercial, and 6% Park

(assumes 57.9 acres residential, 2.5 acres commercial, 3.6 acres park)

Land use index = =-(0.9*LN(0.9)+0.04*LN(0.04)+0.06*LN(0.06)+3*0.01*LN(0.01))/LN(6) = 0.3

VMT reduction = (0.3-0.15)/0.15*0.09 = 9%

Per CAPCOA a 5% reduction is the maximum achievable for a Project in a Suburban setting

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Project Component #2: Increase Diversity for the Existing Community (External Capture)

Existing Residential + Project = 97% Residential, 1% Commercial, and 2% Park

(assumes 185.3 acres residential, 2.5 acres commercial, 3.6 acres park)

Land use index = =-(0.97*LN(0.97)+0.01*LN(0.01)+0.02*LN(0.02)+3*0.01*LN(0.01))/LN(6) = 0.16

VMT reduction = (0.16-0.15)/0.15*0.09 = 1%

Equation source: CAPCOA

Project Component #3: SDT-1 Improve Pedestrian Network

Mitigation Method:

Estimated VMT Reduction	Extent of Pedestrian Accommodations	Context
2%	Within Project Site and Connecting Off-Site	Urban/Suburban
1%	Within Project Site	Urban/Suburban
< 1%	Within Project Site and Connecting Off-Site	Rural

Source: CAPCOA

Mitigation Measure #2: SDT-2 Provide Traffic Calming Measures

Mitigation Method:

		% of streets with improvements			
		25%	*50%*	*75%*	*100%*
		% VMT Reduction			
% of intersections with improvements	*25%*	**0.25%**	**0.25%**	**0.5%**	**0.5%**
	50%	**0.25%**	**0.5%**	**0.5%**	**0.75%**
	75%	**0.5%**	**0.5%**	**0.75%**	**0.75%**
	100%	**0.5%**	**0.75%**	**0.75%**	**1%**

Source: CAPCOA

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Mitigation Measure #4: SDT-3 Implement a Neighborhood Electric Vehicle (NEV) Network

Inputs:

The following information needs to be provided by the Project Applicant:

- low vs. high penetration

Mitigation Method:

% VMT reduction = Pop * Number * NEV

Where

Penetration	=	Number of NEVs per household (0.04 to 1.0 from [1])
NEV	=	VMT reduction rate per household (12.7% from [2])

Assumptions:

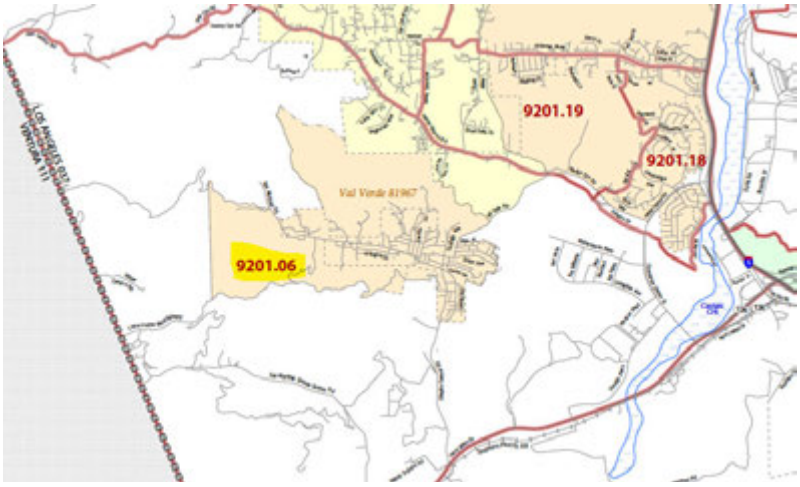
Data based upon the following reference:

[1] City of Lincoln, MHM Engineers & Surveyors, *Neighborhood Electric Vehicle Transportation Program Final Report*, Issued 04/05/05
[2] City of Lincoln, *A Report to the California Legislature as required by Assembly Bill 2353, Neighborhood Electric Vehicle Transportation Plan Evaluation,* January 1, 2008.

- Low Range % VMT Reduction (low penetration) = 0.04 * 12.7% = 0.5%

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Mitigation Measure #1: Provide Community Wi-Fi to Encourage Telecommute/Telework



Census Tract 9201.06, Los Angeles County, California

	Total		Male	
	Estimate	Margin of Error	Estimate	Margin of Erro
Workers 16 years and over	1,779	+/-181	1,066	
MEANS OF TRANSPORTATIO				
Car, truck, or van	91.8%	+/-3.5	92.7%	
Drove alone	74.5%	+/-5.4	74.6%	
Carpooled	17.3%	+/-5.0	18.1%	
In 2-person carpool	15.8%	+/-4.9	17.0%	
In 3-person carpool	1.0%	+/-1.1	1.1%	
In 4-or-more person ca	0.4%	+/-0.5	0.0%	
Workers per car, truck, or	1.11	+/-0.03	1.11	
Public transportation (excl	3.3%	+/-2.1	2.1%	
Walked	0.0%	+/-1.9	0.0%	
Bicycle	1.5%	+/-2.1	2.4%	
Taxicab, motorcycle, or oth	1.1%	+/-0.9	1.9%	
Worked at home	2.4%	+/-1.7	0.9%	

	Total	
	Estimate	Margin of Error
HOUSEHOLDS		
Total households	922	+/-43

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Mitigation Measure #1: Provide Community Wi-Fi to Encourage Telecommute/Telework

MEANS OF TRANSPORTATION TO WORK BY CLASS OF WORKER
Survey/Program: American Community Survey
TableID: B08128
Product: 2018: ACS 5-Year Estimates Detai
Universe: Workers 16 years and over

Label	Census Tract 9201.06, Los Angeles County, California: Estimate	Margin of Error
Total:	1,779	±181
Private for-profit wage and salary workers:	1,328	±168
Private not-for-profit wage and salary workers	84	±41
Local government workers	164	±72
State government workers	40	±29
Federal government workers	20	±17
Self-employed in own not incorporated business workers	143	±60
Unpaid family workers	0	±12
Car, truck, or van - drove alone:	1,326	±167
Car, truck, or van - carpooled:	307	±97
Public transportation (excluding taxicab):	58	±36
Walked:	0	±12
Taxicab, motorcycle, bicycle, or other means:	46	±39
Worked at home:	42	±29
Private for-profit wage and salary workers:	28	±22
Employee of private company workers	18	±16
Self-employed in own incorporated business workers	10	±13
Private not-for-profit wage and salary workers	0	±12
Local government workers	0	±12
State government workers	0	±12
Federal government workers	0	±12
Self-employed in own not incorporated business workers	14	±13
Unpaid family workers	0	±12

Source: United States Census Bureau (Accessed 7/24/2020)

In the SCAG region, about 5.0 percent of all workers telecommute or work from home on a daily basis according to the American Communities Survey (ACS). Separating out the self-employed, the number of full-time telecommuters in the SCAG region is closer to 2.6 percent percent for 2013. Currently, telecommuting is limited to "knowledge-based" workers including some management functions. However, knowledge based workers exist in most industries, allowing some occasional telecommuting.

Source: SCAG 2016 RTP/SCS

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Mitigation Measure #1: Provide Community Wi-Fi to Encourage Telecommute/Telework

TELECOMMUTING/WORK-AT-HOME/FLEXIBLE WORK SCHEDULES

Increasing the number of workers who work-at-home (self-employed, home-based business owners) or who telecommute/telework (wage and salary employees conducting some or all of their work from home or remotely) decreases home-based work trips, VMT, congestion, air pollution and GHGs.

Telecommuting/teleworking can be defined as working outside the traditional office or workplace, usually at home, but also remotely while traveling, at client/customer workplaces, libraries and other Internet accessible locations.

Flexible work schedules involve adjusting hours an employee works, for example working 7:00 to 3:30, or 10:00 to 6:30 instead of 9:00 to 5:30. It also includes 9/80 and 10/40 schedules where employees work nine, nine hour days a pay period or eight, 10 hour days per pay period.

According to the AQMD Rule 2202 Employee Commute Reduction Program (ECRP) data, roughly eight to nine percent of all workers in the South Coast Air Basin utilized a flexible work schedule in the last 15 years.

SCAG defines three types of **teleworkers** based on their home and primary work locations:

- **Self-employed home workers,** for whom home is their primary work location;
- **Remote employee home workers,** who work remotely from home and do not regularly commute to their firm's location; and
- **Telecommuters,** who are defined by one travel behavior characteristic on the teleworking day: they do not make a commute tour (i.e., a minimum of two trips that begin or end at home, with a stop at a regular work location in between these home ends).

According to the American Communities Survey, the percentage of employees who work from home in the SCAG region has grown from 2.64 percent in 1990 to 5.67 percent in 2017. The growth has been more pronounced since 2010, especially in the last few years.

Source: SCAG Connect SoCal 2020 RTP/SCS

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Assumptions:

- Per SCAG's Connect SoCal 2020 RTP/SCS 5.67% of employees "Worked at Home" in the SCAG region. Of those, 2.9% are full-time telecommuters. (assumes same proportion of teleworkers per 2016 RTP/SCS (.026/.05 = 0.52) therefore (0.52 x 0.567 = 0.29))
- Per ACS the current rate for the community area (Census Tract 9201.06) that "Work from Home" is 2.4%
- Per ACS the current rate for the community area that "Worked at Home", separating out the self-employed, is 1% full time telecommuters (per SCAG RTP/SCS methodology).
- Providing internet accessible locations (i.e., free WIFI at the retail center and park) encourage more employees in the community to telework and will help increase the community area telecommuting/telework levels (1%) closer to SCAG regional levels (2.9%). An increase of 1.9%.
- Assume a conservative 1% increase in telework instead of 1.9% that would bring telework levels to 2.9% SCAG regional levels

Step 1: Calculate the increase in employees that would telework in the community.

Census Tract 9201.06 total number of workers = 1,779

Census Tract 9201.06 total number of households = 922

Workers per household = 1779 / 922 = 1.93

Total additional community workers telecommuting = 1,779 workers x 1% = 18 workers

Step 2: Calculate the increase in employees that would telework in the Project.

Number of households = 222

Number of workers = 222 x 1.93 (based on existing census rate) = 428

Total Project workers that telecommuting = 428 x 1% = 4

Step 3: Calculate the increase in total number of teleworkers in the community and the Project. Calculate equivalent Project Commute VMT reduction.

Community + Project:

Total Project workers + Community workers = 18 + 4 = 22

Project Commute Equivalent

% Project Commute VMT reduction = 22 workers / 428 workers = 5.1%

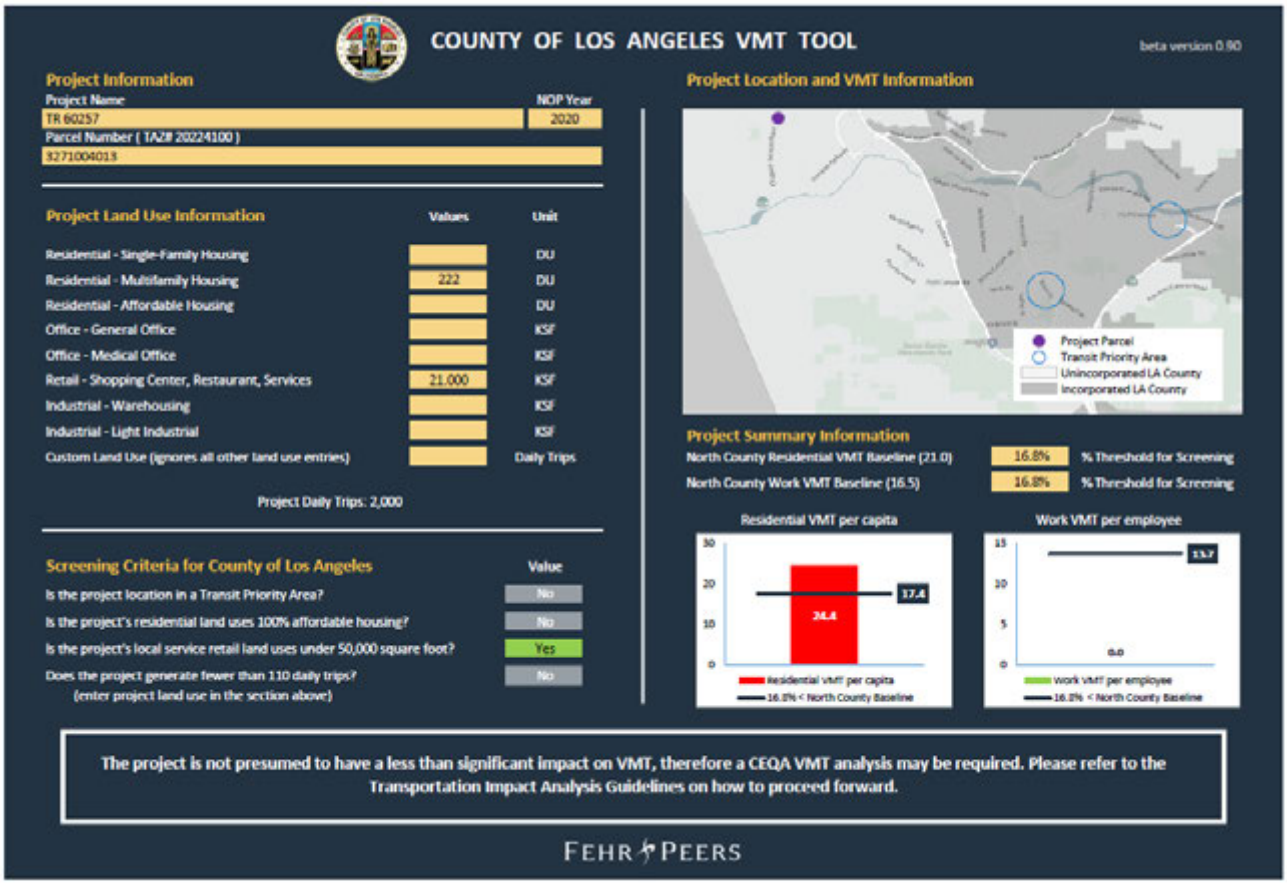
5.1% reduction in commute VMT

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Step 4: Convert commute VMT reduction % (HBW VMT) to total VMT reduction % (HB VMT) by calculating the proportion of HBW trips from all HB trips. HBW Trips = home-based work, commute trips HB Trips = All home-based trips, including commute trips (HBW) Caltrans CSTDM TAZ 3614 HBW VMT = 67,550 HBW VMT Caltrans CSTDM TAZ 3614 Total HB VMT = 174,445 HB VMT 67,550 HBW VMT / 174,445 HB VMT = 0.39 Therefore, 39% of all home-based trips are commute trips (HBW). **Step 5: Calculate total VMT reduction** % Total VMT reduction = .051 x .39 = .02 2% Home-based VMT reduction
Source: Caltrans CSTDM VMT data

Reference: **Sterling Ranch Estates VMT Impact Analysis**

Attachment B: TR 60257 Preliminary VMT Score from County VMT Tool



APPENDIX M.2

Traffic Impact Analysis

Sterling Ranch Estates (VTTM 60257)

Traffic Impact Analysis

Los Angeles County, California

July 23, 2019

Prepared for:

Sterling Ranch Estates

Prepared by:

Stantec Consulting Services Inc.

Sign-off Sheet

This document entitled Sterling Ranch Estates (VTTM 60257) Traffic Impact Analysis was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of Sterling Gateway, L.P. (the “Client”).

Prepared by

(signature)

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Senior Transportation Planner

(949) 923–6074

Reviewed by

(signature)

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Principal, Transportation Planning and Traffic Engineering

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Table of Contents

EXECUTIVE SUMMARY 1

1.0 INTRODUCTION 1.1
1.1 PROPOSED PROJECT 1.1
1.2 STUDY AREA 1.1
1.3 METHODOLOGY 1.1
1.4 PERFORMANCE CRITERIA 1.5
1.5 DEFINITIONS 1.7
1.6 REFERENCES 1.7

2.0 PROJECT DESCRIPTION 2.1
2.1 PROJECT TRIP GENERATION 2.1
2.2 PROJECT TRIP DISTRIBUTION 2.2
2.3 ON-SITE ROADWAY SYSTEM 2.2
2.3.1 Public Transportation 2.13
2.3.2 Active Transportation 2.13

3.0 TRAFFIC IMPACT ANALYSIS 3.1
3.1 EXISTING CONDITIONS 3.1
3.2 EXISTING CONDITIONS – WITH PROJECT 3.7
3.3 CUMULATIVE CONDITIONS ANALYSIS 3.7
3.4 MITIGATION 3.20
3.5 CONGESTION MANAGEMENT PROGRAM ANALYSIS (CMP) 3.23

4.0 CONCLUSION 4.1

LIST OF TABLES

Table 1-1 Level of Service Descriptions – Arterial Roadways and intersections 1.6
Table 1-2 Arterial Intersection Performance Criteria 1.8
Table 2-1 Trip Generation Summary 2.1
Table 2-2 Intersection LOS Summary – Project Site and Local Streets (2035 General Plan Buildout Conditions) 2.13
Table 3-1 Intersection LOS Summary – Existing 3.2
Table 3-2 Intersection LOS Summary – Existing Plus Project 3.8
Table 3-3 Cumulative Project List 3.13
Table 3-4 Intersection LOS Summary – Cumulative Conditions 3.19
Table 3-5 Mitigation Measures for Cumulative Impacts 3.22
Table 3-6 Intersection LOS Summary – Cumulative Conditions with Mitigation 3.24
Table 3-7 Transit Trip Summary 3.25
Table 4-1 Mitigation Measures 4.2

LIST OF FIGURES

Figure 1-1 Project Site Location 1.2
Figure 1-2 Project Site Plan 1.3

Figure 1-3 Commercial Site Plan 1.4
Figure 2-1 Master Plan of Highways 2.3
Figure 2-2 Project Trip Distribution – Residential 2.4
Figure 2-3 Project Trip Distribution – Commercial 2.5
Figure 2-4 Residential Project Trips – AM Peak Hour 2.6
Figure 2-5 Residential Project Trips – PM Peak Hour 2.7
Figure 2-6 Commercial Project Trips – AM Peak Hour 2.8
Figure 2-7 Commercial Project Trips – PM Peak Hour 2.9
Figure 2-8 Total Project Trips – ADT 2.10
Figure 2-9 Total Project Trips – AM Peak Hour 2.11
Figure 2-10 Total Project Trips – PM Peak Hour 2.12
Figure 2-11 Project Site Access (2035 General Plan Buildout Conditions) – AM Peak Hour Volumes 2.14
Figure 2-12 Project Site Access (2035 General Plan Buildout Conditions) – PM Peak Hour Volumes 2.15
Figure 2-13 Public Transportation 2.16
Figure 2-14 Existing and Future Bicycle Facilities 2.17
Figure 3-1 Existing Intersection Lane Configurations 3.3
Figure 3-2 Existing ADT Volumes 3.4
Figure 3-3 Existing Volumes – AM Peak Hour 3.5
Figure 3-4 Existing Volumes – PM Peak Hour 3.6
Figure 3-5 Existing Plus Project ADT Volumes 3.9
Figure 3-6 Existing Plus Project Volumes – AM Peak Hour 3.10
Figure 3-7 Existing Plus Project Volumes – PM Peak Hour 3.11
Figure 3-8 Related (Cumulative) Project Locations 3.15
Figure 3-9 Cumulative with Project ADT Volumes 3.16
Figure 3-10 Cumulative with Project Volumes – AM Peak Hour 3.17
Figure 3-11 Cumulative with Project Volumes – PM Peak Hour 3.18
Figure 3-12 Signal Warrant – Existing plus Project Conditions 3.21
Figure 3-13 Signal Warrant – Cumulative with Project Conditions 3.21

LIST OF APPENDICES

APPENDIX A ITE TRIP GENERATION DATA A.1

APPENDIX B TRAFFIC COUNTS B.1

APPENDIX C ICU CALCULATION WORKSHEETS C.1

APPENDIX D DELAY WORKSHEETS D.1

APPENDIX E PROJECT FAIR SHARE CALCULATIONS E.1

Executive Summary

This report, prepared by Stantec Consulting Services Inc. (Stantec), presents the findings of a traffic study carried out to determine the potential traffic impacts of the Sterling Ranch Estates Project, Vesting Tentative Tract Map (VTTM) 60257. The Project site is located in unincorporated Los Angeles County within the Santa Clarita Valley, northwest of the City of Santa Clarita within the Castaic/Val Verde Community. The Project site is accessed via Chiquito Canyon Road to the south and Del Valle Road to the north. It is divided roughly into two halves by the proposed extension of Chiquito Canyon Road (as Sterling Parkway) through the Project site along with the realignment of Del Valle Road within the Project site.

The Project includes the construction of 221 single-family dwelling units (DU), a 21,000-square foot neighborhood retail commercial center at the northwest corner of Chiquito Canyon Road and Hunstock Street, and a 3.1-acre neighborhood park. This traffic study complies with the County's thresholds of significance criteria, the methodologies of the California Department of Transportation (Caltrans), and the Los Angeles County Congestion Management Plan (CMP) requirements.

The Project would generate 3,309 average daily trips, with 204 trips occurring during the AM peak hour and 326 trips occurring during the PM peak hour. The Project trip distribution patterns were derived from the Santa Clarita Valley Consolidated Traffic Model (SCVCTM) and were applied to the peak hour trip generation estimates to produce the estimates of Project traffic.

The analysis in this report is based on traffic conditions for the following scenarios and evaluates the AM and PM peak hour settings for determination of Project impacts:

- Existing conditions – Without Project
- Existing conditions – With Project
- Cumulative Conditions – With Project

The extension of Chiquito Canyon Road (as Sterling Parkway) will provide access to the Project site and will include four new intersections with local roadways constructed within VTTM 60257.

The on-site and local street intersections that would be used to access the Project site were also evaluated under 2035 General Plan Buildout conditions using forecast peak hour turning movement volumes. Based on the analysis, the proposed on-site intersections would operate at an acceptable LOS.

The results of the Project impact analyses for Existing-plus-Project and for cumulative conditions with Project are summarized in detail in Chapter 3.0 of this report.

The Project's impacts will be less than significant at the study intersections under Existing-plus-Project conditions based on County or Caltrans impact criteria.

However, under cumulative with Project conditions the following intersections experience a cumulative significant impact based on the applicable LA County or Caltrans methodology prior to mitigation:

1. Chiquito Canyon Road & SR-126 (County/Caltrans)
4. Del Valle Road & Hasley Canyon Road (County)
5. Commerce Center Drive & Hasley Canyon Road (County)
6. The Old Road & I-5 SB Ramps at Sedona Way (County/Caltrans)
14. Wolcott Way & SR-126 (County/Caltrans)

Mitigation is identified for each of the above intersections which experience a cumulative impact. With mitigation, the cumulative impacts are less than significant. Note that the cumulative impacts at the Caltrans intersection 11, Commerce Center Drive and SR-126 WB Ramps, which is forecast to operate at LOS C using Caltrans methodology, will be less than significant based on Caltrans criteria and therefore mitigation is not required for that location.

The following intersections exceed an acceptable LOS based on the HCM methodology utilized by Caltrans for intersection analysis.

1. Chiquito Canyon Road & SR-126 (County/Caltrans)
6. The Old Road & I-5 SB Ramps at Sedona Way (County/Caltrans)
14. Wolcott Way & SR-126 (County/Caltrans)

Roadway improvements have been identified to mitigate the intersections that are significantly impacted under cumulative conditions. The identified mitigation measures and the Project's fair share of the mitigation cost are summarized in Table ES-1 on the following page.

A Congestion Management Program (CMP) analysis of the Project's traffic impacts on the CMP highway shows that the Project's impacts on the CMP monitoring locations or to transit would be less than significant.

Table ES-1 Cumulative Mitigation Measures and Project Fair-Share Percentages

Int #	Location	Mitigation	Project Traffic Share %
		County Intersections	
4	Del Valle Road & Hasley Canyon Road	Install traffic signal Intersection modification to provide one northbound left-turn lane, one northbound free-flow right-turn lane, and one westbound left-turn lane	18.6%
5	Commerce Center & Hasley Canyon Road	Intersection modification to restripe the eastbound shared left and through lane to a shared left, through and right lane (for 1EB Left, 1 shared EB Left/Through/Right and 1 EB Right)	10.3%
		County/Caltrans Intersections	
1	Chiquito Canyon Road & SR-126	Intersection modification to provide two southbound left-turn lanes, three southbound through lanes, one southbound right-turn lane (for 2 SB Left, 3 SB Through and 1 SB Right), two westbound left-turn lanes, three westbound through lanes, one westbound right-turn lane (for 2 WB Left, 3 WB Through and 1 WB Right), two northbound left-turn lanes, two northbound through lanes, two northbound right-turn lanes (for 2 NB Left, 2 NB Through and 2 NB Right), two eastbound left-turn lanes, three eastbound through lanes, one eastbound right-turn lane (for 2 EB Left, 3 EB Through and 1 EB Right). Install traffic signal[1]	1.2%
6	The Old Road & I-5 SB Ramps (at Sedona Way)	Intersection modification to add one southbound left-turn lane (for 2 SB Left and 2 SB Through)	0.6 %
14	Wolcott Way & SR-126	Intersection modification to provide two southbound left-turn lanes, one southbound through lane, one southbound right-turn lane (for 2 SB Left, 1 SB Through and 1 SB Right), two westbound left-turn lanes, four westbound through lanes, one westbound right-turn lane (for 2 WB Left, 4 WB Through and 1 WB Right), one northbound left-turn lanes, one northbound through lanes, two northbound right-turn lanes (for 1 NB Left, 1 NB Through and 2 NB Right), two eastbound left-turn lanes, four eastbound through lanes, one eastbound right-turn lane (for 2 EB Left, 4 EB Through and 1 EB Right)	0.9%

Note:
[1]Improvements identified in Caltrans SR-126 PSR
The Caltrans intersection of Commerce Center Drive and SR-126 WB Ramps is forecast to operate at LOS C and is not significantly impacted based on Caltrans methodology, therefore mitigation is not required for that location.
See Appendix D for fair-share calculations

1.0 INTRODUCTION

This report presents the findings of a traffic study conducted to evaluate the potential impacts of the Sterling Ranch Estates Project, Vesting Tentative Tract Map (VTTM) 60257. The Project site is located in unincorporated Los Angeles County within the Santa Clarita Valley, northwest of the City of Santa Clarita within the Castaic/Val Verde Community. Specifically, the Project site comprises an area immediately north of the existing Val Verde Community. The site is accessed via Chiquito Canyon Road and Del Valle Road. It is divided roughly into two halves by the proposed extension of Chiquito Canyon Road (as Sterling Parkway) along with the realignment of Del Valle Road.

1.1 PROPOSED PROJECT

The location of the Project site is shown in Figure 1-1. The Project includes the construction of 221 single-family dwelling units (DU), a 21,000-square foot neighborhood retail commercial center on 2.04 acres at the northwest corner of Chiquito Canyon Road and Hunstock Street, and a 3.1-acre neighborhood park. The Project site plan is illustrated in Figure 1-2 and a conceptual commercial site plan is illustrated in Figure 1-3.

1.2 STUDY AREA

The study area for the local roadway network is shown in the previously referenced Figure 1-1. The study area generally includes intersections and freeway ramps where the Project would add 50 or more trips during either the AM or PM peak hour.

1.3 METHODOLOGY

The traffic study evaluates the Project utilizing the established traffic analysis guidelines of the County of Los Angeles (See Reference 3 in Section 1.6). The scenarios analyzed are as follows:

1. Existing Conditions
2. Existing Plus Project Conditions
3. Cumulative Conditions with Project

The analysis addresses both the Existing plus Project scenario that assumes full buildout of the Project and the Cumulative Conditions scenario which includes buildout of the Project as well as the related projects in the proximity of the study area. Impact methodology for each setting is discussed in the next section.

The Santa Clarita Valley is a growing area with numerous proposed, approved and pending projects (i.e., “Related Projects”), and the Santa Clarita Valley Consolidated Traffic Model (SCVCTM) is utilized to forecast the complex interaction of vehicle trips between existing and these future land uses.

The SCVCTM was developed jointly by the County of Los Angeles Department of Public Works and the City of Santa Clarita and is the primary tool used for forecasting traffic volumes for the Santa Clarita Valley. The SCVCTM provides traffic volume forecasts for a long-range setting, which represents buildout conditions (generally considered as year 2035 or later as well as Interim Year forecasts that are based on a defined list of planned, approved, and pending

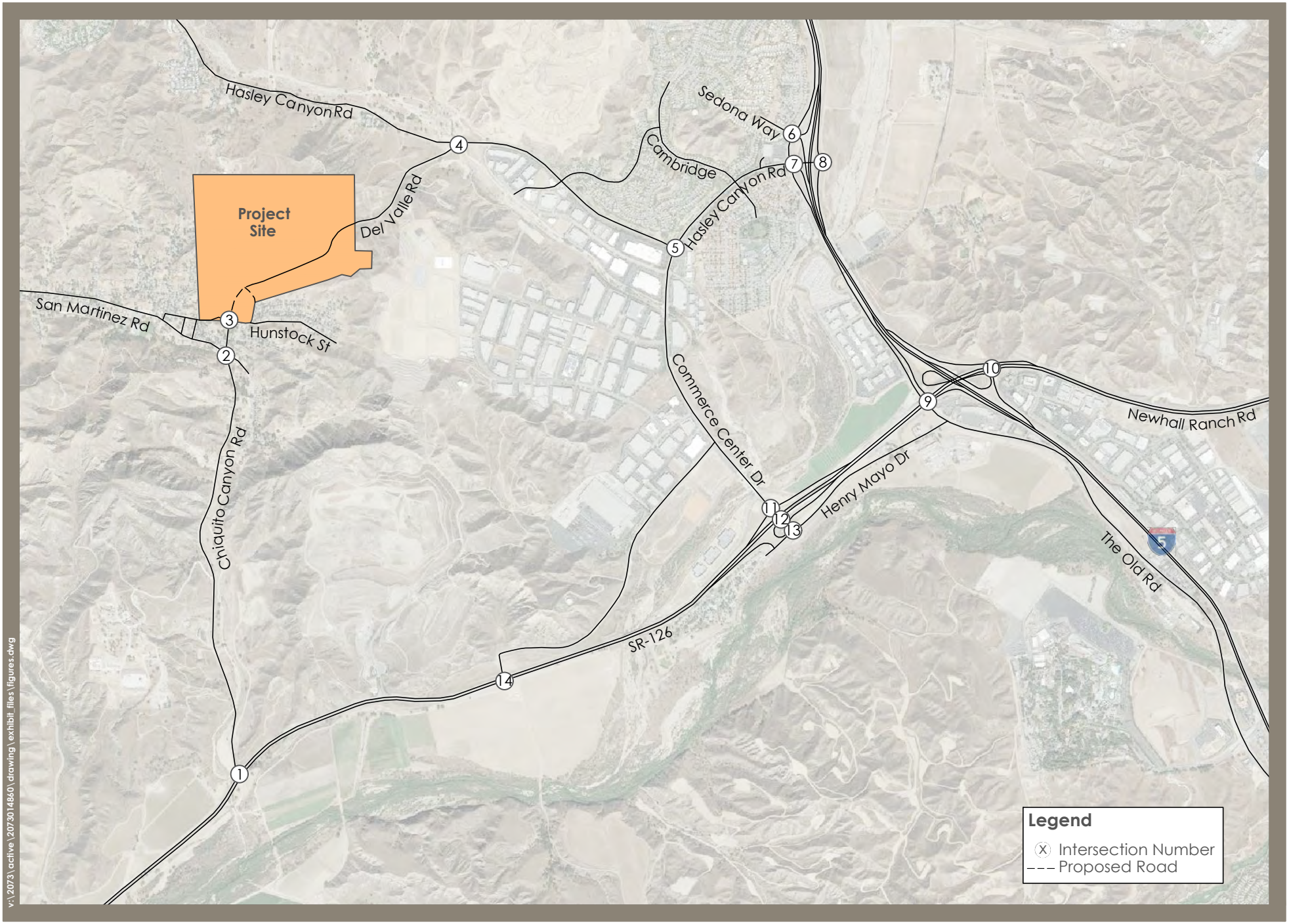

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Figure 1-1

Project Site and Study Area

1.2

LOT AREA SUMMARY

Lot No.	Gross Area (sq.ft.)	Frontage (ft.)
1	11,372	80
2	8,889	60
3	7,660	80
4	7,002	66
5	6,379	85
6	7,192	67
7	7,027	66
8	7,056	66
9	7,194	54*
10	10,558	44*
11	10,651	145
12	8,196	89
13	7,785	63
14	13,144	118
15	11,569	164
16	7,190	72
17	7,634	73
18	12,374	60
19	10,143	61
20	7,054	60
21	8,348	44*
22	7,139	30**
23	7,184	48*
24	8,462	67
25	10,036	96
26	12,932	79
27	12,597	68
28	11,480	66
29	10,030	83
30	10,243	67
31	10,180	71
32	7,065	60
33	7,064	61
34	7,434	60
35	7,118	64
36	10,122	65
37	8,963	82
38	8,618	67
39	7,700	65
40	7,073	67
41	7,048	100
42	9,731	41*
43	10,458	52*
44	10,718	65
45	12,418	62
46	10,533	66
47	11,907	70
48	13,093	71
49	14,196	72
50	16,205	69
51	16,646	79
52	19,172	65
53	8,693	40*
54	8,747	40*
55	20,140	126
56	12,145	80
57	11,407	60
58	10,146	80
59	10,067	63
60	10,036	65
61	11,395	65
62	13,088	96
63	11,915	71
64	12,073	71
65	12,107	75
66	12,196	78
67	11,628	76
68	12,532	67
69	13,689	63
70	17,578	63
71	17,407	128
72	11,616	116
73	9,722	76
74	8,587	78
75	8,808	75
76	7,594	66
77	7,838	64
78	7,529	72
79	7,980	66
80	7,583	78
81	7,168	70
82	7,106	70
83	7,271	70
84	7,456	65
85	8,061	65
86	10,054	65
87	10,077	77
88	10,137	81
89	8,753	79
90	10,059	86
91	13,246	118
92	17,026	91
93	10,382	93
94	10,888	61
95	11,149	61
96	11,537	60
97	11,947	61
98	12,120	60
99	12,051	61
100	11,740	62
101	11,602	61
102	11,024	66
103	10,498	65
104	11,576	65
105	11,869	61
106	15,568	153
107	18,028	82
108	7,709	60
109	8,240	61
110	11,522	40*
111	12,909	40*
112	23,502	40*
113	10,902	60
114	11,272	60
115	11,586	73
116	28,579	86***
117	51,735	86***
118	33,791	86***
119	40,089	118
120	12,455	96
121	10,420	68
122	10,734	64
123	11,343	60
124	11,268	62
125	12,263	60
126	12,622	81
127	12,860	63
128	13,323	63
129	21,490	46*
130	14,218	40*
131	7,935	40*
132	11,925	40*
133	9,198	51
134	8,529	54*
135	12,451	40*
136	8,405	48*
137	7,966	66
138	6,973	73
139	8,483	100
140	8,653	132
141	7,893	80
142	7,336	78
143	13,120	89*
144	14,235	66
145	19,021	69
146	22,625	60
147	12,198	60
148	8,263	75
149	8,205	63
150	15,390	58
151	16,336	63
152	12,493	60
153	8,303	62
154	9,765	84
155	8,842	66
156	14,965	50*
157	24,529	40*
158	10,158	85
159	8,238	68
160	8,808	73
161	7,916	69
162	7,973	70
163	15,806	66
164	57,136	81***
165	34,087	88
166	13,826	60
167	12,633	60
168	11,461	60
169	10,225	60
170	11,830	60
171	10,057	60
172	10,403	60
173	11,752	60
174	14,389	60
175	7,799	60
176	7,202	64
177	7,031	63
178	8,337	60
179	10,171	60
180	9,448	60
181	8,994	60
182	7,971	60
183	8,185	60
184	7,724	61
185	7,221	75
186	7,201	84***
187	7,336	84***
188	15,411	87***
189	10,589	64
190	10,352	60
191	10,017	63
192	10,164	72
193	13,060	219*
194	14,836	30**
195	7,485	72
196	7,318	84
197	7,018	84
198	7,029	70
199	8,139	65
200	10,588	100
201	10,003	93
202	10,040	104
203	8,813	108
204	8,293	70
205	12,573	348
206	8,543	87
207	8,293	80
208	7,699	75
209	7,028	64
210	7,455	85
211	7,796	66
212	7,975	79
213	7,967	76
214	7,935	72
215	7,236	72
216	7,006	72
217	10,160	104
218	9,023	104
219	10,102	87
220	10,065	61
221	11,311	60

Lot no.	Area (ac.)	Lot Use
222	2.5	Commercial
223	3.8	Recreation Center
224	0.2	
225	0.3	
226	0.6	
227	0.6	Debris Basin
228	0.6	
229	1.5	
230	0.5	
231	2.5	
232	0.3	Infiltration Basin
233	1.9	
234	0.2	Pump Station
235	0.1	
236	0.1	
237	0.06	Open Space
238	18.8	
239	0.2	
240	5.8	
241	0.3	
242	0.06	Access Road
243	0.05	

*CUL-DE-SAC
**FLAG LOT
***KNUCKLE

NOTE:
* THE GROSS AREA OF LOT 178 (1390 SQ.FT.) AND 192 (2290 SQ.FT.) SQUARE FOOTAGE ARE INCLUDING THE SQUARE FOOTAGE FOR SD AND SEWER EASEMENT.

EXHIBIT "A"

PREPARED FOR:
Sterling Ranch ESTATES
STERLING GATEWAY
3019 EAST MEADOWS DRIVE
PARK CITY, UTAH 84098
ATTN: HUNT WILLIAMS
(435) 901-3488

7	XX-XX-18	MISC REVISIONS SCM DATED 06-27-18			
6	5-8-18	MISC REVISIONS, AND SHEET 3, REDUCE TO SIX (6)			
5	2-13-18	MISC ADJUSTMENTS & ADDED ALT. A TO SHEET 2			
4	2-12-16	MISC LOT ADJUSTMENTS			
3	9-5-12	DEL ROUNDABOUTS, SHOW PARKING, LARGE LOTS, SEPTIC OPTION & CORRECT ST SECTIONS			
2	7-17-07	REVISED HUNSTOCK INTERSECTION			
1	3-27-07	REVISED LAYOUT TO MEET CASTAIC C.S.D. STANDARDS			
DRAWN: AS SHOWN	DATE: DATE AS	APPROVED BY:	JOB NO: 09-18-06	DWG NO: 3100-056-01	SHEET 2 OF 3

LEGAL DESCRIPTION
PORTION OF LOT A OF TRACT NO. 8599 M.B. 101-87-88

N

SIKAND Engineering | Planning | Surveying
15230 Burbank Blvd., Van Nuys, CA 91411
Tel: (818) 787-8550
Fax: (818) 901-7451
info@sikand.com

MAJOR LAND DIVISION
VESTING TENTATIVE TRACT NO. 60257
LOCATED IN THE UNINCORPORATED TERRITORY OF THE COUNTY OF LOS ANGELES, STATE OF CALIFORNIA

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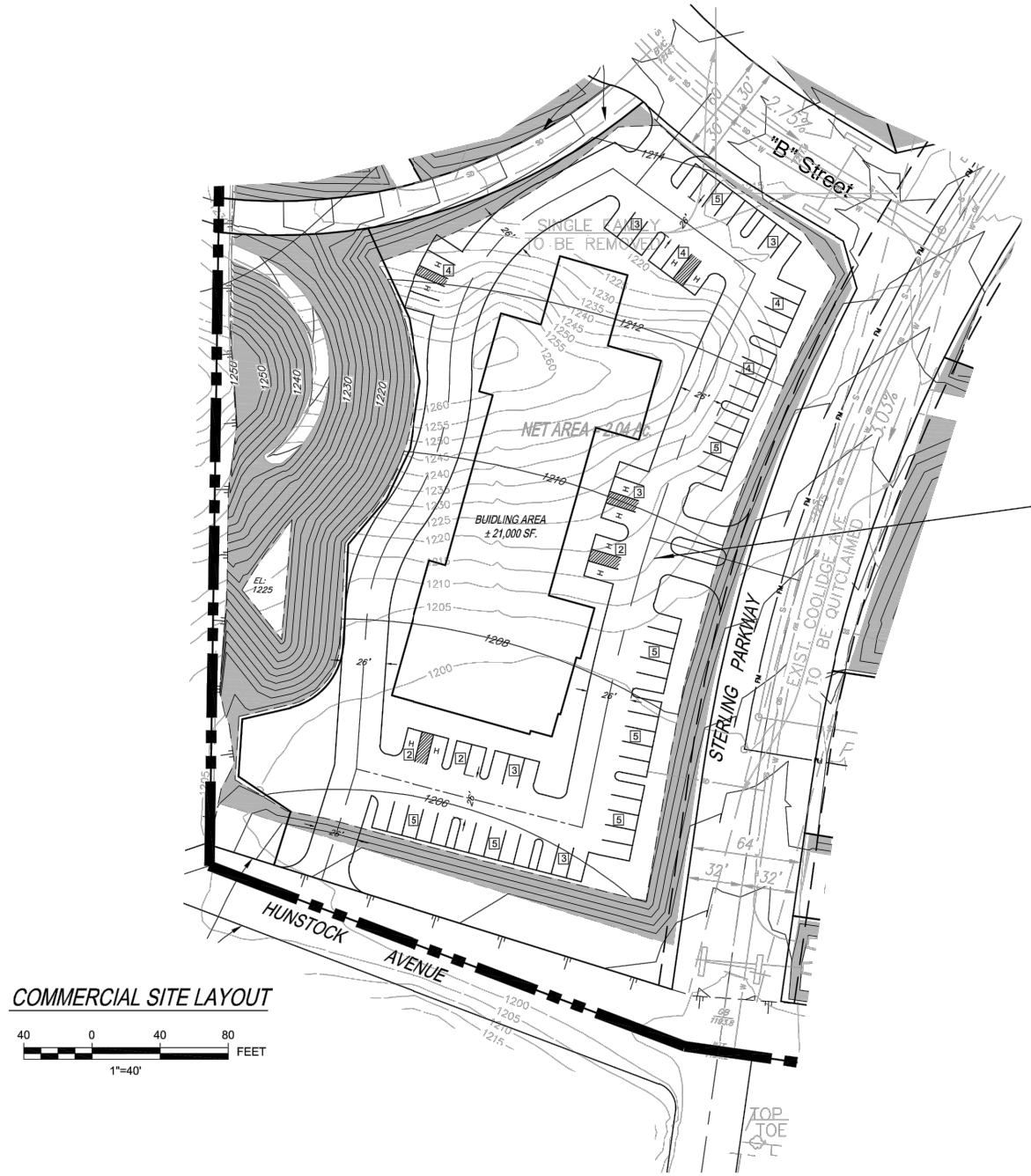
Stantec

Figure 1-2
Project Site Plan
1.3



LOT 232: COMMERCIAL SITE

GROSS AREA:	2.50 Ac.
NET AREA:	2.04 Ac.
BUILDING AREA:	21,000 Sq. ft.
PARKING REQUIRED (1 Parking/ 400 sq.ft.)	
PARKING:	53 Spaces
HANDICAPPED:	10 Spaces
TOTAL	63 Spaces
PROVIDED PARKING:	
PARKING:	61 Spaces
HANDICAPPED:	10 Spaces
TOTAL	71 Spaces

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Stantec

Figure 1-3

Commercial Site Plan

1.4

projects (i.e., Related Projects). The SCVCTM is regularly updated with known cumulative projects and the buildout version of the model is based on the currently approved General Plans of the County and City of Santa Clarita, and the One Valley One Vision (OVOV) Area Plan. For this analysis, the interim year version of the model was used to forecast traffic data for cumulative plus Project conditions.

To assess the level of service for the roundabout intersections, specialized software (Sidra Intersection) is used. Sidra Intersection is a micro-analytical modeling software widely accepted for roundabout analysis and is recognized by the HCM 2010 and the TRB-FHWA Roundabout Guide.

1.4 PERFORMANCE CRITERIA

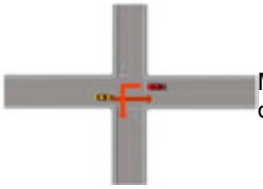
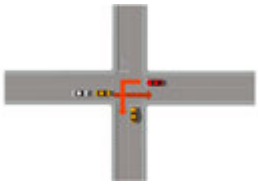
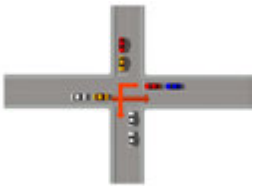
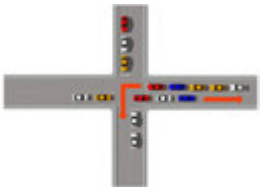
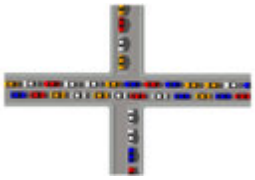
The impact analysis is based on specific performance criteria which are outlined in the following paragraphs. Where appropriate, mitigation measures are identified when the analysis indicates the Project's impacts or cumulative impacts will exceed established impact thresholds.

In traffic impact studies, impact criteria are based on two primary measures. The first is "capacity," which establishes the vehicle carrying ability of a road segment, and the second is "volume". The volume measures is either a traffic count (in the case of existing volumes) or a traffic forecast for a future point in time. The ratio between the volume and the capacity gives a volume/capacity (V/C) ratio, and based on that V/C ratio, a corresponding level of service (LOS) is defined. Traffic LOS is designated "A" through "F" with LOS "A" representing free flow conditions and LOS "F" representing severe traffic congestion. Traffic flow quality for each LOS is described in Table 1-1 for arterial roadways and intersections.

Both the V/C ratio and the LOS are used in identifying significant impacts. Certain LOS values are deemed unacceptable and increases in the V/C ratio that cause or contribute to the LOS being unacceptable are defined as a significant impact. Note that while the Caltrans guidelines for the preparation of traffic studies (see Reference 4 in Section 1.6) recommend the HCM 2010 method for the evaluation of State highway facilities, those guidelines do not include a threshold of significance criteria for the determination of a significant Project impact that is based on the HCM 2010 methodologies. While the Caltrans guidelines do not identify specific impact criteria due to differences between rural and urban areas of the State, as well as differences between the northern, central, and southern regions, the local Caltrans District will determine the impact criteria based on the appropriate requirements of that District. As such, the thresholds of significance criteria specified by the local agencies (i.e., Caltrans District 7, County of Los Angeles, and the LA County CMP) are utilized. For this analysis a LOS D threshold is used for Caltrans ramp-arterial intersections consistent with Caltrans methodology for suburban areas.

In establishing V/C based performance criteria, there are certain items that need to be addressed to obtain suitable V/C estimates and relate them to LOS. For instance, while average daily traffic (ADT) is a useful measure to show general levels of traffic on a facility and to provide data for other related aspects such as noise and air quality, highway congestion is largely a peak hour or peak period occurrence and ADT does not reflect peak period conditions very effectively. Because of this, ADT is not used here as the basis for capacity evaluation but instead this evaluation focuses on those parts of the day when such congestion can occur, specifically the AM and PM peak hours.

Table 1-1 Level of Service Descriptions – Arterial Roadways and intersections

LOS	Traffic Flow Description	ICU	Signal & Roundabout Control Delay	Stop Control Delay
A	 Minimal or no vehicle delay	0.00 – 0.60	≤ 10	≤ 10
B	 Slight delay to vehicles	0.61 – 0.70	> 10 – 20	> 10 – 15
C	 Moderate vehicle delays, traffic flow remains stable	0.71 – 0.80	> 20 – 35	> 15 – 25
D	 More extensive delays at intersections	0.81 – 0.90	> 35 – 55	> 25 – 35
E	Long queues create lengthy delays	0.91 – 1.00	> 55 – 80	> 35 – 50
F	 Severe delays and congestion	> 1.00	> 80	> 50

Sources: Congestion Management Program of Los Angeles County; HCM 2010
ICU = Intersection Capacity Utilization
Delay = average seconds of delay per vehicle

LOS for arterial roadway intersections and for freeway mainline segments are determined based on operating conditions during the AM and PM peak hours. For intersections, the intersection capacity utilization (ICU) methodology is applied, providing a planning level basis for determining V/C and LOS. This methodology sums the V/C ratios for the critical movements of an intersection and is the preferred procedure of the County of Los Angeles for intersection analysis.

The ICU calculation methodology and associated impact criteria for the study area arterial system are summarized in Table 1-2. The County utilizes a variable scale of ICU impact that is based on the pre-Project LOS.

1.5 DEFINITIONS

Certain terms used throughout this report are defined below to clarify their intended meaning:

ADT	Average Daily Traffic. Generally used to measure the total two-directional traffic volumes passing a given point on a roadway.
ICU	Intersection Capacity Utilization. A measure of the volume to capacity ratio for an intersection. Typically used to determine the peak hour level of service for a given set of intersection volumes.
LOS	Level of Service. A scale used to evaluate circulation system performance based on intersection ICU values or volume/capacity ratios of arterial segments.
Peak Hour	This refers to the hour during the AM peak period (typically 7 AM - 9 AM) or the PM peak period (typically 3 PM - 6 PM) in which the greatest number of vehicle trips are generated by a given land use or are traveling on a given roadway.
V/C	Volume to Capacity Ratio. This is typically used to describe the percentage of capacity utilized by existing or projected traffic on a segment of an arterial or intersection.

1.6 REFERENCES

1. “Trip Generation 10th Edition,” Institute of Transportation Engineers, 2017.
2. “Highway Capacity Manual 2010,” Transportation Research Board, National Research Council, 2010.
3. “Traffic Impact Analysis Report Guidelines,” County of Los Angeles Department of Public Works, January 1997.
4. “Guide for the Preparation of Traffic Impact Studies,” Caltrans, December 2002.
5. “Public Subdivision Activity,” Los Angeles County Department of Regional Planning GIS-NET3, Accessed February 2018.

Table 1-2 Arterial Intersection Performance Criteria

Calculation Methodology

Level of service to be based on peak hour intersection capacity utilization (ICU) values calculated using the following assumptions:

Saturation Flow Rates:

County Methodology: 1,600 vehicles/hour/lane for through lanes, right-turn lanes, and single left-turn lanes
2,880 vehicles/hour/lane for dual left-turn lanes (total of both lanes)

Clearance Interval: 0.10

Sidra delay-based intersection methodology for roundabouts

Performance Standards

County: LOS D (peak hour ICU less than or equal to 0.90) for new and/or future intersections for buildout conditions
Mid-LOS C (peak hour ICU less than 0.75) or existing LOS, whichever is greater, for existing intersections

Caltrans: LOS D or existing LOS, whichever is greater

LOS D defined as -
stopped delay to not exceed 50 seconds for roundabouts

Significant Impact Thresholds[1]

An intersection is considered to be significantly impacted if the Project increases the ICU by an amount equal to or greater than the amounts set forth below:

County Thresholds:	Pre-Project ICU	Project Increment
	0.71 - 0.80 (LOS C)[2]	greater than or equal to 0.04
	0.81 - 0.90 (LOS D)	greater than or equal to 0.02
	0.91 or more (LOS E & F)	greater than or equal to 0.01

[1]Note: For intersections under joint jurisdiction of the County and Caltrans or Caltrans, the analysis utilizes the corresponding threshold of the agency with responsibility for the operation of the intersection, which is typically Caltrans.

[2]Note: The County guidelines do not address situations where pre-Project conditions are less than 0.71. In that situation, County staff has interpreted the guidelines to mean that an increase resulting in a with-Project condition of 0.75 or more is considered significant. The interpretation is based on the following scenario, which is addressed by the guidelines: 0.71 (pre-Project) + 0.04 (Project increment) = 0.75 and is a significant impact.

Abbreviations:
LOS – Level of Service
ICU – Intersection Capacity Utilization

2.0 PROJECT DESCRIPTION

This section describes the Project in terms of its transportation characteristics. Trip generation is summarized and the distribution of residential and commercial Project trips on the adjoining roadway network is presented. The County Master Plan of Highways is shown in Figure 2-1.

2.1 PROJECT TRIP GENERATION

As previously outlined, the Project includes 221 single-family dwelling units, a 21,000-square foot neighborhood retail commercial center, and a 3.1-acre neighborhood park. Table 2-1 summarizes the anticipated trip generation of the Project. The trip generation is based on the trip generation rates from Institute of Transportation Engineers (ITE) Trip Generation Manual (see Reference 1 in Section 1.6). For the neighborhood retail commercial center, the trip generation rate is available for a very broad spectrum of case studies ranging from 9 TSF to 1,510 TSF of Gross Leasable Area (GLA). Therefore, given the Project's 21,000-square foot neighborhood retail commercial center, the trip rate data is filtered for a range of 9-100 TSF GLA and the resulting trip generation rate is used for analysis of the Project. See Appendix A for ITE trip generation data.

Table 2-1 Trip Generation Summary

Scenario	Amount	Unit	AM Peak Hour			PM Peak Hour			ADT
			In	Out	Total	In	Out	Total	
Trip Rates									
Single-Family Detached Housing (210)	-	DU	0.19	0.56	0.74	0.62	0.37	0.99	9.44
Shopping Center (820)[1]	-	TSF	1.69	1.08	2.77	3.48	3.78	7.26	83.01
Public Park (411)		Acres	0.01	0.01	0.02	0.06	0.05	0.11	0.78
Trip Generation									
Single-Family	*221*	*DU*	*41*	*123*	*164*	*138*	*81*	*219*	*2,086*
Internal Capture (Residential)[2]	-	-	2	4	6	8	7	15	174
Total Residential Trips			**39**	**119**	**158**	**130**	**74**	**204**	**1,912**
Shopping Center	21	TSF	35	23	58	73	79	152	1,743
Internal Capture (Retail)[2]	10%	-	4	2	6	7	8	15	174
Pass-by Trips[3]	10%	-	4	2	6	7	8	15	174
Total Retail Trips			**28**	**18**	**47**	**59**	**63**	**122**	**1,395**
Public Park	*3.1*	*Acres*	*0*	*0*	*0*	*0*	*0*	*0*	*2*
Total New Trips			***67***	***137***	***204***	***189***	***137***	***326***	**3,309**

Trip Rate Source: Institute of Transportation Engineers (ITE), 10th Edition, 2017, with ITE code in parentheses
[1] Shopping Center rate is based on the filtered data set
[2] Internal capture based on 10% of Retail trip generation
[3] Pass-by trips based on 10% of Retail trip generation
ADT - Average Daily Trips; DU - Dwelling Units

The trip generation estimates show that the proposed Project would result in approximately 3,309 ADT, with 204 trips occurring in the AM peak hour (137 outbound) and 326 trips occurring in the PM peak hour (189 inbound).

2.2 PROJECT TRIP DISTRIBUTION

The distribution percentage of Project trips is broken down into residential-based and commercial-based trips for the Projects study area. The distribution is illustrated in Figure 2-2 and Figure 2-3 for the Project's residential and commercial uses, respectively. The Project distribution percentages were derived from the SCVCTM and were applied to the peak hour trip generation estimates noted previously in Table 2-1.

Approximately 78 percent of the Project's residential trips are oriented to the north via Del Valle Road and approximately 20 percent of the Project's residential trips are oriented to the south via Chiquito Canyon Road. The remaining 2 percent of residential trips interact with the commercial site. Approximately 39 percent of the Project's retail trips are oriented to the north via North Del Valle Road and approximately 6 percent of the Project's retail trips are oriented to the south via Chiquito Canyon Road. The remaining 55 percent of the Project's retail trips are local trips within the existing Val Verde neighborhood.

Figure 2-4 and Figure 2-5 illustrate the Project's AM and PM peak hour traffic volume projections for the residential component of the Project and Figure 2-6 and Figure 2-7 illustrate the corresponding AM and PM peak hour volumes for the Project's retail component. Figure 2-8,Figure 2-9, and Figure 2-10 illustrate the total Project trips (residential and commercial) for ADT as well as the AM and PM peak hours.

2.3 ON-SITE ROADWAY SYSTEM

Access to the Project site will be provided via an extension of Chiquito Canyon Road (as Sterling Parkway) that will intersect with Del Valle Road to create a new alignment, dividing VTTM 60257 roughly in half. This new alignment will include three newly constructed intersections with local roadways constructed within VTTM 60257 and a fourth new intersection with Del Valle Road. The access to and from the commercial retail center will be provided via three driveways, one on Hunstock Street just west of Chiquito Canyon Road/Sterling Parkway, another on Sterling Parkway just north of Hunstock Street, and a third on B Street (VTTM 60257) just west of Sterling Parkway as shown previously in Figure 1-3.

The Project's on-site "B" Street roadway will provide a connection to the existing Lexington Drive. Given the orientation of the Project site in relation to the primary access roadways for the community, no Project traffic is anticipated to utilize Lexington Drive as it would represent a significantly more circuitous route to typical destinations. The connection will provide a more direct and convenient route for the existing residents along Lexington Drive to access Del Valle Road, thereby reducing traffic volumes along various streets within that portion of Val Verde.

Chiquito Canyon Road from Del Valle Road to SR-126 and Del Valle Road from Chiquito Canyon Road to Hasley Canyon Road is designated as a Limited Secondary Arterial Highway in the County Highway Plan as shown previously in Figure 2-1. SR-126 is designated as an Expressway. Hasley Canyon Road between Del Valle Road and Commerce Center Drive is designated as Secondary Highway. Commerce Center Drive south of Hasley Canyon and Hasley Canyon north of Commerce Center Drive are designated as Major Highways.

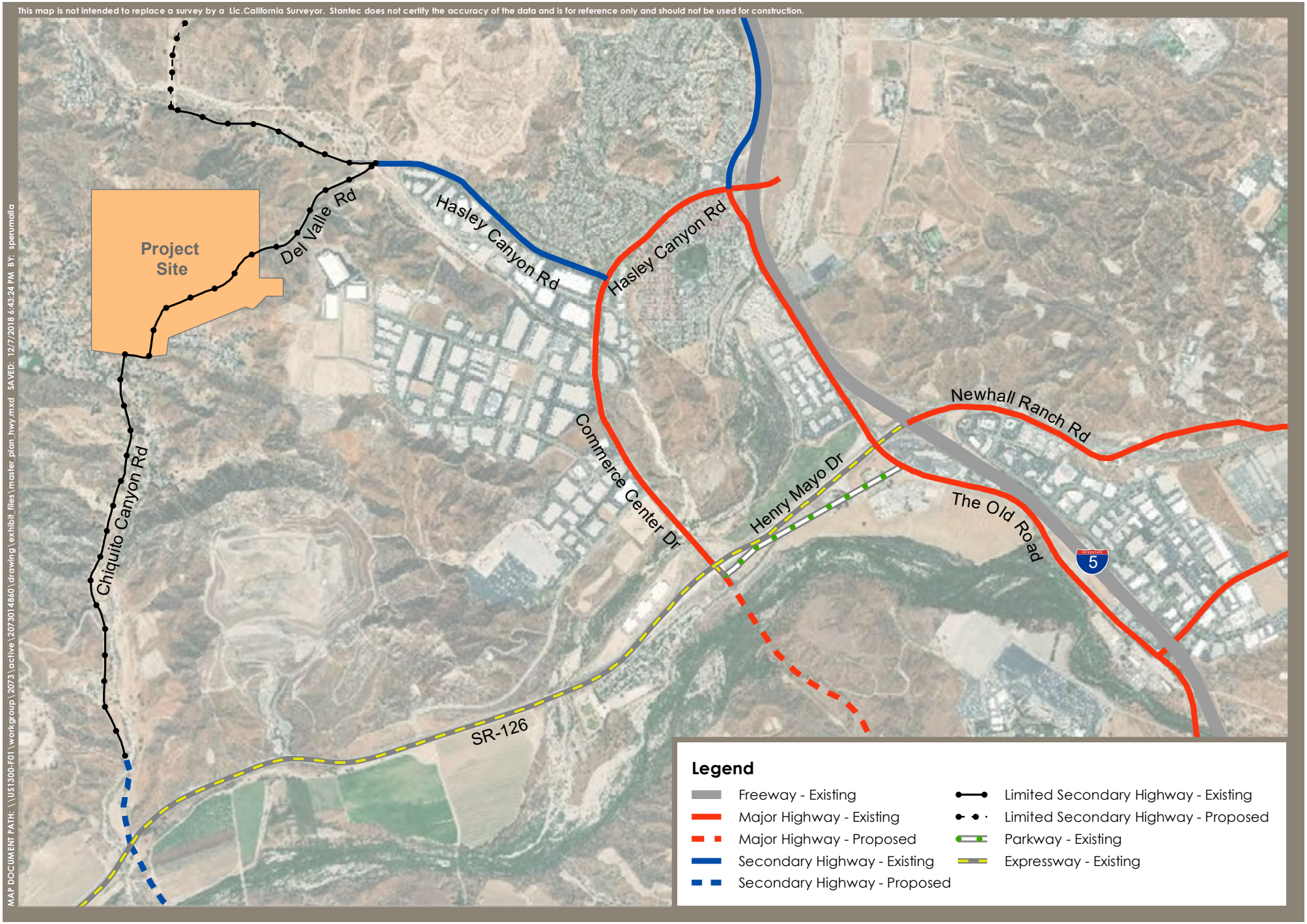


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Figure 2-1

Master Plan of Highways

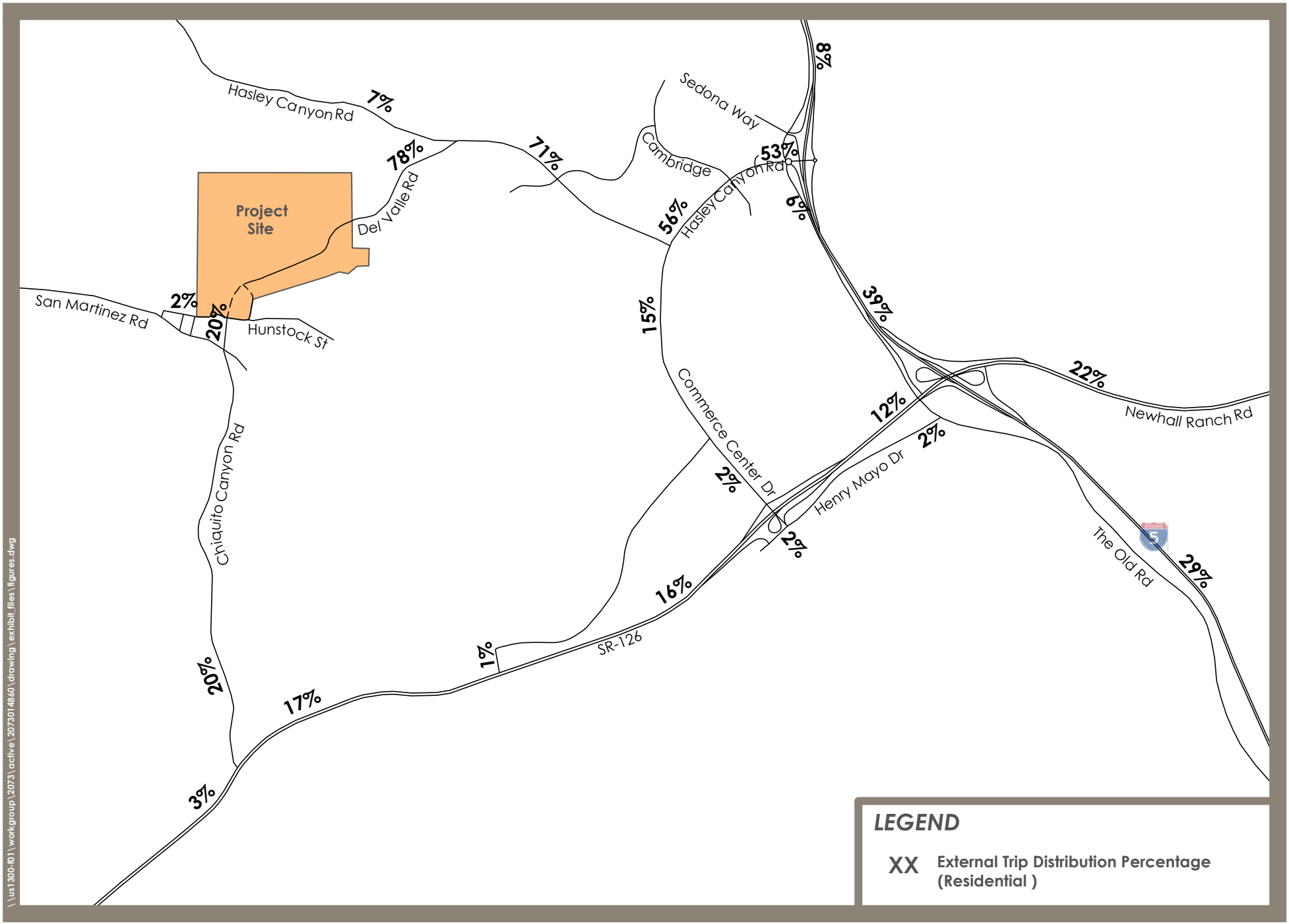

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Figure 2-2

Project Trip Distribution - Residential

2.4

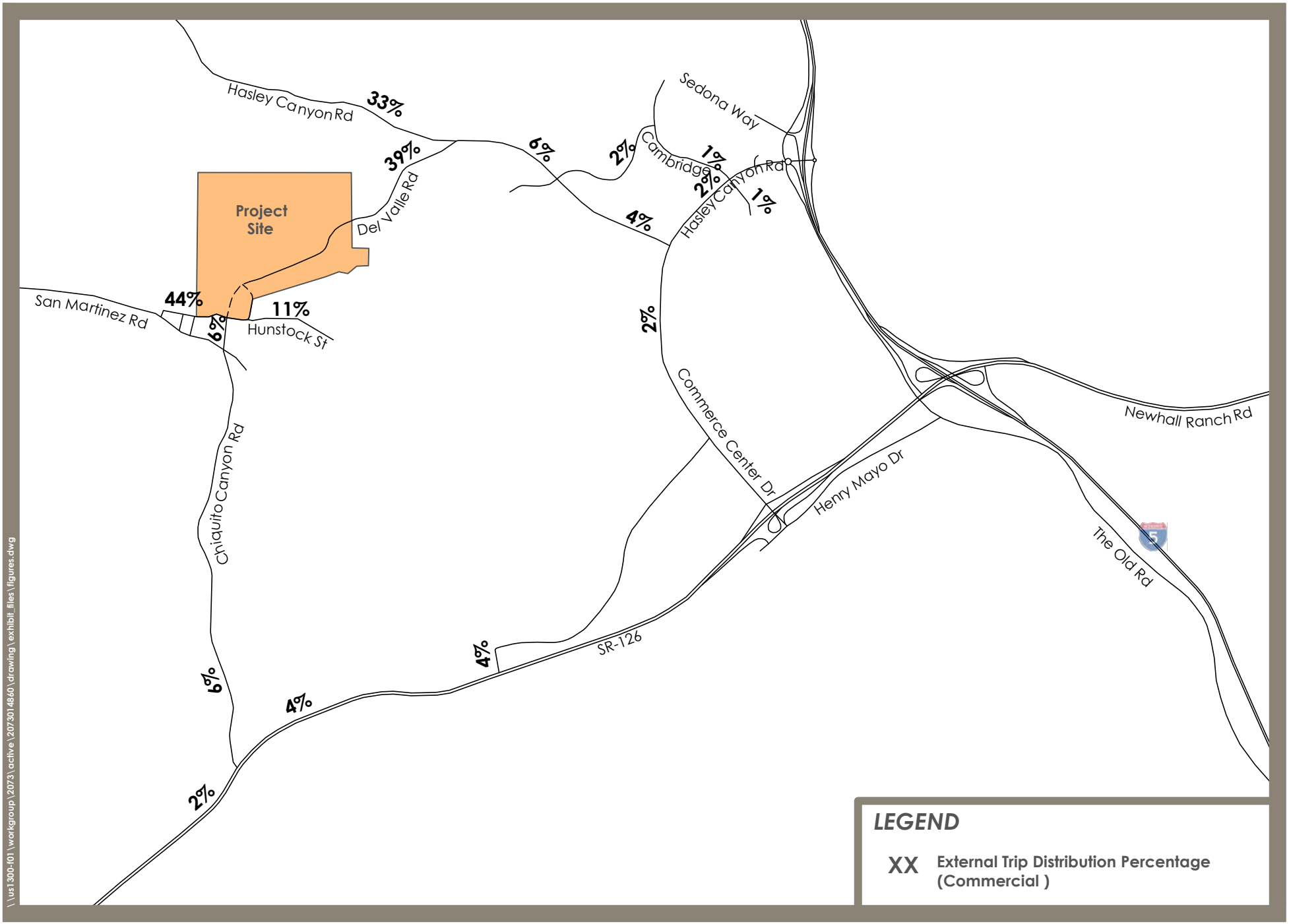

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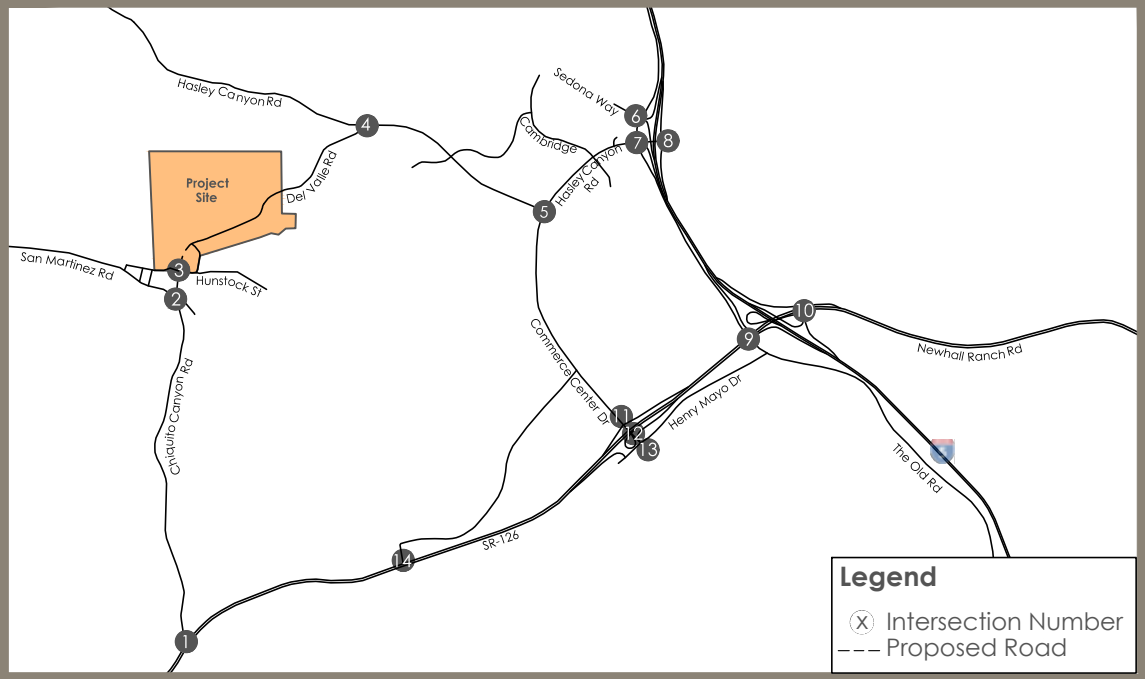
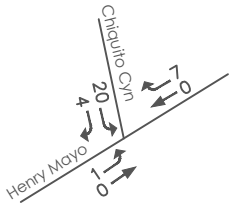
Figure 2-3

Project Trip Distribution - Commercial

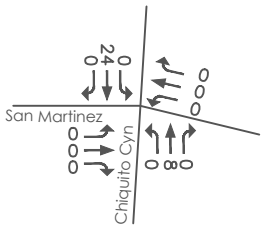
2.5



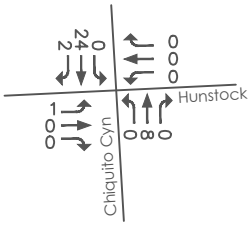
1. Chiquito Canyon & SR 126/Henry Mayo



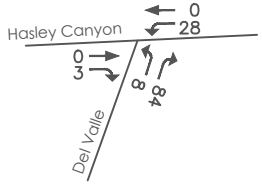
2. Chiquito Canyon & San Martinez



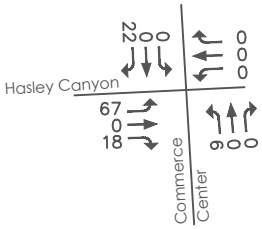
3. Chiquito Canyon & Hunstock



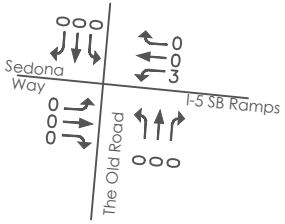
4. Del Valle & Hasley Canyon



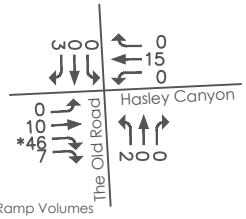
5. Commerce Center & Hasley Canyon



6. The Old Road & I-5 SB Ramps (at Sedona Way)

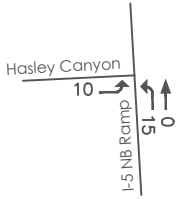


7. The Old Road & Hasley Canyon

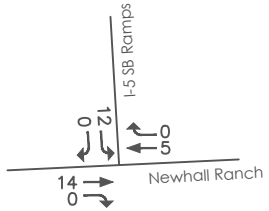


*I-5 SB On-Ramp Volumes

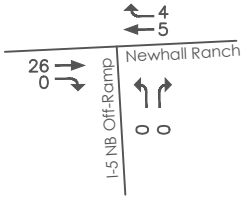
8. I-5 NB Ramps & Hasley Canyon



9. I-5 SB Off-Ramp & Newhall Ranch

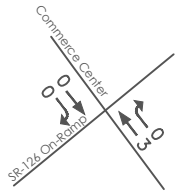


10. I-5 NB Off-Ramp & Newhall Ranch

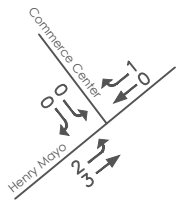


11. Commerce Center & SR-126 WB Ramps

12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

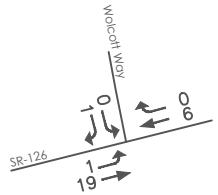


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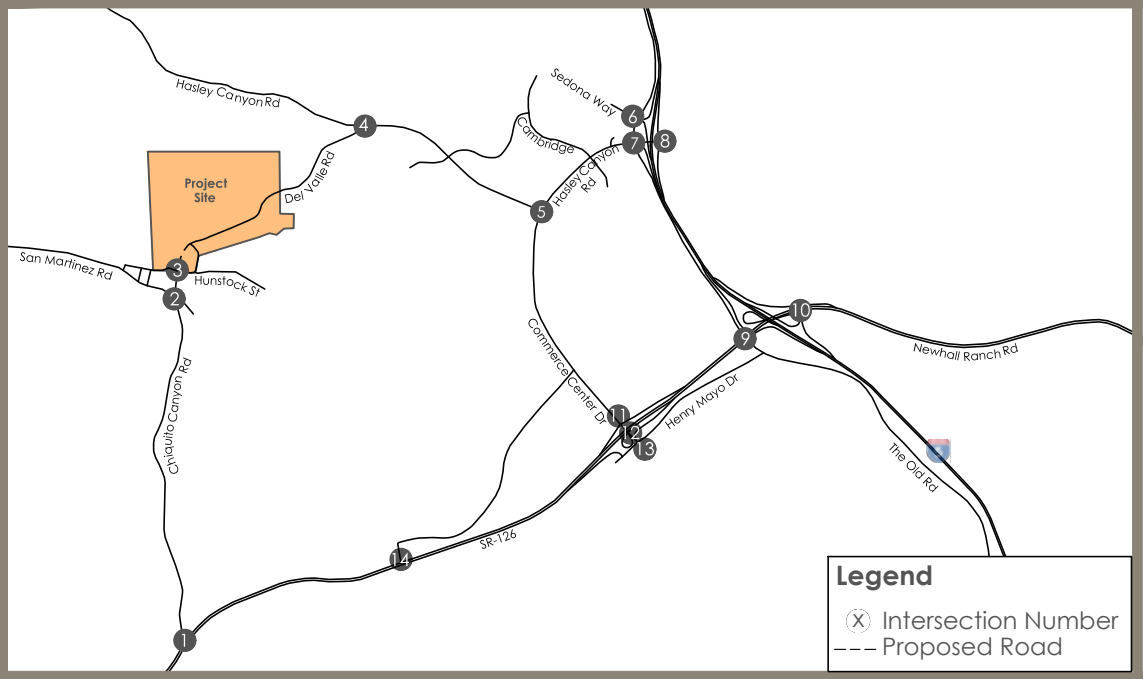
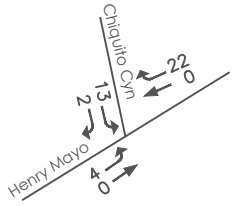
Figure 2-4

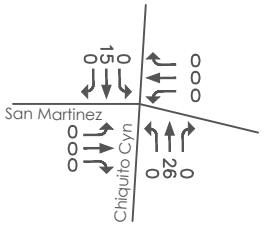
Residential Project Trips - AM Peak Hour



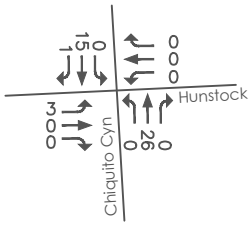
1. Chiquito Canyon & SR 126/Henry Mayo



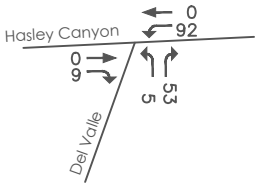
2. Chiquito Canyon & San Martinez



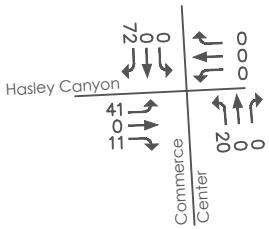
3. Chiquito Canyon & Hunstock



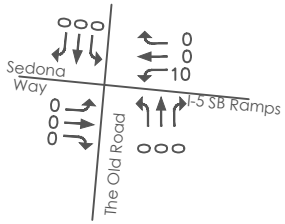
4. Del Valle & Hasley Canyon



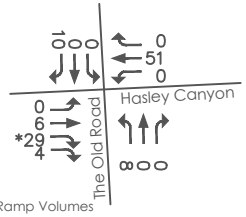
5. Commerce Center & Hasley Canyon



6. The Old Road & I-5 SB Ramps (at Sedona Way)

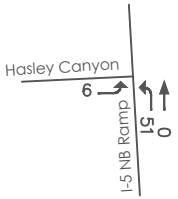


7. The Old Road & Hasley Canyon

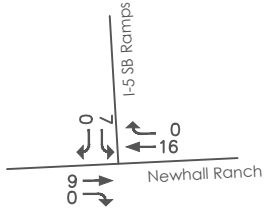


*I-5 SB On-Ramp Volumes

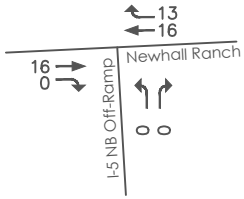
8. I-5 NB Ramps & Hasley Canyon



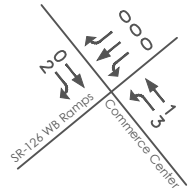
9. I-5 SB Off-Ramp & Newhall Ranch



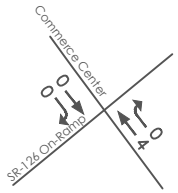
10. I-5 NB Off-Ramp & Newhall Ranch



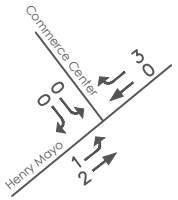
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

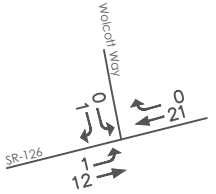


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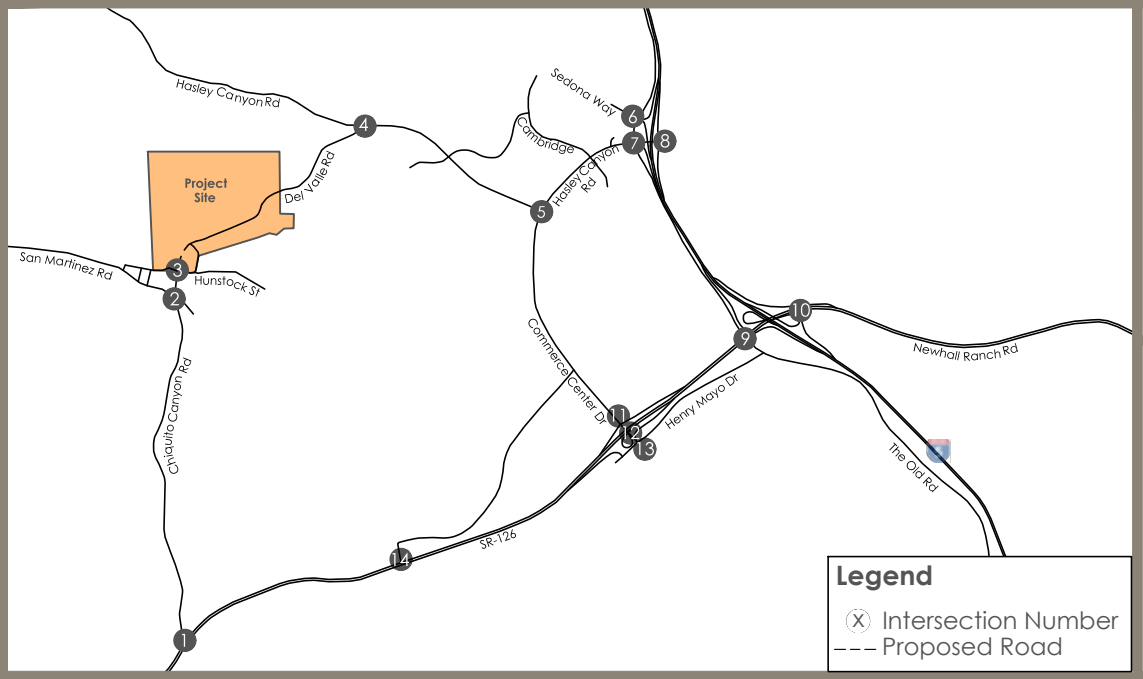
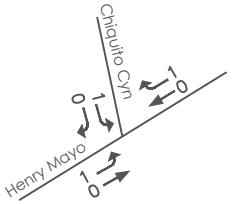
Figure 2-5

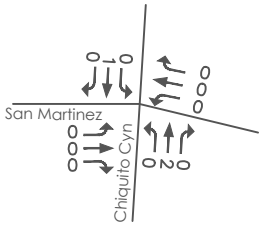
Residential Project Trips - PM Peak Hour



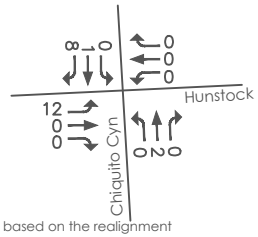
1. Chiquito Canyon & SR 126/Henry Mayo



2. Chiquito Canyon & San Martinez

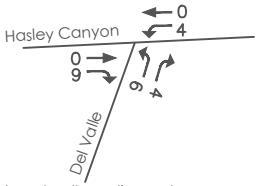


3. Chiquito Canyon & Hunstock



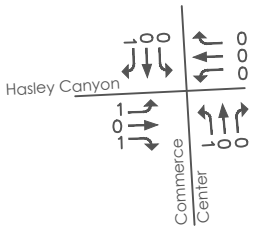
*Volumes based on the realignment

4. Del Valle & Hasley Canyon

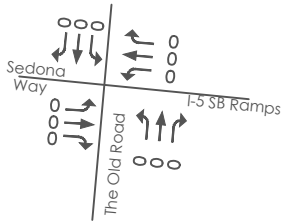


*Volumes based on the realignment

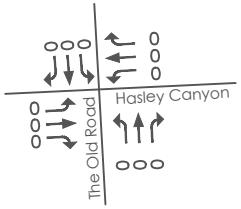
5. Commerce Center & Hasley Canyon



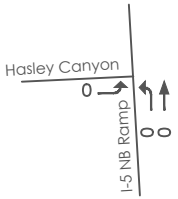
6. The Old Road & I-5 SB Ramps (at Sedona Way)



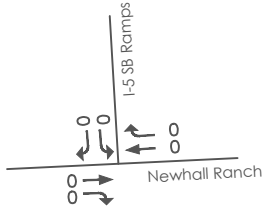
7. The Old Road & Hasley Canyon



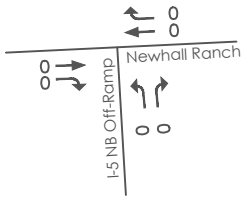
8. I-5 NB Ramps & Hasley Canyon



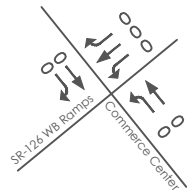
9. I-5 SB Off-Ramp & Newhall Ranch



10. I-5 NB Off-Ramp & Newhall Ranch



11. Commerce Center & SR-126 WB Ramps



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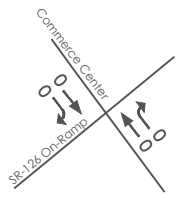
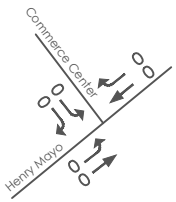


13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

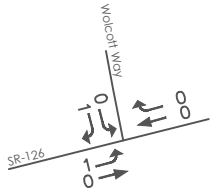


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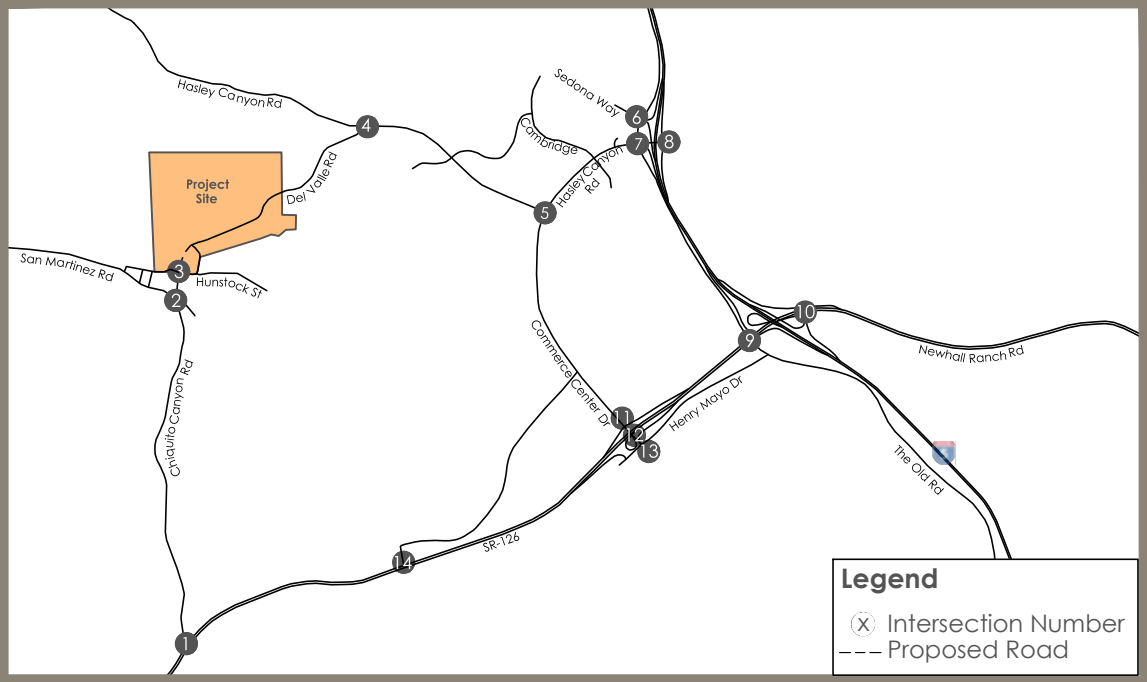
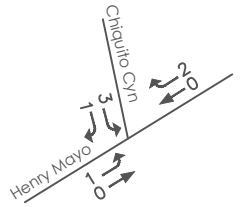
Figure 2-6

Commercial Project Trips - AM Peak Hour

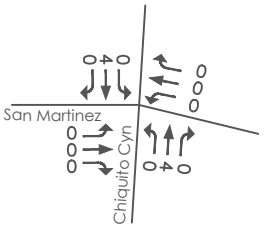
2.8



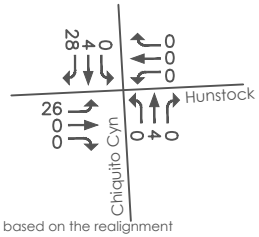
1. Chiquito Canyon & SR 126/Henry Mayo



2. Chiquito Canyon & San Martinez

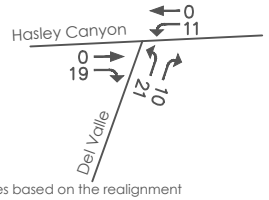


3. Chiquito Canyon & Hunstock



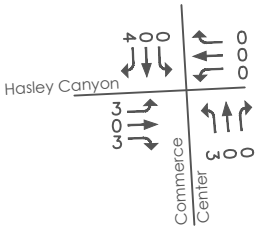
*Volumes based on the realignment

4. Del Valle & Hasley Canyon

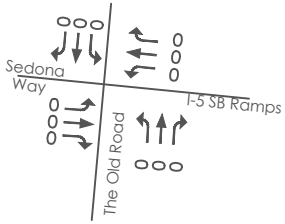


*Volumes based on the realignment

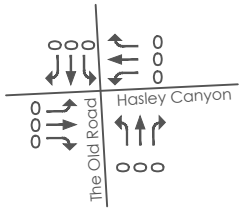
5. Commerce Center & Hasley Canyon



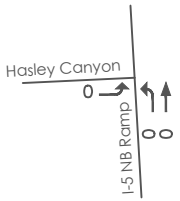
6. The Old Road & I-5 SB Ramps (at Sedona Way)



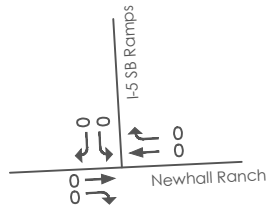
7. The Old Road & Hasley Canyon



8. I-5 NB Ramps & Hasley Canyon



9. I-5 SB Off-Ramp & Newhall Ranch



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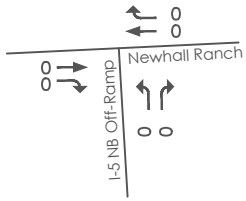
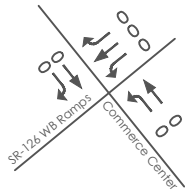
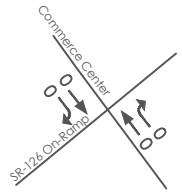


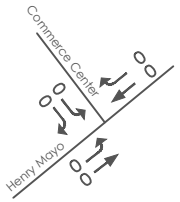
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

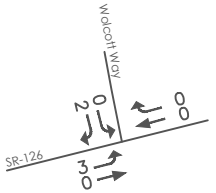


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Figure 2-7

Commercial Project Trips - PM Peak Hour

2.9

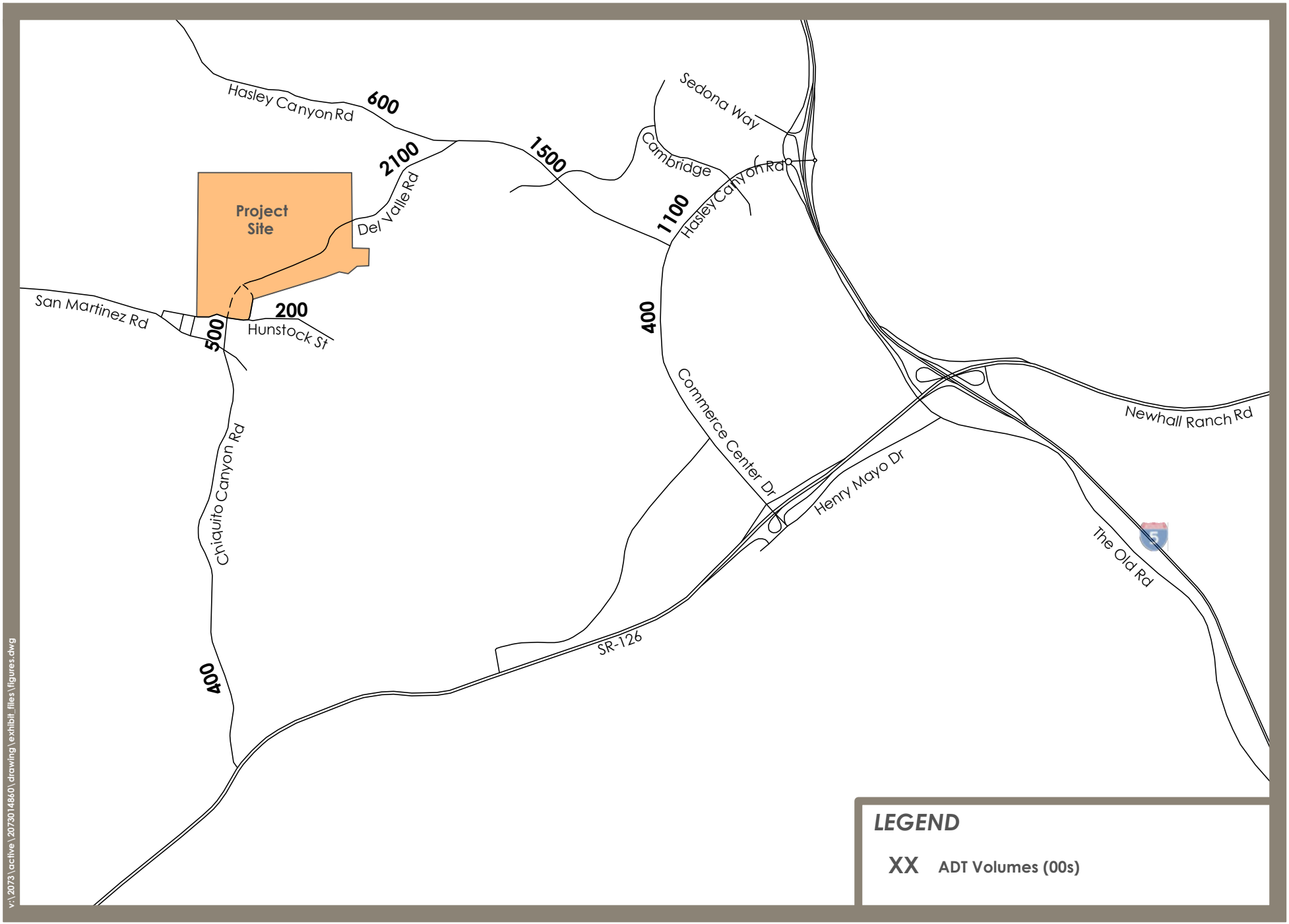

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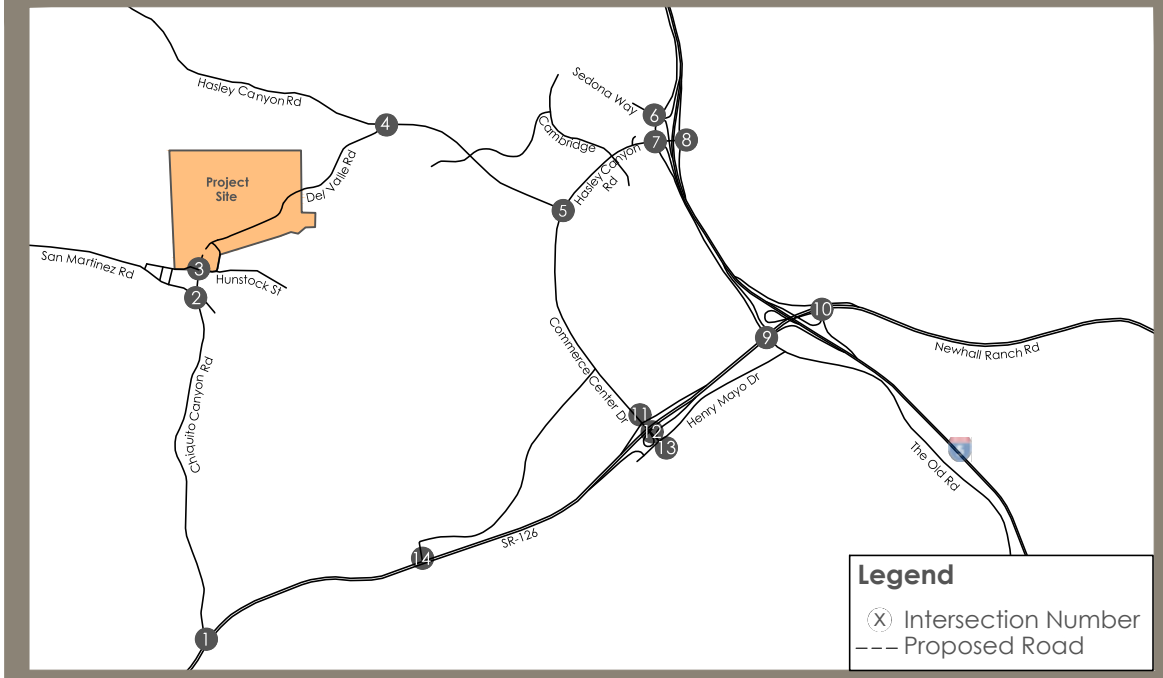
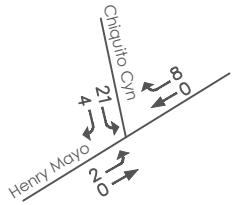
Figure 2-8

Project Trips - ADT

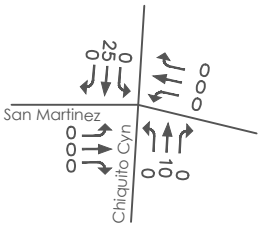
2.10



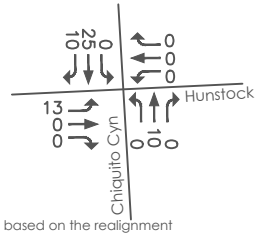
1. Chiquito Canyon & SR 126/Henry Mayo



2. Chiquito Canyon & San Martinez

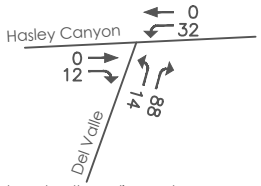


3. Chiquito Canyon & Hunstock



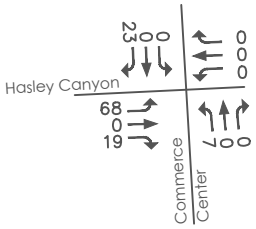
*Volumes based on the realignment

4. Del Valle & Hasley Canyon

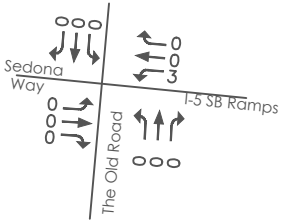


*Volumes based on the realignment

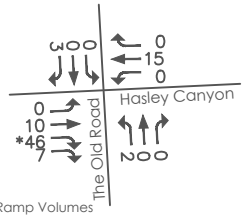
5. Commerce Center & Hasley Canyon



6. The Old Road & I-5 SB Ramps (at Sedona Way)

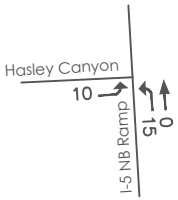


7. The Old Road & Hasley Canyon

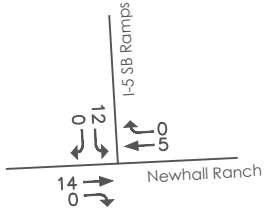


*I-5 SB On-Ramp Volumes

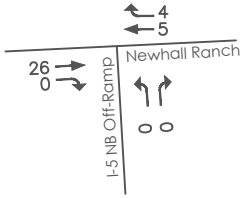
8. I-5 NB Ramps & Hasley Canyon



9. I-5 SB Off-Ramp & Newhall Ranch

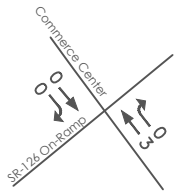


10. I-5 NB Off-Ramp & Newhall Ranch

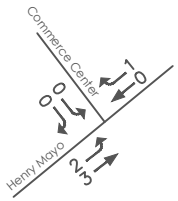


11. Commerce Center & SR-126 WB Ramps

12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

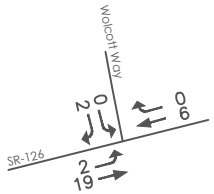


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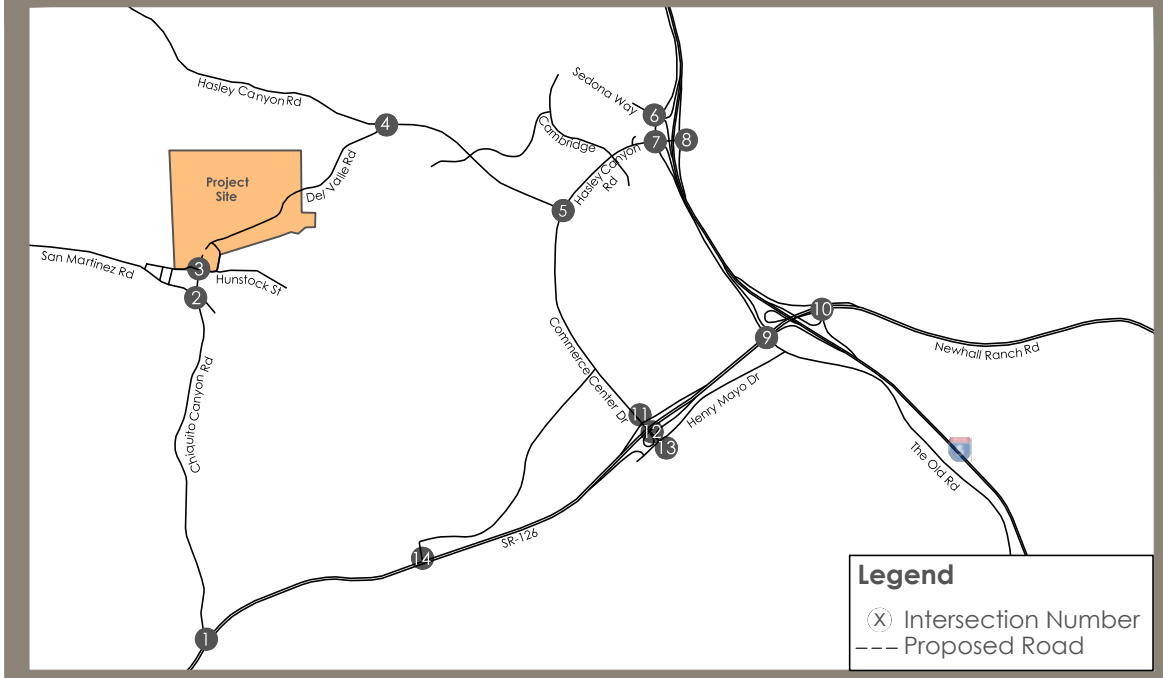
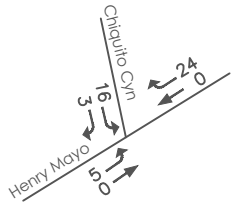
Figure 2-9

Total Project Trips - AM Peak Hour

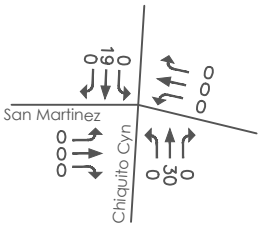
2.11



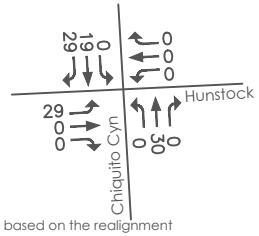
1. Chiquito Canyon & SR 126/Henry Mayo



2. Chiquito Canyon & San Martinez

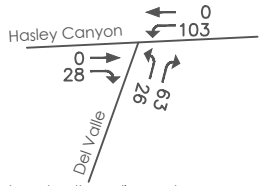


3. Chiquito Canyon & Hunstock



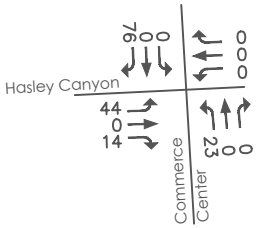
*Volumes based on the realignment

4. Del Valle & Hasley Canyon

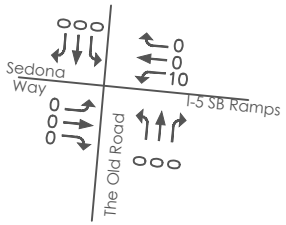


*Volumes based on the realignment

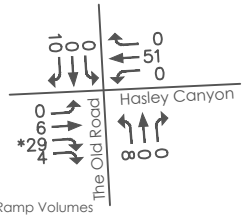
5. Commerce Center & Hasley Canyon



6. The Old Road & I-5 SB Ramps (at Sedona Way)

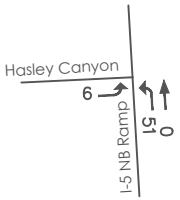


7. The Old Road & Hasley Canyon

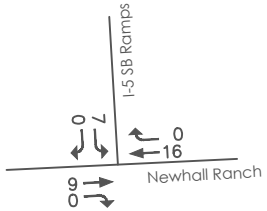


*I-5 SB On-Ramp Volumes

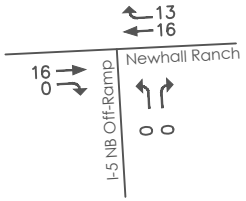
8. I-5 NB Ramps & Hasley Canyon



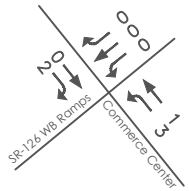
9. I-5 SB Off-Ramp & Newhall Ranch



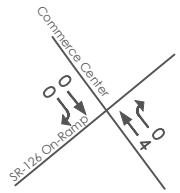
10. I-5 NB Off-Ramp & Newhall Ranch



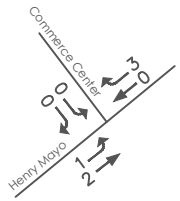
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

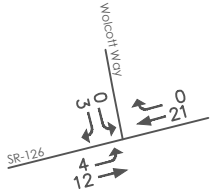


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Figure 2-10

Total Project Trips - PM Peak Hour

2.12

Forecast peak hour turning movement volumes for the 2035 General Plan buildout conditions for the intersections used to access the Project site are illustrated in Figure 2-11 and Figure 2-12 for the AM and PM peak hours respectively. The peak hour traffic volumes referenced above were utilized to derive the intersection lane configurations. Intersection capacity analysis based on these lanes and the forecast peak hour volumes is summarized in Table 2-2. As shown, each of the on-site Project intersections is anticipated to operate at LOS C or better for long-range buildout conditions. ICU calculation worksheets for the intersections are provided in Appendix C.

Table 2-2 Intersection LOS Summary – Project Site and Local Streets (2035 General Plan Buildout Conditions)

Int #	Intersection Name	AM Peak Hour		PM Peak Hour	
		ICU	LOS	ICU	LOS
2	Chiquito Canyon Road & San Martinez	0.67	B	0.80	C
3	Chiquito Canyon Road/Sterling Parkway & Hunstock Street	0.57	A	0.60	A
4	Del Valle Road & Hasley Canyon Road	0.73	C	0.74	C
20	Sterling Parkway & “B” Street (VTTM 60257)	0.55	A	0.57	A
21	Sterling Parkway & “A” Street/Del Valle Road (VTTM 60257)	0.56	A	0.57	A
22	Del Valle Road & “F” Street/”H” Street (VTTM 60257)	0.59	A	0.60	A
23	Del Valle Road & “M” Street/”I” Street (VTTM 60257)	0.59	A	0.61	B

2.3.1 Public Transportation

The Project site is currently serviced by City of Santa Clarita Transit (SCT) Route 2. The nearest bus stop is approximately 1.5 miles away from the Project site on Del Valle Road, just north of Hunstock Street. SCT Route 2 operates along Chiquito Canyon Road, Del Valle, Hasley Canyon east of Del Valle Road, Commerce Center Drive and SR-126. It provides services between Val Verde Park and the McBean Regional Transit Center. Figure 2-13 shows the map of SCT Route 2 in the area of the Project site.

SCT Commuter Express offers express commuter bus travel to Los Angeles, Warner Center, Van Nuys, Century City and the Antelope Valley and can be access from the McBean Regional Transit Center. Three Metrolink stations exist within the City of Santa Clarita, which serve the Antelope Valley line. This line travels between Lancaster and Union Station, Los Angeles.

2.3.2 Active Transportation

The County of Los Angeles adopted the 2012 Bicycle Master Plan in March 2012 and it provides a comprehensive overview of the state of bicycling and walking in the County as well as direction for future investments in bicycle and pedestrian facilities programs. Figure 2-14 illustrates the existing and planned future bicycle facilities in the area.

The Project site and surrounding area currently do not contain bike paths or roadways with bike lanes. However, a future Class II Bike Lane along Hasley Canyon Road as well as along The Old Road, and a Class III Bike Route along Chiquito Canyon Road are identified in the County plan.

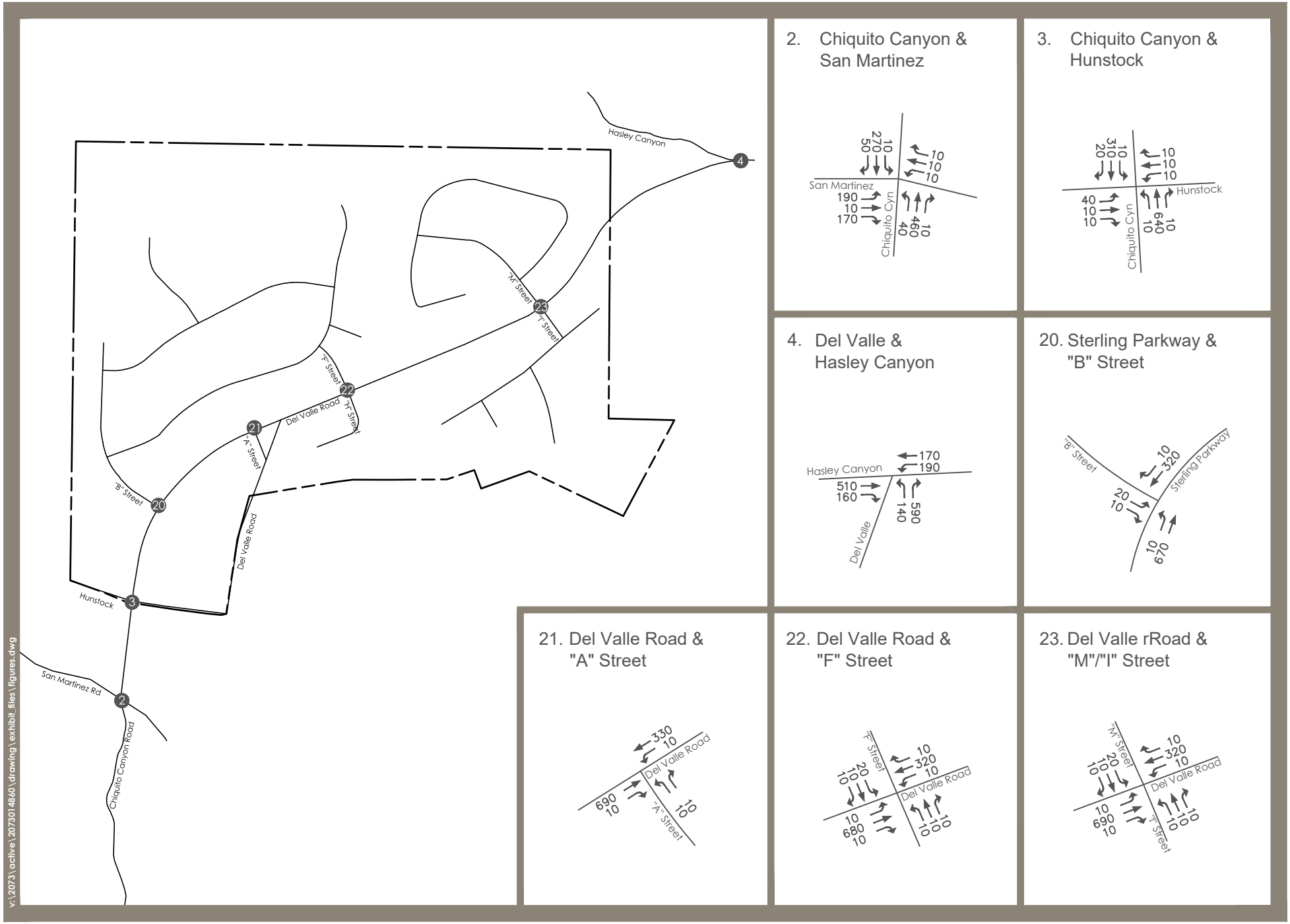
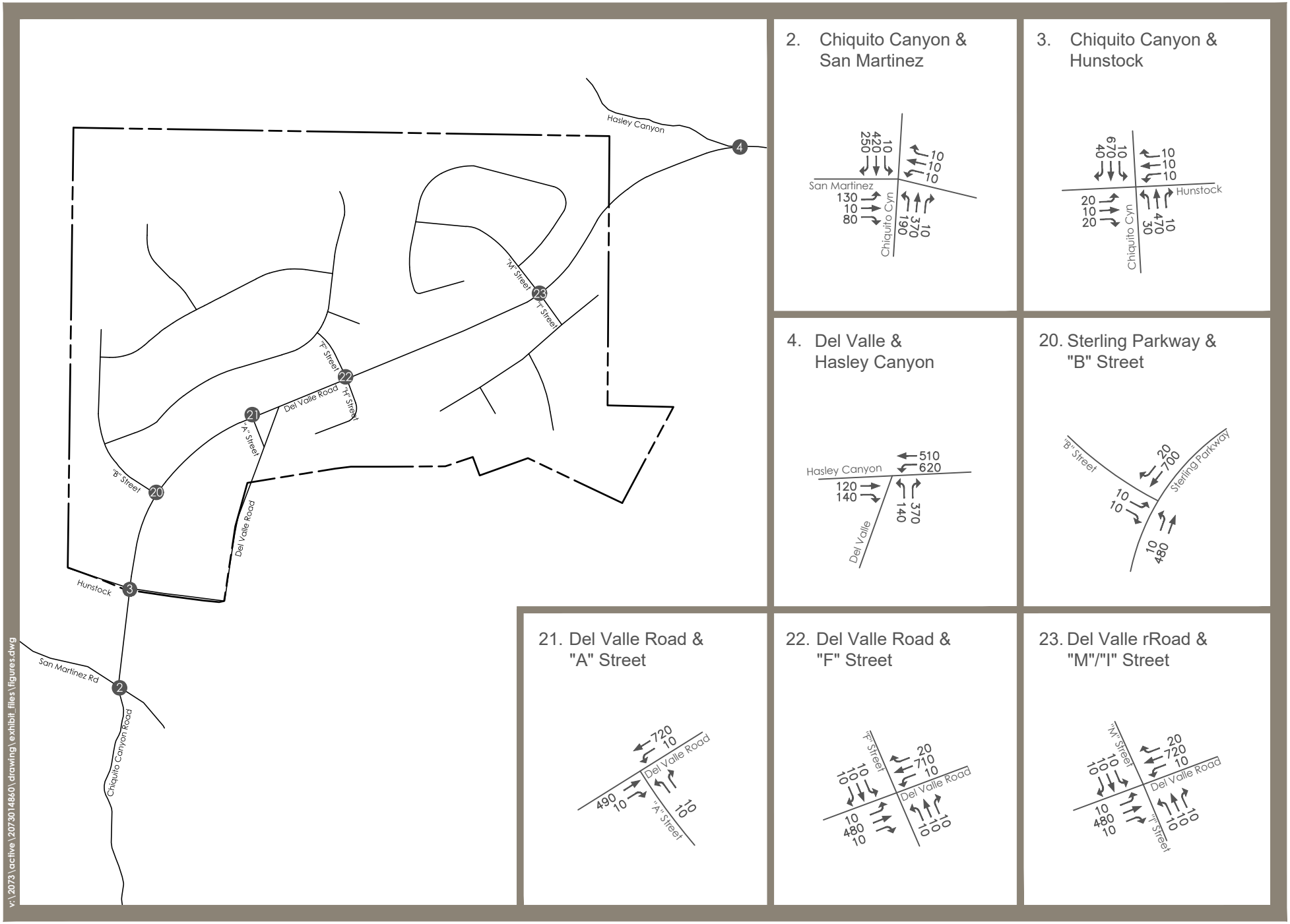


Figure 2-11

Project Site Access (2035 General Plan Buildout Conditions) - AM Peak Hour Volumes

2.14



2. Chiquito Canyon & San Martinez

3. Chiquito Canyon & Hunstock

4. Del Valle & Hasley Canyon

20. Sterling Parkway & "B" Street

21. Del Valle Road & "A" Street

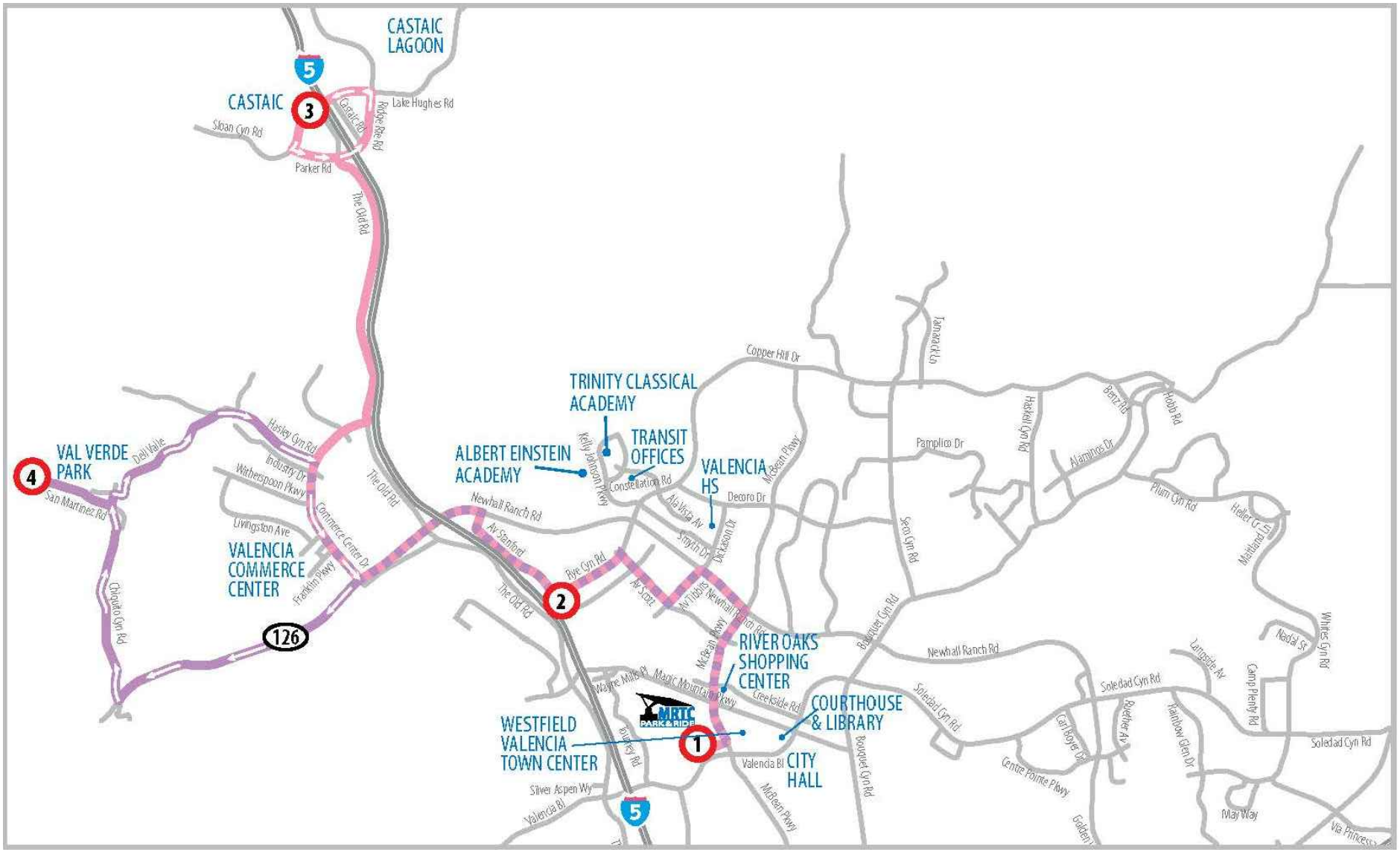
22. Del Valle Road & "F" Street

23. Del Valle rRoad & "M"/"I" Street

Figure 2-12

Project Site Access (2035 General Plan Buildout Conditions) - PM Peak Hour Volumes

2.15



Source: City of Santa Clarita Transit, January 2018

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Figure 2-13

Existing Public Transportation

2.16

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Figure 2-14

Existing and Future Bike Facilities

2.17

3.0 TRAFFIC IMPACT ANALYSIS

This chapter addresses the traffic impacts of the Project. Existing conditions are first summarized, followed by the cumulative setting against which Project impacts are evaluated. The following sections summarize the results of the analysis of the study area.

3.1 EXISTING CONDITIONS

The study area used for this analysis includes intersections where the Project could potentially result in a significant impact. The study area intersections are under the jurisdiction of Los Angeles County, Caltrans or jointly between Los Angeles County and Caltrans.

The study area includes the intersections of the arterial roadways generally spanning the distance between the Project site and SR-126 to the south, Hasley Canyon Road to the north, and I-5 to the east. The distance from the Project site to SR-126 is approximately two miles to the south and the distance to Hasley Canyon Road is approximately one mile to the north. The I-5 freeway is approximately two miles to the east of the Project site and is accessed via a modern interchange at Hasley Canyon Road.

County arterial highways near the Project site consist of Chiquito Canyon Road and Del Valle Road. The SR-126 provides regional access to the site and can be accessed via an intersection with Chiquito Canyon Road. The study area is illustrated in the previously referenced Figure 1-1 and consists of 14 intersections. The existing roadway network in the study area is illustrated in Figure 3-1 in the form of intersection lane configurations for the intersections being studied.

Illustrations of existing conditions for ADT and for peak hour turning movement volumes at each study area intersection can be found in Figure 3-2, Figure 3-3 and Figure 3-4 for the ADT, AM peak hour, and PM peak hours respectively. These traffic counts were collected in late 2017 and early 2018. Copies of the traffic count data sheets are provided in Appendix B.

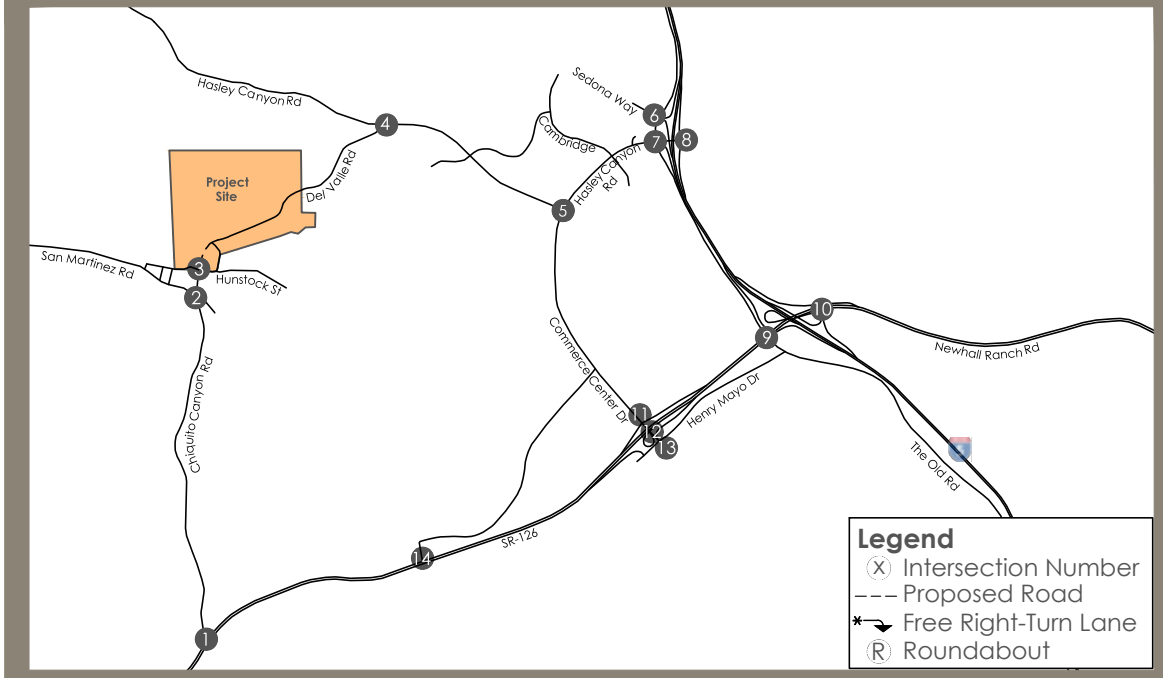
A summary of the existing ICUs and intersection delay, and the corresponding LOS of the study area intersections is provided in Table 3-1. The intersections are grouped based on jurisdiction. The control type of each intersection, whether stop controlled, signalized or a roundabout is also shown in the table.

The intersections are evaluated using the methodology described in the previous Chapter. The table shows that each intersection currently operates at LOS B or better. Detailed ICU and LOS calculation worksheets are provided in Appendix C.

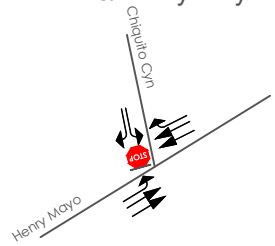
Table 3-1 Intersection LOS Summary – Existing

Int #	Intersection Name	Control Type	AM Peak Hour		PM Peak Hour	
			Delay / ICU	LOS	Delay / ICU	LOS
County Intersections						
2	Chiquito Canyon Road & San Martinez Road	Stop	0.23	A	0.28	A
3	Chiquito Canyon Road & Hunstock Street	Stop	0.20	A	0.21	A
4	Del Valle Road & Hasley Canyon Road	Stop	0.41	A	0.39	A
5	Commerce Center Drive & Hasley Canyon Road	Signal	0.42	A	0.35	A
13	Commerce Center Drive & Henry Mayo Drive	Signal	0.20	A	0.26	A
County/Caltrans Intersections						
1	Chiquito Canyon Road & SR-126	Stop	0.44	A	0.43	A
6	The Old Road & I-5 SB Ramps (at Sedona Way)	Signal	0.65	B	0.56	A
7	The Old Road/I-5 SB Ramp & Hasley Canyon Road[1]	Roundabout	15.9	B	18.4	B
8	I-5 NB Ramps & Hasley Canyon Road[1]	Roundabout	11.3	B	14.8	B
11	Commerce Center Drive & SR-126 WB Ramps	Signal	0.45	A	0.38	A
12	Commerce Center Drive & SR-126 EB On-Ramps	Free-Flow	0.13	A	0.18	A
14	Wolcott Way & SR-126	Signal	0.44	A	0.41	A
Caltrans Intersections						
9	I-5 SB Off-Ramp & SR-126/Newhall Ranch Road	Signal	15.1	B	12.0	B
10	I-5 NB Off-Ramp & SR-126/Newhall Ranch Road	Signal	16.9	B	16.1	B

See Table 1-1 for LOS ranges
[1] Roundabouts are calculated using delay methodology

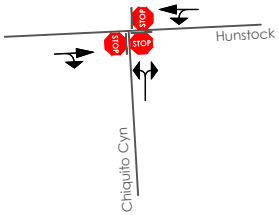


1. Chiquito Canyon & SR 126/Henry Mayo

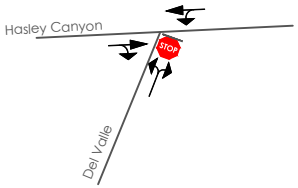


2. Chiquito Canyon & San Martinez

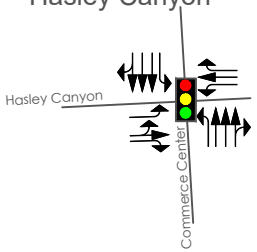
3. Chiquito Canyon & Hunstock



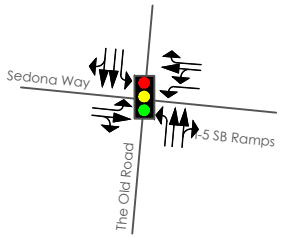
4. Del Valle & Hasley Canyon



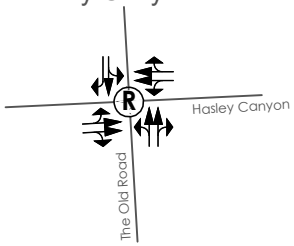
5. Commerce Center & Hasley Canyon



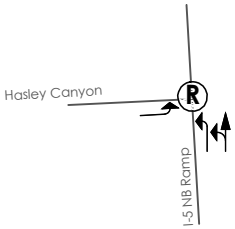
6. The Old Road & I-5 SB Ramps (at Sedona Way)



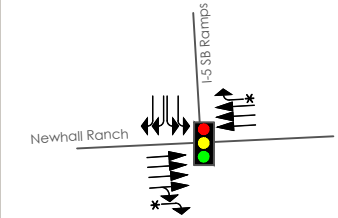
7. The Old Road & Hasley Canyon



8. I-5 NB Ramps & Hasley Canyon



9. I-5 SB Off-Ramp & Newhall Ranch



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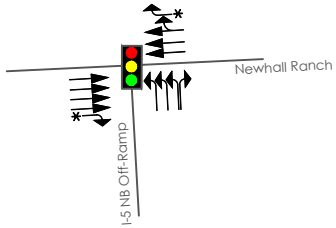
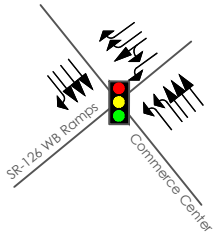


11. Commerce Center & SR-126 WB Ramps



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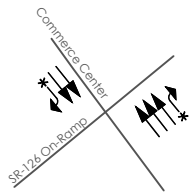
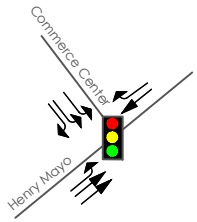


13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

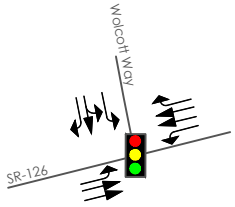


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Figure 3-1

Existing Intersection Lane Configuration

3.3

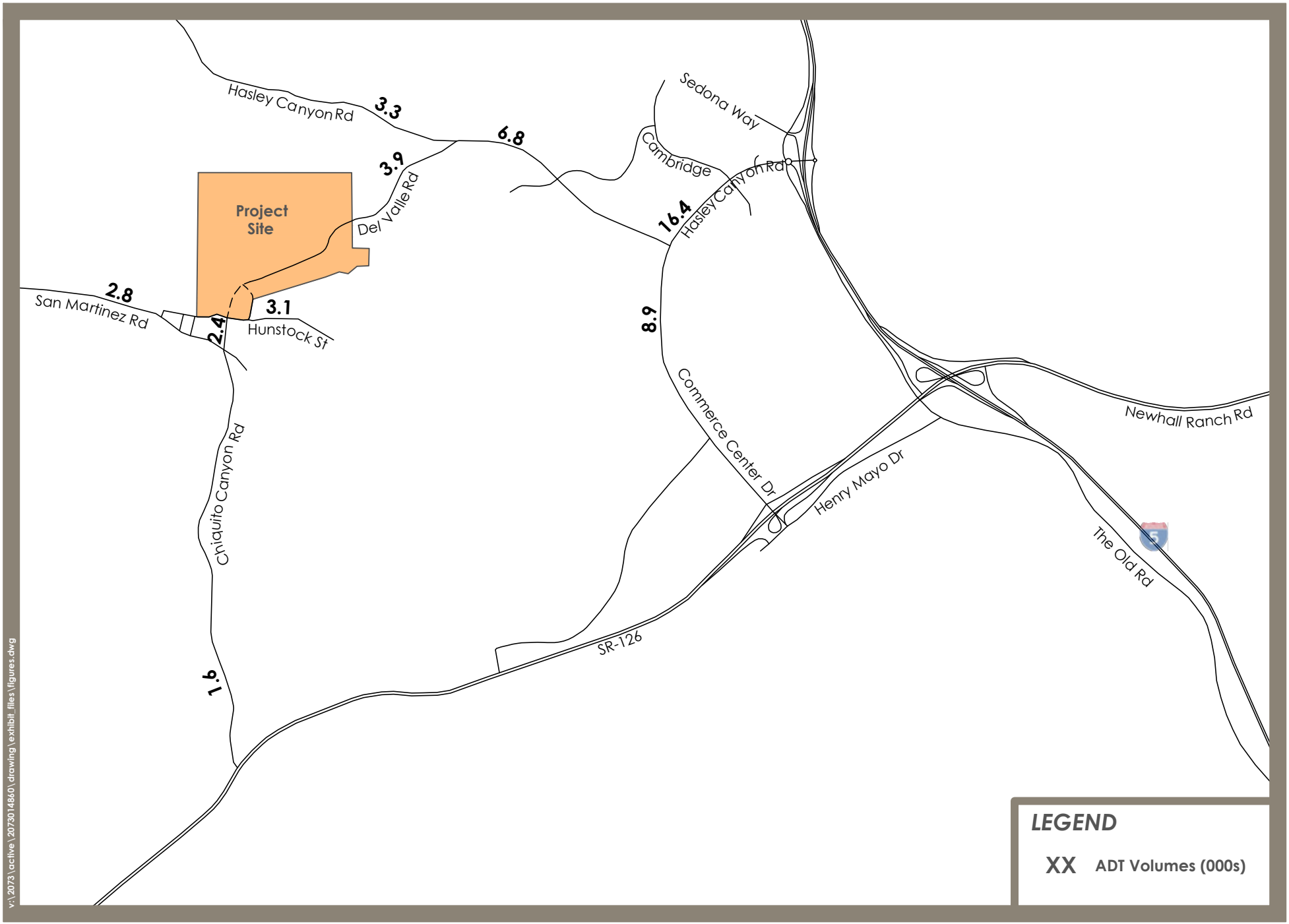

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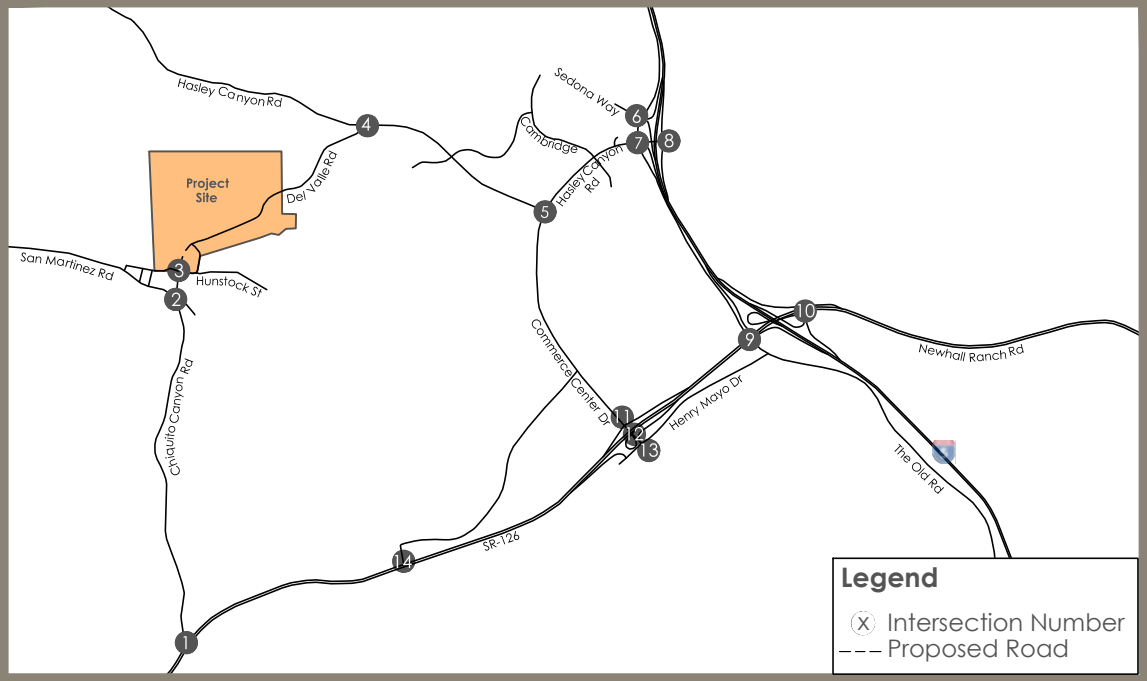
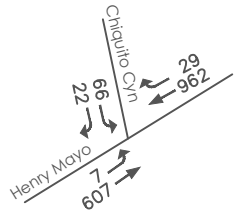
Figure 3-2

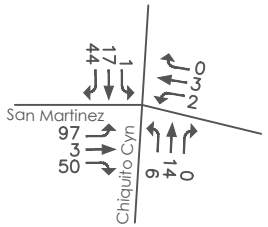
Existing ADT Volumes (000s)



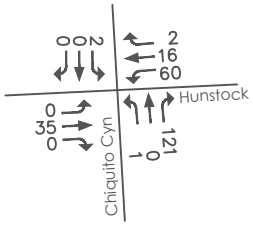
1. Chiquito Canyon & SR 126/Henry Mayo



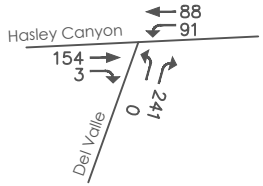
2. Chiquito Canyon & San Martinez



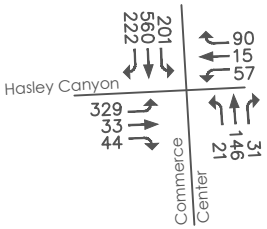
3. Chiquito Canyon & Hunstock



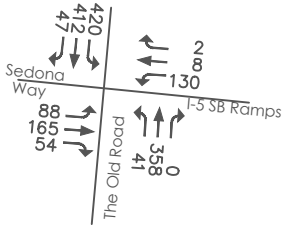
4. Del Valle & Hasley Canyon



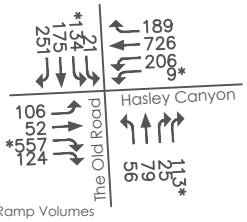
5. Commerce Center & Hasley Canyon



6. The Old Road & I-5 SB Ramps (at Sedona Way)

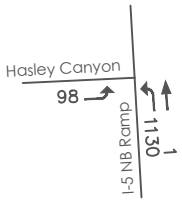


7. The Old Road & Hasley Canyon

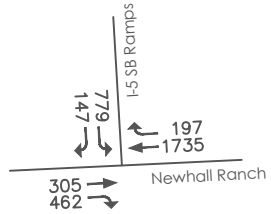


*I-5 SB On-Ramp Volumes

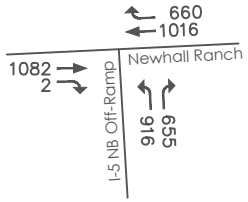
8. I-5 NB Ramps & Hasley Canyon



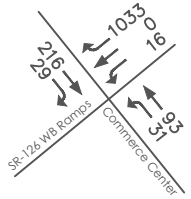
9. I-5 SB Off-Ramp & Newhall Ranch



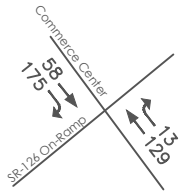
10. I-5 NB Off-Ramp & Newhall Ranch



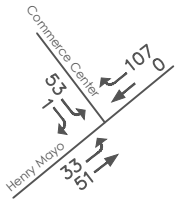
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

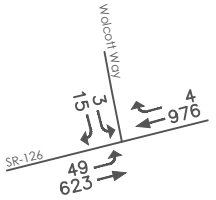


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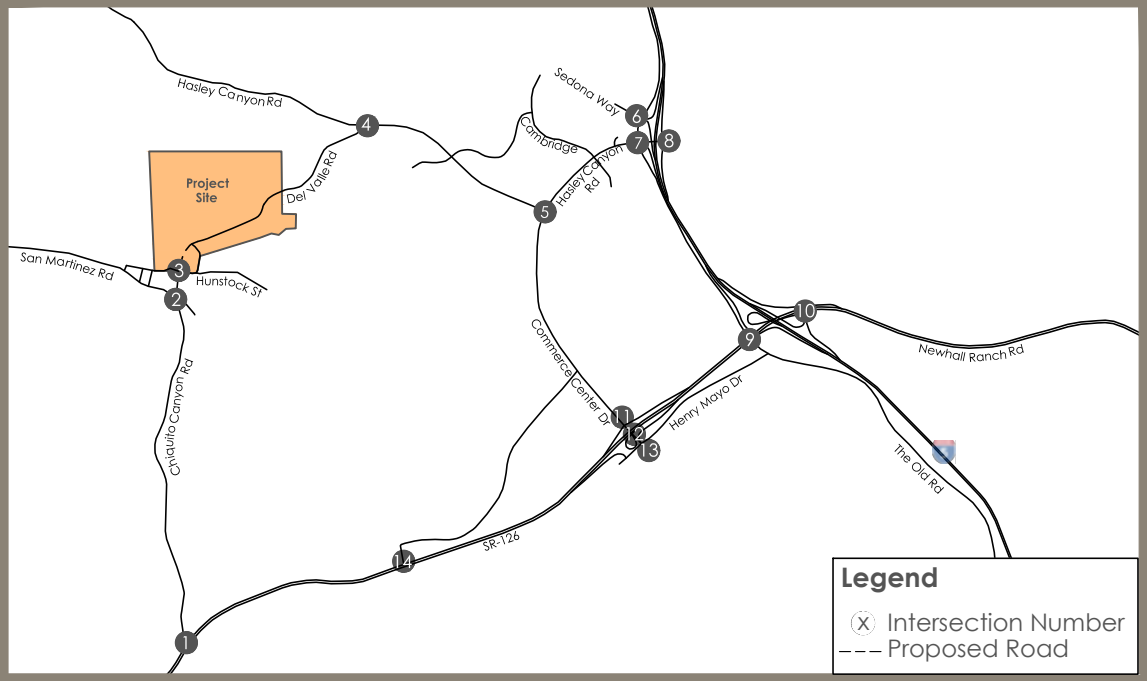
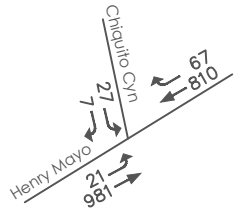
Figure 3-3

Existing Volumes - AM Peak Hour

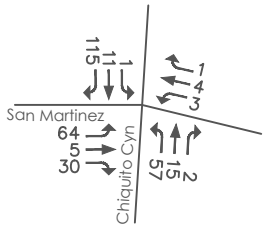
3.5



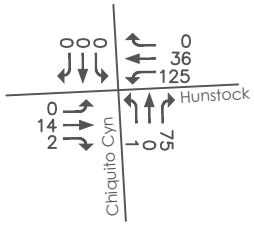
1. Chiquito Canyon & SR 126/Henry Mayo



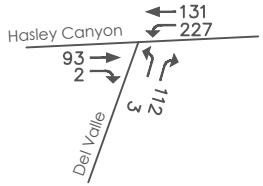
2. Chiquito Canyon & San Martinez



3. Chiquito Canyon & Hunstock



4. Del Valle & Hasley Canyon



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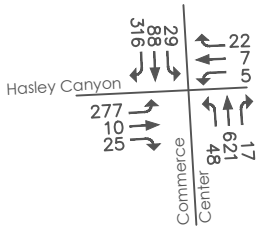
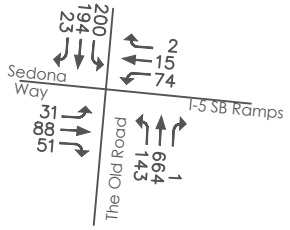
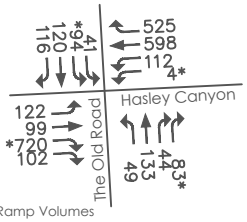


6. The Old Road & I-5 SB Ramps (at Sedona Way)

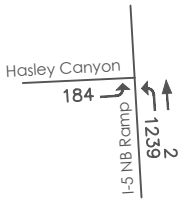


7. The Old Road & Hasley Canyon

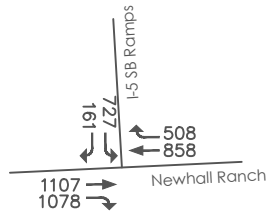


*I-5 SB On-Ramp Volumes

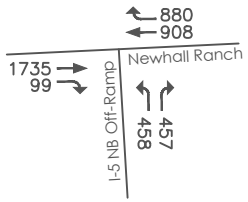
8. I-5 NB Ramps & Hasley Canyon



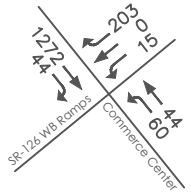
9. I-5 SB Off-Ramp & Newhall Ranch



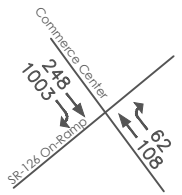
10. I-5 NB Off-Ramp & Newhall Ranch



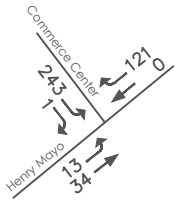
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

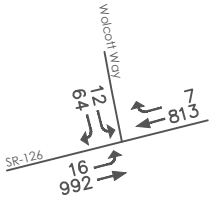


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Figure 3-4

Existing Volumes - PM Peak Hour

3.6

3.2 EXISTING CONDITIONS – WITH PROJECT

The ADT volumes for Existing plus Project conditions for the study area circulation system are illustrated in Figure 3-5. Illustrations of peak hour turning movement volumes can be found in Figure 3-6 for the AM peak hour and Figure 3-7 for the PM peak hour. Peak hour ICU and delay values, and LOS that correspond with the existing traffic and Existing plus Project traffic forecasts can be found in Table 3-2, which provides a comparison between the no-Project and the with-Project conditions. The evaluation of County intersections is prepared using ICU methodology, the evaluation of Caltrans signalized intersections is based on HCM methodology using Synchro software, and the evaluation of roundabouts is based on HCM methodology using Sidra methodology.

The Project's impacts are less than significant in both the AM and PM peak hour conditions based on County and Caltrans criteria as shown in Table 3-2 below. Each of the study intersections are forecast to operate at LOS C or better with Project traffic added. The two signalized intersections under Caltrans jurisdiction are forecast to operate at LOS B with Project traffic. The two roundabout intersections are forecast to operate at LOS C or better with Project traffic.

3.3 CUMULATIVE CONDITIONS ANALYSIS

The purpose of the cumulative conditions impact analysis is to evaluate the Project's impacts in the context of other approved, planned or anticipated projects (also referred to as an "Existing plus Project plus related projects" analysis). The intent of the analysis is to determine the combined impact of Project and related project traffic. This is in contrast to the direct impact of the Project traffic only, which was evaluated in Section 3.2. If the combined impact of Project and related project traffic triggers a significant impact, the Project will pay its fair-share of mitigation that offsets the Project's share of the combined impact.

Several significant land development projects are planned or are under construction in the immediate vicinity of the Project site. In addition, numerous other projects are at various stages of development throughout the Santa Clarita Valley. Due to the complexity of estimating future traffic volumes for a large number of cumulative projects, a traffic model is utilized for forecasting a cumulative conditions scenario. As previously discussed in Section 1.0, cumulative conditions traffic volumes presented in this analysis are derived by the SCVCTM, which is a sophisticated travel demand model maintained by the City of Santa Clarita.

The cumulative version of the SCVCTM includes the approved, pending and proposed development within the Santa Clarita Valley. Where specific development projects have not yet been proposed, the model includes future land uses as allowed by the current County and City General Plans. For the purpose of this analysis, a listing of projects from the County's Department of Regional Planning GIS-NET3 has been referenced. The SCVCTM was then reviewed to confirm that these cumulative projects are included. The SCVCTM also includes cumulative projects with the City of Santa Clarita.

