Addendum to the Red Hill Specific Plan Final Environmental Impact Report

(SCH #2017041031)

For the

Compass at Red Hill Project

Lead Agency:

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April 2025

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1. INTRODUCTION

1.1. PURPOSE AND SCOPE

This document is an Addendum to the Red Hill Avenue Specific Plan (RHASP) Final Environmental Impact Report (Final EIR) (SCH # 2017041031) certified by the City of Tustin (City) in 2018. The Final EIR, in conjunction with the previously approved Addendum and this Addendum, serve as the environmental review for the proposed Compass at Red Hill Project (Project, proposed Project). The Project applicant proposes development of a site consistent with the approved uses in the Red Hill Avenue Specific Plan, City General Plan, and zoning designations, and within the assumptions that were evaluated in the Final EIR.

On October 16, 2018, the Tustin City Council adopted the RHASP and certified the Final EIR. The 43.11-acre RHASP area (inclusive of 7.32 acres of roadway right-of-way) would allow for up to 500 additional dwelling units (primarily integrated mixed use) and 325,000 sf of non-residential uses in a predominantly developed part of the City. Streetscape improvements could include new medians, landscaping, and Class II bike lanes. Total development (existing development plus RHASP development) would be 521 dwelling units and 621,446 sf of non-residential development.

The RHASP Final EIR assumed and evaluated the construction of Mixed Use development on the Project site. The Final EIR identified potential impacts from buildout of the RHASP and included mitigation measures for development projects. Development within the RHASP area is subject to mitigation measures identified in the Final EIR, the development regulations in the RHASP, and the City's municipal code. Pursuant to Public Resources Code Section 21167.2, the Final EIR must be conclusively presumed to be valid with regard to its use for later activities unless any of the circumstances requiring supplemental review exist.[1]

On November 12, 2020, the Community Development Director approved the Residential Allocation Reservation (RAR 2020-001) allocation of 114 DUs to the 3.39-acre Project site (does not include density bonus units) for the future development of a Mixed Use project containing 114 residential units, subject to obtaining required entitlements and complying with CEQA.

On August 17, 2021, City Council approved Resolution No. 443, which included approval of Design Review 2021-0002, Development Agreement 2021-0001, Subdivision 2021-0001/Vesting Tentative Tract Map (VTTM) No. 17822, and a Density Bonus and Voluntary Workforce Housing Agreement including a Concession/Incentive for a reduction in private and common open pace and a waiver of park fees for affordable units, for a Mixed Use project containing 137 residential units and 7,000 square feet of retail commercial space at 13751 and 13841 Red Hill Avenue within the RHASP. An Addendum to the RHASP Final EIR was prepared and approved in compliance with CEQA for the project (Approved Project). Ultimately, the Approved Project was never constructed on the site. However, the previously existing commercial structure that was previously located on the northern portion of the Project site was demolished and nothing was developed in its place.

The proposed Project evaluated herein includes a Tentative Tract Map, Design Review, Development Agreement, Density Bonus Law Concession/ Incentives Request, Residential Allocation Reservation, Senate Bill (SB) 330 Preliminary Application, Voluntary Workforce Housing Incentives Agreement, and Infrastructure Construction and Reimbursement Agreement for construction and operation of approximately 73 townhomes

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[1] *See Pub. Resources Code, § 21167.2; Laurel Heights Improvement Ass'n v. Regents of the University of California (1993) 6 Cal.4th 1112, 1130 ("[a]fter certification, the interests of finality are favored"); Santa Teresa Citizen Action Group v. City of San Jose (2003) 114 Cal. App. 4th 689, 705-706.)*

on the approximately 3.39-acre Project site located at 13841 and 13751 Red Hill Avenue within the center of the City of Tustin.

The proposed Project would result in 87 fewer dwelling units than analyzed by the RHASP Final EIR, as detailed in the following evaluation. Therefore, a CEQA Addendum to the RHASP Final EIR has been prepared for the proposed Project.

This environmental checklist provides the basis for an Addendum to the previously certified RHASP Final EIR and serves as the appropriate level of environmental review of the proposed Project, as required pursuant to the provisions of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.) and the CEQA Guidelines. This checklist confirms that the Project is within the scope of the RHASP analyzed in the RHASP Final EIR as provided in CEQA Guideline Section 15168 and the Addendum augments the analysis in the RHASP Final EIR as provided in CEQA Guidelines Sections 15162 and 15164 and provides the basis for the City's determination that no supplemental or Subsequent EIR is required to evaluate the proposed Project. Environmental analysis and mitigation measures from the RHASP Final EIR and previously approved addendum have been incorporated into this Addendum, and applicability of each has been described. In cases where mitigation measures from the RHASP Final EIR have been satisfied by studies prepared for the Addendum, it is noted.

Pursuant to the provisions of CEQA and the CEQA Guidelines, the City, as the Lead Agency, is charged with the responsibility of deciding whether or not to approve the proposed Project. As part of the decision-making process, the City is required to review and consider the potential environmental effects that could result from construction and operation of the proposed Project. The analysis in this document discusses the impacts identified within the RHASP Final EIR and 2021 Addendum for buildout of the Approved Project and compares them with the impacts that would result from implementation of the proposed Project. This Addendum compares the impacts of constructing and operating the proposed Project to impacts identified in the RHASP Final EIR and 2021 Addendum, which evaluated the buildout of the site pursuant to the RHASP, City General Plan, and the zoning designation standards.

Existing Plans, Programs, or Policies (PPPs) and Project Design Features (PDFs)

Throughout the analysis of this document, reference is made to requirements that are applied to all development on the basis of federal, State, or local law. Existing Plans, Programs, or Policies are collectively identified in this document as "PPPs". Where applicable, PPPs are listed to show their effect in reducing potential environmental impacts.

Additionally, the Project incorporates various measures that serve to reduce potentially significant impacts. These measures are referred to as Project Design Features (PDFs), which are design features that are already incorporated into the Project as-is (not mitigation) and are listed below.

Mitigation Measures

Applicable Mitigation Measures from the RHASP Final EIR are included herein and will be incorporated into the Project. As shown throughout the analysis, the Project does not result in any new impacts and no additional mitigation measures are required, although some of the mitigation language has been modified to reflect current City standards, although the intent, requirements, and ability to reduce potential impacts are still the same. All references to mitigation measures relate only to those from the RHASP.

1.2. ENVIRONMENTAL PROCEDURES

Pursuant to CEQA and the CEQA Guidelines, the City's review of the Checklist and Addendum will determine if approval of the requested discretionary actions and subsequent development could cause a change in the conclusions of the certified RHASP Final EIR and disclose any change in circumstances or new information of substantial importance that would substantially change the conclusions of the RHASP Final EIR. This environmental Checklist and Addendum provide the City with information to document potential impacts of the proposed Project.

Pursuant to Section 21166 of the Public Resources Code and Section 15162 of the CEQA Guidelines, when an EIR has been certified or a negative declaration adopted for a project, no Subsequent EIR shall be prepared for the project unless the lead agency determines, on the basis of substantial evidence, that one or more of the following conditions are met:

1. Substantial changes are proposed in the project which will require major revisions of the previous EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;
2. Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or
3. New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete, shows any of the following:

   a. The project will have one or more significant effects not discussed in the previous EIR or negative declaration.
   b. Significant effects previously examined will be substantially more severe than identified in the previous EIR.
   c. Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponent declines to adopt the mitigation measures or alternatives.
   d. Mitigation measures or alternatives that are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponent declines to adopt the mitigation measures or alternatives.

Section 15164 of the CEQA Guidelines states that an Addendum to an EIR shall be prepared "if some changes or additions are necessary, but none of the conditions described in Section 15162 calling for preparation of a Subsequent EIR have occurred." Section 15168 of the CEQA Guidelines states that where the later activities involve site specific operations, the agency should use a written Checklist to document the evaluation of the site and the activity to determine whether the environmental effects of the operation were within the scope of the program EIR. Under Section 15168, where if the agency finds that pursuant to Section 15162, no Subsequent EIR would be required, the agency can approve the activity as being within the scope of the project covered by the program EIR, and no new environmental document is required.

In reviewing this Addendum, the question before the City decisionmakers is not whether the RHASP Final EIR complies with CEQA, but only whether one of the events triggering the need for subsequent environmental review has occurred. (*A Local & Regional Monitor v. City of Los Angeles* (1993) 12 Cal.App.4th 1773; *Committee for Green Foothills v. Santa Clara County Board of Supervisors* (2010) 48 Cal.4th 32.)

This Addendum and the technical studies in support of the analysis review the proposed Project and any changes to the existing conditions that have occurred since the RHASP Final EIR and previously Approved Addendum were certified. It also reviews any new information of substantial importance that was not known and could not have been known with exercise of reasonable diligence at the time that the RHASP Final EIR was certified. It further examines whether, as a result of any changes or any new information, a Subsequent EIR may be required. This examination includes an analysis of the provisions of Section 21166 of the Public Resources Code and Section 15162 of the CEQA Guidelines and their applicability to the proposed Project. This Addendum relies on use of the Environmental Analysis provided herein, which addresses environmental issues on a section-by-section basis and provides a comparison to the findings in the RHASP Final EIR and 2021 Addendum.

On the basis of the findings of the certified RHASP Final EIR and the provisions of the CEQA Guidelines, the City as the Lead Agency determined that, as documented in this Addendum to the previously certified RHASP Final EIR, no supplemental or Subsequent EIR is required to review the proposed Project.

1.3. PREVIOUS ENVIRONMENTAL DOCUMENTATION

As directed by CEQA, this Addendum relies on the environmental analysis in the RHASP Final EIR and the 2021 Addendum. A summary of the previous environmental documentation and how they relate to the proposed Project is provided below.

The RHASP Final EIR evaluated buildout of the RHASP area pursuant to RHASP design criteria and residential and non-residential allowances. For the area within the RHASP north of Interstate 5, including the Project site, the RHASP Final EIR analyzed construction and operation of approximately 395 dwelling units and 175,000 SF of non-residential uses, as allowed pursuant to the RHASP's Mixed Use designation.

The RHASP Final EIR identified that the RHASP would have significant and unavoidable environmental impacts related to air quality, greenhouse gas emissions, transportation, and traffic. The RHASP Final EIR also identified six environmental impact areas for which mitigation measures were required: air quality; cultural resources; hazards and hazardous materials; hydrology & water quality; noise; recreation; transportation and traffic; and utilities and service systems. Mitigation measures adopted through the RHASP Final EIR are included as Appendix I.

The 2021 Addendum to the RHASP Final EIR evaluated the buildout of the Approved Mixed-Use Project which was inclusive of 7,000 square feet of retail commercial space and 137 residential units. The 2021 Addendum identified that the Approved Project would have no new environmental effects when compared to what had been previously analyzed in the RHASP Final EIR. The Approved Project was not constructed.

A Trip Generation Assessment was prepared and included as Appendix C of the 2021 RHASP Final EIR Addendum. The assessment compared the trip generation forecast of the Approved Mixed-Use Project to what was previously approved for the Project site under the RHASP Final EIR (Linscott Law & Greenspan, 2021). The Project site encompasses the entirety of Traffic Analysis Zone (TAZ) 1 of the Irvine Transportation Analysis Model (ITAM). TAZ 1 is comprised of two parcels of land with a total acreage of 3.38 acres located south of San Juan Street and west of Red Hill Avenue at 13751 and 13841 Red Hill Avenue. Within TAZ 1, the RHASP Final EIR evaluated up to 160 residential units and 30,000 SF of commercial uses. Direct comparison between the development potential for TAZ 1 under the RHASP and the Approved Mixed-Use Project showed that the Approved Mixed-Use Project was less intensive of use, resulting in 23 dwelling units below the RHASP residential allotment and the 23,000 SF below the commercial allotment for TAZ 1. Overall, the 2021 Addendum to the RHASP Final EIR determined that the Approved Mixed-Use Project would result in 1,001 fewer daily trips, 22 fewer AM peak hour trips and 84 fewer PM peak hour trips than the maximum development allowed under the RHASP. This formed the basis for determination that the Mixed-Use Project was within the allowable limits of development previously established by the RHASP, and environmental impacts would be less than previously analyzed under the RHASP Final EIR.

This Addendum incorporates by reference the RHASP Final EIR, 2021 Addendum, and the technical documents that relate to the proposed Project or provide additional information concerning the environmental setting of the proposed Project. The information within this Addendum is based on the following technical studies and/or planning documents:

- The Red Hill Avenue Specific Plan (https://www.tustinca.org/DocumentCenter/View/548/Red-Hill-Avenue-Specific-Plan-PDF)
- The RHASP Final EIR and certifying resolutions and findings (https://www.tustinca.org/DocumentCenter/View/544/Red-Hill-Avenue-Specific-Plan-Final-Draft-EIR-Volume-1-PDF)
- Tustin City Code (https://library.municode.com/ca/tustin)
- The Red Hill Avenue Specific Plan Mitigation Monitoring and reporting Program (https://www.tustinca.org/DocumentCenter/View/543/Mitigation-Monitoring-and-Reporting-Program-MMRP-PDF)
- Technical studies, personal communications, and web sites listed in Section 7, *References*

In addition to the websites listed above, all documents are available for review at the City of Tustin Planning Department, located at 300 Centennial Way, Tustin, CA 92780.

2. ENVIRONMENTAL SETTING

2.1. PROJECT LOCATION

The proposed 3.39-acre Project site is located within the central portion of the City of Tustin. As depicted on Figure 2-1, *Regional Location*, the City of Tustin is in central Orange County, approximately 5 miles northeast of downtown Irvine, 35 miles southeast of downtown Los Angeles, and 15 miles southeast of Los Angeles County.

As depicted on Figure 2-2, *Local Vicinity,* the Project site is located at 13751 & 13841 Red Hill Avenue (APNs 500-141-09 and 500-141-10), on the northwest corner of San Juan Street and Red Hill Avenue. Regional access to the site is provided via Interstate 5 (I-5), located approximately 0.1 mile to the southwest, and State Route 55 (SR-55), located approximately 1 mile to the west of the Project site. Local access is provided by Red Hill Avenue and San Juan Street.

2.2. EXISTING PROJECT SITE

The Project site is 3.39 acres and consists of two parcels (APNs 500-141-09 and 500-141-10). The northwestern portion of the Project site, at 13751 Red Hill Avenue, was previously developed with a commercial office building, associated parking, and ornamental landscaping. Under the Approved Project, this development has been demolished. The entire site is now vacant and disturbed with some ruderal vegetation, as shown on Figure 2-3, *Site Photos.*

2.3. EXISTING LAND USES AND ZONING DESIGNATION OF THE PROJECT SITE

The Project site has a General Plan land use and zoning designation of Red Hill Avenue Specific Plan (RHASP). As shown on Figure 2-4, *Red Hill Specific Plan,* the Project site is designated as "Mixed Use" within the RHASP. According to the RHASP, the Mixed Use designation provides for Commercial/Office and Mixed Use elements. The Mixed Use designation allows for a variety of future development opportunities as market conditions are suitable for high-value use of the property. It allows for Mixed Use developments with commercial retail and/or office on the ground floor, and either residential or office uses on upper floors in a vertical Mixed Use environment, or commercial/office uses and residential uses in a horizontal Mixed Use setting on a single development site.

2.4. SURROUNDING GENERAL PLAN AND ZONING DESIGNATIONS

The Project site is located within a fully developed and urbanized area.

As shown in Figure 2-5, *Aerial,* the site is surrounded by Tustin High School sports fields to the northwest; a car wash and U-Haul to the southwest; Red Hill Avenue followed by commercial uses to the southeast; and San Juan Street followed by single-family residences to the northeast.

Land uses surrounding the Project site are described in Table 2-1.

Table 2-1: Surrounding Existing Land Use and Zoning Designations

	Existing Land Use	General Plan Designation	Zoning Designation
Northwest	Tustin High School baseball fields.	Public/Institutional (PI)	Public and Institutional (PI)
Southwest	Car wash and U-Haul store.	Red Hill Area Specific Plan (RHASP)	Red Hill Area Specific Plan (RHASP)
Southeast	Commercial uses and parking lot.	Red Hill Area Specific Plan (RHASP)	Red Hill Area Specific Plan (RHASP)
Northeast	Single-family and multi-family residences.	High Density Residential (HDR)	Multiple Family Residential (R3)

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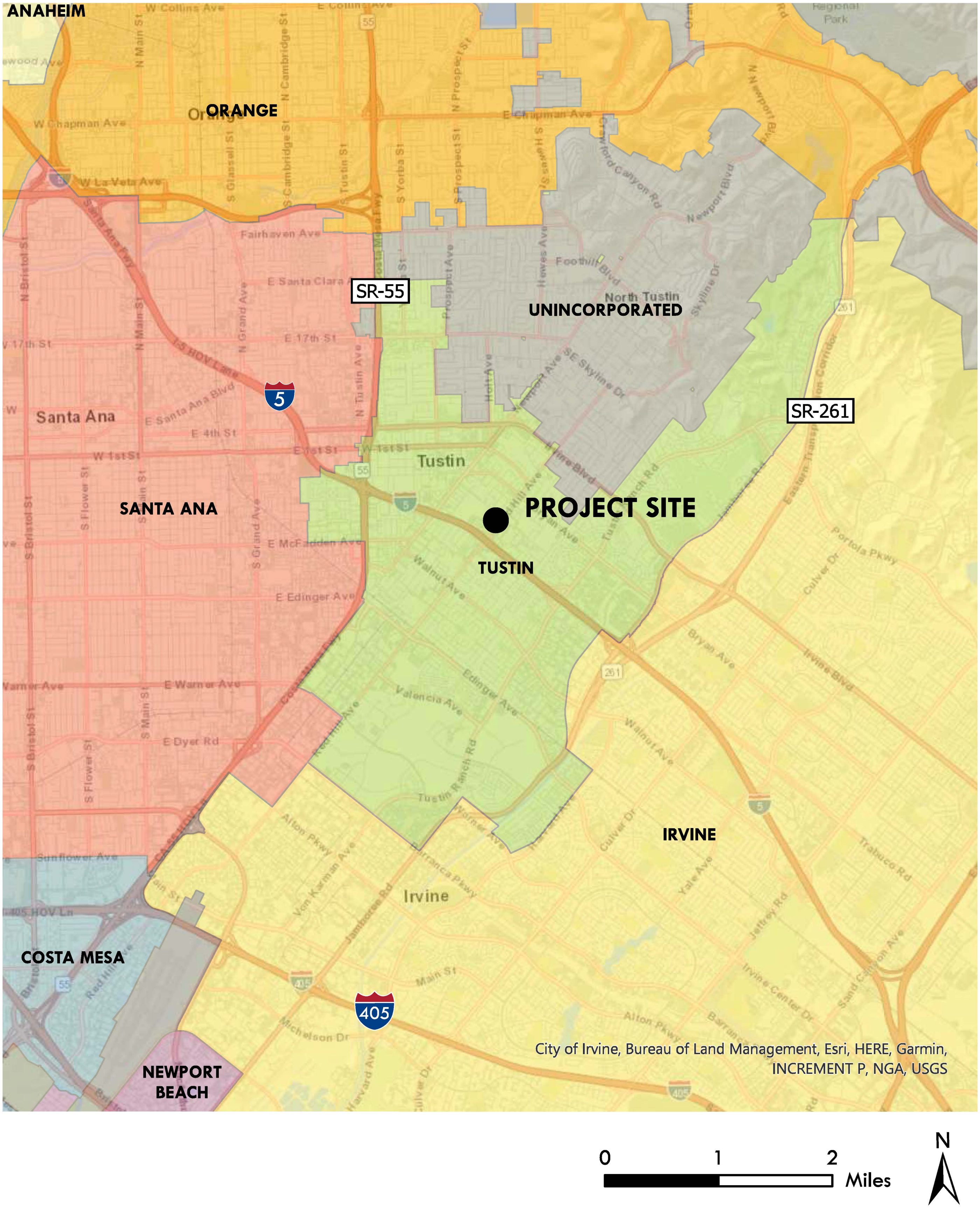
Regional Location



City of Irvine, Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

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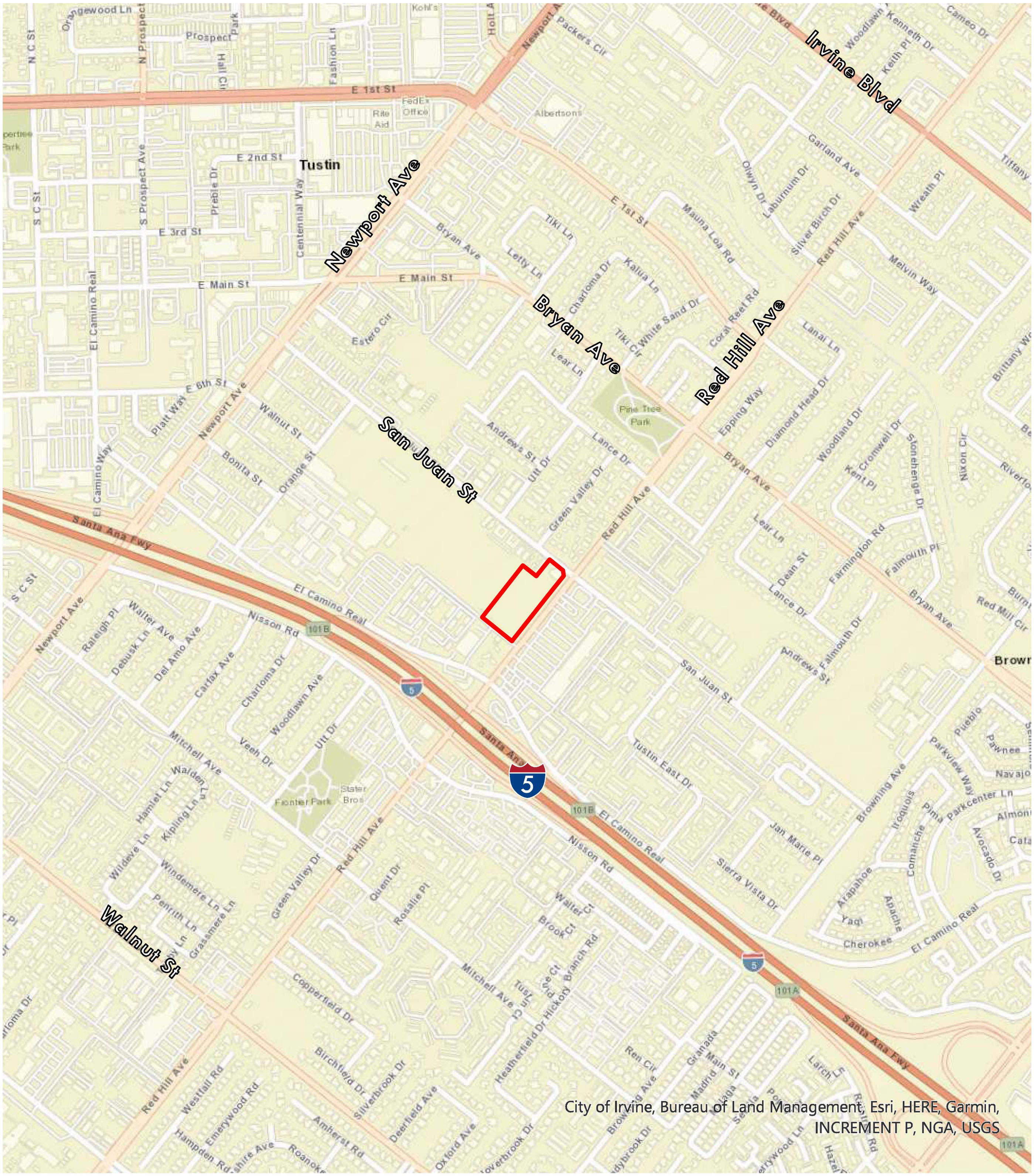
Local Vicinity



City of Irvine, Bureau of Land Management, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

Legend

🟥 Project Site

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Existing Site Photos

Key

- Viewpoint location
- → Direction of sight

View of the Project site from Red Hill Avenue.

Figure 2-3

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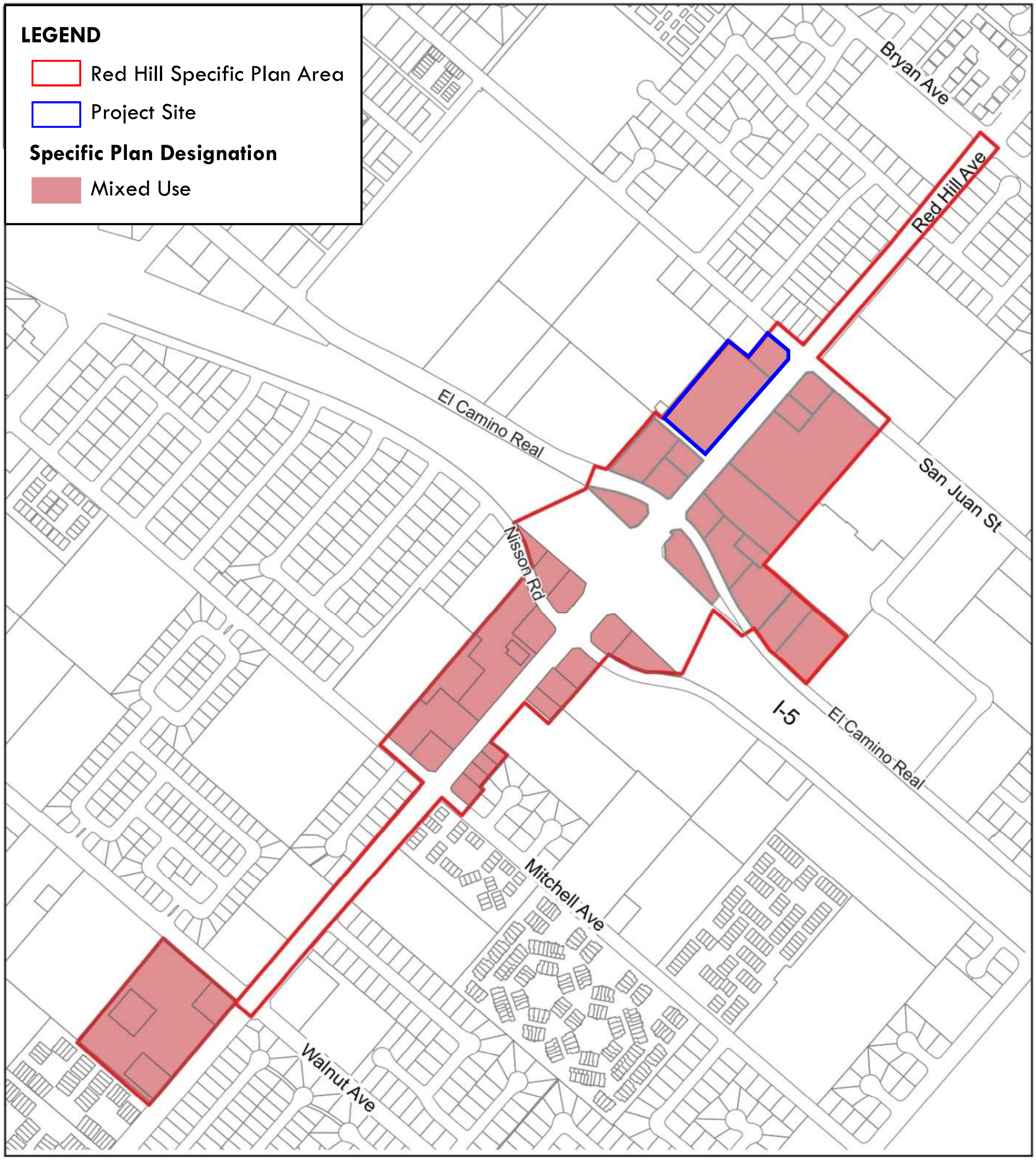
Red Hill Specific Plan Designation



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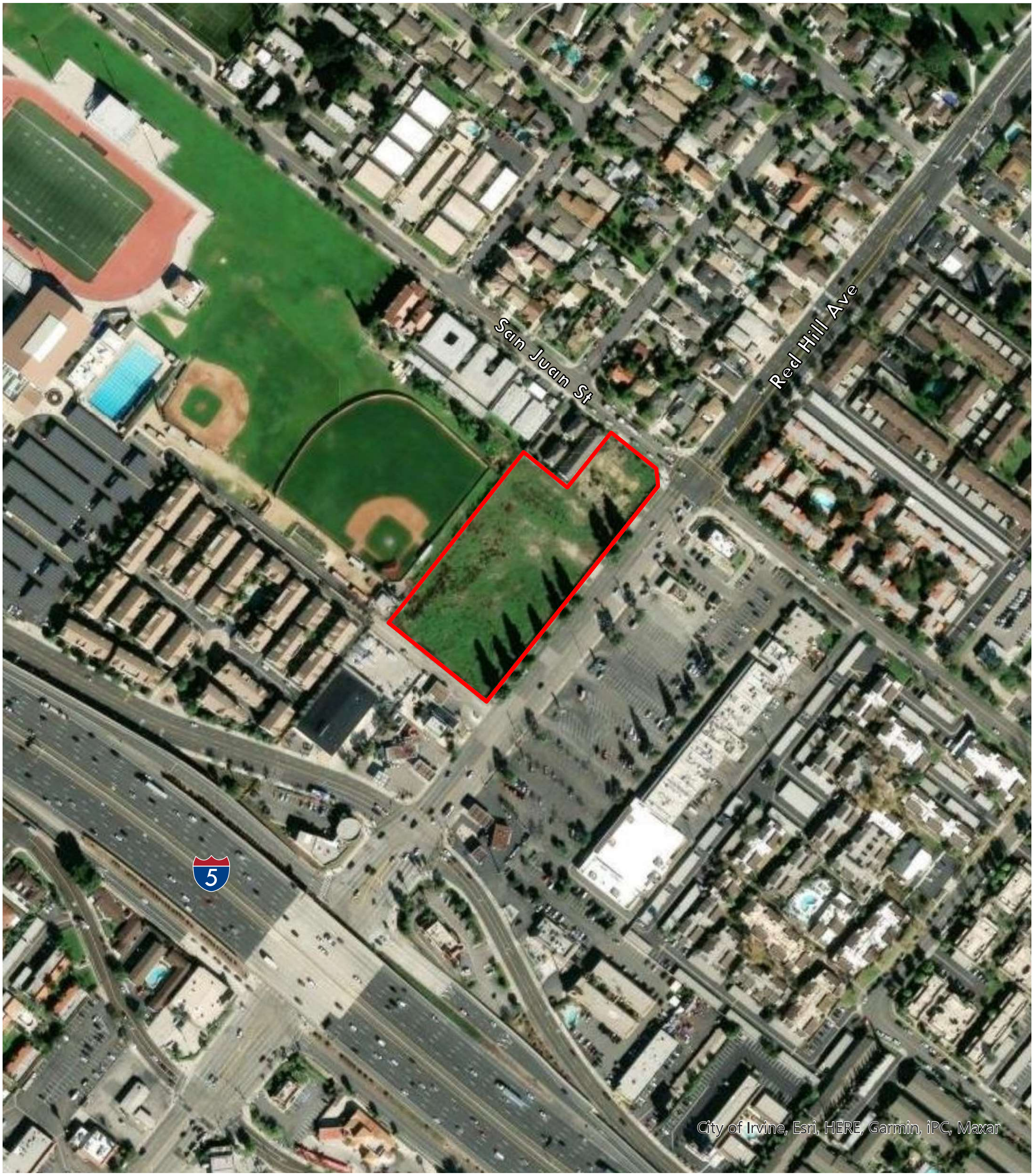
Aerial



Legend

🟥 Project Site

Figure 2-5

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3. PROJECT DESCRIPTION

3.1. PROJECT SITE PLANNING AND CEQA BACKGROUND

A summary of the previous RHASP and approvals for the Project site are contained above under Section 1.1, *Purpose and* Scope, and Section 1.3, *Previous Environmental Documentation*. The City of Tustin adopted the RHASP and certified the RHASP Final EIR in 2018. The 43.11-acre RHASP area (inclusive of 7.32 acres of roadway right-of-way) allows for development of up to a total of 521 dwelling units (DUs) and 621,446 SF of non-residential uses (commercial and office uses) along the prominent Red Hill Avenue corridor within the City. Additionally, the City of Tustin adopted an addendum to the RHASP Final EIR in 2021. The 2021 Addendum evaluated the buildout of the Approved 3.39-acre Mixed-Use Project, which was inclusive of 7,000 square feet of retail commercial space, and 137 residential units on the corner of Red Hill Avenue and San Juan Street.

3.2. PREVIOUS CEQA ASSUMPTIONS FOR PROJECT SITE

The approved 2018 RHASP increased the development potential of the Specific Plan area by 500 DUs and 325,000 SF of non-residential uses from existing conditions, for a total maximum development potential of 521 DUs and 621,446 SF of non-residential land uses. The RHASP also included a design framework for future development in the Specific Plan area, including streetscape, median, and landscaping improvements, as well as a plan for incorporation of Class II bike lanes throughout the area. Development pursuant to RHASP is subject to mitigation measures identified in the RHASP Final EIR and the Tustin City Code (TCC).

Following approval of the RHASP and RHASP Final EIR, the following approvals have been made that are related to the Project site:

- On November 12, 2020, the Community Development Director approved the Residential Allocation Reservation (RAR 2020-001) allocation of 114 DUs to the 3.39-acre Project site (does not include density bonus units) for the development of a Mixed Use project containing 137 residential units, including a twenty percent density bonus, subject to obtaining the required entitlements.
- On August 17, 2021, the City Council approved Resolution No. 443, which included approval of Design Review 2021- 0002, Development Agreement 2021-0001, Subdivision 2021-0001/Vesting Tentative Tract Map No. 17822, and a Density Bonus and Voluntary Workforce Housing Agreement including a Concession/Incentive for a reduction in private and common open pace and a waiver of park fees for affordable units, for a Mixed Use project containing 137 residential units and 7,000 square feet of retail commercial space at 13751 and 13841 Red Hill Avenue within the RHASP. An Addendum to the RHASP Final EIR was prepared and approved in compliance with CEQA for the project.

The previous assumptions for the 3.39-acre Project site contained in the 2018 RHASP Final EIR and 2021 Addendum for analysis purposes are contained below.

Table 3-1: Previous CEQA Assumptions

Land Use	Units	Daily Trips	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Approved RHASP								
Apartment[1]	160 du	930	12	58	70	56	24	84
General Retail[2]	30,000 SF	1,281	18	11	29	53	58	111
Total		**2,221**	**30**	**69**	**99**	**109**	**82**	**195**
Approved 2021 Addendum								
Apartment[1]	137 du	911	14	56	70	55	30	85
General Retail[2]	7,000 SF	299	4	3	7	12	14 26	
Total		**1,210**	**18**	**59**	**77**	**67**	**44**	**111**

Source: EPD Solutions, 2021, Addendum to the Red Hill Specific Plan EIR
[1] ITE Land Use Code: 220 Apartment
[2] ITE Land Use Code: 820 Shopping Center
[3] Total Net Trip Gen= Proposed Project – Approved RHASP Site Density

3.3. PROPOSED PROJECT

Project Overview

The Project proposes development of nine multifamily residential buildings containing 73 townhome-style residential condominium units. The Project applicant would construct the proposed 73 residential units within the 3.39-acre site for a net density of 21.53 dwelling units per acre. The Project would also include construction of one driveway entrance from Red Hill Avenue, two private recreational common spaces for resident use, and one public plaza for community use. The Project design concept is illustrated in Figure 3-1, *Conceptual Site Plan.*

Project Features

Building Summary

The proposed 73 residential units would be developed across nine, three-story buildings. Proposed buildings would include four design variations, inclusive of one 4-plex, one 7-plex, four 8-plexes, and three 10-plexes, resulting in a total building footprint of 85,931 SF and floor area of 110,957 SF. The proposed units would include two-, three-, and four-bedroom for sale condominiums, as shown in Tables 3-2 and 3-3.

Table 3-2: Unit Breakdown

Unit Type	Number of Units
1,210 SF, 2 Bed, 2.5 Bath, Standard Garage	12
1,497 SF, 3 Bed, 3 Bath, Tandem Garage	30
1,791SF, 4 Bed, 4 Bath, Standard, Garage	31
Total	**73**

Table 3-3: Proposed Development

Building	Number of Units	Footprint (SF)	Floor Area (SF)	Garage Parking
Buildings 1 through 4	8 (32 total)	6,825 (46,192 total)	10,993 (43,972 total)	2 spaces/unit (64 total)
Buildings 5, 8, and 9	10 (30 total)	8,903 (26,709 total)	16,305 (48,915 total)	2 spaces (60 total)
Building 6	4	3,556	6,522	2 spaces/unit (8 total)
Building 7	7	6,474	11,548	2 spaces/unit (14 total)
Total	**73**	**85,931**	**110,957**	**146 spaces**

The nine buildings would be 37 feet in height and three stories, consistent with the 40-foot and three-story maximums imposed by the RHASP. The proposed buildings would have a Spanish Eclectic architectural style, with stucco architectural treatment, clay roofs, decorative ceramic tiles in classic Spanish blue and rust color schemes, as shown on Figure 3-2, *Building A Elevations,* Figure 3-3, *Building B Elevations*, Figure 3-4, *Building C Elevations*, and Figure 3-5, *Building D Elevations*.

Affordable Housing Component

Of the Project's 73 total unit count, four units would be designated as affordable units, consistent with the City's "Workforce Housing Ordinance." These four units would be designated as very low-income units and would consist of two two-bedroom units, and two three-bedroom units.

State Density Bonus Law (California Government Code Section 65915-65918) provides qualifying projects to take advantage of various tools to maximize density and offset the cost of providing affordable housing on-site. Because the proposed Project qualifies for the State Density Bonus Law, the applicant has requested incentives and concessions in lieu of density bonus, consistent with the provisions of State Density Bonus Law. The applicant requests:

1. A concession to eliminate the requirement for a commercial component of the Project as required by the site's "Mixed Use" land use designation within the RHASP.

Access and Parking

Access to the site would be provided via a driveway on Red Hill Avenue. On-site drives would provide residents and guests with access to commercial guest spaces and residential garages. The Transformative Climate Communities program was adopted in March 2025 through Ordinance 1554 and 1555 to amend the off-street parking requirements for multifamily housing, which requires 1 space per studio unit, 1.4 spaces for one-bedroom units, 1.6 spaces for 2-bedroom units, and 2 spaces for three-bedroom or more units. Additionally, one (1) unassigned guest parking spaces shall be required per every four (4) units. Tandem parking is permitted only for resident parking. This would require the proposed Project to have a total of 141 residential parking spaces based on the variety of units proposed, plus 18 unassigned guest spaces. The proposed Project would include a total of 164 off-street parking spaces, inclusive of 18 guest parking spaces. Additionally, the Project would include 13 on-street public parking bays. The Project is provided flexibility in implementation of parking through minimum parking requirements established under the State Density Bonus Law (Gov. Code §§65915-65918).

The Project would provide garage parking at a rate of 2 spaces per residential unit and guest parking at 0.24 stall per residential unit, for a total of 146 residential parking spaces and 18 guest parking spaces. Proposed parking would comply with both the State Density Bonus Law and the City's Transformative Climate Communities .program. Additionally, the Project would include up to 13 parallel public street parking spaces along Red Hill Avenue, as shown on Figure 3-1, *Conceptual Site Plan*.

Recreation and Open Space

The Project proposes two private recreational amenities designed to provide residents with opportunities for outdoor recreation and social gathering. The Project applicant proposes both private and common open space to meet and exceed the required standards. RHASP requires that developments provide 100 square feet (sf) per unit private open space, 200 sf per unit of common open space, or 300 sf of combined private and open space per unit. The proposed Project would provide 6,825 square feet of private open space and 31,016 square feet of common open space, totaling 37,841 sf (or 518 sf per unit). These spaces are designed to offer residents ample outdoor areas for both individual and communal use.

The first amenity is located in the southwest portion of the Project site and would consist of an 8,827 square-foot area, featuring a Tot Lot with fixed seating to accommodate young children and their families. The space would include a central gathering area with a shade structure, barbecue counters, and fixed tables with seating, fostering a sense of community and providing opportunities for outdoor dining and socializing. An open turf area for free play would also be included, offering residents a flexible space for informal recreational activities.

The second amenity is located in the northcentral portion of the Project site and would encompass a 3,049 square-foot area, similarly, featuring a central gathering space with fixed seating, promoting communal use and outdoor gatherings. Additionally, the area would provide an open turf space for free play, allowing residents to engage in a variety of recreational activities.

Additionally, the Project applicant proposes the development of an approximately 3,200-SF Public Plaza located at the northeast corner of Red Hill Avenue and San Juan Street that would be accessible to the public, fostering community engagement and activating the street corner. The plaza would feature seating, landscaping, and lighting. bike rack, and low walls with Secondary Gateway ignage. It would be enhanced with trees, landscaping, and a pet station to serve the needs of the surrounding neighborhood

Landscaping

The Project would install new drought tolerant ornamental landscaping throughout the Project site pursuant to RHASP requirements, which would include a large variety of 15-gallon and 24-inch box trees, such as: Chaste Tree, Strawberry Tree, Australian Willow, Crape Myrtle, Japanese Zelkova, Keith Davey and more. In addition, a variety of ornamental shrubs, vines, and ground covers would be installed. The proposed Project would provide 35,881.84 SF of landscape area, which would result in overall decrease of perviousness from 100 percent to 23.9 percent post-development.

Lighting

The proposed Project applicant would install new exterior lighting on-site for security, to accent landscaping, and to light signage, walkways, and parking areas. The new lighting would be focused on the site, shielded from offsite areas, and be in compliance with lighting regulations in TCC Section 9271.

Infrastructure Improvements

The proposed Project applicant would construct on-site infrastructure including new internal private streets, curb, gutter, sidewalk, and storm drain improvements, wet and dry utilities, and related infrastructure improvements. The Project would install a new public sidewalk and landscaped parkway, on-street public parking spaces, and raised median along Red Hill Avenue.

Water and Sewer Improvements

The Project would construct private domestic water lines and private fire water lines that would connect to a proposed 12-inch domestic water line within Red Hill Avenue and existing 8-inch domestic water line within San Juan Street. Based on Orange County Fire Authority fire flow standards and demands, a new water main in Red Hill Avenue will be constructed to a minimum 12-inch line.

Drainage Improvements

A series of on-site storm drain facilities with Low Impact Development (LID) are proposed to capture, treat, and infiltrate stormwater. Treated runoff from the Project would be directed to the existing Red Hill Avenue catch basin via the Red Hill Avenue or San Juan Street storm drain. The basin would be designed to capture and treat the Project's required design capture volume (DCV) of 6,989 as required by the County of Orange Santa Ana Region NPDES permit.

Off-Site Improvements

The Project would include construction of parking bays and striping of up to thirteen (13) parallel public parking spaces along with a Class II bike lane along Red Hill Avenue pursuant to the circulation plan of the RHASP.

The Project would construct a signalized intersection at Red Hill Avenue and the proposed Project driveway, including driveway and curb ramp improvements on the east side of the street. Additionally, the Project would stripe a pedestrian crosswalk at the proposed intersection.

Construction and Phasing

Construction activities for the Project would occur over one phase and include site preparation, grading, building construction, paving, and architectural coatings. Construction is expected to occur over 13 months and would occur within the hours allowable by TCC Section 4614, which states that construction is prohibited between the hours of 6:00 p.m. and 7:00 a.m., Monday through Friday and 5:00 p.m. and 9:00 a.m. on Saturdays and during all hours Sundays and City-observed federal holidays.

Operational Characteristics

The Project would be operated as residential condominium units and a public recreational space. Typical operational characteristics include residents traveling to and from the site, and delivery of materials and supplies to the site. The park space would be open to the public from sunrise to 10:00 P.M., consistent with the City of Tustin park hours.

Discretionary Approvals, Permits, and Studies

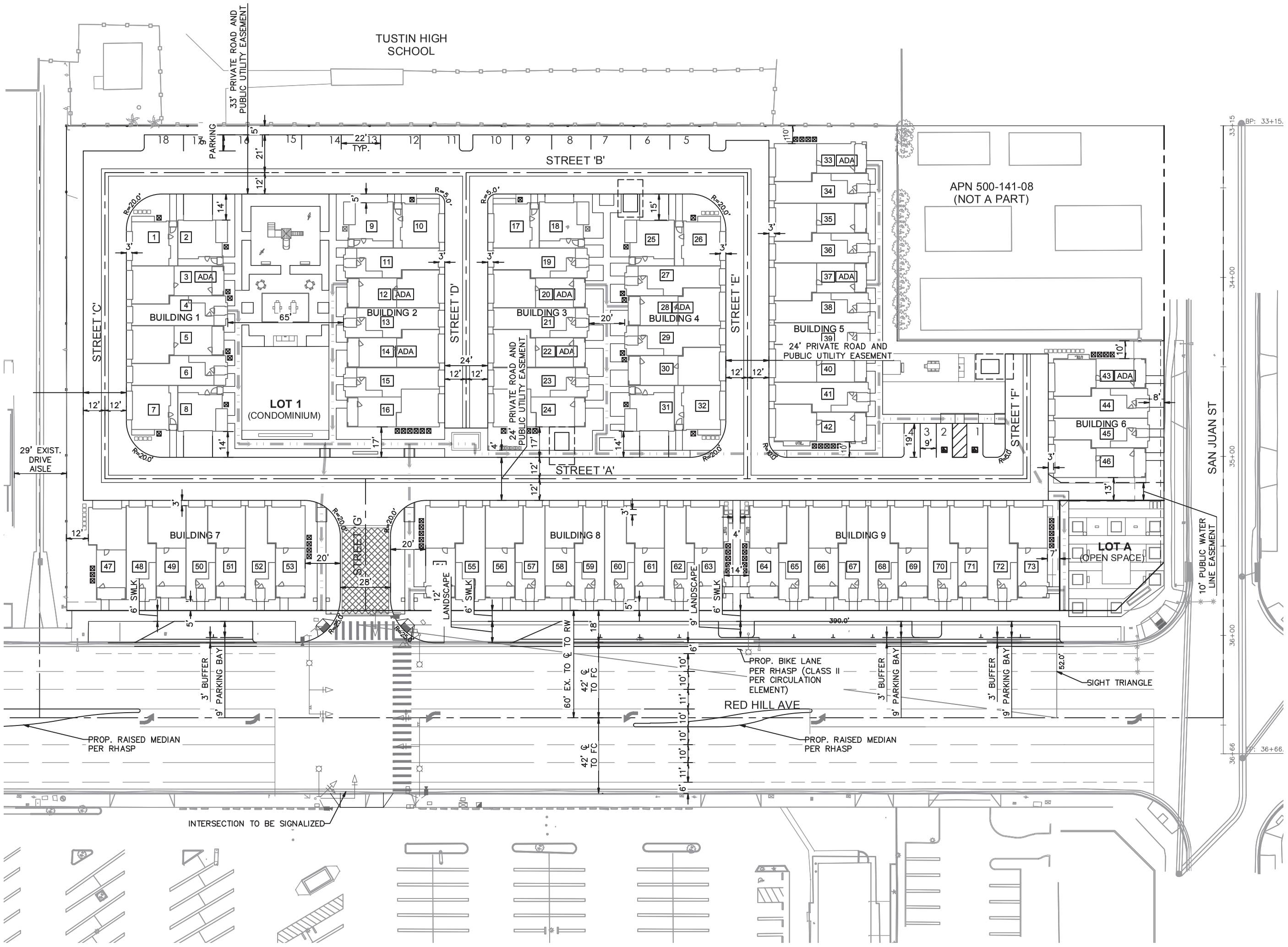
The following discretionary approvals and permits are anticipated to be necessary for implementation of the proposed Project:

City of Tustin

- Adoption of this Addendum
- Design Review
- Subdivision/ Tentative Tract Map (TTM) Approval
- Development Agreement

- Density Bonus Law Concession/Incentive Requests
- Residential Allocation Reservation (RAR)
- SB 330 Preliminary Application
- Voluntary Workforce Housing Incentive Agreement
- Infrastructure Construction and Reimbursement Agreement
- Approvals and permits necessary to execute the proposed Project, including but not limited to, demolition permit, grading permit, building permits, etc.

Site Plan



Development Standard	Required per RHASP	Proposed
RHASP Table 4-3		
A. Minimum Required Street Frontage/Lot Width	• 100 feet	• San Juan: 123 feet • Red Hill: 585 feet
B. Maximum Building Height	• 4 stories and 50 feet for mixeduse • 3 stories and 40 feet	• 37 feet (3 stories)
C. Front Yard (Building) Setback	• None with required pedestrian accessible amenities • 5-foot (aggregate) setback above the second story; • Addtional upper story setbacks may be imposed during design review process.	• None with a combination of porch and landing frontages • 5-foot aggregate setback with the inclusion of upper story balconies
D. Side Yard (Interior) Setback	• 10 feet	• 10 feet
E. Side Yard (Corner/Street Side) Setback	• None with required pedestrian accessible amenities • None with required frontage style or porch, courtyard, or landing	• None with a combination of porch and landing frontages
F. Rear Yard	• 10 feet	• 10 feet
G. Building Separation (freestanding buildings containing residential and adjacent building(s)	• 10 feet	• 22 feet
H. Open Space 1. Private 2. Common	1. 100 SF per unit x 73 = 7,300 2. 200 SF per unit x 73 = 14,600 3. Or 300 SF per Unit Combined	Approximately 519 SF per unit combined (see page L-3.00)
RHASP Table 4.4 Parking Standards		
Resident Parking	• 2 bed: 1 space/unit • 3 or more bed: 2 spaces/unit	• 146 spaces (2.0 space/unit)
Guest Parking	1 guest space per 4 units	• 18 spaces

1. Reduced through Density Bonus Law (DBL) Parking Ratios

Compass at Red Hill Project
City of Tustin

Figure 3-1

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Elevations - 4-Plex Building

FRONT ELEVATION

REAR ELEVATION

LEFT ELEVATION

RIGHT ELEVATION

Figure 3-2

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Elevations - 7-Plex Building

FRONT ELEVATION

LEFT ELEVATION

REAR ELEVATION

RIGHT ELEVATION

Figure 3-3

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Elevations - 8-Plex Building

FRONT ELEVATION

LEFT ELEVATION

REAR ELEVATION

RIGHT ELEVATION

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Elevations - 10-Plex Building

FRONT ELEVATION

LEFT ELEVATION

REAR ELEVATION

RIGHT ELEVATION

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Conceptual Landscape Plan

NOTES

- AC UNITS, WALLS, AND ALL GROUND MOUNTED EQUIPMENT TO HAVE PLANT SCREENING.
- SIGNALIZED INTERSECTION AND CROSSWALK AT PROJECT ENTRY TO OTHER SIDE OF RED HILL AVENUE.
- LANDSCAPING WILL ENHANCE THE QUALITY OF THE DEVELOPMENT BY FRAMING AND SOFTENING THE APPEARANCE OF THE BUILDINGS, ENHANCING THE OVERALL IMAGE, SCREEN UNDESIRABLE VIEWS, AND PROVIDE SHADE.
- THE PROJECT SHALL COMPLY WITH THE TUSTIN WATER EFFICIENCY ORDINANCE.

NORTH

SCALE: 1" = 20'
0 10 20 40

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4. ENVIRONMENTAL CHECKLIST

4.1. BACKGROUND

Date: February 14, 2025
Project Title: Red Hill Ave Townhomes
Lead Agency: City of Tustin 300 Centennial Way Tustin, CA 92780
Lead Agency Contact: Leila Carver, Senior Planner Consultant LCarver@tustinca.org
Project Location: The Project site is located at 13751 & 13841 Red Hill Avenue (APNs 500-141-09 and 500-141-10), on the southwest corner of San Juan Street and Red Hill Avenue.
Project Sponsor's Name and Address: MLC/ Meritage Homes 5 Peters Canyon Road, Suite 310 Tustin, CA 92780
Land Use and Zoning Designation: Red Hill Avenue Specific Plan (RHASP)
Project Description: The Project proposes development of nine multifamily residential buildings containing 73 townhome-style residential units. The Project applicant would construct the proposed 73 three-story residential units within the 3.39-acre site for a net density of 21.53 dwelling units per acre. The Project would also include construction of one driveway entrance from Red Hill Avenue, public and private drives, two private recreational common spaces for resident use, and one public plaza for community use. A more detailed description of the proposed Project is provided in Section 3, *Project Description*.
Surrounding Land Uses and Setting: The Project site is within an urban environment, , and is surrounded by residential, commercial, and public institutional uses.
Other Public Agencies Whose Approval is Required: None

4.2. ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED

The subject areas checked below were determined to be new significant environmental effects or to be previously identified effects that have a substantial increase in severity either due to a change in project, change in circumstances or new information of substantial importance, as indicated by the checklist and discussion on the following pages.

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

4.3. DETERMINATION

On the basis of this initial evaluation

☐ No substantial changes are proposed in the Project and there are no substantial changes in the circumstances under which the Project will be undertaken that will require major revisions to the previous approved ND or MND or certified EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects. Also, there is no "new information of substantial importance" as that term is used in CEQA Guidelines Section 15162(a)(3). Therefore, the previously adopted ND or MND or previously certified EIR adequately discusses the potential impacts of the Project without modification.

☒ The Checklist/Addendum concludes that none of the conditions or circumstances that would require preparation of a subsequent or supplemental EIR pursuant to Public Resources Code Section 21166 and CEQA Guidelines Section 15162 exists in connection with the design of the Project. No substantial changes have been proposed to the Project described in the RHASP Final EIR that require major revisions to RHASP Final EIR. No new significant environmental effects or substantial increase in the severity of previously identified significant environmental effects would occur. The Checklist/Addendum also indicates that there have not been any substantial changes with respect to the circumstances under which development of the Project site, including the Project, would be undertaken that would require major revisions to the RHASP Final EIR. The Checklist/Addendum concludes that no substantial changes with respect to circumstances under which the Project is undertaken have occurred that have not already been accounted for. The Checklist/Addendum also concludes that no new information of substantial importance, which was not known and could not have been known at the time that the RHASP EIR was certified, shows that the Project would cause or substantially worsen significant environmental impacts discussed in the RHASP Final EIR, that mitigation measures or alternatives found infeasible in the RHASP EIR would in fact be feasible, or that different mitigation measures or alternatives from those analyzed in the RHASP Final EIR would substantially reduce one or more significant environmental effects found in the RHASP Final EIR.

☐ Substantial changes are proposed in the Project or there are substantial changes in the circumstances under which the Project will be undertaken that will require major revisions to the previous ND, MND or EIR due to the involvement of significant new environmental effects or a substantial increase in the severity of previously identified significant effects. Or, there is "new information of substantial importance," as that term is used in CEQA Guidelines Section 15162(a)(3). However, all new potentially significant environmental effects or substantial increases in the severity of previously identified significant effects are clearly reduced to below a level of significance through the incorporation of mitigation measures agreed to by the Project applicant. Therefore, a Subsequent MND is required.

☐ Substantial changes are proposed in the Project or there are substantial changes in the circumstances under which the Project will be undertaken that will require major revisions to the previous environmental document due to the involvement of significant new environmental effects or a substantial increase in the severity of previously identified significant effects. Or, there is "new information of substantial importance," as that term is used in CEQA Guidelines Section 15162(a)(3). However, only minor changes or additions or changes would be necessary to make the previous EIR adequate for the Project in the changed situation. Therefore, a Supplemental EIR is required.

☐ Substantial changes are proposed in the Project or there are substantial changes in the circumstances under which the Project will be undertaken that will require major revisions to the previous environmental document due to the involvement of significant new environmental effects or a substantial increase in the severity of previously identified significant effects. Or, there is "new information of substantial importance," as that term is used in CEQA Guidelines Section 15162(a)(3) such as one or more significant effects not discussed in the previous EIR. Therefore, a SUBSEQUENT EIR is required.

____

Signature Date

____

Printed Name For

4.4. EVALUATION OF ENVIRONMENTAL IMPACTS

The evaluation of environmental impacts in this addendum summarizes conclusions made in the RHASP Final EIR and previous addendum. It compares them to the impacts of the proposed Compass at Red Hill Project. Mitigation measures referenced are from the Mitigation Monitoring and Reporting Program adopted as part of the RHASP Final EIR and are described as either being previously implemented, applicable to the proposed Project, or not applicable.

This comparative analysis has been undertaken pursuant to the provisions of CEQA and the CEQA Guidelines, to provide the factual basis for determining whether the proposed Project, or any new information that has come to light permits or requires the preparation of a subsequent or supplemental EIR.

The analysis herein follows the outline and format, and applies the impact thresholds, of the RHASP Final EIR, as required by CEQA (*Citizens Against Airport Pollution v. City of San Jose* (2014) 227 Cal. App. 4th 788). As discussed previously in Section 1.2, *Environmental Procedures*, pursuant to CEQA Guidelines Section 15162, when an EIR has been previously certified that includes the scope of development of a site or area, no subsequent or supplemental EIR shall be prepared for the Project unless the lead agency determines that one or more of the following three conditions are met:

1. the Project would result in new or substantially more severe impacts than were disclosed in the previous EIR;
2. changes in the circumstances surrounding the Project result in new or substantially more severe impacts than were disclosed in the previous EIR; or
3. new information has come to light showing that new or substantially more severe impacts than were disclosed in the previous EIR will occur.

Terminology Used in the Checklist

For each question listed in the Environmental Checklist, a determination of the level of significance of the impact is provided. Impacts are categorized in the following categories:

Substantial Change in Project or Circumstances Resulting in New Significant Effects. A Subsequent EIR is required when 1) substantial project changes are proposed or substantial changes to the circumstances under which the project is undertaken, and 2) those changes result in new significant environmental effects or a substantial increase in the severity of previously identified significant effects, and 3) project changes require major revisions of the EIR.[2]

New Information Showing Greater Significant Effects than Previous EIR. A Subsequent EIR is required if new information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the EIR was certified, shows 1) the project will have one or more significant effects not discussed in the EIR; or 2) significant effects previously examined will be substantially more severe than shown in the EIR.[3]

New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined. A Subsequent EIR is required if new information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the EIR was certified shows 1) mitigation measures or alternatives previously found not to be feasible would in fact be feasible (or new mitigation measures or alternatives are considerably different) and would substantially reduce one or more

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[2] CEQA Guidelines. California Code of Regulations (CCR), Title 14, Division 6, Chapter 3, § 15162, as amended.

[3] CEQA Guidelines. § 15162.

significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative.[4]

With regard to the foregoing three categories, a Supplement to an EIR can be prepared if the criterion for a Subsequent EIR is met, and only minor additions or changes would be necessary to make the EIR adequately apply to the proposed Project.[5]

Minor Technical Changes or Additions. An Addendum to the EIR is required if only minor technical changes or additions are necessary and none of the criteria for a Subsequent EIR is met.[6]

No Impact. A designation of *no impact* is given when the proposed Project would have no changes in the environment as compared to the original project analyzed in the EIR.

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[4] CEQA Guidelines. § 15162.

[5] CEQA Guidelines § 15163.

[6] CEQA Guidelines § 15164.

5. ENVIRONMENTAL ANALYSIS

This section provides evidence to substantiate the conclusions in the environmental checklist. The section briefly summarizes the conclusions of the RHASP Final EIR and then discusses whether or not the proposed Project is consistent with the findings contained in the RHASP Final EIR, or if further analysis is required in a supplemental or Subsequent EIR.

Mitigation measures referenced herein are from the RHASP Final EIR. Measures specifically required to reduce potentially significant impacts of the Project to a less than significant level have been included throughout the analysis below. All projects implemented under the RHASP are subject to previously adopted mitigation measures as applicable.

5.1. AESTHETICS	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway	☐	☐	☐	☐	☒
c) In nonurbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the RHASP EIR

The RHASP Final EIR analyzed programmatic impacts from buildout of the RHASP related to aesthetics from page 4.1-1 to 4.1-12. The RHASP Final EIR described that the RHASP area is generally flat and includes commercial, office, and residential uses. The EIR noted that the City of Tustin General Plan does not identify any scenic vistas or viewpoints in the City. The RHASP area has some distant views of the Santa Ana Mountains to the east and the San Gabriel Mountains to the north; however, these views are limited and often obstructed by existing structures within the RHASP area. Future building heights would be a maximum of 40 feet and three stories based on existing RHASP design standards. The City of Tustin General Plan EIR determined buildout according to the General Plan would not result in the obstruction of existing public or scenic views. The height limitations for the RHASP are the same as the existing height limitations under existing Tustin

General Plan and zoning designations for the RHASP area, and therefore, would be consistent with findings under the General Plan EIR of less than significant.

According to the RHASP Final EIR, there are no rock outcroppings or any other scenic resources within the RHASP area. There are ornamental trees located in landscaped areas, but the trees are not considered scenic resources. Additionally, there are no State Scenic Highways adjacent to or in the vicinity of the RHASP area. The RHASP area is not within a State Scenic Highway, nor is the RHASP area visible from any officially designated or eligible scenic highways.

The RHASP Final EIR described that the RHASP allows for reuse of existing structures and sites, redevelopment of underutilized parcels, and the development of vacant parcels with commercial, office, and residential uses. Future development projects within the RHASP could have short-term visual effects during construction activities. Any construction impacts associated with individual development projects within the RHASP area would be temporary in nature and would be expected to be typical for projects located in an urban environment with surrounding development. Construction activities would be required to comply with the RHASP, the City's General Plan, and the Tustin City Code requirements. Ongoing development within the RHASP area would alter the existing character and quality of the area. While the aesthetics of a project can be subjective, future development projects in the RHASP area would be required to comply with the proposed Red Hill Avenue Development Standards and Design Criteria. Individual projects would also be subject to design review by the City. Implementation of the RHASP was proposed to improve the visual character and quality of the area.

According to the RHASP Final EIR, sources of lighting include streetlights, signage, and on-building and freestanding security lighting. Future development projects within the RHASP area would have the potential to create new sources of light. The addition of buildings to the Project site would result in new sources of light and glare consistent with that found in an urban area. Reuse of existing sites would have similar sources of lighting as currently exists in the area. However, the RHASP provides requirements related to lighting for implementing projects. Because the RHASP area is located within an urban environment, the lighting associated with implementation of the RHASP would not substantially increase light and glare within the RHASP area or its surroundings.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses aesthetic impacts on page 40 and 41. The Addendum determined that the Approved Project would not obstruct existing scenic views. Additionally, the 2021 EIR Addendum concluded that there would be no negative effect on the existing scenic quality or a substantial increase in light and glare from the previously Approved Project. For these reasons, the 2021 Addendum concluded that no new aesthetics-related impacts would occur.

a) Have a substantial adverse effect on a scenic vista?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no impacts would occur from buildout of the RHASP on scenic vistas and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site is located in an urbanized commercial and residential area of the City of Tustin. The Tustin General Plan does not designate any scenic vistas within the City; however, the General Plan designates several landforms and visual interest points as scenic resources within the Conservation Element (City of Tustin, 2018a). The City of Tustin protects public views along the ridge lines, views toward the inland mountains and along scenic transportation corridors.

The Project site is vacant and is surrounded by residential and commercial development. The Project site and surrounding public roadways, including Red Hill Avenue and San Juan Street, do not provide views of Peters

Canyon Ridgeline due to low elevation and visual obstruction by surrounding buildings and trees (City of Tustin, 2018a). The Project site and surrounding public rights-of-way do not feature any scenic views.

The maximum height of the proposed Project would be 37 feet and three stories, consistent with the maximum building height of 50 feet allowed by the RHASP and previously analyzed in the RHASP Final EIR. Additionally, the Project would comply with the development standards per the RHASP and City municipal code (see Table 5-1 below). Therefore, no new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the RHASP Final EIR or 2021 Addendum. Impacts from the proposed Project would be consistent with those identified in the RHASP Final EIR.

Table 5-1: Project Consistency with Applicable Development Standards

Development Standards	Requirements	Proposed Project
Minimum Required Street Frontage/ Lot Width	100 feet	• San Juan: 124 feet • Red Hill: 585 feet
Maximum Building Height	• 4 stories and 50 feet •	• 37 feet (3 stories)
Front Yard (Building)	• None with required pedestrian accessible amenities • 5-foot (aggregate) setback above the second story; • None with required frontage style or porch, courtyard, or landing	• None with a combination of porch and landing frontages. • 5-foot aggregate setback with the inclusion of upper story balconies.
Side Yard (Interior)	• 10 feet	• 10 feet
Side Yard (Corner/Street Side)	• None with required pedestrian accessible amenities • None with required frontages style or porch, courtyard, or landing	• None with a combination of porch and landing frontages
Rear Yard	• 10 feet	• 10 feet
Building Separation (freestanding buildings containing residential and adjacent building(s))	• 10 feet	• 22 feet
Open Space Private Common	• 100 SF per unit x 73 = 7,300 • 200 SF per unit x 73 = 14,600 • Or 300 SF per unit combined	• Approximately 518 SF per unit combined common and private
Resident Parking	*TCC Parking Requirements:* • 1.6 spaces/ 2 bed units • 2 spaces/ 3+ bed units *State Density Bonus Law Parking Requirements:* • 1.5 spaces/ 2 bed units • 1.5 spaces/ 3 bed units • 2.5 spaces/ 4 bed units	• 146 off-street residential parking spaces
Guest Parking	0.25 space/unit	18 spaces (0.24 space/unit)

Source: Red Hill Avenue Specific Plan

b) Substantially damage scenic resources, including trees, rock outcroppings, and historic buildings within a State scenic highway?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no impacts would occur from buildout of the RHASP related to State scenic highways and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The proposed Project is not located within view of a State scenic highway, as there are no designated State scenic highways within the vicinity of the site. The nearest State-designated scenic highway is State Route 91, located approximately 7.47 miles north of the Project site. The Project would not result in impacts to trees, rock outcroppings, or historic buildings within a State scenic highway. Therefore, no impacts to scenic resources would occur. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the RHASP Final EIR. Impacts from the proposed Project would be consistent with those identified in the RHASP Final EIR, which did not identify impacts to scenic resources, including, trees, rock outcroppings, and historic buildings within a State scenic highway.

c) In nonurbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded implementation of the RHASP would alter the existing visual character or quality of the RHASP area with the goal of improving them and the 2021 Addendum was found to be consistent with the RHASP Final EIR. With compliance with the Specific Plan Design Criteria and Land Use Regulations, the City's General Plan, and the Tustin City Code, impacts to visual resources from buildout of the RHASP would be less than significant. As described previously, the Project site is located within an urbanized area and is surrounded by roadways, single-family and multi-family residences, and commercial uses. The existing character of the Project site and surrounding area is neither unique nor is it of special aesthetic value or quality. The proposed Project would develop 73 dwelling units, open space areas, a recreation center, and private streets on the Project site.

RHASP. The Project site and surrounding area to the northeast, southeast, and southwest are designated as Mixed Use within the RHASP. Areas to the northwest are designated Public/Institutional (PI) by the City of Tustin General Plan. The proposed Project would have a density of 21.53 du/acre, which is consistent and compatible with the surrounding multi-family residential densities. Thus, the Project would not conflict with applicable RHASP buildout densities that govern scenic quality. In addition, the Project would comply with Chapter 5 of the RHASP, Design Criteria, which provides a framework for high-quality design within the RHASP area. Additionally, the Project would be consistent with the RHASP development standards. The Project would be below four stories and would be a maximum of 37 feet in height, which is consistent with the RHASP maximum of 40 feet. The Project would be consistent with the required setbacks and, with approval of the Density Bonus Waiver, would be consistent with the open space requirements.

Thus, the Project would not conflict with applicable RHASP criteria and other regulations governing scenic quality. As the Project would develop the site with multi-family uses, which is consistent with the land uses adjacent to the site and assumed by the RHASP, the Project would be visually compatible with the surrounding uses. Hence, the proposed Project would not degrade the visual character of the Project site and surrounding area and impacts would be less than significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the RHASP Final EIR. Impacts from the proposed Project would be consistent with those identified in the RHASP Final EIR.

d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded future development within the RHASP area would introduce new sources of lighting and the 2021 Addendum was found to be consistent with the RHASP Final EIR the RHASP Final EIR. However, compliance with the land use regulations and the Design Criteria of the Specific Plan, the General Plan and the Tustin City Code would preclude significant impacts. The Project would introduce new sources of light from new building lighting, exterior lighting, interior lights shining through building windows, and headlights from nighttime vehicular trips generated by the Project. New landscaping would be provided throughout the Project site that would limit impacts from new sources of light and glare. Landscaping, including trees, would limit spill of light to adjacent properties. Also, as a standard condition of Project approval, the proposed Project would be required to comply with lighting standards detailed in the City's Municipal Code, which would require Project lighting to be shielded, diffused, or indirect to avoid glare to both on offsite residents, pedestrians, motorists. Compliance with the Municipal Code would be implemented through the construction permitting and plan check process. Therefore, impacts associated with new lighting would be less than significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the RHASP Final EIR. Impacts from the proposed Project would be consistent with those identified in the RHASP Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding aesthetics. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the previous RHASP Final EIR and 2021 Addendum due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the RHASP Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review, and the Project is within the scope of the RHASP with respect to aesthetics.

Plans, Programs, or Policies (PPP)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe aesthetic impacts would result from implementation of the proposed Project; therefore, no mitigation measures are required for aesthetics.

5.2. AGRICULTURE AND FOREST RESOURCES	Subsequent or Supplemental EIR			Addendum to EIR	
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 Dept. 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 the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
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?	☐	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the RHASP Final EIR

The RHASP Final EIR analyzed programmatic impacts from buildout of the RHASP related to agriculture and forestry resources on page 1-4. The RHASP Final EIR described that the RHASP area does not contain Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. No portion of the RHASP area is covered by a Williamson Act Contract. Additionally, the area does not include forest resources, including timberlands, and is not zoned for agriculture. For these reasons, the Final EIR concluded that no impacts would occur related to farmland or timberland.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses agricultural and forestry impacts on page 43 through page 45. The 2021 EIR Addendum determined that the Approved Project site does not contain Prime Farmland, Unique Farmland, Farmland of Statewide Importance, or forest land. For these reasons, the 2021 Addendum concluded that no new impacts related to farmland or timberland would occur.

a) **Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?**

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR found that no impacts would occur related to farmland and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The site is not designated as Prime, Unique, or Farmland of Statewide Importance (California Department of Conservation, 2022). Therefore, the proposed Project would not have impacts related to the conversion of Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to non-agricultural use. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

b) **Conflict with existing zoning for agricultural use, or a Williamson Act contract?**

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR found that no impacts would occur related to farmland and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Williamson Act (California Land Conservation Act of 1965) restricts the use of agricultural and open space lands to farming and ranching by enabling local governments to contract with private landowners for indefinite terms in exchange for reduced property tax assessments. The Project site is not zoned for agricultural use or located within an Agricultural Resource Area. Additionally, the Project site does not have a Williamson Act contract based on Chapter VI., Resource Element, of the Orange County General Plan (County of Orange, 2015). As such, the Project would not conflict with existing zoning for agricultural use or with an Agricultural Resource Area or Williamson Act contract, and no impacts would occur. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR found that no impacts would occur related to forest land and timberland and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The site does not contain forest land and there are no forestland resources in the vicinity of the Project site. It is not designated or zoned as forest land or timberland or used for timberland production. As a result, the Project would not result in impacts on timberland resources. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no impacts would occur related to forest land and timberland and the 2021 Addendum was found to be consistent with the RHASP Final EIR. As discussed previously, there are no forest or timberland resources on or in the vicinity of the Project site. The proposed Project would not convert forest land to a non-forest use. Therefore, there would be no impacts related to the loss of forest land or the conversion of forest land to non-forest uses. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no impacts would occur related to farmland and forest land and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The site was previously developed and is not used for agricultural purposes. The site is not designated or zoned for forest land. The proposed Project would not convert farmland to a nonagricultural use or convert forest land to a non-forest use. Therefore, no impacts would occur, and the Project would not 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. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding agriculture and forest resources. There have not been 1) changes related development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site undertaken that require major revisions of the previous Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review, and the Project is within the scope of the RHASP with respect to agriculture and forest resources.

Plans, Programs, or Policies (PPP)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe agriculture and forest resources impacts would result from the proposed Project; therefore, no new or revised mitigation measures are required for agriculture and forest resources.

5.3. AIR QUALITY	Subsequent or Supplemental EIR			Addendum to EIR	
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☐	☒
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)?	☐	☐	☐	☐	☒
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☐	☒
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☐	☐	☒

Impacts Identified in the Final EIR

The RHASP Final EIR analyzed programmatic impacts from buildout of the RHASP related to air quality on page 4.2-1 through page 4.2-21. The RHASP Final EIR described that a project may be inconsistent with the Air Quality Management Plan (AQMP) if it would generate a considerable increase in regional air quality violations and affect the region's attainment of air quality standards, or if it would generate population, housing, or employment growth exceeding forecasts used in the development of the AQMP. The 2016 AQMP, the most recent AQMP adopted by the South Coast Air Quality Management District (SCAQMD) at the time the RHASP was adopted, incorporates local municipalities' general plans and Southern California Association of Governments' (SCAG) 2016 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) socioeconomic forecast projections of regional population, housing and employment growth.

The RHASP allows for the development of 500 additional residential units and 325,000 additional square feet of non-residential development. According to the RHASP Final EIR, buildout of the RHASP could generate 1,520 additional residents and 722 new employment positions. Although the RHASP would be consistent with the goals of the RTP/SCS to reduce vehicle miles traveled and associated air pollutant emissions, the RHASP would exceed population forecasts, on which the AQMP is based. Further, implementation of proposed mitigation measures and compliance with SCAQMD rules would reduce conflicts and obstruction of the AQMP; however, the combined emissions from RHASP buildout would exceed SCAQMD operational thresholds.

According to the RHASP Final EIR, construction activities associated with future development would occur in incremental phases over time based upon numerous factors, including market demand, and economic and planning considerations. Construction activities would consist of grading, demolition, excavation, cut-and-fill, paving, building construction, and application of architectural coatings. In addition, construction worker vehicle trips, building material deliveries, soil hauling, etc. would occur during construction. Due to the unknown nature of future construction activities associated with implementation of the RHASP, construction-related air quality impacts would be considered significant and unavoidable due to the potential magnitude of construction that could occur from implementation of the RHASP. RHASP operational emissions would exceed SCAQMD thresholds for NOx due to the amount of vehicle trips to, from, and within the RHASP area. The RHASP Final EIR included MM 4.2-1, MM 4.2-2, and MM 4.2-3 to reduce impacts related to regional operational emissions; however, impacts would still be significant and unavoidable.

The RHASP Final EIR described that RHASP buildout would not generate CO emissions above thresholds and would not result in the creation of CO hotspots. The I-5 bisects the RHASP area, and the I-5 freeway segment that crosses Red Hill Avenue experiences an average of 324,300 trips per day. Residential units could be constructed as close as 100 feet from I-5. The proximity of potential future development to I-5 poses a concern for Toxic Air Contaminant (TAC) exposure. Therefore, implementation of MM 4.2-4 is required to ensure a project-specific Health Risk Assessment (HRA) is conducted for future residential uses located within 500 feet of I-5. Implementation of MM 4.2-4 would reduce exposure of sensitive receptors to substantial pollutant concentrations.

According to the RHASP Final EIR, the RHASP would include residential and commercial development. Commercial development within the Specific Plan area would likely consist of retail facilities. As residential and retail land uses are not identified as land uses associated with odor complaints by SCAQMD, implementation of the RHASP would not generate objectionable odors affecting a substantial number of people.

Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses air quality impacts. According to the 2021 EIR Addendum, the Approved Project would have exceeded population growth forecasted in the RHASP as well as exceed SCAQMD operational thresholds. The Approved Project would produce cumulatively considerable net increases of pollutants during construction and operation. Additionally, the 2021 Addendum concluded that the Project could potentially expose sensitive receptors to substantial pollutant concentrations and does not contain land uses typically associated with emitting objectionable odors.

A Trip Generation Assessment was prepared to summarize the trip generation forecast potential of the Approved Mixed-Use Project in comparison to what was planned for under the RHASP for the 2021 Addendum to the RHASP Final EIR (Linscott Law & Greenspan, 2021). The Project encompasses the entirety of Traffic Analysis Zone (TAZ) 1 of the ITAM Model. TAZ 1 is comprised of two parcels of land with a total acreage of 3.38 acres located south of San Juan Street and west of Red Hill Avenue at 13751 and 13841 Red Hill Avenue. Within TAZ 1, the RHASP Final EIR evaluated up to 160 residential units and 30,000 SF of commercial uses. Direct comparison between the development potential for TAZ 1 under the RHASP and the Approved Mixed-Use Project showed that the Approved Mixed-Use Project was less intensive of a use, resulting in 23 dwelling units below the residential allotment and the 23,000 SF below the commercial allotment for TAZ 1. Overall, the 2021 Addendum to the RHASP Final EIR determined that the Approved Mixed-Use Project would result in 1,001 fewer daily trips, 22 fewer AM peak hour trips and 84 fewer PM peak hour trips than the maximum development allowed under the RHASP. This formed the basis for determination that the Mixed-Use Project was within the allowable limits of development previously established by the RHASP, and no new environmental impacts would occur. Further, anticipated mobile source emissions of the Approved Mixed-Use Project were determined to be less than potential mobile source emissions assumed under the RHASP for the Project site. Therefore, air quality impacts anticipated to result from the Approved Project were determined to be less than assumed by the RHASP Final EIR.

RHASP Final EIR Mitigation Measures

MM 4.2-1: Electric Vehicle (EV) Charging Stations. Prior to the issuance of building permits, the City's Building Official shall confirm that Project plans and specifications designate that vehicle parking spaces developed within the Specific Plan area shall be EV ready to encourage EV use and appropriately size electrical panels to accommodate future expanded EV use.

MM 4.2-2: Vanpool/Rideshare Programs. Prior to the issuance of occupancy permits, the City's Building Official shall confirm that future commercial uses within the Specific Plan area include Codes, Covenants, and Restrictions (CC&Rs) that provide for a voluntary vanpool/shuttle and employee ridesharing programs for which all employees shall be eligible to participate. The voluntary ride sharing program could be achieved through a multi-faceted approach, such as designating a certain percentage of parking spaces for ride-sharing vehicles, designating adequate passenger loading and unloading and waiting areas for ridesharing vehicles, and/or providing a web site or message board for coordinating rides. This measure is not applicable to residential uses.

MM 4.2-3: Operational Emissions Reductions. Prior to the issuance of building permits, the City's Planning Official shall confirm that Project plans and specifications consider and mitigate the impacts on regional air quality and GHG emissions when reviewing proposals for new development. Impacts shall be evaluated in accordance with SCAQMD recommended methodologies and procedures. Recommended mitigation measure may include, but are not limited to, the following:

- Install heat transfer modules in all furnaces;
- Install solar panels for water heating systems for residential and other facilities;
- Incorporate renewable energy sources in the Project design (e.g., solar photovoltaic panels).
- Include passive solar cooling/heating design elements in building designs;
- Include design elements that maximize use of natural lighting in new development;
- Include provisions to install energy efficient appliances and lighting in new development.
- Install higher efficacy public street and exterior lighting.
- Increase Project density.
- Incorporate design measures that promote bicycle, pedestrian, and public transportation use.
- Provide preferential parking spaces for alternatively-fueled vehicles.
- Incorporate measures that reduce water use and waste generation.
- Provide informational materials on low ROG/VOC consumer products, cleaners, paints, and other products, as well as the importance of recycling and purchasing recycled material. Informational materials shall be provided to residential and commercial occupants through CC&R requirements
- Incorporate measures and design features that promote ride sharing and consistency with the commute-reduction requirements of SCAQMD Rule 2202 (On-Road Motor Vehicle Mitigation Options).

MM 4.2-4: Toxic Air Contaminants/Health Risk Assessment. A Project-specific Health Risk Assessment shall be conducted for future residential development proposed within 500 feet of the Interstate 5 right-of-way, pursuant to the recommendations set forth in the CARB Air Quality and Land Use Handbook. The Health Risk Assessment shall evaluate a Project per the following SCAQMD thresholds:

- Cancer Risk: Emit carcinogenic or toxic contaminants that exceed the maximum individual cancer risk of 10 in one million.
- Non-Cancer Risk: Emit toxic contaminants that exceed the maximum hazard quotient of one in one million.

a) Conflict with or obstruct implementation of the applicable air quality plan?

<u>Impacts Associated with the Proposed Project</u>

No New Impact. The RHASP Final EIR found that implementation of the RHASP would incrementally exceed population growth forecasts on which the 2016 Air Quality Management Plan (AQMP) is based, as well as surpass South Coast Air Quality Management District (SCAQMD) operational thresholds, resulting in significant and unavoidable air quality impacts. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

The approved RHASP allows for the development of 500 additional residential units and 325,000 additional square feet of non-residential development. According to the California Department of Finance 2017 housing estimates utilized at the time of preparation of the RHASP Final EIR, the average household size for the City of Tustin was 3.04 persons per household and the City's total population was an estimated 82,372 persons (City of Tustin, 2018b). Assuming 3.04 persons per dwelling unit, the RHASP was determined to have the potential to generate 1,520 additional residents. Generation of 1,520 new residents by the RHASP, when added to the existing population, was calculated to result in a population of 83,892 persons, which exceeded both SCAG's forecasted population for the city of 83,100 and the City of Tustin's General Plan projected population of 82,878.

The most recent AQMP is the 2022 AQMP, adopted in December 2022, is based on the buildout of land use designations outlined in the 2018 City of Tustin General Plan, inclusive of the 2018 RHASP. The adopted RHASP accounted for the addition of 500 dwelling units, and therefore, the 2022 AQMP accounted for the future development of the additional units as well. As previously discussed, the proposed Project would develop 73 townhomes. Therefore, the Project is within the RHASP development assumptions and consistent with the latest 2022 AQMP.

The 2016 AQMP that was used to analyze the Approved Project within the RHASP Final EIR was not based on the latest General Plan or the RHASP and did not anticipate the incremental residential development proposed on the Project site. Further, based on an assumption of 3.04 persons per household—consistent with the RHASP Final EIR—the proposed Project could generate approximately 222 residents. As previously mentioned, the RHASP Final EIR anticipated that the Project site would generate 1,520 additional residents. Therefore, the proposed Project is within the assumptions of the RHASP Final EIR.

Because the proposed Project would generate fewer residents, vehicle trips, and emissions than the maximum development scenario analyzed in the RHASP Final EIR, it would not introduce any new adverse impacts or substantially increase the severity of previously identified impacts. Therefore, no new or substantially greater air quality impacts would occur compared to those identified in the Final EIR and 2021 Addendum. Impacts from the proposed Project would remain consistent with those previously analyzed.

Additionally, the 2022 AQMP has been updated to reflect the RHASP maximum buildout conditions, and the RHASP is now consistent with the applicable AQMP . Thus, there is no longer a potentially significant impact resulting from the RHASP's inconsistency with an applicable AQMP.

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)?

<u>**Impacts Associated with the Proposed Project**</u>

No New Impact. The RHASP Final EIR found that buildout of the RHASP would result in cumulatively considerable net increases of pollutants during construction and operation, and impacts would be significant and unavoidable. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

Construction

Construction activities associated with the proposed Project would generate pollutant emissions from the following: (1) site preparation, (2) grading, (43 building construction, (4) paving, and (5) architectural coating. The quantity of emissions generated on a daily basis would vary, depending on the intensity and types of construction activities occurring.

It is mandatory for all construction projects to comply with several SCAQMD Rules, including Rule 403 for controlling fugitive dust, PM10, and PM2.5 emissions from construction activities. Rule 403 requirements include, but are not limited to, applying water in sufficient quantities to prevent the generation of visible dust plumes, applying soil binders to uncovered areas, reestablishing ground cover as quickly as possible, utilizing a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit the proposed Project site, covering all trucks hauling soil with a fabric cover and maintaining a freeboard height of 12 inches, and maintaining effective cover over exposed areas. Compliance with Rule 403 is included as PPP AQ-1. In addition, implementation of SCAQMD Rule 1113, which governs the VOC content in architectural coating, paint, thinners, and solvents is included as PPP AQ-2. The proposed Project would consist of construction of 73 dwelling units of the maximum 160 dwelling units, and construction of 0 SF of the 30,000 commercial SF analyzed within TAZ 1 of the ITAM Model. As such, potential pollutant emissions from construction of the proposed Project would be less than those analyzed in the RHASP Final EIR.

Operation

On November 12, 2020, the Community Development Director approved the 2021 Addendum, Residential Allocation Reservation (RAR 2020-001) allocation, of 114 DUs to the 3.39-acre Project site (does not include density bonus units) for the future development of a Mixed Use project containing 114 residential units, subject to obtaining required entitlements. As discussed previously, the proposed 73 dwelling units are within the previous Residential Allocation Reservation approval for the Project site, as well as the 500-unit maximum development assumption analyzed within the RHASP Final EIR. Therefore, the emissions from the Project would be consistent with those anticipated by the Final EIR and 2021 Addendum. As detailed previously, up to 160 dwelling units could potentially be developed on the Project site based on residential allocation within the RHASP. The proposed Project would only develop 73 of the 160 dwelling units analyzed for the Project site. Additionally, the Project would not develop any of the 30,000 SF analyzed within TAZ 1. The decrease in both residential capacity and commercial retail square footage would lead to a reduced number of vehicle trips. Therefore, the emissions generated by the proposed Project would be less than those identified by the RHASP Final EIR. Furthermore, Project emissions would be reduced through implementation of RHASP Final EIR MM 4.2-1, with requires the construction of electric vehicle charging infrastructure. Additionally, the Project would include energy efficient appliances, bike parking, pedestrian-oriented retail, and preferential parking spaces for alternatively fueled vehicles pursuant to RHASP Final EIR MM 4.2-3. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

c) Expose sensitive receptors to substantial pollutant concentrations?

No New Impact. The RHASP Final EIR found that buildout of the RHASP could potentially expose sensitive receptors to substantial pollutant concentrations; however, impacts would be less than significant with the inclusion of mitigation. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. Sensitive receptors can include residences, schools, playgrounds, childcare centers, and athletic facilities.

The nearest sensitive receptors are existing residences located northeast of the Project site, across San Juan Street, the Tustin High School baseball field, and the multi-family residences to the northwest of the site. The distance between the Project site boundary and the closest existing residence is 5 feet northwest of the Project site. The distance between the Project site boundary and the Tustin High School baseball field is approximately 25 feet.

Construction

Construction of the proposed Project would generate airborne particulates and emissions from diesel-fueled construction equipment, potentially affecting nearby residential sensitive receptors. However, construction contractors must comply with the South Coast Air Quality Management District's (SCAQMD) Rule 403 and implement standard dust control and emissions reduction measures, as required under PPP AQ-1. These measures would substantially reduce pollutant emissions, as outlined in the RHASP Final EIR. Furthermore, pollutant emissions from the proposed Project's construction would be lower than those anticipated under the maximum development scenario analyzed in the RHASP Final EIR. Therefore, the proposed Project's construction-related emissions would remain within the environmental impact thresholds established in the RHASP Final EIR, and no new or more severe air quality impacts would occur.

Operation

Under the SCAQMD Localized Significance Threshold (LST) methodology, operational-phase LSTs apply to projects with stationary emission sources or those that generate mobile sources with prolonged idling or queuing, such as transfer facilities and warehouses. The proposed Project does not include stationary sources or land uses that would result in prolonged vehicle idling. As a result, operational-phase emissions would not exceed LST thresholds or result in significant localized air quality impacts.

Additionally, the Project site is approximately 516 feet from the I-5 corridor, reducing the potential for future residents to be exposed to substantial pollution concentrations from freeway emissions. Given the absence of new stationary sources and the Project's distance from major emission sources, the proposed Project would not result in new or substantially greater air quality impacts compared to those analyzed in the Final EIR. Therefore, operational-phase air quality impacts would remain within the significance thresholds established in the Final EIR.

d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

Impacts Associated with the Proposed Project

No New Impact. The proposed Project does not contain land uses typically associated with emitting objectionable odors. The Project site is not located near existing agricultural uses. Potential odor sources associated with the proposed Project may result from construction equipment exhaust and the application of asphalt and architectural coatings during construction activities. However, any construction odors would be temporary in nature.

Standard construction requirements would minimize odor impacts from construction. The construction odor emissions would be temporary, short-term, and intermittent in nature and would cease upon completion of the respective phase of construction and are thus considered less than significant. Project-generated refuse would be stored in covered containers and removed at regular intervals in compliance with the City's solid waste regulations. Additionally, the proposed Project would be required to implement CARB Rule 2485 regulations that limit idling to 5 minutes (13 CCR, Chapter 10 Section 2485), which would reduce odors from the smell of truck exhaust. The proposed Project would also be required to comply with SCAQMD Rule 402 to prevent occurrences of public nuisances. Therefore, odor impacts associated with the proposed Project's construction and operations would not be significant compared to what was previously analyzed and determined in the Final EIR.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding air quality. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project is undertaken that require major revisions of the previous Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to air quality.

Plans, Programs, or Policies (PPP)

PPP AQ-1: SCAQMD Rule 403. The following measures shall be incorporated into construction plans and specifications as implementation of SCAQMD Rule 403:

- All clearing, grading, earth-moving, or excavation activities shall cease when winds exceed 25 mph per SCAQMD guidelines in order to limit fugitive dust emissions.
- The contractor shall ensure that all disturbed unpaved roads and disturbed areas within the Project are watered at least three (3) times daily during dry weather. Watering, with complete coverage of disturbed areas, shall occur at least three times a day, preferably in the mid-morning, afternoon, and after work is done for the day.
- The contractor shall ensure that traffic speeds on unpaved roads and Project site areas are reduced to 15 miles per hour or less.

PPP AQ-2: SCAQMD Rule 1113. The following measure shall be incorporated into construction plans and specifications as implementation of SCAQMD Rule 1113. The Project shall only use "Low-Volatile Organic Compounds (VOC)" paints (no more than 50 gram/liter of VOC) consistent with SCAQMD Rule 1113.

PPP AQ-3: SCAQMD Rule 445. The following measure shall be incorporated into construction plans and specifications as implementation of SCAQMD Rule 445. Wood burning stoves and fireplaces shall not be included or used in the new development.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

Final EIR mitigation measures that are applicable to the proposed Project would be implemented as intended by the RHASP and the Final EIR. After implementation of Final EIR mitigation measures, no new impacts nor substantially more severe air quality impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for air quality.

Applicable Final EIR Mitigation Measures

MM 4.2-1: Electric Vehicle (EV) Charging Stations. Prior to the issuance of building permits, the City's Building Official shall confirm that Project plans and specifications designate that vehicle parking spaces developed within the Specific Plan area shall be EV ready to encourage EV use and appropriately size electrical panels to accommodate future expanded EV use.

MM 4.2-3: Operational Emissions Reductions. Prior to the issuance of building permits, the City's Planning Official shall confirm that Project plans and specifications consider and mitigate the impacts on regional air quality and GHG emissions when reviewing proposals for new development. Impacts shall be evaluated in accordance with SCAQMD recommended methodologies and procedures. Recommended mitigation measure may include, but are not limited to, the following:

- Install heat transfer modules in all furnaces;
- Install solar panels for water heating systems for residential and other facilities;
- Incorporate renewable energy sources in the Project design (e.g., solar photovoltaic panels).
- Include passive solar cooling/heating design elements in building designs;
- Include design elements that maximize use of natural lighting in new development;
- Include provisions to install energy efficient appliances and lighting in new development.
- Install higher efficacy public street and exterior lighting.
- Increase Project density.
- Incorporate design measures that promote bicycle, pedestrian, and public transportation use.
- Provide preferential parking spaces for alternatively-fueled vehicles.
- Incorporate measures that reduce water use and waste generation.
- Provide informational materials on low ROG/VOC consumer products, cleaners, paints, and other products, as well as the importance of recycling and purchasing recycled material. Informational materials shall be provided to residential and commercial occupants through CC&R requirements

5.4. BIOLOGICAL RESOURCES	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
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 or U.S. Fish and Wildlife Service?	☐	☐	☐	☐	☒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or US Fish and Wildlife Service?	☐	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed programmatic impacts from buildout of the RHASP related to biological resources on page 1-5. The RHASP Final EIR describes that the RHASP area is a developed area within the City of Tustin. The area does not include sensitive habitat or protected wildlife species. It does not contain riparian habitat or any water resources (e.g., streams, creeks, channels, vernal pools). Therefore, no impacts to riparian habitat would result from RHASP buildout. Additionally, the RHASP area does not contain waters, including wetland waters, that are subject to federal jurisdiction under Section 404 of the Clean Water Act. The RHASP would be implemented consistent with the City General Plan and the City's Master Tree Plan (Tustin City Code Section 7309). All applicable policies would be enforced as a part of future development within the RHASP area. Therefore, the RHASP Final EIR concluded that no impacts would occur from RHASP buildout related to biological resources.

Summary of Impacts in the 2021 EIR Addendum

The 2021 EIR Addendum discusses biological resource impacts. . According to the 2021 Addendum, the Approved Project site would have no significant impacts on biological resources since the existing site is a developed urban area. The 2021 Addendum would not significantly impact sensitive, candidate, or native biological species. Additionally, the Approved Project would not considerably impact sensitive natural communities or wetlands. Therefore, there would be no new impacts on biological resources from the Approved 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 or U.S. Fish and Wildlife Service?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no significant impacts would occur to candidate, sensitive, or special status species. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site is partially developed, completely disturbed, and located within an urban area that does not contain any native habitats. Due to the disturbed status of the site, it does not provide habitat that could be utilized by species listed or candidates for listing by the U. S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), or California Native Plant Society (CNPS).

However, existing ornamental trees on the site could provide nesting habitat for migratory birds. Since many of these trees would be removed during construction, the Project has the potential to impact active bird nests if removal occurs during the nesting season. Migratory birds are protected under the federal Migratory Bird Treaty Act (MBTA) (United States Code Title 16, Section 703 et seq.; Code of Federal Regulations Title 50, Part 10) and Section 3503 of the California Fish and Game Code. The City enforces compliance with these protections through standard conditions of approval, which require implementation of avoidance measures if tree removal occurs during the nesting season. Because compliance with these existing regulations would ensure protection of nesting birds, impacts related to tree removal would remain less than significant. The proposed Project would not result in new or substantially greater biological resource impacts beyond those analyzed in the Final EIR.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no significant impacts would occur related to biological resources and the 2021 Addendum was found to be consistent with the RHASP Final EIR Riparian habitats are those occurring along the banks of rivers and streams. Sensitive natural communities are natural communities that are considered rare in the region by regulatory agencies, known to provide habitat for sensitive animal or plant species, or known to be important wildlife corridors.

As described above, the Project site is completely disturbed, and partially developed with commercial uses, a parking lot, and ornamental landscaping. No riparian habitat or sensitive natural communities exist on the site. Therefore, no significant impacts related to riparian habitat or other sensitive natural communities identified in local or regional plans would result from proposed Project implementation, and no mitigation is required.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

c) 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?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no significant impacts would occur related to biological resources and the 2021 Addendum was found to be consistent with the RHASP Final EIR. As described previously, the Project site is vacant and has been heavily graded. No natural hydrologic features or federally protected wetlands as defined by Section 404 of the Clean Water Act occur on-site, and the Project site does not meet the Army Corps of Engineers criteria for wetlands and waters of the U.S. (FCS, 2024). Therefore, no direct removal, filling, or hydrological interruption of a wetland area would occur with development of the Project site. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no significant impacts would occur related to biological resources and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site does not contain wildlife habitat and is located within a developed urban area. The Project site is disturbed and surrounded on all four sides by urban developed land uses, including roadways, residential, recreation and commercial uses. Therefore, no impacts to wildlife corridors would occur.

There are no existing trees on-site, however, the existing ornamental landscaping trees off-site have the potential to provide habitat for nesting migratory birds. Many of these trees would be removed during construction. However, nesting birds are protected under the MBTA (United States Code Title 33, Section 703 et seq.; see also Code of Federal Regulations Title 50, Part 10) and Section 3503 of the California Fish and Game Code that is implemented through the City's permitting process. The City enforces compliance with these protections through standard conditions of approval, which require implementation of avoidance measures if tree removal occurs during the nesting season. Because compliance with these existing regulations would ensure protection of nesting birds, impacts related to tree removal would remain less than significant. Therefore, should removal of the existing landscaping occur during the nesting/breeding season, the existing permitting process would ensure that the MBTA is implemented and that impacts related to nesting birds would be less than significant.

With required adherence to existing regulations that would be implemented through the City's permitting process, no new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

e) Conflict with any local policies or ordinances protecting biological resources?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no significant impacts related to biological resources would occur and the 2021 Addendum was found to be consistent with the RHASP Final EIR. As described previously, the Project site is partially developed and located within an urban area. No biological resources are located on the site. Consistent with the conclusions of the Final EIR, the proposed Project would not conflict with any local policies protecting biological resources. Additionally, the Project would comply with the City's Master Tree Plan, which would apply to any trees within City sidewalks or rights-of-way, as verified through the permitting and plan check process. Therefore, impacts would be less than significant.

With required adherence to existing regulations that would be implemented through the City's permitting process, no new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no significant impacts would occur related to biological resources and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site is located within the County of Orange Central and Coastal Subregion Natural Community Conservation Plan (NCCP). The Central and Coastal Sub-region is a 208,000-acre area that includes the central portion of Orange County, incorporating the area from the coastline inland to Riverside County. However, the City of Tustin is not located within the 37,378-acre NCCP habitat Reserve System. Therefore, the Project would not conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or State habitat conservation plan. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding biological resources. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to biological resources.

Plans, Programs, or Policies (PPP)

PPP BIO-1: The Project applicant shall comply with the MBTA (United States Code Title 33, Section 703 et seq.; see also Code of Federal Regulations Title 50, Part 10) and Section 3503 of the California Fish and Game Code.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe biological resources impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for biological resources.

5.5. CULTURAL RESOURCES	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒	☐
c) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts to cultural and tribal cultural resources from pages 4.3-1 to 4.3-14. The RHASP Final EIR discussed that there are buildings and structures of historical, cultural, and architectural importance within the City. The Tustin Historic Resources Survey identified over 400 sites of possible distinction and notable recognition. None of these sites are within the RHASP area. Outside of but adjacent to the RHASP area on the northeast corner of Red Hill Avenue at Walnut Avenue, the property at 14462 Red Hill Avenue includes a residence constructed in 1915. The Tustin Historic Resources Survey identifies the building as a significant resource (Status Code 3S – eligible for the NRHP) due to its architecture and association with early Tustin residents. Future development would be subject to compliance with the established Federal and State regulatory framework, which is intended to mitigate potential impacts to historical resources. As a part of RHASP implementation, no existing buildings would be directly or indirectly affected in the context of historic resources. Consequently, implementation of the RHASP would not impact an historic resource.

According to the RHASP Final EIR, an archaeological and historical records search was conducted at the South Central Coastal Information Center of the California Historic Resources Inventory System (CHRIS) in June 2017. The records search found one archaeological resource within 0.5 mile of the RHASP area. While the properties within the RHASP area have been extensively altered by prior ground disturbance and development, there is the potential for RHASP implementation to affect previously unidentified archaeological resources. Future development within the Specific Plan area would be required to comply with MM 4.3-1, which requires future developments under the Specific Plan to retain an archaeologist to determine if any found archaeological deposits meet the CEQA definition of historical (CEQA Guidelines § 15064.5(a)) and/or unique archaeological resource (Public Resources Code § 21083.2(g)).

As described by the RHASP Final EIR, there is no indication that there are burials present within the RHASP area and it is unlikely that human remains would be discovered during RHASP implementation. In the event that human remains are discovered during grading activities at any point during future development under the RHASP, California Health and Safety Code Section 7050.5 and Public Resources Code Section 5097.98 address procedures to follow in the event of a discovery of suspected human remains.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses cultural resource impacts. . According to the 2021 Addendum, the Approved Project would not have significantly impacted archaeological and historical resources. The likelihood of discovering human remains on-site during grading is low since the existing site is a developed urban area, and with the inclusion of appliable mitigation from the RHASP Final EIR, this impact would be less than significant. Therefore, there would be no new impact on cultural resources from the Approved Project.

RHASP Final EIR Mitigation Measures

The RHASP Final EIR included MM Measure 4.3-1 to address the potential inadvertent discovery of archaeological resources. MM 4.3-1 has since been updated to be consistent with City standard measures for archeological and tribal cultural resources; the full text of MM 4.3-1 is provided herein at the end of this section. Mitigation regarding tribal cultural resources has been renumbered to MM TCR-1, MM TCR-2, and MM TCR-3, as listed in Section 5.18, *Tribal Cultural Resources*. The revisions to the mitigation would be consistent with the Certified EIR and are consistent with CEQA Guidelines Section 15162(a).

a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that implementation of the RHASP would not cause adverse impacts to historic resources, and impacts would be less than significant. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

According to the *CEQA Guidelines*, a historical resource is defined as something that meets one or more of the following criteria: (1) listed in, or determined eligible for listing in, the California Register of Historical Resources; (2) listed in a local register of historical resources as defined in Public Resources Code (PRC) Section 5020.1(k); (3) identified as significant in a historical resources survey meeting the requirements of PRC Section 5024.1(g); or (4) determined to be a historical resource by the Project's Lead Agency. Implementation of the proposed Project would not cause a substantial adverse change in the significance of a historical resource as defined in Section 15064.5 of the CEQA Guidelines, as there are no eligible historical resources on the Project site.

The California Register of Historical Resources defines a "historical resource" as a resource that meets one or more of the following criteria: (1) associated with events that have made a significant contribution to the broad patterns or local or regional history of the cultural heritage of California or the United States; (2) associated with the lives of persons important to local, California, or national history; (3) embodies the distinctive characteristics of a type, period, region, or method of construction or represents the work of a master or possesses high artistic values; or (4) has yielded, or has the potential to yield, information important to the prehistory or history of the local area, California, or the nation.

Based on historical aerials, the Project site was used as agricultural land from as early as 1946 until 1963, By 1980, the site was developed with the existing commercial office building and an additional building, which was demolished by 2009. There are no architecturally important aspects to the building. Therefore, there would be no impacts related to historic resources. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR describes that with implementation of MM 4.3-1, impacts to archaeological resources from buildout of the RHASP would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site has been previously disturbed from past uses that involve grading, building construction, and building demolition of the southern parcel, and grading and building construction on the site. Because the site has previously been disturbed, there is reduced potential for the Project to impact archeological resources. However, the Project may result in excavation into the underlying older alluvium where undiscovered archaeological resources could exist. RHASP MM 4.3-1 requires the retention of an archaeologist for archaeological monitoring. With implementation of MM 4.3-1, the Project would not cause a substantial adverse change in the significance of an archaeological resource and impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

c) Disturb any human remains, including those interred outside of formal cemeteries?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR describes that impacts relating to the discovery of human remains would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site has been previously disturbed, as described above, and has not been previously used as a cemetery. It is not anticipated that implementation of the proposed Project would result in the disturbance of human remains. In the unlikely event that human remains are encountered during earth removal or disturbance activities, the California Health and Safety Code Section 7050.5 requires that disturbance of the site shall halt until the coroner has conducted an investigation into the circumstances, manner, and cause of any death, and the recommendations concerning the treatment and disposition of the human remains have been made to the person responsible for the excavation or to his or her authorized representative. The Coroner would also be contacted pursuant to Sections 5097.98 and 5097.99 of the Public Resources Code relative to Native American remains (PPP CUL-1). Should the Coroner determine the human remains to be of Native American descent, the coroner has 24 hours to notify the Native American Heritage Commission (NAHC). The NAHC would then be required to contact the most likely descendant of the deceased Native American, who would then serve as a consultant on how to proceed with the remains. Compliance with the established regulatory framework (i.e., California Health and Safety Code Section 7050.5 and Public Resources Code Section 5097.98) would reduce potential impacts involving disturbance to human remains would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate proposed Project impacts or mitigation measures exist regarding cultural resources. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to cultural resources.

Plans, Programs, or Policies (PPPs)

PPP CUL-1: Should human remains be discovered during Project construction, the Project would be required to comply with State Health and Safety Code Section 7050.5, which states that no further disturbance may occur in the vicinity of the body until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission, which will determine the identity of and notify a Most Likely Descendant (MLD). With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD must complete the inspection within 48 hours of notification by the NAHC.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe cultural resources impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for cultural resources.

<u>Applicable Final EIR Mitigation Measures</u>

Mitigation Measure 4.3-1 has been updated to be consistent with City standard measures for archeological and tribal cultural resources. Mitigation regarding tribal cultural resources has been broken up and renumbered to MM TCR-1, MM TCR-2, and MM TCR-3, as listed in Section 5.18, *Tribal Cultural Resources*. These measures reflect the latest standard City language and are equivalent in intent and implementation. The revisions to the mitigation would be consistent with the Certified EIR and are consistent with CEQA Guidelines Section 15162(a).

MM 4.3-1: The CEQA Guidelines (14 CCR §15126.4[b][3]) direct public agencies, wherever feasible, to avoid damaging historical resources of an archaeological nature, preferably by preserving the resource(s) in place. Preservation in place options suggested by the CEQA Guidelines include (1) planning construction to avoid an archaeological site; (2) incorporating the site into open space; (3) capping the site with a chemically stable soil; and/or (4) deeding the site into a permanent conservation easement.

Prior to issuance of a grading permit for grading of 2 feet or more in depth below the natural or existing grade, the applicant/developer shall provide written evidence to the City Planning Division that a qualified archaeologist has been retained by the applicant/developer to respond on an as-needed basis to address unanticipated archaeological discoveries and any archaeological requirements (e.g., conditions of approval) that are applicable to the Project. The applicant/developer is encouraged to conduct a field meeting prior to the start of construction activity with all construction supervisors to train staff to identify potential archaeological resources. In the event that archaeological materials ~~are~~ encountered during ground-disturbing activities, work in the immediate vicinity of the resource shall cease until a qualified archaeologist has assessed the discovery and appropriate treatment pursuant to CEQA Guidelines Section 15064.5 is determined.

If discovered archaeological resources are found to be significant, the archaeologist shall determine, in consultation with the City ~~and any local Native American groups expressing interest following notification by the City~~, appropriate avoidance measures or other appropriate mitigation. Per CEQA Guidelines Section 15126.4(b)(3), preservation in place shall be the preferred means to avoid impacts to archaeological resources qualifying as historical resources. Consistent with CEQA Guidelines Section 15126.4(b)(3)(C), if it is demonstrated that confirmed resources cannot be avoided, the qualified archaeologist shall develop additional treatment measures, such as data recovery, reburial/relocation, deposit at a local museum that accepts such resources, or other appropriate measures~~, in consultation with the implementing agency and any local Native American representatives expressing interest in prehistoric or tribal resources~~. If an archaeological site does not qualify as a historical resource but meets the criteria for a unique archaeological resource as defined in Section 21083.2, then the site shall be treated in accordance with the provisions of Section 21083.2.

5.6. ENERGY	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Result in potentially significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☐	☐	☒
b) Conflict with or obstruct a State or local plan for renewable energy or energy efficiency?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed energy consumption. . The RHASP Final EIR described that new development within the RHASP would increase demand for electricity and natural gas services provided by Southern California Edison (SCE) and SoCalGas. Implementing development projects would be required to adhere to the current version of the California Building and Energy Efficiency Standards. Future development within the Specific Plan would also be required to adhere to the provisions of CALGreen, which establishes planning and design standards for sustainable site development, energy efficiency (in excess of the California Energy Code requirements), water conservation, material conservation, and internal air contaminants. The RHASP is not anticipated to result in a substantial demand for energy that would require expanded supplies or the construction of other infrastructure or expansion of existing facilities. Additionally, fuel consumption associated with vehicle trips generated by the RHASP would not be considered inefficient, wasteful, or unnecessary.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses energy impacts. . According to the 2021 Addendum, the Approved Project would not result in wasteful, inefficient, or unnecessary consumption of energy resources. Therefore, the energy usage anticipated from the Approved Project was determined to have no new impact.

a) Result in potentially significant environmental impacts due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR found that the RHASP would not result in wasteful, inefficient, or unnecessary consumption of energy resources. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

Construction

Construction of the proposed Project would consume energy in three general forms:

1. Petroleum-based fuels used to power off-road construction vehicles and equipment on the Project site, construction worker travel to and from the Project site, as well as delivery truck trips;

2. Electricity associated with providing temporary power for lighting and electric equipment; and
3. Energy used in the production of construction materials, such as asphalt, steel, concrete, pipes, and manufactured or processed materials such as lumber and glass.

Construction activities related to redevelopment of the site for new residential uses would be permitted to require compliance with existing fuel standards, machinery efficiency standards, and CARB requirements that limit idling of trucks. Through compliance with existing standards the Project would not result in demand for fuel greater on a per-development basis than other development projects in Southern California. There are no unusual Project characteristics that would cause the use of construction equipment that would be less energy efficient compared with other similar construction sites in other parts of the State. Therefore, construction-related fuel consumption by the Project would not result in inefficient, wasteful, or unnecessary energy use compared with other construction sites in the region, and impacts would be less than significant.

Operation

Once operational, the Project would generate demand for electricity, natural gas, as well as gasoline for fuel tanks. Operational use of energy includes the heating, cooling, and lighting of the building, water heating, operation of electrical systems and plug-in appliances, parking lot and outdoor lighting, and the transport of electricity, natural gas, and water to the areas where they would be consumed. This use of energy is typical for urban development, and no operational activities or land uses would occur that would result in extraordinary energy consumption.

The State of California provides a minimum standard for building design and construction standards through Title 24 of the California Code of Regulations (CCR). Compliance with Title 24 is mandatory at the time new building permits are issued by the City that the Project shall comply with the adopted California Energy Code (Code of Regulations, Title 24 Part 6). The City's administration of the Title 24 requirements includes review of design components and energy conservation measures that occurs during the permitting process, which ensures that all requirements are met. Typical Title 24 measures include insulation; use of energy-efficient heating, ventilation and air conditioning equipment (HVAC); energy-efficient indoor and outdoor lighting systems; reclamation of heat rejection from refrigeration equipment to generate hot water; and incorporation of skylights, etc. In complying with the Title 24 standards, impacts to peak energy usage periods would be minimized, and impacts on statewide and regional energy needs would be reduced. Thus, operation of the Project would not use large amounts of energy or fuel in a wasteful manner, and no operational energy impacts would occur.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

b) Conflict with or obstruct a State or local plan for renewable energy or energy efficiency?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that buildout of the RHASP would not obstruct a State or local plan for renewable energy or energy efficiency and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The California Title 24 Building Energy Efficiency Standards are designed to ensure new and existing buildings achieve energy efficiency and preserve outdoor and indoor environmental quality. These measures (Title 24, Part 6) are listed in the California Code of Regulations. The California Energy Commission is responsible for adopting, implementing and updating building energy efficiency. Local city and county enforcement agencies have the authority to verify compliance with applicable building codes, including energy efficiency. All development is required to comply with the adopted California Energy Code (Code of Regulations, Title 24 Part 6), which is ensured through the City's development permitting process.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate proposed Project impacts or mitigation measures exist regarding energy. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to energy.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe energy impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for energy.

5.7. GEOLOGY AND SOILS	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Expose people or structures to 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 fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR discussed impacts related to geology and soils on pages 4.4-1 through 4.4-12. The RHASP Final EIR described that the nearest active fault to the RHASP area is the Newport-Inglewood Fault, which is located approximately ten miles to the southwest. The RHASP area is not located within an Alquist-Priolo Earthquake Fault Zone and no known active faults cross the area. The RHASP area lies within a region of active faulting and seismicity in Southern California. Potential regional sources for major ground-shaking hazards include the San Andreas, San Jacinto, and Elsinore fault zones. While such shaking would be less severe from an earthquake that originates at a greater distance from the RHASP area, the effects could potentially be damaging to buildings and supporting infrastructure within the RHASP area. It is likely that the RHASP area would be subject to a moderate or larger earthquake occurring close enough to produce strong ground shaking at the RHASP area. Future development within the RHASP area would be required to conform to the seismic design requirements of the most current CBC (or applicable adopted code at the time of plan submittal or grading and building permit issuance for construction) which would reduce anticipated impacts related to the proximity of earthquake faults by requiring structures to be built to withstand seismic ground shaking. Additionally, projects would need to comply with the Tustin City Code, Article 8, Chapter 1, and Chapter 9 (Grading and Excavation) which regulates grading, drainage, and cuts and fills. Grading permits are required for all development sites requiring excavation, fills, and paving. Building permits are issued for a site graded under a valid precise grading permit.

According to the RHASP Final EIR, most of the RHASP is mapped as within a liquefaction zone. However, site-specific geotechnical investigations would be required for implementing development projects prior to approval of a grading permit. Remedial grading, including the replacement of unsuitable soil materials with suitable engineered fill materials, can preclude liquefaction impacts. However, the RHASP is not within a landscape hazard area and the ground surface of the RHASP area is relatively flat. Therefore, the RHASP would not expose people or structures to substantial adverse effects involving landslides.

The RHASP Final EIR described that, where future development projects would disturb one or more acres of soil, or where a project would disturb less than one acre but is a part of a larger development plan that totals one or more acres, the National Pollutant Discharge Elimination System (NPDES) permitting process requires coverage under the General Permit for Discharges of Storm Water Associated with Construction Activity. The Construction General Permit requires the development of a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP would include erosion-control and sediment-control Best Management Practices (BMPs) to be implemented throughout the construction process which would prevent or reduce erosion. Erosion-control BMPs are designed to prevent erosion, whereas sediment controls are designed to trap sediment once it has been mobilized. For future development projects that would disturb less than one acre, the City requires an Erosion and Sediment Control Plan be prepared. Upon completion of projects, sites would be fully developed and landscaped. The potential for soil erosion or loss would be extremely minimal.

According to the RHASP Final EIR, lateral spreading typically occurs adjacent to slopes and creek channels. Considering the general topography of the terrain, the potential for lateral spreading to occur in the RHASP area would be low. Future development projects in the RHASP area would be required to evaluate geological conditions in compliance with the City's Municipal Code. Compliance would preclude potentially significant impacts. Ground subsidence is the lowering of the ground surface over a wide area, most often due to withdrawal of water or soil. Subsidence resulting from groundwater withdrawal has not been reported in the region. Groundwater levels in the Municipal Water District of Orange County's service area, which includes the RHASP area, are managed to avoid overdraft of the underlying groundwater basin. Soils that expand and contract in volume ("shrink-swell" pattern) are considered to be expansive and may cause damage to aboveground infrastructure as a result of density changes that shift overlying materials. Soils testing to determine expansive characteristics is required for new development pursuant to the CBC. Where expansive soils are present, remedial grading, including the replacement of unsuitable soil materials with suitable engineered fill materials, is anticipated to be required. Development within the RHASP area would not require the use of septic tanks or assume the use of alternative wastewater disposal systems.

Impacts related to paleontological resources were described on page 4.3-9 of the RHASP Final EIR. As described in the RHASP Final EIR, a paleontological records search was conducted at the Natural History Museum of Los Angeles. The RHASP area has surface exposures of younger terrestrial Quaternary Terrace deposits. The records search identified no vertebrate fossil localities that lie directly within the RHASP area, but that there are nearby localities from the same sedimentary deposits that probably occur subsurface in the RHASP area. Deeper excavations that extend down into older Quaternary deposits may encounter significant fossil vertebrate specimens. Future development under the RHASP area would be required to comply with MM 4.3-2. MM 4.3-2 requires a paleontologist be retained to determine if any found paleontological resources require further treatment.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses geology and soil impacts. . The 2021 EIR Addendum determined that the Approved Project site is not located within an Alquist-Priolo Earthquake Fault Zone and no known active faults cross the area. Compliance with regulatory requirements, including adherence to the California Building Code, would ensure that potential risks related to seismic activity, soil instability, and erosion are minimized. Additionally, the Approved Project would not impact unique paleontological resources, and any earthmoving activities would be monitored to mitigate potential disturbances to previously unknown resources. For these reasons, the 2021 Addendum concluded that no new geology and soil impacts would occur.

RHASP Final EIR Mitigation Measures

a) **The RHASP included MM 4.3-2 to address the potential discovery of unknown paleontological resources. The full text of MM 4.3-2 is provided herein at the end of this section. Expose people or structures to 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 fault?***

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that buildout of the RHASP would not result in any significant impacts in relation to a rupture of a known earthquake fault as delineated on the most recent Alquist-Priolo Earthquake Fault Map. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

An updated geotechnical report was prepared for the proposed Project and is included as Appendix C (SA Geotechnical, Inc., 2023). The Project site is not within an Alquist-Priolo Earthquake Fault Zone. The Project site does not contain and is not in the vicinity of an earthquake fault. The closest earthquake fault is the Newport-Inglewood Fault, located approximately 10 miles to the southwest. Because the Project site is not within an Alquist-Priolo Earthquake Fault zone and the site does not include, or adjacent to a fault, impacts related to rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map would not occur.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

   ii. ***Strong seismic ground shaking?***

Impacts Associated with the Proposed Project

No New Impact. The Final EIR concluded that impacts related to seismic ground shaking would be less than significant with compliance with regulatory requirements and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site is located within a seismically active region of Southern California.

As mentioned previously, the closest earthquake fault is the Newport-Inglewood Fault, located approximately 10 miles to the southwest. Thus, moderate to strong ground shaking can be expected at the site. The amount of motion can vary depending upon the distance to the fault, the magnitude of the earthquake, and the local geology. Greater movement can be expected at sites located closer to an earthquake epicenter, that consists of poorly consolidated material such as alluvium, and in response to an earthquake of great magnitude.

Structures built in the City are required to be built in compliance with the California Building Code (CBC [California Code of Regulations, Title 24, Part 2]), included in the Municipal Code as Section 8102. Compliance with the CBC would ensure earthquake safety based on factors including occupancy type, the types of soils on-site, and the probable strength of the ground motion. Compliance with the CBC would include the incorporation of: 1) seismic safety features to minimize the potential for significant effects as a result of earthquakes; 2) proper building footings and foundations; and 3) construction of the building structures so that it would withstand the effects of strong ground shaking. Therefore, with CBC compliance, the proposed Project would not expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking more than other developments in Southern California.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

iii. Seismic-related ground failure, including liquefaction?

Impacts Associated with the Proposed Project

No New Impact. The Final EIR concluded that impacts related to liquefaction would be less than significant upon compliance with the CBC and the 2021 Addendum was found to be consistent with the RHASP Final EIR. Soils that are most susceptible to liquefaction are clean, loose, saturated, and uniformly graded fine-grained sands that lie below the groundwater table within approximately 50 feet below ground surface. Lateral spreading is a form of seismic ground failure due to liquefaction in a subsurface layer.

As described in the RHASP Final EIR, the Project site is located within the liquefaction hazard zone (California State Geoportal, 2022). Within the updated geotechnical report prepared for the proposed Project, there was potential for liquefaction identified due to the presence of undocumented fill (Appendix C). The Project would be required to remove undocumented fill and replace fill with recompacted soils, per state and local geotechnical engineering standards included in the CBC. However, the Project would be required to comply with the CBC, as included in the TCC. As required by City Code and the CBC, prior to the issuance of grading permits, a geotechnical report must be prepared including geotechnical recommendations for the proposed Project. Compliance with the geotechnical recommendations, pursuant to CBC requirements and the TCC, would reduce impacts related to liquefaction to less than signficant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

iv. Landslides?

Impacts Associated with the Proposed Project

No New Impact. The Project site is relatively flat with a gentle slope to the to the south. The site elevation is approximately 108 feet above mean sea level (Hillmann Consulting, 2024). The site is not near any hillsides or slope areas that could result in a landslide. Therefore, no impacts related to landslides would occur from redevelopment of the Project site.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

b) Result in soil erosion or the loss of topsoil?

<u>**Impacts Associated with the Proposed Project**</u>

No New Impact. Consistent with the assumptions of the Final EIR, the proposed Project would involve excavation, grading, and construction activities that would disturb soil and leave exposed soil on the ground surface. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. As such, the proposed Project would be required to comply with the City's grading standards and erosion control measures, as verified through the permitting and plan check process. Additionally, the Construction General Permit (CGP; Order No. R8-2002-0011) issued by the State Water Resources Control Board (SWRCB), regulates construction activities to minimize water pollution, including sediment. The proposed Project would be subject to the NPDES permitting regulations, including implementation of a SWPPP and associated BMPs during grading and construction, which would be required during construction permitting of the Project.

Adherence to the BMPs in the SWPPP would reduce, prevent, or minimize soil erosion from Project-related grading and construction activities. After completion of construction, the Project site would be developed with 73 townhomes, new paved parking lot, and landscape improvements, and would not contain exposed soil. Thus, the potential for soil erosion or the loss of topsoil would be low. In addition, the City of Tustin, through implementation of the regional NPDES permit, requires new development projects to prepare a Water Quality Management Plan (WQMP) including Low Impact Development BMPs to reduce the potential of erosion and/or sedimentation through site design and structural treatment control. Implementation of the WQMP and BMPs is verified through the City's permitting process.

Therefore, the proposed Project would have a less than significant impact related to soil erosion. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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 offsite landslide, lateral spreading, subsidence, liquefaction or collapse?

<u>**Impacts Associated with the Proposed Project**</u>

No New Impact. The RHASP Final EIR concluded that impacts related to unstable geologic units and soil would be less than significant with compliance to regulatory requirements. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. As described above, the Project site is relatively flat, and does not contain nor is adjacent to any significant slope or hillside area. The Project would not create slopes. Thus, on- or off-site landslides would not occur from implementation of the Project.

As described previously, the Project site is within a liquefaction hazard area. Prior to issuance of grading permits, pursuant to the CBC, included as Section 8102 of the TCC, a geotechnical report must be prepared for the Project. The report would provide CBC regulations for the proposed development to reduce the potential for liquefaction-induced settlement to a less than significant level and would be verified by the City through the building plan check and development permitting process, and would reduce potential impacts related to liquefaction, settlement, and ground collapse to a less than significant level.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to expansive soils would be less than significant with compliance to regulatory requirements. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. Expansive soils contain certain types of clay minerals that shrink or well as the moisture content changes; the shrinking or swelling can shift, crack, or break structures built on such soils. Arid or semiarid areas with seasonal changes of soil moisture experiences, such as southern California, have a higher potential of expansive soils than areas with higher rainfall and more constant soil moisture.

Prior to the issuance of grading permits, a geotechnical report will be prepared which will evaluate the potential for expansive soils on-site. In addition, as described previously, compliance with the CBC would be incorporated into grading plans and building specifications as a condition of construction permit approval to ensure that Project structures would withstand the effects related to ground movement, including expansive soils. Therefore, impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

e) Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts would not occur related to septic tanks and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The proposed Project would connect to existing sewer lines within Red Hill Avenue. No septic tanks are proposed. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Impacts Associated with the Proposed Project

No New Impact. The proposed Project would construct new residential buildings. Earthmoving activities, including grading and trenching activities, would have the potential to disturb previously unknown paleontological resources if earthmoving activities occur at significant depths below previously disturbed soils. However, the proposed Project would implement RHASP Final EIR MM 4.3-2, which would require retention of a paleontologist and paleontological monitoring. With implementation MM 4.3-2, potential impacts to paleontological resources and unique geologic features would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding geology and soils. There have not been 1) changes to the Project that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which the Project is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to geology and soils.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe geology and soils impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for geology and soils.

Applicable Final EIR Mitigation Measures

MM 4.3-2: Prior to issuance of any grading or building permits for any development projects under the Red Hill Avenue Specific Plan, the applicant shall provide a letter to the City of Tustin Community Development Department, or designee, from a paleontologist selected from the roll of qualified paleontologists maintained by the County of Orange, stating that the applicant has retained this individual, and that the paleontologist shall provide on-call services in the event resources are discovered. The paleontologist shall be present at the pre-grading conference to establish procedures for paleontological resource surveillance. If paleontological resources are discovered during any development project within the Red Hill Avenue Specific Plan area, ground-disturbing activity within 50 feet of the area of the discovery shall cease.

If the find is determined by paleontologists to require further treatment, the area of discovery will be protected from disturbance while qualified paleontologists and appropriate officials, in consultation with a recognized museum repository (e.g., National History Museum of Los Angeles County), determine an appropriate treatment plan.

5.8. GREENHOUSE GAS EMISSIONS	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☐	☒
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to greenhouse gas (GHG) emissions. . The EIR described that construction of the future development within the RHASP would generate temporary GHG emissions primarily due to the operation of construction equipment and truck trips. Site preparation and grading typically generate the greatest amount of emissions due to the use of grading equipment and soil hauling. Operational emissions related to the RHASP include area sources, including consumer products, landscape maintenance, and architectural coating; emissions from waste, emissions from water and wastewater use, and mobile sources. For mobile sources, the estimate of total daily trips associated with the RHASP was based on vehicle trip data provided in the traffic study. Annual emissions from implementation of the RHASP would total approximately 9.1 MT of CO2e per service population. Under a worst-case scenario, these emissions would substantially exceed the 4.1 MT CO2e per year threshold. MM 4.2-1 through MM 4.2-3 would also reduce project-related operational GHG emissions. Further, development within the RHASP area would locate a mix of residential, commercial (retail and office), and other land uses proximate to nearby public transportation. Increased use of public transportation, walking, and biking would help reduce mobile GHG emissions from vehicle trips. The RHASP would be consistent with the policies and initiatives of State GHG reduction programs as well as the regional RTP/SCS. In addition, development with the RHASP area would be required to comply with Title 24 of the California Code of Regulations, which include measures to ensure new development has solar-ready roofs, and energy and water efficient building design, appliances, and fixtures. Furthermore, future development within the RHASP area would be required to comply with the City's AB 341 commitments to increase solid waste diversion to 50 percent within the City. However, GHG emissions would exceed SCAQMD thresholds; therefore, impacts would be significant and unavoidable.

As described by the RHASP Final EIR, development within the RHASP area would be able to achieve emissions reductions with the following considerations:

- Future legislative actions and policies provided in CARB's Scoping Plan would be responsible for guiding GHG reductions for new development in accordance with State goals;
- Future development within the Specific Plan area would increase local transit access and would help reduce mobile sources of local GHG emissions within the Specific Plan area; and
- Buildout of the Specific Plan would be consistent with State GHG Reduction Programs as well as the regional RTP/SCS.

With the above conditions, the future development within the RHASP would demonstrate compliance with the State's GHG reduction targets, which would help reduce potential GHG emissions generated by development within the RHASP. Therefore, the RHASP Final EIR concluded that implementation of the RHASP would not conflict with State regulations to reduce GHG emissions or with the policies and initiatives of the 2016-2040 RTP/SCS.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses greenhouse gas emission impacts on page 72 through page 74. The 2021 EIR Addendum determined that the previously Approved Project's GHG emissions generated would be less than those identified by the RHASP Final EIR, due to fewer dwelling units than what was initially analyzed in the RHASP Final EIR. Therefore, GHG impacts anticipated to result from the Approved Project were determined to be less than assumed by the RHASP Final EIR.

RHASP Final EIR Mitigation Measures

See RHASP MM 4.2-1 through MM 4.2-3, above, in Section 5.3, *Air Quality*.

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that despite implementation of MM 4.2-1 through MM 4.2-3, impacts related to GHG emissions would be significant and unavoidable and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The majority of construction GHG emissions would occur from equipment exhaust, construction-related vehicular activity, and construction worker automobile trips. The majority of operational GHG emissions would occur from vehicle trips to and from the Project site, with additional emissions generated by energy consumption during operations.

The proposed Project's GHG emissions would be lower than those analyzed in the RHASP Final EIR. The Final EIR evaluated potential development of up to 160 dwelling units on the Project site based on the residential allocation within the RHASP. In contrast, the proposed Project would develop only 73 dwelling units, significantly reducing vehicle trips and associated emissions. Since vehicle emissions are a primary source of GHGs, fewer dwelling units mean fewer residents, resulting in less traffic, fuel consumption, and overall emissions. Additionally, the Project would not develop any portion of the 30,000 square feet of non-residential space analyzed within Traffic Analysis Zone (TAZ) 1, further minimizing trip generation and energy demand. With fewer buildings and people using electricity, heating, and cooling, the overall energy consumption and related emissions would also be lower.

GHG emissions would also be reduced through the implementation of RHASP Final EIR Mitigation Measures (MMs). Furthermore, the Project would incorporate sustainability features such as energy-efficient appliances, bicycle parking, pedestrian-oriented retail, and preferential parking for alternatively fueled vehicles, consistent with RHASP Final EIR MM 4.2-3.

Given the Project's reduced density, lower trip generation, and incorporation of mitigation measures, its GHG emissions would remain below those identified in the RHASP Final EIR. Therefore, the proposed Project would not result in new or substantially greater GHG impacts beyond those previously analyzed.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts would be less than significant and the RHASP would not conflict with applicable plans, policies, or regulations related to reducing GHG Emissions. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. The CARB Scoping Plan recommends strategies for implementation at the statewide level to meet the goals of AB 32. The CARB Scoping Plan recommendations serve as statewide measures to reduce GHG emissions levels. The proposed Project would be consistent with the applicable measures established in the Scoping Plan.

The proposed Project would be implemented pursuant to the 2022 CALGreen Building (Title 24) requirements, and provide new land uses in a sustainable manner. The City's administration of the Title 24 requirements includes review of proposed energy conservation measures during the permitting process, which ensures that all requirements are met. Typical Title 24 measures include increased insulation; use of energy and water efficient appliances; water efficient plumbing and fixtures; Low-E windows, high performance; heating, ventilation and air conditioning equipment (HVAC); and more. In complying with the 2022 Title 24 standards, the Project would be implementing regulations that reduce GHG emissions. Therefore, the proposed Project would not conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing GHG emissions, and impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding greenhouse gas emissions. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to GHGs.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe greenhouse gas emissions impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures with respect to greenhouse gas emissions impacts are required.

Applicable Final EIR Mitigation Measures

RHASP Final EIR MM 4.2-1 and 4.2-3, as detailed above in Section 5.3, *Air Quality*.

5.9. HAZARDS AND HAZARDOUS MATERIALS	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☐	☒
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 for people residing or working in the project area?	☐	☐	☐	☐	☒
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☐	☒
g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to hazardous resources. According to the RHASP Final EIR, the types of uses and facilities allowed in the RHASP area may generate, store, use, distribute or dispose of hazardous materials such as oils, solvents, paints, diesel fuel, fertilizers and household chemicals. Implementation of the RHASP would not create a significant impact through the transport, use or disposal of hazardous materials since all uses and facilities are required to comply with all applicable federal, State and regional regulations which are intended to avoid impacts to the public or environment. If during the individual development review process, the City determines that a prospective user may generate inordinate quantities or unusual hazardous waste material, the proposed development may be subject to further review prior to approval. Future developments on sites with a current or former hazardous materially regulated facility would need to be evaluated in consultation with Orange County Health Care Authority-Environmental Health (OCHCA-EH) to determine if there is a contamination risk to the proposed land use. Remediation of a contaminated site to applicable standards for the proposed land use may be required as described in MM 4.6-1, as listed below.

According to the RHASP Final EIR, the nearest elementary schools to the RHASP area are Benjamin Beswick Elementary School, approximately 300 feet west of Red Hill Avenue, and Marjorie Veeh Elementary School, approximately 650 feet east of Red Hill Avenue. The nearest middle school is C.E. Utt Middle School, approximately 1,900 feet east of Red Hill Avenue. Tustin High School is adjacent to the RHASP area. The proposed land uses within the RHASP area do not propose any industrial uses which could potentially generate hazardous emissions or involve the handling of hazardous materials, substances, or waste in significant quantities that would have an impact to surrounding schools. The types of hazardous substances that would be routinely handled (e.g., pool chemicals, household cleaners, etc.) are similar to those found in schools and would have no impact on surrounding schools.

The RHASP Final EIR described that the RHASP area is not included on a hazardous site list compiled pursuant to California Government Code Section 65962.5. However, review of regulatory databases through EDR, the California State Water Resources Control Board GeoTracker, and the California Department of Toxic Substances Control (DTSC) Envirostor indicate that there are multiple listings currently present within the RHASP area that have or previously had cases associated with hazardous material spills, violations or incidents. As such, the contamination status of each property with a current or former hazardous materially regulated facility would need to be evaluated, if and, when the site changes land use. Implementation of MM 4.6-1 would reduce potential impacts to the public or environment from a hazardous material site to a less than significant level.

According to the RHASP Final EIR, implementation of the RHASP would not impair or physically interfere with an adopted emergency response or evacuation plan, including the City of Tustin Emergency Operations Plan, which was revised in April 2014. The purpose of the Emergency Operations Plan is to provide guidance for the City's response to emergency situations from natural disasters, technological incidents, and National security emergencies. The Emergency Operations Plan describes procedures for the effective and efficient allocation response to a hazardous materials emergency. It establishes an emergency organization, assigns tasks, specifies policy and general procedures, and provides coordination of planning for all phases of emergency planning for a hazardous materials emergency. No revisions to the adopted Emergency Operations Plan would be required as a result of implementation of the RHASP. Primary access to all major roads would be maintained during construction of future developments within the RHASP area.

The Final EIR described that implementation of the RHASP would not expose people or structures to a risk of loss, injury or death involving wildland fires. The RHASP area is in a developed urban area and it is not adjacent to any wildland areas. There are no private airstrips located immediately adjacent to or near the RHASP area. While the City's southern boundary is approximately two miles north of Orange County's John Wayne Airport, the RHASP area is approximately four miles northeast of Orange County's John Wayne Airport. Because the RHASP area is not located within two miles of a private or public airport and is not located within the John Wayne Airport, Airport Environs Land Use Plan (AELUP), no impacts would occur.

Summary of Impacts Identified in 2021 Addendum

The 2021 EIR Addendum discusses hazards and hazardous materials.. The 2021 EIR Addendum determined that the previously Approved Project would not create significant hazards to the Public, beyond what was initially analyzed in the RHASP Final EIR. Additionally, the proposed Project would not increase risks pertaining to wildfire and emergency operations. Therefore, hazard impacts anticipated to result from the Approved Project were determined to be less than assumed by the RHASP Final EIR.

RHASP Final EIR Mitigation Measures

MM 4.6-1: Prior to the issuance of grading permits, a human health risk evaluation shall be prepared by a qualified environmental professional in consultation with Orange County Health Care Agency, Environmental Health Division (OCHCA-EH) for any individual site application proposed on a site with a current or former hazardous materially regulated facility to determine if there is a contamination risk to the proposed land use. Remedial activities, if necessary, may be required, in consultation with OCHCA-EH.

a) **Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?**

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that compliance with all applicable Federal, State and regional regulations, and implementation of RHASP Final EIR MM 4.6-1, would reduce potential impacts to the public or environment to less than significant level. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

An updated Phase I Environmental Site Assessment (ESA) was prepared for the proposed Project and has been included as Appendix D (Hillmann Consulting, 2024). The Phase I ESA found that the Project site contained no recognized environmental conditions (RECs) within the Project site.

Construction

The proposed construction activities would involve the routine transport, use, and disposal of hazardous materials such as paints, solvents, oils, grease, and caulking during construction activities typical of residential construction. In addition, hazardous materials would routinely be needed for fueling and servicing construction equipment on the site. These types of materials are not acutely hazardous, and all storage, handling, use, and disposal of these materials are regulated by federal and State regulations that are implemented by the County of Orange and City of Tustin during building permitting for construction activities. Additionally, according to the DTSC and State Water Resources Control Board (SWRCB), the Project is not located on a former or current hazardous materially regulated facility. As such, RHASP MM 4.6-1 is not applicable to the proposed Project. As a result, hazardous material impacts related to construction materials would be less than significant.

Operation

Operation of the proposed Project includes activities related to multi-family residential development, which generally uses common hazardous materials, including: solvents, cleaning agents, paints, pesticides, batteries, and aerosol cans. Although the Project would utilize common types of hazardous materials, normal routine use of these products pursuant to existing regulations would not result in a significant hazard to the environment, residents, or workers in the vicinity of the Project. Therefore, operational impacts related to routine transport, use, and disposal of hazardous materials during operation of the Project would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that compliance with all applicable federal, State and regional regulations, and implementation of RHASP Final EIR MM 4.6-1, would reduce potential impacts to the public or environment to less than significant level. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

Construction

Accidental Releases. While the routine use, storage, transport, and disposal of hazardous materials in accordance with applicable regulations during construction activities would not pose health risks or result in significant impacts; improper use, storage, transportation and disposal of hazardous materials and wastes could result in accidental spills or releases, posing health risks to workers, the public, and the environment. To avoid an impact related to an accidental release, the use of BMPs during construction are implemented as part of a SWPPP as required by the NPDES General Construction Permit. Implementation of a SWPPP would minimize potential adverse effects to workers, the public, and the environment. Construction contract specifications would include strict on-site handling rules and BMPs that include, but are not limited to:

- Establishing a dedicated area for fuel storage and refueling and construction dewatering activities that includes secondary containment protection measures and spill control supplies;
- Following manufacturers' recommendations on the use, storage, and disposal of chemical products used in construction;
- Avoiding overtopping construction equipment fuel tanks;
- Properly containing and removing grease and oils during routine maintenance of equipment; and
- Properly disposing of discarded containers of fuels and other chemicals.

Lead Based Materials. According to the California DTSC and SWRCB, the Project is not located on a former or current hazardous material regulated facility. As such, RHASP MM 4.6-1 is not applicable to the proposed Project. This is consistent with the Final EIR determination that compliance with existing regulations would reduce impacts to a less than significant level.

Operation

Operation of the proposed residential development and associated areas involve use and storage of common hazardous materials such as paints, solvents, cleaning products, fuels, lubricants, adhesives, sealers, and pesticides/herbicides. Normal routine use of these typical commercially used products pursuant to existing regulations would not result in a significant hazard to the environment, residents, or workers in the vicinity of the Project. With adherence of existing regulations, impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

c) Emit hazardous emissions or handle hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to hazardous material use near schools would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project is directly adjacent to sports fields associated with Tustin High School, located at 1171 El Camino Real, Tustin, CA 92780. However, as noted in Sections 5.9(a) and 5.9(b), the proposed Project is a residential Project and is not anticipated to release hazardous emissions or handle hazardous or acutely hazardous materials, substances, or wastes. Therefore, the proposed Project would not emit hazardous emissions or handle hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school and impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that implementation of RHASP Final EIR MM 4.6-1 would reduce potential impacts to the public or environment from a hazardous material site to a less than significant level and the 2021 Addendum was found to be consistent with the RHASP Final EIR.

According to DTSC and the State Water Resources Control Board, the Project site is not included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, nor are any of the adjacent properties (Department of Toxic Substances Control, 2025). Government Code Section 65962.5 specifies lists of the following types of hazardous materials sites: hazardous waste facilities; hazardous waste discharges for which the State Water Resources Control Board has issued certain types of orders; public drinking water wells containing detectable levels of organic contaminants; underground storage tanks with reported unauthorized releases; and solid waste disposal facilities from which hazardous waste has migrated. Thus, the Project is not located on a hazardous materials site and impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

e) For a project 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 for people residing or working in the project area?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to airport hazards would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. John Wayne International Airport is located approximately 4.45 miles southwest of the Project site. The Project site is not within the John Wayne International Airport land use plan. Therefore, the proposed Project would not result in a safety hazard for people working on the site and impacts from the proposed Project would be less than significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

f) Impair implementation of an adopted emergency response plan or emergency evacuation plan?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that the RHASP would not impair implementation of an adopted emergency response plan or emergency evacuation plan, and impacts would be less than significant. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. The proposed Project would not physically interfere with an adopted emergency response plan or emergency evacuation plan.

Construction

The proposed construction activities, including equipment and supply staging and storage, would occur within the Project site, and would not restrict access of emergency vehicles to the Project site or adjacent areas. The installation of a new driveway and connections to existing and proposed infrastructure systems that would be implemented during construction of the proposed Project would not require closure of Red Hill Avenue or San Juan Street. Any temporary lane closures needed for utility connections or driveway construction would be required to implement appropriate measures to facilitate vehicle circulation, as included within construction permits. Thus, implementation of the Project through the City's permitting process would ensure existing regulations are adhered to and would reduce potential construction-related emergency access or evacuation impacts to a less than significant level.

Operation

Direct access to the Project site would be provided from Red Hill Avenue by one driveway and San Juan Street by one driveway. The Project driveway and internal circulation would be required through the City's permitting procedures to meet the City's design standards to ensure adequate emergency access and evacuation. The Project is also required to provide fire suppression facilities (e.g., hydrants and sprinklers). The Fire Department and/or Public Works Department would review the development plans as part of the permitting procedures to ensure adequate emergency access pursuant to the requirements in Section 503 of the California Fire Code (Title 24, California Code of Regulations, Part 9), included as Municipal Code Section 8104.

As detailed in Section 5.17, *Transportation*, the proposed Project would result in approximately 812 fewerdaily trips, 43 fewer AM peak hour trips, and 79 fewer PM peak hour trips than buildout of the site pursuant to the previously Approved Project. Thus, the Project would not generate traffic that would impact roadway capacity in such a manner that would interfere with implementation of the City's emergency response or evacuation plan. As such, the Project would not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan, and impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no significant impacts would occur related to wildland fires and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site is within an urbanized area surrounded by residences, commercial uses, Tustin High School sports fields, and roadways. The Project site is not adjacent to any wildland areas. According to the CAL FIRE Fire Hazard Severity Zone map, the Project site is not within an area identified as a Fire Hazard Area that may contain substantial fire risk or a Very High Fire Hazard Severity Zone (VHFHSZ) (CAL FIRE 2021). As a result, the proposed Project would not expose people or structures, either directly or indirectly, to a significant risk of loss, injury, or death involving wildland fires.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Sections 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding hazards and hazardous materials. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to hazards and hazardous materials.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe hazards and hazardous materials impacts would result from the proposed Project; therefore, no new or revised mitigation measures are required for hazards and hazardous materials.

5.10. HYDROLOGY AND WATER QUALITY	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?	☐	☐	☐	☐	☒
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	☐	☒
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;	☐	☐	☐	☐	☒
ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	☐	☐	☐	☐	☒
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; or	☐	☐	☐	☐	☒
iv) impede or redirect flood flows?	☐	☐	☐	☐	☒
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☐	☒
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to hydrology and water quality. According to the RHASP Final EIR, the RHASP area lies within a hydromodification zone. Receiving waters for the RHASP area consist of Peters Canyon Channel, San Diego Creek, and Newport Bay. Hydromodification would likely be a minimal concern since current regulations allow for discharge up to the current existing condition, which is developed in the RHASP.

In addition, the EIR identified that receiving waters have several water quality impairments and several Total Maximum Daily Loads (TMDLs) as defined by the SWRCB. As part of its stormwater discharge permit with the SWRCB, the City must enforce development regulations consistent with the Stormwater Quality Technical Guidance document to limit discharge of TMDL pollutants. The TMDL pollutants for the combined receiving water include metals, nutrients, other organics, pesticides, pathogens, and siltation.

Construction activities would loosen soils or remove stabilizing vegetation and expose areas of loose soil. These areas, if not properly stabilized during construction, could be subject to increased stormwater runoff and impact water quality. In compliance with NPDES regulations, the State of California requires that any construction activity disturbing one acre or more of soil comply with the Construction General Permit. The permit requires development and implementation of a SWPPP and monitoring plan, which must include erosion-control and sediment-control BMPs that would meet or exceed measures required by the Construction General Permit to control potential construction-related pollutants. Prior to issuance of any grading permits for any development project within the Specific Plan area, the EIR specified that a WQMP would be submitted for review and approval to the City of Tustin Public Works Department per City requirements. The preliminary WQMP would outline the required quantities of stormwater required to be treated and the appropriate treatment methods. A final WQMP would be submitted as part of final construction documents to identify the BMPs for the Project. New developments would implement Low Impact Development (LID) principles in their design as part of the WQMP requirements to treat and infiltrate stormwater. MM 4.7-1 requires an applicant to prepare a hydrology and hydraulics analysis demonstrating that the existing condition flow rates are not exceeded by project flow rates. As addressed in MM 4.7-1, future development would be required to apply for encroachment permits through the City for connection into the City storm drain infrastructure. Compliance with federal, State, and local regulation and implementation of MM 4.7-1 and MM 4.7-2 would mitigate potential significant impacts.

The RHASP Final EIR described that the RHASP area is an urbanized environment that is primarily impervious. Because the area is primarily impervious, it does not contribute significantly to groundwater recharge. Implementation of the RHASP would not significantly change the amount of impervious surfaces in the RHASP area. Therefore, implementation of the RHASP would not interfere substantially with groundwater recharge in the coastal plain/Orange County Groundwater Basin. Additionally, while there would be an increase in the water demand over the anticipated General Plan buildout, the EIR determined that water resources would be sufficient to accommodate anticipated population growth.

According to the RHASP Final EIR, the Federal Emergency Management District (FEMA) Flood Insurance Rate Maps (FIRM) applicable to the RHASP area (FIRM Numbers 06059C0277J and 06059C0281J) show that the RHASP is located within Flood Zone X. FEMA defines Zone X as areas of minimal flood hazard and is outside of the 100-year and 500-year flood zones. The RHASP area is located approximately ten miles from the Pacific Ocean and is approximately 100 feet above mean sea level. The California Geological Survey (CGS) notes that the RHASP area is not within an area at risk of tsunami inundation. It is also unlikely that the RHASP area could be affected by a seiche, which occurs in large bodies of water such as a lake because there are no large water bodies proximate to the RHASP area. Peters Canyon Reservoir is the nearest body of water and is approximately 5.5 miles northeast of the RHASP area. Lastly, the EIR found that the RHASP area is flat and in a developed area; no inundation by mudflow would be expected.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses hydrology and water quality impacts. The 2021 EIR Addendum concluded that the Approved Project would comply with all water quality standards and would not negatively impact on-site drainage patterns. Additionally, it confirmed that the Approved Project would not interfere with groundwater management or contribute to flooding. As a result, the hydrology-related impacts of the Approved Project were found to be consistent with the assumptions made in the RHASP Final EIR, with no additional impacts anticipated.

RHASP Final EIR Mitigation Measures

MM 4.7-1: Prior to the issuance of any grading or building permits for any development projects under the Red Hill Avenue Specific Plan, the project applicant shall prepare and submit to the Department of Public Works a hydrology and hydraulics analysis demonstrating that the existing condition flow rates are not exceeded by the proposed project flow rates.

MM 4.7-2: Prior to the issuance of any grading or building permits for any development projects under the Red Hill Avenue Specific Plan that do not have a direct connection to the City's existing storm drain system, shall provide to the Department of Public Works hydraulic analyses of the downstream storm drain system that demonstrate no significant impacts to the City storm drain infrastructure.

a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or groundwater quality?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that implementation of the RHASP would have the potential to adversely impact water quality in downstream receiving waters through discharge of runoff that contains various pollutants of concern. However, compliance with the WQMP and NPDES permit would provide for the protection of surface water quality by avoiding and/or minimizing pollutant runoff into surface waters. Therefore, RHASP impacts to water quality would be less than significant. The 2021 Addendum was found to be consistent with the RHASP Final EIR.

Construction

Construction of the Project would require grading and excavation of soils, which would loosen sediment, and then have the potential to mix with surface water runoff and degrade water quality. Pollutants of concern during Project construction include sediments, trash, petroleum products, concrete waste (dry and wet), sanitary waste, and chemicals. During construction activities, excavated soil would be exposed, and there would be an increased potential for soil erosion and transport of sediment downstream compared to existing conditions. During a storm event, soil erosion could occur at an accelerated rate. In addition, construction-related pollutants, such as chemicals, liquid and petroleum products (e.g., paints, solvents, and fuels), and concrete-related waste, could be spilled, leaked, or transported via stormwater runoff into adjacent drainages and into downstream receiving waters.

These types of water quality impacts during construction of the Project would be prevented through implementation of a SWPPP that is required to identify all potential sources of pollution that are reasonably expected to affect the quality of storm water discharges from the construction site. The SWPPP would include construction BMPs such as:

- Maximizing the permeable area,
- Incorporating landscaped buffer areas,
- Maximizing canopy interception with drought tolerant landscaping
- Installation of Low flow infiltration within sand filter zones
- Landscape design to capture and infiltrate runoff
- Conveying roof run-off into treatment control facilities

Adherence to the existing requirements and implementation of the appropriate BMPs as ensured through the City's construction permitting process would ensure that the Project would not violate any water quality standards or waste discharge requirements. Potential water quality degradation associated with construction activities would be minimized, and impacts would be less than significant.

Operation

The proposed Project would introduce new multi-family residential uses, which have the potential to generate pollutants such as chemicals from cleaning products, pesticides and sediment from landscaping, trash and debris, oil and grease from vehicles and trucks. If not properly managed, these pollutants could enter surface waters and degrade water quality.

The proposed Project would be required to implement a Water Quality Management Plan (WQMP) by the City of Tustin in compliance with the applicable regional NPDES permit. The WQMP would include LID to capture, treat, and infiltrate runoff, reducing the volume and velocity of stormwater discharge to permitted levels. The Project is conditions to submit a final WQMP as part of final construction documents for the Project prior to issuance of grading permit. Additionally, MM 4.7-1 requires preparation of a hydrology and hydraulics analysis demonstrating that proposed conditions would not exceed existing flow rates. A preliminary hydrology report has been provided as Appendix E, which shows that the Project would be consistent with existing hydrology conditions based on preliminary design. However, a final hydrology report would be updated based on the final WQMP design, demonstrating that proposed conditions would not exceed existing flow rates and storm drain capacity. With implementation of the final WQMP and hydrology study, Project operation would not substantially degrade water quality, and impacts would remain less than significant.

Furthermore, the Project would not introduce new or substantially greater water quality impacts beyond those analyzed in the Final EIR. The level of impact would remain consistent with the findings of the Final EIR, and no additional mitigation would be required.

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

<u>**Impacts Associated with the Proposed Project**</u>

No New Impact. The RHASP Final EIR concluded that impacts to groundwater supplies would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR.

The proposed Project would provide 35,881.84 SF of landscape area, which would result in overall decrease of perviousness from 100 percent to approximately 23.9 percent post-development. However, the proposed Project would install an on-site storm drain system that would convey runoff to an underground infiltration system that would capture, filter, and infiltrate runoff consistent with the required Project WQMP and regional NPDES permit. In addition, the Project includes landscaping that would infiltrate stormwater on-site. As a result, the proposed Project would not decrease groundwater supplies or interfere substantially with groundwater recharge; and the Project would not impede sustainable groundwater management of the basin. Thus, the proposed Project would have a less than significant impact.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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 substantially increase the rate or amount of surface runoff in a manner which would:

  i. Result in substantial erosion or siltation on- or off-site?

<u>**Impacts Associated with the Proposed Project**</u>

No New Impact. The RHASP Final EIR concluded that impacts related to runoff increases would be less than significant with implementation of RHASP Final EIR MM 4.7-1 and 4.7-2. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

Construction

The construction of the Project would include ground disturbing activities that could cause erosion and sedimentation during a storm event. As described previously, existing City regulations require the Project to implement a SWPPP during construction activities, that would implement erosion control BMPs, such as silt fencing, fiber rolls, or gravel bags, stabilized construction entrance/exit, hydroseeding, etc. to reduce the potential for siltation or erosion.

Operation

According to the preliminary hydrology report prepared for the proposed Project (see Appendix E), the Project site stormwater currently drains as sheet flow to the southwest corner of the Project site. Majority of the Project site drains to Red Hill Avenue and a small portion drains to San Juan Street. All stormwater from the site is eventually discharged into an existing catch basin in Red Hill Avenue (Kimley Horn, 2025).

The Project would introduce new development to the existing undeveloped site. The Project would include new onsite stormwater infrastructure as part of proposed development. Stormwater would be captured and treated, and stormwater flows would be ultimately discharged to San Juan Street or Red Hill Avenue and into the existing Red Hill catch basin. Therefore, Project drainage patterns would mimic existing drainage patterns. Additionally, with implementation of a WQMP, BMPs for erosion and sedimentation would be required and implemented in consistency with the applicable NPDES permit. With implementation of the WQMP, operational impacts related to erosion or siltation on-site or off-site would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

ii. Substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site?

<u>**Impacts Associated with the Proposed Project**</u>

No New Impact. The RHASP Final EIR concluded that impacts related to runoff increases would be less than significant with implementation of RHASP Final EIR MM 4.7-1 and 4.7-2.

As previously mentioned, the Project site is not located within a flood zone. The Project would include development of 73 residential units, which would introduce new impervious surfaces to the existing undeveloped site. Additional impervious surface area could result in increased stormwater runoff volume generated by the Project site during a storm event.

As discussed above, a SWPPP would be implemented to control surface runoff during Project construction. The SWPPP would ensure that stormwater runoff is properly managed during Project construction through stormwater BMPs. Therefore, Project construction would result in less than significant impacts on flooding on- or off-site.

Additionally, a WQMP would be prepared and approved prior to grading. The WQMP would ensure that stormwater runoff from the Project would be adequately handled by the Project's proposed stormwater infrastructure. The Project comply with applicable City and NPDES requirements for stormwater capture and infiltration, and would not result increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site. Therefore, impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to runoff increases would be less than significant with implementation of RHASP Final EIR MM 4.7-1 and 4.7-2. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

Stormwater runoff currently flows to the southeast corner of the Project site and discharges to the catch basin within Red Hill Avenue (Kimley Horn, 2025). The majority of stormwater is collected within Red Hill Avenue and a small portion is collected within San Juan Street. Stormwater captured from Project site would be captured, treated, and infiltrated through an underground stormwater infiltration and treatment system. Flows that are not infiltrated would be discharged to existing storm drains in either Red Hill Avenue or San Juan Street. The proposed Project would implement LID according to the approved final WQMP, which would be reviewed and approved by the City prior to issuance of a grading permit. Additionally, the Applicant would be conditioned to prepare an updated hydrology study that shows the proposed stormwater infrastructure could be accommodated by existing infrastructure. Therefore, existing drainage patterns on-site would be maintained under proposed conditions.

As a result redevelopment of the Project site would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

iv. Impede or redirect flood flows?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to runoff increases would be less than significant with implementation of RHASP Final EIR MM 4.7-1 and 4.7-2. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

According to FEMA's FIRM Flood Map 06059C0277J, the Project site is classified as Zone X, which are areas with minimal or 0.2 percent annual chance of flood hazard. In addition, the Project it must comply with Municipal Code Article 9, Chapter 8 regarding encroachment into flooding areas. Therefore, the proposed Project would not impede or redirect flood flows and impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to flood hazard, tsunami, and seiche zones would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR.

As discussed above, the Project site is not within a flood hazard area. As such, the Project site is at slight risk of inundation during a storm event. However, the Project SWPPP would ensure that proper storage requirements for hazardous materials such as fuels and oils would be followed in order to limit the risk of release of pollutants due to site inundation during Project construction. Additionally, the Project WQMP would ensure that stormwater is captured and treated in compliance with the applicable NPDES permit. Therefore, implementation of the Project would not risk the release of pollutants due to inundation in a flood hazard zone.

The Project site is located over 10.61 miles east of the Pacific Ocean and is not located within a tsunami zone. Thus, impacts related to tsunamis would not occur.

A seiche is the sloshing of a closed body of water from earthquake shaking. Seiches are of concern relative to water storage facilities because inundation from a seiche can occur if the wave overflows a containment wall, such as the wall of a reservoir, water storage tank, dam, or other artificial body of water. Peters Canyon Reservoir is the nearest body of water and is approximately 5.5 miles northeast of the Project site. Therefore, impacts related to seiche would not occur.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that implementation of the RHASP would have the potential to adversely impact water quality in downstream receiving waters through discharge of runoff that contains various pollutants of concern. However, compliance with a WQMP and NPDES permit would provide for the protection of surface water quality by avoiding and/or minimizing pollutant runoff into surface waters. Therefore, RHASP impacts to water quality would be less than significant. The 2021 Addendum was found to be consistent with the RHASP Final EIR.

As described previously, the Project would be required to have an approved SWPPP, which would include construction BMPs to minimize the potential for construction related sources of pollution. For operations, the proposed Project would be required to implement a WQMP to minimize the introduction of pollutants and treat runoff. With implementation of the operational source and treatment control BMPs, potential pollutants would be reduced to the maximum extent feasible, and implementation of the proposed Project would not obstruct implementation of a water quality control plan.

The Project site is within the coastal plain/Orange County Groundwater Basin (UWMP 2020). According to the Municipal Water District of Orange County's (MWDOC) 2020 Urban Water Management Plan, increased demands from further development in Orange County are expected to be met by existing water supplies. Overall, the proposed Project would not conflict with or obstruct a groundwater management plan, and no impacts would occur.

Therefore, the proposed Project would not conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan, and no new substantial environmental impacts would occur in comparison to the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding hydrology and water quality. There have not been 1) changes related to the development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to hydrology and water quality.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe hydrology and water quality impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for hydrology and water quality.

<u>Applicable Final EIR Mitigation Measures</u>

MM 4.7-1: Prior to the issuance of any grading or building permits for any development projects under the Red Hill Avenue Specific Plan, the project applicant shall prepare and submit to the Department of Public Works a hydrology and hydraulics analysis demonstrating that the existing condition flow rates are not exceeded by the proposed project flow rates.

MM 4.7-2: Prior to the issuance of any grading or building permits for any development projects under the Red Hill Avenue Specific Plan that do not have a direct connection to the City's existing storm drain system, shall provide to the Department of Public Works hydraulic analyses of the downstream storm drain system that demonstrate no significant impacts to the City storm drain infrastructure.

5.11. LAND USE AND PLANNING	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Physically divide an established community?	☐	☐	☐	☐	☒
b) Cause a significant environmental impact due to conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to land use. The RHASP Final EIR described that the RHASP area is developed and contains commercial, retail shopping centers, professional office, residential, and motel uses, and an institutional use. There are also vacant parcels within the Specific Plan area. Land uses adjacent to but outside of the RHASP area are characterized by a mix of attached single-family and multi-family units, parks, and public schools. The RHASP's goal is to promote revitalization of the area by adding a mix of land uses. The RHASP would not introduce new roadways or infrastructure that would bisect or transect the existing uses. The allowable massing and heights of the future developments would not create significant visual barriers or separations. Therefore, the proposed RHASP would not divide an established area but rather would better connect the community by establishing a pedestrian-friendly urban environment.

According to the RHASP, properties in the RHASP area have the following General Plan land use designations: Community Commercial (CC) on approximately 90 percent of the properties; Planned Community Commercial/ Business (PCCB) on approximately 8 percent of the properties; and Professional Office (PO) on approximately 2 percent of the properties. The RHASP required a General Plan Amendment to update the Land Use Map to show the boundaries of the RHASP, and an update the General Plan Land Use Element and other related conforming amendments to General Plan exhibits to ensure that the RHASP and the General Plan, as amended, are internally consistent. The RHASP's new development potential is 325,000 additional square feet non-residential development and 500 additional dwelling units. The RHASP assumes 395 additional dwelling units and 175,000 additional square feet of non-residential uses north of I-5 and 105 additional dwelling units and 150,000 additional square feet of non-residential uses south of I-5. Implementation of the RHASP would not result in significant conflicts related to relevant Tustin General Plan goals and policies. The RHASP requires a zoning amendment to create the "Red Hill Avenue Specific Plan (SP-13)". The adoption of the zoning amendment would correct any inconsistencies between proposed and existing zoning within the RHASP area.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum determined that the previously Approved Project would not physically divide an established community and would not conflict with land use plans or policies. As a result, the land use and planning impacts anticipated to result from the Approved Project were determined to be less than significant.

a) Physically divide an established community?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that the RHASP would not physically divide an established community and no impacts would occur. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. The proposed Project would be developed to be consistent with the General Plan, RHASP, and zoning designations and would not introduce roadways or other infrastructure improvements that would bisect or transect the Project site or surrounding area. The proposed residential use would be compatible with the surrounding land uses. Furthermore, access to the site would be provided by a driveway from the adjacent roadway. Thus, impacts related to physically dividing an established community would not occur from the proposed Project.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The documents regulating land use for the Project site include the RHASP, City's General Plan, and the City's Municipal Code. The proposed Project's relationship to these planning documents is described below.

RHASP. The Project site is designated as Mixed Use by the RHASP. The Project would develop 73 dwelling units, which is below the 160 dwelling units assumed for the Project site by the RHASP and RHASP Final EIR. Additionally, the Project would develop 0 SF of commercial retail, with is below the 30,000 SF of commercial space assumed for the site by the RHASP and the RHASP Final EIR. Additionally, the proposed Project would comply with RHASP goals, as shown in Table LU-1.

Table LU-1: Project Consistency with RHASP Policies

RHASP Goals	Project Consistency
Goal 1- Enhance streetscape, landscape, and public amenities throughout the Specific Plan area.	C*onsistent*. The proposed Project would enhance the streetscape along Red Hill Avenue and San Juan Street by replacing the existing sidewalks and curbs with enhanced pedestrian amenities and plazas.
Goal 2 – Improve visual and functional connections and linkages between Red Hill Avenue, surrounding residential neighborhoods, adjacent public and institutional uses, and Interstate 5.	C*onsistent*. The Project would provide visual connections between the residential and commercial uses adjacent to the site through development of73 townhomes, with similar heights to surrounding development. The Project would construct a bulb-out on the corner of Red Hill Avenue and San Juan Street to promote pedestrian connectivity.
Goal 3 – Balance flexible and diverse land uses that foster economic development opportunities and support housing opportunities. Land use in the project area will maximize residential opportunities along with neighborhood-serving retail and commercial uses	C*onsistent*., The Project would maximize residential units on the site by constructing 73 multi-family residential units, inclusive of four low-income units.
Goal 4 – Streamline processes to support future development in the Specific Plan area.	*Not Applicable*. This goal is intended for the City of Tustin.

RHASP Goals	Project Consistency
Goal 5 – Improve pedestrian and bicycle accessibility and vehicular circulation to minimize potential conflicts between different users and improve mobility throughout the Specific Plan area and connectivity with the greater community	C*onsistent*. The Project would construct a bulb-out on the corner of Red Hill Avenue and San Juan Street to promote pedestrian connectivity. Additionally, the Project would include pedestrian plazas and a Class II bike lane along Red Hill Avenue to promote alternative transportation and improve mobility.
Goal 6 – Implement parking standards that reflect verifiable demand and consider future land uses in the area.	C*onsistent*. In compliance with The Transformative Climate Communities program, adopted in March 2025 through Ordinance 1554 and 1555, the proposed Project would be required to provide 141 residential parking spaces and one guest parking space for every four units. The Project would provide 146 residential off-street parking spaces and 18 off-street guest spaces. The ratio for residential stalls would be 2 stalls per unit and 0.24 guest stalls per unit. Additionally, the proposed Project would also provide a total of 13 on-street public parking bays along Red Hill Ave.
Goal 7 – Coordinate existing and future development with infrastructure capacity.	C*onsistent*. As demonstrated in Section 5.19, *Utilities and Service Systems,* the Project would be served by existing and expanded infrastructure.
Goal 8 – Ensure development within the Specific Plan area is sensitive to and compatible with surrounding land uses.	C*onsistent*. As described in Section 5.3, *Air Quality,* and Section 5.13, *Noise,* the Project would not have significant impacts on adjacent sensitive land uses related to pollutant emissions, noise, and vibration.

General Plan. The Project site is designated as RHASP by the City's General Plan. As described above, the proposed Project would be consistent with the RHASP, and therefore, would be consistent with the General Plan. No impact related to the General Plan land use designation would occur from implementation of the Project.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding land use and planning. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to land use and planning.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe land use and planning impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required regarding land use and planning.

5.12. MINERAL RESOURCES	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
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?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to mineral resources.. According to the RHASP Final EIR, the California Geological Survey does not identify any known or available mineral resources on or adjacent to the RHASP area. Therefore, the RHASP Final EIR concluded that no impacts to mineral resources would occur.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses mineral resource impacts.. The 2021 EIR Addendum determined that the previously Approved Project would not result in a loss of mineral resources. As a result, the mineral impacts anticipated from the Approved Project were determined to be less than significant.

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?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that no impacts would occur related to mineral resources and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project site is currently undeveloped and graded and is not used for mineral extractions. The Project site is identified as within an MRZ-1 zone, which are areas where adequate information indicates that no significant mineral deposits are present or where it is judged that little likelihood exists for their presence. No known mineral resources are located on the site. Therefore, development of the proposed Project would not result in impacts related to mineral resources.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. As described previously, the Project site is identified as within an MRZ-1 zone by the CGS and has a RHASP designation of Mixed Use. Therefore, implementation of the proposed Project would not result in the loss of availability of a locally-important mineral resource recovery site as delineated on a local plan, and no impacts would occur.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding mineral resources. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to mineral resources.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe mineral resources impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required regarding mineral resources.

5.13. NOISE	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project result in:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
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 local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☐	☒
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

Impacts related to noise were analyzed in the RHASP Final EIR. The RHASP Final EIR described that operation of equipment during various phases of construction could generate Leqs of approximately 74 to 87 dBA at the closest receptors, which are residences 50 feet from the RHASP area along and adjacent to various roadways, such as Red Hill Avenue, Mitchell Avenue, and San Juan Street. Such noise levels would exceed ambient noise levels in the area. As indicated in Table 4.9-4 of the RHASP Final EIR, ambient noise levels range from 60.8 to 70.0 dBA and potentially already exceed the City's 55 dBA daytime standards for residential uses. However, equipment noise levels are based on a standard noise attenuation rate of 6 dBA per doubling of distance from the highest-volume individual pieces of equipment. These estimates do not take into account any intervening structures that would block noise from construction sites; therefore, these estimates represent a conservative assessment of temporary construction noise levels within the RHASP area. Section 4, Chapter 6 of the Tustin City Code exempts noise from construction activities between the hours of 7:00 AM and 6:00 PM Monday through Friday, and 9:00 AM and 5:00 PM on Saturdays, excluding City-observed federal holidays and requires construction to occur within these hours. Construction of individual projects within the RHASP area would be required to occur within the hours, as specified in the Tustin City Code, per Section 4616(2). Additionally, construction-related noise increases would be temporary in nature, and the operation of each piece of construction equipment would not be constant throughout the construction day, as equipment would be turned off when they are not in use. The typical operating cycle for a piece of construction equipment would involve one or two minutes of full power operation followed by three or four minutes at lower power settings. Implementation of MM 4.9-1 would ensure construction noise associated with future development does not exceed 85 dBA Leq, through the use of a site-specific noise reduction features. MM 4.9-1 provides Best Management Practices such as noise barriers, using sound dampening mats or blankets on engine compartments of heavy mobile equipment, and limiting haul trips. With implementation of MM 4.9-1 as well as compliance with the Tustin City Code, construction noise impacts would be reduced to a less than significant level.

According to the RHASP Final EIR, consistent with the General Plan Noise Element, noise impacts at new noise-sensitive receptors within the RHASP area would be significant if new residences would be exposed to exterior noise that exceeds 65 dBA CNEL or interior noise that exceeds 45 dBA CNEL. Noise impacts to new commercial/non-residential land uses in the RHASP area would be significant if the exterior noise exceeds 67 dBA Leq or interior noise exceeds 50 dBA Leq. Consistent with the Tustin City Code, noise impacts to the nearest sensitive receptors would be significant if implementation of the RHASP would result in noise that exceeds 55 dBA Leq from 7:00 AM to 10:00 PM and 50 dBA Leq from 10:00 PM to 7:00 AM. The RHASP would allow for up to 500 additional residential units (integrated Mixed Use) and 325,000 additional SF of new non-residential uses in the RHASP area. The primary noise sources from these land uses include landscaping, maintenance activities, mechanical equipment, and delivery and trash hauling.

Noise levels from commercial HVAC systems typically range from 60 to 70 dBA Leq at 15 feet from the source. Based on this noise range, noise-sensitive receptors located as close as 50 feet to HVAC units would not be exposed to equipment noise exceeding 60 dBA Leq, which exceeds the 55 dBA Leq standard as established by the General Plan Noise Element. Existing ambient noise levels along arterial roadways and near sensitive receptors in the Specific Plan area were approximately 61 to 70 dBA Leq. The estimated noise level from HVAC equipment at the nearest existing noise-sensitive receptors would not exceed these measured ambient noise levels.

Noise from individual trucks moving or idling in the RHASP area may be as high as 70 dBA at adjacent properties. However, California State law prohibits trucks from idling for longer than five minutes. Tustin City Code Chapter 3, Section 4313 prohibits the collection of solid waste from within 200 feet of any residences in the City between the hours of 6:00 PM and 7:00 AM and on Federal holidays. Therefore, noise from increased waste delivery would not disturb residences during the hours when people are typically sleeping and more sensitive to noise. Delivery and trash truck trips in the RHASP area would be a periodic source of operational noise. However, because trash trucks would be required to comply with the Tustin City Code standards for trash collection vehicles and delivery trucks would be subject to State regulations, there would not be a significant noise impact.

The City requires proposed developments to prepare and submit an acoustical report to demonstrate compliance with the General Plan and to identify all reasonable and feasible measures to satisfy the 65 dBA CNEL exterior noise level standard and 45 dBA CNEL interior noise level standard. Typical building construction provides a noise reduction of approximately 12 dBA with "windows open" and a minimum 24 dBA noise reduction with "windows closed" (EPA, 1974). However, because exterior noise levels exceed 70 dBA CNEL in areas of the RHASP where residential units are proposed, an interior noise analysis based on site-specific architectural floor plans and elevations would be required, to satisfy the City of Tustin General Plan Noise Element, Table N-3, 45 dBA CNEL interior noise level standard for residential units. With implementation of existing regulations, impacts related to development of residential units within the RHASP area would be anticipated to be less than significant.

The RHASP Final EIR described that construction of individual projects within the RHASP area could generate vibration impacts at nearby sensitive receptors. The City has not adopted any thresholds for construction or operational groundborne vibration impacts. The vibration thresholds established by the FTA are 65 VdB for buildings where low ambient vibration is essential for interior operations (such as hospitals and recording studios), 72 VdB for residences and buildings where people normally sleep, including hotels, and 75 VdB for institutional land uses with primary daytime use (such as churches and schools). 100 VdB is the threshold where minor damage to fragile buildings may occur. Vibration would be considered significant if it exceeded the 72 VdB vibration threshold for residential buildings, 75 VdB vibration threshold for institutional land uses, or 100 VdB for fragile buildings. These thresholds apply to “frequent events,” which the FTA defines as vibration events occurring more than 70 times per day. Because the Tustin City Code limits the hours of construction, residents would not be exposed to substantial vibration levels exceeding 72 VdB during the hours when people normally sleep. It is unknown whether impact pile drivers would be used for any development within the RHASP area. However, vibration levels up to 103 VdB from impact pile drivers would exceed the 100 VdB threshold for fragile buildings, such as the structure at 14462 Red Hill Avenue, designated by Tustin as a historic resource. Vibration levels up to 79 VdB would exceed the threshold of 75 VdB for institutional land uses like schools with primary daytime use. The temporary use of impact pile drivers may disturb classes and other educational activities at nearby schools, such as Benjamin Beswick Elementary School and Marjorie Veeh Elementary School. Therefore, vibration impacts would be potentially significant. MM 4.9-2 would minimize and avoid vibration impacts related to pile-driving. Potential construction vibration impacts would be less than significant with mitigation.

According to the RHASP Final EIR, there are no private airstrips located immediately adjacent to or near the RHASP area. While the City's southern boundary is approximately two miles north of Orange County's John Wayne Airport, the RHASP area is approximately four miles northeast of Orange County's John Wayne Airport. Because the RHASP area is not located within two miles of a private or public airport and is not located within the John Wayne Airport AELUP, no impacts would occur.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses noise impacts. The 2021 EIR Addendum determined that the previously Approved Project would not result in an increase of noise or vibration that exceed standards. Additionally, the previously Approved Project is not within the vicinity of an airport land use plan. As a result, the noise impacts anticipated from the Approved Project were determined to be less than significant.

RHASP Final EIR Mitigation Measures

The RHASP included MM 4.9-1 to reduce construction noise impacts and MM 4.9-2 to reduce potential construction vibration impacts. The full text of these measures is provided herein at the end of this section.

a) Generation of substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that construction noise that complies with the required construction hours is exempt from the City's noise standards. Additionally, implementation of MM 4.9-1 and regulatory requirements would ensure that construction noise would be reduced to a less than significant level. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

City of Tustin General Plan

The City of Tustin General Plan Noise Element identifies noise criteria as outlined below in Table N-1.

Table N-1: General Plan Noise Element Standards

Land Use	Noise Standard	
	Interior[1,2]	Exterior
Residential: single-family, multi-family, duplex, mobile home	45 dBA CNEL	65 dBA CNEL[3]
Residential: transient lodging, hotels, motels, nursing homes, hospitals	45 dBA CNEL	65 dBA CNEL[3]
Private office, church sanctuaries, libraries, boardrooms, conference rooms, theaters, auditoriums, concert halls, meeting rooms, etc.	45 dBA CNEL (12)	-
Schools	45 dBA CNEL (12)	67 dBA Leq (12)[4]
General offices, reception, clerical, etc.	50 dBA Leq (12)	-
Bank lobby, retail store, restaurant, typing pool, etc.	55 dBA Leq (12)	-
Manufacturing, kitchen, warehousing, etc.	65 dBA Leq (12)	-
Parks, playgrounds	-	65 dBA CNEL[4]
Golf courses, outdoor spectator sports, amusement parks	-	70 dBA CNEL[4]

Note: Leq (12) = A-weighted equivalent sound level averaged over a 12-hour period (usually the hours of operation)

[1] Noise standard with windows closed. Mechanical ventilation shall be provided per UBC requirements to provide a habitable environment.

[2] Indoor environment excluding bathrooms, toilets, closets, and corridors.

[3] Outdoor environment limited to rear yard of single-family homes, multi-family patios, and balconies (with a depth of 6 feet or more) and common recreation areas.

[4] Outdoor environment limited to playground areas, picnic areas, and other areas of frequent human use

City of Tustin Municipal Code

The Tustin City Code establishes the City's standards, guidelines, and procedures concerning the regulation of operational noise. These are described specifically in Article 4, Chapter 6, Noise Control. Section 4, Chapter 6 of the Tustin City Code exempts noise from construction activities between the hours of 7:00 AM and 6:00 PM Monday through Friday, and 9:00 AM and 5:00 PM on Saturdays, excluding City-observed federal holidays and requires construction to occur within these hours.

The Code presents permissible noise intrusion levels by land use, as shown in Table N-2, City of Tustin Exterior Noise Standards. These standards are not to be exceeded for a cumulative period of 30 minutes in any hour, by 5 dBA for a cumulative period of 15 minutes in an hour, by 10 dBA for a cumulative period of 5 minutes in any hour, by 15 dBA for a cumulative period of 1 minute in any hour, or by 20 dBA for any period of time. When the ambient noise already exceeds these standards, the allowable noise shall be increased to reflect the ambient noise accordingly.

Table N-2: City of Tustin Exterior Noise Standards

Land Use Category	Time Period	Noise Level
Residential	7 am to 10 pm 10 pm to 7 am	55 dBA 50 dBA
Commercial	Anytime	60 dBA
Industrial	Anytime	70 dBA
Institutional (e.g., hospitals, convalescent homes, schools, libraries, churches)	Anytime	55 dBA
Mixed Use	Anytime	60 dBA
Non-Urban	Anytime	70 dBA

Section 4615 of the Tustin City Code contains interior noise standards for residential land uses shown in Table N-3, below.

Table N-3: City of Tustin Interior Noise Standards

Land Use Category	Time Period	Noise Level
Residential	7 am to 10 pm 10 pm to 7 am	55 dBA 45 dBA
Mixed Use	7 am to 10 pm 10 pm to 7 am	55 dBA 45 dBA

Existing Sensitive Receptors

As described previously, the Project site is vacant and is surrounded by residential, institutional, and commercial uses. The closest sensitive receptors are the existing multi-family residences approximately 5 feet to the northwest of the Project site, the multi-family residences approximately 83 feet southwest of the Project site, and the single-family residences approximately 82 feet northeast of the Project site. The Tustin High School baseball fields directly adjacent to the northwest of the Project site are not considered noise sensitive receptors.

Construction Noise

Noise generated by construction equipment would include a combination of trucks, power tools, concrete mixers, and portable generators that when combined can reach high levels. Construction is expected to occur in the following stages: demolition, grading, building construction, architectural coating, and paving. The Project does not include pile driving, which typically results in the highest construction noise volumes.

Noise levels generated by heavy construction equipment can range from approximately 74 dBA to 83 dBA when measured at 50 feet, as shown on Table N-4. However, these noise levels diminish with distance from the construction site at a rate of 6 dBA per doubling of distance. For example, a noise level of 90 dBA measured at 50 feet from the noise source to the receiver would be reduced to 84 dBA at 100 feet from the source to the receiver and would be further reduced to 78 dBA at 200 feet from the source to the receiver.

Table N-4: Construction Reference Noise Levels

Construction Stage	Reference Construction Equipment[1]	Number of Equipment	Acoustical Use Factor[1] (percent)	Spec 721.560 Lmax at 50 feet2 (dBA, slow3)	Actual Measured Lmax at 50 feet4 (dBA, slow3)
Site Preparation	Rubber Tired Dozers	3	40	85	82
	Backhoe	1	40	80	78
	Front End Loader	1	40	80	79
	Tractor	2	40	84	N/A
Grading	Excavators	1	40	85	81
	Grader	1	40	85	83
	Rubber Tired Dozers	1	40	85	82
	Backhoe	1	40	80	78
	Front End Loader	1	40	80	79
	Tractor	1	40	84	N/A

Construction Stage	Reference Construction Equipment[1]	Number of Equipment	Acoustical Use Factor[1] (percent)	Spec 721.560 Lmax at 50 feet2 (dBA, slow3)	Actual Measured Lmax at 50 feet4 (dBA, slow3)
Building Construction	Crane	1	16	85	81
	Forklift (Gradall)	3	40	85	83
	Generator	1	50	82	81
	Backhoe	1	40	80	78
	Front End Loader	1	40	80	79
	Tractor	1	40	84	N/A
	Welders	1	40	73	74
Paving	Cement and Mortar Mixers	2	40	85	79
	Paver	1	50	85	77
	Paving Equipment	2	50	85	77
	Roller	2	20	85	80
	Tractor	1	40	84	N/A
Architectural Coating	Air Compressor	1	40	80	78

Source: Appendix F

As described above, Section 4, Chapter 6 of the Tustin City Code exempts noise from construction activities between the hours of 7:00 AM and 6:00 PM Monday through Friday, and 9:00 AM and 5:00 PM on Saturdays, excluding City-observed federal holidays and requires construction to occur within these hours. The proposed Project's construction activities would occur pursuant to these regulations and would not exceed established standards.

The construction noise from the proposed Project would be temporary in nature as the operation of each piece of construction equipment would not be constant throughout the construction day, and equipment would be turned off when not in use. The typical operating cycle for a piece of construction equipment involves one or two minutes of full power operation followed by three or four minutes at lower power settings. The construction equipment would include a combination of trucks, power tools, concrete mixers, and portable generators. Additionally, the most noise intensive equipment would only be utilized during the shorter grading portion of the 13-month construction period. Furthermore, implementation of MM NOI-1 limits the use of loud construction equipment within close proximity to adjacent sensitive receptors, such as multi-family residences.

As described previously, the closest sensitive receptor is 5 feet from the Project site and the ambient noise levels range from 56.3 to 70.0 dBA. In addition, RHASP Final EIR MM 4.9-1 requires that construction for Projects within 50 feet of sensitive receptors where construction noise levels are above 85 dBA, must implement Best Management Practices to reduce noise to below 85 dBA. The existing 6-foot high concrete wall surrounding the adjacent sensitive receptor would be left in place during construction and would provide 6 dBA of attenuation. Additionally, as demonstrated in PDF N-1, Project contractors shall not use graders and jackhammers during construction within 25 feet of the property line next to the adjacent multi-family residences. However, due to the close proximity of sensitive receptors, noise levels will exceed 85 dBA. As such, the Project would implement RHASP MM NOI-1, which requires the utilization of temporary construction noise barriers, which provide a minimum transmission loss of 20 dBA, and would bring the ambient noise levels range down to 36.3 to 50.0 dBA. With implementation of RHASP NOI-1, impacts related to construction noise would be less than significant.

Operational Noise

Development of the Project would result in 73 townhomes, which would generate approximately 812 fewer daily vehicular trips when compared to the previously Approved Project; of which 43 fewer would occur in the a.m. peak hour and 79 fewer would occur in the p.m. peak hour. Since the Project would result in 64 fewer dwelling units than the previously Approved Project, the Project would not result in a substantial increase in ambient noise.

On-Site Noise. Once the proposed Project is operational, noise levels generated at the Project site would occur from stationary equipment such as heating, ventilation, and air conditioning (HVAC) units that would be installed for the new development, internal street and driveway vehicle movements, trash removal activity, and activity at outdoor gathering areas. Typical noise levels from on-site operations include the following:

- Air Conditioning Unit: 60 to 70 dBA L_{50} at 15 feet from the source
- Trash Enclosure Activity: 61-70 dBA L_{50} at 25 feet from the source
- Outdoor Community Recreation Activity: 48.7 dBA L_{50} at 50 feet from the source

Typically, air conditioning units are located away from sensitive receivers and shielded to ensure that noise from operation of the units does not have the potential to result in an impact.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to vibration would be less than significant with incorporation of MM 4.9-2. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR.

Construction

Ground-borne vibration can be generated from construction activities such as blasting, pile driving, and operating heavy earthmoving equipment. Construction of the proposed Project would involve grading, site preparation, and construction activities but would not involve the use of construction equipment that would result in substantial ground-borne vibration or ground-borne noise on properties adjacent to the Project site. No pile driving or blasting are proposed, and the site is relatively level, so substantial grading activities are not required. Additionally, the Project would implement RHASP MM 4.9-2, which would require suspension of construction activities when vibration approaches vibration standards. Thus, construction of the Project would not generate significant effects relating to construction vibration.

Operation

The proposed Project involves the development of a multi-family residential community. During its operation, no significant sources of vibration are anticipated, aside from typical vehicle movements associated with the residential development. Given this, the vibration impact from the operation of the Project is expected to be minimal and less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to airport hazards would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. John Wayne International Airport is located approximately 4.45 miles southwest of the Project site. The Project site is not within the John Wayne International Airport land use plan. Therefore, the proposed Project would not result in a safety hazard for people working on the site and impacts from the proposed Project would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding noise. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to noise.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe noise and vibration-related impacts would result from the proposed Project; therefore, no new or revised mitigation measures are required for noise or vibration.

Applicable Final EIR Mitigation Measures

MM 4.9-1: Construction Noise. Prior to the approval of grading plans, the City of Tustin Building Division shall ensure that all plans include Best Management Practices to minimize construction noise. Construction noise Best Management Practices may include the following:

- Construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards, and all stationary construction equipment shall be placed so that emitted noise is directed away from the noise sensitive use near the construction activity
- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receivers nearest to the construction activities.
- The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment by Tustin City Code Article 4, Chapter 6, Section 4617. The contractor shall design delivery routes to minimize the exposure of sensitive land uses to delivery truck noise
- Construction activity within 50 feet of occupied noise sensitive uses shall reduce construction noise levels exceeding 85 dBA Leq at nearby sensitive land uses by one or more of the following methods to reduce noise to below 85 dBA Leq:
  - Install temporary construction noise barriers within the line of site of occupied sensitive uses for the duration of construction activities that could generate noise exceeding 85 dBA Leq. The noise control barrier(s) must provide a solid face from top to bottom and shall
    - Provide a minimum transmission loss of 20 dBA and be constructed with an acoustical blanket (e.g. vinyl acoustic curtains or quilted blankets) attached to the construction site perimeter fence or equivalent temporary fence posts;
    - Be maintained and any damage promptly repaired. Gaps, holes, or weakness in the barrier or openings between the barrier and the ground shall be promptly repaired; and
    - Be removed and the site appropriately restored upon the conclusion of the construction activity.
  - Install sound dampening mats or blankets to the engine compartments of mobile equipment (e.g. graders, dozers, heavy trucks). The dampening materials must be capable of a 5-dBA minimum noise reduction, must be installed prior to the use of heavy mobile construction equipment, and must remain installed for the duration of the equipment use.

MM 4.9-2: Construction Vibration. The following measures shall be implemented by applicants for development within the Red Hill Avenue Specific Plan area to reduce construction vibration at nearby receptors:

- Avoid impact pile-driving where possible
- In areas where project construction is anticipated to include pile drivers or in close proximity to schools or historical structures, conduct site-specific vibration studies to determine the area of impact and to present appropriate vibration reduction technique that may include the following:
  - Develop a vibration monitoring and construction contingency plan to identify structures where monitoring should be conducted, set up a vibration monitoring schedule, define structure specific vibration limits, and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions.
  - Identify construction contingencies for when vibration levels approach the standards
  - At a minimum, conduct vibration monitoring during pile-driving activities. Monitoring results may indicate the need for more or less intensive measurements.
  - When vibration levels approach standards, suspend construction and implement contingencies to either lower vibration levels or secure the affected structures.
  - Conduct a post-survey on any structures where either monitoring has indicated high levels or complaints of damage has been made. Make appropriate repairs or compensation where damage has occurred as a result of vibration.

5.14. POPULATION AND HOUSING	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
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)?	☐	☐	☐	☐	☒
b) Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to population and housing. The RHASP Final EIR discussed that assuming 3.04 persons per dwelling unit, the RHASP has the potential to generate 1,520 residents at buildout. The estimated population increase of 1,520 new residents is well within the forecasted population increase by SCAG for the City of Tustin of 5,700 residents between 2012 and 2040 and would represent approximately 26.6 percent of the expected growth. SCAG forecasts 27,800 households in the City by 2040. The forecasted increase of households in the City between 2012 and 2040 is 2,200 households. The increase of 500 units represents approximately 23 percent of the housing growth in the City during this time period. The City's Housing Element identifies vacant and underutilized properties within the RHASP area that are suitable for residential development. Table H-14 of the City of Tustin Housing Element identifies 13841 Red Hill Avenue as a vacant property suitable for residential development.

According to the RHASP Final EIR, the forecasted employment in the City by 2040 is 66,400 jobs. The increase in employment in the City between 2012 and 2040 is forecasted to be 28,800 jobs. Implementation of the RHASP would generate both short-term (construction) and long-term jobs associated with development in the RHASP area including office and retail uses. Based on SCAG's estimate of employment density, which is the number of employees per square feet of building space, the RHASP is anticipated to create 722 new permanent employment opportunities which could include both full-time and part-time employment positions with varying salaries including minimum wage positions. The 722 jobs represent approximately 3 percent of the City's total forecasted increase in employment between 2012 and 2040. The County of Orange's job to housing ratio in 2012 was 1.53, while the City's job to housing ratio in 2013 was 1.47. By 2040, the City is forecasted to become increasingly jobs-rich as a result of economic and demographic forces. Implementation of the RHASP would provide housing and employment and would benefit the overall City jobs to housing ratio. Buildout of the RHASP has a job to housing ratio of 1.44 because an estimated 722 jobs and 500 residential units would be added. This is consistent with existing jobs and housing opportunities in the City. In summary, the RHASP's population, housing, and employment growth are within the overall projections for the City and the County.

The implementation of the RHASP would allow for 500 additional dwelling units in a Mixed Use environment to the predominately commercial RHASP area. There are currently non-conforming uses along Nisson Road with multi-family residential uses located on parcels zoned for commercial uses, and two single-family homes north of Mitchell Avenue on parcels zoned for professional office uses (2 single-family and 19 multi-family units). Existing non-conforming residential development can remain unless changes to the structure are proposed. The RHASP and Tustin City Code requires that non-conforming uses and structures not be enlarged, expanded or extended, except as expressly stated in Section 4 of the RHASP, nor will the existence of a non-conforming use or structure be a determining factor for adding other uses or structures prohibited in the RHASP or Tustin City Code. Therefore, implementation of the RHASP would not displace substantial numbers of existing housing or people.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses population and housing. . The 2021 EIR Addendum determined that the previously Approved Project would be within the forecasted population and housing growth for the City of Tustin. As a result, the additional population and housing impacts anticipated from the Approved Project were determined to be less than significant.

a) Induce substantial unplanned population growth in an area, either directly or indirectly?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that the RHASP's population, housing, and employment growth are within overall SCAG projections for the City of Tustin, and impacts would be less than significant. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Project would involve the development of 73 townhomes open spaces, drainage and utility infrastructure, and new private streets.

Based on population estimates utilized by the RHASP, assuming 3.04 persons per dwelling unit, the Project would result in approximately 222 additional residents. Overall, SCAG's 2020-2045 RTP/SCS population and household growth forecast from 2016 through 2045 envisions a population increase of 10,500 additional persons, yielding a 12.8% growth rate. Tustin is projected to have a population of 92,600 persons, 30,600 housing units, and 70,800 jobs by 2045. The proposed Project would generate approximately 222 new residents, which represents approximately 0.24% of the forecasted population in 2045 and approximately 2.11% of the forecasted growth between 2016 and 2045 for the City. Thus, the proposed increase in population, housing units, and jobs as a result of the proposed Project is within SCAG's 2020-2045 RTP/SCS growth forecast.

Furthermore, the proposed Project is located in an urbanized area of Tustin and is surrounded by residential, institutional, and commercial uses. The proposed Project does not propose to expand surrounding utility infrastructure (e.g., water, electricity, cell tower, gas, sanitary sewer, and stormwater drains) in the Project vicinity. All on-site systems would be provided and maintained by the property owner, as well as connect to existing and planned infrastructure within adjacent roadways. In addition, vehicular access would be provided by a new private street from Red Hill Avenue. Because the Project proposes development in an already built-out neighborhood, it would not indirectly induce population growth through the extension of roads or other infrastructure.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

b) Displace substantial numbers of existing people housing, necessitating the construction of replacement housing elsewhere?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The proposed Project would provide 73 new residential units on the Project site. No housing units currently exist on the Project site and none would be removed; therefore, replacement housing would not need to be constructed elsewhere. Therefore, there would be no impacts related to the displacement of substantial numbers of existing people or housing, and impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding population and housing. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to population and housing.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe population and housing impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for population and housing.

5.15. PUBLIC SERVICES	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Fire protection?	☐	☐	☐	☐	☒
b) Police protection?	☐	☐	☐	☐	☒
c) Schools?	☐	☐	☐	☐	☒
d) Parks?	☐	☐	☐	☐	☒
e) Other public facilities?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to public services. According to the RHASP Final EIR, the Orange County Fire Authority (OCFA) is a regional fire service agency that serves 23 cities including the City of Tustin in Orange County and all unincorporated areas. The RHASP Final EIR identifies three stations (Station 21, 37, and 43) within the City of Tustin that have a response time goal for the first unit to arrive on scene in 5 minutes from receipt of the call. All new development would be required to comply with the existing International Fire Code and California Fire and Building Codes in the California Health and Safety Code. In addition, as a standard condition of approval, future development projects would be required to prepare a Fire Master Plan, required by OCFA, prior to the issuance of a building permit. Compliance with all applicable federal, State, and local regulations would result in less than significant impacts to fire protection service.

Based on the City's current ratio of officers to residents (1.21 officers per 1,000), at buildout of the RHASP would result in the need for one additional police officer. The Police Department currently provides police services within the RHASP area. Although the RHASP would incrementally increase the demand for City police protection services, this demand would not be expected to require the construction of new facilities or the expansion of existing facilities. Thus, impacts related to police services were less than significant.

In accordance with Government Code Section 65995 and the Tustin City Code, the Tustin Unified School District requires all new development to pay fees to help offset the effects to school facilities from new residential, commercial, and industrial development. Payment of these fees would offset impacts from increased demand for school services associated with development in the RHASP area by providing an adequate financial base to construct and equip new and existing schools. Overall, the School District would be able to provide adequate school facilities for the projected students and the RHASP Final EIR concluded that payment of impact fees would ensure that impacts are less than significant.

The buildout of the Specific Plan is anticipated to generate approximately 1,520 residents and 722 employees, thereby incrementally increasing the demand for library services. However, the RHASP Final EIR concluded that the Tustin Library would continue to meet the County's standard for library size with buildout of the RHASP.

<u>**Summary of Impacts Identified in the 2021 Addendum**</u>

The 2021 EIR Addendum discusses public service impacts. The 2021 EIR Addendum determined that the previously Approved Project would not impact police or fire services more than what was analyzed in the RHASP Final EIR. Additionally, the Approved Project would not impact parks or schools. As a result, the public service impacts anticipated from the Approved Project were determined to be less than significant.

a) Fire Protection and Emergency Services

<u>**Impacts Associated with the Proposed Project**</u>

No New Impact. The RHASP Final EIR concluded that impacts would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. Fire protection services would be provided by the OCFA from 71 fire stations located throughout Orange County. There are currently 3 OCFA operated fire stations located within 3.4 miles of the Project site. Station 21, which is located 1.1 miles from the Project site is the first responding unit. The location, equipment, and staffing of the fire stations near the Project site are provided in Table PS-1.

OCFA's average response time in the City varies based on the level of emergency; however, the response time goal is for the first unit to arrive on scene in 5 minutes from receipt of the call, 90 percent of the time. Engine 21 from Station 21 would have a drive time of 2 minutes and 12 seconds to the Project site.[7]

Table PS-1: OCFA Fire Stations in Tustin

Fire Station	Location	Staffing	Apparatus
Station 21	1241 Irvine Boulevard	1 Battalion Chief 1 Fire Captain 1 Fire Engineer 2 Firefighters	Battalion 3 Medic 21 Engine 121
Station 37	15011 Kensington Park Drive	Division 4 Chief 1 Fire Captain 1 Fire Engineer 2 Firefighters	Division 4 Medic Engine 37 Command 2
Station 43	11490 Pioneer Way	1 Fire Captain 1 Fire Engineer 2 Firefighters	Medic Engine 43

Source: Operation 4 Division

Construction and operation of the proposed Project would increase demands for fire protection and emergency medical services. As described previously, the proposed Project is anticipated to result in 222. The residential and commercial uses are expected to create the typical range of service calls to OCFA.

Because the Project site is within 3.4 miles of 3 existing fire stations and the Project site is within a developed area that is currently served by these stations, the Project would not result in the requirement to construct a new fire station. The Project would comply with the California Fire Code adopted as Article 8, Chapter 1, Section 8100 of the Tustin City Code. In addition, the Project would be required to prepare a Fire Master Plan, as required by OCFA prior to the issuance of a building permit.

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[7] Personal Comment Baryic Hunter, Division Chief OCFA (July 7, 2021)

Additionally, the majority of the funds for facilities, equipment, and service personnel come from the City's General Fund. Funding from property taxes, as a result of population growth, would be expected to grow roughly proportional to any increase in residential units and business in the City. Therefore, the additional demand for fire services would be satisfied through the General Fund.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

b) Police Protection

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The Tustin Police Department provides emergency police response, non-emergency response, routine police patrol, traffic violation enforcement, traffic accident investigation, animal control, and parking code enforcement within the City including the Project area. The Project would be served by the Tustin Police Department, which is located 1.1 roadway miles from the Project site at 300 Centennial Way, Tustin, CA 92780.

As mentioned in the RHASP Final EIR, the Tustin Police Department has approximately 100 sworn officers and 55 Civilian Support Personnel. Based on the City's current ratio of officers to residents (1.21 officers per 1,000), the Project would not require any additional officers at the Tustin Police Department.

Additionally, the majority of the funds for facilities, equipment, and service personnel come from the City's General Fund. Funding from property taxes, as a result of population growth, would be expected to grow roughly proportional to any increase in residential units and business in the City. Therefore, the additional demand for police services would be satisfied through the General Fund.

With the existing personnel at the Tustin Police Department, law enforcement personnel are anticipated to be able to respond in a timely manner, and within set standard response times, to emergency calls in the Project area. Therefore, no new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

c) School Services

Impacts Associated with the Proposed Project

No New Impact. The RHASP concluded that impacts would be less than significant. The Project site is located within the Tustin Unified School District. The schools that serve the site are listed below:

- Benjamin F. Beswick Elementary School (K-5) located at 1362 Mitchell Avenue, Tustin, CA 92780, which is located 0.6 roadway miles from the Project site.
- C.E. Utt Middle School (6-8) located at 13601 Browning Avenue, Tustin, CA 92780, which is located 0.8 roadway miles from the Project site.
- Tustin High School (9-12) located at 1171 El Camino Real, Tustin, CA 92780, which is located 0.3 roadway miles from the Project site.

The Project proposes the development of 73 residences and would create additional students to be served by the existing schools. Student generation rates for Tustin Unified School District are identified as 0.1610 student per dwelling unit for elementary school, 0.0636 student per dwelling unit for intermediate school, and 0.0661 student per dwelling unit for high school. Using this generation factor, the proposed 73 residences would generate 22 students that would range in age from elementary to high school. Additionally, the applicant shall pay developer fees to the Tustin Unified School District pursuant to Section 65955 of the California Government Code. Thus, the Project would not generate the need for new or physically altered school facilities and the 22 new students would be accommodated by existing facilities.

Table PS-2: School Enrollment between 2019-2020 and 2023-2024

School	2023-24	2022-23	2021-22	2020-21	2019-20
Benjamin F. Beswick Elementary	453	424	469	455	538
C.E. Utt Middle School	607	642	712	821	975
Tustin High School	1,905	2,087	2,250	2,344	2,380

Source: Ed Data

As such, impacts related to school services would be less than significant. Therefore, no new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

d) Parks

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR analyzed parks under Section 5.16, *Recreation*. The RHASP Final EIR concluded that future development projects could cumulatively contribute to the parkland deficiency identified in the City's General Plan. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. In order for parks to be provided to serve future residents within the RHASP area, MM 5.16-1 is required. This mitigation measure applies the parkland dedication and development fee provisions set forth in the Tustin City Code to new residential dwelling units within the Specific Plan area that would not be subject to Tustin City Code Article 9, Chapter 3, Part 3, Section 9331.d (Parkland Dedication). The Project would comply with MM 5.16-1 as discussed below in Section 5.16. Therefore, the Project would be less than significant with mitigation.

As such, impacts related to parks would be less than significant. Therefore, no new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

e) Other Public Facilities

Impacts Associated with the Proposed Project

No New Impact. The Orange County Public Library has 33 libraries throughout the County, one of which is in Tustin; the Tustin Branch Library is located at 345 E. Main Street. The General Plan outlines the County's standards for library service as one 10,000- square foot branch library facility per 50,000 residents, or, if appropriate, one 15,000-square-foot regional library per 75,000 residents. As mentioned previously, the Project is anticipated to result in the addition of 222 residents. Tustin Library is a 32,000 square-foot library with a book capacity of 209,000 volumes and would not require the addition of new facilities for the additional 222 residents.

As such, impacts related to other public facilities would be less than significant. Therefore, no new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding public services. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to public services.

Plans, Programs, or Policies (PPP)

PPP PS-1: Pursuant to Section 65995 of the California Government Code, prior to the issuance of building permits for any development projects under the Red Hill Avenue Specific Plan, the applicant shall pay developer fees to the Tustin Unified School District; payment of the adopted fees would provide full and complete mitigation of school impacts.

PPP PS-2: New development under the Red Hill Avenue Specific Plan shall be subject to the same General Obligation bond tax rate as already applied to other properties within the Tustin Unified School District for Measure G (approved in 2008) based upon assessed value of the residential and commercial uses.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe public services impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for public services.

5.16. RECREATION	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New 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?	☐	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to recreation. As discussed in the RHASP Final EIR, the RHASP area would have an estimated buildout of approximately 500 additional residential units (primarily integrated Mixed Use development) and 325,000 additional square feet of non-residential uses. At buildout, the RHASP could generate approximately 1,520 new residents and 722 new employees in addition to approximately 64 existing residents (based on 3.04 persons per unit) and 659 existing employees (based on 450 square feet per employee) within the boundaries of the proposed RHASP area. This population increase would result in an increased use of existing and planned City parks and recreational facilities. In accordance with the Quimby Act, a jurisdiction may establish a parkland dedication standard based on its existing parkland ratio, provided required dedications do not exceed 5 acres per 1,000 persons. The City's parkland dedication requirements of 3 acres per 1,000 residents is the same as the Quimby Act.

The City identifies parkland acreage requirements by multiplying the number of dwelling units by the parkland acres per unit based on the established density categories in the Tustin City Code. Because the RHASP proposes multi-family residential development and encourages it to be provided in a Mixed Use setting, the RHASP Final EIR uses the 15.1 to 25 dwelling units per gross acre category in the Tustin City Code which assumes 2.24 persons per unit or 0.0067 acre of parkland per unit. If future residential units were subject to the Quimby Act (because of a subdivision), the total amount of new parkland would be approximately 3.35 acres. The Tustin City Code also notes that dedication of land may be required by the City for a condominium, stock cooperative, or community apartment project which exceeds 50 dwelling units, regardless of the number of parcels. Therefore, the City may require the dedication of land regardless of where the future residential development projects within the RHASP are subdivisions. Because future residential development within the RHASP area may not be subject to the Quimby Act or the subdivision provisions of the Tustin City Code, future development projects could cumulatively contribute to the parkland deficiency identified in the City's General Plan. In order that park and recreational facilities be provided to serve future residents within the RHASP area, MM 4.12-1 is required.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses recreation impacts. The 2021 EIR Addendum determined that the previously Approved Project would not impact public parks and would include the development of passive and active open space. As a result, the usage of recreation public facilities anticipated from the Approved Project were determined to be less than significant.

RHASP Final EIR Mitigation Measures

MM 4.12-1: For residential projects not subject to City of Tustin Subdivision Code (Article 9, Chapter 3, Section 9331 of the Tustin City Code), prior to the issuance of building permits, applicants shall dedicate parkland or pay a park fee, on a per unit basis, reflecting the value of land required for park purposes. The amount of land which would otherwise be required for dedication shall be computed by multiplying the number of proposed dwelling units by 0.003 acre per person and 2.24 persons per dwelling unit. The parkland in-lieu fee shall be computed by multiplying the amount of land required for dedication by $2,500,000 per acre.

a) **Increase the use of existing neighborhood and regional parks or other recreational facilities such that physical deterioration of the facility would be accelerated?**

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to parkland would be less than significant with incorporation of regulatory requirements and RHASP MM 4.12-1. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. As discussed in 5.15(d), above, Pine Tree Park, Tustin Heritage Park, Peppertree Park, Frontier Park, and Columbus Tustin Park are all within 1 mile of the Project site. The Project-related increase in population could incrementally increase the use of existing parks within the City. The City's standard for provision of parkland is 3 acres of parkland per 1,000 residents, and the Tustin Municipal Code Section 9331 requires the developer of a residential subdivision to mitigate recreational impacts by dedicating park space, paying an in-lieu fee, or doing a combination of the two. Residents are expected to utilize the on-site open space to a greater degree than offsite facilities due to convenience and proximity. In this way, the Project's provision of open space would reduce the use of area parks by residents. Nevertheless, some Project residents would be expected to utilize other public recreational facilities. As discussed previously, the Project would result in the generation of approximately 222 new residents. Based on the City's standard for parkland provision of 3 acres of parkland per 1,000 residents, the Project would utilize approximately .22 acres of parkland. As a result, the Project would create a limited incremental increase in the use of area parks. However, a portion of this parkland demand would be met by proposed Project's common open space.

Overall, the Project would be subject to City Code requirements to provide local park space or pay an in-lieu fee, which would be used for the purpose of acquiring, developing, improving, and expanding open space and parklands. Therefore, due to the limited increase in residents near existing park and recreational facilities, and compliance with Section 9331 of the Municipal Code, the Project's contribution to deterioration of parks and recreational facilities would not be significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

b) **Require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?**

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to parkland would be less than significant with incorporation of regulatory requirements and RHASP MM 4.12-1. Additionally, the 2021

Addendum was found to be consistent with the RHASP Final EIR. The Project would include development of passive and active open space within the Project site. The potential adverse effects associated with implementation of the proposed Project have been considered throughout the analysis of this document. Development of the open space areas would not have any potentially significant effects. The Project would be required to pay parkland fees in compliance with Municipal Code Section 9331 to satisfy its park obligation. Therefore, the Project does not include any recreational facilities that would have an adverse physical effect on the environment, and impacts would be less than significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. Impacts from the proposed Project would be consistent with those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding recreation. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to recreation.

Plans, Programs, or Policies (PPPs)

PPP Rec-1: The proposed residential Project would be required to comply with the City of Tustin Subdivision Code (Article 9, Chapter 3, Section 9331 of the Tustin City Code). The City of Tustin Subdivision Code serves to implement the California Subdivision Map Act for land divisions within Tustin.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe recreation impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for recreation.

5.17. TRANSPORTATION	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☐	☐	☐	☒
b) Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☐	☒	☐
c) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☐	☒
d) Result in inadequate emergency access?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to traffic and transportation. Since the RHASP Final EIR was certified before July 1, 2020, when vehicle miles traveled (VMT) became the threshold utilized for analysis of CEQA impacts, levels of service (LOS) was utilized by the EIR to analyze transportation impacts. According to the RHASP Final EIR, with the addition of RHASP traffic to Existing Conditions peak hour traffic volumes, all study intersections would continue to operate at an acceptable LOS in both peak hours. The addition of RHASP traffic would not cause a significant impact at any traffic study area intersection. However, in long-range future conditions, the Red Hill Avenue at I-5 southbound ramps would operate a deficient level LOS in the evening peak hour. Implementation of MM 4.13-1 would mitigate the Project's impact to a level considered less than significant based on the ICU methodology. However, the City cannot impose mitigation on or mandate the implementation of mitigation in another jurisdiction, in this case, Caltrans. Therefore, the RHASP Final EIR concluded that impacts related to traffic would be significant and unavoidable.

According to the RHASP Final EIR, Orange County Transit Authority (OCTA) Routes 66, 71, and 79 serve the RHASP area, which includes many employment-based uses. As such, the transit schedules and frequencies are geared toward commuter needs and would be convenient for RHASP residents and patrons to/from the area. The RHASP encourages the installation of new bus shelters at transit stops where no benches are currently provided. Modifications to existing and/or installation of new shelters would be coordinated with OCTA. Existing pedestrian facilities within the RHASP area include sidewalks along all roadways and crosswalks across the signalized intersections. There are no unsignalized crosswalks across Red Hill Avenue within the RHASP area. Streetscape improvements are proposed to promote attractive, compatible, and consistent environments with new development. The basic streetscape would consist of parkway plantings adjacent to the street along the entire length of Red Hill Avenue, with new landscaped medians where feasible. As previously addressed, the streetscape would have a minimum four-foot-wide landscaped parkway and a minimum four-foot-wide sidewalk. The City's Master Bikeway Plan shows the entire length of Red Hill Avenue within the City limits as a designated or a potential Class II bikeway. The proposed circulation components of the RHASP include revisions to the Red Hill Avenue roadway cross section to include a Class II striped on-street bike lane along the entire length of the RHASP area to promote more multimodal travel opportunities. Enhanced bikeway signage would be introduced to promote bike usage and provide directions on how to connect to other bikeways or key points in the City. Enhanced or decorative bike racks are another feature that may be introduced within private developments. The intent of the recommended bikeway system improvements is to provide a safe, non-vehicular way for residents, employees, and students to travel. The addition of residential units in this area that is largely developed with employment and commercial uses could facilitate the use of alternative travel modes. The proximity of residential uses to employment and commercial centers encourages people to walk or bike to work or shop, rather than drive a vehicle. Therefore, implementation of the RHASP would not adversely affect the use of alternative modes of transportation.

The RHASP Final EIR discussed that implementation of the RHASP is not anticipated to result in inadequate features or incompatible uses. Through the City's design review process, future development under the RHASP would be evaluated to determine the appropriate permitting requirements and conditions of approval. At a minimum, compliance with relevant Tustin City Code standards would be required. Therefore, implementation of the RHASP would not substantially increase hazards due to design features or incompatible uses.

According to the RHASP Final EIR, the RHASP does not include policies that would change standards related to emergency access. Future development projects in the Specific Plan area would be required to comply with the Tustin City Code. New development would also be required to comply with all applicable fire code and ordinance review requirements for construction and access. Additionally, all access roads for future development projects would be required to meet standards for fire access roads in the 2016 California Fire Code (CCR Title 24 Part 9), Section 503. Individual development projects under the RHASP would be reviewed by the City to determine the specific fire requirements applicable to the development and to ensure compliance with these requirements. This would ensure that new development in the RHASP area would provide adequate emergency access. Further, the City would review any modifications to existing roadways to ensure that adequate emergency access or emergency response would be maintained. Emergency response and evacuation procedures would be coordinated with the City's Police and Fire Departments.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses transportation impacts. The 2021 EIR Addendum determined that the previously Approved Project would not conflict with the existing circulation system, would not create any design hazards, and would satisfy requirements for emergency access. Additionally, it was concluded that the Approved Project would have a less than significant VMT impact and would follow CEQA Guidelines 15064.3. As a result, the transportation impacts anticipated from the Approved Project were determined to be less than significant.

RHASP Final EIR Mitigation Measures

MM 4.13-1 Red Hill Avenue at Interstate 5 Southbound Ramps: Re-stripe the eastbound approach (the off-ramp) to convert from a shared left-through lane and one dedicated right-turn lane to one dedicated left-turn lane and a shared left-through-right lane. This improvement would provide additional capacity for the heavy eastbound left-turn volume. With this improvement, the intersection would operate at Level of Service D or better during both peak hours. The California Department of Transportation' (Caltrans) approval and cooperation would be required to implement this improvement.

a) Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that buildout of the RHASP would result in significant and unavoidable impacts related to traffic; however, impacts related to alternative transportation would be less than significant. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. The proposed Project involves the construction of 73 dwelling units. The primary patrons of the proposed development would be residents and their visitors. As discussed above, due to amendments to the CEQA Guidelines, automobile delay no longer is considered a significant impact. Thus, the following information is provided solely for informational purposes. The Project trip generation was calculated using trip rates from the Institute of Transportation Engineers, *Trip Generation 11th Edition*, as well as other sources. The previously Approved 2021 Addendum assumed that the Project site would be developed with 137 residential dwelling units, and 7,000 SF of commercial retail uses. As shown in Table T-1 below, the proposed Project is forecast to generate approximately net -812 daily trips, including -43 vehicle trips during the AM peak hour and -79 vehicle trips during the PM peak hour when compared to projected density of the site analyzed in the 2021 Addendum (LLG, 2024).

Table T-1: Comparison of Proposed Project Trips and RHASP Buildout Trips Analyzed in Final EIR

Land Use	Units	Daily	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
Approved RHASP Site Density								
Apartment	160 du	930	12	58	70	56	24	84
General Retail	30,000 SF	1,281	18	11	29	53	58	111
Total Approved		**2,221**	**30**	**69**	**99**	**109**	**82**	**195**
Approved 2021 Addendum								
Apartment	137 du	911	14	56	70	55	30	85
General Retail	7,000 SF	299	4	3	7	12	14 26	
Total Proposed		**1,210**	**18**	**59**	**77**	**67**	**44**	**111**
Proposed Project								
Condominium/ Townhouse	73 du	492	7	22	29	23	14	37
Total Net Trip Gen[3]		**-812**	**-16**	**-27**	**-43**	**-44**	**-35**	**-79**

Source: LLG, 2024 (Appendix G)
[3]Total Net Trip Gen= Proposed Project – Approved 2021 Addendum

Vehicular access to the Project site would be provided via one driveway from Red Hill Avenue. Vehicular traffic to and from the Project site would utilize the existing network of regional and local roadways that currently serve the Project area. The proposed Project would construct internal roadways that would provide resident access to residential units. In addition, final design plans would be subject to review and approval by the City's Public Works Department prior to the issuance of building permits. As such, the proposed Project would not introduce any new roadways or land uses that would interfere with adopted plans, programs, ordinances, or policies regarding roadway facilities.

Alternative Transportation

The RHASP includes various policies to provide a system of bikeways and pedestrian facilities to connect residential areas, businesses, schools, parks, and other key destination points. The Project would restripe Red

Hill Avenue to include a Class II bike lane pursuant to RHASP guidelines. The proposed bicycle route would provide bicycle transportation opportunities for residents of the Project site. The Project would not conflict with any bicycle facilities. The Project includes widening Red Hill Avenue and adding a public sidewalk along Red Hill Avenue and San Juan Street. The proposed Project would improve the existing pedestrian access to nearby locations. Therefore, the proposed Project would also not conflict with pedestrian facilities. Overall, Project impacts to transit, bicycle, and pedestrian facilities would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR did not evaluate impacts related to conflicts or inconsistencies with CEQA Guidelines Section 15064.2, subdivision (b) as the threshold was not included in CEQA Guidelines Appendix G at the time the Final EIR was certified. CEQA analysis of Vehicle Miles Travelled (VMT) went into effect July 1, 2020, and therefore was not a CEQA consideration in 2018, when the Final EIR was certified.

This addendum does not need to include a VMT analysis because the Final EIR was certified before VMT analyses were required to be prepared (*A Local & Regional Monitor v. City of Los Angeles (*1993) 12 Cal.App.4th 1773, 1801). Also, because at the time the RHASP Final EIR was certified, VMT impacts were known or should have been known, adoption of the requirement to analyze VMT does not constitute significant new information, requiring preparation of a subsequent or supplemental EIR (C*oncerned Dublin* C*itizens v. City of Dublin* (2013) 214 Cal.App.4th 1301, 1320). Nonetheless, the following analyzes the Project's VMT impacts. Senate Bill 743 (SB 743) was signed into law on September 27, 2013, and changed the way that public agencies evaluate transportation impact under CEQA. A key element of this law is the elimination of using auto delay, level of service, and other similar measures of vehicular capacity or traffic congestion as a basis for determining significant transportation impacts under CEQA. The legislative intent of SB 743 was to "more appropriately balance the needs of congestion management with statewide goals related to infill development, promotion of public health through active transportation, and reduction of greenhouse gas emissions." According to the law, "traffic congestion shall not be considered a significant impact on the environment" within CEQA transportation analysis.

SB 743 does not prevent a city or county from continuing to analyze delay or level of service as part of other plans (i.e., a city's General Plan), studies, congestion management and transportation improvements, but these metrics may no longer constitute the basis for transportation impacts under CEQA analysis as of July 1, 2020. For example, in the City, the General Plan identifies level of service as being a required analysis, and even though it will no longer be a requirement of CEQA, unless the General Plan is amended, level of service will continue to be analyzed as part of Project review.

The Governor's Office of Planning and Research updated the CEQA Guidelines to establish new criteria for determining the significance of transportation impacts. Based on input from the public, public agencies, and various organizations, the Office of Planning and Research recommended that Vehicle Miles Traveled be the primary metric for evaluating transportation impacts under CEQA.

In December 2018, OPR issued a Technical Advisory on evaluating transportation impacts in CEQA that provides the following screening criteria for land development projects that may result in a less than significant VMT impact:

- Local-serving retail less than 50,000 SF, including schools, daycare, student housing, etc.
- Small projects generating less than 110 trips per day
- Residential and office projects located in areas with low-VMT
- Projects near transit stations or a major transit stop that is located along a high quality transit corridor
- Residential projects with a high percentage of affordable housing

In addition, the Technical Advisory describes that projects with the following may result in a VMT impact:

- Has a Floor Area Ratio (FAR) of less than 0.75;
- Includes more parking for use by residents, customers, or employees of the project than required by the jurisdiction (if the jurisdiction requires the project to supply parking);

Is inconsistent with the applicable Sustainable Communities Strategy (as determined by the Lead Agency with input from the Metropolitan Planning Organization).

The City of Tustin VMT Guidelines describes that projects with the following may result in a less than significant VMT impact.

- 100% affordable housing
- Within a ½ mile of an existing major transit stop
- Local serving uses
- Located in a low VMT area

The City of Tustin VMT Guidelines state that the Project site is located within TAZ 1115 of the Orange County Transportation Authority Model (OCTAM), a low VMT area and would generate less than 500 daily trips. Therefore, according to City of Tustin VMT Analysis Guidelines and the Governor's Office of Planning and Research CEQA Guidelines, the proposed Project is exempt from the preparation of a VMT Analysis as concluded in the VMT Screening Analysis (Appendix H). Therefore, the Project would have a less than significant impact on Vehicle Miles Traveled.

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

<u>Impacts Associated with the Proposed Project</u>

No New Impact. The RHASP Final EIR concluded that impacts would be less than significant, and the 2021 Addendum was found to be consistent with the RHASP Final EIR. Vehicular access to the Project site would be provided via an ingress and egress driveway connecting to Red Hill Avenue. Additionally, a new signalized intersection would be constructed at the entrance of the proposed Project on Red Hill Avenue to improve traffic flow and enhance safety. Vehicular traffic to and from the Project site would also utilize the existing network of regional and local roadways that currently serve the Project area. The proposed Project would not introduce any new roadways or land use that would conflict with existing urban land uses in the surrounding area. Design of the proposed Project, including the internal circulation, is subject to the City’s development standards and RHASP design guidelines. Design of the Project would be reviewed to ensure fire engine accessibility and turn around area is provided to the fire code standards. As a result, impacts related to vehicular circulation design features would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

d) Result in inadequate emergency access?

Impacts Associated with the Proposed Project

No New Impact.

Construction

The proposed construction activities, including equipment and supply staging and storage, would occur within the Project site, and would not restrict access of emergency vehicles to the Project site or adjacent areas. The installation of the driveway, connections to existing infrastructure systems, and construction of new infrastructure that would be implemented during construction of the proposed Project could require the temporary closure of one side or portions of Red Hill Avenue for a short period of time (i.e., hours or a few days). However, the construction activities would be required to ensure emergency access in accordance with Section 503 of the California Fire Code (Title 24, California Code of Regulations, Part 9), which would be ensured through the City's permitting process. Thus, implementation of the Project through the City's permitting process would ensure existing regulations are adhered to and would reduce potential construction related emergency access impacts to a less than significant level.

Operation

As described previously, the proposed Project area would be accessed from a driveway along Red Hill Avenue. The construction permitting process would provide adequate and safe circulation to, from, and through the Project area, and would provide routes for emergency responders to access different portions of the Project site. The Fire Department and/or Public Works Department would review the development plans as part of the permitting procedures to ensure adequate emergency access pursuant to the requirements in Section 503 of the California Fire Code (Title 24, California Code of Regulations, Part 9), included as Municipal Code Section 8104. Because the Project is required to comply with all applicable City codes, as verified by the City's permitting process, potential impacts related to inadequate emergency access would be less than significant.

Also, as detailed in Table T-1, the proposed Project would result in approximately 812 fewer daily trips, 43 fewer AM peak hour trips, and 79 fewer PM peak hour trips than buildout of the site pursuant to the previously Approved 2021 Addendum. Thus, the Project would not generate traffic that would impact roadway capacity in such a manner that would result in inadequate emergency access. Overall, impacts related to emergency access would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding transportation and traffic. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to transportation.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe transportation impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required for transportation. Additionally, adopted MM 4.13-1, Red Hill Avenue at Interstate 5 Southbound Ramps (see RHASP MMRP in Appendix J), is not applicable to the proposed Project, has not yet been implemented and would not be carried out under the proposed Project.

5.18. TRIBAL CULTURAL RESOURCES	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 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:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) 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 section 5020.1(k), or	☐	☐	☐	☒	☐
b) 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 Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒	☐

Summary of Impacts Identified in the Final EIR

Impacts related to tribal cultural resources were discussed in the RHASP Final EIR. According to the RHASP Final EIR, the City contacted the following tribal representatives prior to approval of the RHASP in compliance with SB 18 and AB 52:

- Campo Band of Mission Indians
- Ewiiaapaayp Tribal Office
- Gabrieleño Band of Mission Indians-Kizh Nation
- Gabrieleño/Tongva San Gabriel Band of Mission Indians
- Gabrieleño/Tongva Nation
- Gabrieleño/Tongva Indians of California Tribal Council
- Gabrieleño/Tongva Tribe
- Jamul Indian Village
- Juaneño Band of Mission Indians
- Juaneño Band of Mission Indians-Acjachemen Nation
- La Posta Band of Mission Indians
- Manzanita Band of Kumeyaay Nation
- San Fernando Band of Mission Indians
- San Pasqual Band of Mission Indians
- Sycuan Band of the Kumeyaay Nation
- Viejas Band of the Kumeyaay Indians
- Soboba Band of Luiseno Indians
- Torres Martinez Desert Cahuilla Indians

The City received responses from two tribal representatives regarding the RHASP project. The Viejas Band of Kumeyaay Indians identified that the RHASP area "has little cultural significance or ties to Viejas". The City received a request for consultation from the Gabrieleño Band of Mission Indians-Kizh Nation. No tribal cultural places or tribal cultural resources were identified by the tribe during consultation. However, the tribe noted the importance of Red Hill, a village or gathering place, located in the hillsides northeast of the RHASP area. While the properties within the RHASP area have been extensively altered by prior ground disturbance and development, there is the potential for RHASP implementation to affect previously unidentified tribal cultural resources. However, implementation of MM TCR-1, TCR-2, and TCR-3 would reduce potential impacts to a less than significant level.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses tribal impacts. The 2021 EIR Addendum determined that the Project site does not include any known tribal cultural resources and impacts were determined to have no new impact compared to the RHASP Final EIR.

RHASP Final EIR Mitigation Measures

See MM 4.3-1 in Section 5.5, *Cultural Resources*.

a) **Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 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 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 section 5020.1(k)?**

Impacts Associated with the Proposed Project

No New Impact. Assembly Bill (AB) 52 (Chapter 532, Statutes of 2014) establishes a formal consultation process for California tribes as part of the CEQA process and equates significant impacts on "tribal cultural resources" with significant environmental impacts (Public Resources Code [PRC] § 21084.2). AB 52 requires that lead agencies undertaking CEQA review evaluate, just as they do for other historical and archeological resources, a project's potential impact to a tribal cultural resource. In addition, AB 52 requires that lead agencies, upon request of a California Native American tribe, begin consultation prior to the release of a negative declaration, mitigated negative declaration, or EIR for a project. AB 52 does not apply to a Notice of Exemption or Addendum.

The Project site has been previously disturbed from past grading and installation of utility infrastructure for the previously existing buildings on the northern parcel and the southerly parcel. There are no known tribal cultural resources on the site. Because the site has previously been disturbed, there is reduced potential for the Project to impact tribal cultural resources. However, the Project may result in excavation into the underlying older alluvium where undiscovered tribal cultural resources could exist. Mitigation Measure TCR-1 requires the retention of an archaeologist for archaeological monitoring. Mitigation Measure TCR-1 and TCR-2 require notification to tribes if tribal cultural resources are unearthed. With implementation of MMTCR-1, TCR-2, and TCR-3 the Project would not cause a substantial adverse change in the significance of a tribal cultural resource. Therefore, the proposed Project would not cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code (PRC) Section 21074 that is a historical resource as defined in Section 15064.5 of the CEQA Guidelines or PRC Section 5020.1(k) and no new substantial environmental impacts would occur in comparison to the Final EIR.

b) **Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 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 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 Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resources Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

Impacts Associated with the Proposed Project

No New Impact. As discussed above, there are no known tribal cultural resources that would be affected by the Project. The Project site has been previously disturbed from past grading and installation of utility infrastructure for a previously existing building on the northern parcel and former building on the southerly parcel. There are no known tribal cultural resources on the site. Because the site has previously been disturbed, there is reduced potential for the Project to impact tribal cultural resources. However, the Project may result in excavation into the underlying older alluvium where undiscovered tribal cultural resources could exist. RHASP MM 4.3-1 requires the retention of an archaeologist for archaeological monitoring and notification to tribes if tribal cultural resources are unearthed. With implementation of MM 4.3-1, the Project would not cause a substantial adverse change in the significance of a tribal cultural resource.

Additionally, the California Health and Safety Code, Section 7050.5 requires that if human remains are discovered in the Project site, disturbance of the site shall halt and remain halted until the coroner has conducted an investigation. If the coroner determines that the remains are those of a Native American, he or she shall contact, by telephone within 24 hours, the Native American Heritage Commission. Therefore, impacts to tribal cultural resources would be less than significant and no new substantial environmental impacts would occur in comparison to the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Sections 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding tribal cultural resources. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to tribal cultural resources.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

Language has been moved from Mitigation Measure 4.3-1 and separated into Mitigation Measures TCR-1, TCR-2, and TCR-3. Language within measures TCR-1, TCR-2, and TCR-3 was revised to be consistent with standard City language applied to all CEQA documents for the purpose of protecting archeological and tribal cultural resources. The addition of mitigation would be consistent with the Certified EIR and is consistent with CEQA Guidelines Section 15162(a).

TCR-1: Retain a Native American Monitor Prior to Commencement of Ground-Disturbing Activities

Prior to the issuance of demolition or grading permits for any projects that would disturb previously undisturbed soils (native soils) or soils that have native fill, the project applicant/developer shall retain a Native American Monitor, with first preference given to the Gabrieleño Band of Mission Indians – Kizh Nation, who responded to the City’s request for consultation on November 14, 2023 (first preference Tribe, Tribe). The applicant/developer shall allow 45 days from the initial contact with the first preference tribe to enter into a contract for monitoring services. If the applicant/developer is unable to contact the Kizh Nation after three documented attempts or is unable to secure an agreement, the applicant shall report to the lead agency, and the lead agency will contact the Kizh Nation to validate that the parties were unable to enter into an agreement. The applicant/developer shall have made three documented attempts to directly contact the Kizh Nation to enter into a tribal monitoring agreement. If the applicant/developer can demonstrate they were unable to secure an agreement with the first preference tribe, as validated and documented by the Community Development Department in writing, or if the contracted tribe fails to fulfill its obligation under the contract terms, then the applicant/developer may retain an alternative qualified tribal monitor from a culturally affiliated tribe if approved by the City.

The monitor shall be retained prior to the issuance of a demolition permit or grading permit, and the commencement of any development related “ground-disturbing activity” for the subject project at all project locations (i.e., both on-site and any off-site locations that are included in the project description/definition and/or required in connection with the project, such as public improvement work). “Ground-disturbing activity” shall include, but is not limited to, demolition, pavement removal, auguring, grubbing, boring, grading, excavation, drilling, and trenching for the purposes of reconstruction and new development. "Ground-disturbing activity" shall not include minor maintenance activities such as potholing, tree removal, and parking lot maintenance. This mitigation measure does not apply to projects that would only disturb soils made up of artificial fill, as verified by a soils or geotechnical report.

A copy of the executed monitoring agreement shall be submitted to the lead agency prior to the commencement of any ground-disturbing activity, or the issuance of any permit necessary to commence a ground-disturbing activity.

The monitor will complete daily monitoring logs that will provide descriptions of the relevant ground-disturbing activities, the type of construction activities performed, locations of ground-disturbing activities, soil types, cultural-related materials, and any other facts, conditions, materials, or discoveries of significance to the Kizh Nation. Monitor logs will identify and describe any discovered TCRs, including but not limited to, Native American cultural and historical artifacts, remains, places of significance, etc., (collectively, tribal cultural resources, or “TCR”), as well as any discovered Native American (ancestral) human remains and burial goods. Copies of monitor logs will be provided to the project applicant/lead agency upon written request to the consulting tribe. If a monitor is selected from a tribe other than the Kizh Nation, the Kizh Nation shall be contacted if any discoveries are found.

On-site tribal monitoring shall conclude upon the latter of the following (1) written confirmation to the consulting tribe from a designated point of contact for the project applicant/lead agency that all ground-disturbing activities and phases that may involve ground-disturbing activities and that have the potential to impact local TCRs on the project site or in connection with the project are complete.

MM TCR-2: Unanticipated Discovery of Tribal Cultural Resource Objects (Non-Funerary/Non-Ceremonial)

A. Upon discovery of any TCRs, all construction activities in the immediate vicinity of the discovery shall cease (i.e., not less than the surrounding 50 feet) and shall not resume until the discovered TCR has been fully assessed by the tribal monitor and consulting archaeologist. If the consulting tribe is other than the Gabrieleño Band of Mission Indians – Kizh Nation, the Kizh Nation shall be contacted and the consulting tribe will recover and retain all discovered TCRs in the form and/or manner the Kizh Nation deems appropriate, in the Kizh Nation sole discretion, and for any purpose the Kizh Nation deems appropriate, including for educational, cultural and/or historic purposes.

TCR-3: Unanticipated Discovery of Human Remains and Associated Funerary or Ceremonial Objects

a. Native American human remains are defined in PRC 5097.98 (d)(1) as an inhumation or cremation, and in any state of decomposition or skeletal completeness. Funerary objects, called associated grave goods in Public Resources Code Section 5097.98, are also to be treated according to this statute.

If Native American human remains and/or grave goods are discovered or recognized on the project site, then Public Resource Code 5097.9 as well as Health and Safety Code Section 7050.5 shall be followed.

Human remains and grave/burial goods shall be treated alike per California Public Resources Code section 5097.98(d)(1) and (2).

Preservation in place (i.e., avoidance) is the preferred manner of treatment for discovered human remains and/or burial goods.

Any discovery of human remains/burial goods shall be kept confidential to prevent further disturbance.

Applicable Final EIR Mitigation Measures

None.

5.19. UTILITIES AND SERVICE SYSTEMS	Subsequent or Supplemental EIR			Addendum to EIR	
Would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Require or result in the construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	☐	☒
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry, and multiple dry years?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒
e) Comply with federal, State, and local statutes and regulations related to solid waste?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to utilities and service systems. According to the RHASP Final EIR, SoCalGas and SCE would be able to provide gas and electric infrastructure, respectively, to the RHASP area. Both companies would be able to provide additional connections, if necessary, which would not cause significant environmental effects outside those already analyzed in the RHASP Final EIR. Projects would be required to apply for encroachment permits for connection to the City storm drain infrastructure. For future development projects within the RHASP, direct connection to the City's existing storm drain system is preferable provided that the existing tributary areas and flow rates to the existing drains are not exceeded by new development. Alternatively, applicants may provide hydraulic analyses of the downstream storm drain system that demonstrate no significant impacts to the City storm drain infrastructure. Should storm drains not be available for connection, applicants can propose drainage systems using parkway drains to direct runoff directly to the adjacent street curb and gutter section. In all cases, stormwater quality requirements must be met. New on-site stormwater drainage facilities would be constructed in accordance with applicable regulatory requirements. Applicants for future development within the RHASP area would be required to demonstrate that existing flow rates would not be exceeded with project development. For all development, post-construction measures under the Orange County DAMP require co-permittees to implement structural and nonstructural BMPs that would mimic predevelopment quantity and quality runoff conditions for new development.

The RHASP Final EIR analyzed that based on the 2015 rate (122 gallons per capita per day), the estimated 1,520 residents and 722 employees within the RHASP would generate an additional water demand of 273,524 gallons per day or 306 AFY. The City's water demand and supply is estimated to grow from 11,113 AFY to 12,238 AFY by 2040, which is an increase of 1,125 AFY for normal year. For single and multiple dry years, demand and supply would be 12,972 AFY, an increase of 1,859 AFY over existing conditions. New uses within the RHASP would generate a demand of 306 AFY, which would be within the anticipated increase in demand and supply of water assumed in the UWMP for 2040 for normal year and multiple dry years. The RHASP accommodates the projected growth within that portion of the City covered by the EOCWD service area. The RHASP would be served from existing entitlements and new or expanded water entitlements would not be needed due to diversified supply and conservation measures. The City can meet all customer demands within the service area through the purchase of significant reserves held by Metropolitan, local groundwater supplies, and through implementation of conservation measures in multiple dry years from 2020 through 2040. To provide potable water and fire service to the existing and proposed land uses within the RHASP area, additional water infrastructure would be required. It is anticipated that the section of the existing 6-inch and 8-inch water mains in Red Hill Avenue would be replaced with a larger diameter pipe and extend east from I-5 to the terminus at San Juan Street as a condition of development of the adjacent properties. The City also has a long-range plan to upgrade other sections of water mains in the area. Other anticipated improvements include public meters and backflow devices that would be required for domestic water service and/or separate fire lines for individual developments as they occur. The RHASP can provide sufficient water infrastructure improvements to provide water to the projects within the RHASP area, as needed.

According to the RHASP Final EIR, the Eastern Orange County Water District (EOCWD) and Orange County Sanitation District (OCSD) only allow new development to connect to their sewer systems if there is sufficient capacity or planned expansions of its facilities to accommodate the new developments. The OCSD has identified no impact to its treatment plants and has adequate capacity to accommodate the RHASP. The OCSD notes that all future development within the RHASP area would be reviewed on a project-by-project basis. New development would not be permitted to exceed the capacity of wastewater conveyance systems or treatment facilities. All expansions of OCSD facilities must be sized and service phased to be consistent with the SCAG regional growth forecasts for the City. The available capacities of OCSD facilities are limited to levels associated with the approved growth identified by SCAG. Future development projects would be required to comply with the City's Sewer capacity allotment, the Tustin City Code, and OCSD regulations in order to connect to the City's sewer system. This would include the payment of a sewer maintenance fee to construct new sewer infrastructure and/or incremental expansions to the existing sewer system to accommodate individual development to preclude any impact of the development on the sewer system.

The RHASP Final EIR discussed that solid waste disposal services must follow federal, State, and local statutes and regulations related to the collection of solid waste. Development within the RHASP area would be required to comply with all applicable State and local waste diversion requirements, including AB 939 and SB 1016, and Article 4, Chapter 3, Part 1, of the Tustin City Code. The Bowerman Landfill has a daily maximum intake load of 11,500 tons per day with 8,500 tons per day annual average. The remaining disposal capacity was 205 million cubic yards, as of February 29, 2008. Land uses within the RHASP area could generate approximately 7,740 pounds of solid waste per day (3.87 tons/day or 1412.5 tons/year). The solid waste generation of the RHASP is consistent with the daily capacity of the Bowerman Landfill, representing a nominal percentage of the maximum intake load.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses utilities and service system impacts. . The 2021 EIR Addendum determined that the Project site would produce any additional impacts on utilities and service systems and would have sufficient water supplies to serve the Approved Project. The Approved Project would not generate soil waste in excess. Therefore, impacts on utilities and service systems were determined to have no new impact compared to the RHASP Final EIR.

RHASP Final EIR Mitigation Measures

Refer to RHASP MM 4.7-1 and MM 4.7-2 in Section 5.10, *Hydrology and Water Quality*.

a) Require or result in the construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to new or expanded water, wastewater treatment, stormwater drainage, electric power, natural gas, and telecommunication facilities would be less than significant. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. Domestic water services would be provided to the Project by the City through the Municipal Water District of Orange County (MWDOC), wastewater treatment services are provided to the area by the OCSD, and stormwater services are provided by Orange County Public Works. As discussed in Section 3.0, *Project Description,* the Project would install new on-site drinking water pipes that would connect to a new 12-inch drinking water main in Red Hill Avenue, which was analyzed in the RHASP Final EIR. Additionally, the Project provides new on-site sewer lines that would connect to an existing 27-inch sewer main in Red Hill Avenue. Additionally, the Project would construct an underground infiltration basin that would convey stormwater to existing storm drain mains in Red Hill Avenue.

The Project would also connect to existing electric power, natural gas, and telecommunication facilities. Therefore, the Project would not result in the relocation or construction of new or expanded water, wastewater treatment, stormwater drainage, electric power, natural gas, or telecommunication facilities that could cause environmental effects. Impacts would be less than significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to water supplies would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The MWDOC is responsible for supplying potable water to the Project site and its region. MWDOC's water supplies consist of groundwater, recycled water, and imported water. MWDOC serves imported water in Orange County to 28 water agencies. These entities, comprised of cities and water districts, are referred to as MWDOC member agencies and provide water to approximately 2.34 million customers.

The 2020 MWDOC Urban Water Management Plan (UWMP) details that MWDOC has adequate supplies to serve its customers during normal, dry year, and multiple dry year demand through 2045 with projected population increases and accompanying increases in water demand. Furthermore, MWDOC forecasts for water demand are based on population projections of SCAG, which rely on adopted land use designations contained in general plans that cover the geographic area. Implementation of the Project would not change the land use designation or zoning of the Project site. The UWMP detailed a 2020 water demand of 109 gallons per capita per day. As described previously in Section 5.14, *Population and Housing,* the Project would result in approximately 222 new residents. Thus, the Project would generate a water demand of 24,198 gallons per day or 27.1 acre-feet per year, which is within the anticipated increased demand and supply for water, as shown on Table UT-1.

Table UT-1: MWDOC Projected Water Supply (AF)

Water Source	2020	2025	2030	2035	2040	2045
OCWD Basin Groundwater	192,652	231,936	236,430	236,506	236,280	236,274
Non-OCWD Groundwater	21,267	22,734	24,747	24,763	24,740	24,890
Recycled Water	42,330	52,017	53,891	56,926	57,043	57,094
Surface Water	9,897	4,700	4,700	4,700	4,700	4,700
Metropolitan Water District of Southern California	142,879	119,743	120,573	123,502	123,107	122,819
Total	***409,025***	***431,130***	***440,341***	***446,397***	***445,870***	***445,777***

Redevelopment of the Project site would also be required to be compliant with CALGreen/Title 24 requirements for low flow plumbing fixtures and irrigation, which would provide for efficient water use. Therefore, MWDOC has sufficient water supplies available to serve the Project during normal, dry, and multiple dry years, and impacts would be less than significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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.?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to wastewater would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. Based on the OCSD wastewater generation rates of 7,516 gallons per day per acre (gpd/ac) for residential, the Project would conservatively generate 25,479 gpd of residential wastewater. Wastewater generated by the Project would be treated at OCSD reclamation Plant 1 and Plant 2. The Plants have a total treatment capacity of 632 million gallons per day (mgd). In 2017, the plants treated a combined average of 184 mgd of wastewater. Therefore, Plants 1 and 2 have a typical remaining capacity of 448 mgd of wastewater. This remaining capacity is adequate to serve the Project and the Project would not result in a determination by the wastewater treatment provider, which serves or may serve the Project, that it has inadequate capacity to serve the Project's projected demand in addition to the provider's existing commitments. As such, impacts would be less than significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

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?

Impacts Associated with the Proposed Project

No New Impact. The RHASP Final EIR concluded that impacts related to the generation of solid waste would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. As discussed in the RHASP Final EIR, the Project site is served by the Frank R. Bowerman landfill. The Bowerman landfill is permitted to accept 11,500 tons per day of solid waste and is permitted to operate through 2053. In December 2024, the highest tonnage Bowerman landfill received was a total of 9,916.04 tons of solid waste (CalRecycle, 2025). Therefore, the landfill has an additional capacity of 1,583.96 tons per day.

Project construction would generate solid waste for landfill disposal in the form of demolition debris from the infrastructure that would be removed from the site. Construction waste in the form of packaging and discarded materials would also be generated by the proposed Project. However, Section 5.408.1 of the 2022 California Green Building Standards Code requires demolition and construction activities to recycle or reuse a minimum of 65 percent of the nonhazardous construction and demolition waste. Thus, the demolition and construction solid waste that would be disposed of at the landfill would be approximately 35 percent of the waste generated. As the Bowerman landfill has an additional capacity of 1,583.96 tons per day, the facilities would be able to accommodate the addition of solid waste during construction of the proposed Project.

Operation of the Project includes development of 73 multi-family residential units. Based on the rates utilized by the RHASP (12.23 lbs/unit/day for residential and 5 lbs/1,000 sf/day for commercial), the Project would generate approximately 892.79 pounds of residential waste per day or 0.45 tons per day of solid waste. However, pursuant to AB 341, at least 75 percent of the solid waste is required to be recycled, which would reduce the volume of landfilled solid waste to approximately .09 tons per day. As the Bowerman Landfill had additional capacity of 1,583.96 tons per day, the facilities would be able to accommodate the addition of 0.09 tons per day of solid waste from operation of the proposed Project. As such, impacts would be less than significant.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

e) Comply with federal, State, and local statutes and regulations related to solid waste?

Impacts Associated with the Proposed Project

No New Impacts. The RHASP Final EIR concluded that impacts related to solid waste would be less than significant and the 2021 Addendum was found to be consistent with the RHASP Final EIR. The proposed Project would result in new development that would generate an increased amount of solid waste. All solid waste-generating activities within the City are subject to the requirements set forth in the 2022 California Green Building Standards Code that requires demolition and construction activities to recycle or reuse a minimum of 65 percent of the nonhazardous construction and demolition waste, and AB 341 that requires diversion of a minimum of 75 percent of operational solid waste. Development of the Project would be consistent with all State regulations, as ensured through the City's permitting process; and impacts would not occur. Therefore, the proposed Project would result in less than significant impacts related to potential conflicts with federal, State, and local management and reduction statutes and regulations pertaining to solid waste.

No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR. The proposed Project is consistent with the impacts identified in the Final EIR and the level of impact remains unchanged from that cited in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding utilities and service systems. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to utilities and service systems.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe utilities and service systems impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required regarding utilities and service systems.

<u>Applicable Final EIR Mitigation Measures</u>

Refer to RHASP MM 4.7-1 and MM 4.7-2 in Section 5.10, *Hydrology and Water Quality*.

5.20. WILDFIRE	Subsequent or Supplemental EIR			Addendum to EIR	
If located in or near State responsibility areas or lands classified as very high fire hazard severity zones, would the project:	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☐	☒
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollution concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒
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?	☐	☐	☐	☐	☒

Summary of Impacts Identified in the Final EIR

The RHASP Final EIR analyzed impacts related to wildfire. The RHASP Final EIR discussed that implementation of the RHASP would not expose people or structures to a risk of loss, injury or death involving wildland fires. The RHASP area is in a developed urban area and it is not adjacent to any wildland areas.

Summary of Impacts Identified in the 2021 Addendum

The 2021 EIR Addendum discusses wildfire impacts The 2021 EIR Addendum determined that the Approved Project site would not impair an emergency evacuation plan nor would the Approved Project expose people or structures to wildfires. For these reasons, the 2021 Addendum concluded that no new wildfire-related impacts would occur.

a) Substantially impair an adopted emergency response plan or emergency evacuation plan?

Impacts Associated with the Proposed Project

No New Impact. According to the CAL FIRE Fire Hazard Severity Zone map, the Project site is not within an area identified as a Fire Hazard Area that may contain substantial fire risk or a Very High Fire Hazard Severity Zone (VHFHSZ) (CAL FIRE 2024). The proposed Project would not substantially impair an adopted emergency response plan or emergency evacuation plan. As stated in Section 5.9, *Hazards and Hazardous Materials*, of this Addendum, the proposed Project would not physically interfere with an adopted emergency response plan or emergency evacuation plan. The Project driveway and internal access would be required through the City's permitting procedures to meet the City's design standards to ensure adequate emergency access and evacuation pursuant to the requirements in Section 503 of the California Fire Code (Title 24, California Code of Regulations, Part 9). Additionally, the proposed Project does not include any characteristics (e.g., permanent road closures or long-term blocking of road access) that would substantially impair or otherwise conflict with an emergency response plan or emergency evacuation plan. Therefore, impacts related to emergency response and evacuation plans associated with construction of the proposed Project would be less than significant.

The proposed Project would provide direct access to the site by one driveway and does not include any changes to public or private roadways that would physically impair or otherwise conflict with an emergency response plan or emergency evacuation plan. Further, the proposed Project would not obstruct or alter any transportation routes that could be used as evacuation routes during emergency events. Further, access to and from the Project site for emergency vehicles would be reviewed and approved by the Fire Department and the City as part of the Project approval process to ensure the proposed Project is compliant with all applicable codes and ordinances for emergency vehicle access. Therefore, impacts would be less than significant. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR.

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

Impacts Associated with the Proposed Project

No New Impact. As stated previously, the Project site is not located within a fire hazard area. Additionally, the Project site and surrounding area are currently developed with commercial, institutional, and residential uses. The areas on and surrounding the site lack extensive combustible materials and vegetation necessary for the uncontrolled spread of a wildfire.

The Project site is relatively flat and there are limited elevation changes in the Project vicinity. The Project proposes development of residential uses in an urban area. As such, the Project itself would not exacerbate wildfire risks as compared to existing conditions because it is representative of existing development in the area. Thus, there is no impact related to other factors that would expose Project occupants to pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire would occur from the Project. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR.

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?**

Impacts Associated with the Proposed Project

No New Impact. As stated previously, the Project site is not located within a fire hazard area. The Project does not require the installation or maintenance of associated infrastructure (including roads, fuel breaks, emergency water sources, power lines, or other utilities) that would exacerbate fire risk or that would result in impacts to the environment. Although the Project includes a driveway within the Project site, the Project does not include any changes to public or private roadways that would exacerbate fire risk or that would result in impacts to the environment. Although utility improvements, including domestic water, recycled water, sanitary sewer, and storm drain lines proposed as part of the Project would be extended throughout the Project site, these utility improvements would be underground and would not exacerbate fire risk. As described by the RHASP Final EIR and Addendum, adherence to existing regulations would reduce risks from urban and wildland fire threats to the City to a less than significant level. The utility improvements that are part of redevelopment of the Project site would be reviewed and approved by the City as part of the

Project approval process to ensure compliance. Therefore, the proposed Project would not include infrastructure (such as roads, fuel breaks, emergency water sources, power lines, or other utilities), that would exacerbate fire risk or that would result in impacts to the environment. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR.

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?

Impacts Associated with the Proposed Project

No New Impact. As stated previously, the Project site is not located within a fire hazard area. According to FEMA's FIRM Flood Map 06059C0281J, the Project site is classified as Zone X, which are areas with minimal or 0.2 percent annual chance of flood hazard. The Project site is relatively flat with a gentle slope to the to the south and southwest. The site is not near any hillsides or slope areas that could result in a landslide.

As established in Section 5.10, *Hydrology and Water Quality*, of this Addendum, during Project construction soil would be compacted and drainage patterns would be temporarily altered due to grading, and there would be an increased potential for flooding compared to existing conditions. However, construction BMPs would be identified and implemented as part of the proposed Project. Implementation of construction BMPs would control and direct surface runoff to prevent flooding, and as such, Project construction would not expose people or structures to significant risks related to downslope and downstream flooding. During operation, the proposed Project would not substantially alter the existing on-site drainage patterns. Compliance with the proposed operational BMPs would ensure on-site storm drain facilities would be sized to accommodate stormwater runoff from the Project site so that on-site flooding would not occur. Therefore, impacts would be less than significant.

Further, projects in the City are required to comply with the CBC, which would include the incorporation of: 1) seismic safety features to minimize the potential for significant effects as a result of earthquakes; 2) proper building footings and foundations; and 3) construction of the building structures so that it would withstand the effects of strong ground shaking. These features would reduce potential impacts related to landslides to a less than significant level. No new or substantially greater impacts would occur with implementation of the proposed Project when compared to those identified in the Final EIR.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding wildfire. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP with respect to wildfire.

Plans, Programs, or Policies (PPPs)

None.

Project Design Features (PDFs)

None.

Mitigation/Monitoring Required

No new impacts nor substantially more severe wildfire impacts would result from implementation of the proposed Project; therefore, no new or revised mitigation measures are required regarding wildfires.

5.21. MANDATORY FINDINGS OF SIGNIFICANCE	Subsequent or Supplemental EIR			Addendum to EIR	
	Substantial Change in Project or Circumstances Resulting in New Significant Effects	New Information Showing Greater Significant Effects than Previous EIR	New Information Identifying New Mitigation or Alternative to Reduce Significant Effect is Declined	Minor Technical Changes or Additions	No New Impact/ No Impact
a) Does the project have the potential to 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?	☐	☐	☐	☐	☒
b) 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)?	☐	☐	☐	☐	☒
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☐	☒

a) Does the project have the potential to 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, 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?

Impacts Associated with the Proposed Project

No New Impact. As discussed in Section 5.4, *Biological Resources*, the Project site is completely developed and located within an urban area that does not contain any native habitats. Due to the disturbed status of the site, it does not provide habitat that could be utilized by species listed or candidates for listing by USFWS, CDFW, or the CNPS. The existing ornamental landscaping trees on the site have the potential to provide for nesting migratory birds. Many of these trees would be removed during construction. Therefore, the proposed Project has the potential to impact active bird nests if vegetation and trees are removed during the nesting season. Nesting birds are protected under the federal MBTA (United States Code Title 33, Section 703 et seq.; see also Code of Federal Regulations Title 50, Part 10) and Section 3503 of the California Fish and Game Code, which is implemented through the City's permitting process. Should removal of the existing landscaping occur during the nesting/breeding season, the existing permitting process and mitigation measures would ensure that the MBTA is implemented and thus impacts related to nesting birds would be less than significant. Therefore, impacts related to fish and wildlife species or plant community would be less than significant, which is consistent with analysis within the Final EIR.

As discussed in Section 5.5, *Cultural Resources*, there are no historic resources located with the Project site. In addition, due to the prior development of the Project site and previous disturbances associated with the construction and operation of the existing site use, the potential for encountering paleontological and archeological resources is small. However, the Project would implement RHASP MM 4.3-1 and 4.3-2, which would reduce impacts to less than significant. Therefore, the proposed Project would not eliminate important examples of the major periods of California history or prehistory, and impacts would be less than significant with mitigation.

b) 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)?

Impacts Associated with the Proposed Project

No New Impact. The proposed Project's potential cumulative impacts were analyzed in the RHASP Final EIR as part of buildout of the RHASP and would not result in new impacts beyond those analyzed in the Final EIR. Additionally, the 2021 Addendum was found to be consistent with the RHASP Final EIR. Therefore, the proposed Project would not result in new or substantially more severe cumulatively considerable impact under any impact area, including aesthetics, air quality, cultural resources, GHG emissions, hazards and hazardous materials, land use and planning, noise, population and housing, public services, recreation, transportation and traffic, or utilities and service systems. With implementation of existing regulations and the relevant Final EIR's mitigation measures, the proposed Project would not result in any new significant impacts.

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

Impacts Associated with the Proposed Project

No New Impact. As described throughout Section 5, above, the proposed Project has no new or substantially more severe potentially significant impacts and no new mitigation measures would be required. The implementation of the Final EIR mitigation measures, City standards, and City guidelines would ensure that there would be no substantial adverse effects on human beings, either directly or indirectly. There would be no new impacts.

Conclusion

Based on the foregoing, none of the conditions identified in CEQA Guidelines Section 15162 that would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts or mitigation measures exist regarding wildfire. There have not been 1) changes related to development of the Project site that involve new significant environmental effects or a substantial increase in the severity of previously identified effects; 2) substantial changes with respect to the circumstances under which development of the Project site is undertaken that require major revisions of the Final EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified effects; or 3) the availability of new information of substantial importance relating to significant effects or mitigation measures or alternatives that were not known and could not have been known when the Final EIR was certified as completed.

Because none of the conditions identified in CEQA Guidelines Section 15162 would trigger the need to prepare a subsequent or supplemental EIR to evaluate Project impacts, CEQA Guidelines 15168 also does not require additional environmental review and the Project is within the scope of the RHASP.

Plans, Programs, or Policies (PPPs)

As outlined in Sections 5.1 through 5.20, above.

Project Design Features (PDFs)

As outlined in Sections 5.1 through 5.20, above.

Mitigation/Monitoring Required

As detailed previously, the Final EIR mitigation measures that are applicable to the proposed Project would be implemented for the Project as intended by the Final EIR. Upon implementation of applicable Final EIR mitigation measures, no new impacts nor substantially more adverse impacts would result from the implementation of the proposed Project; therefore, no new or revised mitigation measures are required. No refinements related to the proposed Project are necessary to the Final EIR mitigation measures and no new mitigation measures are required.

6. DOCUMENT PREPARERS AND CONTRIBUTORS

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VISTA
ENVIRONMENTAL

October 24, 2024

Johanna Crooker
MLC Holdings, Inc.
5 Peters Canyon Road, Suite 310
Irvine, CA 92606

Subject: **City of Tustin – Compass at Red Hill Residential Project Construction-Related Diesel Particulate Matter (DPM) Emissions Health Risk Assessment (HRA) Technical Memorandum.**

Dear Ms. Crooker:

Vista Environmental has prepared this construction-related DPM emissions HRA for the proposed Compass at Red Hill residential project (Project) in order to analyze the cancer and non-cancer risks to the nearby sensitive receptors from DPM emissions, which have been classified as a toxic air contaminant (TAC) by the California Air Resources Board (CARB).

The Project consists of development of a residential community with 73 townhomes located on the west side of the intersection of Red Hill Avenue and San Juan Street, in the City of Tustin (City). The nearby sensitive receptors to the project site include multi-family homes that are adjacent to the north corner of the project site and across a public alley to the west of the project site and Tustin High School that is adjacent to the northwest side of the project site.

The following details a summary of noise impacts to the project, the applicable regulations, the measured noise levels, the noise modeling parameters, the exterior and interior noise modeling results, and a comparison to the City's noise standards.

Summary of Analysis

- **Construction-Related Cancer Risks** – This analysis found that the cancer risk from DPM emissions created from construction of the proposed project would be as high as 8.4 per million persons at the nearby multi-family homes. The project-related cancer risk from construction-related DPM emissions would be below the SCAQMD's threshold of 10 per million persons. This calculation is based on a worst-case condition of a person being outside for 24 hours per day during the duration of construction. Research has shown that homes with HVAC systems result in up to an 80 percent reduction in DPM when compared to outdoor levels of DPM concentrations. For these reasons, construction of the proposed project would result in a less than significant impact due to the cancer risk from DPM emissions.

- **Construction-Related Non-Cancer Risks** – This analysis found that the non-cancer, chronic risk to the respiratory system from DPM emissions created from construction of the proposed project would create a Hazard Index of 0.0117, which is well below the SCAQMD Hazard Index threshold of 1.0. Therefore, the on-going operations of the proposed project would result in a less than significant impact due to the non-cancer chronic health risk from TAC emissions created by the proposed project.

Modeling Parameters

CalEEMod Model Input Parameters

The DPM emissions created from diesel powered off-road equipment used during construction of the Project have been quantified through use of the California Emissions Estimator Model (CalEEMod) Version 2022.1.1.28. CalEEMod is a computer model published by the California Air Pollution Control Officers Association (CAPCOA) for estimating air pollutant and GHG emissions. The CalEEMod program uses the EMFAC2021 computer program to calculate the emission rates specific for Orange County for employee, vendor and haul truck vehicle trips and the OFFROAD2011 computer program to calculate emission rates for heavy equipment operations. EMFAC2021 and OFFROAD2011 are computer programs generated by CARB that calculates composite emission rates for vehicles. Emission rates are reported by the program in grams per trip and grams per mile or grams per running hour.

Land Use Parameters

The proposed project would consist of development of 73 townhomes, with an associated onsite road system and parking areas on a 3.39 acre project site. The proposed project's land use parameters that were entered into the CalEEMod model are shown in Table A.

Table A – CalEEMod Land Use Parameters

Proposed Land Use	Land Use Subtype in CalEEMod	Land Use Size[1]	Lot Acreage[2]	Building[3] (sq ft)	Landscaped Area[4] (sq ft)
Townhomes	Condo/Townhouse	73 DU	2.09	116,393	13,656
Onsite Roads and Parking	Other Asphalt Surfaces	1.3 AC	1.3	--	8,494

Notes:
[1] DU = Dwelling unit; AC = Acre.
[2] Lot acreage calculated based on the total project site of 3.39 acres.
[3] Building square feet represent area where architectural coatings will be applied
[4] Landscaped area based on 15 percent of project site landscaped.

Construction Parameters

Construction of the proposed project is anticipated to start in Fall 2025 and the CalEEMod default construction phasing and timing was utilized, which found that construction would be completed in approximately 13 months. The construction equipment, worker trips and truck trips utilized for each phase of construction was based on the CalEEMod default values.

CalEEMod Results

The CalEEMod model calculated the PM2.5 exhaust emissions, which is equivalent to the DPM emissions, and found average daily rates of 0.09 pounds per day for 2025 and 0.18 pounds per day for 2026. The CalEEMod model also found that construction activities would generate an average of 7.8 truck trips per day during the building construction phase that has a duration of 230 workdays. This would result in a total of 1,794 truck trips generated from the Project.

AERMOD Model Input Parameters

The dispersion modeling utilized for analyzing the TAC emissions in this analysis has been based on the recommended methodology described in *Health Risk Assessment Guidance for Analyzing Cancer Risks from Mobile Source Diesel idling Emissions for CEQA Air Quality Analysis* (SCAQMD HRA Guidance), prepared by SCAQMD, 2003, *Air Toxics Hot Spots Program Risk Assessment Guidelines* (OEHHA

Guidelines), prepared by Office of Environmental Health Hazard, February 2015, and *Risk Assessment Procedures for Rules 1401, 1401.1 and 212* (SCAQMD Risk Assessment Procedures), prepared by SCAQMD, September 1, 2017. Important issues that affect the dispersion modeling include the following: 1) Model Selection, 2) Source Treatment, 3) Meteorological Data, and 4) Receptor Grid. Each of these issues is addressed below.

Model Selection

The AERMOD View Version 12.0.0 Model was used for all dispersion modeling. Key dispersion modeling options selected include the regulatory default option and urban modeling option for Orange County with a population of 3,010,232[1]. Flagpole receptor height was set to 0 meters. AERMAP was run with a 1 degree USGS DEM Map of Santa Ana, which covers the project site.

Meteorological Data

Meteorological data from the John Wayne Airport Meteorological Station was selected for this modeling application. Meteorological data of years 2012 to 2016 was collected at the John Wayne Airport Station. The SCAQMD processed the data for input to the model. The elevation of 17 meters was utilized for the John Wayne Airport Station[2].

Receptor Grid

The nearest sensitive receptors to the project site are residents at the multi-family homes that are adjacent to the north corner of the project site and across a public alley to the west of the project site and Tustin High School that is adjacent to the northwest side of the project site. Discrete receptors were placed at nine representative nearby sensitive receptors. Figure 1 shows the locations of the sources and receptors modeled in the AERMOD model for TAC emissions.

DPM Emissions Assumptions

The Age Sensitivity Factors (ASF) that are defined in the OEHHA Guidance (OEHHA 2015) have been utilized in this analysis. The ASF requirements, utilize separate emission factors over a person's life segmented into three distinct periods with the first period starting at the third trimester of a pregnancy to 2 years of age, the second period is from 2 to 16 years, and the third if from 16 to 70 years old.

Since the construction emissions would occur over a 13 month period from October 2025 to October 2026, each year was analyzed separately, with year 2025 representing from third trimester to 0 months and year 2026 represented 0 months to 10 months of age. For each year the daily breathing rates and associated cancer risks were adjusted to match the above age levels. The use of the above age breakdowns represents a worst-case assumption that a woman who is in her third trimester is living in one of the nearby homes at the start of construction and the newborn child would remain at the home through the duration of construction. Construction activities have been modeled as occurring from 7 a.m. to 4 p.m. every day.

Off-Road Construction Equipment DPM Emissions

TAC emissions from construction activities would be primarily from DPM emissions associated with the onsite operation of off-road diesel equipment. The off-road equipment exhaust emissions that would be created from construction of the proposed project has been calculated by the CalEEMod Model, described

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[1] Obtained from: https://www.aqmd.gov/home/air-quality/meteorological-data/modeling-guidance

[2] Obtained from: https://www.aqmd.gov/home/air-quality/meteorological-data/aermod-table-1

above, which found construction would generate daily averages of 0.09 pounds per day of PM2.5 in 2025 and 0.18 pounds per day of PM2.5 in 2026.

The off-road construction equipment was modeled as three point sources, located in the northeastern portion, middle portion and southwestern portion of the project site, where each point source emitted one third of the PM2.5 emissions from the CalEEMod model. The three point source were modeled in the AERMOD model with a 13-foot release height, a 0.1-meter diameter stack, a velocity of 50 meters per second, and a temperature of 366°K. The emission rates for each of three point sources are based on a 9-hour workday and are shown in Table B. The placement of the off-road equipment point sources in the AERMOD model is shown in Figure 1.

Table B – Off-Road Equipment DPM Emission Entered into AERMOD

Source ID	Location on Project Site	PM2.5 Emissions Rates (grams/second)	
		2025	2026
EQUIPNE	Northeastern Portion	4.20E-04	8.40E-04
EQUIPM	Middle Portion	4.20E-04	8.40E-04
EQUIPSW	Southwestern Portion	4.20E-04	8.40E-04

Source: CalEEMod Version 2022.1

Construction-Related Truck Running Emissions

The emission factors used for the roadway line volume sources were derived from the CARB EMFAC2021 Version 1.0.2. The parameters entered into the EMFAC2021 model included Orange County, for calendar years 2025 and 2026, a vehicle category of T7 Single Dump Class 8, model year of aggregated, speeds of 10 miles per hour for the onsite road and 35 miles per hour for the offsite roads, temperature of 50 degrees Fahrenheit, humidity of 50 percent, and set for diesel fuel. The EMFAC2021 version 1.0.2 model calculated running emission rates are shown in Table C and the calculated truck idling emissions rates are shown in Table E and the EMFAC2021 printouts are attached to this Memo.

Table C – EMFAC2021 Diesel Truck Running PM2.5 Emission Rates

Vehicle Class	Speed (mph)	EMFAC2021 PM2.5 Running Emissions Rates (grams/mile)	
		2025	2026
T7 Single Dump Class 8	10	0.0076	0.0075
	35	0.0058	0.0057

Source: EMFAC2021 version 1.0.2.

The offsite construction-related truck trips have been modeled with all trips traveling to and from the project site on Red Hill Avenue to Interstate 5. The CalEEMod model calculated that 1,790 truck trips would be generated from construction of the Project. This would result in average of 4.6 truck trips per day over the entire 13 month duration of construction.

The truck travel emissions were modeled in the AERMOD model by using line volume sources. The line volume sources were modeled with a plume height of 6 feet and plume width of 12 feet for the onsite path and a 34-foot width on the offsite roads. The road source emissions rates entered into the AERMOD model are shown in Table D. The road source emissions were determined by calculating the time it takes for each truck to cross the road length and then multiplying that amount of time by the daily truck operations and dividing it by 9 hours in order to determine the percent of daily running time. The daily running time was then multiplied by the EMFAC2021 emissions rates that are detailed above and were converted to grams per second. The placement of the truck travel line volume sources in the AERMOD model is shown in Figure 1.

Table D – Construction-Related Truck Travel Emissions Rates used in the AERMOD Model

Source ID	Road	Length of Road (Meters)	PM2.5 Emission Rates (grams/second) 2025	PM2.5 Emission Rates (grams/second) 2026
RDOFF	Red Hill Avenue	118	6.07E-08	1.76E-07
RDON	Onsite	87	5.86E-08	9.73-08

Notes:

[1] A daily truck trip represent either entering or leaving project site. A delivery to the project site would generate two trips.

Source: EMFAC2021

Construction-Related Truck Idling Emissions

The emissions factors used for the truck idling point source are based on the EMFAC2021 Idling Emission Rates shown in Table E and the EMFAC2021 input parameters have been described above and the EMFAC2021 printouts are attached to this Memo.

Table E – EMFAC2021 Diesel Truck Idling PM2.5 Emission Rates

Vehicle Class	EMFAC2021 PM2.5 Idling Emissions Rates (grams/hour) 2025	EMFAC2021 PM2.5 Idling Emissions Rates (grams/hour) 2026
T7 Single Dump Class 8	0.0191	0.0177

Source: EMFAC2021 version 1.0.2.

The construction diesel truck idling was modeled as a point source located approximately in the middle of the project site. The analysis was based on each truck delivery idling on the project site for 10 minutes (5 minutes per trip). The 5-minute period is based on Section 2485 of the California Code of Regulations that limits commercial truck idling to 5 minutes at any location. The idling point source was modeled in the AERMOD model with a 12-foot height, a 0.1-meter diameter, a velocity of 50 meters per second, and a temperature of 366°K. The idling DPM emission rates used in the AERMOD model for each year of construction analyzed are shown in Table F and are based on a 9-hour workday. The placement of the idling point source in the AERMOD model is shown in Figure 1.