Table 3-2 Intersection LOS Summary – Existing Plus Project

Int #	Intersection Name	Control Type	Existing				Existing plus Project				Increase	
			AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM	PM
			Delay/ ICU	LOS	Delay/ ICU	LOS	Delay/ ICU	LOS	Delay/ ICU	LOS		
County Intersections												
2	Chiquito Canyon Road & San Martinez Road	Stop	0.23	A	0.28	A	0.24	A	0.29	A	0.01	0.01
3	Chiquito Canyon Road & Hunstock Street	Stop	0.20	A	0.21	A	0.21	A	0.26	A	0.01	0.05
4	Del Valle Road & Hasley Canyon Road	Stop	0.41	A	0.39	A	0.51	A	0.52	A	0.10	0.13
5	Commerce Center Drive & Hasley Canyon Road	Signal	0.42	A	0.35	A	0.46	A	0.41	A	0.04	0.06
13	Commerce Center Drive & Henry Mayo Drive	Signal	0.20	A	0.26	A	0.20	A	0.26	A	0.00	0.00
County/Caltrans Intersections												
1	Chiquito Canyon Road & SR-126	Stop	0.44	A	0.43	A	0.46 **(68.0)[2,3]**	A **(F)[2,3]**	0.44 **(49.0)[2,3]**	A **(E)[2,3]**	0.02	0.01
6	The Old Road & I-5 SB Ramps (at Sedona Way)	Signal	0.65	B	0.56	A	0.65 (45.7)[2]	B (D)[2]	0.56 (28.1)[2]	A (C)[2]	0.00	0.00
7	The Old Road/I-5 SB Ramp & Hasley Canyon Road[1]	Roundabout	15.9	B	18.4	B	16.9	B	20.4	C	1.00	2.00
8	I-5 NB Ramps & Hasley Canyon Road[1]	Roundabout	11.3	B	14.8	B	11.5	B	15.5	C	0.20	0.70
11	Commerce Center Drive & SR-126 WB Ramps	Signal	0.45	A	0.38	A	0.45 (5.6)[2]	A (A)[2]	0.38 (12.5)[2]	A (B)[2]	0.00	0.00
12	Commerce Center Drive & SR-126 EB On-Ramps	Free-Flow	0.13	A	0.18	A	0.13	A	0.18	A	0.00	0.00
14	Wolcott Way & SR-126	Signal	0.44	A	0.41	A	0.44 (20.4)[2]	A (C)[2]	0.41 (17.4)[2]	A (B)[2]	0.00	0.00
Caltrans Intersections												
9	I-5 SB Off-Ramp & SR-126/Newhall Ranch Road	Signal	15.1	B	12.0	B	15.2	B	12.1	B	0.10	0.10
10	I-5 NB Off-Ramp & SR-126/Newhall Ranch Road	Signal	16.9	B	16.1	B	17.0	B	16.2	B	0.10	0.10

Bold – denotes significant impact
See Table 1-1 for LOS ranges and Table 1-2 significant impact thresholds
[1] Roundabouts are calculated using Delay Methodology
[2] Values in parentheses indicate average delay (seconds/vehicle) and LOS based on Caltrans HCM delay methodology
[3]Delay represents the movement with the highest individual delay

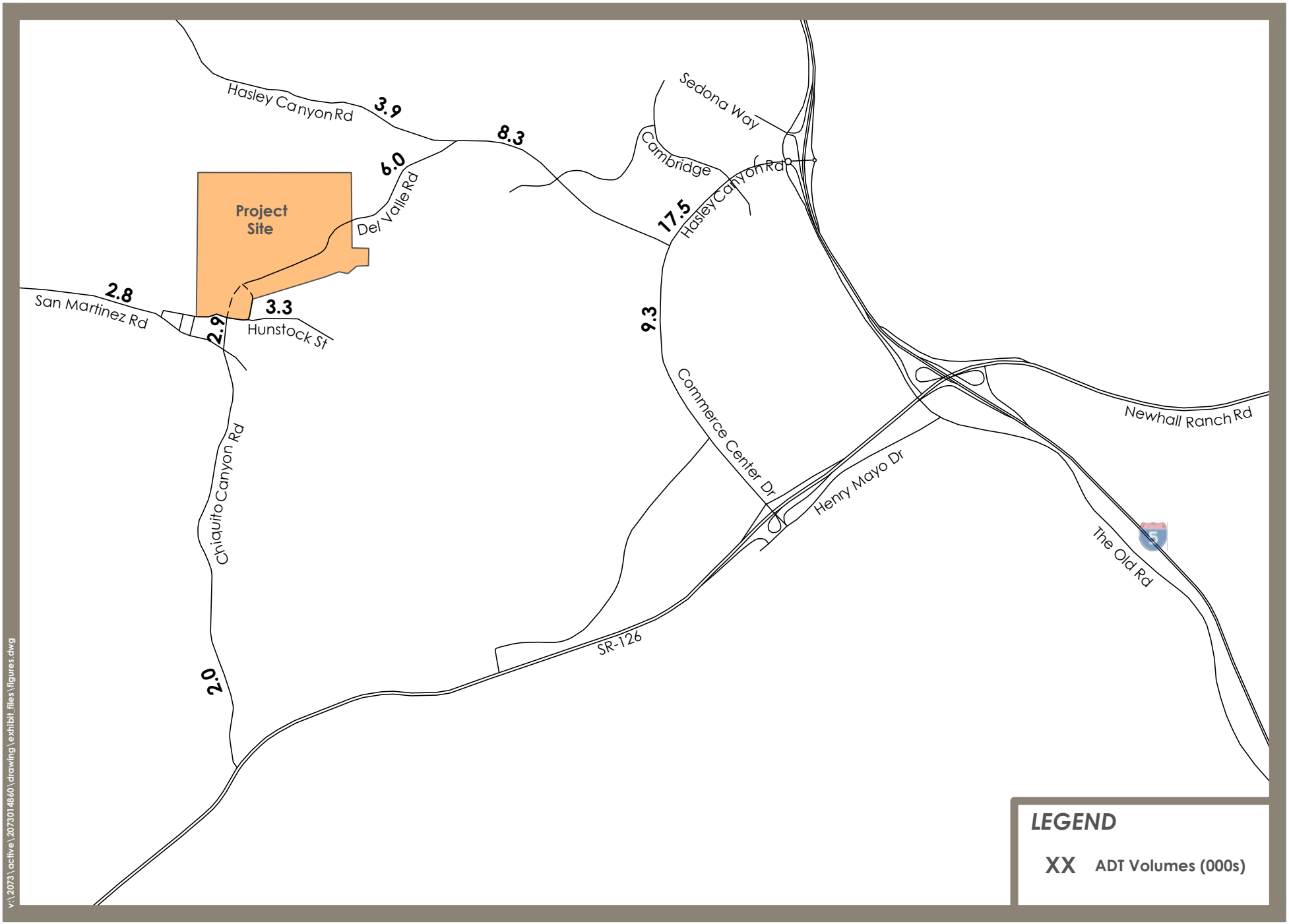

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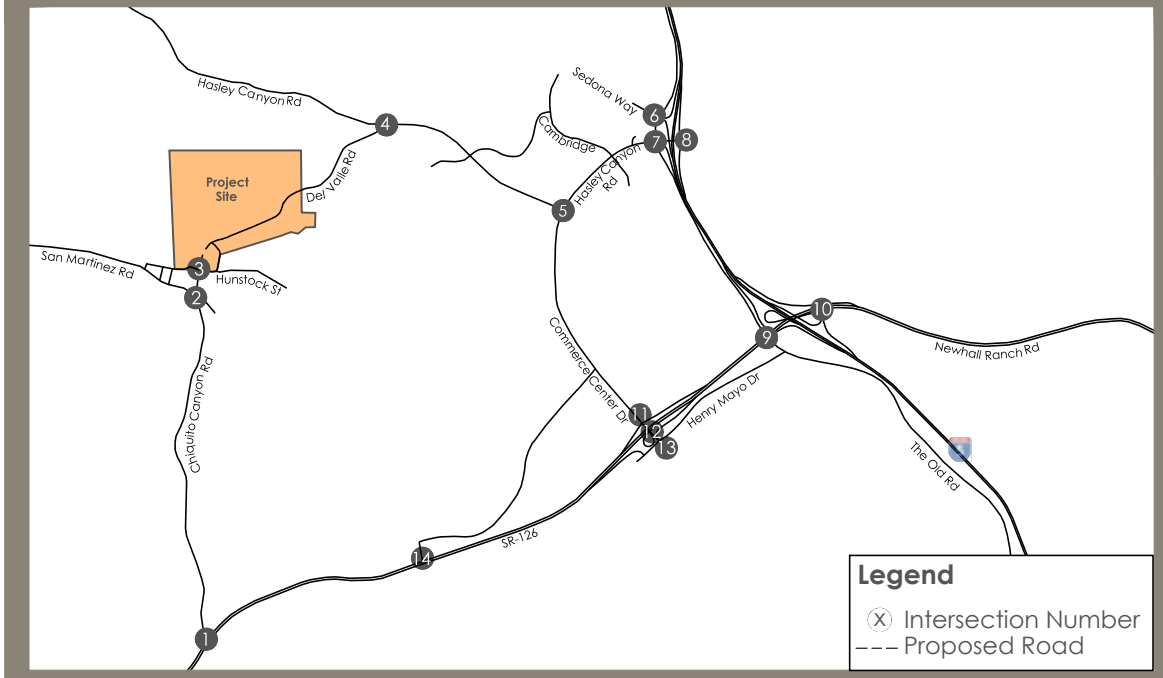
Figure 3-5

Existing Plus Project ADT Volumes (000s)

3.9



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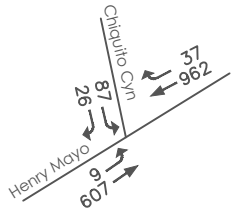

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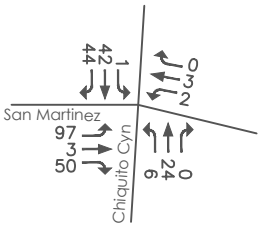
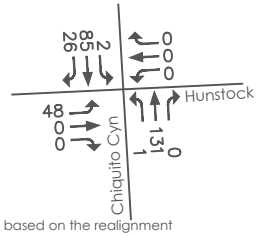
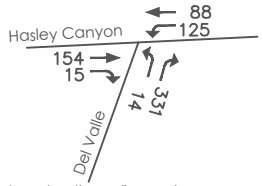


3. Chiquito Canyon & Hunstock



*Volumes based on the realignment

4. Del Valle & Hasley Canyon



*Volumes based on the realignment

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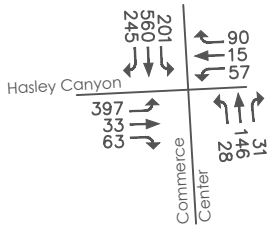
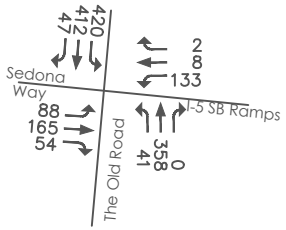


6. The Old Road & I-5 SB Ramps (at Sedona Way)



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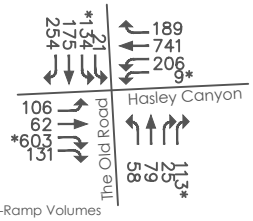

*I-5 SB On-Ramp Volumes

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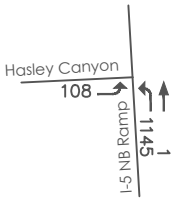
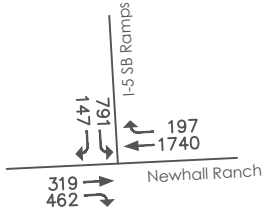
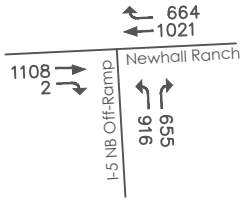


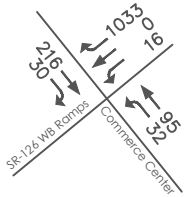
9. I-5 SB Off-Ramp & Newhall Ranch



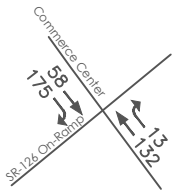
10. I-5 NB Off-Ramp & Newhall Ranch



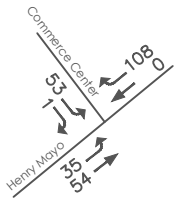
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

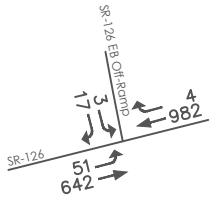


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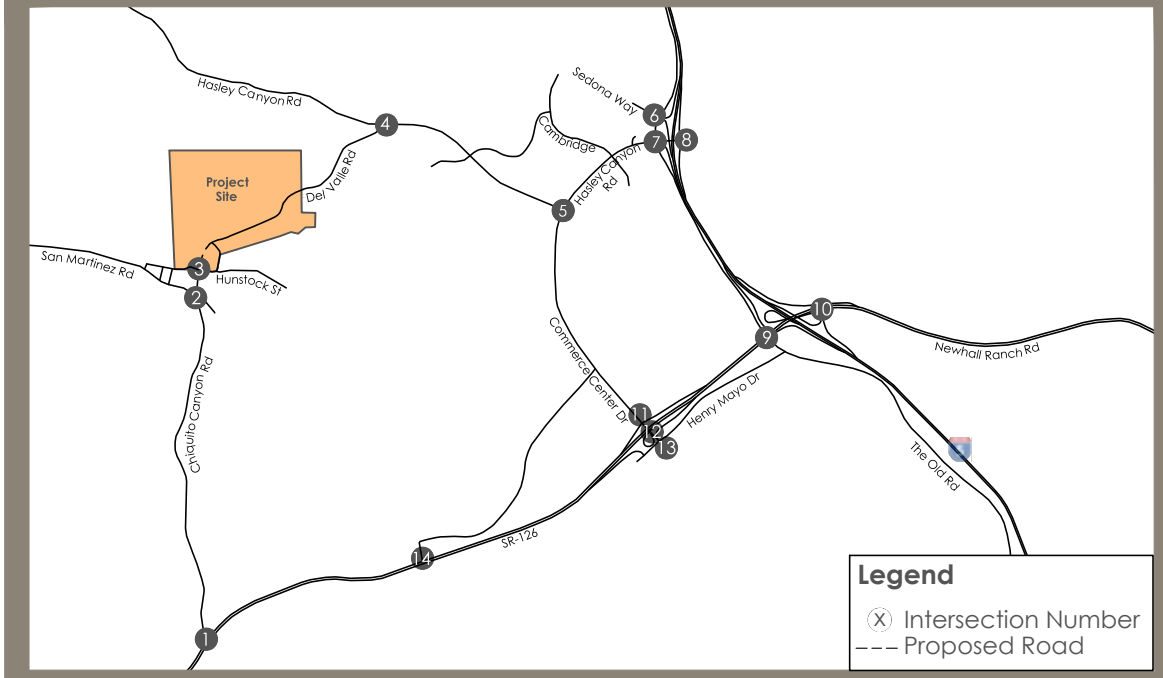
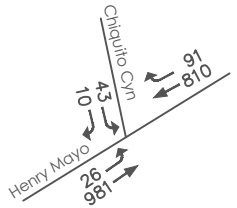
Figure 3-6

Existing Plus Project Volumes - AM Peak Hour

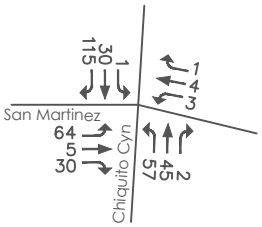
3.10



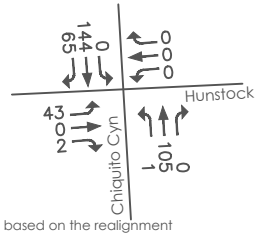
1. Chiquito Canyon & SR 126/Henry Mayo



2. Chiquito Canyon & San Martinez

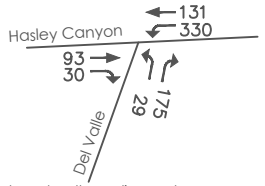


3. Chiquito Canyon & Hunstock



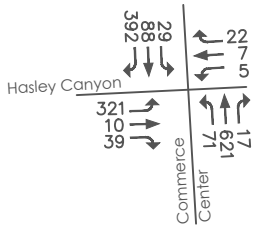
*Volumes based on the realignment

4. Del Valle & Hasley Canyon

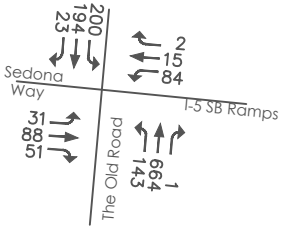


*Volumes based on the realignment

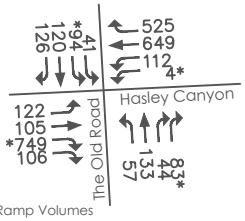
5. Commerce Center & Hasley Canyon



6. The Old Road & I-5 SB Ramps (at Sedona Way)

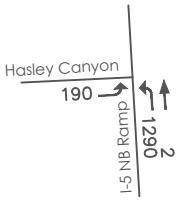


7. The Old Road & Hasley Canyon

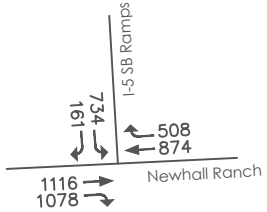


*I-5 SB On-Ramp Volumes

8. I-5 NB Ramps & Hasley Canyon



9. I-5 SB Off-Ramp & Newhall Ranch



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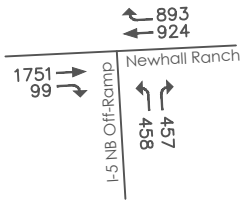
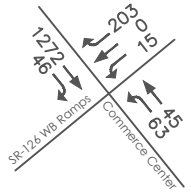
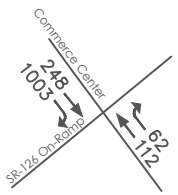


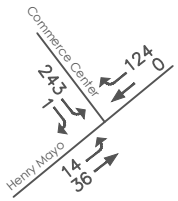
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

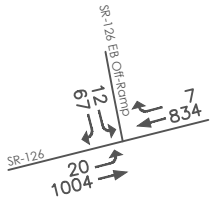


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Figure 3-7

Existing Plus Project Volumes - PM Peak Hour

3.11

Table 3-3 summarizes the cumulative projects within the vicinity of the Project site as well as other significant cumulative projects that are within the Santa Clarita Valley but are further from the Project site. The SCVCTM utilizes a comprehensive database of cumulative projects when developing traffic forecasts and, as such, includes more projects than those listed here. The SCVCTM also includes factors for regional growth. A location map of the cumulative projects within the vicinity of the Project site is provided in Figure 3-8.

The impact analysis for cumulative conditions is based on the buildout year of the Project as well as the known cumulative projects within the study area. A horizon year of 2028 is utilized for this analysis to encompass the broad range of cumulative projects. All the intersections assume existing lane configuration except Intersections 1, 13 and 14 which assume improvements to be constructed by other nearby projects for the purpose of site access, such as construction of the south leg of the SR-126 intersections at Chiquito Canyon Road and at Wolcott Way, as well as the southerly extension of Commerce Center Drive south of Henry Mayo Drive.

Forecast ADT volumes for cumulative with Project conditions are from the SCVCTM and are illustrated in Figure 3-9. Peak hour turning movement volumes for cumulative with Project conditions for the intersections in the study area are illustrated in Figure 3-10 for the AM peak hour and in Figure 3-11 for the PM peak hour.

Peak hour ICU and delay values, and the corresponding LOS can be found in Table 3-4, which provides a comparison between cumulative conditions with the proposed Project to the existing conditions, in accordance with the County's impact analysis guidelines.

Table 3-4 shows that the following intersections experience a cumulative significant impact based on the applicable LA County or Caltrans methodology prior to mitigation. Mitigation that addresses these impacts is presented in the next section.

1. Chiquito Canyon Road & SR-126 (County/Caltrans)
4. Del Valle Road & Hasley Canyon Road (County)
5. Commerce Center Drive & Hasley Canyon Road (County)
6. The Old Road & I-5 SB Ramps (at Sedona Way (County/Caltrans)
14. Wolcott Way & SR-126 (County/Caltrans)

Mitigation is addressed for all the above intersections which experience a cumulative impact under both County and Caltrans criteria. With mitigation, the cumulative impacts are less than significant. A peak hour traffic signal warrant analysis was conducted for the intersection of Del Valle Road and Hasley Canyon Road for existing and cumulative conditions with Project, discussed further in the Section 3.4. Note that the cumulative impacts at the Caltrans intersection of 11. Commerce Center Drive and SR-126 WB Ramps, which is forecast to operate at LOS C using Caltrans methodology, will be less than significant based on Caltrans criteria and therefore mitigation is not required for that location.

As noted above, the intersection of Commerce Center Drive and SR-126 WB Ramps, which operates under the jurisdiction of Caltrans, is forecast to operate at LOS C based on Caltrans LOS methodology, but LOS D based on County methodology. This intersection was recently constructed as part of a Project to construct the grade separated interchange for Commerce Center Drive at SR-126. Since the intersection has been fully improved to its planned configuration based on the Caltrans Project Report for this location, and since it is forecast to operate at an

Table 3-3 Cumulative Project List

S.No	Project	Description
1	TR42537	222 SF Lots
2	TR51852	1,696 DU Middle School
3	TR51852	3,000 Students
4	TR 46443	95 SF Lots
5	TR 47807	77 SF Lots
6	PM 071059	3 SF
7	TR 52729	36 SF
8	PM 069961	4 SF Lots
9	TR 53933	70 SF units
10	TR 46798	55 SF Units
11	PM 060646	4 DU SF
12	PM 19149-2	4 DU SF
13	PM 069664	2 SF units
14	TR 53725	42 DU SF
15	PM 070839	4 SF Lots
16	TR 52584	214 DU SF
17	TR 060319	35 DU Multi Family
18	TR 060665	109 DU
19	TR 45084	294 SF Lots
20	PM 060030	1,221.36 TSF Industrial Park
21	TR 062000	19 SF Lots
22	PM 26574	16 Industrial Lots
23	PM 060734	10 Commercial lots
24	PM 18108	3.7 MSF Industrial Park
25	PM 26363 (Part of PM 18108)	400 TSF Industrial Park
26	TR 53295	3,230 DU Residential 3.3 MSF Commercial 300 Room Hotel
27	PM 18654	200 TSF Office Building
28	TR 53295	408 SF Lots 1,232 Condo units
29	TR 061105	4,055 DU Residential 1,300 TSF Commercial
30	TR 53108	1,444 DU Residential (308 Single Family, 1,136 Multi-Family) 1,033 TSF Commercial
31	PM 24500-01	22 SF Units

S.No	Project	Description
32	TR 060678	5,777 DU Residential (965 Single Family, 4,812 Multi Family) 1,310 TSF Commercial
33	TR 061996	3,767 DU Residential (537 Single Family, 1,545 Condominium/Townhome, 1,685 Senior residences) 503 TSF Commercial
34	TR 48208	6 DU Multi Family
35	TR 53653	95 DU Single Family 95 Senior Housing
36	TR 53822	405 SF Units
37	TR 051644	714 DU SF
38	TR 53189	41 SF Units
39	PM 26755	2 SF Units
40	TR 53159	8 SF Units
41	PM 069788	4 SF units
42	TR52455-03	329 SF Lots 1107 Condo units
43	TR52455-14	9 SF units
44	TR52455	1,476 Condo units 1036 SF
45	TR52455-12	113 Condo

Legend:
TSF – Thousand Square Feet
MSF – Million Square Feet
DU – Dwelling Unit
SF – Single Family
TR – Tract
PM – Parcel Map

See Figure 3-8 for location map
Source: LA County Department of Regional Planning GIS-NET3 Public Subdivision Activity (accessed Feb 2018)

	Cumulative Developments	Description
1.	TR 42537	222 SF Lots
2.	TR 51852	1696 DU / Middle School
3.	TR 51852	3000 Students
4.	TR 46443	95 SF Lots
5.	TR 47807	77 SF Lots
6.	PM 071059	3 SF
7.	TR 52729	36 SF
8	PM 069961	4 SF Lots
9.	TR 53933	70 SF Units
10.	TR 46798	55 SF Units
11.	PM 060646	4 DU SF
12.	PM19149-2	4 DU SF
13.	PM 069664	2 SF Units
14.	TR 53725	42 DU SF
15.	PM 070839	4 SF Lots
16.	TR 52584	214 DU SF
17.	TR 060319	35 DU Multi Family
18.	TR 060665	109 DU SF
19.	TR 45084	294 SF Lots
20.	PM 060030	1221.36 TSF Industrial Park
21.	TR 062000	19 SF Lots
22.	PM 26574	16 Industrial Lots
23.	PM 06734	10 Commercial Lots
24.	PM 18108	3.7 MSF Industrial Park
25.	PM 26363	400 TSF Industrial Park
26.	TR 53295	3230 DU Residential / 3.3 MSF Commercial / 300 Room Hotel
27.	PM 18654	200 TSF Office Building
28.	TR 53295	408 SF Lots / 1232 Condo Units
29.	TR 061105	4,055 DU Residential / 1300 TSF Commercial
30.	TR 53108	1444 DU Residential / 1033 TSF Commercial
31.	PM 24500-01	22 SF Units
32.	TR 060678	5777 DU Residential/ 1310 TSF Commercial
33.	TR 061996	3767 DU Residential / 503 TSF Commercial
34.	TR 48208	6 DU Multi Family
35.	TR 53653	95 DU Single Family / 95 Senior Housing
36.	TR 53822	405 SF Units
37.	TR 051644	714 DU SF
38.	TR 53189	41 SF Units
39.	PM 26755	2 SF Units
40.	TR 53159	8 SF Units
41.	PM 069788	4 SF Units
42.	TR 52455-03	329 SF Lots / 1107 Condo Units
43.	TR 52455-14	9 SF Units
44.	TR 52455	1476 Condo units / 1036 SF
45.	TR 52455-12	113 Condo

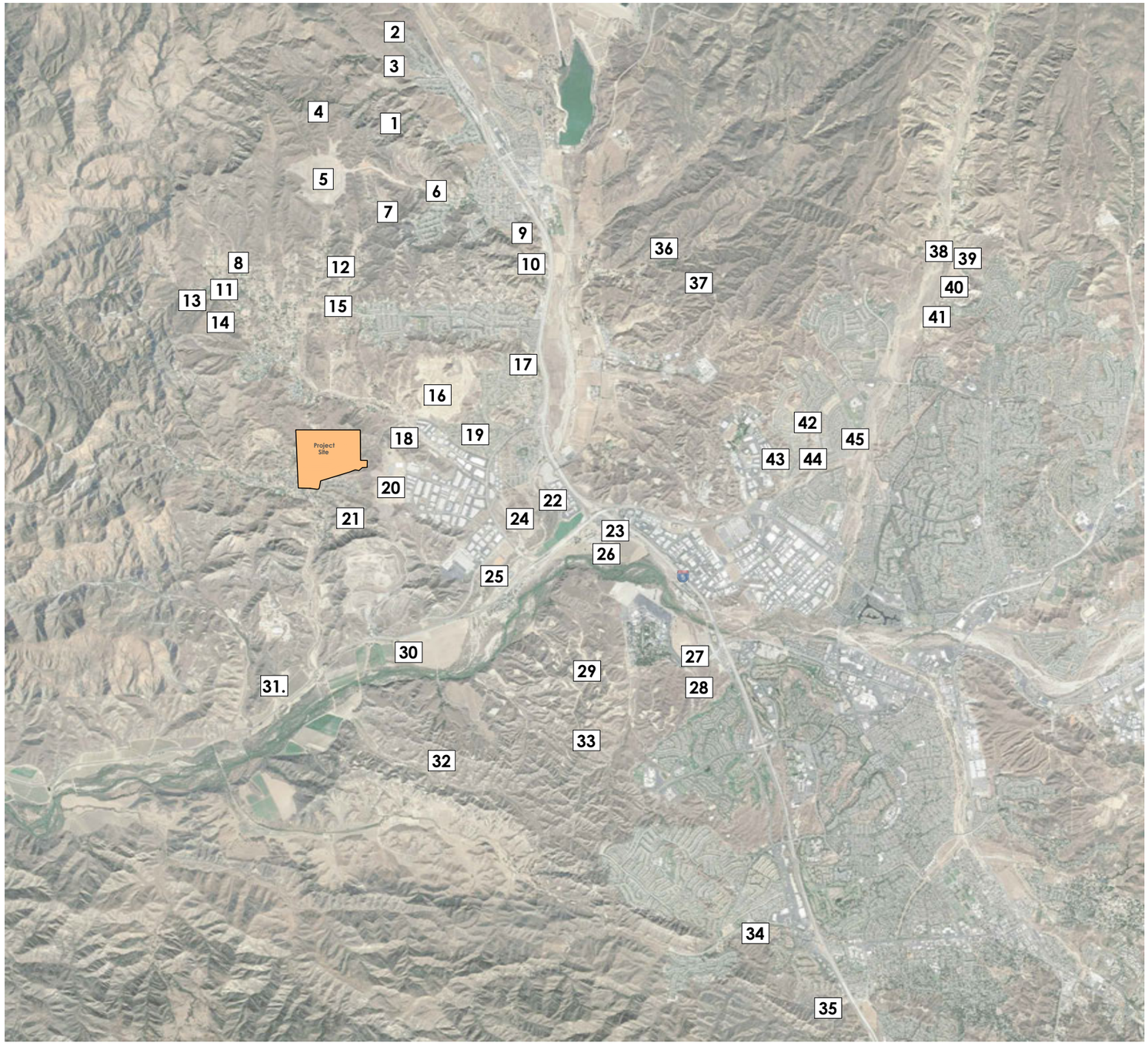

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Figure 3-8

Related (Cumulative) Project Locations

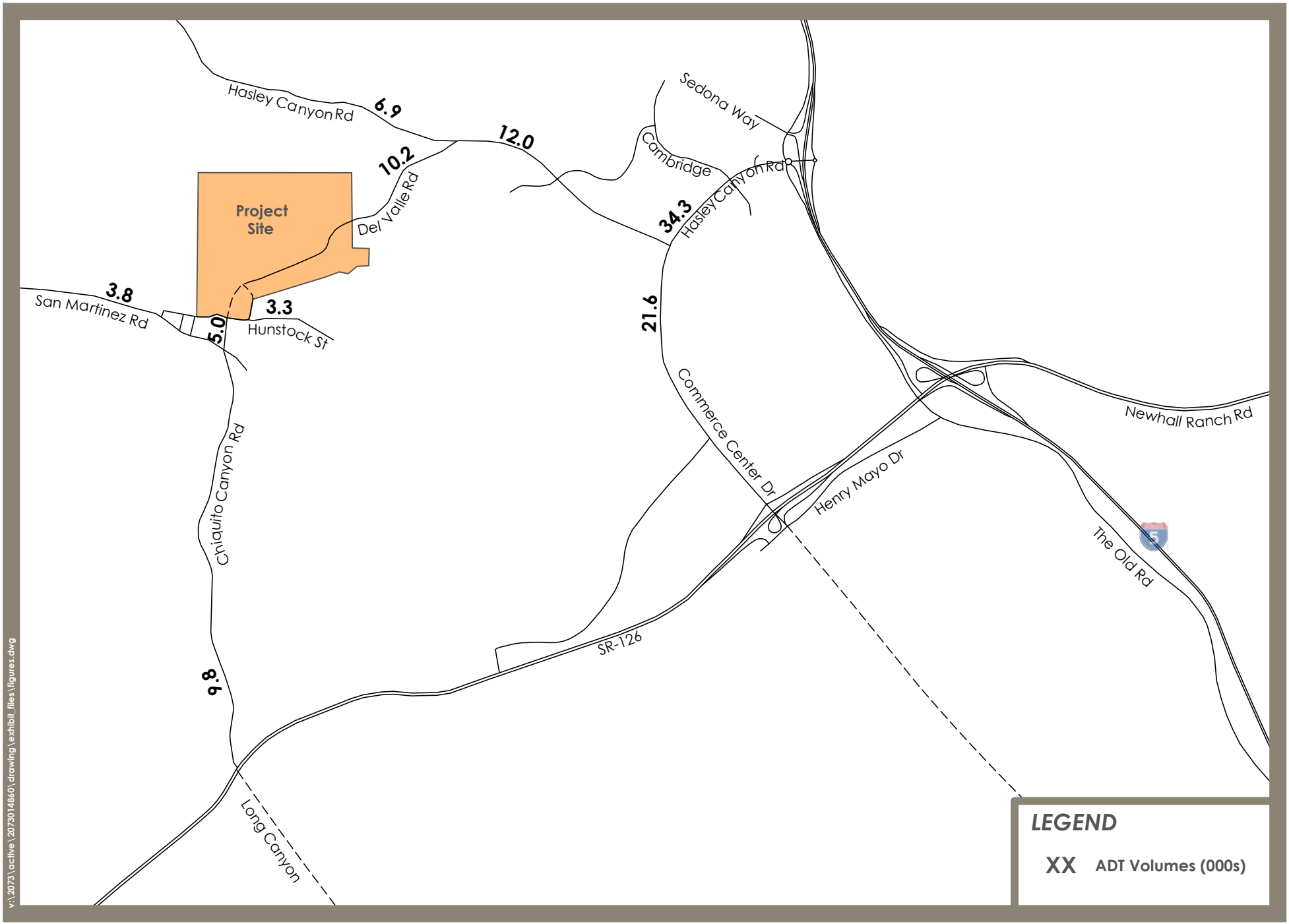

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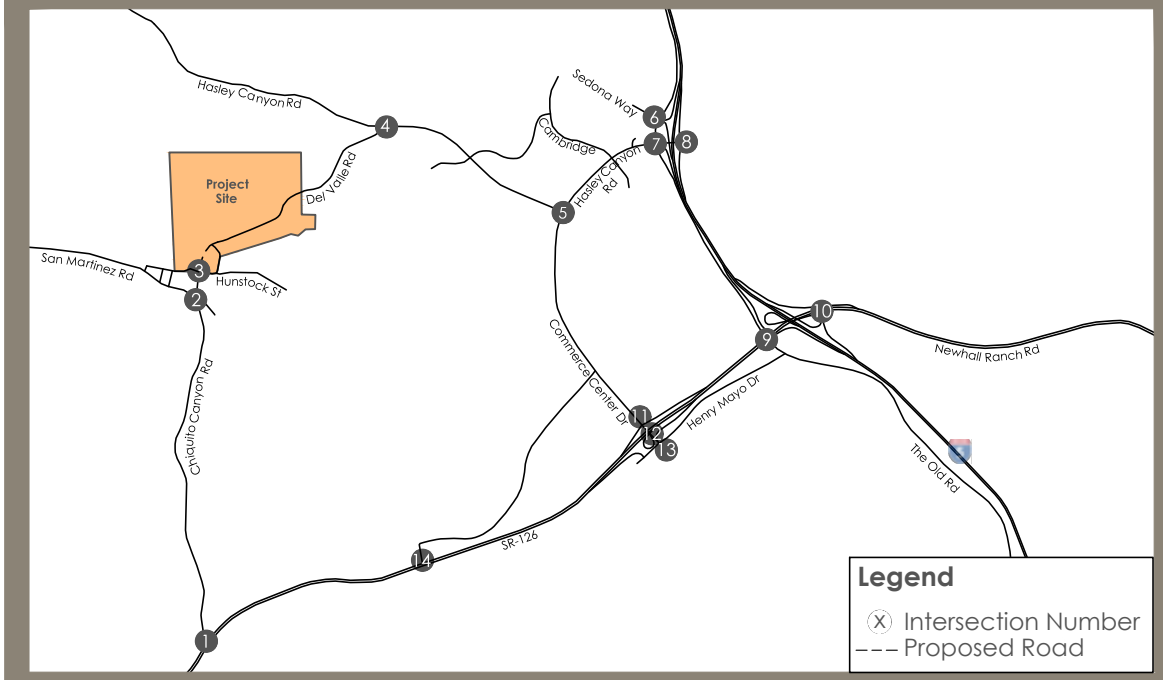
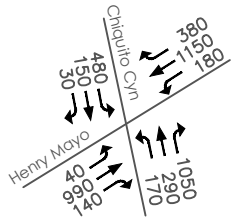
Figure 3-9

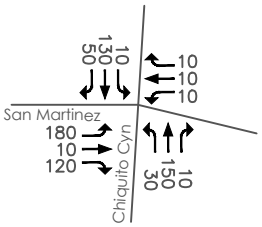
Cumulative with Project ADT Volumes (000s)



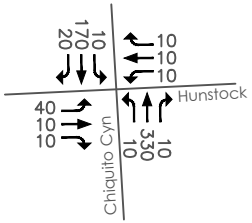
1. Chiquito Canyon & SR 126/Henry Mayo



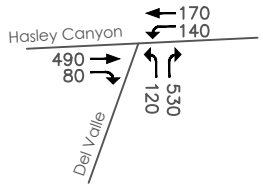
2. Chiquito Canyon & San Martinez



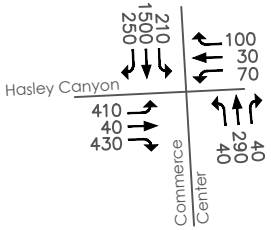
3. Chiquito Canyon & Hunstock



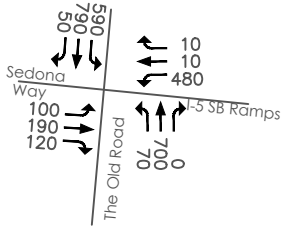
4. Del Valle & Hasley Canyon



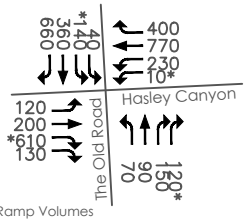
5. Commerce Center & Hasley Canyon



6. The Old Road & I-5 SB Ramps (at Sedona Way)

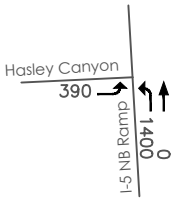


7. The Old Road & Hasley Canyon



*I-5 SB On-Ramp Volumes

8. I-5 NB Ramps & Hasley Canyon



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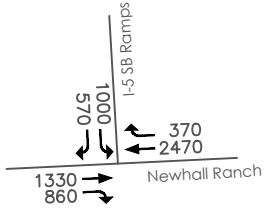

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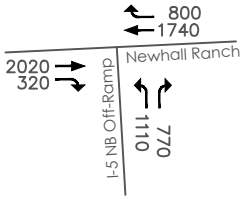
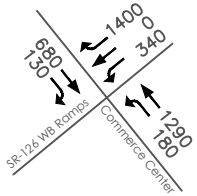
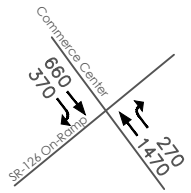


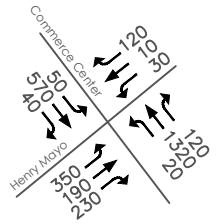
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

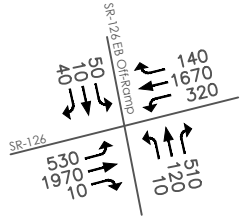


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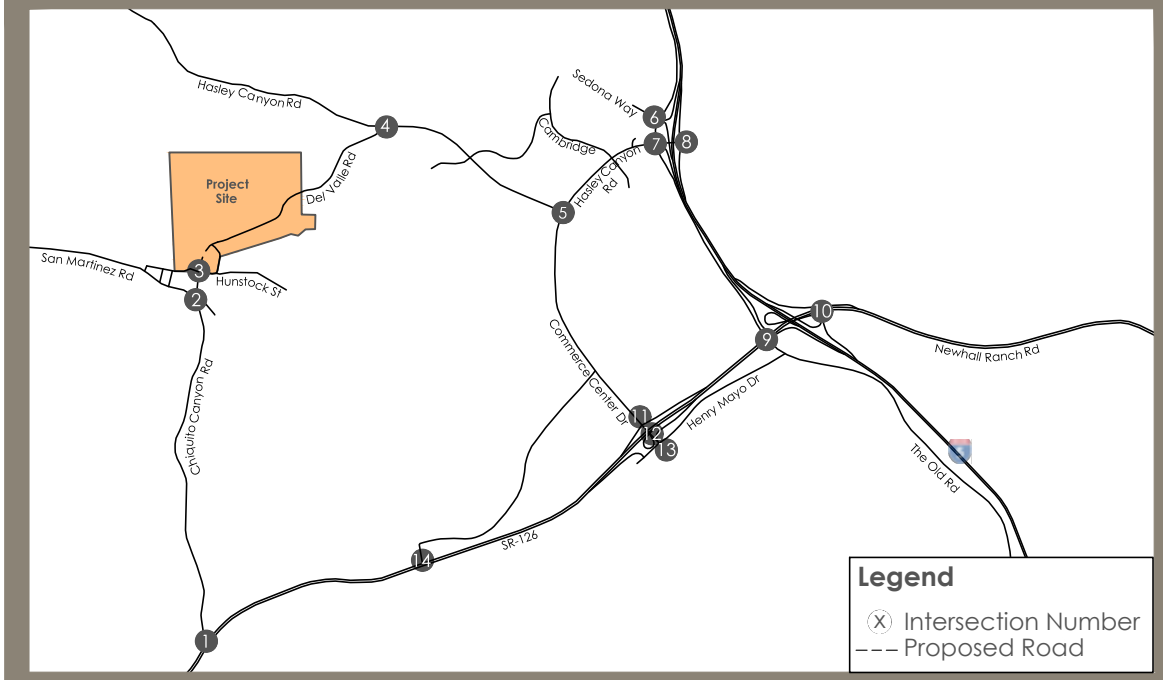
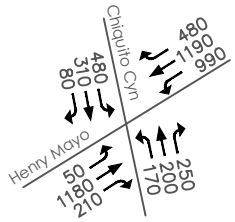
Figure 3-10

Cumulative With Project Volumes - AM Peak Hour

3.17



1. Chiquito Canyon & SR 126/Henry Mayo



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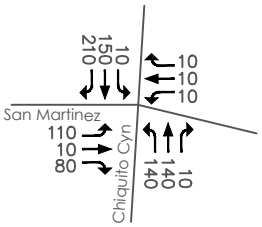
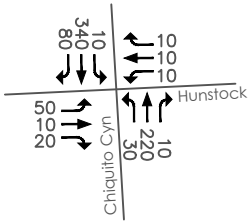
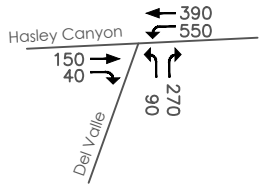


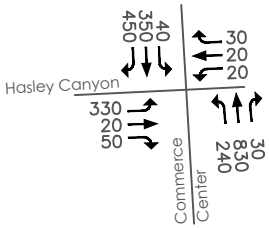
3. Chiquito Canyon & Hunstock



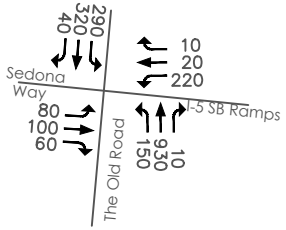
4. Del Valle & Hasley Canyon



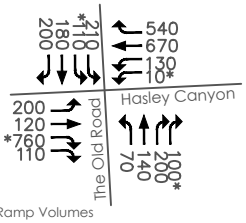
5. Commerce Center & Hasley Canyon



6. The Old Road & I-5 SB Ramps (at Sedona Way)

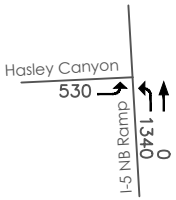


7. The Old Road & Hasley Canyon

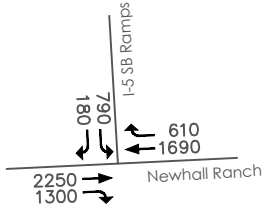


*I-5 SB On-Ramp Volumes

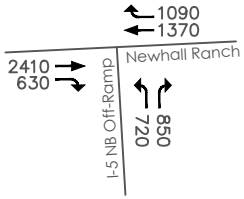
8. I-5 NB Ramps & Hasley Canyon



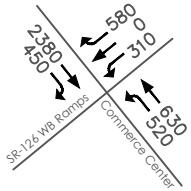
9. I-5 SB Off-Ramp & Newhall Ranch



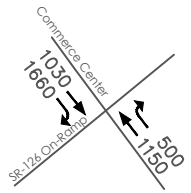
10. I-5 NB Off-Ramp & Newhall Ranch



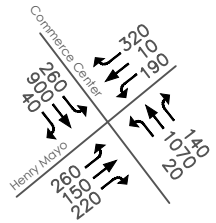
11. Commerce Center & SR-126 WB Ramps



12. Commerce Center & SR-126 EB Ramps



13. Commerce Center & Henry Mayo



14. Wolcott & SR-126

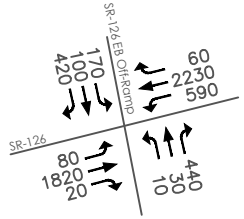


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Figure 3-11

Cumulative With Project Volumes - PM Peak Hour

Table 3-4 Intersection LOS Summary – Cumulative Conditions

Int #	Intersection Name	Control Type	Existing				Cumulative with Project				Increase	
			AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour		AM	PM
			Delay/ ICU	LOS	Delay/ ICU	LOS	Delay/ ICU	LOS	Delay/ ICU	LOS		
County Intersections												
2	Chiquito Canyon Road & San Martinez Road	Stop	0.23	A	0.28	A	0.44	A	0.56	A	0.21	0.28
3	Chiquito Canyon Road & Hunstock Street	Stop	0.20	A	0.21	A	0.38	A	0.45	A	0.18	0.24
4	Del Valle Road & Hasley Canyon Road	Stop	0.41	A	0.39	A	**0.96**	**E**	**0.79**	**C**	0.55	0.40
5	Commerce Center Drive & Hasley Canyon Road	Signal	0.42	A	0.35	A	**0.78**	**C**	0.57	A	0.36	0.22
13	Commerce Center Drive & Henry Mayo Drive	Signal	0.20	A	0.26	A	0.70	B	0.73	C	0.50	0.47
County/Caltrans Intersections												
1	Chiquito Canyon Road & SR-126	Stop	0.44	A	0.43	A	**1.06 (62.9)[1]**	**F (E)[1]**	**1.17 (88.0)[1]**	**F (F)[1]**	0.62	0.74
6	The Old Road & I-5 SB Ramps (at Sedona Way)	Signal	0.65	B	0.56	A	**1.03 (81.1)[1]**	**F (F)[1]**	0.75 (43.3)[1]	C (D)[1]	0.38	0.19[2]
7	The Old Road/I-5 SB Ramp & Hasley Canyon Road[3]	Roundabout	15.9	B	18.4	B	38.3	D	47.9	D	22.4	29.5
8	I-5 NB Ramps & Hasley Canyon Road[3]	Roundabout	11.3	B	14.8	B	31.3	C	33.9	C	20.0	19.1
11	Commerce Center Drive & SR-126 WB Ramps	Signal	0.45	A	0.38	A	0.81 (31.8)[1]	D (C)[1]	0.88 (31.7)[1]	D (C)[1]	0.36[2]	0.50[2]
12	Commerce Center Drive & SR-126 EB on-Ramps	Free-Flow	0.13	A	0.18	A	0.41	A	0.42	A	0.28	0.24
14	Wolcott Way & SR-126	Signal	0.44	A	0.41	A	**1.05 (76.9)[1]**	**F (E)[1]**	**1.09 (61.5)[1]**	**F (E)[1]**	0.61	0.68
Caltrans Intersections												
9	I-5 SB Off-Ramp & SR-126/Newhall Ranch Road	Signal	15.1	B	12.0	B	18.0	B	14.5	B	2.9	2.50
10	I-5 NB Off-Ramp & SR-126/Newhall Ranch Road	Signal	16.9	B	16.1	B	37.5	D	50.9	D	20.6	34.8

Bold – denotes significant impact (See Table 1-2 for criteria)
[1] Values in parentheses indicate average delay (seconds/vehicle) and LOS based on HCM delay methodology
[2] Not a significant impact under Caltrans methodology due to LOS D or better conditions based on Caltrans HCM delay calculation (See Appendix C for Delay worksheets)
[3] Roundabouts are calculated using Delay Methodology

acceptable LOS C as set forth in the Caltrans Project Report, the location is not considered significantly impacted and mitigation is not required.

The following intersections exceed an acceptable LOS based on the HCM methodology utilized by Caltrans for intersection analysis.

1. Chiquito Canyon Road & SR-126 (County/Caltrans)
6. The Old Road & I-5 SB Ramps (at Sedona Way (County/Caltrans)
14. Wolcott Way & SR-126 (County/Caltrans)

The two roundabout intersections under joint County/Caltrans jurisdiction will operate at LOS D or better with Project traffic in the cumulative setting. These intersections, which are either under joint County/Caltrans jurisdiction or entirely under Caltrans jurisdiction, are not cumulatively impacted since they are forecast to operate at LOS D or better under cumulative with Project conditions.

3.4 MITIGATION

Roadway improvements have been identified to mitigate the cumulative impacts identified in the previous section. Table 3-5 lists the identified mitigation measures to address cumulative impacts in the cumulative conditions setting. As the identified impacts are cumulative impacts, the Project is responsible for its fair-share of the costs of the identified mitigation measures. The Project's fair-share of the cumulative impact for each location is also shown in the Table 3-5. The fair-share costs for the Project is based on a percentage that is calculated by dividing the volume of peak hour Project traffic by the total volume of new peak hour cumulative traffic. Fair-share calculations are shown in Appendix E. The Project site is not located within one of the County's Bridge and Major Thoroughfare (B&T) District.

A peak hour traffic signal warrant analysis was conducted for the intersection of Del Valle Road and Hasley Canyon Road for existing and cumulative conditions with the Project as illustrated in Figure 3-12 and Figure 3-13, respectively.

For Existing plus Project conditions, the total vehicles per hour (vph) of both approaches for Hasley Canyon Road is 382 and 584 during AM and PM peak hours, respectively. Del Valle Road represents the higher volume approach of the minor street with 14 vph during AM peak hour and 29 vph during the PM peak hour. Plotting these points based on the peak hour warrant criteria indicates that a traffic signal is not warranted at the intersection since the volumes fall below the curve for the applicable type of roadway (one major lane and one minor lane).

Similarly, for cumulative with Project conditions, the total vehicles per hour (vph) of both approaches for Hasley Canyon Road is 880 and 1130 during AM and PM peak hours, respectively. Del Valle Road represents the higher volume approach of the minor street with 120 vph during AM peak hour and 90 vph during the PM peak hour. Plotting these points on the peak hour warrant criteria, a traffic signal is warranted at the intersection since the volumes fall above the curve for the applicable type of roadway (one major lane and one minor lane). Based on the results, a traffic signal is not warranted at the intersection during Existing plus Project conditions, but a signal is warranted under cumulative with Project conditions.

Figure 3-12 Signal Warrant – Existing plus Project Conditions

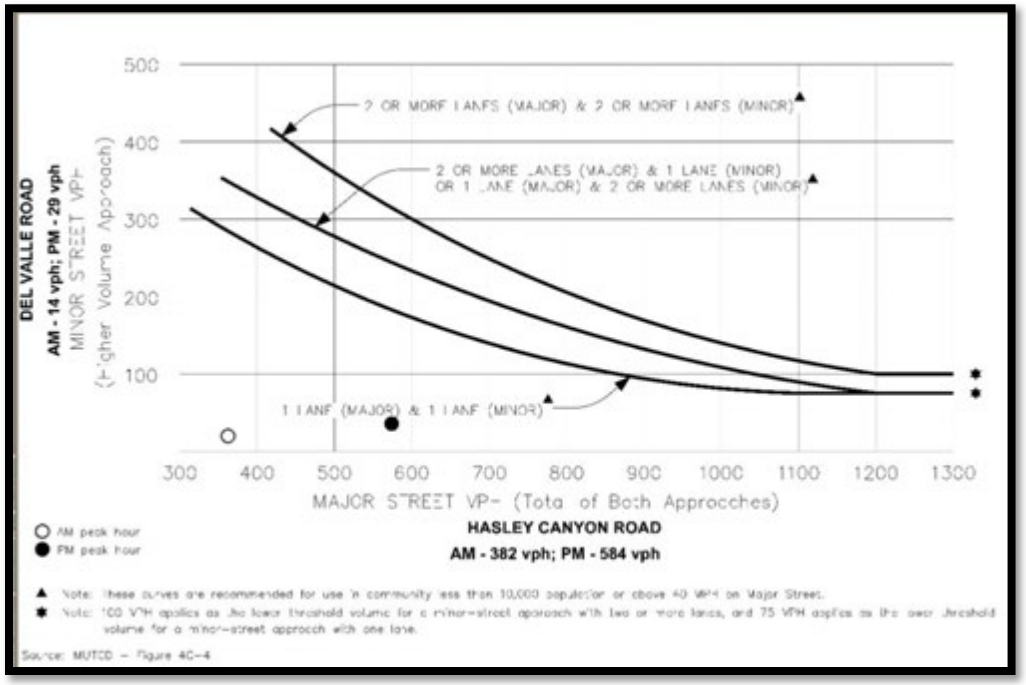
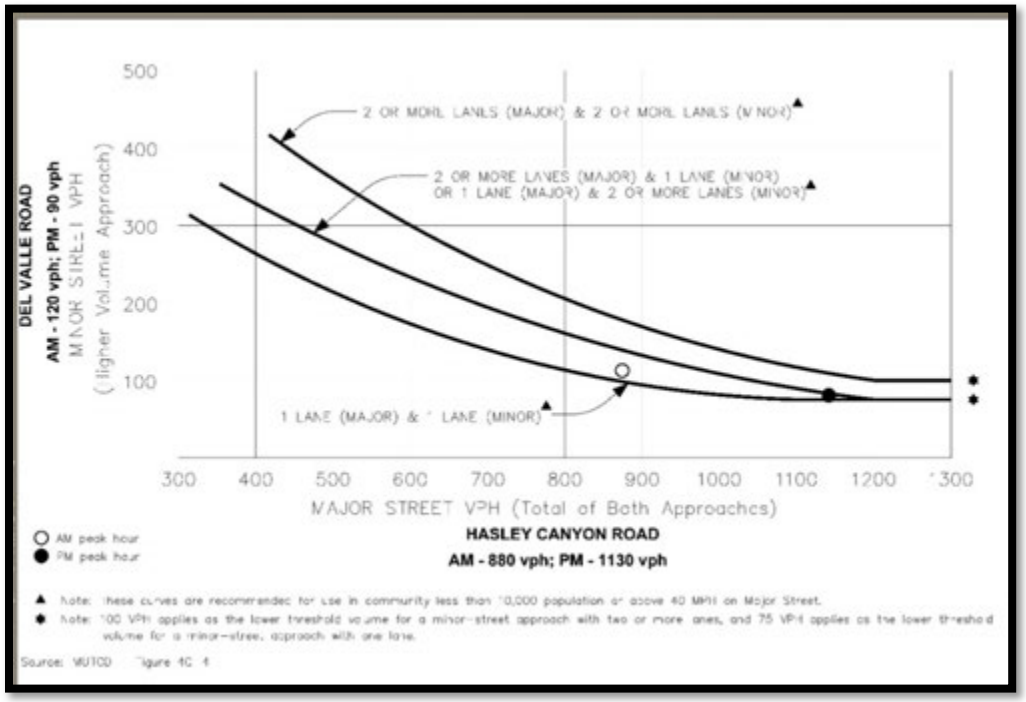


Figure 3-13 Signal Warrant – Cumulative with Project Conditions



Note: Per the aforementioned mitigation at the intersection of Hasley Canyon Road and Del Valle Road, northbound right-turn lane is a free-flow movement. Therefore, northbound right-turn volumes were excluded from traffic signal warrant analyses.

Table 3-5 Mitigation Measures for Cumulative Impacts

Int #	Location	Mitigation	Project Traffic Share %
County Intersections			
4	Del Valle Road & Hasley Canyon Road	Install traffic signal Intersection modification to provide one northbound left-turn lane, one northbound free-flow right-turn lane, and one westbound left-turn lane	18.6%
5	Commerce Center & Hasley Canyon Road	Intersection modification to restripe the eastbound shared left and through lane to a shared left, through and right lane (for 1 EB Left, 1 shared EB Left/Through/Right and 1 EB Right)	10.3%
County/Caltrans Intersections			
1	Chiquito Canyon Road & SR-126	Intersection modification to provide two southbound left-turn lanes, three southbound through lanes, one southbound right-turn lane (for 2 SB Left, 3 SB Through and 1 SB Right), two westbound left-turn lanes, three westbound through lanes, one westbound right-turn lane (for 2 WB Left, 3 WB Through and 1 WB Right), two northbound left-turn lanes, two northbound through lanes, two northbound right-turn lanes (for 2 NB Left, 2 NB Through and 2 NB Right), two eastbound left-turn lanes, three eastbound through lanes, one eastbound right-turn lane (for 2 EB Left, 3 EB Through and 1 EB Right). Install traffic signal[1]	1.2%
6	The Old Road & I-5 SB Ramps (at Sedona Way)	Intersection modification to add one southbound left-turn lane (for 2 SB Left and 2 SB Through)	0.6%
14	Wolcott Way & SR-126	Intersection modification to provide two southbound left-turn lanes, one southbound through lane, one southbound right-turn lane (for 2 SB Left, 1 SB Through and 1 SB Right), two westbound left-turn lanes, four westbound through lanes, one westbound right-turn lane (for 2 WB Left, 4 WB Through and 1 WB Right), one northbound left-turn lanes, one northbound through lanes, two northbound right-turn lanes (for 1 NB Left, 1 NB Through and 2 NB Right), two eastbound left-turn lanes, four eastbound through lanes, one eastbound right-turn lane (for 2 EB Left, 4 EB Through and 1 EB Right)	0.9%

Note:
[1] Improvements identified in Caltrans SR-126 PSR
The intersection of Commerce Center Drive and SR-126 WB Ramps is forecast to operate at LOS C and is not significantly impacted based on Caltrans methodology, therefore mitigation is not required for that location.
See Appendix D for fair-share calculations

The need for a traffic signal for the seven on-site Project intersections has been evaluated. Since none of the on-site Project intersections are forecast to have volumes that meet the minimum threshold of 75 vehicle per hour to warrant a traffic signal, none of the on-site intersections will require a traffic signal.

For the intersection of Chiquito Canyon Road and SR-126, Caltrans has a Project Study Report (PSR) that has identified the need for the improvements identified here as mitigation for cumulative conditions, including the installation of a traffic signal at that location.

The Project's fair-share of each of the identified improvements would fully mitigate the Project's cumulative significant impact, as shown in Table 3-6.

3.5 CONGESTION MANAGEMENT PROGRAM ANALYSIS (CMP)

The Los Angeles County Congestion Management Program (CMP) requires that a proposed development address two major subject areas with respect to traffic impacts. These are the Project's impacts on the CMP highway system and the Project's impacts on the local and regional transit systems.

CMP Highway System

According to the CMP guidelines, the geographical area to be examined in a CMP traffic impact analysis (TIA) consists of the CMP monitoring locations that meet the following criteria:

- CMP identified arterial intersections where the proposed Project will add 50 or more trips during either the AM or PM weekday peak hours (determined based on adjacent street traffic)
- CMP identified mainline freeway locations where the Project will add 150 or more trips, in either direction, during either the a.m. or p.m. weekday peak hour.

None of the study area intersections are part of the CMP arterial monitoring intersections. Therefore, no CMP analysis was conducted.

The Project would add less than the CMP analysis guideline threshold of 150 peak hour trips at the nearest freeway monitoring stations. Therefore, CMP mainline freeway segment analysis is not required.

Local and Regional Transit Systems

Another component of the CMP transportation impact analysis is a review of transit impacts; public transit in the Santa Clarita Valley includes both bus and commuter rail service. The CMP transit impact review requires evidence that transit operators received the Notice of Preparation of the applicable draft environmental impact report, identification of existing transit services near the Project site, estimation of the number of Project trips assigned to transit, information on facilities and/or programs that will encourage public transit use, and an analysis of Project impacts on transit service. The following discussion describes the CMP transit analysis for the Project.

The Project's environmental documentation includes evidence that the applicable transit operators (i.e., City of Santa Clarita Transit (SCT), Metro, and Metrolink) received the Notice of Preparation.

Table 3-6 Intersection LOS Summary – Cumulative Conditions with Mitigation

Int #	Intersection Name	Control Type	Existing				Cumulative with Project with Mitigation				Net Change With Mitigation	
			AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour			
			ICU	LOS	ICU	LOS	Delay/ ICU	LOS	Delay/ ICU	LOS	AM	PM
County Intersections												
4	Del Valle Road & Hasley Canyon Road[1]	Stop	0.41	A	0.39	A	0.63	B	0.62	B	0.22	0.23
5	Commerce Center Drive & Hasley Canyon Road[1]	Signal	0.42	A	0.35	A	0.70	B	0.56	A	0.28	0.21
County/Caltrans Intersections												
1	Chiquito Canyon Road & SR-126[1]	Stop	0.44	A	0.43	A	29.5	C	39.6	D	n/a	n/a
6	The Old Road & I-5 SB Ramps (at Sedona Way)[1]	Signal	0.65	B	0.56	A	53.6	D	34.6	C	n/a	n/a
14	Wolcott Way & SR-126[1]	Signal	0.44	A	0.41	A	29.0	C	29.6	C	n/a	n/a

Note:
[1]See Table 3-5 for descriptions of the Mitigation Measures
The intersection of Commerce Center Drive and SR-126 WB Ramps is forecast to operate at LOS C and is not significantly impacted based on Caltrans methodology, therefore mitigation is not required for that location.

SCT provides bus route services to the entire City as well as connections to Amtrak and Metrolink. SCT Route 2 operates along Chiquito Canyon Road, Del Valle and SR-126. It provides services between Val Verde Park and the McBean Regional Transit Center. The nearest bus stop is approximately 1.5 miles away from the Project site.

The buildout of the Project is forecast to generate approximately 3,309 total ADT as mentioned in Section 2.1. To estimate the number of Project trips that would use public transit, the number of Project vehicle trips is multiplied by an occupancy factor (1.4), which is provided in the CMP, to determine total person trips. The number of person trips is then multiplied by the applicable Metro factor (3.5%), which is also provided in the CMP, to determine the number of transit trips generated by the Project. Based on this calculation, the Project is anticipated to generate approximately 162 daily transit trips, as shown in Table 3-7.

Table 3-7 Transit Trip Summary

Description	Time Period		
	Daily	AM Peak Hour	PM Peak Hour
Vehicle Trips	3,309	204	326
Person Trips[1]	4,633	286	456
Factor to Transit Trips	3.5%	3.5%	3.5%
Total Transit Trips	162	10	16
[1]Person Trips = Vehicle Trips x 1.4 Sources: Congestion Management Program for Los Angeles County 2010			

With respect to the Project's impacts on transit service, while the County does not have LOS standards applicable to future development such as the Project, the demand for transit service that would result from the Project, approximately 10 to 16 peak hour trips as shown in above Table 3-7 does not significantly impact transit services.

It is anticipated that, over time, the local bus service will expand as additional development occurs within the valley. Typically, bus route plans are evaluated on an annual basis by the transit agency, and routes are added and/or modified as appropriate and as funding permits. Therefore, as the Project site develops, service to the Project area could be added as determined at the discretion of City of Santa Clarita Transit. Meanwhile, the current transit arrangement is anticipated to continue to serve local residents of the area, connecting residential areas with employment and commercial centers.

With respect to commuter rail, Metrolink, governed by the Southern California Regional Rail Authority (SCRAA), provides commuter rail service between the Antelope Valley and Downtown Los Angeles, and also links Ventura, Los Angeles, San Bernardino, Riverside, Orange, and San Diego counties with transfer service between the bus and rail systems. The Metrolink station closest to the Project site is located along Soledad Canyon Road east of Bouquet Canyon Road. A second Metrolink station is located along Railroad Avenue just south of Lyons Canyon Road. Long-range plans include a potential Metrolink extension along the SR-126 corridor and land within Newhall Ranch is set aside for rail right-of-way and a park-and-ride and/or train station.

4.0 CONCLUSION

This traffic study was conducted to evaluate Project impacts associated with the development of the proposed Project consisting of residential uses, a commercial retail center, and neighborhood park uses. Existing conditions with and without Project, and a cumulative conditions scenario with 2028 as the horizon year, which includes buildout of the Project as well as the related projects in the proximity of the study area were analyzed, and the findings of each scenario are presented.

The on-site and local street intersections that would be used to access the Project site were also evaluated under 2035 General Plan Buildout conditions using forecast peak hour turning movement volumes. Based on the analysis, the proposed on-site intersections would operate at an acceptable LOS.

Based on the results of the LOS analyses and the criteria set forth by the County of Los Angeles and Caltrans, there are no intersections found to be significantly impacted by the Project.

Under cumulative conditions, the following intersections have been found to be significantly impacted by cumulative increases in traffic volumes including the Project:

1. Chiquito Canyon Road & SR-126 (County/Caltrans)
4. Del Valle Road & Hasley Canyon Road (County)
5. Commerce Center Drive & Hasley Canyon Road (County)
6. The Old Road & I-5 SB Ramps at Sedona Way (County/Caltrans)
14. Wolcott Way & SR-126 (County/Caltrans)

Feasible mitigation has been identified for each of the significantly impacted intersections listed above, which reduces the cumulative impact to less than significant. This mitigation is summarized in Table 4-1.

Mitigation identified for the County's Del Valle Road/Hasley Canyon Road intersection includes installation of a traffic signal and intersection modifications to provide one northbound left-turn lane, one northbound free-flow right-turn lane, and one westbound left-turn lane. Mitigation identified for the County's Commerce Center/Hasley Canyon Road intersection includes intersection modification to restripe the eastbound shared left and through lane to a shared left, through and right lane. The Project is responsible for its fair-share of the cost of these mitigation measures that address cumulative impacts, which ranges from approximately 10 percent to 19 percent.

In addition to the mitigation described above for County intersections, mitigation has also been identified for the intersections under Caltrans jurisdiction as summarized in Table 4-1. The Project is responsible for its fair-share of the cost of these mitigation measures that address cumulative impacts, which is approximately one percent at each location.

A CMP analysis of the Project's traffic impacts on the CMP highway system and on the local and regional transit systems determined that the Project would not have any impact to the CMP monitoring locations or to transit.

Table 4-1 Mitigation Measures

Int #	Location	Mitigation	Project Traffic Share %
County Intersections			
4	Del Valle Road & Hasley Canyon Road	Install traffic signal Intersection modification to provide one northbound left-turn lane, one northbound free-flow right-turn lane, and one westbound left-turn lane	18.6%
5	Commerce Center & Hasley Canyon Road	Intersection modification to restripe the eastbound shared left and through lane to a shared left, through and right lane (for 1 EB Left, 1 shared EB Left/Through/Right and 1 EB Right)	10.3%
County/Caltrans Intersections			
1	Chiquito Canyon Road & SR-126	Intersection modification to provide two southbound left-turn lanes, three southbound through lanes, one southbound right-turn lane (for 2 SB Left, 3 SB Through and 1 SB Right), two westbound left-turn lanes, three westbound through lanes, one westbound right-turn lane (for 2 WB Left, 3 WB Through and 1 WB Right), two northbound left-turn lanes, two northbound through lanes, two northbound right-turn lanes (for 2 NB Left, 2 NB Through and 2 NB Right), two eastbound left-turn lanes, three eastbound through lanes, one eastbound right-turn lane (for 2 EB Left, 3 EB Through and 1 EB Right). Install traffic signal[1]	1.2%
6	The Old Road & I-5 SB Ramps (at Sedona Way)	Intersection modification to add one southbound left-turn lane (for 2 SB Left and 2 SB Through)	0.6%
14	Wolcott Way & SR-126	Intersection modification to provide two southbound left-turn lanes, one southbound through lane, one southbound right-turn lane (for 2 SB Left, 1 SB Through and 1 SB Right), two westbound left-turn lanes, four westbound through lanes, one westbound right-turn lane (for 2 WB Left, 4 WB Through and 1 WB Right), one northbound left-turn lanes, one northbound through lanes, two northbound right-turn lanes (for 1 NB Left, 1 NB Through and 2 NB Right), two eastbound left-turn lanes, four eastbound through lanes, one eastbound right-turn lane (for 2 EB Left, 4 EB Through and 1 EB Right)	0.9%

Note:
[1] Improvements identified in Caltrans SR-126 PSR
The intersection of Commerce Center Drive and SR-126 WB Ramps is forecast to operate at LOS C and is not significantly impacted based on Caltrans methodology, therefore mitigation is not required for that location.
See Appendix D for fair-share calculations

Appendix A ITE TRIP GENERATION DATA

Single-Family Detached Housing
(210)

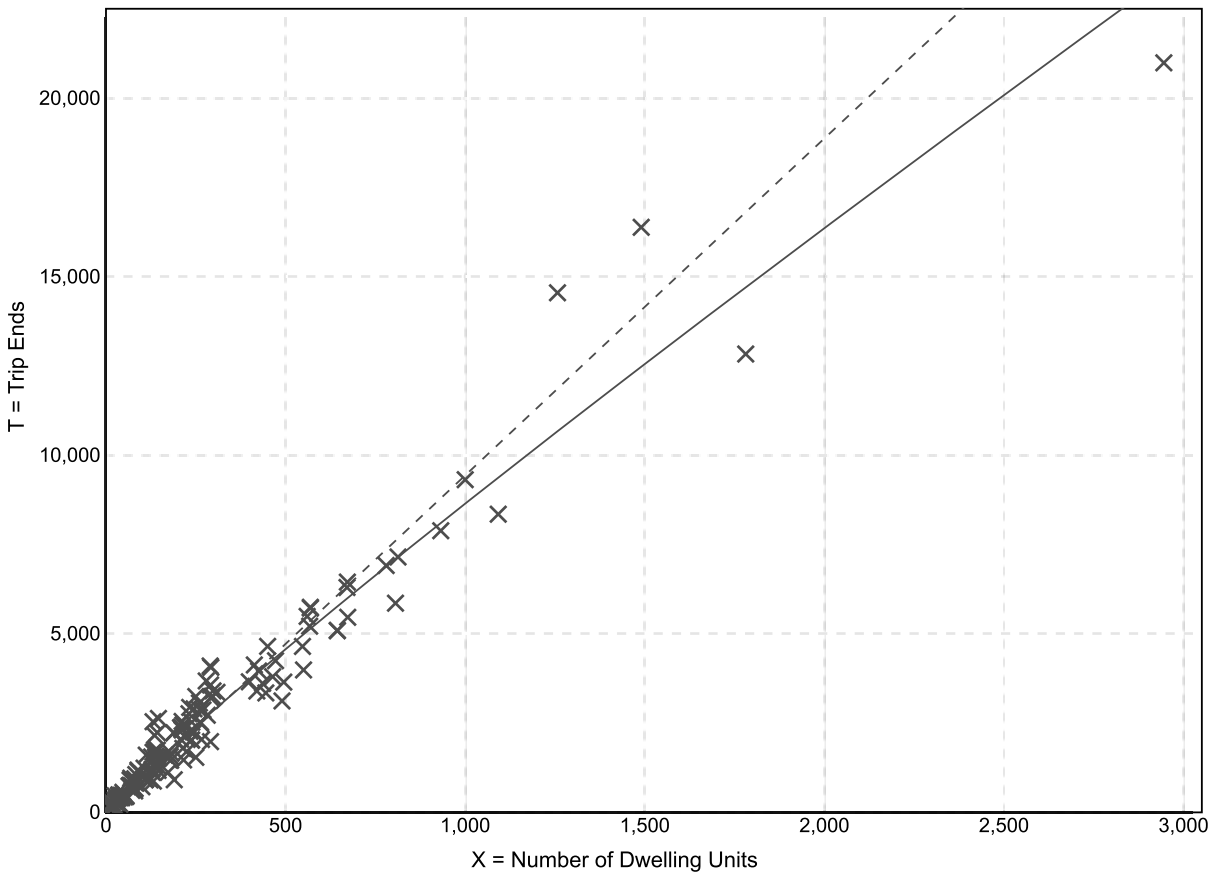
Vehicle Trip Ends vs: **Dwelling Units**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 159
Avg. Num. of Dwelling Units: 264
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
9.44	4.81 - 19.39	2.10

Data Plot and Equation



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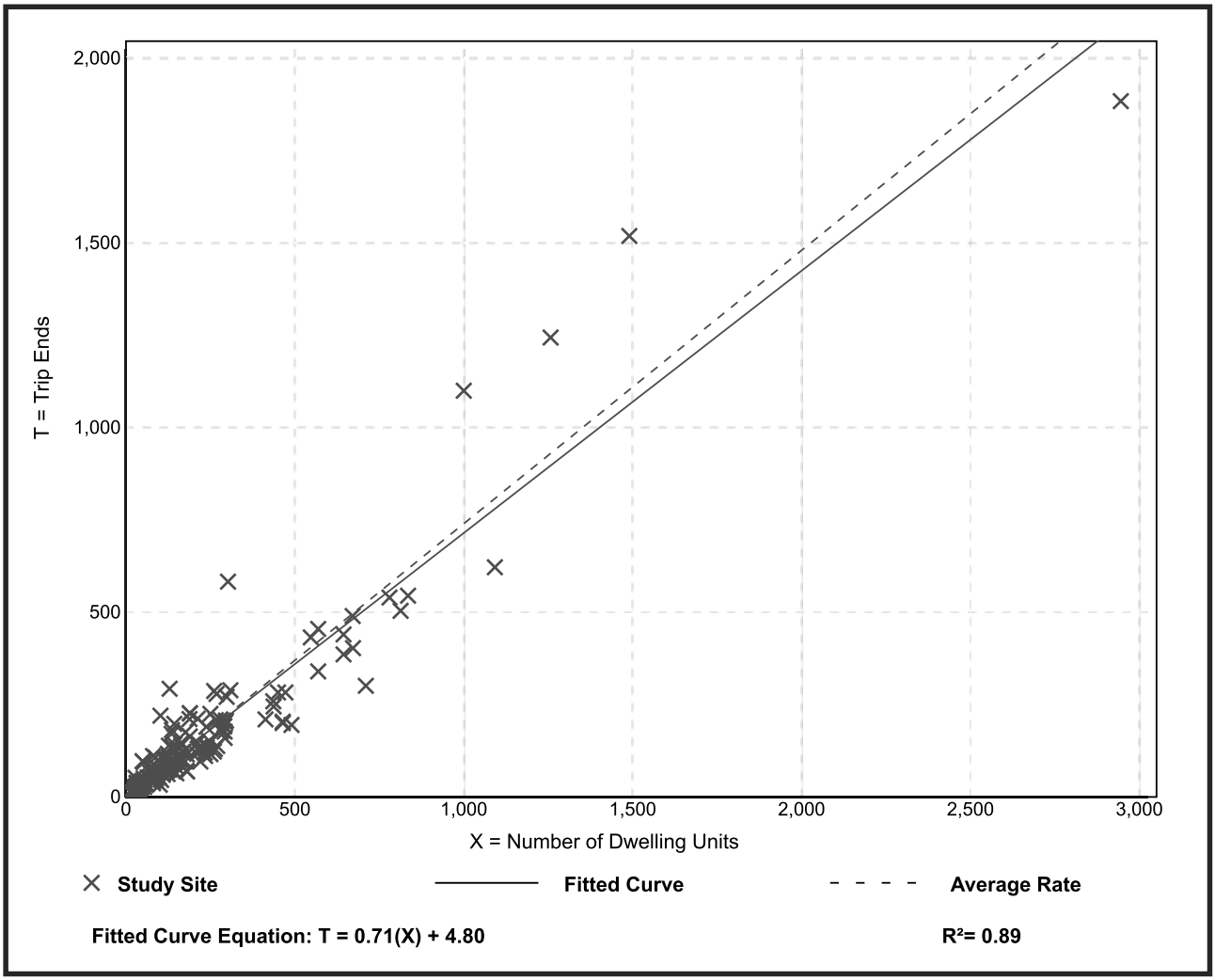
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	173
Avg. Num. of Dwelling Units:	219
Directional Distribution:	25% entering, 75% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.74	0.33 - 2.27	0.27

Data Plot and Equation



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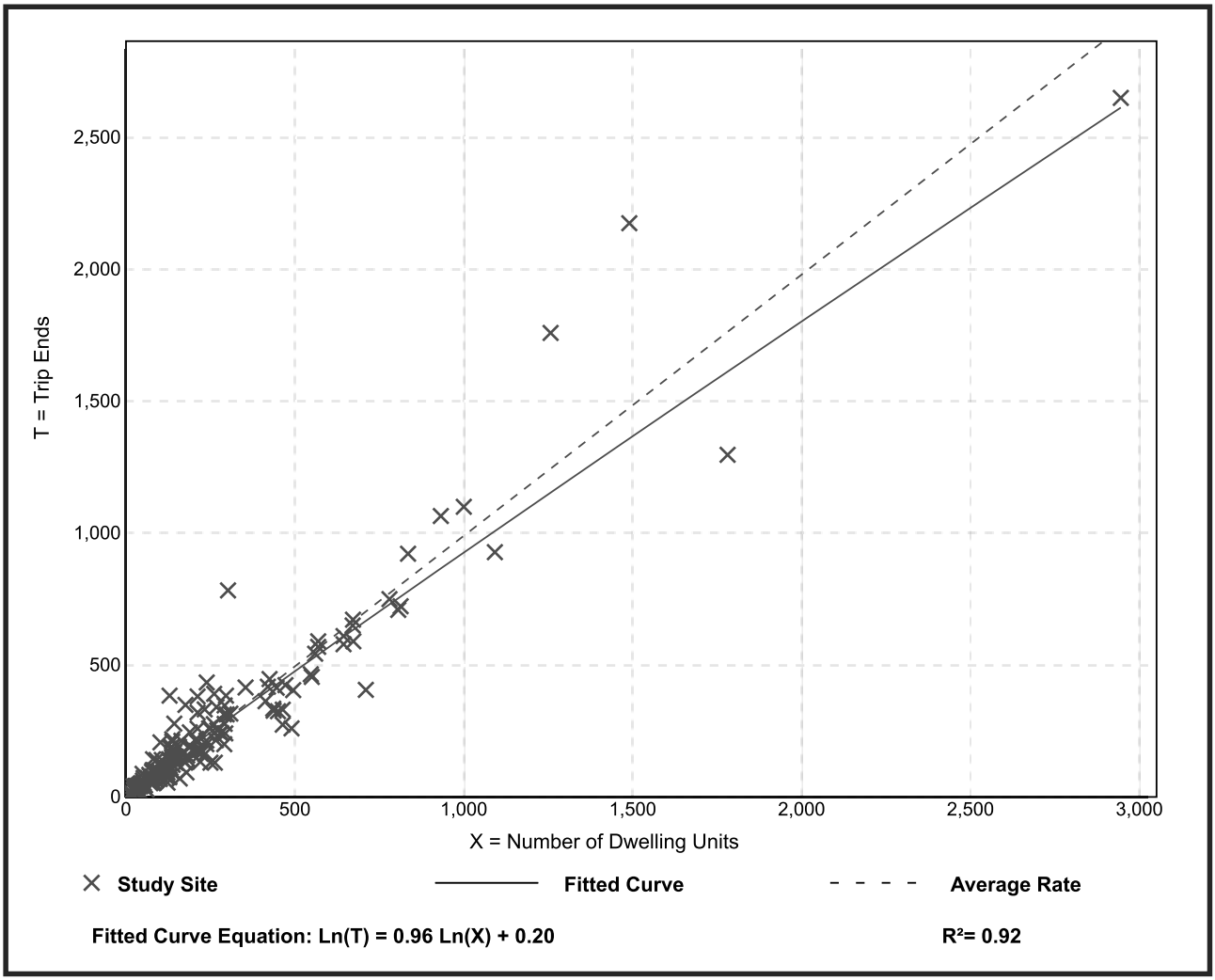
Single-Family Detached Housing
(210)

Vehicle Trip Ends vs:	**Dwelling Units**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	190
Avg. Num. of Dwelling Units:	242
Directional Distribution:	63% entering, 37% exiting

Vehicle Trip Generation per Dwelling Unit

Average Rate	Range of Rates	Standard Deviation
0.99	0.44 - 2.98	0.31

Data Plot and Equation



Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday**

Setting/Location: **General Urban/Suburban**
Number of Studies: 25 out of 147
Avg. 1000 Sq. Ft. GLA: 53
Directional Distribution: 50% entering , 50% exiting

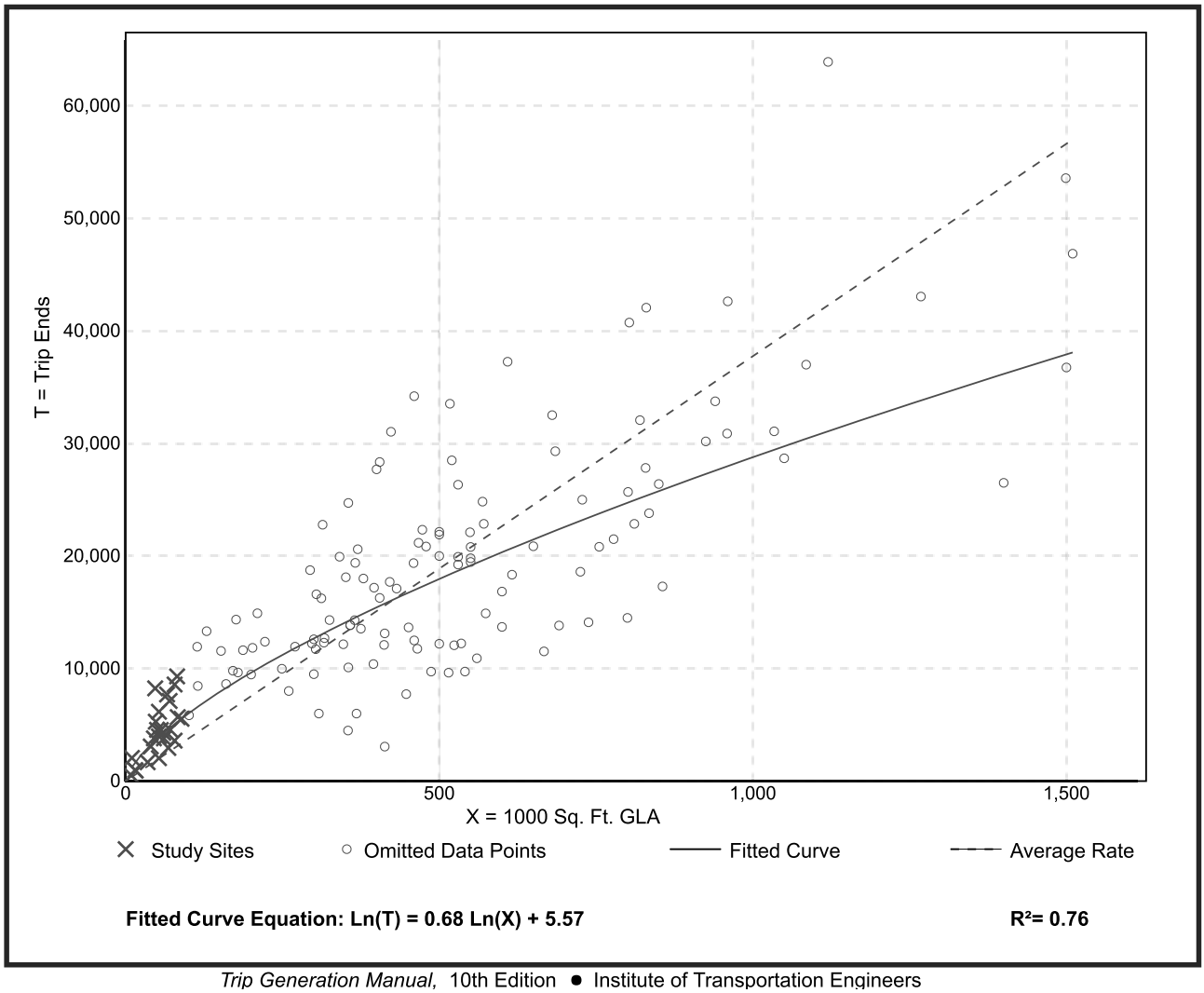
Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
83.01	38.45 - 207.98	32.90

Data Filtered By: [IV Value: 9-100]

Data Plot and Equation

Caution – Filtered Data Set



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Shopping Center
(820)

Vehicle Trip Ends vs:	**1000 Sq. Ft. GLA**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	25 out of 84
Avg. 1000 Sq. Ft. GLA:	54
Directional Distribution:	61% entering , 39% exiting

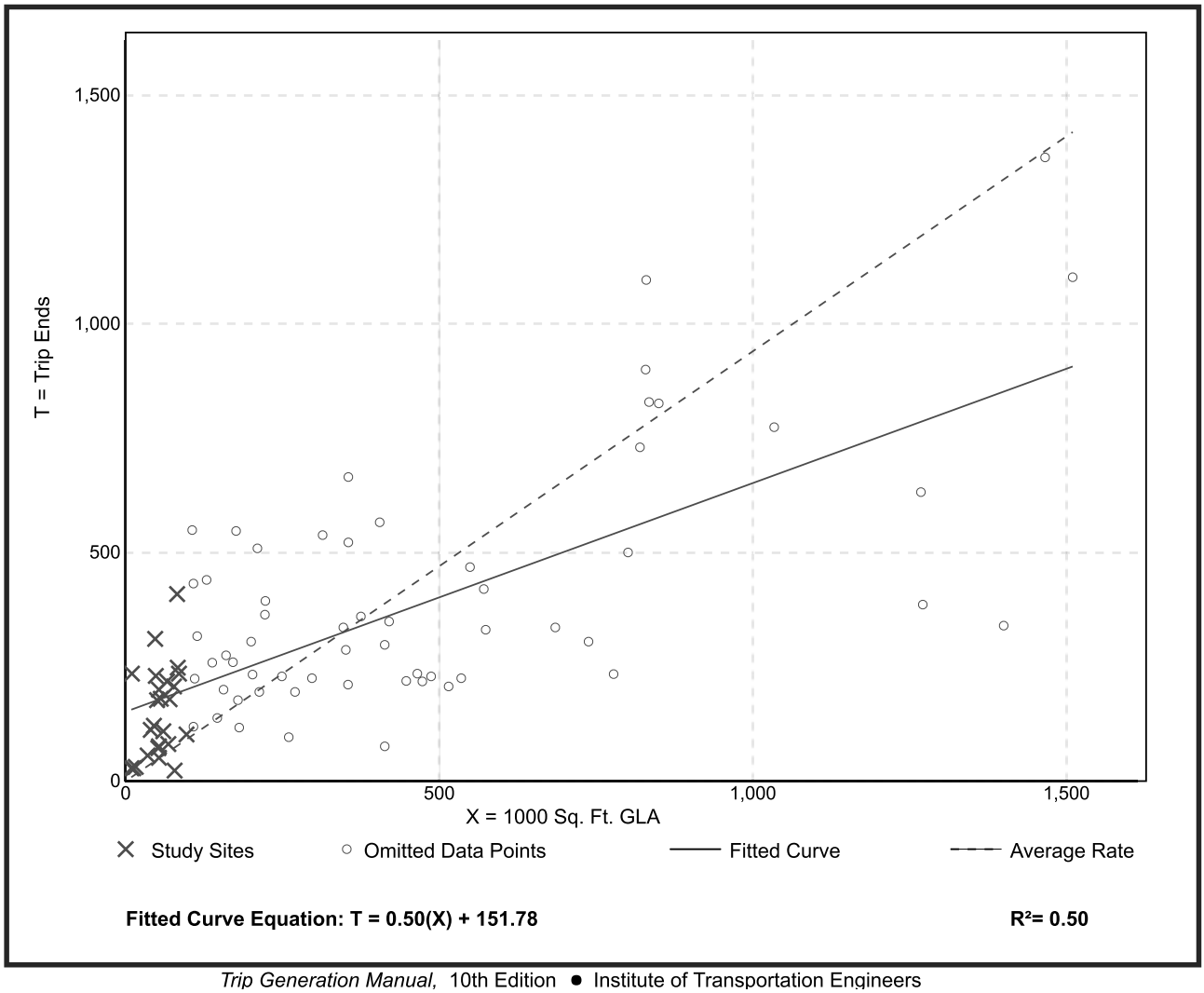
Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
2.77	0.29 - 23.74	2.36

Data Filtered By: [IV Value: 9-100]

Data Plot and Equation

Caution – Filtered Data Set



Trip Generation Manual, 10th Edition ● Institute of Transportation Engineers

Shopping Center
(820)

Vehicle Trip Ends vs: **1000 Sq. Ft. GLA**
On a: **Weekday,**
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.
Setting/Location: **General Urban/Suburban**
Number of Studies: 94 out of 261
Avg. 1000 Sq. Ft. GLA: 53
Directional Distribution: 48% entering , 52% exiting

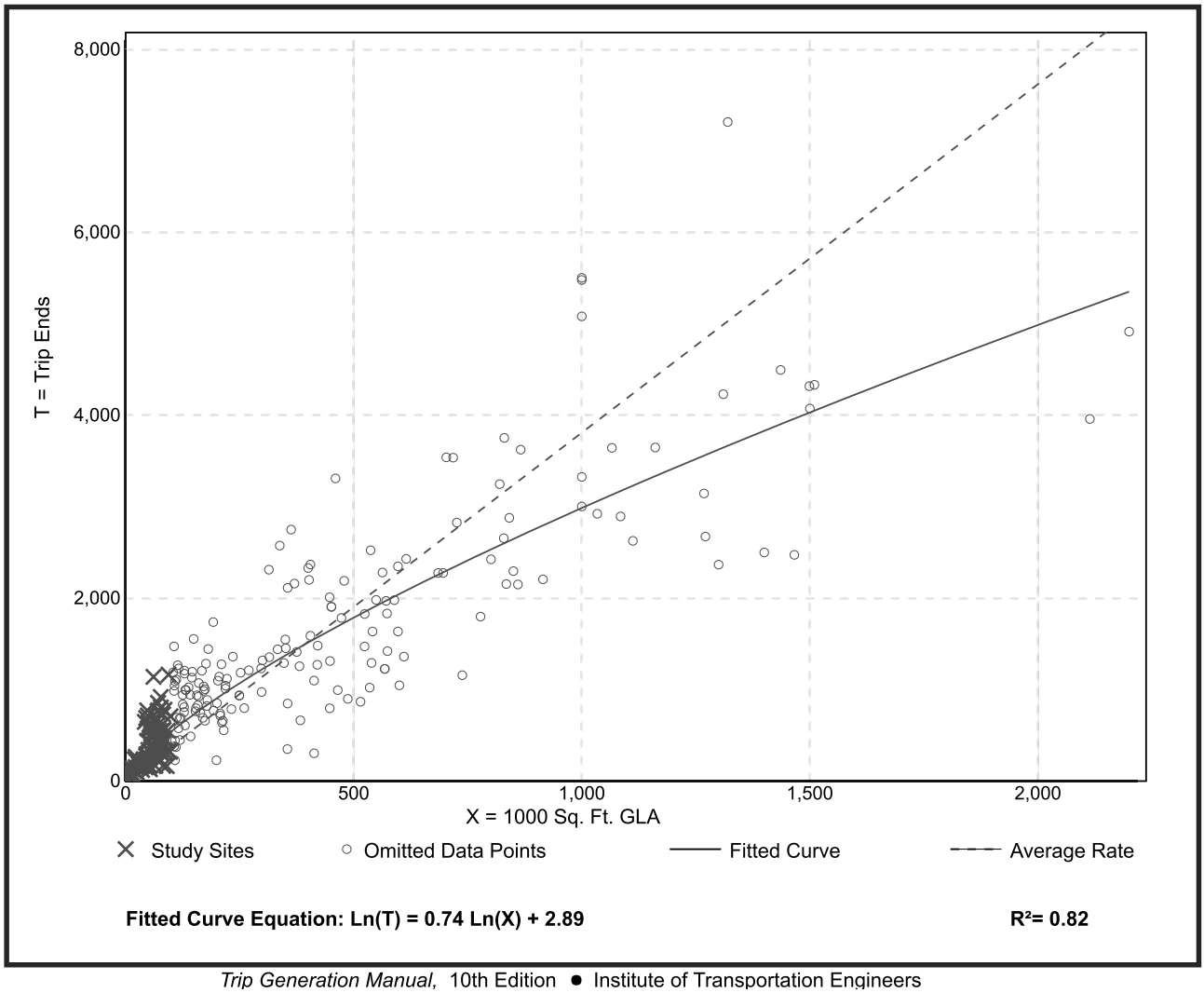
Vehicle Trip Generation per 1000 Sq. Ft. GLA

Average Rate	Range of Rates	Standard Deviation
7.26	1.82 - 18.69	3.55

Data Filtered By: [IV Value: 2-100]

Data Plot and Equation

Caution – Filtered Data Set



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Public Park
(411)

Vehicle Trip Ends vs: **Acres**
On a: **Weekday**

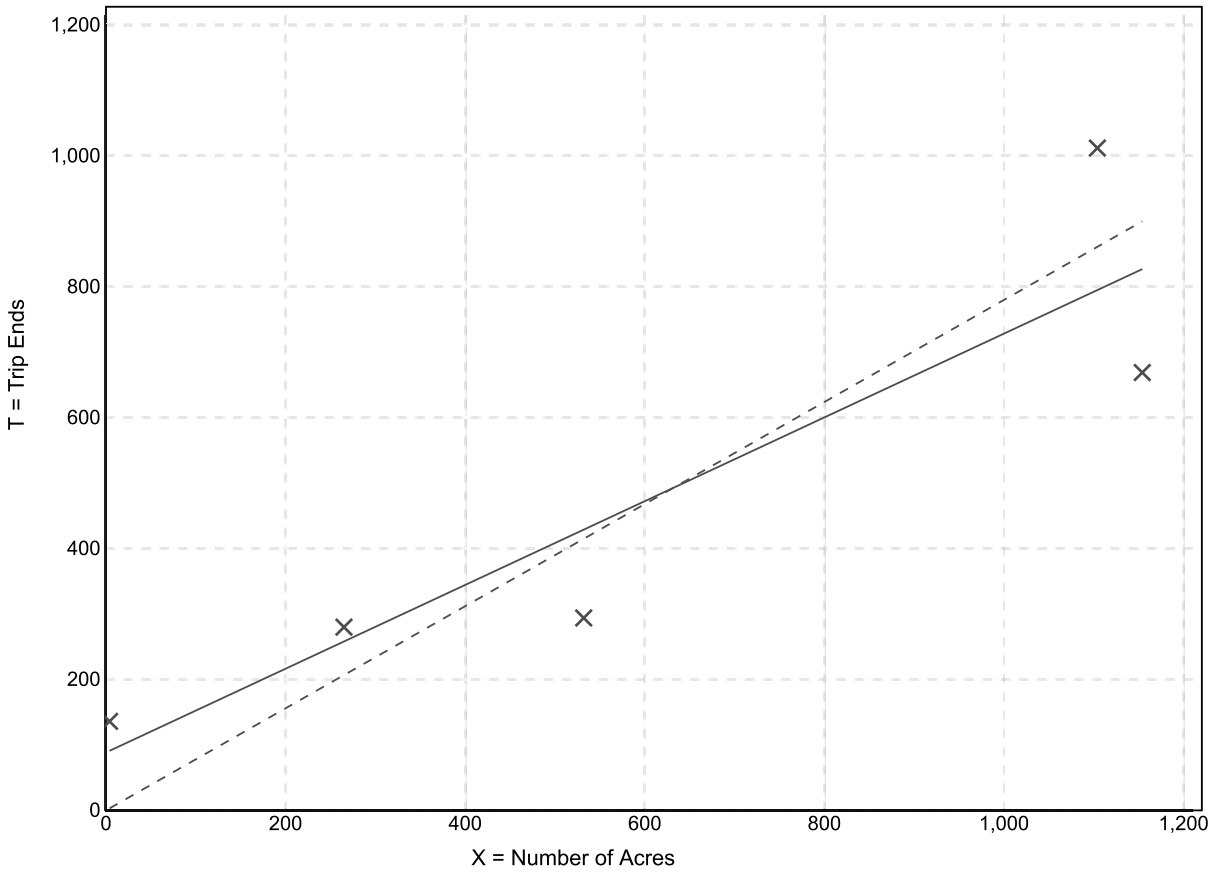
Setting/Location: **General Urban/Suburban**
Number of Studies: 5
Avg. Num. of Acres: 612
Directional Distribution: 50% entering, 50% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
0.78	0.55 - 34.00	1.36

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: T = 0.64(X) + 88.46

R^2= 0.82

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Public Park
(411)

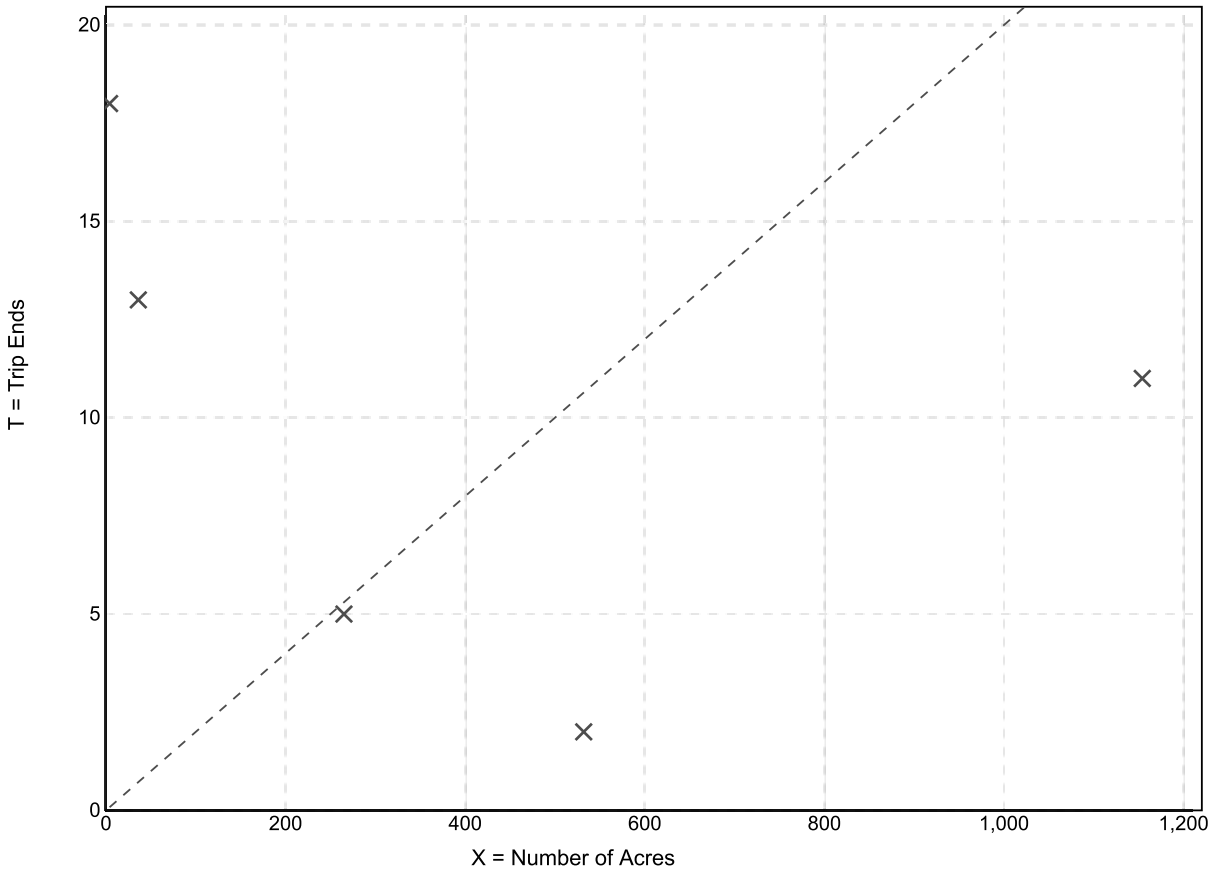
Vehicle Trip Ends vs:	**Acres**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 7 and 9 a.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	5
Avg. Num. of Acres:	398
Directional Distribution:	59% entering, 41% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
0.02	0.00 - 4.50	0.23

Data Plot and Equation

Caution – Small Sample Size



Fitted Curve Equation: Not Given

R^2= ****

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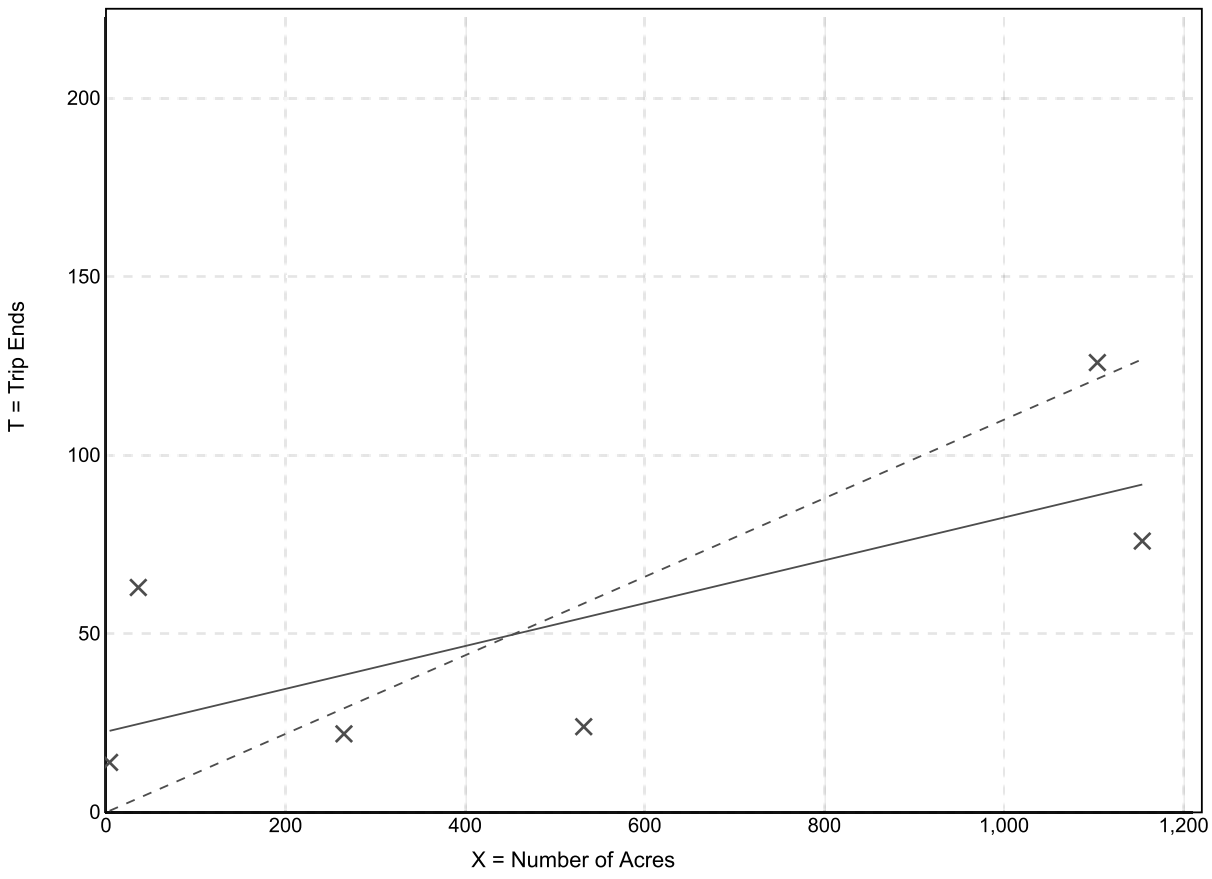
Public Park
(411)

Vehicle Trip Ends vs:	**Acres**
On a:	**Weekday,**
	Peak Hour of Adjacent Street Traffic,
	One Hour Between 4 and 6 p.m.
Setting/Location:	**General Urban/Suburban**
Number of Studies:	6
Avg. Num. of Acres:	516
Directional Distribution:	55% entering, 45% exiting

Vehicle Trip Generation per Acre

Average Rate	Range of Rates	Standard Deviation
0.11	0.05 - 3.50	0.24

Data Plot and Equation



Fitted Curve Equation: T = 0.06(X) + 22.60

R^2= 0.53

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Appendix B TRAFFIC COUNTS

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: HENRY MAYO DRIVE

File Name : H1711065
Site Code : 00000000
Start Date : 11/8/2017
Page No : 1

Groups Printed- Turning Movements

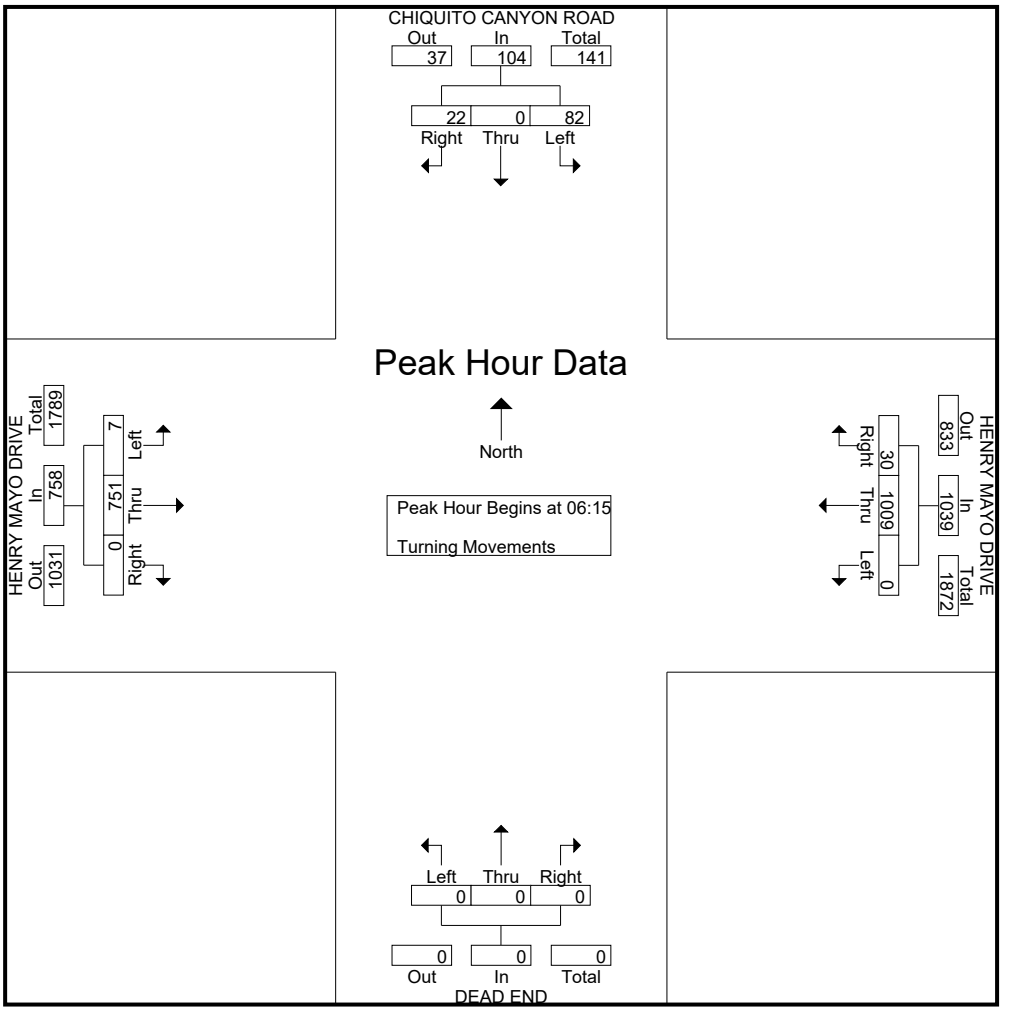
	CHIQUITO CANYON ROAD Southbound			HENRY MAYO DRIVE Westbound			DEAD END Northbound			HENRY MAYO DRIVE Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
06:00	6	0	24	7	228	0	0	0	0	0	131	2	398
06:15	6	0	21	4	259	0	0	0	0	0	170	3	463
06:30	6	0	31	8	234	0	0	0	0	0	210	3	492
06:45	5	0	14	6	242	0	0	0	0	0	213	1	481
Total	23	0	90	25	963	0	0	0	0	0	724	9	1834
07:00	5	0	16	12	274	0	0	0	0	0	158	0	465
07:15	4	0	18	5	253	0	0	0	0	0	169	2	451
07:30	8	0	15	2	220	0	0	0	0	0	188	4	437
07:45	1	0	15	7	227	0	0	0	0	0	191	1	442
Total	18	0	64	26	974	0	0	0	0	0	706	7	1795
08:00	4	0	14	6	246	0	0	0	0	0	165	1	436
08:15	1	0	19	4	253	0	0	0	0	0	154	1	432
08:30	1	0	20	8	190	0	0	0	0	0	184	1	404
08:45	3	0	24	5	168	0	0	0	0	0	185	1	386
Total	9	0	77	23	857	0	0	0	0	0	688	4	1658
*** BREAK ***													
11:00	2	0	8	7	136	0	0	0	0	0	150	2	305
11:15	2	0	11	9	148	0	0	0	0	0	133	1	304
11:30	0	0	11	10	111	0	0	0	0	0	180	2	314
11:45	1	0	6	4	132	0	0	0	0	0	149	0	292
Total	5	0	36	30	527	0	0	0	0	0	612	5	1215
12:00	3	0	13	12	116	0	0	0	0	0	121	2	267
12:15	4	0	13	12	127	0	0	0	0	0	142	2	300
12:30	1	0	16	6	118	0	0	0	0	0	142	2	285
12:45	1	0	8	1	155	0	0	0	0	0	140	0	305
Total	9	0	50	31	516	0	0	0	0	0	545	6	1157
*** BREAK ***													
15:00	3	0	7	14	229	0	0	0	0	0	236	4	493
15:15	2	0	7	15	237	0	0	0	0	0	338	5	604
15:30	3	0	12	12	223	0	0	0	0	0	328	9	587
15:45	2	0	16	11	189	0	0	0	0	0	350	6	574
Total	10	0	42	52	878	0	0	0	0	0	1252	24	2258
16:00	2	0	11	15	225	0	0	0	0	0	329	5	587
16:15	2	0	3	19	182	0	0	0	0	0	338	3	547
16:30	1	0	4	24	236	0	0	0	0	0	318	7	590
16:45	2	0	10	8	169	0	0	0	0	0	340	6	535
Total	7	0	28	66	812	0	0	0	0	0	1325	21	2259
17:00	5	0	9	18	190	0	0	0	0	0	337	4	563
17:15	1	0	10	16	142	0	0	0	0	0	301	4	474
17:30	3	0	9	14	133	0	0	0	0	0	252	1	412
17:45	1	0	12	10	134	0	0	0	0	0	233	4	394
Total	10	0	40	58	599	0	0	0	0	0	1123	13	1843
Grand Total	91	0	427	311	6126	0	0	0	0	0	6975	89	14019
Apprch %	17.6	0	82.4	4.8	95.2	0	0	0	0	0	98.7	1.3	
Total %	0.6	0	3	2.2	43.7	0	0	0	0	0	49.8	0.6	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: HENRY MAYO DRIVE

File Name : H1711065
Site Code : 00000000
Start Date : 11/8/2017
Page No : 2

	CHIQUITO CANYON ROAD Southbound				HENRY MAYO DRIVE Westbound				DEAD END Northbound				HENRY MAYO DRIVE Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 06:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 06:15																	
06:15	**6**	0	21	27	4	259	0	263	0	0	0	0	0	170	**3**	173	463
06:30	6	0	**31**	**37**	8	234	0	242	0	0	0	0	0	210	3	213	**492**
06:45	5	0	14	19	6	242	0	248	0	0	0	0	0	**213**	1	**214**	481
07:00	5	0	16	21	**12**	**274**	0	**286**	0	0	0	0	0	158	0	158	465
Total Volume	22	0	82	104	30	1009	0	1039	0	0	0	0	0	751	7	758	1901
% App. Total	21.2	0	78.8		2.9	97.1	0		0	0	0		0	99.1	0.9		
PHF	.917	.000	.661	.703	.625	.921	.000	.908	.000	.000	.000	.000	.000	.881	.583	.886	.966

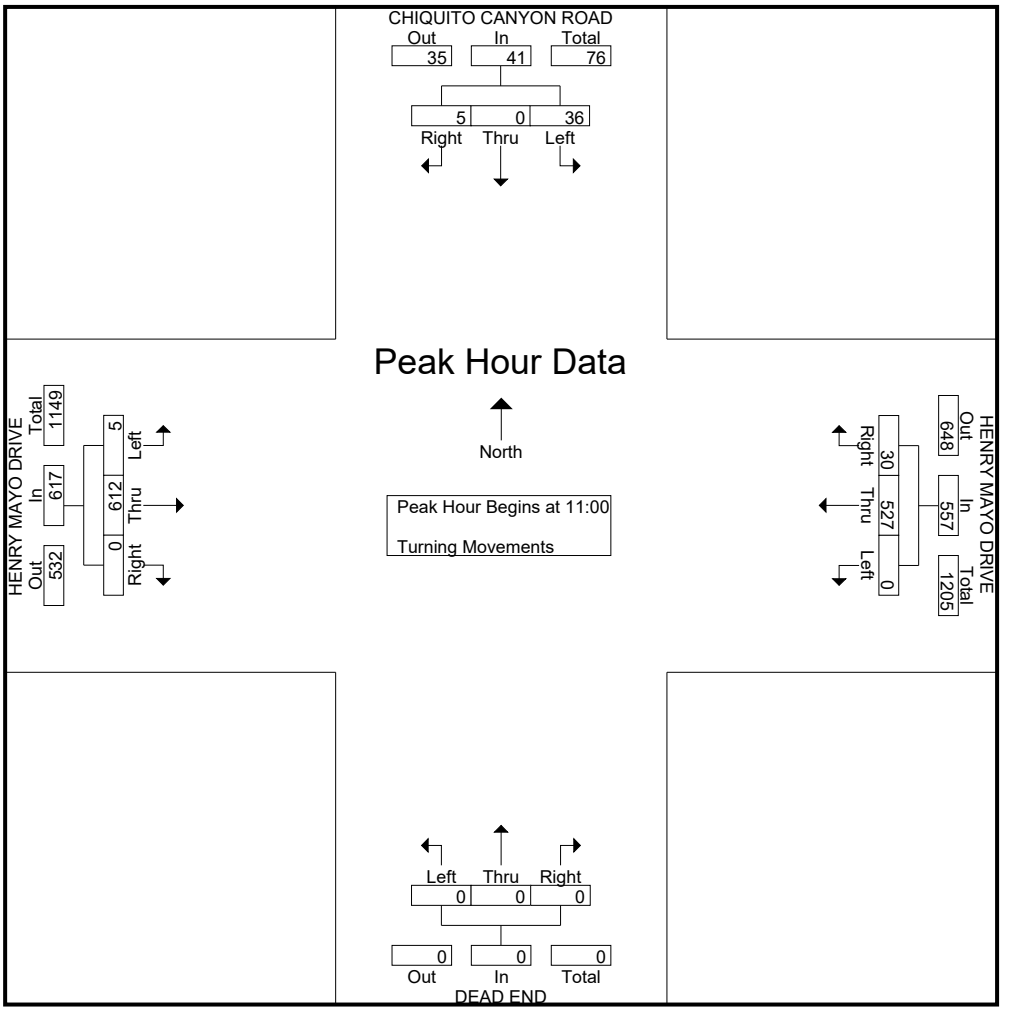


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: HENRY MAYO DRIVE

File Name : H1711065
Site Code : 00000000
Start Date : 11/8/2017
Page No : 3

	CHIQUITO CANYON ROAD Southbound				HENRY MAYO DRIVE Westbound				DEAD END Northbound				HENRY MAYO DRIVE Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 11:00																	
11:00	**2**	0	8	10	7	136	0	143	0	0	0	0	0	150	**2**	152	305
11:15	2	0	**11**	**13**	9	**148**	0	**157**	0	0	0	0	0	133	1	134	304
11:30	0	0	11	11	**10**	111	0	121	0	0	0	0	0	**180**	2	**182**	**314**
11:45	1	0	6	7	4	132	0	136	0	0	0	0	0	149	0	149	292
Total Volume	5	0	36	41	30	527	0	557	0	0	0	0	0	612	5	617	1215
% App. Total	12.2	0	87.8		5.4	94.6	0		0	0	0		0	99.2	0.8		
PHF	.625	.000	.818	.788	.750	.890	.000	.887	.000	.000	.000	.000	.000	.850	.625	.848	.967

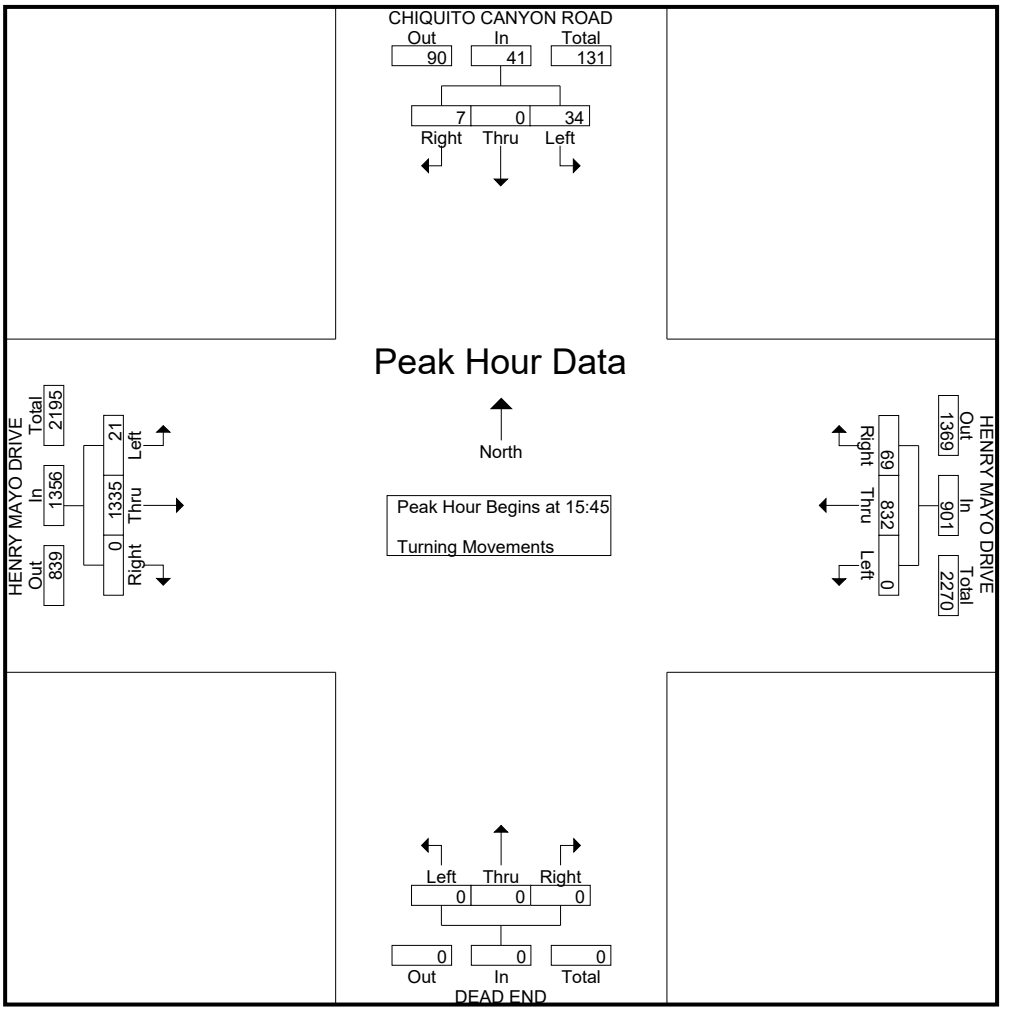


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: HENRY MAYO DRIVE

File Name : H1711065
Site Code : 00000000
Start Date : 11/8/2017
Page No : 4

	CHIQUITO CANYON ROAD Southbound				HENRY MAYO DRIVE Westbound				DEAD END Northbound				HENRY MAYO DRIVE Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 15:45																	
15:45	**2**	0	**16**	**18**	11	189	0	200	0	0	0	0	0	**350**	6	**356**	574
16:00	2	0	11	13	15	225	0	240	0	0	0	0	0	329	5	334	587
16:15	2	0	3	5	19	182	0	201	0	0	0	0	0	338	3	341	547
16:30	1	0	4	5	**24**	**236**	0	**260**	0	0	0	0	0	318	**7**	325	**590**
Total Volume	7	0	34	41	69	832	0	901	0	0	0	0	0	1335	21	1356	2298
% App. Total	17.1	0	82.9		7.7	92.3	0		0	0	0		0	98.5	1.5		
PHF	.875	.000	.531	.569	.719	.881	.000	.866	.000	.000	.000	.000	.000	.954	.750	.952	.974



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: SAN MARTINEZ ROAD

File Name : H1711057
Site Code : 00000000
Start Date : 11/8/2017

Groups Printed- Turning Movements

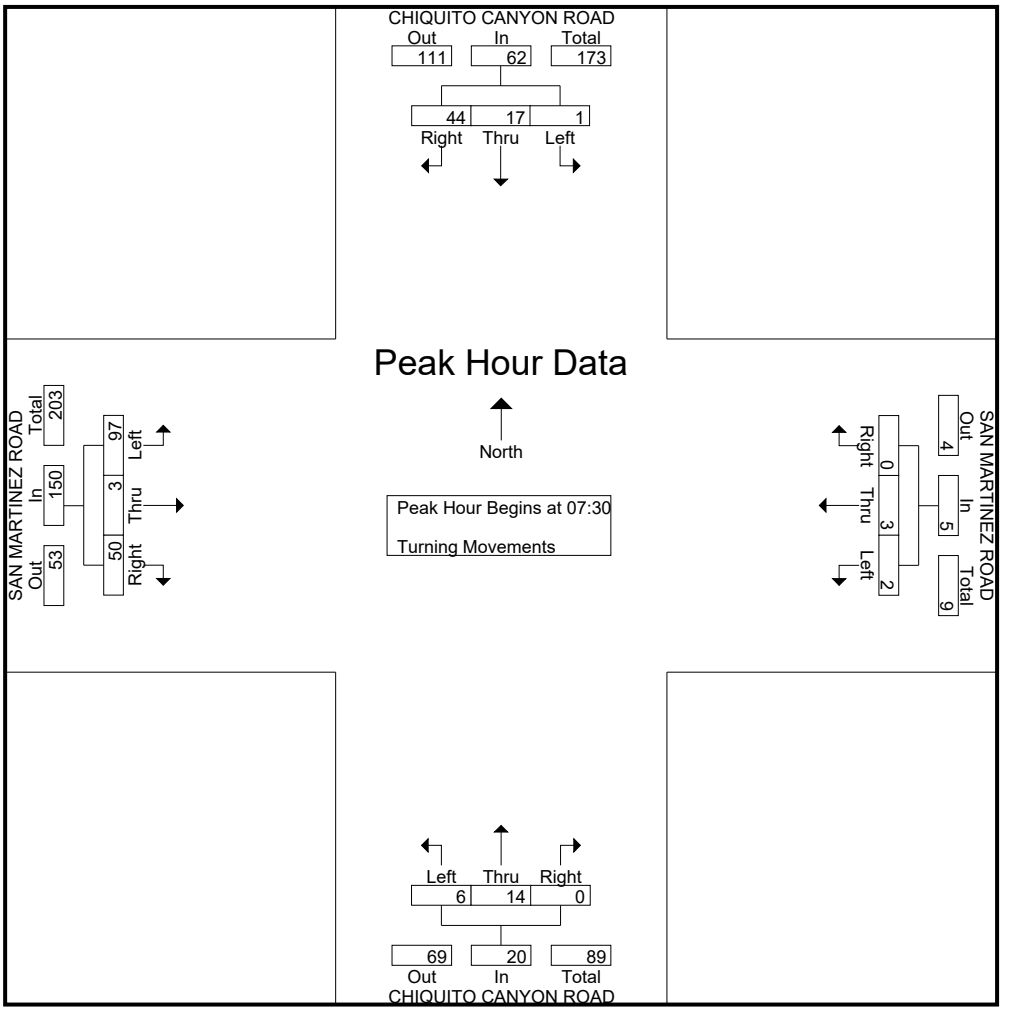
	CHIQUITO CANYON ROAD Southbound			SAN MARTINEZ ROAD Westbound			CHIQUITO CANYON ROAD Northbound			SAN MARTINEZ ROAD Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00	3	1	0	0	0	1	0	5	6	16	0	21	53
07:15	3	4	0	0	2	0	0	3	2	12	0	23	49
07:30	6	8	0	0	2	2	0	9	1	14	0	33	75
07:45	13	2	0	0	1	0	0	2	1	10	0	30	59
Total	25	15	0	0	5	3	0	19	10	52	0	107	236
08:00	9	5	1	0	0	0	0	1	3	10	2	20	51
08:15	16	2	0	0	0	0	0	2	1	16	1	14	52
08:30	15	0	0	1	0	1	0	8	2	10	1	22	60
08:45	8	4	0	0	0	0	1	2	2	14	1	12	44
Total	48	11	1	1	0	1	1	13	8	50	5	68	207
*** BREAK ***													
16:00	24	5	0	0	0	0	0	7	15	3	0	13	67
16:15	26	2	1	0	2	0	0	9	8	12	2	19	81
16:30	23	3	0	0	1	0	0	6	9	10	0	11	63
16:45	19	2	0	0	0	0	0	5	16	2	0	17	61
Total	92	12	1	0	3	0	0	27	48	27	2	60	272
17:00	34	0	0	0	0	0	0	6	12	5	0	21	78
17:15	31	3	0	0	0	1	0	5	16	8	0	17	81
17:30	25	3	0	1	4	1	1	3	8	8	4	13	71
17:45	25	5	1	0	0	1	1	1	21	9	1	13	78
Total	115	11	1	1	4	3	2	15	57	30	5	64	308
Grand Total	280	49	3	2	12	7	3	74	123	159	12	299	1023
Apprch %	84.3	14.8	0.9	9.5	57.1	33.3	1.5	37	61.5	33.8	2.6	63.6	
Total %	27.4	4.8	0.3	0.2	1.2	0.7	0.3	7.2	12	15.5	1.2	29.2	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: SAN MARTINEZ ROAD

File Name : H1711057
Site Code : 00000000
Start Date : 11/8/2017
Page No : 2

	CHIQUITO CANYON ROAD Southbound				SAN MARTINEZ ROAD Westbound				CHIQUITO CANYON ROAD Northbound				SAN MARTINEZ ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	6	**8**	0	14	0	**2**	**2**	**4**	0	**9**	1	**10**	14	0	**33**	**47**	**75**
07:45	13	2	0	15	0	1	0	1	0	2	1	3	10	0	30	40	59
08:00	9	5	**1**	15	0	0	0	0	0	1	**3**	4	10	**2**	20	32	51
08:15	**16**	2	0	**18**	0	0	0	0	0	2	1	3	**16**	1	14	31	52
Total Volume	44	17	1	62	0	3	2	5	0	14	6	20	50	3	97	150	237
% App. Total	71	27.4	1.6		0	60	40		0	70	30		33.3	2	64.7		
PHF	.688	.531	.250	.861	.000	.375	.250	.313	.000	.389	.500	.500	.781	.375	.735	.798	.790

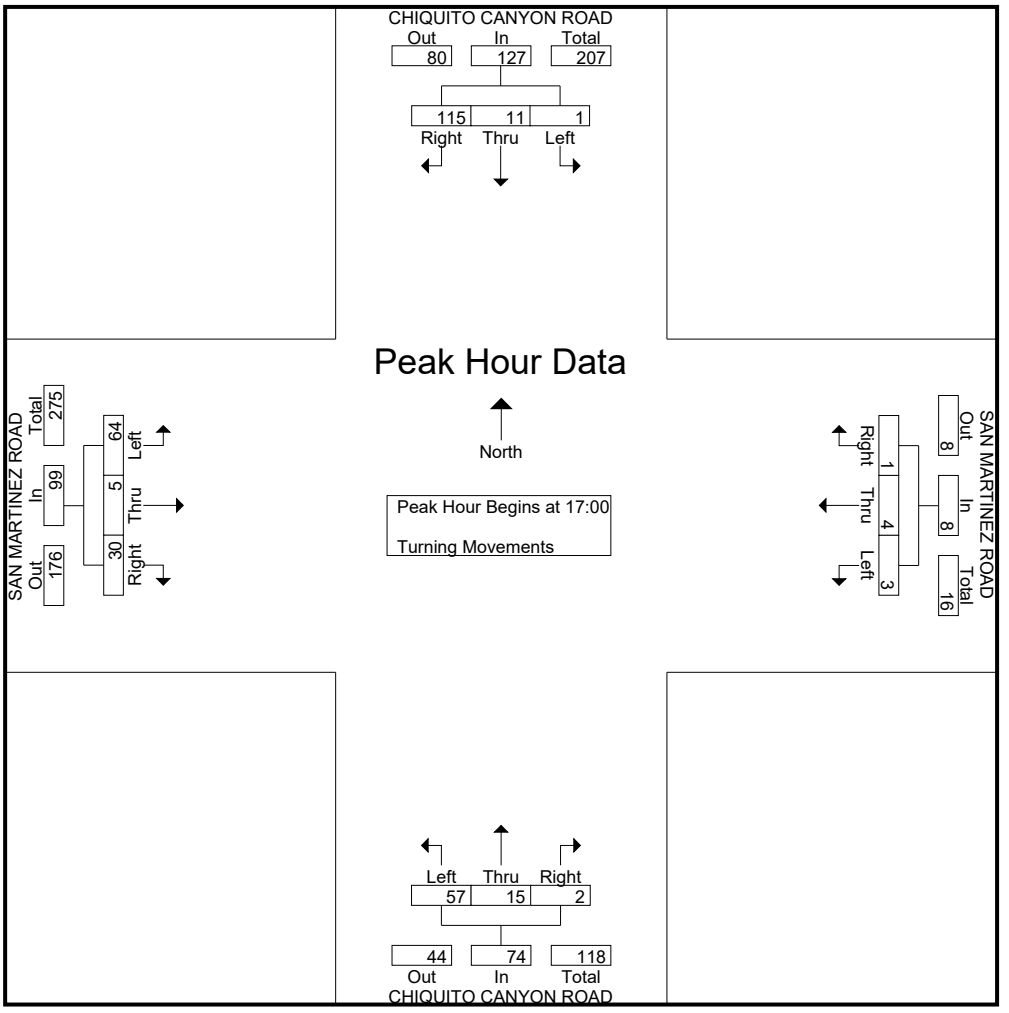


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: SAN MARTINEZ ROAD

File Name : H1711057
Site Code : 00000000
Start Date : 11/8/2017
Page No : 3

	CHIQUITO CANYON ROAD Southbound				SAN MARTINEZ ROAD Westbound				CHIQUITO CANYON ROAD Northbound				SAN MARTINEZ ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 17:00																	
17:00	**34**	0	0	**34**	0	0	0	0	0	**6**	12	18	5	0	**21**	**26**	78
17:15	31	3	0	34	0	0	**1**	1	0	5	16	21	8	0	17	25	**81**
17:30	25	3	0	28	**1**	**4**	1	**6**	**1**	3	8	12	8	**4**	13	25	71
17:45	25	**5**	**1**	31	0	0	1	1	1	1	**21**	**23**	**9**	1	13	23	78
Total Volume	115	11	1	127	1	4	3	8	2	15	57	74	30	5	64	99	308
% App. Total	90.6	8.7	0.8		12.5	50	37.5		2.7	20.3	77		30.3	5.1	64.6		
PHF	.846	.550	.250	.934	.250	.250	.750	.333	.500	.625	.679	.804	.833	.313	.762	.952	.951



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: HUNSTOCK STREET

File Name : H1711056
Site Code : 00000000
Start Date : 11/8/2017

Groups Printed- Turning Movements

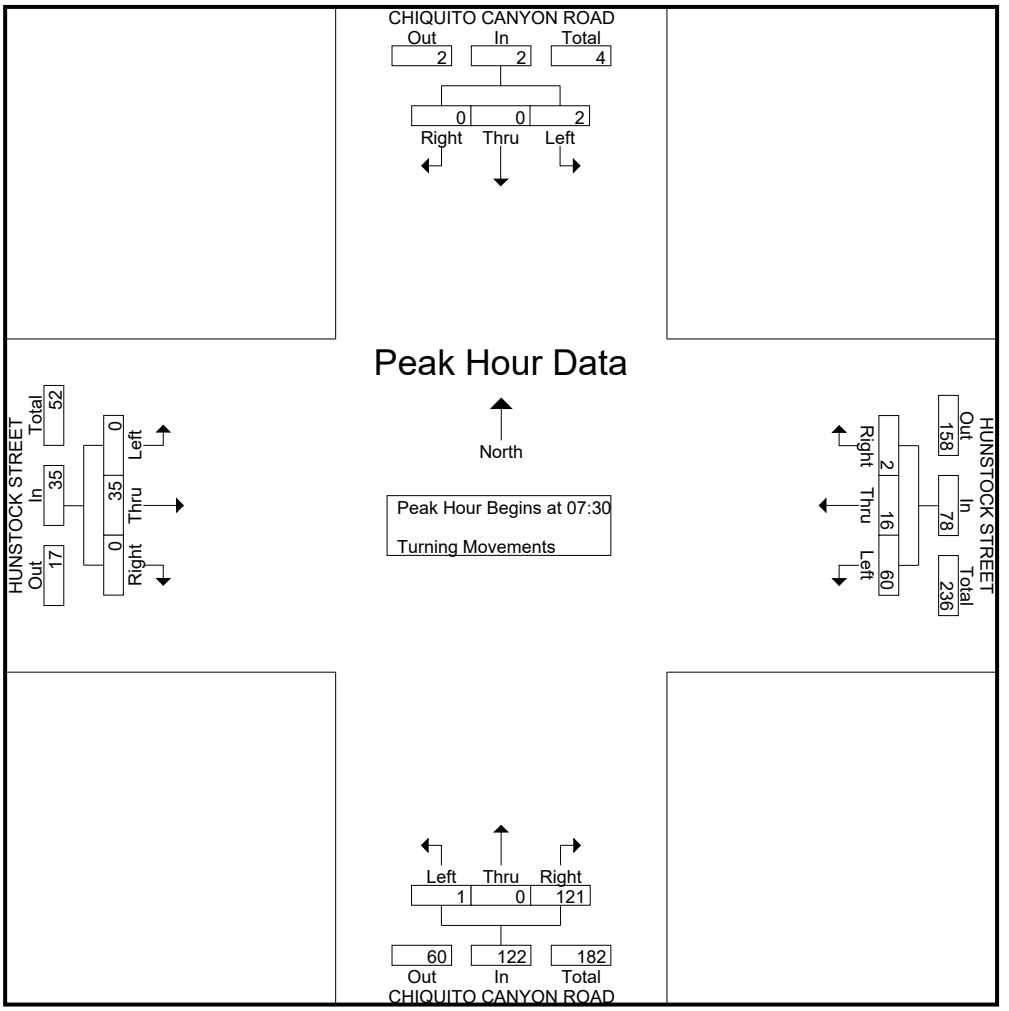
	CHIQUITO CANYON ROAD Southbound			HUNSTOCK STREET Westbound			CHIQUITO CANYON ROAD Northbound			HUNSTOCK STREET Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00	0	0	0	0	2	3	22	0	0	0	10	0	37
07:15	0	0	0	0	0	3	30	0	1	0	5	0	39
07:30	0	0	0	0	3	15	47	0	0	0	15	0	80
07:45	0	0	2	1	4	14	36	0	1	0	11	0	69
Total	0	0	2	1	9	35	135	0	2	0	41	0	225
08:00	0	0	0	0	6	14	21	0	0	0	5	0	46
08:15	0	0	0	1	3	17	17	0	0	0	4	0	42
08:30	0	1	0	0	4	14	30	1	1	0	4	0	55
08:45	0	0	0	0	2	11	15	0	1	1	0	0	30
Total	0	1	0	1	15	56	83	1	2	1	13	0	173
*** BREAK ***													
16:00	0	0	0	0	4	29	19	0	1	1	1	0	55
16:15	0	0	0	0	8	27	22	0	2	2	2	0	63
16:30	0	0	0	0	7	28	16	0	0	1	5	0	57
16:45	0	0	0	0	9	20	20	0	1	0	6	0	56
Total	0	0	0	0	28	104	77	0	4	4	14	0	231
17:00	0	0	0	0	6	37	23	0	0	0	3	0	69
17:15	0	0	0	0	11	32	22	0	0	0	4	0	69
17:30	0	0	0	0	13	25	15	0	1	2	2	0	58
17:45	0	0	0	0	6	31	15	0	0	0	5	0	57
Total	0	0	0	0	36	125	75	0	1	2	14	0	253
Grand Total	0	1	2	2	88	320	370	1	9	7	82	0	882
Apprch %	0	33.3	66.7	0.5	21.5	78	97.4	0.3	2.4	7.9	92.1	0	
Total %	0	0.1	0.2	0.2	10	36.3	42	0.1	1	0.8	9.3	0	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: HUNSTOCK STREET

File Name : H1711056
Site Code : 00000000
Start Date : 11/8/2017

	CHIQUITO CANYON ROAD Southbound				HUNSTOCK STREET Westbound				CHIQUITO CANYON ROAD Northbound				HUNSTOCK STREET Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	0	0	0	0	0	3	15	18	**47**	0	0	**47**	0	**15**	0	**15**	**80**
07:45	0	0	**2**	**2**	**1**	4	14	19	36	0	**1**	37	0	11	0	11	69
08:00	0	0	0	0	0	**6**	14	20	21	0	0	21	0	5	0	5	46
08:15	0	0	0	0	1	3	**17**	**21**	17	0	0	17	0	4	0	4	42
Total Volume	0	0	2	2	2	16	60	78	121	0	1	122	0	35	0	35	237
% App. Total	0	0	100		2.6	20.5	76.9		99.2	0	0.8		0	100	0		
PHF	.000	.000	.250	.250	.500	.667	.882	.929	.644	.000	.250	.649	.000	.583	.000	.583	.741

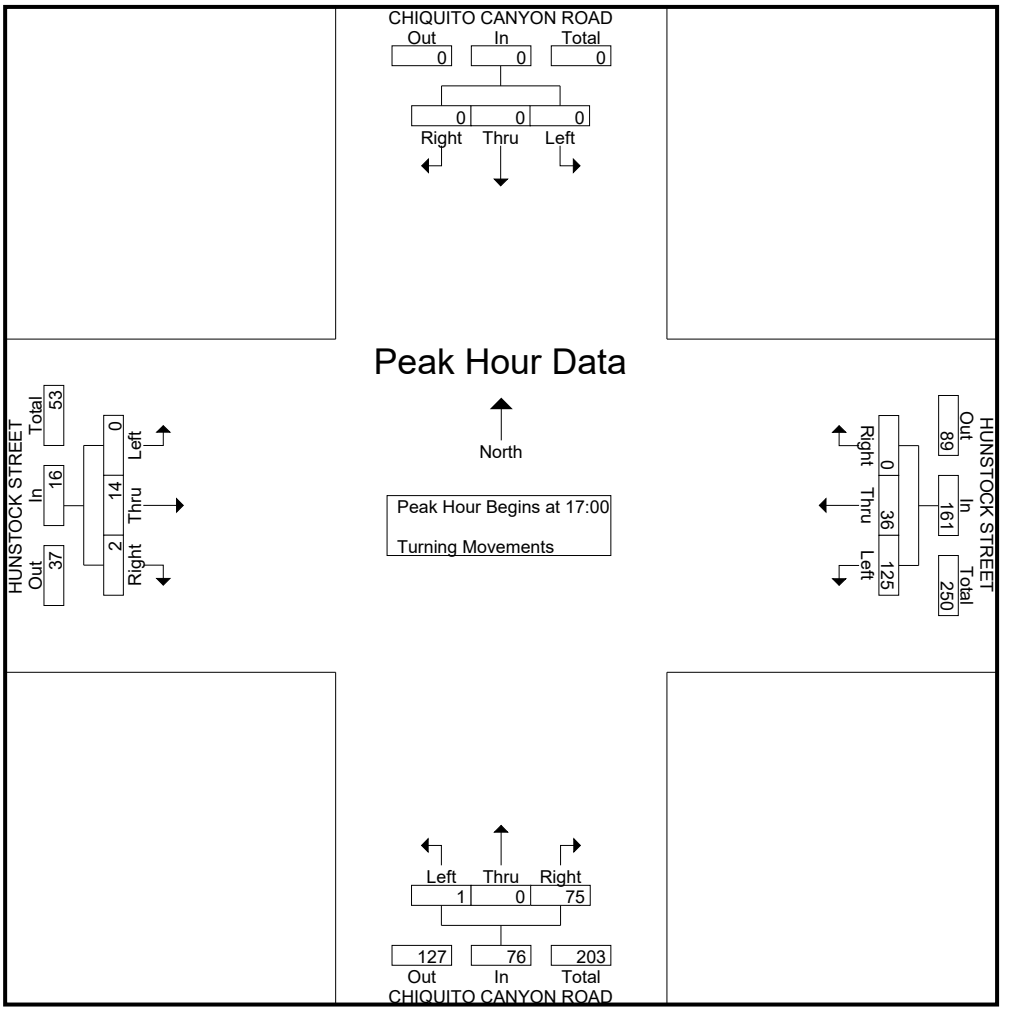


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: CHIQUITO CANYON ROAD
E-W Direction: HUNSTOCK STREET

File Name : H1711056
Site Code : 00000000
Start Date : 11/8/2017

	CHIQUITO CANYON ROAD Southbound				HUNSTOCK STREET Westbound				CHIQUITO CANYON ROAD Northbound				HUNSTOCK STREET Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 17:00																	
17:00	0	0	0	0	0	6	**37**	**43**	**23**	0	0	**23**	0	3	0	3	**69**
17:15	0	0	0	0	0	11	32	43	22	0	0	22	0	4	0	4	69
17:30	0	0	0	0	0	**13**	25	38	15	0	**1**	16	**2**	2	0	4	58
17:45	0	0	0	0	0	6	31	37	15	0	0	15	0	**5**	0	**5**	57
Total Volume	0	0	0	0	0	36	125	161	75	0	1	76	2	14	0	16	253
% App. Total	0	0	0		0	22.4	77.6		98.7	0	1.3		12.5	87.5	0		
PHF	.000	.000	.000	.000	.000	.692	.845	.936	.815	.000	.250	.826	.250	.700	.000	.800	.917



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: DEL VALLE ROAD
E-W Direction: HASLEY CANYON ROAD

File Name : H1711058
Site Code : 00000000
Start Date : 11/8/2017

Groups Printed- Turning Movements

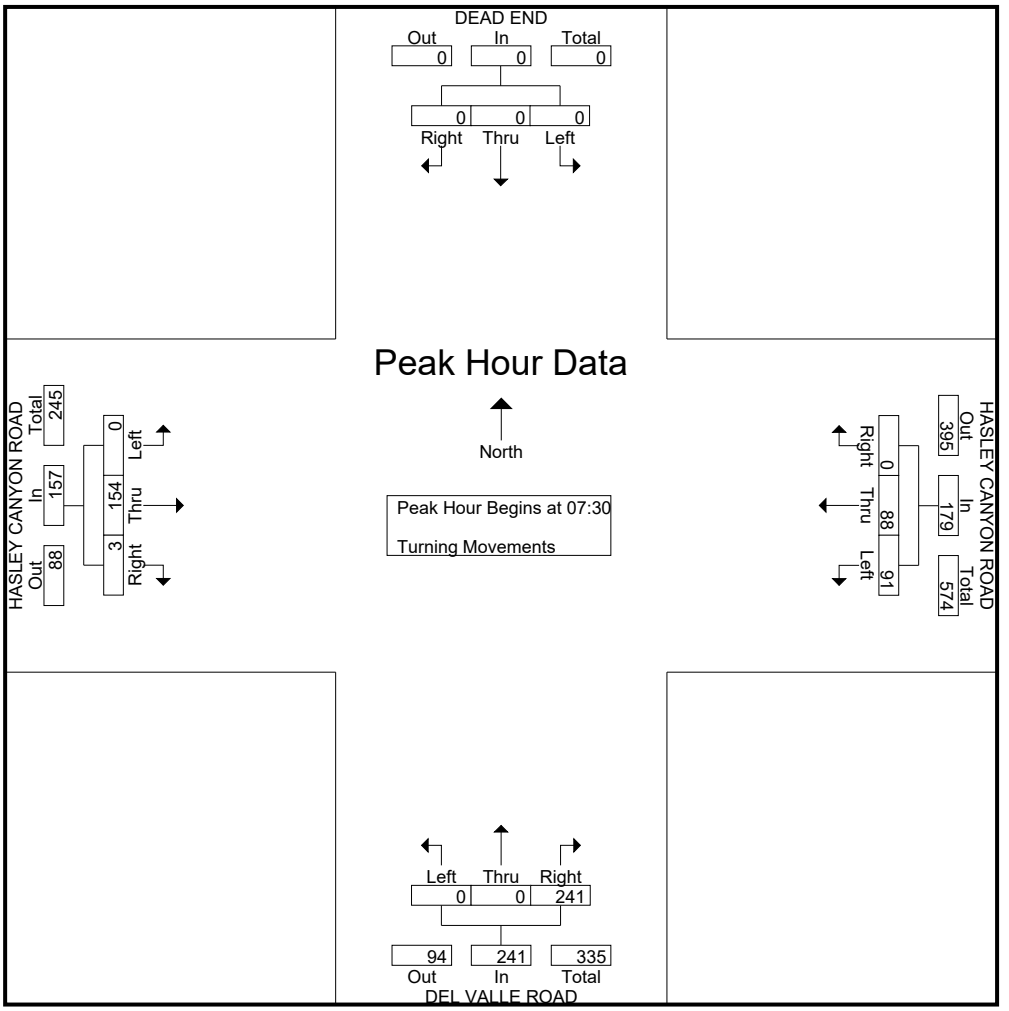
	DEAD END Southbound			HASLEY CANYON ROAD Westbound			DEL VALLE ROAD Northbound			HASLEY CANYON ROAD Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00	0	0	0	0	11	6	38	0	0	0	30	0	85
07:15	0	0	0	0	6	2	50	0	0	0	33	0	91
07:30	0	0	0	0	18	17	87	0	0	1	57	0	180
07:45	0	0	0	0	28	25	76	0	0	2	29	0	160
Total	0	0	0	0	63	50	251	0	0	3	149	0	516
08:00	0	0	0	0	17	24	45	0	0	0	35	0	121
08:15	0	0	0	0	25	25	33	0	0	0	33	0	116
08:30	0	0	0	0	17	21	38	0	0	0	36	0	112
08:45	0	0	0	0	19	11	31	0	0	2	32	0	95
Total	0	0	0	0	78	81	147	0	0	2	136	0	444
*** BREAK ***													
16:00	0	0	0	0	40	40	18	0	1	2	29	0	130
16:15	0	0	0	0	28	42	37	0	0	0	26	0	133
16:30	0	0	0	0	35	54	22	0	2	0	23	0	136
16:45	0	0	0	0	32	48	31	0	0	0	24	0	135
Total	0	0	0	0	135	184	108	0	3	2	102	0	534
17:00	0	0	0	0	38	63	27	0	1	0	15	0	144
17:15	0	0	0	0	26	62	32	0	0	2	31	0	153
17:30	0	0	0	0	31	56	22	0	0	1	20	0	130
17:45	0	0	0	0	35	56	27	0	2	1	16	0	137
Total	0	0	0	0	130	237	108	0	3	4	82	0	564
Grand Total	0	0	0	0	406	552	614	0	6	11	469	0	2058
Apprch %	0	0	0	0	42.4	57.6	99	0	1	2.3	97.7	0	
Total %	0	0	0	0	19.7	26.8	29.8	0	0.3	0.5	22.8	0	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: DEL VALLE ROAD
E-W Direction: HASLEY CANYON ROAD

File Name : H1711058
Site Code : 00000000
Start Date : 11/8/2017
Page No : 2

	DEAD END Southbound				HASLEY CANYON ROAD Westbound				DEL VALLE ROAD Northbound				HASLEY CANYON ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	0	0	0	0	0	18	17	35	**87**	0	0	**87**	1	**57**	0	**58**	**180**
07:45	0	0	0	0	0	**28**	**25**	**53**	76	0	0	76	**2**	29	0	31	160
08:00	0	0	0	0	0	17	24	41	45	0	0	45	0	35	0	35	121
08:15	0	0	0	0	0	25	25	50	33	0	0	33	0	33	0	33	116
Total Volume	0	0	0	0	0	88	91	179	241	0	0	241	3	154	0	157	577
% App. Total	0	0	0		0	49.2	50.8		100	0	0		1.9	98.1	0		
PHF	.000	.000	.000	.000	.000	.786	.910	.844	.693	.000	.000	.693	.375	.675	.000	.677	.801

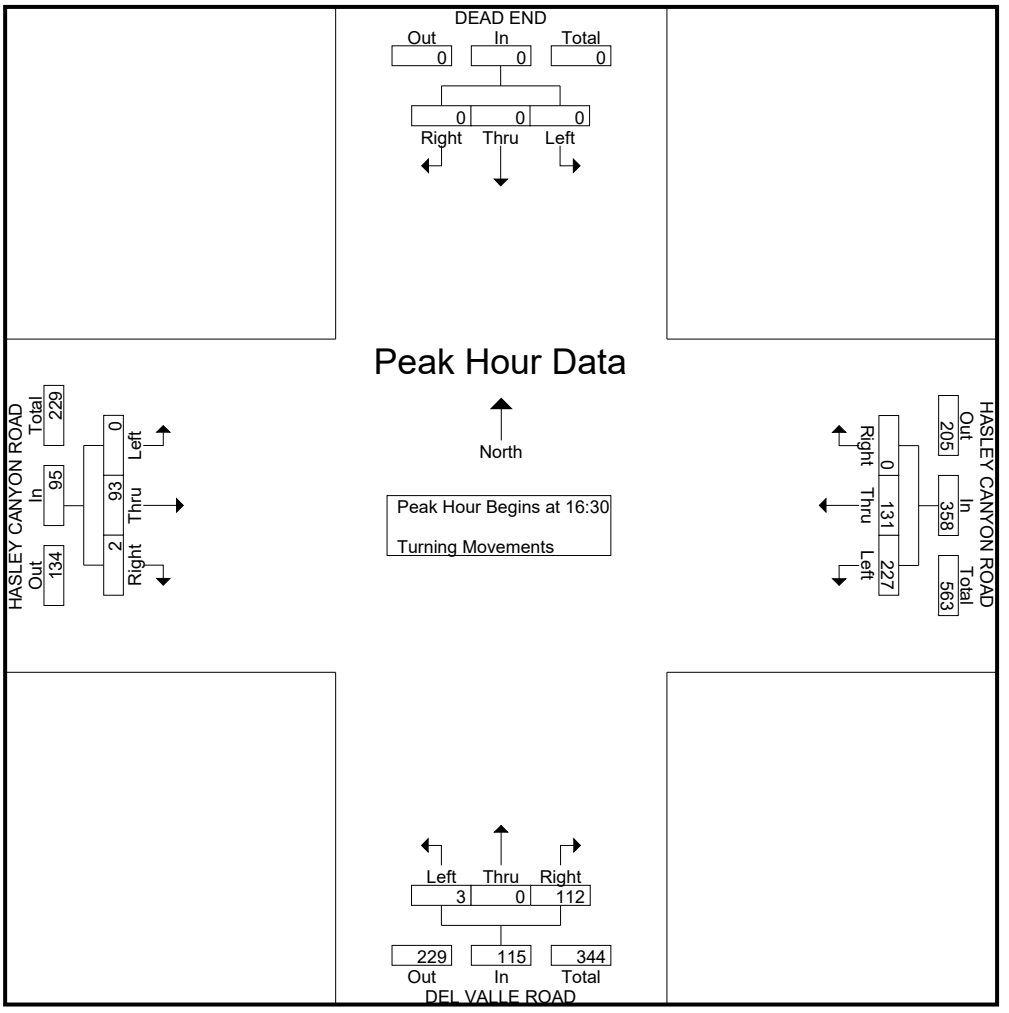


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: DEL VALLE ROAD
E-W Direction: HASLEY CANYON ROAD

File Name : H1711058
Site Code : 00000000
Start Date : 11/8/2017
Page No : 3

	DEAD END Southbound				HASLEY CANYON ROAD Westbound				DEL VALLE ROAD Northbound				HASLEY CANYON ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:30																	
16:30	0	0	0	0	0	35	54	89	22	0	**2**	24	0	23	0	23	136
16:45	0	0	0	0	0	32	48	80	31	0	0	31	0	24	0	24	135
17:00	0	0	0	0	0	**38**	**63**	**101**	27	0	1	28	0	15	0	15	144
17:15	0	0	0	0	0	26	62	88	**32**	0	0	**32**	**2**	**31**	0	**33**	**153**
Total Volume	0	0	0	0	0	131	227	358	112	0	3	115	2	93	0	95	568
% App. Total	0	0	0		0	36.6	63.4		97.4	0	2.6		2.1	97.9	0		
PHF	.000	.000	.000	.000	.000	.862	.901	.886	.875	.000	.375	.898	.250	.750	.000	.720	.928



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER / HASLEY
E-W Direction: HASLEY CANYON ROAD

File Name : H1711059
Site Code : 00000000
Start Date : 11/8/2017

Groups Printed- Turning Movements

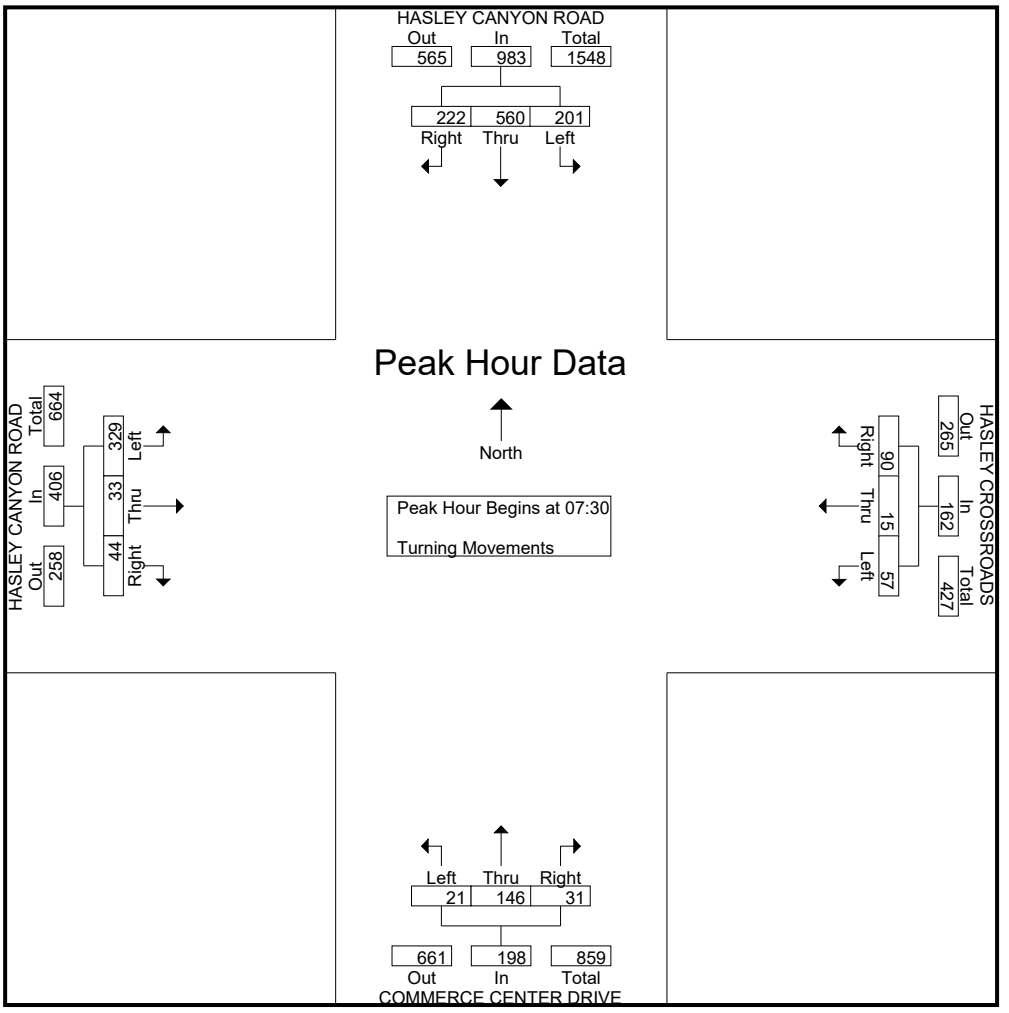
	HASLEY CANYON ROAD Southbound			HASLEY CROSSROADS Westbound			COMMERCE CENTER DRIVE Northbound			HASLEY CANYON ROAD Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00	25	91	21	3	2	8	4	23	1	13	3	51	245
07:15	28	113	27	5	3	12	9	12	0	9	9	81	308
07:30	52	129	28	11	1	13	7	22	4	10	6	110	393
07:45	72	170	51	14	3	14	10	27	6	13	6	107	493
Total	177	503	127	33	9	47	30	84	11	45	24	349	1439
08:00	40	117	52	24	7	13	10	37	4	5	5	62	376
08:15	58	144	70	41	4	17	4	60	7	16	16	50	487
08:30	33	64	66	40	5	10	9	36	3	8	13	57	344
08:45	35	56	27	26	1	10	4	26	6	6	8	54	259
Total	166	381	215	131	17	50	27	159	20	35	42	223	1466
*** BREAK ***													
16:00	68	31	14	19	3	3	3	136	10	4	3	59	353
16:15	87	22	8	3	3	2	5	91	6	7	0	51	285
16:30	77	23	6	4	1	2	3	251	17	7	6	85	482
16:45	69	27	8	9	1	1	7	99	11	7	2	58	299
Total	301	103	36	35	8	8	18	577	44	25	11	253	1419
17:00	83	16	7	6	2	0	2	180	14	4	2	83	399
17:15	77	19	6	8	1	3	6	78	14	6	5	59	282
17:30	82	26	4	3	0	4	3	91	16	7	3	48	287
17:45	77	18	7	8	3	2	6	53	9	6	3	45	237
Total	319	79	24	25	6	9	17	402	53	23	13	235	1205
Grand Total	963	1066	402	224	40	114	92	1222	128	128	90	1060	5529
Apprch %	39.6	43.9	16.5	59.3	10.6	30.2	6.4	84.7	8.9	10	7	82.9	
Total %	17.4	19.3	7.3	4.1	0.7	2.1	1.7	22.1	2.3	2.3	1.6	19.2	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER / HASLEY
E-W Direction: HASLEY CANYON ROAD

File Name : H1711059
Site Code : 00000000
Start Date : 11/8/2017

	HASLEY CANYON ROAD Southbound				HASLEY CROSSROADS Westbound				COMMERCE CENTER DRIVE Northbound				HASLEY CANYON ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	52	129	28	209	11	1	13	25	7	22	4	33	10	6	**110**	**126**	393
07:45	**72**	**170**	51	**293**	14	3	14	31	**10**	27	6	43	13	6	107	126	**493**
08:00	40	117	52	209	24	**7**	13	44	10	37	4	51	5	5	62	72	376
08:15	58	144	**70**	272	**41**	4	**17**	**62**	4	**60**	**7**	**71**	**16**	**16**	50	82	487
Total Volume	222	560	201	983	90	15	57	162	31	146	21	198	44	33	329	406	1749
% App. Total	22.6	57	20.4		55.6	9.3	35.2		15.7	73.7	10.6		10.8	8.1	81		
PHF	.771	.824	.718	.839	.549	.536	.838	.653	.775	.608	.750	.697	.688	.516	.748	.806	.887

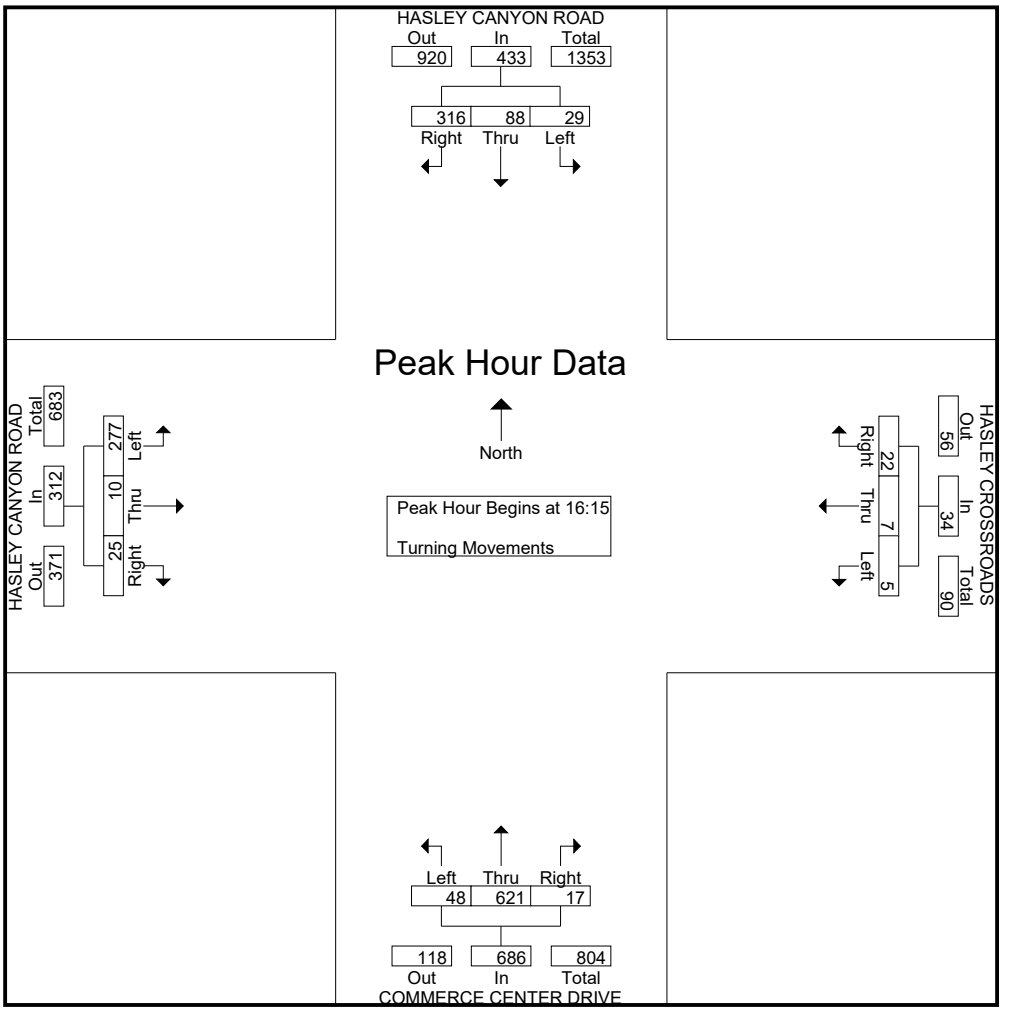


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER / HASLEY
E-W Direction: HASLEY CANYON ROAD

File Name : H1711059
Site Code : 00000000
Start Date : 11/8/2017

	HASLEY CANYON ROAD Southbound				HASLEY CROSSROADS Westbound				COMMERCE CENTER DRIVE Northbound				HASLEY CANYON ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:15																	
16:15	**87**	22	**8**	**117**	3	**3**	**2**	8	5	91	6	102	**7**	0	51	58	285
16:30	77	23	6	106	4	1	2	7	3	**251**	**17**	**271**	7	**6**	**85**	**98**	**482**
16:45	69	**27**	8	104	**9**	1	1	**11**	**7**	99	11	117	7	2	58	67	299
17:00	83	16	7	106	6	2	0	8	2	180	14	196	4	2	83	89	399
Total Volume	316	88	29	433	22	7	5	34	17	621	48	686	25	10	277	312	1465
% App. Total	73	20.3	6.7		64.7	20.6	14.7		2.5	90.5	7		8	3.2	88.8		
PHF	.908	.815	.906	.925	.611	.583	.625	.773	.607	.619	.706	.633	.893	.417	.815	.796	.760



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: THE OLD ROAD
E-W Direction: I-5 SB RAMPS/SEDONA WAY

File Name : H1711061
Site Code : 00000000
Start Date : 11/8/2017

Groups Printed- Turning Movements

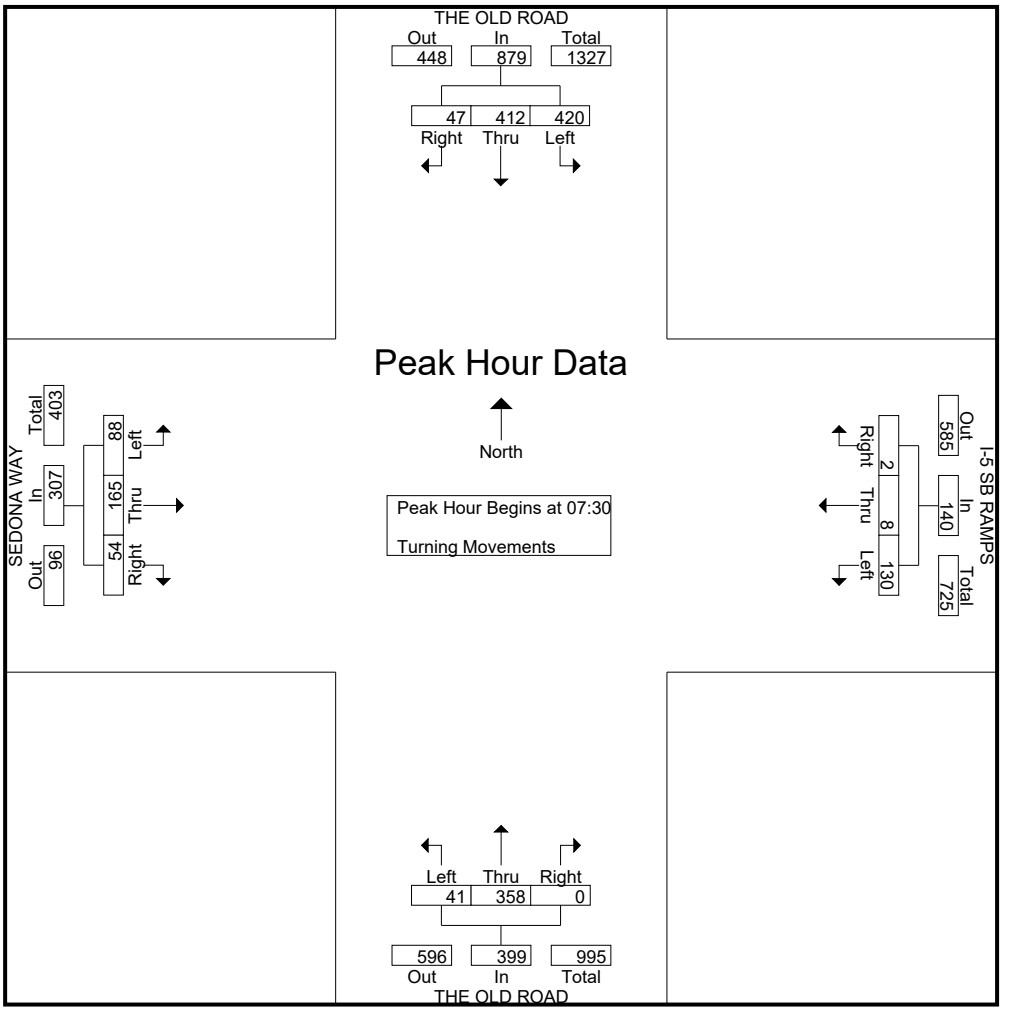
	THE OLD ROAD Southbound			I-5 SB RAMPS Westbound			THE OLD ROAD Northbound			SEDONA WAY Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
06:00	0	30	56	0	1	27	0	13	3	15	19	0	164
06:15	1	42	79	2	0	13	1	19	4	7	36	0	204
06:30	0	54	70	0	1	22	0	32	10	8	31	3	231
06:45	0	58	62	1	0	36	0	31	8	16	37	2	251
Total	1	184	267	3	2	98	1	95	25	46	123	5	850
07:00	1	66	77	0	0	25	1	35	8	13	40	4	270
07:15	5	74	82	0	1	22	1	59	7	5	42	2	300
07:30	5	88	100	2	0	32	0	94	4	15	44	30	414
07:45	16	119	139	0	2	41	0	110	16	19	43	16	521
Total	27	347	398	2	3	120	2	298	35	52	169	52	1505
08:00	12	93	98	0	2	27	0	81	11	11	35	26	396
08:15	14	112	83	0	4	30	0	73	10	9	43	16	394
08:30	11	91	78	1	4	27	0	57	9	8	47	3	336
08:45	1	65	94	1	0	21	0	57	15	9	37	6	306
Total	38	361	353	2	10	105	0	268	45	37	162	51	1432
*** BREAK ***													
11:00	2	49	31	1	1	16	0	74	17	7	17	3	218
11:15	4	33	30	1	3	19	0	75	13	7	18	5	208
11:30	1	49	31	1	1	22	0	91	16	8	9	5	234
11:45	3	47	38	3	2	22	0	94	24	8	16	5	262
Total	10	178	130	6	7	79	0	334	70	30	60	18	922
12:00	2	57	41	1	0	23	0	100	16	10	16	6	272
12:15	2	48	26	1	3	35	0	110	19	11	19	9	283
12:30	1	59	31	1	5	27	2	106	18	13	16	11	290
12:45	8	71	55	0	4	25	0	104	24	13	23	8	335
Total	13	235	153	3	12	110	2	420	77	47	74	34	1180
*** BREAK ***													
15:30	7	56	54	2	4	23	0	174	32	8	24	4	388
15:45	8	56	40	0	4	18	0	144	37	10	19	8	344
Total	15	112	94	2	8	41	0	318	69	18	43	12	732
16:00	3	42	57	0	2	21	1	155	32	9	14	7	343
16:15	5	45	33	0	1	21	2	151	30	7	20	5	320
16:30	3	50	55	0	2	9	0	165	34	10	19	10	357
16:45	6	52	44	1	5	24	0	169	25	7	17	4	354
Total	17	189	189	1	10	75	3	640	121	33	70	26	1374
17:00	2	34	48	0	2	25	0	173	38	13	29	8	372
17:15	3	66	45	2	5	17	0	160	42	18	14	7	379
17:30	8	43	54	0	1	18	0	171	21	7	31	9	363
17:45	10	51	53	0	7	14	1	160	42	13	14	7	372
Total	23	194	200	2	15	74	1	664	143	51	88	31	1486
18:00	4	44	41	0	6	26	1	134	26	11	12	5	310
18:15	2	32	35	0	2	19	0	138	26	9	10	2	275
Grand Total	150	1876	1860	21	75	747	10	3309	637	334	811	236	10066
Apprch %	3.9	48.3	47.9	2.5	8.9	88.6	0.3	83.6	16.1	24.2	58.7	17.1	
Total %	1.5	18.6	18.5	0.2	0.7	7.4	0.1	32.9	6.3	3.3	8.1	2.3	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: THE OLD ROAD
E-W Direction: I-5 SB RAMPS/SEDONA WAY

File Name : H1711061
Site Code : 00000000
Start Date : 11/8/2017

	THE OLD ROAD Southbound				I-5 SB RAMPS Westbound				THE OLD ROAD Northbound				SEDONA WAY Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 06:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	5	88	100	193	**2**	0	32	34	0	94	4	98	15	**44**	**30**	**89**	414
07:45	**16**	**119**	**139**	**274**	0	2	**41**	**43**	0	**110**	**16**	**126**	**19**	43	16	78	**521**
08:00	12	93	98	203	0	2	27	29	0	81	11	92	11	35	26	72	396
08:15	14	112	83	209	0	**4**	30	34	0	73	10	83	9	43	16	68	394
Total Volume	47	412	420	879	2	8	130	140	0	358	41	399	54	165	88	307	1725
% App. Total	5.3	46.9	47.8		1.4	5.7	92.9		0	89.7	10.3		17.6	53.7	28.7		
PHF	.734	.866	.755	.802	.250	.500	.793	.814	.000	.814	.641	.792	.711	.938	.733	.862	.828

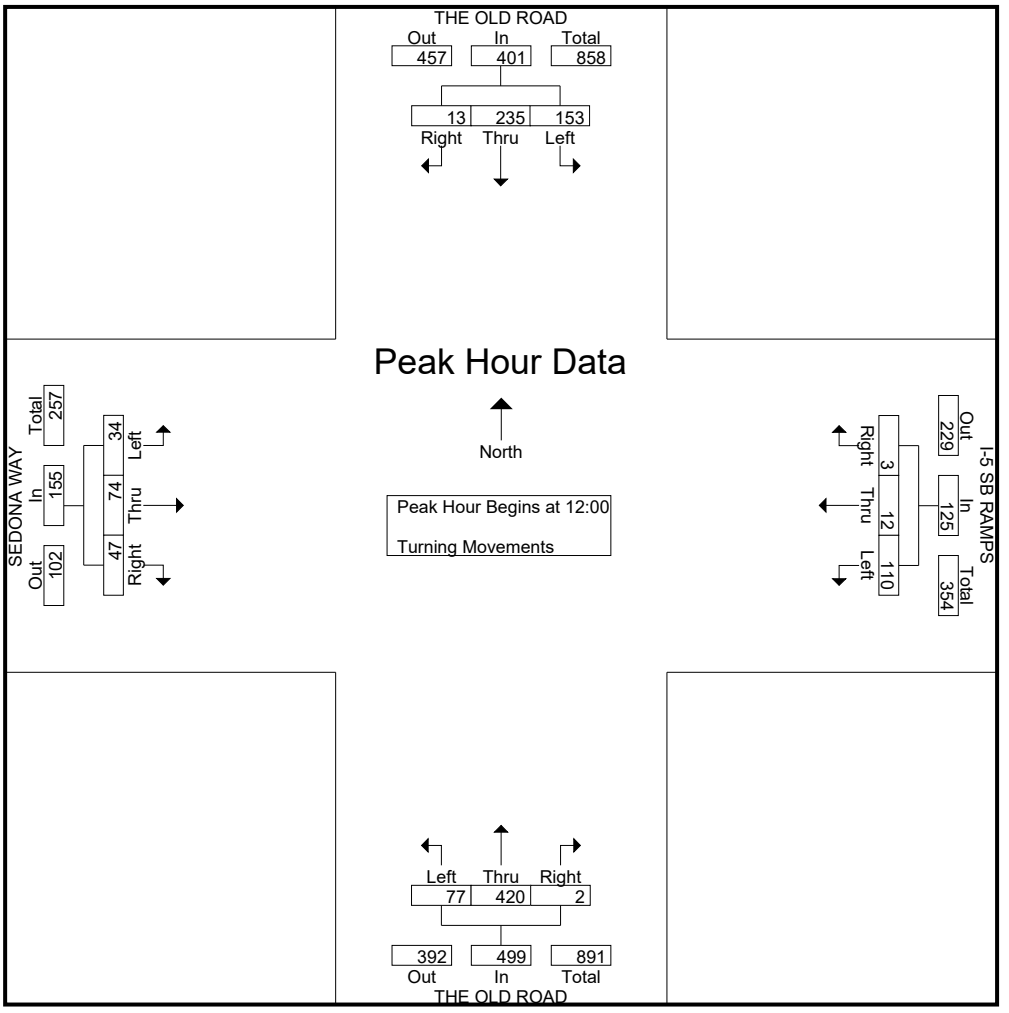


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: THE OLD ROAD
E-W Direction: I-5 SB RAMPS/SEDONA WAY

File Name : H1711061
Site Code : 00000000
Start Date : 11/8/2017

	THE OLD ROAD Southbound				I-5 SB RAMPS Westbound				THE OLD ROAD Northbound				SEDONA WAY Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:00																	
12:00	2	57	41	100	**1**	0	23	24	0	100	16	116	10	16	6	32	272
12:15	2	48	26	76	1	3	**35**	**39**	0	**110**	19	**129**	11	19	9	39	283
12:30	1	59	31	91	1	**5**	27	33	**2**	106	18	126	**13**	16	**11**	40	290
12:45	**8**	**71**	**55**	**134**	0	4	25	29	0	104	**24**	128	13	**23**	8	**44**	**335**
Total Volume	13	235	153	401	3	12	110	125	2	420	77	499	47	74	34	155	1180
% App. Total	3.2	58.6	38.2		2.4	9.6	88		0.4	84.2	15.4		30.3	47.7	21.9		
PHF	.406	.827	.695	.748	.750	.600	.786	.801	.250	.955	.802	.967	.904	.804	.773	.881	.881

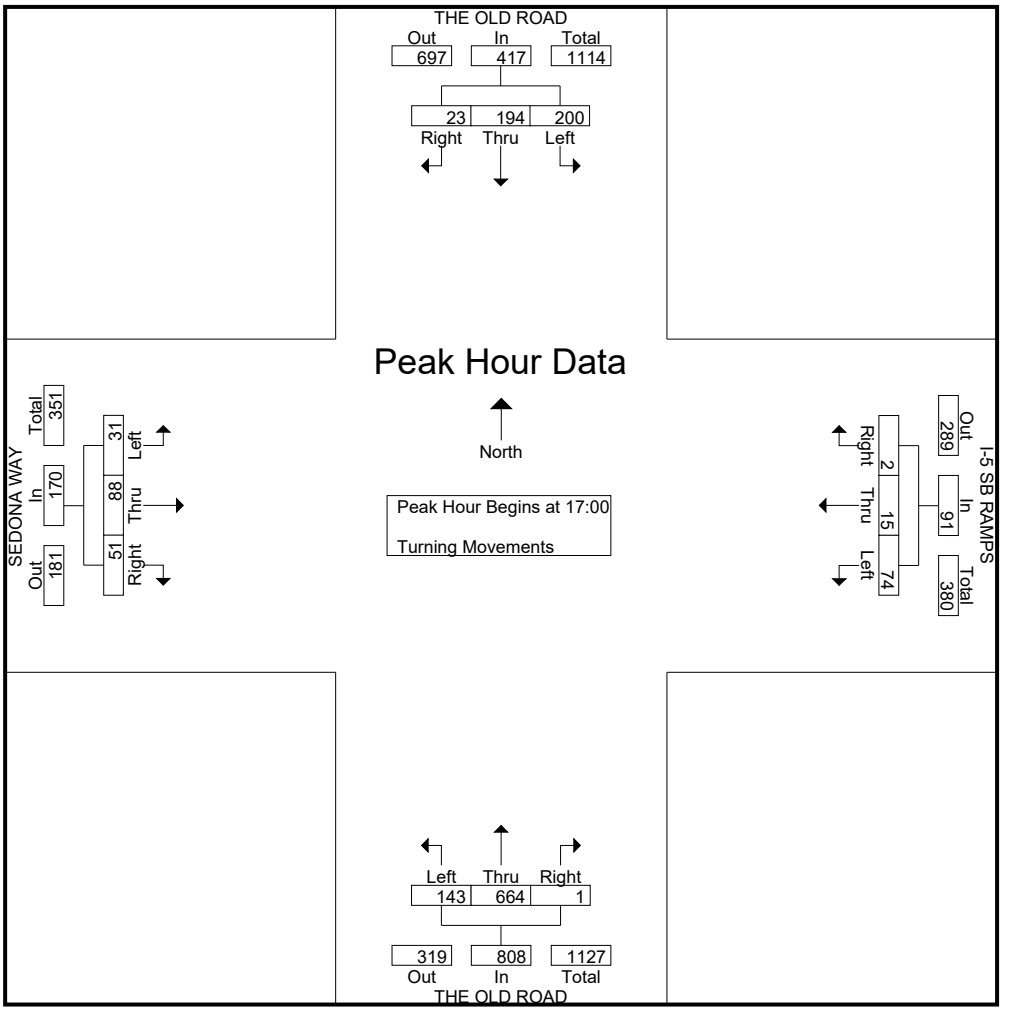


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: THE OLD ROAD
E-W Direction: I-5 SB RAMPS/SEDONA WAY

File Name : H1711061
Site Code : 00000000
Start Date : 11/8/2017
Page No : 4

	THE OLD ROAD Southbound				I-5 SB RAMPS Westbound				THE OLD ROAD Northbound				SEDONA WAY Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 17:00																	
17:00	2	34	48	84	0	2	**25**	**27**	0	**173**	38	**211**	13	29	8	**50**	372
17:15	3	**66**	45	**114**	**2**	5	17	24	0	160	**42**	202	**18**	14	7	39	**379**
17:30	8	43	**54**	105	0	1	18	19	0	171	21	192	7	**31**	**9**	47	363
17:45	**10**	51	53	114	0	**7**	14	21	**1**	160	42	203	13	14	7	34	372
Total Volume	23	194	200	417	2	15	74	91	1	664	143	808	51	88	31	170	1486
% App. Total	5.5	46.5	48		2.2	16.5	81.3		0.1	82.2	17.7		30	51.8	18.2		
PHF	.575	.735	.926	.914	.250	.536	.740	.843	.250	.960	.851	.957	.708	.710	.861	.850	.980



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: THE OLD ROAD / I-5 SB
E-W Direction: HASLEY CANYON ROAD

File Name : h1711060
Site Code : 00000000
Start Date : 11/8/2017

Groups Printed- Turning Movements

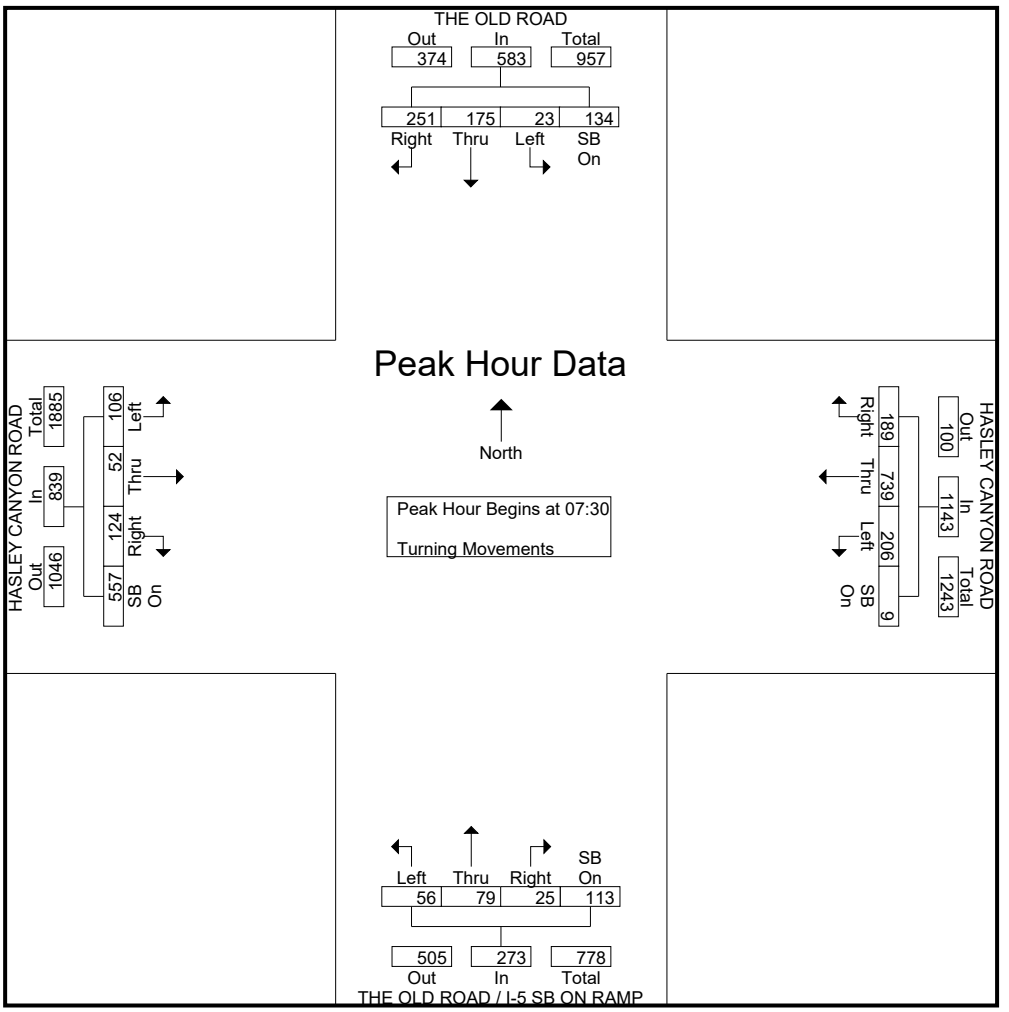
	THE OLD ROAD Southbound				HASLEY CANYON ROAD Westbound				THE OLD ROAD / I-5 SB ON RAMP Northbound				HASLEY CANYON ROAD Eastbound				
Start Time	Right	Thru	Left	SB On	Right	Thru	Left	SB On	Right	Thru	Left	SB On	Right	Thru	Left	SB On	Int. Total
07:00	30	27	7	42	30	105	31	0	4	8	7	22	19	7	3	88	430
07:15	35	31	3	26	40	154	47	0	5	7	10	19	15	8	18	142	560
07:30	37	50	6	40	56	157	61	1	6	10	17	33	33	14	35	142	698
07:45	80	48	5	34	52	210	50	2	9	28	13	42	40	12	23	133	781
Total	182	156	21	142	178	626	189	3	24	53	47	116	107	41	79	505	2469
08:00	56	37	6	31	47	164	48	1	5	21	14	16	18	10	22	126	622
08:15	78	40	6	29	34	208	47	5	5	20	12	22	33	16	26	156	737
08:30	41	47	7	28	34	122	37	3	2	13	6	19	25	5	15	148	552
08:45	31	27	2	22	41	110	28	0	5	21	11	26	23	14	12	152	525
Total	206	151	21	110	156	604	160	9	17	75	43	83	99	45	75	582	2436
*** BREAK ***																	
16:00	25	19	10	18	114	137	39	1	11	25	10	16	21	24	29	173	672
16:15	19	25	5	20	111	138	26	1	10	36	11	21	16	20	36	122	617
16:30	17	21	6	27	131	132	29	0	7	28	14	23	30	35	30	249	779
16:45	34	26	15	21	122	148	36	3	14	22	12	18	23	25	28	148	695
Total	95	91	36	86	478	555	130	5	42	111	47	78	90	104	123	692	2763
17:00	33	33	9	21	132	166	24	1	13	42	11	20	29	33	35	198	800
17:15	32	40	12	25	140	156	23	0	12	41	12	22	20	15	29	125	704
17:30	30	22	9	15	140	120	36	1	8	32	18	15	16	21	25	129	637
17:45	24	23	10	26	129	121	19	1	11	29	13	15	14	6	15	101	557
Total	119	118	40	87	541	563	102	3	44	144	54	72	79	75	104	553	2698
Grand Total	602	516	118	425	1353	2348	581	20	127	383	191	349	375	265	381	2332	10366
Apprch %	36.2	31.1	7.1	25.6	31.5	54.6	13.5	0.5	12.1	36.5	18.2	33.2	11.2	7.9	11.4	69.5	
Total %	5.8	5	1.1	4.1	13.1	22.7	5.6	0.2	1.2	3.7	1.8	3.4	3.6	2.6	3.7	22.5	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: THE OLD ROAD / I-5 SB
E-W Direction: HASLEY CANYON ROAD

File Name : h1711060
Site Code : 00000000
Start Date : 11/8/2017

	THE OLD ROAD Southbound					HASLEY CANYON ROAD Westbound					THE OLD ROAD / I-5 SB ON RAMP Northbound					HASLEY CANYON ROAD Eastbound					
Start Time	Right	Thru	Left	SB On	App. Total	Right	Thru	Left	SB On	App. Total	Right	Thru	Left	SB On	App. Total	Right	Thru	Left	SB On	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30																					
07:30	37	**50**	**6**	**40**		**56**	157	**61**					**17**	33	66	33	14	**35**			
07:45	**80**	**48**	**5**	**34**	**167**	52	**210**	**50**	**2**	**314**	**9**	**28**	**13**	**42**	**92**	**40**	**12**	**23**	**133**	**208**	**781**
08:00	56	37	6	31	130	47	164	48	1	260	5	21	14	16	56	18	10	22	126	176	622
08:15	78	40	6	29	153	34	208	47	**5**	294	5	20	12	22	59	33	**16**	26	**156**	**231**	737
Total Volume	251	175	23	134	583	189	739	206	9	1143	25	79	56	113	273	124	52	106	557	839	2838
% App. Total	43.1	30	3.9	23		16.5	64.7	18	0.8		9.2	28.9	20.5	41.4		14.8	6.2	12.6	66.4		
PHF	.784	.875	.958	.838	.873	.844	.880	.844	.450	.910	.694	.705	.824	.673	.742	.775	.813	.757	.893	.908	.908

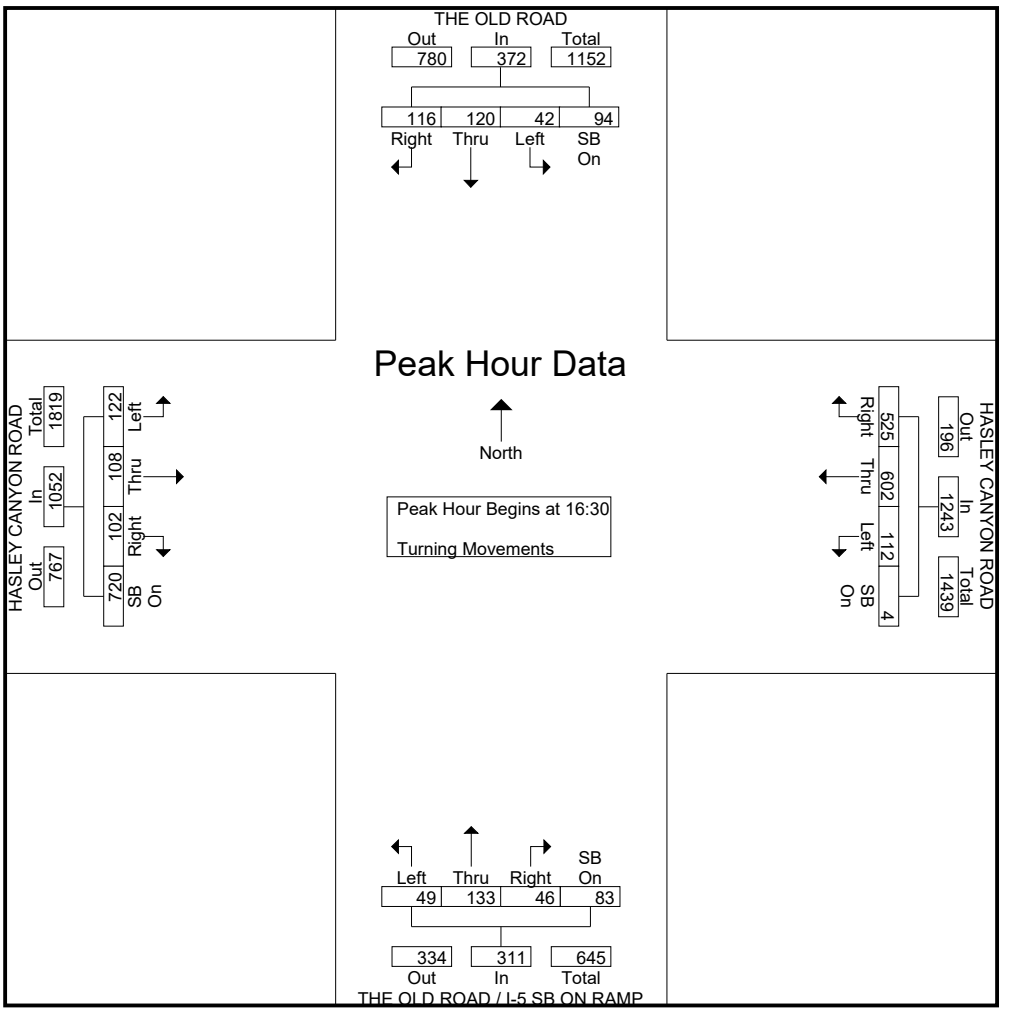


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: THE OLD ROAD / I-5 SB
E-W Direction: HASLEY CANYON ROAD

File Name : h1711060
Site Code : 00000000
Start Date : 11/8/2017
Page No : 3

	THE OLD ROAD Southbound					HASLEY CANYON ROAD Westbound					THE OLD ROAD / I-5 SB ON RAMP Northbound					HASLEY CANYON ROAD Eastbound					
Start Time	Right	Thru	Left	SB On	App. Total	Right	Thru	Left	SB On	App. Total	Right	Thru	Left	SB On	App. Total	Right	Thru	Left	SB On	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 16:30																					
16:30	17	21	6	**27**									**14**	**23**		**30**	**35**	30	**249**	**344**	779
16:45	**34**		**15**					**36**	**3**	309	**14**										
17:00	**33**	**33**	**9**	**21**	**96**	**132**	**166**	**24**	**1**	**323**	13	**42**	**11**	**20**	**86**	**29**	**33**	**35**	**198**	**295**	**800**
17:15	32	**40**	12	25	**109**	**140**	156	23	0	319	12	41	12	22	**87**	20	15	29	125	189	704
Total Volume	116	120	42	94	372	525	602	112	4	1243	46	133	49	83	311	102	108	122	720	1052	2978
% App. Total	31.2	32.3	11.3	25.3		42.2	48.4	9	0.3		14.8	42.8	15.8	26.7		9.7	10.3	11.6	68.4		
PHF	.853	.750	.700	.870	.853	.938	.907	.778	.333	.962	.821	.792	.875	.902	.894	.850	.771	.871	.723	.765	.931



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 NB RAMPS
E-W Direction: HASLEY CANYON

File Name : h1711062
Site Code : 00000000
Start Date : 11/8/2017
Page No : 1

Groups Printed- Turning Movements

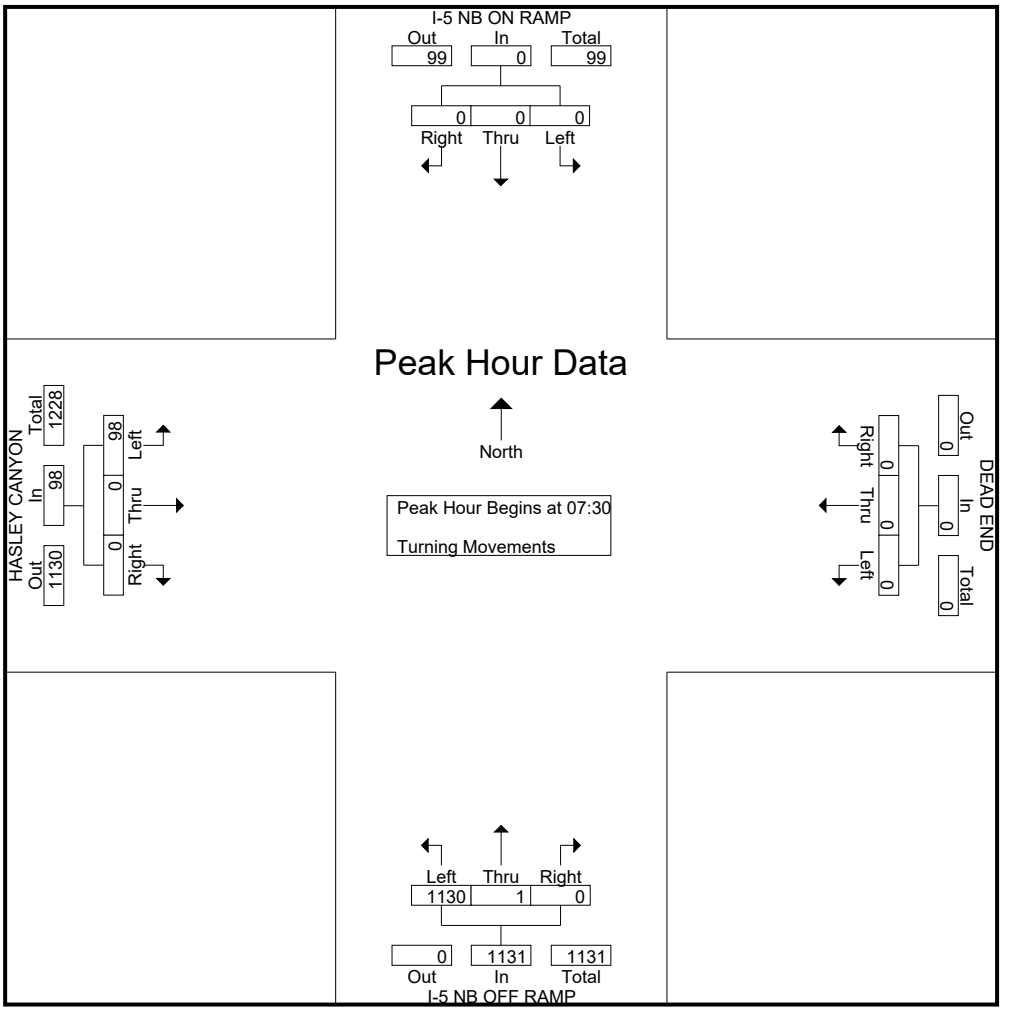
	I-5 NB ON RAMP Southbound			DEAD END Westbound			I-5 NB OFF RAMP Northbound			HASLEY CANYON Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
06:00	0	0	0	0	0	0	0	2	113	0	0	9	124
06:15	0	0	0	0	0	0	0	0	134	0	0	8	142
06:30	0	0	0	0	0	0	0	0	188	0	0	15	203
06:45	0	0	0	0	0	0	0	1	223	0	0	10	234
Total	0	0	0	0	0	0	0	3	658	0	0	42	703
07:00	0	0	0	0	0	0	0	1	170	0	0	22	193
07:15	0	0	0	0	0	0	0	1	235	0	0	17	253
07:30	0	0	0	0	0	0	0	0	288	0	0	30	318
07:45	0	0	0	0	0	0	0	0	303	0	0	23	326
Total	0	0	0	0	0	0	0	2	996	0	0	92	1090
08:00	0	0	0	0	0	0	0	1	275	0	0	20	296
08:15	0	0	0	0	0	0	0	0	264	0	0	25	289
08:30	0	0	0	0	0	0	0	0	197	0	0	15	212
08:45	0	0	0	0	0	0	0	0	190	0	0	22	212
Total	0	0	0	0	0	0	0	1	926	0	0	82	1009
*** BREAK ***													
11:00	0	0	0	0	0	0	0	0	144	0	0	30	174
11:15	0	0	0	0	0	0	0	1	148	0	0	34	183
11:30	0	0	0	0	0	0	0	0	201	0	0	27	228
11:45	0	0	0	0	0	0	0	0	194	0	0	33	227
Total	0	0	0	0	0	0	0	1	687	0	0	124	812
12:00	0	0	0	0	0	0	0	2	183	0	0	38	223
12:15	0	0	0	0	0	0	0	0	201	0	0	31	232
12:30	0	0	0	0	0	0	0	0	201	0	0	36	237
12:45	0	0	0	0	0	0	0	0	201	0	0	41	242
Total	0	0	0	0	0	0	0	2	786	0	0	146	934
*** BREAK ***													
15:30	0	0	0	0	0	0	0	0	298	0	0	42	340
15:45	0	0	0	0	0	0	0	0	275	0	0	41	316
Total	0	0	0	0	0	0	0	0	573	0	0	83	656
16:00	0	0	0	0	0	0	0	0	283	0	0	46	329
16:15	0	0	0	0	0	0	0	0	284	0	0	45	329
16:30	0	0	0	0	0	0	0	2	294	0	0	46	342
16:45	0	0	0	0	0	0	0	0	302	0	0	45	347
Total	0	0	0	0	0	0	0	2	1163	0	0	182	1347
17:00	0	0	0	0	0	0	0	0	331	0	0	57	388
17:15	0	0	0	0	0	0	0	0	312	0	0	36	348
17:30	0	0	0	0	0	0	0	0	282	0	0	37	319
17:45	0	0	0	0	0	0	0	0	282	0	0	25	307
Total	0	0	0	0	0	0	0	0	1207	0	0	155	1362
18:00	0	0	0	0	0	0	0	0	256	0	0	22	278
18:15	0	0	0	0	0	0	0	1	240	0	0	23	264
Grand Total	0	0	0	0	0	0	0	12	7492	0	0	951	8455
Apprch %	0	0	0	0	0	0	0	0.2	99.8	0	0	100	
Total %	0	0	0	0	0	0	0	0.1	88.6	0	0	11.2	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 NB RAMPS
E-W Direction: HASLEY CANYON

File Name : h1711062
Site Code : 00000000
Start Date : 11/8/2017

	I-5 NB ON RAMP Southbound				DEAD END Westbound				I-5 NB OFF RAMP Northbound				HASLEY CANYON Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 06:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	0	0	0	0	0	0	0	0	0	0	288	288	0	0	**30**	**30**	318
07:45	0	0	0	0	0	0	0	0	0	0	**303**	**303**	0	0	23	23	**326**
08:00	0	0	0	0	0	0	0	0	0	**1**	275	276	0	0	20	20	296
08:15	0	0	0	0	0	0	0	0	0	0	264	264	0	0	25	25	289
Total Volume	0	0	0	0	0	0	0	0	0	1	1130	1131	0	0	98	98	1229
% App. Total	0	0	0		0	0	0		0	0.1	99.9		0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.932	.933	.000	.000	.817	.817	.942

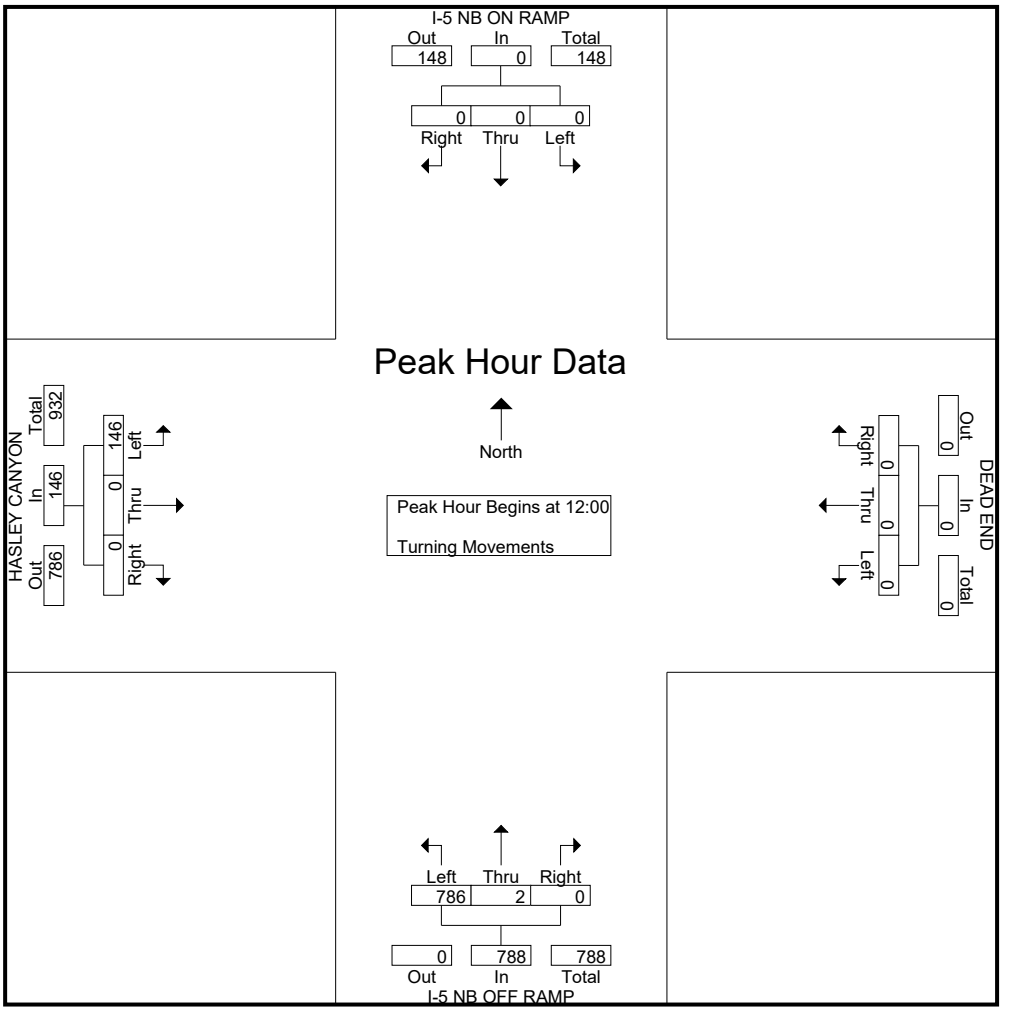


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 NB RAMPS
E-W Direction: HASLEY CANYON

File Name : h1711062
Site Code : 00000000
Start Date : 11/8/2017

	I-5 NB ON RAMP Southbound				DEAD END Westbound				I-5 NB OFF RAMP Northbound				HASLEY CANYON Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:00																	
12:00	0	0	0	0	0	0	0	0	0	**2**	183	185	0	0	38	38	223
12:15	0	0	0	0	0	0	0	0	0	0	**201**	**201**	0	0	31	31	232
12:30	0	0	0	0	0	0	0	0	0	0	201	201	0	0	36	36	237
12:45	0	0	0	0	0	0	0	0	0	0	201	201	0	0	**41**	**41**	**242**
Total Volume	0	0	0	0	0	0	0	0	0	2	786	788	0	0	146	146	934
% App. Total	0	0	0		0	0	0		0	0.3	99.7		0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.978	.980	.000	.000	.890	.890	.965

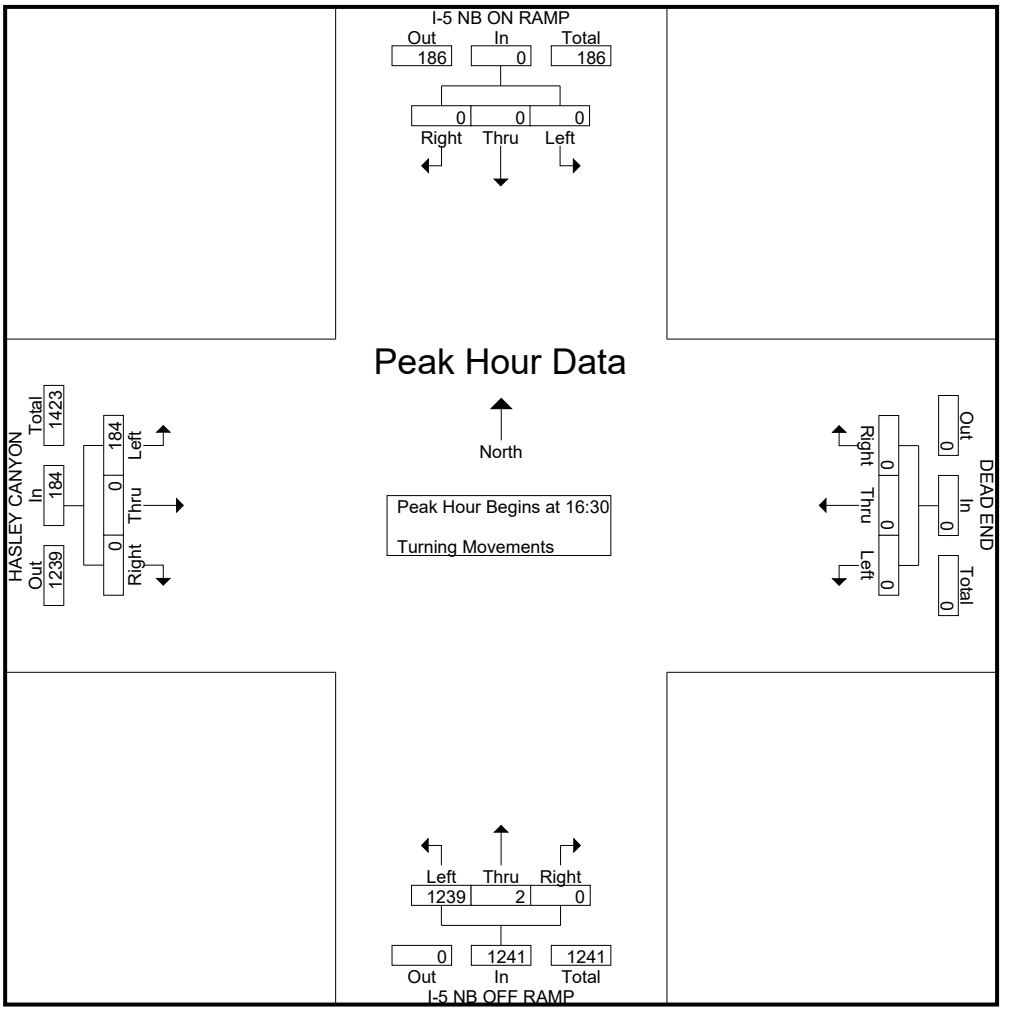


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 NB RAMPS
E-W Direction: HASLEY CANYON

File Name : h1711062
Site Code : 00000000
Start Date : 11/8/2017

	I-5 NB ON RAMP Southbound				DEAD END Westbound				I-5 NB OFF RAMP Northbound				HASLEY CANYON Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:30																	
16:30	0	0	0	0	0	0	0	0	0	**2**	294	296	0	0	46	46	342
16:45	0	0	0	0	0	0	0	0	0	0	302	302	0	0	45	45	347
17:00	0	0	0	0	0	0	0	0	0	0	**331**	**331**	0	0	**57**	**57**	**388**
17:15	0	0	0	0	0	0	0	0	0	0	312	312	0	0	36	36	348
Total Volume	0	0	0	0	0	0	0	0	0	2	1239	1241	0	0	184	184	1425
% App. Total	0	0	0		0	0	0		0	0.2	99.8		0	0	100		
PHF	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250	.936	.937	.000	.000	.807	.807	.918



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 SB OFF RAMP
E-W Direction: NEWHALL RANCH ROAD

File Name : H1711063
Site Code : 00000000
Start Date : 11/8/2017

Groups Printed- Turning Movements

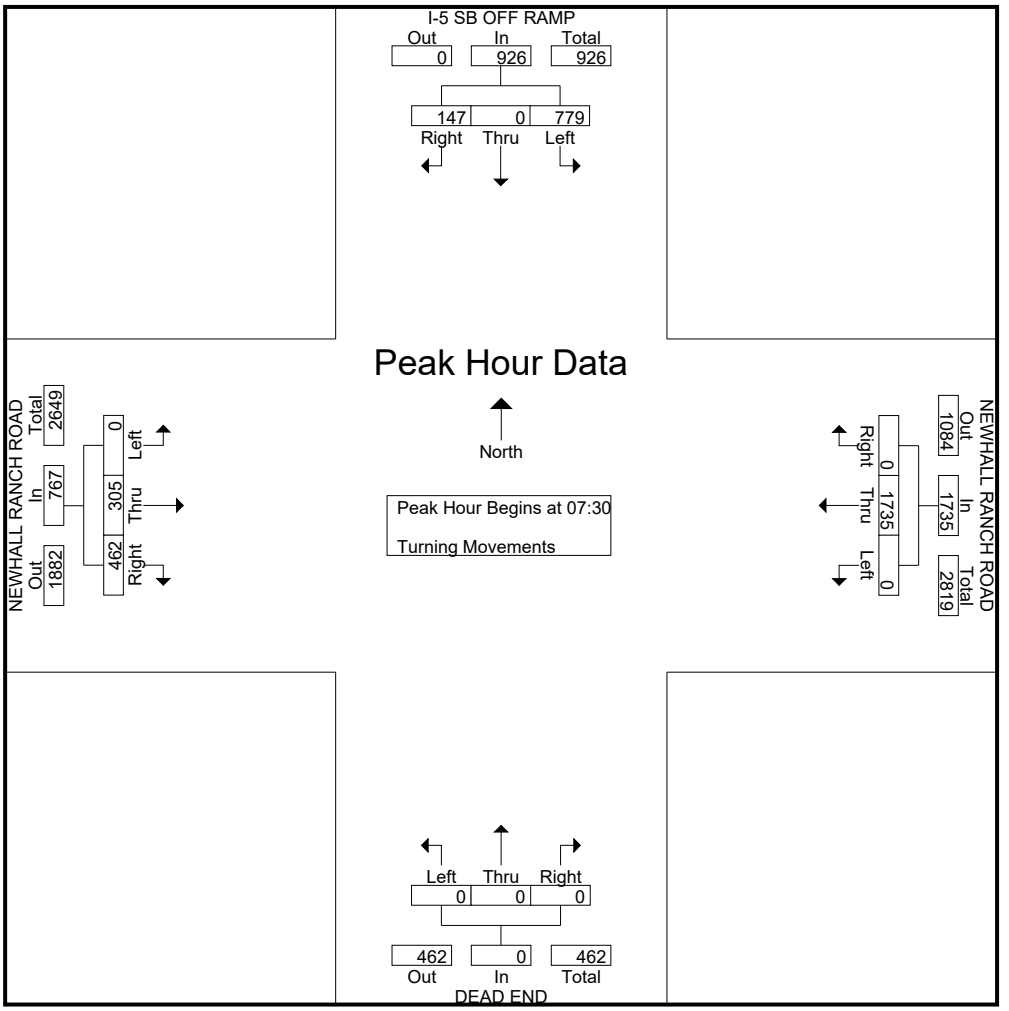
	I-5 SB OFF RAMP Southbound			NEWHALL RANCH ROAD Westbound			DEAD END Northbound			NEWHALL RANCH ROAD Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
06:00	29	0	67	0	335	0	0	0	0	133	66	0	630
06:15	37	0	91	0	374	0	0	0	0	114	75	0	691
06:30	47	0	106	0	367	0	0	0	0	115	109	0	744
06:45	43	0	125	0	440	0	0	0	0	92	103	0	803
Total	156	0	389	0	1516	0	0	0	0	454	353	0	2868
07:00	45	0	130	0	383	0	0	0	0	119	92	0	769
07:15	36	0	170	0	444	0	0	0	0	98	76	0	824
07:30	34	0	195	0	412	0	0	0	0	119	79	0	839
07:45	40	0	232	0	460	0	0	0	0	122	85	0	939
Total	155	0	727	0	1699	0	0	0	0	458	332	0	3371
08:00	30	0	151	0	430	0	0	0	0	93	71	0	775
08:15	43	0	201	0	433	0	0	0	0	128	70	0	875
08:30	38	0	190	0	331	0	0	0	0	113	86	0	758
08:45	26	0	179	0	240	0	0	0	0	132	106	0	683
Total	137	0	721	0	1434	0	0	0	0	466	333	0	3091
*** BREAK ***													
11:00	37	0	97	0	170	0	0	0	0	105	101	0	510
11:15	34	0	101	0	192	0	0	0	0	122	97	0	546
11:30	33	0	93	0	158	0	0	0	0	140	91	0	515
11:45	33	0	115	0	161	0	0	0	0	131	100	0	540
Total	137	0	406	0	681	0	0	0	0	498	389	0	2111
12:00	21	0	98	0	168	0	0	0	0	130	111	0	528
12:15	22	0	104	0	176	0	0	0	0	147	94	0	543
12:30	25	0	115	0	168	0	0	0	0	133	88	0	529
12:45	38	0	127	0	178	0	0	0	0	124	98	0	565
Total	106	0	444	0	690	0	0	0	0	534	391	0	2165
*** BREAK ***													
15:30	40	0	187	0	225	0	0	0	0	279	226	0	957
15:45	47	0	161	0	273	0	0	0	0	188	200	0	869
Total	87	0	348	0	498	0	0	0	0	467	426	0	1826
16:00	41	0	184	0	231	0	0	0	0	232	254	0	942
16:15	45	0	145	0	200	0	0	0	0	229	238	0	857
16:30	36	0	222	0	234	0	0	0	0	302	350	0	1144
16:45	44	0	165	0	205	0	0	0	0	248	247	0	909
Total	166	0	716	0	870	0	0	0	0	1011	1089	0	3852
17:00	36	0	195	0	219	0	0	0	0	299	272	0	1021
17:15	30	0	160	0	188	0	0	0	0	252	226	0	856
17:30	36	0	161	0	197	0	0	0	0	277	198	0	869
17:45	26	0	140	0	179	0	0	0	0	199	183	0	727
Total	128	0	656	0	783	0	0	0	0	1027	879	0	3473
18:00	32	0	120	0	130	0	0	0	0	218	160	0	660
18:15	33	0	107	0	127	0	0	0	0	159	131	0	557
Grand Total	1137	0	4634	0	8428	0	0	0	0	5292	4483	0	23974
Apprch %	19.7	0	80.3	0	100	0	0	0	0	54.1	45.9	0	
Total %	4.7	0	19.3	0	35.2	0	0	0	0	22.1	18.7	0	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 SB OFF RAMP
E-W Direction: NEWHALL RANCH ROAD

File Name : H1711063
Site Code : 00000000
Start Date : 11/8/2017
Page No : 2

	I-5 SB OFF RAMP Southbound				NEWHALL RANCH ROAD Westbound				DEAD END Northbound				NEWHALL RANCH ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 06:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	34	0	195	229	0	412	0	412	0	0	0	0	119	79	0	198	839
07:45	40	0	**232**	**272**	0	**460**	0	**460**	0	0	0	0	122	**85**	0	**207**	**939**
08:00	30	0	151	181	0	430	0	430	0	0	0	0	93	71	0	164	775
08:15	**43**	0	201	244	0	433	0	433	0	0	0	0	**128**	70	0	198	875
Total Volume	147	0	779	926	0	1735	0	1735	0	0	0	0	462	305	0	767	3428
% App. Total	15.9	0	84.1		0	100	0		0	0	0		60.2	39.8	0		
PHF	.855	.000	.839	.851	.000	.943	.000	.943	.000	.000	.000	.000	.902	.897	.000	.926	.913

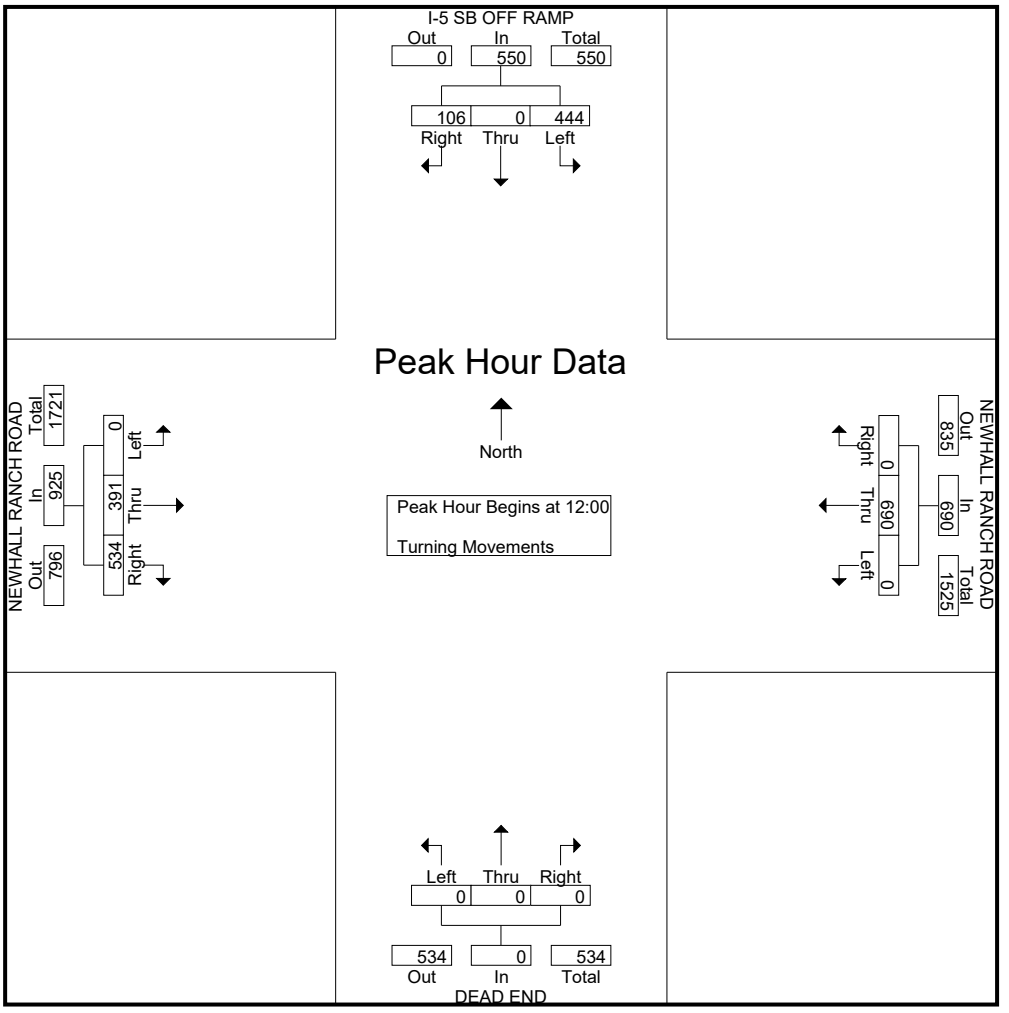


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 SB OFF RAMP
E-W Direction: NEWHALL RANCH ROAD

File Name : H1711063
Site Code : 00000000
Start Date : 11/8/2017
Page No : 3

	I-5 SB OFF RAMP Southbound				NEWHALL RANCH ROAD Westbound				DEAD END Northbound				NEWHALL RANCH ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:00																	
12:00	21	0	98	119	0	168	0	168	0	0	0	0	130	**111**	0	**241**	528
12:15	22	0	104	126	0	176	0	176	0	0	0	0	**147**	94	0	241	543
12:30	25	0	115	140	0	168	0	168	0	0	0	0	133	88	0	221	529
12:45	**38**	0	**127**	**165**	0	**178**	0	**178**	0	0	0	0	124	98	0	222	**565**
Total Volume	106	0	444	550	0	690	0	690	0	0	0	0	534	391	0	925	2165
% App. Total	19.3	0	80.7		0	100	0		0	0	0		57.7	42.3	0		
PHF	.697	.000	.874	.833	.000	.969	.000	.969	.000	.000	.000	.000	.908	.881	.000	.960	.958

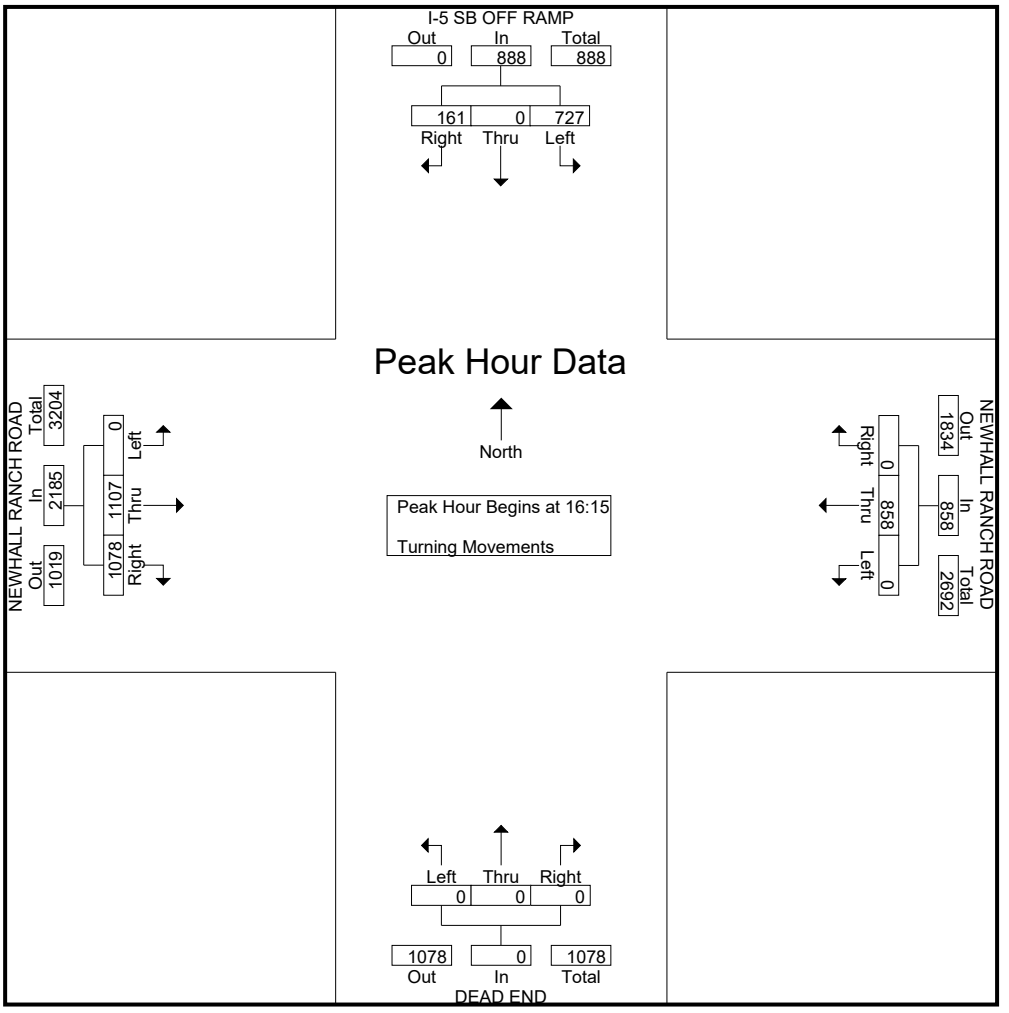


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 SB OFF RAMP
E-W Direction: NEWHALL RANCH ROAD

File Name : H1711063
Site Code : 00000000
Start Date : 11/8/2017
Page No : 4

	I-5 SB OFF RAMP Southbound				NEWHALL RANCH ROAD Westbound				DEAD END Northbound				NEWHALL RANCH ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:15																	
16:15	**45**	0	145	190	0	200	0	200	0	0	0	0	229	238	0	467	857
16:30	36	0	**222**	**258**	0	**234**	0	**234**	0	0	0	0	**302**	**350**	0	**652**	**1144**
16:45	44	0	165	209	0	205	0	205	0	0	0	0	248	247	0	495	909
17:00	36	0	195	231	0	219	0	219	0	0	0	0	299	272	0	571	1021
Total Volume	161	0	727	888	0	858	0	858	0	0	0	0	1078	1107	0	2185	3931
% App. Total	18.1	0	81.9		0	100	0		0	0	0		49.3	50.7	0		
PHF	.894	.000	.819	.860	.000	.917	.000	.917	.000	.000	.000	.000	.892	.791	.000	.838	.859



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 NB OFF RAMP
E-W Direction: NEWHALL RANCH ROAD

File Name : H1711064
Site Code : 00000000
Start Date : 11/8/2017
Page No : 1

Groups Printed- Turning Movements

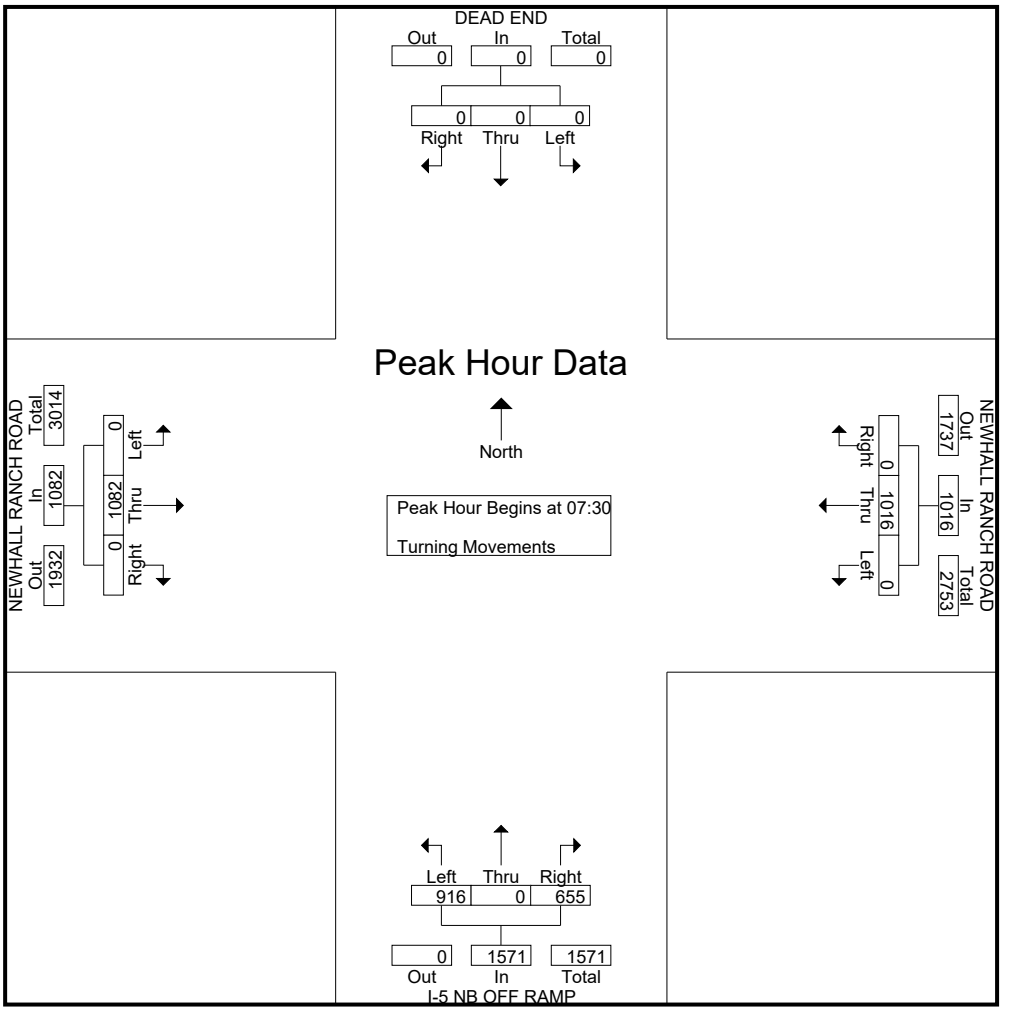
	DEAD END Southbound			NEWHALL RANCH ROAD Westbound			I-5 NB OFF RAMP Northbound			NEWHALL RANCH ROAD Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
06:00	0	0	0	0	249	0	65	0	120	0	118	0	552
06:15	0	0	0	0	273	0	66	0	157	0	150	0	646
06:30	0	0	0	0	226	0	92	0	203	0	189	0	710
06:45	0	0	0	0	301	0	136	0	212	0	202	0	851
Total	0	0	0	0	1049	0	359	0	692	0	659	0	2759
07:00	0	0	0	0	252	0	107	0	188	0	211	0	758
07:15	0	0	0	0	248	0	136	0	240	0	237	0	861
07:30	0	0	0	0	267	0	134	0	189	0	265	0	855
07:45	0	0	0	0	248	0	195	0	286	0	305	0	1034
Total	0	0	0	0	1015	0	572	0	903	0	1018	0	3508
08:00	0	0	0	0	270	0	155	0	219	0	263	0	907
08:15	0	0	0	0	231	0	171	0	222	0	249	0	873
08:30	0	0	0	0	172	0	148	0	191	0	277	0	788
08:45	0	0	0	0	159	0	128	0	128	0	266	0	681
Total	0	0	0	0	832	0	602	0	760	0	1055	0	3249
*** BREAK ***													
11:00	0	0	0	0	110	0	62	0	90	0	172	0	434
11:15	0	0	0	0	133	0	56	0	102	0	170	0	461
11:30	0	0	0	0	124	0	64	0	91	0	172	0	451
11:45	0	0	0	0	117	0	70	0	80	0	166	0	433
Total	0	0	0	0	484	0	252	0	363	0	680	0	1779
12:00	0	0	0	0	133	0	61	0	79	0	185	0	458
12:15	0	0	0	0	138	0	68	0	95	0	157	0	458
12:30	0	0	0	0	128	0	72	0	92	0	173	0	465
12:45	0	0	0	0	139	0	95	0	95	0	208	0	537
Total	0	0	0	0	538	0	296	0	361	0	723	0	1918
*** BREAK ***													
15:30	0	0	0	0	279	0	83	0	96	0	364	0	822
15:45	0	0	0	0	230	0	135	0	150	0	332	0	847
Total	0	0	0	0	509	0	218	0	246	0	696	0	1669
16:00	0	0	0	0	226	0	126	0	106	0	438	0	896
16:15	0	0	0	0	173	0	101	0	114	0	329	0	717
16:30	0	0	0	0	270	0	120	0	123	0	513	0	1026
16:45	0	0	0	0	211	0	113	0	107	0	415	0	846
Total	0	0	0	0	880	0	460	0	450	0	1695	0	3485
17:00	0	0	0	0	236	0	107	0	122	0	430	0	895
17:15	0	0	0	0	191	0	117	0	106	0	377	0	791
17:30	0	0	0	0	192	0	99	0	110	0	375	0	776
17:45	0	0	0	0	152	0	130	0	98	0	344	0	724
Total	0	0	0	0	771	0	453	0	436	0	1526	0	3186
18:00	0	0	0	0	139	0	99	0	80	0	302	0	620
18:15	0	0	0	0	119	0	100	0	72	0	249	0	540
Grand Total	0	0	0	0	6336	0	3411	0	4363	0	8603	0	22713
Apprch %	0	0	0	0	100	0	43.9	0	56.1	0	100	0	
Total %	0	0	0	0	27.9	0	15	0	19.2	0	37.9	0	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 NB OFF RAMP
E-W Direction: NEWHALL RANCH ROAD

File Name : H1711064
Site Code : 00000000
Start Date : 11/8/2017

	DEAD END Southbound				NEWHALL RANCH ROAD Westbound				I-5 NB OFF RAMP Northbound				NEWHALL RANCH ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 06:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	0	0	0	0	0	267	0	267	134	0	189	323	0	265	0	265	855
07:45	0	0	0	0	0	248	0	248	**195**	0	**286**	**481**	0	**305**	0	**305**	**1034**
08:00	0	0	0	0	0	**270**	0	**270**	155	0	219	374	0	263	0	263	907
08:15	0	0	0	0	0	231	0	231	171	0	222	393	0	249	0	249	873
Total Volume	0	0	0	0	0	1016	0	1016	655	0	916	1571	0	1082	0	1082	3669
% App. Total	0	0	0		0	100	0		41.7	0	58.3		0	100	0		
PHF	.000	.000	.000	.000	.000	.941	.000	.941	.840	.000	.801	.817	.000	.887	.000	.887	.887

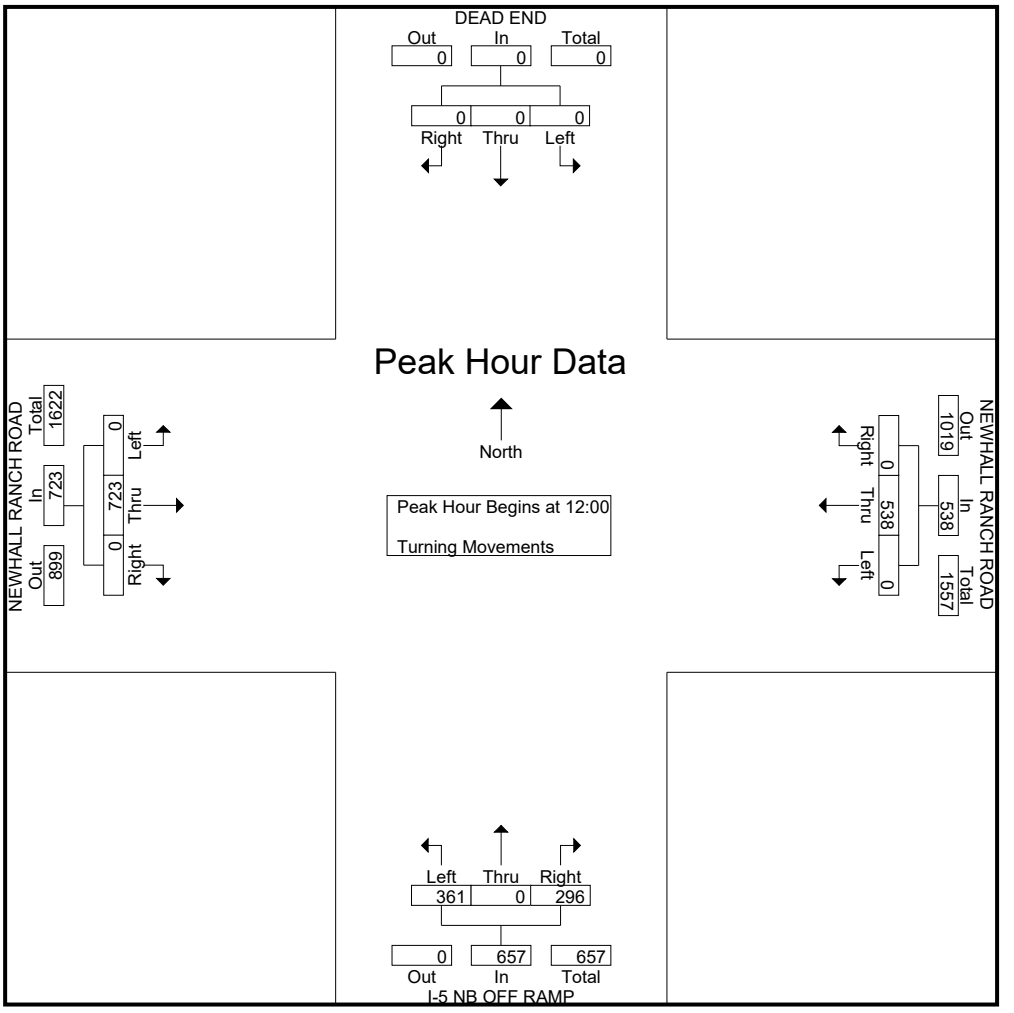


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 NB OFF RAMP
E-W Direction: NEWHALL RANCH ROAD

File Name : H1711064
Site Code : 00000000
Start Date : 11/8/2017
Page No : 3

	DEAD END Southbound				NEWHALL RANCH ROAD Westbound				I-5 NB OFF RAMP Northbound				NEWHALL RANCH ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 11:00 to 12:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 12:00																	
12:00	0	0	0	0	0	133	0	133	61	0	79	140	0	185	0	185	458
12:15	0	0	0	0	0	138	0	138	68	0	**95**	163	0	157	0	157	458
12:30	0	0	0	0	0	128	0	128	72	0	92	164	0	173	0	173	465
12:45	0	0	0	0	0	**139**	0	**139**	**95**	0	95	**190**	0	**208**	0	**208**	**537**
Total Volume	0	0	0	0	0	538	0	538	296	0	361	657	0	723	0	723	1918
% App. Total	0	0	0		0	100	0		45.1	0	54.9		0	100	0		
PHF	.000	.000	.000	.000	.000	.968	.000	.968	.779	.000	.950	.864	.000	.869	.000	.869	.893

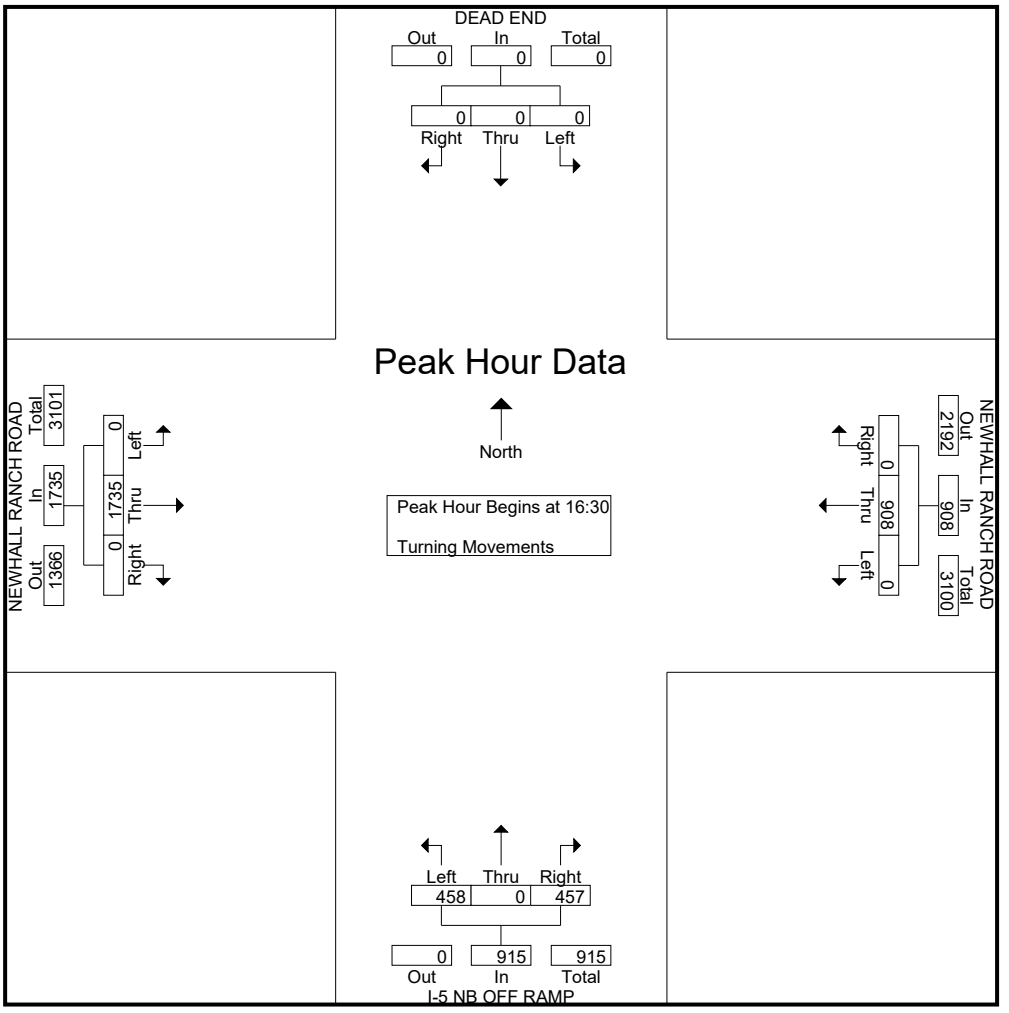


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: I-5 NB OFF RAMP
E-W Direction: NEWHALL RANCH ROAD

File Name : H1711064
Site Code : 00000000
Start Date : 11/8/2017
Page No : 4

	DEAD END Southbound				NEWHALL RANCH ROAD Westbound				I-5 NB OFF RAMP Northbound				NEWHALL RANCH ROAD Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 15:30 to 18:15 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:30																	
16:30	0	0	0	0	0	**270**	0	**270**	**120**	0	**123**	**243**	0	**513**	0	**513**	**1026**
16:45	0	0	0	0	0	211	0	211	113	0	107	220	0	415	0	415	846
17:00	0	0	0	0	0	236	0	236	107	0	122	229	0	430	0	430	895
17:15	0	0	0	0	0	191	0	191	117	0	106	223	0	377	0	377	791
Total Volume	0	0	0	0	0	908	0	908	457	0	458	915	0	1735	0	1735	3558
% App. Total	0	0	0		0	100	0		49.9	0	50.1		0	100	0		
PHF	.000	.000	.000	.000	.000	.841	.000	.841	.952	.000	.931	.941	.000	.846	.000	.846	.867



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER DRIVE
E-W Direction: SR-126 WB RAMPS

File Name : H1801028
Site Code : 83
Start Date : 1/24/2018
Page No : 1

Groups Printed- Turning Movements

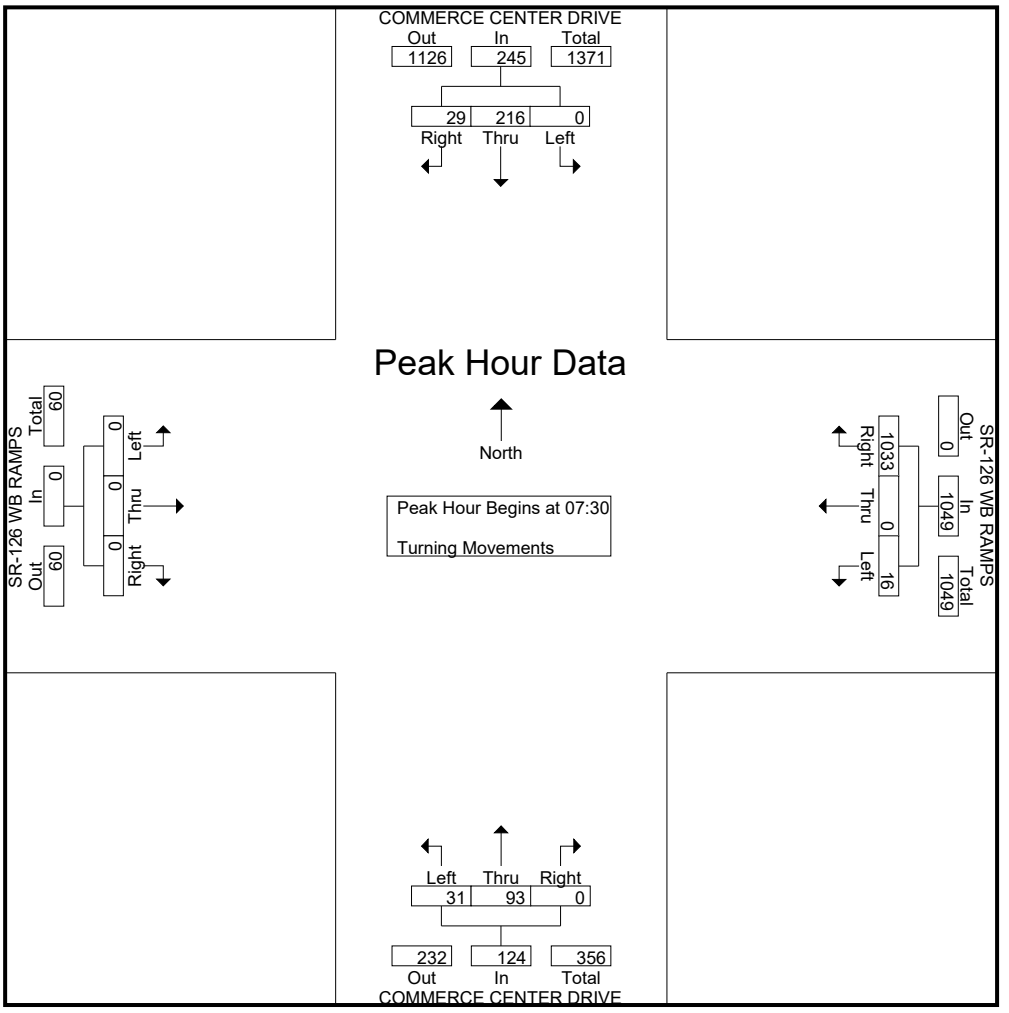
	COMMERCE CENTER DRIVE Southbound			SR-126 WB RAMPS Westbound			COMMERCE CENTER DRIVE Northbound			SR-126 WB RAMPS Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00	4	46	0	190	0	4	0	19	4	0	0	0	267
07:15	3	34	0	221	0	3	0	13	5	0	0	0	279
07:30	8	65	0	256	0	4	0	19	8	0	0	0	360
07:45	5	42	0	357	0	2	0	34	7	0	0	0	447
Total	20	187	0	1024	0	13	0	85	24	0	0	0	1353
08:00	7	54	0	203	0	6	0	20	12	0	0	0	302
08:15	9	55	0	217	0	4	0	20	4	0	0	0	309
08:30	8	55	0	147	0	2	0	16	10	0	0	0	238
08:45	6	50	0	134	0	3	0	11	2	0	0	0	206
Total	30	214	0	701	0	15	0	67	28	0	0	0	1055
*** BREAK ***													
16:00	8	306	0	47	1	1	0	14	13	0	0	0	390
16:15	9	182	0	46	0	2	0	15	13	0	0	0	267
16:30	14	478	0	61	0	4	0	10	8	0	0	0	575
16:45	12	217	0	42	0	0	0	15	20	0	0	0	306
Total	43	1183	0	196	1	7	0	54	54	0	0	0	1538
17:00	12	365	0	52	0	2	0	10	21	0	0	0	462
17:15	6	212	0	48	0	9	0	9	11	0	0	0	295
17:30	12	240	0	40	0	6	0	14	15	0	0	0	327
17:45	5	115	0	50	0	2	0	5	22	0	0	0	199
Total	35	932	0	190	0	19	0	38	69	0	0	0	1283
Grand Total	128	2516	0	2111	1	54	0	244	175	0	0	0	5229
Apprch %	4.8	95.2	0	97.5	0	2.5	0	58.2	41.8	0	0	0	
Total %	2.4	48.1	0	40.4	0	1	0	4.7	3.3	0	0	0	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER DRIVE
E-W Direction: SR-126 WB RAMPS

File Name : H1801028
Site Code : 83
Start Date : 1/24/2018

	COMMERCE CENTER DRIVE Southbound				SR-126 WB RAMPS Westbound				COMMERCE CENTER DRIVE Northbound				SR-126 WB RAMPS Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	8	**65**	0	**73**	256	0	4	260	0	19	8	27	0	0	0	0	360
07:45	5	42	0	47	**357**	0	2	**359**	0	**34**	7	**41**	0	0	0	0	**447**
08:00	7	54	0	61	203	0	**6**	209	0	20	**12**	32	0	0	0	0	302
08:15	**9**	55	0	64	217	0	4	221	0	20	4	24	0	0	0	0	309
Total Volume	29	216	0	245	1033	0	16	1049	0	93	31	124	0	0	0	0	1418
% App. Total	11.8	88.2	0		98.5	0	1.5		0	75	25		0	0	0		
PHF	.806	.831	.000	.839	.723	.000	.667	.731	.000	.684	.646	.756	.000	.000	.000	.000	.793

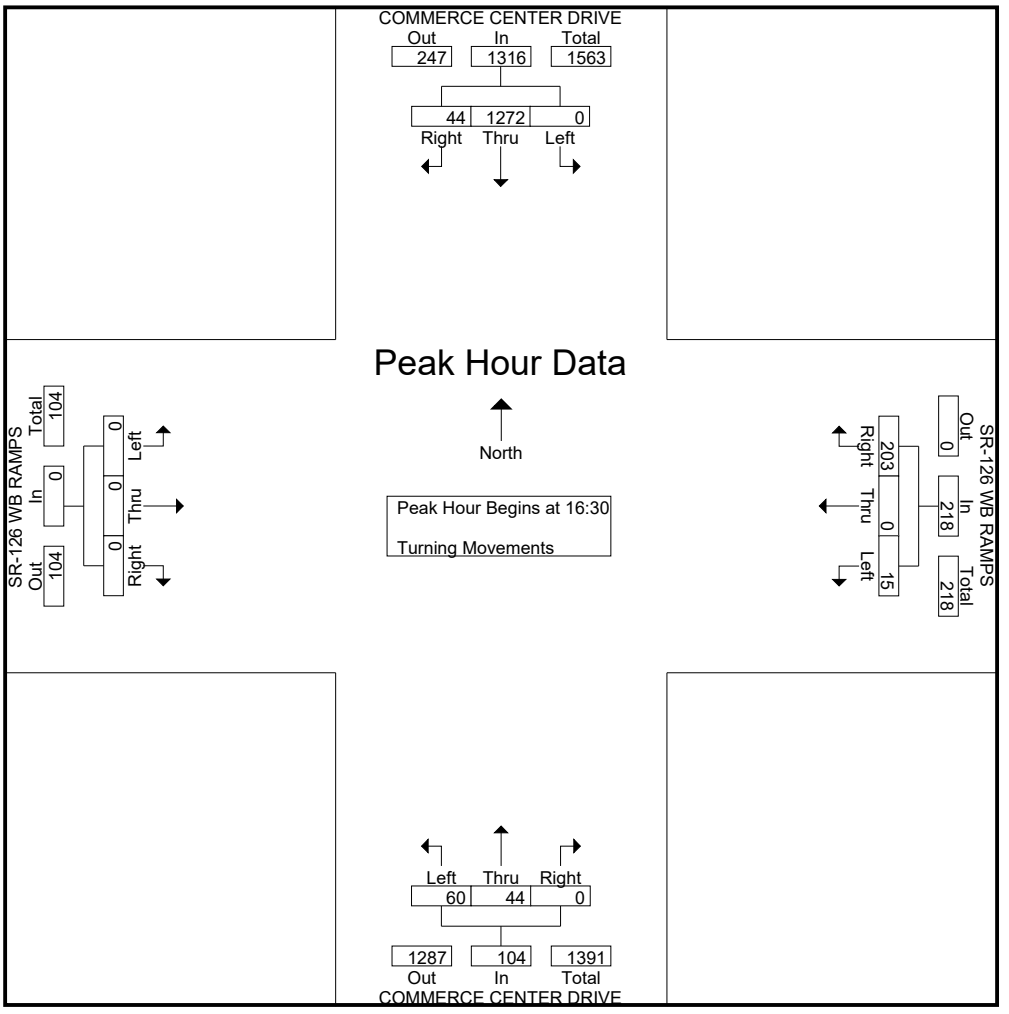


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER DRIVE
E-W Direction: SR-126 WB RAMPS

File Name : H1801028
Site Code : 83
Start Date : 1/24/2018

	COMMERCE CENTER DRIVE Southbound				SR-126 WB RAMPS Westbound				COMMERCE CENTER DRIVE Northbound				SR-126 WB RAMPS Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:30																	
16:30	**14**	**478**	0	**492**	**61**	0	4	**65**	0	10	8	18	0	0	0	0	**575**
16:45	12	217	0	229	42	0	0	42	0	**15**	20	**35**	0	0	0	0	306
17:00	12	365	0	377	52	0	2	54	0	10	**21**	31	0	0	0	0	462
17:15	6	212	0	218	48	0	**9**	57	0	9	11	20	0	0	0	0	295
Total Volume	44	1272	0	1316	203	0	15	218	0	44	60	104	0	0	0	0	1638
% App. Total	3.3	96.7	0		93.1	0	6.9		0	42.3	57.7		0	0	0		
PHF	.786	.665	.000	.669	.832	.000	.417	.838	.000	.733	.714	.743	.000	.000	.000	.000	.712



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER DRIVE
E-W Direction: HENRY MAYO DRIVE

File Name : H1801026
Site Code : 81
Start Date : 1/24/2018

Groups Printed- Turning Movements

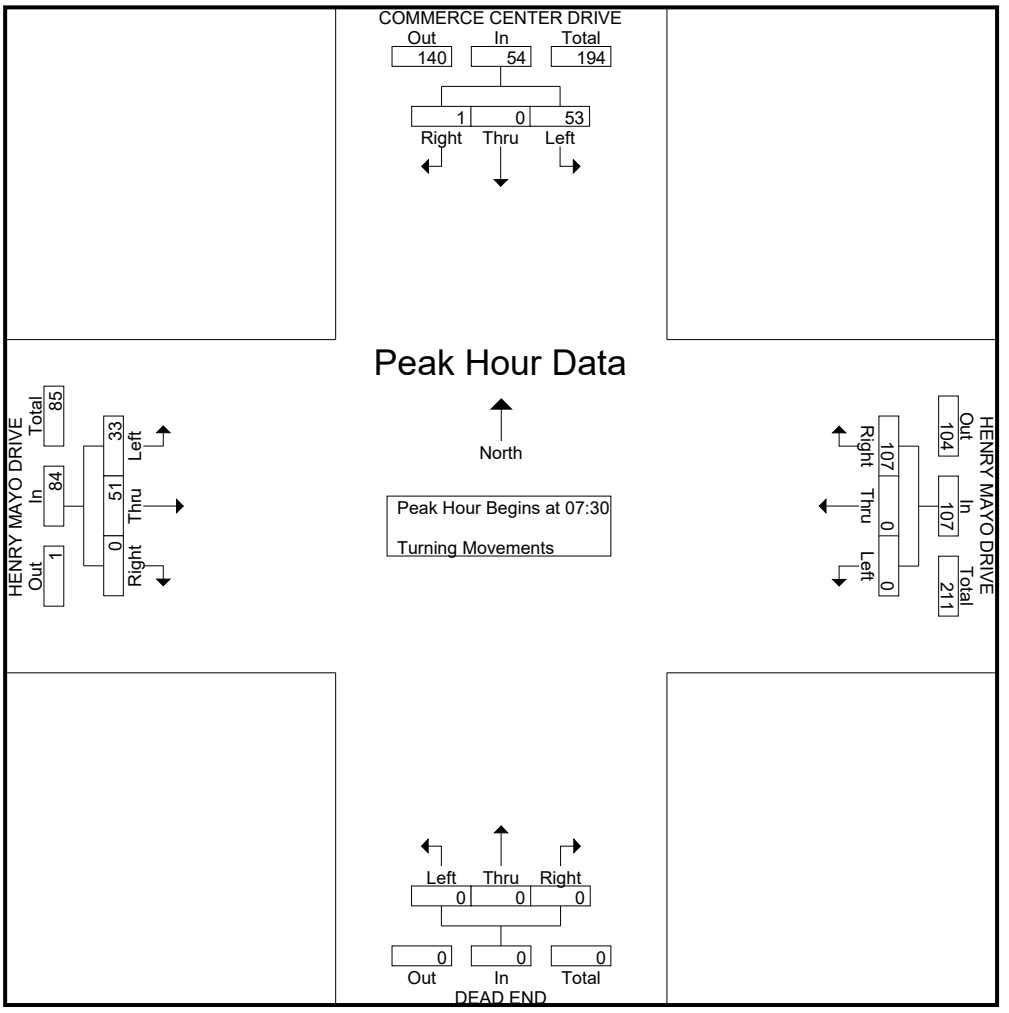
	COMMERCE CENTER DRIVE Southbound			HENRY MAYO DRIVE Westbound			DEAD END Northbound			HENRY MAYO DRIVE Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00	1	0	10	21	0	0	0	0	0	0	5	8	45
07:15	1	0	7	16	0	0	0	0	0	0	8	5	37
07:30	0	0	12	22	0	0	0	0	0	0	14	3	51
07:45	1	0	8	38	0	0	0	0	0	0	9	8	64
Total	3	0	37	97	0	0	0	0	0	0	36	24	197
08:00	0	0	15	25	0	0	0	0	0	0	14	11	65
08:15	0	0	18	22	0	0	0	0	0	0	14	11	65
08:30	0	0	11	22	0	0	0	0	0	0	7	5	45
08:45	0	0	18	15	1	0	0	0	0	0	8	6	48
Total	0	0	62	84	1	0	0	0	0	0	43	33	223
*** BREAK ***													
16:00	0	0	40	27	0	0	0	0	0	0	8	8	83
16:15	0	0	43	25	0	0	0	0	0	0	7	4	79
16:30	0	0	86	20	0	0	0	0	0	0	10	5	121
16:45	1	0	48	32	0	0	0	0	0	0	11	2	94
Total	1	0	217	104	0	0	0	0	0	0	36	19	377
17:00	0	0	66	44	0	0	0	0	0	0	6	2	118
17:15	0	0	41	26	1	0	0	0	0	0	9	1	78
17:30	1	0	40	28	1	0	0	0	0	0	6	4	80
17:45	0	0	32	26	0	0	0	0	0	0	10	3	71
Total	1	0	179	124	2	0	0	0	0	0	31	10	347
Grand Total	5	0	495	409	3	0	0	0	0	0	146	86	1144
Apprch %	1	0	99	99.3	0.7	0	0	0	0	0	62.9	37.1	
Total %	0.4	0	43.3	35.8	0.3	0	0	0	0	0	12.8	7.5	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER DRIVE
E-W Direction: HENRY MAYO DRIVE

File Name : H1801026
Site Code : 81
Start Date : 1/24/2018

	COMMERCE CENTER DRIVE Southbound				HENRY MAYO DRIVE Westbound				DEAD END Northbound				HENRY MAYO DRIVE Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30																	
07:30	0	0	12	12	22	0	0	22	0	0	0	0	0	**14**	3	17	51
07:45	**1**	0	8	9	**38**	0	0	**38**	0	0	0	0	0	9	8	17	64
08:00	0	0	15	15	25	0	0	25	0	0	0	0	0	14	**11**	**25**	**65**
08:15	0	0	**18**	**18**	22	0	0	22	0	0	0	0	0	14	11	25	65
Total Volume	1	0	53	54	107	0	0	107	0	0	0	0	0	51	33	84	245
% App. Total	1.9	0	98.1		100	0	0		0	0	0		0	60.7	39.3		
PHF	.250	.000	.736	.750	.704	.000	.000	.704	.000	.000	.000	.000	.000	.911	.750	.840	.942

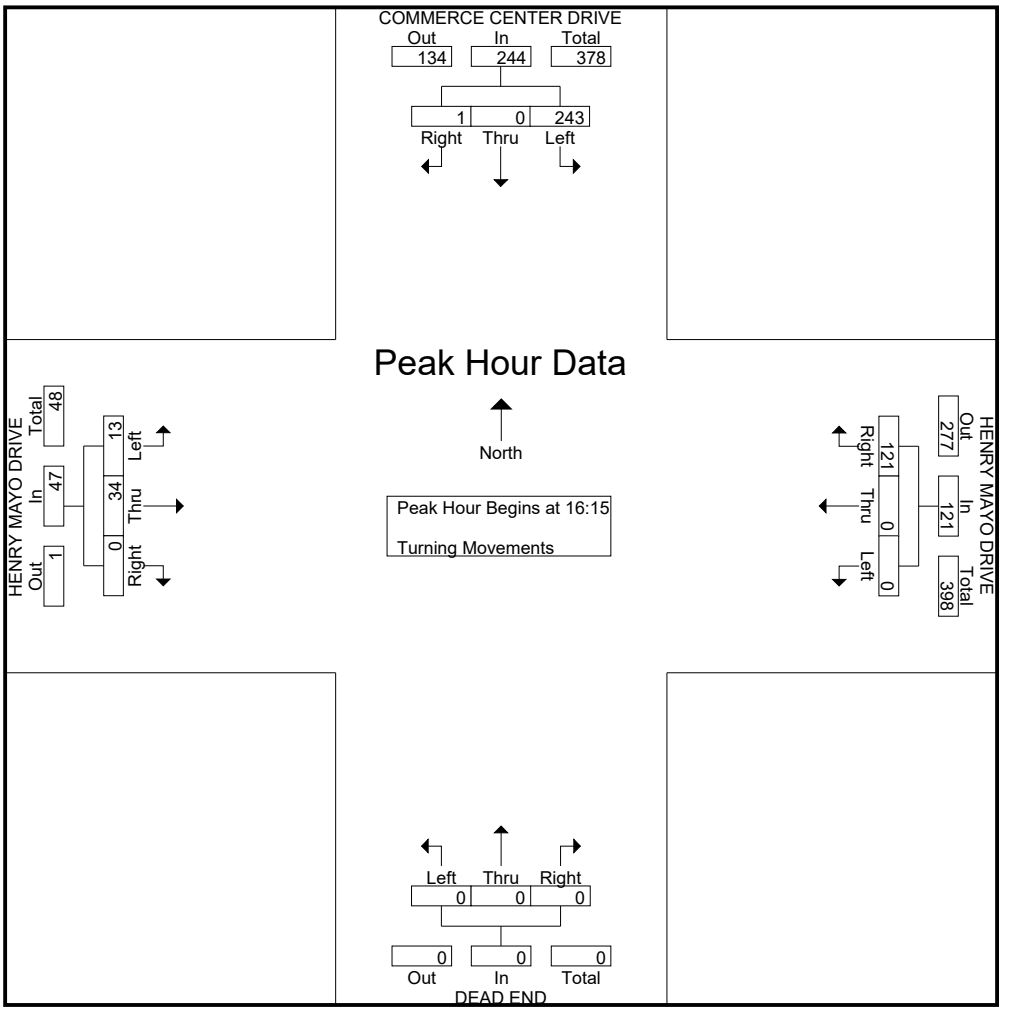


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: COMMERCE CENTER DRIVE
E-W Direction: HENRY MAYO DRIVE

File Name : H1801026
Site Code : 81
Start Date : 1/24/2018
Page No : 3

	COMMERCE CENTER DRIVE Southbound				HENRY MAYO DRIVE Westbound				DEAD END Northbound				HENRY MAYO DRIVE Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:15																	
16:15	0	0	43	43	25	0	0	25	0	0	0	0	0	7	4	11	79
16:30	0	0	**86**	**86**	20	0	0	20	0	0	0	0	0	10	**5**	**15**	**121**
16:45	**1**	0	48	49	32	0	0	32	0	0	0	0	0	**11**	2	13	94
17:00	0	0	66	66	**44**	0	0	**44**	0	0	0	0	0	6	2	8	118
Total Volume	1	0	243	244	121	0	0	121	0	0	0	0	0	34	13	47	412
% App. Total	0.4	0	99.6		100	0	0		0	0	0		0	72.3	27.7		
PHF	.250	.000	.706	.709	.688	.000	.000	.688	.000	.000	.000	.000	.000	.773	.650	.783	.851



Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: WOLCOTT WAY
E-W Direction: SR-126

File Name : H1801025
Site Code : 80
Start Date : 1/24/2018

Groups Printed- Turning Movements

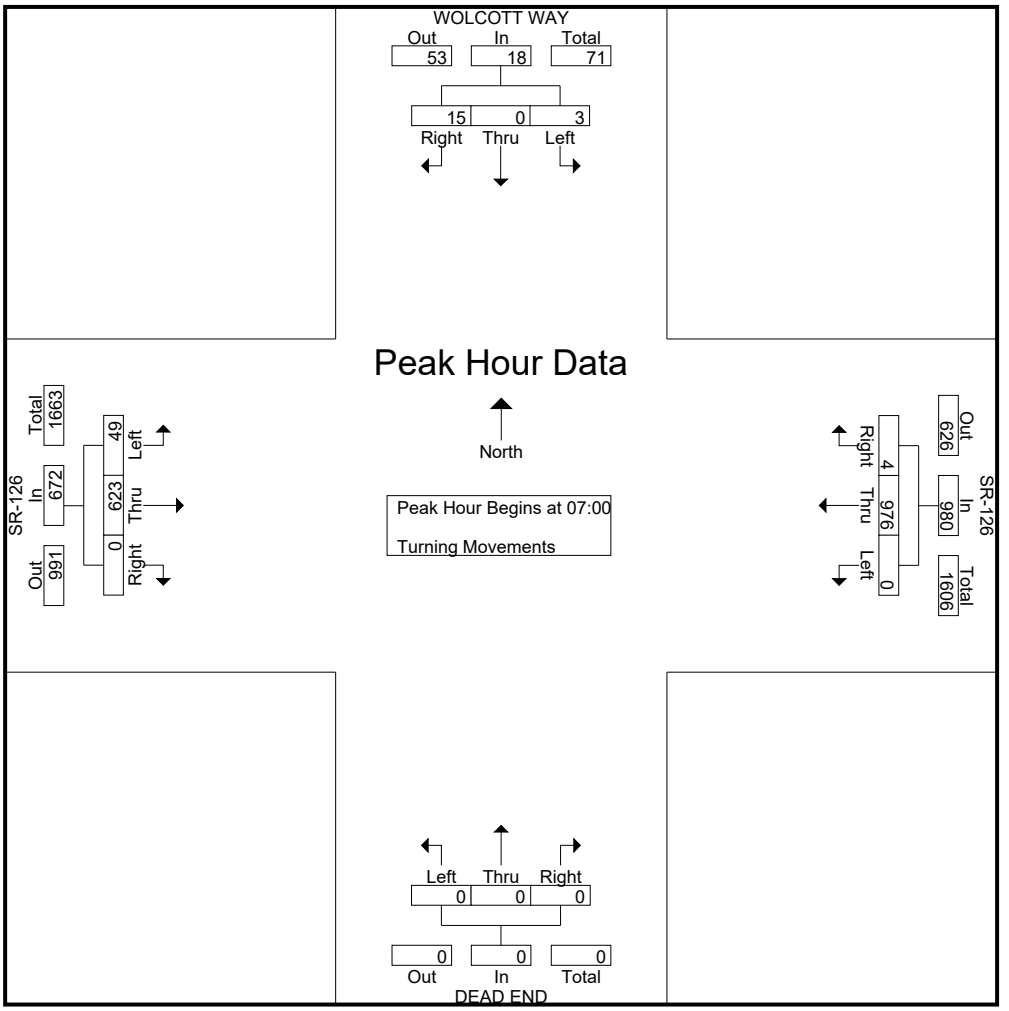
	WOLCOTT WAY Southbound			SR-126 Westbound			DEAD END Northbound			SR-126 Eastbound			
Start Time	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Int. Total
07:00	1	0	1	1	262	0	0	0	0	0	145	12	422
07:15	4	0	0	1	280	0	0	0	0	0	153	4	442
07:30	7	0	0	1	236	0	0	0	0	0	169	9	422
07:45	3	0	2	1	198	0	0	0	0	0	156	24	384
Total	15	0	3	4	976	0	0	0	0	0	623	49	1670
08:00	4	0	1	1	218	0	0	0	0	0	141	14	379
08:15	6	0	0	1	226	0	0	0	0	0	175	18	426
08:30	7	0	0	0	181	0	0	0	0	0	187	6	381
08:45	2	0	0	1	165	0	0	0	0	0	184	10	362
Total	19	0	1	3	790	0	0	0	0	0	687	48	1548
*** BREAK ***													
16:00	25	0	5	1	208	0	0	0	0	0	280	4	523
16:15	8	0	2	3	190	0	0	0	0	0	319	4	526
16:30	21	0	2	1	208	0	0	0	0	0	282	4	518
16:45	10	0	3	2	207	0	0	0	0	0	111	4	337
Total	64	0	12	7	813	0	0	0	0	0	992	16	1904
17:00	18	0	1	1	210	0	0	0	0	0	68	0	298
17:15	4	0	3	1	132	0	0	0	0	0	96	0	236
17:30	5	0	1	2	146	0	0	0	0	0	78	3	235
17:45	3	0	0	0	106	0	0	0	0	0	124	1	234
Total	30	0	5	4	594	0	0	0	0	0	366	4	1003
Grand Total	128	0	21	18	3173	0	0	0	0	0	2668	117	6125
Apprch %	85.9	0	14.1	0.6	99.4	0	0	0	0	0	95.8	4.2	
Total %	2.1	0	0.3	0.3	51.8	0	0	0	0	0	43.6	1.9	

Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: WOLCOTT WAY
E-W Direction: SR-126

File Name : H1801025
Site Code : 80
Start Date : 1/24/2018
Page No : 2

	WOLCOTT WAY Southbound				SR-126 Westbound				DEAD END Northbound				SR-126 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 07:00 to 08:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:00																	
07:00	1	0	1	2	**1**	262	0	263	0	0	0	0	0	145	12	157	422
07:15	4	0	0	4	1	**280**	0	**281**	0	0	0	0	0	153	4	157	**442**
07:30	**7**	0	0	**7**	1	236	0	237	0	0	0	0	0	**169**	9	178	422
07:45	3	0	**2**	5	1	198	0	199	0	0	0	0	0	156	**24**	**180**	384
Total Volume	15	0	3	18	4	976	0	980	0	0	0	0	0	623	49	672	1670
% App. Total	83.3	0	16.7		0.4	99.6	0		0	0	0		0	92.7	7.3		
PHF	.536	.000	.375	.643	1.00	.871	.000	.872	.000	.000	.000	.000	.000	.922	.510	.933	.945

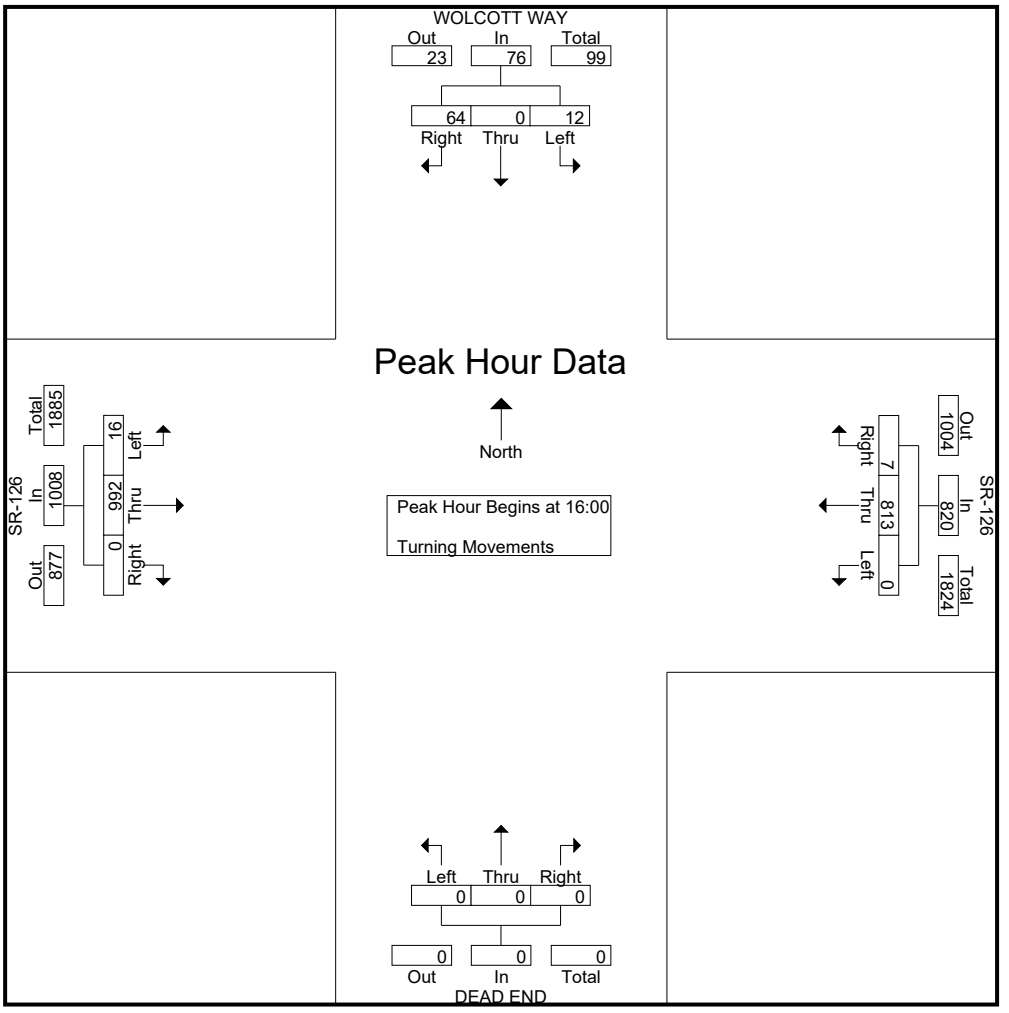


Transportation Studies, Inc.
2640 Walnut Avenue, Suite L
Tustin, CA. 92780

City: SANTA CLARITA
N-S Direction: WOLCOTT WAY
E-W Direction: SR-126

File Name : H1801025
Site Code : 80
Start Date : 1/24/2018

	WOLCOTT WAY Southbound				SR-126 Westbound				DEAD END Northbound				SR-126 Eastbound				
Start Time	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Right	Thru	Left	App. Total	Int. Total
Peak Hour Analysis From 16:00 to 17:45 - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 16:00																	
16:00	**25**	0	**5**	**30**	1	**208**	0	**209**	0	0	0	0	0	280	**4**	284	523
16:15	8	0	2	10	**3**	190	0	193	0	0	0	0	0	**319**	4	**323**	**526**
16:30	21	0	2	23	1	208	0	209	0	0	0	0	0	282	4	286	518
16:45	10	0	3	13	2	207	0	209	0	0	0	0	0	111	4	115	337
Total Volume	64	0	12	76	7	813	0	820	0	0	0	0	0	992	16	1008	1904
% App. Total	84.2	0	15.8		0.9	99.1	0		0	0	0		0	98.4	1.6		
PHF	.640	.000	.600	.633	.583	.977	.000	.981	.000	.000	.000	.000	.000	.777	1.00	.780	.905



Transportation Studies, Inc.

2640 Walnut Avenue, Suite L
Tustin, CA. 92780

Location : HASLEY CANYON ROAD
Segment : W/O DEL VALLE RD
Client : STANTEC

Site: SANTA CLARIT
Date: 11/07/17
Day: Tuesday

Interval	WB				EB				Combined			
Begin	AM		PM		AM		PM		AM		PM	
12:00	2	7	24	115	1	1	14	84	3	8	38	199
12:15	1		28		0		18		1		46	
12:30	2		36		0		34		2		70	
12:45	2		27		0		18		2		45	
01:00	2	8	16	88	0	0	23	107	2	8	39	195
01:15	4		26		0		18		4		44	
01:30	1		28		0		40		1		68	
01:45	1		18		0		26		1		44	
02:00	0	2	19	105	1	3	20	108	1	5	39	213
02:15	1		19		0		28		1		47	
02:30	1		28		0		34		1		62	
02:45	0		39		2		26		2		65	
03:00	0	4	37	153	0	5	23	104	0	9	60	257
03:15	0		39		1		20		1		59	
03:30	1		36		2		32		3		68	
03:45	3		41		2		29		5		70	
04:00	0	5	30	148	5	23	29	104	5	28	59	252
04:15	1		38		1		24		2		62	
04:30	2		34		7		32		9		66	
04:45	2		46		10		19		12		65	
05:00	3	14	37	148	13	69	23	82	16	83	60	230
05:15	5		31		16		22		21		53	
05:30	5		39		19		20		24		59	
05:45	1		41		21		17		22		58	
06:00	8	40	35	147	20	108	18	73	28	148	53	220
06:15	3		38		28		16		31		54	
06:30	9		24		32		19		41		43	
06:45	20		50		28		20		48		70	
07:00	13	69	25	96	37	173	29	59	50	242	54	155
07:15	14		17		34		15		48		32	
07:30	16		24		60		7		76		31	
07:45	26		30		42		8		68		38	
08:00	15	79	22	86	38	128	6	24	53	207	28	110
08:15	28		21		28		7		56		28	
08:30	16		13		30		6		46		19	
08:45	20		30		32		5		52		35	
09:00	13	73	25	78	30	101	14	52	43	174	39	130
09:15	19		17		22		24		41		41	
09:30	23		24		25		11		48		35	
09:45	18		12		24		3		42		15	
10:00	15	71	11	27	32	87	8	13	47	158	19	40
10:15	19		9		22		1		41		10	
10:30	20		6		20		3		40		9	
10:45	17		1		13		1		30		2	
11:00	24	91	8	24	27	85	1	6	51	176	9	30
11:15	25		5		22		2		47		7	
11:30	20		6		10		0		30		6	
11:45	22		5		26		3		48		8	
Totals	463		1,215		783		816		1,246		2,031	
Split%	37.2		59.8		62.8		40.2					
Day Totals		1,678				1,599				3,277		
Day Splits		51.2				48.8						
Peak Hour	11:00		04:15		07:15		01:30		07:30		03:30	
Volume	91		155		174		114		253		259	
Factor	0.91		0.84		0.73		0.71		0.83		0.93	

Transportation Studies, Inc.

2640 Walnut Avenue, Suite L

Tustin, CA. 92780

Location : HASLEY CANYON ROAD — Site: SANTA CLARIT

Segment : E/O DEL VALLE RD — Date: 11/07/17

Client : STANTEC — Day: Tuesday

Interval	EB				WB				Combined			
Begin	AM		PM		AM		PM		AM		PM	
12:00	2	2	45	180	14	36	40	183	16	38	85	363
12:15	0		35		6		42		6		77	
12:30	0		49		6		53		6		102	
12:45	0		51		10		48		10		99	
01:00	1	2	43	172	4	13	37	162	5	15	80	334
01:15	0		30		4		38		4		68	
01:30	1		53		2		49		3		102	
01:45	0		46		3		38		3		84	
02:00	1	7	55	210	3	11	40	240	4	18	95	450
02:15	2		59		1		52		3		111	
02:30	1		44		2		79		3		123	
02:45	3		52		5		69		8		121	
03:00	1	14	45	198	2	10	66	305	3	24	111	503
03:15	2		41		2		86		4		127	
03:30	5		57		3		74		8		131	
03:45	6		55		3		79		9		134	
04:00	9	64	45	206	0	6	76	337	9	70	121	543
04:15	10		56		1		65		11		121	
04:30	13		53		4		98		17		151	
04:45	32		52		1		98		33		150	
05:00	35	189	46	175	2	17	80	341	37	206	126	516
05:15	41		44		8		78		49		122	
05:30	53		47		6		91		59		138	
05:45	60		38		1		92		61		130	
06:00	62	284	44	150	10	65	89	330	72	349	133	480
06:15	68		37		12		90		80		127	
06:30	80		34		16		64		96		98	
06:45	74		35		27		87		101		122	
07:00	65	463	48	107	20	132	59	213	85	595	107	320
07:15	116		25		24		44		140		69	
07:30	154		17		32		47		186		64	
07:45	128		17		56		63		184		80	
08:00	76	263	17	57	42	156	49	181	118	419	66	238
08:15	61		17		44		43		105		60	
08:30	62		12		34		40		96		52	
08:45	64		11		36		49		100		60	
09:00	50	185	20	80	19	112	51	166	69	297	71	246
09:15	42		34		28		37		70		71	
09:30	48		18		30		47		78		65	
09:45	45		8		35		31		80		39	
10:00	54	176	9	28	22	111	19	84	76	287	28	112
10:15	43		4		26		25		69		29	
10:30	40		10		25		24		65		34	
10:45	39		5		38		16		77		21	
11:00	40	157	4	15	34	159	21	53	74	316	25	68
11:15	44		6		45		11		89		17	
11:30	23		2		36		11		59		13	
11:45	50		3		44		10		94		13	
Totals	1,806		1,578		828		2,595		2,634		4,173	
Split%	68.6		37.8		31.4		62.2					
Day Totals		3,384				3,423				6,807		
Day Splits		49.7				50.3						
Peak Hour	07:15		01:30		07:45		05:30		07:15		04:30	
Volume	474		213		176		362		628		549	
Factor	0.77		0.90		0.79		0.98		0.84		0.91	

Transportation Studies, Inc.

2640 Walnut Avenue, Suite L

Tustin, CA. 92780

Location : HUNSTOCK STREET — Site: SANTA CLARIT

Segment : E/O CHIQUITO CANYON RD — Date: 11/07/17

Client : STANTEC — Day: Tuesday

Interval	WB				EB				Combined			
Begin	AM		PM		AM		PM		AM		PM	
12:00	8	20	10	60	4	13	32	97	12	33	42	157
12:15	4		16		3		24		7		40	
12:30	2		17		2		16		4		33	
12:45	6		17		4		25		10		42	
01:00	2	6	18	70	1	4	20	63	3	10	38	133
01:15	1		14		1		9		2		23	
01:30	2		18		2		20		4		38	
01:45	1		20		0		14		1		34	
02:00	2	7	16	105	0	4	34	100	2	11	50	205
02:15	1		23		1		20		2		43	
02:30	0		38		1		14		1		52	
02:45	4		28		2		32		6		60	
03:00	1	4	21	121	2	6	21	93	3	10	42	214
03:15	1		45		0		22		1		67	
03:30	1		34		2		26		3		60	
03:45	1		21		2		24		3		45	
04:00	0	3	44	148	3	28	24	118	3	31	68	266
04:15	1		24		3		27		4		51	
04:30	2		38		9		29		11		67	
04:45	0		42		13		38		13		80	
05:00	2	18	27	144	17	87	30	109	19	105	57	253
05:15	4		35		19		32		23		67	
05:30	8		38		19		25		27		63	
05:45	4		44		32		22		36		66	
06:00	5	39	39	132	25	130	28	98	30	169	67	230
06:15	19		40		29		30		48		70	
06:30	7		25		50		20		57		45	
06:45	8		28		26		20		34		48	
07:00	5	50	26	85	30	228	20	64	35	278	46	149
07:15	9		20		49		15		58		35	
07:30	12		15		82		11		94		26	
07:45	24		24		67		18		91		42	
08:00	30	77	25	79	36	109	10	50	66	186	35	129
08:15	14		15		27		10		41		25	
08:30	15		24		24		18		39		42	
08:45	18		15		22		12		40		27	
09:00	11	42	18	60	17	76	16	46	28	118	34	106
09:15	10		11		16		10		26		21	
09:30	5		16		21		10		26		26	
09:45	16		15		22		10		38		25	
10:00	12	42	7	40	16	75	7	21	28	117	14	61
10:15	8		10		24		4		32		14	
10:30	6		11		14		6		20		17	
10:45	16		12		21		4		37		16	
11:00	14	65	11	26	16	67	10	16	30	132	21	42
11:15	17		6		20		0		37		6	
11:30	20		4		17		4		37		8	
11:45	14		5		14		2		28		7	
Totals	373		1,070		827		875		1,200		1,945	
Split%	31.1		55.0		68.9		45.0					
Day Totals		1,443				1,702				3,145		
Day Splits		45.9				54.1						
Peak Hour	07:45		05:30		07:15		04:30		07:15		04:30	
Volume	83		161		234		129		309		271	
Factor	0.69		0.91		0.71		0.85		0.82		0.85	

Transportation Studies, Inc.

2640 Walnut Avenue, Suite L
Tustin, CA. 92780

Location : DEL VALLE ROAD
Segment : S/O HASLEY CANYON RD
Client : STANTEC

Site: SANTA CLARIT
Date: 11/07/17

Interval	NB				SB				Combined				Day: Tuesday
Begin	AM		PM		AM		PM		AM		PM		
12:00	1	1	36	108	13	30	20	83	14	31	56	191	
12:15	0		20		5		18		5		38		
12:30	0		22		4		25		4		47		
12:45	0		30		8		20		8		50		
01:00	1	2	21	80	2	7	25	95	3	9	46	175	
01:15	1		15		1		20		2		35		
01:30	0		25		2		26		2		51		
01:45	0		19		2		24		2		43		
02:00	0	4	36	113	3	9	24	143	3	13	60	256	
02:15	2		34		0		33		2		67		
02:30	1		14		1		48		2		62		
02:45	1		29		5		38		6		67		
03:00	1	9	25	100	2	6	31	171	3	15	56	271	
03:15	1		24		2		56		3		80		
03:30	3		21		2		48		5		69		
03:45	4		30		0		36		4		66		
04:00	5	38	19	112	0	4	50	218	5	42	69	330	
04:15	8		30		1		34		9		64		
04:30	5		31		3		76		8		107		
04:45	20		32		0		58		20		90		
05:00	23	120	26	101	3	14	47	201	26	134	73	302	
05:15	27		25		4		50		31		75		
05:30	30		28		6		52		36		80		
05:45	40		22		1		52		41		74		
06:00	45	188	25	82	7	38	54	193	52	226	79	275	
06:15	40		23		11		58		51		81		
06:30	60		15		8		40		68		55		
06:45	43		19		12		41		55		60		
07:00	36	291	20	59	15	76	34	123	51	367	54	182	
07:15	73		12		10		30		83		42		
07:30	98		11		19		24		117		35		
07:45	84		16		32		35		116		51		
08:00	40	137	10	32	36	91	29	102	76	228	39	134	
08:15	35		9		20		25		55		34		
08:30	34		7		18		26		52		33		
08:45	28		6		17		22		45		28		
09:00	21	98	9	28	12	54	25	87	33	152	34	115	
09:15	25		7		12		19		37		26		
09:30	25		6		11		19		36		25		
09:45	27		6		19		24		46		30		
10:00	18	88	3	15	13	52	9	58	31	140	12	73	
10:15	24		3		11		16		35		19		
10:30	19		6		7		18		26		24		
10:45	27		3		21		15		48		18		
11:00	15	76	3	8	14	73	13	32	29	149	16	40	
11:15	23		4		19		7		42		11		
11:30	15		1		21		6		36		7		
11:45	23		0		19		6		42		6		
Totals	1,052		838		454		1,506		1,506		2,344		
Split%	69.9		35.8		30.1		64.2						
Day Totals		1,890				1,960				3,850			
Day Splits		49.1				50.9							
Peak Hour	07:15		04:15		07:30		04:30		07:15		04:30		
Volume	295		119		107		231		392		345		
Factor	0.75		0.93		0.74		0.76		0.84		0.81		

Transportation Studies, Inc.

2640 Walnut Avenue, Suite L
Tustin, CA. 92780

Location : HASLEY CANYON ROAD
Segment : N/O HASLEY CANYON RD
Client : STANTEC

Site: SANTA CLARIT
Date: 11/07/17
Day: Tuesday

Interval	NB				SB				Combined			
Begin	AM		PM		AM		PM		AM		PM	
12:00	16	31	188	579	16	48	113	559	32	79	301	1,138
12:15	2		134		10		158		12		292	
12:30	9		141		16		124		25		265	
12:45	4		116		6		164		10		280	
01:00	18	26	104	390	4	23	130	452	22	49	234	842
01:15	2		86		6		115		8		201	
01:30	4		114		1		111		5		225	
01:45	2		86		12		96		14		182	
02:00	21	40	111	578	8	26	86	484	29	66	197	1,062
02:15	6		101		2		120		8		221	
02:30	9		250		8		142		17		392	
02:45	4		116		8		136		12		252	
03:00	5	34	134	821	8	43	200	649	13	77	334	1,470
03:15	8		213		8		186		16		399	
03:30	10		278		10		114		20		392	
03:45	11		196		17		149		28		345	
04:00	12	77	214	944	12	181	116	483	24	258	330	1,427
04:15	12		172		22		118		34		290	
04:30	22		356		54		132		76		488	
04:45	31		202		93		117		124		319	
05:00	43	207	288	716	66	530	112	451	109	737	400	1,167
05:15	41		148		74		125		115		273	
05:30	51		179		136		92		187		271	
05:45	72		101		254		122		326		223	
06:00	67	324	113	317	80	521	97	362	147	845	210	679
06:15	82		67		100		92		182		159	
06:30	78		88		129		79		207		167	
06:45	97		49		212		94		309		143	
07:00	118	604	70	167	154	948	70	252	272	1,552	140	419
07:15	138		38		222		50		360		88	
07:30	170		35		208		64		378		99	
07:45	178		24		364		68		542		92	
08:00	140	580	32	117	250	868	50	227	390	1,448	82	344
08:15	143		29		305		56		448		85	
08:30	156		34		184		53		340		87	
08:45	141		22		129		68		270		90	
09:00	78	302	35	119	83	339	50	173	161	641	85	292
09:15	69		40		89		39		158		79	
09:30	70		30		72		52		142		82	
09:45	85		14		95		32		180		46	
10:00	80	346	12	54	66	289	31	114	146	635	43	168
10:15	88		12		70		36		158		48	
10:30	72		19		75		30		147		49	
10:45	106		11		78		17		184		28	
11:00	100	430	16	48	104	429	28	72	204	859	44	120
11:15	104		16		108		20		212		36	
11:30	94		10		101		12		195		22	
11:45	132		6		116		12		248		18	
Totals	3,001		4,850		4,245		4,278		7,246		9,128	
Split%	41.4		53.1		58.6		46.9					
Day Totals		7,851				8,523				16,374		
Day Splits		47.9				52.1						
Peak Hour	07:30		04:15		07:30		02:30		07:30		04:15	
Volume	631		1,018		1,127		664		1,758		1,497	
Factor	0.89		0.71		0.77		0.83		0.81		0.77	

Transportation Studies, Inc.

2640 Walnut Avenue, Suite L

Tustin, CA. 92780

Location : SAN MARTINEZ ROAD
Segment : W/O CHIQUITO CANYON RD
Client : STANTEC

Site: SANTA CLARIT
Date: 11/07/17
Day: Tuesday

Interval	EB				WB				Combined			
Begin	AM		PM		AM		PM		AM		PM	
12:00	1	3	28	74	4	13	15	54	5	16	43	128
12:15	1		18		3		18		4		36	
12:30	0		12		1		10		1		22	
12:45	1		16		5		11		6		27	
01:00	0	2	17	63	2	6	13	68	2	8	30	131
01:15	0		10		1		13		1		23	
01:30	1		18		1		18		2		36	
01:45	1		18		2		24		3		42	
02:00	0	4	30	98	2	5	14	92	2	9	44	190
02:15	1		21		1		22		2		43	
02:30	1		14		0		28		1		42	
02:45	2		33		2		28		4		61	
03:00	2	5	16	76	0	4	21	129	2	9	37	205
03:15	1		17		0		42		1		59	
03:30	1		22		2		34		3		56	
03:45	1		21		2		32		3		53	
04:00	4	40	10	81	0	4	39	147	4	44	49	228
04:15	9		26		1		28		10		54	
04:30	12		22		3		32		15		54	
04:45	15		23		0		48		15		71	
05:00	21	92	28	91	2	14	37	156	23	106	65	247
05:15	22		19		2		40		24		59	
05:30	15		23		6		39		21		62	
05:45	34		21		4		40		38		61	
06:00	27	131	21	70	8	37	24	113	35	168	45	183
06:15	40		28		11		39		51		67	
06:30	42		11		6		24		48		35	
06:45	22		10		12		26		34		36	
07:00	30	179	18	48	6	41	25	83	36	220	43	131
07:15	48		13		9		26		57		39	
07:30	60		6		10		16		70		22	
07:45	41		11		16		16		57		27	
08:00	23	100	7	38	24	64	21	73	47	164	28	111
08:15	30		10		16		16		46		26	
08:30	32		6		13		21		45		27	
08:45	15		15		11		15		26		30	
09:00	22	91	11	32	8	28	16	69	30	119	27	101
09:15	28		7		2		15		30		22	
09:30	23		10		7		23		30		33	
09:45	18		4		11		15		29		19	
10:00	18	67	1	12	10	36	7	42	28	103	8	54
10:15	19		2		11		12		30		14	
10:30	10		5		6		8		16		13	
10:45	20		4		9		15		29		19	
11:00	11	58	1	2	13	63	9	18	24	121	10	20
11:15	19		0		18		3		37		3	
11:30	13		1		20		4		33		5	
11:45	15		0		12		2		27		2	
Totals	772		685		315		1,044		1,087		1,729	
Split%	71.0		39.6		29.0		60.4					
Day Totals		1,457				1,359				2,816		
Day Splits		51.7				48.3						
Peak Hour	07:00		04:15		07:45		04:45		07:15		04:45	
Volume	179		99		69		164		231		257	
Factor	0.75		0.88		0.72		0.85		0.82		0.90	

Transportation Studies, Inc.

2640 Walnut Avenue, Suite L

Tustin, CA. 92780

Location : COMMERCE CENTER DRIVE — Site: SANTA CLARIT

Segment : S/O HASLEY CANYON RD — Date: 11/07/17

Client : STANTEC — Day: Tuesday

Interval	NB				SB				Combined			
Begin	AM		PM		AM		PM		AM		PM	
12:00	16	25	119	355	1	5	54	320	17	30	173	675
12:15	2		80		2		94		4		174	
12:30	6		88		2		72		8		160	
12:45	1		68		0		100		1		168	
01:00	18	27	65	245	2	9	77	271	20	36	142	516
01:15	2		67		1		62		3		129	
01:30	6		63		0		64		6		127	
01:45	1		50		6		68		7		118	
02:00	20	30	59	406	0	8	44	220	20	38	103	626
02:15	4		49		0		64		4		113	
02:30	4		222		4		60		8		282	
02:45	2		76		4		52		6		128	
03:00	5	18	98	574	4	21	60	271	9	39	158	845
03:15	4		108		2		80		6		188	
03:30	6		218		6		63		12		281	
03:45	3		150		9		68		12		218	
04:00	4	22	155	694	11	149	39	162	15	171	194	856
04:15	4		110		15		46		19		156	
04:30	10		269		37		43		47		312	
04:45	4		160		86		34		90		194	
05:00	6	32	219	507	52	446	36	99	58	478	255	606
05:15	4		102		52		21		56		123	
05:30	8		118		114		17		122		135	
05:45	14		68		228		25		242		93	
06:00	7	67	64	187	58	373	11	62	65	440	75	249
06:15	22		40		61		18		83		58	
06:30	18		54		100		13		118		67	
06:45	20		29		154		20		174		49	
07:00	47	162	35	94	106	599	22	63	153	761	57	157
07:15	24		20		159		13		183		33	
07:30	42		23		130		14		172		37	
07:45	49		16		204		14		253		30	
08:00	49	223	21	84	178	498	9	57	227	721	30	141
08:15	73		17		148		12		221		29	
08:30	53		28		104		16		157		44	
08:45	48		18		68		20		116		38	
09:00	33	127	20	57	63	218	11	38	96	345	31	95
09:15	24		14		57		10		81		24	
09:30	32		14		36		7		68		21	
09:45	38		9		62		10		100		19	
10:00	38	183	7	30	48	167	5	27	86	350	12	57
10:15	50		8		40		12		90		20	
10:30	31		9		50		7		81		16	
10:45	64		6		29		3		93		9	
11:00	71	327	15	41	76	294	8	20	147	621	23	61
11:15	70		11		75		7		145		18	
11:30	78		10		54		3		132		13	
11:45	108		5		89		2		197		7	
Totals	1,243		3,274		2,787		1,610		4,030		4,884	
Split%	30.8		67.0		69.2		33.0					
Day Totals		4,517				4,397				8,914		
Day Splits		50.7				49.3						
Peak Hour	11:00		04:15		07:15		12:15		07:30		04:15	
Volume	327		758		671		343		873		917	
Factor	0.76		0.70		0.82		0.86		0.86		0.73	

* Data File : D1711273 — Printed : 11/15/2017

Transportation Studies, Inc.