Table F – Construction-Related Truck Idling Emissions Rates Used in the AERMOD Model

Source ID	Description	PM2.5 Emission Rates (grams/second) 2025	PM2.5 Emission Rates (grams/second) 2026
IDLE	Construction-Related Truck Idling	1.88E-07	8.07E-08

Source: EMFAC2021 version 1.0.2; CalEEMod version 2022.1

Impact Analysis

Construction activities associated with the proposed project would generate DPM emissions from diesel truck trips to the project site as well as from off-road diesel-powered equipment. The TAC impacts to the nearby sensitive receptors have been analyzed through use of the AERMOD model and the model input parameters detailed above. Health risks from TACs are twofold. First, TACs are carcinogens according to the State of California. Second, short-term acute and long-term chronic exposure to TACs can cause health effects to the respiratory system. Each of these health risks is discussed below.

Cancer Risks

According to the OEHHA Guidance (OEHHA, 2015) and *Risk Assessment Procedures for Rules 1401, 1401.1 and 212*, (SCAQMD, 2017), the cancer risk should be calculated using the following formula:

Cancer Risk = [Dose-inh (mg/(Kg-day))] * [Cancer Potency Factor (kg-day)/mg]*[$1x10^6$] * Age Sensitivity Factor * Fraction of Time at Home

$$\text{Dose-inh} = (C_{air} * DBR * A * EF * ED * 10^6) / AT$$

Where:

C_{air}	[Concentration in air ($\mu g/m^3$)] = (Calculated by AERMOD Model)
DBR	[Daily breathing rate (L/kg body weight – day)]
A	[Inhalation absorption factor]
EF	[Exposure frequency (days/year)]
ED	[Exposure duration (years)]
10^6	[Micrograms to milligrams conversion]
AT	[Average time period over which exposure is averaged in days]

The cancer risk parameters used in this evaluation for the nearby residential uses are shown in Table G and are based on construction occurring over a 13 month period from October 2025 to October 2026. Each year was analyzed separately, with year 2025 representing from third trimester to 0 months and year 2026 represented 0 months to 10 months of age.

Table G – DPM Cancer Risk Calculation Parameters

Parameter	Construction Year	
	2025 (3rd Tri to 0 months)	**2026 (0 months to 10 months)**
Cancer Potency Factor (mg/kg-day) for DPM	1.1	1.1
Daily Breathing Rate (L/kg body weight-day)	361	1,090
Inhalation Absorption Factor	1	1
Exposure Frequency (days/year)	350	350
Exposure Duration (years)	0.25	0.83
Age Sensitivity Factor	10	10
Fraction of Time at Home	1.0	1.0
Averaging Time[1] (days)	25,550	25,550
Potential Cancer Risk =	C_{air} * 14	C_{air} * 137

Notes:
[1] Based on a 70-year average lifetime.
Source: OEHHA, 2015; SCAQMD, 2017

Table H provides a summary of the calculated DPM concentrations at the nearest sensitive receptors and associated cancer risk from DPM emissions at the nearby homes and school. The AERMOD printouts are attached to this Memo.

Table H – Construction-Related DPM Emissions Cancer Risks

Sensitive Receptor[1]	Receptor Location X	Receptor Location Y	Annual DPM Concentration ($\mu g/m^3$) 2025	Annual DPM Concentration ($\mu g/m^3$) 2026	Cancer Risk Per Million People[2]
1	424,482	3,733,111	0.0040	0.0080	1.2
2	424,498	3,733,130	0.0054	0.0107	1.5
3	424,482	3,733,144	0.0041	0.0082	1.2
4	424,527	3,733,155	0.0080	0.0159	2.3
5	424,563	3,733,196	0.0118	0.0236	3.4
6	424,588	3,733,228	0.0123	0.0246	3.5
7	424,630	3,733,232	0.0251	0.0502	7.2
8	424,641	3,733,224	0.0292	0.0584	8.4
9	424,664	3,733,249	0.0205	0.0411	5.9
				Threshold of Significance	**10**
				Exceed Threshold?	**No**

Notes:

[1] The locations of each Sensitive Receptor are shown above in Figure 1.

[2] The residential cancer risk based on: C_{air} (2025) * 14 + C_{air} (2026) * 137.

Source: Calculated from ISC-AERMOD View Version 12.0.0.

Table H shows that the cancer risk from DPM emissions created from construction of the proposed project would be as high as **8.4 per million persons** at the multi-family homes located on the north side of the project site (Sensitive Receptor 8). The project-related cancer risk from construction-related DPM emissions would be below the SCAQMD's threshold of 10 per million persons.

It should be noted that the calculated cancer risk is based on a worst-case condition of a person being outside for 24 hours per day during the duration of construction. According to *Status of Research on Potential Mitigation Concepts to Reduce Exposure to Nearby Traffic Pollution,* prepared by CARB, August 23, 2012, research has shown that homes with HVAC systems result in up to an 80 percent reduction in DPM when compared to outdoor levels of DPM concentrations. For these reasons, construction of the proposed project would result in a less than significant impact due to the cancer risk from DPM emissions.

Non-Cancer Risks

In addition to the cancer risk from exposure to TAC emissions there is also the potential TAC exposure may result in adverse health impacts from chronic illnesses, which is detailed below. According to the OEHHA, no acute risk had been found to be created from DPM, so there is no acute AREL assigned to DPM and no further analysis is provided as no acute impact would be created from the DPM emissions created by the proposed project.

Chronic Health Impacts

Chronic health effects are characterized by prolonged or repeated exposure to a TAC over many days, months, or years. Symptoms from chronic health impacts may not be immediately apparent and are often irreversible. The chronic hazard index is based on the most impacted sensitive receptor from the proposed project and is calculated from the annual average concentrations of PM2.5. The relationship for non-cancer chronic health effects is given by the equation:

$$HI_{DPM} = C_{DPM} / REL_{DPM}$$

Where,

HI_{DPM} = Hazard Index; an expression of the potential for non-cancer health effects.

C_{DPM} = Annual average diesel particulate matter concentration in $\mu g/m^3$.

REL_{DPM}= Reference Exposure Level (REL) for diesel particulate matter; the diesel particulate matter concentration at which no adverse health effects are anticipated.

The REL_{DPM} is 5 $\mu g/m^3$. The Office of Environmental Health Hazard Assessment has established this concentration as protective for the respiratory system. As shown above in Table H, the AERMOD model found that the highest annual off-site concentration is 0.0584 $\mu g/m^3$ for DPM chronic non-cancer risk emissions. The resulting Hazard Index is:

$$HI_{DPM} = 0.0584 / 5 = 0.0117$$

The criterion for significance is a Chronic Hazard Index increase of 1.0 or greater, which is detailed above. Therefore, the on-going operations of the proposed project would result in a less than significant impact due to the non-cancer chronic health risk from TAC emissions created by the proposed project.

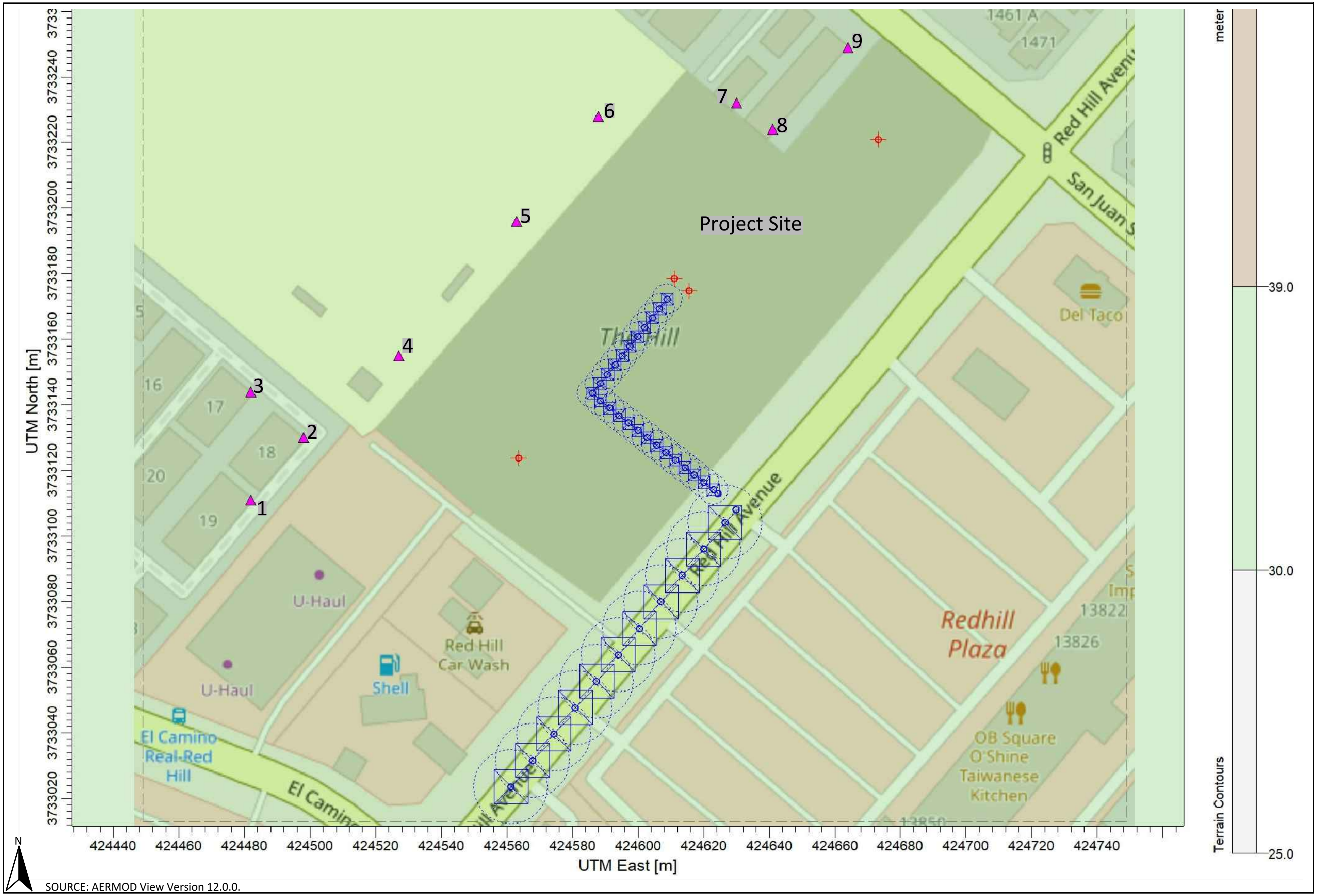
Please call me at (949) 510-5355 if you have any questions related to the above analysis.

Sincerely,

Greg Tonkovich

Greg Tonkovich, INCE
Vista Environmental
949 510 5355

Encl.: Figure 1 – AERMOD Model Sources and Receptors Placement
CalEEMod Output Files
AERMOD Output Files
EMFAC2021 Output File



SOURCE: AERMOD View Version 12.0.0.

VISTA
ENVIRONMENTAL

Figure 1
AERMOD Model Sources and Receptors Placement

Compass at Red Hill Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Compass at Red Hill
Construction Start Date	9/22/2025
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	2.50
Precipitation (days)	18.6
Location	33.735848877045015, -117.81385839163354
County	Orange
City	Tustin
Air District	South Coast AQMD
Air Basin	South Coast
TAZ	5938
EDFZ	7
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.28

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
Condo/Townhouse	73.0	Dwelling Unit	2.09	116,393	13,656	—	218	—
Other Asphalt Surfaces	1.30	Acre	1.30	0.00	8,494	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Un/Mit.	PM2.5E
Daily, Summer (Max)	—
Unmit.	0.35
Daily, Winter (Max)	—
Unmit.	1.26
Average Daily (Max)	—
Unmit.	0.18
Annual (Max)	—
Unmit.	0.03

2.2. Construction Emissions by Year, Unmitigated

Year	PM2.5E
Daily - Summer (Max)	—
2026	0.35
Daily - Winter (Max)	—
2025	1.26
2026	0.35
Average Daily	—
2025	0.09
2026	0.18
Annual	—
2025	0.02

2026	0.03

3. Construction Emissions Details

3.1. Site Preparation (2025) - Unmitigated

Location	PM2.5E
Onsite	—
Daily, Summer (Max)	—
Daily, Winter (Max)	—
Off-Road Equipment	1.26
Dust From Material Movement	—
Onsite truck	0.00
Average Daily	—
Off-Road Equipment	0.02
Dust From Material Movement	—
Onsite truck	0.00
Annual	—
Off-Road Equipment	< 0.005
Dust From Material Movement	—
Onsite truck	0.00
Offsite	—
Daily, Summer (Max)	—
Daily, Winter (Max)	—
Worker	0.00
Vendor	0.00
Hauling	0.00
Average Daily	—
Worker	0.00

Vendor	0.00
Hauling	0.00
Annual	—
Worker	0.00
Vendor	0.00
Hauling	0.00

3.3. Grading (2025) - Unmitigated

Location	PM2.5E
Onsite	—
Daily, Summer (Max)	—
Daily, Winter (Max)	—
Off-Road Equipment	0.66
Dust From Material Movement	—
Onsite truck	0.00
Average Daily	—
Off-Road Equipment	0.01
Dust From Material Movement	—
Onsite truck	0.00
Annual	—
Off-Road Equipment	< 0.005
Dust From Material Movement	—
Onsite truck	0.00
Offsite	—
Daily, Summer (Max)	—
Daily, Winter (Max)	—
Worker	0.00
Vendor	0.00

Hauling	0.00
Average Daily	—
Worker	0.00
Vendor	0.00
Hauling	0.00
Annual	—
Worker	0.00
Vendor	0.00
Hauling	0.00

3.5. Building Construction (2025) - Unmitigated

Location	PM2.5E
Onsite	—
Daily, Summer (Max)	—
Daily, Winter (Max)	—
Off-Road Equipment	0.40
Onsite truck	0.00
Average Daily	—
Off-Road Equipment	0.06
Onsite truck	0.00
Annual	—
Off-Road Equipment	0.01
Onsite truck	0.00
Offsite	—
Daily, Summer (Max)	—
Daily, Winter (Max)	—
Worker	0.00
Vendor	< 0.005

Hauling	0.00
Average Daily	—
Worker	0.00
Vendor	< 0.005
Hauling	0.00
Annual	—
Worker	0.00
Vendor	< 0.005
Hauling	0.00

3.7. Building Construction (2026) - Unmitigated

Location	PM2.5E
Onsite	—
Daily, Summer (Max)	—
Off-Road Equipment	0.35
Onsite truck	0.00
Daily, Winter (Max)	—
Off-Road Equipment	0.35
Onsite truck	0.00
Average Daily	—
Off-Road Equipment	0.17
Onsite truck	0.00
Annual	—
Off-Road Equipment	0.03
Onsite truck	0.00
Offsite	—
Daily, Summer (Max)	—
Worker	0.00

Vendor	< 0.005
Hauling	0.00
Daily, Winter (Max)	—
Worker	0.00
Vendor	< 0.005
Hauling	0.00
Average Daily	—
Worker	0.00
Vendor	< 0.005
Hauling	0.00
Annual	—
Worker	0.00
Vendor	< 0.005
Hauling	0.00

3.9. Paving (2026) - Unmitigated

Location	PM2.5E
Onsite	—
Daily, Summer (Max)	—
Off-Road Equipment	0.24
Paving	—
Onsite truck	0.00
Daily, Winter (Max)	—
Average Daily	—
Off-Road Equipment	0.01
Paving	—
Onsite truck	0.00
Annual	—

Off-Road Equipment	< 0.005
Paving	—
Onsite truck	0.00
Offsite	—
Daily, Summer (Max)	—
Worker	0.00
Vendor	0.00
Hauling	0.00
Daily, Winter (Max)	—
Average Daily	—
Worker	0.00
Vendor	0.00
Hauling	0.00
Annual	—
Worker	0.00
Vendor	0.00
Hauling	0.00

3.11. Architectural Coating (2026) - Unmitigated

Location	PM2.5E
Onsite	—
Daily, Summer (Max)	—
Daily, Winter (Max)	—
Off-Road Equipment	0.02
Architectural Coatings	—
Onsite truck	0.00
Average Daily	—
Off-Road Equipment	< 0.005

Architectural Coatings	—
Onsite truck	0.00
Annual	—
Off-Road Equipment	< 0.005
Architectural Coatings	—
Onsite truck	0.00
Offsite	—
Daily, Summer (Max)	—
Daily, Winter (Max)	—
Worker	0.00
Vendor	0.00
Hauling	0.00
Average Daily	—
Worker	0.00
Vendor	0.00
Hauling	0.00
Annual	—
Worker	0.00
Vendor	0.00
Hauling	0.00

4. Operations Emissions Details

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Vegetation	PM2.5E
Daily, Summer (Max)	—

Total	—
Daily, Winter (Max)	—
Total	—
Annual	—
Total	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Land Use	PM2.5E
Daily, Summer (Max)	—
Total	—
Daily, Winter (Max)	—
Total	—
Annual	—
Total	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Species	PM2.5E
Daily, Summer (Max)	—
Avoided	—
Subtotal	—
Sequestered	—
Subtotal	—
Removed	—
Subtotal	—
—	—
Daily, Winter (Max)	—
Avoided	—
Subtotal	—

Sequestered	—
Subtotal	—
Removed	—
Subtotal	—
—	—
Annual	—
Avoided	—
Subtotal	—
Sequestered	—
Subtotal	—
Removed	—
Subtotal	—
—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Site Preparation	Site Preparation	10/1/2025	10/7/2025	5.00	5.00	—
Grading	Grading	10/8/2025	10/17/2025	5.00	8.00	—
Building Construction	Building Construction	10/20/2025	9/4/2026	5.00	230	—
Paving	Paving	9/7/2026	9/30/2026	5.00	18.0	—
Architectural Coating	Architectural Coating	10/1/2026	10/26/2026	5.00	18.0	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

Site Preparation	Rubber Tired Dozers	Diesel	Average	3.00	8.00	367	0.40
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Average	4.00	8.00	84.0	0.37
Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Excavators	Diesel	Average	1.00	8.00	36.0	0.38
Grading	Tractors/Loaders/Backhoes	Diesel	Average	3.00	8.00	84.0	0.37
Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40
Building Construction	Cranes	Diesel	Average	1.00	7.00	367	0.29
Building Construction	Forklifts	Diesel	Average	3.00	8.00	82.0	0.20
Building Construction	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Building Construction	Welders	Diesel	Average	1.00	8.00	46.0	0.45
Building Construction	Tractors/Loaders/Backhoes	Diesel	Average	3.00	7.00	84.0	0.37
Paving	Tractors/Loaders/Backhoes	Diesel	Average	1.00	8.00	84.0	0.37
Paving	Cement and Mortar Mixers	Diesel	Average	2.00	6.00	10.0	0.56
Paving	Pavers	Diesel	Average	1.00	8.00	81.0	0.42
Paving	Paving Equipment	Diesel	Average	2.00	6.00	89.0	0.36
Paving	Rollers	Diesel	Average	2.00	6.00	36.0	0.38
Architectural Coating	Air Compressors	Diesel	Average	1.00	6.00	37.0	0.48

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Site Preparation	—	—	—	—
Site Preparation	Worker	17.5	18.5	LDA,LDT1,LDT2
Site Preparation	Vendor	—	10.2	HHDT,MHDT

Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	15.0	18.5	LDA,LDT1,LDT2
Grading	Vendor	—	10.2	HHDT,MHDT
Grading	Hauling	0.00	20.0	HHDT
Grading	Onsite truck	—	—	HHDT
Building Construction	—	—	—	—
Building Construction	Worker	52.6	18.5	LDA,LDT1,LDT2
Building Construction	Vendor	7.80	10.2	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	20.0	18.5	LDA,LDT1,LDT2
Paving	Vendor	—	10.2	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT
Architectural Coating	—	—	—	—
Architectural Coating	Worker	10.5	18.5	LDA,LDT1,LDT2
Architectural Coating	Vendor	—	10.2	HHDT,MHDT
Architectural Coating	Hauling	0.00	20.0	HHDT
Architectural Coating	Onsite truck	—	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
Architectural Coating	235,696	78,565	0.00	0.00	3,398

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Site Preparation	—	—	7.50	0.00	—
Grading	—	—	8.00	0.00	—
Paving	0.00	0.00	0.00	0.00	1.30

5.6.2. Construction Earthmoving Control Strategies

Non-applicable. No control strategies activated by user.

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Condo/Townhouse	—	0%
Other Asphalt Surfaces	1.30	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2025	0.00	532	0.03	< 0.005
2026	0.00	532	0.03	< 0.005

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	9.03	annual days of extreme heat
Extreme Precipitation	3.50	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	1.31	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	0	0	N/A
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	0	0	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	1	1	1	2
Extreme Precipitation	N/A	N/A	N/A	N/A
Sea Level Rise	1	1	1	2
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A

Snowpack Reduction	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	60.7
AQ-PM	70.3
AQ-DPM	88.7
Drinking Water	42.0
Lead Risk Housing	55.4
Pesticides	0.00
Toxic Releases	86.4
Traffic	93.0
Effect Indicators	—
CleanUp Sites	11.8
Groundwater	10.6
Haz Waste Facilities/Generators	46.8
Impaired Water Bodies	0.00
Solid Waste	0.00

Sensitive Population	—
Asthma	31.4
Cardio-vascular	36.5
Low Birth Weights	10.9
Socioeconomic Factor Indicators	—
Education	45.6
Housing	66.5
Linguistic	63.0
Poverty	50.2
Unemployment	51.3

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	45.65635827
Employed	64.05748749
Median HI	49.09534197
Education	—
Bachelor's or higher	60.45168741
High school enrollment	100
Preschool enrollment	19.04273066
Transportation	—
Auto Access	43.87270627
Active commuting	63.69819068
Social	—
2-parent households	25.42024894
Voting	15.21878609

Neighborhood	—
Alcohol availability	25.75388169
Park access	81.35506224
Retail density	87.28345951
Supermarket access	80.79045297
Tree canopy	37.31553959
Housing	—
Homeownership	12.34441165
Housing habitability	15.61657898
Low-inc homeowner severe housing cost burden	46.70858463
Low-inc renter severe housing cost burden	61.67073014
Uncrowded housing	24.18837418
Health Outcomes	—
Insured adults	37.80315668
Arthritis	85.3
Asthma ER Admissions	66.8
High Blood Pressure	88.4
Cancer (excluding skin)	68.9
Asthma	43.1
Coronary Heart Disease	77.0
Chronic Obstructive Pulmonary Disease	59.8
Diagnosed Diabetes	70.5
Life Expectancy at Birth	69.7
Cognitively Disabled	39.7
Physically Disabled	47.8
Heart Attack ER Admissions	62.1
Mental Health Not Good	39.8
Chronic Kidney Disease	79.8

Obesity	59.2
Pedestrian Injuries	19.6
Physical Health Not Good	49.9
Stroke	70.4
Health Risk Behaviors	—
Binge Drinking	19.3
Current Smoker	38.5
No Leisure Time for Physical Activity	43.3
Climate Change Exposures	—
Wildfire Risk	0.0
SLR Inundation Area	0.0
Children	48.8
Elderly	78.6
English Speaking	42.4
Foreign-born	70.9
Outdoor Workers	57.9
Climate Change Adaptive Capacity	—
Impervious Surface Cover	28.7
Traffic Density	99.3
Traffic Access	23.0
Other Indices	—
Hardship	59.0
Other Decision Support	—
2016 Voting	56.6

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	46.0

Healthy Places Index Score for Project Location (b)	44.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	Yes
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	Project Site 3.39 acres. 15% landscaped
Construction: Construction Phases	No Demolition

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**
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**
** AERMOD Input Produced by:
** AERMOD View Ver. 12.0.0
** Lakes Environmental Software Inc.
** Date: 10/24/2024
** File: C:\Vista Env\2024\24054 Tustin\AERMOD\2025\2025.ADI
**
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** AERMOD Control Pathway
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**
**
CO STARTING
   TITLEONE Tustin Compass at Red Hill - Construction DPM 2025
   TITLETWO PM2.5
   MODELOPT DFAULT CONC
   AVERTIME 24 PERIOD
   URBANOPT 3010232 Orange_County
   POLLUTID PM_2.5
   RUNORNOT RUN
   ERRORFIL 2025.err
CO FINISHED
**
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** AERMOD Source Pathway
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**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
   LOCATION EQUIPNE      POINT      424673.180  3733220.920       30.000
** DESCRSRC Off-Road Equipment Northeast
   LOCATION EQUIPM       POINT      424611.060  3733178.530       30.000
** DESCRSRC Off-Road Equipment Middle
   LOCATION EQUIPSW      POINT      424563.560  3733123.720       30.000
** DESCRSRC Off-Road Equipment Southwest
** ---------------------------------------------------------------------
** Line Source Represented by Adjacent Volume Sources
** LINE VOLUME Source ID = RDON
** DESCRSRC Total Trucks Onsite
** PREFIX
** Length of Side = 3.66
** Configuration = Adjacent
** Emission Rate = 5.86E-08
** Vertical Dimension = 1.83
** SZINIT = 0.85
** Nodes = 3
** 424624.395, 3733113.001, 30.00, 0.00, 1.70
```

```
** 424585.897, 3733143.308, 30.00, 0.00, 1.70
** 424609.651, 3733173.206, 30.00, 0.00, 1.70
** -----------------------------------------------------------------------
   LOCATION L0000001     VOLUME   424622.958 3733114.132 30.00
   LOCATION L0000002     VOLUME   424620.084 3733116.395 30.00
   LOCATION L0000003     VOLUME   424617.210 3733118.657 30.00
   LOCATION L0000004     VOLUME   424614.337 3733120.920 30.00
   LOCATION L0000005     VOLUME   424611.463 3733123.182 30.00
   LOCATION L0000006     VOLUME   424608.589 3733125.445 30.00
   LOCATION L0000007     VOLUME   424605.715 3733127.707 30.00
   LOCATION L0000008     VOLUME   424602.841 3733129.969 30.00
   LOCATION L0000009     VOLUME   424599.967 3733132.232 30.00
   LOCATION L0000010     VOLUME   424597.093 3733134.494 30.00
   LOCATION L0000011     VOLUME   424594.219 3733136.757 30.00
   LOCATION L0000012     VOLUME   424591.345 3733139.019 30.00
   LOCATION L0000013     VOLUME   424588.471 3733141.282 30.00
   LOCATION L0000014     VOLUME   424586.134 3733143.607 30.00
   LOCATION L0000015     VOLUME   424588.409 3733146.471 30.00
   LOCATION L0000016     VOLUME   424590.685 3733149.334 30.00
   LOCATION L0000017     VOLUME   424592.960 3733152.198 30.00
   LOCATION L0000018     VOLUME   424595.235 3733155.062 30.00
   LOCATION L0000019     VOLUME   424597.511 3733157.926 30.00
   LOCATION L0000020     VOLUME   424599.786 3733160.789 30.00
   LOCATION L0000021     VOLUME   424602.061 3733163.653 30.00
   LOCATION L0000022     VOLUME   424604.336 3733166.517 30.00
   LOCATION L0000023     VOLUME   424606.612 3733169.380 30.00
   LOCATION L0000024     VOLUME   424608.887 3733172.244 30.00
** End of LINE VOLUME Source ID = RDON
** -----------------------------------------------------------------------
** Line Source Represented by Adjacent Volume Sources
** LINE VOLUME Source ID = RDOFF
** DESCRSRC Construction Truck Trips on Red Hill Ave
** PREFIX
** Length of Side = 10.36
** Configuration = Adjacent
** Emission Rate = 6.07E-08
** Vertical Dimension = 1.83
** SZINIT = 0.85
** Nodes = 2
** 424629.813, 3733108.108, 30.00, 0.00, 4.82
** 424555.610, 3733016.559, 30.00, 0.00, 4.82
** -----------------------------------------------------------------------
   LOCATION L0000025     VOLUME   424626.551 3733104.083 30.00
   LOCATION L0000026     VOLUME   424620.025 3733096.032 30.00
   LOCATION L0000027     VOLUME   424613.500 3733087.981 30.00
   LOCATION L0000028     VOLUME   424606.975 3733079.930 30.00
   LOCATION L0000029     VOLUME   424600.449 3733071.879 30.00
   LOCATION L0000030     VOLUME   424593.924 3733063.829 30.00
   LOCATION L0000031     VOLUME   424587.398 3733055.778 30.00
   LOCATION L0000032     VOLUME   424580.873 3733047.727 30.00
   LOCATION L0000033     VOLUME   424574.348 3733039.676 30.00
   LOCATION L0000034     VOLUME   424567.822 3733031.625 30.00
   LOCATION L0000035     VOLUME   424561.297 3733023.575 30.00
** End of LINE VOLUME Source ID = RDOFF
```

```
   LOCATION IDLE         POINT      424615.660  3733174.780       30.000
** DESCRSRC Construction Truck Idling
** Source Parameters **
   SRCPARAM EQUIPNE        0.00042     3.962   366.000        50       0.1
   SRCPARAM EQUIPM         0.00042     3.962   366.000        50       0.1
   SRCPARAM EQUIPSW        0.00042     3.962   366.000        50       0.1
** LINE VOLUME Source ID = RDON
   SRCPARAM L0000001     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000002     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000003     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000004     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000005     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000006     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000007     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000008     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000009     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000010     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000011     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000012     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000013     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000014     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000015     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000016     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000017     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000018     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000019     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000020     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000021     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000022     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000023     0.000000002442      0.00      1.70      0.85
   SRCPARAM L0000024     0.000000002442      0.00      1.70      0.85
** ---------------------------------------------------------------------
** LINE VOLUME Source ID = RDOFF
   SRCPARAM L0000025     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000026     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000027     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000028     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000029     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000030     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000031     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000032     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000033     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000034     0.000000005518      0.00      4.82      0.85
   SRCPARAM L0000035     0.000000005518      0.00      4.82      0.85
** ---------------------------------------------------------------------
   SRCPARAM IDLE          2.26E-07     3.658   366.000        50       0.1
   URBANSRC ALL

** Variable Emissions Type: "By Hour-of-Day (HROFDY)"
** Variable Emission Scenario: "Scenario 2"
   EMISFACT EQUIPNE      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EQUIPNE      HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EQUIPNE      HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT EQUIPNE      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
```

```
EMISFACT EQUIPM       HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT EQUIPM       HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT EQUIPM       HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT EQUIPM       HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT EQUIPSW      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT EQUIPSW      HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT EQUIPSW      HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT EQUIPSW      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000001     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000001     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000001     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000001     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000002     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000002     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000002     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000002     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000003     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000003     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000003     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000003     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000004     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000004     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000004     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000004     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000005     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000005     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000005     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000005     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000006     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000006     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000006     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000006     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000007     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000007     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000007     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000007     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000008     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000008     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000008     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000008     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000009     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000009     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000009     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000009     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000010     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000010     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000010     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000010     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000011     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000011     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000011     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000011     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000012     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000012     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
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EMISFACT L0000012     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000012     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000013     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000013     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000013     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000013     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000014     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000014     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000014     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000014     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000015     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000015     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000015     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000015     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000016     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000016     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000016     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000016     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT L0000017     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000017     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000018     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000018     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000018     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000018     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000019     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000019     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000019     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000019     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000020     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000020     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000020     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000020     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000021     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000021     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
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EMISFACT L0000022     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT L0000022     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000022     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000023     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000023     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000023     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000023     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000024     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000024     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000024     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000024     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000025     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000025     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000025     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000025     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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   EMISFACT L0000026     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000026     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000026     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000026     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000027     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000027     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000027     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000027     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000028     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000028     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000028     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000028     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000029     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000029     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000029     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000029     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000030     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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   EMISFACT L0000030     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000030     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000031     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000031     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000031     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000031     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000032     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000032     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000032     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000032     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000033     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000033     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000033     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000033     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000034     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000034     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000034     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000034     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000035     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000035     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000035     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000035     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   SRCGROUP ALL
SO FINISHED
**
****************************************
** AERMOD Receptor Pathway
****************************************
**
**
RE STARTING
   INCLUDED 2025.rou
RE FINISHED
**
****************************************
** AERMOD Meteorology Pathway
```

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***************************************
**
**
ME STARTING
   SURFFILE ..\KSNA_V9_ADJU\KSNA_v9.SFC
   PROFFILE ..\KSNA_V9_ADJU\KSNA_v9.PFL
   SURFDATA 93184 2012 John_Wayne_Airport
   UAIRDATA 3190 2012
   PROFBASE 17.0 METERS
ME FINISHED
**
***************************************
** AERMOD Output Pathway
***************************************
**
**
OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 24 1ST
** Auto-Generated Plotfiles
   PLOTFILE 24 ALL 1ST 2025.AD\24H1GALL.PLT 31
   PLOTFILE PERIOD ALL 2025.AD\PE00GALL.PLT 32
   SUMMFILE 2025.sum
OU FINISHED
**
***************************************
** Project Parameters
***************************************
** PROJCTN  CoordinateSystemUTM
** DESCPTN  UTM: Universal Transverse Mercator
** DATUM    World Geodetic System 1984
** DTMRGN   Global Definition
** UNITS    m
** ZONE     11
** ZONEINX  0
**
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* AERMOD (23132 ): Tustin Compass at Red Hill - Construction DPM 2025                     10/24/24
* AERMET ( 16216):                                                                         14:39:03
* MODELING OPTIONS USED:   RegDFAULT  CONC  ELEV  URBAN  ADJ_U*
*         PLOT FILE OF PERIOD VALUES AVERAGED ACROSS   0 YEARS FOR SOURCE GROUP: ALL
*         FOR A TOTAL OF     9 RECEPTORS.
*         FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,I8.8,2X,A8)
*        X             Y      AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP       NUM HRS   NET ID
* ____________ ____________ _____________ ______ ______ ______ ______ ________ ________ ________
  424482.00000 3733111.00000       0.00402    30.00    30.00     0.00  PERIOD  ALL       00043848
  424498.00000 3733130.00000       0.00537    30.00    30.00     0.00  PERIOD  ALL       00043848
  424482.00000 3733144.00000       0.00411    30.00    30.00     0.00  PERIOD  ALL       00043848
  424527.00000 3733155.00000       0.00796    30.00    30.00     0.00  PERIOD  ALL       00043848
  424563.00000 3733196.00000       0.01182    30.00    30.00     0.00  PERIOD  ALL       00043848
  424588.00000 3733228.00000       0.01232    30.00    30.00     0.00  PERIOD  ALL       00043848
  424630.00000 3733232.00000       0.02513    30.00    30.00     0.00  PERIOD  ALL       00043848
  424641.00000 3733224.00000       0.02924    30.00    30.00     0.00  PERIOD  ALL       00043848
  424664.00000 3733249.00000       0.02055    30.00    30.00     0.00  PERIOD  ALL       00043848
** CONCUNIT ug/m^3
** DEPUNIT g/m^2
```

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**
****************************************
**
** AERMOD Input Produced by:
** AERMOD View Ver. 12.0.0
** Lakes Environmental Software Inc.
** Date: 10/24/2024
** File: C:\Vista Env\2024\24054 Tustin\AERMOD\2026\2026.ADI
**
****************************************
**
**
****************************************
** AERMOD Control Pathway
****************************************
**
**
CO STARTING
   TITLEONE Tustin Compass at Red Hill - Construction DPM 2026
   TITLETWO PM2.5
   MODELOPT DFAULT CONC
   AVERTIME 24 PERIOD
   URBANOPT 3010232 Orange_County
   POLLUTID PM_2.5
   RUNORNOT RUN
   ERRORFIL 2026.err
CO FINISHED
**
****************************************
** AERMOD Source Pathway
****************************************
**
**
SO STARTING
** Source Location **
** Source ID - Type - X Coord. - Y Coord. **
   LOCATION EQUIPNE      POINT      424673.180  3733220.920       30.000
** DESCRSRC Off-Road Equipment Northeast
   LOCATION EQUIPM       POINT      424611.060  3733178.530       30.000
** DESCRSRC Off-Road Equipment Middle
   LOCATION EQUIPSW      POINT      424563.560  3733123.720       30.000
** DESCRSRC Off-Road Equipment Southwest
** ------------------------------------------------------------------------
** Line Source Represented by Adjacent Volume Sources
** LINE VOLUME Source ID = RDON
** DESCRSRC Total Trucks Onsite
** PREFIX
** Length of Side = 3.66
** Configuration = Adjacent
** Emission Rate = 5.75E-08
** Vertical Dimension = 1.83
** SZINIT = 0.85
** Nodes = 3
** 424624.395, 3733113.001, 30.00, 0.00, 1.70
```

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** 424585.897, 3733143.308, 30.00, 0.00, 1.70
** 424609.651, 3733173.206, 30.00, 0.00, 1.70
** ---------------------------------------------------------------------
   LOCATION L0000036     VOLUME   424622.958 3733114.132 30.00
   LOCATION L0000037     VOLUME   424620.084 3733116.395 30.00
   LOCATION L0000038     VOLUME   424617.210 3733118.657 30.00
   LOCATION L0000039     VOLUME   424614.337 3733120.920 30.00
   LOCATION L0000040     VOLUME   424611.463 3733123.182 30.00
   LOCATION L0000041     VOLUME   424608.589 3733125.445 30.00
   LOCATION L0000042     VOLUME   424605.715 3733127.707 30.00
   LOCATION L0000043     VOLUME   424602.841 3733129.969 30.00
   LOCATION L0000044     VOLUME   424599.967 3733132.232 30.00
   LOCATION L0000045     VOLUME   424597.093 3733134.494 30.00
   LOCATION L0000046     VOLUME   424594.219 3733136.757 30.00
   LOCATION L0000047     VOLUME   424591.345 3733139.019 30.00
   LOCATION L0000048     VOLUME   424588.471 3733141.282 30.00
   LOCATION L0000049     VOLUME   424586.134 3733143.607 30.00
   LOCATION L0000050     VOLUME   424588.409 3733146.471 30.00
   LOCATION L0000051     VOLUME   424590.685 3733149.334 30.00
   LOCATION L0000052     VOLUME   424592.960 3733152.198 30.00
   LOCATION L0000053     VOLUME   424595.235 3733155.062 30.00
   LOCATION L0000054     VOLUME   424597.511 3733157.926 30.00
   LOCATION L0000055     VOLUME   424599.786 3733160.789 30.00
   LOCATION L0000056     VOLUME   424602.061 3733163.653 30.00
   LOCATION L0000057     VOLUME   424604.336 3733166.517 30.00
   LOCATION L0000058     VOLUME   424606.612 3733169.380 30.00
   LOCATION L0000059     VOLUME   424608.887 3733172.244 30.00
** End of LINE VOLUME Source ID = RDON
** ---------------------------------------------------------------------
** Line Source Represented by Adjacent Volume Sources
** LINE VOLUME Source ID = RDOFF
** DESCRSRC Construction Truck Trips on Red Hill Ave
** PREFIX
** Length of Side = 10.36
** Configuration = Adjacent
** Emission Rate = 5.98E-08
** Vertical Dimension = 1.83
** SZINIT = 0.85
** Nodes = 2
** 424629.813, 3733108.108, 30.00, 0.00, 4.82
** 424555.610, 3733016.559, 30.00, 0.00, 4.82
** ---------------------------------------------------------------------
   LOCATION L0000060     VOLUME   424626.551 3733104.083 30.00
   LOCATION L0000061     VOLUME   424620.025 3733096.032 30.00
   LOCATION L0000062     VOLUME   424613.500 3733087.981 30.00
   LOCATION L0000063     VOLUME   424606.975 3733079.930 30.00
   LOCATION L0000064     VOLUME   424600.449 3733071.879 30.00
   LOCATION L0000065     VOLUME   424593.924 3733063.829 30.00
   LOCATION L0000066     VOLUME   424587.398 3733055.778 30.00
   LOCATION L0000067     VOLUME   424580.873 3733047.727 30.00
   LOCATION L0000068     VOLUME   424574.348 3733039.676 30.00
   LOCATION L0000069     VOLUME   424567.822 3733031.625 30.00
   LOCATION L0000070     VOLUME   424561.297 3733023.575 30.00
** End of LINE VOLUME Source ID = RDOFF
```

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   LOCATION IDLE         POINT      424615.660  3733174.780       30.000
** DESCRSRC Construction Truck Idling
** Source Parameters **
   SRCPARAM EQUIPNE        0.00084     3.962   366.000        50       0.1
   SRCPARAM EQUIPM         0.00084     3.962   366.000        50       0.1
   SRCPARAM EQUIPSW        0.00084     3.962   366.000        50       0.1
** LINE VOLUME Source ID = RDON
   SRCPARAM L0000036     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000037     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000038     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000039     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000040     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000041     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000042     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000043     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000044     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000045     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000046     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000047     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000048     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000049     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000050     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000051     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000052     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000053     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000054     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000055     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000056     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000057     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000058     0.000000002396      0.00      1.70      0.85
   SRCPARAM L0000059     0.000000002396      0.00      1.70      0.85
** --------------------------------------------------------------------
** LINE VOLUME Source ID = RDOFF
   SRCPARAM L0000060     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000061     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000062     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000063     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000064     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000065     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000066     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000067     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000068     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000069     0.000000005436      0.00      4.82      0.85
   SRCPARAM L0000070     0.000000005436      0.00      4.82      0.85
** --------------------------------------------------------------------
   SRCPARAM IDLE           2.1E-07     3.658   366.000        50       0.1
   URBANSRC ALL

** Variable Emissions Type: "By Hour-of-Day (HROFDY)"
** Variable Emission Scenario: "Scenario 2"
   EMISFACT EQUIPNE      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT EQUIPNE      HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT EQUIPNE      HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT EQUIPNE      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
```

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EMISFACT EQUIPM       HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT EQUIPM       HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT EQUIPM       HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT EQUIPM       HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT EQUIPSW      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT EQUIPSW      HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT EQUIPSW      HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT EQUIPSW      HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000036     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000036     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000036     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000036     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000037     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000037     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000037     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000037     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000038     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000038     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000038     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000038     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000039     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000039     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000039     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000039     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000040     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000040     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000040     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000040     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000041     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000041     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000041     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000041     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000042     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000042     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000042     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000042     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000043     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT L0000043     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000043     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000044     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000044     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000044     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000044     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000045     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000045     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000045     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000045     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000046     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000046     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000046     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000046     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000047     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000047     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
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EMISFACT L0000047     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000047     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000048     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT L0000048     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000048     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000049     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000049     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000049     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000049     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000050     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000050     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
EMISFACT L0000050     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000050     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
EMISFACT L0000051     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT L0000059     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT L0000060     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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EMISFACT L0000060     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
EMISFACT L0000060     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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   EMISFACT L0000061     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000061     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
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   EMISFACT L0000061     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000062     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000062     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000062     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000062     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000063     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000063     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000063     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000063     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
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   EMISFACT L0000065     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000065     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000066     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000066     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000066     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000066     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000067     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000067     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000067     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000067     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000068     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000068     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000068     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000068     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000069     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000069     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000069     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000069     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000070     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   EMISFACT L0000070     HROFDY 0.0 1.0 1.0 1.0 1.0 1.0
   EMISFACT L0000070     HROFDY 1.0 1.0 1.0 1.0 0.0 0.0
   EMISFACT L0000070     HROFDY 0.0 0.0 0.0 0.0 0.0 0.0
   SRCGROUP ALL
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** AERMOD Receptor Pathway
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** AERMOD Meteorology Pathway
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ME STARTING
   SURFFILE ..\KSNA_V9_ADJU\KSNA_v9.SFC
   PROFFILE ..\KSNA_V9_ADJU\KSNA_v9.PFL
   SURFDATA 93184 2012 John_Wayne_Airport
   UAIRDATA 3190 2012
   PROFBASE 17.0 METERS
ME FINISHED
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** AERMOD Output Pathway
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OU STARTING
   RECTABLE ALLAVE 1ST
   RECTABLE 24 1ST
** Auto-Generated Plotfiles
   PLOTFILE 24 ALL 1ST 2026.AD\24H1GALL.PLT 31
   PLOTFILE PERIOD ALL 2026.AD\PE00GALL.PLT 32
   SUMMFILE 2026.sum
OU FINISHED
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** Project Parameters
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** PROJCTN  CoordinateSystemUTM
** DESCPTN  UTM: Universal Transverse Mercator
** DATUM    World Geodetic System 1984
** DTMRGN   Global Definition
** UNITS    m
** ZONE     11
** ZONEINX  0
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* AERMOD (23132 ): Tustin Compass at Red Hill - Construction DPM 2026                    10/24/24
* AERMET ( 16216):                                                                       17:05:26
* MODELING OPTIONS USED:   RegDFAULT  CONC  ELEV  URBAN  ADJ_U*
*         PLOT FILE OF PERIOD VALUES AVERAGED ACROSS   0 YEARS FOR SOURCE GROUP: ALL
*         FOR A TOTAL OF     9 RECEPTORS.
*         FORMAT: (3(1X,F13.5),3(1X,F8.2),2X,A6,2X,A8,2X,I8.8,2X,A8)
*        X             Y      AVERAGE CONC    ZELEV    ZHILL    ZFLAG    AVE     GRP       NUM HRS   NET ID
* ____________  ____________  ____________  ______  ______  ______  ______  ________  ________  ________
  424482.00000 3733111.00000       0.00803    30.00    30.00     0.00  PERIOD  ALL       00043848
  424498.00000 3733130.00000       0.01072    30.00    30.00     0.00  PERIOD  ALL       00043848
  424482.00000 3733144.00000       0.00821    30.00    30.00     0.00  PERIOD  ALL       00043848
  424527.00000 3733155.00000       0.01592    30.00    30.00     0.00  PERIOD  ALL       00043848
  424563.00000 3733196.00000       0.02362    30.00    30.00     0.00  PERIOD  ALL       00043848
  424588.00000 3733228.00000       0.02463    30.00    30.00     0.00  PERIOD  ALL       00043848
  424630.00000 3733232.00000       0.05023    30.00    30.00     0.00  PERIOD  ALL       00043848
  424641.00000 3733224.00000       0.05844    30.00    30.00     0.00  PERIOD  ALL       00043848
  424664.00000 3733249.00000       0.04108    30.00    30.00     0.00  PERIOD  ALL       00043848
** CONCUNIT ug/m^3
** DEPUNIT g/m^2
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EMFAC2021 version 1.0.2

calendar_year	season_month	sub area	vehicle class	fuel	temperature	relative humidity	process	speed time	pollutant	emission rate
2026	Annual	Orange (SC)	T7 Single Dump Class 8	Dsl	50	50	RUNEX	10	PM2_5	0.0075
2026	Annual	Orange (SC)	T7 Single Dump Class 8	Dsl	50	50	RUNEX	35	PM2_5	0.0057
2026	Annual	Orange (SC)	T7 Single Dump Class 8	Dsl			IDLEX		PM2_5	0.0177
2025	Annual	Orange (SC)	T7 Single Dump Class 8	Dsl	50	50	RUNEX	10	PM2_5	0.0076
2025	Annual	Orange (SC)	T7 Single Dump Class 8	Dsl	50	50	RUNEX	35	PM2_5	0.0058
2025	Annual	Orange (SC)	T7 Single Dump Class 8	Dsl			IDLEX		PM2_5	0.0191

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Memorandum

Date:	November 7, 2024
To:	Johanna Crooker, Vice President, MLC Holdings, Inc.
From:	Joseph Vu, Senior Biologist
Subject:	Biological Resources Memorandum for the Tustin Compass Project, City of Tustin, California

This memorandum summarizes the findings of a desktop-level biological resources evaluation, documents the existing biological conditions, and analyzes potential impacts to biological resources for the proposed Tustin Compass Project (proposed project), located in Tustin, California (Attachment A).

PROJECT LOCATION AND PROJECT DESCRIPTION

The approximately 3.39-acre project site (Assessor's Parcel Numbers [APNs] 500-141-09 and -10) is located at the northwest corner of the Red Hill Avenue and San Juan Street, within an urbanized area in the City of Tustin (City), in Orange County, California. The project site is bound by Red Hill Avenue to the east, San Juan Street to the north, Tustin High School to the west, and an alleyway and commercial uses to the south. Interstate 5 (I-5) is located approximately 500 feet south of the project site (Attachment A). The site is located within the *Tustin, California* United States Geological Survey (USGS) 7.5-minute Topographic Quadrangle Map.

The proposed project is an urban infill redevelopment project which proposes the development of 73 3-story high-density townhomes. The proposed project would also include common recreational and open space areas, parking areas, and a community entryway along Red Hill Avenue.

METHODOLOGY

Analysis of the biological resources associated with the project site entailed a thorough review of relevant literature followed by a desktop review to document existing site conditions and identify biological resources, if any, that may occur on-site. The desktop review included the entire project site as well as the immediate vicinity where possible.

Literature Review

A literature review was conducted to provide a baseline from which to evaluate the biological resources potentially occurring on the project site and in the surrounding area.

Topographic Maps and Aerial Photographs

A FirstCarbon Solutions (FCS) Biologist reviewed current topographic maps and aerial photographs as a preliminary analysis of the existing conditions within the project site and immediate vicinity. Information obtained from the review of topographic maps included elevation range, general watershed information, and potential drainage feature locations.[1] Aerial photographs provide a perspective of site conditions relative to on-site and off-site land uses, preliminary plant community locations, and potential locations of wildlife movement corridors.

Soil Surveys

An FCS Biologist reviewed the Natural Resources Conservation Service (NRCS) Web Soil Survey to determine soil series (i.e., group of soils with similar profiles) and soil mapping units occurring at the project site.[2] The Biologist reviewed habitat requirements pertaining to soils and substrates for special-status species to establish whether on-site conditions are suitable for occurrence of special-status plant and wildlife species.

Special-status Species Database Search

An FCS Biologist reviewed the California Department of Fish and Wildlife's (CDFW) California Natural Diversity Database (CNDDB), a special-status species and plant community account database, and the California Native Plant Society (CNPS) Electronic Inventory (CNPSEI) of Rare and Endangered Vascular Plants of California database for the *Tustin, California* USGS 7.5-minute Topographic Quadrangle Map and the eight surrounding quadrangles (Attachment A).[3,4]

Jurisdictional Waters and Wetlands

An FCS Biologist reviewed the United States Environmental Protection Agency (EPA) Watershed Assessment, Tracing and Environmental Results System (WATERS) and aerial photography to identify potential natural drainage features and water bodies.[5] In general, all surface drainage features identified as blue-line streams on USGS maps and linear water or wetland features that exhibit evidence of concentrated flow are considered potentially subject to State and federal regulatory authority as waters of the United States and/or State. A preliminary assessment in the field was conducted to determine the location of any existing drainages and the limits of project-related grading activities, to aid in determining whether a formal delineation of waters of the United States or State is necessary.

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[1] United States Environmental Protection Agency (EPA). 2023. Watershed Assessment, Tracking and Environmental Results System (WATERS). Website: https://www.epa.gov/waterdata/waters-watershed-assessment-tracking-environmental-results-system. Accessed November 1, 2024.

[2] United States Department of Agriculture (USDA). Natural Resources Conservation Service (NRCS). 2024. Official Soil Series Descriptions (OSD). Website: https://www.nrcs.usda.gov/resources/data-and-reports/official-soil-series-descriptions-osd. Accessed November 1, 2024.

[3] California Department of Fish and Wildlife (CDFW). 2024. CNDDB RareFind 5 California Natural Diversity Database Query for Special-Status Species. Website: https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data. Accessed November 1, 2024.

[4] California Native Plant Society (CNPS). 2024. California Native Plant Society Rare and Endangered Plant Inventory (CNPSEI). Website: http://www.rareplants.cnps.org/. Accessed November 1, 2024.

[5] United States Environmental Protection Agency (EPA). 2024. Watershed Assessment, Tracking and Environmental Results System (WATERS). Website: https://www.epa.gov/waterdata/waters-watershed-assessment-tracking-environmental-results-system. Accessed November 1, 2024.

Protected Trees

Prior to conducting the desktop review, an FCS Biologist reviewed applicable City ordinances pertaining to tree preservation and protective measures and their tree replacement conditions or permits required.

Habitat Conservation Plan

As part of the literature review, FCS also took into consideration whether the proposed project is located within the boundaries of any adopted Habitat Conservation Plan (HCP), Natural Community Conservation Plan (NCCP), or other approved local, regional, or State HCP and whether any such plan would be applicable to the proposed project.

Desktop Review

FCS Biologist Joseph Vu conducted the desktop review of the project site and its immediate vicinity. The objective of the review was to assess and characterize the biological conditions on and adjacent to the site, including the potential of special-status plant and wildlife species and their habitats. During the review, FCS Biologist analyzed for evidence of habitat for special-status species and other sensitive biological resources that were identified in the literature review.

RESULTS

Existing Conditions

The project site is currently a disturbed lot in the urban part of the City. Historic aerial photographs show the site as fully developed and containing paved parking lots and two buildings, one of which was taken down around 2008. A smaller building existed on the northeast corner of the site until 2022, when it was taken down.

Soils

According to the NRCS Web Soil Survey, the project site consists of Mocho loam, 0 to 2 percent slopes, warm MAAT, MLRA 19.[6] This soil type is not considered a hydric soil.

Vegetation Communities or Land Cover

Ruderal

Ruderal vegetation is the dominant vegetation community in the project site. This land cover type is characterized by disturbed, cleared, and/or bare ground that is being invaded by native and non-native ruderal plant species. This vegetation community is composed of non-native plant species, such as ornamentals or ruderal exotic species that take advantage of disturbance or that exhibit signs of past or

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[6] United States Department of Agriculture (USDA). Natural Resources Conservation Service (NRCS). 2024. Official Soil Series Descriptions (OSD). Website: https://www.nrcs.usda.gov/resources/data-and-reports/official-soil-series-descriptions-osd. Accessed November 1, 2024.

present animal usage that precludes them from providing viable natural habitat for uses other than dispersal.

Wildlife

The project site may provide habitat for generalist and opportunistic wildlife species that are able to tolerate high levels of habitat disturbance. Potential species that could exist on-site may include common species such as ground squirrel (*Spermophilus beecheyi*), American crow (*Corvus brachyrhynchos*), and western fence lizard (*Sceloporus undulatus*).

Special-status Plant and Animal Species

The project site does not provide habitat for any rare, endangered, threatened, or special-status wildlife and plant species as recorded in the CNDDB and CNPS Inventories. This is attributable to the disturbed state of the project site and it being maintained on a regular basis, resulting in the lack of natural vegetation and the lack of suitable substrates. Attachment B provides a list of special-status animals evaluated for the project site the desktop review. Species were evaluated based on the following factors, including: (1) species identified by the CNDDB as occurring (either currently or historically) on or in the vicinity of the project site, and (2) any other special-status animals that are known to occur within the vicinity of the project site, for which potentially suitable habitat occurs on the site.

Jurisdictional Waters and Wetlands

No wetlands, riparian habitat, or other aquatic features that meet criteria as waters of the United States or State are anticipated to occur based on the desktop review.

Wildlife Movement Corridors and Nursery Sites

The project site consists primarily of ruderal vegetation and is surrounded by urban development that limits wildlife movement. Therefore, the project site itself does not serve as a wildlife movement corridor.

Protected Trees

The project site does not contain any trees. As such, no trees protected under any City regulations would be impacted as part of the proposed project.

Habitat Conservation Plans

The project site is within the boundary of the County of Orange (Central/Coastal) NCCP/HCP Program. However, the project site is not within an NCCP/HCP-designated reserve or conservation easement lands and the proposed project would not impact coastal sage scrub vegetation community. As such, implementation of the proposed project would be consistent with the rules and regulations of the County (Central/Coastal) NCCP/HCP, and, therefore, no impacts are anticipated with project implementation.

CONCLUSIONS

The biological memorandum determined the following:

- The project site does not contain suitable habitat for any rare, endangered, threatened, or special-status wildlife and plant species or riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the CDFW or USFWS.
- The project site does not contain potentially jurisdictional wetlands or waters of the United States or waters of the State.
- The proposed project would not significantly impact any known wildlife corridors or nursery sites as none are locally present.
- The proposed project would not conflict with any NCCP or HCP or other approved local, regional, or State HCP.
- The project site does not contain any suitable vegetation or structures that nesting birds could use.

If you have any questions or comments regarding the memorandum provided, please contact me at jvu@fcs-intl.com via email or 714.7222032 via telephone.

Sincerely,

Joseph Vu
Senior Biologist
FirstCarbon Solutions
250 Commerce, Suite 210
Irvine, CA 92602

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Attachment A:
Site Plan

Selected Elements by Scientific Name

California Department of Fish and Wildlife

California Natural Diversity Database

Query Criteria: Quad IS (Anaheim (3311778) OR Orange (3311777) OR Black Star Canyon (3311776) OR Newport Beach (3311768) OR Tustin (3311767) OR El Toro (3311766) OR Laguna Beach (3311757) OR San Juan Capistrano (3311756))

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Abronia villosa var. aurita chaparral sand-verbena	PDNYC010P1	None	None	G5T2?	S2	1B.1
Accipiter cooperii Cooper's hawk	ABNKC12040	None	None	G5	S4	WL
Actinemys pallida southwestern pond turtle	ARAAD02032	Proposed Threatened	None	G2G3	SNR	SSC
Agelaius tricolor tricolored blackbird	ABPBXB0020	None	Threatened	G1G2	S2	SSC
Aimophila ruficeps canescens southern California rufous-crowned sparrow	ABPBX91091	None	None	G5T3	S4	WL
Allium marvinii Yucaipa onion	PMLIL02330	None	None	G1	S1	1B.2
Ammodramus savannarum grasshopper sparrow	ABPBXA0020	None	None	G5	S3	SSC
Anaxyrus californicus arroyo toad	AAABB01230	Endangered	None	G2G3	S2	SSC
Anniella stebbinsi Southern California legless lizard	ARACC01060	None	None	G3	S3	SSC
Antrozous pallidus pallid bat	AMACC10010	None	None	G4	S3	SSC
Aphanisma blitoides aphanisma	PDCHE02010	None	None	G3G4	S2	1B.2
Ardea herodias great blue heron	ABNGA04010	None	None	G5	S4	
Arizona elegans occidentalis California glossy snake	ARADB01017	None	None	G5T2	S2	SSC
Asio otus long-eared owl	ABNSB13010	None	None	G5	S3?	SSC
Aspidoscelis hyperythra orange-throated whiptail	ARACJ02060	None	None	G5	S2S3	WL
Aspidoscelis tigris stejnegeri coastal whiptail	ARACJ02143	None	None	G5T5	S3	SSC
Astragalus brauntonii Braunton's milk-vetch	PDFAB0F1G0	Endangered	None	G2	S2	1B.1
Astragalus hornii var. hornii Horn's milk-vetch	PDFAB0F421	None	None	GUT1	S1	1B.1
Athene cunicularia burrowing owl	ABNSB10010	None	None	G4	S2	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Atriplex coulteri Coulter's saltbush	PDCHE040E0	None	None	G3	S2	1B.2
Atriplex pacifica south coast saltscale	PDCHE041C0	None	None	G4	S2	1B.2
Atriplex parishii Parish's brittlescale	PDCHE041D0	None	None	G1G2	S1	1B.1
Atriplex serenana var. davidsonii Davidson's saltscale	PDCHE041T1	None	None	G5T1	S1	1B.2
Baccharis malibuensis Malibu baccharis	PDAST0W0W0	None	None	G1	S1	1B.1
Bombus crotchii Crotch's bumble bee	IIHYM24480	None	Candidate Endangered	G2	S2	
Bombus pensylvanicus American bumble bee	IIHYM24260	None	None	G3G4	S2	
Branchinecta sandiegonensis San Diego fairy shrimp	ICBRA03060	Endangered	None	G2	S1	
Brodiaea filifolia thread-leaved brodiaea	PMLIL0C050	Threatened	Endangered	G2	S2	1B.1
Buteo regalis ferruginous hawk	ABNKC19120	None	None	G4	S3S4	WL
Buteo swainsoni Swainson's hawk	ABNKC19070	None	Threatened	G5	S4	
California Walnut Woodland California Walnut Woodland	CTT71210CA	None	None	G2	S2.1	
Calochortus plummerae Plummer's mariposa-lily	PMLIL0D150	None	None	G4	S4	4.2
Calochortus weedii var. intermedius intermediate mariposa-lily	PMLIL0D1J1	None	None	G3G4T3	S3	1B.2
Campylorhynchus brunneicapillus sandiegensis coastal cactus wren	ABPBG02095	None	None	G5T3Q	S2	SSC
Catostomus santaanae Santa Ana sucker	AFCJC02190	Threatened	None	G1	S1	SSC
Centromadia parryi ssp. australis southern tarplant	PDAST4R0P4	None	None	G3T2	S2	1B.1
Chaenactis glabriuscula var. orcuttiana Orcutt's pincushion	PDAST20095	None	None	G5T1	S1	1B.1
Chaetodipus fallax fallax northwestern San Diego pocket mouse	AMAFD05031	None	None	G5T3T4	S3S4	
Charadrius nivosus nivosus western snowy plover	ABNNB03031	Threatened	None	G3T3	S3	SSC
Chloropyron maritimum ssp. maritimum salt marsh bird's-beak	PDSCR0J0C2	Endangered	Endangered	G4?T1	S1	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Choeronycteris mexicana Mexican long-tongued bat	AMACB02010	None	None	G3G4	S1	SSC
Chorizanthe parryi var. fernandina San Fernando Valley spineflower	PDPGN040J1	None	Endangered	G3T1	S1	1B.1
Chorizanthe polygonoides var. longispina long-spined spineflower	PDPGN040K1	None	None	G5T3	S3	1B.2
Cicindela hirticollis gravida sandy beach tiger beetle	IICOL02101	None	None	G5T2	S2	
Cicindela latesignata western beach tiger beetle	IICOL02110	None	None	G2G3	S1	
Coccyzus americanus occidentalis western yellow-billed cuckoo	ABNRB02022	Threatened	Endangered	G5T2T3	S1	
Coelus globosus globose dune beetle	IICOL4A010	None	None	G1G2	S1S2	
Comarostaphylis diversifolia ssp. diversifolia summer holly	PDERI0B011	None	None	G3T2	S2	1B.2
Coturnicops noveboracensis yellow rail	ABNME01010	None	None	G4	S2	SSC
Crotalus ruber red-diamond rattlesnake	ARADE02090	None	None	G4	S3	SSC
Danaus plexippus plexippus pop. 1 monarch - California overwintering population	IILEPP2012	Candidate	None	G4T1T2Q	S2	
Dudleya multicaulis many-stemmed dudleya	PDCRA040H0	None	None	G2	S2	1B.2
Dudleya stolonifera Laguna Beach dudleya	PDCRA040P0	Threatened	Threatened	G1	S1	1B.1
Elanus leucurus white-tailed kite	ABNKC06010	None	None	G5	S3S4	FP
Eremophila alpestris actia California horned lark	ABPAT02011	None	None	G5T4Q	S4	WL
Eriastrum densifolium ssp. sanctorum Santa Ana River woollystar	PDPLM03035	Endangered	Endangered	G4T1	S1	1B.1
Eryngium aristulatum var. parishii San Diego button-celery	PDAPI0Z042	Endangered	Endangered	G5T1	S1	1B.1
Eucyclogobius newberryi tidewater goby	AFCQN04010	Endangered	None	G3	S3	SSC
Eumops perotis californicus western mastiff bat	AMACD02011	None	None	G4G5T4	S3S4	SSC
Euphorbia misera cliff spurge	PDEUP0Q1B0	None	None	G5	S2	2B.2
Euphydryas editha quino quino checkerspot butterfly	IILEPK405L	Endangered	None	G4G5T1T2	S1S2	

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Falco peregrinus anatum American peregrine falcon	ABNKD06071	Delisted	Delisted	G4T4	S3S4	
Gila orcuttii arroyo chub	AFCJB13120	None	None	G1	S2	SSC
Glyptostoma gabrielense San Gabriel chestnut	IMGASB1010	None	None	G2	S3	
Habroscelimorpha gabbii western tidal-flat tiger beetle	IICOL02080	None	None	G2G4	S1	
Haliaeetus leucocephalus bald eagle	ABNKC10010	Delisted	Endangered	G5	S3	FP
Helianthus nuttallii ssp. parishii Los Angeles sunflower	PDAST4N102	None	None	G5TX	SX	1A
Hesperocyparis forbesii Tecate cypress	PGCUP040C0	None	None	G2	S2	1B.1
Horkelia cuneata var. puberula mesa horkelia	PDROS0W045	None	None	G4T1	S1	1B.1
Icteria virens yellow-breasted chat	ABPBX24010	None	None	G5	S4	SSC
Isocoma menziesii var. decumbens decumbent goldenbush	PDAST57091	None	None	G3G5T2T3	S2	1B.2
Lasiurus cinereus hoary bat	AMACC05032	None	None	G3G4	S4	
Lasthenia glabrata ssp. coulteri Coulter's goldfields	PDAST5L0A1	None	None	G4T2	S2	1B.1
Laterallus jamaicensis coturniculus California black rail	ABNME03041	None	Threatened	G3T1	S2	FP
Lepechinia cardiophylla heart-leaved pitcher sage	PDLAM0V020	None	None	G3	S2S3	1B.2
Lepidium virginicum var. robinsonii Robinson's pepper-grass	PDBRA1M114	None	None	G5T3	S3	4.3
Monardella hypoleuca ssp. intermedia intermediate monardella	PDLAM180A4	None	None	G4T2?	S2?	1B.3
Myotis yumanensis Yuma myotis	AMACC01020	None	None	G5	S4	
Nama stenocarpa mud nama	PDHYD0A0H0	None	None	G4G5	S1S2	2B.2
Nasturtium gambelii Gambel's water cress	PDBRA270V0	Endangered	Threatened	G1	S1	1B.1
Navarretia prostrata prostrate vernal pool navarretia	PDPLM0C0Q0	None	None	G2	S2	1B.2
Nemacaulis denudata var. denudata coast woolly-heads	PDPGN0G011	None	None	G3G4T2	S2	1B.2

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Neotoma lepida intermedia San Diego desert woodrat	AMAFF08041	None	None	G5T3T4	S3S4	SSC
Nolina cismontana chaparral nolina	PMAGA080E0	None	None	G3	S3	1B.2
Nyctinomops macrotis big free-tailed bat	AMACD04020	None	None	G5	S3	SSC
Oncorhynchus mykiss irideus pop. 10 steelhead - southern California DPS	AFCHA0209J	Endangered	Candidate Endangered	G5T1Q	S1	
Onychomys torridus ramona southern grasshopper mouse	AMAFF06022	None	None	G5T3	S3	SSC
Orcuttia californica California Orcutt grass	PMPOA4G010	Endangered	Endangered	G1	S1	1B.1
Pandion haliaetus osprey	ABNKC01010	None	None	G5	S4	WL
Panoquina errans wandering (=saltmarsh) skipper	IILEP84030	None	None	G4	S2	
Passerculus sandwichensis beldingi Belding's savannah sparrow	ABPBX99015	None	Endangered	G5T3	S3	
Penstemon californicus California beardtongue	PDSCR1L110	None	None	G3	S2	1B.2
Pentachaeta aurea ssp. allenii Allen's pentachaeta	PDAST6X021	None	None	G4T1	S1	1B.1
Perognathus longimembris pacificus Pacific pocket mouse	AMAFD01042	Endangered	None	G5T2	S2	SSC
Phrynosoma blainvillii coast horned lizard	ARACF12100	None	None	G4	S4	SSC
Polioptila californica californica coastal California gnatcatcher	ABPBJ08081	Threatened	None	G4G5T3Q	S2	SSC
Pseudognaphalium leucocephalum white rabbit-tobacco	PDAST440C0	None	None	G4	S2	2B.2
Quercus dumosa Nuttall's scrub oak	PDFAG050D0	None	None	G3	S3	1B.1
Rallus obsoletus levipes light-footed Ridgway's rail	ABNME05014	Endangered	Endangered	G3T1T2	S1	FP
Rhinichthys gabrielino Santa Ana speckled dace	AFCJB3705K	Proposed Threatened	None	G5T1	S1	SSC
Riparia riparia bank swallow	ABPAU08010	None	Threatened	G5	S3	
Riversidian Alluvial Fan Sage Scrub Riversidian Alluvial Fan Sage Scrub	CTT32720CA	None	None	G1	S1.1	
Salvadora hexalepis virgultea coast patch-nosed snake	ARADB30033	None	None	G5T4	S3	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Senecio aphanactis chaparral ragwort	PDAST8H060	None	None	G3	S2	2B.2
Setophaga petechia yellow warbler	ABPBX03010	None	None	G5	S3	SSC
Sidalcea neomexicana salt spring checkerbloom	PDMAL110J0	None	None	G4	S2	2B.2
Sorex ornatus salicornicus southern California saltmarsh shrew	AMABA01104	None	None	G5T1?	S1	SSC
Southern California Arroyo Chub/Santa Ana Sucker Stream Southern California Arroyo Chub/Santa Ana Sucker Stream	CARE2330CA	None	None	GNR	SNR	
Southern Coast Live Oak Riparian Forest Southern Coast Live Oak Riparian Forest	CTT61310CA	None	None	G4	S4	
Southern Coastal Salt Marsh Southern Coastal Salt Marsh	CTT52120CA	None	None	G2	S2.1	
Southern Cottonwood Willow Riparian Forest Southern Cottonwood Willow Riparian Forest	CTT61330CA	None	None	G3	S3.2	
Southern Dune Scrub Southern Dune Scrub	CTT21330CA	None	None	G1	S1.1	
Southern Foredunes Southern Foredunes	CTT21230CA	None	None	G2	S2.1	
Southern Interior Cypress Forest Southern Interior Cypress Forest	CTT83230CA	None	None	G2	S2.1	
Southern Riparian Scrub Southern Riparian Scrub	CTT63300CA	None	None	G3	S3.2	
Southern Sycamore Alder Riparian Woodland Southern Sycamore Alder Riparian Woodland	CTT62400CA	None	None	G4	S4	
Southern Willow Scrub Southern Willow Scrub	CTT63320CA	None	None	G3	S2.1	
Spea hammondii western spadefoot	AAABF02020	Proposed Threatened	None	G2G3	S3S4	SSC
Sternula antillarum browni California least tern	ABNNM08103	Endangered	Endangered	G4T2T3Q	S2	FP
Streptocephalus woottoni Riverside fairy shrimp	ICBRA07010	Endangered	None	G1G2	S2	
Suaeda esteroa estuary seablite	PDCHE0P0D0	None	None	G3	S2	1B.2
Symphyotrichum defoliatum San Bernardino aster	PDASTE80C0	None	None	G2	S2	1B.2
Taricha torosa Coast Range newt	AAAAF02032	None	None	G4	S4	SSC
Taxidea taxus American badger	AMAJF04010	None	None	G5	S3	SSC

Species	Element Code	Federal Status	State Status	Global Rank	State Rank	Rare Plant Rank/CDFW SSC or FP
Thamnophis hammondii two-striped gartersnake	ARADB36160	None	None	G4	S3S4	SSC
Tryonia imitator mimic tryonia (=California brackishwater snail)	IMGASJ7040	None	None	G2	S2	
Valley Needlegrass Grassland Valley Needlegrass Grassland	CTT42110CA	None	None	G3	S3.1	
Verbesina dissita big-leaved crownbeard	PDAST9R050	Threatened	Threatened	G1G2	S1	1B.1
Vireo bellii pusillus least Bell's vireo	ABPBW01114	Endangered	Endangered	G5T2	S3	

Record Count: 129

California
Native Plant Society

CNPS Rare Plant Inventory

Search Results

72 matches found. Click on scientific name for details

Search Criteria: 9-Quad include [**3311757:3311767:3311766:3311776:3311756:3311778:3311777:3311768**]

▲ SCIENTIFIC NAME	COMMON NAME	FAMILY	LIFEFORM	BLOOMING PERIOD	FED LIST	STATE LIST	GLOBAL RANK	STATE RANK	CA RARE PLANT RANK	CA ENDEMIC	DATE ADDED
Abronia maritima	red sand-verbena	Nyctaginaceae	perennial herb	Feb-Nov	None	None	G4	S3?	4.2		1994-01-01
Abronia villosa var. aurita	chaparral sand-verbena	Nyctaginaceae	annual herb	(Jan)Mar-Sep	None	None	G5T2?	S2	1B.1		2001-01-01
Allium marvinii	Yucaipa onion	Alliaceae	perennial bulbiferous herb	Apr-May	None	None	G1	S1	1B.2	Yes	2001-01-01
Aphanisma blitoides	aphanisma	Chenopodiaceae	annual herb	Feb-Jun	None	None	G3G4	S2	1B.2		1980-01-01
Astragalus brauntonii	Braunton's milk-vetch	Fabaceae	perennial herb	Jan-Aug	FE	None	G2	S2	1B.1	Yes	1974-01-01
Astragalus hornii var. hornii	Horn's milk-vetch	Fabaceae	annual herb	May-Oct	None	None	GUT1	S1	1B.1		2006-12-01
Atriplex coulteri	Coulter's saltbush	Chenopodiaceae	perennial herb	Mar-Oct	None	None	G3	S2	1B.2		1994-01-01
Atriplex pacifica	south coast saltscale	Chenopodiaceae	annual herb	Mar-Oct	None	None	G4	S2	1B.2		1994-01-01
Atriplex parishii	Parish's brittlescale	Chenopodiaceae	annual herb	Jun-Oct	None	None	G1G2	S1	1B.1		1988-01-01
Atriplex serenana var. davidsonii	Davidson's saltscale	Chenopodiaceae	annual herb	Apr-Oct	None	None	G5T1	S1	1B.2		1994-01-01
Baccharis malibuensis	Malibu baccharis	Asteraceae	perennial deciduous shrub	Aug	None	None	G1	S1	1B.1	Yes	2001-01-01
Bahiopsis laciniata	San Diego County viguiera	Asteraceae	perennial shrub	Feb-Jun(Aug)	None	None	G4	S4	4.3		1974-01-01
Brodiaea filifolia	thread-leaved brodiaea	Themidaceae	perennial bulbiferous herb	Mar-Jun	FT	CE	G2	S2	1B.1	Yes	1974-01-01
Calandrinia breweri	Brewer's calandrinia	Montiaceae	annual herb	(Jan)Mar-Jun	None	None	G4	S4	4.2		1994-01-01
Calochortus catalinae	Catalina mariposa lily	Liliaceae	perennial bulbiferous herb	(Feb)Mar-Jun	None	None	G3G4	S3S4	4.2	Yes	1974-01-01
Calochortus plummerae	Plummer's mariposa-lily	Liliaceae	perennial bulbiferous herb	May-Jul	None	None	G4	S4	4.2	Yes	1994-01-01

Calochortus weedii var. *intermedius*	intermediate mariposa-lily	Liliaceae	perennial bulbiferous herb	May-Jul	None	None	G3G4T3	S3	1B.2	Yes	1994-01-01
Camissoniopsis lewisii	Lewis' evening-primrose	Onagraceae	annual herb	Mar-May(Jun)	None	None	G4	S4	3		1994-01-01
Centromadia parryi ssp. *australis*	southern tarplant	Asteraceae	annual herb	May-Nov	None	None	G3T2	S2	1B.1		1994-01-01
Chaenactis glabriuscula var. *orcuttiana*	Orcutt's pincushion	Asteraceae	annual herb	Jan-Aug	None	None	G5T1	S1	1B.1		2001-01-01
Chloropyron maritimum ssp. *maritimum*	salt marsh bird's-beak	Orobanchaceae	annual herb (hemiparasitic)	May-Oct(Nov)	FE	CE	G4?T1	S1	1B.2		1974-01-01
Chorizanthe parryi var. *fernandina*	San Fernando Valley spineflower	Polygonaceae	annual herb	Apr-Jul	None	CE	G3T1	S1	1B.1	Yes	1974-01-01
Chorizanthe polygonoides var. *longispina*	long-spined spineflower	Polygonaceae	annual herb	Apr-Jul	None	None	G5T3	S3	1B.2		1994-01-01
Cistanthe maritima	seaside cistanthe	Montiaceae	annual herb	(Feb)Mar-Jun(Aug)	None	None	G3G4	S3	4.2		1980-01-01
Comarostaphylis diversifolia ssp. *diversifolia*	summer holly	Ericaceae	perennial evergreen shrub	Apr-Jun	None	None	G3T2	S2	1B.2		1980-01-01
Convolvulus simulans	small-flowered morning-glory	Convolvulaceae	annual herb	Mar-Jul	None	None	G4	S4	4.2		1994-01-01
Deinandra paniculata	paniculate tarplant	Asteraceae	annual herb	(Mar)Apr-Nov	None	None	G4	S4	4.2		2001-01-01
Dichondra occidentalis	western dichondra	Convolvulaceae	perennial rhizomatous herb	(Jan)Mar-Jul	None	None	G3G4	S3S4	4.2		1974-01-01
Diplacus clevelandii	Cleveland's bush monkeyflower	Phrymaceae	perennial rhizomatous herb	Apr-Jul	None	None	G4	S4	4.2		1980-01-01
Dudleya multicaulis	many-stemmed dudleya	Crassulaceae	perennial herb	Apr-Jul	None	None	G2	S2	1B.2	Yes	1974-01-01
Dudleya stolonifera	Laguna Beach dudleya	Crassulaceae	perennial stoloniferous herb	May-Jul	FT	CT	G1	S1	1B.1	Yes	1974-01-01
Eleocharis parvula	small spikerush	Cyperaceae	perennial herb	(Apr)Jun-Aug(Sep)	None	None	G5	S3	4.3		1980-01-01
Eriastrum densifolium ssp. *sanctorum*	Santa Ana River woollystar	Polemoniaceae	perennial herb	Apr-Sep	FE	CE	G4T1	S1	1B.1	Yes	1980-01-01
Eryngium aristulatum var. *parishii*	San Diego button-celery	Apiaceae	annual/perennial herb	Apr-Jun	FE	CE	G5T1	S1	1B.1		1974-01-01
Euphorbia misera	cliff spurge	Euphorbiaceae	perennial shrub	(Oct)Dec-Aug	None	None	G5	S2	2B.2		1974-01-01

Harpagonella palmeri	Palmer's grapplinghook	Boraginaceae	annual herb	Mar-May	None	None	G4	S3	4.2		1980-01-01
Helianthus nuttallii ssp. *parishii*	Los Angeles sunflower	Asteraceae	perennial rhizomatous herb	Aug-Oct	None	None	G5TX	SX	1A	Yes	1974-01-01
Hesperocyparis forbesii	Tecate cypress	Cupressaceae	perennial evergreen tree		None	None	G2	S2	1B.1		1974-01-01
Hesperocyparis goveniana	Gowen cypress	Cupressaceae	perennial evergreen tree		FT	None	G1	S1	1B.2	Yes	1980-01-01
Hordeum intercedens	vernal barley	Poaceae	annual herb	Mar-Jun	None	None	G3G4	S3S4	3.2		1994-01-01
Horkelia cuneata var. *puberula*	mesa horkelia	Rosaceae	perennial herb	Feb-Jul(Sep)	None	None	G4T1	S1	1B.1	Yes	2001-01-01
Isocoma menziesii var. *decumbens*	decumbent goldenbush	Asteraceae	perennial shrub	Apr-Nov	None	None	G3G5T2T3	S2	1B.2		1994-01-01
Juglans californica	Southern California black walnut	Juglandaceae	perennial deciduous tree	Mar-Aug	None	None	G4	S4	4.2	Yes	1994-01-01
Juncus acutus ssp. *leopoldii*	southwestern spiny rush	Juncaceae	perennial rhizomatous herb	(Mar)May-Jun	None	None	G5T5	S4	4.2		1988-01-01
Lasthenia glabrata ssp. *coulteri*	Coulter's goldfields	Asteraceae	annual herb	Feb-Jun	None	None	G4T2	S2	1B.1		1994-01-01
Lepechinia cardiophylla	heart-leaved pitcher sage	Lamiaceae	perennial shrub	Apr-Jul	None	None	G3	S2S3	1B.2		1974-01-01
Lepidium virginicum var. *robinsonii*	Robinson's pepper-grass	Brassicaceae	annual herb	Jan-Jul	None	None	G5T3	S3	4.3		1994-01-01
Lilium humboldtii ssp. *ocellatum*	ocellated Humboldt lily	Liliaceae	perennial bulbiferous herb	Mar-Jul(Aug)	None	None	G4T4?	S4?	4.2	Yes	1980-01-01
Lycium californicum	California box-thorn	Solanaceae	perennial shrub	Mar-Aug(Dec)	None	None	G4	S4	4.2		2001-01-01
Malacothrix saxatilis var. *saxatilis*	cliff malacothrix	Asteraceae	perennial rhizomatous herb	Mar-Sep	None	None	G5T4	S4	4.2	Yes	2001-01-01
Monardella hypoleuca ssp. *intermedia*	intermediate monardella	Lamiaceae	perennial rhizomatous herb	Apr-Sep	None	None	G4T2?	S2?	1B.3	Yes	2012-10-16
Nama stenocarpa	mud nama	Namaceae	annual/perennial herb	Jan-Jul	None	None	G4G5	S1S2	2B.2		1994-01-01
Nasturtium gambelii	Gambel's water cress	Brassicaceae	perennial rhizomatous herb	Apr-Oct	FE	CT	G1	S1	1B.1		1980-01-01
Navarretia prostrata	prostrate vernal pool navarretia	Polemoniaceae	annual herb	Apr-Jul	None	None	G2	S2	1B.2	Yes	2001-01-01
Nemacaulis denudata var. *denudata*	coast woolly-heads	Polygonaceae	annual herb	Apr-Sep	None	None	G3G4T2	S2	1B.2		1994-01-01
Nolina cismontana	chaparral nolina	Ruscaceae	perennial evergreen shrub	(Mar)May-Jul	None	None	G3	S3	1B.2	Yes	2001-01-01
Orcuttia californica	California Orcutt grass	Poaceae	annual herb	Apr-Aug	FE	CE	G1	S1	1B.1		1974-01-01

Penstemon californicus	California beardtongue	Plantaginaceae	perennial herb	May-Jun(Aug)	None	None	G3	S2	1B.2		1974-01-01
Pentachaeta aurea ssp. allenii	Allen's pentachaeta	Asteraceae	annual herb	Mar-Jun	None	None	G4T1	S1	1B.1	Yes	2008-05-08
Phacelia hubbyi	Hubby's phacelia	Hydrophyllaceae	annual herb	Apr-Jul	None	None	G4	S4	4.2	Yes	2007-02-02
Phacelia ramosissima var. australitoralis	south coast branching phacelia	Hydrophyllaceae	perennial herb	Mar-Aug	None	None	G5?T3Q	S3	3.2		2007-05-17
Pseudognaphalium leucocephalum	white rabbit-tobacco	Asteraceae	perennial herb	(Jul)Aug-Nov(Dec)	None	None	G4	S2	2B.2		2006-11-03
Quercus dumosa	Nuttall's scrub oak	Fagaceae	perennial evergreen shrub	Feb-Apr(May-Aug)	None	None	G3	S3	1B.1		1994-01-01
Rhinotropis cornuta var. fishiae	Fish's milkwort	Polygalaceae	perennial deciduous shrub	May-Aug	None	None	G5T4	S4	4.3		1974-01-01
Romneya coulteri	Coulter's matilija poppy	Papaveraceae	perennial rhizomatous herb	Mar-Jul(Aug)	None	None	G4	S4	4.2		1974-01-01
Selaginella cinerascens	ashy spike-moss	Selaginellaceae	perennial rhizomatous herb		None	None	G3G4	S3?	4.1		1974-01-01
Senecio aphanactis	chaparral ragwort	Asteraceae	annual herb	Jan-Apr(May)	None	None	G3	S2	2B.2		1994-01-01
Sidalcea neomexicana	salt spring checkerbloom	Malvaceae	perennial herb	Mar-Jun	None	None	G4	S2	2B.2		1994-01-01
Suaeda esteroa	estuary seablite	Chenopodiaceae	perennial herb	(Jan-May)Jul-Oct	None	None	G3	S2	1B.2		1984-01-01
Suaeda taxifolia	woolly seablite	Chenopodiaceae	perennial evergreen shrub	Jan-Dec	None	None	G4	S3S4	4.2		1994-01-01
Symphyotrichum defoliatum	San Bernardino aster	Asteraceae	perennial rhizomatous herb	Jul-Nov	None	None	G2	S2	1B.2	Yes	2004-01-01
Verbesina dissita	big-leaved crownbeard	Asteraceae	perennial herb	(Mar)Apr-Jul	FT	CT	G1G2	S1	1B.1		1984-01-01

Showing 1 to 72 of 72 entries

Suggested Citation:

California Native Plant Society, Rare Plant Program. 2024. Rare Plant Inventory (online edition, v9.5). Website https://www.rareplants.cnps.org [accessed 31 October 2024].

FCS
An ADEC Innovation

Attachment B:
Literature Search Results

Guest Parking

- Located at back of project to preserve streetscene along Red Hill Avenue
- Provides a buffer between homes and high school sports fields
- Separated from fields by block wall and landscaping to preserve privacy

Primary Common Recreation Area

- Tot Lot with fixed seating
- Central gathering space with shade structure, barbecue counters, and fixed tables with seating
- Open turf area for free play
- (See Sheet L-1.00 and Sheet L-1.03)

Residential Townhomes

- Three-story R-3 Townhomes
- 1210-1791 square feet
- 2-3 Bedrooms
- 2-Car Garages in both tandem and side-by side configurations to achieve density

Neighbor Adjacency

- Existing block walls to be protected in place and painted with anti-graffiti coating
- Planting to include vertical evergreen screen trees (See Sheet L-1)

Summary

Site Area: 3.39 acres

Total Homes: 73
- (4) Plan 2531X: 1,210 SF, 2 Bed, 2.5 Bath, Standard Garage
- (4) Plan 2532X: 1,210 SF, 2 Bed, 2.5 Bath, Standard Garage
- (32) Plan 1633: 1,497 SF, 3 Bed, 3 Bath, Tandem Garage
- (33) Plan 1638: 1,791SF, 4 Bed, 4 Bath, Standard, Garage

Net Density: 21.53 du/ac

Parking Spaces Required: 165 Total Spaces
- 2 covered per unit
- 1 guest space p

Parking Spaces Provided: 165 Total Spaces
- 2 garage per unit = 146
- Off-street Guest = 19

Open Spaces Required: 300 SF per unit

Open Space Provided: 361 per unit (

Notes:
GP: Red Hill Avenue Specific Plan (RHASP)
Zoning: Red Hill Avenue Specific Plan (RHASP)
APN: 500-141-09 and -10

San Juan Frontage

- Homes are oriented toward San Juan to face and engage single family homes across the street
- New street trees to be planted to enhance entry into the existing residential neighborhood

Secondary Common Recreation Area

- Tot Lot with fixed seating
- Central gathering space with shade structure, barbecue counters, and fixed tables with seating
- Open turf area for free play
- (See Sheet L-1.00 and Sheet L-1.03)

Corner Plaza

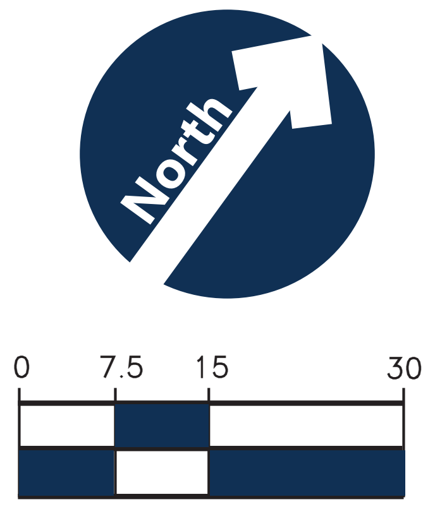
- Plaza space accessible to the public welcomes visitors, engages neighbors, and activates the corner
- Low walls with Secondary Gateway Signage will announces entry into the District
- Enhanced with trees, landscaping, and a pet station to serve the neighborhood
- A future mural or other public art will also be incorporated into the space or as part of the Gateway Signage
- (See Sheet L-1.00 and Sheet L-1.03)

Community Entry

- New Signalized intersection with continental crosswalks will provide connectivity to commercial uses across the street (to be illustrated on future submittal)
- Entry to be enhanced with focal accent trees, landscaping, special paving and community signage to announce arrival
- Glazing wraps at entry to anchor corner and establish a commercial presence
- Street curb to be redesigned with deceleration and acceleration lanes

Red Hill Avenue Frontage

- Homes are designed to front along Red Hill Avenue and provide a superior street scene
- Front doors and porches face the sidewalk to create a welcoming and pedestrian friendly corridor
- Second story balconies and windows face the street to support "eyes-on" security and further activate the district
- Expanded parkways with trees will grow to provide shade, beauty, and comfort to new sidewalks and Class II bike lanes, promoting walking and biking



Kimley»Horn

Illustrative Site Plan

Red Hill & San Juan

Tustin, California

MeritageHomes
MLC Holdings, Inc.

S/A GEOTECHNICAL
OPTIMIZED SOIL ENGINEERING

February 2, 2023

Project No. 24011-01

To: Meritage Homes
5 Peters Canyon Road, Suite 310
Irvine, California 92606

Attention: Ms. Johanna Crooker

Subject: Geotechnical Due Diligence Review, Subsurface Exploration and Preliminary Design, Proposed 76-Unit Residential Development, 13841 and 13751 Red Hill Avenue, City of Tustin, California

At your request, SA Geotechnical, Inc. (SA GEO) has conducted geotechnical due diligence review and subsurface exploration for the proposed residential development at 13841 and 13751 Red Avenue in the City of Tustin, California (Figure 1). The purpose of this study was to evaluate the geotechnical site conditions in light of the proposed grading and improvements in order to provide a geotechnical summary and preliminary geotechnical recommendations for project design, grading, and construction. Our evaluation included review of background geologic and geotechnical engineering maps and reports for the subject site; review of the prior site-specific geotechnical reports provided by you; subsurface exploration; geotechnical analysis; and preparation of this report.

The subject site is a vacant/dirt lot that was previously occupied by a church facility (13841 Red Hill Avenue) and commercial building (13751 Red Hill Avenue). Based on our review and subsurface exploration, the primary geotechnical constraints include the presence of undocumented fill and weathered/unsuitable alluvium near surface, potentially liquefiable soils, presence of granular soils at depth that may be prone to caving in steep sided excavations, and seismic shaking during a strong earthquake event. Subsurface soils at the site generally consist of interlayered silty/clayey sand mixtures, clean sand, sandy silt, and silty/sandy clay. Groundwater was encountered during prior explorations by others (NMG, 2015 and Geosoils, 2005) at depths ranging from 40.5 to 47.4 feet below ground surface.

This report presents our findings, conclusions, and preliminary design recommendations for the proposed residential development. Based on our exploration and review, the proposed grading and development is considered geotechnically feasible provided the recommendations in this report are implemented during design, grading, and construction. Additional geotechnical evaluation and analysis may need to be performed as the project plans for grading, foundations, and stormwater infiltration systems are developed. Infiltration testing was performed by others during a prior study (NMG, 2015) which indicated that infiltration of stormwater was generally feasible at depths between 8 and 12.5 feet.

References pertinent to the site are included in Appendix A. Boring and cone penetrometer test (CPT) logs are included in Appendix B. Laboratory test results by others are included in Appendix C. Seismic design parameters are presented in Appendix D. Percolation test data sheets are provided in Appendix E. Liquefaction analysis is included in Appendix F. General Earthwork and grading specifications are presented in Appendix G.

If you have any questions regarding this report, please contact our office. We appreciate the opportunity to provide our services.

Respectfully submitted,

SA GEOTECHNICAL, INC.

Anthony Zepeda, CEG 2681
Project Geologist

Reza Saberi, GE 3071
Principal Engineer

CERTIFIED ENGINEERING GEOLOGIST
ANTHONY L. ZEPEDA
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STATE OF CALIFORNIA

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EXECUTIVE SUMMARY

The subject site is underlain by undocumented fill materials and native alluvium. Undocumented artificial fill was encountered in most borings performed onsite, ranging in thickness from 2 to 9.5 feet; however, the undocumented fill thickness was estimated based on limited sampling by others. The onsite alluvial soils are generally composed of silty/clayey sand, sand, and sandy/silty clay. Groundwater was encountered during prior subsurface explorations (NMG, 2015 and Geosoils, 2005) at depths ranging from 40.5 to 47.4 feet below ground surface (bgs). Historic high groundwater is mapped between 30 and 40 feet bgs (CDMG, 1998) and existing groundwater data available through the GeoTracker database indicate depths to groundwater between 30 and 60+ feet bgs in the vicinity of the site.

The primary geotechnical constraints at the site include the following:

- The presence of undocumented artificial fill and weathered/unsuitable alluvium which will need to be removed and replaced as compacted fill;
- Potentially liquefiable alluvium during a strong/design earthquake event;
- Potential for strong seismic shaking during an earthquake event; and,
- The presence of granular friable soils (at depth) that are prone to caving in steep sided excavations.

Remedial grading at the site should consist of the removal and recompaction of all undocumented fill materials and weathered/disturbed alluvium in order to provide competent subgrade and bearing conditions. In general, remedial removals are anticipated to extend 5 feet below existing grades within the proposed building pads. Removals within the proposed streets may be limited to removal and re-compaction of the upper 3 to 4 feet, below existing grades, upon review and approval by the geotechnical consultant. Deeper removals may be required locally, where existing trees, utility lines, and structures/foundations are to be abandoned and removed or where deeper undocumented fill is encountered. The recommended remedial removals will help reduce the potential for future settlement at the site. Septic tanks, cesspools, and/or wells may be encountered at the site during grading. If encountered, they should be removed in accordance with Orange County Health Care Agency requirements and the project environmental engineer's recommendations.

Considering the relatively minor grading anticipated to achieve design grades, the laboratory test data, and our analysis, building foundations and slabs should be designed to tolerate a total settlement of 2 inches and a differential settlement of 1 inch over a span of 40 feet. Onsite soils are anticipated to have a "Medium" expansion potential at the completion of grading.

Based on our findings, we conclude that the proposed residential development is feasible from a geotechnical viewpoint, provided it is designed and constructed in accordance with the recommendations presented in this report and any future design report(s). The site is considered suitable for infiltration of stormwater at the tested depths, between 8 and 12.5 feet below existing grades.

1.0 INTRODUCTION

1.1 Introduction and Scope of Services

At your request, SA Geotechnical, Inc. (SA GEO) has conducted geotechnical due diligence review and subsurface exploration for the proposed residential development located at 13841 and 13751 Red Hill Avenue in the City of Tustin, California (Figure 1). The purpose of this review and exploration was to assess the onsite geologic and geotechnical conditions and provide preliminary recommendations for design, grading, and construction of the proposed improvements. We have reviewed the Conceptual Site Plan, dated January 9, 2024, which shows the generalized lot/building layout; however, contains no existing or proposed grades. The Conceptual Site Plan and Google Earth satellite imagery were used as the base for our Geotechnical Map (Plate 1).

Our scope of services for this due diligence study included the following tasks:

- Review of available geologic and geotechnical maps, reports, and data for the subject site and surrounding area. A list of references is included in Appendix A.
- Review of available historic aerial photographs dating back to 1946.
- Notification and coordination with DigAlert to identify and clear Cone Penetrometer Test (CPT) locations of underground utilities.
- Subsurface exploration consisting of advancement of five Cone Penetration Tests, CPT, (CPT-1 through CPT-5) to depths ranging from 50.3 to 55.4 feet bgs. CPT logs are included in Appendix B.
- Review of boring logs and laboratory test data by others (included in Appendix B and C, respectively).
- Review, analysis, and recalculation of the percolation test data by others in accordance with the County of Orange WQMP Technical Guidance Document. The percolation test data is included in Appendix E.
- Geotechnical evaluation and analysis of the compiled data with respect to the proposed grading and development.
- Evaluation of faulting, seismicity, and seismic and static settlement in accordance with the 2022 California Building Code (CBC).
- Preparation of this report including our findings, conclusions, preliminary recommendations, and accompanying illustrations.
- Consultations with the project team.

SA GEO's expertise and scope of services do not include assessment of potential subsurface environmental contaminants or environmental health hazards.

1.2 Site Condition and History

The subject site is located southeast of the Red Hill Avenue and San Juan Street intersection, at 13841 and 13751 Red Hill Avenue, in the City of Tustin, California (see Figure 1). The

approximately 3.4-acre, roughly rectangular shaped parcel is bound by San Juan Street to the north, Red Hill Avenue to the east, Tustin High School to the west, and existing commercial properties to the south. The site is a vacant dirt lot with flat topography, with elevations ranging from about 105 to 109 feet above mean sea level. Existing free standing screen walls are present at the northwestern portion of the site.

Based on our review of available historic aerial photographs dating back to 1946, the earliest observed land use appears to be for agricultural purposes (orchard). By the early 1960s, the orchard was cleared from the southern portion of the site and developed with a church and dirt parking lot. By 1972 the remaining orchard in the northerly portion of the site was removed. Prior to 1980, the church had expanded significantly in size and the surrounding parking lot was paved with asphalt concrete. Also, by 1980 the commercial building at 13751 Red Hill Avenue was built. Between 2007 and 2009, the church and parking lot improvements were demolished, and it has been a vacant lot since that time. Based on our site reconnaissance, the commercial building has also been recently demolished.

1.3 Proposed Grading and Improvements

Prior to site development and grading, any remaining improvements or utilities to be abandoned will be demolished and removed. Based on review of the Conceptual Site Plan, the development is proposed to include grading for 12 multifamily residential buildings (76 total units), interior streets, community/common space areas, stormwater treatment features, and utility improvements to support the development. We anticipate that the proposed multifamily units will be three stories, consisting of wood-framed construction.

1.4 Prior Geotechnical Studies

A prior geotechnical study was performed onsite by NMG Geotechnical, Inc (NMG). We were provided and have reviewed the "Preliminary Geotechnical Investigation Report for Proposed Red Hill Avenue Apartment Site Development, City of Tustin, California" (NMG, 2015). The investigation included six hollow-stem auger borings (H-1 and P-1 through P-5) to depths ranging from 10 to 51.5 feet bgs. Percolation testing was also performed in four of the borings, P-1 through P-4, at depths ranging from 8 to 12.5 feet bgs. As part of our review and analysis, we have used the data provided in the prior report and have independently calculated infiltration rates in accordance with the County of Orange WQMP Technical Guidance Document.

Prior to the 2015 study, Geosoils, Inc. performed a subsurface exploration at the subject site. The report titled "Preliminary Geotechnical Investigation, Proposed Senior Apartment Complex, 13841 Red Hill Avenue, Tentative Tract 11282, Block 141 and Parcel No. 10, City of Tustin, County of Orange, California" (Geosoils, 2005) was not available for our review; however, the boring logs and laboratory data performed as part of thir study were included in the report by NMG (2015).

The approximate boring locations associated with the prior studies are provided on the Geotechnical Map (Plate 1). Boring logs and laboratory test data are provided in Appendix B and C, respectively.

1.5 Subsurface Exploration

Our field exploration was performed on January 26, 2024, and included advancement of five CPTs (CPT-1 through CPT-5) to depths ranging from 50.3 to 55.4 feet bgs. The CPTs use an integrated electronic cone system which measures and records cone tip resistance, sleeve friction, and friction ratio parameters at 5-centimeter depth intervals by advancement of a 1.25-inch diameter, pointed steel probe that is hydraulically pushed into the ground at a constant rate. The CPT provides a detailed subsurface profile to allow for assessment of potential liquefaction hazards and static settlement. The CPT data was used in conjunction with boring and laboratory test data to develop our interpretation of the subsurface conditions. At the completion of testing, the CPTs were backfilled with bentonite granules.

The approximate CPT locations are shown on Plate 1 (Geotechnical Map). CPT logs are included in Appendix B.

2.0 GEOTECHNICAL FINDINGS

2.1 Geologic Setting and Geotechnical Conditions

The subject site is located on the western Tustin Plain within the Peninsular Ranges geomorphic province of Southern California. The site is mapped by the United States Geological Survey (USGS, 2006) as underlain by Quaternary-age younger alluvial deposits (Figure 2). The alluvium (Qal) encountered in prior borings and our CPTs generally consisted of yellowish-brown, reddish brown, and grayish brown silty/clayey sand, sand, sandy silt, and silty clay. The alluvium was found to be damp to wet and medium dense to dense/medium stiff to very stiff.

Undocumented artificial fill (Afu) material was encountered in most borings performed onsite during the prior exploration, ranging in thickness from 2 to 9.5 feet. However, it should be noted that the thickness of undocumented fill was determined based on limited sampling within some of the borings and; therefore, the actual depth to the bottom of the undocumented fill materials may be shallower. Considering the relatively flat topography and prior land use, we anticipate that, in general, the undocumented fill materials do not extend to a depth of 9.5 feet bgs. The undocumented fill materials generally consisted of brown silty sand with trace to some gravel and was damp and loose to medium dense.

Based on our review of the prior geotechnical exploratory data and laboratory testing (Appendix C; NMG, 2015 and Geosoils, 2005) the site geotechnical conditions are generally as follows:

Soil Moisture Content and Dry Density: Onsite soils had in-situ moisture content and dry densities generally ranging from 2.0 to 28.9 percent and 90 to 125 pounds per cubic foot (pcf), respectively. Blow counts (modified California sampler) in the alluvial materials ranged from 3 to 67 blows per foot. The alluvium was generally found to be medium dense to dense/medium stiff to very stiff and damp to wet.

Soil Properties: Grain-size distribution test was conducted on one bulk sample collected from the uppermost 5 feet (NMG, 2015). The near-surface bulk sample was classified in accordance with the Unified Soil Classification System (USCS) as sandy clay (CL), with a fines content (passing No. 200 sieve) of 64 percent.

Soil plasticity testing was also performed on the same sandy clay sample and indicates a Plasticity Index (PI) of 16 and Liquid Limit (LL) of 34 percent. A sample collected from a depth of 20 feet (Geosoils, 2005) was also tested and had a PI of 13 and LL of 28 percent.

Maximum dry density testing was performed on two samples collected from the uppermost 5 feet. The results indicate that the sandy clay had a maximum dry density of 121.5 pcf at an optimum moisture content of 11.5 percent. The silty sand sample had a maximum dry density and optimum moisture content of 126.0 pcf and 12 percent, respectively.

Consolidation: Tests were performed on six samples collected at depths of 5, 7.5, 8, 10, and 15 feet from Borings H-1, P-2, P-5, B-3, and B-4. The testing showed that the native alluvium has relatively low compressibility potential and minor hydro-collapse potential (less than half a percent) upon addition of water.

Shear Strength: Direct shear testing was performed on two remolded samples, representative of future compacted fill material. The test results for the sample collected in Boring H-1 indicate ultimate and peak internal friction angles and cohesion of 30 degrees and 100 pounds per square foot (psf), respectively. The test results of the remolded sample collected from Boring B-1 indicate an internal friction angle of 13 degrees with a cohesion of 523 psf.

Expansion Potential: Expansion index testing was reportedly performed as part of the NMG study; however, no laboratory test results were included in the report. NMG reported an Expansion Index of 55 for the tested sample collected in the upper 5 feet at the site. Based on our review of the available data, we anticipate the site will have "Medium" expansion potential at the completion of grading.

Chemical Testing: A bulk sample collected at depths of 0 to 5 feet in Boring B-2 was also tested for pH, chloride, sulfate content, and resistivity. The test results indicate that sulfate-content of the soils may be classified as "S0" (negligible) per Table 19.3.1.1 of ACI-318. Saturated resistivity was 1,900 ohm-cm. pH level was 8.4 and chloride contents were 85 ppm.

2.2 Groundwater

Historic high groundwater at the subject site is mapped by California Division of Mines and Geology as between 30 and 40 feet bgs (CDMG, 1998). Groundwater was encountered during prior subsurface explorations at depths ranging from 40.5 to 47.4 feet bgs. Additionally, we have reviewed groundwater data available through the GeoTracker database for several sites near the subject site. The data indicates groundwater in the vicinity of the site ranges from 30 to 60+ feet deep for monitoring periods between 2001 to 2014.

2.3 Regional Faulting and Seismicity

Regional Faults: The site is not located within a fault-rupture hazard zone as defined by the Alquist-Priolo Special Studies Zones Act (CGS, 2018). Also, based on mapping by the State (Jennings and Bryant, 2010), there are no active faults mapped at the site. Regional Faults are presented in Figure 3.

Seismicity: Properties in southern California are subject to seismic hazards of varying degrees depending upon the proximity, degree of activity, and capability of nearby faults. These hazards can be primary (i.e., directly related to the energy release of an earthquake) or secondary (i.e., related to the effect of earthquake energy on the physical world). Since there are no active faults at the site, the potential for primary ground rupture is considered very low. The primary seismic hazard for this site is ground shaking during a future earthquake. The maximum moment magnitude for the closest/controlling fault is 7.2 Mw, which would be generated from the San Joaquin Hills Blind Thrust Fault.

The site is located within a potential liquefaction hazard zone, as defined by the State's Seismic Hazard Mapping (CDMG, 2001). The attached Site Location and Seismic Hazards Map (Figure 1) depicts the site relative to mapped potential liquefaction hazard zones. CPTs were performed

during our exploration to supplement the borings data and to assist in evaluation of the liquefaction hazard. Liquefaction analysis is presented in the following section (Section 2.4).

Other secondary seismic hazards, such as tsunami and seiche are considered nil due to site elevation and distance from the ocean or other confined body of water.

2.4 Liquefaction Potential

Liquefaction is a phenomenon in which earthquake-induced stress generates excess pore water pressure in low density, saturated, sandy and silty soils below the groundwater table. Liquefaction causes a loss of strength and is often accompanied by ground settlement. For liquefaction to occur, the following four conditions must be present at the site: 1) Severe ground shaking, such as during a strong earthquake, 2) Soil must be saturated or nearly saturated, generally below the groundwater table, 3) Corrected normalized standard penetration test (SPT) blow counts (N1) and/or CPT tip resistance (Qt) must be relatively low, and 4) Soils must be granular (typically sand or sandy silt) with low plasticity; clays and silts of relatively high plasticity are generally not liquefiable.

Our assessment was performed using the collected CPT data and CLiq software, version 3.5.2.17 by Geologismiki. Liquefaction potential was performed using the Robertson method (NCEER R&W 2009a). We have also implemented the depth weighting factor for calculation of the equivalent volumetric strain of the soil profile, included in CLiq and per the study by Cetin, et. Al. (2009). CLiq provides CPT data interpretation, final plots of factor-of-safety, liquefaction potential index, and post-earthquake displacement, and vertical settlement.

The liquefaction potential of onsite soils was estimated based on a peak ground acceleration of 0.59g and a maximum earthquake magnitude of 7.2Mw, as determined in our site seismicity analysis, discussed in Sections 2.3 and 3.7. A seismic (design) groundwater table of 30 feet was used in our analysis for all CPTs.

Seismic Settlement: The results of our analysis indicate that liquefiable layers are present and, when subject to ground accelerations generated during a large earthquake event near the subject site, may be prone to settlement. Based on our calculations, settlement due to liquefaction is estimated to be less than 1 inch. The graphic representations of the CPT soundings are included in Appendix B and the liquefaction analysis is included in Appendix F.

Loss of Bearing and Surface Manifestations: The potential for loss of bearing and surface manifestations was reviewed based on the thickness of the liquefiable layers that will be left in-place, versus the amount of fill and non-liquefiable native soils overlying liquefiable soils. Considering the depth to design groundwater and that the proposed structures will be underlain by compacted fill, the potential for local surface disruptions, loss of bearing strength and surface manifestation is considered very low.

Lateral Spread: Considering the proposed improvements are not located on sloping ground or near any slope/free face, depth to liquefiable layers, and the relative flat grades across the site, we anticipate the potential for lateral spread as a result of seismic shaking to be very low (less than the maximum acceptable values specified in the building code for conventional foundations).

2.5 Settlement and Foundation Considerations

In general, the anticipated settlements depend upon the building loads, type of foundations, and the geotechnical properties of the supporting subgrade soils. We performed settlement analysis using the CPT, boring and consolidation test data. Considering the relatively flat site, we do not anticipate significant design fills to be placed during grading (3 feet or less).

Considering the subsurface soil conditions and laboratory test data, and relatively lightly loaded residential structures, we estimate total post-construction settlement (combined static and seismic) to be on the order of 2 inches and differential settlement to be on the order of 1 inch over a 40-foot span. This assumes remedial grading measures included in Section 3.2 of this report are implemented during grading of the site.

2.6 Shrinkage and Bulking

The shrinkage and bulking (reduction or increase in volume of excavated materials upon recompaction) depend primarily on in-situ density and the maximum dry density of the soil type. We anticipate that the undocumented fill and weathered alluvium will shrink 5 to 15 percent. An average shrinkage value of 10 percent may be assumed for soil in the upper 5 feet. Ground subsidence at the site is estimated to be on the order of 0.1 foot.

2.7 Percolation Testing

Percolation testing at the site was performed as part of a prior study (NMG, 2015). Testing was reported to have been performed in general accordance with the County of Orange WQMP Technical Guidance Document. We have reviewed the raw field data collected during the prior testing in order to perform our own calculations (Appendix E).

The County of Orange TGD does not include calculation adjustments to account for the presence of the annular backfill material (3/4-inch gravel) used to construct the test wells. In our experience, this generally results in overestimation of infiltration rates. We have used a correction factor to account for the volume loss due to the annular material, based on the porosity of the material, the pipe diameter used, and the boring diameter. The correction factor is noted on the percolation test data sheets (Appendix E).

The calculated infiltration rates are provided below, which include the correction factor discussed above; however, the rates below do not include a factor of safety reduction. A discussion of the design infiltration rates, including factor of safety, is provided in Section 3.14. The infiltration test results are representative of the locations and depths the tests were performed. Due to the potential for variation in the subsurface conditions, infiltration rates could vary across the site and with depth.

Boring No.	*Tested Depth (ft. bgs)*	*Calculated Infiltration Rate (in./hr.)*
P-1	9.25 to 12.5	3.5
P-2	8.25 to 12	1.5
P-3	8.25 to 11.25	3.2
P-4	8 to 11	2.7

3.0 CONCLUSION AND PRELIMINARY RECOMMENDATIONS

3.1 General Conclusion and Recommendation

Based on our subsurface exploration and review, construction of the proposed residential development, as described herein, is considered geotechnically feasible provided the preliminary recommendations in this report are implemented during design, grading, and construction. The geotechnical consultant should review the WQMP once available. Additional geotechnical exploration and/or percolation testing may need to be performed during the design phase, depending upon the location and depth of the infiltration device(s). Also, grading, foundation, utility, structural and wall plans for the project should be reviewed by the geotechnical consultant during the design phase. Updated recommendations should be provided once the project plans are finalized and reviewed by SA GEO and as needed.

The recommendations in this report should be considered minimum and may be superseded by more restrictive requirements of others. In addition to the following recommendations, General Earthwork and Grading Specifications are provided in Appendix G.

3.2 Site Preparation and Earthwork

Site preparation and grading should be performed in accordance with the recommendations herein and the requirements of the City of Tustin.

3.2.1 Site Demolition and Clearing

Prior to remedial grading, any existing structures, foundations, hardscape/landscape, and utilities to be abandoned should be demolished. Deleterious materials and debris should be cleared and disposed of offsite. Excavations for the removal of existing foundations, utilities (if any) and vegetation, including onsite trees, should be observed by the geotechnical consultant. Large roots, highly organic soils, and existing utilities should be removed and should not be incorporated into new fills.

Soil that is disturbed as part of excavations or removal of trees or underground utilities should be evaluated by the geotechnical consultant. Excavations that require backfill should be properly documented and compacted under the observation and testing of the geotechnical consultant.

Cesspools, septic tanks and/or wells may be encountered at the site. If encountered, they should be removed in accordance with Orange County Health Care Agency requirements and the project environmental engineer's recommendations. Any voids should be backfilled with suitable onsite or import materials and compacted in accordance with the recommendations provided in Section 3.2.4.

3.2.2 Protection of Existing Improvements and Utilities

Existing buildings, improvements and utilities adjacent to the site that are to be protected in place should be located and visually marked prior to grading operations. Excavations adjacent to improvements to be protected in-place or any utility easement should be performed with care, so as not to undermine existing foundations or destabilize the adjacent ground.

Stockpiling of soils more than 5 feet in height at or near existing structures and over utility lines should not be allowed. If deeper removals are required, shoring or other special measures (i.e., setback or laybacks) to provide safety and mitigate the potential for lateral/vertical movements may be required.

3.2.3 Remedial Grading Measures

Remedial grading at the site should consist of removal of undocumented fill and weathered/unsuitable alluvium in their entirety. In general, we recommend that remedial removals within the proposed building pads consist of removal and recompaction of soils in the upper 5 feet, below existing grades. Removals within the proposed streets may be limited to removal and re-compaction of the upper 3 to 4 feet, below existing grades, provided the removal bottom exposes competent native alluvium. Where deeper unsuitable material or undocumented fill is encountered, the removals should be extended to the bottom of unsuitable materials and/or undocumented fill to competent native soils. Please note that some boring logs indicate undocumented fill may be as deep as 9.5 feet at the site. Where not limited by adjacent properties, the removals should extend a minimum of 5 feet laterally beyond the building footprints.

The geotechnical consultant should review and approve removal bottoms prior to fill placement and should provide specific recommendations based on actual conditions, if necessary.

Excavations deeper than 4 feet will need to be laid back at a minimum inclination of 1H:1V (horizontal to vertical) or provided with shoring. Shallow, unconfined excavations (4 feet or less) may consist of near-vertical excavation, locally, and upon review by the geotechnical consultant. Trench excavations should be performed in accordance with Cal/OSHA requirements for Soil Type "B". Locally, and within deeper trenches, excavations may need to be performed in accordance with Cal/OSHA requirements for Soil Type "C" due to the presence of friable sand (see Section 3.12). The contractor's qualified person should verify compliance with Cal/OSHA requirements. Excavations near existing structures (within a 1:1 projection) should be provided with shoring that is designed to support the surcharge load of the existing structure. Otherwise, excavations may need to be performed in sections (A/B/C slot cuts). The conditions should be reviewed in the field by the project geotechnical consultant. Additional recommendations should be provided based on the actual conditions encountered during excavation and grading, as needed.

3.2.4 Fill Placement

Upon the completion of remedial grading measures, the approved removal bottoms should be scarified a minimum of 6 inches. The removal bottoms and fill materials should be compacted to at least 90 percent of maximum dry density, as determined by ASTM Test Method D1557. Fill materials should be placed in loose lifts no thicker than 8 inches.

Fill materials should be relatively free of deleterious material. The existing native alluvial soils and undocumented fill are considered suitable for re-use as compacted fill provided any deleterious material is removed. The compacted fill soils should be moisture conditioned to 2 to 3 percentage points above optimum moisture content but within the compactable moisture range.

3.2.5 Import

The geotechnical consultant should evaluate and accept any import soils prior to transportation to the subject site. We recommend that import soils have similar engineering properties as onsite soils. At minimum, the import materials should have Expansion Index of less than 90, Plasticity Index of less than 15, fines content (passing Sieve 200) of less than 50 percent, and negligible soluble sulfate content.

3.3 Settlement Potential

The amount of settlement will depend upon the type of foundation(s) selected and future loading by additional fill and structures. Based on our subsurface exploration, liquefaction analysis, and considering the remedial grading recommendations provided in this report are implemented during grading, and the anticipated structural loads typically associated with the proposed structures, we estimate that total and differential post-construction settlement (combined static and seismic) will be on the order of 2 inches and 1 inch over a span of 40 feet, respectively.

SA GEO should be provided with the foundation plans and structural loads, once available, in order to further evaluate the potential for post-construction settlement of the proposed building and associated improvements. The parameters provided herein will then be confirmed/updated based on the planned foundations and loads and additional testing and analysis.

3.4 Foundation Design

The slab and foundations should be designed by the project structural engineer based on the proposed structure type and the anticipated loading conditions. The foundation soils have expansive soil conditions (Expansion Index of greater than 20) and will be subject to climatic and landscape moisture fluctuations. The following foundation recommendations are provided with the assumption that the recommendations included in Section 3.2 of this report are implemented during grading of the site.

The recommended net allowable bearing capacity for continuous and isolated footings may be calculated based on the following equation:

$q_{all} = 700\,D + 200\,B + 900$ (but not to exceed 3,000 psf)

where:
D = embedment depth of footing, in feet
B = width of footing, in feet

Also, the following parameters may be used for design of foundation and slabs:

- Soil unit weight = 120 pcf
- Soil internal friction angle = 28 degrees
- Coefficient of Friction = 0.35
- Subgrade modulus (k) of 100 pci (corrected for large slabs)
- Soil elastic modulus (Es) of 2,000 psi

The dead load of concrete below adjacent grades (buried concrete foundations) may be neglected. The allowable bearing pressure and friction coefficient may be increased by one-third for wind and seismic loading.

We recommend that strip and isolated footings for the buildings have a minimum embedment depth of 18 inches below the lowest adjacent grade. Continuous footings should be at least 12 inches wide and isolated column footings should be at least 24 inches wide. The footings of freestanding and isolated structures, such as walls and pilasters, should have a minimum embedment depth of 18 inches into approved soils.

The following table provides our general guidelines and preliminary recommendations for design of post-tensioned foundations and slabs in accordance with the 2022 California Building Code (CBC) and Post-Tension Institute (PTI) DC 10.5 Edition provisions.

GEOTECHNICAL GUIDELINES FOR DESIGN OF POST-TENSIONED SLABS

Parameter	Recommendation
Center Lift	
Edge Moisture Variation Distance, e_m	9.00 feet
Center Lift, y_m	0.55 inches
Edge Lift	
Edge Moisture Variation Distance, e_m	4.60 feet
Edge Lift, y_m	0.71 inch
Presaturation, as needed, to obtain the minimum moisture down to the minimum depth	1.2 x optimum down to 12 inches

We recommend that post-tensioned slabs have a thickened edge such that the slab is embedded a minimum of 12 inches below the lowest adjacent grade.

In addition, as indicated in the DC 10.5 Edition of PTI, shape factor calculations should be performed by the project structural engineer in order to determine if strengthening/modification of

foundations are necessary. Per PTI guidelines, modifications to the foundations design should be considered if the shape factor (ratio of square of foundation perimeter over foundation area) exceeds 24.

If non-post-tensioned slabs-on-grade and foundations are considered at the site, an effective Plasticity Index of 20 is considered appropriate for the upper 15 feet of soil materials, in accordance with Wire Reinforcement Institute (WRI) method (per the 2022 CBC). For non-post-tensioned slabs, we recommend a minimum embedment of 12 inches below the lowest adjacent grade for the perimeter footings. Also, the upper 12 inches of subgrade soil should be pre-saturated to 120 percent of optimum moisture content prior to placement of moisture barrier and concrete.

The foundations and slabs should also be designed to tolerate the total and differential settlements discussed in Section 3.3 of this report.

For the design of pole-type foundations (i.e., light poles, shade structures, etc.), an allowable soil-bearing pressure (S_1) of 340 psf/ft may be used for Equation 18-1 (the "pole" equation) of the 2022 CBC Section 1807.3.2.1 to determine the depth of embedment for the footings, considering level ground conditions. The equation is applicable for designed embedment depths of less than 12 feet for the purpose of computing lateral pressure. Also, for vertical loads on pole-type foundations, an allowable skin friction of 250 pounds per square foot may be used. For cast-in-place pole-type foundations, the vertical end bearing pressure should be neglected. We recommend that pole-type foundations have a minimum embedment of 2.5 feet below lowest adjacent grades.

3.5 Interior Slab Moisture Mitigation

In addition to geotechnical and structural considerations, the project owner should also consider interior moisture mitigation when designing and constructing slabs-on-grade.

The intended use of the interior space, type of flooring, and the type of goods in contact with the floor may dictate the need for, and design of, measures to mitigate potential effects of moisture emission from and/or moisture vapor transmission through the slab. Typically, for human occupied structures, a vapor retarder or barrier is recommended under the slab to help mitigate moisture transmission through slabs. The most recent guidelines by the American Concrete Institute (ACI 302.1R-04) suggest that the vapor retarder be placed directly under the slab (no sand layer). However, the location of the vapor retarder may also be subject to the builder's past successful practice. Placement of 1 or 2 inches of sand over the moisture retardant has been common practice by builders in southern California. Specifying the strength of the retarder to resist puncture and its permeance rating is important. These qualities are not necessarily a function of the retarder thickness. A minimum of 10-mil is typical but some materials, such as 10-mil polyethylene ("Visqueen"), may not meet the desired standards for toughness and permeance.

Vapor retarders, when used, should be installed in accordance with standards such as ASTM E 1643 and/or those specified by the manufacturer.

Concrete mix design and curing are also significant factors in mitigating slab moisture problems. Concrete with lower water/cement ratios results in denser, less permeable slabs that also "dry" faster with regard to when flooring can be installed (reduced moisture emission quantities and

rates). Rewetting of the slab following curing should be avoided since it can result in additional drying time required prior to flooring installation. Proper concrete slab testing prior to flooring installation is also important.

Concrete mix design, the type and location of the vapor retarder should be determined in coordination with all parties involved in the finished product, including the project owner, architect, structural engineer, geotechnical consultant, concrete subcontractors, and flooring subcontractors.

3.6 Retaining Walls Design and Lateral Earth Pressures

Recommendations for lateral earth pressures for permanent retaining walls and structures (if any) with approved onsite drained soils and above groundwater table are as follows:

Conditions	***Level (pcf)***	***2:1 Sloping***
Active	43	68
At-Rest	63	90
Passive	340	160 (sloping down)

These parameters are based on a soil internal friction angle of 28 degrees and soil unit weight of 120 pcf.

To design an unrestrained retaining wall, such as a cantilever wall, the active earth pressure may be used. For a restrained retaining wall, the at-rest pressure should be used. Passive pressure is used to compute lateral soils resistance developed against lateral structural movement. The passive pressures provided above may be increased by one-third for wind and seismic loads. The passive resistance is taken into account only if it is ensured that the soil against embedded structure will remain intact with time. Future landscaping/planting and improvements adjacent to the retaining walls should also be taken into account in the design of the retaining walls. Excessive soil disturbance, trenches (excavation and backfill), future landscaping adjacent to footings and over-saturation can adversely impact retaining structures and result in reduced lateral resistance.

For sliding resistance, the friction coefficient of 0.35 may be used at the concrete and soil interface. The coefficient of friction may be increased by one-third for wind and seismic loading. The retaining walls may also need to be designed for additional lateral loads if other structures or walls are planned within a 1H:1V projection.

The seismic lateral earth pressure for walls retaining more than 6 feet of soil and level backfill conditions may be estimated to be an additional 17 pcf for active and at-rest conditions. The earthquake soil pressure has a triangular distribution and is added to the static pressures. For the active and at-rest conditions, the additional earthquake loading is zero at the top and maximum at the base. The seismic lateral earth pressure does not apply to walls retaining less than, or equal to, 6 feet of soil (2022 CBC Section 1803.5.12).

Drainage behind walls retaining more than 2.5 feet of soil should also be provided in accordance with the attached Figure 4. Specific drainage connections, outlets and avoiding open joints should be considered during design.

3.7 Seismic Design Parameters

The following table summarizes the seismic design criteria for the subject site. The seismic design parameters are developed in accordance with ASCE 7-16 and 2022 CBC. Please note that, considering the proposed structures and anticipated structural periods, site-specific ground-motion hazard analysis was not performed for the site. Per Supplement 3 of ASCE 7-16, the value of S_{M1}, and therefore S_{D1}, have been increased by 50 percent. The seismic response coefficient, Cs, should be determined per the parameters provided below and using equation 12.8-2 of ASCE 7-16.

Selected Seismic Design Parameters from 2022 CBC/ASCE 7-16	***Seismic Design Values***	***Reference***
Latitude	33.7359 North	
Longitude	-117.8139 West	
Controlling Seismic Source	San Joaquin Hills	USGS, 2024
Site Class per Table 20.3-1 of ASCE 7-16	D	
Spectral Acceleration for Short Periods (Ss)	1.284 g	SEA/OSHPD, 2024
Spectral Accelerations for 1-Second Periods (S_1)	0.459 g	SEA/OSHPD, 2024
Site Coefficient F_a, Table 11.4-1 of ASCE 7-16	1.0	SEA/OSHPD, 2024
Site Coefficient F_v, Table 11.4-2 of ASCE 7-16	1.841	
Design Spectral Response Acceleration at Short Periods (S_{DS}) from Equation 11.4-4 of ASCE 7-16	0.856 g	SEA/OSHPD, 2024
Design Spectral Response Acceleration at 1-Second Period (S_{D1}) from Equation 11.4-4 of ASCE 7-16 (Includes 50% increase per Supplement 3)	0.845 g	
T_S, S_{D1} /S_{DS} 11.4.6 of ASCE 7-16	0.987 sec	
T_L, Long-Period Transition Period	8 sec	SEA/OSHPD, 2024
Peak Ground Acceleration Corrected for Site Class Effects (PGA_M) from Equation 11.8-1 of ASCE 7-16	0.59 g	SEA/OSHPD, 2024
Seismic Design Category, Section 11.6 of ASCE 7-16	D	

3.8 Corrosivity

Based on the laboratory testing performed during prior studies, soluble sulfates exposure in the onsite soils may be classified as "S0" per Table 19.3.1.1 of ACI-318-14. Structural concrete elements in contact with soil include footings and building slabs-on-grade. The flatwork and sidewalk concrete are typically not considered structural elements. Concrete mix for structural elements should be based on the "S0" soluble sulfate exposure class of Table 19.3.2.1 in ACI-318-14. Other ACI guidelines for structural concrete are recommended. Also, onsite soils are anticipated to be corrosive to metals.

3.9 Expansion Potential

At the completion of grading, we anticipate that onsite soils will have "Medium" expansion potential. The geotechnical recommendations provided in this report including the design parameters for foundations, slab-on-grade and flatwork improvement should be implemented

during design and construction. These parameters may be updated upon additional testing at the completion of grading.

Homeowners and their design/construction team should be familiar with the recommendations in this report as well as principles described in a useful reference published by the California Geotechnical Engineers Association (CalGeo), titled, "Coexisting with Expansive Soil: An Informational Guide for Homeowners." This free booklet can be downloaded at www.calgeo.org.

3.10 Exterior Concrete

The driveway, patio slabs and other flatwork elements should be at least 4 inches thick. Concrete should be reinforced with No. 3 bars placed at 24 inches on center both ways (or equivalent wire-mesh). Concrete slabs should be provided with construction or weakened plane control joints at a maximum spacing of 8 feet. The control joints should have a thickness that is ¼ of the total concrete thickness. Upon the placement and compaction of subgrade soils (per Section 3.2 of these recommendations), the upper 12 inches of the subgrade soils should be pre-saturated to 120 percent of optimum moisture content prior to placement of concrete and reinforcement.

For exterior slabs, the use of a granular sublayer is primarily intended to facilitate presaturation and subsequent construction by providing a better working surface over the saturated soil. It also helps retain the added moisture in the native soil in the event that the slab is not placed immediately. Where these factors are not significant, the layer may be omitted. If used, we recommend placement of 2 to 4 inches of granular material over subgrade soils.

Exterior concrete elements such as curb and gutter, driveways, sidewalks and patios are susceptible to lifting and cracking when constructed over expansive soils. With expansive soils, the impacts to flatwork/hardscape can be significant, generally requiring removal and replacement of the affected improvements. Please note that reducing concrete problems is often a function of proper slab design, concrete mix design, placement, and curing/finishing practices. Adherence to guidelines of the American Concrete Institute (ACI) is recommended. Also, the amount of post-construction watering, or lack thereof, can have a very significant impact on the adjacent concrete flatwork.

On projects with expansive soils, additional measures such as thickened concrete edges/footings, subdrains and/or moisture barriers should be considered where planters or natural areas with irrigation are located adjacent to the concrete improvements. Design and maintenance of proper surface drainage is also very important. If the concrete will be subject to heavy loading from cars/trucks or other heavy objects, at minimum, a 6-inch-thick pavement section should be used; however, the section should be designed by the geotechnical consultant using appropriate traffic indices for the intended use.

The above recommendations typically are not applied to curb and gutter.

3.11 Preliminary Asphalt Concrete Pavement Design

Final structural pavement sections should be based on R-value testing after the completion of grading and in accordance with City of Tustin requirements. Based on an assumed R-value of 15 and estimated traffic indices (TIs), we recommend the following preliminary pavement sections:

Street Location	*Estimated TIs*	*Pavement Section*
General Drives	TI – 5.5	0.35' AC / 0.65' AB
Parking Stalls	TI – 4.0	0.25' AC / 0.50' AB
AC = Asphalt Concrete, AB = Aggregate Base		

Please note that for two-stage paving operations, we recommend that the final AC cap be a minimum of 0.10 foot thick and the base AC course have a minimum thickness of 0.25 foot.

Asphalt concrete pavement should be placed in accordance with the requirements of Sections 301 and 302 of the Standard Specifications of Public Works Construction (the Greenbook). Prior to construction of pavement sections, the subgrade soils should be scarified to a minimum depth of 6 inches, moisture-conditioned as needed, and recompacted in-place to a minimum of 90 percent relative compaction (per ASTM D1557). Subgrade should be firm prior to aggregate base placement.

Aggregate base materials may consist of crushed aggregate base or crushed miscellaneous base, in accordance with the Greenbook (Section 200-2). The materials should be free of any deleterious materials. Aggregate base materials should be placed in 6- to 8-inch-thick loose lifts, moisture-conditioned as necessary, and compacted to a minimum of 95 percent relative compaction (per ASTM D1557). Asphalt concrete should also be compacted to a minimum relative compaction of 95 percent.

Unpaved median and parkway areas should also be provided with vertical moisture barriers.

3.12 Trench Excavation and Backfill

Excavations should be performed in accordance with the requirements set forth by Cal/OSHA Excavation Safety Regulations (Construction Safety Orders, Section 1504, 1539 through 1547, Title 8, California Code of Regulations). In general, onsite soils may be classified as Type "B"; however, locally, and in deeper excavations Type "C" soils may be encountered (friable sand). Cal/OSHA regulations indicate that, for workmen in confined conditions, the steepest allowable slopes in Type "B" and "C" soils are 1H:1V and 1.5H:1V (horizontal to vertical), respectively, for excavations less than 20 feet deep. Where there is no room for these layback slopes, we anticipate that shoring will be necessary. This condition should also be anticipated for excavations within the streets adjacent to the site. Adequate shoring (i.e., shields) should be provided, as deemed necessary. Backfilling may require sand-cement slurry in order to reduce the potential of caving during the removal of shoring, if friable sandy soils are encountered. Excavations should be reviewed periodically by the contractor's qualified person to confirm compliance with Cal/OSHA requirements.

Utility trench backfill should be in accordance with City of Tustin Department of Public Works "Standard Plans and Design Standards" and/or the governing jurisdiction's specifications (i.e. Irvine Ranch Water District, East Orange County Water District, etc.). In general, native soils are anticipated to be suitable for use as trench backfill from a geotechnical viewpoint; however, the City or governing agency may require select material, sand-slurry, or other measures. Native soils used as backfill materials should be compacted to a minimum of 90 percent relative compaction (per ASTM D1557). Rocks/oversize material greater than 3 inches in largest diameter should generally not be used as trench backfill unless approved by the agency and geotechnical consultant of record. Excavation and backfilling of HDPE pipes should be in accordance with the manufacturer's requirement and the Greenbook. Select granular backfill (i.e., clean sand with SE 30 or better) may be used in lieu of native soils but should also be compacted or densified with water jetting and flooding.

Trenches excavated next to structures and foundations should also be properly backfilled and compacted to provide full lateral support and reduce settlement potential.

3.13 Groundwater

Based on our subsurface exploration and review of published groundwater data in the vicinity, groundwater is anticipated to remain 30 feet or more below proposed finish grades. Groundwater is not expected to be encountered during rough grading; however, the presence of locally saturated soils and/or perched water cannot be ruled out, especially during rainy seasons.

3.14 Stormwater Infiltration

Based on the prior onsite percolation testing, storm water infiltration is considered feasible at the tested locations at depths between 8 and 12.5 feet bgs. Additional infiltration testing may need to be conducted onsite once a water quality management plan has been prepared and in order to evaluate the infiltration rates at the actual location and depth of the proposed devices. For preliminary design purposes, a design infiltration rate of 0.75 inches per hour may be used for devices that are 8 to 12.5 feet deep in the vicinity of Borings P-1 through P-4. This rate includes the required minimum factor-of-safety of 2.

Also, based on our review of the groundwater data in the vicinity, historic high groundwater is documented at approximately 30 feet bgs. Infiltration systems should maintain a minimum 10-foot vertical separation from high groundwater; thus, infiltration systems should not be deeper than 20 feet bgs.

Infiltration systems should be designed and constructed in accordance with County of Orange and City of Tustin guidelines. Infiltration systems should have a minimum setback of 10 feet from proposed residential structures. The subgrade soil utilized as the infiltration surface should be reviewed and approved by the geotechnical consultant prior to installation of any infiltration devices. Special care should be taken to limit disturbance to native soils used as the infiltration surface. Proper maintenance will also be required to extend the operational life and reduce siltation or reduction in infiltration performance. All infiltration devices should be provided with an overflow system.

3.15 Surface Drainage and Irrigation

Maintaining adequate surface drainage, proper disposal of run-off water, and control of irrigation will help reduce the potential for future moisture-related problems and differential movements from soil heave/settlement.

Surface drainage should be carefully taken into consideration during design, grading, landscaping, and building construction. Positive surface drainage should be provided to direct surface water away from structures and slopes and toward the street or suitable drainage devices. Ponding of water adjacent to the structures should not be allowed. Buildings should have roof gutter systems and the run-off should be directed to parking lot/street gutters by area drainpipes or by sheet flow over paved areas. Paved areas should be provided with adequate drainage devices, gradients, and curbing to prevent run-off flowing from paved areas onto adjacent unpaved areas.

Considering the climatic conditions in southern California and the recommended mitigation measures for expansive soils included in this report, a two-percent slope away from structures should be provided and is in substantial compliance with the 2022 CBC. Also, swales with one-percent slopes are acceptable from our geotechnical standpoint and are common practice in this locale.

Construction of planter areas immediately adjacent to structures should be avoided if possible. If planter boxes are constructed adjacent to or near buildings, the planters should be provided with controls to prevent excessive penetration of the irrigation water into the foundation and flatwork subgrades. Provisions should be made to drain excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Raised planter boxes may be drained with weepholes. Deep planters (such as palm tree planters) should be drained with below-ground, water-tight drainage lines connected to a suitable outlet. Moisture barriers should also be considered.

It is also important to maintain a consistent level of soil moisture, not allowing the subgrade soils to become overly dry or overly wet. Properly designed landscaping and irrigation systems can help in that regard.

3.16 Additional Subsurface Exploration and Laboratory Testing

Additional subsurface exploration and laboratory testing may be necessary during the design phase of the project for determination/confirmation of the percolation rates, depending on the location and depth of the proposed system(s). Also, additional laboratory testing should be performed during and upon the completion of grading to confirm/update the design parameters provided herein.

3.17 Review of Future Plans

The project grading, foundation, wall, water quality management, and landscape plans should be reviewed and accepted by the geotechnical consultant prior to grading and construction.

3.18 Observation and Testing during Grading and Construction

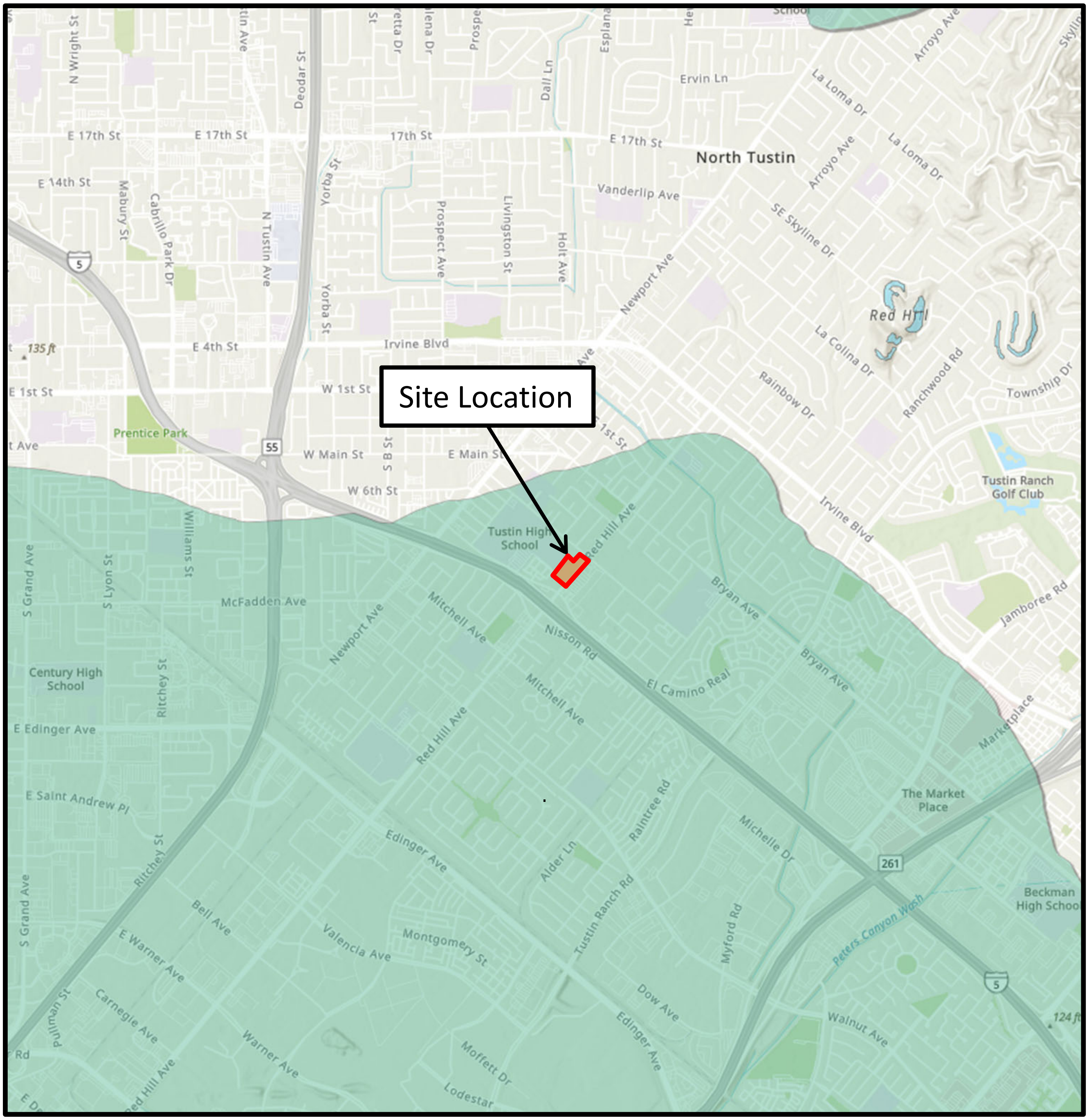
Geotechnical observation and testing should be performed by SA GEO during the following phases of grading and construction:

- During site demolition, preparation and clearing;
- During excavations performed for remedial grading and to relocate or remove existing underground improvements;
- During earthwork, including observation and acceptance of remedial removal bottoms and fill placement, including import material (if any);
- Following the completion of grading, in order to verify soil properties for foundations, slab-on-grade and pavements;
- Upon completion of any foundation or structural excavation, prior to pouring concrete;
- During slab and flatwork subgrade preparation prior to pouring concrete;
- During placement of backfill for utility trenches, and stormwater infiltration devices;
- During placement of backfill for retaining structures (if any);
- During installation and backfill of subdrainage systems (if any); and
- When any unusual soil conditions are encountered.

4.0 LIMITATIONS

This report has been prepared for the exclusive use of our client, Meritage Homes, within the scope of services requested for the subject property described herein. This report or its contents should not be used or relied upon for other projects or purposes, or by other parties without the acknowledgement of SA GEO and the consultation of a geotechnical professional. The means and methods used by SA GEO for this study are based on local geotechnical standards of practice, care, and requirements of governing agencies. No warranty or guarantee, expressed or implied, is given.

Our findings, conclusions, and recommendations are professional opinions based on interpretations and inferences made from geologic and engineering data from specific locations and depths, observed or collected at a given time. By nature, geologic conditions can vary from point to point, can be very different in-between exploration points, and can also change over time. Our conclusions and recommendations are, by nature, preliminary and subject to verification and/or modification during grading and construction when more subsurface data is exposed.



Source: Seismic Hazard Zones Map, Tustin Quadrangle (CDMG, 2001)

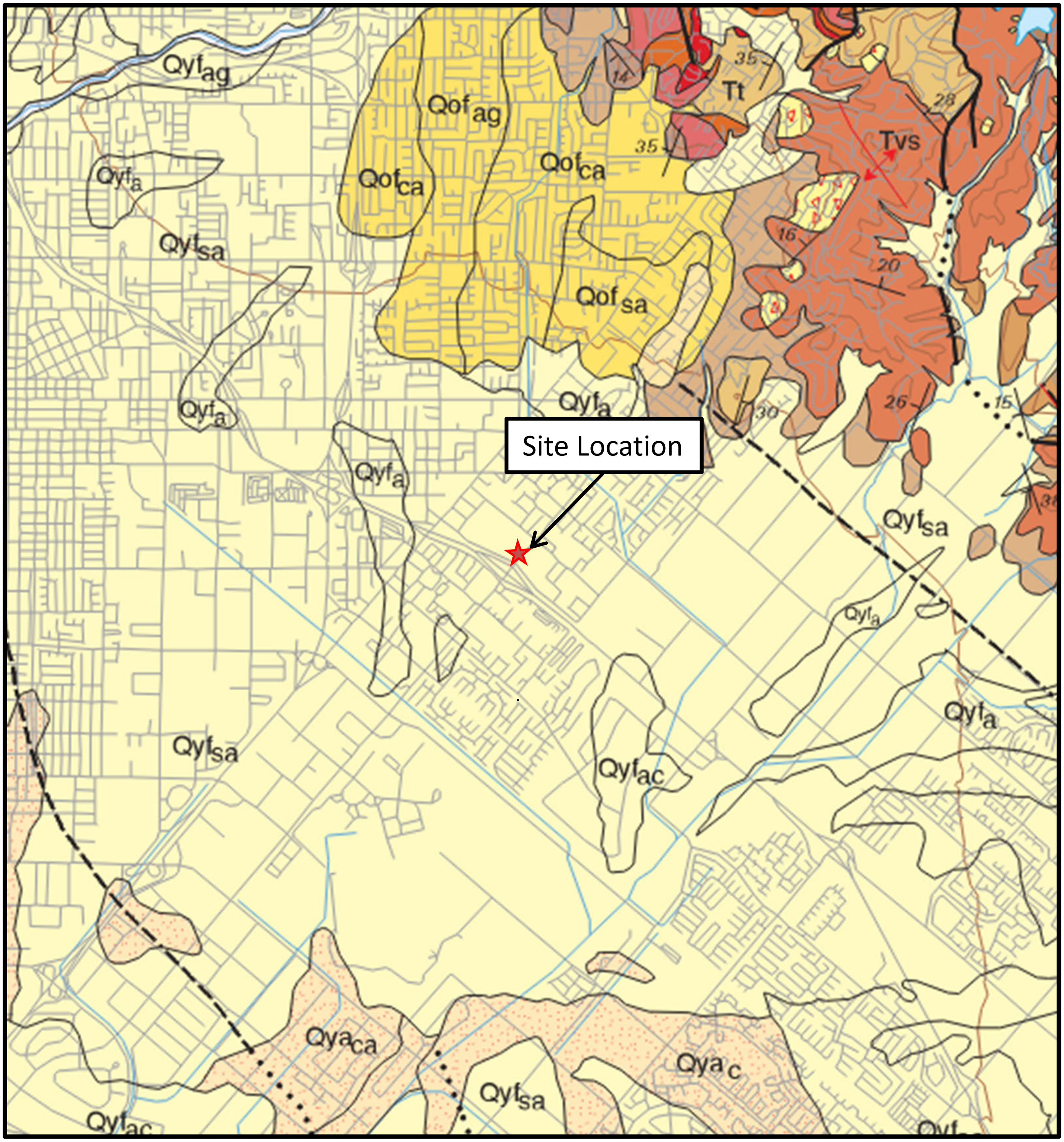
🟩 **Liquefaction**
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

🟦 **Earthquake-Induced Landslides**
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

Site Location and Seismic Hazard Zones Map

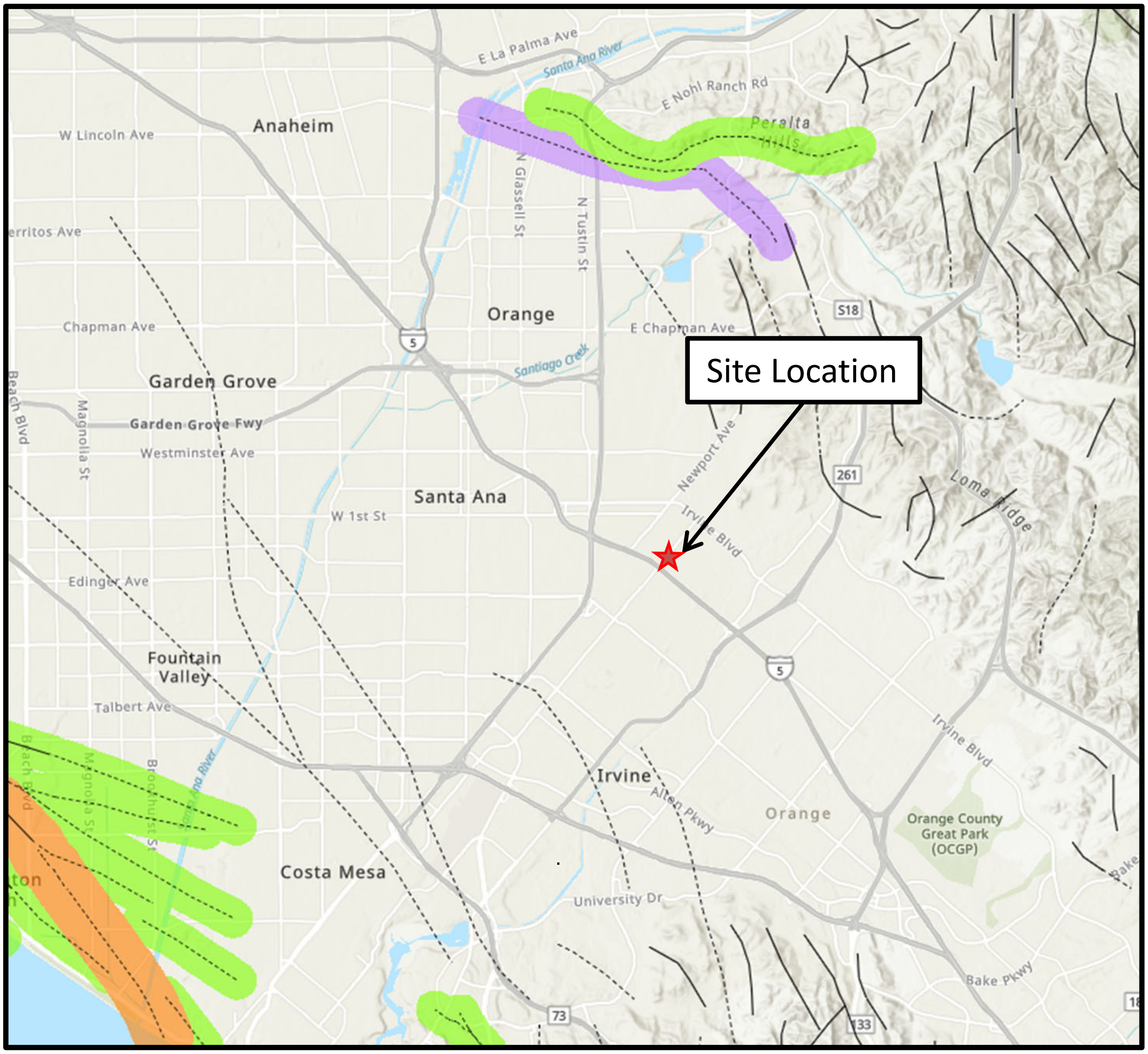
Meritage Homes
Proposed Residential Development
13841 & 13751 Red Hill Avenue
Tustin, California

Project Number: 24011-01
Date: February 2, 2024
Figure 1



Source: Geologic Map of the San Bernardino and Santa Ana 30’x60’ Quadrangle, (USGS, 2006)

Regional Geologic Map	
Meritage Homes Proposed Residential Development 13841 & 13751 Red Hill Avenue Tustin, California	Project Number: 24011-01 Date: February 2, 2024 Figure 2



Source: Fault Activity Map of California (Jennings and Bryant, 2010)

🟧 — — — ……?	Holocene fault displacement (during past 11,700 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.
🟩 — — — ……?	Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.
🟪 — — — ……?	Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.
—— — — — ……?	Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissnce nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

Regional Fault Map

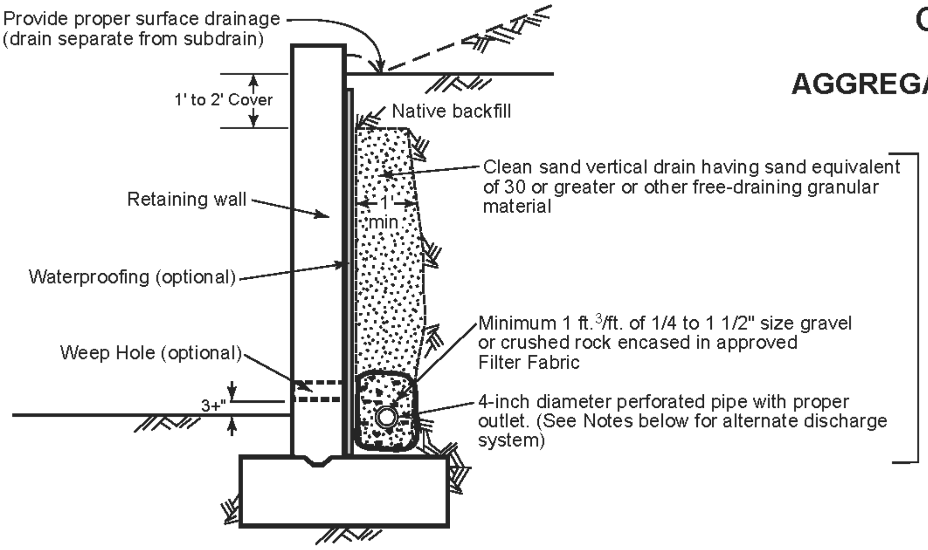
Meritage Homes
Proposed Residential Development
13841 & 13751 Red Hill Avenue
Tustin, California

Project Number: 24011-01
Date: February 2, 2024
Figure 3

S/A

OPTION 1:

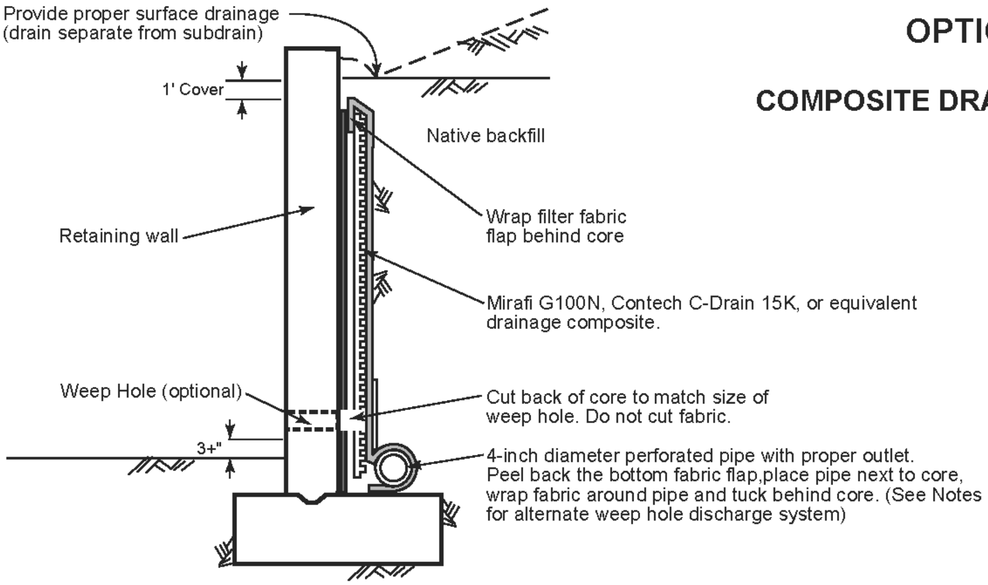
AGGREGATE SYSTEM DRAIN



Alternative: Class 2 permeable filter material (Per Caltrans specifications) may be used for vertical drain and around perforated pipe (without filter fabric)

OPTION 2:

COMPOSITE DRAINAGE SYSTEM



NOTES:

1. PIPE TYPE SHOULD BE PVC OR ABS, SCHEDULE 40 OR SDR35 SATISFYING THE REQUIREMENTS OF ASTM TEST STANDARD D1527, D1785, D2751 , OR D3034.
2. FILTER FABRIC SHALL BE APPROVED PERMEABLE NON-WOVEN POLYESTER, NYLON, OR POLYPROPYLENE MATERIAL.
3. DRAIN PIPE SHOULD HAVE A GRADIENT OF 1 PERCENT MINIMUM.
4. WATERPROOFING MEMBRANE MAY BE REQUIRED FOR A SPECIFIC RETAINING WALL (SUCH AS A STUCCO OR BASEMENT WALL).
5. WEEP HOLES MAY BE PROVIDED FOR LOW RETAINING WALLS (LESS THAN 3 FEET IN HEIGHT) IN LIEU OF A VERTICAL DRAIN AND PIPE AND WHERE POTENTIAL WATER FROM BEHIND THE RETAINING WALL WILL NOT CREATE A NUISANCE WATER CONDITION. IF EXPOSURE IS NOT PERMITTED, A PROPER SUBDRAIN OUTLET SYSTEM SHOULD BE PROVIDED.
6. IF EXPOSURE IS PERMITTED, WEEP HOLES SHOULD BE 2-INCH MINIMUM DIAMETER AND PROVIDED AT 25-FOOT MAXIMUM SPACING ALONG WALL. WEEP HOLES SHOULD BE LOCATED 3+ INCHES ABOVE FINISHED GRADE.
7. SCREENING SUCH AS WITH A FILTER FABRIC SHOULD BE PROVIDED FOR WEEP HOLES/OPEN JOINTS TO PREVENT EARTH MATERIALS FROM ENTERING THE HOLES/JOINTS.
8. OPEN VERTICAL MASONRY JOINTS (I.E., OMIT MORTAR FROM JOINTS OF FIRST COURSE ABOVE FINISHED GRADE) AT 32-INCH MAXIMUM INTERVALS MAY BE SUBSTITUTED FOR WEEP HOLES.
9 THE GEOTECHNICAL CONSULTANT MAY PROVIDE ADDITIONAL RECOMMENDATIONS FOR RETAINING WALLS DESIGNED FOR SELECT SAND BACKFILL.

Retaining Wall Drainage Detail

Figure 4

Appendix A

APPENDIX A

REFERENCES

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APPENDIX A (Cont'd)

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Appendix B

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

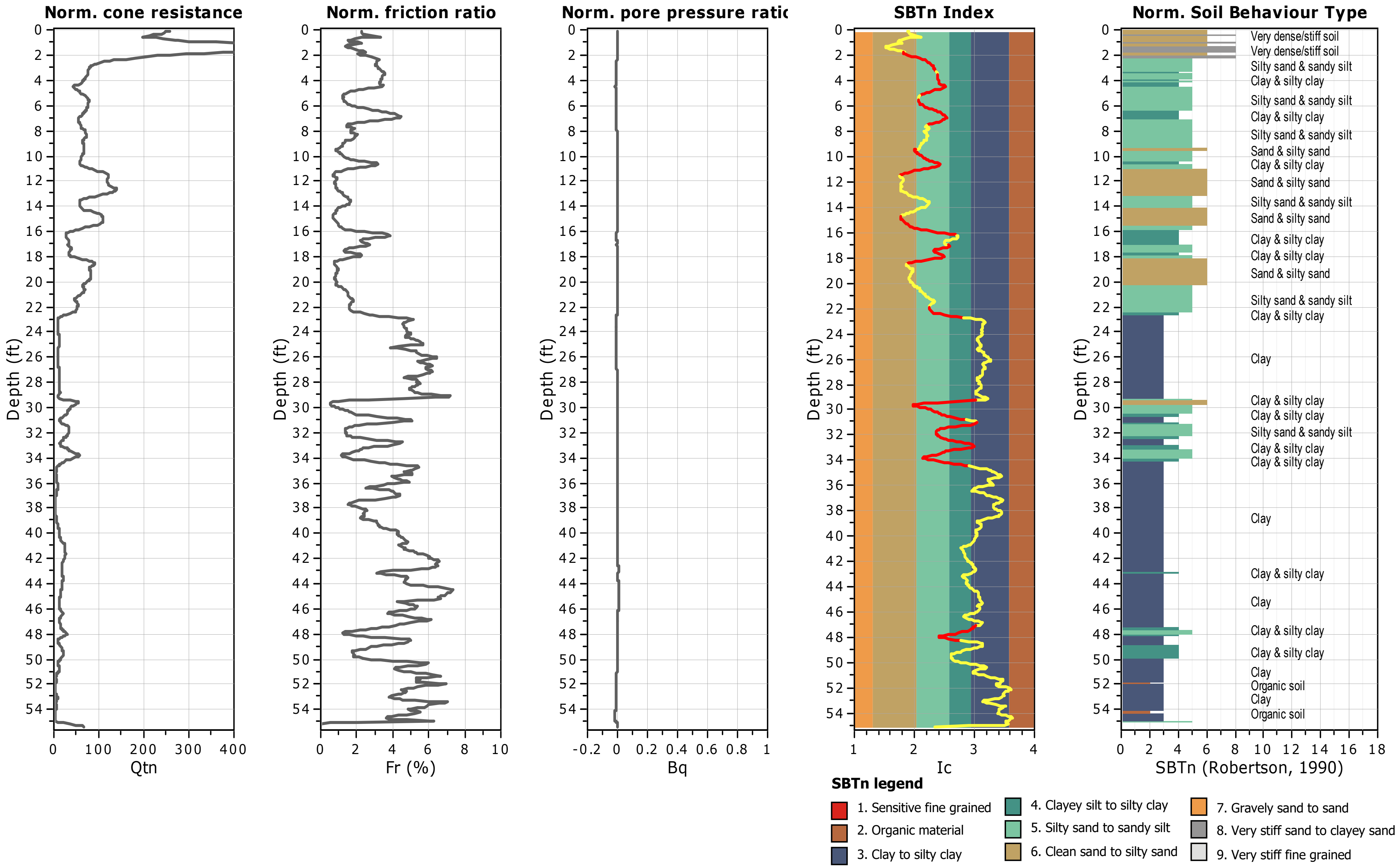
CPT-1

Project: **Meritage/13841 & 13751 Red Hill Avenue**

Location: **Tustin, CA**

Total depth: 55.40 ft, Date: 1/26/2024

Cone Operator: Kehoe Testing



SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

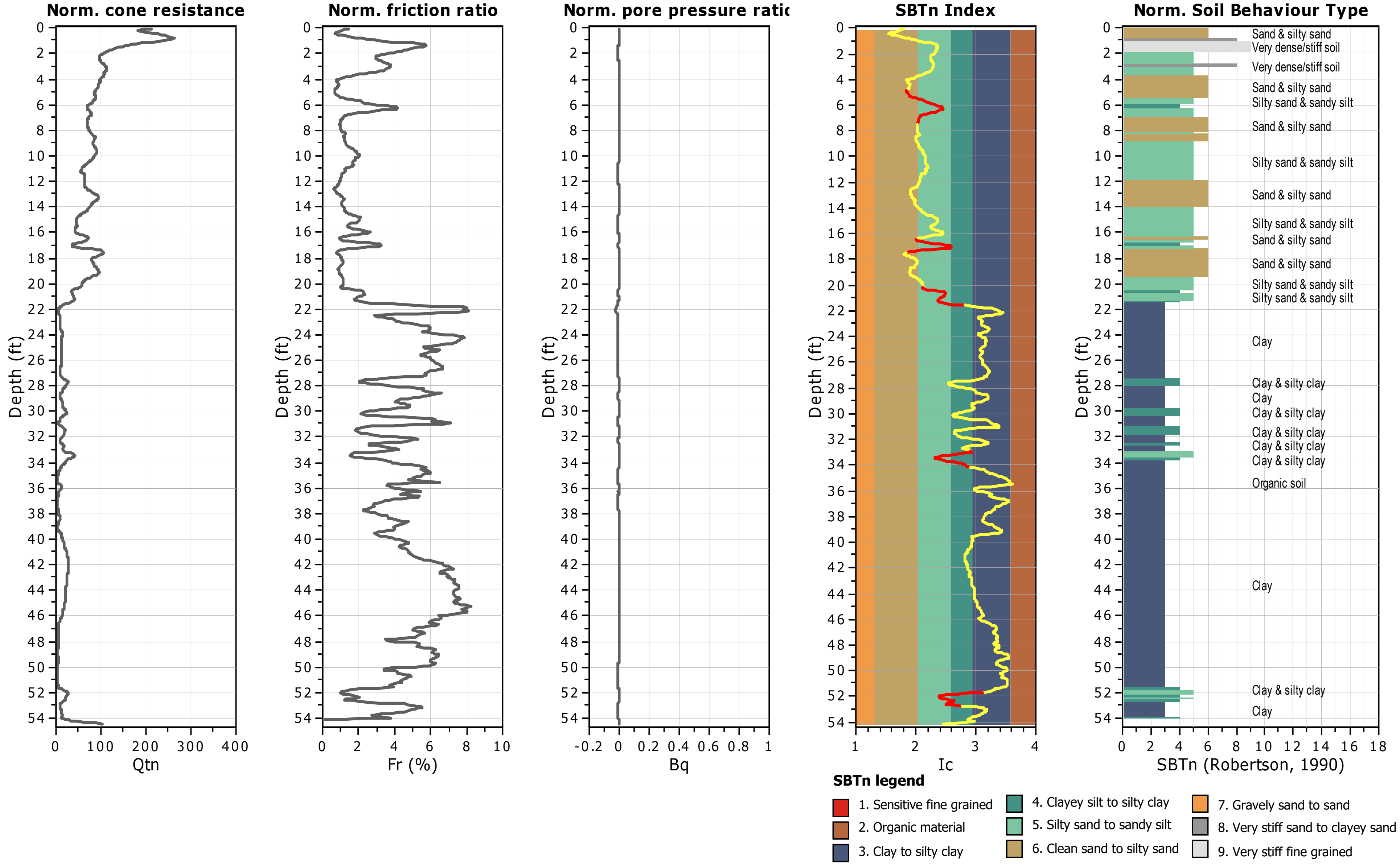
CPT-2

Project: **Meritage/13841 & 13751 Red Hill Avenue**

Location: **Tustin, CA**

Total depth: 54.47 ft, Date: 1/26/2024

Cone Operator: Kehoe Testing

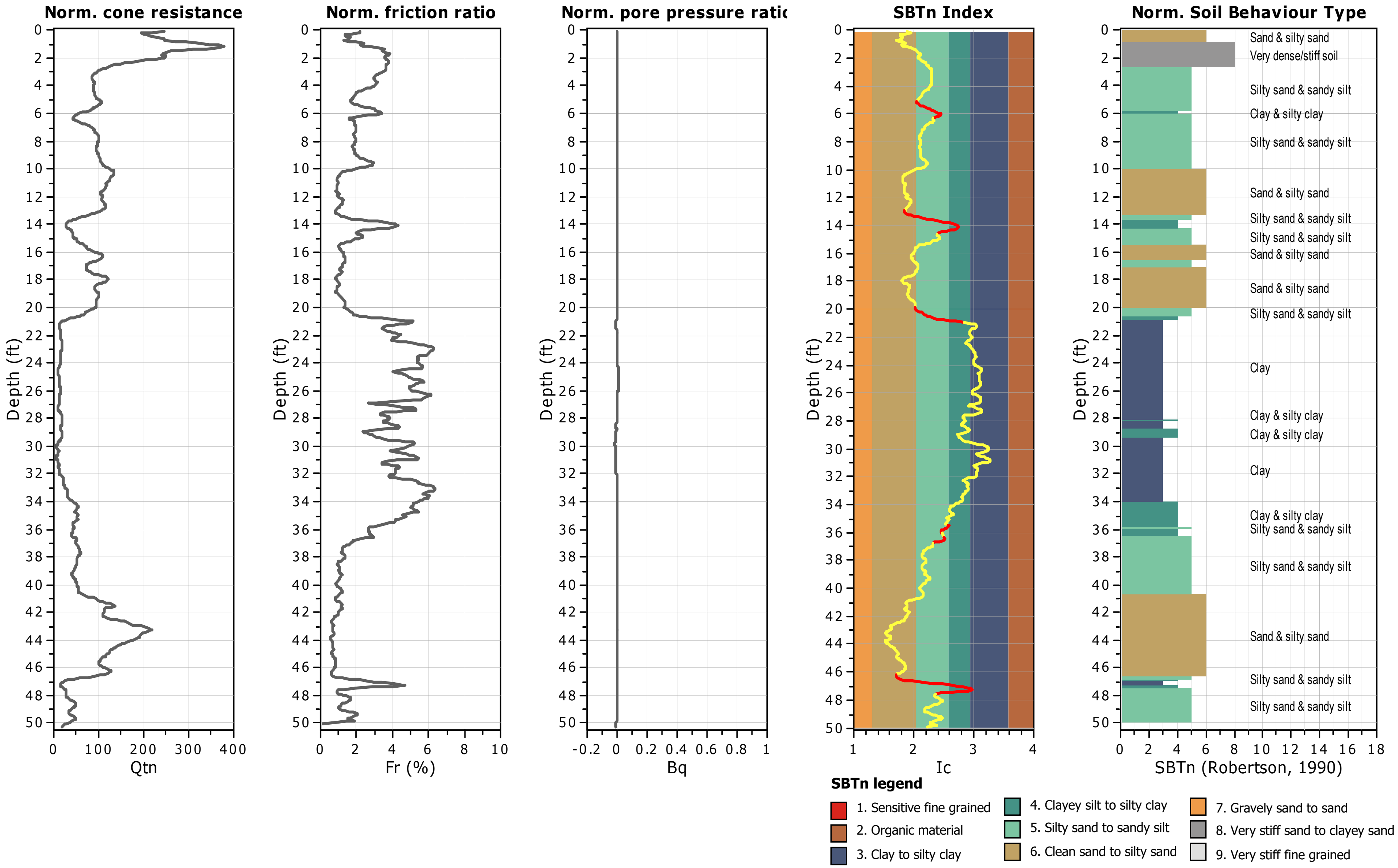


SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

CPT-3

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

Total depth: 50.27 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing



SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

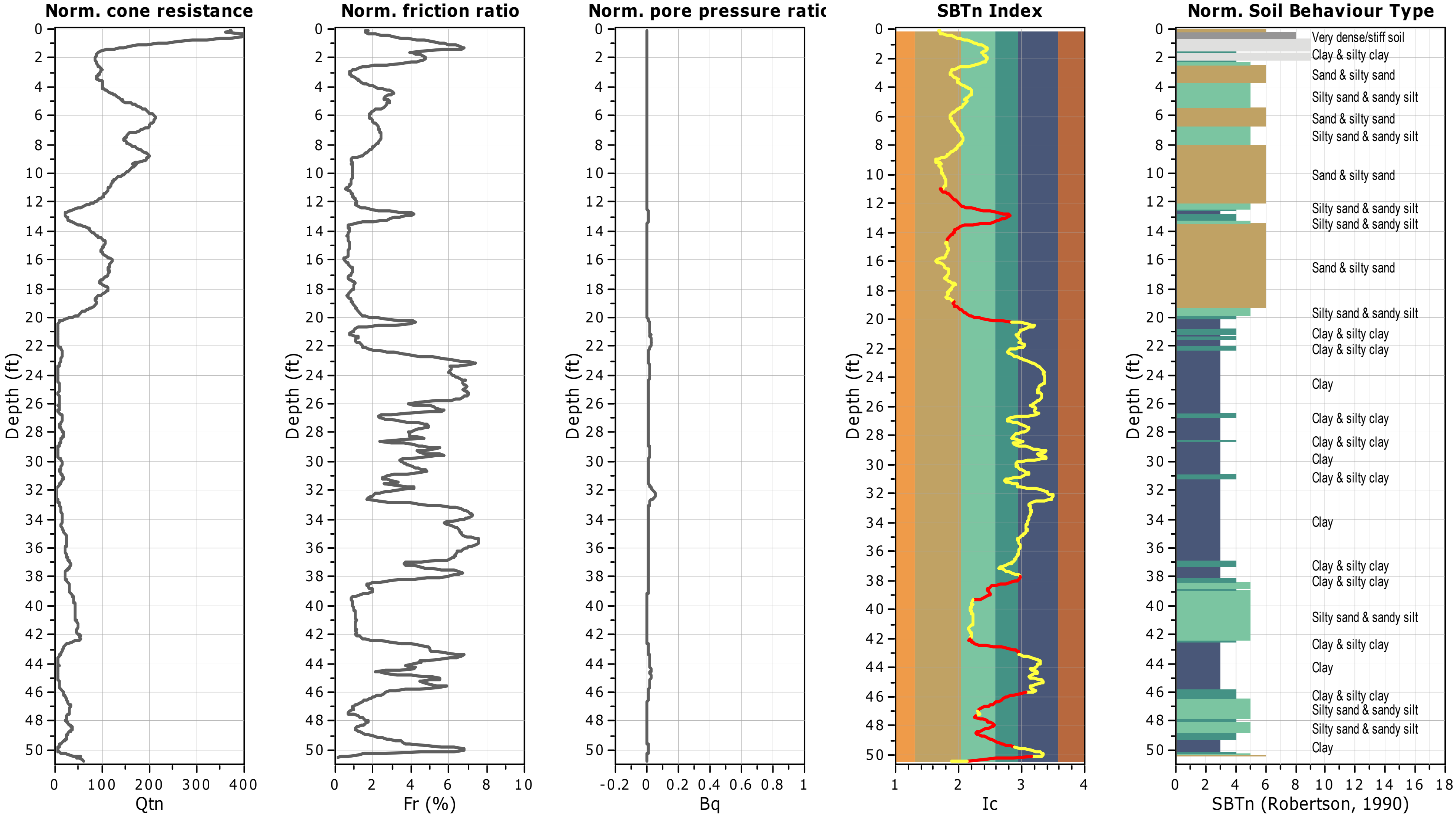
CPT-4

Project: Meritage/13841 & 13751 Red Hill Avenue

Location: Tustin, CA

Total depth: 50.79 ft, Date: 1/26/2024

Cone Operator: Kehoe Testing



SBTn legend

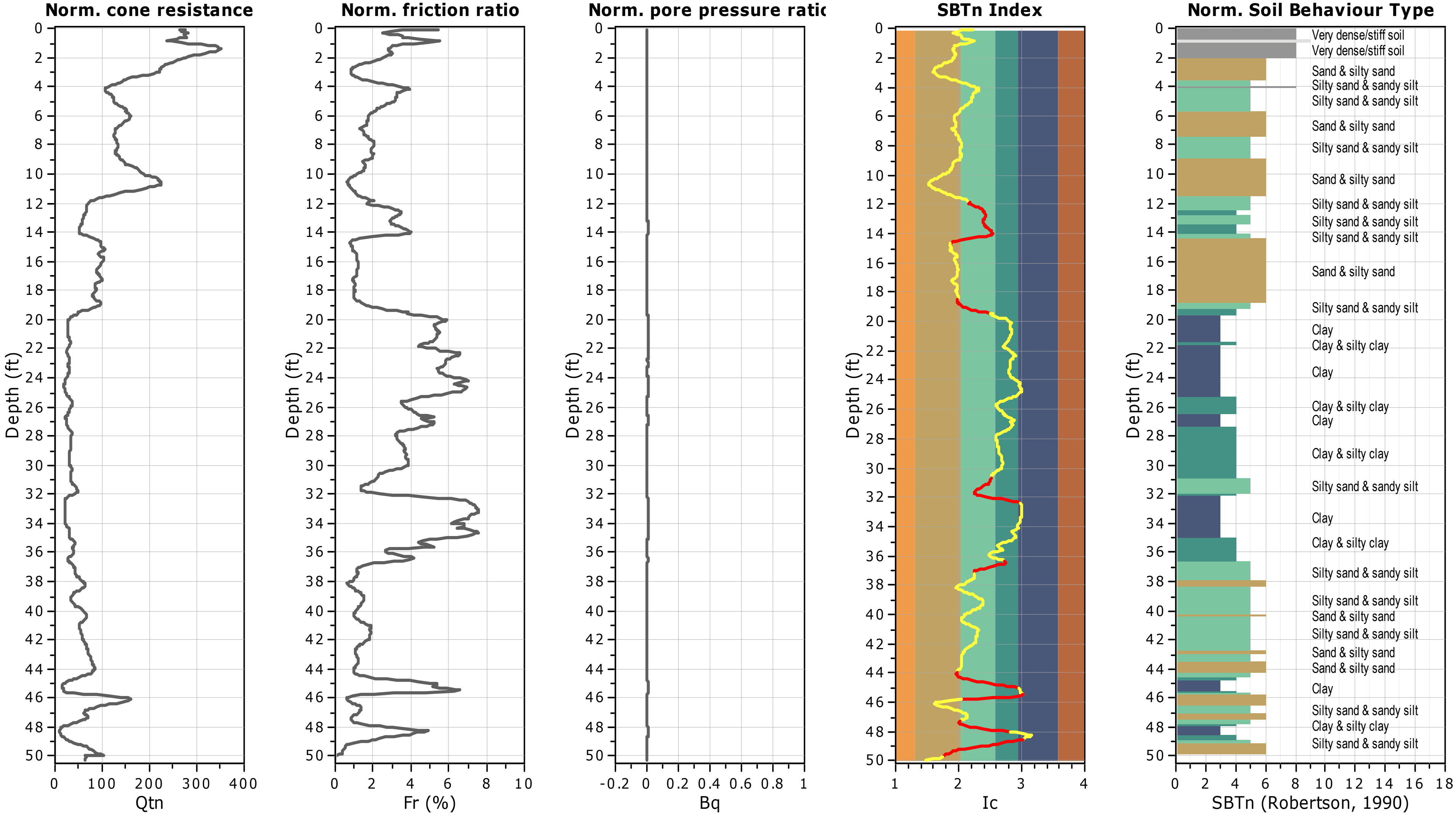
🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty clay	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

CPT-5

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

Total depth: 50.28 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing



SBTn legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

Boring Logs by NMG Geotechnical (2015)

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 2/10/15

Date(s) Drilled	**9/16/14**	Logged By	**AZ**	**H-1** **Sheet 1 of 2**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**10"**	
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**	
Sampling Method(s)	**Modified California, Bulk**			
Approximate Groundwater Depth:	**Groundwater Encountered at 47.4'**			Total Depth Drilled (ft) **51.5**
Comments				Approximate Ground Surface Elevation (ft) **107.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					CL	Surface: 4" AC over 6" AB. **Artificial Fill (Af)**			B-1 @ 1' - 5' GS, AL, MD, DS, EI, CC
		▨ ■	B-1 D-1	11		ML	**Alluvium (Qal)** @ 2.5': Dark yellowish brown fine sandy SILT, moist, medium stiff, trace caliche stringers.	14.5	104.2	
	5	■	D-2	13		SM	@ 5': Upper: Dark yellowish brown silty fine SAND, damp, loose to medium dense, trace caliche stringers.	8.5	104.2	
						SC-CL	Lower: Dark yellowish brown clayey fine SAND/sandy CLAY, damp, medium dense/stiff, trace caliche stringers.			
100		■	D-3	11		SM	@ 7.5': Dark yellowish brown to reddish brown silty fine to medium SAND, moist, loose to medium dense, root hairs, pinhole pores, trace fine gravel.	8.1	115.5	CN
	10	■	D-4	22			@ 10': Yellowish brown silty fine to medium SAND, damp, medium dense, slightly friable, trace fine gravel and mica.	6.3	121.1	
	15	■	D-5	12			@ 15': Yellowish brown silty fine SAND, damp to moist, loose to medium dense, slightly friable, trace mica.	10.9	103.9	CN
90										
	20	■	D-6	14			@ 20': Upper: Light yellowish brown clayey and silty fine to medium SAND, moist, medium dense, slightly friable, trace coarse sand fine gravel and mica. Lower: Yellowish brown silty fine SAND, moist, medium dense, slightly friable, trace mica.	13.4	103.7	
	25	■	D-7	13		CL	@ 25': Brown to reddish brown silty CLAY, wet, medium stiff, caliche stringers.	17.8	111.8	
80										
	30									

LOG OF BORING

WASL/Tustin

Tustin, CA

PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

WASL/Tustin **Tustin, CA**

H-1
Sheet 2 of 2

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	30	■	D-8	18	▨	ML-CL	@ 30': Upper: Light yellowish brown to gray brown clayey SILT/silty CLAY, saturated, stiff, pinhole pores.	22.4	104.9	
					░	SM	Lower: Dark yellowish brown silty fine to medium SAND, saturated, medium dense, trace mica.			
	35	■	D-9	11	▨	CL	@ 35': Reddish brown to gray silty fine sandy CLAY, saturated, medium stiff.	28.9	98.4	
70					▨					
	40	■	D-10	67	▨		@ 40': Reddish brown to gray silty fine sandy CLAY, wet, very stiff to hard, trace mica.	15.2	117.7	
	45	■	D-11	52	▨		@ 45': Reddish brown to gray silty fine sandy CLAY, wet, very stiff to hard, trace mica.	17.4	114.1	
60					▨		∇			
	50	■	D-12	17	▨		@ 50': Red to gray mottled silty, fine sandy CLAY, wet, stiff, trace mica.	23.6	102.2	
							Notes: Total Depth: 51.5 Feet. Groundwater Encountered 47.4 Feet. Backfilled with Cuttings, Tamped, and Patched with Concrete.			
	55									
50										
	60									
	65									

LOG OF BORING
WASL/Tustin
Tustin, CA

PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 2/6/15

Date(s) Drilled	**9/16/14**	Logged By	**TBF**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**
Sampling Method(s)	**Modified California, Bulk**		
Approximate Groundwater Depth:	**Groundwater Not Encountered**		
Comments			

P-1

Sheet 1 of 1

Total Depth Drilled (ft)	**13.0**
Approximate Ground Surface Elevation (ft)	**106.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0	▨				SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)**			
		▨ ■	B-1 D-1	 12			@ 2.5': Upper: Brown silty fine to coarse SAND, damp, loose to medium dense, micaceous, very porous, friable, trace gravel.	8.7	106.7	B-1 @ 0' - 5'
		▨				SM	**Alluvium (Qal)** Lower: Brown silty fine to coarse SAND, damp, loose to medium dense, micaceous, porous, trace gravel.			
100	5	■	D-2	15			@ 5': Brown silty fine SAND, damp, medium dense, porous, caliche, micaceous.	9.9	108.3	
	10									
		■	D-3	12			@ 11': Upper: Light brown slightly silty fine to medium SAND, damp, loose to medium dense, micaceous, highly friable. Lower: Light brown slightly fine SAND, damp, loose, micaceous, more dense than above.	6.2	108.7	
90	15						Notes: Total Depth: 13 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	20									
80	25									
	30									

LOG OF BORING

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Tustin, CA
PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	9/16/14	Logged By	AZ/TBF
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	Groundwater Not Encountered		
Comments			

P-2

Sheet 1 of 1

Total Depth Drilled (ft)	12.0
Approximate Ground Surface Elevation (ft)	107.0

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)**			
		■	D-1	11			@ 2.5': Light brown to brown silty fine SAND, damp, loose, friable, pores up to 3 mm in diameter.	11.0	99.1	
	5	■	D-2	15		SM	**Alluvium (Qal)** @ 5': Brown silty fine SAND, damp, loose, porous, trace root hairs, micaceous.	7.6	109.7	GS, CN
100										
	10	■	D-3	16		SP	@ 10': Upper: Yellowish brown to brown fine to medium SAND, damp, medium dense, highly friable, trace mica.	1.7		
						SM	Lower: Yellowish brown to brown silty fine to medium SAND, damp, medium dense, highly friable, trace mica.			
	15						Notes: Total Depth 12 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfillied with Cuttings.			
90										
	20									
	25									
80										
	30									

LOG OF BORING

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PROJECT NO. 14083-01

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Date(s) Drilled	9/16/14	Logged By	AZ
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	Groundwater Not Encountered		
Comments			

P-3

Sheet 1 of 1

Total Depth Drilled (ft)	11.5
Approximate Ground Surface Elevation (ft)	107.0

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial Fill (Af)/Alluvium (Qal)?**			
	5	■	D-1	12			@ 5': No sample recovery.			
100										
	10	■	D-2	25		SM SP	**Alluvium (Qal)** @ 10': Upper: Light reddish brown to strong brown silty fine to coarse SAND, damp, medium dense, slightly friable, coarse gravel in uppermost rings. Lower: Light pale yellow slightly silty fine to coarse SAND, damp, medium dense, highly friable, trace mica.	2.0		
							Notes: Total Depth 11.5 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

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PROJECT NO. 14083-01

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Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	**9/16/14**	Logged By	**AZ**	**P-4** **Sheet 1 of 1**	
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**		
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**		
Sampling Method(s)	**Modified California, Bulk**				
Approximate Groundwater Depth:	**Groundwater Not Encountered**			Total Depth Drilled (ft)	**11.0**
Comments				Approximate Ground Surface Elevation (ft)	**107.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)/Alluvium (Qal)?**			
	5									B-1 @ 2' - 7'
100										
	10	■	D-1	13		SM	**Alluvium (Qal)** @ 9.5': Dark yellowish brown silty fine to medium SAND, damp, medium dense, trace mica and coarse sand.	8.4	116.1	
							Notes: Total Depth 11.0 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING
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Tustin, CA
PROJECT NO. 14083-01

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Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	**9/16/14**	Logged By	**AZ**	**P-5** **Sheet 1 of 1**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**	
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**	
Sampling Method(s)	**Modified California**			
Approximate Groundwater Depth:	**Groundwater Not Encountered**			Total Depth Drilled (ft): **10.0**
Comments				Approximate Ground Surface Elevation (ft): **108.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)/Alluvium (Qal)?**			
	5									
100		▮	D-1	15		SM	**Alluvium (Qal)** @ 8': Dark yellowish brown silty fine to medium SAND, damp, medium dense, trace pinhole pores.	7.6	113.3	GS, CN
	10						Notes: Total Depth 10.0 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG

Boring Logs by Geosoils (2005)

LOG OF BORING B-1

Sheet 1 of 1

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

⊠ SPT
⧓ Modified California
∇ Water Level ADT
▨ Grab Sample
■ Shelby Tube
▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
		2.5" Asphalt Over 6" Base						
		SILTY SAND, loose, brown, dry to slightly moist, fine grained	⧓		15	13	111	
5		SANDY CLAY, very stiff, dry, brownish gray, some Silt, trace caliche	⧓		40	9	112	
10		Same as above	⊠		18			
		SAND w/some gravel, medium dense, brown, dry						
15		SAND, gray beach sand, medium dense, slightly moist	⧓		24	2	104	
20		SILTY CLAY, medium stiff, brown, moist, some sand	⊠		8			
25		Same as above	⧓		16	19	108	
30		SILTY SAND, loose, brown, moist, fine to medium grained	⊠		5			
35		SANDY CLAY, very stiff, reddish brown/orange brown, moist,	⧓		44	14	121	
40			⊠		11			
		SAND, medium dense, brown, saturated, some clay at tip						
45		Same as above, loose, saturated	⊠		9			
50		Same, medium dense	⊠		14			
		Total depth of Boring = 51'6" Groundwater encountered @ 40'6" Backfilled with cuttings						
55								

GSI

GEOSOILS, INC.
1446 East Chestnut Avenue
Santa Ana, California
Phone: 714-647-0277 Fax: 714-647-0745

ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-2

Sheet 1 of 1

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

⊠ SPT
⧓ Modified California
▽ Water Level ADT
✋ Grab Sample
■ Shelby Tube
▼ Static Water Table

DEPTH (ft)	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: Sample Type	SAMPLES: Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	2.5" Asphalt over 6" Base						
	Sandy CLAY w/gravel, brown, medium stiff, moist, low plasticity	⧓		8	17	76	
5	Same as above	⊠		8			
10	SAND, brown, medium dense, moist, fine grained	⧓		19	12	125	
15	Silty SAND, brown, loose, moist, fine grained	⊠		6			
20	SAND, brown, medium dense, moist, fine grained	⧓		22	6	102	
25	Silty CLAY, brown, soft, moist, low to medium plasticity	⊠		3			
30	Same as above	⧓		19	15	111	
35	Same but orange brown	⊠		3			
40	Silty CLAY, reddish brown, very stiff, moist, medium plasticity	⧓		35	16	114	
▼45	Same as above	⊠		3			
50		⊠		3			
55	Total Depth = 51.5 feet Groundwater encountered @ 45 feet Backfilled w/cuttings						

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ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-3

Sheet 1 of 1

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

☒ SPT
⧓ Modified California
▽ Water Level ADT
Grab Sample
■ Shelby Tube
▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	■	2.5" Asphalt over 6" Base						
	▨	Silty CLAY w/gravel, dark brown, soft, moist, low to medium plasticity	⧓		3	23	90	
5	▥	Silty SAND, brown, loose, fine grained, moist	⧓		12	-	-	
10	▨	Clayey SAND, brown, loose, slightly moist, fine grained	☒		9			
15	▨	Same as above	⧓		14	6	94	
20	▥	Sandy SILT, soft to medium stiff, brown, moist	☒		4			
25	▨	Silty CLAY, medium stiff, reddish brown, moist, medium plasticity	⧓		14	20	105	
		Total Depth = 26'6" No Groundwater encountered within boring depth Backfilled w/cuttings						

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4735-A1-OC

Plate

LOG OF BORING B-4

Sheet 1 of 1

Date Drilled: 3/18/05 Logged by: DXS

Equipment: CME-55 Driving Weight and Drop: 140 lbs and 30"

Surface Elevation(ft): Depth to Water(ft):

⊠ SPT ⧓ Modified California ▽ Water Level ADT

▣ Grab Sample ■ Shelby Tube ▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	■	2.5" Asphalt over 6" Base						
	▨	Silty CLAY, soft, brown, moist, fine grained, low to medium plasticity						
	▥	Sandy SILT, brown, soft, moist, fine grained	⧓		5	22	96	
5	▨	Silty CLAY, soft, brown, moist, medium plasticity	⊠		2			
10	▨	Same as above, sandy	⧓		20	13	120	
15	▥	SIlty SAND, brown, loose, moist, fine to medium grained	⊠		6			
20	▥	same as above	⧓		15	23	96	
	▨	SIlty CLAY, brown, soft to medium stiff, moist, low to medium plasticity						
25	▨		⊠		5			
		Total Depth = 26'6" No groundwater encountered within the boring depth Backfilled w/cuttings						

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4735-A1-OC

Plate

LOG OF BORING B-5

Sheet 1 of 1

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

☒ SPT
⧓ Modified California
∇ Water Level ADT
Grab Sample
■ Shelby Tube
▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
		2.5" Asphalt over 6" Base						
		SAND w/gravel, medium dense, brown, moist						
		Sandy CLAY, medium stiff, dark brown, moist, low plasticity	⧓		9	18	100	
5		Same as above	⧓		18	19	93	
10		SAND, brown, medium dense, moist, fine to medium grained	☒		19			
15		Silty SAND, brown, medium dense, moist, fine to medium grained	⧓		36	7	99	
20		SAND, loose, brown, slightly moist, fine grained, some silt	☒		7			
25		Silty CLAY, very stiff, brown, moist, low to medium plasticity	⧓		29	17	113	
30		Sandy SILT, medium stiff, reddish brown, moist, rust, some caliche	☒		5			
		Total Depth of Boring = 31'6" No groundwater encountered within the boring depth Backfilled w/cuttings						

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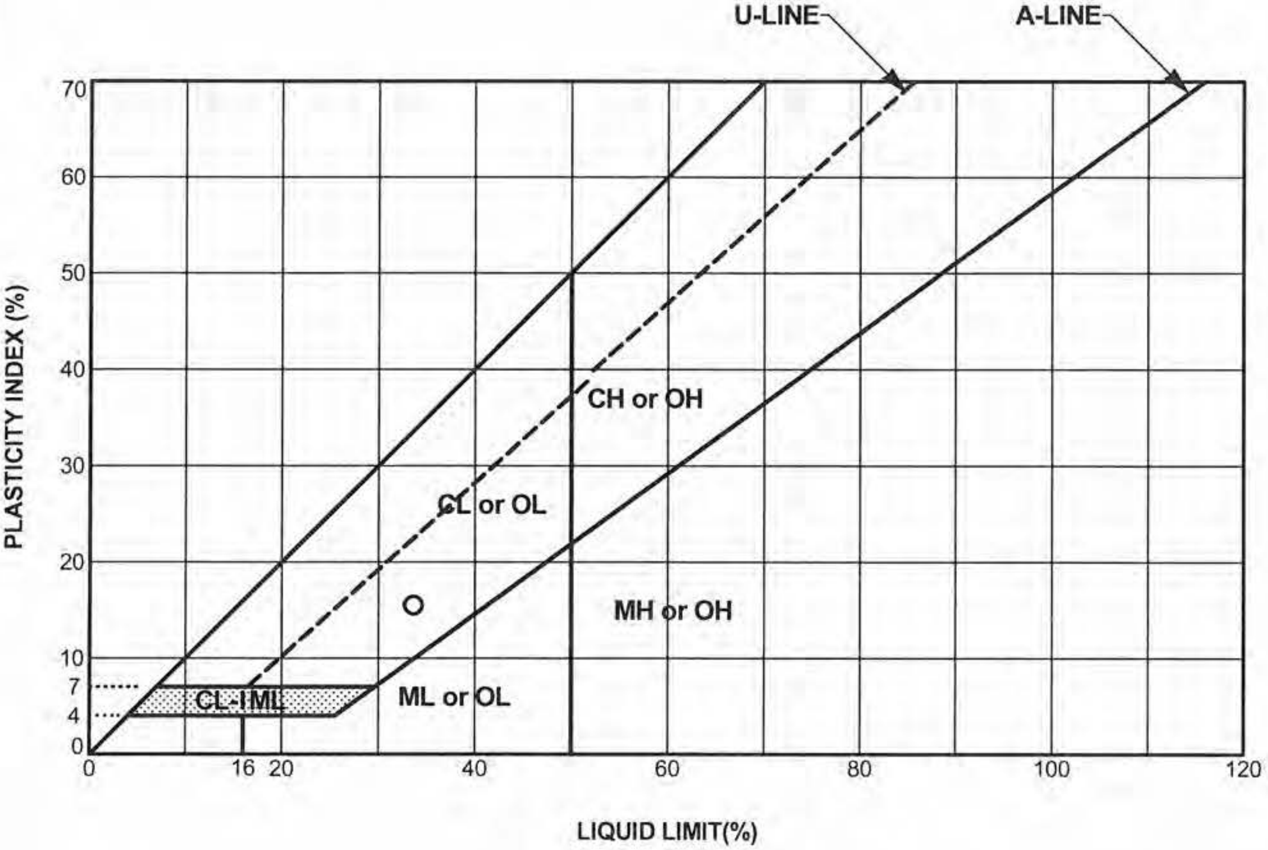
ASL Tustin

4735-A1-OC

Plate

Appendix C

Laboratory Test Results by NMG Geotechnical (2015)

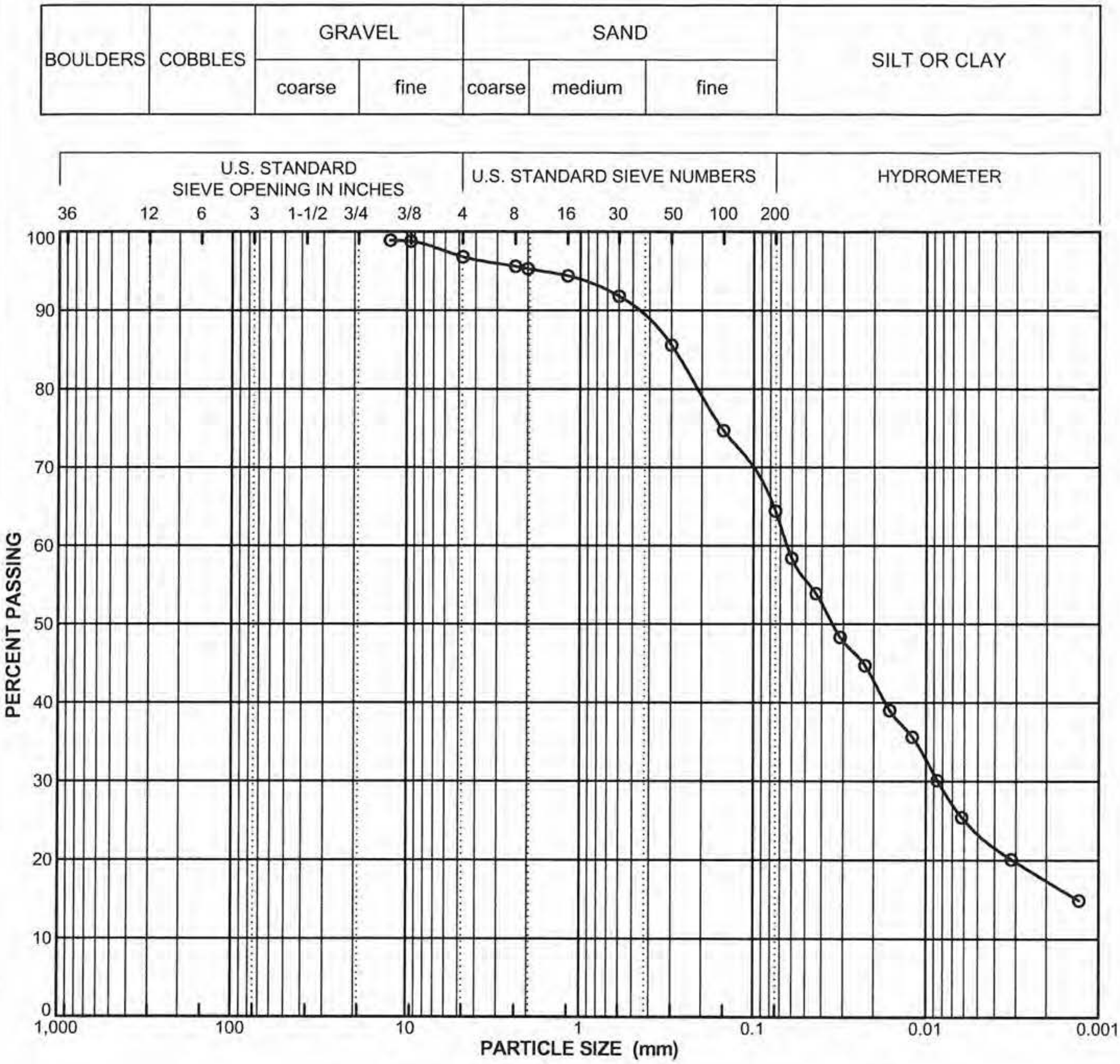


Symbol	Boring Number	Depth (feet)	Sample Number	Passing No. 200 Sieve (%)	LL	PI	USCS	Description
○	H-1	1.0	B-1	64	34	16	CL	Brown sandy silty CLAY

PLASTICITY CHART

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.

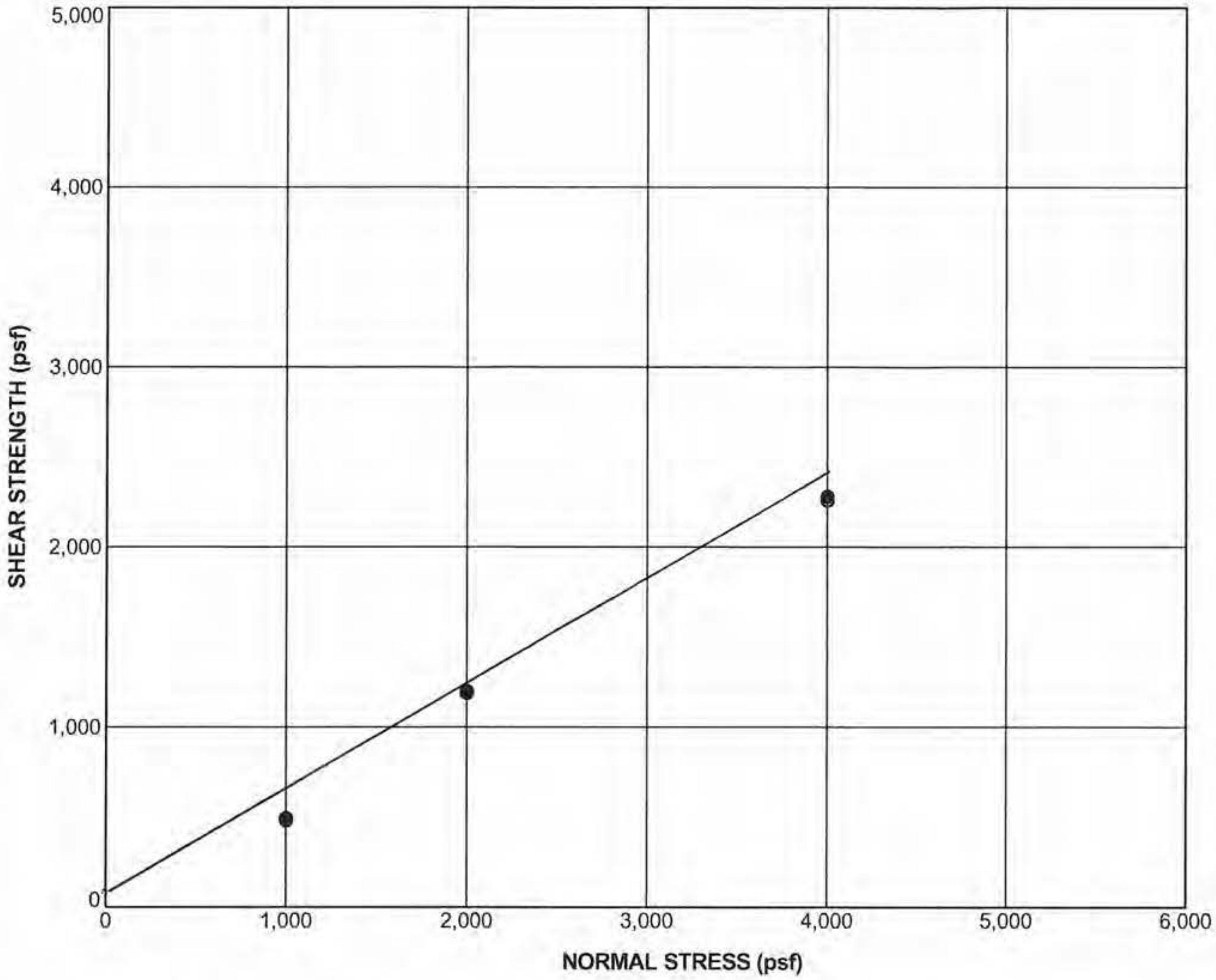


Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
○	H-1	B-1	1.0		34	16				64	17	CL

PARTICLE SIZE DISTRIBUTION

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



Boring No. H-1	**Sample No. B-1**	**Depth: 1.0 ft**

Sample Description:	Brown sandy silty CLAY

Liquid Limit:	34	**Plasticity Index:**	16	**Percent Passing No. 200 Sieve:**	64
Moisture Content (%):	24.9	**Dry Density (pcf):**	103.9	**Degree of Saturation (%):**	99
Sample Type:	Remolded	**Rate of Shear (in./min.):**	0.005		

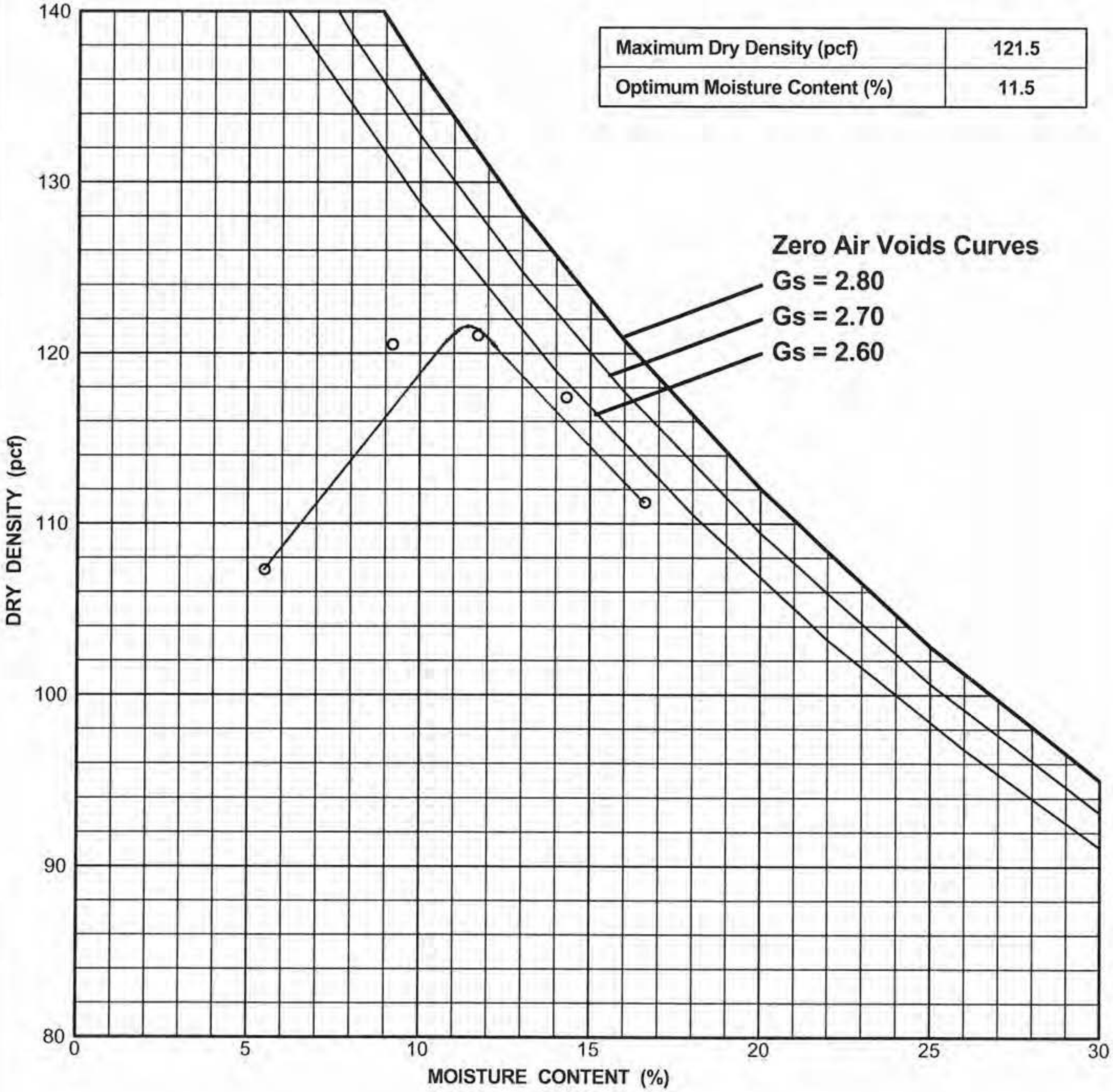
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	100	100
Friction Angle (degrees)	30	30.0

DIRECT SHEAR TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



Maximum Dry Density (pcf)	121.5
Optimum Moisture Content (%)	11.5

Boring No. H-1		**Sample No. B-1**		**Depth: 1.0 ft**	
Sample Description:	Brown sandy silty CLAY				
Liquid Limit:	34	**Plasticity Index:**	16	**Percent Passing No. 200 Sieve:**	64
Comments:	1557A				

COMPACTION TEST RESULTS

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PROJECT NO. 14083-01

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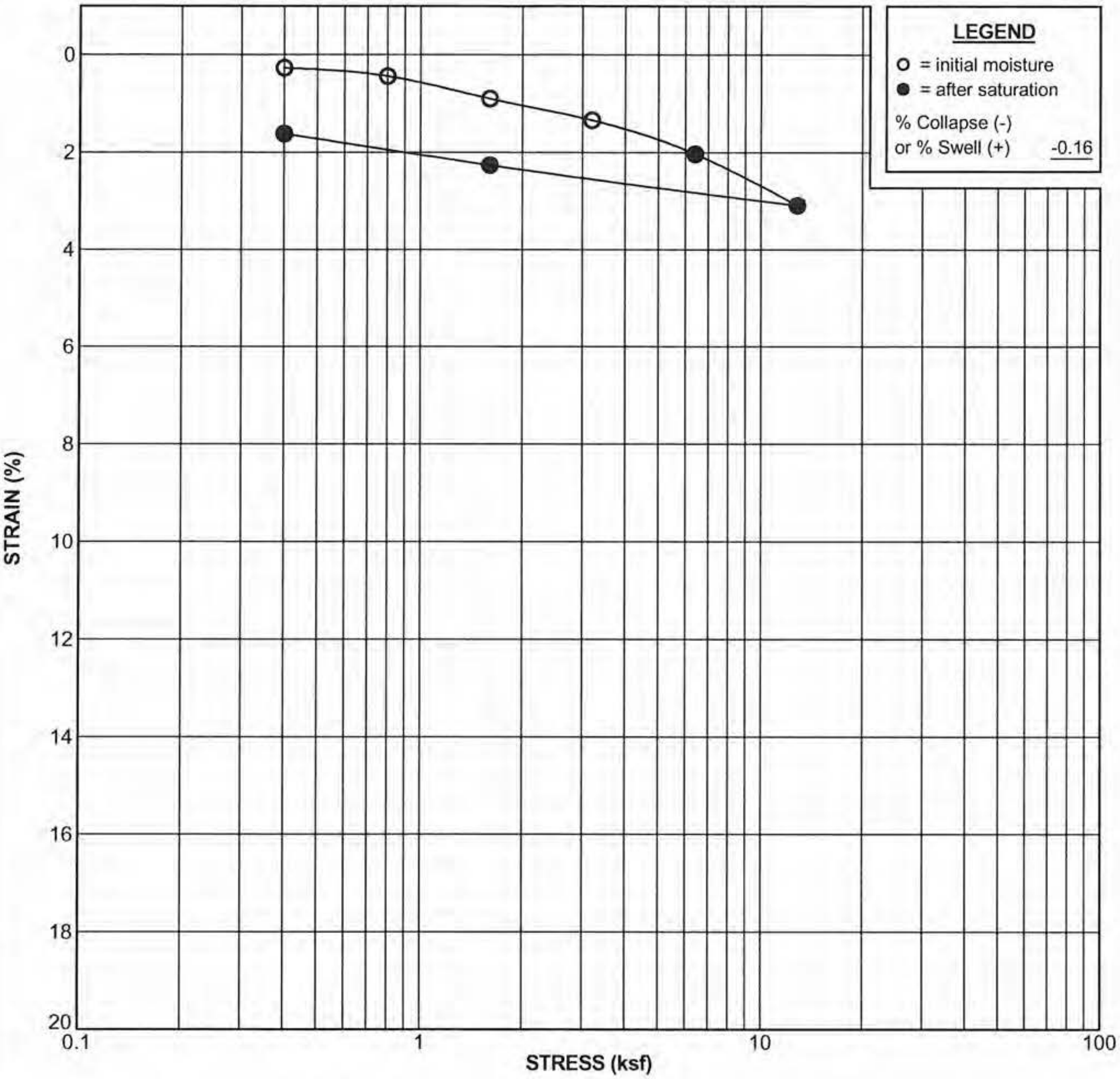


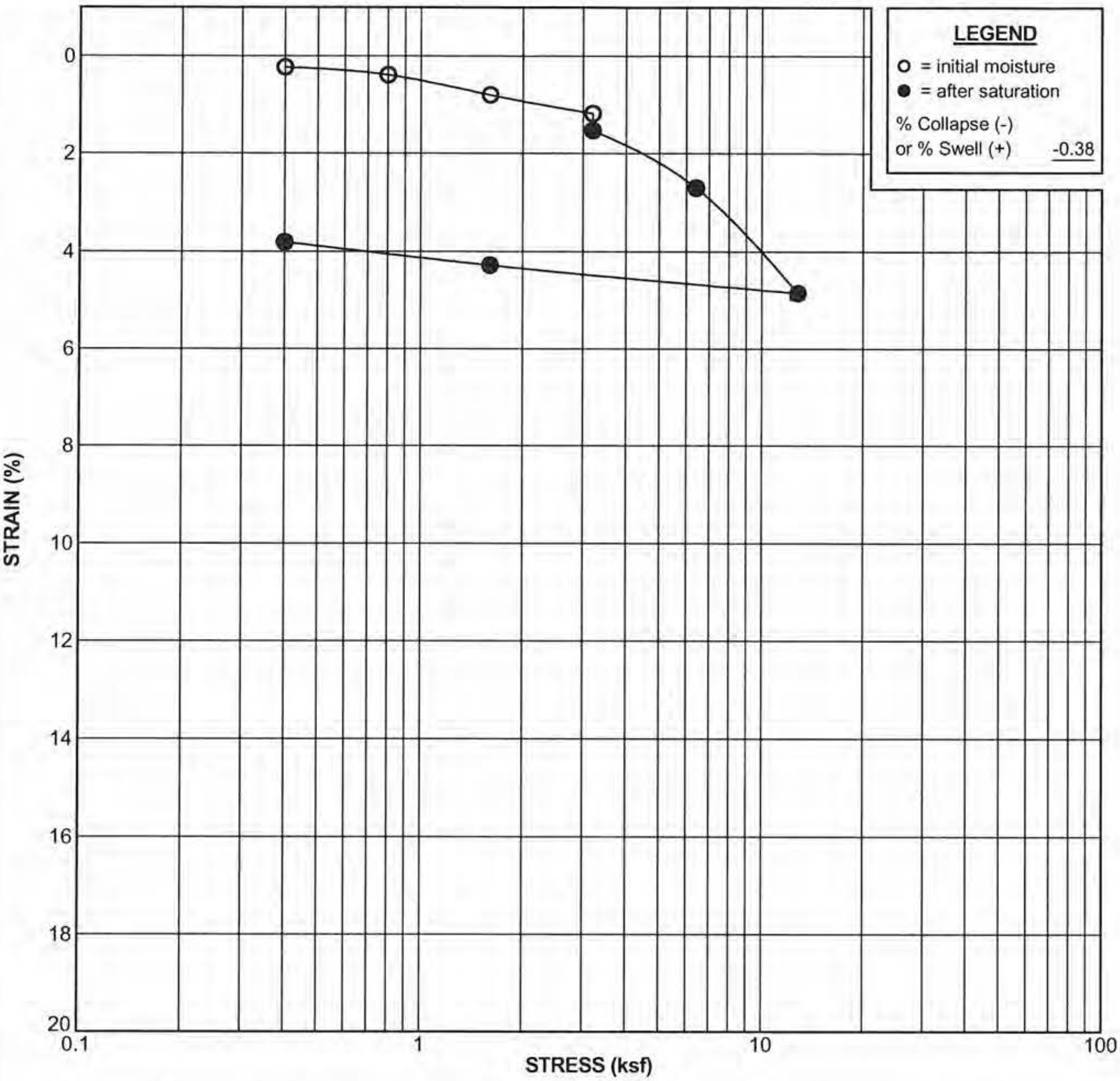
Boring No. H-1	**Sample No. D-5**	**Depth: 15.0 ft**
Sample Description: (Qal) Brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	16.0	103.1	70.2	0.604
Final	21.0	104.8	96.3	0.578

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



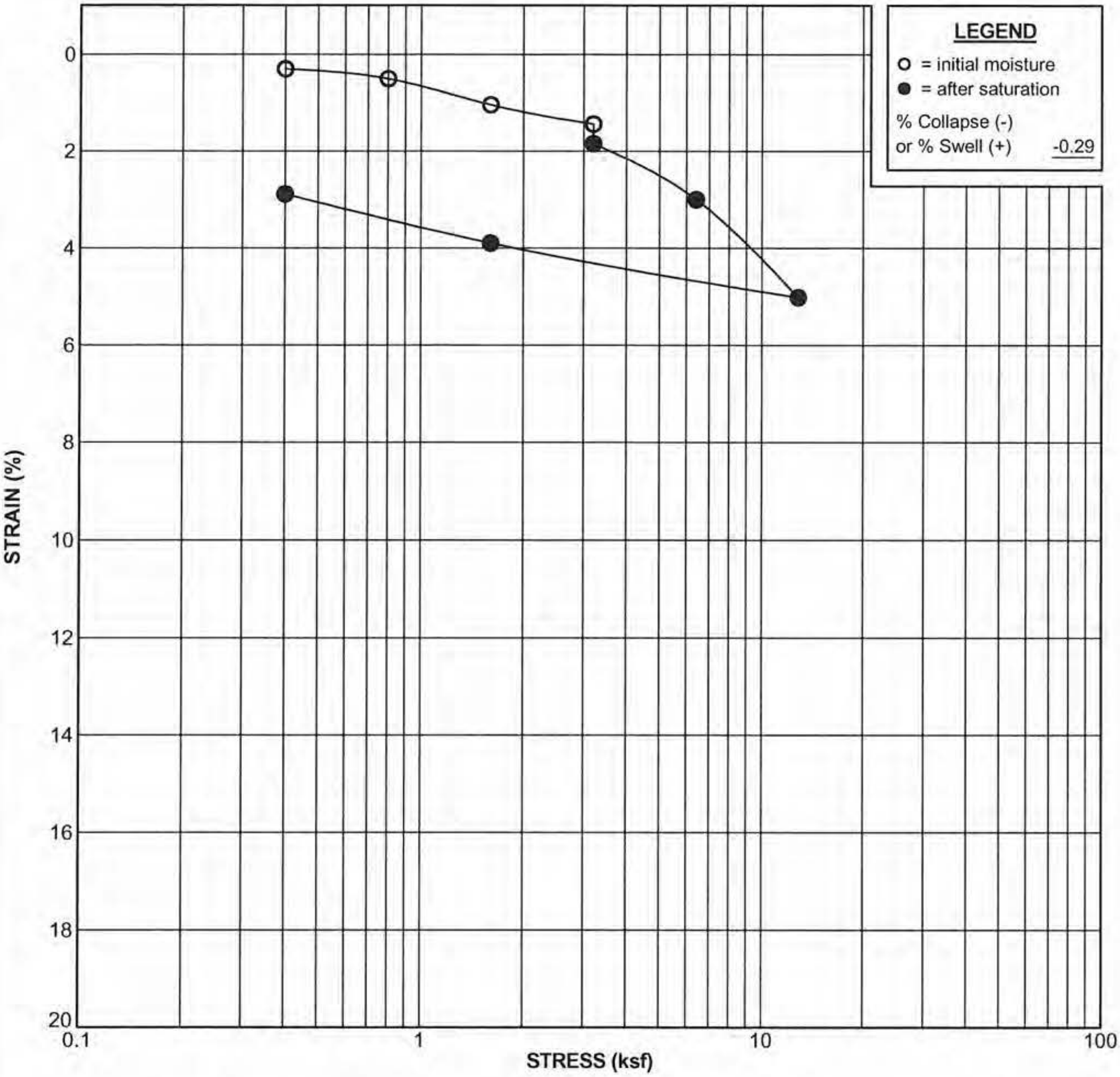
Boring No. H-1	**Sample No. D-3**	**Depth: 7.5 ft**
Sample Description: (Qal) Reddish brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	8.4	114.5	50.1	0.444
Final	14.4	118.9	97.7	0.391

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



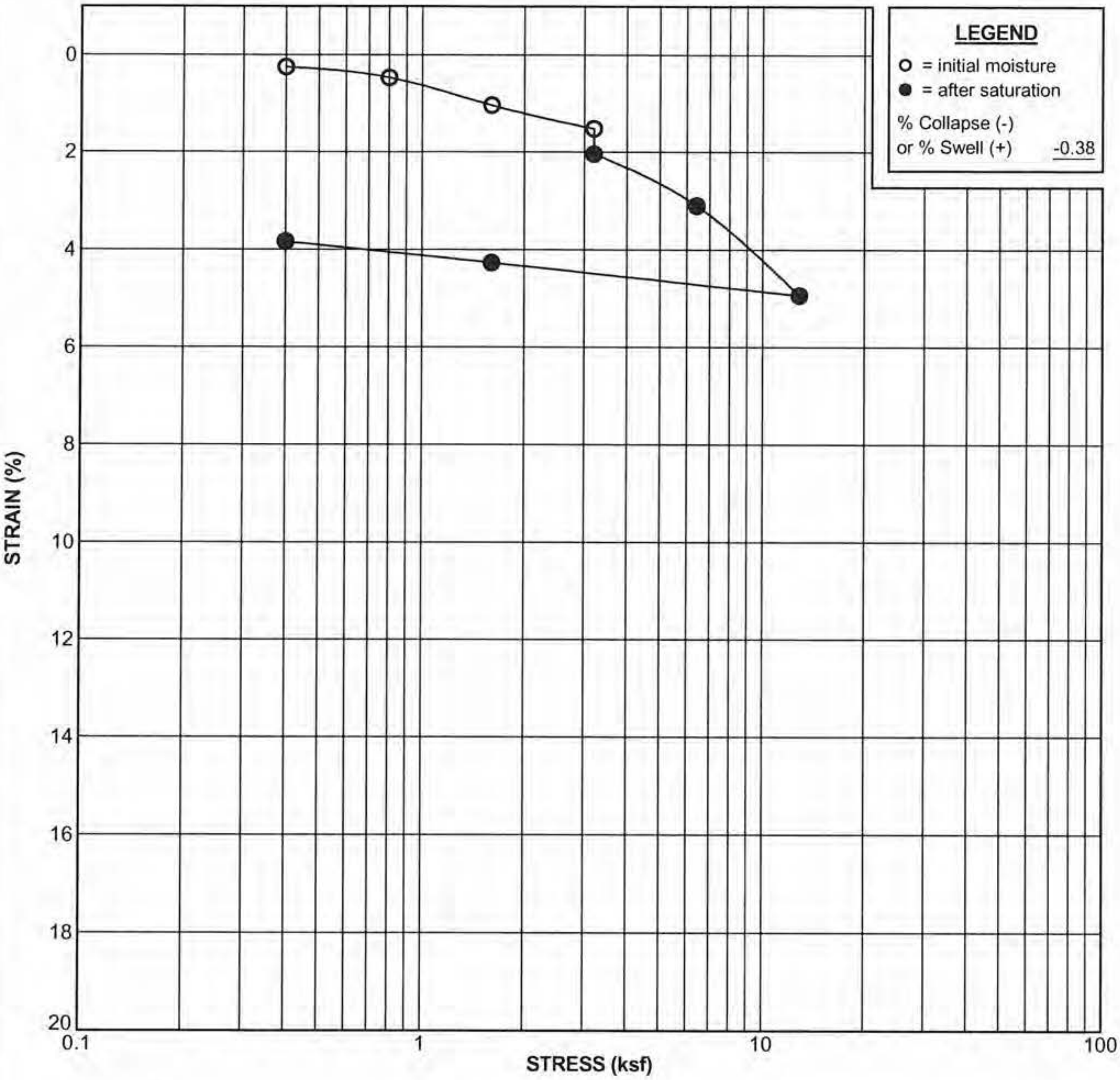
Boring No. P-2	**Sample No. D-2**	**Depth: 5.0 ft**
Sample Description: (Qal) Brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	8.2	113.3	44.8	0.498
Final	16.6	116.6	99.1	0.456

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



Boring No. P-5	**Sample No. D-1**	**Depth: 8.0 ft**
Sample Description:	(Qal) Reddish brown sandy SILT	
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	7.7	111.7	42.5	0.480
Final	14.4	116.0	89.7	0.426

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.

Laboratory Test Results
by Geosoils (2005)

Job No. **4735-A1-OC**
Project **ASL TUSTIN**

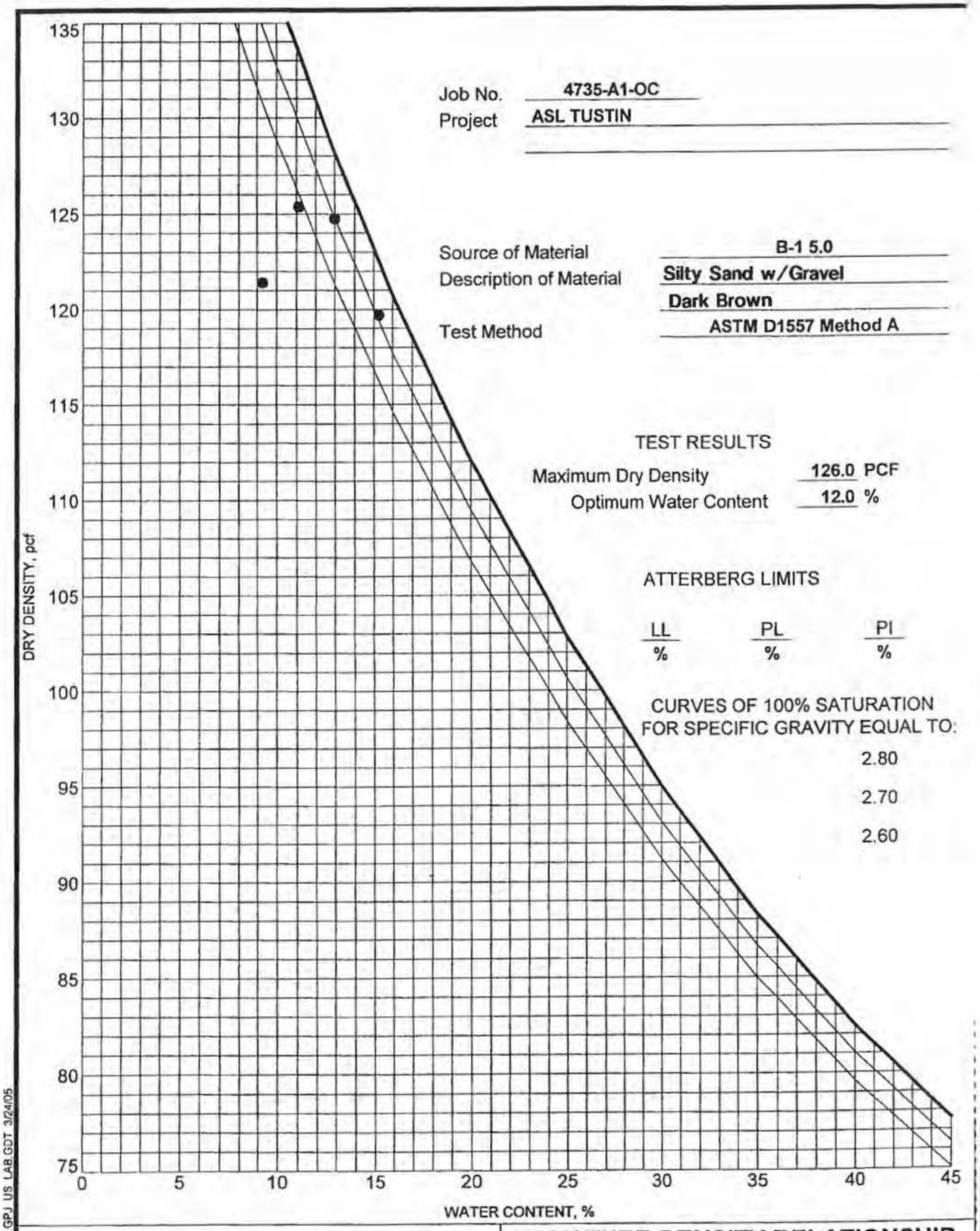
Source of Material **B-1 5.0**
Description of Material **Silty Sand w/Gravel**
Dark Brown
Test Method **ASTM D1557 Method A**

TEST RESULTS

Maximum Dry Density	**126.0** PCF
Optimum Water Content	**12.0** %

ATTERBERG LIMITS

LL	PL	PI
%	%	%



MOISTURE-DENSITY RELATIONSHIP

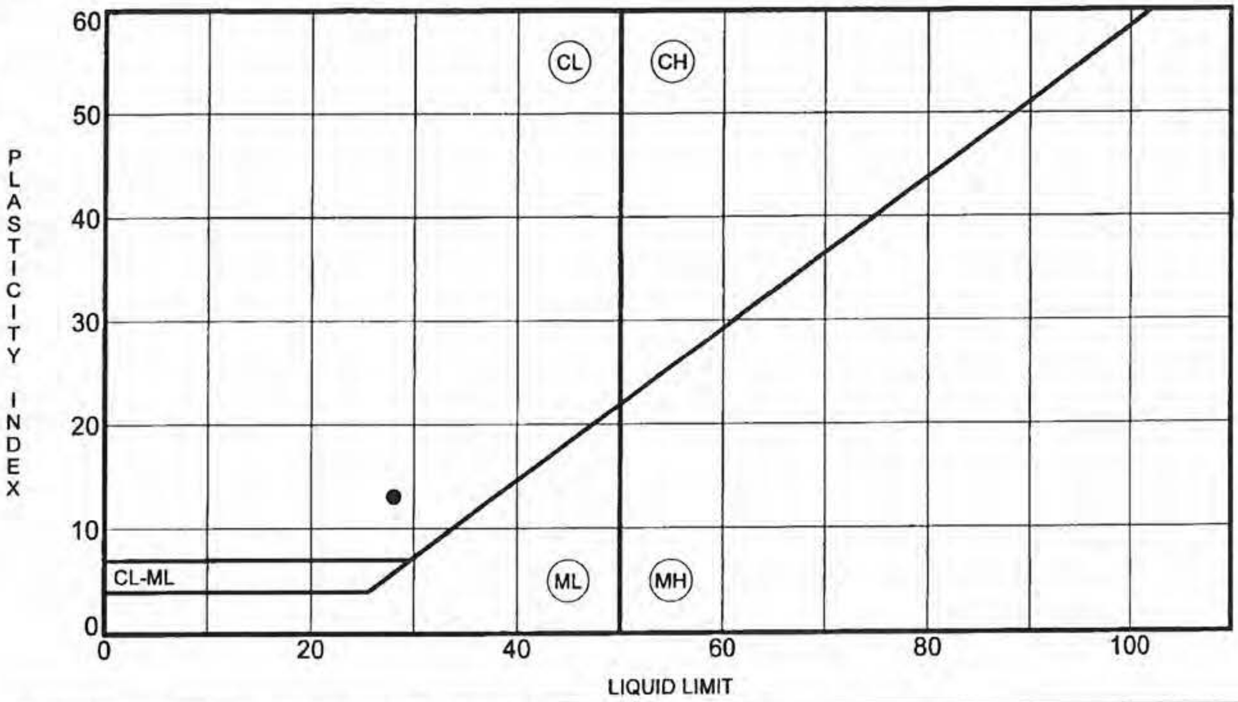
GSI

GEOSOILS, INC.
1446 East Chestnut Avenue
Santa Ana, California
Telephone: 714-647-0277
Fax: 714-647-0745

Project: ASL TUSTIN
Location:
Number: 4735-A1-OC

PLATE

US_COMPACTION 4735.GPJ US_LAB.GDT 3/24/05



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-1**	**20.0**	**28**	**15**	**13**		

GSI

GEOSOILS, INC.
1446 East Chestnut Avenue
Santa Ana, California
Telephone: 714-647-0277
Fax: 714-647-0745

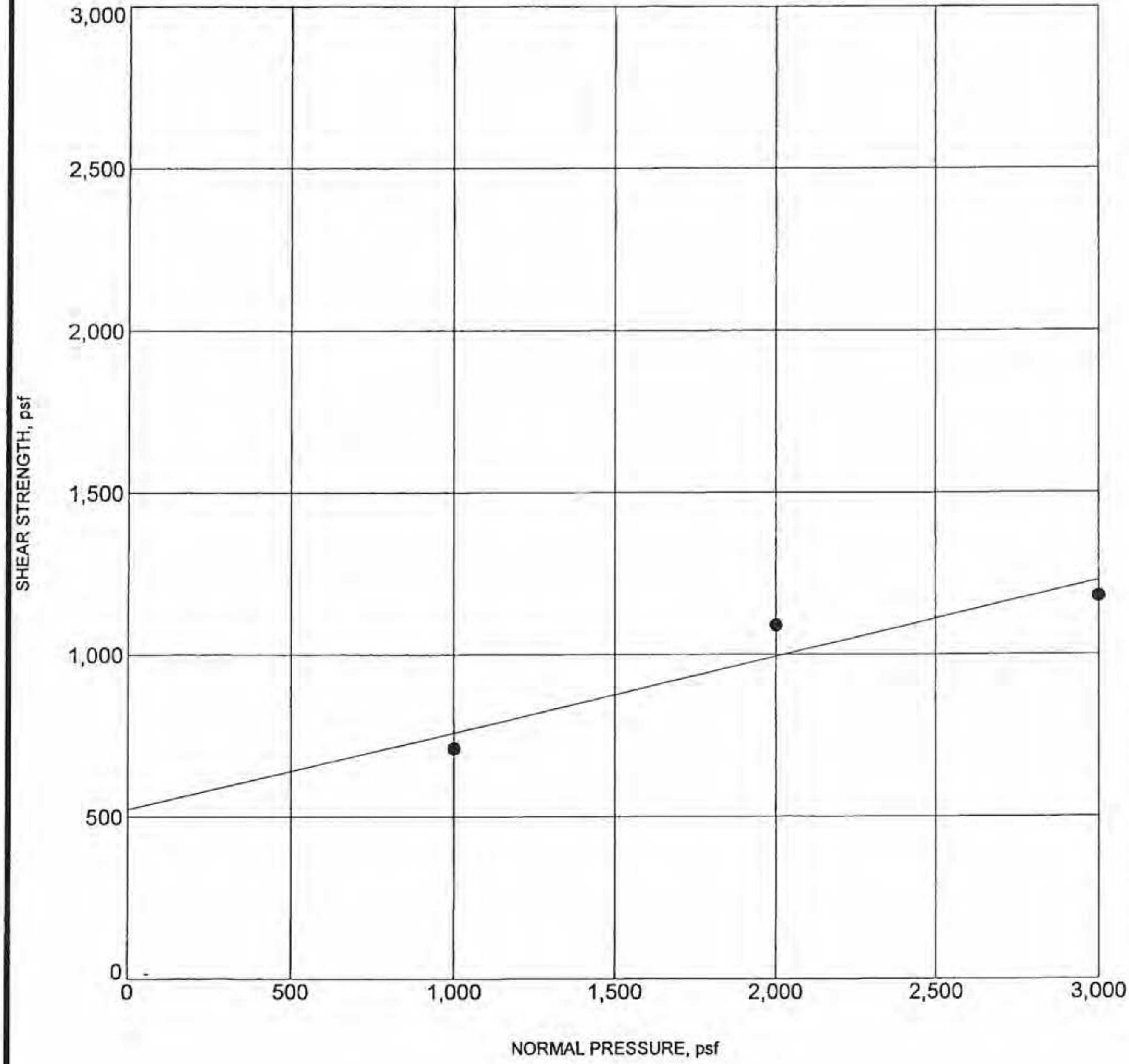
ATTERBERG LIMITS' RESULTS

Project: ASL Tustin

Location:

Number: 4735-A1-OC

PLATE



	Specimen Identification		Classification	γ_d	MC%	c	ϕ
●	**B-1**	**5.0**	**REMOLDED**	**104**	**19**	**523**	**13**

GSI

GEOSOILS, INC.
1446 East Chestnut Avenue
Santa Ana, California
Telephone: 714-647-0277
Fax: 714-647-0745

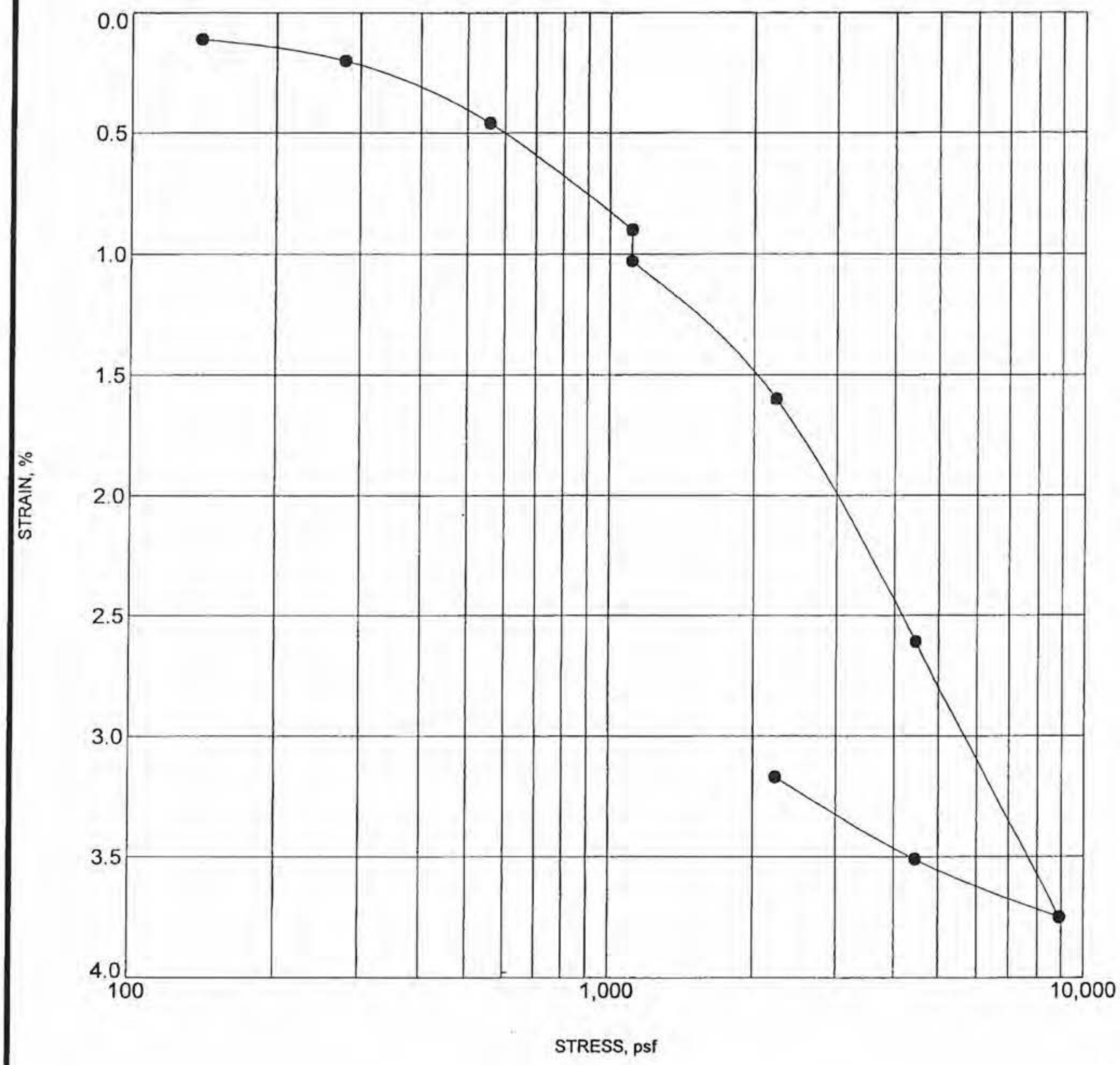
DIRECT SHEAR TEST

Project: ASL TUSTIN

Location:

Number: 4735-A1-OC

PLATE



	Specimen Identification		Classification	γ_d	MC%
●	B-3	15.0		100	23

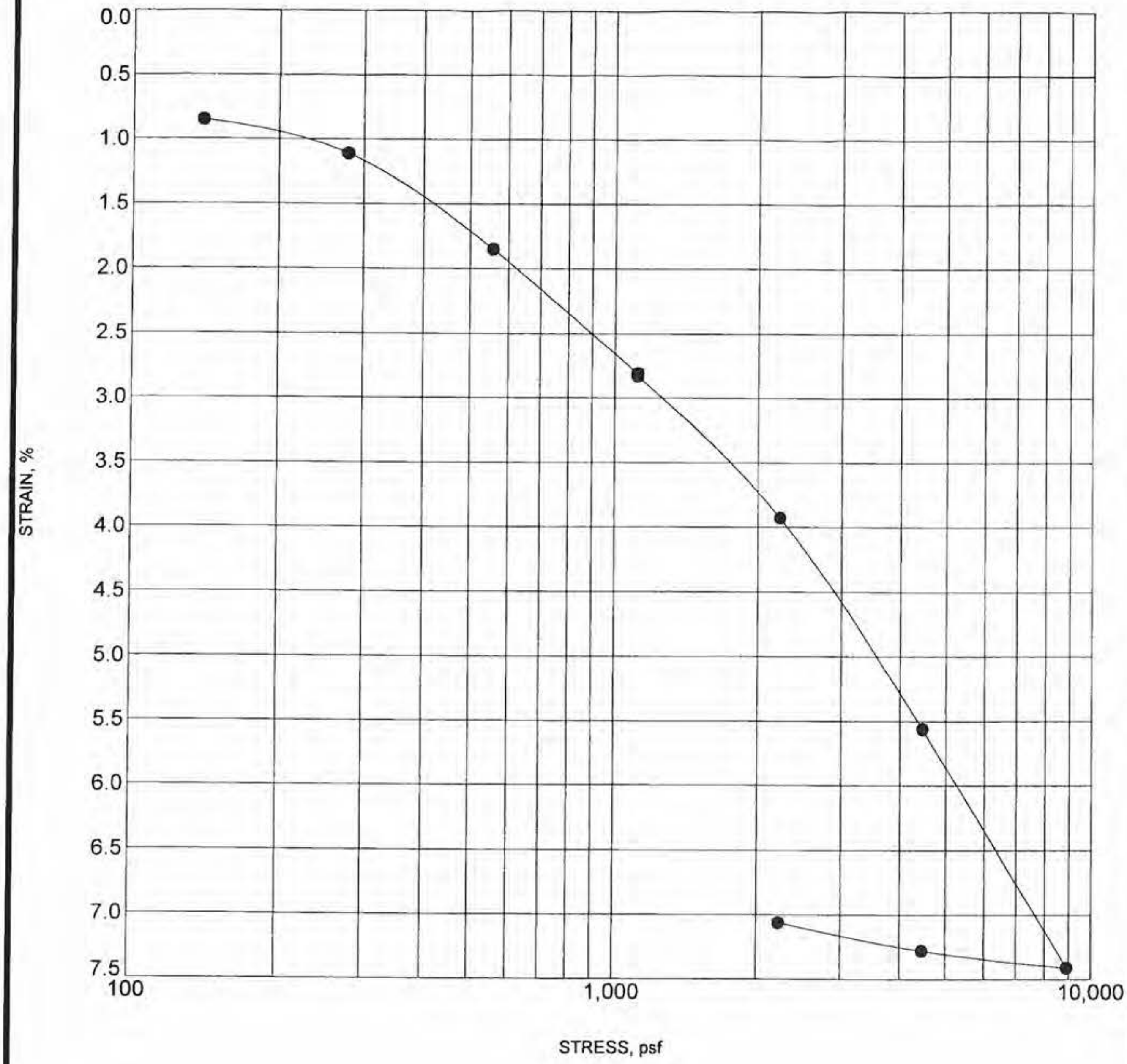
GSI

GEOSOILS, INC.
1446 East Chestnut Avenue
Santa Ana, California
Telephone: 714-647-0277
Fax: 714-647-0745

CONSOLIDATION TEST

Project: ASL TUSTIN
Location:
Number: 4735-A1-OC

PLATE



	Specimen Identification		Classification	γ_d	MC%
●	B-4	10.0		120	12

US CONSOL STRAIN 4735.GPJ US LAB.GDT 3/25/05

GSI

GEOSOILS, INC.
1446 East Chestnut Avenue
Santa Ana, California
Telephone: 714-647-0277
Fax: 714-647-0745

CONSOLIDATION TEST

Project: ASL TUSTIN

Location:

Number: 4735-A1-OC

PLATE

Cal Land Engineering, Inc.
dba Quartech Consultant
Geotechnical, Environmental, and Civil Engineering

SUMMARY OF LABORATORY TEST DATA

Client Name: GeoSoils, Inc.
Project Name: ASL Tustin
Project No.: W.O. 4735-A-OC

QCI Project No.: 05-029-003i
Date: March 24, 2005
Summarized by: ABK

Sample ID (Boring No.)	Sample Depth (Feet)	pH CT-532	Chloride CT-422 (ppm)	Sulfate CT-417 (% By Weight)	Resistivity CT-532 (ohm-cm)
B - 2	0-5	8.36	85	0.0230	1,900

Appendix D

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

Latitude, Longitude: 33.7359, -117.8139

Date	1/24/2024, 11:14:22 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.284	MCE$_R$ ground motion. (for 0.2 second period)
S_1	0.459	MCE$_R$ ground motion. (for 1.0s period)
S_{MS}	1.284	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.856	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.536	MCE$_G$ peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.59	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.284	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.37	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.459	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.493	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.582	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.536	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.937	Mapped value of the risk coefficient at short periods
C_{R1}	0.93	Mapped value of the risk coefficient at a period of 1 s
C_V	1.357	Vertical coefficient

DISCLAIMER

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U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition

Dynamic: Conterminous U.S. 2014 (updat…

Latitude

Decimal degrees

33.7359

Longitude

Decimal degrees, negative values for western longitudes

-117.8139

Site Class

259 m/s (Site class D)

Spectral Period

Peak Ground Acceleration

Time Horizon

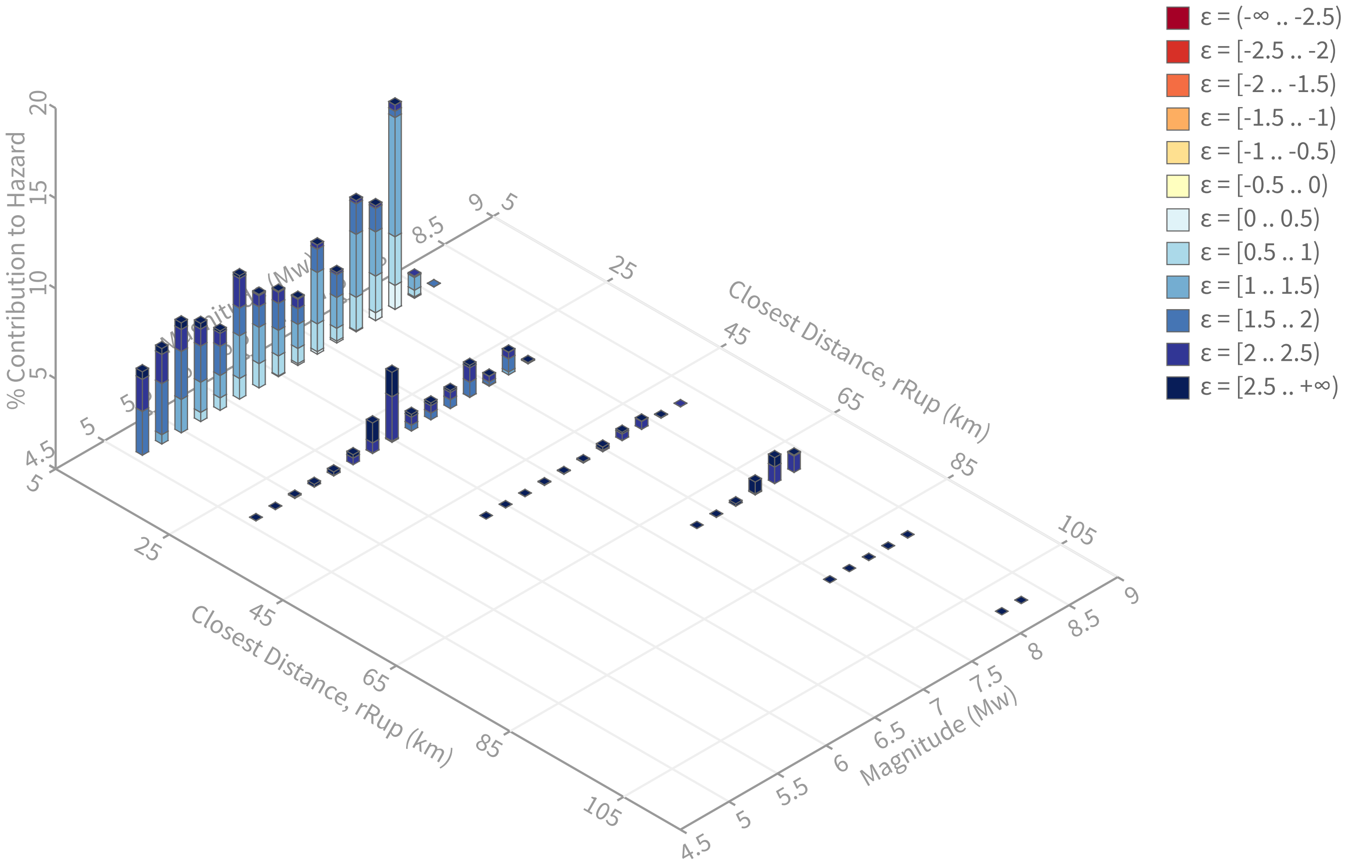
Return period in years

2475

^ Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.63774094 g

Recovered targets

Return period: 3044.5692 yrs
Exceedance rate: 0.00032845369 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.04 %

Mean (over all sources)

m: 6.64
r: 15.59 km
ε_0: 1.59 σ

Mode (largest m-r bin)

m: 7.71
r: 14.6 km
ε_0: 1.15 σ
Contribution: 11.32 %

Mode (largest m-r-ε_0 bin)

m: 7.71
r: 17.17 km
ε_0: 1.35 σ
Contribution: 6.61 %

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 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							28.29
San Joaquin Hills [1]		8.38	7.17	0.95	117.835°W	33.668°N	194.80	6.22
Whittier alt 2 [1]		18.13	7.59	1.51	117.719°W	33.878°N	28.85	3.90
Elsinore (Glen Ivy) rev [0]		23.17	6.58	2.40	117.590°W	33.829°N	63.38	2.45
Compton [0]		18.92	7.29	1.26	118.043°W	33.702°N	260.12	2.22
Newport-Inglewood alt 2 [0]		17.13	7.51	1.45	117.956°W	33.638°N	230.33	2.01
Peralta Hills [0]		11.18	7.35	1.17	117.814°W	33.835°N	0.01	1.75
Chino alt 2 [2]		21.61	7.03	1.90	117.622°W	33.870°N	49.92	1.53
Anaheim [0]		13.76	6.98	1.29	117.943°W	33.780°N	292.50	1.09
UC33brAvg_FM31	System							27.10
San Joaquin Hills [1]		8.38	7.53	0.79	117.835°W	33.668°N	194.80	4.80
Whittier alt 1 [2]		18.19	7.51	1.56	117.722°W	33.880°N	27.96	3.96
Elsinore (Glen Ivy) rev [0]		23.17	6.60	2.39	117.590°W	33.829°N	63.38	2.42
Newport-Inglewood alt 1 [0]		17.24	7.48	1.46	117.958°W	33.639°N	230.98	2.17
Compton [0]		18.92	7.23	1.29	118.043°W	33.702°N	260.12	2.06
Peralta Hills [0]		11.18	7.01	1.40	117.814°W	33.835°N	0.01	1.85
Chino alt 1 [4]		18.55	6.81	1.93	117.617°W	33.862°N	52.39	1.81
Anaheim [0]		13.76	6.92	1.33	117.943°W	33.780°N	292.50	1.07
UC33brAvg_FM31 (opt)	Grid							22.34
PointSourceFinite: -117.814, 33.776		6.58	5.78	1.24	117.814°W	33.776°N	0.00	3.79
PointSourceFinite: -117.814, 33.776		6.58	5.78	1.24	117.814°W	33.776°N	0.00	3.79
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.66
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.66
PointSourceFinite: -117.814, 33.812		9.38	5.77	1.64	117.814°W	33.812°N	0.00	1.53
PointSourceFinite: -117.814, 33.812		9.38	5.77	1.64	117.814°W	33.812°N	0.00	1.53
PointSourceFinite: -117.814, 33.830		10.39	5.97	1.67	117.814°W	33.830°N	0.00	1.08
PointSourceFinite: -117.814, 33.830		10.39	5.97	1.67	117.814°W	33.830°N	0.00	1.08
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
UC33brAvg_FM32 (opt)	Grid							22.27
PointSourceFinite: -117.814, 33.776		6.58	5.77	1.24	117.814°W	33.776°N	0.00	3.82
PointSourceFinite: -117.814, 33.776		6.58	5.77	1.24	117.814°W	33.776°N	0.00	3.82
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.71
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.71
PointSourceFinite: -117.814, 33.812		9.43	5.75	1.65	117.814°W	33.812°N	0.00	1.46
PointSourceFinite: -117.814, 33.812		9.43	5.75	1.65	117.814°W	33.812°N	0.00	1.46
PointSourceFinite: -117.814, 33.830		10.41	5.96	1.68	117.814°W	33.830°N	0.00	1.05
PointSourceFinite: -117.814, 33.830		10.41	5.96	1.68	117.814°W	33.830°N	0.00	1.05
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01

Appendix E

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-1
Depth (in): 150 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	3:40	11	111.6	129.6	18.0
	3:51				
2	3:51	14	111.6	128.1	16.5
	4:05				

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
1:37	10	10	128.1	141.6	13.5	81.0
1:47						
1:53	10	26	116.4	138.0	21.6	129.6
2:03						
2:10	10	43	112.2	133.2	21.0	126.0
2:20						
2:25	10	58	112.2	131.4	19.2	115.2
2:35						
2:38	10	71	114.3	132.0	17.7	106.2
2:48						
2:49	10	82	115.2	132.0	16.8	100.8
2:59						

Initial Height of Water (Ho) = 34.8

Final Height of Water (Hf) = 18

Change in Height Over Time (ΔH) = 16.8

Average Head Over Time (Havg) = 26.4

Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)

I_t= 7.1 in./hr.

C x I_t = **3.5** **in./hr.**

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-2
Depth (in): 145.2 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	1:55 2:07	12	99.6	113.4	13.8
2	2:07 2:25	18	113.4	130.2	16.8

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
2:27 2:37	10	10	100.8	114.6	13.8	82.8
2:39 2:49	10	22	114.6	127.2	12.6	75.6
2:59 3:09	10	42	100.8	112.8	12.0	72.0
3:09 3:19	10	52	100.8	112.2	11.4	68.4
3:21 3:31	10	64	100.8	112.8	12.0	72.0
3:33 3:43	10	76	101.7	111.6	9.9	59.4

Initial Height of Water (Ho) = 43.5
Final Height of Water (Hf) = 33.6
Change in Height Over Time (ΔH) = 9.9
Average Head Over Time (Havg) = 38.6
Annulus Gravel/Sand Correction (C) = 0.5

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$
$I_t = 2.9$ in./hr.
$C \times I_t =$ **1.5** **in./hr.**

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-3
Depth (in): 135 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	2:44	7	99.0	106.8	7.8
	2:51				
2	2:51	9	106.8	120	13.2
	3:00				

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
3:02	10	10	99.0	119.4	20.4	122.4
3:12						
3:12	10	20	102.6	121.2	18.6	111.6
3:22						
3:24	10	32	99.6	118.2	18.6	111.6
3:34						
3:38	10	46	99.6	118.2	18.6	111.6
3:48						
3:49	10	57	101.1	118.8	17.7	106.2
3:59						
4:01	10	69	100.2	115.8	15.6	93.6
4:11						

Initial Height of Water (Ho) = 34.8
Final Height of Water (Hf) = 19.2
Change in Height Over Time (ΔH) = 15.6
Average Head Over Time (Havg) = 27
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 6.5 in./hr.
C x I_t = **3.2** **in./hr.**

Percolation Data Sheet

Project Name:	13841 & 13751 Red Hill Ave	Project Number:	24011-01
Test Hole Number:	P-4	Date Excavated:	9/16/2014
Depth (in):	132 Radius (in.): 4	Date Presoak:	9/16/2014
Tested By:	NMG (2015) Pipe Diameter (in.): 3	Date Tested:	9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	3:40 3:51	11	93.6	105	11.4
2	3:51 4:05	14	105	116.4	11.4

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
4:06 4:16	10	10	100.8	115.8	15.0	90.0
4:17 4:27	10	21	96.0	114.0	18.0	108.0
4:40 4:50	10	44	100.5	118.8	18.3	109.8
4:51 5:01	10	55	100.8	114.9	14.1	84.6
5:02 5:12	10	66	97.8	114.0	16.2	97.2
5:14 5:24	10	78	97.8	111.0	13.2	79.2

Initial Height of Water (Ho) = 34.2

Final Height of Water (Hf) = 21.0

Change in Height Over Time (ΔH) = 13.2

Average Head Over Time (Havg) = 27.6

Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)

I_t= 5.4 in./hr.

C x I_t = **2.7** **in./hr.**

Appendix F

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

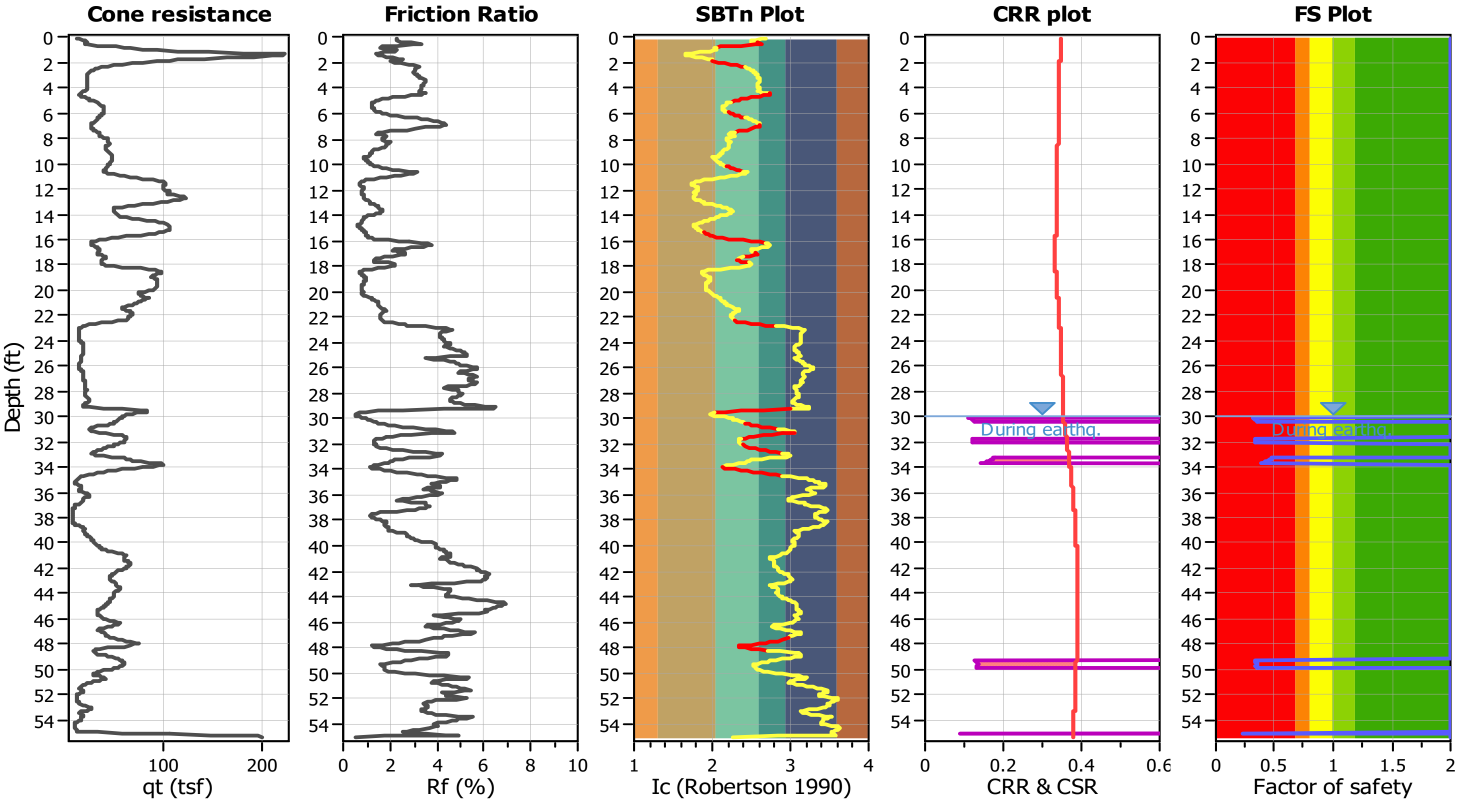
LIQUEFACTION ANALYSIS REPORT

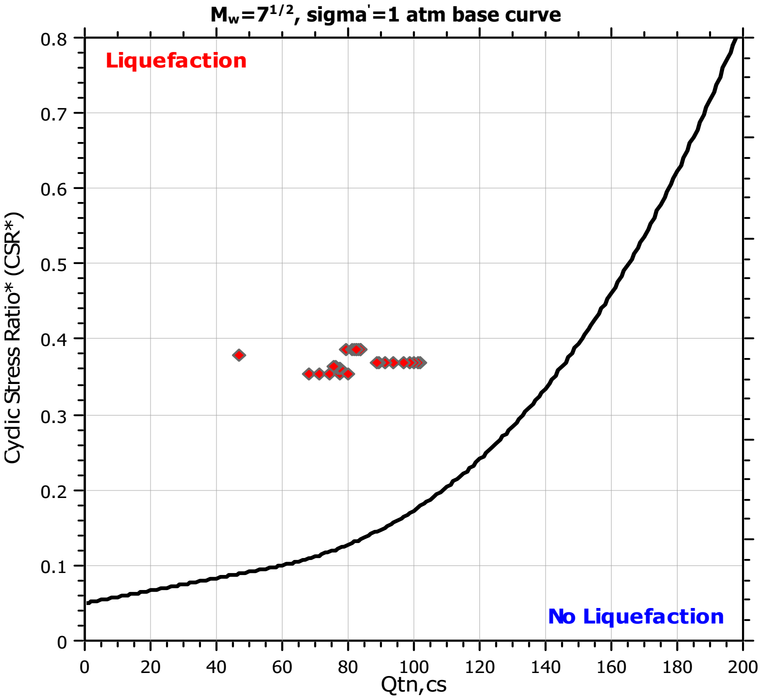
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

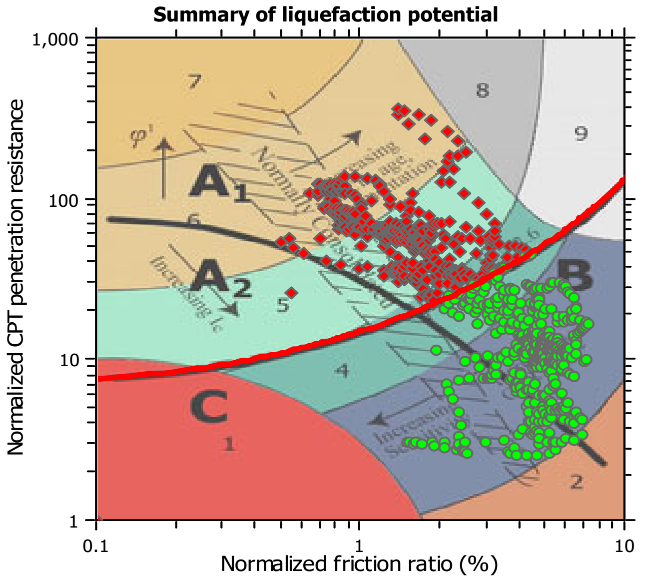
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

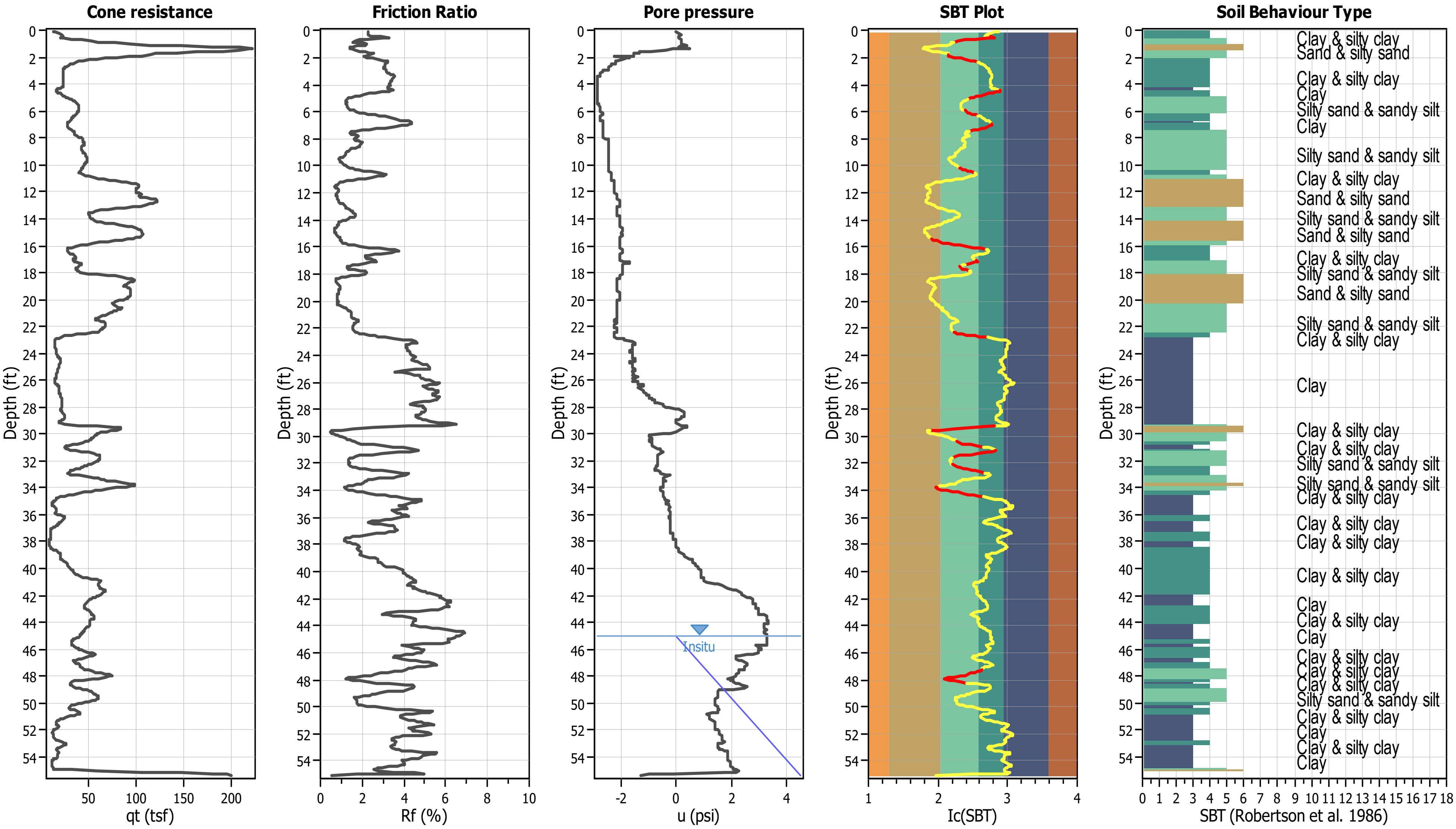

Cone resistance **Friction Ratio** **SBTn Plot** **CRR plot** **FS Plot**


M_w=$7^{1/2}$, sigma'=1 atm base curve


Summary of liquefaction potential

Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



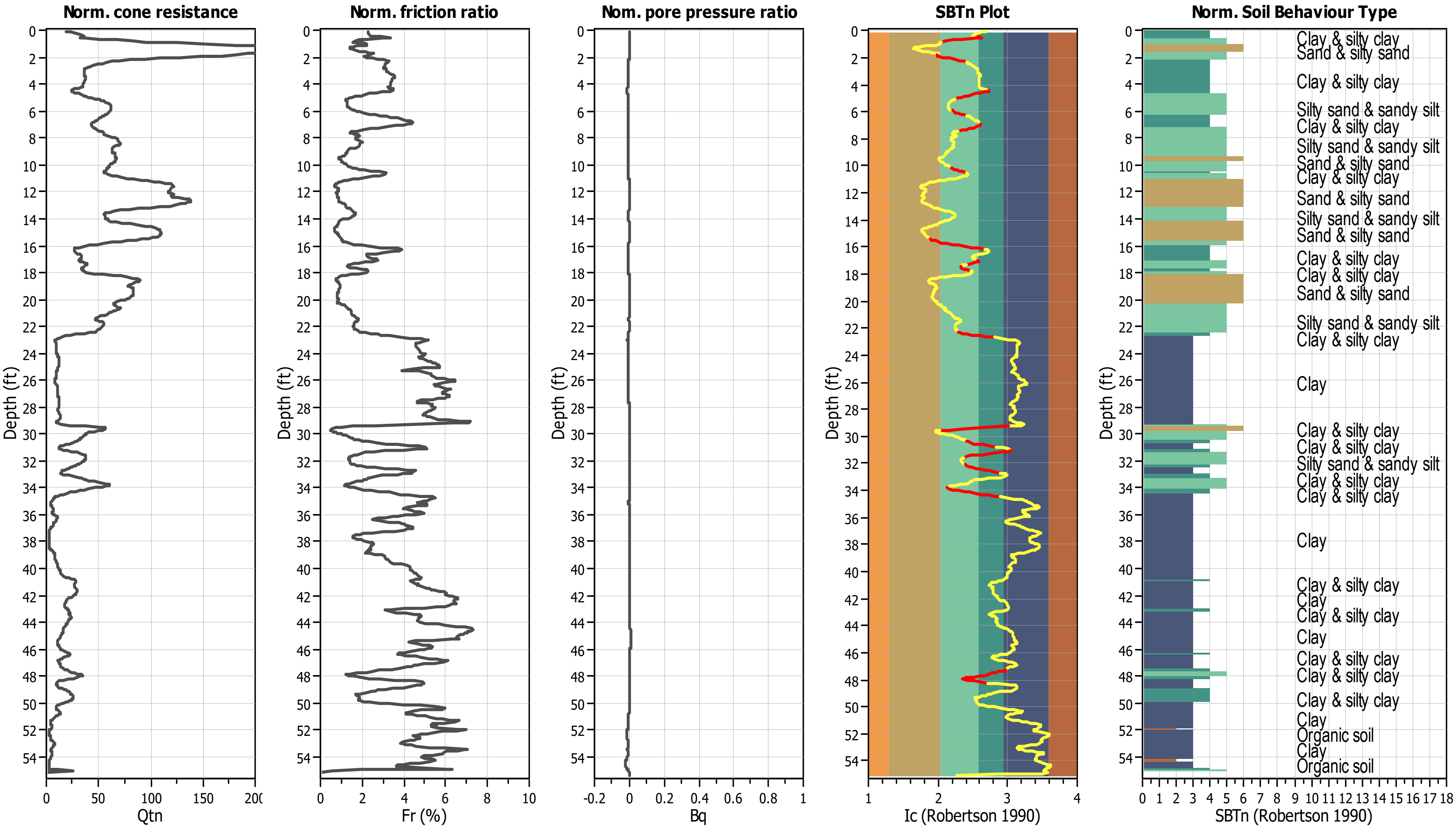
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
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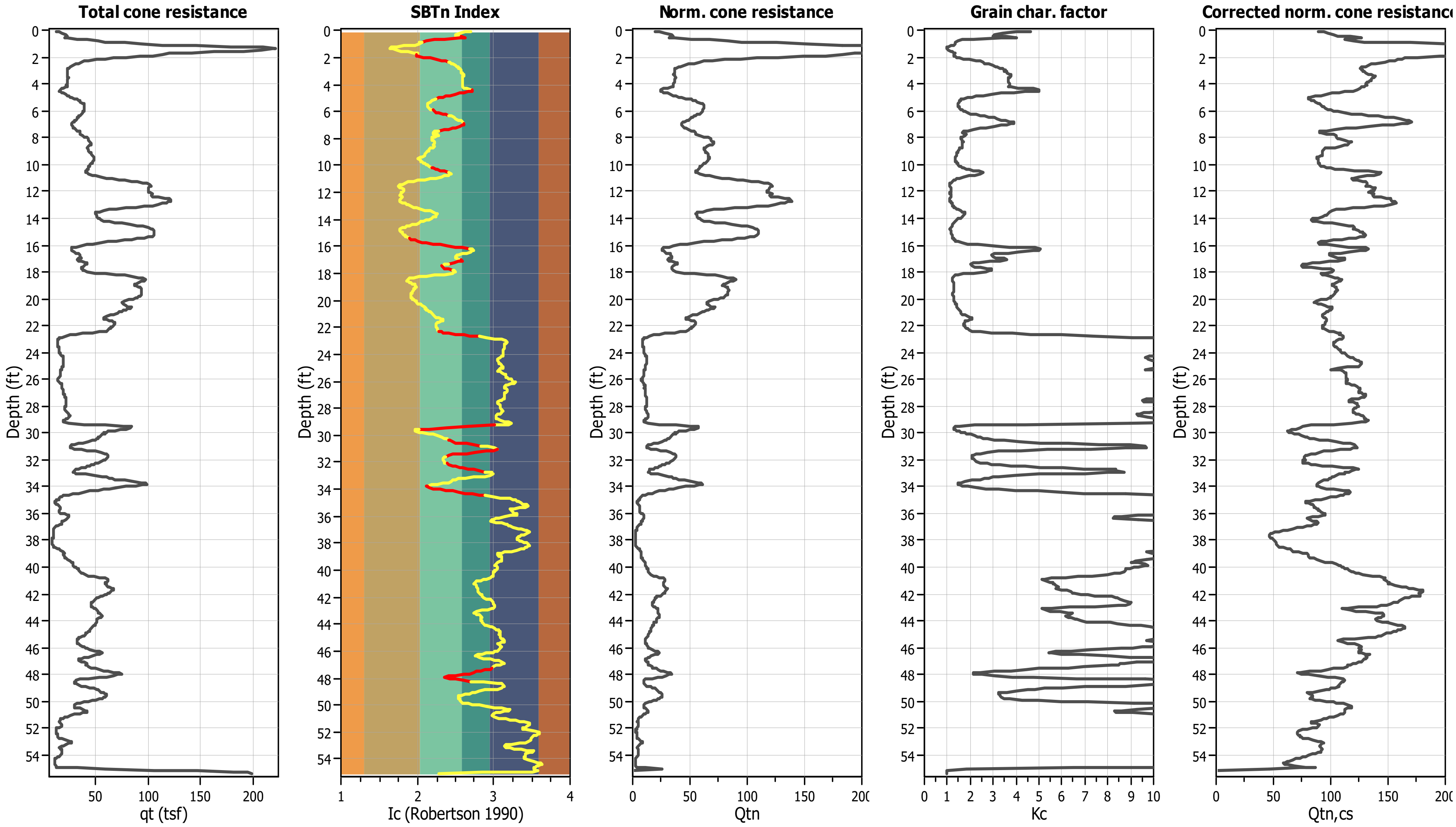
Liquefaction analysis overall plots (intermediate results)



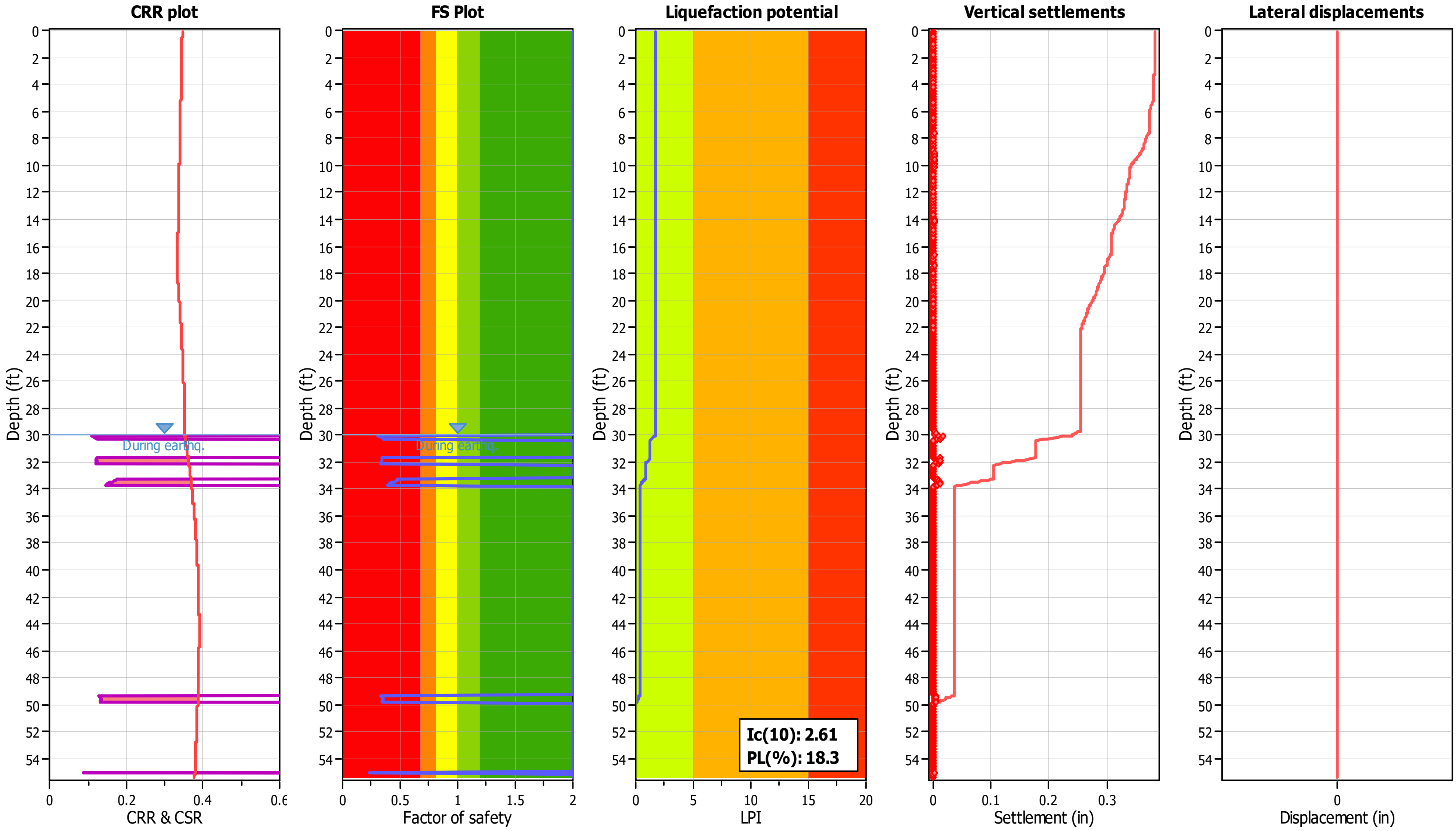
Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
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Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

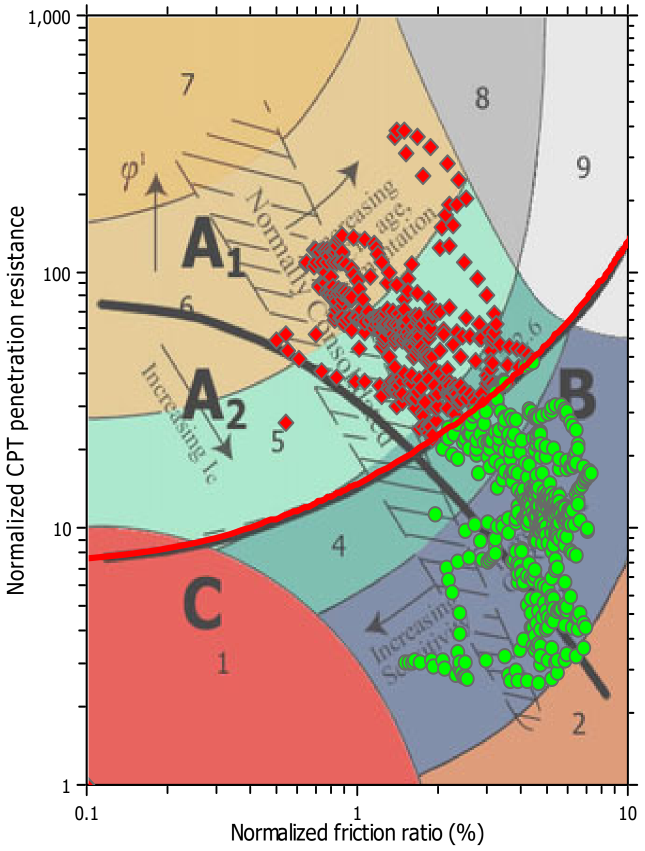
F.S. color scheme

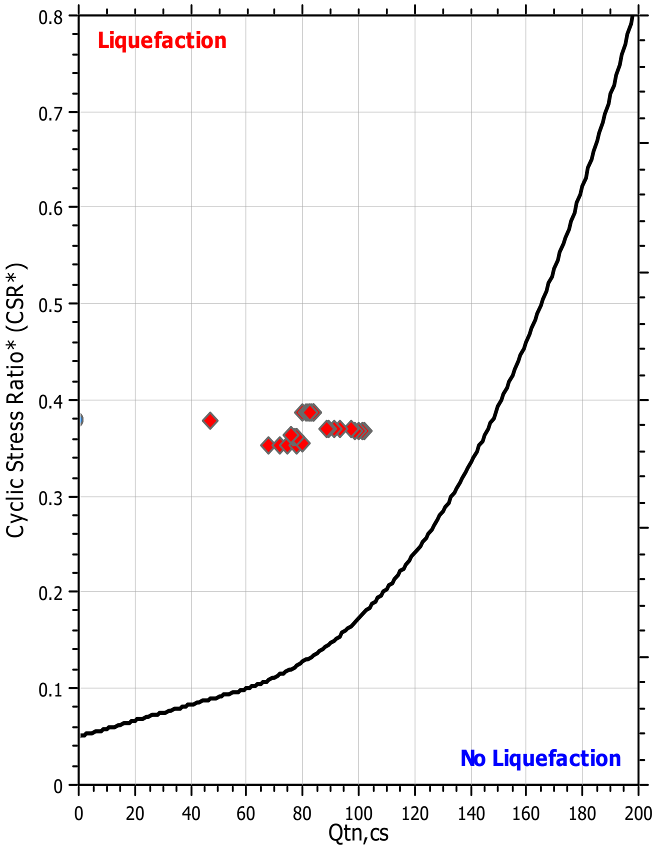
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

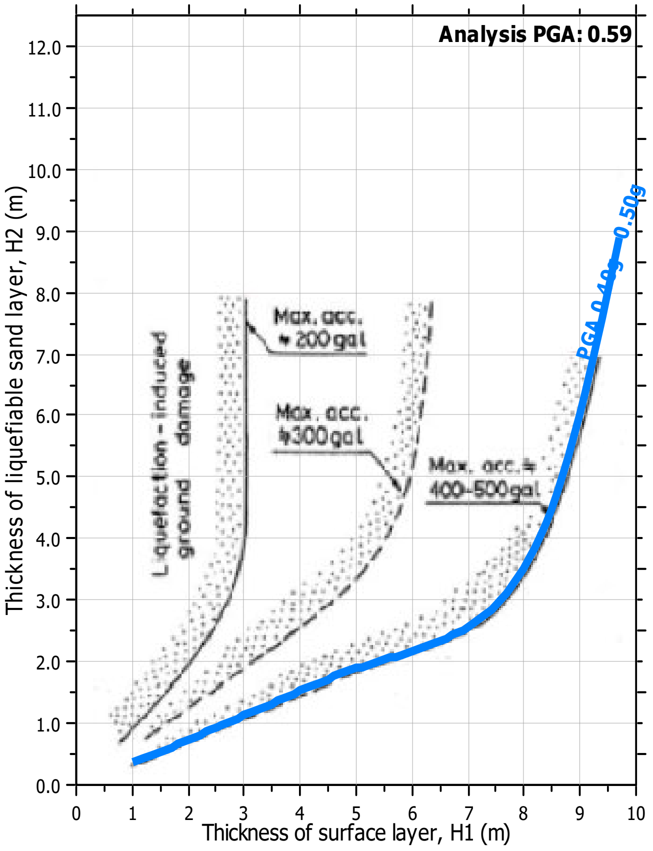
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟨 Low risk

Liquefaction analysis summary plots







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Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
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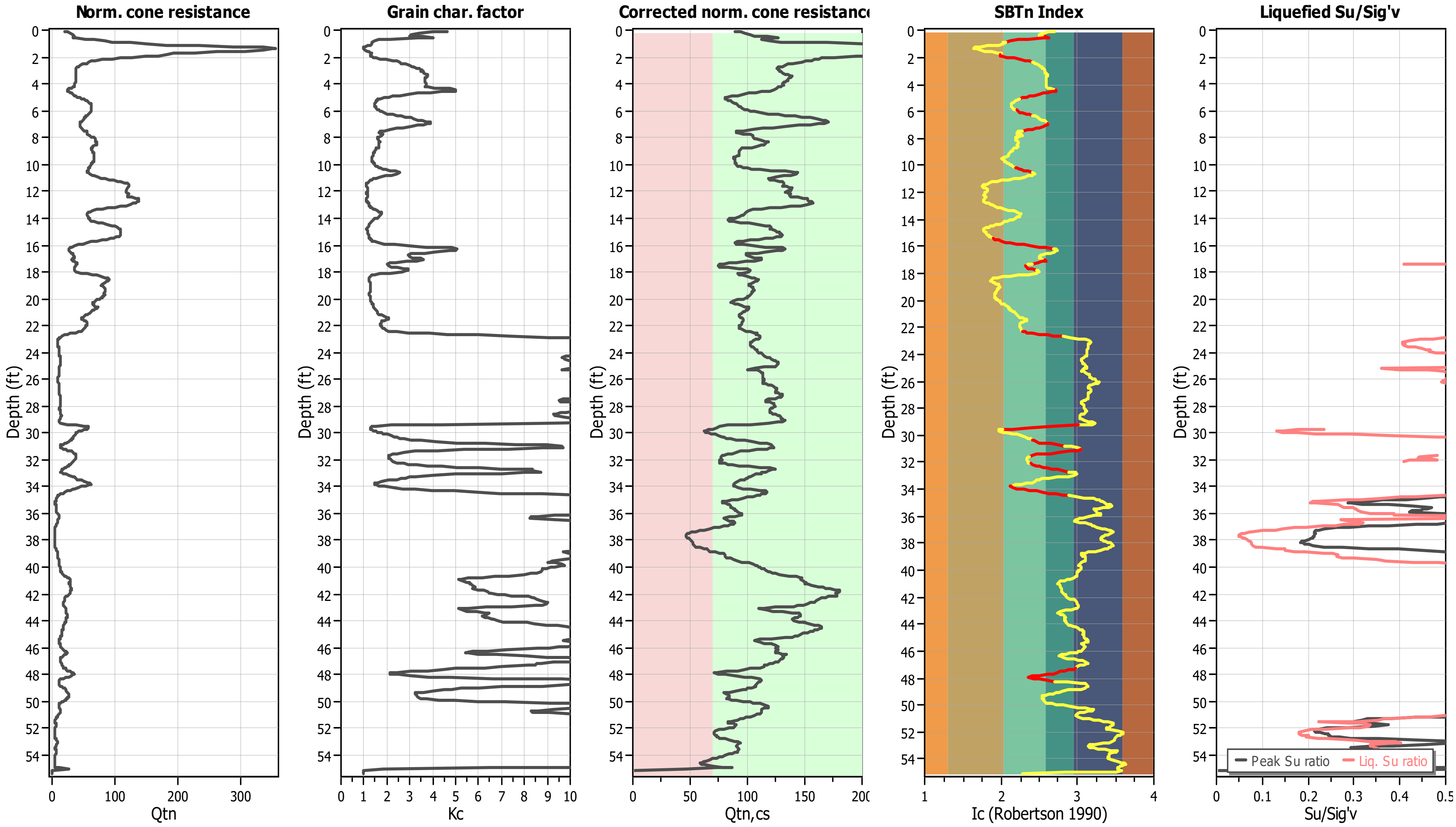
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



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Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
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SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

LIQUEFACTION ANALYSIS REPORT

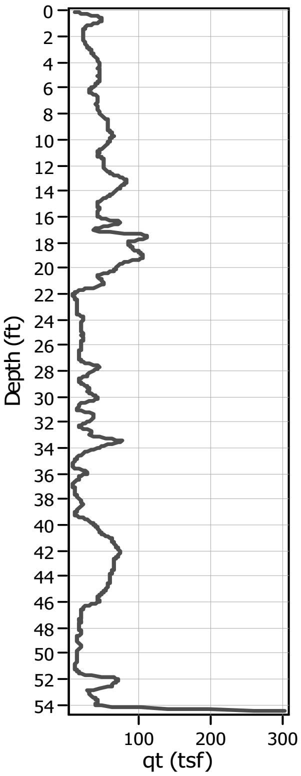
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

CPT file : CPT-2

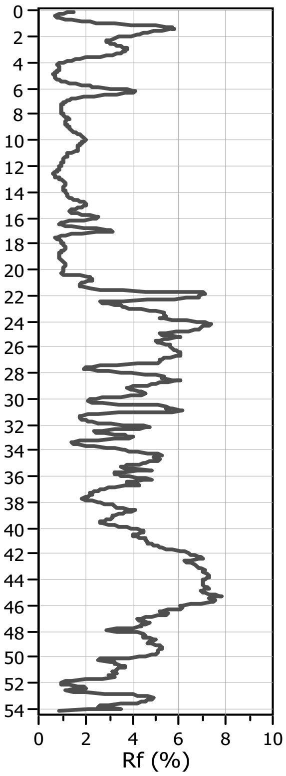
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based

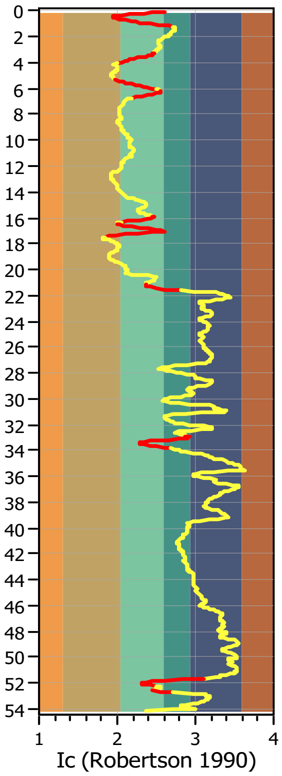
Cone resistance



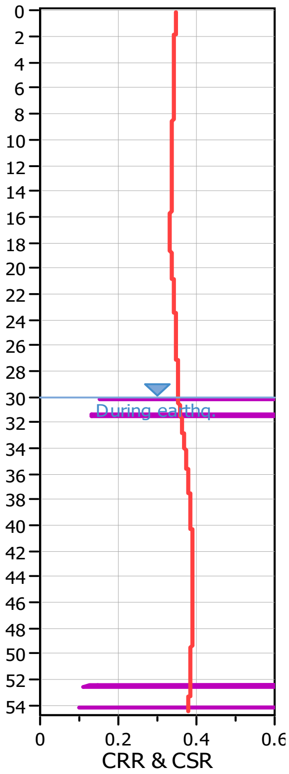
Friction Ratio



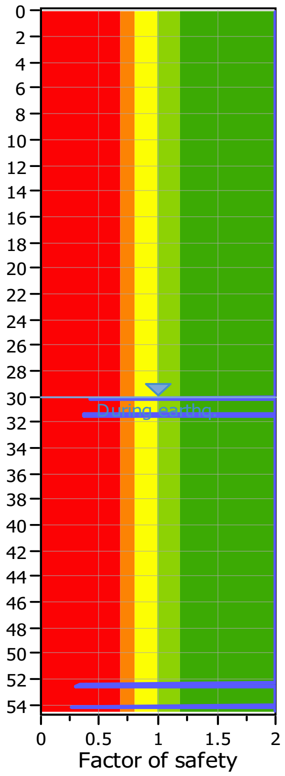
SBTn Plot



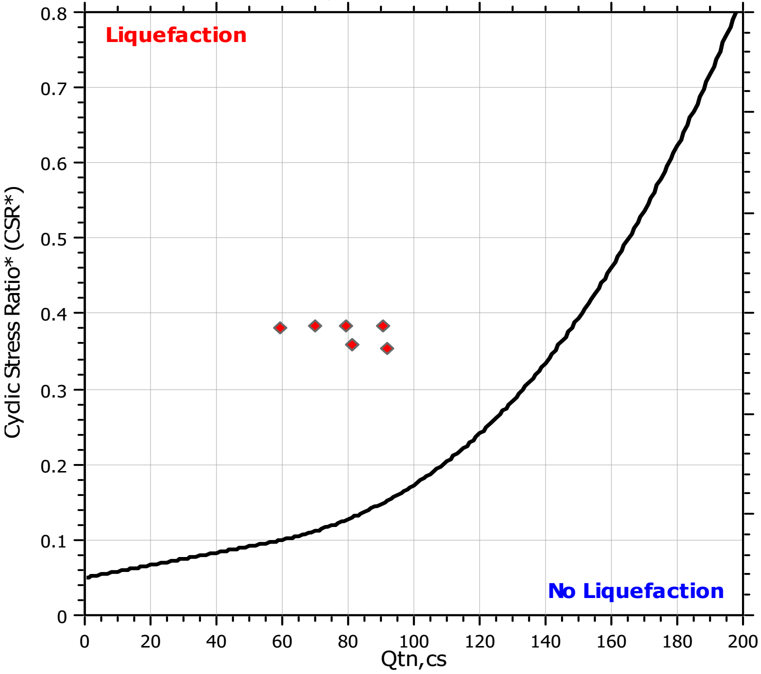
CRR plot



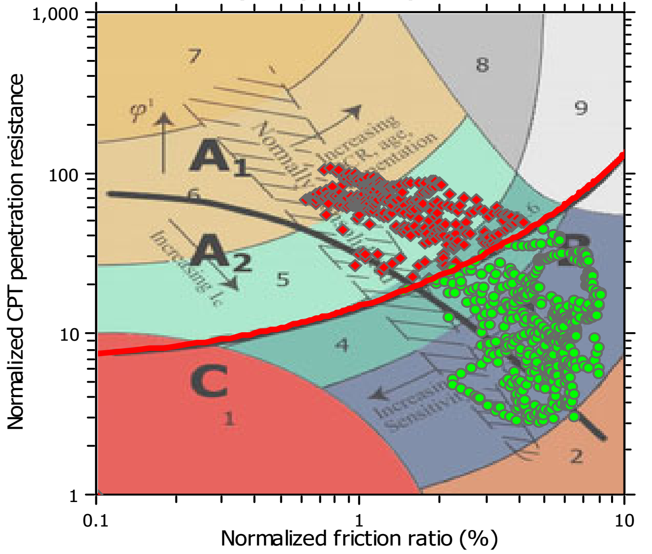
FS Plot



$M_w=7^{1/2}$, sigma'=1 atm base curve



Summary of liquefaction potential



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
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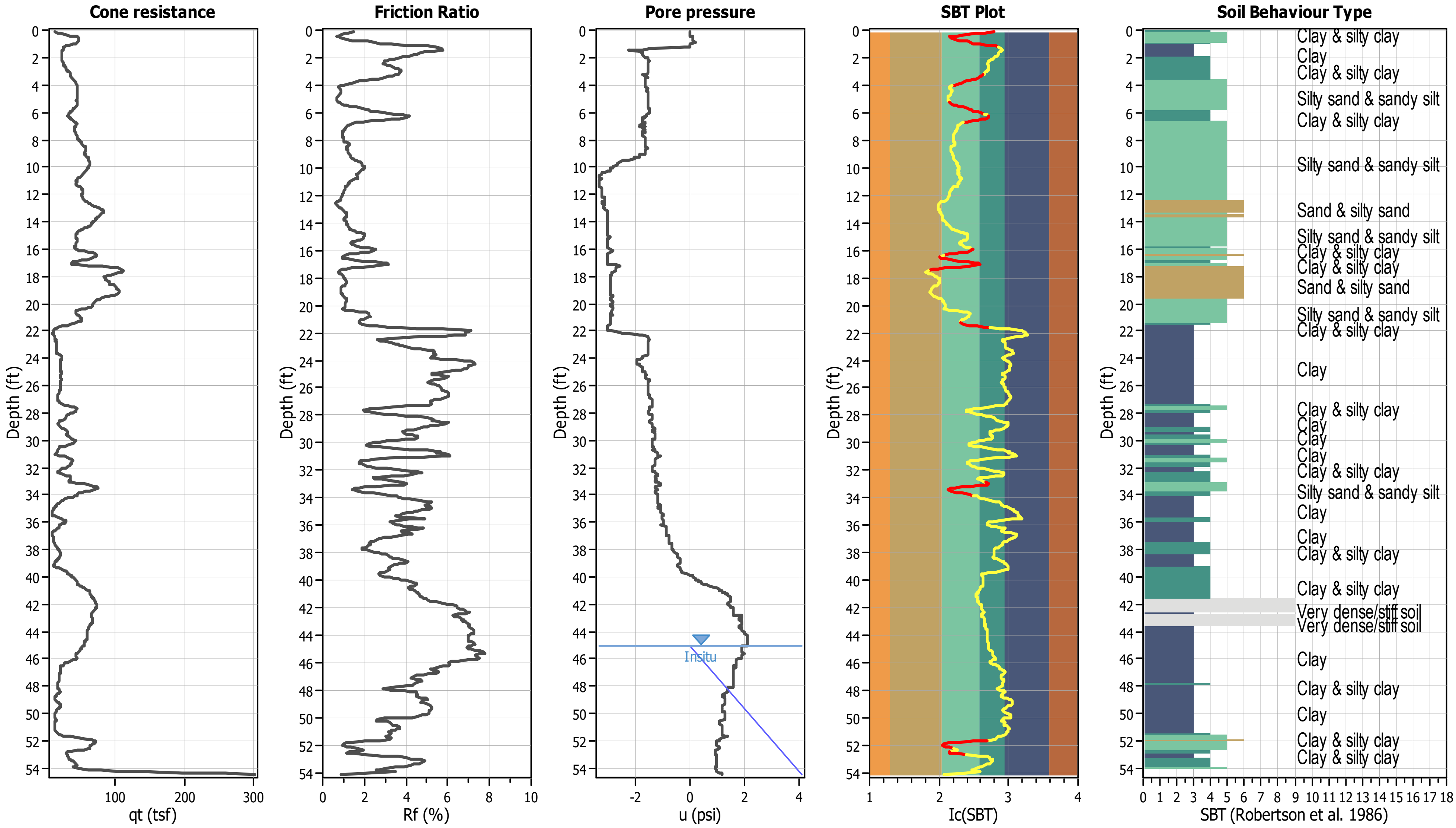
CPT basic interpretation plots



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SBT legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty
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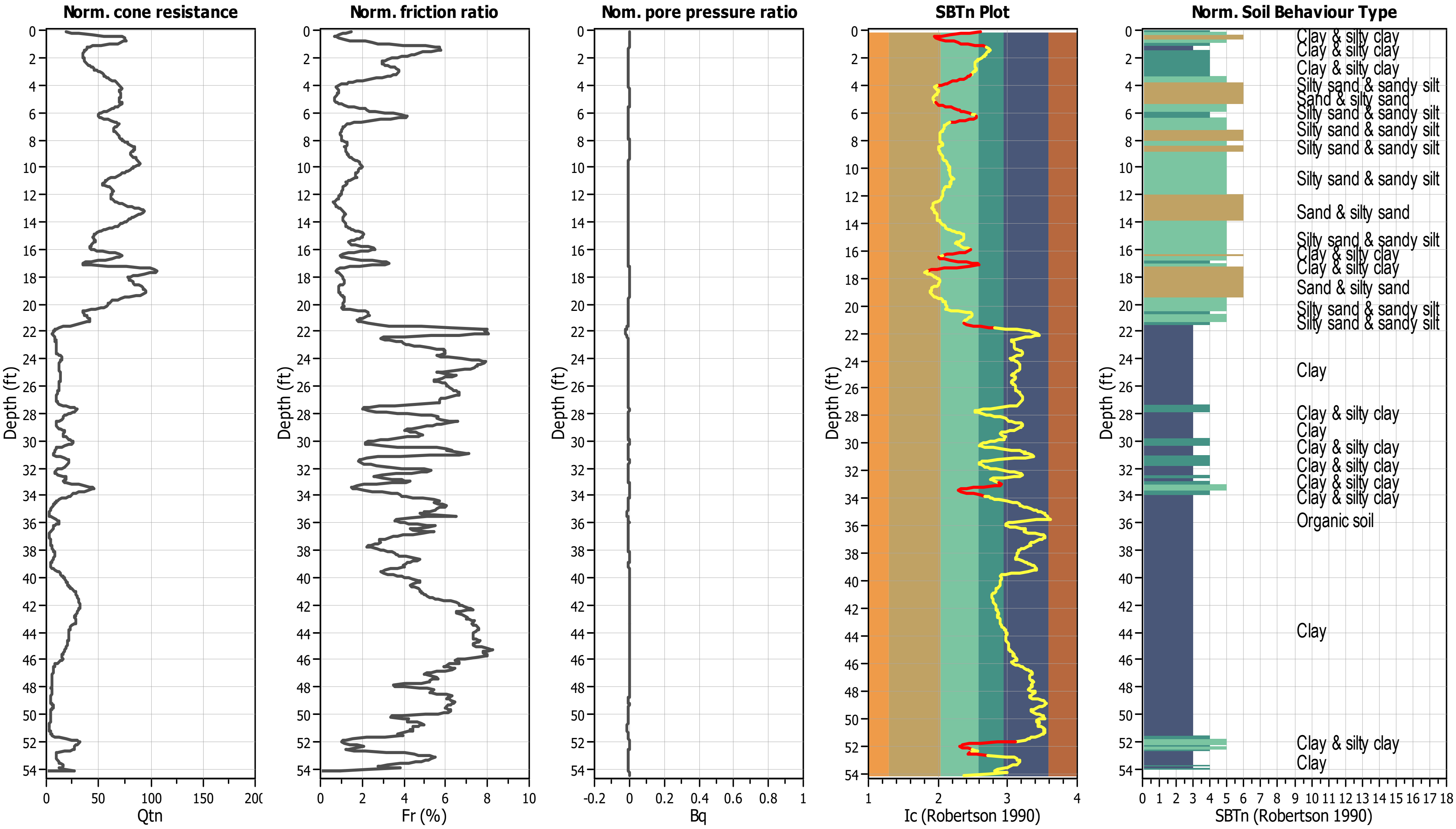
CPT basic interpretation plots (normalized)



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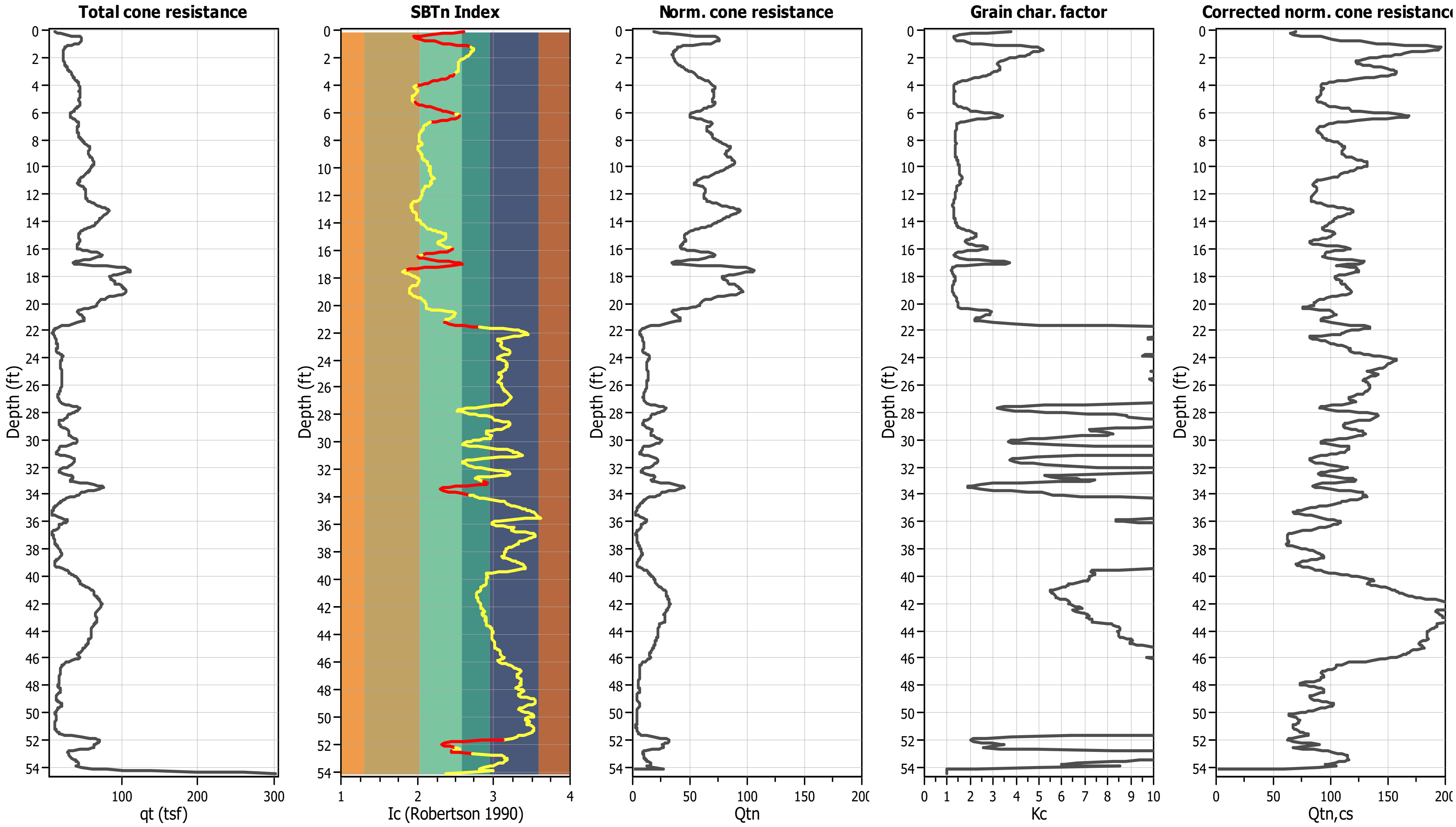
Liquefaction analysis overall plots (intermediate results)


Total cone resistance

SBTn Index

Norm. cone resistance

Grain char. factor

Corrected norm. cone resistance

Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
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Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
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Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
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Limit depth applied: No
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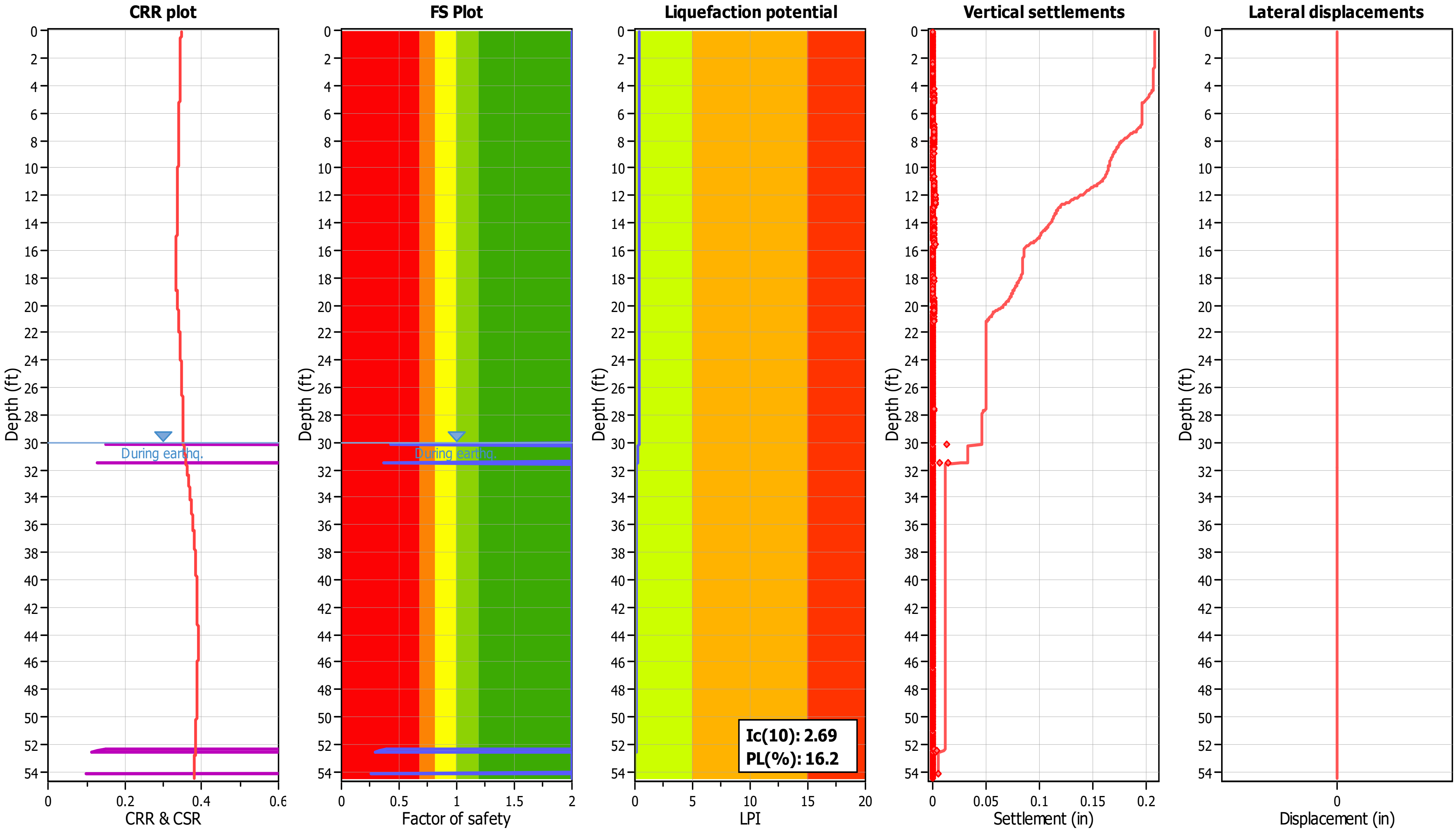
Liquefaction analysis overall plots



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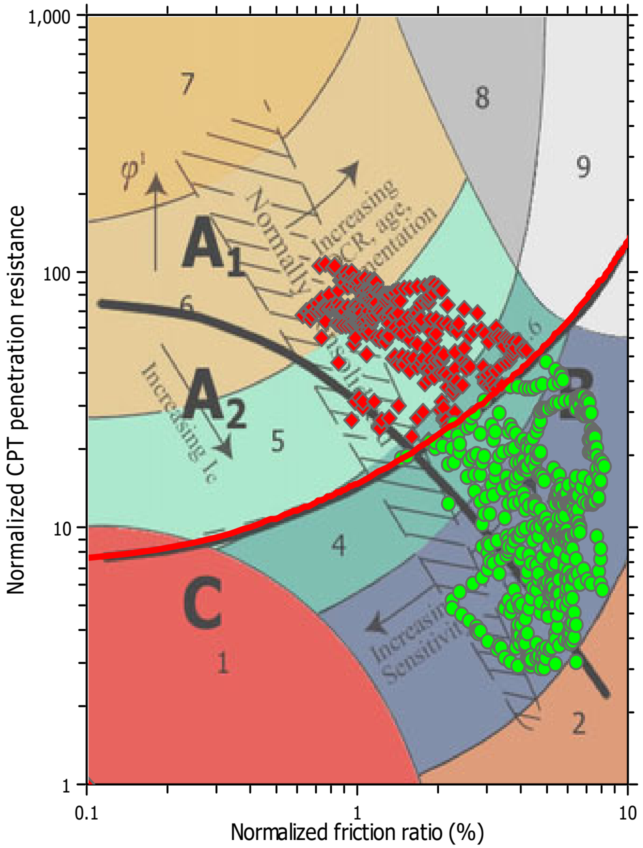
F.S. color scheme

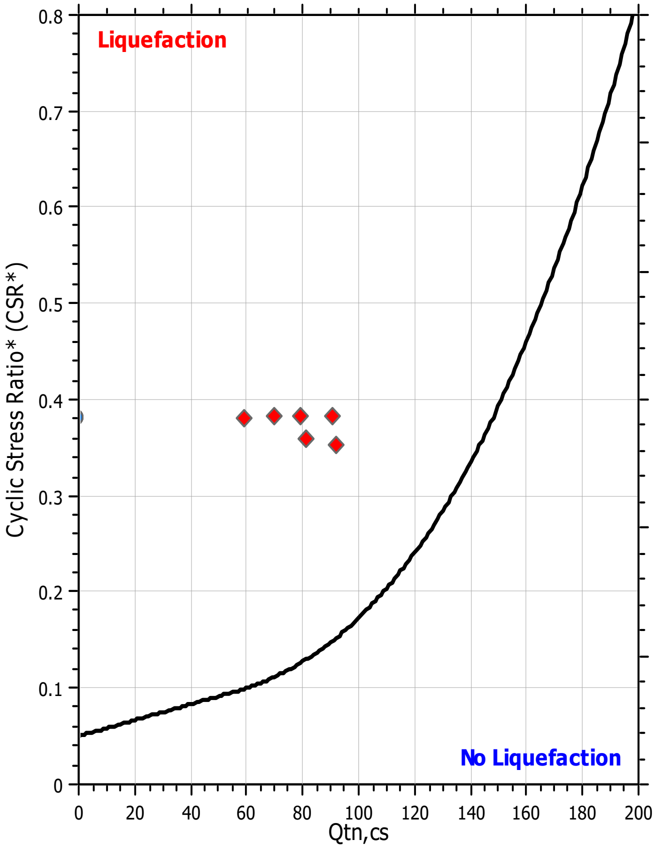
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

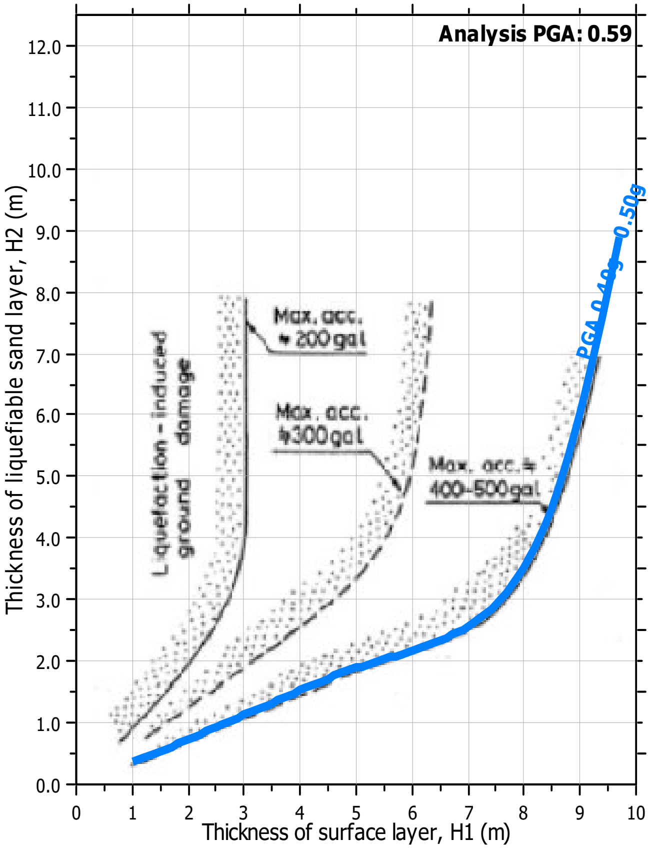
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟨 Low risk

Liquefaction analysis summary plots







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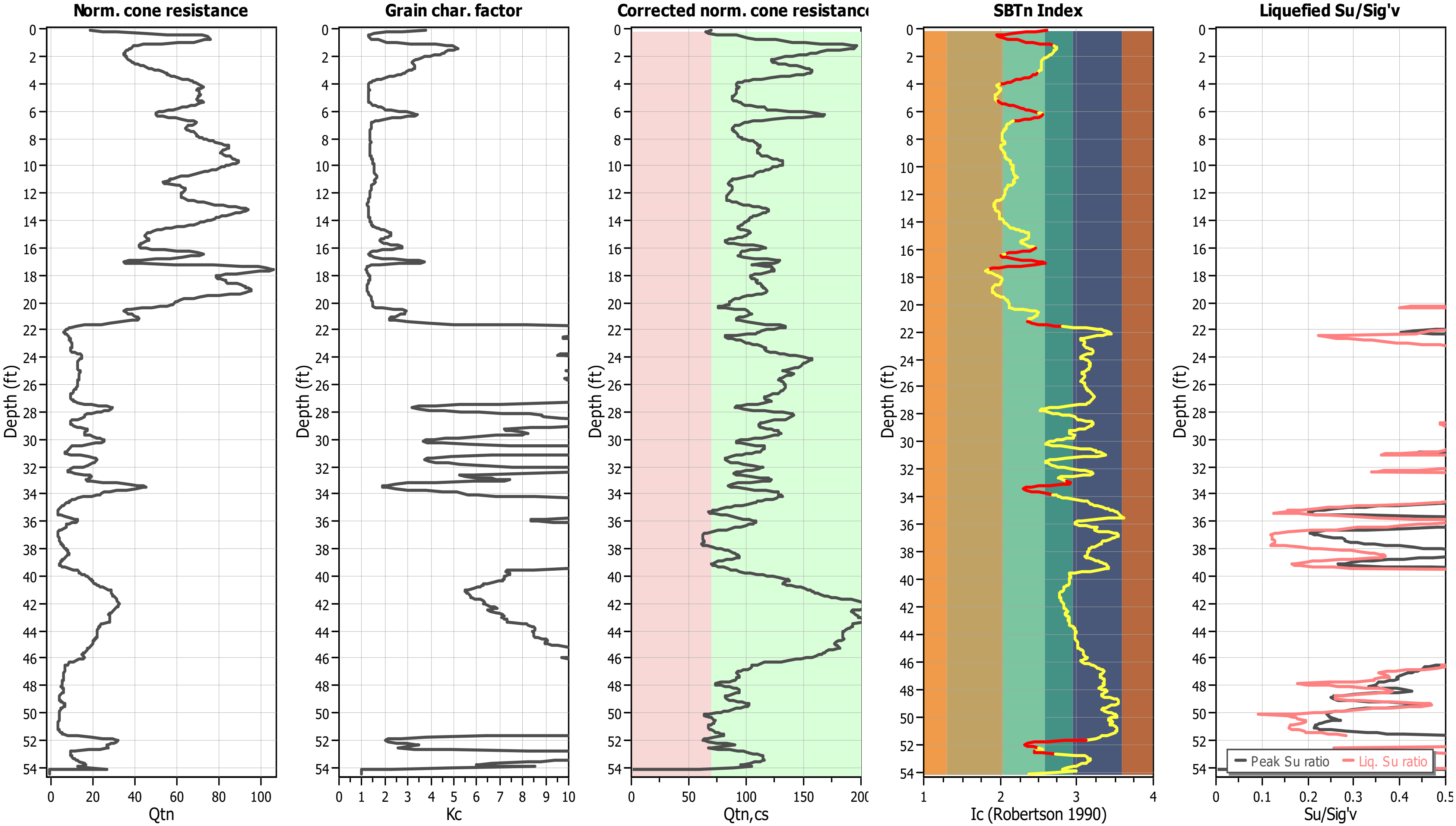
Check for strength loss plots (Robertson (2010))



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LIQUEFACTION ANALYSIS REPORT

Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

CPT file : CPT-3

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
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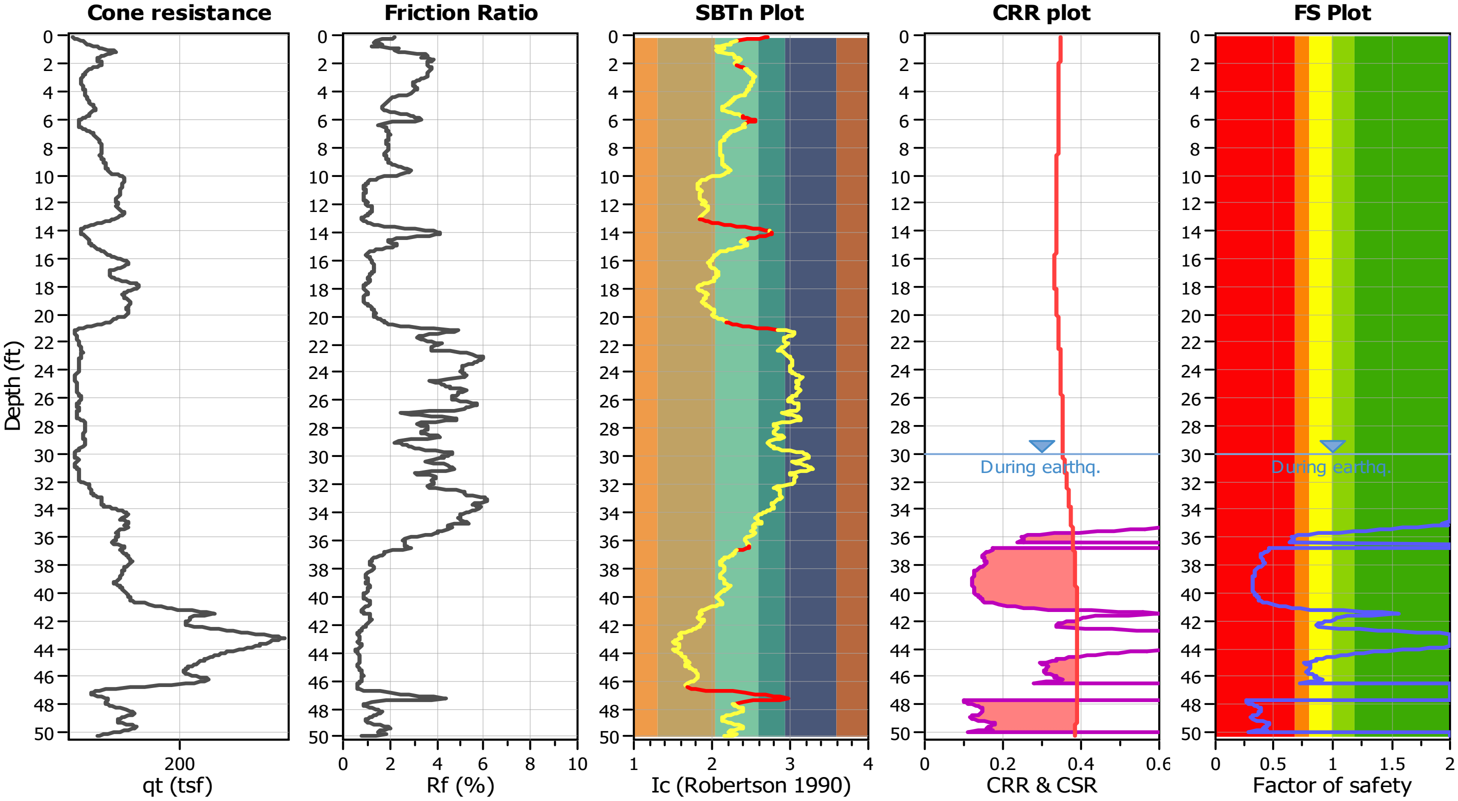
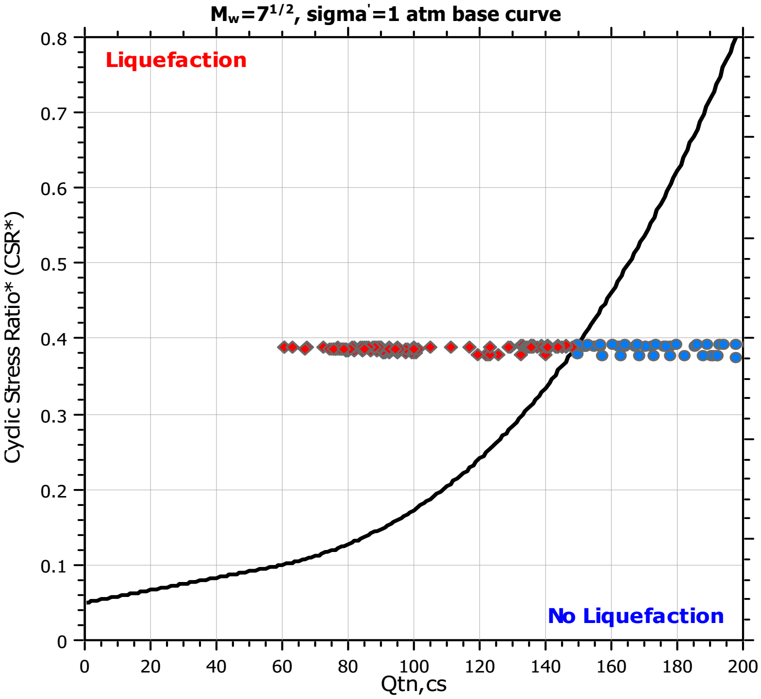
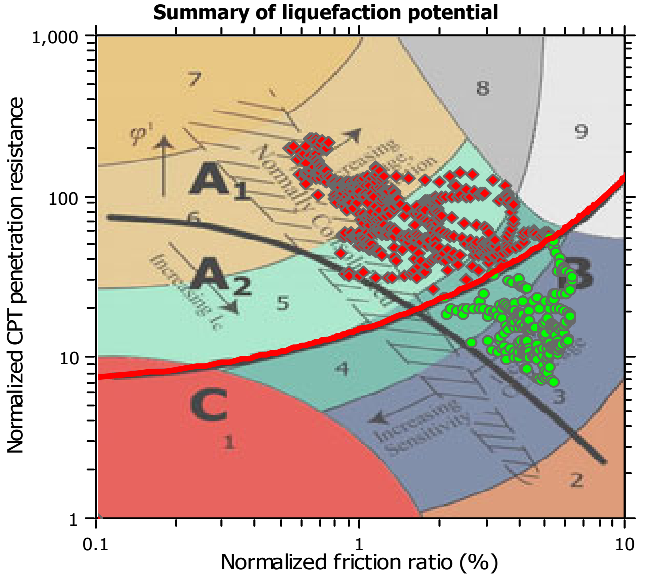
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		







Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
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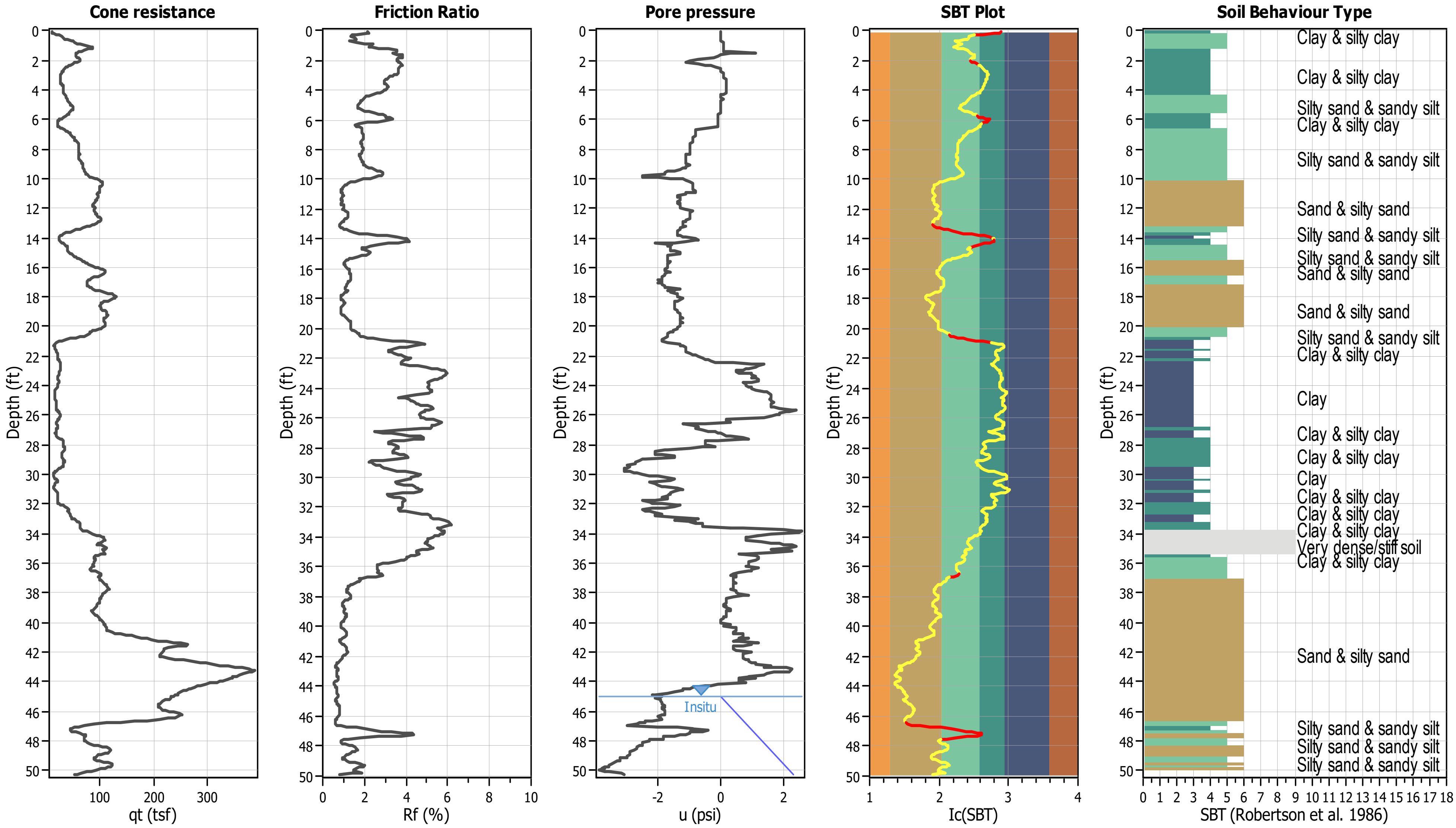
CPT basic interpretation plots



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SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
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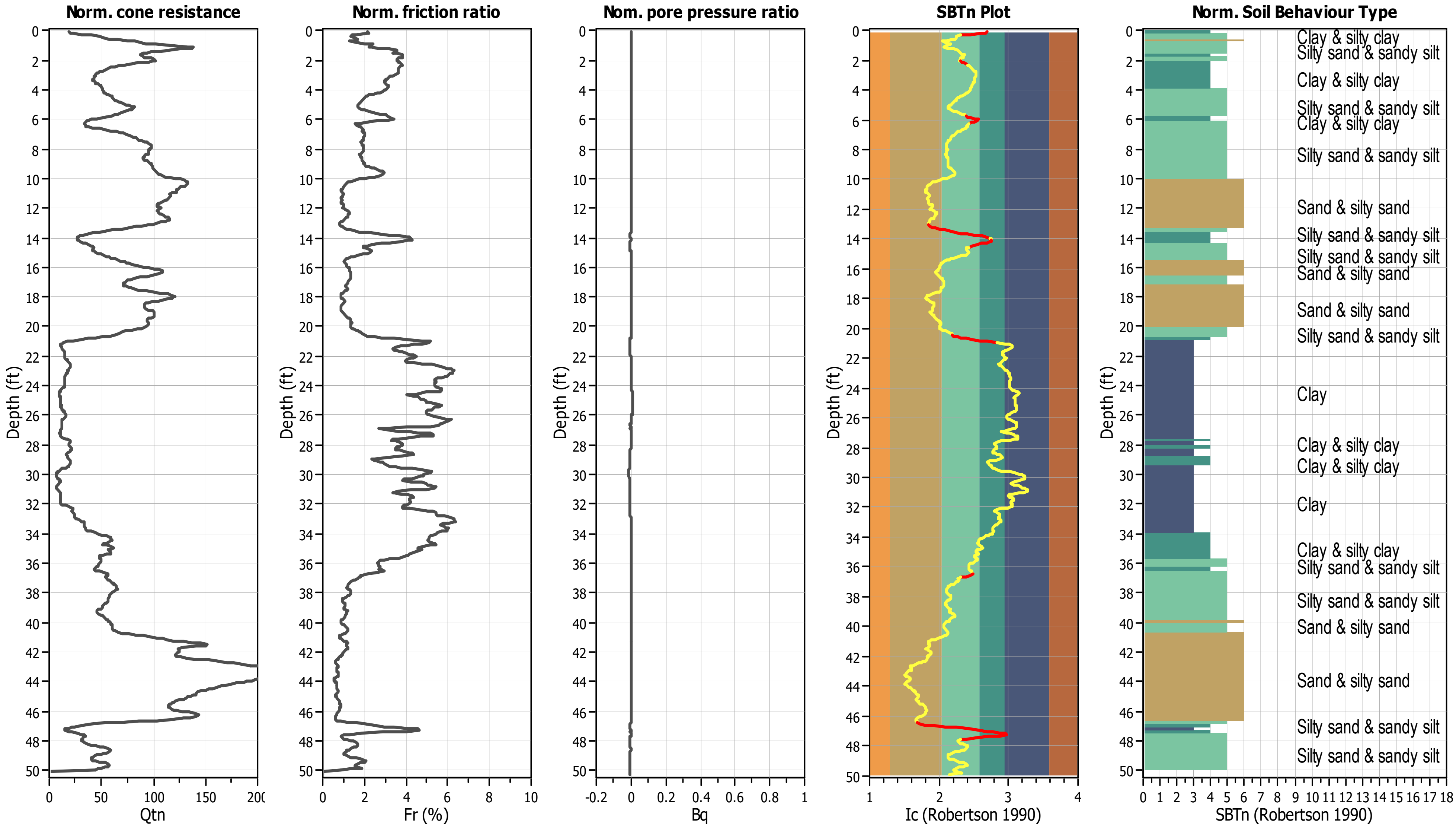
CPT basic interpretation plots (normalized)



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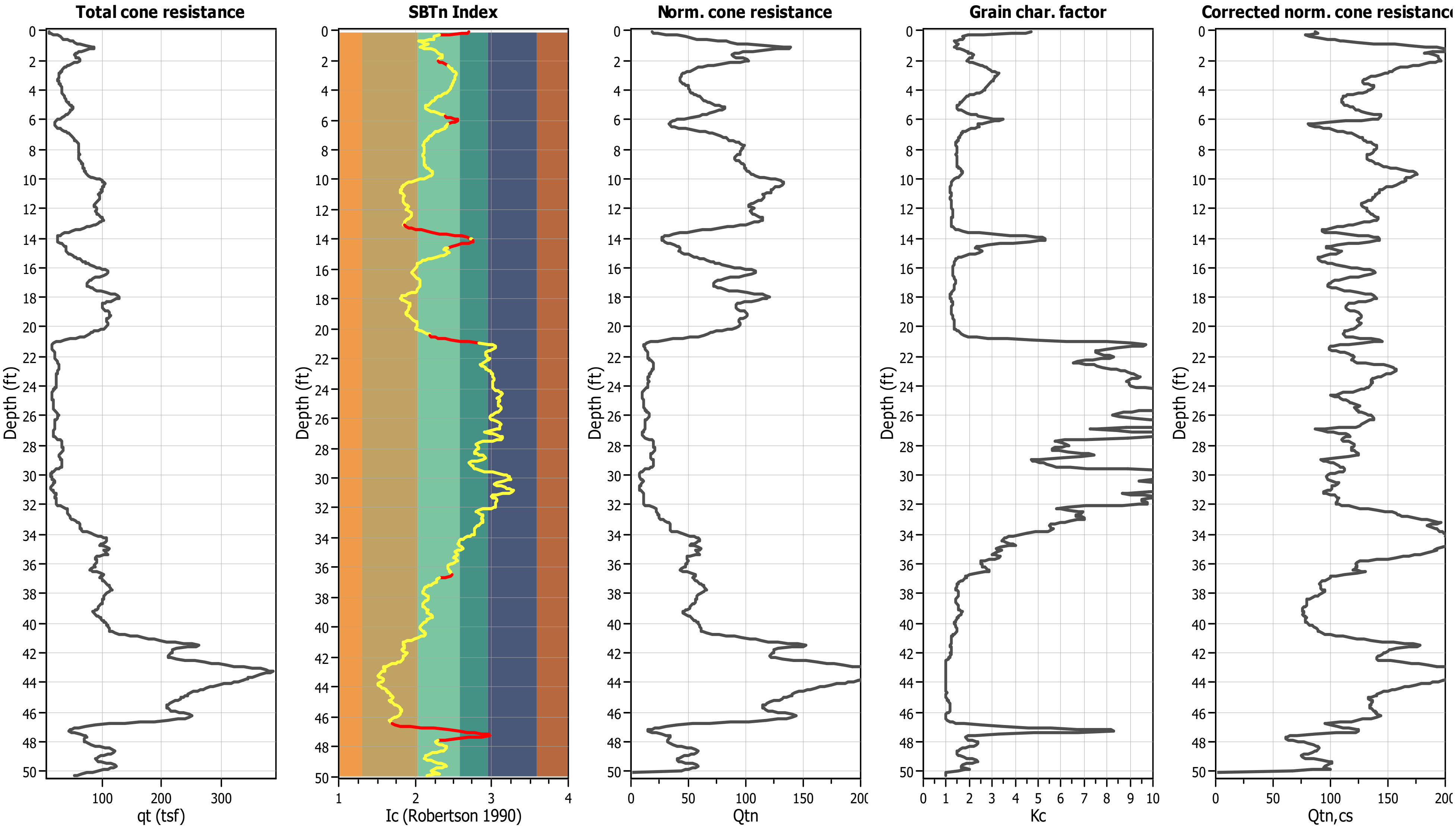
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty
- 🟩 5. Silty sand to sandy silt
- 🟨 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to
- ⬜ 9. Very stiff fine grained

Liquefaction analysis overall plots (intermediate results)



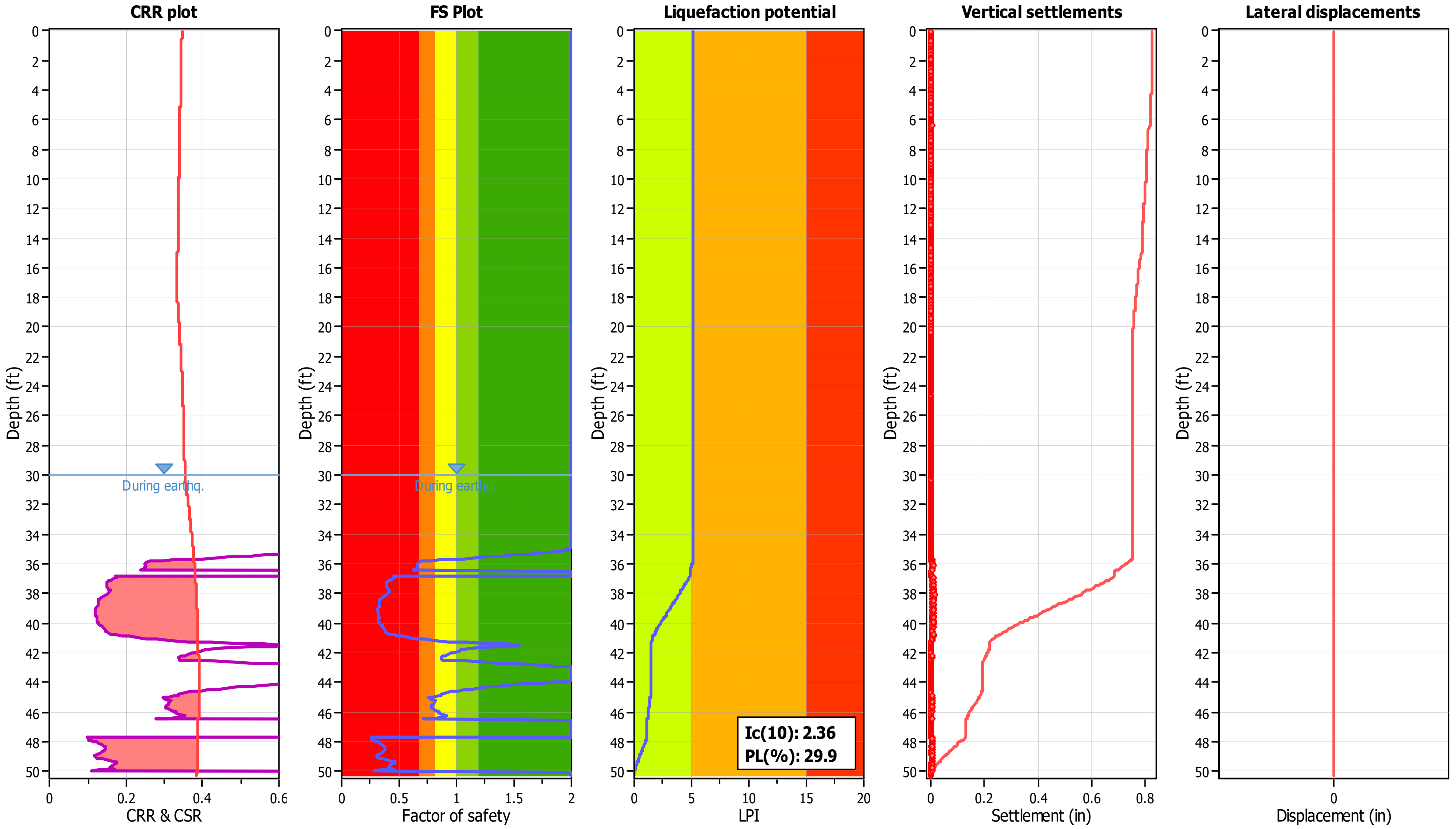
Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_{σ} applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

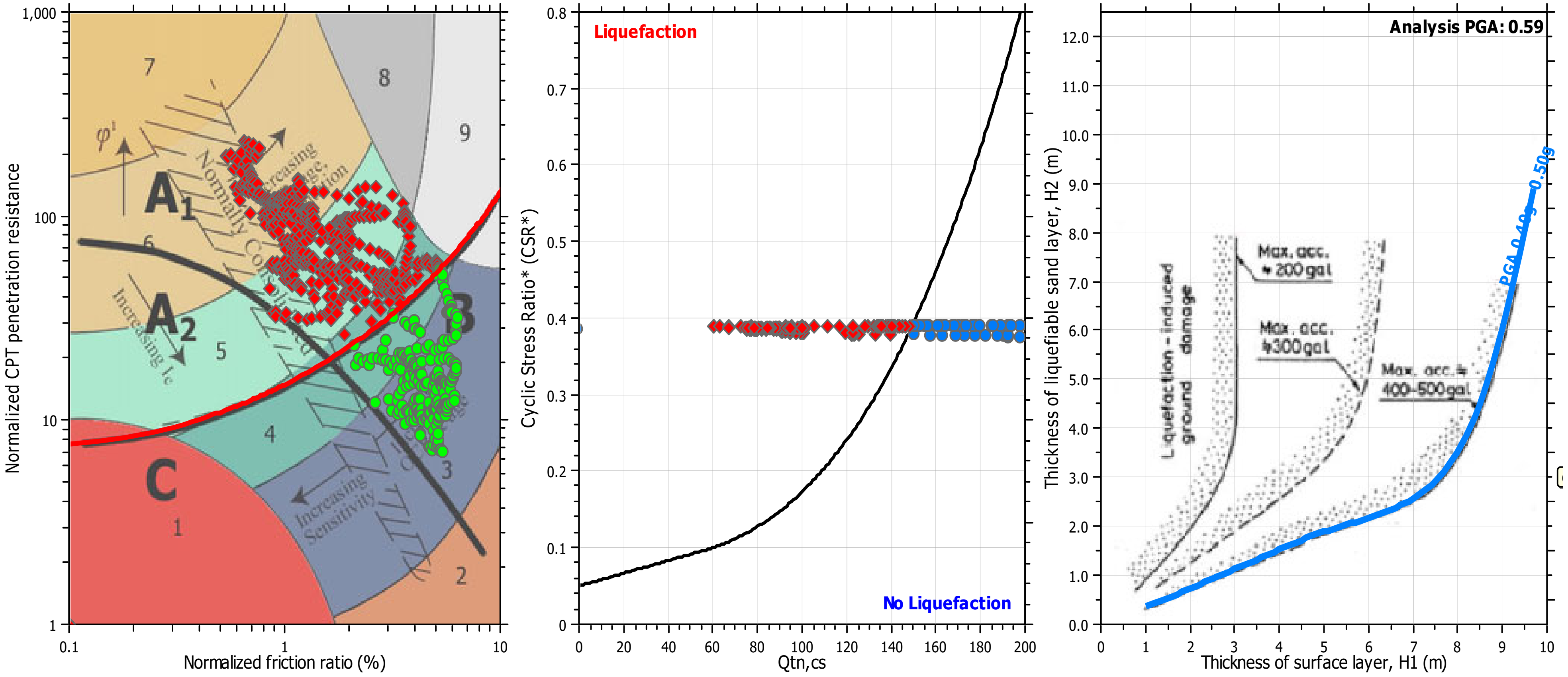
F.S. color scheme

- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟩 Low risk

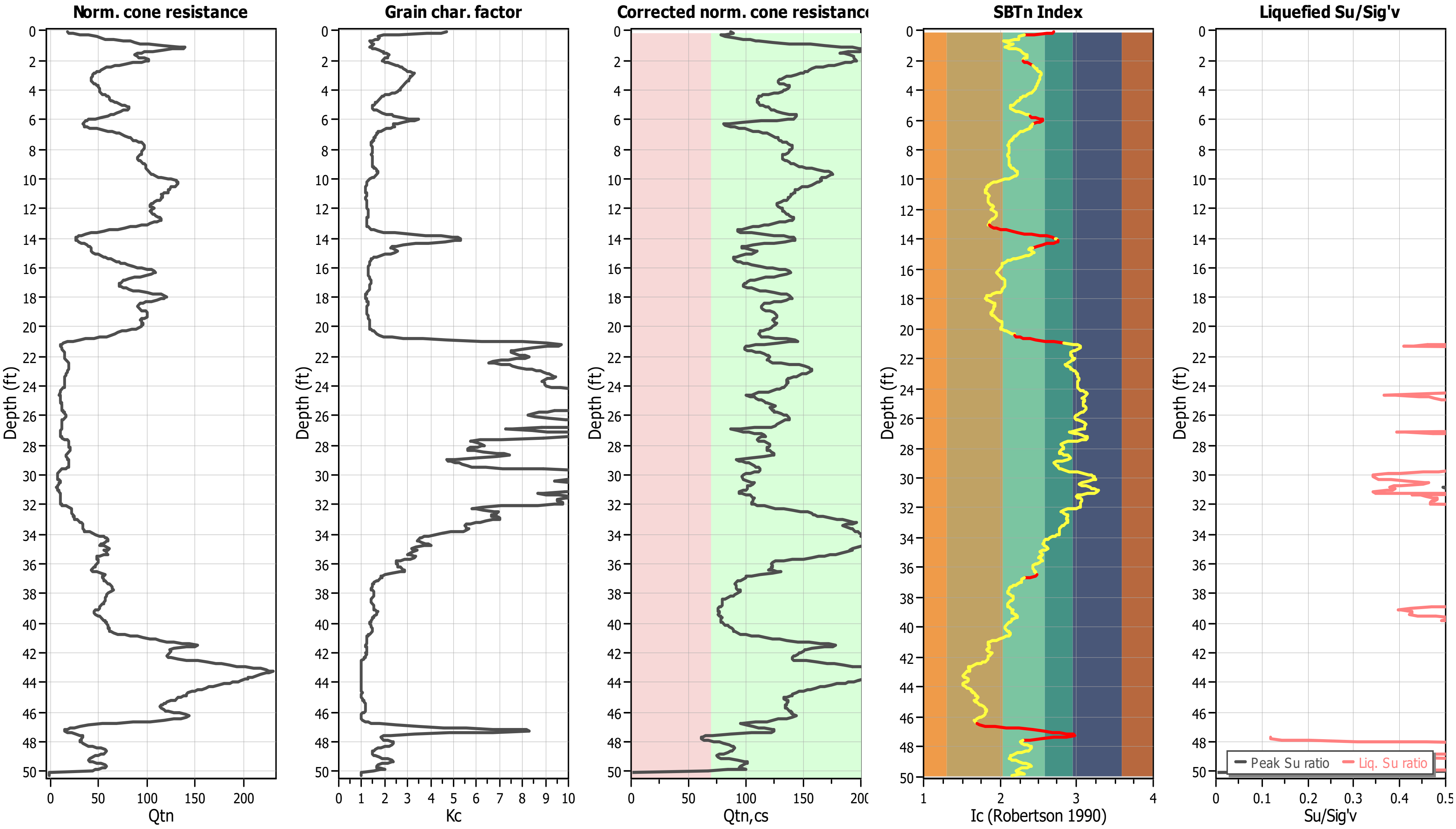
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

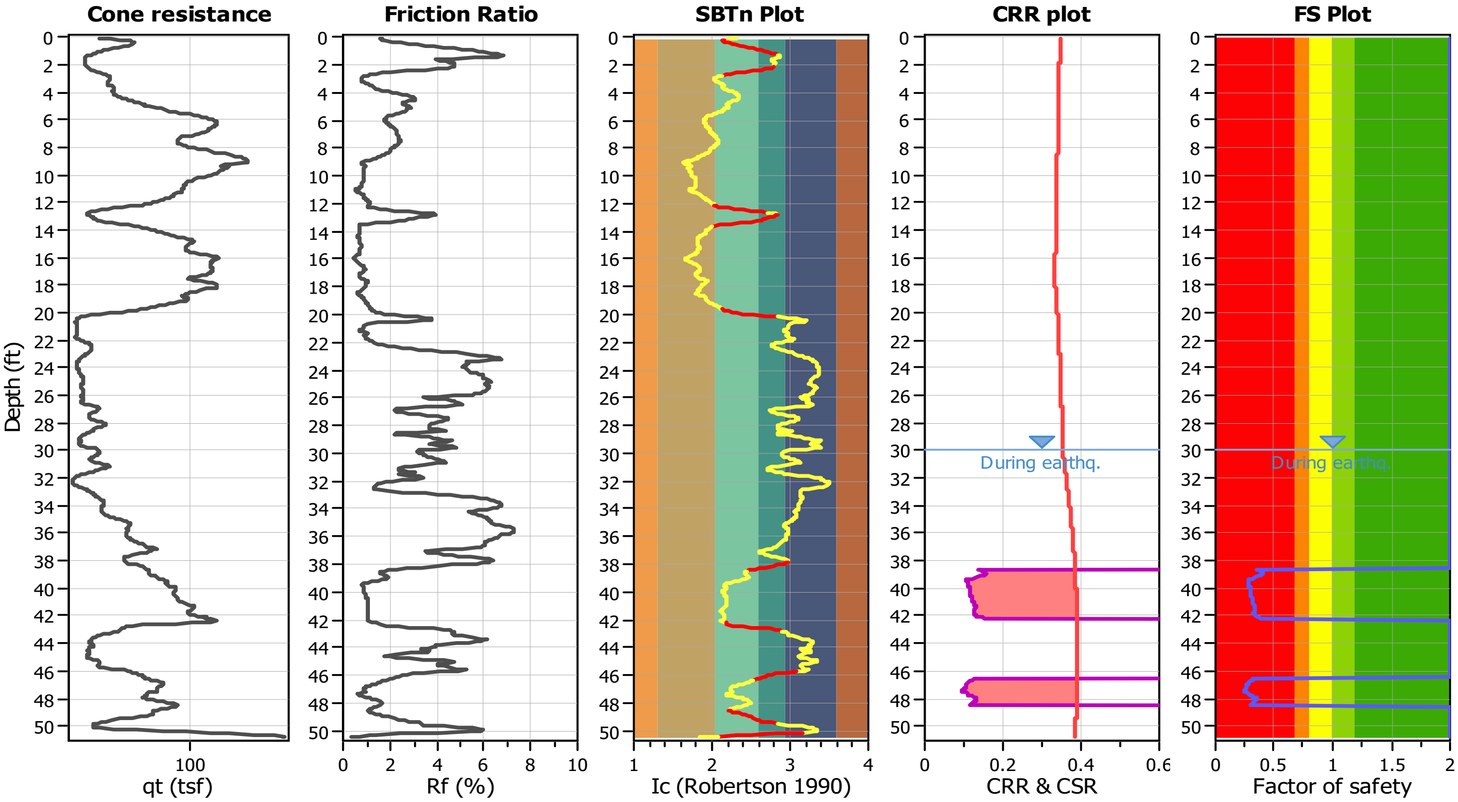
LIQUEFACTION ANALYSIS REPORT

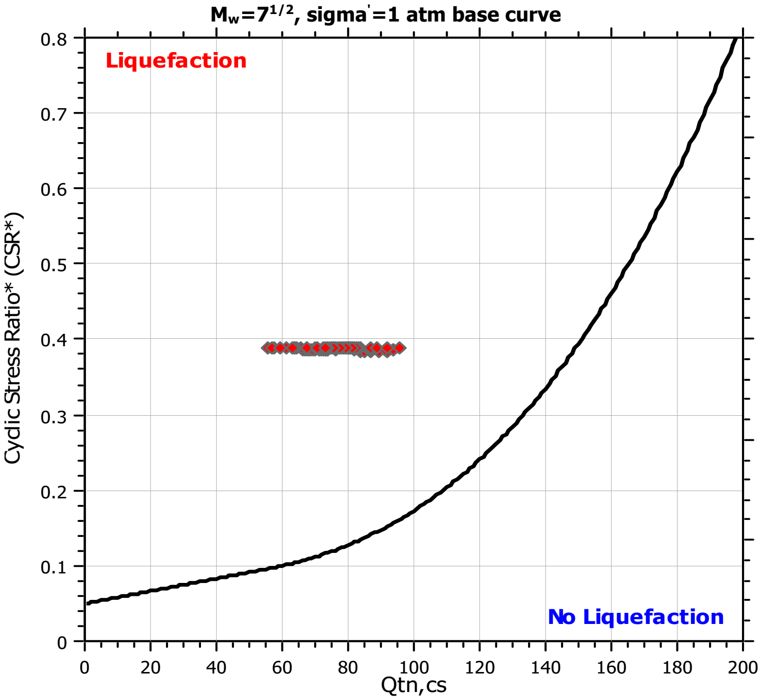
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

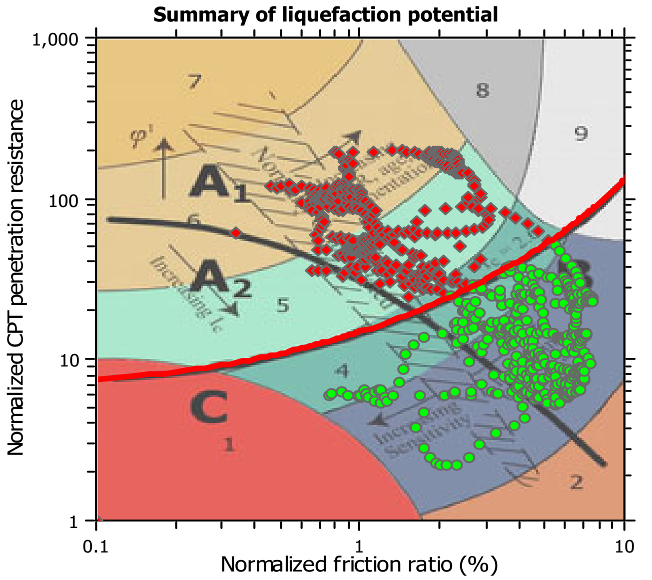
CPT file : CPT-4

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

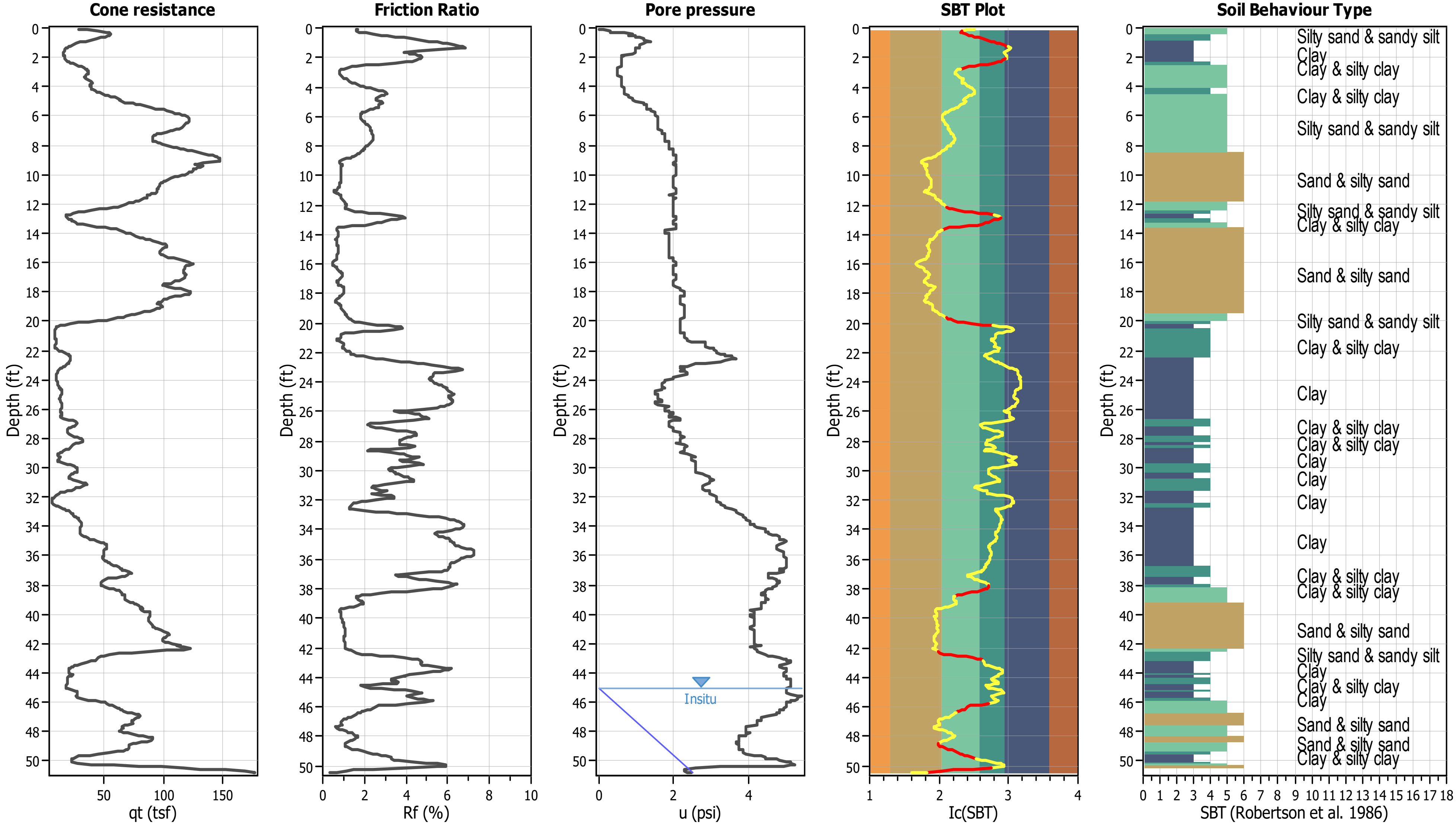






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



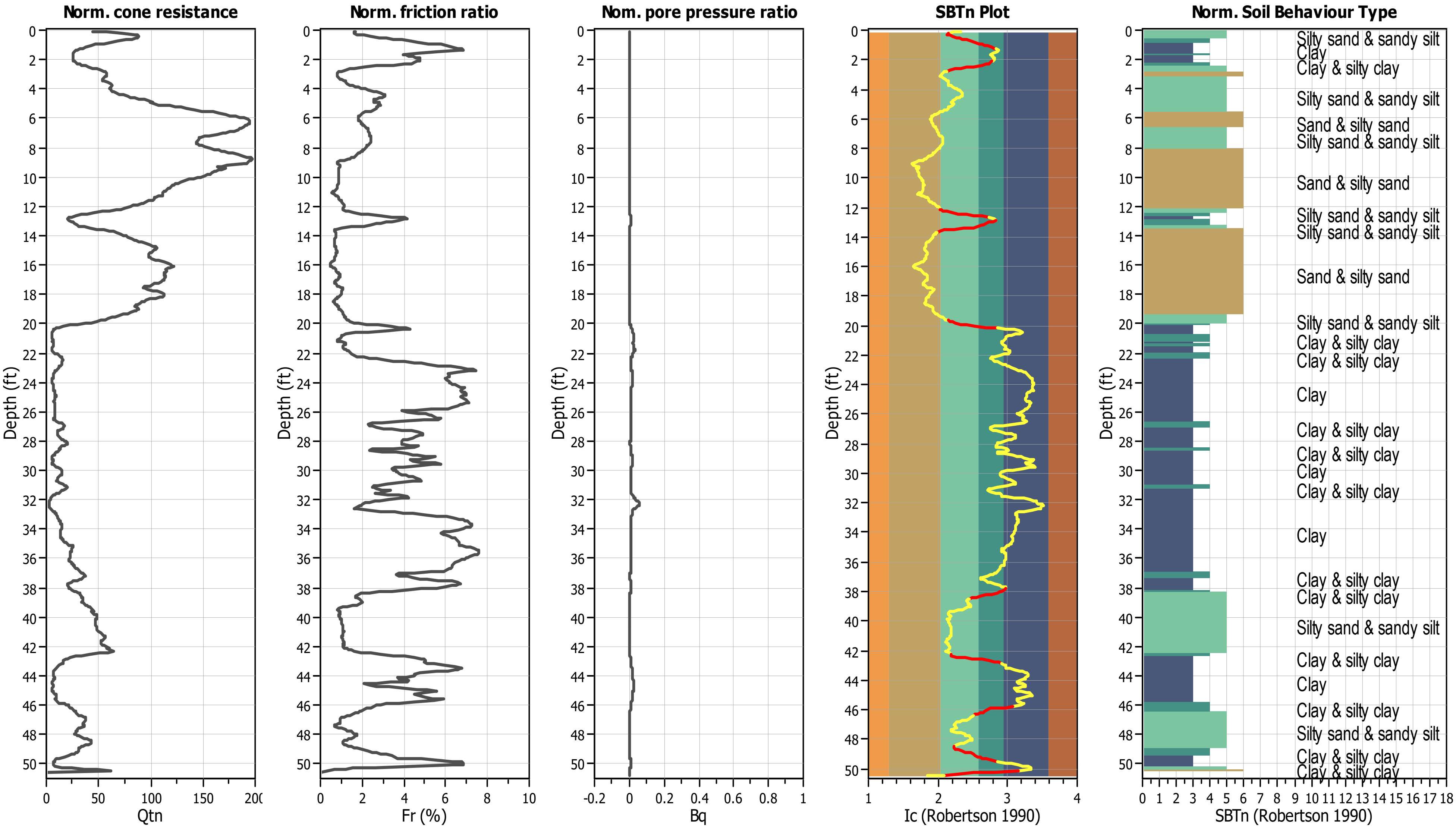
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty
- 🟩 5. Silty sand to sandy silt
- 🟨 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to
- ⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



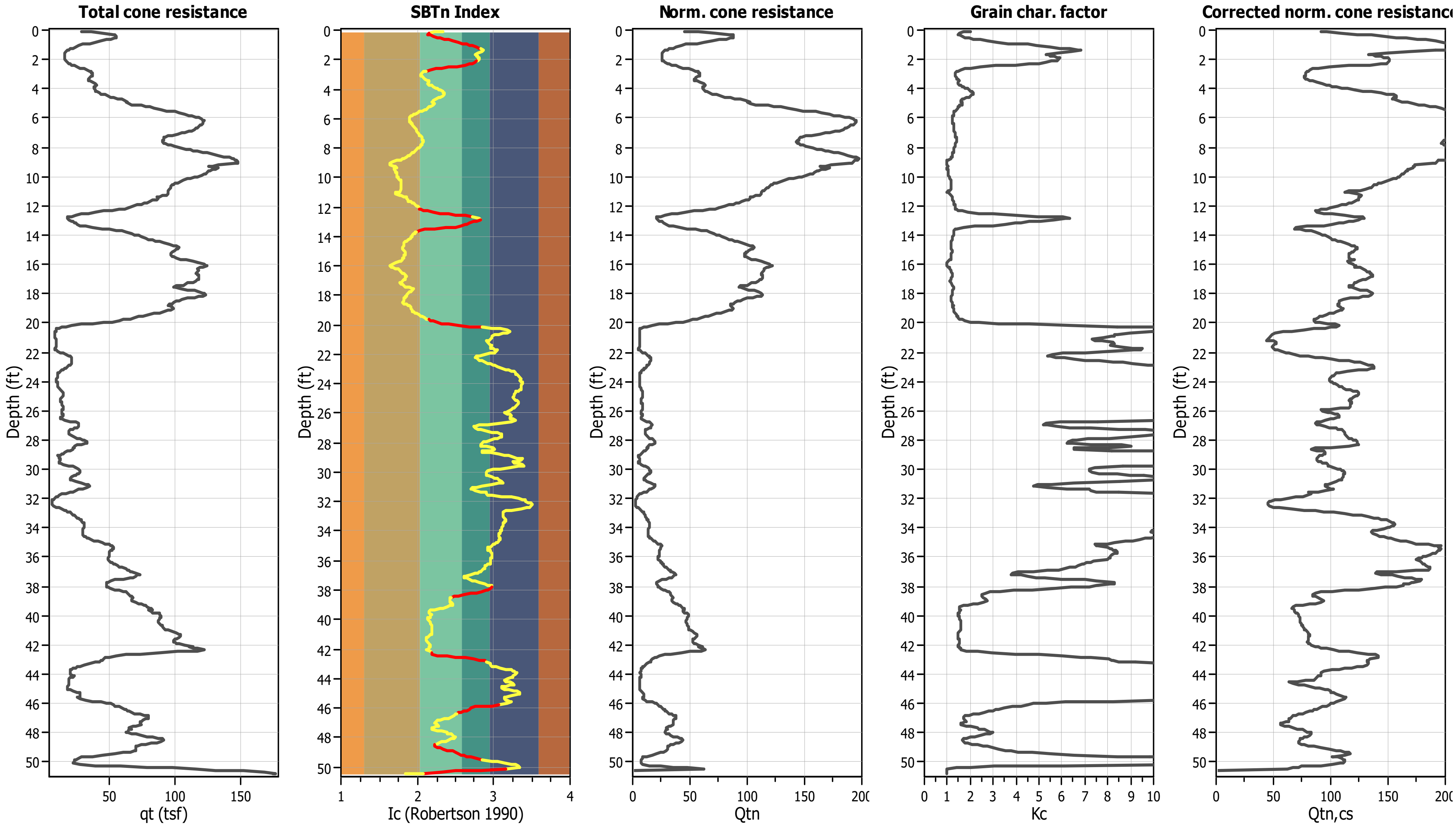
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	▨ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

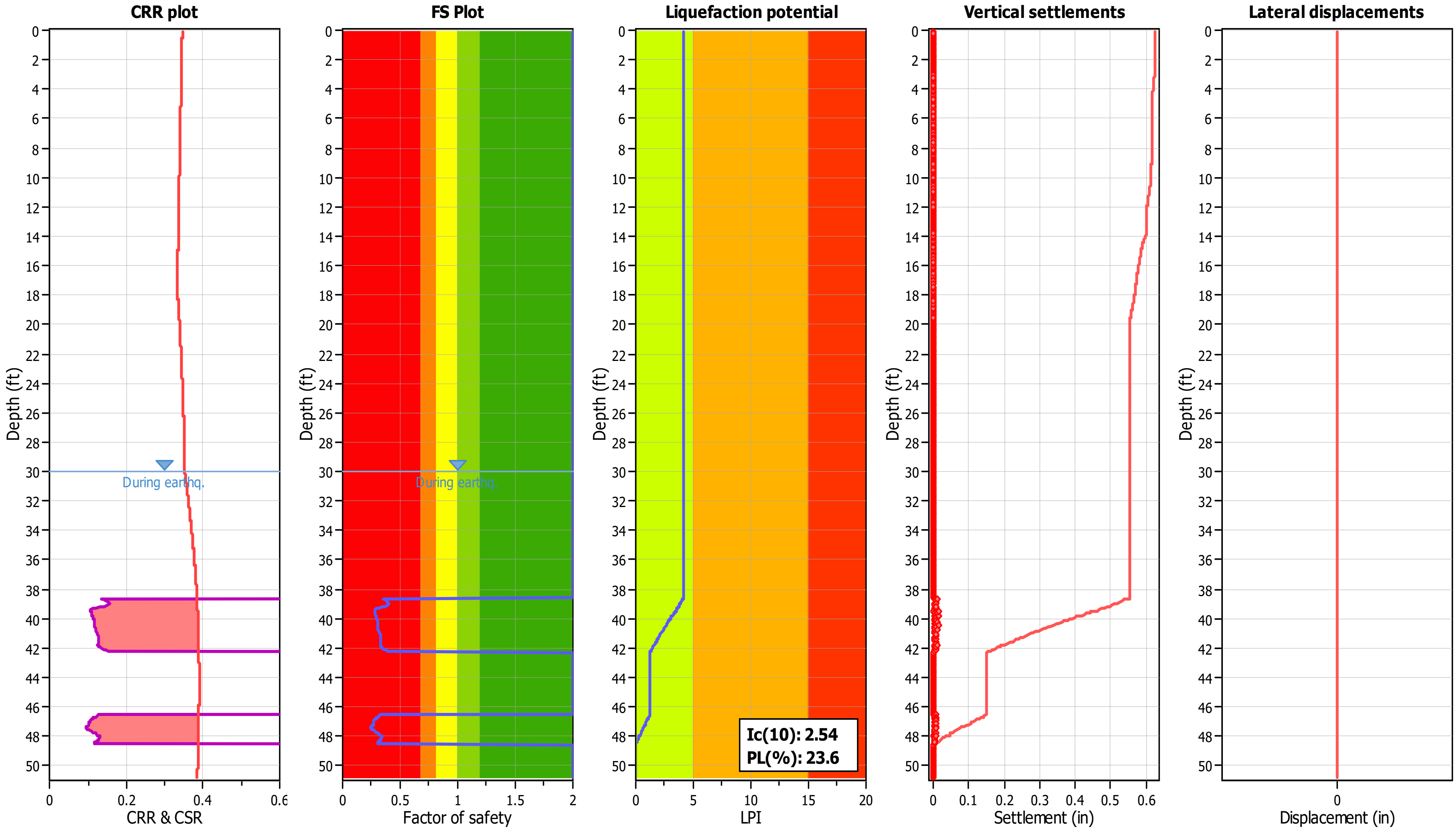
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

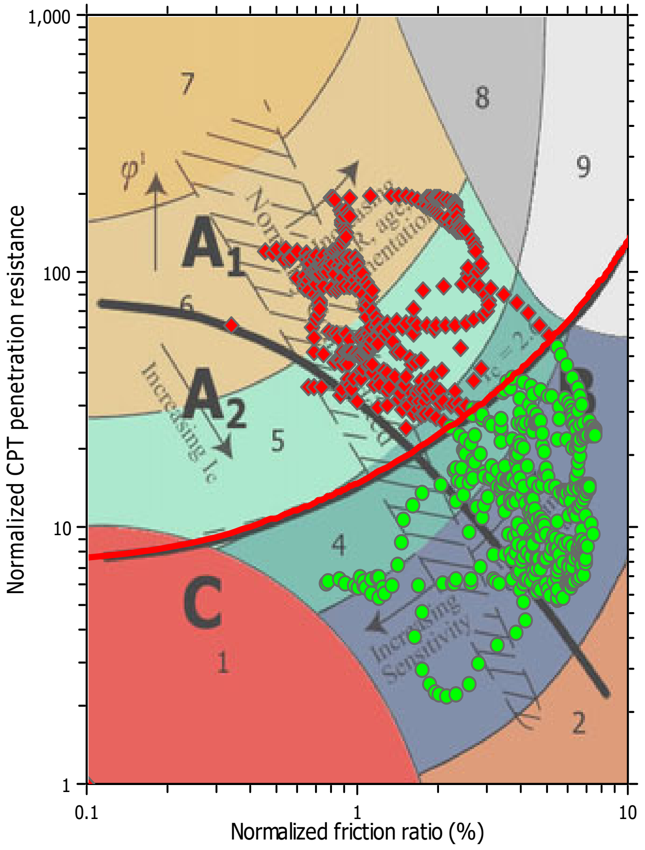
F.S. color scheme

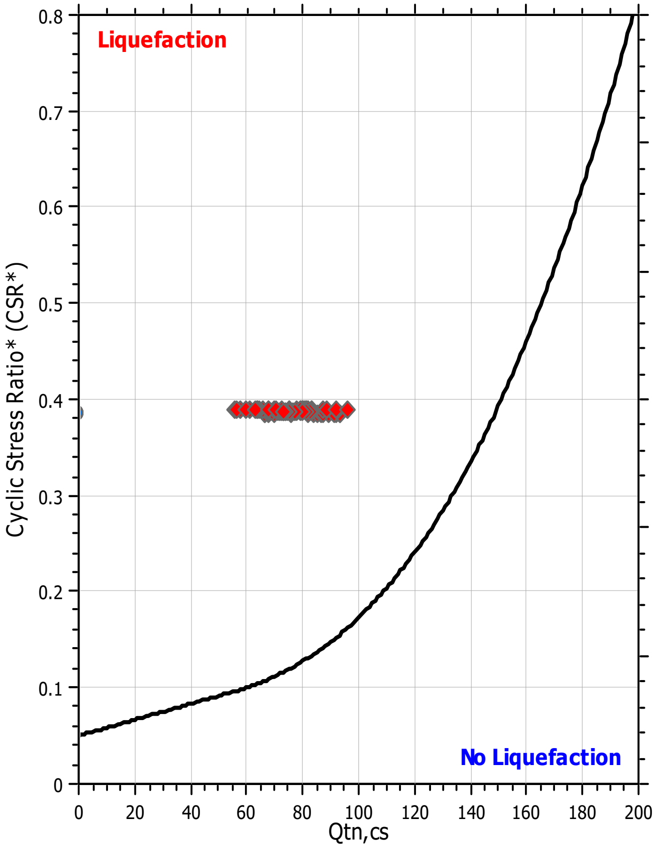
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

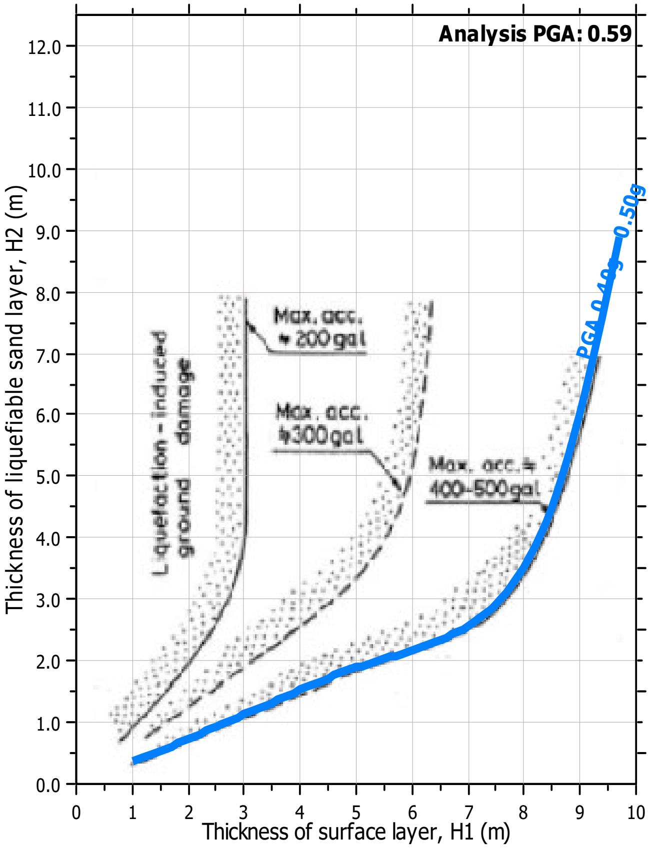
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟩 Low risk

Liquefaction analysis summary plots



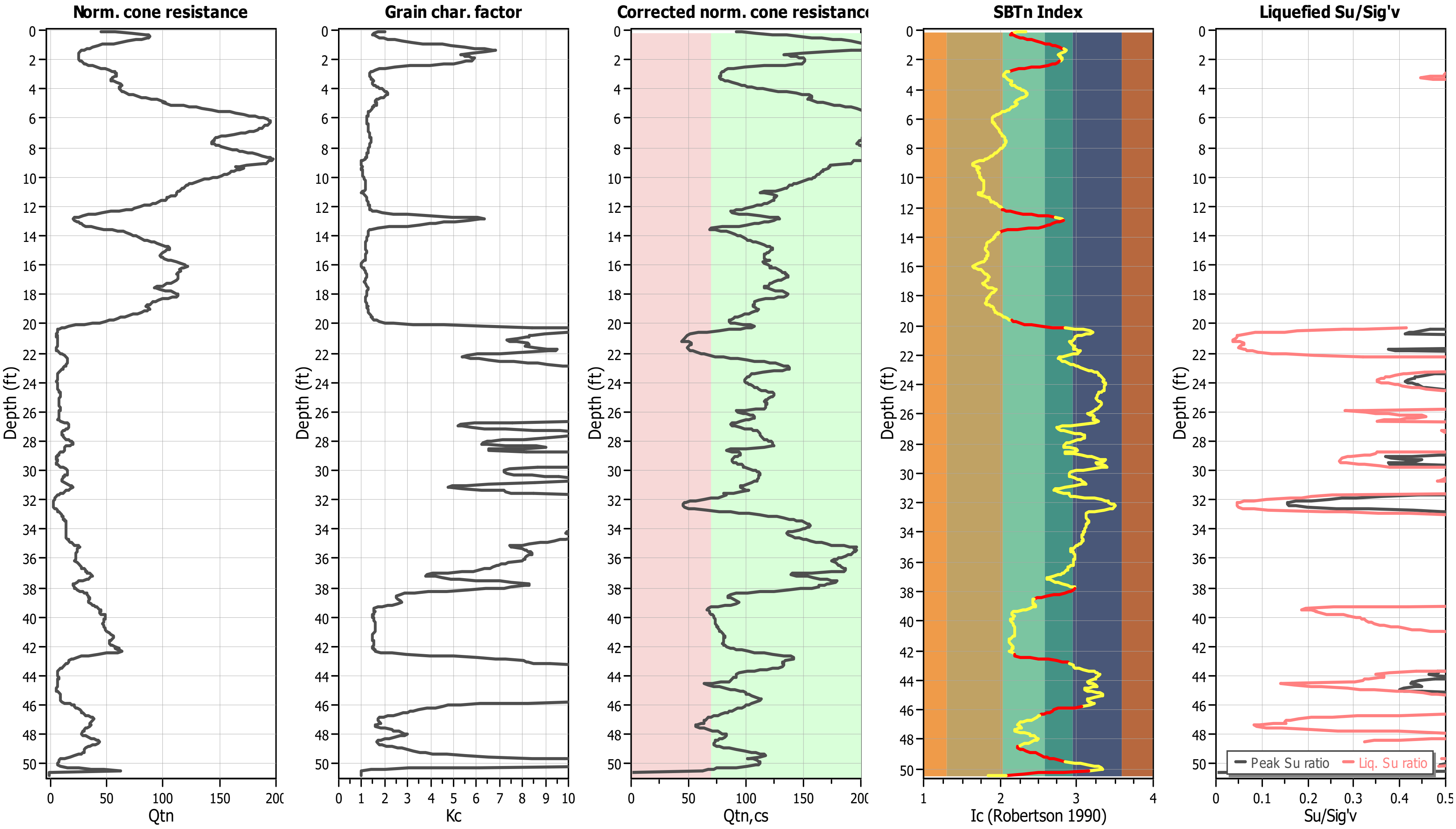




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft
Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A
Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

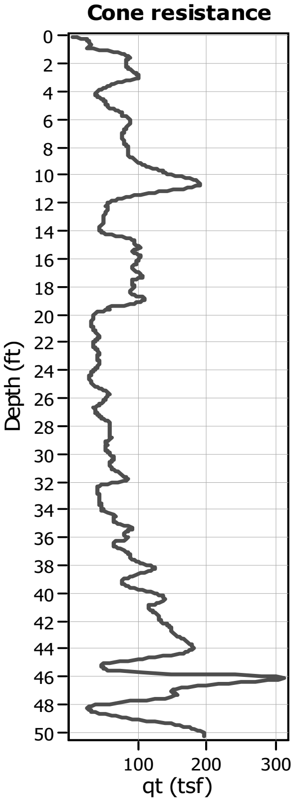
LIQUEFACTION ANALYSIS REPORT

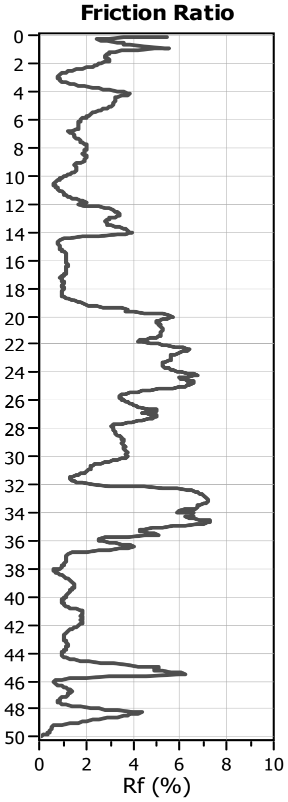
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

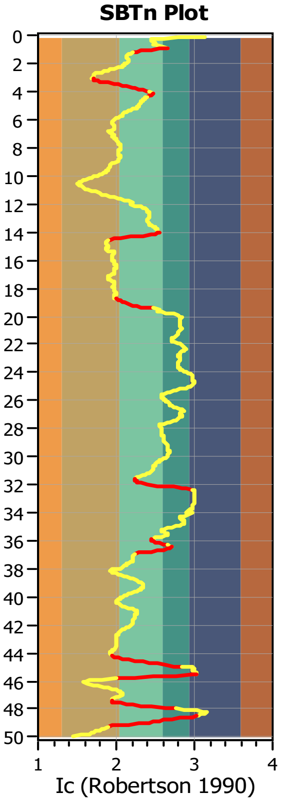
CPT file : CPT-5

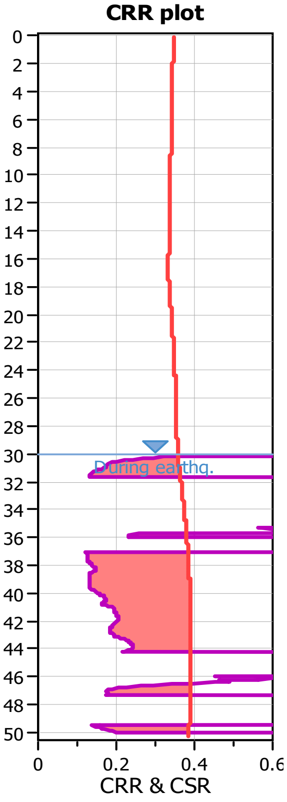
Input parameters and analysis data

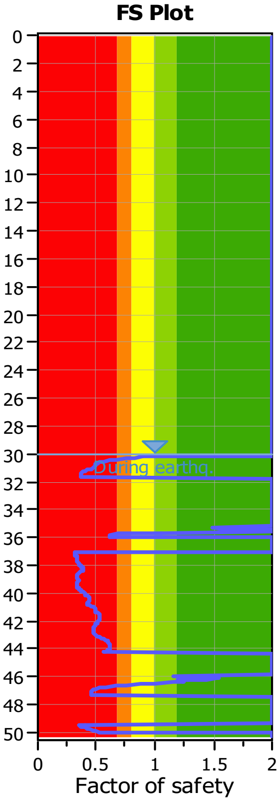
Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

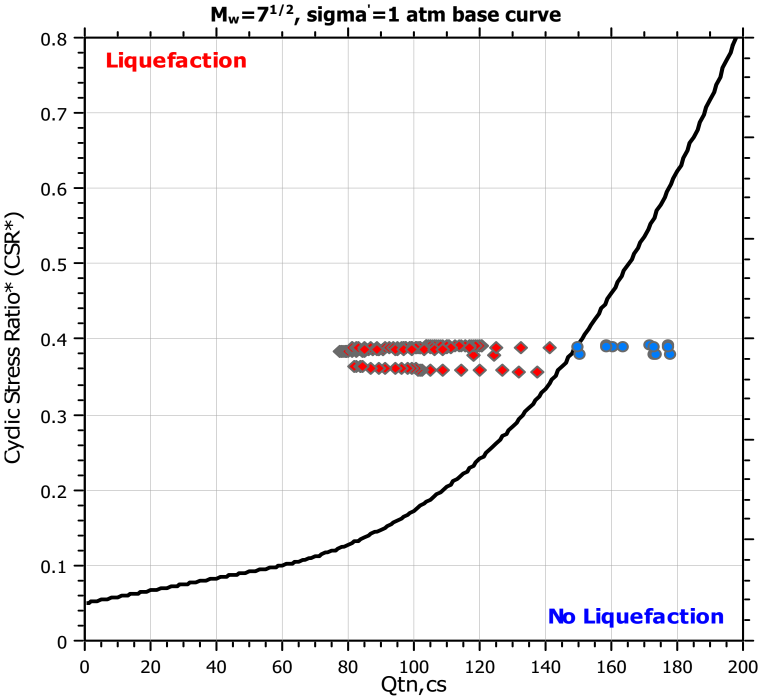


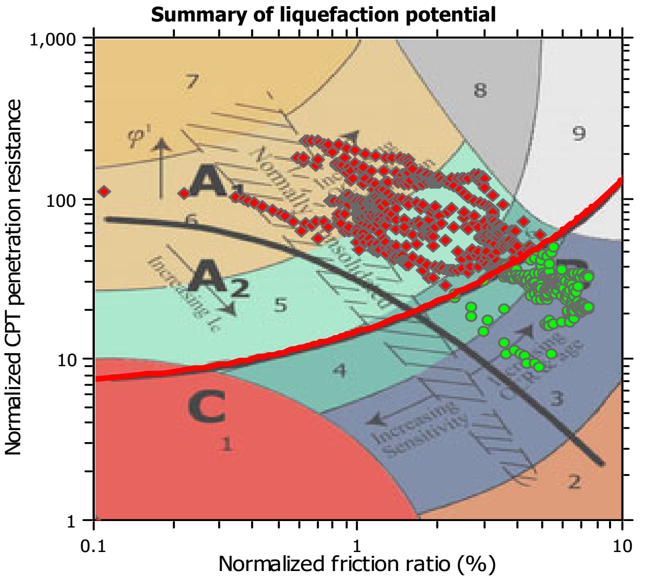






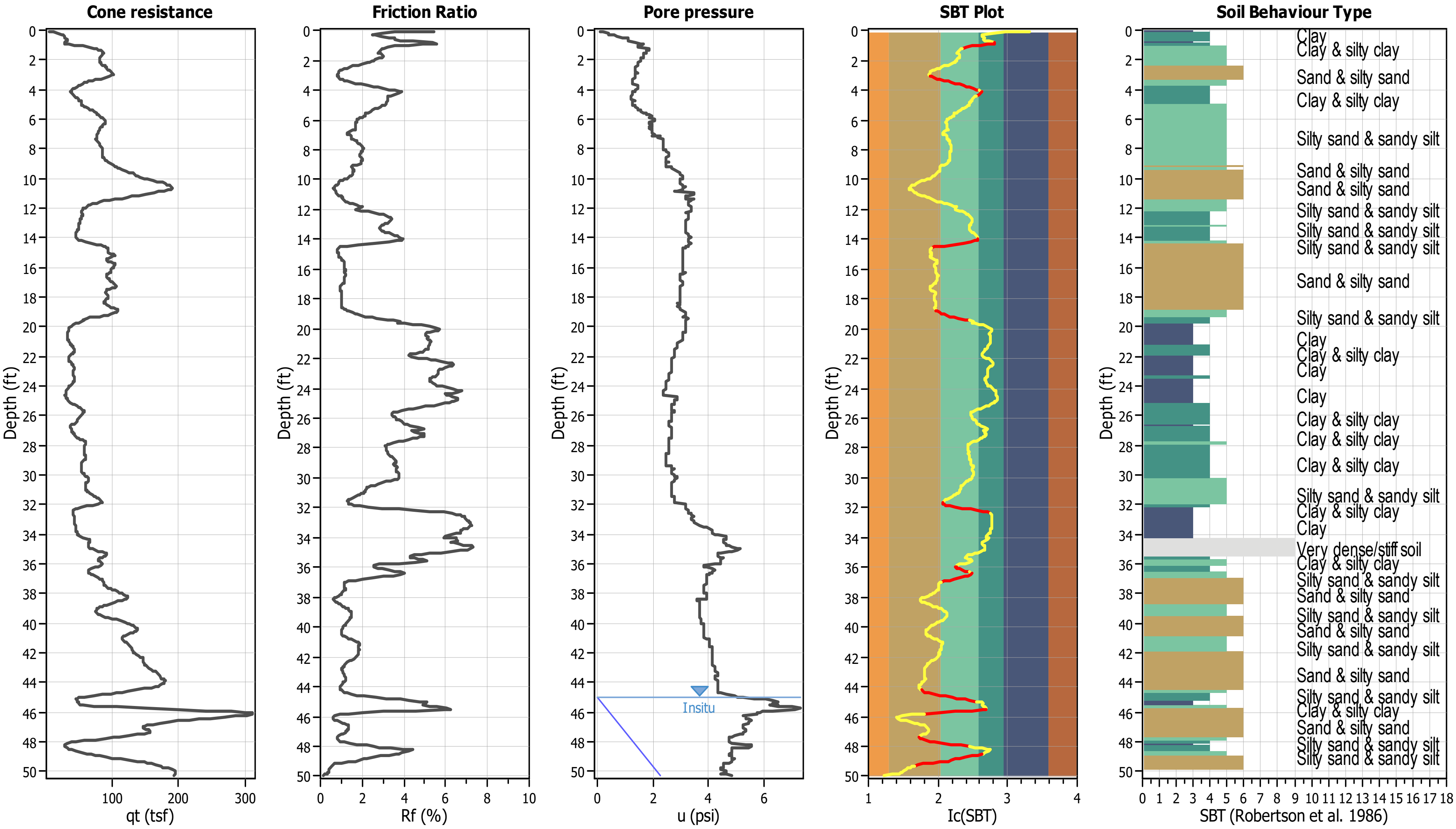






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



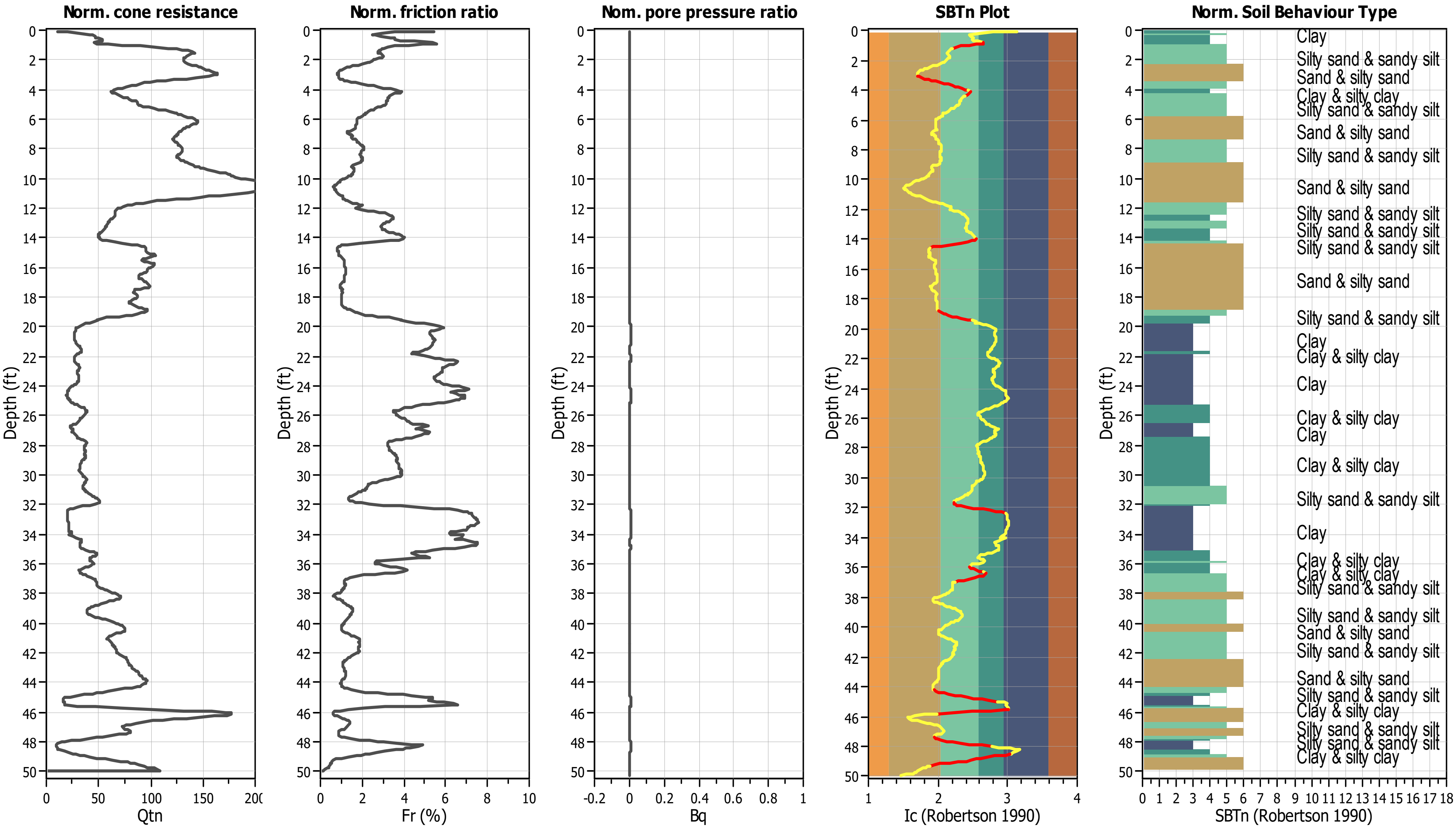
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



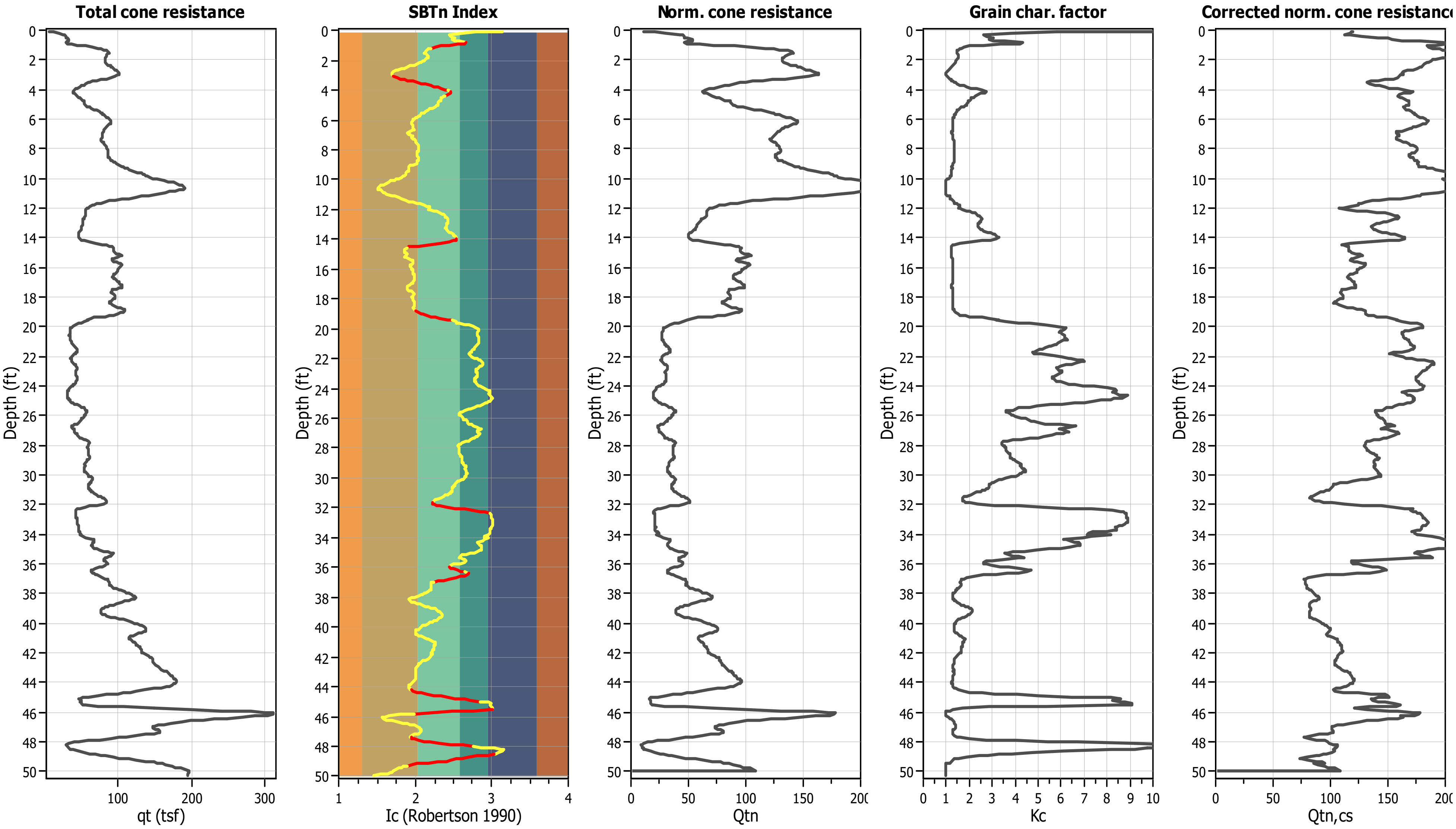
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

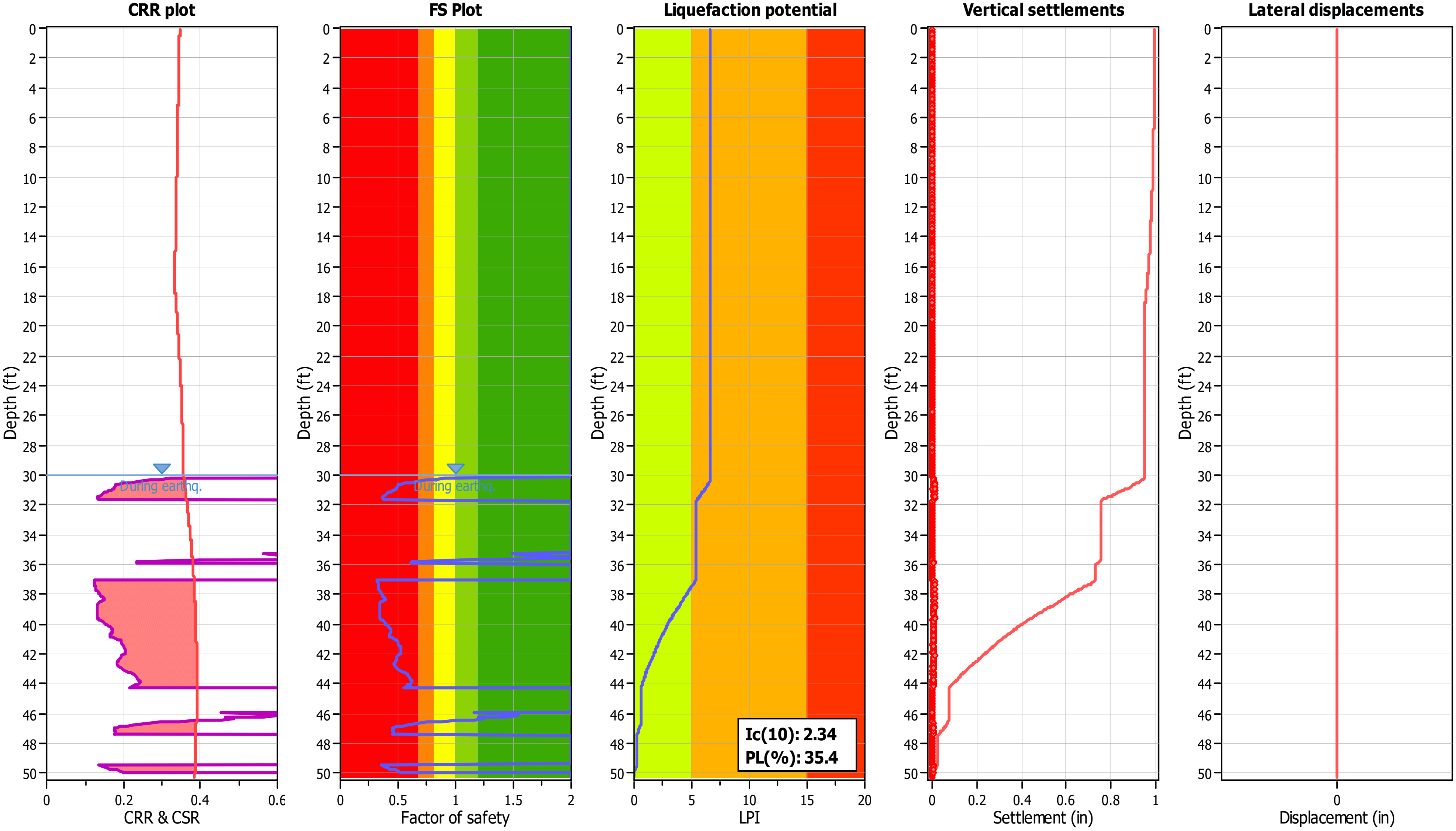
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

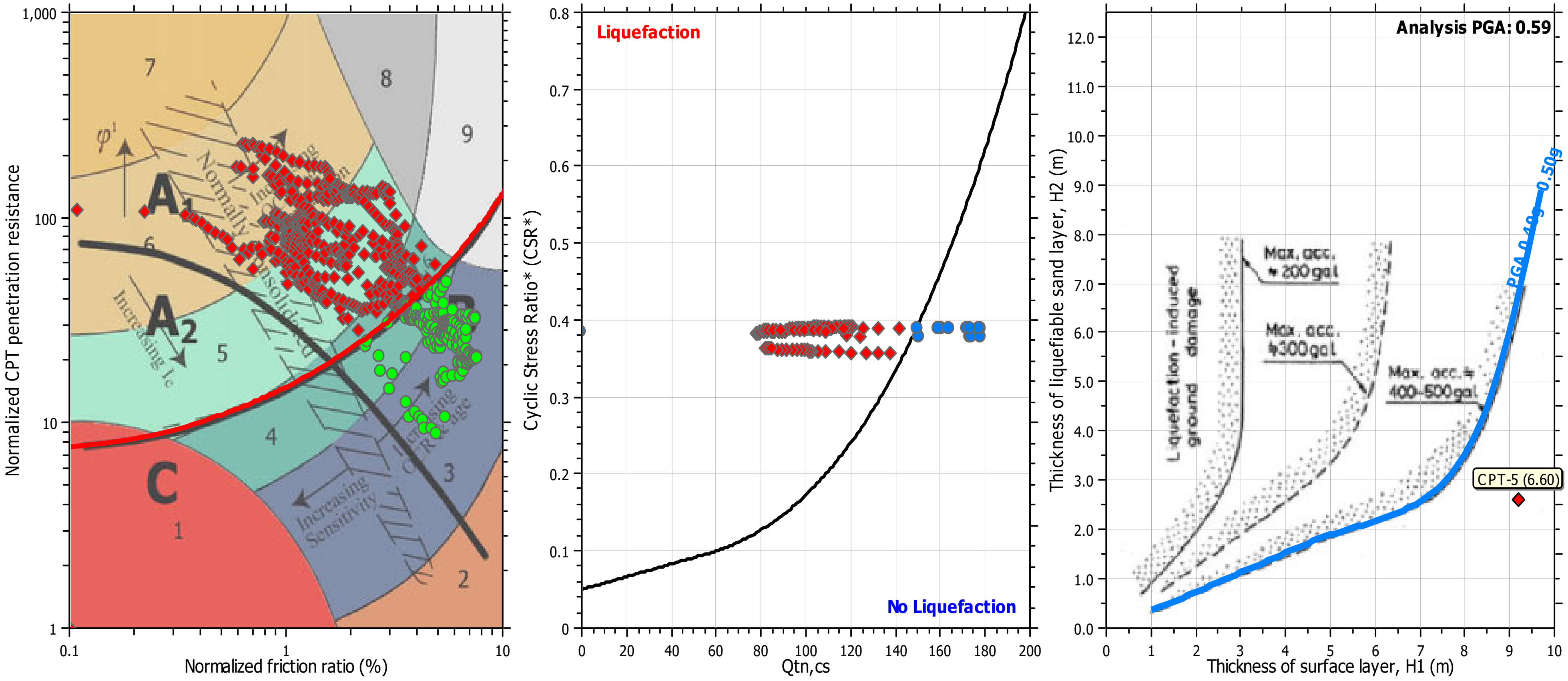
F.S. color scheme

- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟩 Low risk

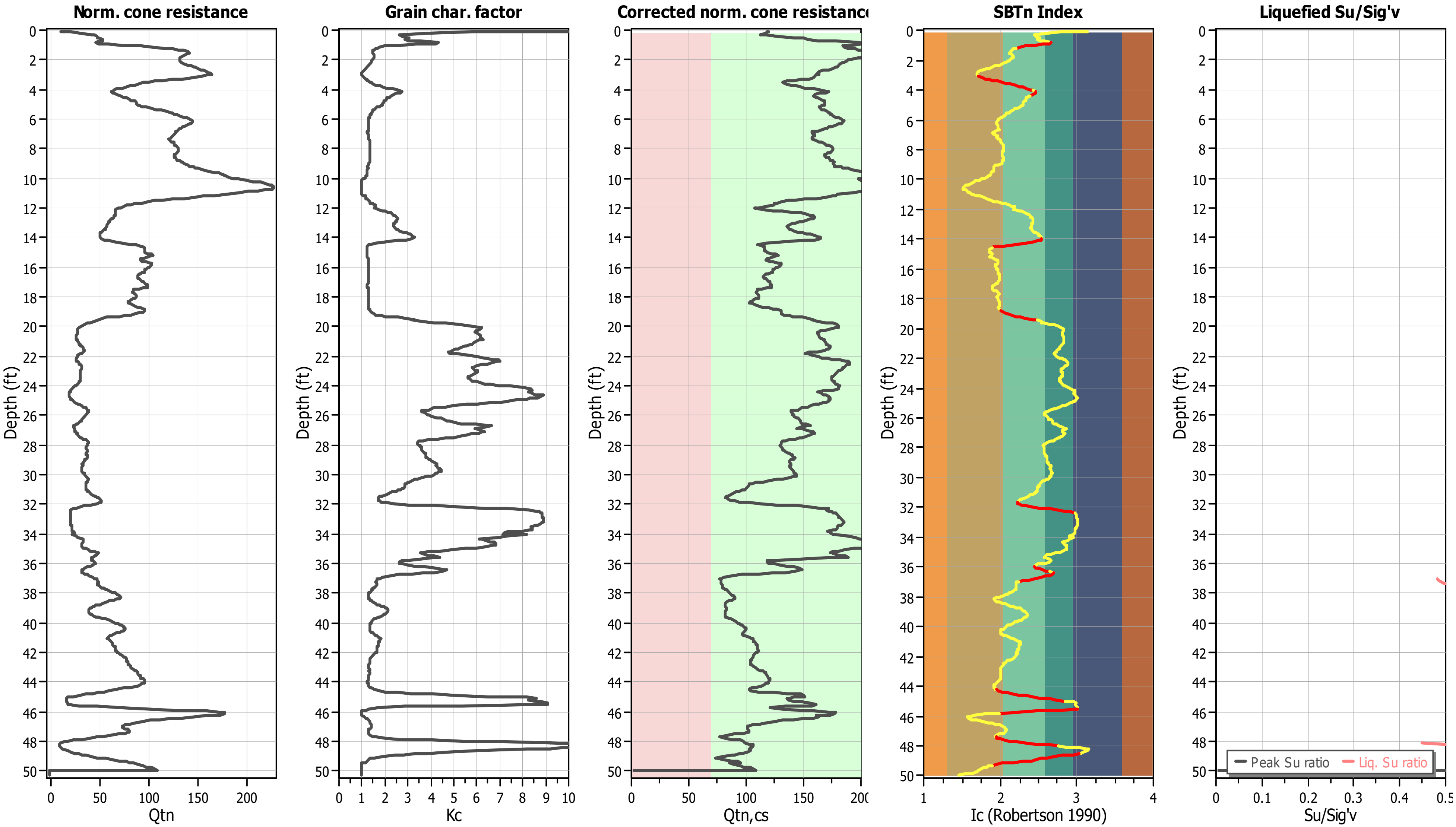
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Appendix G

APPENDIX G

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL

1.1 **Intent:** These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these general Specifications. Observations of the earthwork by the project Geotechnical Consultant during grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 **Geotechnical Consultant:** Prior to commencement of work, the project owner shall employ a geotechnical consultant. The geotechnical consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all keyway bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of subgrade and fill materials and perform adequate relative compaction testing of fill to determine the attained level of compaction and assess if, in their opinion, if the work was performed in substantial compliance

with the geotechnical report(s) and these specifications. The Geotechnical Consultant shall provide test results to the owner on a routine and frequent basis.

1.3 **The Earthwork Contractor:** The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with applicable grading codes, the project plans, and these specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork planned for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are corrected.

2.0 PREPARATION OF FILL AREAS

2.1 **Clearing and Grubbing:** Areas to be excavated and filled shall be cleared and grubbed. Vegetation, such as brush, grass, roots, and other deleterious material, man-made structures, and similar debris shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant. Borrow areas shall be cleared and grubbed to the extent necessary to provide a suitable fill material.

Concrete fragments that are free of reinforcing street may be placed in fills, provided they are placed in accordance with Section 3 and 4. Earth fill material

shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent organic matter. Nesting of organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, etc.) have chemical constituents that are considered hazardous waste. As such, the indiscriminate dumping or spillage of such fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

The Geotechnical Consultant shall not be responsible for the identification or analysis of potentially hazardous materials; however, if observations, odors, or soil discoloration are suspect, the Geotechnical Consultant may request from the owner the termination of grading operations until such materials are deemed not hazardous as defined by applicable laws and regulations.

2.2 **Evaluation/Acceptance of Fill Areas:** All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

2.3 **Processing:** Ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Ground that is not satisfactory shall be removed/overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. After scarification, the surface should be moisture conditioned, as necessary, to achieve the proper moisture content and compacted in accordance with Section 4 of these specifications.

2.4 **Overexcavation:** In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured, or otherwise unsuitable ground shall be overexcavated to competent ground as recommended by the Geotechnical Consultant during grading.

2.5 **Benching:** Fills to be placed on ground sloping steeper than 5H:1V (horizontal to vertical units) shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for fill placement.

3.0 FILL MATERIAL

3.1 **General:** Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 **Oversize:** Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or other underground construction.

3.3 **Import:** If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1 and/or requirements defined in the project geotechnical report(s). The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before import begins so that suitability can be determined, and appropriate laboratory tests performed.

4.0 FILL PLACEMENT AND COMPACTION

4.1 **Fill Layers:** Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 **Fill Moisture Conditioning:** Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with ASTM International (ASTM Test Method D1557).

4.3 **Compaction of Fill:** After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction and uniformity.

Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.4 **Compaction Testing:** Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.5 **Frequency of Compaction Testing:** Tests shall be taken at intervals required by the governing agency and as deemed necessary by the Geotechnical Consultant in order to adequately qualify the fill material. In general, it should be anticipated that tests will be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill, unless recommended otherwise by the Geotechnical Consultant. In addition, test(s) shall be taken on slope faces and/or each 10 feet of vertical height of slope as deemed necessary by the Geotechnical Consultant. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.6 **Compaction Test Locations:** The Geotechnical Consultant shall document the approximate elevation and location of each compaction test. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided. Alternatively, GPS units may be used to determine the approximate location/coordinates of the field density tests.

5.0 SUBDRAIN INSTALLATION

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and standard details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys. The Contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The Contractor is responsible for the performance of subdrains.

6.0 EXCAVATION

Excavations, including over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical report(s) and plans are estimates. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 TRENCH BACKFILLS

7.1 Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

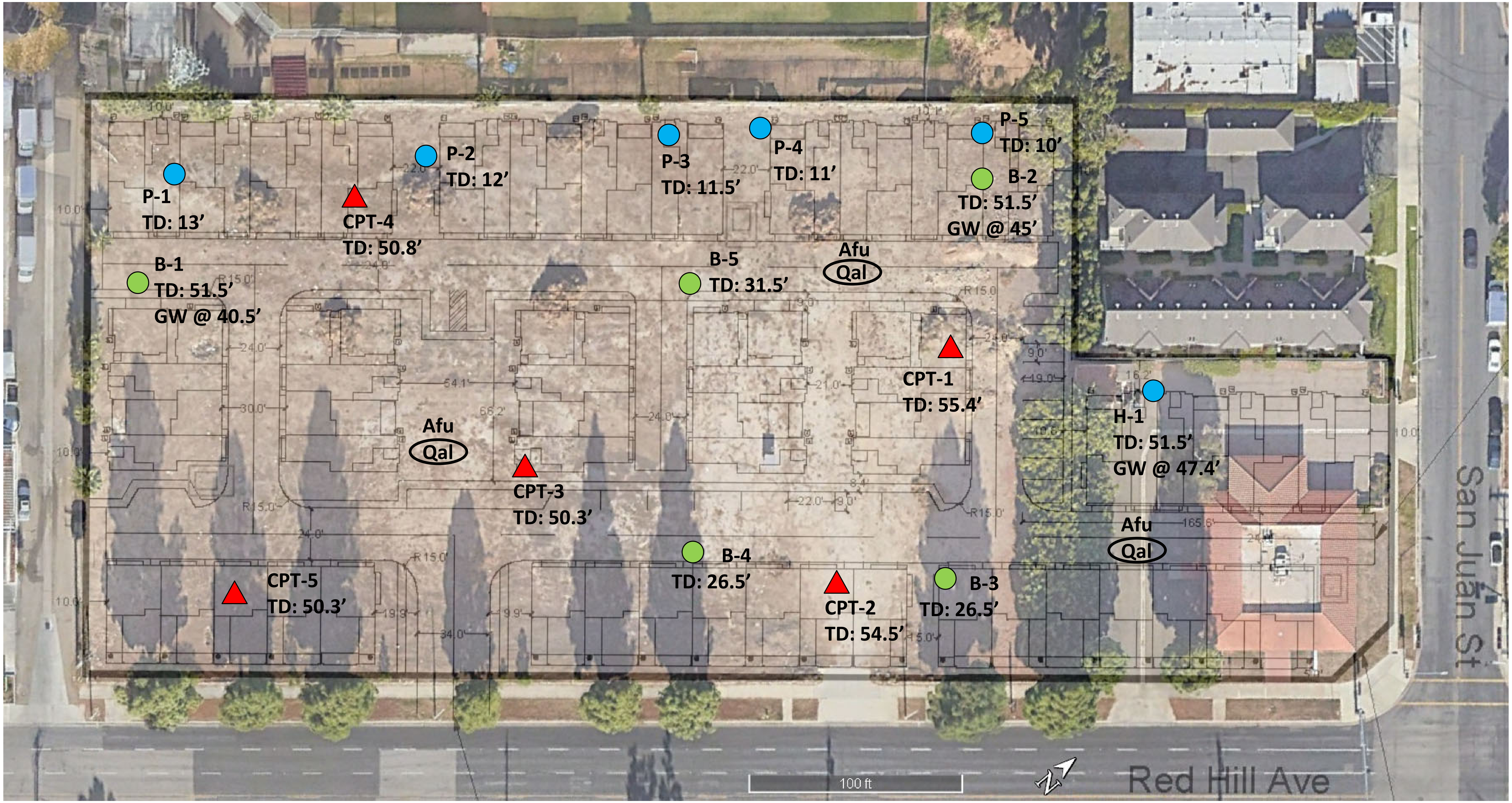
7.2 Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum 90 percent of maximum from 1 foot above the top of the conduit to the surface, except in traveled ways (see Section 7.6 below).

7.3 Jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

7.4 Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill, unless required differently by the governing agency or the Geotechnical Consultant.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.6 Trench backfill in the upper foot measured from finish grade within existing or future traveled way, shoulder, and other paved areas (or areas to receive pavement) should be placed to a minimum 95 percent relative compaction.



Base Map Source: Google Earth

Legend

▲ CPT-5 TD: 50.3’ Cone Penetrometer Test Location by SA GEO, Showing Total Depth.

● H-1/P-4 TD: 51.5’ GW @ 47.4’ Approximate Hollow Stem Auger Boring/Percolation Test Location (NMG, 2015), Showing Total Depth and Depth to Groundwater.

● B-5 TD: 31.5’ Approximate Hollow Stem Auger Boring Location (Geosoils, 2005), Showing Total Depth and Depth to Groundwater

Earth Units
Circled Where Buried

Afu Undocumented Artificial Fill

Qal Alluvium

GEOTECHNCIAL MAP

Meritage Homes
Proposed Residential Development
13841 & 13751 Red Hill Avenue
Tustin, California

Project Number: 24011-01
Date: February 2, 2023
Plate 1

S/A

Compass at Redhill

Preliminary Hydrology & Hydraulics Report

13841 Red Hill Ave.
Tustin, CA 92780

April 2025

Prepared for:

Johanna Crooker
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Prepared by:

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KHA Project # 195261019

4/11/2025

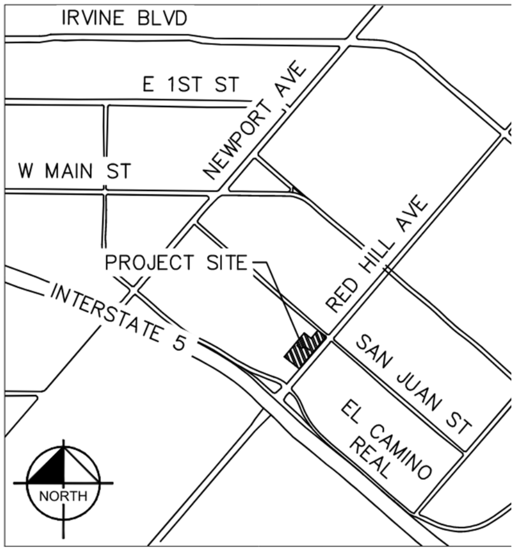
Kirkpatrick P. Myers, P.E. DATE:

Table of Contents

Appendices

1. Project Description

The approximate 3.38 acre project site is located southwest of the intersection of San Juan St and Red Hill Ave in the City of Tustin (City). The site is bound by Tustin High School to the northwest, an existing residential development to the northeast, Red Hill Ave to the southeast, and an existing commercial development to the southwest. (See Vicinity Map below for more detail). The purpose of this project is to analyze existing and proposed hydrologic conditions at the site. This analysis will serve as the basis for the design of onsite storm drain systems.



2. Methodology

The rainfall data used for the analysis is important for the runoff results. After comparison of the NOAA 2 data from the Orange County Hydrology Manual and the most recent online NOAA Atlas 14 data, it was determined that the NOAA 14 precipitation data provided more conservative and updated values, and thus was utilized for design. See Appendix E for the rainfall data used.

The hydrology calculations were prepared using the Orange County Hydrology Manual methodology as incorporated in the Advanced Engineering Software (AES) “RATSC” program. The small unit hydrographs for proposed conditions were prepared using AES. A multi-day storm analysis was conducted up until the 72-hour event for the 2-year, 25-year, and 100-year storms via AES Orange County Small Area Unit Hydrograph Method software. Successive day storms are developed and added in the front of the previously developed design storm patterns. Basin routing calculations were conducted in Bentley’s PondPack software using the Modified Pul’s Method for the 24-hour, 48-hour, and 72-hour storm durations. Catch basins and pipes will be sized using Bentley’s Flow Master during final design.

The project is a part of shaded FEMA flood zone X as shown in the FIRM Map 06059C0277J effective December 3, 2009. Flood zone X is defined as areas of 1% annual chance flood. The FEMA map can be found in Appendix E.

Web Soil Survey was used to determine the hydrologic soil type “B”. A geotechnical investigation was conducted by SA Geotechnical in their “Geotechnical Due Diligence Review” dated February 2, 2023. Infiltration testing shows a measured infiltration rate of 1.5 in/hr, which confirmed the soil type used for design. Based on guidance from the geotechnical investigation, a factor of safety of 2 was applied to the infiltration rate for all calculations. The geotechnical report can be found in Appendix F.

3. Existing Conditions

The existing site is currently vacant, with rough graded dirt where a portion of the site was previously developed with a real estate office building and parking lot, which has since been demolished. Existing block walls run along the northern property line between the existing residential development. There is an existing chain-link fence along the western portion of the site along Tustin High School. In addition to the block walls, site improvements and existing grades for the site and surrounding properties prohibit off-site run-ons into the property from the north, south and west. Runoff produced from the site sheet flows toward the southwest corner of the site through the driveway and discharges into an existing catch basin on Red Hill Ave as shown on the Existing Hydrology Exhibit in Appendix A. A summary of the existing peak flows can be found in Table 1 below.

Table 1: Summary of Existing Peak Flows

Drainage Area	Area (ac)	2-yr peak flow (cfs)	25-yr peak flow (cfs)	100-yr peak flow (cfs)
A	3.39	2.31	6.89	9.26
Total	**3.39**	**2.31**	**6.89**	**9.26**

4. Proposed Conditions

The project site will consist of the development of condominium buildings with their associated parking. Drainage areas A1-A7 are comprised of the proposed condominium buildings and their respective landscape and parking areas. Runoff produced from sub-areas A1 and A7 will sheet flow along curb and gutter and be collected in proposed catch basins. Runoff that is not infiltrated will discharge to either the public underground storm drain along San Juan Street or through a parkway drain (via bubble/pump) to Red Hill Ave following existing drainage patterns. Per the storm drain record drawing D-226B, located within Appendix E, the depth of the proposed underground infiltration system and overflow connection will be placed at a higher elevation than the calculated HGL within the existing storm drain to avoid a tailwater condition. Drainage area B consists of the southwestern portion of the site and is made up of proposed landscape. Runoff from this drainage area sheet flows onto an existing private alley before eventually discharging to an existing catch basin on Red Hill Ave. See the Proposed Hydrology Exhibit in Appendix B for a view of the drainage areas. A summary of the unmitigated peak flows can be found in Table 2 below.

Table 2: Summary of Proposed Peak Flows (unmitigated)

Drainage Area	Area (ac)	2-yr peak flow (cfs)	25-yr peak flow (cfs)	100-yr peak flow (cfs)
A1-A7	3.32	4.37	9.54	12.52
B	0.07	0.08	0.19	0.25

Total	**3.39**	**4.45**	**9.73**	**12.77**

4.1 Detention Calculations

The project site ultimately discharges to a city-owned storm drain lateral along San Juan St. The project is subject to hydromodification and requires detention to mitigate proposed peak flows. Because a detention basin has been proposed on-site, a multi-day storm analysis for the 24-hr, 48-hr, and 72-hr storm was conducted. Per Section B.5 of the Orange County Hydrology Manual guidelines, if the change in detention basin storage volume between the 72-hr and 48-hr events is less than the change between the 48-hr and 24-hr events, the 72-hr storm is considered the governing event (or critical duration). If this successive change in volume is greater, then the 96-hr event would need to be analyzed and the process would be repeated until the basin demonstrates no successive change increase in volume.

In constructing the multi-day storm hyetographs, it was determined that the rainfall durations were to be analyzed in 24-hour durations. Per the Orange County Hydrology Manual, the first 24-hr duration precipitation depth of the storm analysis corresponds with the 24-hr point precipitation value (taken from NOAA 14). The successive 24-hr hyetograph will occur prior to the first 24-hr duration with its mass precipitation depth equal to the difference between the 24-hr and 48-hr depth (taken from NOAA 14). All remaining point precipitation values for the hyetograph construction are determined based off simple scaling of the 24-hr depth. The 24-hr storm durations would be stacked in the following order Day 3 (72hr), Day 2 (48hr), and then Day 1 (24hr), which can be referenced from Section B.6 of the Orange County Hydrology Manual. Refer to Appendix E for the precipitation data used and Appendix B for the associated multi-day storm unit hydrographs.

Detention calculations were completed for the site for the 2-yr, 25-yr, and 100-yr storm event and with mitigation, the project is not expected to increase flow rates. The 72-hr storm duration was determined to be the governing event as the detention volume difference between the 48-hr and 72-hr events were less than the detention volume difference between the 24-hr and 48-hr events. The detention system mitigates peak flows via a 13-inch orifice and retains the water quality volume below this orifice. The water quality volume draws down within 20 hours, which is compliant with the 48-hour maximum drawdown of retention volume per the North Orange County WQMP Technical Guidance Document. Based on the Minimum Drain Time calculator, the peak 100-year detention volume routed through the infiltration chambers draws down within 36 hours. A summary of the proposed peak flows and volumes with mitigation are provided in Table 3 and 4 below. Refer to Appendix C for the full basin routing analysis.

Table 3: Summary of Proposed Peak Flows (mitigated)

Drainage Area	Area (ac)	2-Yr Peak Flow (cfs)			25-Yr Peak Flow (cfs)			100-Yr Peak Flow (cfs)		
		24-hr	48-hr	72-hr	24-hr	48-hr	72-hr	24-hr	48-hr	72-hr
A1-A7	3.32	1.02	1.04	**1.05**	4.74	4.77	**4.79**	6.06	6.12	**6.13**
B	0.07	0.09	0.09	**0.09**	0.19	0.19	**0.19**	0.25	0.25	**0.25**
Total	*3.39*	*1.11*	*1.13*	***1.14***	*4.93*	*4.96*	***4.98***	*6.31*	*6.37*	***6.38***

Table 4a: Summary of Detention Volumes (mitigated)

Storm Duration	2-Yr Max Volume Used (cf)	25-Yr Max Volume Used (cf)	100-Yr Max Volume Used (cf)
24-hr	11,050	15,593	17,512
48-hr	11,093	15,636	17,594
72-hr	**11,101**	**15,661**	**17,611**

Table 4b: Summary of Differences in Detention Volumes (mitigated)

Storm Duration	2-Yr Delta Volume (cf)	25-Yr Delta Volume (cf)	100-Yr Delta Volume (cf)
48-24 Hr Delta	43	43	82
72-48 Hr Delta	8	25	17
72-48 Hr Delta smaller than 48-24 Hr Delta?*	YES	YES	YES

*Note- If YES, then the 72-hour storm is governing, and no additional durations are required to be analyzed.

4.2 Drainage Structures Calculations

The proposed drainage pipes will be sized to convey the 100-year storm event during final design. Manning's roughness coefficients, slopes, and diameters will be selected based on the proposed pipe geometry and material. Catch basins for the onsite portion of the site will be sized to maintain the 100-year ponding depth within the curb and gutter. Refer to Appendix D for capacity calculations during final design.

Myers, Kirk

From: Waite, Alex <AWaite@tustinca.org>
Sent: Friday, October 11, 2024 3:02 PM
To: Jennifer Peterson; Myers, Kirk; Sutton, Mike; Astorga, Lupita; Crooker, Johanna; Carver, Leila; Lee, Katy
Subject: RE: Help Desk Question

No problems. And thank you everyone for your patience. With the new permit next year, I'm sure everything is going to be changing again.

Alex Waite
Senior Management Analyst

300 Centennial Way, Tustin, CA 92780
P: 714-573-3305 | **F**: 714-734-8991
awaite@tustinca.org | tustinca.org

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From: Jennifer Peterson <JENNIFER.PETERSON@nv5.com>
Sent: Friday, October 11, 2024 2:25 PM
To: Waite, Alex <AWaite@tustinca.org>; Myers, Kirk <Kirk.Myers@kimley-horn.com>; Sutton, Mike <Mike.Sutton@kimley-horn.com>; Astorga, Lupita <lupita.astorga@kimley-horn.com>; Crooker, Johanna <Johanna.Crooker@mlcholdings.net>; Carver, Leila <LCarver@tustinca.org>; Lee, Katy <KLee@tustinca.org>
Subject: RE: Help Desk Question

Thanks Alex. I appreciate you getting clarification on this matter.

Jennifer M. Peterson P.E., CFM, CPESC, QSD, LEED AP | Senior Project Manager| NV5
15092 Avenue of Science, Suite 200 | San Diego, CA 92128 | P: 619.807.6202 | F: 858.385.0400

Electronic Communications Disclaimer

From: Waite, Alex <AWaite@tustinca.org>
Sent: Thursday, October 10, 2024 4:21 PM
To: Myers, Kirk <Kirk.Myers@kimley-horn.com>; Jennifer Peterson <JENNIFER.PETERSON@nv5.com>; Sutton, Mike <Mike.Sutton@kimley-horn.com>; Astorga, Lupita <lupita.astorga@kimley-horn.com>; Crooker, Johanna <Johanna.Crooker@mlcholdings.net>; Carver, Leila <LCarver@tustinca.org>; Lee, Katy <KLee@tustinca.org>
Subject: FW: Help Desk Question

Good Afternoon,
Please see the response below from the Orange County Help Desk.

Alex Waite
Senior Management Analyst

300 Centennial Way, Tustin, CA 92780
P: 714-573-3305 | **F**: 714-734-8991
awaite@tustinca.org | tustinca.org

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From: Tucker, Matt <Matt.Tucker2@ocpw.ocgov.com>
Sent: Thursday, October 10, 2024 4:15 PM
To: Waite, Alex <AWaite@tustinca.org>
Cc: Chiang, Sarah <Sarah.Chiang@ocpw.ocgov.com>
Subject: Help Desk Question

Response:

Per the Section 9.3.3 of the Orange County Flood Control District (OCFCD) Design Manual, multiple-use basins such as the one proposed by the applicant must maintain the 100-year flood protection objective even when designed with a water quality component. Additionally, Section 9.4 of the OCFCD Design Manual notes that "a detention basin shall be designed for 100-year multiple day design storm as prescribed by the Orange County Hydrology Manual," which is the same procedure referenced in the applicant's response. As such, the applicant's proposed approach of modeling the multi-use detention facility as a multiple-day event to show that the proposed system can satisfy both water quality and flood control requirements would be an acceptable approach, and consistent with the OC Local Drainage Manual, the OCFCD Design Manual, and the OC Hydrology Manual. This approach is also acceptable per the OC Technical Guidance Document as long as the design adequately accounts for pretreatment to avoid excess sedimentation in the infiltration area.

Note: This response is intended to assist Permittees and applicants in interpretation and application of program documents. However, Permittees are responsible for compliance with the MS4 Permit and all responsibilities under the New Development/Significant Redevelopment Program. This answer is not intended to supersede any elements of the MS4 Permit, Model WQMP, or TGD.

Question:

Plan Check Consultant Comment:
Per Orange County Local Drainage Manual Section 7.2.8, when a detention facility is used for both water quality and flood control, the water quality retention volume (e.g., volume for infiltration, which is the volume below the lowest surface outlet) shall be provided in addition to the volume designated for flood storage. Begin the basin routing calculations at the water surface elevation of the water quality storm. State the water quality treatment volume (DCV) and elevation in this report. Additionally, assume 100 year storm cannot be infiltrated, due to detention facility already containing DCV.

The applicant stated they will need to enlarge the BMP to meet this language. We had a meeting with the planner checker and applicant but there were still questions. The applicant has submitted the email below. Is this approach okay.

Applicant Response:
Hi Alex

After having some internal discussions following our call earlier this week, we thought is best to adjust our approach to the hydrology & hydraulics as it pertains to storage.

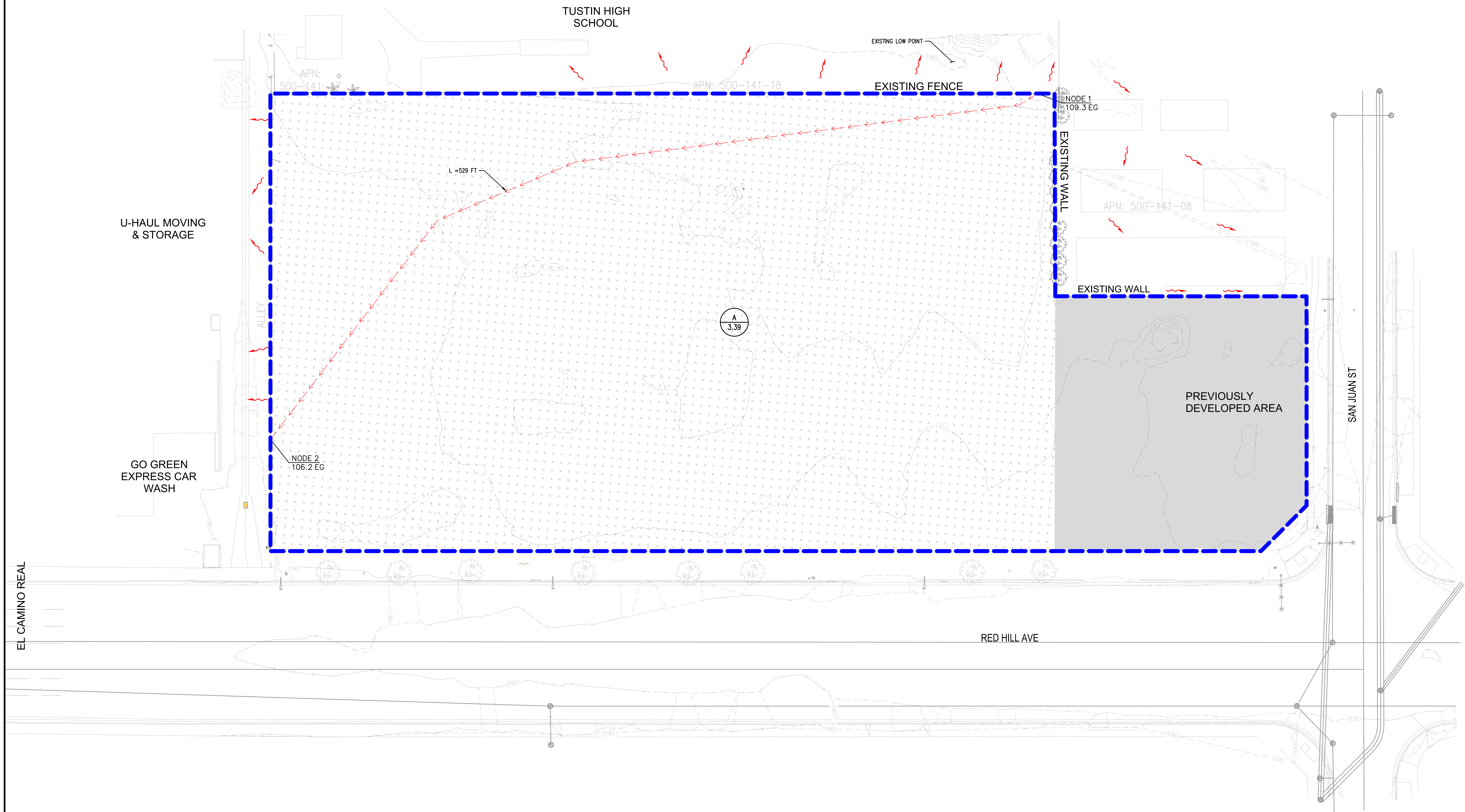
We are going to continue to use our water quality chamber as a conjunctive use with flood mitigation, but rather than adding the entire design storm on top the water quality event (as NV5 has interpreted section 7.2.8 of the OC Drainage Manual), we would propose to model the whole thing as a multi-day event as prescribed in section 7.2.10 of the Drainage Manual. In other words, instead modeling the 100-yr 24-hour event with the water quality event volume already in the chamber, we would model the multi-day event starting from zero. The dead storage would be provided at the bottom of the chamber for the water quality volume, but that would be a portion of the overall multi-day event rather than added to it.

This multi-day approach is consistent with the OC drainage manual and should address the concerns expressed in the comments on our preliminary hydrology and hydraulic report. Please confirm that this is an acceptable approach. Thank you.

Appendix A: Existing Conditions

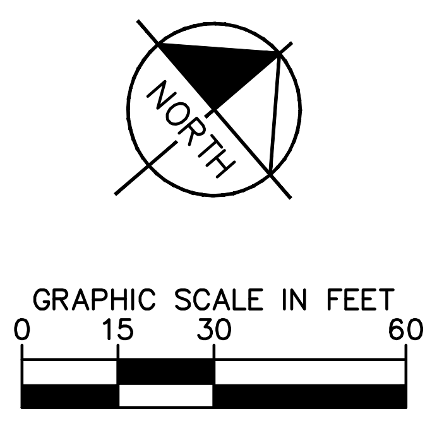
CITY OF TUSTIN

PRELIMINARY EXISTING HYDROLOGY EXHIBIT



LEGEND

— — — - (575) - — — —	CONTOUR
———	PROPERTY LINE
▬ ▬ ▬ ▬ ▬	DMA BOUNDARY
—— > —— > ——	FLOW ARROW
〜►	OFFSITE FLOW ARROW
DA XX	DRAINAGE AREA NAME
XX AC	AREA (IN ACRES)
NODE 10 50.00 FS	NODE ID AND ELEVATION
—— — — ——	RIGHT-OF-WAY
═ ═ ═	EXISTING STORM DRAIN
▨	PERVIOUS AREA



REVISIONS	DATE	BY

SCALE: 1"=30'
DATE: 01/2024
DESIGNED: KPM
CHECKED: KPM
PLN CK REF:
F.B.

Kimley»Horn
3801 UNIVERSITY AVE. SUITE 300, RIVERSIDE, CA 92501
PHONE: (951) 543-9868 WWW.KIMLEY-HORN.COM

PRELIMINARY EXISTING HYDROLOGY EXHIBIT
RED HILL STREET AND SAN JUAN AVENUE

PROJ. # 195261019
SHEET 1
OF 2 SHEETS
DWG. NO.

K:\RIV_LDEV\195261019 - MLC RED HILL\CAD\EXHIBITS\HYDROLOGY\EXISTING HYDROLOGY.DWG 10/2/2024 3:32:54 PM