2640 Walnut Avenue, Suite L

Tustin, CA. 92780

Location : CHIQUITO CANYON ROAD — Site: SANTA CLARIT

Segment : N/O HENRY MAYO DRIVE — Date: 11/07/17

Client : STANTEC

Interval	NB				SB				Combined				Day: Tuesday
Begin	AM		PM		AM		PM		AM		PM		
12:00	3	4	12	43	0	1	10	50	3	5	22	93	
12:15	0		13		1		11		1		24		
12:30	1		6		0		11		1		17		
12:45	0		12		0		18		0		30		
01:00	1	6	5	35	0	2	14	42	1	8	19	77	
01:15	2		8		0		8		2		16		
01:30	1		13		1		8		2		21		
01:45	2		9		1		12		3		21		
02:00	0	3	9	44	0	2	14	49	0	5	23	93	
02:15	0		10		1		10		1		20		
02:30	1		12		0		12		1		24		
02:45	2		13		1		13		3		26		
03:00	0	3	14	72	3	8	7	33	3	11	21	105	
03:15	0		16		2		5		2		21		
03:30	1		16		1		15		2		31		
03:45	2		26		2		6		4		32		
04:00	0	2	18	72	2	27	2	45	2	29	20	117	
04:15	1		11		9		14		10		25		
04:30	1		20		7		19		8		39		
04:45	0		23		9		10		9		33		
05:00	0	8	18	74	12	59	11	42	12	67	29	116	
05:15	3		29		13		6		16		35		
05:30	1		9		15		15		16		24		
05:45	4		18		19		10		23		28		
06:00	9	29	7	50	21	102	11	35	30	131	18	85	
06:15	6		15		40		14		46		29		
06:30	6		12		20		8		26		20		
06:45	8		16		21		2		29		18		
07:00	8	24	15	54	15	79	2	14	23	103	17	68	
07:15	2		14		24		4		26		18		
07:30	2		16		28		4		30		20		
07:45	12		9		12		4		24		13		
08:00	8	22	14	32	14	59	2	11	22	81	16	43	
08:15	7		5		16		2		23		7		
08:30	1		7		18		3		19		10		
08:45	6		6		11		4		17		10		
09:00	7	35	7	31	20	56	3	14	27	91	10	45	
09:15	6		6		14		2		20		8		
09:30	12		14		9		6		21		20		
09:45	10		4		13		3		23		7		
10:00	6	25	9	30	9	40	2	8	15	65	11	38	
10:15	12		6		11		2		23		8		
10:30	4		7		12		1		16		8		
10:45	3		8		8		3		11		11		
11:00	6	34	7	12	6	30	1	3	12	64	8	15	
11:15	10		2		12		1		22		3		
11:30	9		2		3		1		12		3		
11:45	9		1		9		0		18		1		
Totals	195		549		465		346		660		895		
Split%	29.5		61.3		70.5		38.7						
Day Totals		744				811				1,555			
Day Splits		47.8				52.2							
Peak Hour	09:30		04:30		06:00		12:15		06:00		04:30		
Volume	40		90		102		54		131		136		
Factor	0.83		0.78		0.64		0.75		0.71		0.87		

Transportation Studies, Inc.

2640 Walnut Avenue, Suite L

Tustin, CA. 92780

Location : CHIQUITO CANYON ROAD — Site: SANTA CLARIT

Segment : SAN MARTINEZ TO HUNSTOCK ST — Date: 11/14/17

Client : STANTEC — Day: Tuesday

Interval	NB				SB				Combined			
Begin	AM		PM		AM		PM		AM		PM	
12:00	0	3	27	57	3	6	11	61	3	9	38	118
12:15	2		11		1		12		3		23	
12:30	1		4		1		23		2		27	
12:45	0		15		1		15		1		30	
01:00	1	3	9	57	4	9	14	58	5	12	23	115
01:15	1		18		1		10		2		28	
01:30	1		13		2		20		3		33	
01:45	0		17		2		14		2		31	
02:00	1	2	23	74	2	2	7	71	3	4	30	145
02:15	0		18		0		10		0		28	
02:30	1		13		0		24		1		37	
02:45	0		20		0		30		0		50	
03:00	0	1	20	67	0	3	21	88	0	4	41	155
03:15	1		12		2		21		3		33	
03:30	0		16		0		23		0		39	
03:45	0		19		1		23		1		42	
04:00	0	30	22	88	0	3	19	108	0	33	41	196
04:15	6		16		1		35		7		51	
04:30	16		23		0		27		16		50	
04:45	8		27		2		27		10		54	
05:00	14	74	15	77	4	18	25	136	18	92	40	213
05:15	13		20		6		40		19		60	
05:30	21		25		3		36		24		61	
05:45	26		17		5		35		31		52	
06:00	16	76	15	68	5	30	27	109	21	106	42	177
06:15	19		13		8		26		27		39	
06:30	19		24		8		32		27		56	
06:45	22		16		9		24		31		40	
07:00	17	135	13	56	13	41	21	70	30	176	34	126
07:15	23		19		6		20		29		39	
07:30	57		10		4		15		61		25	
07:45	38		14		18		14		56		28	
08:00	24	87	13	53	23	65	9	63	47	152	22	116
08:15	15		20		12		19		27		39	
08:30	22		9		16		22		38		31	
08:45	26		11		14		13		40		24	
09:00	12	72	8	27	9	39	9	39	21	111	17	66
09:15	23		7		9		11		32		18	
09:30	16		8		8		12		24		20	
09:45	21		4		13		7		34		11	
10:00	9	39	5	15	8	33	10	32	17	72	15	47
10:15	12		5		7		9		19		14	
10:30	9		4		6		5		15		9	
10:45	9		1		12		8		21		9	
11:00	10	55	6	12	8	49	6	25	18	104	12	37
11:15	17		4		8		10		25		14	
11:30	14		2		16		7		30		9	
11:45	14		0		17		2		31		2	
Totals	577		651		298		860		875		1,511	
Split%	65.9		43.1		34.1		56.9					
Day Totals		1,228				1,158				2,386		
Day Splits		51.5				48.5						
Peak Hour	07:15		04:00		07:45		05:15		07:15		04:45	
Volume	142		88		69		138		193		215	
Factor	0.62		0.81		0.75		0.86		0.79		0.88	

Appendix C ICU CALCULATION WORKSHEETS

INTERSECTION CAPACITY UTILIZATION

Peak hour intersection volume/capacity ratios are calculated by means of intersection capacity utilization (ICU) values.

The procedure is based on the critical movement methodology, and shows the amount of capacity utilized by each critical move. A capacity of 1,700 vehicles per hour (VPH) per lane is assumed together with a .05 clearance interval for City of Irvine intersections, and a capacity of 1,600 VPH is assumed for the City of Newport Beach intersection. A "de-facto" right-turn lane is used in the ICU calculation for cases where a curb lane is wide enough to separately serve both through and right-turn traffic (i.e., with a width of 19 feet from curb to outside of through-lane with parking prohibited during peak periods). Such lanes are treated the same as striped right-turn lanes during the ICU calculations, but they are denoted on the ICU calculation worksheets using the letter "d" in place of a numerical entry for right-turn lanes.

The methodology also incorporates a check for right-turn capacity utilization. Both right-turn-on-green (RTOG) and right-turn-on-red (RTOR) capacity availability are calculated and checked against the total right-turn capacity need. If insufficient capacity is available, then an adjustment is made to the total capacity utilization value. The following example shows how this adjustment is made.

Example for Northbound Right

1. Right-Turn-On-Green (RTOG)

If NBT is critical move, then:

RTOG = V/C (NBT)

Otherwise,

RTOG = V/C (NBL) + V/C (SBT) - V/C (SBL)

2. Right-Turn-On-Red (RTOR)

If WBL is critical move, then:

RTOR = V/C (WBL)

Otherwise,

RTOR = V/C (EBL) + V/C (WBT) - V/C (EBT)

3. Right-Turn Overlap Adjustment

If the northbound right is assumed to overlap with the adjacent westbound left, adjustments to the RTOG and RTOR values are made as follows:

RTOG = RTOG + V/C (WBL)

RTOR = RTOR - V/C (WBL)

4. Total Right-Turn Capacity (RTC) Availability for NBR

RTC = RTOG + factor x RTOR

Where factor = RTOR saturation flow factor (75%)

Right-turn adjustment is then as follows:

Additional ICU = V/C (NBR) - RTC

A zero or negative value indicates that adequate capacity is available and no adjustment is necessary. A positive value indicates that the available RTOR and RTOG capacity does not adequately accommodate the right-turn V/C; therefore, the right-turn is essentially considered to be a critical movement. In such cases, the right-turn adjustment is noted on the ICU worksheet and it is included in the total capacity utilization value. When it is determined that a right-turn adjustment is required for more than one right-turn movement, the word "multi" is printed on the worksheet instead of an actual right-turn movement reference, and the right-turn adjustments are cumulatively added to the total capacity utilization value. In such cases, further operational evaluation is typically carried out to determine if under actual operational conditions, the critical right-turns would operate simultaneously, and therefore a right-turn adjustment credit should be applied.

Shared Lane V/C Methodology

For intersection approaches where shared usage of a lane is permitted by more than one turn movement (e.g., left/through, through/right, left/through/right), the individual turn volumes are evaluated to determine whether dedication of the shared lane is warranted to any one given turn movement. The following example demonstrates how this evaluation is carried out:

Example for Shared Left/Through Lane

1. Average Lane Volume (ALV)

$$ALV = \frac{\text{Left-Turn Volume + Through Volume}}{\text{Total Left + Through Approach Lanes (including shared lane)}}$$

2. ALV for Each Approach

$$\text{ALV (Left)} = \frac{\text{Left-Turn Volume}}{\text{Left Approach Lanes (including shared lane)}}$$

$$\text{ALV (Through)} = \frac{\text{Through Volume}}{\text{Through Approach Lanes (including shared lane)}}$$

3. Lane Dedication is Warranted

If ALV (Left) is greater than ALV, then full dedication of the shared lane to the left-turn approach is warranted. Left-turn and through V/C ratios for this case are calculated as follows:

$$\text{V/C (Left)} = \frac{\text{Left-Turn Volume}}{\text{Left Approach Capacity (including shared lane)}}$$

$$\text{V/C (Through)} = \frac{\text{Through Volume}}{\text{Through Approach Capacity (excluding shared lane)}}$$

Similarly, if ALV (Through) is greater than ALV then full dedication to the through approach is warranted, and left-turn and through V/C ratios are calculated as follows:

$$\text{V/C (Left)} = \frac{\text{Left-Turn Volume}}{\text{Left Approach Capacity (excluding shared lane)}}$$

$$\text{V/C (Through)} = \frac{\text{Through Volume}}{\text{Through Approach Capacity (including shared lane)}}$$

4. Lane Dedication is not Warranted

If ALV (Left) and ALV (Through) are both less than ALV, the left/through lane is assumed to be truly shared and each left, left/through or through approach lane carries an evenly distributed volume of traffic equal to ALV. A combined left/through V/C ratio is calculated as follows:

$$\text{V/C (Left/Through)} = \frac{\text{Left-Turn Volume + Through Volume}}{\text{Total Left + Through Approach Capacity (including shared lane)}}$$

This V/C (Left/Through) ratio is assigned as the V/C (Through) ratio for the critical movement analysis and ICU summary listing.

If split phasing has not been designated for this approach, the relative proportion of V/C (Through) that is attributed to the left-turn volume is estimated as follows:

If approach has more than one left-turn lane (including shared lane), then:

V/C (Left) = V/C (Through)

If approach has only one left-turn lane (shared lane), then:

$$\text{V/C (Left)} = \frac{\text{Left-Turn Volume}}{\text{Single Approach Lane Capacity}}$$

If this left-turn movement is determined to be a critical movement, the V/C (Left) value is posted in brackets on the ICU summary printout.

These same steps are carried out for shared through/right lanes. If full dedication of a shared through/right lane to the right-turn movement is warranted, the right-turn V/C value calculated in step three is checked against the RTOR and RTOG capacity availability if the option to include right-turns in the V/C ratio calculations is selected. If the V/C value that is determined using the shared lane methodology described here is reduced due to RTOR and RTOG capacity availability, the V/C value for the through/right lanes is posted in brackets.

When an approach contains more than one shared lane (e.g., left/through and through/right), steps one and two listed above are carried out for the three turn movements combined. Step four is carried out if dedication is not warranted for either of the shared lanes. If dedication of one of the shared lanes is warranted to one movement or another, step three is carried out for the two movements involved, and then steps one through four are repeated for the two movements involved in the other shared lane.

1. Chiquito Cyn & SR 126/Henry Mayo

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	0	0	0		0	
NBR	0	0	0		0	
SBL	1	1600	66	.04*	27	.02*
SBT	0	0	0		0	
SBR	1	1600	22	.01	7	.00
EBL	1	1600	7	.00	21	.01
EBT	2	3200	607	.19	981	.31*
EBR	0	0	0		0	
WBL	0	0	0		0	
WBT	2	3200	962	.30*	810	.25
WBR	1	1600	29	.02	67	.04
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.44** **.43**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	0	0	0		0	
NBR	0	0	0		0	
SBL	1	1600	87	.05*	43	.03*
SBT	0	0	0		0	
SBR	1	1600	26	.02	10	.01
EBL	1	1600	9	.01*	26	.02
EBT	2	3200	607	.19	981	.31*
EBR	0	0	0		0	
WBL	0	0	0		0	
WBT	2	3200	962	.30*	810	.25
WBR	1	1600	37	.02	91	.06
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.46** **.44**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	2880	170	.06	170	.06
NBT	2	3200	290	.09*	200	.06*
NBR	2	3200	1050	.33	250	.08
SBL	1	1600	480	.30*	480	.30*
SBT	1	1600	150	.09	310	.19
SBR	1	1600	30	.02	80	.05
EBL	1	1600	40	.03*	50	.03
EBT	2	3200	990	.31	1180	.37*
EBR	1	1600	140	.09	210	.13
WBL	2	2880	180	.06	990	.34*
WBT	2	3200	1150	.36*	1190	.37
WBR	1	1600	380	.24	480	.30
Right Turn Adjustment		NBR		.18*		
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **1.06** **1.17**

Cumulative with Project - Mitigation

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	2880	170	.06	170	.06
NBT	2	3200	290	.09*	200	.06*
NBR	2	3200	1050	.33	250	.08
SBL	2	2880	480	.17*	480	.17*
SBT	3	4800	150	.03	310	.06
SBR	1	1600	30	.02	80	.05
EBL	2	2880	40	.01	50	.02
EBT	3	4800	990	.21*	1180	.25*
EBR	1	1600	140	.09	210	.13
WBL	2	2880	180	.06*	990	.34*
WBT	3	4800	1150	.24	1190	.25
WBR	1	1600	380	.24	480	.30
Right Turn Adjustment		NBR		.18*		
Clearance Interval				.10*		.10*

Note: Assumes Right-Turn Overlap for NBR

TOTAL CAPACITY UTILIZATION **.81** **.92**

2. Chiquito Cyn & San Martinez

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	6		57	{.04}*
NBT	1	1600	14	.01	15	.05
NBR	0	0	0		2	
SBL	0	0	1		1	
SBT	1	1600	17	.04*	11	.08*
SBR	0	0	44		115	
EBL	0	0	97		64	
EBT	1	1600	3	.09*	5	.06*
EBR	0	0	50		30	
WBL	0	0	2		3	
WBT	1	1600	3	.00	4	.01
WBR	0	0	0		1	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.23**		**.28**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	6		57	{.04}*
NBT	1	1600	24	.02	45	.07
NBR	0	0	0		2	
SBL	0	0	1		1	
SBT	1	1600	42	.05*	30	.09*
SBR	0	0	44		115	
EBL	0	0	97		64	
EBT	1	1600	3	.09*	5	.06*
EBR	0	0	50		30	
WBL	0	0	2		3	
WBT	1	1600	3	.00	4	.01
WBR	0	0	0		1	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.24**		**.29**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	30	{.02}*	140	{.09}*
NBT	1	1600	150	.12	140	.18
NBR	0	0	10		10	
SBL	0	0	10		10	
SBT	1	1600	130	.12*	150	.23*
SBR	0	0	50		210	
EBL	0	0	180		110	
EBT	1	1600	10	.19*	10	.13*
EBR	0	0	120		80	
WBL	0	0	10	{.01}*	10	{.01}*
WBT	1	1600	10	.02	10	.02
WBR	0	0	10		10	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.44**		**.56**

3. Chiquito Cyn & Hunstock

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	1		1	
NBT	1	1600	121	.08*	75	.05
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	1	1600	60	.05	125	.10*
SBR	0	0	16		36	
EBL	0	0	35	{.02}*	14	{.01}*
EBT	1	1600	0	.02	0	.01
EBR	0	0	0		2	
WBL	0	0	0		0	
WBT	1	1600	0	.00*	0	.00*
WBR	0	0	0		0	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.20**		**.21**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	1		1	
NBT	1	1600	131	.08*	105	.07
NBR	0	0	0		0	
SBL	0	0	2		0	
SBT	1	1600	85	.07	144	.13*
SBR	0	0	26		65	
EBL	0	0	48	{.03}*	43	{.03}*
EBT	1	1600	0	.03	0	.03
EBR	0	0	0		2	
WBL	0	0	0		0	
WBT	1	1600	0	.00*	0	.00*
WBR	0	0	0		0	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.21**		**.26**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	10		30	{.02}*
NBT	1	1600	330	.22*	220	.16
NBR	0	0	10		10	
SBL	0	0	10	{.01}*	10	
SBT	1	1600	170	.13	340	.27*
SBR	0	0	20		80	
EBL	0	0	40		50	
EBT	1	1600	10	.04*	10	.05*
EBR	0	0	10		20	
WBL	0	0	10	{.01}*	10	{.01}*
WBT	1	1600	10	.02	10	.02
WBR	0	0	10		10	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.38**		**.45**

4. Del Valle & Hasley Cyn

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		3	
NBT	1	1600	0	.15*	0	.07*
NBR	0	0	241		112	
SBL	0	0	0		0	
SBT	0	0	0		0	
SBR	0	0	0		0	
EBL	0	0	0		0	
EBT	1	1600	154	.10*	93	.06
EBR	0	0	3		2	
WBL	0	0	91	{.06}*	227	
WBT	1	1600	88	.11	131	.22*
WBR	0	0	0		0	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.41**		**.39**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	14		29	
NBT	1	1600	0	.22*	0	.13*
NBR	0	0	331		175	
SBL	0	0	0		0	
SBT	0	0	0		0	
SBR	0	0	0		0	
EBL	0	0	0		0	
EBT	1	1600	154	.11*	93	.08*
EBR	0	0	15		30	
WBL	1	1600	125	.08*	330	.21*
WBT	1	1600	88	.06	131	.08
WBR	0	0	0		0	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.51**		**.52**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	120		90	
NBT	1	1600	0	.41*	0	.23*
NBR	0	0	530		270	
SBL	0	0	0		0	
SBT	0	0	0		0	
SBR	0	0	0		0	
EBL	0	0	0		0	
EBT	1	1600	490	.36*	150	.12*
EBR	0	0	80		40	
WBL	1	1600	140	.09*	550	.34*
WBT	1	1600	170	.11	390	.24
WBR	0	0	0		0	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.96**		**.79**

Cumulative with Project - Mitigation

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	120	.08*	90	.06*
NBT	0	0	0		0	
NBR	f		530		270	
SBL	0	0	0		0	
SBT	0	0	0		0	
SBR	0	0	0		0	
EBL	0	0	0		0	
EBT	1	1600	490	.36*	150	.12*
EBR	0	0	80		40	
WBL	1	1600	140	.09*	550	.34*
WBT	1	1600	170	.11	390	.24
WBR	0	0	0		0	
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.63**		**.62**

5. Commerce Center & Hasley Cyn

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	21	.01*	48	.03
NBT	3	4800	146	.04	621	.13*
NBR	0	0	31		17	
SBL	1	1600	201	.13	29	.02*
SBT	3	4800	560	.16*	88	.03
SBR	0	0	222		316	.20
EBL	1.5		329		277	
EBT	0.5	3200	33	.11*	10	.09*
EBR	1	1600	44	.03	25	.02
WBL	1	1600	57	.04*	5	.00
WBT	1	1600	15	.01	7	.00*
WBR	1	1600	90	.06	22	.01
Right Turn Adjustment					SBR	.01*
Clearance Interval				.10*		.10*
Note: Assumes E/W Split Phasing						

TOTAL CAPACITY UTILIZATION **.42** **.35**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	28	.02*	71	.04
NBT	3	4800	146	.04	621	.13*
NBR	0	0	31		17	
SBL	1	1600	201	.13	29	.02*
SBT	3	4800	560	.17*	88	.03
SBR	0	0	245		392	.25
EBL	1.5		397		321	
EBT	0.5	3200	33	.13*	10	.10*
EBR	1	1600	63	.04	39	.02
WBL	1	1600	57	.04*	5	.00
WBT	1	1600	15	.01	7	.00*
WBR	1	1600	90	.06	22	.01
Right Turn Adjustment					SBR	.06*
Clearance Interval				.10*		.10*
Note: Assumes E/W Split Phasing						

TOTAL CAPACITY UTILIZATION **.46** **.41**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	40	.03*	240	.15*
NBT	3	4800	290	.07	830	.18
NBR	0	0	40		30	
SBL	1	1600	210	.13	40	.03
SBT	3	4800	1500	.36*	350	.11*
SBR	0	0	250		450	.28
EBL	1.5		410		330	
EBT	0.5	3200	40	.14*	20	.11*
EBR	1	1600	430	.27	50	.03
WBL	1	1600	70	.04*	20	.01
WBT	1	1600	30	.02	20	.01*
WBR	1	1600	100	.06	30	.02
Right Turn Adjustment		EBR	.11*		SBR	.09*
Clearance Interval				.10*		.10*
Note: Assumes E/W Split Phasing						

TOTAL CAPACITY UTILIZATION **.78** **.57**

Cumulative with Project - Mitigation

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	40	.03*	240	.15*
NBT	3	4800	290	.07	830	.18
NBR	0	0	40		30	
SBL	1	1600	210	.13	40	.03
SBT	3	4800	1500	.36*	350	.11*
SBR	0	0	250		450	.28
EBL	1.5		410		330	.10*
EBT	0	4800	40	{.17}*	20	
EBR	1.5		430		50	
WBL	1	1600	70	.04*	20	.01
WBT	1	1600	30	.02	20	.01*
WBR	1	1600	100	.06	30	.02
Right Turn Adjustment					SBR	.09*
Clearance Interval				.10*		.10*
Note: Assumes E/W Split Phasing						

TOTAL CAPACITY UTILIZATION **.70** **.56**

6. The Old Road & I-5 SB Ramps

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	41	.03	143	.09
NBT	2	3200	358	.11*	664	.21*
NBR	0	0	0		1	
SBL	1	1600	420	.26*	200	.13*
SBT	2	3200	412	.14	194	.07
SBR	0	0	47		23	
EBL	1	1600	88	.06	31	.02
EBT	1	1600	165	.14*	88	.09*
EBR	0	0	54		51	
WBL	1.5		130	{.04}*	74	{.03}*
WBT	0.5	3200	8	.04	15	.03
WBR	1	1600	2	.00	2	.00
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.65** **.56**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	41	.03	143	.09
NBT	2	3200	358	.11*	664	.21*
NBR	0	0	0		1	
SBL	1	1600	420	.26*	200	.13*
SBT	2	3200	412	.14	194	.07
SBR	0	0	47		23	
EBL	1	1600	88	.06	31	.02
EBT	1	1600	165	.14*	88	.09*
EBR	0	0	54		51	
WBL	1.5		133	{.04}*	84	{.03}*
WBT	0.5	3200	8	.04	15	.03
WBR	1	1600	2	.00	2	.00
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.65** **.56**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	70	.04	150	.09
NBT	2	3200	700	.22*	930	.29*
NBR	0	0	0		10	
SBL	1	1600	590	.37*	290	.18*
SBT	2	3200	790	.26	320	.11
SBR	0	0	50		40	
EBL	1	1600	100	.06	80	.05
EBT	1	1600	190	.19*	100	.10*
EBR	0	0	120		60	
WBL	1.5		480	{.15}*	220	{.08}*
WBT	0.5	3200	10	.15	20	.08
WBR	1	1600	10	.01	10	.01
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **1.03** **.75**

Cumulative with Project - Mitigation

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	70	.04	150	.09
NBT	2	3200	700	.22*	930	.29*
NBR	0	0	0		10	
SBL	2	2880	590	.20*	290	.10*
SBT	2	3200	790	.26	320	.11
SBR	0	0	50		40	
EBL	1	1600	100	.06	80	.05
EBT	1	1600	190	.19*	100	.10*
EBR	0	0	120		60	
WBL	1.5		480		220	
WBT	0.5	3200	10	.15*	20	.08*
WBR	1	1600	10	.01	10	.01
Clearance Interval				.10*		.10*

Note: Assumes E/W Split Phasing

TOTAL CAPACITY UTILIZATION **.86** **.67**

11. Commerce Ctr & SR-126 WB on/off ramp

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	2880	31	.01*	60	.02*
NBT	3	4800	93	.02	44	.01
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	3	4800	216	.05*	1272	.26*
SBR	1	1600	29	.02	44	.03
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	1.5		16		15	
WBT	0.5	3200	0	.01*	0	.00*
WBR	2	3200	1033	.32	203	.06
Right Turn Adjustment			WBR	.28*		
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.45**		**.38**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	2880	32	.01*	63	.02*
NBT	3	4800	95	.02	45	.01
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	3	4800	216	.05*	1272	.26*
SBR	1	1600	30	.02	46	.03
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	1.5		16		15	
WBT	0.5	3200	0	.01*	0	.00*
WBR	2	3200	1033	.32	203	.06
Right Turn Adjustment			WBR	.28*		
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.45**		**.38**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	2	2880	180	.06	520	.18*
NBT	3	4800	1290	.27*	630	.13
NBR	0	0	0		0	
SBL	0	0	0		0	
SBT	3	4800	680	.14	2380	.50*
SBR	1	1600	130	.08	450	.28
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	1.5		340		310	
WBT	0.5	3200	0	.11*	0	.10*
WBR	2	3200	1400	.44	580	.18
Right Turn Adjustment			WBR	.33*		
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.81**		**.88**

12. Commerce Ctr & SR-126 EB

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	3	4800	129	.03*	108	.02
NBR	f		13		62	
SBL	0	0	0		0	
SBT	2	3200	58	.02	248	.08*
SBR	f		175		1003	
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.13** **.18**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	3	4800	132	.03*	112	.02
NBR	f		13		62	
SBL	0	0	0		0	
SBT	2	3200	58	.02	248	.08*
SBR	f		175		1003	
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.13** **.18**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	3	4800	1470	.31*	1150	.24
NBR	f		270		500	
SBL	0	0	0		0	
SBT	2	3200	660	.21	1030	.32*
SBR	f		370		1660	
EBL	0	0	0		0	
EBT	0	0	0		0	
EBR	0	0	0		0	
WBL	0	0	0		0	
WBT	0	0	0		0	
WBR	0	0	0		0	
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.41** **.42**

13. Commerce Ctr & Henry Mayo

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	0	0	0		0	
NBR	0	0	0		0	
SBL	1	1600	53	.03*	243	.15*
SBT	0	0	0		0	
SBR	1	1600	1	.00	1	.00
EBL	1	1600	33	.02*	13	.01*
EBT	2	3200	51	.02	34	.01
EBR	0	0	0		0	
WBL	0	0	0		0	
WBT	1	1600	0	.00*	0	.00*
WBR	1	1600	107	.07	121	.08
Right Turn Adjustment			WBR	.05*		
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.20**		**.26**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	0	0	0		0	
NBR	0	0	0		0	
SBL	1	1600	53	.03*	243	.15*
SBT	0	0	0		0	
SBR	1	1600	1	.00	1	.00
EBL	1	1600	35	.02*	14	.01*
EBT	2	3200	54	.02	36	.01
EBR	0	0	0		0	
WBL	0	0	0		0	
WBT	1	1600	0	.00*	0	.00*
WBR	1	1600	108	.07	124	.08
Right Turn Adjustment			WBR	.05*		
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.20**		**.26**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	20	.01	20	.01
NBT	3	4800	1320	.30*	1070	.25*
NBR	0	0	120		140	
SBL	2	2880	50	.02*	260	.09*
SBT	2	3200	570	.18	900	.28
SBR	1	1600	40	.03	40	.03
EBL	1	1600	350	.22*	260	.16*
EBT	2	3200	190	.06	150	.05
EBR	1	1600	230	.14	220	.14
WBL	1.5		30		190	
WBT	0.5	3200	10	.01*	10	.06*
WBR	1	1600	120	.08	320	.20
Right Turn Adjustment			WBR	.05*	WBR	.07*
Clearance Interval				.10*		.10*
TOTAL CAPACITY UTILIZATION				**.70**		**.73**

14. Wolcott & SR-126

Existing (2017)

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	1	1600	0	.00	0	.00
NBR	0	0	0		0	
SBL	1.5		3		12	
SBT	0.5	3200	0	.00*	0	.00*
SBR	1	1600	15	.01	64	.04
EBL	1	1600	49	.03*	16	.01
EBT	2	3200	623	.19	992	.31*
EBR	0	0	0		0	
WBL	1	1600	0	.00	0	.00
WBT	2	3200	976	.31*	813	.25
WBR	1	1600	4	.00	7	.00
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.44** **.41**

Existing plus project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	0	0	0		0	
NBT	1	1600	0	.00	0	.00
NBR	0	0	0		0	
SBL	1.5		3		12	
SBT	0.5	3200	0	.00*	0	.00*
SBR	1	1600	17	.01	67	.04
EBL	1	1600	51	.03*	20	.01
EBT	2	3200	642	.20	1004	.31*
EBR	0	0	0		0	
WBL	1	1600	0	.00	0	.00
WBT	2	3200	982	.31*	834	.26
WBR	1	1600	4	.00	7	.00
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **.44** **.41**

Cumulative with Project

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	10	.01	10	.01
NBT	1	1600	120	.08*	30	.02*
NBR	2	3200	510	.16	440	.14
SBL	1.5		50	.02*	170	{.06}*
SBT	1.5	4800	10	.01	100	.06
SBR	1	1600	40	.03	420	.26
EBL	1	1600	530	.33*	80	.05
EBT	2	3200	1970	.62	1820	.57*
EBR	1	1600	10	.01	20	.01
WBL	2	2880	320	.11	590	.20*
WBT	2	3200	1670	.52*	2230	.70
WBR	1	1600	140	.09	60	.04
Right Turn Adjustment					SBR	.14*
Clearance Interval				.10*		.10*

TOTAL CAPACITY UTILIZATION **1.05** **1.09**

Cumulative with Project - Mitigation

	LANES	CAPACITY	AM PK HOUR VOL	AM PK HOUR V/C	PM PK HOUR VOL	PM PK HOUR V/C
NBL	1	1600	10	.01	10	.01
NBT	1	1600	120	.08*	30	.02*
NBR	2	3200	510	.16	440	.14
SBL	2	2880	50	.02*	170	.06*
SBT	1	1600	10	.01	100	.06
SBR	1	1600	40	.03	420	.26
EBL	2	2880	530	.18*	80	.03
EBT	4	6400	1970	.31	1820	.28*
EBR	1	1600	10	.01	20	.01
WBL	2	2880	320	.11	590	.20*
WBT	4	6400	1670	.26*	2230	.35
WBR	1	1600	140	.09	60	.04
Right Turn Adjustment					SBR	.08*
Clearance Interval				.10*		.10*

Note: Assumes Right-Turn Overlap for SBR NBR

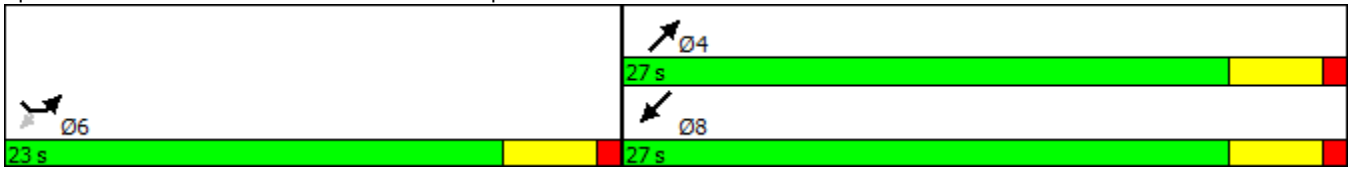
TOTAL CAPACITY UTILIZATION **.64** **.74**

Appendix D DELAY WORKSHEETS

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	779	147	0	305	1735	0
Future Volume (vph)	779	147	0	305	1735	0
Satd. Flow (prot)	3433	2787	0	6408	5085	0
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	0	6408	5085	0
Satd. Flow (RTOR)		6				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	847	160	0	332	1886	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	847	160	0	332	1886	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Perm		NA	NA	
Protected Phases	6			4	8	
Permitted Phases		6				
Total Split (s)	23.0	23.0		27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	
Act Effct Green (s)	18.5	18.5		22.5	22.5	
Actuated g/C Ratio	0.37	0.37		0.45	0.45	
v/c Ratio	0.67	0.15		0.12	0.82	
Control Delay	16.3	10.6		8.1	16.1	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	16.3	10.6		8.1	16.1	
LOS	B	B		A	B	
Approach Delay	15.4			8.1	16.1	
Approach LOS	B			A	B	

Intersection Summary	
Cycle Length: 50	
Actuated Cycle Length: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.82	
Intersection Signal Delay: 15.1	Intersection LOS: B
Intersection Capacity Utilization 63.2%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: SR-126 & I-5 SB Off-Ramp



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1082	0	0	1016	916	655
Future Volume (vph)	1082	0	0	1016	916	655
Satd. Flow (prot)	6408	0	0	5085	4990	1583
Flt Permitted					0.950	
Satd. Flow (perm)	6408	0	0	5085	4990	1583
Satd. Flow (RTOR)						8
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1176	0	0	1104	996	712
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1176	0	0	1104	996	712
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Total Split (s)	22.6			22.6	32.4	32.4
Total Lost Time (s)	4.5			4.5	4.5	4.5
Act Effct Green (s)	16.8			16.8	27.9	27.9
Actuated g/C Ratio	0.31			0.31	0.52	0.52
v/c Ratio	0.59			0.69	0.38	0.86
Control Delay	16.8			18.8	8.5	25.9
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	16.8			18.8	8.5	25.9
LOS	B			B	A	C
Approach Delay	16.8			18.8	15.8	
Approach LOS	B			B	B	

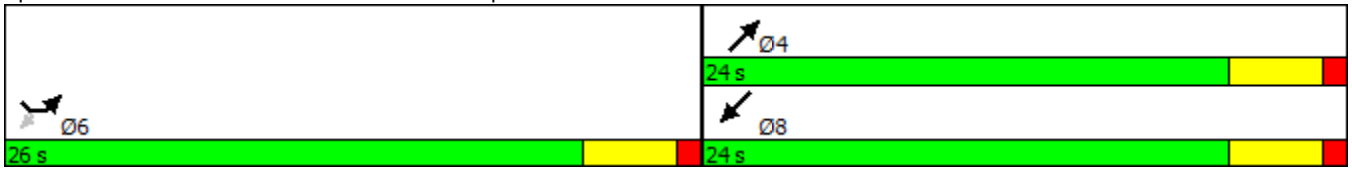
Intersection Summary			
Cycle Length: 55			
Actuated Cycle Length: 53.8			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 16.9		Intersection LOS: B	
Intersection Capacity Utilization 63.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 10: I-5 NB Off-Ramp & Newhall Ranch Rd

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	727	161	0	1107	858	0
Future Volume (vph)	727	161	0	1107	858	0
Satd. Flow (prot)	3433	2787	0	6408	5085	0
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	0	6408	5085	0
Satd. Flow (RTOR)		77				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	790	175	0	1203	933	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	790	175	0	1203	933	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Perm		NA	NA	
Protected Phases	6			4	8	
Permitted Phases		6				
Total Split (s)	26.0	26.0		24.0	24.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	
Act Effct Green (s)	21.5	21.5		17.6	17.6	
Actuated g/C Ratio	0.45	0.45		0.37	0.37	
v/c Ratio	0.51	0.14		0.51	0.50	
Control Delay	11.5	5.5		12.7	12.8	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	11.5	5.5		12.7	12.8	
LOS	B	A		B	B	
Approach Delay	10.4			12.7	12.8	
Approach LOS	B			B	B	

Intersection Summary	
Cycle Length: 50	
Actuated Cycle Length: 48.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.51	
Intersection Signal Delay: 12.0	Intersection LOS: B
Intersection Capacity Utilization 44.8%	ICU Level of Service A
Analysis Period (min) 15	

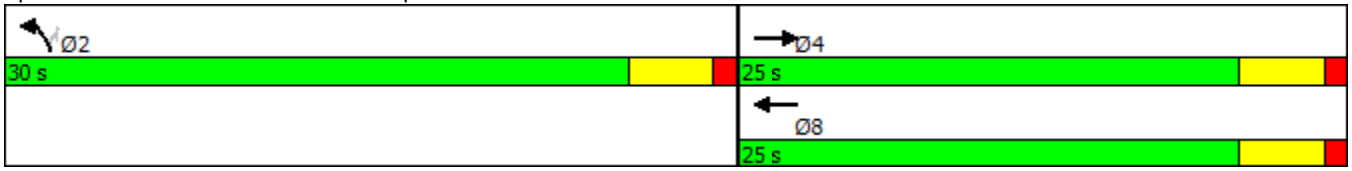
Splits and Phases: 9: SR-126 & I-5 SB Off-Ramp



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1735	0	0	908	458	457
Future Volume (vph)	1735	0	0	908	458	457
Satd. Flow (prot)	6408	0	0	5085	4990	1583
Flt Permitted					0.950	
Satd. Flow (perm)	6408	0	0	5085	4990	1583
Satd. Flow (RTOR)						1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1886	0	0	987	498	497
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1886	0	0	987	498	497
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Total Split (s)	25.0			25.0	30.0	30.0
Total Lost Time (s)	4.5			4.5	4.5	4.5
Act Effct Green (s)	20.5			20.5	25.5	25.5
Actuated g/C Ratio	0.37			0.37	0.46	0.46
v/c Ratio	0.79			0.52	0.22	0.68
Control Delay	18.3			14.6	9.1	17.3
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	18.3			14.6	9.1	17.3
LOS	B			B	A	B
Approach Delay	18.3			14.6	13.2	
Approach LOS	B			B	B	

Intersection Summary			
Cycle Length: 55			
Actuated Cycle Length: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.79			
Intersection Signal Delay: 16.1		Intersection LOS: B	
Intersection Capacity Utilization 60.9%		ICU Level of Service B	
Analysis Period (min) 15			

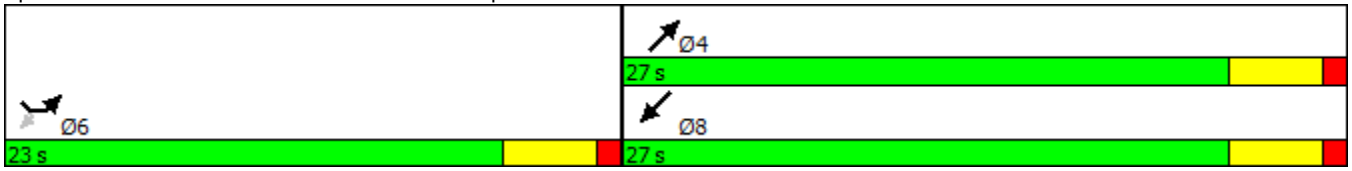
Splits and Phases: 10: I-5 NB Off-Ramp & Newhall Ranch Rd



Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	792	147	0	320	1740	0
Future Volume (vph)	792	147	0	320	1740	0
Satd. Flow (prot)	3433	2787	0	6408	5085	0
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	0	6408	5085	0
Satd. Flow (RTOR)		5				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	861	160	0	348	1891	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	861	160	0	348	1891	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Perm		NA	NA	
Protected Phases	6			4	8	
Permitted Phases		6				
Total Split (s)	23.0	23.0		27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	
Act Effct Green (s)	18.5	18.5		22.5	22.5	
Actuated g/C Ratio	0.37	0.37		0.45	0.45	
v/c Ratio	0.68	0.15		0.12	0.83	
Control Delay	16.5	10.7		8.1	16.2	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	16.5	10.7		8.1	16.2	
LOS	B	B		A	B	
Approach Delay	15.6			8.1	16.2	
Approach LOS	B			A	B	

Intersection Summary	
Cycle Length: 50	
Actuated Cycle Length: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 15.2	Intersection LOS: B
Intersection Capacity Utilization 63.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: SR-126 & I-5 SB Off-Ramp



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1110	0	0	1021	916	655
Future Volume (vph)	1110	0	0	1021	916	655
Satd. Flow (prot)	6408	0	0	5085	4990	1583
Flt Permitted					0.950	
Satd. Flow (perm)	6408	0	0	5085	4990	1583
Satd. Flow (RTOR)						7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1207	0	0	1110	996	712
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1207	0	0	1110	996	712
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Total Split (s)	22.6			22.6	32.4	32.4
Total Lost Time (s)	4.5			4.5	4.5	4.5
Act Effct Green (s)	16.9			16.9	27.9	27.9
Actuated g/C Ratio	0.31			0.31	0.52	0.52
v/c Ratio	0.60			0.70	0.38	0.86
Control Delay	17.0			18.9	8.5	25.9
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	17.0			18.9	8.5	25.9
LOS	B			B	A	C
Approach Delay	17.0			18.9	15.8	
Approach LOS	B			B	B	

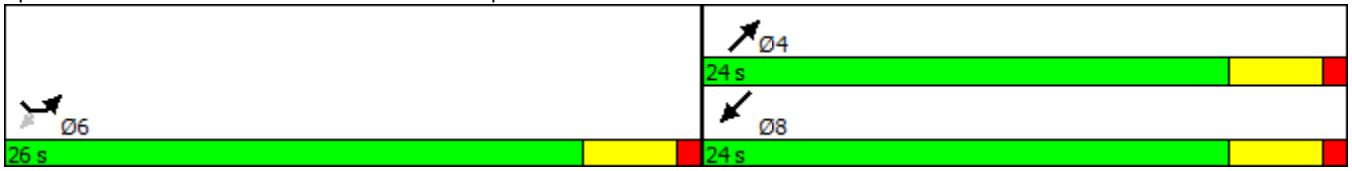
Intersection Summary			
Cycle Length: 55			
Actuated Cycle Length: 53.8			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.86			
Intersection Signal Delay: 17.0		Intersection LOS: B	
Intersection Capacity Utilization 64.1%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 10: I-5 NB Off-Ramp & Newhall Ranch Rd

Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	735	161	0	1116	874	0
Future Volume (vph)	735	161	0	1116	874	0
Satd. Flow (prot)	3433	2787	0	6408	5085	0
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	0	6408	5085	0
Satd. Flow (RTOR)		72				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	799	175	0	1213	950	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	799	175	0	1213	950	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Perm		NA	NA	
Protected Phases	6			4	8	
Permitted Phases		6				
Total Split (s)	26.0	26.0		24.0	24.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	
Act Effct Green (s)	21.6	21.6		17.7	17.7	
Actuated g/C Ratio	0.45	0.45		0.37	0.37	
v/c Ratio	0.52	0.14		0.52	0.51	
Control Delay	11.6	5.8		12.7	12.9	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	11.6	5.8		12.7	12.9	
LOS	B	A		B	B	
Approach Delay	10.5			12.7	12.9	
Approach LOS	B			B	B	

Intersection Summary			
Cycle Length: 50			
Actuated Cycle Length: 48.3			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.52			
Intersection Signal Delay: 12.1		Intersection LOS: B	
Intersection Capacity Utilization 45.4%		ICU Level of Service A	
Analysis Period (min) 15			

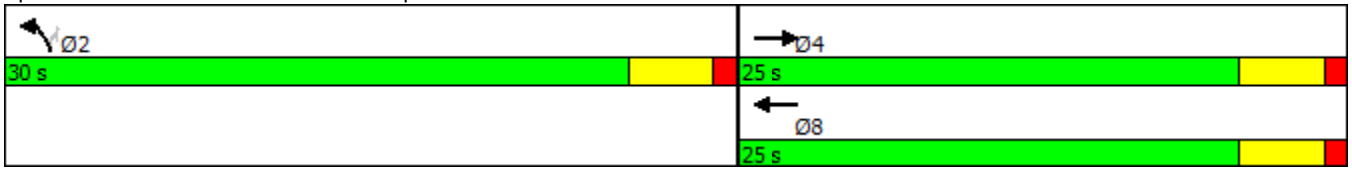
Splits and Phases: 9: SR-126 & I-5 SB Off-Ramp



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1752	0	0	924	458	457
Future Volume (vph)	1752	0	0	924	458	457
Satd. Flow (prot)	6408	0	0	5085	4990	1583
Flt Permitted					0.950	
Satd. Flow (perm)	6408	0	0	5085	4990	1583
Satd. Flow (RTOR)						1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1904	0	0	1004	498	497
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1904	0	0	1004	498	497
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Total Split (s)	25.0			25.0	30.0	30.0
Total Lost Time (s)	4.5			4.5	4.5	4.5
Act Effct Green (s)	20.5			20.5	25.5	25.5
Actuated g/C Ratio	0.37			0.37	0.46	0.46
v/c Ratio	0.80			0.53	0.22	0.68
Control Delay	18.5			14.7	9.1	17.3
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	18.5			14.7	9.1	17.3
LOS	B			B	A	B
Approach Delay	18.5			14.7	13.2	
Approach LOS	B			B	B	

Intersection Summary			
Cycle Length: 55			
Actuated Cycle Length: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.80			
Intersection Signal Delay: 16.2		Intersection LOS: B	
Intersection Capacity Utilization 61.2%		ICU Level of Service B	
Analysis Period (min) 15			

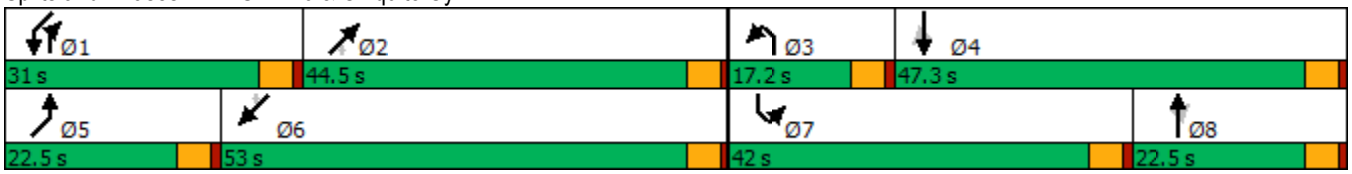
Splits and Phases: 10: I-5 NB Off-Ramp & Newhall Ranch Rd



Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	170	290	1050	480	150	30	40	990	140	180	1150	380
Future Volume (vph)	170	290	1050	480	150	30	40	990	140	180	1150	380
Satd. Flow (prot)	3433	3539	2787	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	2787	1770	1863	1583	1770	3539	1583	3433	3539	1583
Satd. Flow (RTOR)			82			117			152			321
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	305	1105	505	158	32	42	1042	147	189	1211	400
Shared Lane Traffic (%)												
Lane Group Flow (vph)	179	305	1105	505	158	32	42	1042	147	189	1211	400
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8	1	7	4		5	2		1	6	
Permitted Phases			8			4			2			6
Total Split (s)	17.2	22.5	31.0	42.0	47.3	47.3	22.5	44.5	44.5	31.0	53.0	53.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	11.6	16.2	47.2	37.5	42.1	42.1	8.7	40.0	40.0	26.5	57.8	57.8
Actuated g/C Ratio	0.08	0.12	0.34	0.27	0.30	0.30	0.06	0.29	0.29	0.19	0.42	0.42
v/c Ratio	0.62	0.74	1.10	1.05	0.28	0.06	0.38	1.02	0.26	0.29	0.82	0.47
Control Delay	71.3	70.1	99.0	103.6	38.4	0.2	71.7	80.8	6.3	49.5	41.7	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.3	70.1	99.0	103.6	38.4	0.2	71.7	80.8	6.3	49.5	41.7	8.3
LOS	E	E	F	F	D	A	E	F	A	D	D	A
Approach Delay		90.3			84.0			71.6			35.1	
Approach LOS		F			F			E			D	

Intersection Summary	
Cycle Length: 140	
Actuated Cycle Length: 138.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.10	
Intersection Signal Delay: 66.5	Intersection LOS: E
Intersection Capacity Utilization 101.9%	ICU Level of Service G
Analysis Period (min) 15	

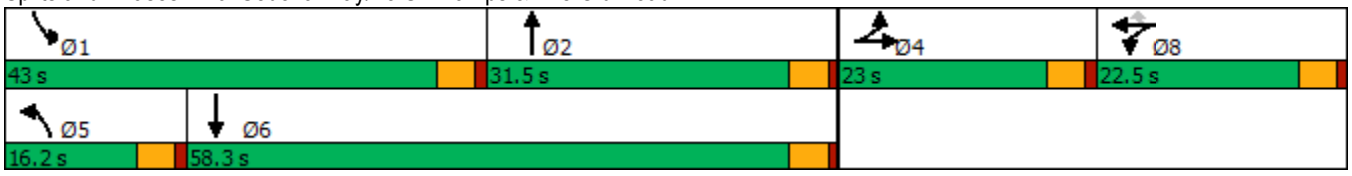
Splits and Phases: 1: SR-126 & Chiquito Cyn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	190	120	480	10	10	70	700	0	590	790	50
Future Volume (vph)	100	190	120	480	10	10	70	700	0	590	790	50
Satd. Flow (prot)	1770	1755	0	1681	1688	1583	1770	3539	0	1770	3507	0
Flt Permitted	0.950			0.950	0.954		0.950			0.950		
Satd. Flow (perm)	1770	1755	0	1681	1688	1583	1770	3539	0	1770	3507	0
Satd. Flow (RTOR)		22				136					7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	207	130	522	11	11	76	761	0	641	859	54
Shared Lane Traffic (%)				49%								
Lane Group Flow (vph)	109	337	0	266	267	11	76	761	0	641	913	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA		Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8						
Total Split (s)	23.0	23.0		22.5	22.5	22.5	16.2	31.5		43.0	58.3	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	18.5	18.5		18.0	18.0	18.0	9.8	27.0		38.5	57.9	
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.08	0.22		0.32	0.48	
v/c Ratio	0.40	1.17		1.06	1.06	0.03	0.53	0.96		1.13	0.54	
Control Delay	50.8	147.6		121.1	120.9	0.2	65.6	69.0		117.3	23.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	50.8	147.6		121.1	120.9	0.2	65.6	69.0		117.3	23.9	
LOS	D	F		F	F	A	E	E		F	C	
Approach Delay		123.9			118.6			68.7			62.4	
Approach LOS		F			F			E			E	

Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 120	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.17	
Intersection Signal Delay: 81.1	Intersection LOS: F
Intersection Capacity Utilization 97.9%	ICU Level of Service F
Analysis Period (min) 15	

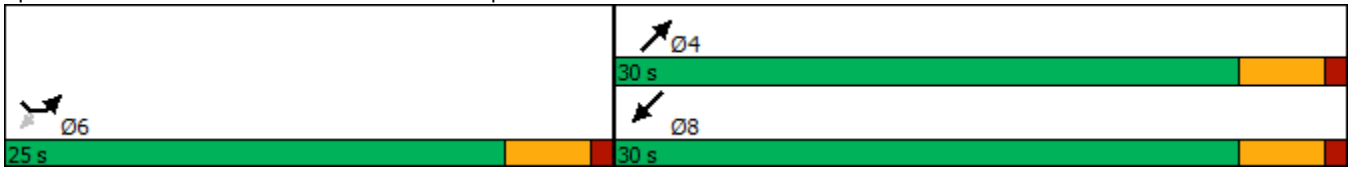
Splits and Phases: 6: Sedona Way/I-5 SB Ramps & The Old Road



Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	1000	570	0	1330	2470	0
Future Volume (vph)	1000	570	0	1330	2470	0
Satd. Flow (prot)	3433	2787	0	6408	6408	0
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	0	6408	6408	0
Satd. Flow (RTOR)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1087	620	0	1446	2685	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1087	620	0	1446	2685	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Perm		NA	NA	
Protected Phases	6			4	8	
Permitted Phases		6				
Total Split (s)	25.0	25.0		30.0	30.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	
Act Effct Green (s)	20.5	20.5		25.5	25.5	
Actuated g/C Ratio	0.37	0.37		0.46	0.46	
v/c Ratio	0.85	0.60		0.49	0.90	
Control Delay	24.4	16.9		10.9	19.6	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	24.4	16.9		10.9	19.6	
LOS	C	B		B	B	
Approach Delay	21.6			10.9	19.6	
Approach LOS	C			B	B	

Intersection Summary	
Cycle Length: 55	
Actuated Cycle Length: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.90	
Intersection Signal Delay: 18.0	Intersection LOS: B
Intersection Capacity Utilization 71.8%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 9: SR-126 & I-5 SB Off-Ramp



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2020	0	0	1740	1110	770
Future Volume (vph)	2020	0	0	1740	1110	770
Satd. Flow (prot)	6408	0	0	5085	4990	1583
Flt Permitted					0.950	
Satd. Flow (perm)	6408	0	0	5085	4990	1583
Satd. Flow (RTOR)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	2196	0	0	1891	1207	837
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2196	0	0	1891	1207	837
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Total Split (s)	34.0			34.0	46.0	46.0
Total Lost Time (s)	4.5			4.5	4.5	4.5
Act Effct Green (s)	29.5			29.5	41.5	41.5
Actuated g/C Ratio	0.37			0.37	0.52	0.52
v/c Ratio	0.93			1.01	0.47	1.02
Control Delay	33.0			49.4	13.0	58.1
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	33.0			49.4	13.0	58.1
LOS	C			D	B	E
Approach Delay	33.0			49.4	31.4	
Approach LOS	C			D	C	

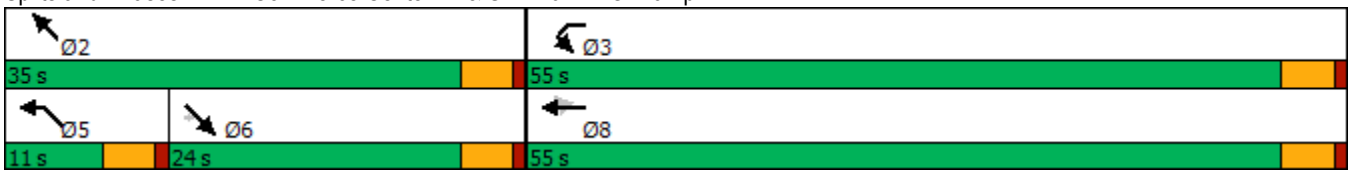
Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.02	
Intersection Signal Delay: 37.5	Intersection LOS: D
Intersection Capacity Utilization 84.4%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 10: I-5 NB Off-Ramp & Newhall Ranch Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	0	0	0	340	0	1400	0	680	130	180	1290	0
Future Volume (vph)	0	0	0	340	0	1400	0	680	130	180	1290	0
Satd. Flow (prot)	0	0	0	1681	1681	2787	0	5085	1583	3433	5085	0
Flt Permitted				0.950	0.950					0.950		
Satd. Flow (perm)	0	0	0	1681	1681	2787	0	5085	1583	3433	5085	0
Satd. Flow (RTOR)						73			141			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	370	0	1522	0	739	141	196	1402	0
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	185	185	1522	0	739	141	196	1402	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Prot	NA	Perm		NA	Perm	Prot	NA	
Protected Phases				3	8			6		5	2	
Permitted Phases						8			6			
Total Split (s)				55.0	55.0	55.0		24.0	24.0	11.0	35.0	
Total Lost Time (s)				4.5	4.5	4.5		4.5	4.5	4.5	4.5	
Act Effct Green (s)				50.5	50.5	50.5		19.5	19.5	6.5	30.5	
Actuated g/C Ratio				0.56	0.56	0.56		0.22	0.22	0.07	0.34	
v/c Ratio				0.20	0.20	0.95		0.67	0.31	0.79	0.81	
Control Delay				10.4	10.4	32.9		35.8	7.4	64.9	31.8	
Queue Delay				0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay				10.4	10.4	32.9		35.8	7.4	64.9	31.8	
LOS				B	B	C		D	A	E	C	
Approach Delay					28.5			31.3			35.9	
Approach LOS					C			C			D	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.95	
Intersection Signal Delay: 31.8	Intersection LOS: C
Intersection Capacity Utilization 81.4%	ICU Level of Service D
Analysis Period (min) 15	

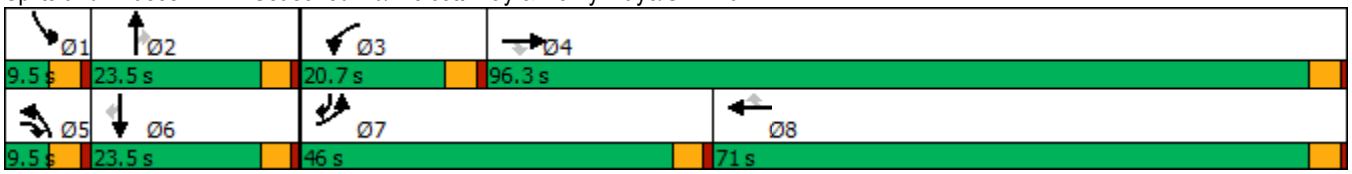
Splits and Phases: 11: Commerce Center Dr & SR-126 WB Off-ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	530	1970	10	320	1670	140	10	120	510	50	10	40
Future Volume (vph)	530	1970	10	320	1670	140	10	120	510	50	10	40
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	1770	1863	2787	1610	3275	1583
Flt Permitted	0.950			0.950			0.950			0.950	0.754	
Satd. Flow (perm)	1770	3539	1583	3433	3539	1583	1770	1863	2787	1610	2556	1583
Satd. Flow (RTOR)			44			130			316			44
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	2141	11	348	1815	152	11	130	554	54	11	43
Shared Lane Traffic (%)										50%		
Lane Group Flow (vph)	576	2141	11	348	1815	152	11	130	554	27	38	43
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8		5	2		1	6	7
Permitted Phases			4			8			2			6
Total Split (s)	46.0	96.3	9.5	20.7	71.0	71.0	9.5	23.5	23.5	9.5	23.5	46.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	41.5	91.8	101.3	16.2	66.5	66.5	5.0	17.3	17.3	5.0	24.1	67.2
Actuated g/C Ratio	0.28	0.62	0.68	0.11	0.45	0.45	0.03	0.12	0.12	0.03	0.16	0.45
v/c Ratio	1.16	0.98	0.01	0.93	1.14	0.19	0.18	0.60	0.92	0.50	0.18	0.06
Control Delay	140.7	42.2	0.0	96.7	110.6	6.2	77.7	74.3	48.6	101.0	52.1	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	140.7	42.2	0.0	96.7	110.6	6.2	77.7	74.3	48.6	101.0	52.1	6.6
LOS	F	D	A	F	F	A	E	E	D	F	D	A
Approach Delay		62.9			101.7			53.9			46.2	
Approach LOS		E			F			D			D	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 148.3	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.16	
Intersection Signal Delay: 76.9	Intersection LOS: E
Intersection Capacity Utilization 94.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 14: Seasoned Rd/Wolcott Way & Henry Mayo/SR-126



Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	170	200	250	480	310	80	50	1180	210	990	1190	480
Future Volume (vph)	170	200	250	480	310	80	50	1180	210	990	1190	480
Satd. Flow (prot)	3433	3539	2787	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	2787	1770	1863	1583	1770	3539	1583	3433	3539	1583
Satd. Flow (RTOR)			76			109			142			388
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	211	263	505	326	84	53	1242	221	1042	1253	505
Shared Lane Traffic (%)												
Lane Group Flow (vph)	179	211	263	505	326	84	53	1242	221	1042	1253	505
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8	1	7	4		5	2		1	6	
Permitted Phases			8			4			2			6
Total Split (s)	17.0	23.5	39.0	40.0	46.5	46.5	24.4	47.5	47.5	39.0	62.1	62.1
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	11.6	13.9	52.9	35.5	37.8	37.8	9.7	43.0	43.0	34.5	67.8	67.8
Actuated g/C Ratio	0.08	0.10	0.36	0.24	0.26	0.26	0.07	0.30	0.30	0.24	0.47	0.47
v/c Ratio	0.65	0.62	0.25	1.17	0.67	0.17	0.45	1.18	0.39	1.28	0.76	0.53
Control Delay	76.6	71.3	22.9	144.6	55.9	3.9	76.8	136.4	17.0	177.6	36.3	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	76.6	71.3	22.9	144.6	55.9	3.9	76.8	136.4	17.0	177.6	36.3	8.6
LOS	E	E	C	F	E	A	E	F	B	F	D	A
Approach Delay		53.2			100.1			116.9			83.9	
Approach LOS		D			F			F			F	

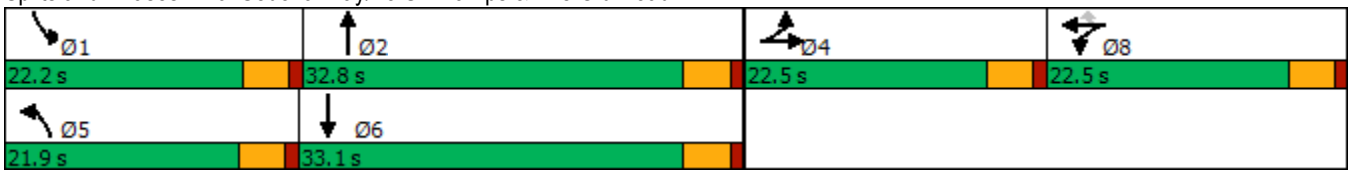
Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 145	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.28	
Intersection Signal Delay: 91.5	Intersection LOS: F
Intersection Capacity Utilization 108.0%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 1: SR-126 & Chiquito Cyn

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	100	60	220	20	10	150	930	10	290	320	40
Future Volume (vph)	80	100	60	220	20	10	150	930	10	290	320	40
Satd. Flow (prot)	1770	1758	0	1681	1699	1583	1770	3532	0	1770	3483	0
Flt Permitted	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (perm)	1770	1758	0	1681	1699	1583	1770	3532	0	1770	3483	0
Satd. Flow (RTOR)		26				115		1			13	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	109	65	239	22	11	163	1011	11	315	348	43
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	87	174	0	129	132	11	163	1022	0	315	391	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA		Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8						
Total Split (s)	22.5	22.5		22.5	22.5	22.5	21.9	32.8		22.2	33.1	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	12.7	12.7		12.4	12.4	12.4	13.0	28.5		17.8	33.3	
Actuated g/C Ratio	0.14	0.14		0.14	0.14	0.14	0.15	0.32		0.20	0.37	
v/c Ratio	0.35	0.64		0.56	0.56	0.03	0.63	0.91		0.89	0.30	
Control Delay	39.3	42.6		46.0	46.2	0.2	48.3	43.7		65.7	22.4	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	39.3	42.6		46.0	46.2	0.2	48.3	43.7		65.7	22.4	
LOS	D	D		D	D	A	D	D		E	C	
Approach Delay		41.5			44.2			44.3			41.7	
Approach LOS		D			D			D			D	

Intersection Summary	
Cycle Length: 100	
Actuated Cycle Length: 89.5	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.91	
Intersection Signal Delay: 43.3	Intersection LOS: D
Intersection Capacity Utilization 72.6%	ICU Level of Service C
Analysis Period (min) 15	

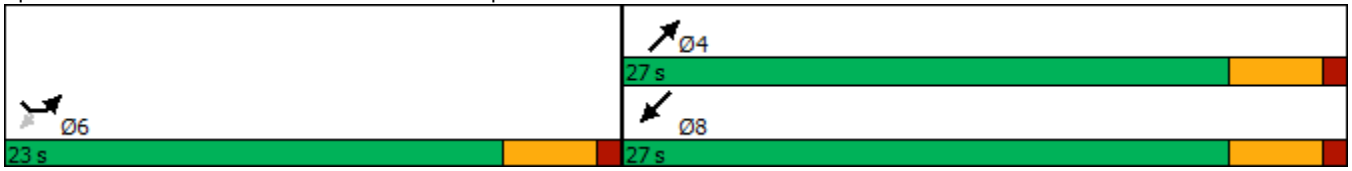
Splits and Phases: 6: Sedona Way/I-5 SB Ramps & The Old Road



Lane Group	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	790	180	0	2250	1690	0
Future Volume (vph)	790	180	0	2250	1690	0
Satd. Flow (prot)	3433	2787	0	6408	6408	0
Flt Permitted	0.950					
Satd. Flow (perm)	3433	2787	0	6408	6408	0
Satd. Flow (RTOR)		7				
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	859	196	0	2446	1837	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	859	196	0	2446	1837	0
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	24			0	0	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	15			9
Turn Type	Prot	Perm		NA	NA	
Protected Phases	6			4	8	
Permitted Phases		6				
Total Split (s)	23.0	23.0		27.0	27.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	
Act Effct Green (s)	18.5	18.5		22.5	22.5	
Actuated g/C Ratio	0.37	0.37		0.45	0.45	
v/c Ratio	0.68	0.19		0.85	0.64	
Control Delay	16.5	10.9		16.1	11.9	
Queue Delay	0.0	0.0		0.0	0.0	
Total Delay	16.5	10.9		16.1	11.9	
LOS	B	B		B	B	
Approach Delay	15.5			16.1	11.9	
Approach LOS	B			B	B	

Intersection Summary	
Cycle Length: 50	
Actuated Cycle Length: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.85	
Intersection Signal Delay: 14.5	Intersection LOS: B
Intersection Capacity Utilization 62.6%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 9: SR-126 & I-5 SB Off-Ramp



Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	2410	0	0	1370	720	850
Future Volume (vph)	2410	0	0	1370	720	850
Satd. Flow (prot)	6408	0	0	5085	4990	1583
Flt Permitted					0.950	
Satd. Flow (perm)	6408	0	0	5085	4990	1583
Satd. Flow (RTOR)						
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2537	0	0	1442	758	895
Shared Lane Traffic (%)						
Lane Group Flow (vph)	2537	0	0	1442	758	895
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	0			0	36	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	16			16	16	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Total Split (s)	38.0			38.0	52.0	52.0
Total Lost Time (s)	4.5			4.5	4.5	4.5
Act Effct Green (s)	33.5			33.5	47.5	47.5
Actuated g/C Ratio	0.37			0.37	0.53	0.53
v/c Ratio	1.06			0.76	0.29	1.07
Control Delay	66.8			28.0	12.2	75.5
Queue Delay	0.0			0.0	0.0	0.0
Total Delay	66.8			28.0	12.2	75.5
LOS	E			C	B	E
Approach Delay	66.8			28.0	46.5	
Approach LOS	E			C	D	

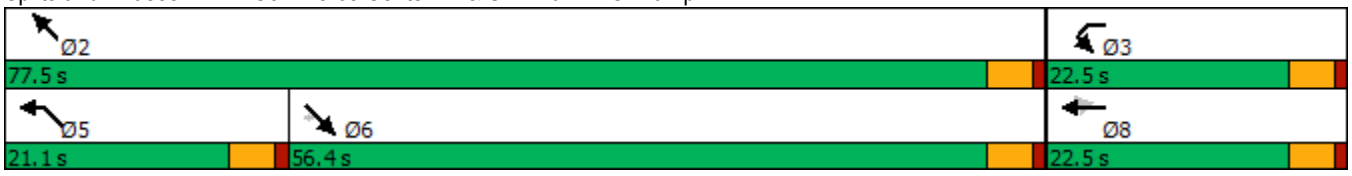
Intersection Summary			
Cycle Length: 90			
Actuated Cycle Length: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.07			
Intersection Signal Delay: 50.9		Intersection LOS: D	
Intersection Capacity Utilization 95.1%		ICU Level of Service F	
Analysis Period (min) 15			

Splits and Phases: 10: I-5 NB Off-Ramp & Newhall Ranch Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	SEL	SET	SER	NWL	NWT	NWR
Lane Configurations												
Traffic Volume (vph)	0	0	0	310	0	580	0	2380	450	520	630	0
Future Volume (vph)	0	0	0	310	0	580	0	2380	450	520	630	0
Satd. Flow (prot)	0	0	0	1681	1681	2787	0	5085	1583	3433	5085	0
Flt Permitted				0.950	0.950					0.950		
Satd. Flow (perm)	0	0	0	1681	1681	2787	0	5085	1583	3433	5085	0
Satd. Flow (RTOR)						569			425			
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	337	0	630	0	2587	489	565	685	0
Shared Lane Traffic (%)				50%								
Lane Group Flow (vph)	0	0	0	168	169	630	0	2587	489	565	685	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type				Prot	NA	Perm		NA	Perm	Prot	NA	
Protected Phases				3	8			6		5	2	
Permitted Phases						8			6			
Total Split (s)				22.5	22.5	22.5		56.4	56.4	21.1	77.5	
Total Lost Time (s)				4.5	4.5	4.5		4.5	4.5	4.5	4.5	
Act Effct Green (s)				18.0	18.0	18.0		51.9	51.9	16.6	73.0	
Actuated g/C Ratio				0.18	0.18	0.18		0.52	0.52	0.17	0.73	
v/c Ratio				0.56	0.56	0.65		0.98	0.48	0.99	0.18	
Control Delay				45.3	45.4	8.7		37.7	4.0	78.8	4.3	
Queue Delay				0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay				45.3	45.4	8.7		37.7	4.0	78.8	4.3	
LOS				D	D	A		D	A	E	A	
Approach Delay					21.5			32.3			38.0	
Approach LOS					C			C			D	

Intersection Summary		
Cycle Length: 100		
Actuated Cycle Length: 100		
Control Type: Actuated-Uncoordinated		
Maximum v/c Ratio: 0.99		
Intersection Signal Delay: 31.7	Intersection LOS: C	
Intersection Capacity Utilization 80.7%	ICU Level of Service D	
Analysis Period (min) 15		

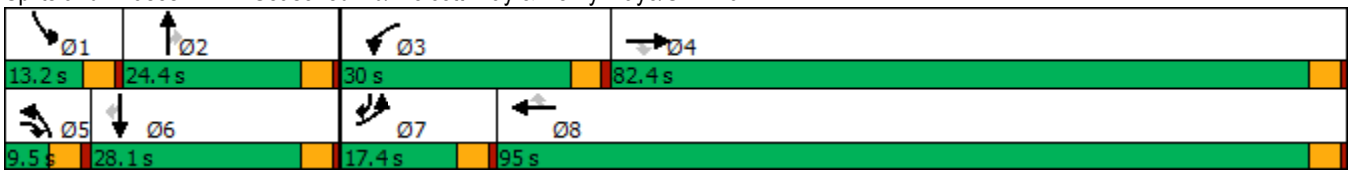
Splits and Phases: 11: Commerce Center Dr & SR-126 WB Off-ramp



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	1820	20	590	2230	60	10	30	440	170	100	420
Future Volume (vph)	80	1820	20	590	2230	60	10	30	440	170	100	420
Satd. Flow (prot)	1770	3539	1583	3433	3539	1583	1770	1863	2787	1610	3316	1583
Flt Permitted	0.950			0.950			0.950			0.950	0.732	
Satd. Flow (perm)	1770	3539	1583	3433	3539	1583	1770	1863	2787	1610	2482	1583
Satd. Flow (RTOR)			76			76			400			76
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	83	1896	21	615	2323	63	10	31	458	177	104	438
Shared Lane Traffic (%)										48%		
Lane Group Flow (vph)	83	1896	21	615	2323	63	10	31	458	92	189	438
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8		5	2		1	6	7
Permitted Phases			4			8			2			6
Total Split (s)	17.4	82.4	9.5	30.0	95.0	95.0	9.5	24.4	24.4	13.2	28.1	17.4
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	12.2	78.0	87.5	25.5	91.3	91.3	5.0	16.0	16.0	8.7	28.7	40.4
Actuated g/C Ratio	0.08	0.53	0.60	0.17	0.62	0.62	0.03	0.11	0.11	0.06	0.20	0.28
v/c Ratio	0.56	1.00	0.02	1.03	1.05	0.06	0.17	0.15	0.69	0.97	0.65	0.89
Control Delay	80.2	55.9	0.1	101.9	62.0	1.8	76.7	59.9	15.5	150.1	60.6	63.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.2	55.9	0.1	101.9	62.0	1.8	76.7	59.9	15.5	150.1	60.6	63.4
LOS	F	E	A	F	E	A	E	E	B	F	E	E
Approach Delay		56.3			68.9			19.5			73.7	
Approach LOS		E			E			B			E	

Intersection Summary	
Cycle Length: 150	
Actuated Cycle Length: 146.2	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.05	
Intersection Signal Delay: 61.5	Intersection LOS: E
Intersection Capacity Utilization 103.1%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 14: Seasoned Rd/Wolcott Way & Henry Mayo/SR-126

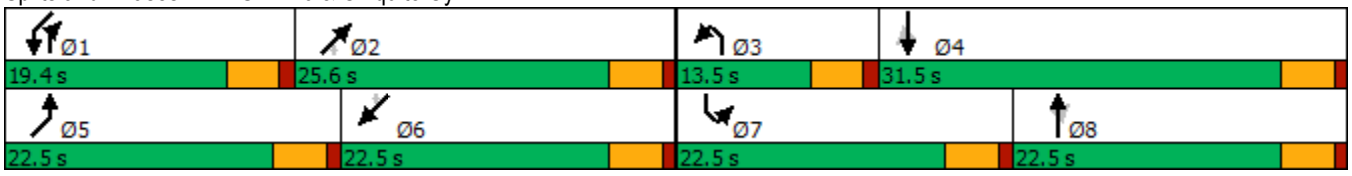


Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	170	290	1050	480	150	30	40	990	140	180	1150	380
Future Volume (vph)	170	290	1050	480	150	30	40	990	140	180	1150	380
Satd. Flow (prot)	3433	3539	2787	3433	5085	1583	3433	5085	1583	3433	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	2787	3433	5085	1583	3433	5085	1583	3433	5085	1583
Satd. Flow (RTOR)			127			127			182			400
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	305	1105	505	158	32	42	1042	147	189	1211	400
Shared Lane Traffic (%)												
Lane Group Flow (vph)	179	305	1105	505	158	32	42	1042	147	189	1211	400
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8	1	7	4		5	2		1	6	
Permitted Phases			8			4			2			6
Total Split (s)	13.5	22.5	19.4	22.5	31.5	31.5	22.5	25.6	25.6	19.4	22.5	22.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	8.5	12.3	31.9	16.0	19.9	19.9	6.5	20.5	20.5	15.0	29.0	29.0
Actuated g/C Ratio	0.10	0.15	0.39	0.20	0.24	0.24	0.08	0.25	0.25	0.18	0.35	0.35
v/c Ratio	0.51	0.57	0.95	0.75	0.13	0.07	0.15	0.82	0.28	0.30	0.67	0.49
Control Delay	41.2	37.2	40.0	39.4	24.3	0.3	38.1	36.0	3.9	31.9	25.5	4.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	41.2	37.2	40.0	39.4	24.3	0.3	38.1	36.0	3.9	31.9	25.5	4.7
LOS	D	D	D	D	C	A	D	D	A	C	C	A
Approach Delay		39.6			34.2			32.3			21.6	
Approach LOS		D			C			C			C	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 81.9
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 31.1 — Intersection LOS: C
Intersection Capacity Utilization 80.8% — ICU Level of Service D
Analysis Period (min) 15

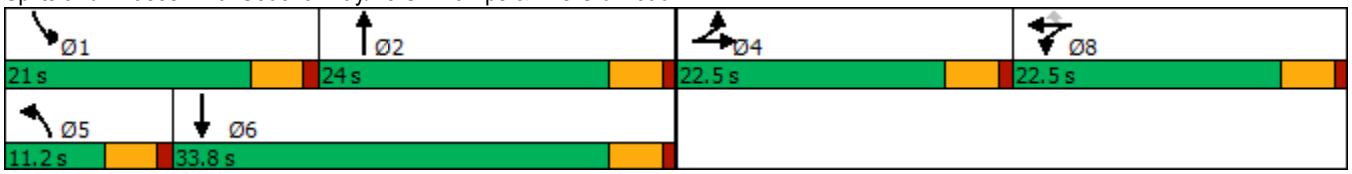
Splits and Phases: 1: SR-126 & Chiquito Cyn



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	190	120	480	10	10	70	700	0	590	790	50
Future Volume (vph)	100	190	120	480	10	10	70	700	0	590	790	50
Satd. Flow (prot)	1770	1755	0	1681	1688	1583	1770	3539	0	3433	3507	0
Flt Permitted	0.950			0.950	0.954		0.950			0.950		
Satd. Flow (perm)	1770	1755	0	1681	1688	1583	1770	3539	0	3433	3507	0
Satd. Flow (RTOR)		31				182					8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	207	130	522	11	11	76	761	0	641	859	54
Shared Lane Traffic (%)				49%								
Lane Group Flow (vph)	109	337	0	266	267	11	76	761	0	641	913	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA		Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8						
Total Split (s)	22.5	22.5		22.5	22.5	22.5	11.2	24.0		21.0	33.8	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	17.4	17.4		16.9	16.9	16.9	6.5	19.5		16.5	31.8	
Actuated g/C Ratio	0.20	0.20		0.19	0.19	0.19	0.07	0.22		0.19	0.36	
v/c Ratio	0.31	0.91		0.83	0.83	0.02	0.58	0.97		1.00	0.72	
Control Delay	33.6	62.3		57.2	57.1	0.1	59.4	62.4		73.3	29.6	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	33.6	62.3		57.2	57.1	0.1	59.4	62.4		73.3	29.6	
LOS	C	E		E	E	A	E	E		E	C	
Approach Delay		55.3			56.0			62.1			47.6	
Approach LOS		E			E			E			D	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 88.4	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 1.00	
Intersection Signal Delay: 53.6	Intersection LOS: D
Intersection Capacity Utilization 82.1%	ICU Level of Service E
Analysis Period (min) 15	

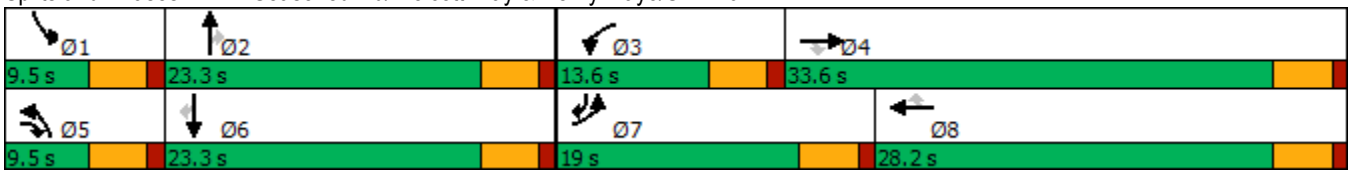
Splits and Phases: 6: Sedona Way/I-5 SB Ramps & The Old Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	530	1970	10	320	1670	140	10	120	510	50	10	40
Future Volume (vph)	530	1970	10	320	1670	140	10	120	510	50	10	40
Satd. Flow (prot)	3433	6408	1583	3433	6408	1583	1770	1863	2787	3433	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	6408	1583	3433	6408	1583	1770	1863	2787	3433	1863	1583
Satd. Flow (RTOR)			82			205			533			82
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	576	2141	11	348	1815	152	11	130	554	54	11	43
Shared Lane Traffic (%)												
Lane Group Flow (vph)	576	2141	11	348	1815	152	11	130	554	54	11	43
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8		5	2		1	6	7
Permitted Phases			4			8			2			6
Total Split (s)	19.0	33.6	9.5	13.6	28.2	28.2	9.5	23.3	23.3	9.5	23.3	19.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	14.6	29.2	38.7	9.1	23.8	23.8	5.0	13.6	13.6	5.0	19.5	38.6
Actuated g/C Ratio	0.19	0.39	0.52	0.12	0.32	0.32	0.07	0.18	0.18	0.07	0.26	0.51
v/c Ratio	0.86	0.86	0.01	0.83	0.89	0.24	0.09	0.39	0.59	0.24	0.02	0.05
Control Delay	45.7	26.3	0.0	52.4	32.4	2.3	36.8	30.0	5.9	37.3	23.1	0.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	45.7	26.3	0.0	52.4	32.4	2.3	36.8	30.0	5.9	37.3	23.1	0.9
LOS	D	C	A	D	C	A	D	C	A	D	C	A
Approach Delay		30.3			33.4			10.9			21.4	
Approach LOS		C			C			B			C	

Intersection Summary	
Cycle Length: 80	
Actuated Cycle Length: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 29.0	Intersection LOS: C
Intersection Capacity Utilization 61.8%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 14: Seasoned Rd/Wolcott Way & Henry Mayo/SR-126



Lane Group	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	170	200	250	480	310	80	50	1180	210	990	1190	480
Future Volume (vph)	170	200	250	480	310	80	50	1180	210	990	1190	480
Satd. Flow (prot)	3433	3539	2787	3433	5085	1583	3433	5085	1583	3433	5085	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3539	2787	3433	5085	1583	3433	5085	1583	3433	5085	1583
Satd. Flow (RTOR)			95			136			215			505
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	211	263	505	326	84	53	1242	221	1042	1253	505
Shared Lane Traffic (%)												
Lane Group Flow (vph)	179	211	263	505	326	84	53	1242	221	1042	1253	505
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	3	8	1	7	4		5	2		1	6	
Permitted Phases			8			4			2			6
Total Split (s)	15.8	22.5	40.1	22.5	29.2	29.2	22.5	34.9	34.9	40.1	52.5	52.5
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	10.3	12.1	52.2	18.0	19.8	19.8	7.2	30.4	30.4	35.6	58.8	58.8
Actuated g/C Ratio	0.09	0.11	0.46	0.16	0.17	0.17	0.06	0.27	0.27	0.31	0.52	0.52
v/c Ratio	0.58	0.56	0.20	0.93	0.37	0.22	0.25	0.92	0.38	0.97	0.48	0.48
Control Delay	57.8	54.5	11.8	73.4	43.1	2.5	54.0	52.4	7.1	61.1	18.9	3.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.8	54.5	11.8	73.4	43.1	2.5	54.0	52.4	7.1	61.1	18.9	3.1
LOS	E	D	B	E	D	A	D	D	A	E	B	A
Approach Delay		38.2			56.1			45.9			31.8	
Approach LOS		D			E			D			C	

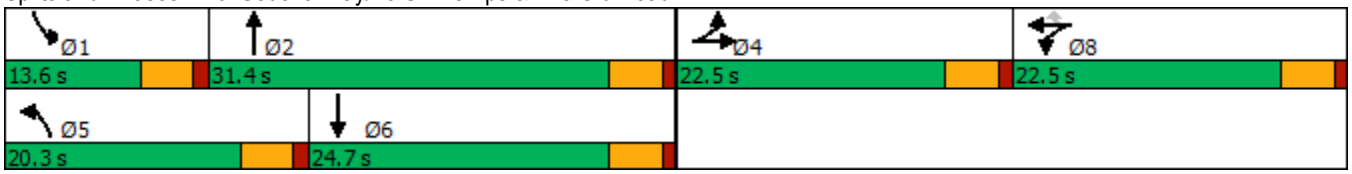
Intersection Summary	
Cycle Length: 120	
Actuated Cycle Length: 114.1	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.97	
Intersection Signal Delay: 39.9	Intersection LOS: D
Intersection Capacity Utilization 85.3%	ICU Level of Service E
Analysis Period (min) 15	

Splits and Phases: 1: SR-126 & Chiquito Cyn

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	100	60	220	20	10	150	930	10	290	320	40
Future Volume (vph)	80	100	60	220	20	10	150	930	10	290	320	40
Satd. Flow (prot)	1770	1758	0	1681	1699	1583	1770	3532	0	3433	3483	0
Flt Permitted	0.950			0.950	0.960		0.950			0.950		
Satd. Flow (perm)	1770	1758	0	1681	1699	1583	1770	3532	0	3433	3483	0
Satd. Flow (RTOR)		30				182		1			14	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	109	65	239	22	11	163	1011	11	315	348	43
Shared Lane Traffic (%)				46%								
Lane Group Flow (vph)	87	174	0	129	132	11	163	1022	0	315	391	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Split	NA		Split	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8						
Total Split (s)	22.5	22.5		22.5	22.5	22.5	20.3	31.4		13.6	24.7	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Act Effct Green (s)	11.8	11.8		11.7	11.7	11.7	11.9	27.2		9.2	24.4	
Actuated g/C Ratio	0.15	0.15		0.15	0.15	0.15	0.15	0.35		0.12	0.31	
v/c Ratio	0.33	0.60		0.51	0.52	0.03	0.60	0.83		0.78	0.36	
Control Delay	33.6	34.9		38.6	38.7	0.1	41.7	32.2		50.1	23.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	33.6	34.9		38.6	38.7	0.1	41.7	32.2		50.1	23.7	
LOS	C	C		D	D	A	D	C		D	C	
Approach Delay		34.5			37.1			33.5			35.5	
Approach LOS		C			D			C			D	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 78	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 34.6	Intersection LOS: C
Intersection Capacity Utilization 64.8%	ICU Level of Service C
Analysis Period (min) 15	

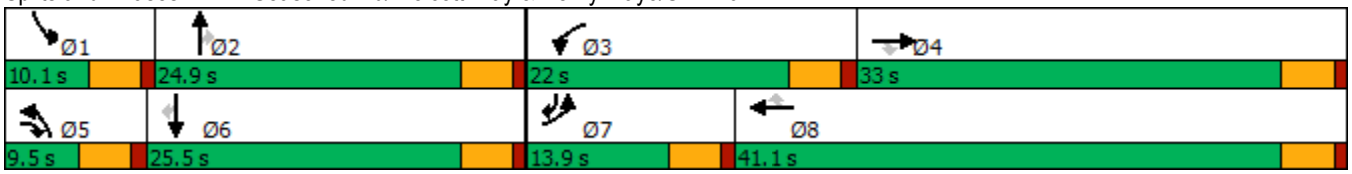
Splits and Phases: 6: Sedona Way/I-5 SB Ramps & The Old Road



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	80	1820	20	590	2230	60	10	30	440	170	100	420
Future Volume (vph)	80	1820	20	590	2230	60	10	30	440	170	100	420
Satd. Flow (prot)	3433	6408	1583	3433	6408	1583	1770	1863	2787	3433	1863	1583
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	6408	1583	3433	6408	1583	1770	1863	2787	3433	1863	1583
Satd. Flow (RTOR)			127			127			458			127
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	83	1896	21	615	2323	63	10	31	458	177	104	438
Shared Lane Traffic (%)												
Lane Group Flow (vph)	83	1896	21	615	2323	63	10	31	458	177	104	438
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pm+ov	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	pm+ov
Protected Phases	7	4	5	3	8		5	2		1	6	7
Permitted Phases			4			8			2			6
Total Split (s)	13.9	33.0	9.5	22.0	41.1	41.1	9.5	24.9	24.9	10.1	25.5	13.9
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Act Effct Green (s)	7.5	28.6	38.1	17.3	38.4	38.4	5.0	16.4	16.4	5.6	21.1	33.1
Actuated g/C Ratio	0.09	0.33	0.44	0.20	0.45	0.45	0.06	0.19	0.19	0.07	0.25	0.38
v/c Ratio	0.28	0.89	0.03	0.89	0.81	0.08	0.10	0.09	0.51	0.79	0.23	0.64
Control Delay	39.9	34.4	0.1	51.2	24.5	0.2	42.6	28.4	5.1	66.5	28.9	20.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.9	34.4	0.1	51.2	24.5	0.2	42.6	28.4	5.1	66.5	28.9	20.3
LOS	D	C	A	D	C	A	D	C	A	E	C	C
Approach Delay		34.3			29.5			7.3			32.9	
Approach LOS		C			C			A			C	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 86	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 29.6	Intersection LOS: C
Intersection Capacity Utilization 73.7%	ICU Level of Service D
Analysis Period (min) 15	

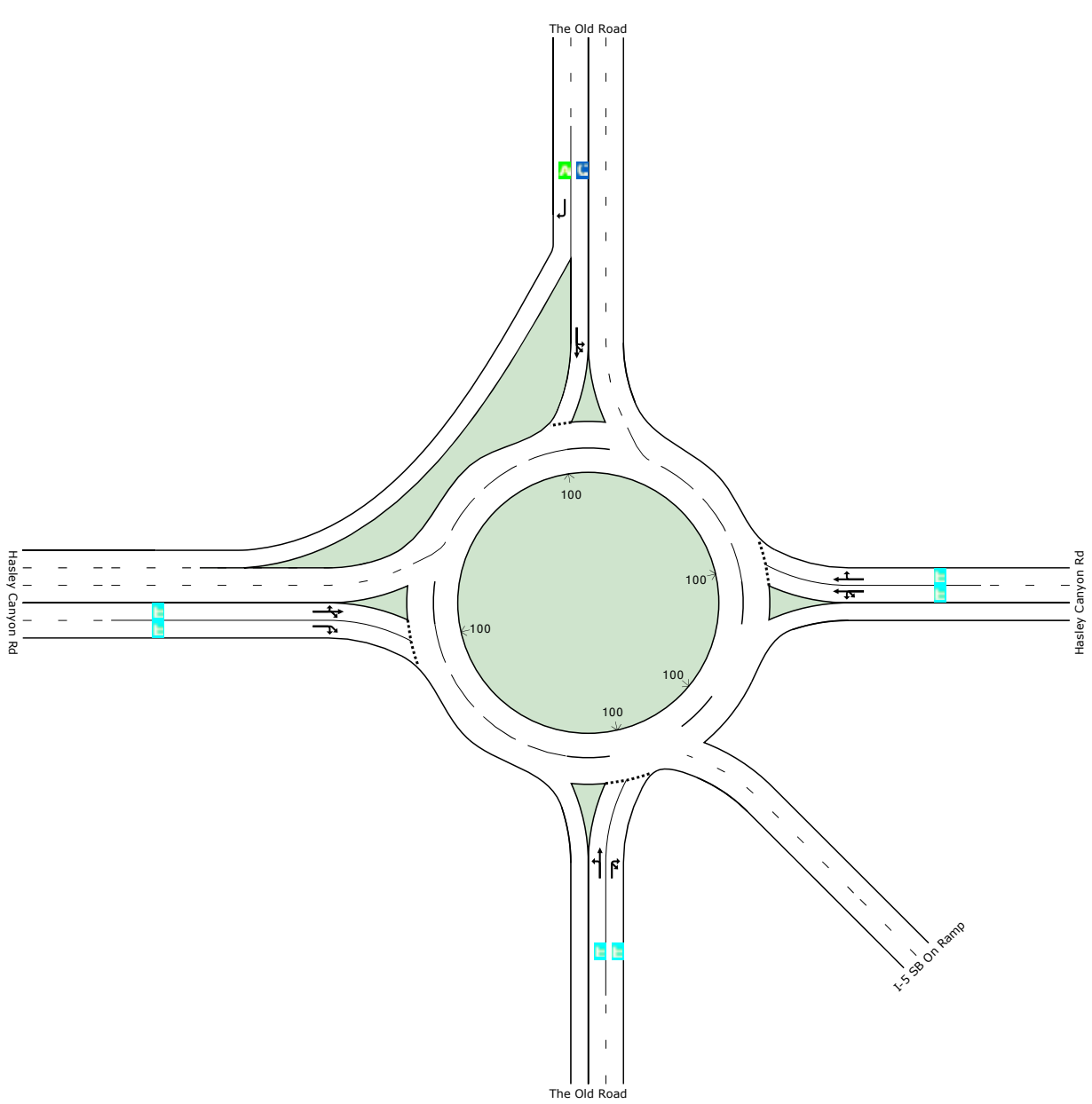
Splits and Phases: 14: Seasoned Rd/Wolcott Way & Henry Mayo/SR-126



LEVEL OF SERVICE

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Existing - AM

New Site
Roundabout



	South	East	North	West	Intersection
LOS	B	B	B	B	B

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

INTERSECTION SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Existing - AM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3097	veh/h	3716	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.726			
Practical Spare Capacity	17.1	%		
Effective Intersection Capacity	4266	veh/h		
Control Delay (Total)	13.64	veh-h/h	16.37	pers-h/h
Control Delay (Average)	15.9	sec	15.9	sec
Control Delay (Worst Lane)	27.7	sec		
Control Delay (Worst Movement)	27.7	sec	27.7	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	15.9	sec		
Idling Time (Average)	11.6	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	4.6	veh		
95% Back of Queue - Distance (Worst Lane)	117.8	ft		
Queue Storage Ratio (Worst Lane)	0.35			
Total Effective Stops	1851	veh/h	2221	pers/h
Effective Stop Rate	0.60	per veh	0.60	per pers
Proportion Queued	0.58		0.58	
Performance Index	76.4		76.4	
Travel Distance (Total)	643.9	veh-mi/h	772.7	pers-mi/h
Travel Distance (Average)	1098	ft	1098	ft
Travel Time (Total)	36.1	veh-h/h	43.3	pers-h/h
Travel Time (Average)	42.0	sec	42.0	sec
Travel Speed	17.8	mph	17.8	mph
Cost (Total)	623.40	$/h	623.40	$/h
Fuel Consumption (Total)	24.9	gal/h		
Carbon Dioxide (Total)	222.1	kg/h		
Hydrocarbons (Total)	0.095	kg/h		
Carbon Monoxide (Total)	0.662	kg/h		
NOx (Total)	0.563	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,486,481	veh/y	1,783,777	pers/y
Delay	6,549	veh-h/y	7,859	pers-h/y
Effective Stops	888,321	veh/y	1,065,985	pers/y
Travel Distance	309,064	veh-mi/y	370,876	pers-mi/y
Travel Time	17,330	veh-h/y	20,795	pers-h/y
Cost	299,233	$/y	299,233	$/y
Fuel Consumption	11,941	gal/y		
Carbon Dioxide	106,608	kg/y		
Hydrocarbons	46	kg/y		
Carbon Monoxide	318	kg/y		
NOx	270	kg/y		

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MOVEMENT SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Existing - AM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: The Old Road											
3	L2	61	3.0	0.283	11.0	LOS B	0.8	21.3	0.61	1.23	22.9
8	T1	86	3.0	0.283	11.0	LOS B	0.8	21.3	0.61	1.23	22.9
18	R2	27	3.0	0.275	10.4	LOS B	0.8	19.7	0.58	1.17	23.2
18b	R3	123	3.0	0.275	10.4	LOS B	0.8	19.7	0.58	1.17	23.2
Approach		297	3.0	0.283	10.7	LOS B	0.8	21.3	0.59	0.60	23.1
East: Hasley Canyon Rd											
1b	L3	10	3.0	0.689	15.9	LOS B	4.6	117.8	0.59	1.11	17.0
1	L2	224	3.0	0.689	15.9	LOS B	4.6	117.8	0.59	1.11	17.0
6	T1	803	3.0	0.689	15.8	LOS B	4.6	117.8	0.57	1.09	17.2
16	R2	205	3.0	0.689	15.7	LOS B	4.4	111.7	0.56	1.06	17.4
Approach		1242	3.0	0.689	15.8	LOS B	4.6	117.8	0.57	0.54	17.2
North: The Old Road											
7	L2	25	3.0	0.726	27.7	LOS C	3.4	87.4	0.80	1.82	13.2
7a	L1	146	3.0	0.726	27.7	LOS C	3.4	87.4	0.80	1.82	13.2
4	T1	190	3.0	0.726	27.7	LOS C	3.4	87.4	0.80	1.82	13.2
14	R2	273	3.0	0.168	0.0	LOS A	0.0	0.0	0.00	0.00	29.0
Approach		634	3.0	0.726	15.8	LOS B	3.4	87.4	0.46	0.52	17.0
West: Hasley Canyon Rd											
5	L2	117	3.0	0.656	17.8	LOS B	3.5	89.4	0.68	1.48	17.2
2	T1	57	3.0	0.656	17.8	LOS B	3.5	89.4	0.68	1.48	17.2
12a	R1	613	3.0	0.656	17.6	LOS B	3.5	89.4	0.66	1.45	17.5
12	R2	137	3.0	0.656	17.4	LOS B	3.4	85.8	0.65	1.42	17.6
Approach		924	3.0	0.656	17.6	LOS B	3.5	89.4	0.66	0.72	17.4
All Vehicles		3097	3.0	0.726	15.9	LOS B	4.6	117.8	0.58	0.60	17.8

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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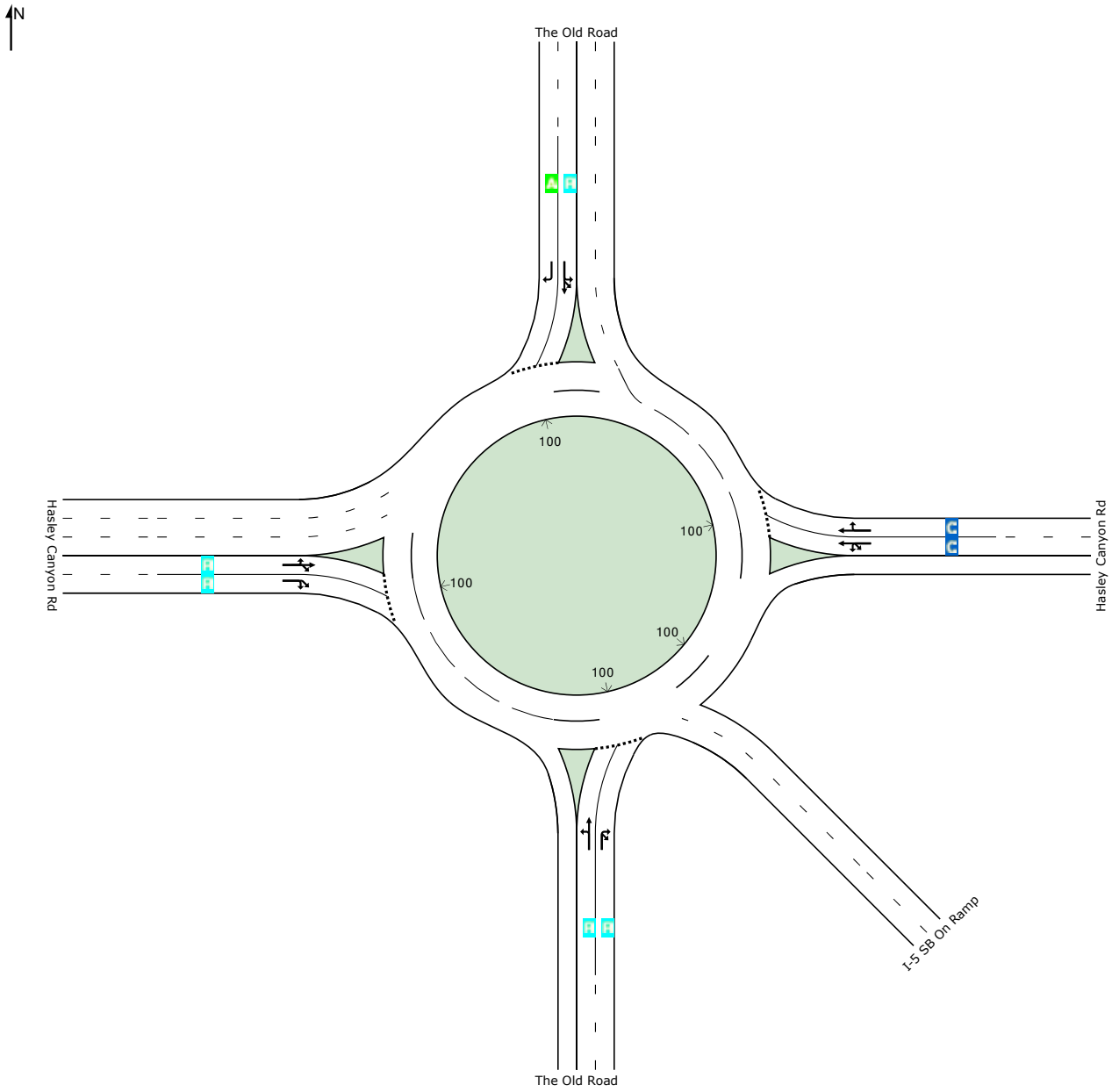
LEVEL OF SERVICE

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Existing - PM

New Site
Roundabout



	South	East	North	West	Intersection
LOS	B	C	B	B	B

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

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INTERSECTION SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Existing - PM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3237	veh/h	3884	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.788			
Practical Spare Capacity	7.9	%		
Effective Intersection Capacity	4107	veh/h		
Control Delay (Total)	16.57	veh-h/h	19.88	pers-h/h
Control Delay (Average)	18.4	sec	18.4	sec
Control Delay (Worst Lane)	21.9	sec		
Control Delay (Worst Movement)	21.9	sec	21.9	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	18.4	sec		
Idling Time (Average)	13.3	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	6.7	veh		
95% Back of Queue - Distance (Worst Lane)	170.5	ft		
Queue Storage Ratio (Worst Lane)	0.50			
Total Effective Stops	2356	veh/h	2828	pers/h
Effective Stop Rate	0.73	per veh	0.73	per pers
Proportion Queued	0.68		0.68	
Performance Index	90.3		90.3	
Travel Distance (Total)	674.5	veh-mi/h	809.4	pers-mi/h
Travel Distance (Average)	1100	ft	1100	ft
Travel Time (Total)	39.9	veh-h/h	47.9	pers-h/h
Travel Time (Average)	44.4	sec	44.4	sec
Travel Speed	16.9	mph	16.9	mph
Cost (Total)	682.97	$/h	682.97	$/h
Fuel Consumption (Total)	26.8	gal/h		
Carbon Dioxide (Total)	239.1	kg/h		
Hydrocarbons (Total)	0.105	kg/h		
Carbon Monoxide (Total)	0.717	kg/h		
NOx (Total)	0.596	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,553,739	veh/y	1,864,487	pers/y
Delay	7,952	veh-h/y	9,543	pers-h/y
Effective Stops	1,131,085	veh/y	1,357,302	pers/y
Travel Distance	323,764	veh-mi/y	388,517	pers-mi/y
Travel Time	19,146	veh-h/y	22,975	pers-h/y
Cost	327,824	$/y	327,824	$/y
Fuel Consumption	12,855	gal/y		
Carbon Dioxide	114,763	kg/y		
Hydrocarbons	50	kg/y		
Carbon Monoxide	344	kg/y		
NOx	286	kg/y		

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MOVEMENT SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Existing - PM

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: The Old Road											
3	L2	53	3.0	0.424	15.4	LOS B	1.4	34.6	0.70	1.46	21.2
8	T1	145	3.0	0.424	15.4	LOS B	1.4	34.6	0.70	1.46	21.2
18	R2	50	3.0	0.319	13.6	LOS B	1.0	24.4	0.68	1.41	21.8
18b	R3	90	3.0	0.319	13.6	LOS B	1.0	24.4	0.68	1.41	21.8
Approach		338	3.0	0.424	14.6	LOS B	1.4	34.6	0.69	0.72	21.4
East: Hasley Canyon Rd											
1b	L3	4	3.0	0.788	21.9	LOS C	6.7	170.5	0.74	1.60	15.0
1	L2	122	3.0	0.788	21.9	LOS C	6.7	170.5	0.74	1.60	15.0
6	T1	654	3.0	0.788	21.9	LOS C	6.7	170.5	0.73	1.59	15.0
16	R2	571	3.0	0.788	21.7	LOS C	6.4	162.6	0.71	1.53	14.9
Approach		1351	3.0	0.788	21.8	LOS C	6.7	170.5	0.72	0.78	14.9
North: The Old Road											
7	L2	46	3.0	0.463	13.3	LOS B	1.6	42.1	0.60	1.27	17.8
7a	L1	102	3.0	0.463	13.3	LOS B	1.6	42.1	0.60	1.27	17.8
4	T1	130	3.0	0.463	13.3	LOS B	1.6	42.1	0.60	1.27	17.8
14	R2	126	3.0	0.219	9.1	LOS A	0.6	15.7	0.53	1.07	20.4
Approach		404	3.0	0.463	12.0	LOS B	1.6	42.1	0.58	0.60	18.5
West: Hasley Canyon Rd											
5	L2	133	3.0	0.705	18.0	LOS B	4.6	116.8	0.67	1.45	17.2
2	T1	117	3.0	0.705	18.0	LOS B	4.6	116.8	0.67	1.45	17.2
12a	R1	783	3.0	0.705	17.8	LOS B	4.6	116.8	0.65	1.42	17.4
12	R2	111	3.0	0.705	17.7	LOS B	4.4	111.4	0.64	1.39	17.6
Approach		1143	3.0	0.705	17.8	LOS B	4.6	116.8	0.66	0.71	17.4
All Vehicles		3237	3.0	0.788	18.4	LOS B	6.7	170.5	0.68	0.73	16.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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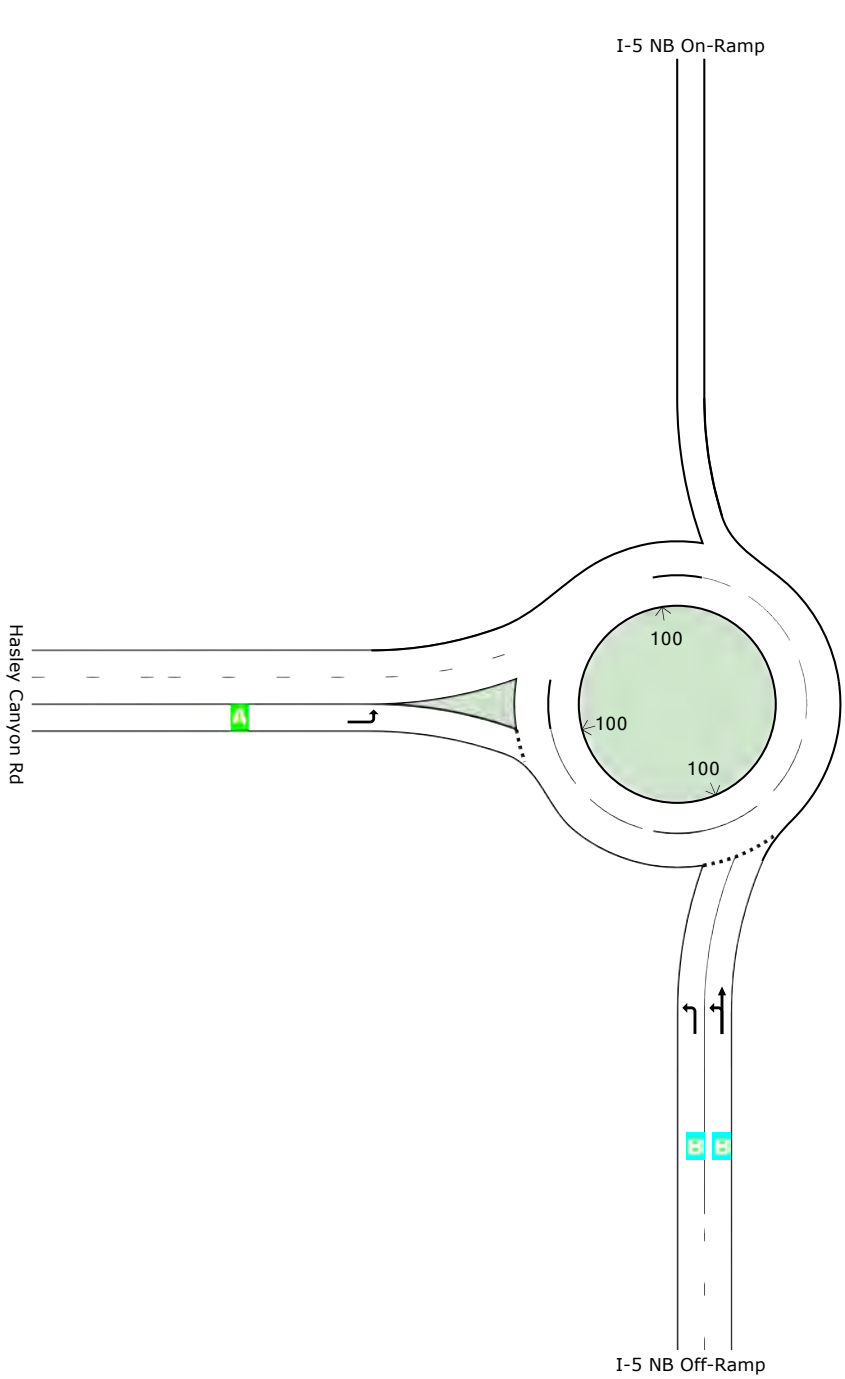
LEVEL OF SERVICE

Site: I-5 NB Ramps & Hasley canyon - Existing - AM

New Site
Roundabout



	South	West	Intersection
LOS	B	A	B

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

INTERSECTION SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Existing - AM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1336	veh/h	1603	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.607			
Practical Spare Capacity	40.1	%		
Effective Intersection Capacity	2202	veh/h		
Control Delay (Total)	4.19	veh-h/h	5.03	pers-h/h
Control Delay (Average)	11.3	sec	11.3	sec
Control Delay (Worst Lane)	11.9	sec		
Control Delay (Worst Movement)	11.9	sec	11.9	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	11.3	sec		
Idling Time (Average)	9.4	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	3.3	veh		
95% Back of Queue - Distance (Worst Lane)	83.8	ft		
Queue Storage Ratio (Worst Lane)	0.07			
Total Effective Stops	263	veh/h	316	pers/h
Effective Stop Rate	0.20	per veh	0.20	per pers
Proportion Queued	0.31		0.31	
Performance Index	24.2		24.2	
Travel Distance (Total)	540.7	veh-mi/h	648.9	pers-mi/h
Travel Distance (Average)	2137	ft	2137	ft
Travel Time (Total)	22.5	veh-h/h	27.0	pers-h/h
Travel Time (Average)	60.7	sec	60.7	sec
Travel Speed	24.0	mph	24.0	mph
Cost (Total)	380.53	$/h	380.53	$/h
Fuel Consumption (Total)	15.3	gal/h		
Carbon Dioxide (Total)	136.4	kg/h		
Hydrocarbons (Total)	0.058	kg/h		
Carbon Monoxide (Total)	0.433	kg/h		
NOx (Total)	0.284	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	641,217	veh/y	769,461	pers/y
Delay	2,010	veh-h/y	2,412	pers-h/y
Effective Stops	126,237	veh/y	151,485	pers/y
Travel Distance	259,552	veh-mi/y	311,462	pers-mi/y
Travel Time	10,814	veh-h/y	12,976	pers-h/y
Cost	182,654	$/y	182,654	$/y
Fuel Consumption	7,335	gal/y		
Carbon Dioxide	65,485	kg/y		
Hydrocarbons	28	kg/y		
Carbon Monoxide	208	kg/y		
NOx	136	kg/y		

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MOVEMENT SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Existing - AM

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: I-5 NB Off-Ramp											
3	L2	1228	3.0	0.607	11.9	LOS B	3.3	83.8	0.34	0.43	24.0
8	T1	1	3.0	0.607	11.9	LOS B	3.1	79.0	0.33	0.42	24.0
Approach		1229	3.0	0.607	11.9	LOS B	3.3	83.8	0.34	0.21	24.0
West: Hasley Canyon Rd											
5	L2	107	3.0	0.097	4.1	LOS A	0.0	0.0	0.00	0.00	24.0
Approach		107	3.0	0.097	4.1	LOS A	0.0	0.0	0.00	0.00	24.0
All Vehicles		1336	3.0	0.607	11.3	LOS B	3.3	83.8	0.31	0.20	24.0

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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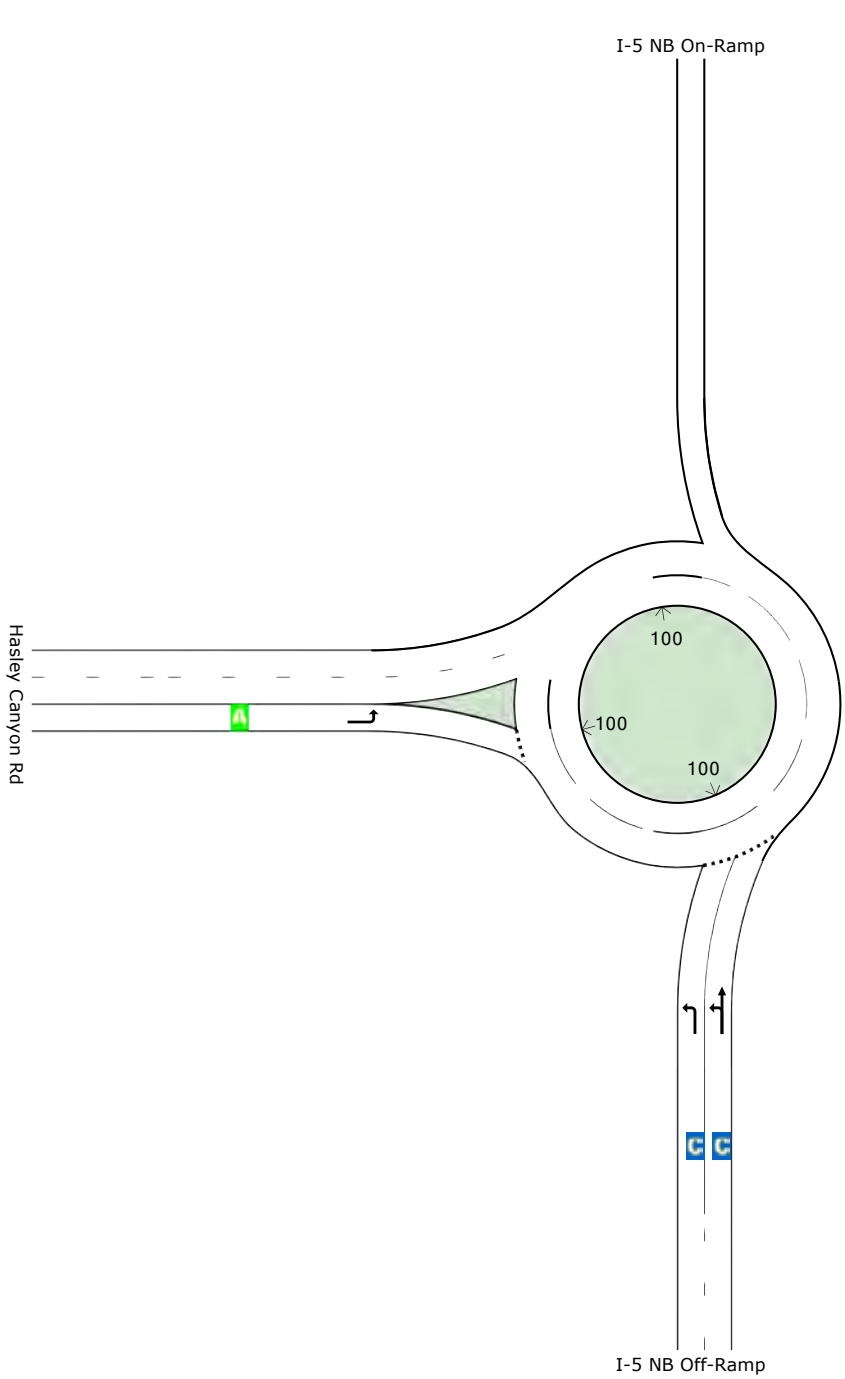
SIDRA INTERSECTION 6

LEVEL OF SERVICE

Site: I-5 NB Ramps & Hasley canyon - Existing - PM

New Site
Roundabout



	South	West	Intersection
LOS	C	A	B

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

INTERSECTION SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Existing - PM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1549	veh/h	1859	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.714			
Practical Spare Capacity	19.1	%		
Effective Intersection Capacity	2170	veh/h		
Control Delay (Total)	6.37	veh-h/h	7.64	pers-h/h
Control Delay (Average)	14.8	sec	14.8	sec
Control Delay (Worst Lane)	16.3	sec		
Control Delay (Worst Movement)	16.3	sec	16.3	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	14.8	sec		
Idling Time (Average)	11.4	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	5.2	veh		
95% Back of Queue - Distance (Worst Lane)	132.4	ft		
Queue Storage Ratio (Worst Lane)	0.12			
Total Effective Stops	633	veh/h	759	pers/h
Effective Stop Rate	0.41	per veh	0.41	per pers
Proportion Queued	0.48		0.48	
Performance Index	33.2		33.2	
Travel Distance (Total)	611.7	veh-mi/h	734.1	pers-mi/h
Travel Distance (Average)	2085	ft	2085	ft
Travel Time (Total)	27.1	veh-h/h	32.5	pers-h/h
Travel Time (Average)	63.0	sec	63.0	sec
Travel Speed	22.6	mph	22.6	mph
Cost (Total)	454.90	$/h	454.90	$/h
Fuel Consumption (Total)	17.9	gal/h		
Carbon Dioxide (Total)	160.1	kg/h		
Hydrocarbons (Total)	0.069	kg/h		
Carbon Monoxide (Total)	0.508	kg/h		
NOx (Total)	0.330	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	743,478	veh/y	892,174	pers/y
Delay	3,057	veh-h/y	3,668	pers-h/y
Effective Stops	303,738	veh/y	364,486	pers/y
Travel Distance	293,628	veh-mi/y	352,354	pers-mi/y
Travel Time	13,017	veh-h/y	15,621	pers-h/y
Cost	218,350	$/y	218,350	$/y
Fuel Consumption	8,609	gal/y		
Carbon Dioxide	76,863	kg/y		
Hydrocarbons	33	kg/y		
Carbon Monoxide	244	kg/y		
NOx	159	kg/y		

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MOVEMENT SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Existing - PM

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: I-5 NB Off-Ramp											
3	L2	1347	3.0	0.714	16.3	LOS C	5.2	132.4	0.55	0.94	22.5
8	T1	2	3.0	0.714	16.2	LOS C	4.9	125.3	0.54	0.91	22.5
Approach		1349	3.0	0.714	16.3	LOS C	5.2	132.4	0.55	0.47	22.5
West: Hasley Canyon Rd											
5	L2	200	3.0	0.182	4.9	LOS A	0.0	0.0	0.00	0.00	24.0
Approach		200	3.0	0.182	4.9	LOS A	0.0	0.0	0.00	0.00	24.0
All Vehicles		1549	3.0	0.714	14.8	LOS B	5.2	132.4	0.48	0.41	22.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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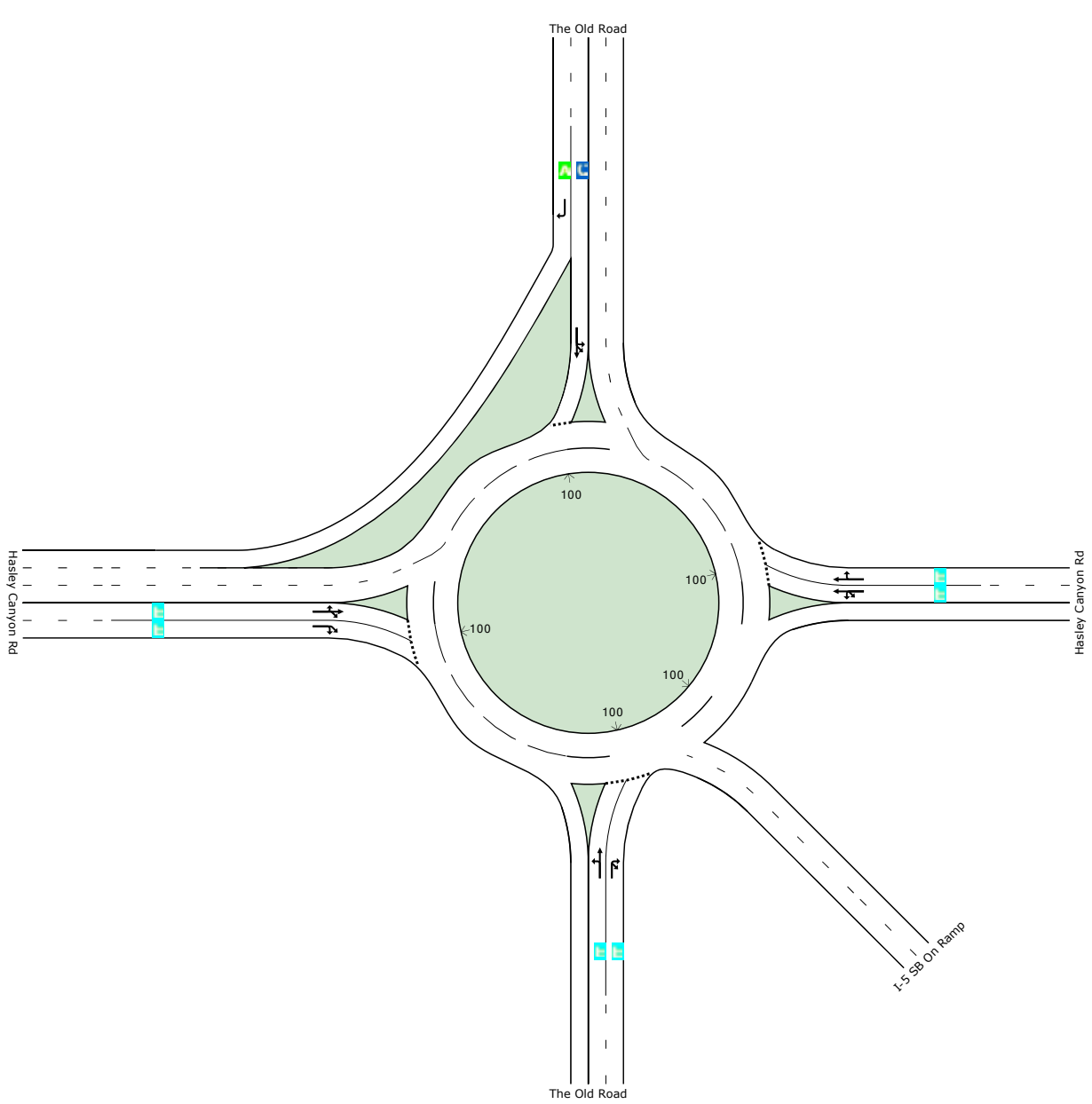
SIDRA INTERSECTION 6

LEVEL OF SERVICE

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Exi+prj- AM

New Site
Roundabout



	South	East	North	West	Intersection
LOS	B	B	B	B	B

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

INTERSECTION SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Exi+prj- AM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3179	veh/h	3815	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.737			
Practical Spare Capacity	15.4	%		
Effective Intersection Capacity	4315	veh/h		
Control Delay (Total)	14.95	veh-h/h	17.94	pers-h/h
Control Delay (Average)	16.9	sec	16.9	sec
Control Delay (Worst Lane)	28.9	sec		
Control Delay (Worst Movement)	28.9	sec	28.9	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	16.9	sec		
Idling Time (Average)	12.4	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	4.8	veh		
95% Back of Queue - Distance (Worst Lane)	124.1	ft		
Queue Storage Ratio (Worst Lane)	0.36			
Total Effective Stops	1993	veh/h	2391	pers/h
Effective Stop Rate	0.63	per veh	0.63	per pers
Proportion Queued	0.60		0.60	
Performance Index	81.8		81.8	
Travel Distance (Total)	660.9	veh-mi/h	793.0	pers-mi/h
Travel Distance (Average)	1097	ft	1097	ft
Travel Time (Total)	38.0	veh-h/h	45.6	pers-h/h
Travel Time (Average)	43.0	sec	43.0	sec
Travel Speed	17.4	mph	17.4	mph
Cost (Total)	652.99	$/h	652.99	$/h
Fuel Consumption (Total)	25.8	gal/h		
Carbon Dioxide (Total)	230.8	kg/h		
Hydrocarbons (Total)	0.100	kg/h		
Carbon Monoxide (Total)	0.690	kg/h		
NOx (Total)	0.580	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,526,087	veh/y	1,831,304	pers/y
Delay	7,176	veh-h/y	8,611	pers-h/y
Effective Stops	956,408	veh/y	1,147,689	pers/y
Travel Distance	317,209	veh-mi/y	380,650	pers-mi/y
Travel Time	18,230	veh-h/y	21,876	pers-h/y
Cost	313,435	$/y	313,435	$/y
Fuel Consumption	12,407	gal/y		
Carbon Dioxide	110,769	kg/y		
Hydrocarbons	48	kg/y		
Carbon Monoxide	331	kg/y		
NOx	278	kg/y		

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MOVEMENT SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Exi+prj- AM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: The Old Road											
3	L2	63	3.0	0.299	11.8	LOS B	0.9	22.8	0.63	1.29	22.5
8	T1	86	3.0	0.299	11.8	LOS B	0.9	22.8	0.63	1.29	22.5
18	R2	27	3.0	0.286	11.0	LOS B	0.8	20.7	0.60	1.22	22.9
18b	R3	123	3.0	0.286	11.0	LOS B	0.8	20.7	0.60	1.22	22.9
Approach		299	3.0	0.299	11.4	LOS B	0.9	22.8	0.62	0.63	22.7
East: Hasley Canyon Rd											
1b	L3	10	3.0	0.703	16.5	LOS B	4.8	124.1	0.60	1.17	16.7
1	L2	224	3.0	0.703	16.5	LOS B	4.8	124.1	0.60	1.17	16.7
6	T1	822	3.0	0.703	16.4	LOS B	4.8	124.1	0.59	1.14	16.9
16	R2	205	3.0	0.703	16.3	LOS B	4.6	117.7	0.58	1.11	17.1
Approach		1261	3.0	0.703	16.4	LOS B	4.8	124.1	0.59	0.57	16.9
North: The Old Road											
7	L2	25	3.0	0.737	28.9	LOS C	3.5	89.7	0.81	1.85	12.9
7a	L1	146	3.0	0.737	28.9	LOS C	3.5	89.7	0.81	1.85	12.9
4	T1	190	3.0	0.737	28.9	LOS C	3.5	89.7	0.81	1.85	12.9
14	R2	275	3.0	0.169	0.0	LOS A	0.0	0.0	0.00	0.00	29.0
Approach		636	3.0	0.737	16.4	LOS B	3.5	89.7	0.46	0.52	16.8
West: Hasley Canyon Rd											
5	L2	121	3.0	0.699	19.8	LOS B	4.0	103.2	0.71	1.56	16.5
2	T1	87	3.0	0.699	19.8	LOS B	4.0	103.2	0.71	1.56	16.5
12a	R1	636	3.0	0.699	19.6	LOS B	4.0	103.2	0.69	1.53	16.7
12	R2	140	3.0	0.699	19.4	LOS B	3.9	99.1	0.69	1.51	16.9
Approach		984	3.0	0.699	19.6	LOS B	4.0	103.2	0.70	0.77	16.7
All Vehicles		3179	3.0	0.737	16.9	LOS B	4.8	124.1	0.60	0.63	17.4

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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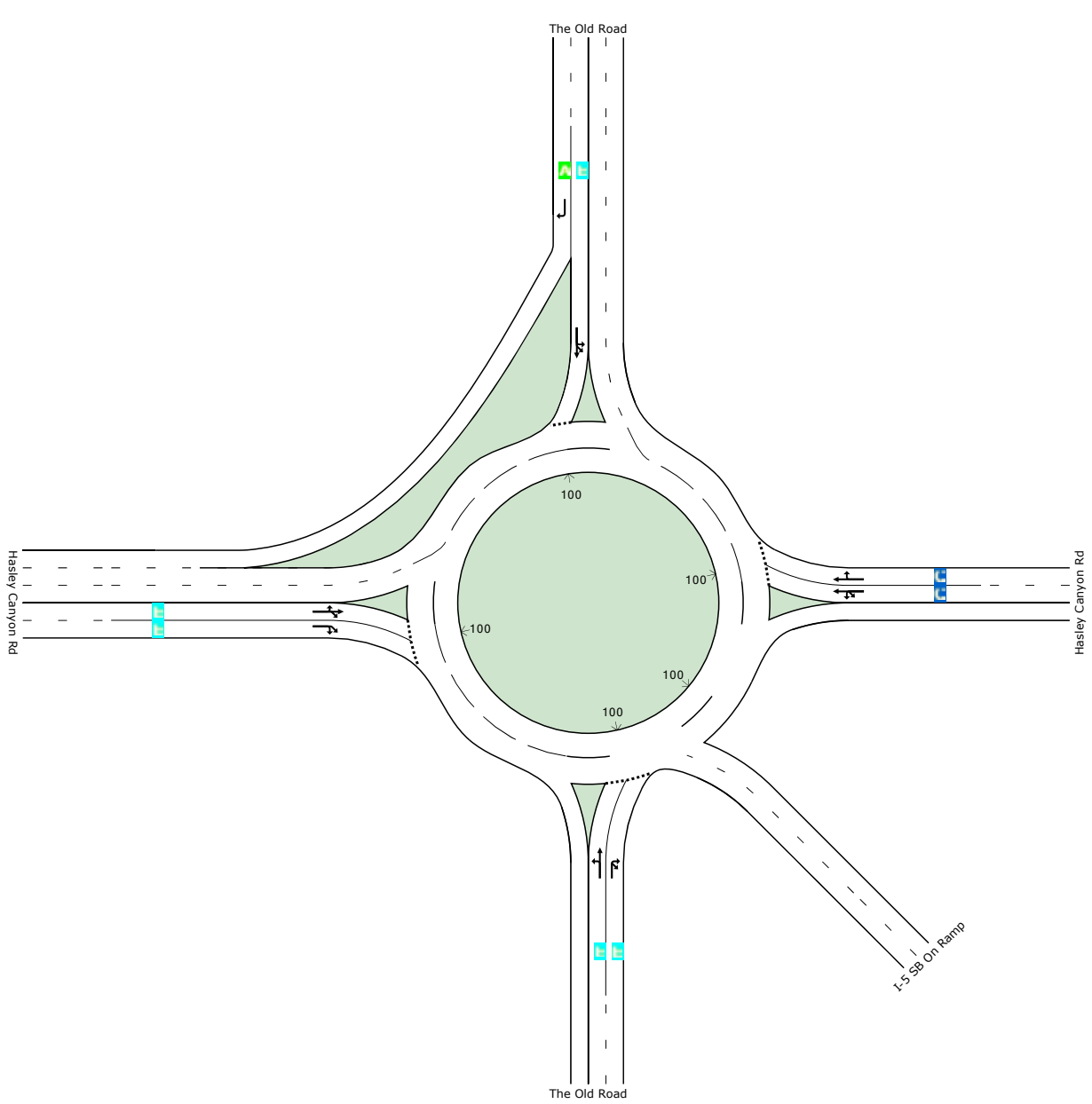
LEVEL OF SERVICE

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Ex+prj- PM

New Site
Roundabout



	South	East	North	West	Intersection
LOS	B	C	A	B	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

INTERSECTION SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Ex+prj- PM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	3358	veh/h	4029	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.832			
Practical Spare Capacity	2.1	%		
Effective Intersection Capacity	4034	veh/h		
Control Delay (Total)	18.99	veh-h/h	22.79	pers-h/h
Control Delay (Average)	20.4	sec	20.4	sec
Control Delay (Worst Lane)	25.7	sec		
Control Delay (Worst Movement)	25.7	sec	25.7	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	20.4	sec		
Idling Time (Average)	14.8	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	8.0	veh		
95% Back of Queue - Distance (Worst Lane)	205.9	ft		
Queue Storage Ratio (Worst Lane)	0.60			
Total Effective Stops	2586	veh/h	3103	pers/h
Effective Stop Rate	0.77	per veh	0.77	per pers
Proportion Queued	0.70		0.70	
Performance Index	100.6		100.6	
Travel Distance (Total)	699.1	veh-mi/h	838.9	pers-mi/h
Travel Distance (Average)	1099	ft	1099	ft
Travel Time (Total)	43.1	veh-h/h	51.7	pers-h/h
Travel Time (Average)	46.2	sec	46.2	sec
Travel Speed	16.2	mph	16.2	mph
Cost (Total)	733.21	$/h	733.21	$/h
Fuel Consumption (Total)	28.4	gal/h		
Carbon Dioxide (Total)	253.2	kg/h		
Hydrocarbons (Total)	0.113	kg/h		
Carbon Monoxide (Total)	0.763	kg/h		
NOx (Total)	0.622	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,611,652	veh/y	1,933,983	pers/y
Delay	9,117	veh-h/y	10,940	pers-h/y
Effective Stops	1,241,287	veh/y	1,489,545	pers/y
Travel Distance	335,544	veh-mi/y	402,653	pers-mi/y
Travel Time	20,697	veh-h/y	24,836	pers-h/y
Cost	351,942	$/y	351,942	$/y
Fuel Consumption	13,615	gal/y		
Carbon Dioxide	121,554	kg/y		
Hydrocarbons	54	kg/y		
Carbon Monoxide	366	kg/y		
NOx	299	kg/y		

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MOVEMENT SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Ex+prj- PM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: The Old Road											
3	L2	62	3.0	0.456	16.7	LOS B	1.5	38.1	0.72	1.52	20.6
8	T1	145	3.0	0.456	16.7	LOS B	1.5	38.1	0.72	1.52	20.6
18	R2	50	3.0	0.330	14.2	LOS B	1.0	25.3	0.70	1.45	21.5
18b	R3	90	3.0	0.330	14.2	LOS B	1.0	25.3	0.70	1.45	21.5
Approach		347	3.0	0.456	15.7	LOS B	1.5	38.1	0.71	0.75	20.9
East: Hasley Canyon Rd											
1b	L3	4	3.0	0.832	25.7	LOS C	8.0	205.9	0.81	1.81	13.9
1	L2	122	3.0	0.832	25.7	LOS C	8.0	205.9	0.81	1.81	13.9
6	T1	717	3.0	0.832	25.6	LOS C	8.0	205.9	0.80	1.80	13.9
16	R2	571	3.0	0.832	25.4	LOS C	7.7	196.7	0.78	1.74	13.8
Approach		1414	3.0	0.832	25.5	LOS C	8.0	205.9	0.79	0.89	13.8
North: The Old Road											
7	L2	46	3.0	0.487	14.6	LOS B	1.8	45.0	0.64	1.35	17.3
7a	L1	102	3.0	0.487	14.6	LOS B	1.8	45.0	0.64	1.35	17.3
4	T1	130	3.0	0.487	14.6	LOS B	1.8	45.0	0.64	1.35	17.3
14	R2	132	3.0	0.081	0.0	LOS A	0.0	0.0	0.00	0.00	29.0
Approach		410	3.0	0.487	9.9	LOS A	1.8	45.0	0.43	0.46	19.7
West: Hasley Canyon Rd											
5	L2	136	3.0	0.732	19.3	LOS B	5.0	129.2	0.69	1.52	16.7
2	T1	136	3.0	0.732	19.3	LOS B	5.0	129.2	0.69	1.52	16.7
12a	R1	804	3.0	0.732	19.1	LOS B	5.0	129.2	0.68	1.48	16.9
12	R2	111	3.0	0.732	19.0	LOS B	4.8	123.3	0.67	1.46	17.0
Approach		1187	3.0	0.732	19.2	LOS B	5.0	129.2	0.68	0.74	16.9
All Vehicles		3358	3.0	0.832	20.4	LOS C	8.0	205.9	0.70	0.77	16.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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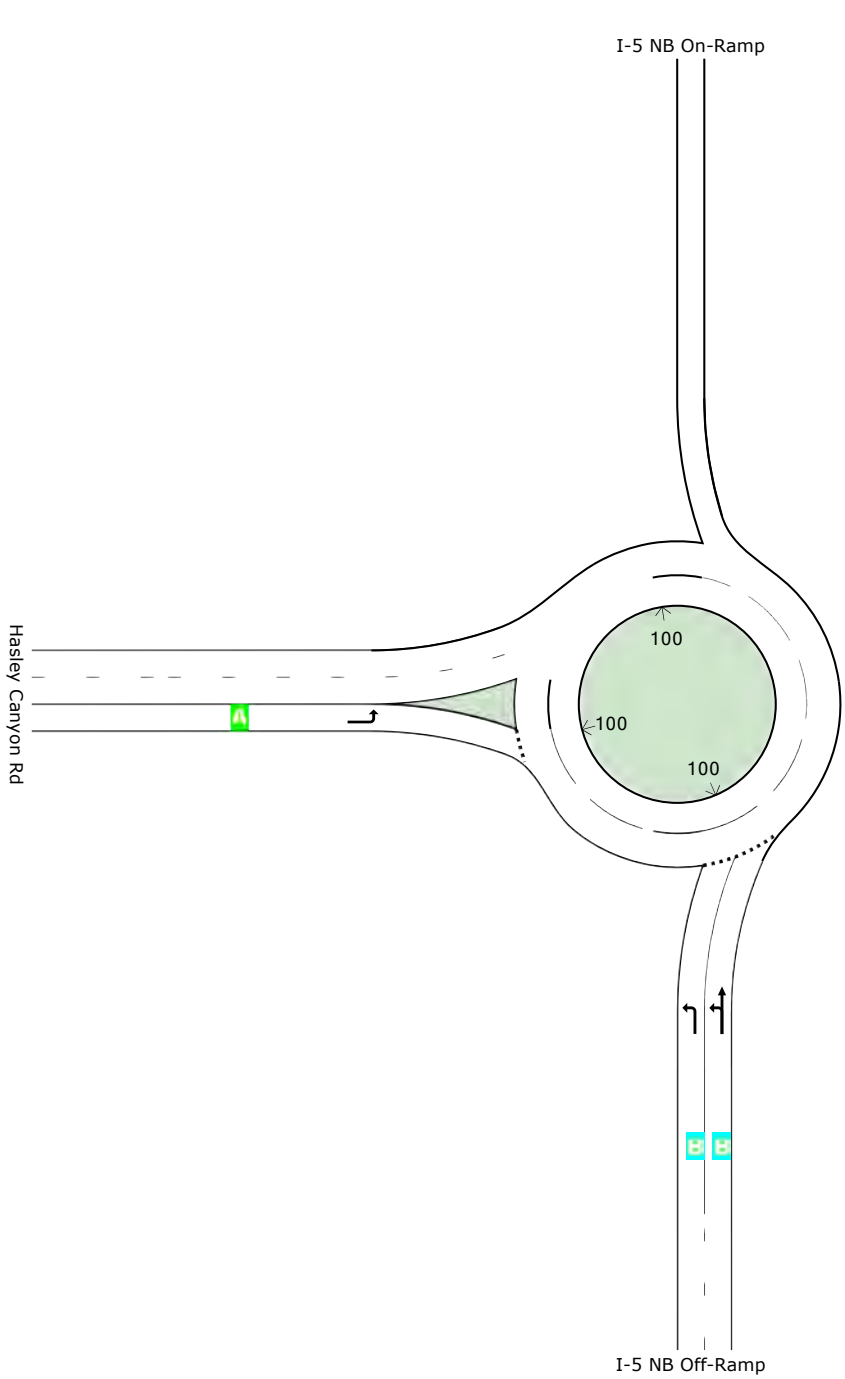
LEVEL OF SERVICE

Site: I-5 NB Ramps & Hasley canyon - Ex+Prj- AM

New Site
Roundabout



	South	West	Intersection
LOS	B	A	B

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

INTERSECTION SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Ex+Prj- AM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1350	veh/h	1620	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.613			
Practical Spare Capacity	38.6	%		
Effective Intersection Capacity	2201	veh/h		
Control Delay (Total)	4.30	veh-h/h	5.16	pers-h/h
Control Delay (Average)	11.5	sec	11.5	sec
Control Delay (Worst Lane)	12.1	sec		
Control Delay (Worst Movement)	12.1	sec	12.1	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	11.5	sec		
Idling Time (Average)	9.5	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	3.3	veh		
95% Back of Queue - Distance (Worst Lane)	85.5	ft		
Queue Storage Ratio (Worst Lane)	0.08			
Total Effective Stops	280	veh/h	337	pers/h
Effective Stop Rate	0.21	per veh	0.21	per pers
Proportion Queued	0.32		0.32	
Performance Index	24.6		24.6	
Travel Distance (Total)	545.6	veh-mi/h	654.7	pers-mi/h
Travel Distance (Average)	2134	ft	2134	ft
Travel Time (Total)	22.8	veh-h/h	27.4	pers-h/h
Travel Time (Average)	60.8	sec	60.8	sec
Travel Speed	23.9	mph	23.9	mph
Cost (Total)	385.05	$/h	385.05	$/h
Fuel Consumption (Total)	15.4	gal/h		
Carbon Dioxide (Total)	137.9	kg/h		
Hydrocarbons (Total)	0.058	kg/h		
Carbon Monoxide (Total)	0.437	kg/h		
NOx (Total)	0.287	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	648,000	veh/y	777,600	pers/y
Delay	2,063	veh-h/y	2,476	pers-h/y
Effective Stops	134,632	veh/y	161,558	pers/y
Travel Distance	261,886	veh-mi/y	314,263	pers-mi/y
Travel Time	10,947	veh-h/y	13,136	pers-h/y
Cost	184,824	$/y	184,824	$/y
Fuel Consumption	7,415	gal/y		
Carbon Dioxide	66,201	kg/y		
Hydrocarbons	28	kg/y		
Carbon Monoxide	210	kg/y		
NOx	138	kg/y		

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MOVEMENT SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Ex+Prj- AM

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: I-5 NB Off-Ramp											
3	L2	1237	3.0	0.613	12.1	LOS B	3.3	85.5	0.35	0.45	23.9
8	T1	1	3.0	0.613	12.1	LOS B	3.1	80.6	0.34	0.44	23.9
Approach		1238	3.0	0.613	12.1	LOS B	3.3	85.5	0.35	0.23	23.9
West: Hasley Canyon Rd											
5	L2	112	3.0	0.102	4.2	LOS A	0.0	0.0	0.00	0.00	24.0
Approach		112	3.0	0.102	4.2	LOS A	0.0	0.0	0.00	0.00	24.0
All Vehicles		1350	3.0	0.613	11.5	LOS B	3.3	85.5	0.32	0.21	23.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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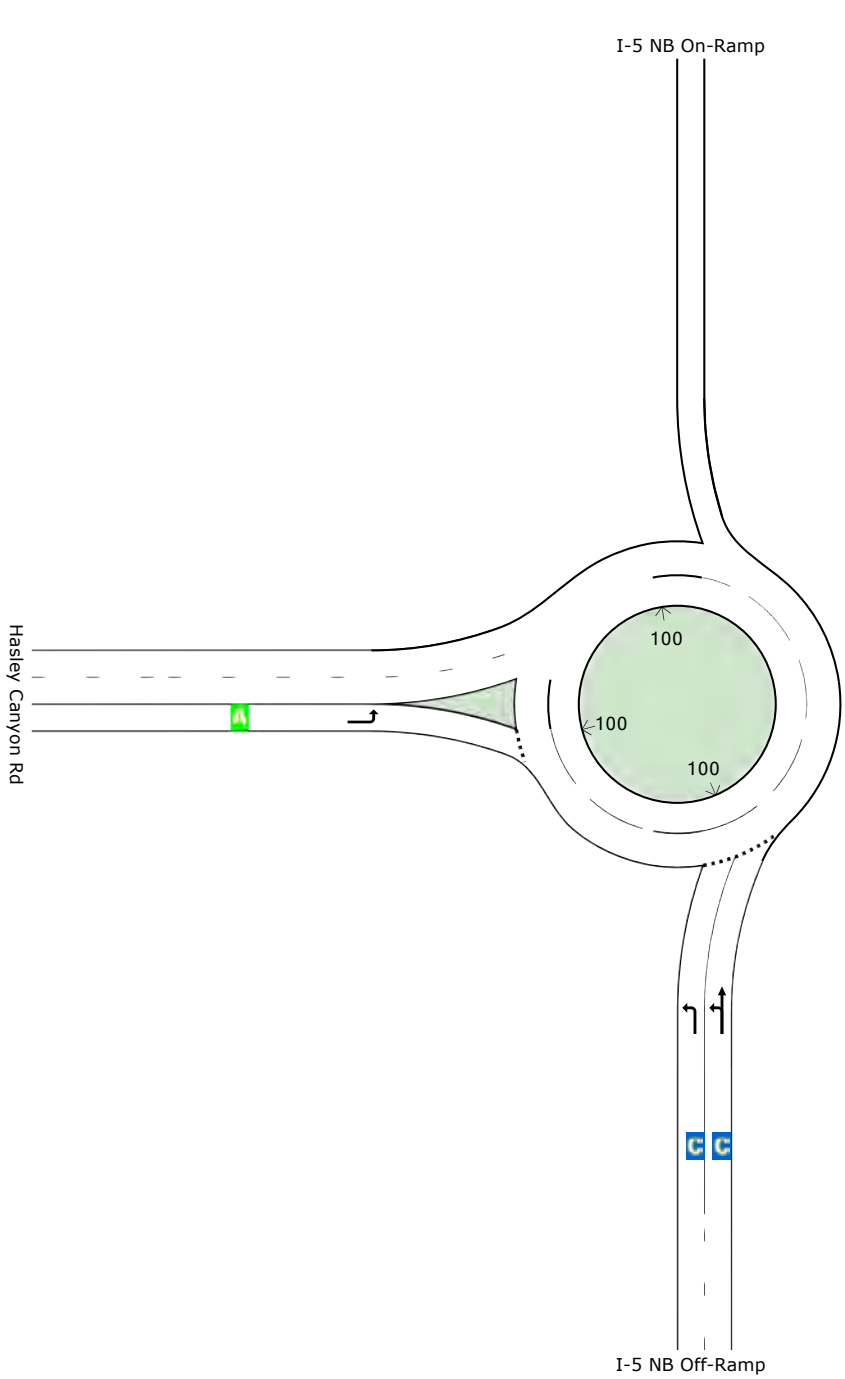
LEVEL OF SERVICE

Site: I-5 NB Ramps & Hasley canyon - Ex+Prj - PM

New Site
Roundabout



	South	West	Intersection
LOS	C	A	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

INTERSECTION SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Ex+Prj - PM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1580	veh/h	1897	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.731			
Practical Spare Capacity	16.4	%		
Effective Intersection Capacity	2163	veh/h		
Control Delay (Total)	6.81	veh-h/h	8.17	pers-h/h
Control Delay (Average)	15.5	sec	15.5	sec
Control Delay (Worst Lane)	17.1	sec		
Control Delay (Worst Movement)	17.1	sec	17.1	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	15.5	sec		
Idling Time (Average)	12.0	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	5.6	veh		
95% Back of Queue - Distance (Worst Lane)	142.4	ft		
Queue Storage Ratio (Worst Lane)	0.13			
Total Effective Stops	682	veh/h	819	pers/h
Effective Stop Rate	0.43	per veh	0.43	per pers
Proportion Queued	0.50		0.50	
Performance Index	34.8		34.8	
Travel Distance (Total)	624.3	veh-mi/h	749.2	pers-mi/h
Travel Distance (Average)	2086	ft	2086	ft
Travel Time (Total)	28.0	veh-h/h	33.6	pers-h/h
Travel Time (Average)	63.7	sec	63.7	sec
Travel Speed	22.3	mph	22.3	mph
Cost (Total)	468.60	$/h	468.60	$/h
Fuel Consumption (Total)	18.4	gal/h		
Carbon Dioxide (Total)	164.4	kg/h		
Hydrocarbons (Total)	0.072	kg/h		
Carbon Monoxide (Total)	0.522	kg/h		
NOx (Total)	0.338	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	758,609	veh/y	910,331	pers/y
Delay	3,268	veh-h/y	3,922	pers-h/y
Effective Stops	327,411	veh/y	392,893	pers/y
Travel Distance	299,682	veh-mi/y	359,618	pers-mi/y
Travel Time	13,433	veh-h/y	16,119	pers-h/y
Cost	224,930	$/y	224,930	$/y
Fuel Consumption	8,836	gal/y		
Carbon Dioxide	78,889	kg/y		
Hydrocarbons	34	kg/y		
Carbon Monoxide	251	kg/y		
NOx	162	kg/y		

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MOVEMENT SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Ex+Prj - PM

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: I-5 NB Off-Ramp											
3	L2	1375	3.0	0.731	17.1	LOS C	5.6	142.4	0.57	0.99	22.2
8	T1	2	3.0	0.731	17.0	LOS C	5.3	134.9	0.56	0.97	22.2
Approach		1377	3.0	0.731	17.1	LOS C	5.6	142.4	0.57	0.50	22.2
West: Hasley Canyon Rd											
5	L2	203	3.0	0.185	5.0	LOS A	0.0	0.0	0.00	0.00	24.0
Approach		203	3.0	0.185	5.0	LOS A	0.0	0.0	0.00	0.00	24.0
All Vehicles		1580	3.0	0.731	15.5	LOS C	5.6	142.4	0.50	0.43	22.3

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Processed: Wednesday, March 14, 2018 11:21:17 AM
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8001309, STANTEC CONSULTING SVCS INC, PLUS / 1PC
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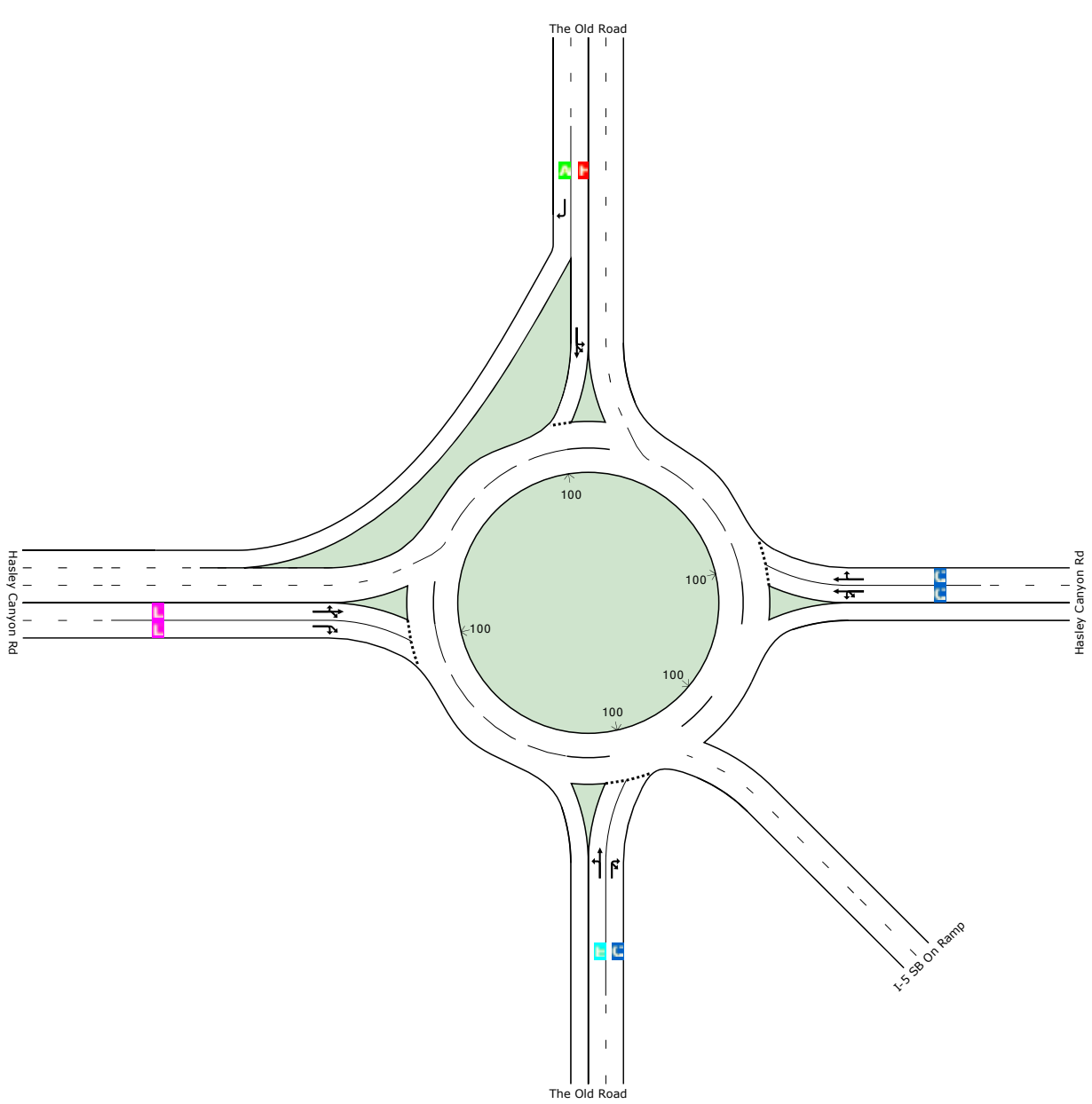
SIDRA INTERSECTION 6

LEVEL OF SERVICE

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Cum+prj - AM

New Site
Roundabout



	South	East	North	West	Intersection
LOS	C	C	E	D	D

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

INTERSECTION SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Cum+prj - AM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4358	veh/h	5230	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	1.148			
Practical Spare Capacity	-26.0	%		
Effective Intersection Capacity	3796	veh/h		
Control Delay (Total)	46.31	veh-h/h	55.57	pers-h/h
Control Delay (Average)	38.3	sec	38.3	sec
Control Delay (Worst Lane)	117.2	sec		
Control Delay (Worst Movement)	117.2	sec	117.2	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	38.3	sec		
Idling Time (Average)	27.4	sec		
Intersection Level of Service (LOS)	LOS D			
95% Back of Queue - Vehicles (Worst Lane)	29.5	veh		
95% Back of Queue - Distance (Worst Lane)	756.4	ft		
Queue Storage Ratio (Worst Lane)	2.22			
Total Effective Stops	4439	veh/h	5327	pers/h
Effective Stop Rate	1.02	per veh	1.02	per pers
Proportion Queued	0.74		0.74	
Performance Index	231.7		231.7	
Travel Distance (Total)	903.3	veh-mi/h	1084.0	pers-mi/h
Travel Distance (Average)	1094	ft	1094	ft
Travel Time (Total)	77.6	veh-h/h	93.2	pers-h/h
Travel Time (Average)	64.1	sec	64.1	sec
Travel Speed	11.6	mph	11.6	mph
Cost (Total)	1258.31	$/h	1258.31	$/h
Fuel Consumption (Total)	44.1	gal/h		
Carbon Dioxide (Total)	393.3	kg/h		
Hydrocarbons (Total)	0.200	kg/h		
Carbon Monoxide (Total)	1.222	kg/h		
NOx (Total)	0.851	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	2,092,008	veh/y	2,510,410	pers/y
Delay	22,229	veh-h/y	26,675	pers-h/y
Effective Stops	2,130,791	veh/y	2,556,948	pers/y
Travel Distance	433,593	veh-mi/y	520,312	pers-mi/y
Travel Time	37,266	veh-h/y	44,719	pers-h/y
Cost	603,990	$/y	603,990	$/y
Fuel Consumption	21,145	gal/y		
Carbon Dioxide	188,779	kg/y		
Hydrocarbons	96	kg/y		
Carbon Monoxide	587	kg/y		
NOx	408	kg/y		

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MOVEMENT SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Cum+prj - AM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: The Old Road											
3	L2	77	3.0	0.399	15.5	LOS B	1.3	32.9	0.71	1.48	20.9
8	T1	99	3.0	0.399	15.5	LOS B	1.3	32.9	0.71	1.48	20.9
18	R2	165	3.0	0.634	23.2	LOS C	2.5	65.0	0.78	1.71	18.1
18b	R3	132	3.0	0.634	23.2	LOS C	2.5	65.0	0.78	1.71	18.1
Approach		474	3.0	0.634	20.3	LOS C	2.5	65.0	0.75	0.81	19.1
East: Hasley Canyon Rd											
1b	L3	11	3.0	0.878	30.1	LOS C	10.5	268.7	0.88	1.96	12.7
1	L2	250	3.0	0.878	30.1	LOS C	10.5	268.7	0.88	1.96	12.7
6	T1	837	3.0	0.878	29.9	LOS C	10.5	268.7	0.87	1.93	12.7
16	R2	435	3.0	0.878	29.7	LOS C	10.0	256.9	0.86	1.89	12.7
Approach		1533	3.0	0.878	29.9	LOS C	10.5	268.7	0.87	0.96	12.7
North: The Old Road											
7	L2	40	3.0	1.148	117.2	LOS F	29.5	756.4	1.00	4.75	4.9
7a	L1	140	3.0	1.148	117.2	LOS F	29.5	756.4	1.00	4.75	4.9
4	T1	360	3.0	1.148	117.2	LOS F	29.5	756.4	1.00	4.75	4.9
14	R2	660	3.0	0.406	0.0	LOS A	0.0	0.0	0.00	0.00	28.9
Approach		1200	3.0	1.148	52.8	LOS E	29.5	756.4	0.45	1.07	8.9
West: Hasley Canyon Rd											
5	L2	130	3.0	0.906	42.1	LOS D	8.6	220.2	0.89	2.28	11.2
2	T1	217	3.0	0.906	42.1	LOS D	8.6	220.2	0.89	2.28	11.2
12a	R1	663	3.0	0.906	41.4	LOS D	8.6	220.2	0.88	2.25	11.3
12	R2	141	3.0	0.906	41.1	LOS D	8.4	213.9	0.88	2.23	11.3
Approach		1152	3.0	0.906	41.6	LOS D	8.6	220.2	0.88	1.13	11.2
All Vehicles		4358	3.0	1.148	38.3	LOS D	29.5	756.4	0.74	1.02	11.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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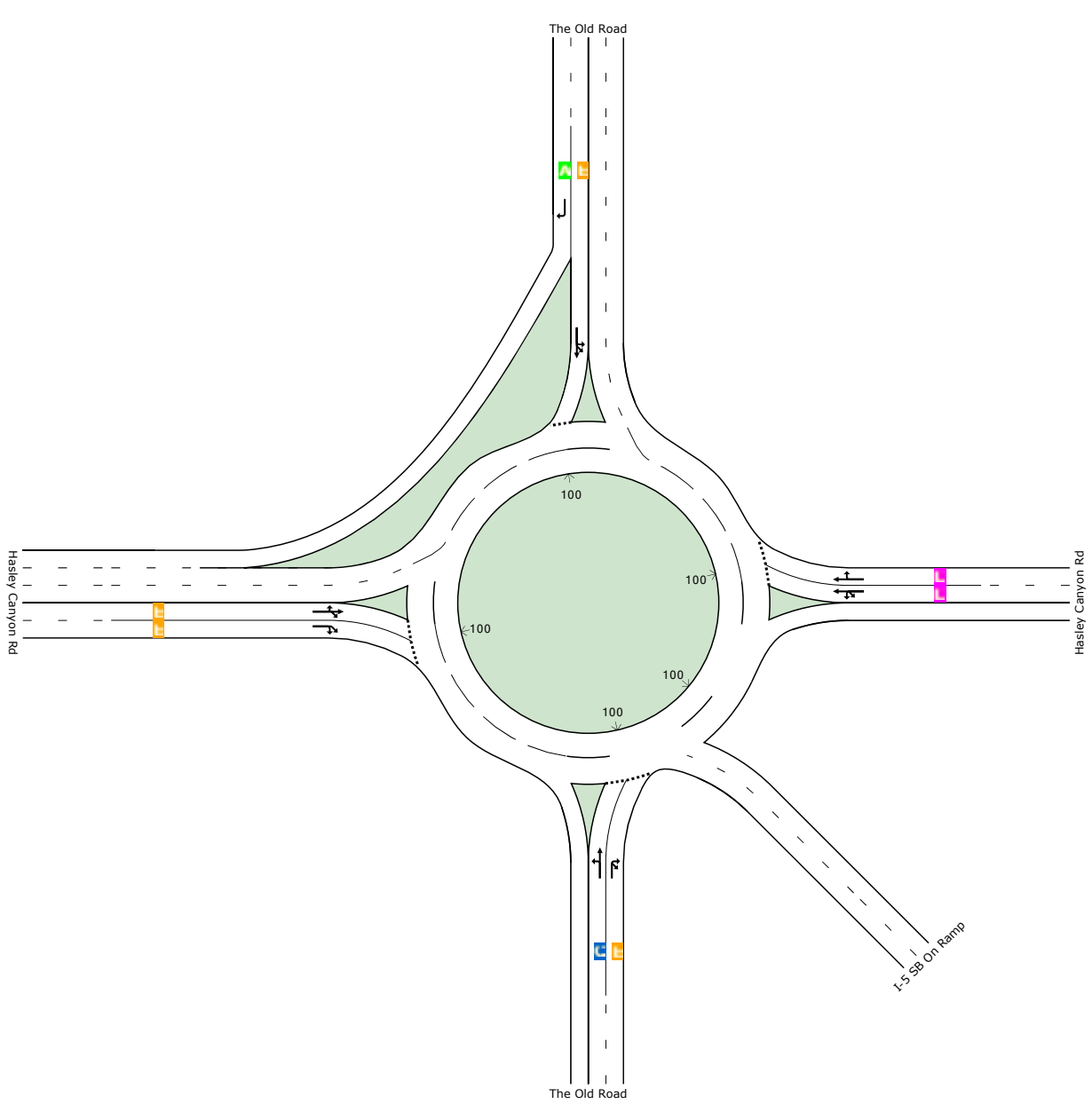
LEVEL OF SERVICE

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Cum+prj - PM

New Site
Roundabout



	South	East	North	West	Intersection
LOS	D	D	D	E	D

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

INTERSECTION SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Cum+prj - PM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	4076	veh/h	4891	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.991			
Practical Spare Capacity	-14.2	%		
Effective Intersection Capacity	4114	veh/h		
Control Delay (Total)	54.28	veh-h/h	65.14	pers-h/h
Control Delay (Average)	47.9	sec	47.9	sec
Control Delay (Worst Lane)	62.6	sec		
Control Delay (Worst Movement)	62.6	sec	62.6	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	47.9	sec		
Idling Time (Average)	35.0	sec		
Intersection Level of Service (LOS)	LOS D			
95% Back of Queue - Vehicles (Worst Lane)	15.3	veh		
95% Back of Queue - Distance (Worst Lane)	392.7	ft		
Queue Storage Ratio (Worst Lane)	0.95			
Total Effective Stops	5115	veh/h	6139	pers/h
Effective Stop Rate	1.25	per veh	1.25	per pers
Proportion Queued	0.92		0.92	
Performance Index	236.4		236.4	
Travel Distance (Total)	866.4	veh-mi/h	1039.7	pers-mi/h
Travel Distance (Average)	1122	ft	1122	ft
Travel Time (Total)	84.5	veh-h/h	101.4	pers-h/h
Travel Time (Average)	74.7	sec	74.7	sec
Travel Speed	10.2	mph	10.2	mph
Cost (Total)	1347.69	$/h	1347.69	$/h
Fuel Consumption (Total)	45.4	gal/h		
Carbon Dioxide (Total)	405.6	kg/h		
Hydrocarbons (Total)	0.217	kg/h		
Carbon Monoxide (Total)	1.279	kg/h		
NOx (Total)	0.826	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1,956,522	veh/y	2,347,826	pers/y
Delay	26,057	veh-h/y	31,268	pers-h/y
Effective Stops	2,455,408	veh/y	2,946,490	pers/y
Travel Distance	415,862	veh-mi/y	499,035	pers-mi/y
Travel Time	40,576	veh-h/y	48,692	pers-h/y
Cost	646,891	$/y	646,891	$/y
Fuel Consumption	21,807	gal/y		
Carbon Dioxide	194,691	kg/y		
Hydrocarbons	104	kg/y		
Carbon Monoxide	614	kg/y		
NOx	396	kg/y		

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MOVEMENT SUMMARY

Site: The Old Road/I-5 SB Ramps & Hasley canyon - Cum+prj - PM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: The Old Road											
3	L2	76	3.0	0.680	34.1	LOS C	2.7	67.9	0.87	1.94	15.4
8	T1	152	3.0	0.680	34.1	LOS C	2.7	67.9	0.87	1.94	15.4
18	R2	217	3.0	0.897	58.6	LOS E	5.4	137.2	0.94	2.41	11.1
18b	R3	109	3.0	0.897	58.6	LOS E	5.4	137.2	0.94	2.41	11.1
Approach		554	3.0	0.897	48.5	LOS D	5.4	137.2	0.91	1.11	12.6
East: Hasley Canyon Rd											
1b	L3	11	3.0	0.933	40.8	LOS D	12.6	323.7	0.98	2.46	10.7
1	L2	141	3.0	0.933	40.8	LOS D	12.6	323.7	0.98	2.46	10.7
6	T1	728	3.0	0.933	40.7	LOS D	12.6	323.7	0.98	2.45	10.6
16	R2	587	3.0	0.933	40.2	LOS D	12.2	312.5	0.96	2.40	10.6
Approach		1467	3.0	0.933	40.5	LOS D	12.6	323.7	0.97	1.22	10.6
North: The Old Road											
7	L2	228	3.0	0.987	62.6	LOS E	12.3	315.9	0.96	2.92	8.1
7a	L1	120	3.0	0.987	62.6	LOS E	12.3	315.9	0.96	2.92	8.1
4	T1	196	3.0	0.987	62.6	LOS E	12.3	315.9	0.96	2.92	8.1
14	R2	217	3.0	0.134	0.0	LOS A	0.0	0.0	0.00	0.00	29.0
Approach		761	3.0	0.987	44.7	LOS D	12.3	315.9	0.69	1.04	10.1
West: Hasley Canyon Rd											
5	L2	217	3.0	0.991	58.6	LOS E	15.3	392.7	0.99	2.99	9.1
2	T1	130	3.0	0.991	58.6	LOS E	15.3	392.7	0.99	2.99	9.1
12a	R1	826	3.0	0.991	57.9	LOS E	15.3	392.7	0.99	2.97	9.0
12	R2	120	3.0	0.991	57.5	LOS E	15.1	387.4	0.99	2.96	9.0
Approach		1293	3.0	0.991	58.1	LOS E	15.3	392.7	0.99	1.49	9.0
All Vehicles		4076	3.0	0.991	47.9	LOS D	15.3	392.7	0.92	1.25	10.2

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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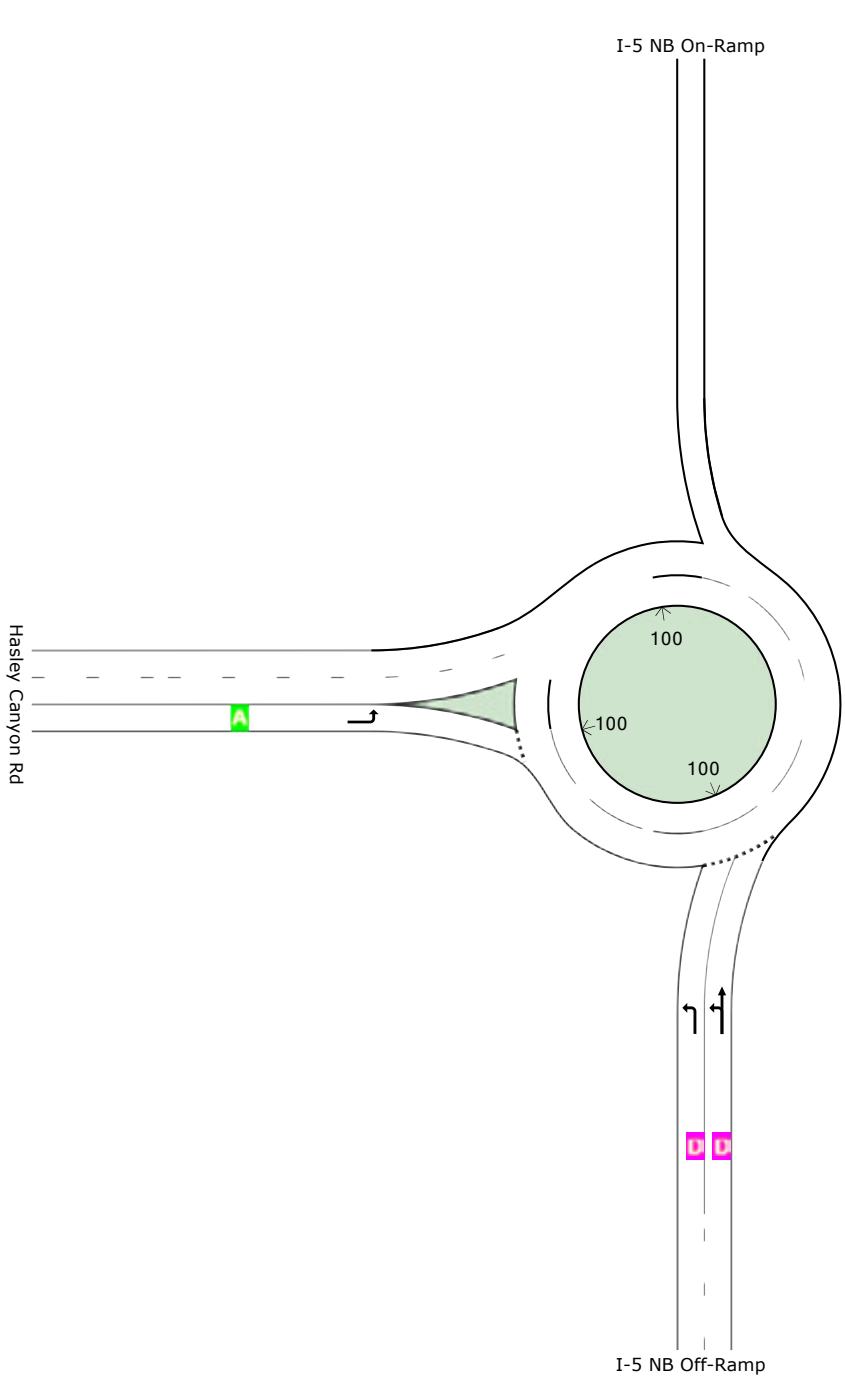
LEVEL OF SERVICE

Site: I-5 NB Ramps & Hasley canyon -Cum+prj - AM

New Site
Roundabout



	South	West	Intersection
LOS	D	A	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

INTERSECTION SUMMARY

Site: I-5 NB Ramps & Hasley canyon -Cum+prj - AM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1899	veh/h	2278	pers/h
Percent Heavy Vehicles (Demand)	3.0	%		
Degree of Saturation	0.922			
Practical Spare Capacity	-7.8	%		
Effective Intersection Capacity	2058	veh/h		
Control Delay (Total)	16.53	veh-h/h	19.84	pers-h/h
Control Delay (Average)	31.3	sec	31.3	sec
Control Delay (Worst Lane)	38.5	sec		
Control Delay (Worst Movement)	38.3	sec	38.3	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	31.3	sec		
Idling Time (Average)	22.4	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	12.1	veh		
95% Back of Queue - Distance (Worst Lane)	309.4	ft		
Queue Storage Ratio (Worst Lane)	0.27			
Total Effective Stops	1728	veh/h	2073	pers/h
Effective Stop Rate	0.91	per veh	0.91	per pers
Proportion Queued	0.74		0.74	
Performance Index	62.9		62.9	
Travel Distance (Total)	714.4	veh-mi/h	857.2	pers-mi/h
Travel Distance (Average)	1987	ft	1987	ft
Travel Time (Total)	40.6	veh-h/h	48.7	pers-h/h
Travel Time (Average)	76.9	sec	76.9	sec
Travel Speed	17.6	mph	17.6	mph
Cost (Total)	660.05	$/h	660.05	$/h
Fuel Consumption (Total)	24.2	gal/h		
Carbon Dioxide (Total)	215.7	kg/h		
Hydrocarbons (Total)	0.103	kg/h		
Carbon Monoxide (Total)	0.693	kg/h		
NOx (Total)	0.418	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	911,352	veh/y	1,093,622	pers/y
Delay	7,936	veh-h/y	9,523	pers-h/y
Effective Stops	829,225	veh/y	995,071	pers/y
Travel Distance	342,892	veh-mi/y	411,470	pers-mi/y
Travel Time	19,471	veh-h/y	23,366	pers-h/y
Cost	316,824	$/y	316,824	$/y
Fuel Consumption	11,599	gal/y		
Carbon Dioxide	103,558	kg/y		
Hydrocarbons	50	kg/y		
Carbon Monoxide	333	kg/y		
NOx	201	kg/y		

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MOVEMENT SUMMARY

Site: I-5 NB Ramps & Hasley canyon -Cum+prj - AM

New Site
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: I-5 NB Off-Ramp											
3	L2	1474	3.0	0.922	38.3	LOS D	12.1	309.4	0.96	2.34	16.9
8	T1	1	3.0	0.922	38.0	LOS D	11.6	298.1	0.95	2.31	17.0
Approach		1475	3.0	0.922	38.3	LOS D	12.1	309.4	0.96	1.17	16.9
West: Hasley Canyon Rd											
5	L2	424	3.0	0.386	7.3	LOS A	0.0	0.0	0.00	0.00	24.0
Approach		424	3.0	0.386	7.3	LOS A	0.0	0.0	0.00	0.00	24.0
All Vehicles		1899	3.0	0.922	31.3	LOS C	12.1	309.4	0.74	0.91	17.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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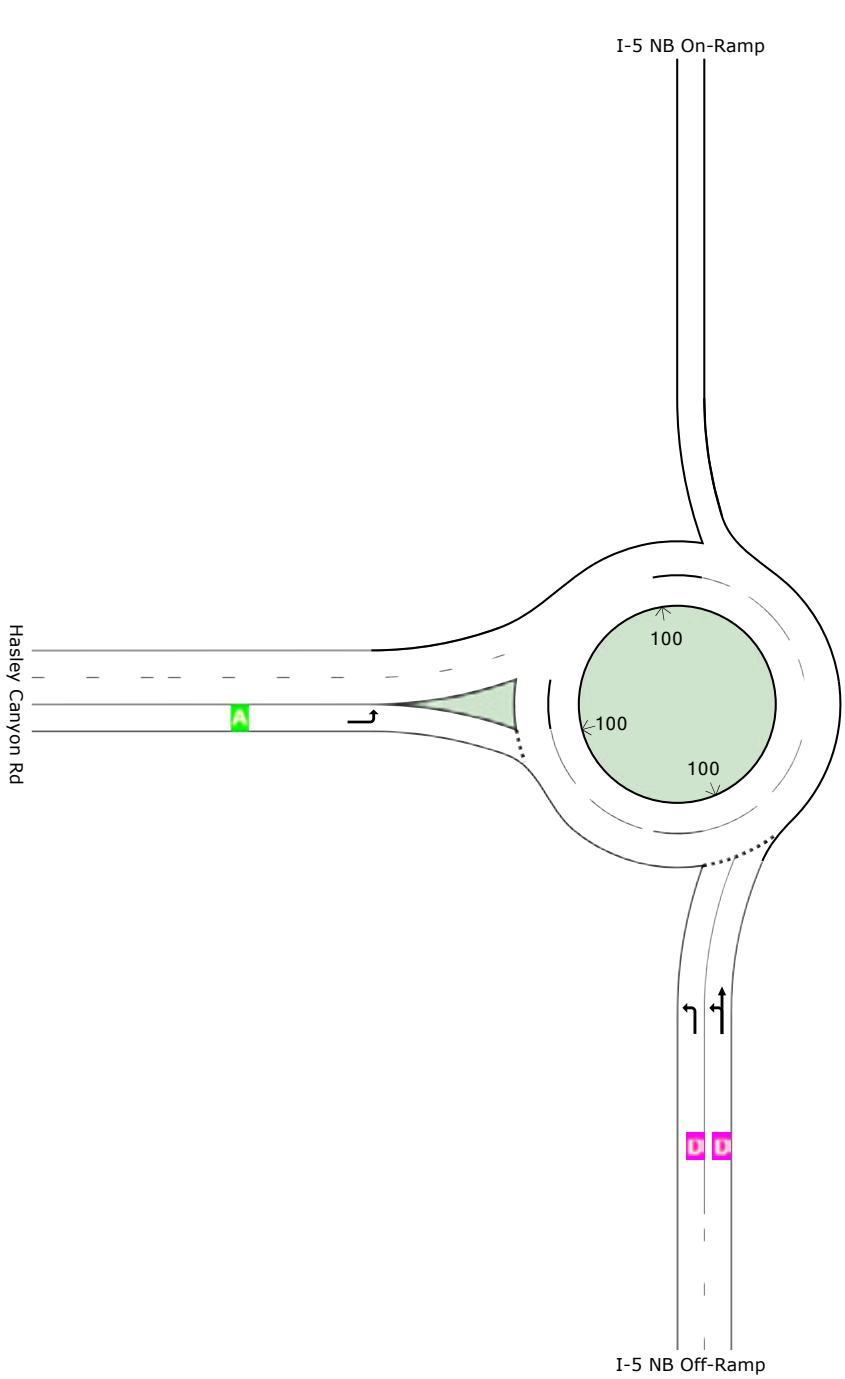
SIDRA INTERSECTION 6

LEVEL OF SERVICE

Site: I-5 NB Ramps & Hasley canyon - Cum+prj - PM

New Site
Roundabout



	South	West	Intersection
LOS	D	A	C

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).

INTERSECTION SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Cum+prj - PM

New Site
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	1917	veh/h	2301	pers/h
Percent Heavy Vehicles (Demand)	3.1	%		
Degree of Saturation	0.940			
Practical Spare Capacity	-9.6	%		
Effective Intersection Capacity	2039	veh/h		
Control Delay (Total)	18.07	veh-h/h	21.68	pers-h/h
Control Delay (Average)	33.9	sec	33.9	sec
Control Delay (Worst Lane)	44.8	sec		
Control Delay (Worst Movement)	44.4	sec	44.4	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	33.9	sec		
Idling Time (Average)	23.2	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	11.8	veh		
95% Back of Queue - Distance (Worst Lane)	302.8	ft		
Queue Storage Ratio (Worst Lane)	0.27			
Total Effective Stops	1671	veh/h	2006	pers/h
Effective Stop Rate	0.87	per veh	0.87	per pers
Proportion Queued	0.67		0.67	
Performance Index	58.6		58.6	
Travel Distance (Total)	691.9	veh-mi/h	830.2	pers-mi/h
Travel Distance (Average)	1905	ft	1905	ft
Travel Time (Total)	40.9	veh-h/h	49.1	pers-h/h
Travel Time (Average)	76.9	sec	76.9	sec
Travel Speed	16.9	mph	16.9	mph
Cost (Total)	665.55	$/h	665.55	$/h
Fuel Consumption (Total)	24.2	gal/h		
Carbon Dioxide (Total)	216.4	kg/h		
Hydrocarbons (Total)	0.104	kg/h		
Carbon Monoxide (Total)	0.693	kg/h		
NOx (Total)	0.424	kg/h		

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	920,202	veh/y	1,104,242	pers/y
Delay	8,673	veh-h/y	10,408	pers-h/y
Effective Stops	802,256	veh/y	962,707	pers/y
Travel Distance	332,089	veh-mi/y	398,507	pers-mi/y
Travel Time	19,655	veh-h/y	23,586	pers-h/y
Cost	319,463	$/y	319,463	$/y
Fuel Consumption	11,632	gal/y		
Carbon Dioxide	103,857	kg/y		
Hydrocarbons	50	kg/y		
Carbon Monoxide	332	kg/y		
NOx	204	kg/y		

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MOVEMENT SUMMARY

Site: I-5 NB Ramps & Hasley canyon - Cum+prj - PM

New Site
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: I-5 NB Off-Ramp											
3	L2	1340	3.0	0.940	44.4	LOS D	11.8	302.8	0.95	2.49	15.8
8	T1	1	100.0	0.940	44.1	LOS D	11.4	293.4	0.95	2.46	15.9
Approach		1341	3.1	0.940	44.4	LOS D	11.8	302.8	0.95	1.25	15.8
West: Hasley Canyon Rd											
5	L2	576	3.0	0.525	9.5	LOS A	0.0	0.0	0.00	0.00	24.0
Approach		576	3.0	0.525	9.5	LOS A	0.0	0.0	0.00	0.00	24.0
All Vehicles		1917	3.1	0.940	33.9	LOS C	11.8	302.8	0.67	0.87	16.9

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: SIDRA Roundabout LOS.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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SIDRA INTERSECTION 6

Appendix E PROJECT FAIR SHARE CALCULATIONS

Intersection	Existing Peak Hour Volumes (AM + PM)	Cumulative Conditions Peak Hour Volumes (AM + PM)	Cumulative Growth	Project Peak Hour Volumes (AM + PM)	Project Fair Share %
1. Chiquito Cyn & SR 126/Henry Mayo	3,606	10,640	7,034	83	1.2%
4. Del Valle & Hasley Cyn	1,145	3,020	1,875	348	18.6%
5. Commerce Center & Hasley Cyn	3,214	5,820	2,606	268	10.3%
6. The Old Road & I-5 SB Ramps	3,211	5,340	2,129	13	0.6%
14. Wolcott & SR-126	3,574	11,350	7,776	69	0.9%

APPENDIX N

Tribal Consultation

From: Jairo Avila [mailto:jairo.avila@tataviam-nsn.us]
Sent: Wednesday, January 3, 2018 10:53 AM
To: Elizabeth Denniston <edenniston@dudek.com>
Subject: Sterling Ranch Estates Project THPO

Tribal Historic & Cultural Preservation Department

Project: ***Sterling Ranch Estates Project in the Community of Val Verde, Los Angeles County, California.***
Address: ***The community of Val Verde (North of Chiquito Canyon Road and Northwest and Southeast of Del Valley Road)***

Hello Elizabeth,

Thank you for reaching out to the Tribal Historic and Cultural Resources ("THCP") department of the Fernandeño Tataviam Band of Mission Indians (Tribe). We received your letter regarding the proposed project referenced above after December 12, 2017.

The proposed project area is located within the traditional ancestral territory, and encompasses the lineage-villages from which members of the Tribe descend. Therefore, the project is of interest to the THCP department.

At this moment we would like to request the contact information for the lead agency of the proposed project.

Respectfully,

--
Jairo F. Avila, M.A., R.P.A.
Tribal Historic and Cultural Preservation Officer

Fernandeño Tataviam Band of Mission Indians
1019 Second Street, Suite 1
San Fernando, California 91340
Office: (818) 837-0794
Website: http://www.tataviam-nsn.us

Los Angeles County
Department of Regional Planning

Planning for the Challenges Ahead

Amy J. Bodek, AICP
Director of Regional Planning

Dennis Slavin
Chief Deputy Director,
Regional Planning

September 18, 2019

Jairo F. Avila, Tribal Historic and Cultural Preservation Officer
Fernandeño Tataviam Band of Mission Indians
1019 Second Street Suite 1
San Fernando CA 91340

RE: Tribal Cultural Resources under the California Environmental Quality Act, AB 52 (Gatto, 2014). Formal Notification of the Proposed Project pursuant to Public Resources Code (PRC) §21080.3.1.

The Los Angeles County Department of Regional Planning is issuing this formal notification of the proposed project. Below please find a description of the proposed project, a map showing the project location, and our contact information along with the name of our point of contact, pursuant to PRC §21080.3.1(d).

Proposed Project: Green Valley Ranch Residential
Project No. 03-250 -5
Vesting Tentative Tract Map No. 60257

Project Description: To create 222 single-family residence lots, one commercial lot, private recreation lots and public infrastructure lots on 113.9 acres within Zone R-1 of the Castaic Area Community Standards District.

Project Location: 29053 Coolidge Avenue, Castaic, CA
(APNs 3271-004-003, -013 and 3271-005-024)

Lead Agency Contact Information:
Steven Jones
Land Divisions Section
Department of Regional Planning
320 W. Temple Street, Room 1360
Los Angeles, CA 90012
Tel: (213) 974-6433
Email: sdjones@planning.lacounty.gov

Pursuant to PRC §21080.3.1(b), you have 30 days from the receipt of this letter to request consultation, in writing, with the Department of Regional Planning. Written request must be submitted to the contact information listed above.

Our office hours are Monday through Thursday, 7:00 a.m. to 5:30 p.m. We are closed on Fridays.

Sincerely,
DEPARTMENT OF REGIONAL PLANNING
Amy J. Bodek, AICP
Director

Steven Jones, Principal Planner
Land Divisions Section

Encl: Map of Project Location

JSH:SDJ

APPENDIX O

Utilities and Service Systems

APPENDIX O.1

Los Angeles County Water Works District No. 36

COUNTY OF LOS ANGELES DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL HEALTH
5050 COMMERCE DRIVE BALDWIN PARK, CA 91706 (626) 430-5380

December 22, 2020

CASE: RTM-TR060257-28682
PROJECT: TR060257
PLANNER: Jones, Steven
LOCATION: 29053 Coolidge Avenue Castaic CA 91384

The Department of Public Health-Environmental Health Division has reviewed the above project to construct a community of 222 detached single-family homes on 57.9 acres with a passive pocket park on 0.2 acres, a parking lot, a shade structure, and tables on 3.4 acres, and a 21,000 square foot commercial building with 71 parking spaces on 2.5 acres. The applicant provided a December 17, 2020 letter from the sanitation district indicating that "The entire project area is outside the jurisdictional boundaries of the District and will require annexation into District before sewerage service can be provided to the proposed development." The applicant also provided a December 16, 2020 Water Service Availability letter.

Public Health provides the following conditional clearance with the condition(s) below that must be completed prior to Final Map approval.

---

1. Complete the annexation process through the Local Agency Formation Commission and provide a sanitation district "Will Serve" letter that indicates that sewerage services will be provided for the above project.

Please contact Shayne LaMont, Land Use Program for any questions regarding this report: slamont@ph.lacounty.gov.

Prepared by: Shayne LaMont, EHS IV
Registered Environmental Health Specialist
Supervisorial District 5

APPENDIX O.2

Approved Sewer Study

SEWER AREA STUDY

FOR:

Tentative Tract No. 060257
PC 11992AS

FOR OWNER:

Sterling Gateway, L.P.
P.O. Box 681007
Park City, UT 84068
Attention: Hunt Williams
Phone (435) 655-0890

PREPARED BY:

SIKAND ENGINEERING ASSOCIATES
15230 Burbank Boulevard, Suite 100
Van Nuys, California 91411
818/787-8550 Fax 818/901-7451

Submittal Date: March 4, 2020

Doug Farmer, Civil Engineer

SEWER AREA STUDY
APPROVED

APPROVED BY: Pedro Romero RCE NO._____ DATE 04/02/2020

CHECKED BY:_____DATE 04/02/2020

COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS
LAND DEVELOPMENT DIVISION

THIS APPROVAL IS ONLY GOOD FOR TWO YEARS FROM THE DATE OF SEWER AREA STUDY APPROVAL

W.O. 5100-056-01

INDEX

I. INTRODUCTION

II. SITE DESCRIPTION

III. PROJECT DESCRIPTION

IV. SEWER PIPE CAPACITY

V. CONCLUSION

VI. EXHIBIT- SEWER AREA STUDY MAP

VII. APPENDIX

A. APPENDIX A

TABLE 1- SEWAGE GENERATION COEFFICIENTS

TABLE 2- FLOW GENERATION CALCULATIONS- ULTIMATE CONDITIONS

TABLE 3- SEWER FLOW SUMMARY: ULTIMATE CONDITIONS

TABLE 4- SEWER FLOW SUMMARY: FLOW TEST

LA COUNTY DEPT. OF PUBLIC WORKS AREA STUDY ZONING COEFFICIENTS

B. APPENDIX B – CSMD INDEX MAPS

C. APPENDIX C – LA COUNTY ZONING MAPS

D. APPENDIX D – AS-BUILT SEWER PLANS

E. APPENDIX E – SEWER FLOW TEST FOR MH #110 AND #100, DATED JUNE 20TH , 2019.

I. INTRODUCTION

The following AREA study has been prepared by Sikand Engineering Associates, to determine and show:

a) Determine the capacity of the existing sewer (P.C.'s 11572, 10942 & 11491) from the project location to the existing trunk line, to accept the flow from TM 60257.

b) Determine the pipe size, if necessary, for any downstream sewer replacement. This analysis will include the tributary flow to the sewer system from the proposed development and future development to the trunk line downstream of the proposed development.

This sewer area study analyzes flows in the sewer line for a proposed pump station that serves TR 60257, and ultimate gravity sewer that will serve both TR 60665 and TR 60257.

II. SITE DESCRIPTION

This proposed development is located South of Hasley Canyon Road and North of Hunstock Avenue, in the County of Los Angeles, State of California.

Sewer flows generated from the western half of the project, and the undeveloped land north of the project, will gravity flow south on Del Valle Road to the proposed pump station located at the intersection of Del Valle Road and Hunstock Avenue. The flows will be pumped through the proposed force main and will combine with gravity sewer flows from the eastern side of the project and TR 60665 residential lots. Sewer flows will continue to gravity flow northeasterly within Del Valle Road, to the existing sewer system on Hasley Canyon Road.

III. PROJECT DESCRIPTION

Tentative Tract Map No. 60257 consists of 221 residential lots and one commercial lot.

IV. SEWER PIPE CAPACITY ANALYSIS

The existing sewer pipes were analyzed per County Standard S-C4 for a maximum design depth at a ¾ full. All outlet pipes $\geq$ 18" diameter.

The design capacity for the existing pipe was obtained by using Kutter's Formula with "n=0.013" as shown in the flow diagram for the design of circular sanitary sewer system (see attached S-C4 chart in appendix VII).

The tributary sewer flow rate (Q) for the studied sewer lines are determined based on County Standards as follows:

Q = (Z)(A)
A = Tributary Area (Acre)
Z = Zoning Coefficients (see County attachment in appendix VII)
Q = # Units x .001 cfs/unit

V. CONCLUSION

This sewer area study analyzes flows in the sewer line for two scenarios.

1. The first scenario is for ultimate build out. Under this scenario there are several segments of the gravity line that are over capacity. The pipes which need to be replaced will be sized using Q's based on the ultimate build out scenario.
2. The second scenario is based on actual flow test results plus approved tentative maps, active tentative maps, the proposed development and vacant land contributing to the sewer shed.

This sewer area study shows the worst case scenario for mitigation for the proposed project (TM 60257). Per the attached study, the mitigation which will be required for this development is:

A. A new temporary pump station and associated force main located at the southwesterly corner of the project near Hunstock Avenue. The pump station and force main will be sized to accommodate flows from TM 60257.

B. A gravity sewer in Del Valle Road from the proposed force main in Del Valle Rd to the existing gravity sewer in Hasley Canyon Road. Sizing of the proposed sewer improvements are included in this analysis.

C. Pipe Replacement: Based on Theoretical Flows, replacement of downstream gravity sewer lines would be required due to construction of this project. The sewer area study shows that portions of the existing gravity sewer line in PC 10942 from MH #108 to the trunk sewer will be over ¾ full capacity due to construction of this project.

   The Ultimate Condition Analysis provides the following pipe mitigation:

   - The existing 18" pipe from MH #108 to MH #105 in Hasley Canyon Road would need to be replaced with a 30" VCP at the same slope to provide for capacity for the ultimate theoretical flow.

   - The existing 18" pipe from MH #105 to the Trunk Sewer would need to be replaced with a 36" VCP at the same slope to provide for capacity for the ultimate theoretical flow.

Flow Testing: Based on Flow Testing, no replacement of downstream sewers should be required at this time. Flow Test results have been provided in the Appendix of this Report.

Per our earlier phone conversation with Imelda and Pedro, we have reviewed the undeveloped but approved areas within the Commerce Center area tributary to Manhole 111. This manhole was flow tested per the sewer area study for TT 60257. The maximum flow rate that was measured in this testing period was 2.002 cfs. The ultimate sewershed area tributary to this manhole is 909.2 Acres. Of this area 635.7 acres was developed at the time of the flow test. In addition there are 68.2 Acres which

are currently approved but not constructed and an additional 205.3 Acres which are undeveloped and not approved.

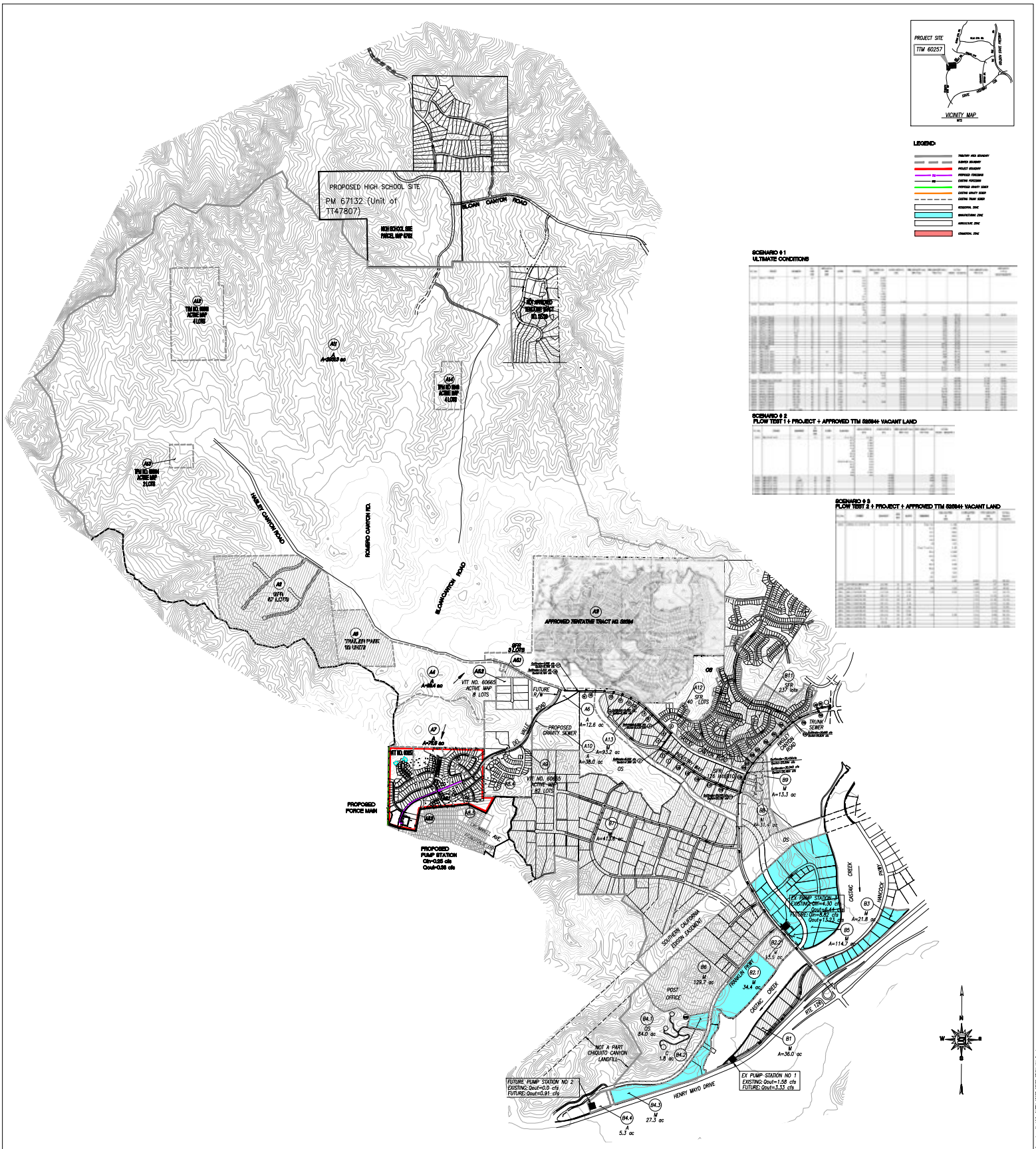
Based on the flow test (2.002 cfs) divided by currently developed acreage (635.7 ac) a rate of .00315 cfs/ acre can be assumed for existing development. As agreed on the phone call, we have used this rate times the undeveloped and not approved areas (205.3 ac). This will add 205.3 x .00315 = .646 cfs to the 2.002 total from the flow test for a total of 2.648 cfs.

For the 68.2 acres which are currently approved but not developed, we originally proposed to pro-rate using the same factor. However, since these areas are part of previously approved developments, you stated that they should be analyzed using the theoretical values based on either zoning or use. Using the theoretical number based on zoning (M Zone) of 0.021 cfs / ac x 68.2 acres gives a value of 1.43 cfs. Adding this to the 2.648 cfs equals a total of 4.078 cfs. When this value is input into Table 6, the downstream sewer reaches between MH 111 and MH 108 (approx. 1100') and MH 104 and MH 99 (approx. 1080') would need to be replaced as they exceed the ¾ full criteria by between 5% to 12%.

We then looked at determining the flow rate for the 68.2 acres based on use. We have very solid information for the proposed development of PM 60030 which is 46.5 acres of the 68.2 total. Per the attached table (Sewer Flow Rates for PM 60030) we determined that an average of 5% of the total area of the buildings is Office with the remaining areas dedicated to various warehouse / manufacturing type uses. Using a 200 gpd / 1000 sf of office use and using a value of 100 gpd / 1000 sf of manufacturing use per City of Los Angeles flow coefficient gives a total of 0.3682 cfs for the remainder of PM 60030. Prorating that to the entire 68.2 acres (0.3682 x 68.2/46.5) equals .540 cfs of additional flow. Added to the 2.648 cfs from above equals a total of 3.188 cfs. When this value is input into Table 6, two downstream reaches will need replacing as flows are slightly above capacity (102.2% max.).

However, further analysis of the large undeveloped tributary area (2931.3 acres – A1.1) shows that we have assumed a coefficient of 0.001 cfs per acre as it is in an agricultural zone. Per the General Plan, this area is designated as RL-2 (1 du / 2Ac). This means that the maximum number of units that can be constructed within this area would be 2931.3/2 = 1466 du. That means that the coefficient that should be assumed for this subarea should be 0.001 cfs per du for a total of 1.466 cfs. Using this number in Table 6, all downstream reaches will not need to be replaced as maximum flow within the downstream pipes is 85.4% of capacity.

In our engineering determination, the "use" analysis is a more accurate representation of the approved but not developed areas and should offer the necessary assurances to the county that the proposed project (TT 60257) will not negatively impact future developments within the tributary Hasley sewershed.



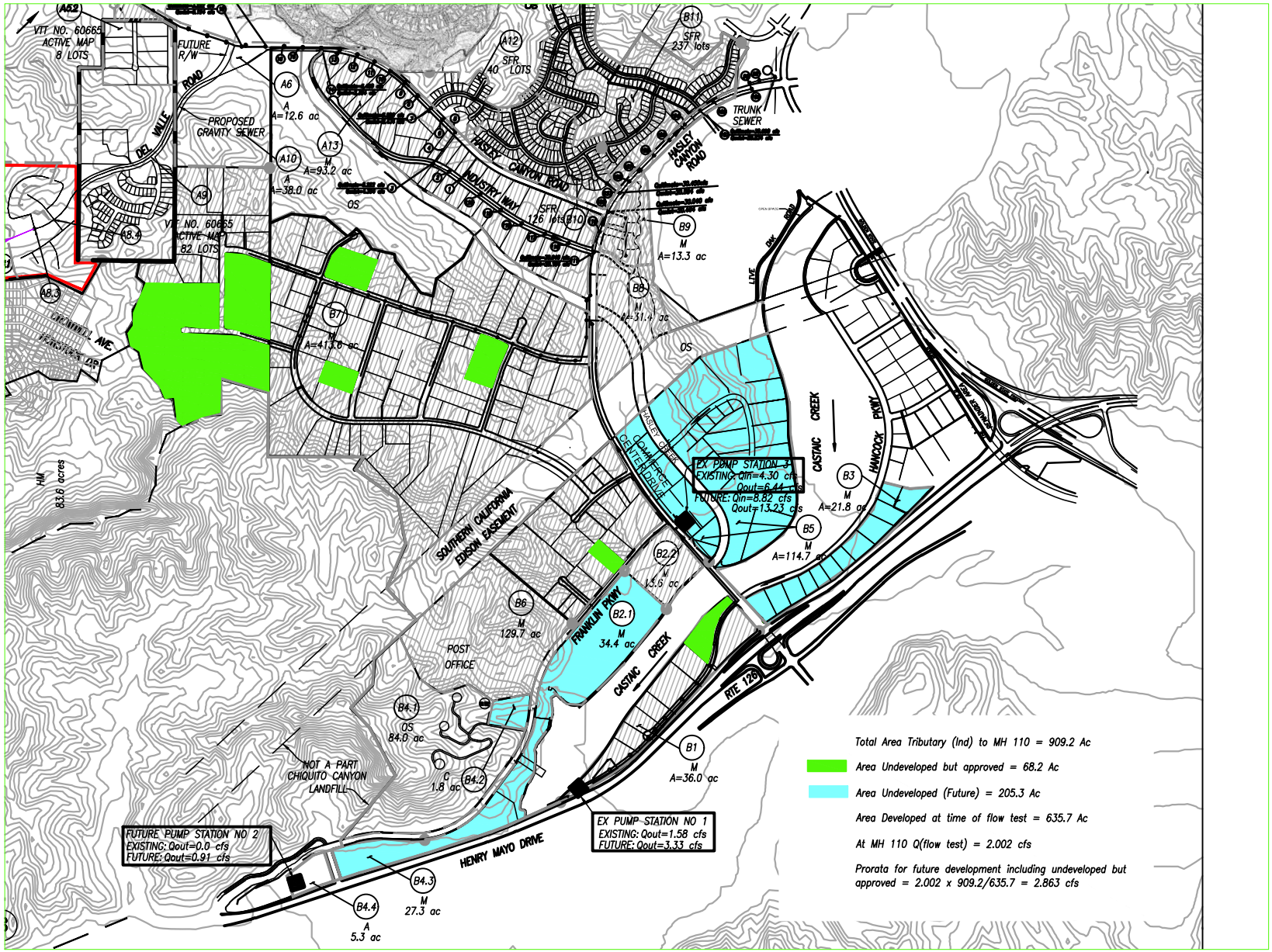
PREPARED FOR

STERLING GATEWAY
P.O. BOX 681007
PARK CITY,UTAH 84068
HUNT WILLIAMS (435)655-0890

LEGAL DESCRIPTION

PORTION OF LOT A, TRACT NO. 8589 RECORDED IN BOOK 101 PAGES 57-68, AND PORTIONS OF PARCELS 10 AND 11 OF PARCEL MAP NO. 19784 P.M.B. 206-61-67

SEWER AREA STUDY MAP
FOR
TENTATIVE PARCEL MAP NO 060257



VTT NO. 60665
ACTIVE MAP
8 LOTS
FUTURE
R/W
DEL VALLE ROAD
PROPOSED
GRAVITY SEWER
A6
A
A=12.6 ac
A13
M
A=93.2 ac
A10
A
A=38.0 ac
A9
A8.4
VTT NO. 60665
ACTIVE MAP
82 LOTS
A8.3
A12
SFR
40 LOTS
B11
SFR
237 lots
TRUNK
SEWER
HASLEY CANYON ROAD
INDUSTRY WAY
SFR
126 lots
B10
B9
M
A=13.3 ac
B8
M
A=31.4 ac
B7
M
A=413.6 ac
OS
LIVE OAK ROAD
CASTAIC CREEK
HANCOCK PKWY
EX PUMP STATION 3
EXISTING: Qin=4.30 cfs
Qout=6.44 cfs
FUTURE: Qin=8.82 cfs
Qout=13.23 cfs
B3
M
A=21.8 ac
B5
M
A=114.7 ac
HASLEY CREEK
COMMERCE CENTER DRIVE
SOUTHERN CALIFORNIA
EDISON EASEMENT
B2.2
M
13.6 ac
B6
M
129.7 ac
B2.1
M
34.4 ac
FRANKLIN PKWY
POST
OFFICE
CASTAIC CREEK
RTE 126
B4.1
OS
84.0 ac
NOT A PART
CHIQUITO CANYON
LANDFILL
C
1.8 ac
B4.2
B1
M
A=36.0 ac
EX PUMP STATION NO 1
EXISTING: Qout=1.58 cfs
FUTURE: Qout=3.33 cfs
FUTURE PUMP STATION NO 2
EXISTING: Qout=0.0 cfs
FUTURE: Qout=0.91 cfs
HENRY MAYO DRIVE
B4.3
M
27.3 ac
B4.4
A
5.3 ac
HM
83.6 acres
Total Area Tributary (Ind) to MH 110 = 909.2 Ac
Area Undeveloped but approved = 68.2 Ac
Area Undeveloped (Future) = 205.3 Ac
Area Developed at time of flow test = 635.7 Ac
At MH 110 Q(flow test) = 2.002 cfs
Prorata for future development including undeveloped but approved = 2.002 x 909.2/635.7 = 2.863 cfs

Appendix A

Tentative Tract No. 060257
Sewer Area Study
TABLE 1

SEWAGE GENERATION COEFFICIENTS

LAND USE	SEWER GENERATION COEFFICIENT (cfs/Ac)	SEWER GENERATION COEFFICIENT (cfs/DU)
Single Family Dwelling		0.001
Rural Land (RL-2)	0.0005	
Commercial	0.015	
Manufacturing	0.021	

Tentative Tract No. 060257
Sewer Area Study
TABLE 3

SEWER FLOW GENERATION CALCULATIONS
Ultimate Conditions

AREA A

TRIBUTARY AREA	LAND USE	AREA (Ac)	DWELLING UNIT (Lots)	COEFF (cfs/Ac)	COEFF (cfs/Lot)	Q (cfs)
A1.1	RL2	2931.3		0.0005		1.47
A1.2	SFR		4		0.001	0.004
A1.3	SFR		2		0.001	0.002
A1.4	SFR		4		0.001	0.004
A2	SFR		67		0.001	0.07
A3	SFR		113		0.001	0.11
A4	RL2	89.4		0.0005		0.04
A5.1	SFR		4		0.001	0.004
A5.2	SFR		8		0.001	0.008
A6	RL2	12.6		0.0005		0.01
A7	RL2	75.6		0.0005		0.04
A8.1	SFR		56		0.001	0.06
A8.2	SFR		63		0.001	0.06
A8.2	C	3		0.015		0.05
A8.3	SFR		39		0.001	0.04
A8.4	SFR		63		0.001	0.06
A9	SFR		82		0.001	0.08
A10	RL2	38		0.0005		0.02
A11*	SFR	410		0.004		1.64
A12	SFR		40		0.001	0.04
A13	M	93.2		0.021		1.96

*From Approved VTTM 052584 Sewer Area Study, Prepared by Land Design Consultants, Dated Feb. 2016

SEWER FLOW GENERATION CALCULATIONS

Ultimate Conditions

AREA B

TRIBUTARY AREA	LAND USE	AREA (Ac)	DWELLING UNIT (Lots)	COEFF (cfs/Ac)	COEFF (cfs/Lot)	Q (cfs)
B1	M	36.0		0.021		0.76
B2.1	M	34.4		0.021		0.72
B2.2	M	13.6		0.021		0.29
B3	M	21.8		0.021		0.46
B4.1	OS	84		0		0.00
B4.2	C	1.8		0.015		0.03
B4.3	M	27.3		0.021		0.57
B4.4	RL2	5.3		0.0005		0.00
B5	M	115.0		0.021		2.42
B6	M	129.7		0.021		2.72
B7	M	413.6		0.021		8.69
B8	M	31.4		0.021		0.66
B9	M	13.3		0.021		0.28
B10	SFR		126		0.001	0.13
B11	SFR		237		0.001	0.24

Existing Conditions

Pump Stations

	TRIB AREA	Q (cfs)	$Q_{cumulative}$ (cfs)
Pump Sta #1 Qin	B1	0.76	
	B2.2	0.29	1.05
*Pump Sta #1 Qout=			1.58
Pump Sta #3 Qin	B6	2.72	4.30
*Pump Sta #3 Qout			6.44

**Pump Sta #2 Qout= Qin*1.5*

Proposed

Pump Station

	TRIB AREA	Q (cfs)	$Q_{cumulative}$ (cfs)
Pump Sta. Qin	A7	0.08	
	A8.1	0.06	
	A8.2	0.06	
	A8.2	0.05	0.25
*Pump Sta Qout=			0.38

Ultimate Condition

Pump Station #3

	TRIB AREA	Q (cfs)	$Q_{cumulative}$ (cfs)
Pump Sta #2 Qin	B4.1	0.00	
	B4.2	0.03	
	B4.3	0.57	
	B4.4	0.01	0.61
*Pump Sta #2 Qout=			0.91
Pump Sta #1 Qin	B1	0.76	
	B2.1	0.72	
	B2.2	0.29	
	B3	0.46	2.22
*Pump Sta #1 Qout=			3.33
Pump Sta #3 Qin	PS #1 Qin	2.22	2.89
	PS #2 Qin	0.61	0.79
	B5	2.42	
	B6	2.72	
			8.82
*Pump Sta #3 Qout			13.23

**Pump Qout= Qin*1.5*

*Pump Sta #3 Qin= #1 Qin*1.3+ #2 Qin*1.3+B5+B6= 2.89+2.55+2.42+2.72*

Tentative Tract No. 060257
Table 4

SEWER FLOW CALCULATION SUMMARY
Ultimate Conditions

P.C. No.	STREET	SEGMENT	EX. PIPE SIZE	MITIGATED PIPE SIZE	SLOPE	SUBAREA	CALCULATED Q (cfs)	CUMULATIVE Q (cfs)	PIPE CAPACITY (cfs) 50% FULL	PIPE CAPACITY (cfs) 75% FULL	% FULL Qcum/ Qcapacity	PIPE CAPACITY (cfs) 75% FULL	MITIGATED % FULL Qcum/Qcapacity
11572	HASLEY CYN RD	18-17	10		3.20	A1.1	1.465						
						A1.2	0.004						
						A1.3	0.002						
						A1.4	0.004						
						A2	0.07						
						A3	0.11						
						A4	0.045						
						A5.1	0.004						
						A5.2	0.008						
						A6	0.01	1.722					
11572	HASLEY CYN RD	17-16	12	15	1.00	PROP PUMP Qout	0.38						
						A8.3	0.04						
						A8.4	0.06						
						A9	0.08						
						A10	0.038	2.320	1.70		136.5%	5.82	39.9%
11572	HASLEY CYN RD	16-15	15		1.00			2.320		5.82	39.9%		
11572	HASLEY CYN RD	15-14	15		1.00			2.320		5.82	39.9%		
11572	HASLEY CYN RD	14-13	15		1.00	A11	1.64	3.960		5.82	68.0%		
11572	HASLEY CYN RD	13-12	15		1.00			3.960		5.82	68.0%		
11572	HASLEY CYN RD	12-11	15		1.00			3.960		5.82	68.0%		
11572	HASLEY CYN RD	11-10	15		1.00			3.960		5.82	68.0%		
11572	HASLEY CYN RD	10-9	18		0.93			3.960		9.23	42.9%		
11572	HASLEY CYN RD	9-8	18		0.93			3.960		9.23	42.9%		
11572	HASLEY CYN RD	8-7	18		0.93			3.960		9.23	42.9%		
11491	HASLEY CYN RD	7-6	15		2.60	A12	0.04	4.000		9.4	42.6%		
11491	HASLEY CYN RD	6-5	15		3.00			4.000		10.09	39.6%		
11491	EASEMENT	5-4	15		3.84			4.000		11.42	35.0%		
11491	EASEMENT	4-3	15		3.96			4.000		11.6	34.5%		
11491	INDUSTRY WAY	3-2	15	18	1.08	A13	1.96	5.960		6.05	98.5%	9.95	59.9%
11491	INDUSTRY WAY	2-1	15		2.88			5.960		9.89	60.3%		
11491	INDUSTRY WAY	1-120	15		2.88			5.960		9.89	60.3%		
11491	INDUSTRY WAY	120-119	15		3.56			5.960		11	54.2%		
11491	INDUSTRY WAY	119-118	15		1.92			5.960		8.07	73.9%		
11491	INDUSTRY WAY	118-117	15	18	1.60			5.960		7.37	80.9%	12.17	49.2%
11491	INDUSTRY WAY	117-116	18		1.42			5.960		11.41	52.2%		
11491	INDUSTRY WAY	116-111	18		1.42			5.960		11.41	52.2%		
10942	COMMERCE CENTER DR	111-110	21		0.36	Pump Sta. #3	13.23						
						B7	8.69						
						B8	0.66	28.540		8.7	328.0%	37.34	76.4%
10942	COMMERCE CENTER DR	110-109	21		0.36			28.540		8.7	328.0%	37.34	76.4%
10942	HASLEY CYN RD	109-223	21		0.36	B9	0.28	28.820		8.7	331.3%	37.34	77.2%
10942	HASLEY CYN RD	223-108	21		0.36	B10	0.13	28.950		8.7	332.8%	37.34	77.5%
10942	HASLEY CYN RD	108-107	18	30	3.32			28.950		17.46	165.8%	38.0	76.2%
10942	HASLEY CYN RD	107-106	18	30	3.84			28.950		18.78	154.2%	40.8	71.0%
10942	HASLEY CYN RD	106-105	18	30	3.16			28.950		17.04	169.9%	37.0	78.2%
10942	HASLEY CYN RD	105-104	18	30	1.90			28.950		13.21	219.2%	47.0	61.6%
10942	HASLEY CYN RD	104-103	18	30	0.92			28.950		9.18	315.4%	32.7	88.5%
10942	HASLEY CYN RD	103-102	18	30	0.98	B11	0.24	29.190		9.48	307.9%	33.7	86.6%
10942	HASLEY CYN RD	102-99	18	30	0.92			29.190		9.18	318.0%	32.7	89.3%
10942	HASLEY CYN RD	99-98	18	30	1.40			29.190		11.33	257.6%	40.3	72.4%
10942	HASLEY CYN RD	98-TR SEWER	18	30	2.64			29.190		15.57	187.5%	55.4	52.7%

Tentative Tract No. 060257
Table 5

SEWER FLOW CALCULATION SUMMARY
Flow test 1 (MH 3) + Project + Approved TTM 52584 + Vacant Land

P.C. No.	STREET	SEGMENT	EX. PIPE SIZE	SLOPE	SUBAREA	CALCULATED Q (cfs)	CUMULATIVE Q (cfs)	PIPE CAPACITY (cfs) 50% FULL	PIPE CAPACITY (cfs) 75% FULL	% FULL Qcum/ Qcapacity
11491	INDUSTRY WAY	3-2	15	1.08	Flow Test	0.3032				
					A1.1	1.465				
					A1.2	0.004				
					A1.3	0.002				
					A1.4	0.004				
					A4	0.04				
					A5.1	0.004				
					A5.2	0.008				
					A6	0.01				
					PROP PUMP Qout	0.38				
					A8.3	0.04				
					A8.4	0.06				
					A9	0.08				
					A10	0.038				
					A11	1.64	4.078		6.05	67.4%
11491	INDUSTRY WAY	2-1	15	2.88			4.078		9.89	41.2%
11491	INDUSTRY WAY	1-120	15	2.88			4.078		9.89	41.2%
11491	INDUSTRY WAY	120-119	15	3.56			4.078		11	37.1%
11491	INDUSTRY WAY	119-118	15	1.92			4.078		8.07	50.5%
11491	INDUSTRY WAY	118-117	15	1.60			4.078		7.37	55.3%
11491	INDUSTRY WAY	117-116	18	1.42			4.078		11.41	35.7%
11491	INDUSTRY WAY	116-111	18	1.42			4.078		11.41	35.7%

Tentative Tract No. 060257

Table 6 (Use)

SEWER FLOW CALCULATION SUMMARY

Flow Test 2 + Project+ Approved TTM 52584+ Active Project +Vacant Land

P.C. No.	STREET	SEGMENT	PIPE SIZE	SLOPE	SUBAREA	CALCULATED Q (cfs)	CUMULATIVE Q (cfs)	PIPE CAPACITY (cfs) 75% FULL	% FULL Qcum/ Qcapacity
10942	COMMERCE CENTER DR	111-110	21	0.36	Flow Test	2.002			
					Undev.-unappd	0.646			
					Undev.-appd	0.54			
					A1.1	1.465			
					A1.2	0.004			
					A1.3	0.002			
					A1.4	0.004			
					A4	0.04			
					Prop. Pump Sta.	0.38			
					A5.1	0.004			
					A5.2	0.008			
					A6	0.01			
					A8.3	0.04			
					A8.4	0.06			
					A9	0.08			
					A10	0.038			
					A11	1.64	6.963	8.7	80.0%
10942	COMMERCE CENTER DR	110-109	21	0.36			6.963	8.7	80.0%
10942	HASLEY CYN RD	109-223	21	0.36	B9	0.28	7.243	8.7	83.3%
10942	HASLEY CANYON RD	223-108	21	0.36	B10	0.13	7.373	8.7	84.7%
10942	HASLEY CANYON RD	108-107	18	3.32			7.373	17.46	42.2%
10942	HASLEY CANYON RD	107-106	18	3.84			7.373	18.78	39.3%
10942	HASLEY CANYON RD	106-105	18	3.16			7.373	17.04	43.3%
10942	HASLEY CANYON RD	105-104	18	1.90			7.373	13.21	55.8%
10942	HASLEY CANYON RD	104-103	18	0.92			7.373	9.18	80.3%
10942	HASLEY CANYON RD	103-102	18	0.98	B11	0.24	7.613	9.48	80.3%
10942	HASLEY CANYON RD	102-99	18	0.92			7.613	9.18	82.9%
10942	HASLEY CANYON RD	99-98	18	1.40			7.613	11.33	67.2%
10942	HASLEY CANYON RD	98-TR SEWER	18	2.64			7.613	15.57	48.9%

LOS ANGELES COUNTY
DEPARTMENT OF PUBLIC WORKS
LAND DEVELOPMENT DIVISION

AREA STUDY

An area study must be made for all private contract sewer projects. See attached sample. The area study must include the following items:

1. Area being served - In Acres
2. Determined Tributary area to main line being designed (incl. areas of future devel.)- In Acres
3. Existing and Land Use Zoning
4. Anticipated Sewer Discharge in cfs of total area based on zoning, and/or heavy water users
5. Existing or proposed utilities if in conflict
6. Existing and proposed sewers showing pipe size and grade leading up to the trunk line in order for you to evaluate the impact of your proposed development on the existing system
7. Direction of sewer flow
8. Contour lines
9. Scale not to be less than 1"=600'
10. North arrow pointing up or to the left

ZONING COEFFICIENTS

ZONE	COEFFICIENT (cfs/Acre)
Agriculture	0.001
Residential	
R-1	0.004
R-2	0.008
R-3	0.012
R-4	0.016 *
Commerical	
C-1 through C-4	0.015 *
Heavy Industrial	
M-1 through M-4	0.021 *

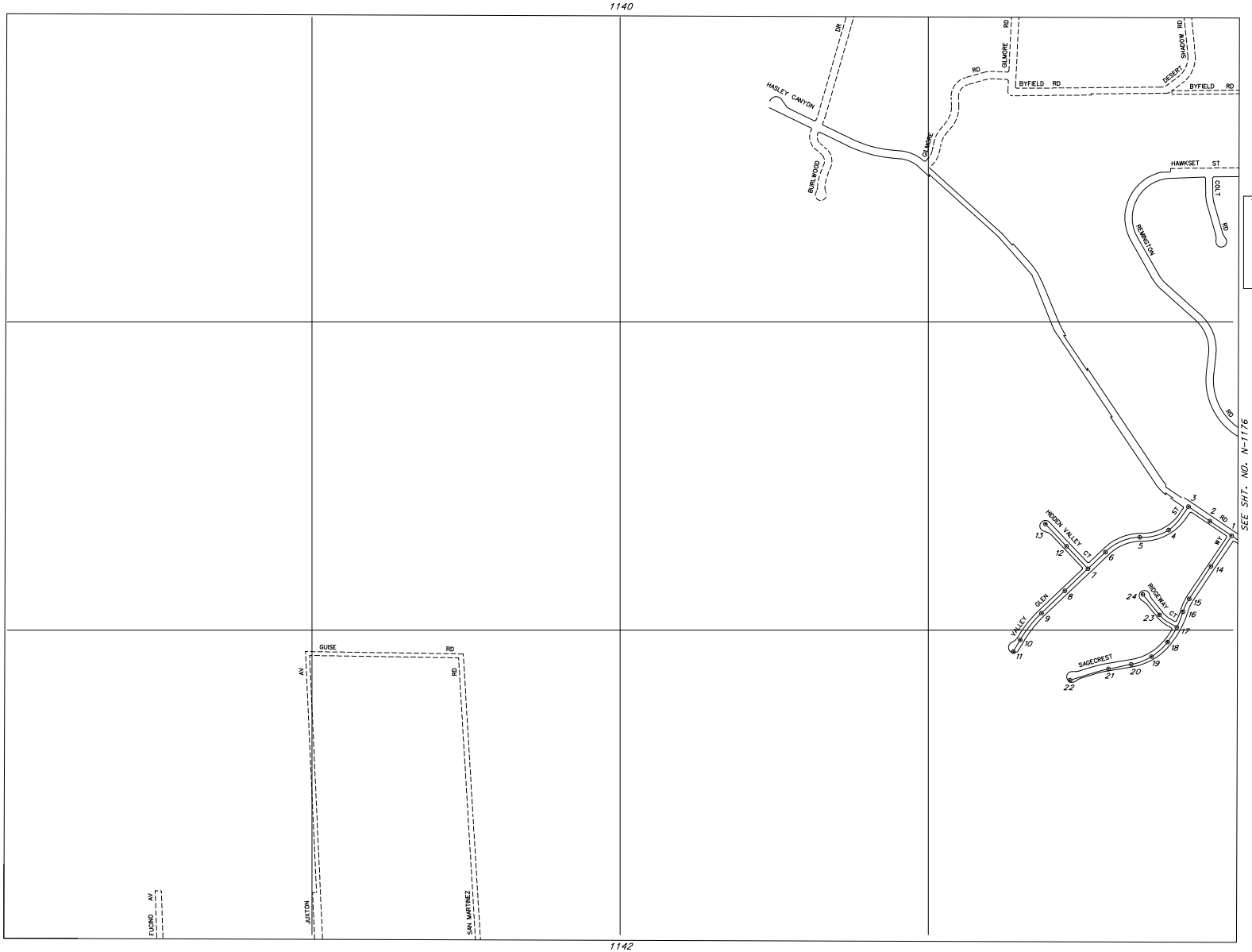
* Individual building, commercial or industrial plant capacities shall be the determining factor when they exceed the coefficients shown.

The coefficient to be used for any zoned areas not listed will be determined by the County based upon the intended development and use.

The County shall determine which of the coefficients or combination of coefficients shall be used for design as determined by the established or proposed zoning in the study area. Any modifications to these coefficients due to topography, development, or hazard areas, shall be approved by the Department of Public Works.

Appendix B

N-1141



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N
AUTOMATED GRAPHICS

METERS
0 50 100 200 250
0 200 400 600 800
FEET

LEGEND

- CLAY SEWERS MAINTAINED BY SMD., 8" UNLESS OTHERWISE NOTED
- PLASTIC SEWERS
- CONCRETE SEWERS
- CLAY SEWERS, LINED
- CEMENT SEWERS, LINED
- SEWERS NOT MAINTAINED BY SMD
- TRUNK SEWERS
- CITY BOUNDARY
- STANDARD MANHOLE
- DROP MANHOLE
- SHALLOW MANHOLE
- TRAP MANHOLE
- WEIR MANHOLE
- C.O. CLEANOUT
- L.H. LAMP HOLE

TOTAL MH'S THIS MAP: 24

MAP REV
03-08-05

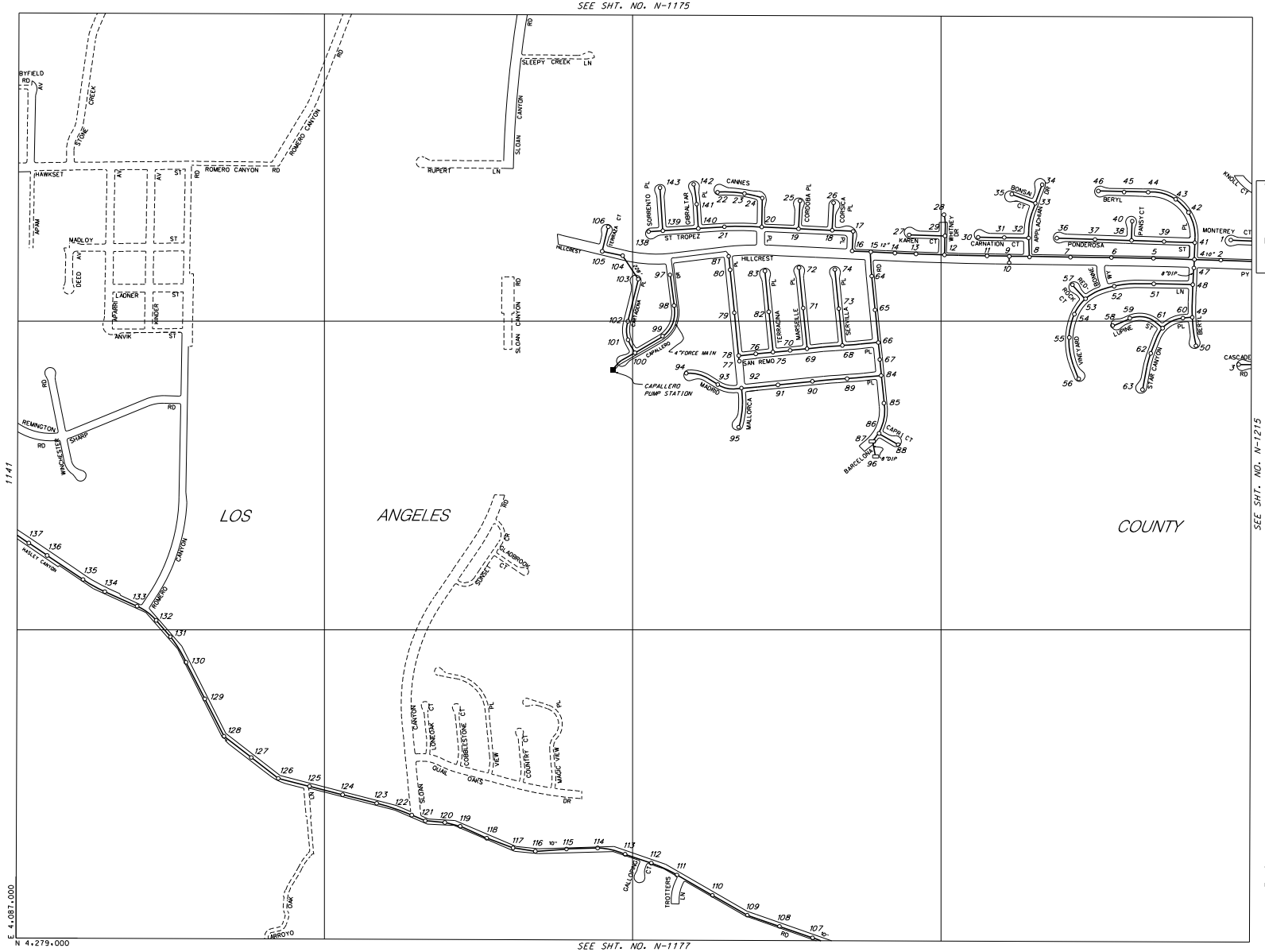
DATA BASE REV
03-08-05

CONSOLIDATED S.M.D.

N-1141

T: 4459 B-3

N-1176



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AUTOMATED GRAPHICS

METERS
0 50 100 200 250
FEET
0 200 400 600 800

LEGEND

- CLAY SEWERS MAINTAINED BY SMD, 8" UNLESS OTHERWISE NOTED
- PLASTIC SEWERS
- CONCRETE SEWERS
- CLAY SEWERS, LINED
- CEMENT SEWERS, LINED
- FORCE MAINS
- SEWERS NOT MAINTAINED BY SMD
- TRUNK SEWERS
- CITY BOUNDARY
- STANDARD MANHOLE
- DROP MANHOLE
- SHALLOW MANHOLE
- TRAP MANHOLE
- WEIR MANHOLE
- C.O. CLEANOUT
- L.H. LAMP HOLE
- PUMP STATION

TOTAL MH'S THIS MAP: 143

MAP REV
10-26-05

DATA BASE REV
01-29-00

CONSOLIDATED S.M.D.

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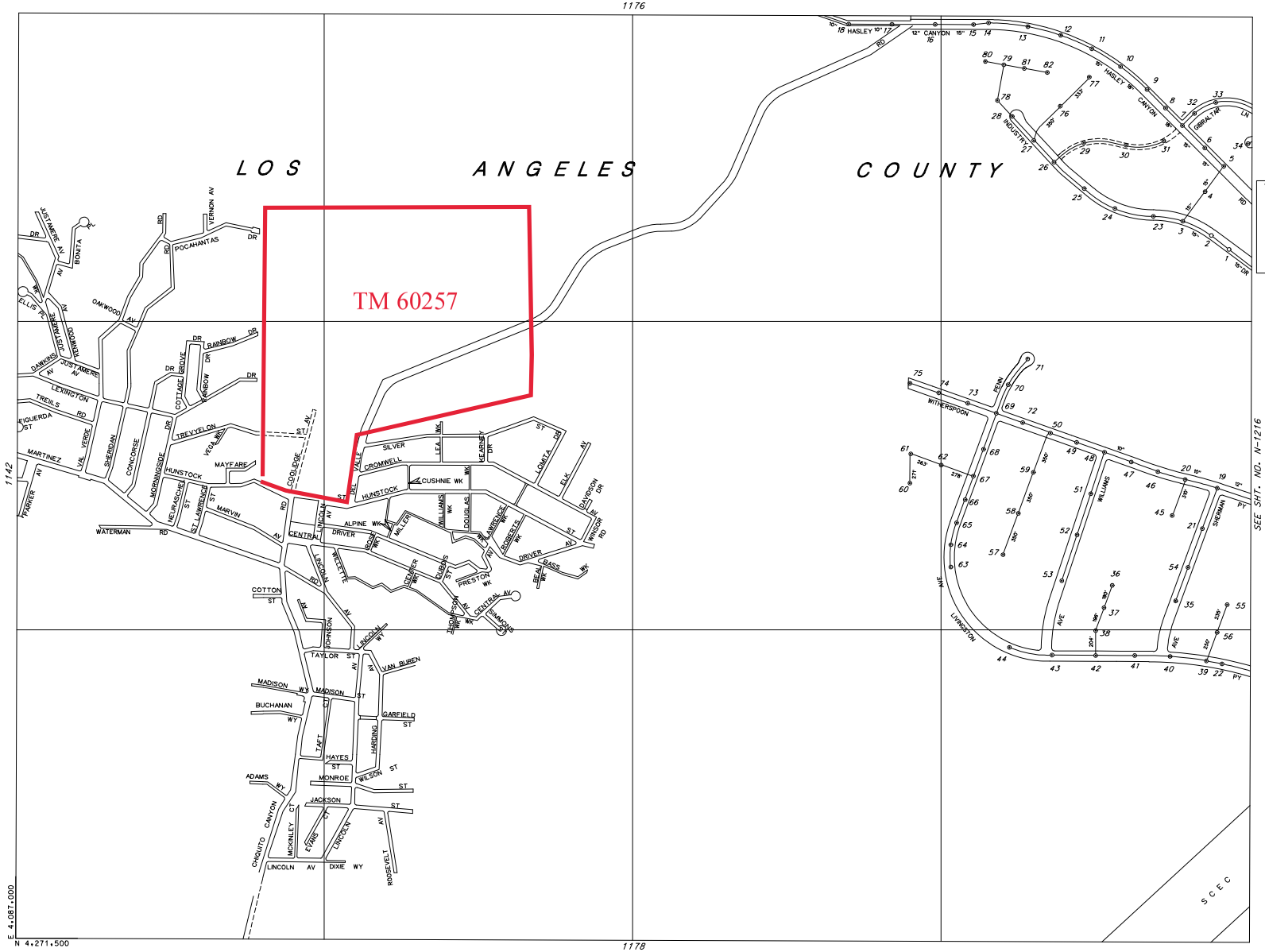
N-1177



MAP REV
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DATA BASE REV
09-22-00

CONSOLIDATED S.M.D.

N-1177

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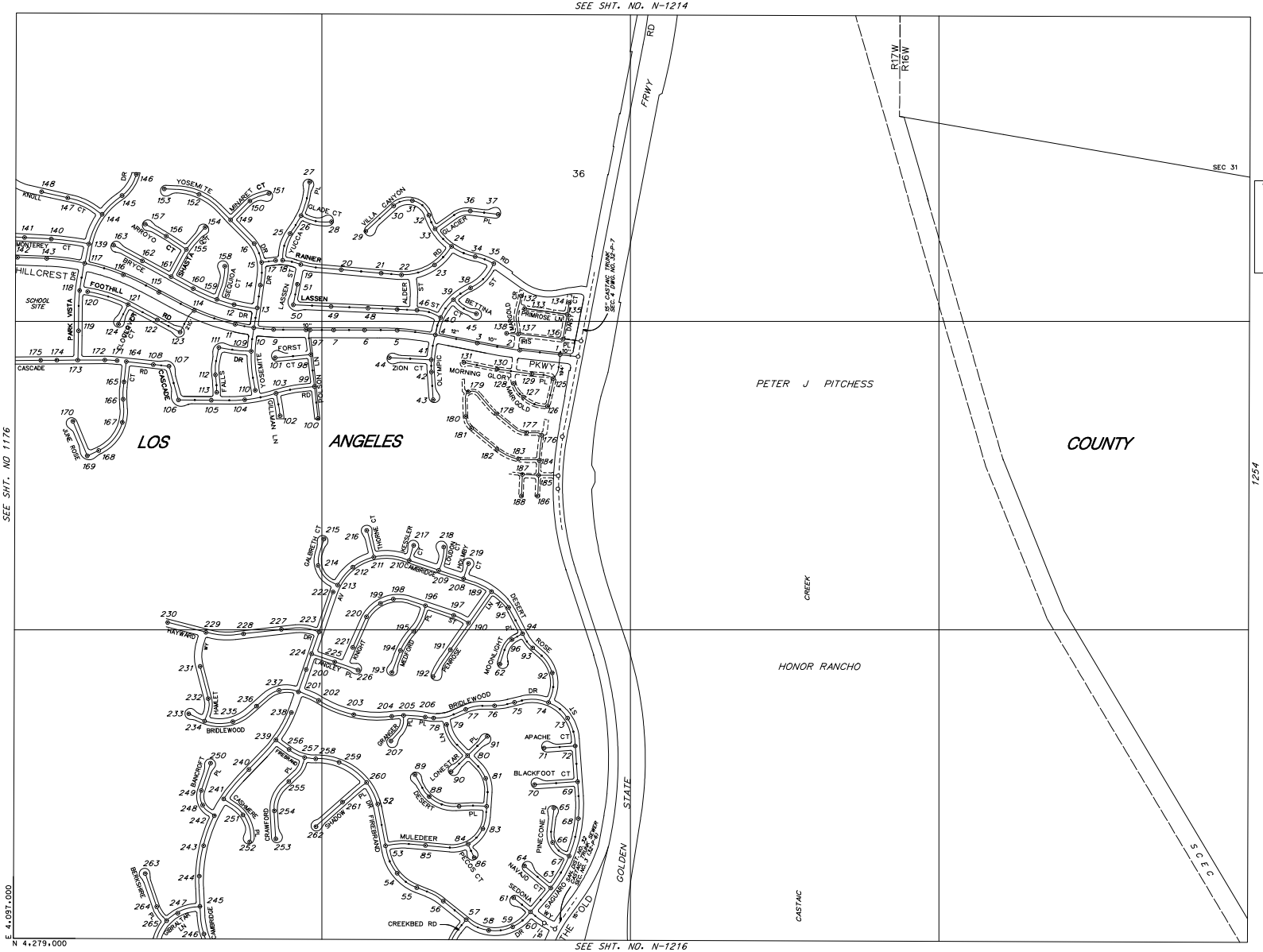

MAP REV
02-27-06

DATA BASE REV
11-04-98

CONSOLIDATED S.M.D.

N-1215

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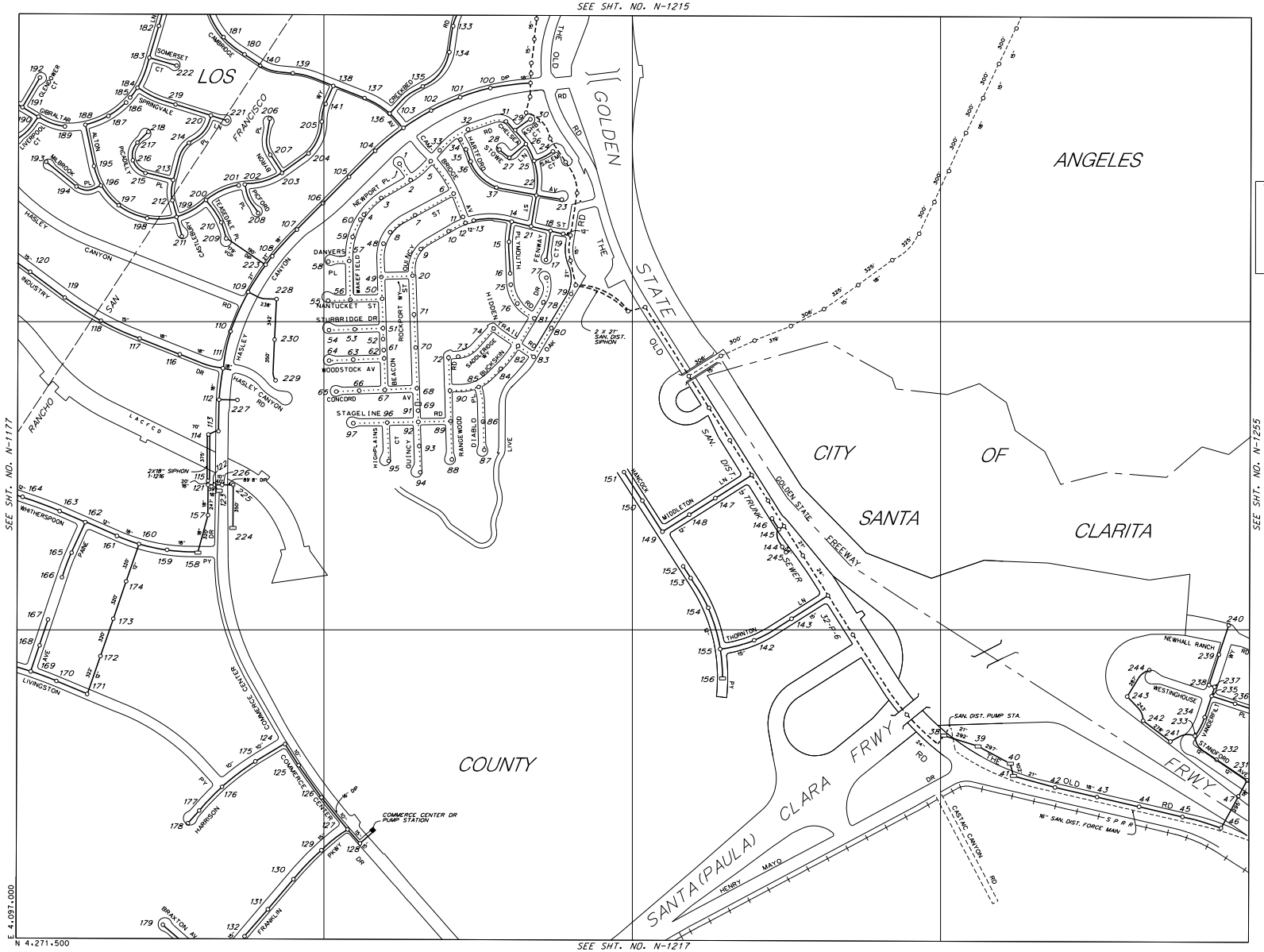
N-1216
SEE SHT. NO. N-1215
A-68
A-87
LOS FRANCISCO
GOLDEN
STATE
OLD
THE
RD
ANGELES
CITY OF SANTA CLARITA
COUNTY
SANTA (PAULA) CLARA FRWY
SAN. DIST.
GOLDEN STATE FREEWAY
SEE SHT. NO. N-1177
SEE SHT. NO. N-1255
SEE SHT. NO. N-1217
RANCHO
SAN
HASLEY CANYON
HASLEY
CANYON
RD
DR
AV
ST
PL
CT
LN
WAY
TRAIL
CIR
AVE
PKWY
FRWY
STUBBRIDGE DR
NANTUCKET ST
WOODSTOCK AV
CONCORD AV
STAGELINE RD
NEWPORT PL
DANVERS PL
WAKEFIELD RD
QUINCY
BEACON
ROCKPORT WAY
HIGHPLAINS CT
RANGEWOOD
DIABLO
SHADYBROOK
GLENSHIRE
HIDDEN TRAIL
PLYMOUTH
FENWAY
OAK
LIVE
SOMERSET CT
GLOUCESTER CT
LIVERPOOL CT
GIBRALTAR
SPRINGVALE
ALTON
PICADILLY PL
MERIDIAN PL
CASTLEBAY
TEAKDALE PL
PINECREST
AQUAS
CAMBRIDGE
GREENBELT
CHARTSFORD
OAKLEAF
PALMLEAF CT
WHITHERSPOON
PANE
LIVINGSTON
INDUSTRY
LACFCD
2X18" SIPHON 1-1216
2 X 21" SAN. DIST. SIPHON
SAN. DIST. PUMP STA.
COMMERCE CENTER
COMMERCE CENTER DR PUMP STATION
HARRISON
FRANKLIN
BRAXTON AV
MAYO
HENRY
CASTAIC CANYON RD
16" SAN. DIST. FORCE MAIN
S P R R
MIDDLETON
JANCEY
THORNTON
NEWHALL RANCH
WESTINGHOUSE
YANCEY CT
STANDFORD
E 4,097,000
N 4,271,500
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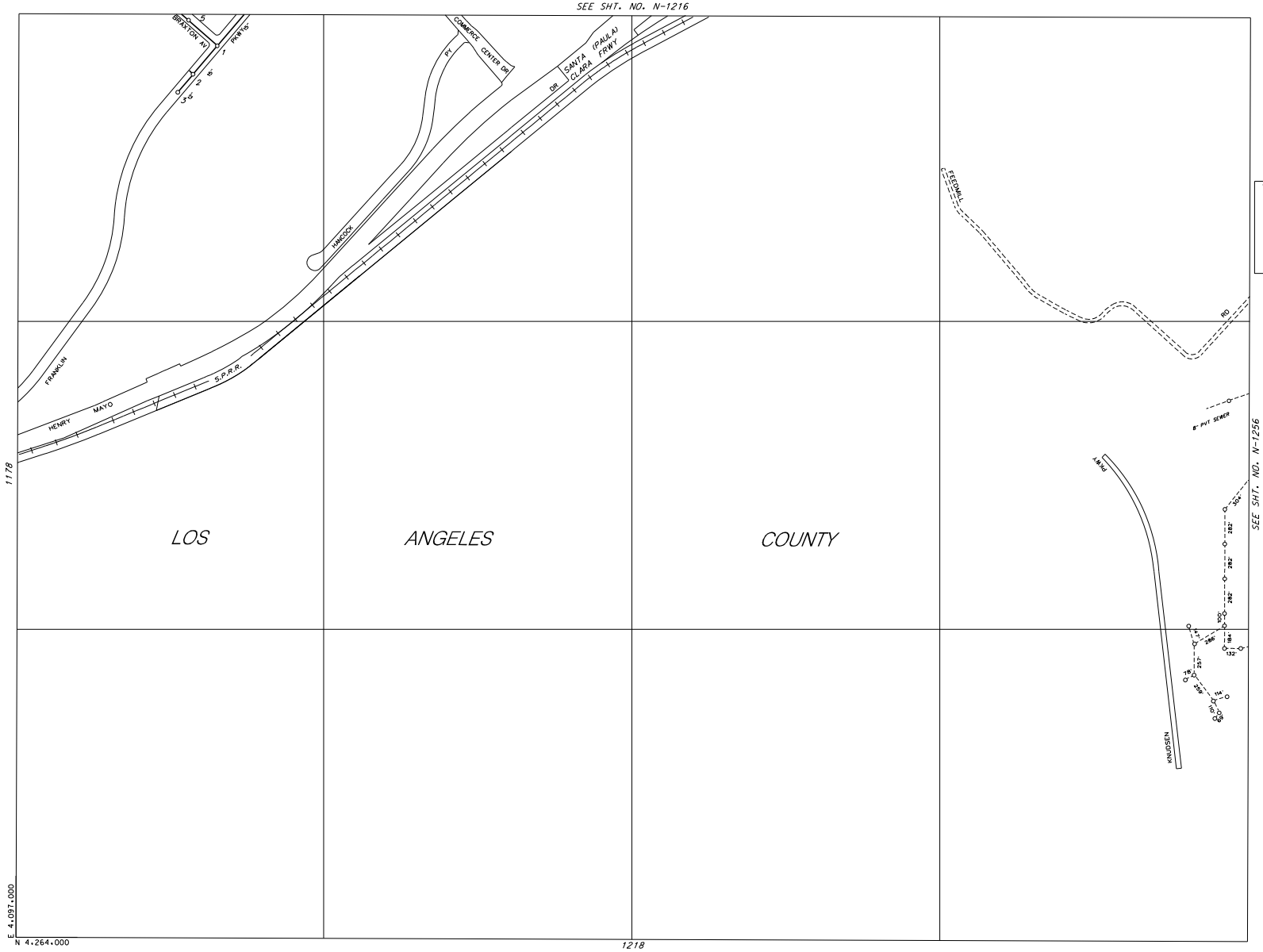
AUTOMATED GRAPHICS
METERS
0 50 100 200 250
0 200 400 600 800
FEET
LEGEND
CLAY SEWERS MAINTAINED BY SMD, 8" UNLESS OTHERWISE NOTED
PLASTIC SEWERS
CONCRETE SEWERS
CLAY SEWERS, LINED
CEMENT SEWERS, LINED
FORCE MAINS
SEWERS NOT MAINTAINED BY SMD
TRUNK SEWERS
CITY BOUNDARY
STANDARD MANHOLE
DROP MANHOLE
SHALLOW MANHOLE
TRAP MANHOLE
WEIR MANHOLE
C.O. CLEANOUT
L.H. LAMP HOLE
PUMP STATION
TOTAL MH'S THIS MAP: 243
MAP REV 08-09-11
DATA BASE REV 05-12-93
CONSOLIDATED S.M.D.
N-1216
T: 4459 G-5
2607.2609.1216

A-65
A-68



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N
AUTOMATED GRAPHICS

METERS
0 50 100 200 250
0 200 400 600 800
FEET

LEGEND

- CLAY SEWERS MAINTAINED BY SMD. 8" UNLESS OTHERWISE NOTED
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- CLAY SEWERS, LINED
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- DROP MANHOLE
- SHALLOW MANHOLE
- TRAP MANHOLE
- WEIR MANHOLE
- C.O. CLEANOUT
- L.H. LAMP HOLE
- PUMP STATION

TOTAL MH'S THIS MAP: 4

MAP REV
08-09-11
DATA BASE REV
05-12-93

N-1217

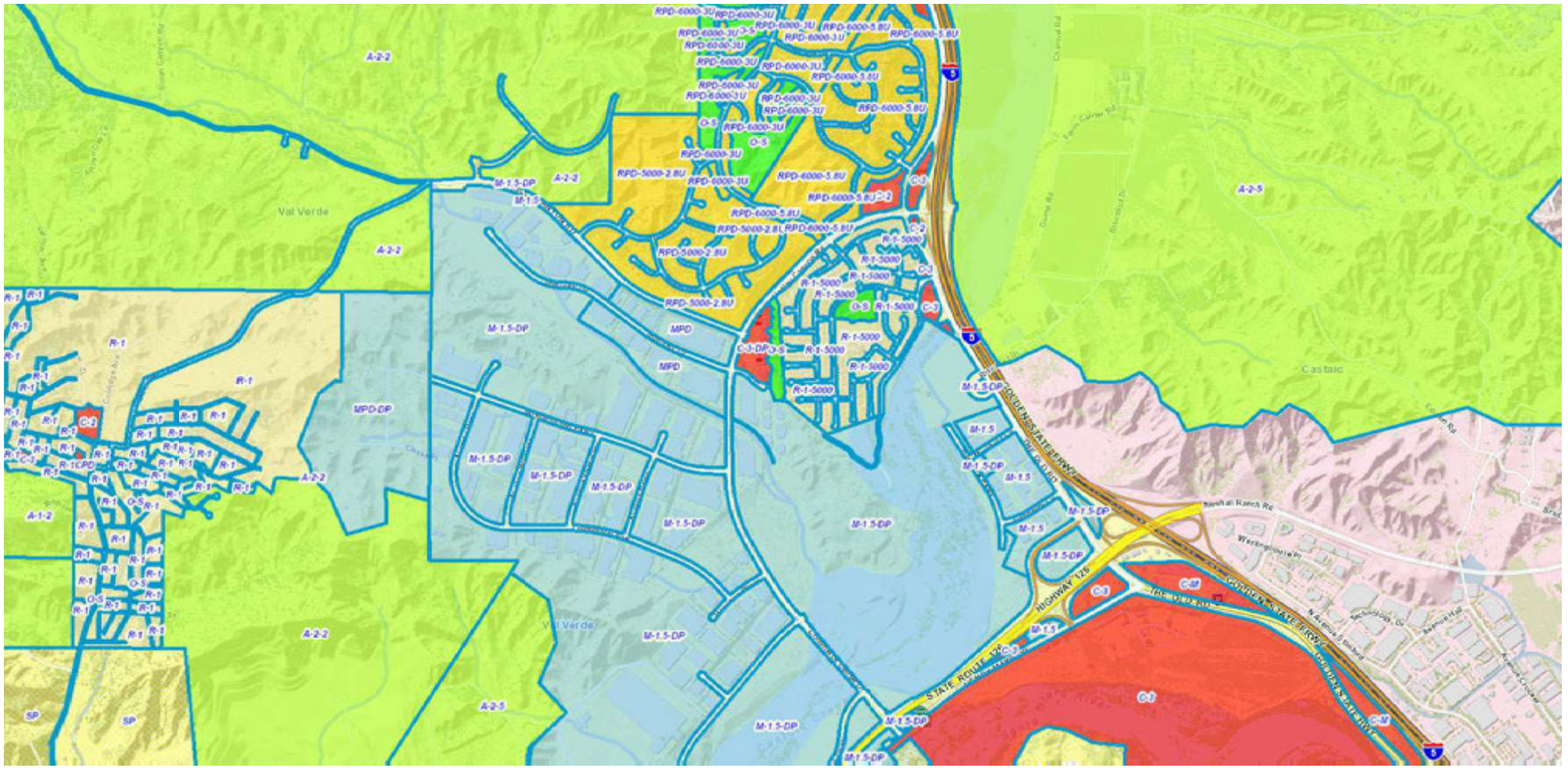
CONSOLIDATED S.M.D.

N-1217

T: 4550 A-1

2607.2609.1217

Appendix C



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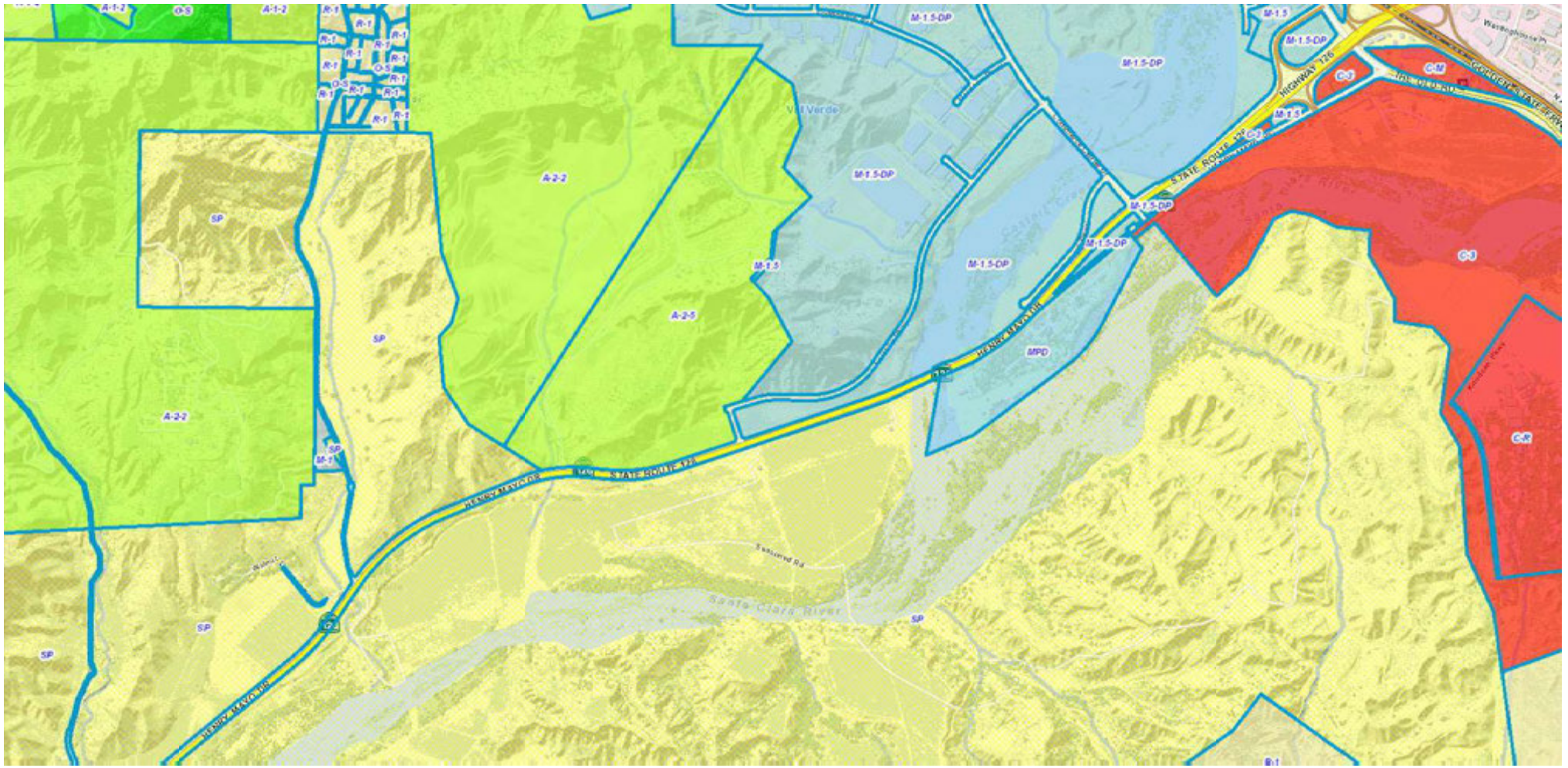
0 5
Miles



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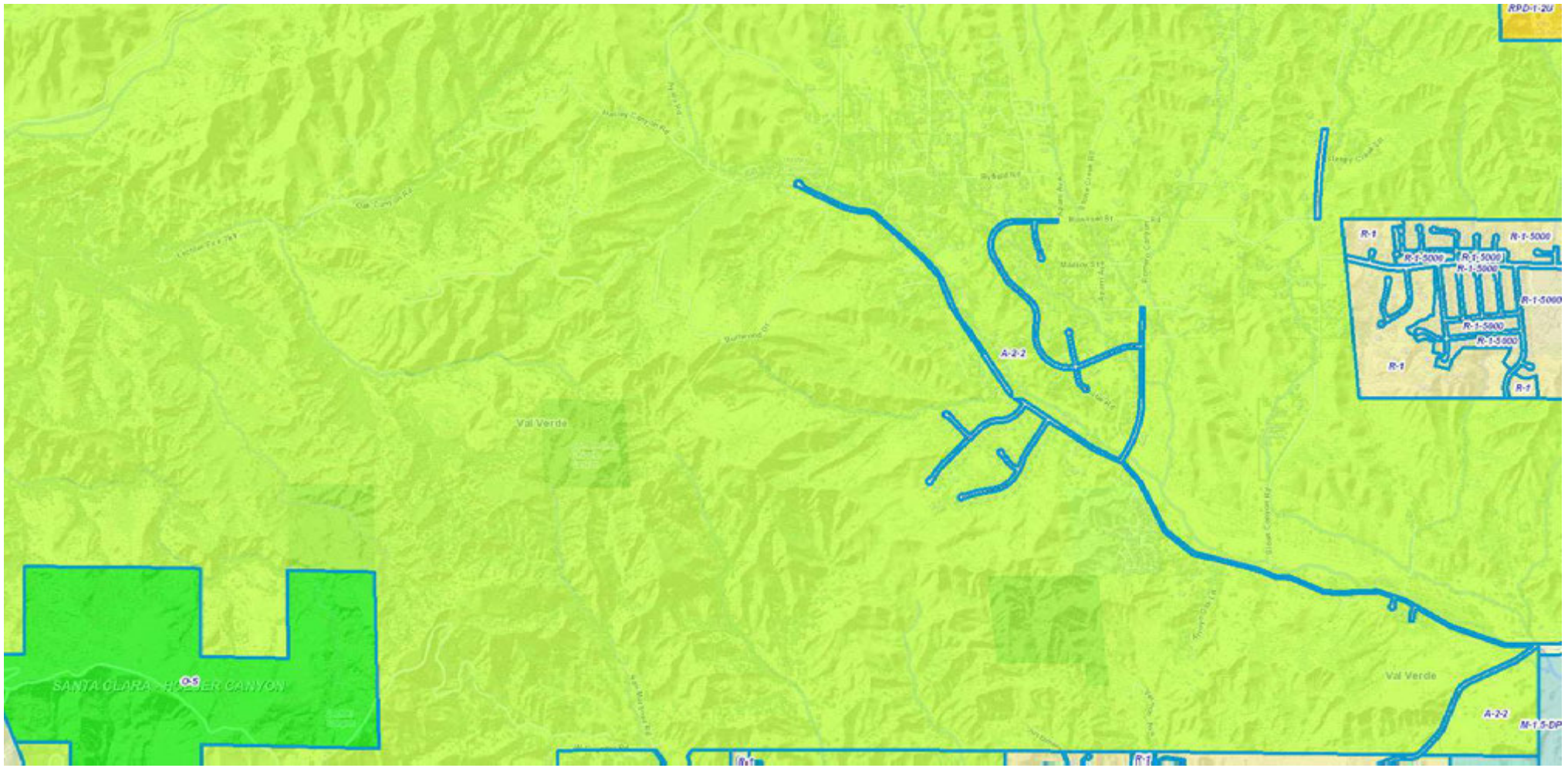
0 5
Miles



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Printed: Nov 29, 2017

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0 5
Miles

Appendix D

BENCH MARK: L 3878
RD SM TAG IN CB 4 FT N/O BCR 70 FT N & 32 FT E/O C/L INT THE OLD ROAD & HASLEY CYN RD OFF-RAMP (@ SHELL GAS STATION)

NEWHALL QUAD. (1967) ELEV. 1065.632

THOMAS GUIDE PAGES 445,5-5,6-5
PC No.11491 DS No.500

NOTE: NUMBERS IN CIRCLES INDICATE PAGE NUMBERS.

NO.	REVISION	REVISED BY	APPROVED BY	DATE
1	REVISED SIZE OF SEWER TO EXIST. 24" RCP FROM STA. 11+00 TO STA. 11+36			

STORMWATER POLLUTION CONTROL REQUIREMENTS FOR SEWER CONSTRUCTION

1. Graded earthwork and other construction should be scheduled so grading and land disturbance activities occur during the dry season (April 15 - October 31).
2. Soils, silt, sediments and other loose materials shall be stored in appropriate areas and shall not be allowed to enter the storm drain system. The use of perimeter controls, silt fences, straw bales, sandbags or other devices shall be required as necessary to prevent sediment from leaving the site.
3. Erosion or wasted materials may not be washed into the public way or any other drainage system. Provisions shall be made to retain concrete rinsates on site and they may not be disposed of on public streets.
4. Trash and construction related solid wastes must be deposited into a covered receptacle to prevent contamination of rainwater and dispersal by wind.
5. Sweeping and other methods may not be limited from the site for various periods. Non-construction pollutant tracking shall be minimized so as to reduce sediments from being deposited into the public way. Accidental depositions must be swept up immediately and may not be washed down by use of water unless.
6. Any access into disturbed soils of materials of construction must be prevented so as to avoid erosion by wind and water.

The following items is required to be met and limited to the best management practices (BMP's) necessary to control storm water pollutant discharges, including, but not limited to, the following categories, as appropriate: Construction Activity, Pollution Prevention/Good Housekeeping for Contractors and Consultants, and Non-Storm Water Management.

CA01 = SCHEDULING
CA02 = PRESERVATION OF EXISTING VEGETATION
CA03 = SEDIMENT CONTROL
CA04 = SILT FENCE
CA05 = SEDIMENT TRAP
CA06 = CHECK DAM
CA07 = FIBER ROLLS
CA08 = GRAVEL BAG BERM
CA09 = STREET SWEEPING AND VACUUMING
CA10 = STORM DRAIN INLET PROTECTION
CA11 = WIND EROSION CONTROL
CA12 = STABILIZED CONSTRUCTION ENTRANCE
CA13 = STABILIZED CONSTRUCTION ROADWAY
CA14 = ENTRANCE/OUTLET TIRE WASH
CA15 = SOIL BINDERS
CA16 = STRAW MULCH
CA17 = GEOTEXTILES AND MATS
CA18 = EARTH DIKE
CA19 = BRUSH OR ROCK FILTER
CA20 = DRAINAGE SWALE
CA21 = LINED DITCH
CA22 = PAVED DITCH
CA23 = OUTLET PROTECTION
CA24 = SLOPE DRAIN
CA25 = SUBSURFACE DRAIN
CA26 = HYDRAULIC MULCH
CA27 = HYDROSEEDING
CA28 = SPRAY ON BINDERS
CA29 = TEMPORARY REVEGETATION
CA30 = BUFFER ZONE
CA31 = SLOPE PROTECTION
CA32 = DUST CONTROL
CA33 = TOPSOILING
CA34 = STREET SWEEPING AND VACUUMING
CA35 = STORM DRAIN INLET PROTECTION
CA36 = WATER CONSERVATION PRACTICES
CA37 = FILTRATION
CA38 = DRAINAGE SWALE
CA39 = LINED DITCH
CA40 = PAVED DITCH
CA41 = OUTLET PROTECTION
CA42 = SLOPE DRAIN
CA43 = SUBSURFACE DRAIN
CA44 = HYDRAULIC MULCH
CA45 = HYDROSEEDING
CA46 = SPRAY ON BINDERS
CA47 = TEMPORARY REVEGETATION
CA48 = BUFFER ZONE

DOUBLE SCALE

PRIOR TO ACCEPTANCE FOR MAINTENANCE ALL SANITARY SEWER EASEMENT MUST BE RECORDED.

NO CONNECTION FOR THE DISPOSAL OF INDUSTRIAL WASTES SHALL BE MADE TO SEWER SHOWN ON THESE DRAWINGS UNTIL A PERMIT FOR INDUSTRIAL WASTEWATER DISCHARGE HAS BEEN ISSUED BY THE SANITATION DISTRICTS FOR SAID CONNECTION.

BEFORE BREAKING GROUND OR COMMENCING CONSTRUCTION ON A COUNTY SANITATION DISTRICT SEWER AND PRIOR TO FINAL ACCEPTANCE OF THE PROJECT, A SANITATION DISTRICT INSPECTOR SHALL BE NOTIFIED BY PHONE AT (562)908-4288, 30 THAT REQUIRED INSPECTIONS CAN BE MADE.

STANDARD PLANS:

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

PRIVATE CONTRACT SEWER GENERAL NOTES

1. All sewer construction permit shall be approved and a pre-job conference scheduled and attended prior to the commencement of any work. Contact the Los Angeles County Sanitation Districts Inspection Section at (562) 908-4288, extension 2727 to schedule the pre-job conference.
2. Prior to beginning of work contact the construction notification system for subscribers and participants of the joint trench. Call Underground Service Alert (USA) at 1-800-422-4133.
3. If work is to be done in a State highway, a permit must be obtained from the State of California, Division of Highways, 120 South Spring Street and two (2) sets of plans submitted.
4. Permit is required for construction work within the jurisdiction of the Los Angeles County Department of Public Works. Contact the Permit Section at (626) 458-3129 for permit requirements.
5. The construction shall conform to the current edition of the "Specifications for Underground Sewers" as amended, of the Los Angeles County Sanitation Districts and the "Standard Specifications for Public Works Construction" as amended, of the Southern California Chapter of the American Public Works Association.
6. Acceptance of this plan by the Director of Los Angeles County Sanitation Districts is authorization to proceed with the construction of the sewer only. It is not authorization to proceed with the construction of any other facilities required for the project. Such facilities require separate approval.
7. Any change, revision, or modification to the approved plans shall be submitted to the Director of Los Angeles County Sanitation Districts for approval. Changes, revisions, or modifications made without approval may be cause for rejection of the work.
8. The contractor's attention is directed to Section 5-1.01, "Plans and Working Drawings" of the Standard Specifications for Public Works Construction, as amended by the Standard Special Provisions, which requires the contractor to submit working drawings for certain items of work.
9. Elevations are in feet above M.S.L. U.S. Geodetic Sea Level Datum of 1929.
10. No revisions shall be made in these plans without the approval of the Director of Public Works.
11. The determination of the requirements of public works will always be left out any portion of the work.
12. Unless otherwise noted, all construction is to be in accordance with the latest edition of the Standard Specifications for Public Works Construction, including the latest supplement thereto, and the Standard Plans for Public Works Construction, including the latest supplement thereto, adopted by the Los Angeles County Department of Public Works.
13. The Permittee hereby agrees that the Department of Public Works may perform such work as may be necessary to make said work conform to the standards established by said Department, and that the Permittee will reimburse said Department for the actual cost thereof. Said cost may be deducted from any deposit made by the Permittee to guarantee the performance of said work. Said Permittee further agrees that the Department of Public Works may perform such work as may be necessary to maintain or repair the work if the Permittee fails to do so after written notice from said Department to perform such maintenance or repair, and that the Permittee will reimburse said Department for the actual cost thereof. Said cost may be deducted from any deposit made by the Permittee to guarantee the performance of said work. Said Permittee further agrees that the Department of Public Works may perform such work as may be necessary to maintain or repair the work if the Permittee fails to do so after written notice from said Department to perform such maintenance or repair, and that the Permittee will reimburse said Department for the actual cost thereof. Said cost may be deducted from any deposit made by the Permittee to guarantee the performance of said work.
14. Where the proposed sewer is to be constructed in fill, the property line elevations at the property line shall be at the top curb elevation for those lots having curbs, or 6" above grade.

CONSTRUCTION NOTES

1. Protect existing sewer, etc. The property line on property lines perpendicular to the sewer line at the beginning of each manhole.
2. Vitrified clay pipe joints shall be type "C" or "D" per standard specifications section 208-3.
3. If a power pole is within 5 feet of the sewer, the sewer shall be encased per standard plan 2020-1, case 3, for a distance of 5 feet from the point of encroachment.
4. Telephone, television, fiber optic, and electrical lines shall be made with a rubber gasket joint, type "A" per ASTM C-443 or ASTM C-425.
5. Where laterals to be constructed into sockets at property line a vitrified clay pipe shall be used as noted.
6. Use of "Y" branches may be used for connections to maximum branch sizes except as noted.
7. If during the course of construction it is determined that there is more than one set of sewer lots, the use of a "Y" branch may be used for connection to the sewer lateral. Such "Y" branch shall be shown on the as-built plans to be sent to Sewer Maintenance Department of the Sanitation Districts.
8. Manholes to be precast, unless noted otherwise, to meet Los Angeles County Public Works or California State Highway Standards.
9. Full compliance with Section 306-1.4.4 of the Standard Specifications shall be required for backfill of trench, including the placement of sand backfill around the pipe and the use of a mechanical tamper for the backfill from the bedding of a minimum depth of sand to the bottom of the base material.
10. All manhole and pipe outside of street right of way to be level with finished grade.
11. Sewers to be tested for leakage per Section 306-1.5 of the Standard Specifications and special provisions.
12. All pipes and/or sewer laterals are to be located at least one foot apart and when possible not closer than one foot to any manhole.

PROFILE, ALIGNMENT AND GRADE OF SANITARY SEWERS

DS 500 PC No. 11491

2 SHEETS; 4 PAGES

55360

COUNTY OF LOS ANGELES CALIFORNIA
INDEX—1216

HARRY W. STONE DIRECTOR OF PUBLIC WORKS

APPROVED: LAND DEVELOPMENT DIVISION

BY _____ 8/8/00

BY _____ 8/16/00

APPROVED: COUNTY SANITATION DISTRICT OF LOS ANGELES COUNTY

JAMES F. STAHL — CHIEF ENGINEER and GENERAL MANAGER

COUNTY SANITATION DISTRICT NO. _____

BY _____ DATE 8/28/00

PRIVATE ENGINEERS NOTICE TO CONTRACTORS:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS OR BY PLOTTING INFORMATION FURNISHED BY THE OWNERS OF SUCH UTILITIES OR STRUCTURES. EXCEPT AS SPECIFICALLY STATED OTHERWISE, THESE ARE NOT GUARANTEED TO BE CORRECT OR TO BE IN THE EXACT LOCATIONS INDICATED NOR ARE IT REPRESENTED THAT ALL UNDERGROUND UTILITY PIPES OR STRUCTURES WITHIN THE AREA HAVE BEEN SHOWN. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ALL UTILITY PIPES AND STRUCTURES SHOWN OR NOT SHOWN ON THESE PLANS. THE CONTRACTOR SHALL NOTIFY THE OWNERS OF ALL UTILITIES AND STRUCTURES SHOWN ON THESE PLANS PRIOR TO THE COMMENCEMENT OF WORK AND SHALL MAKE ARRANGEMENTS FOR THE PROTECTION OF SAID UTILITIES AND STRUCTURES. THE CONTRACTOR SHALL ASSUME SOLE RESPONSIBILITY FOR THE COMPLETE PROTECTION OF ALL UTILITIES AND STRUCTURES SHOWN OR NOT SHOWN ON THESE PLANS AND SHALL PROTECT THE COUNTY OF LOS ANGELES AND ITS OFFICERS AND EMPLOYEES FROM ANY AND ALL CLAIMS ARISING OUT OF DAMAGE TO PROTECTED UTILITIES AND STRUCTURES. IN CASE OF DISCREPANCY BETWEEN THE LOCATIONS OF UNDERGROUND FACILITIES SHOWN ON THESE PLANS AND THE LOCATIONS OF UNDERGROUND FACILITIES IN THE FIELD, THE CONTRACTOR SHALL NOTIFY THE CONSULTING ENGINEER OF THE DAY AND THE DISCREPANCY SHALL BE RESOLVED BY THE CONSULTING ENGINEER AND THE DIRECTOR OF PUBLIC WORKS OR HIS AUTHORIZED REPRESENTATIVE. THE CONTRACTOR SHALL CONTACT THE OWNERS OF UNDERGROUND UTILITIES FOR THE EXACT LOCATIONS OF THEIR FACILITIES BEFORE EXCAVATING AND SHALL BE RESPONSIBLE FOR ANY DAMAGE TO SUCH FACILITIES CAUSED BY HIS OPERATIONS. THE CONTRACTOR SHALL CONFORM TO THE REQUIREMENTS OF GENERAL ORDER 128 OF THE PUBLIC UTILITIES COMMISSION REGARDING EXCAVATION IN THE VICINITY OF UNDERGROUND UTILITIES.

8/16/00

P.C. 11491 PAGE 2

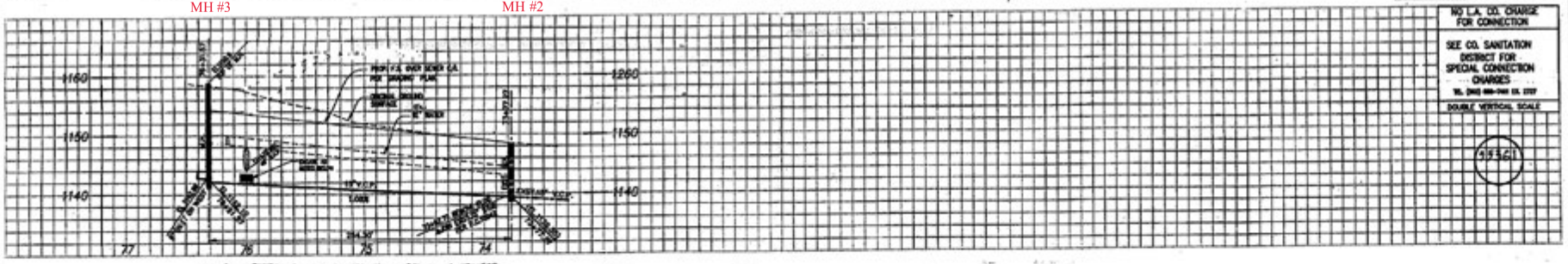
MH #3 MH #2

NO L.A. CO. CHARGE FOR CONNECTION

SEE CO. SANITATION DISTRICT FOR SPECIAL CONNECTION CHARGES
TEL. (562) 699-7411 EX. 2727

DOUBLE VERTICAL SCALE

55360



ISSUE NO PERMITS UNTIL LINE MUST BE EXTENDED & M.H. CONSTRUCTED

PLAN
SCALE: 1" = 40'

SANITARY SEWER PLANS IN
DS 500 P.C. No. 11491

8/16/00

PREPARED BY:
SIKAND ENGINEERING ASSOCIATES
CONSULTING ENGINEERS
1020 DURHAM BLVD.
THOUSAND OAKS, CALIFORNIA 91360 (805) 497-6555

8/16/00

1

P.C. No. 11491 20 SEP 2000

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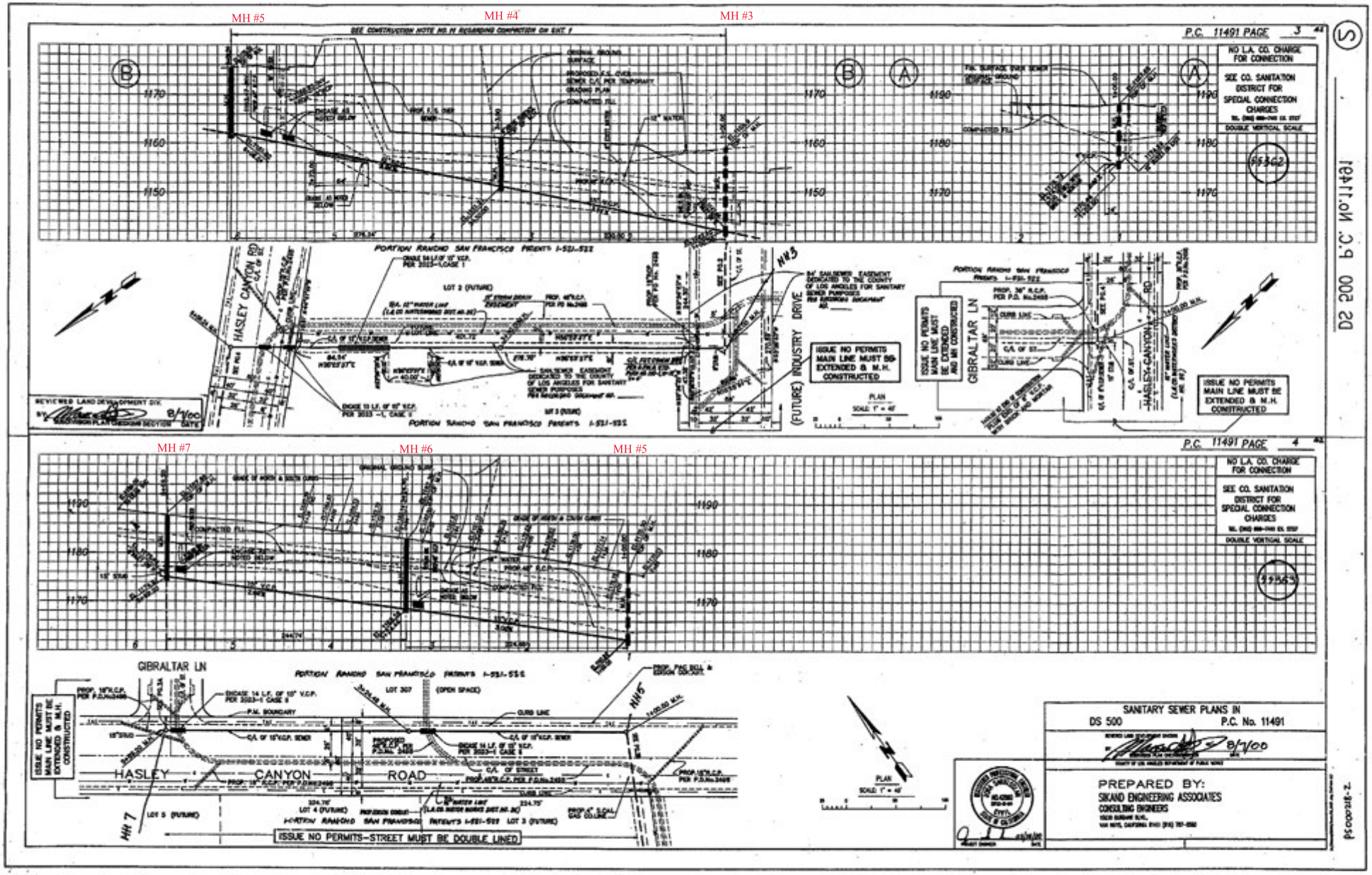
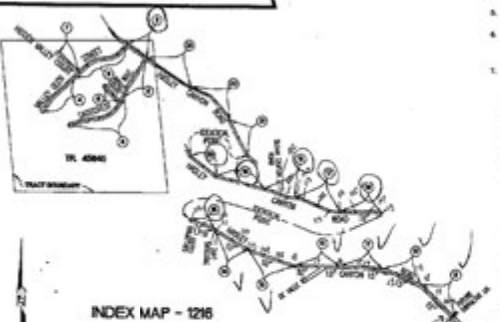

MH #5
MH #4
MH #3
P.C. 11491 PAGE 3
NO L.A. CO. CHARGE FOR CONNECTION
SEE CO. SANITATION DISTRICT FOR SPECIAL CONNECTION CHARGES
DOUBLE VERTICAL SCALE
55362
HASLEY CANYON RD
(FUTURE) INDUSTRY DRIVE
GIBRALTAR LN
ISSUE NO PERMITS MAIN LINE MUST BE EXTENDED & M.H. CONSTRUCTED
ISSUE NO PERMITS MAIN LINE MUST BE EXTENDED AND MH CONSTRUCTED
MH #7
MH #6
MH #5
P.C. 11491 PAGE 4
55363
GIBRALTAR LN
HASLEY CANYON ROAD
ISSUE NO PERMITS-STREET MUST BE DOUBLE LINED
SANITARY SEWER PLANS IN
DS 500
P.C. No. 11491
PREPARED BY:
SIKAND ENGINEERING ASSOCIATES
CONSULTING ENGINEERS

BENCH MARK

NEWHALL (1993)
RD BM TAG IN SC COR CONC BASE OF FIRE H/P 19FT S/D C/L HASLEY CYN RD 1.2M W/D DS, VALLE RD IN FRONT OF MOBILE HOME PARK 0.15M C/O ROMERO CYN RD 47FT W/D PP #2015736
ELEV. 1382.246 B.M. No. L 4562



INDEX MAP - 1216
TRACT NO. 45645
P.C. 11572

SCALE: 1" = 800'
THOMAS GUIDE PG. 4459-H3/J4

NOTE: NUMBER IN CIRCLE INDICATES PAGE NUMBER

NO.	REVISION	NOTED BY	APPROVED BY	DATE

STORMWATER POLLUTION CONTROL REQUIREMENTS FOR SEWER CONSTRUCTION

DOUBLE SCALE

1. Erected settlements and other pollutants must be retained on site and may not be transported from the site via sheet flow, swales, area drains, natural drainage courses, or wind.
2. Stockpiles of earth and other construction related materials must be protected from being transported from the site by the forces of wind or water.
3. Fuels, oils, solvents, and other toxic materials must be stored in accordance with their listing and are not to contaminate the soil and surface waters. All approved storage containers are to be protected from the weather. Spills must be cleaned up immediately and disposed of in a proper manner. Spills may not be washed into the drainage system.
4. Excess or waste concrete may not be washed into the public way or any other drainage system. Provisions must be made to retain concrete wastes on site until they can be disposed of as solid waste.
5. Trash and construction-related solid wastes must be deposited into a covered receptacle to prevent contamination of rainwater and dispersal by wind.
6. Sediments and other materials may not be tracked from the site by vehicle traffic. The construction entrance roadways must be stabilized so as to inhibit sediments from being deposited into the public way. Accidental depositions must be swept up immediately and may not be washed down by rain or other means.
7. Any slopes with disturbed soils or denuded of vegetation must be stabilized so as to inhibit erosion by wind and water.

CA001 = CLEARING OPERATIONS	EC010 = SEEDING AND PLANTING
CA002 = PAVING OPERATIONS	EC011 = MULCHING
CA003 = STRUCTURE CONSTRUCTION AND PAINTING	EC020 = WATERFIELD AND MATS
CA010 = MATERIAL DELIVERY AND STORAGE	EC022 = DUST CONTROLS
CA021 = SOLID WASTE MANAGEMENT	EC023 = TEMPORARY STREAM CROSSING
CA022 = HAZARDOUS WASTE MANAGEMENT	EC024 = CONSTRUCTION ROAD STABILIZATION
CA023 = CONCRETE WASTE MANAGEMENT	EC025 = STABILIZED CONSTRUCTION ENTRANCE
CA024 = SANITARY/SEPTIC WASTE MANAGEMENT	EC026 = SPOILS SHAR MULT PROTECTION
CA030 = VEHICLE AND EQUIPMENT CLEANING	
CA031 = VEHICLE AND EQUIPMENT FUELING	
CA032 = VEHICLE AND EQUIPMENT MAINTENANCE	
CA041 = SCHEDULING	
CA042 = PRESERVATION OF EXISTING VEGETATION	

STANDARD PLANS:

THE FOLLOWING LATEST REVISED STANDARD PLANS ON FILE IN THE OFFICE OF THE FOLLOWING DEPARTMENT SHALL APPLY IN THE CONSTRUCTION OF THIS PROJECT.

LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

LOGO'S	
MINIMUM PUBLIC SAFETY REQUIREMENTS	2000-0
BRICK MANHOLE	2006-0
STANDARD ASPHALT SIZE	2007-0
BEDDING FOR STRUCK PIPE	2008-0
BEDDING FOR VITRIFIED CLAY PIPE	2009-0
RIP RAP AND SUPPORTS	2010-0
ALLOWABLE TRENCH WIDTHS	2011-0
LOCKING MANHOLE FRAME AND COVER	2012-0
NON-REINFORCED PRECAST CONCRETE MANHOLE	2013-0
REPAIR AND EXISTING MANHOLE	2014-0
SPECIAL COURSE LATERALS	2015-0
ANCHORS FOR PIPES IN STEEP SLOPES	2016-0
ANCHOR BLOCKS	2017-0
BACKFILL SLURRY FOR SEWER PIPE	2018-0
CHANNELS	2019-0
TERMINAL CLEANOUT STRUCTURE	*2004-0

* REFERS TO A.P.W.A. STD. DRAWING NO.

NO CONNECTION FOR THE DISPOSAL OF INDUSTRIAL WASTES SHALL BE MADE TO SEWERS SHOWN ON THESE DRAWINGS UNTIL A PERMIT FOR INDUSTRIAL WASTEWATER DISCHARGE HAS BEEN ISSUED BY THE SANITATION DISTRICTS FOR THE SAID CONNECTION.

BEFORE BREAKING INTO OR CONSTRUCTION ON A COUNTY SANITATION DISTRICT SEWER AND PRIOR TO FINAL ACCEPTANCE OF THE PROJECT, A SANITATION DISTRICT INSPECTOR SHALL BE NOTIFIED BY PHONE AT (562) 908-4288 SO THAT REQUIRED INSPECTIONS CAN BE MADE.

PRIVATE CONTRACT SEWER GENERAL NOTES

1. A sewer construction permit shall be obtained and a fee paid for construction inspection and record plans to the Department of Public Works at the Permit Counter, 900 South Fremont Avenue, 5th Floor, Alhambra, at least 72 hours prior to starting work under this permit. Copies of all other required permits, such as Road Excavation, Caltrans, etc., must be filed with the permit application.
2. Prior to issuance of any permit, the contractor shall file a permit for excavations and trenches from the State of California Division of Industrial Safety, and a Certificate of Worker's Compensation Insurance in accordance with the Department of Public Works manual on the Certificate holder to be notified 30 days prior to commencement of work.
3. If work is done in a State Highway, a permit must be obtained from the State of California Division of Highways, 120 South Spring Street, Los Angeles, California.
4. Where work is within a contract city, the contractor shall contact the Director of Public Works of that city to determine the location to vary the inspection fee.
5. The contractor shall contact the district office listed on the "Application for Construction Permit" to arrange for an acceptable construction start date.
6. Approval of the plans by the County of Los Angeles does not constitute a representation as to accuracy of the location or of the elevations of the existing or non-existences of any underground utility pipe or structure within the limits of this project. This note applies to all pipes.
7. All work shall be in accordance with the latest approved edition of the "Standard Specifications for Public Works Construction, including supplements and the latest Special Provisions for the Construction of Sanitary Sewers and shall be prosecuted only in the presence of the Department of Public Works.
8. The contractor's attention is directed to Section 7-10.4.1 of the Standard Specifications for Public Works Construction in regard to safety orders and also particularly to the "Minimum Public Safety Requirements" as shown on Los Angeles Department of Public Works' Standard D-6.
9. Elevations are in feet above M.S.L. of U.S. sea level datum of 1929.
10. No variations shall be made in these plans without the approval of the Director of Public Works.
11. No representative of the Department of Public Works will survey or lay out any portion of the work.
12. Grades to which this improvement is to be constructed are shown on plans and profiles. Grade points for top of curbs, centerlines of streets, or centerline of alleys, are shown for circles on profiles of all points between designated points. The grade shall be established as are to conform to a straight line drawn between said designated points.
13. The private engineer shall furnish the Department of Public Works with grade sheets and stationing for all house laterals and "Y" or "T" branches and shall provide station for them at their proper locations with elevations giving invert. All house laterals shall be constructed in a straight alignment at right angles from the main line sewer except as shown on the plans. House laterals from cleanouts shall not have an angle of less than 45 degrees with the M.L. sewer. Any change in alignment shall be requested in writing by the private engineer.
14. The private engineer shall furnish the house lateral depth at the property line below the top of curb elevation for each house lateral on the grade sheet.

CONSTRUCTION NOTES

1. Provide survey stakes on the property line or property lines proposed at right angles to the sewer line at the centerline of each manhole.
2. Vitrified clay pipe joints shall be type "O" or "C" per standard specifications section 208-3.
3. 7 ft. separation in either lines from face of the sewer, this sewer shall be shielded per standard plan S-22, case 1, two feet on each side from the point of interference.
4. All joints between cast iron pipe and vitrified clay shall be made with a rubber sleeve joint, type "D" (with bushing if necessary) per standard specifications section 208-3.
5. House laterals to be constructed with inverts at the property line 8 feet below curb grade except as noted.
6. Wye or tee branches may be used for connection to the maximum sewers except as noted.
7. If during the course of construction, it is determined that there is less than four feet of cover over the top of a vitrified clay pipe sewer which is not indicated on the plans, the plans shall be amended per standard plan S-22, case 1, unless otherwise approved by the Director of Public Works.
8. All structures shall be either brick sewer manholes per standard plan S-3 or precast concrete sewer manholes per standard plan S-4.2B, or reinforced precast concrete manholes per standard plan S-4, except as noted.
9. Centerline of trenches within paved areas to meet Los Angeles County Public Works or California State Highway requirements in accordance with the permit.
10. Any connection with section 309-1.2.6, of the standard specification will be required for backfill in sewer construction of bedded compaction and sand equivalents by a qualified civil engineer shall be provided by the permittee prior to the issuance of a certificate of partial occupancy.
11. All backfill and fills outside of the street right of way shall be compacted to 90% of the maximum density as determined by ASTM and compaction test D 1557-78 method "A" unless otherwise specified. This shall be certified by a qualified civil engineer. Such certification shall be submitted to the Construction Division of the Department of Public Works prior to the acceptance of the work by the county.
12. Concrete base to encroachment rights of way to be six inches above finished grade. Contractor to verify that manhole located in roadway shoulder conform to this requirement.
13. Sewers to be tested for leakage per section 306-1.14 of the standard specifications and special provisions.
14. Manhole from along Wesley Canyon Road will be required to have a 3'x6'x6" thick A.C. pad around the rim. See detail 1 on page 10.

55493

PROFILE, ALIGNMENT AND GRADE OF

SANITARY SEWERS

TO BE CONSTRUCTED IN
TRACT NO. 45645 PC NO. 11572
INDEX 1216
12 SHEETS: 23 PAGES

COUNTY OF LOS ANGELES CALIFORNIA

JAMES A. NOYES DIRECTOR OF PUBLIC WORKS

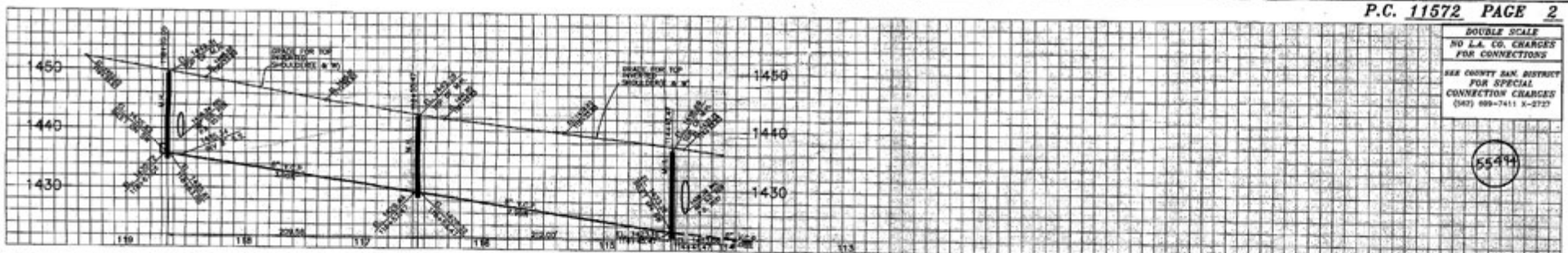
APPROVED BY LAND DEVELOPMENT DIVISION
BY _____ 3/27/01
SUBMITTED
BY _____ 3/27/01

APPROVED: COUNTY SANITATION DISTRICT OF LOS ANGELES COUNTY
JAMES F. STAHL — CHIEF ENGINEER AND GENERAL MANAGER
COUNTY SANITATION DISTRICT NO. 32
BY _____ DATE 4/2/01

PRIVATE ENGINEERS NOTICE TO CONTRACTORS:

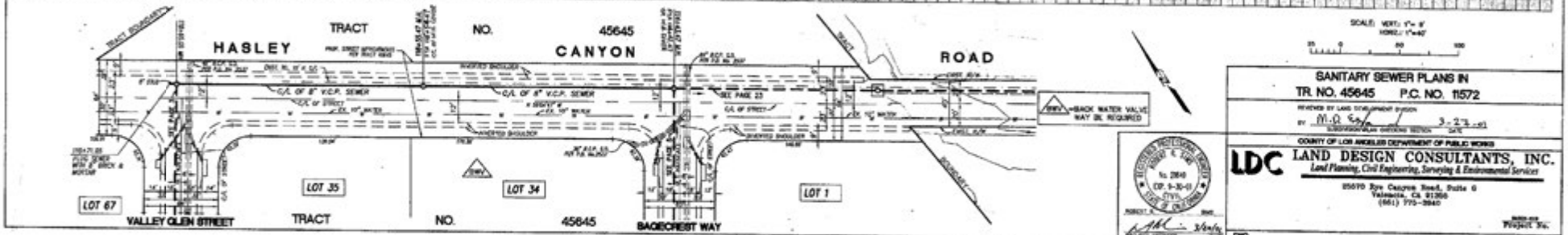
THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS IS REQUIRED BY A SEARCH OF AVAILABLE RECORDS BY THE ENGINEER OF WORK. THERE ARE NO GUARANTEES MADE BY THE COUNTY AS SHOWN ON THIS MAP. THE CONTRACTOR IS REQUIRED TO TAKE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN AND ANY OTHER LINES NOT SHOWN ON THE RECORDS BUT EXISTING ON THE GROUND. PRIOR TO EXCAVATION, THE CONTRACTOR SHALL CALL TOLL FREE 1-800-422-4133 TO VERIFY THE UNDERGROUND LOCATION OF GAS AND TELEPHONE LINES. THE CONTRACTOR SHALL ALSO CALL THE LOS ANGELES DEPARTMENT OF TRANSPORTATION AT 1-818-448-4911 SO THAT THEY CAN MARK THE LOCATION OF UNDERGROUND TELEPHONE CABLES.