```
****************************************************************************
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            (Reference: 1986 ORANGE COUNTY HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* Red Hill                                                                 *
* Existing 2 yr                                                            *
* Kimley-Horn                                                              *
 **************************************************************************

  FILE NAME: RHE2.DAT
  TIME/DATE OF STUDY: 11:35 09/17/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  1.790
   2)   10.00;  1.280
   3)   15.00;  1.030
   4)   60.00;  0.499
   5)  180.00;  0.298
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   529.00
  ELEVATION DATA: UPSTREAM(FEET) =    109.34  DOWNSTREAM(FEET) =    106.16

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.502
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.012
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                B       3.39      0.30     0.850    36   16.50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      2.31
  TOTAL AREA(ACRES) =      3.39   PEAK FLOW RATE(CFS) =      2.31
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.4  TC(MIN.) =     16.50
  EFFECTIVE AREA(ACRES) =      3.39  AREA-AVERAGED Fm(INCH/HR)=  0.26
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.850
  PEAK FLOW RATE(CFS)   =      2.31
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

↑
```

```
****************************************************************************
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                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* Red Hill                                                                 *
* Existing 25 yr                                                           *
* Kimley-Horn                                                              *
 **************************************************************************

  FILE NAME: RHE25.DAT
  TIME/DATE OF STUDY: 19:00 06/06/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  3.470
   2)   30.00;  1.390
   3)   60.00;  0.969
   4)  120.00;  0.704
   5)  360.00;  0.409
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   529.00
  ELEVATION DATA: UPSTREAM(FEET) =    109.34  DOWNSTREAM(FEET) =    106.16

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.502
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.513
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                B        3.39      0.30     0.850    56   16.50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      6.89
  TOTAL AREA(ACRES) =      3.39   PEAK FLOW RATE(CFS) =      6.89
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.4  TC(MIN.) =     16.50
  EFFECTIVE AREA(ACRES) =      3.39  AREA-AVERAGED Fm(INCH/HR)=  0.26
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.850
  PEAK FLOW RATE(CFS)   =       6.89
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                           Analysis prepared by:






 ************************* DESCRIPTION OF STUDY *************************
* Red Hill                                                                 *
* Existing 100 yr                                                          *
* Kimley-Horn                                                              *
 **************************************************************************

  FILE NAME: RHE100.DAT
  TIME/DATE OF STUDY: 18:59 06/06/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  4.540
   2)   30.00;  1.820
   3)   60.00;  1.270
   4)  120.00;  0.924
   5)  360.00;  0.537
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)   (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

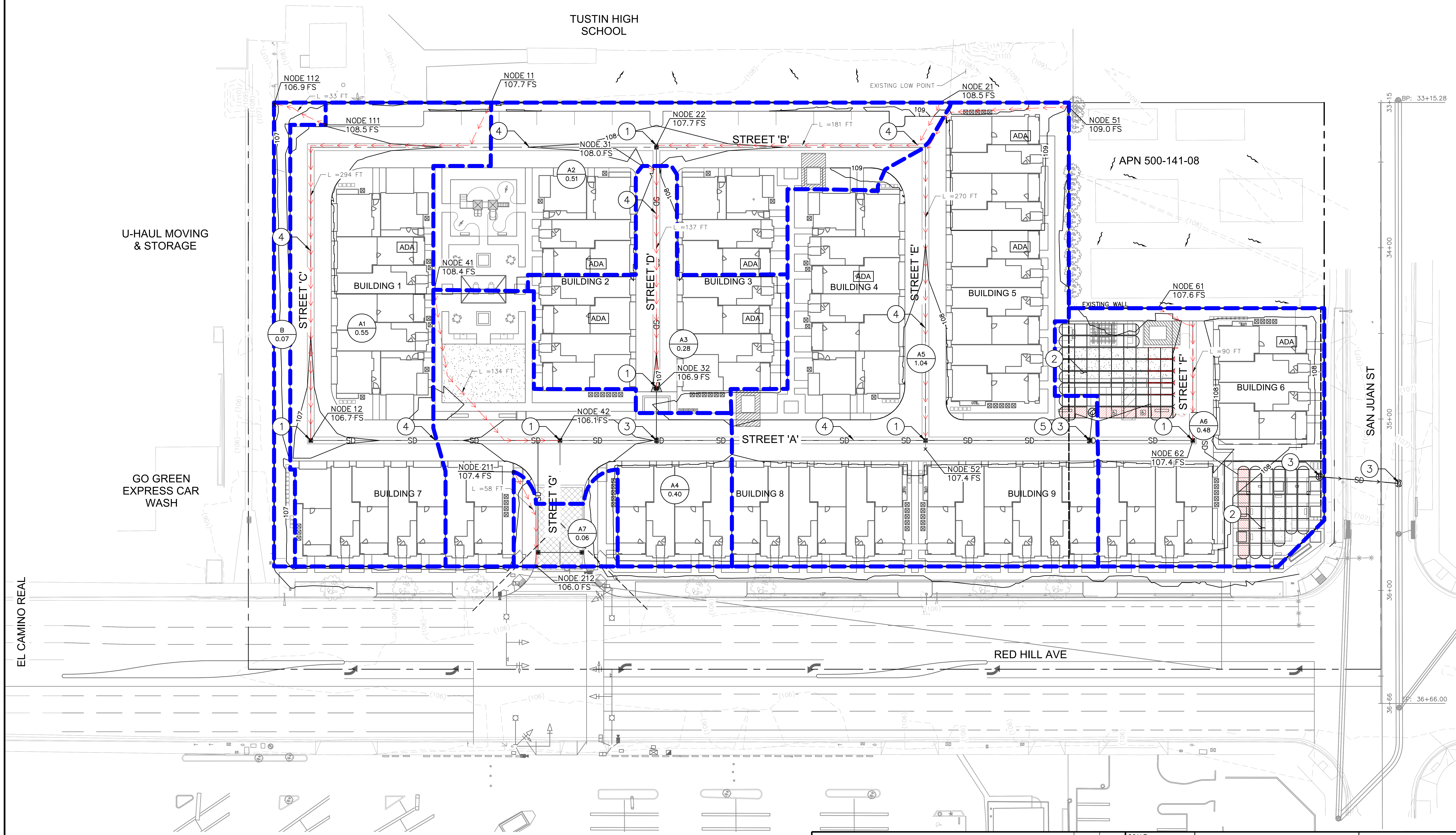
*****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
-----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   529.00
  ELEVATION DATA: UPSTREAM(FEET) =    109.34  DOWNSTREAM(FEET) =    106.16

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   16.502
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.289
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  PUBLIC PARK                B        3.39      0.30     0.850    76   16.50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.850
  SUBAREA RUNOFF(CFS) =      9.26
  TOTAL AREA(ACRES) =      3.39   PEAK FLOW RATE(CFS) =      9.26
=============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        3.4  TC(MIN.) =     16.50
  EFFECTIVE AREA(ACRES) =      3.39  AREA-AVERAGED Fm(INCH/HR)=  0.26
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.850
  PEAK FLOW RATE(CFS)   =       9.26
=============================================================================
=============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

Appendix B: Proposed Conditions

CITY OF TUSTIN

PRELIMINARY PROPOSED HYDROLOGY EXHIBIT



LEGEND

575	PROPOSED CONTOUR
(575)	EXISTING CONTOUR
――	PROPERTY LINE
‒ ‒ ‒	DMA BOUNDARY
‒ > ‒ > ‒	FLOW PATH
DA XX	DRAINAGE AREA NAME
XX AC	AREA (IN ACRES)
NODE 10 50.00 FS	NODE ID AND ELEVATION
―― ‒ ――	RIGHT-OF-WAY
―SD―	PROPOSED STORM DRAIN
═══	EXISTING STORM DRAIN
▨	LANDSCAPE/PLANTER AREA
〰	OFFSITE FLOW DIRECTION
‒ > ‒ > ‒	OVERFLOW DIRECTION

DRAINAGE KEYNOTES

① PROPOSED CATCH BASIN
② PROPOSED INFILTRATION SYSTEM, BMP-1, PER DETAIL 1
③ PROPOSED MANHOLE
④ PROPOSED VALLEY GUTTER
⑤ PROPOSED CONNECTOR PIPE SCREEN INSERT

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

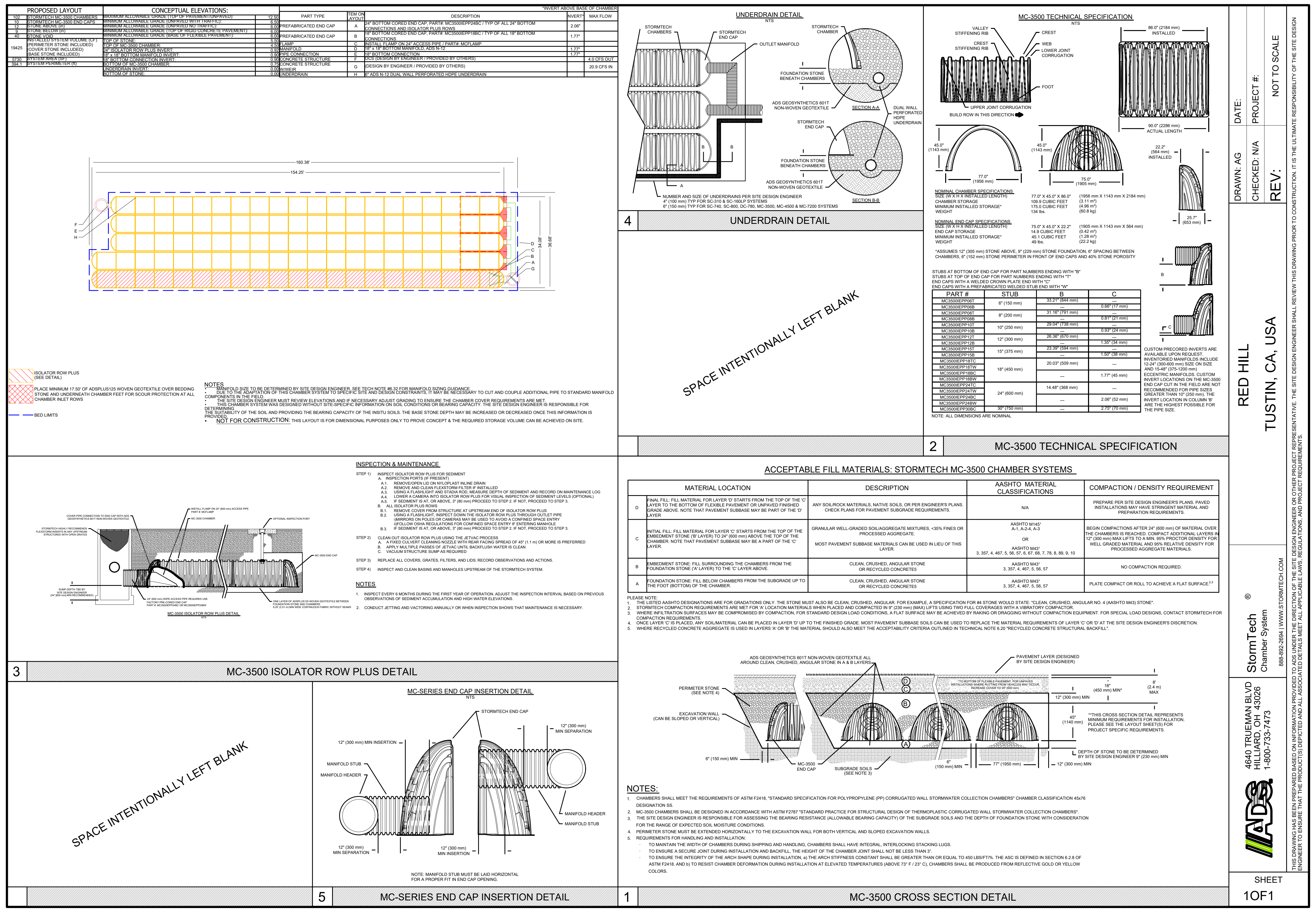
REVISIONS	DATE	BY	
			SCALE:
			DATE: 01/2024
			DESIGNED: KPM
			CHECKED: KPM
			PLN CK REF:
			F.B.

Kimley»Horn
3801 UNIVERSITY AVE. SUITE 300, RIVERSIDE, CA 92501
PHONE: (951) 543-9868 WWW.KIMLEY-HORN.COM

PRELIMINARY PROPOSED
HYDROLOGY EXHIBIT
RED HILL STREET AND SAN JUAN AVENUE

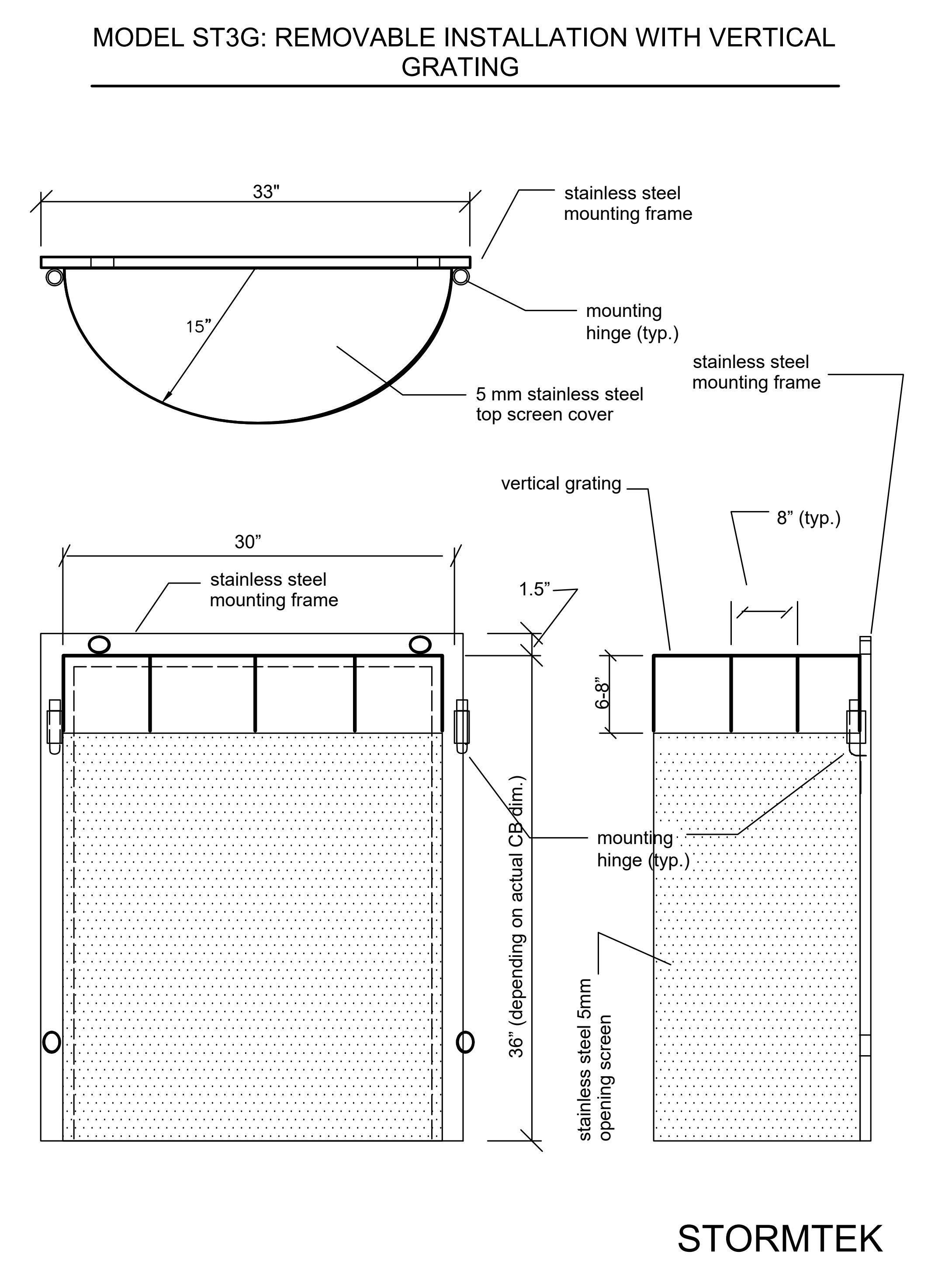
PROJ. # 195261019
SHEET 2
OF 2 SHEETS
DWG. NO.

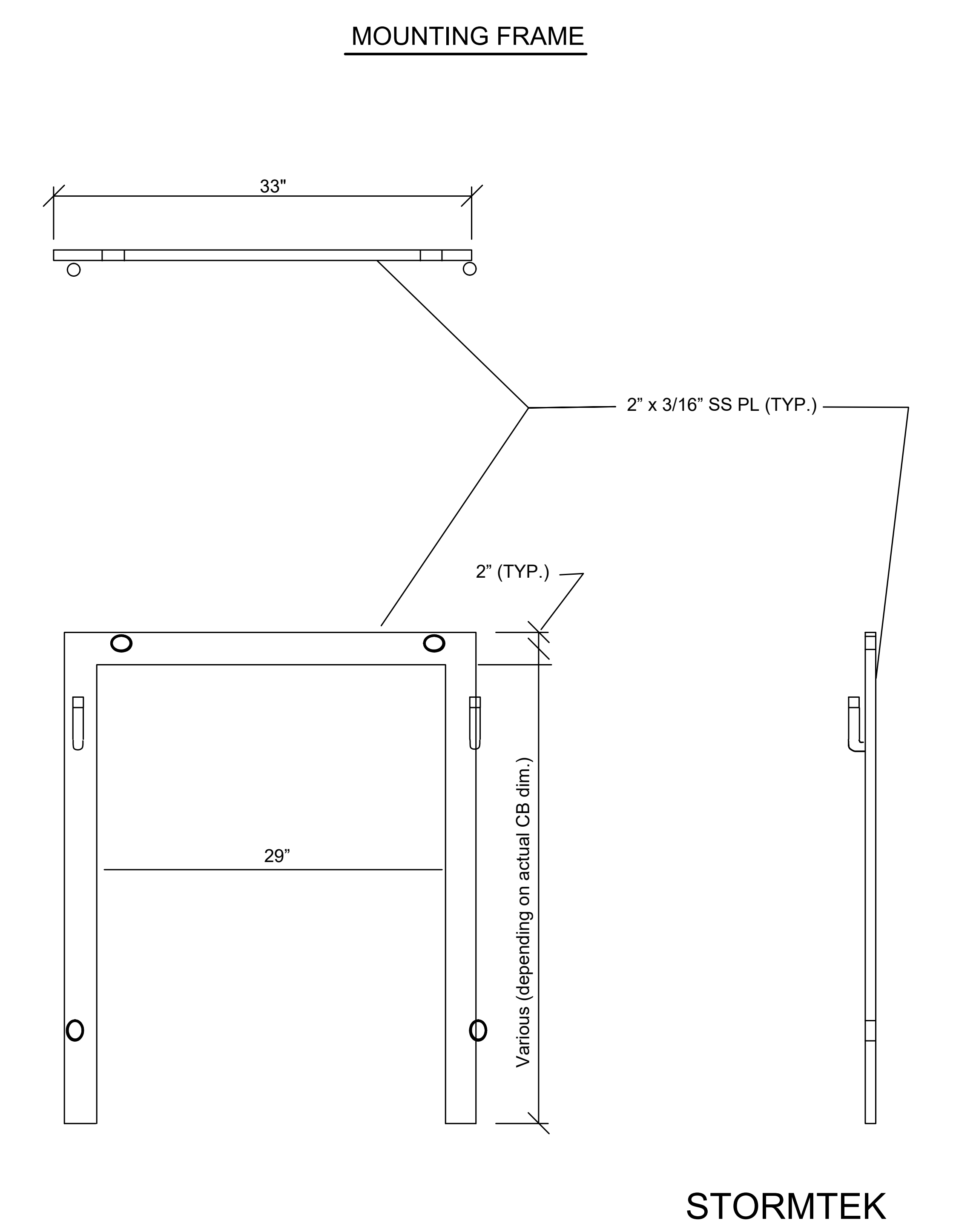
\\RVFP01\CA_RIV2\RIV_LDEV\195261019 – MLC RED HILL\CAD\EXHIBITS\HYDROLOGY\PROPOSED HYDROLOGY.DWG 11/4/2024 6:26:15 PM



1. BMP #1

NOT TO SCALE





2. BMP #2

NOT TO SCALE

DESCRIPTION OF DESIGN ELEMENTS

- The mounting frame can be made of coated or stainless steel. Frame members are made from 2" flat bars with a minimum thickness of 3/16 inch.
- The insert screen is made of heavy-gage sheet metal with 5 millimeter (mm) openings. Total openings constitute 50% of the screen surface. Top 4 inches of the screen is grated with bars spaced at 2 inches on center.
- Insert top cover is made of heavy-gage sheet metal screen with 5 mm openings and 1" support frames.
- Structural support members for the screen and top cover are made of coated or stainless steel. Members are made from 1" flat bars with a minimum thickness of 1/8 inch.
- Mounting frame members are welded
- Structural support frame members are welded
- Insert screens are welded onto structural support frames.
- Mounting frames are bolted onto the catch basin wall at the outlet opening. Mounting frames are to be anchored at all four corners with HILTI expansion anchors or equal.
- Inserts are installed vertically onto the mounting frame directly in front of the outlet opening.
- The insert is completely removable by lifting it off the mounting frame

STORMTEK

REVISIONS	DATE	BY

SCALE:
DATE: 01/2024
DESIGNED: KPM
CHECKED: KPM
PLN CK REF:
F.B.

Kimley»Horn
3801 UNIVERSITY AVE. SUITE 300, RIVERSIDE, CA 92501
PHONE: (951) 543-9868 WWW.KIMLEY-HORN.COM

PRELIMINARY WQMP
EXHIBIT DETAILS
RED HILL STREET AND SAN JUAN AVENUE

PROJ. # 195261019
SHEET 2
OF 2 SHEETS
DWG. NO.

K:\RIV_LDEV\195261019 – MLC RED HILL\CAD\EXHIBITS\HYDROLOGY\WQMP.DWG 9/25/2024 2:04:28 PM

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                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY ***************************
* Red Hill                                                                  *
* Proposed 2 yr                                                             *
* Kimley-Horn                                                               *
 ***************************************************************************

  FILE NAME: RHP2.DAT
  TIME/DATE OF STUDY: 14:53 09/17/2024
=============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  1.790
   2)   10.00;  1.280
   3)   15.00;  1.030
   4)   60.00;  0.499
   5)  180.00;  0.298
  *ANTECEDENT MOISTURE CONDITION (AMC) I ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   299.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.70  DOWNSTREAM(FEET) =    106.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.907
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.289
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.55      0.30     0.200    36    9.91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.61
  TOTAL AREA(ACRES) =      0.55   PEAK FLOW RATE(CFS) =      0.61

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   181.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.50  DOWNSTREAM(FEET) =    107.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.487
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.536
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.51      0.30     0.200    36    7.49
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.68
  TOTAL AREA(ACRES) =      0.51   PEAK FLOW RATE(CFS) =      0.68

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.00  DOWNSTREAM(FEET) =    106.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.981
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.690
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.28      0.30     0.200    36    5.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.41
  TOTAL AREA(ACRES) =      0.28   PEAK FLOW RATE(CFS) =      0.41

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.00  DOWNSTREAM(FEET) =    106.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.455
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.744
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.40      0.30     0.200    36    5.46
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.61
  TOTAL AREA(ACRES) =      0.40   PEAK FLOW RATE(CFS) =      0.61

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  ELEVATION DATA: UPSTREAM(FEET) =    109.00  DOWNSTREAM(FEET) =    107.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.285
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.455
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 B        1.04      0.30     0.200    36    8.29
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.31
  TOTAL AREA(ACRES) =      1.04   PEAK FLOW RATE(CFS) =      1.31

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.60  DOWNSTREAM(FEET) =    107.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.870
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.599
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.48      0.30     0.200    36    6.87
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.66
  TOTAL AREA(ACRES) =      0.48   PEAK FLOW RATE(CFS) =      0.66

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.40  DOWNSTREAM(FEET) =    106.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.026
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.583
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    B        0.07      0.30     1.000    41    7.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.08
  TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.08

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    58.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =    106.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *   2 YEAR RAINFALL INTENSITY(INCH/HR) =  1.790
  SUBAREA Tc AND LOSS RATE DATA(AMC  I ):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.06      0.30     0.200    36    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.09
  TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.09
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.1  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.06  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       0.09
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

↑
```

```
****************************************************************************
             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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                           Analysis prepared by:







 ************************** DESCRIPTION OF STUDY **************************
* Red Hill                                                                 *
* Proposed 25 yr                                                           *
* Kimley-Horn                                                              *
 **************************************************************************

  FILE NAME: RHP25.DAT
  TIME/DATE OF STUDY: 08:09 09/20/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  3.470
   2)   30.00;  1.390
   3)   60.00;  0.969
   4)  120.00;  0.704
   5)  360.00;  0.409
  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   299.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.70  DOWNSTREAM(FEET) =    106.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.907
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.062
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B       0.55      0.30     0.200    56    9.91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.49
  TOTAL AREA(ACRES) =      0.55   PEAK FLOW RATE(CFS) =      1.49

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   181.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.50  DOWNSTREAM(FEET) =    107.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.487
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.263
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B       0.51      0.30     0.200    56    7.49
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.47
  TOTAL AREA(ACRES) =      0.51   PEAK FLOW RATE(CFS) =      1.47

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.00  DOWNSTREAM(FEET) =    106.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.981
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.388
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.28      0.30     0.200    56    5.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.84
  TOTAL AREA(ACRES) =      0.28   PEAK FLOW RATE(CFS) =      0.84

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.00  DOWNSTREAM(FEET) =    106.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.455
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.432
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.40      0.30     0.200    56    5.46
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.21
  TOTAL AREA(ACRES) =      0.40   PEAK FLOW RATE(CFS) =      1.21

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  ELEVATION DATA: UPSTREAM(FEET) =    109.00  DOWNSTREAM(FEET) =    107.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.285
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.197
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                  B        1.04      0.30     0.200    56    8.29
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      2.94
  TOTAL AREA(ACRES) =      1.04   PEAK FLOW RATE(CFS) =      2.94

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.60  DOWNSTREAM(FEET) =    107.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.870
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.314
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                  B        0.48      0.30     0.200    56    6.87
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.41
  TOTAL AREA(ACRES) =      0.48   PEAK FLOW RATE(CFS) =      1.41

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.40  DOWNSTREAM(FEET) =    106.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.026
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.301
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                     B        0.07      0.30     1.000    61    7.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.19
  TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.19

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    58.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =    106.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.470
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.06      0.30     0.200    56    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.18
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.1  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.06  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       0.18
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                           Analysis prepared by:








 ************************** DESCRIPTION OF STUDY **************************
* Red Hill                                                                  *
* Proposed 100 yr                                                           *
* Kimley-Horn                                                               *
 **************************************************************************

  FILE NAME: RHP100.DAT
  TIME/DATE OF STUDY: 08:11 09/20/2024
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   8.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED TABLED RAINFALL USED*
  NUMBER OF [TIME,INTENSITY] DATA PAIRS =  5
   1)    5.00;  4.540
   2)   30.00;  1.820
   3)   60.00;  1.270
   4)  120.00;  0.924
   5)  360.00;  0.537
  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
```

```
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   299.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.70  DOWNSTREAM(FEET) =    106.70

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.907
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.006
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.55      0.30     0.200    76    9.91
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.95
  TOTAL AREA(ACRES) =      0.55   PEAK FLOW RATE(CFS) =      1.95

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   181.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.50  DOWNSTREAM(FEET) =    107.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.487
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.269
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.51      0.30     0.200    76    7.49
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.93
  TOTAL AREA(ACRES) =      0.51   PEAK FLOW RATE(CFS) =      1.93

****************************************************************************
  FLOW PROCESS FROM NODE     31.00 TO NODE     32.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.00  DOWNSTREAM(FEET) =    106.80

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.981
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.433
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B       0.28      0.30     0.200    76    5.98
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.10
  TOTAL AREA(ACRES) =      0.28   PEAK FLOW RATE(CFS) =      1.10

****************************************************************************
  FLOW PROCESS FROM NODE     41.00 TO NODE     42.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   137.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.00  DOWNSTREAM(FEET) =    106.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.455
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.490
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B       0.40      0.30     0.200    76    5.46
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.59
  TOTAL AREA(ACRES) =      0.40   PEAK FLOW RATE(CFS) =      1.59

****************************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  ELEVATION DATA: UPSTREAM(FEET) =    109.00  DOWNSTREAM(FEET) =    107.20

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.285
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.183
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  APARTMENTS                 B        1.04      0.30     0.200    76    8.29
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      3.86
  TOTAL AREA(ACRES) =      1.04   PEAK FLOW RATE(CFS) =      3.86

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     62.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    95.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.60  DOWNSTREAM(FEET) =    107.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.870
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.337
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.48      0.30     0.200    76    6.87
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      1.85
  TOTAL AREA(ACRES) =      0.48   PEAK FLOW RATE(CFS) =      1.85

****************************************************************************
  FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    33.00
  ELEVATION DATA: UPSTREAM(FEET) =    108.40  DOWNSTREAM(FEET) =    106.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.026
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.320
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL GOOD COVER
  "GRASS"                    B        0.07      0.30     1.000    80    7.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.25
  TOTAL AREA(ACRES) =      0.07   PEAK FLOW RATE(CFS) =      0.25

****************************************************************************
  FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    58.00
  ELEVATION DATA: UPSTREAM(FEET) =    107.00  DOWNSTREAM(FEET) =    106.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.540
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  APARTMENTS                 B        0.06      0.30     0.200    76    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.200
  SUBAREA RUNOFF(CFS) =      0.24
  TOTAL AREA(ACRES) =      0.06   PEAK FLOW RATE(CFS) =      0.24
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.1  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.06  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.30  AREA-AVERAGED Ap = 0.200
  PEAK FLOW RATE(CFS)   =       0.24
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

↑
```

```
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:






****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  Red Hill
  2yr Proposed UH Day 1
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.20 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00       56.(AMC II)     0.300       0.762

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.238
============================================================================

 Problem Descriptions:
  Red Hill
  2yr Proposed UH Day 1
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.08
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.238
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.15
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.36
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.50
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.90
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.26
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.20

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.52
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.09

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0007      0.10  Q         .         .         .         .
  0.31      0.0021      0.10  Q         .         .         .         .
  0.47      0.0035      0.10  Q         .         .         .         .
  0.64      0.0049      0.10  Q         .         .         .         .
  0.80      0.0063      0.10  Q         .         .         .         .
  0.97      0.0077      0.10  Q         .         .         .         .
  1.14      0.0091      0.10  Q         .         .         .         .
  1.30      0.0105      0.11  Q         .         .         .         .
  1.47      0.0120      0.11  Q         .         .         .         .
  1.63      0.0134      0.11  Q         .         .         .         .
  1.80      0.0149      0.11  Q         .         .         .         .
  1.96      0.0164      0.11  Q         .         .         .         .
  2.13      0.0179      0.11  Q         .         .         .         .
  2.29      0.0194      0.11  Q         .         .         .         .
  2.46      0.0209      0.11  Q         .         .         .         .
  2.62      0.0224      0.11  Q         .         .         .         .
  2.79      0.0239      0.11  Q         .         .         .         .
  2.95      0.0254      0.11  Q         .         .         .         .
  3.12      0.0270      0.11  Q         .         .         .         .
  3.28      0.0286      0.12  Q         .         .         .         .
  3.45      0.0301      0.12  Q         .         .         .         .
  3.61      0.0317      0.12  Q         .         .         .         .
  3.78      0.0333      0.12  Q         .         .         .         .
  3.94      0.0349      0.12  Q         .         .         .         .
  4.11      0.0365      0.12  Q         .         .         .         .
  4.27      0.0382      0.12  Q         .         .         .         .
  4.44      0.0398      0.12  Q         .         .         .         .
  4.60      0.0415      0.12  Q         .         .         .         .
  4.77      0.0432      0.12  Q         .         .         .         .
  4.93      0.0449      0.12  Q         .         .         .         .
  5.10      0.0466      0.13  Q         .         .         .         .
  5.26      0.0483      0.13  Q         .         .         .         .
```

```
 5.43      0.0501      0.13  Q         .         .         .         .
 5.59      0.0518      0.13  Q         .         .         .         .
 5.76      0.0536      0.13  Q         .         .         .         .
 5.92      0.0554      0.13  Q         .         .         .         .
 6.09      0.0572      0.13  Q         .         .         .         .
 6.26      0.0590      0.13  Q         .         .         .         .
 6.42      0.0609      0.14  Q         .         .         .         .
 6.59      0.0627      0.14  Q         .         .         .         .
 6.75      0.0646      0.14  Q         .         .         .         .
 6.92      0.0665      0.14  Q         .         .         .         .
 7.08      0.0684      0.14  Q         .         .         .         .
 7.25      0.0704      0.14  Q         .         .         .         .
 7.41      0.0723      0.14  Q         .         .         .         .
 7.58      0.0743      0.15  Q         .         .         .         .
 7.74      0.0763      0.15  Q         .         .         .         .
 7.91      0.0784      0.15  Q         .         .         .         .
 8.07      0.0804      0.15  Q         .         .         .         .
 8.24      0.0825      0.15  Q         .         .         .         .
 8.40      0.0846      0.16  Q         .         .         .         .
 8.57      0.0868      0.16  Q         .         .         .         .
 8.73      0.0889      0.16  Q         .         .         .         .
 8.90      0.0911      0.16  Q         .         .         .         .
 9.06      0.0934      0.16  Q         .         .         .         .
 9.23      0.0956      0.17  Q         .         .         .         .
 9.39      0.0979      0.17  Q         .         .         .         .
 9.56      0.1002      0.17  Q         .         .         .         .
 9.72      0.1026      0.17  Q         .         .         .         .
 9.89      0.1050      0.18  Q         .         .         .         .
10.05      0.1074      0.18  Q         .         .         .         .
10.22      0.1099      0.18  Q         .         .         .         .
10.38      0.1124      0.19  Q         .         .         .         .
10.55      0.1150      0.19  Q         .         .         .         .
10.71      0.1176      0.19  Q         .         .         .         .
10.88      0.1202      0.20  Q         .         .         .         .
11.05      0.1229      0.20  Q         .         .         .         .
11.21      0.1257      0.20  Q         .         .         .         .
11.38      0.1285      0.21  Q         .         .         .         .
11.54      0.1314      0.21  Q         .         .         .         .
11.71      0.1343      0.22  Q         .         .         .         .
11.87      0.1373      0.22  Q         .         .         .         .
12.04      0.1404      0.23  Q         .         .         .         .
12.20      0.1439      0.29  .Q        .         .         .         .
12.37      0.1478      0.29  .Q        .         .         .         .
12.53      0.1518      0.30  .Q        .         .         .         .
12.70      0.1559      0.30  .Q        .         .         .         .
12.86      0.1601      0.31  .Q        .         .         .         .
13.03      0.1645      0.32  .Q        .         .         .         .
13.19      0.1689      0.33  .Q        .         .         .         .
13.36      0.1735      0.34  .Q        .         .         .         .
13.52      0.1782      0.35  .Q        .         .         .         .
13.69      0.1830      0.36  .Q        .         .         .         .
```

```
13.85      0.1881      0.38  .Q        .         .         .         .
14.02      0.1933      0.39  .Q        .         .         .         .
14.18      0.1990      0.44  .Q        .         .         .         .
14.35      0.2051      0.46  .Q        .         .         .         .
14.51      0.2115      0.48  .Q        .         .         .         .
14.68      0.2182      0.50  .Q        .         .         .         .
14.84      0.2254      0.55  . Q       .         .         .         .
15.01      0.2330      0.58  . Q       .         .         .         .
15.17      0.2414      0.65  . Q       .         .         .         .
15.34      0.2507      0.70  . Q       .         .         .         .
15.50      0.2605      0.73  . Q       .         .         .         .
15.67      0.2712      0.83  .  Q      .         .         .         .
15.83      0.2853      1.24  .   Q     .         .         .         .
16.00      0.3052      1.67  .     Q   .         .         .         .
16.17      0.3465      4.37  .         .      Q  .         .         .
16.33      0.3829      0.98  .  Q      .         .         .         .
16.50      0.3948      0.76  .  Q      .         .         .         .
16.66      0.4041      0.61  . Q       .         .         .         .
16.83      0.4118      0.52  . Q       .         .         .         .
16.99      0.4186      0.47  .Q        .         .         .         .
17.16      0.4245      0.40  .Q        .         .         .         .
17.32      0.4298      0.37  .Q        .         .         .         .
17.49      0.4347      0.35  .Q        .         .         .         .
17.65      0.4392      0.33  .Q        .         .         .         .
17.82      0.4436      0.31  .Q        .         .         .         .
17.98      0.4477      0.29  .Q        .         .         .         .
18.15      0.4514      0.25  Q         .         .         .         .
18.31      0.4546      0.22  Q         .         .         .         .
18.48      0.4575      0.21  Q         .         .         .         .
18.64      0.4603      0.20  Q         .         .         .         .
18.81      0.4630      0.19  Q         .         .         .         .
18.97      0.4656      0.19  Q         .         .         .         .
19.14      0.4681      0.18  Q         .         .         .         .
19.30      0.4706      0.18  Q         .         .         .         .
19.47      0.4729      0.17  Q         .         .         .         .
19.63      0.4752      0.17  Q         .         .         .         .
19.80      0.4774      0.16  Q         .         .         .         .
19.96      0.4796      0.16  Q         .         .         .         .
20.13      0.4817      0.15  Q         .         .         .         .
20.29      0.4838      0.15  Q         .         .         .         .
20.46      0.4858      0.15  Q         .         .         .         .
20.62      0.4877      0.14  Q         .         .         .         .
20.79      0.4897      0.14  Q         .         .         .         .
20.95      0.4916      0.14  Q         .         .         .         .
21.12      0.4934      0.13  Q         .         .         .         .
21.29      0.4952      0.13  Q         .         .         .         .
21.45      0.4970      0.13  Q         .         .         .         .
21.62      0.4987      0.13  Q         .         .         .         .
21.78      0.5004      0.12  Q         .         .         .         .
21.95      0.5021      0.12  Q         .         .         .         .
22.11      0.5038      0.12  Q         .         .         .         .
```

```
  22.28      0.5054      0.12  Q         .         .         .         .
  22.44      0.5070      0.12  Q         .         .         .         .
  22.61      0.5086      0.11  Q         .         .         .         .
  22.77      0.5101      0.11  Q         .         .         .         .
  22.94      0.5116      0.11  Q         .         .         .         .
  23.10      0.5131      0.11  Q         .         .         .         .
  23.27      0.5146      0.11  Q         .         .         .         .
  23.43      0.5161      0.11  Q         .         .         .         .
  23.60      0.5175      0.11  Q         .         .         .         .
  23.76      0.5190      0.10  Q         .         .         .         .
  23.93      0.5204      0.10  Q         .         .         .         .
  24.09      0.5218      0.10  Q         .         .         .         .
  24.26      0.5224      0.00  Q         .         .         .         .
 ----------------------------------------------------------------------------
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
               0%                            1446.9
              10%                             178.4
              20%                              39.6
              30%                              19.8
              40%                               9.9
              50%                               9.9
              60%                               9.9
              70%                               9.9
              80%                               9.9
              90%                               9.9
```

```
____________________________________________________________________________
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:






****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  Red Hill
  2yr Proposed UH Day 2
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     0.54 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00       56.(AMC II)     0.300       0.558

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.442
============================================================================

 Problem Descriptions:
  Red Hill
  2yr Proposed UH Day 2
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.442
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.04
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.09
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.12
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.22
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  0.31
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  0.54

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.09
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.06

****************************************************************************
  TIME      VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0001      0.02  Q         .         .         .         .
  0.31      0.0003      0.02  Q         .         .         .         .
  0.47      0.0006      0.02  Q         .         .         .         .
  0.64      0.0008      0.02  Q         .         .         .         .
  0.80      0.0010      0.02  Q         .         .         .         .
  0.97      0.0013      0.02  Q         .         .         .         .
  1.14      0.0015      0.02  Q         .         .         .         .
  1.30      0.0018      0.02  Q         .         .         .         .
  1.47      0.0020      0.02  Q         .         .         .         .
  1.63      0.0022      0.02  Q         .         .         .         .
  1.80      0.0025      0.02  Q         .         .         .         .
  1.96      0.0027      0.02  Q         .         .         .         .
  2.13      0.0030      0.02  Q         .         .         .         .
  2.29      0.0032      0.02  Q         .         .         .         .
  2.46      0.0035      0.02  Q         .         .         .         .
  2.62      0.0037      0.02  Q         .         .         .         .
  2.79      0.0040      0.02  Q         .         .         .         .
  2.95      0.0042      0.02  Q         .         .         .         .
  3.12      0.0045      0.02  Q         .         .         .         .
  3.28      0.0048      0.02  Q         .         .         .         .
  3.45      0.0050      0.02  Q         .         .         .         .
  3.61      0.0053      0.02  Q         .         .         .         .
  3.78      0.0055      0.02  Q         .         .         .         .
  3.94      0.0058      0.02  Q         .         .         .         .
  4.11      0.0061      0.02  Q         .         .         .         .
  4.27      0.0064      0.02  Q         .         .         .         .
  4.44      0.0066      0.02  Q         .         .         .         .
  4.60      0.0069      0.02  Q         .         .         .         .
  4.77      0.0072      0.02  Q         .         .         .         .
  4.93      0.0075      0.02  Q         .         .         .         .
  5.10      0.0078      0.02  Q         .         .         .         .
  5.26      0.0080      0.02  Q         .         .         .         .
```

```
 5.43      0.0083      0.02  Q         .         .         .         .
 5.59      0.0086      0.02  Q         .         .         .         .
 5.76      0.0089      0.02  Q         .         .         .         .
 5.92      0.0092      0.02  Q         .         .         .         .
 6.09      0.0095      0.02  Q         .         .         .         .
 6.26      0.0098      0.02  Q         .         .         .         .
 6.42      0.0101      0.02  Q         .         .         .         .
 6.59      0.0104      0.02  Q         .         .         .         .
 6.75      0.0108      0.02  Q         .         .         .         .
 6.92      0.0111      0.02  Q         .         .         .         .
 7.08      0.0114      0.02  Q         .         .         .         .
 7.25      0.0117      0.02  Q         .         .         .         .
 7.41      0.0120      0.02  Q         .         .         .         .
 7.58      0.0124      0.02  Q         .         .         .         .
 7.74      0.0127      0.02  Q         .         .         .         .
 7.91      0.0130      0.03  Q         .         .         .         .
 8.07      0.0134      0.03  Q         .         .         .         .
 8.24      0.0137      0.03  Q         .         .         .         .
 8.40      0.0141      0.03  Q         .         .         .         .
 8.57      0.0144      0.03  Q         .         .         .         .
 8.73      0.0148      0.03  Q         .         .         .         .
 8.90      0.0152      0.03  Q         .         .         .         .
 9.06      0.0155      0.03  Q         .         .         .         .
 9.23      0.0159      0.03  Q         .         .         .         .
 9.39      0.0163      0.03  Q         .         .         .         .
 9.56      0.0167      0.03  Q         .         .         .         .
 9.72      0.0171      0.03  Q         .         .         .         .
 9.89      0.0175      0.03  Q         .         .         .         .
10.05      0.0179      0.03  Q         .         .         .         .
10.22      0.0183      0.03  Q         .         .         .         .
10.38      0.0187      0.03  Q         .         .         .         .
10.55      0.0191      0.03  Q         .         .         .         .
10.71      0.0196      0.03  Q         .         .         .         .
10.88      0.0200      0.03  Q         .         .         .         .
11.05      0.0205      0.03  Q         .         .         .         .
11.21      0.0209      0.03  Q         .         .         .         .
11.38      0.0214      0.03  Q         .         .         .         .
11.54      0.0219      0.04  Q         .         .         .         .
11.71      0.0224      0.04  Q         .         .         .         .
11.87      0.0229      0.04  Q         .         .         .         .
12.04      0.0234      0.04  Q         .         .         .         .
12.20      0.0239      0.05  Q         .         .         .         .
12.37      0.0246      0.05  Q         .         .         .         .
12.53      0.0253      0.05  Q         .         .         .         .
12.70      0.0259      0.05  Q         .         .         .         .
12.86      0.0266      0.05  Q         .         .         .         .
13.03      0.0274      0.05  Q         .         .         .         .
13.19      0.0281      0.05  Q         .         .         .         .
13.36      0.0288      0.06  Q         .         .         .         .
13.52      0.0296      0.06  Q         .         .         .         .
13.69      0.0304      0.06  Q         .         .         .         .
```

```
13.85      0.0313      0.06  Q         .         .         .         .
14.02      0.0321      0.06  Q         .         .         .         .
14.18      0.0331      0.07  Q         .         .         .         .
14.35      0.0341      0.08  Q         .         .         .         .
14.51      0.0352      0.08  Q         .         .         .         .
14.68      0.0363      0.08  Q         .         .         .         .
14.84      0.0375      0.09  Q         .         .         .         .
15.01      0.0387      0.09  Q         .         .         .         .
15.17      0.0401      0.10  Q         .         .         .         .
15.34      0.0416      0.11  Q         .         .         .         .
15.50      0.0431      0.11  Q         .         .         .         .
15.67      0.0447      0.12  Q         .         .         .         .
15.83      0.0467      0.17  Q         .         .         .         .
16.00      0.0497      0.26  .Q        .         .         .         .
16.17      0.0576      0.89  .  Q      .         .         .         .
16.33      0.0646      0.14  Q         .         .         .         .
16.50      0.0664      0.12  Q         .         .         .         .
16.66      0.0678      0.10  Q         .         .         .         .
16.83      0.0691      0.09  Q         .         .         .         .
16.99      0.0702      0.08  Q         .         .         .         .
17.16      0.0712      0.07  Q         .         .         .         .
17.32      0.0721      0.06  Q         .         .         .         .
17.49      0.0729      0.06  Q         .         .         .         .
17.65      0.0736      0.05  Q         .         .         .         .
17.82      0.0744      0.05  Q         .         .         .         .
17.98      0.0750      0.05  Q         .         .         .         .
18.15      0.0757      0.04  Q         .         .         .         .
18.31      0.0762      0.04  Q         .         .         .         .
18.48      0.0767      0.03  Q         .         .         .         .
18.64      0.0771      0.03  Q         .         .         .         .
18.81      0.0776      0.03  Q         .         .         .         .
18.97      0.0780      0.03  Q         .         .         .         .
19.14      0.0784      0.03  Q         .         .         .         .
19.30      0.0789      0.03  Q         .         .         .         .
19.47      0.0792      0.03  Q         .         .         .         .
19.63      0.0796      0.03  Q         .         .         .         .
19.80      0.0800      0.03  Q         .         .         .         .
19.96      0.0804      0.03  Q         .         .         .         .
20.13      0.0807      0.03  Q         .         .         .         .
20.29      0.0810      0.02  Q         .         .         .         .
20.46      0.0814      0.02  Q         .         .         .         .
20.62      0.0817      0.02  Q         .         .         .         .
20.79      0.0820      0.02  Q         .         .         .         .
20.95      0.0823      0.02  Q         .         .         .         .
21.12      0.0827      0.02  Q         .         .         .         .
21.29      0.0830      0.02  Q         .         .         .         .
21.45      0.0832      0.02  Q         .         .         .         .
21.62      0.0835      0.02  Q         .         .         .         .
21.78      0.0838      0.02  Q         .         .         .         .
21.95      0.0841      0.02  Q         .         .         .         .
22.11      0.0844      0.02  Q         .         .         .         .
```

```
 22.28      0.0846      0.02  Q         .         .         .         .
 22.44      0.0849      0.02  Q         .         .         .         .
 22.61      0.0852      0.02  Q         .         .         .         .
 22.77      0.0854      0.02  Q         .         .         .         .
 22.94      0.0857      0.02  Q         .         .         .         .
 23.10      0.0859      0.02  Q         .         .         .         .
 23.27      0.0862      0.02  Q         .         .         .         .
 23.43      0.0864      0.02  Q         .         .         .         .
 23.60      0.0867      0.02  Q         .         .         .         .
 23.76      0.0869      0.02  Q         .         .         .         .
 23.93      0.0871      0.02  Q         .         .         .         .
 24.09      0.0874      0.02  Q         .         .         .         .
 24.26      0.0875      0.00  Q         .         .         .         .
----------------------------------------------------------------------------
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                Duration
        Peak Flow Rate                     (minutes)
    =======================                =========
               0%                            1446.9
              10%                             118.9
              20%                              19.8
              30%                               9.9
              40%                               9.9
              50%                               9.9
              60%                               9.9
              70%                               9.9
              80%                               9.9
              90%                               9.9
```

```
____________________________________________________________________________
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                           Analysis prepared by:







****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  Red Hill
  2yr Proposed UH Day 3
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     0.38 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00       56.(AMC II)     0.300       0.474

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.526
============================================================================

 Problem Descriptions:
  Red Hill
  2yr Proposed UH Day 3
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.526
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =   2
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.03
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.06
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.09
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.16
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  0.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  0.38

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.05
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.05

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0001      0.01  Q         .         .         .         .
  0.31      0.0002      0.01  Q         .         .         .         .
  0.47      0.0003      0.01  Q         .         .         .         .
  0.64      0.0005      0.01  Q         .         .         .         .
  0.80      0.0006      0.01  Q         .         .         .         .
  0.97      0.0008      0.01  Q         .         .         .         .
  1.14      0.0009      0.01  Q         .         .         .         .
  1.30      0.0010      0.01  Q         .         .         .         .
  1.47      0.0012      0.01  Q         .         .         .         .
  1.63      0.0013      0.01  Q         .         .         .         .
  1.80      0.0015      0.01  Q         .         .         .         .
  1.96      0.0016      0.01  Q         .         .         .         .
  2.13      0.0018      0.01  Q         .         .         .         .
  2.29      0.0019      0.01  Q         .         .         .         .
  2.46      0.0021      0.01  Q         .         .         .         .
  2.62      0.0022      0.01  Q         .         .         .         .
  2.79      0.0024      0.01  Q         .         .         .         .
  2.95      0.0025      0.01  Q         .         .         .         .
  3.12      0.0027      0.01  Q         .         .         .         .
  3.28      0.0028      0.01  Q         .         .         .         .
  3.45      0.0030      0.01  Q         .         .         .         .
  3.61      0.0031      0.01  Q         .         .         .         .
  3.78      0.0033      0.01  Q         .         .         .         .
  3.94      0.0035      0.01  Q         .         .         .         .
  4.11      0.0036      0.01  Q         .         .         .         .
  4.27      0.0038      0.01  Q         .         .         .         .
  4.44      0.0039      0.01  Q         .         .         .         .
  4.60      0.0041      0.01  Q         .         .         .         .
  4.77      0.0043      0.01  Q         .         .         .         .
  4.93      0.0044      0.01  Q         .         .         .         .
  5.10      0.0046      0.01  Q         .         .         .         .
  5.26      0.0048      0.01  Q         .         .         .         .
```

```
 5.43      0.0050      0.01  Q         .         .         .         .
 5.59      0.0051      0.01  Q         .         .         .         .
 5.76      0.0053      0.01  Q         .         .         .         .
 5.92      0.0055      0.01  Q         .         .         .         .
 6.09      0.0057      0.01  Q         .         .         .         .
 6.26      0.0058      0.01  Q         .         .         .         .
 6.42      0.0060      0.01  Q         .         .         .         .
 6.59      0.0062      0.01  Q         .         .         .         .
 6.75      0.0064      0.01  Q         .         .         .         .
 6.92      0.0066      0.01  Q         .         .         .         .
 7.08      0.0068      0.01  Q         .         .         .         .
 7.25      0.0070      0.01  Q         .         .         .         .
 7.41      0.0072      0.01  Q         .         .         .         .
 7.58      0.0074      0.01  Q         .         .         .         .
 7.74      0.0076      0.01  Q         .         .         .         .
 7.91      0.0078      0.01  Q         .         .         .         .
 8.07      0.0080      0.02  Q         .         .         .         .
 8.24      0.0082      0.02  Q         .         .         .         .
 8.40      0.0084      0.02  Q         .         .         .         .
 8.57      0.0086      0.02  Q         .         .         .         .
 8.73      0.0088      0.02  Q         .         .         .         .
 8.90      0.0090      0.02  Q         .         .         .         .
 9.06      0.0093      0.02  Q         .         .         .         .
 9.23      0.0095      0.02  Q         .         .         .         .
 9.39      0.0097      0.02  Q         .         .         .         .
 9.56      0.0099      0.02  Q         .         .         .         .
 9.72      0.0102      0.02  Q         .         .         .         .
 9.89      0.0104      0.02  Q         .         .         .         .
10.05      0.0107      0.02  Q         .         .         .         .
10.22      0.0109      0.02  Q         .         .         .         .
10.38      0.0111      0.02  Q         .         .         .         .
10.55      0.0114      0.02  Q         .         .         .         .
10.71      0.0117      0.02  Q         .         .         .         .
10.88      0.0119      0.02  Q         .         .         .         .
11.05      0.0122      0.02  Q         .         .         .         .
11.21      0.0125      0.02  Q         .         .         .         .
11.38      0.0127      0.02  Q         .         .         .         .
11.54      0.0130      0.02  Q         .         .         .         .
11.71      0.0133      0.02  Q         .         .         .         .
11.87      0.0136      0.02  Q         .         .         .         .
12.04      0.0139      0.02  Q         .         .         .         .
12.20      0.0143      0.03  Q         .         .         .         .
12.37      0.0147      0.03  Q         .         .         .         .
12.53      0.0151      0.03  Q         .         .         .         .
12.70      0.0155      0.03  Q         .         .         .         .
12.86      0.0159      0.03  Q         .         .         .         .
13.03      0.0163      0.03  Q         .         .         .         .
13.19      0.0168      0.03  Q         .         .         .         .
13.36      0.0172      0.03  Q         .         .         .         .
13.52      0.0177      0.04  Q         .         .         .         .
13.69      0.0182      0.04  Q         .         .         .         .
```

```
13.85      0.0187      0.04  Q         .         .         .         .
14.02      0.0192      0.04  Q         .         .         .         .
14.18      0.0198      0.04  Q         .         .         .         .
14.35      0.0204      0.05  Q         .         .         .         .
14.51      0.0210      0.05  Q         .         .         .         .
14.68      0.0217      0.05  Q         .         .         .         .
14.84      0.0224      0.05  Q         .         .         .         .
15.01      0.0231      0.06  Q         .         .         .         .
15.17      0.0240      0.06  Q         .         .         .         .
15.34      0.0248      0.07  Q         .         .         .         .
15.50      0.0257      0.07  Q         .         .         .         .
15.67      0.0267      0.07  Q         .         .         .         .
15.83      0.0279      0.11  Q         .         .         .         .
16.00      0.0296      0.14  Q         .         .         .         .
16.17      0.0345      0.58  . Q       .         .         .         .
16.33      0.0391      0.09  Q         .         .         .         .
16.50      0.0401      0.07  Q         .         .         .         .
16.66      0.0410      0.06  Q         .         .         .         .
16.83      0.0418      0.05  Q         .         .         .         .
16.99      0.0424      0.05  Q         .         .         .         .
17.16      0.0430      0.04  Q         .         .         .         .
17.32      0.0436      0.04  Q         .         .         .         .
17.49      0.0440      0.03  Q         .         .         .         .
17.65      0.0445      0.03  Q         .         .         .         .
17.82      0.0449      0.03  Q         .         .         .         .
17.98      0.0453      0.03  Q         .         .         .         .
18.15      0.0457      0.02  Q         .         .         .         .
18.31      0.0460      0.02  Q         .         .         .         .
18.48      0.0463      0.02  Q         .         .         .         .
18.64      0.0466      0.02  Q         .         .         .         .
18.81      0.0469      0.02  Q         .         .         .         .
18.97      0.0471      0.02  Q         .         .         .         .
19.14      0.0474      0.02  Q         .         .         .         .
19.30      0.0476      0.02  Q         .         .         .         .
19.47      0.0478      0.02  Q         .         .         .         .
19.63      0.0481      0.02  Q         .         .         .         .
19.80      0.0483      0.02  Q         .         .         .         .
19.96      0.0485      0.02  Q         .         .         .         .
20.13      0.0487      0.02  Q         .         .         .         .
20.29      0.0489      0.01  Q         .         .         .         .
20.46      0.0491      0.01  Q         .         .         .         .
20.62      0.0493      0.01  Q         .         .         .         .
20.79      0.0495      0.01  Q         .         .         .         .
20.95      0.0497      0.01  Q         .         .         .         .
21.12      0.0499      0.01  Q         .         .         .         .
21.29      0.0501      0.01  Q         .         .         .         .
21.45      0.0502      0.01  Q         .         .         .         .
21.62      0.0504      0.01  Q         .         .         .         .
21.78      0.0506      0.01  Q         .         .         .         .
21.95      0.0507      0.01  Q         .         .         .         .
22.11      0.0509      0.01  Q         .         .         .         .
```

```
  22.28       0.0511      0.01  Q         .         .         .         .
  22.44       0.0512      0.01  Q         .         .         .         .
  22.61       0.0514      0.01  Q         .         .         .         .
  22.77       0.0515      0.01  Q         .         .         .         .
  22.94       0.0517      0.01  Q         .         .         .         .
  23.10       0.0518      0.01  Q         .         .         .         .
  23.27       0.0520      0.01  Q         .         .         .         .
  23.43       0.0521      0.01  Q         .         .         .         .
  23.60       0.0523      0.01  Q         .         .         .         .
  23.76       0.0524      0.01  Q         .         .         .         .
  23.93       0.0525      0.01  Q         .         .         .         .
  24.09       0.0527      0.01  Q         .         .         .         .
  24.26       0.0528      0.00  Q         .         .         .         .
 -----------------------------------------------------------------------------
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                  Duration
        Peak Flow Rate                       (minutes)
    =======================                  =========
              0%                              1446.9
             10%                                99.1
             20%                                19.8
             30%                                 9.9
             40%                                 9.9
             50%                                 9.9
             60%                                 9.9
             70%                                 9.9
             80%                                 9.9
             90%                                 9.9
```

```
____________________________________________________________________________
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:






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----------------------------------------------------------------------------

 Problem Descriptions:
  Red Hill
  25yr Proposed UH Day 1
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.32 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00            56.       0.300       0.828

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.172
============================================================================

 Problem Descriptions:
  Red Hill
  25yr Proposed UH Day 1
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.20
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.172
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.29
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.70
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.97
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  1.75
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  2.45
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  4.32

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.23
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =    -0.03

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0017      0.24  Q         .         .         .         .
  0.31      0.0050      0.24  Q         .         .         .         .
  0.47      0.0083      0.24  Q         .         .         .         .
  0.64      0.0117      0.25  Q         .         .         .         .
  0.80      0.0150      0.25  Q         .         .         .         .
  0.97      0.0184      0.25  Q         .         .         .         .
  1.14      0.0218      0.25  .Q        .         .         .         .
  1.30      0.0253      0.25  .Q        .         .         .         .
  1.47      0.0288      0.25  .Q        .         .         .         .
  1.63      0.0322      0.26  .Q        .         .         .         .
  1.80      0.0358      0.26  .Q        .         .         .         .
  1.96      0.0393      0.26  .Q        .         .         .         .
  2.13      0.0428      0.26  .Q        .         .         .         .
  2.29      0.0464      0.26  .Q        .         .         .         .
  2.46      0.0500      0.27  .Q        .         .         .         .
  2.62      0.0537      0.27  .Q        .         .         .         .
  2.79      0.0573      0.27  .Q        .         .         .         .
  2.95      0.0610      0.27  .Q        .         .         .         .
  3.12      0.0647      0.27  .Q        .         .         .         .
  3.28      0.0685      0.28  .Q        .         .         .         .
  3.45      0.0723      0.28  .Q        .         .         .         .
  3.61      0.0761      0.28  .Q        .         .         .         .
  3.78      0.0799      0.28  .Q        .         .         .         .
  3.94      0.0838      0.28  .Q        .         .         .         .
  4.11      0.0876      0.29  .Q        .         .         .         .
  4.27      0.0916      0.29  .Q        .         .         .         .
  4.44      0.0955      0.29  .Q        .         .         .         .
  4.60      0.0995      0.29  .Q        .         .         .         .
  4.77      0.1035      0.30  .Q        .         .         .         .
  4.93      0.1076      0.30  .Q        .         .         .         .
  5.10      0.1117      0.30  .Q        .         .         .         .
  5.26      0.1158      0.30  .Q        .         .         .         .
```

```
 5.43      0.1200      0.31  .Q         .         .         .         .
 5.59      0.1242      0.31  .Q         .         .         .         .
 5.76      0.1284      0.31  .Q         .         .         .         .
 5.92      0.1327      0.32  .Q         .         .         .         .
 6.09      0.1371      0.32  .Q         .         .         .         .
 6.26      0.1414      0.32  .Q         .         .         .         .
 6.42      0.1458      0.32  .Q         .         .         .         .
 6.59      0.1503      0.33  .Q         .         .         .         .
 6.75      0.1548      0.33  .Q         .         .         .         .
 6.92      0.1593      0.34  .Q         .         .         .         .
 7.08      0.1639      0.34  .Q         .         .         .         .
 7.25      0.1686      0.34  .Q         .         .         .         .
 7.41      0.1733      0.35  .Q         .         .         .         .
 7.58      0.1780      0.35  .Q         .         .         .         .
 7.74      0.1828      0.35  .Q         .         .         .         .
 7.91      0.1877      0.36  .Q         .         .         .         .
 8.07      0.1926      0.36  .Q         .         .         .         .
 8.24      0.1976      0.37  .Q         .         .         .         .
 8.40      0.2026      0.37  .Q         .         .         .         .
 8.57      0.2078      0.38  .Q         .         .         .         .
 8.73      0.2129      0.38  .Q         .         .         .         .
 8.90      0.2182      0.39  .Q         .         .         .         .
 9.06      0.2235      0.39  .Q         .         .         .         .
 9.23      0.2289      0.40  .Q         .         .         .         .
 9.39      0.2343      0.40  .Q         .         .         .         .
 9.56      0.2399      0.41  .Q         .         .         .         .
 9.72      0.2455      0.41  .Q         .         .         .         .
 9.89      0.2512      0.42  .Q         .         .         .         .
10.05      0.2570      0.43  .Q         .         .         .         .
10.22      0.2629      0.44  .Q         .         .         .         .
10.38      0.2689      0.44  .Q         .         .         .         .
10.55      0.2750      0.45  .Q         .         .         .         .
10.71      0.2812      0.46  .Q         .         .         .         .
10.88      0.2875      0.47  .Q         .         .         .         .
11.05      0.2939      0.47  .Q         .         .         .         .
11.21      0.3005      0.49  .Q         .         .         .         .
11.38      0.3072      0.49  .Q         .         .         .         .
11.54      0.3140      0.51  . Q        .         .         .         .
11.71      0.3210      0.51  . Q        .         .         .         .
11.87      0.3281      0.53  . Q        .         .         .         .
12.04      0.3354      0.54  . Q        .         .         .         .
12.20      0.3436      0.66  . Q        .         .         .         .
12.37      0.3527      0.67  . Q        .         .         .         .
12.53      0.3619      0.69  . Q        .         .         .         .
12.70      0.3714      0.70  . Q        .         .         .         .
12.86      0.3811      0.72  . Q        .         .         .         .
13.03      0.3911      0.74  . Q        .         .         .         .
13.19      0.4014      0.77  .  Q       .         .         .         .
13.36      0.4120      0.78  .  Q       .         .         .         .
13.52      0.4228      0.81  .  Q       .         .         .         .
13.69      0.4341      0.83  .  Q       .         .         .         .
```

```
13.85      0.4458      0.88  .  Q      .         .         .         .
14.02      0.4579      0.90  .  Q      .         .         .         .
14.18      0.4715      1.09  .   Q     .         .         .         .
14.35      0.4866      1.12  .   Q     .         .         .         .
14.51      0.5025      1.20  .   Q     .         .         .         .
14.68      0.5192      1.25  .   Q     .         .         .         .
14.84      0.5371      1.36  .    Q    .         .         .         .
15.01      0.5561      1.43  .    Q    .         .         .         .
15.17      0.5767      1.59  .     Q   .         .         .         .
15.34      0.5991      1.70  .     Q   .         .         .         .
15.50      0.6226      1.75  .     Q   .         .         .         .
15.67      0.6479      1.96  .      Q  .         .         .         .
15.83      0.6806      2.83  .         .Q        .         .         .
16.00      0.7256      3.76  .         .    Q    .         .         .
16.17      0.8164      9.54  .         .         .         .       Q .
16.33      0.8969      2.27  .        Q.         .         .         .
16.50      0.9248      1.81  .      Q  .         .         .         .
16.66      0.9474      1.50  .     Q   .         .         .         .
16.83      0.9665      1.30  .    Q    .         .         .         .
16.99      0.9833      1.16  .   Q     .         .         .         .
17.16      0.9978      0.95  .  Q      .         .         .         .
17.32      1.0101      0.85  .  Q      .         .         .         .
17.49      1.0214      0.80  .  Q      .         .         .         .
17.65      1.0319      0.75  .  Q      .         .         .         .
17.82      1.0419      0.71  . Q       .         .         .         .
17.98      1.0514      0.68  . Q       .         .         .         .
18.15      1.0600      0.58  . Q       .         .         .         .
18.31      1.0675      0.52  . Q       .         .         .         .
18.48      1.0745      0.50  . Q       .         .         .         .
18.64      1.0812      0.48  .Q        .         .         .         .
18.81      1.0877      0.46  .Q        .         .         .         .
18.97      1.0939      0.45  .Q        .         .         .         .
19.14      1.0999      0.43  .Q        .         .         .         .
19.30      1.1057      0.42  .Q        .         .         .         .
19.47      1.1113      0.41  .Q        .         .         .         .
19.63      1.1167      0.39  .Q        .         .         .         .
19.80      1.1221      0.38  .Q        .         .         .         .
19.96      1.1272      0.37  .Q        .         .         .         .
20.13      1.1323      0.36  .Q        .         .         .         .
20.29      1.1372      0.36  .Q        .         .         .         .
20.46      1.1420      0.35  .Q        .         .         .         .
20.62      1.1467      0.34  .Q        .         .         .         .
20.79      1.1513      0.33  .Q        .         .         .         .
20.95      1.1558      0.33  .Q        .         .         .         .
21.12      1.1602      0.32  .Q        .         .         .         .
21.29      1.1645      0.31  .Q        .         .         .         .
21.45      1.1688      0.31  .Q        .         .         .         .
21.62      1.1730      0.30  .Q        .         .         .         .
21.78      1.1770      0.30  .Q        .         .         .         .
21.95      1.1811      0.29  .Q        .         .         .         .
22.11      1.1850      0.29  .Q        .         .         .         .
```

```
  22.28      1.1889      0.28  .Q        .         .         .         .
  22.44      1.1928      0.28  .Q        .         .         .         .
  22.61      1.1965      0.27  .Q        .         .         .         .
  22.77      1.2002      0.27  .Q        .         .         .         .
  22.94      1.2039      0.27  .Q        .         .         .         .
  23.10      1.2075      0.26  .Q        .         .         .         .
  23.27      1.2111      0.26  .Q        .         .         .         .
  23.43      1.2146      0.26  .Q        .         .         .         .
  23.60      1.2180      0.25  .Q        .         .         .         .
  23.76      1.2215      0.25  Q         .         .         .         .
  23.93      1.2248      0.25  Q         .         .         .         .
  24.09      1.2282      0.24  Q         .         .         .         .
  24.26      1.2298      0.00  Q         .         .         .         .
 ----------------------------------------------------------------------------
-------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
              0%                             1446.9
             10%                              188.3
             20%                               49.5
             30%                               19.8
             40%                                9.9
             50%                                9.9
             60%                                9.9
             70%                                9.9
             80%                                9.9
             90%                                9.9
```

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           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:






****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  Red Hill
  25yr Proposed UH Day 2
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     1.14 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00            56.       0.300       0.691

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.309
============================================================================

 Problem Descriptions:
  Red Hill
  25yr Proposed UH Day 2
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.309
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.08
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.18
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.26
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.46
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  0.65
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  1.14

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.23
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.09

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0003      0.04  Q         .         .         .         .
  0.31      0.0009      0.04  Q         .         .         .         .
  0.47      0.0015      0.05  Q         .         .         .         .
  0.64      0.0021      0.05  Q         .         .         .         .
  0.80      0.0028      0.05  Q         .         .         .         .
  0.97      0.0034      0.05  Q         .         .         .         .
  1.14      0.0040      0.05  Q         .         .         .         .
  1.30      0.0047      0.05  Q         .         .         .         .
  1.47      0.0053      0.05  Q         .         .         .         .
  1.63      0.0059      0.05  Q         .         .         .         .
  1.80      0.0066      0.05  Q         .         .         .         .
  1.96      0.0072      0.05  Q         .         .         .         .
  2.13      0.0079      0.05  Q         .         .         .         .
  2.29      0.0085      0.05  Q         .         .         .         .
  2.46      0.0092      0.05  Q         .         .         .         .
  2.62      0.0099      0.05  Q         .         .         .         .
  2.79      0.0106      0.05  Q         .         .         .         .
  2.95      0.0112      0.05  Q         .         .         .         .
  3.12      0.0119      0.05  Q         .         .         .         .
  3.28      0.0126      0.05  Q         .         .         .         .
  3.45      0.0133      0.05  Q         .         .         .         .
  3.61      0.0140      0.05  Q         .         .         .         .
  3.78      0.0147      0.05  Q         .         .         .         .
  3.94      0.0154      0.05  Q         .         .         .         .
  4.11      0.0161      0.05  Q         .         .         .         .
  4.27      0.0169      0.05  Q         .         .         .         .
  4.44      0.0176      0.05  Q         .         .         .         .
  4.60      0.0183      0.05  Q         .         .         .         .
  4.77      0.0191      0.05  Q         .         .         .         .
  4.93      0.0198      0.06  Q         .         .         .         .
  5.10      0.0206      0.06  Q         .         .         .         .
  5.26      0.0213      0.06  Q         .         .         .         .
```

```
 5.43      0.0221      0.06  Q          .         .         .         .
 5.59      0.0229      0.06  Q          .         .         .         .
 5.76      0.0236      0.06  Q          .         .         .         .
 5.92      0.0244      0.06  Q          .         .         .         .
 6.09      0.0252      0.06  Q          .         .         .         .
 6.26      0.0260      0.06  Q          .         .         .         .
 6.42      0.0268      0.06  Q          .         .         .         .
 6.59      0.0277      0.06  Q          .         .         .         .
 6.75      0.0285      0.06  Q          .         .         .         .
 6.92      0.0293      0.06  Q          .         .         .         .
 7.08      0.0302      0.06  Q          .         .         .         .
 7.25      0.0310      0.06  Q          .         .         .         .
 7.41      0.0319      0.06  Q          .         .         .         .
 7.58      0.0328      0.06  Q          .         .         .         .
 7.74      0.0337      0.07  Q          .         .         .         .
 7.91      0.0346      0.07  Q          .         .         .         .
 8.07      0.0355      0.07  Q          .         .         .         .
 8.24      0.0364      0.07  Q          .         .         .         .
 8.40      0.0373      0.07  Q          .         .         .         .
 8.57      0.0382      0.07  Q          .         .         .         .
 8.73      0.0392      0.07  Q          .         .         .         .
 8.90      0.0402      0.07  Q          .         .         .         .
 9.06      0.0411      0.07  Q          .         .         .         .
 9.23      0.0421      0.07  Q          .         .         .         .
 9.39      0.0431      0.07  Q          .         .         .         .
 9.56      0.0442      0.08  Q          .         .         .         .
 9.72      0.0452      0.08  Q          .         .         .         .
 9.89      0.0462      0.08  Q          .         .         .         .
10.05      0.0473      0.08  Q          .         .         .         .
10.22      0.0484      0.08  Q          .         .         .         .
10.38      0.0495      0.08  Q          .         .         .         .
10.55      0.0506      0.08  Q          .         .         .         .
10.71      0.0518      0.08  Q          .         .         .         .
10.88      0.0529      0.09  Q          .         .         .         .
11.05      0.0541      0.09  Q          .         .         .         .
11.21      0.0553      0.09  Q          .         .         .         .
11.38      0.0566      0.09  Q          .         .         .         .
11.54      0.0578      0.09  Q          .         .         .         .
11.71      0.0591      0.09  Q          .         .         .         .
11.87      0.0604      0.10  Q          .         .         .         .
12.04      0.0618      0.10  Q          .         .         .         .
12.20      0.0633      0.12  Q          .         .         .         .
12.37      0.0649      0.12  Q          .         .         .         .
12.53      0.0666      0.13  Q          .         .         .         .
12.70      0.0684      0.13  Q          .         .         .         .
12.86      0.0702      0.13  Q          .         .         .         .
13.03      0.0720      0.14  Q          .         .         .         .
13.19      0.0739      0.14  Q          .         .         .         .
13.36      0.0759      0.14  Q          .         .         .         .
13.52      0.0779      0.15  Q          .         .         .         .
13.69      0.0800      0.15  Q          .         .         .         .
```

```
13.85      0.0821      0.16  Q         .         .         .         .
14.02      0.0843      0.17  Q         .         .         .         .
14.18      0.0868      0.19  Q         .         .         .         .
14.35      0.0895      0.20  Q         .         .         .         .
14.51      0.0923      0.21  Q         .         .         .         .
14.68      0.0952      0.22  Q         .         .         .         .
14.84      0.0983      0.23  Q         .         .         .         .
15.01      0.1015      0.24  Q         .         .         .         .
15.17      0.1051      0.27  .Q        .         .         .         .
15.34      0.1089      0.29  .Q        .         .         .         .
15.50      0.1128      0.29  .Q        .         .         .         .
15.67      0.1171      0.33  .Q        .         .         .         .
15.83      0.1228      0.52  . Q       .         .         .         .
16.00      0.1313      0.72  . Q       .         .         .         .
16.17      0.1498      1.99  .      Q  .         .         .         .
16.33      0.1661      0.39  .Q        .         .         .         .
16.50      0.1709      0.30  .Q        .         .         .         .
16.66      0.1747      0.26  .Q        .         .         .         .
16.83      0.1780      0.23  Q         .         .         .         .
16.99      0.1809      0.20  Q         .         .         .         .
17.16      0.1835      0.17  Q         .         .         .         .
17.32      0.1857      0.16  Q         .         .         .         .
17.49      0.1878      0.15  Q         .         .         .         .
17.65      0.1898      0.14  Q         .         .         .         .
17.82      0.1916      0.13  Q         .         .         .         .
17.98      0.1934      0.13  Q         .         .         .         .
18.15      0.1950      0.11  Q         .         .         .         .
18.31      0.1963      0.10  Q         .         .         .         .
18.48      0.1976      0.09  Q         .         .         .         .
18.64      0.1989      0.09  Q         .         .         .         .
18.81      0.2000      0.09  Q         .         .         .         .
18.97      0.2012      0.08  Q         .         .         .         .
19.14      0.2023      0.08  Q         .         .         .         .
19.30      0.2034      0.08  Q         .         .         .         .
19.47      0.2044      0.07  Q         .         .         .         .
19.63      0.2054      0.07  Q         .         .         .         .
19.80      0.2064      0.07  Q         .         .         .         .
19.96      0.2073      0.07  Q         .         .         .         .
20.13      0.2083      0.07  Q         .         .         .         .
20.29      0.2092      0.07  Q         .         .         .         .
20.46      0.2101      0.06  Q         .         .         .         .
20.62      0.2109      0.06  Q         .         .         .         .
20.79      0.2118      0.06  Q         .         .         .         .
20.95      0.2126      0.06  Q         .         .         .         .
21.12      0.2134      0.06  Q         .         .         .         .
21.29      0.2142      0.06  Q         .         .         .         .
21.45      0.2150      0.06  Q         .         .         .         .
21.62      0.2157      0.06  Q         .         .         .         .
21.78      0.2165      0.05  Q         .         .         .         .
21.95      0.2172      0.05  Q         .         .         .         .
22.11      0.2180      0.05  Q         .         .         .         .
```

```
  22.28      0.2187      0.05  Q         .         .         .         .
  22.44      0.2194      0.05  Q         .         .         .         .
  22.61      0.2201      0.05  Q         .         .         .         .
  22.77      0.2208      0.05  Q         .         .         .         .
  22.94      0.2214      0.05  Q         .         .         .         .
  23.10      0.2221      0.05  Q         .         .         .         .
  23.27      0.2228      0.05  Q         .         .         .         .
  23.43      0.2234      0.05  Q         .         .         .         .
  23.60      0.2240      0.05  Q         .         .         .         .
  23.76      0.2247      0.05  Q         .         .         .         .
  23.93      0.2253      0.05  Q         .         .         .         .
  24.09      0.2259      0.04  Q         .         .         .         .
  24.26      0.2262      0.00  Q         .         .         .         .
 ----------------------------------------------------------------------------
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
                 0%                          1446.9
                10%                           158.6
                20%                            29.7
                30%                            19.8
                40%                             9.9
                50%                             9.9
                60%                             9.9
                70%                             9.9
                80%                             9.9
                90%                             9.9
```

```
____________________________________________________________________________
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:






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 Problem Descriptions:
  Red Hill
  25yr Proposed UH Day 2
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC II:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     0.80 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00            56.       0.300       0.636

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.364
============================================================================

 Problem Descriptions:
  Red Hill
  25yr Proposed UH Day 2
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.364
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) =  25
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.05
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.13
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.18
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.32
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  0.45
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  0.80

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.15
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.07

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0002      0.03  Q         .         .         .         .
  0.31      0.0006      0.03  Q         .         .         .         .
  0.47      0.0010      0.03  Q         .         .         .         .
  0.64      0.0014      0.03  Q         .         .         .         .
  0.80      0.0018      0.03  Q         .         .         .         .
  0.97      0.0022      0.03  Q         .         .         .         .
  1.14      0.0026      0.03  Q         .         .         .         .
  1.30      0.0030      0.03  Q         .         .         .         .
  1.47      0.0034      0.03  Q         .         .         .         .
  1.63      0.0038      0.03  Q         .         .         .         .
  1.80      0.0043      0.03  Q         .         .         .         .
  1.96      0.0047      0.03  Q         .         .         .         .
  2.13      0.0051      0.03  Q         .         .         .         .
  2.29      0.0055      0.03  Q         .         .         .         .
  2.46      0.0059      0.03  Q         .         .         .         .
  2.62      0.0064      0.03  Q         .         .         .         .
  2.79      0.0068      0.03  Q         .         .         .         .
  2.95      0.0073      0.03  Q         .         .         .         .
  3.12      0.0077      0.03  Q         .         .         .         .
  3.28      0.0081      0.03  Q         .         .         .         .
  3.45      0.0086      0.03  Q         .         .         .         .
  3.61      0.0090      0.03  Q         .         .         .         .
  3.78      0.0095      0.03  Q         .         .         .         .
  3.94      0.0100      0.03  Q         .         .         .         .
  4.11      0.0104      0.03  Q         .         .         .         .
  4.27      0.0109      0.03  Q         .         .         .         .
  4.44      0.0114      0.03  Q         .         .         .         .
  4.60      0.0118      0.03  Q         .         .         .         .
  4.77      0.0123      0.04  Q         .         .         .         .
  4.93      0.0128      0.04  Q         .         .         .         .
  5.10      0.0133      0.04  Q         .         .         .         .
  5.26      0.0138      0.04  Q         .         .         .         .
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  5.43      0.0143      0.04  Q         .         .         .         .
  5.59      0.0148      0.04  Q         .         .         .         .
  5.76      0.0153      0.04  Q         .         .         .         .
  5.92      0.0158      0.04  Q         .         .         .         .
  6.09      0.0163      0.04  Q         .         .         .         .
  6.26      0.0168      0.04  Q         .         .         .         .
  6.42      0.0173      0.04  Q         .         .         .         .
  6.59      0.0179      0.04  Q         .         .         .         .
  6.75      0.0184      0.04  Q         .         .         .         .
  6.92      0.0189      0.04  Q         .         .         .         .
  7.08      0.0195      0.04  Q         .         .         .         .
  7.25      0.0200      0.04  Q         .         .         .         .
  7.41      0.0206      0.04  Q         .         .         .         .
  7.58      0.0212      0.04  Q         .         .         .         .
  7.74      0.0217      0.04  Q         .         .         .         .
  7.91      0.0223      0.04  Q         .         .         .         .
  8.07      0.0229      0.04  Q         .         .         .         .
  8.24      0.0235      0.04  Q         .         .         .         .
  8.40      0.0241      0.04  Q         .         .         .         .
  8.57      0.0247      0.04  Q         .         .         .         .
  8.73      0.0253      0.05  Q         .         .         .         .
  8.90      0.0259      0.05  Q         .         .         .         .
  9.06      0.0266      0.05  Q         .         .         .         .
  9.23      0.0272      0.05  Q         .         .         .         .
  9.39      0.0279      0.05  Q         .         .         .         .
  9.56      0.0285      0.05  Q         .         .         .         .
  9.72      0.0292      0.05  Q         .         .         .         .
  9.89      0.0299      0.05  Q         .         .         .         .
 10.05      0.0306      0.05  Q         .         .         .         .
 10.22      0.0313      0.05  Q         .         .         .         .
 10.38      0.0320      0.05  Q         .         .         .         .
 10.55      0.0327      0.05  Q         .         .         .         .
 10.71      0.0334      0.05  Q         .         .         .         .
 10.88      0.0342      0.06  Q         .         .         .         .
 11.05      0.0350      0.06  Q         .         .         .         .
 11.21      0.0357      0.06  Q         .         .         .         .
 11.38      0.0365      0.06  Q         .         .         .         .
 11.54      0.0373      0.06  Q         .         .         .         .
 11.71      0.0382      0.06  Q         .         .         .         .
 11.87      0.0390      0.06  Q         .         .         .         .
 12.04      0.0399      0.06  Q         .         .         .         .
 12.20      0.0409      0.08  Q         .         .         .         .
 12.37      0.0419      0.08  Q         .         .         .         .
 12.53      0.0431      0.08  Q         .         .         .         .
 12.70      0.0442      0.08  Q         .         .         .         .
 12.86      0.0453      0.09  Q         .         .         .         .
 13.03      0.0465      0.09  Q         .         .         .         .
 13.19      0.0478      0.09  Q         .         .         .         .
 13.36      0.0490      0.09  Q         .         .         .         .
 13.52      0.0503      0.10  Q         .         .         .         .
 13.69      0.0517      0.10  Q         .         .         .         .
```

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13.85      0.0531      0.10  Q         .         .         .         .
14.02      0.0545      0.11  Q         .         .         .         .
14.18      0.0561      0.13  Q         .         .         .         .
14.35      0.0578      0.13  Q         .         .         .         .
14.51      0.0596      0.14  Q         .         .         .         .
14.68      0.0615      0.14  Q         .         .         .         .
14.84      0.0635      0.15  Q         .         .         .         .
15.01      0.0657      0.16  Q         .         .         .         .
15.17      0.0679      0.17  Q         .         .         .         .
15.34      0.0704      0.19  Q         .         .         .         .
15.50      0.0729      0.19  Q         .         .         .         .
15.67      0.0756      0.21  Q         .         .         .         .
15.83      0.0792      0.31  .Q        .         .         .         .
16.00      0.0844      0.46  .Q        .         .         .         .
16.17      0.0969      1.36  .    Q    .         .         .         .
16.33      0.1078      0.24  Q         .         .         .         .
16.50      0.1108      0.20  Q         .         .         .         .
16.66      0.1133      0.17  Q         .         .         .         .
16.83      0.1154      0.15  Q         .         .         .         .
16.99      0.1173      0.13  Q         .         .         .         .
17.16      0.1190      0.11  Q         .         .         .         .
17.32      0.1204      0.10  Q         .         .         .         .
17.49      0.1218      0.10  Q         .         .         .         .
17.65      0.1230      0.09  Q         .         .         .         .
17.82      0.1242      0.09  Q         .         .         .         .
17.98      0.1254      0.08  Q         .         .         .         .
18.15      0.1264      0.07  Q         .         .         .         .
18.31      0.1273      0.06  Q         .         .         .         .
18.48      0.1281      0.06  Q         .         .         .         .
18.64      0.1289      0.06  Q         .         .         .         .
18.81      0.1297      0.06  Q         .         .         .         .
18.97      0.1304      0.05  Q         .         .         .         .
19.14      0.1311      0.05  Q         .         .         .         .
19.30      0.1318      0.05  Q         .         .         .         .
19.47      0.1325      0.05  Q         .         .         .         .
19.63      0.1331      0.05  Q         .         .         .         .
19.80      0.1338      0.05  Q         .         .         .         .
19.96      0.1344      0.04  Q         .         .         .         .
20.13      0.1350      0.04  Q         .         .         .         .
20.29      0.1356      0.04  Q         .         .         .         .
20.46      0.1361      0.04  Q         .         .         .         .
20.62      0.1367      0.04  Q         .         .         .         .
20.79      0.1372      0.04  Q         .         .         .         .
20.95      0.1378      0.04  Q         .         .         .         .
21.12      0.1383      0.04  Q         .         .         .         .
21.29      0.1388      0.04  Q         .         .         .         .
21.45      0.1393      0.04  Q         .         .         .         .
21.62      0.1398      0.04  Q         .         .         .         .
21.78      0.1403      0.04  Q         .         .         .         .
21.95      0.1408      0.03  Q         .         .         .         .
22.11      0.1413      0.03  Q         .         .         .         .
```

```
  22.28      0.1417      0.03  Q         .         .         .         .
  22.44      0.1422      0.03  Q         .         .         .         .
  22.61      0.1426      0.03  Q         .         .         .         .
  22.77      0.1431      0.03  Q         .         .         .         .
  22.94      0.1435      0.03  Q         .         .         .         .
  23.10      0.1439      0.03  Q         .         .         .         .
  23.27      0.1444      0.03  Q         .         .         .         .
  23.43      0.1448      0.03  Q         .         .         .         .
  23.60      0.1452      0.03  Q         .         .         .         .
  23.76      0.1456      0.03  Q         .         .         .         .
  23.93      0.1460      0.03  Q         .         .         .         .
  24.09      0.1464      0.03  Q         .         .         .         .
  24.26      0.1466      0.00  Q         .         .         .         .
 ---------------------------------------------------------------------------
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
               0%                            1446.9
              10%                             148.6
              20%                              29.7
              30%                              19.8
              40%                               9.9
              50%                               9.9
              60%                               9.9
              70%                               9.9
              80%                               9.9
              90%                               9.9
```

```
____________________________________________________________________________
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                           Analysis prepared by:






****************************************************************************
----------------------------------------------------------------------------

 Problem Descriptions:
  Red Hill
  100yr Proposed UH Day 1
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     5.66 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00       56.(AMC II)     0.300       0.896

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.104
============================================================================

 Problem Descriptions:
  Red Hill
  100yr Proposed UH Day 1
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.19
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.104
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.38
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.91
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  1.27
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  2.30
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  3.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  5.66

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     1.70
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =    -0.13

****************************************************************************
  TIME     VOLUME       Q    0.        5.0      10.0      15.0      20.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0023      0.34  Q         .         .         .         .
  0.31      0.0070      0.34  Q         .         .         .         .
  0.47      0.0117      0.34  Q         .         .         .         .
  0.64      0.0164      0.35  Q         .         .         .         .
  0.80      0.0212      0.35  Q         .         .         .         .
  0.97      0.0260      0.35  Q         .         .         .         .
  1.14      0.0308      0.35  Q         .         .         .         .
  1.30      0.0356      0.36  Q         .         .         .         .
  1.47      0.0405      0.36  Q         .         .         .         .
  1.63      0.0454      0.36  Q         .         .         .         .
  1.80      0.0504      0.36  Q         .         .         .         .
  1.96      0.0553      0.37  Q         .         .         .         .
  2.13      0.0603      0.37  Q         .         .         .         .
  2.29      0.0654      0.37  Q         .         .         .         .
  2.46      0.0705      0.37  Q         .         .         .         .
  2.62      0.0756      0.38  Q         .         .         .         .
  2.79      0.0808      0.38  Q         .         .         .         .
  2.95      0.0860      0.38  Q         .         .         .         .
  3.12      0.0912      0.38  Q         .         .         .         .
  3.28      0.0965      0.39  Q         .         .         .         .
  3.45      0.1018      0.39  Q         .         .         .         .
  3.61      0.1071      0.39  Q         .         .         .         .
  3.78      0.1125      0.40  Q         .         .         .         .
  3.94      0.1180      0.40  Q         .         .         .         .
  4.11      0.1235      0.40  Q         .         .         .         .
  4.27      0.1290      0.41  Q         .         .         .         .
  4.44      0.1346      0.41  Q         .         .         .         .
  4.60      0.1402      0.41  Q         .         .         .         .
  4.77      0.1459      0.42  Q         .         .         .         .
  4.93      0.1516      0.42  Q         .         .         .         .
  5.10      0.1574      0.42  Q         .         .         .         .
  5.26      0.1632      0.43  Q         .         .         .         .
```

```
 5.43      0.1691      0.43  Q         .         .         .         .
 5.59      0.1750      0.44  Q         .         .         .         .
 5.76      0.1810      0.44  Q         .         .         .         .
 5.92      0.1870      0.45  Q         .         .         .         .
 6.09      0.1931      0.45  Q         .         .         .         .
 6.26      0.1993      0.45  Q         .         .         .         .
 6.42      0.2055      0.46  Q         .         .         .         .
 6.59      0.2118      0.46  Q         .         .         .         .
 6.75      0.2181      0.47  Q         .         .         .         .
 6.92      0.2245      0.47  Q         .         .         .         .
 7.08      0.2310      0.48  Q         .         .         .         .
 7.25      0.2376      0.48  Q         .         .         .         .
 7.41      0.2442      0.49  Q         .         .         .         .
 7.58      0.2509      0.49  Q         .         .         .         .
 7.74      0.2577      0.50  Q         .         .         .         .
 7.91      0.2645      0.51  .Q        .         .         .         .
 8.07      0.2715      0.51  .Q        .         .         .         .
 8.24      0.2785      0.52  .Q        .         .         .         .
 8.40      0.2856      0.52  .Q        .         .         .         .
 8.57      0.2928      0.53  .Q        .         .         .         .
 8.73      0.3001      0.54  .Q        .         .         .         .
 8.90      0.3075      0.55  .Q        .         .         .         .
 9.06      0.3150      0.55  .Q        .         .         .         .
 9.23      0.3226      0.56  .Q        .         .         .         .
 9.39      0.3303      0.57  .Q        .         .         .         .
 9.56      0.3381      0.58  .Q        .         .         .         .
 9.72      0.3461      0.58  .Q        .         .         .         .
 9.89      0.3541      0.60  .Q        .         .         .         .
10.05      0.3623      0.60  .Q        .         .         .         .
10.22      0.3706      0.62  .Q        .         .         .         .
10.38      0.3791      0.62  .Q        .         .         .         .
10.55      0.3877      0.64  .Q        .         .         .         .
10.71      0.3965      0.65  .Q        .         .         .         .
10.88      0.4054      0.66  .Q        .         .         .         .
11.05      0.4145      0.67  .Q        .         .         .         .
11.21      0.4237      0.69  .Q        .         .         .         .
11.38      0.4332      0.70  .Q        .         .         .         .
11.54      0.4428      0.72  .Q        .         .         .         .
11.71      0.4527      0.73  .Q        .         .         .         .
11.87      0.4627      0.75  .Q        .         .         .         .
12.04      0.4730      0.76  .Q        .         .         .         .
12.20      0.4846      0.94  .Q        .         .         .         .
12.37      0.4975      0.95  .Q        .         .         .         .
12.53      0.5107      0.98  .Q        .         .         .         .
12.70      0.5241      1.00  .Q        .         .         .         .
12.86      0.5380      1.03  . Q       .         .         .         .
13.03      0.5521      1.05  . Q       .         .         .         .
13.19      0.5667      1.09  . Q       .         .         .         .
13.36      0.5817      1.11  . Q       .         .         .         .
13.52      0.5972      1.16  . Q       .         .         .         .
13.69      0.6132      1.18  . Q       .         .         .         .
```

```
13.85      0.6297      1.24  . Q       .         .         .         .
14.02      0.6469      1.27  . Q       .         .         .         .
14.18      0.6658      1.50  . Q       .         .         .         .
14.35      0.6865      1.54  .  Q      .         .         .         .
14.51      0.7082      1.64  .  Q      .         .         .         .
14.68      0.7311      1.70  .  Q      .         .         .         .
14.84      0.7553      1.85  .  Q      .         .         .         .
15.01      0.7812      1.93  .  Q      .         .         .         .
15.17      0.8090      2.15  .   Q     .         .         .         .
15.34      0.8393      2.29  .   Q     .         .         .         .
15.50      0.8710      2.35  .   Q     .         .         .         .
15.67      0.9050      2.63  .    Q    .         .         .         .
15.83      0.9487      3.76  .      Q  .         .         .         .
16.00      1.0083      4.98  .        Q.         .         .         .
16.17      1.1276     12.52  .         .         .    Q    .         .
16.33      1.2338      3.03  .     Q   .         .         .         .
16.50      1.2711      2.44  .   Q     .         .         .         .
16.66      1.3017      2.03  .   Q     .         .         .         .
16.83      1.3276      1.77  .  Q      .         .         .         .
16.99      1.3506      1.59  .  Q      .         .         .         .
17.16      1.3705      1.33  . Q       .         .         .         .
17.32      1.3879      1.21  . Q       .         .         .         .
17.49      1.4039      1.13  . Q       .         .         .         .
17.65      1.4189      1.07  . Q       .         .         .         .
17.82      1.4331      1.01  . Q       .         .         .         .
17.98      1.4466      0.96  .Q        .         .         .         .
18.15      1.4588      0.82  .Q        .         .         .         .
18.31      1.4694      0.74  .Q        .         .         .         .
18.48      1.4793      0.71  .Q        .         .         .         .
18.64      1.4887      0.68  .Q        .         .         .         .
18.81      1.4978      0.65  .Q        .         .         .         .
18.97      1.5066      0.63  .Q        .         .         .         .
19.14      1.5151      0.61  .Q        .         .         .         .
19.30      1.5232      0.59  .Q        .         .         .         .
19.47      1.5312      0.57  .Q        .         .         .         .
19.63      1.5389      0.56  .Q        .         .         .         .
19.80      1.5464      0.54  .Q        .         .         .         .
19.96      1.5537      0.53  .Q        .         .         .         .
20.13      1.5608      0.51  .Q        .         .         .         .
20.29      1.5677      0.50  .Q        .         .         .         .
20.46      1.5745      0.49  Q         .         .         .         .
20.62      1.5811      0.48  Q         .         .         .         .
20.79      1.5876      0.47  Q         .         .         .         .
20.95      1.5940      0.46  Q         .         .         .         .
21.12      1.6002      0.45  Q         .         .         .         .
21.29      1.6063      0.44  Q         .         .         .         .
21.45      1.6123      0.43  Q         .         .         .         .
21.62      1.6182      0.43  Q         .         .         .         .
21.78      1.6239      0.42  Q         .         .         .         .
21.95      1.6296      0.41  Q         .         .         .         .
22.11      1.6352      0.41  Q         .         .         .         .
```

```
 22.28      1.6407      0.40  Q         .         .         .         .
 22.44      1.6461      0.39  Q         .         .         .         .
 22.61      1.6514      0.39  Q         .         .         .         .
 22.77      1.6566      0.38  Q         .         .         .         .
 22.94      1.6618      0.38  Q         .         .         .         .
 23.10      1.6669      0.37  Q         .         .         .         .
 23.27      1.6719      0.36  Q         .         .         .         .
 23.43      1.6768      0.36  Q         .         .         .         .
 23.60      1.6817      0.36  Q         .         .         .         .
 23.76      1.6865      0.35  Q         .         .         .         .
 23.93      1.6913      0.35  Q         .         .         .         .
 24.09      1.6960      0.34  Q         .         .         .         .
 24.26      1.6983      0.00  Q         .         .         .         .
----------------------------------------------------------------------------
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                  Duration
       Peak Flow Rate                       (minutes)
   =======================                  =========
             0%                              1446.9
            10%                               198.2
            20%                                49.5
            30%                                29.7
            40%                                 9.9
            50%                                 9.9
            60%                                 9.9
            70%                                 9.9
            80%                                 9.9
            90%                                 9.9
```

```
____________________________________________________________________________
****************************************************************************
           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:





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 Problem Descriptions:
  Red Hill
  100-yr Proposed UH Day 2
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     1.49 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00       56.(AMC II)     0.300       0.743

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.257
============================================================================

 Problem Descriptions:
  Red Hill
  100-yr Proposed UH Day 2
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.257
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.10
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.24
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.33
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.61
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  0.85
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  1.49

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.32
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.10

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0004      0.06  Q         .         .         .         .
  0.31      0.0013      0.06  Q         .         .         .         .
  0.47      0.0021      0.06  Q         .         .         .         .
  0.64      0.0030      0.06  Q         .         .         .         .
  0.80      0.0039      0.06  Q         .         .         .         .
  0.97      0.0047      0.06  Q         .         .         .         .
  1.14      0.0056      0.06  Q         .         .         .         .
  1.30      0.0065      0.07  Q         .         .         .         .
  1.47      0.0074      0.07  Q         .         .         .         .
  1.63      0.0083      0.07  Q         .         .         .         .
  1.80      0.0092      0.07  Q         .         .         .         .
  1.96      0.0101      0.07  Q         .         .         .         .
  2.13      0.0110      0.07  Q         .         .         .         .
  2.29      0.0120      0.07  Q         .         .         .         .
  2.46      0.0129      0.07  Q         .         .         .         .
  2.62      0.0138      0.07  Q         .         .         .         .
  2.79      0.0148      0.07  Q         .         .         .         .
  2.95      0.0157      0.07  Q         .         .         .         .
  3.12      0.0167      0.07  Q         .         .         .         .
  3.28      0.0176      0.07  Q         .         .         .         .
  3.45      0.0186      0.07  Q         .         .         .         .
  3.61      0.0196      0.07  Q         .         .         .         .
  3.78      0.0206      0.07  Q         .         .         .         .
  3.94      0.0216      0.07  Q         .         .         .         .
  4.11      0.0226      0.07  Q         .         .         .         .
  4.27      0.0236      0.07  Q         .         .         .         .
  4.44      0.0246      0.07  Q         .         .         .         .
  4.60      0.0256      0.08  Q         .         .         .         .
  4.77      0.0267      0.08  Q         .         .         .         .
  4.93      0.0277      0.08  Q         .         .         .         .
  5.10      0.0288      0.08  Q         .         .         .         .
  5.26      0.0298      0.08  Q         .         .         .         .
```

```
  5.43       0.0309      0.08  Q          .         .         .         .
  5.59       0.0320      0.08  Q          .         .         .         .
  5.76       0.0331      0.08  Q          .         .         .         .
  5.92       0.0342      0.08  Q          .         .         .         .
  6.09       0.0353      0.08  Q          .         .         .         .
  6.26       0.0364      0.08  Q          .         .         .         .
  6.42       0.0376      0.08  Q          .         .         .         .
  6.59       0.0387      0.08  Q          .         .         .         .
  6.75       0.0399      0.09  Q          .         .         .         .
  6.92       0.0410      0.09  Q          .         .         .         .
  7.08       0.0422      0.09  Q          .         .         .         .
  7.25       0.0434      0.09  Q          .         .         .         .
  7.41       0.0446      0.09  Q          .         .         .         .
  7.58       0.0459      0.09  Q          .         .         .         .
  7.74       0.0471      0.09  Q          .         .         .         .
  7.91       0.0484      0.09  Q          .         .         .         .
  8.07       0.0496      0.09  Q          .         .         .         .
  8.24       0.0509      0.09  Q          .         .         .         .
  8.40       0.0522      0.10  Q          .         .         .         .
  8.57       0.0535      0.10  Q          .         .         .         .
  8.73       0.0549      0.10  Q          .         .         .         .
  8.90       0.0562      0.10  Q          .         .         .         .
  9.06       0.0576      0.10  Q          .         .         .         .
  9.23       0.0590      0.10  Q          .         .         .         .
  9.39       0.0604      0.10  Q          .         .         .         .
  9.56       0.0618      0.11  Q          .         .         .         .
  9.72       0.0633      0.11  Q          .         .         .         .
  9.89       0.0647      0.11  Q          .         .         .         .
 10.05       0.0662      0.11  Q          .         .         .         .
 10.22       0.0677      0.11  Q          .         .         .         .
 10.38       0.0693      0.11  Q          .         .         .         .
 10.55       0.0709      0.12  Q          .         .         .         .
 10.71       0.0725      0.12  Q          .         .         .         .
 10.88       0.0741      0.12  Q          .         .         .         .
 11.05       0.0758      0.12  Q          .         .         .         .
 11.21       0.0775      0.13  Q          .         .         .         .
 11.38       0.0792      0.13  Q          .         .         .         .
 11.54       0.0809      0.13  Q          .         .         .         .
 11.71       0.0827      0.13  Q          .         .         .         .
 11.87       0.0846      0.14  Q          .         .         .         .
 12.04       0.0865      0.14  Q          .         .         .         .
 12.20       0.0886      0.17  Q          .         .         .         .
 12.37       0.0910      0.17  Q          .         .         .         .
 12.53       0.0934      0.18  Q          .         .         .         .
 12.70       0.0958      0.18  Q          .         .         .         .
 12.86       0.0984      0.19  Q          .         .         .         .
 13.03       0.1010      0.19  Q          .         .         .         .
 13.19       0.1037      0.20  Q          .         .         .         .
 13.36       0.1064      0.20  Q          .         .         .         .
 13.52       0.1093      0.21  Q          .         .         .         .
 13.69       0.1122      0.22  Q          .         .         .         .
```

```
13.85      0.1152      0.23  Q         .         .         .         .
14.02      0.1184      0.23  Q         .         .         .         .
14.18      0.1218      0.27  .Q        .         .         .         .
14.35      0.1256      0.28  .Q        .         .         .         .
14.51      0.1296      0.30  .Q        .         .         .         .
14.68      0.1337      0.31  .Q        .         .         .         .
14.84      0.1381      0.33  .Q        .         .         .         .
15.01      0.1427      0.35  .Q        .         .         .         .
15.17      0.1477      0.38  .Q        .         .         .         .
15.34      0.1530      0.40  .Q        .         .         .         .
15.50      0.1586      0.41  .Q        .         .         .         .
15.67      0.1646      0.47  .Q        .         .         .         .
15.83      0.1727      0.71  . Q       .         .         .         .
16.00      0.1843      0.98  .  Q      .         .         .         .
16.17      0.2091      2.66  .         Q         .         .         .
16.33      0.2311      0.56  . Q       .         .         .         .
16.50      0.2378      0.43  .Q        .         .         .         .
16.66      0.2432      0.36  .Q        .         .         .         .
16.83      0.2479      0.32  .Q        .         .         .         .
16.99      0.2520      0.29  .Q        .         .         .         .
17.16      0.2557      0.24  Q         .         .         .         .
17.32      0.2589      0.22  Q         .         .         .         .
17.49      0.2618      0.21  Q         .         .         .         .
17.65      0.2645      0.20  Q         .         .         .         .
17.82      0.2672      0.19  Q         .         .         .         .
17.98      0.2696      0.18  Q         .         .         .         .
18.15      0.2719      0.15  Q         .         .         .         .
18.31      0.2738      0.13  Q         .         .         .         .
18.48      0.2756      0.13  Q         .         .         .         .
18.64      0.2773      0.12  Q         .         .         .         .
18.81      0.2790      0.12  Q         .         .         .         .
18.97      0.2806      0.12  Q         .         .         .         .
19.14      0.2822      0.11  Q         .         .         .         .
19.30      0.2837      0.11  Q         .         .         .         .
19.47      0.2851      0.10  Q         .         .         .         .
19.63      0.2865      0.10  Q         .         .         .         .
19.80      0.2879      0.10  Q         .         .         .         .
19.96      0.2892      0.10  Q         .         .         .         .
20.13      0.2905      0.09  Q         .         .         .         .
20.29      0.2918      0.09  Q         .         .         .         .
20.46      0.2930      0.09  Q         .         .         .         .
20.62      0.2942      0.09  Q         .         .         .         .
20.79      0.2954      0.09  Q         .         .         .         .
20.95      0.2966      0.08  Q         .         .         .         .
21.12      0.2977      0.08  Q         .         .         .         .
21.29      0.2988      0.08  Q         .         .         .         .
21.45      0.2999      0.08  Q         .         .         .         .
21.62      0.3010      0.08  Q         .         .         .         .
21.78      0.3021      0.08  Q         .         .         .         .
21.95      0.3031      0.08  Q         .         .         .         .
22.11      0.3041      0.07  Q         .         .         .         .
```

```
  22.28      0.3051      0.07  Q         .         .         .         .
  22.44      0.3061      0.07  Q         .         .         .         .
  22.61      0.3071      0.07  Q         .         .         .         .
  22.77      0.3080      0.07  Q         .         .         .         .
  22.94      0.3090      0.07  Q         .         .         .         .
  23.10      0.3099      0.07  Q         .         .         .         .
  23.27      0.3108      0.07  Q         .         .         .         .
  23.43      0.3117      0.07  Q         .         .         .         .
  23.60      0.3126      0.06  Q         .         .         .         .
  23.76      0.3135      0.06  Q         .         .         .         .
  23.93      0.3144      0.06  Q         .         .         .         .
  24.09      0.3152      0.06  Q         .         .         .         .
  24.26      0.3156      0.00  Q         .         .         .         .
 ---------------------------------------------------------------------------
-------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
               0%                            1446.9
              10%                             178.4
              20%                              39.6
              30%                              19.8
              40%                               9.9
              50%                               9.9
              60%                               9.9
              70%                               9.9
              80%                               9.9
              90%                               9.9
```

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           NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                     AND LOW LOSS FRACTION ESTIMATIONS
============================================================================
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                           Analysis prepared by:







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----------------------------------------------------------------------------

 Problem Descriptions:
  Red Hill
  100-yr Proposed UH Day 3
  Kimley-Horn
============================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     1.07 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
         1          3.32       15.00       56.(AMC II)     0.300       0.690

    TOTAL AREA (Acres) =      3.32
                             _
    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                     _
    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.310
============================================================================

 Problem Descriptions:
  Red Hill
  100-yr Proposed UH Day 3
  Kimley-Horn
----------------------------------------------------------------------------


    RATIONAL METHOD CALIBRATION COEFFICIENT = 1.00
    TOTAL CATCHMENT AREA(ACRES) =    3.32
    SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
    LOW LOSS FRACTION = 0.310
    TIME OF CONCENTRATION(MIN.) =  9.91
```

```
    SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
    USER SPECIFIED RAINFALL VALUES ARE USED
    RETURN FREQUENCY(YEARS) = 100
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.07
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.17
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.24
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.44
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  0.61
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  1.07

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.21
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.08

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0003      0.04  Q         .         .         .         .
  0.31      0.0009      0.04  Q         .         .         .         .
  0.47      0.0014      0.04  Q         .         .         .         .
  0.64      0.0020      0.04  Q         .         .         .         .
  0.80      0.0026      0.04  Q         .         .         .         .
  0.97      0.0032      0.04  Q         .         .         .         .
  1.14      0.0038      0.04  Q         .         .         .         .
  1.30      0.0043      0.04  Q         .         .         .         .
  1.47      0.0049      0.04  Q         .         .         .         .
  1.63      0.0055      0.04  Q         .         .         .         .
  1.80      0.0061      0.04  Q         .         .         .         .
  1.96      0.0067      0.04  Q         .         .         .         .
  2.13      0.0074      0.04  Q         .         .         .         .
  2.29      0.0080      0.05  Q         .         .         .         .
  2.46      0.0086      0.05  Q         .         .         .         .
  2.62      0.0092      0.05  Q         .         .         .         .
  2.79      0.0098      0.05  Q         .         .         .         .
  2.95      0.0105      0.05  Q         .         .         .         .
  3.12      0.0111      0.05  Q         .         .         .         .
  3.28      0.0118      0.05  Q         .         .         .         .
  3.45      0.0124      0.05  Q         .         .         .         .
  3.61      0.0131      0.05  Q         .         .         .         .
  3.78      0.0137      0.05  Q         .         .         .         .
  3.94      0.0144      0.05  Q         .         .         .         .
  4.11      0.0150      0.05  Q         .         .         .         .
  4.27      0.0157      0.05  Q         .         .         .         .
  4.44      0.0164      0.05  Q         .         .         .         .
  4.60      0.0171      0.05  Q         .         .         .         .
  4.77      0.0178      0.05  Q         .         .         .         .
  4.93      0.0185      0.05  Q         .         .         .         .
  5.10      0.0192      0.05  Q         .         .         .         .
  5.26      0.0199      0.05  Q         .         .         .         .
```

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 5.43      0.0206      0.05  Q         .         .         .         .
 5.59      0.0213      0.05  Q         .         .         .         .
 5.76      0.0221      0.05  Q         .         .         .         .
 5.92      0.0228      0.05  Q         .         .         .         .
 6.09      0.0235      0.05  Q         .         .         .         .
 6.26      0.0243      0.06  Q         .         .         .         .
 6.42      0.0250      0.06  Q         .         .         .         .
 6.59      0.0258      0.06  Q         .         .         .         .
 6.75      0.0266      0.06  Q         .         .         .         .
 6.92      0.0274      0.06  Q         .         .         .         .
 7.08      0.0282      0.06  Q         .         .         .         .
 7.25      0.0290      0.06  Q         .         .         .         .
 7.41      0.0298      0.06  Q         .         .         .         .
 7.58      0.0306      0.06  Q         .         .         .         .
 7.74      0.0314      0.06  Q         .         .         .         .
 7.91      0.0322      0.06  Q         .         .         .         .
 8.07      0.0331      0.06  Q         .         .         .         .
 8.24      0.0339      0.06  Q         .         .         .         .
 8.40      0.0348      0.06  Q         .         .         .         .
 8.57      0.0357      0.06  Q         .         .         .         .
 8.73      0.0366      0.07  Q         .         .         .         .
 8.90      0.0375      0.07  Q         .         .         .         .
 9.06      0.0384      0.07  Q         .         .         .         .
 9.23      0.0393      0.07  Q         .         .         .         .
 9.39      0.0403      0.07  Q         .         .         .         .
 9.56      0.0412      0.07  Q         .         .         .         .
 9.72      0.0422      0.07  Q         .         .         .         .
 9.89      0.0432      0.07  Q         .         .         .         .
10.05      0.0442      0.07  Q         .         .         .         .
10.22      0.0452      0.08  Q         .         .         .         .
10.38      0.0462      0.08  Q         .         .         .         .
10.55      0.0473      0.08  Q         .         .         .         .
10.71      0.0483      0.08  Q         .         .         .         .
10.88      0.0494      0.08  Q         .         .         .         .
11.05      0.0505      0.08  Q         .         .         .         .
11.21      0.0516      0.08  Q         .         .         .         .
11.38      0.0528      0.08  Q         .         .         .         .
11.54      0.0540      0.09  Q         .         .         .         .
11.71      0.0552      0.09  Q         .         .         .         .
11.87      0.0564      0.09  Q         .         .         .         .
12.04      0.0577      0.09  Q         .         .         .         .
12.20      0.0591      0.11  Q         .         .         .         .
12.37      0.0606      0.12  Q         .         .         .         .
12.53      0.0623      0.12  Q         .         .         .         .
12.70      0.0639      0.12  Q         .         .         .         .
12.86      0.0656      0.13  Q         .         .         .         .
13.03      0.0673      0.13  Q         .         .         .         .
13.19      0.0691      0.13  Q         .         .         .         .
13.36      0.0709      0.14  Q         .         .         .         .
13.52      0.0728      0.14  Q         .         .         .         .
13.69      0.0748      0.14  Q         .         .         .         .
```

```
13.85      0.0768      0.15  Q         .         .         .         .
14.02      0.0789      0.16  Q         .         .         .         .
14.18      0.0812      0.18  Q         .         .         .         .
14.35      0.0837      0.19  Q         .         .         .         .
14.51      0.0864      0.20  Q         .         .         .         .
14.68      0.0891      0.21  Q         .         .         .         .
14.84      0.0920      0.22  Q         .         .         .         .
15.01      0.0951      0.23  Q         .         .         .         .
15.17      0.0985      0.25  .Q        .         .         .         .
15.34      0.1020      0.27  .Q        .         .         .         .
15.50      0.1058      0.28  .Q        .         .         .         .
15.67      0.1098      0.31  .Q        .         .         .         .
15.83      0.1151      0.48  .Q        .         .         .         .
16.00      0.1229      0.67  . Q       .         .         .         .
16.17      0.1401      1.85  .      Q  .         .         .         .
16.33      0.1552      0.36  .Q        .         .         .         .
16.50      0.1596      0.29  .Q        .         .         .         .
16.66      0.1633      0.24  Q         .         .         .         .
16.83      0.1664      0.21  Q         .         .         .         .
16.99      0.1691      0.19  Q         .         .         .         .
17.16      0.1716      0.16  Q         .         .         .         .
17.32      0.1737      0.15  Q         .         .         .         .
17.49      0.1756      0.14  Q         .         .         .         .
17.65      0.1775      0.13  Q         .         .         .         .
17.82      0.1792      0.12  Q         .         .         .         .
17.98      0.1809      0.12  Q         .         .         .         .
18.15      0.1823      0.10  Q         .         .         .         .
18.31      0.1836      0.09  Q         .         .         .         .
18.48      0.1848      0.09  Q         .         .         .         .
18.64      0.1860      0.08  Q         .         .         .         .
18.81      0.1871      0.08  Q         .         .         .         .
18.97      0.1882      0.08  Q         .         .         .         .
19.14      0.1892      0.07  Q         .         .         .         .
19.30      0.1902      0.07  Q         .         .         .         .
19.47      0.1912      0.07  Q         .         .         .         .
19.63      0.1921      0.07  Q         .         .         .         .
19.80      0.1930      0.07  Q         .         .         .         .
19.96      0.1939      0.06  Q         .         .         .         .
20.13      0.1948      0.06  Q         .         .         .         .
20.29      0.1956      0.06  Q         .         .         .         .
20.46      0.1965      0.06  Q         .         .         .         .
20.62      0.1973      0.06  Q         .         .         .         .
20.79      0.1980      0.06  Q         .         .         .         .
20.95      0.1988      0.06  Q         .         .         .         .
21.12      0.1996      0.05  Q         .         .         .         .
21.29      0.2003      0.05  Q         .         .         .         .
21.45      0.2011      0.05  Q         .         .         .         .
21.62      0.2018      0.05  Q         .         .         .         .
21.78      0.2025      0.05  Q         .         .         .         .
21.95      0.2032      0.05  Q         .         .         .         .
22.11      0.2038      0.05  Q         .         .         .         .
```

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  22.28      0.2045      0.05  Q         .         .         .         .
  22.44      0.2052      0.05  Q         .         .         .         .
  22.61      0.2058      0.05  Q         .         .         .         .
  22.77      0.2065      0.05  Q         .         .         .         .
  22.94      0.2071      0.05  Q         .         .         .         .
  23.10      0.2077      0.05  Q         .         .         .         .
  23.27      0.2083      0.04  Q         .         .         .         .
  23.43      0.2089      0.04  Q         .         .         .         .
  23.60      0.2095      0.04  Q         .         .         .         .
  23.76      0.2101      0.04  Q         .         .         .         .
  23.93      0.2107      0.04  Q         .         .         .         .
  24.09      0.2113      0.04  Q         .         .         .         .
  24.26      0.2115      0.00  Q         .         .         .         .
 ----------------------------------------------------------------------------
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated                 Duration
        Peak Flow Rate                      (minutes)
    =======================                 =========
               0%                            1446.9
              10%                             168.5
              20%                              29.7
              30%                              19.8
              40%                               9.9
              50%                               9.9
              60%                               9.9
              70%                               9.9
              80%                               9.9
              90%                               9.9
```

Appendix C: Detention Calculations

Detention Basin Infiltration Calculation

Project Name: Red Hill
Completed by: AG
Reviewed by: LAC
Date: 31-Mar-23
Updated: 4-Nov-24
County: Orange County

BMP	Measured Infiltration Rate	Design Factor of Safety	Design Infiltration Rate*	Detention Basin Infiltration Area	In/Hr to Ft/Sec Conversion Value	Constant Infiltration Rate
	(in/hr)		(in/hr)	(sf)		(cf/sec)
BMP 1	1.5	2.00	0.75	5730	43200	0.099

*Design infiltration rate and factor of safety is recommended by geotech report

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Project Summary

Title	Red Hill
Engineer	
Company	Kimley-Horn and Associates, Inc.
Date	11/14/2024

Notes	1. Inflow hydrographs for 24-72 hours calculated using AES v2016. 2. Flow-through basin analysis completed using modified Pul's (storage indication routing).