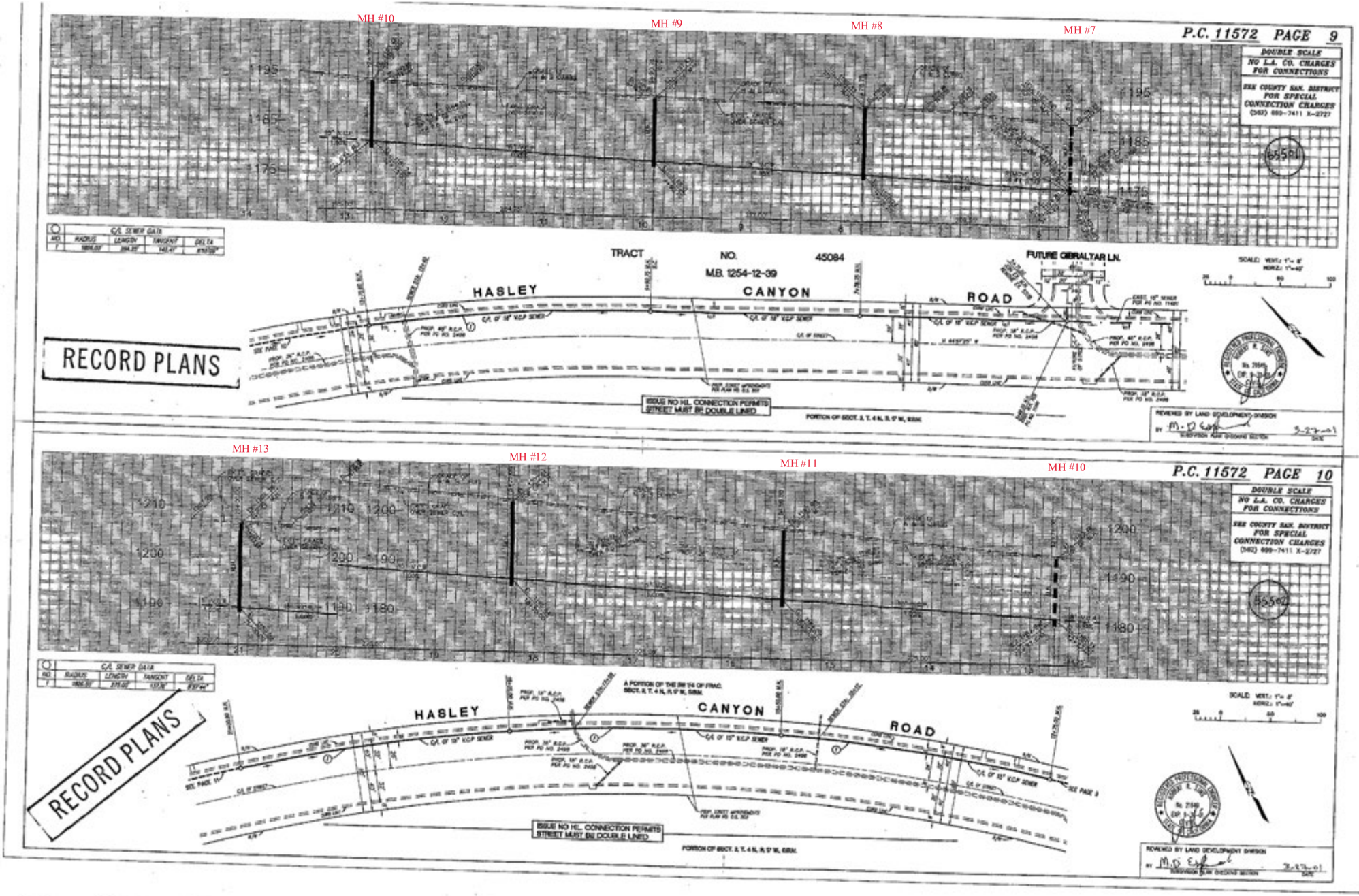
RCE No. 21446 DATE 3/6/01

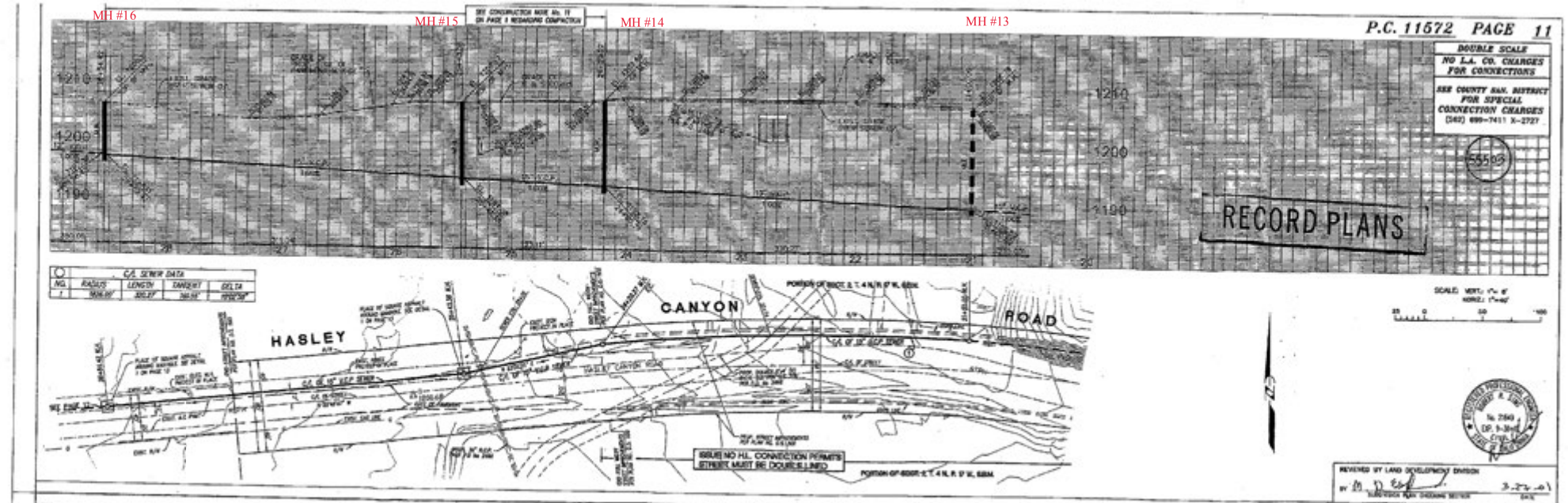


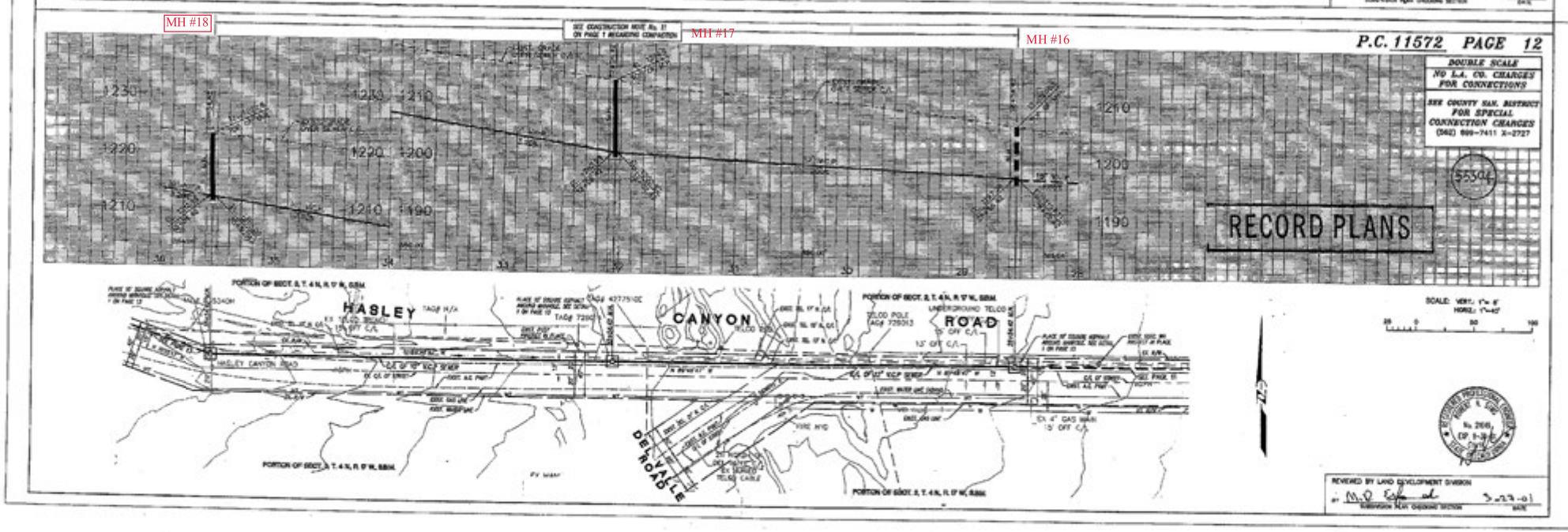
DOUBLE SCALE
NO L.A. CO. CHARGES FOR CONNECTIONS
SEE COUNTY SAN. DISTRICT FOR SPECIAL CONNECTION CHARGES
(562) 699-7411 X-2727

55493


TRACT BOUNDARY
HASLEY CANYON ROAD
TRACT NO. 45645
PROP. STREET IMPROVEMENT PER VALLEY GLEN
C/L OF 8" V.C.P. SEWER
C/L OF STREET
EX. 10" WATER
EX. 12" WATER
EX. 8" SEWER
EX. 10" SEWER
DIVERTED SHOULDER
SEE PAGE 23
EX. 8" V.C.P. SEWER
EX. 12" WATER
EX. 8" SEWER
EX. 10" SEWER


MH #10
MH #9
MH #8
MH #7
P.C. 11572 PAGE 9
DOUBLE SCALE
NO L.A. CO. CHARGES FOR CONNECTIONS
SEE COUNTY SAN. DISTRICT FOR SPECIAL CONNECTION CHARGES
TRACT NO. 45084
M.B. 1254-12-39
HASLEY CANYON ROAD
FUTURE GIBRALTAR LN.
RECORD PLANS
ISSUE NO H.L. CONNECTION PERMITS
STREET MUST BE DOUBLE LINED
MH #13
MH #12
MH #11
MH #10
P.C. 11572 PAGE 10
DOUBLE SCALE
NO L.A. CO. CHARGES FOR CONNECTIONS
SEE COUNTY SAN. DISTRICT FOR SPECIAL CONNECTION CHARGES
HASLEY CANYON ROAD
RECORD PLANS
ISSUE NO H.L. CONNECTION PERMITS
STREET MUST BE DOUBLE LINED

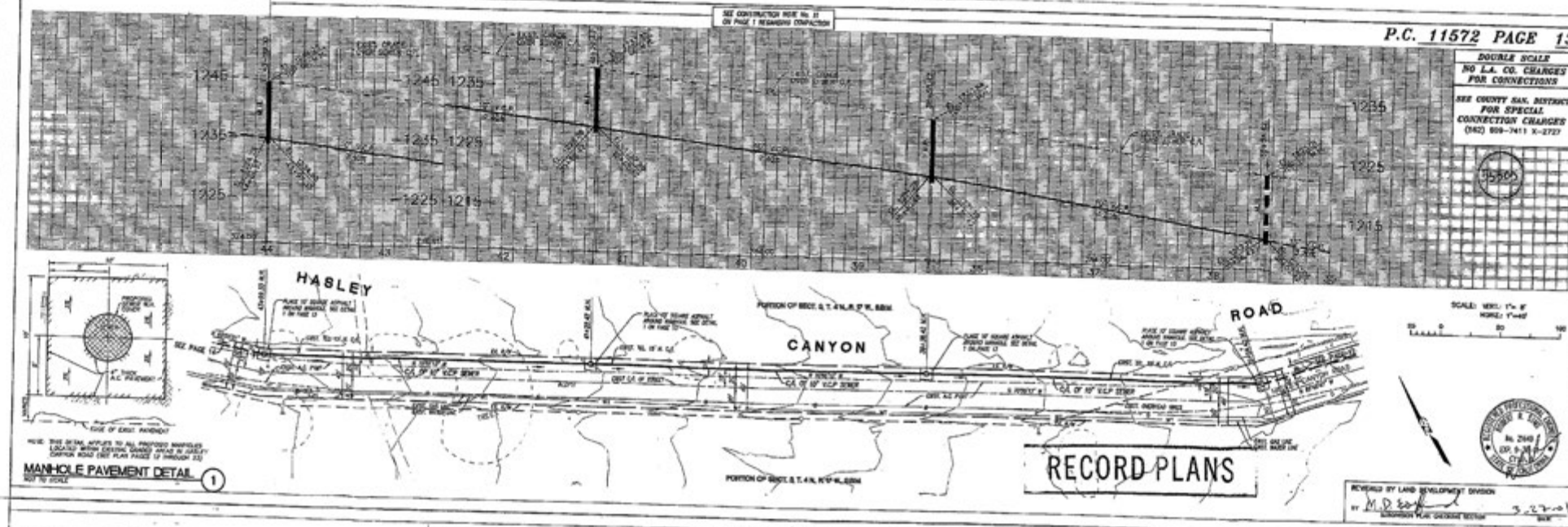


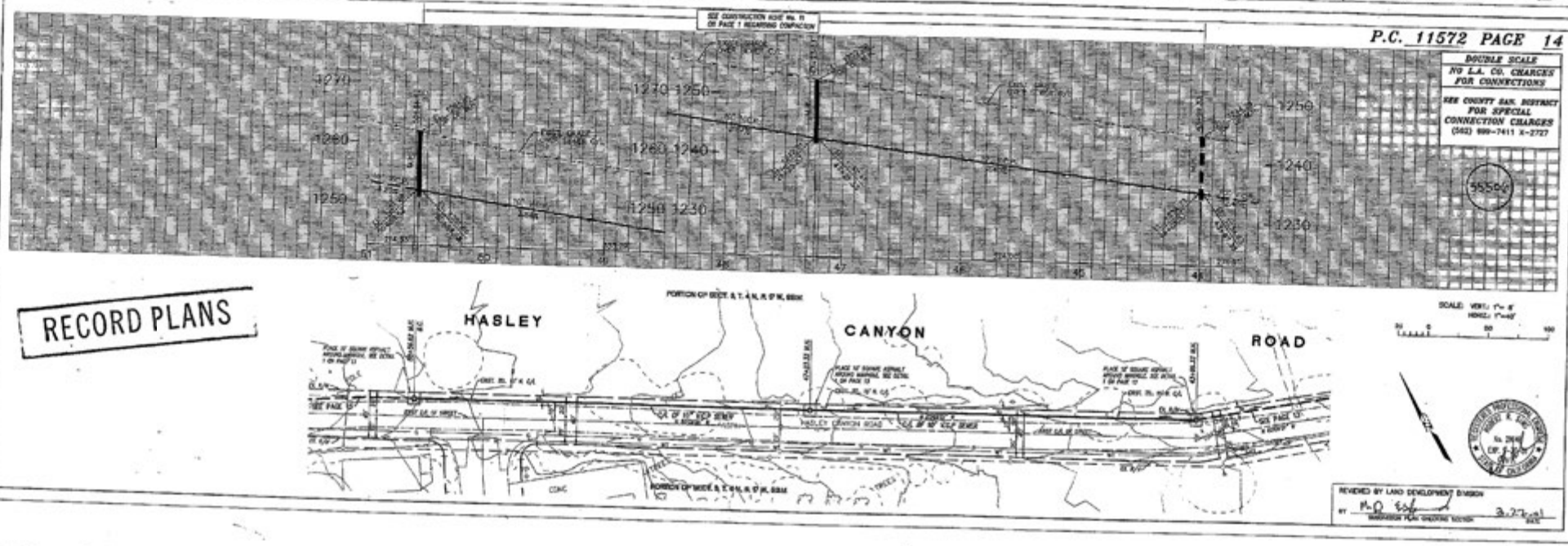


TR. NO. 45645 P.C. 11572

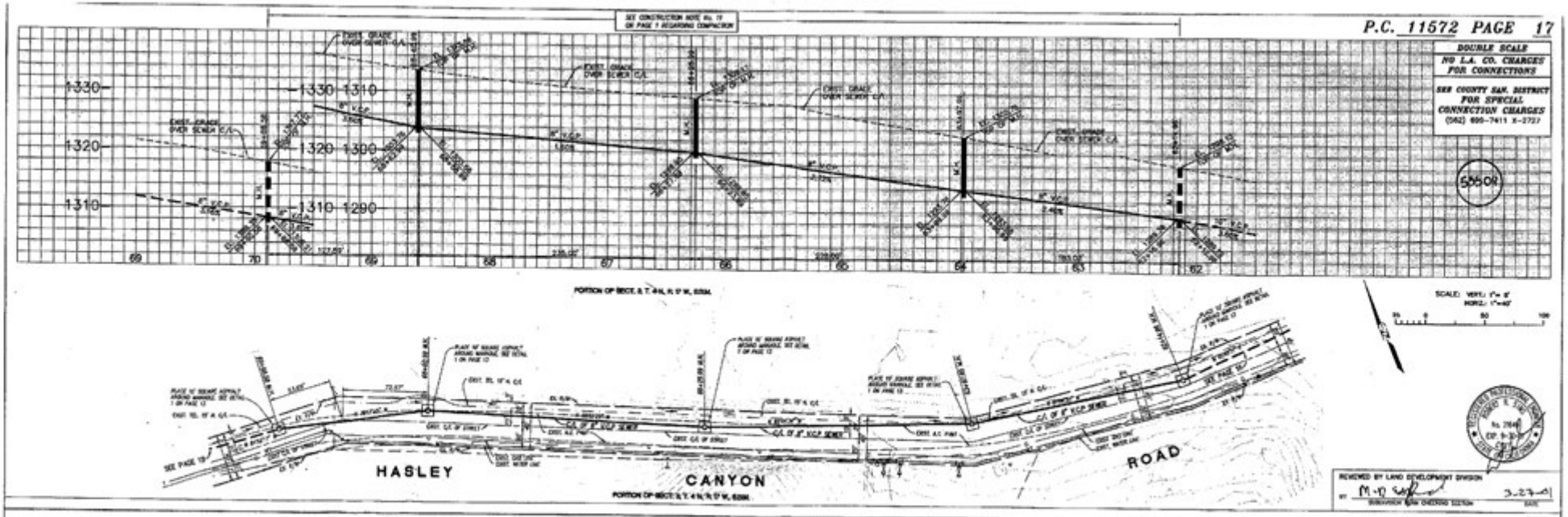
TR. NO. 45645 P.C. 11572

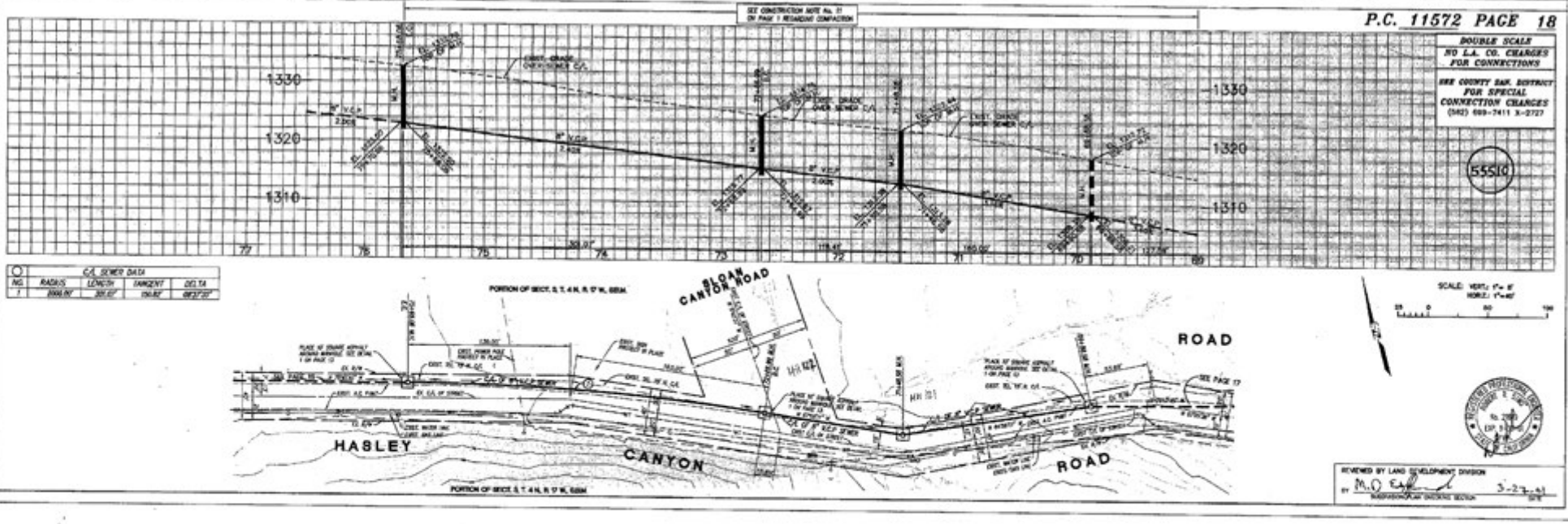
(7)





P.C. 11572 PAGE 15
P.C. 11572 PAGE 16
DOUBLE SCALE
FOR L.A. CO. CHARGES
FOR CONNECTIONS
SEE COUNTY SAN. DISTRICT
FOR SPECIAL
CONNECTION CHARGES
(562) 699-7411 X-2727
5550'
ROAD
CANYON
HASLEY
TROTTERS
LANE
GALLOPING
COURT
1270
1260
1250
1290
1280
SEE CONSTRUCTION NOTE No. 27
ON PAGE 1 REGARDING CONNECTION
REVISED BY LAND DEVELOPMENT DIVISION
SEWER DATA
RADIUS
LENGTH
PIPE
TANGENT
SLOPE
STATION

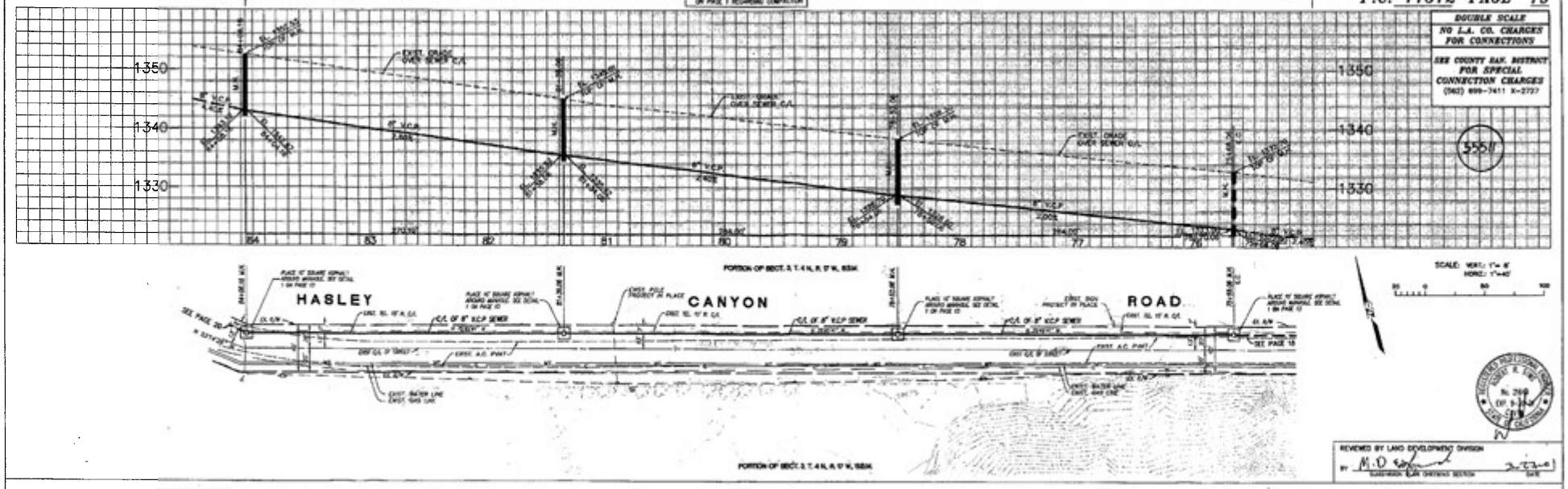




TR. NO. 45645 P.C. 11572

P.C. 11572 PAGE 19

DOUBLE SCALE
NO L.A. CO. CHARGES FOR CONNECTIONS
SEE COUNTY SAN. DISTRICT FOR SPECIAL CONNECTION CHARGES (562) 699-7411 X-2727



REVIEWED BY LAND DEVELOPMENT DIVISION
BY M.O. 3-27-00
SUBDIVISION & ENGINEERING SECTION DATE

P.C. 11572 PAGE 20

DOUBLE SCALE
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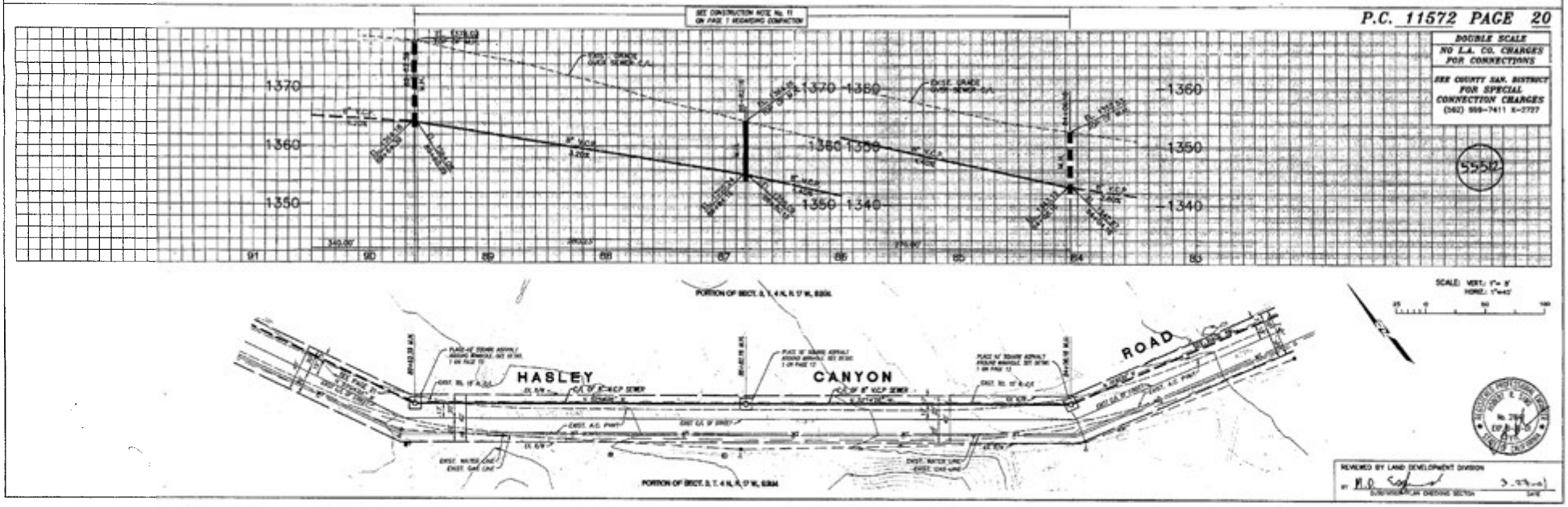
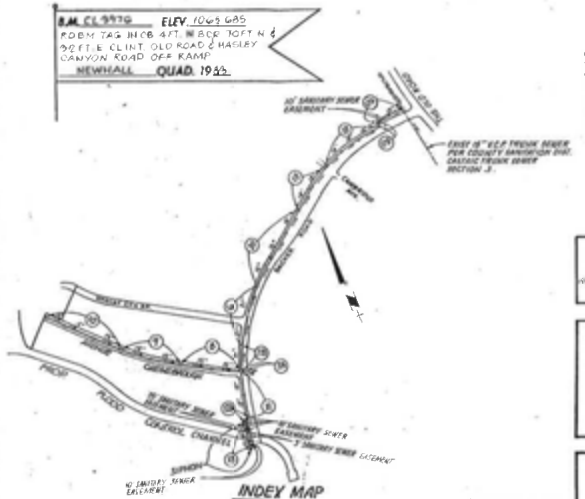


REVIEWED BY LAND DEVELOPMENT DIVISION
BY M.O. 3-27-00
SUBDIVISION & ENGINEERING SECTION DATE

TR. NO. 45645 P.C. 11572

10

B.M. CL 9970 ELEV. 1063.685
ROBM TAG IN CB 4FT. N & 80FT. W OF N & SOFT. E CLINT. OLD ROAD & HASLEY CANYON ROAD OFF RAMP
NEWHALL QUAD. 1965



INDEX MAP
SCALE: 1" = 800'

NOTE: NUMBERS IN CIRCLES INDICATE PAGE NUMBER

P.C. NO. 10942
P.M. NO. 18229
T.G. 123 - D4

DOUBLE SCALE

NO CONNECTION FOR THE DISPOSAL OF INDUSTRIAL WASTES SHALL BE MADE TO SEWERS SHOWN ON THESE DRAWINGS UNTIL A PERMIT FOR INDUSTRIAL WASTEWATER DISCHARGE HAS BEEN ISSUED BY THE SANITATION DISTRICTS FOR SAID CONNECTION.

BEFORE BREAKING INTO OR CONSTRUCTION ON A COUNTY SANITATION DISTRICT SEWER AND PRIOR TO FINAL ACCEPTANCE OF THE PROJECT, SANITATION DISTRICT INSPECTOR SHALL BE NOTIFIED BY PHONE (805) 949-5027 SO THAT REQUIRED INSPECTION CAN BE MADE.

REVISION NO. 1 DATE 3-26-91
PAGE 10, ADDED 6" V.C. @ STA 6+46.00
APPROVED BY: [signature] RCE 19, 33134
OFFICE OF THE DIRECTOR OF PUBLIC WORKS

REVISION NO. 2 DATE 6-10-91
1. REVISED KEY MAP AND NUMBER OF SHEETS / PAGES IN TITLE BLOCK ON PAGE 1.
2. VOIDED PAGES 2, 3, 4 & 5 AND SUPERSEDED WITH NEW PAGES 17, 18, 19 & 20 DUE TO ROAD REALIGNMENT.
3. VOIDED PAGE 16 (B-LINE PAGE).
4. ADDED SHEETS 21 & 22 (PAGES 21, 15, 19 & 20).
5. REVISED PLAN & PROFILE ON PAGE 12 B.
APPROVED: [signature] RCE 33134
OFFICE OF THE DIRECTOR OF PUBLIC WORKS

REVISION NO. 3 DATE: 12-09-92
1. PAGE 13 - ADD 18"x6" WYE TO EXIST 18" STUB OF SUPHAM M.H. @ STA. 46+90.00
APPROVED BY: [signature] R.C.E. NO. 33134
OFFICE OF THE DIRECTOR OF PUBLIC WORKS

REVISED

GENERAL NOTES:

1. ELEVATIONS ARE IN FEET BASED ON U.S.C. & G.S. MEAN SEA LEVEL DATUM OF 1929.
2. NO REVISIONS SHALL BE MADE IN THESE PLANS WITHOUT THE APPROVAL OF THE DIRECTOR OF PUBLIC WORKS.
3. NOTIFY THE DEPARTMENT OF PUBLIC WORKS AT LEAST TWO WORKING DAYS IN ADVANCE OF THE START OF WORK.
4. CONSULT UTILITY COMPANIES AND/OR OWNERS AS TO THE EXISTENCE AND LOCATION OF ANY UTILITIES SHOWN OR NOT SHOWN ON THESE PLANS PRIOR TO THE START OF ANY WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE DONE BY HIS OPERATIONS TO ANY UTILITY FACILITIES AND SHALL BEAR THE COST OF REPAIR OR REPLACEMENT OF SUCH FACILITIES.
5. THE PRIVATE ENGINEER'S SEAL, UNDER THE DEPARTMENT OF PUBLIC WORKS' WITH GRADE SHEETS AND STAMPING FOR ALL HOUSE SEWERS SHALL BE AFFIXED TO AND SHALL INCLUDE ALL STAKE SHEETS THEREOF. THESE PRINTS / EQUATIONS WITH STATIONING FOR ALL HOUSE LATERALS SHALL BE CONSTRUCTED TO A STRAIGHT LINE BETWEEN MANHOLES AT THE MINIMUM GRADE INDICATED ON THE PLANS. HOUSE LATERAL STUBS CHANGE OF GRADE, ANGLE POINTS ARE ALLOWED ONLY AT THE MANHOLE OR AT THE CLEANOUT (C.O.) AT CHANGE SHALL BE REQUESTED IN WRITING BY THE PRIVATE ENGINEER.
6. THE PRIVATE ENGINEER'S CERTIFICATE THROUGH THE HOUSE LATERAL OUTLET AT THE PROPERTY LINE AND ON THE TOP OF CURB ELEVATION TO BE SHOWN ON THE GRADE SHEET.
7. BEFORE WORK CAN BE STARTED, THE CONTRACTOR MUST OBTAIN A PERMIT TO EXCAVATE IN THE COUNTY STREET(S) WITHIN THE CONSTRUCTION LIMITS OF THIS PROJECT FROM THE DEPARTMENT OF PUBLIC WORKS, PERMIT OFFICE, 900 SOUTH FREMONT AVENUE, ALHAMBRA, CALIFORNIA 91803 - 1331. A FEE WILL BE CHARGED TO COVER THE COST OF CONSTRUCTION INSPECTION AND RECORD PLANS.
8. A PERMIT FROM THE STATE OF CALIFORNIA, DEPARTMENT OF TRANSPORTATION, 120 SOUTH SPRING STREET, LOS ANGELES, CALIFORNIA 90012 - 3606 MUST BE OBTAINED PRIOR TO ANY CONSTRUCTION WITHIN STATE HIGHWAY RIGHT-OF-WAY.
9. APPROVAL OF THESE PLANS BY THE COUNTY OF LOS ANGELES DOES NOT CONSTITUTE A REPRESENTATION AS TO THE ACCURACY OF THE LOCATION OR THE EXISTENCE OR NON-EXISTENCE OF ANY OTHER FACILITIES WITHIN THE PROJECT BOUNDARIES.
10. REFER TO SECTION 7-10.4 OF THE STANDARD SPECIFICATIONS REGARDING SAFETY ORDERS.
11. PRIOR TO THE ISSUANCE OF THE RELEASE OF GRADE (LESS THAN FINAL), THE CONTRACTOR SHALL SUBMIT TO THE ENGINEER OF WORK A COPY OF A PERMIT TO USE WATER FROM A FIRE HYDRANT OR OTHER SOURCE OF SUPPLY FOR CONSTRUCTION PURPOSES, ISSUED BY THE DEPARTMENT OF PUBLIC WORKS, WATER AND SANITATION DIVISION, 900 SOUTH FREMONT AVENUE, ALHAMBRA, CALIFORNIA 91803 - 1331. ALL WATER USED FOR CONSTRUCTION PURPOSES SHALL BE OBTAINED FROM FIRE HYDRANTS METERED BY THE DEPARTMENT OF PUBLIC WORKS. NO CONSTRUCTION WATER SHALL BE OBTAINED FROM ANY OTHER SOURCE UNLESS AUTHORIZED IN WRITING BY THE DIRECTOR OF PUBLIC WORKS OR HIS AUTHORIZED REPRESENTATIVE.

CONSTRUCTION NOTES:

1. WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 1991 EDITION (GREEN BOOK) AND ADDENDUM NO. 1 DATED JULY 1, 1991, AND ADDENDUM NO. 2 DATED JULY 31, 1991, AND ANY SUBSEQUENT ADDENDUMS THERETO, EXCEPT AS MODIFIED BY SPECIAL PROVISIONS DATED JULY 31, 1991 AND SHALL BE INTERPRETED ONLY IN THE PRESENCE OF THE DEPARTMENT OF PUBLIC WORKS.
2. ANY CONTRACTOR SHALL NOTIFY ANY CONSTRUCTION SUPERINTENDENT BY TELEPHONE, AND FOR LESS THAN 8 HOURS NOTICE, AT LEAST TWENTY-FOUR HOURS BEFORE STARTING ANY WORK UNDER THIS CONTRACT.
3. HOUSE LATERALS SHALL NOT BE CONSTRUCTED WITH GRADES, AT PROPERTY LINE, 5 FEET BELOW CURB GRADE EXCEPT AS NOTED.
4. WYE OR TEE BRANCHES MAY BE USED IF CONVENIENT TO MAKE THE CONNECTIONS TO THE DEPARTMENT'S SYSTEM AS NOTED.
5. ALL 8 INCH PIPE SHALL BE EITHER SDR35 PLASTIC OR CLASS 150 PRECAST CONCRETE SEWER MEETING ASTM C 478 OR EXCEPT AS NOTED.
6. PROVIDE 5 INCH CLEAR IN THE PROPERTY LINE CLEANOUT PIPES PERPENDICULAR TO THE SEWER LINE AT THE CENTER LINE OF EACH SEWER LOT.
7. MANHOLE TOPS IN UNIMPROVED AREAS OF WAY TO BE SET 1 INCH ABOVE ADJACENT GROUND.
8. MANHOLE TO EXIT PIPE JOINT SHALL BE PER "D" OR "E" PIPE STANDARD DETAILS FROM SECTION 306-1.
9. A STAKED OFFSET TWO FEET OUTSIDE THE CURB FACE AT THE GRADE BREAK SHALL BE ESTABLISHED AT EACH MANHOLE AND CLEANOUT FROM WHICH THE DEPTH OF THE SEWER MAY BE DETERMINED.
10. REMOVE ALL TEMPORARY PIPE PLUGS AT THE TIME OF INSTALLATION OF THE ADJACENT SEWER LINE. ALL PIPE SHALL BE CLEAN AND FREE FROM DEBRIS AT THE POINT OF WITH REFERENCE.
11. PROVIDE THE COUNTY OF LOS ANGELES WITH A CERTIFICATE OF COMPLIANCE FOR THE INSTALLATION OF THE SEWER LINE(S) AND MANHOLE(S) AS REQUIRED BY THE DEPARTMENT OF PUBLIC WORKS' CODE, SECTION 7005.
12. ALL JOINTS SHALL BE TESTED FOR LEAKAGE IN ACCORDANCE WITH SECTION 306-1.3 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 1991 EDITION (GREEN BOOK) AND ADDENDUM NO. 1 DATED JULY 1, 1991 AND ADDENDUM NO. 2 DATED JULY 31, 1991 AND ANY SUBSEQUENT ADDENDUMS THERETO, EXCEPT AS MODIFIED BY SPECIAL PROVISIONS DATED JULY 31, 1991 AND SHALL BE INTERPRETED ONLY IN THE PRESENCE OF THE DEPARTMENT OF PUBLIC WORKS.
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14. HOUSE LATERALS SHALL NOT BE CONSTRUCTED WITH GRADES, AT PROPERTY LINE, 5 FEET BELOW CURB GRADE EXCEPT AS NOTED.
15. ANY OR TEE BRANCHES MAY BE USED IF CONVENIENT TO MAKE THE CONNECTIONS TO THE DEPARTMENT'S SYSTEM AS NOTED.
16. ALL 8 INCH PIPE SHALL BE EITHER SDR35 PLASTIC OR CLASS 150 PRECAST CONCRETE SEWER MEETING ASTM C 478 OR EXCEPT AS NOTED.
17. PROVIDE 5 INCH CLEAR IN THE PROPERTY LINE CLEANOUT PIPES PERPENDICULAR TO THE SEWER LINE AT THE CENTER LINE OF EACH SEWER LOT.
18. MANHOLE TOPS IN UNIMPROVED AREAS OF WAY TO BE SET 1 INCH ABOVE ADJACENT GROUND.
19. MANHOLE TO EXIT PIPE JOINT SHALL BE PER "D" OR "E" PIPE STANDARD DETAILS FROM SECTION 306-1.
20. A STAKED OFFSET TWO FEET OUTSIDE THE CURB FACE AT THE GRADE BREAK SHALL BE ESTABLISHED AT EACH MANHOLE AND CLEANOUT FROM WHICH THE DEPTH OF THE SEWER MAY BE DETERMINED.
21. REMOVE ALL TEMPORARY PIPE PLUGS AT THE TIME OF INSTALLATION OF THE ADJACENT SEWER LINE. ALL PIPE SHALL BE CLEAN AND FREE FROM DEBRIS AT THE POINT OF WITH REFERENCE.
22. PROVIDE THE COUNTY OF LOS ANGELES WITH A CERTIFICATE OF COMPLIANCE FOR THE INSTALLATION OF THE SEWER LINE(S) AND MANHOLE(S) AS REQUIRED BY THE DEPARTMENT OF PUBLIC WORKS' CODE, SECTION 7005.
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26. ANY OR TEE BRANCHES MAY BE USED IF CONVENIENT TO MAKE THE CONNECTIONS TO THE DEPARTMENT'S SYSTEM AS NOTED.
27. ALL 8 INCH PIPE SHALL BE EITHER SDR35 PLASTIC OR CLASS 150 PRECAST CONCRETE SEWER MEETING ASTM C 478 OR EXCEPT AS NOTED.
28. PROVIDE 5 INCH CLEAR IN THE PROPERTY LINE CLEANOUT PIPES PERPENDICULAR TO THE SEWER LINE AT THE CENTER LINE OF EACH SEWER LOT.
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30. MANHOLE TO EXIT PIPE JOINT SHALL BE PER "D" OR "E" PIPE STANDARD DETAILS FROM SECTION 306-1.
31. A STAKED OFFSET TWO FEET OUTSIDE THE CURB FACE AT THE GRADE BREAK SHALL BE ESTABLISHED AT EACH MANHOLE AND CLEANOUT FROM WHICH THE DEPTH OF THE SEWER MAY BE DETERMINED.
32. REMOVE ALL TEMPORARY PIPE PLUGS AT THE TIME OF INSTALLATION OF THE ADJACENT SEWER LINE. ALL PIPE SHALL BE CLEAN AND FREE FROM DEBRIS AT THE POINT OF WITH REFERENCE.
33. PROVIDE THE COUNTY OF LOS ANGELES WITH A CERTIFICATE OF COMPLIANCE FOR THE INSTALLATION OF THE SEWER LINE(S) AND MANHOLE(S) AS REQUIRED BY THE DEPARTMENT OF PUBLIC WORKS' CODE, SECTION 7005.
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43. REMOVE ALL TEMPORARY PIPE PLUGS AT THE TIME OF INSTALLATION OF THE ADJACENT SEWER LINE. ALL PIPE SHALL BE CLEAN AND FREE FROM DEBRIS AT THE POINT OF WITH REFERENCE.
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54. REMOVE ALL TEMPORARY PIPE PLUGS AT THE TIME OF INSTALLATION OF THE ADJACENT SEWER LINE. ALL PIPE SHALL BE CLEAN AND FREE FROM DEBRIS AT THE POINT OF WITH REFERENCE.
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87. REMOVE ALL TEMPORARY PIPE PLUGS AT THE TIME OF INSTALLATION OF THE ADJACENT SEWER LINE. ALL PIPE SHALL BE CLEAN AND FREE FROM DEBRIS AT THE POINT OF WITH REFERENCE.
88. PROVIDE THE COUNTY OF LOS ANGELES WITH A CERTIFICATE OF COMPLIANCE FOR THE INSTALLATION OF THE SEWER LINE(S) AND MANHOLE(S) AS REQUIRED BY THE DEPARTMENT OF PUBLIC WORKS' CODE, SECTION 7005.
89. ALL JOINTS SHALL BE TESTED FOR LEAKAGE IN ACCORDANCE WITH SECTION 306-1.3 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 1991 EDITION (GREEN BOOK) AND ADDENDUM NO. 1 DATED JULY 1, 1991 AND ADDENDUM NO. 2 DATED JULY 31, 1991 AND ANY SUBSEQUENT ADDENDUMS THERETO, EXCEPT AS MODIFIED BY SPECIAL PROVISIONS DATED JULY 31, 1991 AND SHALL BE INTERPRETED ONLY IN THE PRESENCE OF THE DEPARTMENT OF PUBLIC WORKS.
90. ANY CONTRACTOR SHALL NOTIFY ANY CONSTRUCTION SUPERINTENDENT BY TELEPHONE, AND FOR LESS THAN 8 HOURS NOTICE, AT LEAST TWENTY-FOUR HOURS BEFORE STARTING ANY WORK UNDER THIS CONTRACT.
91. HOUSE LATERALS SHALL NOT BE CONSTRUCTED WITH GRADES, AT PROPERTY LINE, 5 FEET BELOW CURB GRADE EXCEPT AS NOTED.
92. ANY OR TEE BRANCHES MAY BE USED IF CONVENIENT TO MAKE THE CONNECTIONS TO THE DEPARTMENT'S SYSTEM AS NOTED.
93. ALL 8 INCH PIPE SHALL BE EITHER SDR35 PLASTIC OR CLASS 150 PRECAST CONCRETE SEWER MEETING ASTM C 478 OR EXCEPT AS NOTED.
94. PROVIDE 5 INCH CLEAR IN THE PROPERTY LINE CLEANOUT PIPES PERPENDICULAR TO THE SEWER LINE AT THE CENTER LINE OF EACH SEWER LOT.
95. MANHOLE TOPS IN UNIMPROVED AREAS OF WAY TO BE SET 1 INCH ABOVE ADJACENT GROUND.
96. MANHOLE TO EXIT PIPE JOINT SHALL BE PER "D" OR "E" PIPE STANDARD DETAILS FROM SECTION 306-1.
97. A STAKED OFFSET TWO FEET OUTSIDE THE CURB FACE AT THE GRADE BREAK SHALL BE ESTABLISHED AT EACH MANHOLE AND CLEANOUT FROM WHICH THE DEPTH OF THE SEWER MAY BE DETERMINED.
98. REMOVE ALL TEMPORARY PIPE PLUGS AT THE TIME OF INSTALLATION OF THE ADJACENT SEWER LINE. ALL PIPE SHALL BE CLEAN AND FREE FROM DEBRIS AT THE POINT OF WITH REFERENCE.
99. PROVIDE THE COUNTY OF LOS ANGELES WITH A CERTIFICATE OF COMPLIANCE FOR THE INSTALLATION OF THE SEWER LINE(S) AND MANHOLE(S) AS REQUIRED BY THE DEPARTMENT OF PUBLIC WORKS' CODE, SECTION 7005.
100. ALL JOINTS SHALL BE TESTED FOR LEAKAGE IN ACCORDANCE WITH SECTION 306-1.3 OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION, 1991 EDITION (GREEN BOOK) AND ADDENDUM NO. 1 DATED JULY 1, 1991 AND ADDENDUM NO. 2 DATED JULY 31, 1991 AND ANY SUBSEQUENT ADDENDUMS THERETO, EXCEPT AS MODIFIED BY SPECIAL PROVISIONS DATED JULY 31, 1991 AND SHALL BE INTERPRETED ONLY IN THE PRESENCE OF THE DEPARTMENT OF PUBLIC WORKS.

PROFILE ALIGNMENT AND GRADE OF PAGE 1

SANITARY SEWERS

TO BE CONSTRUCTED IN

PARCEL MAP NO. 18229

PRIVATE CONTRACT NO. 10942

INDEX: 1216

10 SHEETS, 20 PAGES REVISED

SCALE: HORZ. 1"=40' VERT. 1"=4' MARCH, 1990

PREPARED IN THE OFFICES OF
SHOWN ENGINEERING ASSOCIATES
1520 BURBANK BLVD. VAN NUYS, CALIF. (818) 787-8150
BY [signature] REG. C.E. NO. 16312

LEGEND:
ALHAMBRA PUBLIC SAFETY REQUIREMENTS 5-2
STANDARD MANHOLE 3-A
STANDARD MANHOLE STEP 3-1
2" CONTROL FOR OTHER PIPE 5-1.1
CRACK AND JOINT SEALANT 5-1.5
WYE OR TEE SUPPORT 5-4
ALLOWABLE TRENCH WIDTHS 5-3.1
LOCATING MONUMENTS AND COVER 5-1.6
MONUMENTATION 5-1.6

IN ADDITION TO ALL APPLICABLE COUNTY ORDINANCES, ANY OTHER LAWS, RULES AND REGULATIONS GOVERNING THE CONSTRUCTION OF THIS PROJECT SHALL APPLY TO SAID CONSTRUCTION.

COUNTY OF LOS ANGELES, CALIFORNIA

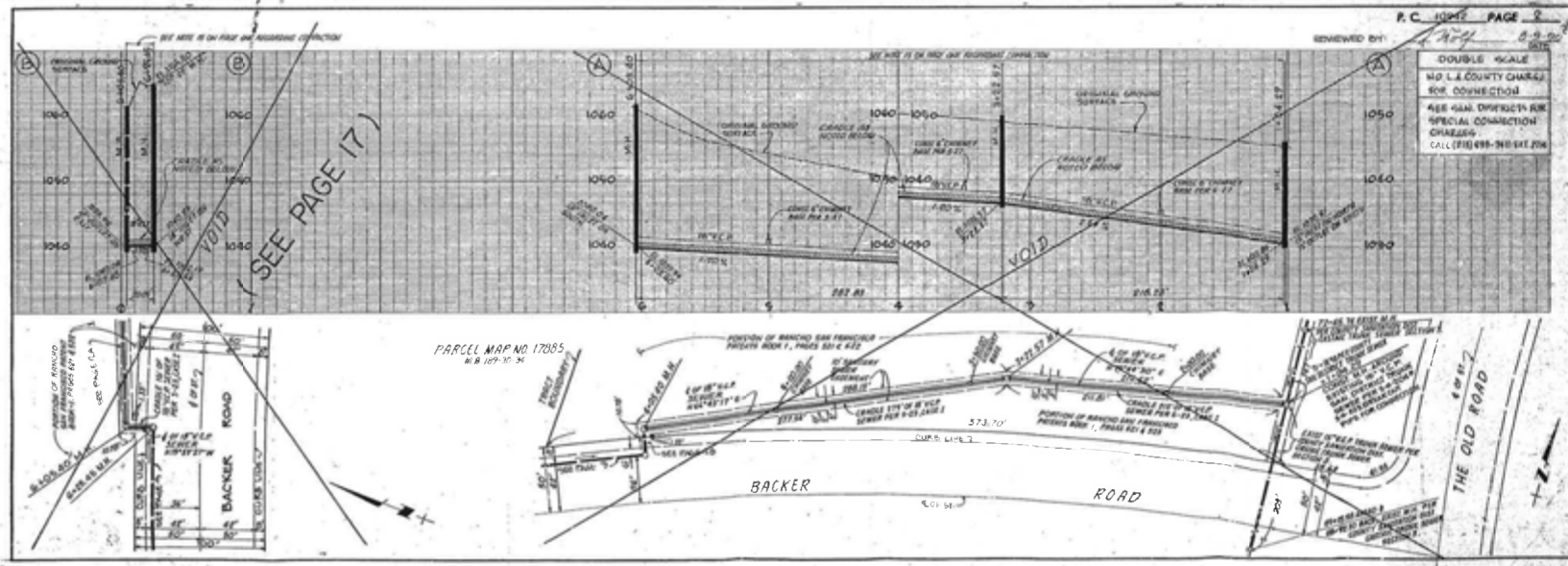
THOMAS A. TIDEMAN
DIRECTOR OF PUBLIC WORKS

CHARLES M. CARRY
CHIEF ENGINEER

APPROVED [signature] APPROVED [signature]
CHECKED [signature]
RCE NO. 33134
SANTA CLARITA VALLEY BLDG DIST #2

P.C. 10942 PAGE 2
REVIEWED BY: [signature] 8-9-92

DOUBLE SCALE
NO L.A. COUNTY CHARGE FOR CONNECTION
SEE SAN. DISTRICTS FOR SPECIAL CONNECTION CHARGES
CALL (818) 699-7411 EXT. 2706



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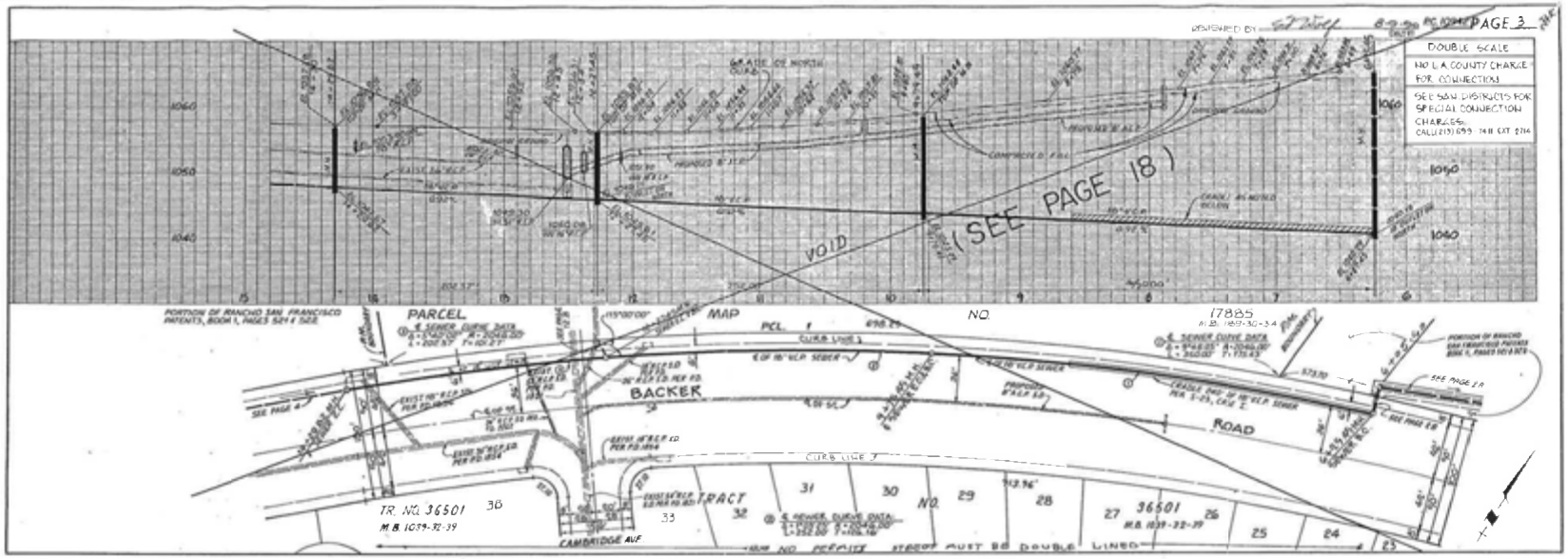

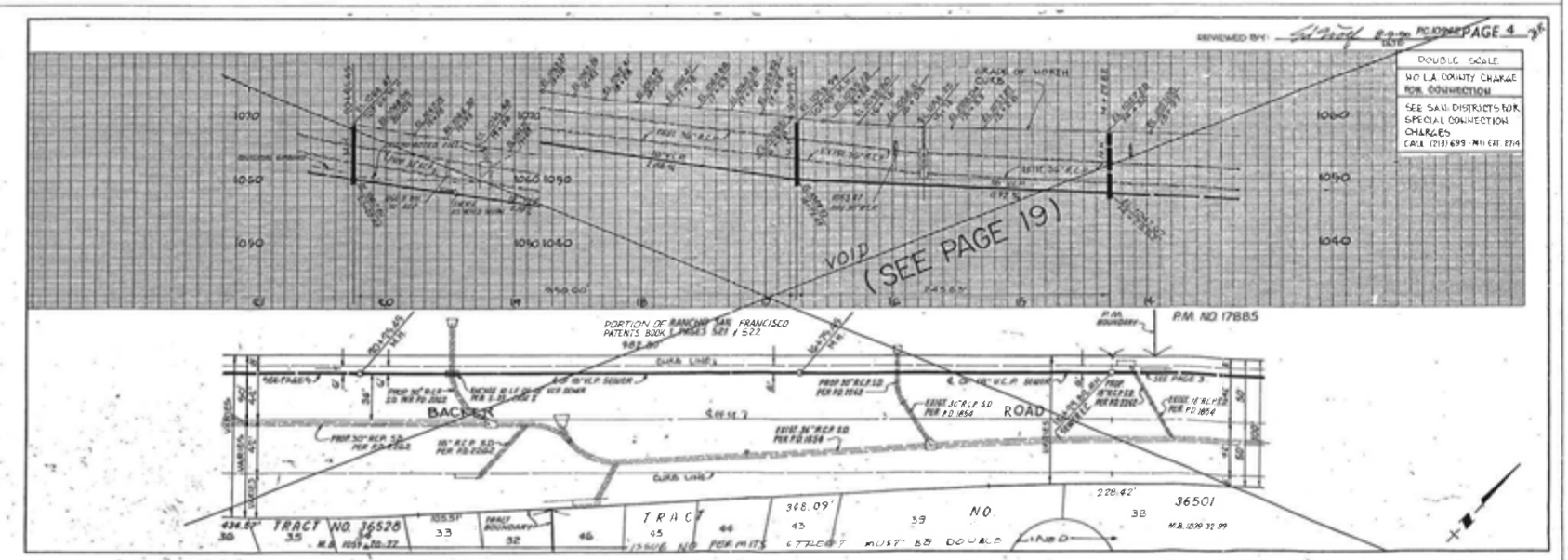

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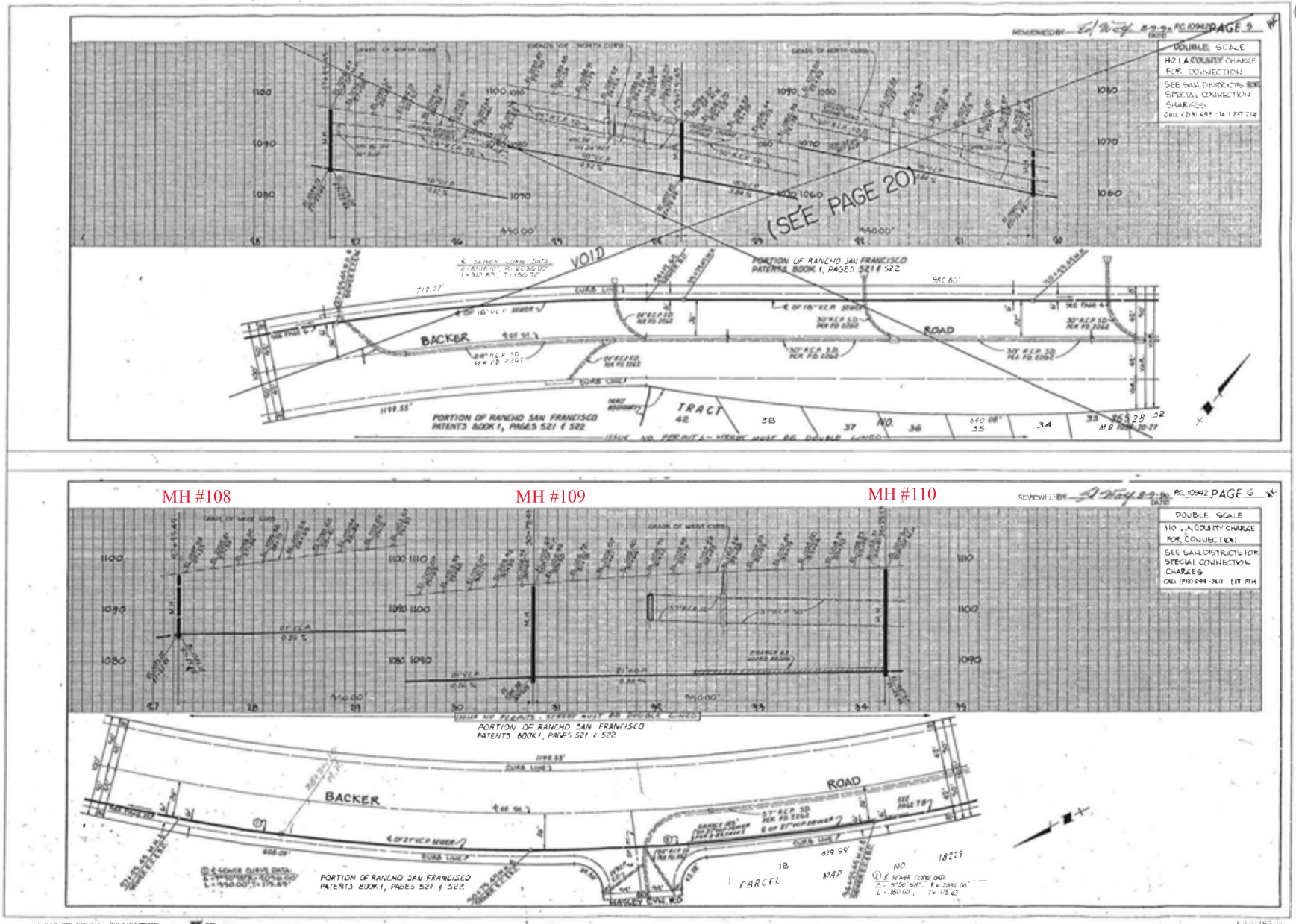
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BACKER
ROAD
TRACT NO. 42
MH #108
MH #109
MH #110
PAGE 6
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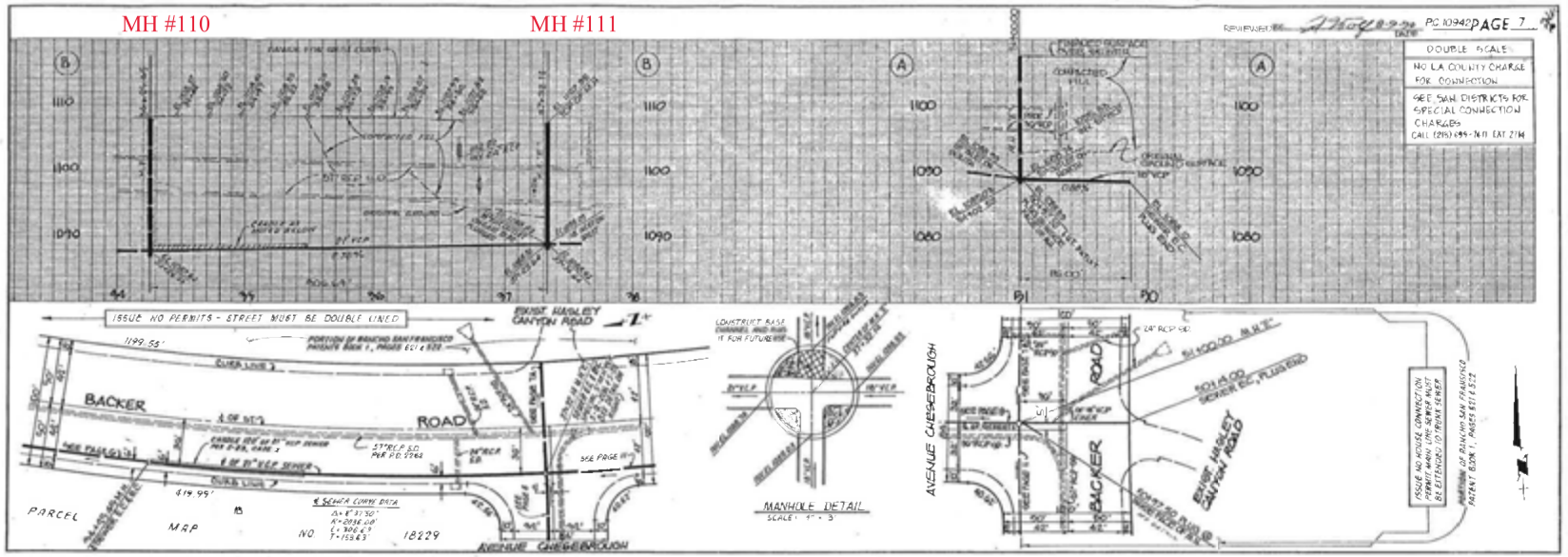
PARCEL MAP NO 18229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MH #111
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PC 10942 PAGE 7
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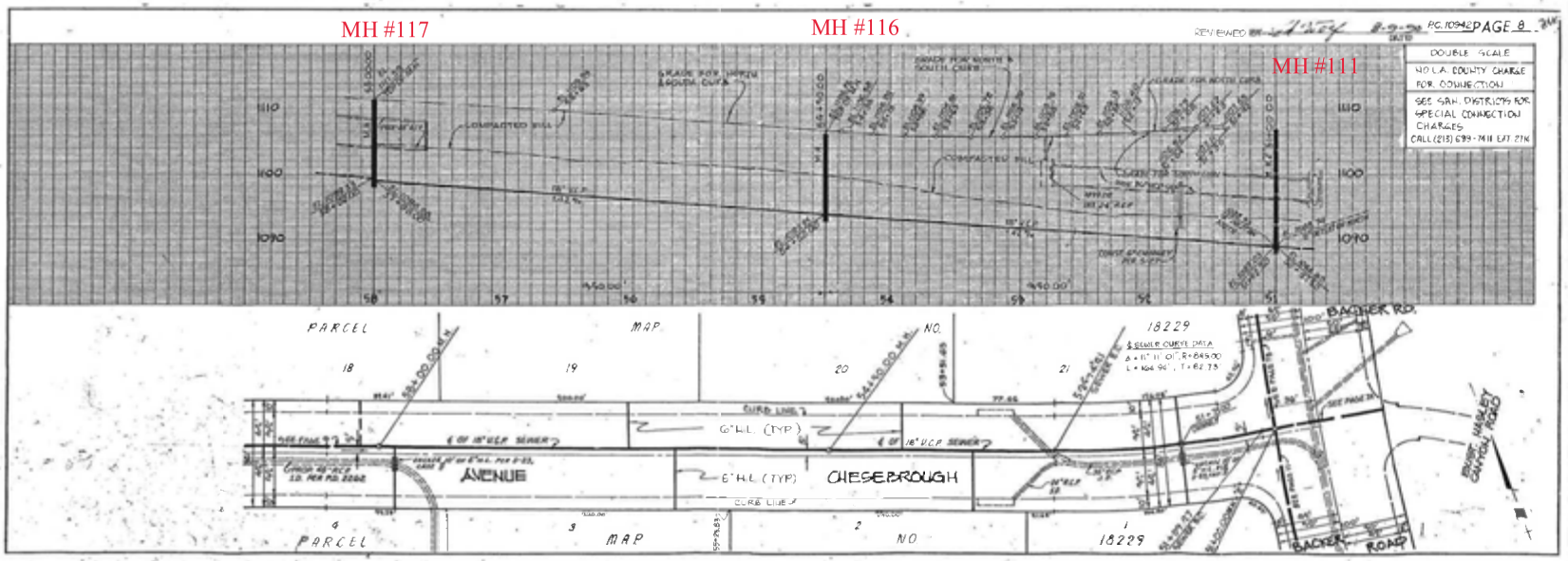
CALL (213) 699-7411 EXT. 2714
ISSUE NO PERMITS - STREET MUST BE DOUBLE LINED
EXIST. HASLEY CANYON ROAD
BACKER
ROAD
PARCEL
MAP
NO.
18229
AVENUE CHESEBROUGH
MANHOLE DETAIL
AVENUE CHESEBROUGH
BACKER
ROAD
EXIST. HASLEY CANYON ROAD
ISSUE NO HOUSE CONNECTION PERMIT MAIN LINE SEWER MUST BE EXTENDED TO TRUNK SEWER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MH #116
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SEE SAN. DISTRICTS FOR SPECIAL CONNECTION CHARGES
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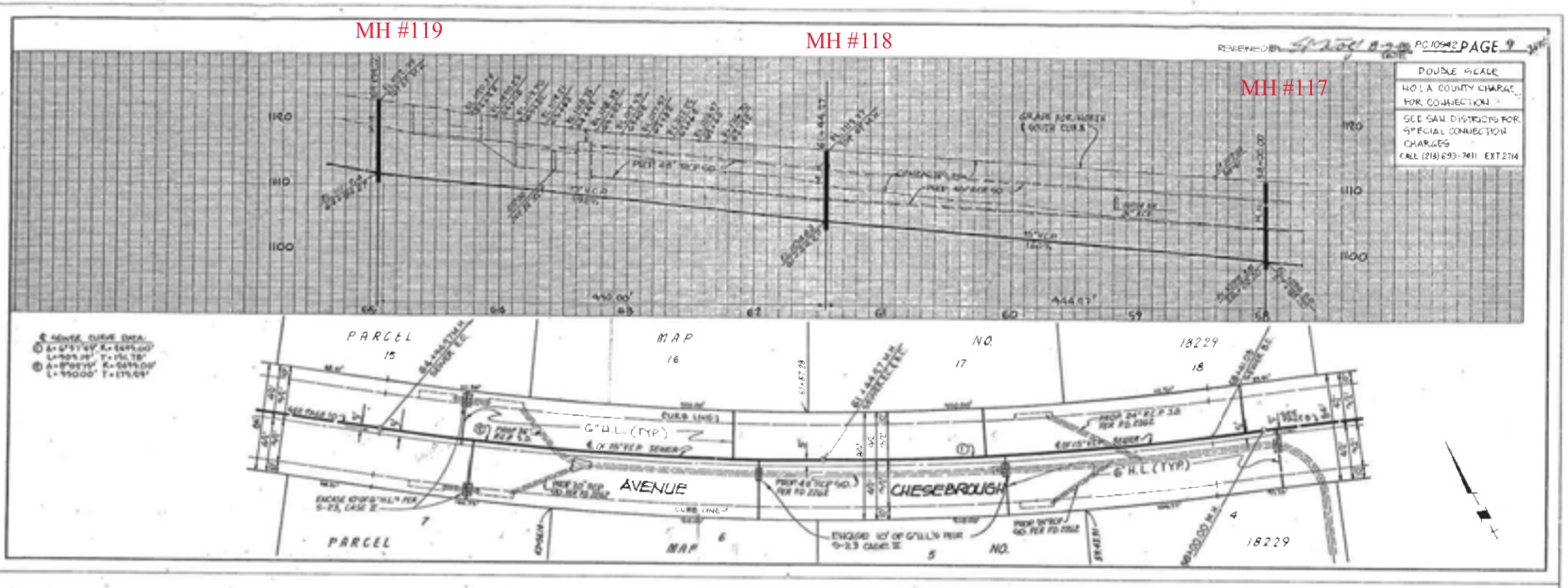
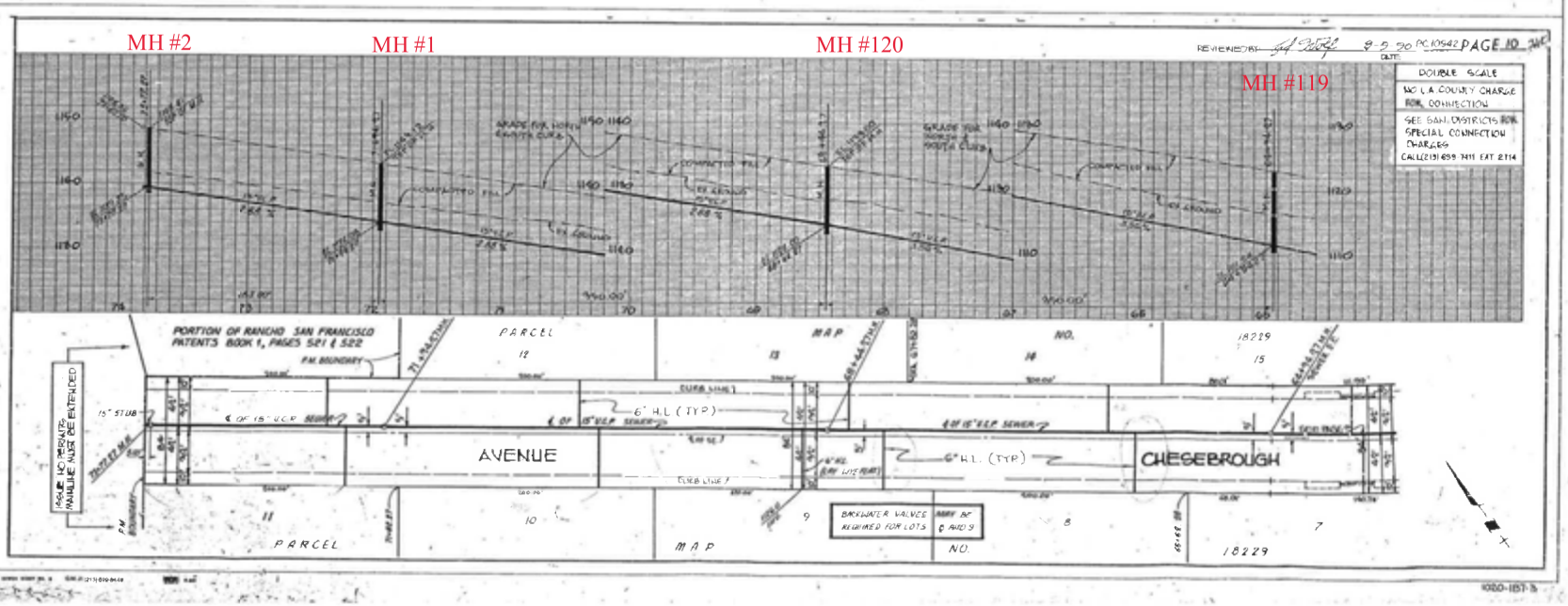
COMPACTED FILL
PARCEL
MAP
NO.
18229
BACKER RD.
AVENUE
CHESEBROUGH
6" H.L. (TYP)
CURB LINE
EXIST. HASLEY CANYON ROAD
BACKER
ROAD

1020-187-3





P.M. NO 18229 PC 10942

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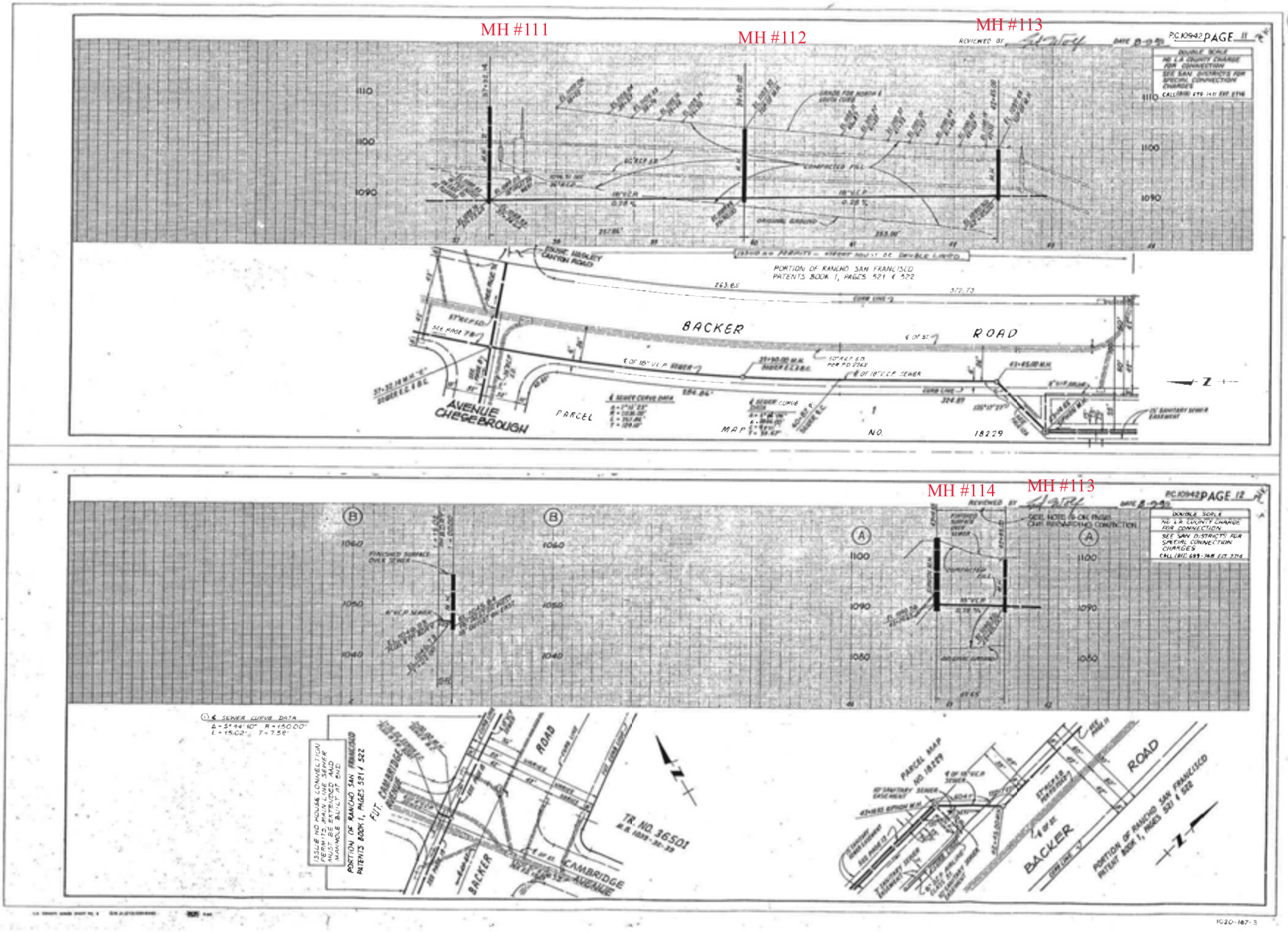
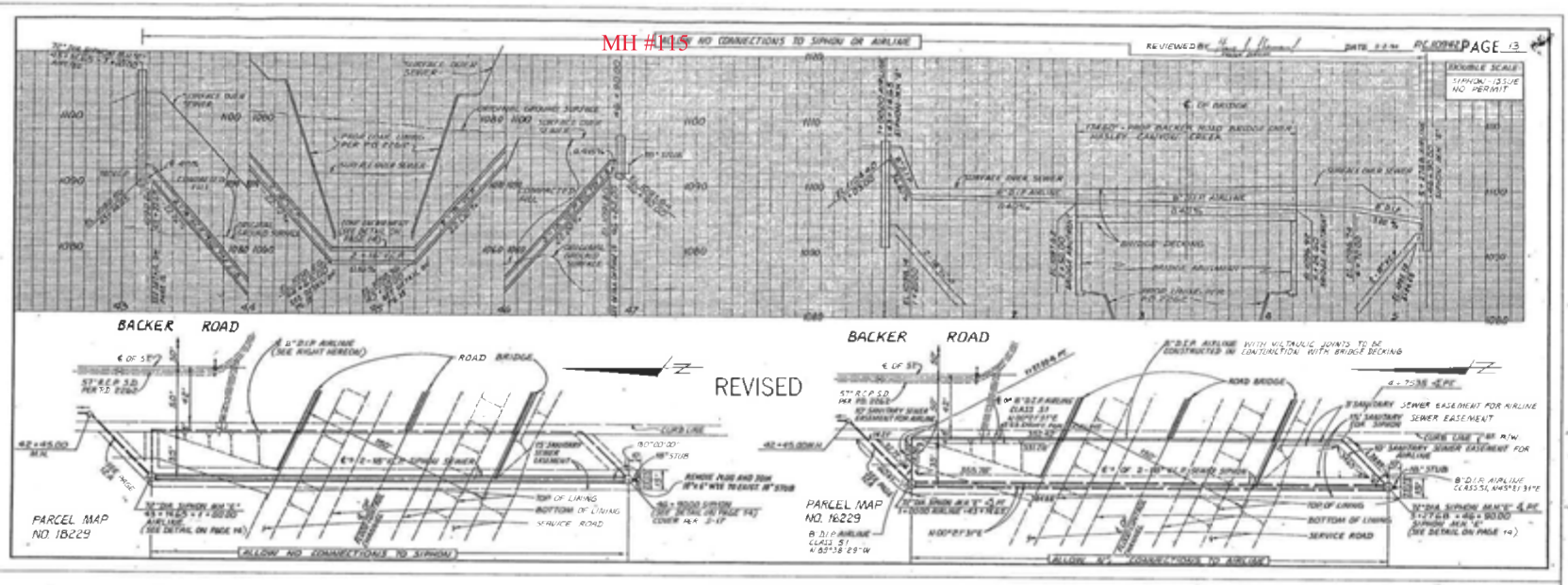
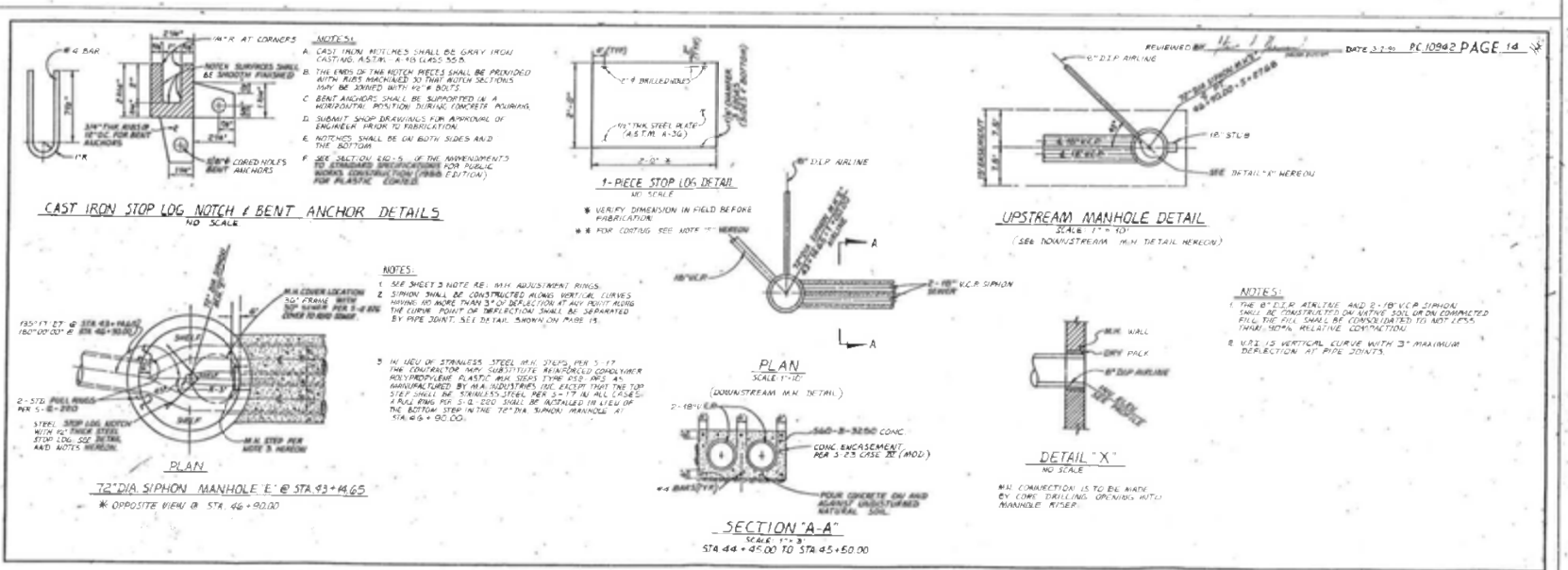


P.W. NO. 18229 P.C. 10942

1020-187-3

MH #115





(1) SHEET 13 OF 18 SHEETS

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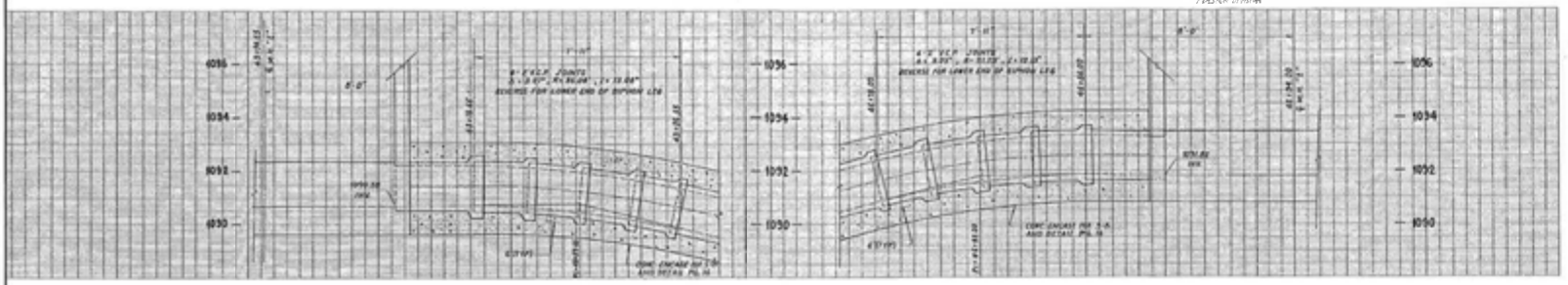
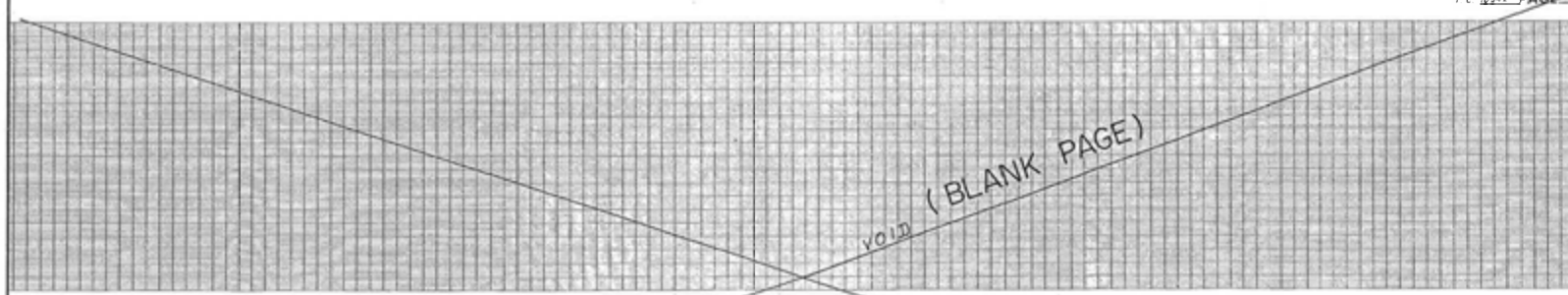


VERTICAL CURVE JOINTS DETAIL

SEE PLAN & PROFILE ON PAGE 13
SCALE: 1" = 2'

P.C. 10942 PAGE 16



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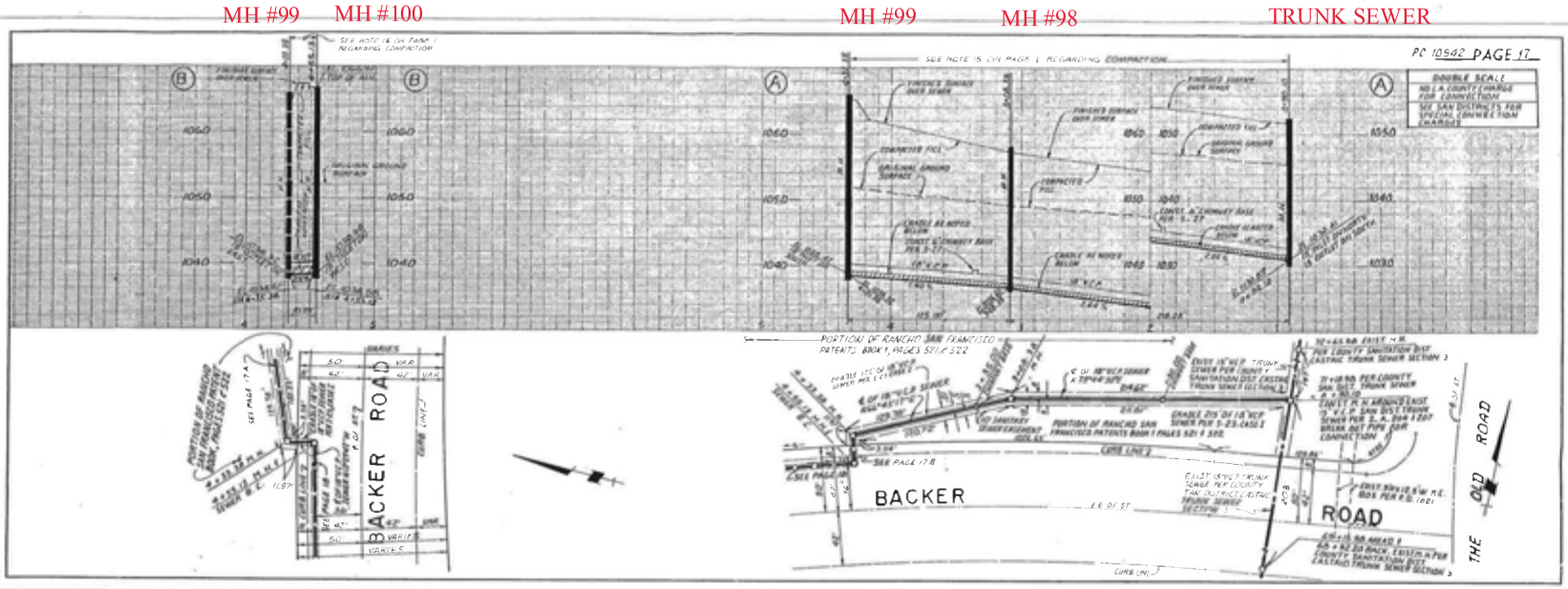
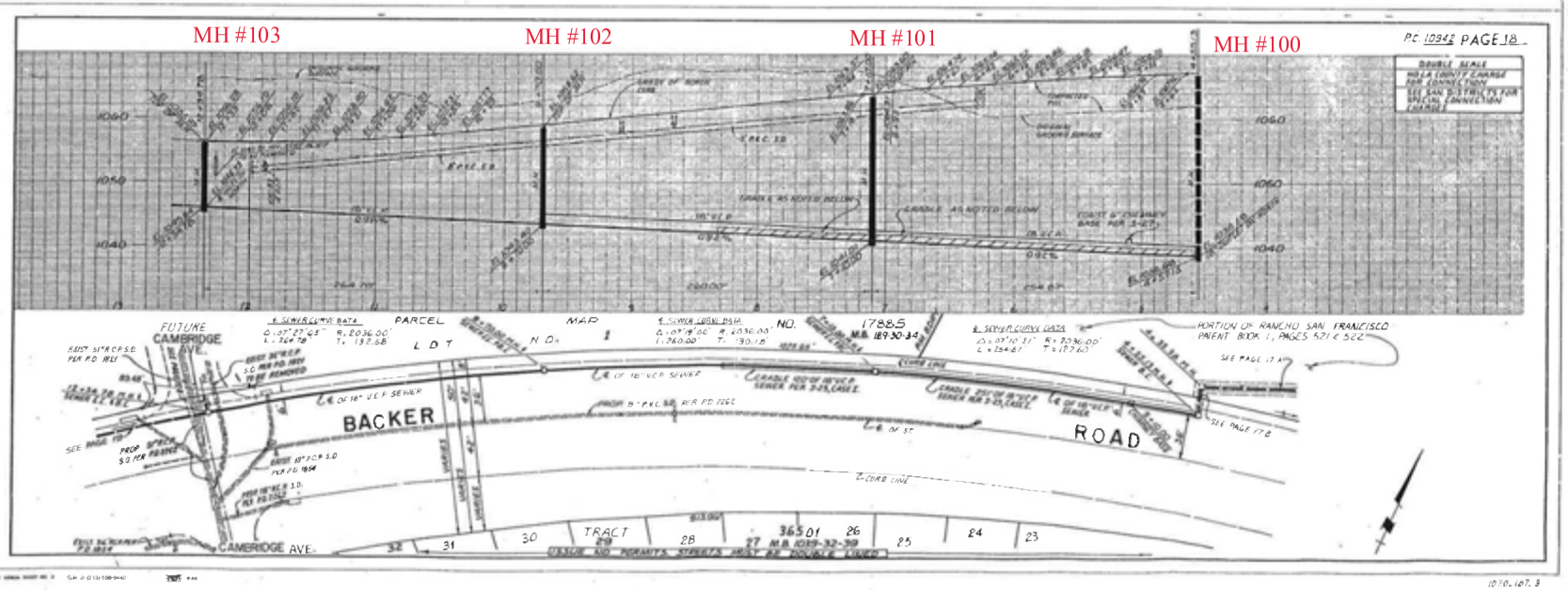
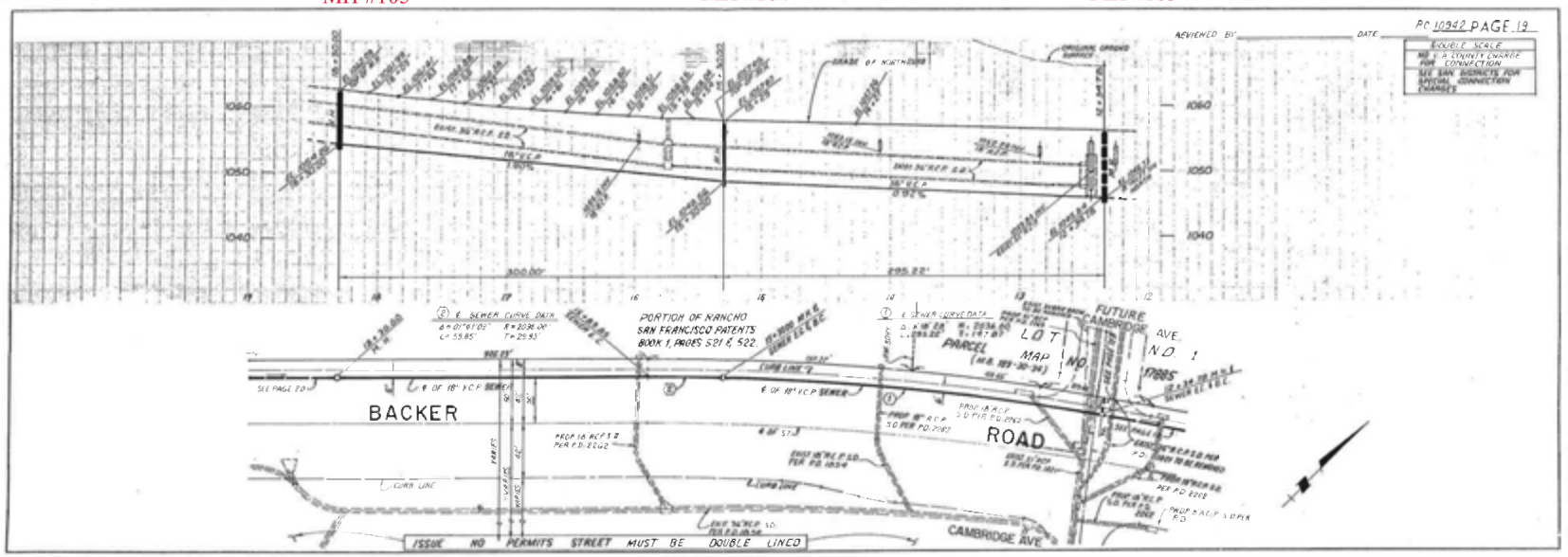




PC 10942
PM NO 18229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MH #104
MH #103
PC 10942 PAGE 19
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SEE SAN DISTRICTS FOR SPECIAL CONNECTION CHARGES
GRADE OF NORTHBOUND
1060
1050
1040
300.00'
295.22'
PORTION OF RANCHO SAN FRANCISCO PATENTS BOOK 1, PAGES 521 & 522
BACKER
ROAD
FUTURE CAMBRIDGE AVE.
LOT
MAP
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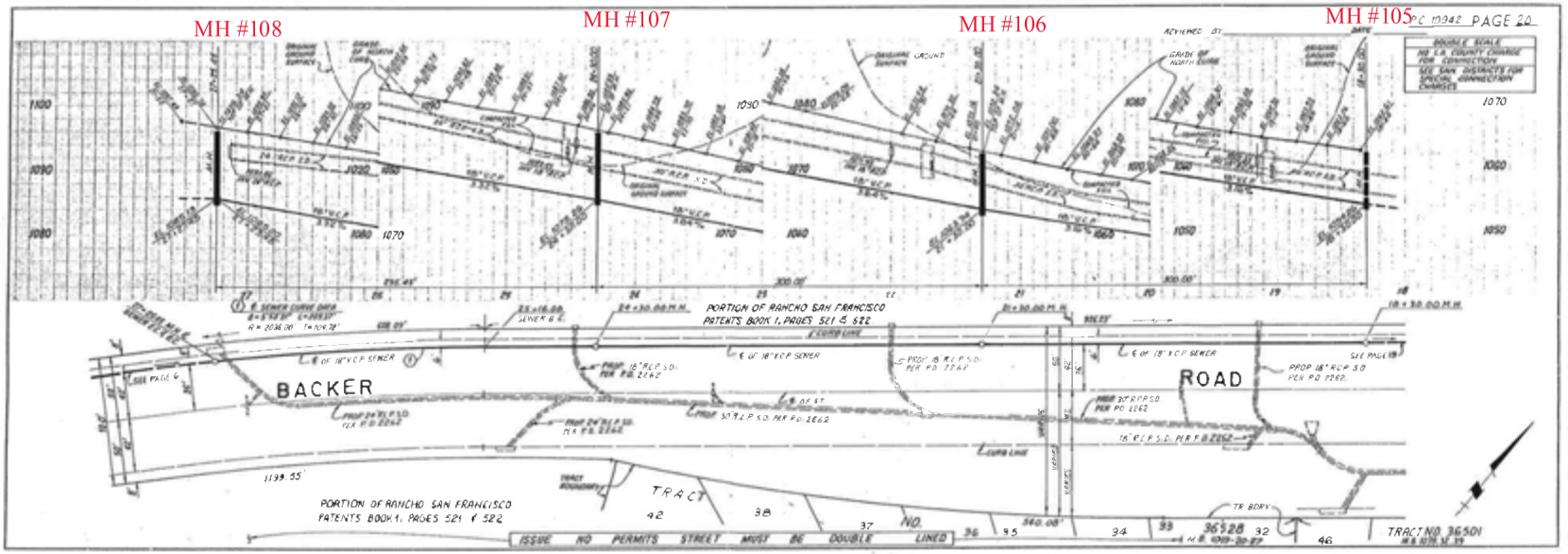
PARCEL
CAMBRIDGE AVE
ISSUE NO PERMITS STREET MUST BE DOUBLE LINED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MH #105
PC 10942 PAGE 20
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DATE
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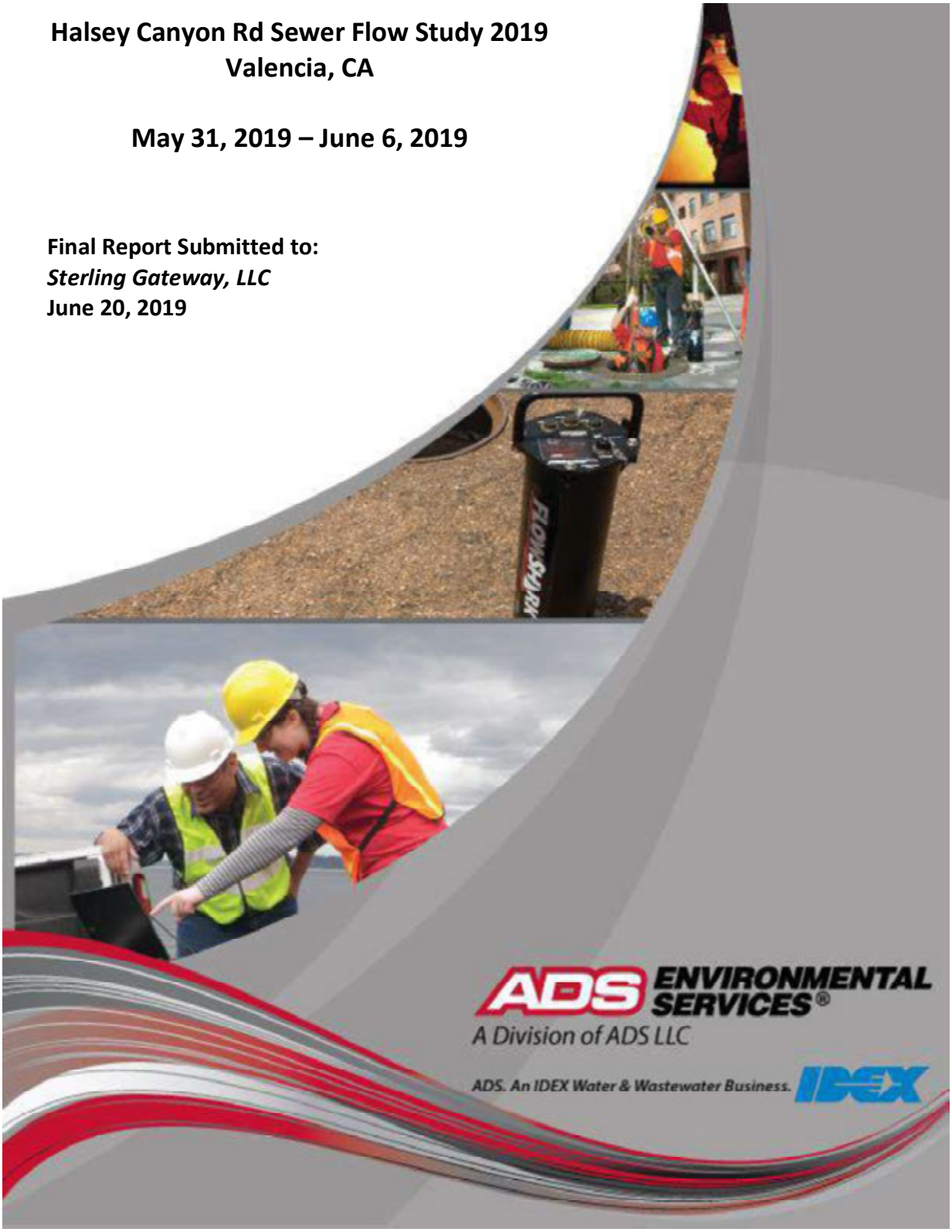
SEE SAN DISTRICTS FOR SPECIAL CONNECTION CHARGES
1100
1090
1080
1070
1060
1050
300.00'
PORTION OF RANCHO SAN FRANCISCO PATENTS BOOK 1, PAGES 521 & 522
BACKER
ROAD
TRACT
NO.
PORTION OF RANCHO SAN FRANCISCO PATENTS BOOK 1, PAGES 521 & 522
ISSUE NO PERMITS STREET MUST BE DOUBLE LINED
TRACT NO. 36501

Appendix E

Halsey Canyon Rd Sewer Flow Study 2019
Valencia, CA

May 31, 2019 – June 6, 2019

Final Report Submitted to:
Sterling Gateway, LLC
June 20, 2019



Halsey Canyon Rd Sewer Flow Study
Valencia, CA 2019

Prepared for:

Hunt Williams
Sterling Gateway, LLC
PO Box 681007
Park City, UT 84068

Prepared by:

ADS, LLC
15201 Springdale St
Huntington Beach, CA 92649

ADS LLC

June 19, 2019

Hunt Williams
Sterling Gateway, LLC
PO Box 681007
Park City, UT 84068

SUBJECT: Halsey Canyon Rd Sewer Flow Study 2019, Valencia CA

Dear Mr. Williams,

ADS is pleased to submit the report for the Halsey Canyon Rd Sewer Flow Study 2019, Valencia CA completed on behalf of Sterling Gateway, LLC. The metering was conducted at three (3) locations over a 1-week period. The study was conducted during the period of May 31, 2019 - June 06, 2019.

The report contains depth, velocity, and quantity hydrographs as well as daily long tables for the metering period in pdf format. An Excel file containing depth, quantity, and velocity entities for the monitoring location in 5-minute format has already been provided.

In addition, we would be happy to further explain any details about the report that may seem unclear. Should you have any questions or comments, you may contact the Project Manager, Paul Mitchell at (714) 379-9778.

Thank you for choosing ADS products and services to meet your flow monitoring needs.

Sincerely,
ADS ENVIRONMENTAL SERVICES

Sean O'Donnell
Data Analyst

Scope and Methodology

Introduction

Sterling Gateway, LLC entered into an agreement with ADS Environmental Services to conduct flow monitoring at three (3) metering points within the City of Valencia, California. The study was conducted over a 1-week period. The objective of this study was to measure depth, velocity, and quantify flows. Data obtained will be used for planning purposes.

Project Scope

The scope of this study involved using flow monitors to quantify wastewater flows at the designated locations. Specifically, the study included the following key components.

- Investigate the proposed flow-monitoring sites for adequate hydraulic conditions.
- Flow monitor installations.
- Flow monitor confirmations and data collections.
- Flow data analysis.

Equipment installation was completed by May 30, 2019 for the monitoring period, which began on May 31, 2019 and was completed on June 06, 2019.

Flow Monitoring Equipment

The ***ADS FlowShark Triton*** monitor was selected for this project. This flow monitor is an area velocity flow monitor that uses both the Continuity and Manning's equations to measure flow.

The ADS FlowShark Triton monitor consists of data acquisition sensors and a battery-powered microcomputer. The microcomputer includes a processor unit, data storage, and an on-board clock to control and synchronize the sensor recordings. The monitor was programmed to acquire and store depth of flow and velocity readings at 5-minute intervals.

The FS Triton monitor features cross-checking using multiple technologies in each sensor for continuous running of comparisons and tolerances. The FS Triton monitor can support two (2) sets of sensors. The sensor option used for this project was:

The Peak Combo Sensor installed at the bottom of the pipe includes three types of data acquisition technologies.

The ***up looking ultrasonic depth*** uses sound waves from two independent transceivers to measure the distance from the sensor upward toward the flow surface; applying the speed of sound in the water and the temperature measured by sensor to calculate depth.

The ***pressure depth*** is calculated by using a piezo-resistive crystal to determine the difference between hydrostatic and atmospheric pressure. The pressure sensor is temperature compensated and vented to the atmosphere through a desiccant filled breather tube.

To obtain ***peak velocity*****,** the sensor sends an ultrasonic signal at an angle upward through the widest cross-section of the oncoming flow. The signal is reflected by suspended particles, air bubbles, or organic matter with a frequency shift proportional to the velocity of the reflecting objects. The reflected signal is received by the sensor and processed using digital spectrum analysis to determine the peak flow velocity.

Installation

Installation of flow monitoring equipment typically proceeds in four steps. First, the site is investigated for safety and to determine physical and hydraulic suitability for the flow monitoring equipment. Second, the equipment is physically installed at the selected location. Third, the monitor is tested to assure proper operation of the velocity and depth of flow sensors and verify that the monitor clock is operational and synchronized to the master computer clock. Fourth, the depth and velocity sensors are confirmed and line confirmations are performed.

In pipes up to 42 inches in diameter, the sensors were mounted on expandable stainless steel rings, inserted at least a foot upstream into influent pipes and tightened against the inside walls of the pipes. Influent pipe installations reduce the influences of turbulence and backwater often caused by changes in channel geometry in manholes.

Data Collection, Confirmation, and Quality Assurance

Data collects were done remotely via wireless connect on a weekly basis via ADS Field Representatives. During the monitoring period, field crews visit each monitoring location to verify proper monitor operation and document field conditions. The following quality assurance steps are taken to assure the integrity of the collected data:

Measure power supplies: monitors were powered by dry cell battery packs. Voltages were recorded and battery packs replaced, as necessary. Separate batteries provided back-up power to memory allowing primary batteries to be replaced without loss of data.

Clock synchronization: Field crews synchronized monitor clocks to master clocks.

Confirm depth and velocity readings: Field crews descended into meter manholes to manually measure depths and velocities and compare them to meter readings to confirm that they agreed. They also measured silt levels, if any, in the inverts of the pipes. Silt areas were subtracted from flow areas to compute true areas of flow.

Confirm average velocities through cross-sectional velocity profiles: Since ADS velocity sensors measure peak velocity, field crews collected cross-sectional velocity profiles in order to develop a relationship between peak and average velocity in lines that meet the hydraulic criteria.

Upload and Review Data: Data collected from the monitors were uploaded and reviewed by a Data Analyst for completeness, outliers and deviations in the flow patterns, which indicate system anomalies or equipment failure.

Flow Quantification Methods

There are two main equations used to measure open channel flow: the ***Continuity Equation*** and the ***Manning Equation.*** The Continuity Equation, which is considered the most accurate, can be used if both depth of flow and velocity are available. In cases where velocity measurements are not available or not practical to obtain, the Manning Equation can be used to estimate velocity from the depth data based on certain physical characteristics of the pipe (i.e. the slope and roughness of the pipe being measured). However, the Manning equation assumes uniform, steady flow hydraulic conditions with non-varying roughness, which are typically invalid assumptions in most sanitary sewers. The Continuity Equation was used exclusively for this study.

Continuity Equation

The Continuity Equation states that the flow quantity (Q) is equal to the wetted area (A) multiplied by the average velocity (V) of the flow.

$$Q = A * V$$

This equation is applicable in a variety of conditions including backwater, surcharge, and reverse flow.

Data Analysis and Presentation

Data Analysis

A flow monitor is typically programmed to collect data at either 15-minute or 5-minute intervals throughout the monitoring period. The monitor stores raw data consisting of (1) the ultrasonic depth, (2) the peak velocity and (3) the pressure depth. The data is imported into ADS's proprietary software and is examined by a data analyst to verify its integrity. The data analyst also reviews the daily field reports and site visit records to identify conditions that would affect the collected data.

Velocity profiles and the line confirmation data developed by the field personnel are reviewed by the data analyst to identify inconsistencies and verify data integrity. Velocity profiles are reviewed and an average to peak velocity ratio is calculated for the site. This ratio is used in converting the peak velocity measured by the sensor to the average velocity

used in the Continuity equation. The data analyst selects which depth sensor entity will be used to calculate the final depth information. Silt levels present at each site visit are reviewed and representative silt levels established.

Occasionally the velocity sensor's performance may be compromised resulting in invalid readings sporadically during the monitoring period. This is generally caused by excessive debris (silt) blocking the sensor's crystals, shallow flows (~< 1") that may drop below the top of the sensor or very clear flows lacking the particles needed to measure rate. In order to use the Continuity equation to quantify the flow during these periods, a Data Analyst and/or Engineer will use the site's historical pipe curve (depth vs. velocity) data along with valid field confirmations to reconstitute and replace the false velocity recordings with expected velocity readings for a given historical depth along the curve.

Selections for the above parameters can be constant or can change during the monitoring period. While the data analysis process is described in a linear manner, it often requires an iterative approach to accurately complete.

Data Presentation

This type of flow monitoring project generates a large volume of data. To facilitate review of the data, results have been provided in graphical and tabular formats. The flow data is presented graphically in the form of scattergraphs and hydrographs. Hydrographs are based on 5-minute averaging. Tables are provided in daily average format. These tables show the flow rate for each day, along with the daily minimum and maximums, the times they were observed, the total daily flow, and total flow for the month (or monitoring period). The following explanation of terms may aid in interpretation of the tables and hydrographs. In addition, please see the "Site Data Quality Summary" table included herein for more comments regarding data quality.

DEPTH - Final calculated depth measurement (in inches)

QUANTITY - Final calculated flow rate (in MGD)

VELOCITY - Final calculated flow velocity (in feet per second)

REPORT TOTAL - Total volume of flow recorded for the indicated time period (in MG)

Site Commentary

Site Information

Has100	
Pipe Dimensions	17.5 "
Silt Level	0.00"

Overview

Site Has100 functioned under normal conditions during the period Friday, May 31, 2019 to Thursday, June 6, 2019. No surcharge conditions were experienced at this location. Review of the scattergraph shows that flows remained free flowing throughout the period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed downstream of site HAS110. A review of balancing shows a moderate net flow between the sites.

Observations

Average flow depth, velocity, and quantity data observed during Friday, May 31, 2019 to Thursday, June 6, 2019 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.38	3.32	0.316
Minimum	1.58	1.21	0.070
Maximum	4.68	5.99	1.354
Time of Minimum	6/6/2019 4:45 AM	5/31/2019 2:40 AM	6/2/2019 3:00 AM
Time of Maximum	5/31/2019 2:40 PM	6/6/2019 10:50 AM	6/6/2019 10:50 AM

Data Quality

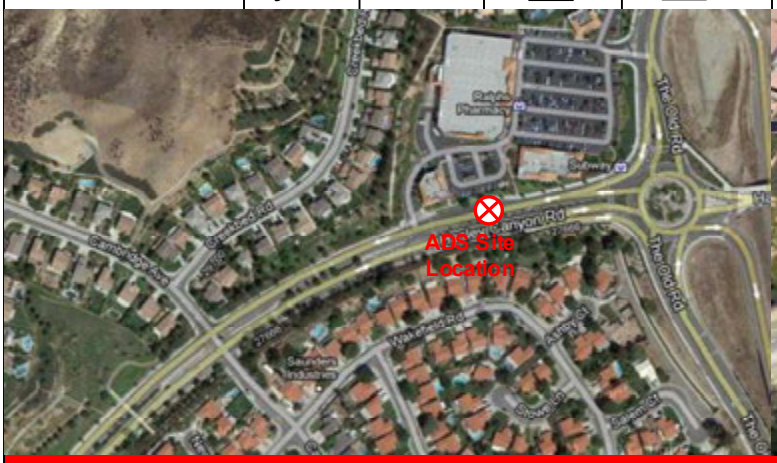
Data uptime observed during the Friday, May 31, 2019 to the Thursday, June 6, 2019 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

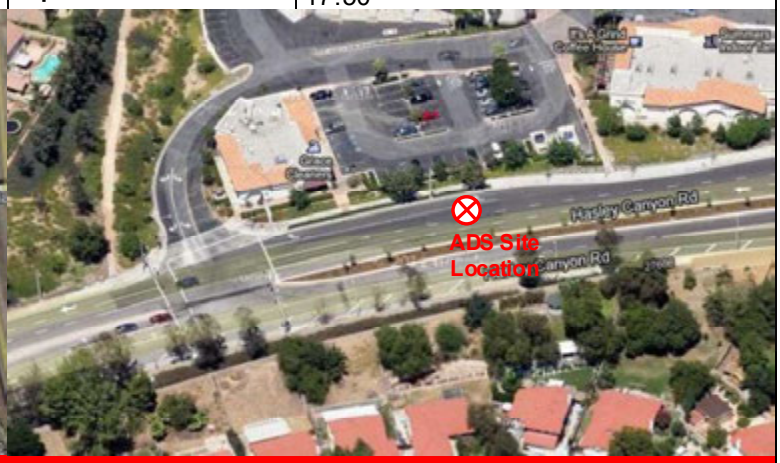
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Valencia Strerling TFM 2019	**City:** Santa Clarita, CA	**Agency:** Santa Clarita	**FM Initials:** SK
Site Name: HAS100	**Install Date:** 5/30/19	**Monitor Type**	Peak Doppler
Address/Location: Hasley Canyon Rd & Cam Bridge Ave (Located north east of Cambridge on Hasley Canyon Rd)		**Monitor Model**	3600
		Data Acquisition	Manual Collect
		Manhole ID	MH100
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	17.50 "
		Pipe Width:	17.50 "





Investigation Information:

Date/Time of Investigation:	5/30/19 @ 0500
Site Hydraulics:	Good straight through flow
Upstream Input: (L/S, P/S)	DNI
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	2.13 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	2.59 fps
Silt:	0.00 Inches

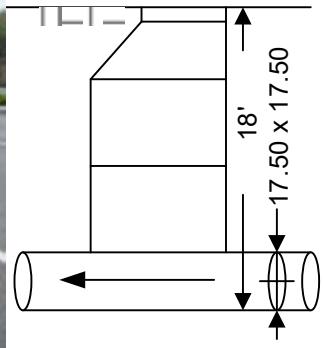
Manhole Information:

Manhole Depth:	18'						
Manhole Material / Condition	Precast/OK						
Pipe Material / Condition:	VCP/Good						
Land Use:	Residential [x]	Commercial [ ]	Industrial [ ]	Trunk [ ]			
Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0				

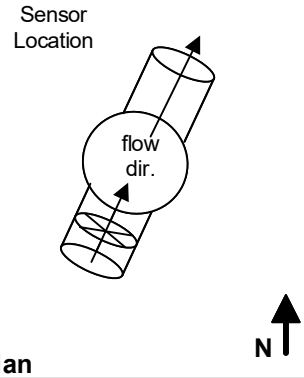
Safety Notes:

2 man crew required and one blowers are to be operated at all times.

Other Information:



Cross Section



Plan

Installation Information		Backup	Yes	No	?	Distance
Installation Type:	Ring	Trunk	[ ]	[x]	[ ]	
Sensors Devices:	Ultrasonic / Pressure/ Velocity	Lift / Pump Station	[ ]	[x]	[ ]	
Surcharge Height:	0	WWTP	[ ]	[x]	[ ]	
Rain Gauge Zone:		Other	[ ]	[x]	[ ]	

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

Has100

Flow Monitor

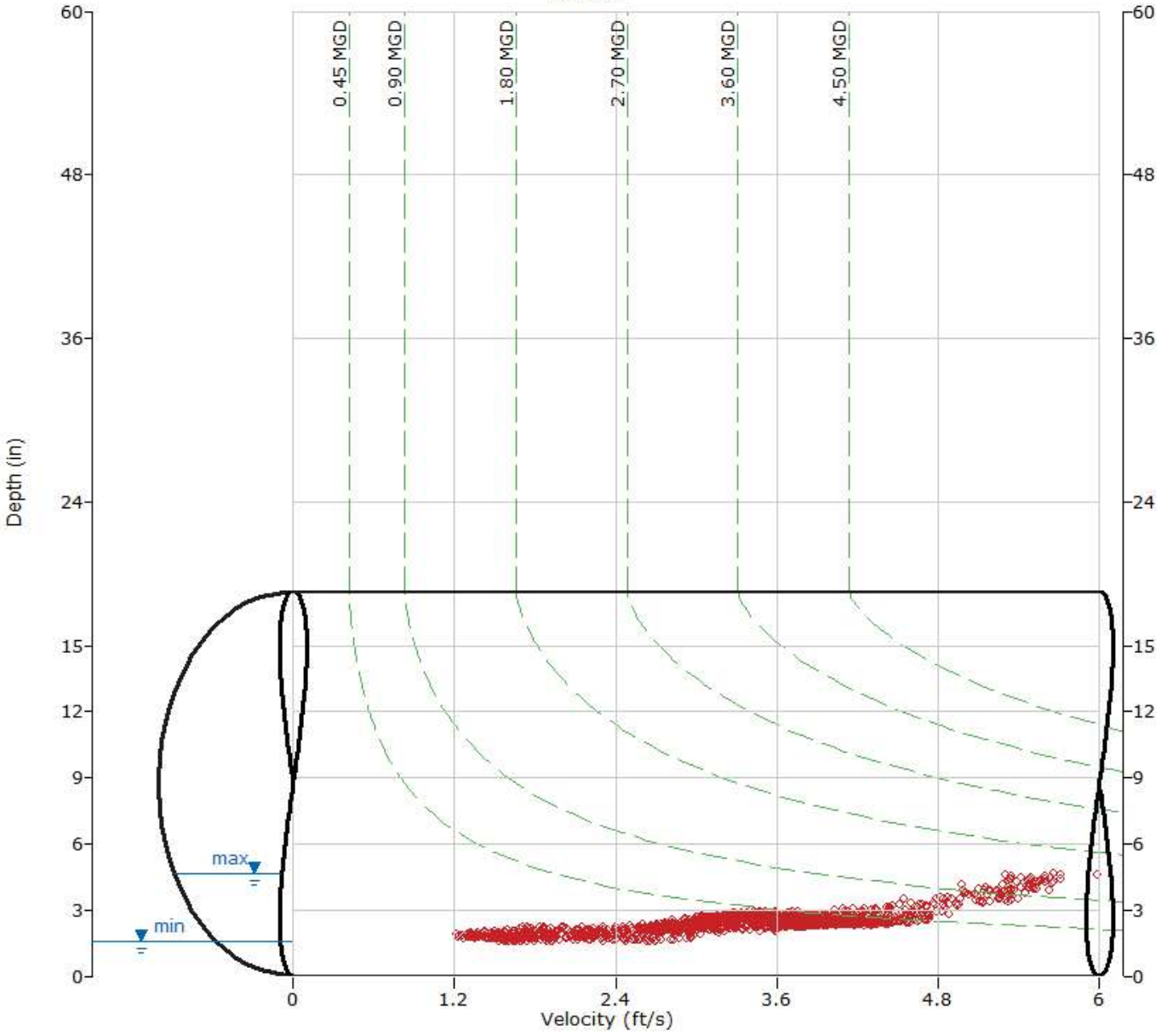
Has100

Report Period

5/31/2019
To
6/6/2019

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

Has100

Flow Monitor

Has100

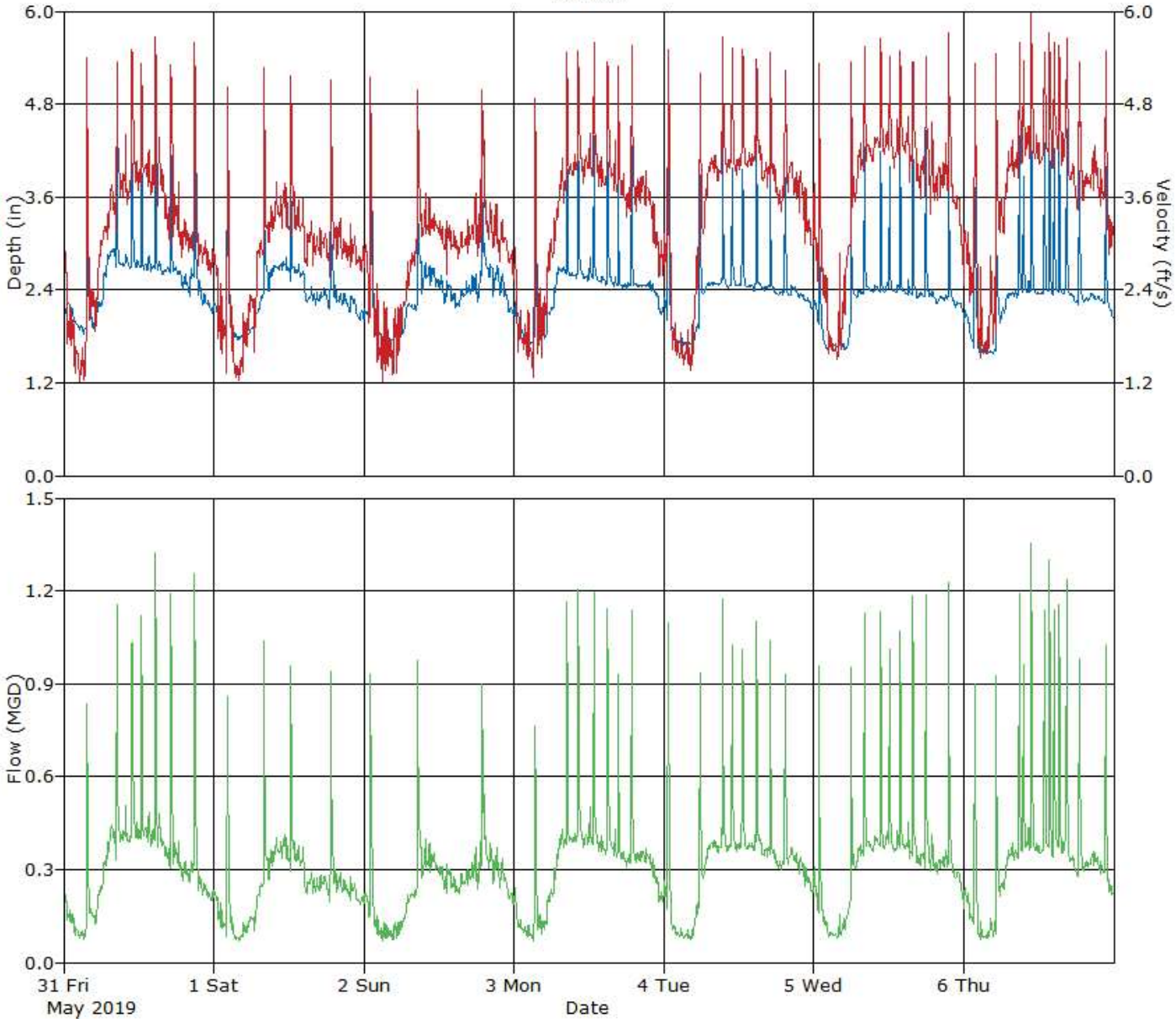
Pipe Height
17.50 in

Report Period

5/31/2019
To
6/6/2019

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 05/31/2019 00:00 - 06/06/2019 23:59

Has100, Pipe Height: 17.50 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
05/31/2019	03:15	1.83	14:40	4.68	2.56	02:40	1.21	14:40	5.66	3.21	03:10	0.076	14:40	1.322	0.340	0.340	
06/01/2019	03:50	1.76	08:00	4.14	2.32	04:00	1.23	08:00	5.28	2.84	04:00	0.071	08:00	1.038	0.258	0.258	
06/02/2019	03:45	1.71	08:35	4.13	2.32	03:00	1.22	01:05	5.15	2.83	03:00	0.070	08:35	0.976	0.255	0.255	
06/03/2019	02:40	1.71	10:15	4.48	2.42	03:00	1.26	12:50	5.60	3.39	03:00	0.070	10:15	1.206	0.332	0.332	
06/04/2019	04:25	1.69	09:25	4.29	2.37	04:20	1.35	09:25	5.66	3.52	04:20	0.074	09:25	1.171	0.333	0.333	
06/05/2019	02:15	1.63	15:50	4.50	2.32	03:40	1.50	21:35	5.71	3.69	03:40	0.079	21:35	1.226	0.340	0.340	
06/06/2019	04:45	1.58	13:40	4.58	2.34	02:40	1.53	10:50	5.99	3.73	02:40	0.075	10:50	1.354	0.352	0.352	

Report Summary For The Period 05/31/2019 00:00 - 06/06/2019 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			2.209
Avg	2.38	3.32	0.316

Site Commentary

Site Information

HAS110	
Pipe Dimensions	21 "
Silt Level	0.00"

Overview

Site HAS110 functioned under normal conditions during the period Friday, May 31, 2019 to Thursday, June 6, 2019. No surcharge conditions were experienced at this location. Review of the scattergraph shows that flows remained free flowing throughout the period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed downstream of site Indus02 and upstream of site Has100. A review of balancing with Indus02 shows a moderate net flow between the sites.

Observations

Average flow depth, velocity, and quantity data observed during Friday, May 31, 2019 to Thursday, June 6, 2019 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	2.58	1.23	0.157
Minimum	1.60	0.65	0.036
Maximum	7.84	2.84	1.294
Time of Minimum	6/3/2019 3:05 AM	6/3/2019 1:50 AM	6/3/2019 1:50 AM
Time of Maximum	6/3/2019 12:40 PM	5/31/2019 12:15 PM	6/3/2019 12:40 PM

Data Quality

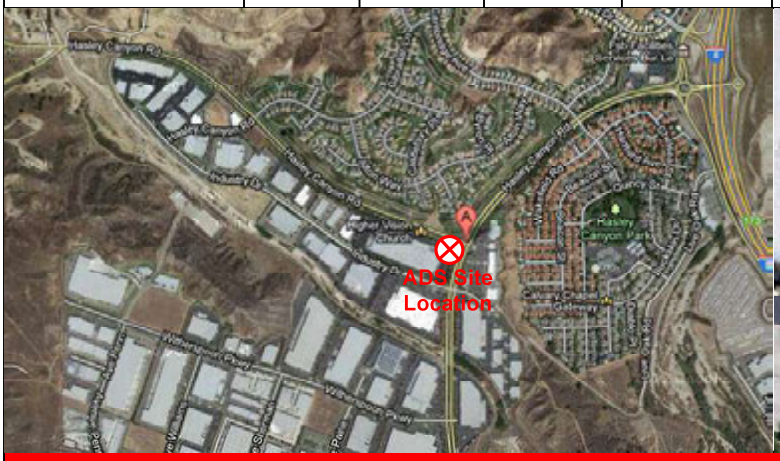
Data uptime observed during the Friday, May 31, 2019 to the Thursday, June 6, 2019 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

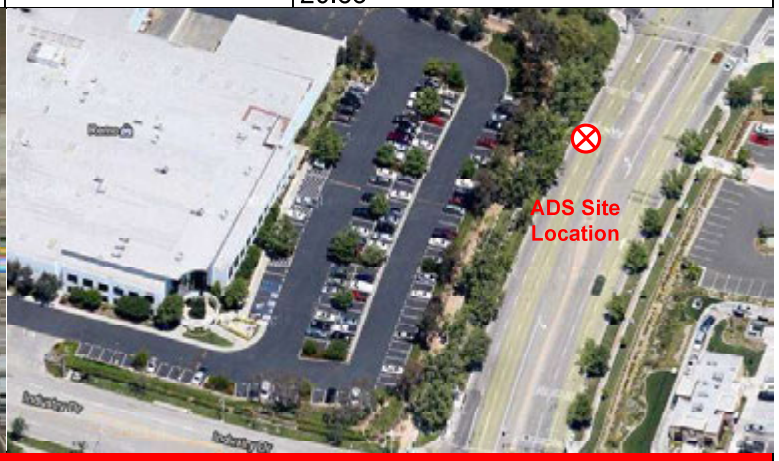
Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Valencia Sterling TFM 2019	**City:** Santa Clarita, CA	**Agency:** Santa Clarita	**FM Initials:** SK
Site Name: HAS110	**Install Date:** 5/30/19	**Monitor Type**	Peak Doppler
Address/Location: Hasley Canyon Rd & Commerce Center (Located on Commerce Center)		**Monitor Model**	3600
		Data Acquisition	Manual Collect
		Manhole ID	MH110
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	21.00 "
		Pipe Width:	20.88 "





Investigation Information:

Date/Time of Investigation:	5/30/19 @0530
Site Hydraulics:	Good straight through flow
Upstream Input: (L/S, P/S)	DNI
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	2.50 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	1.31 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	18'
Manhole Material / Condition	Precast/OK
Pipe Material / Condition:	VCP/Good

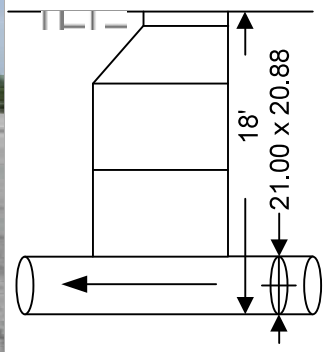
Land Use:	Residential	Commercial	Industrial	Trunk
	[x]	[ ]	[ ]	[ ]

Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0

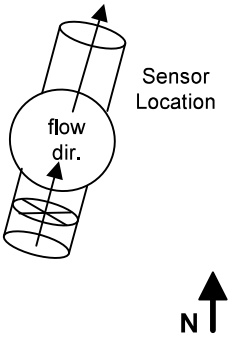
Safety Notes:

2 man crew required and one blowers are to be operated at all times.

Other Information:



Cross Section



Plan

Installation Information	
Installation Type:	Ring
Sensors Devices:	Ultrasonic / Pressure/ Velocity
Surcharge Height:	0
Rain Gauge Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[x]	[ ]	
Lift / Pump Station	[ ]	[x]	[ ]	
WWTP	[ ]	[x]	[ ]	
Other	[ ]	[x]	[ ]	

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

HAS110

Flow Monitor

HAS110

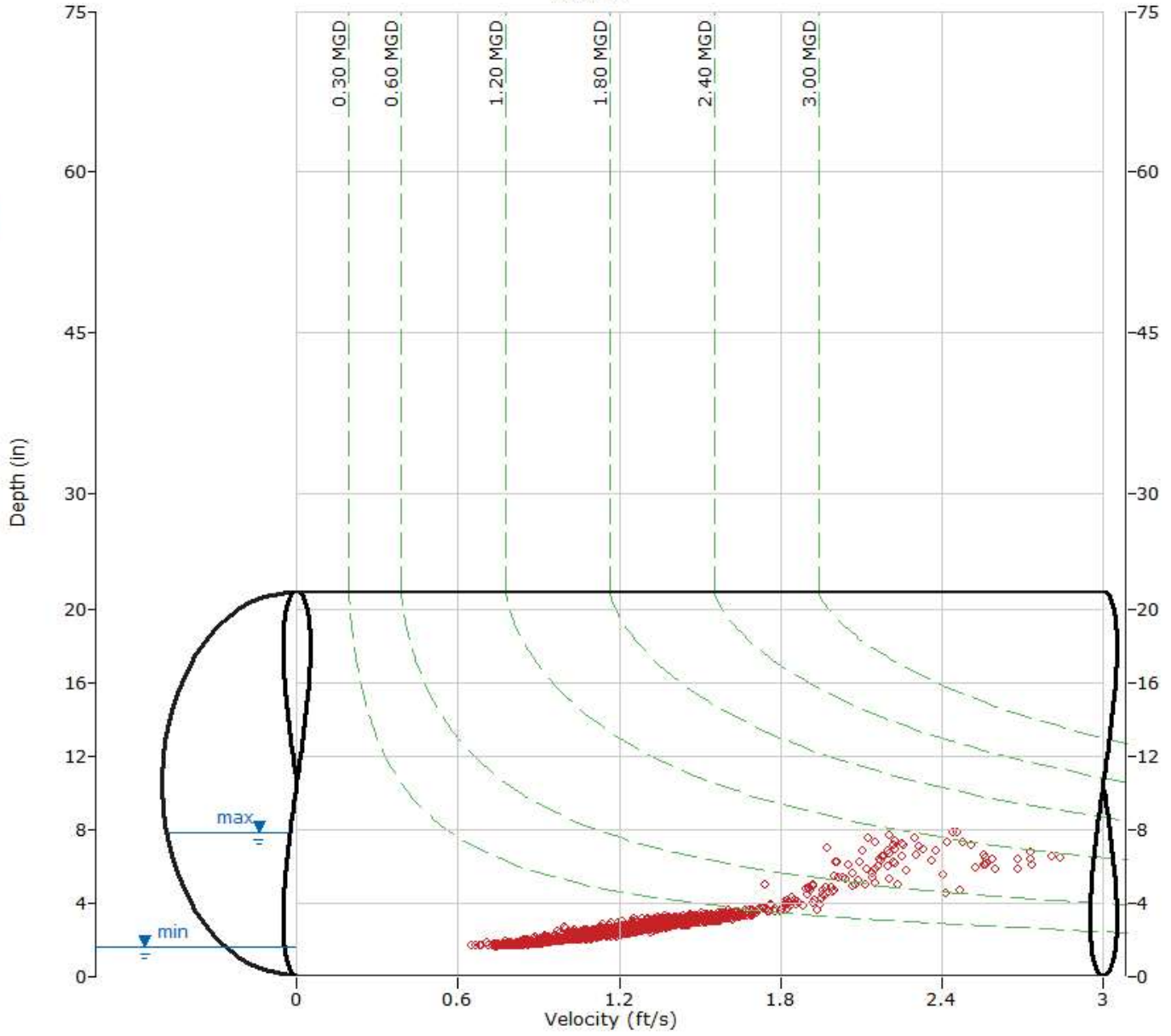
Pipe Height
21.00 in

Report Period

5/31/2019
To
6/6/2019

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

HAS110

Flow Monitor

HAS110

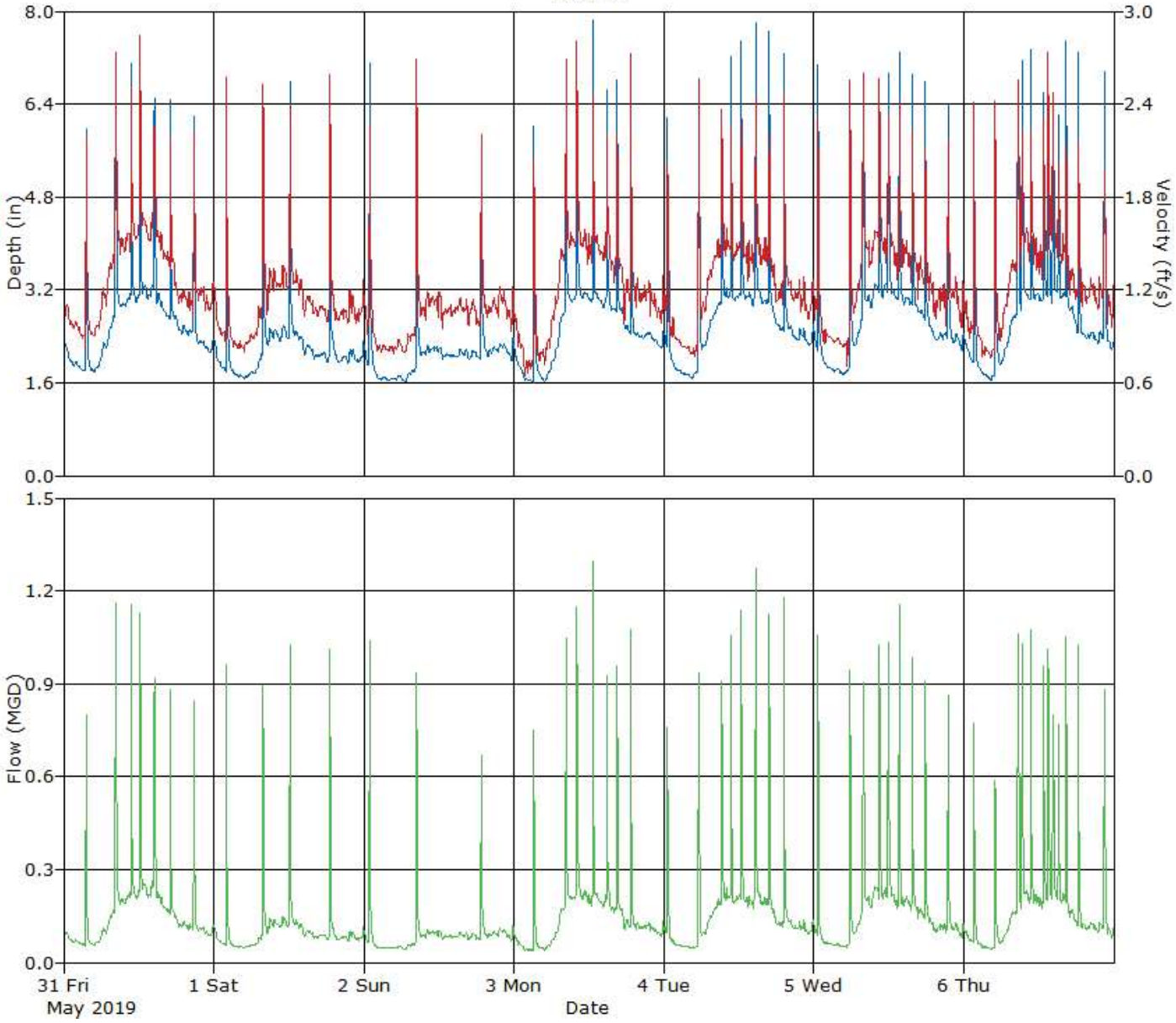
Pipe Height
21.00 in

Report Period

5/31/2019
To
6/6/2019

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 05/31/2019 00:00 - 06/06/2019 23:59

HAS110, Pipe Height: 21.00 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
05/31/2019	04:55	1.80	10:50	7.11	2.69	03:30	0.82	12:15	2.84	1.32	03:30	0.053	08:20	1.161	0.175	0.175	
06/01/2019	04:55	1.68	12:10	6.78	2.21	04:55	0.80	18:35	2.59	1.11	04:55	0.046	12:10	1.026	0.109	0.109	
06/02/2019	06:35	1.63	00:55	7.10	2.09	04:40	0.79	08:25	2.69	1.05	06:35	0.044	00:55	1.036	0.092	0.092	
06/03/2019	03:05	1.60	12:40	7.84	2.65	01:50	0.65	10:05	2.81	1.25	01:50	0.036	12:40	1.294	0.167	0.167	
06/04/2019	04:35	1.68	14:40	7.79	2.76	05:00	0.77	05:35	2.56	1.28	04:35	0.046	14:40	1.274	0.178	0.178	
06/05/2019	04:45	1.75	13:40	7.30	2.79	05:20	0.71	07:55	2.60	1.29	05:20	0.046	13:40	1.155	0.183	0.183	
06/06/2019	04:20	1.63	16:20	7.48	2.84	04:20	0.76	13:30	2.74	1.31	04:20	0.042	10:45	1.073	0.195	0.194	

Report Summary For The Period 05/31/2019 00:00 - 06/06/2019 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			1.098
Avg	2.58	1.23	0.157

Site Commentary

Site Information

Indus02	
Pipe Dimensions	14.88 "
Silt Level	0.00"

Overview

Site Indus02 functioned under normal conditions during the period Friday, May 31, 2019 to Thursday, June 6, 2019. No surcharge conditions were experienced at this location. Review of the scattergraph shows that flows remained free flowing throughout the period.

Flow depth and velocity measurements recorded by the flow monitor are consistent with field confirmations conducted to date and support the relative accuracy of the flow monitor at this location.

This location was installed upstream of site HAS110 (See Site HAS110 Site Commentary For More Details).

Observations

Average flow depth, velocity, and quantity data observed during Friday, May 31, 2019 to Thursday, June 6, 2019 , along with observed minimum and maximum data, are provided in the following table. The values presented are based on 5-minute data.

Observed Flow Conditions			
Item	Depth (in)	Velocity (ft/s)	Quantity (MGD)
Average	1.42	2.39	0.096
Minimum	1.12	0.90	0.024
Maximum	1.69	4.45	0.196
Time of Minimum	5/31/2019 4:30 AM	5/31/2019 3:55 AM	5/31/2019 4:05 AM
Time of Maximum	6/3/2019 11:25 AM	6/6/2019 8:25 PM	6/6/2019 10:05 AM

Data Quality

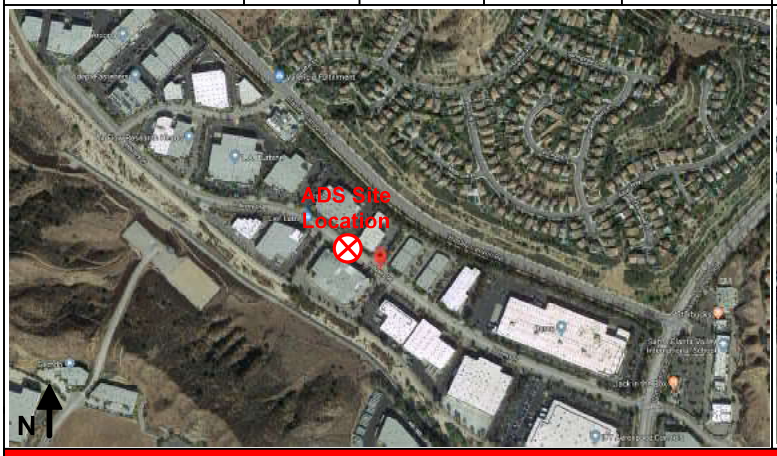
Data uptime observed during the Friday, May 31, 2019 to the Thursday, June 6, 2019 monitoring period is provided in the table below. Based upon the quality and consistency of the observed flow depth and velocity data, the Continuity equation was used to calculate flow rate and quantities during the monitoring period.

Percent Uptime	
Depth (in)	100
Velocity (ft/s)	100
Quantity (MGD)	100

ADS Site Report

Quality Form

Project Name: Valencia Sterling TFM 2019	**City:** Santa Clarita, CA	**Agency:** Santa Clarita	**FM Initials:** SK
Site Name: Indus02	**Install Date:** 5/30/19	**Monitor Type**	Peak Doppler
Address/Location:	28410 Industry Dr.	**Monitor Model**	3600
		Data Acquisition	Manual Collect
		Manhole ID	Unknown
Access: Drive	**Type of System:** Sanitary [X] Storm [ ] Combined [ ]	**Pipe Height:**	14.88 "
		Pipe Width:	15.13 "



Investigation Information:

Date/Time of Investigation:	5/30/19 @0530
Site Hydraulics:	Good straight through flow
Upstream Input: (L/S, P/S)	DNI
Upstream Manhole:	DNI
Downstream Manhole:	DNI
Depth of Flow:	1.38 " +/- 0.13"
Range (Air DOF):	+/-
Peak Velocity:	3.19 fps
Silt:	0.00 Inches

Manhole Information:

Manhole Depth:	8'
Manhole Material / Condition	Precast/OK
Pipe Material / Condition:	VCP/Good

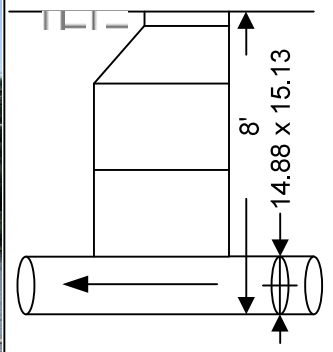
Land Use:	Residential	Commercial	Industrial	Trunk
	[x]	[ ]	[ ]	[ ]

Oxygen: 20.9	**H2S:** 0	**LEL:** 0	**CO:** 0

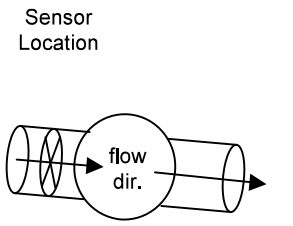
Safety Notes:

2 man crew required and one blowers are to be operated at all times.

Other Information:



Cross Section



Plan

Installation Information	
Installation Type:	Ring
Sensors Devices:	Ultrasonic / Pressure/ Velocity
Surcharge Height:	0
Rain Gauge Zone:	

Backup	Yes	No	?	Distance
Trunk	[ ]	[x]	[ ]	
Lift / Pump Station	[ ]	[x]	[ ]	
WWTP	[ ]	[x]	[ ]	
Other	[ ]	[x]	[ ]	

Additional Site Information / Comments:

Standard Traffic Control with No Safety Concerns

SCATTERGRAPH REPORT

Indus02

Flow Monitor

Indus02

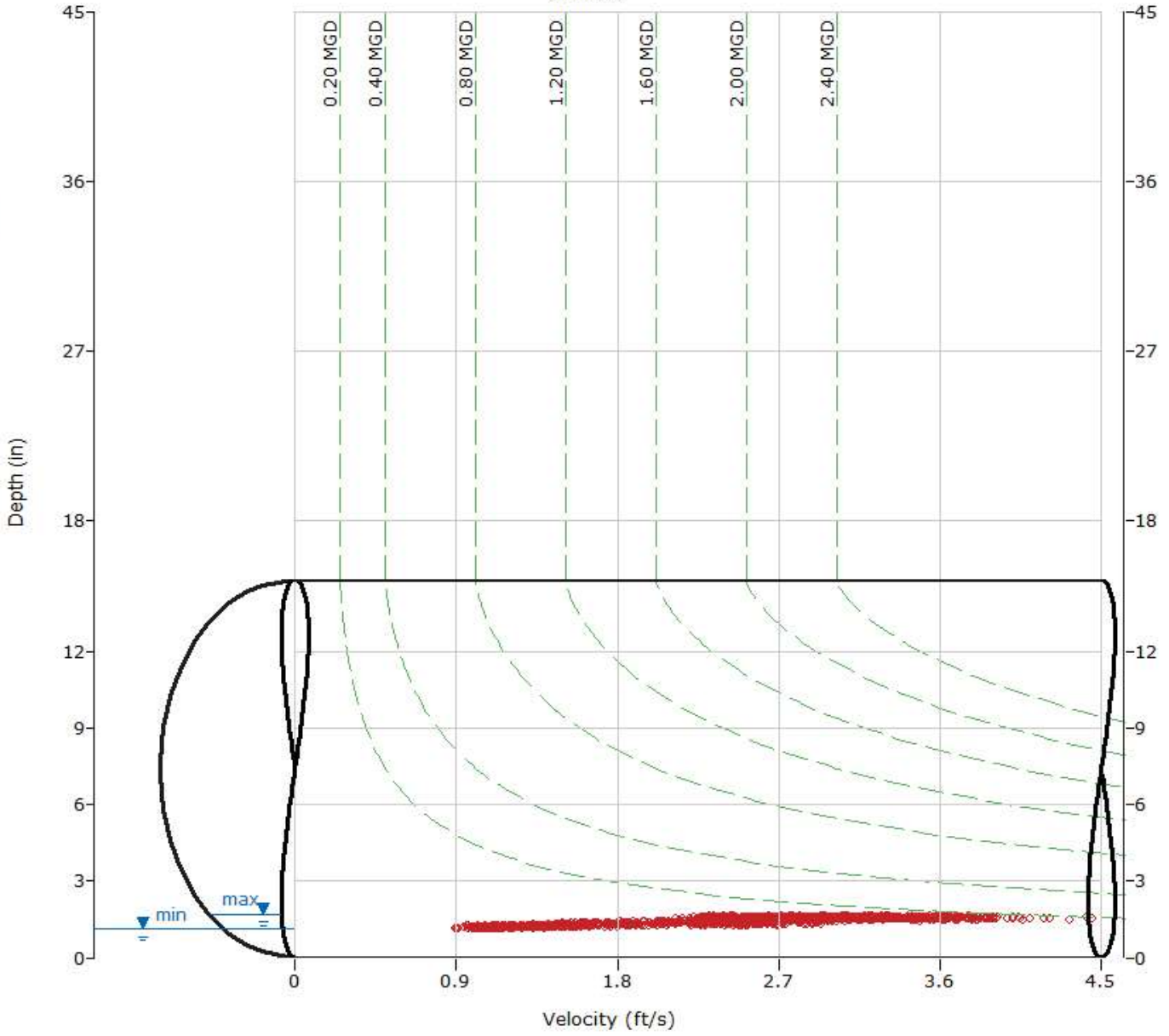
Pipe Height
14.88 in

Report Period

5/31/2019
To
6/6/2019

Legend

- Depth - Velocity
- Iso-Q™
- Silt
- Min-Max Depth



ADS ENVIRONMENTAL SERVICES

HYDROGRAPH REPORT

Indus02

Flow Monitor

Indus02

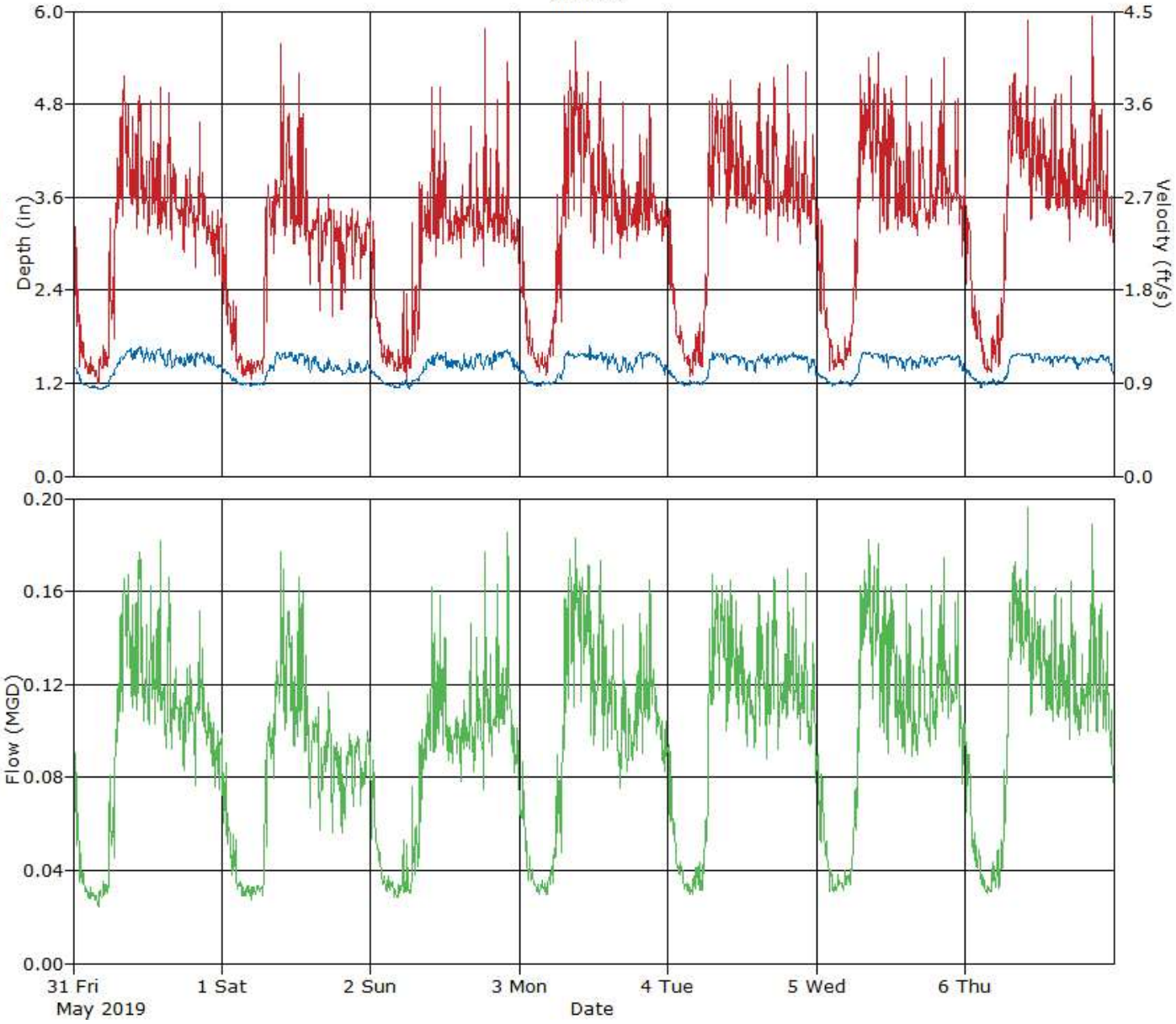
Pipe Height
14.88 in

Report Period

5/31/2019
To
6/6/2019

Legend

- Depth
- Velocity
- Quantity



ADS ENVIRONMENTAL SERVICES

Daily Tabular Report For The Period 05/31/2019 00:00 - 06/06/2019 23:59

Indus02, Pipe Height: 14.88 in, Silt: 0.00 in

Daily Tabular Report

Date	Depth (in)					Velocity (ft/s)					Quantity (MGD - Total MG)						Rain (in)
	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Time	Min	Time	Max	Avg	Total	Total
05/31/2019	04:30	1.12	10:50	1.66	1.44	03:55	0.90	08:10	3.87	2.33	04:05	0.024	14:00	0.181	0.096	0.096	
06/01/2019	04:30	1.17	09:00	1.60	1.38	04:40	0.94	09:30	4.18	2.13	04:40	0.027	09:30	0.177	0.082	0.082	
06/02/2019	06:10	1.13	21:55	1.63	1.40	05:45	0.96	18:20	4.33	2.16	03:45	0.029	22:05	0.186	0.085	0.085	
06/03/2019	02:50	1.16	11:25	1.69	1.43	04:20	0.99	09:10	4.21	2.43	03:10	0.030	09:10	0.183	0.099	0.099	
06/04/2019	02:35	1.15	20:10	1.59	1.43	03:40	0.97	19:25	3.98	2.52	04:00	0.030	19:25	0.170	0.102	0.102	
06/05/2019	02:40	1.16	08:00	1.60	1.43	02:05	1.03	10:00	4.10	2.54	02:50	0.031	08:25	0.182	0.103	0.103	
06/06/2019	02:30	1.14	08:35	1.58	1.43	04:10	1.01	20:25	4.45	2.59	03:30	0.030	10:05	0.196	0.105	0.105	

Report Summary For The Period 05/31/2019 00:00 - 06/06/2019 23:59

	Depth (in)	Velocity (ft/s)	Quantity (MGD - Total MG)
Total			0.672
Avg	1.42	2.39	0.096

APPENDIX P

Fire Behavior and Analysis Report

Fire Behavior Analysis and Report
Sterling Ranch

Prepared for:

Sterling Gateway, LP

and

Los Angeles County Fire Department

Prepared By:

firesafe ::PLANNING SOLUTIONS

07/21/20

Table of Contents

Purpose and Scope of Report **3**

General Geographic Description **4**

Fire Risk Assessment **6**

Fire History **6**

Fire Behavior Analysis (BehavePlus) **10**

Weather Inputs and Wind Patterns 10
Wildland Interface Fuel Types 17
Fuels Discussion 21
Topography/Terrain 23
Fire Behavior Inputs and Results: 27
Fire Access and Egress Route Analysis 33
Fire Behavior Summary 48

Fire Behavior Analysis and Report Summary **49**

Appendix A **51**

Site Photos Locations 51

Appendix B **76**

BehavePlus Reports and Model Outputs 76

STERLING RANCH
FIRE BEHAVIOR ANALYSIS AND REPORT
County of Los Angeles, California

Purpose and Scope of Report

Firesafe Planning Solutions performed an assessment of risks related to wildfires in order to assess the intensity of a wildfire approaching the Sterling Ranch project site and the adequacy of ingress and egress roadways to the project site and the community of Val Verde. This report provides the results of that assessment and objective hazard and risk assessments which can be used to establish the community mitigations (hazard less mitigations = risk) that are equal to or greater than the hazards which would be encountered in a worst-case scenario. The study takes into consideration existing/future vegetative interface fuels, topography, fire history and weather conditions during extreme fire conditions. The report provides results of computer calculations that measured the fire intensity, flame lengths, rate of spread and fire travel distance (arrival times) from worst-case scenario wildfires in both the extreme (Santa Ana wind) and the predominant (Onshore wind) wind conditions. The results of fire behavior calculations have been incorporated into the design of the interfaces of the Sterling Ranch project with adjacent wildlands and the Val Verde community.