Table of Contents

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DMA-1	2yr24hr	0	22,441.000	15.8	4.37000
DMA-1	2yr48hr	0	26,233.000	39.8	4.37000
DMA-1	2yr72hr	0	28,467.000	63.8	4.37000

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
Outfall 1	2yr24hr	0	5,975.000	16.0	1.02059
Outfall 1	2yr48hr	0	6,044.000	40.0	1.04973
Outfall 1	2yr72hr	0	6,076.000	63.9	1.05569

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BMP1 (IN)	2yr24hr	0	22,435.000	15.8	4.09862	(N/A)	(N/A)
BMP1 (OUT)	2yr24hr	0	5,975.000	16.0	1.02059	2.773	11,050.000
BMP1 (IN)	2yr48hr	0	26,216.000	39.8	4.06969	(N/A)	(N/A)
BMP1 (OUT)	2yr48hr	0	6,044.000	40.0	1.04973	2.783	11,093.000
BMP1 (IN)	2yr72hr	0	28,480.000	63.8	4.29181	(N/A)	(N/A)
BMP1 (OUT)	2yr72hr	0	6,076.000	63.9	1.05569	2.785	11,101.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 2yr24hr

Label: DMA-1

Peak Discharge	4.37000 ft³/s
Time to Peak	15.8 hours
Hydrograph Volume	22,441.010 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.0	0.10000	0.10000	0.10000	0.10000	0.10000
0.8	0.10000	0.10000	0.11000	0.11000	0.11000
1.6	0.11000	0.11000	0.11000	0.11000	0.11000
2.4	0.11000	0.11000	0.11000	0.11000	0.12000
3.3	0.12000	0.12000	0.12000	0.12000	0.12000
4.1	0.12000	0.12000	0.12000	0.12000	0.12000
4.9	0.13000	0.13000	0.13000	0.13000	0.13000
5.7	0.13000	0.13000	0.13000	0.14000	0.14000
6.5	0.14000	0.14000	0.14000	0.14000	0.14000
7.3	0.15000	0.15000	0.15000	0.15000	0.15000
8.2	0.16000	0.16000	0.16000	0.16000	0.16000
9.0	0.17000	0.17000	0.17000	0.17000	0.18000
9.8	0.18000	0.18000	0.19000	0.19000	0.19000
10.6	0.20000	0.20000	0.20000	0.21000	0.21000
11.4	0.22000	0.22000	0.23000	0.29000	0.29000
12.2	0.30000	0.30000	0.31000	0.32000	0.33000
13.0	0.34000	0.35000	0.36000	0.38000	0.39000
13.9	0.44000	0.46000	0.48000	0.50000	0.55000
14.7	0.58000	0.65000	0.70000	0.73000	0.83000
15.5	1.24000	1.67000	4.37000	0.98000	0.76000
16.3	0.61000	0.52000	0.47000	0.40000	0.37000
17.1	0.35000	0.33000	0.31000	0.29000	0.25000
17.9	0.22000	0.21000	0.20000	0.19000	0.19000
18.8	0.18000	0.18000	0.17000	0.17000	0.16000
19.6	0.16000	0.15000	0.15000	0.15000	0.14000
20.4	0.14000	0.14000	0.13000	0.13000	0.13000
21.2	0.13000	0.12000	0.12000	0.12000	0.12000
22.0	0.12000	0.11000	0.11000	0.11000	0.11000
22.8	0.11000	0.11000	0.11000	0.10000	0.10000
23.6	0.10000	0.00000	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 2yr48hr

Label: DMA-1

Peak Discharge	4.37000 ft³/s
Time to Peak	39.8 hours
Hydrograph Volume	26,233.030 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.0	0.02000	0.02000	0.02000	0.02000	0.02000
0.8	0.02000	0.02000	0.02000	0.02000	0.02000
1.6	0.02000	0.02000	0.02000	0.02000	0.02000
2.4	0.02000	0.02000	0.02000	0.02000	0.02000
3.3	0.02000	0.02000	0.02000	0.02000	0.02000
4.1	0.02000	0.02000	0.02000	0.02000	0.02000
4.9	0.02000	0.02000	0.02000	0.02000	0.02000
5.7	0.02000	0.02000	0.02000	0.02000	0.02000
6.5	0.02000	0.02000	0.02000	0.02000	0.02000
7.3	0.02000	0.02000	0.03000	0.03000	0.03000
8.2	0.03000	0.03000	0.03000	0.03000	0.03000
9.0	0.03000	0.03000	0.03000	0.03000	0.03000
9.8	0.03000	0.03000	0.03000	0.03000	0.03000
10.6	0.03000	0.03000	0.03000	0.03000	0.04000
11.4	0.04000	0.04000	0.04000	0.05000	0.05000
12.2	0.05000	0.05000	0.05000	0.05000	0.05000
13.0	0.06000	0.06000	0.06000	0.06000	0.06000
13.9	0.07000	0.08000	0.08000	0.08000	0.09000
14.7	0.09000	0.10000	0.11000	0.11000	0.12000
15.5	0.17000	0.26000	0.89000	0.14000	0.12000
16.3	0.10000	0.09000	0.08000	0.07000	0.06000
17.1	0.06000	0.05000	0.05000	0.05000	0.04000
17.9	0.04000	0.03000	0.03000	0.03000	0.03000
18.8	0.03000	0.03000	0.03000	0.03000	0.03000
19.6	0.03000	0.03000	0.02000	0.02000	0.02000
20.4	0.02000	0.02000	0.02000	0.02000	0.02000
21.2	0.02000	0.02000	0.02000	0.02000	0.02000
22.0	0.02000	0.02000	0.02000	0.02000	0.02000
22.8	0.02000	0.02000	0.02000	0.02000	0.02000
23.6	0.02000	0.00000	0.10000	0.10000	0.10000
24.5	0.10000	0.10000	0.10000	0.10000	0.11000
25.3	0.11000	0.11000	0.11000	0.11000	0.11000
26.1	0.11000	0.11000	0.11000	0.11000	0.11000
26.9	0.11000	0.12000	0.12000	0.12000	0.12000
27.7	0.12000	0.12000	0.12000	0.12000	0.12000
28.5	0.12000	0.12000	0.13000	0.13000	0.13000
29.4	0.13000	0.13000	0.13000	0.13000	0.13000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 2yr48hr

Label: DMA-1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
30.2	0.14000	0.14000	0.14000	0.14000	0.14000
31.0	0.14000	0.14000	0.15000	0.15000	0.15000
31.8	0.15000	0.15000	0.16000	0.16000	0.16000
32.6	0.16000	0.16000	0.17000	0.17000	0.17000
33.4	0.17000	0.18000	0.18000	0.18000	0.19000
34.2	0.19000	0.19000	0.20000	0.20000	0.20000
35.1	0.21000	0.21000	0.22000	0.22000	0.23000
35.9	0.29000	0.29000	0.30000	0.30000	0.31000
36.7	0.32000	0.33000	0.34000	0.35000	0.36000
37.5	0.38000	0.39000	0.44000	0.46000	0.48000
38.3	0.50000	0.55000	0.58000	0.65000	0.70000
39.1	0.73000	0.83000	1.24000	1.67000	4.37000
39.9	0.98000	0.76000	0.61000	0.52000	0.47000
40.8	0.40000	0.37000	0.35000	0.33000	0.31000
41.6	0.29000	0.25000	0.22000	0.21000	0.20000
42.4	0.19000	0.19000	0.18000	0.18000	0.17000
43.2	0.17000	0.16000	0.16000	0.15000	0.15000
44.0	0.15000	0.14000	0.14000	0.14000	0.13000
44.8	0.13000	0.13000	0.13000	0.12000	0.12000
45.7	0.12000	0.12000	0.12000	0.11000	0.11000
46.5	0.11000	0.11000	0.11000	0.11000	0.11000
47.3	0.10000	0.10000	0.10000	0.00000	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 2yr72hr

Label: DMA-1

Peak Discharge	4.37000 ft^3/s
Time to Peak	63.8 hours
Hydrograph Volume	28,466.565 ft^3

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.0	0.01000	0.01000	0.01000	0.01000	0.01000
0.8	0.01000	0.01000	0.01000	0.01000	0.01000
1.6	0.01000	0.01000	0.01000	0.01000	0.01000
2.4	0.01000	0.01000	0.01000	0.01000	0.01000
3.3	0.01000	0.01000	0.01000	0.01000	0.01000
4.1	0.01000	0.01000	0.01000	0.01000	0.01000
4.9	0.01000	0.01000	0.01000	0.01000	0.01000
5.7	0.01000	0.01000	0.01000	0.01000	0.01000
6.5	0.01000	0.01000	0.01000	0.01000	0.01000
7.3	0.01000	0.01000	0.01000	0.02000	0.02000
8.2	0.02000	0.02000	0.02000	0.02000	0.02000
9.0	0.02000	0.02000	0.02000	0.02000	0.02000
9.8	0.02000	0.02000	0.02000	0.02000	0.02000
10.6	0.02000	0.02000	0.02000	0.02000	0.02000
11.4	0.02000	0.02000	0.02000	0.03000	0.03000
12.2	0.03000	0.03000	0.03000	0.03000	0.03000
13.0	0.03000	0.04000	0.04000	0.04000	0.04000
13.9	0.04000	0.05000	0.05000	0.05000	0.05000
14.7	0.06000	0.06000	0.07000	0.07000	0.07000
15.5	0.11000	0.14000	0.58000	0.09000	0.07000
16.3	0.06000	0.05000	0.05000	0.04000	0.04000
17.1	0.03000	0.03000	0.03000	0.03000	0.02000
17.9	0.02000	0.02000	0.02000	0.02000	0.02000
18.8	0.02000	0.02000	0.02000	0.02000	0.02000
19.6	0.02000	0.02000	0.01000	0.01000	0.01000
20.4	0.01000	0.01000	0.01000	0.01000	0.01000
21.2	0.01000	0.01000	0.01000	0.01000	0.01000
22.0	0.01000	0.01000	0.01000	0.01000	0.01000
22.8	0.01000	0.01000	0.01000	0.01000	0.01000
23.6	0.01000	0.00000	0.02000	0.02000	0.02000
24.5	0.02000	0.02000	0.02000	0.02000	0.02000
25.3	0.02000	0.02000	0.02000	0.02000	0.02000
26.1	0.02000	0.02000	0.02000	0.02000	0.02000
26.9	0.02000	0.02000	0.02000	0.02000	0.02000
27.7	0.02000	0.02000	0.02000	0.02000	0.02000
28.5	0.02000	0.02000	0.02000	0.02000	0.02000
29.4	0.02000	0.02000	0.02000	0.02000	0.02000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 2yr72hr

Label: DMA-1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
30.2	0.02000	0.02000	0.02000	0.02000	0.02000
31.0	0.02000	0.02000	0.02000	0.02000	0.03000
31.8	0.03000	0.03000	0.03000	0.03000	0.03000
32.6	0.03000	0.03000	0.03000	0.03000	0.03000
33.4	0.03000	0.03000	0.03000	0.03000	0.03000
34.2	0.03000	0.03000	0.03000	0.03000	0.03000
35.1	0.03000	0.04000	0.04000	0.04000	0.04000
35.9	0.05000	0.05000	0.05000	0.05000	0.05000
36.7	0.05000	0.05000	0.06000	0.06000	0.06000
37.5	0.06000	0.06000	0.07000	0.08000	0.08000
38.3	0.08000	0.09000	0.09000	0.10000	0.11000
39.1	0.11000	0.12000	0.17000	0.26000	0.89000
39.9	0.14000	0.12000	0.10000	0.09000	0.08000
40.8	0.07000	0.06000	0.06000	0.05000	0.05000
41.6	0.05000	0.04000	0.04000	0.03000	0.03000
42.4	0.03000	0.03000	0.03000	0.03000	0.03000
43.2	0.03000	0.03000	0.03000	0.03000	0.02000
44.0	0.02000	0.02000	0.02000	0.02000	0.02000
44.8	0.02000	0.02000	0.02000	0.02000	0.02000
45.7	0.02000	0.02000	0.02000	0.02000	0.02000
46.5	0.02000	0.02000	0.02000	0.02000	0.02000
47.3	0.02000	0.02000	0.02000	0.00000	0.10000
48.1	0.10000	0.10000	0.10000	0.10000	0.10000
48.9	0.10000	0.11000	0.11000	0.11000	0.11000
49.7	0.11000	0.11000	0.11000	0.11000	0.11000
50.5	0.11000	0.11000	0.11000	0.12000	0.12000
51.4	0.12000	0.12000	0.12000	0.12000	0.12000
52.2	0.12000	0.12000	0.12000	0.12000	0.13000
53.0	0.13000	0.13000	0.13000	0.13000	0.13000
53.8	0.13000	0.13000	0.14000	0.14000	0.14000
54.6	0.14000	0.14000	0.14000	0.14000	0.15000
55.4	0.15000	0.15000	0.15000	0.15000	0.16000
56.3	0.16000	0.16000	0.16000	0.16000	0.17000
57.1	0.17000	0.17000	0.17000	0.18000	0.18000
57.9	0.18000	0.19000	0.19000	0.19000	0.20000
58.7	0.20000	0.20000	0.21000	0.21000	0.22000
59.5	0.22000	0.23000	0.29000	0.29000	0.30000
60.3	0.30000	0.31000	0.32000	0.33000	0.34000
61.1	0.35000	0.36000	0.38000	0.39000	0.44000
62.0	0.46000	0.48000	0.50000	0.55000	0.58000
62.8	0.65000	0.70000	0.73000	0.83000	1.24000
63.6	1.67000	4.37000	0.98000	0.76000	0.61000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 2yr72hr

Label: DMA-1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
64.4	0.52000	0.47000	0.40000	0.37000	0.35000
65.2	0.33000	0.31000	0.29000	0.25000	0.22000
66.0	0.21000	0.20000	0.19000	0.19000	0.18000
66.9	0.18000	0.17000	0.17000	0.16000	0.16000
67.7	0.15000	0.15000	0.15000	0.14000	0.14000
68.5	0.14000	0.13000	0.13000	0.13000	0.13000
69.3	0.12000	0.12000	0.12000	0.12000	0.12000
70.1	0.11000	0.11000	0.11000	0.11000	0.11000
70.9	0.11000	0.11000	0.10000	0.10000	0.10000
71.7	0.00000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation　　Scenario: 2yr24hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.008	0.015	0.023	0.030
0.3	0.038	0.045	0.052	0.059	0.066
0.5	0.073	0.079	0.086	0.092	0.099
0.8	0.105	0.111	0.117	0.123	0.129
1.0	0.135	0.141	0.147	0.153	0.159
1.3	0.166	0.172	0.178	0.183	0.189
1.5	0.195	0.200	0.206	0.211	0.217
1.8	0.222	0.227	0.232	0.237	0.242
2.0	0.247	0.251	0.256	0.261	0.265
2.3	0.270	0.274	0.279	0.283	0.287
2.5	0.291	0.295	0.299	0.303	0.307
2.8	0.311	0.315	0.318	0.322	0.326
3.0	0.329	0.333	0.337	0.342	0.346
3.3	0.350	0.354	0.358	0.361	0.365
3.5	0.369	0.373	0.376	0.380	0.383
3.8	0.387	0.390	0.393	0.397	0.400
4.0	0.403	0.406	0.409	0.412	0.415
4.3	0.418	0.421	0.424	0.427	0.430
4.5	0.432	0.435	0.438	0.440	0.443
4.8	0.445	0.448	0.451	0.454	0.457
5.0	0.460	0.463	0.466	0.469	0.472
5.3	0.475	0.478	0.480	0.483	0.486
5.5	0.488	0.491	0.494	0.496	0.499
5.8	0.501	0.502	0.504	0.506	0.507
6.0	0.509	0.511	0.512	0.514	0.517
6.3	0.519	0.521	0.523	0.525	0.528
6.5	0.530	0.532	0.534	0.536	0.538
6.8	0.541	0.543	0.545	0.547	0.549
7.0	0.552	0.554	0.556	0.558	0.560
7.3	0.563	0.565	0.568	0.571	0.573
7.5	0.576	0.579	0.582	0.584	0.587
7.8	0.590	0.592	0.595	0.598	0.601
8.0	0.603	0.606	0.609	0.612	0.616
8.3	0.619	0.622	0.625	0.629	0.632
8.5	0.635	0.638	0.642	0.645	0.648
8.8	0.651	0.655	0.658	0.661	0.665
9.0	0.669	0.673	0.676	0.680	0.684
9.3	0.688	0.692	0.695	0.699	0.703
9.5	0.707	0.711	0.715	0.719	0.724
9.8	0.728	0.732	0.737	0.741	0.745
10.0	0.750	0.754	0.759	0.764	0.769

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr24hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	0.774	0.778	0.783	0.788	0.793
10.5	0.798	0.803	0.809	0.814	0.819
10.8	0.825	0.830	0.836	0.841	0.846
11.0	0.852	0.858	0.863	0.869	0.875
11.3	0.881	0.887	0.893	0.900	0.906
11.5	0.913	0.919	0.926	0.932	0.939
11.8	0.946	0.954	0.962	0.972	0.982
12.0	0.992	1.002	1.009	1.016	1.024
12.3	1.031	1.039	1.046	1.054	1.061
12.5	1.069	1.077	1.085	1.093	1.101
12.8	1.109	1.117	1.126	1.135	1.143
13.0	1.152	1.161	1.170	1.179	1.189
13.3	1.198	1.208	1.217	1.227	1.237
13.5	1.247	1.258	1.268	1.279	1.290
13.8	1.301	1.313	1.325	1.338	1.351
14.0	1.364	1.378	1.391	1.405	1.420
14.3	1.434	1.449	1.463	1.479	1.495
14.5	1.511	1.529	1.546	1.564	1.583
14.8	1.602	1.622	1.643	1.665	1.687
15.0	1.710	1.733	1.756	1.780	1.805
15.3	1.830	1.857	1.886	1.919	1.956
15.5	1.998	2.047	2.100	2.159	2.236
15.8	2.345	2.483	2.624	2.721	2.767
16.0	2.773	2.765	2.756	2.745	2.733
16.3	2.720	2.707	2.695	2.682	2.670
16.5	2.659	2.648	2.637	2.628	2.618
16.8	2.609	2.600	2.592	2.584	2.577
17.0	2.570	2.564	2.558	2.553	2.548
17.3	2.543	2.539	2.535	2.531	2.527
17.5	2.524	2.521	2.518	2.515	2.511
17.8	2.508	2.505	2.501	2.498	2.494
18.0	2.491	2.487	2.484	2.480	2.477
18.3	2.473	2.469	2.466	2.462	2.459
18.5	2.455	2.452	2.449	2.446	2.442
18.8	2.439	2.436	2.433	2.430	2.427
19.0	2.424	2.421	2.418	2.415	2.413
19.3	2.410	2.407	2.404	2.402	2.399
19.5	2.396	2.394	2.391	2.389	2.386
19.8	2.384	2.381	2.379	2.377	2.374
20.0	2.372	2.370	2.368	2.366	2.364
20.3	2.361	2.359	2.357	2.355	2.353

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr24hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	2.351	2.350	2.348	2.346	2.344
20.8	2.342	2.340	2.338	2.337	2.335
21.0	2.333	2.332	2.330	2.329	2.327
21.3	2.326	2.324	2.323	2.321	2.320
21.5	2.318	2.317	2.315	2.314	2.312
21.8	2.311	2.310	2.309	2.308	2.306
22.0	2.305	2.304	2.303	2.302	2.301
22.3	2.299	2.298	2.297	2.296	2.295
22.5	2.294	2.293	2.292	2.291	2.290
22.8	2.289	2.288	2.287	2.286	2.285
23.0	2.285	2.284	2.283	2.283	2.282
23.3	2.281	2.280	2.279	2.278	2.277
23.5	2.276	2.276	2.275	2.274	2.272
23.8	2.270	2.266	2.262	2.257	2.253
24.0	2.249	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr48hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.002	0.003	0.005	0.006
0.3	0.008	0.009	0.010	0.012	0.013
0.5	0.015	0.016	0.017	0.018	0.020
0.8	0.021	0.022	0.023	0.025	0.026
1.0	0.027	0.028	0.029	0.030	0.031
1.3	0.033	0.034	0.035	0.036	0.037
1.5	0.038	0.039	0.040	0.041	0.041
1.8	0.042	0.043	0.044	0.045	0.046
2.0	0.047	0.048	0.048	0.049	0.050
2.3	0.051	0.052	0.052	0.053	0.054
2.5	0.055	0.055	0.056	0.057	0.057
2.8	0.058	0.059	0.059	0.060	0.061
3.0	0.061	0.062	0.062	0.063	0.064
3.3	0.064	0.065	0.065	0.066	0.066
3.5	0.067	0.068	0.068	0.069	0.069
3.8	0.070	0.070	0.071	0.071	0.071
4.0	0.072	0.072	0.073	0.073	0.074
4.3	0.074	0.074	0.075	0.075	0.076
4.5	0.076	0.076	0.077	0.077	0.078
4.8	0.078	0.078	0.079	0.079	0.079
5.0	0.080	0.080	0.080	0.081	0.081
5.3	0.081	0.082	0.082	0.082	0.082
5.5	0.083	0.083	0.083	0.084	0.084
5.8	0.084	0.084	0.085	0.085	0.085
6.0	0.085	0.086	0.086	0.086	0.086
6.3	0.087	0.087	0.087	0.087	0.087
6.5	0.088	0.088	0.088	0.088	0.088
6.8	0.089	0.089	0.089	0.089	0.089
7.0	0.090	0.090	0.090	0.090	0.090
7.3	0.090	0.091	0.091	0.091	0.091
7.5	0.091	0.091	0.092	0.093	0.094
7.8	0.094	0.095	0.096	0.097	0.098
8.0	0.099	0.100	0.100	0.101	0.102
8.3	0.103	0.103	0.104	0.105	0.106
8.5	0.106	0.107	0.108	0.108	0.109
8.8	0.110	0.110	0.111	0.112	0.112
9.0	0.113	0.113	0.114	0.115	0.115
9.3	0.116	0.116	0.117	0.117	0.118
9.5	0.118	0.119	0.119	0.120	0.120
9.8	0.121	0.121	0.122	0.122	0.123
10.0	0.123	0.124	0.124	0.124	0.125

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation		Scenario: 2yr48hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	0.125	0.126	0.126	0.126	0.127
10.5	0.127	0.128	0.128	0.128	0.129
10.8	0.129	0.129	0.130	0.130	0.130
11.0	0.131	0.131	0.131	0.132	0.133
11.3	0.134	0.135	0.136	0.137	0.138
11.5	0.139	0.140	0.141	0.142	0.143
11.8	0.143	0.145	0.146	0.147	0.149
12.0	0.151	0.152	0.154	0.155	0.157
12.3	0.158	0.160	0.161	0.162	0.164
12.5	0.165	0.167	0.168	0.169	0.170
12.8	0.172	0.173	0.174	0.175	0.177
13.0	0.178	0.180	0.182	0.184	0.186
13.3	0.188	0.189	0.191	0.193	0.195
13.5	0.196	0.198	0.200	0.201	0.203
13.8	0.204	0.206	0.208	0.211	0.213
14.0	0.216	0.219	0.222	0.225	0.227
14.3	0.230	0.233	0.235	0.238	0.241
14.5	0.244	0.247	0.251	0.254	0.257
14.8	0.260	0.264	0.267	0.271	0.275
15.0	0.279	0.284	0.288	0.292	0.296
15.3	0.300	0.305	0.310	0.315	0.322
15.5	0.330	0.340	0.352	0.365	0.387
15.8	0.423	0.473	0.518	0.546	0.562
16.0	0.567	0.569	0.571	0.572	0.573
16.3	0.574	0.574	0.574	0.574	0.573
16.5	0.573	0.572	0.571	0.570	0.569
16.8	0.568	0.566	0.565	0.563	0.561
17.0	0.559	0.557	0.555	0.553	0.550
17.3	0.548	0.545	0.543	0.540	0.537
17.5	0.535	0.532	0.530	0.527	0.524
17.8	0.521	0.518	0.515	0.512	0.508
18.0	0.505	0.502	0.497	0.492	0.487
18.3	0.482	0.476	0.471	0.466	0.462
18.5	0.457	0.452	0.447	0.443	0.438
18.8	0.434	0.430	0.425	0.421	0.417
19.0	0.413	0.409	0.405	0.401	0.397
19.3	0.393	0.390	0.386	0.382	0.379
19.5	0.375	0.372	0.368	0.365	0.362
19.8	0.358	0.355	0.351	0.348	0.344
20.0	0.340	0.336	0.333	0.329	0.326
20.3	0.322	0.319	0.315	0.312	0.309

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	0.306	0.303	0.299	0.296	0.293
20.8	0.290	0.287	0.285	0.282	0.279
21.0	0.276	0.274	0.271	0.268	0.266
21.3	0.263	0.261	0.258	0.256	0.253
21.5	0.251	0.249	0.246	0.244	0.242
21.8	0.240	0.238	0.236	0.233	0.231
22.0	0.229	0.227	0.225	0.224	0.222
22.3	0.220	0.218	0.216	0.214	0.213
22.5	0.211	0.209	0.208	0.206	0.204
22.8	0.203	0.201	0.200	0.198	0.197
23.0	0.195	0.194	0.192	0.191	0.189
23.3	0.188	0.187	0.185	0.184	0.183
23.5	0.182	0.180	0.179	0.178	0.176
23.8	0.174	0.172	0.170	0.171	0.174
24.0	0.179	0.184	0.189	0.194	0.198
24.3	0.203	0.208	0.212	0.217	0.221
24.5	0.226	0.230	0.234	0.238	0.243
24.8	0.247	0.251	0.255	0.258	0.262
25.0	0.266	0.270	0.274	0.279	0.283
25.3	0.287	0.291	0.295	0.299	0.303
25.5	0.307	0.311	0.315	0.319	0.322
25.8	0.326	0.329	0.333	0.336	0.340
26.0	0.343	0.346	0.350	0.353	0.356
26.3	0.359	0.362	0.365	0.368	0.371
26.5	0.374	0.376	0.379	0.382	0.385
26.8	0.387	0.390	0.392	0.395	0.398
27.0	0.400	0.403	0.406	0.409	0.412
27.3	0.415	0.418	0.421	0.424	0.427
27.5	0.430	0.432	0.435	0.438	0.440
27.8	0.443	0.445	0.448	0.450	0.453
28.0	0.455	0.457	0.460	0.462	0.464
28.3	0.466	0.469	0.471	0.473	0.475
28.5	0.477	0.479	0.481	0.483	0.485
28.8	0.487	0.489	0.491	0.494	0.496
29.0	0.499	0.501	0.502	0.504	0.506
29.3	0.507	0.509	0.511	0.512	0.514
29.5	0.516	0.517	0.519	0.521	0.522
29.8	0.524	0.526	0.527	0.529	0.531
30.0	0.532	0.534	0.536	0.538	0.540
30.3	0.542	0.545	0.547	0.549	0.551
30.5	0.553	0.555	0.558	0.560	0.562

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr48hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
30.8	0.564	0.566	0.569	0.571	0.573
31.0	0.575	0.577	0.580	0.582	0.584
31.3	0.586	0.589	0.592	0.595	0.597
31.5	0.600	0.603	0.605	0.608	0.611
31.8	0.614	0.616	0.619	0.622	0.624
32.0	0.627	0.630	0.633	0.637	0.640
32.3	0.643	0.646	0.650	0.653	0.656
32.5	0.659	0.663	0.666	0.669	0.672
32.8	0.676	0.679	0.682	0.686	0.690
33.0	0.693	0.697	0.701	0.705	0.709
33.3	0.712	0.716	0.720	0.724	0.728
33.5	0.732	0.736	0.740	0.744	0.749
33.8	0.753	0.757	0.762	0.766	0.770
34.0	0.775	0.779	0.784	0.789	0.794
34.3	0.799	0.804	0.809	0.813	0.818
34.5	0.823	0.829	0.834	0.839	0.845
34.8	0.850	0.856	0.861	0.866	0.872
35.0	0.878	0.883	0.889	0.895	0.901
35.3	0.907	0.913	0.920	0.926	0.932
35.5	0.939	0.945	0.952	0.959	0.965
35.8	0.973	0.981	0.990	1.000	1.007
36.0	1.015	1.022	1.029	1.036	1.044
36.3	1.051	1.059	1.066	1.074	1.081
36.5	1.089	1.097	1.105	1.113	1.121
36.8	1.130	1.138	1.147	1.155	1.164
37.0	1.173	1.182	1.191	1.201	1.210
37.3	1.219	1.229	1.239	1.249	1.259
37.5	1.269	1.280	1.290	1.301	1.312
37.8	1.324	1.336	1.348	1.361	1.375
38.0	1.388	1.402	1.415	1.430	1.444
38.3	1.458	1.473	1.488	1.504	1.521
38.5	1.538	1.555	1.573	1.592	1.611
38.8	1.630	1.651	1.672	1.694	1.717
39.0	1.740	1.763	1.787	1.811	1.836
39.3	1.863	1.890	1.921	1.957	1.997
39.5	2.043	2.095	2.152	2.221	2.318
39.8	2.444	2.588	2.706	2.768	2.783
40.0	2.775	2.765	2.754	2.742	2.729
40.3	2.716	2.703	2.690	2.677	2.665
40.5	2.654	2.643	2.633	2.623	2.614
40.8	2.605	2.596	2.588	2.580	2.573

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
41.0	2.567	2.561	2.555	2.550	2.545
41.3	2.541	2.537	2.533	2.529	2.526
41.5	2.522	2.519	2.516	2.513	2.509
41.8	2.506	2.503	2.499	2.496	2.492
42.0	2.489	2.485	2.482	2.478	2.474
42.3	2.471	2.467	2.464	2.460	2.457
42.5	2.453	2.450	2.447	2.444	2.440
42.8	2.437	2.434	2.431	2.428	2.425
43.0	2.422	2.419	2.416	2.414	2.411
43.3	2.408	2.406	2.403	2.400	2.397
43.5	2.395	2.392	2.390	2.387	2.385
43.8	2.382	2.380	2.377	2.375	2.373
44.0	2.371	2.369	2.367	2.364	2.362
44.3	2.360	2.358	2.356	2.354	2.352
44.5	2.350	2.349	2.347	2.345	2.343
44.8	2.341	2.339	2.337	2.336	2.334
45.0	2.332	2.331	2.329	2.328	2.326
45.3	2.325	2.323	2.322	2.320	2.319
45.5	2.317	2.316	2.314	2.313	2.312
45.8	2.310	2.309	2.308	2.307	2.306
46.0	2.305	2.304	2.302	2.301	2.300
46.3	2.299	2.297	2.296	2.295	2.294
46.5	2.293	2.292	2.291	2.290	2.289
46.8	2.288	2.287	2.287	2.286	2.285
47.0	2.284	2.283	2.283	2.282	2.281
47.3	2.280	2.280	2.279	2.278	2.277
47.5	2.276	2.275	2.274	2.273	2.271
47.8	2.267	2.263	2.259	2.255	2.251
48.0	2.247	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.001	0.002	0.002	0.003
0.3	0.004	0.004	0.005	0.006	0.007
0.5	0.007	0.008	0.009	0.009	0.010
0.8	0.011	0.011	0.012	0.012	0.013
1.0	0.013	0.014	0.015	0.015	0.016
1.3	0.016	0.017	0.017	0.018	0.018
1.5	0.019	0.019	0.020	0.020	0.021
1.8	0.021	0.022	0.022	0.023	0.023
2.0	0.023	0.024	0.024	0.025	0.025
2.3	0.025	0.026	0.026	0.027	0.027
2.5	0.027	0.028	0.028	0.028	0.029
2.8	0.029	0.029	0.030	0.030	0.030
3.0	0.031	0.031	0.031	0.032	0.032
3.3	0.032	0.032	0.033	0.033	0.033
3.5	0.033	0.034	0.034	0.034	0.035
3.8	0.035	0.035	0.035	0.035	0.036
4.0	0.036	0.036	0.036	0.037	0.037
4.3	0.037	0.037	0.037	0.038	0.038
4.5	0.038	0.038	0.038	0.039	0.039
4.8	0.039	0.039	0.039	0.040	0.040
5.0	0.040	0.040	0.040	0.040	0.040
5.3	0.041	0.041	0.041	0.041	0.041
5.5	0.041	0.042	0.042	0.042	0.042
5.8	0.042	0.042	0.042	0.042	0.043
6.0	0.043	0.043	0.043	0.043	0.043
6.3	0.043	0.043	0.043	0.044	0.044
6.5	0.044	0.044	0.044	0.044	0.044
6.8	0.044	0.044	0.045	0.045	0.045
7.0	0.045	0.045	0.045	0.045	0.045
7.3	0.045	0.045	0.045	0.045	0.046
7.5	0.046	0.046	0.046	0.046	0.046
7.8	0.046	0.047	0.048	0.049	0.049
8.0	0.050	0.051	0.052	0.052	0.053
8.3	0.054	0.055	0.055	0.056	0.057
8.5	0.057	0.058	0.059	0.059	0.060
8.8	0.061	0.061	0.062	0.063	0.063
9.0	0.064	0.064	0.065	0.065	0.066
9.3	0.067	0.067	0.068	0.068	0.069
9.5	0.069	0.070	0.070	0.071	0.071
9.8	0.071	0.072	0.072	0.073	0.073
10.0	0.074	0.074	0.075	0.075	0.075

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	0.076	0.076	0.077	0.077	0.077
10.5	0.078	0.078	0.078	0.079	0.079
10.8	0.079	0.080	0.080	0.080	0.081
11.0	0.081	0.081	0.082	0.082	0.082
11.3	0.082	0.083	0.083	0.083	0.084
11.5	0.084	0.084	0.084	0.085	0.085
11.8	0.085	0.086	0.086	0.087	0.088
12.0	0.089	0.090	0.091	0.092	0.093
12.3	0.094	0.095	0.096	0.096	0.097
12.5	0.098	0.099	0.100	0.101	0.101
12.8	0.102	0.103	0.104	0.104	0.105
13.0	0.106	0.106	0.107	0.108	0.110
13.3	0.111	0.112	0.114	0.115	0.117
13.5	0.118	0.119	0.120	0.122	0.123
13.8	0.124	0.125	0.127	0.128	0.129
14.0	0.131	0.133	0.135	0.136	0.138
14.3	0.140	0.142	0.143	0.145	0.147
14.5	0.148	0.150	0.152	0.154	0.156
14.8	0.159	0.161	0.163	0.165	0.168
15.0	0.171	0.173	0.176	0.179	0.182
15.3	0.184	0.187	0.190	0.193	0.198
15.5	0.203	0.209	0.215	0.222	0.235
15.8	0.257	0.290	0.325	0.351	0.366
16.0	0.370	0.371	0.372	0.371	0.371
16.3	0.370	0.369	0.368	0.367	0.365
16.5	0.364	0.362	0.360	0.359	0.357
16.8	0.355	0.352	0.350	0.348	0.346
17.0	0.343	0.341	0.338	0.335	0.332
17.3	0.330	0.327	0.324	0.322	0.319
17.5	0.316	0.314	0.311	0.309	0.306
17.8	0.303	0.300	0.297	0.294	0.291
18.0	0.288	0.285	0.282	0.279	0.277
18.3	0.274	0.271	0.269	0.266	0.264
18.5	0.261	0.259	0.256	0.254	0.251
18.8	0.249	0.247	0.245	0.242	0.240
19.0	0.238	0.236	0.234	0.232	0.230
19.3	0.228	0.226	0.224	0.222	0.220
19.5	0.218	0.216	0.215	0.213	0.211
19.8	0.209	0.208	0.205	0.203	0.201
20.0	0.198	0.196	0.194	0.192	0.190
20.3	0.187	0.185	0.183	0.181	0.179

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation　　Scenario: 2yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	0.177	0.175	0.173	0.171	0.170
20.8	0.168	0.166	0.164	0.162	0.161
21.0	0.159	0.157	0.156	0.154	0.152
21.3	0.151	0.149	0.148	0.146	0.145
21.5	0.143	0.142	0.140	0.139	0.138
21.8	0.136	0.135	0.134	0.132	0.131
22.0	0.130	0.129	0.128	0.126	0.125
22.3	0.124	0.123	0.122	0.121	0.120
22.5	0.119	0.117	0.116	0.115	0.114
22.8	0.113	0.112	0.112	0.111	0.110
23.0	0.109	0.108	0.107	0.106	0.105
23.3	0.104	0.104	0.103	0.102	0.101
23.5	0.100	0.100	0.099	0.098	0.097
23.8	0.096	0.095	0.093	0.093	0.092
24.0	0.092	0.093	0.093	0.093	0.093
24.3	0.093	0.093	0.093	0.093	0.094
24.5	0.094	0.094	0.094	0.094	0.094
24.8	0.094	0.094	0.094	0.095	0.095
25.0	0.095	0.095	0.095	0.095	0.095
25.3	0.095	0.095	0.095	0.095	0.096
25.5	0.096	0.096	0.096	0.096	0.096
25.8	0.096	0.096	0.096	0.096	0.096
26.0	0.096	0.096	0.097	0.097	0.097
26.3	0.097	0.097	0.097	0.097	0.097
26.5	0.097	0.097	0.097	0.097	0.097
26.8	0.097	0.097	0.097	0.098	0.098
27.0	0.098	0.098	0.098	0.098	0.098
27.3	0.098	0.098	0.098	0.098	0.098
27.5	0.098	0.098	0.098	0.098	0.098
27.8	0.098	0.098	0.098	0.098	0.099
28.0	0.099	0.099	0.099	0.099	0.099
28.3	0.099	0.099	0.099	0.099	0.099
28.5	0.099	0.099	0.099	0.099	0.099
28.8	0.099	0.099	0.099	0.099	0.099
29.0	0.099	0.099	0.099	0.099	0.099
29.3	0.099	0.099	0.099	0.099	0.099
29.5	0.099	0.099	0.100	0.100	0.100
29.8	0.100	0.100	0.100	0.100	0.100
30.0	0.100	0.100	0.100	0.100	0.100
30.3	0.100	0.100	0.100	0.100	0.100
30.5	0.100	0.100	0.100	0.100	0.100

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
30.8	0.100	0.100	0.100	0.100	0.100
31.0	0.100	0.100	0.100	0.100	0.100
31.3	0.100	0.100	0.100	0.100	0.100
31.5	0.100	0.101	0.101	0.102	0.103
31.8	0.103	0.104	0.105	0.105	0.106
32.0	0.107	0.108	0.108	0.109	0.110
32.3	0.110	0.111	0.111	0.112	0.113
32.5	0.113	0.114	0.114	0.115	0.116
32.8	0.116	0.117	0.117	0.118	0.118
33.0	0.119	0.119	0.120	0.120	0.121
33.3	0.121	0.122	0.122	0.123	0.123
33.5	0.124	0.124	0.124	0.125	0.125
33.8	0.126	0.126	0.126	0.127	0.127
34.0	0.128	0.128	0.128	0.129	0.129
34.3	0.129	0.130	0.130	0.130	0.131
34.5	0.131	0.131	0.132	0.132	0.132
34.8	0.133	0.133	0.133	0.133	0.134
35.0	0.134	0.134	0.135	0.135	0.136
35.3	0.137	0.138	0.139	0.140	0.141
35.5	0.142	0.143	0.144	0.145	0.145
35.8	0.146	0.148	0.149	0.151	0.152
36.0	0.154	0.155	0.157	0.158	0.160
36.3	0.161	0.162	0.164	0.165	0.167
36.5	0.168	0.169	0.170	0.172	0.173
36.8	0.174	0.175	0.177	0.178	0.179
37.0	0.181	0.183	0.185	0.187	0.188
37.3	0.190	0.192	0.194	0.195	0.197
37.5	0.199	0.200	0.202	0.203	0.205
37.8	0.207	0.209	0.211	0.213	0.216
38.0	0.219	0.222	0.225	0.227	0.230
38.3	0.233	0.235	0.238	0.241	0.244
38.5	0.247	0.250	0.253	0.257	0.260
38.8	0.263	0.267	0.271	0.274	0.279
39.0	0.283	0.287	0.291	0.295	0.299
39.3	0.304	0.308	0.314	0.320	0.328
39.5	0.337	0.347	0.360	0.379	0.409
39.8	0.454	0.506	0.538	0.558	0.567
40.0	0.569	0.570	0.572	0.573	0.573
40.3	0.574	0.574	0.574	0.573	0.573
40.5	0.572	0.572	0.571	0.570	0.568
40.8	0.567	0.565	0.564	0.562	0.560

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
41.0	0.558	0.555	0.553	0.551	0.549
41.3	0.546	0.544	0.541	0.538	0.536
41.5	0.533	0.531	0.528	0.525	0.522
41.8	0.519	0.516	0.513	0.510	0.506
42.0	0.503	0.499	0.494	0.489	0.484
42.3	0.478	0.473	0.468	0.464	0.459
42.5	0.454	0.449	0.445	0.440	0.436
42.8	0.431	0.427	0.423	0.419	0.414
43.0	0.410	0.406	0.402	0.399	0.395
43.3	0.391	0.387	0.384	0.380	0.377
43.5	0.373	0.370	0.366	0.363	0.360
43.8	0.356	0.353	0.349	0.345	0.342
44.0	0.338	0.334	0.331	0.327	0.324
44.3	0.320	0.317	0.313	0.310	0.307
44.5	0.304	0.301	0.298	0.295	0.292
44.8	0.289	0.286	0.283	0.280	0.277
45.0	0.275	0.272	0.269	0.267	0.264
45.3	0.262	0.259	0.257	0.254	0.252
45.5	0.250	0.247	0.245	0.243	0.241
45.8	0.238	0.236	0.234	0.232	0.230
46.0	0.228	0.226	0.224	0.222	0.221
46.3	0.219	0.217	0.215	0.213	0.212
46.5	0.210	0.208	0.207	0.205	0.203
46.8	0.202	0.200	0.199	0.197	0.196
47.0	0.194	0.193	0.191	0.190	0.189
47.3	0.187	0.186	0.185	0.183	0.182
47.5	0.181	0.180	0.178	0.177	0.175
47.8	0.173	0.171	0.171	0.173	0.177
48.0	0.182	0.187	0.192	0.197	0.202
48.3	0.206	0.211	0.215	0.220	0.224
48.5	0.229	0.233	0.237	0.241	0.245
48.8	0.249	0.253	0.257	0.261	0.265
49.0	0.269	0.273	0.277	0.282	0.286
49.3	0.290	0.294	0.298	0.302	0.306
49.5	0.310	0.314	0.317	0.321	0.325
49.8	0.328	0.332	0.335	0.339	0.342
50.0	0.345	0.348	0.352	0.355	0.358
50.3	0.361	0.364	0.367	0.370	0.373
50.5	0.376	0.378	0.381	0.384	0.386
50.8	0.389	0.392	0.394	0.397	0.399
51.0	0.402	0.405	0.408	0.411	0.414

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation | Scenario: 2yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
51.3	0.417	0.420	0.423	0.426	0.429
51.5	0.432	0.434	0.437	0.439	0.442
51.8	0.445	0.447	0.450	0.452	0.454
52.0	0.457	0.459	0.461	0.463	0.466
52.3	0.468	0.470	0.472	0.474	0.476
52.5	0.478	0.480	0.482	0.484	0.486
52.8	0.488	0.490	0.493	0.495	0.498
53.0	0.500	0.502	0.504	0.505	0.507
53.3	0.509	0.510	0.512	0.513	0.515
53.5	0.517	0.518	0.520	0.522	0.523
53.8	0.525	0.527	0.528	0.530	0.532
54.0	0.533	0.535	0.537	0.539	0.542
54.3	0.544	0.546	0.548	0.550	0.552
54.5	0.555	0.557	0.559	0.561	0.563
54.8	0.566	0.568	0.570	0.572	0.574
55.0	0.577	0.579	0.581	0.583	0.586
55.3	0.588	0.591	0.594	0.596	0.599
55.5	0.602	0.604	0.607	0.610	0.613
55.8	0.615	0.618	0.621	0.624	0.626
56.0	0.629	0.632	0.635	0.639	0.642
56.3	0.645	0.648	0.652	0.655	0.658
56.5	0.661	0.665	0.668	0.671	0.674
56.8	0.678	0.681	0.685	0.688	0.692
57.0	0.696	0.700	0.703	0.707	0.711
57.3	0.715	0.719	0.722	0.726	0.730
57.5	0.734	0.738	0.743	0.747	0.751
57.8	0.756	0.760	0.764	0.769	0.773
58.0	0.778	0.783	0.787	0.792	0.797
58.3	0.802	0.807	0.812	0.817	0.822
58.5	0.827	0.832	0.838	0.843	0.848
58.8	0.854	0.859	0.864	0.870	0.876
59.0	0.881	0.887	0.893	0.899	0.905
59.3	0.911	0.917	0.924	0.930	0.937
59.5	0.943	0.949	0.956	0.963	0.970
59.8	0.978	0.987	0.997	1.005	1.012
60.0	1.019	1.026	1.034	1.041	1.048
60.3	1.056	1.063	1.071	1.079	1.086
60.5	1.094	1.102	1.110	1.118	1.127
60.8	1.135	1.144	1.152	1.161	1.170
61.0	1.179	1.188	1.197	1.206	1.216
61.3	1.225	1.235	1.245	1.255	1.265

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
61.5	1.276	1.286	1.297	1.308	1.319
61.8	1.331	1.344	1.357	1.370	1.383
62.0	1.397	1.410	1.424	1.439	1.453
62.3	1.468	1.483	1.498	1.514	1.531
62.5	1.549	1.567	1.585	1.603	1.623
62.8	1.643	1.664	1.686	1.708	1.731
63.0	1.754	1.778	1.802	1.827	1.853
63.3	1.880	1.909	1.943	1.981	2.025
63.5	2.075	2.130	2.192	2.276	2.391
63.8	2.536	2.671	2.753	2.785	2.785
64.0	2.775	2.763	2.751	2.738	2.724
64.3	2.711	2.697	2.684	2.672	2.660
64.5	2.649	2.638	2.628	2.618	2.609
64.8	2.600	2.592	2.584	2.576	2.570
65.0	2.563	2.558	2.552	2.547	2.543
65.3	2.539	2.534	2.531	2.527	2.524
65.5	2.520	2.517	2.514	2.511	2.507
65.8	2.504	2.501	2.497	2.494	2.490
66.0	2.487	2.483	2.479	2.476	2.472
66.3	2.469	2.465	2.462	2.458	2.455
66.5	2.451	2.448	2.445	2.442	2.438
66.8	2.435	2.432	2.429	2.426	2.423
67.0	2.421	2.418	2.415	2.412	2.409
67.3	2.407	2.404	2.401	2.398	2.396
67.5	2.393	2.391	2.388	2.386	2.383
67.8	2.381	2.378	2.376	2.374	2.372
68.0	2.370	2.367	2.365	2.363	2.361
68.3	2.359	2.357	2.355	2.353	2.351
68.5	2.349	2.347	2.346	2.344	2.342
68.8	2.340	2.338	2.336	2.335	2.333
69.0	2.331	2.330	2.328	2.327	2.325
69.3	2.324	2.322	2.321	2.319	2.318
69.5	2.316	2.315	2.313	2.312	2.311
69.8	2.310	2.308	2.307	2.306	2.305
70.0	2.304	2.303	2.302	2.300	2.299
70.3	2.298	2.297	2.296	2.294	2.293
70.5	2.292	2.291	2.290	2.289	2.289
70.8	2.288	2.287	2.286	2.285	2.285
71.0	2.284	2.283	2.282	2.282	2.281
71.3	2.280	2.279	2.278	2.277	2.276
71.5	2.275	2.275	2.274	2.272	2.269

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
71.8	2.265	2.260	2.256	2.252	2.248
72.0	2.244	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr24hr

Label: BMP1

Time vs. Volume (ft^3)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)
0.0	0.000	18.000	35.000	53.000	70.000
0.3	87.000	103.000	119.000	135.000	151.000
0.5	167.000	182.000	197.000	212.000	226.000
0.8	241.000	255.000	269.000	283.000	296.000
1.0	310.000	323.000	337.000	351.000	366.000
1.3	380.000	393.000	407.000	420.000	433.000
1.5	446.000	459.000	472.000	484.000	496.000
1.8	508.000	520.000	532.000	543.000	554.000
2.0	565.000	576.000	587.000	598.000	608.000
2.3	618.000	629.000	638.000	648.000	658.000
2.5	667.000	677.000	686.000	695.000	704.000
2.8	713.000	721.000	730.000	738.000	747.000
3.0	755.000	764.000	774.000	783.000	792.000
3.3	802.000	811.000	820.000	828.000	837.000
3.5	846.000	854.000	862.000	870.000	878.000
3.8	886.000	894.000	902.000	909.000	917.000
4.0	924.000	931.000	938.000	945.000	952.000
4.3	959.000	965.000	972.000	978.000	985.000
4.5	991.000	997.000	1,003.000	1,009.000	1,015.000
4.8	1,021.000	1,027.000	1,034.000	1,041.000	1,048.000
5.0	1,055.000	1,062.000	1,069.000	1,075.000	1,082.000
5.3	1,088.000	1,095.000	1,101.000	1,107.000	1,114.000
5.5	1,120.000	1,126.000	1,131.000	1,137.000	1,143.000
5.8	1,148.000	1,151.000	1,155.000	1,159.000	1,163.000
6.0	1,167.000	1,171.000	1,175.000	1,179.000	1,184.000
6.3	1,189.000	1,194.000	1,199.000	1,204.000	1,209.000
6.5	1,214.000	1,219.000	1,224.000	1,229.000	1,234.000
6.8	1,239.000	1,244.000	1,249.000	1,254.000	1,259.000
7.0	1,264.000	1,269.000	1,274.000	1,279.000	1,284.000
7.3	1,290.000	1,296.000	1,302.000	1,308.000	1,314.000
7.5	1,320.000	1,327.000	1,333.000	1,339.000	1,345.000
7.8	1,352.000	1,358.000	1,364.000	1,370.000	1,377.000
8.0	1,383.000	1,389.000	1,396.000	1,403.000	1,411.000
8.3	1,418.000	1,426.000	1,433.000	1,441.000	1,448.000
8.5	1,456.000	1,463.000	1,471.000	1,478.000	1,486.000
8.8	1,493.000	1,501.000	1,508.000	1,516.000	1,525.000
9.0	1,533.000	1,542.000	1,551.000	1,559.000	1,568.000
9.3	1,577.000	1,585.000	1,594.000	1,603.000	1,611.000
9.5	1,620.000	1,629.000	1,639.000	1,649.000	1,659.000
9.8	1,669.000	1,679.000	1,688.000	1,698.000	1,708.000
10.0	1,718.000	1,729.000	1,741.000	1,754.000	1,767.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr24hr

Label: BMP1

Time vs. Volume (ft^3)

Output Time increment = 0.1 hours

Time on left represents time for first value in each row.

Time (hours)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)
10.3	1,781.000	1,796.000	1,811.000	1,827.000	1,844.000
10.5	1,863.000	1,882.000	1,904.000	1,927.000	1,950.000
10.8	1,975.000	2,001.000	2,027.000	2,054.000	2,081.000
11.0	2,108.000	2,136.000	2,165.000	2,194.000	2,223.000
11.3	2,252.000	2,281.000	2,311.000	2,342.000	2,374.000
11.5	2,405.000	2,437.000	2,469.000	2,501.000	2,534.000
11.8	2,569.000	2,606.000	2,648.000	2,695.000	2,745.000
12.0	2,795.000	2,840.000	2,875.000	2,911.000	2,947.000
12.3	2,983.000	3,020.000	3,056.000	3,093.000	3,129.000
12.5	3,167.000	3,205.000	3,243.000	3,282.000	3,322.000
12.8	3,362.000	3,403.000	3,444.000	3,485.000	3,528.000
13.0	3,571.000	3,614.000	3,658.000	3,702.000	3,747.000
13.3	3,793.000	3,839.000	3,885.000	3,933.000	3,981.000
13.5	4,030.000	4,080.000	4,131.000	4,183.000	4,235.000
13.8	4,289.000	4,346.000	4,405.000	4,466.000	4,529.000
14.0	4,592.000	4,657.000	4,723.000	4,790.000	4,857.000
14.3	4,926.000	4,996.000	5,067.000	5,140.000	5,216.000
14.5	5,295.000	5,378.000	5,462.000	5,548.000	5,636.000
14.8	5,727.000	5,822.000	5,921.000	6,023.000	6,128.000
15.0	6,235.000	6,344.000	6,455.000	6,567.000	6,682.000
15.3	6,802.000	6,927.000	7,061.000	7,213.000	7,387.000
15.5	7,582.000	7,806.000	8,052.000	8,322.000	8,671.000
15.8	9,163.000	9,781.000	10,403.000	10,826.000	11,021.000
16.0	11,050.000	11,016.000	10,975.000	10,927.000	10,875.000
16.3	10,821.000	10,766.000	10,710.000	10,656.000	10,604.000
16.5	10,553.000	10,506.000	10,461.000	10,418.000	10,377.000
16.8	10,337.000	10,298.000	10,262.000	10,227.000	10,195.000
17.0	10,166.000	10,138.000	10,113.000	10,090.000	10,068.000
17.3	10,048.000	10,029.000	10,011.000	9,994.000	9,978.000
17.5	9,963.000	9,949.000	9,935.000	9,921.000	9,907.000
17.8	9,892.000	9,877.000	9,862.000	9,847.000	9,832.000
18.0	9,816.000	9,800.000	9,785.000	9,769.000	9,753.000
18.3	9,737.000	9,721.000	9,705.000	9,690.000	9,674.000
18.5	9,658.000	9,644.000	9,629.000	9,615.000	9,601.000
18.8	9,586.000	9,572.000	9,558.000	9,545.000	9,532.000
19.0	9,519.000	9,506.000	9,493.000	9,480.000	9,467.000
19.3	9,455.000	9,444.000	9,431.000	9,419.000	9,407.000
19.5	9,395.000	9,384.000	9,373.000	9,362.000	9,350.000
19.8	9,339.000	9,328.000	9,317.000	9,306.000	9,296.000
20.0	9,286.000	9,277.000	9,268.000	9,258.000	9,248.000
20.3	9,238.000	9,229.000	9,220.000	9,211.000	9,202.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr24hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	9,194.000	9,185.000	9,177.000	9,169.000	9,160.000
20.8	9,151.000	9,143.000	9,135.000	9,127.000	9,119.000
21.0	9,112.000	9,105.000	9,098.000	9,091.000	9,085.000
21.3	9,078.000	9,071.000	9,064.000	9,057.000	9,050.000
21.5	9,043.000	9,036.000	9,030.000	9,024.000	9,018.000
21.8	9,012.000	9,007.000	9,001.000	8,996.000	8,991.000
22.0	8,986.000	8,981.000	8,976.000	8,970.000	8,965.000
22.3	8,959.000	8,953.000	8,948.000	8,943.000	8,938.000
22.5	8,933.000	8,928.000	8,924.000	8,919.000	8,915.000
22.8	8,911.000	8,907.000	8,903.000	8,900.000	8,896.000
23.0	8,893.000	8,889.000	8,886.000	8,883.000	8,880.000
23.3	8,876.000	8,872.000	8,868.000	8,863.000	8,859.000
23.5	8,855.000	8,851.000	8,848.000	8,844.000	8,837.000
23.8	8,825.000	8,807.000	8,788.000	8,769.000	8,751.000
24.0	8,733.000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr48hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	4.000	7.000	11.000	14.000
0.3	17.000	21.000	24.000	27.000	30.000
0.5	33.000	36.000	39.000	42.000	45.000
0.8	48.000	51.000	54.000	57.000	59.000
1.0	62.000	64.000	67.000	70.000	72.000
1.3	75.000	77.000	79.000	82.000	84.000
1.5	86.000	89.000	91.000	93.000	95.000
1.8	97.000	99.000	101.000	103.000	105.000
2.0	107.000	109.000	111.000	113.000	115.000
2.3	117.000	118.000	120.000	122.000	123.000
2.5	125.000	127.000	128.000	130.000	132.000
2.8	133.000	135.000	136.000	138.000	139.000
3.0	140.000	142.000	143.000	145.000	146.000
3.3	147.000	149.000	150.000	151.000	152.000
3.5	154.000	155.000	156.000	157.000	158.000
3.8	159.000	161.000	162.000	163.000	164.000
4.0	165.000	166.000	167.000	168.000	169.000
4.3	170.000	171.000	172.000	173.000	174.000
4.5	174.000	175.000	176.000	177.000	178.000
4.8	179.000	179.000	180.000	181.000	182.000
5.0	183.000	183.000	184.000	185.000	186.000
5.3	186.000	187.000	188.000	188.000	189.000
5.5	190.000	190.000	191.000	192.000	192.000
5.8	193.000	193.000	194.000	195.000	195.000
6.0	196.000	196.000	197.000	197.000	198.000
6.3	198.000	199.000	199.000	200.000	200.000
6.5	201.000	201.000	202.000	202.000	203.000
6.8	203.000	204.000	204.000	204.000	205.000
7.0	205.000	206.000	206.000	206.000	207.000
7.3	207.000	208.000	208.000	208.000	209.000
7.5	209.000	210.000	211.000	212.000	215.000
7.8	217.000	219.000	221.000	223.000	224.000
8.0	226.000	228.000	230.000	232.000	234.000
8.3	235.000	237.000	239.000	240.000	242.000
8.5	244.000	245.000	247.000	248.000	250.000
8.8	251.000	253.000	254.000	256.000	257.000
9.0	259.000	260.000	261.000	263.000	264.000
9.3	265.000	267.000	268.000	269.000	270.000
9.5	271.000	273.000	274.000	275.000	276.000
9.8	277.000	278.000	279.000	280.000	281.000
10.0	282.000	283.000	284.000	285.000	286.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.3	287.000	288.000	289.000	290.000	291.000
10.5	292.000	293.000	293.000	294.000	295.000
10.8	296.000	297.000	297.000	298.000	299.000
11.0	300.000	300.000	301.000	302.000	304.000
11.3	306.000	309.000	311.000	313.000	316.000
11.5	318.000	320.000	322.000	325.000	327.000
11.8	329.000	331.000	334.000	338.000	341.000
12.0	345.000	349.000	352.000	356.000	359.000
12.3	363.000	366.000	369.000	372.000	376.000
12.5	379.000	382.000	385.000	388.000	391.000
12.8	394.000	397.000	399.000	402.000	405.000
13.0	409.000	413.000	418.000	422.000	426.000
13.3	430.000	434.000	438.000	442.000	446.000
13.5	450.000	454.000	458.000	461.000	465.000
13.8	469.000	473.000	478.000	483.000	489.000
14.0	495.000	502.000	508.000	515.000	521.000
14.3	527.000	533.000	539.000	546.000	552.000
14.5	560.000	567.000	574.000	581.000	589.000
14.8	596.000	604.000	613.000	621.000	631.000
15.0	640.000	650.000	660.000	669.000	679.000
15.3	688.000	699.000	710.000	723.000	739.000
15.5	757.000	779.000	806.000	837.000	886.000
15.8	969.000	1,084.000	1,188.000	1,252.000	1,287.000
16.0	1,300.000	1,305.000	1,308.000	1,311.000	1,313.000
16.3	1,314.000	1,315.000	1,315.000	1,315.000	1,314.000
16.5	1,313.000	1,311.000	1,309.000	1,307.000	1,304.000
16.8	1,301.000	1,298.000	1,294.000	1,290.000	1,286.000
17.0	1,281.000	1,276.000	1,271.000	1,266.000	1,261.000
17.3	1,256.000	1,250.000	1,244.000	1,238.000	1,232.000
17.5	1,226.000	1,220.000	1,214.000	1,208.000	1,201.000
17.8	1,194.000	1,187.000	1,180.000	1,173.000	1,165.000
18.0	1,158.000	1,150.000	1,140.000	1,128.000	1,116.000
18.3	1,104.000	1,092.000	1,081.000	1,069.000	1,058.000
18.5	1,047.000	1,036.000	1,026.000	1,015.000	1,005.000
18.8	995.000	985.000	975.000	965.000	956.000
19.0	946.000	937.000	928.000	919.000	910.000
19.3	902.000	893.000	885.000	876.000	868.000
19.5	860.000	852.000	844.000	837.000	829.000
19.8	822.000	814.000	806.000	797.000	788.000
20.0	780.000	771.000	763.000	755.000	747.000
20.3	739.000	731.000	723.000	715.000	708.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr48hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	701.000	693.000	686.000	679.000	672.000
20.8	666.000	659.000	652.000	646.000	639.000
21.0	633.000	627.000	621.000	615.000	609.000
21.3	603.000	597.000	592.000	586.000	581.000
21.5	575.000	570.000	565.000	560.000	555.000
21.8	550.000	545.000	540.000	535.000	530.000
22.0	526.000	521.000	517.000	512.000	508.000
22.3	504.000	500.000	495.000	491.000	487.000
22.5	483.000	479.000	476.000	472.000	468.000
22.8	465.000	461.000	457.000	454.000	450.000
23.0	447.000	444.000	441.000	437.000	434.000
23.3	431.000	428.000	425.000	422.000	419.000
23.5	416.000	413.000	410.000	408.000	404.000
23.8	400.000	394.000	391.000	392.000	399.000
24.0	410.000	421.000	433.000	444.000	455.000
24.3	466.000	476.000	487.000	497.000	507.000
24.5	517.000	527.000	537.000	547.000	556.000
24.8	565.000	574.000	583.000	592.000	601.000
25.0	610.000	619.000	629.000	639.000	649.000
25.3	658.000	668.000	677.000	686.000	695.000
25.5	704.000	713.000	722.000	730.000	739.000
25.8	747.000	755.000	763.000	771.000	779.000
26.0	786.000	794.000	801.000	808.000	816.000
26.3	823.000	830.000	836.000	843.000	850.000
26.5	856.000	863.000	869.000	875.000	882.000
26.8	888.000	894.000	899.000	905.000	911.000
27.0	917.000	924.000	931.000	938.000	945.000
27.3	952.000	959.000	966.000	972.000	979.000
27.5	985.000	991.000	997.000	1,003.000	1,009.000
27.8	1,015.000	1,021.000	1,027.000	1,032.000	1,038.000
28.0	1,043.000	1,048.000	1,054.000	1,059.000	1,064.000
28.3	1,069.000	1,074.000	1,079.000	1,084.000	1,088.000
28.5	1,093.000	1,097.000	1,102.000	1,106.000	1,111.000
28.8	1,115.000	1,120.000	1,126.000	1,132.000	1,138.000
29.0	1,143.000	1,148.000	1,152.000	1,155.000	1,159.000
29.3	1,163.000	1,167.000	1,171.000	1,174.000	1,178.000
29.5	1,182.000	1,186.000	1,190.000	1,193.000	1,197.000
29.8	1,201.000	1,205.000	1,209.000	1,212.000	1,216.000
30.0	1,220.000	1,224.000	1,228.000	1,233.000	1,238.000
30.3	1,243.000	1,248.000	1,253.000	1,258.000	1,263.000
30.5	1,268.000	1,273.000	1,278.000	1,283.000	1,288.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr48hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
30.8	1,293.000	1,298.000	1,303.000	1,308.000	1,313.000
31.0	1,318.000	1,323.000	1,328.000	1,333.000	1,339.000
31.3	1,344.000	1,350.000	1,356.000	1,363.000	1,369.000
31.5	1,375.000	1,381.000	1,388.000	1,394.000	1,400.000
31.8	1,406.000	1,413.000	1,419.000	1,425.000	1,431.000
32.0	1,438.000	1,444.000	1,452.000	1,459.000	1,466.000
32.3	1,474.000	1,481.000	1,489.000	1,496.000	1,504.000
32.5	1,511.000	1,519.000	1,526.000	1,534.000	1,541.000
32.8	1,549.000	1,556.000	1,564.000	1,572.000	1,581.000
33.0	1,589.000	1,598.000	1,607.000	1,615.000	1,624.000
33.3	1,633.000	1,642.000	1,650.000	1,659.000	1,668.000
33.5	1,677.000	1,686.000	1,696.000	1,706.000	1,716.000
33.8	1,726.000	1,736.000	1,747.000	1,759.000	1,771.000
34.0	1,784.000	1,799.000	1,814.000	1,831.000	1,848.000
34.3	1,866.000	1,884.000	1,904.000	1,924.000	1,946.000
34.5	1,969.000	1,994.000	2,020.000	2,047.000	2,073.000
34.8	2,100.000	2,126.000	2,153.000	2,179.000	2,206.000
35.0	2,234.000	2,262.000	2,291.000	2,320.000	2,349.000
35.3	2,379.000	2,408.000	2,439.000	2,470.000	2,502.000
35.5	2,533.000	2,565.000	2,597.000	2,630.000	2,663.000
35.8	2,699.000	2,740.000	2,785.000	2,833.000	2,868.000
36.0	2,902.000	2,937.000	2,972.000	3,008.000	3,044.000
36.3	3,081.000	3,117.000	3,154.000	3,190.000	3,228.000
36.5	3,265.000	3,304.000	3,342.000	3,382.000	3,422.000
36.8	3,462.000	3,503.000	3,544.000	3,586.000	3,629.000
37.0	3,672.000	3,716.000	3,760.000	3,805.000	3,850.000
37.3	3,896.000	3,942.000	3,989.000	4,037.000	4,086.000
37.5	4,136.000	4,186.000	4,238.000	4,289.000	4,343.000
37.8	4,398.000	4,456.000	4,517.000	4,579.000	4,642.000
38.0	4,706.000	4,772.000	4,838.000	4,905.000	4,974.000
38.3	5,043.000	5,114.000	5,186.000	5,261.000	5,340.000
38.5	5,422.000	5,505.000	5,591.000	5,678.000	5,767.000
38.8	5,861.000	5,958.000	6,059.000	6,162.000	6,268.000
39.0	6,377.000	6,487.000	6,598.000	6,712.000	6,829.000
39.3	6,952.000	7,081.000	7,224.000	7,390.000	7,577.000
39.5	7,791.000	8,028.000	8,289.000	8,606.000	9,041.000
39.8	9,609.000	10,247.000	10,758.000	11,028.000	11,093.000
40.0	11,058.000	11,016.000	10,967.000	10,914.000	10,859.000
40.3	10,802.000	10,745.000	10,689.000	10,635.000	10,582.000
40.5	10,532.000	10,485.000	10,441.000	10,399.000	10,358.000
40.8	10,318.000	10,280.000	10,244.000	10,211.000	10,180.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr48hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
41.0	10,151.000	10,125.000	10,101.000	10,078.000	10,057.000
41.3	10,038.000	10,019.000	10,002.000	9,985.000	9,970.000
41.5	9,955.000	9,941.000	9,927.000	9,913.000	9,898.000
41.8	9,883.000	9,868.000	9,853.000	9,838.000	9,822.000
42.0	9,807.000	9,791.000	9,775.000	9,759.000	9,743.000
42.3	9,727.000	9,712.000	9,696.000	9,680.000	9,664.000
42.5	9,649.000	9,635.000	9,620.000	9,606.000	9,592.000
42.8	9,578.000	9,564.000	9,550.000	9,537.000	9,524.000
43.0	9,511.000	9,498.000	9,485.000	9,472.000	9,460.000
43.3	9,448.000	9,436.000	9,424.000	9,412.000	9,400.000
43.5	9,388.000	9,377.000	9,366.000	9,355.000	9,343.000
43.8	9,332.000	9,321.000	9,310.000	9,300.000	9,290.000
44.0	9,281.000	9,271.000	9,262.000	9,252.000	9,242.000
44.3	9,232.000	9,223.000	9,214.000	9,205.000	9,197.000
44.5	9,188.000	9,180.000	9,172.000	9,163.000	9,155.000
44.8	9,146.000	9,138.000	9,130.000	9,122.000	9,115.000
45.0	9,107.000	9,100.000	9,094.000	9,087.000	9,081.000
45.3	9,074.000	9,067.000	9,060.000	9,052.000	9,046.000
45.5	9,039.000	9,032.000	9,026.000	9,020.000	9,014.000
45.8	9,009.000	9,003.000	8,998.000	8,993.000	8,988.000
46.0	8,983.000	8,978.000	8,973.000	8,967.000	8,961.000
46.3	8,955.000	8,950.000	8,945.000	8,940.000	8,935.000
46.5	8,930.000	8,925.000	8,921.000	8,917.000	8,913.000
46.8	8,909.000	8,905.000	8,901.000	8,897.000	8,894.000
47.0	8,891.000	8,887.000	8,884.000	8,881.000	8,877.000
47.3	8,874.000	8,869.000	8,865.000	8,861.000	8,857.000
47.5	8,853.000	8,849.000	8,845.000	8,840.000	8,830.000
47.8	8,814.000	8,795.000	8,776.000	8,757.000	8,738.000
48.0	8,720.000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	2.000	4.000	5.000	7.000
0.3	9.000	10.000	12.000	14.000	15.000
0.5	17.000	18.000	20.000	21.000	23.000
0.8	24.000	25.000	27.000	28.000	30.000
1.0	31.000	32.000	34.000	35.000	36.000
1.3	37.000	38.000	40.000	41.000	42.000
1.5	43.000	44.000	45.000	46.000	48.000
1.8	49.000	50.000	51.000	52.000	53.000
2.0	54.000	55.000	56.000	56.000	57.000
2.3	58.000	59.000	60.000	61.000	62.000
2.5	63.000	63.000	64.000	65.000	66.000
2.8	67.000	67.000	68.000	69.000	70.000
3.0	70.000	71.000	72.000	72.000	73.000
3.3	74.000	74.000	75.000	76.000	76.000
3.5	77.000	77.000	78.000	79.000	79.000
3.8	80.000	80.000	81.000	81.000	82.000
4.0	82.000	83.000	83.000	84.000	84.000
4.3	85.000	85.000	86.000	86.000	87.000
4.5	87.000	88.000	88.000	88.000	89.000
4.8	89.000	90.000	90.000	91.000	91.000
5.0	91.000	92.000	92.000	92.000	93.000
5.3	93.000	93.000	94.000	94.000	95.000
5.5	95.000	95.000	95.000	96.000	96.000
5.8	96.000	97.000	97.000	97.000	98.000
6.0	98.000	98.000	98.000	99.000	99.000
6.3	99.000	99.000	100.000	100.000	100.000
6.5	100.000	101.000	101.000	101.000	101.000
6.8	102.000	102.000	102.000	102.000	102.000
7.0	103.000	103.000	103.000	103.000	103.000
7.3	104.000	104.000	104.000	104.000	104.000
7.5	105.000	105.000	105.000	105.000	105.000
7.8	106.000	108.000	109.000	111.000	113.000
8.0	115.000	117.000	119.000	120.000	122.000
8.3	124.000	125.000	127.000	129.000	130.000
8.5	132.000	133.000	135.000	136.000	138.000
8.8	139.000	141.000	142.000	143.000	145.000
9.0	146.000	147.000	149.000	150.000	151.000
9.3	152.000	154.000	155.000	156.000	157.000
9.5	158.000	160.000	161.000	162.000	163.000
9.8	164.000	165.000	166.000	167.000	168.000
10.0	169.000	170.000	171.000	172.000	173.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr72hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.3	174.000	175.000	175.000	176.000	177.000
10.5	178.000	179.000	180.000	180.000	181.000
10.8	182.000	183.000	183.000	184.000	185.000
11.0	186.000	186.000	187.000	188.000	188.000
11.3	189.000	190.000	190.000	191.000	192.000
11.5	192.000	193.000	193.000	194.000	195.000
11.8	195.000	196.000	198.000	200.000	202.000
12.0	204.000	206.000	209.000	211.000	213.000
12.3	215.000	217.000	219.000	221.000	223.000
12.5	225.000	227.000	229.000	230.000	232.000
12.8	234.000	236.000	237.000	239.000	241.000
13.0	242.000	244.000	246.000	248.000	251.000
13.3	255.000	258.000	261.000	264.000	267.000
13.5	270.000	273.000	276.000	279.000	282.000
13.8	285.000	287.000	290.000	293.000	296.000
14.0	300.000	304.000	309.000	313.000	317.000
14.3	321.000	325.000	329.000	333.000	336.000
14.5	340.000	344.000	348.000	353.000	358.000
14.8	363.000	369.000	374.000	379.000	385.000
15.0	391.000	398.000	404.000	410.000	416.000
15.3	422.000	428.000	435.000	443.000	453.000
15.5	465.000	478.000	493.000	510.000	538.000
15.8	589.000	664.000	744.000	805.000	838.000
16.0	849.000	851.000	851.000	851.000	850.000
16.3	849.000	847.000	844.000	841.000	838.000
16.5	834.000	830.000	826.000	822.000	818.000
16.8	813.000	808.000	803.000	797.000	792.000
17.0	787.000	781.000	775.000	768.000	762.000
17.3	756.000	749.000	743.000	737.000	731.000
17.5	725.000	719.000	713.000	708.000	701.000
17.8	695.000	688.000	680.000	674.000	667.000
18.0	660.000	653.000	647.000	640.000	634.000
18.3	628.000	622.000	616.000	610.000	604.000
18.5	598.000	593.000	587.000	582.000	576.000
18.8	571.000	566.000	560.000	555.000	550.000
19.0	545.000	541.000	536.000	531.000	527.000
19.3	522.000	518.000	513.000	509.000	504.000
19.5	500.000	496.000	492.000	488.000	484.000
19.8	480.000	476.000	471.000	466.000	460.000
20.0	455.000	450.000	445.000	439.000	434.000
20.3	430.000	425.000	420.000	415.000	411.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr72hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	406.000	402.000	397.000	393.000	389.000
20.8	384.000	380.000	376.000	372.000	368.000
21.0	364.000	360.000	357.000	353.000	349.000
21.3	346.000	342.000	339.000	335.000	332.000
21.5	328.000	325.000	322.000	319.000	316.000
21.8	313.000	310.000	307.000	304.000	301.000
22.0	298.000	295.000	292.000	290.000	287.000
22.3	284.000	282.000	279.000	277.000	274.000
22.5	272.000	269.000	267.000	265.000	262.000
22.8	260.000	258.000	256.000	253.000	251.000
23.0	249.000	247.000	245.000	243.000	241.000
23.3	239.000	237.000	235.000	234.000	232.000
23.5	230.000	228.000	226.000	225.000	223.000
23.8	220.000	217.000	214.000	212.000	212.000
24.0	212.000	212.000	212.000	213.000	213.000
24.3	213.000	214.000	214.000	214.000	214.000
24.5	215.000	215.000	215.000	215.000	216.000
24.8	216.000	216.000	216.000	217.000	217.000
25.0	217.000	217.000	218.000	218.000	218.000
25.3	218.000	218.000	219.000	219.000	219.000
25.5	219.000	219.000	220.000	220.000	220.000
25.8	220.000	220.000	220.000	221.000	221.000
26.0	221.000	221.000	221.000	221.000	222.000
26.3	222.000	222.000	222.000	222.000	222.000
26.5	222.000	223.000	223.000	223.000	223.000
26.8	223.000	223.000	223.000	224.000	224.000
27.0	224.000	224.000	224.000	224.000	224.000
27.3	224.000	224.000	225.000	225.000	225.000
27.5	225.000	225.000	225.000	225.000	225.000
27.8	225.000	225.000	226.000	226.000	226.000
28.0	226.000	226.000	226.000	226.000	226.000
28.3	226.000	226.000	226.000	227.000	227.000
28.5	227.000	227.000	227.000	227.000	227.000
28.8	227.000	227.000	227.000	227.000	227.000
29.0	227.000	227.000	227.000	228.000	228.000
29.3	228.000	228.000	228.000	228.000	228.000
29.5	228.000	228.000	228.000	228.000	228.000
29.8	228.000	228.000	228.000	228.000	228.000
30.0	228.000	229.000	229.000	229.000	229.000
30.3	229.000	229.000	229.000	229.000	229.000
30.5	229.000	229.000	229.000	229.000	229.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume　　Scenario: 2yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
30.8	229.000	229.000	229.000	229.000	229.000
31.0	229.000	229.000	229.000	229.000	229.000
31.3	229.000	229.000	230.000	230.000	230.000
31.5	230.000	230.000	232.000	233.000	235.000
31.8	237.000	238.000	240.000	242.000	243.000
32.0	245.000	247.000	248.000	250.000	251.000
32.3	253.000	254.000	256.000	257.000	258.000
32.5	260.000	261.000	262.000	264.000	265.000
32.8	266.000	267.000	269.000	270.000	271.000
33.0	272.000	273.000	275.000	276.000	277.000
33.3	278.000	279.000	280.000	281.000	282.000
33.5	283.000	284.000	285.000	286.000	287.000
33.8	288.000	289.000	290.000	291.000	291.000
34.0	292.000	293.000	294.000	295.000	296.000
34.3	296.000	297.000	298.000	299.000	300.000
34.5	300.000	301.000	302.000	302.000	303.000
34.8	304.000	304.000	305.000	306.000	306.000
35.0	307.000	308.000	308.000	310.000	312.000
35.3	314.000	316.000	318.000	321.000	323.000
35.5	325.000	327.000	329.000	331.000	333.000
35.8	336.000	338.000	342.000	345.000	349.000
36.0	352.000	356.000	359.000	363.000	366.000
36.3	369.000	372.000	376.000	379.000	382.000
36.5	385.000	388.000	391.000	394.000	397.000
36.8	399.000	402.000	405.000	408.000	411.000
37.0	415.000	419.000	424.000	428.000	432.000
37.3	436.000	440.000	444.000	448.000	452.000
37.5	455.000	459.000	463.000	466.000	470.000
37.8	474.000	479.000	484.000	489.000	495.000
38.0	502.000	508.000	515.000	521.000	527.000
38.3	533.000	540.000	546.000	552.000	559.000
38.5	566.000	574.000	581.000	588.000	595.000
38.8	603.000	611.000	620.000	629.000	638.000
39.0	648.000	658.000	667.000	677.000	686.000
39.3	696.000	707.000	719.000	734.000	751.000
39.5	771.000	796.000	826.000	868.000	937.000
39.8	1,040.000	1,159.000	1,233.000	1,280.000	1,298.000
40.0	1,303.000	1,307.000	1,310.000	1,312.000	1,314.000
40.3	1,315.000	1,315.000	1,315.000	1,314.000	1,313.000
40.5	1,312.000	1,310.000	1,308.000	1,306.000	1,303.000
40.8	1,299.000	1,296.000	1,292.000	1,287.000	1,283.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
41.0	1,278.000	1,273.000	1,268.000	1,263.000	1,258.000
41.3	1,252.000	1,246.000	1,240.000	1,234.000	1,228.000
41.5	1,222.000	1,216.000	1,210.000	1,204.000	1,197.000
41.8	1,190.000	1,183.000	1,175.000	1,168.000	1,161.000
42.0	1,153.000	1,145.000	1,132.000	1,120.000	1,108.000
42.3	1,097.000	1,085.000	1,074.000	1,062.000	1,051.000
42.5	1,041.000	1,030.000	1,019.000	1,009.000	999.000
42.8	989.000	979.000	969.000	959.000	950.000
43.0	941.000	932.000	923.000	914.000	905.000
43.3	896.000	888.000	879.000	871.000	863.000
43.5	855.000	847.000	840.000	832.000	825.000
43.8	817.000	809.000	800.000	792.000	783.000
44.0	774.000	766.000	758.000	750.000	742.000
44.3	734.000	726.000	718.000	711.000	704.000
44.5	696.000	689.000	682.000	675.000	668.000
44.8	662.000	655.000	648.000	642.000	636.000
45.0	629.000	623.000	617.000	611.000	605.000
45.3	600.000	594.000	588.000	583.000	577.000
45.5	572.000	567.000	562.000	557.000	552.000
45.8	547.000	542.000	537.000	532.000	528.000
46.0	523.000	519.000	514.000	510.000	505.000
46.3	501.000	497.000	493.000	489.000	485.000
46.5	481.000	477.000	473.000	470.000	466.000
46.8	462.000	459.000	455.000	452.000	448.000
47.0	445.000	442.000	439.000	435.000	432.000
47.3	429.000	426.000	423.000	420.000	417.000
47.5	414.000	412.000	409.000	406.000	402.000
47.8	396.000	392.000	391.000	396.000	406.000
48.0	417.000	429.000	440.000	451.000	462.000
48.3	473.000	483.000	494.000	504.000	514.000
48.5	524.000	534.000	543.000	553.000	562.000
48.8	571.000	581.000	589.000	598.000	607.000
49.0	616.000	626.000	635.000	645.000	655.000
49.3	665.000	674.000	683.000	692.000	701.000
49.5	710.000	719.000	727.000	736.000	744.000
49.8	752.000	760.000	768.000	776.000	784.000
50.0	791.000	799.000	806.000	813.000	820.000
50.3	827.000	834.000	841.000	848.000	854.000
50.5	861.000	867.000	873.000	879.000	886.000
50.8	892.000	897.000	903.000	909.000	915.000
51.0	922.000	929.000	936.000	943.000	950.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
51.3	957.000	963.000	970.000	976.000	983.000
51.5	989.000	995.000	1,001.000	1,007.000	1,013.000
51.8	1,019.000	1,025.000	1,030.000	1,036.000	1,041.000
52.0	1,047.000	1,052.000	1,057.000	1,062.000	1,067.000
52.3	1,072.000	1,077.000	1,082.000	1,087.000	1,091.000
52.5	1,096.000	1,100.000	1,105.000	1,109.000	1,114.000
52.8	1,119.000	1,124.000	1,130.000	1,136.000	1,141.000
53.0	1,147.000	1,150.000	1,154.000	1,158.000	1,162.000
53.3	1,166.000	1,169.000	1,173.000	1,177.000	1,181.000
53.5	1,185.000	1,188.000	1,192.000	1,196.000	1,200.000
53.8	1,203.000	1,207.000	1,211.000	1,215.000	1,219.000
54.0	1,223.000	1,227.000	1,231.000	1,236.000	1,241.000
54.3	1,246.000	1,251.000	1,256.000	1,261.000	1,266.000
54.5	1,271.000	1,276.000	1,281.000	1,286.000	1,291.000
54.8	1,296.000	1,301.000	1,306.000	1,311.000	1,316.000
55.0	1,322.000	1,327.000	1,332.000	1,337.000	1,342.000
55.3	1,348.000	1,354.000	1,360.000	1,367.000	1,373.000
55.5	1,379.000	1,385.000	1,392.000	1,398.000	1,404.000
55.8	1,410.000	1,417.000	1,423.000	1,429.000	1,435.000
56.0	1,442.000	1,449.000	1,456.000	1,464.000	1,471.000
56.3	1,479.000	1,486.000	1,494.000	1,501.000	1,509.000
56.5	1,516.000	1,523.000	1,531.000	1,538.000	1,546.000
56.8	1,553.000	1,561.000	1,569.000	1,578.000	1,586.000
57.0	1,595.000	1,604.000	1,612.000	1,621.000	1,630.000
57.3	1,638.000	1,647.000	1,656.000	1,664.000	1,673.000
57.5	1,683.000	1,692.000	1,702.000	1,712.000	1,722.000
57.8	1,732.000	1,743.000	1,755.000	1,767.000	1,779.000
58.0	1,793.000	1,808.000	1,825.000	1,841.000	1,859.000
58.3	1,877.000	1,897.000	1,917.000	1,938.000	1,961.000
58.5	1,985.000	2,011.000	2,037.000	2,064.000	2,090.000
58.8	2,117.000	2,143.000	2,170.000	2,196.000	2,224.000
59.0	2,252.000	2,281.000	2,310.000	2,339.000	2,368.000
59.3	2,397.000	2,428.000	2,459.000	2,490.000	2,522.000
59.5	2,553.000	2,585.000	2,618.000	2,651.000	2,686.000
59.8	2,725.000	2,768.000	2,816.000	2,855.000	2,890.000
60.0	2,925.000	2,960.000	2,995.000	3,031.000	3,067.000
60.3	3,104.000	3,140.000	3,177.000	3,214.000	3,251.000
60.5	3,289.000	3,328.000	3,367.000	3,407.000	3,447.000
60.8	3,488.000	3,529.000	3,571.000	3,613.000	3,656.000
61.0	3,700.000	3,744.000	3,788.000	3,833.000	3,879.000
61.3	3,925.000	3,972.000	4,019.000	4,067.000	4,117.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr72hr

Label: BMP1

Time vs. Volume (ft^3)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)
61.5	4,167.000	4,219.000	4,270.000	4,323.000	4,377.000
61.8	4,434.000	4,494.000	4,556.000	4,619.000	4,682.000
62.0	4,747.000	4,813.000	4,880.000	4,948.000	5,017.000
62.3	5,088.000	5,159.000	5,232.000	5,310.000	5,391.000
62.5	5,474.000	5,559.000	5,645.000	5,733.000	5,825.000
62.8	5,921.000	6,021.000	6,123.000	6,228.000	6,336.000
63.0	6,445.000	6,556.000	6,668.000	6,784.000	6,905.000
63.3	7,031.000	7,169.000	7,326.000	7,504.000	7,708.000
63.5	7,937.000	8,188.000	8,473.000	8,852.000	9,372.000
63.8	10,014.000	10,608.000	10,964.000	11,101.000	11,099.000
64.0	11,057.000	11,008.000	10,954.000	10,897.000	10,839.000
64.3	10,780.000	10,722.000	10,665.000	10,611.000	10,559.000
64.5	10,510.000	10,464.000	10,420.000	10,378.000	10,337.000
64.8	10,298.000	10,260.000	10,226.000	10,194.000	10,164.000
65.0	10,137.000	10,112.000	10,088.000	10,066.000	10,046.000
65.3	10,027.000	10,009.000	9,992.000	9,976.000	9,961.000
65.5	9,947.000	9,933.000	9,919.000	9,904.000	9,890.000
65.8	9,874.000	9,859.000	9,844.000	9,829.000	9,813.000
66.0	9,797.000	9,781.000	9,766.000	9,750.000	9,734.000
66.3	9,718.000	9,702.000	9,686.000	9,671.000	9,655.000
66.5	9,641.000	9,626.000	9,612.000	9,598.000	9,583.000
66.8	9,569.000	9,555.000	9,542.000	9,529.000	9,516.000
67.0	9,503.000	9,490.000	9,477.000	9,465.000	9,453.000
67.3	9,441.000	9,429.000	9,417.000	9,405.000	9,393.000
67.5	9,382.000	9,371.000	9,359.000	9,348.000	9,336.000
67.8	9,325.000	9,315.000	9,304.000	9,294.000	9,284.000
68.0	9,275.000	9,266.000	9,256.000	9,246.000	9,236.000
68.3	9,227.000	9,218.000	9,209.000	9,200.000	9,192.000
68.5	9,184.000	9,175.000	9,167.000	9,158.000	9,149.000
68.8	9,141.000	9,133.000	9,125.000	9,118.000	9,110.000
69.0	9,103.000	9,096.000	9,090.000	9,083.000	9,077.000
69.3	9,070.000	9,062.000	9,055.000	9,048.000	9,041.000
69.5	9,035.000	9,029.000	9,022.000	9,016.000	9,011.000
69.8	9,005.000	9,000.000	8,995.000	8,990.000	8,985.000
70.0	8,980.000	8,975.000	8,969.000	8,963.000	8,958.000
70.3	8,952.000	8,947.000	8,942.000	8,937.000	8,932.000
70.5	8,927.000	8,923.000	8,918.000	8,914.000	8,910.000
70.8	8,906.000	8,902.000	8,899.000	8,895.000	8,892.000
71.0	8,889.000	8,885.000	8,882.000	8,879.000	8,875.000
71.3	8,871.000	8,867.000	8,862.000	8,858.000	8,854.000
71.5	8,850.000	8,847.000	8,842.000	8,834.000	8,821.000

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
71.8	8,803.000	8,783.000	8,763.000	8,745.000	8,727.000
72.0	8,709.000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 2yr24hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 2yr24hr
Label: Bypass

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 2yr48hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data | Scenario: 2yr48hr

Label: Bypass

Structure ID: Orifice - 1
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 2yr72hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data　　Scenario: 2yr72hr

Label: Bypass

Structure ID: Orifice - 1
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 2yr24hr

Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 2yr48hr

Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 2yr72hr

Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary   Scenario: 2yr24hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	4.09862 ft³/s	Time to Peak (Flow, In)	15.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	5.8 hours
Flow (Peak Outlet)	1.02059 ft³/s	Time to Peak (Flow, Outlet)	16.0 hours

Elevation (Water Surface, Peak)	2.773 ft
Volume (Peak)	11,050.146 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	22,435.000 ft³
Volume (Total Infiltration)	7,745.000 ft³
Volume (Total Outlet Outflow)	5,975.000 ft³
Volume (Retained)	8,716.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary — Scenario: 2yr48hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	4.06969 ft³/s	Time to Peak (Flow, In)	39.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	15.9 hours
Flow (Peak Outlet)	1.04973 ft³/s	Time to Peak (Flow, Outlet)	40.0 hours

Elevation (Water Surface, Peak)	2.783 ft
Volume (Peak)	11,092.546 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	26,216.000 ft³
Volume (Total Infiltration)	11,470.000 ft³
Volume (Total Outlet Outflow)	6,044.000 ft³
Volume (Retained)	8,703.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary Scenario: 2yr72hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	4.29181 ft³/s	Time to Peak (Flow, In)	63.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	39.8 hours
Flow (Peak Outlet)	1.05569 ft³/s	Time to Peak (Flow, Outlet)	63.9 hours

Elevation (Water Surface, Peak)	2.785 ft
Volume (Peak)	11,101.208 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	28,480.000 ft³
Volume (Total Infiltration)	13,712.000 ft³
Volume (Total Outlet Outflow)	6,076.000 ft³
Volume (Retained)	8,691.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Pond Inflow Summary Scenario: 2yr24hr
Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft^3)	Time to Peak (hours)	Flow (Peak) (ft^3/s)
Flow (From)	DMA-1	22,441.010	15.8	4.37000
Flow (In)	BMP1	22,435.280	15.8	4.09862

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Pond Inflow Summary Scenario: 2yr48hr

Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	26,233.030	39.8	4.37000
Flow (In)	BMP1	26,216.117	39.8	4.06969

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Pond Inflow Summary Scenario: 2yr72hr

Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	28,466.565	63.8	4.37000
Flow (In)	BMP1	28,479.743	63.8	4.29181

Red Hill 2 Year 24-72 Hour Multi-Day Storm Analysis

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Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Project Summary	
Title	Red Hill
Engineer	
Company	Kimley-Horn and Associates, Inc.
Date	11/14/2024

Notes	1. Inflow hydrographs for 24-72 hours calculated using AES v2016. 2. Flow-through basin analysis completed using modified Pul's (storage indication routing).

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DMA-1

BMP1 (IN)

BMP1

Bypass

BMP1

BMP1 (IN)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DMA-1	25yr24hr	0	52,801.000	15.8	9.54000
DMA-1	25yr48hr	0	62,604.000	39.8	9.54000
DMA-1	25yr72hr	0	68,905.000	63.8	9.54000

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
Outfall 1	25yr24hr	0	35,108.000	15.9	4.74528
Outfall 1	25yr48hr	0	38,558.000	39.9	4.77467
Outfall 1	25yr72hr	0	38,658.000	63.9	4.79193

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BMP1 (IN)	25yr24hr	0	52,788.000	15.8	8.95905	(N/A)	(N/A)
BMP1 (OUT)	25yr24hr	0	35,108.000	15.9	4.74528	3.943	15,593.000
BMP1 (IN)	25yr48hr	0	62,569.000	39.8	8.89598	(N/A)	(N/A)
BMP1 (OUT)	25yr48hr	0	38,558.000	39.9	4.77467	3.955	15,636.000
BMP1 (IN)	25yr72hr	0	68,934.000	63.8	9.37261	(N/A)	(N/A)
BMP1 (OUT)	25yr72hr	0	38,658.000	63.9	4.79193	3.963	15,661.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 25yr24hr

Label: DMA-1

Peak Discharge	9.54000 ft^3/s
Time to Peak	15.8 hours
Hydrograph Volume	52,800.650 ft^3

HYDROGRAPH ORDINATES (ft^3/s)

Output Time Increment = 0.2 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.0	0.24000	0.24000	0.24000	0.25000	0.25000
0.8	0.25000	0.25000	0.25000	0.25000	0.26000
1.6	0.26000	0.26000	0.26000	0.26000	0.27000
2.4	0.27000	0.27000	0.27000	0.27000	0.28000
3.3	0.28000	0.28000	0.28000	0.28000	0.29000
4.1	0.29000	0.29000	0.29000	0.30000	0.30000
4.9	0.30000	0.30000	0.31000	0.31000	0.31000
5.7	0.32000	0.32000	0.32000	0.32000	0.33000
6.5	0.33000	0.34000	0.34000	0.34000	0.35000
7.3	0.35000	0.35000	0.36000	0.36000	0.37000
8.2	0.37000	0.38000	0.38000	0.39000	0.39000
9.0	0.40000	0.40000	0.41000	0.41000	0.42000
9.8	0.43000	0.44000	0.44000	0.45000	0.46000
10.6	0.47000	0.47000	0.49000	0.49000	0.51000
11.4	0.51000	0.53000	0.54000	0.66000	0.67000
12.2	0.69000	0.70000	0.72000	0.74000	0.77000
13.0	0.78000	0.81000	0.83000	0.88000	0.90000
13.9	1.09000	1.12000	1.20000	1.25000	1.36000
14.7	1.43000	1.59000	1.70000	1.75000	1.96000
15.5	2.83000	3.76000	9.54000	2.27000	1.81000
16.3	1.50000	1.30000	1.16000	0.95000	0.85000
17.1	0.80000	0.75000	0.71000	0.68000	0.58000
17.9	0.52000	0.50000	0.48000	0.46000	0.45000
18.8	0.43000	0.42000	0.41000	0.39000	0.38000
19.6	0.37000	0.36000	0.36000	0.35000	0.34000
20.4	0.33000	0.33000	0.32000	0.31000	0.31000
21.2	0.30000	0.30000	0.29000	0.29000	0.28000
22.0	0.28000	0.27000	0.27000	0.27000	0.26000
22.8	0.26000	0.26000	0.25000	0.25000	0.25000
23.6	0.24000	0.00000	(N/A)	(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 25yr48hr

Label: DMA-1

Peak Discharge	9.54000 ft^3/s
Time to Peak	39.8 hours
Hydrograph Volume	62,603.550 ft^3

HYDROGRAPH ORDINATES (ft^3/s)

Output Time Increment = 0.2 hours

Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.0	0.04000	0.04000	0.05000	0.05000	0.05000
0.8	0.05000	0.05000	0.05000	0.05000	0.05000
1.6	0.05000	0.05000	0.05000	0.05000	0.05000
2.4	0.05000	0.05000	0.05000	0.05000	0.05000
3.3	0.05000	0.05000	0.05000	0.05000	0.05000
4.1	0.05000	0.05000	0.05000	0.05000	0.06000
4.9	0.06000	0.06000	0.06000	0.06000	0.06000
5.7	0.06000	0.06000	0.06000	0.06000	0.06000
6.5	0.06000	0.06000	0.06000	0.06000	0.06000
7.3	0.06000	0.07000	0.07000	0.07000	0.07000
8.2	0.07000	0.07000	0.07000	0.07000	0.07000
9.0	0.07000	0.07000	0.08000	0.08000	0.08000
9.8	0.08000	0.08000	0.08000	0.08000	0.08000
10.6	0.09000	0.09000	0.09000	0.09000	0.09000
11.4	0.09000	0.10000	0.10000	0.12000	0.12000
12.2	0.13000	0.13000	0.13000	0.14000	0.14000
13.0	0.14000	0.15000	0.15000	0.16000	0.17000
13.9	0.19000	0.20000	0.21000	0.22000	0.23000
14.7	0.24000	0.27000	0.29000	0.29000	0.33000
15.5	0.52000	0.72000	1.99000	0.39000	0.30000
16.3	0.26000	0.23000	0.20000	0.17000	0.16000
17.1	0.15000	0.14000	0.13000	0.13000	0.11000
17.9	0.10000	0.09000	0.09000	0.09000	0.08000
18.8	0.08000	0.08000	0.07000	0.07000	0.07000
19.6	0.07000	0.07000	0.07000	0.06000	0.06000
20.4	0.06000	0.06000	0.06000	0.06000	0.06000
21.2	0.06000	0.05000	0.05000	0.05000	0.05000
22.0	0.05000	0.05000	0.05000	0.05000	0.05000
22.8	0.05000	0.05000	0.05000	0.05000	0.05000
23.6	0.04000	0.00000	0.24000	0.24000	0.24000
24.5	0.25000	0.25000	0.25000	0.25000	0.25000
25.3	0.25000	0.26000	0.26000	0.26000	0.26000
26.1	0.26000	0.27000	0.27000	0.27000	0.27000
26.9	0.27000	0.28000	0.28000	0.28000	0.28000
27.7	0.28000	0.29000	0.29000	0.29000	0.29000
28.5	0.30000	0.30000	0.30000	0.30000	0.31000
29.4	0.31000	0.31000	0.32000	0.32000	0.32000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 25yr48hr

Label: DMA-1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
30.2	0.32000	0.33000	0.33000	0.34000	0.34000
31.0	0.34000	0.35000	0.35000	0.35000	0.36000
31.8	0.36000	0.37000	0.37000	0.38000	0.38000
32.6	0.39000	0.39000	0.40000	0.40000	0.41000
33.4	0.41000	0.42000	0.43000	0.44000	0.44000
34.2	0.45000	0.46000	0.47000	0.47000	0.49000
35.1	0.49000	0.51000	0.51000	0.53000	0.54000
35.9	0.66000	0.67000	0.69000	0.70000	0.72000
36.7	0.74000	0.77000	0.78000	0.81000	0.83000
37.5	0.88000	0.90000	1.09000	1.12000	1.20000
38.3	1.25000	1.36000	1.43000	1.59000	1.70000
39.1	1.75000	1.96000	2.83000	3.76000	9.54000
39.9	2.27000	1.81000	1.50000	1.30000	1.16000
40.8	0.95000	0.85000	0.80000	0.75000	0.71000
41.6	0.68000	0.58000	0.52000	0.50000	0.48000
42.4	0.46000	0.45000	0.43000	0.42000	0.41000
43.2	0.39000	0.38000	0.37000	0.36000	0.36000
44.0	0.35000	0.34000	0.33000	0.33000	0.32000
44.8	0.31000	0.31000	0.30000	0.30000	0.29000
45.7	0.29000	0.28000	0.28000	0.27000	0.27000
46.5	0.27000	0.26000	0.26000	0.26000	0.25000
47.3	0.25000	0.25000	0.24000	0.00000	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 25yr72hr

Label: DMA-1

Peak Discharge	9.54000 ft³/s
Time to Peak	63.8 hours
Hydrograph Volume	68,904.995 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.0	0.03000	0.03000	0.03000	0.03000	0.03000
0.8	0.03000	0.03000	0.03000	0.03000	0.03000
1.6	0.03000	0.03000	0.03000	0.03000	0.03000
2.4	0.03000	0.03000	0.03000	0.03000	0.03000
3.3	0.03000	0.03000	0.03000	0.03000	0.03000
4.1	0.03000	0.03000	0.03000	0.04000	0.04000
4.9	0.04000	0.04000	0.04000	0.04000	0.04000
5.7	0.04000	0.04000	0.04000	0.04000	0.04000
6.5	0.04000	0.04000	0.04000	0.04000	0.04000
7.3	0.04000	0.04000	0.04000	0.04000	0.04000
8.2	0.04000	0.04000	0.05000	0.05000	0.05000
9.0	0.05000	0.05000	0.05000	0.05000	0.05000
9.8	0.05000	0.05000	0.05000	0.05000	0.05000
10.6	0.06000	0.06000	0.06000	0.06000	0.06000
11.4	0.06000	0.06000	0.06000	0.08000	0.08000
12.2	0.08000	0.08000	0.09000	0.09000	0.09000
13.0	0.09000	0.10000	0.10000	0.10000	0.11000
13.9	0.13000	0.13000	0.14000	0.14000	0.15000
14.7	0.16000	0.17000	0.19000	0.19000	0.21000
15.5	0.31000	0.46000	1.36000	0.24000	0.20000
16.3	0.17000	0.15000	0.13000	0.11000	0.10000
17.1	0.10000	0.09000	0.09000	0.08000	0.07000
17.9	0.06000	0.06000	0.06000	0.06000	0.05000
18.8	0.05000	0.05000	0.05000	0.05000	0.05000
19.6	0.04000	0.04000	0.04000	0.04000	0.04000
20.4	0.04000	0.04000	0.04000	0.04000	0.04000
21.2	0.04000	0.04000	0.03000	0.03000	0.03000
22.0	0.03000	0.03000	0.03000	0.03000	0.03000
22.8	0.03000	0.03000	0.03000	0.03000	0.03000
23.6	0.03000	0.00000	0.04000	0.04000	0.05000
24.5	0.05000	0.05000	0.05000	0.05000	0.05000
25.3	0.05000	0.05000	0.05000	0.05000	0.05000
26.1	0.05000	0.05000	0.05000	0.05000	0.05000
26.9	0.05000	0.05000	0.05000	0.05000	0.05000
27.7	0.05000	0.05000	0.05000	0.05000	0.05000
28.5	0.05000	0.06000	0.06000	0.06000	0.06000
29.4	0.06000	0.06000	0.06000	0.06000	0.06000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 25yr72hr

Label: DMA-1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
30.2	0.06000	0.06000	0.06000	0.06000	0.06000
31.0	0.06000	0.06000	0.06000	0.07000	0.07000
31.8	0.07000	0.07000	0.07000	0.07000	0.07000
32.6	0.07000	0.07000	0.07000	0.07000	0.08000
33.4	0.08000	0.08000	0.08000	0.08000	0.08000
34.2	0.08000	0.08000	0.09000	0.09000	0.09000
35.1	0.09000	0.09000	0.09000	0.10000	0.10000
35.9	0.12000	0.12000	0.13000	0.13000	0.13000
36.7	0.14000	0.14000	0.14000	0.15000	0.15000
37.5	0.16000	0.17000	0.19000	0.20000	0.21000
38.3	0.22000	0.23000	0.24000	0.27000	0.29000
39.1	0.29000	0.33000	0.52000	0.72000	1.99000
39.9	0.39000	0.30000	0.26000	0.23000	0.20000
40.8	0.17000	0.16000	0.15000	0.14000	0.13000
41.6	0.13000	0.11000	0.10000	0.09000	0.09000
42.4	0.09000	0.08000	0.08000	0.08000	0.07000
43.2	0.07000	0.07000	0.07000	0.07000	0.07000
44.0	0.06000	0.06000	0.06000	0.06000	0.06000
44.8	0.06000	0.06000	0.06000	0.05000	0.05000
45.7	0.05000	0.05000	0.05000	0.05000	0.05000
46.5	0.05000	0.05000	0.05000	0.05000	0.05000
47.3	0.05000	0.05000	0.04000	0.00000	0.24000
48.1	0.24000	0.24000	0.25000	0.25000	0.25000
48.9	0.25000	0.25000	0.25000	0.26000	0.26000
49.7	0.26000	0.26000	0.26000	0.27000	0.27000
50.5	0.27000	0.27000	0.27000	0.28000	0.28000
51.4	0.28000	0.28000	0.28000	0.29000	0.29000
52.2	0.29000	0.29000	0.30000	0.30000	0.30000
53.0	0.30000	0.31000	0.31000	0.31000	0.32000
53.8	0.32000	0.32000	0.32000	0.33000	0.33000
54.6	0.34000	0.34000	0.34000	0.35000	0.35000
55.4	0.35000	0.36000	0.36000	0.37000	0.37000
56.3	0.38000	0.38000	0.39000	0.39000	0.40000
57.1	0.40000	0.41000	0.41000	0.42000	0.43000
57.9	0.44000	0.44000	0.45000	0.46000	0.47000
58.7	0.47000	0.49000	0.49000	0.51000	0.51000
59.5	0.53000	0.54000	0.66000	0.67000	0.69000
60.3	0.70000	0.72000	0.74000	0.77000	0.78000
61.1	0.81000	0.83000	0.88000	0.90000	1.09000
62.0	1.12000	1.20000	1.25000	1.36000	1.43000
62.8	1.59000	1.70000	1.75000	1.96000	2.83000
63.6	3.76000	9.54000	2.27000	1.81000	1.50000

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
64.4	1.30000	1.16000	0.95000	0.85000	0.80000
65.2	0.75000	0.71000	0.68000	0.58000	0.52000
66.0	0.50000	0.48000	0.46000	0.45000	0.43000
66.9	0.42000	0.41000	0.39000	0.38000	0.37000
67.7	0.36000	0.36000	0.35000	0.34000	0.33000
68.5	0.33000	0.32000	0.31000	0.31000	0.30000
69.3	0.30000	0.29000	0.29000	0.28000	0.28000
70.1	0.27000	0.27000	0.27000	0.26000	0.26000
70.9	0.26000	0.25000	0.25000	0.25000	0.24000
71.7	0.00000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr24hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.019	0.037	0.055	0.073
0.3	0.091	0.108	0.125	0.142	0.159
0.5	0.176	0.193	0.209	0.226	0.242
0.8	0.257	0.273	0.288	0.303	0.318
1.0	0.332	0.347	0.361	0.375	0.389
1.3	0.402	0.415	0.429	0.442	0.455
1.5	0.468	0.481	0.494	0.505	0.513
1.8	0.522	0.530	0.539	0.548	0.556
2.0	0.565	0.573	0.582	0.591	0.599
2.3	0.608	0.617	0.627	0.636	0.645
2.5	0.654	0.663	0.672	0.681	0.690
2.8	0.700	0.709	0.718	0.727	0.736
3.0	0.745	0.755	0.764	0.774	0.784
3.3	0.793	0.803	0.813	0.822	0.832
3.5	0.842	0.851	0.861	0.871	0.880
3.8	0.890	0.900	0.910	0.920	0.930
4.0	0.940	0.950	0.961	0.971	0.981
4.3	0.991	1.001	1.008	1.015	1.022
4.5	1.030	1.037	1.045	1.052	1.060
4.8	1.067	1.075	1.082	1.090	1.097
5.0	1.105	1.112	1.120	1.127	1.135
5.3	1.143	1.151	1.159	1.167	1.174
5.5	1.182	1.190	1.198	1.206	1.214
5.8	1.223	1.231	1.239	1.247	1.256
6.0	1.264	1.272	1.280	1.289	1.297
6.3	1.305	1.314	1.322	1.331	1.340
6.5	1.348	1.357	1.366	1.374	1.383
6.8	1.392	1.401	1.410	1.419	1.428
7.0	1.437	1.446	1.456	1.465	1.474
7.3	1.484	1.493	1.502	1.512	1.522
7.5	1.531	1.541	1.551	1.561	1.571
7.8	1.581	1.591	1.601	1.611	1.621
8.0	1.631	1.642	1.652	1.662	1.673
8.3	1.683	1.694	1.705	1.716	1.726
8.5	1.737	1.748	1.759	1.770	1.781
8.8	1.792	1.804	1.815	1.826	1.838
9.0	1.849	1.861	1.872	1.884	1.895
9.3	1.907	1.919	1.931	1.943	1.955
9.5	1.967	1.979	1.991	2.003	2.016
9.8	2.029	2.042	2.055	2.068	2.082
10.0	2.095	2.108	2.122	2.135	2.149

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr24hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	2.162	2.176	2.190	2.204	2.218
10.5	2.233	2.247	2.262	2.276	2.290
10.8	2.303	2.316	2.329	2.341	2.353
11.0	2.365	2.377	2.388	2.399	2.410
11.3	2.421	2.431	2.441	2.451	2.460
11.5	2.470	2.479	2.488	2.498	2.506
11.8	2.515	2.523	2.532	2.541	2.550
12.0	2.558	2.565	2.572	2.578	2.583
12.3	2.588	2.593	2.597	2.601	2.605
12.5	2.608	2.612	2.615	2.618	2.621
12.8	2.624	2.626	2.629	2.632	2.635
13.0	2.638	2.640	2.642	2.645	2.647
13.3	2.650	2.652	2.655	2.657	2.660
13.5	2.663	2.666	2.669	2.673	2.676
13.8	2.680	2.685	2.693	2.701	2.709
14.0	2.716	2.723	2.730	2.737	2.744
14.3	2.751	2.758	2.764	2.771	2.779
14.5	2.787	2.795	2.803	2.811	2.819
14.8	2.828	2.837	2.848	2.859	2.870
15.0	2.881	2.891	2.901	2.911	2.920
15.3	2.931	2.943	2.958	2.980	3.010
15.5	3.048	3.091	3.138	3.190	3.273
15.8	3.413	3.619	3.830	3.943	3.935
16.0	3.843	3.724	3.611	3.504	3.417
16.3	3.342	3.274	3.215	3.164	3.118
16.5	3.078	3.043	3.012	2.985	2.959
16.8	2.935	2.910	2.887	2.865	2.845
17.0	2.826	2.808	2.792	2.777	2.764
17.3	2.751	2.739	2.728	2.718	2.708
17.5	2.700	2.692	2.684	2.677	2.669
17.8	2.661	2.653	2.645	2.637	2.630
18.0	2.622	2.616	2.610	2.604	2.599
18.3	2.595	2.590	2.586	2.582	2.578
18.5	2.575	2.572	2.569	2.566	2.563
18.8	2.561	2.558	2.556	2.554	2.552
19.0	2.550	2.548	2.546	2.544	2.543
19.3	2.541	2.539	2.537	2.536	2.534
19.5	2.533	2.531	2.530	2.528	2.527
19.8	2.526	2.525	2.524	2.523	2.522
20.0	2.521	2.520	2.519	2.518	2.517
20.3	2.516	2.515	2.514	2.514	2.513

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	2.512	2.511	2.510	2.510	2.509
20.8	2.508	2.507	2.507	2.506	2.505
21.0	2.504	2.504	2.503	2.502	2.502
21.3	2.501	2.500	2.500	2.499	2.499
21.5	2.498	2.497	2.496	2.496	2.495
21.8	2.494	2.493	2.492	2.491	2.490
22.0	2.489	2.488	2.487	2.486	2.485
22.3	2.484	2.482	2.481	2.480	2.479
22.5	2.478	2.477	2.476	2.475	2.474
22.8	2.473	2.471	2.470	2.469	2.468
23.0	2.467	2.466	2.465	2.464	2.463
23.3	2.461	2.460	2.459	2.458	2.457
23.5	2.456	2.455	2.454	2.452	2.449
23.8	2.443	2.435	2.425	2.415	2.406
24.0	2.397	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.003	0.006	0.009	0.012
0.3	0.015	0.019	0.022	0.026	0.029
0.5	0.033	0.036	0.040	0.043	0.046
0.8	0.049	0.052	0.056	0.059	0.062
1.0	0.065	0.067	0.070	0.073	0.076
1.3	0.079	0.081	0.084	0.087	0.089
1.5	0.092	0.094	0.097	0.099	0.101
1.8	0.104	0.106	0.108	0.110	0.113
2.0	0.115	0.117	0.119	0.121	0.123
2.3	0.125	0.127	0.129	0.131	0.133
2.5	0.135	0.136	0.138	0.140	0.142
2.8	0.143	0.145	0.147	0.148	0.150
3.0	0.152	0.153	0.155	0.156	0.158
3.3	0.159	0.161	0.162	0.163	0.165
3.5	0.166	0.167	0.169	0.170	0.171
3.8	0.173	0.174	0.175	0.176	0.177
4.0	0.179	0.180	0.181	0.182	0.183
4.3	0.184	0.185	0.186	0.187	0.188
4.5	0.189	0.190	0.191	0.192	0.194
4.8	0.196	0.197	0.199	0.200	0.202
5.0	0.204	0.205	0.207	0.208	0.210
5.3	0.211	0.212	0.214	0.215	0.217
5.5	0.218	0.219	0.221	0.222	0.223
5.8	0.224	0.225	0.227	0.228	0.229
6.0	0.230	0.231	0.232	0.233	0.235
6.3	0.236	0.237	0.238	0.239	0.240
6.5	0.241	0.242	0.243	0.244	0.244
6.8	0.245	0.246	0.247	0.248	0.249
7.0	0.250	0.250	0.251	0.252	0.253
7.3	0.254	0.254	0.255	0.256	0.257
7.5	0.259	0.260	0.262	0.263	0.264
7.8	0.266	0.267	0.268	0.270	0.271
8.0	0.272	0.274	0.275	0.276	0.277
8.3	0.278	0.280	0.281	0.282	0.283
8.5	0.284	0.285	0.286	0.287	0.288
8.8	0.289	0.290	0.291	0.292	0.293
9.0	0.294	0.295	0.296	0.297	0.298
9.3	0.299	0.301	0.302	0.304	0.305
9.5	0.307	0.308	0.310	0.311	0.313
9.8	0.314	0.316	0.317	0.318	0.320
10.0	0.321	0.322	0.323	0.325	0.326

Subsection: Time vs. Elevation Scenario: 25yr48hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	0.327	0.328	0.329	0.331	0.332
10.5	0.333	0.335	0.336	0.338	0.340
10.8	0.342	0.343	0.345	0.347	0.349
11.0	0.350	0.352	0.353	0.355	0.356
11.3	0.358	0.359	0.361	0.362	0.364
11.5	0.366	0.367	0.370	0.372	0.374
11.8	0.376	0.378	0.381	0.384	0.387
12.0	0.391	0.394	0.398	0.401	0.405
12.3	0.409	0.412	0.416	0.420	0.423
12.5	0.427	0.431	0.434	0.438	0.442
12.8	0.446	0.450	0.454	0.458	0.462
13.0	0.465	0.469	0.473	0.477	0.481
13.3	0.485	0.490	0.494	0.498	0.502
13.5	0.505	0.508	0.511	0.515	0.518
13.8	0.522	0.527	0.531	0.536	0.541
14.0	0.547	0.552	0.558	0.563	0.569
14.3	0.575	0.581	0.588	0.594	0.601
14.5	0.608	0.615	0.622	0.630	0.637
14.8	0.645	0.654	0.663	0.672	0.682
15.0	0.692	0.702	0.712	0.722	0.733
15.3	0.744	0.755	0.768	0.784	0.802
15.5	0.824	0.848	0.876	0.908	0.950
15.8	1.009	1.068	1.130	1.179	1.210
16.0	1.226	1.236	1.245	1.253	1.260
16.3	1.267	1.273	1.279	1.284	1.290
16.5	1.294	1.299	1.303	1.307	1.310
16.8	1.314	1.316	1.319	1.321	1.324
17.0	1.326	1.328	1.330	1.332	1.334
17.3	1.335	1.337	1.338	1.340	1.341
17.5	1.342	1.343	1.344	1.346	1.346
17.8	1.347	1.347	1.348	1.348	1.348
18.0	1.348	1.348	1.347	1.347	1.347
18.3	1.346	1.346	1.346	1.345	1.345
18.5	1.345	1.344	1.343	1.343	1.342
18.8	1.341	1.341	1.340	1.339	1.338
19.0	1.338	1.337	1.336	1.334	1.333
19.3	1.332	1.331	1.330	1.329	1.328
19.5	1.327	1.326	1.325	1.324	1.323
19.8	1.321	1.320	1.319	1.318	1.317
20.0	1.316	1.314	1.313	1.311	1.310
20.3	1.309	1.307	1.306	1.304	1.303

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	1.301	1.300	1.298	1.297	1.295
20.8	1.294	1.293	1.291	1.290	1.288
21.0	1.287	1.285	1.284	1.282	1.281
21.3	1.279	1.278	1.276	1.274	1.272
21.5	1.271	1.269	1.267	1.265	1.263
21.8	1.261	1.260	1.258	1.256	1.254
22.0	1.252	1.250	1.249	1.247	1.245
22.3	1.243	1.241	1.239	1.238	1.236
22.5	1.234	1.232	1.230	1.228	1.227
22.8	1.225	1.223	1.221	1.219	1.217
23.0	1.216	1.214	1.212	1.210	1.208
23.3	1.206	1.205	1.203	1.201	1.199
23.5	1.197	1.195	1.193	1.191	1.189
23.8	1.186	1.182	1.180	1.180	1.183
24.0	1.187	1.193	1.198	1.203	1.209
24.3	1.214	1.219	1.224	1.230	1.235
24.5	1.241	1.247	1.252	1.258	1.264
24.8	1.269	1.275	1.281	1.286	1.292
25.0	1.297	1.303	1.309	1.314	1.320
25.3	1.326	1.331	1.337	1.343	1.349
25.5	1.355	1.361	1.367	1.373	1.379
25.8	1.385	1.391	1.397	1.403	1.409
26.0	1.415	1.421	1.427	1.433	1.439
26.3	1.446	1.452	1.458	1.465	1.471
26.5	1.478	1.484	1.490	1.497	1.503
26.8	1.510	1.516	1.523	1.529	1.536
27.0	1.543	1.550	1.557	1.563	1.570
27.3	1.577	1.584	1.591	1.598	1.605
27.5	1.612	1.619	1.626	1.633	1.640
27.8	1.647	1.654	1.661	1.668	1.676
28.0	1.683	1.690	1.698	1.705	1.712
28.3	1.719	1.727	1.734	1.741	1.749
28.5	1.756	1.764	1.772	1.780	1.787
28.8	1.795	1.803	1.810	1.818	1.826
29.0	1.833	1.841	1.849	1.857	1.865
29.3	1.873	1.881	1.889	1.897	1.905
29.5	1.914	1.922	1.930	1.938	1.947
29.8	1.955	1.964	1.972	1.981	1.989
30.0	1.997	2.006	2.015	2.023	2.032
30.3	2.041	2.050	2.059	2.068	2.077
30.5	2.086	2.095	2.105	2.114	2.124

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
30.8	2.133	2.142	2.152	2.161	2.171
31.0	2.180	2.190	2.200	2.209	2.219
31.3	2.229	2.239	2.249	2.259	2.268
31.5	2.278	2.287	2.296	2.305	2.313
31.8	2.321	2.329	2.337	2.344	2.352
32.0	2.359	2.366	2.373	2.379	2.386
32.3	2.392	2.398	2.405	2.410	2.416
32.5	2.422	2.427	2.433	2.438	2.443
32.8	2.448	2.453	2.458	2.462	2.467
33.0	2.472	2.476	2.480	2.484	2.489
33.3	2.493	2.497	2.501	2.504	2.508
33.5	2.511	2.514	2.516	2.519	2.521
33.8	2.523	2.525	2.527	2.529	2.530
34.0	2.532	2.533	2.534	2.535	2.537
34.3	2.538	2.539	2.540	2.541	2.542
34.5	2.543	2.544	2.545	2.546	2.547
34.8	2.548	2.549	2.550	2.551	2.552
35.0	2.553	2.554	2.554	2.555	2.557
35.3	2.558	2.559	2.560	2.561	2.562
35.5	2.563	2.564	2.565	2.566	2.567
35.8	2.569	2.572	2.576	2.580	2.585
36.0	2.589	2.593	2.596	2.599	2.603
36.3	2.606	2.608	2.611	2.613	2.616
36.5	2.618	2.620	2.623	2.625	2.627
36.8	2.630	2.632	2.634	2.637	2.639
37.0	2.641	2.643	2.646	2.648	2.650
37.3	2.653	2.655	2.657	2.660	2.663
37.5	2.666	2.669	2.672	2.675	2.678
37.8	2.683	2.690	2.698	2.706	2.713
38.0	2.720	2.727	2.734	2.741	2.748
38.3	2.755	2.762	2.769	2.776	2.784
38.5	2.792	2.800	2.808	2.816	2.824
38.8	2.834	2.844	2.855	2.865	2.876
39.0	2.887	2.897	2.907	2.917	2.927
39.3	2.938	2.952	2.970	2.997	3.032
39.5	3.073	3.119	3.169	3.239	3.357
39.8	3.533	3.757	3.919	3.955	3.882
40.0	3.762	3.648	3.539	3.446	3.367
40.3	3.297	3.235	3.181	3.134	3.092
40.5	3.055	3.022	2.994	2.969	2.944
40.8	2.919	2.895	2.873	2.852	2.833

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
41.0	2.815	2.798	2.783	2.769	2.756
41.3	2.743	2.732	2.722	2.712	2.703
41.5	2.695	2.687	2.679	2.672	2.664
41.8	2.656	2.648	2.640	2.632	2.625
42.0	2.618	2.612	2.606	2.601	2.596
42.3	2.592	2.587	2.583	2.580	2.576
42.5	2.573	2.570	2.567	2.564	2.562
42.8	2.559	2.557	2.555	2.552	2.550
43.0	2.549	2.547	2.545	2.543	2.541
43.3	2.540	2.538	2.536	2.535	2.533
43.5	2.532	2.530	2.529	2.528	2.526
43.8	2.525	2.524	2.523	2.522	2.521
44.0	2.521	2.520	2.519	2.518	2.517
44.3	2.516	2.515	2.514	2.513	2.512
44.5	2.511	2.511	2.510	2.509	2.508
44.8	2.508	2.507	2.506	2.505	2.504
45.0	2.504	2.503	2.503	2.502	2.501
45.3	2.501	2.500	2.499	2.499	2.498
45.5	2.497	2.497	2.496	2.495	2.494
45.8	2.493	2.492	2.491	2.490	2.489
46.0	2.489	2.488	2.486	2.485	2.484
46.3	2.483	2.482	2.481	2.480	2.479
46.5	2.478	2.477	2.476	2.474	2.473
46.8	2.472	2.471	2.470	2.469	2.468
47.0	2.467	2.465	2.464	2.463	2.462
47.3	2.461	2.459	2.458	2.457	2.456
47.5	2.455	2.454	2.453	2.450	2.446
47.8	2.438	2.429	2.419	2.409	2.400
48.0	2.391	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.002	0.005	0.007	0.009
0.3	0.011	0.013	0.016	0.018	0.020
0.5	0.022	0.024	0.026	0.028	0.030
0.8	0.032	0.033	0.035	0.037	0.039
1.0	0.040	0.042	0.044	0.046	0.047
1.3	0.049	0.050	0.052	0.053	0.055
1.5	0.056	0.058	0.059	0.061	0.062
1.8	0.064	0.065	0.066	0.068	0.069
2.0	0.070	0.071	0.073	0.074	0.075
2.3	0.076	0.077	0.079	0.080	0.081
2.5	0.082	0.083	0.084	0.085	0.086
2.8	0.087	0.088	0.089	0.090	0.091
3.0	0.092	0.093	0.094	0.095	0.096
3.3	0.096	0.097	0.098	0.099	0.100
3.5	0.100	0.101	0.102	0.103	0.104
3.8	0.104	0.105	0.106	0.106	0.107
4.0	0.108	0.109	0.109	0.110	0.110
4.3	0.111	0.112	0.112	0.113	0.114
4.5	0.115	0.116	0.117	0.118	0.120
4.8	0.121	0.122	0.123	0.125	0.126
5.0	0.127	0.128	0.129	0.130	0.132
5.3	0.133	0.134	0.135	0.136	0.137
5.5	0.138	0.139	0.140	0.141	0.142
5.8	0.143	0.144	0.144	0.145	0.146
6.0	0.147	0.148	0.149	0.150	0.150
6.3	0.151	0.152	0.153	0.153	0.154
6.5	0.155	0.156	0.156	0.157	0.158
6.8	0.158	0.159	0.160	0.160	0.161
7.0	0.162	0.162	0.163	0.164	0.164
7.3	0.165	0.165	0.166	0.166	0.167
7.5	0.168	0.168	0.169	0.169	0.170
7.8	0.170	0.171	0.171	0.172	0.172
8.0	0.173	0.173	0.173	0.174	0.174
8.3	0.175	0.175	0.176	0.176	0.177
8.5	0.178	0.179	0.181	0.182	0.183
8.8	0.184	0.185	0.186	0.187	0.188
9.0	0.189	0.190	0.191	0.192	0.193
9.3	0.194	0.195	0.196	0.196	0.197
9.5	0.198	0.199	0.200	0.201	0.201
9.8	0.202	0.203	0.204	0.205	0.205
10.0	0.206	0.207	0.207	0.208	0.209

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	0.209	0.210	0.211	0.211	0.212
10.5	0.213	0.214	0.215	0.217	0.218
10.8	0.219	0.221	0.222	0.223	0.224
11.0	0.225	0.227	0.228	0.229	0.230
11.3	0.231	0.232	0.233	0.235	0.236
11.5	0.237	0.238	0.239	0.240	0.241
11.8	0.242	0.243	0.245	0.247	0.249
12.0	0.252	0.254	0.256	0.259	0.261
12.3	0.263	0.265	0.267	0.270	0.272
12.5	0.274	0.277	0.280	0.282	0.285
12.8	0.288	0.290	0.293	0.295	0.298
13.0	0.300	0.302	0.305	0.308	0.310
13.3	0.313	0.316	0.319	0.322	0.325
13.5	0.328	0.331	0.333	0.337	0.340
13.8	0.343	0.347	0.352	0.357	0.361
14.0	0.366	0.370	0.375	0.380	0.385
14.3	0.390	0.395	0.399	0.404	0.409
14.5	0.415	0.420	0.425	0.431	0.437
14.8	0.443	0.449	0.455	0.462	0.469
15.0	0.476	0.484	0.491	0.498	0.504
15.3	0.509	0.515	0.521	0.528	0.537
15.5	0.548	0.561	0.577	0.595	0.621
15.8	0.661	0.716	0.775	0.821	0.848
16.0	0.861	0.868	0.874	0.880	0.885
16.3	0.890	0.894	0.897	0.901	0.904
16.5	0.906	0.909	0.911	0.912	0.914
16.8	0.915	0.916	0.916	0.916	0.916
17.0	0.917	0.917	0.917	0.917	0.917
17.3	0.916	0.916	0.915	0.915	0.914
17.5	0.914	0.913	0.912	0.911	0.910
17.8	0.908	0.907	0.905	0.903	0.901
18.0	0.899	0.897	0.895	0.893	0.891
18.3	0.889	0.887	0.885	0.883	0.880
18.5	0.878	0.876	0.873	0.871	0.868
18.8	0.865	0.863	0.860	0.858	0.855
19.0	0.852	0.850	0.847	0.844	0.842
19.3	0.839	0.837	0.834	0.831	0.829
19.5	0.826	0.823	0.820	0.817	0.813
19.8	0.810	0.807	0.804	0.801	0.798
20.0	0.794	0.791	0.788	0.785	0.782
20.3	0.779	0.776	0.772	0.769	0.766

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	0.763	0.760	0.757	0.754	0.750
20.8	0.747	0.744	0.741	0.738	0.735
21.0	0.731	0.728	0.725	0.722	0.719
21.3	0.716	0.713	0.709	0.706	0.703
21.5	0.699	0.696	0.692	0.688	0.685
21.8	0.681	0.677	0.674	0.670	0.666
22.0	0.663	0.659	0.655	0.651	0.648
22.3	0.644	0.640	0.637	0.633	0.629
22.5	0.626	0.622	0.618	0.615	0.611
22.8	0.607	0.604	0.600	0.596	0.593
23.0	0.589	0.585	0.581	0.578	0.574
23.3	0.570	0.567	0.563	0.559	0.556
23.5	0.552	0.548	0.545	0.541	0.537
23.8	0.532	0.527	0.522	0.518	0.514
24.0	0.511	0.508	0.505	0.502	0.498
24.3	0.494	0.490	0.486	0.483	0.479
24.5	0.476	0.472	0.469	0.466	0.462
24.8	0.459	0.456	0.453	0.450	0.447
25.0	0.444	0.441	0.438	0.435	0.432
25.3	0.429	0.427	0.424	0.421	0.419
25.5	0.416	0.414	0.411	0.409	0.406
25.8	0.404	0.402	0.399	0.397	0.395
26.0	0.393	0.390	0.388	0.386	0.384
26.3	0.382	0.380	0.378	0.376	0.374
26.5	0.372	0.371	0.369	0.367	0.365
26.8	0.363	0.362	0.360	0.358	0.357
27.0	0.355	0.354	0.352	0.350	0.349
27.3	0.347	0.346	0.345	0.343	0.342
27.5	0.340	0.339	0.338	0.336	0.335
27.8	0.334	0.333	0.331	0.330	0.329
28.0	0.328	0.327	0.325	0.324	0.323
28.3	0.322	0.321	0.320	0.319	0.318
28.5	0.317	0.316	0.315	0.315	0.314
28.8	0.314	0.314	0.314	0.314	0.313
29.0	0.313	0.313	0.313	0.313	0.313
29.3	0.313	0.312	0.312	0.312	0.312
29.5	0.312	0.312	0.312	0.311	0.311
29.8	0.311	0.311	0.311	0.311	0.311
30.0	0.311	0.310	0.310	0.310	0.310
30.3	0.310	0.310	0.310	0.310	0.310
30.5	0.309	0.309	0.309	0.309	0.309

Subsection: Time vs. Elevation Scenario: 25yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
30.8	0.309	0.309	0.309	0.309	0.309
31.0	0.309	0.308	0.308	0.308	0.308
31.3	0.308	0.308	0.308	0.308	0.309
31.5	0.309	0.310	0.311	0.311	0.312
31.8	0.313	0.313	0.314	0.315	0.315
32.0	0.316	0.316	0.317	0.318	0.318
32.3	0.319	0.319	0.320	0.320	0.321
32.5	0.321	0.322	0.322	0.323	0.323
32.8	0.324	0.324	0.325	0.325	0.325
33.0	0.326	0.326	0.327	0.327	0.328
33.3	0.329	0.330	0.331	0.332	0.334
33.5	0.335	0.336	0.337	0.338	0.339
33.8	0.340	0.341	0.342	0.343	0.344
34.0	0.345	0.346	0.346	0.347	0.348
34.3	0.349	0.350	0.351	0.352	0.352
34.5	0.354	0.355	0.356	0.358	0.359
34.8	0.361	0.362	0.364	0.365	0.367
35.0	0.368	0.369	0.371	0.372	0.373
35.3	0.374	0.376	0.377	0.378	0.379
35.5	0.381	0.383	0.385	0.387	0.388
35.8	0.390	0.393	0.396	0.399	0.402
36.0	0.405	0.408	0.412	0.415	0.419
36.3	0.422	0.426	0.429	0.433	0.436
36.5	0.440	0.443	0.447	0.450	0.454
36.8	0.458	0.462	0.466	0.470	0.473
37.0	0.477	0.480	0.484	0.488	0.492
37.3	0.496	0.500	0.503	0.506	0.509
37.5	0.512	0.515	0.519	0.523	0.526
37.8	0.531	0.535	0.540	0.545	0.550
38.0	0.555	0.561	0.567	0.572	0.578
38.3	0.585	0.591	0.597	0.604	0.611
38.5	0.618	0.625	0.632	0.640	0.648
38.8	0.656	0.665	0.674	0.683	0.693
39.0	0.704	0.714	0.724	0.734	0.745
39.3	0.756	0.769	0.783	0.800	0.820
39.5	0.844	0.870	0.901	0.939	0.994
39.8	1.049	1.111	1.168	1.205	1.225
40.0	1.235	1.245	1.253	1.260	1.267
40.3	1.274	1.280	1.286	1.291	1.296
40.5	1.300	1.305	1.309	1.312	1.316
40.8	1.319	1.321	1.324	1.326	1.328

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
41.0	1.331	1.333	1.335	1.336	1.338
41.3	1.340	1.341	1.342	1.344	1.345
41.5	1.346	1.347	1.348	1.349	1.350
41.8	1.351	1.351	1.351	1.351	1.351
42.0	1.351	1.351	1.350	1.350	1.350
42.3	1.349	1.349	1.349	1.348	1.348
42.5	1.348	1.347	1.346	1.345	1.345
42.8	1.344	1.343	1.343	1.342	1.341
43.0	1.340	1.339	1.338	1.337	1.336
43.3	1.335	1.334	1.333	1.332	1.331
43.5	1.329	1.328	1.327	1.326	1.325
43.8	1.324	1.323	1.322	1.321	1.319
44.0	1.318	1.317	1.315	1.314	1.312
44.3	1.311	1.309	1.308	1.307	1.305
44.5	1.304	1.302	1.301	1.299	1.298
44.8	1.296	1.295	1.293	1.292	1.291
45.0	1.289	1.288	1.286	1.285	1.283
45.3	1.282	1.280	1.278	1.276	1.274
45.5	1.273	1.271	1.269	1.267	1.265
45.8	1.263	1.262	1.260	1.258	1.256
46.0	1.254	1.252	1.251	1.249	1.247
46.3	1.245	1.243	1.242	1.240	1.238
46.5	1.236	1.234	1.232	1.231	1.229
46.8	1.227	1.225	1.223	1.221	1.220
47.0	1.218	1.216	1.214	1.212	1.210
47.3	1.209	1.207	1.205	1.203	1.201
47.5	1.199	1.197	1.195	1.193	1.190
47.8	1.187	1.184	1.183	1.185	1.189
48.0	1.194	1.200	1.205	1.210	1.215
48.3	1.221	1.226	1.231	1.237	1.242
48.5	1.248	1.254	1.259	1.265	1.271
48.8	1.276	1.282	1.288	1.293	1.299
49.0	1.304	1.310	1.316	1.321	1.327
49.3	1.333	1.338	1.344	1.350	1.356
49.5	1.362	1.368	1.374	1.380	1.386
49.8	1.392	1.398	1.404	1.410	1.416
50.0	1.422	1.428	1.434	1.441	1.447
50.3	1.453	1.460	1.466	1.472	1.479
50.5	1.485	1.491	1.498	1.504	1.511
50.8	1.517	1.524	1.531	1.537	1.544
51.0	1.551	1.557	1.564	1.571	1.578

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation　　Scenario: 25yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours

Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
51.3	1.585	1.592	1.599	1.606	1.613
51.5	1.620	1.627	1.634	1.641	1.648
51.8	1.655	1.662	1.669	1.676	1.684
52.0	1.691	1.698	1.706	1.713	1.720
52.3	1.728	1.735	1.742	1.750	1.757
52.5	1.765	1.773	1.780	1.788	1.796
52.8	1.803	1.811	1.819	1.826	1.834
53.0	1.842	1.850	1.858	1.866	1.874
53.3	1.882	1.890	1.898	1.906	1.914
53.5	1.922	1.930	1.939	1.947	1.956
53.8	1.964	1.972	1.981	1.989	1.998
54.0	2.006	2.015	2.024	2.033	2.041
54.3	2.050	2.059	2.068	2.077	2.086
54.5	2.096	2.105	2.114	2.124	2.133
54.8	2.143	2.152	2.162	2.171	2.180
55.0	2.190	2.200	2.209	2.219	2.229
55.3	2.239	2.249	2.259	2.268	2.278
55.5	2.287	2.296	2.304	2.313	2.321
55.8	2.329	2.337	2.344	2.351	2.359
56.0	2.366	2.373	2.379	2.386	2.392
56.3	2.398	2.404	2.410	2.416	2.421
56.5	2.427	2.432	2.437	2.443	2.448
56.8	2.452	2.457	2.462	2.467	2.471
57.0	2.475	2.480	2.484	2.488	2.492
57.3	2.496	2.500	2.504	2.507	2.510
57.5	2.513	2.516	2.518	2.521	2.523
57.8	2.525	2.527	2.528	2.530	2.532
58.0	2.533	2.534	2.535	2.536	2.537
58.3	2.538	2.540	2.541	2.542	2.543
58.5	2.544	2.545	2.546	2.547	2.548
58.8	2.548	2.549	2.550	2.551	2.552
59.0	2.553	2.554	2.555	2.556	2.557
59.3	2.558	2.559	2.560	2.561	2.562
59.5	2.563	2.564	2.566	2.567	2.568
59.8	2.571	2.574	2.579	2.583	2.587
60.0	2.591	2.595	2.598	2.601	2.605
60.3	2.607	2.610	2.612	2.615	2.617
60.5	2.620	2.622	2.624	2.626	2.629
60.8	2.631	2.633	2.636	2.638	2.640
61.0	2.643	2.645	2.647	2.649	2.652
61.3	2.654	2.656	2.659	2.661	2.664

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
61.5	2.668	2.671	2.674	2.677	2.681
61.8	2.687	2.695	2.703	2.711	2.718
62.0	2.725	2.732	2.739	2.746	2.753
62.3	2.759	2.766	2.773	2.781	2.789
62.5	2.797	2.805	2.813	2.821	2.830
62.8	2.840	2.850	2.861	2.872	2.883
63.0	2.894	2.903	2.913	2.923	2.934
63.3	2.946	2.962	2.986	3.018	3.057
63.5	3.101	3.150	3.207	3.302	3.454
63.8	3.679	3.881	3.963	3.929	3.823
64.0	3.705	3.593	3.489	3.404	3.329
64.3	3.263	3.206	3.155	3.110	3.071
64.5	3.036	3.006	2.980	2.954	2.930
64.8	2.905	2.882	2.861	2.841	2.822
65.0	2.805	2.789	2.774	2.761	2.748
65.3	2.737	2.726	2.716	2.706	2.698
65.5	2.690	2.682	2.675	2.667	2.659
65.8	2.651	2.643	2.635	2.628	2.621
66.0	2.615	2.609	2.603	2.598	2.594
66.3	2.589	2.585	2.581	2.577	2.574
66.5	2.571	2.568	2.565	2.563	2.560
66.8	2.558	2.555	2.553	2.551	2.549
67.0	2.548	2.546	2.544	2.542	2.540
67.3	2.539	2.537	2.535	2.534	2.532
67.5	2.531	2.530	2.528	2.527	2.526
67.8	2.525	2.524	2.523	2.522	2.521
68.0	2.520	2.519	2.518	2.517	2.516
68.3	2.515	2.514	2.513	2.512	2.512
68.5	2.511	2.510	2.510	2.509	2.508
68.8	2.507	2.506	2.505	2.505	2.504
69.0	2.503	2.503	2.502	2.501	2.501
69.3	2.500	2.500	2.499	2.498	2.498
69.5	2.497	2.496	2.495	2.495	2.494
69.8	2.493	2.492	2.491	2.490	2.489
70.0	2.488	2.487	2.486	2.485	2.483
70.3	2.482	2.481	2.480	2.479	2.478
70.5	2.477	2.476	2.475	2.474	2.472
70.8	2.471	2.470	2.469	2.468	2.467
71.0	2.466	2.465	2.464	2.462	2.461
71.3	2.460	2.459	2.458	2.457	2.456
71.5	2.455	2.453	2.452	2.448	2.441

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 25yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
71.8	2.432	2.422	2.412	2.403	2.394
72.0	2.385	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume　　Scenario: 25yr24hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	43.000	85.000	127.000	168.000
0.3	208.000	247.000	287.000	326.000	365.000
0.5	403.000	442.000	480.000	517.000	554.000
0.8	590.000	625.000	660.000	695.000	729.000
1.0	762.000	795.000	827.000	859.000	891.000
1.3	922.000	952.000	982.000	1,012.000	1,043.000
1.5	1,073.000	1,103.000	1,132.000	1,156.000	1,176.000
1.8	1,196.000	1,216.000	1,235.000	1,255.000	1,275.000
2.0	1,294.000	1,314.000	1,334.000	1,354.000	1,374.000
2.3	1,394.000	1,415.000	1,436.000	1,457.000	1,478.000
2.5	1,499.000	1,520.000	1,541.000	1,562.000	1,582.000
2.8	1,603.000	1,624.000	1,645.000	1,666.000	1,687.000
3.0	1,708.000	1,730.000	1,755.000	1,782.000	1,812.000
3.3	1,845.000	1,882.000	1,921.000	1,964.000	2,010.000
3.5	2,058.000	2,105.000	2,153.000	2,200.000	2,247.000
3.8	2,295.000	2,342.000	2,391.000	2,440.000	2,490.000
4.0	2,540.000	2,589.000	2,639.000	2,689.000	2,739.000
4.3	2,788.000	2,836.000	2,871.000	2,905.000	2,940.000
4.5	2,976.000	3,012.000	3,048.000	3,085.000	3,121.000
4.8	3,158.000	3,194.000	3,231.000	3,267.000	3,304.000
5.0	3,340.000	3,376.000	3,413.000	3,450.000	3,488.000
5.3	3,526.000	3,564.000	3,602.000	3,640.000	3,679.000
5.5	3,717.000	3,755.000	3,793.000	3,832.000	3,872.000
5.8	3,912.000	3,951.000	3,991.000	4,031.000	4,071.000
6.0	4,111.000	4,150.000	4,190.000	4,230.000	4,270.000
6.3	4,310.000	4,350.000	4,391.000	4,433.000	4,474.000
6.5	4,515.000	4,557.000	4,599.000	4,641.000	4,684.000
6.8	4,727.000	4,771.000	4,814.000	4,857.000	4,900.000
7.0	4,943.000	4,986.000	5,030.000	5,074.000	5,119.000
7.3	5,163.000	5,208.000	5,253.000	5,299.000	5,344.000
7.5	5,390.000	5,436.000	5,483.000	5,530.000	5,577.000
7.8	5,625.000	5,672.000	5,720.000	5,768.000	5,816.000
8.0	5,865.000	5,914.000	5,963.000	6,012.000	6,062.000
8.3	6,111.000	6,162.000	6,212.000	6,263.000	6,314.000
8.5	6,365.000	6,416.000	6,467.000	6,520.000	6,572.000
8.8	6,624.000	6,676.000	6,729.000	6,782.000	6,835.000
9.0	6,889.000	6,943.000	6,997.000	7,050.000	7,105.000
9.3	7,159.000	7,215.000	7,270.000	7,325.000	7,381.000
9.5	7,436.000	7,492.000	7,549.000	7,606.000	7,665.000
9.8	7,724.000	7,784.000	7,844.000	7,905.000	7,967.000
10.0	8,028.000	8,090.000	8,151.000	8,213.000	8,275.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr24hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.3	8,337.000	8,400.000	8,464.000	8,528.000	8,592.000
10.5	8,657.000	8,722.000	8,788.000	8,853.000	8,915.000
10.8	8,975.000	9,034.000	9,091.000	9,147.000	9,203.000
11.0	9,256.000	9,308.000	9,358.000	9,407.000	9,456.000
11.3	9,503.000	9,550.000	9,595.000	9,639.000	9,681.000
11.5	9,723.000	9,765.000	9,806.000	9,846.000	9,885.000
11.8	9,922.000	9,958.000	9,997.000	10,038.000	10,077.000
12.0	10,112.000	10,144.000	10,173.000	10,200.000	10,224.000
12.3	10,247.000	10,267.000	10,286.000	10,303.000	10,319.000
12.5	10,334.000	10,349.000	10,362.000	10,376.000	10,388.000
12.8	10,401.000	10,413.000	10,426.000	10,439.000	10,451.000
13.0	10,462.000	10,472.000	10,482.000	10,493.000	10,504.000
13.3	10,515.000	10,526.000	10,537.000	10,548.000	10,560.000
13.5	10,573.000	10,587.000	10,601.000	10,614.000	10,627.000
13.8	10,645.000	10,670.000	10,703.000	10,738.000	10,771.000
14.0	10,802.000	10,832.000	10,862.000	10,892.000	10,923.000
14.3	10,954.000	10,983.000	11,012.000	11,041.000	11,073.000
14.5	11,107.000	11,142.000	11,176.000	11,210.000	11,245.000
14.8	11,283.000	11,325.000	11,369.000	11,415.000	11,462.000
15.0	11,508.000	11,553.000	11,596.000	11,636.000	11,677.000
15.3	11,722.000	11,773.000	11,836.000	11,927.000	12,052.000
15.5	12,210.000	12,387.000	12,582.000	12,790.000	13,124.000
15.8	13,674.000	14,456.000	15,213.000	15,593.000	15,570.000
16.0	15,256.000	14,838.000	14,428.000	14,027.000	13,693.000
16.3	13,396.000	13,131.000	12,894.000	12,685.000	12,499.000
16.5	12,334.000	12,188.000	12,059.000	11,946.000	11,841.000
16.8	11,736.000	11,634.000	11,535.000	11,443.000	11,355.000
17.0	11,274.000	11,199.000	11,130.000	11,067.000	11,008.000
17.3	10,953.000	10,902.000	10,855.000	10,811.000	10,770.000
17.5	10,732.000	10,697.000	10,664.000	10,632.000	10,599.000
17.8	10,564.000	10,529.000	10,494.000	10,460.000	10,427.000
18.0	10,396.000	10,368.000	10,341.000	10,317.000	10,295.000
18.3	10,274.000	10,254.000	10,236.000	10,218.000	10,202.000
18.5	10,187.000	10,173.000	10,161.000	10,148.000	10,137.000
18.8	10,125.000	10,114.000	10,104.000	10,094.000	10,085.000
19.0	10,077.000	10,069.000	10,061.000	10,053.000	10,045.000
19.3	10,037.000	10,029.000	10,022.000	10,015.000	10,008.000
19.5	10,001.000	9,995.000	9,989.000	9,983.000	9,977.000
19.8	9,971.000	9,966.000	9,962.000	9,958.000	9,954.000
20.0	9,950.000	9,946.000	9,942.000	9,938.000	9,934.000
20.3	9,929.000	9,925.000	9,921.000	9,917.000	9,913.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr24hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	9,909.000	9,906.000	9,903.000	9,900.000	9,896.000
20.8	9,893.000	9,889.000	9,886.000	9,882.000	9,878.000
21.0	9,876.000	9,873.000	9,870.000	9,867.000	9,864.000
21.3	9,861.000	9,858.000	9,856.000	9,853.000	9,851.000
21.5	9,847.000	9,844.000	9,840.000	9,837.000	9,834.000
21.8	9,830.000	9,826.000	9,822.000	9,817.000	9,813.000
22.0	9,808.000	9,804.000	9,800.000	9,795.000	9,789.000
22.3	9,784.000	9,779.000	9,774.000	9,770.000	9,765.000
22.5	9,761.000	9,756.000	9,751.000	9,746.000	9,741.000
22.8	9,735.000	9,730.000	9,725.000	9,720.000	9,716.000
23.0	9,711.000	9,707.000	9,702.000	9,696.000	9,691.000
23.3	9,685.000	9,680.000	9,675.000	9,670.000	9,665.000
23.5	9,661.000	9,656.000	9,651.000	9,644.000	9,630.000
23.8	9,604.000	9,566.000	9,522.000	9,480.000	9,439.000
24.0	9,400.000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	7.000	14.000	21.000	28.000
0.3	36.000	43.000	51.000	60.000	68.000
0.5	75.000	83.000	91.000	98.000	106.000
0.8	113.000	120.000	127.000	134.000	141.000
1.0	148.000	155.000	161.000	168.000	174.000
1.3	180.000	186.000	192.000	198.000	204.000
1.5	210.000	216.000	221.000	227.000	232.000
1.8	238.000	243.000	248.000	253.000	258.000
2.0	263.000	268.000	273.000	278.000	282.000
2.3	287.000	291.000	296.000	300.000	304.000
2.5	309.000	313.000	317.000	321.000	325.000
2.8	329.000	333.000	336.000	340.000	344.000
3.0	347.000	351.000	355.000	358.000	361.000
3.3	365.000	368.000	371.000	375.000	378.000
3.5	381.000	384.000	387.000	390.000	393.000
3.8	396.000	398.000	401.000	404.000	407.000
4.0	409.000	412.000	415.000	417.000	420.000
4.3	422.000	424.000	427.000	429.000	431.000
4.5	434.000	436.000	438.000	441.000	444.000
4.8	448.000	452.000	456.000	459.000	463.000
5.0	467.000	470.000	474.000	477.000	480.000
5.3	484.000	487.000	490.000	493.000	496.000
5.5	499.000	502.000	505.000	508.000	511.000
5.8	514.000	517.000	520.000	522.000	525.000
6.0	528.000	530.000	533.000	535.000	538.000
6.3	540.000	542.000	545.000	547.000	549.000
6.5	552.000	554.000	556.000	558.000	560.000
6.8	562.000	564.000	566.000	568.000	570.000
7.0	572.000	574.000	576.000	578.000	580.000
7.3	581.000	583.000	585.000	587.000	590.000
7.5	593.000	596.000	599.000	603.000	606.000
7.8	609.000	612.000	615.000	618.000	621.000
8.0	624.000	627.000	630.000	633.000	635.000
8.3	638.000	641.000	643.000	646.000	648.000
8.5	651.000	653.000	656.000	658.000	660.000
8.8	663.000	665.000	667.000	670.000	672.000
9.0	674.000	676.000	678.000	680.000	683.000
9.3	686.000	689.000	693.000	696.000	700.000
9.5	703.000	707.000	710.000	714.000	717.000
9.8	720.000	723.000	726.000	729.000	732.000
10.0	735.000	738.000	741.000	744.000	747.000

Subsection: Time vs. Volume Scenario: 25yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.3	750.000	752.000	755.000	758.000	760.000
10.5	763.000	767.000	771.000	775.000	779.000
10.8	783.000	787.000	791.000	795.000	799.000
11.0	803.000	806.000	810.000	813.000	817.000
11.3	820.000	824.000	827.000	831.000	834.000
11.5	838.000	842.000	847.000	852.000	856.000
11.8	861.000	867.000	873.000	880.000	888.000
12.0	896.000	903.000	911.000	919.000	928.000
12.3	936.000	945.000	954.000	962.000	971.000
12.5	979.000	987.000	995.000	1,004.000	1,013.000
12.8	1,022.000	1,031.000	1,040.000	1,049.000	1,058.000
13.0	1,067.000	1,075.000	1,084.000	1,093.000	1,103.000
13.3	1,113.000	1,122.000	1,132.000	1,141.000	1,149.000
13.5	1,156.000	1,164.000	1,172.000	1,180.000	1,188.000
13.8	1,197.000	1,207.000	1,218.000	1,229.000	1,241.000
14.0	1,253.000	1,265.000	1,278.000	1,291.000	1,305.000
14.3	1,318.000	1,333.000	1,347.000	1,362.000	1,378.000
14.5	1,393.000	1,410.000	1,426.000	1,443.000	1,460.000
14.8	1,479.000	1,498.000	1,519.000	1,540.000	1,563.000
15.0	1,586.000	1,609.000	1,632.000	1,656.000	1,680.000
15.3	1,705.000	1,732.000	1,766.000	1,812.000	1,878.000
15.5	1,970.000	2,090.000	2,228.000	2,381.000	2,590.000
15.8	2,877.000	3,162.000	3,463.000	3,701.000	3,850.000
16.0	3,928.000	3,975.000	4,018.000	4,056.000	4,091.000
16.3	4,124.000	4,154.000	4,182.000	4,209.000	4,234.000
16.5	4,257.000	4,279.000	4,299.000	4,317.000	4,334.000
16.8	4,349.000	4,363.000	4,375.000	4,387.000	4,398.000
17.0	4,409.000	4,419.000	4,429.000	4,438.000	4,446.000
17.3	4,454.000	4,462.000	4,469.000	4,475.000	4,481.000
17.5	4,487.000	4,492.000	4,498.000	4,503.000	4,507.000
17.8	4,510.000	4,512.000	4,513.000	4,514.000	4,515.000
18.0	4,514.000	4,514.000	4,512.000	4,511.000	4,509.000
18.3	4,507.000	4,506.000	4,504.000	4,502.000	4,501.000
18.5	4,499.000	4,496.000	4,493.000	4,489.000	4,486.000
18.8	4,482.000	4,479.000	4,476.000	4,472.000	4,469.000
19.0	4,465.000	4,460.000	4,455.000	4,450.000	4,444.000
19.3	4,439.000	4,434.000	4,429.000	4,424.000	4,418.000
19.5	4,413.000	4,408.000	4,403.000	4,398.000	4,392.000
19.8	4,387.000	4,382.000	4,377.000	4,372.000	4,366.000
20.0	4,360.000	4,353.000	4,346.000	4,339.000	4,332.000
20.3	4,325.000	4,318.000	4,311.000	4,304.000	4,297.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr48hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	4,290.000	4,283.000	4,276.000	4,269.000	4,262.000
20.8	4,255.000	4,248.000	4,241.000	4,234.000	4,227.000
21.0	4,220.000	4,213.000	4,206.000	4,199.000	4,192.000
21.3	4,185.000	4,177.000	4,169.000	4,160.000	4,151.000
21.5	4,142.000	4,133.000	4,125.000	4,116.000	4,107.000
21.8	4,098.000	4,089.000	4,080.000	4,072.000	4,063.000
22.0	4,054.000	4,045.000	4,036.000	4,028.000	4,019.000
22.3	4,010.000	4,001.000	3,992.000	3,983.000	3,975.000
22.5	3,966.000	3,957.000	3,948.000	3,939.000	3,930.000
22.8	3,922.000	3,913.000	3,904.000	3,895.000	3,886.000
23.0	3,877.000	3,869.000	3,860.000	3,851.000	3,842.000
23.3	3,833.000	3,824.000	3,816.000	3,807.000	3,798.000
23.5	3,789.000	3,780.000	3,770.000	3,759.000	3,747.000
23.8	3,733.000	3,716.000	3,704.000	3,705.000	3,719.000
24.0	3,741.000	3,767.000	3,792.000	3,818.000	3,843.000
24.3	3,869.000	3,894.000	3,920.000	3,946.000	3,973.000
24.5	4,000.000	4,027.000	4,054.000	4,082.000	4,109.000
24.8	4,136.000	4,163.000	4,190.000	4,217.000	4,245.000
25.0	4,272.000	4,299.000	4,326.000	4,353.000	4,380.000
25.3	4,407.000	4,435.000	4,462.000	4,490.000	4,519.000
25.5	4,548.000	4,577.000	4,606.000	4,634.000	4,663.000
25.8	4,692.000	4,721.000	4,750.000	4,778.000	4,807.000
26.0	4,836.000	4,865.000	4,894.000	4,923.000	4,952.000
26.3	4,983.000	5,013.000	5,044.000	5,074.000	5,105.000
26.5	5,135.000	5,166.000	5,196.000	5,226.000	5,257.000
26.8	5,288.000	5,320.000	5,351.000	5,382.000	5,413.000
27.0	5,445.000	5,478.000	5,511.000	5,544.000	5,577.000
27.3	5,609.000	5,642.000	5,675.000	5,708.000	5,741.000
27.5	5,774.000	5,807.000	5,840.000	5,872.000	5,905.000
27.8	5,938.000	5,972.000	6,005.000	6,040.000	6,074.000
28.0	6,109.000	6,144.000	6,178.000	6,213.000	6,247.000
28.3	6,281.000	6,316.000	6,350.000	6,385.000	6,420.000
28.5	6,455.000	6,491.000	6,528.000	6,564.000	6,600.000
28.8	6,636.000	6,672.000	6,708.000	6,744.000	6,780.000
29.0	6,816.000	6,852.000	6,889.000	6,926.000	6,963.000
29.3	7,001.000	7,039.000	7,077.000	7,114.000	7,152.000
29.5	7,189.000	7,227.000	7,265.000	7,304.000	7,343.000
29.8	7,383.000	7,422.000	7,461.000	7,500.000	7,540.000
30.0	7,579.000	7,619.000	7,659.000	7,699.000	7,739.000
30.3	7,780.000	7,821.000	7,863.000	7,905.000	7,946.000
30.5	7,988.000	8,030.000	8,073.000	8,116.000	8,159.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
30.8	8,203.000	8,246.000	8,289.000	8,332.000	8,376.000
31.0	8,419.000	8,463.000	8,507.000	8,552.000	8,596.000
31.3	8,641.000	8,686.000	8,731.000	8,776.000	8,819.000
31.5	8,861.000	8,903.000	8,943.000	8,982.000	9,020.000
31.8	9,057.000	9,093.000	9,127.000	9,162.000	9,195.000
32.0	9,228.000	9,259.000	9,289.000	9,319.000	9,348.000
32.3	9,376.000	9,404.000	9,432.000	9,458.000	9,483.000
32.5	9,508.000	9,533.000	9,557.000	9,581.000	9,604.000
32.8	9,626.000	9,647.000	9,668.000	9,689.000	9,710.000
33.0	9,731.000	9,750.000	9,769.000	9,788.000	9,806.000
33.3	9,824.000	9,842.000	9,860.000	9,876.000	9,891.000
33.5	9,905.000	9,917.000	9,929.000	9,939.000	9,949.000
33.8	9,959.000	9,968.000	9,976.000	9,984.000	9,991.000
34.0	9,998.000	10,003.000	10,009.000	10,014.000	10,019.000
34.3	10,024.000	10,028.000	10,033.000	10,038.000	10,043.000
34.5	10,048.000	10,052.000	10,057.000	10,061.000	10,065.000
34.8	10,068.000	10,072.000	10,076.000	10,081.000	10,086.000
35.0	10,090.000	10,094.000	10,097.000	10,102.000	10,107.000
35.3	10,112.000	10,116.000	10,120.000	10,124.000	10,128.000
35.5	10,133.000	10,138.000	10,144.000	10,149.000	10,154.000
35.8	10,162.000	10,174.000	10,191.000	10,211.000	10,231.000
36.0	10,249.000	10,265.000	10,281.000	10,295.000	10,309.000
36.3	10,322.000	10,334.000	10,345.000	10,356.000	10,367.000
36.5	10,377.000	10,387.000	10,397.000	10,407.000	10,417.000
36.8	10,427.000	10,437.000	10,448.000	10,459.000	10,469.000
37.0	10,478.000	10,487.000	10,497.000	10,507.000	10,517.000
37.3	10,527.000	10,537.000	10,547.000	10,558.000	10,571.000
37.5	10,584.000	10,598.000	10,612.000	10,624.000	10,640.000
37.8	10,662.000	10,691.000	10,726.000	10,760.000	10,792.000
38.0	10,822.000	10,851.000	10,881.000	10,912.000	10,943.000
38.3	10,973.000	11,001.000	11,031.000	11,061.000	11,094.000
38.5	11,129.000	11,163.000	11,198.000	11,232.000	11,268.000
38.8	11,308.000	11,352.000	11,398.000	11,444.000	11,490.000
39.0	11,536.000	11,579.000	11,620.000	11,660.000	11,704.000
39.3	11,753.000	11,808.000	11,885.000	11,997.000	12,145.000
39.5	12,315.000	12,504.000	12,708.000	12,991.000	13,458.000
39.8	14,134.000	14,958.000	15,514.000	15,636.000	15,391.000
40.0	14,973.000	14,561.000	14,158.000	13,802.000	13,494.000
40.3	13,219.000	12,974.000	12,755.000	12,562.000	12,390.000
40.5	12,238.000	12,103.000	11,985.000	11,879.000	11,775.000
40.8	11,671.000	11,571.000	11,477.000	11,387.000	11,304.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
41.0	11,227.000	11,156.000	11,090.000	11,030.000	10,974.000
41.3	10,921.000	10,873.000	10,827.000	10,785.000	10,746.000
41.5	10,710.000	10,676.000	10,644.000	10,611.000	10,577.000
41.8	10,542.000	10,507.000	10,473.000	10,439.000	10,407.000
42.0	10,378.000	10,351.000	10,326.000	10,303.000	10,281.000
42.3	10,261.000	10,242.000	10,225.000	10,208.000	10,193.000
42.5	10,178.000	10,165.000	10,153.000	10,141.000	10,129.000
42.8	10,118.000	10,108.000	10,098.000	10,089.000	10,080.000
43.0	10,072.000	10,064.000	10,056.000	10,048.000	10,040.000
43.3	10,032.000	10,025.000	10,017.000	10,010.000	10,004.000
43.5	9,997.000	9,991.000	9,985.000	9,979.000	9,973.000
43.8	9,968.000	9,963.000	9,959.000	9,955.000	9,952.000
44.0	9,948.000	9,944.000	9,939.000	9,935.000	9,931.000
44.3	9,927.000	9,922.000	9,918.000	9,914.000	9,910.000
44.5	9,907.000	9,904.000	9,901.000	9,898.000	9,894.000
44.8	9,891.000	9,887.000	9,883.000	9,880.000	9,877.000
45.0	9,874.000	9,871.000	9,868.000	9,865.000	9,862.000
45.3	9,859.000	9,857.000	9,854.000	9,852.000	9,849.000
45.5	9,845.000	9,842.000	9,838.000	9,835.000	9,831.000
45.8	9,828.000	9,823.000	9,819.000	9,814.000	9,810.000
46.0	9,806.000	9,801.000	9,797.000	9,791.000	9,786.000
46.3	9,781.000	9,776.000	9,771.000	9,767.000	9,762.000
46.5	9,758.000	9,753.000	9,748.000	9,743.000	9,737.000
46.8	9,732.000	9,727.000	9,722.000	9,718.000	9,713.000
47.0	9,708.000	9,703.000	9,698.000	9,693.000	9,687.000
47.3	9,682.000	9,677.000	9,672.000	9,667.000	9,663.000
47.5	9,658.000	9,653.000	9,647.000	9,637.000	9,615.000
47.8	9,581.000	9,539.000	9,495.000	9,452.000	9,410.000
48.0	9,370.000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume　　Scenario: 25yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours

Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	5.000	11.000	16.000	21.000
0.3	26.000	31.000	36.000	41.000	45.000
0.5	50.000	55.000	59.000	64.000	68.000
0.8	72.000	76.000	81.000	85.000	89.000
1.0	93.000	97.000	101.000	104.000	108.000
1.3	112.000	115.000	119.000	123.000	126.000
1.5	129.000	133.000	136.000	139.000	143.000
1.8	146.000	149.000	152.000	155.000	158.000
2.0	161.000	164.000	167.000	169.000	172.000
2.3	175.000	177.000	180.000	183.000	185.000
2.5	188.000	190.000	193.000	195.000	197.000
2.8	200.000	202.000	204.000	206.000	209.000
3.0	211.000	213.000	215.000	217.000	219.000
3.3	221.000	223.000	225.000	227.000	229.000
3.5	230.000	232.000	234.000	236.000	237.000
3.8	239.000	241.000	242.000	244.000	246.000
4.0	247.000	249.000	250.000	252.000	253.000
4.3	255.000	256.000	258.000	259.000	261.000
4.5	263.000	265.000	268.000	271.000	274.000
4.8	277.000	280.000	283.000	286.000	288.000
5.0	291.000	294.000	296.000	299.000	301.000
5.3	304.000	306.000	309.000	311.000	314.000
5.5	316.000	318.000	320.000	323.000	325.000
5.8	327.000	329.000	331.000	333.000	335.000
6.0	337.000	339.000	341.000	343.000	345.000
6.3	346.000	348.000	350.000	352.000	353.000
6.5	355.000	357.000	358.000	360.000	362.000
6.8	363.000	365.000	366.000	368.000	369.000
7.0	371.000	372.000	374.000	375.000	376.000
7.3	378.000	379.000	380.000	381.000	383.000
7.5	384.000	385.000	386.000	388.000	389.000
7.8	390.000	391.000	392.000	393.000	394.000
8.0	395.000	396.000	397.000	398.000	399.000
8.3	400.000	401.000	403.000	404.000	406.000
8.5	409.000	411.000	414.000	416.000	419.000
8.8	421.000	424.000	426.000	429.000	431.000
9.0	433.000	435.000	438.000	440.000	442.000
9.3	444.000	446.000	448.000	450.000	452.000
9.5	454.000	456.000	458.000	460.000	462.000
9.8	464.000	465.000	467.000	469.000	470.000
10.0	472.000	474.000	475.000	477.000	479.000

Subsection: Time vs. Volume Scenario: 25yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.3	480.000	482.000	483.000	485.000	486.000
10.5	488.000	490.000	493.000	496.000	499.000
10.8	502.000	505.000	508.000	511.000	514.000
11.0	517.000	520.000	522.000	525.000	528.000
11.3	530.000	533.000	535.000	538.000	540.000
11.5	542.000	545.000	547.000	549.000	552.000
11.8	554.000	557.000	561.000	566.000	571.000
12.0	577.000	582.000	588.000	593.000	598.000
12.3	603.000	608.000	613.000	618.000	623.000
12.5	628.000	634.000	641.000	647.000	653.000
12.8	659.000	665.000	671.000	676.000	682.000
13.0	688.000	693.000	699.000	705.000	712.000
13.3	719.000	725.000	732.000	739.000	745.000
13.5	751.000	758.000	764.000	771.000	779.000
13.8	787.000	796.000	807.000	817.000	828.000
14.0	838.000	849.000	859.000	870.000	882.000
14.3	893.000	904.000	916.000	927.000	938.000
14.5	950.000	963.000	975.000	988.000	1,001.000
14.8	1,015.000	1,029.000	1,043.000	1,059.000	1,074.000
15.0	1,091.000	1,108.000	1,125.000	1,142.000	1,155.000
15.3	1,167.000	1,179.000	1,194.000	1,211.000	1,232.000
15.5	1,257.000	1,286.000	1,322.000	1,363.000	1,422.000
15.8	1,515.000	1,641.000	1,785.000	1,957.000	2,090.000
16.0	2,153.000	2,187.000	2,217.000	2,245.000	2,270.000
16.3	2,292.000	2,312.000	2,330.000	2,346.000	2,361.000
16.5	2,374.000	2,386.000	2,396.000	2,404.000	2,411.000
16.8	2,416.000	2,419.000	2,422.000	2,423.000	2,424.000
17.0	2,424.000	2,425.000	2,425.000	2,425.000	2,424.000
17.3	2,423.000	2,421.000	2,419.000	2,416.000	2,414.000
17.5	2,411.000	2,407.000	2,403.000	2,398.000	2,392.000
17.8	2,385.000	2,377.000	2,369.000	2,360.000	2,350.000
18.0	2,340.000	2,330.000	2,319.000	2,309.000	2,299.000
18.3	2,289.000	2,279.000	2,268.000	2,258.000	2,248.000
18.5	2,237.000	2,225.000	2,213.000	2,200.000	2,187.000
18.8	2,174.000	2,161.000	2,148.000	2,136.000	2,123.000
19.0	2,110.000	2,097.000	2,084.000	2,071.000	2,059.000
19.3	2,046.000	2,033.000	2,020.000	2,007.000	1,994.000
19.5	1,980.000	1,966.000	1,952.000	1,938.000	1,924.000
19.8	1,911.000	1,898.000	1,885.000	1,873.000	1,861.000
20.0	1,850.000	1,838.000	1,827.000	1,817.000	1,806.000
20.3	1,796.000	1,787.000	1,777.000	1,768.000	1,760.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	1,751.000	1,743.000	1,735.000	1,727.000	1,720.000
20.8	1,713.000	1,705.000	1,698.000	1,691.000	1,684.000
21.0	1,677.000	1,669.000	1,662.000	1,655.000	1,648.000
21.3	1,640.000	1,633.000	1,626.000	1,619.000	1,611.000
21.5	1,603.000	1,595.000	1,586.000	1,578.000	1,569.000
21.8	1,561.000	1,552.000	1,544.000	1,536.000	1,527.000
22.0	1,519.000	1,510.000	1,502.000	1,493.000	1,485.000
22.3	1,476.000	1,468.000	1,459.000	1,451.000	1,443.000
22.5	1,434.000	1,426.000	1,417.000	1,409.000	1,400.000
22.8	1,392.000	1,383.000	1,375.000	1,367.000	1,358.000
23.0	1,350.000	1,341.000	1,333.000	1,324.000	1,316.000
23.3	1,307.000	1,299.000	1,291.000	1,282.000	1,274.000
23.5	1,265.000	1,257.000	1,248.000	1,240.000	1,231.000
23.8	1,220.000	1,209.000	1,198.000	1,187.000	1,179.000
24.0	1,171.000	1,164.000	1,157.000	1,150.000	1,142.000
24.3	1,132.000	1,123.000	1,115.000	1,107.000	1,098.000
24.5	1,090.000	1,083.000	1,075.000	1,067.000	1,060.000
24.8	1,052.000	1,045.000	1,038.000	1,031.000	1,024.000
25.0	1,017.000	1,010.000	1,003.000	997.000	990.000
25.3	984.000	978.000	972.000	966.000	960.000
25.5	954.000	948.000	942.000	937.000	931.000
25.8	926.000	920.000	915.000	910.000	905.000
26.0	900.000	895.000	890.000	885.000	880.000
26.3	876.000	871.000	867.000	862.000	858.000
26.5	853.000	849.000	845.000	841.000	837.000
26.8	833.000	829.000	825.000	821.000	818.000
27.0	814.000	810.000	807.000	803.000	800.000
27.3	796.000	793.000	790.000	786.000	783.000
27.5	780.000	777.000	774.000	771.000	768.000
27.8	765.000	762.000	759.000	756.000	754.000
28.0	751.000	748.000	746.000	743.000	741.000
28.3	738.000	736.000	733.000	731.000	729.000
28.5	726.000	724.000	722.000	721.000	720.000
28.8	720.000	720.000	719.000	719.000	718.000
29.0	718.000	718.000	717.000	717.000	717.000
29.3	716.000	716.000	716.000	715.000	715.000
29.5	715.000	714.000	714.000	714.000	713.000
29.8	713.000	713.000	713.000	712.000	712.000
30.0	712.000	712.000	711.000	711.000	711.000
30.3	710.000	710.000	710.000	710.000	710.000
30.5	709.000	709.000	709.000	709.000	708.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr72hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
30.8	708.000	708.000	708.000	708.000	707.000
31.0	707.000	707.000	707.000	707.000	706.000
31.3	706.000	706.000	706.000	707.000	708.000
31.5	709.000	711.000	712.000	714.000	715.000
31.8	717.000	718.000	720.000	721.000	722.000
32.0	724.000	725.000	726.000	728.000	729.000
32.3	730.000	732.000	733.000	734.000	735.000
32.5	736.000	737.000	739.000	740.000	741.000
32.8	742.000	743.000	744.000	745.000	746.000
33.0	747.000	748.000	749.000	750.000	752.000
33.3	754.000	757.000	759.000	762.000	764.000
33.5	767.000	769.000	772.000	774.000	777.000
33.8	779.000	781.000	783.000	786.000	788.000
34.0	790.000	792.000	794.000	796.000	798.000
34.3	800.000	802.000	804.000	806.000	808.000
34.5	810.000	814.000	817.000	820.000	824.000
34.8	827.000	831.000	834.000	837.000	840.000
35.0	843.000	846.000	849.000	852.000	855.000
35.3	858.000	861.000	864.000	867.000	870.000
35.5	873.000	878.000	882.000	886.000	890.000
35.8	895.000	900.000	907.000	914.000	921.000
36.0	929.000	936.000	943.000	951.000	959.000
36.3	968.000	976.000	984.000	992.000	1,000.000
36.5	1,008.000	1,016.000	1,024.000	1,032.000	1,041.000
36.8	1,050.000	1,059.000	1,068.000	1,076.000	1,085.000
37.0	1,093.000	1,101.000	1,110.000	1,119.000	1,128.000
37.3	1,138.000	1,147.000	1,153.000	1,159.000	1,166.000
37.5	1,174.000	1,181.000	1,189.000	1,198.000	1,207.000
37.8	1,216.000	1,226.000	1,237.000	1,249.000	1,261.000
38.0	1,273.000	1,286.000	1,299.000	1,312.000	1,326.000
38.3	1,340.000	1,354.000	1,369.000	1,384.000	1,400.000
38.5	1,416.000	1,432.000	1,449.000	1,466.000	1,484.000
38.8	1,503.000	1,523.000	1,545.000	1,567.000	1,589.000
39.0	1,612.000	1,636.000	1,659.000	1,683.000	1,707.000
39.3	1,734.000	1,766.000	1,809.000	1,869.000	1,954.000
39.5	2,068.000	2,199.000	2,346.000	2,532.000	2,801.000
39.8	3,068.000	3,373.000	3,645.000	3,828.000	3,923.000
40.0	3,973.000	4,018.000	4,058.000	4,094.000	4,127.000
40.3	4,158.000	4,187.000	4,214.000	4,240.000	4,264.000
40.5	4,286.000	4,307.000	4,326.000	4,343.000	4,359.000
40.8	4,373.000	4,386.000	4,398.000	4,409.000	4,420.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume　　Scenario: 25yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
41.0	4,431.000	4,441.000	4,450.000	4,459.000	4,467.000
41.3	4,475.000	4,482.000	4,488.000	4,494.000	4,500.000
41.5	4,505.000	4,511.000	4,516.000	4,521.000	4,524.000
41.8	4,527.000	4,528.000	4,529.000	4,530.000	4,530.000
42.0	4,529.000	4,528.000	4,527.000	4,525.000	4,523.000
42.3	4,522.000	4,520.000	4,519.000	4,517.000	4,515.000
42.5	4,512.000	4,509.000	4,506.000	4,503.000	4,499.000
42.8	4,496.000	4,492.000	4,489.000	4,486.000	4,482.000
43.0	4,477.000	4,472.000	4,467.000	4,462.000	4,457.000
43.3	4,452.000	4,446.000	4,441.000	4,436.000	4,431.000
43.5	4,426.000	4,420.000	4,415.000	4,410.000	4,405.000
43.8	4,399.000	4,394.000	4,389.000	4,384.000	4,378.000
44.0	4,371.000	4,364.000	4,357.000	4,350.000	4,343.000
44.3	4,336.000	4,329.000	4,322.000	4,315.000	4,308.000
44.5	4,301.000	4,294.000	4,287.000	4,280.000	4,273.000
44.8	4,266.000	4,259.000	4,252.000	4,245.000	4,238.000
45.0	4,231.000	4,224.000	4,217.000	4,210.000	4,203.000
45.3	4,195.000	4,187.000	4,179.000	4,170.000	4,161.000
45.5	4,152.000	4,143.000	4,135.000	4,126.000	4,117.000
45.8	4,108.000	4,099.000	4,090.000	4,082.000	4,073.000
46.0	4,064.000	4,055.000	4,046.000	4,038.000	4,029.000
46.3	4,020.000	4,011.000	4,002.000	3,993.000	3,985.000
46.5	3,976.000	3,967.000	3,958.000	3,949.000	3,940.000
46.8	3,932.000	3,923.000	3,914.000	3,905.000	3,896.000
47.0	3,887.000	3,879.000	3,870.000	3,861.000	3,852.000
47.3	3,843.000	3,834.000	3,826.000	3,817.000	3,808.000
47.5	3,799.000	3,789.000	3,779.000	3,767.000	3,754.000
47.8	3,738.000	3,724.000	3,720.000	3,728.000	3,749.000
48.0	3,774.000	3,800.000	3,825.000	3,850.000	3,876.000
48.3	3,901.000	3,927.000	3,953.000	3,980.000	4,007.000
48.5	4,034.000	4,061.000	4,088.000	4,115.000	4,143.000
48.8	4,170.000	4,197.000	4,224.000	4,251.000	4,278.000
49.0	4,305.000	4,333.000	4,360.000	4,387.000	4,414.000
49.3	4,441.000	4,468.000	4,496.000	4,525.000	4,554.000
49.5	4,583.000	4,611.000	4,640.000	4,669.000	4,698.000
49.8	4,727.000	4,755.000	4,784.000	4,813.000	4,842.000
50.0	4,871.000	4,899.000	4,928.000	4,958.000	4,988.000
50.3	5,018.000	5,049.000	5,079.000	5,110.000	5,140.000
50.5	5,171.000	5,201.000	5,231.000	5,262.000	5,294.000
50.8	5,325.000	5,356.000	5,387.000	5,418.000	5,450.000
51.0	5,482.000	5,515.000	5,548.000	5,581.000	5,614.000

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
51.3	5,647.000	5,680.000	5,713.000	5,746.000	5,778.000
51.5	5,811.000	5,844.000	5,877.000	5,910.000	5,943.000
51.8	5,976.000	6,009.000	6,044.000	6,078.000	6,113.000
52.0	6,147.000	6,182.000	6,216.000	6,251.000	6,285.000
52.3	6,320.000	6,354.000	6,389.000	6,423.000	6,459.000
52.5	6,495.000	6,531.000	6,567.000	6,603.000	6,639.000
52.8	6,675.000	6,711.000	6,747.000	6,783.000	6,819.000
53.0	6,855.000	6,892.000	6,929.000	6,966.000	7,004.000
53.3	7,041.000	7,079.000	7,117.000	7,154.000	7,192.000
53.5	7,230.000	7,268.000	7,306.000	7,345.000	7,385.000
53.8	7,424.000	7,463.000	7,502.000	7,541.000	7,581.000
54.0	7,620.000	7,661.000	7,701.000	7,741.000	7,781.000
54.3	7,822.000	7,864.000	7,906.000	7,947.000	7,989.000
54.5	8,031.000	8,073.000	8,116.000	8,160.000	8,203.000
54.8	8,246.000	8,290.000	8,333.000	8,376.000	8,419.000
55.0	8,463.000	8,507.000	8,551.000	8,596.000	8,641.000
55.3	8,686.000	8,730.000	8,775.000	8,819.000	8,861.000
55.5	8,902.000	8,942.000	8,981.000	9,019.000	9,056.000
55.8	9,092.000	9,127.000	9,160.000	9,194.000	9,226.000
56.0	9,258.000	9,288.000	9,318.000	9,346.000	9,375.000
56.3	9,403.000	9,430.000	9,456.000	9,482.000	9,507.000
56.5	9,531.000	9,555.000	9,579.000	9,602.000	9,624.000
56.8	9,645.000	9,666.000	9,687.000	9,708.000	9,728.000
57.0	9,748.000	9,767.000	9,785.000	9,804.000	9,822.000
57.3	9,840.000	9,858.000	9,875.000	9,889.000	9,903.000
57.5	9,915.000	9,927.000	9,938.000	9,948.000	9,957.000
57.8	9,966.000	9,974.000	9,982.000	9,989.000	9,996.000
58.0	10,002.000	10,007.000	10,012.000	10,017.000	10,022.000
58.3	10,027.000	10,032.000	10,037.000	10,041.000	10,046.000
58.5	10,051.000	10,055.000	10,060.000	10,063.000	10,067.000
58.8	10,070.000	10,074.000	10,079.000	10,084.000	10,088.000
59.0	10,092.000	10,096.000	10,100.000	10,105.000	10,110.000
59.3	10,115.000	10,119.000	10,123.000	10,127.000	10,131.000
59.5	10,136.000	10,142.000	10,147.000	10,152.000	10,158.000
59.8	10,169.000	10,184.000	10,204.000	10,224.000	10,243.000
60.0	10,259.000	10,275.000	10,290.000	10,304.000	10,317.000
60.3	10,330.000	10,341.000	10,352.000	10,363.000	10,373.000
60.5	10,383.000	10,393.000	10,403.000	10,413.000	10,423.000
60.8	10,433.000	10,444.000	10,455.000	10,465.000	10,474.000
61.0	10,484.000	10,493.000	10,503.000	10,513.000	10,523.000
61.3	10,533.000	10,544.000	10,554.000	10,566.000	10,579.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
61.5	10,593.000	10,606.000	10,619.000	10,633.000	10,652.000
61.8	10,679.000	10,713.000	10,748.000	10,781.000	10,811.000
62.0	10,840.000	10,870.000	10,901.000	10,931.000	10,962.000
62.3	10,991.000	11,019.000	11,049.000	11,082.000	11,116.000
62.5	11,150.000	11,185.000	11,219.000	11,254.000	11,293.000
62.8	11,335.000	11,380.000	11,426.000	11,473.000	11,519.000
63.0	11,563.000	11,605.000	11,645.000	11,686.000	11,733.000
63.3	11,785.000	11,853.000	11,952.000	12,086.000	12,249.000
63.5	12,430.000	12,629.000	12,861.000	13,241.000	13,835.000
63.8	14,677.000	15,388.000	15,661.000	15,547.000	15,189.000
64.0	14,771.000	14,360.000	13,967.000	13,640.000	13,348.000
64.3	13,087.000	12,854.000	12,649.000	12,466.000	12,305.000
64.5	12,162.000	12,035.000	11,925.000	11,820.000	11,715.000
64.8	11,613.000	11,516.000	11,424.000	11,338.000	11,258.000
65.0	11,184.000	11,117.000	11,054.000	10,996.000	10,942.000
65.3	10,892.000	10,845.000	10,802.000	10,762.000	10,724.000
65.5	10,689.000	10,657.000	10,625.000	10,591.000	10,556.000
65.8	10,521.000	10,486.000	10,452.000	10,420.000	10,389.000
66.0	10,361.000	10,336.000	10,312.000	10,290.000	10,269.000
66.3	10,250.000	10,232.000	10,215.000	10,199.000	10,184.000
66.5	10,170.000	10,158.000	10,146.000	10,134.000	10,122.000
66.8	10,112.000	10,102.000	10,092.000	10,083.000	10,075.000
67.0	10,067.000	10,059.000	10,051.000	10,043.000	10,035.000
67.3	10,028.000	10,020.000	10,013.000	10,006.000	10,000.000
67.5	9,993.000	9,987.000	9,981.000	9,976.000	9,970.000
67.8	9,965.000	9,961.000	9,957.000	9,953.000	9,949.000
68.0	9,945.000	9,941.000	9,937.000	9,933.000	9,928.000
68.3	9,924.000	9,920.000	9,916.000	9,912.000	9,908.000
68.5	9,905.000	9,902.000	9,899.000	9,896.000	9,892.000
68.8	9,888.000	9,885.000	9,881.000	9,878.000	9,875.000
69.0	9,872.000	9,869.000	9,866.000	9,863.000	9,860.000
69.3	9,858.000	9,855.000	9,853.000	9,850.000	9,847.000
69.5	9,843.000	9,840.000	9,836.000	9,833.000	9,829.000
69.8	9,825.000	9,821.000	9,816.000	9,812.000	9,808.000
70.0	9,803.000	9,798.000	9,793.000	9,788.000	9,783.000
70.3	9,778.000	9,773.000	9,769.000	9,764.000	9,760.000
70.5	9,755.000	9,750.000	9,745.000	9,739.000	9,734.000
70.8	9,729.000	9,724.000	9,719.000	9,715.000	9,710.000
71.0	9,705.000	9,700.000	9,695.000	9,689.000	9,684.000
71.3	9,679.000	9,674.000	9,669.000	9,664.000	9,660.000
71.5	9,655.000	9,649.000	9,641.000	9,625.000	9,595.000

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 25yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
71.8	9,555.000	9,510.000	9,467.000	9,425.000	9,384.000
72.0	9,345.000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 25yr24hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data | Scenario: 25yr24hr

Label: Bypass

Structure ID: Orifice - 1
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 25yr48hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 25yr72hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data | Scenario: 25yr72hr

Label: Bypass

Structure ID: Orifice - 1
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances

Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 25yr24hr

Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 25yr48hr
Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary　　Scenario: 25yr24hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	8.95905 ft³/s	Time to Peak (Flow, In)	15.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	1.7 hours
Flow (Peak Outlet)	4.74528 ft³/s	Time to Peak (Flow, Outlet)	15.9 hours

Elevation (Water Surface, Peak)	3.943 ft
Volume (Peak)	15,593.457 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	52,788.000 ft³
Volume (Total Infiltration)	8,302.000 ft³
Volume (Total Outlet Outflow)	35,108.000 ft³
Volume (Retained)	9,360.000 ft³
Volume (Unrouted)	-19.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary | Scenario: 25yr48hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	8.89598 ft³/s	Time to Peak (Flow, In)	39.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	13.5 hours
Flow (Peak Outlet)	4.77467 ft³/s	Time to Peak (Flow, Outlet)	39.9 hours

Elevation (Water Surface, Peak)	3.955 ft
Volume (Peak)	15,635.872 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	62,569.000 ft³
Volume (Total Infiltration)	14,661.000 ft³
Volume (Total Outlet Outflow)	38,558.000 ft³
Volume (Retained)	9,331.000 ft³
Volume (Unrouted)	-18.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary Scenario: 25yr72hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	9.37261 ft³/s	Time to Peak (Flow, In)	63.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	15.2 hours
Flow (Peak Outlet)	4.79193 ft³/s	Time to Peak (Flow, Outlet)	63.9 hours

Elevation (Water Surface, Peak)	3.963 ft
Volume (Peak)	15,660.669 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	68,934.000 ft³
Volume (Total Infiltration)	20,952.000 ft³
Volume (Total Outlet Outflow)	38,658.000 ft³
Volume (Retained)	9,307.000 ft³
Volume (Unrouted)	-17.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Pond Inflow Summary Scenario: 25yr24hr
Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	52,800.650	15.8	9.54000
Flow (In)	BMP1	52,788.174	15.8	8.95905

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Pond Inflow Summary Scenario: 25yr48hr

Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	62,603.550	39.8	9.54000
Flow (In)	BMP1	62,568.635	39.8	8.89598

Red Hill 25 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Pond Inflow Summary Scenario: 25yr72hr

Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	68,904.995	63.8	9.54000
Flow (In)	BMP1	68,934.062	63.8	9.37261

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Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Project Summary

Title	Red Hill
Engineer	
Company	Kimley-Horn and Associates, Inc.
Date	11/14/2024

Notes	1. Inflow hydrographs for 24-72 hours calculated using AES v2016. 2. Flow-through basin analysis completed using modified Pul's (storage indication routing).

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Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DMA-1	100yr24hr	0	72,929.000	15.8	12.52000
DMA-1	100yr48hr	0	86,565.000	39.8	12.52000
DMA-1	100yr72hr	0	95,652.000	63.8	12.52000

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
Outfall 1	100yr24hr	0	54,914.000	16.0	6.06320
Outfall 1	100yr48hr	0	61,517.000	39.9	6.11991
Outfall 1	100yr72hr	0	63,111.000	63.9	6.13186

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BMP1 (IN)	100yr24hr	0	72,914.000	15.8	11.76215	(N/A)	(N/A)
BMP1 (OUT)	100yr24hr	0	54,914.000	16.0	6.06320	4.667	17,512.000
BMP1 (IN)	100yr48hr	0	86,518.000	39.8	11.67932	(N/A)	(N/A)
BMP1 (OUT)	100yr48hr	0	61,517.000	39.9	6.11991	4.702	17,594.000
BMP1 (IN)	100yr72hr	0	95,690.000	63.8	12.30164	(N/A)	(N/A)
BMP1 (OUT)	100yr72hr	0	63,111.000	63.9	6.13186	4.710	17,611.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 100yr24hr

Label: DMA-1

Peak Discharge	12.52000 ft³/s
Time to Peak	15.8 hours
Hydrograph Volume	72,928.880 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.0	0.34000	0.34000	0.34000	0.35000	0.35000
0.8	0.35000	0.35000	0.36000	0.36000	0.36000
1.6	0.36000	0.37000	0.37000	0.37000	0.37000
2.4	0.38000	0.38000	0.38000	0.38000	0.39000
3.3	0.39000	0.39000	0.40000	0.40000	0.40000
4.1	0.41000	0.41000	0.41000	0.42000	0.42000
4.9	0.42000	0.43000	0.43000	0.44000	0.44000
5.7	0.45000	0.45000	0.45000	0.46000	0.46000
6.5	0.47000	0.47000	0.48000	0.48000	0.49000
7.3	0.49000	0.50000	0.51000	0.51000	0.52000
8.2	0.52000	0.53000	0.54000	0.55000	0.55000
9.0	0.56000	0.57000	0.58000	0.58000	0.60000
9.8	0.60000	0.62000	0.62000	0.64000	0.65000
10.6	0.66000	0.67000	0.69000	0.70000	0.72000
11.4	0.73000	0.75000	0.76000	0.94000	0.95000
12.2	0.98000	1.00000	1.03000	1.05000	1.09000
13.0	1.11000	1.16000	1.18000	1.24000	1.27000
13.9	1.50000	1.54000	1.64000	1.70000	1.85000
14.7	1.93000	2.15000	2.29000	2.35000	2.63000
15.5	3.76000	4.98000	12.52000	3.03000	2.44000
16.3	2.03000	1.77000	1.59000	1.33000	1.21000
17.1	1.13000	1.07000	1.01000	0.96000	0.82000
17.9	0.74000	0.71000	0.68000	0.65000	0.63000
18.8	0.61000	0.59000	0.57000	0.56000	0.54000
19.6	0.53000	0.51000	0.50000	0.49000	0.48000
20.4	0.47000	0.46000	0.45000	0.44000	0.43000
21.2	0.43000	0.42000	0.41000	0.41000	0.40000
22.0	0.39000	0.39000	0.38000	0.38000	0.37000
22.8	0.36000	0.36000	0.36000	0.35000	0.35000
23.6	0.34000	0.00000	(N/A)	(N/A)	(N/A)

Peak Discharge	12.52000 ft^3/s
Time to Peak	39.8 hours
Hydrograph Volume	86,564.890 ft^3

HYDROGRAPH ORDINATES (ft^3/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)	Flow (ft^3/s)
0.0	0.06000	0.06000	0.06000	0.06000	0.06000
0.8	0.06000	0.06000	0.07000	0.07000	0.07000
1.6	0.07000	0.07000	0.07000	0.07000	0.07000
2.4	0.07000	0.07000	0.07000	0.07000	0.07000
3.3	0.07000	0.07000	0.07000	0.07000	0.07000
4.1	0.07000	0.07000	0.08000	0.08000	0.08000
4.9	0.08000	0.08000	0.08000	0.08000	0.08000
5.7	0.08000	0.08000	0.08000	0.08000	0.08000
6.5	0.09000	0.09000	0.09000	0.09000	0.09000
7.3	0.09000	0.09000	0.09000	0.09000	0.09000
8.2	0.10000	0.10000	0.10000	0.10000	0.10000
9.0	0.10000	0.10000	0.11000	0.11000	0.11000
9.8	0.11000	0.11000	0.11000	0.12000	0.12000
10.6	0.12000	0.12000	0.13000	0.13000	0.13000
11.4	0.13000	0.14000	0.14000	0.17000	0.17000
12.2	0.18000	0.18000	0.19000	0.19000	0.20000
13.0	0.20000	0.21000	0.22000	0.23000	0.23000
13.9	0.27000	0.28000	0.30000	0.31000	0.33000
14.7	0.35000	0.38000	0.40000	0.41000	0.47000
15.5	0.71000	0.98000	2.66000	0.56000	0.43000
16.3	0.36000	0.32000	0.29000	0.24000	0.22000
17.1	0.21000	0.20000	0.19000	0.18000	0.15000
17.9	0.13000	0.13000	0.12000	0.12000	0.12000
18.8	0.11000	0.11000	0.10000	0.10000	0.10000
19.6	0.10000	0.09000	0.09000	0.09000	0.09000
20.4	0.09000	0.08000	0.08000	0.08000	0.08000
21.2	0.08000	0.08000	0.08000	0.07000	0.07000
22.0	0.07000	0.07000	0.07000	0.07000	0.07000
22.8	0.07000	0.07000	0.06000	0.06000	0.06000
23.6	0.06000	0.00000	0.34000	0.34000	0.34000
24.5	0.35000	0.35000	0.35000	0.35000	0.36000
25.3	0.36000	0.36000	0.36000	0.37000	0.37000
26.1	0.37000	0.37000	0.38000	0.38000	0.38000
26.9	0.38000	0.39000	0.39000	0.39000	0.40000
27.7	0.40000	0.40000	0.41000	0.41000	0.41000
28.5	0.42000	0.42000	0.42000	0.43000	0.43000
29.4	0.44000	0.44000	0.45000	0.45000	0.45000

Subsection: Read Hydrograph
Scenario: 100yr48hr
Label: DMA-1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
30.2	0.46000	0.46000	0.47000	0.47000	0.48000
31.0	0.48000	0.49000	0.49000	0.50000	0.51000
31.8	0.51000	0.52000	0.52000	0.53000	0.54000
32.6	0.55000	0.55000	0.56000	0.57000	0.58000
33.4	0.58000	0.60000	0.60000	0.62000	0.62000
34.2	0.64000	0.65000	0.66000	0.67000	0.69000
35.1	0.70000	0.72000	0.73000	0.75000	0.76000
35.9	0.94000	0.95000	0.98000	1.00000	1.03000
36.7	1.05000	1.09000	1.11000	1.16000	1.18000
37.5	1.24000	1.27000	1.50000	1.54000	1.64000
38.3	1.70000	1.85000	1.93000	2.15000	2.29000
39.1	2.35000	2.63000	3.76000	4.98000	12.52000
39.9	3.03000	2.44000	2.03000	1.77000	1.59000
40.8	1.33000	1.21000	1.13000	1.07000	1.01000
41.6	0.96000	0.82000	0.74000	0.71000	0.68000
42.4	0.65000	0.63000	0.61000	0.59000	0.57000
43.2	0.56000	0.54000	0.53000	0.51000	0.50000
44.0	0.49000	0.48000	0.47000	0.46000	0.45000
44.8	0.44000	0.43000	0.43000	0.42000	0.41000
45.7	0.41000	0.40000	0.39000	0.39000	0.38000
46.5	0.38000	0.37000	0.36000	0.36000	0.36000
47.3	0.35000	0.35000	0.34000	0.00000	(N/A)

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph　　Scenario: 100yr72hr

Label: DMA-1

Peak Discharge	12.52000 ft³/s
Time to Peak	63.8 hours
Hydrograph Volume	95,651.650 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.0	0.04000	0.04000	0.04000	0.04000	0.04000
0.8	0.04000	0.04000	0.04000	0.04000	0.04000
1.6	0.04000	0.04000	0.04000	0.05000	0.05000
2.4	0.05000	0.05000	0.05000	0.05000	0.05000
3.3	0.05000	0.05000	0.05000	0.05000	0.05000
4.1	0.05000	0.05000	0.05000	0.05000	0.05000
4.9	0.05000	0.05000	0.05000	0.05000	0.05000
5.7	0.05000	0.05000	0.06000	0.06000	0.06000
6.5	0.06000	0.06000	0.06000	0.06000	0.06000
7.3	0.06000	0.06000	0.06000	0.06000	0.06000
8.2	0.06000	0.06000	0.07000	0.07000	0.07000
9.0	0.07000	0.07000	0.07000	0.07000	0.07000
9.8	0.07000	0.08000	0.08000	0.08000	0.08000
10.6	0.08000	0.08000	0.08000	0.08000	0.09000
11.4	0.09000	0.09000	0.09000	0.11000	0.12000
12.2	0.12000	0.12000	0.13000	0.13000	0.13000
13.0	0.14000	0.14000	0.14000	0.15000	0.16000
13.9	0.18000	0.19000	0.20000	0.21000	0.22000
14.7	0.23000	0.25000	0.27000	0.28000	0.31000
15.5	0.48000	0.67000	1.85000	0.36000	0.29000
16.3	0.24000	0.21000	0.19000	0.16000	0.15000
17.1	0.14000	0.13000	0.12000	0.12000	0.10000
17.9	0.09000	0.09000	0.08000	0.08000	0.08000
18.8	0.07000	0.07000	0.07000	0.07000	0.07000
19.6	0.06000	0.06000	0.06000	0.06000	0.06000
20.4	0.06000	0.06000	0.05000	0.05000	0.05000
21.2	0.05000	0.05000	0.05000	0.05000	0.05000
22.0	0.05000	0.05000	0.05000	0.05000	0.05000
22.8	0.04000	0.04000	0.04000	0.04000	0.04000
23.6	0.04000	0.00000	0.06000	0.06000	0.06000
24.5	0.06000	0.06000	0.06000	0.06000	0.07000
25.3	0.07000	0.07000	0.07000	0.07000	0.07000
26.1	0.07000	0.07000	0.07000	0.07000	0.07000
26.9	0.07000	0.07000	0.07000	0.07000	0.07000
27.7	0.07000	0.07000	0.07000	0.07000	0.08000
28.5	0.08000	0.08000	0.08000	0.08000	0.08000
29.4	0.08000	0.08000	0.08000	0.08000	0.08000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 100yr72hr
Label: DMA-1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
30.2	0.08000	0.08000	0.09000	0.09000	0.09000
31.0	0.09000	0.09000	0.09000	0.09000	0.09000
31.8	0.09000	0.09000	0.10000	0.10000	0.10000
32.6	0.10000	0.10000	0.10000	0.10000	0.11000
33.4	0.11000	0.11000	0.11000	0.11000	0.11000
34.2	0.12000	0.12000	0.12000	0.12000	0.13000
35.1	0.13000	0.13000	0.13000	0.14000	0.14000
35.9	0.17000	0.17000	0.18000	0.18000	0.19000
36.7	0.19000	0.20000	0.20000	0.21000	0.22000
37.5	0.23000	0.23000	0.27000	0.28000	0.30000
38.3	0.31000	0.33000	0.35000	0.38000	0.40000
39.1	0.41000	0.47000	0.71000	0.98000	2.66000
39.9	0.56000	0.43000	0.36000	0.32000	0.29000
40.8	0.24000	0.22000	0.21000	0.20000	0.19000
41.6	0.18000	0.15000	0.13000	0.13000	0.12000
42.4	0.12000	0.12000	0.11000	0.11000	0.10000
43.2	0.10000	0.10000	0.10000	0.09000	0.09000
44.0	0.09000	0.09000	0.09000	0.08000	0.08000
44.8	0.08000	0.08000	0.08000	0.08000	0.08000
45.7	0.07000	0.07000	0.07000	0.07000	0.07000
46.5	0.07000	0.07000	0.07000	0.07000	0.06000
47.3	0.06000	0.06000	0.06000	0.00000	0.34000
48.1	0.34000	0.34000	0.35000	0.35000	0.35000
48.9	0.35000	0.36000	0.36000	0.36000	0.36000
49.7	0.37000	0.37000	0.37000	0.37000	0.38000
50.5	0.38000	0.38000	0.38000	0.39000	0.39000
51.4	0.39000	0.40000	0.40000	0.40000	0.41000
52.2	0.41000	0.41000	0.42000	0.42000	0.42000
53.0	0.43000	0.43000	0.44000	0.44000	0.45000
53.8	0.45000	0.45000	0.46000	0.46000	0.47000
54.6	0.47000	0.48000	0.48000	0.49000	0.49000
55.4	0.50000	0.51000	0.51000	0.52000	0.52000
56.3	0.53000	0.54000	0.55000	0.55000	0.56000
57.1	0.57000	0.58000	0.58000	0.60000	0.60000
57.9	0.62000	0.62000	0.64000	0.65000	0.66000
58.7	0.67000	0.69000	0.70000	0.72000	0.73000
59.5	0.75000	0.76000	0.94000	0.95000	0.98000
60.3	1.00000	1.03000	1.05000	1.09000	1.11000
61.1	1.16000	1.18000	1.24000	1.27000	1.50000
62.0	1.54000	1.64000	1.70000	1.85000	1.93000
62.8	2.15000	2.29000	2.35000	2.63000	3.76000
63.6	4.98000	12.52000	3.03000	2.44000	2.03000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Read Hydrograph Scenario: 100yr72hr

Label: DMA-1

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
64.4	1.77000	1.59000	1.33000	1.21000	1.13000
65.2	1.07000	1.01000	0.96000	0.82000	0.74000
66.0	0.71000	0.68000	0.65000	0.63000	0.61000
66.9	0.59000	0.57000	0.56000	0.54000	0.53000
67.7	0.51000	0.50000	0.49000	0.48000	0.47000
68.5	0.46000	0.45000	0.44000	0.43000	0.43000
69.3	0.42000	0.41000	0.41000	0.40000	0.39000
70.1	0.39000	0.38000	0.38000	0.37000	0.36000
70.9	0.36000	0.36000	0.35000	0.35000	0.34000
71.7	0.00000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr24hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.026	0.053	0.078	0.104
0.3	0.128	0.153	0.177	0.201	0.225
0.5	0.249	0.272	0.295	0.318	0.340
0.8	0.362	0.384	0.405	0.426	0.447
1.0	0.468	0.488	0.505	0.519	0.533
1.3	0.547	0.561	0.575	0.589	0.603
1.5	0.617	0.631	0.645	0.659	0.673
1.8	0.687	0.701	0.716	0.730	0.745
2.0	0.759	0.774	0.788	0.803	0.817
2.3	0.832	0.846	0.861	0.876	0.891
2.5	0.906	0.921	0.936	0.951	0.966
2.8	0.981	0.996	1.007	1.018	1.028
3.0	1.039	1.050	1.060	1.071	1.082
3.3	1.093	1.104	1.115	1.126	1.137
3.5	1.148	1.159	1.170	1.181	1.192
3.8	1.204	1.215	1.226	1.237	1.249
4.0	1.260	1.271	1.283	1.295	1.306
4.3	1.318	1.329	1.341	1.353	1.364
4.5	1.376	1.388	1.400	1.412	1.424
4.8	1.436	1.448	1.460	1.472	1.484
5.0	1.496	1.509	1.521	1.534	1.547
5.3	1.559	1.572	1.585	1.598	1.611
5.5	1.624	1.637	1.651	1.664	1.677
5.8	1.691	1.704	1.718	1.731	1.744
6.0	1.758	1.771	1.785	1.799	1.812
6.3	1.826	1.840	1.854	1.868	1.882
6.5	1.896	1.910	1.924	1.938	1.953
6.8	1.967	1.981	1.996	2.011	2.026
7.0	2.041	2.056	2.071	2.086	2.102
7.3	2.117	2.132	2.148	2.163	2.179
7.5	2.194	2.210	2.226	2.242	2.258
7.8	2.274	2.290	2.305	2.319	2.333
8.0	2.347	2.360	2.373	2.386	2.398
8.3	2.410	2.421	2.432	2.443	2.454
8.5	2.465	2.475	2.485	2.495	2.504
8.8	2.513	2.521	2.528	2.534	2.540
9.0	2.545	2.550	2.554	2.558	2.561
9.3	2.564	2.567	2.570	2.573	2.575
9.5	2.577	2.579	2.580	2.582	2.584
9.8	2.586	2.587	2.588	2.590	2.591
10.0	2.593	2.594	2.595	2.596	2.598

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation　　　Scenario: 100yr24hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	2.599	2.600	2.602	2.603	2.604
10.5	2.606	2.607	2.608	2.609	2.610
10.8	2.611	2.613	2.614	2.615	2.617
11.0	2.618	2.620	2.621	2.622	2.624
11.3	2.625	2.627	2.628	2.630	2.631
11.5	2.633	2.634	2.636	2.637	2.639
11.8	2.640	2.643	2.648	2.654	2.661
12.0	2.667	2.673	2.678	2.683	2.687
12.3	2.692	2.696	2.700	2.704	2.707
12.5	2.711	2.714	2.718	2.721	2.724
12.8	2.727	2.730	2.734	2.737	2.740
13.0	2.743	2.746	2.750	2.753	2.756
13.3	2.760	2.764	2.767	2.770	2.774
13.5	2.777	2.782	2.786	2.790	2.794
13.8	2.799	2.806	2.815	2.825	2.835
14.0	2.844	2.852	2.861	2.870	2.879
14.3	2.888	2.896	2.904	2.913	2.922
14.5	2.932	2.943	2.953	2.963	2.973
14.8	2.985	2.997	3.012	3.026	3.039
15.0	3.052	3.065	3.076	3.085	3.095
15.3	3.107	3.120	3.136	3.162	3.197
15.5	3.241	3.292	3.350	3.414	3.523
15.8	3.735	4.045	4.429	4.664	4.667
16.0	4.497	4.306	4.126	3.967	3.845
16.3	3.730	3.622	3.520	3.437	3.365
16.5	3.303	3.248	3.201	3.159	3.121
16.8	3.086	3.054	3.025	3.000	2.978
17.0	2.957	2.938	2.920	2.904	2.888
17.3	2.874	2.860	2.848	2.836	2.824
17.5	2.814	2.804	2.794	2.785	2.775
17.8	2.765	2.754	2.744	2.733	2.723
18.0	2.714	2.705	2.697	2.690	2.683
18.3	2.676	2.670	2.664	2.659	2.654
18.5	2.649	2.644	2.640	2.636	2.632
18.8	2.629	2.626	2.622	2.619	2.616
19.0	2.613	2.611	2.608	2.605	2.603
19.3	2.601	2.599	2.596	2.594	2.592
19.5	2.590	2.589	2.587	2.585	2.583
19.8	2.581	2.579	2.578	2.576	2.575
20.0	2.573	2.572	2.570	2.569	2.568
20.3	2.566	2.565	2.564	2.563	2.561

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr24hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	2.560	2.559	2.558	2.557	2.556
20.8	2.555	2.554	2.552	2.551	2.550
21.0	2.549	2.548	2.547	2.546	2.546
21.3	2.545	2.544	2.543	2.542	2.542
21.5	2.541	2.540	2.539	2.538	2.538
21.8	2.537	2.536	2.536	2.535	2.534
22.0	2.533	2.532	2.532	2.531	2.530
22.3	2.530	2.529	2.528	2.528	2.527
22.5	2.527	2.526	2.526	2.525	2.524
22.8	2.524	2.523	2.522	2.521	2.521
23.0	2.520	2.520	2.519	2.519	2.519
23.3	2.518	2.518	2.517	2.516	2.516
23.5	2.516	2.515	2.515	2.514	2.511
23.8	2.504	2.494	2.482	2.471	2.460
24.0	2.449	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr48hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.005	0.009	0.014	0.018
0.3	0.023	0.027	0.031	0.035	0.040
0.5	0.044	0.048	0.052	0.055	0.059
0.8	0.063	0.067	0.070	0.074	0.078
1.0	0.081	0.085	0.089	0.093	0.097
1.3	0.101	0.104	0.108	0.112	0.116
1.5	0.119	0.123	0.127	0.130	0.134
1.8	0.137	0.140	0.144	0.147	0.150
2.0	0.153	0.156	0.159	0.162	0.165
2.3	0.168	0.171	0.174	0.177	0.179
2.5	0.182	0.185	0.187	0.190	0.192
2.8	0.195	0.197	0.200	0.202	0.204
3.0	0.207	0.209	0.211	0.213	0.216
3.3	0.218	0.220	0.222	0.224	0.226
3.5	0.228	0.230	0.232	0.234	0.235
3.8	0.237	0.239	0.241	0.243	0.244
4.0	0.246	0.248	0.249	0.251	0.252
4.3	0.254	0.256	0.258	0.260	0.262
4.5	0.264	0.266	0.268	0.271	0.273
4.8	0.275	0.277	0.279	0.281	0.282
5.0	0.284	0.286	0.288	0.290	0.292
5.3	0.293	0.295	0.297	0.298	0.300
5.5	0.302	0.303	0.305	0.306	0.308
5.8	0.309	0.311	0.312	0.314	0.315
6.0	0.316	0.318	0.319	0.320	0.322
6.3	0.323	0.324	0.325	0.327	0.328
6.5	0.330	0.332	0.334	0.336	0.337
6.8	0.339	0.341	0.343	0.344	0.346
7.0	0.348	0.349	0.351	0.353	0.354
7.3	0.356	0.357	0.359	0.360	0.362
7.5	0.363	0.365	0.366	0.367	0.369
7.8	0.370	0.371	0.373	0.374	0.375
8.0	0.376	0.378	0.379	0.381	0.383
8.3	0.385	0.387	0.389	0.390	0.392
8.5	0.394	0.396	0.397	0.399	0.401
8.8	0.402	0.404	0.405	0.407	0.408
9.0	0.410	0.411	0.413	0.414	0.416
9.3	0.418	0.420	0.422	0.424	0.426
9.5	0.428	0.430	0.432	0.434	0.436
9.8	0.437	0.439	0.441	0.443	0.445
10.0	0.446	0.448	0.450	0.451	0.453

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	0.455	0.458	0.460	0.462	0.464
10.5	0.467	0.469	0.471	0.473	0.475
10.8	0.477	0.479	0.481	0.484	0.487
11.0	0.489	0.492	0.494	0.497	0.499
11.3	0.501	0.503	0.504	0.506	0.508
11.5	0.510	0.512	0.514	0.516	0.518
11.8	0.520	0.523	0.526	0.530	0.533
12.0	0.537	0.541	0.545	0.549	0.553
12.3	0.557	0.561	0.566	0.570	0.575
12.5	0.579	0.584	0.589	0.594	0.598
12.8	0.603	0.608	0.614	0.619	0.624
13.0	0.630	0.635	0.641	0.646	0.652
13.3	0.658	0.664	0.671	0.677	0.684
13.5	0.691	0.697	0.704	0.711	0.718
13.8	0.726	0.734	0.743	0.752	0.761
14.0	0.770	0.780	0.790	0.801	0.811
14.3	0.822	0.833	0.844	0.856	0.867
14.5	0.880	0.892	0.905	0.918	0.931
14.8	0.945	0.960	0.974	0.990	1.004
15.0	1.015	1.026	1.037	1.049	1.061
15.3	1.073	1.086	1.101	1.117	1.136
15.5	1.158	1.183	1.211	1.243	1.284
15.8	1.345	1.425	1.509	1.578	1.623
16.0	1.648	1.664	1.679	1.692	1.704
16.3	1.715	1.726	1.736	1.745	1.754
16.5	1.762	1.770	1.778	1.785	1.792
16.8	1.798	1.804	1.809	1.814	1.819
17.0	1.824	1.828	1.833	1.837	1.841
17.3	1.845	1.849	1.853	1.856	1.860
17.5	1.863	1.867	1.870	1.873	1.875
17.8	1.878	1.880	1.881	1.883	1.884
18.0	1.885	1.886	1.888	1.889	1.890
18.3	1.891	1.892	1.892	1.893	1.894
18.5	1.895	1.896	1.896	1.897	1.898
18.8	1.898	1.899	1.899	1.899	1.900
19.0	1.900	1.900	1.900	1.900	1.900
19.3	1.900	1.900	1.900	1.901	1.901
19.5	1.901	1.901	1.901	1.901	1.900
19.8	1.900	1.900	1.899	1.899	1.899
20.0	1.898	1.898	1.898	1.897	1.897
20.3	1.897	1.896	1.896	1.895	1.895

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	1.894	1.894	1.893	1.892	1.892
20.8	1.891	1.890	1.889	1.889	1.888
21.0	1.887	1.887	1.886	1.885	1.884
21.3	1.884	1.883	1.882	1.881	1.881
21.5	1.880	1.879	1.878	1.877	1.876
21.8	1.875	1.874	1.873	1.872	1.871
22.0	1.870	1.869	1.867	1.866	1.865
22.3	1.864	1.863	1.862	1.861	1.860
22.5	1.859	1.857	1.856	1.855	1.854
22.8	1.853	1.852	1.851	1.850	1.849
23.0	1.847	1.846	1.845	1.844	1.842
23.3	1.841	1.839	1.838	1.836	1.835
23.5	1.833	1.832	1.830	1.829	1.827
23.8	1.824	1.821	1.819	1.820	1.826
24.0	1.834	1.844	1.853	1.862	1.871
24.3	1.881	1.890	1.899	1.909	1.918
24.5	1.928	1.937	1.947	1.957	1.966
24.8	1.976	1.985	1.995	2.005	2.015
25.0	2.025	2.035	2.045	2.055	2.065
25.3	2.076	2.086	2.096	2.106	2.117
25.5	2.127	2.137	2.147	2.158	2.168
25.8	2.179	2.189	2.200	2.211	2.221
26.0	2.232	2.243	2.253	2.264	2.274
26.3	2.284	2.294	2.303	2.312	2.321
26.5	2.330	2.338	2.346	2.354	2.362
26.8	2.369	2.376	2.383	2.390	2.396
27.0	2.402	2.409	2.415	2.421	2.426
27.3	2.432	2.437	2.442	2.447	2.452
27.5	2.457	2.462	2.467	2.471	2.476
27.8	2.480	2.484	2.488	2.492	2.496
28.0	2.500	2.503	2.507	2.510	2.513
28.3	2.515	2.517	2.519	2.521	2.522
28.5	2.524	2.525	2.526	2.528	2.529
28.8	2.529	2.530	2.531	2.532	2.532
29.0	2.533	2.534	2.535	2.535	2.536
29.3	2.536	2.537	2.538	2.538	2.539
29.5	2.539	2.540	2.540	2.541	2.542
29.8	2.542	2.543	2.543	2.543	2.544
30.0	2.544	2.544	2.545	2.545	2.546
30.3	2.546	2.547	2.547	2.548	2.548
30.5	2.549	2.549	2.550	2.550	2.551

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
30.8	2.551	2.552	2.552	2.553	2.553
31.0	2.554	2.554	2.555	2.555	2.556
31.3	2.556	2.557	2.557	2.558	2.558
31.5	2.559	2.559	2.560	2.561	2.562
31.8	2.562	2.563	2.563	2.564	2.565
32.0	2.565	2.566	2.566	2.567	2.567
32.3	2.568	2.569	2.569	2.570	2.571
32.5	2.572	2.572	2.573	2.574	2.575
32.8	2.575	2.576	2.577	2.577	2.578
33.0	2.579	2.580	2.580	2.581	2.582
33.3	2.583	2.584	2.585	2.585	2.586
33.5	2.587	2.588	2.589	2.590	2.591
33.8	2.591	2.592	2.593	2.594	2.595
34.0	2.596	2.597	2.598	2.599	2.600
34.3	2.601	2.602	2.604	2.605	2.606
34.5	2.607	2.608	2.609	2.610	2.612
34.8	2.613	2.614	2.615	2.616	2.618
35.0	2.619	2.621	2.622	2.623	2.625
35.3	2.626	2.628	2.629	2.631	2.632
35.5	2.634	2.635	2.637	2.638	2.640
35.8	2.642	2.646	2.652	2.658	2.665
36.0	2.670	2.676	2.681	2.685	2.690
36.3	2.694	2.698	2.702	2.706	2.709
36.5	2.713	2.716	2.720	2.723	2.726
36.8	2.729	2.732	2.736	2.739	2.742
37.0	2.745	2.748	2.752	2.755	2.759
37.3	2.762	2.766	2.769	2.772	2.776
37.5	2.780	2.784	2.788	2.792	2.797
37.8	2.803	2.812	2.821	2.831	2.840
38.0	2.849	2.858	2.866	2.875	2.884
38.3	2.893	2.901	2.910	2.919	2.928
38.5	2.939	2.949	2.959	2.969	2.980
38.8	2.992	3.006	3.020	3.034	3.047
39.0	3.060	3.071	3.082	3.091	3.102
39.3	3.114	3.129	3.150	3.182	3.222
39.5	3.271	3.327	3.389	3.477	3.650
39.8	3.916	4.299	4.611	4.702	4.571
40.0	4.367	4.185	4.012	3.885	3.768
40.3	3.658	3.555	3.464	3.389	3.324
40.5	3.267	3.217	3.174	3.135	3.099
40.8	3.066	3.036	3.009	2.986	2.965

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr48hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
41.0	2.945	2.927	2.910	2.894	2.879
41.3	2.865	2.852	2.840	2.829	2.818
41.5	2.808	2.798	2.789	2.779	2.769
41.8	2.758	2.748	2.737	2.727	2.717
42.0	2.708	2.700	2.692	2.685	2.679
42.3	2.672	2.666	2.661	2.656	2.651
42.5	2.646	2.642	2.638	2.634	2.630
42.8	2.627	2.623	2.620	2.617	2.614
43.0	2.612	2.609	2.606	2.604	2.602
43.3	2.599	2.597	2.595	2.593	2.591
43.5	2.589	2.587	2.586	2.584	2.582
43.8	2.580	2.578	2.577	2.575	2.574
44.0	2.572	2.571	2.569	2.568	2.567
44.3	2.566	2.564	2.563	2.562	2.561
44.5	2.560	2.558	2.557	2.556	2.555
44.8	2.554	2.553	2.552	2.551	2.550
45.0	2.549	2.547	2.547	2.546	2.545
45.3	2.544	2.544	2.543	2.542	2.541
45.5	2.540	2.539	2.539	2.538	2.537
45.8	2.537	2.536	2.535	2.534	2.534
46.0	2.533	2.532	2.531	2.531	2.530
46.3	2.529	2.529	2.528	2.527	2.527
46.5	2.526	2.526	2.525	2.525	2.524
46.8	2.523	2.522	2.522	2.521	2.520
47.0	2.520	2.519	2.519	2.519	2.518
47.3	2.518	2.517	2.517	2.516	2.516
47.5	2.515	2.515	2.514	2.512	2.507
47.8	2.498	2.487	2.475	2.463	2.452
48.0	2.441	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.003	0.006	0.009	0.012
0.3	0.015	0.018	0.021	0.024	0.026
0.5	0.029	0.032	0.034	0.037	0.040
0.8	0.042	0.044	0.047	0.049	0.052
1.0	0.054	0.056	0.059	0.061	0.063
1.3	0.065	0.067	0.069	0.071	0.073
1.5	0.075	0.077	0.079	0.081	0.083
1.8	0.085	0.087	0.088	0.090	0.092
2.0	0.094	0.096	0.098	0.100	0.103
2.3	0.105	0.107	0.109	0.112	0.114
2.5	0.116	0.118	0.120	0.122	0.124
2.8	0.126	0.128	0.130	0.132	0.134
3.0	0.136	0.137	0.139	0.141	0.143
3.3	0.144	0.146	0.148	0.149	0.151
3.5	0.152	0.154	0.155	0.157	0.158
3.8	0.160	0.161	0.163	0.164	0.166
4.0	0.167	0.168	0.169	0.171	0.172
4.3	0.173	0.174	0.176	0.177	0.178
4.5	0.179	0.180	0.181	0.183	0.184
4.8	0.185	0.186	0.187	0.188	0.189
5.0	0.190	0.191	0.192	0.193	0.194
5.3	0.194	0.195	0.196	0.197	0.198
5.5	0.199	0.200	0.200	0.201	0.202
5.8	0.203	0.204	0.204	0.205	0.206
6.0	0.207	0.209	0.210	0.212	0.213
6.3	0.214	0.216	0.217	0.218	0.220
6.5	0.221	0.222	0.224	0.225	0.226
6.8	0.227	0.228	0.230	0.231	0.232
7.0	0.233	0.234	0.235	0.236	0.237
7.3	0.238	0.239	0.240	0.241	0.242
7.5	0.243	0.244	0.245	0.246	0.247
7.8	0.247	0.248	0.249	0.250	0.251
8.0	0.252	0.252	0.253	0.254	0.255
8.3	0.255	0.256	0.257	0.258	0.259
8.5	0.261	0.262	0.263	0.265	0.266
8.8	0.268	0.269	0.270	0.271	0.273
9.0	0.274	0.275	0.276	0.278	0.279
9.3	0.280	0.281	0.282	0.283	0.284
9.5	0.285	0.286	0.288	0.289	0.290
9.8	0.291	0.292	0.293	0.294	0.296
10.0	0.297	0.299	0.301	0.302	0.304

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	0.305	0.307	0.308	0.310	0.311
10.5	0.313	0.314	0.316	0.317	0.318
10.8	0.320	0.321	0.322	0.323	0.325
11.0	0.326	0.327	0.328	0.330	0.331
11.3	0.333	0.335	0.337	0.339	0.340
11.5	0.342	0.344	0.346	0.347	0.349
11.8	0.351	0.352	0.355	0.358	0.361
12.0	0.364	0.368	0.371	0.375	0.379
12.3	0.382	0.386	0.389	0.392	0.396
12.5	0.399	0.403	0.407	0.411	0.415
12.8	0.418	0.422	0.426	0.429	0.433
13.0	0.437	0.441	0.445	0.449	0.453
13.3	0.457	0.461	0.465	0.469	0.472
13.5	0.477	0.481	0.485	0.490	0.495
13.8	0.500	0.504	0.508	0.512	0.517
14.0	0.521	0.526	0.531	0.537	0.542
14.3	0.547	0.553	0.559	0.565	0.571
14.5	0.577	0.584	0.591	0.597	0.604
14.8	0.612	0.619	0.627	0.636	0.644
15.0	0.653	0.663	0.672	0.681	0.691
15.3	0.702	0.712	0.724	0.738	0.755
15.5	0.774	0.797	0.822	0.851	0.890
15.8	0.949	1.018	1.076	1.121	1.149
16.0	1.164	1.173	1.181	1.189	1.195
16.3	1.202	1.207	1.212	1.217	1.222
16.5	1.226	1.230	1.233	1.237	1.240
16.8	1.243	1.245	1.247	1.249	1.251
17.0	1.253	1.255	1.257	1.258	1.259
17.3	1.261	1.262	1.263	1.264	1.265
17.5	1.266	1.266	1.267	1.268	1.268
17.8	1.269	1.269	1.269	1.268	1.268
18.0	1.268	1.267	1.267	1.267	1.266
18.3	1.266	1.265	1.264	1.263	1.263
18.5	1.262	1.261	1.261	1.260	1.259
18.8	1.258	1.257	1.256	1.255	1.253
19.0	1.252	1.251	1.250	1.249	1.248
19.3	1.247	1.246	1.245	1.244	1.243
19.5	1.241	1.240	1.239	1.237	1.236
19.8	1.234	1.233	1.231	1.230	1.228
20.0	1.227	1.225	1.224	1.223	1.221
20.3	1.220	1.218	1.217	1.215	1.214

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation   Scenario: 100yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours

Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	1.212	1.211	1.209	1.208	1.206
20.8	1.204	1.202	1.200	1.199	1.197
21.0	1.195	1.193	1.191	1.190	1.188
21.3	1.186	1.184	1.182	1.180	1.179
21.5	1.177	1.175	1.173	1.171	1.169
21.8	1.168	1.166	1.164	1.162	1.160
22.0	1.158	1.157	1.155	1.153	1.151
22.3	1.149	1.147	1.146	1.144	1.142
22.5	1.140	1.138	1.136	1.135	1.133
22.8	1.131	1.129	1.127	1.124	1.122
23.0	1.120	1.118	1.116	1.113	1.111
23.3	1.109	1.107	1.104	1.102	1.100
23.5	1.098	1.096	1.093	1.091	1.089
23.8	1.086	1.082	1.079	1.076	1.074
24.0	1.073	1.071	1.070	1.068	1.067
24.3	1.065	1.064	1.062	1.061	1.060
24.5	1.058	1.057	1.055	1.054	1.052
24.8	1.051	1.049	1.048	1.046	1.045
25.0	1.044	1.042	1.041	1.040	1.039
25.3	1.038	1.037	1.036	1.035	1.034
25.5	1.032	1.031	1.030	1.029	1.028
25.8	1.027	1.026	1.025	1.024	1.023
26.0	1.022	1.021	1.019	1.018	1.017
26.3	1.016	1.015	1.014	1.013	1.012
26.5	1.011	1.010	1.009	1.008	1.006
26.8	1.005	1.004	1.003	1.002	1.001
27.0	1.000	0.998	0.997	0.995	0.994
27.3	0.992	0.991	0.989	0.988	0.986
27.5	0.984	0.983	0.981	0.980	0.978
27.8	0.977	0.975	0.974	0.972	0.971
28.0	0.969	0.967	0.966	0.964	0.963
28.3	0.961	0.960	0.959	0.958	0.957
28.5	0.956	0.955	0.954	0.953	0.952
28.8	0.951	0.950	0.949	0.948	0.947
29.0	0.946	0.945	0.944	0.943	0.942
29.3	0.940	0.939	0.938	0.937	0.936
29.5	0.935	0.934	0.933	0.932	0.931
29.8	0.930	0.929	0.928	0.927	0.926
30.0	0.925	0.924	0.923	0.922	0.921
30.3	0.920	0.919	0.918	0.917	0.917
30.5	0.916	0.916	0.915	0.915	0.914

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
30.8	0.914	0.913	0.913	0.912	0.912
31.0	0.911	0.911	0.910	0.910	0.909
31.3	0.909	0.908	0.908	0.907	0.907
31.5	0.906	0.906	0.906	0.905	0.905
31.8	0.904	0.904	0.903	0.903	0.902
32.0	0.902	0.901	0.901	0.901	0.901
32.3	0.902	0.902	0.902	0.902	0.902
32.5	0.902	0.902	0.902	0.902	0.902
32.8	0.902	0.902	0.902	0.902	0.902
33.0	0.902	0.902	0.902	0.903	0.903
33.3	0.903	0.904	0.904	0.905	0.906
33.5	0.906	0.907	0.907	0.908	0.909
33.8	0.909	0.910	0.910	0.911	0.912
34.0	0.912	0.913	0.913	0.914	0.915
34.3	0.916	0.917	0.918	0.919	0.920
34.5	0.922	0.923	0.924	0.925	0.926
34.8	0.927	0.929	0.930	0.932	0.933
35.0	0.935	0.936	0.938	0.940	0.941
35.3	0.943	0.945	0.946	0.948	0.950
35.5	0.952	0.954	0.956	0.958	0.961
35.8	0.963	0.966	0.969	0.973	0.977
36.0	0.980	0.984	0.988	0.992	0.996
36.3	1.001	1.004	1.007	1.010	1.013
36.5	1.016	1.019	1.023	1.026	1.030
36.8	1.033	1.037	1.040	1.044	1.048
37.0	1.052	1.056	1.060	1.064	1.068
37.3	1.072	1.076	1.081	1.085	1.090
37.5	1.095	1.100	1.105	1.110	1.115
37.8	1.120	1.126	1.132	1.139	1.145
38.0	1.152	1.159	1.166	1.173	1.181
38.3	1.189	1.196	1.204	1.213	1.221
38.5	1.230	1.238	1.247	1.257	1.266
38.8	1.276	1.286	1.297	1.308	1.319
39.0	1.330	1.341	1.353	1.365	1.377
39.3	1.390	1.403	1.419	1.437	1.458
39.5	1.482	1.509	1.540	1.578	1.632
39.8	1.707	1.794	1.873	1.927	1.957
40.0	1.973	1.989	2.003	2.015	2.027
40.3	2.038	2.049	2.059	2.068	2.077
40.5	2.085	2.093	2.101	2.108	2.115
40.8	2.121	2.126	2.132	2.137	2.141

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
41.0	2.146	2.150	2.155	2.159	2.163
41.3	2.167	2.171	2.175	2.179	2.182
41.5	2.186	2.189	2.192	2.195	2.198
41.8	2.200	2.201	2.203	2.204	2.206
42.0	2.207	2.208	2.209	2.210	2.211
42.3	2.212	2.213	2.214	2.215	2.216
42.5	2.216	2.217	2.218	2.219	2.219
42.8	2.220	2.220	2.220	2.221	2.221
43.0	2.221	2.222	2.222	2.222	2.222
43.3	2.222	2.222	2.222	2.222	2.222
43.5	2.222	2.222	2.222	2.222	2.221
43.8	2.221	2.221	2.220	2.220	2.220
44.0	2.219	2.219	2.219	2.218	2.218
44.3	2.217	2.217	2.217	2.216	2.216
44.5	2.215	2.214	2.214	2.213	2.212
44.8	2.211	2.211	2.210	2.209	2.208
45.0	2.208	2.207	2.206	2.205	2.205
45.3	2.204	2.203	2.203	2.202	2.201
45.5	2.200	2.199	2.198	2.197	2.196
45.8	2.195	2.194	2.193	2.192	2.191
46.0	2.189	2.188	2.187	2.186	2.185
46.3	2.184	2.183	2.181	2.180	2.179
46.5	2.178	2.177	2.176	2.175	2.173
46.8	2.172	2.171	2.170	2.169	2.168
47.0	2.167	2.165	2.164	2.162	2.161
47.3	2.159	2.158	2.156	2.155	2.153
47.5	2.152	2.150	2.149	2.147	2.144
47.8	2.141	2.138	2.139	2.143	2.151
48.0	2.160	2.170	2.179	2.189	2.198
48.3	2.208	2.217	2.227	2.237	2.246
48.5	2.256	2.266	2.275	2.284	2.293
48.8	2.302	2.310	2.318	2.325	2.333
49.0	2.340	2.347	2.354	2.361	2.367
49.3	2.374	2.380	2.386	2.392	2.397
49.5	2.402	2.408	2.413	2.418	2.422
49.8	2.427	2.432	2.437	2.441	2.445
50.0	2.449	2.453	2.457	2.461	2.464
50.3	2.468	2.471	2.475	2.478	2.482
50.5	2.485	2.488	2.491	2.494	2.497
50.8	2.500	2.502	2.505	2.507	2.509
51.0	2.511	2.513	2.514	2.516	2.517

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
51.3	2.518	2.519	2.520	2.520	2.521
51.5	2.522	2.523	2.524	2.524	2.525
51.8	2.526	2.526	2.526	2.527	2.527
52.0	2.528	2.528	2.529	2.529	2.530
52.3	2.530	2.531	2.531	2.531	2.532
52.5	2.532	2.533	2.533	2.533	2.534
52.8	2.534	2.534	2.535	2.535	2.535
53.0	2.536	2.536	2.537	2.537	2.537
53.3	2.538	2.538	2.539	2.539	2.540
53.5	2.540	2.541	2.541	2.542	2.542
53.8	2.543	2.543	2.544	2.544	2.544
54.0	2.545	2.545	2.545	2.546	2.546
54.3	2.547	2.547	2.547	2.548	2.548
54.5	2.549	2.550	2.550	2.550	2.551
54.8	2.551	2.552	2.553	2.553	2.553
55.0	2.554	2.554	2.555	2.556	2.556
55.3	2.557	2.557	2.557	2.558	2.559
55.5	2.559	2.560	2.561	2.561	2.562
55.8	2.563	2.563	2.564	2.564	2.565
56.0	2.566	2.566	2.567	2.567	2.568
56.3	2.568	2.569	2.570	2.570	2.571
56.5	2.572	2.573	2.574	2.574	2.575
56.8	2.576	2.576	2.577	2.578	2.579
57.0	2.579	2.580	2.581	2.582	2.583
57.3	2.584	2.584	2.585	2.586	2.586
57.5	2.587	2.588	2.589	2.590	2.591
57.8	2.592	2.593	2.594	2.595	2.596
58.0	2.597	2.598	2.599	2.600	2.601
58.3	2.602	2.603	2.604	2.605	2.607
58.5	2.608	2.609	2.610	2.611	2.612
58.8	2.613	2.615	2.616	2.617	2.619
59.0	2.620	2.621	2.623	2.624	2.626
59.3	2.627	2.629	2.630	2.632	2.633
59.5	2.635	2.636	2.638	2.639	2.641
59.8	2.644	2.649	2.656	2.662	2.668
60.0	2.674	2.679	2.684	2.688	2.693
60.3	2.697	2.701	2.705	2.708	2.712
60.5	2.715	2.719	2.722	2.725	2.728
60.8	2.731	2.734	2.738	2.741	2.744
61.0	2.747	2.750	2.754	2.757	2.761
61.3	2.764	2.768	2.771	2.775	2.778

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation Scenario: 100yr72hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
61.5	2.783	2.787	2.791	2.795	2.800
61.8	2.808	2.818	2.828	2.837	2.846
62.0	2.854	2.863	2.872	2.881	2.890
62.3	2.898	2.906	2.915	2.925	2.935
62.5	2.945	2.956	2.966	2.976	2.988
62.8	3.000	3.015	3.029	3.043	3.055
63.0	3.067	3.078	3.087	3.098	3.109
63.3	3.123	3.141	3.169	3.206	3.252
63.5	3.305	3.365	3.436	3.567	3.800
63.8	4.155	4.526	4.710	4.657	4.467
64.0	4.277	4.098	3.946	3.825	3.711
64.3	3.604	3.503	3.423	3.353	3.292
64.5	3.239	3.192	3.151	3.114	3.080
64.8	3.048	3.020	2.995	2.973	2.953
65.0	2.934	2.917	2.900	2.885	2.871
65.3	2.857	2.845	2.833	2.822	2.812
65.5	2.802	2.792	2.783	2.773	2.762
65.8	2.752	2.741	2.731	2.721	2.712
66.0	2.703	2.695	2.688	2.681	2.675
66.3	2.669	2.663	2.658	2.653	2.648
66.5	2.643	2.639	2.635	2.632	2.628
66.8	2.625	2.622	2.618	2.616	2.613
67.0	2.610	2.607	2.605	2.602	2.600
67.3	2.598	2.596	2.594	2.592	2.590
67.5	2.588	2.586	2.584	2.583	2.581
67.8	2.579	2.577	2.576	2.574	2.573
68.0	2.571	2.570	2.569	2.567	2.566
68.3	2.565	2.564	2.562	2.561	2.560
68.5	2.559	2.558	2.557	2.555	2.554
68.8	2.553	2.552	2.551	2.550	2.549
69.0	2.548	2.547	2.546	2.545	2.545
69.3	2.544	2.543	2.542	2.541	2.540
69.5	2.540	2.539	2.538	2.538	2.537
69.8	2.536	2.535	2.535	2.534	2.533
70.0	2.532	2.532	2.531	2.530	2.530
70.3	2.529	2.528	2.528	2.527	2.527
70.5	2.526	2.526	2.525	2.524	2.523
70.8	2.523	2.522	2.521	2.521	2.520
71.0	2.520	2.519	2.519	2.518	2.518
71.3	2.517	2.517	2.516	2.516	2.516
71.5	2.515	2.515	2.513	2.509	2.501

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Elevation
Scenario: 100yr72hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
71.8	2.491	2.479	2.467	2.456	2.445
72.0	2.435	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume　　Scenario: 100yr24hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours

Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	61.000	121.000	179.000	237.000
0.3	294.000	351.000	406.000	461.000	516.000
0.5	570.000	624.000	677.000	729.000	780.000
0.8	831.000	880.000	929.000	977.000	1,025.000
1.0	1,072.000	1,118.000	1,159.000	1,190.000	1,222.000
1.3	1,254.000	1,286.000	1,318.000	1,350.000	1,382.000
1.5	1,414.000	1,446.000	1,478.000	1,510.000	1,542.000
1.8	1,575.000	1,608.000	1,641.000	1,674.000	1,707.000
2.0	1,742.000	1,782.000	1,828.000	1,881.000	1,941.000
2.3	2,009.000	2,080.000	2,152.000	2,224.000	2,297.000
2.5	2,370.000	2,444.000	2,517.000	2,590.000	2,664.000
2.8	2,737.000	2,810.000	2,867.000	2,919.000	2,970.000
3.0	3,021.000	3,073.000	3,126.000	3,179.000	3,231.000
3.3	3,284.000	3,337.000	3,390.000	3,442.000	3,495.000
3.5	3,548.000	3,602.000	3,656.000	3,710.000	3,765.000
3.8	3,819.000	3,873.000	3,928.000	3,982.000	4,036.000
4.0	4,091.000	4,147.000	4,202.000	4,258.000	4,314.000
4.3	4,370.000	4,426.000	4,482.000	4,537.000	4,593.000
4.5	4,650.000	4,707.000	4,764.000	4,821.000	4,879.000
4.8	4,936.000	4,993.000	5,051.000	5,108.000	5,166.000
5.0	5,224.000	5,283.000	5,344.000	5,404.000	5,464.000
5.3	5,525.000	5,585.000	5,647.000	5,709.000	5,771.000
5.5	5,832.000	5,894.000	5,956.000	6,019.000	6,082.000
5.8	6,146.000	6,209.000	6,272.000	6,336.000	6,399.000
6.0	6,462.000	6,525.000	6,589.000	6,653.000	6,718.000
6.3	6,782.000	6,847.000	6,911.000	6,976.000	7,041.000
6.5	7,107.000	7,173.000	7,239.000	7,305.000	7,371.000
6.8	7,438.000	7,505.000	7,572.000	7,641.000	7,710.000
7.0	7,779.000	7,848.000	7,918.000	7,988.000	8,058.000
7.3	8,129.000	8,199.000	8,269.000	8,340.000	8,411.000
7.5	8,483.000	8,555.000	8,627.000	8,700.000	8,773.000
7.8	8,846.000	8,915.000	8,983.000	9,048.000	9,112.000
8.0	9,173.000	9,233.000	9,291.000	9,347.000	9,401.000
8.3	9,454.000	9,506.000	9,556.000	9,605.000	9,653.000
8.5	9,700.000	9,745.000	9,790.000	9,834.000	9,876.000
8.8	9,915.000	9,950.000	9,980.000	10,008.000	10,033.000
9.0	10,056.000	10,076.000	10,095.000	10,112.000	10,127.000
9.3	10,141.000	10,155.000	10,166.000	10,177.000	10,186.000
9.5	10,195.000	10,203.000	10,212.000	10,220.000	10,228.000
9.8	10,235.000	10,241.000	10,247.000	10,253.000	10,260.000
10.0	10,266.000	10,272.000	10,277.000	10,282.000	10,287.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 100yr24hr
Label: BMP1

Time vs. Volume (ft^3)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)	Volume (ft^3)
10.3	10,293.000	10,299.000	10,305.000	10,311.000	10,316.000
10.5	10,322.000	10,327.000	10,332.000	10,338.000	10,343.000
10.8	10,348.000	10,353.000	10,359.000	10,365.000	10,371.000
11.0	10,377.000	10,383.000	10,389.000	10,395.000	10,401.000
11.3	10,408.000	10,415.000	10,421.000	10,427.000	10,434.000
11.5	10,440.000	10,447.000	10,454.000	10,461.000	10,467.000
11.8	10,474.000	10,487.000	10,507.000	10,534.000	10,564.000
12.0	10,591.000	10,615.000	10,637.000	10,658.000	10,679.000
12.3	10,698.000	10,716.000	10,733.000	10,749.000	10,765.000
12.5	10,781.000	10,796.000	10,811.000	10,825.000	10,838.000
12.8	10,852.000	10,865.000	10,879.000	10,894.000	10,908.000
13.0	10,921.000	10,934.000	10,948.000	10,962.000	10,978.000
13.3	10,993.000	11,008.000	11,022.000	11,036.000	11,052.000
13.5	11,068.000	11,086.000	11,103.000	11,120.000	11,137.000
13.8	11,159.000	11,190.000	11,230.000	11,273.000	11,314.000
14.0	11,352.000	11,388.000	11,425.000	11,462.000	11,500.000
14.3	11,538.000	11,574.000	11,608.000	11,645.000	11,684.000
14.5	11,727.000	11,771.000	11,814.000	11,856.000	11,899.000
14.8	11,946.000	11,999.000	12,059.000	12,118.000	12,174.000
15.0	12,228.000	12,279.000	12,324.000	12,364.000	12,405.000
15.3	12,452.000	12,505.000	12,574.000	12,677.000	12,820.000
15.5	12,996.000	13,202.000	13,431.000	13,680.000	14,098.000
15.8	14,878.000	15,924.000	16,960.000	17,505.000	17,512.000
16.0	17,120.000	16,655.000	16,171.000	15,673.000	15,263.000
16.3	14,860.000	14,467.000	14,088.000	13,768.000	13,490.000
16.5	13,244.000	13,027.000	12,836.000	12,666.000	12,511.000
16.8	12,369.000	12,236.000	12,116.000	12,009.000	11,918.000
17.0	11,832.000	11,752.000	11,677.000	11,606.000	11,540.000
17.3	11,479.000	11,422.000	11,368.000	11,317.000	11,269.000
17.5	11,224.000	11,181.000	11,141.000	11,101.000	11,059.000
17.8	11,014.000	10,968.000	10,922.000	10,878.000	10,835.000
18.0	10,794.000	10,756.000	10,721.000	10,689.000	10,659.000
18.3	10,630.000	10,604.000	10,579.000	10,555.000	10,533.000
18.5	10,511.000	10,492.000	10,473.000	10,456.000	10,440.000
18.8	10,424.000	10,409.000	10,395.000	10,381.000	10,368.000
19.0	10,356.000	10,344.000	10,332.000	10,321.000	10,311.000
19.3	10,301.000	10,291.000	10,282.000	10,273.000	10,264.000
19.5	10,255.000	10,247.000	10,239.000	10,231.000	10,223.000
19.8	10,215.000	10,207.000	10,200.000	10,193.000	10,186.000
20.0	10,179.000	10,173.000	10,167.000	10,161.000	10,155.000
20.3	10,150.000	10,144.000	10,139.000	10,133.000	10,128.000

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	10,123.000	10,118.000	10,113.000	10,108.000	10,103.000
20.8	10,098.000	10,093.000	10,088.000	10,084.000	10,079.000
21.0	10,074.000	10,069.000	10,065.000	10,061.000	10,058.000
21.3	10,055.000	10,051.000	10,048.000	10,044.000	10,040.000
21.5	10,036.000	10,033.000	10,029.000	10,026.000	10,023.000
21.8	10,020.000	10,017.000	10,014.000	10,011.000	10,007.000
22.0	10,004.000	10,000.000	9,997.000	9,994.000	9,992.000
22.3	9,989.000	9,986.000	9,983.000	9,980.000	9,977.000
22.5	9,975.000	9,973.000	9,970.000	9,967.000	9,964.000
22.8	9,961.000	9,958.000	9,955.000	9,951.000	9,949.000
23.0	9,946.000	9,944.000	9,942.000	9,941.000	9,939.000
23.3	9,937.000	9,934.000	9,932.000	9,930.000	9,928.000
23.5	9,926.000	9,924.000	9,922.000	9,918.000	9,904.000
23.8	9,873.000	9,828.000	9,777.000	9,727.000	9,679.000
24.0	9,632.000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 100yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	11.000	21.000	32.000	42.000
0.3	52.000	62.000	72.000	81.000	91.000
0.5	100.000	109.000	118.000	127.000	136.000
0.8	144.000	153.000	161.000	170.000	178.000
1.0	186.000	194.000	203.000	212.000	221.000
1.3	230.000	239.000	248.000	257.000	265.000
1.5	274.000	282.000	290.000	298.000	306.000
1.8	314.000	322.000	329.000	337.000	344.000
2.0	351.000	358.000	365.000	372.000	379.000
2.3	385.000	392.000	398.000	405.000	411.000
2.5	417.000	423.000	429.000	435.000	441.000
2.8	447.000	452.000	458.000	463.000	469.000
3.0	474.000	479.000	484.000	489.000	494.000
3.3	499.000	504.000	508.000	513.000	518.000
3.5	522.000	527.000	531.000	535.000	540.000
3.8	544.000	548.000	552.000	556.000	560.000
4.0	564.000	568.000	571.000	575.000	579.000
4.3	582.000	586.000	591.000	595.000	601.000
4.5	606.000	610.000	615.000	620.000	625.000
4.8	630.000	634.000	639.000	643.000	647.000
5.0	652.000	656.000	660.000	664.000	668.000
5.3	672.000	676.000	680.000	684.000	688.000
5.5	691.000	695.000	698.000	702.000	705.000
5.8	709.000	712.000	715.000	719.000	722.000
6.0	725.000	728.000	731.000	734.000	737.000
6.3	740.000	743.000	746.000	749.000	752.000
6.5	756.000	760.000	765.000	769.000	773.000
6.8	777.000	782.000	786.000	789.000	793.000
7.0	797.000	801.000	805.000	808.000	812.000
7.3	815.000	819.000	822.000	826.000	829.000
7.5	832.000	836.000	839.000	842.000	845.000
7.8	848.000	851.000	854.000	857.000	860.000
8.0	863.000	866.000	869.000	874.000	878.000
8.3	882.000	887.000	891.000	895.000	899.000
8.5	903.000	907.000	911.000	914.000	918.000
8.8	922.000	926.000	929.000	933.000	936.000
9.0	940.000	943.000	946.000	950.000	953.000
9.3	957.000	962.000	967.000	972.000	976.000
9.5	981.000	985.000	990.000	994.000	998.000
9.8	1,003.000	1,007.000	1,011.000	1,015.000	1,019.000
10.0	1,023.000	1,027.000	1,031.000	1,035.000	1,039.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 100yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.3	1,044.000	1,049.000	1,054.000	1,060.000	1,065.000
10.5	1,070.000	1,075.000	1,079.000	1,084.000	1,089.000
10.8	1,093.000	1,098.000	1,103.000	1,109.000	1,115.000
11.0	1,121.000	1,127.000	1,133.000	1,139.000	1,144.000
11.3	1,149.000	1,152.000	1,156.000	1,160.000	1,164.000
11.5	1,168.000	1,173.000	1,178.000	1,183.000	1,188.000
11.8	1,193.000	1,199.000	1,206.000	1,214.000	1,222.000
12.0	1,231.000	1,240.000	1,249.000	1,258.000	1,267.000
12.3	1,277.000	1,287.000	1,297.000	1,307.000	1,317.000
12.5	1,327.000	1,338.000	1,349.000	1,361.000	1,372.000
12.8	1,383.000	1,395.000	1,406.000	1,419.000	1,431.000
13.0	1,443.000	1,456.000	1,468.000	1,481.000	1,495.000
13.3	1,508.000	1,523.000	1,537.000	1,552.000	1,567.000
13.5	1,583.000	1,599.000	1,615.000	1,631.000	1,647.000
13.8	1,664.000	1,682.000	1,702.000	1,723.000	1,746.000
14.0	1,772.000	1,801.000	1,834.000	1,872.000	1,915.000
14.3	1,963.000	2,016.000	2,070.000	2,127.000	2,184.000
14.5	2,243.000	2,304.000	2,367.000	2,431.000	2,496.000
14.8	2,564.000	2,634.000	2,707.000	2,781.000	2,849.000
15.0	2,903.000	2,958.000	3,014.000	3,070.000	3,127.000
15.3	3,188.000	3,252.000	3,321.000	3,401.000	3,494.000
15.5	3,601.000	3,722.000	3,857.000	4,007.000	4,209.000
15.8	4,499.000	4,881.000	5,285.000	5,614.000	5,825.000
16.0	5,942.000	6,019.000	6,088.000	6,151.000	6,208.000
16.3	6,262.000	6,311.000	6,357.000	6,401.000	6,443.000
16.5	6,483.000	6,521.000	6,557.000	6,591.000	6,623.000
16.8	6,652.000	6,679.000	6,703.000	6,727.000	6,749.000
17.0	6,771.000	6,792.000	6,812.000	6,832.000	6,851.000
17.3	6,870.000	6,888.000	6,906.000	6,923.000	6,939.000
17.5	6,955.000	6,971.000	6,986.000	6,999.000	7,012.000
17.8	7,023.000	7,032.000	7,040.000	7,047.000	7,052.000
18.0	7,058.000	7,064.000	7,069.000	7,074.000	7,079.000
18.3	7,083.000	7,087.000	7,091.000	7,095.000	7,098.000
18.5	7,102.000	7,106.000	7,109.000	7,113.000	7,116.000
18.8	7,118.000	7,120.000	7,122.000	7,124.000	7,125.000
19.0	7,127.000	7,128.000	7,128.000	7,128.000	7,128.000
19.3	7,128.000	7,129.000	7,129.000	7,129.000	7,129.000
19.5	7,129.000	7,129.000	7,129.000	7,129.000	7,128.000
19.8	7,127.000	7,125.000	7,123.000	7,122.000	7,120.000
20.0	7,119.000	7,117.000	7,115.000	7,114.000	7,112.000
20.3	7,111.000	7,109.000	7,107.000	7,106.000	7,104.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume   Scenario: 100yr48hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	7,101.000	7,098.000	7,094.000	7,091.000	7,088.000
20.8	7,084.000	7,081.000	7,077.000	7,074.000	7,071.000
21.0	7,067.000	7,064.000	7,060.000	7,057.000	7,054.000
21.3	7,050.000	7,047.000	7,043.000	7,040.000	7,037.000
21.5	7,033.000	7,030.000	7,026.000	7,021.000	7,016.000
21.8	7,011.000	7,006.000	7,001.000	6,996.000	6,990.000
22.0	6,985.000	6,980.000	6,975.000	6,970.000	6,964.000
22.3	6,959.000	6,954.000	6,949.000	6,944.000	6,939.000
22.5	6,933.000	6,928.000	6,923.000	6,918.000	6,913.000
22.8	6,907.000	6,902.000	6,897.000	6,892.000	6,887.000
23.0	6,881.000	6,876.000	6,870.000	6,863.000	6,856.000
23.3	6,849.000	6,842.000	6,835.000	6,828.000	6,821.000
23.5	6,814.000	6,807.000	6,800.000	6,793.000	6,784.000
23.8	6,772.000	6,756.000	6,747.000	6,755.000	6,781.000
24.0	6,821.000	6,864.000	6,907.000	6,950.000	6,993.000
24.3	7,036.000	7,079.000	7,123.000	7,167.000	7,211.000
24.5	7,256.000	7,300.000	7,345.000	7,390.000	7,434.000
24.8	7,479.000	7,523.000	7,568.000	7,613.000	7,658.000
25.0	7,704.000	7,751.000	7,797.000	7,845.000	7,892.000
25.3	7,939.000	7,986.000	8,033.000	8,080.000	8,127.000
25.5	8,174.000	8,221.000	8,268.000	8,315.000	8,363.000
25.8	8,411.000	8,460.000	8,508.000	8,557.000	8,605.000
26.0	8,654.000	8,702.000	8,750.000	8,798.000	8,845.000
26.3	8,889.000	8,933.000	8,975.000	9,017.000	9,057.000
26.5	9,096.000	9,134.000	9,171.000	9,206.000	9,240.000
26.8	9,273.000	9,304.000	9,335.000	9,365.000	9,394.000
27.0	9,422.000	9,450.000	9,477.000	9,504.000	9,529.000
27.3	9,554.000	9,578.000	9,601.000	9,623.000	9,645.000
27.5	9,667.000	9,688.000	9,709.000	9,729.000	9,749.000
27.8	9,768.000	9,786.000	9,804.000	9,821.000	9,838.000
28.0	9,855.000	9,872.000	9,887.000	9,900.000	9,912.000
28.3	9,923.000	9,932.000	9,940.000	9,948.000	9,955.000
28.5	9,961.000	9,968.000	9,973.000	9,979.000	9,983.000
28.8	9,987.000	9,991.000	9,994.000	9,997.000	10,000.000
29.0	10,003.000	10,006.000	10,009.000	10,012.000	10,015.000
29.3	10,017.000	10,020.000	10,023.000	10,026.000	10,028.000
29.5	10,030.000	10,033.000	10,035.000	10,038.000	10,040.000
29.8	10,043.000	10,045.000	10,047.000	10,049.000	10,050.000
30.0	10,052.000	10,053.000	10,055.000	10,057.000	10,060.000
30.3	10,062.000	10,063.000	10,065.000	10,067.000	10,069.000
30.5	10,072.000	10,074.000	10,076.000	10,078.000	10,080.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 100yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
30.8	10,082.000	10,085.000	10,087.000	10,089.000	10,092.000
31.0	10,093.000	10,095.000	10,098.000	10,100.000	10,103.000
31.3	10,105.000	10,107.000	10,109.000	10,111.000	10,114.000
31.5	10,117.000	10,120.000	10,123.000	10,126.000	10,129.000
31.8	10,132.000	10,134.000	10,136.000	10,139.000	10,142.000
32.0	10,145.000	10,147.000	10,150.000	10,152.000	10,154.000
32.3	10,157.000	10,159.000	10,162.000	10,166.000	10,169.000
32.5	10,172.000	10,176.000	10,180.000	10,183.000	10,187.000
32.8	10,190.000	10,192.000	10,195.000	10,198.000	10,201.000
33.0	10,204.000	10,208.000	10,212.000	10,215.000	10,219.000
33.3	10,223.000	10,227.000	10,230.000	10,233.000	10,236.000
33.5	10,239.000	10,243.000	10,248.000	10,252.000	10,256.000
33.8	10,260.000	10,263.000	10,267.000	10,272.000	10,277.000
34.0	10,281.000	10,285.000	10,289.000	10,293.000	10,298.000
34.3	10,303.000	10,308.000	10,313.000	10,318.000	10,323.000
34.5	10,328.000	10,333.000	10,338.000	10,343.000	10,348.000
34.8	10,353.000	10,358.000	10,364.000	10,370.000	10,376.000
35.0	10,382.000	10,387.000	10,393.000	10,399.000	10,406.000
35.3	10,413.000	10,419.000	10,425.000	10,432.000	10,438.000
35.5	10,445.000	10,451.000	10,458.000	10,465.000	10,471.000
35.8	10,481.000	10,498.000	10,523.000	10,552.000	10,580.000
36.0	10,605.000	10,628.000	10,650.000	10,670.000	10,690.000
36.3	10,709.000	10,727.000	10,743.000	10,759.000	10,775.000
36.5	10,790.000	10,805.000	10,819.000	10,833.000	10,846.000
36.8	10,860.000	10,874.000	10,888.000	10,903.000	10,916.000
37.0	10,929.000	10,943.000	10,957.000	10,972.000	10,987.000
37.3	11,002.000	11,017.000	11,031.000	11,046.000	11,062.000
37.5	11,079.000	11,097.000	11,114.000	11,130.000	11,150.000
37.8	11,178.000	11,215.000	11,257.000	11,298.000	11,338.000
38.0	11,374.000	11,411.000	11,448.000	11,486.000	11,524.000
38.3	11,560.000	11,595.000	11,631.000	11,669.000	11,711.000
38.5	11,754.000	11,798.000	11,840.000	11,882.000	11,927.000
38.8	11,978.000	12,035.000	12,095.000	12,153.000	12,208.000
39.0	12,260.000	12,307.000	12,349.000	12,389.000	12,433.000
39.3	12,483.000	12,542.000	12,628.000	12,758.000	12,923.000
39.5	13,118.000	13,339.000	13,581.000	13,924.000	14,570.000
39.8	15,506.000	16,636.000	17,384.000	17,594.000	17,293.000
40.0	16,808.000	16,336.000	15,820.000	15,401.000	14,996.000
40.3	14,600.000	14,217.000	13,873.000	13,584.000	13,327.000
40.5	13,101.000	12,901.000	12,725.000	12,566.000	12,419.000
40.8	12,283.000	12,159.000	12,048.000	11,951.000	11,863.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 100yr48hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours

Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
41.0	11,781.000	11,704.000	11,632.000	11,564.000	11,501.000
41.3	11,443.000	11,388.000	11,336.000	11,287.000	11,241.000
41.5	11,197.000	11,156.000	11,116.000	11,075.000	11,031.000
41.8	10,985.000	10,939.000	10,894.000	10,850.000	10,809.000
42.0	10,770.000	10,734.000	10,701.000	10,670.000	10,641.000
42.3	10,614.000	10,588.000	10,564.000	10,541.000	10,519.000
42.5	10,499.000	10,480.000	10,462.000	10,446.000	10,430.000
42.8	10,415.000	10,400.000	10,386.000	10,373.000	10,361.000
43.0	10,348.000	10,336.000	10,325.000	10,314.000	10,304.000
43.3	10,295.000	10,286.000	10,276.000	10,267.000	10,258.000
43.5	10,250.000	10,242.000	10,234.000	10,226.000	10,218.000
43.8	10,210.000	10,203.000	10,195.000	10,188.000	10,182.000
44.0	10,175.000	10,169.000	10,163.000	10,157.000	10,152.000
44.3	10,146.000	10,141.000	10,135.000	10,130.000	10,125.000
44.5	10,120.000	10,115.000	10,110.000	10,105.000	10,100.000
44.8	10,095.000	10,090.000	10,085.000	10,081.000	10,076.000
45.0	10,071.000	10,067.000	10,063.000	10,059.000	10,056.000
45.3	10,053.000	10,049.000	10,045.000	10,042.000	10,038.000
45.5	10,034.000	10,030.000	10,027.000	10,024.000	10,022.000
45.8	10,019.000	10,015.000	10,012.000	10,009.000	10,005.000
46.0	10,002.000	9,998.000	9,995.000	9,993.000	9,990.000
46.3	9,987.000	9,984.000	9,981.000	9,978.000	9,976.000
46.5	9,974.000	9,971.000	9,969.000	9,966.000	9,963.000
46.8	9,959.000	9,956.000	9,953.000	9,950.000	9,947.000
47.0	9,945.000	9,943.000	9,941.000	9,939.000	9,938.000
47.3	9,935.000	9,933.000	9,931.000	9,928.000	9,927.000
47.5	9,925.000	9,923.000	9,920.000	9,911.000	9,886.000
47.8	9,847.000	9,797.000	9,744.000	9,693.000	9,644.000
48.0	9,596.000	(N/A)	(N/A)	(N/A)	(N/A)

Subsection: Time vs. Volume Scenario: 100yr72hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	7.000	14.000	21.000	28.000
0.3	35.000	41.000	48.000	54.000	60.000
0.5	67.000	73.000	79.000	85.000	91.000
0.8	96.000	102.000	108.000	113.000	118.000
1.0	124.000	129.000	134.000	139.000	144.000
1.3	149.000	154.000	159.000	163.000	168.000
1.5	173.000	177.000	182.000	186.000	190.000
1.8	194.000	198.000	203.000	207.000	211.000
2.0	215.000	219.000	224.000	230.000	235.000
2.3	240.000	246.000	251.000	256.000	261.000
2.5	266.000	271.000	275.000	280.000	285.000
2.8	289.000	294.000	298.000	302.000	307.000
3.0	311.000	315.000	319.000	323.000	327.000
3.3	331.000	335.000	338.000	342.000	346.000
3.5	349.000	353.000	356.000	360.000	363.000
3.8	367.000	370.000	373.000	376.000	379.000
4.0	382.000	385.000	388.000	391.000	394.000
4.3	397.000	400.000	403.000	405.000	408.000
4.5	411.000	413.000	416.000	418.000	421.000
4.8	423.000	426.000	428.000	430.000	433.000
5.0	435.000	437.000	439.000	441.000	444.000
5.3	446.000	448.000	450.000	452.000	454.000
5.5	456.000	458.000	459.000	461.000	463.000
5.8	465.000	467.000	468.000	470.000	472.000
6.0	475.000	478.000	482.000	485.000	488.000
6.3	491.000	495.000	498.000	501.000	504.000
6.5	507.000	510.000	512.000	515.000	518.000
6.8	521.000	523.000	526.000	529.000	531.000
7.0	534.000	536.000	539.000	541.000	543.000
7.3	546.000	548.000	550.000	553.000	555.000
7.5	557.000	559.000	561.000	563.000	565.000
7.8	567.000	569.000	571.000	573.000	575.000
8.0	577.000	579.000	580.000	582.000	584.000
8.3	586.000	587.000	589.000	591.000	594.000
8.5	597.000	601.000	604.000	607.000	610.000
8.8	613.000	616.000	619.000	622.000	625.000
9.0	628.000	631.000	634.000	636.000	639.000
9.3	642.000	644.000	647.000	649.000	652.000
9.5	654.000	657.000	659.000	661.000	664.000
9.8	666.000	668.000	671.000	674.000	678.000
10.0	681.000	685.000	689.000	693.000	696.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume — Scenario: 100yr72hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.3	700.000	703.000	707.000	710.000	713.000
10.5	717.000	720.000	723.000	726.000	729.000
10.8	732.000	735.000	738.000	741.000	744.000
11.0	747.000	750.000	752.000	756.000	759.000
11.3	763.000	767.000	772.000	776.000	780.000
11.5	784.000	788.000	792.000	796.000	800.000
11.8	803.000	808.000	813.000	820.000	827.000
12.0	835.000	843.000	851.000	859.000	868.000
12.3	876.000	884.000	891.000	899.000	907.000
12.5	915.000	924.000	933.000	942.000	951.000
12.8	959.000	968.000	976.000	984.000	993.000
13.0	1,002.000	1,011.000	1,020.000	1,030.000	1,039.000
13.3	1,048.000	1,056.000	1,065.000	1,074.000	1,083.000
13.5	1,092.000	1,102.000	1,112.000	1,123.000	1,134.000
13.8	1,146.000	1,155.000	1,164.000	1,174.000	1,184.000
14.0	1,195.000	1,206.000	1,218.000	1,230.000	1,242.000
14.3	1,255.000	1,268.000	1,281.000	1,295.000	1,309.000
14.5	1,323.000	1,338.000	1,354.000	1,369.000	1,385.000
14.8	1,402.000	1,420.000	1,438.000	1,457.000	1,477.000
15.0	1,497.000	1,519.000	1,540.000	1,562.000	1,584.000
15.3	1,608.000	1,633.000	1,659.000	1,691.000	1,730.000
15.5	1,783.000	1,858.000	1,964.000	2,104.000	2,297.000
15.8	2,581.000	2,921.000	3,200.000	3,420.000	3,557.000
16.0	3,628.000	3,672.000	3,711.000	3,747.000	3,780.000
16.3	3,810.000	3,837.000	3,862.000	3,885.000	3,906.000
16.5	3,926.000	3,945.000	3,963.000	3,979.000	3,994.000
16.8	4,007.000	4,019.000	4,030.000	4,040.000	4,049.000
17.0	4,058.000	4,067.000	4,075.000	4,082.000	4,089.000
17.3	4,095.000	4,101.000	4,106.000	4,110.000	4,114.000
17.5	4,118.000	4,122.000	4,126.000	4,129.000	4,131.000
17.8	4,133.000	4,133.000	4,133.000	4,132.000	4,130.000
18.0	4,129.000	4,127.000	4,125.000	4,123.000	4,121.000
18.3	4,118.000	4,115.000	4,111.000	4,108.000	4,104.000
18.5	4,101.000	4,098.000	4,094.000	4,090.000	4,086.000
18.8	4,081.000	4,076.000	4,071.000	4,065.000	4,060.000
19.0	4,055.000	4,050.000	4,044.000	4,039.000	4,034.000
19.3	4,029.000	4,024.000	4,018.000	4,013.000	4,008.000
19.5	4,002.000	3,995.000	3,988.000	3,981.000	3,974.000
19.8	3,967.000	3,960.000	3,953.000	3,946.000	3,939.000
20.0	3,932.000	3,925.000	3,918.000	3,911.000	3,904.000
20.3	3,897.000	3,890.000	3,883.000	3,876.000	3,869.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 100yr72hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	3,862.000	3,855.000	3,847.000	3,839.000	3,831.000
20.8	3,822.000	3,813.000	3,804.000	3,795.000	3,787.000
21.0	3,778.000	3,769.000	3,760.000	3,751.000	3,742.000
21.3	3,734.000	3,725.000	3,716.000	3,707.000	3,698.000
21.5	3,689.000	3,680.000	3,672.000	3,663.000	3,654.000
21.8	3,645.000	3,636.000	3,627.000	3,618.000	3,610.000
22.0	3,601.000	3,592.000	3,583.000	3,574.000	3,565.000
22.3	3,556.000	3,548.000	3,539.000	3,530.000	3,521.000
22.5	3,512.000	3,503.000	3,494.000	3,486.000	3,476.000
22.8	3,467.000	3,457.000	3,446.000	3,436.000	3,425.000
23.0	3,414.000	3,404.000	3,393.000	3,382.000	3,372.000
23.3	3,361.000	3,350.000	3,340.000	3,329.000	3,318.000
23.5	3,307.000	3,297.000	3,286.000	3,275.000	3,263.000
23.8	3,249.000	3,232.000	3,216.000	3,202.000	3,192.000
24.0	3,185.000	3,178.000	3,171.000	3,164.000	3,156.000
24.3	3,149.000	3,142.000	3,135.000	3,128.000	3,121.000
24.5	3,114.000	3,107.000	3,100.000	3,093.000	3,086.000
24.8	3,079.000	3,072.000	3,064.000	3,057.000	3,050.000
25.0	3,044.000	3,037.000	3,032.000	3,026.000	3,021.000
25.3	3,016.000	3,011.000	3,005.000	3,000.000	2,995.000
25.5	2,989.000	2,984.000	2,979.000	2,974.000	2,968.000
25.8	2,963.000	2,958.000	2,953.000	2,947.000	2,942.000
26.0	2,937.000	2,932.000	2,926.000	2,921.000	2,916.000
26.3	2,910.000	2,905.000	2,900.000	2,895.000	2,889.000
26.5	2,884.000	2,879.000	2,874.000	2,868.000	2,863.000
26.8	2,858.000	2,852.000	2,847.000	2,842.000	2,837.000
27.0	2,832.000	2,824.000	2,816.000	2,809.000	2,801.000
27.3	2,793.000	2,786.000	2,778.000	2,771.000	2,763.000
27.5	2,756.000	2,748.000	2,741.000	2,733.000	2,726.000
27.8	2,718.000	2,710.000	2,703.000	2,695.000	2,688.000
28.0	2,680.000	2,673.000	2,665.000	2,658.000	2,650.000
28.3	2,643.000	2,636.000	2,631.000	2,626.000	2,621.000
28.5	2,616.000	2,611.000	2,606.000	2,601.000	2,596.000
28.8	2,591.000	2,586.000	2,581.000	2,576.000	2,571.000
29.0	2,566.000	2,561.000	2,556.000	2,551.000	2,546.000
29.3	2,541.000	2,536.000	2,531.000	2,526.000	2,522.000
29.5	2,517.000	2,512.000	2,507.000	2,502.000	2,497.000
29.8	2,492.000	2,487.000	2,482.000	2,477.000	2,472.000
30.0	2,467.000	2,462.000	2,457.000	2,452.000	2,447.000
30.3	2,442.000	2,437.000	2,433.000	2,428.000	2,425.000
30.5	2,422.000	2,420.000	2,418.000	2,415.000	2,413.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume
Scenario: 100yr72hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
30.8	2,410.000	2,408.000	2,406.000	2,403.000	2,401.000
31.0	2,399.000	2,396.000	2,394.000	2,392.000	2,389.000
31.3	2,387.000	2,385.000	2,382.000	2,380.000	2,378.000
31.5	2,375.000	2,373.000	2,371.000	2,368.000	2,366.000
31.8	2,363.000	2,361.000	2,359.000	2,356.000	2,354.000
32.0	2,352.000	2,351.000	2,350.000	2,350.000	2,351.000
32.3	2,351.000	2,351.000	2,351.000	2,352.000	2,352.000
32.5	2,352.000	2,352.000	2,353.000	2,353.000	2,353.000
32.8	2,353.000	2,354.000	2,354.000	2,354.000	2,355.000
33.0	2,355.000	2,355.000	2,355.000	2,356.000	2,357.000
33.3	2,360.000	2,362.000	2,365.000	2,368.000	2,371.000
33.5	2,374.000	2,377.000	2,380.000	2,383.000	2,385.000
33.8	2,388.000	2,391.000	2,394.000	2,397.000	2,400.000
34.0	2,403.000	2,406.000	2,409.000	2,412.000	2,417.000
34.3	2,422.000	2,427.000	2,433.000	2,438.000	2,444.000
34.5	2,449.000	2,455.000	2,460.000	2,466.000	2,471.000
34.8	2,477.000	2,483.000	2,490.000	2,498.000	2,506.000
35.0	2,514.000	2,522.000	2,530.000	2,538.000	2,546.000
35.3	2,554.000	2,562.000	2,570.000	2,579.000	2,587.000
35.5	2,597.000	2,607.000	2,618.000	2,629.000	2,639.000
35.8	2,651.000	2,665.000	2,681.000	2,699.000	2,717.000
36.0	2,736.000	2,754.000	2,774.000	2,793.000	2,814.000
36.3	2,834.000	2,849.000	2,864.000	2,879.000	2,894.000
36.5	2,910.000	2,926.000	2,943.000	2,959.000	2,976.000
36.8	2,993.000	3,010.000	3,029.000	3,047.000	3,065.000
37.0	3,084.000	3,102.000	3,121.000	3,141.000	3,161.000
37.3	3,181.000	3,203.000	3,224.000	3,247.000	3,270.000
37.5	3,293.000	3,317.000	3,341.000	3,364.000	3,389.000
37.8	3,415.000	3,444.000	3,474.000	3,506.000	3,538.000
38.0	3,570.000	3,604.000	3,638.000	3,674.000	3,710.000
38.3	3,747.000	3,785.000	3,823.000	3,863.000	3,903.000
38.5	3,944.000	3,987.000	4,031.000	4,076.000	4,122.000
38.8	4,170.000	4,219.000	4,270.000	4,322.000	4,375.000
39.0	4,429.000	4,483.000	4,538.000	4,595.000	4,653.000
39.3	4,715.000	4,780.000	4,854.000	4,941.000	5,041.000
39.5	5,154.000	5,284.000	5,430.000	5,613.000	5,871.000
39.8	6,221.000	6,633.000	7,000.000	7,252.000	7,389.000
40.0	7,467.000	7,538.000	7,603.000	7,662.000	7,717.000
40.3	7,768.000	7,816.000	7,861.000	7,904.000	7,944.000
40.5	7,983.000	8,020.000	8,055.000	8,088.000	8,119.000
40.8	8,146.000	8,172.000	8,196.000	8,219.000	8,240.000

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
41.0	8,262.000	8,282.000	8,302.000	8,322.000	8,341.000
41.3	8,359.000	8,377.000	8,395.000	8,411.000	8,428.000
41.5	8,443.000	8,458.000	8,473.000	8,486.000	8,497.000
41.8	8,507.000	8,515.000	8,523.000	8,529.000	8,534.000
42.0	8,540.000	8,545.000	8,551.000	8,556.000	8,560.000
42.3	8,564.000	8,568.000	8,572.000	8,575.000	8,579.000
42.5	8,583.000	8,587.000	8,590.000	8,593.000	8,596.000
42.8	8,598.000	8,600.000	8,602.000	8,603.000	8,605.000
43.0	8,606.000	8,606.000	8,606.000	8,607.000	8,607.000
43.3	8,607.000	8,607.000	8,607.000	8,608.000	8,608.000
43.5	8,608.000	8,608.000	8,608.000	8,607.000	8,606.000
43.8	8,604.000	8,602.000	8,601.000	8,599.000	8,598.000
44.0	8,596.000	8,594.000	8,593.000	8,591.000	8,590.000
44.3	8,588.000	8,586.000	8,585.000	8,583.000	8,580.000
44.5	8,577.000	8,574.000	8,571.000	8,567.000	8,564.000
44.8	8,561.000	8,557.000	8,554.000	8,550.000	8,547.000
45.0	8,544.000	8,540.000	8,537.000	8,533.000	8,530.000
45.3	8,527.000	8,523.000	8,520.000	8,516.000	8,513.000
45.5	8,510.000	8,506.000	8,501.000	8,497.000	8,491.000
45.8	8,486.000	8,481.000	8,476.000	8,471.000	8,465.000
46.0	8,460.000	8,455.000	8,450.000	8,445.000	8,440.000
46.3	8,434.000	8,429.000	8,424.000	8,419.000	8,414.000
46.5	8,408.000	8,403.000	8,398.000	8,393.000	8,388.000
46.8	8,382.000	8,377.000	8,372.000	8,367.000	8,362.000
47.0	8,356.000	8,350.000	8,344.000	8,337.000	8,330.000
47.3	8,323.000	8,316.000	8,309.000	8,302.000	8,295.000
47.5	8,288.000	8,281.000	8,274.000	8,266.000	8,254.000
47.8	8,240.000	8,228.000	8,228.000	8,248.000	8,284.000
48.0	8,327.000	8,371.000	8,414.000	8,457.000	8,500.000
48.3	8,543.000	8,587.000	8,630.000	8,675.000	8,719.000
48.5	8,764.000	8,808.000	8,850.000	8,891.000	8,931.000
48.8	8,969.000	9,006.000	9,041.000	9,076.000	9,109.000
49.0	9,142.000	9,174.000	9,205.000	9,236.000	9,265.000
49.3	9,294.000	9,321.000	9,348.000	9,373.000	9,398.000
49.5	9,422.000	9,445.000	9,468.000	9,490.000	9,512.000
49.8	9,533.000	9,554.000	9,575.000	9,594.000	9,613.000
50.0	9,632.000	9,649.000	9,666.000	9,683.000	9,699.000
50.3	9,714.000	9,730.000	9,745.000	9,761.000	9,776.000
50.5	9,790.000	9,804.000	9,818.000	9,831.000	9,844.000
50.8	9,856.000	9,868.000	9,878.000	9,887.000	9,896.000
51.0	9,904.000	9,912.000	9,919.000	9,925.000	9,931.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume Scenario: 100yr72hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
51.3	9,936.000	9,940.000	9,944.000	9,947.000	9,951.000
51.5	9,955.000	9,958.000	9,962.000	9,965.000	9,967.000
51.8	9,970.000	9,972.000	9,974.000	9,976.000	9,978.000
52.0	9,980.000	9,983.000	9,985.000	9,987.000	9,989.000
52.3	9,990.000	9,992.000	9,993.000	9,995.000	9,996.000
52.5	9,999.000	10,001.000	10,003.000	10,004.000	10,006.000
52.8	10,007.000	10,009.000	10,010.000	10,011.000	10,013.000
53.0	10,015.000	10,017.000	10,019.000	10,020.000	10,022.000
53.3	10,024.000	10,026.000	10,029.000	10,031.000	10,033.000
53.5	10,035.000	10,036.000	10,039.000	10,041.000	10,044.000
53.8	10,046.000	10,048.000	10,049.000	10,051.000	10,052.000
54.0	10,054.000	10,055.000	10,057.000	10,059.000	10,061.000
54.3	10,063.000	10,065.000	10,067.000	10,069.000	10,071.000
54.5	10,073.000	10,076.000	10,078.000	10,079.000	10,081.000
54.8	10,084.000	10,086.000	10,089.000	10,091.000	10,093.000
55.0	10,095.000	10,097.000	10,099.000	10,102.000	10,104.000
55.3	10,106.000	10,108.000	10,110.000	10,113.000	10,116.000
55.5	10,118.000	10,121.000	10,125.000	10,128.000	10,131.000
55.8	10,133.000	10,135.000	10,138.000	10,141.000	10,144.000
56.0	10,146.000	10,149.000	10,151.000	10,153.000	10,156.000
56.3	10,158.000	10,161.000	10,164.000	10,168.000	10,171.000
56.5	10,175.000	10,178.000	10,182.000	10,185.000	10,188.000
56.8	10,191.000	10,194.000	10,197.000	10,200.000	10,203.000
57.0	10,207.000	10,210.000	10,214.000	10,218.000	10,221.000
57.3	10,225.000	10,229.000	10,232.000	10,235.000	10,238.000
57.5	10,242.000	10,246.000	10,251.000	10,255.000	10,258.000
57.8	10,262.000	10,266.000	10,270.000	10,275.000	10,280.000
58.0	10,284.000	10,288.000	10,291.000	10,296.000	10,301.000
58.3	10,306.000	10,311.000	10,316.000	10,322.000	10,327.000
58.5	10,331.000	10,336.000	10,341.000	10,346.000	10,351.000
58.8	10,356.000	10,361.000	10,367.000	10,373.000	10,379.000
59.0	10,385.000	10,391.000	10,397.000	10,403.000	10,410.000
59.3	10,417.000	10,423.000	10,429.000	10,435.000	10,442.000
59.5	10,449.000	10,456.000	10,462.000	10,469.000	10,477.000
59.8	10,491.000	10,513.000	10,541.000	10,570.000	10,597.000
60.0	10,620.000	10,642.000	10,663.000	10,683.000	10,702.000
60.3	10,720.000	10,737.000	10,753.000	10,769.000	10,784.000
60.5	10,799.000	10,814.000	10,828.000	10,841.000	10,855.000
60.8	10,868.000	10,883.000	10,897.000	10,911.000	10,924.000
61.0	10,938.000	10,951.000	10,966.000	10,981.000	10,997.000
61.3	11,012.000	11,026.000	11,040.000	11,055.000	11,072.000

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
61.5	11,090.000	11,107.000	11,124.000	11,142.000	11,166.000
61.8	11,200.000	11,241.000	11,284.000	11,324.000	11,361.000
62.0	11,397.000	11,434.000	11,472.000	11,509.000	11,546.000
62.3	11,582.000	11,617.000	11,654.000	11,694.000	11,738.000
62.5	11,782.000	11,824.000	11,866.000	11,910.000	11,958.000
62.8	12,013.000	12,073.000	12,131.000	12,187.000	12,241.000
63.0	12,290.000	12,333.000	12,373.000	12,414.000	12,463.000
63.3	12,517.000	12,592.000	12,706.000	12,858.000	13,041.000
63.5	13,253.000	13,487.000	13,766.000	14,265.000	15,109.000
63.8	16,254.000	17,189.000	17,611.000	17,491.000	17,050.000
64.0	16,581.000	16,087.000	15,605.000	15,195.000	14,792.000
64.3	14,399.000	14,022.000	13,714.000	13,441.000	13,200.000
64.5	12,988.000	12,801.000	12,634.000	12,482.000	12,341.000
64.8	12,211.000	12,093.000	11,990.000	11,900.000	11,815.000
65.0	11,735.000	11,661.000	11,591.000	11,527.000	11,466.000
65.3	11,410.000	11,356.000	11,306.000	11,259.000	11,214.000
65.5	11,172.000	11,132.000	11,092.000	11,049.000	11,004.000
65.8	10,957.000	10,912.000	10,868.000	10,825.000	10,785.000
66.0	10,748.000	10,714.000	10,682.000	10,652.000	10,624.000
66.3	10,598.000	10,573.000	10,550.000	10,528.000	10,507.000
66.5	10,487.000	10,469.000	10,452.000	10,436.000	10,420.000
66.8	10,406.000	10,392.000	10,378.000	10,365.000	10,353.000
67.0	10,341.000	10,329.000	10,318.000	10,308.000	10,299.000
67.3	10,289.000	10,280.000	10,271.000	10,262.000	10,253.000
67.5	10,245.000	10,237.000	10,229.000	10,221.000	10,213.000
67.8	10,206.000	10,198.000	10,191.000	10,184.000	10,178.000
68.0	10,172.000	10,166.000	10,160.000	10,154.000	10,148.000
68.3	10,143.000	10,137.000	10,132.000	10,127.000	10,122.000
68.5	10,117.000	10,112.000	10,107.000	10,102.000	10,097.000
68.8	10,092.000	10,087.000	10,082.000	10,078.000	10,073.000
69.0	10,068.000	10,064.000	10,061.000	10,057.000	10,054.000
69.3	10,050.000	10,047.000	10,043.000	10,039.000	10,036.000
69.5	10,032.000	10,028.000	10,025.000	10,023.000	10,020.000
69.8	10,017.000	10,013.000	10,010.000	10,007.000	10,003.000
70.0	9,999.000	9,996.000	9,994.000	9,991.000	9,988.000
70.3	9,985.000	9,982.000	9,979.000	9,977.000	9,974.000
70.5	9,972.000	9,970.000	9,967.000	9,964.000	9,961.000
70.8	9,957.000	9,954.000	9,951.000	9,948.000	9,946.000
71.0	9,944.000	9,942.000	9,940.000	9,938.000	9,936.000
71.3	9,934.000	9,931.000	9,929.000	9,927.000	9,925.000
71.5	9,923.000	9,921.000	9,915.000	9,897.000	9,863.000

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Time vs. Volume　　Scenario: 100yr72hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
71.8	9,816.000	9,763.000	9,711.000	9,661.000	9,613.000
72.0	9,566.000	(N/A)	(N/A)	(N/A)	(N/A)

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 100yr48hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 100yr72hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Outlet Input Data Scenario: 100yr72hr

Label: Bypass

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 100yr24hr

Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 100yr48hr

Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 100yr72hr

Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary   Scenario: 100yr24hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	11.76215 ft³/s	Time to Peak (Flow, In)	15.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	1.1 hours
Flow (Peak Outlet)	6.06320 ft³/s	Time to Peak (Flow, Outlet)	16.0 hours

Elevation (Water Surface, Peak)	4.667 ft
Volume (Peak)	17,512.097 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	72,914.000 ft³
Volume (Total Infiltration)	8,388.000 ft³
Volume (Total Outlet Outflow)	54,914.000 ft³
Volume (Retained)	9,584.000 ft³
Volume (Unrouted)	-27.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary | Scenario: 100yr48hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	11.67932 ft³/s	Time to Peak (Flow, In)	39.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	11.3 hours
Flow (Peak Outlet)	6.11991 ft³/s	Time to Peak (Flow, Outlet)	39.9 hours

Elevation (Water Surface, Peak)	4.702 ft
Volume (Peak)	17,593.926 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	86,518.000 ft³
Volume (Total Infiltration)	15,426.000 ft³
Volume (Total Outlet Outflow)	61,517.000 ft³
Volume (Retained)	9,550.000 ft³
Volume (Unrouted)	-26.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Level Pool Pond Routing Summary — Scenario: 100yr72hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	12.30164 ft³/s	Time to Peak (Flow, In)	63.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	13.8 hours
Flow (Peak Outlet)	6.13186 ft³/s	Time to Peak (Flow, Outlet)	63.9 hours

Elevation (Water Surface, Peak)	4.710 ft
Volume (Peak)	17,611.172 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	95,690.000 ft³
Volume (Total Infiltration)	23,033.000 ft³
Volume (Total Outlet Outflow)	63,111.000 ft³
Volume (Retained)	9,521.000 ft³
Volume (Unrouted)	-25.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Pond Inflow Summary Scenario: 100yr24hr

Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	72,928.880	15.8	12.52000
Flow (In)	BMP1	72,914.026	15.8	11.76215

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	86,564.890	39.8	12.52000
Flow (In)	BMP1	86,518.297	39.8	11.67932

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Subsection: Pond Inflow Summary Scenario: 100yr72hr
Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	95,651.650	63.8	12.52000
Flow (In)	BMP1	95,689.766	63.8	12.30164

Red Hill 100 Year 24-72 Hour Multi-Day Storm Analysis

Index

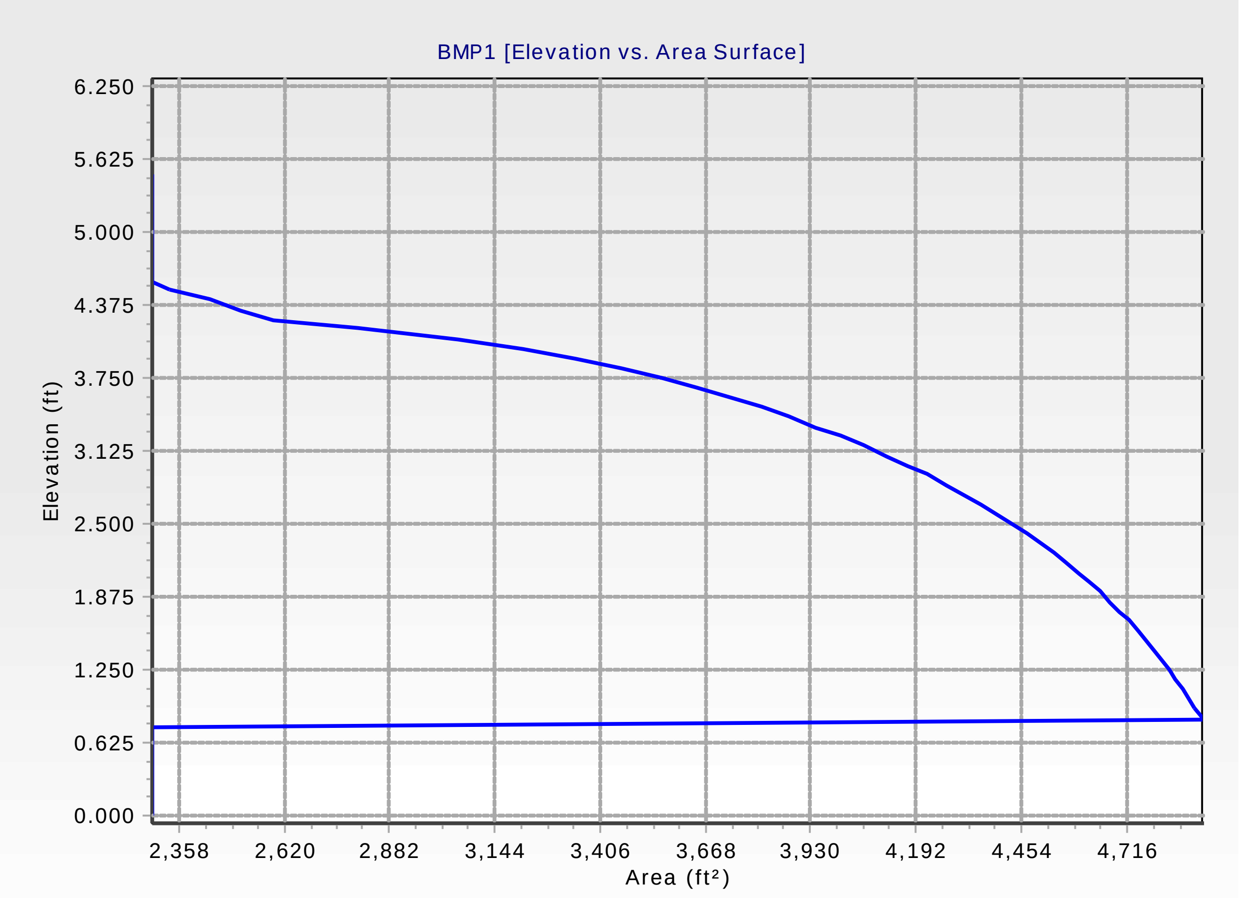
Minimum Drain Time Detailed Report: Minimum Drain Time

Element Details

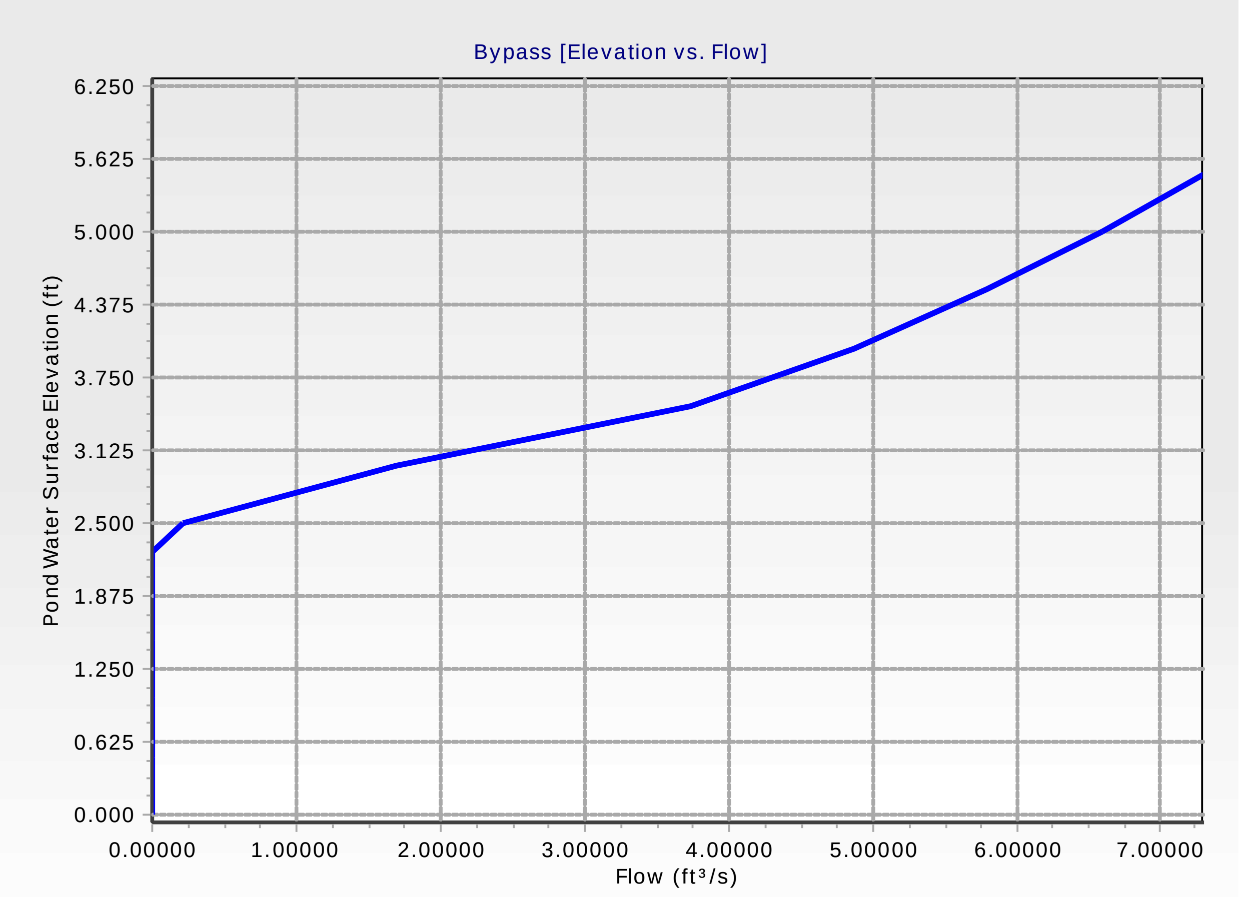
ID	22	End	48.0 hours
Label	Minimum Drain Time	Pond Node	BMP1
Start	0.0 hours	Outlet Structure	Bypass
Increment	0.1 hours		

Notes

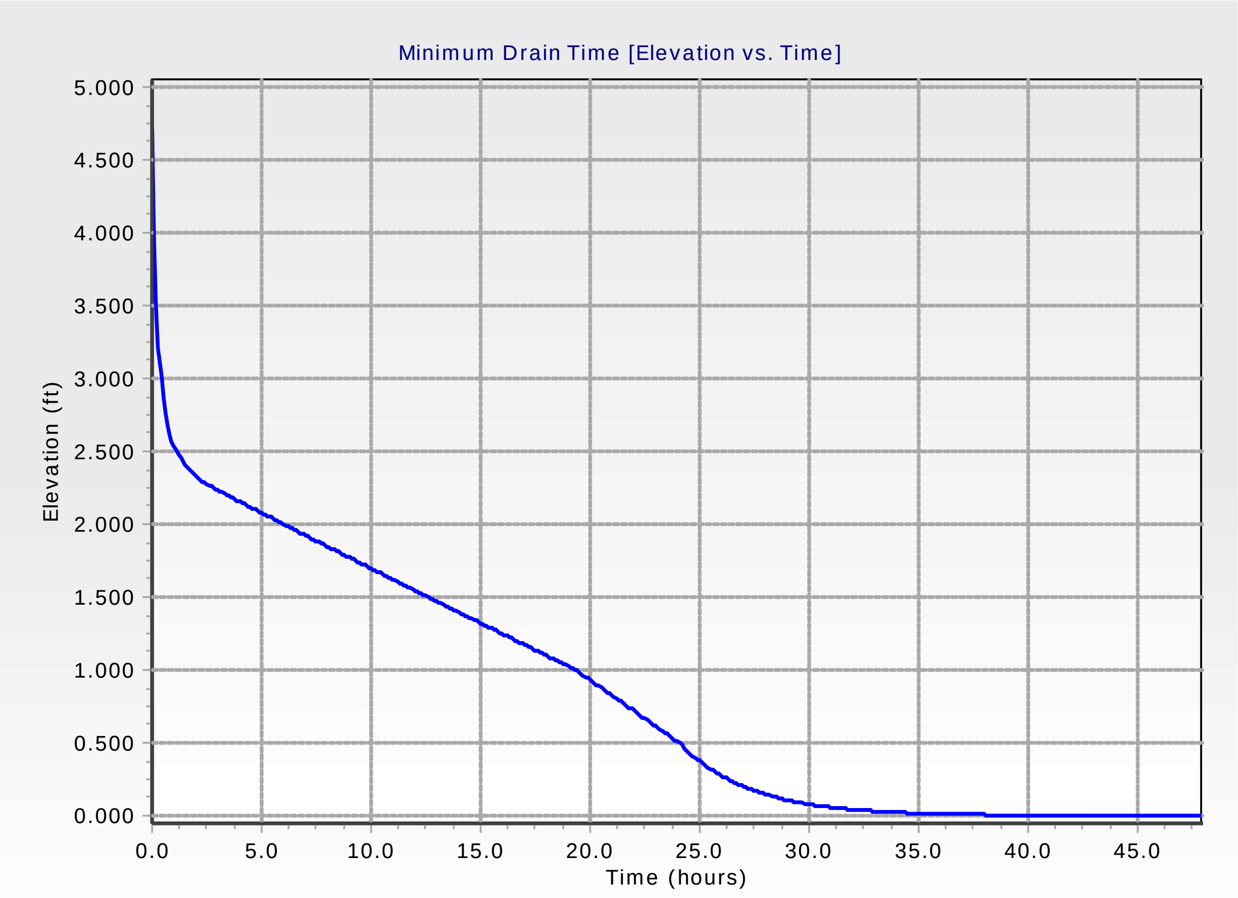
Minimum Drain Time Detailed Report: Minimum Drain Time



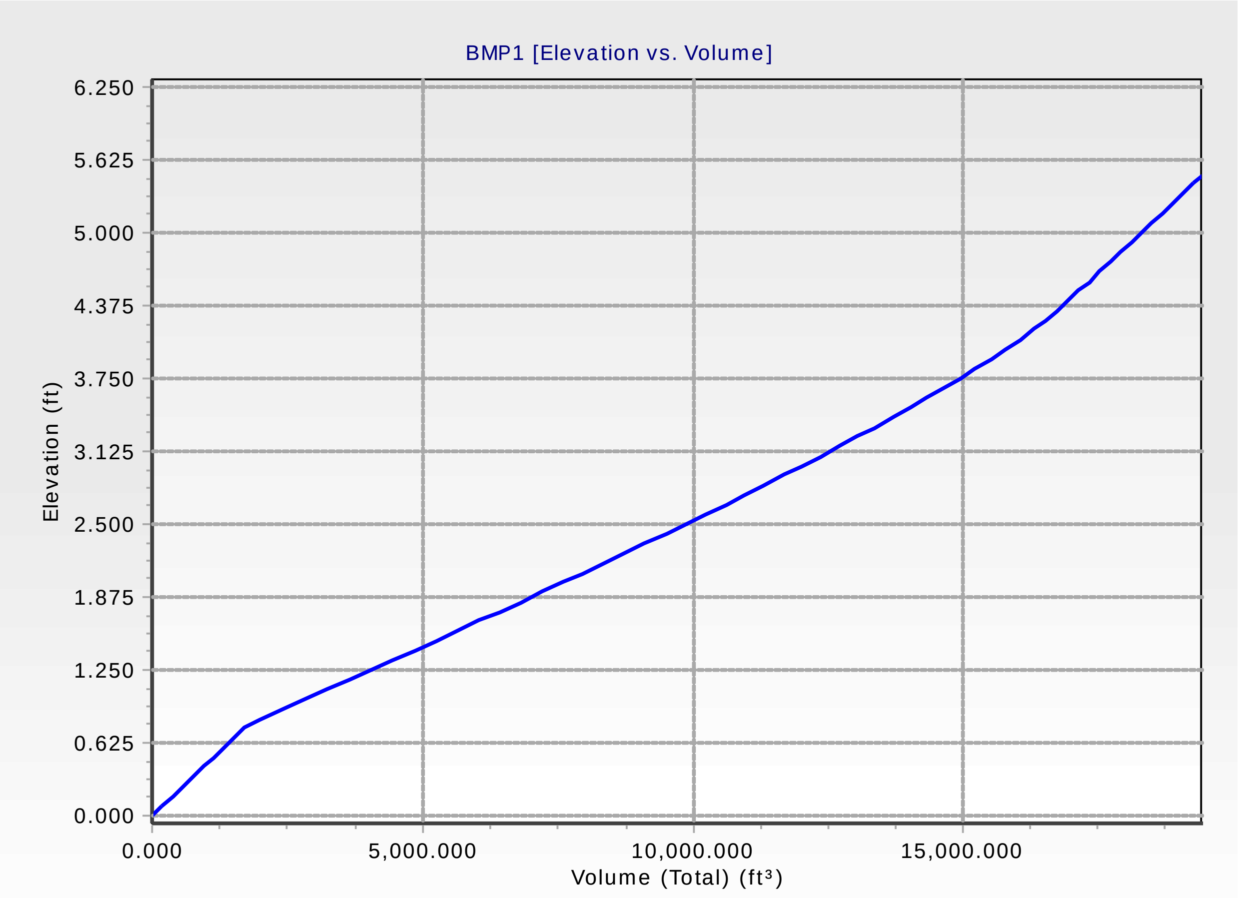
Minimum Drain Time Detailed Report: Minimum Drain Time



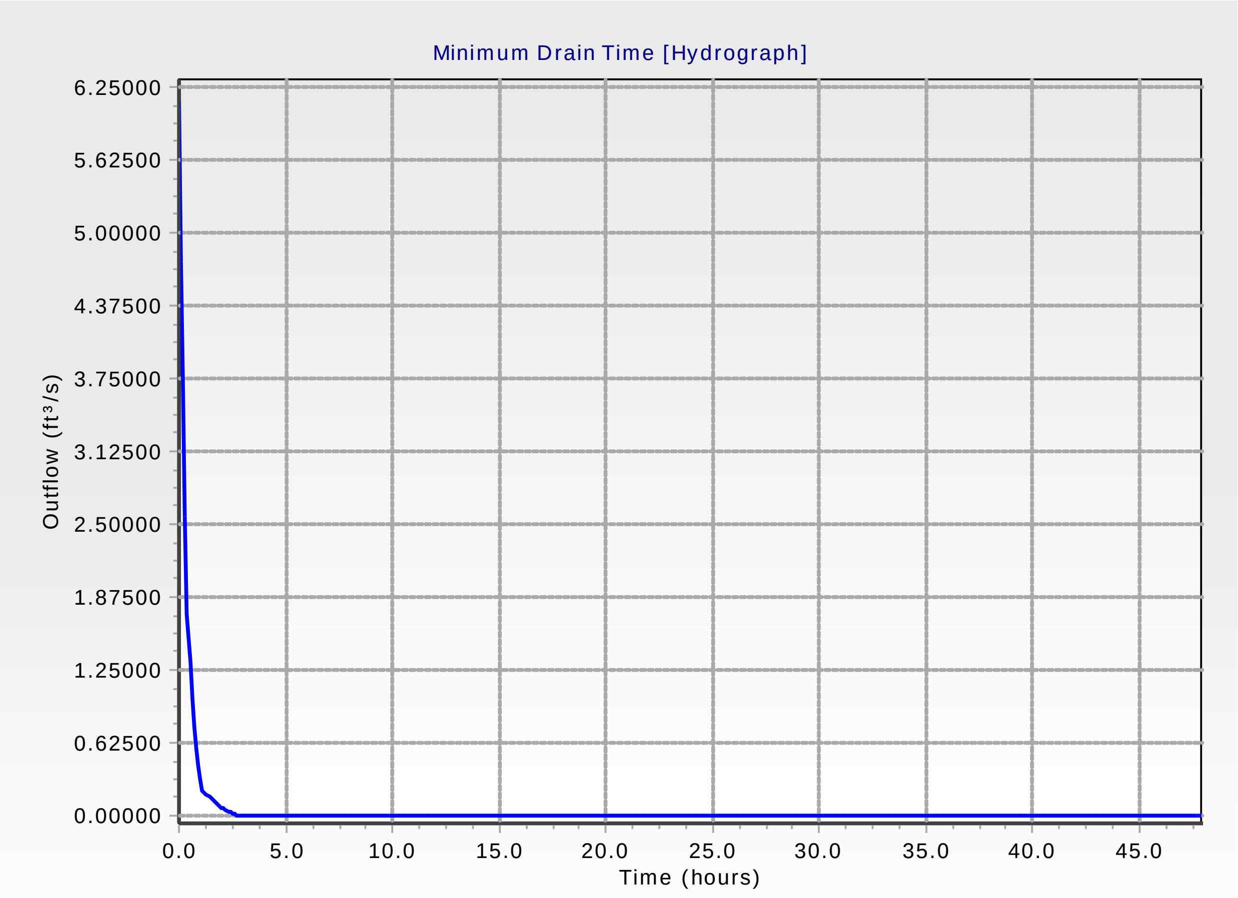
Minimum Drain Time Detailed Report: Minimum Drain Time



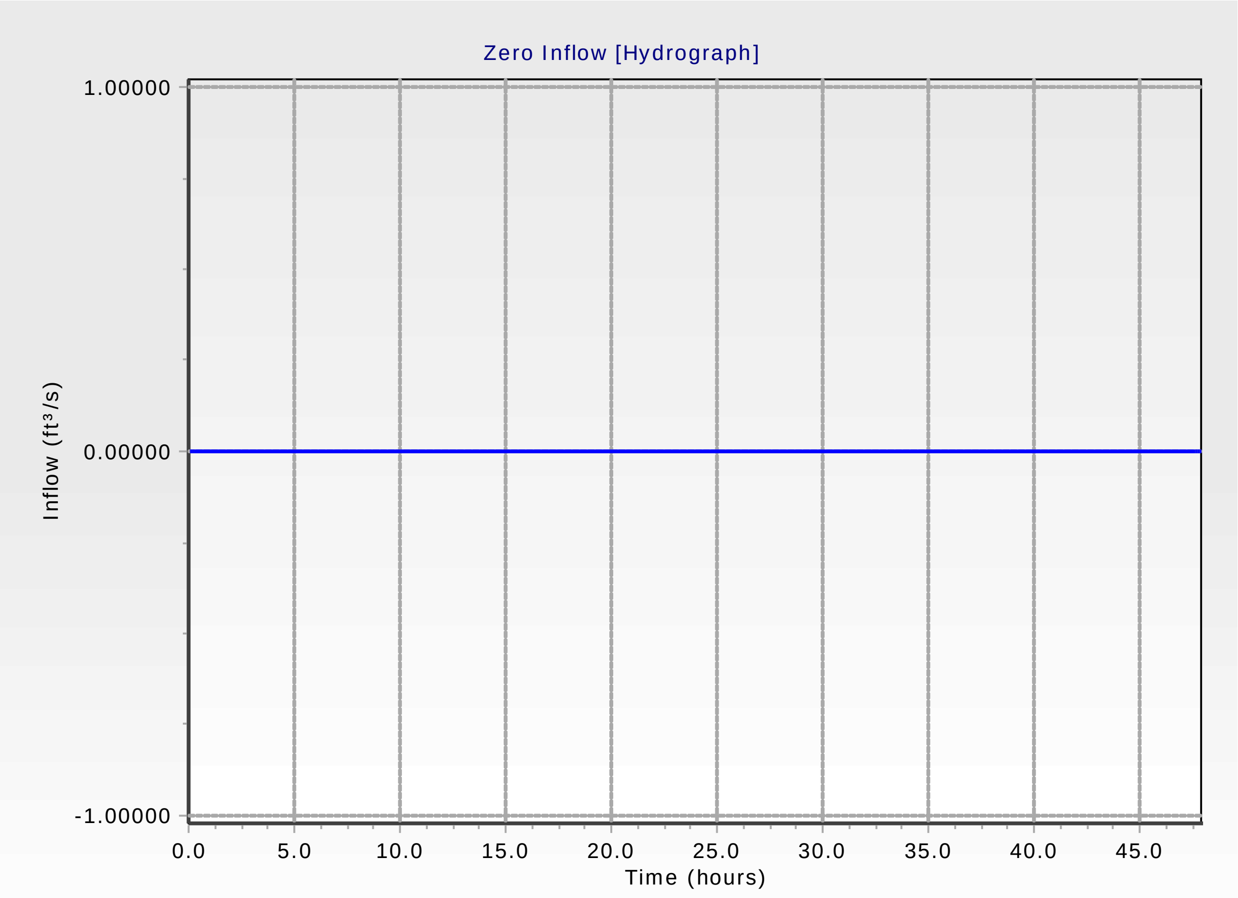
Minimum Drain Time Detailed Report: Minimum Drain Time



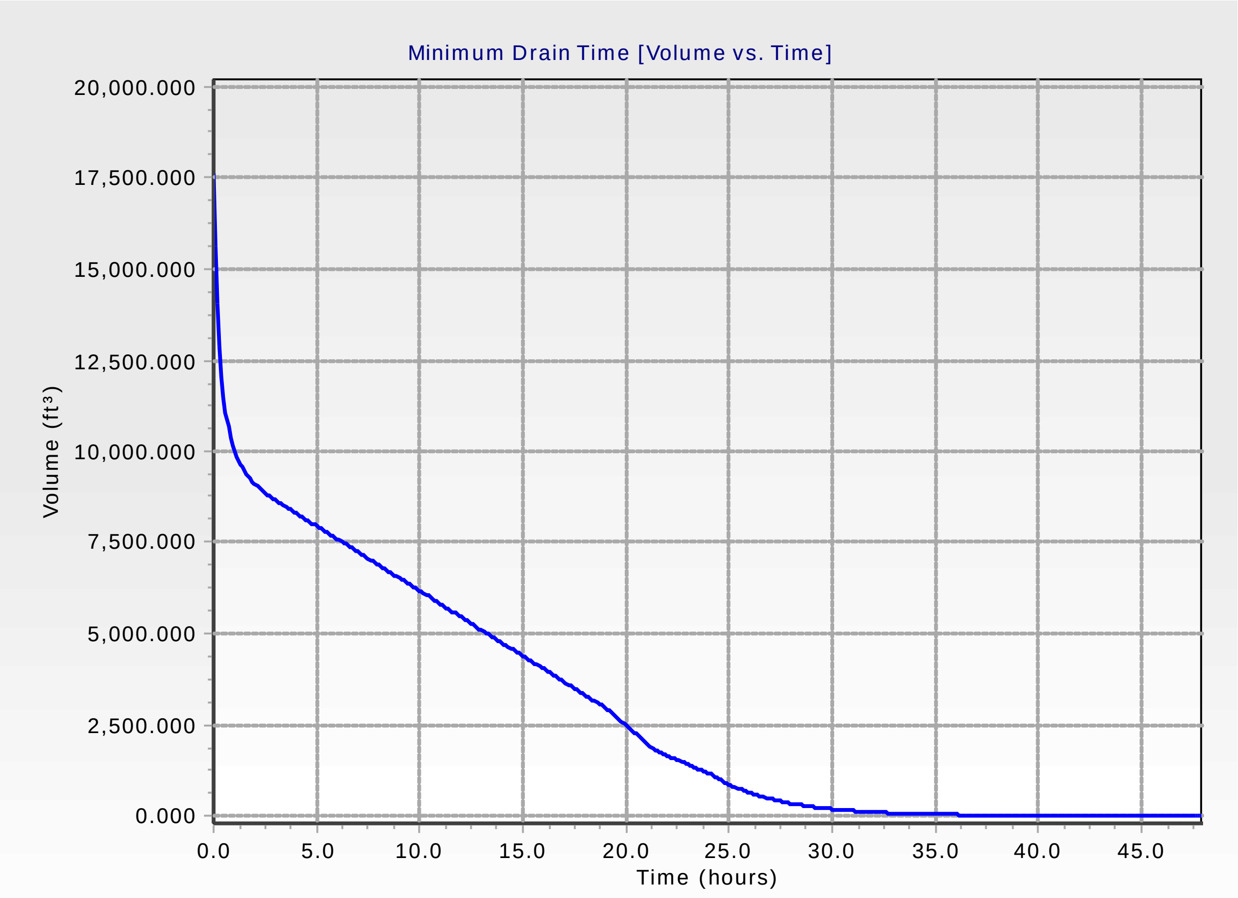
Minimum Drain Time Detailed Report: Minimum Drain Time



Minimum Drain Time Detailed Report: Minimum Drain Time



Minimum Drain Time Detailed Report: Minimum Drain Time



Project: **Red Hill**

ADS StormTech™

Chamber Model -	MC-3500	
Units -	Imperial	
Number of Chambers -	102	
Number of End Caps -	10	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	9	in
Area of system -	5730	sf Min. Area - 5219 sf min. area

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Single End Cap *(cubic feet)*	Incremental Chambers *(cubic feet)*	Incremental End Cap *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch, EC and Stone *(cubic feet)*	Cumulative System *(cubic feet)*	Elevation (feet)
66	0.00	0.00	0.00	0.00	191.00	191.00	19424.50	5.50
65	0.00	0.00	0.00	0.00	191.00	191.00	19233.50	5.42
64	0.00	0.00	0.00	0.00	191.00	191.00	19042.50	5.33
63	0.00	0.00	0.00	0.00	191.00	191.00	18851.50	5.25
62	0.00	0.00	0.00	0.00	191.00	191.00	18660.50	5.17
61	0.00	0.00	0.00	0.00	191.00	191.00	18469.50	5.08
60	0.00	0.00	0.00	0.00	191.00	191.00	18278.50	5.00
59	0.00	0.00	0.00	0.00	191.00	191.00	18087.50	4.92
58	0.00	0.00	0.00	0.00	191.00	191.00	17896.50	4.83
57	0.00	0.00	0.00	0.00	191.00	191.00	17705.50	4.75
56	0.00	0.00	0.00	0.00	191.00	191.00	17514.50	4.67
55	0.00	0.00	0.00	0.00	191.00	191.00	17323.50	4.58
54	0.06	0.00	5.92	0.00	188.63	194.55	17132.50	4.50
53	0.19	0.02	19.80	0.24	182.99	203.02	16937.95	4.42
52	0.29	0.04	29.98	0.38	178.86	209.22	16734.93	4.33
51	0.40	0.05	41.17	0.52	174.33	216.01	16525.71	4.25
50	0.69	0.07	70.09	0.68	162.69	233.46	16309.70	4.17
49	1.03	0.09	104.89	0.88	148.69	254.46	16076.24	4.08
48	1.25	0.11	127.45	1.07	139.59	268.11	15821.78	4.00
47	1.42	0.13	145.07	1.26	132.47	278.80	15553.66	3.92
46	1.57	0.14	160.46	1.44	126.24	288.14	15274.86	3.83
45	1.71	0.16	174.13	1.63	120.70	296.45	14986.72	3.75
44	1.83	0.18	186.51	1.82	115.67	303.99	14690.27	3.67
43	1.94	0.20	197.65	2.01	111.14	310.79	14386.27	3.58
42	2.04	0.22	208.16	2.18	106.86	317.21	14075.48	3.50
41	2.13	0.23	217.74	2.35	102.96	323.05	13758.27	3.42
40	2.22	0.25	226.87	2.51	99.25	328.63	13435.22	3.33
39	2.31	0.27	235.29	2.66	95.82	333.77	13106.59	3.25
38	2.38	0.28	243.25	2.80	92.58	338.63	12772.82	3.17
37	2.46	0.29	250.83	2.94	89.49	343.26	12434.19	3.08
36	2.53	0.31	257.87	3.08	86.62	347.57	12090.93	3.00
35	2.59	0.32	264.56	3.21	83.89	351.66	11743.36	2.92
34	2.66	0.33	270.92	3.34	81.30	355.56	11391.70	2.83
33	2.72	0.35	276.94	3.47	78.84	359.25	11036.14	2.75
32	2.77	0.36	282.67	3.60	76.49	362.76	10676.89	2.67
31	2.82	0.37	288.11	3.72	74.27	366.10	10314.13	2.58
30	2.88	0.38	293.30	3.84	72.14	369.28	9948.03	2.50
29	2.92	0.40	298.26	3.96	70.11	372.33	9578.75	2.42
28	2.97	0.41	302.93	4.08	68.20	375.20	9206.41	2.33
27	3.01	0.42	307.27	4.19	66.42	377.87	8831.21	2.25
26	3.05	0.43	311.43	4.30	64.71	380.44	8453.34	2.17
25	3.09	0.44	315.62	4.40	62.99	383.01	8072.90	2.08
24	3.13	0.45	319.32	4.51	61.47	385.29	7689.89	2.00
23	3.17	0.46	322.90	4.61	60.00	387.50	7304.59	1.92
22	3.20	0.47	326.34	4.71	58.58	389.63	6917.09	1.83
21	3.23	0.48	329.57	4.80	57.25	391.62	6527.46	1.75
20	3.26	0.49	332.66	4.89	55.98	393.53	6135.83	1.67
19	3.29	0.50	335.61	4.98	54.77	395.35	5742.30	1.58
18	3.32	0.51	338.43	5.06	53.60	397.10	5346.95	1.50
17	3.34	0.51	341.10	5.14	52.50	398.75	4949.85	1.42
16	3.37	0.52	343.60	5.22	51.47	400.29	4551.10	1.33
15	3.39	0.53	346.04	5.30	50.47	401.80	4150.81	1.25
14	3.41	0.54	348.28	5.37	49.54	403.19	3749.01	1.17
13	3.44	0.54	350.58	5.43	48.60	404.60	3345.82	1.08
12	3.46	0.55	352.69	5.49	47.73	405.91	2941.22	1.00
11	3.48	0.56	354.83	5.55	46.85	407.23	2535.31	0.92
10	3.51	0.59	357.52	5.95	45.61	409.08	2128.08	0.83
9	0.00	0.00	0.00	0.00	191.00	191.00	1719.00	0.75
8	0.00	0.00	0.00	0.00	191.00	191.00	1528.00	0.67
7	0.00	0.00	0.00	0.00	191.00	191.00	1337.00	0.58
6	0.00	0.00	0.00	0.00	191.00	191.00	1146.00	0.50
5	0.00	0.00	0.00	0.00	191.00	191.00	955.00	0.42
4	0.00	0.00	0.00	0.00	191.00	191.00	764.00	0.33
3	0.00	0.00	0.00	0.00	191.00	191.00	573.00	0.25
2	0.00	0.00	0.00	0.00	191.00	191.00	382.00	0.17
1	0.00	0.00	0.00	0.00	191.00	191.00	191.00	0.08

Required overflow invert height to retain/treat DCV of 7118 CF

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

ADS

Advanced Drainage Systems, Inc.

ADS SiteAssist™

FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

RED HILL

TUSTIN, CA, USA

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
    - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
    - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
    - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
    - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
    - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
    - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
    - STONESHOOTER LOCATED OFF THE CHAMBER BED.
    - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
    - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
    - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
    - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
    - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT

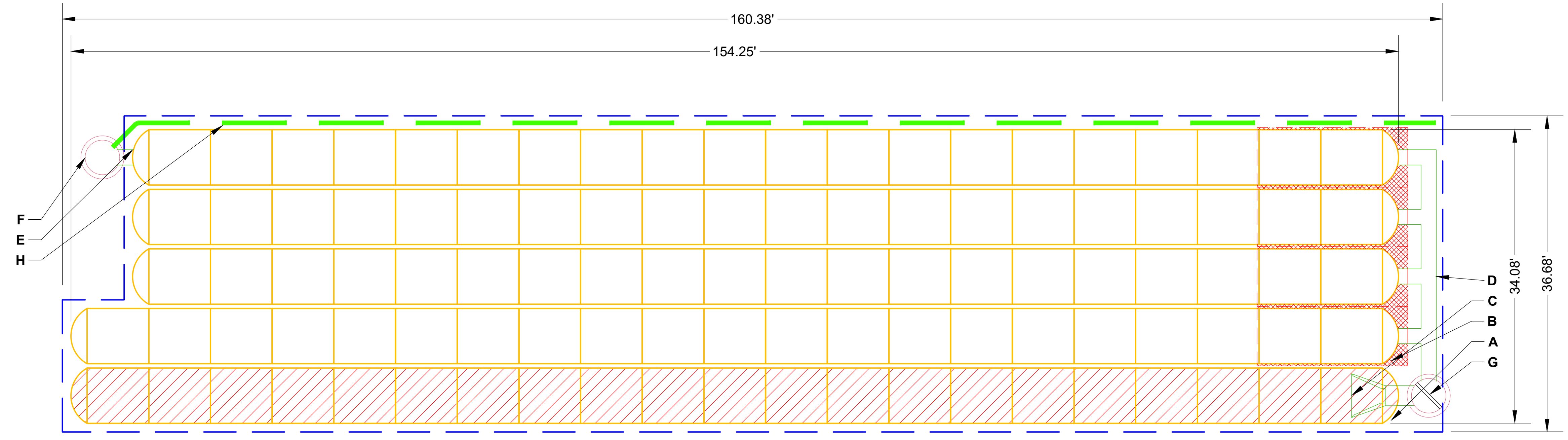
102	STORMTECH MC-3500 CHAMBERS
10	STORMTECH MC-3500 END CAPS
12	STONE ABOVE (in)
9	STONE BELOW (in)
40	STONE VOID
19425	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
5730	SYSTEM AREA (SF)
394.1	SYSTEM PERIMETER (ft)

CONCEPTUAL ELEVATIONS:

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.50
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	6.50
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	6.00
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	6.00
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	6.00
TOP OF STONE:	5.50
TOP OF MC-3500 CHAMBER:	4.50
24" ISOLATOR ROW PLUS INVERT:	0.92
18" x 18" BOTTOM MANIFOLD INVERT:	0.90
18" BOTTOM CONNECTION INVERT:	0.90
BOTTOM OF MC-3500 CHAMBER:	0.75
UNDERDRAIN INVERT:	0.00
BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.06"	
PREFABRICATED END CAP	B	18" BOTTOM CORED END CAP, PART#: MC3500IEPP18BC / TYP OF ALL 18" BOTTOM CONNECTIONS	1.77"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.77"	
PIPE CONNECTION	E	18" BOTTOM CONNECTION	1.77"	
CONCRETE STRUCTURE	F	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		4.0 CFS OUT
CONCRETE STRUCTURE W/WEIR	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		20.9 CFS IN
UNDERDRAIN	H	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		



▨ ISOLATOR ROW PLUS
(SEE DETAIL)

▩ PLACE MINIMUM 17.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

— — BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

RED HILL
TUSTIN, CA, USA

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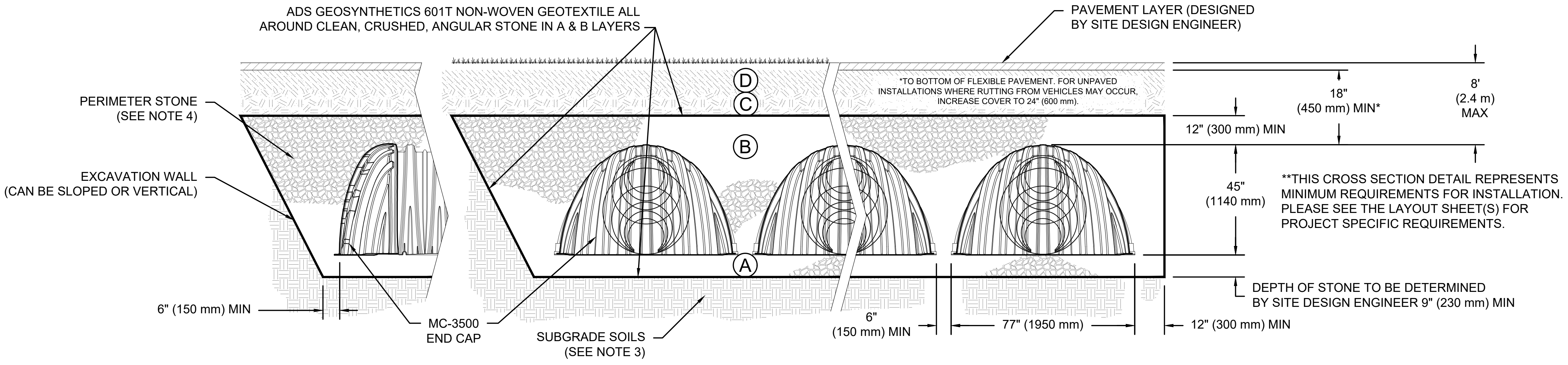
ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE[5]	AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:

1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
    - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
    - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
    - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

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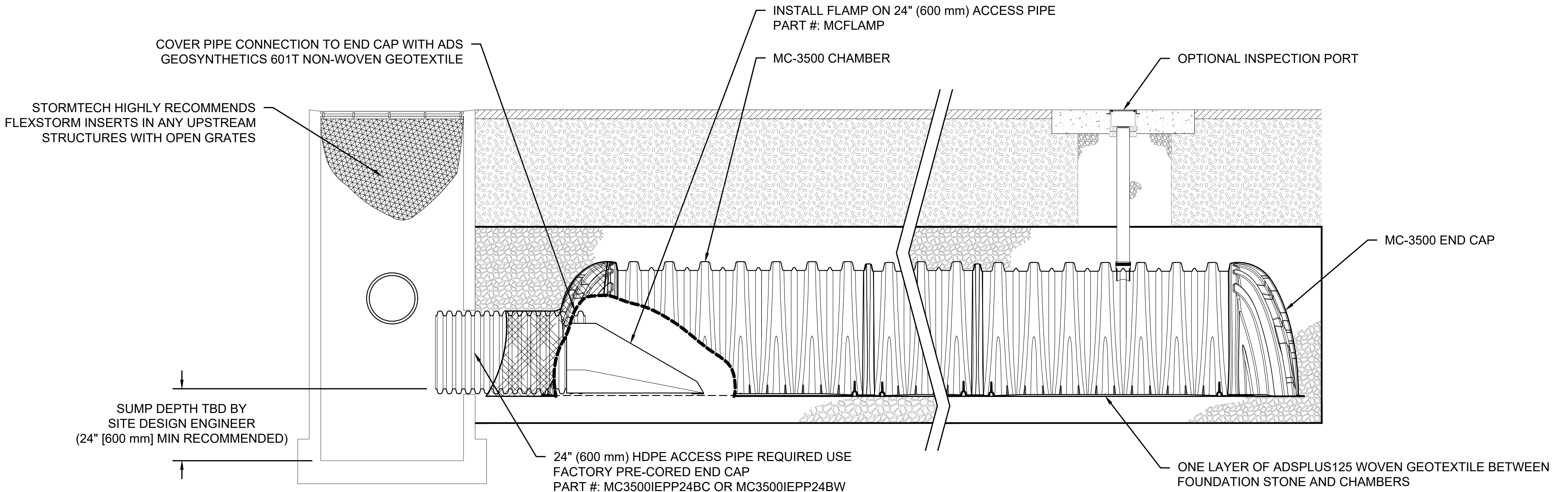

MC-3500 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

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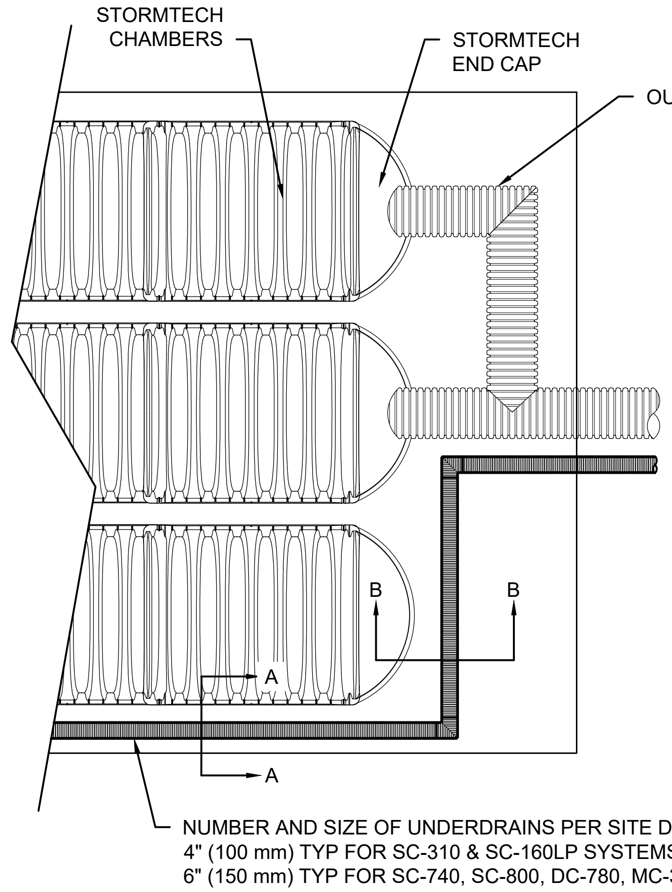
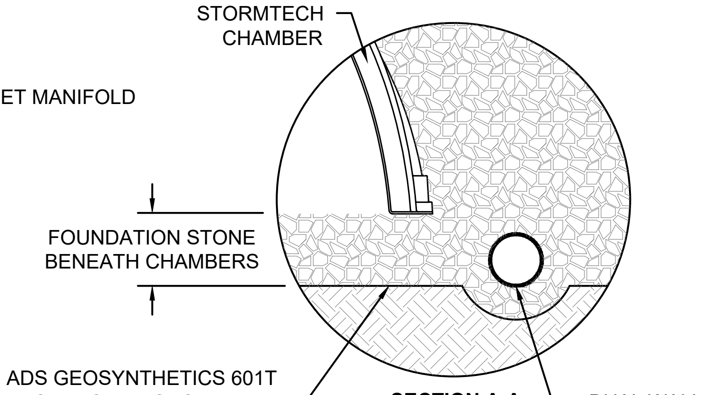
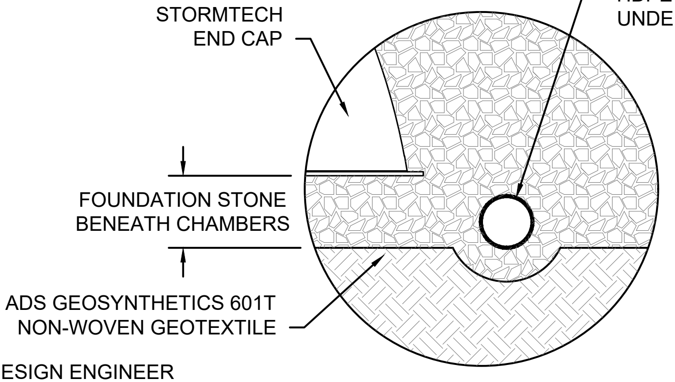
UNDERDRAIN DETAIL

NTS





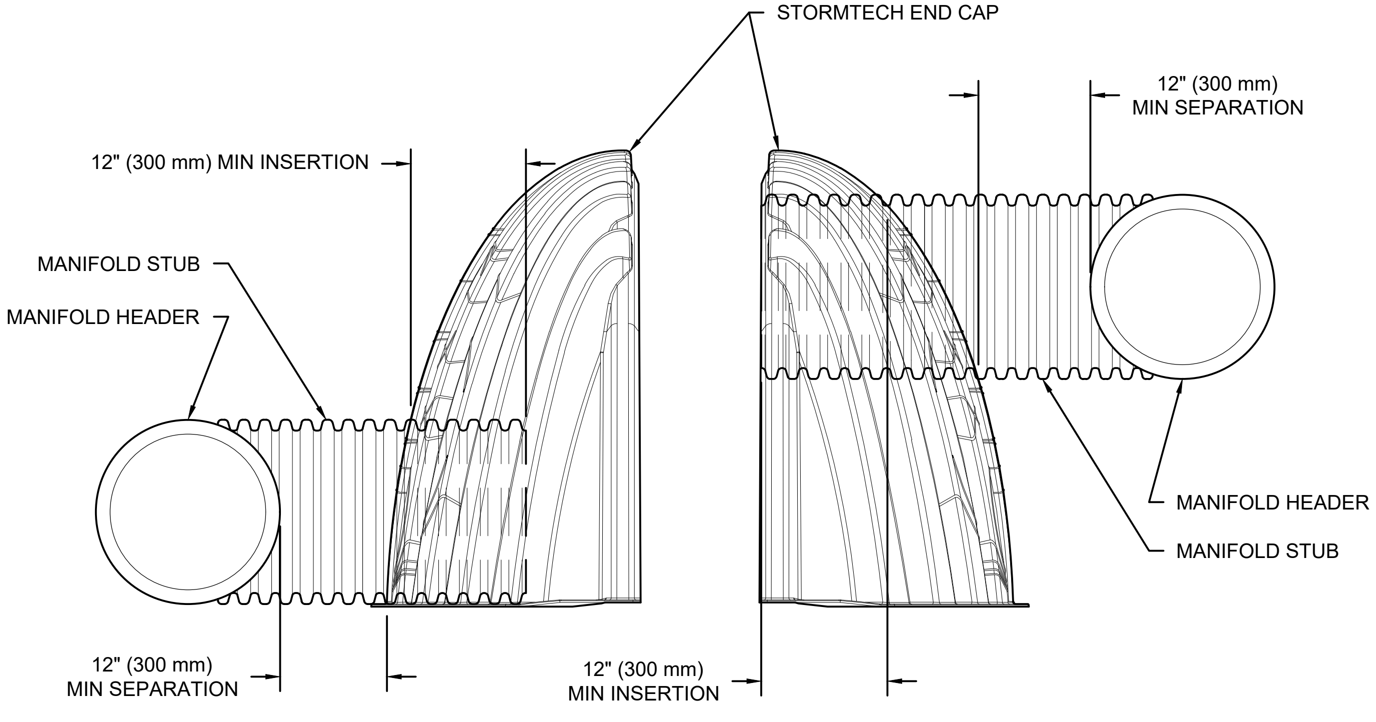
SECTION A-A



SECTION B-B

MC-SERIES END CAP INSERTION DETAIL

NTS



NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL
FOR A PROPER FIT IN END CAP OPENING.

MC-3500 TECHNICAL SPECIFICATION

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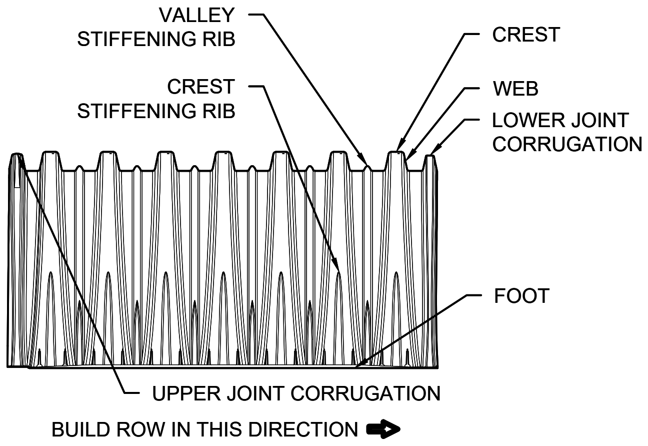
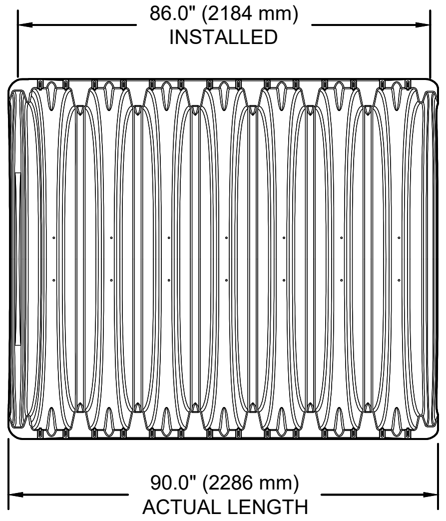
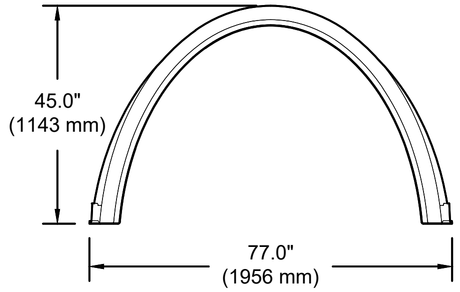
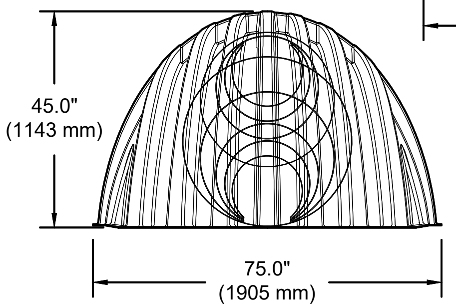
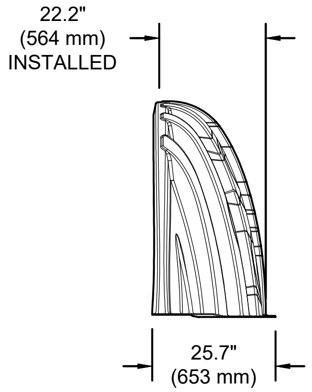










NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m^3)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m^3)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

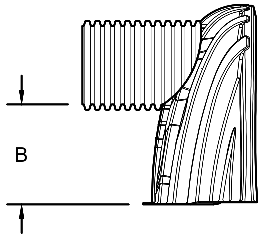
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m^3)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m^3)
WEIGHT	49 lbs.	(22.2 kg)

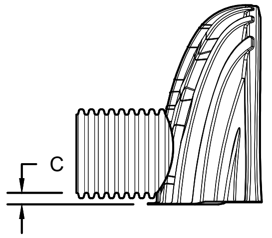
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL





CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

RED HILL
TUSTIN, CA, USA

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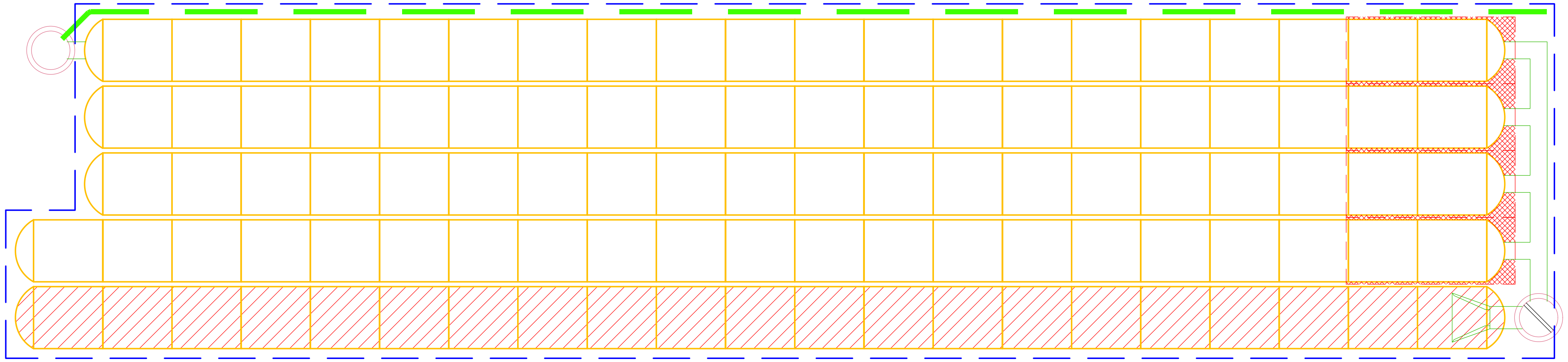

Appendix D: Drainage Structure Calculations References

Appendix E: References

Hydrograph Precipitation Data
Red Hill
11/4/2024

	2-Year Precipitation Depth (in)		
Duration	Day 1	Day 2	Day 3
5-min	0.149	0.037	0.026
30-min	0.359	0.088	0.062
60-min	0.499	0.122	0.086
3-hour	0.896	0.220	0.155
6-hour	1.260	0.309	0.218
24-hour	2.200	0.540	0.380

48-hour	2.74
48-24 hour delta	0.54
Hyetograph Scale Factor	0.245

72-hour	3.12
76-48 hour delta	0.38
Hyetograph Scale Factor	0.704

	25-Year Precipitation Depth (in)		
Duration	Day 1	Day 2	Day 3
5-min	0.289	0.076	0.054
30-min	0.697	0.184	0.129
60-min	0.969	0.256	0.179
3-hour	1.750	0.462	0.324
6-hour	2.450	0.647	0.454
24-hour	4.320	1.140	0.800

48-hour	5.46
48-24 hour delta	1.14
Hyetograph Scale Factor	0.264

72-hour	6.26
76-48 hour delta	0.8
Hyetograph Scale Factor	0.702

	100-Year Precipitation Depth (in)		
Duration	Day 1	Day 2	Day 3
5-min	0.378	0.100	0.071
30-min	0.912	0.240	0.172
60-min	1.270	0.334	0.240
3-hour	2.300	0.605	0.435
6-hour	3.220	0.848	0.609
24-hour	5.660	1.490	1.070

48-hour	7.15
48-24 hour delta	1.49
Hyetograph Scale Factor	0.263

72-hour	8.22
76-48 hour delta	1.07
Hyetograph Scale Factor	0.718

*Source - NOAA14 Precipitation

NOAA Atlas 14, Volume 6, Version 2
Location name: Tustin, California, USA*
Latitude: 33.7364°, Longitude: -117.8131°
Elevation: 108 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.115 (0.096-0.138)	0.149 (0.125-0.180)	0.195 (0.163-0.236)	0.234 (0.194-0.286)	0.289 (0.231-0.365)	0.332 (0.260-0.430)	0.378 (0.288-0.501)	0.426 (0.315-0.583)	0.493 (0.349-0.705)	0.547 (0.373-0.812)
10-min	0.164 (0.138-0.198)	0.213 (0.179-0.257)	0.280 (0.234-0.339)	0.336 (0.278-0.410)	0.414 (0.331-0.524)	0.476 (0.372-0.616)	0.542 (0.412-0.719)	0.611 (0.451-0.835)	0.707 (0.500-1.01)	0.785 (0.534-1.16)
15-min	0.199 (0.167-0.239)	0.258 (0.216-0.311)	0.339 (0.283-0.409)	0.406 (0.336-0.495)	0.501 (0.400-0.633)	0.576 (0.450-0.745)	0.655 (0.498-0.869)	0.738 (0.545-1.01)	0.855 (0.604-1.22)	0.949 (0.646-1.41)
30-min	0.277 (0.232-0.333)	0.359 (0.301-0.433)	0.471 (0.394-0.570)	0.565 (0.468-0.690)	0.697 (0.557-0.882)	0.802 (0.627-1.04)	0.912 (0.694-1.21)	1.03 (0.760-1.41)	1.19 (0.842-1.70)	1.32 (0.900-1.96)
60-min	0.384 (0.322-0.463)	0.499 (0.418-0.602)	0.655 (0.547-0.792)	0.785 (0.650-0.958)	0.969 (0.774-1.22)	1.12 (0.871-1.44)	1.27 (0.964-1.68)	1.43 (1.06-1.95)	1.66 (1.17-2.36)	1.84 (1.25-2.72)
2-hr	0.556 (0.466-0.669)	0.723 (0.606-0.872)	0.949 (0.793-1.15)	1.14 (0.943-1.39)	1.41 (1.12-1.78)	1.62 (1.27-2.10)	1.85 (1.41-2.45)	2.09 (1.54-2.86)	2.43 (1.72-3.48)	2.71 (1.85-4.02)
3-hr	0.689 (0.578-0.830)	0.896 (0.751-1.08)	1.18 (0.982-1.42)	1.41 (1.17-1.72)	1.75 (1.40-2.21)	2.01 (1.57-2.60)	2.30 (1.75-3.05)	2.60 (1.92-3.56)	3.03 (2.14-4.34)	3.39 (2.31-5.02)
6-hr	0.971 (0.814-1.17)	1.26 (1.06-1.52)	1.66 (1.38-2.00)	1.98 (1.64-2.42)	2.45 (1.96-3.10)	2.83 (2.21-3.65)	3.22 (2.45-4.27)	3.64 (2.69-4.98)	4.24 (3.00-6.06)	4.72 (3.22-7.01)
12-hr	1.27 (1.07-1.53)	1.66 (1.39-2.00)	2.18 (1.82-2.64)	2.62 (2.17-3.19)	3.23 (2.58-4.08)	3.71 (2.90-4.80)	4.22 (3.21-5.60)	4.76 (3.51-6.51)	5.51 (3.89-7.87)	6.11 (4.16-9.06)
24-hr	1.68 (1.49-1.94)	2.20 (1.95-2.55)	2.91 (2.56-3.37)	3.50 (3.06-4.09)	4.32 (3.66-5.22)	4.98 (4.13-6.13)	5.66 (4.58-7.13)	6.38 (5.03-8.26)	7.38 (5.59-9.95)	8.18 (5.99-11.4)
2-day	2.07 (1.83-2.39)	2.74 (2.42-3.17)	3.65 (3.22-4.23)	4.41 (3.85-5.15)	5.46 (4.62-6.59)	6.29 (5.22-7.74)	7.15 (5.79-9.02)	8.06 (6.35-10.4)	9.33 (7.06-12.6)	10.3 (7.56-14.4)
3-day	2.34 (2.06-2.70)	3.12 (2.75-3.60)	4.17 (3.67-4.83)	5.04 (4.40-5.89)	6.26 (5.30-7.55)	7.22 (5.99-8.89)	8.22 (6.66-10.4)	9.27 (7.30-12.0)	10.7 (8.12-14.5)	11.9 (8.71-16.6)
4-day	2.52 (2.23-2.91)	3.38 (2.98-3.90)	4.53 (3.99-5.25)	5.49 (4.80-6.41)	6.83 (5.78-8.24)	7.89 (6.54-9.71)	8.99 (7.28-11.3)	10.1 (8.00-13.1)	11.8 (8.90-15.9)	13.0 (9.55-18.2)
7-day	2.88 (2.54-3.32)	3.85 (3.40-4.45)	5.18 (4.56-6.00)	6.29 (5.50-7.35)	7.87 (6.66-9.49)	9.12 (7.56-11.2)	10.4 (8.45-13.2)	11.8 (9.32-15.3)	13.8 (10.4-18.6)	15.4 (11.2-21.4)
10-day	3.11 (2.75-3.59)	4.17 (3.68-4.82)	5.62 (4.95-6.51)	6.85 (5.98-8.00)	8.60 (7.27-10.4)	10.0 (8.29-12.3)	11.5 (9.29-14.5)	13.1 (10.3-16.9)	15.3 (11.6-20.6)	17.1 (12.5-23.8)
20-day	3.76 (3.32-4.34)	5.08 (4.49-5.88)	6.92 (6.10-8.02)	8.50 (7.42-9.92)	10.8 (9.10-13.0)	12.6 (10.4-15.5)	14.5 (11.8-18.3)	16.6 (13.1-21.5)	19.6 (14.9-26.5)	22.1 (16.2-30.8)
30-day	4.42 (3.91-5.10)	6.01 (5.31-6.95)	8.23 (7.24-9.53)	10.1 (8.85-11.8)	12.9 (10.9-15.5)	15.1 (12.5-18.6)	17.5 (14.2-22.1)	20.1 (15.9-26.1)	23.8 (18.0-32.1)	26.9 (19.7-37.5)
45-day	5.19 (4.58-5.99)	7.05 (6.22-8.15)	9.67 (8.51-11.2)	11.9 (10.4-13.9)	15.2 (12.9-18.4)	17.9 (14.8-22.0)	20.8 (16.8-26.2)	23.9 (18.8-31.0)	28.4 (21.5-38.3)	32.1 (23.5-44.8)
60-day	6.03 (5.33-6.96)	8.16 (7.20-9.43)	11.2 (9.83-12.9)	13.8 (12.0-16.1)	17.6 (14.9-21.2)	20.7 (17.1-25.4)	24.0 (19.5-30.3)	27.7 (21.8-35.8)	32.9 (24.9-44.4)	37.3 (27.3-52.0)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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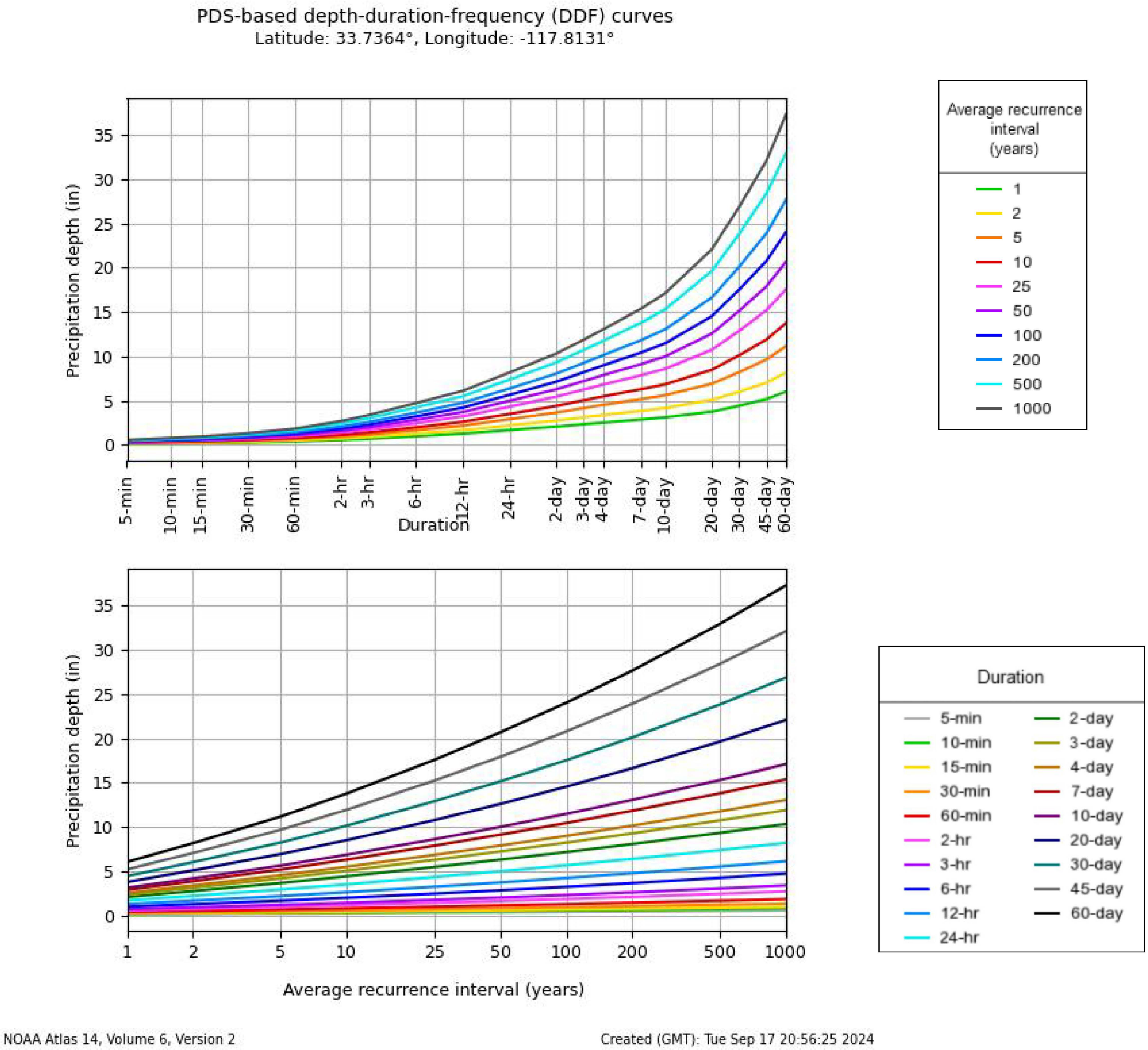
PF graphical



PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.7364°, Longitude: -117.8131°

NOAA Atlas 14, Volume 6, Version 2

Created (GMT): Tue Sep 17 20:56:25 2024

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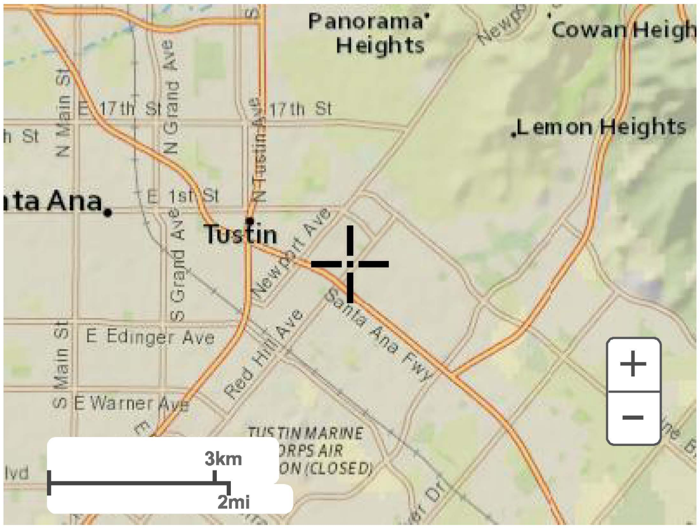
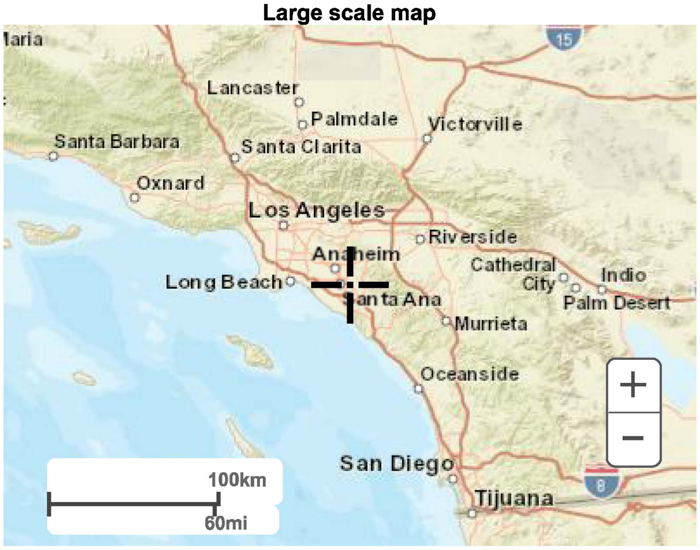
Maps & aerials

Small scale terrain

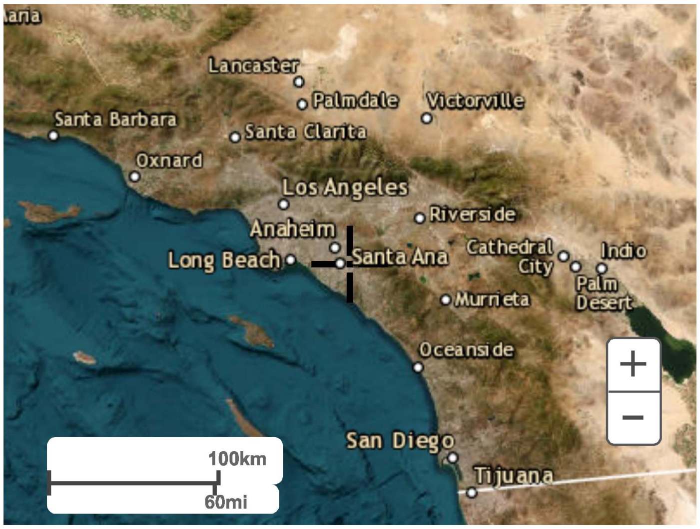


Large scale terrain

Large scale map



Large scale aerial



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National Weather Service
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Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOAA Atlas 14, Volume 6, Version 2
Location name: Tustin, California, USA*
Latitude: 33.7364°, Longitude: -117.8131°
Elevation: 108 ft**
* source: ESRI Maps
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POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.38** (1.15-1.66)	**1.79** (1.50-2.16)	**2.34** (1.96-2.83)	**2.81** (2.33-3.43)	**3.47** (2.77-4.38)	**3.98** (3.12-5.16)	**4.54** (3.46-6.01)	**5.11** (3.78-7.00)	**5.92** (4.19-8.46)	**6.56** (4.48-9.74)
10-min	**0.984** (0.828-1.19)	**1.28** (1.07-1.54)	**1.68** (1.40-2.03)	**2.02** (1.67-2.46)	**2.48** (1.99-3.14)	**2.86** (2.23-3.70)	**3.25** (2.47-4.31)	**3.67** (2.71-5.01)	**4.24** (3.00-6.07)	**4.71** (3.20-6.98)
15-min	**0.796** (0.668-0.956)	**1.03** (0.864-1.24)	**1.36** (1.13-1.64)	**1.62** (1.34-1.98)	**2.00** (1.60-2.53)	**2.30** (1.80-2.98)	**2.62** (1.99-3.48)	**2.95** (2.18-4.04)	**3.42** (2.42-4.89)	**3.80** (2.58-5.63)
30-min	**0.554** (0.464-0.666)	**0.718** (0.602-0.866)	**0.942** (0.788-1.14)	**1.13** (0.936-1.38)	**1.39** (1.11-1.76)	**1.60** (1.25-2.08)	**1.82** (1.39-2.42)	**2.06** (1.52-2.81)	**2.38** (1.68-3.41)	**2.64** (1.80-3.92)
60-min	**0.384** (0.322-0.463)	**0.499** (0.418-0.602)	**0.655** (0.547-0.792)	**0.785** (0.650-0.958)	**0.969** (0.774-1.22)	**1.12** (0.871-1.44)	**1.27** (0.964-1.68)	**1.43** (1.06-1.95)	**1.66** (1.17-2.36)	**1.84** (1.25-2.72)
2-hr	**0.278** (0.233-0.334)	**0.361** (0.303-0.436)	**0.474** (0.396-0.574)	**0.570** (0.471-0.695)	**0.704** (0.562-0.890)	**0.811** (0.634-1.05)	**0.924** (0.703-1.23)	**1.04** (0.772-1.43)	**1.22** (0.859-1.74)	**1.36** (0.923-2.01)
3-hr	**0.229** (0.192-0.276)	**0.298** (0.250-0.359)	**0.391** (0.327-0.473)	**0.470** (0.389-0.573)	**0.581** (0.464-0.734)	**0.670** (0.523-0.867)	**0.764** (0.582-1.01)	**0.865** (0.639-1.18)	**1.01** (0.713-1.44)	**1.13** (0.768-1.67)
6-hr	**0.162** (0.135-0.195)	**0.210** (0.176-0.254)	**0.276** (0.230-0.334)	**0.331** (0.274-0.404)	**0.409** (0.327-0.517)	**0.471** (0.368-0.610)	**0.537** (0.409-0.713)	**0.607** (0.449-0.831)	**0.707** (0.500-1.01)	**0.789** (0.537-1.17)
12-hr	**0.105** (0.088-0.127)	**0.137** (0.115-0.166)	**0.180** (0.151-0.218)	**0.217** (0.179-0.264)	**0.267** (0.214-0.338)	**0.308** (0.240-0.398)	**0.350** (0.266-0.465)	**0.394** (0.291-0.540)	**0.457** (0.323-0.653)	**0.507** (0.345-0.751)
24-hr	**0.070** (0.061-0.080)	**0.091** (0.081-0.106)	**0.121** (0.106-0.140)	**0.145** (0.127-0.170)	**0.180** (0.152-0.217)	**0.207** (0.171-0.255)	**0.235** (0.190-0.297)	**0.265** (0.209-0.344)	**0.307** (0.232-0.414)	**0.341** (0.249-0.475)
2-day	**0.043** (0.038-0.049)	**0.057** (0.050-0.066)	**0.076** (0.066-0.088)	**0.091** (0.080-0.107)	**0.113** (0.096-0.137)	**0.131** (0.108-0.161)	**0.149** (0.120-0.187)	**0.167** (0.132-0.217)	**0.194** (0.147-0.261)	**0.215** (0.157-0.300)
3-day	**0.032** (0.028-0.037)	**0.043** (0.038-0.050)	**0.057** (0.050-0.067)	**0.070** (0.061-0.081)	**0.086** (0.073-0.104)	**0.100** (0.083-0.123)	**0.114** (0.092-0.143)	**0.128** (0.101-0.166)	**0.149** (0.112-0.200)	**0.165** (0.120-0.230)
4-day	**0.026** (0.023-0.030)	**0.035** (0.031-0.040)	**0.047** (0.041-0.054)	**0.057** (0.049-0.066)	**0.071** (0.060-0.085)	**0.082** (0.068-0.101)	**0.093** (0.075-0.117)	**0.105** (0.083-0.136)	**0.122** (0.092-0.165)	**0.135** (0.099-0.189)
7-day	**0.017** (0.015-0.019)	**0.022** (0.020-0.026)	**0.030** (0.027-0.035)	**0.037** (0.032-0.043)	**0.046** (0.039-0.056)	**0.054** (0.045-0.066)	**0.062** (0.050-0.078)	**0.070** (0.055-0.091)	**0.082** (0.062-0.110)	**0.091** (0.066-0.127)
10-day	**0.012** (0.011-0.014)	**0.017** (0.015-0.020)	**0.023** (0.020-0.027)	**0.028** (0.024-0.033)	**0.035** (0.030-0.043)	**0.041** (0.034-0.051)	**0.047** (0.038-0.060)	**0.054** (0.042-0.070)	**0.063** (0.048-0.085)	**0.071** (0.052-0.099)
20-day	**0.007** (0.006-0.009)	**0.010** (0.009-0.012)	**0.014** (0.012-0.016)	**0.017** (0.015-0.020)	**0.022** (0.018-0.027)	**0.026** (0.021-0.032)	**0.030** (0.024-0.038)	**0.034** (0.027-0.044)	**0.040** (0.030-0.055)	**0.046** (0.033-0.064)
30-day	**0.006** (0.005-0.007)	**0.008** (0.007-0.009)	**0.011** (0.010-0.013)	**0.014** (0.012-0.016)	**0.017** (0.015-0.021)	**0.021** (0.017-0.025)	**0.024** (0.019-0.030)	**0.027** (0.022-0.036)	**0.033** (0.025-0.044)	**0.037** (0.027-0.052)
45-day	**0.004** (0.004-0.005)	**0.006** (0.005-0.007)	**0.008** (0.007-0.010)	**0.011** (0.009-0.012)	**0.014** (0.011-0.016)	**0.016** (0.013-0.020)	**0.019** (0.015-0.024)	**0.022** (0.017-0.028)	**0.026** (0.019-0.035)	**0.029** (0.021-0.041)
60-day	**0.004** (0.003-0.004)	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.009** (0.008-0.011)	**0.012** (0.010-0.014)	**0.014** (0.011-0.017)	**0.016** (0.013-0.021)	**0.019** (0.015-0.024)	**0.022** (0.017-0.030)	**0.025** (0.018-0.036)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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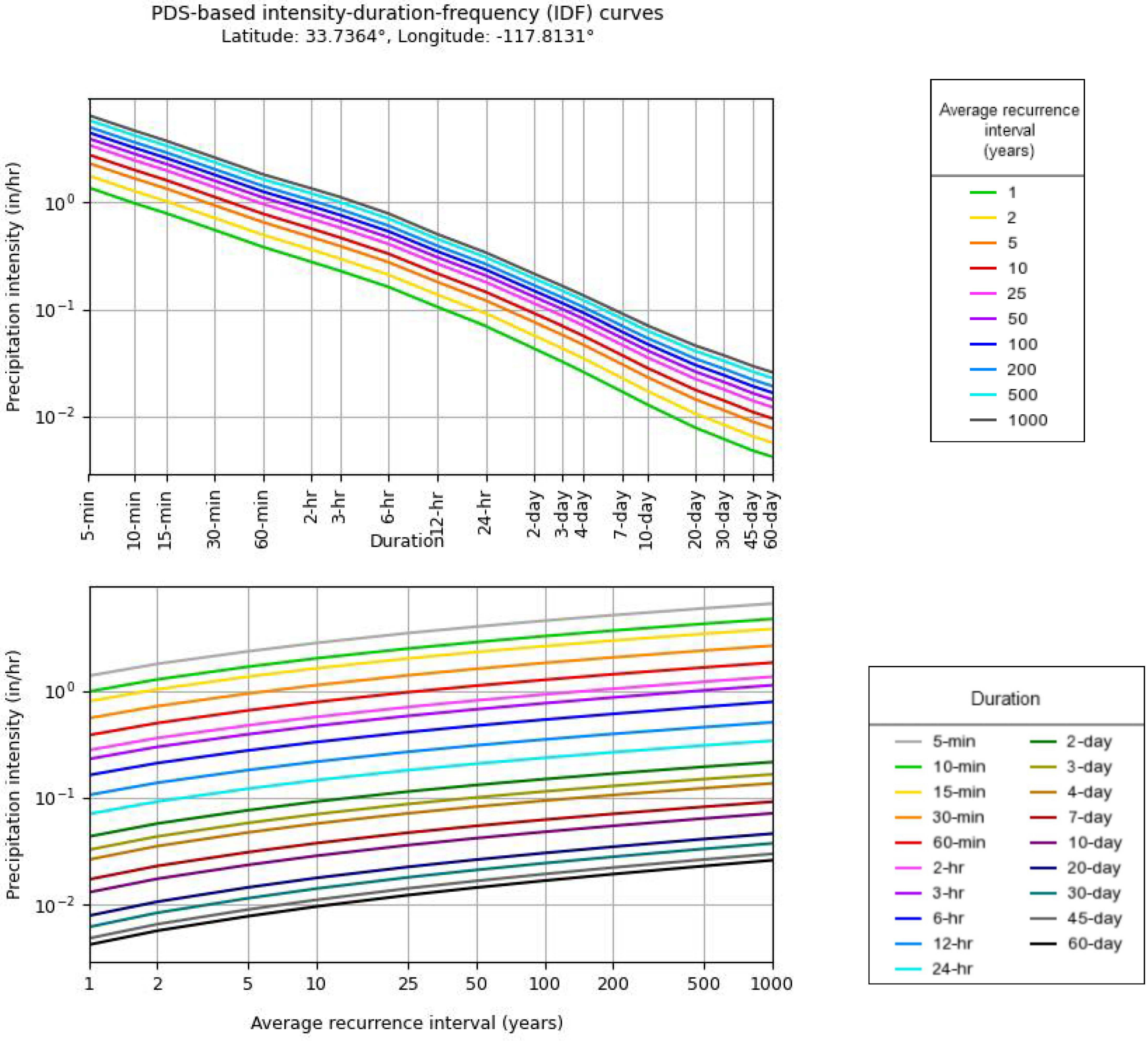
PF graphical



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Maps & aerials

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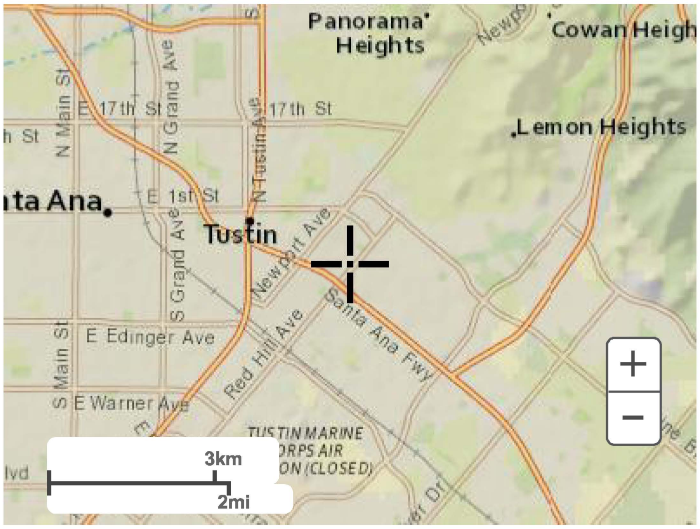
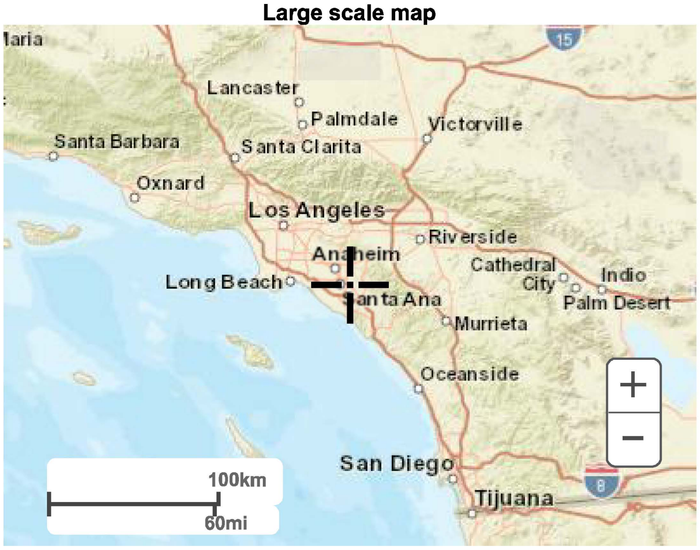
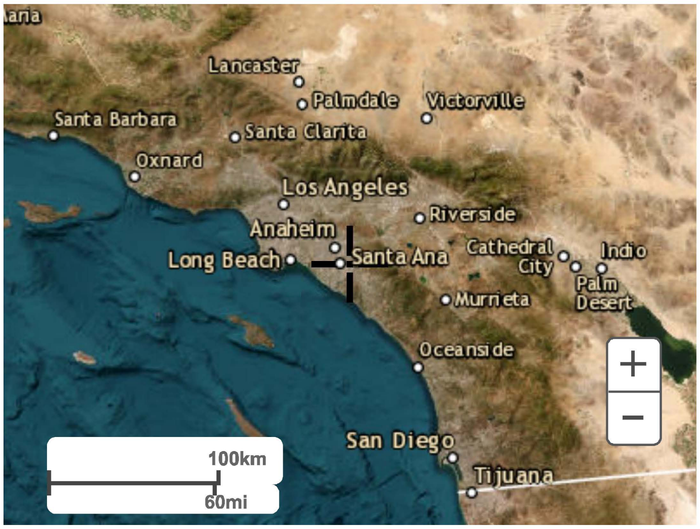


Large scale terrain

Large scale map



Large scale aerial



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National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

NOTE: UTILITIES INDICATED THUS * DENOTES THEY HAVE BEEN POTHOLED AND FIELD VERIFIED. ALL OTHERS ARE ASSUMED LOCATIONS. DIG WITH CARE!

CONSTRUCTION NOTES

① SAWCUT AC AND/OR PCC.
② FURNISH AND INSTALL 45" RCP, MINIMUM D LOAD AS INDICATED ON PLAN & PROFILE.
③ FURNISH AND INSTALL 42" RCP, MINIMUM D LOAD AS INDICATED ON PLAN & PROFILE.
④ FURNISH AND INSTALL 18" RCP, MINIMUM D LOAD AS INDICATED ON PLAN & PROFILE.
⑤ REMOVE AND DISPOSE OF EXISTING 45" RCP BETWEEN PIPE JOINTS PER PLAN AND FURNISH AND CONSTRUCT JUNCTION STRUCTURE TYPE III PER OCEMA STD. PLAN NO. 312. ANGLE A=40°; C=10.28'; ELEVATION R=95.90; ELEVATION S=95.88; OVERALL LENGTH OF STRUCTURE=8.83'.
⑥ REMOVE AND DISPOSE OF INTERFERING PORTION OF EXISTING 30" RCP AND FURNISH AND INSTALL JUNCTION STRUCTURE TYPE II PER OCEMA STD. PLAN NO. 311. L=7'-6"; M=2'-1½"±. USE 24" DIA. GRADE RINGS AND 24" DIA. MANHOLE FRAME & COVER IN LIEU OF REDUCER CONE. CONNECT EXIST. 30" RCP TO JUNCTION STRUCTURE.
⑦ REMOVE AND DISPOSE OF INTERFERING PORTION OF EXISTING 30" RCP AND FURNISH AND INSTALL JUNCTION STRUCTURE TYPE II PER OCEMA STD. PLAN NO. 311. L=5'-6"; M=2'-6"±. USE 24" DIA. GRADE RINGS AND 24" DIA. MANHOLE FRAME & COVER IN LIEU OF REDUCER CONE. CONNECT EXIST. 30" RCP TO JUNCTION STRUCTURE.
⑧ FURNISH AND CONSTRUCT JUNCTION STRUCTURE TYPE II PER OCEMA STD. PLAN NO. 311. L=6'-0"; M=2'-3"±. USE 24" DIA. GRADE RINGS AND 24" DIA. MANHOLE FRAME & COVER IN LIEU OF REDUCER CONE.
⑨ FURNISH AND CONSTRUCT JUNCTION STRUCTURE TYPE VI, CASE I, PER OCEMA STD. PLAN NO. 315.
⑩ FURNISH AND CONSTRUCT TWO LAYER BRICK & MORTAR PLUG.
⑪ FURNISH AND CONSTRUCT CATCH BASIN TYPE OS PER CITY OF TUSTIN STD. PLAN NO. 110 WITH LOCAL DEPRESSION PER CITY OF TUSTIN STD. PLAN NO. 113.
㉞ REMOVE AND DISPOSE OF EXISTING CURB & GUTTER.
㉟ REMOVE AND DISPOSE OF EXISTING SIDEWALK AND CONSTRUCT 4" THICK PCC SIDEWALK PER CITY OF TUSTIN STD. PLAN NO. 104.
㊱ ADJUST EXISTING JUNCTION STRUCTURE MANHOLE FRAME & COVER TO FINISHED GRADE.
㊲ FURNISH AND CONSTRUCT TYPE A-2 PCC CURB & GUTTER PER CITY OF TUSTIN STD. PLAN NO. 103.
㊳ REMOVE AND DISPOSE OF EXISTING PAVEMENT AND BASE AND CONSTRUCT 0.70' THICK DEEP LIFT ASPHALT CONCRETE PAVEMENT REPLACEMENT.
㊴ REMOVE AND DISPOSE OF EXISTING CURB RETURN, SPANDREL AND CROSS GUTTER.
㊵ REMOVE AND DISPOSE OF EXISTING CURB RETURN AND SPANDREL AND CONSTRUCT TYPE A-2 PCC CURB & GUTTER WITH VARIABLE CURB FACE PER CITY OF TUSTIN STD. PLAN NO. 103.
㊶ CONSTRUCT WHEELCHAIR RAMP PER CITY OF TUSTIN STD. PLAN NO. 124.
㊷ SWEEP CLEAN, APPLY TACKCOAT AND CONSTRUCT VARIABLE THICKNESS ASPHALT CONCRETE OVERLAY.
(52) ADJUST NEW MANHOLE FRAME & COVER TO FINISHED GRADE ONLY AFTER FINAL ASPHALT CONCRETE OVERLAY AND FEATHERING HAS BEEN COMPLETED.

REVISIONS	
DATE	DESCRIPTION

CITY OF TUSTIN, CALIFORNIA
DEPARTMENT OF PUBLIC WORKS

PREPARED BY:
ENGINEERING DIVISION
300 CENTENNIAL WAY, TUSTIN, CA. 92680 (714) 544-8890

CONSTRUCTION PLAN FOR:
SAN JUAN STORM DRAIN FACILITY
NO. F07P24 AND LATERALS
PLAN & PROFILE

LOCATION:
SAN JUAN STREET
STA. 8+96.64 TO
STA. 14+00

PREPARED UNDER SUPERVISION OF: Dale A. Wick DATE: 4/19/85 RCE: 27380

DESIGN BY: J. Ottesod
CHECK BY: Daw

APPROVED BY: Robert S. Ledendecker DATE: 4-22-85
CITY ENGINEER RCE: 16349

SHT 2 OF 14

MISC. APPROVAL DATE:

FILE NO.
D-266B

"AS BUILT"

D - 266B
SHEET 2 OF 14

D266 002

National Flood Hazard Layer FIRMette

FEMA

117°49'6"W 33°44'26"N

117°48'28"W 33°43'56"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	■	Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
	▨	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	■	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	▨	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	▨	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	▨	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
	▭	Effective LOMRs
	■	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	— — —	Channel, Culvert, or Storm Sewer
	I I I I I I I	Levee, Dike, or Floodwall
OTHER FEATURES	(B) 20.2 / 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8 — — —	Coastal Transect
	~~ 513 ~~~	Base Flood Elevation Line (BFE)
	—	Limit of Study
	—	Jurisdiction Boundary
	--- ---	Coastal Transect Baseline
	—	Profile Baseline
	—	Hydrographic Feature
MAP PANELS	☐	Digital Data Available
	☐	No Digital Data Available
	☒	Unmapped

N

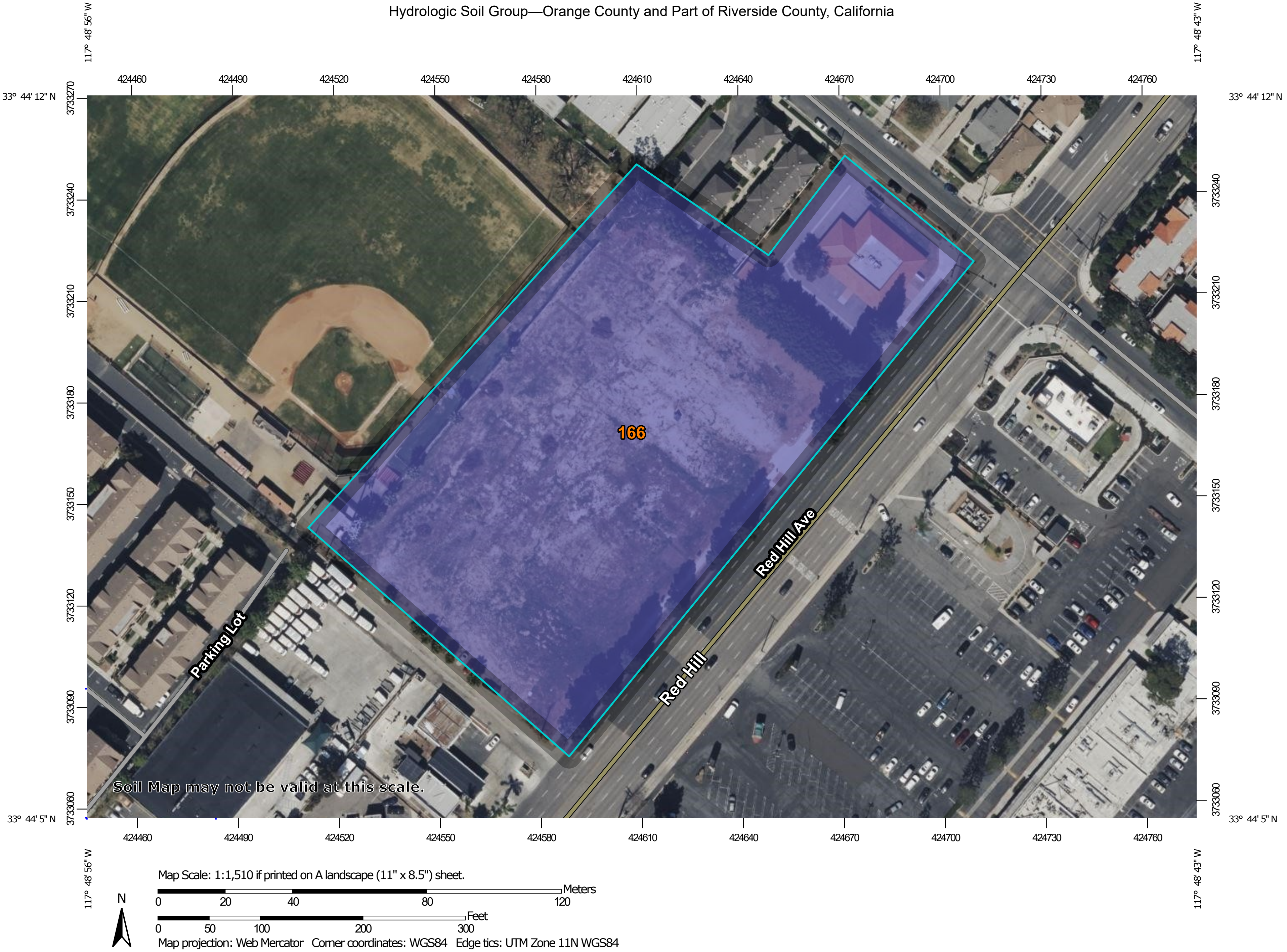
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/7/2024 at 5:11 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Hydrologic Soil Group—Orange County and Part of Riverside County, California



Map Scale: 1:1,510 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- ▭ Area of Interest (AOI)

Soils

Soil Rating Polygons

- ▭ A
- ▭ A/D
- ▭ B
- ▭ B/D
- ▭ C
- ▭ C/D
- ▭ D
- ▭ Not rated or not available

Soil Rating Lines

- 〰 A
- 〰 A/D
- 〰 B
- 〰 B/D
- 〰 C
- 〰 C/D
- 〰 D
- 〰 Not rated or not available

Soil Rating Points

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- ■ Not rated or not available

Water Features

- 〰 Streams and Canals

Transportation

- ┼┼┼ Rails
- 〰 Interstate Highways
- 〰 US Routes
- 〰 Major Roads
- 〰 Local Roads

Background

- ▨ Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 17, Aug 30, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
166	Mocho loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	B	4.1	100.0%
Totals for Area of Interest			**4.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix F: Geotechnical Report

S A GEOTECHNICAL
OPTIMIZED SOIL ENGINEERING

February 2, 2023

Project No. 24011-01

To: Meritage Homes
5 Peters Canyon Road, Suite 310
Irvine, California 92606

Attention: Ms. Johanna Crooker

Subject: Geotechnical Due Diligence Review, Subsurface Exploration and Preliminary Design, Proposed 76-Unit Residential Development, 13841 and 13751 Red Hill Avenue, City of Tustin, California

At your request, SA Geotechnical, Inc. (SA GEO) has conducted geotechnical due diligence review and subsurface exploration for the proposed residential development at 13841 and 13751 Red Avenue in the City of Tustin, California (Figure 1). The purpose of this study was to evaluate the geotechnical site conditions in light of the proposed grading and improvements in order to provide a geotechnical summary and preliminary geotechnical recommendations for project design, grading, and construction. Our evaluation included review of background geologic and geotechnical engineering maps and reports for the subject site; review of the prior site-specific geotechnical reports provided by you; subsurface exploration; geotechnical analysis; and preparation of this report.

The subject site is a vacant/dirt lot that was previously occupied by a church facility (13841 Red Hill Avenue) and commercial building (13751 Red Hill Avenue). Based on our review and subsurface exploration, the primary geotechnical constraints include the presence of undocumented fill and weathered/unsuitable alluvium near surface, potentially liquefiable soils, presence of granular soils at depth that may be prone to caving in steep sided excavations, and seismic shaking during a strong earthquake event. Subsurface soils at the site generally consist of interlayered silty/clayey sand mixtures, clean sand, sandy silt, and silty/sandy clay. Groundwater was encountered during prior explorations by others (NMG, 2015 and Geosoils, 2005) at depths ranging from 40.5 to 47.4 feet below ground surface.

This report presents our findings, conclusions, and preliminary design recommendations for the proposed residential development. Based on our exploration and review, the proposed grading and development is considered geotechnically feasible provided the recommendations in this report are implemented during design, grading, and construction. Additional geotechnical evaluation and analysis may need to be performed as the project plans for grading, foundations, and stormwater infiltration systems are developed. Infiltration testing was performed by others during a prior study (NMG, 2015) which indicated that infiltration of stormwater was generally feasible at depths between 8 and 12.5 feet.

References pertinent to the site are included in Appendix A. Boring and cone penetrometer test (CPT) logs are included in Appendix B. Laboratory test results by others are included in Appendix C. Seismic design parameters are presented in Appendix D. Percolation test data sheets are provided in Appendix E. Liquefaction analysis is included in Appendix F. General Earthwork and grading specifications are presented in Appendix G.

If you have any questions regarding this report, please contact our office. We appreciate the opportunity to provide our services.

Respectfully submitted,

SA GEOTECHNICAL, INC.

Anthony Zepeda, CEG 2681
Project Geologist

ANTHONY L. ZEPEDA
CEG No. 2681

Reza Saberi, GE 3071
Principal Engineer

MOHAMMAD REZA SABERI
No. 3071

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EXECUTIVE SUMMARY

The subject site is underlain by undocumented fill materials and native alluvium. Undocumented artificial fill was encountered in most borings performed onsite, ranging in thickness from 2 to 9.5 feet; however, the undocumented fill thickness was estimated based on limited sampling by others. The onsite alluvial soils are generally composed of silty/clayey sand, sand, and sandy/silty clay. Groundwater was encountered during prior subsurface explorations (NMG, 2015 and Geosoils, 2005) at depths ranging from 40.5 to 47.4 feet below ground surface (bgs). Historic high groundwater is mapped between 30 and 40 feet bgs (CDMG, 1998) and existing groundwater data available through the GeoTracker database indicate depths to groundwater between 30 and 60+ feet bgs in the vicinity of the site.

The primary geotechnical constraints at the site include the following:

- The presence of undocumented artificial fill and weathered/unsuitable alluvium which will need to be removed and replaced as compacted fill;
- Potentially liquefiable alluvium during a strong/design earthquake event;
- Potential for strong seismic shaking during an earthquake event; and,
- The presence of granular friable soils (at depth) that are prone to caving in steep sided excavations.

Remedial grading at the site should consist of the removal and recompaction of all undocumented fill materials and weathered/disturbed alluvium in order to provide competent subgrade and bearing conditions. In general, remedial removals are anticipated to extend 5 feet below existing grades within the proposed building pads. Removals within the proposed streets may be limited to removal and re-compaction of the upper 3 to 4 feet, below existing grades, upon review and approval by the geotechnical consultant. Deeper removals may be required locally, where existing trees, utility lines, and structures/foundations are to be abandoned and removed or where deeper undocumented fill is encountered. The recommended remedial removals will help reduce the potential for future settlement at the site. Septic tanks, cesspools, and/or wells may be encountered at the site during grading. If encountered, they should be removed in accordance with Orange County Health Care Agency requirements and the project environmental engineer’s recommendations.

Considering the relatively minor grading anticipated to achieve design grades, the laboratory test data, and our analysis, building foundations and slabs should be designed to tolerate a total settlement of 2 inches and a differential settlement of 1 inch over a span of 40 feet. Onsite soils are anticipated to have a "Medium" expansion potential at the completion of grading.

Based on our findings, we conclude that the proposed residential development is feasible from a geotechnical viewpoint, provided it is designed and constructed in accordance with the recommendations presented in this report and any future design report(s). The site is considered suitable for infiltration of stormwater at the tested depths, between 8 and 12.5 feet below existing grades.

1.0 INTRODUCTION

1.1 Introduction and Scope of Services

At your request, SA Geotechnical, Inc. (SA GEO) has conducted geotechnical due diligence review and subsurface exploration for the proposed residential development located at 13841 and 13751 Red Hill Avenue in the City of Tustin, California (Figure 1). The purpose of this review and exploration was to assess the onsite geologic and geotechnical conditions and provide preliminary recommendations for design, grading, and construction of the proposed improvements. We have reviewed the Conceptual Site Plan, dated January 9, 2024, which shows the generalized lot/building layout; however, contains no existing or proposed grades. The Conceptual Site Plan and Google Earth satellite imagery were used as the base for our Geotechnical Map (Plate 1).

Our scope of services for this due diligence study included the following tasks:

- Review of available geologic and geotechnical maps, reports, and data for the subject site and surrounding area. A list of references is included in Appendix A.
- Review of available historic aerial photographs dating back to 1946.
- Notification and coordination with DigAlert to identify and clear Cone Penetrometer Test (CPT) locations of underground utilities.
- Subsurface exploration consisting of advancement of five Cone Penetration Tests, CPT, (CPT-1 through CPT-5) to depths ranging from 50.3 to 55.4 feet bgs. CPT logs are included in Appendix B.
- Review of boring logs and laboratory test data by others (included in Appendix B and C, respectively).
- Review, analysis, and recalculation of the percolation test data by others in accordance with the County of Orange WQMP Technical Guidance Document. The percolation test data is included in Appendix E.
- Geotechnical evaluation and analysis of the compiled data with respect to the proposed grading and development.
- Evaluation of faulting, seismicity, and seismic and static settlement in accordance with the 2022 California Building Code (CBC).
- Preparation of this report including our findings, conclusions, preliminary recommendations, and accompanying illustrations.
- Consultations with the project team.

SA GEO's expertise and scope of services do not include assessment of potential subsurface environmental contaminants or environmental health hazards.

1.2 Site Condition and History

The subject site is located southeast of the Red Hill Avenue and San Juan Street intersection, at 13841 and 13751 Red Hill Avenue, in the City of Tustin, California (see Figure 1). The

approximately 3.4-acre, roughly rectangular shaped parcel is bound by San Juan Street to the north, Red Hill Avenue to the east, Tustin High School to the west, and existing commercial properties to the south. The site is a vacant dirt lot with flat topography, with elevations ranging from about 105 to 109 feet above mean sea level. Existing free standing screen walls are present at the northwestern portion of the site.

Based on our review of available historic aerial photographs dating back to 1946, the earliest observed land use appears to be for agricultural purposes (orchard). By the early 1960s, the orchard was cleared from the southern portion of the site and developed with a church and dirt parking lot. By 1972 the remaining orchard in the northerly portion of the site was removed. Prior to 1980, the church had expanded significantly in size and the surrounding parking lot was paved with asphalt concrete. Also, by 1980 the commercial building at 13751 Red Hill Avenue was built. Between 2007 and 2009, the church and parking lot improvements were demolished, and it has been a vacant lot since that time. Based on our site reconnaissance, the commercial building has also been recently demolished.

1.3 Proposed Grading and Improvements

Prior to site development and grading, any remaining improvements or utilities to be abandoned will be demolished and removed. Based on review of the Conceptual Site Plan, the development is proposed to include grading for 12 multifamily residential buildings (76 total units), interior streets, community/common space areas, stormwater treatment features, and utility improvements to support the development. We anticipate that the proposed multifamily units will be three stories, consisting of wood-framed construction.

1.4 Prior Geotechnical Studies

A prior geotechnical study was performed onsite by NMG Geotechnical, Inc (NMG). We were provided and have reviewed the "Preliminary Geotechnical Investigation Report for Proposed Red Hill Avenue Apartment Site Development, City of Tustin, California" (NMG, 2015). The investigation included six hollow-stem auger borings (H-1 and P-1 through P-5) to depths ranging from 10 to 51.5 feet bgs. Percolation testing was also performed in four of the borings, P-1 through P-4, at depths ranging from 8 to 12.5 feet bgs. As part of our review and analysis, we have used the data provided in the prior report and have independently calculated infiltration rates in accordance with the County of Orange WQMP Technical Guidance Document.

Prior to the 2015 study, Geosoils, Inc. performed a subsurface exploration at the subject site. The report titled "Preliminary Geotechnical Investigation, Proposed Senior Apartment Complex, 13841 Red Hill Avenue, Tentative Tract 11282, Block 141 and Parcel No. 10, City of Tustin, County of Orange, California" (Geosoils, 2005) was not available for our review; however, the boring logs and laboratory data performed as part of thir study were included in the report by NMG (2015).

The approximate boring locations associated with the prior studies are provided on the Geotechnical Map (Plate 1). Boring logs and laboratory test data are provided in Appendix B and C, respectively.

1.5 Subsurface Exploration

Our field exploration was performed on January 26, 2024, and included advancement of five CPTs (CPT-1 through CPT-5) to depths ranging from 50.3 to 55.4 feet bgs. The CPTs use an integrated electronic cone system which measures and records cone tip resistance, sleeve friction, and friction ratio parameters at 5-centimeter depth intervals by advancement of a 1.25-inch diameter, pointed steel probe that is hydraulically pushed into the ground at a constant rate. The CPT provides a detailed subsurface profile to allow for assessment of potential liquefaction hazards and static settlement. The CPT data was used in conjunction with boring and laboratory test data to develop our interpretation of the subsurface conditions. At the completion of testing, the CPTs were backfilled with bentonite granules.

The approximate CPT locations are shown on Plate 1 (Geotechnical Map). CPT logs are included in Appendix B.

2.0 GEOTECHNICAL FINDINGS

2.1 Geologic Setting and Geotechnical Conditions

The subject site is located on the western Tustin Plain within the Peninsular Ranges geomorphic province of Southern California. The site is mapped by the United States Geological Survey (USGS, 2006) as underlain by Quaternary-age younger alluvial deposits (Figure 2). The alluvium (Qal) encountered in prior borings and our CPTs generally consisted of yellowish-brown, reddish brown, and grayish brown silty/clayey sand, sand, sandy silt, and silty clay. The alluvium was found to be damp to wet and medium dense to dense/medium stiff to very stiff.

Undocumented artificial fill (Afu) material was encountered in most borings performed onsite during the prior exploration, ranging in thickness from 2 to 9.5 feet. However, it should be noted that the thickness of undocumented fill was determined based on limited sampling within some of the borings and; therefore, the actual depth to the bottom of the undocumented fill materials may be shallower. Considering the relatively flat topography and prior land use, we anticipate that, in general, the undocumented fill materials do not extend to a depth of 9.5 feet bgs. The undocumented fill materials generally consisted of brown silty sand with trace to some gravel and was damp and loose to medium dense.

Based on our review of the prior geotechnical exploratory data and laboratory testing (Appendix C; NMG, 2015 and Geosoils, 2005) the site geotechnical conditions are generally as follows:

Soil Moisture Content and Dry Density: Onsite soils had in-situ moisture content and dry densities generally ranging from 2.0 to 28.9 percent and 90 to 125 pounds per cubic foot (pcf), respectively. Blow counts (modified California sampler) in the alluvial materials ranged from 3 to 67 blows per foot. The alluvium was generally found to be medium dense to dense/medium stiff to very stiff and damp to wet.

Soil Properties: Grain-size distribution test was conducted on one bulk sample collected from the uppermost 5 feet (NMG, 2015). The near-surface bulk sample was classified in accordance with the Unified Soil Classification System (USCS) as sandy clay (CL), with a fines content (passing No. 200 sieve) of 64 percent.

Soil plasticity testing was also performed on the same sandy clay sample and indicates a Plasticity Index (PI) of 16 and Liquid Limit (LL) of 34 percent. A sample collected from a depth of 20 feet (Geosoils, 2005) was also tested and had a PI of 13 and LL of 28 percent.

Maximum dry density testing was performed on two samples collected from the uppermost 5 feet. The results indicate that the sandy clay had a maximum dry density of 121.5 pcf at an optimum moisture content of 11.5 percent. The silty sand sample had a maximum dry density and optimum moisture content of 126.0 pcf and 12 percent, respectively.

Consolidation: Tests were performed on six samples collected at depths of 5, 7.5, 8, 10, and 15 feet from Borings H-1, P-2, P-5, B-3, and B-4. The testing showed that the native alluvium has relatively low compressibility potential and minor hydro-collapse potential (less than half a percent) upon addition of water.

Shear Strength: Direct shear testing was performed on two remolded samples, representative of future compacted fill material. The test results for the sample collected in Boring H-1 indicate ultimate and peak internal friction angles and cohesion of 30 degrees and 100 pounds per square foot (psf), respectively. The test results of the remolded sample collected from Boring B-1 indicate an internal friction angle of 13 degrees with a cohesion of 523 psf.

Expansion Potential: Expansion index testing was reportedly performed as part of the NMG study; however, no laboratory test results were included in the report. NMG reported an Expansion Index of 55 for the tested sample collected in the upper 5 feet at the site. Based on our review of the available data, we anticipate the site will have "Medium" expansion potential at the completion of grading.

Chemical Testing: A bulk sample collected at depths of 0 to 5 feet in Boring B-2 was also tested for pH, chloride, sulfate content, and resistivity. The test results indicate that sulfate-content of the soils may be classified as "S0" (negligible) per Table 19.3.1.1 of ACI-318. Saturated resistivity was 1,900 ohm-cm. pH level was 8.4 and chloride contents were 85 ppm.

2.2 Groundwater

Historic high groundwater at the subject site is mapped by California Division of Mines and Geology as between 30 and 40 feet bgs (CDMG, 1998). Groundwater was encountered during prior subsurface explorations at depths ranging from 40.5 to 47.4 feet bgs. Additionally, we have reviewed groundwater data available through the GeoTracker database for several sites near the subject site. The data indicates groundwater in the vicinity of the site ranges from 30 to 60+ feet deep for monitoring periods between 2001 to 2014.

2.3 Regional Faulting and Seismicity

Regional Faults: The site is not located within a fault-rupture hazard zone as defined by the Alquist-Priolo Special Studies Zones Act (CGS, 2018). Also, based on mapping by the State (Jennings and Bryant, 2010), there are no active faults mapped at the site. Regional Faults are presented in Figure 3.

Seismicity: Properties in southern California are subject to seismic hazards of varying degrees depending upon the proximity, degree of activity, and capability of nearby faults. These hazards can be primary (i.e., directly related to the energy release of an earthquake) or secondary (i.e., related to the effect of earthquake energy on the physical world). Since there are no active faults at the site, the potential for primary ground rupture is considered very low. The primary seismic hazard for this site is ground shaking during a future earthquake. The maximum moment magnitude for the closest/controlling fault is 7.2 M_W, which would be generated from the San Joaquin Hills Blind Thrust Fault.

The site is located within a potential liquefaction hazard zone, as defined by the State's Seismic Hazard Mapping (CDMG, 2001). The attached Site Location and Seismic Hazards Map (Figure 1) depicts the site relative to mapped potential liquefaction hazard zones. CPTs were performed

during our exploration to supplement the borings data and to assist in evaluation of the liquefaction hazard. Liquefaction analysis is presented in the following section (Section 2.4).

Other secondary seismic hazards, such as tsunami and seiche are considered nil due to site elevation and distance from the ocean or other confined body of water.

2.4 Liquefaction Potential

Liquefaction is a phenomenon in which earthquake-induced stress generates excess pore water pressure in low density, saturated, sandy and silty soils below the groundwater table. Liquefaction causes a loss of strength and is often accompanied by ground settlement. For liquefaction to occur, the following four conditions must be present at the site: 1) Severe ground shaking, such as during a strong earthquake, 2) Soil must be saturated or nearly saturated, generally below the groundwater table, 3) Corrected normalized standard penetration test (SPT) blow counts (N1) and/or CPT tip resistance (Qt) must be relatively low, and 4) Soils must be granular (typically sand or sandy silt) with low plasticity; clays and silts of relatively high plasticity are generally not liquefiable.

Our assessment was performed using the collected CPT data and CLiq software, version 3.5.2.17 by Geologismiki. Liquefaction potential was performed using the Robertson method (NCEER R&W 2009a). We have also implemented the depth weighting factor for calculation of the equivalent volumetric strain of the soil profile, included in CLiq and per the study by Cetin, et. Al. (2009). CLiq provides CPT data interpretation, final plots of factor-of-safety, liquefaction potential index, and post-earthquake displacement, and vertical settlement.

The liquefaction potential of onsite soils was estimated based on a peak ground acceleration of 0.59g and a maximum earthquake magnitude of 7.2M_W, as determined in our site seismicity analysis, discussed in Sections 2.3 and 3.7. A seismic (design) groundwater table of 30 feet was used in our analysis for all CPTs.

Seismic Settlement: The results of our analysis indicate that liquefiable layers are present and, when subject to ground accelerations generated during a large earthquake event near the subject site, may be prone to settlement. Based on our calculations, settlement due to liquefaction is estimated to be less than 1 inch. The graphic representations of the CPT soundings are included in Appendix B and the liquefaction analysis is included in Appendix F.

Loss of Bearing and Surface Manifestations: The potential for loss of bearing and surface manifestations was reviewed based on the thickness of the liquefiable layers that will be left in-place, versus the amount of fill and non-liquefiable native soils overlying liquefiable soils. Considering the depth to design groundwater and that the proposed structures will be underlain by compacted fill, the potential for local surface disruptions, loss of bearing strength and surface manifestation is considered very low.

Lateral Spread: Considering the proposed improvements are not located on sloping ground or near any slope/free face, depth to liquefiable layers, and the relative flat grades across the site, we anticipate the potential for lateral spread as a result of seismic shaking to be very low (less than the maximum acceptable values specified in the building code for conventional foundations).

2.5 Settlement and Foundation Considerations

In general, the anticipated settlements depend upon the building loads, type of foundations, and the geotechnical properties of the supporting subgrade soils. We performed settlement analysis using the CPT, boring and consolidation test data. Considering the relatively flat site, we do not anticipate significant design fills to be placed during grading (3 feet or less).

Considering the subsurface soil conditions and laboratory test data, and relatively lightly loaded residential structures, we estimate total post-construction settlement (combined static and seismic) to be on the order of 2 inches and differential settlement to be on the order of 1 inch over a 40-foot span. This assumes remedial grading measures included in Section 3.2 of this report are implemented during grading of the site.

2.6 Shrinkage and Bulking

The shrinkage and bulking (reduction or increase in volume of excavated materials upon recompaction) depend primarily on in-situ density and the maximum dry density of the soil type. We anticipate that the undocumented fill and weathered alluvium will shrink 5 to 15 percent. An average shrinkage value of 10 percent may be assumed for soil in the upper 5 feet. Ground subsidence at the site is estimated to be on the order of 0.1 foot.

2.7 Percolation Testing

Percolation testing at the site was performed as part of a prior study (NMG, 2015). Testing was reported to have been performed in general accordance with the County of Orange WQMP Technical Guidance Document. We have reviewed the raw field data collected during the prior testing in order to perform our own calculations (Appendix E).

The County of Orange TGD does not include calculation adjustments to account for the presence of the annular backfill material (3/4-inch gravel) used to construct the test wells. In our experience, this generally results in overestimation of infiltration rates. We have used a correction factor to account for the volume loss due to the annular material, based on the porosity of the material, the pipe diameter used, and the boring diameter. The correction factor is noted on the percolation test data sheets (Appendix E).

The calculated infiltration rates are provided below, which include the correction factor discussed above; however, the rates below do not include a factor of safety reduction. A discussion of the design infiltration rates, including factor of safety, is provided in Section 3.14. The infiltration test results are representative of the locations and depths the tests were performed. Due to the potential for variation in the subsurface conditions, infiltration rates could vary across the site and with depth.

Boring No.	*Tested Depth (ft. bgs)*	*Calculated Infiltration Rate (in./hr.)*
P-1	9.25 to 12.5	3.5
P-2	8.25 to 12	1.5
P-3	8.25 to 11.25	3.2
P-4	8 to 11	2.7

3.0 CONCLUSION AND PRELIMINARY RECOMMENDATIONS

3.1 General Conclusion and Recommendation

Based on our subsurface exploration and review, construction of the proposed residential development, as described herein, is considered geotechnically feasible provided the preliminary recommendations in this report are implemented during design, grading, and construction. The geotechnical consultant should review the WQMP once available. Additional geotechnical exploration and/or percolation testing may need to be performed during the design phase, depending upon the location and depth of the infiltration device(s). Also, grading, foundation, utility, structural and wall plans for the project should be reviewed by the geotechnical consultant during the design phase. Updated recommendations should be provided once the project plans are finalized and reviewed by SA GEO and as needed.

The recommendations in this report should be considered minimum and may be superseded by more restrictive requirements of others. In addition to the following recommendations, General Earthwork and Grading Specifications are provided in Appendix G.

3.2 Site Preparation and Earthwork

Site preparation and grading should be performed in accordance with the recommendations herein and the requirements of the City of Tustin.

3.2.1 Site Demolition and Clearing

Prior to remedial grading, any existing structures, foundations, hardscape/landscape, and utilities to be abandoned should be demolished. Deleterious materials and debris should be cleared and disposed of offsite. Excavations for the removal of existing foundations, utilities (if any) and vegetation, including onsite trees, should be observed by the geotechnical consultant. Large roots, highly organic soils, and existing utilities should be removed and should not be incorporated into new fills.

Soil that is disturbed as part of excavations or removal of trees or underground utilities should be evaluated by the geotechnical consultant. Excavations that require backfill should be properly documented and compacted under the observation and testing of the geotechnical consultant.

Cesspools, septic tanks and/or wells may be encountered at the site. If encountered, they should be removed in accordance with Orange County Health Care Agency requirements and the project environmental engineer's recommendations. Any voids should be backfilled with suitable onsite or import materials and compacted in accordance with the recommendations provided in Section 3.2.4.

3.2.2 Protection of Existing Improvements and Utilities

Existing buildings, improvements and utilities adjacent to the site that are to be protected in place should be located and visually marked prior to grading operations. Excavations adjacent to improvements to be protected in-place or any utility easement should be performed with care, so as not to undermine existing foundations or destabilize the adjacent ground.

Stockpiling of soils more than 5 feet in height at or near existing structures and over utility lines should not be allowed. If deeper removals are required, shoring or other special measures (i.e., setback or laybacks) to provide safety and mitigate the potential for lateral/vertical movements may be required.

3.2.3 Remedial Grading Measures

Remedial grading at the site should consist of removal of undocumented fill and weathered/unsuitable alluvium in their entirety. In general, we recommend that remedial removals within the proposed building pads consist of removal and recompaction of soils in the upper 5 feet, below existing grades. Removals within the proposed streets may be limited to removal and re-compaction of the upper 3 to 4 feet, below existing grades, provided the removal bottom exposes competent native alluvium. Where deeper unsuitable material or undocumented fill is encountered, the removals should be extended to the bottom of unsuitable materials and/or undocumented fill to competent native soils. Please note that some boring logs indicate undocumented fill may be as deep as 9.5 feet at the site. Where not limited by adjacent properties, the removals should extend a minimum of 5 feet laterally beyond the building footprints.

The geotechnical consultant should review and approve removal bottoms prior to fill placement and should provide specific recommendations based on actual conditions, if necessary.

Excavations deeper than 4 feet will need to be laid back at a minimum inclination of 1H:1V (horizontal to vertical) or provided with shoring. Shallow, unconfined excavations (4 feet or less) may consist of near-vertical excavation, locally, and upon review by the geotechnical consultant. Trench excavations should be performed in accordance with Cal/OSHA requirements for Soil Type "B". Locally, and within deeper trenches, excavations may need to be performed in accordance with Cal/OSHA requirements for Soil Type "C" due to the presence of friable sand (see Section 3.12). The contractor’s qualified person should verify compliance with Cal/OSHA requirements. Excavations near existing structures (within a 1:1 projection) should be provided with shoring that is designed to support the surcharge load of the existing structure. Otherwise, excavations may need to be performed in sections (A/B/C slot cuts). The conditions should be reviewed in the field by the project geotechnical consultant. Additional recommendations should be provided based on the actual conditions encountered during excavation and grading, as needed.

3.2.4 Fill Placement

Upon the completion of remedial grading measures, the approved removal bottoms should be scarified a minimum of 6 inches. The removal bottoms and fill materials should be compacted to at least 90 percent of maximum dry density, as determined by ASTM Test Method D1557. Fill materials should be placed in loose lifts no thicker than 8 inches.

Fill materials should be relatively free of deleterious material. The existing native alluvial soils and undocumented fill are considered suitable for re-use as compacted fill provided any deleterious material is removed. The compacted fill soils should be moisture conditioned to 2 to 3 percentage points above optimum moisture content but within the compactable moisture range.

3.2.5 Import

The geotechnical consultant should evaluate and accept any import soils prior to transportation to the subject site. We recommend that import soils have similar engineering properties as onsite soils. At minimum, the import materials should have Expansion Index of less than 90, Plasticity Index of less than 15, fines content (passing Sieve 200) of less than 50 percent, and negligible soluble sulfate content.

3.3 Settlement Potential

The amount of settlement will depend upon the type of foundation(s) selected and future loading by additional fill and structures. Based on our subsurface exploration, liquefaction analysis, and considering the remedial grading recommendations provided in this report are implemented during grading, and the anticipated structural loads typically associated with the proposed structures, we estimate that total and differential post-construction settlement (combined static and seismic) will be on the order of 2 inches and 1 inch over a span of 40 feet, respectively.

SA GEO should be provided with the foundation plans and structural loads, once available, in order to further evaluate the potential for post-construction settlement of the proposed building and associated improvements. The parameters provided herein will then be confirmed/updated based on the planned foundations and loads and additional testing and analysis.

3.4 Foundation Design

The slab and foundations should be designed by the project structural engineer based on the proposed structure type and the anticipated loading conditions. The foundation soils have expansive soil conditions (Expansion Index of greater than 20) and will be subject to climatic and landscape moisture fluctuations. The following foundation recommendations are provided with the assumption that the recommendations included in Section 3.2 of this report are implemented during grading of the site.

The recommended net allowable bearing capacity for continuous and isolated footings may be calculated based on the following equation:

$q_{all} = 700\ D + 200\ B + 900$ (but not to exceed 3,000 psf)

where:
D = embedment depth of footing, in feet
B = width of footing, in feet

Also, the following parameters may be used for design of foundation and slabs:

- Soil unit weight = 120 pcf
- Soil internal friction angle = 28 degrees
- Coefficient of Friction = 0.35
- Subgrade modulus (k) of 100 pci (corrected for large slabs)
- Soil elastic modulus (Es) of 2,000 psi

The dead load of concrete below adjacent grades (buried concrete foundations) may be neglected. The allowable bearing pressure and friction coefficient may be increased by one-third for wind and seismic loading.

We recommend that strip and isolated footings for the buildings have a minimum embedment depth of 18 inches below the lowest adjacent grade. Continuous footings should be at least 12 inches wide and isolated column footings should be at least 24 inches wide. The footings of freestanding and isolated structures, such as walls and pilasters, should have a minimum embedment depth of 18 inches into approved soils.

The following table provides our general guidelines and preliminary recommendations for design of post-tensioned foundations and slabs in accordance with the 2022 California Building Code (CBC) and Post-Tension Institute (PTI) DC 10.5 Edition provisions.

GEOTECHNICAL GUIDELINES FOR DESIGN OF POST-TENSIONED SLABS

Parameter	Recommendation
Center Lift	
Edge Moisture Variation Distance, e_m	9.00 feet
Center Lift, y_m	0.55 inches
Edge Lift	
Edge Moisture Variation Distance, e_m	4.60 feet
Edge Lift, y_m	0.71 inch
Presaturation, as needed, to obtain the minimum moisture down to the minimum depth	1.2 x optimum down to 12 inches

We recommend that post-tensioned slabs have a thickened edge such that the slab is embedded a minimum of 12 inches below the lowest adjacent grade.

In addition, as indicated in the DC 10.5 Edition of PTI, shape factor calculations should be performed by the project structural engineer in order to determine if strengthening/modification of

foundations are necessary. Per PTI guidelines, modifications to the foundations design should be considered if the shape factor (ratio of square of foundation perimeter over foundation area) exceeds 24.

If non-post-tensioned slabs-on-grade and foundations are considered at the site, an effective Plasticity Index of 20 is considered appropriate for the upper 15 feet of soil materials, in accordance with Wire Reinforcement Institute (WRI) method (per the 2022 CBC). For non-post-tensioned slabs, we recommend a minimum embedment of 12 inches below the lowest adjacent grade for the perimeter footings. Also, the upper 12 inches of subgrade soil should be pre-saturated to 120 percent of optimum moisture content prior to placement of moisture barrier and concrete.

The foundations and slabs should also be designed to tolerate the total and differential settlements discussed in Section 3.3 of this report.

For the design of pole-type foundations (i.e., light poles, shade structures, etc.), an allowable soil-bearing pressure (S_1) of 340 psf/ft may be used for Equation 18-1 (the "pole" equation) of the 2022 CBC Section 1807.3.2.1 to determine the depth of embedment for the footings, considering level ground conditions. The equation is applicable for designed embedment depths of less than 12 feet for the purpose of computing lateral pressure. Also, for vertical loads on pole-type foundations, an allowable skin friction of 250 pounds per square foot may be used. For cast-in-place pole-type foundations, the vertical end bearing pressure should be neglected. We recommend that pole-type foundations have a minimum embedment of 2.5 feet below lowest adjacent grades.

3.5 Interior Slab Moisture Mitigation

In addition to geotechnical and structural considerations, the project owner should also consider interior moisture mitigation when designing and constructing slabs-on-grade.

The intended use of the interior space, type of flooring, and the type of goods in contact with the floor may dictate the need for, and design of, measures to mitigate potential effects of moisture emission from and/or moisture vapor transmission through the slab. Typically, for human occupied structures, a vapor retarder or barrier is recommended under the slab to help mitigate moisture transmission through slabs. The most recent guidelines by the American Concrete Institute (ACI 302.1R-04) suggest that the vapor retarder be placed directly under the slab (no sand layer). However, the location of the vapor retarder may also be subject to the builder's past successful practice. Placement of 1 or 2 inches of sand over the moisture retardant has been common practice by builders in southern California. Specifying the strength of the retarder to resist puncture and its permeance rating is important. These qualities are not necessarily a function of the retarder thickness. A minimum of 10-mil is typical but some materials, such as 10-mil polyethylene ("Visqueen"), may not meet the desired standards for toughness and permeance.

Vapor retarders, when used, should be installed in accordance with standards such as ASTM E 1643 and/or those specified by the manufacturer.

Concrete mix design and curing are also significant factors in mitigating slab moisture problems. Concrete with lower water/cement ratios results in denser, less permeable slabs that also "dry" faster with regard to when flooring can be installed (reduced moisture emission quantities and

rates). Rewetting of the slab following curing should be avoided since it can result in additional drying time required prior to flooring installation. Proper concrete slab testing prior to flooring installation is also important.

Concrete mix design, the type and location of the vapor retarder should be determined in coordination with all parties involved in the finished product, including the project owner, architect, structural engineer, geotechnical consultant, concrete subcontractors, and flooring subcontractors.

3.6 Retaining Walls Design and Lateral Earth Pressures

Recommendations for lateral earth pressures for permanent retaining walls and structures (if any) with approved onsite drained soils and above groundwater table are as follows:

Conditions	*Level (pcf)*	*2:1 Sloping*
Active	43	68
At-Rest	63	90
Passive	340	160 (sloping down)

These parameters are based on a soil internal friction angle of 28 degrees and soil unit weight of 120 pcf.

To design an unrestrained retaining wall, such as a cantilever wall, the active earth pressure may be used. For a restrained retaining wall, the at-rest pressure should be used. Passive pressure is used to compute lateral soils resistance developed against lateral structural movement. The passive pressures provided above may be increased by one-third for wind and seismic loads. The passive resistance is taken into account only if it is ensured that the soil against embedded structure will remain intact with time. Future landscaping/planting and improvements adjacent to the retaining walls should also be taken into account in the design of the retaining walls. Excessive soil disturbance, trenches (excavation and backfill), future landscaping adjacent to footings and over-saturation can adversely impact retaining structures and result in reduced lateral resistance.

For sliding resistance, the friction coefficient of 0.35 may be used at the concrete and soil interface. The coefficient of friction may be increased by one-third for wind and seismic loading. The retaining walls may also need to be designed for additional lateral loads if other structures or walls are planned within a 1H:1V projection.

The seismic lateral earth pressure for walls retaining more than 6 feet of soil and level backfill conditions may be estimated to be an additional 17 pcf for active and at-rest conditions. The earthquake soil pressure has a triangular distribution and is added to the static pressures. For the active and at-rest conditions, the additional earthquake loading is zero at the top and maximum at the base. The seismic lateral earth pressure does not apply to walls retaining less than, or equal to, 6 feet of soil (2022 CBC Section 1803.5.12).

Drainage behind walls retaining more than 2.5 feet of soil should also be provided in accordance with the attached Figure 4. Specific drainage connections, outlets and avoiding open joints should be considered during design.

3.7 Seismic Design Parameters

The following table summarizes the seismic design criteria for the subject site. The seismic design parameters are developed in accordance with ASCE 7-16 and 2022 CBC. Please note that, considering the proposed structures and anticipated structural periods, site-specific ground-motion hazard analysis was not performed for the site. Per Supplement 3 of ASCE 7-16, the value of S_{M1}, and therefore S_{D1}, have been increased by 50 percent. The seismic response coefficient, Cs, should be determined per the parameters provided below and using equation 12.8-2 of ASCE 7-16.

Selected Seismic Design Parameters from 2022 CBC/ASCE 7-16	***Seismic Design Values***	***Reference***
Latitude	33.7359 North	
Longitude	-117.8139 West	
Controlling Seismic Source	San Joaquin Hills	USGS, 2024
Site Class per Table 20.3-1 of ASCE 7-16	D	
Spectral Acceleration for Short Periods (Ss)	1.284 g	SEA/OSHPD, 2024
Spectral Accelerations for 1-Second Periods (S_1)	0.459 g	SEA/OSHPD, 2024
Site Coefficient F_a, Table 11.4-1 of ASCE 7-16	1.0	SEA/OSHPD, 2024
Site Coefficient F_v, Table 11.4-2 of ASCE 7-16	1.841	
Design Spectral Response Acceleration at Short Periods (S_{DS}) from Equation 11.4-4 of ASCE 7-16	0.856 g	SEA/OSHPD, 2024
Design Spectral Response Acceleration at 1-Second Period (S_{D1}) from Equation 11.4-4 of ASCE 7-16 (Includes 50% increase per Supplement 3)	0.845 g	
T_S, S_{D1} /S_{DS} 11.4.6 of ASCE 7-16	0.987 sec	
T_L, Long-Period Transition Period	8 sec	SEA/OSHPD, 2024
Peak Ground Acceleration Corrected for Site Class Effects (PGA_M) from Equation 11.8-1 of ASCE 7-16	0.59 g	SEA/OSHPD, 2024
Seismic Design Category, Section 11.6 of ASCE 7-16	D	

3.8 Corrosivity

Based on the laboratory testing performed during prior studies, soluble sulfates exposure in the onsite soils may be classified as "S0" per Table 19.3.1.1 of ACI-318-14. Structural concrete elements in contact with soil include footings and building slabs-on-grade. The flatwork and sidewalk concrete are typically not considered structural elements. Concrete mix for structural elements should be based on the "S0" soluble sulfate exposure class of Table 19.3.2.1 in ACI-318-14. Other ACI guidelines for structural concrete are recommended. Also, onsite soils are anticipated to be corrosive to metals.

3.9 Expansion Potential

At the completion of grading, we anticipate that onsite soils will have "Medium" expansion potential. The geotechnical recommendations provided in this report including the design parameters for foundations, slab-on-grade and flatwork improvement should be implemented

during design and construction. These parameters may be updated upon additional testing at the completion of grading.

Homeowners and their design/construction team should be familiar with the recommendations in this report as well as principles described in a useful reference published by the California Geotechnical Engineers Association (CalGeo), titled, "Coexisting with Expansive Soil: An Informational Guide for Homeowners." This free booklet can be downloaded at www.calgeo.org.

3.10 Exterior Concrete

The driveway, patio slabs and other flatwork elements should be at least 4 inches thick. Concrete should be reinforced with No. 3 bars placed at 24 inches on center both ways (or equivalent wire-mesh). Concrete slabs should be provided with construction or weakened plane control joints at a maximum spacing of 8 feet. The control joints should have a thickness that is ¼ of the total concrete thickness. Upon the placement and compaction of subgrade soils (per Section 3.2 of these recommendations), the upper 12 inches of the subgrade soils should be pre-saturated to 120 percent of optimum moisture content prior to placement of concrete and reinforcement.

For exterior slabs, the use of a granular sublayer is primarily intended to facilitate presaturation and subsequent construction by providing a better working surface over the saturated soil. It also helps retain the added moisture in the native soil in the event that the slab is not placed immediately. Where these factors are not significant, the layer may be omitted. If used, we recommend placement of 2 to 4 inches of granular material over subgrade soils.

Exterior concrete elements such as curb and gutter, driveways, sidewalks and patios are susceptible to lifting and cracking when constructed over expansive soils. With expansive soils, the impacts to flatwork/hardscape can be significant, generally requiring removal and replacement of the affected improvements. Please note that reducing concrete problems is often a function of proper slab design, concrete mix design, placement, and curing/finishing practices. Adherence to guidelines of the American Concrete Institute (ACI) is recommended. Also, the amount of post-construction watering, or lack thereof, can have a very significant impact on the adjacent concrete flatwork.

On projects with expansive soils, additional measures such as thickened concrete edges/footings, subdrains and/or moisture barriers should be considered where planters or natural areas with irrigation are located adjacent to the concrete improvements. Design and maintenance of proper surface drainage is also very important. If the concrete will be subject to heavy loading from cars/trucks or other heavy objects, at minimum, a 6-inch-thick pavement section should be used; however, the section should be designed by the geotechnical consultant using appropriate traffic indices for the intended use.

The above recommendations typically are not applied to curb and gutter.

3.11 Preliminary Asphalt Concrete Pavement Design

Final structural pavement sections should be based on R-value testing after the completion of grading and in accordance with City of Tustin requirements. Based on an assumed R-value of 15 and estimated traffic indices (TIs), we recommend the following preliminary pavement sections:

Street Location	*Estimated TIs*	*Pavement Section*
General Drives	TI – 5.5	0.35' AC / 0.65' AB
Parking Stalls	TI – 4.0	0.25' AC / 0.50' AB
AC = Asphalt Concrete, AB = Aggregate Base		

Please note that for two-stage paving operations, we recommend that the final AC cap be a minimum of 0.10 foot thick and the base AC course have a minimum thickness of 0.25 foot.

Asphalt concrete pavement should be placed in accordance with the requirements of Sections 301 and 302 of the Standard Specifications of Public Works Construction (the Greenbook). Prior to construction of pavement sections, the subgrade soils should be scarified to a minimum depth of 6 inches, moisture-conditioned as needed, and recompacted in-place to a minimum of 90 percent relative compaction (per ASTM D1557). Subgrade should be firm prior to aggregate base placement.

Aggregate base materials may consist of crushed aggregate base or crushed miscellaneous base, in accordance with the Greenbook (Section 200-2). The materials should be free of any deleterious materials. Aggregate base materials should be placed in 6- to 8-inch-thick loose lifts, moisture-conditioned as necessary, and compacted to a minimum of 95 percent relative compaction (per ASTM D1557). Asphalt concrete should also be compacted to a minimum relative compaction of 95 percent.

Unpaved median and parkway areas should also be provided with vertical moisture barriers.

3.12 Trench Excavation and Backfill

Excavations should be performed in accordance with the requirements set forth by Cal/OSHA Excavation Safety Regulations (Construction Safety Orders, Section 1504, 1539 through 1547, Title 8, California Code of Regulations). In general, onsite soils may be classified as Type "B"; however, locally, and in deeper excavations Type "C" soils may be encountered (friable sand). Cal/OSHA regulations indicate that, for workmen in confined conditions, the steepest allowable slopes in Type "B" and "C" soils are 1H:1V and 1.5H:1V (horizontal to vertical), respectively, for excavations less than 20 feet deep. Where there is no room for these layback slopes, we anticipate that shoring will be necessary. This condition should also be anticipated for excavations within the streets adjacent to the site. Adequate shoring (i.e., shields) should be provided, as deemed necessary. Backfilling may require sand-cement slurry in order to reduce the potential of caving during the removal of shoring, if friable sandy soils are encountered. Excavations should be reviewed periodically by the contractor's qualified person to confirm compliance with Cal/OSHA requirements.

Utility trench backfill should be in accordance with City of Tustin Department of Public Works "Standard Plans and Design Standards" and/or the governing jurisdiction's specifications (i.e. Irvine Ranch Water District, East Orange County Water District, etc.). In general, native soils are anticipated to be suitable for use as trench backfill from a geotechnical viewpoint; however, the City or governing agency may require select material, sand-slurry, or other measures. Native soils used as backfill materials should be compacted to a minimum of 90 percent relative compaction (per ASTM D1557). Rocks/oversize material greater than 3 inches in largest diameter should generally not be used as trench backfill unless approved by the agency and geotechnical consultant of record. Excavation and backfilling of HDPE pipes should be in accordance with the manufacturer's requirement and the Greenbook. Select granular backfill (i.e., clean sand with SE 30 or better) may be used in lieu of native soils but should also be compacted or densified with water jetting and flooding.

Trenches excavated next to structures and foundations should also be properly backfilled and compacted to provide full lateral support and reduce settlement potential.

3.13 Groundwater

Based on our subsurface exploration and review of published groundwater data in the vicinity, groundwater is anticipated to remain 30 feet or more below proposed finish grades. Groundwater is not expected to be encountered during rough grading; however, the presence of locally saturated soils and/or perched water cannot be ruled out, especially during rainy seasons.

3.14 Stormwater Infiltration

Based on the prior onsite percolation testing, storm water infiltration is considered feasible at the tested locations at depths between 8 and 12.5 feet bgs. Additional infiltration testing may need to be conducted onsite once a water quality management plan has been prepared and in order to evaluate the infiltration rates at the actual location and depth of the proposed devices. For preliminary design purposes, a design infiltration rate of 0.75 inches per hour may be used for devices that are 8 to 12.5 feet deep in the vicinity of Borings P-1 through P-4. This rate includes the required minimum factor-of-safety of 2.

Also, based on our review of the groundwater data in the vicinity, historic high groundwater is documented at approximately 30 feet bgs. Infiltration systems should maintain a minimum 10-foot vertical separation from high groundwater; thus, infiltration systems should not be deeper than 20 feet bgs.

Infiltration systems should be designed and constructed in accordance with County of Orange and City of Tustin guidelines. Infiltration systems should have a minimum setback of 10 feet from proposed residential structures. The subgrade soil utilized as the infiltration surface should be reviewed and approved by the geotechnical consultant prior to installation of any infiltration devices. Special care should be taken to limit disturbance to native soils used as the infiltration surface. Proper maintenance will also be required to extend the operational life and reduce siltation or reduction in infiltration performance. All infiltration devices should be provided with an overflow system.

3.15 Surface Drainage and Irrigation

Maintaining adequate surface drainage, proper disposal of run-off water, and control of irrigation will help reduce the potential for future moisture-related problems and differential movements from soil heave/settlement.

Surface drainage should be carefully taken into consideration during design, grading, landscaping, and building construction. Positive surface drainage should be provided to direct surface water away from structures and slopes and toward the street or suitable drainage devices. Ponding of water adjacent to the structures should not be allowed. Buildings should have roof gutter systems and the run-off should be directed to parking lot/street gutters by area drainpipes or by sheet flow over paved areas. Paved areas should be provided with adequate drainage devices, gradients, and curbing to prevent run-off flowing from paved areas onto adjacent unpaved areas.

Considering the climatic conditions in southern California and the recommended mitigation measures for expansive soils included in this report, a two-percent slope away from structures should be provided and is in substantial compliance with the 2022 CBC. Also, swales with one-percent slopes are acceptable from our geotechnical standpoint and are common practice in this locale.

Construction of planter areas immediately adjacent to structures should be avoided if possible. If planter boxes are constructed adjacent to or near buildings, the planters should be provided with controls to prevent excessive penetration of the irrigation water into the foundation and flatwork subgrades. Provisions should be made to drain excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Raised planter boxes may be drained with weepholes. Deep planters (such as palm tree planters) should be drained with below-ground, water-tight drainage lines connected to a suitable outlet. Moisture barriers should also be considered.

It is also important to maintain a consistent level of soil moisture, not allowing the subgrade soils to become overly dry or overly wet. Properly designed landscaping and irrigation systems can help in that regard.

3.16 Additional Subsurface Exploration and Laboratory Testing

Additional subsurface exploration and laboratory testing may be necessary during the design phase of the project for determination/confirmation of the percolation rates, depending on the location and depth of the proposed system(s). Also, additional laboratory testing should be performed during and upon the completion of grading to confirm/update the design parameters provided herein.

3.17 Review of Future Plans

The project grading, foundation, wall, water quality management, and landscape plans should be reviewed and accepted by the geotechnical consultant prior to grading and construction.

3.18 Observation and Testing during Grading and Construction

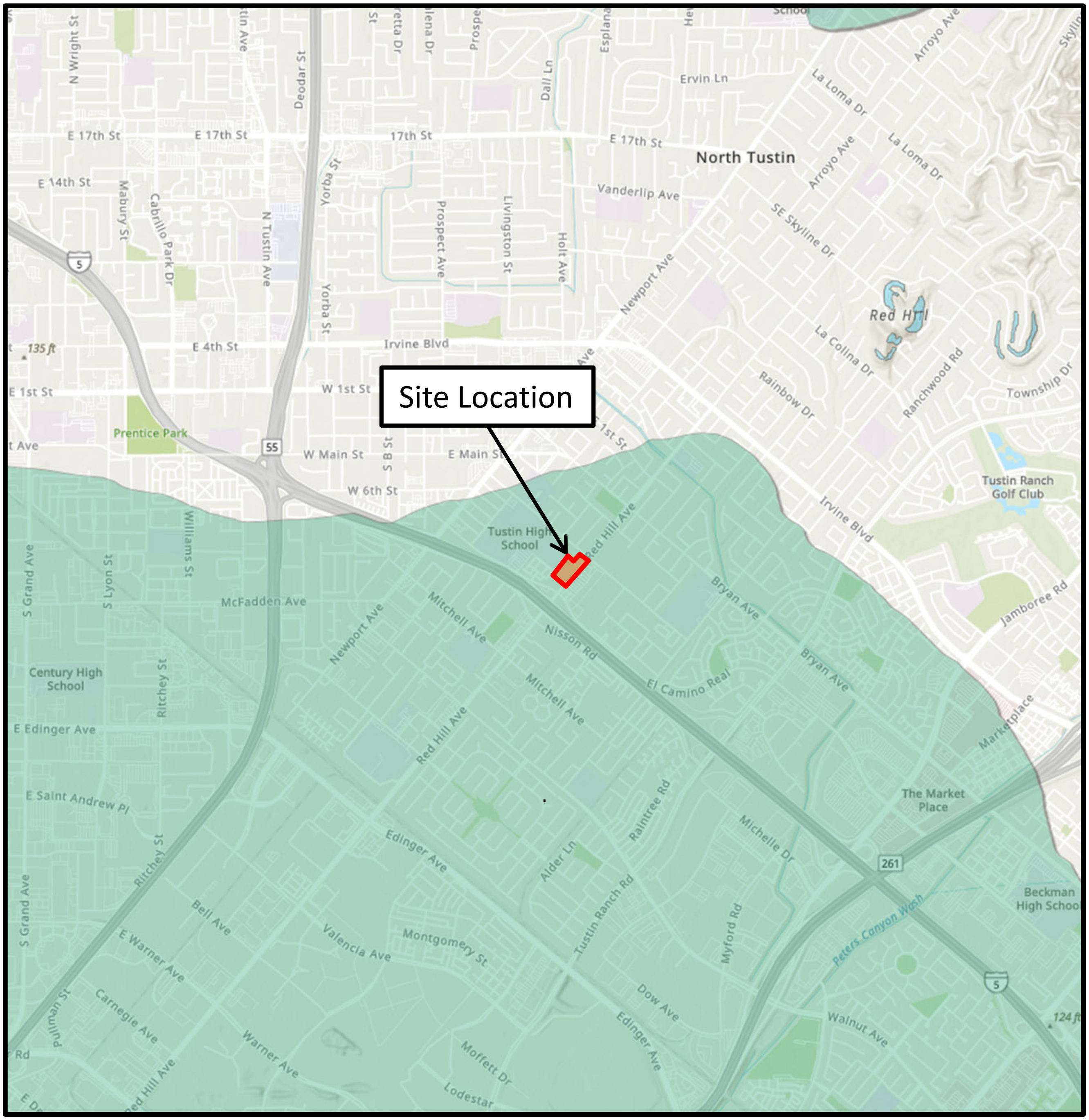
Geotechnical observation and testing should be performed by SA GEO during the following phases of grading and construction:

- During site demolition, preparation and clearing;
- During excavations performed for remedial grading and to relocate or remove existing underground improvements;
- During earthwork, including observation and acceptance of remedial removal bottoms and fill placement, including import material (if any);
- Following the completion of grading, in order to verify soil properties for foundations, slab-on-grade and pavements;
- Upon completion of any foundation or structural excavation, prior to pouring concrete;
- During slab and flatwork subgrade preparation prior to pouring concrete;
- During placement of backfill for utility trenches, and stormwater infiltration devices;
- During placement of backfill for retaining structures (if any);
- During installation and backfill of subdrainage systems (if any); and
- When any unusual soil conditions are encountered.

4.0 LIMITATIONS

This report has been prepared for the exclusive use of our client, Meritage Homes, within the scope of services requested for the subject property described herein. This report or its contents should not be used or relied upon for other projects or purposes, or by other parties without the acknowledgement of SA GEO and the consultation of a geotechnical professional. The means and methods used by SA GEO for this study are based on local geotechnical standards of practice, care, and requirements of governing agencies. No warranty or guarantee, expressed or implied, is given.

Our findings, conclusions, and recommendations are professional opinions based on interpretations and inferences made from geologic and engineering data from specific locations and depths, observed or collected at a given time. By nature, geologic conditions can vary from point to point, can be very different in-between exploration points, and can also change over time. Our conclusions and recommendations are, by nature, preliminary and subject to verification and/or modification during grading and construction when more subsurface data is exposed.



Source: Seismic Hazard Zones Map, Tustin Quadrangle (CDMG, 2001)

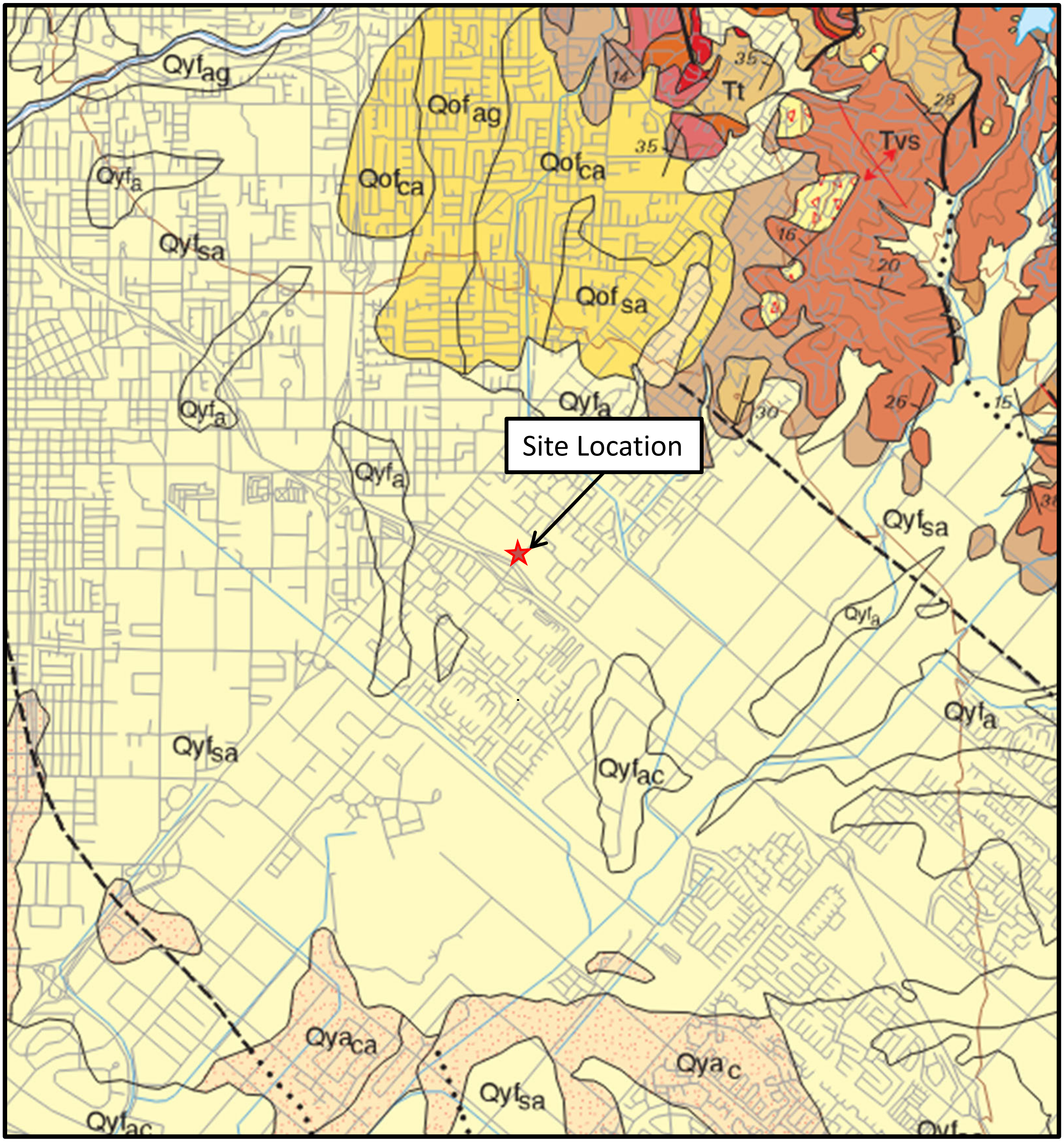
🟩 **Liquefaction**
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

🟦 **Earthquake-Induced Landslides**
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

Site Location and Seismic Hazard Zones Map

Meritage Homes
Proposed Residential Development
13841 & 13751 Red Hill Avenue
Tustin, California

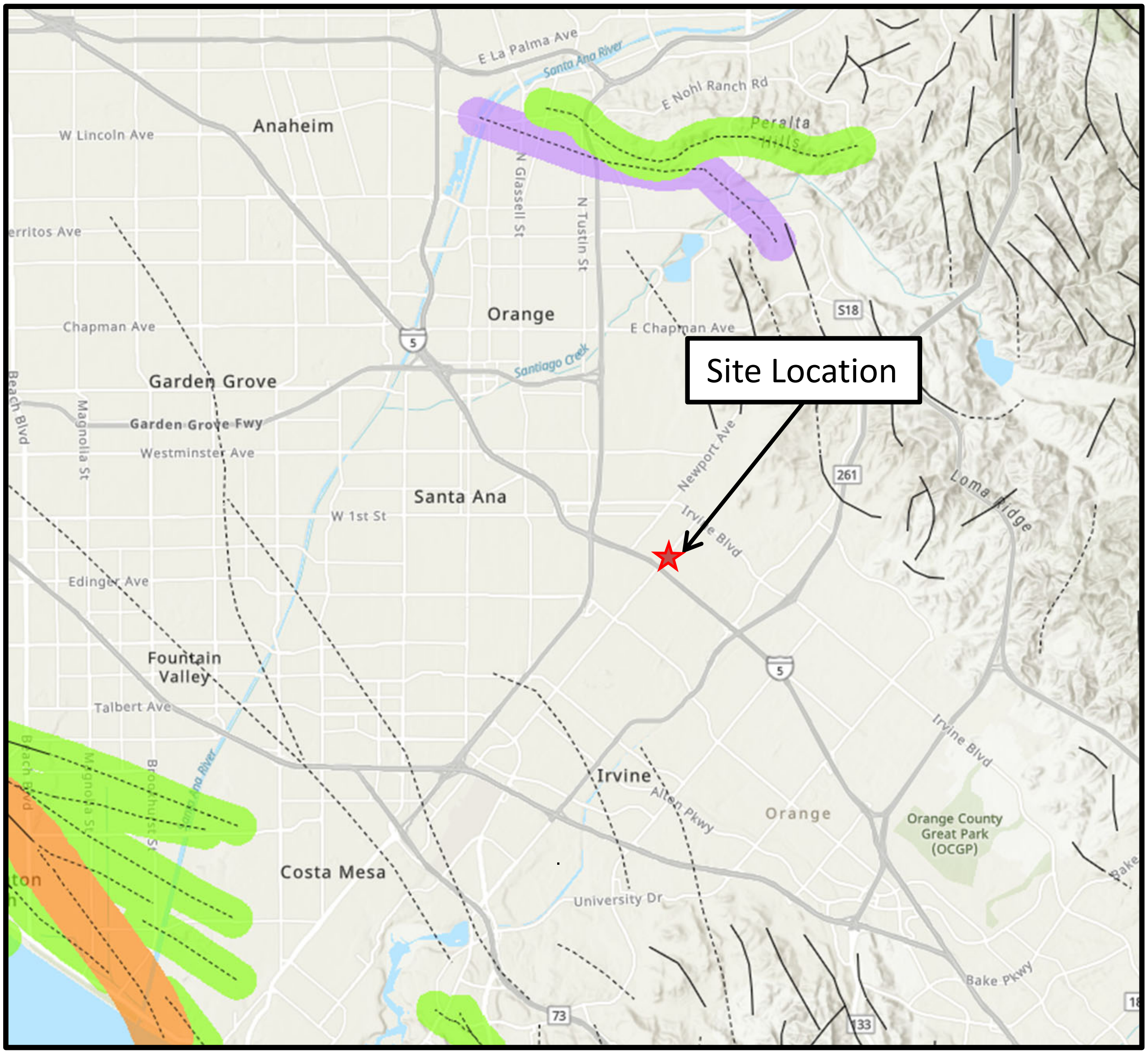
Project Number: 24011-01
Date: February 2, 2024
Figure 1



Source: Geologic Map of the San Bernardino and Santa Ana 30'x60' Quadrangle, (USGS, 2006)

Regional Geologic Map

Meritage Homes Proposed Residential Development 13841 & 13751 Red Hill Avenue Tustin, California	Project Number: 24011-01 Date: February 2, 2024 Figure 2



Source: Fault Activity Map of California (Jennings and Bryant, 2010)

🟧 ——— — — — ·······?	Holocene fault displacement (during past 11,700 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.
🟩 ——— — — — ·······?	Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.
🟪 ——— — — — ·······?	Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.
——— — — — ·······?	Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissnce nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

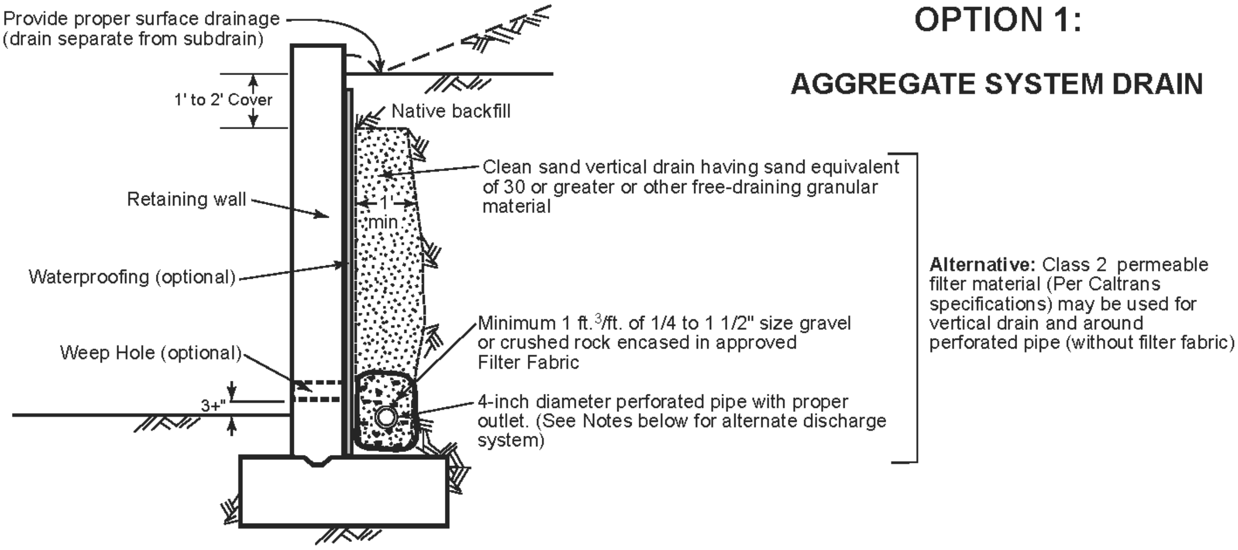
Regional Fault Map

Meritage Homes Proposed Residential Development 13841 & 13751 Red Hill Avenue Tustin, California	Project Number: 24011-01 Date: February 2, 2024 Figure 3

S/A

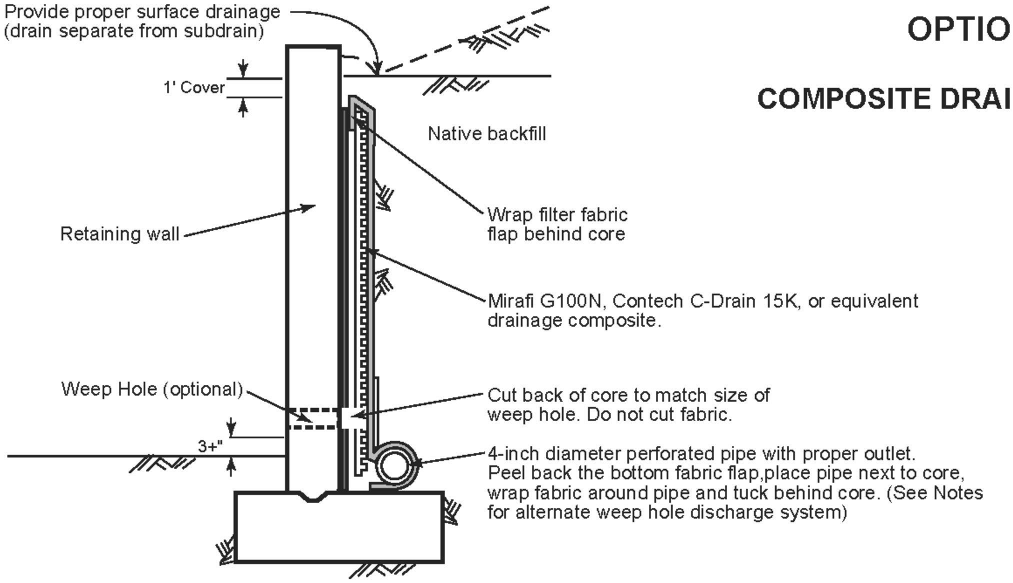
OPTION 1:

AGGREGATE SYSTEM DRAIN



OPTION 2:

COMPOSITE DRAINAGE SYSTEM



NOTES:

1. PIPE TYPE SHOULD BE PVC OR ABS, SCHEDULE 40 OR SDR35 SATISFYING THE REQUIREMENTS OF ASTM TEST STANDARD D1527, D1785, D2751 , OR D3034.
2. FILTER FABRIC SHALL BE APPROVED PERMEABLE NON-WOVEN POLYESTER, NYLON, OR POLYPROPYLENE MATERIAL.
3. DRAIN PIPE SHOULD HAVE A GRADIENT OF 1 PERCENT MINIMUM.
4. WATERPROOFING MEMBRANE MAY BE REQUIRED FOR A SPECIFIC RETAINING WALL (SUCH AS A STUCCO OR BASEMENT WALL).
5. WEEP HOLES MAY BE PROVIDED FOR LOW RETAINING WALLS (LESS THAN 3 FEET IN HEIGHT) IN LIEU OF A VERTICAL DRAIN AND PIPE AND WHERE POTENTIAL WATER FROM BEHIND THE RETAINING WALL WILL NOT CREATE A NUISANCE WATER CONDITION. IF EXPOSURE IS NOT PERMITTED, A PROPER SUBDRAIN OUTLET SYSTEM SHOULD BE PROVIDED.
6. IF EXPOSURE IS PERMITTED, WEEP HOLES SHOULD BE 2-INCH MINIMUM DIAMETER AND PROVIDED AT 25-FOOT MAXIMUM SPACING ALONG WALL. WEEP HOLES SHOULD BE LOCATED 3+ INCHES ABOVE FINISHED GRADE.
7. SCREENING SUCH AS WITH A FILTER FABRIC SHOULD BE PROVIDED FOR WEEP HOLES/OPEN JOINTS TO PREVENT EARTH MATERIALS FROM ENTERING THE HOLES/JOINTS.
8. OPEN VERTICAL MASONRY JOINTS (I.E., OMIT MORTAR FROM JOINTS OF FIRST COURSE ABOVE FINISHED GRADE) AT 32-INCH MAXIMUM INTERVALS MAY BE SUBSTITUTED FOR WEEP HOLES.
9 THE GEOTECHNICAL CONSULTANT MAY PROVIDE ADDITIONAL RECOMMENDATIONS FOR RETAINING WALLS DESIGNED FOR SELECT SAND BACKFILL.

Retaining Wall Drainage Detail

S/A

Figure 4

Appendix A

APPENDIX A

REFERENCES

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APPENDIX A (Cont'd)

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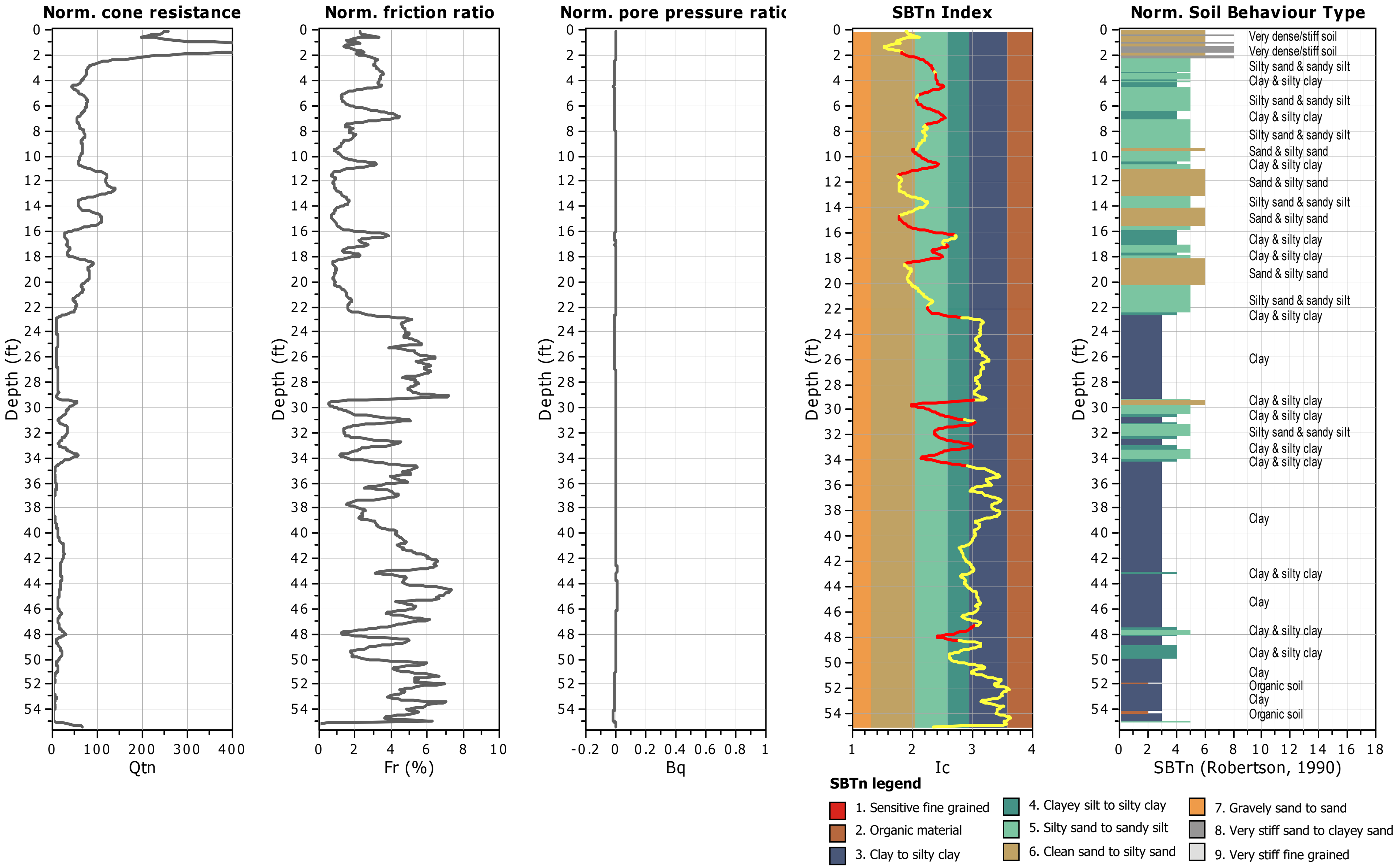
Appendix B

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

CPT-1

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

Total depth: 55.40 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing

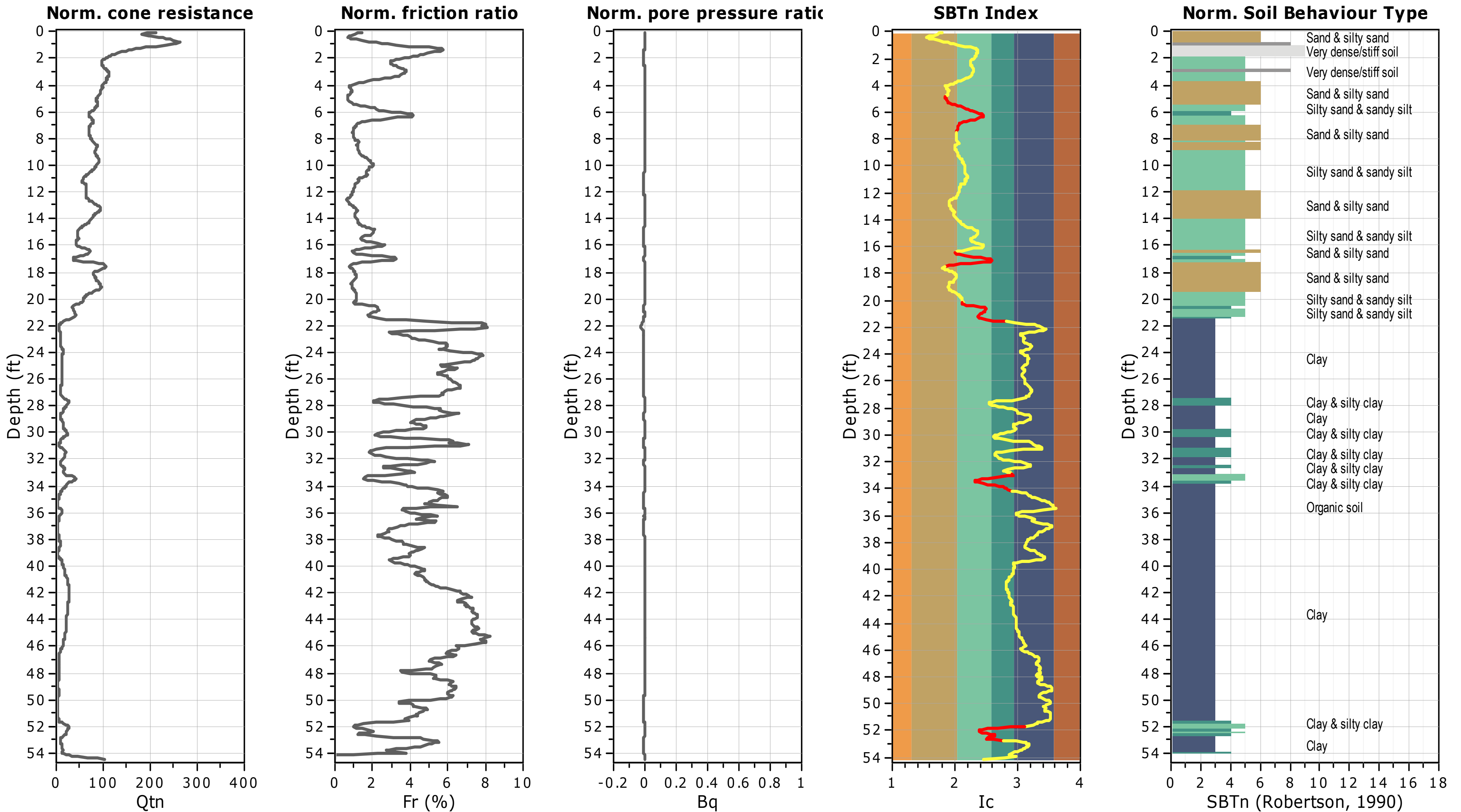


SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

CPT-2

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

Total depth: 54.47 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing



SBTn legend

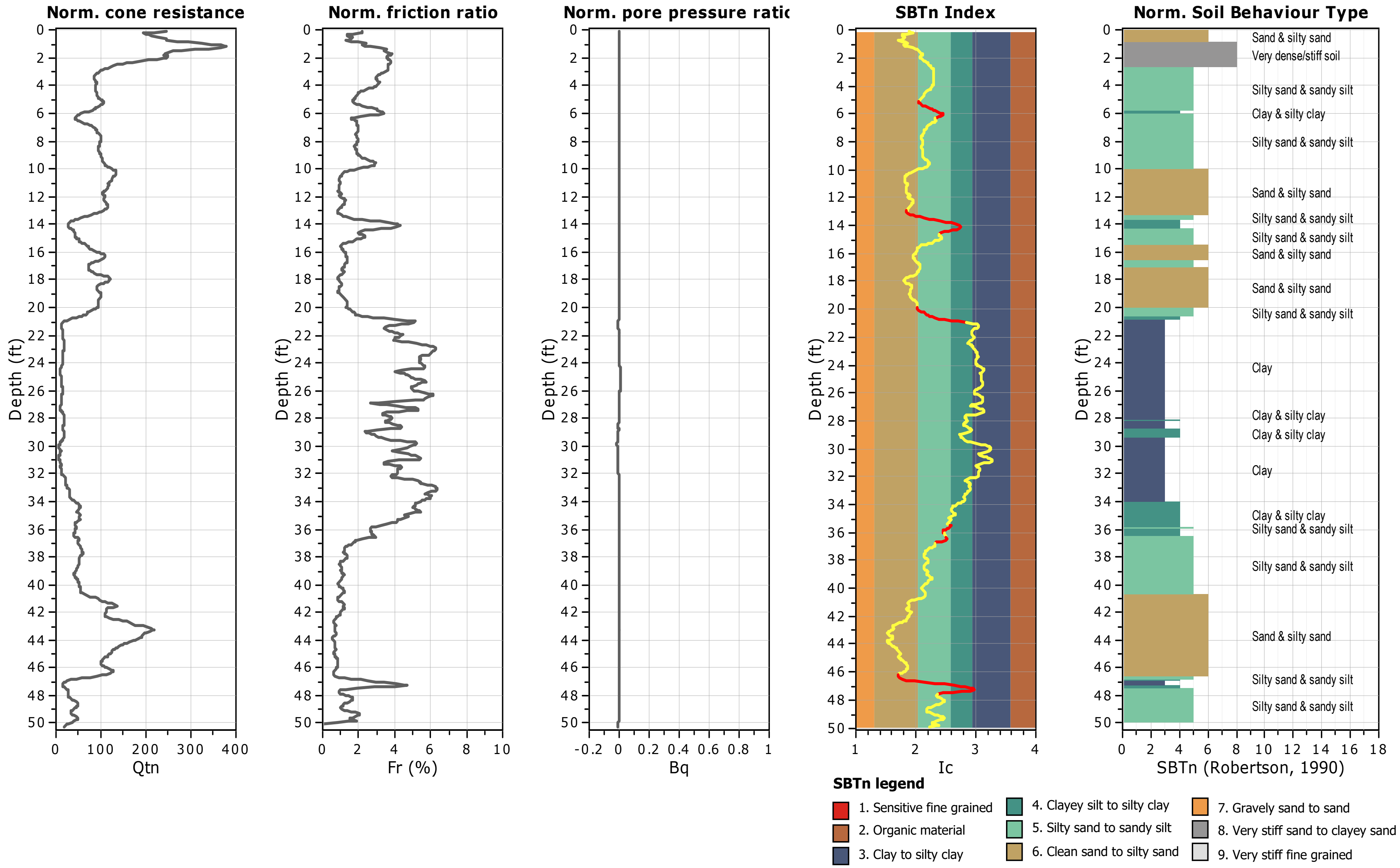
- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

CPT-3

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

Total depth: 50.27 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing

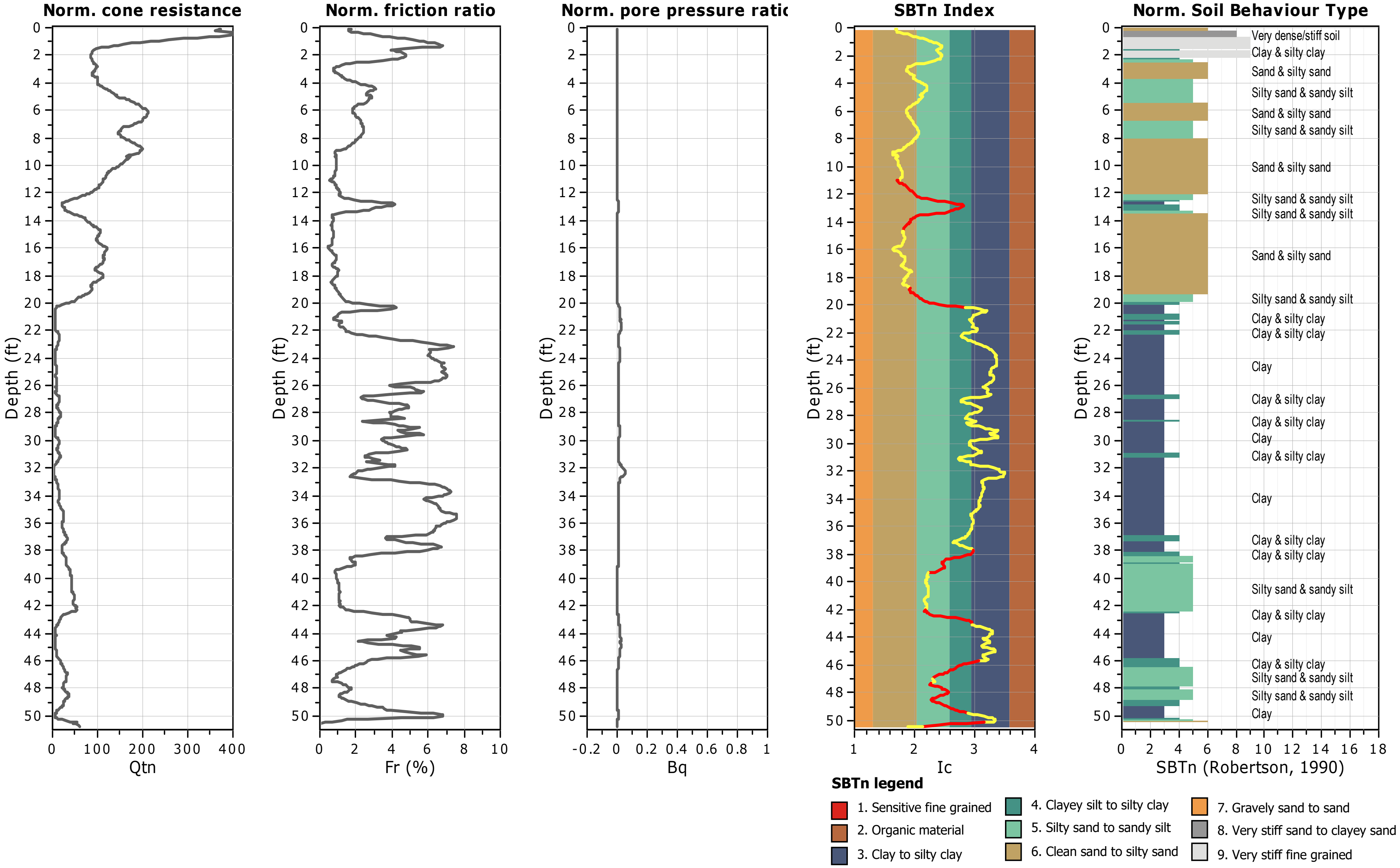


SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

CPT-4

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

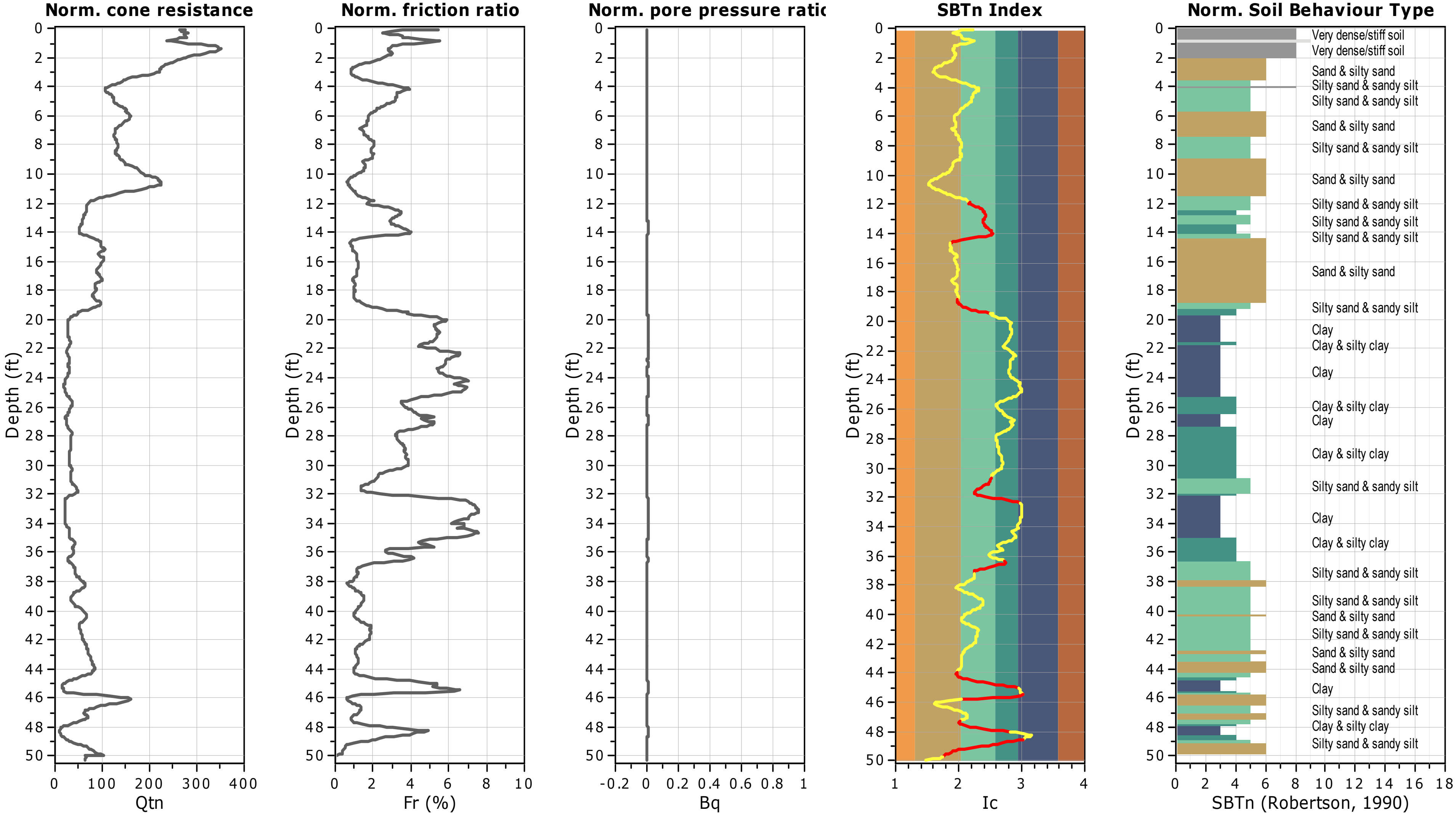
Total depth: 50.79 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing



CPT-5

Total depth: 50.28 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**



SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty clay	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬜ 8. Very stiff sand to clayey sand
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

Boring Logs by NMG Geotechnical (2015)

Date(s) Drilled	9/16/14	Logged By	AZ
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	Groundwater Encountered at 47.4'		
Comments			

H-1

Sheet 1 of 2

Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation (ft)	107.0

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					CL	Surface: 4" AC over 6" AB. **Artificial Fill (Af)**			B-1 @ 1' - 5' GS, AL, MD, DS, EI, CC
		▨ ■	B-1 D-1	11		ML	**Alluvium (Qal)** @ 2.5': Dark yellowish brown fine sandy SILT, moist, medium stiff, trace caliche stringers.	14.5	104.2	
	5	■	D-2	13		SM	@ 5': Upper: Dark yellowish brown silty fine SAND, damp, loose to medium dense, trace caliche stringers.	8.5	104.2	
100						SC-CL	Lower: Dark yellowish brown clayey fine SAND/sandy CLAY, damp, medium dense/stiff, trace caliche stringers.			
		■	D-3	11		SM	@ 7.5': Dark yellowish brown to reddish brown silty fine to medium SAND, moist, loose to medium dense, root hairs, pinhole pores, trace fine gravel.	8.1	115.5	CN
	10	■	D-4	22			@ 10': Yellowish brown silty fine to medium SAND, damp, medium dense, slightly friable, trace fine gravel and mica.	6.3	121.1	
	15	■	D-5	12			@ 15': Yellowish brown silty fine SAND, damp to moist, loose to medium dense, slightly friable, trace mica.	10.9	103.9	CN
90										
	20	■	D-6	14			@ 20': Upper: Light yellowish brown clayey and silty fine to medium SAND, moist, medium dense, slightly friable, trace coarse sand fine gravel and mica. Lower: Yellowish brown silty fine SAND, moist, medium dense, slightly friable, trace mica.	13.4	103.7	
	25	■	D-7	13		CL	@ 25': Brown to reddish brown silty CLAY, wet, medium stiff, caliche stringers.	17.8	111.8	
80										
	30									

LOG OF BORING

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG

WASL/Tustin **Tustin, CA**

H-1
Sheet 2 of 2

Elevation (ft)	Depth (ft)	SAMPLES Type	 Number	 Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	30	■	D-8	18	▨	ML-CL	@ 30': Upper: Light yellowish brown to gray brown clayey SILT/silty CLAY, saturated, stiff, pinhole pores.	22.4	104.9	
					░	SM	Lower: Dark yellowish brown silty fine to medium SAND, saturated, medium dense, trace mica.			
	35	■	D-9	11	▨	CL	@ 35': Reddish brown to gray silty fine sandy CLAY, saturated, medium stiff.	28.9	98.4	
70					▨					
	40	■	D-10	67	▨		@ 40': Reddish brown to gray silty fine sandy CLAY, wet, very stiff to hard, trace mica.	15.2	117.7	
	45	■	D-11	52	▨		@ 45': Reddish brown to gray silty fine sandy CLAY, wet, very stiff to hard, trace mica.	17.4	114.1	
60					▨		∇			
	50	■	D-12	17	▨		@ 50': Red to gray mottled silty, fine sandy CLAY, wet, stiff, trace mica.	23.6	102.2	
							Notes: Total Depth: 51.5 Feet. Groundwater Encountered 47.4 Feet. Backfilled with Cuttings, Tamped, and Patched with Concrete.			
	55									
50										
	60									
	65									

LOG OF BORING

WASL/Tustin
Tustin, CA

PROJECT NO. 14083-01

NMG

Date(s) Drilled	9/16/14	Logged By	TBF
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	Groundwater Not Encountered		
Comments			

P-1

Sheet 1 of 1

Total Depth Drilled (ft)	13.0
Approximate Ground Surface Elevation (ft)	106.0

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0	▨				SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)**			
		▨	B-1							B-1 @ 0' - 5'
		■	D-1	12			@ 2.5': Upper: Brown silty fine to coarse SAND, damp, loose to medium dense, micaceous, very porous, friable, trace gravel.	8.7	106.7	
		▨				SM	**Alluvium (Qal)** Lower: Brown silty fine to coarse SAND, damp, loose to medium dense, micaceous, porous, trace gravel.			
100	5	■	D-2	15			@ 5': Brown silty fine SAND, damp, medium dense, porous, caliche, micaceous.	9.9	108.3	
	10									
		■	D-3	12			@ 11': Upper: Light brown slightly silty fine to medium SAND, damp, loose to medium dense, micaceous, highly friable. Lower: Light brown slightly fine SAND, damp, loose, micaceous, more dense than above.	6.2	108.7	
90	15						Notes: Total Depth: 13 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	20									
80	25									
	30									

LOG OF BORING

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	9/16/14	Logged By	AZ/TBF
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	Groundwater Not Encountered		
Comments			

P-2

Sheet 1 of 1

Total Depth Drilled (ft)	12.0
Approximate Ground Surface Elevation (ft)	107.0

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)**			
		■	D-1	11			@ 2.5': Light brown to brown silty fine SAND, damp, loose, friable, pores up to 3 mm in diameter.	11.0	99.1	
	5	■	D-2	15		SM	**Alluvium (Qal)** @ 5': Brown silty fine SAND, damp, loose, porous, trace root hairs, micaceous.	7.6	109.7	GS, CN
100										
	10	■	D-3	16		SP	@ 10': Upper: Yellowish brown to brown fine to medium SAND, damp, medium dense, highly friable, trace mica.	1.7		
						SM	Lower: Yellowish brown to brown silty fine to medium SAND, damp, medium dense, highly friable, trace mica.			
							Notes: Total Depth 12 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfillied with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	9/16/14	Logged By	AZ
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	Groundwater Not Encountered	Total Depth Drilled (ft)	11.5
Comments		Approximate Ground Surface Elevation (ft)	107.0

P-3

Sheet 1 of 1

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)/Alluvium (Qal)?**			
	5	■	D-1	12			@ 5': No sample recovery.			
100										
	10	■	D-2	25		SM SP	**Alluvium (Qal)** @ 10': Upper: Light reddish brown to strong brown silty fine to coarse SAND, damp, medium dense, slightly friable, coarse gravel in uppermost rings. Lower: Light pale yellow slightly silty fine to coarse SAND, damp, medium dense, highly friable, trace mica.	2.0		
							Notes: Total Depth 11.5 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin

Tustin, CA

PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	**9/16/14**	Logged By	**AZ**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**
Sampling Method(s)	**Modified California, Bulk**		

Approximate Groundwater Depth: **Groundwater Not Encountered**

Comments

P-4

Sheet 1 of 1

Total Depth Drilled (ft): **11.0**

Approximate Ground Surface Elevation (ft): **107.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)/Alluvium (Qal)?**			
	5									B-1 @ 2' - 7'
100										
	10	■	D-1	13		SM	**Alluvium (Qal)** @ 9.5': Dark yellowish brown silty fine to medium SAND, damp, medium dense, trace mica and coarse sand.	8.4	116.1	
							Notes: Total Depth 11.0 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin

Tustin, CA

PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	**9/16/14**	Logged By	**AZ**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**
Sampling Method(s)	**Modified California**		
Approximate Groundwater Depth:	**Groundwater Not Encountered**		
Comments			

P-5

Sheet 1 of 1

Total Depth Drilled (ft)	**10.0**
Approximate Ground Surface Elevation (ft)	**108.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0				▨	SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)/Alluvium (Qal)?**			
	5				▨					
100		■	D-1	15	▨	SM	**Alluvium (Qal)** @ 8': Dark yellowish brown silty fine to medium SAND, damp, medium dense, trace pinhole pores.	7.6	113.3	GS, CN
	10						Notes: Total Depth 10.0 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG

Boring Logs by Geosoils (2005)

LOG OF BORING B-1

Sheet 1 of 1

Date Drilled: 3/18/05 Logged by: DXS

Equipment: CME-55 Driving Weight and Drop: 140 lbs and 30"

Surface Elevation(ft): Depth to Water(ft):

⊠ SPT ⧓ Modified California ∇ Water Level ADT

Grab Sample ■ Shelby Tube ▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
0	■	2.5" Asphalt Over 6" Base						
		SILTY SAND, loose, brown, dry to slightly moist, fine grained	⧓		15	13	111	
5	▨	SANDY CLAY, very stiff, dry, brownish gray, some Silt, trace caliche	⧓		40	9	112	
10	▨	Same as above	⊠		18			
		SAND w/some gravel, medium dense, brown, dry						
15		SAND, gray beach sand, medium dense, slightly moist	⧓		24	2	104	
20	▨	SILTY CLAY, medium stiff, brown, moist, some sand	⊠		8			
25	▨	Same as above	⧓		16	19	108	
30		SILTY SAND, loose, brown, moist, fine to medium grained	⊠		5			
35	▨	SANDY CLAY, very stiff, reddish brown/orange brown, moist,	⧓		44	14	121	
▼40		SAND, medium dense, brown, saturated, some clay at tip	⊠		11			
45		Same as above, loose, saturated	⊠		9			
50		Same, medium dense	⊠		14			
55		Total depth of Boring = 51'6" Groundwater encountered @ 40'6" Backfilled with cuttings						

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Santa Ana, California
Phone: 714-647-0277 Fax: 714-647-0745

ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-2

Sheet 1 of 1

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

☒ SPT ⧓ Modified California ▽ Water Level ADT
Grab Sample ■ Shelby Tube ▼ Static Water Table

DEPTH (ft)	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	2.5" Asphalt over 6" Base						
	Sandy CLAY w/gravel, brown, medium stiff, moist, low plasticity	⧓		8	17	76	
5	Same as above	☒		8			
10	SAND, brown, medium dense, moist, fine grained	⧓		19	12	125	
15	Silty SAND, brown, loose, moist, fine grained	☒		6			
20	SAND, brown, medium dense, moist, fine grained	⧓		22	6	102	
25	Silty CLAY, brown, soft, moist, low to medium plasticity	☒		3			
30	Same as above	⧓		19	15	111	
35	Same but orange brown	☒		3			
40	Silty CLAY, reddish brown, very stiff, moist, medium plasticity	⧓		35	16	114	
▼45	Same as above	☒		3			
50		☒		3			
55	Total Depth = 51.5 feet Groundwater encountered @ 45 feet Backfilled w/cuttings						

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Plate

LAGNNN01 4735.GPJ LAGNNN01.GDT 3/31/05

LOG OF BORING B-3

Sheet **1** of **1**

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

☒ SPT
⧓ Modified California
▽ Water Level ADT
☐ Grab Sample
■ Shelby Tube
▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	■	2.5" Asphalt over 6" Base						
	▨	Silty CLAY w/gravel, dark brown, soft, moist, low to medium plasticity	⧓		3	23	90	
5	▥	Silty SAND, brown, loose, fine grained, moist	⧓		12	-	-	
10	▨	Clayey SAND, brown, loose, slightly moist, fine grained	☒		9			
15	▨	Same as above	⧓		14	6	94	
20	▥	Sandy SILT, soft to medium stiff, brown, moist	☒		4			
25	▨	Silty CLAY, medium stiff, reddish brown, moist, medium plasticity	⧓		14	20	105	
		Total Depth = 26'6" No Groundwater encountered within boring depth Backfilled w/cuttings						

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ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-4

Sheet 1 of 1

Date Drilled: 3/18/05 Logged by: DXS

Equipment: CME-55 Driving Weight and Drop: 140 lbs and 30"

Surface Elevation(ft): ______ Depth to Water(ft): ______

⊠ SPT ⧗ Modified California ∇ Water Level ADT

☐ Grab Sample ■ Shelby Tube ▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	■	2.5" Asphalt over 6" Base						
	▨	Silty CLAY, soft, brown, moist, fine grained, low to medium plasticity						
		Sandy SILT, brown, soft, moist, fine grained	⧗		5	22	96	
5	▨	Silty CLAY, soft, brown, moist, medium plasticity	⊠		2			
10	▨	Same as above, sandy	⧗		20	13	120	
15		SIlty SAND, brown, loose, moist, fine to medium grained	⊠		6			
20		same as above	⧗		15	23	96	
	▨	SIlty CLAY, brown, soft to medium stiff, moist, low to medium plasticity						
25	▨		⊠		5			
		Total Depth = 26'6" No groundwater encountered within the boring depth Backfilled w/cuttings						

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ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-5

Sheet 1 of 1

Date Drilled: 3/18/05 Logged by: DXS

Equipment: CME-55 Driving Weight and Drop: 140 lbs and 30"

Surface Elevation(ft): Depth to Water(ft):

⊠ SPT ⧓ Modified California ▽ Water Level ADT

☐ Grab Sample ■ Shelby Tube ▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
		2.5" Asphalt over 6" Base						
		SAND w/gravel, medium dense, brown, moist						
		Sandy CLAY, medium stiff, dark brown, moist, low plasticity	⧓		9	18	100	
5		Same as above	⧓		18	19	93	
10		SAND, brown, medium dense, moist, fine to medium grained	⊠		19			
15		Silty SAND, brown, medium dense, moist, fine to medium grained	⧓		36	7	99	
20		SAND, loose, brown, slightly moist, fine grained, some silt	⊠		7			
25		Silty CLAY, very stiff, brown, moist, low to medium plasticity	⧓		29	17	113	
30		Sandy SILT, medium stiff, reddish brown, moist, rust, some caliche	⊠		5			
		Total Depth of Boring = 31'6" No groundwater encountered within the boring depth Backfilled w/cuttings						

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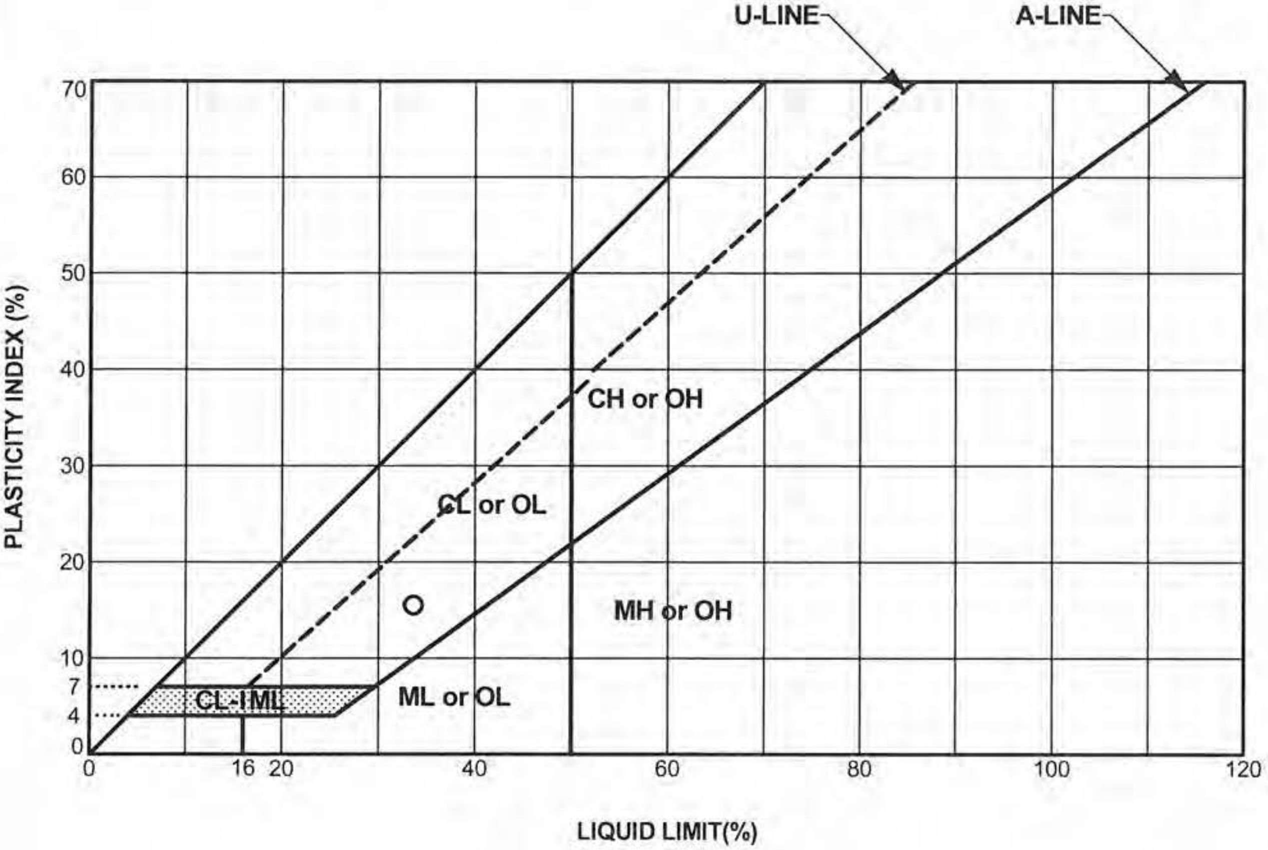
ASL Tustin

4735-A1-OC

Plate

Appendix C

Laboratory Test Results
by NMG Geotechnical
(2015)

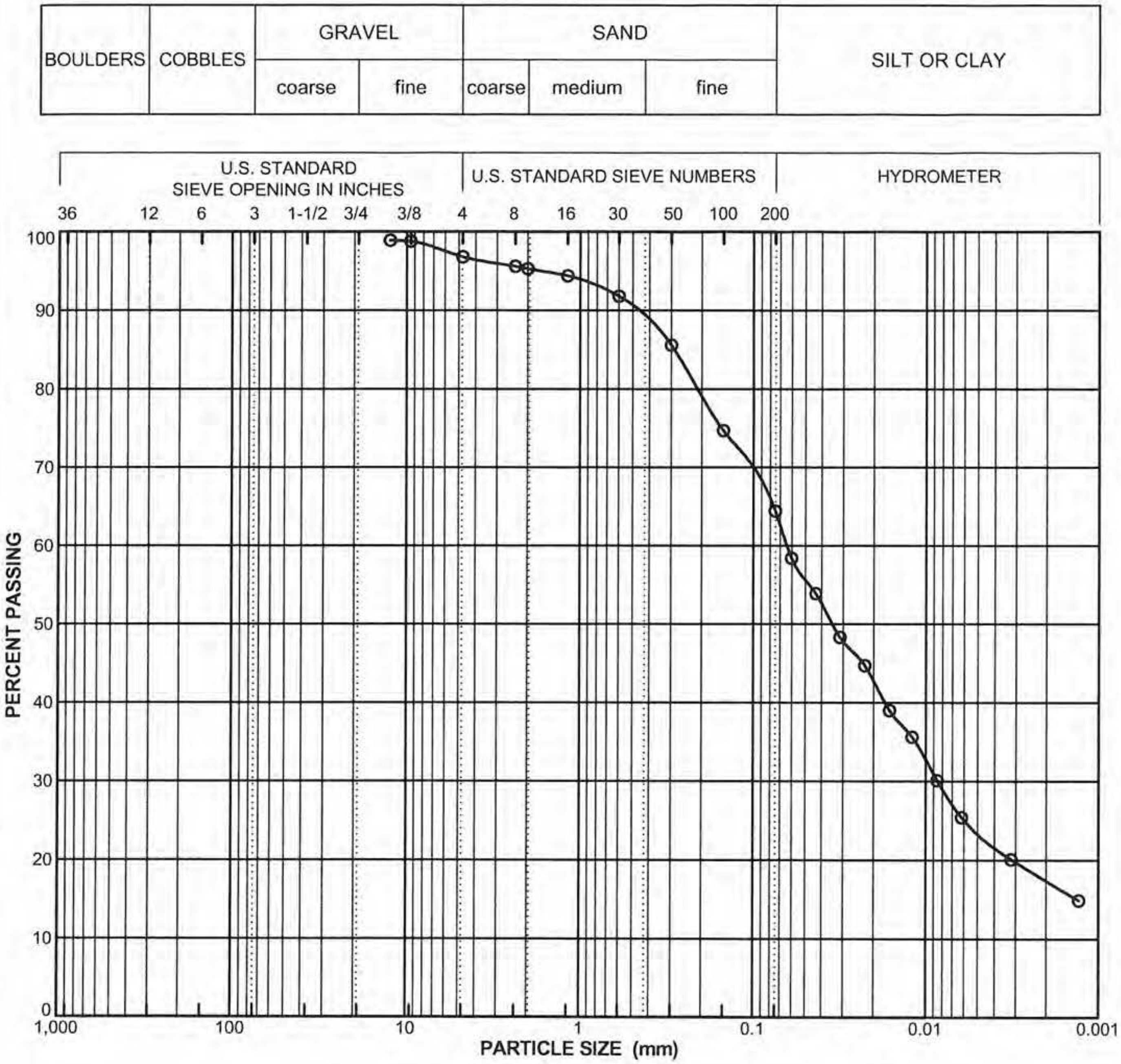


Symbol	Boring Number	Depth (feet)	Sample Number	Passing No. 200 Sieve (%)	LL	PI	USCS	Description
○	H-1	1.0	B-1	64	34	16	CL	Brown sandy silty CLAY

PLASTICITY CHART

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2µ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2µ (%)	USCS
O	H-1	B-1	1.0		34	16				64	17	CL

PARTICLE SIZE DISTRIBUTION

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

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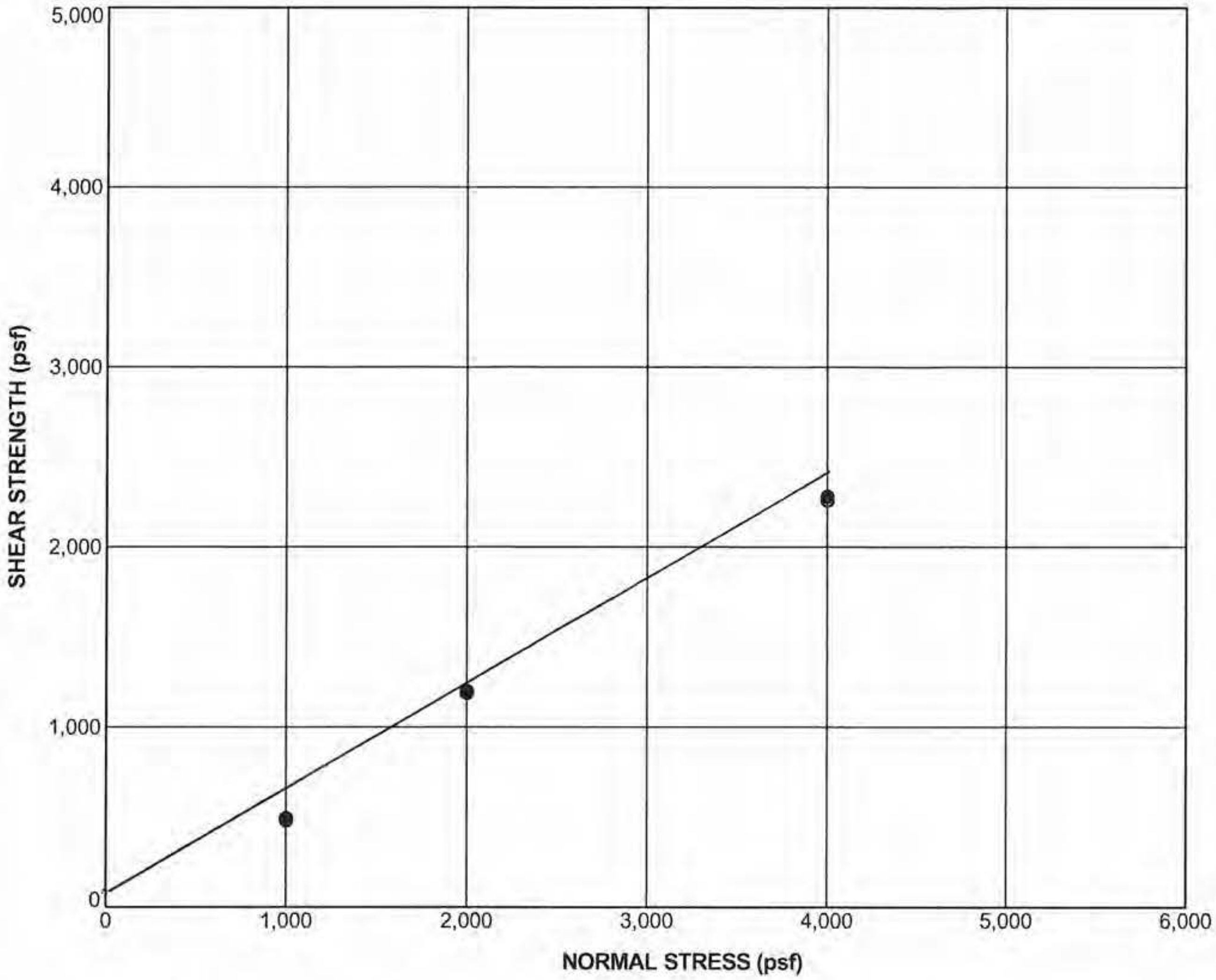

Boring No. H-1	Sample No. B-1	Depth: 1.0 ft
Sample Description: Brown sandy silty CLAY		

Liquid Limit:	34	**Plasticity Index:**	16	**Percent Passing No. 200 Sieve:**	64
Moisture Content (%):	24.9	**Dry Density (pcf):**	103.9	**Degree of Saturation (%):**	99
Sample Type:	Remolded	**Rate of Shear (in./min.):**	0.005		

SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	100	100
Friction Angle (degrees)	30	30.0

DIRECT SHEAR TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

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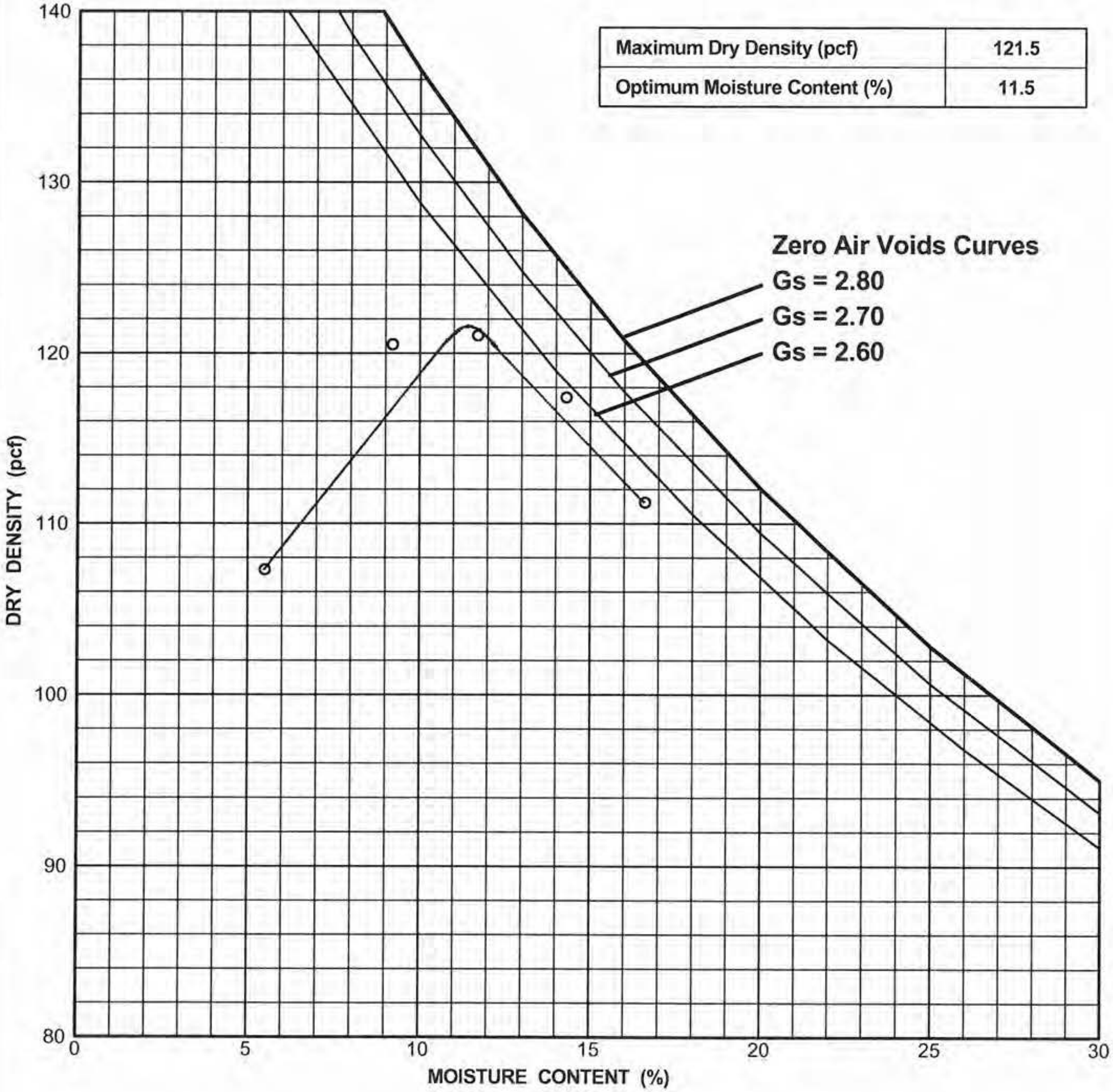

Maximum Dry Density (pcf)	**121.5**
Optimum Moisture Content (%)	**11.5**

Boring No. H-1		**Sample No. B-1**		**Depth: 1.0 ft**	
Sample Description:	Brown sandy silty CLAY				
Liquid Limit:	34	**Plasticity Index:**	16	**Percent Passing No. 200 Sieve:**	64
Comments:	1557A				

COMPACTION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

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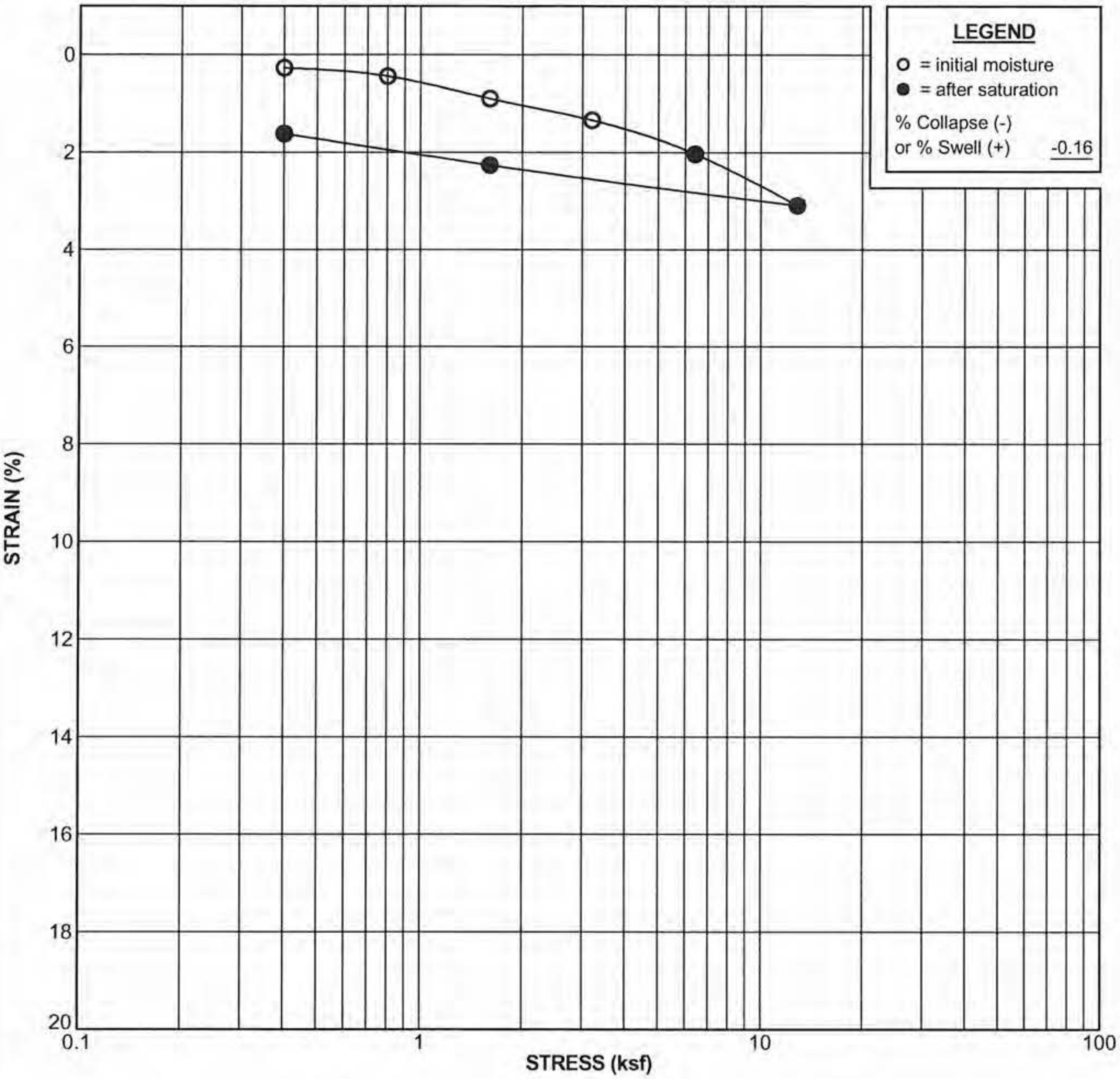


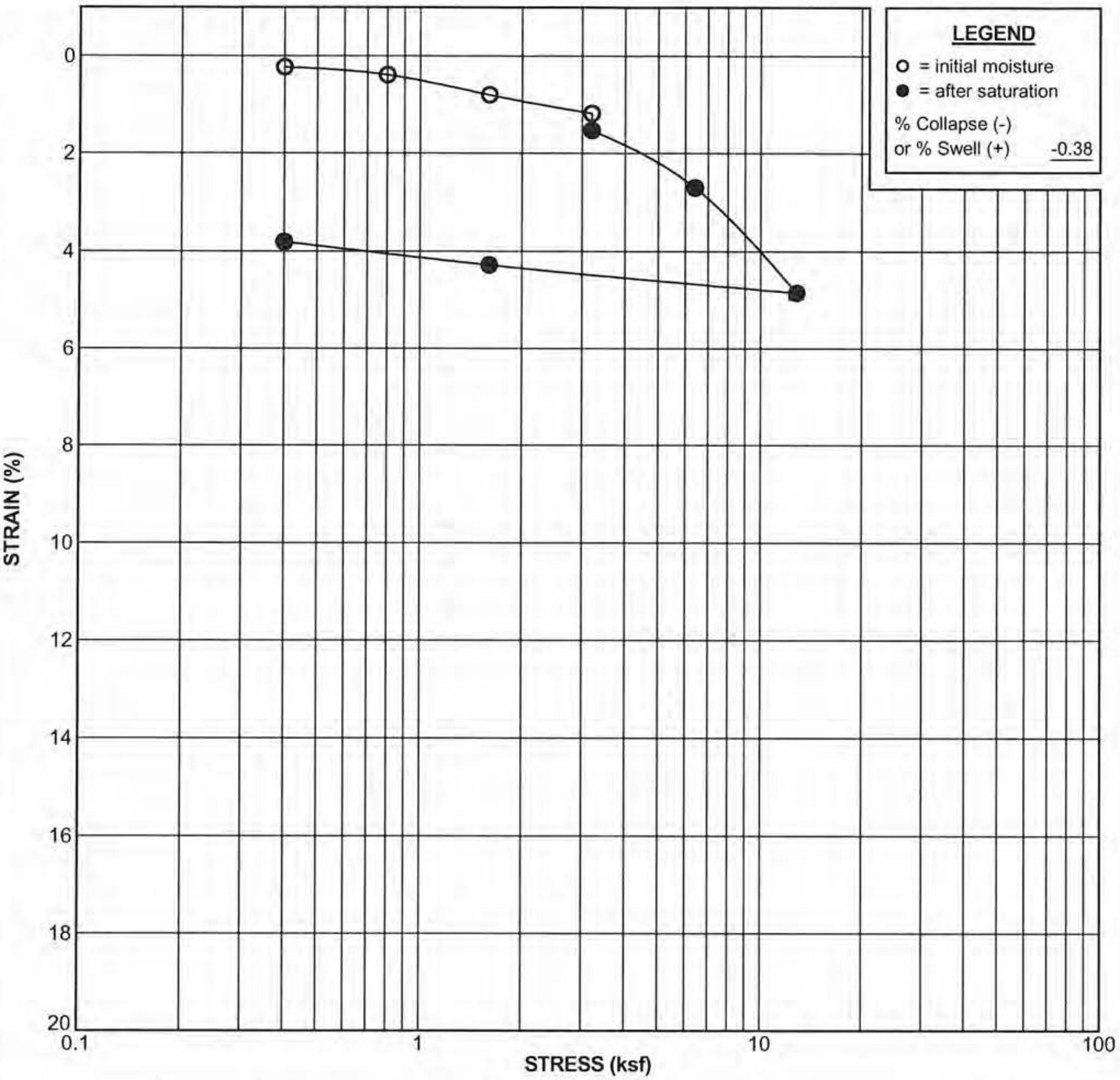
Boring No. H-1	**Sample No. D-5**	**Depth: 15.0 ft**
Sample Description:	(Qal) Brown sandy SILT	
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	16.0	103.1	70.2	0.604
Final	21.0	104.8	96.3	0.578

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



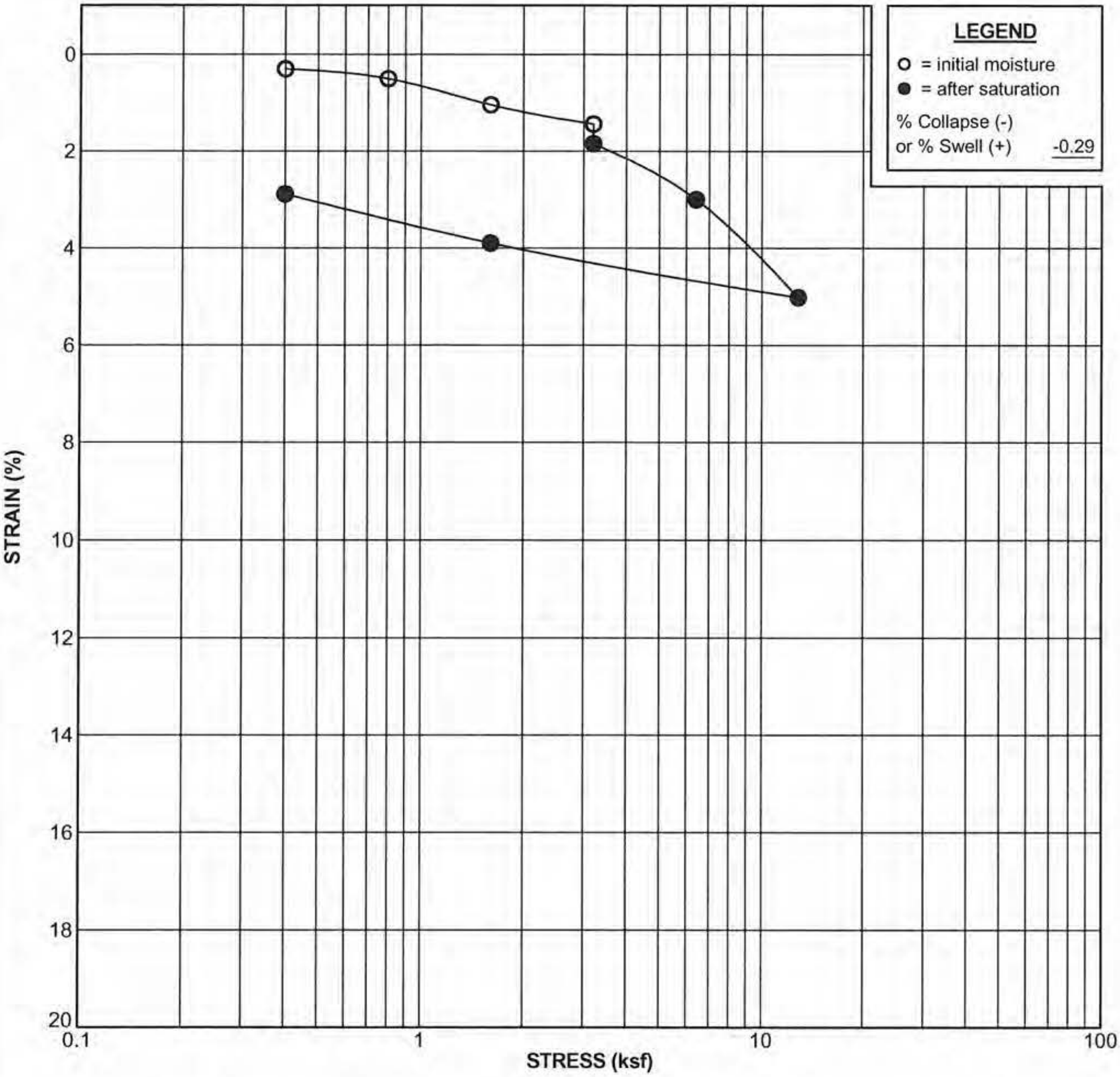
Boring No. H-1	**Sample No. D-3**	**Depth: 7.5 ft**
Sample Description: (Qal) Reddish brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	8.4	114.5	50.1	0.444
Final	14.4	118.9	97.7	0.391

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



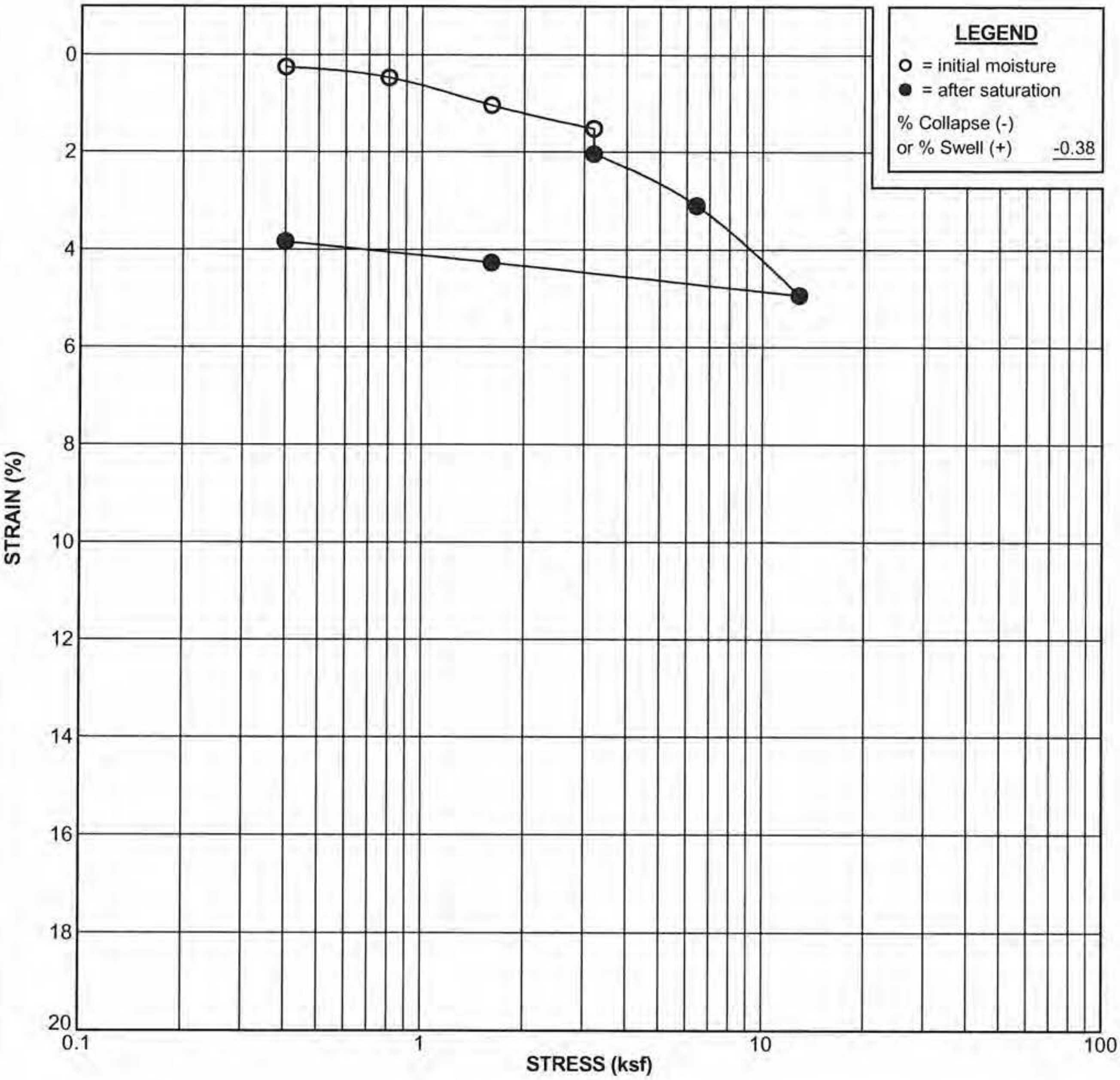
Boring No. P-2	**Sample No. D-2**	**Depth: 5.0 ft**
Sample Description: (Qal) Brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	8.2	113.3	44.8	0.498
Final	16.6	116.6	99.1	0.456

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



Boring No. P-5	**Sample No. D-1**	**Depth: 8.0 ft**
Sample Description:	(Qal) Reddish brown sandy SILT	
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

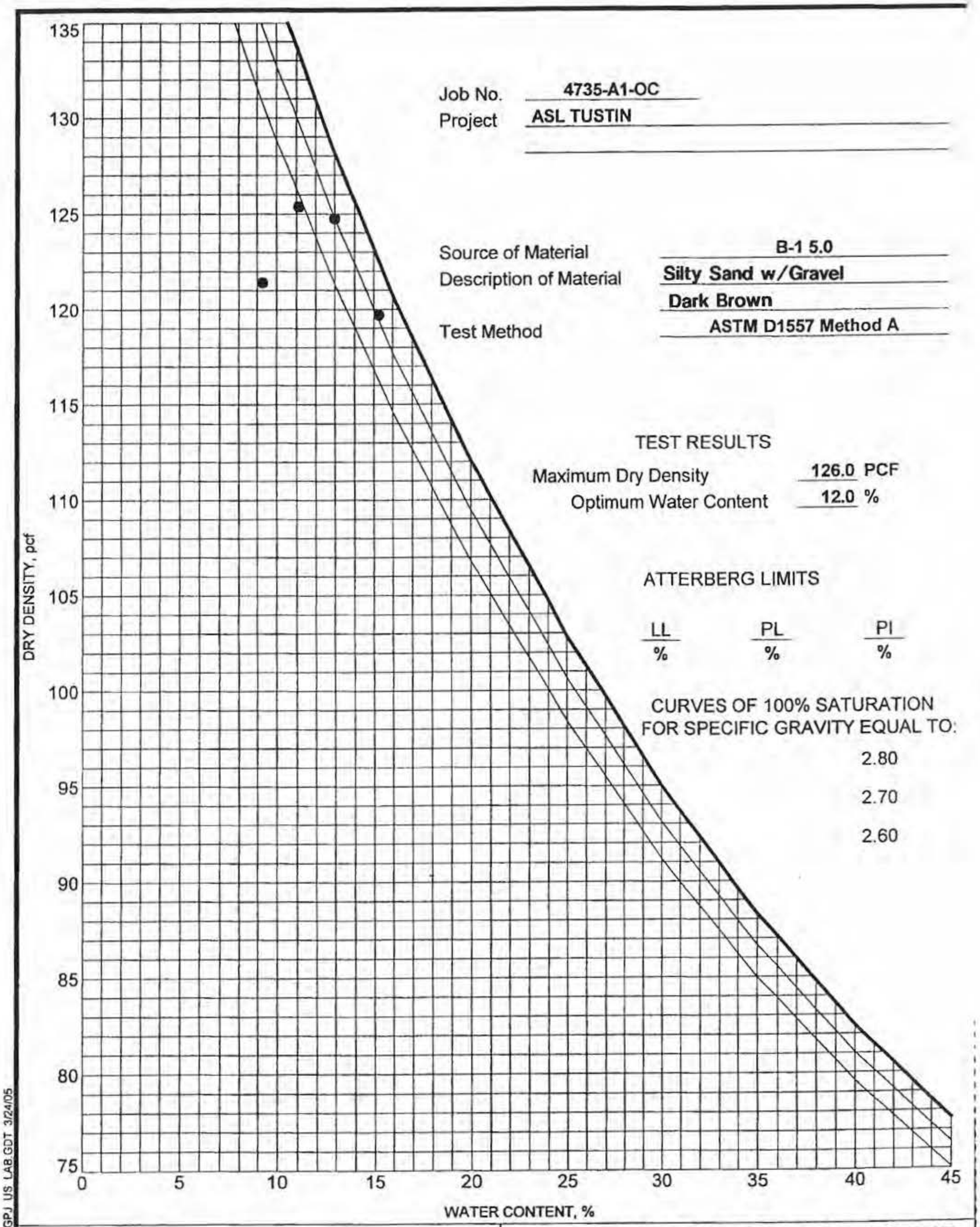
Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	7.7	111.7	42.5	0.480
Final	14.4	116.0	89.7	0.426

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.