The current address of the Project Site is 29053 Coolidge Avenue, Val Verde, CA 91384; and the site includes the following APNs: 3271-004-012, 3271-004-013, and 3271-005-032. Sterling Gateway, LP proposes the Sterling Ranch Estates Residential Project (Sterling Ranch project), a 113.9- acre residential Project Site. Of the proposed 222 residential lots, 91 residential lots would be 7,000 square feet to 10,000 square feet in size and 131 residential lots would be greater than 10,000 square feet in size, for an average of 11,364 square feet, consistent with Castaic Area Community Standards District (CSD) development standards.

In addition to the homes, 21,000 square feet of commercial uses on 2.5 acres is proposed along with five open space lots on 21 acres, six landscaped/open space HOA lots on 0.1 acre, three access strip lots at Trevylon Street (20' emergency access), Rainbow Drive (20' emergency access) and Lexington Drive (26' project access) on 0.2 acre, three infiltration basins and six debris basins on 8.8 acres, a pump station on 0.1 acre, and public streets and private and future streets for the Project Site on 19.7 acres.

The Sterling Ranch project also includes the following off-site improvements: a portion of Del Valle Road from the easterly Project boundary to approximately 772-feet east of the Project boundary within the adjacent property; the off-site construction of a mainline sewer from the Project site to Hasley Canyon Road within Del Valle Road; the upsizing of the existing water line within Hasley Canyon Road; and the dedication of off-site permanent open space on 37.9 acres. The Project also involves the construction of a one-million-gallon water tank, located on approximately 1.4 acres of disturbed land, at an elevation of 1575 feet, approximately 2.2 miles westerly from the Project site, and in the vicinity of the existing Cuyama water tank site.

The Project's system of public streets would access Del Valle Road. The extension of Chiquito Canyon Road (as Sterling Parkway) would provide access to the Project site and would include four new intersections with local roadways constructed within the Project site.

The Project site is currently undeveloped, apart from one single-family residential structure, unimproved hiking trails and dirt roads. The Project would demolish and remove the existing on-site residential structure, which is located off Hunstock Street and Coolidge Avenue (proposed Sterling Parkway).

General Geographic Description

The Project is in the community of Val Verde, north of Chiquito Canyon Road, as well as northwest and southeast of Del Valle Road. The Project site lies within unincorporated Los Angeles County, just west of the City of Santa Clarita and south of the community of Castaic. The Sterling Ranch project is located at the northern terminus of Chiquito Canyon Road. The eastern edge of the project site interfaces with Del Valle Road (which bisects the project site) just over ½ miles west of Hasley Canyon Road. The location is shown below in Figure 1 and Figure 2, on the next page.

The Project site varies from flat to moderate north and south facing slopes with elevations ranging from approximately 1,200 feet above mean sea level along the southern boundary to approximately 1,400 feet above mean sea level in the northeastern portion of the site.

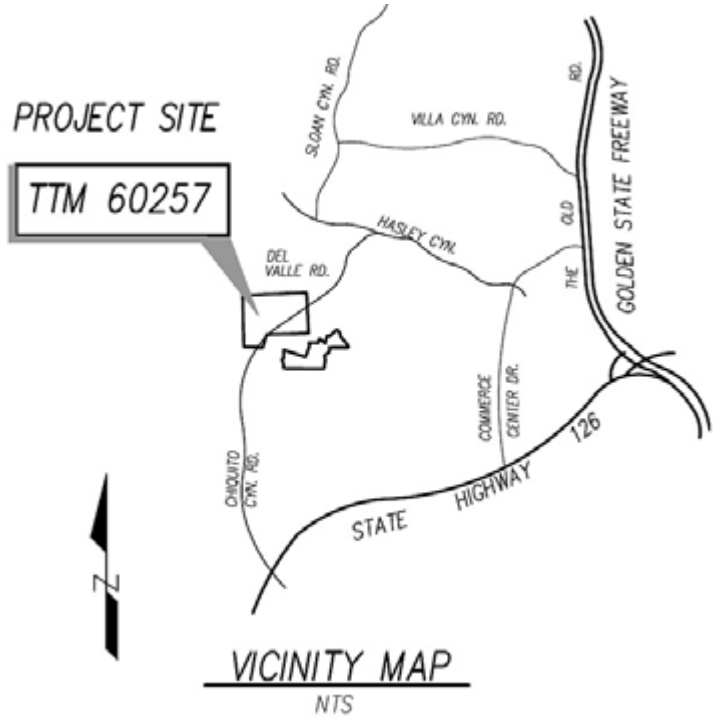


Figure 1 - Vicinity Map

The Project Site is situated NE of the current Val Verde community. With this location, most any fire approaching the area from the typical Santa Ana Wind Conditions (NE and ENE) would impact the Sterling Ranch project prior to impacting the balance of the community. Later in this report, discussion is provided on the slope, aspect and orientation of the wildland areas to the new development but it will also be discussed in terms of the two access roadways that service the entire community (Chiquito Canyon Road and Del Valle Road).

Chiquito Canyon Road runs through the bottom of the canyon for approximately two miles from State Route 126 to its termination at Hunstock Street in the heart of the Val Verde community. This roadway runs north and south with the roadway holding mostly to the west side of the canyon. The canyon has relatively steep walls, which are a plus and a minus in fire behavior and evacuation planning. Del Valle Road run northeast and southwest in alignment with the Santa Ana winds and some of the normal onshore winds. Del Valle Rd. runs through a saddle and along the base of slopes which are mostly N or NE facing.

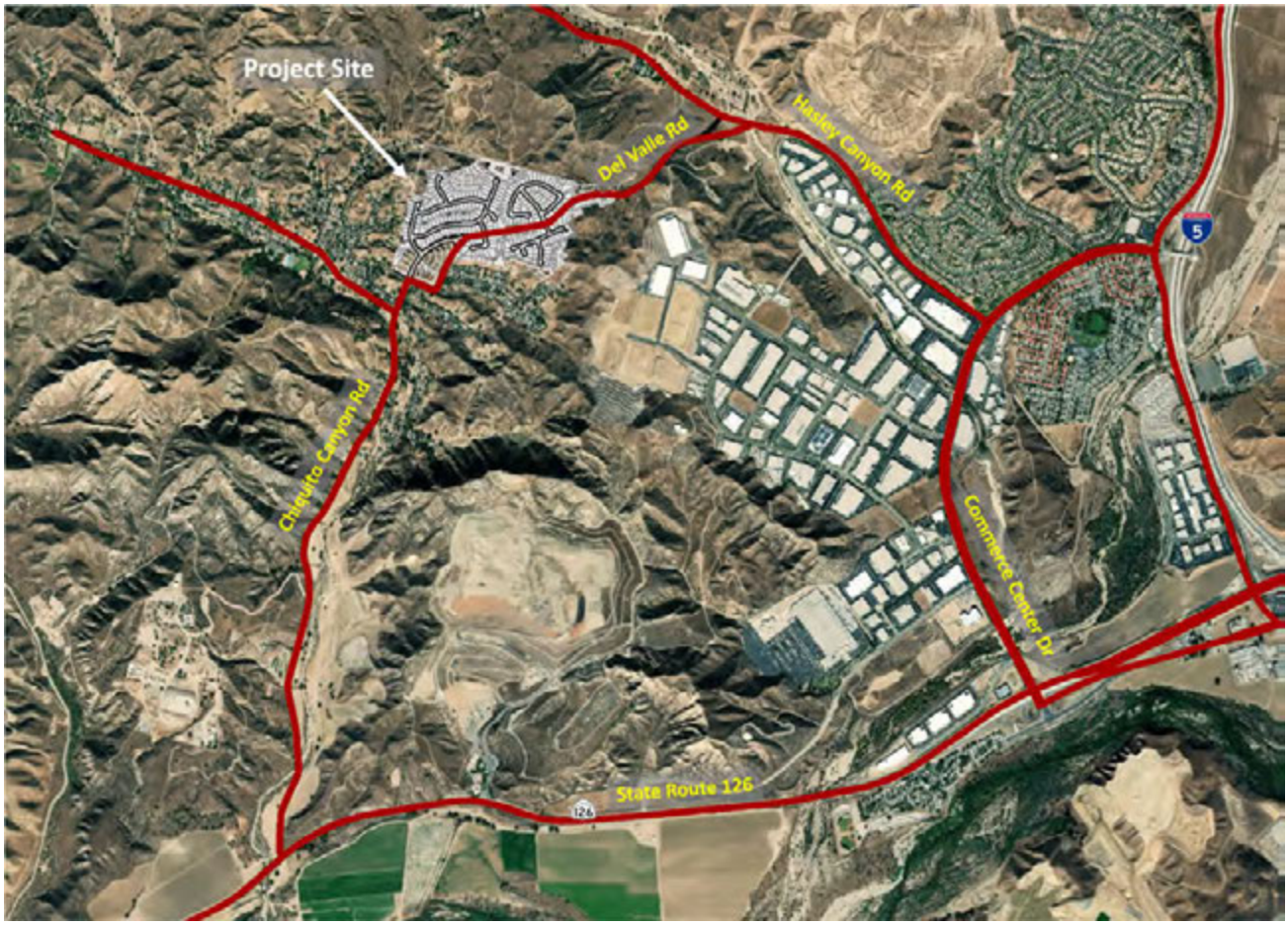


Figure 2 -Location Map

Sterling Ranch is located within CalFire Fire Hazard Severity Zones. The project site is within a State Responsibility Area (SRA). The Fire Severity Zones are geographical areas designated pursuant to California Public Resources Code Sections 4201 through 4204 and are classified as Very High, High, or Moderate in State Responsibility Areas or as Local Agency Very High Fire Hazard Severity Zones designated pursuant to California Government Code sections 51175 through 51189.

All areas within Very High Fire Hazard Severity Zones in either a SRA or Local Responsibility Area (LRA) areas are required by state code to comply with the Chapter 7A of the California Building Code, Chapter 49 of the California Fire Code and Section R337 of the California Residential Code as adopted and amended by the local agency (Los Angeles County). Areas within High and Moderate Zones within SRA areas are also required to comply with the same code sections.

These Fire Severity Zones are shown in red areas on the map on the next page (Figure 3). In addition to the project site, the two community access roadways are within the Very High Fire Hazard Severity Zone for the entire distance that each must be traveled. The only area within the immediate vicinity which is not mapped into a fire severity zone is the area around the intersection of Hasley Canyon Road and Commerce Center Drive (both the homes and commercial areas).

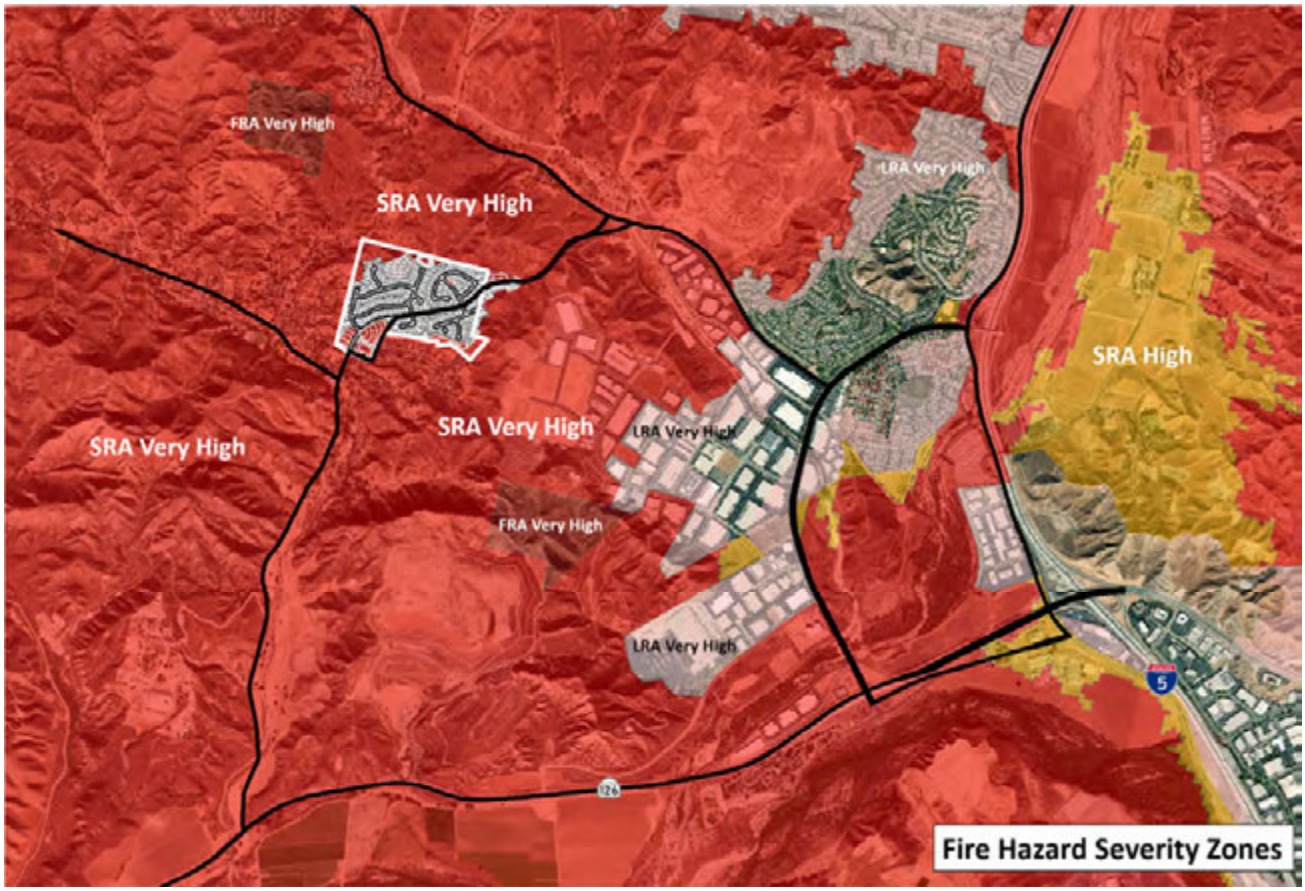


Figure 3 - Fire Hazard Severity Zones Project Site Outline in white

Fire Risk Assessment

Fire risk assessment is based on several factors. These include the fire history of the developed area and the surrounding areas; the vegetation (fuel) that surrounds the community; the weather history for the general area and the specific site; the topography of the project site (slope and aspect); and the placement of structures relative to the factors listed above.

The fire behavior analysis for this project site was completed to assess the risk factors from the modeling results (based on a worst-case scenario) for the Sterling Ranch project. By using the worst-case scenario fire conditions, it is expected that any future fires will be equal to, or less extreme, than those modeled here and would produce fire behavior spread/intensity that is within the risks analyzed and therefore safe. FPS completed the fire hazard assessment and expected wildland fire behaviors in order to provide objective data for consideration of the mitigations that may be necessary in the event of a wildland fire.

Fire History

A review of the CalFire database (FRAP), which maintains a statewide spatial database of fire perimeters from BLM, NPS, and USFS fires 10 acres and greater in size and CAL FIRE fires 300 acres and greater in size since 1980, is shown on the next page (Figures 5). Collection criteria for CAL FIRE fires changed in 2002 to include timber fires greater than 10 acres, brush fires greater than 50 acres, grass fires greater than 300 acres, fires destroying three or more structures, and fires causing $300,000 or more damage. In 2008 collection criteria for CAL FIRE fires eliminated the monetary criterion and redefined the definition of structures.

Sterling Ranch is outlined in white in the figure below (Figure 4). The fire perimeters are shown in red with a shading effect that allows the overlap between fire perimeters to be seen. The overlap areas are more highly shaded so that it is possible to see the areas that have had more fire activity and the extent of each of the perimeters without having to provide separate graphics for each.

As shown in the graphics, while there have been numerous fires on or near the project site in the past 50 years, only 10 have burned onto or immediately adjacent to the project site. Of these ten fires, only one (Ranch Fire) burned onto the project site and it did not make it to the development area. The areas on all sides of the project site are considered historic fire corridors. Fires are likely to continue to burn within these historic fire corridors and will likely burn to the edge of Sterling Ranch project.

In the past 20 years, the fire history in the general area (Figure 5 on next page) has been less impactful. It should be noted that some of these data files only include large fires (over 50 acres) while the more recent history contains fires as small as one acre. Of specific and considerable note is the lack of large fire history in the area between Chiquito Canyon Road, Del Valle Road, Hasley Canyon Road, Commerce Center Drive and State Route 126. Only three fires (Madison Fire 2013 @ 6 acres; Hasley Fire 2017 @ 1.4 acres; and Commerce Fire 2018 @ 14 acres) have burned within or at the edge of this area over the past 20 years which indicates a change in fire conditions. This lack of large fires in the area is likely a combination of development replacing fuels in this area, quicker response times to the area by fire resources with the opening of new fire stations in the area and a lack of fire starts during extreme weather conditions.

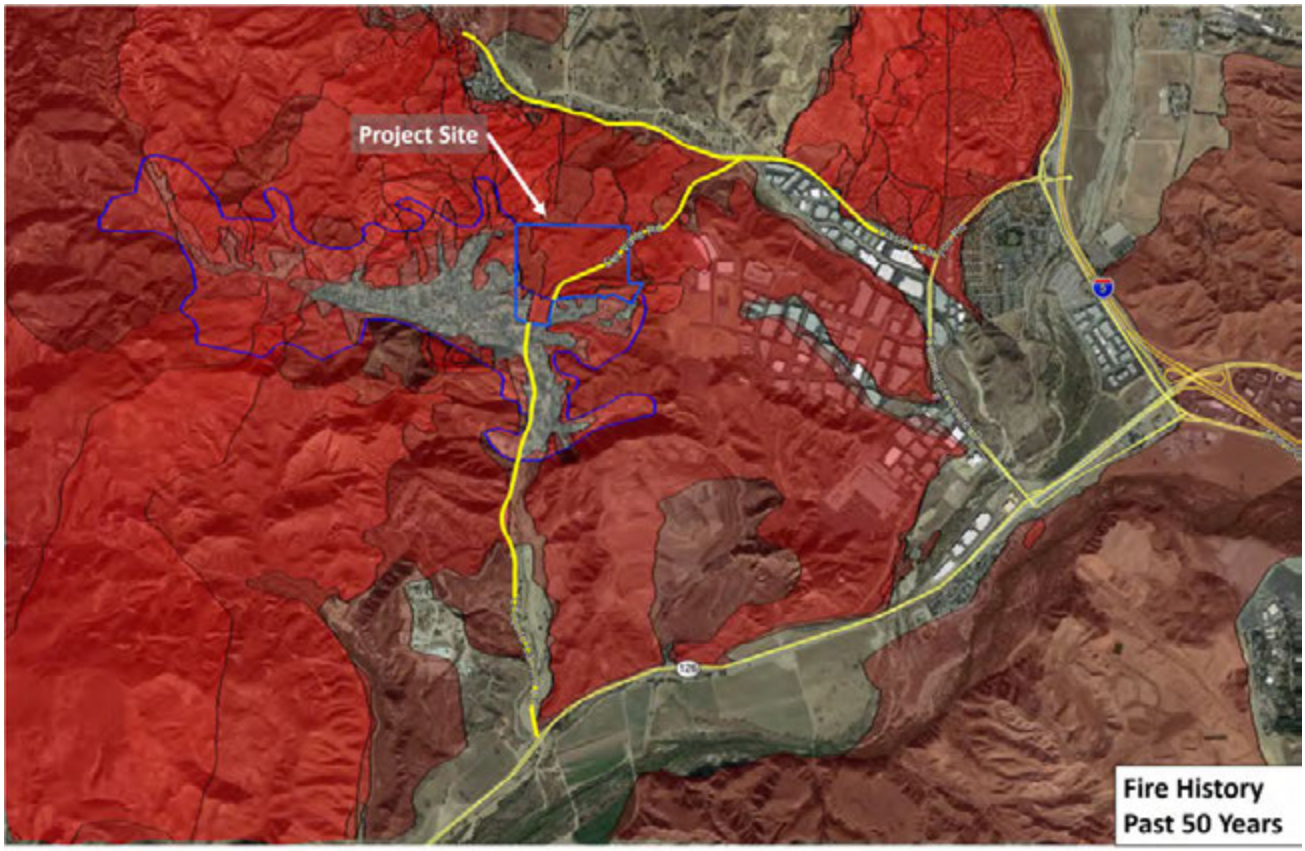


Figure 4 – Fire History Map (Past 50 years) Project Site and Val Verde Community outlined in Blue

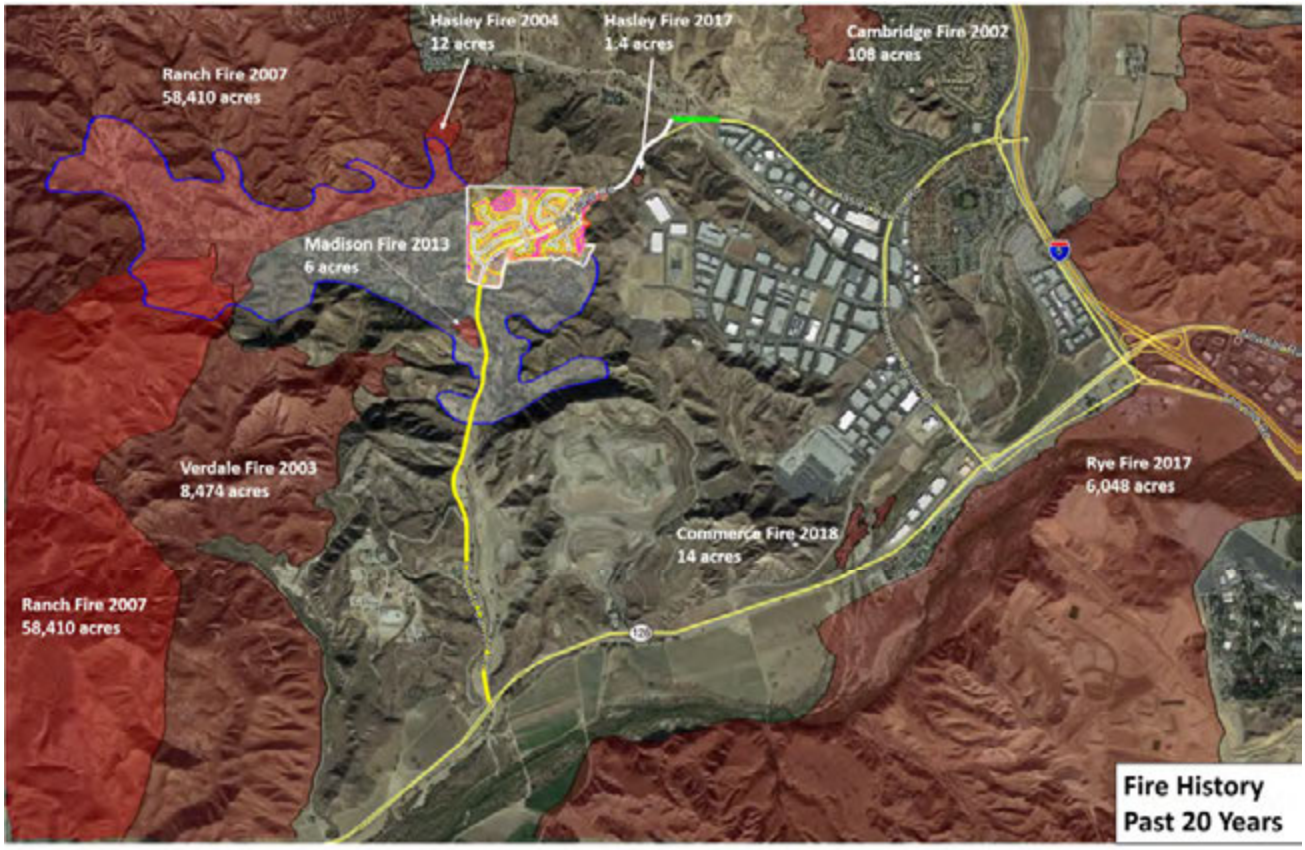


Figure 5 – Fire History (Past 20 years) Project Site oulined in White/Val Verde Community in Blue

With respect to the fire history and Chiquito Canyon Road, in the past 50 years, only one fire (Piru 1988) crossed over the canyon and burned on the other side. This is shown in Figure 6, on the next page. The balance of the fires, while having some impact on Chiquito Canyon Road, tended to hang up on the steep slope at the sides of the canyon due to the fact that the winds were blowing across the canyon rather than straight up or down canyon.

Del Valle Road and Chiquito Canyon Road have no fire history in the past 20 years that would compromise them as access roadways. In the 50-year fire history there has been several fires, including the 1988 Piru Fire, that crossed over Chiquito Canyon Road at its midpoint and several other which impacted the Del Valle Road. Figure 7, on page 10, provides an overlay of the Piru Fire on an older aerial (1994 as 1989 was not available) to show the configuration of the land at that time. Much of the development to the east of Val Verde and the project site was not present west of Commerce Center Drive at this time. While it is unlikely that both roads were impacted at the same time, no records could be found to answer this question.

The fire perimeter indicates that the Piru Fire (13,310 acres) burned over many days under changing weather conditions. It is likely (due to the shape of the fire perimeter and local weather data) that the fire burned through several transitions of offshore to onshore and back wind patterns. This type of back and forth tends to produce fire spread in all directions at one point or another. This is likely the reason that Val Verde Community has fire around its entire perimeter with limited burning into the community if the fire perimeter is accurate. Given the level of detail on the edges, it is likely very accurate.

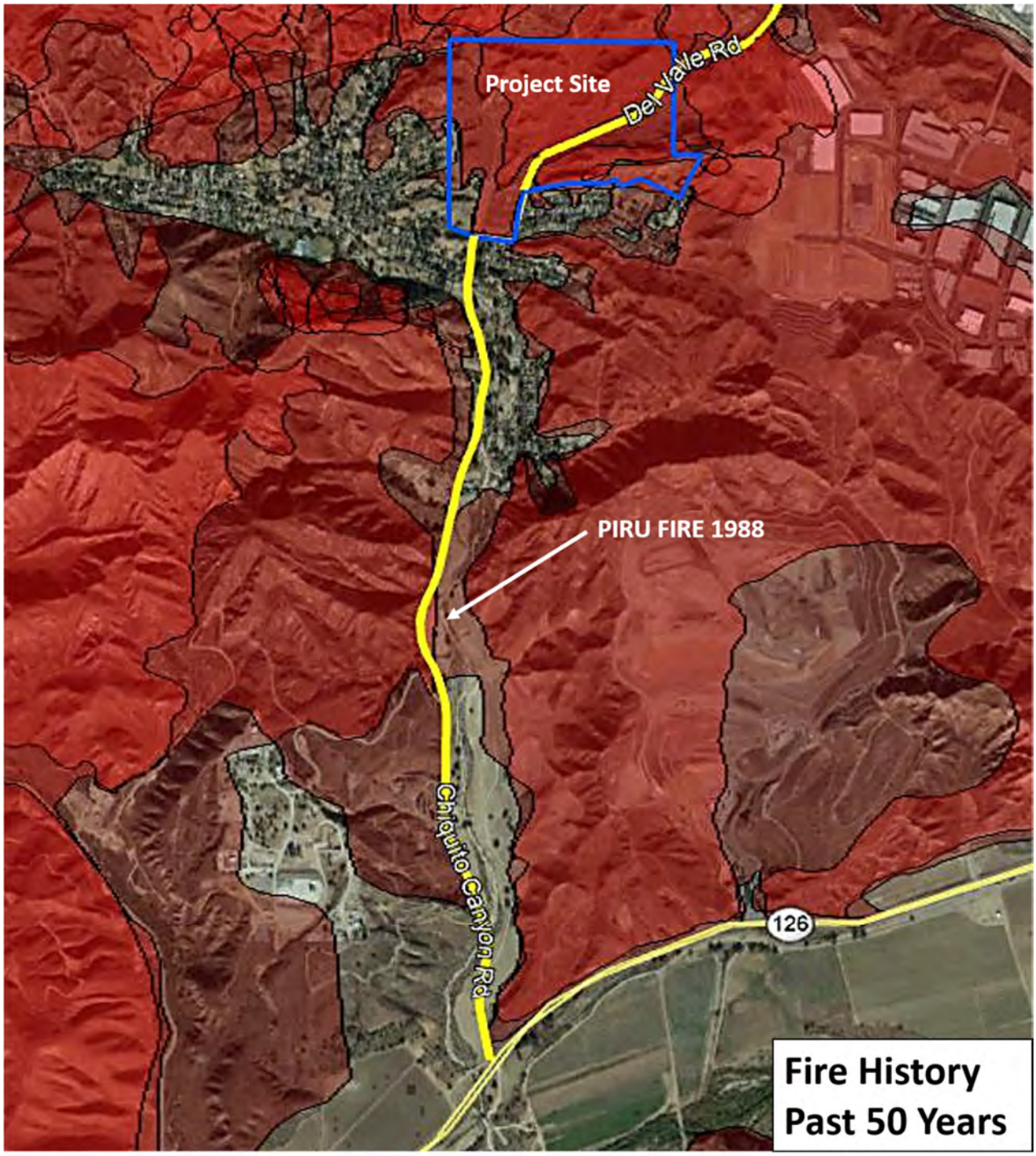


Figure 6 – Fire in Chiquito Canyon (past 50 years)

The fire history of this area is extremely complicated. It involves very dynamic terrain, a fuel mosaic that involves chaparral fuels and grasses and weather patterns which produce extreme fire behavior conditions on a regular basis.

In order to assess these factors, the BehavePlus, FlamMap and FARSITE fire modeling programs were used to produce accurate projected fire conditions that are consistent with this fire history and seek to reproduce the extreme fire behavior that has occurred in this area in the past.

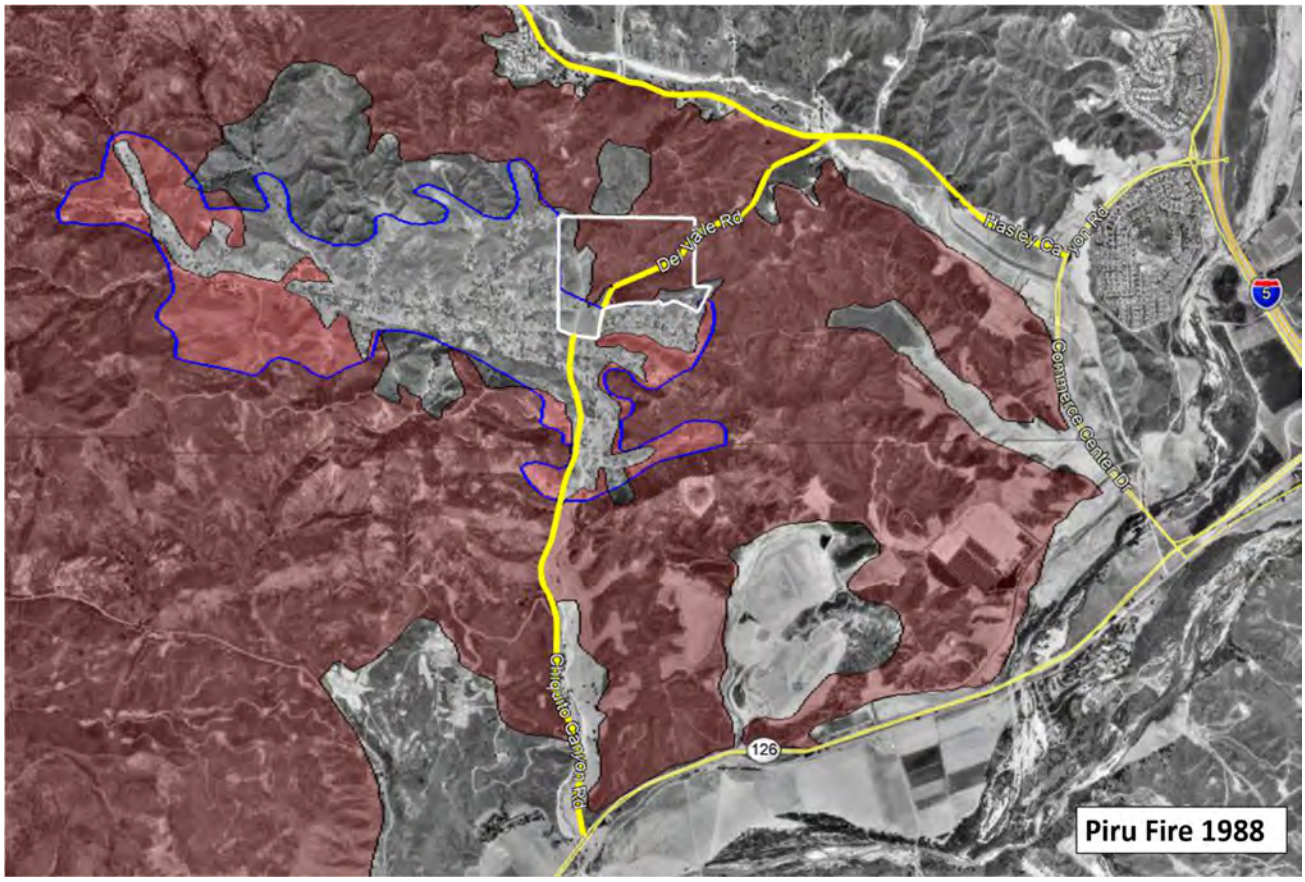


Figure 7 – Fire Perimeter for 1988 Piru Fire over 1995 aerial photo

Fire Behavior Analysis (BehavePlus)

The BehavePlus, Fire Behavior Prediction and Fuel Modeling System, is the most popular and accurate method for predicting wildland fire behavior in prefire defense planning. The BehavePlus fire behavior computer modeling system is utilized by wildland fire experts nationwide. Because the model was designed to predict the spread of a fire, the fire model describes the fire behavior only within the flaming front. The primary driving force in the fire behavior calculations is the amount of dead fuel less than ¼" in diameter; these are the fine fuels that carry the fire. Fuels larger than ¼" contribute to fire intensity, but not necessarily to fire spread. The BehavePlus fire model describes wildfire spreading through surface fuels, which are the burnable materials within 6' of the ground and contiguous to the ground. This type of modeling demonstrates the potential of a wind driven fire that could potentially enter the fuel modification zones from the adjacent wildland areas.

In addition to BehavePlus, the FlamMap/FARSITE model was used to model the fires across the landscape. The biggest difference between the two models is that FlamMap uses a single set of inputs to model the fire cell by cell (30 meter grids in this case) across the landscape whereas, FARSITE uses hourly weather inputs (using real fire weather in this case from the Thomas and Rye Fires) to provide movement across the landscape which is more realistic and likely more accurate.

Weather Inputs and Wind Patterns

Weather data was retrieved from the Del Valle Remote Automated Weather Station (RAWS) which is located at the fire training site on the top of the ridge near the mouth of Chiquito Canyon. This site is located approximately 1.3 miles SSW of the project site (Figure 8, on the next page).

The results of the RAWS data are shown on the wind rose graph in Figure 9, below. This data is for maximum wind direction per hours for 3 years (2017-2019). This graph clearly shows the prevailing wind direction is from the West (daytime onshore) and from the North to Northeast (Santa Ana winds and nightly offshore wind).

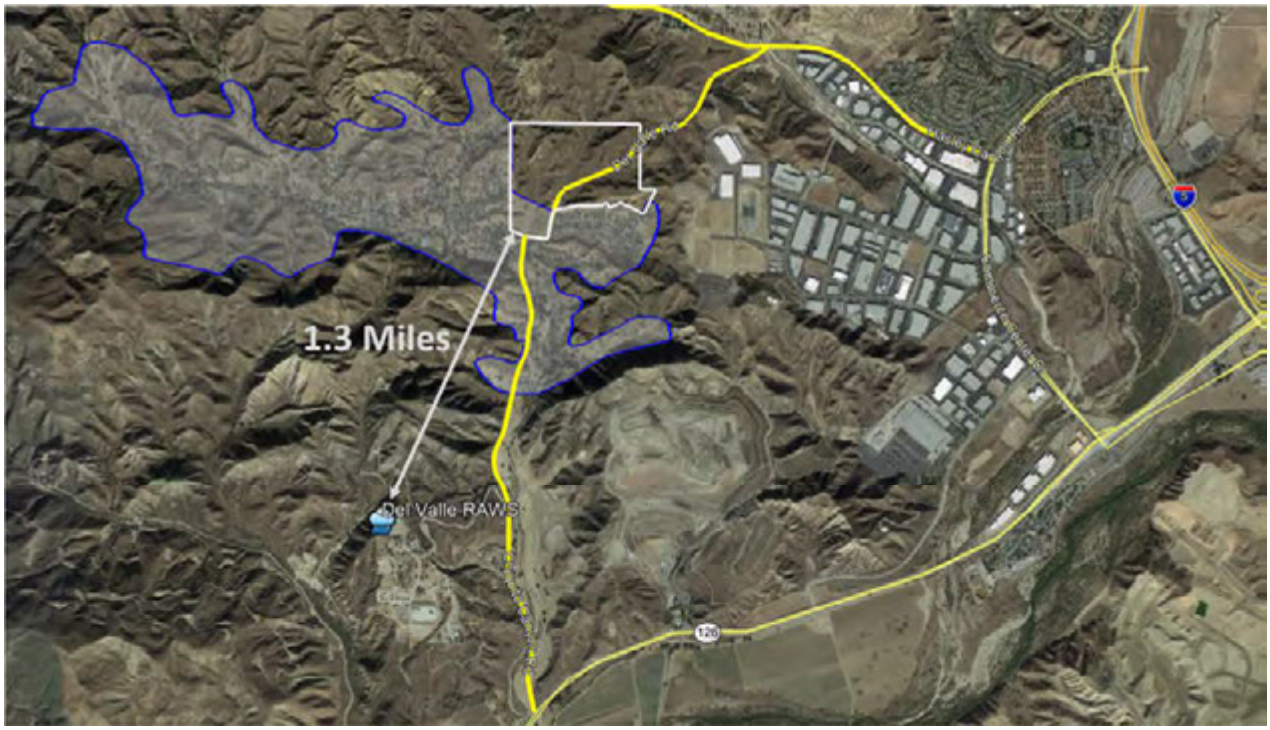


Figure 8 –Del Val **RAWS** Location

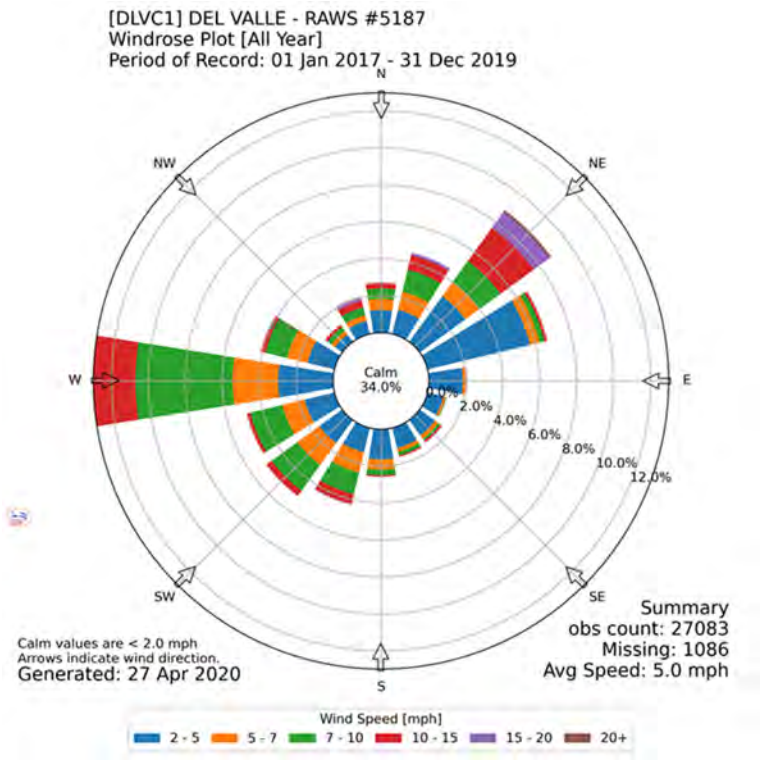


Figure 9 – Wind Rose Del Valle RAWS

With both the onshore and offshore winds, they tend to rotate around from the prominent to the transition. The West wind tends to move to the SW as it transitions, and the NE moves to the ENE while it transitions.

The Santa Ana winds tend to flow from the ENE and NE. and when they breakdown, the onshore flow returns, normally out of the West in the fall. Figure 10, on the next page is a data stream from the Del Valle RAWS that shows a typical offshore/onshore transition when the onshore winds are caused by heat inland which create a low pressure and the cooler air over the water rushes in to fill that low pressure area. This diurnal effect occurs regularly but not at this level of change and wind speed.

Date/Time	Temp	RH	Wind	Direction	Wind Gust	Accum Rain	Peak Wind	Peak Dir	Cardinal	
	Fahrenheit	%	Miles/hour	Degrees	Miles/hour	Inches	Miles/hour	Degrees	Code	
06/25/2017 06:55	68	72	4	75	6	18	6	71	ENE	Offshore
06/25/2017 07:55	75	59	3	76	6	18	6	68	ENE	
06/25/2017 08:55	83	44	2	56	5	18	5	69	NE	
06/25/2017 09:55	91	31	1	29	5	18	5	212	NNE	
06/25/2017 10:55	96	24	3	167	7	18	7	187	SSE	Onshore
06/25/2017 11:55	100	20	9	217	14	18	14	220	SW	
06/25/2017 12:55	103	17	9	262	16	18	16	230	W	
06/25/2017 13:55	106	15	10	249	23	18	23	276	WSW	
06/25/2017 14:55	104	16	15	269	32	18	32	276	W	
06/25/2017 15:55	104	17	13	259	31	18	31	276	W	
06/25/2017 16:55	102	15	16	262	30	18	30	288	W	
06/25/2017 17:55	100	16	13	256	30	18	30	271	WSW	
06/25/2017 18:55	97	19	12	275	26	18	26	268	W	
06/25/2017 19:55	89	29	9	288	19	18	19	261	WNW	
06/25/2017 20:55	83	37	4	250	13	18	13	282	WSW	
06/25/2017 21:55	80	40	3	246	9	18	9	261	WSW	
06/25/2017 22:55	74	55	4	69	6	18	6	65	ENE	Offshore

Figure 10 – Heat Generated Onshore Flow RAWS data

Within the RAWS dataset are two fires in the general area (Rye Fire and Thomas Fire) which both occurred in December of 2017. The close proximity of the RAWS to the fires and to the project site create a data set which is incredibly valuable. The FARSITE program requires hourly data to compute the fire travel across the landscape. In the modeling scenarios, this report has used the actual RAWS data from the early extreme fire behavior to model potential fires that would directly impact the project site, the access roadways for ingress/egress, and the Val Verde Community as a whole.

Station	Date/Time	Temp	RH	Wind	Direction	Wind Gust	Accum Rain	Peak Wind	Peak Dir	Cardinal	
		Fahrenheit	%	Miles/hour	Degrees	Miles/hour	Inches	Miles/hour	Degrees	Code	
DLVC1	12/05/2017 09:55	56	10	12	57	29	0.01	29	33	ENE	Rye Fire
DLVC1	12/05/2017 10:55	57	10	13	57	38	0.01	38	45	ENE	
DLVC1	12/05/2017 11:55	58	9	23	53	42	0.01	42	58	NE	
DLVC1	12/05/2017 12:55	60	9	20	52	39	0.01	39	38	NE	
DLVC1	12/05/2017 13:55	62	6	19	55	52	0.01	52	26	NE	
DLVC1	12/05/2017 14:55	62	6	13	82	30	0.01	30	30	E	
DLVC1	12/05/2017 15:55	61	6	11	72	28	0.01	28	81	ENE	
DLVC1	12/05/2017 16:55	59	6	8	68	19	0.01	19	63	ENE	
		59	8	15	62	35	0	35	47		
Station	Date/Time	Temp	RH	Wind	Direction	Wind Gust	Accum Rain	Peak Wind	Peak Dir	Cardinal	
		Fahrenheit	%	Miles/hour	Degrees	Miles/hour	Inches	Miles/hour	Degrees	Code	
DLVC1	12/04/2017 07:55	52	23	12	38	30	0.01	30	49	NE	Thomas Fire
DLVC1	12/04/2017 08:55	54	18	20	38	41	0.01	41	46	NE	
DLVC1	12/04/2017 09:55	55	16	22	51	43	0.01	43	51	NE	
DLVC1	12/04/2017 10:55	56	14	21	38	40	0.01	40	34	NE	
DLVC1	12/04/2017 11:55	58	12	21	41	38	0.01	38	34	NE	
DLVC1	12/04/2017 12:55	60	11	17	44	39	0.01	39	61	NE	
DLVC1	12/04/2017 13:55	60	9	20	48	34	0.01	34	34	NE	
DLVC1	12/04/2017 14:55	61	10	18	40	33	0.01	33	34	NE	
DLVC1	12/04/2017 15:55	60	9	17	48	33	0.01	33	44	NE	
DLVC1	12/04/2017 16:55	57	9	12	56	36	0.01	36	26	NE	
		57	13	18	44	37	0	37	41		

Figure 11 – RAWS data for Rye and Thomas Fires in 2017

A wind rose is superimposed onto the project site (Figure 12, on the next page) to illustrate the orientation of the wind and its relationship to the project boundaries. These same compass headings will be used to reference the aspect and fire spread direction during the fire behavior discussion.

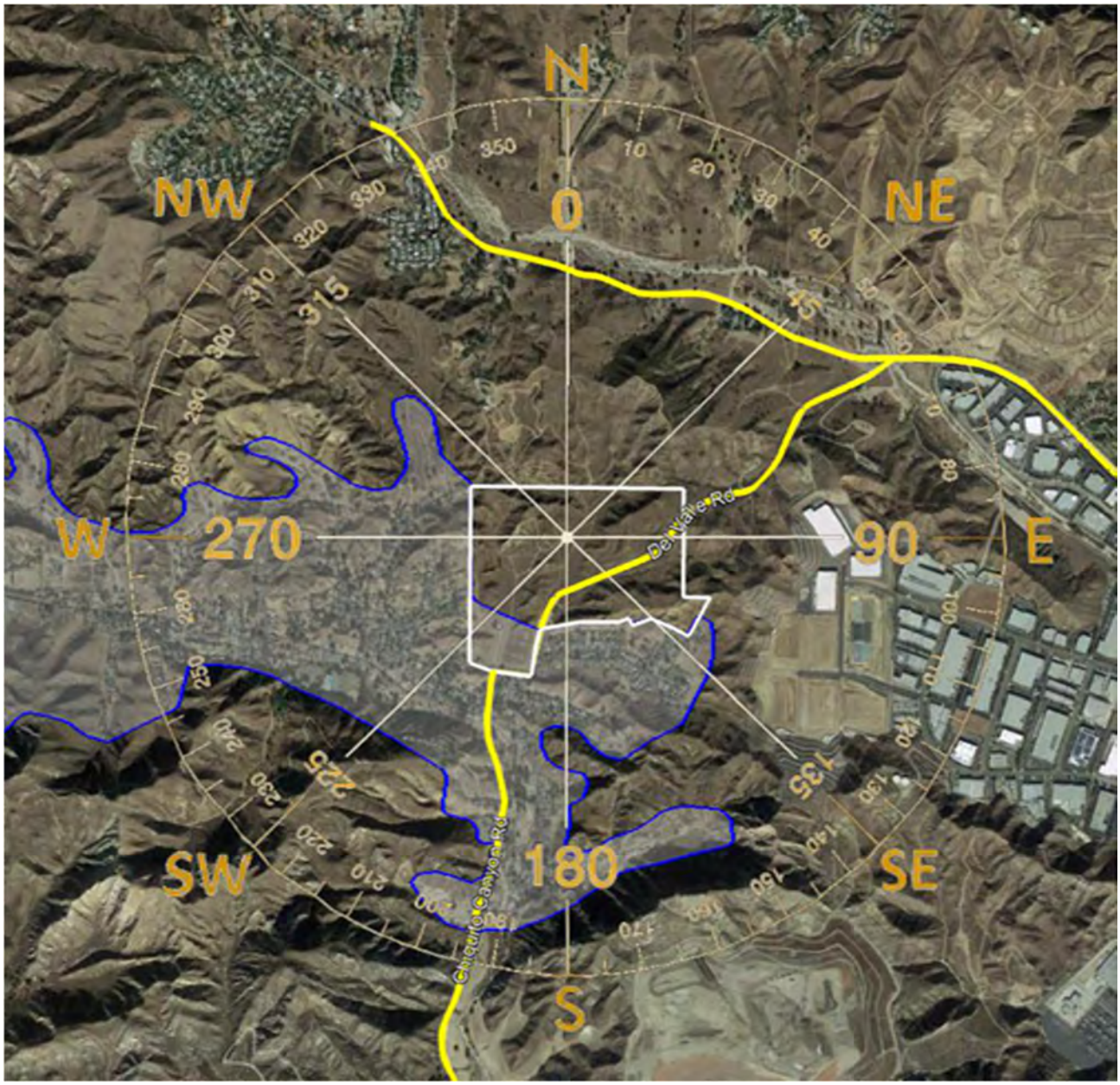


Figure 12 – Project Site with Compass Overlay

In addition to the general direction of the wind from the fire history and the RAWS data, the wind flow through and around the topography must also be considered. The project site was modeled in Wind Ninja (a computer program that computes spatially varying wind fields for wildland fire and other applications requiring high resolution wind prediction in complex terrain) to provide an illustration of the wind flow as the wind travels down through the project site, the Val Verde Community and the ingress/egress roadways. In all the wind scenarios yellow arrows represent the modeled wind speed for the domain average (average of the wind speed values for entire area of analysis). Figure 13, on the next page and several others that follow provide the outputs.

Areas of green indicate up to 40% lower than the modeled domain average and the blue arrows are 100% lower (zero wind) whereas the orange arrows are up to 40% above the average and the red arrows are up to nearly 200% of the modeled wind speed. Wind acceleration (red or orange) is present on the ridgetops around the project site and wind sheltering (green and blue) is present on the leeward

slope/bottom of drainages. Of interest to this report is that the south access roadway (Chiquito Canyon) has no wind acceleration area because much of the canyon is sheltered from a NE wind.

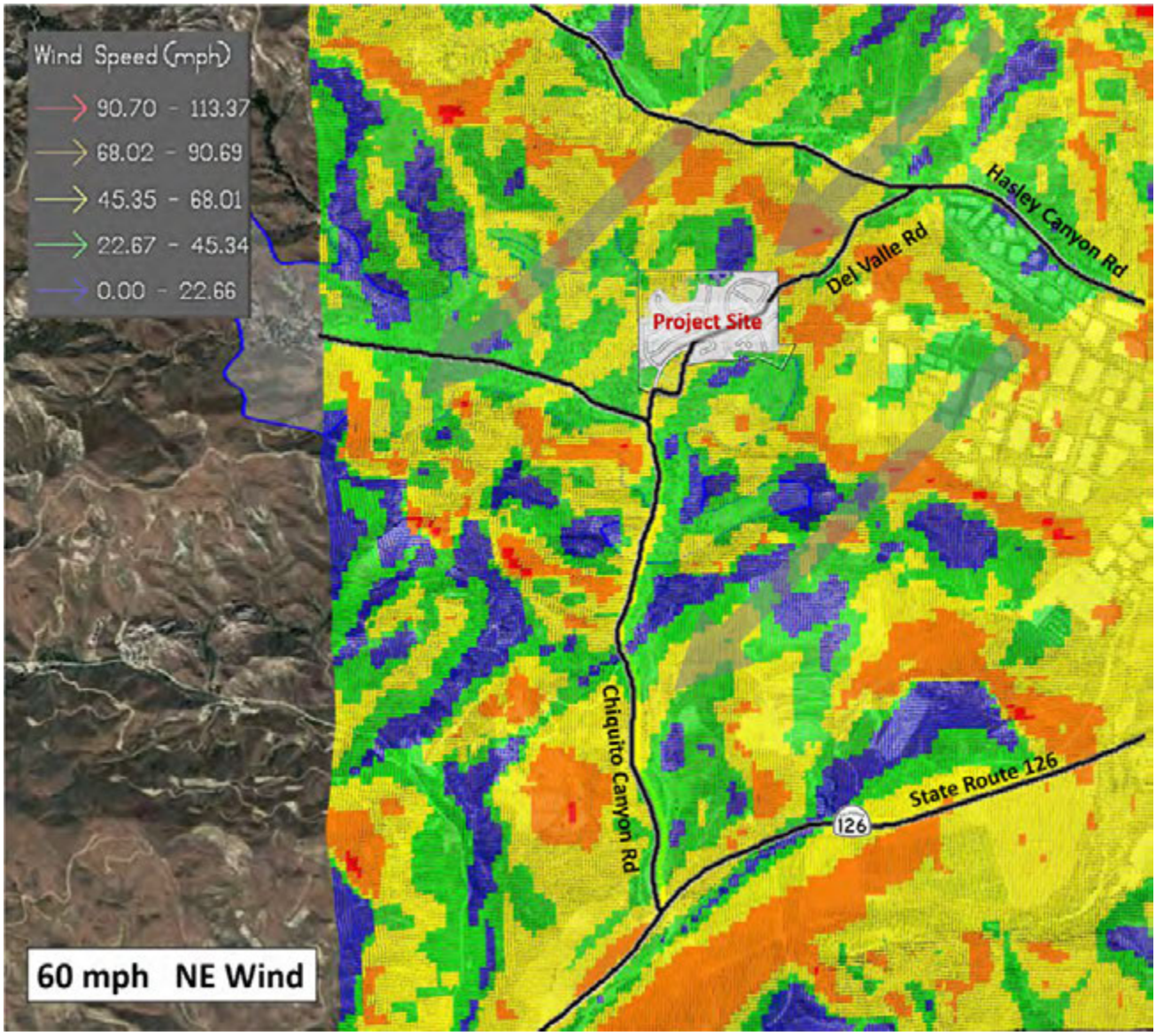


Figure 13 – Project Site Wind Directions (30,000 foot view)

The project site has one area (NE corner) where wind acceleration is a factor at the interface of the project site with the adjacent open space area. This area, along with the entire project interface, will have an approved fuel modification zone designed to provide the distances necessary for the fire behavior that is expected in this interface. The NE access roadway (Del Valle Road) is also only impacted at this same location. The balance of the roadway from the project boundary to the Halsey Canyon Road is either green or yellow (at or below the modeling wind speed). Figure 14, on the next page, provides a closer view of the Del Valle Road wind alignment and the location of the wind acceleration.

In the NE wind model Chiquito Canyon has no areas of acceleration (orange or red) and at the midpoint, there is a blue zone (lowest wind speeds) which causes the wind to change directions or swirl in some cases. Note that while the modeled wind direction is NE, in some of the wind sheltered

areas, the wind is actually running SSW. While the wind speeds are greatly reduced, the complexity is greatly increased (Figure 15, on next page).

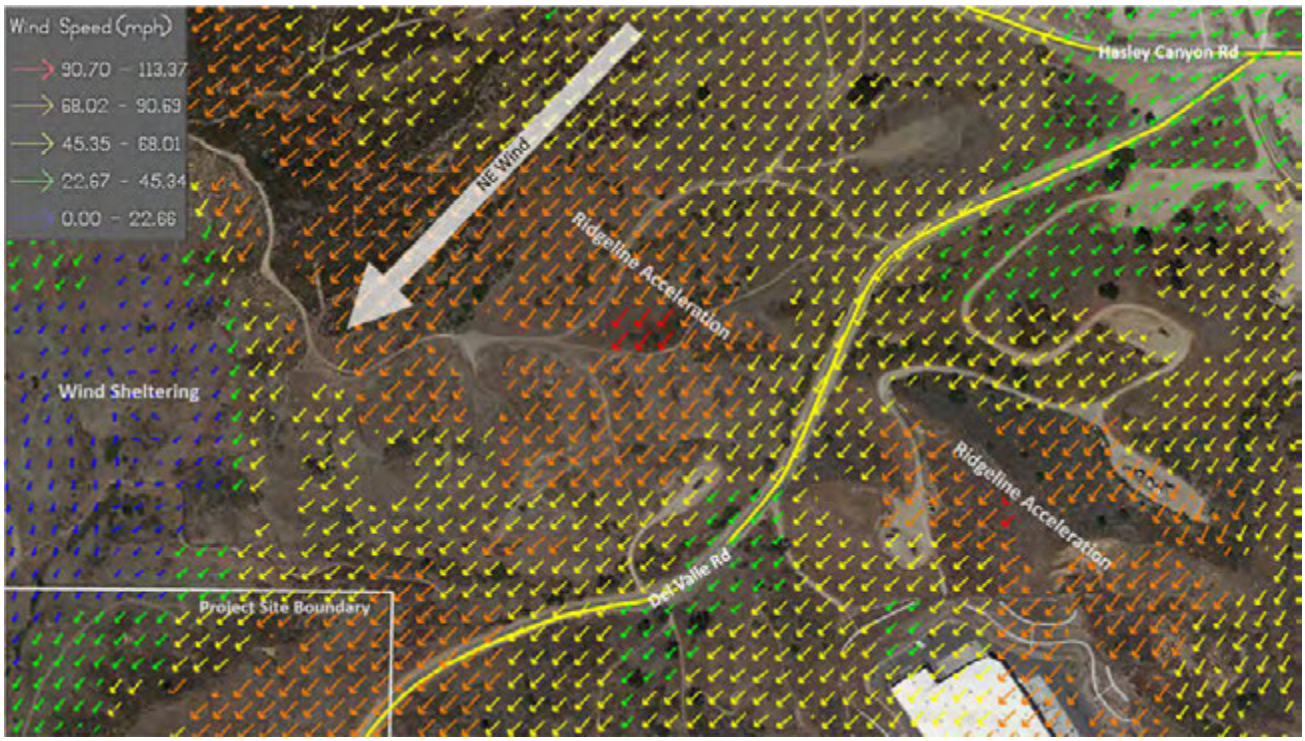


Figure 14 – Wind Ninja Output for NE 60 mph Del Valle Road

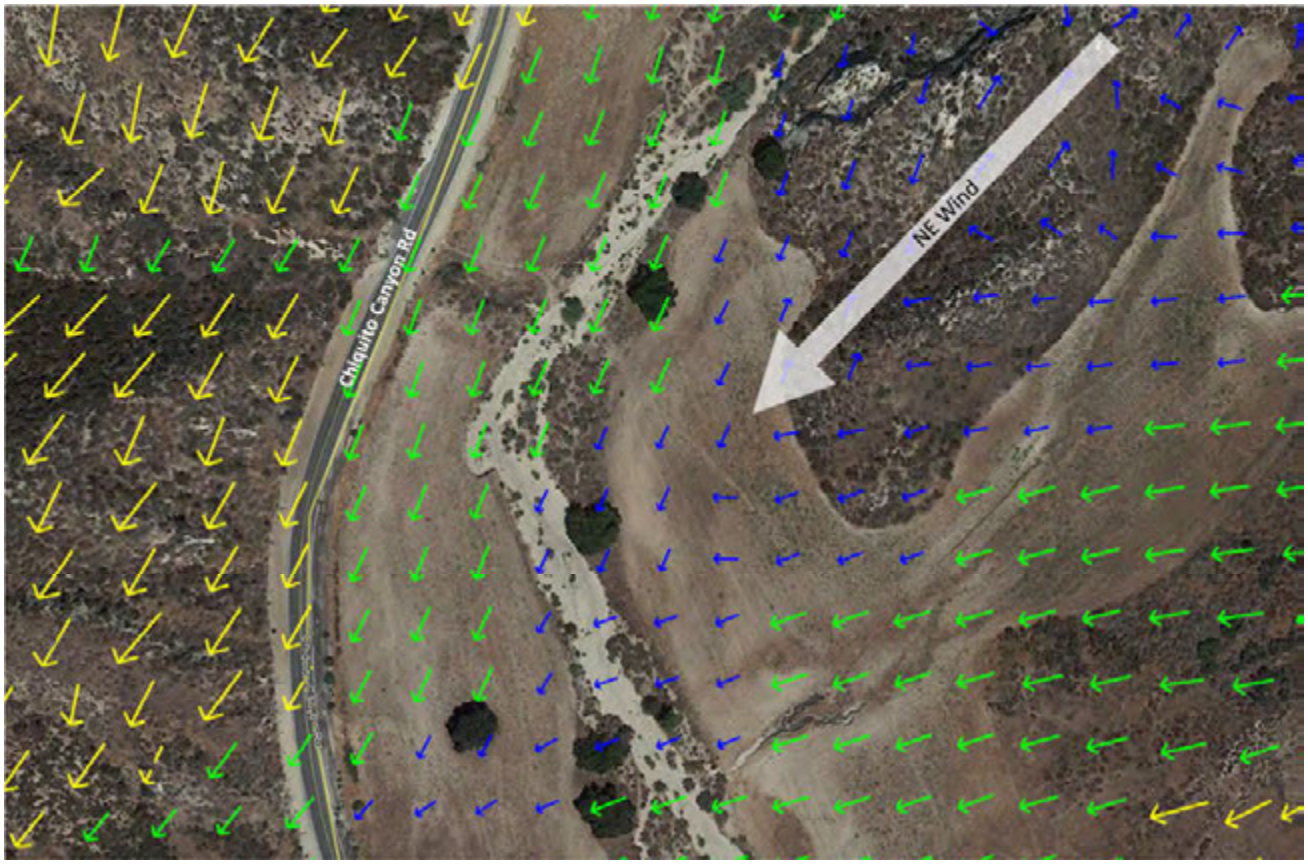


Figure 15 – Wind Ninja Output Chiquito Canyon NE 60 mph wind

Under a north wind (Ranch Fire 2007) the dynamics of the wind alignment change but the impacts are not significantly different. Chiquito Canyon aligns with the north wind and therefore, the wind sheltering is gone, and the acceleration areas are closer to the roadway but still up on the ridgelines (not below or at the road level) as shown below in an oblique view of the Wind Ninja outputs.

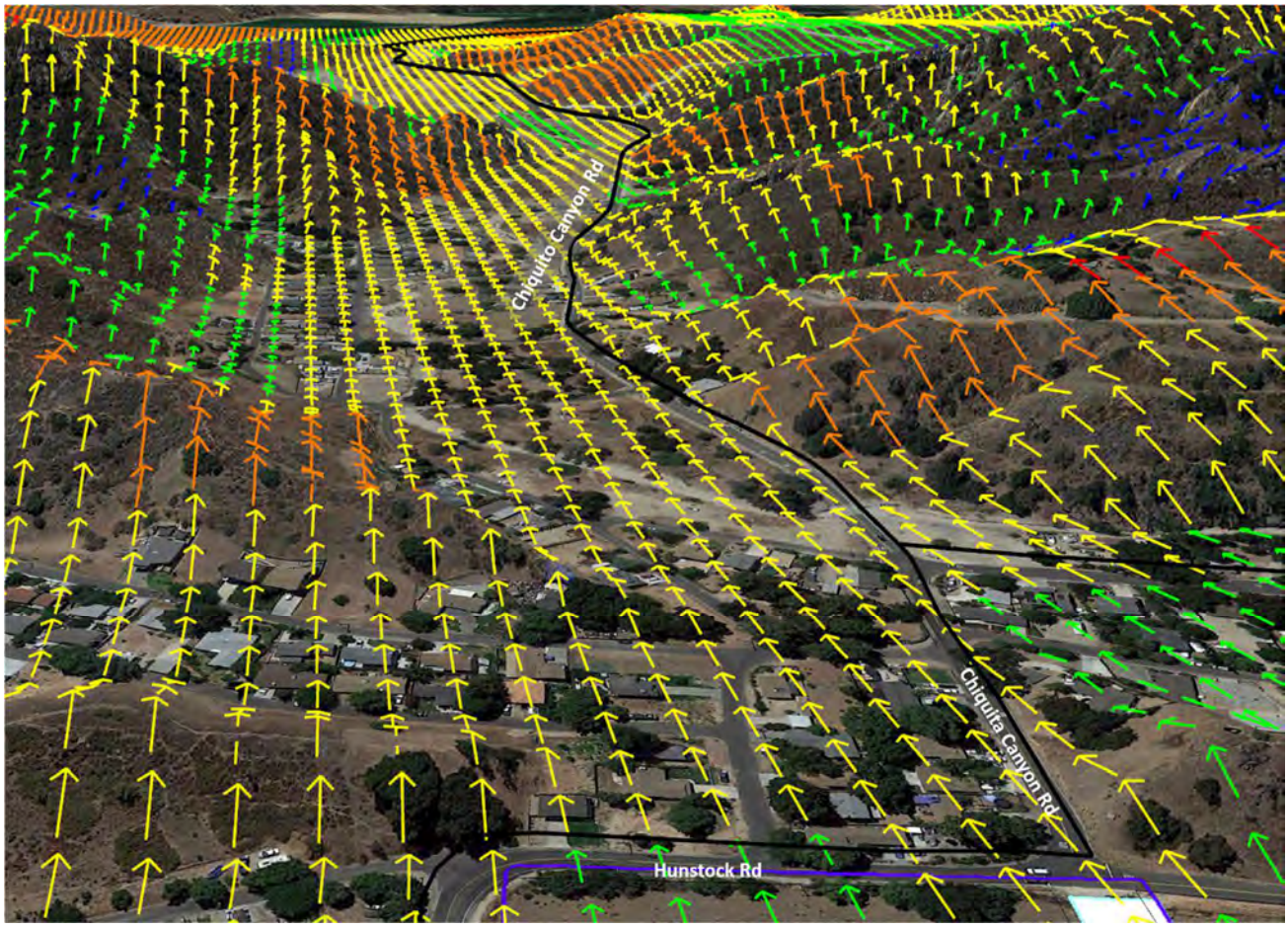


Figure 16- Wind Ninja Output Oblique Chiquito Canyon looking South from Hunstock Rd (North Wind at 60 mph)

Del Valle Road, under a north wind, has a similar condition where the winds at the roadway level of at or below the domain average and the adjacent ridgelines are wind acceleration but not where it impacts the roadway. This is illustrated in Figure 17, on the next page.

Wind impacts can change within a few degrees of rotation and this report does not discuss all of them but seeks to show the impacts of the worst-case conditions. Wind factors will be addressed in the fire behavior modeling as they are relevant to the FlamMap and FARSITE model outputs.

Overall, the project site has limited wind impacts (negative impacts) and the fuel modification zones have been designed to address potential impacts where they occur. The two access roadways (Del Valle Road and Chiquito Canyon Road) are not significantly impacted by the wind direction for winds from the North or NE, as a general rule, but are addressed specifically in the fire behavior discussion.

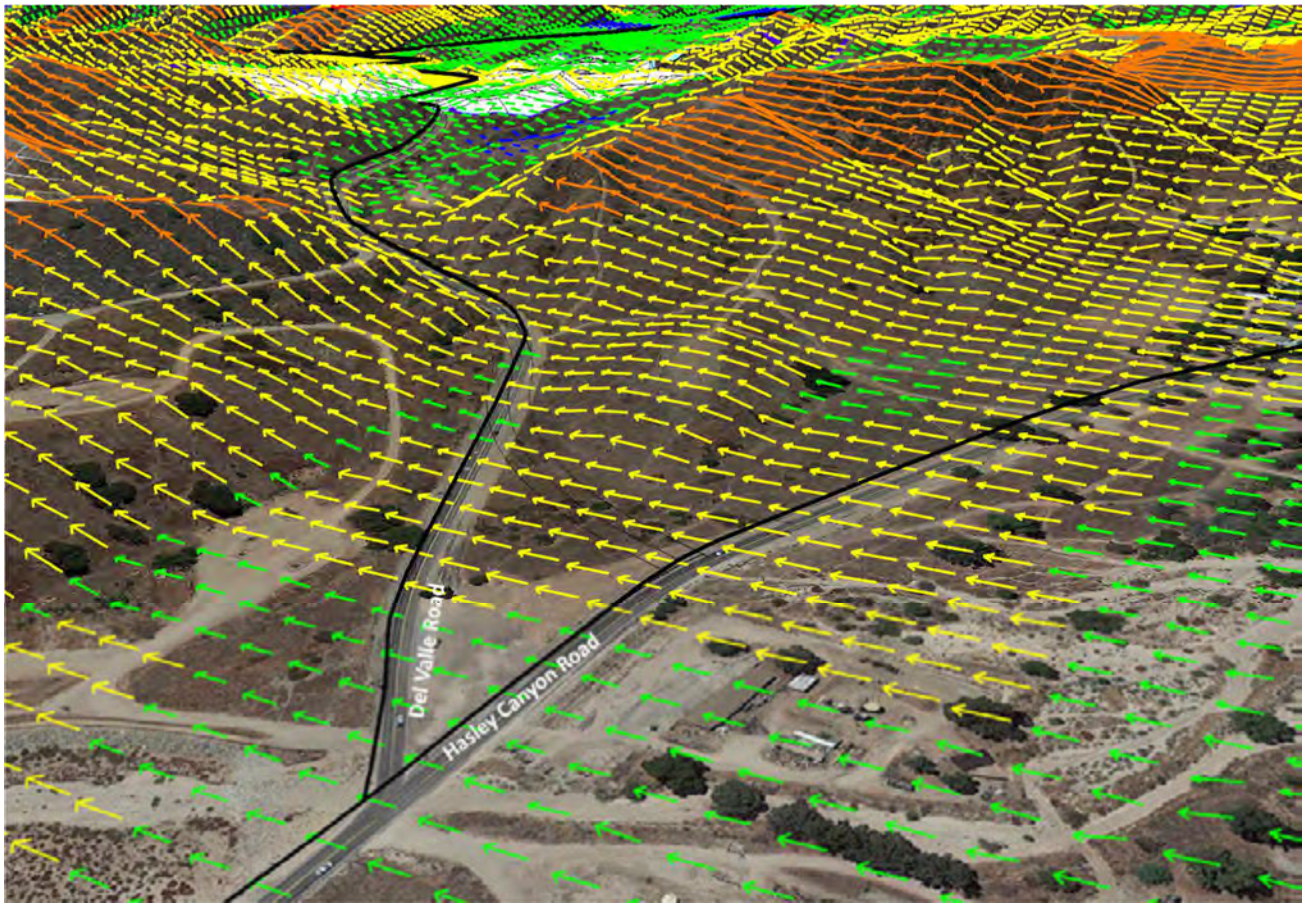


Figure 17 – Del Valle Road viewed from Hasley Canyon Road with Wind Ninja Output for NE 60 mph wind

Wildland Interface Fuel Types

For the purposes of the BehavePlus modeling the standardized fuel models were used as provided by the National LANDFIRE Database maintained by U.S. Department of the Interior | U.S. Geological Survey. Figure 18, on page 19, provides an illustration of the wildland fuels adjacent to Sterling Ranch. The parameter of each fuel type shown in the Landfire Database and those identified on the site survey are as follows:

Fuel **Model GR1** (101) Dry Climate Grass is short, patchy, and possibly heavily grazed. Spread rate moderate; flame length low. Dynamic. Moisture of extinction is 15%. Fuel bed depth is 0.4 feet.

Fuel **Model GR2** (102) Dry Climate - Moderately coarse continuous grass, average depth about 1 foot. Spread rate high; flame length moderate. Dynamic. Moisture of extinction is 15%. Fuel bed depth is 1.0 feet.

Fuel **Model GS1** (121) Dry Climate - Shrubs are about 1-foot high, low grass load. Spread rate moderate; flame length low. Dynamic. Moisture of extinction is 15%. Fuel bed depth is 0.9 feet.

Fuel **Model GS2** (122) Dry Climate - Shrubs are 1 to 3 feet high, moderate grass load. Spread rate high; flame length moderate. Dynamic. Moisture of extinction is 15%. Fuel bed depth is 1.5 feet.

Fuel **Model SH2** (142) Dry Climate - Moderate fuel load (higher than SH1), depth about 1 foot, no grass fuel present. Spread rate low; flame length low. Moisture of extinction is 15%. Fuel bed depth is 1.0 feet.

Fuel **Model SH7** (147) Dry Climate - Very heavy shrub load, depth 4-6 feet. Spread rate lower than SH5, but flame length similar. Spread rate high; flame length very high. Moisture of extinction is 15%. Fuel bed depth is 6.0 feet.

A site visit found the following fuel conditions in addition to those described above:

Fuel **Model SH5** (145) Dry Climate - Heavy shrub load, depth 4 to 6 feet. Spread rate very high; flame length very high. Moisture of extinction is 15%. Fuel bed depth is 6.0 feet.

Fuel **Model SCAL18** is a southern California specific model for coastal sage scrub and Buckwheat OR dominated by coastal sage scrub AND greater than 15 years maturity OR dominated by northern mixed chaparral AND greater than or equal to 3 years maturity AND less than or equal to 12 years maturity. The vegetation has an average fuel depth of 3 feet and a moisture of extinction of 25%.

The predominant fuels near the project site are grasses, grass/scrub mixtures, and shrub fuels, mostly on the north aspects, as shown on the next two figures and in a series of photos in Appendix B of this report. Each of the grids in the graphic is 30 meters square (just under ¼ acre). Fuels parameters for each grid are determined by the predominant fuel types. This does mean that other fuels can and may be present in each grid. All eight of the fuel models above are represented within the interface area.

In addition to the fuel models provided in the Landfire database, the project biological report provides a graphic that indicates the vegetation class as well. This information is provided on Figure 19 on page 20 and in the project biological report. The grasses, sage and buckwheat are clearly identified.

According to the Landfire database and confirmed with the site visit, the fuels adjacent to the project access roadways (Del Valle Road and Chiquito Canyon Road) are the same configuration as the interfaces detailed for the project site from a fire behavior standpoint. There are likely differences at a biologist's level but none that will influence fire behavior modeling when viewed at the time of this analysis. Table 1, on pages 20-21, provides an accounting of the specific grass and shrub fuels that have been found on the project site and the area that are adjacent.

Starting on page 21, is a series of site photos that provide a visualization of the types fuels which are present at or near the project site. As indicated previously, full site photos are provided in the appendices. Photo 1, on page 21, was taken from the roadside on Del Valle Road, provides an example of the annual grasses (gr2 or fuel 102) in the foreground and some grass/shrub mixture on the hillside in the distance. Photo 2, on page 22, is an example of a north aspect (right side of photo) and a south aspect (left side of photo) and the difference that the aspect can make on vegetation. The heavier fuels are sh5 (145) or sh7 (147) and only occur in pockets as indicated in Figures 18 and 19. Photo 3, on page 22 as well, is an example of a grass/shrub mixture (gs2); this the predominant fuel within the Landfire database and confirmed in the site visit.

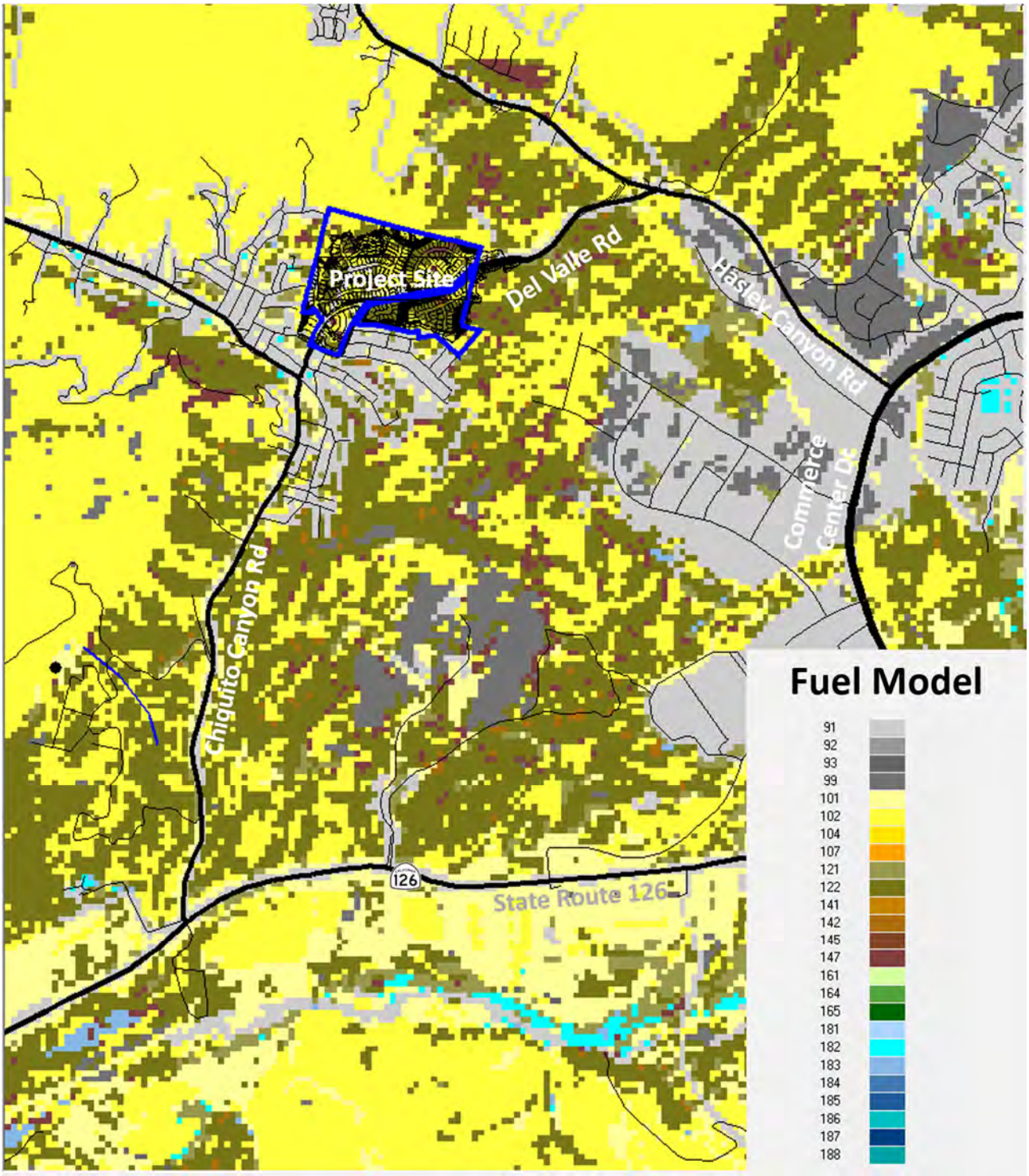


Figure 18 – Wildland Fuels (Landfire Database – Scott and Burgan 40)

Photo 4 provides a view of Del Valle Road looking to the SE from the project site. Here the north aspect fuels are obvious. It should be noted that they will all be removed in the grading process that creates the building pads in this area.

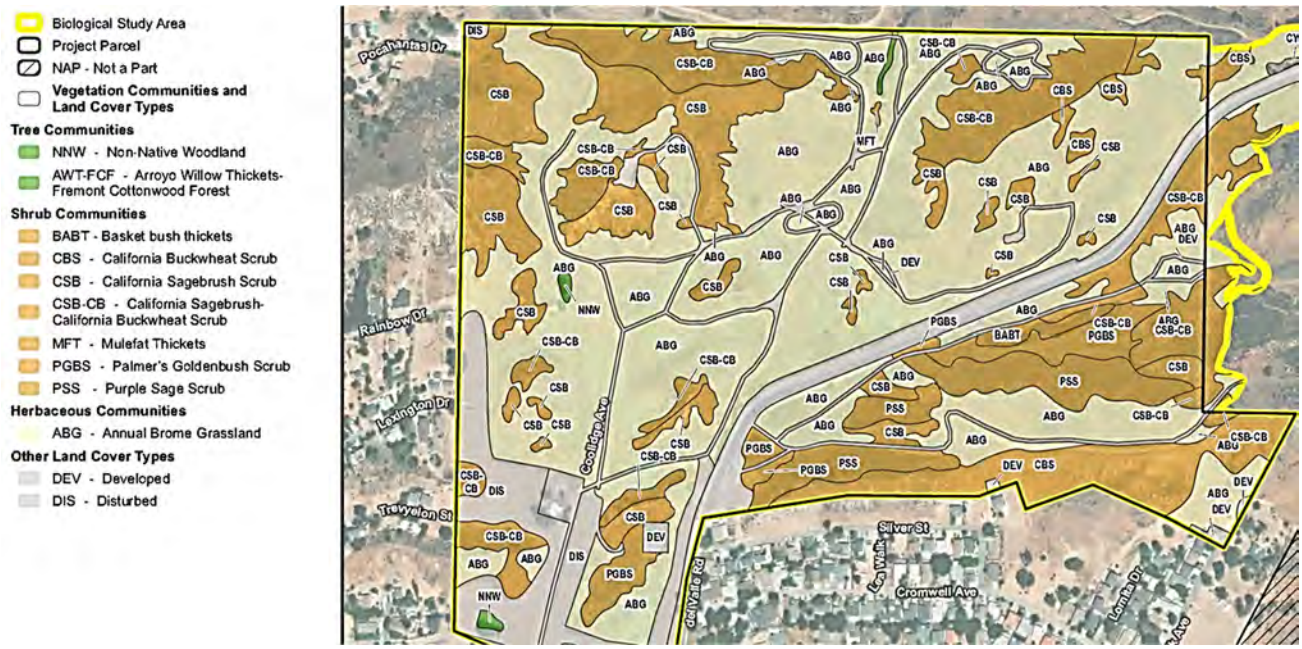


Figure 19 – Vegetation Classes for project site interfaces

Table 1 - Species Specific Wildland Fuels (Project Site)

Macrogroup	Alliance	State Rank*	Acres on the Project Site	% of BSA
MG036. Southwestern North American Riparian, Flooded and Swamp Forest	*Salix lasiolepis* (arroyo willow thickets) – *Populus fremontii* (Fremont cottonwood forest) alliance	S4/ S3	0.09	0.1%
	Baccharis salicifolia (mulefat thickets) alliance	S4	0.03	0.0%[1]
MG036. Southwestern North American Riparian, Flooded & Swamp Forest Total		--	*0.12*	--
MG044. California Coastal Scrub	*Artemisia californica* (California sagebrush scrub) alliance	S5	35.51	22.9%
	Artemisia californica–Eriogonum fasciculatum (California sagebrush–California buckwheat) alliance	S4	20.26	13.0%
	Eriogonum fasciculatum (California buckwheat scrub) alliance	S5	6.47	4.2%
	Ericameria palmeri (Palmer's goldenbush scrub) alliance	S3?	3.54	2.3%
	Salvia leucophylla (purple sage scrub) alliance	S4	6.88	4.4%
	Baccharis pilularis (coyote brush scrub) alliance	S5	0.13	0.1%
MG044. California Coastal Scrub Total		--	*72.79*	--
MG049. Western Cordilleran Montane Shrubland and Grassland	*Rhus trilobata* (basket bush thickets) provisional alliance	S3?	0.55	0.4%
MG045. California Annual and Perennial Grassland	*Bromus diandrus–Bromus hordeaceus* (annual brome grasslands)	No Rank	61.24	39.5%

MG027. Introduced North American Mediterranean Woodland and Forest	Non-Native Woodland	No Rank	0.47	0.3%
Other Land Cover Types	Disturbed Land	N/A	8.78	5.7%
	Developed Land	N/A	11.26	7.3%
		Total	155.10	100%[2]

[*] For alliances with state ranks of S1-S3, all associations within them are considered highly imperiled. A question mark (?) denotes an inexact numeric rank due to insufficient samples over the full expected range of the type, but existing information points to this rank (CDFW 2018f).

[1] Mulefat thickets totals 0.02% of the total acreage within the BSA.

[2] Total does not sum to 100% due to rounding

Photo 1

Fuels Discussion

Overall, the wildland fuels for the project site and access roadways to and from are light to moderate fuel at the interface for each area. The fuels adjacent to Del Valle Road are mostly grasses and grass/shrub mixtures, especially on the north side of the roadway were a NE wind driven fire would be approaching. Some portions of the road have north aspect fuels that are adjacent on the south side but none which are downslope from the roadway. Chiquito Canyon Road runs along the canyon bottom on its west side from Highway 126 to the community of Val Verde. The fuel loading ranges from mineral earth to moderate chaparral. In no case is the chaparral fuel below the roadway in any amount that could create extreme fire behavior. The interface to the west is upslope in nearly all areas and as it rises away from the roadway, it increases in depth and complexity. No adjustments have been made to the Landfire fuels database on the site visit (ground truthing).

Photo 2

Photo 3

Photo 4

Topography/Terrain

Topography is an important input to the fire modeling software. Topography includes elevation, slope and aspect. Each has its own impacts on wildland fuels, wind impacts, and fire behavior. First is elevation. Figure 20, on the next page, is a graphic representation of changes in elevation in and around the project site. The Santa Clarita river valley is obvious as it runs along State Route 126. Chiquito Canyon and Halsey Canyon are also easily recognizable on the elevation map. As elevation increases it is easy to see the ridgelines and mountains (green and blue areas) as well as the high mountain tops (purple areas). The orientation of these ridgelines and canyons is important. As previously identified, the strongest winds from a fire behavior perspective are from the NE. Many of the ridgelines are perpendicular to the NE winds and therefore create the greatest amount of wind acceleration at the ridgeline as previously shown. The project site ranges from about 1,200 to about 1,400 feet above sea level. The Santa Clarita Valley adjacent to the project site ranges from 900 to 1,000 feet above sea level. Chiquito Canyon Road slopes down from Val Verde to State Route 126 at a rate of about 125 feet per mile (2-3% overall grade). Del Valle Road begins and ends at about 1,200 foot elevation with a peak around 1,300-foot over its approximate one-mile length from Silver Street to Hasley Canyon Road. This equated to an average 4-6% grade for the area between Silver Street and the breakover point and 3-4% for the balance of the travel down to Hasley Canyon Road. These are important in relationship to the topography around the access roadways which is varied and complex in some areas.

While the overall grade of the roads is important to access issues for the fire resources and possible egress routes for residents of the area, the slope of the wildland is an important issue that drives the fire behavior. Slope can and does change on a regular basis in the native fuels. In Figure 21, on page 25, the slope of the adjacent native fuels is in 30-meter grids within the dataset (Landfire Dataset).

The maximum slope in any grid within the immediate areas is 90% (42 degrees). While some small areas are likely steeper than 42 degrees, the overall average and impact on fire behavior does not exceed this level. All interface areas which will be regraded will be reestablished with slope not to exceed 50% (2:1 slope).

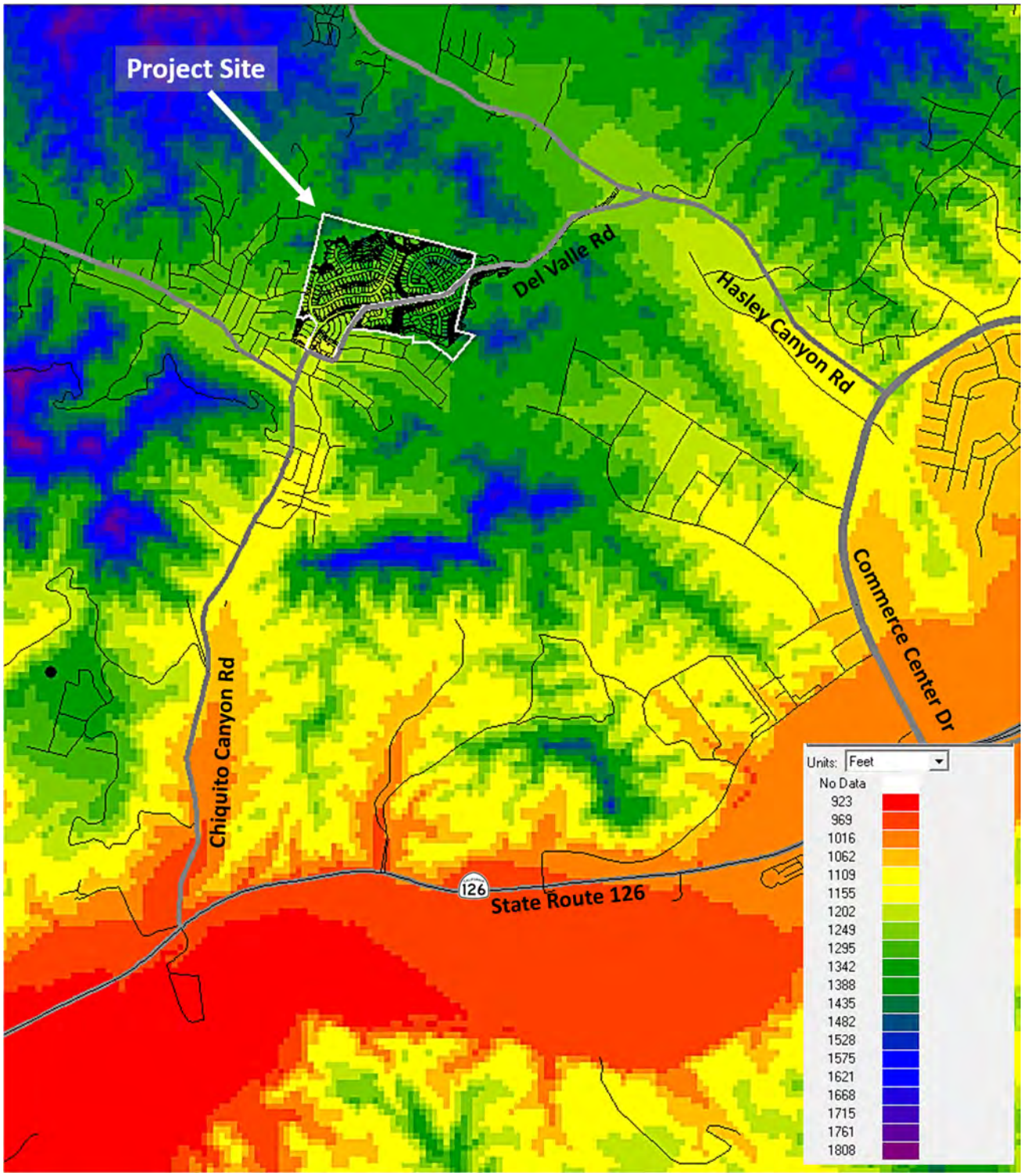


Figure 20 – Elevation Map from Landfire Database

Just as in the elevation map (above), the slope map (next page) outlines the ridgelines but the slope map has added detail, providing more ability to see the very steep area as opposed to the flatter areas.

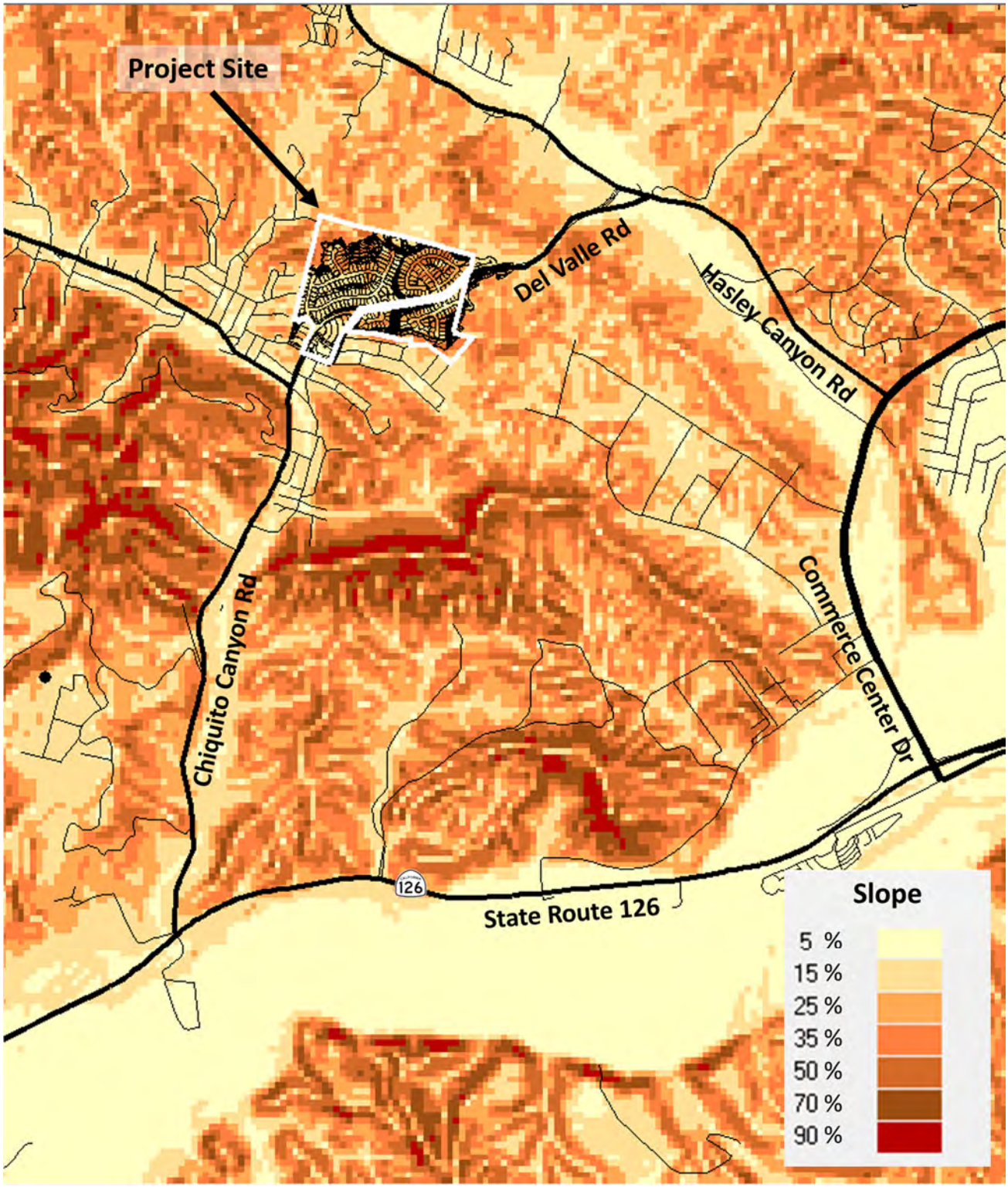


Figure 21 – Slope Analysis from Landfire Database. Project site outlined in white.

The project site access roadways, Del Valle Road and Chiquito Canyon Road, are typical canyon roads. They are near the edge of the canyon bottom (away from the flow line whenever possible

without having to complete massive grading into the canyon walls). This tendency generally creates a condition where only one side of the roadways has significant fuel loading. This is the case in Chiquito and Hasley Canyons. Del Valle Road, being a transition road between canyons, does not have this condition working in its favor. The worst-case fire conditions exist when topography, fuels and wind are in alignment. Full alignment (homes are up slope from the fuel modification zones and are in alignment with the extreme winds–Santa Ana) of all three factors does not occur in the project site as fuel modification will remove any fuels where wind, slope, and aspect align.

Aspect along the project perimeter varies due the orientation of the various drainages. This is shown in Figure 22, below.

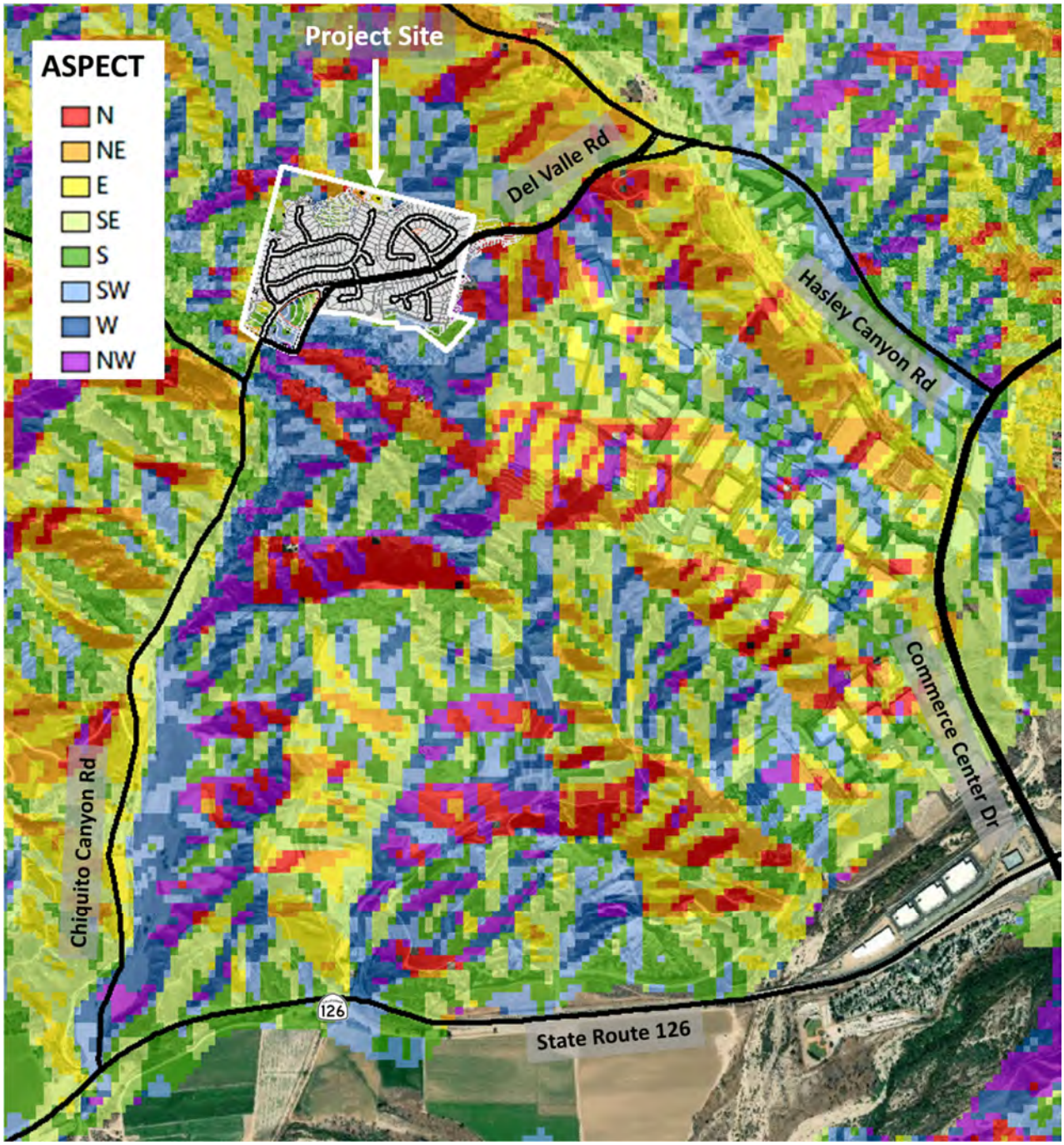


Figure 22 – Aspect Analysis from Landfire Database. Project site outlined in black

The same 30-meter grids that are used for fuels, slope and elevation are used here for the aspect calculation. While accurate overall, some anomalies can exist. For example, if a grid were half north, and half south aspect, the algorithm would average the two values (north = 0 degrees and south = 180 degrees) into an east aspect (90 degrees). Ground truthing is needed to correct these. The aspects have been checked and found to accurate in the areas of the project interface and in the overall general area.

Important to this discussion are the N, NE and NW aspect which tend to be protected from the sun for longer periods in the steeper slopes. This allows for more moisture to be retained and normally creates a higher fuel loading on these aspects. Photos 2, 3 and 4 previously indicated heavier fuels on the north aspect of the project site. Most of these problematic aspects are above or away from the project site building pad and/or access roadways.

Fire Behavior Inputs and Results:

Worst case National Wildfire Coordinating Group Fireline Handbook models have been used for analysis; specifically, all dry climate fuel models have been used. Worst case fire weather was used as well. Inputs for the BehavePlus Fire Behavior Model are as follows:

- One-hour dead fuel moistures were calculated at 3%; ten-hour at 4% and 100-hour at 5%.
- Live Herbaceous fuels were calculated at 30% in the wildland.
- Live Woody fuels were calculated at 50% in wildland.
- Worst-case scenarios assumed a 50% slope (27 degrees) in the wildland interface and the Landfire slope for the specific grid in the FlamMap and FARSITE calculations.
- Winds are calculated at 60 mph (20-foot wind speed) for the Behave and FlamMap calculation and actual wind speeds and directions for the FARSITE calculations.
- Aspect of the slope is assumed to be in alignment with the wind (directly upslope as worst-case) for the Behave runs.
- Spread direction is shown at the direction as indicated in the outputs.
- Wind adjustment factor of 0.5 was used under the worst-case scenario in Behave.

The inputs to the fire modeling are shown in Figures 23 and 24, Fuel Descriptions from the outputs have been added for readability.

Fuel Model	
gr2	Low load, dry climate grass (D) (102)
gs2	Moderate load, dry climate grass-shrub (D) (122)
sh7	Very high load, dry climate shrub (S) (147)
SCAL18	Sage / Buckwheat

Figure 23 – Fuel Model Descriptions (Behave run)

Full details for each model run are available in the appendices. Version 5.0.5 of the BehavePlus and FlamMap 6 Version 6.0 modeling programs were used for this analysis. The modeling inputs/outputs are attached in the appendixes but have been summarized here in the next few figures for discussion purposes.

Inputs: SURFACE		
Description		Worst Case Sterling Ranch
Fuel/Vegetation, Surface/Understory		
Fuel Model		gr2, gs2, sh7, SCAL18
Fuel Moisture		
1-h Moisture	%	3
10-h Moisture	%	4
100-h Moisture	%	5
Live Herbaceous Moisture	%	30
Live Woody Moisture	%	50
Weather		
20-ft Wind Speed	mi/h	60
Wind Adjustment Factor		0.5
Wind Direction (from north)	deg	45
Terrain		
Slope Steepness	%	50
Aspect	deg	45
Fire		
Spread Direction (from north)	deg	0, 15, 30, 45, 60, 75, 90, 105, 120,

Figure 24 – Behave Inputs

Modeling Assumptions

In completing the modeling for the project site, the base for the worst-case scenario was established by using BehavePlus software, to show the characteristics of the scenario. Behave is a snapshot in time. It has static parameters. In this case, the moisture scenario was set at 3, 4, 5, 30, 50, as shown above for the live and dead fuels (also used in FlamMap). Wind was assumed to be 60 mph out of the NE (Aspect was aligned with the wind) and a 0.5 adjustment factor was used. A slope at the interface was assumed to be 2:1 or less. Finally, the spread direction was set to 15-degree intervals for a 360 degree look at the fire spread. At 225 degrees, the maximum impact is achieved (directly upslope).

For the Behave model runs, the fuels indicated on the Landfire database were used with one southern California specific fuel added (SCAL18/Sage and Buckwheat). All southern California fuels were considered and modeled for a comparison but since the fuel beds in the project area and roadsides are not dense enough to have an average six-foot fuel bed, the models with six foot fuel beds were eliminated except for the pockets of sh7 (147) that remain in the Landfire database (Figure 25, on the next page). Some of the north aspects in the general area would qualify, but none of these are next to the access roadways. All but the SCAL18 fuel were removed from the analysis based on the biology report and the fact that SCAL18 is the worst-case fuel for this set of fuels (Figure 26, also on the next page).

Using the Behave outputs to see when the FlamMap and FARSITE calculations reached the rate of spread, fire line intensity and flame lengths for the worst case scenario, it is possible to see the locations of the extreme fire behavior and where the fire behavior has been pushed to its maximum.

Fuel model parameters					
Fuel Model Code	Fuel Model Number	Dead load	Total Load	Percentage Dead Component	Fuel bed depth (ft)
Model 4	4	11.0	16.0	69%	6.0
Model 5	5	1.5	3.5	43%	2.0
Model 6	6	6.0	6.0	100%	2.5
GR1	101	0.4	0.4	100%	0.4
GR2	102	1.1	1.1	100%	1.0
GS1	121	0.7	1.4	52%	0.9
GS2	122	1.6	2.6	62%	1.5
SH1	141	0.7	2.0	33%	1.0
SH2	142	4.5	8.4	54%	1.0
SH5	145	5.7	8.6	66%	6.0
SH7	147	11.0	14.4	76%	6.0
TU5	165	11.0	14.0	79%	1.0
SCAL14	Manzanita	8.6	15.0	57%	3.0
SCAL15	Chamise 1	6.0	8.5	71%	3.0
SCAL16	North Slope Ceanothus	8.9	14.7	60%	6.0
SCAL17	Chamise 2	3.3	7.3	45%	4.0
SCAL18	Sage/Buckwheat	6.4	9.7	66%	3.0

Figure 25 – Fuel Parameters for Dry Climate Fuels

Worst Case Fuels - SCAL

Flame Length (ft)

Fuel Model	20-ft Wind Speed mi/h				
	0	15	30	45	60
1	4.0	8.6	10.0	10.0	10.0
2	5.9	12.7	21.3	29.5	37.4
4	19.7	40.7	60.1	76.9	92.1
5	6.0	12.7	18.6	23.8	28.4
6	5.1	10.7	15.4	19.4	19.6
gr1	1.8	2.6	2.6	2.6	2.6
gr2	4.2	9.0	11.6	11.6	11.6
gs1	3.5	7.4	11.1	11.7	11.7
gs2	5.1	10.7	16.1	20.7	23.4
sh1	2.9	6.2	9.0	9.8	9.8
sh2	4.8	9.3	13.5	17.1	20.4
sh5	12.2	26.5	36.8	45.2	52.5
sh7	12.0	25.1	34.6	42.4	49.1
SCAL14	9.8	19.7	25.2	29.4	32.9
SCAL15	7.3	15.1	20.1	24.1	27.5
SCAL16	9.6	20.3	27.3	32.8	37.6
SCAL17	6.5	13.8	20.2	25.6	30.6
SCAL18	13.1	27.6	35.4	41.3	46.2

Figure 26 – Behave Output for SCAL Fuels

Using the four selected fuels for Sterling Ranch, the Behave scenario was completed for the NE 60 mph wind event. Below are two of the outputs from the model. On the left is flame length and on the right is the Rate of Spread (ROS). Two conclusions can be drawn from these outputs relative to the project site building pads. First is the maximum expected flame length under the worst-case fire behavior scenario is 49.1 feet. Any structure 50 feet or more from the native fuels will not be directly impacted by flames. The second is that the flaming front of this fire is moving at 620 feet per minute or approximately 10 feet per second. There is simply not enough fuel to sustain a fire impact for a period of over one minute. This is extreme fire behavior which requires a continuous homogenous fuel bed and a fire which is burning in equilibrium (self-sustaining); sometimes referred to as "the perfect storm".

Worst Case Sterling Ranch
Flame Length (ft)

Spread Dir	Fuel Model			
deg	gr2	gs2	sh7	SCAL18
0	1.8	2.0	3.8	3.5
15	1.7	1.9	3.6	3.4
30	1.7	1.9	3.6	3.3
45	1.7	1.8	3.5	3.3
60	1.7	1.9	3.6	3.3
75	1.7	1.9	3.6	3.4
90	1.8	2.0	3.8	3.5
105	1.9	2.1	4.0	3.7
120	2.1	2.3	4.4	4.0
135	2.3	2.5	4.8	4.5
150	2.6	2.9	5.6	5.1
165	3.1	3.5	6.7	6.1
180	3.9	4.4	8.5	7.8
195	5.3	6.2	12.0	11.1
210	8.2	10.9	21.2	19.6
225	11.6	23.4	49.1	46.2
240	8.2	10.9	21.2	19.6
255	5.3	6.2	12.0	11.1
270	3.9	4.4	8.5	7.8
285	3.1	3.5	6.7	6.1
300	2.6	2.9	5.6	5.1
315	2.3	2.5	4.8	4.5
330	2.1	2.3	4.4	4.0
345	1.9	2.1	4.0	3.7

Worst Case Sterling Ranch
Surface Rate of Spread (ft/min)

Spread Dir	Fuel Model			
deg	gr2	gs2	sh7	SCAL18
0	4.7	2.6	2.4	1.3
15	4.3	2.4	2.2	1.2
30	4.1	2.3	2.1	1.1
45	4.0	2.2	2.0	1.1
60	4.1	2.3	2.1	1.1
75	4.3	2.4	2.2	1.2
90	4.7	2.6	2.4	1.3
105	5.3	3.0	2.7	1.4
120	6.3	3.6	3.2	1.7
135	7.9	4.5	4.0	2.2
150	10.6	6.0	5.4	2.9
165	15.4	8.9	8.0	4.3
180	25.2	15.0	13.6	7.2
195	49.6	31.7	28.9	15.4
210	126.5	107.0	100.1	53.7
225	268.7	565.2	620.1	346.9
240	126.5	107.0	100.1	53.7
255	49.6	31.7	28.9	15.4
270	25.2	15.0	13.6	7.2
285	15.4	8.9	8.0	4.3
300	10.6	6.0	5.4	2.9
315	7.9	4.5	4.0	2.2
330	6.3	3.6	3.2	1.7
345	5.3	3.0	2.7	1.4

Figure 27 – Behave Outputs for Sterling Ranch Worst-Case Scenario

This extreme fire behavior can only exist for short periods of time when all of the factors needed are in alignment. Even when they align, only the tip of the fire front is burning with this intensity. As shown above in Figure 27, a 15 degree change of alignment reduces the maximum flame length from 49.1' to 21.2' (57% reduction); another 15 degrees further reduces the flame length to 12.0' (now a 76% reduction over the tip of the fire front). Not only does the flame length diminish, so does the ROS and Fireline Intensity. One of the reasons that Behave calculations are not applicable when applied across the entire area is that too many factors change as the fire moves. Flammap and FARSITE are used for this analysis. Behave is used here to calculate the worst-case of all factors to find the most impactful scenario on which to design the defense system.

FlamMap, calculates the same parameters as the Behave model for each of the 30-meter grids as the fire travels across the landscape. For this reason, FlamMap is more accurate to the specific conditions at any given point and allows for additional outputs to be considered since the element of time has been introduced to the model.

One of the main reasons for completing this fire behavior analysis is to provide objective data for the determination of the adequacy of issues such as the time arrival of fire resources and, when necessary, the evacuation of residents prior to fire impacting the community.

The assessment of property risk needs to examine the potential for a fire within the adjacent native fuel to damage or ignite a structure within the project site. This can happen in one of four ways. First is direct contact with the fire. The maximum flame length is 50 feet under any scenario. Any distance greater than 50 feet will keep the flames off of the structure.

Second is radiant heat. The laws of physics indicate that the decay of radiant heat is calculated by dividing the energy produced by the square of the distance from the heat source. Any structure 100 feet from the native fuels (two times the maximum flame length) is expected to have a radiant flux value of less than 20 kW/m^2 on the exposed structure which will be acceptable given the residence time for the 60 mph wind event based on Newton's Inverse Square Law. (Figure 28, below).

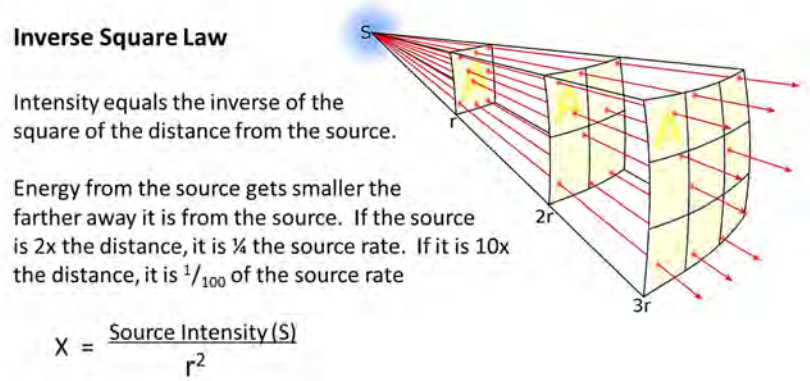


Figure 28 – Inverse Square Law

While this is simplified, it is accurate at a general level. Several models exist for the calculation of the Radiant Heat Flux on a structure from various fire sources. Most are complicated and require a set of complex assumptions that must be made. The Inverse Square Law does not specify a unit of measure. The decay is relational between the distance and the source. The drop in heat from the source to distance r is relational to distant 2r and 3r. Firesafe uses a simple formula as a "yardstick" for generalized assumptions about radiant heat from fire. This formula is the FI (Fireline Intensity) from the Behave outputs over the distance in feet squared. Because Newton's Law is relational, it does not specify a unit of measure. Firesafe has derived a "rule of thumb" from the research done by several researchers to provide some rationale for why we use "two times the maximum flame length" rather than some other distance.

Making the calculation in meters and then converting the distances to feet means that the 93,360,779 kW/m from the 50-foot flame lengths in the sh7 fuel model provides a radiant heat flux of 9.3 kW/m^2 using the formula at 100 feet of separation from the native fuels to the structure. Firesafe uses the

Fireline Intensity (FI) and divides this by the distance in feet squared and arrives at a value under 10 kW/m^2. This method will always overestimate the radiant heat flux by 17% over the meter formula which adds to the safety margin in the design criteria.

In nearly all cases, two times the maximum flame length will provide a radiant heat flux value of about 10 kW/m^2 or less. This stands to reason as flame length (LF) is a function of fireline intensity (*I*) in Byram's formula $LF=0.0775*I^{0.46}$ which most closely approximates the interchanges between these two values (fireline intensity and flame length) in the Behave program. We should be noticeably clear here; this is not the only factor of the amount of heat that might be subject to a specific structure. The real world is much more complicated than a simple formula. Most literature indicates that a hardened structure should be able to withstand 20 to 30 kW/m^2 for a period of 5 minutes or less and not ignite. Using the two times the maximum flame length on the worst-case fire should place the actual value much less than the ones calculated here when a fire actually burns in the interface.

Jack Cohen's SIAM (Structural Ignition Assessment Model) uses a radiant heat flux threshold of 20 kW/m^2 for 5.5 minutes as the baseline for structure ignition (Cohen, J.D., 1995. Structure Ignition Assessment Model (SIAM), USDA Forest Service Gen. Tech. Rep. PSW-GTR- 158). The residence time for a fire within the adjacent wildland would have a residence time of less than one minute under the worst-case scenario; far below the 5.5 minutes needed and would not have sufficient heat beyond the fuel medication zone to ignite any structures. The adjacent wildland areas simply lack the quantity of fuel necessary to burn at a high rate for a time period long enough to create a radiant heat issue at the distances provided at two times the maximum flame length.

The third method of fire encroachment is convected heat. This impact area is generally about 75% of the radiant heat impact zone. While small pulses of convected heat may exceed the radiant heat zone and be a danger to the respiratory tracts of firefighters, these pulses are not sufficient in duration to cause ignition of structural materials. This factor can change when large fuels are below the subject property and burn for an extended duration prior to the flaming front impacting the interface. This would be a condition where the Model 4 fuel model would be more appropriate creating a separation distance of over 200 feet. This condition does not exist on the project site. To be clear, the amount of radiant heat or convected heat that a structure can withstand and not ignite is far more than the human body can withstand. As indicated in Figure 29, on the next page, a rate of 18 kW/m^2 is fatal to 50% of those exposed for 30 seconds while a structure can withstand 20 kW/m^2 for over 5 minutes without igniting. These are not interchangeable environments.

The final method of fire encroachment would be embers and brands. These can and will travel great distances. The project site will be protected from this threat by compliance with California Residential Code Section R337. (*Section R337 applies to building materials, systems and/or assemblies used in the exterior design and construction of new buildings located within a High Fire Hazard Areas. Area covered by this section include: Roofing, Exterior Covering, Roof Eaves, Floor/Underfloor Protection, Decking, Venting and Exterior Windows/Doors*)

The use of the Behave model for the structure protection calculation is enough information to make reasonable assumptions and decisions on distances, configuration and acceptable risk. The calculations for community risk are more difficult and involve the issues of time, distance, and shielding.

Fire Access and Egress Route Analysis

This report also addresses how a fire might impact the two existing access roadways, Del Valle Road and Chiquito Canyon Road, which provide access to the project site and the surrounding community. This report will not address traffic modeling issue, which are addressed by traffic engineers in another report nor does this report provide the trigger points that could be developed for precautionary evacuations which need to be completed with the input from all stakeholders (Fire, Law Enforcement, Public Works, Disaster Management, Community Leaders, etc.). This report will analyze the expected fire behavior, how and when it might impact the community and the access roadways.

$Btu/s/ft^2$	kW/m^2	Time to Ignition		
Rate	Rate	seconds	minutes	
17.3	60	10	0.17	
14.4	50	16	0.27	
11.6	40	28	0.47	
10.7	37			Damage to process equipment and collapse of mechanical structures
9.0	31	60	1.00	
8.7	30	66	1.10	
6.4	22	210	3.50	
5.8	20	337	5.50	Piloted wood ignition after 5.5 minutes
5.2	18			Death in 50% of victims after 30 seconds
4.6	16			Blistering of exposed skin after 5 seconds
3.6	12.5	1,200	20.00	20 minutes to ignition/2nd degree burn in 8 seconds
2.9	10			Pain on exposed skin after 3 sec/ death in 1% of victims after 40 seconds
2.0	7			Max exposure in PPE for 90 sec
1.8	6.4			Pain on exposed skin after 8 sec
1.4	5.0			2nd degree burns on exposed skin in 40 seconds
1.2	4.3	18,000	300.00	5 hours to ignition
1.2	4.0			First degree burns after 20 seconds
0.7	2.3			Pain on exposed skin after 2 minutes
0.6	2.1			Minimum to cause pain after 60 second
0.5	1.7			Minimum to cause pain
0.3	1.0			Equal to the maximum radiant heat transfer on a clear sunny day

Figure 29 – Calculation of Radiant Heat Exposure

Time is the first issue. Is there enough time to react to a fire before the impacts are upon the community and if there is not time, how long will the exposure last? The issue of reaction involves the location of the fire in relationship to the community. If the fire is close, the reaction time is shortened but the size of the fire should be smaller, at least initially. California's history with wildland fires has clearly shown that populations in transit do not fare well in wildland fire conditions. Many of the fire deaths in California have been people trying to escape after the fire was upon them or in proximity to them. Moving populations out of "harm's way" is a complicated matter. Whenever possible, it is best to move the most at risk first. Having a safe route and a place which is safe are essential to making the decision to move people ahead of a fire.

A 2011 publication on this matter provides some excellent insight:

> No single protective option represents a universal solution to eliminating casualties in fire-prone areas—each one has circumstances where it eclipses the others as the best form of protection. For example, the 2003 Cedar Fire in San Diego County, California

involved evacuating hundreds of thousands of residents, but some last-minute evacuations by residents near the San Vicente Reservoir resulted in 14 fatalities. At the same time, a few neighboring households successfully sheltered in their homes [10,11]. Refuge shelter was also used in this event, as an estimated 300 people were directed to stay put in the Barona Casino rather than attempt to evacuate. In 2008, thousands of residents successfully evacuated from the path of the 2008 Tea Fire in Montecito, California, while an estimated 800 Westmont College students sought refuge in a campus gymnasium [12]. In general, evacuation, refuge shelter, and in-home shelter have all resulted in successful and unsuccessful outcomes in protecting people in wildfires and developing effective community protection plans is a significant policy and research focus. Cova, Thomas & Dennison, Philip & Drews, Frank. (2011). Modeling Evacuate versus Shelter-in-Place Decisions in Wildfires. Sustainability. 3. 1662-1687. 10.3390/su3101662.

The project site and Val Verde Community depend on Del Valle Road and Chiquito Canyon Road , which are fully paved public roads, for ingress and egress to the area. These two access roadways are separated by the community and some wildland areas. For a fire to impact both access roadways simultaneously, the fire would have to burn in a certain direction and could only originate in the upwind area of both roadways. Figure 30 below provides the three wind scenarios which are supported by the fire and weather history. These include a NE/SW travel, N/S travel and fire from the predominant onshore W wind.

Figure 30 – Orientation of Access Roadways to Wind/Fire Travel Paths

Using Hunstock Road and Chiquito Canyon Road as a start point, it is 1.9 miles to State Route 126 and 1.4 miles along Del Valle Road to a point on Hasley Canyon Road where it becomes a four-lane divided road (Figure 31, on next page). The project site will connect Chiquito Canyon Road directly with Del Valle Road (leaving Hunstock as an alternative). When the project site improvements are completed, the distance from the eastern edge of the project site to the same point on Hasley Canyon Road will be 0.75 miles or approximately half the distance.

Figure 31 – Wind/Fire Directions and Access Roadway Distances

In terms of fire related impacts, the reduction in the distance the roadway will travel through unmanaged vegetation is extremely important. A review of the fire history for the past 50 years indicates that no fire has burned through the community. Some fires have burned into the community but as whole, the community has served as a barrier to the fire's advancement as shown in Figure 32, on the next page, where the core of the community has no fire history.

With this in mind, a fire must travel around the community to impact both access roadways. The expansion of the community with the proposed project site will reduce the length of the Del Valle Road access which is susceptible to fire impacts by half. The areas within the new Project Site will be protected by fuel modification zones and managed in terms of the vegetation not only at the roadside but in the entire project site.

Chiquito Canyon Road will not be involved in the project site improvements, but it should be noted that only one fire in the past 50 years (Piru 1988) has burned up to Chiquito Canyon and continued on the other side. This fire crossed south of the Val Verde community. As illustrated in Figures 32 and 33 on the next two pages, the development of the Commerce Center Industrial Park in combination

with the improvement of the project site will create a small area of remaining vegetation that can burn between the two access roadways. In fact, a West or East wind will not impact this area and a North wind has limited ability to burn over both roads without a significant wind shift (Figure 33, on page 37).

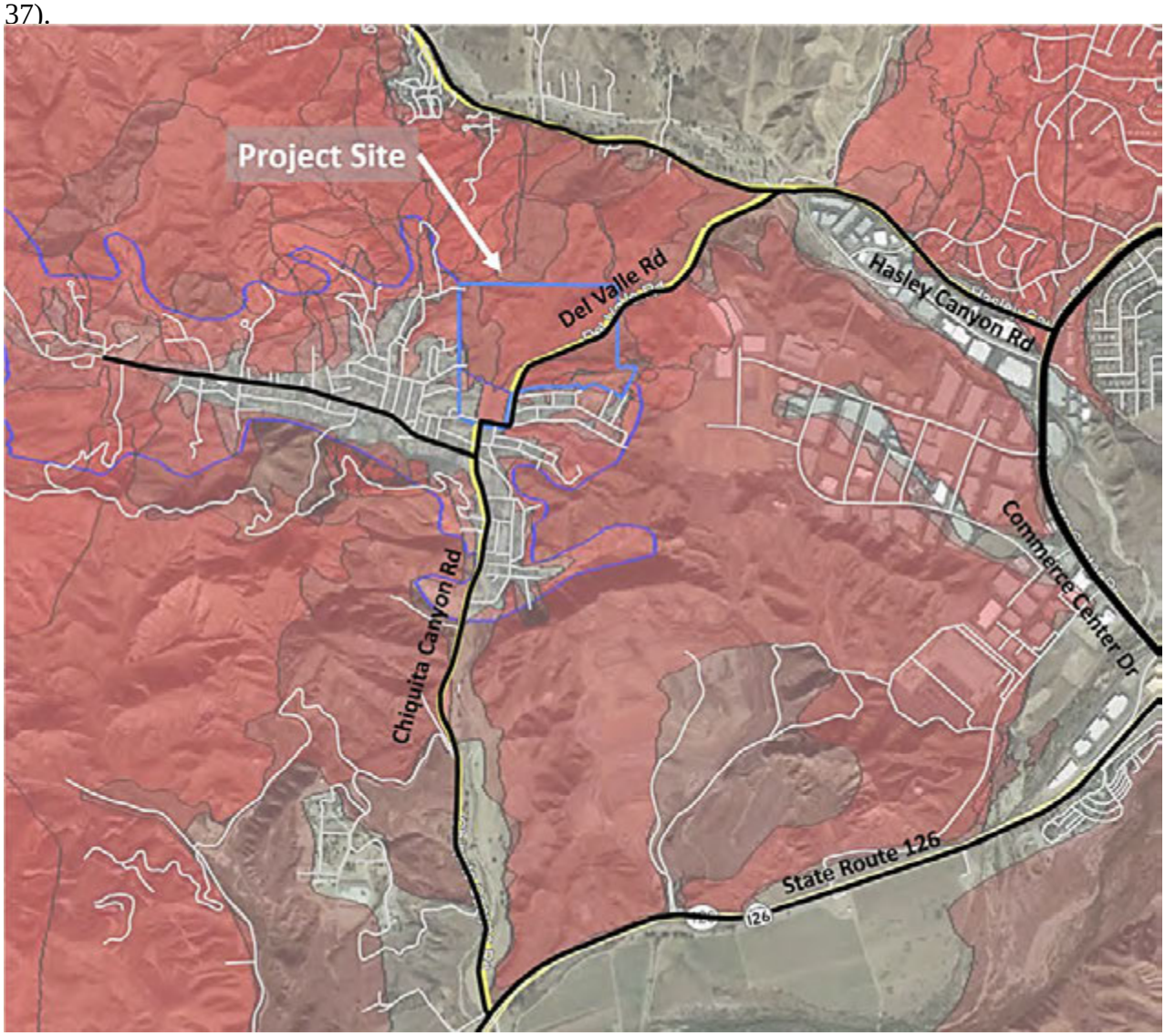


Figure 32 – Fire History Overlay (Past 50 Years)

In order to establish how a fire might impact the two access roadways, several locations have been selected to create fire scenarios for analysis. Five specific, points fire locations and four, line fire areas were established for analysis (provided in Figure 34, on page 37).

These points/lines were then modeled with different wind and weather inputs. Using FlamMap, NE, N and SW fire scenarios were completed and with the FARSITE program, fire weather from the Rye and Thomas fires was used. An additional June heat generated onshore was also used as discussed earlier in this report.

For each of the scenarios Firesafe was looking to the see if the fire would impact both access roadways in the same timeframe. To do this, we focused on "Arrival Times", "Major Flow Paths" and "Fire Perimeters". The modeling software has many outputs and some other output will be used but in order to be useful in comparison, the analysis has used the arrival times as the primary focus.

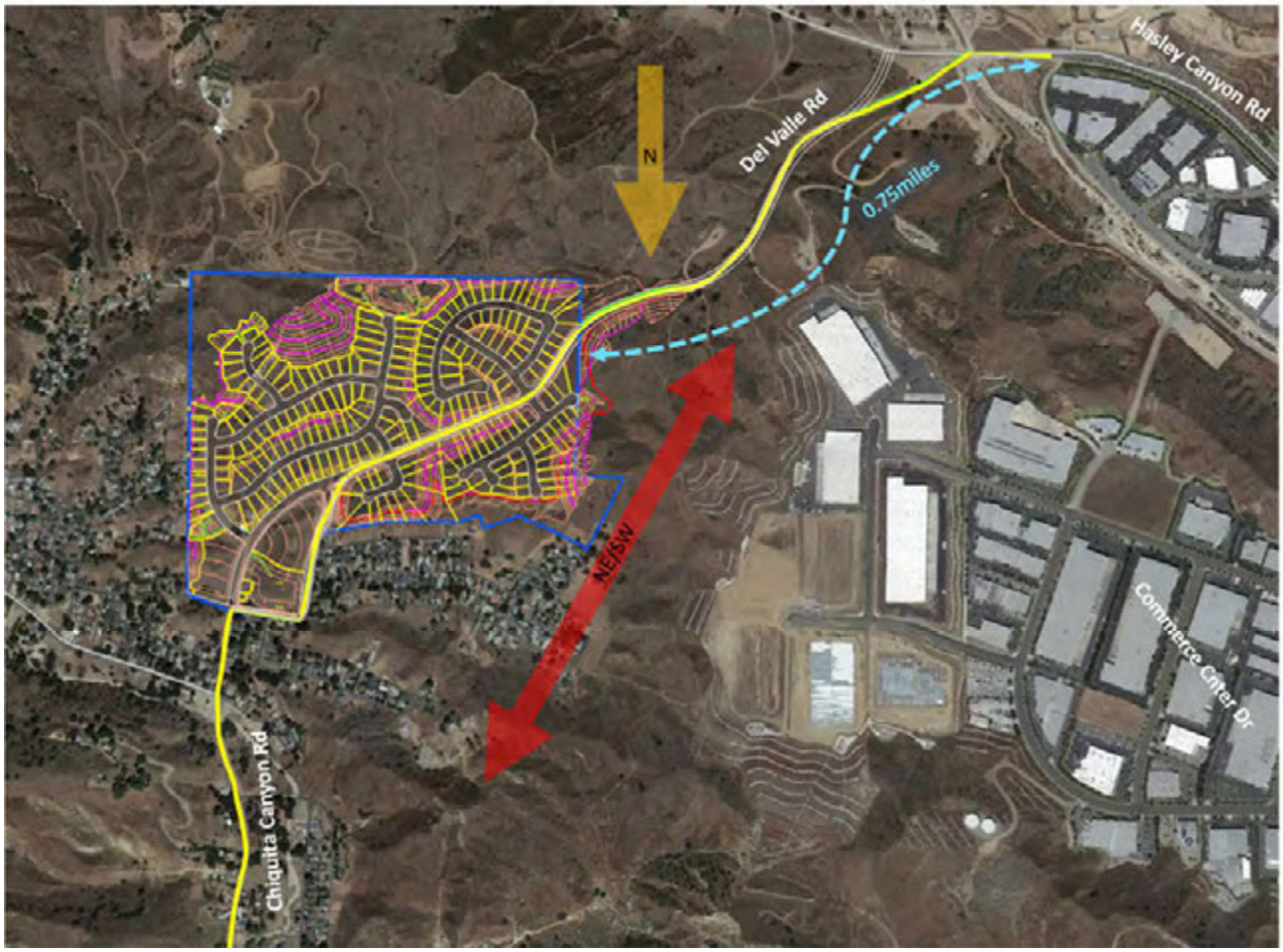


Figure 33 – Identification of Pinch Point between Project Site/Val Verde and Commerce Center Industrial Park

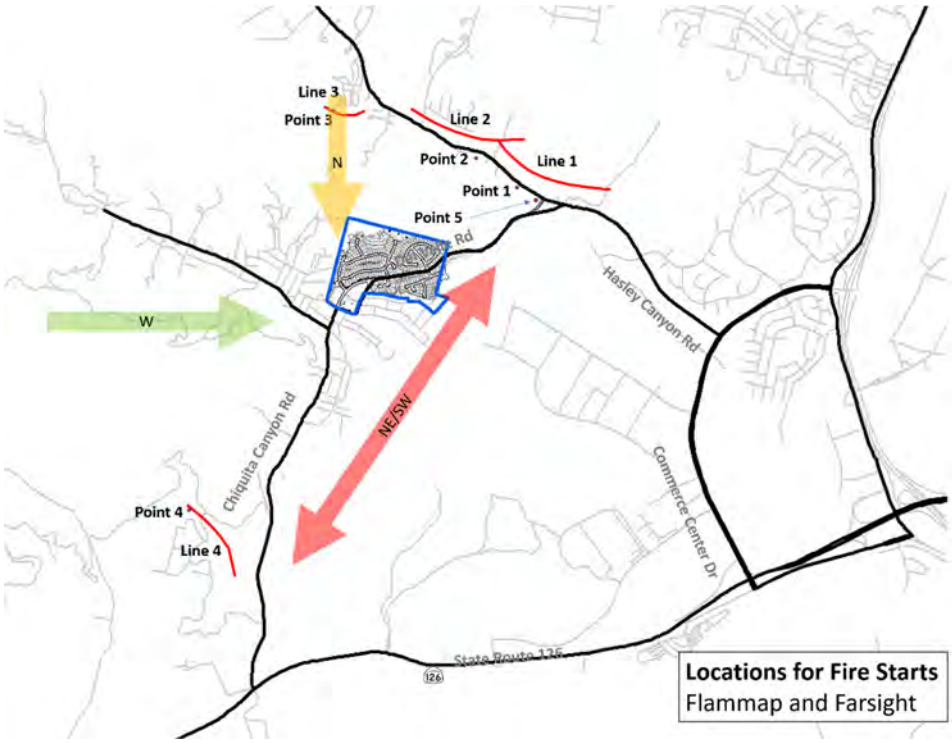


Figure 34 – Location of Start Points and Lines used in modeling scenarios

Using FlamMap, a point fire scenario was completed using a 60 mph NE wind. The graphic below provided the approximate arrival times for the flaming front of the fire. The location was used to maximize the impact to Del Valle Road. The fire impacts the road within 24 minutes but does not travel to the Chiquito Canyon Road interface for over two hours and does not cross the canyon for three hours. At the time the fire impacts the Chiquito Canyon Road access, only lateral and backing fire remain on the Del Valle Road access (only a small portion of the eastern section of the road would be impacted. This point source fire could be discarded smoking materials, a road flare from a car accident, a lightning strike, a downed power line or any number of other source point fire ignitions. Each of the source point fire needs to accelerate into a fire burning in equilibrium before it can burn at the maximum rate for the conditions in that specific area. Line fire (a line of fire or edge of an existing fire front) does not have this same component in the analysis.

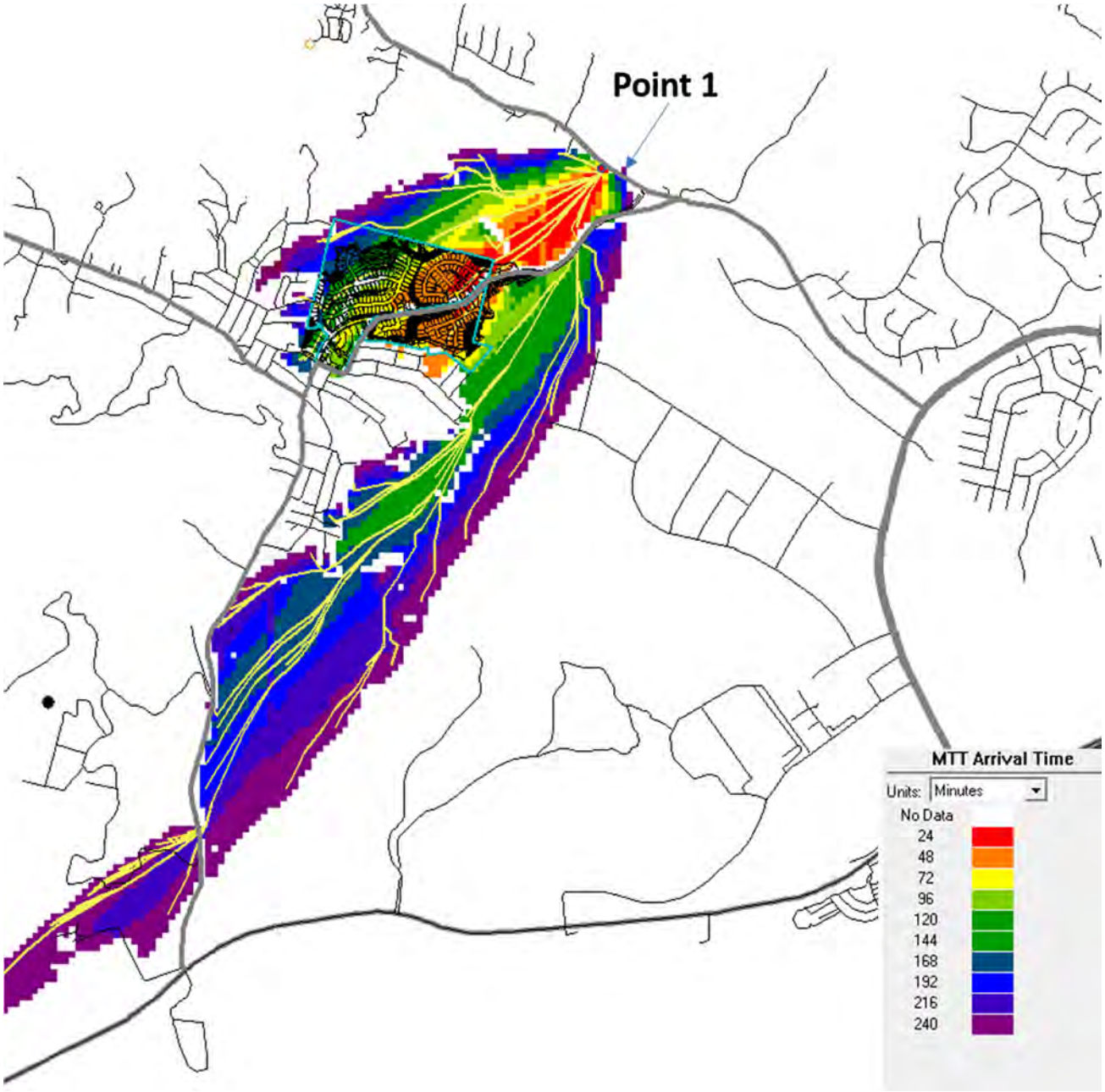


Figure 35 - FlamMap Arrival Times for Point Source Fire at Location 1

In this scenario, the fire was allowed to burn through the project site with the current fuel loading to illustrate how the entire Del Valle Road would be impacted in the hours with the added protection of the project site development and fuel modification zones.

Point source fires normally have little warning and can occur at any time or place. Line fire inputs are to see the impacts of an existing fire burning into the community. In the case of the Life Fire 1 location, it assumes the head of fire coming from the NE. It was placed on the NE side of the road to account for the impacts of the roadway on the fire behavior. The outputs for the line fire scenario are significantly different than the point fire outputs.

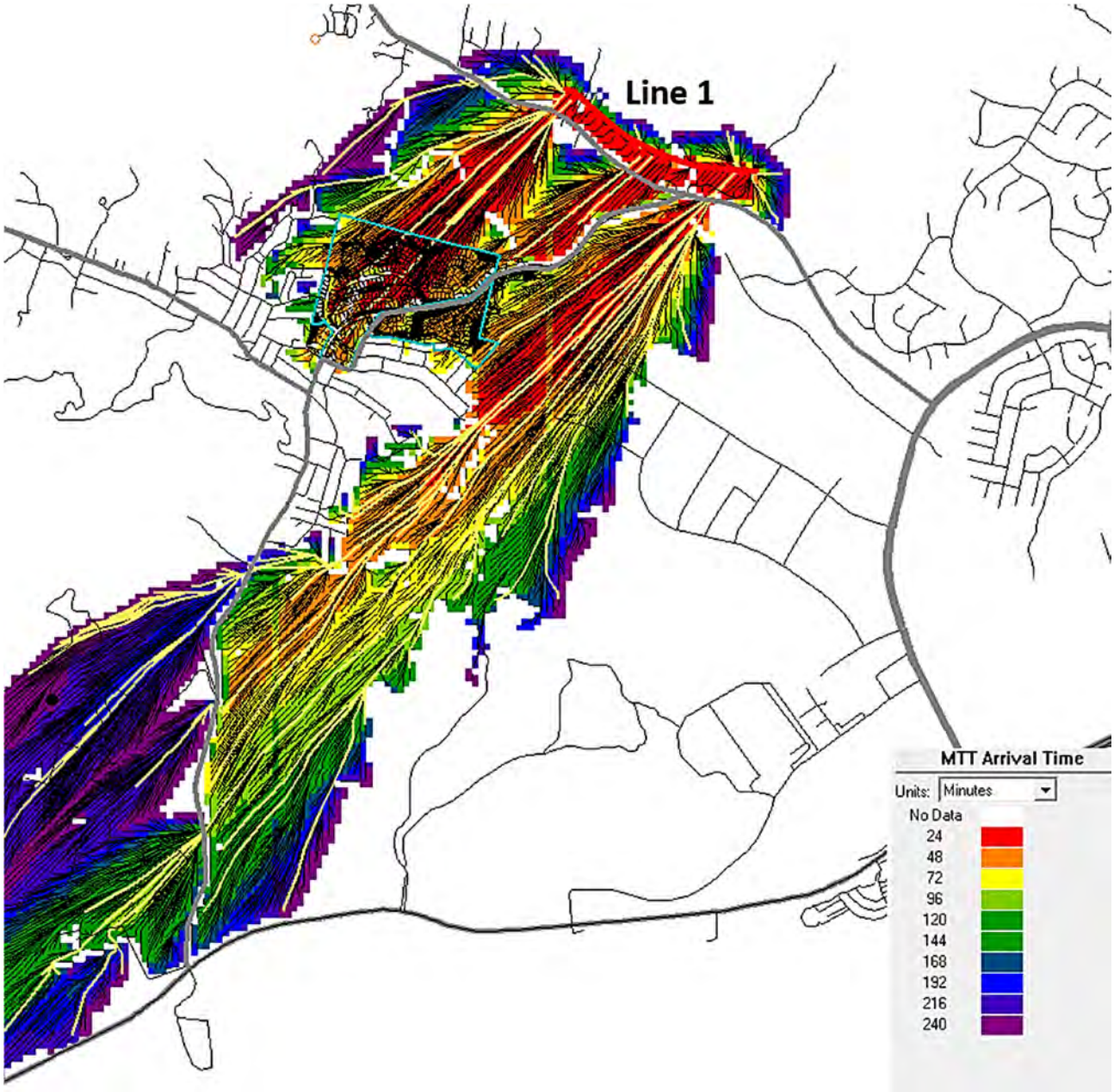


Figure 36 – FlamMap Arrival Times for Line Fire at Location 1

Due to the size and extent of the line of fire vs the point source fire, the fire travel and arrival times are much sooner to the access roadway. The complete length of Del Valle Road is impacted in under

24 minutes and the fire front reaches the Chiquito Canyon Road in 48 minutes. This is the scenario that would require the incident commander(s) or field officer of the fire and law enforcement agencies to decide on how to protect the citizens. Below is a simple decision tree for evacuation vs. protecting people in place. Evacuation is always the preferred option but sometimes, it is not possible. It should be noted that the scenario runs from the time the fire impacts Halsey Canyon Road. This fire would have already been burning and would no doubt be discovered and emergency personnel would be working on the decision below before the fire came to the point of the scenario but the modeling shows that if the fire reaches this point, evacuation is not a likely choice. If there is not enough time to safely move the population at risk to an uninvolved area, consideration of where to best protect them is the next action on the decision tree.

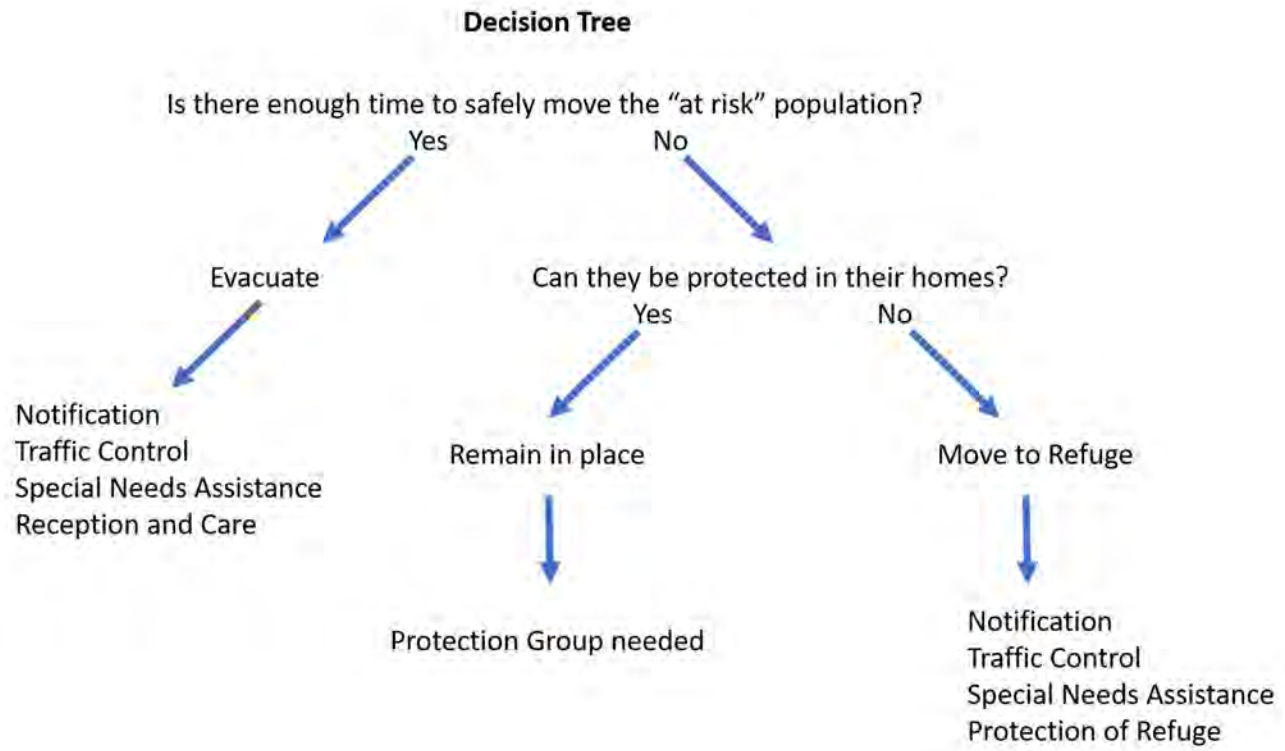


Figure 37 – Evacuation Decision Tree

For the project site, a remain in place order is not significant. Evacuation, if possible, is the safest and best choice but the new community will have fuel modifications zones, Chapter 7A/Section R337 construction features (including radiant heat mitigations, ember resistance and limited use of combustible materials on the exterior of the structures), wide streets, good water supply and defensible space around the structures. Fuels to the north and east of the project site are light to moderate at the edge of the Project Site. Only limited fire resources would be needed to protect the project site. Other portions of the Val Verde Community were not built to current codes, do not have wide streets or a robust water supply. For these reasons, the project site would be a good choice for refuge to the existing community if evacuation is not a possible for any reason.