Laboratory Test Results
by Geosoils (2005)



Job No. **4735-A1-OC**

Project **ASL TUSTIN**

Source of Material **B-1 5.0**

Description of Material **Silty Sand w/Gravel**

Dark Brown

Test Method **ASTM D1557 Method A**

TEST RESULTS

Maximum Dry Density **126.0** PCF

Optimum Water Content **12.0** %

ATTERBERG LIMITS

LL	PL	PI
%	%	%

CURVES OF 100% SATURATION
FOR SPECIFIC GRAVITY EQUAL TO:

2.80

2.70

2.60

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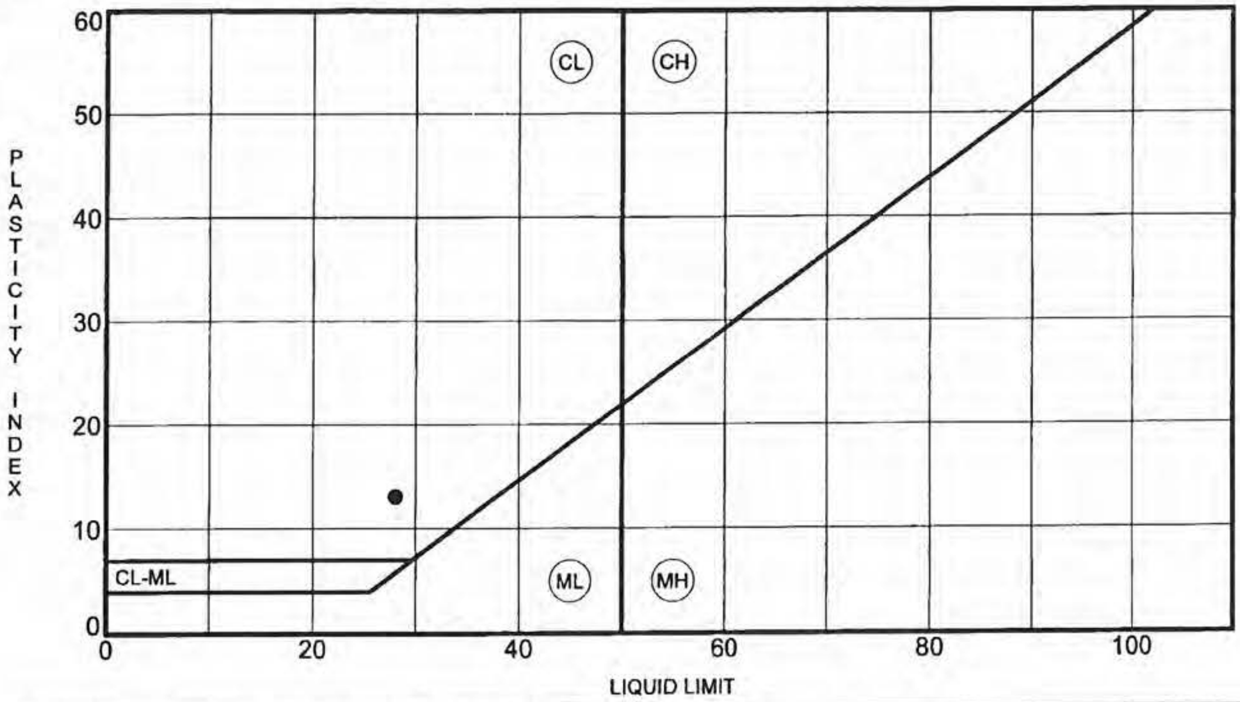
MOISTURE-DENSITY RELATIONSHIP

Project: ASL TUSTIN

Location:

Number: 4735-A1-OC

PLATE



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-1**	**20.0**	**28**	**15**	**13**		

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ATTERBERG LIMITS' RESULTS

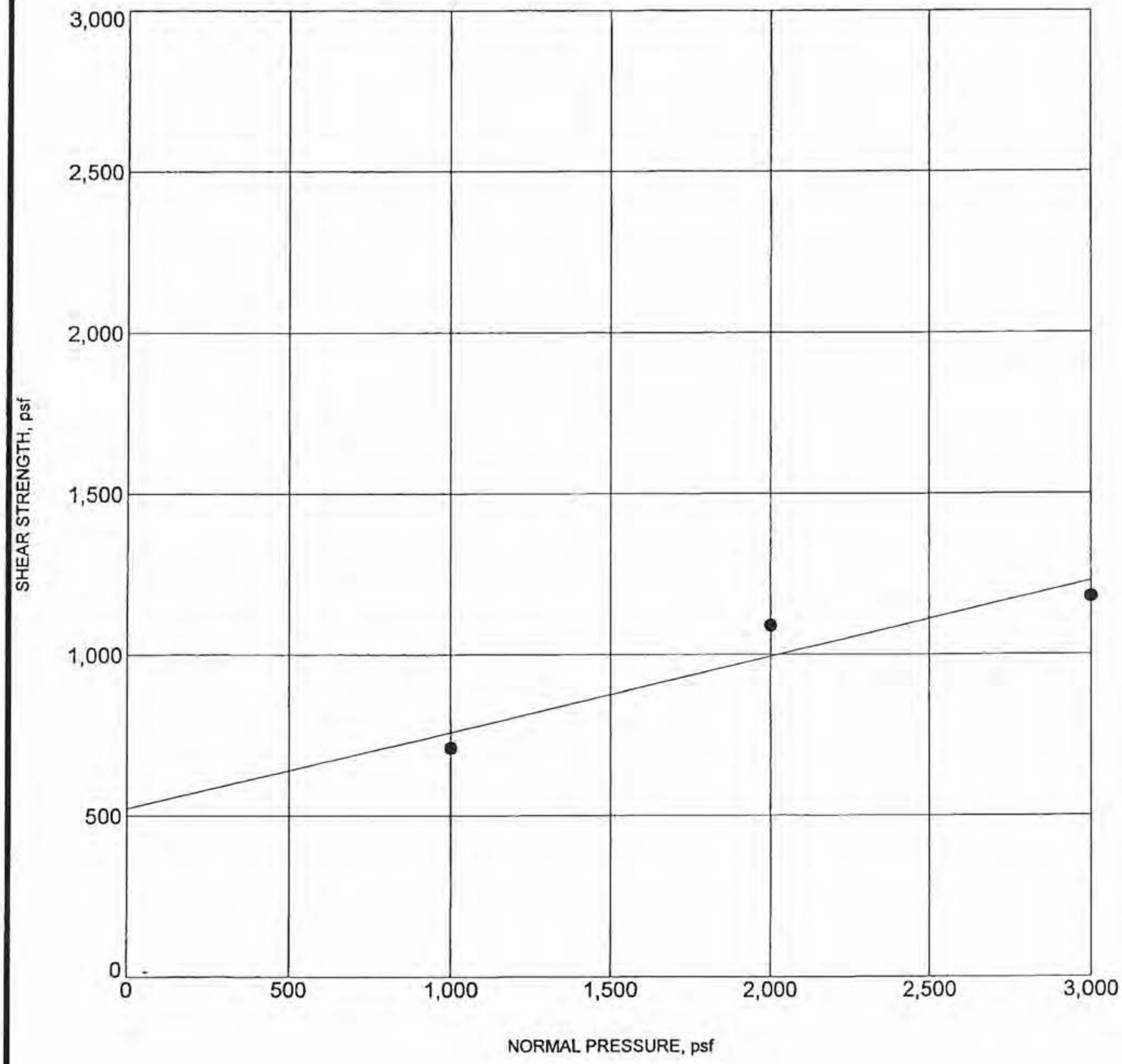
Project: ASL Tustin

Location:

Number: 4735-A1-OC

PLATE

US ATTERBERG LIMITS 4735.GPJ US LAB.GDT 3/29/05



Specimen Identification			Classification	γ_d	MC%	c	ϕ
●	**B-1**	**5.0**	**REMOLDED**	**104**	**19**	**523**	**13**

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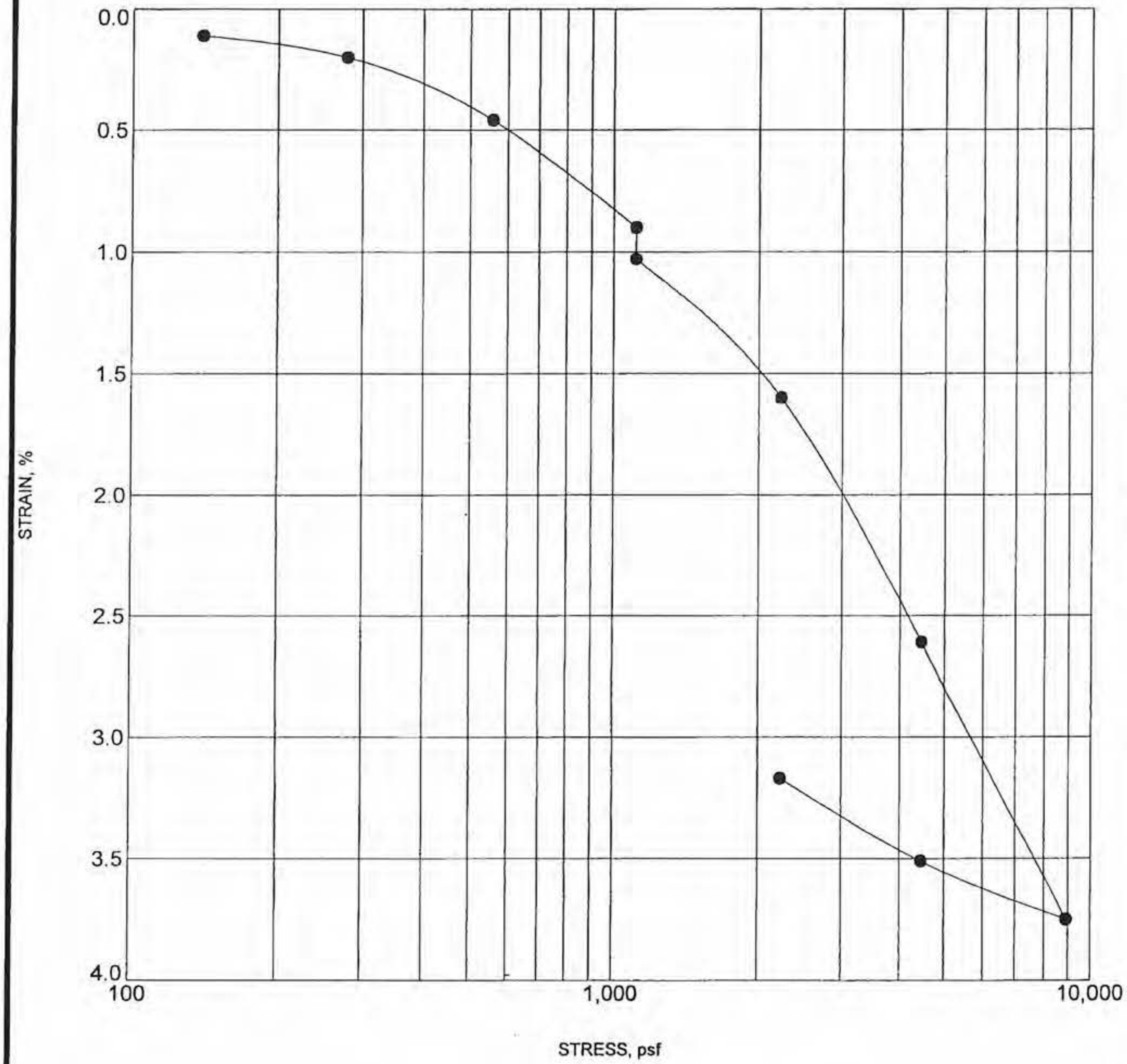
DIRECT SHEAR TEST

Project: ASL TUSTIN

Location:

Number: 4735-A1-OC

PLATE



	Specimen Identification		Classification	γ_d	MC%
●	B-3	15.0		100	23

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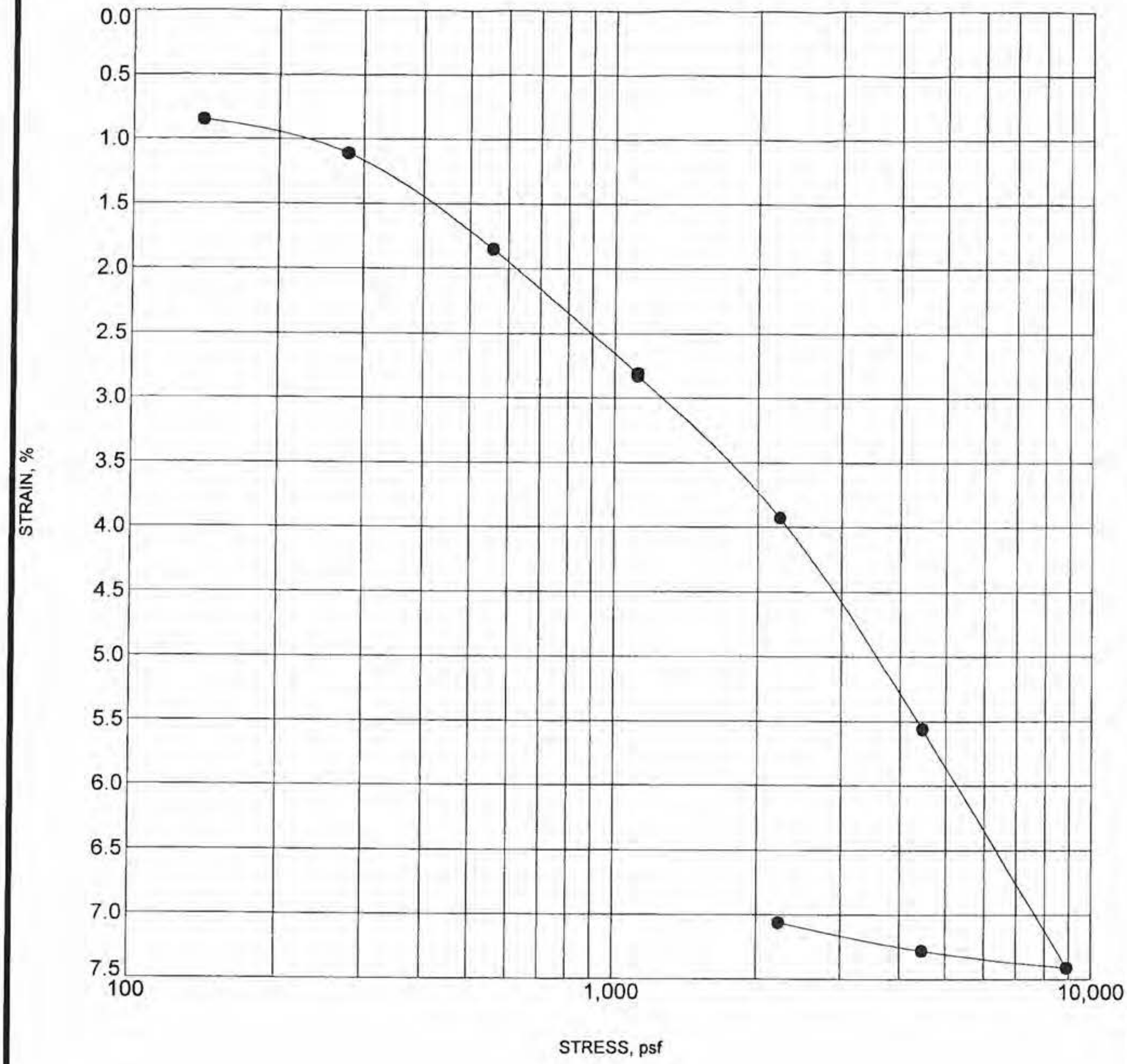
CONSOLIDATION TEST

Project: ASL TUSTIN

Location:

Number: 4735-A1-OC

PLATE



	Specimen Identification		Classification	γ_d	MC%
●	**B-4**	**10.0**		**120**	**12**

US CONSOL STRAIN 4735.GPJ US LAB.GDT 3/25/05

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CONSOLIDATION TEST

Project: ASL TUSTIN
Location:
Number: 4735-A1-OC

PLATE

Cal Land Engineering, Inc.
dba Quartech Consultant
Geotechnical, Environmental, and Civil Engineering

SUMMARY OF LABORATORY TEST DATA

Client Name: GeoSoils, Inc.
Project Name: ASL Tustin
Project No.: W.O. 4735-A-OC

QCI Project No.: 05-029-003i
Date: March 24, 2005
Summarized by: ABK

Sample ID (Boring No.)	Sample Depth (Feet)	pH CT-532	Chloride CT-422 (ppm)	Sulfate CT-417 (% By Weight)	Resistivity CT-532 (ohm-cm)
B - 2	0-5	8.36	85	0.0230	1,900

Appendix D

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

Latitude, Longitude: 33.7359, -117.8139

Date	1/24/2024, 11:14:22 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.284	MCE$_R$ ground motion. (for 0.2 second period)
S_1	0.459	MCE$_R$ ground motion. (for 1.0s period)
S_{MS}	1.284	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.856	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.536	MCE$_G$ peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.59	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.284	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.37	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.459	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.493	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.582	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.536	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.937	Mapped value of the risk coefficient at short periods
C_{R1}	0.93	Mapped value of the risk coefficient at a period of 1 s
C_V	1.357	Vertical coefficient

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U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition

Dynamic: Conterminous U.S. 2014 (updat…

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.7359

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

-117.8139

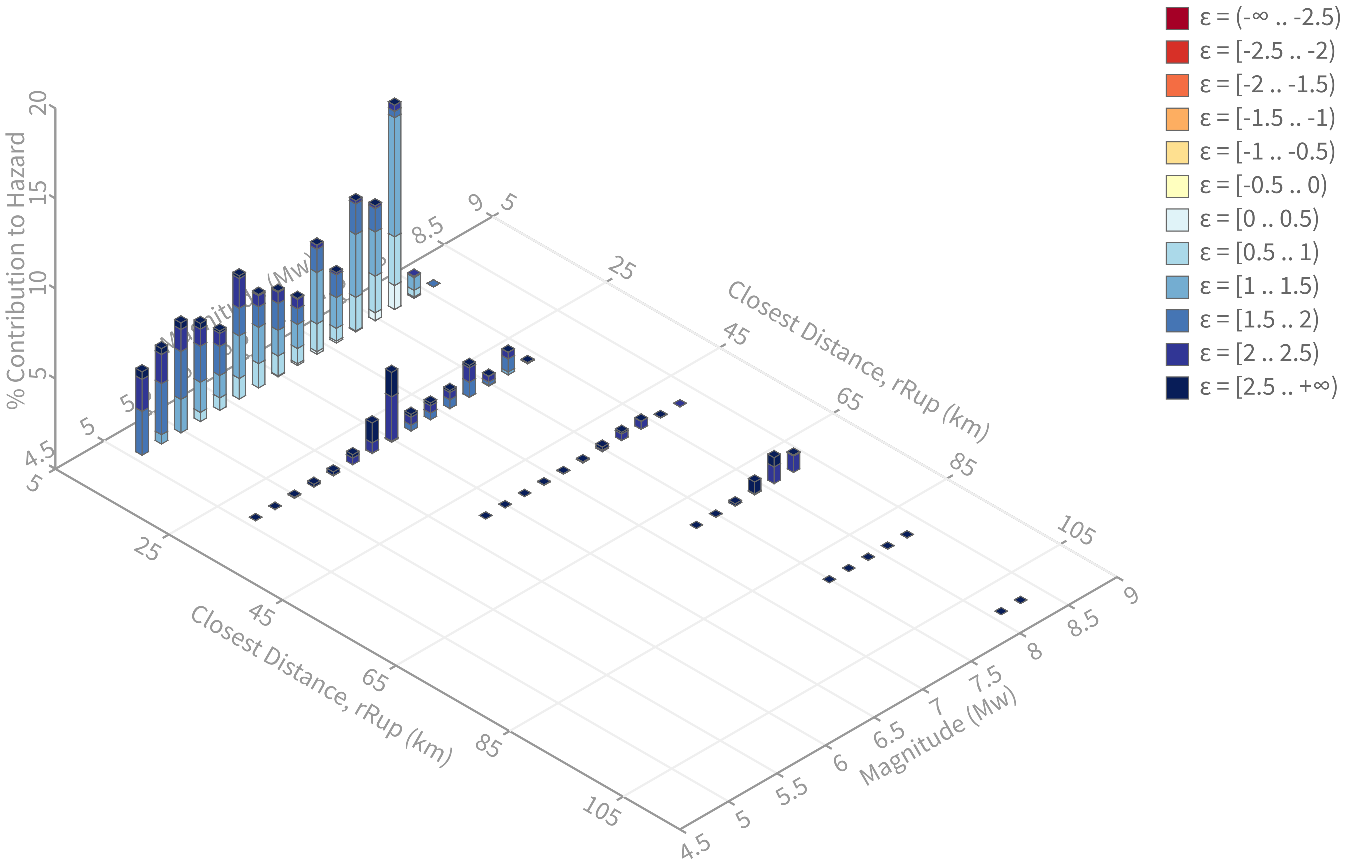
Site Class

259 m/s (Site class D)

^ Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.63774094 g

Recovered targets

Return period: 3044.5692 yrs
Exceedance rate: 0.00032845369 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.04 %

Mean (over all sources)

m: 6.64
r: 15.59 km
ε_0: 1.59 σ

Mode (largest m-r bin)

m: 7.71
r: 14.6 km
ε_0: 1.15 σ
Contribution: 11.32 %

Mode (largest m-r-ε_0 bin)

m: 7.71
r: 17.17 km
ε_0: 1.35 σ
Contribution: 6.61 %

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 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							28.29
San Joaquin Hills [1]		8.38	7.17	0.95	117.835°W	33.668°N	194.80	6.22
Whittier alt 2 [1]		18.13	7.59	1.51	117.719°W	33.878°N	28.85	3.90
Elsinore (Glen Ivy) rev [0]		23.17	6.58	2.40	117.590°W	33.829°N	63.38	2.45
Compton [0]		18.92	7.29	1.26	118.043°W	33.702°N	260.12	2.22
Newport-Inglewood alt 2 [0]		17.13	7.51	1.45	117.956°W	33.638°N	230.33	2.01
Peralta Hills [0]		11.18	7.35	1.17	117.814°W	33.835°N	0.01	1.75
Chino alt 2 [2]		21.61	7.03	1.90	117.622°W	33.870°N	49.92	1.53
Anaheim [0]		13.76	6.98	1.29	117.943°W	33.780°N	292.50	1.09
UC33brAvg_FM31	System							27.10
San Joaquin Hills [1]		8.38	7.53	0.79	117.835°W	33.668°N	194.80	4.80
Whittier alt 1 [2]		18.19	7.51	1.56	117.722°W	33.880°N	27.96	3.96
Elsinore (Glen Ivy) rev [0]		23.17	6.60	2.39	117.590°W	33.829°N	63.38	2.42
Newport-Inglewood alt 1 [0]		17.24	7.48	1.46	117.958°W	33.639°N	230.98	2.17
Compton [0]		18.92	7.23	1.29	118.043°W	33.702°N	260.12	2.06
Peralta Hills [0]		11.18	7.01	1.40	117.814°W	33.835°N	0.01	1.85
Chino alt 1 [4]		18.55	6.81	1.93	117.617°W	33.862°N	52.39	1.81
Anaheim [0]		13.76	6.92	1.33	117.943°W	33.780°N	292.50	1.07
UC33brAvg_FM31 (opt)	Grid							22.34
PointSourceFinite: -117.814, 33.776		6.58	5.78	1.24	117.814°W	33.776°N	0.00	3.79
PointSourceFinite: -117.814, 33.776		6.58	5.78	1.24	117.814°W	33.776°N	0.00	3.79
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.66
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.66
PointSourceFinite: -117.814, 33.812		9.38	5.77	1.64	117.814°W	33.812°N	0.00	1.53
PointSourceFinite: -117.814, 33.812		9.38	5.77	1.64	117.814°W	33.812°N	0.00	1.53
PointSourceFinite: -117.814, 33.830		10.39	5.97	1.67	117.814°W	33.830°N	0.00	1.08
PointSourceFinite: -117.814, 33.830		10.39	5.97	1.67	117.814°W	33.830°N	0.00	1.08
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
UC33brAvg_FM32 (opt)	Grid							22.27
PointSourceFinite: -117.814, 33.776		6.58	5.77	1.24	117.814°W	33.776°N	0.00	3.82
PointSourceFinite: -117.814, 33.776		6.58	5.77	1.24	117.814°W	33.776°N	0.00	3.82
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.71
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.71
PointSourceFinite: -117.814, 33.812		9.43	5.75	1.65	117.814°W	33.812°N	0.00	1.46
PointSourceFinite: -117.814, 33.812		9.43	5.75	1.65	117.814°W	33.812°N	0.00	1.46
PointSourceFinite: -117.814, 33.830		10.41	5.96	1.68	117.814°W	33.830°N	0.00	1.05
PointSourceFinite: -117.814, 33.830		10.41	5.96	1.68	117.814°W	33.830°N	0.00	1.05
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01

Appendix E

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-1
Depth (in): 150 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	3:40	11	111.6	129.6	18.0
	3:51				
2	3:51	14	111.6	128.1	16.5
	4:05				

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
1:37	10	10	128.1	141.6	13.5	81.0
1:47						
1:53	10	26	116.4	138.0	21.6	129.6
2:03						
2:10	10	43	112.2	133.2	21.0	126.0
2:20						
2:25	10	58	112.2	131.4	19.2	115.2
2:35						
2:38	10	71	114.3	132.0	17.7	106.2
2:48						
2:49	10	82	115.2	132.0	16.8	100.8
2:59						

Initial Height of Water (Ho) = 34.8
Final Height of Water (Hf) = 18
Change in Height Over Time (ΔH) = 16.8
Average Head Over Time (Havg) = 26.4
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 7.1 in./hr.
C x I_t = **3.5** **in./hr.**

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-2
Depth (in): 145.2 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	1:55 2:07	12	99.6	113.4	13.8
2	2:07 2:25	18	113.4	130.2	16.8

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
2:27 2:37	10	10	100.8	114.6	13.8	82.8
2:39 2:49	10	22	114.6	127.2	12.6	75.6
2:59 3:09	10	42	100.8	112.8	12.0	72.0
3:09 3:19	10	52	100.8	112.2	11.4	68.4
3:21 3:31	10	64	100.8	112.8	12.0	72.0
3:33 3:43	10	76	101.7	111.6	9.9	59.4

Initial Height of Water (Ho) = 43.5
Final Height of Water (Hf) = 33.6
Change in Height Over Time (ΔH) = 9.9
Average Head Over Time (Havg) = 38.6
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 2.9 in./hr.
C x I_t = **1.5** **in./hr.**

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-3
Depth (in): 135 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	2:44 2:51	7	99.0	106.8	7.8
2	2:51 3:00	9	106.8	120	13.2

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
3:02 3:12	10	10	99.0	119.4	20.4	122.4
3:12 3:22	10	20	102.6	121.2	18.6	111.6
3:24 3:34	10	32	99.6	118.2	18.6	111.6
3:38 3:48	10	46	99.6	118.2	18.6	111.6
3:49 3:59	10	57	101.1	118.8	17.7	106.2
4:01 4:11	10	69	100.2	115.8	15.6	93.6

Initial Height of Water (Ho) = 34.8
Final Height of Water (Hf) = 19.2
Change in Height Over Time (ΔH) = 15.6
Average Head Over Time (Havg) = 27
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 6.5 in./hr.
C x I_t = **3.2** **in./hr.**

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-4
Depth (in): 132 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	3:40 3:51	11	93.6	105	11.4
2	3:51 4:05	14	105	116.4	11.4

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
4:06 4:16	10	10	100.8	115.8	15.0	90.0
4:17 4:27	10	21	96.0	114.0	18.0	108.0
4:40 4:50	10	44	100.5	118.8	18.3	109.8
4:51 5:01	10	55	100.8	114.9	14.1	84.6
5:02 5:12	10	66	97.8	114.0	16.2	97.2
5:14 5:24	10	78	97.8	111.0	13.2	79.2

Initial Height of Water (Ho) = 34.2
Final Height of Water (Hf) = 21.0
Change in Height Over Time (ΔH) = 13.2
Average Head Over Time (Havg) = 27.6
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 5.4 in./hr.
C x I_t = **2.7** **in./hr.**

Appendix F

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

LIQUEFACTION ANALYSIS REPORT

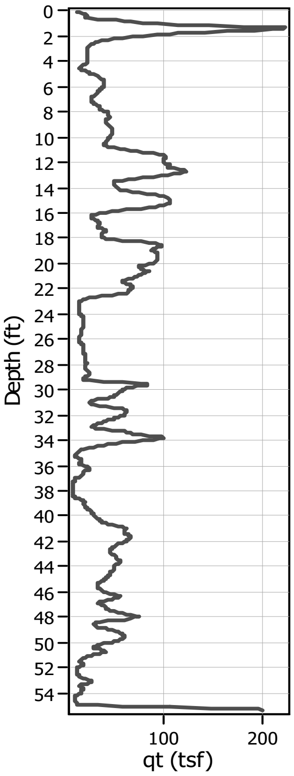
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

CPT file : CPT-1

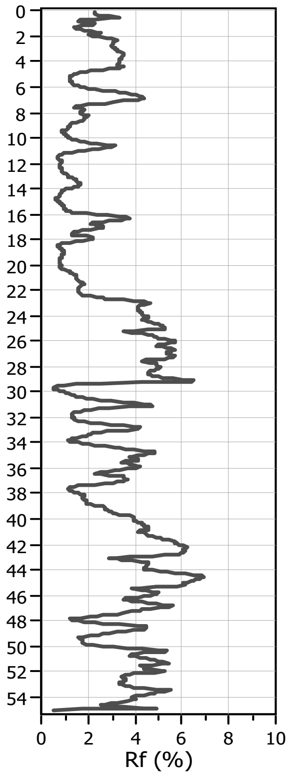
Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

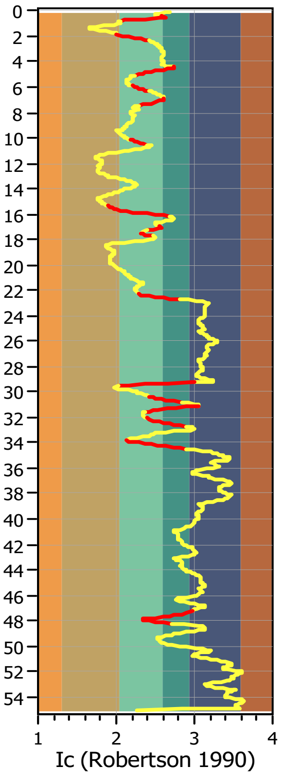
Cone resistance



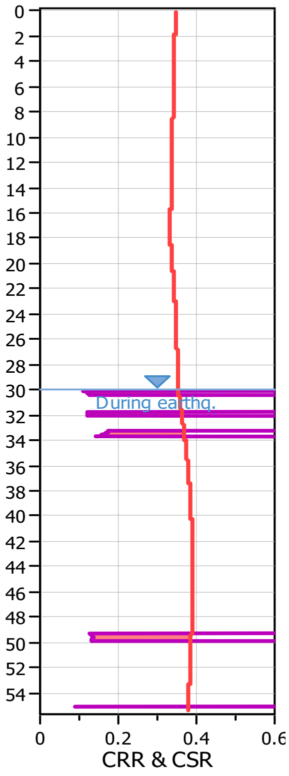
Friction Ratio



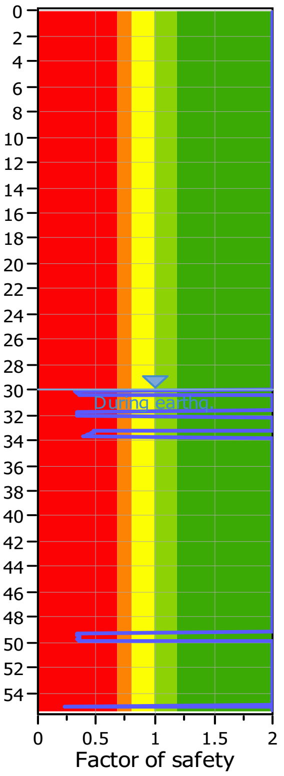
SBTn Plot



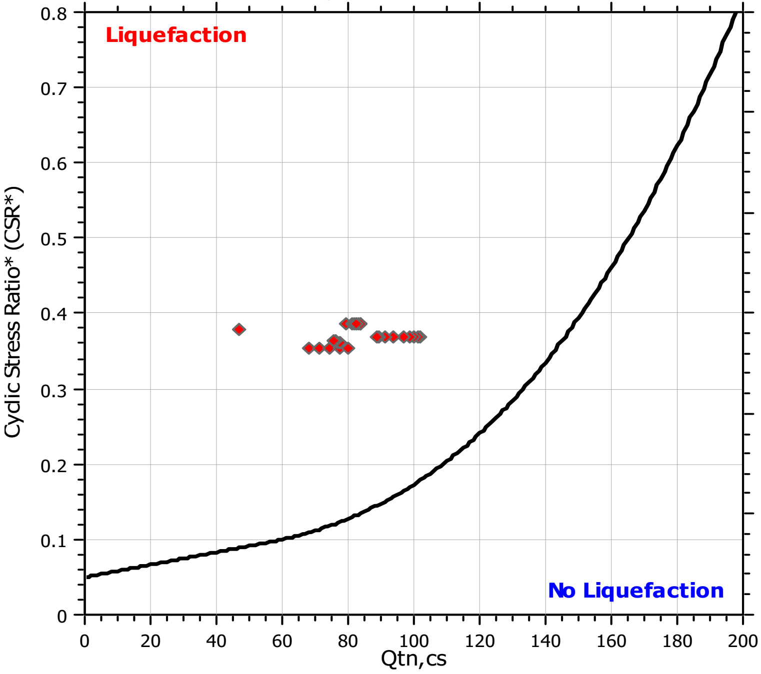
CRR plot



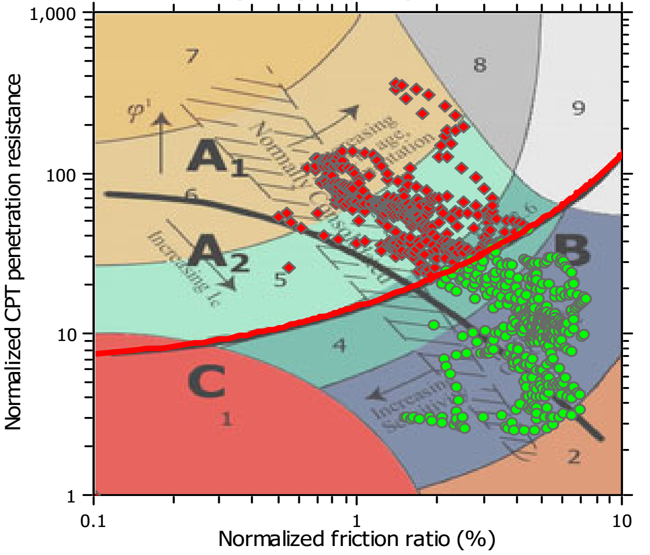
FS Plot



$M_w=7^{1/2}$, sigma'=1 atm base curve

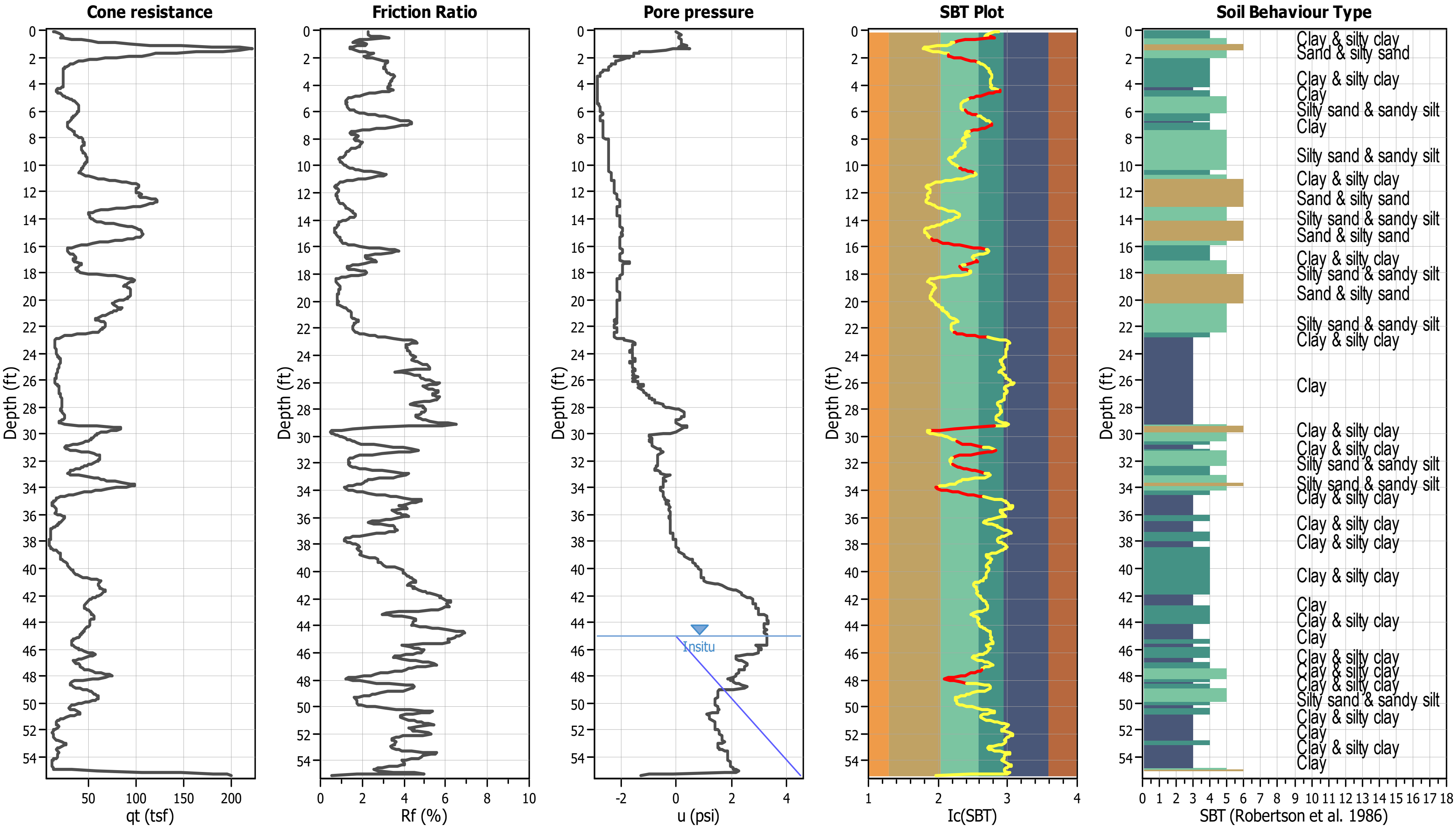


Summary of liquefaction potential



Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



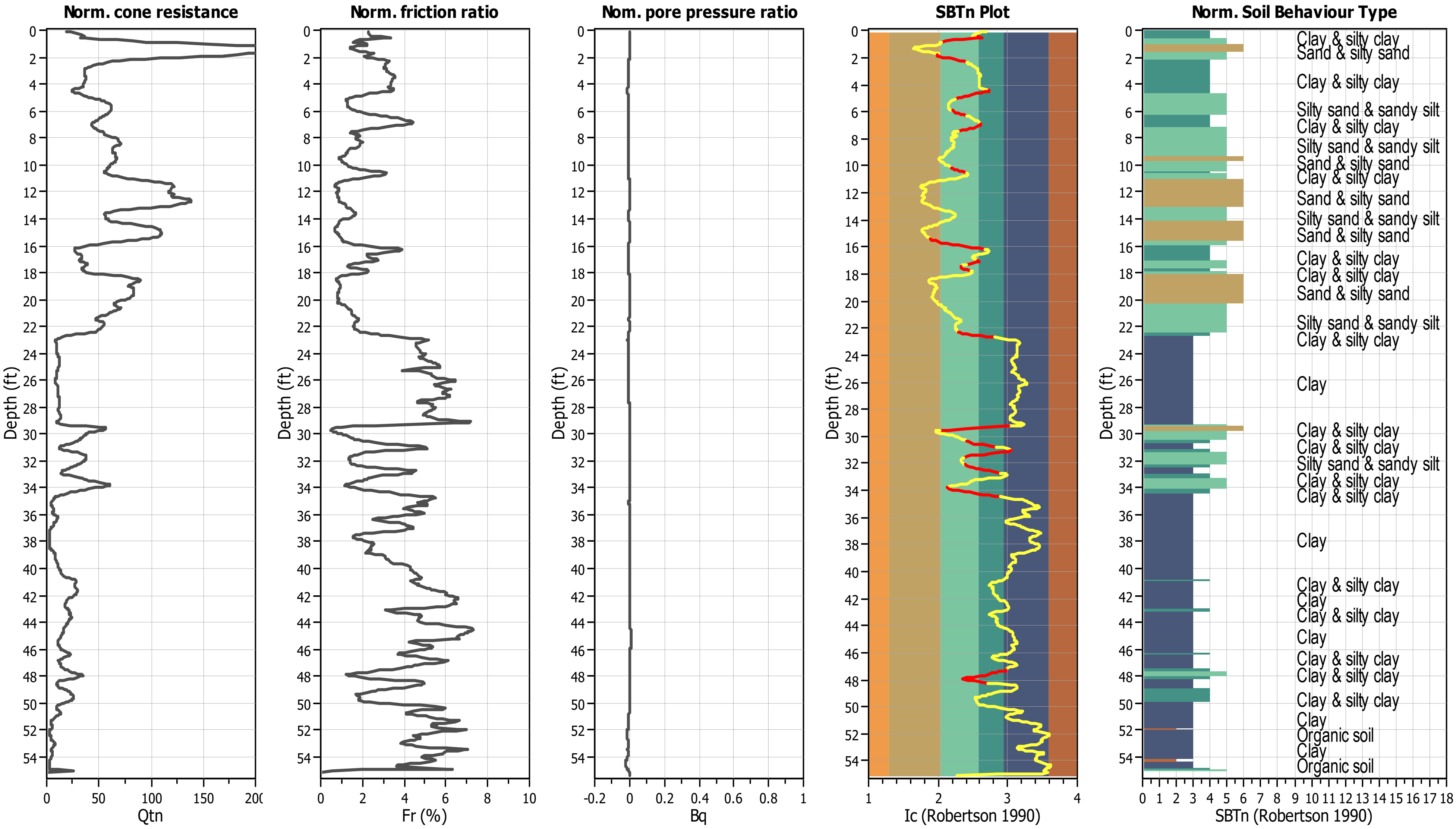
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬜ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



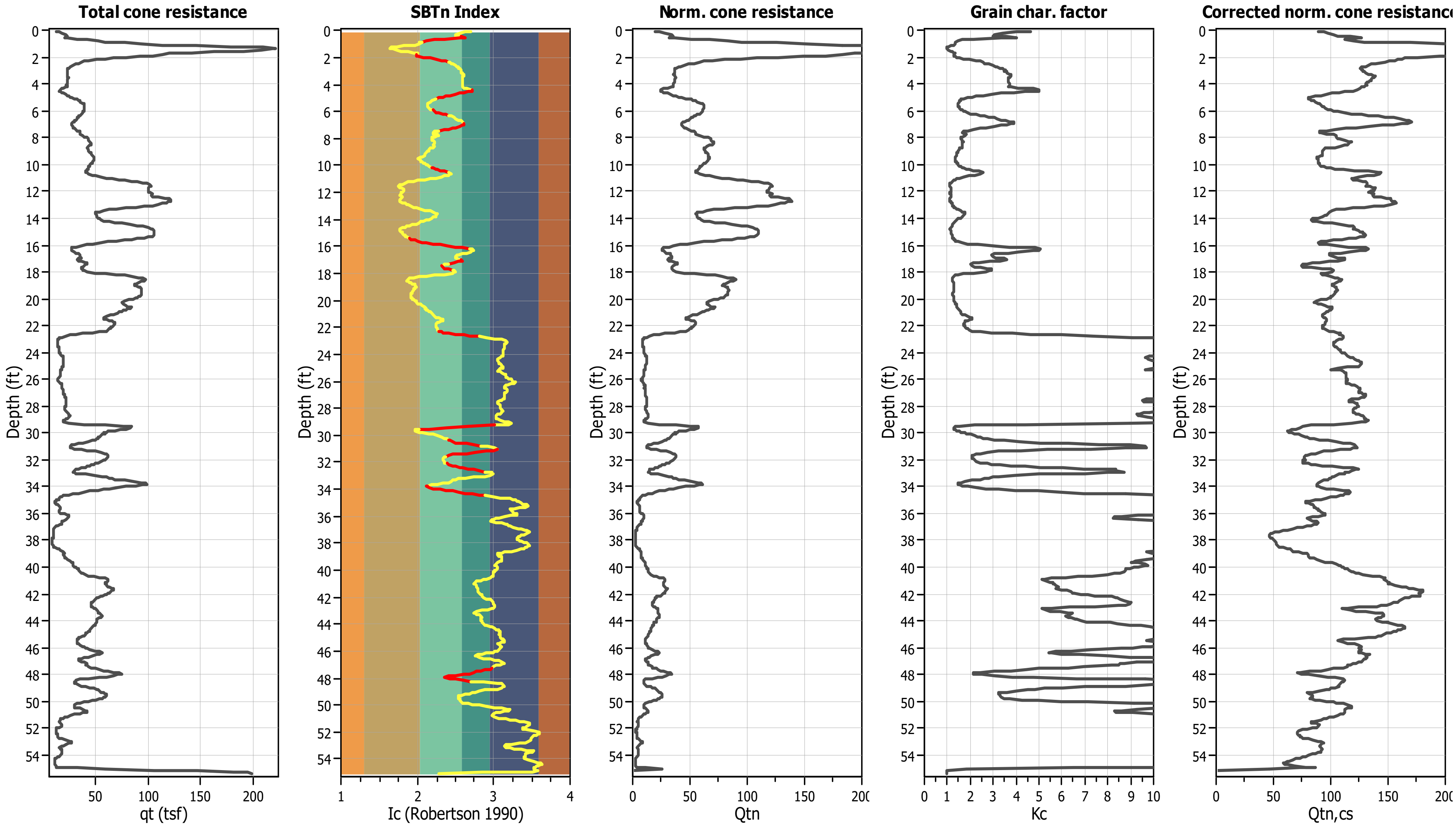
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

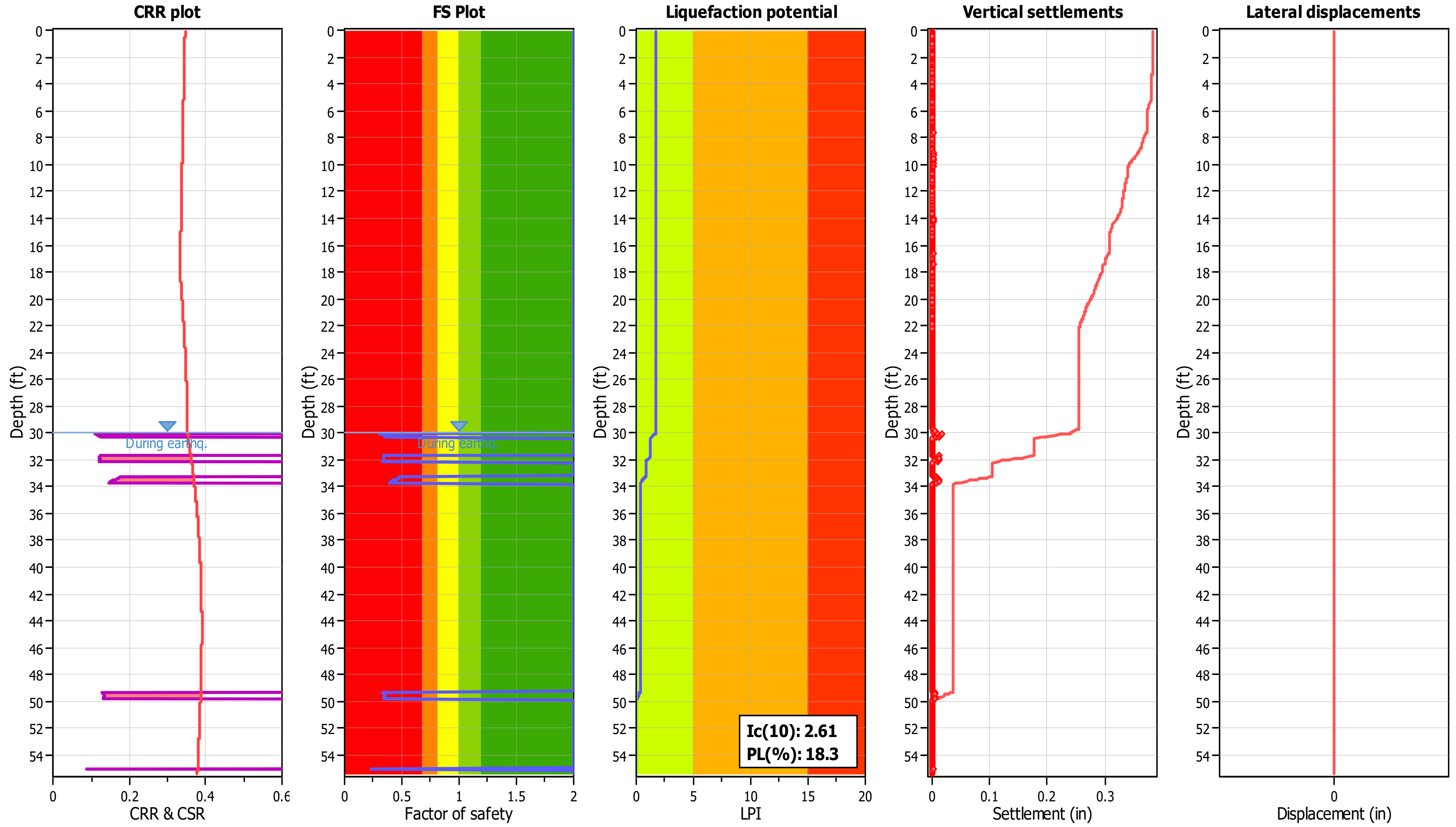
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

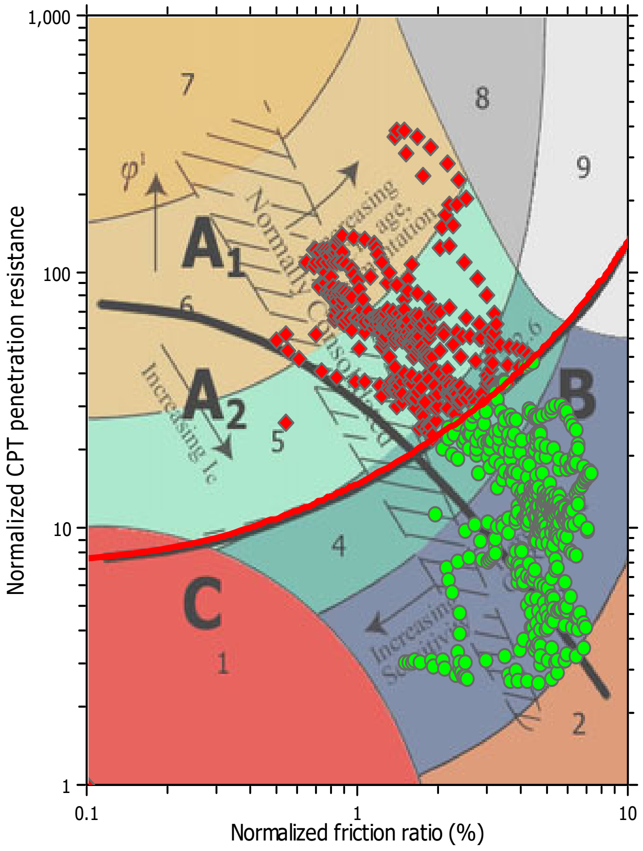
F.S. color scheme

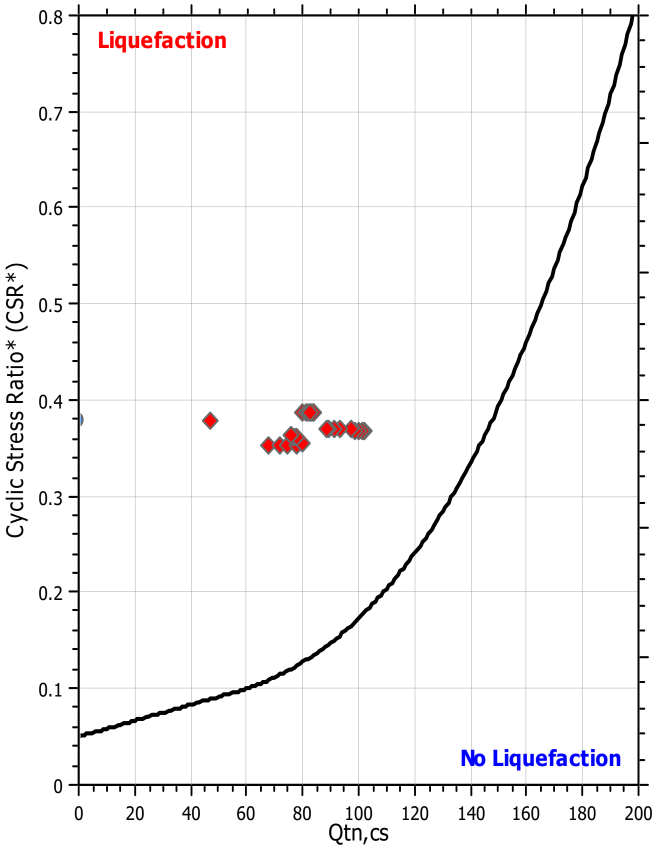
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

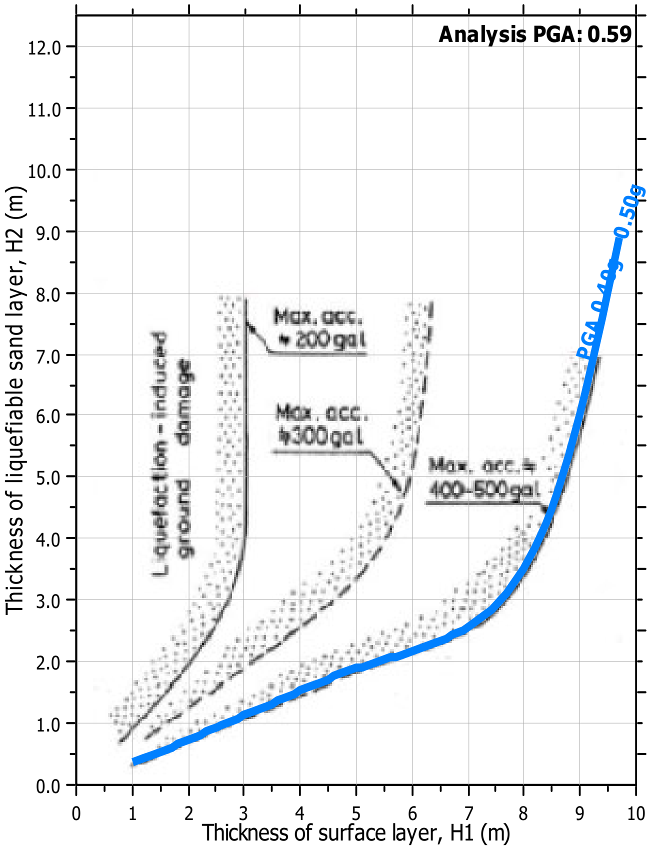
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟨 Low risk

Liquefaction analysis summary plots



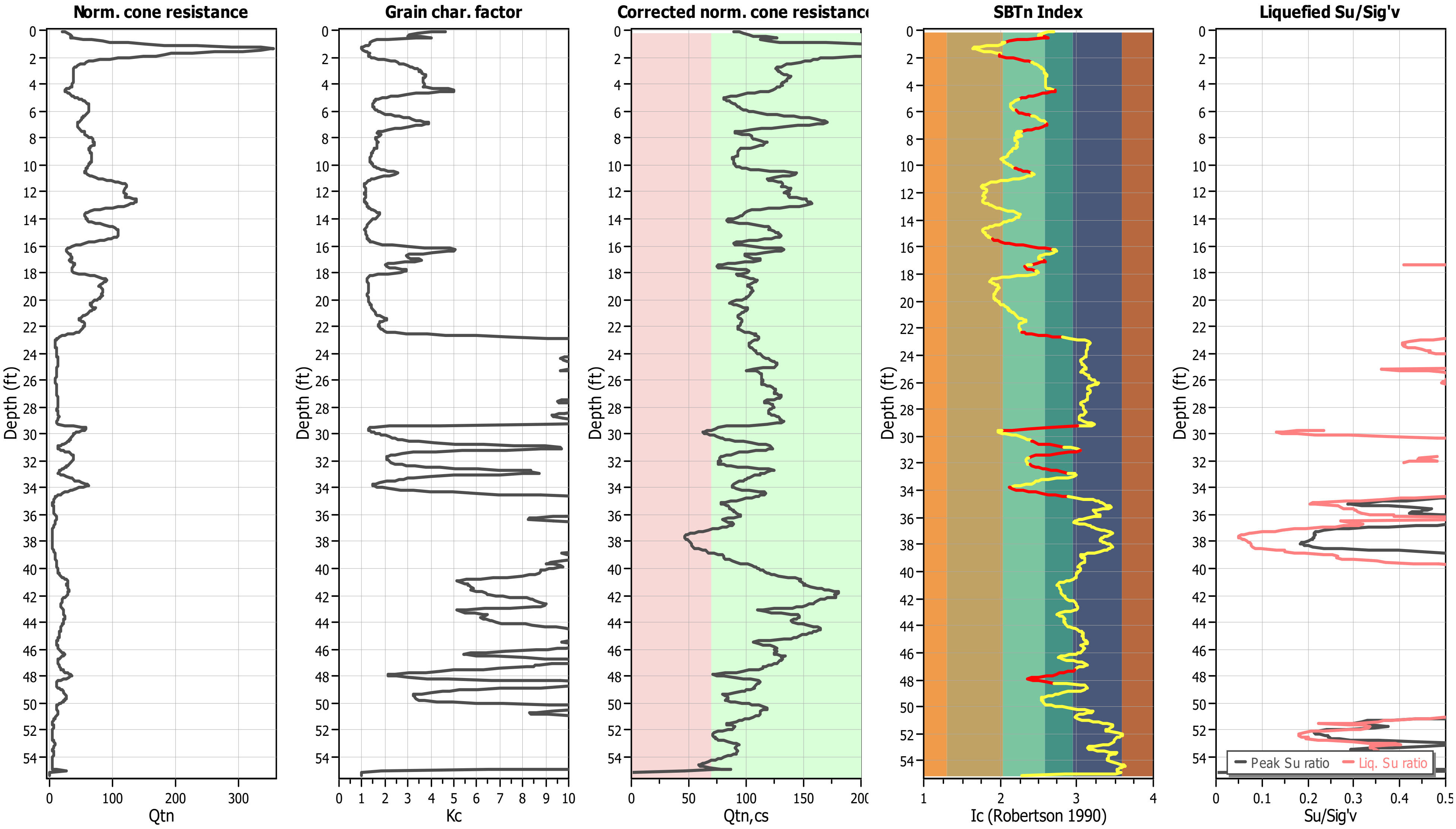




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SA Geotechnical, Inc.
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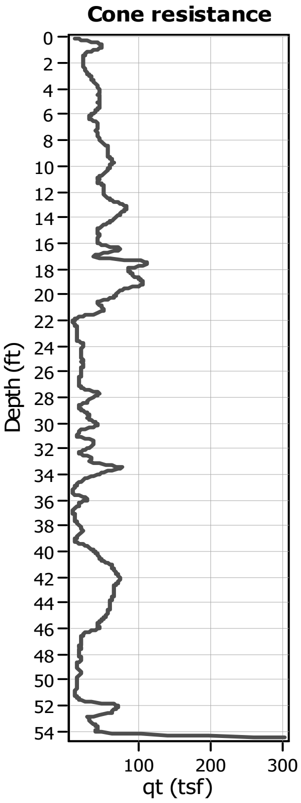
LIQUEFACTION ANALYSIS REPORT

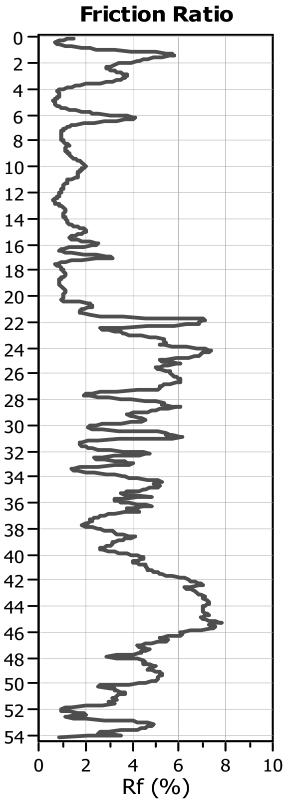
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

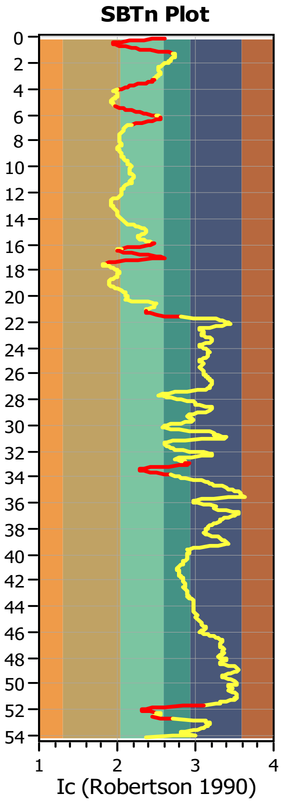
CPT file : CPT-2

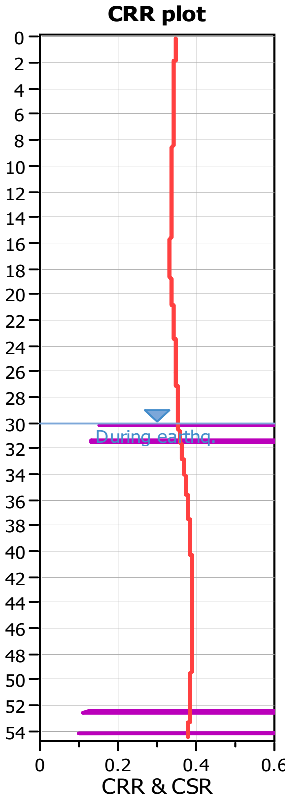
Input parameters and analysis data

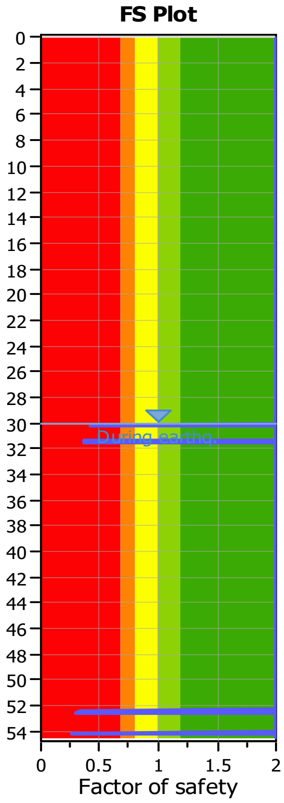
Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based

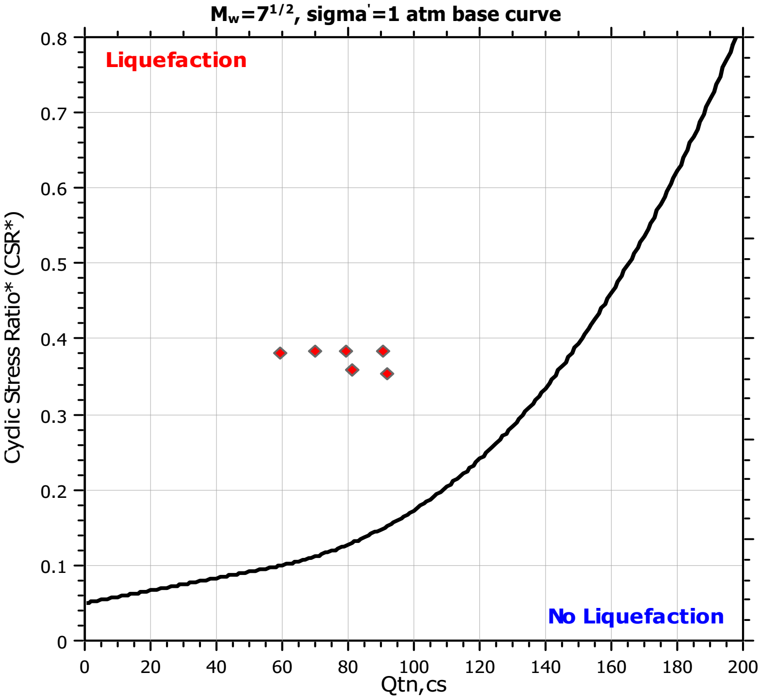


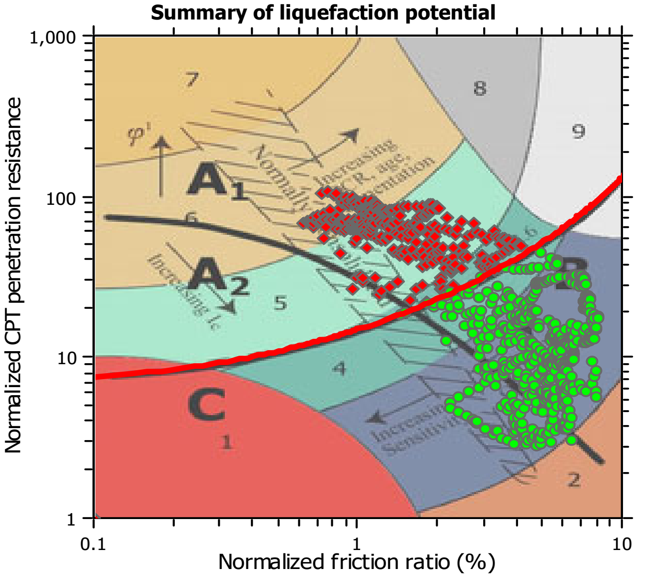












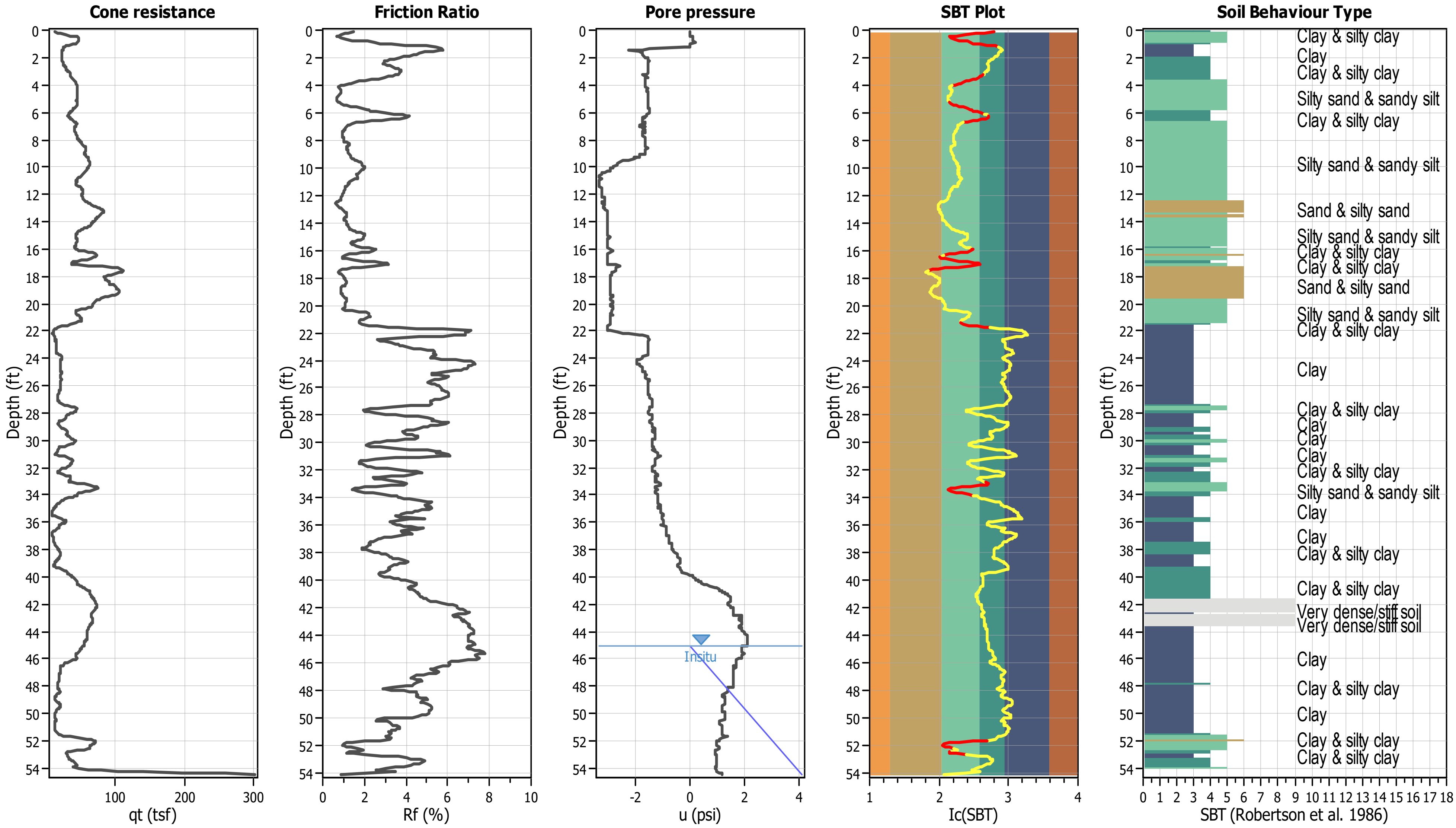
Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading

Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry

Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening

Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



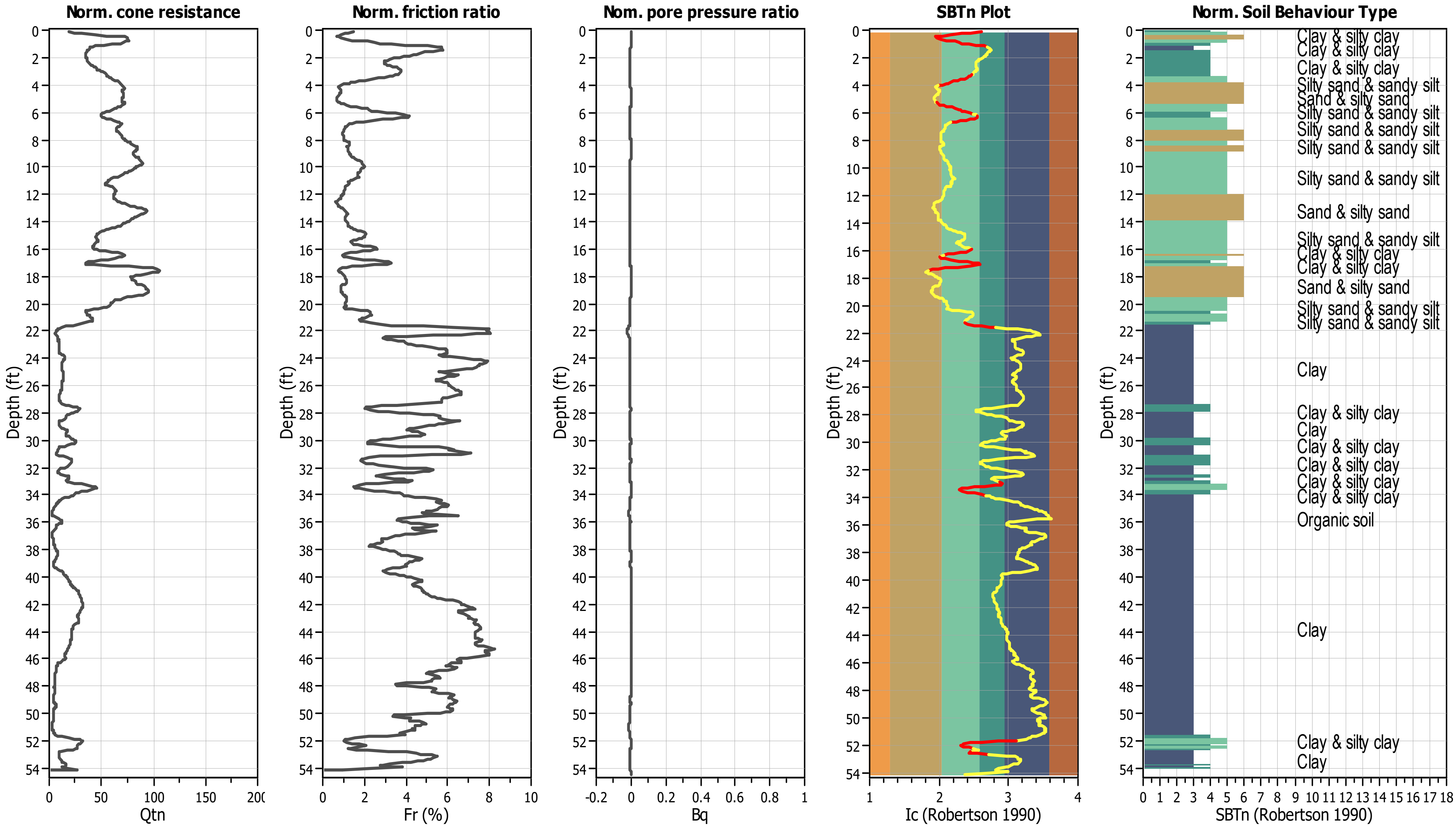
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟫 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



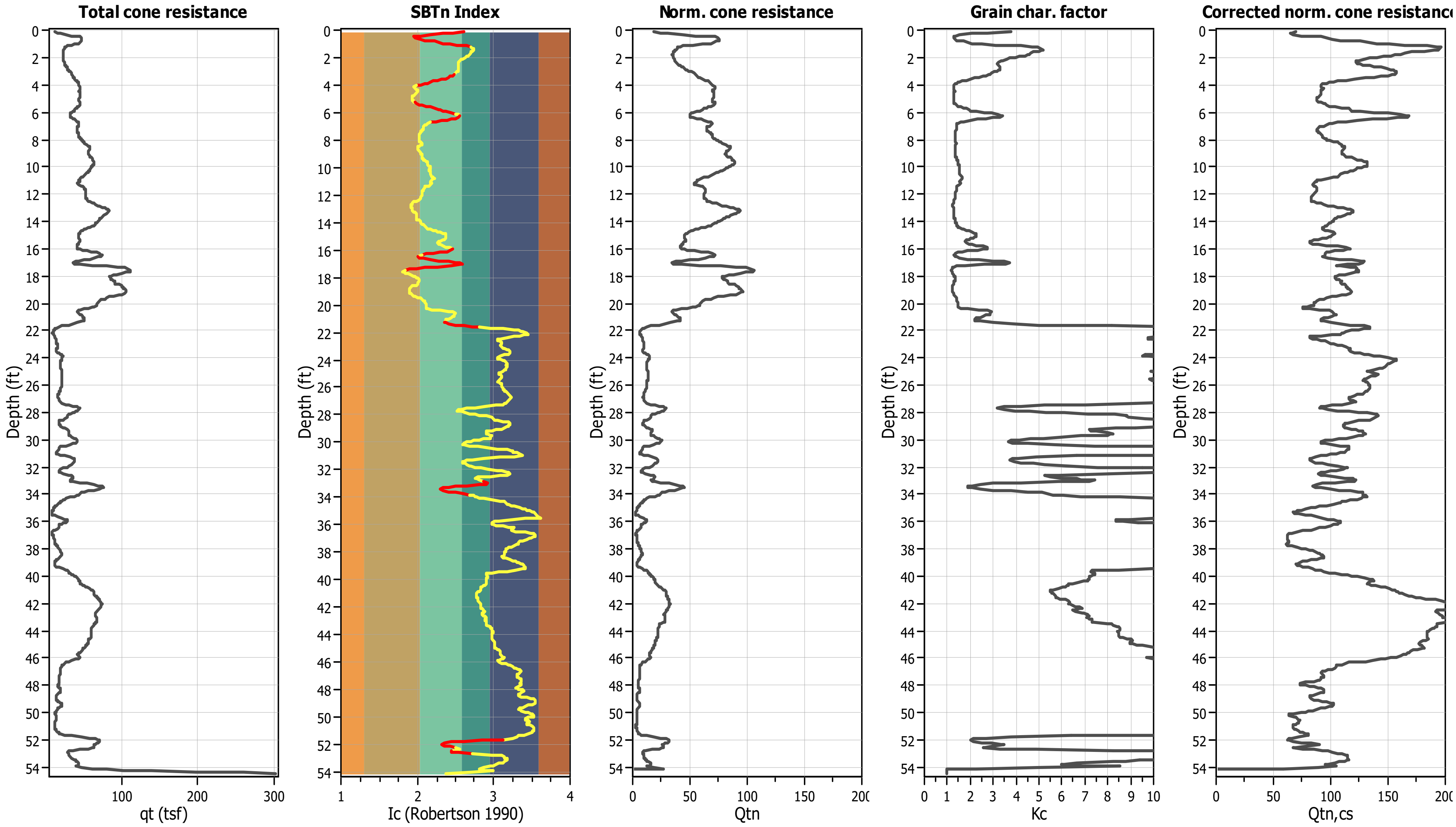
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

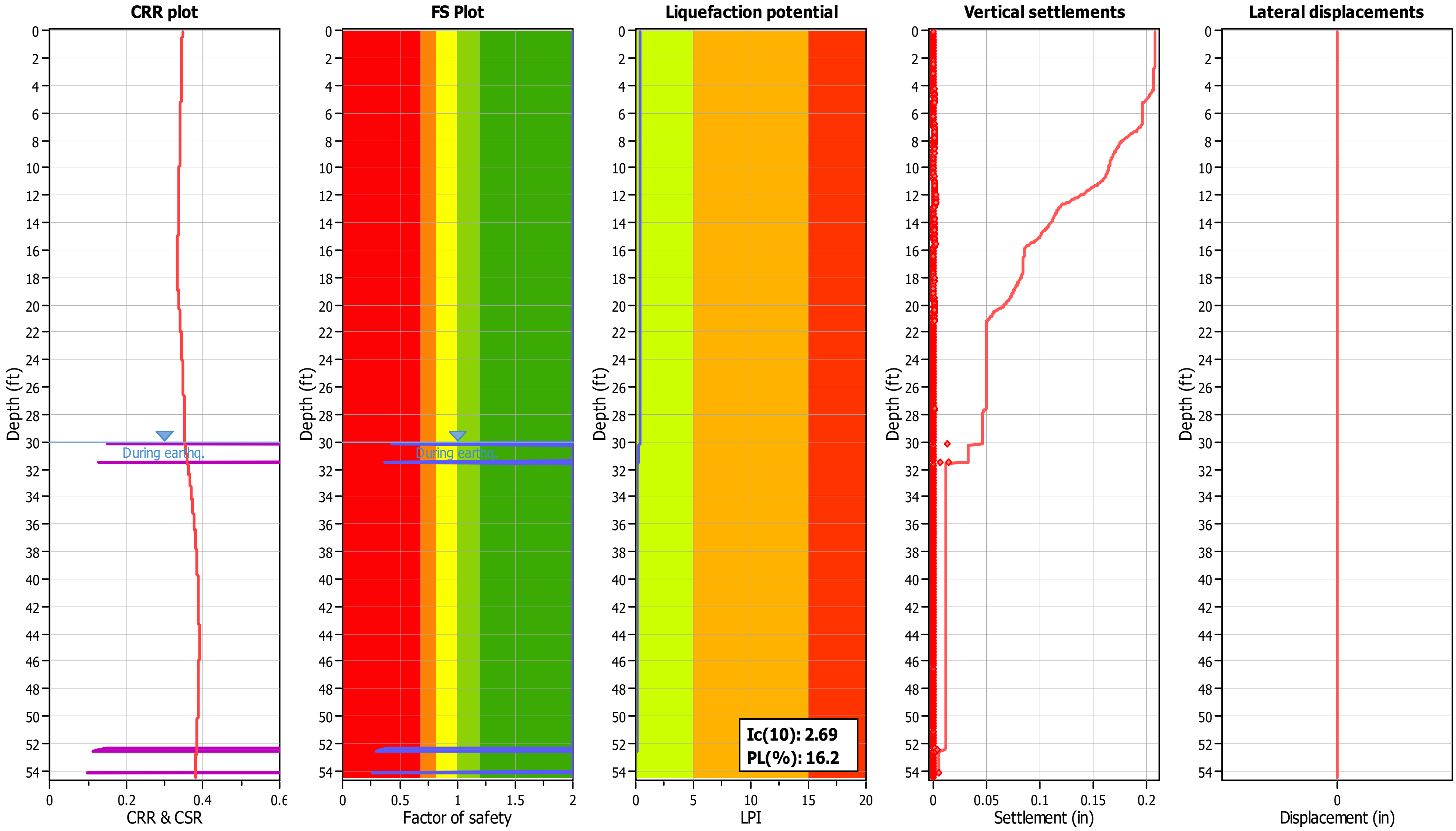
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

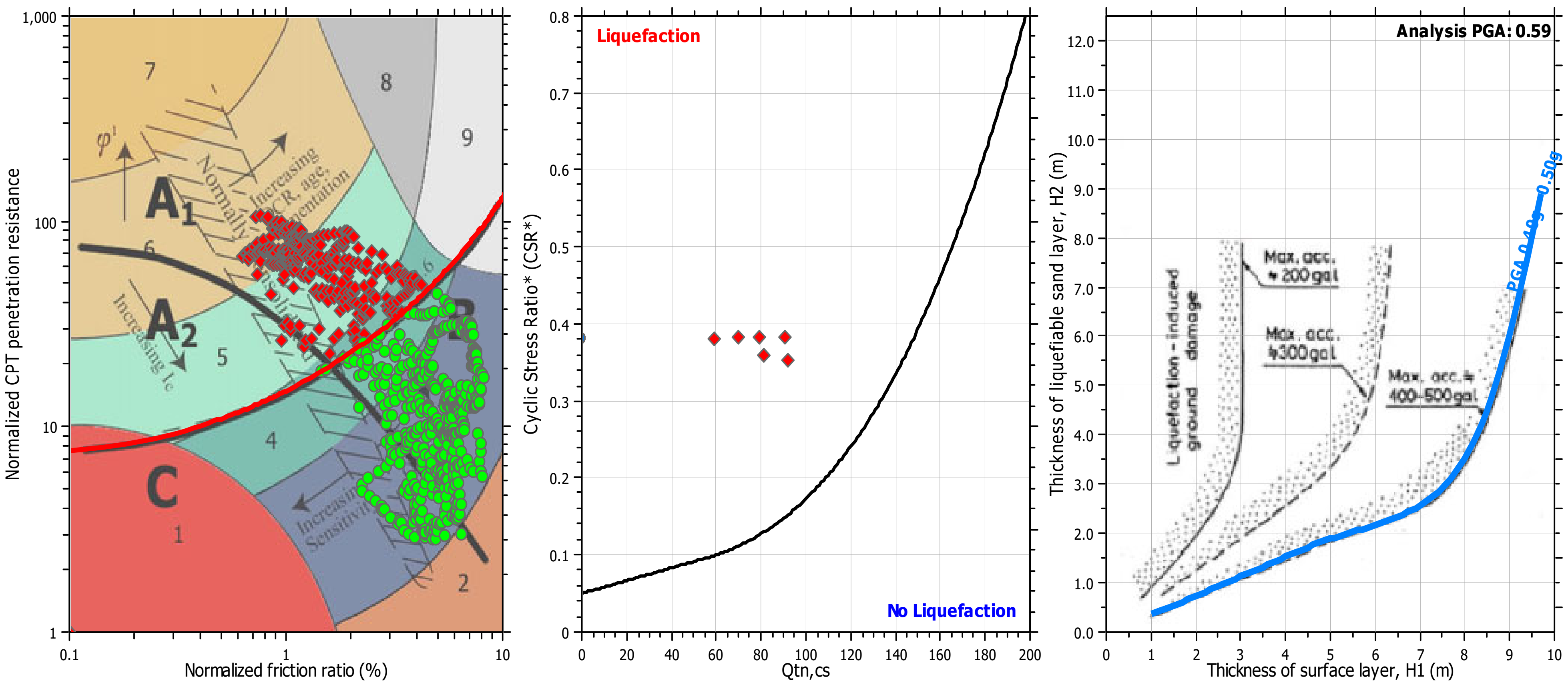
F.S. color scheme

- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟨 Low risk

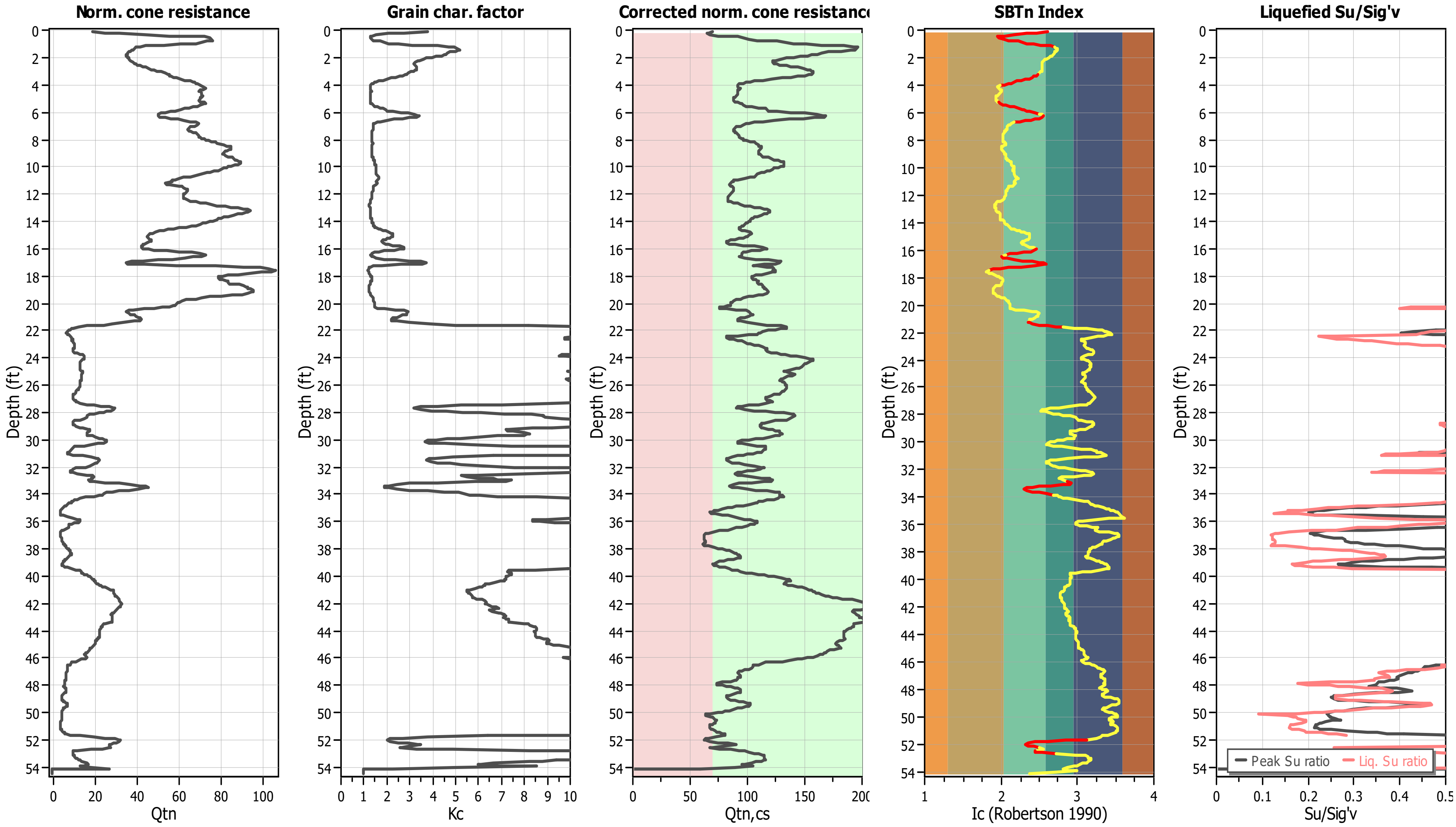
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

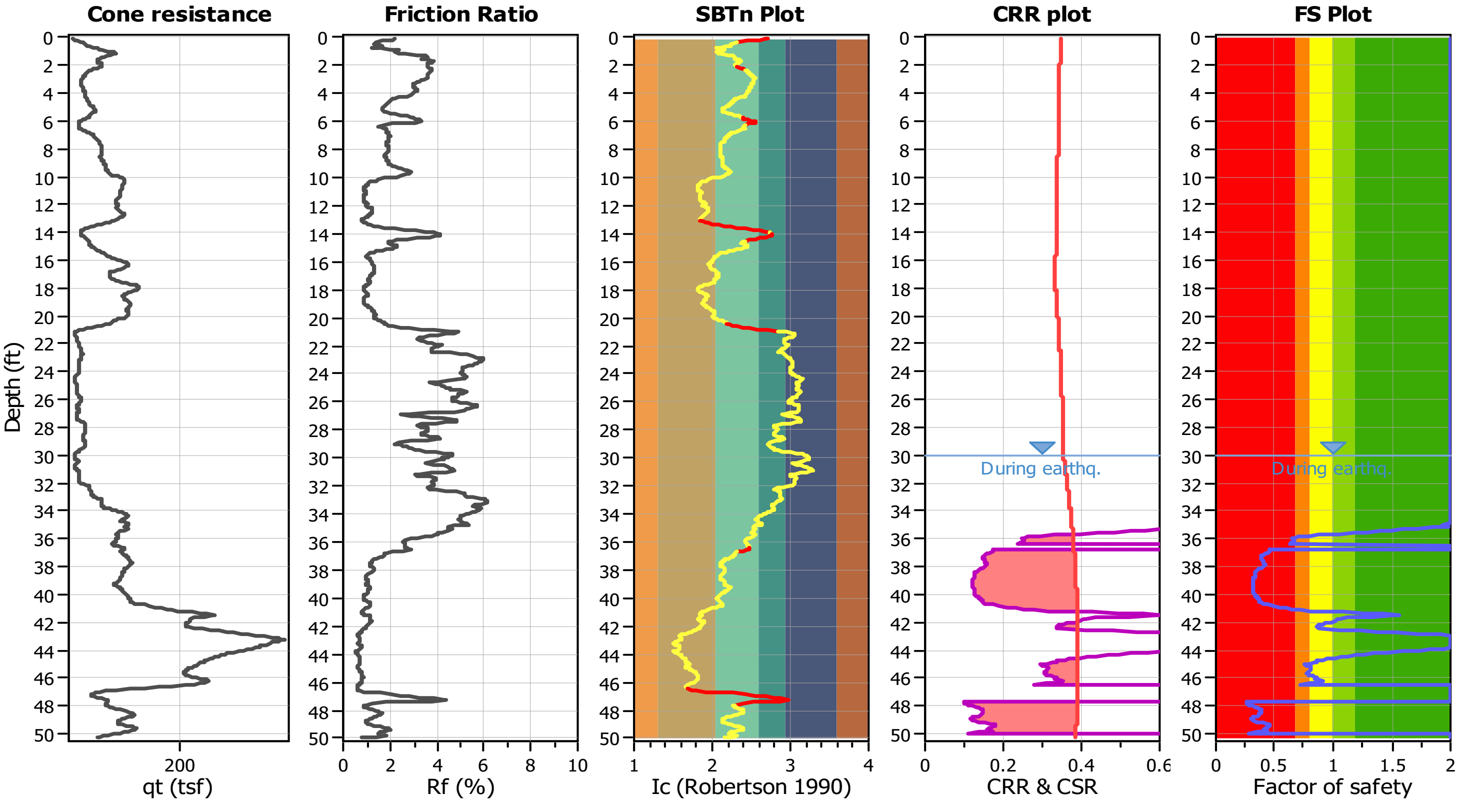
LIQUEFACTION ANALYSIS REPORT

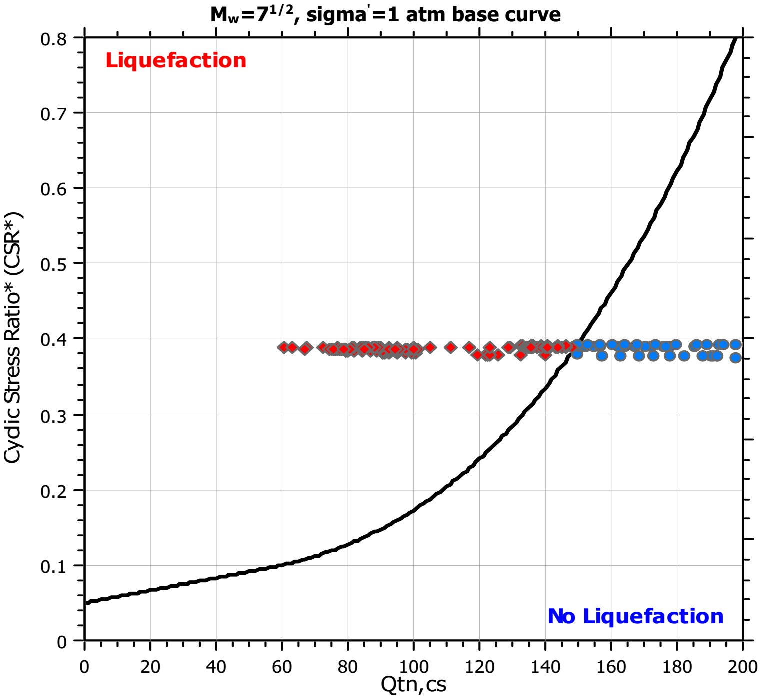
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

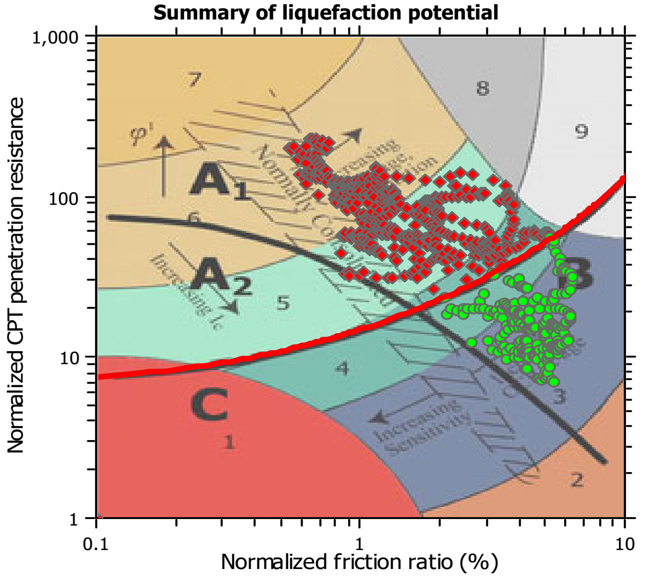
CPT file : CPT-3

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

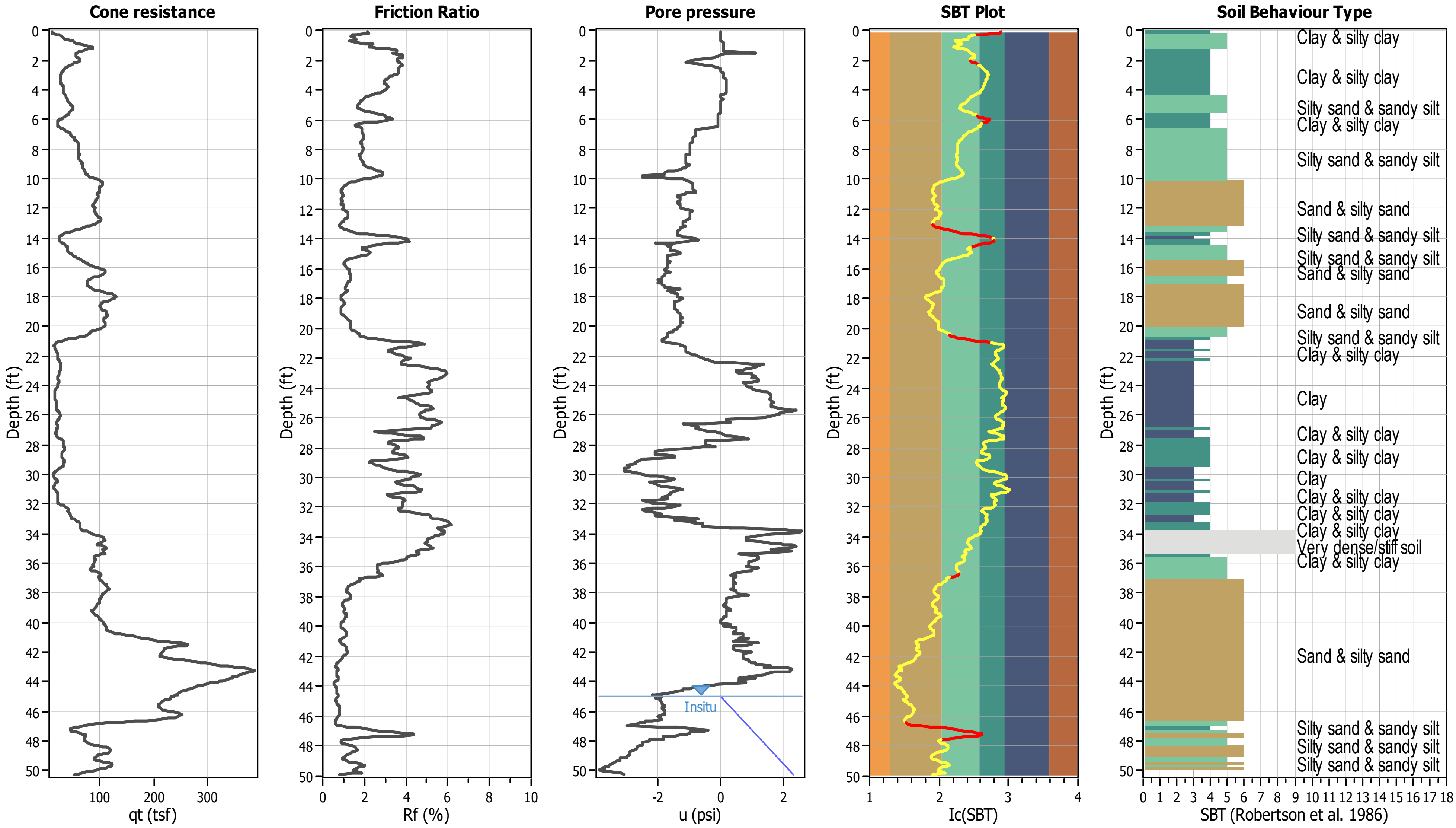






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



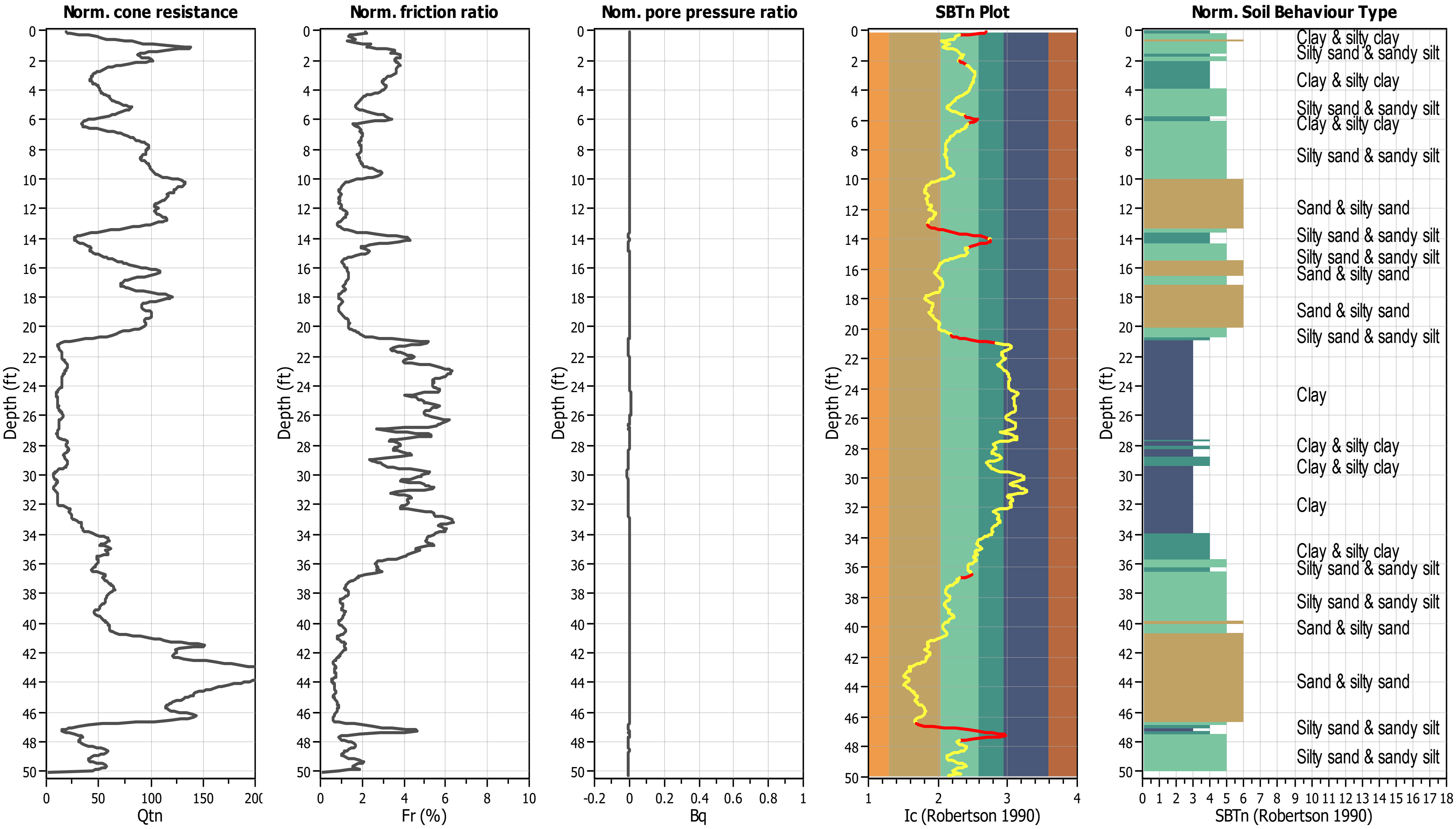
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



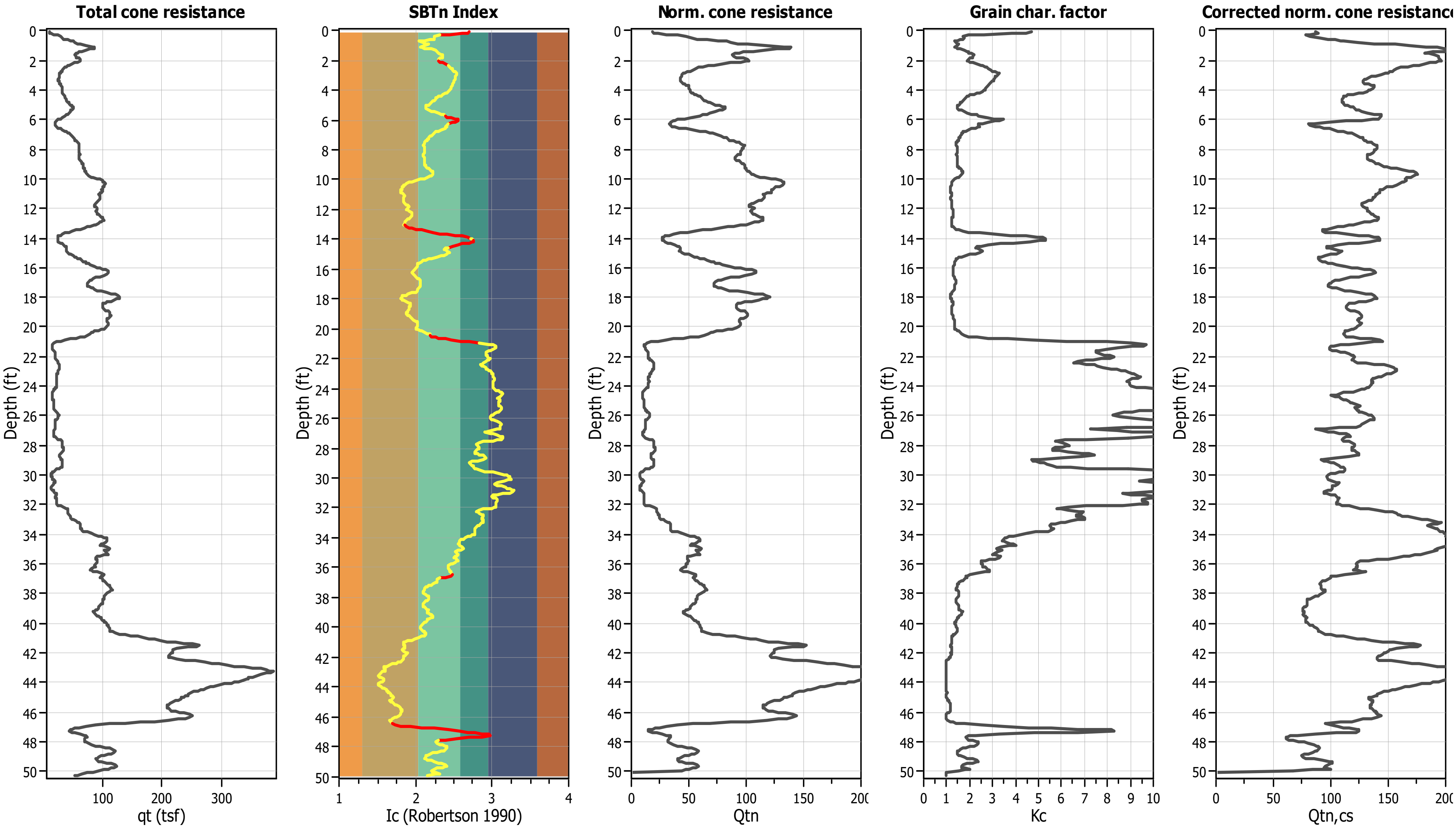
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

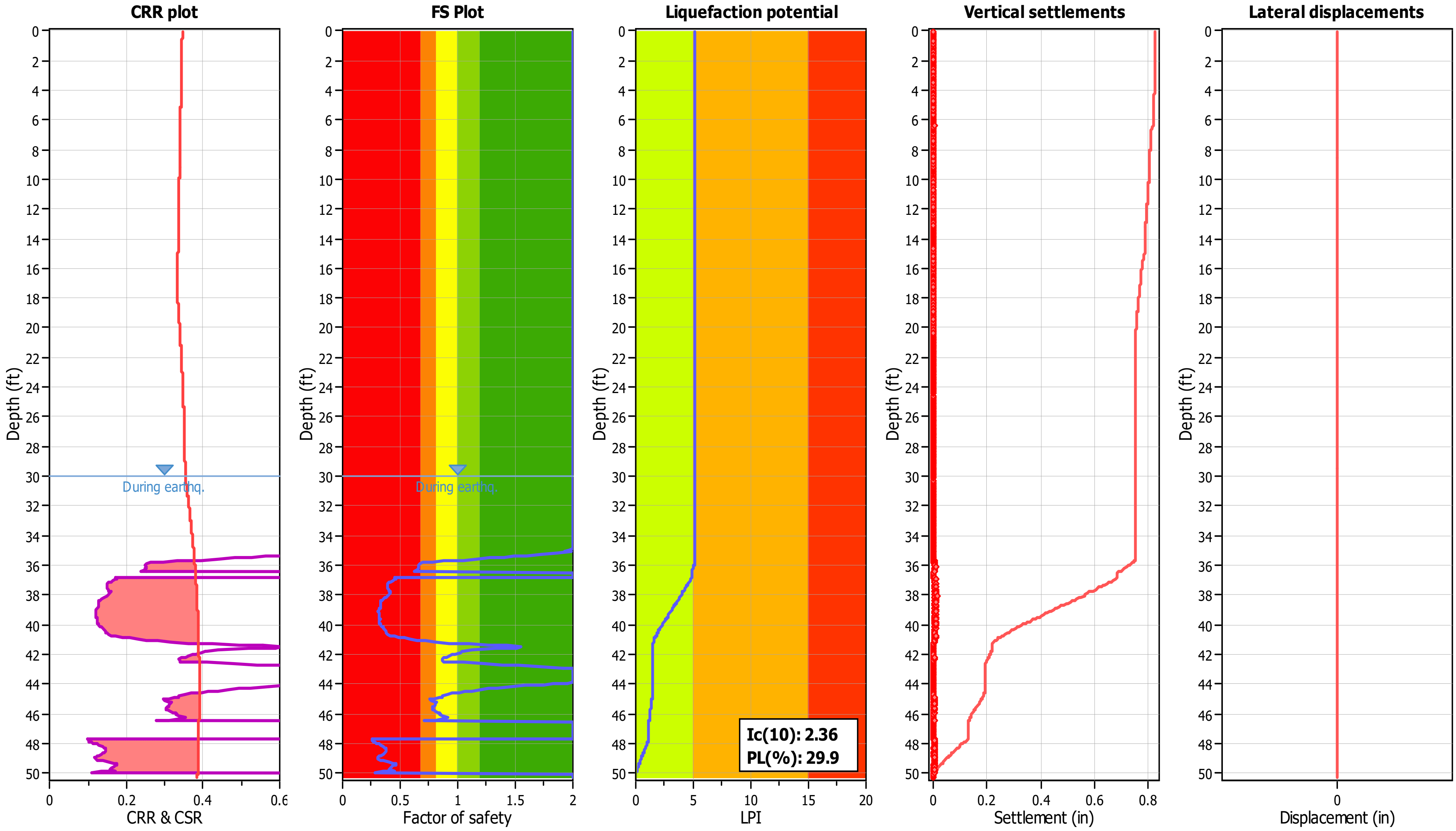
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

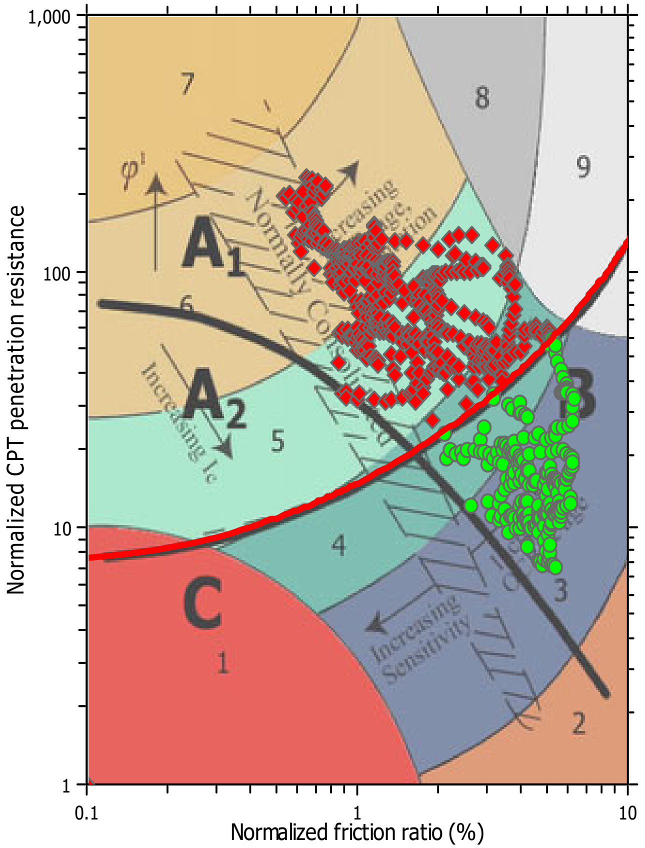
F.S. color scheme

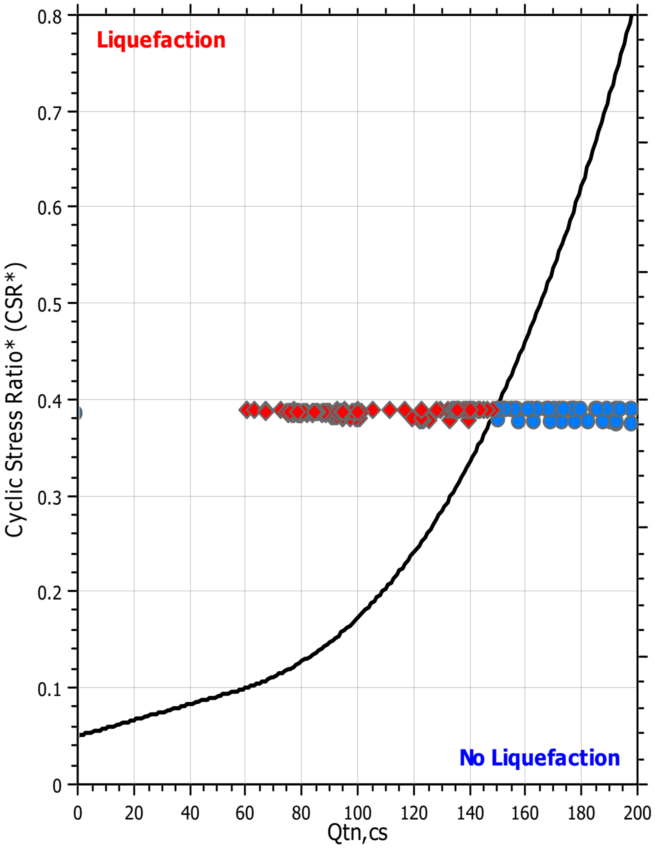
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

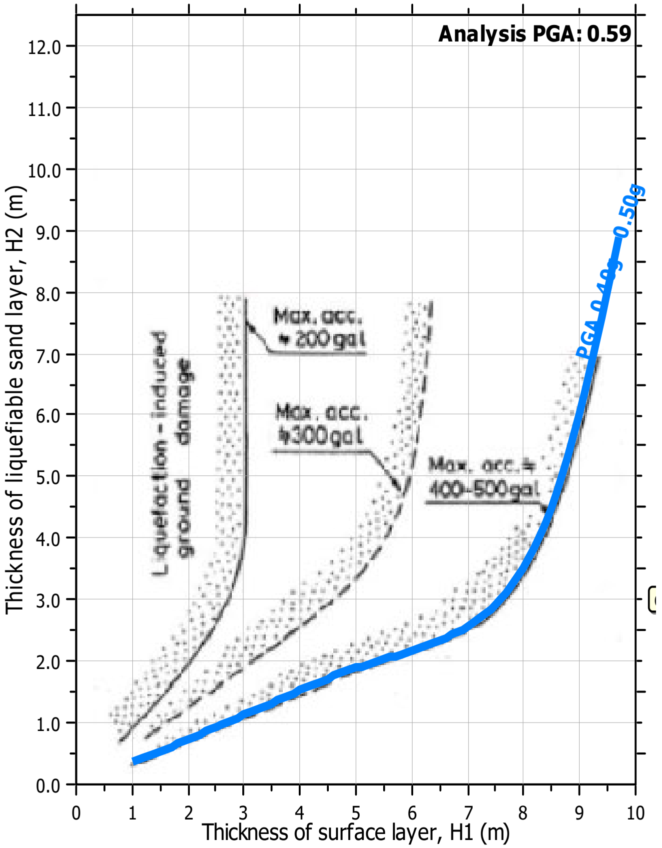
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟨 Low risk

Liquefaction analysis summary plots



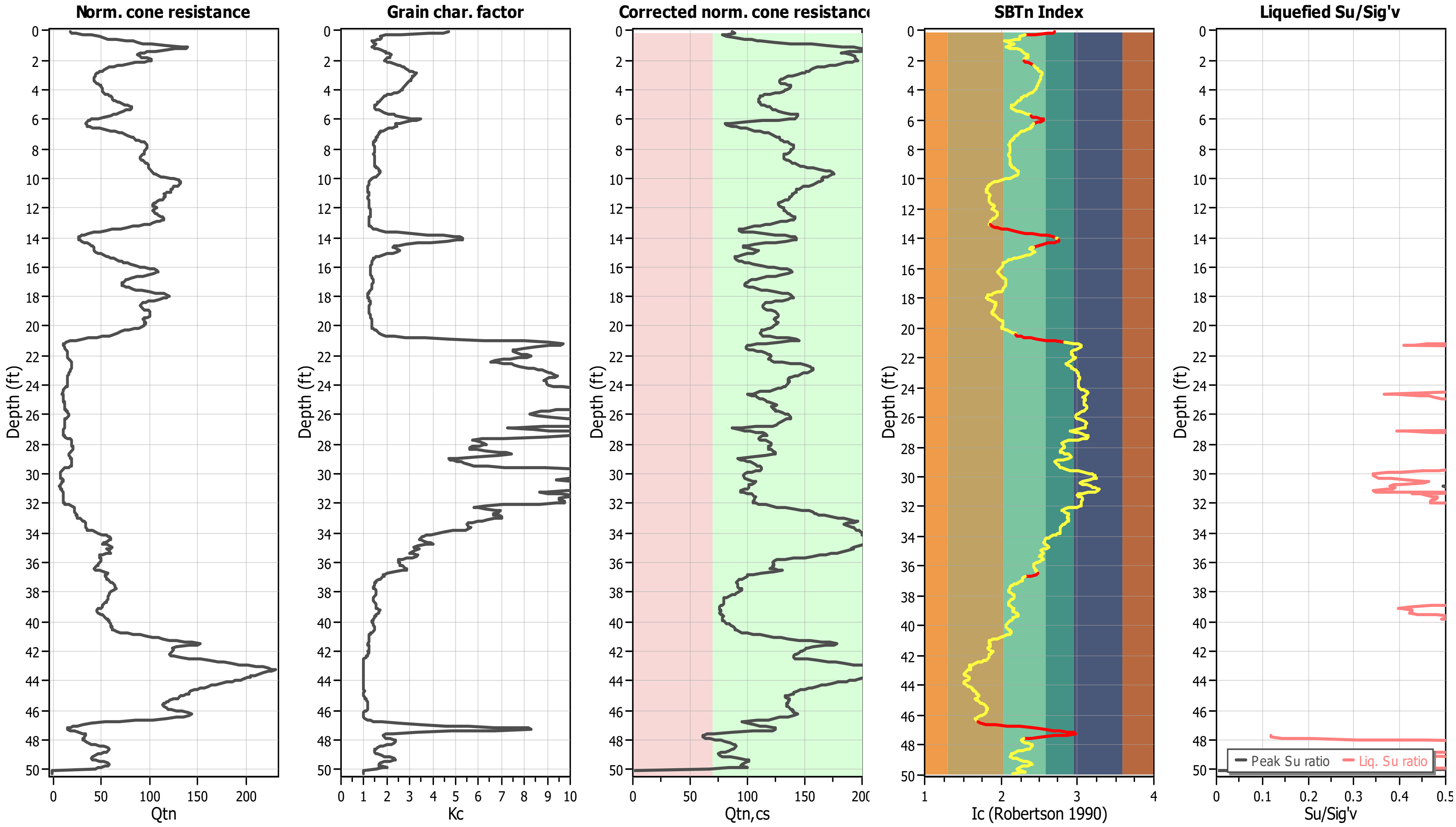




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

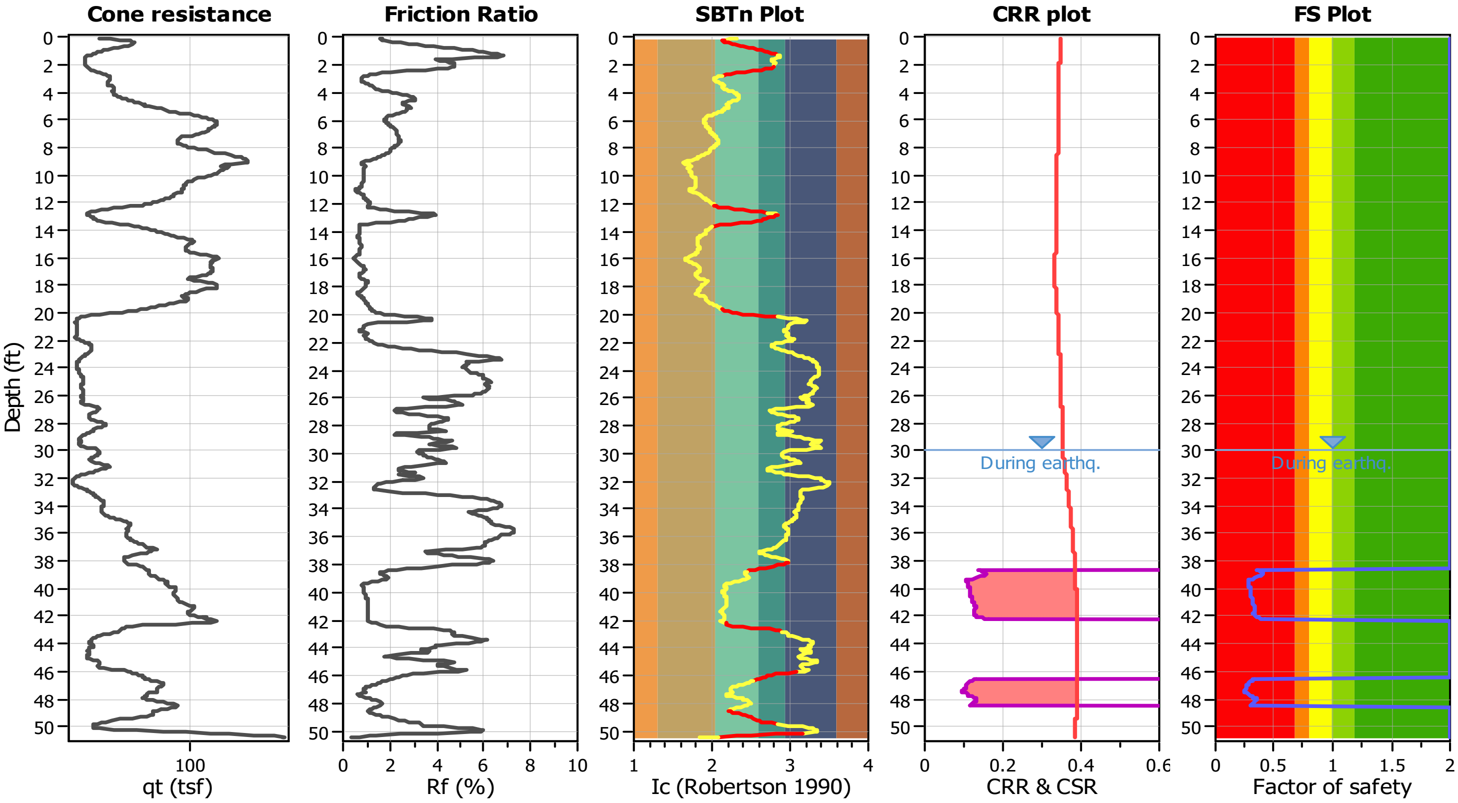
LIQUEFACTION ANALYSIS REPORT

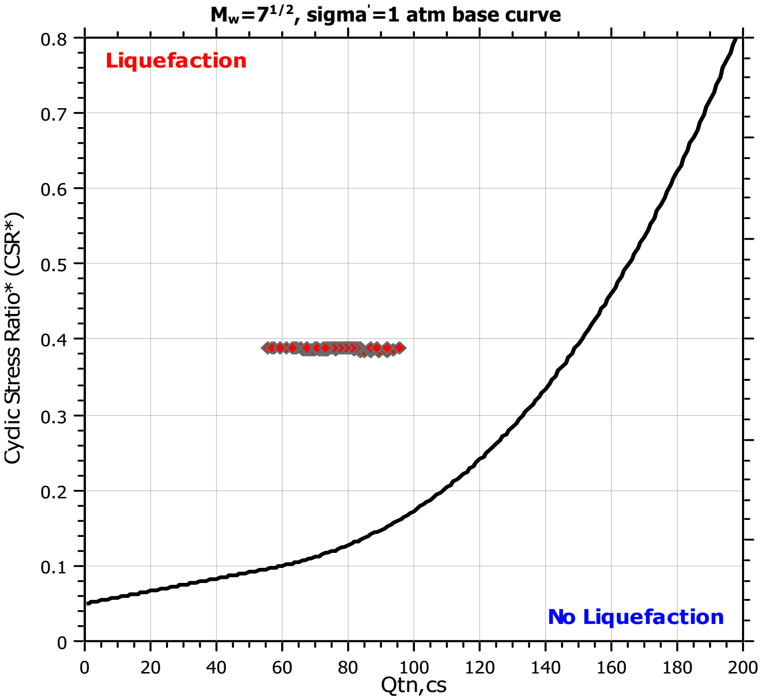
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

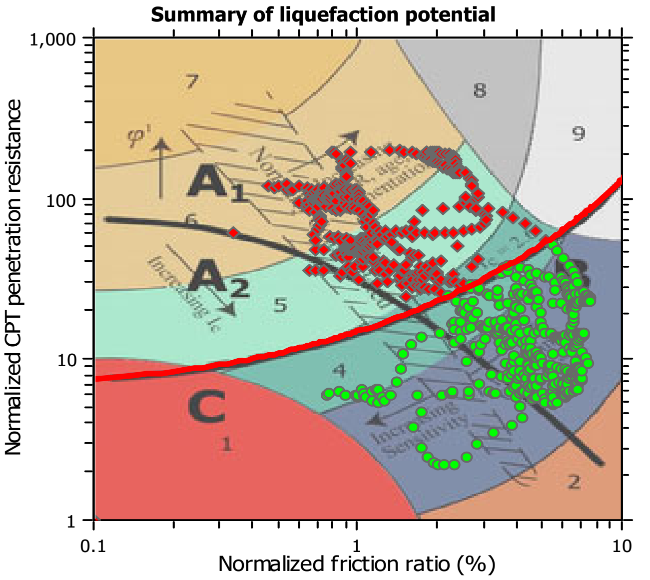
CPT file : CPT-4

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

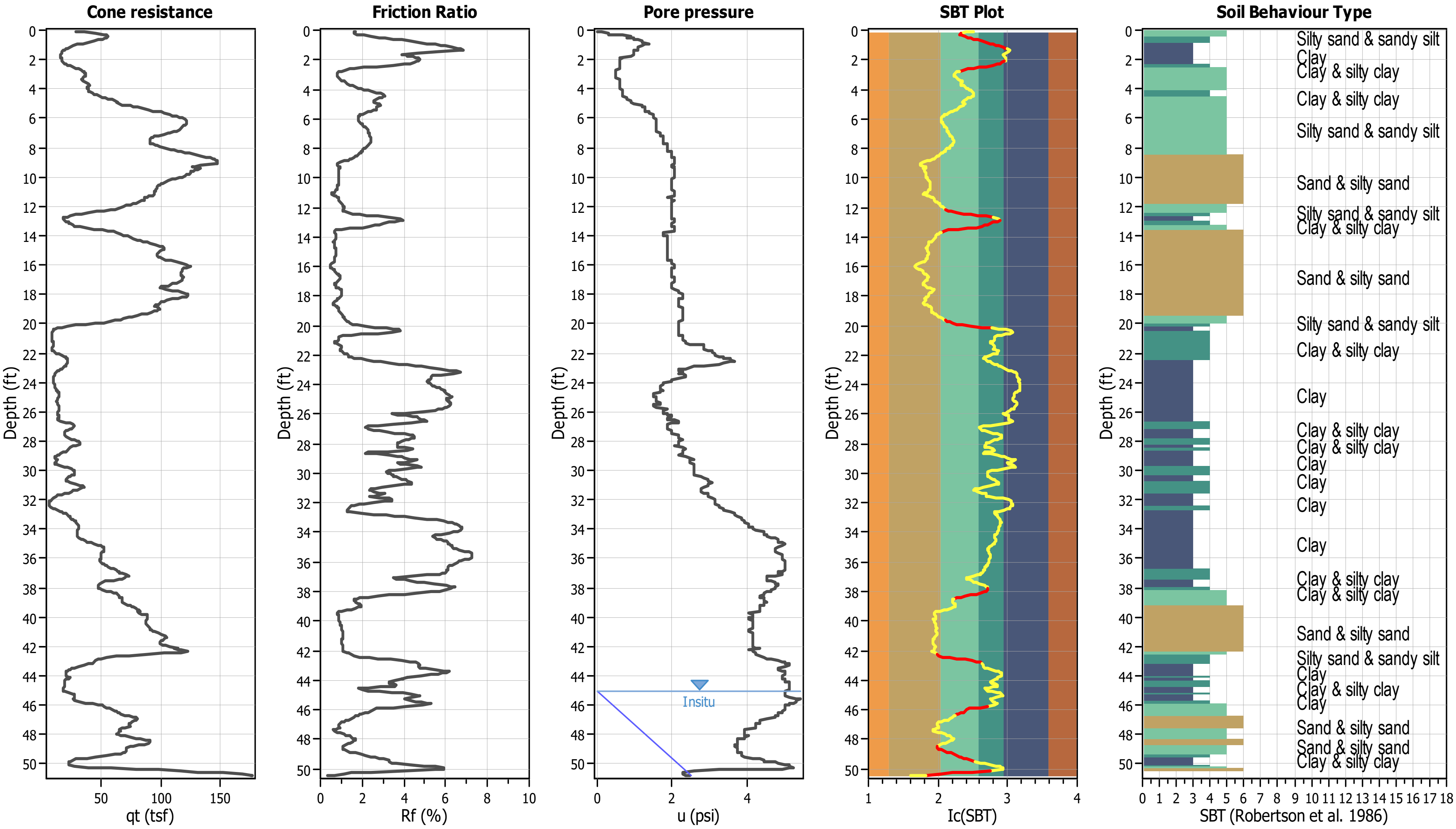






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



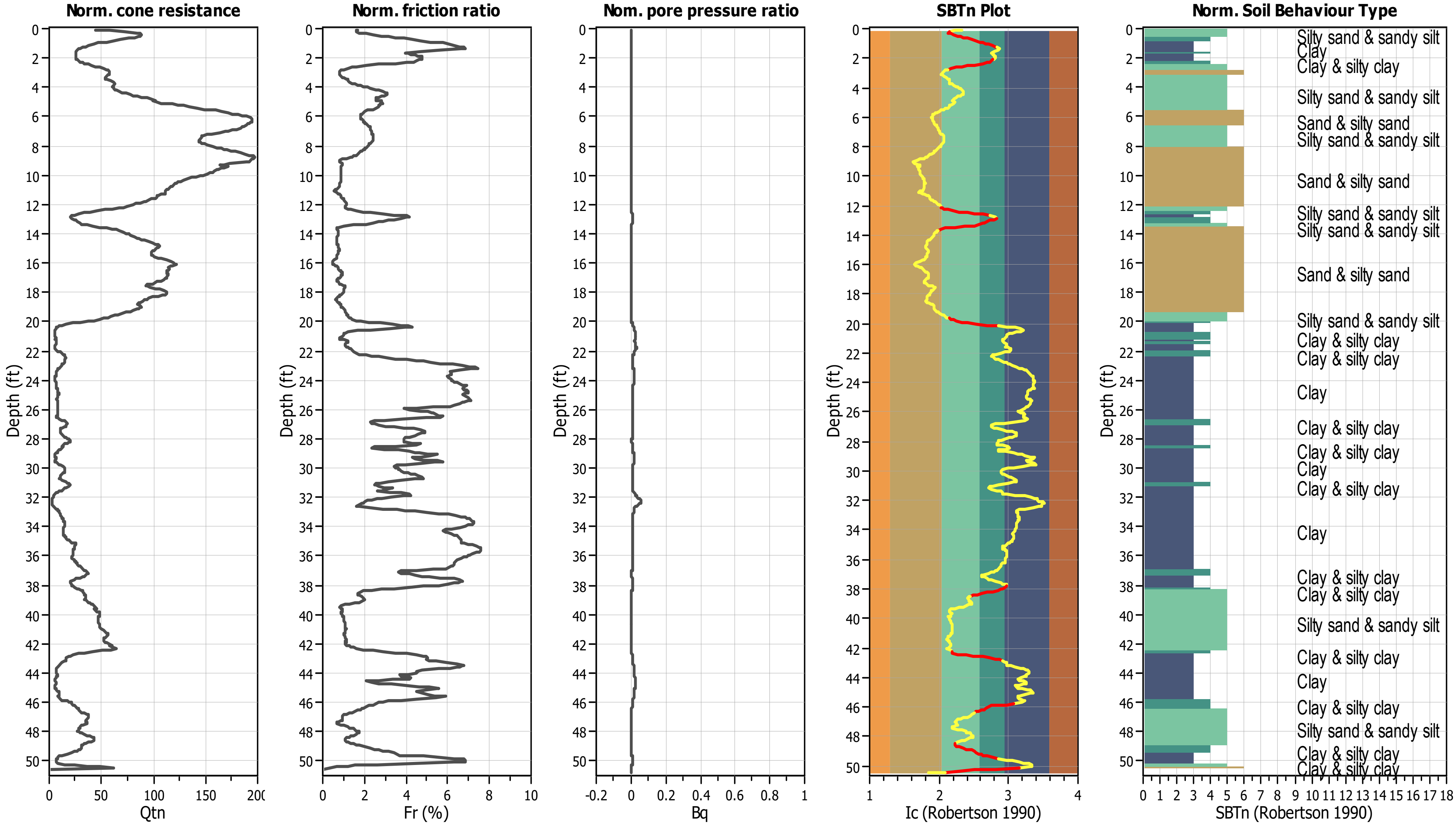
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



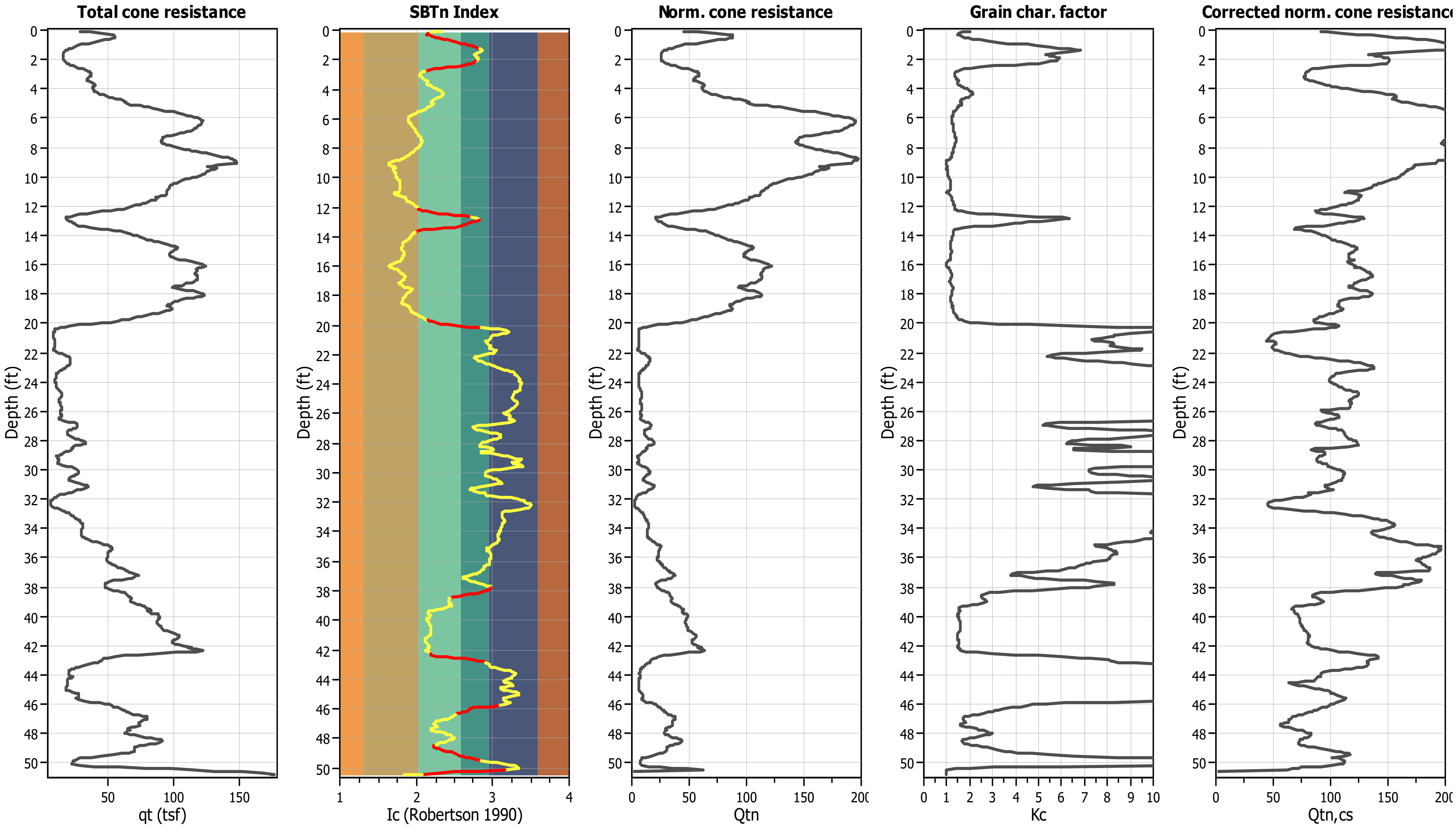
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to
- ⬜ 9. Very stiff fine grained

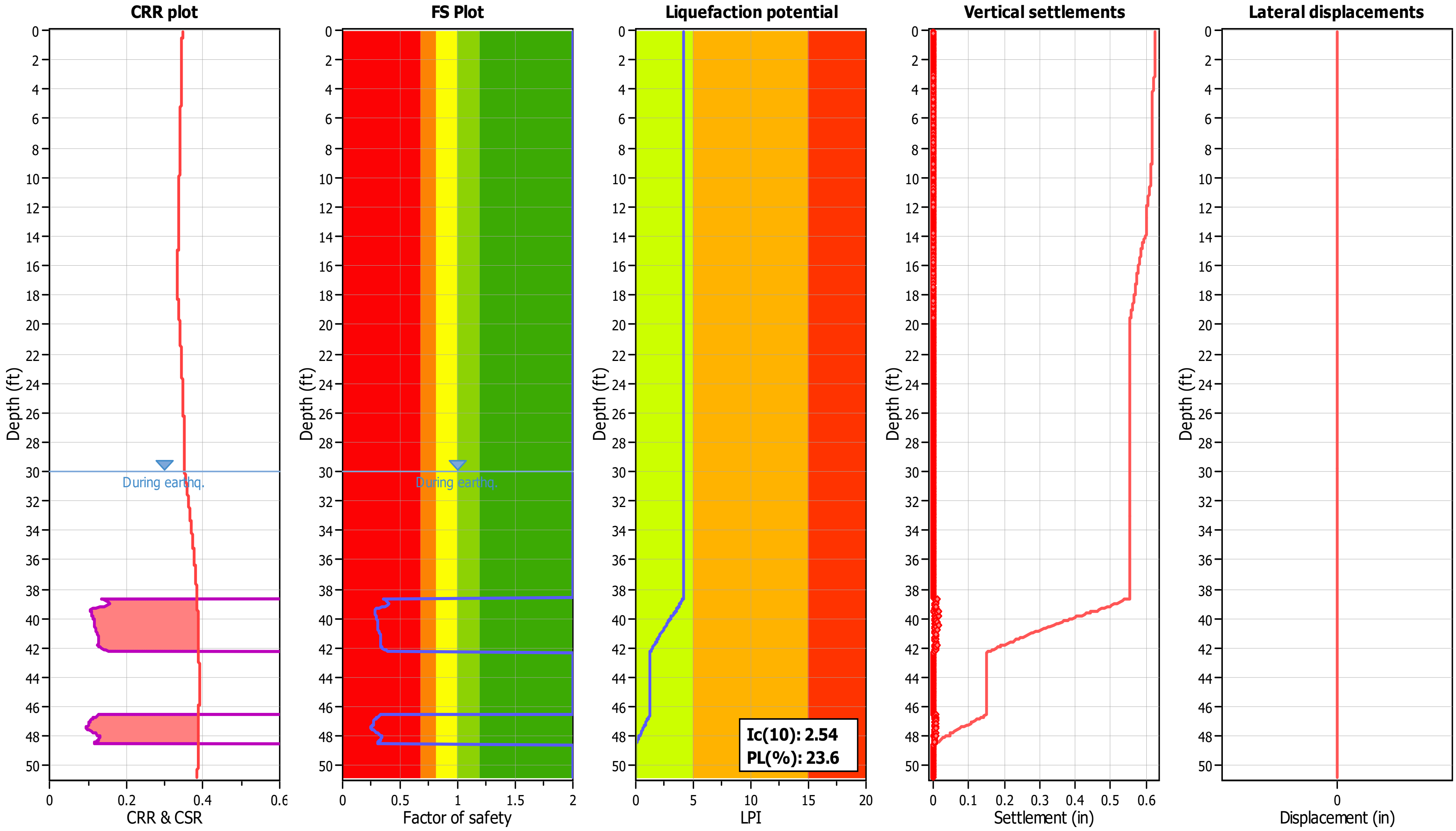
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

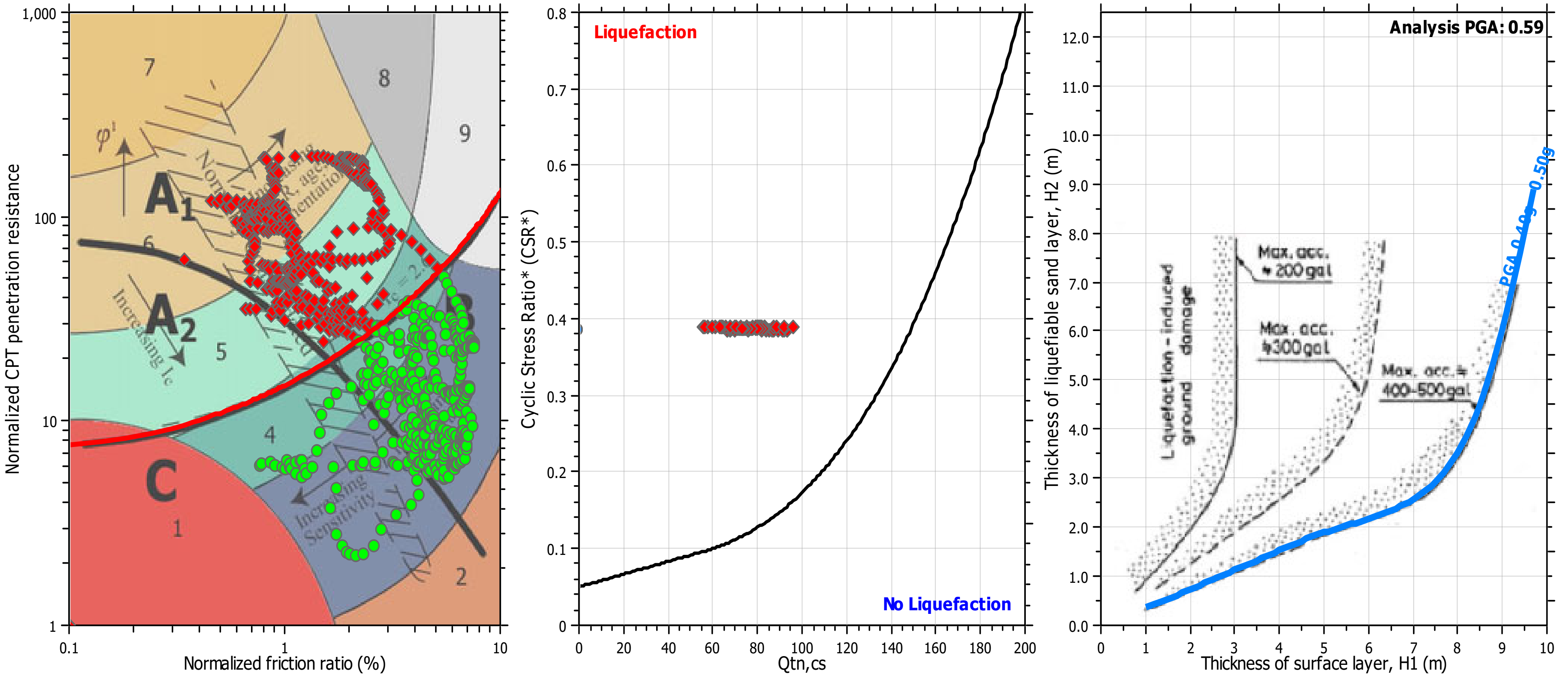
F.S. color scheme

- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟨 Low risk

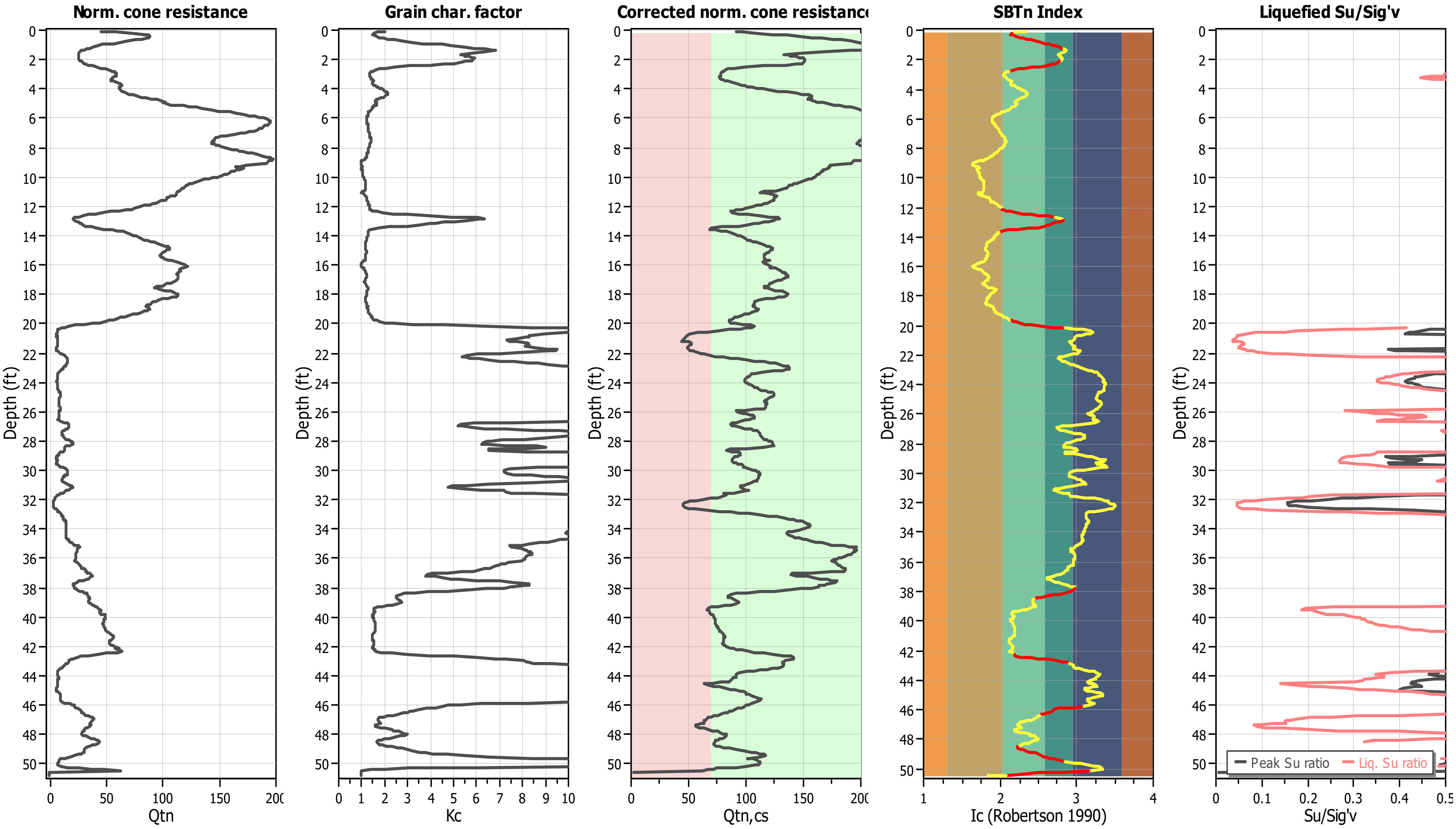
Liquefaction analysis summary plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

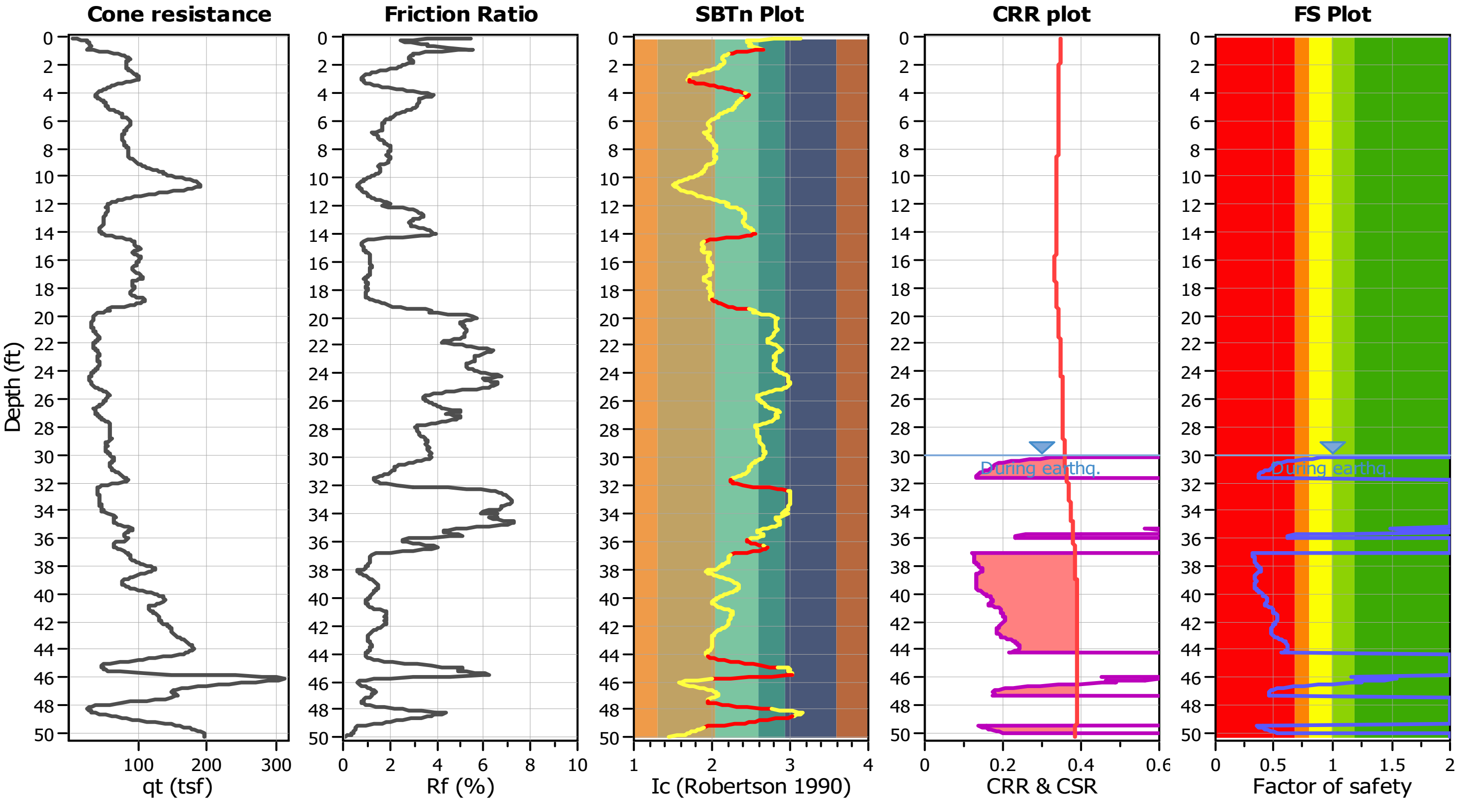
LIQUEFACTION ANALYSIS REPORT

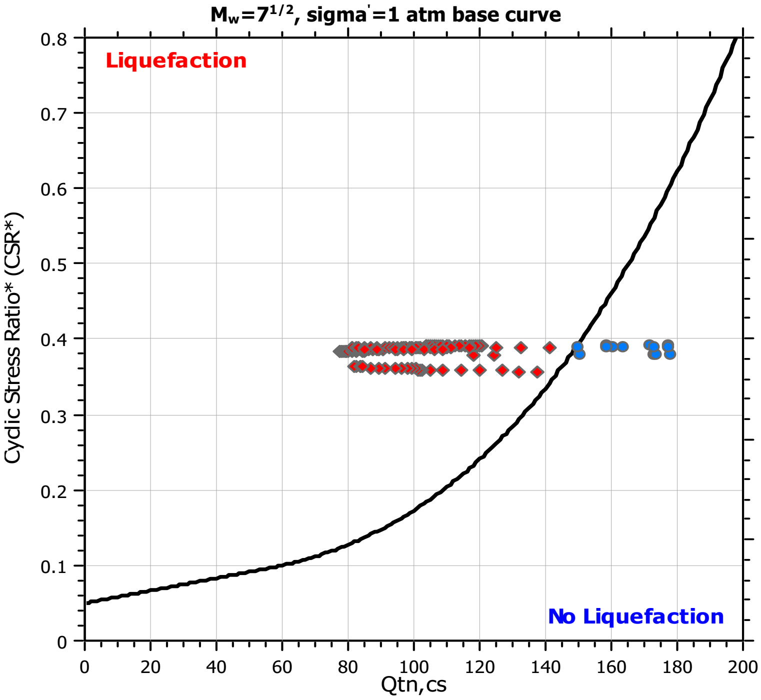
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

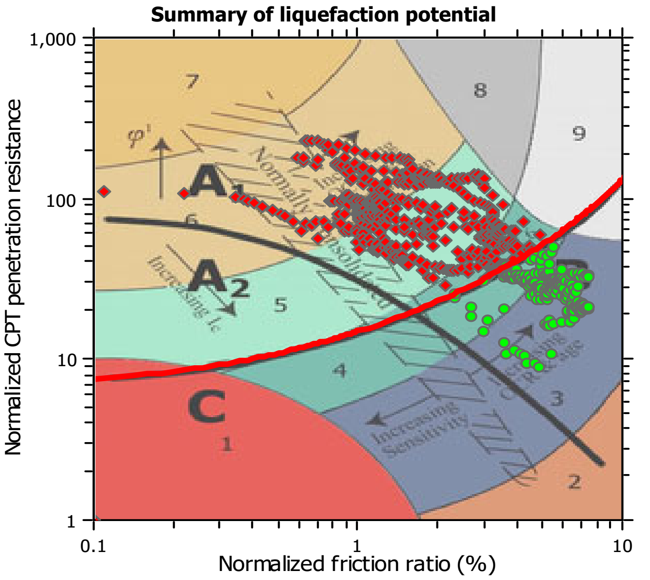
CPT file : CPT-5

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No		
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Clay like behavior applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based

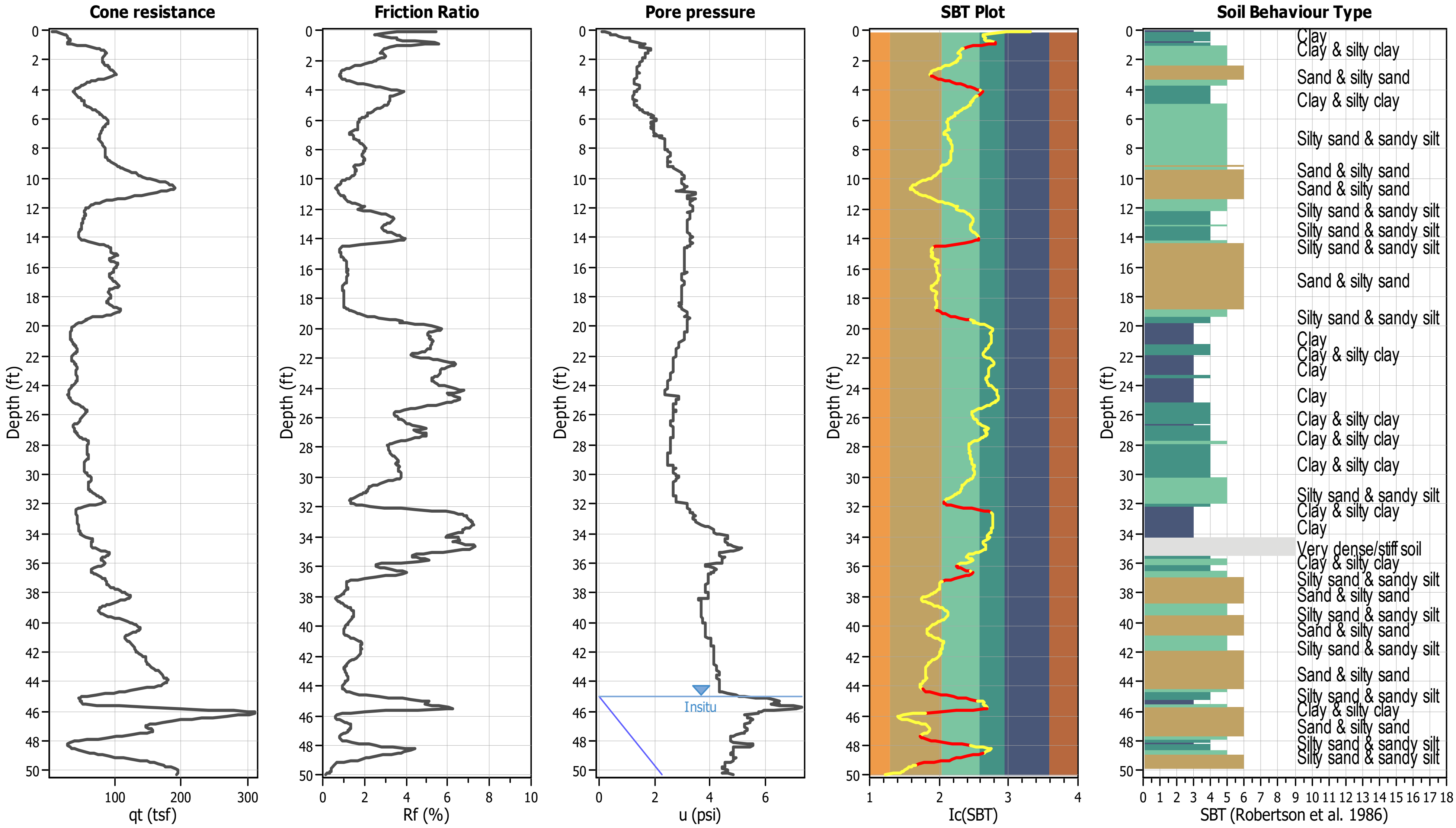






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



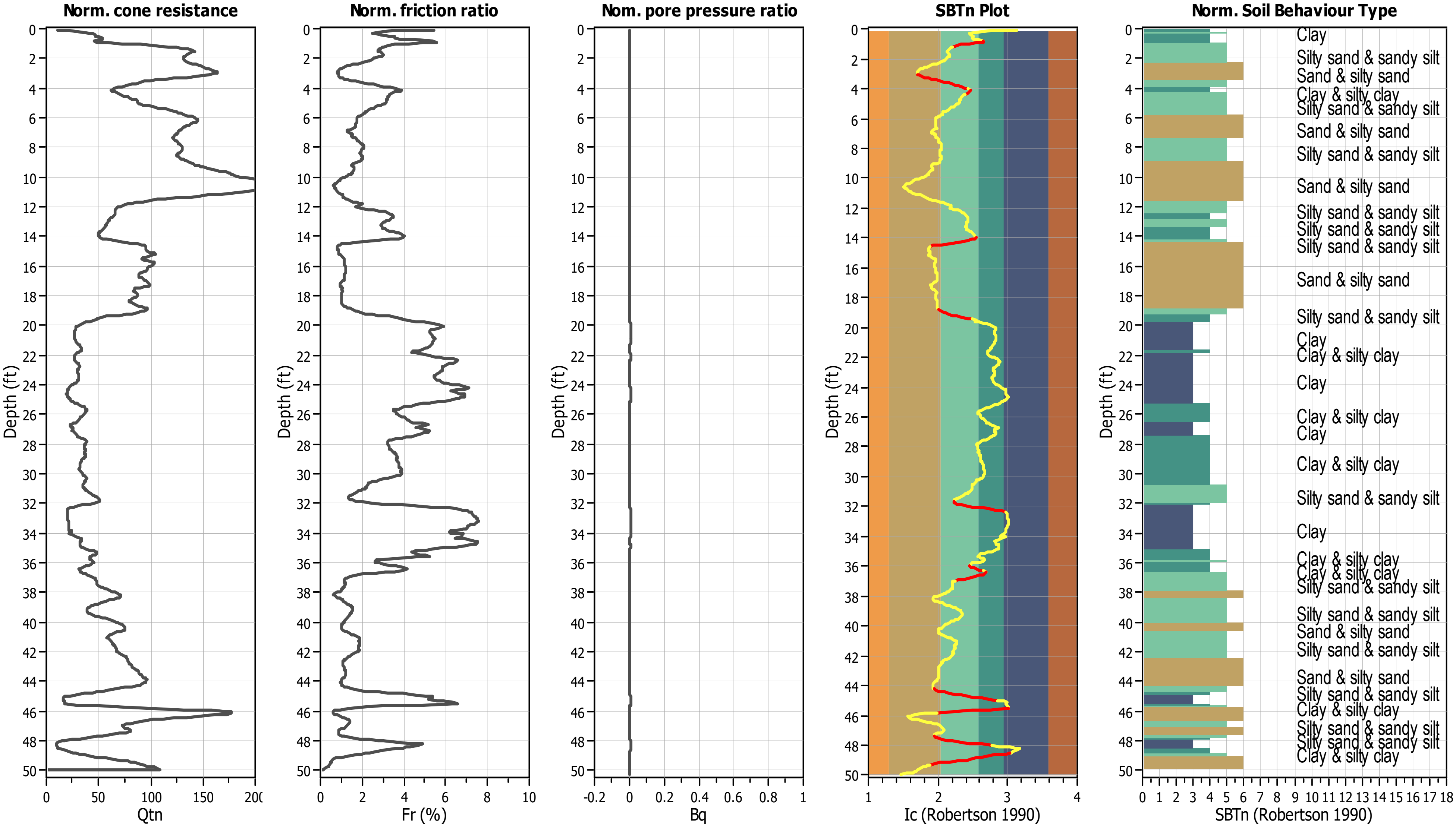
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	8. Very stiff sand to
🟦 3. Clay to silty clay	6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



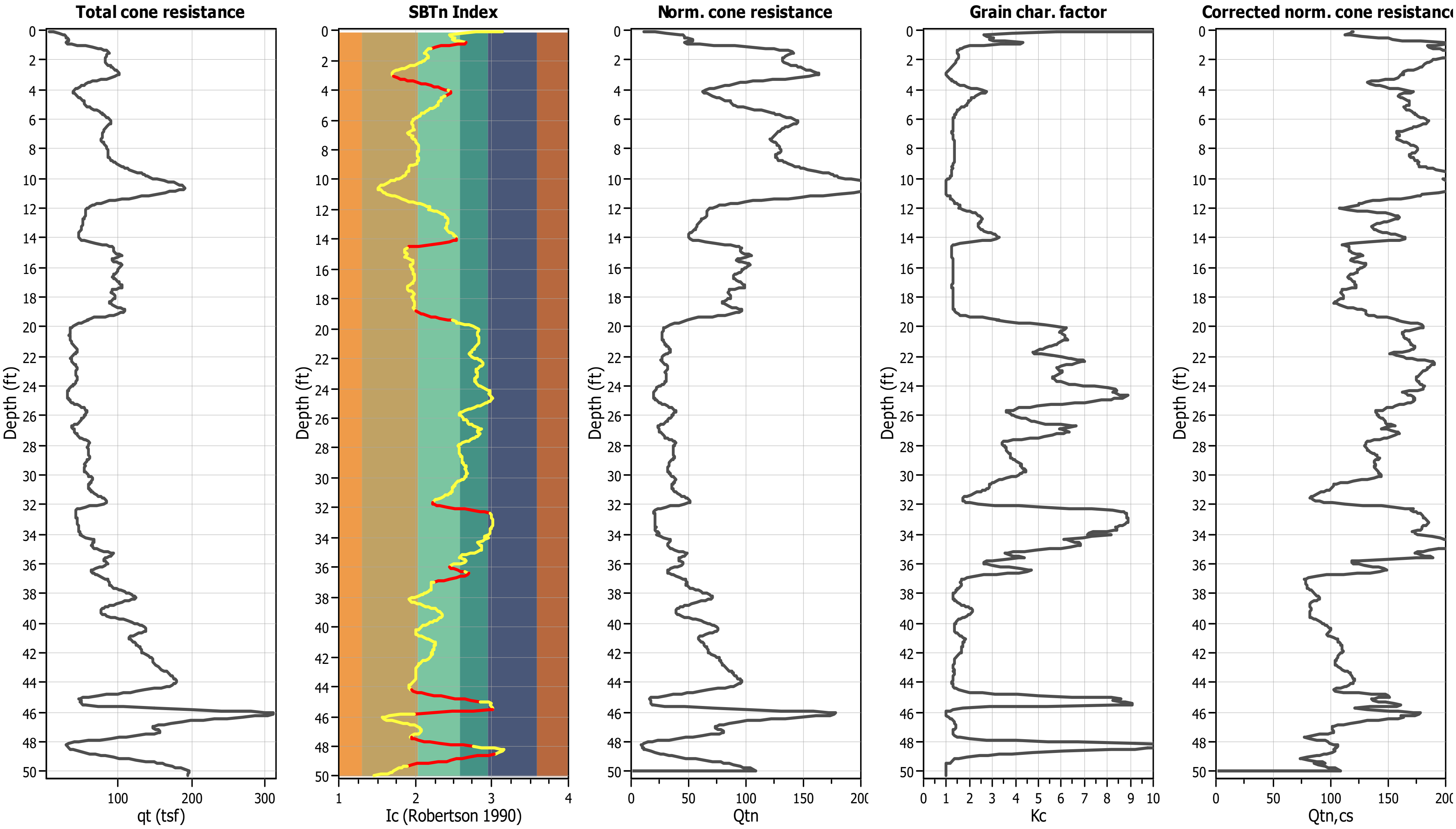
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

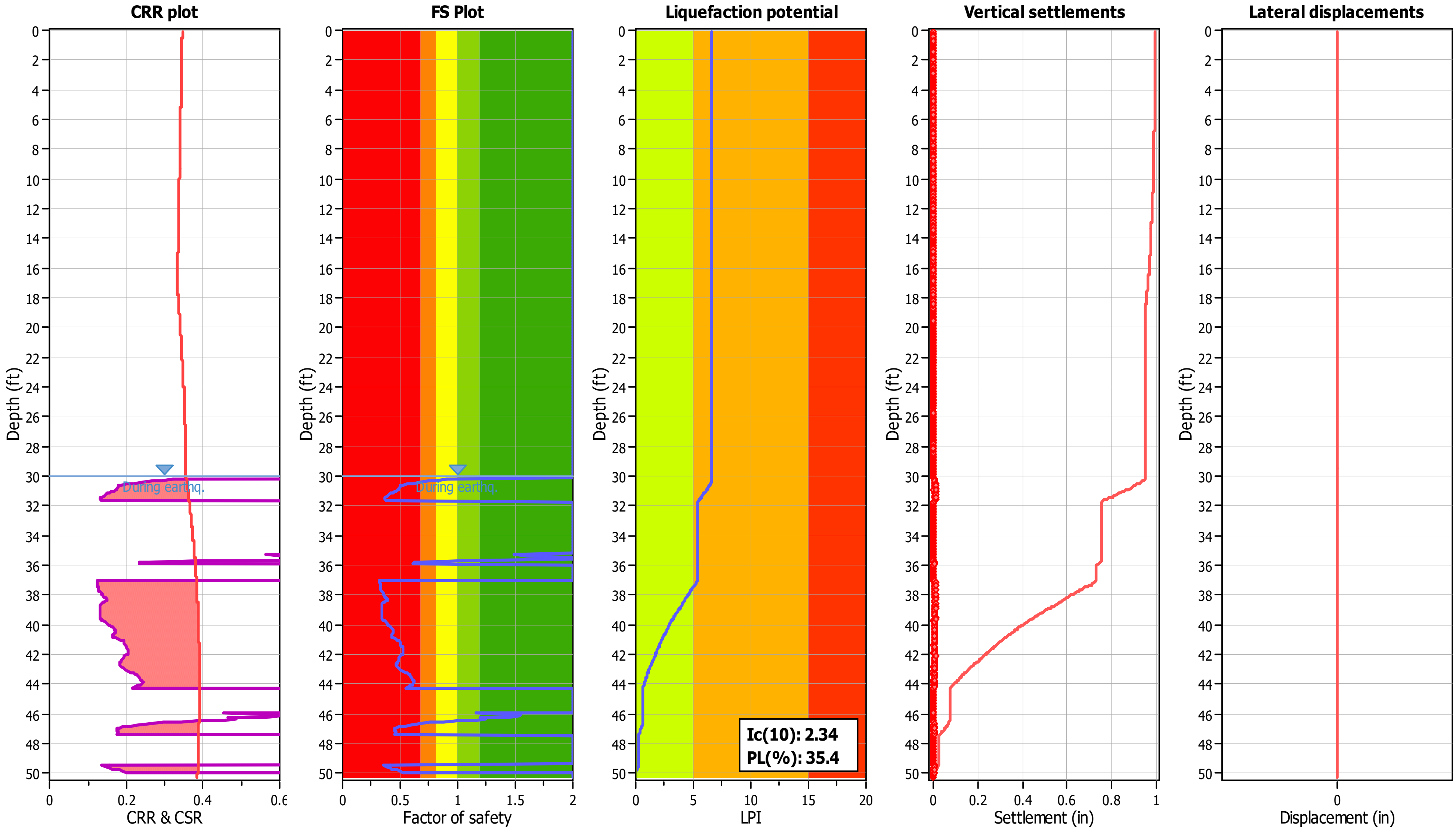
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K$_\sigma$ applied:	Yes
Earthquake magnitude M$_w$:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

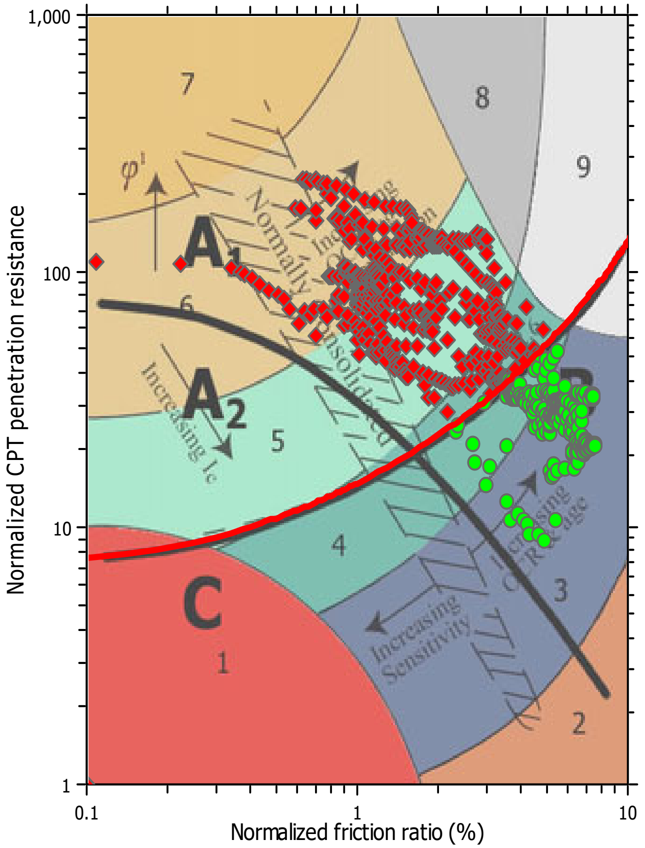
F.S. color scheme

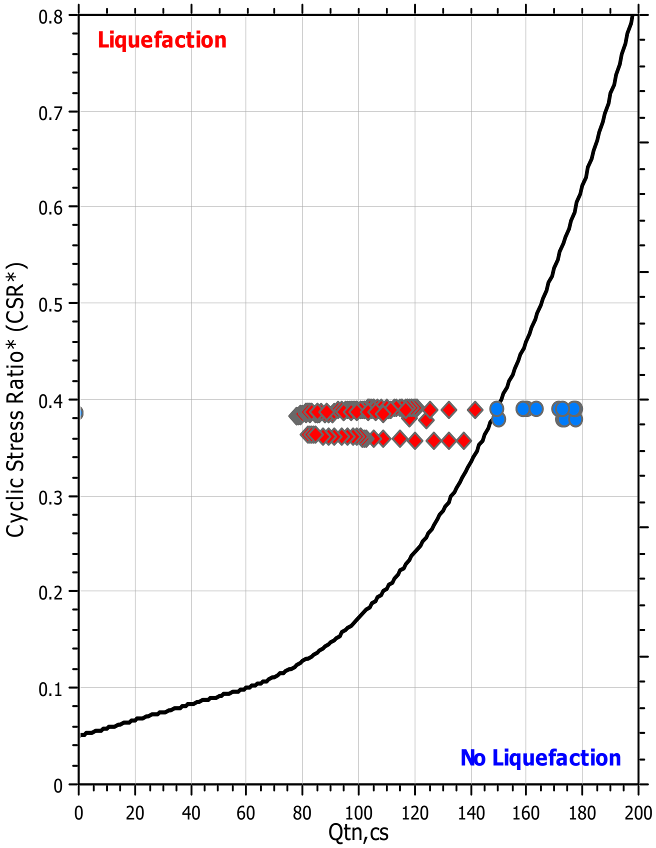
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

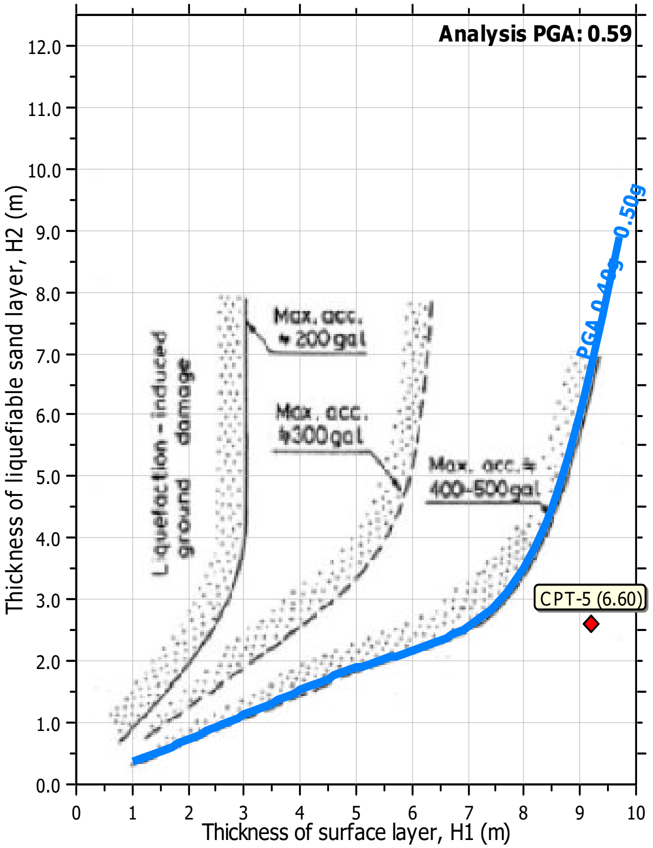
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟩 Low risk

Liquefaction analysis summary plots







Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
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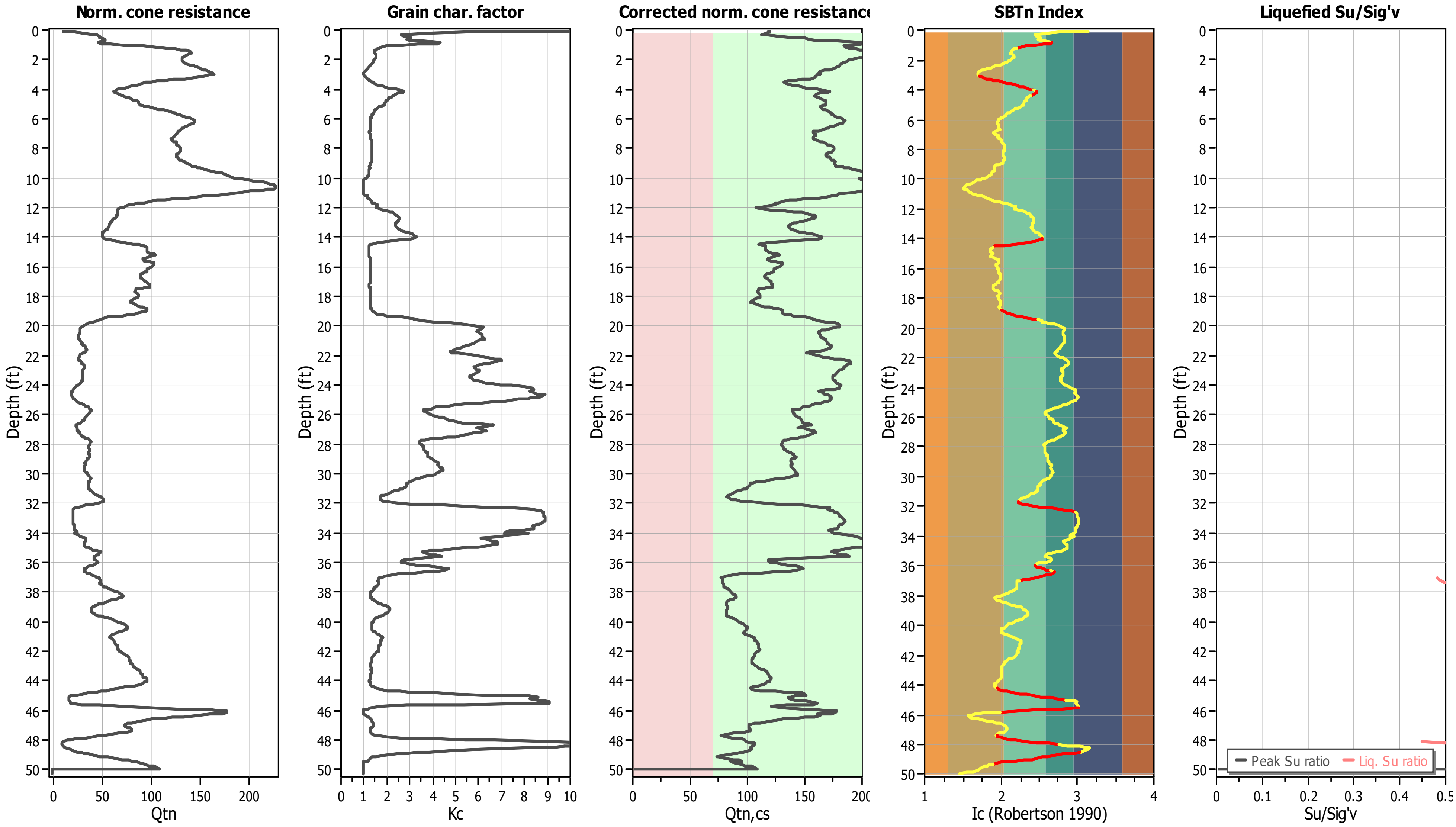
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

Appendix G

APPENDIX G

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL

1.1 **Intent:** These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these general Specifications. Observations of the earthwork by the project Geotechnical Consultant during grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 **Geotechnical Consultant:** Prior to commencement of work, the project owner shall employ a geotechnical consultant. The geotechnical consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all keyway bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of subgrade and fill materials and perform adequate relative compaction testing of fill to determine the attained level of compaction and assess if, in their opinion, if the work was performed in substantial compliance

with the geotechnical report(s) and these specifications. The Geotechnical Consultant shall provide test results to the owner on a routine and frequent basis.

1.3 **The Earthwork Contractor:** The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with applicable grading codes, the project plans, and these specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork planned for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are corrected.

2.0 PREPARATION OF FILL AREAS

2.1 **Clearing and Grubbing:** Areas to be excavated and filled shall be cleared and grubbed. Vegetation, such as brush, grass, roots, and other deleterious material, man-made structures, and similar debris shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant. Borrow areas shall be cleared and grubbed to the extent necessary to provide a suitable fill material.

Concrete fragments that are free of reinforcing street may be placed in fills, provided they are placed in accordance with Section 3 and 4. Earth fill material

shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent organic matter. Nesting of organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, etc.) have chemical constituents that are considered hazardous waste. As such, the indiscriminate dumping or spillage of such fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

The Geotechnical Consultant shall not be responsible for the identification or analysis of potentially hazardous materials; however, if observations, odors, or soil discoloration are suspect, the Geotechnical Consultant may request from the owner the termination of grading operations until such materials are deemed not hazardous as defined by applicable laws and regulations.

2.2 **Evaluation/Acceptance of Fill Areas:** All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

2.3 **Processing:** Ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Ground that is not satisfactory shall be removed/overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. After scarification, the surface should be moisture conditioned, as necessary, to achieve the proper moisture content and compacted in accordance with Section 4 of these specifications.

2.4 **Overexcavation:** In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured, or otherwise unsuitable ground shall be overexcavated to competent ground as recommended by the Geotechnical Consultant during grading.

2.5 **<u>Benching</u>:** Fills to be placed on ground sloping steeper than 5H:1V (horizontal to vertical units) shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for fill placement.

3.0 FILL MATERIAL

3.1 **<u>General</u>:** Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 **<u>Oversize</u>:** Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or other underground construction.

3.3 **<u>Import</u>:** If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1 and/or requirements defined in the project geotechnical report(s). The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before import begins so that suitability can be determined, and appropriate laboratory tests performed.

4.0 FILL PLACEMENT AND COMPACTION

4.1 **<u>Fill Layers</u>:** Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 **Fill Moisture Conditioning:** Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with ASTM International (ASTM Test Method D1557).

4.3 **Compaction of Fill:** After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction and uniformity.

Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.4 **Compaction Testing:** Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant’s discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.5 **Frequency of Compaction Testing:** Tests shall be taken at intervals required by the governing agency and as deemed necessary by the Geotechnical Consultant in order to adequately qualify the fill material. In general, it should be anticipated that tests will be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill, unless recommended otherwise by the Geotechnical Consultant. In addition, test(s) shall be taken on slope faces and/or each 10 feet of vertical height of slope as deemed necessary by the Geotechnical Consultant. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.6 **Compaction Test Locations:** The Geotechnical Consultant shall document the approximate elevation and location of each compaction test. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided. Alternatively, GPS units may be used to determine the approximate location/coordinates of the field density tests.

5.0 SUBDRAIN INSTALLATION

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and standard details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys. The Contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The Contractor is responsible for the performance of subdrains.

6.0 EXCAVATION

Excavations, including over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical report(s) and plans are estimates. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 TRENCH BACKFILLS

7.1 Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

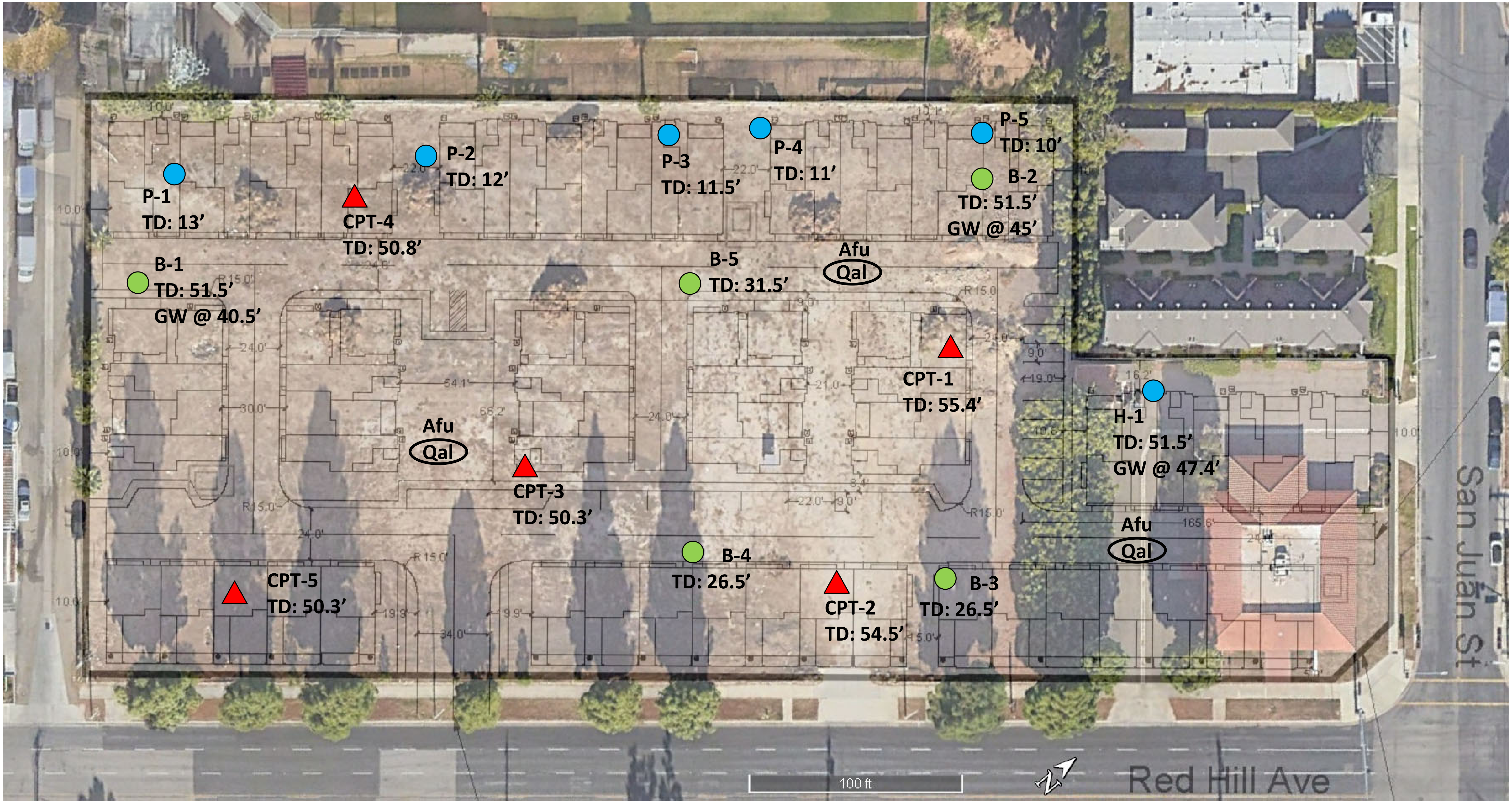
7.2 Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum 90 percent of maximum from 1 foot above the top of the conduit to the surface, except in traveled ways (see Section 7.6 below).

7.3 Jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

7.4 Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill, unless required differently by the governing agency or the Geotechnical Consultant.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.6 Trench backfill in the upper foot measured from finish grade within existing or future traveled way, shoulder, and other paved areas (or areas to receive pavement) should be placed to a minimum 95 percent relative compaction.



Base Map Source: Google Earth

Legend

▲ CPT-5 TD: 50.3'	Cone Penetrometer Test Location by SA GEO, Showing Total Depth.
● H-1/P-4 TD: 51.5' GW @ 47.4'	Approximate Hollow Stem Auger Boring/Percolation Test Location (NMG, 2015), Showing Total Depth and Depth to Groundwater.
● B-5 TD: 31.5'	Approximate Hollow Stem Auger Boring Location (Geosoils, 2005), Showing Total Depth and Depth to Groundwater

Earth Units
Circled Where Buried

Afu	Undocumented Artificial Fill
Qal	Alluvium

GEOTECHCNICAL MAP

Meritage Homes
Proposed Residential Development
13841 & 13751 Red Hill Avenue
Tustin, California

Project Number: 24011-01
Date: February 2, 2023
Plate 1

S/A

Permit No. WQMP-2024-00011

County of Orange/Santa Ana Region
Priority Project
Preliminary Water Quality Management Plan (WQMP)

Project Name:
Compass at Red Hill
13841 Red Hill Avenue
Tustin, CA
APN: 035-010-51
WQMP-2024-00011

Prepared for:
Johanna Crooker
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3801 University Ave, Suite 300
Riverside, CA 92501
(951) 335-8278

WQMP Preparation Date: April 11, 2025

Project Owner's Certification

Planning Application No. (If applicable)	DR-2024-0014/SUB-2024-0005	Grading Permit No.	TBD
Tract/Parcel Map and Lot(s) No.	TTM 19361	Building Permit No.	TBD
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			Address: 13841 Red Hill Ave, Tustin, CA APN 500-141-09 & 10

This Water Quality Management Plan (WQMP) has been prepared for Meritage Homes by Kimley-Horn. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan , including the ongoing operation and maintenance of all best management practices (BMPs), and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

Owner: Johanna Crooker			
Title	Director of Forward Planning		
Company	Meritage Homes		
Address	5 Peter Canyon Rd, Suite 310, Irvine, CA 92606		
Email	johanna.crooker@mlcholdings.net		
Telephone #	949-299-3847		
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Owner Signature		Date	

Preparer (Engineer): Kirkpatrick P. Myers, PE			
Title	Project Engineer	PE Registration #	71470
Company	Kimley-Horn and Associates		
Address	3801 University Ave, Suite 300		
Email	kirk.myers@kimley-horn.com		
Telephone #	951-335-8278		
I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.			
Preparer Signature		Date	4/11/2025
Place Stamp Here	REGISTERED PROFESSIONAL ENGINEER KIRKPATRICK P. MYERS No. 71470 CIVIL STATE OF CALIFORNIA **Exp. Dec 31, 2025**		

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Section I Permit(s) and Water Quality Conditions of Approval or Issuance

Project Infomation			
Permit/Application No. (If applicable)	WQMP-2024-00011	Grading or Building Permit No. (If applicable)	N/A
Address of Project Site (or Tract Map and Lot Number if no address) and APN	Address: 13841 Red Hill Ave., Tustin, CA, 92780 APN: 50014110, 500141409		

Water Quality Conditions of Approval or Issuance	
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	The project is subject to the requirements of New Development and Significant Redevelopment projects to control urban runoff, in accordance County of Orange Drainage Area Management Plan. Project specific conditions of approval are not available at this time and will be provided upon discretionary approval.

Conceptual WQMP	
Was a Conceptual Water Quality Management Plan previously approved for this project?	No.

Watershed-Based Plan Conditions	
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	The project is located within the San Diego Creek Watershed. Currently, there is no approved WIHMP for the San Diego Creek Watershed. The project drains to Peters Canyon Wash, Peters Canyon Channel, San Diego Creek, Upper Newport Bay, Newport Bay, Lower Newport Bay, Corona Del Mar Bend, and then ultimately into the Pacific Ocean. The project's receiving waters are considered impaired under Section 303(d) of the Clean Water Act. The current applicable TMDLs are the following: • Newport Bay Sediment TMDL • Newport Bay/San Diego Creek Nutrient TMDL • Newport Bay Toxics TMDL • Newport Bay Fecal Coliform TMDL

Section II Project Description

II.1 Project Description

Description of Proposed Project				
Development Category (From Model WQMP, Table 7.11-2; or -3):	Priority Project, Category 1 – New development projects that create 10,000 square feet or more of impervious surface. This category includes commercial, industrial, residential housing subdivisions, mixed-use, and public projects on private or public property that falls under the planning and building authority or the Permittees. Priority Project, Category 6 – Parking lots 5,000 square feet or more including associated drive aisle, and potentially exposed to urban storm water runoff. A parking lot is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce.			
Project Area (ft^2): 147,629 ft2 (3.39 acres) Refer to WQMP Exhibit (Section IV) for Project Area Summary	Number of Dwelling Units: 73		SIC Code: N/A for residential development	
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	3.38	100	0.0	0
Post-Project Conditions	0.51	15	2.88	85
Drainage Patterns/Connections	The pre-project site is currently vacant, rough-graded dirt lot site where the previous building and parking lot was recently demolished. In general, runoff flows across the site from the north to south towards Red Hill Ave, with any overflows discharging to the existing catch basin downstream on Red Hill and conveyed approximately 0.10 mile south to the existing OCFCD Facility, El Moderna-Irvine Channel, flows will continue easterly and confluence with Peters Canyon Wash and Channel then southerly towards San Diego Creek, Upper Newport Bay, Newport Bay, Lower Newport Bay, Corona Del Mar Bend, and ultimately discharge into the Pacific Ocean.			

Narrative Project Description: (Use as much space as necessary.)	In existing condition, there is no current offsite run-on to the project site as there exists a low point to the north of the project perimeter that prevents any offsite run-on from the north. In addition, existing block walls run along the northwestern property boundary, preventing any off-site run-on from these perimeters. This condition will be kept within the proposed condition. The proposed project is an approximate 3.39-acre parcel of land located southwest of the intersection of San Juan St and Red Hill Ave in the City of Tustin, California. The WQMP Exhibit in Section IV also illustrates the project's overall area and the impacted areas as part of the site's redevelopment. The site is bound by Tustin High School to the northwest, by an existing residential development to the northeast, by Red Hill Ave to the southeast, and by an existing commercial development to the southwest. The project proposes 73 condominiums, wet and dry utilities, drive-aisle, parking structure, storm drain improvements, walkways and parkway improvements. Proposed open space/landscaping will consist of parkway and walkway landscaping, common landscaping located in the large courtyard areas and perimeter landscaping. Paved and other impervious areas of the site include the project's drive aisle, walkways, parkway, drive approaches and gutter improvements, building structures, amenity courtyards and other exposed paved surfaces. Total impervious area is anticipated to consist of approximately 85% of the project site, or 2.88 acres. Activities typical of residential developments are anticipated for the project. These include day-to-day activities such as recreation, lounging, commuting, exercising and other residential related activities. Typical wastes from apartments are anticipated to be generated daily from the project. These include food wastes, paper products and recyclable materials. Designated trash bins are located throughout the site. For residents, there will be designated trash bins for each unit. Trash shall be removed on a weekly basis, or as needed, by the local waste management company. Two subsurface ADS StormTech chamber systems will be installed as the primary BMP for the proposed project. The chambers provide sufficient surface area that allow for both detention and infiltration of flows. The two systems will also include sediment rows, which utilizes filter fabric to provide enhanced suspended solids and pollutant removal. Refer to Section VI for details. A hydro-dynamic separator trash capture BMP will be provided to comply with trash capture requirements under the Orange County MS4 permit. United Storm Water Inc. The CPS was selected based off the list of certified

	full capture system list of trash treatment control devices per California State Water Resources Control Board. This manhole insert BMP will be placed in the most downstream manhole structure prior to flows entering the infiltration chambers. The BMP consists of an inlet screen with graduated openings that prevents pollutants, trash and debris from entering the storm water collection system. Refer to Section VI for CPS details. The project does not propose any outdoor storage areas, car wash areas or other commercial activities. All proposed improvements are shown on the WQMP Exhibit in Section VI of this WQMP. Site improvements will include the residential condominium buildings, access drive, parking structure, interior courtyards, walkway, and perimeter landscaping. The limits of the proposed improvements are depicted on the site plan.

II.2 Potential Stormwater Pollutants

Table 2.1, Anticipated and Potential Pollutants Generated by Land Use Type from the Technical Guidance Document (December 2013) lists the following Pollutants of Concern (POC's) associated with the project:

Pollutants of Concern			
Pollutant	Check One for each: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	Potential sources of sediment include landscaping areas and disturbed earth surfaces.
Nutrients	E ☒	N ☐	Potential sources of nutrients include fertilizers, sediment, and trash/debris.
Heavy Metals	E ☒	N ☐	Potential sources include vehicles and automotive fluids.
Pathogens (Bacteria/Virus)	E ☒	N ☐	Potential sources of pathogens include landscaping areas, animal waste, and food wastes.
Pesticides	E ☒	N ☐	Potential sources of pesticides include landscaping areas.
Oil and Grease	E ☒	N ☐	Potential source includes automobiles.
Toxic Organic Compounds	E ☒	N ☐	Potential source includes automobiles.
Trash and Debris	E ☒	N ☐	Potential sources include common litter and trash from residents.

II.3 Hydrologic Conditions of Concern

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2013 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

In the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent.

or

- Time of concentration (Tc) of post-development runoff for the 2-yr, 24-hr storm event is less than the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent.

If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

Is the proposed project potentially susceptible to hydromodification impacts?

☐ No – Show map

☒ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the Technical Guidance Document (TGD).*

See next page for the project's HCOC criteria description.

Based on the County's current hydromodification susceptibility map (provided in Attachment B), as well as the Orange County Stormwater Network Map, it has been determined that the project drains to the OCFCD-owned El Modena-Irvine Channel, then to Peters Canyon Wash and Channel, and eventually downstream to the San Diego Creek which is susceptible to hydromodification impacts.

The table below provides a summary comparison of the project's 2-year Tc, Q2 (cfs) and Q2 (volume, ac-ft) in the pre-development and post-development conditions to demonstrate how the project meets HCOC requirements.

The decrease in time of concentration and increase in volume and flows for unmitigated post-development runoff exceeds the respective 5% limitations for both HCOC conditions. As a result, underground infiltration systems are proposed to help mitigate flows. Water first flows into a connected manhole, allowing for detention and pretreatment of waste and solids. Flow then continues into the infiltration chambers, where sediment rows within the chambers also allow for treatment control. The flow is then discharges out of these infiltration chambers and into an existing RCP storm drain structure northeast of the project site.

Analyses were performed in Advanced Engineering Software (AES) and PondPack, a hydrologic modeling program created by Bentley Systems. Unit hydrographs were created from AES and input into PondPack, from which the mitigated flow, volume, and time of concentration above were obtained for the 2-year, 24-hour storm. The Design Capture Volume (DCV) produced by the 85th percentile water quality event will be infiltrated (retained) onsite, while storm events larger than the 85th percentile event will be discharged following the existing drainage patterns toward Red Hill Avenue and San Juan Street.

It is demonstrated in the results that the new time of concentration and volume for post-development runoff are sufficiently mitigated for HCOC.

Refer to the pre-development and post-development hydrology calculations for the 2-year storm condition included in Attachment B.

Condition	Q2 (Tc, minutes)	Q2 (cfs)	Q2 (volume, ac-ft)
Pre-Development	16.5	2.31	0.12
Post-Development (unmitigated)	9.91	4.37	0.40
Post-Development (mitigated)	9.91	1.81	0.13

II.4 Post Development Drainage Characteristics

In general, post-development drainage area and flow direction will be consistent with pre-project conditions. Runoff is conveyed as surface flow to project gutters and discharged to catch basins and the project's main storm drain system.

Low Impact Development

To satisfy the project requirements for Low Impact Development (LID) and addressing runoff pollutants of concern, the project proposes to retain water quality volume within a proposed underground infiltration system.

DA A (3.32 acres) – Consists of a majority of the project's on-site areas Runoff generated from the roof areas, the project's exposed areas (parking garage, drive aisle, walkways, etc is conveyed to an underground infiltration system located at the northwest corner of the site. Low flows from the westerly walkways will surface flow north towards proposed catch basins and will be directed via a low flow storm drain line to the underground infiltration system located at the northwest corner. The infiltration system will outlet directly to Red Hill Ave and/or the storm drain located on San Juan St consistent with existing drainage patterns.

DA B (0.07 acres) – Consists of the project's southern landscape area. This area is considered self-treating as the landscape is depressed and will retain the DCV before discharging to a private drive aisle to the south of the site.

To meet the trash capture requirements of the Ocean Plan, the project's onsite catch basins will be fitted with full trash capture devices.

The locations of the project's proposed BMPs are provided in the WQMP Exhibit in Section VI of this WQMP.

II.5 Property Ownership/Management

The property owner, Meritage Homes, shall assume all BMP maintenance and inspection responsibilities for the project site until all site responsibilities have been transferred to the POA. This includes all proposed storm drain infrastructure and source control BMPs within the private property. Thereafter, the POA shall assume all BMP maintenance and inspection responsibilities, including long-term funding for implementation of the project's onsite BMPs. Inspection and maintenance activities are provided in Section V of this WQMP.

Section III Site Description

III.1 Physical Setting

Name of Planned Community/Planning Area (if applicable)	Planning Area: Red Hill Specific Plan
Location/Address	13841 Red Hill Ave Tustin, CA 92606
General Plan Land Use Designation	Existing: Mixed-Use High Proposed: Mixed-Use High
Zoning	Existing: Industrial (I) Proposed: Mixed Use (MU) Overlay
Acreage of Project Site	3.39 acres
Predominant Soil Type	Based on the soils report, the subsurface soils at the site generally consist of interlayered silty/clayey sand mixtures, clean sand, sandy silt, and silty/sandy clay. HSG soil type "B"

III.2 Site Characteristics

Site Characteristics	
Precipitation Zone	0.75 in
Topography	The pre-project site is very flat, with a gentle gradient to the southwest.
Drainage Patterns/Connections	The pre-project site consists of an industrial site. In general, runoff flows across the site from the north to south towards Red Hill Ave, with any overflows discharging to the existing catch basin in Red Hill Ave and conveyed approximately 0.10 mile south to the existing OCFCD Facility, El Moderna-Irvine Channel. Flows will continue westerly and confluence with Peters Canyon Wash, then southerly towards San Diego Creek, Newport Bay and ultimately discharges into the Pacific Ocean.
Soil Type, Geology, and Infiltration Properties	Infiltration testing was conducted at four locations, with measured infiltration rates ranging from 1.5 inches per hour to 3.5 inches per hour. The project is located with Hydrologic Soil Group B per USGS Web Soil

	Survey.
Hydrogeologic (Groundwater) Conditions	Groundwater was encountered during site exploration at depth of 40.5 to 47.4 ft bgs. Existing groundwater data available through the GeoTracker database indicate depths to groundwater between 30 and 60+ feet bgs in the vicinity of the site.
Geotechnical Conditions (relevant to infiltration)	Based on infiltration testing conducted on site, measure infiltration rates ranged from 1.5 to 3.5 inches per hour. Based on the State of California's Geotracker database, the site is not located within 250' of any clean up sites. However, the Orange County Water District (OCWD) has identified the facility has potentially being downstream of an active remediation site (Carioca Cleaners). OCWD also identified that a portion of the contamination from the remediation site may have migrated toward the project site. A Phase II study was completed on January 10, 2024 by Advanced Environmental Group, Inc. (AEG) for the facility and found that there are no contaminants found within the project limits above the residential limits. An additional review of the analyses was completed and were found to be below California's maximum contaminant levels (MCLs) for Regulated Drinking Water Contaminants, and thus mobilization of pollutants from the project's proposed infiltration BMP is not a geotechnical concern. Refer to the Phase II Study in Attachment H. This information will be provided to OCWD for review.
Off-Site Drainage	The project does not receive offsite run-on from adjacent properties.
Utility and Infrastructure Information	Wet and dry utilities are proposed for the project and will connect to existing facilities located in San Jose St.

III.3 Watershed Description

Receiving Waters	San Diego Creek Reach 1 Newport Bay (Upper) Newport Bay (Lower) Pacific Ocean
303(d) Listed Impairments	San Diego Creek Reach 1 – Benthic Community Effects, DDT, Indicator Bacteria, Malathion, Nutrients, Sedimentation/Siltation, Selenium,

	Toxaphene, Toxicity Newport Bay (Upper) – Chlordane, Copper, DDT, Indicator Bacteria, Nutrients, PCBs (Polychlorinated biphenyls), Sedimentation/Siltation, Toxicity Newport Bay (Lower) - Chlordane, Copper, DDT, Indicator Bacteria, Nutrients, PCBs (Polychlorinated biphenyls), Toxicity
Applicable TMDLs	San Diego Creek Reach 1 – DDT, Toxaphene Newport Bay (Upper) - Chlordane, DDT, PCBs Newport Bay (Lower) - Chlordane, DDT, PCBs
Pollutants of Concern for the Project	*Pollutants of Concern*: Suspended Solids/Sediment, Nutrients, Pathogens, Pesticides, Oil & Grease, Toxic Organic Compounds, Trash & Debris. *Primary Pollutants of Concern*: Nutrients, Pathogens and Pesticides.
Environmentally Sensitive and Special Biological Significant Areas	There are no Areas of Special Biological Significance (ASBS) or ESA's within 200' of the project site.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

(NOC Permit Area only) Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?	YES ☐	NO ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.	A WIHMP has not been approved for the watershed.	

Project Performance Criteria	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	Based on the County's most recent HCOC Susceptibility Map, HCOC do exist for the project (Refer to Section II.3). See Attachment B for 2-year, 24-hour calculations and hydrology map. The performance criteria that apply are as follows: • Post-development runoff volume for the two-year frequency storm does not exceed that of the predevelopment condition by more than five percent, and • Time of concentration of post-development runoff for the two-year storm event is not less than that for the predevelopment condition by more than five percent.

List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	The applicable LID performance criteria are as follows (the project's selected LID performance criteria is provided in bold below): • Retain, onsite (infiltrate, harvest and use, or evapotranspire) stormwater runoff as feasible up to the Design Capture Volume, and • **If the proposed project is a street, road, highway or freeway with 5,000 square feet or more of paved surface, the project shall incorporate USEPA guidance, "Managing Wet Weather with Green Infrastructure: Green Streets" in a manner consistent with the MEP standard.** • Recover (i.e.) drawdown the storage volume as soon as possible after a storm event, and, if necessary • **Biotreat, onsite, additional runoff, as feasible, up to 80 percent average annual capture efficiency, and, if necessary** • NOC Permit Area only – Retain or biotreat, in a regional facility, the remaining runoff up to 80 percent average annual capture efficiency, and, if necessary • Fulfill alternative compliance obligations for runoff volume not retained or biotreated up to 80 percent average annual capture efficiency using treatment controls or other alternative approaches as described in Section 7.II-3.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	Ocean Plan Trash Amendments – Full Capture System to trap particles 5mm or greater, and has a design treatment capacity that is either (the project's selected performance criteria is provided in bold): • **Equal to or greater than peak flow rate for the one-year, one-hour storm in the sub-drainage area; or** • Appropriately sized to, and designed to carry at least the same lows as, the corresponding storm drain.
Calculate LID design storm capture volume for Project.	N/A

IV.2. Site Design and Drainage

The primary goal of site design principles and techniques is to reduce land development impacts on water quality and downstream hydrologic conditions. Benefits of site design include reductions in the size of downstream BMPs, conveyance systems, pollutant loading and hydromodification impacts.

Site Design BMPs

The following section describes the site design BMPs that have been incorporated into this project.

Minimize Impervious Area

The project will minimize impervious area by providing all multi-level structures and incorporating landscaping within the project's opens space areas, parkways, areas between residential buildings and other suitable landscaping areas to minimize the project's impervious footprint, thereby reducing runoff generated during rain events. The project overall proposes to maximize landscape areas.

Maximize Water Quality

The project will maximize water quality by employing the use of an underground infiltration system to treat onsite runoff.

Preserve Existing Drainage Patterns and Time of Concentration

The proposed drainage pattern is consistent with existing drainage patterns, with flows conveyed to San Juan St.

Disconnect Impervious Areas

Landscaping will be provided adjacent to walkways and parkways to break up the project's impervious areas.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

The pre-project site consists of an industrial site. There are no vegetation and sensitive areas to preserve. All disturbed areas will be paved or landscaped.

Xeriscape Landscaping

Native and/or tolerant landscaping will be incorporated into the site design consistent with City guidelines.

Drainage Management Areas

Per the TGD, the project site has been divided into Drainage Areas (DAs) to be utilized for defining drainage areas tributary to the project's BMPs. DA limits have been delineated based on the tributary drainage area for each BMP. The DA limits is the proposed disturbed area for the project site.

The design capture volume (DCV) described in the TGD Section III.3.1 is provided below. Locations of DAs and associated treatment BMPs are provided on the exhibits in Section VI. Additional calculations and TGD Worksheets are provided in Attachment C of this WQMP.

DA	Tributary Drainage Area (Ac.)	Imp.	C-value	Design Depth (in)	V_{BMP} (cf)	Provided Treatment Volume (cf)
A	3.32	0.85	0.79	0.75	7,118	19,425
B	0.07	0	0.16	0.75	-	-

IV.3 LID BMP Selection and Project Conformance Analysis

Per the 4th Term MS4 Storm Water Permit (Order No. R8-2009-0030, as amended by Order No. R8-2010-0062), Low Impact Development (LID) BMPs must be incorporated into design features and source controls to reduce project related storm water pollutants. The incorporation of LID BMPs into project design requires evaluation of LID measures in the following BMP hierarchy: infiltration, evapotranspiration, harvest/reuse and biotreatment.

The project proposes the use of proprietary biotreatment and nonproprietary BMPs to address the projects runoff pollutants.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be an integration of site design practices and LID BMPs. The goal of HSCs is to reduce runoff volume for a given drainage area without reducing the site's true impervious area.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

IV.3.2 Infiltration BMPs

Name	**Included?**
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☒
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐
Other:	☐

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, Infiltration Wells, permeable pavement, and underground infiltration galleries.

The project proposes the use of infiltration BMPs to meet the project's onsite LID requirements. BMP #1 will treat runoff from DA A.

DA B is entirely made up of depressed landscape area and is considered self-treating.

DA/ BMP#	BMP System	Tributary Drainage Area (ac)	Design Storm Depth (in)	Design Capture Volume (cf)	Volume Provided (cf)	Lat/Long
A	Underground Infiltration (BMP 1)	3.32	0.75	7,118	7,304	33.736047, -117.813572
B	Self-Treating	0.07	0.75	-	-	-

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

Name	Included?
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐
Other:	☐
Other:	☐

Evapotranspiration

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, through some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in the proposed BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

Harvest and Reuse

Harvest and Reuse (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes, and other non-potable uses.

The project does not propose the use of harvesting BMPs, as the project has selected the use of infiltration BMPs to meet the project's onsite LID requirements.

IV.3.4 Biotreatment BMPs

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☐
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Biotreatment BMPs are a class of structural LID BMPs that treat suspended solids and dissolved pollutants in storm water using mechanisms characteristic of biologically active systems. These BMPs are considered treat and release facilities and include treatment mechanisms that employ soil microbes and plants. Additional benefits of these BMPs may include aesthetic enjoyment, recreational use, wildlife habitat and reduction in storm water volume.

Biotreatment BMPs are not being implemented.

IV.3.5 Hydromodification Control BMPs

Per discussion in Section II.3 of this WQMP, HCOCs are considered to exist for this project.

Hydromodification Control BMPs	
BMP Name	**BMP Description**
ADS StormTech Underground Infiltration System	Subsurface stormwater management system that utilizes chambers to capture, store, and infiltrate stormwater runoff for HCOC 2-yr, 24-hr flow and volume mitigation.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. The project is able to meet LID requirements onsite.

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs. Describe treatment control BMPs including sections for selection, sizing, and infeasibility, as applicable.

Treatment Control BMPs	
BMP Name	**BMP Description**

IV.3.8 Non-structural Source Control BMPs

The Table below indicates all Non-Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Non-Structural Source Control BMPs

Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Proposed facility will not generate waste subject to Title 22 CCR Compliance.
N6	Local Water Quality Permit Compliance	☒	☐	
N7	Spill Contingency Plan	☐	☒	Proposed facilities will not generate waste or store materials subject to the requirements of Chapter 6.95 of the CA Health and Safety Code.
N8	Underground Storage Tank Compliance	☐	☒	None proposed.
N9	Hazardous Materials Disclosure Compliance	☐	☒	Proposed project will not store or generate hazardous materials subject to agency requirements.
N10	Uniform Fire Code Implementation	☐	☒	Proposed facility does not propose to store toxic or highly toxic compressed gases.
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks are proposed.
N14	Common Area Catch Basin Inspection	☒	☐	

N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Not in project scope.

A discussion of each selected Non-Structural Source Control BMP is provided in the following section. The implementation of each BMP is described in the Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP as well as the Operation and Maintenance Plan provided in Attachment B.

N1 Education for Property Owners, Tenants and Occupants – Educational materials will be provided to tenants at close of escrow by the owner and periodically thereafter by the POA to inform them of their potential impacts to downstream water quality. Materials include those described in Section VII of this WQMP and provided in the Final WQMP.

N2 Activity Restrictions – Activity restrictions to minimize potential impacts to water quality and with the purpose of protecting water quality will be prescribed by the project's Covenant, Conditions and Restrictions (CC&Rs), or other equally effective measure.

N3 Common Area Landscape Management – Maintenance activities for landscape areas shall be consistent with City, County and manufacturer guidelines for fertilizer and pesticide use (OC DAMP Section 5.5). Maintenance includes trimming, weeding and debris removal and vegetation planting and replacement. Stockpiled materials during maintenance activities shall be placed away from drain inlets and runoff conveyance devices. Wastes shall be properly disposed of or recycled.

N4 BMP Maintenance – Responsibility for implementation, inspection and maintenance of all BMPs (structural and non-structural) shall be consistent with the BMP Inspection and Maintenance Responsibilities Matrix provided in Section V of this WQMP, with documented records of inspections and maintenance activities completed.

N11 Common Area Litter Control – Litter control onsite will include the use of POA litter patrols, violation reporting and clean up during landscaping maintenance activities and as needed to ensure good housekeeping of the project's common areas.

N12 Employee Training – All employees, contractors and subcontractors of the POA shall be trained on the proper use and staging of landscaping and other materials with the potential to impact runoff and proper clean up of spills and materials.

N14 Common Area Catch Basin – As required by the TGD, at least 80% of the project's private drainage facilities shall be inspected, cleaned/maintained annually, with 100% of facilities inspected and maintained within a two-year period. Cleaning should take place in the late summer/early fall, prior to the start of the wet season. Records shall be kept to document annual compliance.

N15 Street Sweeping Private Streets and Parking Lots – The project's private streets shall be swept, at minimum, on a weekly basis.

IV.3.9 Structural Source Control BMPs

The Table below indicates all Structural Source Control BMPs to be utilized in the project. Discussions of the selected BMPs are provided in text following the table below and in the BMP Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP.

Structural Source Control BMPs

Identifier	Name	Check One		If not applicable, state brief reason
		Included	Not Applicable	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor material storage areas proposed for project use.
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	Not applicable. No large slopes (hillside landscaping) proposed.
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☒	Not applicable. Project resides in SARWQCB.
S6	Dock areas	☐	☒	None proposed.
S7	Maintenance bays	☐	☒	None proposed.
S8	Vehicle wash areas	☐	☒	None proposed.
S9	Outdoor processing areas	☐	☒	None proposed.
S10	Equipment wash areas	☐	☒	None proposed.
S11	Fueling areas	☐	☒	None proposed.
S12	Hillside landscaping	☐	☒	None proposed.
S13	Wash water control for food preparation areas	☐	☒	
S14	Community car wash racks	☐	☒	None proposed.

A discussion of each selected Structural Source Control BMP is provided in the following section. The implementation of each BMP and the responsible party are described in the Inspection and Maintenance Responsibility Matrix provided in Section V of this WQMP as well as the Operation and Maintenance Plan provided in Attachment B.

S1 Storm Drain Stenciling – Storm drain stencils or signage prohibiting dumping and discharge of materials ("No Dumping – Drains to Ocean") shall be provided adjacent to each of the project's proposed inlets. The stencils shall be inspected and restenciled as needed to maintain legibility.

S3 Designated Trash Enclosure – Designated trash enclosure areas shall be covered and designed to preclude trash and pad area from run-on, run-off and wind. Any drains within area shall be connected to the sanitary sewer system, with proper approval from the sewer company. Site shall be inspected with use to ensure all materials are disposed of properly.

S4 (SD-10, SD-12) Use Efficient Irrigation Systems and Landscape Design – In conjunction with routine landscaping maintenance activities, inspect irrigation for signs of leaks, overspray and repair or adjust accordingly. Adjust system cycle to accommodate seasonal fluctuations in water demand and temperatures. Ensure use of native or drought tolerant/non-invasive plant species to minimize water consumption.

IV.4 Alternative Compliance Plan (If Applicable)

IV.4.1 Water Quality Credits

The project does not propose the use of water quality credits as it is able to meet LID requirements onsite.

<table>
<tr><th colspan="6">Description of Proposed Project</th></tr>
<tr><td colspan="6">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td>☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="3">☐Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface WQ if not redeveloped.</td><td colspan="2">☐ Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance).</td></tr>
<tr><td colspan="2">☐ Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).</td><td colspan="3">☐ Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned</td><td>☐ Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td colspan="2">☐ Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.</td><td>☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
</table>

Calculation of Water Quality Credits (if applicable)	Not applicable to project.

IV.4.2 Alternative Compliance Plan Information

Not applicable. The project is able to meet LID BMP requirements onsite to address pollutants in project related storm water runoff.

Section V Inspection/Maintenance Responsibility for BMPs

Refer to the BMP inspection and maintenance responsibility matrix below. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

A property owners' association (POA) shall be established for this project. The POA shall be responsible the long-term funding, inspection and maintenance of all BMPs prescribed in this WQMP.

Until the project's POA has been established, all responsibilities pertaining to this WQMP shall be that of the project developer/owner, Meritage Homes. Contact for the interim responsible party is as follows:

Responsible Party: Meritage Homes

Contact Name: Johanna Crooker

Address: 5 Peters Canyon Rd, Suite 310, Irvine, CA, 92606

Phone: johanna.crooker@mlcholdings.net

Email: 949-299-3847

Inspection and maintenance activities, frequencies and responsibilities for the project's selected BMPs are provided in the following BMP matrix. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies.

BMP Inspection/Maintenance				
BMP		**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency**
INFILTRATION CHAMBERS				
BMP#1	ADS MC-3500 Chambers	Owner until POA is established. POA thereafter.	Inspect unit for accumulated debris and sediment; remove trash from screening device and separation chamber; Remove sediment from Sediment chamber .	12-24 months
GROSS SOLIDS REMOVAL BMPs				

PRE-2	Connector Pipe Screen	Onsite- Owner until POA is established. POA thereafter. Offsite- The City of Tustin.	Inspect unit for accumulated debris and sediment. Remove when accumulated material reaches 1" of the height of screen.	Ongoing and as needed
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Owner until POA is established. POA thereafter.	Educational materials will be provided to the owner at close of escrow and thereafter on an annual basis. Materials shall include those provided in Attachment A of this WQMP and any updated materials.	Annually
N2	Activity Restrictions	Owner until POA is established. POA thereafter.	The Owner will prescribe activity restrictions to protect surface water quality, through a Covenant, Conditions and Restrictions (CC&Rs) agreement, or other equally effective measure, for the property.	Ongoing
N3	Common Area Landscape Management	Owner until POA is established. POA thereafter.	Maintenance shall be consistent with County requirements, plus fertilizer and/or pesticide usages shall be consistent with City, County and manufacturer guidelines for use of fertilizers and pesticides (OC DAMP Section 5.5). Maintenance includes mowing, weeding, and debris removal on a monthly basis. Trimming, replanting and replacement of mulch shall be performed on an as-needed basis. Trimmings, clippings, and other waste shall be properly disposed of off-site in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and drain inlets.	Monthly

N4	BMP Maintenance	Owner until POA is established. POA thereafter.	Maintenance of BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be maintained by the responsible party and documented with the WQMP, and shall be available for review upon request.	Ongoing
N11	Common Area Litter control	Owner until POA is established. POA thereafter.	Litter patrol, violations investigation, reporting and other litter control activities shall be performed by routine patrols along with landscaping maintenance activities. Litter collection and removal shall be performed as needed and monthly with landscaping maintenance.	Ongoing patrols and as needed
N12	Employee Training	Owner until POA is established. POA thereafter.	All staff and employees shall receive initial training upon hire and annually thereafter on the importance of their actions on storm water quality. Training shall include educational materials provided by the County as well as other permitting agencies.	Upon hire and annually
N14	Common Area Catch Basin Inspection	Owner until POA is established. POA thereafter.	Catch basin inlets, area drains, swales, curb-and-gutter systems and other drainage systems shall be inspected prior to October 1st of each year and after large storm events. If necessary, drains shall be cleaned prior to any succeeding rain events. 80% of facilities shall be inspected and cleaned annually, with 100% of facilities inspected and maintained	Annually

N15	Street Sweeping Private Streets and Parking Lots	Owner until POA is established. POA thereafter.	Streets and parking lots shall be vacuum swept on a weekly basis, at minimum.	Weekly
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stencilling and signage	Owner until POA is established. POA thereafter.	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually
S3 SD-32	Designated Trash Enclosure	Owner until POA is established. POA thereafter.	Designated trash enclosure areas shall be covered and designed to preclude trash and pad area from run-on, run-off and wind. Any drains within area shall be connected to the sanitary sewer system, with proper approval from the sewer company. Site shall be inspected with use to ensure all materials are disposed of properly.	Daily with Use
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	Owner until POA is established. POA thereafter.	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, day or night time temperatures based on system specifications and local climate patterns.	Monthly

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

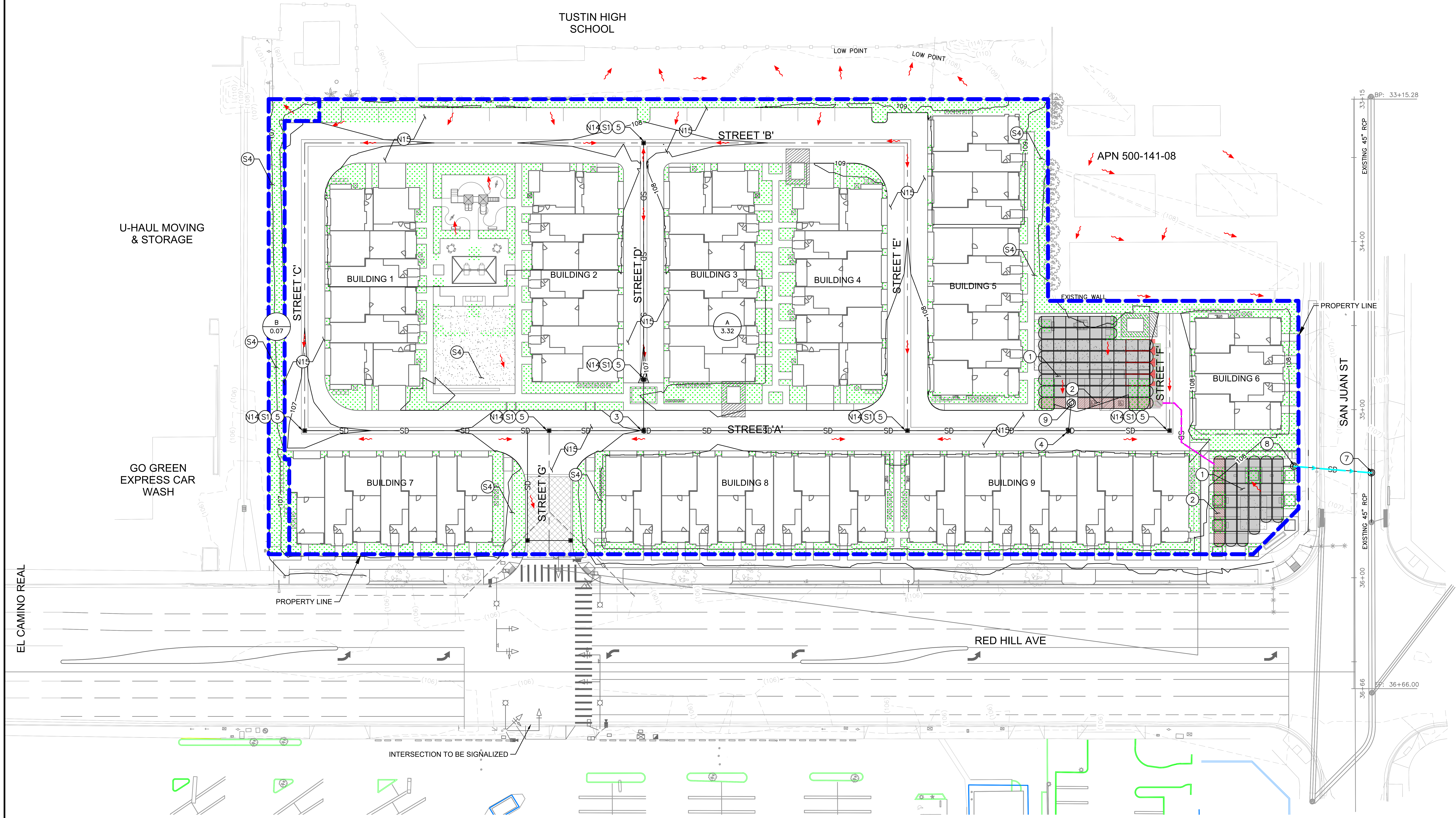
Exhibits

- Vicinity Map
- WQMP Exhibit

VI.2 Submittal and Recordation of Water Quality Management Plan

CITY OF TUSTIN

PRELIMINARY WQMP EXHIBIT



LEGEND

——575——	PROPOSED CONTOUR
— —(575)— —	EXISTING CONTOUR
———	PROPERTY LINE
▬ ▬ ▬	DMA BOUNDARY
→	FLOW ARROW
DA XX	DRAINAGE AREA NAME
XX AC	AREA (IN ACRES)
Ⓓ	MANHOLE
— - —	RIGHT-OF-WAY
—SD—	PROPOSED STORM DRAIN
- - -	EQUALIZER PIPE
- > - >	OVERFLOW PATH
🟩	LANDSCAPE/PLANTER AREA
▨	TURF
▨	ENHANCED PAVEMENT
▥	STORM DRAIN INLET

STRUCTURAL BMP NOTES

① PROPOSED BMP-1 INFILTRATION CHAMBERS PER DETAIL 1.

② PROPOSED SEDIMENT ROW PER DETAIL 1.

③ PROPOSED MANHOLE.

④ PROPOSED CONNECTOR PIPE SCREEN PER DETAIL 2.

⑤ PROPOSED CATCH BASIN.

⑥ PROPOSED MANHOLE WITH 3-FT WEIR. WEIR CREST ELEVATION PER STORM DRAIN PLANS.

⑦ PROPOSED CONNECTION TO EXISTING 45" RCP STORM DRAIN

⑧ OVERFLOW STRUCTURE

⑨ PRE-TREATMENT HYDRODYNAMIC SEPARATOR

STRUCTURAL SOURCE CONTROL BMP NOTES

(S1) STORM DRAIN INLET – MARK ALL INLETS WITH WORDS "ONLY RAIN DOWN THE STORM DRAIN" OR SIMILAR.

(S4) USE EFFICIENT IRRIGATION SYSTEMS AND LANDSCAPE DESIGN, WATER CONSERVATION, SMART CONTROLLERS, AND SOURCE CONTROL

NON-STRUCTURAL SOURCE CONTROL BMP NOTES

(N3) COMMON AREA LANDSCAPE MANAGEMENT

(N4) BMP MAINTENANCE

(N14) COMMON AREA CATCH BASIN INSPECTION

(N15) STREET SWEEPING PRIVATE STREETS AND PARKING LOTS

THE FOLLOWING BMPS MAY BE APPLICABLE THROUGHOUT THE SITE AS NEEDED PER FORM IV.3.8 IN PROJECT WQMP FOR DETAILS.

- N1 – EDUCATION OF PROPERTY OWNERS, TENANTS, AND OCCUPANTS
- N2 – ACTIVITY RESTRICTIONS
- N6 – LOCAL WATER QUALITY PERMIT COMPLIANCE
- N11 – COMMON AREA LITTER CONTROL
- N12 – EMPLOYEE TRAINING

NORTH

GRAPHIC SCALE IN FEET
0 15 30 60

DRAINAGE AREA SUMMARY:

DRAINAGE AREA	AREA (AC)	AREA (SF)	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)	IMPERVIOUS %	BMP	WATER QUALITY VOLUME REQUIRED TO BE TREATED (CF)	RETENTION VOLUME PROVIDED (CF)
DA A	3.32	144,620	122,927	21693	85.00	1 – UNDERGROUND INFILTRATION	7118	7304
DA B	0.07	3049	0	3049	0.00	SELF-TREATING	N/A	N/A
TOTAL	3.39	147669.00	122927.00	24742.00	85	-	7118	7304

REVISIONS	DATE	BY

SCALE:
DATE: 01/2024
DESIGNED: BY
CHECKED: LAC
PLN CK REF:
F.B.

Kimley»Horn
3801 UNIVERSITY AVE. SUITE 300, RIVERSIDE, CA 92501
PHONE: (951) 543-9868 WWW.KIMLEY-HORN.COM

PRELIMINARY WQMP
EXHIBIT
RED HILL STREET AND SAN JUAN AVENUE

PROJ. # 195261019
SHEET 1
OF 2 SHEETS
DWG. NO.
W-1

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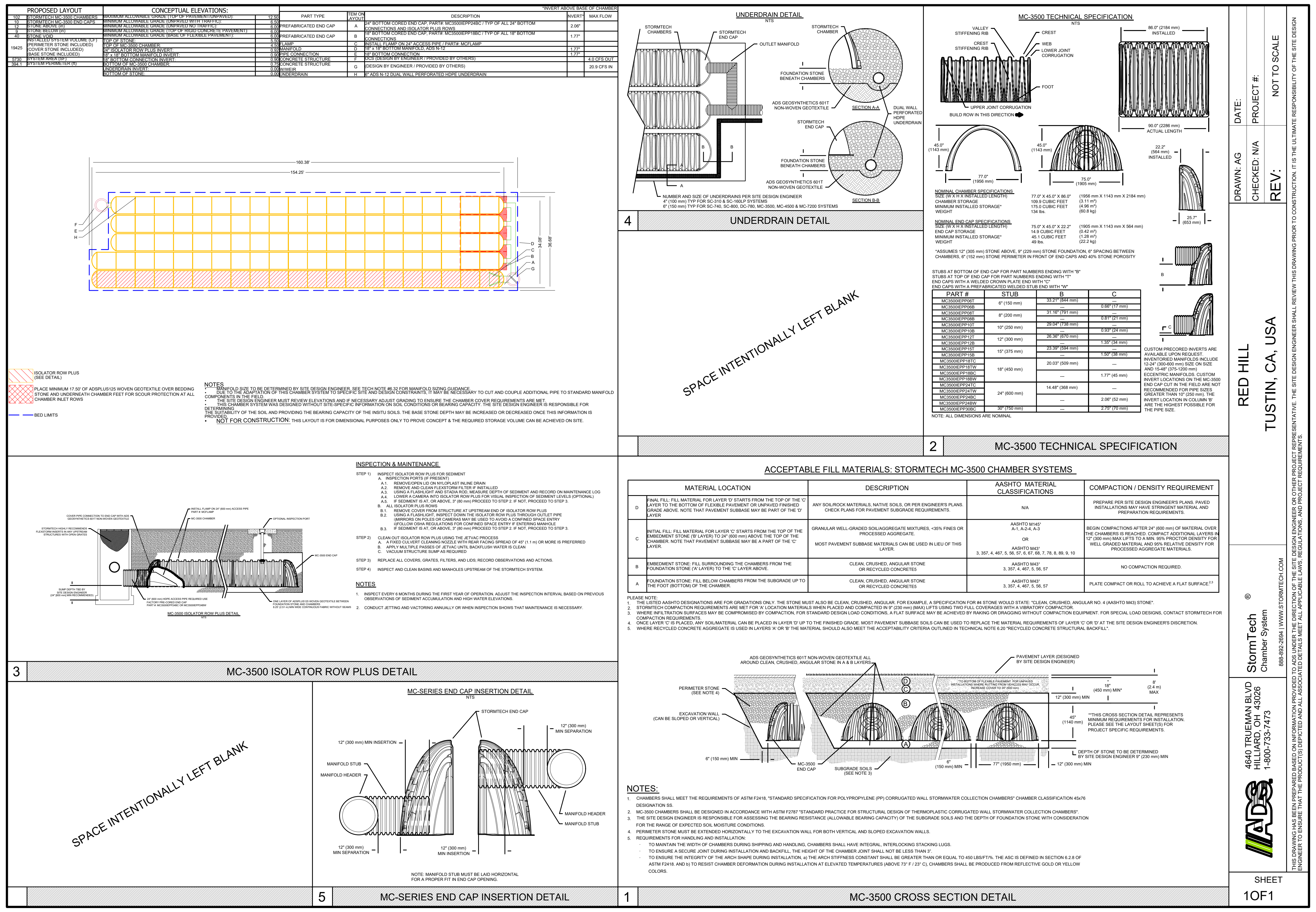
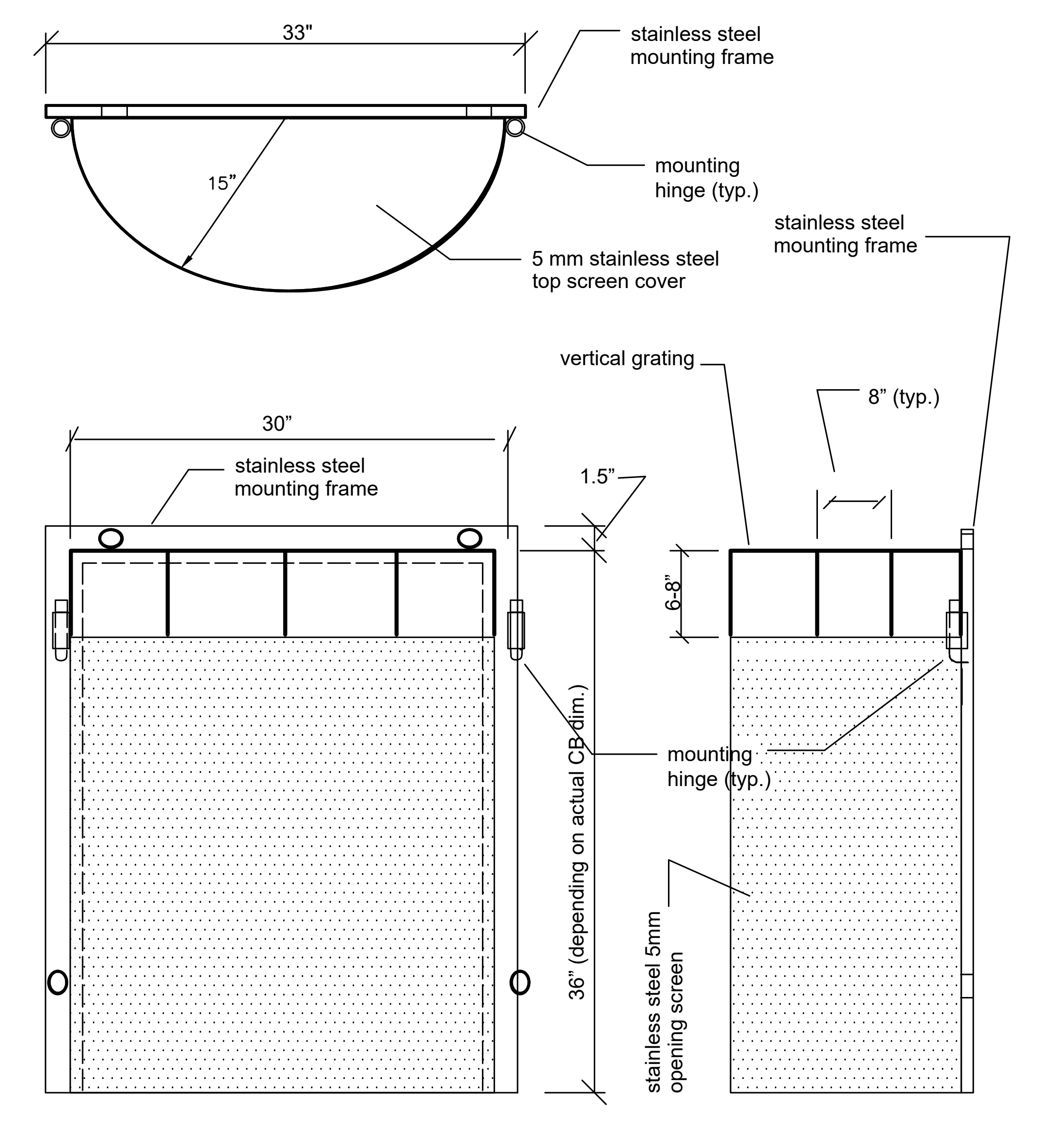


1. BMP #1

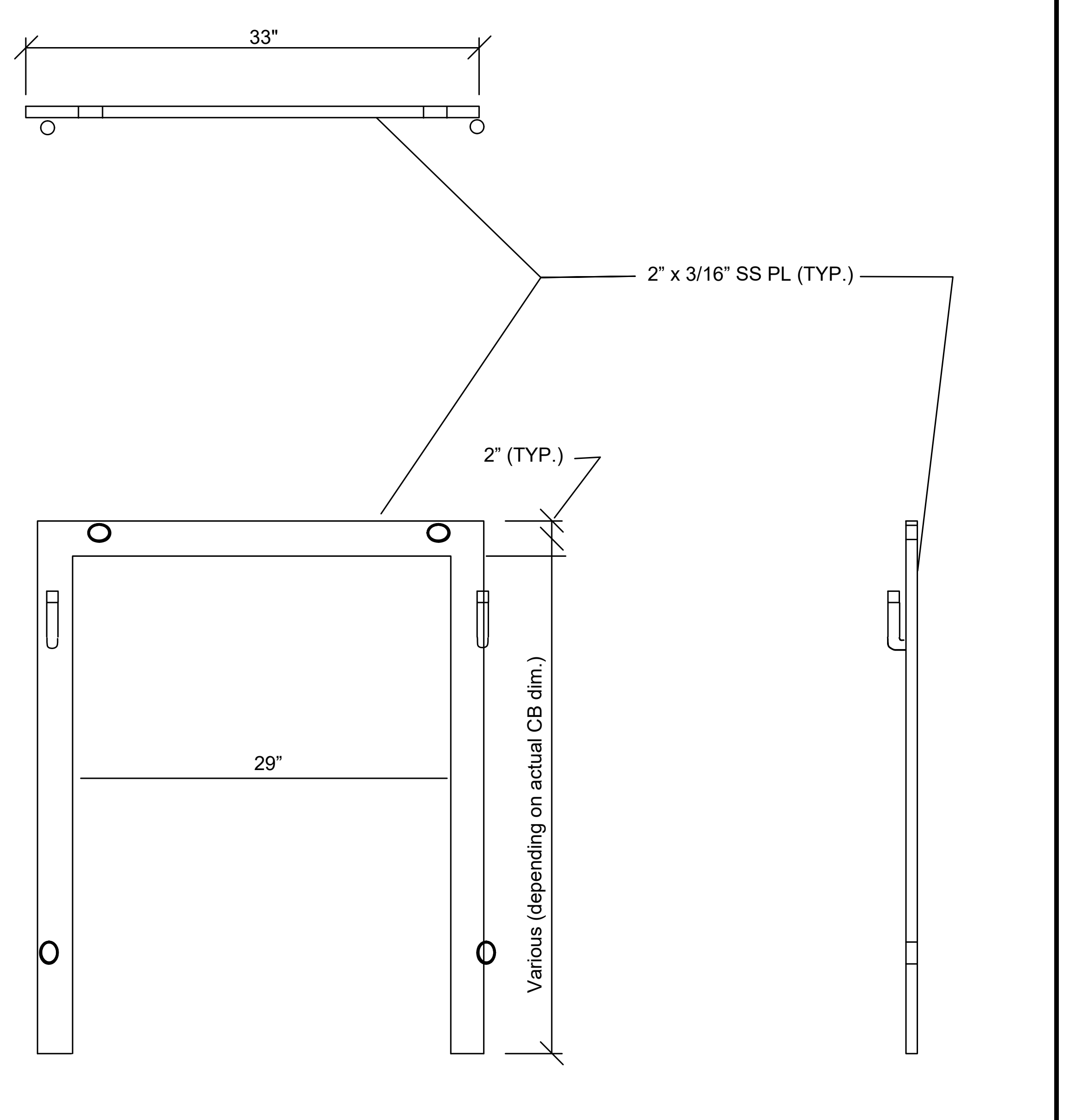
NOT TO SCALE

MODEL ST3G: REMOVABLE INSTALLATION WITH VERTICAL GRATING



STORMTEK

MOUNTING FRAME



STORMTEK

2. BMP #2

NOT TO SCALE

DESCRIPTION OF DESIGN ELEMENTS

- The mounting frame can be made of coated or stainless steel. Frame members are made from 2" flat bars with a minimum thickness of 3/16 inch.
- The insert screen is made of heavy-gage sheet metal with 5 millimeter (mm) openings. Total openings constitute 50% of the screen surface. Top 4 inches of the screen is grated with bars spaced at 2 inches on center.
- Insert top cover is made of heavy-gage sheet metal screen with 5 mm openings and 1" support frames.
- Structural support members for the screen and top cover are made of coated or stainless steel. Members are made from 1" flat bars with a minimum thickness of 1/8 inch.
- Mounting frame members are welded
- Structural support frame members are welded
- Insert screens are welded onto structural support frames.
- Mounting frames are bolted onto the catch basin wall at the outlet opening. Mounting frames are to be anchored at all four corners with HILTI expansion anchors or equal.
- Inserts are installed vertically onto the mounting frame directly in front of the outlet opening.
- The insert is completely removable by lifting it off the mounting frame

STORMTEK

REVISIONS	DATE	BY

SCALE:
DATE: 01/2024
DESIGNED: KPM
CHECKED: KPM
PLN CK REF:
F.B.

Kimley»Horn
3801 UNIVERSITY AVE. SUITE 300, RIVERSIDE, CA 92501
PHONE: (951) 543-9868 WWW.KIMLEY-HORN.COM

PRELIMINARY WQMP
EXHIBIT DETAILS
RED HILL STREET AND SAN JUAN AVENUE

PROJ. # 195261019
SHEET 2
OF 2 SHEETS
DWG. NO.
W-1

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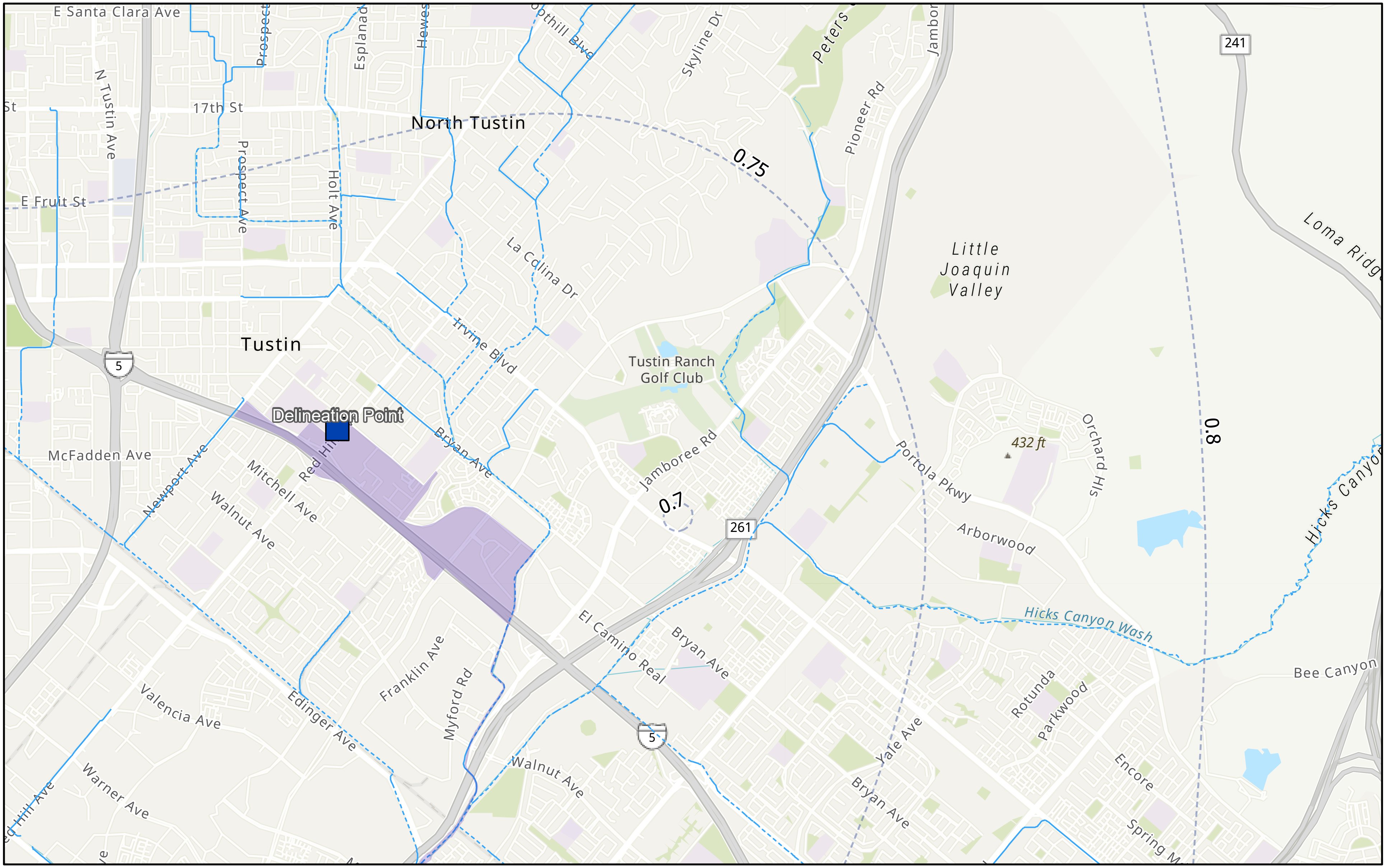
Section VII Educational Materials

Education Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☒	Tips for the Food Service Industry	☐
Homeowners Guide for Sustainable Water Use	☒	Proper Maintenance Practices for Your Business	☐
Household Tips	☒	**Other Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☒		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☒		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☒		☐
Tips for Pool Maintenance	☒		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☒		☐
Tips for Projects Using Paint	☒		☐

Attachment A – Calculations, Worksheets, and Cross-Sections

85th percentile depth



2/7/2024

▨ Trace Results

Regional Channels

--- Rainfall 85th Percentile

- - - Open Conveyance

— Closed Conveyance

1:54,409

0 0.38 0.75 1.5 mi

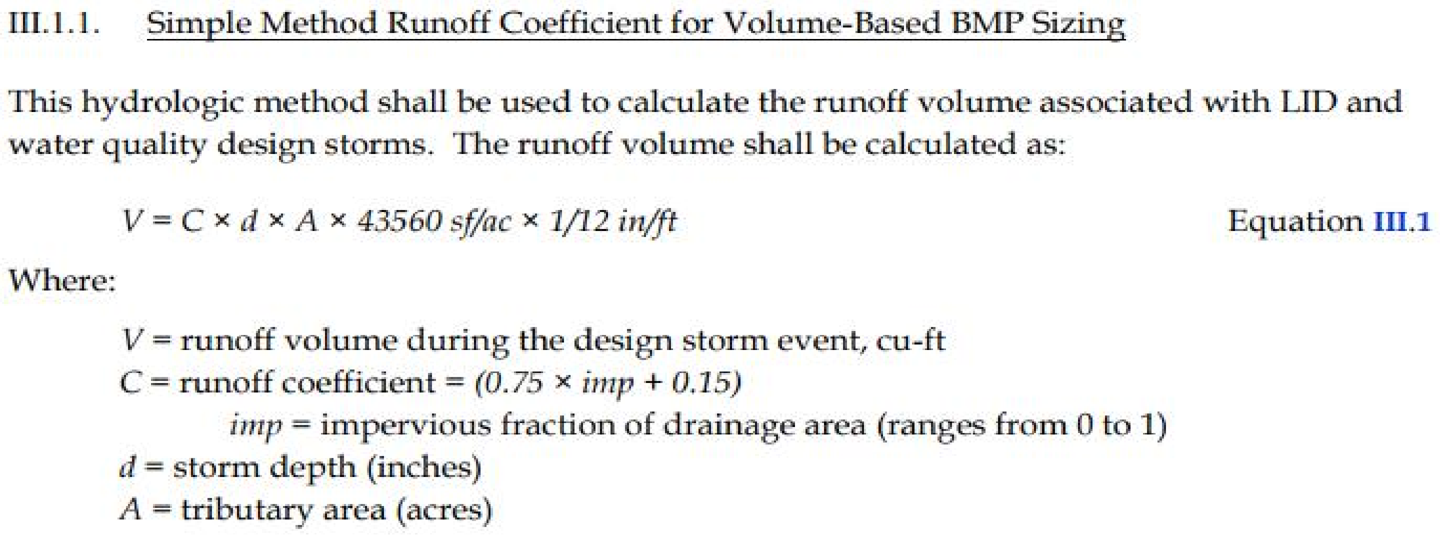
0 0.5 1 2 km

City of Irvine, County of Los Angeles, California State Parks, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of

TGD Section III.1.1 Simple Method Runoff Coefficient For Volume Based Sizing

Project:	Red Hill
Designed by:	AG
Reviewed by:	LAC
Date:	11/4/2024

DMA	imp decimal	Design Storm Depth (in)	C	Drainage Area (ac)	DCV (cf)	
A	0.85	0.75	0.788	3.32	7118	
C	0.01	0.75	0.158	0.07	30	(self treating)
TOTAL				3.32	7118	



III.1.1. Simple Method Runoff Coefficient for Volume-Based BMP Sizing

This hydrologic method shall be used to calculate the runoff volume associated with LID and water quality design storms. The runoff volume shall be calculated as:

$$V = C \times d \times A \times 43560\ sf/ac \times 1/12\ in/ft \qquad \text{Equation III.1}$$

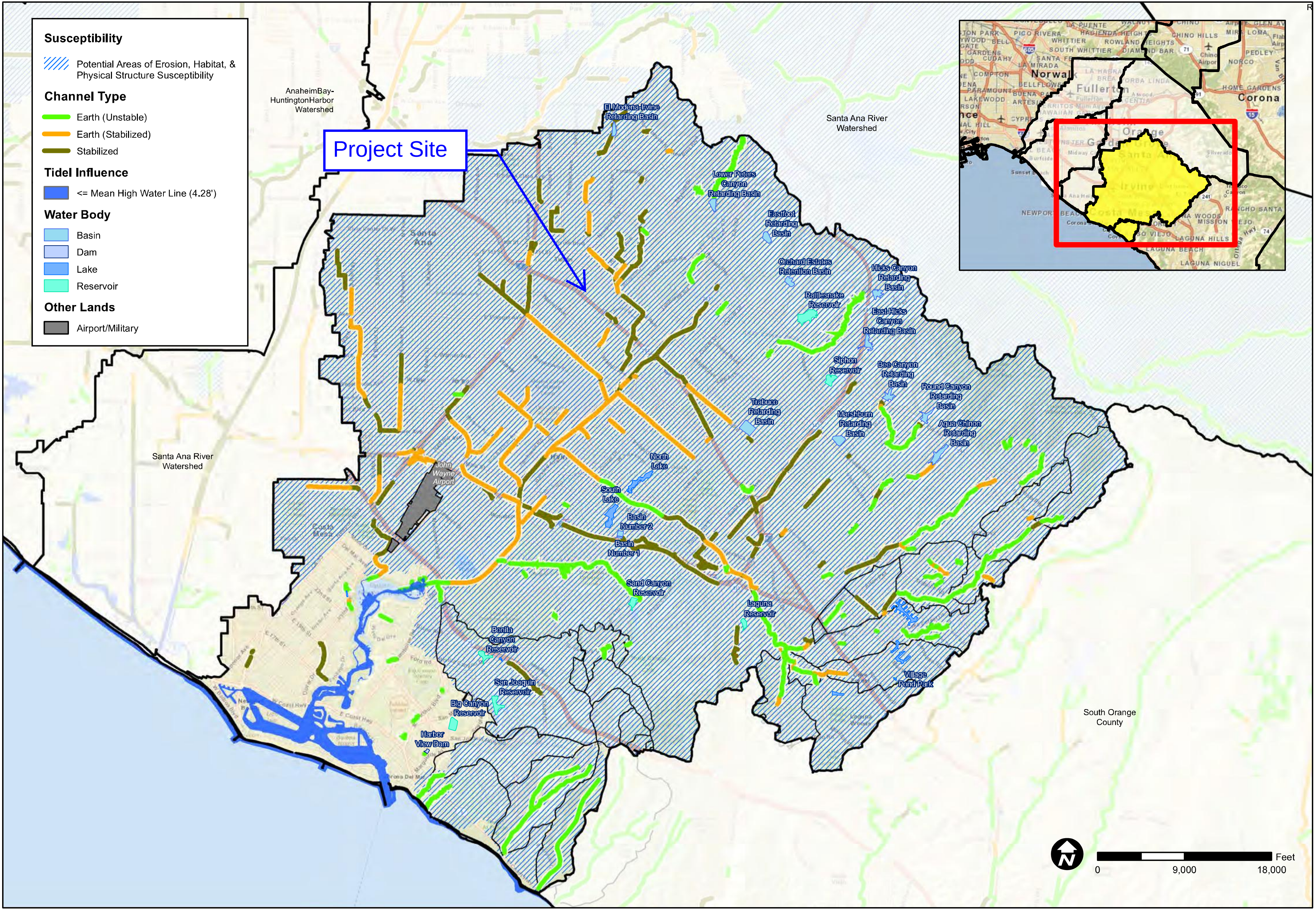
Where:

V = runoff volume during the design storm event, cu-ft
C = runoff coefficient = $(0.75 \times imp + 0.15)$
imp = impervious fraction of drainage area (ranges from 0 to 1)
d = storm depth (inches)
A = tributary area (acres)

Attachment A – Calculations, Worksheets, and Cross-Sections

Attachment B – 2-Year Storm Event Hydrology Calculations, if Applicable

SUSCEPTIBILITY MAP UPATE (FEB 2013)



SUSCEPTIBILITY ANALYSIS
NEWPORT BAY-
NEWPORT COASTAL STREAMS

TITLE

ORANGE COUNTY
WATERSHED
MASTER PLANNING

ORANGE CO.
CA

JOB

SCALE 1" = 12000'
DESIGNED TH
DRAWING TH
CHECKED BMP
DATE 04/30/10
JOB NO. 9526-E

PACE
Advanced Water Engineering

FIGURE
4

P:\9526E\6-GIS\Mxds\SusceptibilityMaps_20100505\9526E_NewportBaySusceptibility_20100430.mxd

```
 ****************************************************************************
                       SMALL AREA UNIT HYDROGRAPH MODEL
 ============================================================================
          (C) Copyright 1989-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                            Analysis prepared by:







 ****************************************************************************
 ----------------------------------------------------------------------------
  Problem Descriptions:
   Red Hill
   2 yr existing
   Kimley-Horn
 ============================================================================
 *** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
     AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

     TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.20 (inches)

     SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
        TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
          1          3.39       85.00       78.(AMC II)     0.300       0.179

     TOTAL AREA (Acres) =      3.39
                              _
     AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.255
                                      _
     AREA-AVERAGED LOW LOSS FRACTION, Y = 0.821
============================================================================

  Problem Descriptions:
   Red Hill
   2 yr existing
   Kimley-Horn
 ----------------------------------------------------------------------------


     RATIONAL METHOD CALIBRATION COEFFICIENT = 0.78
     TOTAL CATCHMENT AREA(ACRES) =    3.39
     SOIL-LOSS RATE, Fm,(INCH/HR) =  0.255
     LOW LOSS FRACTION = 0.821
     TIME OF CONCENTRATION(MIN.) = 16.50
     SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
     ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
     RETURN FREQUENCY(YEARS) =   2
```

```
      5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
     30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
      1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
      3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
      6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
     24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.12
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.46

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.05      0.0000      0.00  Q         .         .         .         .
  0.32      0.0002      0.02  Q         .         .         .         .
  0.60      0.0005      0.02  Q         .         .         .         .
  0.88      0.0009      0.02  Q         .         .         .         .
  1.15      0.0012      0.02  Q         .         .         .         .
  1.42      0.0016      0.02  Q         .         .         .         .
  1.70      0.0019      0.02  Q         .         .         .         .
  1.98      0.0023      0.02  Q         .         .         .         .
  2.25      0.0027      0.02  Q         .         .         .         .
  2.53      0.0030      0.02  Q         .         .         .         .
  2.80      0.0034      0.02  Q         .         .         .         .
  3.08      0.0038      0.02  Q         .         .         .         .
  3.35      0.0042      0.02  Q         .         .         .         .
  3.62      0.0046      0.02  Q         .         .         .         .
  3.90      0.0050      0.02  Q         .         .         .         .
  4.18      0.0054      0.02  Q         .         .         .         .
  4.45      0.0058      0.02  Q         .         .         .         .
  4.72      0.0062      0.02  Q         .         .         .         .
  5.00      0.0066      0.02  Q         .         .         .         .
  5.28      0.0071      0.02  Q         .         .         .         .
  5.55      0.0075      0.02  Q         .         .         .         .
  5.82      0.0080      0.02  Q         .         .         .         .
  6.10      0.0084      0.02  Q         .         .         .         .
  6.38      0.0089      0.02  Q         .         .         .         .
  6.65      0.0093      0.02  Q         .         .         .         .
  6.93      0.0098      0.02  Q         .         .         .         .
  7.20      0.0103      0.02  Q         .         .         .         .
  7.47      0.0108      0.02  Q         .         .         .         .
  7.75      0.0113      0.02  Q         .         .         .         .
  8.02      0.0118      0.02  Q         .         .         .         .
  8.30      0.0123      0.02  Q         .         .         .         .
  8.57      0.0129      0.02  Q         .         .         .         .
  8.85      0.0134      0.02  Q         .         .         .         .
  9.12      0.0140      0.03  Q         .         .         .         .
  9.40      0.0146      0.03  Q         .         .         .         .
```

```
 9.68      0.0151      0.03  Q         .         .         .         .
 9.95      0.0157      0.03  Q         .         .         .         .
10.23      0.0164      0.03  Q         .         .         .         .
10.50      0.0170      0.03  Q         .         .         .         .
10.77      0.0177      0.03  Q         .         .         .         .
11.05      0.0184      0.03  Q         .         .         .         .
11.32      0.0191      0.03  Q         .         .         .         .
11.60      0.0198      0.03  Q         .         .         .         .
11.88      0.0205      0.03  Q         .         .         .         .
12.15      0.0213      0.04  Q         .         .         .         .
12.43      0.0222      0.05  Q         .         .         .         .
12.70      0.0233      0.05  Q         .         .         .         .
12.98      0.0244      0.05  Q         .         .         .         .
13.25      0.0255      0.05  Q         .         .         .         .
13.52      0.0267      0.05  Q         .         .         .         .
13.80      0.0280      0.06  Q         .         .         .         .
14.07      0.0293      0.06  Q         .         .         .         .
14.35      0.0308      0.07  Q         .         .         .         .
14.62      0.0324      0.08  Q         .         .         .         .
14.90      0.0341      0.08  Q         .         .         .         .
15.18      0.0361      0.09  Q         .         .         .         .
15.45      0.0384      0.11  Q         .         .         .         .
15.73      0.0410      0.13  Q         .         .         .         .
16.00      0.0461      0.32  .Q        .         .         .         .
16.27      0.0761      2.31  .        Q.         .         .         .
16.55      0.1036      0.11  Q         .         .         .         .
16.83      0.1058      0.09  Q         .         .         .         .
17.10      0.1076      0.07  Q         .         .         .         .
17.38      0.1091      0.06  Q         .         .         .         .
17.65      0.1103      0.05  Q         .         .         .         .
17.92      0.1115      0.05  Q         .         .         .         .
18.20      0.1125      0.04  Q         .         .         .         .
18.48      0.1134      0.03  Q         .         .         .         .
18.75      0.1141      0.03  Q         .         .         .         .
19.02      0.1148      0.03  Q         .         .         .         .
19.30      0.1154      0.03  Q         .         .         .         .
19.58      0.1160      0.03  Q         .         .         .         .
19.85      0.1166      0.02  Q         .         .         .         .
20.12      0.1171      0.02  Q         .         .         .         .
20.40      0.1177      0.02  Q         .         .         .         .
20.67      0.1182      0.02  Q         .         .         .         .
20.95      0.1187      0.02  Q         .         .         .         .
21.23      0.1191      0.02  Q         .         .         .         .
21.50      0.1196      0.02  Q         .         .         .         .
21.77      0.1200      0.02  Q         .         .         .         .
22.05      0.1204      0.02  Q         .         .         .         .
22.33      0.1208      0.02  Q         .         .         .         .
22.60      0.1212      0.02  Q         .         .         .         .
22.88      0.1216      0.02  Q         .         .         .         .
23.15      0.1220      0.02  Q         .         .         .         .
23.42      0.1224      0.02  Q         .         .         .         .
```

```
  23.70      0.1227      0.02  Q         .         .         .         .
  23.98      0.1231      0.02  Q         .         .         .         .
  24.25      0.1234      0.02  Q         .         .         .         .
  24.52      0.1236      0.00  Q         .         .         .         .
 -----------------------------------------------------------------------------
--------------------------------------------------------------------------------
```

```
 ****************************************************************************
                       SMALL AREA UNIT HYDROGRAPH MODEL
 ============================================================================
          (C) Copyright 1989-2016 Advanced Engineering Software (aes)
              Ver. 23.0  Release Date: 07/01/2016  License ID 1499

                            Analysis prepared by:






 ****************************************************************************
 ----------------------------------------------------------------------------
  Problem Descriptions:
   Red Hill
   2 yr proposed
   Kimley-Horn
 ============================================================================
 *** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
     AND LOW LOSS FRACTION ESTIMATIONS FOR AMC I:

     TOTAL 24-HOUR DURATION RAINFALL DEPTH =     2.20 (inches)

     SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
        TYPE      (Acres)   PERVIOUS AREA     NUMBER    Fp(in./hr.)    YIELD
          1          3.32       15.00       56.(AMC II)     0.300       0.762

     TOTAL AREA (Acres) =      3.32
                                  _
     AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.045
                                          _
     AREA-AVERAGED LOW LOSS FRACTION, Y = 0.238
============================================================================
  Problem Descriptions:
   Red Hill
   2 yr proposed DMA A+B
   Kimley-Horn
 ----------------------------------------------------------------------------


     RATIONAL METHOD CALIBRATION COEFFICIENT = 0.89
     TOTAL CATCHMENT AREA(ACRES) =    3.32
     SOIL-LOSS RATE, Fm,(INCH/HR) =  0.045
     LOW LOSS FRACTION = 0.238
     TIME OF CONCENTRATION(MIN.) =  9.91
     SMALL AREA PEAK Q COMPUTED USING PEAK FLOW RATE FORMULA
     ORANGE COUNTY "VALLEY" RAINFALL VALUES ARE USED
     RETURN FREQUENCY(YEARS) =   2
```

```
       5-MINUTE POINT RAINFALL VALUE(INCHES) =  0.19
      30-MINUTE POINT RAINFALL VALUE(INCHES) =  0.40
       1-HOUR   POINT RAINFALL VALUE(INCHES) =  0.53
       3-HOUR   POINT RAINFALL VALUE(INCHES) =  0.89
       6-HOUR   POINT RAINFALL VALUE(INCHES) =  1.22
      24-HOUR   POINT RAINFALL VALUE(INCHES) =  2.05

----------------------------------------------------------------------------

    TOTAL CATCHMENT   RUNOFF  VOLUME(ACRE-FEET) =     0.40
    TOTAL CATCHMENT SOIL-LOSS VOLUME(ACRE-FEET) =     0.17

****************************************************************************
  TIME     VOLUME       Q    0.        2.5       5.0       7.5      10.0
 (HOURS)    (AF)      (CFS)
----------------------------------------------------------------------------
  0.14      0.0005      0.07  Q         .         .         .         .
  0.31      0.0015      0.07  Q         .         .         .         .
  0.47      0.0025      0.07  Q         .         .         .         .
  0.64      0.0035      0.07  Q         .         .         .         .
  0.80      0.0045      0.07  Q         .         .         .         .
  0.97      0.0055      0.07  Q         .         .         .         .
  1.14      0.0065      0.07  Q         .         .         .         .
  1.30      0.0075      0.08  Q         .         .         .         .
  1.47      0.0085      0.08  Q         .         .         .         .
  1.63      0.0096      0.08  Q         .         .         .         .
  1.80      0.0106      0.08  Q         .         .         .         .
  1.96      0.0117      0.08  Q         .         .         .         .
  2.13      0.0127      0.08  Q         .         .         .         .
  2.29      0.0138      0.08  Q         .         .         .         .
  2.46      0.0149      0.08  Q         .         .         .         .
  2.62      0.0160      0.08  Q         .         .         .         .
  2.79      0.0170      0.08  Q         .         .         .         .
  2.95      0.0181      0.08  Q         .         .         .         .
  3.12      0.0193      0.08  Q         .         .         .         .
  3.28      0.0204      0.08  Q         .         .         .         .
  3.45      0.0215      0.08  Q         .         .         .         .
  3.61      0.0226      0.08  Q         .         .         .         .
  3.78      0.0238      0.08  Q         .         .         .         .
  3.94      0.0249      0.09  Q         .         .         .         .
  4.11      0.0261      0.09  Q         .         .         .         .
  4.27      0.0273      0.09  Q         .         .         .         .
  4.44      0.0285      0.09  Q         .         .         .         .
  4.60      0.0297      0.09  Q         .         .         .         .
  4.77      0.0309      0.09  Q         .         .         .         .
  4.93      0.0321      0.09  Q         .         .         .         .
  5.10      0.0333      0.09  Q         .         .         .         .
  5.26      0.0346      0.09  Q         .         .         .         .
  5.43      0.0358      0.09  Q         .         .         .         .
  5.59      0.0371      0.09  Q         .         .         .         .
  5.76      0.0383      0.09  Q         .         .         .         .
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  5.92      0.0396      0.10  Q         .         .         .         .
  6.09      0.0409      0.10  Q         .         .         .         .
  6.26      0.0423      0.10  Q         .         .         .         .
  6.42      0.0436      0.10  Q         .         .         .         .
  6.59      0.0449      0.10  Q         .         .         .         .
  6.75      0.0463      0.10  Q         .         .         .         .
  6.92      0.0477      0.10  Q         .         .         .         .
  7.08      0.0491      0.10  Q         .         .         .         .
  7.25      0.0505      0.10  Q         .         .         .         .
  7.41      0.0519      0.10  Q         .         .         .         .
  7.58      0.0533      0.11  Q         .         .         .         .
  7.74      0.0548      0.11  Q         .         .         .         .
  7.91      0.0563      0.11  Q         .         .         .         .
  8.07      0.0577      0.11  Q         .         .         .         .
  8.24      0.0593      0.11  Q         .         .         .         .
  8.40      0.0608      0.11  Q         .         .         .         .
  8.57      0.0623      0.11  Q         .         .         .         .
  8.73      0.0639      0.12  Q         .         .         .         .
  8.90      0.0655      0.12  Q         .         .         .         .
  9.06      0.0671      0.12  Q         .         .         .         .
  9.23      0.0688      0.12  Q         .         .         .         .
  9.39      0.0704      0.12  Q         .         .         .         .
  9.56      0.0721      0.13  Q         .         .         .         .
  9.72      0.0739      0.13  Q         .         .         .         .
  9.89      0.0756      0.13  Q         .         .         .         .
 10.05      0.0774      0.13  Q         .         .         .         .
 10.22      0.0792      0.13  Q         .         .         .         .
 10.38      0.0810      0.14  Q         .         .         .         .
 10.55      0.0829      0.14  Q         .         .         .         .
 10.71      0.0848      0.14  Q         .         .         .         .
 10.88      0.0868      0.14  Q         .         .         .         .
 11.05      0.0887      0.15  Q         .         .         .         .
 11.21      0.0908      0.15  Q         .         .         .         .
 11.38      0.0928      0.15  Q         .         .         .         .
 11.54      0.0949      0.16  Q         .         .         .         .
 11.71      0.0971      0.16  Q         .         .         .         .
 11.87      0.0993      0.16  Q         .         .         .         .
 12.04      0.1016      0.17  Q         .         .         .         .
 12.20      0.1042      0.21  Q         .         .         .         .
 12.37      0.1071      0.21  Q         .         .         .         .
 12.53      0.1100      0.22  Q         .         .         .         .
 12.70      0.1130      0.22  Q         .         .         .         .
 12.86      0.1162      0.23  Q         .         .         .         .
 13.03      0.1194      0.24  Q         .         .         .         .
 13.19      0.1227      0.25  Q         .         .         .         .
 13.36      0.1261      0.25  .Q        .         .         .         .
 13.52      0.1296      0.26  .Q        .         .         .         .
 13.69      0.1332      0.27  .Q        .         .         .         .
 13.85      0.1370      0.28  .Q        .         .         .         .
 14.02      0.1409      0.29  .Q        .         .         .         .
 14.18      0.1451      0.32  .Q        .         .         .         .
```

```
14.35      0.1495      0.33  .Q        .         .         .         .
14.51      0.1542      0.35  .Q        .         .         .         .
14.68      0.1591      0.37  .Q        .         .         .         .
14.84      0.1643      0.40  .Q        .         .         .         .
15.01      0.1699      0.42  .Q        .         .         .         .
15.17      0.1761      0.48  .Q        .         .         .         .
15.34      0.1830      0.53  . Q       .         .         .         .
15.50      0.1902      0.54  . Q       .         .         .         .
15.67      0.1982      0.62  . Q       .         .         .         .
15.83      0.2090      0.97  .  Q      .         .         .         .
16.00      0.2250      1.37  .    Q    .         .         .         .
16.17      0.2641      4.37  .         .      Q  .         .         .
16.33      0.2990      0.75  . Q       .         .         .         .
16.50      0.3080      0.57  . Q       .         .         .         .
16.66      0.3150      0.45  .Q        .         .         .         .
16.83      0.3207      0.38  .Q        .         .         .         .
16.99      0.3256      0.34  .Q        .         .         .         .
17.16      0.3300      0.30  .Q        .         .         .         .
17.32      0.3339      0.28  .Q        .         .         .         .
17.49      0.3376      0.26  .Q        .         .         .         .
17.65      0.3410      0.24  Q         .         .         .         .
17.82      0.3442      0.23  Q         .         .         .         .
17.98      0.3472      0.22  Q         .         .         .         .
18.15      0.3499      0.18  Q         .         .         .         .
18.31      0.3523      0.16  Q         .         .         .         .
18.48      0.3545      0.15  Q         .         .         .         .
18.64      0.3565      0.15  Q         .         .         .         .
18.81      0.3585      0.14  Q         .         .         .         .
18.97      0.3604      0.14  Q         .         .         .         .
19.14      0.3623      0.13  Q         .         .         .         .
19.30      0.3640      0.13  Q         .         .         .         .
19.47      0.3658      0.12  Q         .         .         .         .
19.63      0.3674      0.12  Q         .         .         .         .
19.80      0.3690      0.12  Q         .         .         .         .
19.96      0.3706      0.11  Q         .         .         .         .
20.13      0.3721      0.11  Q         .         .         .         .
20.29      0.3736      0.11  Q         .         .         .         .
20.46      0.3751      0.11  Q         .         .         .         .
20.62      0.3765      0.10  Q         .         .         .         .
20.79      0.3779      0.10  Q         .         .         .         .
20.95      0.3793      0.10  Q         .         .         .         .
21.12      0.3806      0.10  Q         .         .         .         .
21.29      0.3819      0.09  Q         .         .         .         .
21.45      0.3832      0.09  Q         .         .         .         .
21.62      0.3844      0.09  Q         .         .         .         .
21.78      0.3857      0.09  Q         .         .         .         .
21.95      0.3869      0.09  Q         .         .         .         .
22.11      0.3881      0.09  Q         .         .         .         .
22.28      0.3892      0.08  Q         .         .         .         .
22.44      0.3904      0.08  Q         .         .         .         .
22.61      0.3915      0.08  Q         .         .         .         .
```

```
 22.77      0.3926      0.08  Q         .         .         .         .
 22.94      0.3937      0.08  Q         .         .         .         .
 23.10      0.3948      0.08  Q         .         .         .         .
 23.27      0.3958      0.08  Q         .         .         .         .
 23.43      0.3969      0.08  Q         .         .         .         .
 23.60      0.3979      0.07  Q         .         .         .         .
 23.76      0.3989      0.07  Q         .         .         .         .
 23.93      0.3999      0.07  Q         .         .         .         .
 24.09      0.4009      0.07  Q         .         .         .         .
 24.26      0.4014      0.00  Q         .         .         .         .
 ----------------------------------------------------------------------------
-------------------------------------------------------------------------------
   TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
   (Note: 100% of Peak Flow Rate estimate assumed to have
   an instantaneous time duration)

   Percentile of Estimated                 Duration
       Peak Flow Rate                      (minutes)
   =======================                 =========
             0%                             1446.9
            10%                               99.1
            20%                               29.7
            30%                               19.8
            40%                                9.9
            50%                                9.9
            60%                                9.9
            70%                                9.9
            80%                                9.9
            90%                                9.9
```

Detention Basin Infiltration Calculation

Project Name: Red Hill
Completed by: AG
Reviewed by: LAC
Date: 31-Mar-23
Updated: 4-Dec-24
County: Orange County

BMP	Measured Infiltration Rate	Design Factor of Safety	Design Infiltration Rate*	Detention Basin Infiltration Area	In/Hr to Ft/Sec Conversion Value	Constant Infiltration Rate
	(in/hr)		(in/hr)	(sf)		(cf/sec)
BMP 1	1.5	2.00	0.75	5730	43200	0.099

*Design infiltration rate and factor of safety is recommended by geotech report

Retention Drawdown Calculations

Project Name: Red Hill
Completed by: AG
Reviewed by: LAC
Date: 31-Mar-23
Updated: 4-Dec-24
County: Orange County

BMP	Design Infiltration Rate	Design Infiltration Rate Converted	Detention Basin Infiltration Area	Volume to Infiltrate	Drawdown Time
	(in/hr)	(ft/hr)	(sf)	(cf)	(hrs)
BMP 1	0.750	0.063	5730	7305	20.398

Red Hill 2 Year 24-Hour Storm Analysis

Project Summary	
Title	Red Hill
Engineer	
Company	Kimley-Horn and Associates, Inc.
Date	11/14/2024

Notes	1. Inflow hydrographs for 24-72 hours calculated using AES v2016. 2. Flow-through basin analysis completed using modified Pul's (storage indication routing).