FlamMap uses static wind and weather inputs to complete the grid by grid analysis (just as Behave uses static input) but FARSITE completes its calculation based on hourly changes to the wind and weather inputs. As indicated previously, the actual conditions for the Thomas and Rye fire have been used in the specific FARSITE scenario that have been completed. In Figure 38, on the next page it is

possible to see the impacts of the changing wind/weather condition on the fire behavior for a point fire at location 1. Note the increase westerly spread (more from the Rye Fire than from the Thomas Fire but significantly more than the FlamMap output which computes only the NE wind for the duration). *The FlamMap Flow Lines have been imposed on all three scenarios to provide reference points*

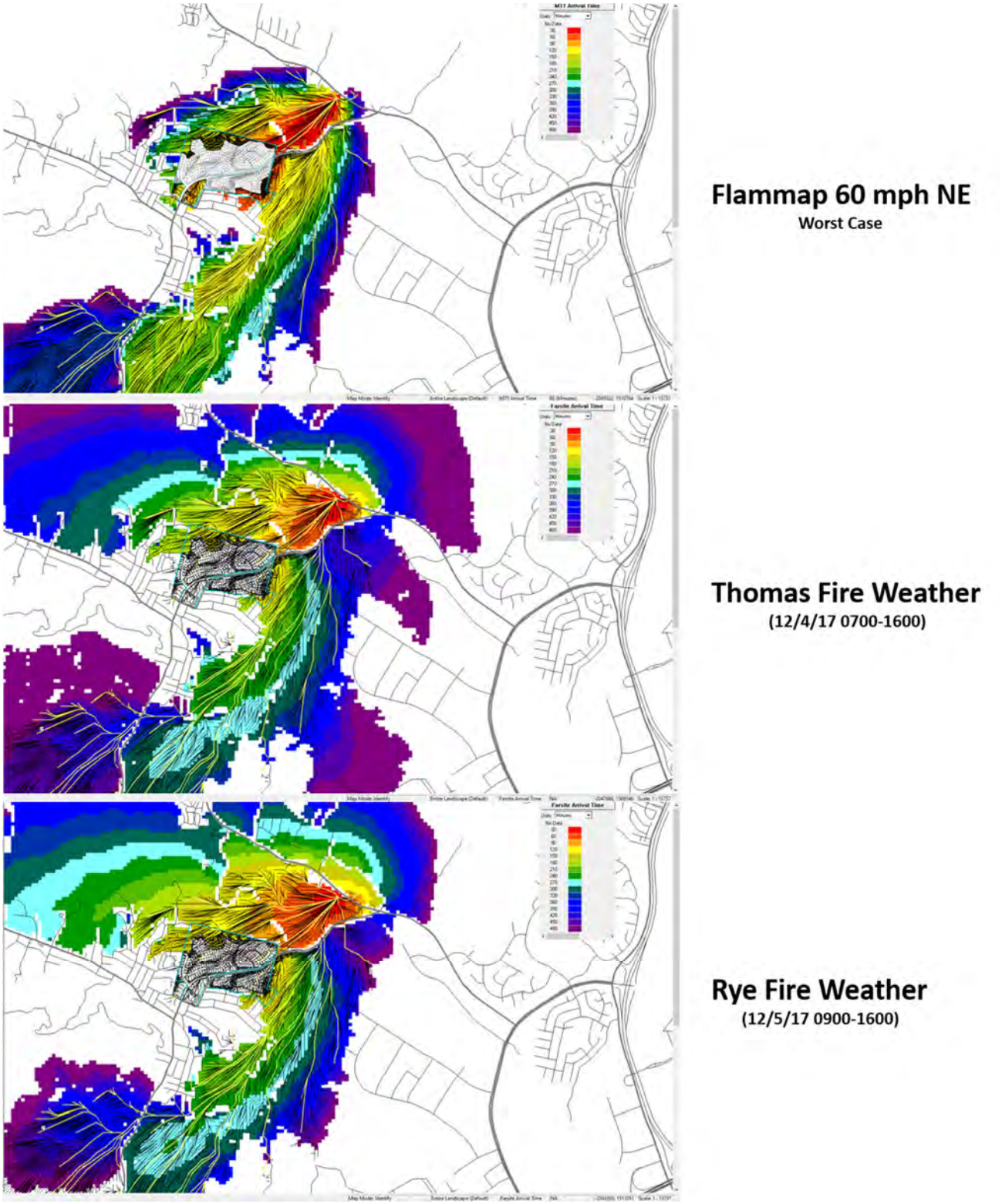


Figure 38 – Comparison of FlamMap and FARSITE Outputs for Source Point fire at Location 1

In all three cases (FlamMap NE 60 and FARSITE Rye and Thomas Fires for Point 1) the fire eventually burned through the gap between the Val Verde community and the Commerce Center Industrial Park. The fire moves the fastest in the FlamMap scenario where the NE wind is constant. This is the case with other ignition points as well. If the point of origin is moved to the NW, the fire burns directly into the community and the project site (Figure 39, below). Without suppression efforts, the fire will eventually burn around the east and down the State Route 126 but without alignment, it will be slow progress.

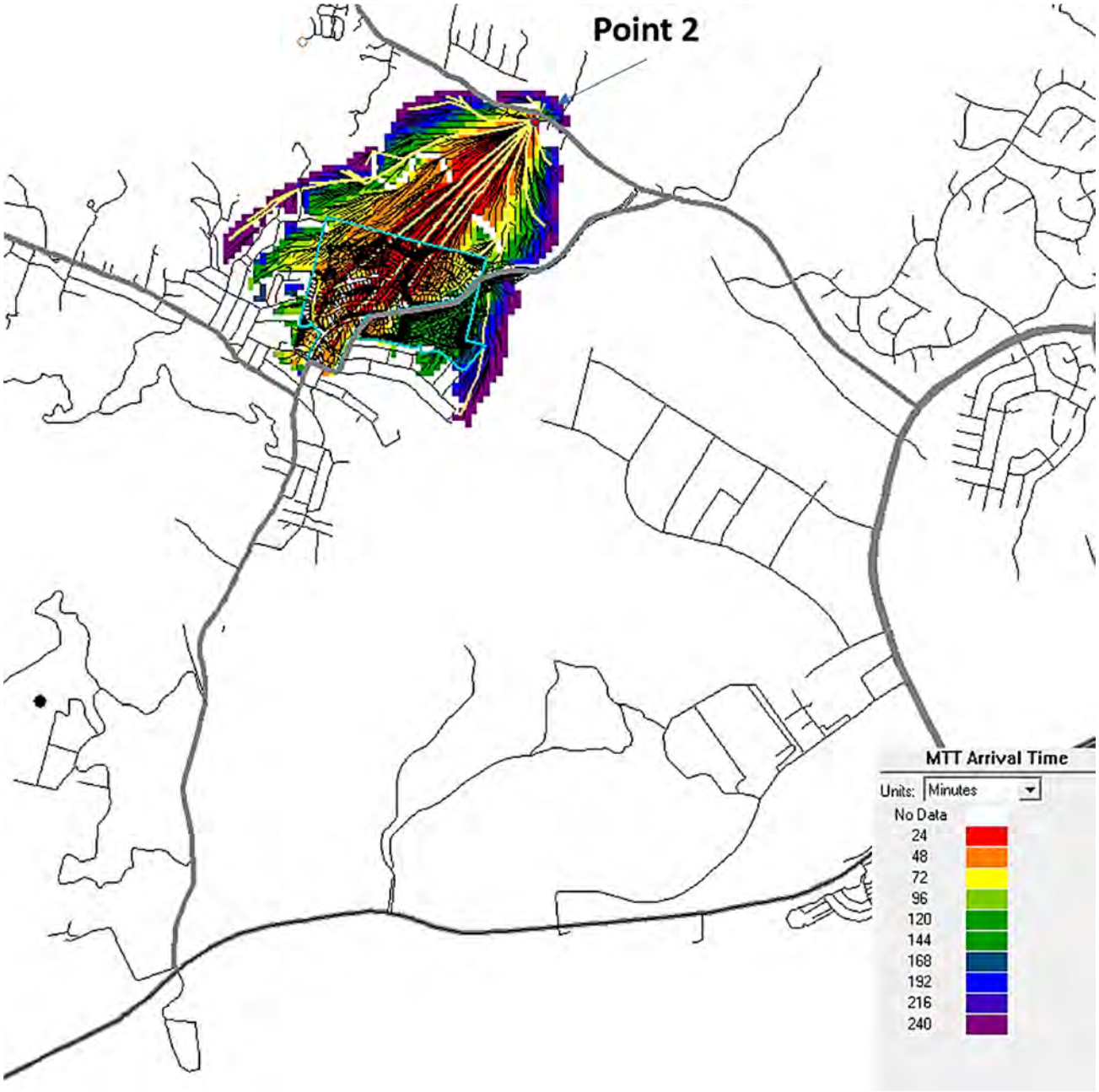


Figure 39- Northeast wind at 60 mph from a Source Point ignition at Point 2

Compare that with a North wind at the same location and the fire behavior is significantly different. The alignment of wind and fuels has the fire running hard to the south; reaching State Route 126 about two hours where the NE wind did not make it past Hunstock Road in eight hours (Figure 40, on the next page.

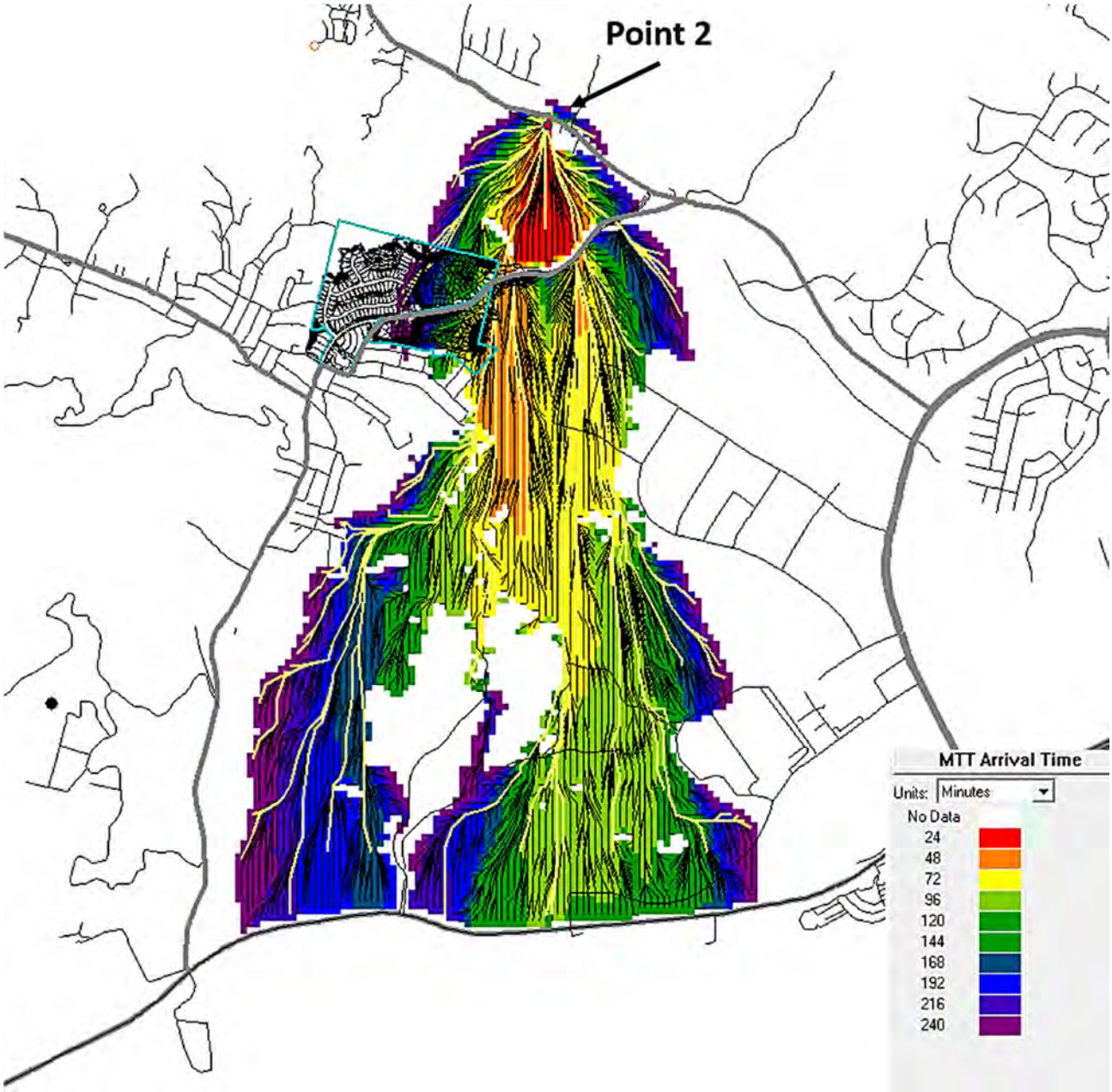


Figure 40 - North wind at 60 mph from a Source Point ignition at Point 2

Figures 41 and 42, on the next page, provide the results of the Line Fire scenarios for the N and NE winds. In four hours, the Chiquito Canyon Road access is not impacted from this location.

On page 45, Figure 43, a Line Fire scenario was used to Location 3. This scenario showed that the fire would not necessarily run around the west side of the community (it could still spot over the community but even with a spotting probability of 90%, the model did not show that outcome).

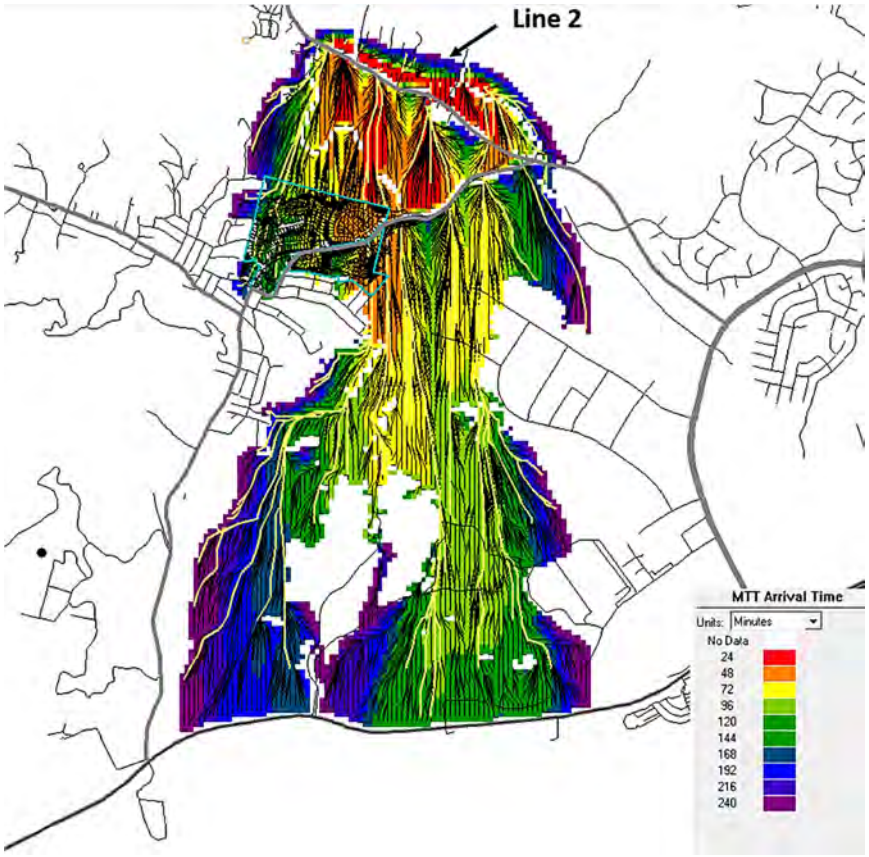


Figure 41 – FlamMap North Wind from Line Fire from Location 2

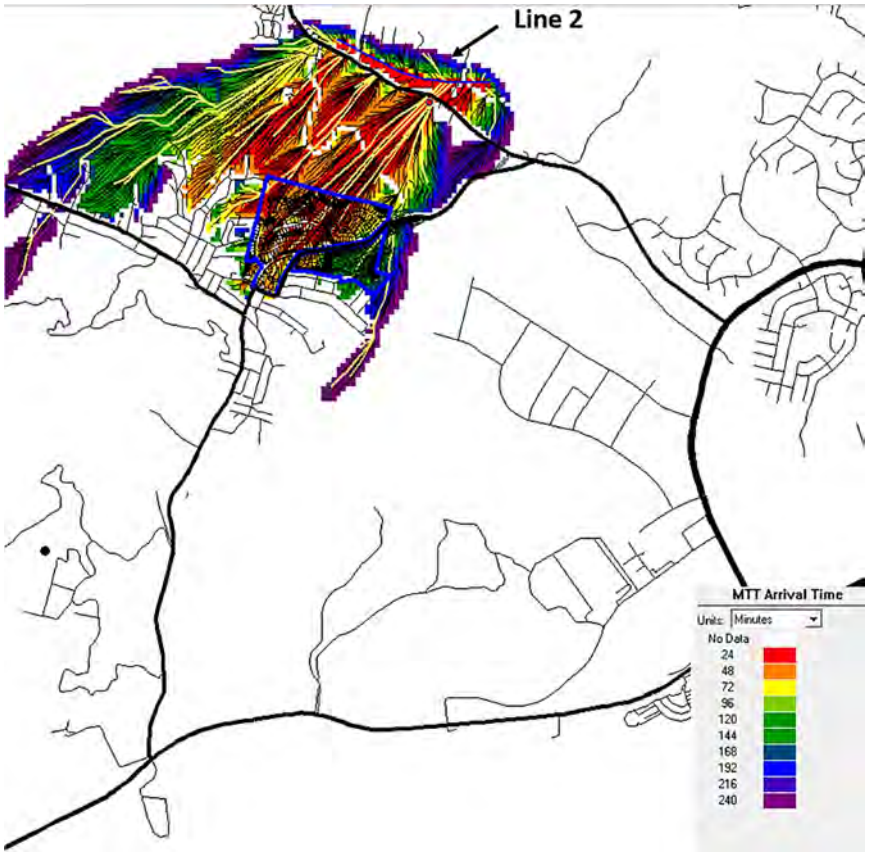


Figure 42 – FlamMap Northeast Wind Line Fire from Location 2

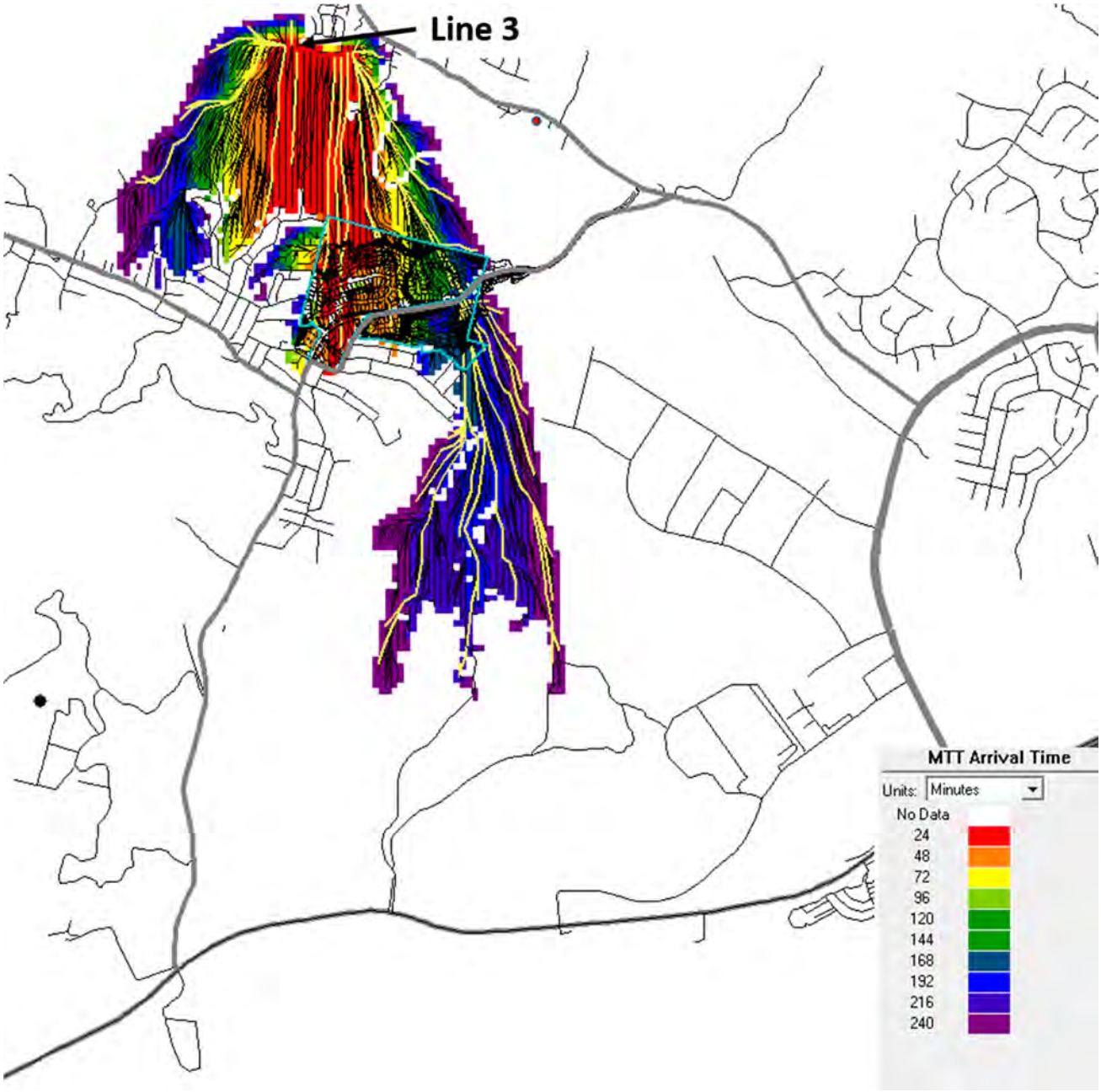


Figure 43 – FlamMap North Wind Line Fire from Location 3

It is necessary to see the impacts of an onshore fire run as well. A Line Fire scenario was completed at Location 4 using a 30 mph SW wind (unusual but not impossible) in the FlamMap and FARSITE programs. Figure 44, on the next page, provides the FlamMap output. The fire closes the Chiquito Canyon Road access quickly but takes about two hours to work its way up to the Del Valle Road access. By the time Del Valle Road is impacted, the head of the fire has passed the Val Verde Community and only lateral and backing fire is remaining as a threat. Given the wind direction and vegetation at the mouth of Chiquito Canyon, it is very likely that law enforcement could escort evacuees down and out of the community through Chiquito Canyon, but unless a wind shift is expected, the residents are likely safer remaining in place at this point.

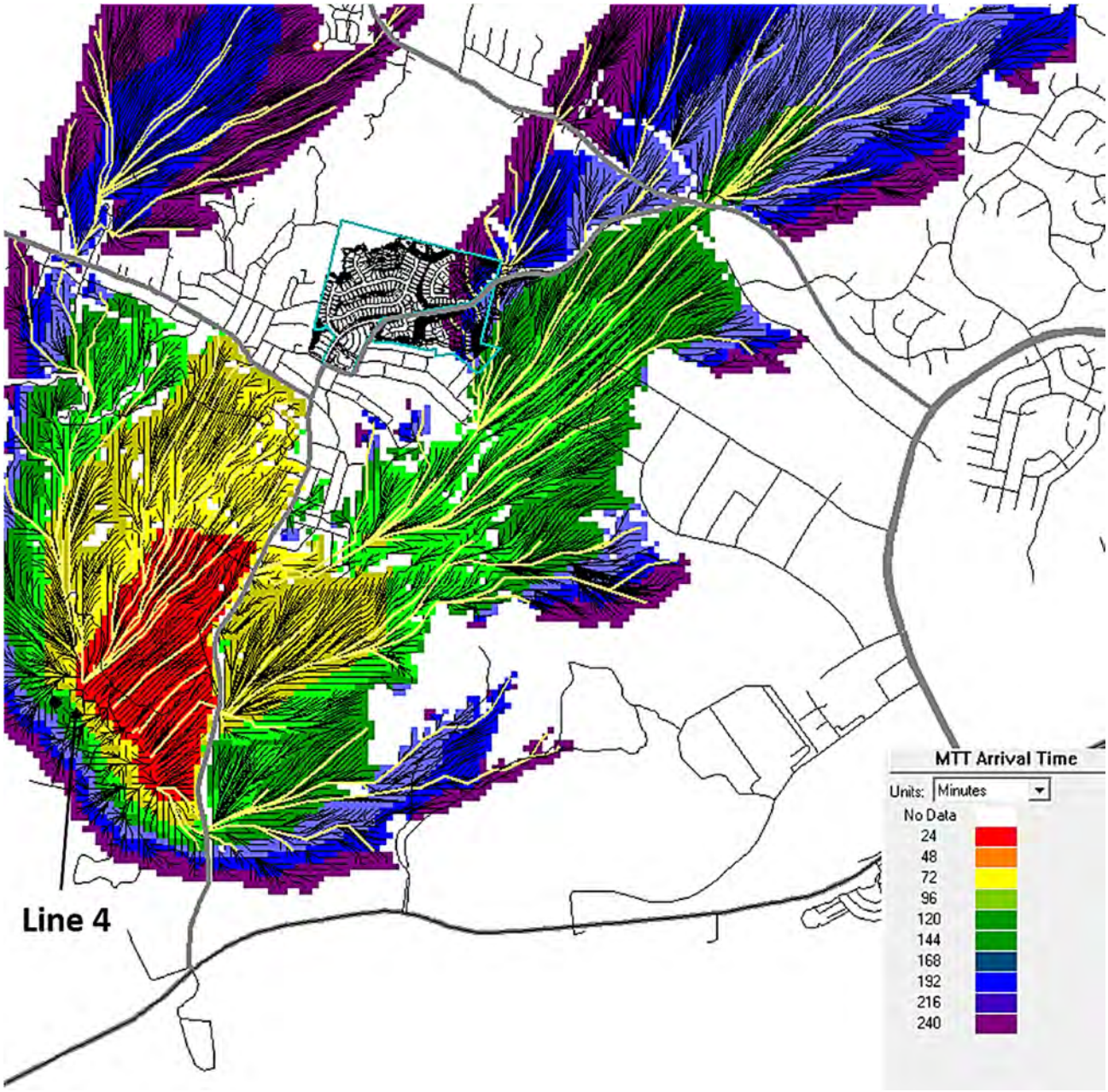


Figure 44 – FlamMap SW 30 mph Line Fire Scenario

Figure 45, on the next page, is the FARSITE output for the June 2017 onshore wind event detailed earlier in this report. As indicated, the movement is more easterly from the predominantly West wind. Without the sustained SW push, the fire does not impact the Del Valle Road access in the hours used in the modeling.

The W and SW winds are not a factor for creating a condition where both Chiquito Canyon Road and Del Valle Road would be impacted simultaneously.

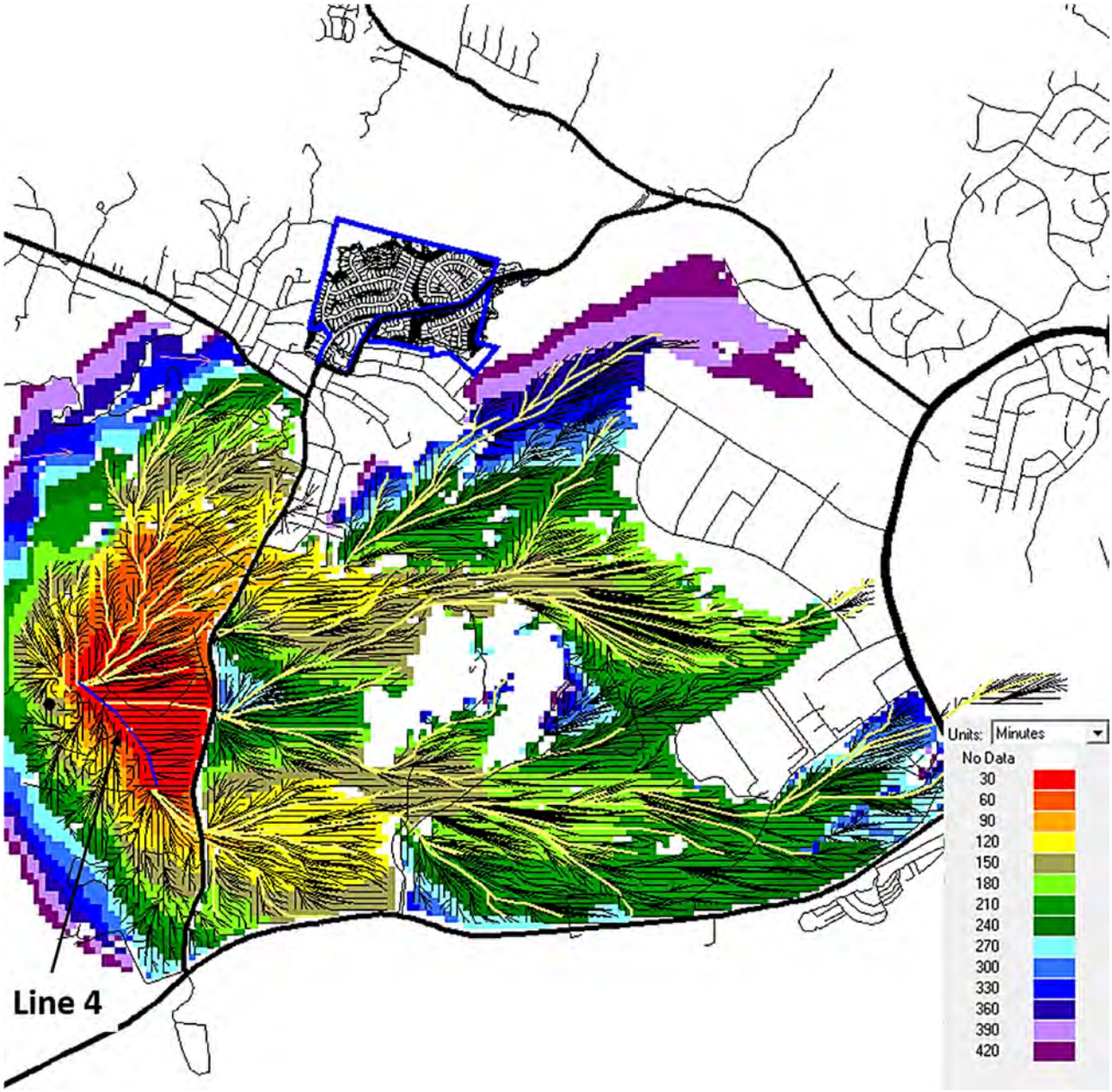


Figure 45 – FARSITE Onshore June 2017 Line Fire from Location 4

In the final analysis of this report, two, point source, fires are simulated from the NE with winds are 60 mph. Point 5 was selected as the most impactful location for a Point Source fire. Point 3 was included to show the effects of the different fuel and the impact of Del Valle Road (it runs parallel with the wind making it a more substantial barrier than it would be if it were perpendicular). The fire from Point 3 runs much faster into the community as it is mostly grasses. The fire at Location 3 will be impactful to that portion of the community but it will be over very quickly, and refuge could be taken in other parts of the community including the project site without evacuating completely out of the area initially. This would be an exact scenario where the Decision Tree process would be applicable.

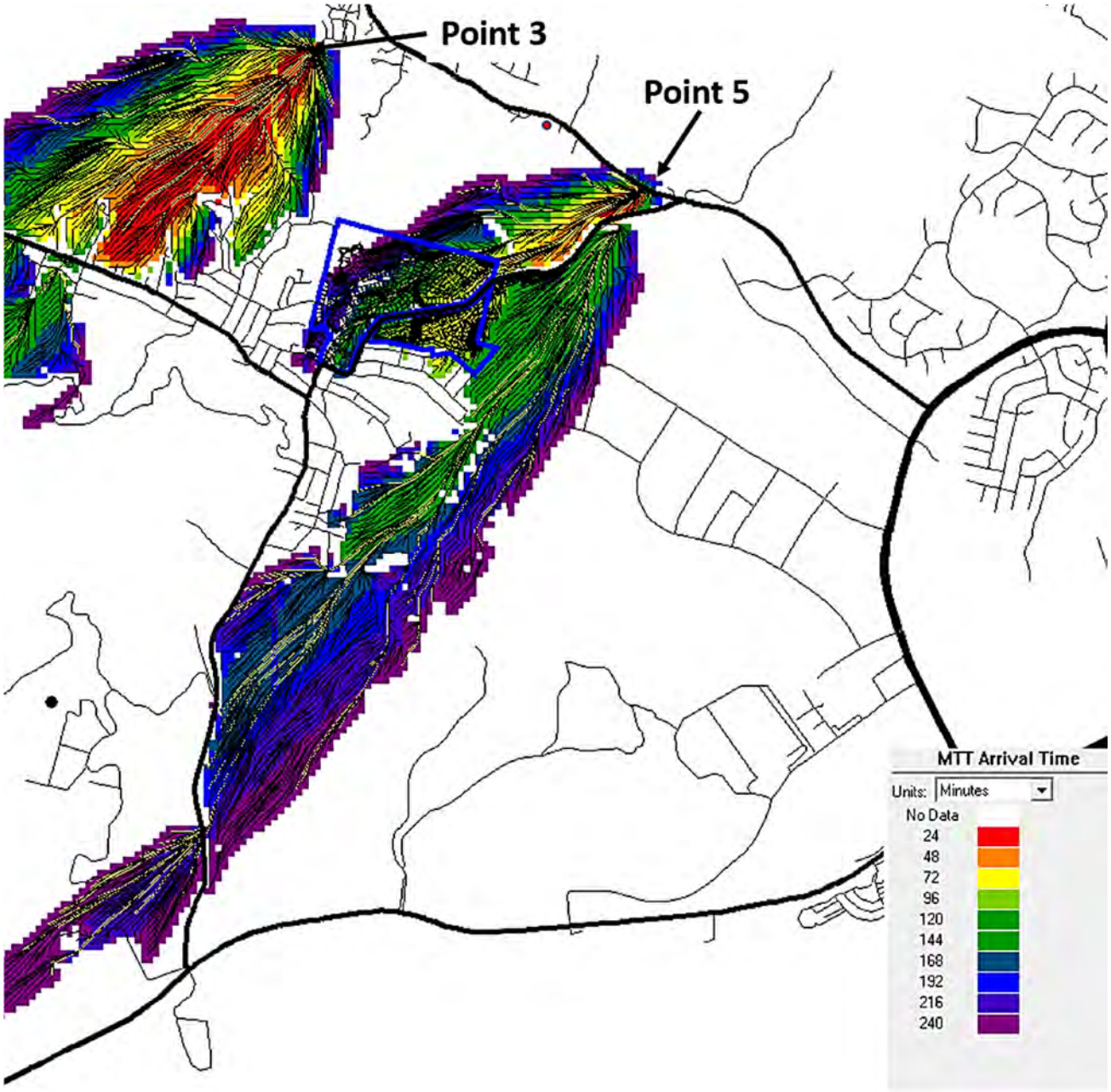


Figure 46 – FlamMap Scenario with Point Source Fires at Location 3 and 5

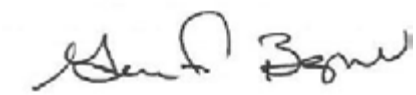
Fire Behavior Summary

The modeling indicates that flame lengths of just under 50 feet are possible under perfect fire conditions, in the worst case scenario in the interface at or near the project site. The design criteria for the project site must properly protect the structures from a wildland fire under these conditions. Most of the fuels are not aligned with the slope and wind and many of the interface fuels are not continuous enough to drive fire behavior to the level of the equilibrium spread rates used in the modeling for shrubs. In most of the areas adjacent to the fuel modification zones in the upslope condition, the areas are significantly wind sheltered. Criteria for these areas are less than the downslope area but are still within the prescriptive 100-foot distance. The entire defense system will be designed to protect all the structures regardless of specific location adjacent to the native fuels on the native vegetation interface to the Sterling Ranch Project Site.

Modeling for the purposes of examining ingress and egress reveals that even when a scenario can be constructed that impacts both of the access roadways (Chiquito Canyon Road and Del Valle Road) by a single fire event, the distance between the two roads, the orientation of the winds, and the nature of the vegetation at the roadside does not result in an event that would close both of the roadways at the same time. In the fast moving scenario fire travels the distance between the two roads in less than an hour is oriented in the perfect location. However, this same speed with which the fire is moving equated to the fire impacts being completed and the fire moving on to the alternative access route which would allow for it to be used. In most cases, there are two or more hours between the impacts of the alternative roads. With the limited number of homes in the community, even with the new homes from the project site, there is both time and space to protect the residents within the community until safe passage is insured.

In accordance with the fuel modification plan, a landscape plan that utilizes a plant palette consisting of fire-resistant plants, native and appropriate non-native drought tolerant species in accordance with Los Angeles County Fire Department guidelines will be designed and implemented within the fuel modification zones. The Sterling Ranch fuel modification plan has been reviewed and approved by LA County Fire Department.

The technical results provided as part of the Fire Behavior Analysis within this report were obtained using BehavePlus Plus version 5.0.5, FlamMap version 6.0 and Wind Ninja 3.6 software.



Gene F. Begnell
Fire Protection Analyst

Fire Behavior Analysis and Report Summary

Based on the scientific fire behavior analysis, the exterior portions of structures within the Sterling Gateway Estates Project will not ignite from the exposure to a wildland vegetation fire with the distances and configuration included in the project as designed, proposed and analyzed in this report. This is primarily because the greatest potential fire energy is too far away from the proposed structures due to lack of wildland fuels and fire intensity as it approaches the Project Site from the easterly direction; all of other edges of the Project Site are developed with residential uses. This does not account for windows or doors which are left open or other factors which may increase the risk of ignition but are not a factor of the design or construction of the Project Site.

The Fire Behavior modeling shows that the performance-based design offered for the Project Site provides the protection necessary to keep the structures safe during a wildland fire incident within the adjacent native fuels and that additional distance would not necessarily increase the safety of these structures beyond what is already provided by the approved Fuel Modification Plan for the Project.

The codes enforced by the Los Angeles County Fire Department for Fuel Modification and Hazard Reduction were developed to address the exact type of fuels that are interfacing with the development area of the Project Site. The approved fuel modification plan meets or exceeds the accepted fuel modification criteria provided by the prescriptive fuel modification distances and configuration. Based

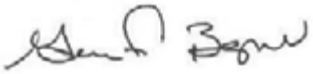
on the analysis, no modifications to the design of the Project or additional mitigation is recommended for the issues covered in this report.

Additionally, the use of FlamMap and FARSITE modeling software provided objective data outputs for consideration in the use and effectiveness of the two access roadways which serve the existing community of Val Verde and the Project Site. While it is possible to create a model scenario where fire travels across both Chiquito Canyon Road and Del Valle Road in the same fire event, the modeling showed that the timeframe in which this could happen is separated by hours in most cases, and in the case of an extremely fast moving fire (about an hour) the fire activity was completed on the first impacted roadway before the fire front impacted the alternative roadway.

The Project will be constructed in compliance with applicable standards that will keep residents safe from an adjacent wildland fire. Unless enough time is available to move residents safely and without additional risk, they would be safer remaining within the Project Site until they can be removed with a high degree of safety. This decision will be made by emergency responders as needed. Firesafe recommends that the community as a whole adopt the Firewise Community standards and adhere to the Ready, Set, Go criteria developed and implemented within California and Los Angeles County. Firewise USA® is a voluntary program that provides a framework to help neighbors get organized, find direction, and take action to increase the ignition resistance of their homes and community. These criteria are available for review on the NFPA (National Fire Protection Association) website: https://www.nfpa.org/Public-Education/Fire-causes-and-risks/Wildfire/Firewise-USA

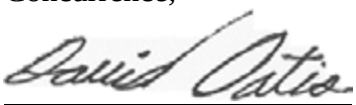
We recommend approval of this Fire Behavior Report as an accurate and acceptable assessment of the hazard and risk factors for the Sterling Ranch as they relate to wildland fire protection, Fuel Modification Zone design and fire department access/egress roadways. The Firesafe team is available to complete any additional analysis or to provide additional support materials for our position on this matter.

Respectfully;



Gene F. Begnell
Fire Protection Analyst

Concurrence;



David Oatis
Principal, Firesafe Planning Solutions

Appendix A

Site Photos Locations

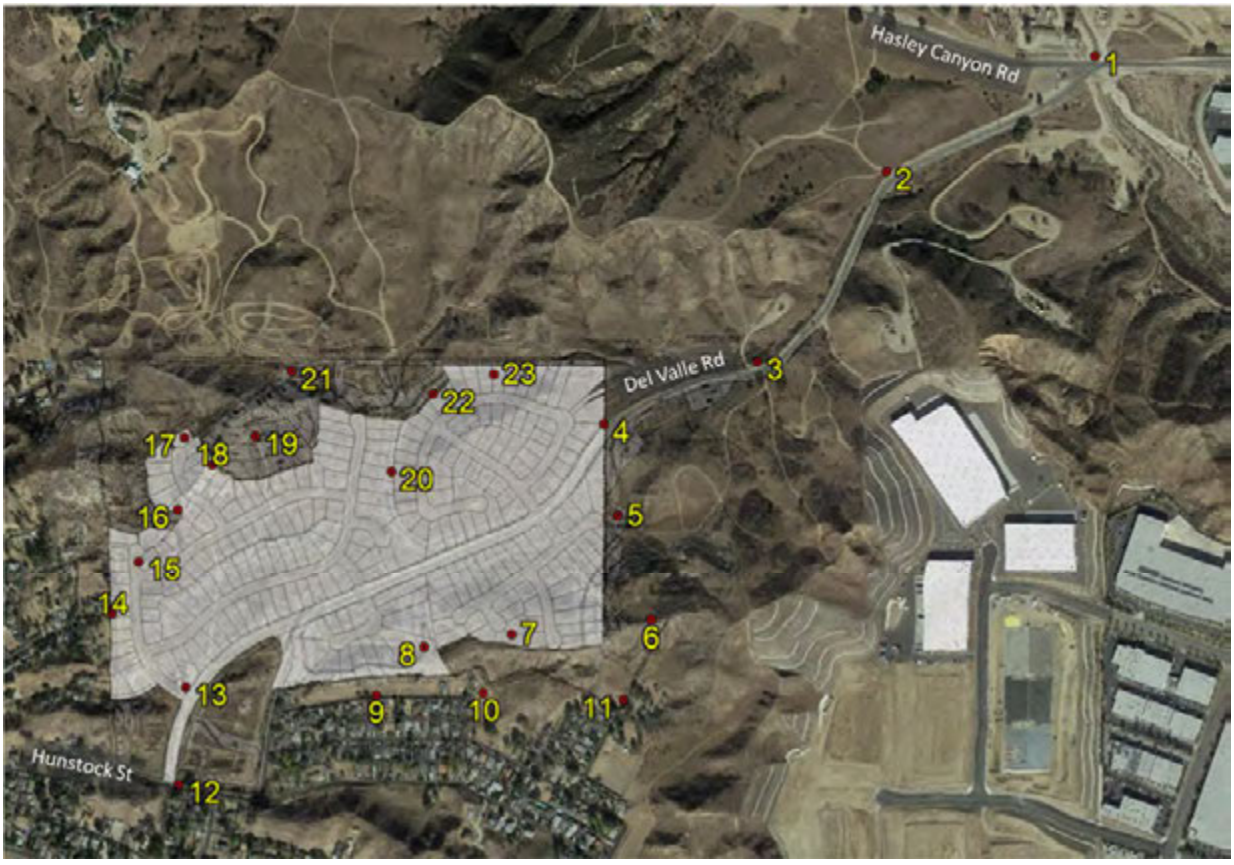


Photo locations are shown on the map above as reference points. Several photos were taken from each general location and are within a few feet of each other. For simplicity, these photo site have been grouped in the locations are shown above.

Photo Site 1 – Looking Southwest from Hasley Canyon Road to Del Valle Road.

Photo Site 2 - Looking Southwest on Del Valle Road.

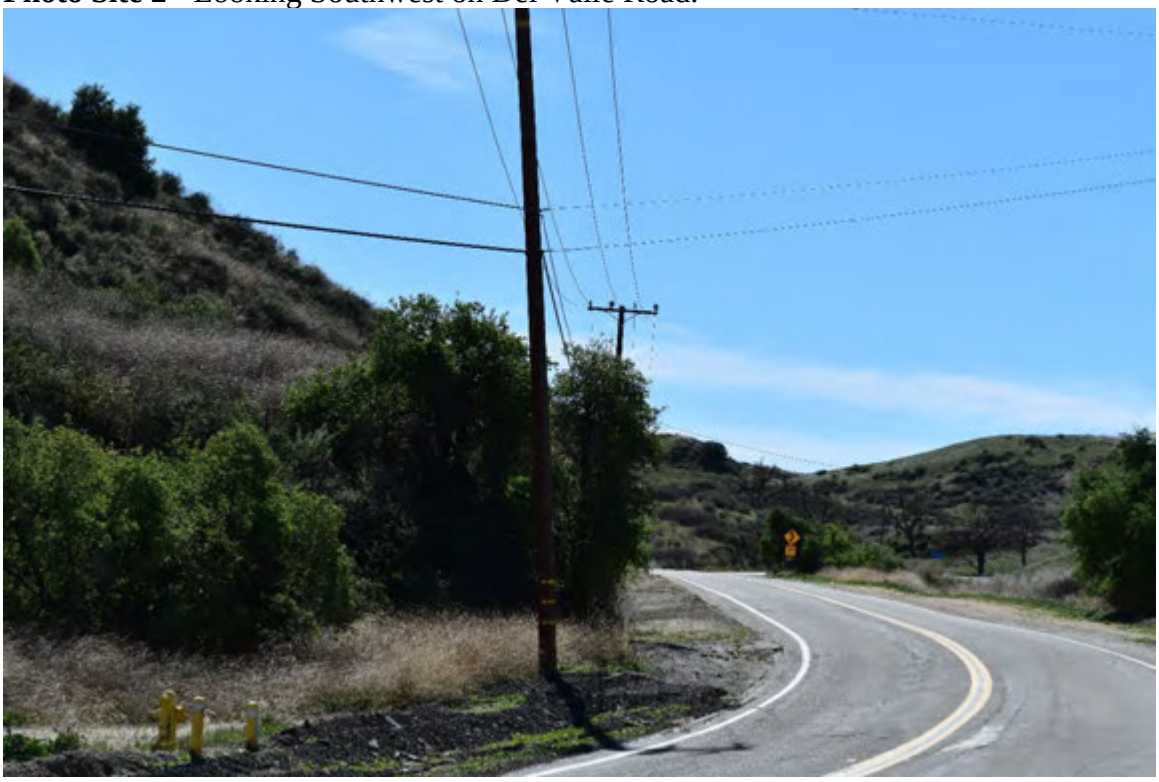


Photo Site 2 - Looking West Southwest on Del Valle Road.

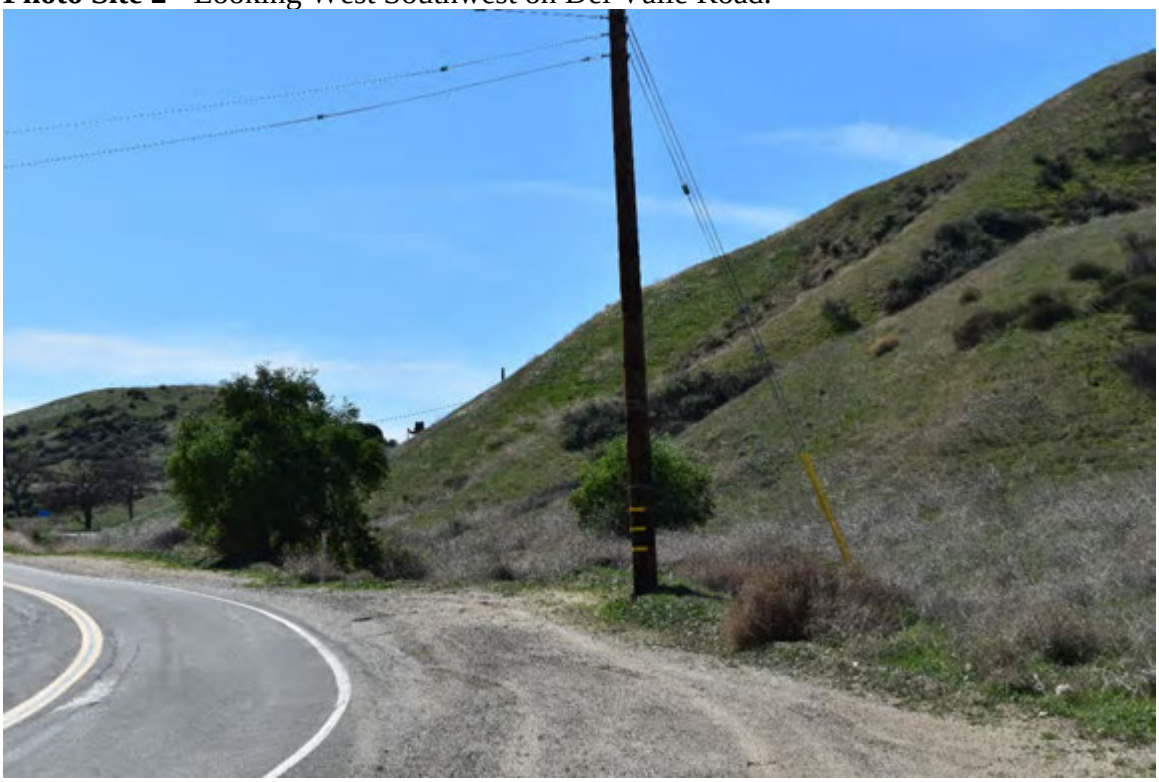


Photo Site 3 - Looking West Northeast on Del Valle Road.

Photo Site 3 - Looking Southwest on Del Valle Road.

Photo Site 3 - Looking North from Del Valle Road.

Photo Site 4 – Looking Northeast on Del Valle Road

Looking Southwest on Del Valle Road

Photo Site 4 - Looking North from Del Valle Road

Photo Site 5 – Looking Northeast

Photo Site 5 – Looking East

Looking North

Photo Site 6 – Looking Southwest

Looking West along the ridgeline

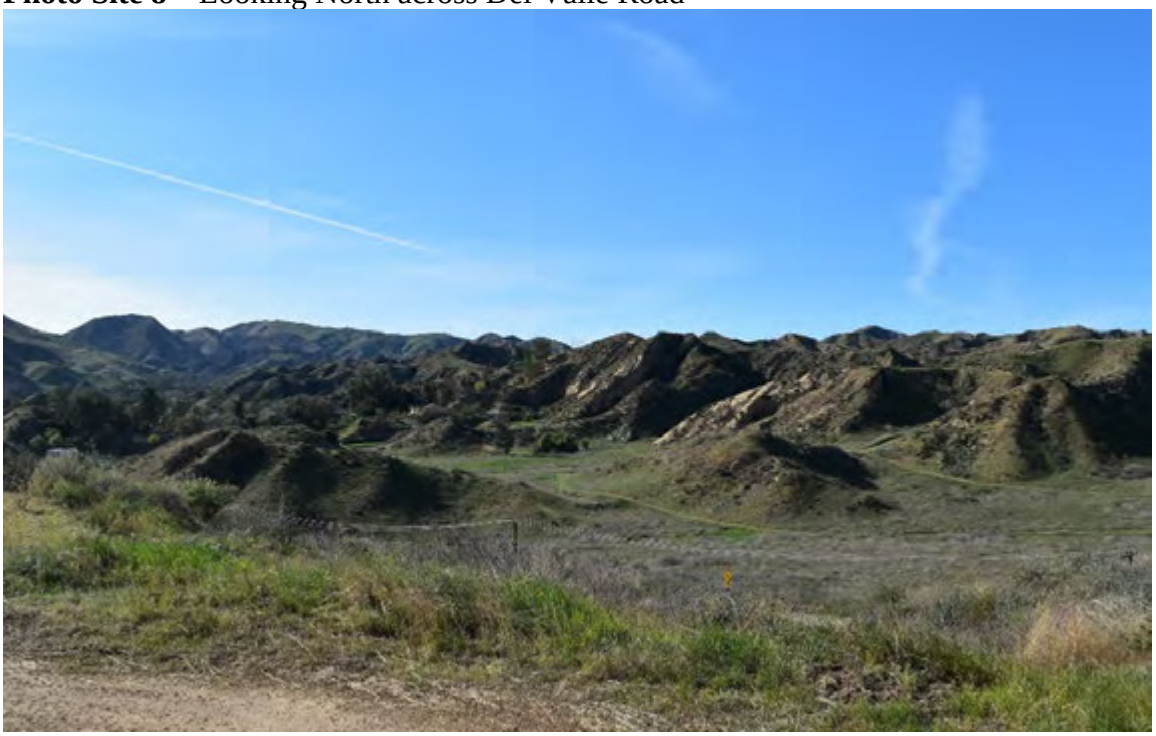
Photo Site 6 – Looking Northeast

Looking East (Industrial building of Witherspoon Parkway visible)

Photo Site 7 – Looking Southwest

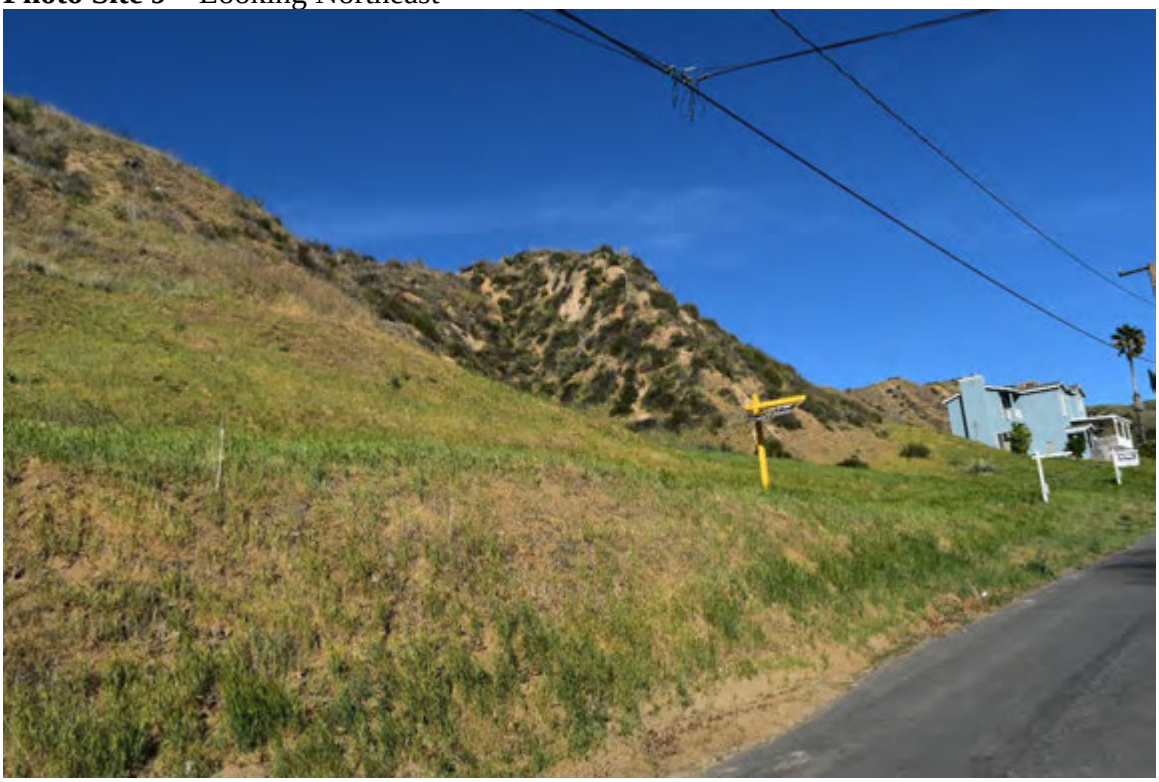
Looking East

Photo Site 8 – Looking North across Del Valle Road



Looking West Southwest along the ridgeline

Photo Site 9 – Looking Northeast



Looking North

Photo Site 10 – Looking Northeast

Photo Site 11 – Looking North

Photo Site 12 – Looking West

Looking Northwest

Photo Site 13 – Looking West

Looking Northwest

Photo Site 14 – Looking South

Looking North

Photo Site 15 – Looking South

Looking North

Photo Site 16 – Looking South

Looking North

Photo Site 17 – Looking South

Looking North

Photo Site 18 – Looking East

Looking South

Photo Site 19 – Looking South

Photo Site 20 – Looking North

Photo Site 20 – Looking Northwest

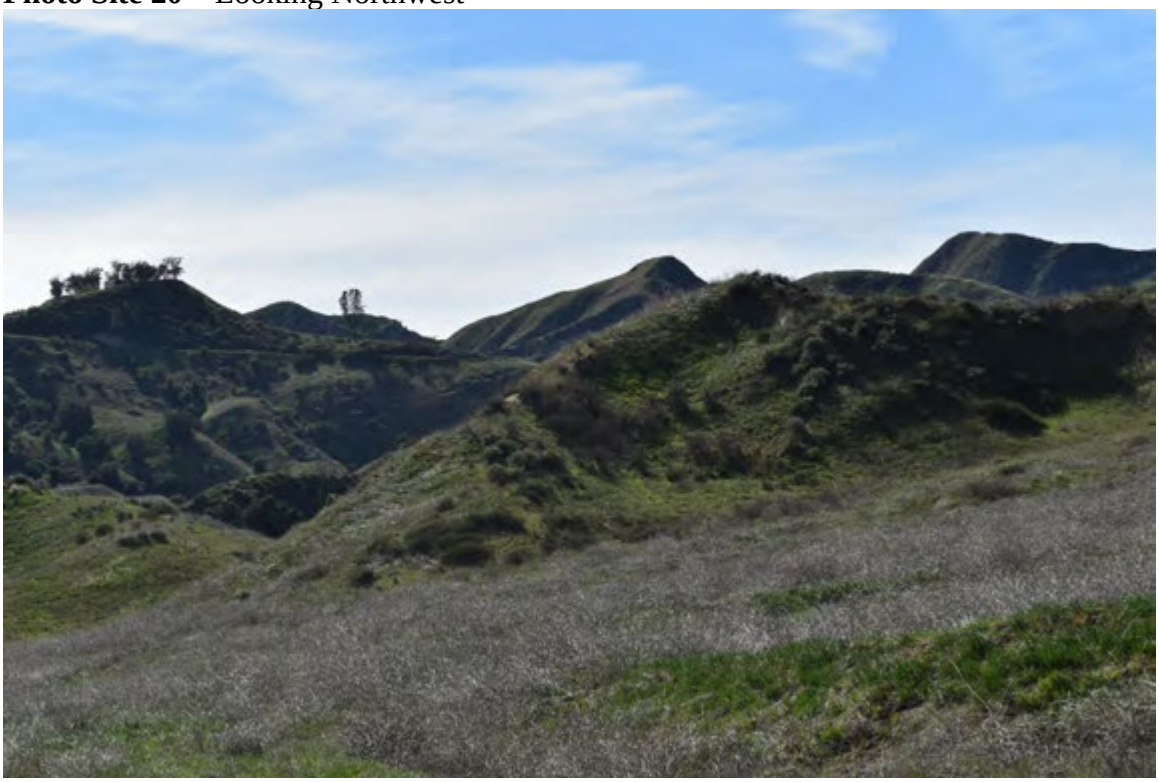


Photo Site 21 – Looking East

Photo Site 21 – Looking West

Looking North

Photo Site 22 – Looking East

Looking Northwest

Photo Site 23 – Looking West

Looking East

Appendix B

BehavePlus Reports and Model Outputs

Inputs: SURFACE

Description		Worst Case Sterling Ranch

Fuel/Vegetation, Surface/Understory

Fuel Model		gr2, gs2, sh7, SCAL18

Fuel Moisture

1-h Moisture	%	3
10-h Moisture	%	4
100-h Moisture	%	5
Live Herbaceous Moisture	%	30
Live Woody Moisture	%	50

Weather

20-ft Wind Speed	mi/h	60
Wind Adjustment Factor		0.5
Wind Direction (from north)	deg	45

Terrain

Slope Steepness	%	50
Aspect	deg	45

Fire

Spread Direction (from north)	deg	0, 15, 30, 45, 60, 75, 90, 105, 120,

---

Run Option Notes

Maximum reliable effective wind speed limit IS imposed [SURFACE].

Calculations are for the specified spread directions [SURFACE].

Fireline intensity, flame length, and spread distance are always for the direction of the spread calculations [SURFACE].

Wind and spread directions are degrees clockwise from north [SURFACE].

Wind direction is the direction from which the wind is blowing [SURFACE].

Output Variables

Surface Rate of Spread (ft/min) [SURFACE]

Fireline Intensity (kW/m) [SURFACE]

Flame Length (ft) [SURFACE]

Direction of Maximum Spread (from north) (deg) [SURFACE]

(continued on next page)

Input Worksheet (continued)

Notes

Worst Case Sterling Ranch

Surface Rate of Spread (ft/min)

Spread Dir	Fuel Model			
deg	gr2	gs2	sh7	SCAL18
0	4.7	2.6	2.4	1.3
15	4.3	2.4	2.2	1.2
30	4.1	2.3	2.1	1.1
45	4.0	2.2	2.0	1.1
60	4.1	2.3	2.1	1.1
75	4.3	2.4	2.2	1.2
90	4.7	2.6	2.4	1.3
105	5.3	3.0	2.7	1.4
120	6.3	3.6	3.2	1.7
135	7.9	4.5	4.0	2.2
150	10.6	6.0	5.4	2.9
165	15.4	8.9	8.0	4.3
180	25.2	15.0	13.6	7.2
195	49.6	31.7	28.9	15.4
210	126.5	107.0	100.1	53.7
225	268.7	565.2	620.1	346.9
240	126.5	107.0	100.1	53.7
255	49.6	31.7	28.9	15.4
270	25.2	15.0	13.6	7.2
285	15.4	8.9	8.0	4.3
300	10.6	6.0	5.4	2.9
315	7.9	4.5	4.0	2.2
330	6.3	3.6	3.2	1.7
345	5.3	3.0	2.7	1.4
360	4.7	2.6	2.4	1.3

Worst Case Sterling Ranch

Fireline Intensity (kW/m)

Spread Dir	Fuel Model			
deg	gr2	gs2	sh7	SCAL18
0	70	87	357	298
15	65	79	327	273
30	61	75	310	259
45	60	74	305	255
60	61	75	310	259
75	65	79	327	273
90	70	87	357	298
105	80	99	406	339
120	95	118	484	404
135	119	148	608	508
150	159	199	819	684
165	231	293	1209	1010
180	379	495	2045	1709
195	745	1049	4357	3647
210	1900	3541	15068	12682
225	4037	18700	93360	81891
240	1900	3541	15068	12682
255	745	1049	4357	3647
270	379	495	2045	1709
285	231	293	1209	1010
300	159	199	819	684
315	119	148	608	508
330	95	118	484	404
345	80	99	406	339
360	70	87	357	298

Worst Case Sterling Ranch

Flame Length (ft)

Spread Dir	Fuel Model			
deg	gr2	gs2	sh7	SCAL18
0	1.8	2.0	3.8	3.5
15	1.7	1.9	3.6	3.4
30	1.7	1.9	3.6	3.3
45	1.7	1.8	3.5	3.3
60	1.7	1.9	3.6	3.3
75	1.7	1.9	3.6	3.4
90	1.8	2.0	3.8	3.5
105	1.9	2.1	4.0	3.7
120	2.1	2.3	4.4	4.0
135	2.3	2.5	4.8	4.5
150	2.6	2.9	5.6	5.1
165	3.1	3.5	6.7	6.1
180	3.9	4.4	8.5	7.8
195	5.3	6.2	12.0	11.1
210	8.2	10.9	21.2	19.6
225	11.6	23.4	49.1	46.2
240	8.2	10.9	21.2	19.6
255	5.3	6.2	12.0	11.1
270	3.9	4.4	8.5	7.8
285	3.1	3.5	6.7	6.1
300	2.6	2.9	5.6	5.1
315	2.3	2.5	4.8	4.5
330	2.1	2.3	4.4	4.0
345	1.9	2.1	4.0	3.7
360	1.8	2.0	3.8	3.5

Worst Case Sterling Ranch

Direction of Maximum Spread (from north) (deg)

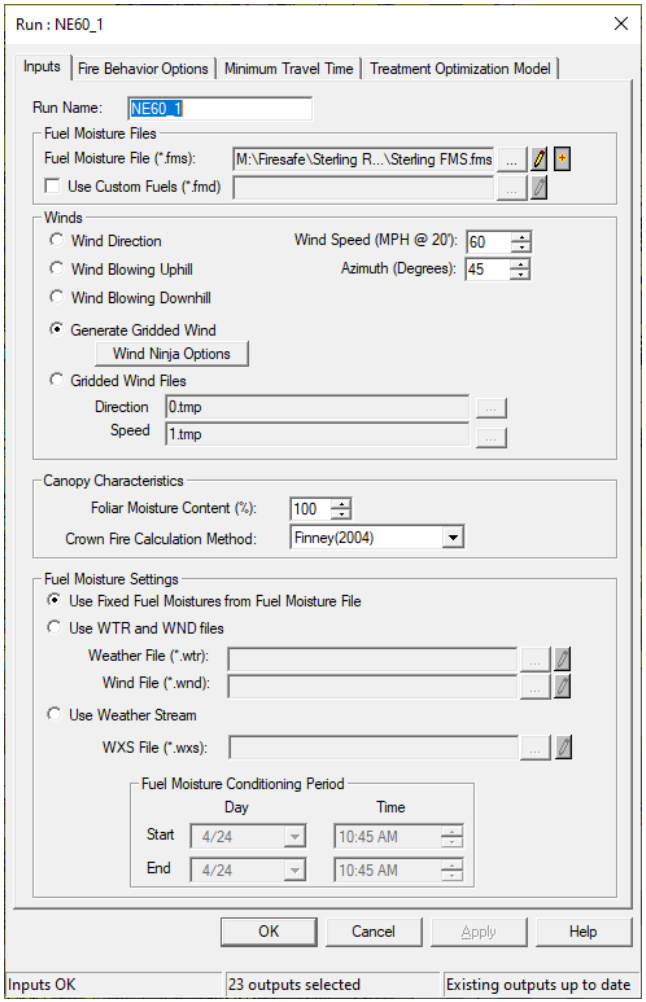
Spread Dir	Fuel Model			
deg	gr2	gs2	sh7	SCAL18
0	225	225	225	225
15	225	225	225	225
30	225	225	225	225
45	225	225	225	225
60	225	225	225	225
75	225	225	225	225
90	225	225	225	225
105	225	225	225	225
120	225	225	225	225
135	225	225	225	225
150	225	225	225	225
165	225	225	225	225
180	225	225	225	225
195	225	225	225	225
210	225	225	225	225
225	225	225	225	225
240	225	225	225	225
255	225	225	225	225
270	225	225	225	225
285	225	225	225	225
300	225	225	225	225
315	225	225	225	225
330	225	225	225	225
345	225	225	225	225
360	225	225	225	225

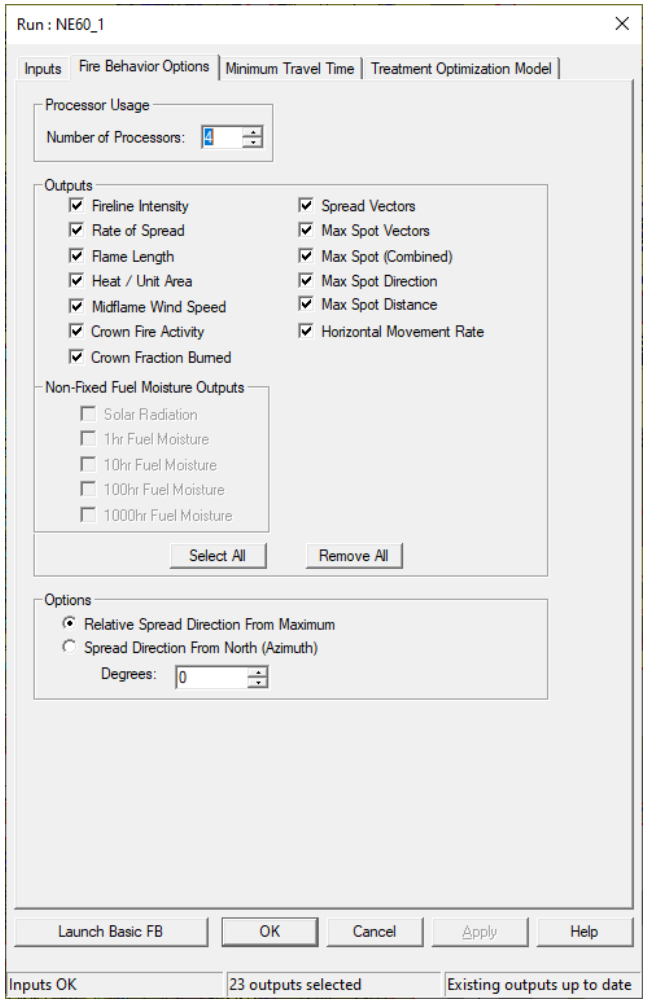
Discrete Variable Codes Used
Worst Case Sterling Ranch

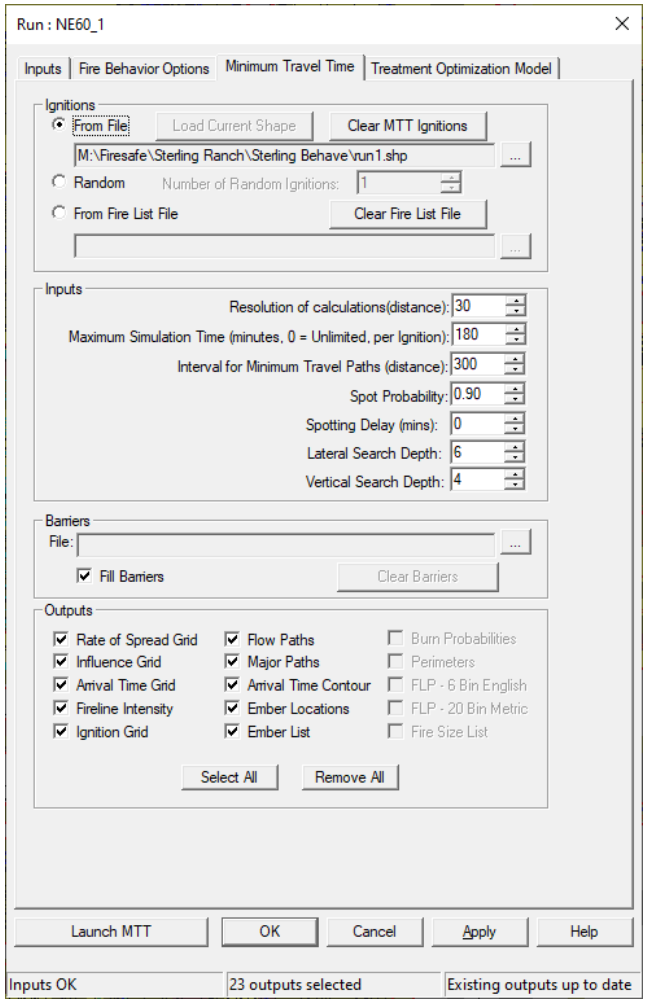
Fuel Model

gr2	Low load, dry climate grass (D) (102)
gs2	Moderate load, dry climate grass-shrub (D) (122)
sh7	Very high load, dry climate shrub (S) (147)
SCAL18	Sage / Buckwheat

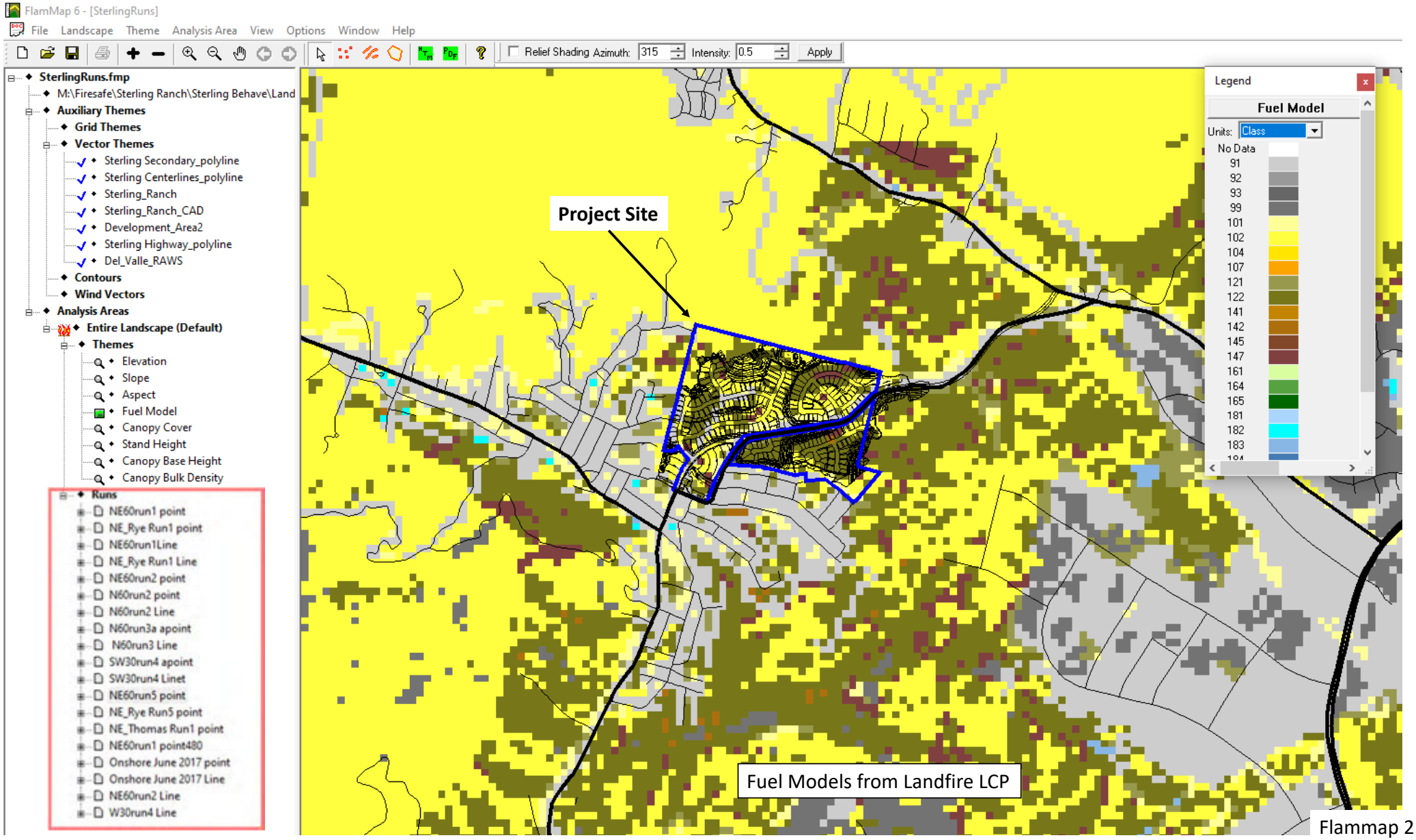
Selected Flammap and FARSITE Inputs/Outputs

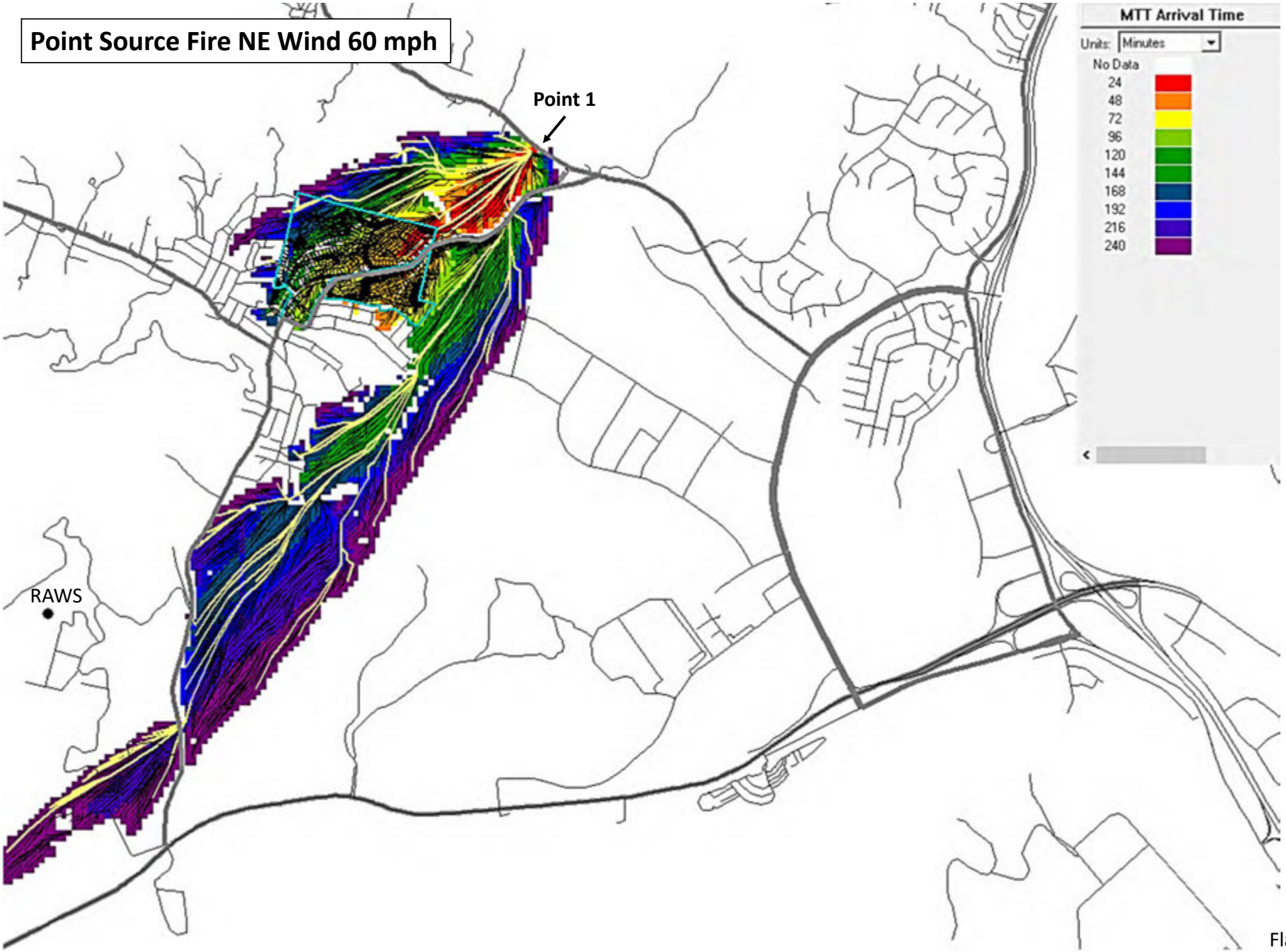




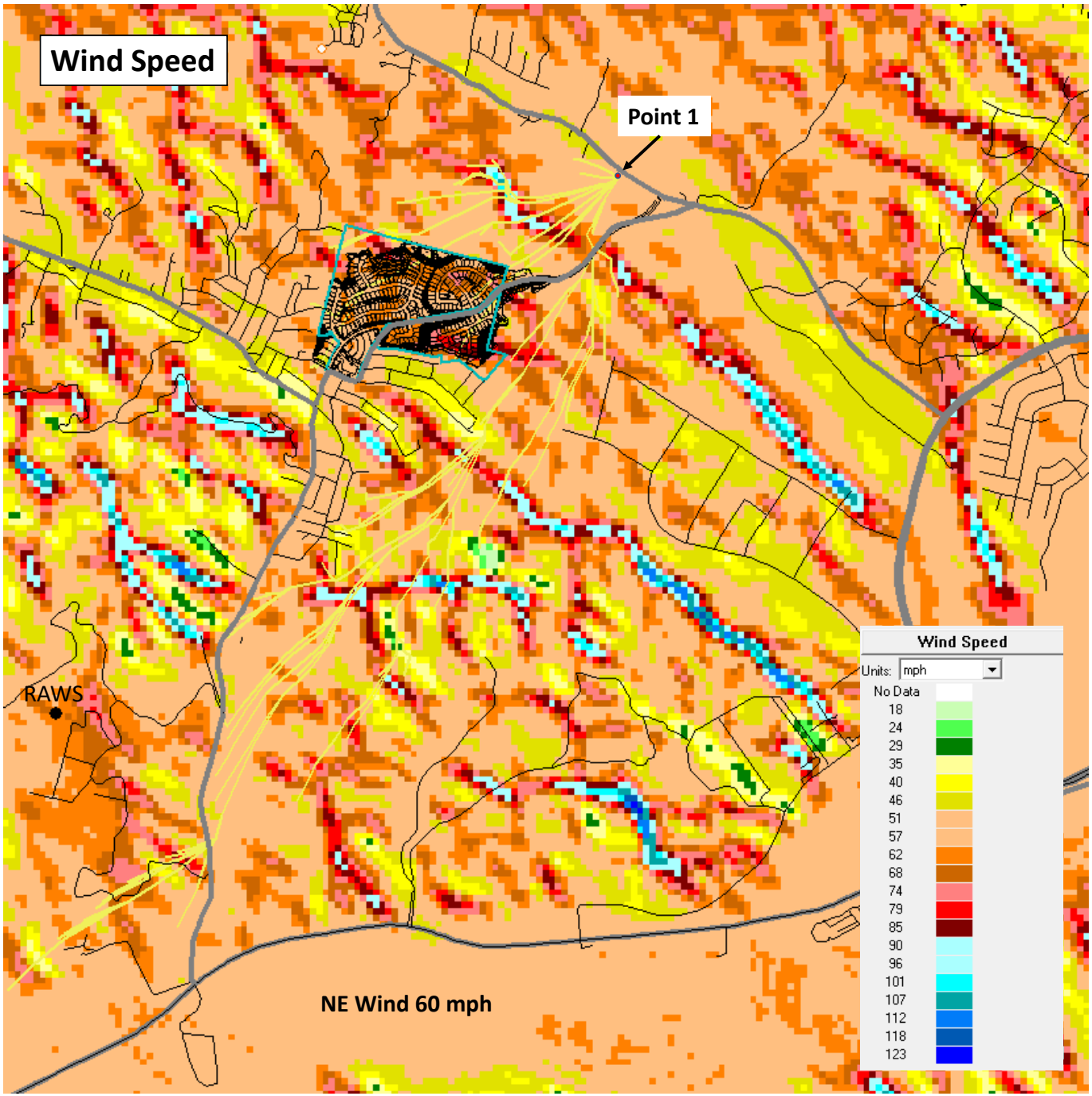


Flammap/FARSITE Runs and Inputs

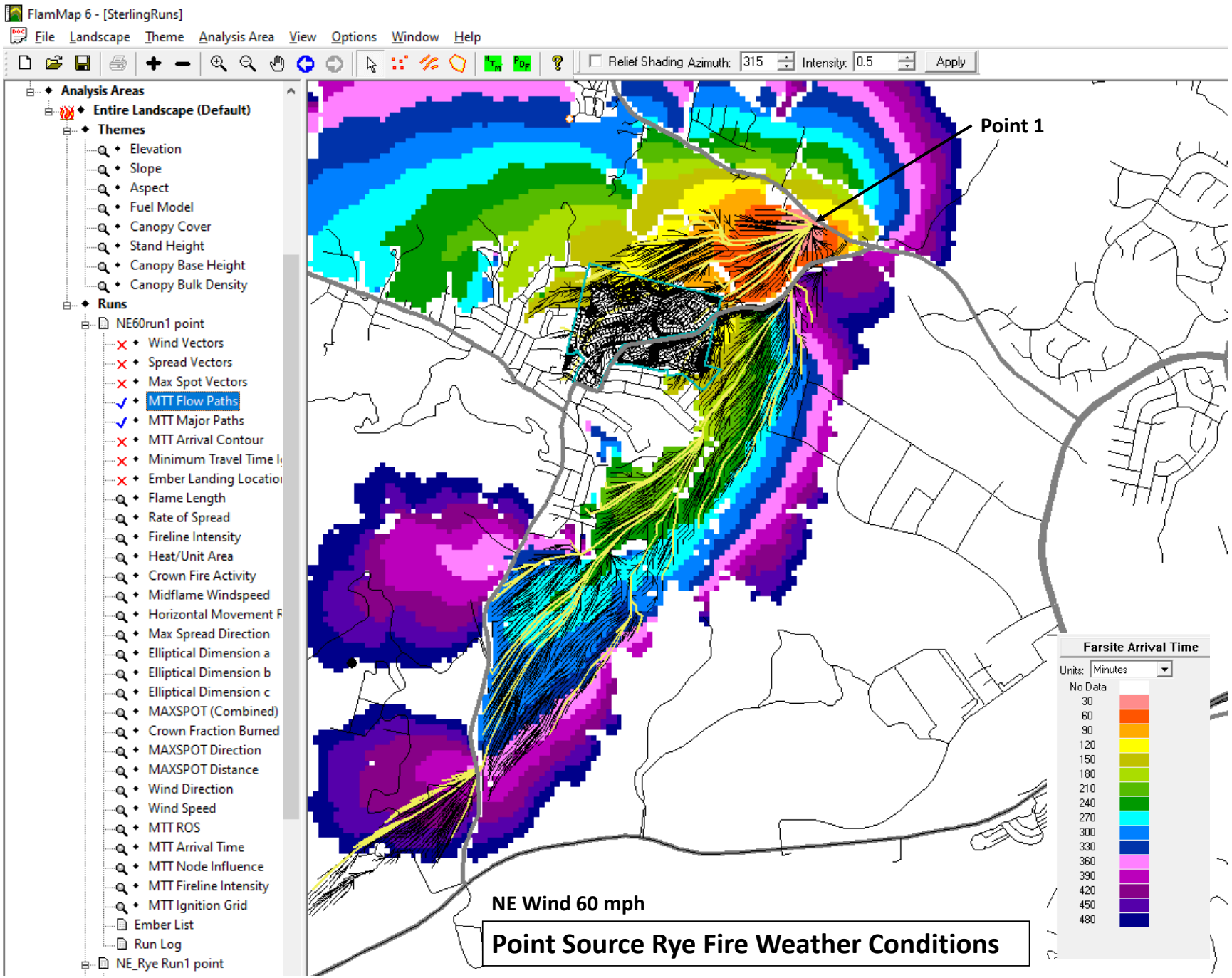



Point Source Fire NE Wind 60 mph
Point 1
RAWS
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240

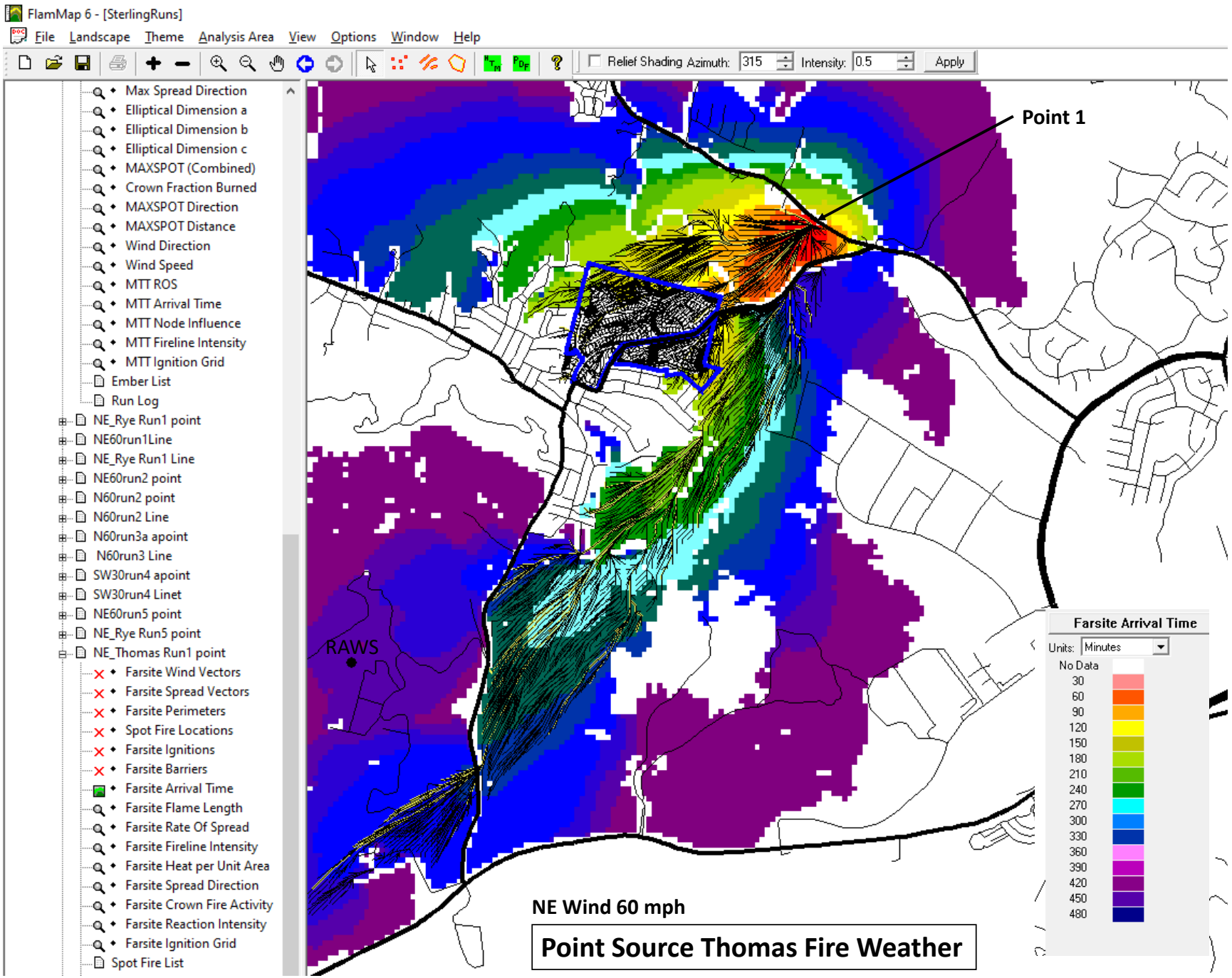
Flammap 3


Wind Speed
Point 1
RAWS
NE Wind 60 mph
Wind Speed
Units: mph
No Data
18
24
29
35
40
46
51
57
62
68
74
79
85
90
96
101
107
112
118
123

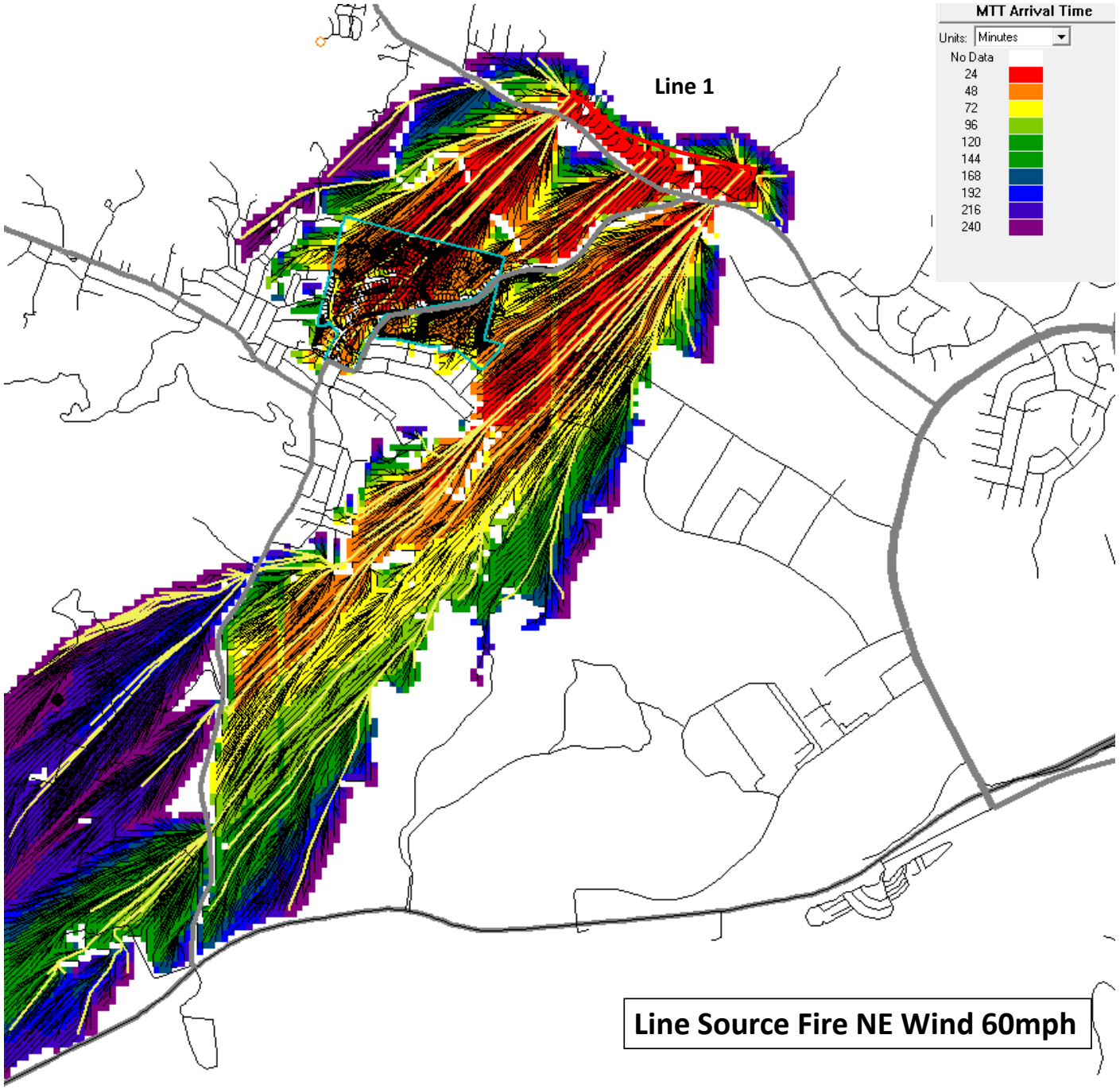
Flammap 4


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Analysis Areas
Entire Landscape (Default)
Themes
Elevation
Slope
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time
Ember Landing Location
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
MTT Node Influence
MTT Fireline Intensity
MTT Ignition Grid
Ember List
Run Log
NE_Rye Run1 point
Point 1
Farsite Arrival Time
Units: Minutes
No Data
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
NE Wind 60 mph
Point Source Rye Fire Weather Conditions

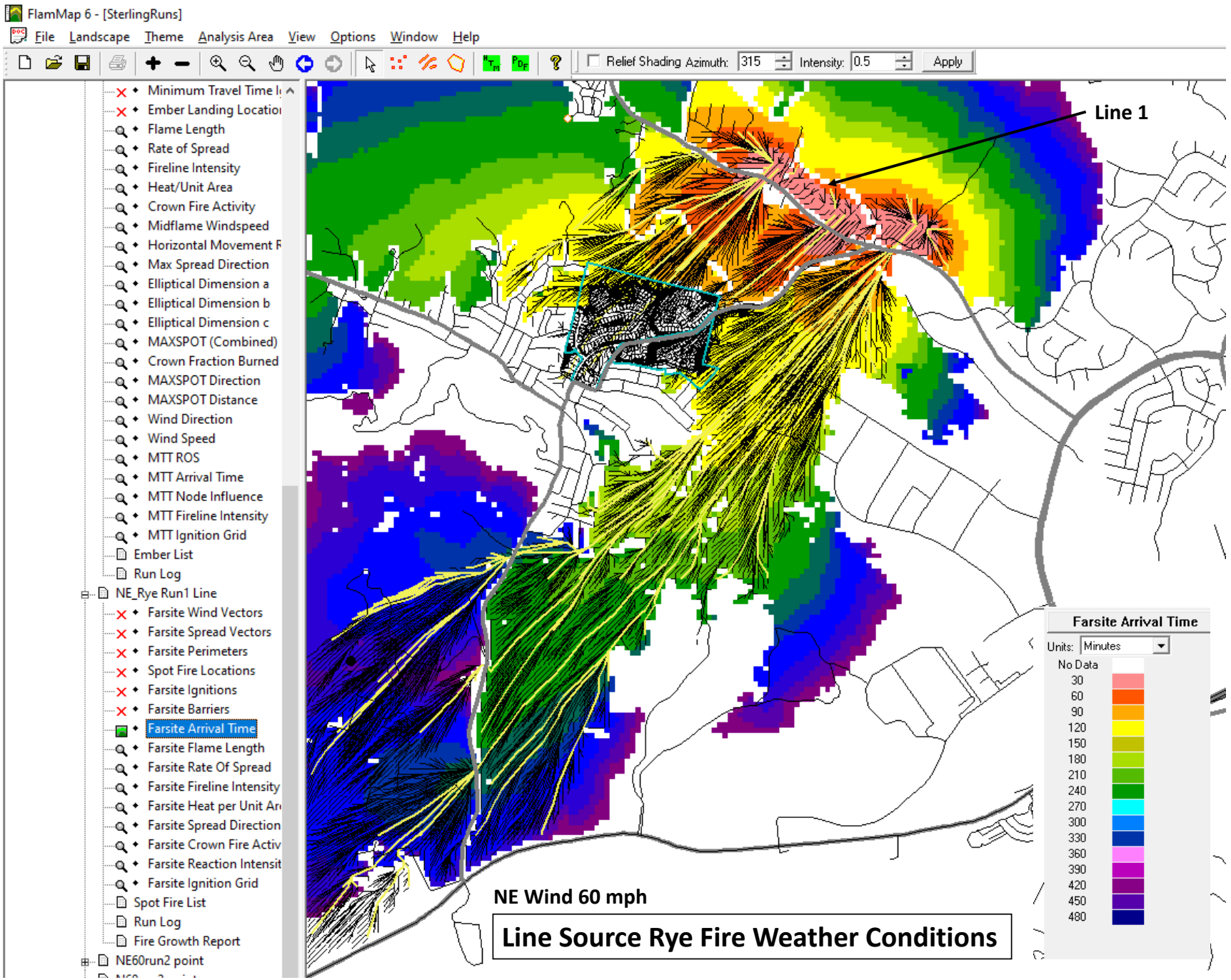
Flammap 5


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
MTT Node Influence
MTT Fireline Intensity
MTT Ignition Grid
Ember List
Run Log
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
N60run2 Line
N60run3a apoint
N60run3 Line
SW30run4 apoint
SW30run4 Linet
NE60run5 point
NE_Rye Run5 point
NE_Thomas Run1 point
Farsite Wind Vectors
Farsite Spread Vectors
Farsite Perimeters
Spot Fire Locations
Farsite Ignitions
Farsite Barriers
Farsite Arrival Time
Farsite Flame Length
Farsite Rate Of Spread
Farsite Fireline Intensity
Farsite Heat per Unit Area
Farsite Spread Direction
Farsite Crown Fire Activity
Farsite Reaction Intensity
Farsite Ignition Grid
Spot Fire List
Point 1
RAWS
Farsite Arrival Time
Units: Minutes
No Data
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
NE Wind 60 mph
Point Source Thomas Fire Weather

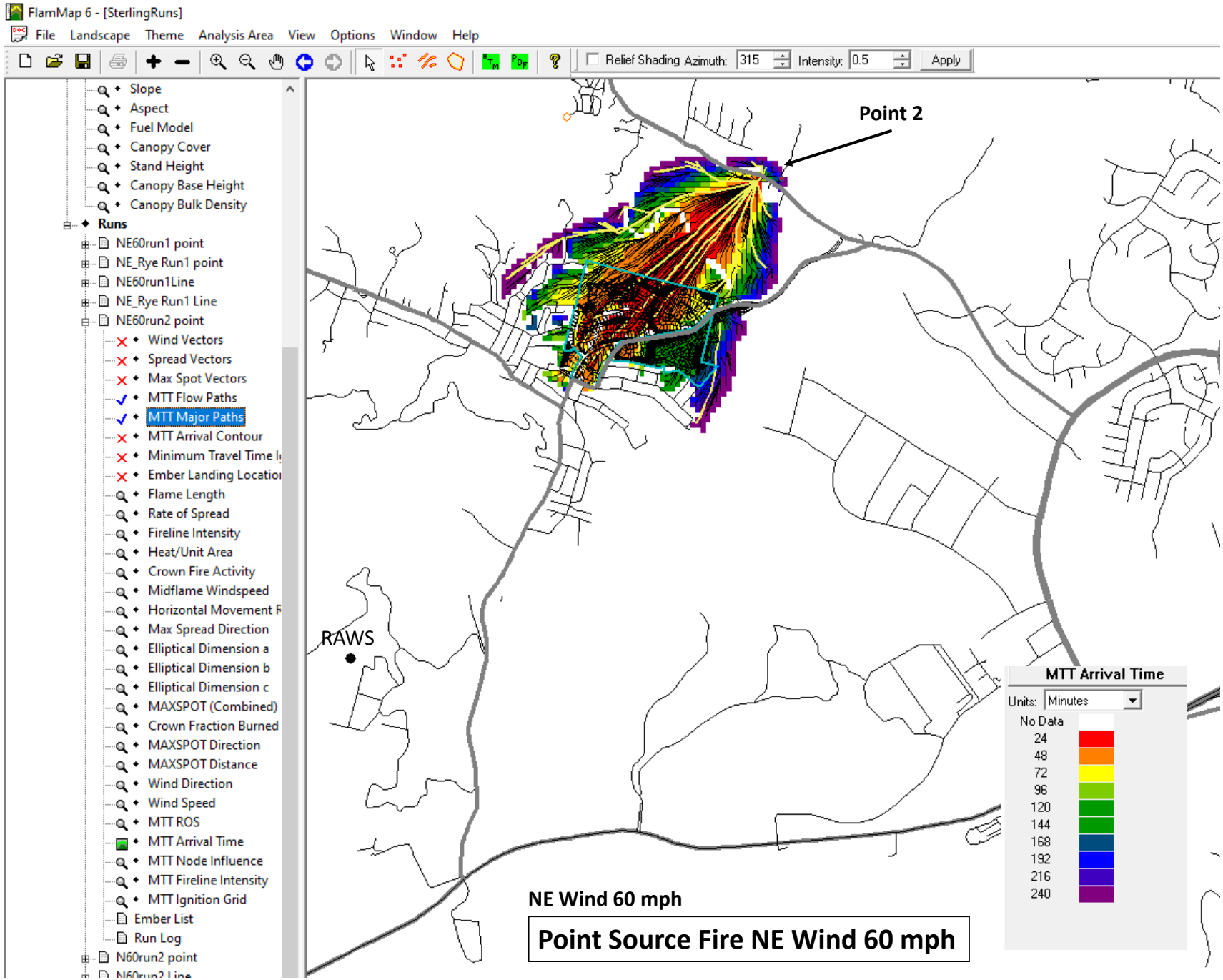
Flammap 6


MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
Line 1
Line Source Fire NE Wind 60mph

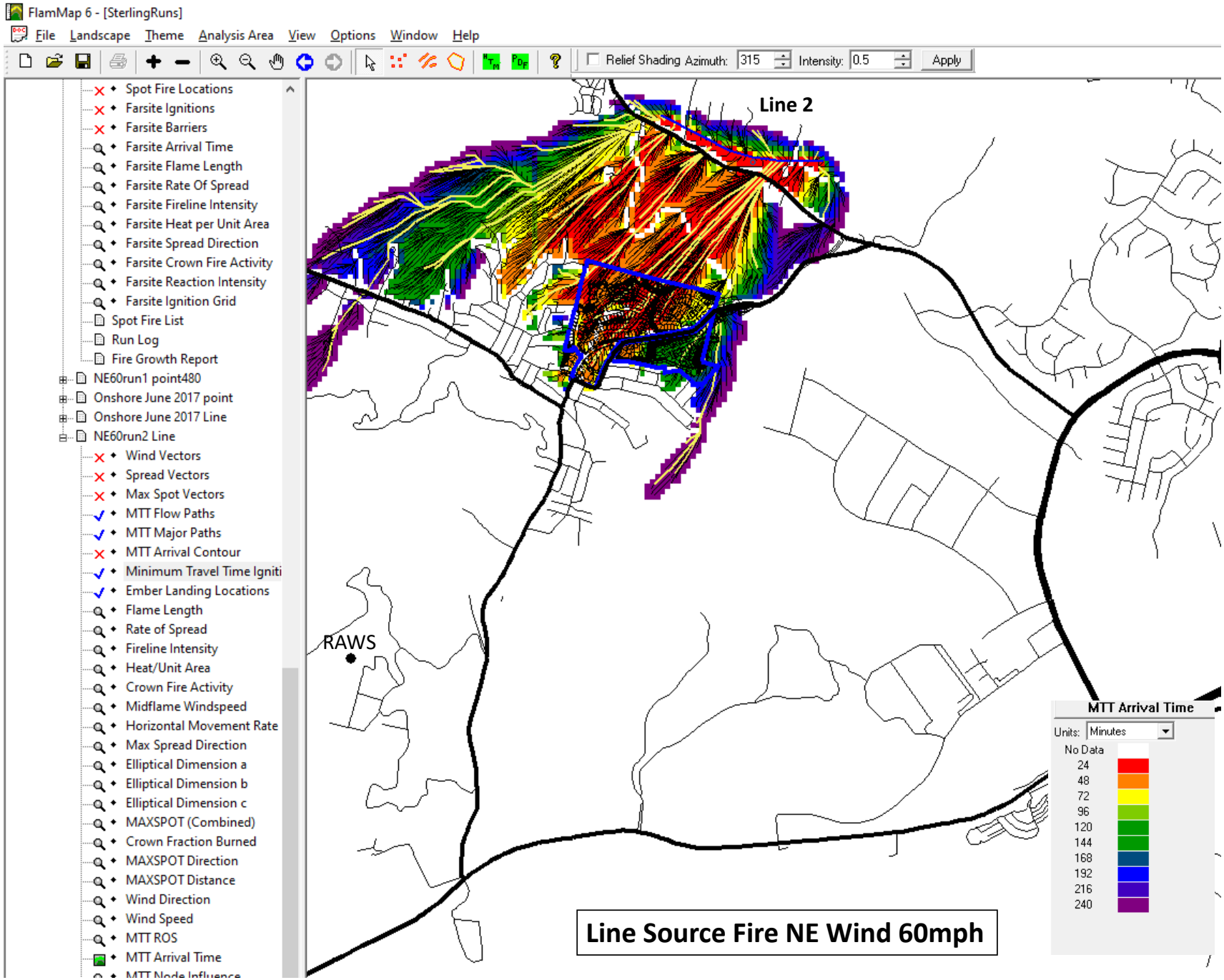
Flammap 7


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Minimum Travel Time
Ember Landing Location
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
MTT Node Influence
MTT Fireline Intensity
MTT Ignition Grid
Ember List
Run Log
NE_Rye Run1 Line
Farsite Wind Vectors
Farsite Spread Vectors
Farsite Perimeters
Spot Fire Locations
Farsite Ignitions
Farsite Barriers
Farsite Arrival Time
Farsite Flame Length
Farsite Rate Of Spread
Farsite Fireline Intensity
Farsite Heat per Unit Ar
Farsite Spread Direction
Farsite Crown Fire Activ
Farsite Reaction Intensit
Farsite Ignition Grid
Spot Fire List
Run Log
Fire Growth Report
NE60run2 point
Line 1
Farsite Arrival Time
Units: Minutes
No Data
30
60
90
120
150
180
210
240
270
300
330
360
390
420
450
480
NE Wind 60 mph
Line Source Rye Fire Weather Conditions

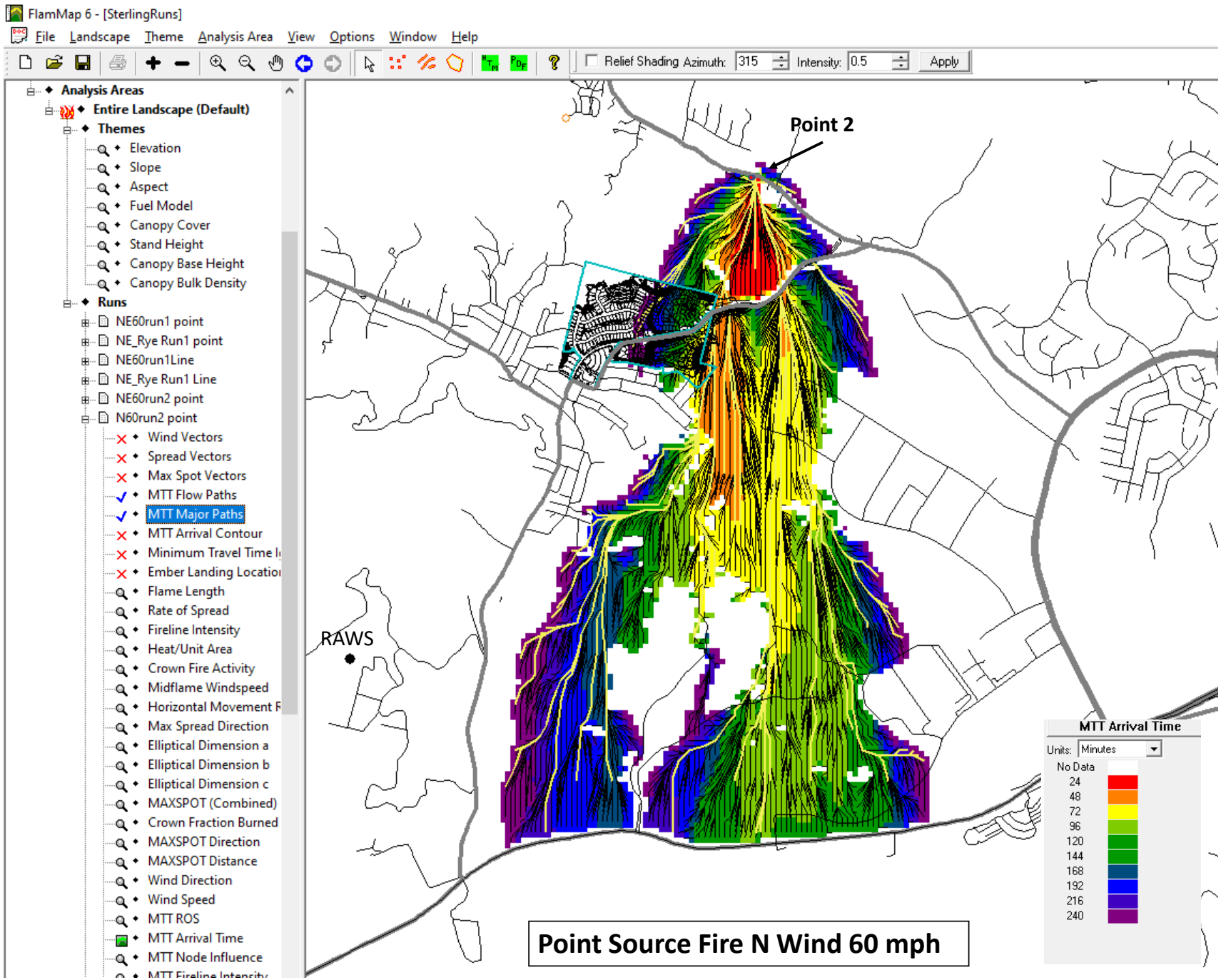
Flammap 8


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Slope
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time l
Ember Landing Locatio
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement F
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
MTT Node Influence
MTT Fireline Intensity
MTT Ignition Grid
Ember List
Run Log
N60run2 point
Point 2
RAWS
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
NE Wind 60 mph
Point Source Fire NE Wind 60 mph

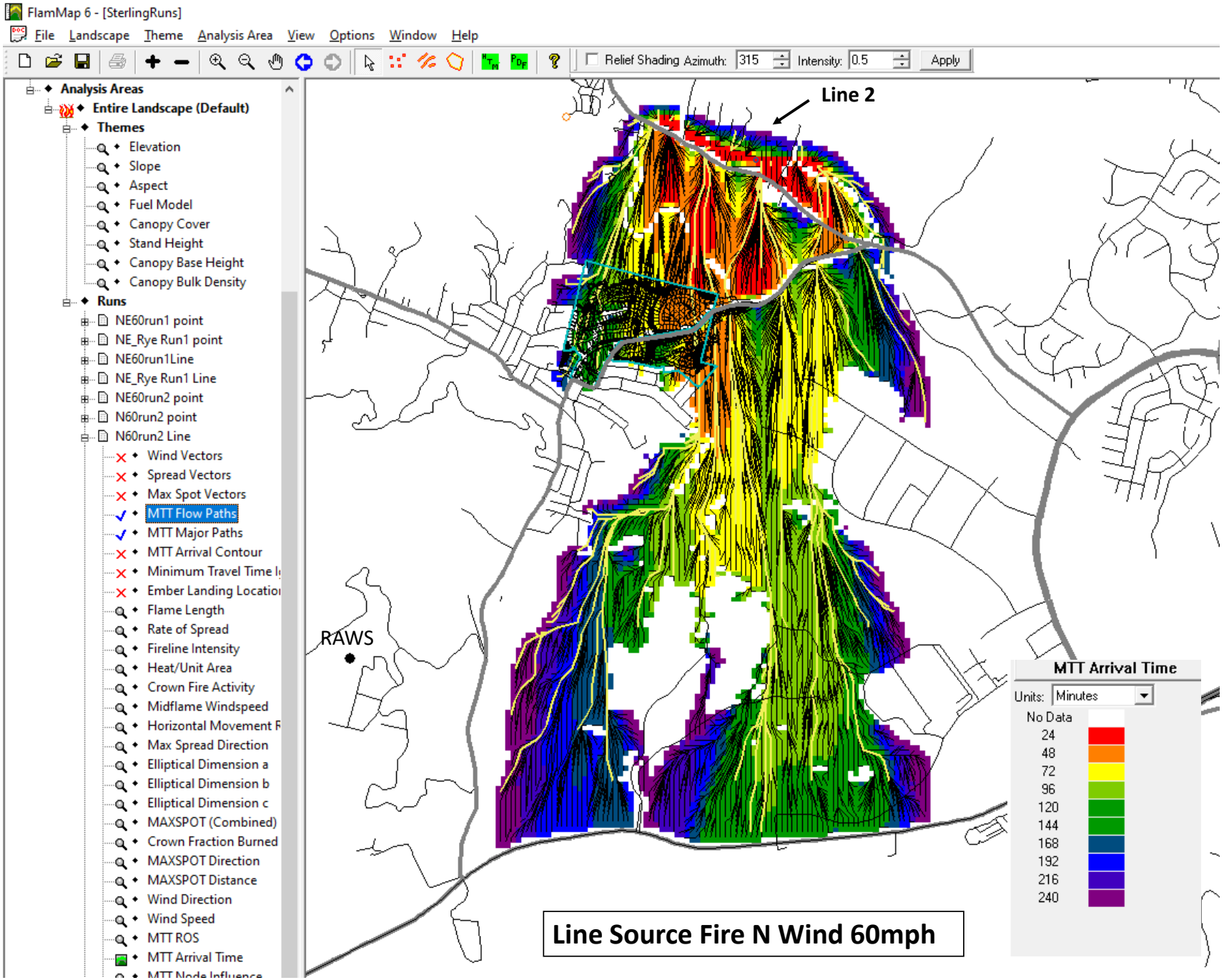
Flammap 9


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Spot Fire Locations
Farsite Ignitions
Farsite Barriers
Farsite Arrival Time
Farsite Flame Length
Farsite Rate Of Spread
Farsite Fireline Intensity
Farsite Heat per Unit Area
Farsite Spread Direction
Farsite Crown Fire Activity
Farsite Reaction Intensity
Farsite Ignition Grid
Spot Fire List
Run Log
Fire Growth Report
NE60run1 point480
Onshore June 2017 point
Onshore June 2017 Line
NE60run2 Line
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time Igniti
Ember Landing Locations
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement Rate
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
Line 2
RAWS
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
Line Source Fire NE Wind 60mph

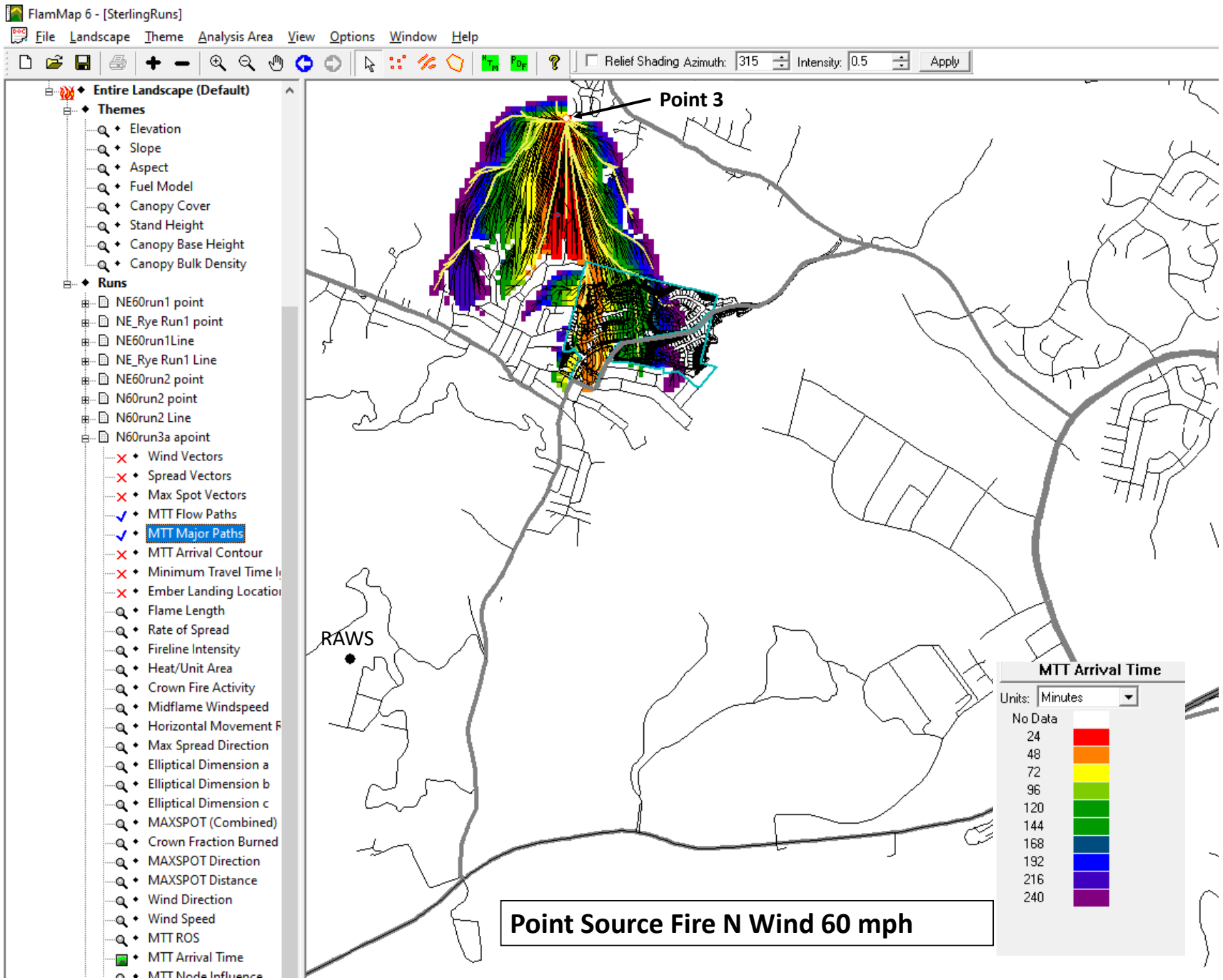
Flammap 10

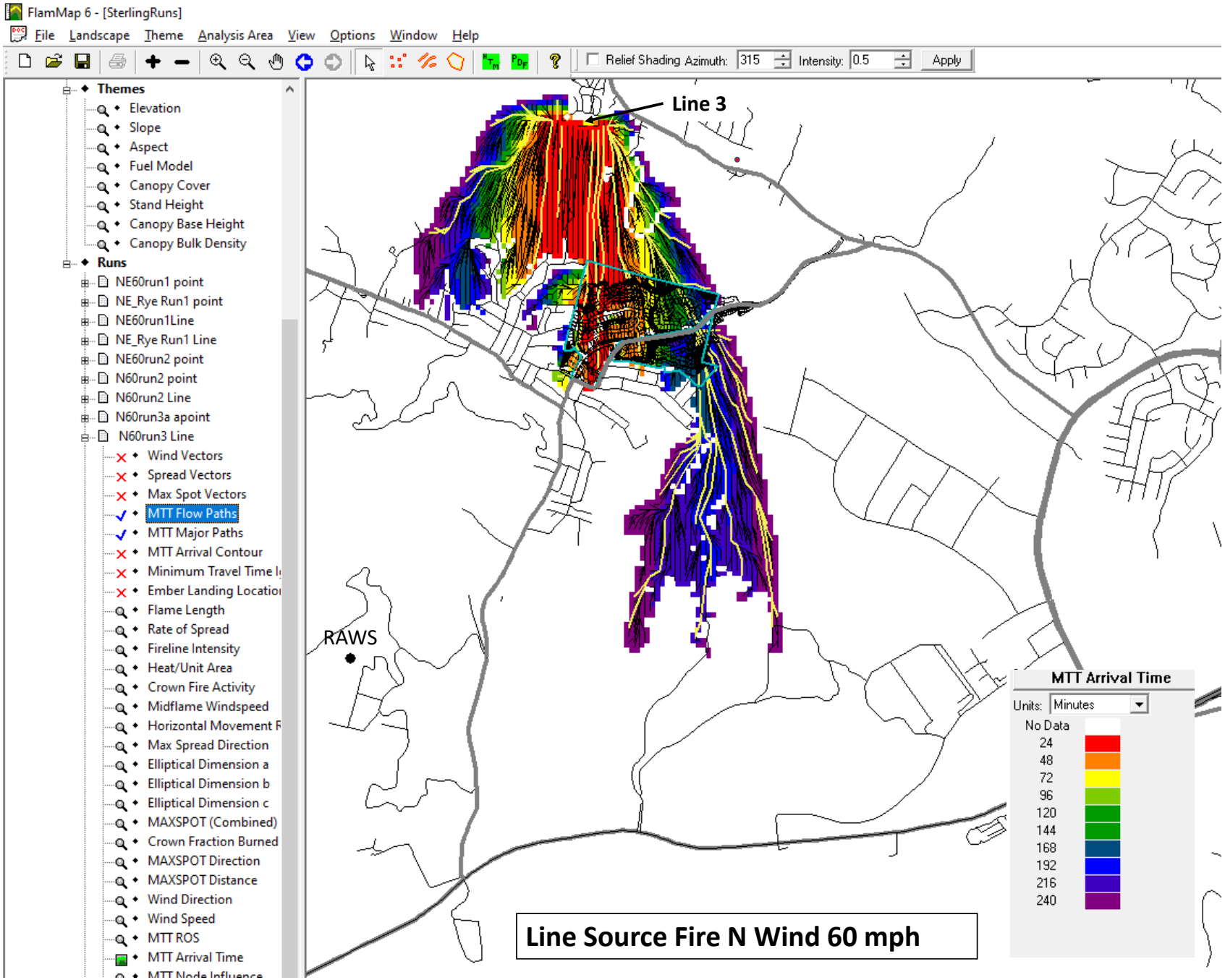

FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Analysis Areas
Entire Landscape (Default)
Themes
Elevation
Slope
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time
Ember Landing Location
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
MTT Node Influence
Point 2
RAWS
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
Point Source Fire N Wind 60 mph

Flammap 11

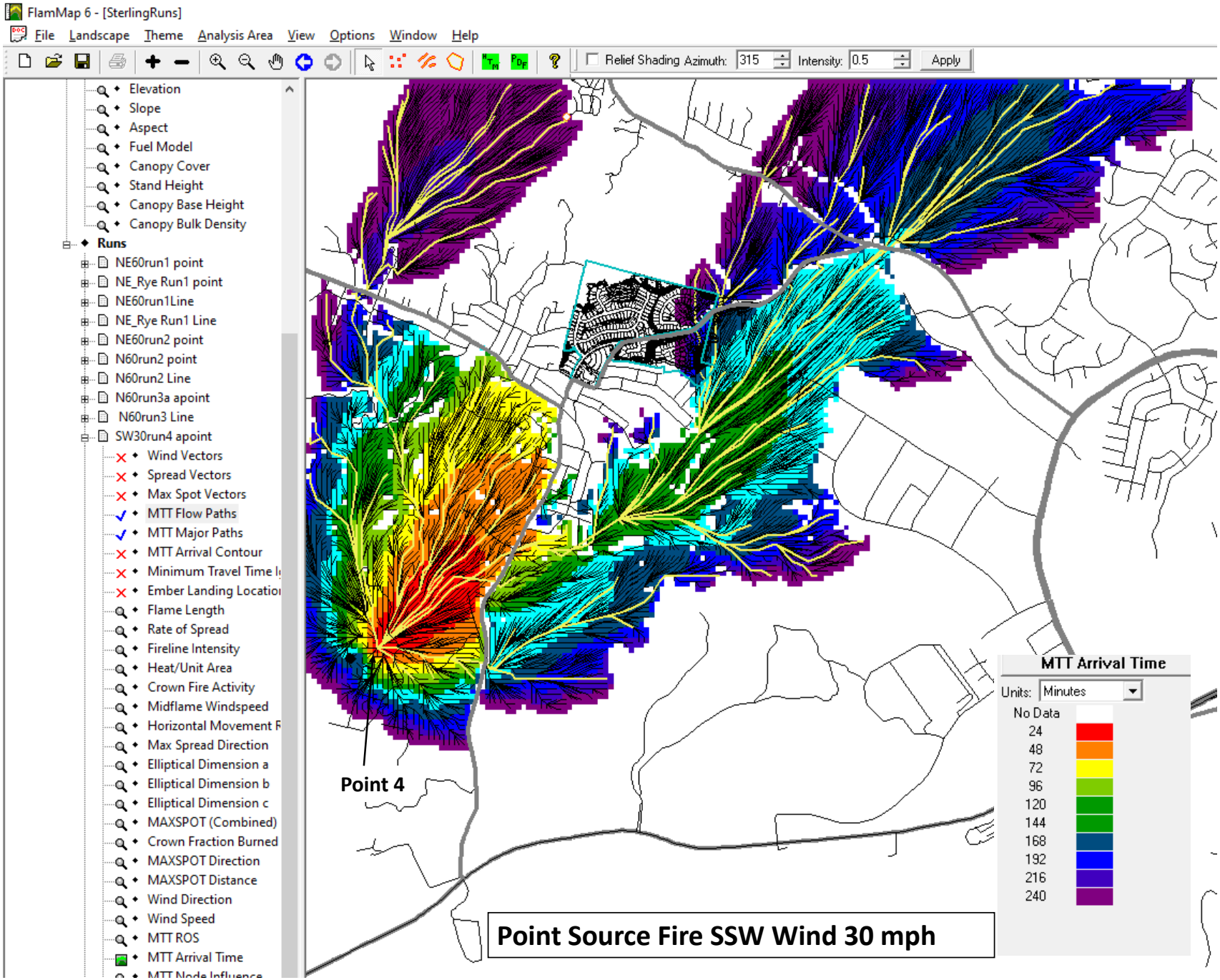

FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Analysis Areas
Entire Landscape (Default)
Themes
Elevation
Slope
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
N60run2 Line
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time
Ember Landing Location
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
Line 2
RAWS
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
Line Source Fire N Wind 60mph

Flammap 12

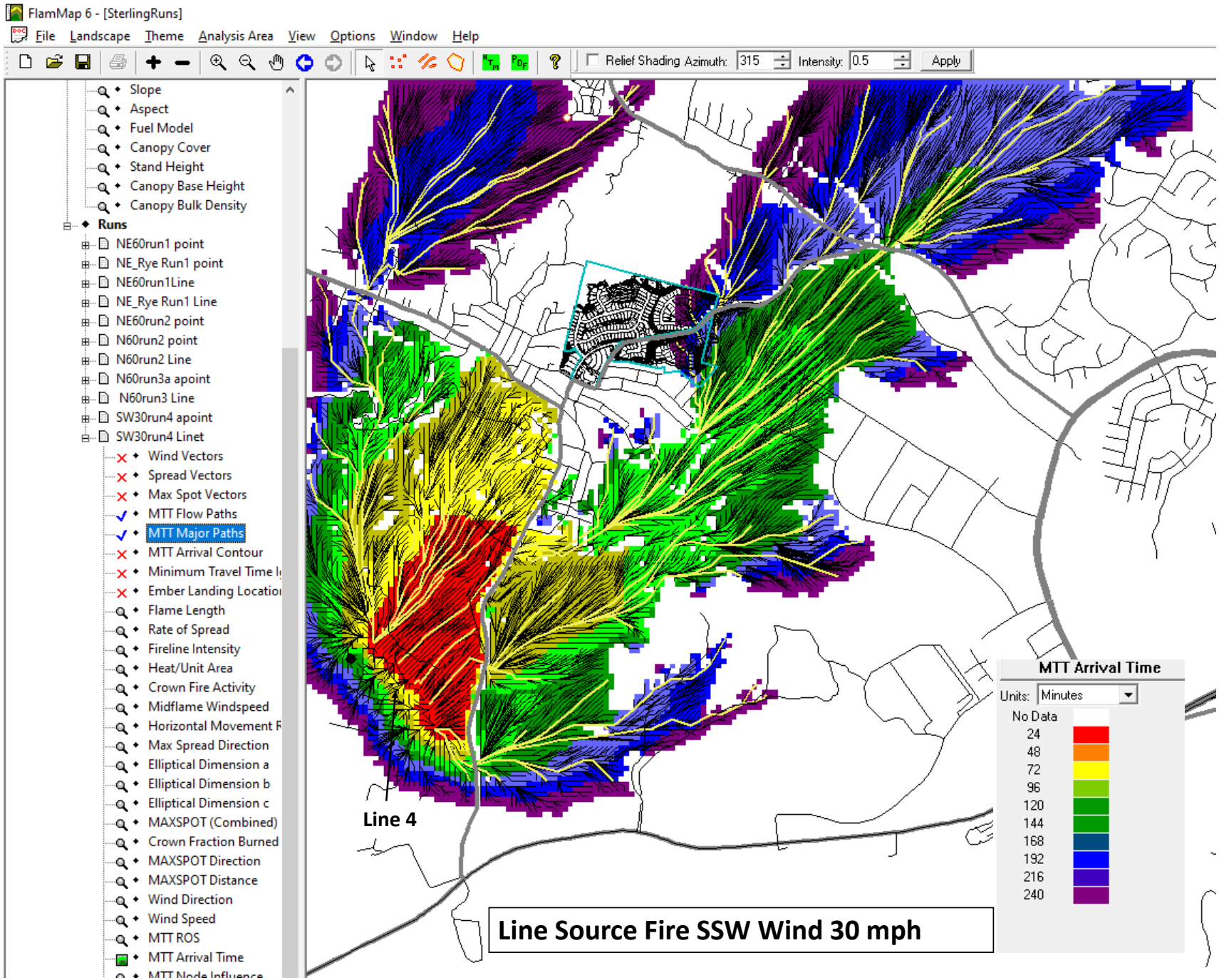

FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Entire Landscape (Default)
Themes
Elevation
Slope
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
N60run2 Line
N60run3a apoint
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time
Ember Landing Locatio
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
Point 3
RAWS
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
Point Source Fire N Wind 60 mph


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Themes
Elevation
Slope
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
N60run2 Line
N60run3a apoint
N60run3 Line
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time
Ember Landing Location
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
Line 3
RAWS
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
Line Source Fire N Wind 60 mph

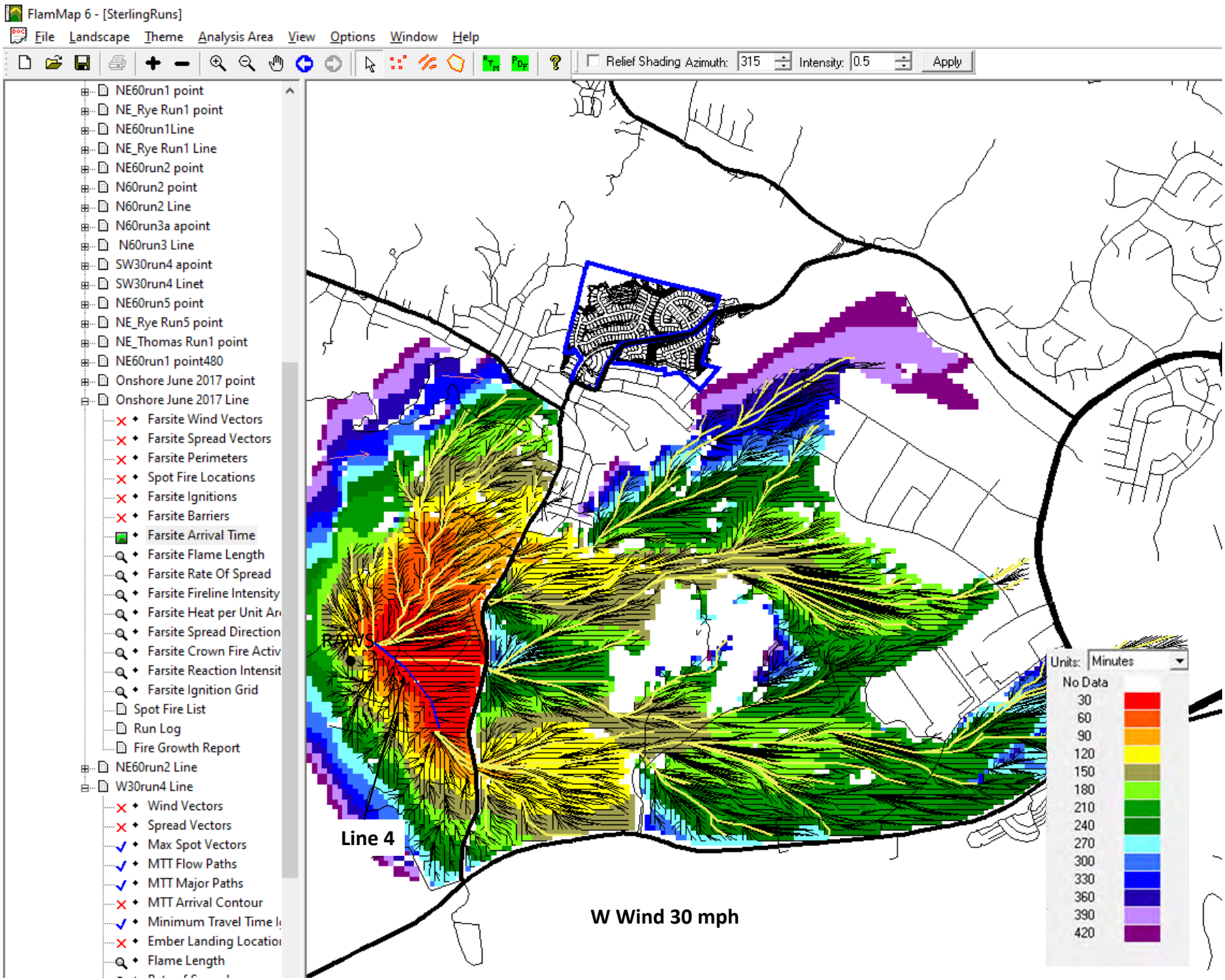
Flammap 14


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Elevation
Slope
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
N60run2 Line
N60run3a apoint
N60run3 Line
SW30run4 apoint
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time
Ember Landing Locatio
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
Point 4
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
Point Source Fire SSW Wind 30 mph

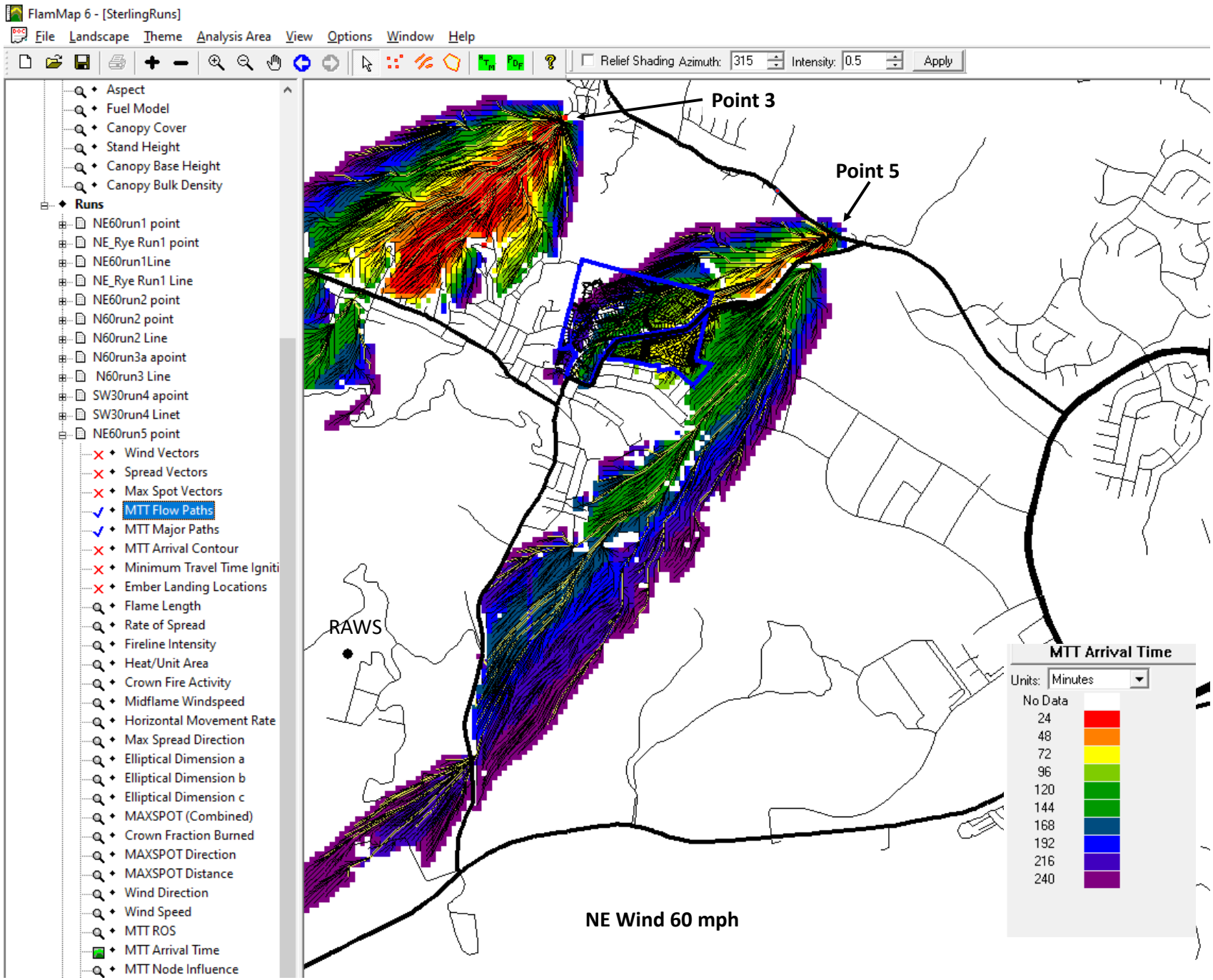
Flammap 15


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Slope
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
N60run2 Line
N60run3a apoint
N60run3 Line
SW30run4 apoint
SW30run4 Linet
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time
Ember Landing Locatio
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240
Line 4
Line Source Fire SSW Wind 30 mph

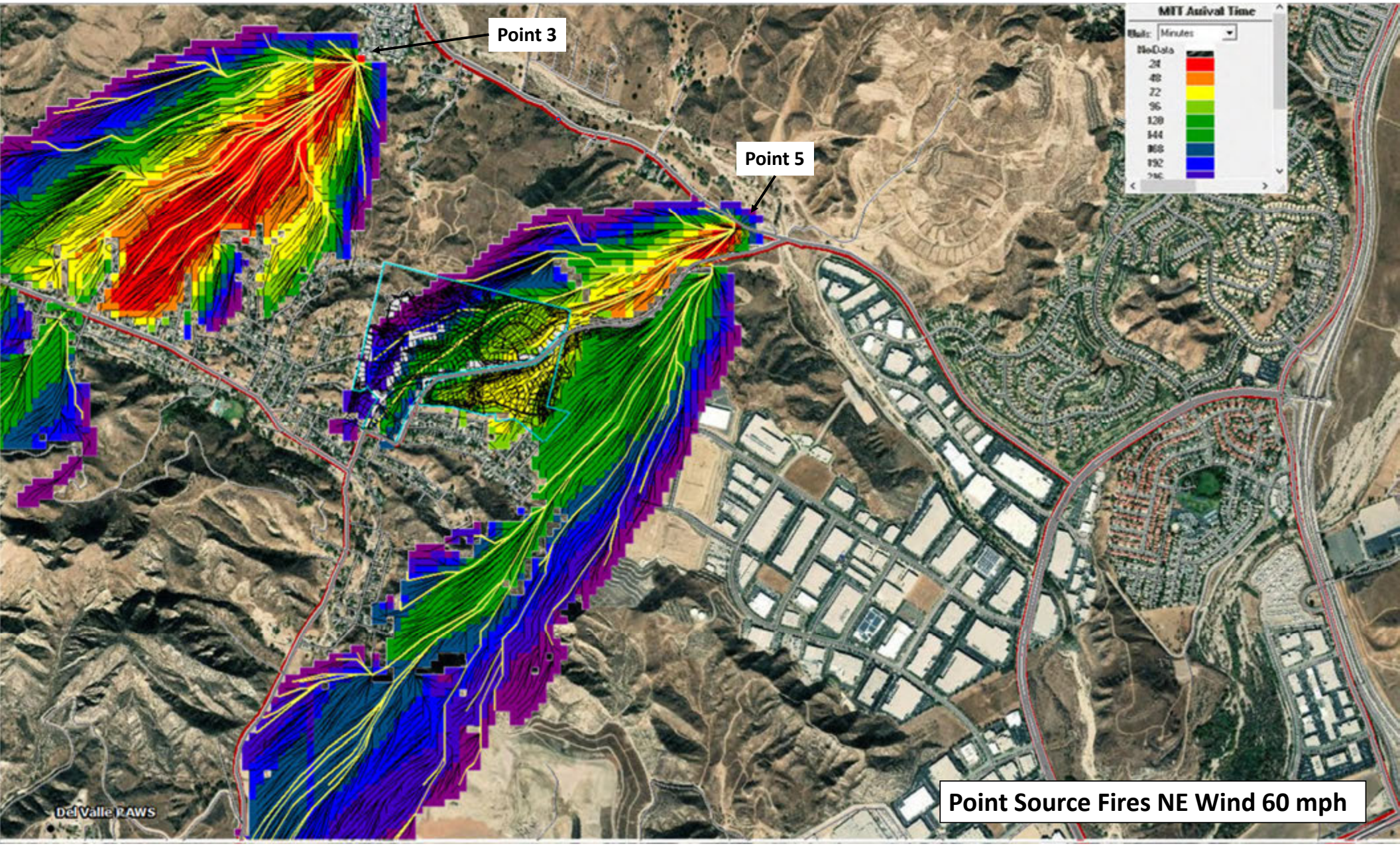
Flammap 16

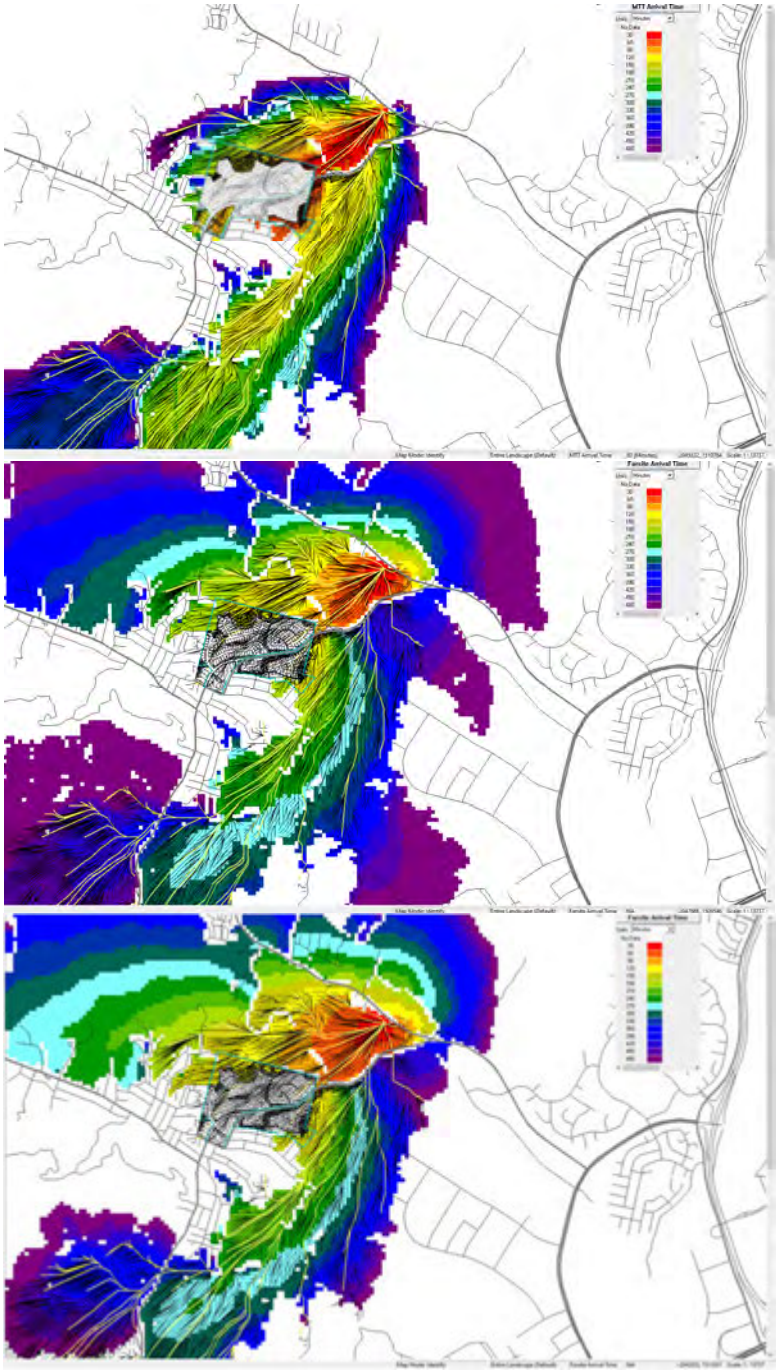

FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
N60run2 Line
N60run3a apoint
N60run3 Line
SW30run4 apoint
SW30run4 Linet
NE60run5 point
NE_Rye Run5 point
NE_Thomas Run1 point
NE60run1 point480
Onshore June 2017 point
Onshore June 2017 Line
Farsite Wind Vectors
Farsite Spread Vectors
Farsite Perimeters
Spot Fire Locations
Farsite Ignitions
Farsite Barriers
Farsite Arrival Time
Farsite Flame Length
Farsite Rate Of Spread
Farsite Fireline Intensity
Farsite Heat per Unit Ar
Farsite Spread Direction
Farsite Crown Fire Activ
Farsite Reaction Intensit
Farsite Ignition Grid
Spot Fire List
Run Log
Fire Growth Report
NE60run2 Line
W30run4 Line
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time I
Ember Landing Locatio
Flame Length
RAWS
Line 4
W Wind 30 mph
Units: Minutes
No Data
30
60
90
120
150
180
210
240
270
300
330
360
390
420

Flammap 17


FlamMap 6 - [SterlingRuns]
File Landscape Theme Analysis Area View Options Window Help
Relief Shading Azimuth: 315 Intensity: 0.5 Apply
Aspect
Fuel Model
Canopy Cover
Stand Height
Canopy Base Height
Canopy Bulk Density
Runs
NE60run1 point
NE_Rye Run1 point
NE60run1Line
NE_Rye Run1 Line
NE60run2 point
N60run2 point
N60run2 Line
N60run3a apoint
N60run3 Line
SW30run4 apoint
SW30run4 Linet
NE60run5 point
Wind Vectors
Spread Vectors
Max Spot Vectors
MTT Flow Paths
MTT Major Paths
MTT Arrival Contour
Minimum Travel Time Igniti
Ember Landing Locations
Flame Length
Rate of Spread
Fireline Intensity
Heat/Unit Area
Crown Fire Activity
Midflame Windspeed
Horizontal Movement Rate
Max Spread Direction
Elliptical Dimension a
Elliptical Dimension b
Elliptical Dimension c
MAXSPOT (Combined)
Crown Fraction Burned
MAXSPOT Direction
MAXSPOT Distance
Wind Direction
Wind Speed
MTT ROS
MTT Arrival Time
MTT Node Influence
Point 3
Point 5
RAWS
NE Wind 60 mph
MTT Arrival Time
Units: Minutes
No Data
24
48
72
96
120
144
168
192
216
240

Flammap 18


Point 3
Point 5
MTT Arrival Time
Units: Minutes
NoData
24
48
72
96
120
144
168
192
Del Valle RAWS
Point Source Fires NE Wind 60 mph



Flammap 60 mph NE
Worst Case

Thomas Fire Weather
(12/4/17 0700-1600)

Rye Fire Weather
(12/5/17 0900-1600)