Table of Contents

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
DMA-1	2yr24hr	0	22,441.000	15.8	4.37000

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)
Outfall 1	2yr24hr	0	5,975.000	16.0	1.02059

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ft³)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ft³)
BMP1 (IN)	2yr24hr	0	22,435.000	15.8	4.09862	(N/A)	(N/A)
BMP1 (OUT)	2yr24hr	0	5,975.000	16.0	1.02059	2.773	11,050.000

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Read Hydrograph Scenario: 2yr24hr

Label: DMA-1

Peak Discharge	4.37000 ft³/s
Time to Peak	15.8 hours
Hydrograph Volume	22,441.010 ft³

HYDROGRAPH ORDINATES (ft³/s)
Output Time Increment = 0.2 hours
Time on left represents time for first value in each row.

Time (hours)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)	Flow (ft³/s)
0.0	0.10000	0.10000	0.10000	0.10000	0.10000
0.8	0.10000	0.10000	0.11000	0.11000	0.11000
1.6	0.11000	0.11000	0.11000	0.11000	0.11000
2.4	0.11000	0.11000	0.11000	0.11000	0.12000
3.3	0.12000	0.12000	0.12000	0.12000	0.12000
4.1	0.12000	0.12000	0.12000	0.12000	0.12000
4.9	0.13000	0.13000	0.13000	0.13000	0.13000
5.7	0.13000	0.13000	0.13000	0.14000	0.14000
6.5	0.14000	0.14000	0.14000	0.14000	0.14000
7.3	0.15000	0.15000	0.15000	0.15000	0.15000
8.2	0.16000	0.16000	0.16000	0.16000	0.16000
9.0	0.17000	0.17000	0.17000	0.17000	0.18000
9.8	0.18000	0.18000	0.19000	0.19000	0.19000
10.6	0.20000	0.20000	0.20000	0.21000	0.21000
11.4	0.22000	0.22000	0.23000	0.29000	0.29000
12.2	0.30000	0.30000	0.31000	0.32000	0.33000
13.0	0.34000	0.35000	0.36000	0.38000	0.39000
13.9	0.44000	0.46000	0.48000	0.50000	0.55000
14.7	0.58000	0.65000	0.70000	0.73000	0.83000
15.5	1.24000	1.67000	4.37000	0.98000	0.76000
16.3	0.61000	0.52000	0.47000	0.40000	0.37000
17.1	0.35000	0.33000	0.31000	0.29000	0.25000
17.9	0.22000	0.21000	0.20000	0.19000	0.19000
18.8	0.18000	0.18000	0.17000	0.17000	0.16000
19.6	0.16000	0.15000	0.15000	0.15000	0.14000
20.4	0.14000	0.14000	0.13000	0.13000	0.13000
21.2	0.13000	0.12000	0.12000	0.12000	0.12000
22.0	0.12000	0.11000	0.11000	0.11000	0.11000
22.8	0.11000	0.11000	0.11000	0.10000	0.10000
23.6	0.10000	0.00000	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr24hr
Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
0.0	0.000	0.008	0.015	0.023	0.030
0.3	0.038	0.045	0.052	0.059	0.066
0.5	0.073	0.079	0.086	0.092	0.099
0.8	0.105	0.111	0.117	0.123	0.129
1.0	0.135	0.141	0.147	0.153	0.159
1.3	0.166	0.172	0.178	0.183	0.189
1.5	0.195	0.200	0.206	0.211	0.217
1.8	0.222	0.227	0.232	0.237	0.242
2.0	0.247	0.251	0.256	0.261	0.265
2.3	0.270	0.274	0.279	0.283	0.287
2.5	0.291	0.295	0.299	0.303	0.307
2.8	0.311	0.315	0.318	0.322	0.326
3.0	0.329	0.333	0.337	0.342	0.346
3.3	0.350	0.354	0.358	0.361	0.365
3.5	0.369	0.373	0.376	0.380	0.383
3.8	0.387	0.390	0.393	0.397	0.400
4.0	0.403	0.406	0.409	0.412	0.415
4.3	0.418	0.421	0.424	0.427	0.430
4.5	0.432	0.435	0.438	0.440	0.443
4.8	0.445	0.448	0.451	0.454	0.457
5.0	0.460	0.463	0.466	0.469	0.472
5.3	0.475	0.478	0.480	0.483	0.486
5.5	0.488	0.491	0.494	0.496	0.499
5.8	0.501	0.502	0.504	0.506	0.507
6.0	0.509	0.511	0.512	0.514	0.517
6.3	0.519	0.521	0.523	0.525	0.528
6.5	0.530	0.532	0.534	0.536	0.538
6.8	0.541	0.543	0.545	0.547	0.549
7.0	0.552	0.554	0.556	0.558	0.560
7.3	0.563	0.565	0.568	0.571	0.573
7.5	0.576	0.579	0.582	0.584	0.587
7.8	0.590	0.592	0.595	0.598	0.601
8.0	0.603	0.606	0.609	0.612	0.616
8.3	0.619	0.622	0.625	0.629	0.632
8.5	0.635	0.638	0.642	0.645	0.648
8.8	0.651	0.655	0.658	0.661	0.665
9.0	0.669	0.673	0.676	0.680	0.684
9.3	0.688	0.692	0.695	0.699	0.703
9.5	0.707	0.711	0.715	0.719	0.724
9.8	0.728	0.732	0.737	0.741	0.745
10.0	0.750	0.754	0.759	0.764	0.769

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr24hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours

Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
10.3	0.774	0.778	0.783	0.788	0.793
10.5	0.798	0.803	0.809	0.814	0.819
10.8	0.825	0.830	0.836	0.841	0.846
11.0	0.852	0.858	0.863	0.869	0.875
11.3	0.881	0.887	0.893	0.900	0.906
11.5	0.913	0.919	0.926	0.932	0.939
11.8	0.946	0.954	0.962	0.972	0.982
12.0	0.992	1.002	1.009	1.016	1.024
12.3	1.031	1.039	1.046	1.054	1.061
12.5	1.069	1.077	1.085	1.093	1.101
12.8	1.109	1.117	1.126	1.135	1.143
13.0	1.152	1.161	1.170	1.179	1.189
13.3	1.198	1.208	1.217	1.227	1.237
13.5	1.247	1.258	1.268	1.279	1.290
13.8	1.301	1.313	1.325	1.338	1.351
14.0	1.364	1.378	1.391	1.405	1.420
14.3	1.434	1.449	1.463	1.479	1.495
14.5	1.511	1.529	1.546	1.564	1.583
14.8	1.602	1.622	1.643	1.665	1.687
15.0	1.710	1.733	1.756	1.780	1.805
15.3	1.830	1.857	1.886	1.919	1.956
15.5	1.998	2.047	2.100	2.159	2.236
15.8	2.345	2.483	2.624	2.721	2.767
16.0	2.773	2.765	2.756	2.745	2.733
16.3	2.720	2.707	2.695	2.682	2.670
16.5	2.659	2.648	2.637	2.628	2.618
16.8	2.609	2.600	2.592	2.584	2.577
17.0	2.570	2.564	2.558	2.553	2.548
17.3	2.543	2.539	2.535	2.531	2.527
17.5	2.524	2.521	2.518	2.515	2.511
17.8	2.508	2.505	2.501	2.498	2.494
18.0	2.491	2.487	2.484	2.480	2.477
18.3	2.473	2.469	2.466	2.462	2.459
18.5	2.455	2.452	2.449	2.446	2.442
18.8	2.439	2.436	2.433	2.430	2.427
19.0	2.424	2.421	2.418	2.415	2.413
19.3	2.410	2.407	2.404	2.402	2.399
19.5	2.396	2.394	2.391	2.389	2.386
19.8	2.384	2.381	2.379	2.377	2.374
20.0	2.372	2.370	2.368	2.366	2.364
20.3	2.361	2.359	2.357	2.355	2.353

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Time vs. Elevation Scenario: 2yr24hr

Label: BMP1 (IN)

Time vs. Elevation (ft)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)	Elevation (ft)
20.5	2.351	2.350	2.348	2.346	2.344
20.8	2.342	2.340	2.338	2.337	2.335
21.0	2.333	2.332	2.330	2.329	2.327
21.3	2.326	2.324	2.323	2.321	2.320
21.5	2.318	2.317	2.315	2.314	2.312
21.8	2.311	2.310	2.309	2.308	2.306
22.0	2.305	2.304	2.303	2.302	2.301
22.3	2.299	2.298	2.297	2.296	2.295
22.5	2.294	2.293	2.292	2.291	2.290
22.8	2.289	2.288	2.287	2.286	2.285
23.0	2.285	2.284	2.283	2.283	2.282
23.3	2.281	2.280	2.279	2.278	2.277
23.5	2.276	2.276	2.275	2.274	2.272
23.8	2.270	2.266	2.262	2.257	2.253
24.0	2.249	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr24hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
0.0	0.000	18.000	35.000	53.000	70.000
0.3	87.000	103.000	119.000	135.000	151.000
0.5	167.000	182.000	197.000	212.000	226.000
0.8	241.000	255.000	269.000	283.000	296.000
1.0	310.000	323.000	337.000	351.000	366.000
1.3	380.000	393.000	407.000	420.000	433.000
1.5	446.000	459.000	472.000	484.000	496.000
1.8	508.000	520.000	532.000	543.000	554.000
2.0	565.000	576.000	587.000	598.000	608.000
2.3	618.000	629.000	638.000	648.000	658.000
2.5	667.000	677.000	686.000	695.000	704.000
2.8	713.000	721.000	730.000	738.000	747.000
3.0	755.000	764.000	774.000	783.000	792.000
3.3	802.000	811.000	820.000	828.000	837.000
3.5	846.000	854.000	862.000	870.000	878.000
3.8	886.000	894.000	902.000	909.000	917.000
4.0	924.000	931.000	938.000	945.000	952.000
4.3	959.000	965.000	972.000	978.000	985.000
4.5	991.000	997.000	1,003.000	1,009.000	1,015.000
4.8	1,021.000	1,027.000	1,034.000	1,041.000	1,048.000
5.0	1,055.000	1,062.000	1,069.000	1,075.000	1,082.000
5.3	1,088.000	1,095.000	1,101.000	1,107.000	1,114.000
5.5	1,120.000	1,126.000	1,131.000	1,137.000	1,143.000
5.8	1,148.000	1,151.000	1,155.000	1,159.000	1,163.000
6.0	1,167.000	1,171.000	1,175.000	1,179.000	1,184.000
6.3	1,189.000	1,194.000	1,199.000	1,204.000	1,209.000
6.5	1,214.000	1,219.000	1,224.000	1,229.000	1,234.000
6.8	1,239.000	1,244.000	1,249.000	1,254.000	1,259.000
7.0	1,264.000	1,269.000	1,274.000	1,279.000	1,284.000
7.3	1,290.000	1,296.000	1,302.000	1,308.000	1,314.000
7.5	1,320.000	1,327.000	1,333.000	1,339.000	1,345.000
7.8	1,352.000	1,358.000	1,364.000	1,370.000	1,377.000
8.0	1,383.000	1,389.000	1,396.000	1,403.000	1,411.000
8.3	1,418.000	1,426.000	1,433.000	1,441.000	1,448.000
8.5	1,456.000	1,463.000	1,471.000	1,478.000	1,486.000
8.8	1,493.000	1,501.000	1,508.000	1,516.000	1,525.000
9.0	1,533.000	1,542.000	1,551.000	1,559.000	1,568.000
9.3	1,577.000	1,585.000	1,594.000	1,603.000	1,611.000
9.5	1,620.000	1,629.000	1,639.000	1,649.000	1,659.000
9.8	1,669.000	1,679.000	1,688.000	1,698.000	1,708.000
10.0	1,718.000	1,729.000	1,741.000	1,754.000	1,767.000

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr24hr
Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours
Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
10.3	1,781.000	1,796.000	1,811.000	1,827.000	1,844.000
10.5	1,863.000	1,882.000	1,904.000	1,927.000	1,950.000
10.8	1,975.000	2,001.000	2,027.000	2,054.000	2,081.000
11.0	2,108.000	2,136.000	2,165.000	2,194.000	2,223.000
11.3	2,252.000	2,281.000	2,311.000	2,342.000	2,374.000
11.5	2,405.000	2,437.000	2,469.000	2,501.000	2,534.000
11.8	2,569.000	2,606.000	2,648.000	2,695.000	2,745.000
12.0	2,795.000	2,840.000	2,875.000	2,911.000	2,947.000
12.3	2,983.000	3,020.000	3,056.000	3,093.000	3,129.000
12.5	3,167.000	3,205.000	3,243.000	3,282.000	3,322.000
12.8	3,362.000	3,403.000	3,444.000	3,485.000	3,528.000
13.0	3,571.000	3,614.000	3,658.000	3,702.000	3,747.000
13.3	3,793.000	3,839.000	3,885.000	3,933.000	3,981.000
13.5	4,030.000	4,080.000	4,131.000	4,183.000	4,235.000
13.8	4,289.000	4,346.000	4,405.000	4,466.000	4,529.000
14.0	4,592.000	4,657.000	4,723.000	4,790.000	4,857.000
14.3	4,926.000	4,996.000	5,067.000	5,140.000	5,216.000
14.5	5,295.000	5,378.000	5,462.000	5,548.000	5,636.000
14.8	5,727.000	5,822.000	5,921.000	6,023.000	6,128.000
15.0	6,235.000	6,344.000	6,455.000	6,567.000	6,682.000
15.3	6,802.000	6,927.000	7,061.000	7,213.000	7,387.000
15.5	7,582.000	7,806.000	8,052.000	8,322.000	8,671.000
15.8	9,163.000	9,781.000	10,403.000	10,826.000	11,021.000
16.0	11,050.000	11,016.000	10,975.000	10,927.000	10,875.000
16.3	10,821.000	10,766.000	10,710.000	10,656.000	10,604.000
16.5	10,553.000	10,506.000	10,461.000	10,418.000	10,377.000
16.8	10,337.000	10,298.000	10,262.000	10,227.000	10,195.000
17.0	10,166.000	10,138.000	10,113.000	10,090.000	10,068.000
17.3	10,048.000	10,029.000	10,011.000	9,994.000	9,978.000
17.5	9,963.000	9,949.000	9,935.000	9,921.000	9,907.000
17.8	9,892.000	9,877.000	9,862.000	9,847.000	9,832.000
18.0	9,816.000	9,800.000	9,785.000	9,769.000	9,753.000
18.3	9,737.000	9,721.000	9,705.000	9,690.000	9,674.000
18.5	9,658.000	9,644.000	9,629.000	9,615.000	9,601.000
18.8	9,586.000	9,572.000	9,558.000	9,545.000	9,532.000
19.0	9,519.000	9,506.000	9,493.000	9,480.000	9,467.000
19.3	9,455.000	9,444.000	9,431.000	9,419.000	9,407.000
19.5	9,395.000	9,384.000	9,373.000	9,362.000	9,350.000
19.8	9,339.000	9,328.000	9,317.000	9,306.000	9,296.000
20.0	9,286.000	9,277.000	9,268.000	9,258.000	9,248.000
20.3	9,238.000	9,229.000	9,220.000	9,211.000	9,202.000

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Time vs. Volume Scenario: 2yr24hr

Label: BMP1

Time vs. Volume (ft³)

Output Time increment = 0.1 hours

Time on left represents time for first value in each row.

Time (hours)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)	Volume (ft³)
20.5	9,194.000	9,185.000	9,177.000	9,169.000	9,160.000
20.8	9,151.000	9,143.000	9,135.000	9,127.000	9,119.000
21.0	9,112.000	9,105.000	9,098.000	9,091.000	9,085.000
21.3	9,078.000	9,071.000	9,064.000	9,057.000	9,050.000
21.5	9,043.000	9,036.000	9,030.000	9,024.000	9,018.000
21.8	9,012.000	9,007.000	9,001.000	8,996.000	8,991.000
22.0	8,986.000	8,981.000	8,976.000	8,970.000	8,965.000
22.3	8,959.000	8,953.000	8,948.000	8,943.000	8,938.000
22.5	8,933.000	8,928.000	8,924.000	8,919.000	8,915.000
22.8	8,911.000	8,907.000	8,903.000	8,900.000	8,896.000
23.0	8,893.000	8,889.000	8,886.000	8,883.000	8,880.000
23.3	8,876.000	8,872.000	8,868.000	8,863.000	8,859.000
23.5	8,855.000	8,851.000	8,848.000	8,844.000	8,837.000
23.8	8,825.000	8,807.000	8,788.000	8,769.000	8,751.000
24.0	8,733.000	(N/A)	(N/A)	(N/A)	(N/A)

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Outlet Input Data　　Scenario: 2yr24hr

Label: Bypass

Requested Pond Water Surface Elevations	
Minimum (Headwater)	0.000 ft
Increment (Headwater)	0.500 ft
Maximum (Headwater)	5.500 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	2.250	5.500
Tailwater Settings	Tailwater			(N/A)	(N/A)

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Outlet Input Data
Scenario: 2yr24hr
Label: Bypass

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	2.250 ft
Orifice Diameter	13.0 in
Orifice Coefficient	0.600

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.010 ft
Tailwater Tolerance (Maximum)	0.500 ft
Headwater Tolerance (Minimum)	0.010 ft
Headwater Tolerance (Maximum)	0.500 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Elevation-Volume-Flow Table (Pond) Scenario: 2yr24hr

Label: BMP1

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ft³)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
0.000	0.00000	0.000	2,292	0.00000	0.00000	0.00000
0.500	0.00000	1,146.000	2,292	0.09900	0.09900	12.83233
1.000	0.00000	2,831.585	4,871	0.09900	0.09900	31.56106
1.500	0.00000	5,241.723	4,765	0.09900	0.09900	58.34037
2.000	0.00000	7,590.568	4,624	0.09900	0.09900	84.43864
2.250	0.00000	8,735.605	4,534	0.09900	0.09900	97.16128
2.500	0.21364	9,856.725	4,431	0.09900	0.31264	109.83180
3.000	1.68995	12,010.492	4,171	0.09900	1.78895	135.23886
3.500	3.73381	14,010.222	3,807	0.09900	3.83281	159.50194
4.000	4.87670	15,781.079	3,217	0.09900	4.97570	180.32102
4.500	5.79855	17,128.499	2,335	0.09900	5.89755	196.21420
5.000	6.59273	18,276.203	2,292	0.09900	6.69173	209.76065
5.500	7.30103	19,422.203	2,292	0.09900	7.40003	223.20228

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Level Pool Pond Routing Summary Scenario: 2yr24hr

Label: BMP1 (IN)

Infiltration	
Infiltration Method (Computed)	Constant
Infiltration Rate (Constant)	0.09900 ft³/s

Initial Conditions	
Elevation (Water Surface, Initial)	0.000 ft
Volume (Initial)	0.000 ft³
Flow (Initial Outlet)	0.00000 ft³/s
Flow (Initial Infiltration)	0.00000 ft³/s
Flow (Initial, Total)	0.00000 ft³/s
Time Increment	0.1 hours

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	4.09862 ft³/s	Time to Peak (Flow, In)	15.8 hours
Infiltration (Peak)	0.09900 ft³/s	Time to Peak (Infiltration)	5.8 hours
Flow (Peak Outlet)	1.02059 ft³/s	Time to Peak (Flow, Outlet)	16.0 hours

Elevation (Water Surface, Peak)	2.773 ft
Volume (Peak)	11,050.146 ft³

Mass Balance (ft³)	
Volume (Initial)	0.000 ft³
Volume (Total Inflow)	22,435.000 ft³
Volume (Total Infiltration)	7,745.000 ft³
Volume (Total Outlet Outflow)	5,975.000 ft³
Volume (Retained)	8,716.000 ft³
Volume (Unrouted)	0.000 ft³
Error (Mass Balance)	0.0 %

Red Hill 2 Year 24-Hour Storm Analysis

Subsection: Pond Inflow Summary Scenario: 2yr24hr

Label: BMP1 (IN)

Summary for Hydrograph Addition at 'BMP1'

Upstream Link	Upstream Node
<Catchment to Outflow Node>	DMA-1

Node Inflows

Inflow Type	Element	Volume (ft³)	Time to Peak (hours)	Flow (Peak) (ft³/s)
Flow (From)	DMA-1	22,441.010	15.8	4.37000
Flow (In)	BMP1	22,435.280	15.8	4.09862

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PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

ADS Advanced Drainage Systems, Inc.

ADS SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
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RED HILL

TUSTIN, CA, USA

MC-3500 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
    - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
    - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3”.
    - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
    - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
    - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
    - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
    - STONESHOOTER LOCATED OFF THE CHAMBER BED.
    - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
    - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 6" (150 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
10. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIALS BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
    - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
    - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
    - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

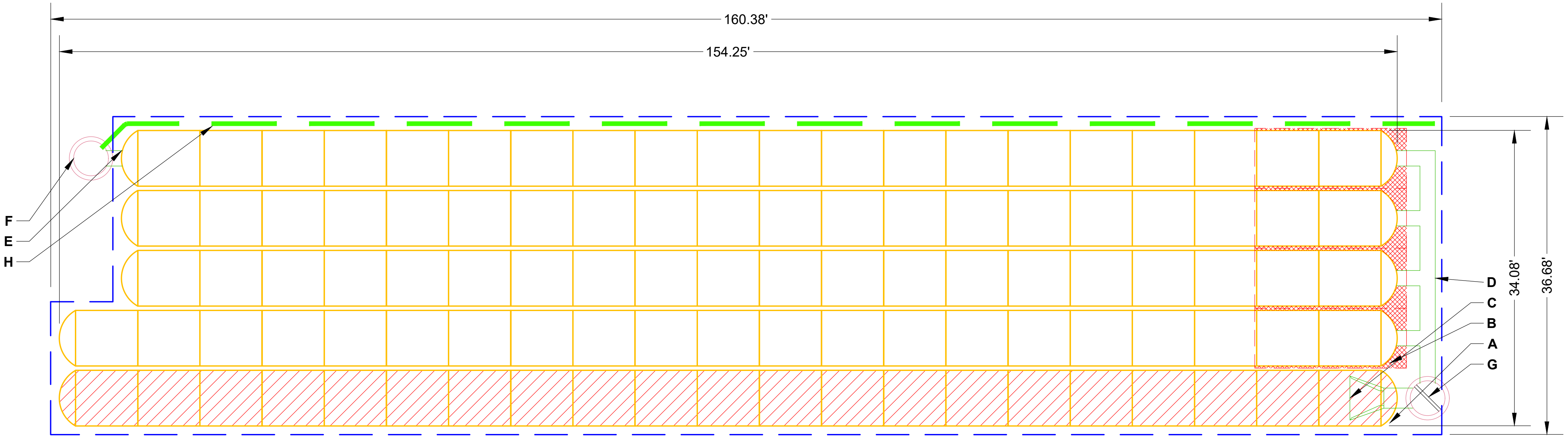
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT	
102	STORMTECH MC-3500 CHAMBERS
10	STORMTECH MC-3500 END CAPS
12	STONE ABOVE (in)
9	STONE BELOW (in)
40	STONE VOID
19425	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
5730	SYSTEM AREA (SF)
394.1	SYSTEM PERIMETER (ft)

CONCEPTUAL ELEVATIONS:	
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	12.50
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	6.50
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	6.00
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	6.00
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	6.00
TOP OF STONE:	5.50
TOP OF MC-3500 CHAMBER:	4.50
24" ISOLATOR ROW PLUS INVERT:	0.92
18" x 18" BOTTOM MANIFOLD INVERT:	0.90
18" BOTTOM CONNECTION INVERT:	0.90
BOTTOM OF MC-3500 CHAMBER:	0.75
UNDERDRAIN INVERT:	0.00
BOTTOM OF STONE:	0.00

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" BOTTOM CORED END CAP, PART#: MC3500IEPP24BC / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.06"	
PREFABRICATED END CAP	B	18" BOTTOM CORED END CAP, PART#: MC3500IEPP18BC / TYP OF ALL 18" BOTTOM CONNECTIONS	1.77"	
FLAMP	C	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP		
MANIFOLD	D	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.77"	
PIPE CONNECTION	E	18" BOTTOM CONNECTION	1.77"	
CONCRETE STRUCTURE	F	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		4.0 CFS OUT
CONCRETE STRUCTURE W/WEIR	G	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		20.9 CFS IN
UNDERDRAIN	H	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		



▨ ISOLATOR ROW PLUS
(SEE DETAIL)

▩ PLACE MINIMUM 17.50' OF ADSPLUS125 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

— — BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

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TUSTIN, CA, USA

DATE:
DRAWN: AG
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

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0 15 30

SHEET
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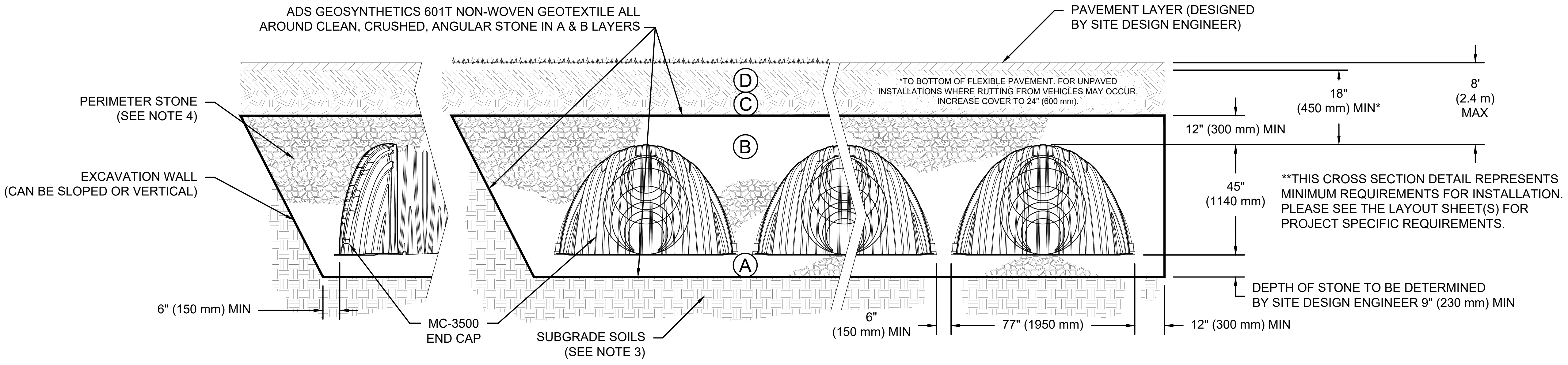
ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

	MATERIAL LOCATION	DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145^{1} A-1, A-2-4, A-3 OR AASHTO M43^{1} 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE^{5}	AASHTO M43^{1} 3, 357, 4, 467, 5, 56, 57	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE OR RECYCLED CONCRETE^{5}	AASHTO M43^{1} 3, 357, 4, 467, 5, 56, 57	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.^{2,3}

PLEASE NOTE:

1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.
5. WHERE RECYCLED CONCRETE AGGREGATE IS USED IN LAYERS 'A' OR 'B' THE MATERIAL SHOULD ALSO MEET THE ACCEPTABILITY CRITERIA OUTLINED IN TECHNICAL NOTE 6.20 "RECYCLED CONCRETE STRUCTURAL BACKFILL".



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 45x76 DESIGNATION SS.
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

RED HILL
TUSTIN, CA, USA

DRAWN: AG
CHECKED: N/A
DATE:
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DATE	DRW	CHK	DESCRIPTION

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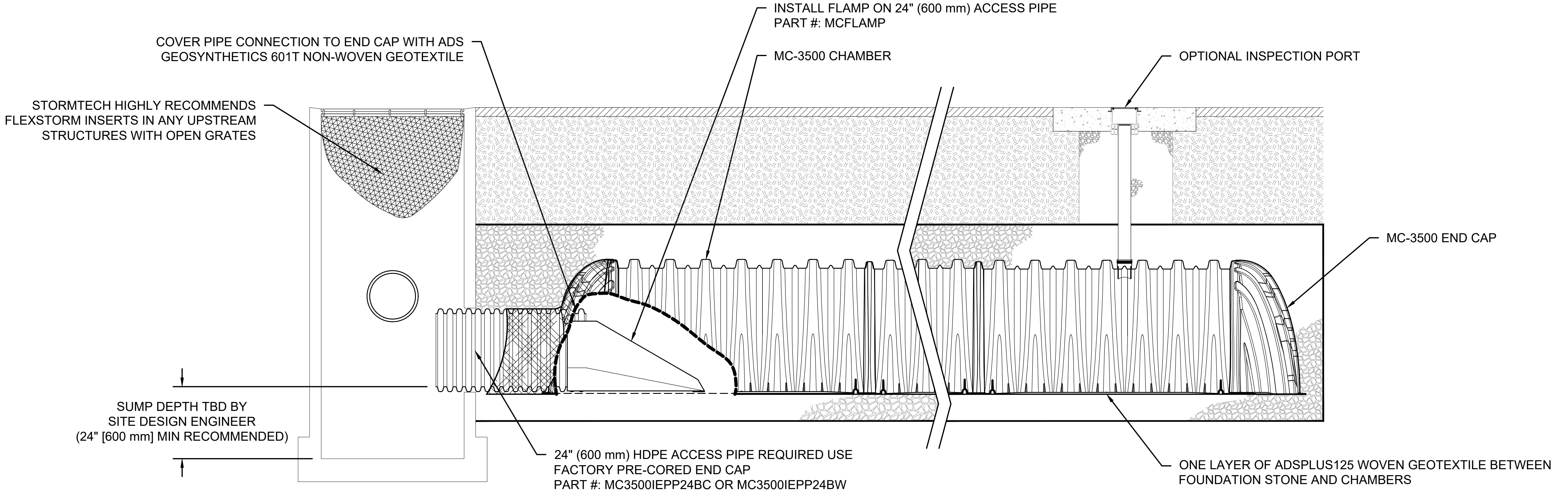
THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

SHEET
3 OF 5



MC-3500 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW PLUS FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW PLUS FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR PLUS ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW PLUS
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW PLUS THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

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DATE:
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UNDERDRAIN DETAIL

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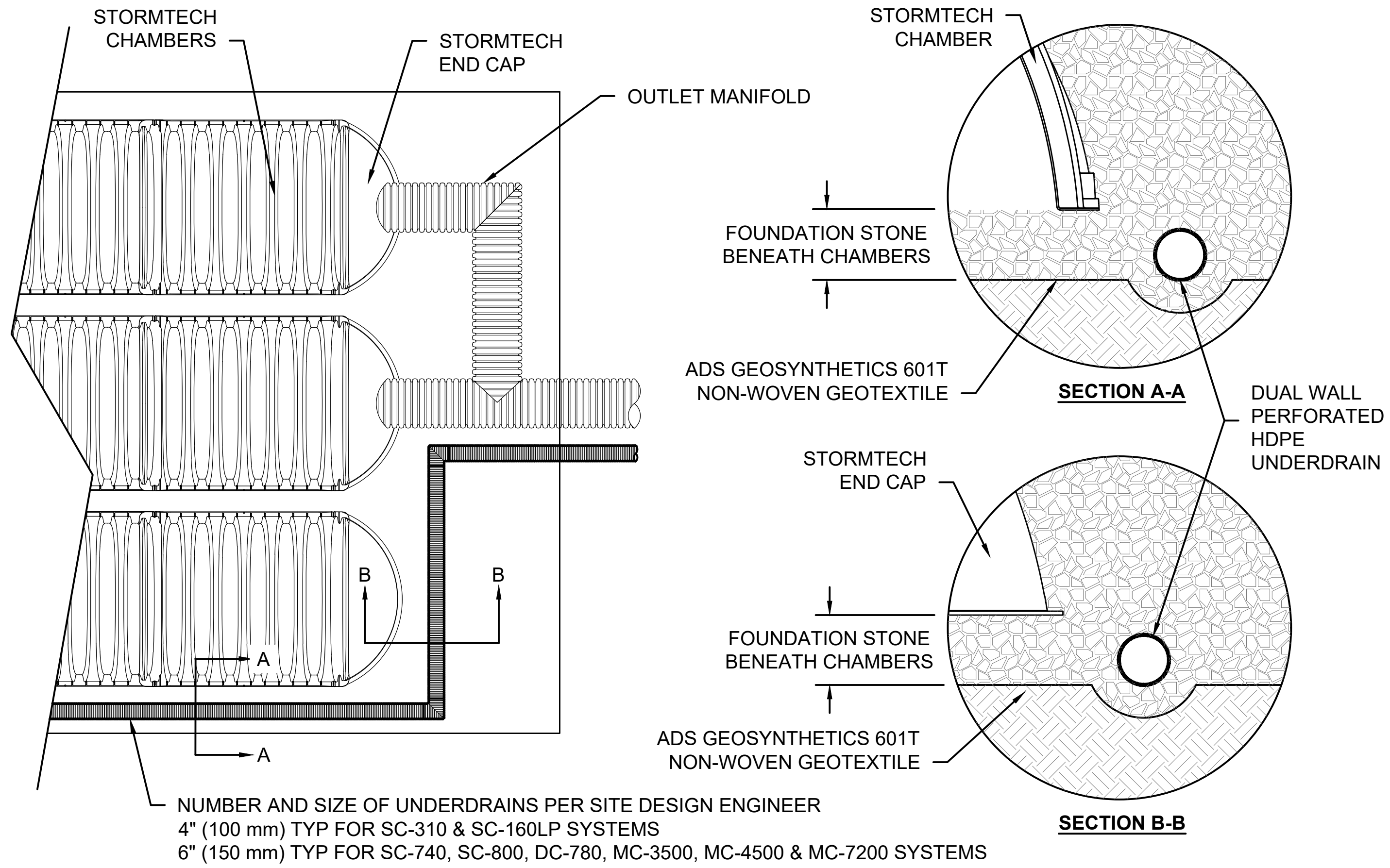
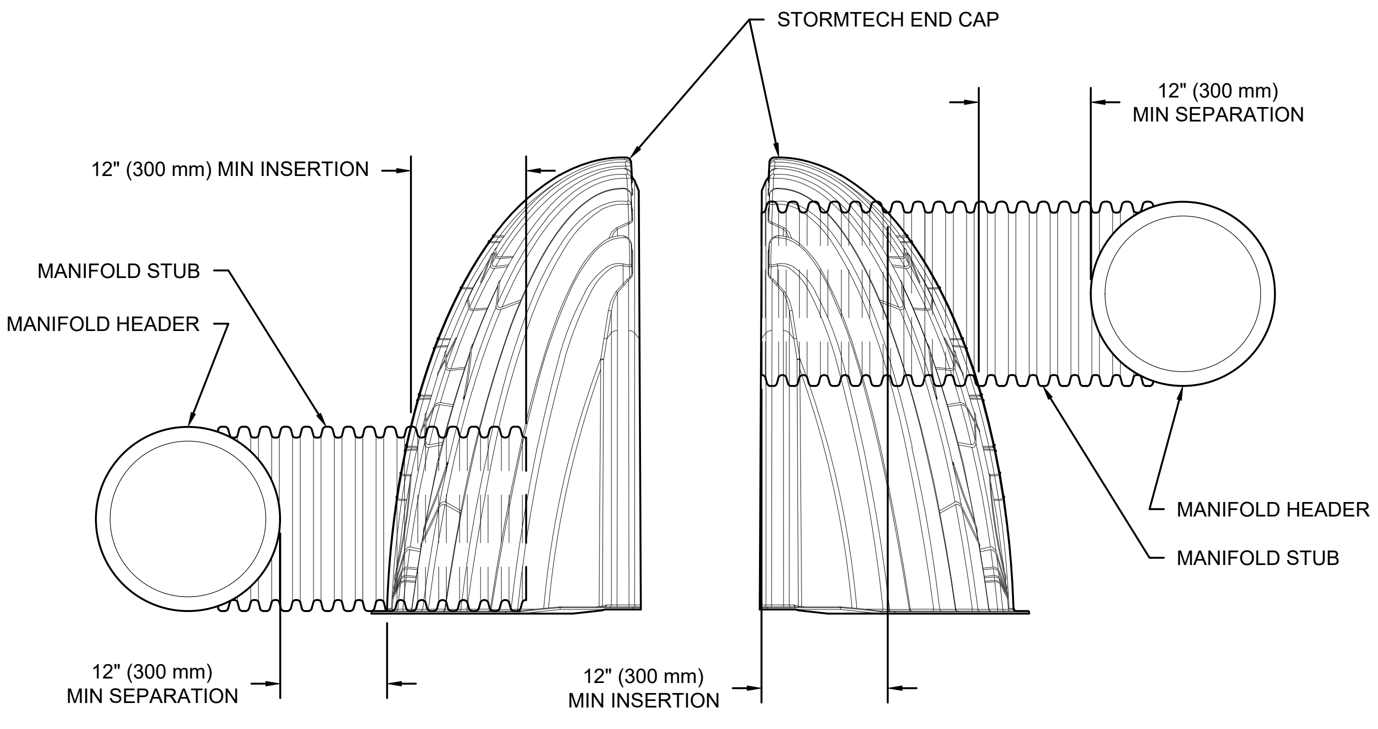


NUMBER AND SIZE OF UNDERDRAINS PER SITE DESIGN ENGINEER
4" (100 mm) TYP FOR SC-310 & SC-160LP SYSTEMS
6" (150 mm) TYP FOR SC-740, SC-800, DC-780, MC-3500, MC-4500 & MC-7200 SYSTEMS

MC-SERIES END CAP INSERTION DETAIL

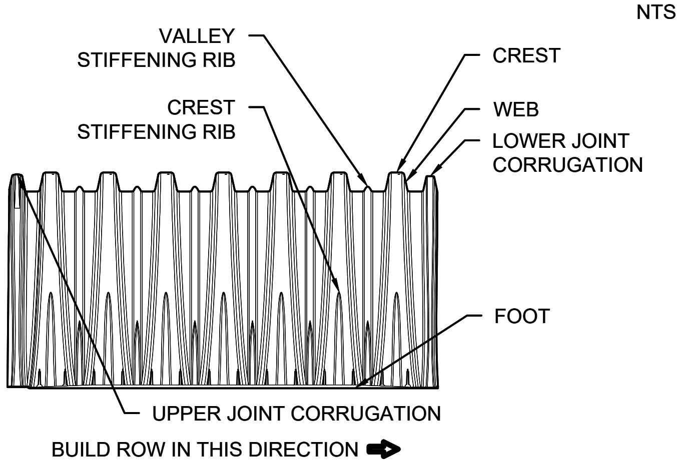
NTS

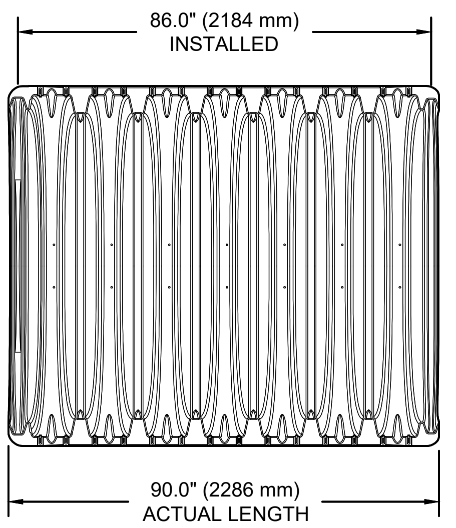


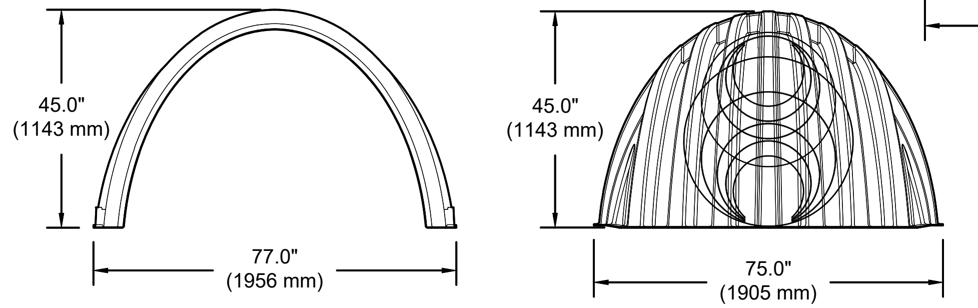
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL
FOR A PROPER FIT IN END CAP OPENING.

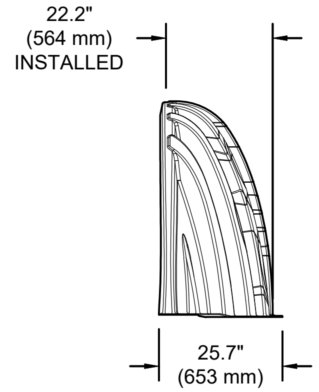
MC-3500 TECHNICAL SPECIFICATION

NTS









NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	175.0 CUBIC FEET	(4.96 m³)
WEIGHT	134 lbs.	(60.8 kg)

NOMINAL END CAP SPECIFICATIONS

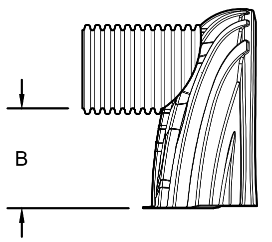
SIZE (W X H X INSTALLED LENGTH)	75.0" X 45.0" X 22.2"	(1905 mm X 1143 mm X 564 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	45.1 CUBIC FEET	(1.28 m³)
WEIGHT	49 lbs.	(22.2 kg)

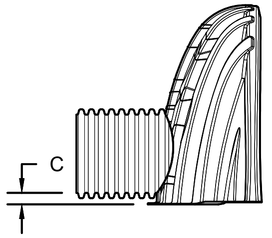
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION, 6" SPACING BETWEEN CHAMBERS, 6" (152 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18TW			
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP18BW			
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24TW			
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP24BW			
MC3500IEPP30BC	30" (750 mm)	---	2.75" (70 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL





CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

RED HILL
TUSTIN, CA, USA

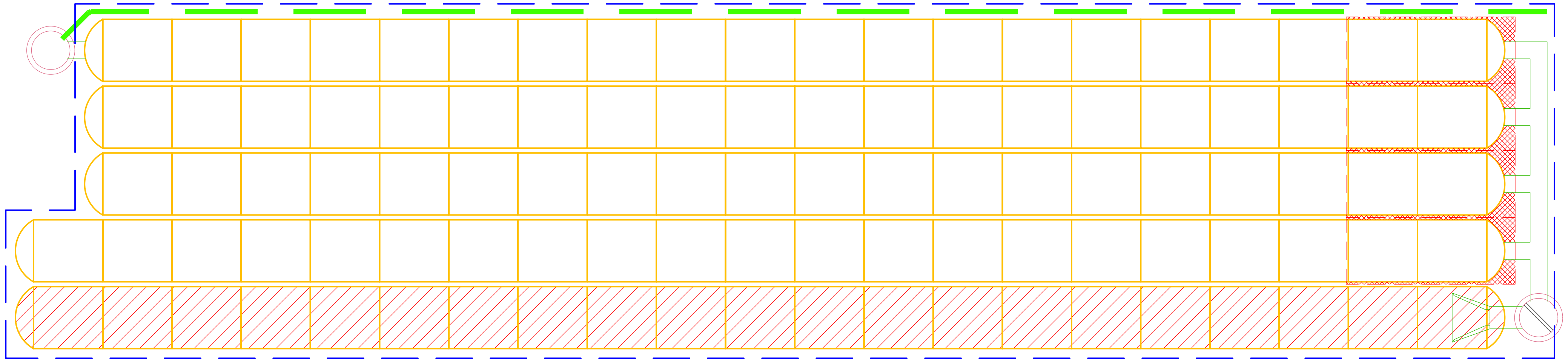
DRAWN: AG
CHECKED: N/A
DATE:
PROJECT #:

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

SHEET
5 OF 5



Project: **Red Hill**

Chamber Model -	MC-3500	
Units -	Imperial	
Number of Chambers -	102	
Number of End Caps -	10	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	0.00	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	9	in

Area of system - 5730 sf Min. Area - 5219 sf min. area

StormTech MC-3500 Cumulative Storage Volumes

Height of System *(inches)*	Incremental Single Chamber *(cubic feet)*	Incremental Single End Cap *(cubic feet)*	Incremental Chambers *(cubic feet)*	Incremental End Cap *(cubic feet)*	Incremental Stone *(cubic feet)*	Incremental Ch, EC and Stone *(cubic feet)*	Cumulative System *(cubic feet)*	Elevation (feet)
66	0.00	0.00	0.00	0.00	191.00	191.00	19424.50	5.50
65	0.00	0.00	0.00	0.00	191.00	191.00	19233.50	5.42
64	0.00	0.00	0.00	0.00	191.00	191.00	19042.50	5.33
63	0.00	0.00	0.00	0.00	191.00	191.00	18851.50	5.25
62	0.00	0.00	0.00	0.00	191.00	191.00	18660.50	5.17
61	0.00	0.00	0.00	0.00	191.00	191.00	18469.50	5.08
60	0.00	0.00	0.00	0.00	191.00	191.00	18278.50	5.00
59	0.00	0.00	0.00	0.00	191.00	191.00	18087.50	4.92
58	0.00	0.00	0.00	0.00	191.00	191.00	17896.50	4.83
57	0.00	0.00	0.00	0.00	191.00	191.00	17705.50	4.75
56	0.00	0.00	0.00	0.00	191.00	191.00	17514.50	4.67
55	0.00	0.00	0.00	0.00	191.00	191.00	17323.50	4.58
54	0.06	0.00	5.92	0.00	188.63	194.55	17132.50	4.50
53	0.19	0.02	19.80	0.24	182.99	203.02	16937.95	4.42
52	0.29	0.04	29.98	0.38	178.86	209.22	16734.93	4.33
51	0.40	0.05	41.17	0.52	174.33	216.01	16525.71	4.25
50	0.69	0.07	70.09	0.68	162.69	233.46	16309.70	4.17
49	1.03	0.09	104.89	0.88	148.69	254.46	16076.24	4.08
48	1.25	0.11	127.45	1.07	139.59	268.11	15821.78	4.00
47	1.42	0.13	145.07	1.26	132.47	278.80	15553.66	3.92
46	1.57	0.14	160.46	1.44	126.24	288.14	15274.86	3.83
45	1.71	0.16	174.13	1.63	120.70	296.45	14986.72	3.75
44	1.83	0.18	186.51	1.82	115.67	303.99	14690.27	3.67
43	1.94	0.20	197.65	2.01	111.14	310.79	14386.27	3.58
42	2.04	0.22	208.16	2.18	106.86	317.21	14075.48	3.50
41	2.13	0.23	217.74	2.35	102.96	323.05	13758.27	3.42
40	2.22	0.25	226.87	2.51	99.25	328.63	13435.22	3.33
39	2.31	0.27	235.29	2.66	95.82	333.77	13106.59	3.25
38	2.38	0.28	243.25	2.80	92.58	338.63	12772.82	3.17
37	2.46	0.29	250.83	2.94	89.49	343.26	12434.19	3.08
36	2.53	0.31	257.87	3.08	86.62	347.57	12090.93	3.00
35	2.59	0.32	264.56	3.21	83.89	351.66	11743.36	2.92
34	2.66	0.33	270.92	3.34	81.30	355.56	11391.70	2.83
33	2.72	0.35	276.94	3.47	78.84	359.25	11036.14	2.75
32	2.77	0.36	282.67	3.60	76.49	362.76	10676.89	2.67
31	2.82	0.37	288.11	3.72	74.27	366.10	10314.13	2.58
30	2.88	0.38	293.30	3.84	72.14	369.28	9948.03	2.50
29	2.92	0.40	298.26	3.96	70.11	372.33	9578.75	2.42
28	2.97	0.41	302.93	4.08	68.20	375.20	9206.41	2.33
27	3.01	0.42	307.27	4.19	66.42	377.87	8831.21	2.25
26	3.05	0.43	311.43	4.30	64.71	380.44	8453.34	2.17
25	3.09	0.44	315.62	4.40	62.99	383.01	8072.90	2.08
24	3.13	0.45	319.32	4.51	61.47	385.29	7689.89	2.00
23	3.17	0.46	322.90	4.61	60.00	387.50	7304.59	1.92
22	3.20	0.47	326.34	4.71	58.58	389.63	6917.09	1.83
21	3.23	0.48	329.57	4.80	57.25	391.62	6527.46	1.75
20	3.26	0.49	332.66	4.89	55.98	393.53	6135.83	1.67
19	3.29	0.50	335.61	4.98	54.77	395.35	5742.30	1.58
18	3.32	0.51	338.43	5.06	53.60	397.10	5346.95	1.50
17	3.34	0.51	341.10	5.14	52.50	398.75	4949.85	1.42
16	3.37	0.52	343.60	5.22	51.47	400.29	4551.10	1.33
15	3.39	0.53	346.04	5.30	50.47	401.80	4150.81	1.25
14	3.41	0.54	348.28	5.37	49.54	403.19	3749.01	1.17
13	3.44	0.54	350.58	5.43	48.60	404.60	3345.82	1.08
12	3.46	0.55	352.69	5.49	47.73	405.91	2941.22	1.00
11	3.48	0.56	354.83	5.55	46.85	407.23	2535.31	0.92
10	3.51	0.59	357.52	5.95	45.61	409.08	2128.08	0.83
9	0.00	0.00	0.00	0.00	191.00	191.00	1719.00	0.75
8	0.00	0.00	0.00	0.00	191.00	191.00	1528.00	0.67
7	0.00	0.00	0.00	0.00	191.00	191.00	1337.00	0.58
6	0.00	0.00	0.00	0.00	191.00	191.00	1146.00	0.50
5	0.00	0.00	0.00	0.00	191.00	191.00	955.00	0.42
4	0.00	0.00	0.00	0.00	191.00	191.00	764.00	0.33
3	0.00	0.00	0.00	0.00	191.00	191.00	573.00	0.25
2	0.00	0.00	0.00	0.00	191.00	191.00	382.00	0.17
1	0.00	0.00	0.00	0.00	191.00	191.00	191.00	0.08

Required overflow invert height to retain/treat DCV of 7118 CF

Attachment C – O+M Plan

(To be provided during final design)

Attachment D – Educational Materials (Include Reference/Link Only)

http://ocwatersheds.com/publiced

Attachment E – Geotechnical Report

SA GEOTECHNICAL
OPTIMIZED SOIL ENGINEERING

February 2, 2023

Project No. 24011-01

To: Meritage Homes
5 Peters Canyon Road, Suite 310
Irvine, California 92606

Attention: Ms. Johanna Crooker

Subject: Geotechnical Due Diligence Review, Subsurface Exploration and Preliminary Design, Proposed 76-Unit Residential Development, 13841 and 13751 Red Hill Avenue, City of Tustin, California

At your request, SA Geotechnical, Inc. (SA GEO) has conducted geotechnical due diligence review and subsurface exploration for the proposed residential development at 13841 and 13751 Red Avenue in the City of Tustin, California (Figure 1). The purpose of this study was to evaluate the geotechnical site conditions in light of the proposed grading and improvements in order to provide a geotechnical summary and preliminary geotechnical recommendations for project design, grading, and construction. Our evaluation included review of background geologic and geotechnical engineering maps and reports for the subject site; review of the prior site-specific geotechnical reports provided by you; subsurface exploration; geotechnical analysis; and preparation of this report.

The subject site is a vacant/dirt lot that was previously occupied by a church facility (13841 Red Hill Avenue) and commercial building (13751 Red Hill Avenue). Based on our review and subsurface exploration, the primary geotechnical constraints include the presence of undocumented fill and weathered/unsuitable alluvium near surface, potentially liquefiable soils, presence of granular soils at depth that may be prone to caving in steep sided excavations, and seismic shaking during a strong earthquake event. Subsurface soils at the site generally consist of interlayered silty/clayey sand mixtures, clean sand, sandy silt, and silty/sandy clay. Groundwater was encountered during prior explorations by others (NMG, 2015 and Geosoils, 2005) at depths ranging from 40.5 to 47.4 feet below ground surface.

This report presents our findings, conclusions, and preliminary design recommendations for the proposed residential development. Based on our exploration and review, the proposed grading and development is considered geotechnically feasible provided the recommendations in this report are implemented during design, grading, and construction. Additional geotechnical evaluation and analysis may need to be performed as the project plans for grading, foundations, and stormwater infiltration systems are developed. Infiltration testing was performed by others during a prior study (NMG, 2015) which indicated that infiltration of stormwater was generally feasible at depths between 8 and 12.5 feet.

References pertinent to the site are included in Appendix A. Boring and cone penetrometer test (CPT) logs are included in Appendix B. Laboratory test results by others are included in Appendix C. Seismic design parameters are presented in Appendix D. Percolation test data sheets are provided in Appendix E. Liquefaction analysis is included in Appendix F. General Earthwork and grading specifications are presented in Appendix G.

If you have any questions regarding this report, please contact our office. We appreciate the opportunity to provide our services.

Respectfully submitted,

SA GEOTECHNICAL, INC.

Anthony Zepeda, CEG 2681
Project Geologist

Reza Saberi, GE 3071
Principal Engineer

ANTHONY L. ZEPEDA
CEG No. 2681

MOHAMMAD REZA SABERI
No. 3071

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EXECUTIVE SUMMARY

The subject site is underlain by undocumented fill materials and native alluvium. Undocumented artificial fill was encountered in most borings performed onsite, ranging in thickness from 2 to 9.5 feet; however, the undocumented fill thickness was estimated based on limited sampling by others. The onsite alluvial soils are generally composed of silty/clayey sand, sand, and sandy/silty clay. Groundwater was encountered during prior subsurface explorations (NMG, 2015 and Geosoils, 2005) at depths ranging from 40.5 to 47.4 feet below ground surface (bgs). Historic high groundwater is mapped between 30 and 40 feet bgs (CDMG, 1998) and existing groundwater data available through the GeoTracker database indicate depths to groundwater between 30 and 60+ feet bgs in the vicinity of the site.

The primary geotechnical constraints at the site include the following:

- The presence of undocumented artificial fill and weathered/unsuitable alluvium which will need to be removed and replaced as compacted fill;
- Potentially liquefiable alluvium during a strong/design earthquake event;
- Potential for strong seismic shaking during an earthquake event; and,
- The presence of granular friable soils (at depth) that are prone to caving in steep sided excavations.

Remedial grading at the site should consist of the removal and recompaction of all undocumented fill materials and weathered/disturbed alluvium in order to provide competent subgrade and bearing conditions. In general, remedial removals are anticipated to extend 5 feet below existing grades within the proposed building pads. Removals within the proposed streets may be limited to removal and re-compaction of the upper 3 to 4 feet, below existing grades, upon review and approval by the geotechnical consultant. Deeper removals may be required locally, where existing trees, utility lines, and structures/foundations are to be abandoned and removed or where deeper undocumented fill is encountered. The recommended remedial removals will help reduce the potential for future settlement at the site. Septic tanks, cesspools, and/or wells may be encountered at the site during grading. If encountered, they should be removed in accordance with Orange County Health Care Agency requirements and the project environmental engineer's recommendations.

Considering the relatively minor grading anticipated to achieve design grades, the laboratory test data, and our analysis, building foundations and slabs should be designed to tolerate a total settlement of 2 inches and a differential settlement of 1 inch over a span of 40 feet. Onsite soils are anticipated to have a "Medium" expansion potential at the completion of grading.

Based on our findings, we conclude that the proposed residential development is feasible from a geotechnical viewpoint, provided it is designed and constructed in accordance with the recommendations presented in this report and any future design report(s). The site is considered suitable for infiltration of stormwater at the tested depths, between 8 and 12.5 feet below existing grades.

1.0 INTRODUCTION

1.1 Introduction and Scope of Services

At your request, SA Geotechnical, Inc. (SA GEO) has conducted geotechnical due diligence review and subsurface exploration for the proposed residential development located at 13841 and 13751 Red Hill Avenue in the City of Tustin, California (Figure 1). The purpose of this review and exploration was to assess the onsite geologic and geotechnical conditions and provide preliminary recommendations for design, grading, and construction of the proposed improvements. We have reviewed the Conceptual Site Plan, dated January 9, 2024, which shows the generalized lot/building layout; however, contains no existing or proposed grades. The Conceptual Site Plan and Google Earth satellite imagery were used as the base for our Geotechnical Map (Plate 1).

Our scope of services for this due diligence study included the following tasks:

- Review of available geologic and geotechnical maps, reports, and data for the subject site and surrounding area. A list of references is included in Appendix A.
- Review of available historic aerial photographs dating back to 1946.
- Notification and coordination with DigAlert to identify and clear Cone Penetrometer Test (CPT) locations of underground utilities.
- Subsurface exploration consisting of advancement of five Cone Penetration Tests, CPT, (CPT-1 through CPT-5) to depths ranging from 50.3 to 55.4 feet bgs. CPT logs are included in Appendix B.
- Review of boring logs and laboratory test data by others (included in Appendix B and C, respectively).
- Review, analysis, and recalculation of the percolation test data by others in accordance with the County of Orange WQMP Technical Guidance Document. The percolation test data is included in Appendix E.
- Geotechnical evaluation and analysis of the compiled data with respect to the proposed grading and development.
- Evaluation of faulting, seismicity, and seismic and static settlement in accordance with the 2022 California Building Code (CBC).
- Preparation of this report including our findings, conclusions, preliminary recommendations, and accompanying illustrations.
- Consultations with the project team.

SA GEO's expertise and scope of services do not include assessment of potential subsurface environmental contaminants or environmental health hazards.

1.2 Site Condition and History

The subject site is located southeast of the Red Hill Avenue and San Juan Street intersection, at 13841 and 13751 Red Hill Avenue, in the City of Tustin, California (see Figure 1). The

approximately 3.4-acre, roughly rectangular shaped parcel is bound by San Juan Street to the north, Red Hill Avenue to the east, Tustin High School to the west, and existing commercial properties to the south. The site is a vacant dirt lot with flat topography, with elevations ranging from about 105 to 109 feet above mean sea level. Existing free standing screen walls are present at the northwestern portion of the site.

Based on our review of available historic aerial photographs dating back to 1946, the earliest observed land use appears to be for agricultural purposes (orchard). By the early 1960s, the orchard was cleared from the southern portion of the site and developed with a church and dirt parking lot. By 1972 the remaining orchard in the northerly portion of the site was removed. Prior to 1980, the church had expanded significantly in size and the surrounding parking lot was paved with asphalt concrete. Also, by 1980 the commercial building at 13751 Red Hill Avenue was built. Between 2007 and 2009, the church and parking lot improvements were demolished, and it has been a vacant lot since that time. Based on our site reconnaissance, the commercial building has also been recently demolished.

1.3 Proposed Grading and Improvements

Prior to site development and grading, any remaining improvements or utilities to be abandoned will be demolished and removed. Based on review of the Conceptual Site Plan, the development is proposed to include grading for 12 multifamily residential buildings (76 total units), interior streets, community/common space areas, stormwater treatment features, and utility improvements to support the development. We anticipate that the proposed multifamily units will be three stories, consisting of wood-framed construction.

1.4 Prior Geotechnical Studies

A prior geotechnical study was performed onsite by NMG Geotechnical, Inc (NMG). We were provided and have reviewed the "Preliminary Geotechnical Investigation Report for Proposed Red Hill Avenue Apartment Site Development, City of Tustin, California" (NMG, 2015). The investigation included six hollow-stem auger borings (H-1 and P-1 through P-5) to depths ranging from 10 to 51.5 feet bgs. Percolation testing was also performed in four of the borings, P-1 through P-4, at depths ranging from 8 to 12.5 feet bgs. As part of our review and analysis, we have used the data provided in the prior report and have independently calculated infiltration rates in accordance with the County of Orange WQMP Technical Guidance Document.

Prior to the 2015 study, Geosoils, Inc. performed a subsurface exploration at the subject site. The report titled "Preliminary Geotechnical Investigation, Proposed Senior Apartment Complex, 13841 Red Hill Avenue, Tentative Tract 11282, Block 141 and Parcel No. 10, City of Tustin, County of Orange, California" (Geosoils, 2005) was not available for our review; however, the boring logs and laboratory data performed as part of thir study were included in the report by NMG (2015).

The approximate boring locations associated with the prior studies are provided on the Geotechnical Map (Plate 1). Boring logs and laboratory test data are provided in Appendix B and C, respectively.

1.5 Subsurface Exploration

Our field exploration was performed on January 26, 2024, and included advancement of five CPTs (CPT-1 through CPT-5) to depths ranging from 50.3 to 55.4 feet bgs. The CPTs use an integrated electronic cone system which measures and records cone tip resistance, sleeve friction, and friction ratio parameters at 5-centimeter depth intervals by advancement of a 1.25-inch diameter, pointed steel probe that is hydraulically pushed into the ground at a constant rate. The CPT provides a detailed subsurface profile to allow for assessment of potential liquefaction hazards and static settlement. The CPT data was used in conjunction with boring and laboratory test data to develop our interpretation of the subsurface conditions. At the completion of testing, the CPTs were backfilled with bentonite granules.

The approximate CPT locations are shown on Plate 1 (Geotechnical Map). CPT logs are included in Appendix B.

2.0 GEOTECHNICAL FINDINGS

2.1 Geologic Setting and Geotechnical Conditions

The subject site is located on the western Tustin Plain within the Peninsular Ranges geomorphic province of Southern California. The site is mapped by the United States Geological Survey (USGS, 2006) as underlain by Quaternary-age younger alluvial deposits (Figure 2). The alluvium (Qal) encountered in prior borings and our CPTs generally consisted of yellowish-brown, reddish brown, and grayish brown silty/clayey sand, sand, sandy silt, and silty clay. The alluvium was found to be damp to wet and medium dense to dense/medium stiff to very stiff.

Undocumented artificial fill (Afu) material was encountered in most borings performed onsite during the prior exploration, ranging in thickness from 2 to 9.5 feet. However, it should be noted that the thickness of undocumented fill was determined based on limited sampling within some of the borings and; therefore, the actual depth to the bottom of the undocumented fill materials may be shallower. Considering the relatively flat topography and prior land use, we anticipate that, in general, the undocumented fill materials do not extend to a depth of 9.5 feet bgs. The undocumented fill materials generally consisted of brown silty sand with trace to some gravel and was damp and loose to medium dense.

Based on our review of the prior geotechnical exploratory data and laboratory testing (Appendix C; NMG, 2015 and Geosoils, 2005) the site geotechnical conditions are generally as follows:

Soil Moisture Content and Dry Density: Onsite soils had in-situ moisture content and dry densities generally ranging from 2.0 to 28.9 percent and 90 to 125 pounds per cubic foot (pcf), respectively. Blow counts (modified California sampler) in the alluvial materials ranged from 3 to 67 blows per foot. The alluvium was generally found to be medium dense to dense/medium stiff to very stiff and damp to wet.

Soil Properties: Grain-size distribution test was conducted on one bulk sample collected from the uppermost 5 feet (NMG, 2015). The near-surface bulk sample was classified in accordance with the Unified Soil Classification System (USCS) as sandy clay (CL), with a fines content (passing No. 200 sieve) of 64 percent.

Soil plasticity testing was also performed on the same sandy clay sample and indicates a Plasticity Index (PI) of 16 and Liquid Limit (LL) of 34 percent. A sample collected from a depth of 20 feet (Geosoils, 2005) was also tested and had a PI of 13 and LL of 28 percent.

Maximum dry density testing was performed on two samples collected from the uppermost 5 feet. The results indicate that the sandy clay had a maximum dry density of 121.5 pcf at an optimum moisture content of 11.5 percent. The silty sand sample had a maximum dry density and optimum moisture content of 126.0 pcf and 12 percent, respectively.

Consolidation: Tests were performed on six samples collected at depths of 5, 7.5, 8, 10, and 15 feet from Borings H-1, P-2, P-5, B-3, and B-4. The testing showed that the native alluvium has relatively low compressibility potential and minor hydro-collapse potential (less than half a percent) upon addition of water.

Shear Strength: Direct shear testing was performed on two remolded samples, representative of future compacted fill material. The test results for the sample collected in Boring H-1 indicate ultimate and peak internal friction angles and cohesion of 30 degrees and 100 pounds per square foot (psf), respectively. The test results of the remolded sample collected from Boring B-1 indicate an internal friction angle of 13 degrees with a cohesion of 523 psf.

Expansion Potential: Expansion index testing was reportedly performed as part of the NMG study; however, no laboratory test results were included in the report. NMG reported an Expansion Index of 55 for the tested sample collected in the upper 5 feet at the site. Based on our review of the available data, we anticipate the site will have "Medium" expansion potential at the completion of grading.

Chemical Testing: A bulk sample collected at depths of 0 to 5 feet in Boring B-2 was also tested for pH, chloride, sulfate content, and resistivity. The test results indicate that sulfate-content of the soils may be classified as "S0" (negligible) per Table 19.3.1.1 of ACI-318. Saturated resistivity was 1,900 ohm-cm. pH level was 8.4 and chloride contents were 85 ppm.

2.2 Groundwater

Historic high groundwater at the subject site is mapped by California Division of Mines and Geology as between 30 and 40 feet bgs (CDMG, 1998). Groundwater was encountered during prior subsurface explorations at depths ranging from 40.5 to 47.4 feet bgs. Additionally, we have reviewed groundwater data available through the GeoTracker database for several sites near the subject site. The data indicates groundwater in the vicinity of the site ranges from 30 to 60+ feet deep for monitoring periods between 2001 to 2014.

2.3 Regional Faulting and Seismicity

Regional Faults: The site is not located within a fault-rupture hazard zone as defined by the Alquist-Priolo Special Studies Zones Act (CGS, 2018). Also, based on mapping by the State (Jennings and Bryant, 2010), there are no active faults mapped at the site. Regional Faults are presented in Figure 3.

Seismicity: Properties in southern California are subject to seismic hazards of varying degrees depending upon the proximity, degree of activity, and capability of nearby faults. These hazards can be primary (i.e., directly related to the energy release of an earthquake) or secondary (i.e., related to the effect of earthquake energy on the physical world). Since there are no active faults at the site, the potential for primary ground rupture is considered very low. The primary seismic hazard for this site is ground shaking during a future earthquake. The maximum moment magnitude for the closest/controlling fault is 7.2 Mw, which would be generated from the San Joaquin Hills Blind Thrust Fault.

The site is located within a potential liquefaction hazard zone, as defined by the State's Seismic Hazard Mapping (CDMG, 2001). The attached Site Location and Seismic Hazards Map (Figure 1) depicts the site relative to mapped potential liquefaction hazard zones. CPTs were performed

during our exploration to supplement the borings data and to assist in evaluation of the liquefaction hazard. Liquefaction analysis is presented in the following section (Section 2.4).

Other secondary seismic hazards, such as tsunami and seiche are considered nil due to site elevation and distance from the ocean or other confined body of water.

2.4 Liquefaction Potential

Liquefaction is a phenomenon in which earthquake-induced stress generates excess pore water pressure in low density, saturated, sandy and silty soils below the groundwater table. Liquefaction causes a loss of strength and is often accompanied by ground settlement. For liquefaction to occur, the following four conditions must be present at the site: 1) Severe ground shaking, such as during a strong earthquake, 2) Soil must be saturated or nearly saturated, generally below the groundwater table, 3) Corrected normalized standard penetration test (SPT) blow counts (N1) and/or CPT tip resistance (Qt) must be relatively low, and 4) Soils must be granular (typically sand or sandy silt) with low plasticity; clays and silts of relatively high plasticity are generally not liquefiable.

Our assessment was performed using the collected CPT data and CLiq software, version 3.5.2.17 by Geologismiki. Liquefaction potential was performed using the Robertson method (NCEER R&W 2009a). We have also implemented the depth weighting factor for calculation of the equivalent volumetric strain of the soil profile, included in CLiq and per the study by Cetin, et. Al. (2009). CLiq provides CPT data interpretation, final plots of factor-of-safety, liquefaction potential index, and post-earthquake displacement, and vertical settlement.

The liquefaction potential of onsite soils was estimated based on a peak ground acceleration of 0.59g and a maximum earthquake magnitude of 7.2Mw, as determined in our site seismicity analysis, discussed in Sections 2.3 and 3.7. A seismic (design) groundwater table of 30 feet was used in our analysis for all CPTs.

Seismic Settlement: The results of our analysis indicate that liquefiable layers are present and, when subject to ground accelerations generated during a large earthquake event near the subject site, may be prone to settlement. Based on our calculations, settlement due to liquefaction is estimated to be less than 1 inch. The graphic representations of the CPT soundings are included in Appendix B and the liquefaction analysis is included in Appendix F.

Loss of Bearing and Surface Manifestations: The potential for loss of bearing and surface manifestations was reviewed based on the thickness of the liquefiable layers that will be left in-place, versus the amount of fill and non-liquefiable native soils overlying liquefiable soils. Considering the depth to design groundwater and that the proposed structures will be underlain by compacted fill, the potential for local surface disruptions, loss of bearing strength and surface manifestation is considered very low.

Lateral Spread: Considering the proposed improvements are not located on sloping ground or near any slope/free face, depth to liquefiable layers, and the relative flat grades across the site, we anticipate the potential for lateral spread as a result of seismic shaking to be very low (less than the maximum acceptable values specified in the building code for conventional foundations).

2.5 Settlement and Foundation Considerations

In general, the anticipated settlements depend upon the building loads, type of foundations, and the geotechnical properties of the supporting subgrade soils. We performed settlement analysis using the CPT, boring and consolidation test data. Considering the relatively flat site, we do not anticipate significant design fills to be placed during grading (3 feet or less).

Considering the subsurface soil conditions and laboratory test data, and relatively lightly loaded residential structures, we estimate total post-construction settlement (combined static and seismic) to be on the order of 2 inches and differential settlement to be on the order of 1 inch over a 40-foot span. This assumes remedial grading measures included in Section 3.2 of this report are implemented during grading of the site.

2.6 Shrinkage and Bulking

The shrinkage and bulking (reduction or increase in volume of excavated materials upon recompaction) depend primarily on in-situ density and the maximum dry density of the soil type. We anticipate that the undocumented fill and weathered alluvium will shrink 5 to 15 percent. An average shrinkage value of 10 percent may be assumed for soil in the upper 5 feet. Ground subsidence at the site is estimated to be on the order of 0.1 foot.

2.7 Percolation Testing

Percolation testing at the site was performed as part of a prior study (NMG, 2015). Testing was reported to have been performed in general accordance with the County of Orange WQMP Technical Guidance Document. We have reviewed the raw field data collected during the prior testing in order to perform our own calculations (Appendix E).

The County of Orange TGD does not include calculation adjustments to account for the presence of the annular backfill material (3/4-inch gravel) used to construct the test wells. In our experience, this generally results in overestimation of infiltration rates. We have used a correction factor to account for the volume loss due to the annular material, based on the porosity of the material, the pipe diameter used, and the boring diameter. The correction factor is noted on the percolation test data sheets (Appendix E).

The calculated infiltration rates are provided below, which include the correction factor discussed above; however, the rates below do not include a factor of safety reduction. A discussion of the design infiltration rates, including factor of safety, is provided in Section 3.14. The infiltration test results are representative of the locations and depths the tests were performed. Due to the potential for variation in the subsurface conditions, infiltration rates could vary across the site and with depth.

Boring No.	***Tested Depth (ft. bgs)***	***Calculated Infiltration Rate (in./hr.)***
P-1	9.25 to 12.5	3.5
P-2	8.25 to 12	1.5
P-3	8.25 to 11.25	3.2
P-4	8 to 11	2.7

3.0 CONCLUSION AND PRELIMINARY RECOMMENDATIONS

3.1 General Conclusion and Recommendation

Based on our subsurface exploration and review, construction of the proposed residential development, as described herein, is considered geotechnically feasible provided the preliminary recommendations in this report are implemented during design, grading, and construction. The geotechnical consultant should review the WQMP once available. Additional geotechnical exploration and/or percolation testing may need to be performed during the design phase, depending upon the location and depth of the infiltration device(s). Also, grading, foundation, utility, structural and wall plans for the project should be reviewed by the geotechnical consultant during the design phase. Updated recommendations should be provided once the project plans are finalized and reviewed by SA GEO and as needed.

The recommendations in this report should be considered minimum and may be superseded by more restrictive requirements of others. In addition to the following recommendations, General Earthwork and Grading Specifications are provided in Appendix G.

3.2 Site Preparation and Earthwork

Site preparation and grading should be performed in accordance with the recommendations herein and the requirements of the City of Tustin.

3.2.1 Site Demolition and Clearing

Prior to remedial grading, any existing structures, foundations, hardscape/landscape, and utilities to be abandoned should be demolished. Deleterious materials and debris should be cleared and disposed of offsite. Excavations for the removal of existing foundations, utilities (if any) and vegetation, including onsite trees, should be observed by the geotechnical consultant. Large roots, highly organic soils, and existing utilities should be removed and should not be incorporated into new fills.

Soil that is disturbed as part of excavations or removal of trees or underground utilities should be evaluated by the geotechnical consultant. Excavations that require backfill should be properly documented and compacted under the observation and testing of the geotechnical consultant.

Cesspools, septic tanks and/or wells may be encountered at the site. If encountered, they should be removed in accordance with Orange County Health Care Agency requirements and the project environmental engineer’s recommendations. Any voids should be backfilled with suitable onsite or import materials and compacted in accordance with the recommendations provided in Section 3.2.4.

3.2.2 Protection of Existing Improvements and Utilities

Existing buildings, improvements and utilities adjacent to the site that are to be protected in place should be located and visually marked prior to grading operations. Excavations adjacent to improvements to be protected in-place or any utility easement should be performed with care, so as not to undermine existing foundations or destabilize the adjacent ground.

Stockpiling of soils more than 5 feet in height at or near existing structures and over utility lines should not be allowed. If deeper removals are required, shoring or other special measures (i.e., setback or laybacks) to provide safety and mitigate the potential for lateral/vertical movements may be required.

3.2.3 Remedial Grading Measures

Remedial grading at the site should consist of removal of undocumented fill and weathered/unsuitable alluvium in their entirety. In general, we recommend that remedial removals within the proposed building pads consist of removal and recompaction of soils in the upper 5 feet, below existing grades. Removals within the proposed streets may be limited to removal and re-compaction of the upper 3 to 4 feet, below existing grades, provided the removal bottom exposes competent native alluvium. Where deeper unsuitable material or undocumented fill is encountered, the removals should be extended to the bottom of unsuitable materials and/or undocumented fill to competent native soils. Please note that some boring logs indicate undocumented fill may be as deep as 9.5 feet at the site. Where not limited by adjacent properties, the removals should extend a minimum of 5 feet laterally beyond the building footprints.

The geotechnical consultant should review and approve removal bottoms prior to fill placement and should provide specific recommendations based on actual conditions, if necessary.

Excavations deeper than 4 feet will need to be laid back at a minimum inclination of 1H:1V (horizontal to vertical) or provided with shoring. Shallow, unconfined excavations (4 feet or less) may consist of near-vertical excavation, locally, and upon review by the geotechnical consultant. Trench excavations should be performed in accordance with Cal/OSHA requirements for Soil Type "B". Locally, and within deeper trenches, excavations may need to be performed in accordance with Cal/OSHA requirements for Soil Type "C" due to the presence of friable sand (see Section 3.12). The contractor's qualified person should verify compliance with Cal/OSHA requirements. Excavations near existing structures (within a 1:1 projection) should be provided with shoring that is designed to support the surcharge load of the existing structure. Otherwise, excavations may need to be performed in sections (A/B/C slot cuts). The conditions should be reviewed in the field by the project geotechnical consultant. Additional recommendations should be provided based on the actual conditions encountered during excavation and grading, as needed.

3.2.4 Fill Placement

Upon the completion of remedial grading measures, the approved removal bottoms should be scarified a minimum of 6 inches. The removal bottoms and fill materials should be compacted to at least 90 percent of maximum dry density, as determined by ASTM Test Method D1557. Fill materials should be placed in loose lifts no thicker than 8 inches.

Fill materials should be relatively free of deleterious material. The existing native alluvial soils and undocumented fill are considered suitable for re-use as compacted fill provided any deleterious material is removed. The compacted fill soils should be moisture conditioned to 2 to 3 percentage points above optimum moisture content but within the compactable moisture range.

3.2.5 Import

The geotechnical consultant should evaluate and accept any import soils prior to transportation to the subject site. We recommend that import soils have similar engineering properties as onsite soils. At minimum, the import materials should have Expansion Index of less than 90, Plasticity Index of less than 15, fines content (passing Sieve 200) of less than 50 percent, and negligible soluble sulfate content.

3.3 Settlement Potential

The amount of settlement will depend upon the type of foundation(s) selected and future loading by additional fill and structures. Based on our subsurface exploration, liquefaction analysis, and considering the remedial grading recommendations provided in this report are implemented during grading, and the anticipated structural loads typically associated with the proposed structures, we estimate that total and differential post-construction settlement (combined static and seismic) will be on the order of 2 inches and 1 inch over a span of 40 feet, respectively.

SA GEO should be provided with the foundation plans and structural loads, once available, in order to further evaluate the potential for post-construction settlement of the proposed building and associated improvements. The parameters provided herein will then be confirmed/updated based on the planned foundations and loads and additional testing and analysis.

3.4 Foundation Design

The slab and foundations should be designed by the project structural engineer based on the proposed structure type and the anticipated loading conditions. The foundation soils have expansive soil conditions (Expansion Index of greater than 20) and will be subject to climatic and landscape moisture fluctuations. The following foundation recommendations are provided with the assumption that the recommendations included in Section 3.2 of this report are implemented during grading of the site.

The recommended net allowable bearing capacity for continuous and isolated footings may be calculated based on the following equation:

$q_{all} = 700\,D + 200\,B + 900$ (but not to exceed 3,000 psf)

where:
D = embedment depth of footing, in feet
B = width of footing, in feet

Also, the following parameters may be used for design of foundation and slabs:

- Soil unit weight = 120 pcf
- Soil internal friction angle = 28 degrees
- Coefficient of Friction = 0.35
- Subgrade modulus (k) of 100 pci (corrected for large slabs)
- Soil elastic modulus (Es) of 2,000 psi

The dead load of concrete below adjacent grades (buried concrete foundations) may be neglected. The allowable bearing pressure and friction coefficient may be increased by one-third for wind and seismic loading.

We recommend that strip and isolated footings for the buildings have a minimum embedment depth of 18 inches below the lowest adjacent grade. Continuous footings should be at least 12 inches wide and isolated column footings should be at least 24 inches wide. The footings of freestanding and isolated structures, such as walls and pilasters, should have a minimum embedment depth of 18 inches into approved soils.

The following table provides our general guidelines and preliminary recommendations for design of post-tensioned foundations and slabs in accordance with the 2022 California Building Code (CBC) and Post-Tension Institute (PTI) DC 10.5 Edition provisions.

GEOTECHNICAL GUIDELINES FOR DESIGN OF POST-TENSIONED SLABS

Parameter	Recommendation
Center Lift	
Edge Moisture Variation Distance, e_m	9.00 feet
Center Lift, y_m	0.55 inches
Edge Lift	
Edge Moisture Variation Distance, e_m	4.60 feet
Edge Lift, y_m	0.71 inch
Presaturation, as needed, to obtain the minimum moisture down to the minimum depth	1.2 x optimum down to 12 inches

We recommend that post-tensioned slabs have a thickened edge such that the slab is embedded a minimum of 12 inches below the lowest adjacent grade.

In addition, as indicated in the DC 10.5 Edition of PTI, shape factor calculations should be performed by the project structural engineer in order to determine if strengthening/modification of

foundations are necessary. Per PTI guidelines, modifications to the foundations design should be considered if the shape factor (ratio of square of foundation perimeter over foundation area) exceeds 24.

If non-post-tensioned slabs-on-grade and foundations are considered at the site, an effective Plasticity Index of 20 is considered appropriate for the upper 15 feet of soil materials, in accordance with Wire Reinforcement Institute (WRI) method (per the 2022 CBC). For non-post-tensioned slabs, we recommend a minimum embedment of 12 inches below the lowest adjacent grade for the perimeter footings. Also, the upper 12 inches of subgrade soil should be pre-saturated to 120 percent of optimum moisture content prior to placement of moisture barrier and concrete.

The foundations and slabs should also be designed to tolerate the total and differential settlements discussed in Section 3.3 of this report.

For the design of pole-type foundations (i.e., light poles, shade structures, etc.), an allowable soil-bearing pressure (s_1) of 340 psf/ft may be used for Equation 18-1 (the "pole" equation) of the 2022 CBC Section 1807.3.2.1 to determine the depth of embedment for the footings, considering level ground conditions. The equation is applicable for designed embedment depths of less than 12 feet for the purpose of computing lateral pressure. Also, for vertical loads on pole-type foundations, an allowable skin friction of 250 pounds per square foot may be used. For cast-in-place pole-type foundations, the vertical end bearing pressure should be neglected. We recommend that pole-type foundations have a minimum embedment of 2.5 feet below lowest adjacent grades.

3.5 Interior Slab Moisture Mitigation

In addition to geotechnical and structural considerations, the project owner should also consider interior moisture mitigation when designing and constructing slabs-on-grade.

The intended use of the interior space, type of flooring, and the type of goods in contact with the floor may dictate the need for, and design of, measures to mitigate potential effects of moisture emission from and/or moisture vapor transmission through the slab. Typically, for human occupied structures, a vapor retarder or barrier is recommended under the slab to help mitigate moisture transmission through slabs. The most recent guidelines by the American Concrete Institute (ACI 302.1R-04) suggest that the vapor retarder be placed directly under the slab (no sand layer). However, the location of the vapor retarder may also be subject to the builder's past successful practice. Placement of 1 or 2 inches of sand over the moisture retardant has been common practice by builders in southern California. Specifying the strength of the retarder to resist puncture and its permeance rating is important. These qualities are not necessarily a function of the retarder thickness. A minimum of 10-mil is typical but some materials, such as 10-mil polyethylene ("Visqueen"), may not meet the desired standards for toughness and permeance.

Vapor retarders, when used, should be installed in accordance with standards such as ASTM E 1643 and/or those specified by the manufacturer.

Concrete mix design and curing are also significant factors in mitigating slab moisture problems. Concrete with lower water/cement ratios results in denser, less permeable slabs that also "dry" faster with regard to when flooring can be installed (reduced moisture emission quantities and

rates). Rewetting of the slab following curing should be avoided since it can result in additional drying time required prior to flooring installation. Proper concrete slab testing prior to flooring installation is also important.

Concrete mix design, the type and location of the vapor retarder should be determined in coordination with all parties involved in the finished product, including the project owner, architect, structural engineer, geotechnical consultant, concrete subcontractors, and flooring subcontractors.

3.6 Retaining Walls Design and Lateral Earth Pressures

Recommendations for lateral earth pressures for permanent retaining walls and structures (if any) with approved onsite drained soils and above groundwater table are as follows:

Conditions	*Level (pcf)*	*2:1 Sloping*
Active	43	68
At-Rest	63	90
Passive	340	160 (sloping down)

These parameters are based on a soil internal friction angle of 28 degrees and soil unit weight of 120 pcf.

To design an unrestrained retaining wall, such as a cantilever wall, the active earth pressure may be used. For a restrained retaining wall, the at-rest pressure should be used. Passive pressure is used to compute lateral soils resistance developed against lateral structural movement. The passive pressures provided above may be increased by one-third for wind and seismic loads. The passive resistance is taken into account only if it is ensured that the soil against embedded structure will remain intact with time. Future landscaping/planting and improvements adjacent to the retaining walls should also be taken into account in the design of the retaining walls. Excessive soil disturbance, trenches (excavation and backfill), future landscaping adjacent to footings and over-saturation can adversely impact retaining structures and result in reduced lateral resistance.

For sliding resistance, the friction coefficient of 0.35 may be used at the concrete and soil interface. The coefficient of friction may be increased by one-third for wind and seismic loading. The retaining walls may also need to be designed for additional lateral loads if other structures or walls are planned within a 1H:1V projection.

The seismic lateral earth pressure for walls retaining more than 6 feet of soil and level backfill conditions may be estimated to be an additional 17 pcf for active and at-rest conditions. The earthquake soil pressure has a triangular distribution and is added to the static pressures. For the active and at-rest conditions, the additional earthquake loading is zero at the top and maximum at the base. The seismic lateral earth pressure does not apply to walls retaining less than, or equal to, 6 feet of soil (2022 CBC Section 1803.5.12).

Drainage behind walls retaining more than 2.5 feet of soil should also be provided in accordance with the attached Figure 4. Specific drainage connections, outlets and avoiding open joints should be considered during design.

3.7 Seismic Design Parameters

The following table summarizes the seismic design criteria for the subject site. The seismic design parameters are developed in accordance with ASCE 7-16 and 2022 CBC. Please note that, considering the proposed structures and anticipated structural periods, site-specific ground-motion hazard analysis was not performed for the site. Per Supplement 3 of ASCE 7-16, the value of S_{M1}, and therefore S_{D1}, have been increased by 50 percent. The seismic response coefficient, Cs, should be determined per the parameters provided below and using equation 12.8-2 of ASCE 7-16.

Selected Seismic Design Parameters from 2022 CBC/ASCE 7-16	*Seismic Design Values*	*Reference*
Latitude	33.7359 North	
Longitude	-117.8139 West	
Controlling Seismic Source	San Joaquin Hills	USGS, 2024
Site Class per Table 20.3-1 of ASCE 7-16	D	
Spectral Acceleration for Short Periods (Ss)	1.284 g	SEA/OSHPD, 2024
Spectral Accelerations for 1-Second Periods (S_1)	0.459 g	SEA/OSHPD, 2024
Site Coefficient F_a, Table 11.4-1 of ASCE 7-16	1.0	SEA/OSHPD, 2024
Site Coefficient F_v, Table 11.4-2 of ASCE 7-16	1.841	
Design Spectral Response Acceleration at Short Periods (S_{DS}) from Equation 11.4-4 of ASCE 7-16	0.856 g	SEA/OSHPD, 2024
Design Spectral Response Acceleration at 1-Second Period (S_{D1}) from Equation 11.4-4 of ASCE 7-16 (Includes 50% increase per Supplement 3)	0.845 g	
T_S, S_{D1} /S_{DS} 11.4.6 of ASCE 7-16	0.987 sec	
T_L, Long-Period Transition Period	8 sec	SEA/OSHPD, 2024
Peak Ground Acceleration Corrected for Site Class Effects (PGA_M) from Equation 11.8-1 of ASCE 7-16	0.59 g	SEA/OSHPD, 2024
Seismic Design Category, Section 11.6 of ASCE 7-16	D	

3.8 Corrosivity

Based on the laboratory testing performed during prior studies, soluble sulfates exposure in the onsite soils may be classified as "S0" per Table 19.3.1.1 of ACI-318-14. Structural concrete elements in contact with soil include footings and building slabs-on-grade. The flatwork and sidewalk concrete are typically not considered structural elements. Concrete mix for structural elements should be based on the "S0" soluble sulfate exposure class of Table 19.3.2.1 in ACI-318-14. Other ACI guidelines for structural concrete are recommended. Also, onsite soils are anticipated to be corrosive to metals.

3.9 Expansion Potential

At the completion of grading, we anticipate that onsite soils will have "Medium" expansion potential. The geotechnical recommendations provided in this report including the design parameters for foundations, slab-on-grade and flatwork improvement should be implemented

during design and construction. These parameters may be updated upon additional testing at the completion of grading.

Homeowners and their design/construction team should be familiar with the recommendations in this report as well as principles described in a useful reference published by the California Geotechnical Engineers Association (CalGeo), titled, "Coexisting with Expansive Soil: An Informational Guide for Homeowners." This free booklet can be downloaded at www.calgeo.org.

3.10 Exterior Concrete

The driveway, patio slabs and other flatwork elements should be at least 4 inches thick. Concrete should be reinforced with No. 3 bars placed at 24 inches on center both ways (or equivalent wire-mesh). Concrete slabs should be provided with construction or weakened plane control joints at a maximum spacing of 8 feet. The control joints should have a thickness that is ¼ of the total concrete thickness. Upon the placement and compaction of subgrade soils (per Section 3.2 of these recommendations), the upper 12 inches of the subgrade soils should be pre-saturated to 120 percent of optimum moisture content prior to placement of concrete and reinforcement.

For exterior slabs, the use of a granular sublayer is primarily intended to facilitate presaturation and subsequent construction by providing a better working surface over the saturated soil. It also helps retain the added moisture in the native soil in the event that the slab is not placed immediately. Where these factors are not significant, the layer may be omitted. If used, we recommend placement of 2 to 4 inches of granular material over subgrade soils.

Exterior concrete elements such as curb and gutter, driveways, sidewalks and patios are susceptible to lifting and cracking when constructed over expansive soils. With expansive soils, the impacts to flatwork/hardscape can be significant, generally requiring removal and replacement of the affected improvements. Please note that reducing concrete problems is often a function of proper slab design, concrete mix design, placement, and curing/finishing practices. Adherence to guidelines of the American Concrete Institute (ACI) is recommended. Also, the amount of post-construction watering, or lack thereof, can have a very significant impact on the adjacent concrete flatwork.

On projects with expansive soils, additional measures such as thickened concrete edges/footings, subdrains and/or moisture barriers should be considered where planters or natural areas with irrigation are located adjacent to the concrete improvements. Design and maintenance of proper surface drainage is also very important. If the concrete will be subject to heavy loading from cars/trucks or other heavy objects, at minimum, a 6-inch-thick pavement section should be used; however, the section should be designed by the geotechnical consultant using appropriate traffic indices for the intended use.

The above recommendations typically are not applied to curb and gutter.

3.11 Preliminary Asphalt Concrete Pavement Design

Final structural pavement sections should be based on R-value testing after the completion of grading and in accordance with City of Tustin requirements. Based on an assumed R-value of 15 and estimated traffic indices (TIs), we recommend the following preliminary pavement sections:

Street Location	***Estimated TIs***	***Pavement Section***
General Drives	TI – 5.5	0.35' AC / 0.65' AB
Parking Stalls	TI – 4.0	0.25' AC / 0.50' AB
AC = Asphalt Concrete, AB = Aggregate Base		

Please note that for two-stage paving operations, we recommend that the final AC cap be a minimum of 0.10 foot thick and the base AC course have a minimum thickness of 0.25 foot.

Asphalt concrete pavement should be placed in accordance with the requirements of Sections 301 and 302 of the Standard Specifications of Public Works Construction (the Greenbook). Prior to construction of pavement sections, the subgrade soils should be scarified to a minimum depth of 6 inches, moisture-conditioned as needed, and recompacted in-place to a minimum of 90 percent relative compaction (per ASTM D1557). Subgrade should be firm prior to aggregate base placement.

Aggregate base materials may consist of crushed aggregate base or crushed miscellaneous base, in accordance with the Greenbook (Section 200-2). The materials should be free of any deleterious materials. Aggregate base materials should be placed in 6- to 8-inch-thick loose lifts, moisture-conditioned as necessary, and compacted to a minimum of 95 percent relative compaction (per ASTM D1557). Asphalt concrete should also be compacted to a minimum relative compaction of 95 percent.

Unpaved median and parkway areas should also be provided with vertical moisture barriers.

3.12 Trench Excavation and Backfill

Excavations should be performed in accordance with the requirements set forth by Cal/OSHA Excavation Safety Regulations (Construction Safety Orders, Section 1504, 1539 through 1547, Title 8, California Code of Regulations). In general, onsite soils may be classified as Type "B"; however, locally, and in deeper excavations Type "C" soils may be encountered (friable sand). Cal/OSHA regulations indicate that, for workmen in confined conditions, the steepest allowable slopes in Type "B" and "C" soils are 1H:1V and 1.5H:1V (horizontal to vertical), respectively, for excavations less than 20 feet deep. Where there is no room for these layback slopes, we anticipate that shoring will be necessary. This condition should also be anticipated for excavations within the streets adjacent to the site. Adequate shoring (i.e., shields) should be provided, as deemed necessary. Backfilling may require sand-cement slurry in order to reduce the potential of caving during the removal of shoring, if friable sandy soils are encountered. Excavations should be reviewed periodically by the contractor's qualified person to confirm compliance with Cal/OSHA requirements.

Utility trench backfill should be in accordance with City of Tustin Department of Public Works "Standard Plans and Design Standards" and/or the governing jurisdiction's specifications (i.e. Irvine Ranch Water District, East Orange County Water District, etc.). In general, native soils are anticipated to be suitable for use as trench backfill from a geotechnical viewpoint; however, the City or governing agency may require select material, sand-slurry, or other measures. Native soils used as backfill materials should be compacted to a minimum of 90 percent relative compaction (per ASTM D1557). Rocks/oversize material greater than 3 inches in largest diameter should generally not be used as trench backfill unless approved by the agency and geotechnical consultant of record. Excavation and backfilling of HDPE pipes should be in accordance with the manufacturer's requirement and the Greenbook. Select granular backfill (i.e., clean sand with SE 30 or better) may be used in lieu of native soils but should also be compacted or densified with water jetting and flooding.

Trenches excavated next to structures and foundations should also be properly backfilled and compacted to provide full lateral support and reduce settlement potential.

3.13 Groundwater

Based on our subsurface exploration and review of published groundwater data in the vicinity, groundwater is anticipated to remain 30 feet or more below proposed finish grades. Groundwater is not expected to be encountered during rough grading; however, the presence of locally saturated soils and/or perched water cannot be ruled out, especially during rainy seasons.

3.14 Stormwater Infiltration

Based on the prior onsite percolation testing, storm water infiltration is considered feasible at the tested locations at depths between 8 and 12.5 feet bgs. Additional infiltration testing may need to be conducted onsite once a water quality management plan has been prepared and in order to evaluate the infiltration rates at the actual location and depth of the proposed devices. For preliminary design purposes, a design infiltration rate of 0.75 inches per hour may be used for devices that are 8 to 12.5 feet deep in the vicinity of Borings P-1 through P-4. This rate includes the required minimum factor-of-safety of 2.

Also, based on our review of the groundwater data in the vicinity, historic high groundwater is documented at approximately 30 feet bgs. Infiltration systems should maintain a minimum 10-foot vertical separation from high groundwater; thus, infiltration systems should not be deeper than 20 feet bgs.

Infiltration systems should be designed and constructed in accordance with County of Orange and City of Tustin guidelines. Infiltration systems should have a minimum setback of 10 feet from proposed residential structures. The subgrade soil utilized as the infiltration surface should be reviewed and approved by the geotechnical consultant prior to installation of any infiltration devices. Special care should be taken to limit disturbance to native soils used as the infiltration surface. Proper maintenance will also be required to extend the operational life and reduce siltation or reduction in infiltration performance. All infiltration devices should be provided with an overflow system.

3.15 Surface Drainage and Irrigation

Maintaining adequate surface drainage, proper disposal of run-off water, and control of irrigation will help reduce the potential for future moisture-related problems and differential movements from soil heave/settlement.

Surface drainage should be carefully taken into consideration during design, grading, landscaping, and building construction. Positive surface drainage should be provided to direct surface water away from structures and slopes and toward the street or suitable drainage devices. Ponding of water adjacent to the structures should not be allowed. Buildings should have roof gutter systems and the run-off should be directed to parking lot/street gutters by area drainpipes or by sheet flow over paved areas. Paved areas should be provided with adequate drainage devices, gradients, and curbing to prevent run-off flowing from paved areas onto adjacent unpaved areas.

Considering the climatic conditions in southern California and the recommended mitigation measures for expansive soils included in this report, a two-percent slope away from structures should be provided and is in substantial compliance with the 2022 CBC. Also, swales with one-percent slopes are acceptable from our geotechnical standpoint and are common practice in this locale.

Construction of planter areas immediately adjacent to structures should be avoided if possible. If planter boxes are constructed adjacent to or near buildings, the planters should be provided with controls to prevent excessive penetration of the irrigation water into the foundation and flatwork subgrades. Provisions should be made to drain excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Raised planter boxes may be drained with weepholes. Deep planters (such as palm tree planters) should be drained with below-ground, water-tight drainage lines connected to a suitable outlet. Moisture barriers should also be considered.

It is also important to maintain a consistent level of soil moisture, not allowing the subgrade soils to become overly dry or overly wet. Properly designed landscaping and irrigation systems can help in that regard.

3.16 Additional Subsurface Exploration and Laboratory Testing

Additional subsurface exploration and laboratory testing may be necessary during the design phase of the project for determination/confirmation of the percolation rates, depending on the location and depth of the proposed system(s). Also, additional laboratory testing should be performed during and upon the completion of grading to confirm/update the design parameters provided herein.

3.17 Review of Future Plans

The project grading, foundation, wall, water quality management, and landscape plans should be reviewed and accepted by the geotechnical consultant prior to grading and construction.

3.18 Observation and Testing during Grading and Construction

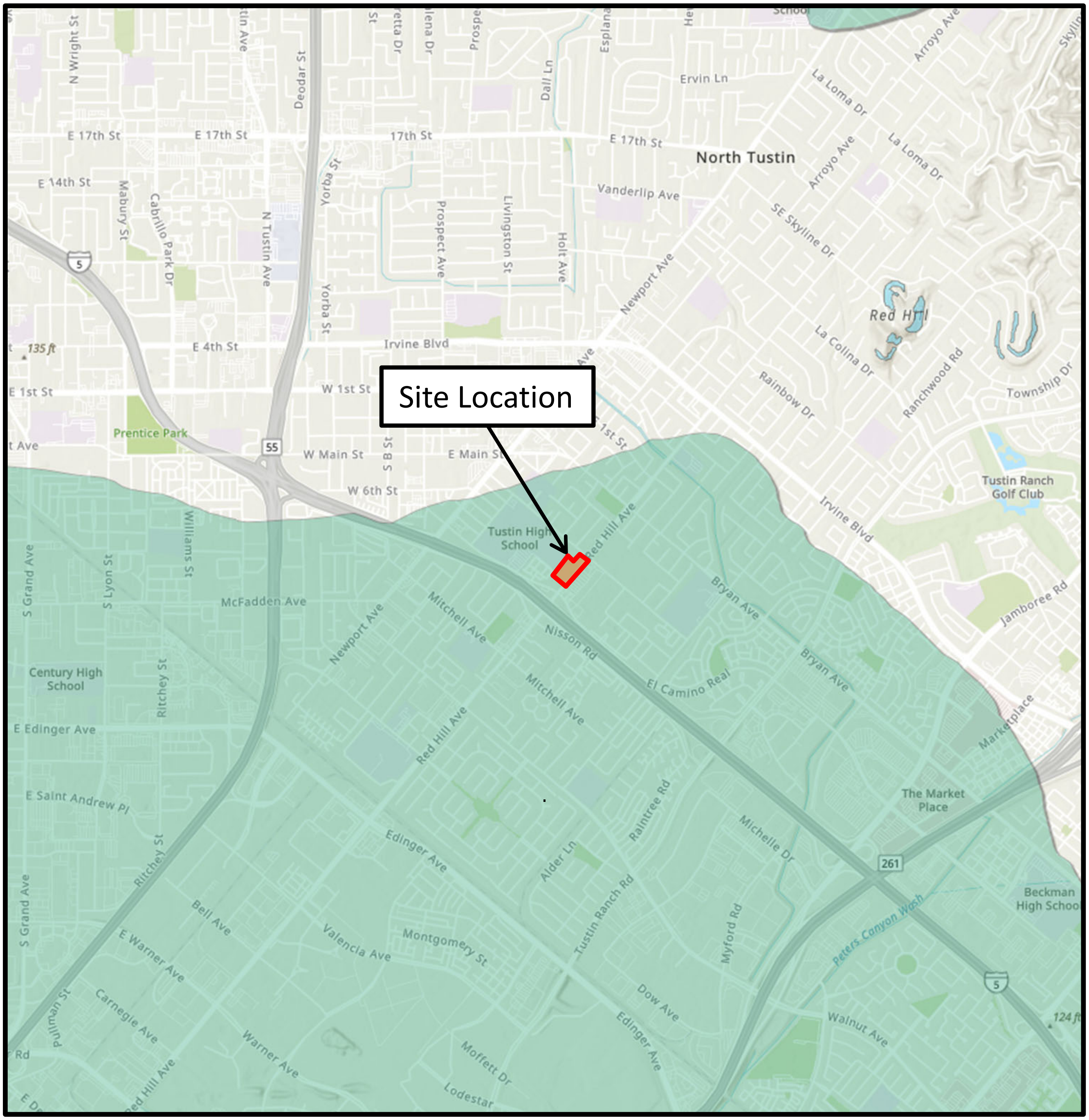
Geotechnical observation and testing should be performed by SA GEO during the following phases of grading and construction:

- During site demolition, preparation and clearing;
- During excavations performed for remedial grading and to relocate or remove existing underground improvements;
- During earthwork, including observation and acceptance of remedial removal bottoms and fill placement, including import material (if any);
- Following the completion of grading, in order to verify soil properties for foundations, slab-on-grade and pavements;
- Upon completion of any foundation or structural excavation, prior to pouring concrete;
- During slab and flatwork subgrade preparation prior to pouring concrete;
- During placement of backfill for utility trenches, and stormwater infiltration devices;
- During placement of backfill for retaining structures (if any);
- During installation and backfill of subdrainage systems (if any); and
- When any unusual soil conditions are encountered.

4.0 LIMITATIONS

This report has been prepared for the exclusive use of our client, Meritage Homes, within the scope of services requested for the subject property described herein. This report or its contents should not be used or relied upon for other projects or purposes, or by other parties without the acknowledgement of SA GEO and the consultation of a geotechnical professional. The means and methods used by SA GEO for this study are based on local geotechnical standards of practice, care, and requirements of governing agencies. No warranty or guarantee, expressed or implied, is given.

Our findings, conclusions, and recommendations are professional opinions based on interpretations and inferences made from geologic and engineering data from specific locations and depths, observed or collected at a given time. By nature, geologic conditions can vary from point to point, can be very different in-between exploration points, and can also change over time. Our conclusions and recommendations are, by nature, preliminary and subject to verification and/or modification during grading and construction when more subsurface data is exposed.



Source: Seismic Hazard Zones Map, Tustin Quadrangle (CDMG, 2001)

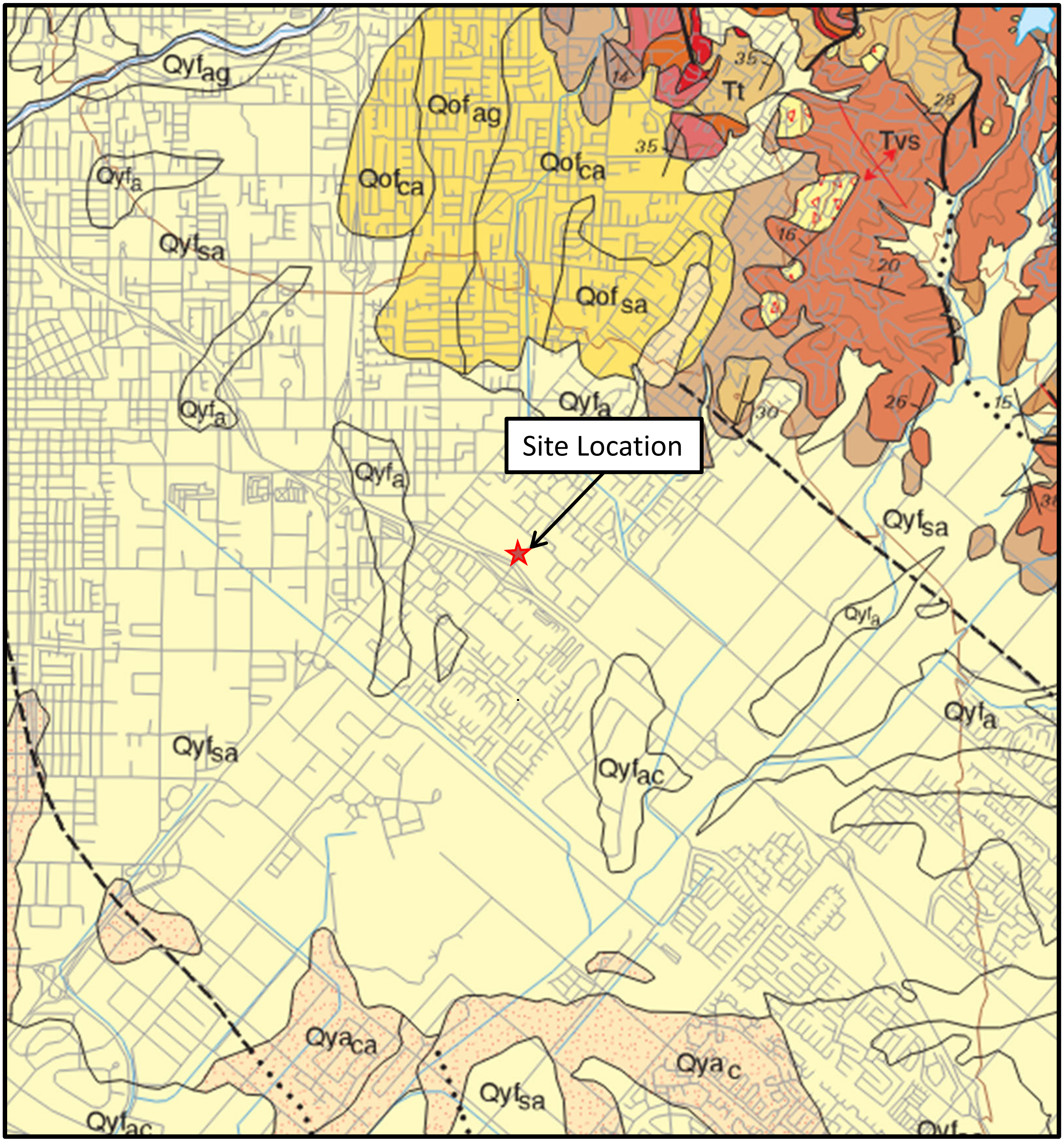
🟩 **Liquefaction**
Areas where historic occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

🟦 **Earthquake-Induced Landslides**
Areas where previous occurrence of landslide movement, or local topographic, geological, geotechnical and subsurface water conditions indicate a potential for permanent ground displacements such that mitigation as defined in Public Resource Code Section 2693(c) would be required.

Site Location and Seismic Hazard Zones Map

Meritage Homes
Proposed Residential Development
13841 & 13751 Red Hill Avenue
Tustin, California

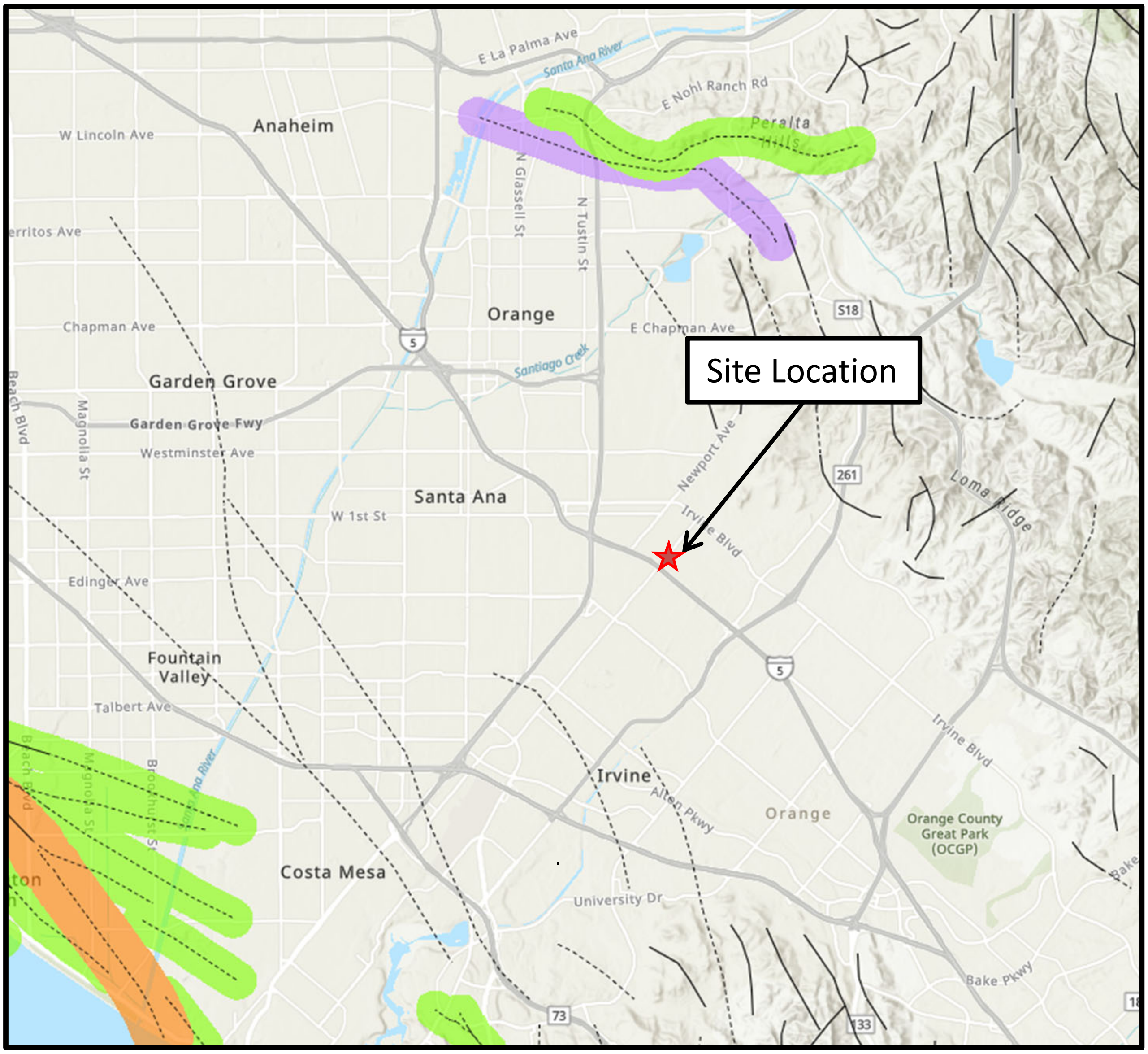
Project Number: 24011-01
Date: February 2, 2024
Figure 1



Source: Geologic Map of the San Bernardino and Santa Ana 30’x60’ Quadrangle, (USGS, 2006)

Regional Geologic Map

Meritage Homes Proposed Residential Development 13841 & 13751 Red Hill Avenue Tustin, California	Project Number: 24011-01 Date: February 2, 2024 Figure 2



Source: Fault Activity Map of California (Jennings and Bryant, 2010)

🟧 — — — ......?	Holocene fault displacement (during past 11,700 years) without historic record. Geomorphic evidence for Holocene faulting includes sag ponds, scarps showing little erosion, or the following features in Holocene age deposits: offset stream courses, linear scarps, shutter ridges, and triangular faceted spurs. Recency of faulting offshore is based on the interpreted age of the youngest strata displaced by faulting.
🟩 — — — ......?	Late Quaternary fault displacement (during past 700,000 years). Geomorphic evidence similar to that described for Holocene faults except features are less distinct. Faulting may be younger, but lack of younger overlying deposits precludes more accurate age classification.
🟪 — — — ......?	Quaternary fault (age undifferentiated). Most faults of this category show evidence of displacement sometime during the past 1.6 million years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age. Unnumbered Quaternary faults were based on Fault Map of California, 1975. See Bulletin 201, Appendix D for source data.
— — — ......?	Pre-Quaternary fault (older that 1.6 million years) or fault without recognized Quaternary displacement. Some faults are shown in this category because the source of mapping used was of reconnaissnce nature, or was not done with the object of dating fault displacements. Faults in this category are not necessarily inactive.

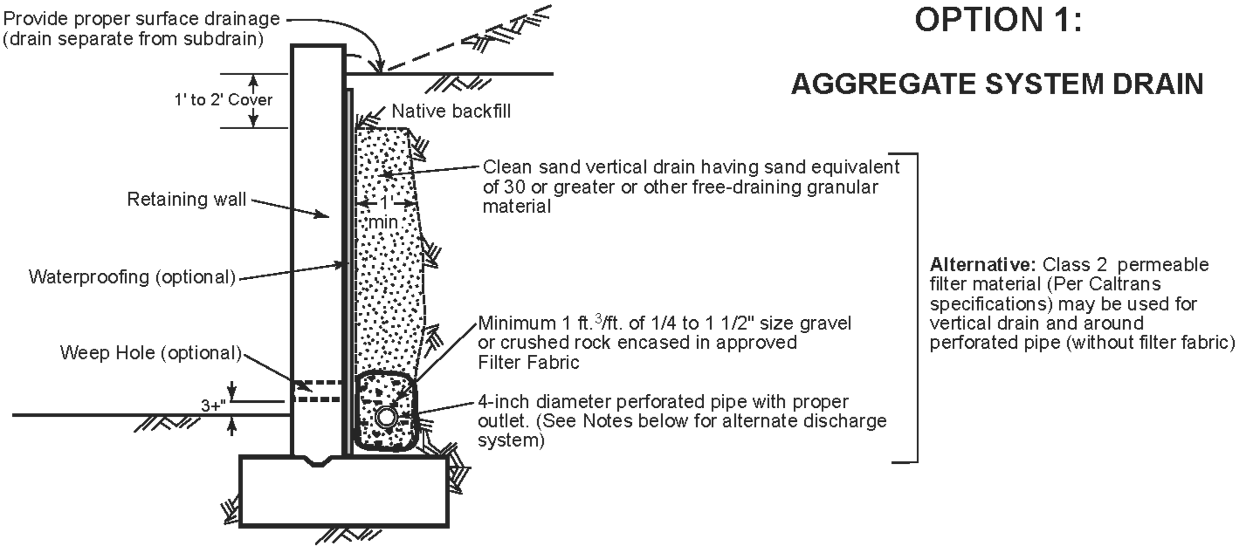
Regional Fault Map

Meritage Homes
Proposed Residential Development
13841 & 13751 Red Hill Avenue
Tustin, California

Project Number: 24011-01
Date: February 2, 2024
Figure 3

OPTION 1:

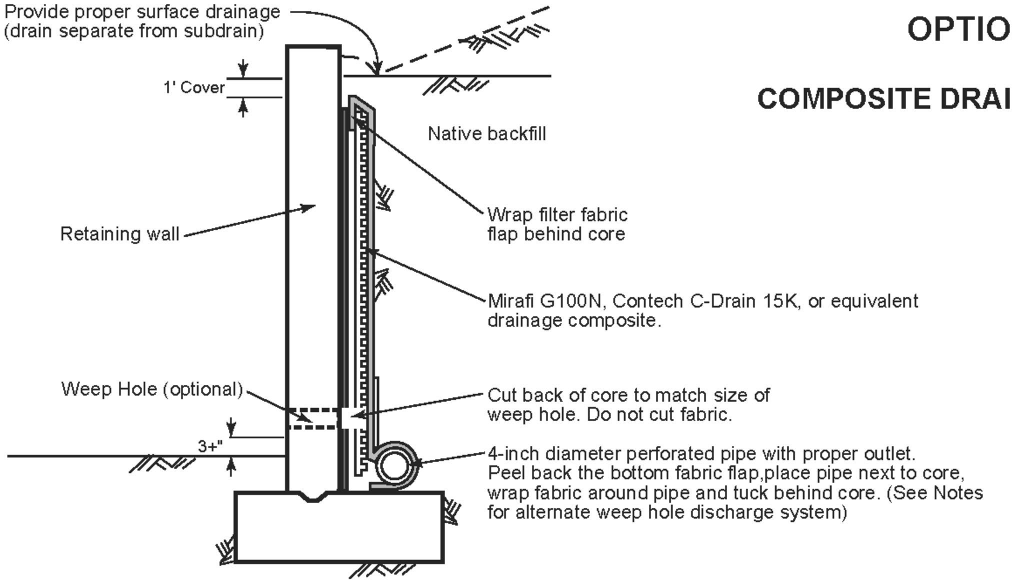
AGGREGATE SYSTEM DRAIN



Alternative: Class 2 permeable filter material (Per Caltrans specifications) may be used for vertical drain and around perforated pipe (without filter fabric)

OPTION 2:

COMPOSITE DRAINAGE SYSTEM



NOTES:

1. **PIPE TYPE SHOULD BE PVC OR ABS, SCHEDULE 40 OR SDR35 SATISFYING THE REQUIREMENTS OF ASTM TEST STANDARD D1527, D1785, D2751 , OR D3034.**
2. **FILTER FABRIC SHALL BE APPROVED PERMEABLE NON-WOVEN POLYESTER, NYLON, OR POLYPROPYLENE MATERIAL.**
3. **DRAIN PIPE SHOULD HAVE A GRADIENT OF 1 PERCENT MINIMUM.**
4. **WATERPROOFING MEMBRANE MAY BE REQUIRED FOR A SPECIFIC RETAINING WALL (SUCH AS A STUCCO OR BASEMENT WALL).**
5. **WEEP HOLES MAY BE PROVIDED FOR LOW RETAINING WALLS (LESS THAN 3 FEET IN HEIGHT) IN LIEU OF A VERTICAL DRAIN AND PIPE AND WHERE POTENTIAL WATER FROM BEHIND THE RETAINING WALL WILL NOT CREATE A NUISANCE WATER CONDITION. IF EXPOSURE IS NOT PERMITTED, A PROPER SUBDRAIN OUTLET SYSTEM SHOULD BE PROVIDED.**
6. **IF EXPOSURE IS PERMITTED, WEEP HOLES SHOULD BE 2-INCH MINIMUM DIAMETER AND PROVIDED AT 25-FOOT MAXIMUM SPACING ALONG WALL. WEEP HOLES SHOULD BE LOCATED 3+ INCHES ABOVE FINISHED GRADE.**
7. **SCREENING SUCH AS WITH A FILTER FABRIC SHOULD BE PROVIDED FOR WEEP HOLES/OPEN JOINTS TO PREVENT EARTH MATERIALS FROM ENTERING THE HOLES/JOINTS.**
8. **OPEN VERTICAL MASONRY JOINTS (I.E., OMIT MORTAR FROM JOINTS OF FIRST COURSE ABOVE FINISHED GRADE) AT 32-INCH MAXIMUM INTERVALS MAY BE SUBSTITUTED FOR WEEP HOLES.**
9. **THE GEOTECHNICAL CONSULTANT MAY PROVIDE ADDITIONAL RECOMMENDATIONS FOR RETAINING WALLS DESIGNED FOR SELECT SAND BACKFILL.**

Retaining Wall Drainage Detail

Figure 4

Appendix A

APPENDIX A

REFERENCES

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APPENDIX A (Cont'd)

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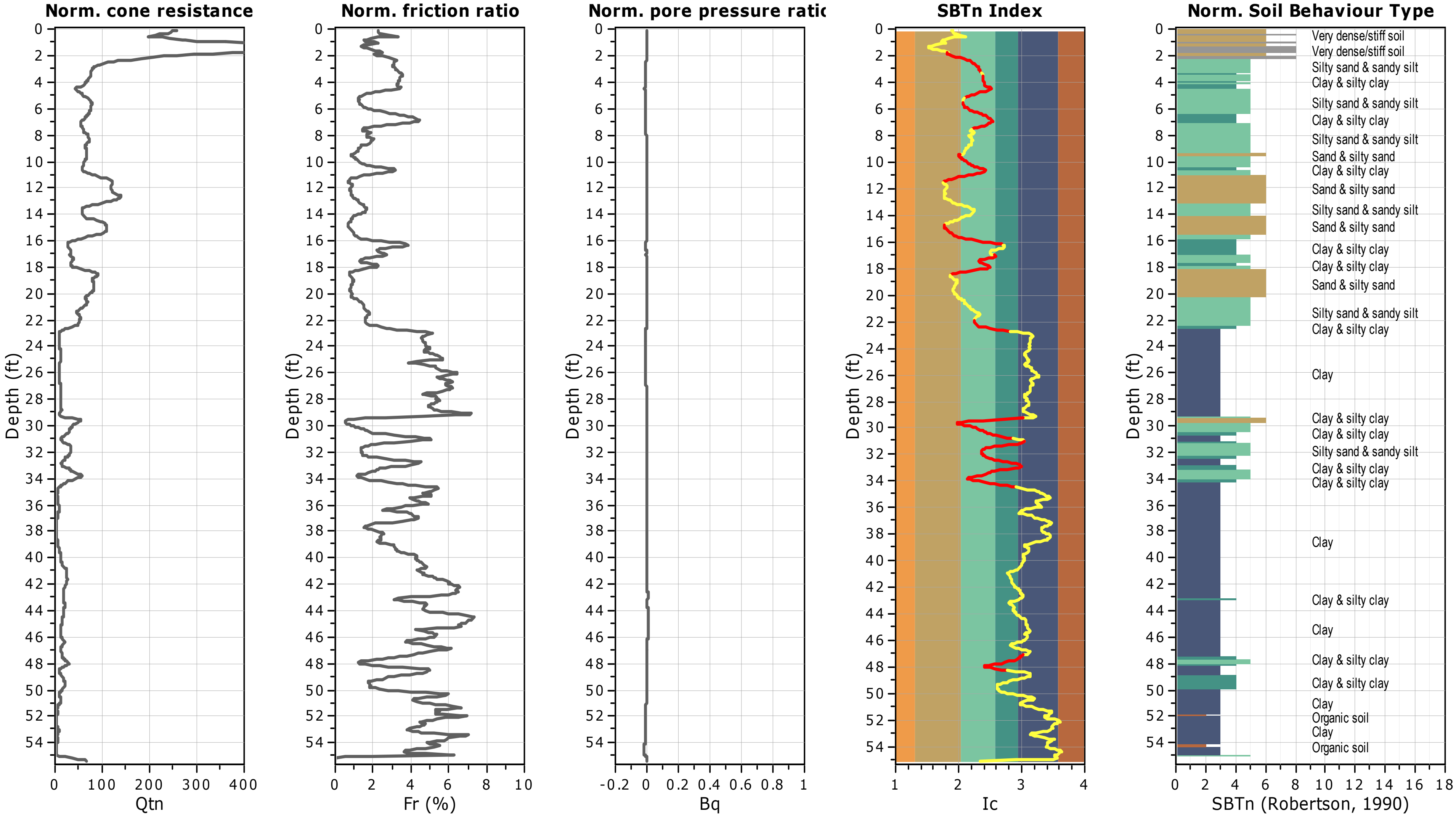
Appendix B

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

CPT-1

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

Total depth: 55.40 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing



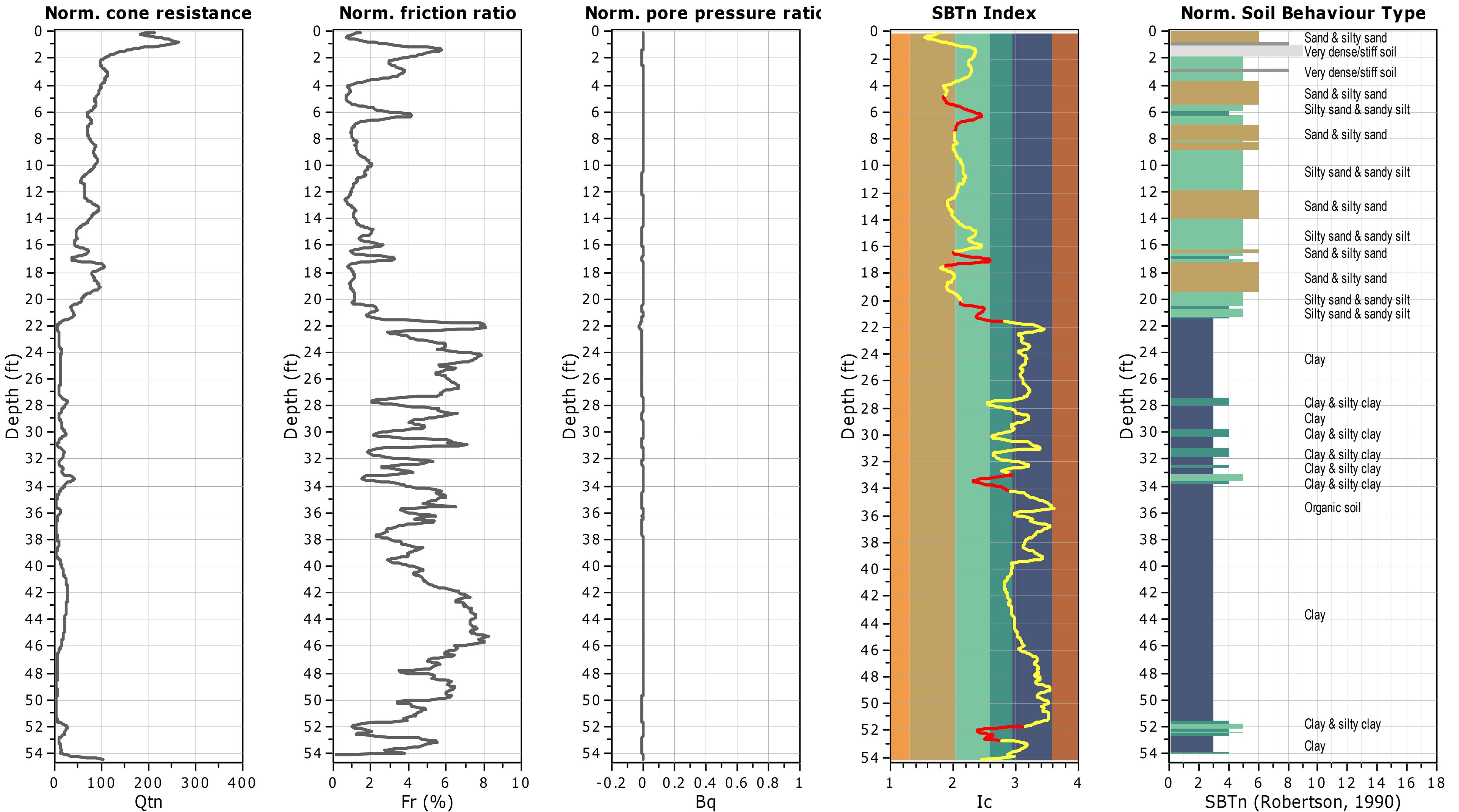
SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty clay
🟩 5. Silty sand to sandy silt
🟨 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬜ 8. Very stiff sand to clayey sand
⬜ 9. Very stiff fine grained

CPT-2

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

Total depth: 54.47 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing



SBTn legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty clay
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to clayey sand
- ⬜ 9. Very stiff fine grained

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

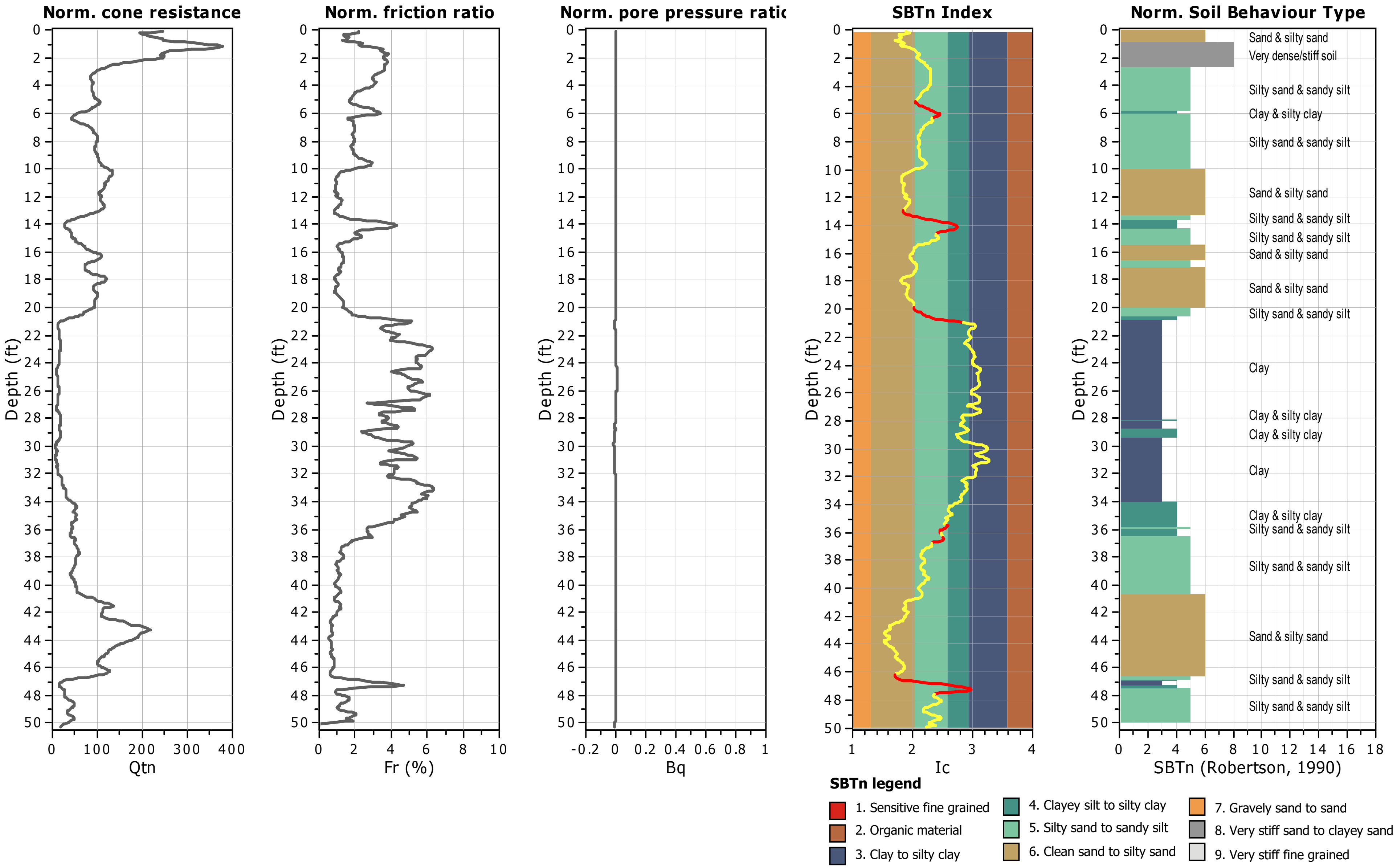
CPT-3

Project: Meritage/13841 & 13751 Red Hill Avenue

Location: Tustin, CA

Total depth: 50.27 ft, Date: 1/26/2024

Cone Operator: Kehoe Testing



SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

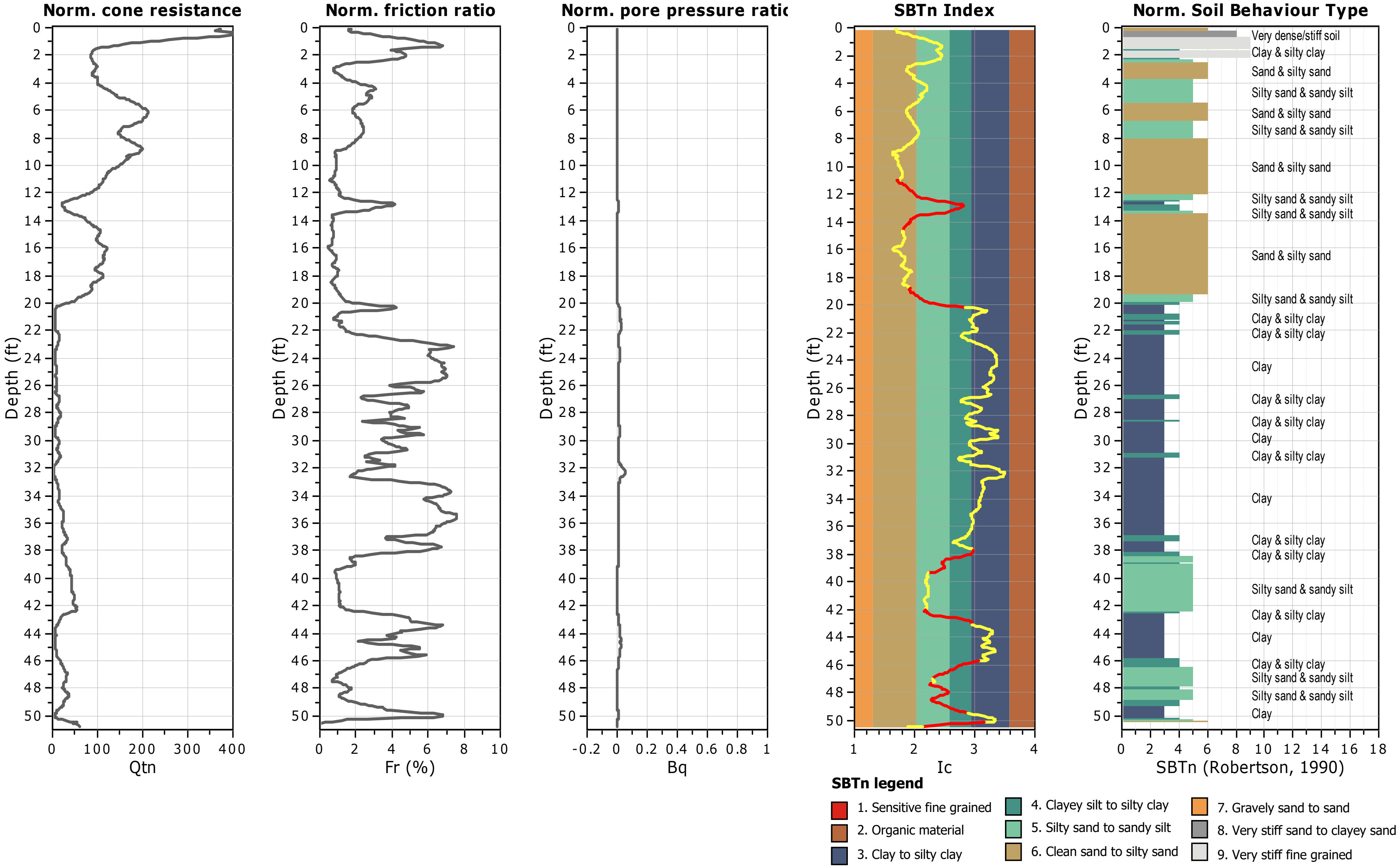
CPT-4

Project: **Meritage/13841 & 13751 Red Hill Avenue**

Location: **Tustin, CA**

Total depth: 50.79 ft, Date: 1/26/2024

Cone Operator: Kehoe Testing

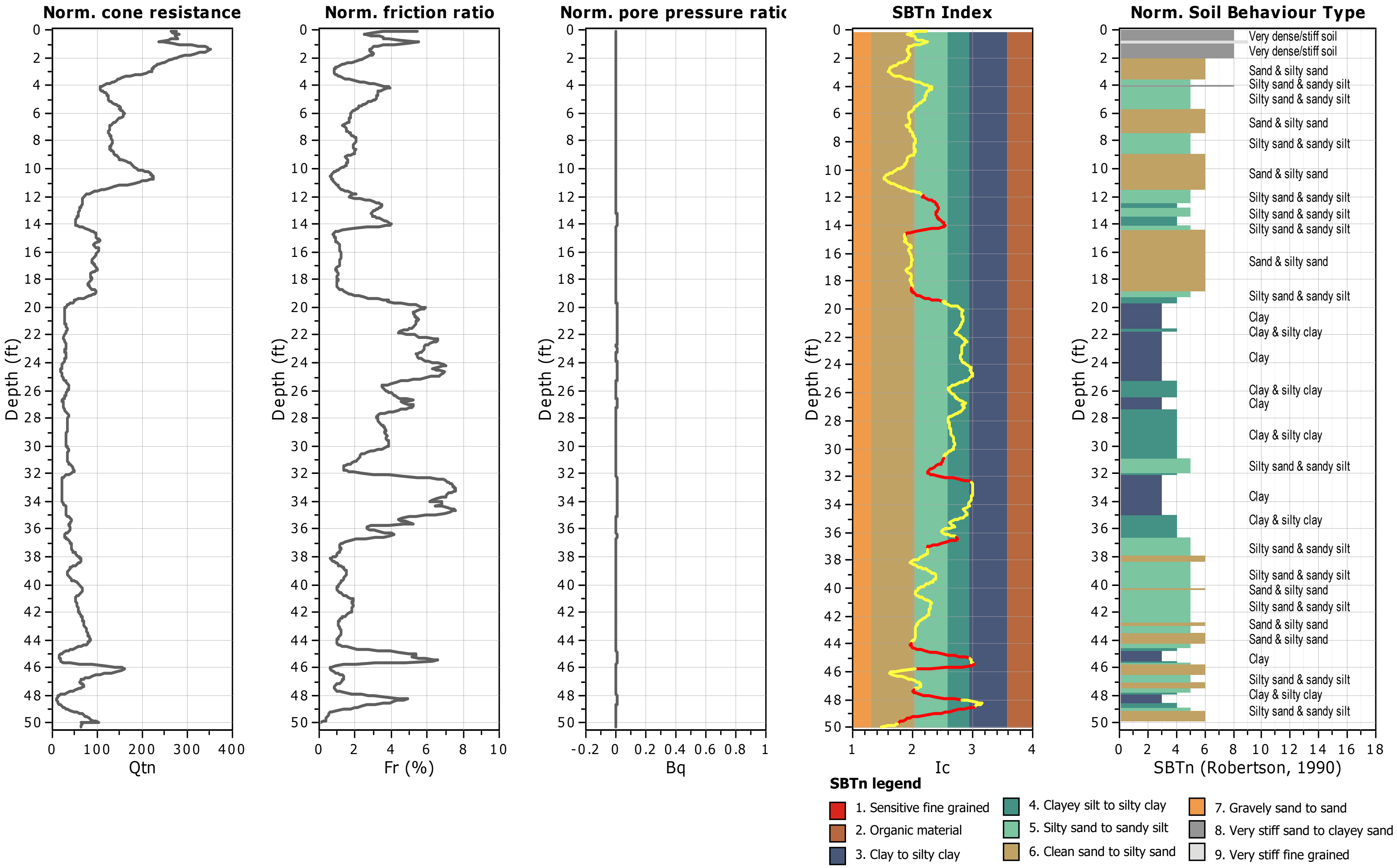


SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

CPT-5

Project: **Meritage/13841 & 13751 Red Hill Avenue**
Location: **Tustin, CA**

Total depth: 50.28 ft, Date: 1/26/2024
Cone Operator: Kehoe Testing



Boring Logs by NMG Geotechnical (2015)

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 2/10/15

Date(s) Drilled	9/16/14	Logged By	AZ
Drilling Company	2R Drilling	Drill Bit Size/Type	10"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	Groundwater Encountered at 47.4'		
Comments			

H-1

Sheet 1 of 2

Total Depth Drilled (ft)	51.5
Approximate Ground Surface Elevation (ft)	107.0

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0	▨				CL	Surface: 4" AC over 6" AB. **Artificial Fill (Af)**			B-1 @ 1' - 5' GS, AL, MD, DS, EI, CC
		■ ▨	B-1 D-1	11		ML	**Alluvium (Qal)** @ 2.5': Dark yellowish brown fine sandy SILT, moist, medium stiff, trace caliche stringers.	14.5	104.2	
	5	■	D-2	13		SM	@ 5': Upper: Dark yellowish brown silty fine SAND, damp, loose to medium dense, trace caliche stringers.	8.5	104.2	
100						SC-CL	Lower: Dark yellowish brown clayey fine SAND/sandy CLAY, damp, medium dense/stiff, trace caliche stringers.			
		■	D-3	11		SM	@ 7.5': Dark yellowish brown to reddish brown silty fine to medium SAND, moist, loose to medium dense, root hairs, pinhole pores, trace fine gravel.	8.1	115.5	CN
	10	■	D-4	22			@ 10': Yellowish brown silty fine to medium SAND, damp, medium dense, slightly friable, trace fine gravel and mica.	6.3	121.1	
	15	■	D-5	12			@ 15': Yellowish brown silty fine SAND, damp to moist, loose to medium dense, slightly friable, trace mica.	10.9	103.9	CN
90										
	20	■	D-6	14			@ 20': Upper: Light yellowish brown clayey and silty fine to medium SAND, moist, medium dense, slightly friable, trace coarse sand fine gravel and mica. Lower: Yellowish brown silty fine SAND, moist, medium dense, slightly friable, trace mica.	13.4	103.7	
	25	■	D-7	13		CL	@ 25': Brown to reddish brown silty CLAY, wet, medium stiff, caliche stringers.	17.8	111.8	
80										
	30									

LOG OF BORING

WASL/Tustin

Tustin, CA

PROJECT NO. 14083-01

NMG

WASL/Tustin **Tustin, CA**

H-1
Sheet 2 of 2

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	30	■	D-8	18	▨	ML-CL	@ 30': Upper: Light yellowish brown to gray brown clayey SILT/silty CLAY, saturated, stiff, pinhole pores.	22.4	104.9	
					░	SM	Lower: Dark yellowish brown silty fine to medium SAND, saturated, medium dense, trace mica.			
	35	■	D-9	11	▨	CL	@ 35': Reddish brown to gray silty fine sandy CLAY, saturated, medium stiff.	28.9	98.4	
70					▨					
	40	■	D-10	67	▨		@ 40': Reddish brown to gray silty fine sandy CLAY, wet, very stiff to hard, trace mica.	15.2	117.7	
	45	■	D-11	52	▨		@ 45': Reddish brown to gray silty fine sandy CLAY, wet, very stiff to hard, trace mica.	17.4	114.1	
60					▨		∇			
	50	■	D-12	17	▨		@ 50': Red to gray mottled silty, fine sandy CLAY, wet, stiff, trace mica.	23.6	102.2	
							Notes: Total Depth: 51.5 Feet. Groundwater Encountered 47.4 Feet. Backfilled with Cuttings, Tamped, and Patched with Concrete.			
	55									
50										
	60									
	65									

LOG OF BORING
WASL/Tustin
Tustin, CA

PROJECT NO. 14083-01

NMG

Date(s) Drilled	**9/16/14**	Logged By	**TBF**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**
Sampling Method(s)	**Modified California, Bulk**		
Approximate Groundwater Depth:	**Groundwater Not Encountered**		
Comments			

P-1

Sheet 1 of 1

Total Depth Drilled (ft)	**13.0**
Approximate Ground Surface Elevation (ft)	**106.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0	▨			░	SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)**			
		■	B-1 D-1	 12	░		@ 2.5': Upper: Brown silty fine to coarse SAND, damp, loose to medium dense, micaceous, very porous, friable, trace gravel.	8.7	106.7	B-1 @ 0' - 5'
		▨			░	SM	**Alluvium (Qal)** Lower: Brown silty fine to coarse SAND, damp, loose to medium dense, micaceous, porous, trace gravel.			
100	5	■	D-2	15	░		@ 5': Brown silty fine SAND, damp, medium dense, porous, caliche, micaceous.	9.9	108.3	
	10				░					
		■	D-3	12	░		@ 11': Upper: Light brown slightly silty fine to medium SAND, damp, loose to medium dense, micaceous, highly friable. Lower: Light brown slightly fine SAND, damp, loose, micaceous, more dense than above.	6.2	108.7	
90	15						Notes: Total Depth: 13 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	20									
80	25									
	30									

LOG OF BORING

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	9/16/14	Logged By	AZ/TBF
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California		
Approximate Groundwater Depth:	Groundwater Not Encountered		
Comments			

P-2

Sheet 1 of 1

Total Depth Drilled (ft)	12.0
Approximate Ground Surface Elevation (ft)	107.0

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial Fill (Af)**			
		■	D-1	11			@ 2.5': Light brown to brown silty fine SAND, damp, loose, friable, pores up to 3 mm in diameter.	11.0	99.1	
	5	■	D-2	15		SM	**Alluvium (Qal)** @ 5': Brown silty fine SAND, damp, loose, porous, trace root hairs, micaceous.	7.6	109.7	GS, CN
100										
	10	■	D-3	16		SP	@ 10': Upper: Yellowish brown to brown fine to medium SAND, damp, medium dense, highly friable, trace mica.	1.7		
						SM	Lower: Yellowish brown to brown silty fine to medium SAND, damp, medium dense, highly friable, trace mica.			
							Notes: Total Depth 12 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfillied with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	**9/16/14**	Logged By	**AZ**	**P-3**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**	**Sheet 1 of 1**
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**	
Sampling Method(s)	**Modified California**			
Approximate Groundwater Depth:	**Groundwater Not Encountered**			Total Depth Drilled (ft) **11.5**
Comments				Approximate Ground Surface Elevation (ft) **107.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)/Alluvium (Qal)?**			
	5	■	D-1	12			@ 5': No sample recovery.			
100										
	10	■	D-2	25		SM SP	**Alluvium (Qal)** @ 10': Upper: Light reddish brown to strong brown silty fine to coarse SAND, damp, medium dense, slightly friable, coarse gravel in uppermost rings. Lower: Light pale yellow slightly silty fine to coarse SAND, damp, medium dense, highly friable, trace mica. Notes: Total Depth 11.5 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.	2.0		
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin

Tustin, CA

PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	9/16/14	Logged By	AZ
Drilling Company	2R Drilling	Drill Bit Size/Type	8"
Drill Rig Type	CME 75 Hollow Stem	Hammer Data	140lbs @ 30" Drop
Sampling Method(s)	Modified California, Bulk		
Approximate Groundwater Depth:	Groundwater Not Encountered	Total Depth Drilled (ft)	11.0
Comments		Approximate Ground Surface Elevation (ft)	107.0

P-4

Sheet 1 of 1

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0					SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial Fill (Af)/Alluvium (Qal)?**			
	5									B-1 @ 2' - 7'
100										
	10	■	D-1	13		SM	**Alluvium (Qal)** @ 9.5': Dark yellowish brown silty fine to medium SAND, damp, medium dense, trace mica and coarse sand.	8.4	116.1	
							Notes: Total Depth 11.0 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG

Report: HOLLOW STEM; Project: P:\2014\14083-01\GINT\14083-01.GPJ; Data Template: NMGNOV98.GDT; Printed: 10/2/14

Date(s) Drilled	**9/16/14**	Logged By	**AZ**
Drilling Company	**2R Drilling**	Drill Bit Size/Type	**8"**
Drill Rig Type	**CME 75 Hollow Stem**	Hammer Data	**140lbs @ 30" Drop**
Sampling Method(s)	**Modified California**		
Approximate Groundwater Depth:	**Groundwater Not Encountered**		
Comments			

P-5

Sheet 1 of 1

Total Depth Drilled (ft)	**10.0**
Approximate Ground Surface Elevation (ft)	**108.0**

Elevation (ft)	Depth (ft)	SAMPLES Type	SAMPLES Number	SAMPLES Blows per foot	Graphic Log	USCS	MATERIAL DESCRIPTION	Moisture Content (%)	Dry Density (pcf)	OTHER TESTS and REMARKS
	0				▨	SM	Surface: Dirt lot with very sparse vegetation. Scattered asphalt, debris, and trash. **Artificial FIll (Af)/Alluvium (Qal)?**			
	5				▨					
100		■	D-1	15	▨	SM	**Alluvium (Qal)** @ 8': Dark yellowish brown silty fine to medium SAND, damp, medium dense, trace pinhole pores.	7.6	113.3	GS, CN
	10									
							Notes: Total Depth 10.0 Feet. No Groundwater Encountered. Presoak and Percolation Testing on 9/16/14. Backfilled with Cuttings.			
	15									
90										
	20									
	25									
80										
	30									

LOG OF BORING

WASL/Tustin

Tustin, CA

PROJECT NO. 14083-01

NMG

Boring Logs by Geosoils (2005)

LOG OF BORING B-1

Sheet 1 of 1

Date Drilled: 3/18/05 Logged by: DXS

Equipment: CME-55 Driving Weight and Drop: 140 lbs and 30"

Surface Elevation(ft): ______ Depth to Water(ft): ______

☒ SPT ⧓ Modified California ▽ Water Level ADT

🖐 Grab Sample ■ Shelby Tube ▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	■	2.5" Asphalt Over 6" Base						
	▥	SILTY SAND, loose, brown, dry to slightly moist, fine grained	⧓		15	13	111	
5	▨	SANDY CLAY, very stiff, dry, brownish gray, some Silt, trace caliche	⧓		40	9	112	
10	▨	Same as above	☒		18			
		SAND w/some gravel, medium dense, brown, dry						
15		SAND, gray beach sand, medium dense, slightly moist	⧓		24	2	104	
20	▨	SILTY CLAY, medium stiff, brown, moist, some sand	☒		8			
25	▨	Same as above	⧓		16	19	108	
30	▥	SILTY SAND, loose, brown, moist, fine to medium grained	☒		5			
35	▨	SANDY CLAY, very stiff, reddish brown/orange brown, moist,	⧓		44	14	121	
▼40			☒		11			
		SAND, medium dense, brown, saturated, some clay at tip						
45		Same as above, loose, saturated	☒		9			
50		Same, medium dense	☒		14			
55		Total depth of Boring = 51'6" Groundwater encountered @ 40'6" Backfilled with cuttings						

GSI

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1446 East Chestnut Avenue
Santa Ana, California
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ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-2

Sheet 1 of 1

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

☒ SPT
⧓ Modified California
▽ Water Level ADT
Grab Sample
■ Shelby Tube
▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	■	2.5" Asphalt over 6" Base						
	▨	Sandy CLAY w/gravel, brown, medium stiff, moist, low plasticity	⧓		8	17	76	
5	▨	Same as above	☒		8			
10		SAND, brown, medium dense, moist, fine grained	⧓		19	12	125	
15	▥	Silty SAND, brown, loose, moist, fine grained	☒		6			
20		SAND, brown, medium dense, moist, fine grained	⧓		22	6	102	
25	▨	Silty CLAY, brown, soft, moist, low to medium plasticity	☒		3			
30	▨	Same as above	⧓		19	15	111	
35	▨	Same but orange brown	☒		3			
40	▨	Silty CLAY, reddish brown, very stiff, moist, medium plasticity	⧓		35	16	114	
▼45	▨	Same as above	☒		3			
50	▨		☒		3			
55		Total Depth = 51.5 feet Groundwater encountered @ 45 feet Backfilled w/cuttings						

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ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-3

Sheet **1** of **1**

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

☒ SPT	⧓ Modified California	▽ Water Level ADT
✋ Grab Sample	■ Shelby Tube	▼ Static Water Table

DEPTH (ft)	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: Sample Type	SAMPLES: Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
0	2.5" Asphalt over 6" Base						
	Silty CLAY w/gravel, dark brown, soft, moist, low to medium plasticity	⧓		3	23	90	
5	Silty SAND, brown, loose, fine grained, moist	⧓		12	-	-	
10	Clayey SAND, brown, loose, slightly moist, fine grained	⧖		9			
15	Same as above	⧓		14	6	94	
20	Sandy SILT, soft to medium stiff, brown, moist	⧖		4			
25	Silty CLAY, medium stiff, reddish brown, moist, medium plasticity	⧓		14	20	105	
	Total Depth = 26'6" No Groundwater encountered within boring depth Backfilled w/cuttings						

LAGNNN01 4735.GPJ LAGNNN01.GDT 3/31/05

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ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-4

Sheet 1 of 1

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

☒ SPT
⧗ Modified California
▽ Water Level ADT
▣ Grab Sample
■ Shelby Tube
▼ Static Water Table

DEPTH (ft)	GRAPHIC LOG	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	■	2.5" Asphalt over 6" Base						
	▨	Silty CLAY, soft, brown, moist, fine grained, low to medium plasticity						
	▥	Sandy SILT, brown, soft, moist, fine grained	⧗		5	22	96	
5	▨	Silty CLAY, soft, brown, moist, medium plasticity	☒		2			
10	▨	Same as above, sandy	⧗		20	13	120	
15	▥	SIlty SAND, brown, loose, moist, fine to medium grained	☒		6			
20	▥	same as above	⧗		15	23	96	
	▨	SIlty CLAY, brown, soft to medium stiff, moist, low to medium plasticity						
25	▨		☒		5			
		Total Depth = 26'6" No groundwater encountered within the boring depth Backfilled w/cuttings						

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ASL Tustin

4735-A1-OC

Plate

LOG OF BORING B-5

Sheet 1 of 1

Date Drilled: 3/18/05
Logged by: DXS
Equipment: CME-55
Driving Weight and Drop: 140 lbs and 30"
Surface Elevation(ft):
Depth to Water(ft):

⊠ SPT
⧓ Modified California
▽ Water Level ADT
☐ Grab Sample
■ Shelby Tube
▼ Static Water Table

DEPTH (ft)	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES Sample Type	SAMPLES Bulk	BLOWS/FOOT	MOISTURE (%)	DRY DENSITY (pcf)	USCS SYMB.
	2.5" Asphalt over 6" Base						
	SAND w/gravel, medium dense, brown, moist						
	Sandy CLAY, medium stiff, dark brown, moist, low plasticity	⧓		9	18	100	
5	Same as above	⧓		18	19	93	
10	SAND, brown, medium dense, moist, fine to medium grained	⊠		19			
15	Silty SAND, brown, medium dense, moist, fine to medium grained	⧓		36	7	99	
20	SAND, loose, brown, slightly moist, fine grained, some silt	⊠		7			
25	Silty CLAY, very stiff, brown, moist, low to medium plasticity	⧓		29	17	113	
30	Sandy SILT, medium stiff, reddish brown, moist, rust, some caliche	⊠		5			

Total Depth of Boring = 31'6"
No groundwater encountered within the boring depth
Backfilled w/cuttings

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Santa Ana, California
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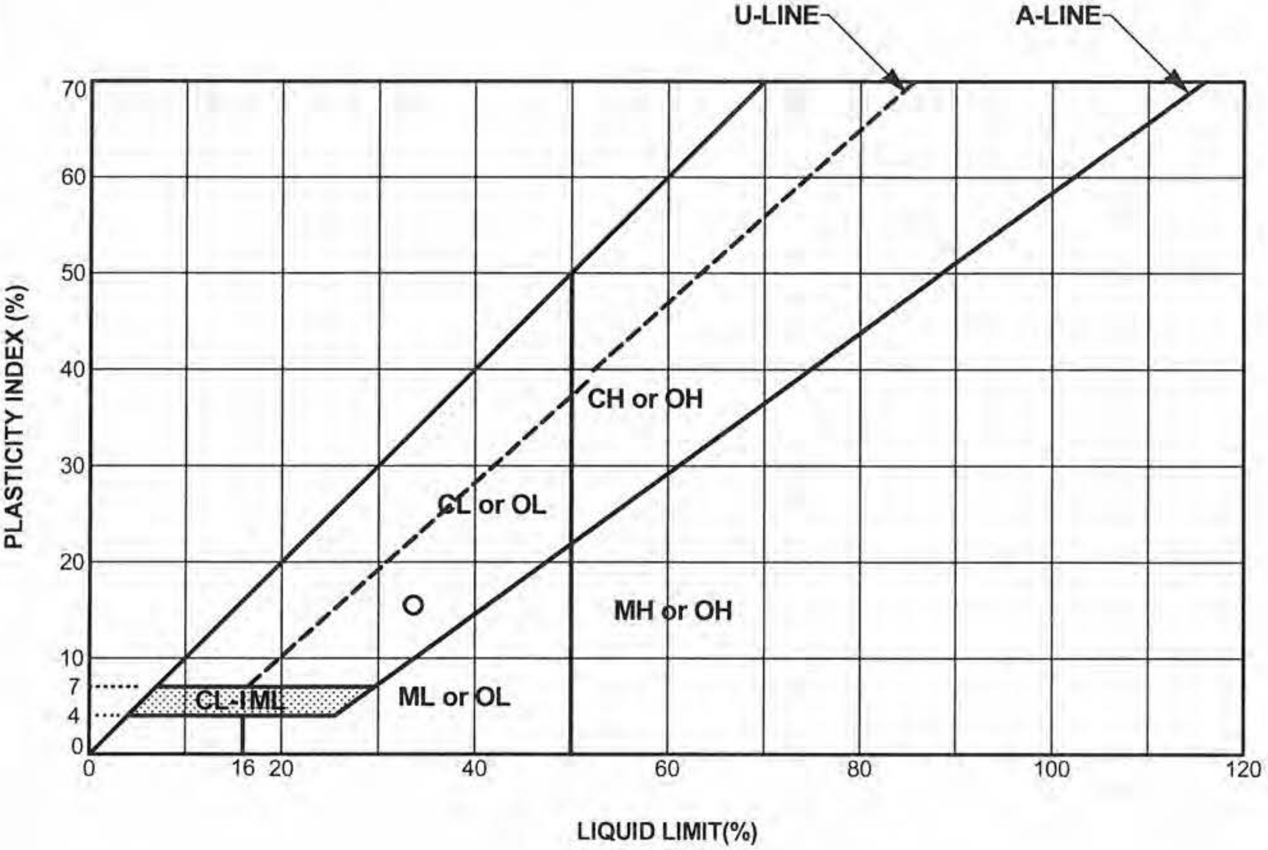
ASL Tustin

4735-A1-OC

Plate

Appendix C

Laboratory Test Results
by NMG Geotechnical
(2015)

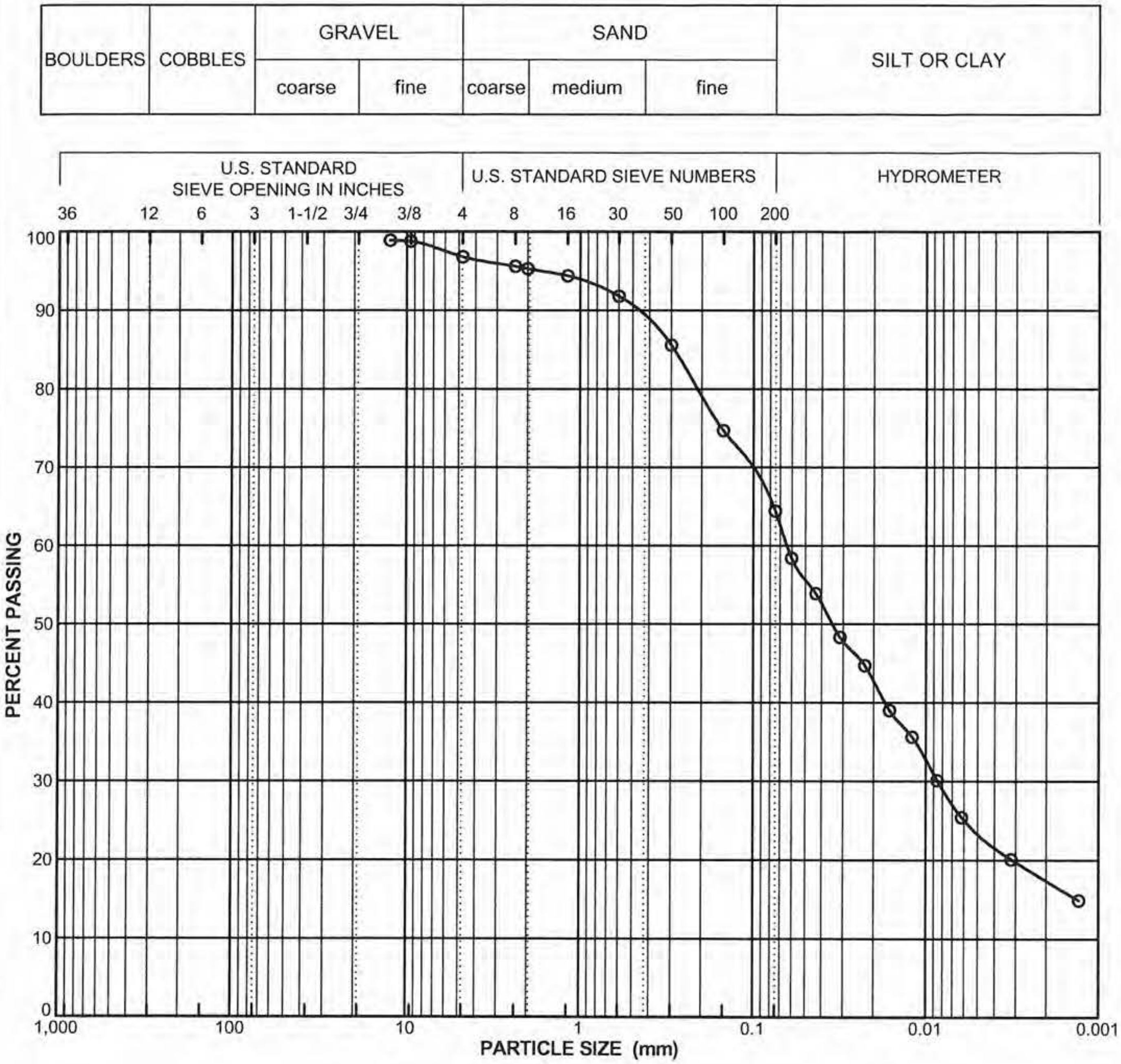


Symbol	Boring Number	Depth (feet)	Sample Number	Passing No. 200 Sieve (%)	LL	PI	USCS	Description
○	H-1	1.0	B-1	64	34	16	CL	Brown sandy silty CLAY

PLASTICITY CHART

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.

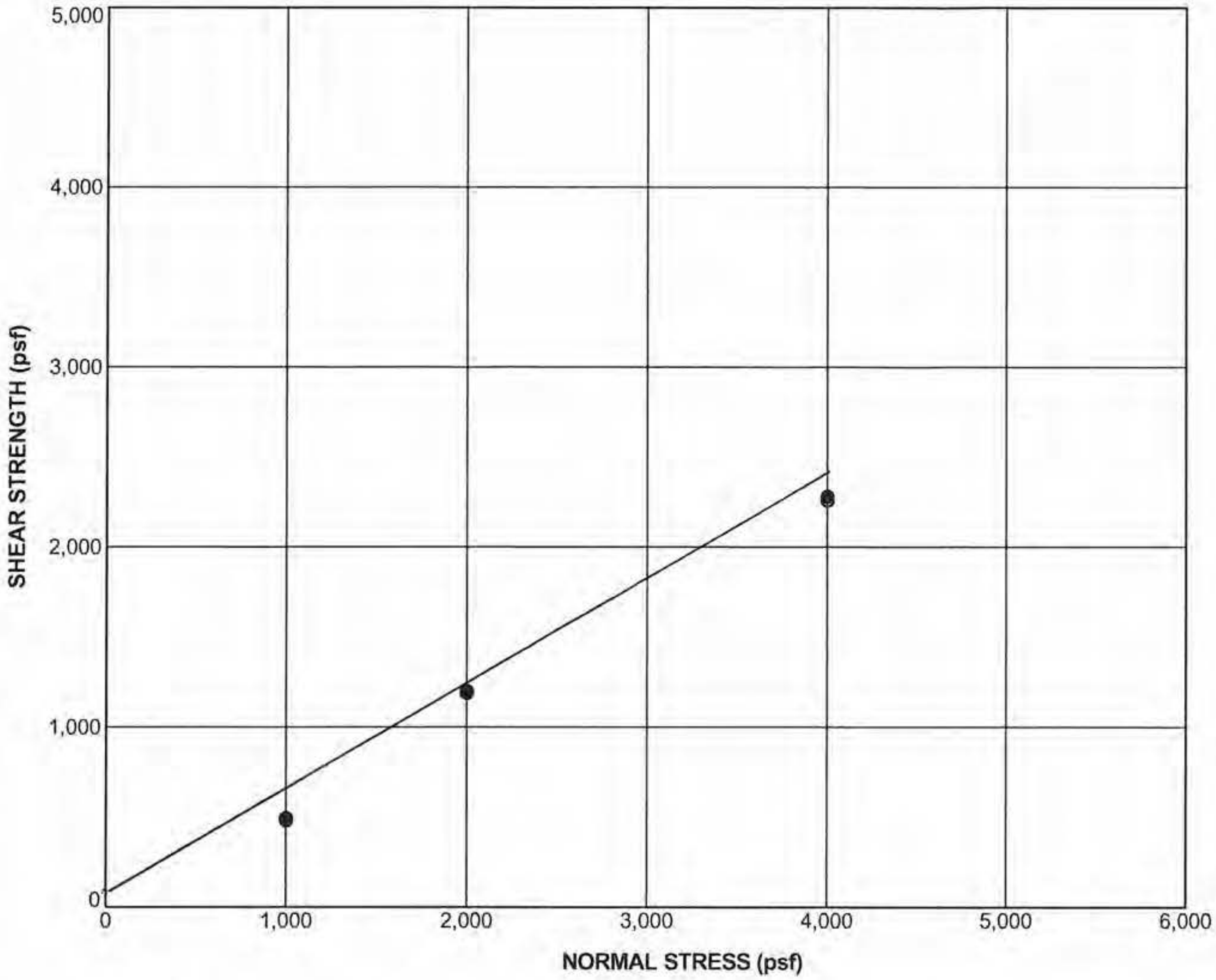


Symbol	Boring Number	Sample Number	Depth (feet)	Field Moisture (%)	LL	PI	Activity PI/-2μ	C_u	C_c	Passing No. 200 Sieve (%)	Passing 2μ (%)	USCS
O	H-1	B-1	1.0		34	16				64	17	CL

PARTICLE SIZE DISTRIBUTION

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



Boring No. H-1		**Sample No. B-1**		**Depth: 1.0 ft**	
Sample Description:	Brown sandy silty CLAY				
Liquid Limit:	34	**Plasticity Index:**	16	**Percent Passing No. 200 Sieve:**	64
Moisture Content (%):	24.9	**Dry Density (pcf):**	103.9	**Degree of Saturation (%):**	99
Sample Type:	Remolded	**Rate of Shear (in./min.):**	0.005		

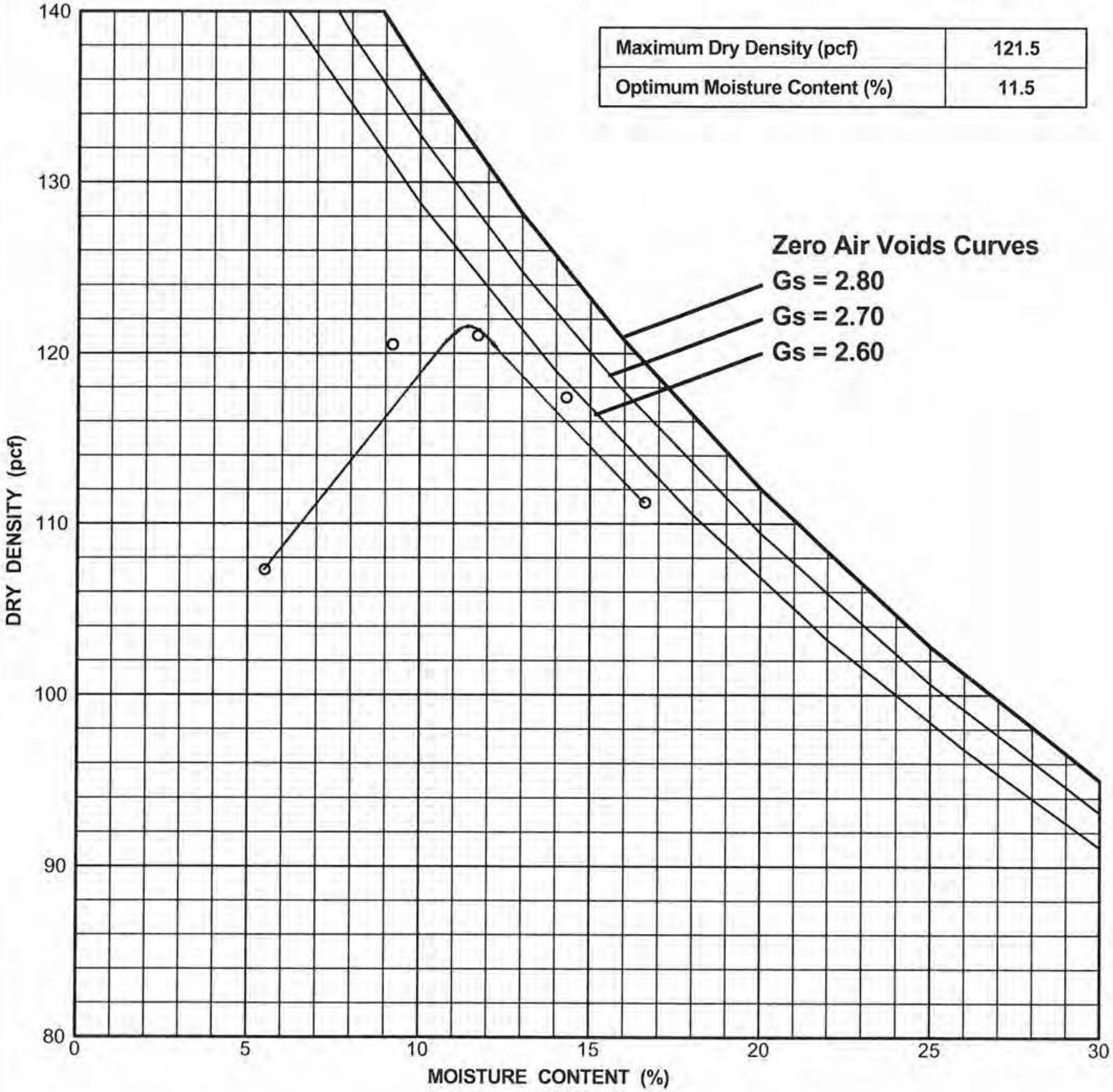
SHEAR STRENGTH PARAMETERS

Parameter	Peak ●	Ultimate ○
Cohesion (psf)	100	100
Friction Angle (degrees)	30	30.0

DIRECT SHEAR TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



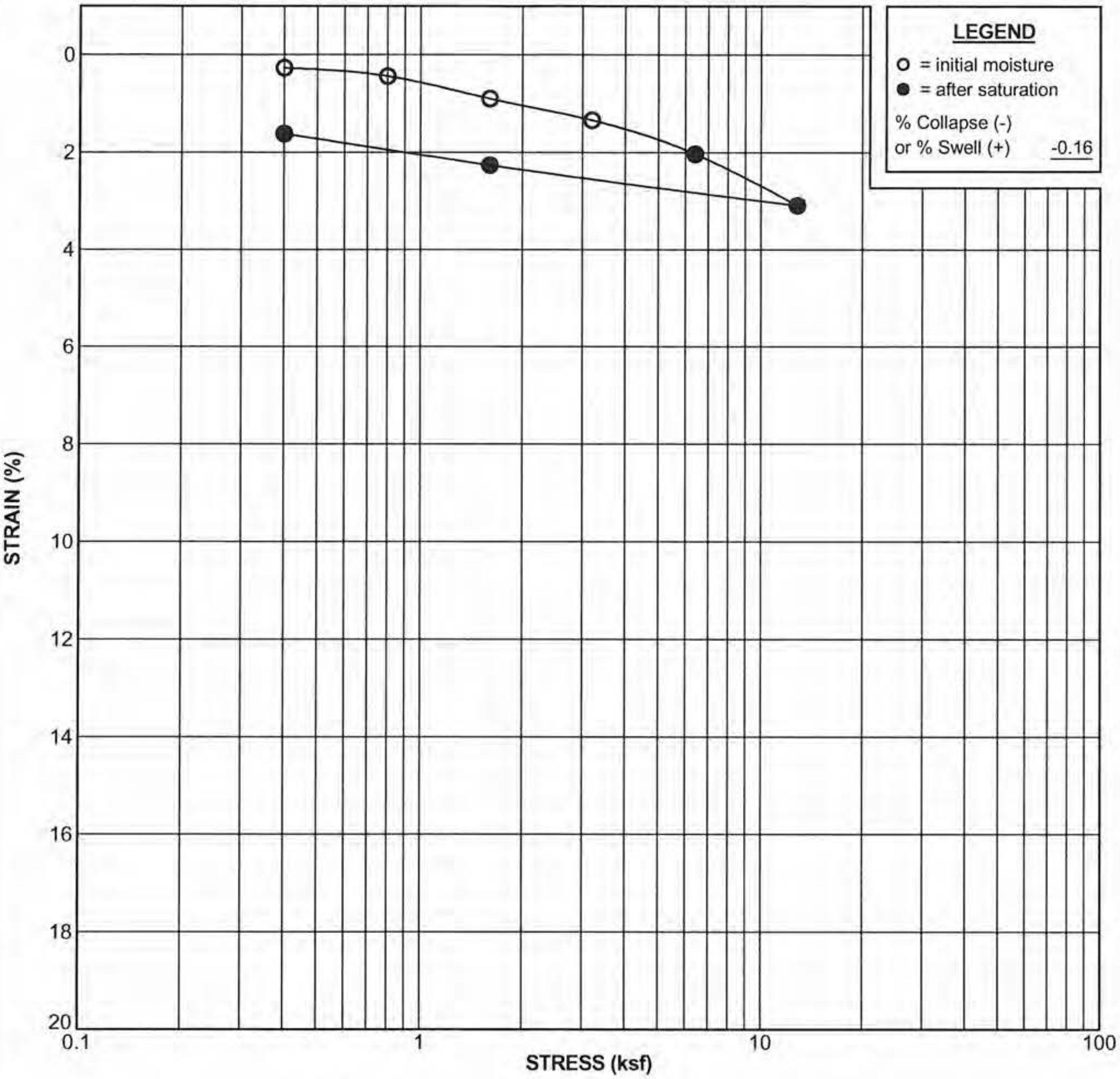
Maximum Dry Density (pcf)	121.5
Optimum Moisture Content (%)	11.5

Boring No. H-1		**Sample No. B-1**		**Depth: 1.0 ft**	
Sample Description:	Brown sandy silty CLAY				
Liquid Limit:	34	**Plasticity Index:**	16	**Percent Passing No. 200 Sieve:**	64
Comments:	1557A				

COMPACTION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



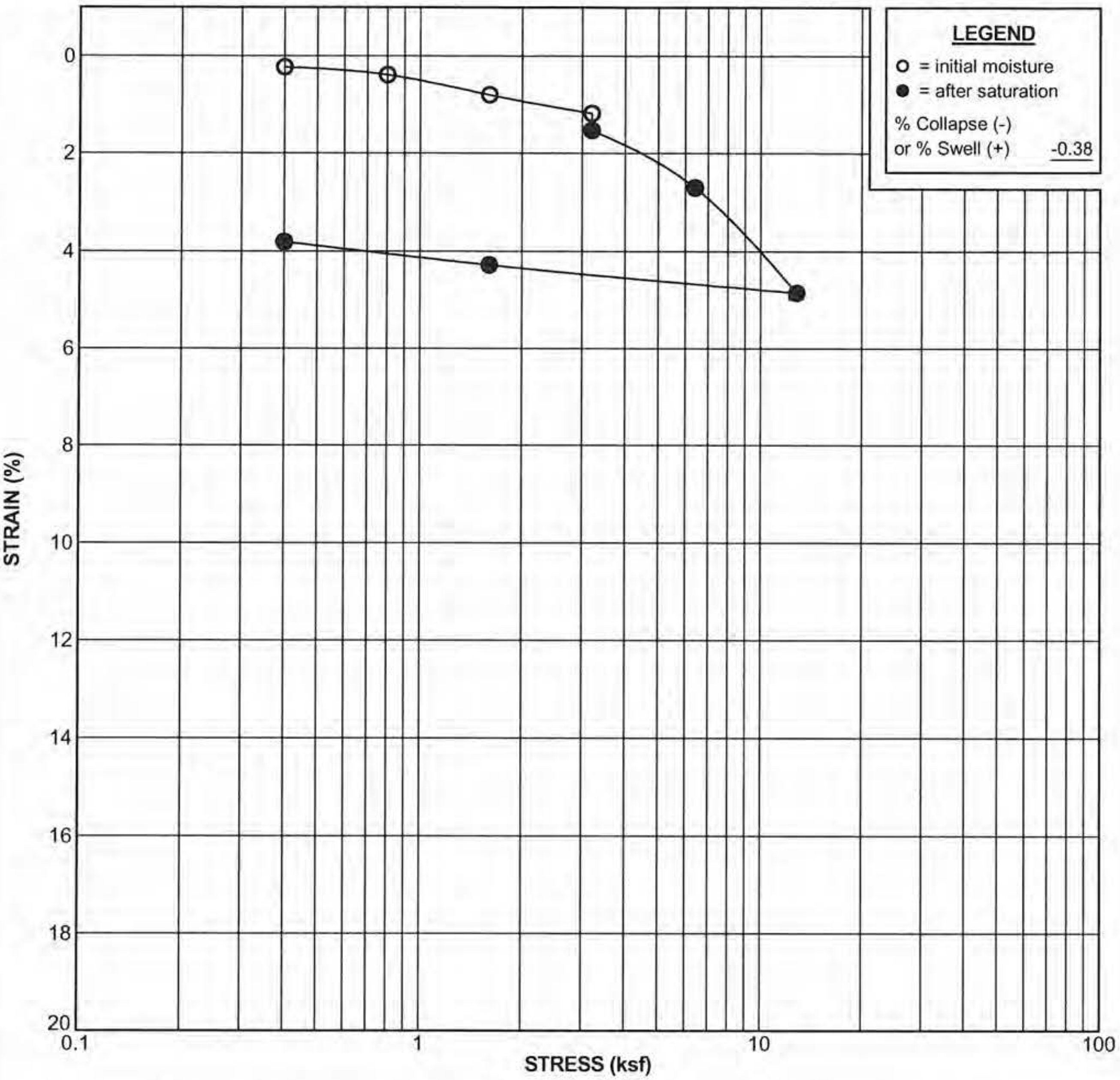
Boring No. H-1	**Sample No. D-5**	**Depth: 15.0 ft**
Sample Description: (Qal) Brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	16.0	103.1	70.2	0.604
Final	21.0	104.8	96.3	0.578

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.



Boring No. H-1	**Sample No. D-3**	**Depth: 7.5 ft**
Sample Description: (Qal) Reddish brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

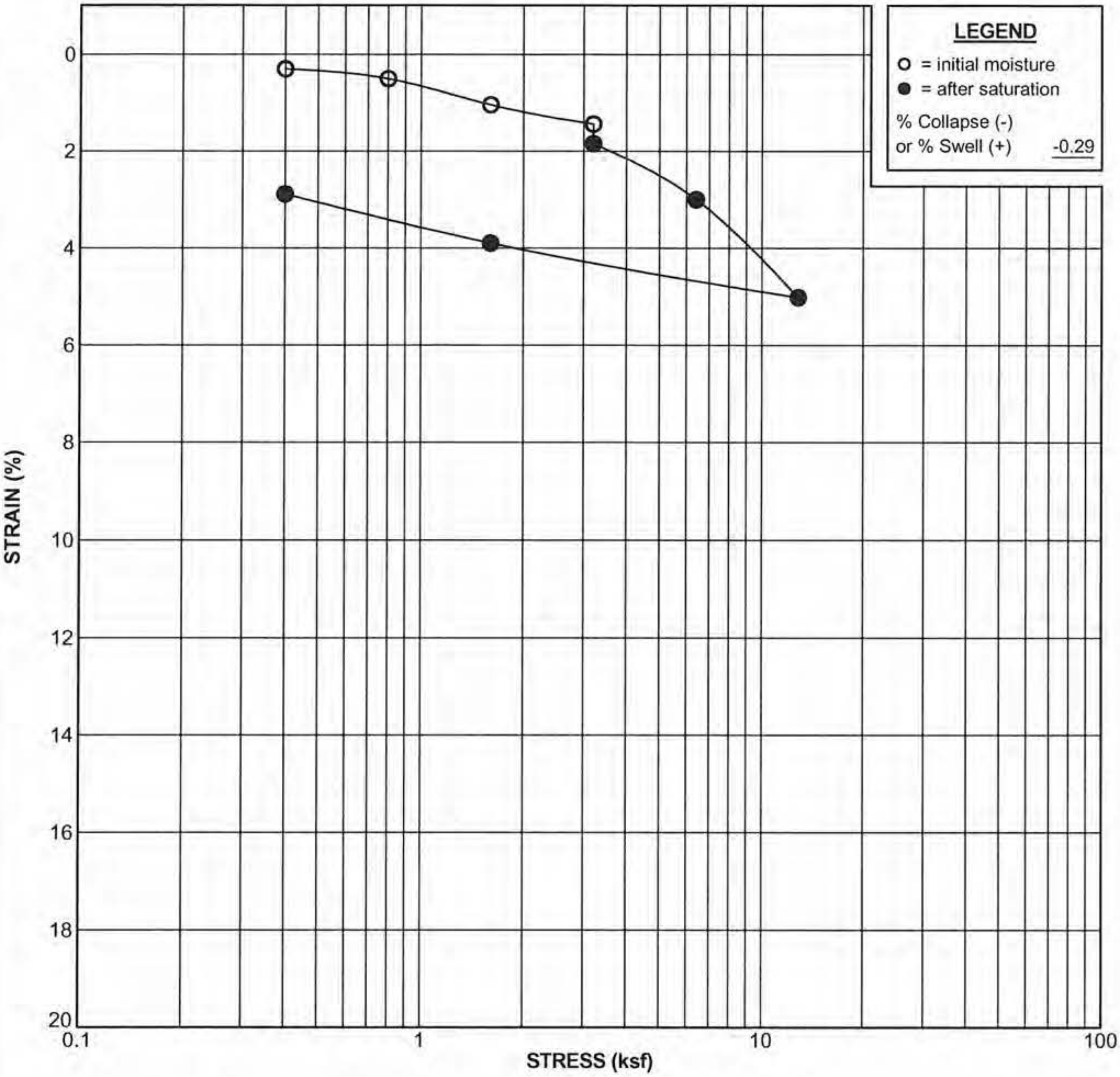
Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	8.4	114.5	50.1	0.444
Final	14.4	118.9	97.7	0.391

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.

Template: NMCONS; Prj ID: 14083-01.GPJ; Printed: 2/3/15



Boring No. P-2	**Sample No. D-2**	**Depth: 5.0 ft**
Sample Description: (Qal) Brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

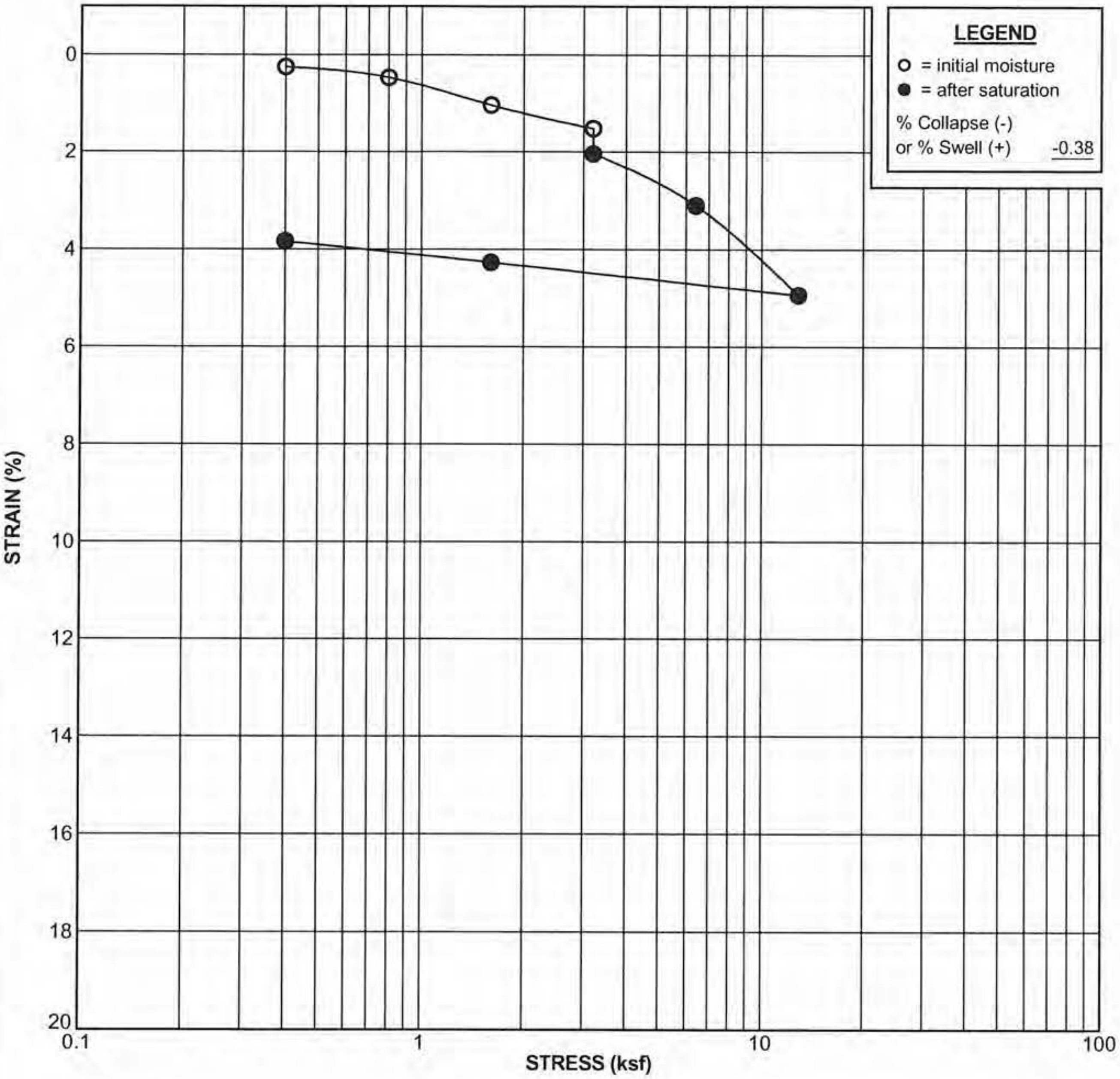
Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	8.2	113.3	44.8	0.498
Final	16.6	116.6	99.1	0.456

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.

Template: NMCONS; Prj ID: 14083-01.GPJ; Printed: 2/3/15



Boring No. P-5	**Sample No. D-1**	**Depth: 8.0 ft**
Sample Description: (Qal) Reddish brown sandy SILT		
Liquid Limit:	**Plasticity Index:**	**Percent Passing No. 200 Sieve:**

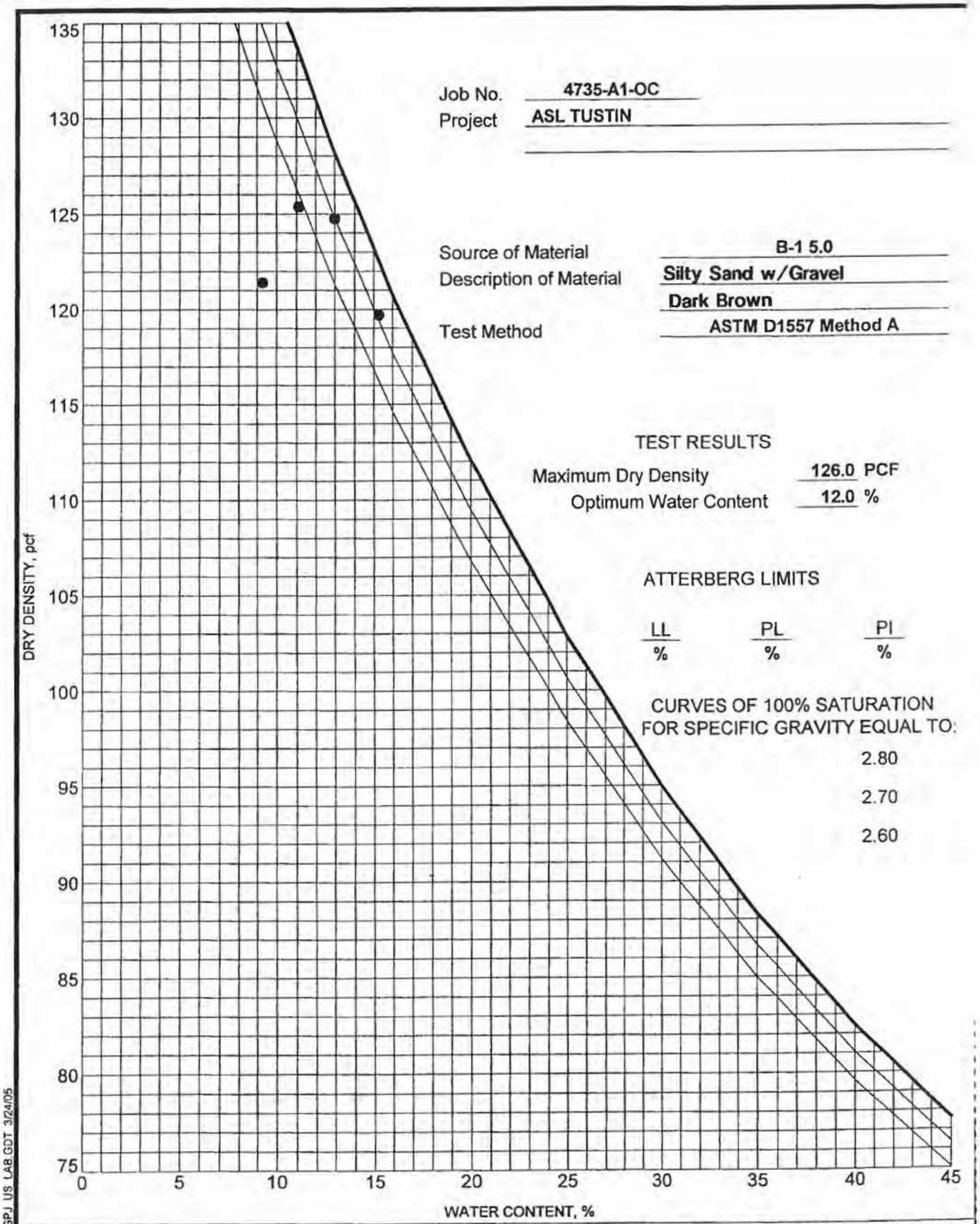
Test Stage	Moisture Content (%)	Dry Density (pcf)	Degree of Saturation (%)	Void Ratio
Initial	7.7	111.7	42.5	0.480
Final	14.4	116.0	89.7	0.426

CONSOLIDATION TEST RESULTS

WASL/Tustin
Tustin, CA
PROJECT NO. 14083-01

NMG Geotechnical, Inc.

Laboratory Test Results
by Geosoils (2005)



Job No. **4735-A1-OC**
Project **ASL TUSTIN**

Source of Material **B-1 5.0**
Description of Material **Silty Sand w/Gravel**
Dark Brown
Test Method **ASTM D1557 Method A**

TEST RESULTS

Maximum Dry Density **126.0** PCF
Optimum Water Content **12.0** %

ATTERBERG LIMITS

LL	PL	PI
%	%	%

MOISTURE-DENSITY RELATIONSHIP

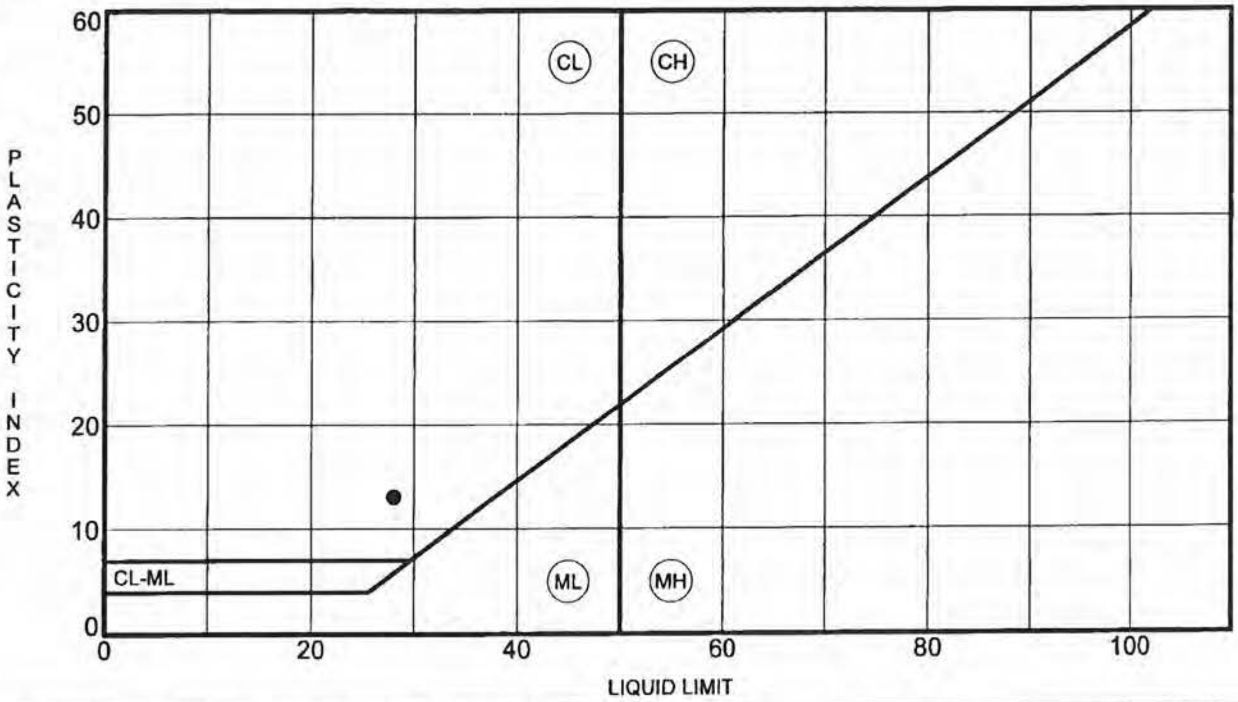
GSI

GEOSOILS, INC.
1446 East Chestnut Avenue
Santa Ana, California
Telephone: 714-647-0277
Fax: 714-647-0745

Project: ASL TUSTIN
Location:
Number: 4735-A1-OC

PLATE

US COMPACTION 4735.GPJ US LAB.GDT 3/24/05



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-1**	**20.0**	**28**	**15**	**13**		

GSI

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Santa Ana, California
Telephone: 714-647-0277
Fax: 714-647-0745

ATTERBERG LIMITS' RESULTS

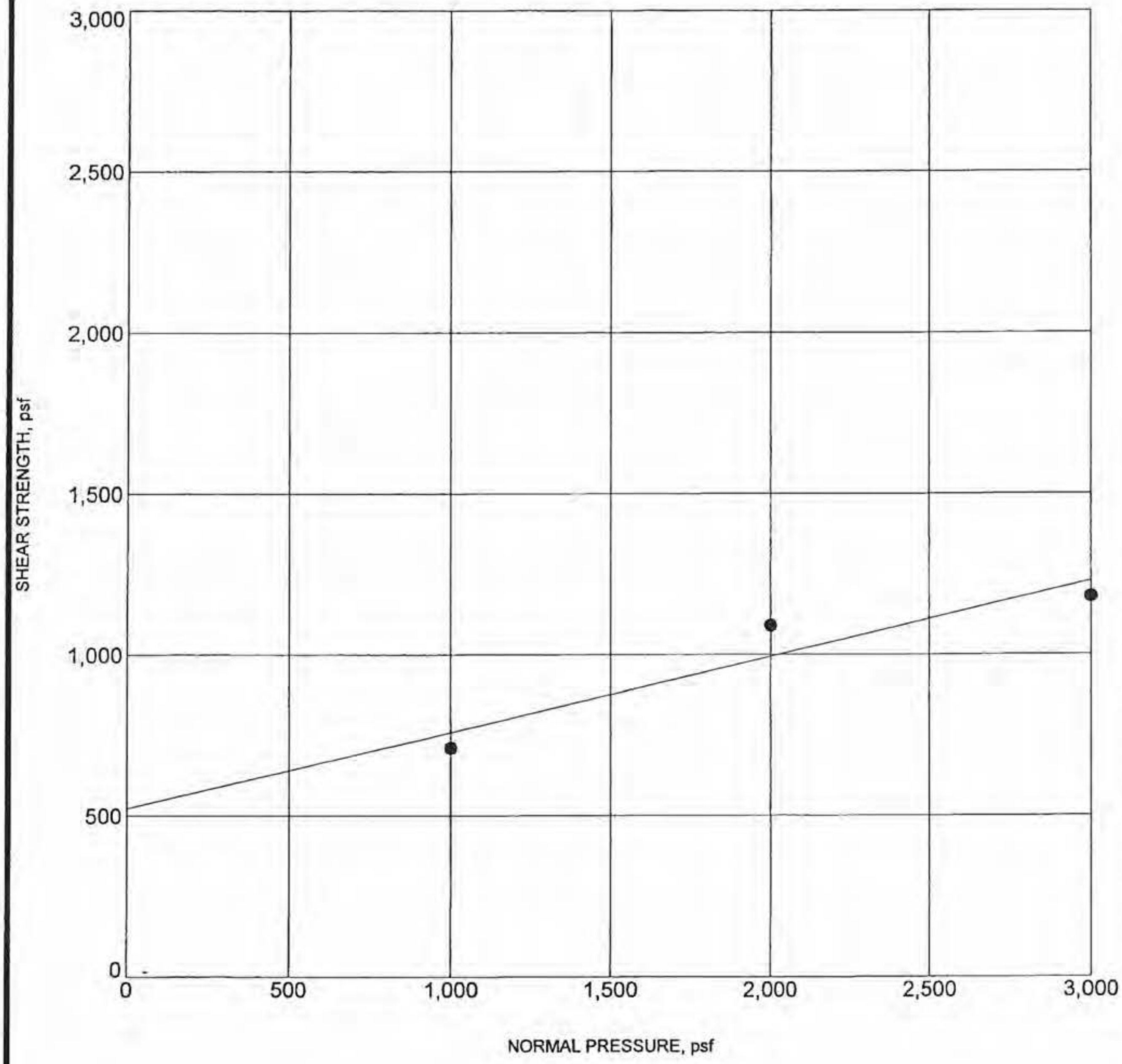
Project: ASL Tustin

Location:

Number: 4735-A1-OC

PLATE

US ATTERBERG LIMITS 4735.GPJ US LAB.GDT 3/29/05



Specimen Identification			Classification	γ_d	MC%	c	ϕ
●	**B-1**	**5.0**	**REMOLDED**	**104**	**19**	**523**	**13**

GSI

GEOSOILS, INC.
1446 East Chestnut Avenue
Santa Ana, California
Telephone: 714-647-0277
Fax: 714-647-0745

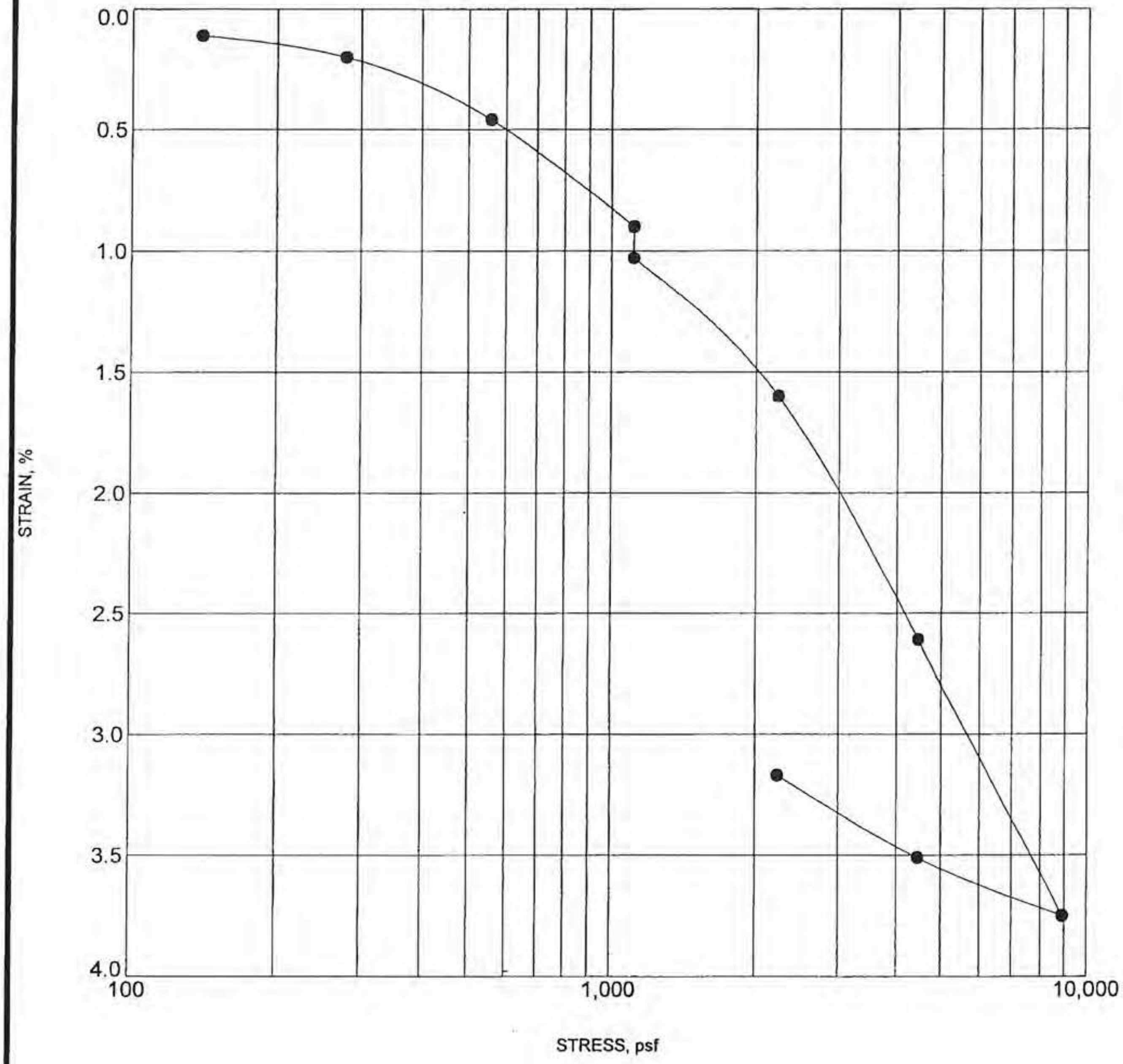
DIRECT SHEAR TEST

Project: ASL TUSTIN

Location:

Number: 4735-A1-OC

PLATE



	Specimen Identification		Classification	γ_d	MC%
●	**B-3**	**15.0**		**100**	**23**

GSI

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Fax: 714-647-0745

CONSOLIDATION TEST

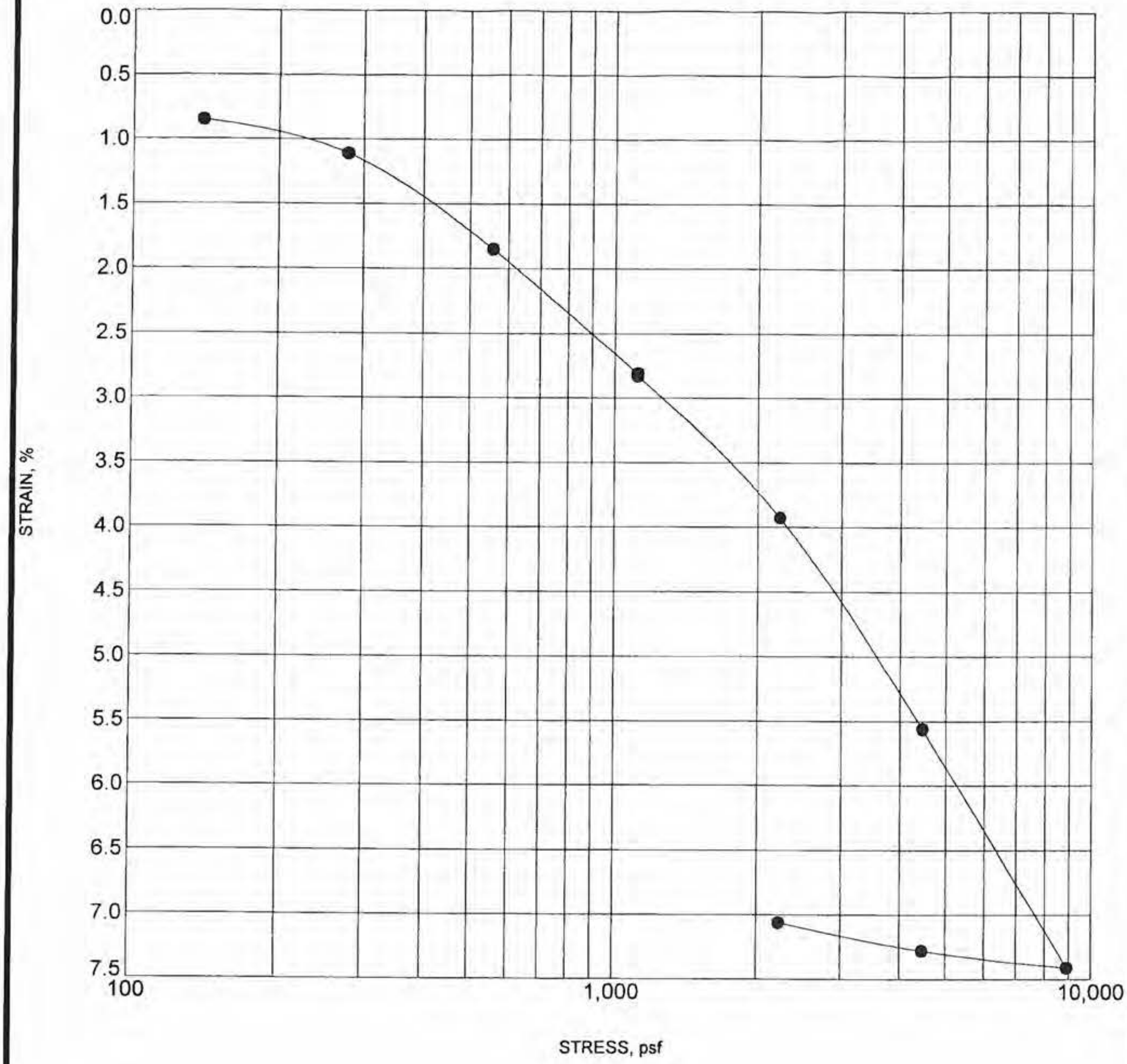
Project: ASL TUSTIN

Location:

Number: 4735-A1-OC

PLATE

US CONSOL STRAIN 4735.GPJ US LAB.GDT 3/24/05



	Specimen Identification		Classification	γ_d	MC%
●	**B-4**	**10.0**		**120**	**12**

US_CONSOL_STRAIN 4735.GPJ US_LAB.GDT 3/25/05

GSI

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Santa Ana, California
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Fax: 714-647-0745

CONSOLIDATION TEST

Project: ASL TUSTIN
Location:
Number: 4735-A1-OC

PLATE

Cal Land Engineering, Inc.
dba Quartech Consultant
Geotechnical, Environmental, and Civil Engineering

SUMMARY OF LABORATORY TEST DATA

Client Name: GeoSoils, Inc.
Project Name: ASL Tustin
Project No.: W.O. 4735-A-OC

QCI Project No.: 05-029-003i
Date: March 24, 2005
Summarized by: ABK

Sample ID (Boring No.)	Sample Depth (Feet)	pH CT-532	Chloride CT-422 (ppm)	Sulfate CT-417 (% By Weight)	Resistivity CT-532 (ohm-cm)
B - 2	0-5	8.36	85	0.0230	1,900

Appendix D

USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

Latitude, Longitude: 33.7359, -117.8139

Date	1/24/2024, 11:14:22 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.284	MCE$_R$ ground motion. (for 0.2 second period)
S_1	0.459	MCE$_R$ ground motion. (for 1.0s period)
S_{MS}	1.284	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.856	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.536	MCE$_G$ peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.59	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.284	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.37	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.459	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.493	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.582	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.536	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.937	Mapped value of the risk coefficient at short periods
C_{R1}	0.93	Mapped value of the risk coefficient at a period of 1 s
C_V	1.357	Vertical coefficient

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U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Please also see the new USGS Earthquake Hazard Toolbox for access to the most recent NSHMs for the conterminous U.S. and Hawaii.

Input

Edition
Dynamic: Conterminous U.S. 2014 (updat…

Latitude
Decimal degrees
33.7359

Longitude
Decimal degrees, negative values for western longitudes
-117.8139

Site Class
259 m/s (Site class D)

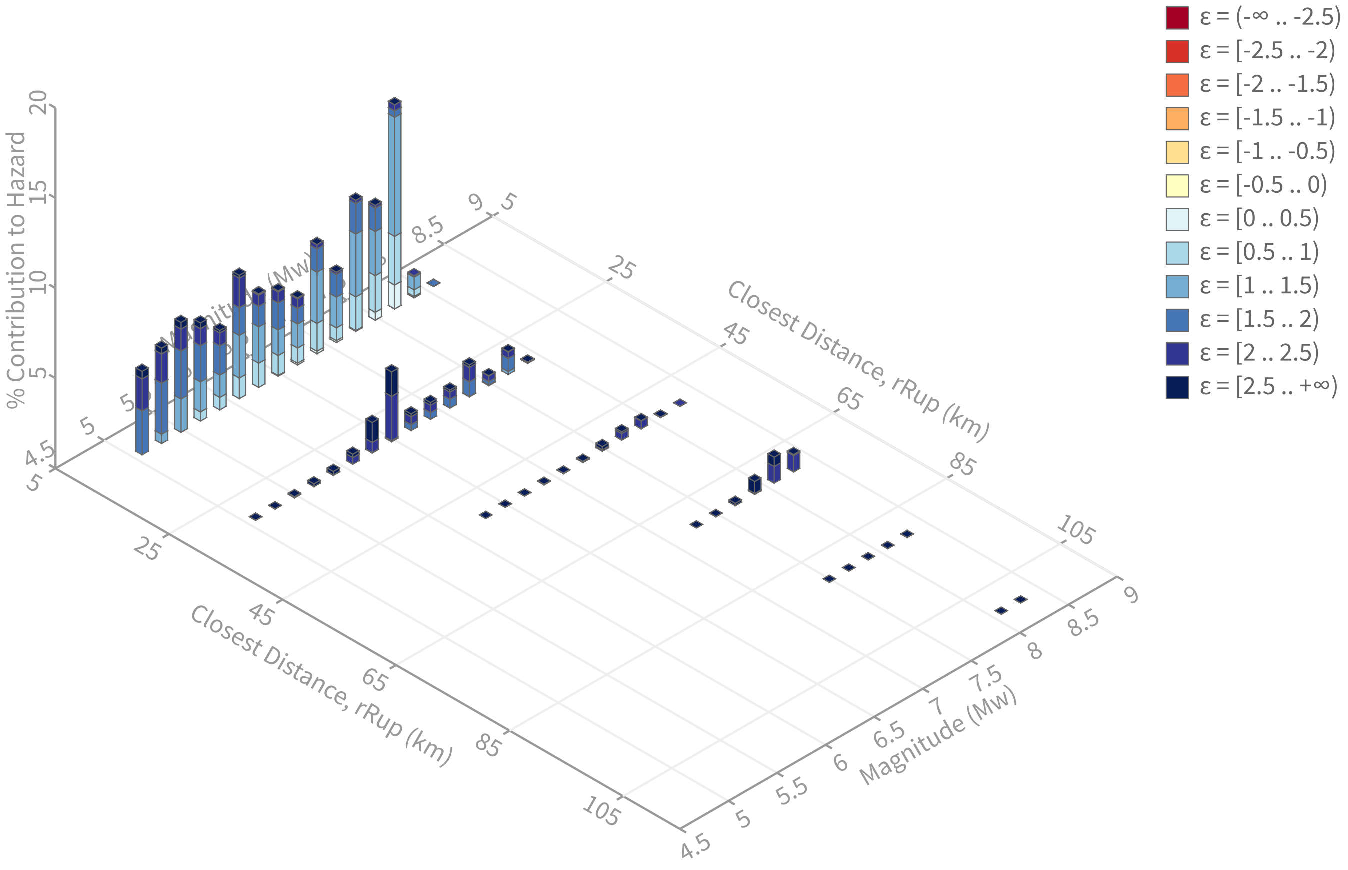
Spectral Period
Peak Ground Acceleration

Time Horizon
Return period in years
2475

^ Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.63774094 g

Recovered targets

Return period: 3044.5692 yrs
Exceedance rate: 0.00032845369 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.04 %

Mean (over all sources)

m: 6.64
r: 15.59 km
ε₀: 1.59 σ

Mode (largest m-r bin)

m: 7.71
r: 14.6 km
ε₀: 1.15 σ
Contribution: 11.32 %

Mode (largest m-r-ε₀ bin)

m: 7.71
r: 17.17 km
ε₀: 1.35 σ
Contribution: 6.61 %

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 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM32	System							28.29
San Joaquin Hills [1]		8.38	7.17	0.95	117.835°W	33.668°N	194.80	6.22
Whittier alt 2 [1]		18.13	7.59	1.51	117.719°W	33.878°N	28.85	3.90
Elsinore (Glen Ivy) rev [0]		23.17	6.58	2.40	117.590°W	33.829°N	63.38	2.45
Compton [0]		18.92	7.29	1.26	118.043°W	33.702°N	260.12	2.22
Newport-Inglewood alt 2 [0]		17.13	7.51	1.45	117.956°W	33.638°N	230.33	2.01
Peralta Hills [0]		11.18	7.35	1.17	117.814°W	33.835°N	0.01	1.75
Chino alt 2 [2]		21.61	7.03	1.90	117.622°W	33.870°N	49.92	1.53
Anaheim [0]		13.76	6.98	1.29	117.943°W	33.780°N	292.50	1.09
UC33brAvg_FM31	System							27.10
San Joaquin Hills [1]		8.38	7.53	0.79	117.835°W	33.668°N	194.80	4.80
Whittier alt 1 [2]		18.19	7.51	1.56	117.722°W	33.880°N	27.96	3.96
Elsinore (Glen Ivy) rev [0]		23.17	6.60	2.39	117.590°W	33.829°N	63.38	2.42
Newport-Inglewood alt 1 [0]		17.24	7.48	1.46	117.958°W	33.639°N	230.98	2.17
Compton [0]		18.92	7.23	1.29	118.043°W	33.702°N	260.12	2.06
Peralta Hills [0]		11.18	7.01	1.40	117.814°W	33.835°N	0.01	1.85
Chino alt 1 [4]		18.55	6.81	1.93	117.617°W	33.862°N	52.39	1.81
Anaheim [0]		13.76	6.92	1.33	117.943°W	33.780°N	292.50	1.07
UC33brAvg_FM31 (opt)	Grid							22.34
PointSourceFinite: -117.814, 33.776		6.58	5.78	1.24	117.814°W	33.776°N	0.00	3.79
PointSourceFinite: -117.814, 33.776		6.58	5.78	1.24	117.814°W	33.776°N	0.00	3.79
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.66
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.66
PointSourceFinite: -117.814, 33.812		9.38	5.77	1.64	117.814°W	33.812°N	0.00	1.53
PointSourceFinite: -117.814, 33.812		9.38	5.77	1.64	117.814°W	33.812°N	0.00	1.53
PointSourceFinite: -117.814, 33.830		10.39	5.97	1.67	117.814°W	33.830°N	0.00	1.08
PointSourceFinite: -117.814, 33.830		10.39	5.97	1.67	117.814°W	33.830°N	0.00	1.08
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
UC33brAvg_FM32 (opt)	Grid							22.27
PointSourceFinite: -117.814, 33.776		6.58	5.77	1.24	117.814°W	33.776°N	0.00	3.82
PointSourceFinite: -117.814, 33.776		6.58	5.77	1.24	117.814°W	33.776°N	0.00	3.82
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.71
PointSourceFinite: -117.814, 33.803		8.69	5.74	1.57	117.814°W	33.803°N	0.00	1.71
PointSourceFinite: -117.814, 33.812		9.43	5.75	1.65	117.814°W	33.812°N	0.00	1.46
PointSourceFinite: -117.814, 33.812		9.43	5.75	1.65	117.814°W	33.812°N	0.00	1.46
PointSourceFinite: -117.814, 33.830		10.41	5.96	1.68	117.814°W	33.830°N	0.00	1.05
PointSourceFinite: -117.814, 33.830		10.41	5.96	1.68	117.814°W	33.830°N	0.00	1.05
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01
PointSourceFinite: -117.814, 33.839		10.85	6.08	1.67	117.814°W	33.839°N	0.00	1.01

Appendix E

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-1
Depth (in): 150 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	3:40 3:51	11	111.6	129.6	18.0
2	3:51 4:05	14	111.6	128.1	16.5

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
1:37 1:47	10	10	128.1	141.6	13.5	81.0
1:53 2:03	10	26	116.4	138.0	21.6	129.6
2:10 2:20	10	43	112.2	133.2	21.0	126.0
2:25 2:35	10	58	112.2	131.4	19.2	115.2
2:38 2:48	10	71	114.3	132.0	17.7	106.2
2:49 2:59	10	82	115.2	132.0	16.8	100.8

Initial Height of Water (Ho) = 34.8
Final Height of Water (Hf) = 18
Change in Height Over Time (ΔH) = 16.8
Average Head Over Time (Havg) = 26.4
Annulus Gravel/Sand Correction (C) = 0.5

$I_t = \Delta H(60r)/\Delta t(r+2Havg)$
$I_t = 7.1$ in./hr.
$C \times I_t =$ **3.5** **in./hr.**

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-2
Depth (in): 145.2 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	1:55 2:07	12	99.6	113.4	13.8
2	2:07 2:25	18	113.4	130.2	16.8

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
2:27 2:37	10	10	100.8	114.6	13.8	82.8
2:39 2:49	10	22	114.6	127.2	12.6	75.6
2:59 3:09	10	42	100.8	112.8	12.0	72.0
3:09 3:19	10	52	100.8	112.2	11.4	68.4
3:21 3:31	10	64	100.8	112.8	12.0	72.0
3:33 3:43	10	76	101.7	111.6	9.9	59.4

Initial Height of Water (Ho) = 43.5
Final Height of Water (Hf) = 33.6
Change in Height Over Time (ΔH) = 9.9
Average Head Over Time (Havg) = 38.6
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 2.9 in./hr.
C x I_t = **1.5** **in./hr.**

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-3
Depth (in): 135 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	2:44 2:51	7	99.0	106.8	7.8
2	2:51 3:00	9	106.8	120	13.2

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
3:02 3:12	10	10	99.0	119.4	20.4	122.4
3:12 3:22	10	20	102.6	121.2	18.6	111.6
3:24 3:34	10	32	99.6	118.2	18.6	111.6
3:38 3:48	10	46	99.6	118.2	18.6	111.6
3:49 3:59	10	57	101.1	118.8	17.7	106.2
4:01 4:11	10	69	100.2	115.8	15.6	93.6

Initial Height of Water (Ho) = 34.8
Final Height of Water (Hf) = 19.2
Change in Height Over Time (ΔH) = 15.6
Average Head Over Time (Havg) = 27
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 6.5 in./hr.
C x I_t = **3.2** **in./hr.**

Percolation Data Sheet

Project Name: 13841 & 13751 Red Hill Ave
Test Hole Number: P-4
Depth (in): 132 Radius (in.): 4
Tested By: NMG (2015) Pipe Diameter (in.): 3

Project Number: 24011-01
Date Excavated: 9/16/2014
Date Presoak: 9/16/2014
Date Tested: 9/16/2014

Sandy Soil Criteria

Trial Number	Time	Time Interval (mins.)	Initial Water Level (in.)	Final Water Level (in.)	Δ in Water Level (in.)
1	3:40 3:51	11	93.6	105	11.4
2	3:51 4:05	14	105	116.4	11.4

Percolation Data

Time	Time Interval (mins.)	Total Elapsed Time (mins)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Δ in Water Level (in.)	Percolation Rate (in./hr.)
4:06 4:16	10	10	100.8	115.8	15.0	90.0
4:17 4:27	10	21	96.0	114.0	18.0	108.0
4:40 4:50	10	44	100.5	118.8	18.3	109.8
4:51 5:01	10	55	100.8	114.9	14.1	84.6
5:02 5:12	10	66	97.8	114.0	16.2	97.2
5:14 5:24	10	78	97.8	111.0	13.2	79.2

Initial Height of Water (Ho) = 34.2
Final Height of Water (Hf) = 21.0
Change in Height Over Time (ΔH) = 13.2
Average Head Over Time (Havg) = 27.6
Annulus Gravel/Sand Correction (C) = 0.5

I_t= ΔH(60r)/Δt(r+2Havg)
I_t= 5.4 in./hr.
C x I_t = **2.7** **in./hr.**

Appendix F

SA Geotechnical, Inc.
1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

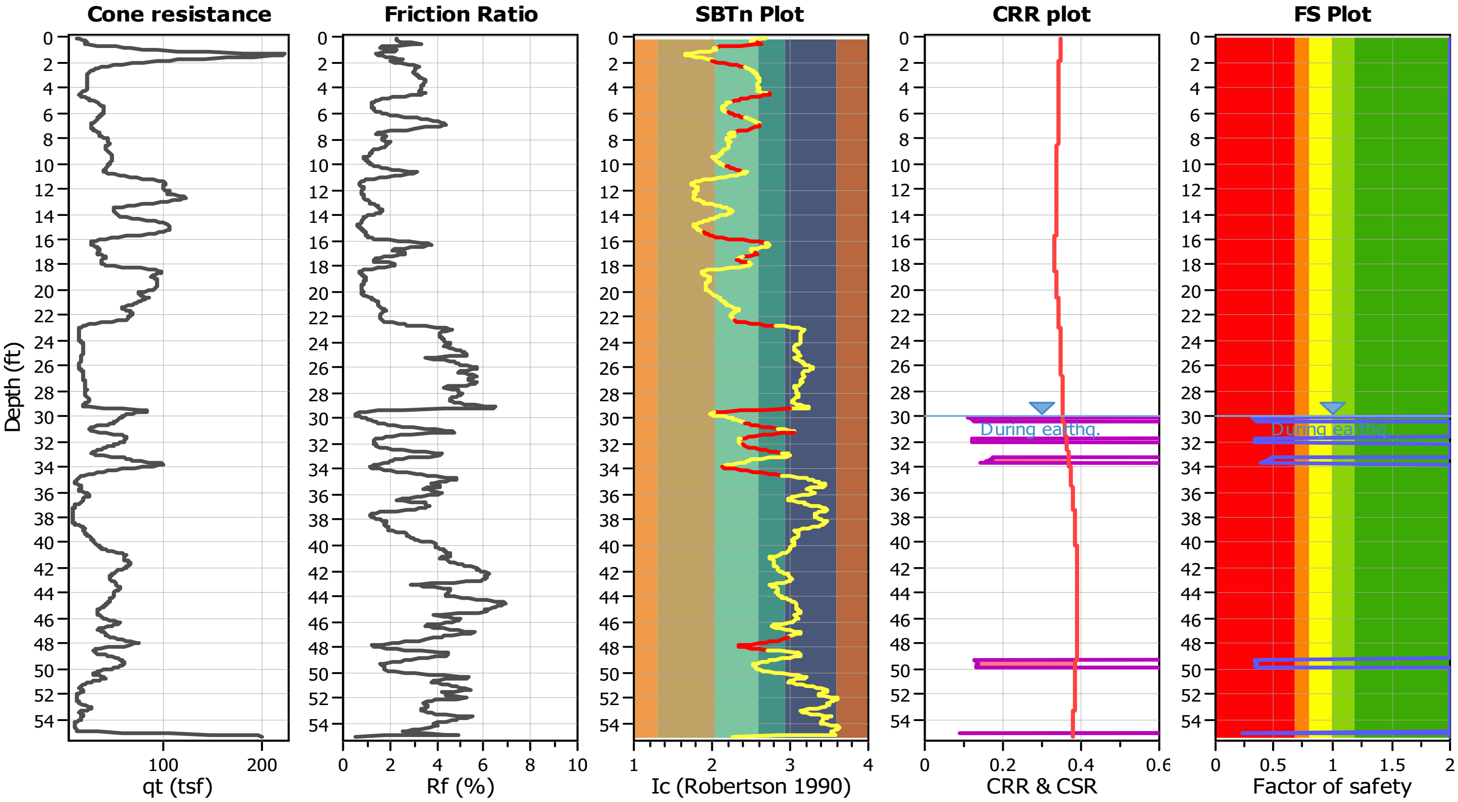
LIQUEFACTION ANALYSIS REPORT

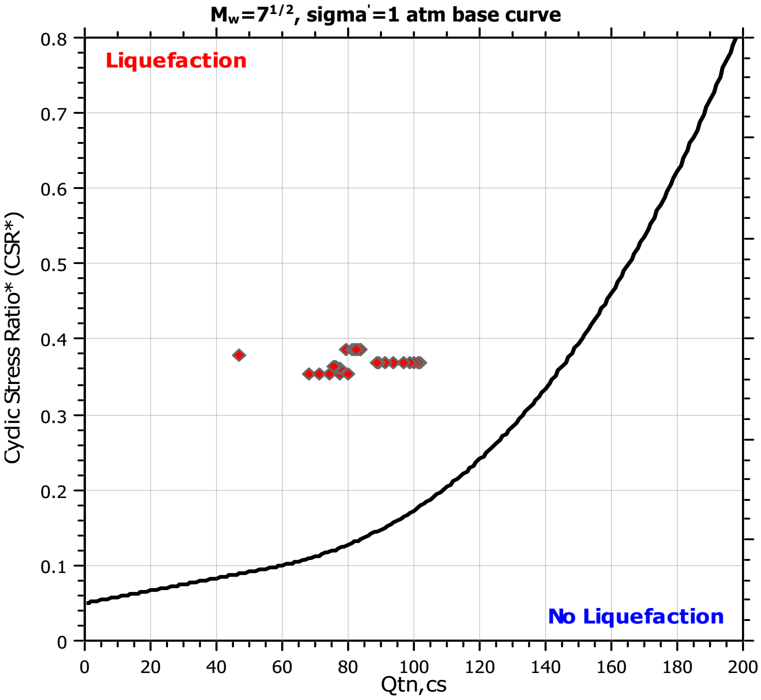
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

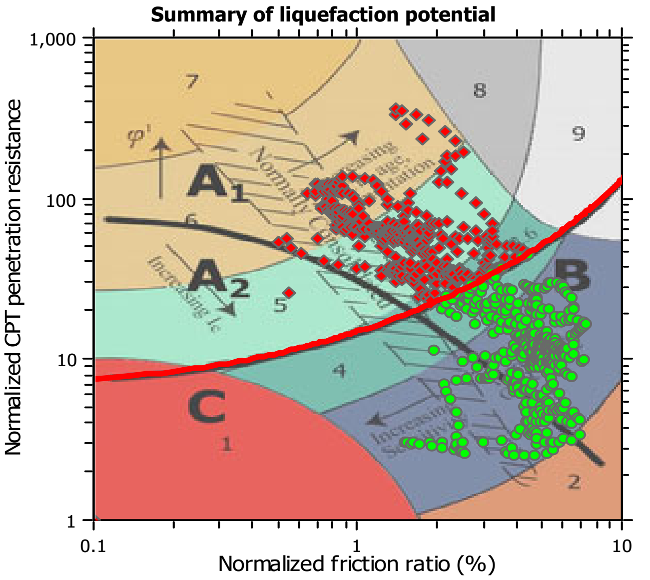
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

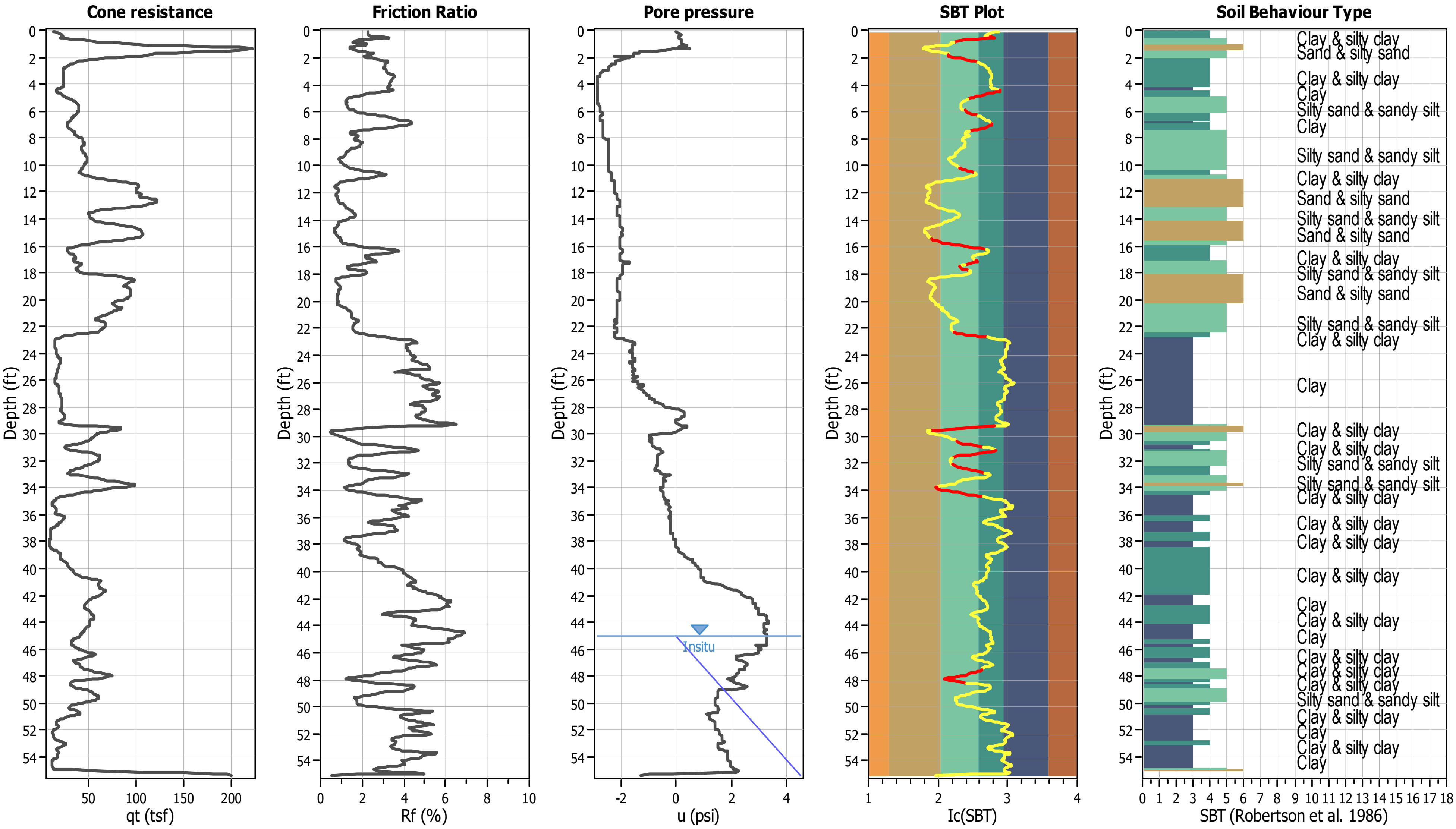






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



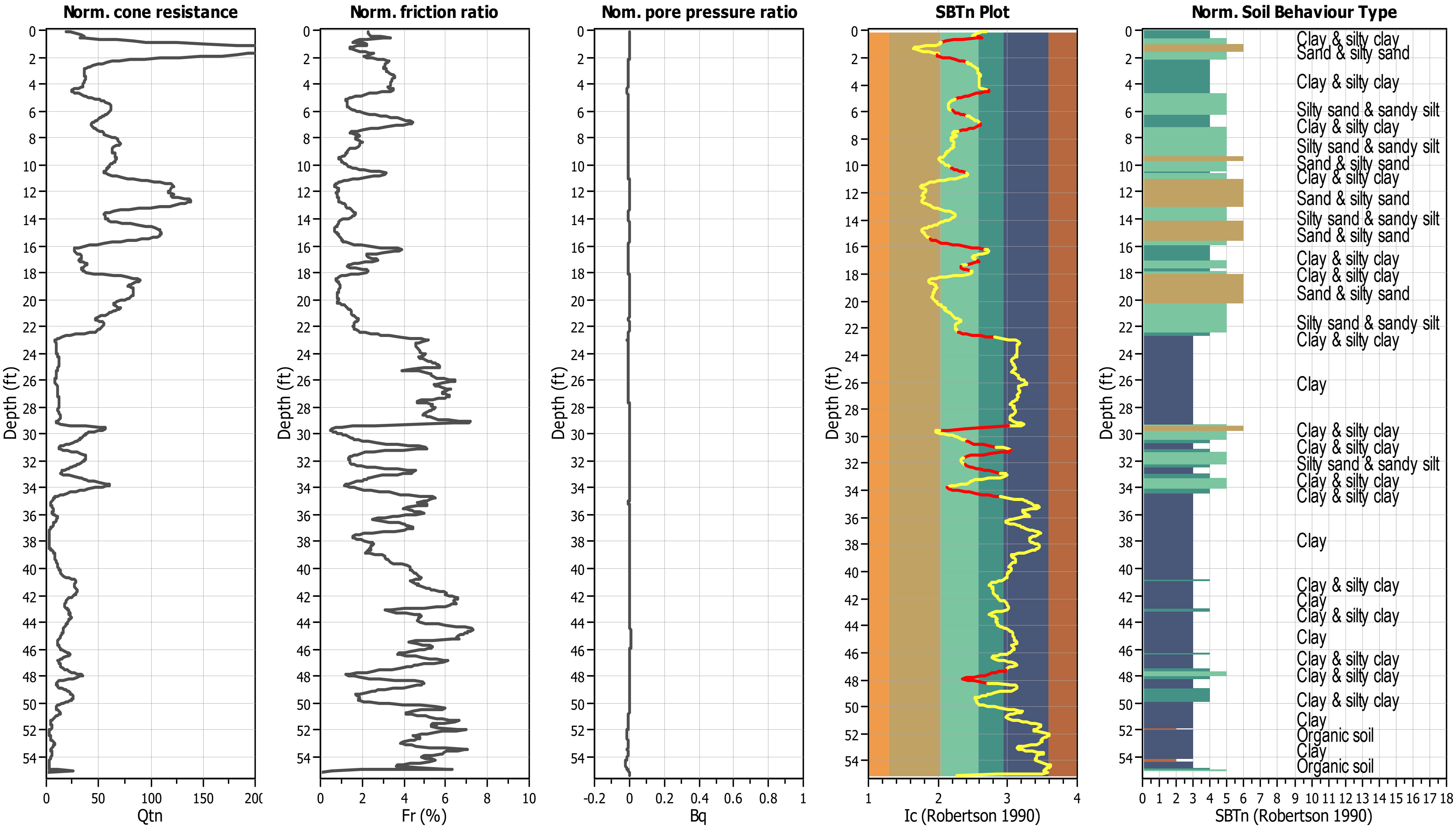
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥	1. Sensitive fine grained	🟩	4. Clayey silt to silty	🟧	7. Gravely sand to sand
🟫	2. Organic material	🟩	5. Silty sand to sandy silt	⬛	8. Very stiff sand to
🟦	3. Clay to silty clay	🟨	6. Clean sand to silty sand	⬜	9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

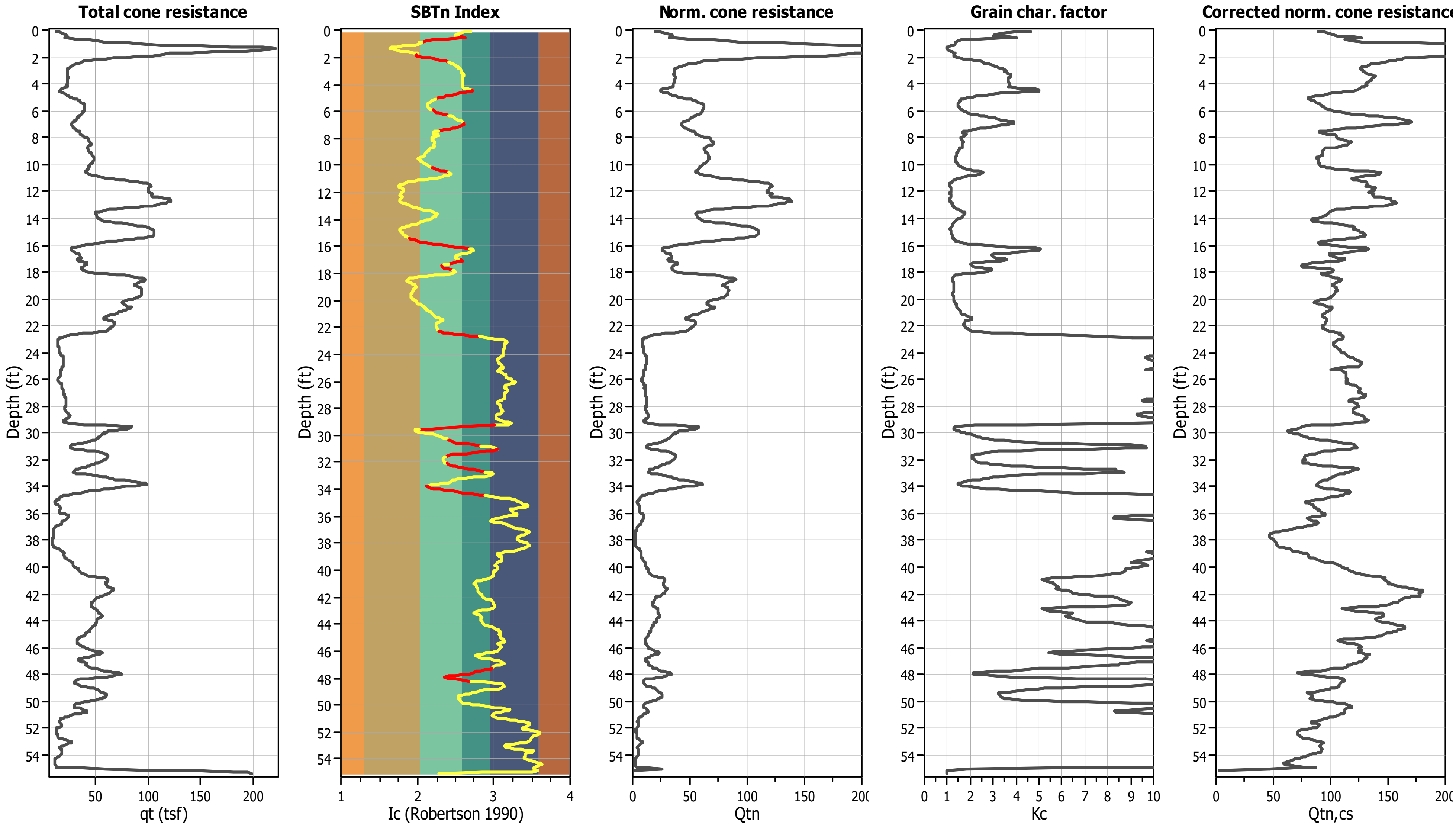
Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

Liquefaction analysis overall plots (intermediate results)



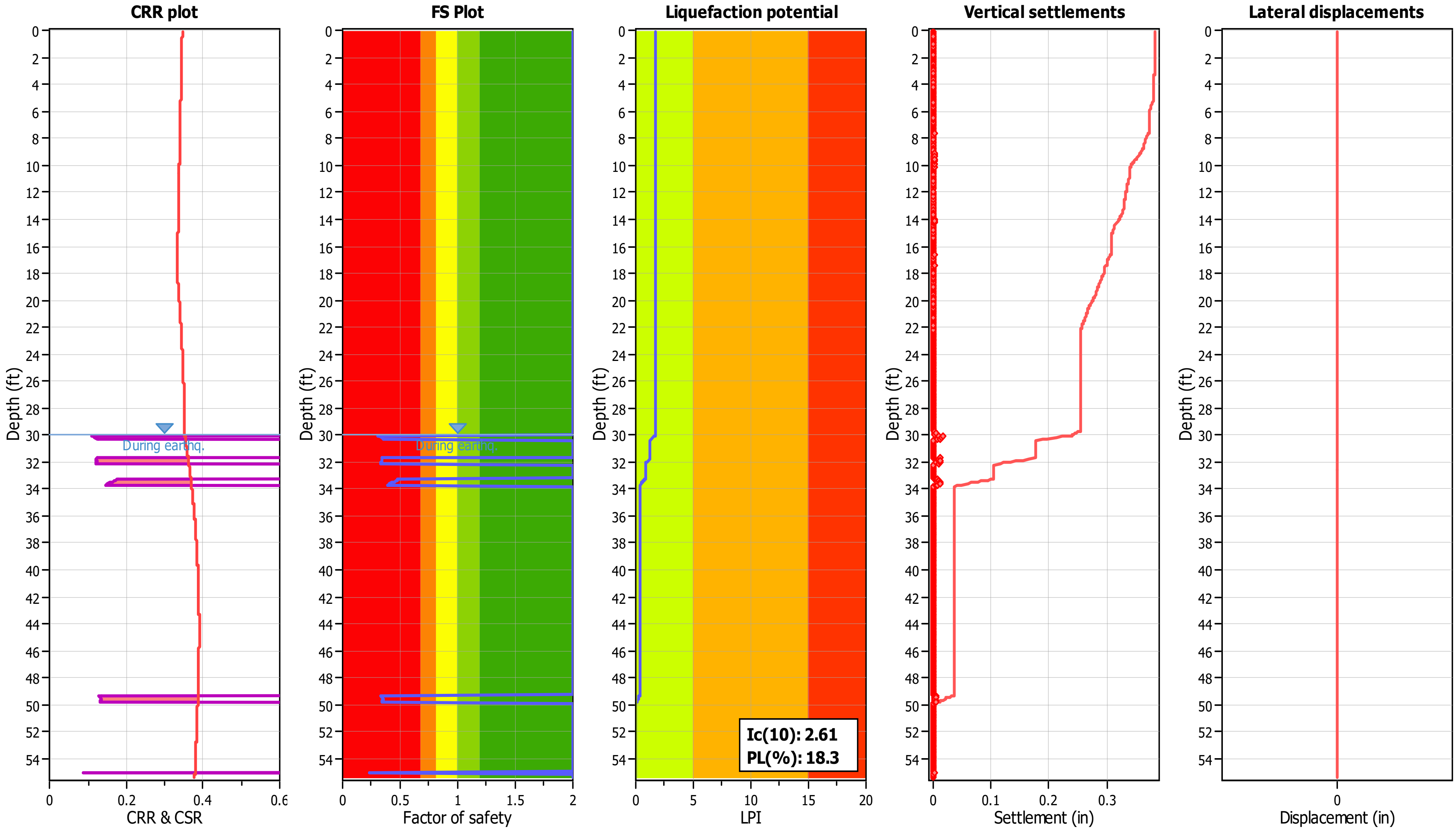
Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

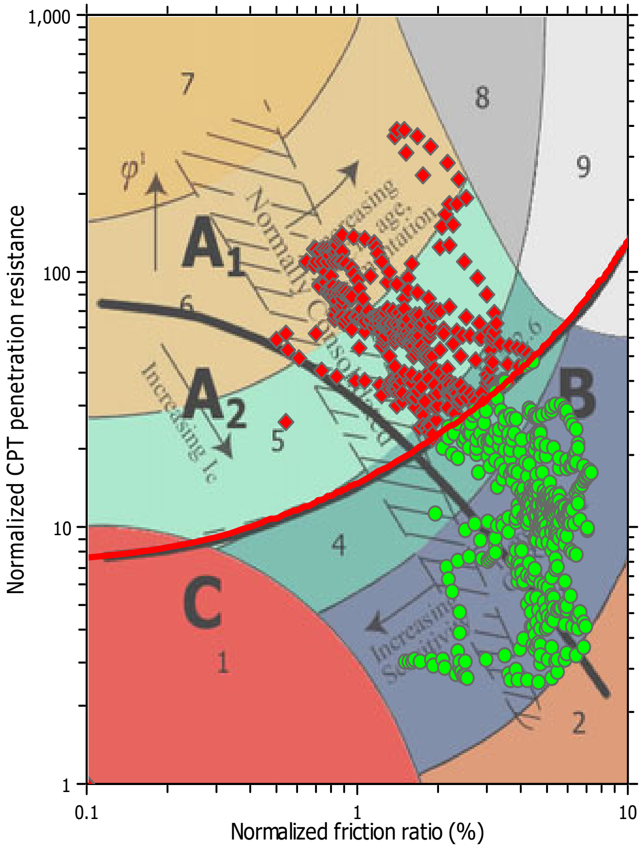
F.S. color scheme

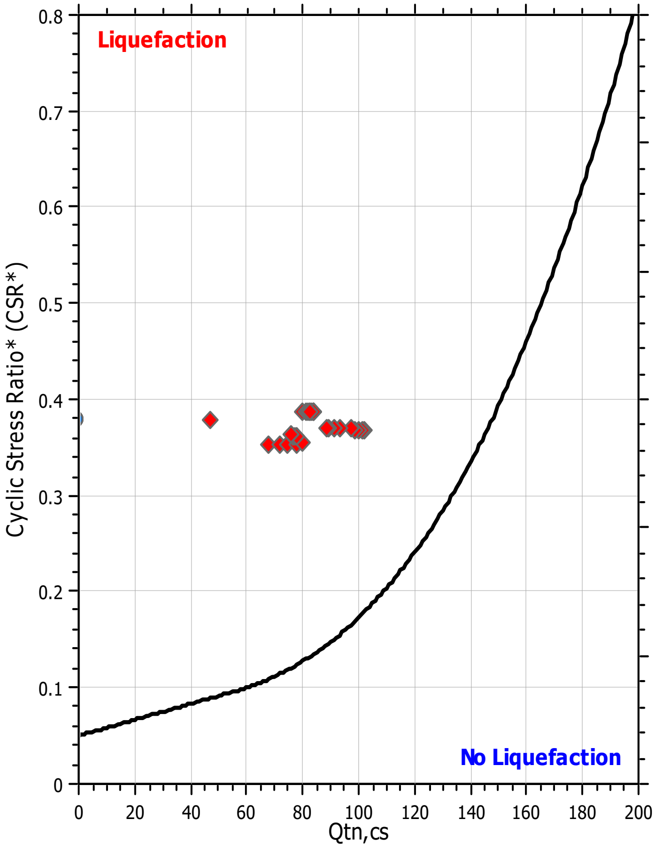
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

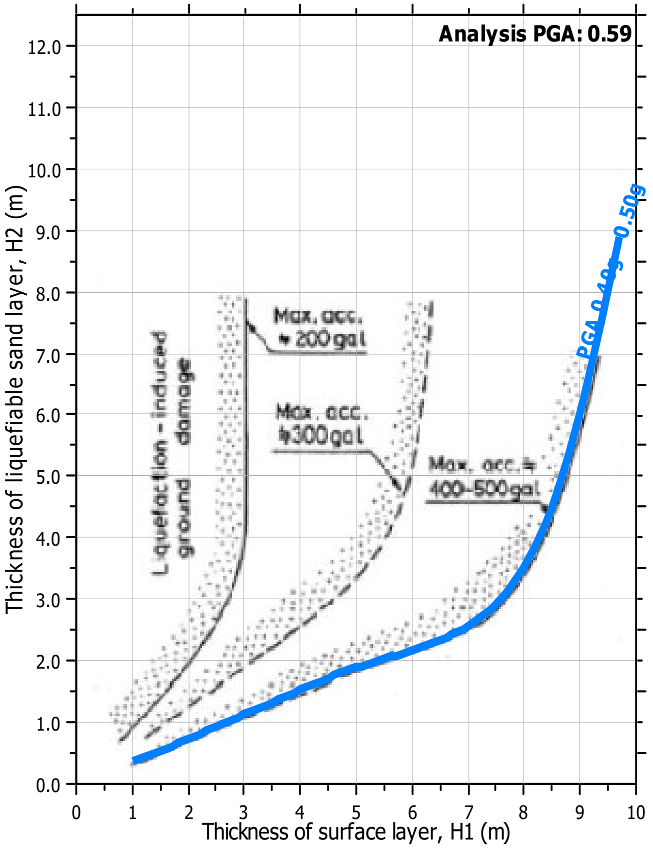
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟨 Low risk

Liquefaction analysis summary plots



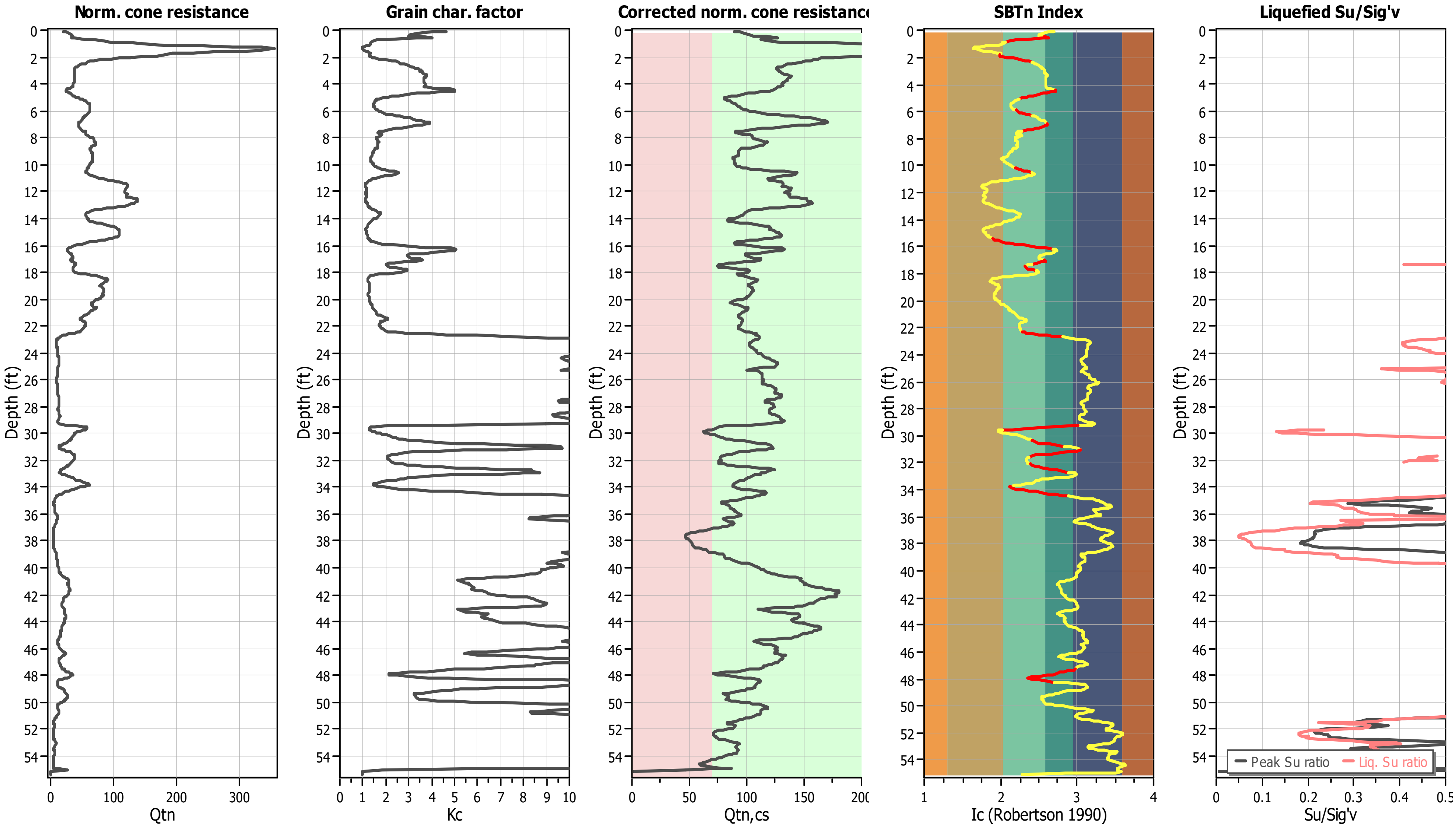




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SA Geotechnical, Inc.
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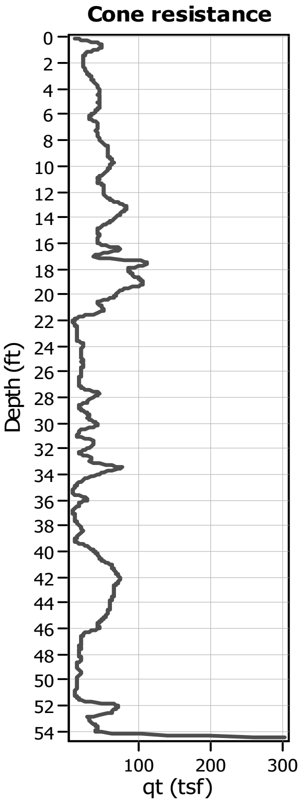
LIQUEFACTION ANALYSIS REPORT

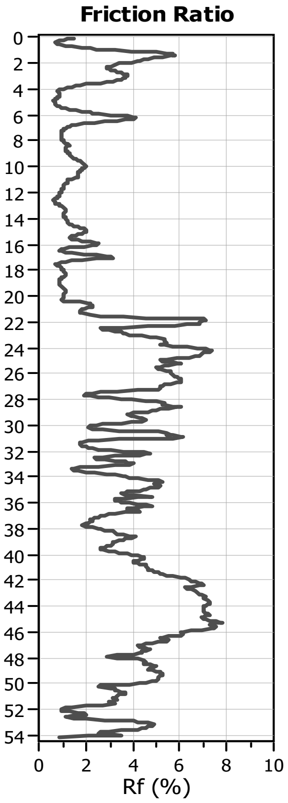
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

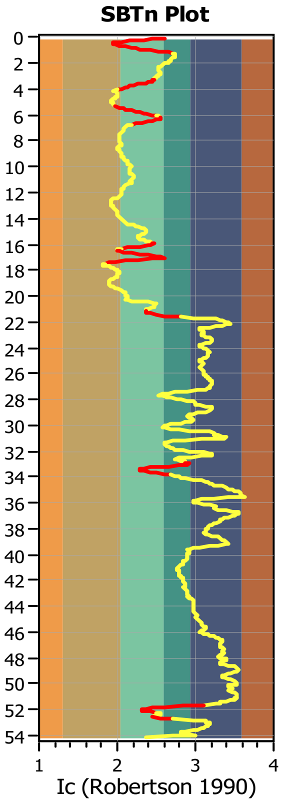
CPT file : CPT-2

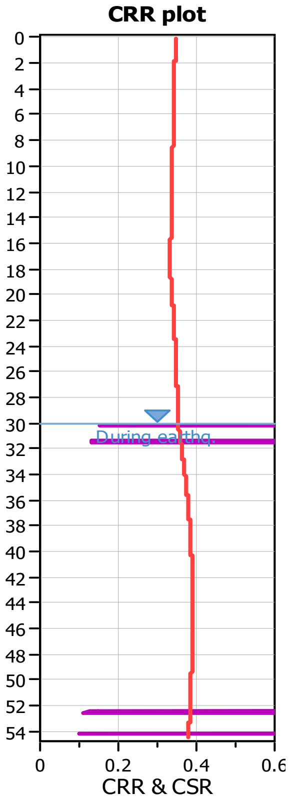
Input parameters and analysis data

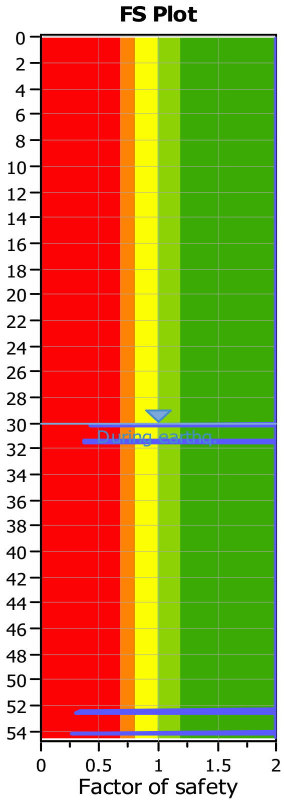
Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

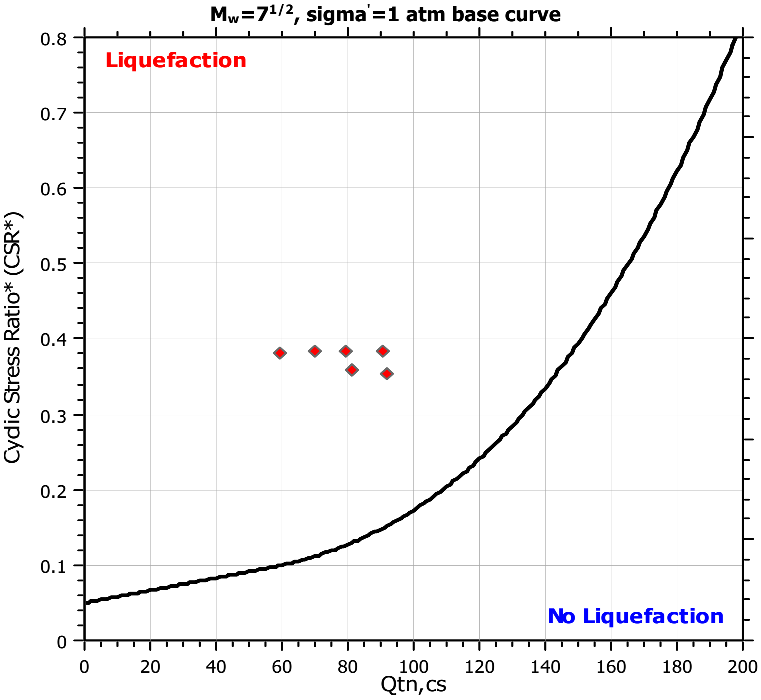


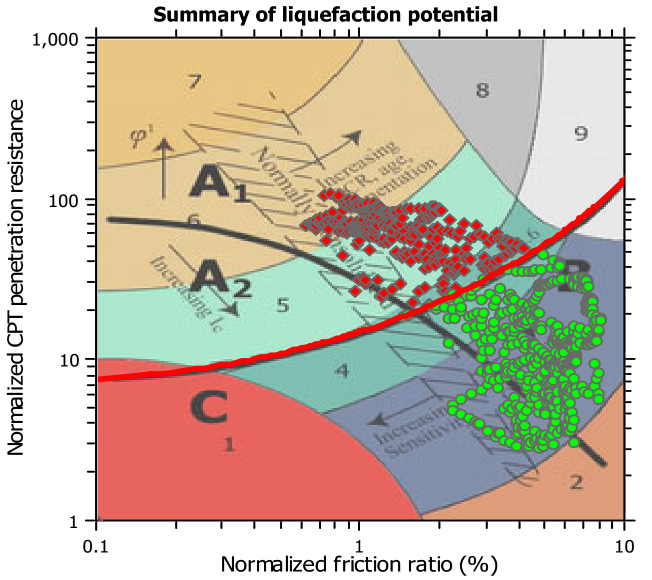






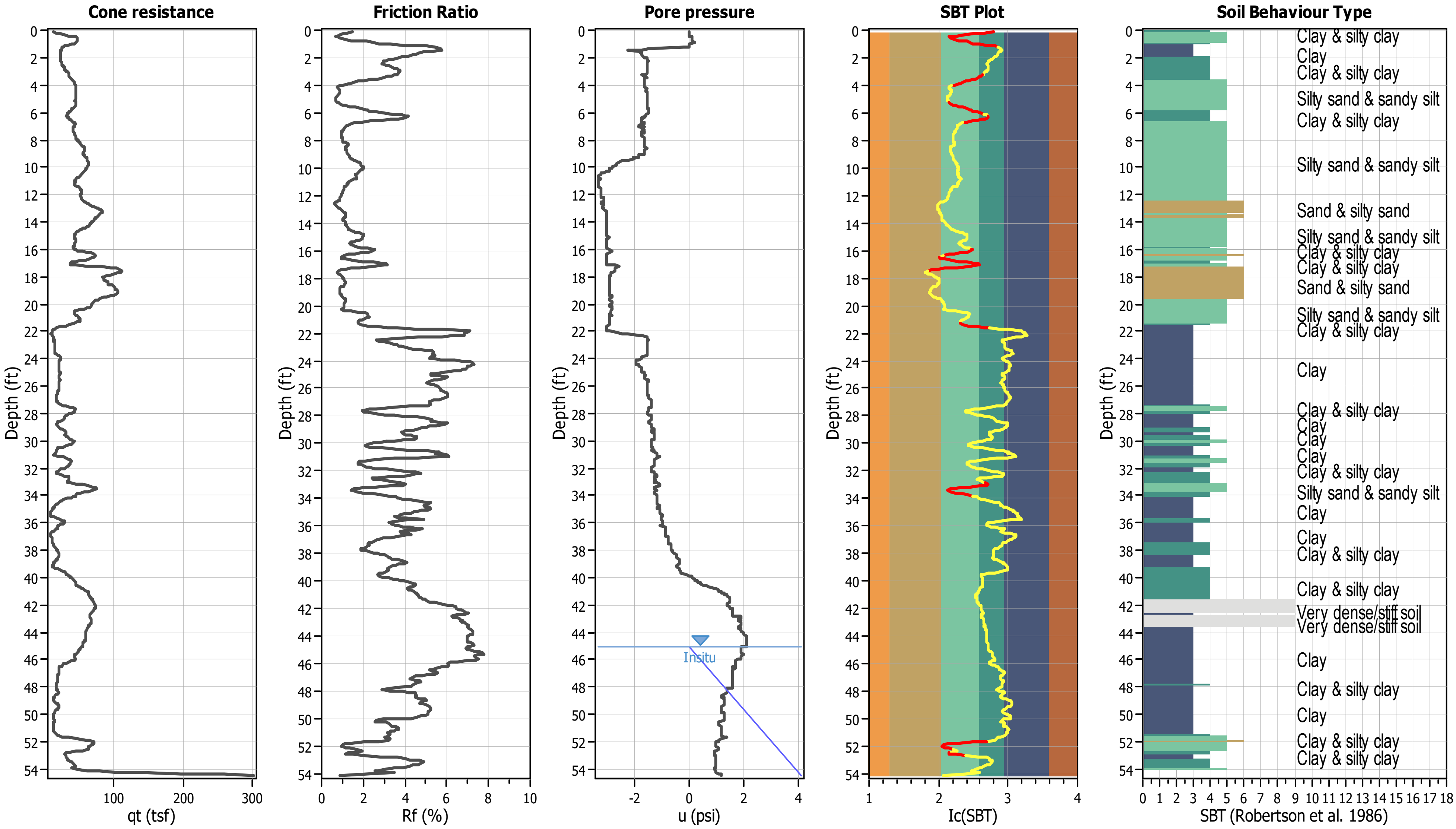






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



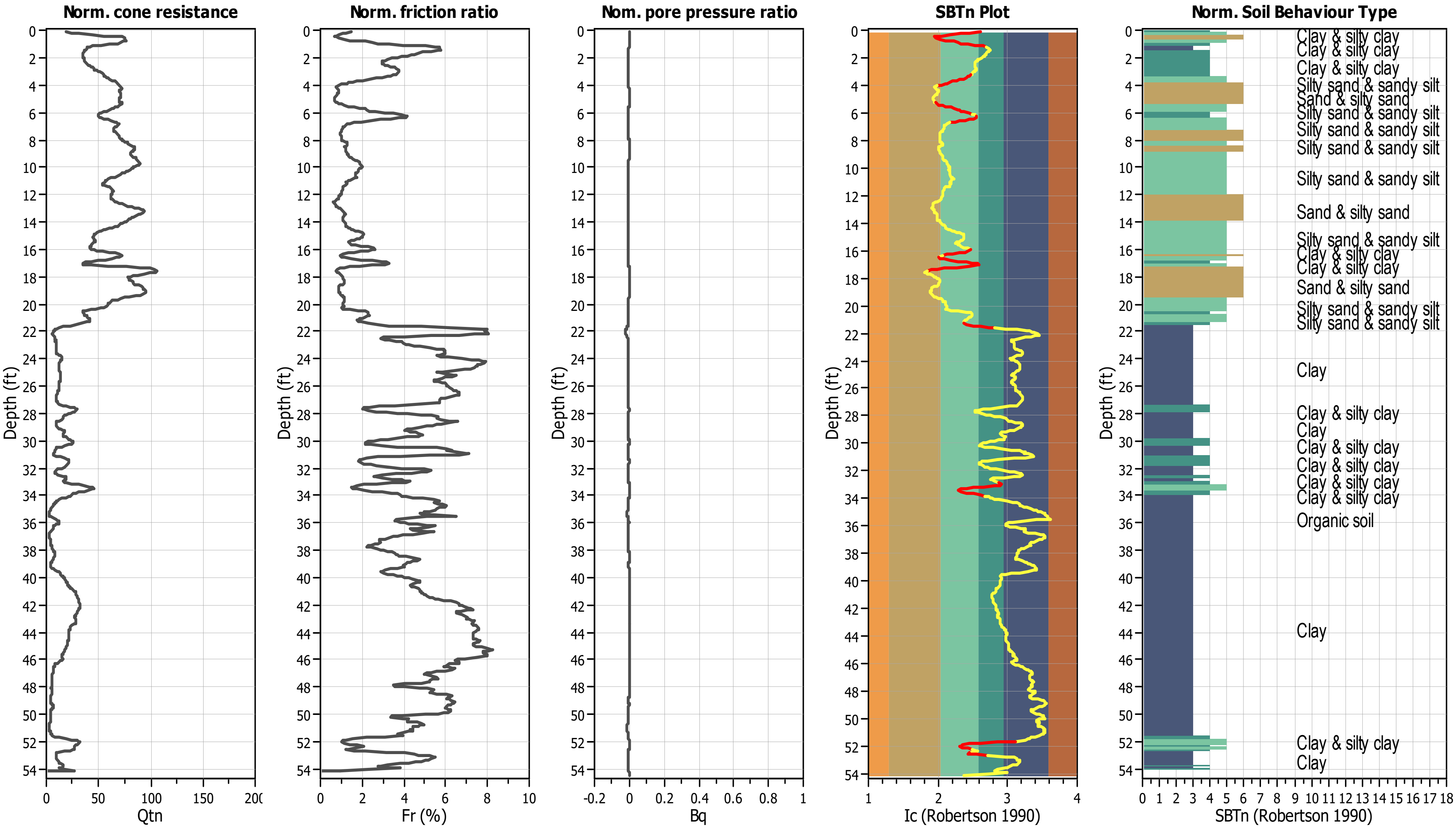
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty
- 🟩 5. Silty sand to sandy silt
- 🟨 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to
- ⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



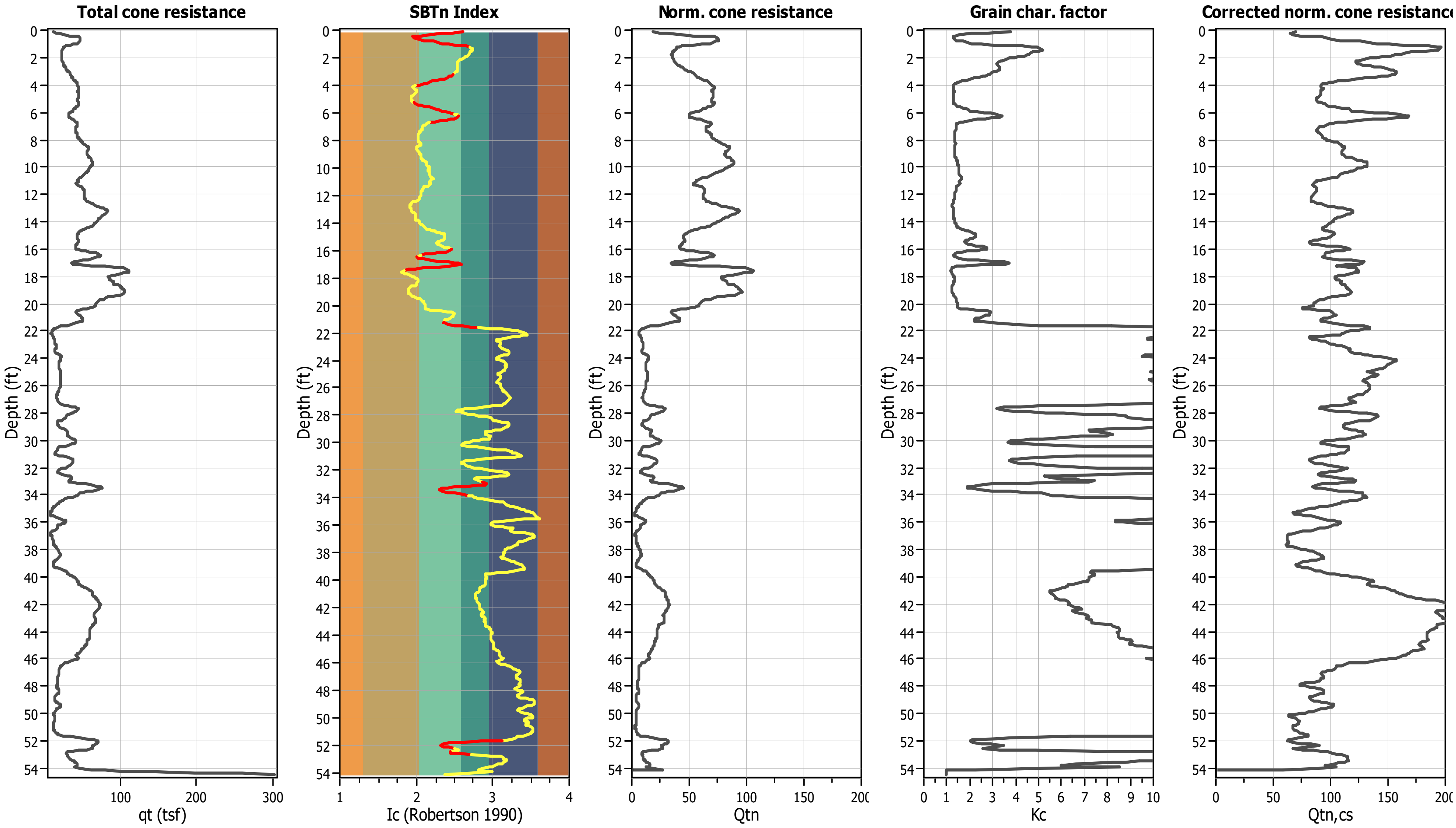
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
🟦 3. Clay to silty clay
🟩 4. Clayey silt to silty
🟩 5. Silty sand to sandy silt
🟫 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬛ 8. Very stiff sand to
⬜ 9. Very stiff fine grained

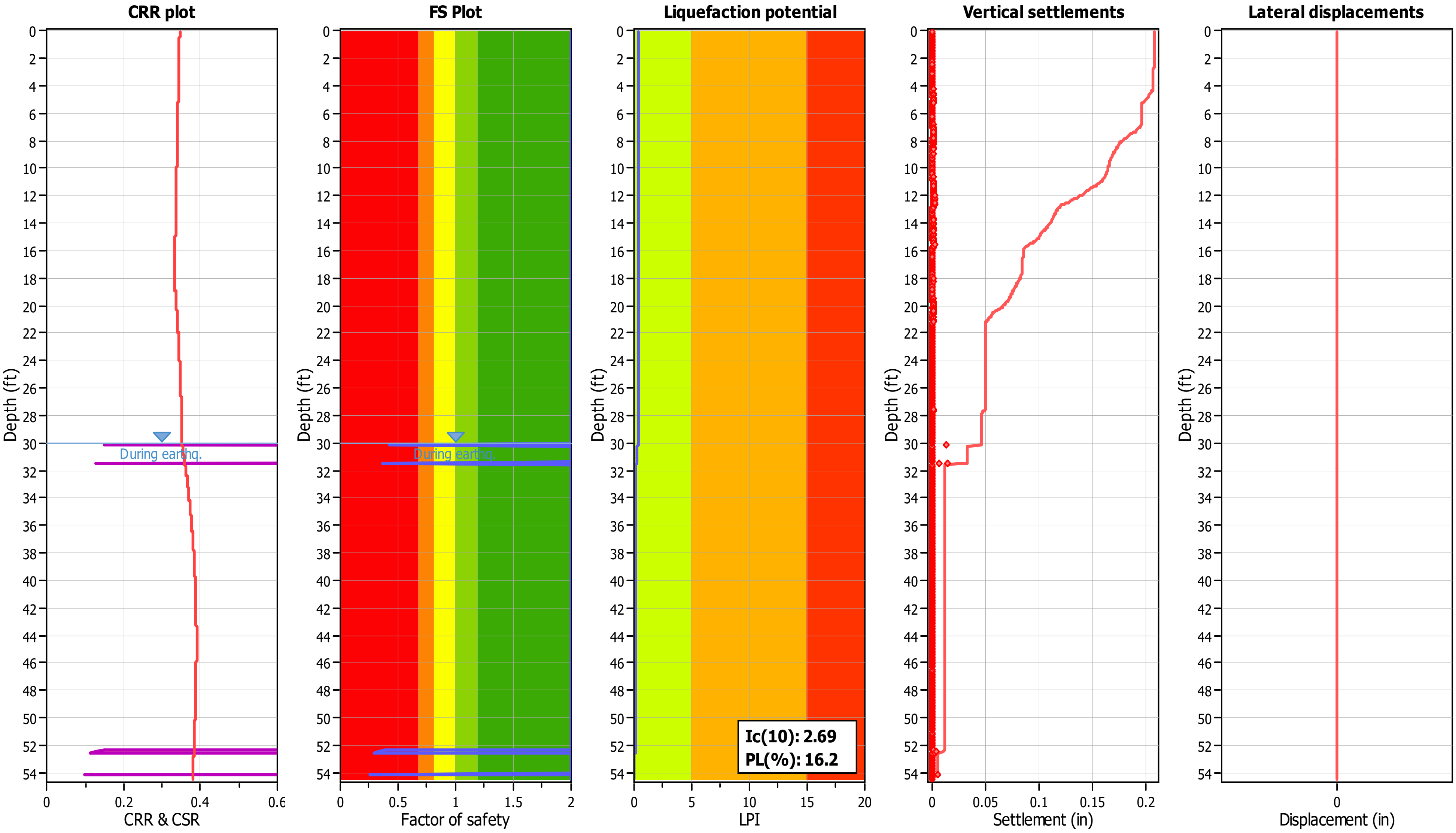
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

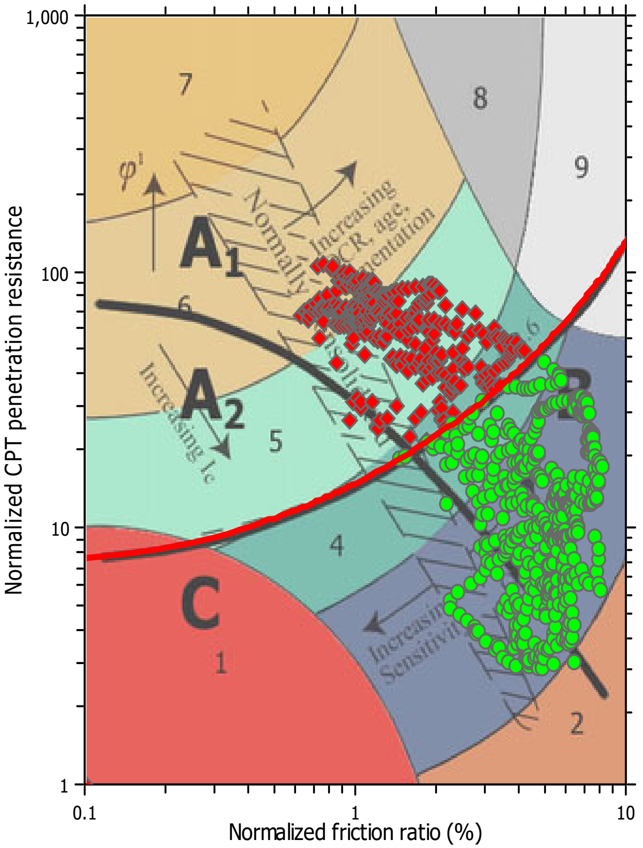
F.S. color scheme

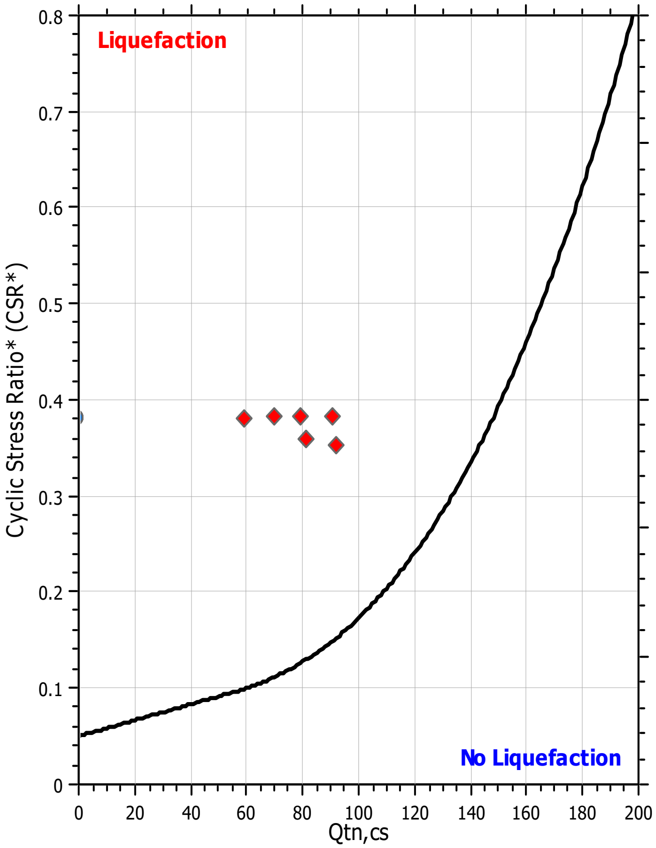
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

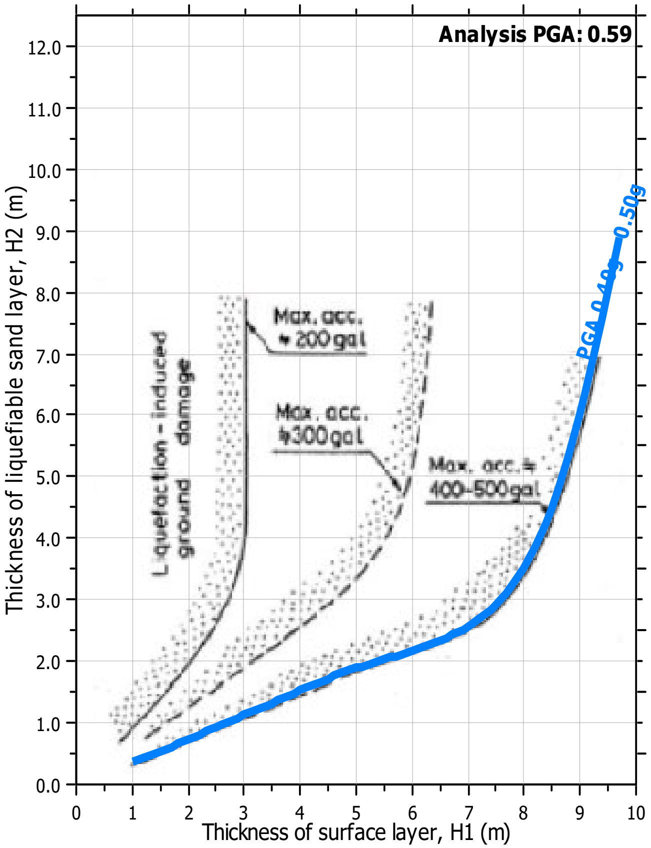
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟨 Low risk

Liquefaction analysis summary plots



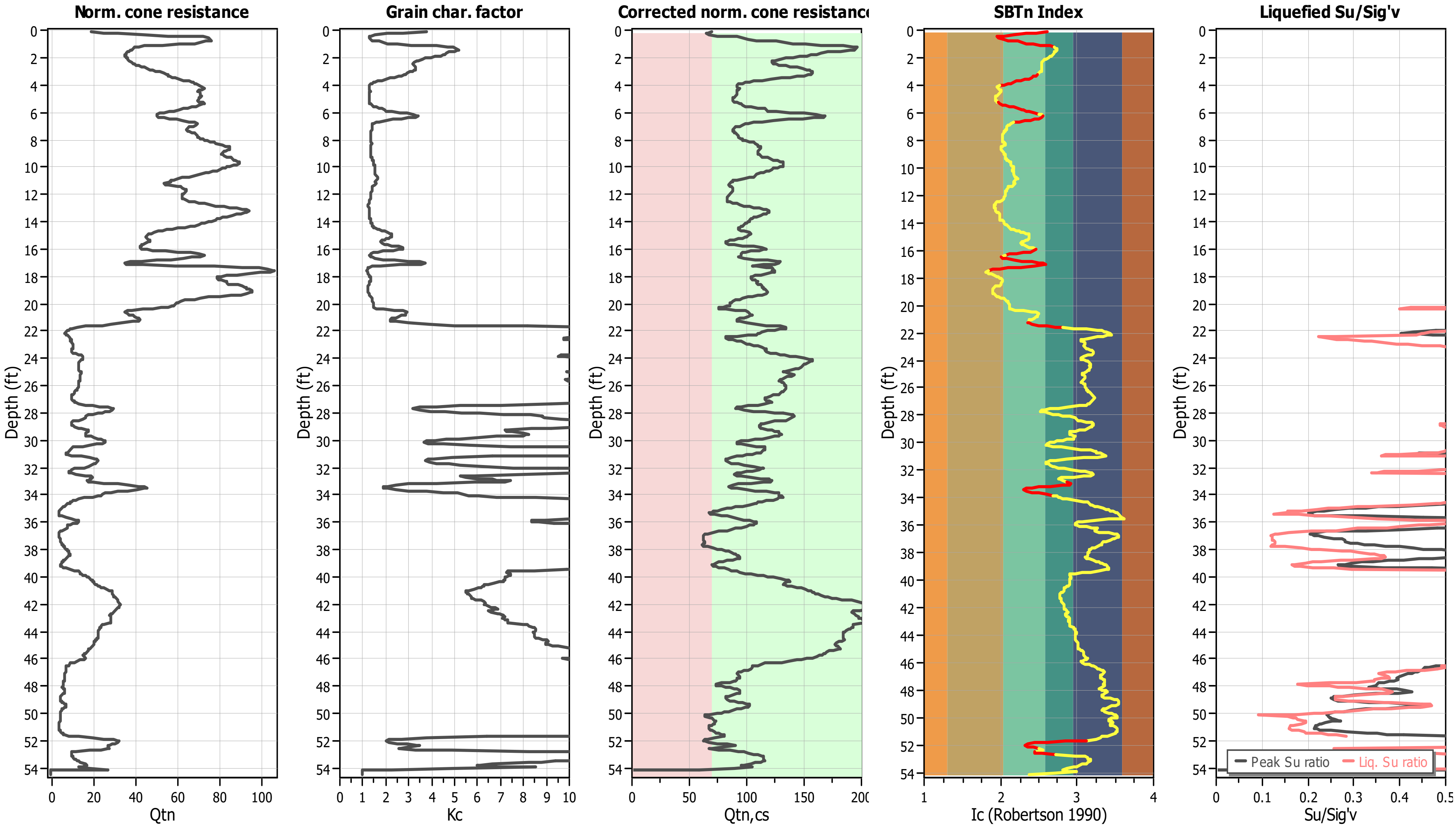




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

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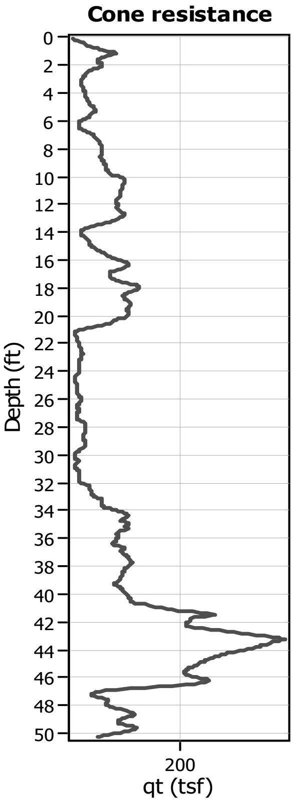
LIQUEFACTION ANALYSIS REPORT

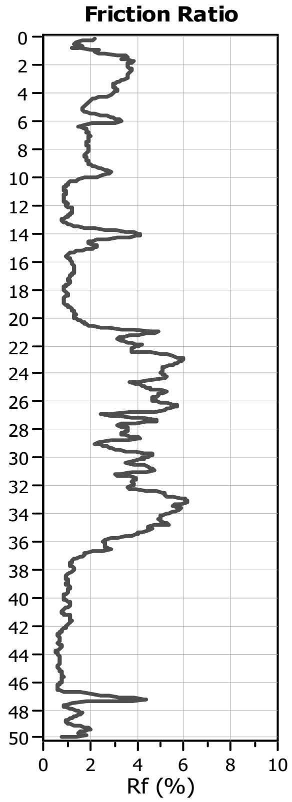
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

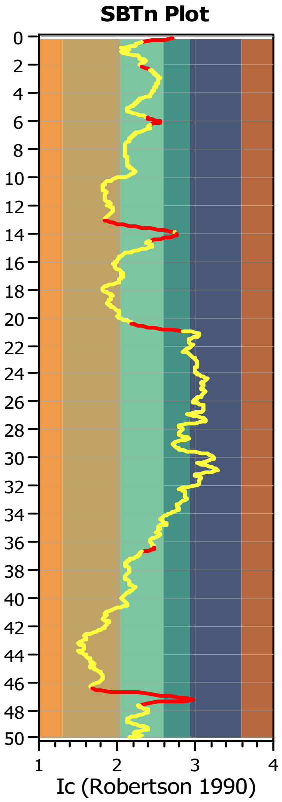
CPT file : CPT-3

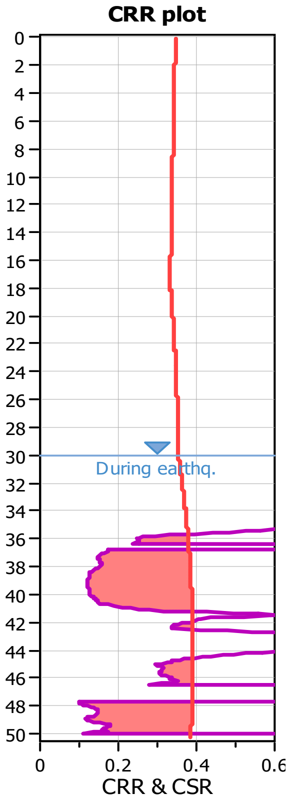
Input parameters and analysis data

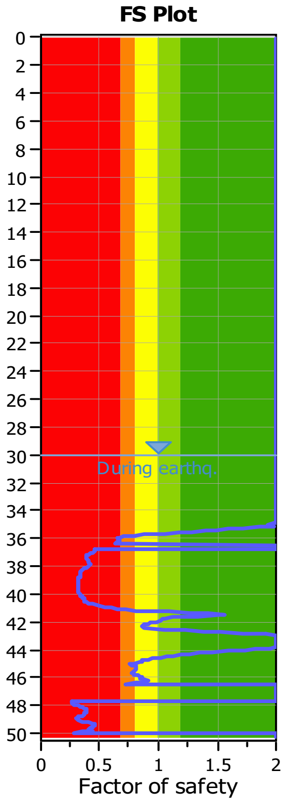
Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

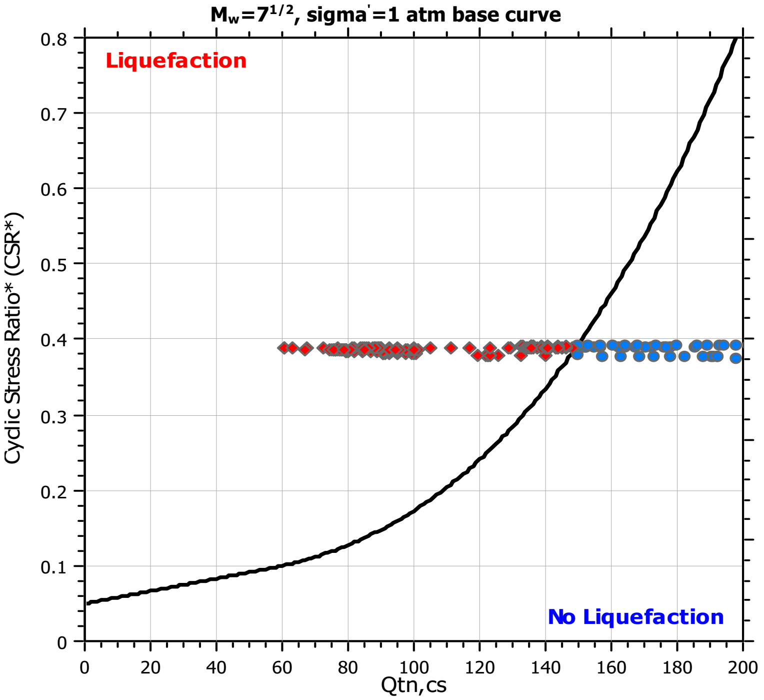


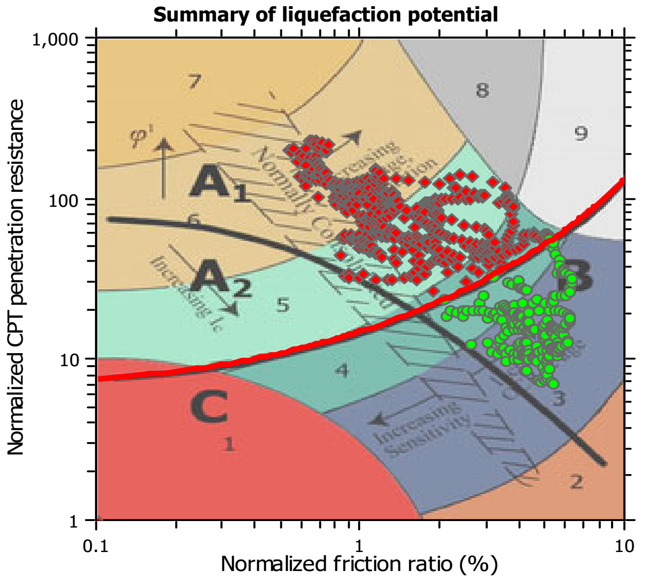






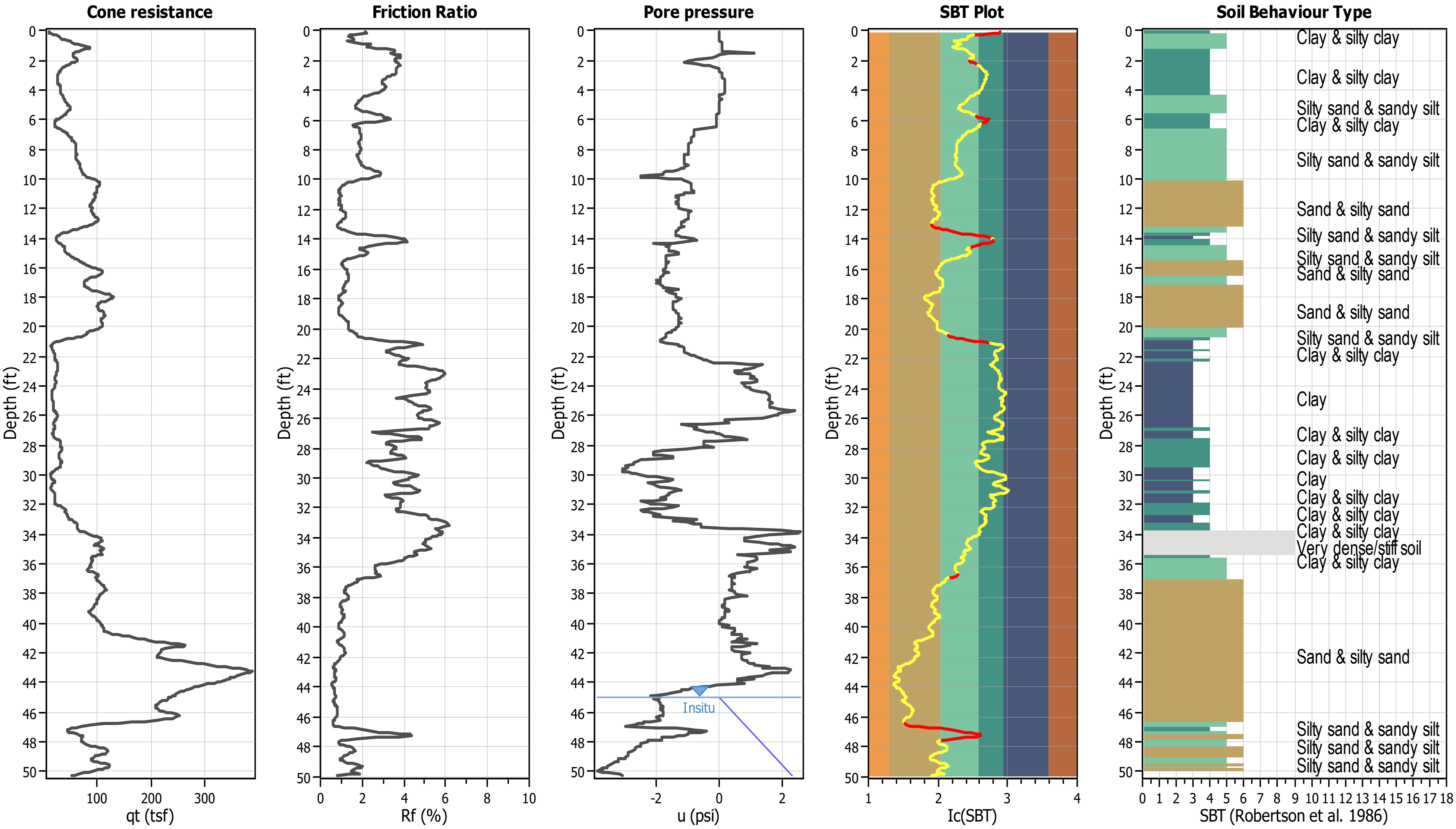






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



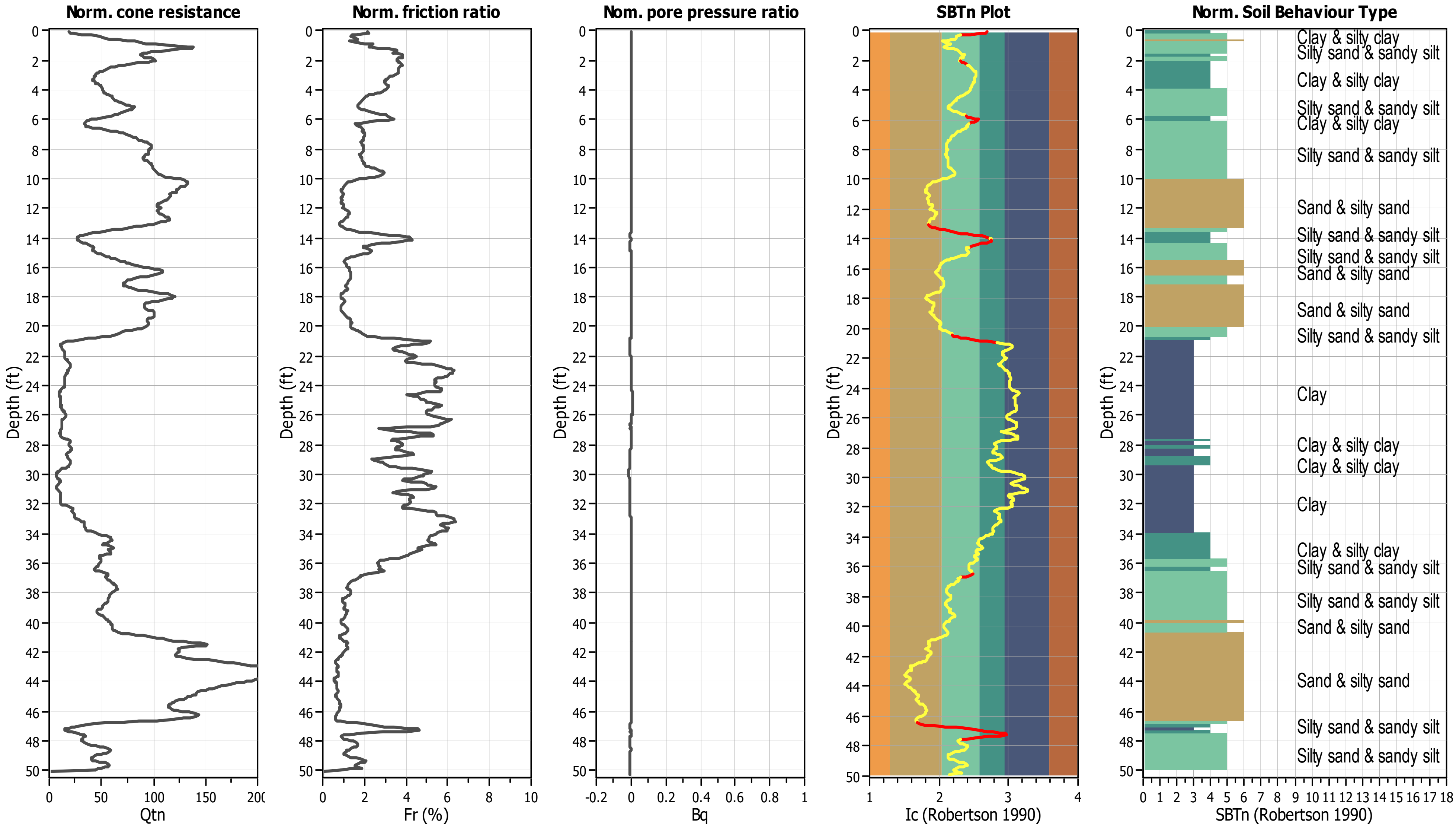
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



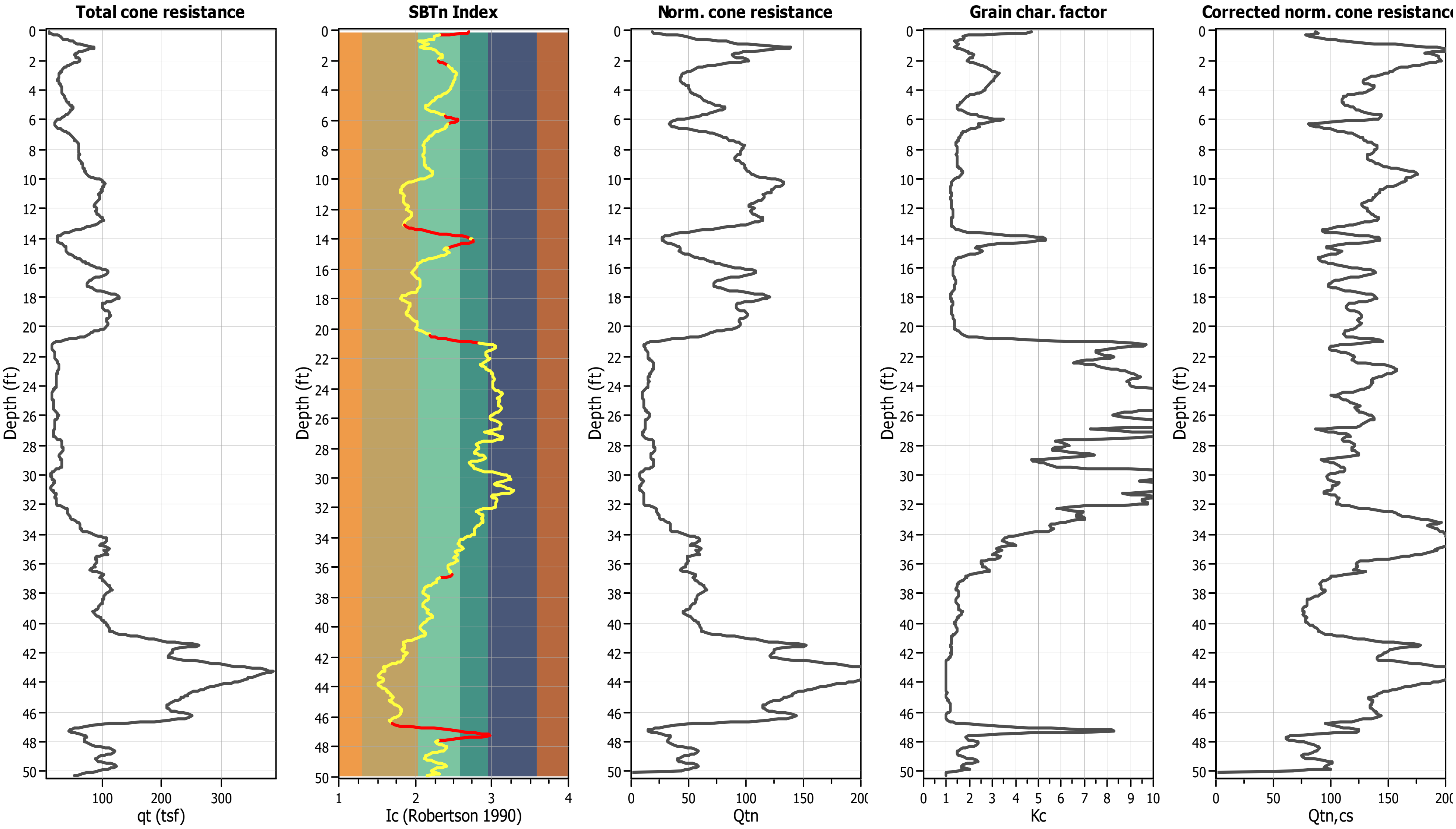
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬛ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

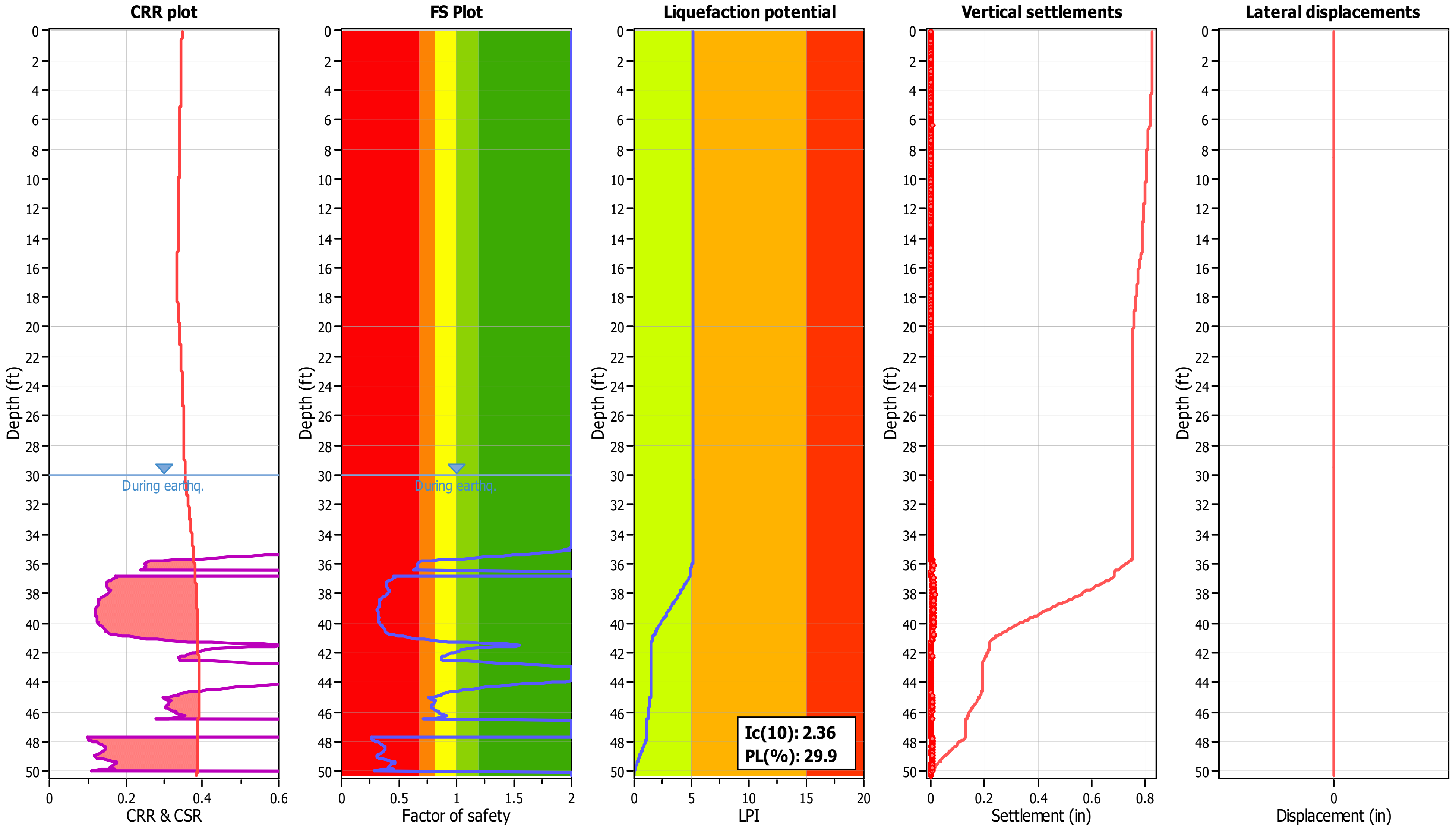
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

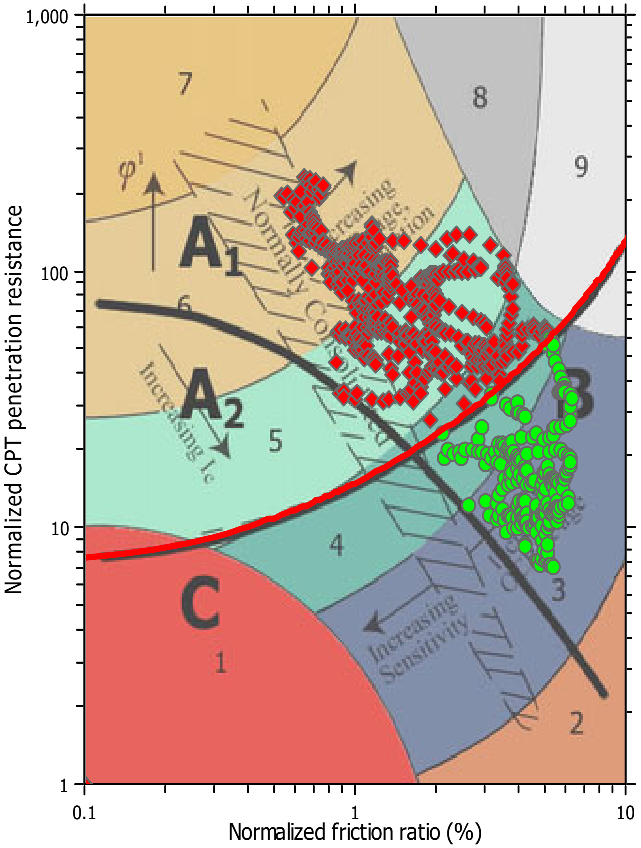
F.S. color scheme

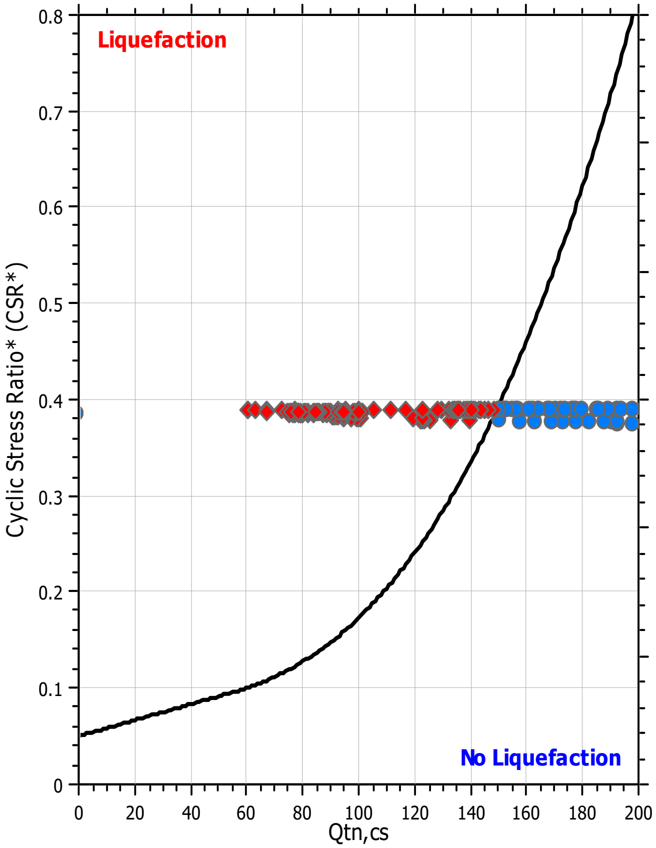
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

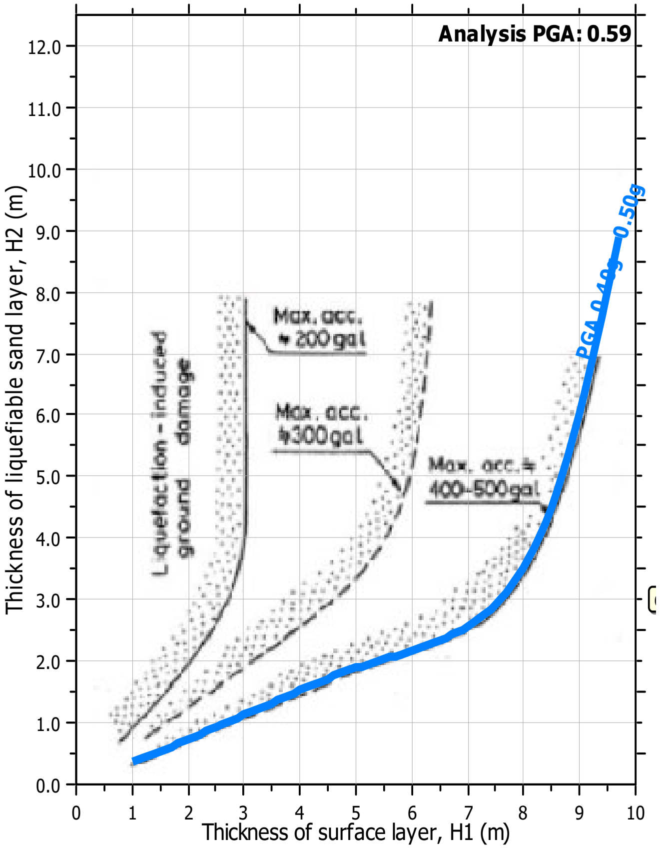
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟩 Low risk

Liquefaction analysis summary plots



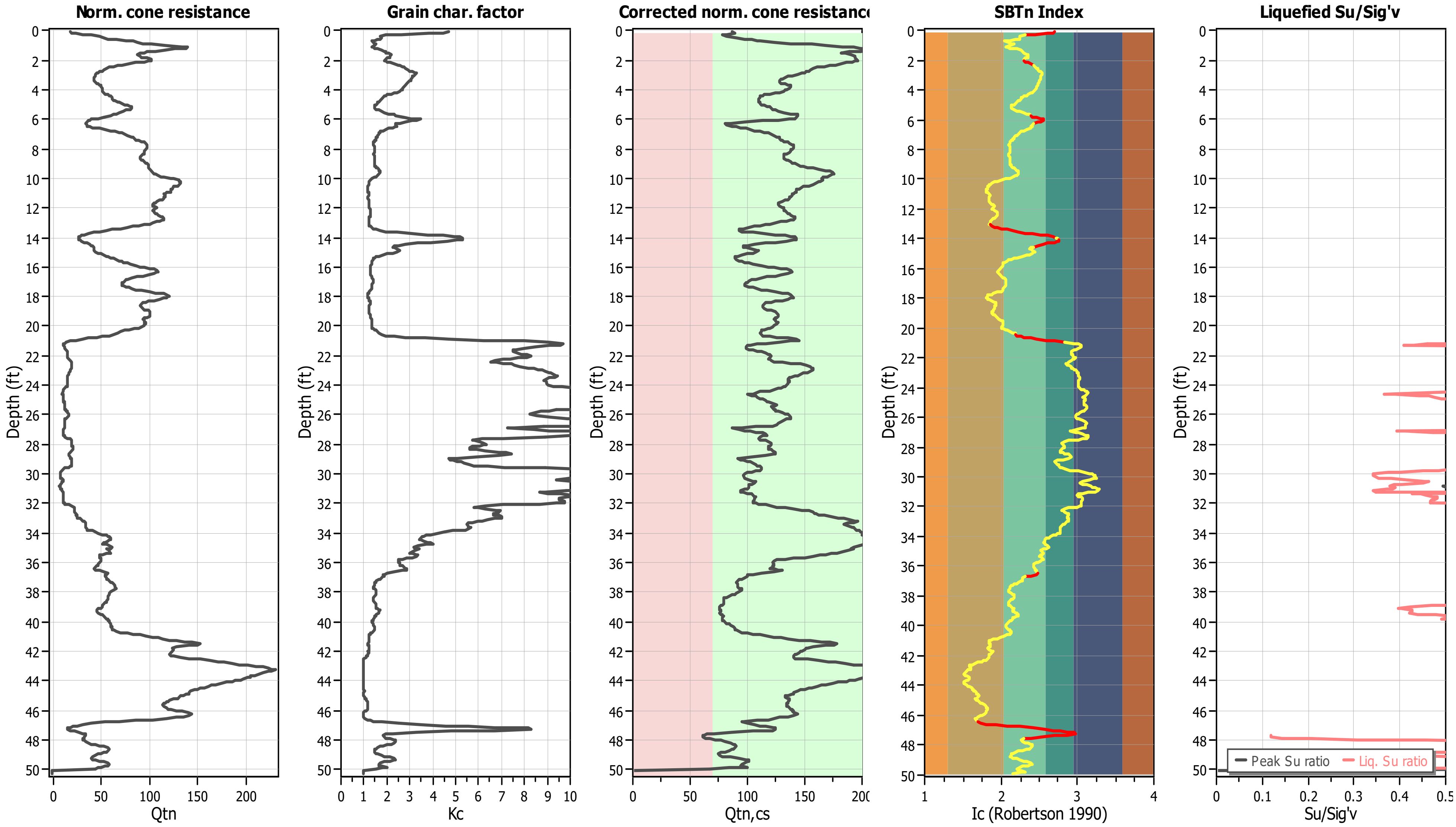




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

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1000 N Coast Highway #10
Laguna Beach, California
sageotechnical.com

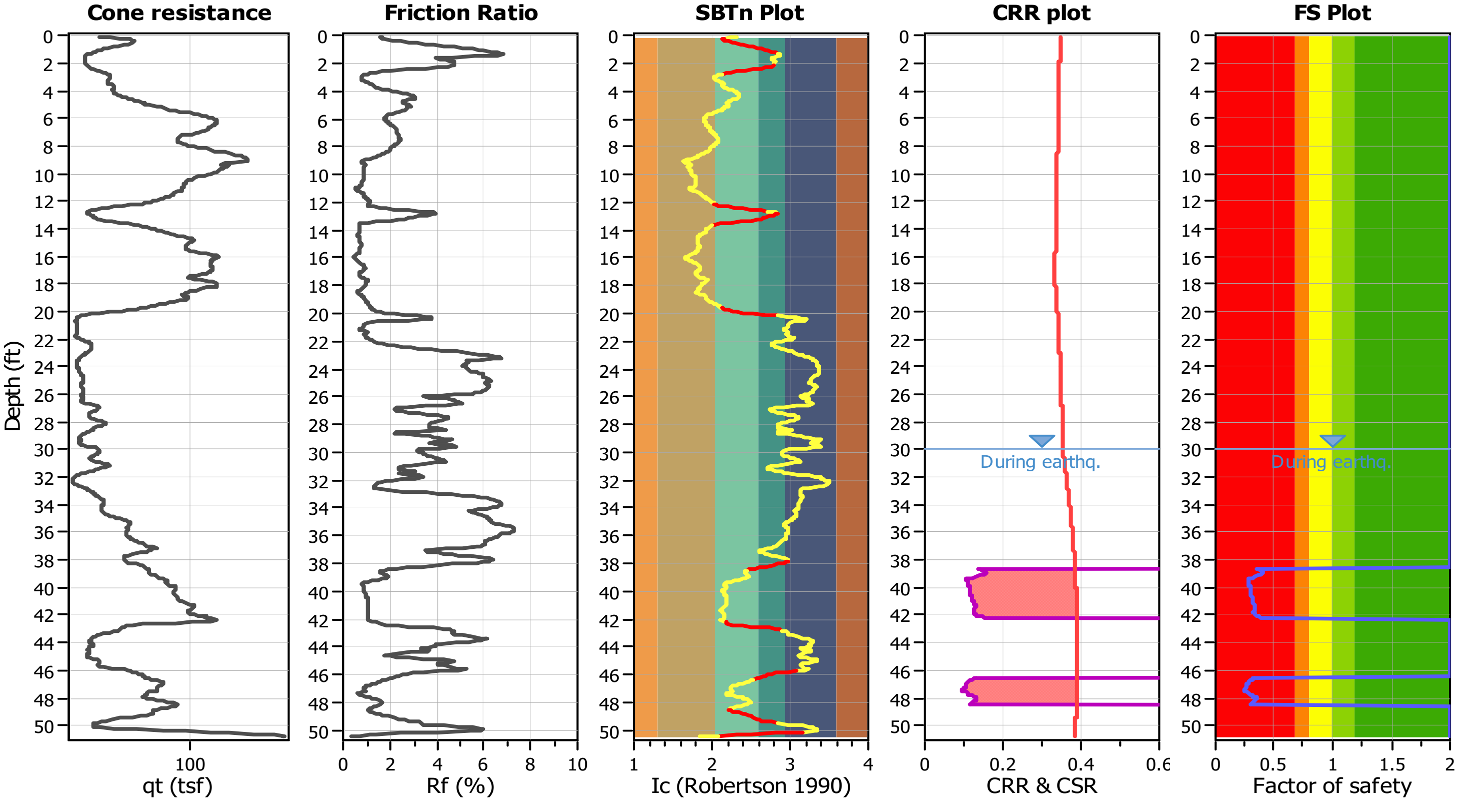
LIQUEFACTION ANALYSIS REPORT

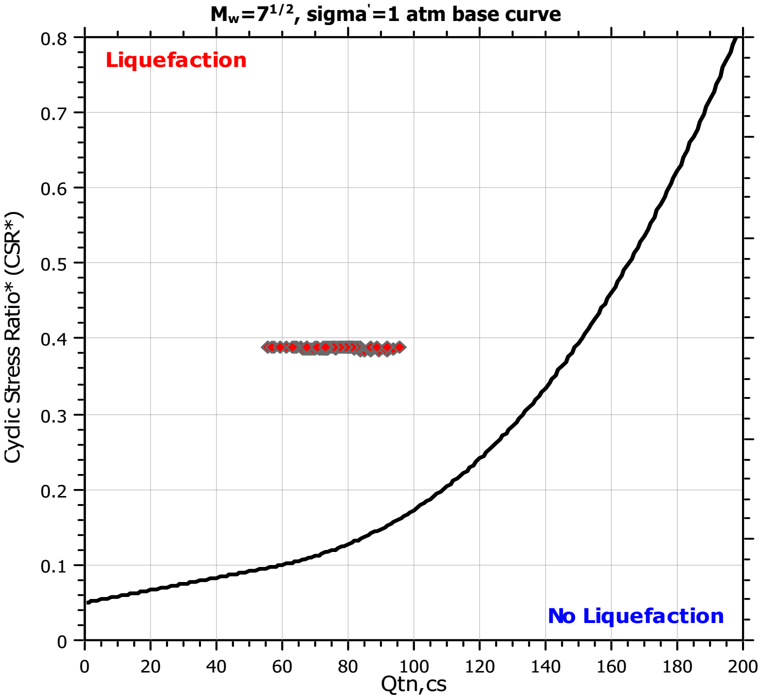
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

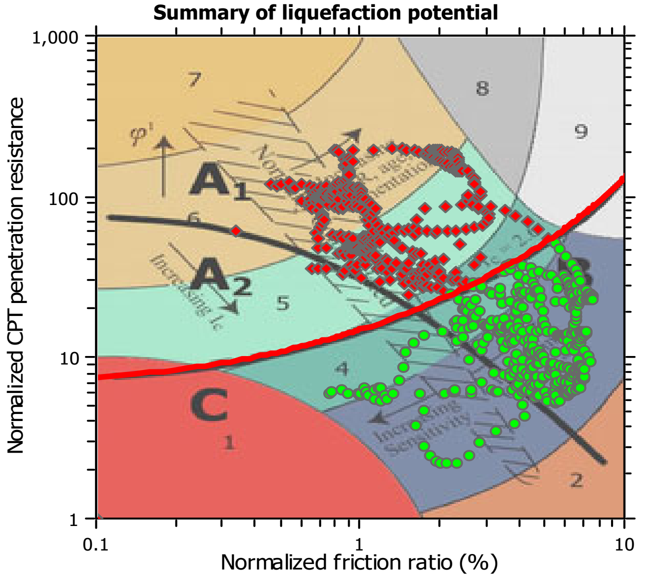
CPT file : CPT-4

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No		
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Clay like behavior applied:	Sands only
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes	MSF method:	Method based

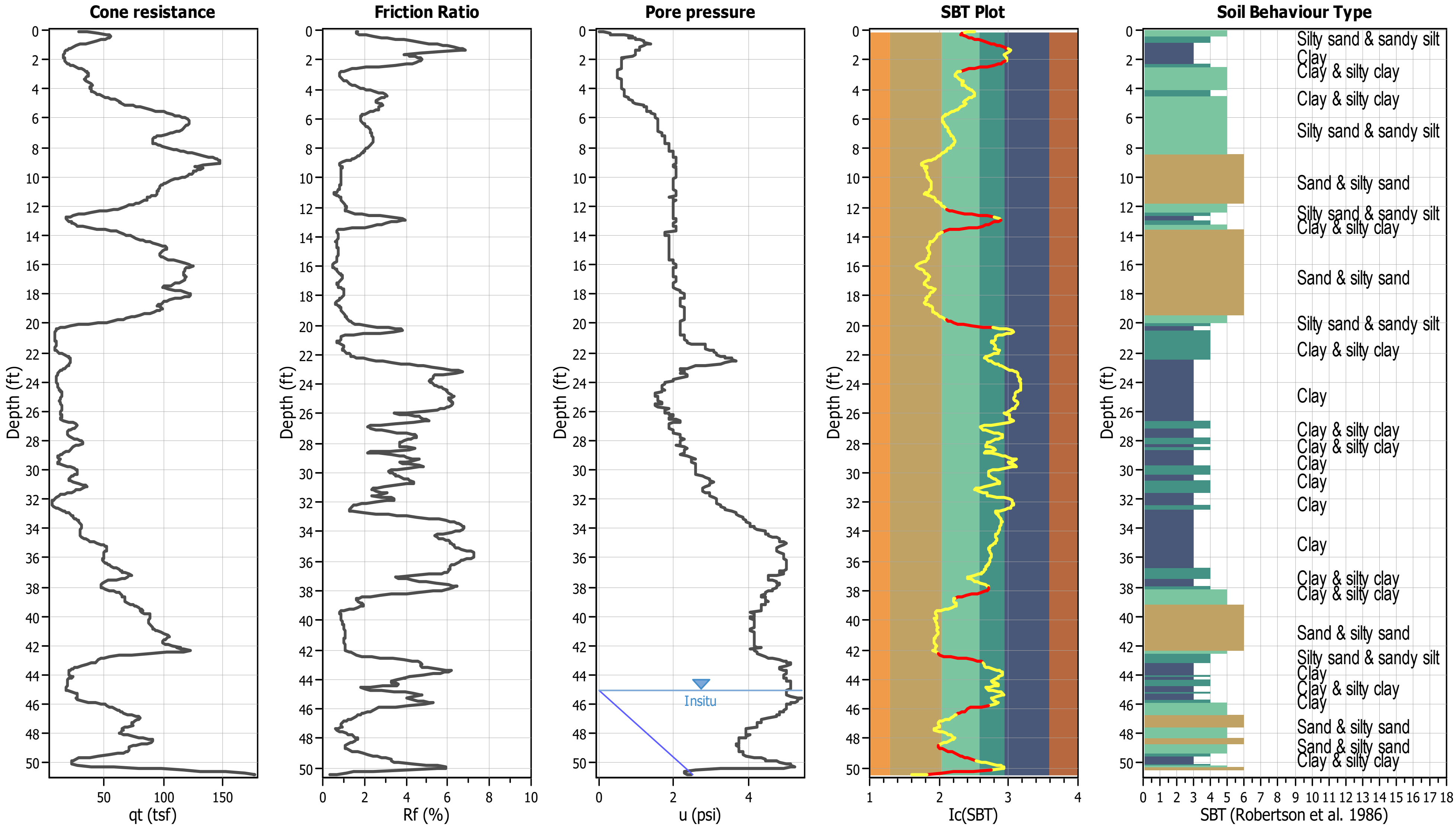






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



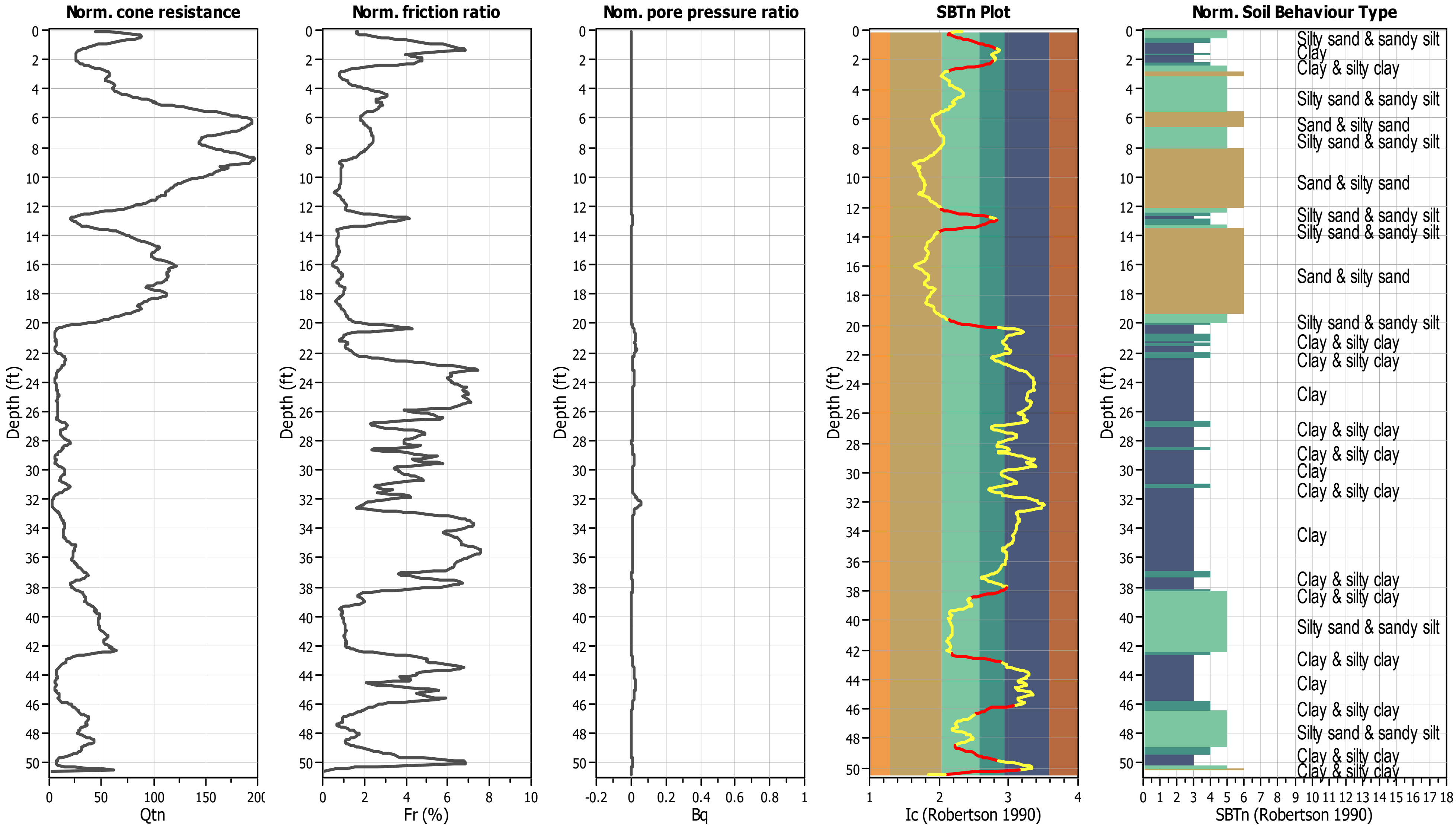
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

🟥 1. Sensitive fine grained	🟩 4. Clayey silt to silty	🟧 7. Gravely sand to sand
🟫 2. Organic material	🟩 5. Silty sand to sandy silt	⬜ 8. Very stiff sand to
🟦 3. Clay to silty clay	🟨 6. Clean sand to silty sand	⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

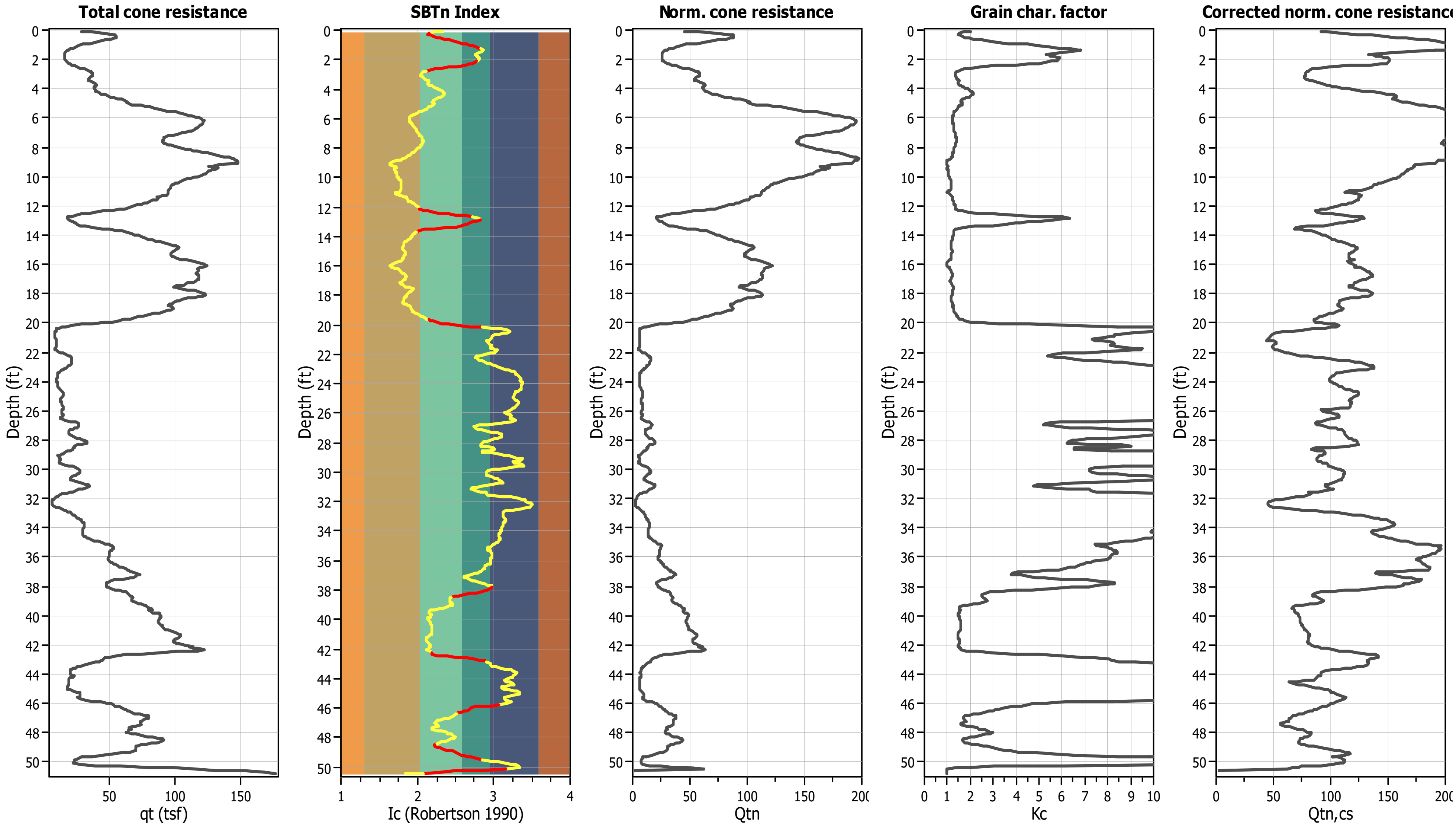
Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

SBTn legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty
- 🟩 5. Silty sand to sandy silt
- 🟫 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to
- ⬜ 9. Very stiff fine grained

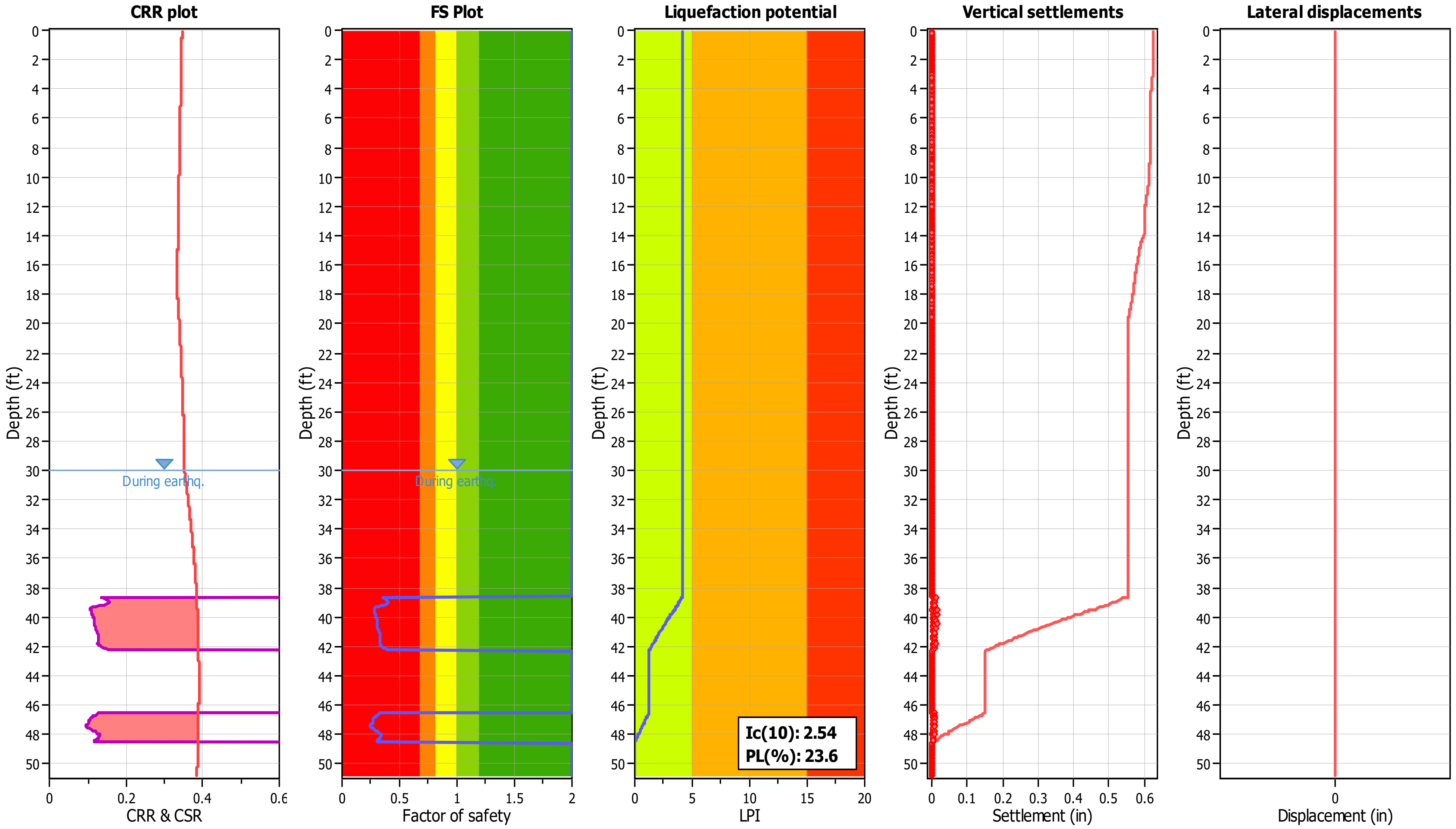
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

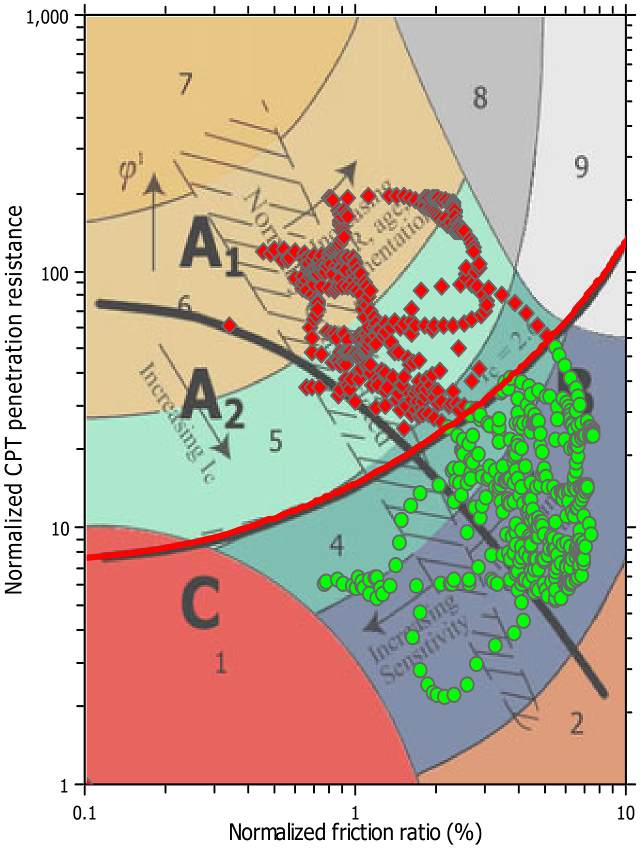
F.S. color scheme

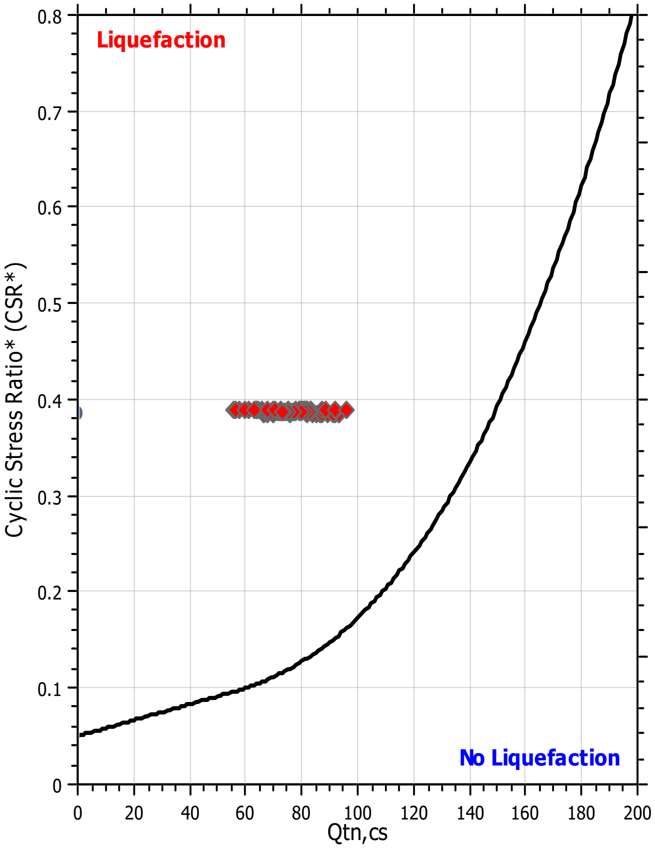
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

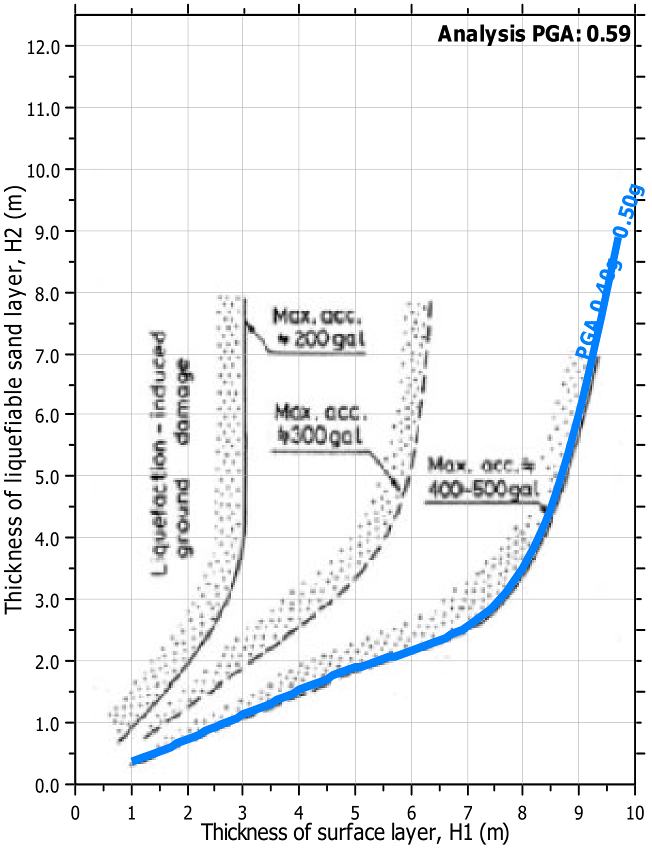
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟩 Low risk

Liquefaction analysis summary plots



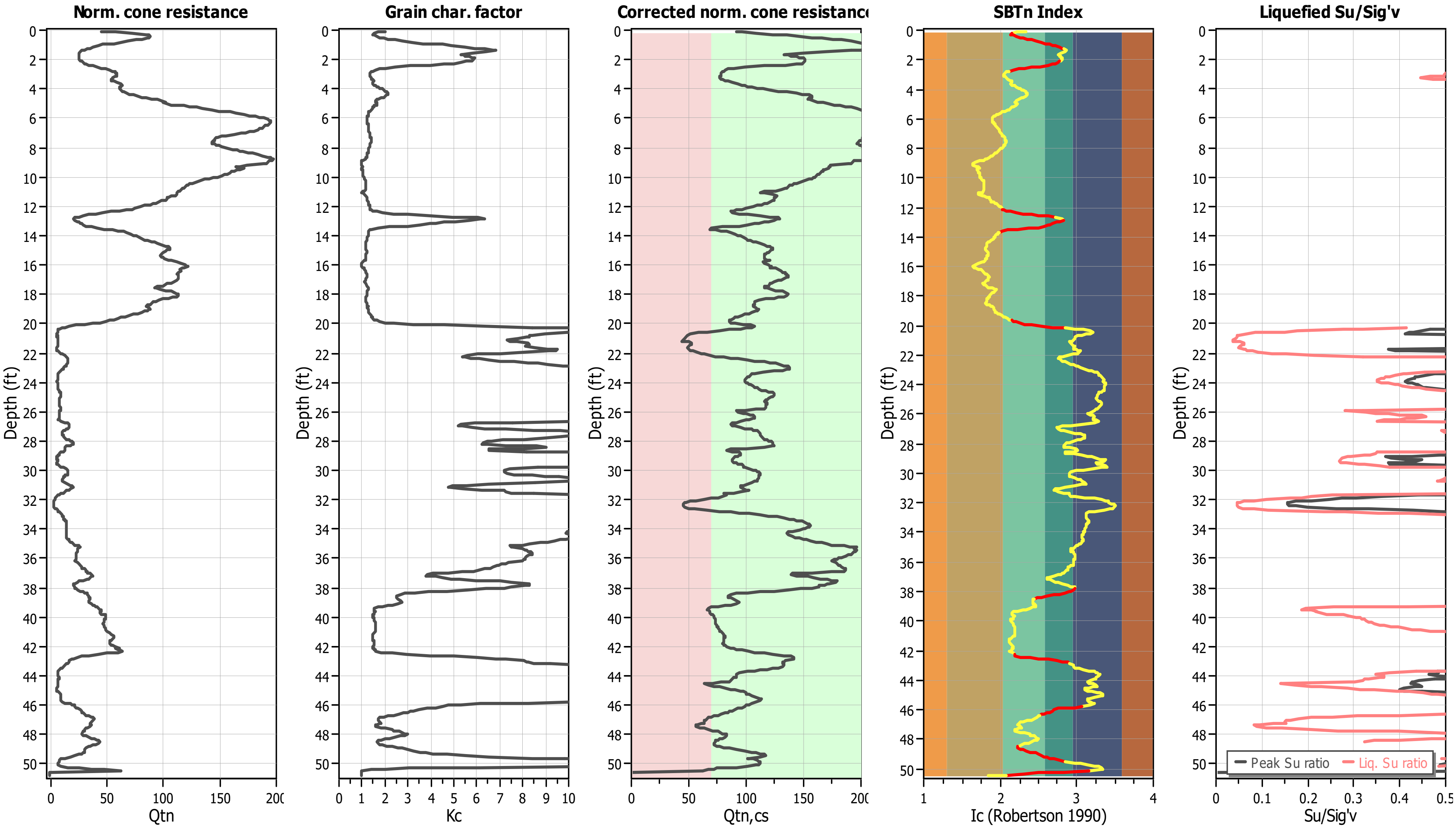




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

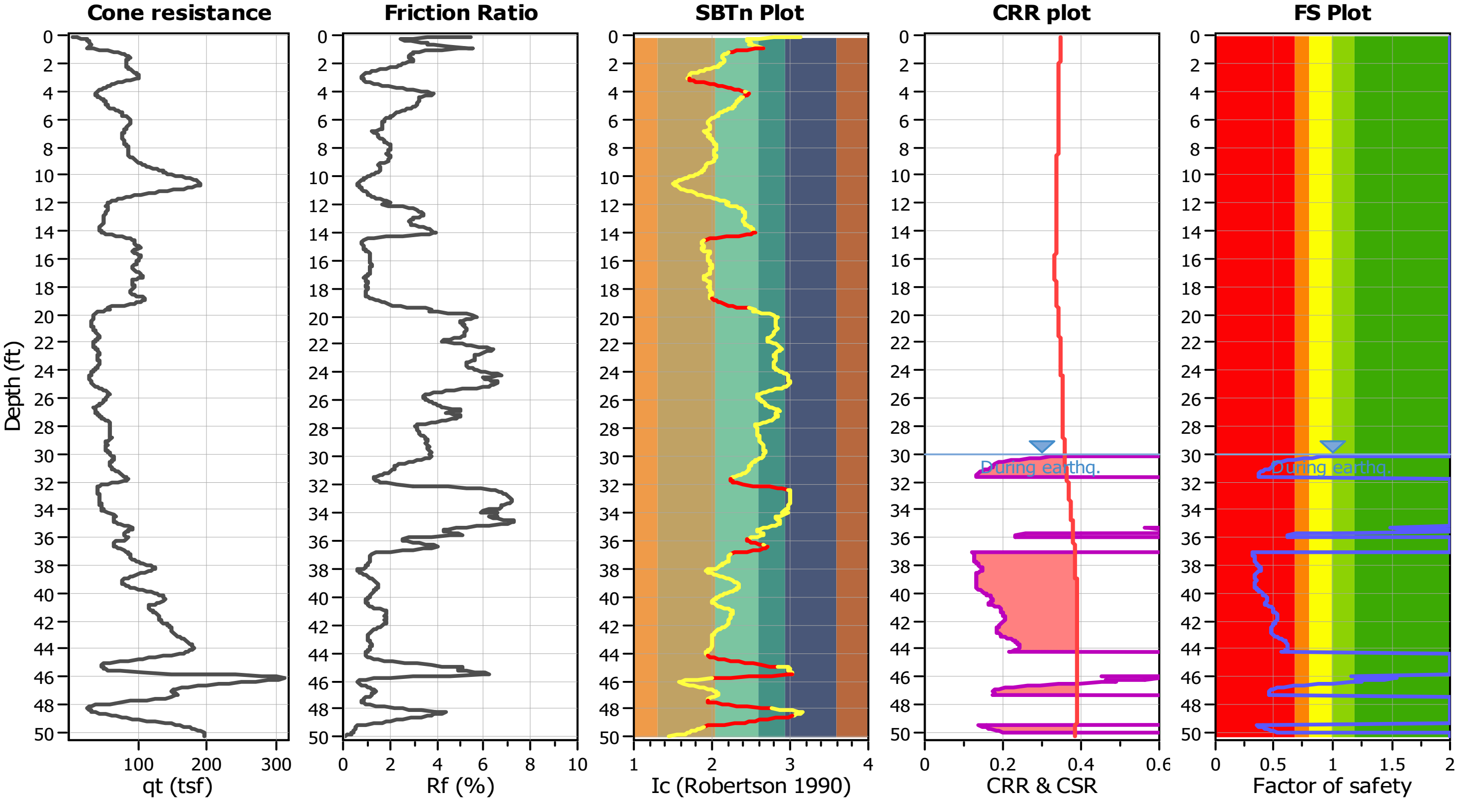
LIQUEFACTION ANALYSIS REPORT

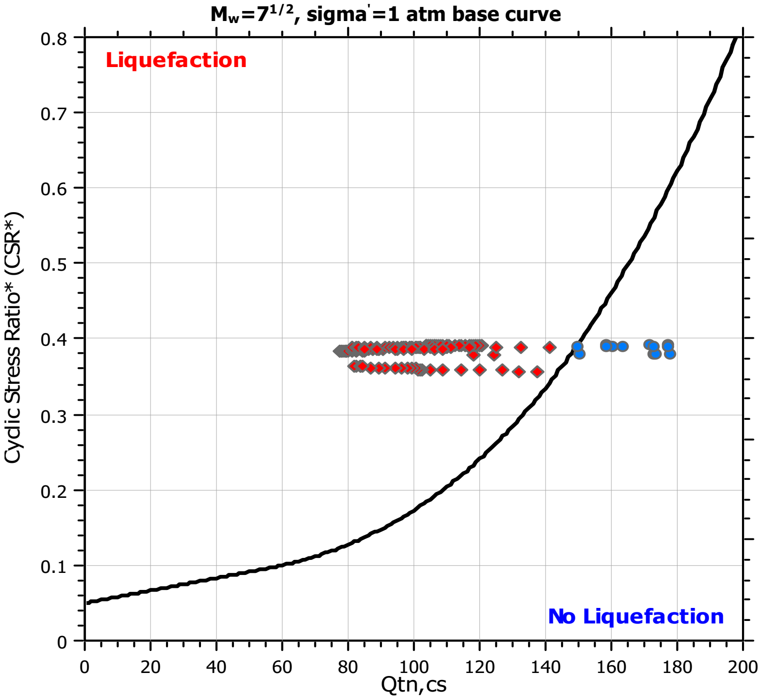
Project title : Meritage/13841 & 13751 Red Hill Avenue **Location : Tustin, CA**

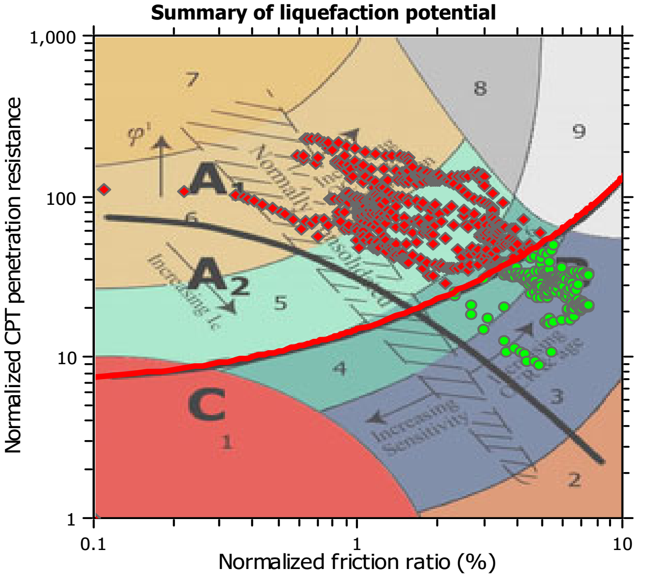
CPT file : CPT-5

Input parameters and analysis data

Analysis method:	NCEER (1998)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	30.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.20	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.59	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

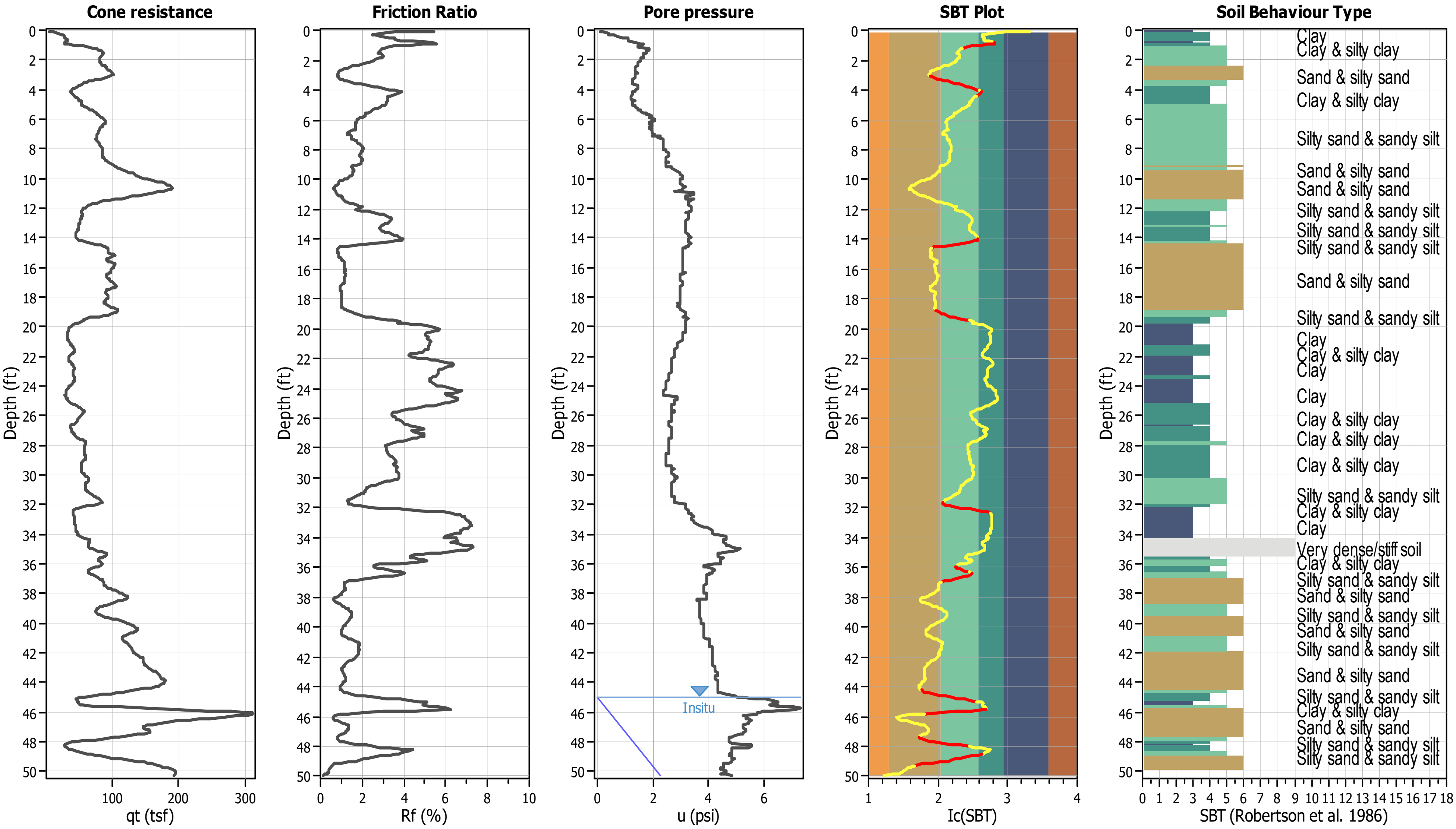






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



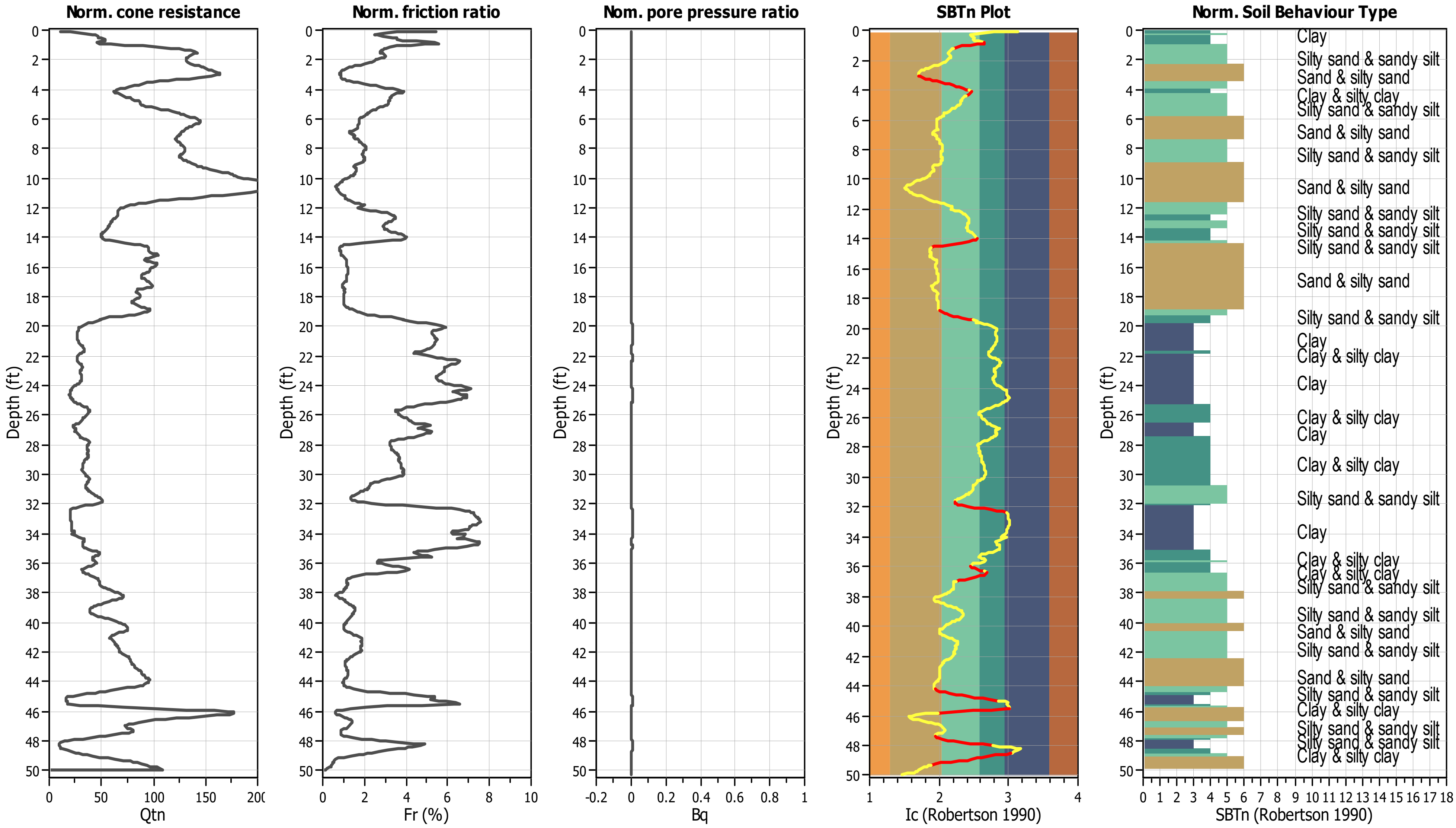
Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

- 🟥 1. Sensitive fine grained
- 🟫 2. Organic material
- 🟦 3. Clay to silty clay
- 🟩 4. Clayey silt to silty
- 🟩 5. Silty sand to sandy silt
- 🟨 6. Clean sand to silty sand
- 🟧 7. Gravely sand to sand
- ⬛ 8. Very stiff sand to
- ⬜ 9. Very stiff fine grained

CPT basic interpretation plots (normalized)



Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

SBTn legend

🟥 1. Sensitive fine grained
🟫 2. Organic material
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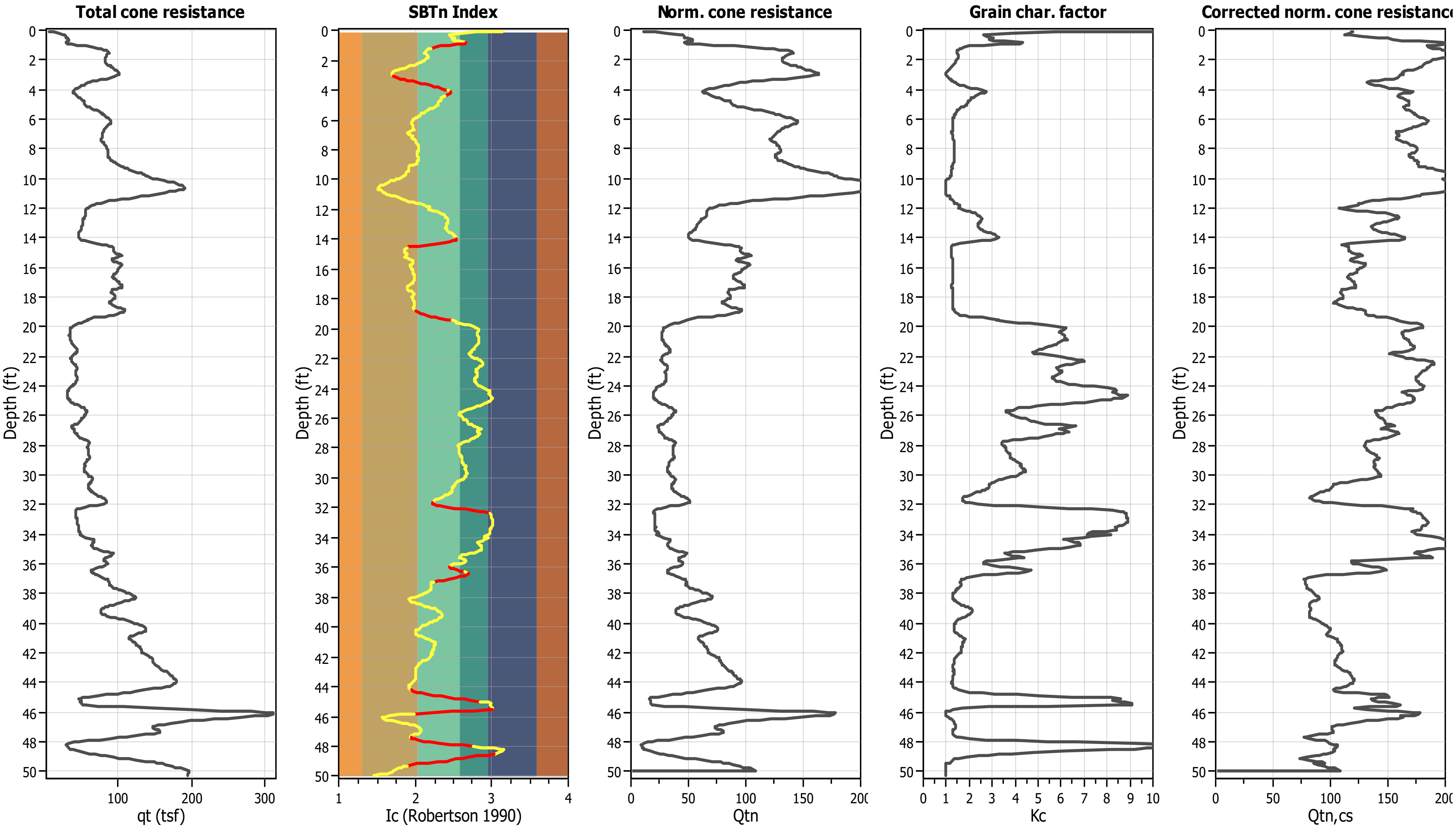
🟩 5. Silty sand to sandy silt
🟨 6. Clean sand to silty sand
🟧 7. Gravely sand to sand
⬛ 8. Very stiff sand to
⬜ 9. Very stiff fine grained

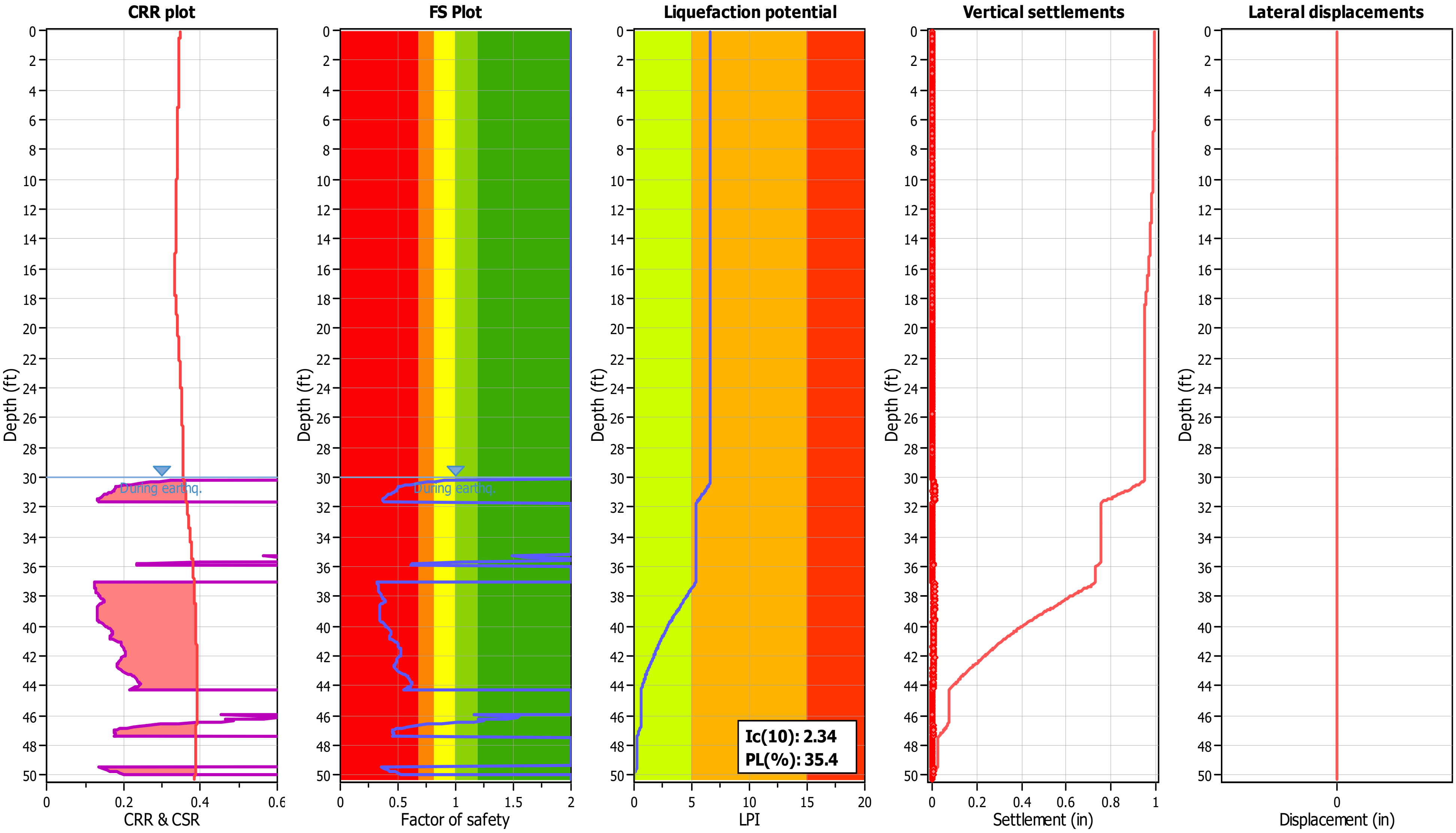
Liquefaction analysis overall plots (intermediate results)



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_{σ} applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Liquefaction analysis overall plots



Input parameters and analysis data

Analysis method: NCEER (1998)
Fines correction method: NCEER (1998)
Points to test: Based on Ic value
Earthquake magnitude M_w: 7.20
Peak ground acceleration: 0.59
Depth to water table (insitu): 45.00 ft

Depth to water table (erthq.): 30.00 ft
Average results interval: 3
Ic cut-off value: 2.60
Unit weight calculation: Based on SBT
Use fill: No
Fill height: N/A

Fill weight: N/A
Transition detect. applied: Yes
K_σ applied: Yes
Clay like behavior applied: Sands only
Limit depth applied: No
Limit depth: N/A

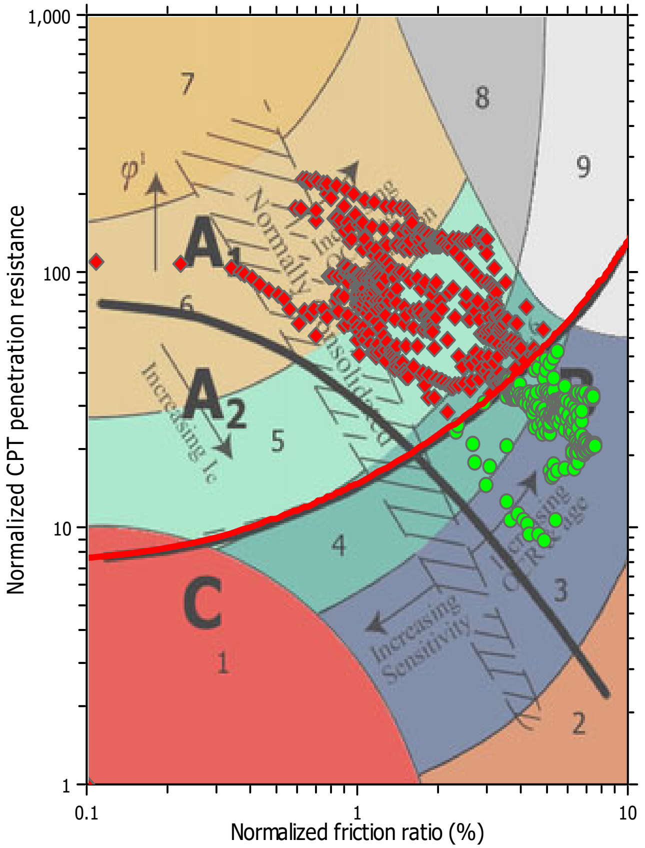
F.S. color scheme

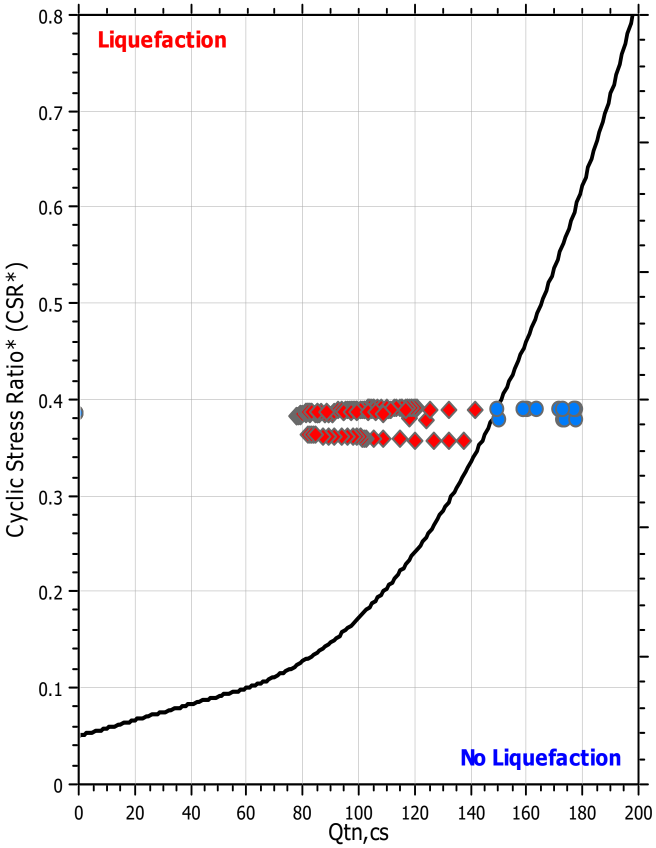
- 🟥 Almost certain it will liquefy
- 🟧 Very likely to liquefy
- 🟨 Liquefaction and no liq. are equally likely
- 🟩 Unlike to liquefy
- 🟩 Almost certain it will not liquefy

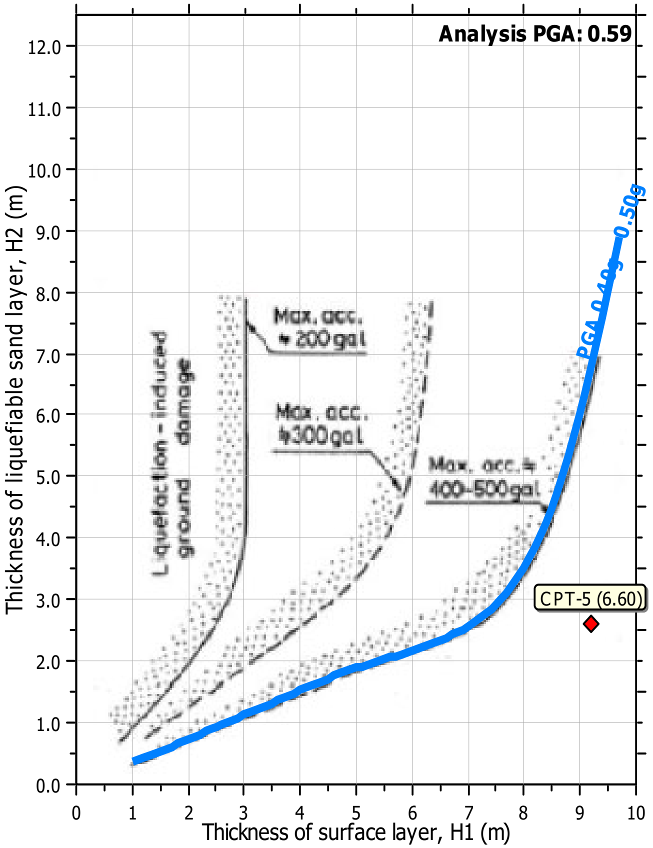
LPI color scheme

- 🟥 Very high risk
- 🟧 High risk
- 🟩 Low risk

Liquefaction analysis summary plots



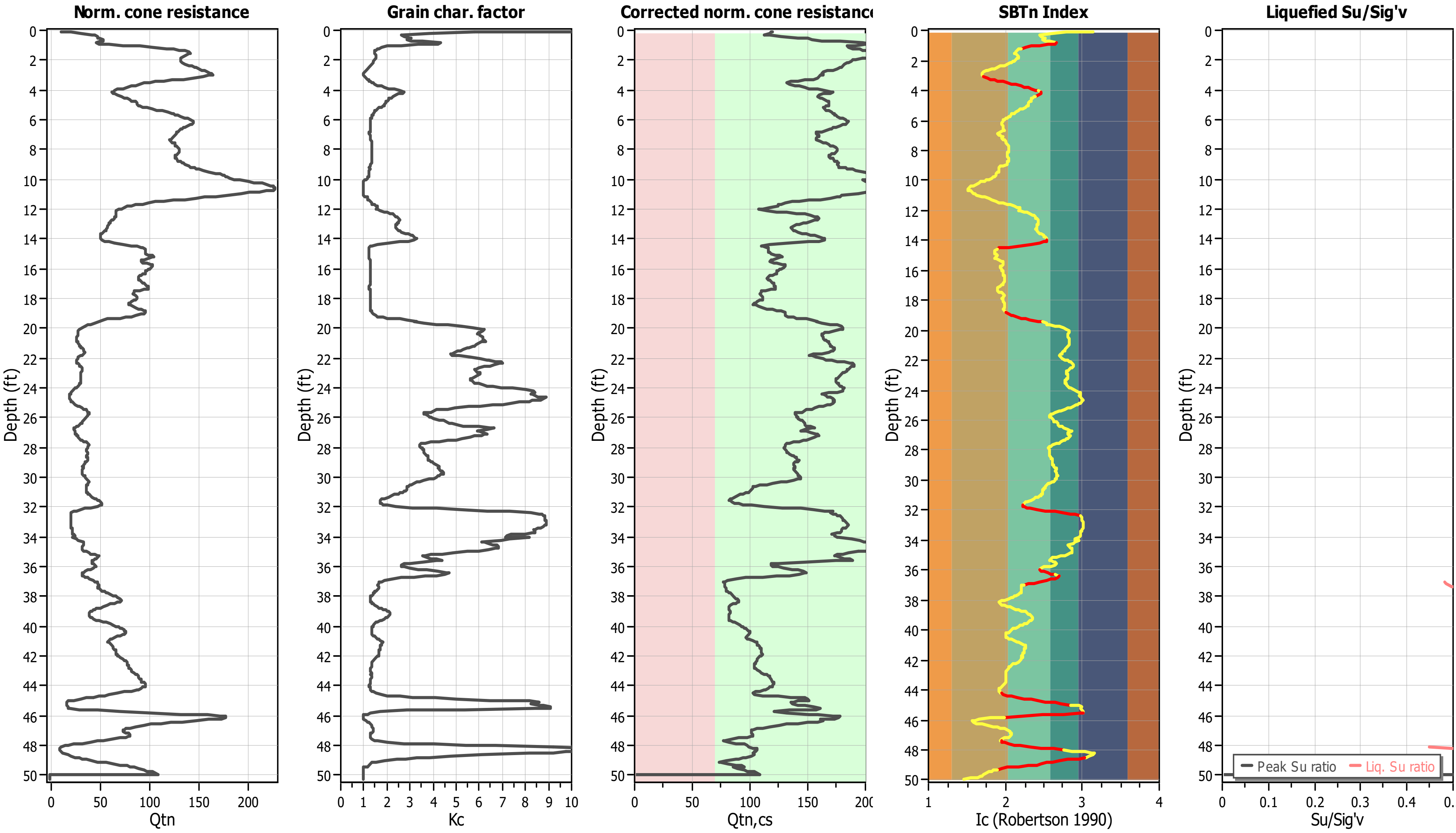




Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	NCEER (1998)	Depth to water table (erthq.):	30.00 ft	Fill weight:	N/A
Fines correction method:	NCEER (1998)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	Yes
Earthquake magnitude M_w:	7.20	Unit weight calculation:	Based on SBT	Clay like behavior applied:	Sands only
Peak ground acceleration:	0.59	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Appendix G

APPENDIX G

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

1.0 GENERAL

1.1 **Intent:** These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these general Specifications. Observations of the earthwork by the project Geotechnical Consultant during grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 **Geotechnical Consultant:** Prior to commencement of work, the project owner shall employ a geotechnical consultant. The geotechnical consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all keyway bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of subgrade and fill materials and perform adequate relative compaction testing of fill to determine the attained level of compaction and assess if, in their opinion, if the work was performed in substantial compliance

with the geotechnical report(s) and these specifications. The Geotechnical Consultant shall provide test results to the owner on a routine and frequent basis.

1.3 **The Earthwork Contractor:** The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with applicable grading codes, the project plans, and these specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork planned for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are corrected.

2.0 PREPARATION OF FILL AREAS

2.1 **Clearing and Grubbing:** Areas to be excavated and filled shall be cleared and grubbed. Vegetation, such as brush, grass, roots, and other deleterious material, man-made structures, and similar debris shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant. Borrow areas shall be cleared and grubbed to the extent necessary to provide a suitable fill material.

Concrete fragments that are free of reinforcing street may be placed in fills, provided they are placed in accordance with Section 3 and 4. Earth fill material

shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent organic matter. Nesting of organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area. As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, etc.) have chemical constituents that are considered hazardous waste. As such, the indiscriminate dumping or spillage of such fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

The Geotechnical Consultant shall not be responsible for the identification or analysis of potentially hazardous materials; however, if observations, odors, or soil discoloration are suspect, the Geotechnical Consultant may request from the owner the termination of grading operations until such materials are deemed not hazardous as defined by applicable laws and regulations.

2.2 **Evaluation/Acceptance of Fill Areas:** All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

2.3 **Processing:** Ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Ground that is not satisfactory shall be removed/overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. After scarification, the surface should be moisture conditioned, as necessary, to achieve the proper moisture content and compacted in accordance with Section 4 of these specifications.

2.4 **Overexcavation:** In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured, or otherwise unsuitable ground shall be overexcavated to competent ground as recommended by the Geotechnical Consultant during grading.

2.5 **Benching:** Fills to be placed on ground sloping steeper than 5H:1V (horizontal to vertical units) shall be stepped or benched. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for fill placement.

3.0 FILL MATERIAL

3.1 **General:** Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 **Oversize:** Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or other underground construction.

3.3 **Import:** If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1 and/or requirements defined in the project geotechnical report(s). The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before import begins so that suitability can be determined, and appropriate laboratory tests performed.

4.0 FILL PLACEMENT AND COMPACTION

4.1 **Fill Layers:** Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 **Fill Moisture Conditioning:** Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with ASTM International (ASTM Test Method D1557).

4.3 **Compaction of Fill:** After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction and uniformity.

Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.4 **Compaction Testing:** Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.5 **Frequency of Compaction Testing:** Tests shall be taken at intervals required by the governing agency and as deemed necessary by the Geotechnical Consultant in order to adequately qualify the fill material. In general, it should be anticipated that tests will be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill, unless recommended otherwise by the Geotechnical Consultant. In addition, test(s) shall be taken on slope faces and/or each 10 feet of vertical height of slope as deemed necessary by the Geotechnical Consultant. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.6 **Compaction Test Locations:** The Geotechnical Consultant shall document the approximate elevation and location of each compaction test. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided. Alternatively, GPS units may be used to determine the approximate location/coordinates of the field density tests.

5.0 SUBDRAIN INSTALLATION

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and standard details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys. The Contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The Contractor is responsible for the performance of subdrains.

6.0 EXCAVATION

Excavations, including over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical report(s) and plans are estimates. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 TRENCH BACKFILLS

7.1 Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

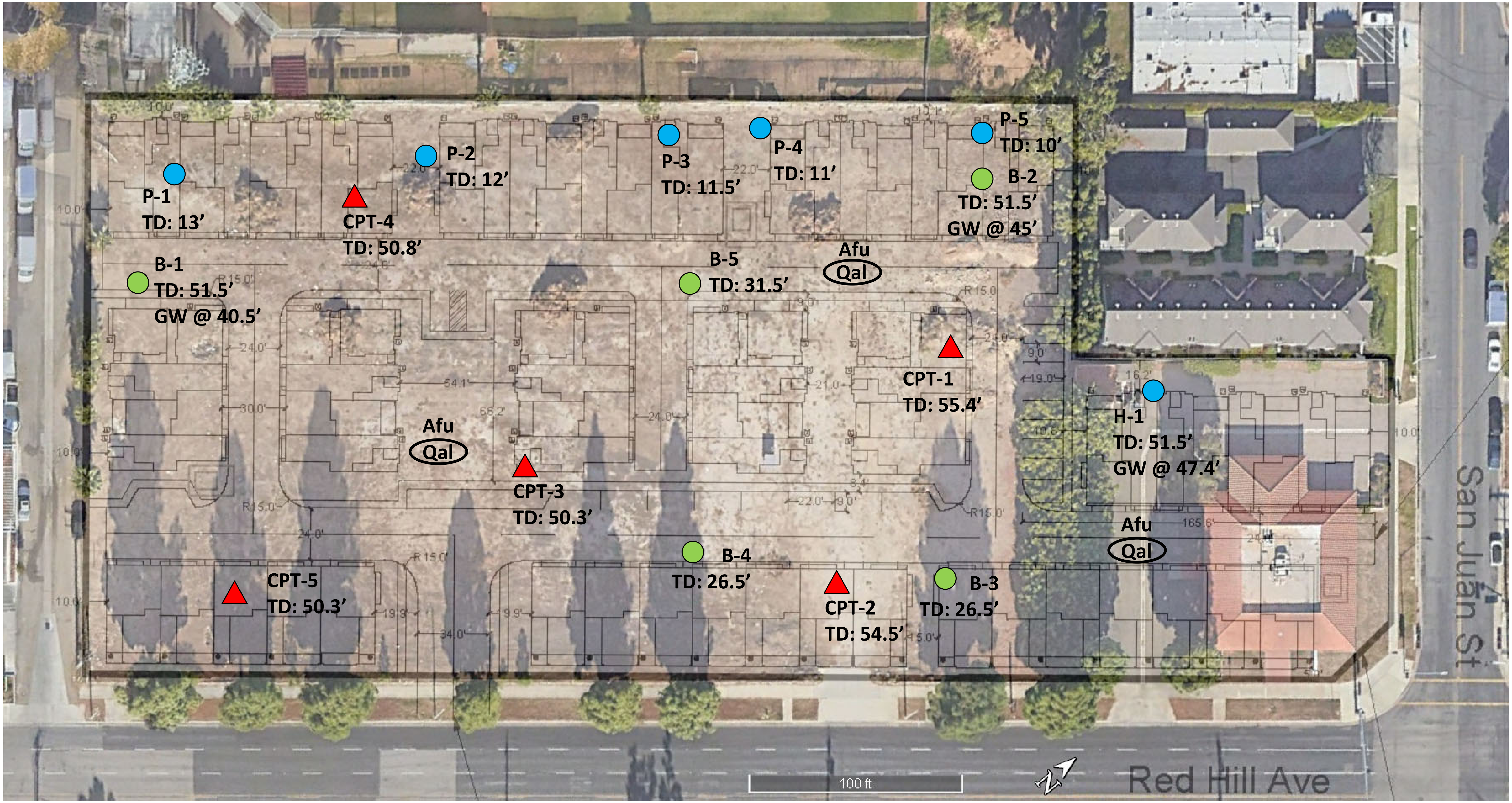
7.2 Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum 90 percent of maximum from 1 foot above the top of the conduit to the surface, except in traveled ways (see Section 7.6 below).

7.3 Jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

7.4 Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill, unless required differently by the governing agency or the Geotechnical Consultant.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.6 Trench backfill in the upper foot measured from finish grade within existing or future traveled way, shoulder, and other paved areas (or areas to receive pavement) should be placed to a minimum 95 percent relative compaction.



Base Map Source: Google Earth

Legend

▲ CPT-5 TD: 50.3’	Cone Penetrometer Test Location by SA GEO, Showing Total Depth.
● H-1/P-4 TD: 51.5’ GW @ 47.4’	Approximate Hollow Stem Auger Boring/Percolation Test Location (NMG, 2015), Showing Total Depth and Depth to Groundwater.
● B-5 TD: 31.5’	Approximate Hollow Stem Auger Boring Location (Geosoils, 2005), Showing Total Depth and Depth to Groundwater

Earth Units
Circled Where Buried

Afu	Undocumented Artificial Fill
Qal	Alluvium

GEOTECHNCIAL MAP

Meritage Homes
Proposed Residential Development
13841 & 13751 Red Hill Avenue
Tustin, California

Project Number: 24011-01
Date: February 2, 2023
Plate 1

Attachment F – Notice of Transfer of Responsibility Form

(To be provided during final design)

Attachment G – City of Tustin Correspondence, if Applicable

N/A

Attachment H – Phase II Study

1/10/2024

Phase II Environmental Site Assessment

Space IAG 1
13751 and 13841 Red Hill Avenue
Tustin, California 92780

Prepared for:
Space IAG 1, LLC
c/o Mr. Mark Moshayedi
CEO
MSM Global Ventures LLC
2600 East Coast Hwy, Suite 240
Corona Del Mar, CA 92625

Advanced Environmental Group, Inc

LIMITATIONS AND WARRANTIES

Advanced Environmental Group, Inc. (AEG) prepared this report for the exclusive use of **Space IAG 1, LLC** and assigned parties only. The services described within this document were performed in accordance with generally accepted professional consulting principles and practices. No other warranty, expressed or implied, is made.

The information contained in this report was based on measurements performed in specific areas during a specific time period. AEG's professional opinions and conclusions are based in part on interpretation of data from discrete sampling or measurement locations that may not represent conditions at un-sampled or un-measured locations.

AEG assumes no responsibility for issues arising from changes in environmental standards, practices, or regulations subsequent to performance of site assessment work. In the event that any changes occur in waste management practices, site conditions, or uses of the property, the conclusions and recommendations contained in this document should be reviewed and modified or verified in writing by AEG. AEG does not warrant the accuracy of information supplied by others, or the use of segregated portions of this document.

PROFESSIONAL GEOLOGIST • STATE OF CALIFORNIA
ANTHONY F. SEVERINI
No. 3852
10/31/25

Anthony F. Severini

Ashley Flores
Project Manager

Anthony F. Severini, PG
President

January 10, 2024

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Tables

Figures

Appendix

1 Introduction

Advanced Environmental Group, Inc. (AEG) prepared this report to document the methods and findings of a Phase II Environmental Site Assessment (ESA) performed for the property located at 13751 and 13841 Red Hill Avenue in Tustin, California (the Site, **Figure 1**). AEG was retained by Space IAG 1, LLC (SIAG) to perform this Phase II ESA as part of an investigation into possible soil vapor contamination of the vacant lot located at 13751 and 13841 Red Hill Avenue. AEG also completed a Phase I ESA for this property on behalf of SIAG in December 2023.

2 Project Background

The Site is located at 13751 and 13841 Red Hill Avenue in a mixed commercial/industrial and residential area within the City of Tustin, Orange County, California. The property currently consists of a vacant lot. AEG performed a Phase I ESA dated December 19, 2023, and provided SIAG a Recommendation Letter dated December 21, 2023, for the Site. The Phase I ESA identified a *Recognized Environmental Condition* and a *Vapor Encroachment Condition* for the Site, based on the review of a *Site Investigation and Remedial Action Plan* for the property located at 13806-13850 Red Hill Avenue, Tustin, California prepared by Ramboll US Consulting Inc. (Ramboll) dated September 26, 2022. The Ramboll report investigated tetrachloroethene (PCE) contamination at the former Carioca Cleaners, located adjacent and to the southeast of the Site across Red Hill Avenue. The report noted that "PCE concentrations exceeding soil vapor screening levels in the parking lot appeared to correspond with the sewer line that runs west/northwest from the strip mall to Red Hill Avenue." The Ramboll report indicates that concentrations of PCE in soil vapor were above screening levels along the property boundary near Red Hill Avenue directly across the street from the Site. It could not be determined if soil vapor contamination with PCE or its breakdown products had migrated onto the Site.

AEG performed this Phase II ESA in order to confirm if any of the PCE soil vapor contamination originating from the Carioca Cleaners had migrated onto the Site.

3 Scope of Work

The scope of work performed for this Phase II ESA is based on observations made during a Site inspection performed on December 11, 2023, as part of a Phase I ESA. AEG performed the following scope of work in completion of the Phase II ESA at the Site.

- Mark boring locations and notify Underground Service Alert (Dig Alert) of the proposed work.
- Prepare a Site Health and Safety Plan for work to be performed.
- Retain a licensed geophysical locating service to clear proposed boring locations of buried obstacles.
- Install seven borings to 15 feet and set temporary soil vapor probes at depths of 5 and 15 feet

at each location (**Figure 2**). Four of the borings are along the property line closest to Red Hill Avenue near the source of the contamination along the sewer line on the adjacent property to the southeast (see **Figure 2**). The remaining three borings are spread across the middle of the Site in order to determine if any contamination potentially spread further onto the property. The soil vapor probes were constructed of plastic tubing, plastic implant tip and surface cap.

- Collect soil vapor samples for on-site chemical analysis of VOCs using a California ELAP Certified Mobile Laboratory according to EPA Method 8260B modified for soil gas. Soil vapor probe installation and sampling were performed according to California Department of Toxic Substances Control (DTSC) 2015 Advisory on Active Soil Gas Investigations.
- Prepare a report documenting the methods and findings of the Phase II ESA.

4 Soil Vapor Sample Collection and Chemical Analysis

4.1 Soil Vapor Probe Installation and Sampling

On January 4, 2024, AEG installed 7 borings on the Site to a maximum depth of 15 feet below ground surface (bgs). AEG used our in-house drilling company, Environmental Support Technologies (EST), to provide a direct-push drilling rig and a 2-man crew to install the borings. EST is a General Engineering A licensed contractor with a C-57 drilling license (license number 1112073). EST used a Geoprobe 5400 direct-push drilling rig in the vacant lot at all locations. Boring locations drilled with the direct-push rig were labelled SV1 to SV7 (see **Figure 2**). Each boring was cleared of utilities prior to drilling. All work was supervised by Ashley Flores, an AEG Environmental Scientist and Project Manager.

4.2 Soil Vapor Probe Installation and Sampling

EST installed temporary soil vapor probes at 5- and 15-foot depths at all locations. The soil vapor investigation activities were conducted in general accordance with the California Department of Toxic Substances Control's (DTSC) Advisory - Active Soil Gas Investigations dated July 2015. Each temporary soil vapor probe was installed from the bottom up. The soil vapor probes were installed using ¼-inch Nylaflow™ sampling tubing in the subsurface. A clean and new implant filter was placed on the end of the tubing. Approximately 12 inches of clean, graded (# 3), kiln dried, Lonestar Monterey sand was poured around the sample tip to allow for diffusion of soil vapors and 12 inches of dry bentonite was added above the sand pack. The remaining borehole was filled with a hydrated bentonite cement mixture to slightly below grade to perform as a leak proof seal.

Prior to soil vapor sample collection, a minimum of 120 minutes were allowed to elapse for soil vapor probe construction materials to set and equilibrate with the surrounding formation. A soil vapor sampling apparatus tray was equipped with a Magnehelic vacuum gauge, purge pump and valves and was used to perform a shut-in test and leak test of the sampling train.

Shut-in tests are performed to ensure all above ground sampling equipment is tight with no dilution of atmospheric air. A shut-in test was performed at each probe between the top of the probe and the inlet to the vacuum pump at a vacuum of at least 100 inches of water column for a period of at least one minute. No vacuum leaks were observed during the shut-in tests.

The leak test is performed to ensure that the sampled subsurface vapor originates from the subsurface without dilution of atmospheric air. Leak testing was performed by applying a liquid leak tracer (2-propanol) to cotton swabs placed at the points where the probes daylight from the subsurface, and at the connections to the sampling apparatus. 2-propanol was included in the list of soil vapor analytes.

Samples were collected in a laboratory clean, one-hundred-centimeter gas-tight, glass syringe designed for soil vapor sampling. EST purged the sample probes at a rate of 200 milliliters a minute (mL/min) prior to sampling and purged a total of 3 volumes prior to sampling. Samples were analyzed on Site with a mobile laboratory certified by the State of California Environmental Laboratory Accreditation Program (ELAP, certificate number 2772).

Once sampled, each temporary soil vapor probe was removed, and the borehole was capped at the surface in concrete.

4.3 Soil Vapor Sample Chemical Analysis

Soil vapor samples from each probe were analyzed on-Site using a California ELAP Certified Mobile Laboratory (California ELAP Number 2772) supplied by Environmental Support Technologies (EST) according to EPA Method 8260B modified for soil gas at environmental screening level reporting limits. The certified laboratory report for soil vapor is provided in **Appendix A**. A summary of the laboratory data is provided in **Table 1**.

Soil gas sample results presented on **Table 1** were compared to adjusted cancer and non-cancer end-point indoor air screening levels (IASL) for residential air as recommended by the DTSC's (Department of Toxic Substances Control) Human and Ecological Risk Office (DTSC/HERO Note 3, May 2022) or the EPA Region 9 Regional Screening Levels (EPA RSL) for Residential Air (November 2023). The cancer and non-cancer end-point IASLs for air are based on the calculation of contaminant intake through inhalation that would produce the probability of a one in one-million (1×10-6) excess cancer risk. The IASL was adjusted for screening soil gas data by using the appropriate attenuation factor (AF) described in DTSC's 2023 Supplemental Guidance: Screening and Evaluation Vapor Intrusion (SEVI 2023). According to the SEVI 2023, "Vapor attenuation refers to the reduction in VFC concentrations that occurs during vapor migration in the subsurface, coupled with the dilution that can occur when the vapors enter a building and mix with indoor air (Johnson and Ettinger, 1991)." The SEVI 2023 recommended AFs for screening are based on the Office of Solid Waste and Emergency Response (OSWER) Technical Guide for Assessing and

Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air (USEPA 2015). The recommended AF that are deemed to be protective for public health under most scenarios and can be used for the initial screening of site has been determined to be 0.03. AEG was informed that the Site will be developed into mixed use property composing of slab-on-grade residential and commercial buildings. Screening levels were calculated by dividing the DTSC/HERO Note 3 IASL for residential air (or when it was not available to the EPA RSL for residential air) by the SEVI 2023 AF of 0.03.

RSLs are chemical-specific concentrations for individual contaminants in air, drinking water and soil that may warrant further investigation or Site cleanup. RSLs have been developed for both commercial/industrial and residential scenarios with residential RSLs being typically lower than commercial/industrial scenarios. The process for derivation of DTSC/HERO Note 3 screening levels is based on the identical computational algorithms used to derive United States Environmental Protection Agency (USEPA) RSLs. Procedurally, a series of spreadsheet worksheets were populated with the algorithms, exposure and toxicity factors, and analyte roster used in the USEPA RSL process. DTSC screening levels were derived by populating copies of the aforementioned spreadsheet workbooks with California exposure and toxicity factors, and DTSC-specific methods. The final roster of DTSC screening levels includes only those analytes for which the combination of California-specific exposure and toxicity factors results in a soil or tap water DTSC-SL that is at least three times more stringent than the corresponding USEPA RSL value.

VOCs were detected in all 15 soil vapor samples analyzed for this investigation (14 primary and one field duplicate). The majority of the VOCs detected at each sampling location appear to be motor fuel related (gasoline) constituents. Chlorinated solvents such as PCE and TCE were not detected above reporting limits in the samples collected.

PCE is a chlorinated solvent commonly used in the past for industrial degreasing and dry cleaning operations. TCE is also a chlorinated solvent used in the past for industrial degreasing and cleaning and is a degradation by-product of PCE. The absence of PCE and TCE concentrations near the property line and within the subject property appears to confirm that soil vapor contamination has not migrated from the adjacent former Carioca Cleaners property and impacted the Site.

The contaminants of 1,2,4-Trimethylbenzene, benzene, ethylbenzene, toluene, and xylenes (meta-, para- & ortho-), appeared slightly above detection limits throughout the site with highest concentrations at SV-5-5 and SV-6-5. Concentrations of benzene ranged from non-detect at 5 $\mu g/m^3$ at a number of locations to a high of 4.8 $\mu g/m^3$ and 5.2 $\mu g/m^3$ at SV-6-5 and SV-5-5, respectively. Benzene concentrations appear to be isolated to these two areas on the Site which was previously a parking lot. Off-site sources were not observed but could also contribute to the benzene concentrations on Site.

The VOCs detected in soil vapor, number of detections, their concentration ranges and environmental screening levels (ESL) for human health risk from potential vapor intrusion at residential sites are listed in **Table 1**.

The California Department of Toxic Substances Control (DTSC), Human and Ecological Risk Office (HERO) residential ESL was exceeded by the following VOC: benzene (see **Table 1**). No other VOCs detected in soil vapor samples exceeded the residential ESLs.

5 Laboratory Quality Assurance/Quality Control Review

The laboratory analytical reports were reviewed and evaluated to assess the overall quality and usability of the data. No quality assurance and quality control (QA/QC) deficiencies or data qualifiers were noted that would otherwise disqualify use of the data for the project purpose. Supporting QA/QC documentation that was evaluated for the soil and soil vapor analytical reports included the following major items:

- Chain of Custody
- Sample Holding Times
- Surrogate Spike Recoveries
- Method Blanks (MB)
- Laboratory Control Samples (LCS)
- Laboratory Control Sample Duplicates (LCSD)
- Field Duplicates and Relative Percent Difference (RPD)
- Equipment Blanks
- Ambient Air Blanks
- Method Detection Level (MDL) and Reporting Limit (RL)
- Data Qualifiers

5.1 Data Qualifiers

Review of the final report of soil vapor sample analyses produced one data qualifier contained in laboratory analytical reports prepared for this investigation. A J-flag was used to note when a chemical constituent flagged was detected but below the Reporting Limit; therefore, the result is an estimated concentration (CLP- J-flag).

5.2 Soil Vapor Probe Equipment and Material Blanks

An equipment blank sample was prepared by collecting a sample from decontaminated equipment and analyzing the sample on-Site by EPA Method 8260B. The purpose of this procedure was to test for VOCs in equipment that may interfere with soil vapor and produce false positive data. . A material blank sample was prepared by collecting an air sample from an assembled soil vapor probe and analyzing the samples on-Site by EPA Method 8260B modified for soil gas. The purpose of this procedure was to confirm cleanliness of materials used for soil vapor probe construction as recommend by the DTSC 2015 Soil Gas Advisory. . VOCs were not detected in the equipment or material blank samples.

5.3 Soil Vapor Probe Shut-In and Tracer Leak Testing

The soil vapor sampling apparatus used by AEG is equipped with a vacuum gauge and valves used to perform a shut-in leak test of the sampling train between the top of the probe and the inlet to the vacuum pump. Shut-in tests were performed for each probe at a vacuum of at least 100 inches of water column for a period of at least one minute. No visible movement of the vacuum gauge needle was observed during the tests. Leak testing was also performed by applying a liquid leak tracer (2-propanol) to cotton swabs placed at the points where the probes daylight from the subsurface, and at the connections to the sampling apparatus. 2-propanol (or isopropanol) was not detected in any of the soil vapor samples analyzed for this project by EPA Method 8260B. These results demonstrate leakage of ambient air into the soil vapor probes did not occur during sampling.

6 Conclusions

AEG concludes the following regarding the findings of this Phase II ESA performed at 13751 and 13841 Red Hill Avenue in Tustin, California:

- PCE and TCE were not detected in soil vapor above reporting limits on the Site.
- VOCs were detected in every soil vapor sample collected for this project. Most of the VOCs detected appear to be motor fuel related (gasoline).
- The ESL for benzene was exceeded at locations SV-5 and SV-6 at 5-feet (see **Table 1**). No other VOCs detected in soil vapor exceeded their respective residential ESLs.

7 Recommendations

AEG makes the following recommendations based on the findings of this investigation:

- All soil vapor samples had detections of VOCs. All compounds detected with the exception of benzene are below their respective ESLs for residential site use.
- Benzene was detected at locations SV-5 and SV-6 at a depth of 5-feet bgs at concentrations of 5.2 $\mu g/m^3$ and 4.8 $\mu g/m^3$, respectively. These concentrations slightly exceed the residential ESL of 3.2 $\mu g/m^3$. AEG was informed by a representative of Space IAG 1, LLC as part of the redevelopment, that the first 3 – 5 feet of soil will be removed as part of the grading process. As the occurrence of benzene only slightly exceeded its respective ESL in soil vapor within the first 5-feet of soil, the grading process should potentially remove and aerate some if not all of the contaminant; as such, it does not appear benzene in soil vapor poses a vapor intrusion risk to future residential structures on the Site.
- AEG understands that Space IAG 1, LLC is planning to redevelop the property for mixed use with commercial and residential properties being constructed slab-on-grade. The detections of VOCs do not require any additional site mitigation measure for the planned construction.

- AEG recommends no further action or testing is required for the Site.

8 References

Department of Toxic Substances Control (DTSC), *Advisory Active Soil Gas Investigations,* July 2015

United States Environmental Protection Agency Office of Solid Waste and Emergency Response (OSWER), *Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air*, June 2015

DTSC's Human and Ecological Risk Office, *Human Health Risk Assessment (HHRA) Note Number 3, DTSC-modified Screening Levels (DTSC-SLs)*, June 2020 – Revised May 2022

DTSC *Supplemental Guidance: Screening and Evaluation Vapor Intrusion*, February 2023

Environmental Protection Agency (EPA) *Region 9 Regional Screening Levels for Residential Air*, November 2023

Advanced Environmental Group, Inc., *Phase I Environmental Site Assessment, 13751 and 13841 Red Hill Avenue, Tustin, California 92780*, December 2023

Tables

TABLE 1
SOIL VAPOR SAMPLING RESULTS FOR VOCs
13751 AND 13841 RED HILL AVENUE, TUSTIN, CA

Probe ID	**Depth (ft)**	**Date**	**Benzene**	**Ethylbenzene**	**p-Isopropyltoluene**	**Tetrachloroethene**	**Toluene**	**Trichloroethene**	**1,2,4-Trimethylbenzene**	**1,3,5-Trimethylbenzene**	**meta- and para-Xylenes**	**ortho-Xylene**
			µg/m^3									
SV-1	5	1/4/2024	<5.0	<10	**7.0J**	<5.0	**18**	<5.0	**5.8**	<5.0	**15**	**4.2J**
	15	1/4/2024	<5.0	<10	<10	<5.0	**9.2**	<5.0	<5.0	<5.0	**3.8J**	<5.0
SV-2	5	1/4/2024	<5.0	**5.4J**	<10	<5.0	**23**	<5.0	**5.0**	**5.8**	**20**	**6.4**
	15	1/4/2024	<5.0	<10	<10	<5.0	**10**	<5.0	<5.0	<5.0	**3.0J**	<5.0
SV-3	5	1/4/2024	<5.0	<10	<10	<5.0	**7.8**	<5.0	<5.0	<5.0	**4.0J**	<5.0
	15	1/4/2024	<5.0	<10	<10	<5.0	**12**	<5.0	<5.0	<5.0	**4.2J**	<5.0
SV-4	5	1/4/2024	<5.0	<10	<10	<5.0	**16**	<5.0	<5.0	<5.0	**8.2**	<5.0
	15	1/4/2024	<5.0	<10	<10	<5.0	**12**	<5.0	<5.0	<5.0	**3.6J**	<5.0
SV-5	5	1/4/2024	**5.2**	**11**	<10	<5.0	**40**	<5.0	**9.2**	<5.0	**39**	**12**
	15	1/4/2024	<5.0	**10**	<10	<5.0	**31**	<5.0	**3.8J**	<5.0	**40**	**12**
SV-6	5	1/4/2024	**4.8J**	**9.2J**	<10	<5.0	**42**	<5.0	**8.4**	<5.0	**30**	**10**
	15	1/4/2024	<5.0	<10	<10	<5.0	**42**	<5.0	<5.0	<5.0	**8.4**	<5.0
SV-7	5	1/4/2024	<5.0	<10	<10	<5.0	**13**	<5.0	<5.0	<5.0	**8.6**	<5.0
	Dup	1/4/2024	<5.0	<10	<10	<5.0	**13**	<5.0	<5.0	<5.0	**9.2**	<5.0
	15	1/4/2024	<5.0	<10	<10	<5.0	**6.8**	<5.0	<5.0	<5.0	<5.0	<5.0
Screening Level												
HERO Note 3 (Residential)			**3.2**	NA	NA	**15**	**10,333**	NA	NA	NA	NA	NA
RSL Region 9 (Residential)			**12**	**37**	NA	**367**	**173,333**	**16**	**2,100**	**2,100**	**3,333**	**3,333**

Notes:

µg/ =m^3 micrograms per cubic meter

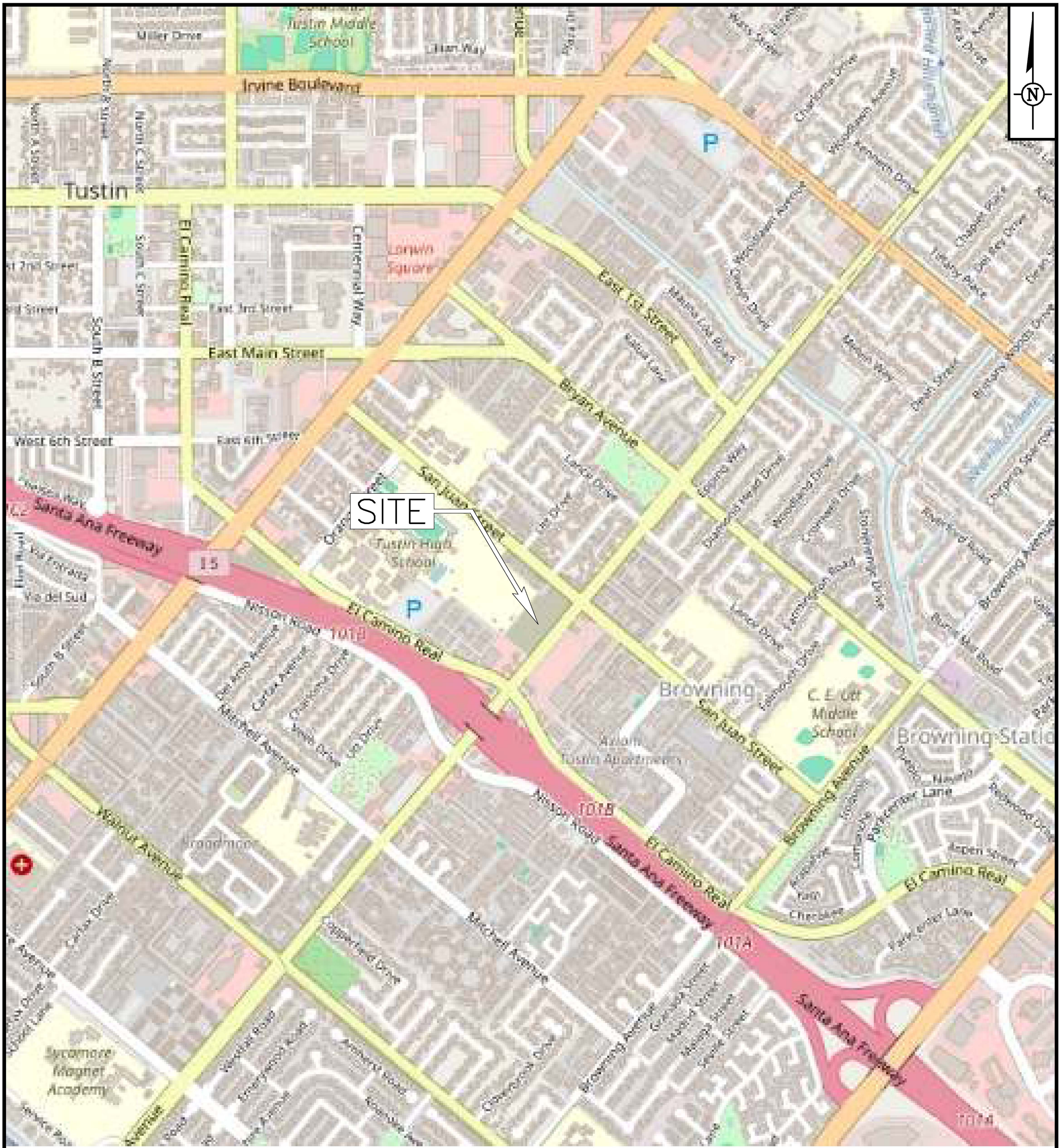
NA = Not Applicable

HERO Note 3 (Residential) = California Department of Toxic Substances Control, Human and Ecological Risk Office (HERO) - Enivronmental Screening Levels - May 2022

RSL Region 9 (Residential) = Environmental Protection Agency Regional Screening Levels Region 9 - November 2023

HERO Note 3 and RSL Region 9 Ambient Air Analytes Are Adjusted for Soil Gas Using an Attenuation Factor of 0.03

Figures



Map Source: Openstreetmap.org

NOT TO SCALE

SITE LOCATION MAP

13751 and 13841 Red Hill Avenue
Tustin, Ca

Phase II Environmental Site Assessment

Project Number EMS588

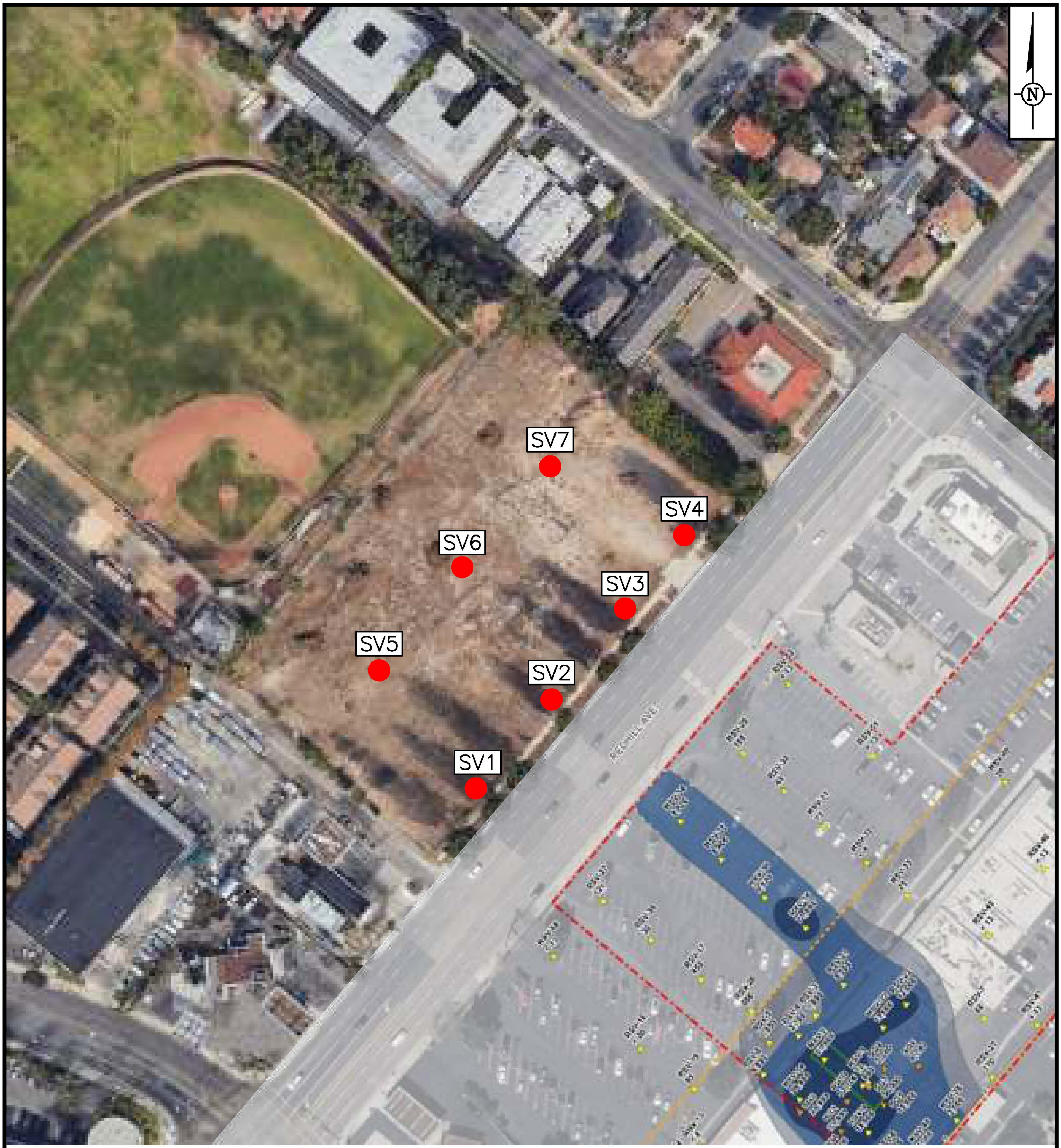
Project Manager AS

Drafter AF

Date 01/10/2024

Advanced Environmental Group, Inc

Figure 1



Map Source: Google Earth

● Soil Vapor Probe Locations 5 and 15 Ft.

NOT TO SCALE

SOIL VAPOR PROBE LOCATIONS

13751 and 13841 Red Hill Avenue
Tustin, Ca

Phase II Environmental Site Assessment

Project Number EMS588

Project Manager AS

Drafter AF

Date 01/10/2024

AEG Advanced Environmental Group, Inc

Figure 2

Appendix A

Laboratory Report for Soil Vapor

January 08, 2024

Craig Swanson
MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

RE: 13751 & 13841 Red Hill Ave. Tustin CA. 92780

Enclosed are the results of analyses for soil gas samples received by Environmental Support Technologies laboratory on 01/04/24 15:16. The analyses were performed according to the prescribed method as outlined by EPA 8260B. A shut in test was performed, leak test was performed, equipment blank was run, and selected purge volume was 3PV. If you have any questions concerning this report, please feel free to contact Project Manager.

Sincerely,

Ashley Flores

Ashley Flores
Project Manager

Environmental Support Technologies laboratories are certified by the California Department of Health Services (CDHS), Environmental Laboratory Accreditation Program (ELAP) No's. 2772.

8 Goodyear, Suite 125 , Irvine, CA. 92618
Telephone: (949) 679-9500   Fax: (949) 679-9501

MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Analyzed
Equipment Blank	BA40401-01	Air	04-Jan-24 07:15	04-Jan-24 07:30
Material Blank	BA40401-02	Air	04-Jan-24 07:50	04-Jan-24 08:03
SV-7-5	BA40401-03	Air	04-Jan-24 11:05	04-Jan-24 11:25
SV-7-5-DUP	BA40401-04	Air	04-Jan-24 12:05	04-Jan-24 12:20
SV-7-15	BA40401-05	Air	04-Jan-24 12:35	04-Jan-24 12:47
SV-6-5	BA40401-06	Air	04-Jan-24 13:00	04-Jan-24 13:14
SV-6-15	BA40401-07	Air	04-Jan-24 13:25	04-Jan-24 13:40
SV-5-5	BA40401-08	Air	04-Jan-24 13:55	04-Jan-24 14:07
SV-5-15	BA40401-09	Air	04-Jan-24 14:20	04-Jan-24 14:34
SV-1-5	BA40401-10	Air	04-Jan-24 14:45	04-Jan-24 15:01
SV-1-15	BA40401-11	Air	04-Jan-24 15:15	04-Jan-24 15:28
SV-2-5	BA40401-12	Air	04-Jan-24 15:40	04-Jan-24 15:55
SV-2-15	BA40401-13	Air	04-Jan-24 16:10	04-Jan-24 16:22
SV-3-5	BA40401-14	Air	04-Jan-24 16:35	04-Jan-24 16:49
SV-3-15	BA40401-15	Air	04-Jan-24 17:00	04-Jan-24 17:14
SV-4-5	BA40401-16	Air	04-Jan-24 17:25	04-Jan-24 17:40
SV-4-15	BA40401-17	Air	04-Jan-24 19:10	04-Jan-24 19:22

The results in this report apply to the samples analyzed. This analytical report must be reproduced in its entirety.

EXECUTIVE SUMMARY

Client ID: **Equipment Blank** Lab ID: **BA40401-01**

No Results Detected

Client ID: **Material Blank** Lab ID: **BA40401-02**

No Results Detected

EXECUTIVE SUMMARY

Client ID: **SV-7-5** Lab ID: **BA40401-03**

Analyte	Results/Qual	DL	RL	Units	Method
meta- and para-Xylenes	8.6	1.5	5.0	ug/m³	EPA 8260B
Toluene	13	0.62	5.0	ug/m³	EPA 8260B

Client ID: **SV-7-5-DUP** Lab ID: **BA40401-04**

Analyte	Results/Qual	DL	RL	Units	Method
meta- and para-Xylenes	9.2	1.5	5.0	ug/m³	EPA 8260B
Toluene	13	0.62	5.0	ug/m³	EPA 8260B

Client ID: **SV-7-15** Lab ID: **BA40401-05**

Analyte	Results/Qual	DL	RL	Units	Method
Toluene	6.8	0.62	5.0	ug/m³	EPA 8260B

Client ID: **SV-6-5** Lab ID: **BA40401-06**

Analyte	Results/Qual	DL	RL	Units	Method
1,2,4-Trimethylbenzene	8.4	0.65	5.0	ug/m³	EPA 8260B
Benzene	4.8 J	0.65	5.0	ug/m³	EPA 8260B
Ethylbenzene	9.2 J	0.70	10	ug/m³	EPA 8260B
meta- and para-Xylenes	30	1.5	5.0	ug/m³	EPA 8260B
ortho-Xylene	10	0.77	5.0	ug/m³	EPA 8260B
Toluene	42	0.62	5.0	ug/m³	EPA 8260B

Client ID: **SV-6-15** Lab ID: **BA40401-07**

Analyte	Results/Qual	DL	RL	Units	Method
meta- and para-Xylenes	8.4	1.5	5.0	ug/m³	EPA 8260B
Toluene	14	0.62	5.0	ug/m³	EPA 8260B

EXECUTIVE SUMMARY

Client ID: **SV-5-5** Lab ID: **BA40401-08**

Analyte	Results	Qual	DL	RL	Units	Method
1,2,4-Trimethylbenzene	9.2		0.65	5.0	ug/m^3	EPA 8260B
Benzene	5.2		0.65	5.0	ug/m^3	EPA 8260B
Ethylbenzene	11		0.70	10	ug/m^3	EPA 8260B
meta- and para-Xylenes	39		1.5	5.0	ug/m^3	EPA 8260B
ortho-Xylene	12		0.77	5.0	ug/m^3	EPA 8260B
Toluene	40		0.62	5.0	ug/m^3	EPA 8260B

Client ID: **SV-5-15** Lab ID: **BA40401-09**

Analyte	Results	Qual	DL	RL	Units	Method
1,2,4-Trimethylbenzene	3.8	J	0.65	5.0	ug/m^3	EPA 8260B
Ethylbenzene	10		0.70	10	ug/m^3	EPA 8260B
meta- and para-Xylenes	40		1.5	5.0	ug/m^3	EPA 8260B
ortho-Xylene	12		0.77	5.0	ug/m^3	EPA 8260B
Toluene	31		0.62	5.0	ug/m^3	EPA 8260B

Client ID: **SV-1-5** Lab ID: **BA40401-10**

Analyte	Results	Qual	DL	RL	Units	Method
1,2,4-Trimethylbenzene	5.8		0.65	5.0	ug/m^3	EPA 8260B
meta- and para-Xylenes	15		1.5	5.0	ug/m^3	EPA 8260B
ortho-Xylene	4.2	J	0.77	5.0	ug/m^3	EPA 8260B
p-Isopropyltoluene	7.0	J	0.59	10	ug/m^3	EPA 8260B
Toluene	18		0.62	5.0	ug/m^3	EPA 8260B

Client ID: **SV-1-15** Lab ID: **BA40401-11**

Analyte	Results	Qual	DL	RL	Units	Method
meta- and para-Xylenes	3.8	J	1.5	5.0	ug/m^3	EPA 8260B
Toluene	9.2		0.62	5.0	ug/m^3	EPA 8260B

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17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

EXECUTIVE SUMMARY

Client ID: **SV-2-5** Lab ID: **BA40401-12**

Analyte	Results/Qual	DL	RL	Units	Method
1,2,4-Trimethylbenzene	5.0	0.65	5.0	ug/m^3	EPA 8260B
1,3,5-Trimethylbenzene	5.8	0.64	5.0	ug/m^3	EPA 8260B
Ethylbenzene	5.4 J	0.70	10	ug/m^3	EPA 8260B
meta- and para-Xylenes	20	1.5	5.0	ug/m^3	EPA 8260B
ortho-Xylene	6.4	0.77	5.0	ug/m^3	EPA 8260B
Toluene	23	0.62	5.0	ug/m^3	EPA 8260B

Client ID: **SV-2-15** Lab ID: **BA40401-13**

Analyte	Results/Qual	DL	RL	Units	Method
meta- and para-Xylenes	3.0 J	1.5	5.0	ug/m^3	EPA 8260B
Toluene	10	0.62	5.0	ug/m^3	EPA 8260B

Client ID: **SV-3-5** Lab ID: **BA40401-14**

Analyte	Results/Qual	DL	RL	Units	Method
meta- and para-Xylenes	4.0 J	1.5	5.0	ug/m^3	EPA 8260B
Toluene	7.8	0.62	5.0	ug/m^3	EPA 8260B

Client ID: **SV-3-15** Lab ID: **BA40401-15**

Analyte	Results/Qual	DL	RL	Units	Method
meta- and para-Xylenes	4.2 J	1.5	5.0	ug/m^3	EPA 8260B
Toluene	12	0.62	5.0	ug/m^3	EPA 8260B

Client ID: **SV-4-5** Lab ID: **BA40401-16**

Analyte	Results/Qual	DL	RL	Units	Method
meta- and para-Xylenes	8.2	1.5	5.0	ug/m^3	EPA 8260B
Toluene	16	0.62	5.0	ug/m^3	EPA 8260B

Client ID: **SV-4-15** Lab ID: **BA40401-17**

Analyte	Results/Qual	DL	RL	Units	Method
meta- and para-Xylenes	3.6 J	1.5	5.0	ug/m^3	EPA 8260B
Toluene	12	0.62	5.0	ug/m^3	EPA 8260B

Environmental Support Technologies does not accept liability for the consequences of any actions taken solely on the basis of the information provided in the Executive Summary section of this report. Users must review this report in its entirety to determine data usability and assessment.

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Equipment Blank (BA40401-01) Air Sampled: 01/04/24 07:15 Analyzed: 01/04/24 07:30										
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Equipment Blank (BA40401-01) Air Sampled: 01/04/24 07:15 Analyzed: 01/04/24 07:30										
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	ND	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	ND	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*93.6 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*97.6 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*95.2 %*		*75-125*		"	"	"	"	

Volatile Organic Compounds
Environmental Support Technologies-3

Material Blank (BA40401-02) Air   Sampled: 01/04/24 07:50   Analyzed: 01/04/24 08:03

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

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Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

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08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Material Blank (BA40401-02) Air Sampled: 01/04/24 07:50 Analyzed: 01/04/24 08:03										
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	ND	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	ND	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*91.2 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*99.2 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*97.6 %*		*75-125*		"	"	"	"	

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Reported:
08-Jan-24 10:02

Volatile Organic Compounds
Environmental Support Technologies-3

SV-7-5 (BA40401-03) Air Sampled: 01/04/24 11:05 Analyzed: 01/04/24 11:25

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

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08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-7-5 (BA40401-03) Air	**Sampled: 01/04/24 11:05**	**Analyzed: 01/04/24 11:25**								
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**8.6**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**13**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*86.4 %*			*75-125*	"	"	"	"	
Surrogate: Toluene-d8		*99.2 %*			*75-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*90.4 %*			*75-125*	"	"	"	"	

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-7-5-DUP (BA40401-04) Air	**Sampled: 01/04/24 12:05**		**Analyzed: 01/04/24 12:20**							
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-7-5-DUP (BA40401-04) Air	**Sampled: 01/04/24 12:05**		**Analyzed: 01/04/24 12:20**							
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**9.2**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**13**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*87.2 %*			*75-125*	"	"	"	"	
Surrogate: Toluene-d8		*96.0 %*			*75-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*90.4 %*			*75-125*	"	"	"	"	

MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

Volatile Organic Compounds
Environmental Support Technologies-3

SV-7-15 (BA40401-05) Air   Sampled: 01/04/24 12:35   Analyzed: 01/04/24 12:47

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

MSM Global Ventures	Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780	
17475 Gillette Ave. Suite A	Project Number: EMS588	**Reported:**
Irvine, CA 92614	Project Manager: Craig Swanson	08-Jan-24 10:02

Volatile Organic Compounds
Environmental Support Technologies-3

SV-7-15 (BA40401-05) Air Sampled: 01/04/24 12:35 Analyzed: 01/04/24 12:47

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	ND	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**6.8**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*89.6 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*95.2 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*89.6 %*		*75-125*		"	"	"	"	

Volatile Organic Compounds
Environmental Support Technologies-3

SV-6-5 (BA40401-06) Air Sampled: 01/04/24 13:00 Analyzed: 01/04/24 13:14

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	**8.4**	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	**4.8**	5.0	0.65	"	"	"	"	"	"	J
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-6-5 (BA40401-06) Air	**Sampled: 01/04/24 13:00**	**Analyzed: 01/04/24 13:14**								
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	**9.2**	10	0.70	"	"	"	"	"	"	J
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**30**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	**10**	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**42**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*87.2 %*			*75-125*	"	"	"	"	
Surrogate: Toluene-d8		*94.4 %*			*75-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*89.6 %*			*75-125*	"	"	"	"	

The results in this report apply to the samples analyzed. This analytical report must be reproduced in its entirety.

Volatile Organic Compounds
Environmental Support Technologies-3

SV-6-15 (BA40401-07) Air Sampled: 01/04/24 13:25 Analyzed: 01/04/24 13:40

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m³	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

Volatile Organic Compounds

Environmental Support Technologies-3

SV-6-15 (BA40401-07) Air   Sampled: 01/04/24 13:25   Analyzed: 01/04/24 13:40

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**8.4**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**14**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*88.8 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*93.6 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*96.0 %*		*75-125*		"	"	"	"	

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-5-5 (BA40401-08) Air	**Sampled: 01/04/24 13:55**	**Analyzed: 01/04/24 14:07**								
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m³	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	**9.2**	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	**5.2**	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

Volatile Organic Compounds
Environmental Support Technologies-3

SV-5-5 (BA40401-08) Air   Sampled: 01/04/24 13:55   Analyzed: 01/04/24 14:07

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	**11**	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**39**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	**12**	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**40**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*95.2 %*			*75-125*	"	"	"	"	
Surrogate: Toluene-d8		*91.2 %*			*75-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*92.8 %*			*75-125*	"	"	"	"	

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08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-5-15 (BA40401-09) Air	**Sampled: 01/04/24 14:20**	**Analyzed: 01/04/24 14:34**								
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	**3.8**	5.0	0.65	"	"	"	"	"	"	J
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

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08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

SV-5-15 (BA40401-09) Air Sampled: 01/04/24 14:20 Analyzed: 01/04/24 14:34

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	**10**	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**40**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	**12**	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**31**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*88.8 %*			*75-125*	"	"	"	"	
Surrogate: Toluene-d8		*94.4 %*			*75-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*92.8 %*			*75-125*	"	"	"	"	

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-1-5 (BA40401-10) Air	**Sampled: 01/04/24 14:45**	**Analyzed: 01/04/24 15:01**								
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	**5.8**	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-1-5 (BA40401-10) Air	**Sampled: 01/04/24 14:45**	**Analyzed: 01/04/24 15:01**								
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**15**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	**4.2**	5.0	0.77	"	"	"	"	"	"	J
p-Isopropyltoluene	**7.0**	10	0.59	"	"	"	"	"	"	J
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**18**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*91.2 %*			*75-125*	"	"	"	"	
Surrogate: Toluene-d8		*96.8 %*			*75-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*88.8 %*			*75-125*	"	"	"	"	

The results in this report apply to the samples analyzed. This analytical report must be reproduced in its entirety.

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-1-15 (BA40401-11) Air Sampled: 01/04/24 15:15 Analyzed: 01/04/24 15:28										
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-1-15 (BA40401-11) Air	**Sampled: 01/04/24 15:15**		**Analyzed: 01/04/24 15:28**							
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**3.8**	5.0	1.5	"	"	"	"	"	"	J
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**9.2**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*93.6 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*94.4 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*89.6 %*		*75-125*		"	"	"	"	

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-2-5 (BA40401-12) Air	**Sampled: 01/04/24 15:40**	**Analyzed: 01/04/24 15:55**								
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	**5.0**	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	**5.8**	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-2-5 (BA40401-12) Air	**Sampled: 01/04/24 15:40**	**Analyzed: 01/04/24 15:55**								
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	**5.4**	10	0.70	"	"	"	"	"	"	J
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**20**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	**6.4**	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**23**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*96.0 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*92.0 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*91.2 %*		*75-125*		"	"	"	"	

The results in this report apply to the samples analyzed. This analytical report must be reproduced in its entirety.

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-2-15 (BA40401-13) Air	**Sampled: 01/04/24 16:10**		**Analyzed: 01/04/24 16:22**							
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-2-15 (BA40401-13) Air	**Sampled: 01/04/24 16:10**		**Analyzed: 01/04/24 16:22**							
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**3.0**	5.0	1.5	"	"	"	"	"	"	J
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**10**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*93.6 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*96.0 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*96.0 %*		*75-125*		"	"	"	"	

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-3-5 (BA40401-14) Air	**Sampled: 01/04/24 16:35**	**Analyzed: 01/04/24 16:49**								
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-3-5 (BA40401-14) Air	**Sampled: 01/04/24 16:35**	**Analyzed: 01/04/24 16:49**								
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**4.0**	5.0	1.5	"	"	"	"	"	"	J
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**7.8**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*90.4 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*98.4 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*93.6 %*		*75-125*		"	"	"	"	

MSM Global Ventures	Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780	
17475 Gillette Ave. Suite A	Project Number: EMS588	**Reported:**
Irvine, CA 92614	Project Manager: Craig Swanson	08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

SV-3-15 (BA40401-15) Air Sampled: 01/04/24 17:00 Analyzed: 01/04/24 17:14

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-3-15 (BA40401-15) Air	**Sampled: 01/04/24 17:00**		**Analyzed: 01/04/24 17:14**							
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**4.2**	5.0	1.5	"	"	"	"	"	"	J
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**12**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*93.6 %*			*75-125*	"	"	"	"	
Surrogate: Toluene-d8		*97.6 %*			*75-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*96.8 %*			*75-125*	"	"	"	"	

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-4-5 (BA40401-16) Air	**Sampled: 01/04/24 17:25**	**Analyzed: 01/04/24 17:40**								
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

Volatile Organic Compounds

Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-4-5 (BA40401-16) Air	**Sampled: 01/04/24 17:25**	**Analyzed: 01/04/24 17:40**								
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**8.2**	5.0	1.5	"	"	"	"	"	"	
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**16**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*87.2 %*			*75-125*	"	"	"	"	
Surrogate: Toluene-d8		*99.2 %*			*75-125*	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*92.0 %*			*75-125*	"	"	"	"	

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-4-15 (BA40401-17) Air Sampled: 01/04/24 19:10 Analyzed: 01/04/24 19:22										
1,1,1,2-Tetrachloroethane	ND	5.0	0.76	ug/m^3	1	B4A0401	01/04/24	01/04/24	EPA 8260B	
1,1,1-Trichloroethane	ND	5.0	0.48	"	"	"	"	"	"	
1,1,2,2-Tetrachloroethane	ND	5.0	1.3	"	"	"	"	"	"	
1,1,2-Trichloroethane	ND	5.0	1.4	"	"	"	"	"	"	
1,1,2-Trichloro-trifluoroethane	ND	5.0	0.50	"	"	"	"	"	"	
1,1-Dichloroethane	ND	5.0	0.57	"	"	"	"	"	"	
1,1-Dichloroethene	ND	5.0	0.54	"	"	"	"	"	"	
1,1-Dichloropropene	ND	5.0	0.63	"	"	"	"	"	"	
1,2,3-Trichlorobenzene	ND	10	0.87	"	"	"	"	"	"	
1,2,3-Trichloropropane	ND	5.0	1.4	"	"	"	"	"	"	
1,2,4-Trichlorobenzene	ND	5.0	0.94	"	"	"	"	"	"	
1,2,4-Trimethylbenzene	ND	5.0	0.65	"	"	"	"	"	"	
1,2-Dibromo-3-chloropropane	ND	45	0.65	"	"	"	"	"	"	
1,2-Dibromoethane	ND	5.0	1.2	"	"	"	"	"	"	
1,2-Dichlorobenzene	ND	5.0	0.84	"	"	"	"	"	"	
1,2-Dichloroethane	ND	5.0	0.88	"	"	"	"	"	"	
1,2-Dichloropropane	ND	10	0.66	"	"	"	"	"	"	
1,3,5-Trimethylbenzene	ND	5.0	0.64	"	"	"	"	"	"	
1,3-Dichlorobenzene	ND	5.0	0.70	"	"	"	"	"	"	
1,3-Dichloropropane	ND	5.0	0.85	"	"	"	"	"	"	
1,4-Dichlorobenzene	ND	5.0	0.64	"	"	"	"	"	"	
2,2-Dichloropropane	ND	20	1.1	"	"	"	"	"	"	
2-Chlorotoluene	ND	5.0	0.68	"	"	"	"	"	"	
4-Chlorotoluene	ND	5.0	0.72	"	"	"	"	"	"	
Benzene	ND	5.0	0.65	"	"	"	"	"	"	
Bromobenzene	ND	5.0	0.74	"	"	"	"	"	"	
Bromochloromethane	ND	90	1.1	"	"	"	"	"	"	
Bromodichloromethane	ND	5.0	0.60	"	"	"	"	"	"	
Bromoform	ND	5.0	0.84	"	"	"	"	"	"	
Bromomethane	ND	10	0.94	"	"	"	"	"	"	
Carbon disulfide	ND	5.0	0.60	"	"	"	"	"	"	
Carbon tetrachloride	ND	20	0.87	"	"	"	"	"	"	
Chlorobenzene	ND	5.0	0.82	"	"	"	"	"	"	
Chloroethane	ND	5.0	0.42	"	"	"	"	"	"	

MSM Global Ventures
17475 Gillette Ave. Suite A
Irvine, CA 92614

Project: 13751 & 13841 Red Hill Ave. Tustin CA. 92780
Project Number: EMS588
Project Manager: Craig Swanson

Reported:
08-Jan-24 10:02

Volatile Organic Compounds
Environmental Support Technologies-3

Analyte	Result	Reporting Limit	MDL	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SV-4-15 (BA40401-17) Air	**Sampled: 01/04/24 19:10**		**Analyzed: 01/04/24 19:22**							
Chloroform	ND	5.0	0.59	"	"	"	"	"	"	
Chloromethane	ND	10	0.79	"	"	"	"	"	"	
cis-1,2-Dichloroethene	ND	10	0.57	"	"	"	"	"	"	
cis-1,3-Dichloropropene	ND	20	0.57	"	"	"	"	"	"	
Dibromochloromethane	ND	5.0	1.4	"	"	"	"	"	"	
Dibromomethane	ND	5.0	0.68	"	"	"	"	"	"	
Dichlorodifluoromethane	ND	5.0	1.1	"	"	"	"	"	"	
Ethylbenzene	ND	10	0.70	"	"	"	"	"	"	
Hexachlorobutadiene	ND	20	1.1	"	"	"	"	"	"	
Isopropylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
meta- and para-Xylenes	**3.6**	5.0	1.5	"	"	"	"	"	"	J
Methylene Chloride	ND	5.0	0.78	"	"	"	"	"	"	
Naphthalene	ND	5.0	1.4	"	"	"	"	"	"	
n-Butylbenzene	ND	5.0	0.63	"	"	"	"	"	"	
n-Propylbenzene	ND	5.0	0.67	"	"	"	"	"	"	
ortho-Xylene	ND	5.0	0.77	"	"	"	"	"	"	
p-Isopropyltoluene	ND	10	0.59	"	"	"	"	"	"	
sec-Butylbenzene	ND	5.0	0.79	"	"	"	"	"	"	
Styrene	ND	5.0	0.63	"	"	"	"	"	"	
tert-Butylbenzene	ND	5.0	0.73	"	"	"	"	"	"	
Tetrachloroethene	ND	5.0	0.56	"	"	"	"	"	"	
Toluene	**12**	5.0	0.62	"	"	"	"	"	"	
trans-1,2-Dichloroethene	ND	10	0.70	"	"	"	"	"	"	
trans-1,3-Dichloropropene	ND	20	0.71	"	"	"	"	"	"	
Trichloroethene	ND	5.0	0.73	"	"	"	"	"	"	
Trichlorofluoromethane	ND	5.0	0.67	"	"	"	"	"	"	
Vinyl Chloride	ND	5.0	0.81	"	"	"	"	"	"	
2-Propanol	ND	5.0	1.3	"	"	"	"	"	"	
Surrogate: Dibromofluoromethane		*87.2 %*		*75-125*		"	"	"	"	
Surrogate: Toluene-d8		*99.2 %*		*75-125*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*89.6 %*		*75-125*		"	"	"	"	

Volatile Organic Compounds - Quality Control
Environmental Support Technologies-3

Analyte	MDL	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B4A0401 - Volatiles											
Blank (B4A0401-BLK1)					Prepared & Analyzed: 01/04/24						
1,1,1,2-Tetrachloroethane	0.76	ND	5.0	ug/m³							
1,1,1-Trichloroethane	0.48	ND	5.0	"							
1,1,2,2-Tetrachloroethane	1.3	ND	5.0	"							
1,1,2-Trichloroethane	1.4	ND	5.0	"							
1,1,2-Trichloro-trifluoroethane	0.50	ND	5.0	"							
1,1-Dichloroethane	0.57	ND	5.0	"							
1,1-Dichloroethene	0.54	ND	5.0	"							
1,1-Dichloropropene	0.63	ND	5.0	"							
1,2,3-Trichlorobenzene	0.87	ND	10	"							
1,2,3-Trichloropropane	1.4	ND	5.0	"							
1,2,4-Trichlorobenzene	0.94	ND	5.0	"							
1,2,4-Trimethylbenzene	0.65	ND	5.0	"							
1,2-Dibromo-3-chloropropane	0.65	ND	45	"							
1,2-Dibromoethane	1.2	ND	5.0	"							
1,2-Dichlorobenzene	0.84	ND	5.0	"							
1,2-Dichloroethane	0.88	ND	5.0	"							
1,2-Dichloropropane	0.66	ND	10	"							
1,3,5-Trimethylbenzene	0.64	ND	5.0	"							
1,3-Dichlorobenzene	0.70	ND	5.0	"							
1,3-Dichloropropane	0.85	ND	5.0	"							
1,4-Dichlorobenzene	0.64	ND	5.0	"							
2,2-Dichloropropane	1.1	ND	20	"							
2-Chlorotoluene	0.68	ND	5.0	"							
4-Chlorotoluene	0.72	ND	5.0	"							
Benzene	0.65	ND	5.0	"							
Bromobenzene	0.74	ND	5.0	"							
Bromochloromethane	1.1	ND	90	"							
Bromodichloromethane	0.60	ND	5.0	"							
Bromoform	0.84	ND	5.0	"							
Bromomethane	0.94	ND	10	"							
Carbon disulfide	0.60	ND	5.0	"							
Carbon tetrachloride	0.87	ND	20	"							
Chlorobenzene	0.82	ND	5.0	"							

Volatile Organic Compounds - Quality Control
Environmental Support Technologies-3

Analyte	MDL	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B4A0401 - Volatiles											
Blank (B4A0401-BLK1)					Prepared & Analyzed: 01/04/24						
Chloroethane	0.42	ND	5.0	ug/m^3							
Chloroform	0.59	ND	5.0	"							
Chloromethane	0.79	ND	10	"							
cis-1,2-Dichloroethene	0.57	ND	10	"							
cis-1,3-Dichloropropene	0.57	ND	20	"							
Dibromochloromethane	1.4	ND	5.0	"							
Dibromomethane	0.68	ND	5.0	"							
Dichlorodifluoromethane	1.1	ND	5.0	"							
Ethylbenzene	0.70	ND	10	"							
Hexachlorobutadiene	1.1	ND	20	"							
Isopropylbenzene	0.67	ND	5.0	"							
meta- and para-Xylenes	1.5	ND	5.0	"							
Methylene Chloride	0.78	ND	5.0	"							
Naphthalene	1.4	ND	5.0	"							
n-Butylbenzene	0.63	ND	5.0	"							
n-Propylbenzene	0.67	ND	5.0	"							
ortho-Xylene	0.77	ND	5.0	"							
p-Isopropyltoluene	0.59	ND	10	"							
sec-Butylbenzene	0.79	ND	5.0	"							
Styrene	0.63	ND	5.0	"							
tert-Butylbenzene	0.73	ND	5.0	"							
Tetrachloroethene	0.56	ND	5.0	"							
Toluene	0.62	ND	5.0	"							
trans-1,2-Dichloroethene	0.70	ND	10	"							
trans-1,3-Dichloropropene	0.71	ND	20	"							
Trichloroethene	0.73	ND	5.0	"							
Trichlorofluoromethane	0.67	ND	5.0	"							
Vinyl Chloride	0.81	ND	5.0	"							
2-Propanol	1.3	ND	5.0	"							
Surrogate: Dibromofluoromethane		*2160*		*"*	*2500*		*86.4*	*75-125*			
Surrogate: Toluene-d8		*2520*		*"*	*2500*		*101*	*75-125*			
Surrogate: 4-Bromofluorobenzene		*2380*		*"*	*2500*		*95.2*	*75-125*			

Volatile Organic Compounds - Quality Control
Environmental Support Technologies-3

Analyte	MDL	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B4A0401 - Volatiles											
LCS (B4A0401-BS1)					Prepared & Analyzed: 01/04/24						
1,1,1,2-Tetrachloroethane	0.76	510	5.0	ug/m^3	500		102	75-136			
1,1,1-Trichloroethane	0.48	450	5.0	"	500		90.0	73-134			
1,1,2,2-Tetrachloroethane	1.3	470	5.0	"	500		94.0	56-149			
1,1,2-Trichloroethane	1.4	460	5.0	"	500		92.0	67-137			
1,1,2-Trichloro-trifluoroethane	0.50	530	5.0	"	500		106	83-125			
1,1-Dichloroethane	0.57	490	5.0	"	500		98.0	80-121			
1,1-Dichloroethene	0.54	560	5.0	"	500		112	73-137			
1,1-Dichloropropene	0.63	460	5.0	"	500		92.0	77-122			
1,2,3-Trichlorobenzene	0.87	510	10	"	500		102	67-133			
1,2,3-Trichloropropane	1.4	520	5.0	"	500		104	56-145			
1,2,4-Trichlorobenzene	0.94	510	5.0	"	500		102	71-135			
1,2,4-Trimethylbenzene	0.65	450	5.0	"	500		90.0	76-140			
1,2-Dibromo-3-chloropropane	0.65	480	45	"	500		96.0	43-158			
1,2-Dibromoethane	1.2	480	5.0	"	500		96.0	80-130			
1,2-Dichlorobenzene	0.84	450	5.0	"	500		90.0	67-139			
1,2-Dichloroethane	0.88	530	5.0	"	500		106	75-131			
1,2-Dichloropropane	0.66	540	10	"	500		108	62-144			
1,3,5-Trimethylbenzene	0.64	450	5.0	"	500		90.0	78-125			
1,3-Dichlorobenzene	0.70	450	5.0	"	500		90.0	82-120			
1,3-Dichloropropane	0.85	570	5.0	"	500		114	61-145			
1,4-Dichlorobenzene	0.64	470	5.0	"	500		94.0	84-120			
2,2-Dichloropropane	1.1	480	20	"	500		96.0	68-134			
2-Chlorotoluene	0.68	540	5.0	"	500		108	65-127			
4-Chlorotoluene	0.72	530	5.0	"	500		106	65-127			
Benzene	0.65	510	5.0	"	500		102	79-118			
Bromobenzene	0.74	470	5.0	"	500		94.0	69-140			
Bromochloromethane	1.1	540	90	"	500		108	61-141			
Bromodichloromethane	0.60	450	5.0	"	500		90.0	67-137			
Bromoform	0.84	500	5.0	"	500		100	57-152			
Bromomethane	0.94	450	10	"	500		90.0	51-148			
Carbon disulfide	0.60	490	5.0	"	500		98.0	61-140			
Carbon tetrachloride	0.87	500	20	"	500		100	74-143			
Chlorobenzene	0.82	470	5.0	"	500		94.0	67-140			

Volatile Organic Compounds - Quality Control
Environmental Support Technologies-3

Analyte	MDL	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B4A0401 - Volatiles											
LCS (B4A0401-BS1)					Prepared & Analyzed: 01/04/24						
Chloroethane	0.42	460	5.0	ug/m³	500		92.0	60-137			
Chloroform	0.59	450	5.0	"	500		90.0	82-140			
Chloromethane	0.79	560	10	"	500		112	58-139			
cis-1,2-Dichloroethene	0.57	520	10	"	500		104	85-116			
cis-1,3-Dichloropropene	0.57	450	20	"	500		90.0	66-142			
Dibromochloromethane	1.4	500	5.0	"	500		100	61-140			
Dibromomethane	0.68	480	5.0	"	500		96.0	66-143			
Dichlorodifluoromethane	1.1	540	5.0	"	500		108	47-129			
Ethylbenzene	0.70	470	10	"	500		94.0	70-125			
Hexachlorobutadiene	1.1	450	20	"	500		90.0	71-145			
Isopropylbenzene	0.67	490	5.0	"	500		98.0	85-116			
meta- and para-Xylenes	1.5	1000	5.0	"	1000		100	83-115			
Methylene Chloride	0.78	510	5.0	"	500		102	81-126			
Naphthalene	1.4	470	5.0	"	500		94.0	56-140			
n-Butylbenzene	0.63	500	5.0	"	500		100	60-149			
n-Propylbenzene	0.67	500	5.0	"	500		100	77-129			
ortho-Xylene	0.77	490	5.0	"	500		98.0	85-115			
p-Isopropyltoluene	0.59	500	10	"	500		100	63-144			
sec-Butylbenzene	0.79	460	5.0	"	500		92.0	68-128			
Styrene	0.63	460	5.0	"	500		92.0	65-142			
tert-Butylbenzene	0.73	470	5.0	"	500		94.0	60-128			
Tetrachloroethene	0.56	500	5.0	"	500		100	60-144			
Toluene	0.62	450	5.0	"	500		90.0	70-115			
trans-1,2-Dichloroethene	0.70	480	10	"	500		96.0	72-133			
trans-1,3-Dichloropropene	0.71	550	20	"	500		110	68-140			
Trichloroethene	0.73	520	5.0	"	500		104	68-132			
Trichlorofluoromethane	0.67	480	5.0	"	500		96.0	62-144			
Vinyl Chloride	0.81	460	5.0	"	500		92.0	66-137			
Surrogate: Dibromofluoromethane		*12900*		*"*	*12500*		*103*	*75-125*			
Surrogate: Toluene-d8		*13400*		*"*	*12500*		*107*	*75-125*			
Surrogate: 4-Bromofluorobenzene		*12600*		*"*	*12500*		*101*	*75-125*			

Volatile Organic Compounds - Quality Control
Environmental Support Technologies-3

Analyte	MDL	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B4A0401 - Volatiles											
Duplicate (B4A0401-DUP1)			**Source: BA40401-03**		Prepared & Analyzed: 01/04/24						
1,1,1,2-Tetrachloroethane	0.76	ND	5.0	ug/m³		ND				50	
1,1,1-Trichloroethane	0.48	ND	5.0	"		ND				50	
1,1,2,2-Tetrachloroethane	1.3	ND	5.0	"		ND				50	
1,1,2-Trichloroethane	1.4	ND	5.0	"		ND				50	
1,1,2-Trichloro-trifluoroethane	0.50	ND	5.0	"		ND				50	
1,1-Dichloroethane	0.57	ND	5.0	"		ND				50	
1,1-Dichloroethene	0.54	ND	5.0	"		ND				50	
1,1-Dichloropropene	0.63	ND	5.0	"		ND				50	
1,2,3-Trichlorobenzene	0.87	ND	10	"		ND				50	
1,2,3-Trichloropropane	1.4	ND	5.0	"		ND				50	
1,2,4-Trichlorobenzene	0.94	ND	5.0	"		ND				50	
1,2,4-Trimethylbenzene	0.65	ND	5.0	"		ND				50	
1,2-Dibromo-3-chloropropane	0.65	ND	45	"		ND				50	
1,2-Dibromoethane	1.2	ND	5.0	"		ND				50	
1,2-Dichlorobenzene	0.84	ND	5.0	"		ND				50	
1,2-Dichloroethane	0.88	ND	5.0	"		ND				50	
1,2-Dichloropropane	0.66	ND	10	"		ND				50	
1,3,5-Trimethylbenzene	0.64	ND	5.0	"		ND				50	
1,3-Dichlorobenzene	0.70	ND	5.0	"		ND				50	
1,3-Dichloropropane	0.85	ND	5.0	"		ND				50	
1,4-Dichlorobenzene	0.64	ND	5.0	"		ND				50	
2,2-Dichloropropane	1.1	ND	20	"		ND				50	
2-Chlorotoluene	0.68	ND	5.0	"		ND				50	
4-Chlorotoluene	0.72	ND	5.0	"		ND				50	
Benzene	0.65	ND	5.0	"		ND				50	
Bromobenzene	0.74	ND	5.0	"		ND				50	
Bromochloromethane	1.1	ND	90	"		ND				50	
Bromodichloromethane	0.60	ND	5.0	"		ND				50	
Bromoform	0.84	ND	5.0	"		ND				50	
Bromomethane	0.94	ND	10	"		ND				50	
Carbon disulfide	0.60	ND	5.0	"		ND				50	
Carbon tetrachloride	0.87	ND	20	"		ND				50	
Chlorobenzene	0.82	ND	5.0	"		ND				50	

Volatile Organic Compounds - Quality Control
Environmental Support Technologies-3

Analyte	MDL	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch B4A0401 - Volatiles											
Duplicate (B4A0401-DUP1)			**Source: BA40401-03**		Prepared & Analyzed: 01/04/24						
Chloroethane	0.42	ND	5.0	ug/m^3		ND				50	
Chloroform	0.59	ND	5.0	"		ND				50	
Chloromethane	0.79	ND	10	"		ND				50	
cis-1,2-Dichloroethene	0.57	ND	10	"		ND				50	
cis-1,3-Dichloropropene	0.57	ND	20	"		ND				50	
Dibromochloromethane	1.4	ND	5.0	"		ND				50	
Dibromomethane	0.68	ND	5.0	"		ND				50	
Dichlorodifluoromethane	1.1	ND	5.0	"		ND				50	
Ethylbenzene	0.70	ND	10	"		ND				50	
Hexachlorobutadiene	1.1	ND	20	"		ND				50	
Isopropylbenzene	0.67	ND	5.0	"		ND				50	
meta- and para-Xylenes	1.5	9.40	5.0	"		8.60			8.89	50	
Methylene Chloride	0.78	ND	5.0	"		ND				50	
Naphthalene	1.4	ND	5.0	"		ND				50	
n-Butylbenzene	0.63	ND	5.0	"		ND				50	
n-Propylbenzene	0.67	ND	5.0	"		ND				50	
ortho-Xylene	0.77	ND	5.0	"		ND				50	
p-Isopropyltoluene	0.59	ND	10	"		ND				50	
sec-Butylbenzene	0.79	ND	5.0	"		ND				50	
Styrene	0.63	ND	5.0	"		ND				50	
tert-Butylbenzene	0.73	ND	5.0	"		ND				50	
Tetrachloroethene	0.56	ND	5.0	"		ND				50	
Toluene	0.62	13.0	5.0	"		13.2			1.53	50	
trans-1,2-Dichloroethene	0.70	ND	10	"		ND				50	
trans-1,3-Dichloropropene	0.71	ND	20	"		ND				50	
Trichloroethene	0.73	ND	5.0	"		ND				50	
Trichlorofluoromethane	0.67	ND	5.0	"		ND				50	
Vinyl Chloride	0.81	ND	5.0	"		ND				50	
2-Propanol	1.3	ND	5.0	"		ND				200	
Surrogate: Dibromofluoromethane		*2220*		*"*	*2500*		*88.8*	*75-125*			
Surrogate: Toluene-d8		*2380*		*"*	*2500*		*95.2*	*75-125*			
Surrogate: 4-Bromofluorobenzene		*2280*		*"*	*2500*		*91.2*	*75-125*			

Phase II ESA Review Memorandum for Compass at Red Hill

Kimley-Horn has completed a review of the Phase II Environmental Site Assessment (ESA), conducted by Advanced Environmental Group, Inc. (AEG) on January 10, 2024, of the potential tetrachloroethene (PCE) contamination of the Site which was identified in a previous Site Investigation and Remedial Action Plan (Ramboll US Consulting Inc., 2022). The following is a summary of the findings and impacts to the design of the proposed onsite infiltration system.

PROJECT BACKGROUND

The approximate 3.38-acre project site (Project) is located southwest of the intersection of San Juan Steet and Red Hill Avenue in the City of Tustin (City). The Project is bounded by Tustin High School to the northwest, an existing residential development to the northeast, Red Hill Ave to the southeast, and an existing commercial development to the southwest. The existing site is currently vacant with a portion the site previously develop with a real estate office building and parking lot which has since been demolished. Existing block walls run along the northern property line between the existing residential development. There is an existing chain-link fence along the western portion of the site along Tustin High School.

The Project will consist of the development of condominium buildings with their associated parking. Runoff produced within the proposed site will sheet flow along curb and gutter and be collected in proposed catch basins. These flows all eventually enter an underground infiltration system before discharging to the existing public storm drain along San Juan St. Runoff produced within the landscaped areas along the western perimeter of the sheet flow onto an existing private alley before eventually discharging to an existing catch basin on Red Hill Ave. The proposed underground infiltration system is an ADS Stormtech MC-3500 Chamber System and is located on the southeast corner of the site, near the intersection of Red Hill Avenue and San Juan Street. The system infiltration depth is at approximately 6.5 feet bgs. The system is design to infiltrate the Water Quality Design Volume (DCV) and has additional detention storage to mitigate the peak flows up to the 100-year storm event.

SURROUNDING AREA OF CONCERN

According to the California State Water Resources Control Board's GeoTracker map, a Cleanup Program Site exists downstream to the southeast of the project site, referred to as former Carioca Cleaners (dry cleaners tenant). The Cleanup Program Site (LoC Case#: 22IC006) determined that the volatile organic compound (VOC) tetrachloroethene, also known as PCE, is a pollutant of concern for soil contamination. As a part of the cleanup initiative, Ramboll US Consulting, Inc., has been contracted on behalf of RHP-8, LLC (Owner) to document the installation and startup of the Soil Vapor Extraction (SVE) well system, conducted at the former Carioca Cleaners located in Suite 13844 Red Hill Avenue.

The installation and trenching work were performed in May 2023. The SVE system was then mobilized to the cleanup site as of August 2023 and was connected to two granular activated carbon (GAC) vessels in series, each filled with approximately 1,000 pounds of virgin coconut-shell activated carbon. The SVE system began operation on September 11, 2023 and as of December 2023, a total of approximately 5.42 pounds of VOCs has been removed. By the end of the analysis, the effluent concentrations of breakdown products of PCE and TCE were analyzed to be below their laboratory reporting limits (RLs) and below the South Coast Air Quality Management District's (SCAQMD) Permit outlet concentration limits, while PCE concentrations decreased but not below environmental screening levels (ESLs).

PHASE II ESA SUMMARY

Ramboll's Site Investigation and Remedial Action Plan (2022), proposed in conjunction with the SVE well cleanup system, indicated that concentrations of PCE in soil vapor were above screening levels along the former Carioca Cleaners' property boundary, directly across the street from the Project. It could not be determined if soil vapor contamination with PCE or TCE (PCE's breakdown product) had migrated onto the Project's site soils. Thus, the Phase II Environmental Site Assessment (ESA), conducted by Advanced Environmental Group, Inc. (AEG), was performed to confirm the presence of PCE soil vapor contamination within the Project's boundaries.

Within the Phase II ESA, seven (7) borings were drilled to 15 feet below ground surface and temporary soil vapor probes were set at depths of 5 feet and 15 feet within each location. Four (4) of the borings were located along the Project's property line, closest to Red Hill, near the source of contamination, while the remaining three (3) borings were spread across the middle of the site. Each of the soil vapor probes were constructed of plastic tubing, plastic implant tip, and a surface cap. The following volatile organic compounds (VOCs) were analyzed: benzene, ethylbenzene, p-isopropyl-toluene, tetrachloroethene, toluene, trichloroethene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, meta- and para-xylenes, and ortho-xylene.

The concentrations analyzed within the soil samples were compared to the Department of Toxic Substances Control's Human and Ecological Risk Office (DTSC/Hero Residential Note 3) and the Environmental Protection Agency's (EPA) Region 9 residential permitted environmental screening levels (ESLs). Based on the results provided in Table 1 of the Phase II ESA, the only pollutant that exceeds either screening levels is benzene at the 5ft depths in borings SV-5 and SV-6 with concentrations of 5.2 and 4.8 micrograms per cubic meter respectively. The ESL of benzene for DTSC/Hero Note 3 (residential) and EPA Region 9 (residential) are 3.2 and 12 micrograms per cubic meter respectively. In comparison, the analyzed benzene concentrations are slightly above the DTSC/Hero ESL. For both tetrachloroethene (PCE) and trichloroethene (TCE), which are the pollutants of concern, the analyzed concentrations within the 5ft and 15ft depths are less than 5 micrograms per cubic meter. The HERO and EPA Region 9 ESLs for tetrachloroethene (PCE) are 15 and 367 micrograms per cubic meter respectively, and the ESLs for trichloroethene (TCE) are Not Applicable and 16 micrograms per cubic meter respectively. Thus, the analyzed concentrations for both PCE and TCE prove less than the ESLs determined by both HERO and EPA Region 9 for residential. Refer to the Phase II ESA Report in Attachment H of the WQMP Report for more information.

POTENTIAL IMPACTS TO INFILTRATION SYSTEM

The proposed underground infiltration chambers will be located near the southeast corner of the site. Based on the Soil Vapor Probe Location Map provided by AEG, SV-4 and SV-7 are located within the closest proximity to the proposed infiltration systems. SV-7 is located approximately 92 feet away from the northern portion of the proposed infiltration chambers, and SV-4 is located approximately 167 feet away from the southern portion of the proposed infiltration chambers. See the attached WQMP Soil Vapor Location Overlay Exhibit within Appendix A for more.

The soil vapor sampling results for the tested VOCs were compared to the Maximum Concentration Levels (MCLs) for Regulated Drinking Water Contaminants to determine the potential impacts to infiltration feasibility. These MCLs have been developed based on California's Title 22 Code of Regulations under Division 4 Environmental Health Chapter 15 Domestic Water Quality and Monitoring Regulations. The highest concentrations for the VOC pollutants sampled on site were determined to reside within soil vapor probe locations SV-1, SV-2, SV-5, and SV-6. These probe locations are located the furthest away from the proposed underground infiltration chambers, situated approximately 340-470 feet west of the proposed chambers. Nonetheless, all the sampled VOCs' concentrations on site were determined to be lower than the listed California Residential MCLs. See the table below for a comparison summary of the highest sampled concentrations and the maximum contaminant levels (MCLs) for each of the VOCs with numeric values, ignoring values below reporting limits (depicted with < the respective reporting limit) within Table 1 from the Phase II ESA.

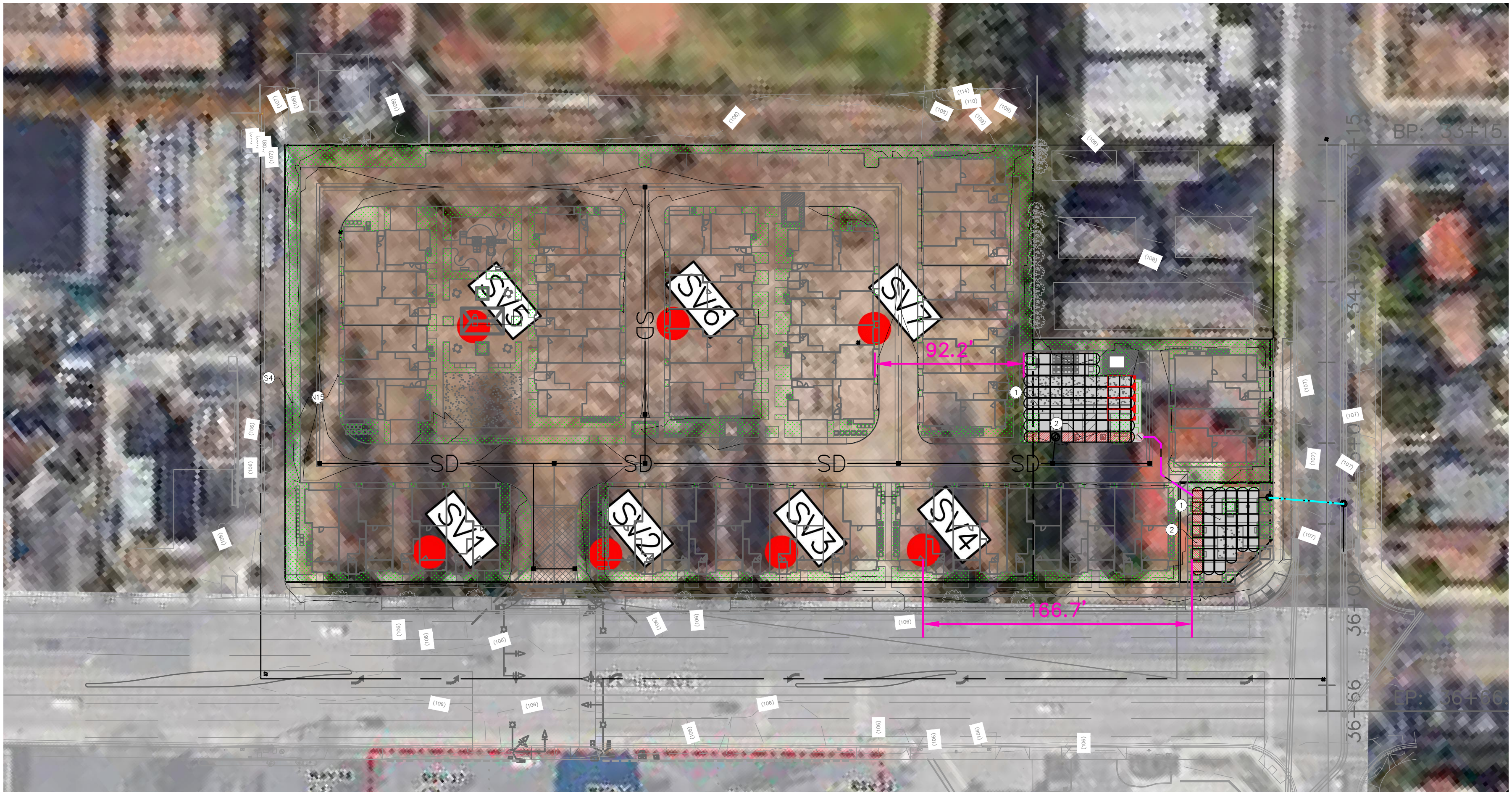
Table A – Comparison of Highest Sampled VOC Concentrations and California MCLs

Highest VOC Pollutant Concentration @ Respective Vapor Probe Location	Sampled Concentration (µg/m^3)	Sampled Concentration (µg/L)	California Title 22 MCL (µg/L)
Benzene @ SV-5	5.2	5.2e-3	1
Ethylbenzene @ SV-5	11	1.1e-2	300
p-Isopropyltoluene @ SV-1	7.0	7.0e-3	N/A
Tetrachloroethene (PCE) @ all probes	<5.0	<5.0e-3	5
Toluene @ SV-6	42	4.2e-2	150
Trichloroethene (TCE) @ all probes	<5.0	<5.0e-3	5
1,2,4-Trimethylbenzene @ SV-5	9.2	9.2e-3	N/A
1,3,5-Trimethylbenzene @ SV-2	5.8	5.8e-3	N/A
meta- and para-Xylene @ SV-5	40	4.0e-2	1,750
ortho-Xylene @ SV-5	12	1.2e-2	1,750

APPENDIX A

Notes and Definitions

J	Detected but below the Reporting Limit; therefore, result is an estimated concentration (CLP J-Flag).
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
RPD	Relative Percent Difference



LEGEND

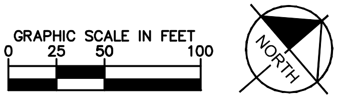
575	PROPOSED CONTOUR
(575)	EXISTING CONTOUR
	PROPERTY LINE
	DMA BOUNDARY
	FLOW ARROW
DA XX XX AC	DRAINAGE AREA NAME AREA (IN ACRES)
Ⓓ	MANHOLE
	PROPOSED STORM DRAIN
	EQUALIZER PIPE
>	OVERFLOW PATH
🟩	LANDSCAPE/PLANTER AREA
▨	TURF

STRUCTURAL BMP NOTES

① PROPOSED BMP-1 UNDERGROUND INFILTRATION CHAMBERS.

② PROPOSED SEDIMENT ROW.

*SOIL VAPOR PROBE LOCATION MAP SOURCE: ADVANCED ENVIRONMENTAL GROUP, INC. (2024)



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DRAWN BY: BY
CHECKED BY: LAC
DATE: 12/04/2024

COMPASS AT RED HILL
WQMP SOIL VAPOR LOCATION
OVERLAY - EXHIBIT

PROJECT NO.
195261019
DRAWING NAME
WQMP OVERLAY
1 OF 1

NOISE IMPACT ANALYSIS

COMPASS AT RED HILL MULTI-FAMILY RESIDENTIAL PROJECT

CITY OF TUSTIN

Lead Agency:

City of Tustin
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Project No. 24054

November 2, 2024

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ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
City	City of Tustin
CNEL	Community Noise Equivalent Level
dB	Decibel
dBA	A-weighted decibels
DOT	Department of Transportation
FHWA	Federal Highway Administration
FTA	Federal Transit Administration
EPA	Environmental Protection Agency
Hz	Hertz
Ldn	Day-night average noise level
Leq	Equivalent sound level
Lmax	Maximum noise level
OSHA	Occupational Safety and Health Administration
PPV	Peak particle velocity
RMS	Root mean square
SEL	Single Event Level or Sound Exposure Level
STC	Sound Transmission Class
VdB	Vibration velocity level in decibels

1.0 INTRODUCTION

1.1 Purpose of Analysis and Study Objectives

This Noise Impact Analysis has been prepared to determine the noise and vibration impacts associated with the proposed Compass at Red Hill Multi-Family Residential project (proposed project). The following is provided in this report:

- A description of the study area and the proposed project;
- Information regarding the fundamentals of noise;
- Information regarding the fundamentals of vibration;
- A description of the local noise guidelines and standards;
- An evaluation of the current noise environment;
- An analysis of the potential short-term construction-related noise and vibration impacts from the proposed project; and
- An analysis of long-term operations-related noise and vibration impacts from the proposed project.

1.2 Site Location and Study Area

The project site is located in the central portion of the City of Tustin (City) and within the Red Hill Avenue Specific Plan Area. The approximately 3.39-acre project site is currently vacant and is bounded by multi-family residential uses to the north, San Juan Street and single-family homes to the northeast, Red Hill Avenue and commercial retail uses to the southeast, a public alley and a carwash, U-Haul and multi-family residential uses to the southwest, and Tustin High School's Baseball field to the northwest. The project study area is shown in Figure 1.

Sensitive Receptors in Project Vicinity

The nearest sensitive receptors to the project site are the residents in the multi-family homes to the north that are located as near as 5 feet from the project site. There are also single-family homes located as near as 85 feet northeast of the project site and multi-family homes located as near as 80 feet west of the project site. The nearest noise sensitive use at Tustin High School to the project site are the portable classrooms next to the gymnasium that are over 950 feet away from the project site.

1.3 Proposed Project Description

The proposed project would consist of development of nine structures with a total of 73 residential townhome units with a community space area, an associated onsite road system and parking areas. The proposed site plan is shown in Figure 2.

1.4 Executive Summary

Standard Noise Regulatory Conditions

The proposed project will be required to comply with the following regulatory conditions from the City and State of California (State).

City of Tustin Noise and Vibration Regulations

The following lists the noise and vibration-related Standard Conditions (SC) and Mitigation Measures (MM) in the *Mitigation Monitoring and Reporting Program Red Hill Avenue Specific Plan Environmental Impact Report* (Red Hill Avenue Specific Plan MMRP), October 2018, that are summarized below (full text is provided below in Section 4.3 – Local Regulations).

- SC 4.9-1: Restricts construction activities from occurring during nighttime and holidays
- SC 4.9-2: Provides exterior and interior noise levels limits at new homes (this impact has been analyzed in the *City of Tustin – Compass at Red Hill Residential Project Noise Impacts to Proposed Townhomes Technical Memorandum,* prepared by Vista Environmental, August 10, 2024)
- MM 4.9-1: Requires BMPs included on construction plans that require proper mufflers on equipment, placement of staging areas away from sensitive receptors, time of day limits on deliveries, and requires temporary sound walls if construction equipment noise exceeds 85 dBA Leq at the nearby sensitive receptors.
- MM 4.9-2: Requires a vibration monitoring plan if vibration intensive equipment such as pile driving will be used in close proximity to existing structures

State of California Noise Regulations

The following lists the State of California noise regulations that are applicable, but not limited to the proposed project.

- California Vehicle Code Section 27200-27207 – On Road Vehicle Noise Limits
- California Vehicle Code Section 38365-38350 – Off-Road Vehicle Noise Limits

Summary of Analysis Results

The following is a summary of the proposed project's impacts with regard to the State CEQA Guidelines noise checklist questions.

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 local general plan or noise ordinance, or applicable standards of other agencies?

Less than significant impact.

Generation of excessive groundborne vibration or groundborne noise levels?

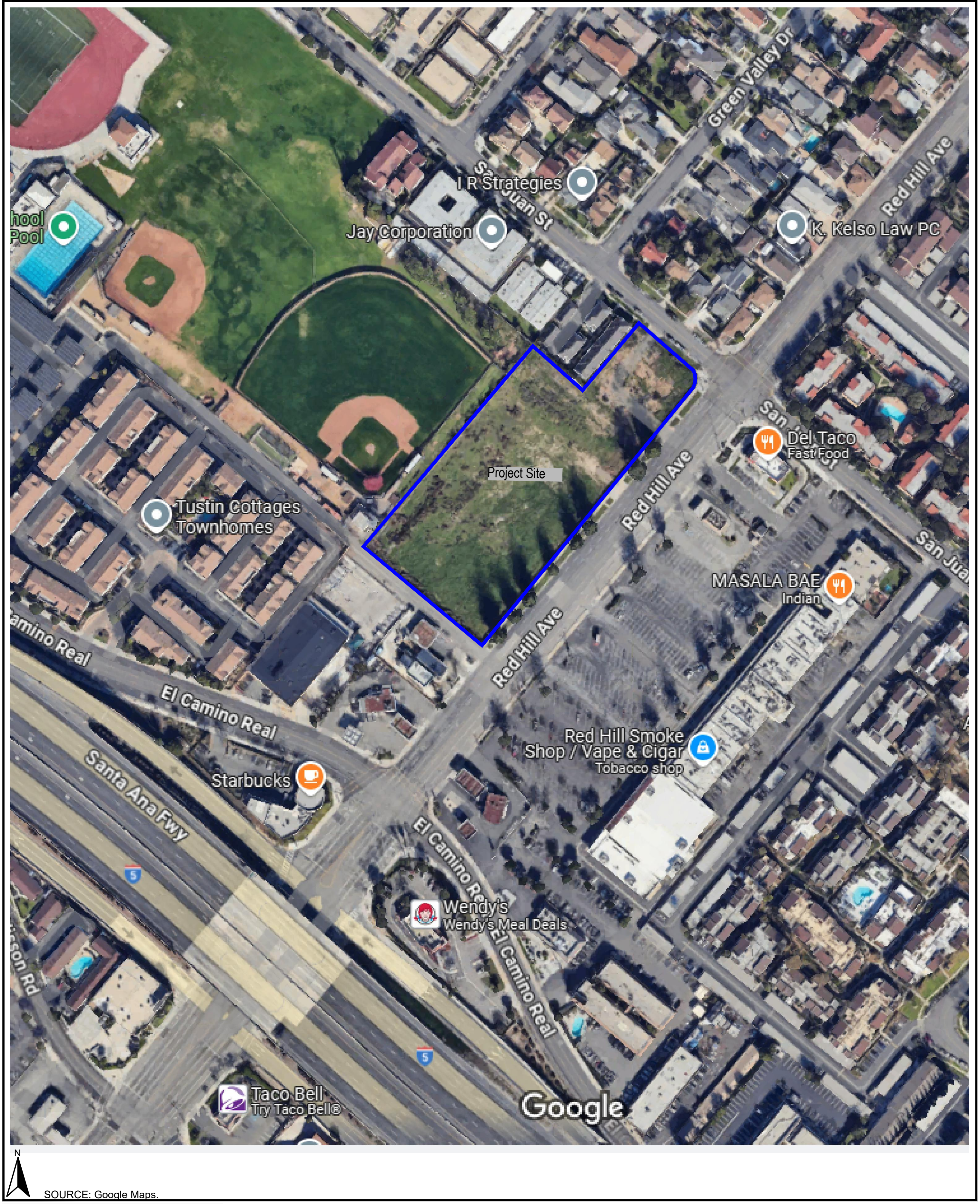
Less than significant impact.

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?

Less than significant impact.

1.5 Mitigation Measures for the Proposed Project

This analysis found that through adherence to the noise and vibration regulations detailed in Section 1.4 above were adequate to limit all noise and vibration impacts to less than significant levels. No mitigation measures are required for the proposed project with respect to noise and vibration impacts.



SOURCE: Google Maps.

VISTA ENVIRONMENTAL

Figure 1
Project Location Map

Community Space
- Central gathering space with barbecue, table and seating
- Open lawn area for free play
- Garden space with herbs and seating for relaxation

Residential Townhomes
- Three-story Residential Townhomes
- 2-3 Bedrooms
- 2-Car Garage

Private Drive/EVA
- 25-foot Private Street provides access to all homes
- Parking distributed throughout community
- Emergency Vehicle Access Only

Community Entry
- Enhanced with trees, landscaping, special paving and community signage
- Glazing wraps at entry to anchor corner and establish a commercial presence
- Terminates on green space
- Possible new signal to be installed pending traffic analysis
- Street curb to be redesigned with deceleration and acceleration lanes

Secondary Gateway Plaza
- Secondary Gateway Signage
- Corner plaza enhanced with trees, landscaping, special paving
- Glazing wrapped to activate plaza space and create
- To be designed

SOURCE: Meritage Homes

VISTA ENVIRONMENTAL

Figure 2
Site Plan

2.0 NOISE FUNDAMENTALS

Noise is defined as unwanted sound. Sound becomes unwanted when it interferes with normal activities, when it causes actual physical harm or when it has adverse effects on health. Sound is produced by the vibration of sound pressure waves in the air. Sound pressure levels are used to measure the intensity of sound and are described in terms of decibels. The decibel (dB) is a logarithmic unit which expresses the ratio of the sound pressure level being measured to a standard reference level. A-weighted decibels (dBA) approximate the subjective response of the human ear to a broad frequency noise source by discriminating against very low and very high frequencies of the audible spectrum. They are adjusted to reflect only those frequencies which are audible to the human ear.

2.1 Noise Descriptors

Noise Equivalent sound levels are not measured directly, but are calculated from sound pressure levels typically measured in A-weighted decibels (dBA). The equivalent sound level (Leq) represents a steady state sound level containing the same total energy as a time varying signal over a given sample period. The worst-hour traffic Leq is the noise metric used by California Department of Transportation (Caltrans) for all traffic noise impact analyses.

The Day-Night Average Level (Ldn) is the weighted average of the intensity of a sound, with corrections for time of day, and averaged over 24 hours. The time of day corrections require the addition of ten decibels to sound levels at night between 10 p.m. and 7 a.m. While the Community Noise Equivalent Level (CNEL) is similar to the Ldn, except that it has another addition of 4.77 decibels to sound levels during the evening hours between 7 p.m. and 10 p.m. These additions are made to the sound levels at these time periods because during the evening and nighttime hours, when compared to daytime hours, there is a decrease in the ambient noise levels, which creates an increased sensitivity to sounds. For this reason the sound appears louder in the evening and nighttime hours and is weighted accordingly. The City of Tustin relies on the CNEL noise standard to assess transportation-related impacts on noise sensitive land uses.

2.2 Tone Noise

A pure tone noise is a noise produced at a single frequency and laboratory tests have shown that humans are more perceptible to changes in noise levels of a pure tone. For a noise source to contain a “pure tone,” there must be a significantly higher A-weighted sound energy in a given frequency band than in the neighboring bands, thereby causing the noise source to “stand out” against other noise sources. A pure tone occurs if the sound pressure level in the one-third octave band with the tone exceeds the average of the sound pressure levels of the two contiguous one-third octave bands by:

- 5 dB for center frequencies of 500 hertz (Hz) and above
- 8 dB for center frequencies between 160 and 400 Hz
- 15 dB for center frequencies of 125 Hz or less

2.3 Noise Propagation

From the noise source to the receiver, noise changes both in level and frequency spectrum. The most obvious is the decrease in level of noise as the distance from the source increases. The manner in which the noise level reduces with distance depends on whether the source is a point or line source as well as ground absorption, atmospheric effects and refraction, and shielding by natural and manmade features. Sound from point sources, such as air conditioning condensers, radiate uniformly outward as it travels away from the source in a spherical pattern. The noise drop-off rate associated with this geometric spreading is 6 dBA per each doubling of the distance (dBA/DD) between source and receiver. Transportation noise sources such as roadways are typically analyzed as line sources, since at any given moment the receiver may be impacted by noise from multiple vehicles at various locations along the roadway. Because of the geometry of a line source, the noise drop-off rate associated with the geometric spreading of a line source is 3 dBA/DD.

2.4 Ground Absorption

The sound drop-off rate is highly dependent on the conditions of the land between the noise source and receiver. To account for this ground-effect attenuation (absorption), two types of site conditions are commonly used in traffic noise models, soft-site and hard-site conditions. Soft-site conditions account for the sound propagation loss over natural surfaces such as normal earth and ground vegetation. For point sources, a drop-off rate of 7.5 dBA/DD is typically observed over soft ground with landscaping, as compared with a 6.0 dBA/DD drop-off rate over hard ground such as asphalt, concrete, stone and very hard packed earth. For line sources a 4.5 dBA/DD is typically observed for soft-site conditions compared to the 3.0 dBA/DD drop-off rate for hard-site conditions. Caltrans research has shown that the use of soft-site conditions is more appropriate for the application of the Federal Highway Administration (FHWA) traffic noise prediction model used in this analysis.

3.0 GROUND-BORNE VIBRATION FUNDAMENTALS

Ground-borne vibrations consist of rapidly fluctuating motions within the ground that have an average motion of zero. The effects of ground-borne vibrations typically only cause a nuisance to people, but at extreme vibration levels damage to buildings may occur. Although ground-borne vibration can be felt outdoors, it is typically only an annoyance to people indoors where the associated effects of the shaking of a building can be notable. Ground-borne noise is an effect of ground-borne vibration and only exists indoors, since it is produced from noise radiated from the motion of the walls and floors of a room and may also consist of the rattling of windows or dishes on shelves.

3.1 Vibration Descriptors

There are several different methods that are used to quantify vibration amplitude such as the maximum instantaneous peak in the vibrations velocity, which is known as the peak particle velocity (PPV) or the root mean square (rms) amplitude of the vibration velocity. Due to the typically small amplitudes of vibrations, vibration velocity is often expressed in decibels and is denoted as (L_v) and is based on the rms velocity amplitude. A commonly used abbreviation is “VdB”, which in this text, is when L_v is based on the reference quantity of 1 micro inch per second.

3.2 Vibration Perception

Typically, developed areas are continuously affected by vibration velocities of 50 VdB or lower. These continuous vibrations are not noticeable to humans whose threshold of perception is around 65 VdB. Off-site sources that may produce perceptible vibrations are usually caused by construction equipment, steel-wheeled trains, and traffic on rough roads, while smooth roads rarely produce perceptible ground-borne noise or vibration.

3.3 Vibration Propagation

The propagation of ground-borne vibration is not as simple to model as airborne noise. This is due to the fact that noise in the air travels through a relatively uniform medium, while ground-borne vibrations travel through the earth which may contain significant geological differences. There are three main types of vibration propagation; surface, compression, and shear waves. Surface waves, or Rayleigh waves, travel along the ground’s surface. These waves carry most of their energy along an expanding circular wave front, similar to ripples produced by throwing a rock into a pool of water. P-waves, or compression waves, are body waves that carry their energy along an expanding spherical wave front. The particle motion in these waves is longitudinal (i.e., in a “push-pull” fashion). P-waves are analogous to airborne sound waves. S-waves, or shear waves, are also body waves that carry energy along an expanding spherical wave front. However, unlike P-waves, the particle motion is transverse or “side-to-side and perpendicular to the direction of propagation.”

As vibration waves propagate from a source, the vibration energy decreases in a logarithmic nature and the vibration levels typically decrease by 6 VdB per doubling of the distance from the vibration source. As stated above, this drop-off rate can vary greatly depending on the soil but has been shown to be effective enough for screening purposes, in order to identify potential vibration impacts that may need to be studied through actual field tests.

4.0 REGULATORY SETTING

The project site is located in the City of Tustin. Noise and vibration regulations are addressed through the efforts of various federal, state, and local government agencies. The agencies responsible for regulating noise and vibration are discussed below.

4.1 Federal Regulations

The adverse impact of noise was officially recognized by the federal government in the Noise Control Act of 1972, which serves three purposes:

- Promulgating noise emission standards for interstate commerce
- Assisting state and local abatement efforts
- Promoting noise education and research

The Federal Office of Noise Abatement and Control (ONAC) was initially tasked with implementing the Noise Control Act. However, the ONAC has since been eliminated, leaving the development of federal noise policies and programs to other federal agencies and interagency committees. For example, the Occupational Safety and Health Administration (OSHA) agency prohibits exposure of workers to excessive sound levels. The Department of Transportation (DOT) assumed a significant role in noise control through its various operating agencies. The Federal Aviation Administration (FAA) regulates noise of aircraft and airports. Surface transportation system noise is regulated by a host of agencies, including the Federal Transit Administration (FTA), which regulates transit noise, while freeways that are part of the interstate highway system are regulated by the Federal Highway Administration (FHWA). Finally, the federal government actively advocates that local jurisdictions use their land use regulatory authority to arrange new development in such a way that "noise sensitive" uses are either prohibited from being sited adjacent to a highway or, alternately that the developments are planned and constructed in such a manner that potential noise impacts are minimized.

Since the federal government has preempted the setting of standards for noise levels that can be emitted by transportation sources, the City is restricted to regulating noise generated by the transportation system through nuisance abatement ordinances and land use planning.

4.2 State Regulations

Noise Standards

California Department of Health Services Office of Noise Control

Established in 1973, the California Department of Health Services Office of Noise Control (ONC) was instrumental in developing regularity tools to control and abate noise for use by local agencies. One significant model is the "Land Use Compatibility for Community Noise Environments Matrix," which allows the local jurisdiction to clearly delineate compatibility of sensitive uses with various incremental levels of noise.

California Noise Insulation Standards

Title 24, Chapter 1, Article 4 of the California Administrative Code (California Noise Insulation Standards) requires noise insulation in new hotels, motels, apartment houses, and dwellings (other than single-family detached housing) that provides an annual average noise level of no more than 45 dBA CNEL. When such structures are located within a 60-dBA CNEL (or greater) noise contour, an acoustical analysis is required to ensure that interior levels do not exceed the 45-dBA CNEL annual threshold. In addition, Title 21, Chapter 6, Article 1 of the California Administrative Code requires that all habitable rooms, hospitals, convalescent homes, and places of worship shall have an interior CNEL of 45 dB or less due to aircraft noise.

Government Code Section 65302

Government Code Section 65302 mandates that the legislative body of each county and city in California adopt a noise element as part of its comprehensive general plan. The local noise element must recognize the land use compatibility guidelines published by the State Department of Health Services. The guidelines rank noise land use compatibility in terms of normally acceptable, conditionally acceptable, normally unacceptable, and clearly unacceptable.

California Vehicle Code Section 27200-27207 – On-Road Vehicle Noise

California Vehicle Code Section 27200-27207 provides noise limits for vehicles operated in California. For vehicles over 10,000 pounds noise is limited to 88 dB for vehicles manufactured before 1973, 86 dB for vehicles manufactured before 1975, 83 dB for vehicles manufactured before 1988, and 80 dB for vehicles manufactured after 1987. All measurements are based at 50 feet from the vehicle.

California Vehicle Section 38365-38380 – Off-Road Vehicle Noise

California Vehicle Code Section 38365-38380 provides noise limits for off-highway motor vehicles operated in California. 92 dBA for vehicles manufactured before 1973, 88 dBA for vehicles manufactured before 1975, 86 dBA for vehicles manufactured before 1986, and 82 dBA for vehicles manufactured after December 31, 1985. All measurements are based at 50 feet from the vehicle.

4.3 Local Regulations

The project site is located within the Red Hill Avenue Specific Plan and the applicable noise and vibration regulations for development projects within the Specific Plan Area are provided as Standard Conditions (SC) and Mitigation Measures (MM) in the *Mitigation Monitoring and Reporting Program Red Hill Avenue Specific Plan Environmental Impact Report* (Red Hill Avenue Specific Plan MMRP), October 2018, that consist of the following:

SC 4.9-1 To ensure compliance with Tustin City Code, grading and construction plans shall include a note indicating that loud noise-generating project construction activities (as defined in Section 4616(2) and Section 4617(e) of the Tustin City Code) shall take place between the hours of 7:00 AM and 6:00 PM on weekdays and from 9:00 AM to 5:00 PM on Saturdays. Loud, noise-generating construction activities are prohibited outside of these hours and on Sundays and City observed Federal holidays.

SC 4.9-2 Development projects are required to meet or exceed the 65 dBA CNEL exterior noise level standard, as defined by Table N-3 of the City of Tustin General Plan Noise Element, and the 45 dBA CNEL interior noise level standard of the City of Tustin General Plan Noise Element, and by Title 24, Part 2, of the California Building Code.

MM 4.9-1 **Construction Noise.** Prior to approval of grading plans, the City of Tustin Building Division shall ensure that plans include Best Management Practices to minimize construction noise. Construction noise Best Management Practices may include the following:

- Construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards, and all stationary construction equipment shall be placed so that emitted noise is directed away from the noise sensitive use nearest the construction activity.
- The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receiver nearest to the construction activity.
- The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment by Tustin City Code Article 4, Chapter 6, Section 4617. The contractor shall design delivery routes to minimize the exposure of sensitive land uses to delivery truck noise.
- Construction activity within 50 feet of occupied noise sensitive uses shall reduce construction noise levels exceeding 85 dBA Leq at nearby sensitive land uses by one or more of the following methods to reduce noise to below 85 dBA Leq:

1. Install temporary construction noise barriers within the line of site of occupied sensitive uses for the duration of construction activities that could generate noise exceeding 85 dBA Leq. The noise control barrier(s) must provide a solid face from top to bottom and shall:
    a. Provide a minimum transmission loss of 20 dBA and be constructed with an acoustical blanket (e.g. vinyl acoustic curtains or quilted blankets) attached to the construction site perimeter fence or equivalent temporary fence posts;
    b. Be maintained and any damage promptly repaired. Gaps, holes, or weaknesses in the barrier or openings between the barrier and the ground shall be promptly repaired; and
    c. Be removed and the site appropriately restored upon the conclusion of the construction activity.
2. Install sound dampening mats or blankets to the engine compartments of heavy mobile equipment (e.g. graders, dozers, heavy trucks). The dampening materials must be capable of a 5-dBA minimum noise reduction, must be installed prior to the use of heavy mobile construction equipment, and must remain installed for the duration of the equipment use.

MM 4.9-2 **Construction Vibration.** The following measures shall be implemented by applicants for development within the Red Hill Avenue Specific Plan area to reduce construction vibration at nearby receptors:

a. Avoid impact pile-driving where possible.

b. In areas where project construction is anticipated to include pile drivers in close proximity to schools or historic structures, conduct site-specific vibration studies to determine the area of impact and to present appropriate vibration reduction techniques that may include the following:

- Develop a vibration monitoring and construction contingency plan to identify structures where monitoring should be conducted, set up a vibration monitoring schedule, define structure-specific vibration limits, and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions.

- Identify construction contingencies for when vibration levels approach the standards.
- At a minimum, conduct vibration monitoring during pile-driving activities. Monitoring results may indicate the need for more or less intensive measurements.
- When vibration levels approach standards, suspend construction and implement contingencies to either lower vibration levels or secure the affected structures.
- Conduct a post-survey on any structures where either monitoring has indicated high levels or complaints of damage has been made. Make appropriate repairs or compensation where damage has occurred as a result of vibration.

5.0 EXISTING NOISE CONDITIONS

To determine the existing noise levels, noise measurements have been taken in the vicinity of the project site. The field survey noted that noise within the proposed project area is generally characterized by vehicle traffic on the nearby roadways and from activities at the Go Green Express Car Wash that is located as near as 20 feet southwest of the project site and from Tustin High School Baseball Field that is located adjacent to the northwest side of the project site. The following describes the measurement procedures, measurement locations, noise measurement results, and the modeling of the existing noise environment.

5.1 Noise Measurement Equipment

The noise measurements were taken using three Larson Davis Model LXT1 Class 1 sound level meters programmed in “slow” mode to record the sound pressure level at 1-second intervals for 24 hours in “A” weighted form. In addition, the L_{eq} averaged over the entire measuring time and L_{max} were recorded with the three sound level meters. The sound level meters and microphones were mounted on fences and poles, were placed approximately six feet above the ground and were equipped with windscreens during all measurements. The noise meters were calibrated before and after the monitoring using a Larson Davis Cal200 calibrator. All noise level measurement equipment meets American National Standards Institute (ANSI) specifications for sound level meters (ANSI S1.4-2014 standard).

Noise Measurement Locations

The noise monitoring locations were selected in order to obtain noise levels in the vicinity of the project site. Descriptions of the noise monitoring sites are provided below in Table A and are shown in Figure 3. Appendix A includes a photo index of the study area and noise level measurement locations.

Noise Measurement Timing and Climate

The noise measurements were recorded between 4:15 p.m. on Wednesday July 24, 2024 and 4:25 p.m. on Thursday, July 25, 2024. At the start of the noise measurements, the sky was clear (no clouds), the temperature was 93 degrees Fahrenheit, the humidity was 43 percent, barometric pressure was 29.80 inches of mercury, and the wind was blowing at an average rate of three miles per hour. Overnight, the temperature dropped to 67 degrees Fahrenheit and the humidity peaked at 90 percent. At the conclusion of the noise measurements, the sky was clear, the temperature was 92 degrees Fahrenheit, the humidity was 46 percent, barometric pressure was 29.76 inches of mercury, and the wind was blowing at an average rate of four miles per hour.

5.2 Noise Measurement Results

The results of the noise level measurements are presented in Table A. The measured sound pressure levels in dBA have been used to calculate the daytime, evening and nighttime Leq, and 24 hour Leq and CNEL, based on the entire measurement time. The noise monitoring data printouts are included in Appendix B. Figure 4 shows a graph of the 24-hour noise measurements.

Table A – Existing (Ambient) Noise Level Measurements

Site No.	Site Description	Average (dBA L_{eq})			24- Hour Average	
		Daytime[1]	Evening[2]	Nighttime[3]	Leq	CNEL[4]
1	On northeast side of project site, approximately 30 feet southwest of San Juan Street centerline and 165 feet northwest of Red Hill Avenue centerline.	59.0	60.8	56.3	58.5	63.9
2	On southeast side of project site, on west side of west driveway on Red Hill Avenue, approximately 60 feet northwest of Red Hill Avenue centerline	67.1	65.3	64.1	65.5	69.6
3	On a power pole on the southwest side of the project site and near carwash to southeast, approximately 210 feet northwest of Red Hill Avenue centerline	61.9	61.0	58.0	60.1	63.1

Notes:

[1] Daytime defined as 7:00 a.m. to 7:00 p.m.

[2] Evening defined as 7:00 p.m. to 10:00 p.m.

[3] Nighttime define as 10:00 p.m. to 7:00 a.m.

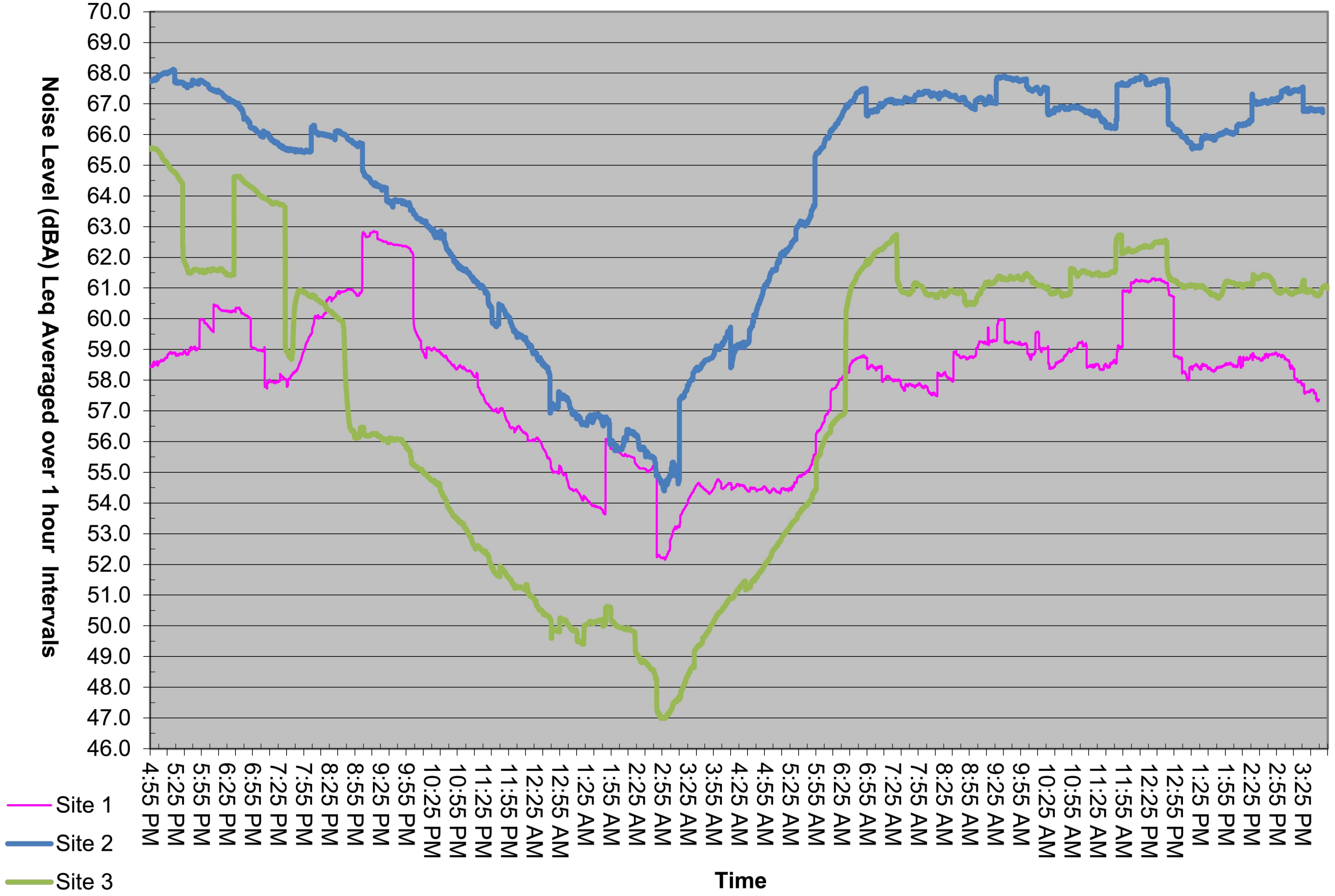
[4] The 24-hour average dBA CNEL is calculated by taking the hourly Leq values and adding a penalty of 4.77 dB during the evening hours of 7 to 10 pm and adding a 10 dB penalty during the nighttime hours of 10 pm to 7 am.

Source: Noise measurements taken between Wednesday, July 24, 2024 and Thursday, July 25, 2024.

SOURCE: Google Maps.

VISTA ENVIRONMENTAL

Figure 3
Field Noise Monitoring Locations



SOURCE: Three Larson Davis Model LXT1 Type 1 Sound Level Meters.

Figure 4
Field Noise Measurements Graph

6.0 MODELING PARAMETERS AND ASSUMPTIONS

6.1 Construction Noise

The noise impacts from construction of the proposed project have been analyzed through use of the FHWA's Roadway Construction Noise Model (RCNM), which is the same model utilized in the construction noise analysis provided in the *Red Hill Avenue Specific Plan Draft Program Environmental Impact Report* (Red Hill Ave SP DPEIR), prepared by Kimley Horn, February 2018. Table B below provides a list of the construction equipment anticipated to be used for each phase of construction that was obtained from the CalEEMod model run provided in the *City of Tustin – Compass at Red Hill Residential Project Construction-Related Diesel Particulate Matter (DPM) Emissions Health Risk Assessment (HRA) Technical Memorandum* (Construction HRA), prepared by Vista Environmental, October 24, 2024.

Table B – Construction Equipment Noise Emissions and Usage Factors

Equipment Description	Number of Equipment	Acoustical Use Factor[1] (percent)	Spec 721.560 Lmax at 50 feet[2] (dBA, slow[3])	Actual Measured Lmax at 50 feet[4] (dBA, slow[3])
Site Preparation				
Rubber Tired Dozers	3	40	85	82
Backhoe	1	40	80	78
Front End Loader	1	40	80	79
Tractor	2	40	84	N/A
Grading				
Grader	1	40	85	83
Excavator	1	40	85	81
Rubber Tired Dozer	1	40	85	82
Backhoe	1	40	80	78
Front End Loader	1	40	80	79
Tractor	1	40	84	N/A
Building Construction				
Crane	1	16	85	81
Forklift (Gradall)	3	40	85	83
Generator	1	50	82	81
Backhoe	1	40	80	78
Front End Loader	1	40	80	79
Tractor	1	40	84	N/A
Welders	1	40	73	74
Paving				
Cement and Mortar Mixers	2	40	85	79
Paver	1	50	85	77
Paving Equipment	2	50	85	77
Rollers	2	20	85	80
Tractor	1	40	84	N/A
Architectural Coating				
Air Compressor	1	40	80	78

Notes:

[1] Acoustical use factor is the percentage of time each piece of equipment is operational during a typical workday.

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[2] Spec 721.560 is the equipment noise level utilized by the RCNM program.
[3] The "slow" response averages sound levels over 1-second increments. A "fast" response averages sound levels over 0.125-second increments.
[4] Actual Measured is the average noise level measured of each piece of equipment during the Central Artery/Tunnel project in Boston, Massachusetts primarily during the 1990s.
Source: Federal Highway Administration, 2006 and CalEEMod default equipment mix.

Table B shows the associated measured noise emissions for each piece of equipment from the RCNM model and measured percentage of typical equipment use per day. Construction noise impacts to the nearby sensitive receptors have been calculated according to the equipment noise levels and usage factors listed in Table B and through use of the RCNM. Since the Red Hill Ave SP DPEIR utilized a minimum distance of 50 feet to analyze construction equipment noise impacts at the nearby sensitive receptors, this analysis has analyzed the construction noise impacts based on the closest piece of equipment being located at the distance from the property line to the sensitive receptor (or at 50 feet if closer than 50 feet) and then each subsequent piece of equipment was placed an additional 50 feet away, since it is not likely that two pieces of equipment would operate in closer proximity than 50 feet apart, other than when passing each other. Five dB of shielding was added to the equipment operating next to the multi-family homes to the north and west, in order to account for the noise reduction provided by the existing approximately 6 foot high walls located on the associated property lines for these homes. The RCNM model printouts are provided in Appendix C.

6.2 Vibration

Construction activity can result in varying degrees of ground vibration, depending on the equipment used on the site. Operation of construction equipment causes ground vibrations that spread through the ground and diminish in strength with distance. Buildings in the vicinity of the construction site respond to these vibrations with varying results ranging from no perceptible effects at the low levels to damage at the highest levels. Table C gives approximate vibration levels for particular construction activities. The data in Table C provides a reasonable estimate for a wide range of soil conditions.

Table C – Vibration Source Levels for Construction Equipment

Equipment		Peak Particle Velocity (inches/second)	Approximate Vibration Level (L_v or VdB) at 25 feet
Pile driver (impact)	Upper range	1.518	112
	typical	0.644	104
Pile driver (sonic)	Upper range	0.734	105
	typical	0.170	93
Clam shovel drop (slurry wall)		0.202	94
Vibratory Roller		0.210	94
Hoe Ram		0.089	87
Large bulldozer		0.089	87
Caisson drill		0.089	87
Loaded trucks		0.076	86
Jackhammer		0.035	79
Small bulldozer		0.003	58

Source: Federal Transit Administration, 2018.

The construction-related vibration impacts have been calculated through the vibration levels shown above in Table C and through typical vibration propagation rates. The equipment assumptions were based on the equipment lists provided above in Table B.

7.0 IMPACT ANALYSIS

7.1 CEQA Thresholds of Significance

Consistent with the California Environmental Quality Act (CEQA) and the State CEQA Guidelines, a significant impact related to noise would occur if a proposed project is determined to result in:

- 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 local general plan or noise ordinance, or applicable standards of other agencies;
- Generation of excessive groundborne vibration or groundborne noise levels; or
- 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.

7.2 Generation of Noise Levels in Excess of Standards

The proposed project would not generate a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies. The following section calculates the potential noise emissions associated with the temporary construction activities and long-term operations of the proposed project and compares the noise levels to the City standards.

Construction-Related Noise

The construction activities for the proposed project are anticipated to include site preparation and grading of the project site, building construction of 73 residential townhome units, paving of the onsite roads and parking areas, sidewalks and hardscapes, and application of architectural coatings. Noise impacts from construction activities associated with the proposed project would be a function of the noise generated by construction equipment, equipment location, sensitivity of nearby land uses, and the timing and duration of the construction activities.

The nearest sensitive receptors to the project site are the residents in the multi-family homes to the north that are located as near as 5 feet from the project site. There are also single-family homes located as near as 85 feet northeast of the project site and multi-family homes located as near as 80 feet west of the project site. The nearest noise sensitive use at Tustin High School to the project site are the portable classrooms next to the gymnasium that are over 950 feet away from the project site.

The Red Hill Avenue Specific Plan MMRP provides the following Standard Condition and Mitigation Measure related to construction noise that the project will be required to implement:

- SC 4.9-1 – Limits construction activities to between the hours of 7:00 a.m. to 6:00 p.m. on weekdays and 9:00 a.m. to 5:00 p.m. on Saturdays, with no construction activities on Sundays and federal holidays.
- MM 4.9-1 – Requires BMPs included on construction plans that require proper mufflers on equipment, placement of staging areas away from sensitive receptors, time of day limits on deliveries, and requires temporary sound walls if construction equipment noise exceeds 85 dBA Leq at the nearby sensitive receptors.

Construction noise levels to the nearby sensitive receptors have been calculated through use of the RCNM and the parameters and assumptions detailed in Section 6.1 of this report including Table B – Construction Equipment Noise Emissions and Usage Factors, in order to determine if the proposed construction activities would exceed the 85 dBA Leq construction noise standard from MM 4.9-1 at the nearby sensitive receptors. The results are shown below in Table D and the RCNM printouts are provided in Appendix C.

Table D – Construction Noise Levels at the Nearby Sensitive Receptors

	Construction Noise Level (dBA Leq) at:			
Construction Phase	Multi-Family Homes to North	Single-Family Homes to Northeast	Multi-Family Homes to West	Tustin High School Classrooms to West
Site Preparation	74	76	71	60
Grading	77	78	73	60
Building Construction	76	77	73	60
Paving	76	76	72	58
Painting	69	69	65	48
Construction Noise Threshold[1]	**85**	**85**	**85**	**85**
Exceed Thresholds?	**No**	**No**	**No**	**No**

Notes:

[1] Obtained from MM 4.9-1 from Red Hill Avenue Specific Plan MMRP, 2018.

Source: RCNM, Federal Highway Administration, 2006

Table D shows that the greatest noise impacts would occur during the grading phase, with a noise level as high as 78 dBA Leq at the single-family homes northeast of the project site. All calculated construction noise levels shown in Table D are within below the 85 dBA Leq construction noise threshold provided in Mitigation Measure 4.9-1 from the Red Hill Avenue Specific Plan MMRP. Therefore, through adherence to the limitation of allowable construction times provided in Standard Condition 4.9-1 from the Red Hill Avenue Specific Plan MMRP, construction-related noise levels would not exceed the applicable standards nor would construction activities create a substantial temporary increase in ambient noise levels from construction of the proposed project. Impacts would be less than significant.

Operational-Related Noise

The proposed project would consist of a multi-family residential development. Potential noise impacts associated with the operations of the proposed project would be from project-generated vehicular traffic on the nearby roadways and from onsite noise sources to the nearby sensitive receptors. The noise impacts created from project generated vehicular traffic on the nearby roadways and from onsite noise sources to the nearby school and homes have been analyzed separately below.

Roadway Vehicular Noise Impacts to the Nearby Sensitive Receptors

The Red Hill Ave SP DPEIR (Kimley Horn, 2018) analyzed the potential impacts from development of the Red Hill Avenue Specific Plan that includes the potential of 500 new residential units, 317,500 square feet of commercial building space, and 7,500 square feet of restaurant building space that was found to generate an additional 1,562 daily trips, which was found to increase the roadway noise level by up to 1.3 dBA, which was well below the 3 dB substantial increase threshold utilized in the Red Hill Ave SP DPEIR. Since the proposed project was accounted for as part of the 500 new residential units in the Red Hill Ave SP DPEIR, it can be reasonably assumed that the vehicle trips generated by operation of the proposed project would not result in a substantial permanent roadway noise increase in ambient noise levels. Operational roadway noise impacts would be less than significant.

Onsite Noise Impacts

The operation of the proposed project may create an increase in onsite noise levels from noise created from the proposed heating, ventilation and air conditioner (HVAC) equipment and from delivery and trash trucks, which were analyzed in the Red Hill Ave SP DPEIR (Kimley Horn, 2018) and are discussed separately below.

HVAC Equipment Noise Impacts

The Red Hill Ave SP DPEIR analyzed potential noise impacts created by the installation of HVAC equipment and utilized the exterior noise standards of 55 dBA between 7:00 a.m. and 10:00 p.m. and 50 dBA between 10:00 p.m. and 7:00 a.m., or if ambient noise exceeds these standards, the ambient noise level becomes the standard that was obtained from the Tustin City Code for determination of significance. The Red Hill Ave SP DPEIR found that the commercial HVAC units create a noise level between 60 to 70 dBA at 15 feet from the source and a sensitive receptor located as near as 50 feet to the HVAC unit would be exposed to equipment noise exceeding 60 dBA Leq, which would exceed both the City's daytime 55 dBA noise standard and nighttime 50 dBA noise standards, however the 60 dBA Leq noise level would be below the measured ambient noise levels in the Specific Plan Area. As such, the DPEIR found a less than significant noise impact would occur from the operation of HVAC equipment.

The project applicant has stated that the proposed townhomes will likely use a heat pump made by Carrier Series 38 MURA, which produces noise levels that range between 54 and 62 dBA at one meter (3.28 feet). Based on standard geometric spreading of noise (6 dBA drop off rate when the distance between the source is doubled), this would result in a noise level as high as 38 dBA Leq at 50 feet from the equipment, which is well below both the City's daytime 55 dBA noise standard and nighttime 50 dBA noise standards. For these reasons, a less than significant noise impact would occur from the operation of the proposed HVAC equipment.

Delivery and Trash Hauling Trucks Noise Impacts

The Red Hill Ave SP DPEIR analyzed the potential noise impacts created by delivery and trash hauling trucks traveling through the Specific Plan area, which found that delivery and trash hauling trucks generally create noise levels in the range of 61 to 70 dBA Leq at 25 feet, which is dependent on the speed of the trucks. The DPEIR references Section 4313 of the Tustin City Code that prohibits the collection of solid waste from within 200 feet of any residence between the hours of 6:00 p.m. and 7:00 a.m. and on Federal holidays and found that due to this time restriction that waste collection activities would not disturb residences during the hours when people are typically sleeping and more sensitive to noise. Since the onsite road system is limited in size, which would limit the traveling speeds and associated noise levels of delivery trucks and trash haul trucks operating onsite, a less than significant noise impact would occur from the operation of delivery and trash hauling trucks.

Level of Significance

Less than significant impact.

7.3 Generation of Excessive Groundborne Vibration

The proposed project would not expose persons to or generation of excessive groundborne vibration or groundborne noise levels. The following section analyzes the potential vibration impacts associated with the construction and operations of the proposed project.

Construction-Related Vibration Impacts

The construction activities for the proposed project are anticipated to include site preparation and grading of the project site, building construction of 73 residential townhome units, paving of the onsite roads and parking areas, sidewalks and hardscapes, and application of architectural coatings. Vibration impacts from construction activities associated with the proposed project would typically be created from the operation of heavy off-road equipment. The nearest vibration sensitive receptors to the project site are the residents in the multi-family homes to the north that are located as near as 5 feet from the project site.

The Red Hill Avenue Specific Plan MMRP includes Mitigation Measure 4.9-2 in order to reduce construction-related vibration impacts to less than significant levels and requires the contractor to implement a vibration monitoring plan if vibration intensive equipment such as pile driving will be used in close proximity to existing structures. The Red Hill Ave SP DPEIR (Kimley Horn, 2018) analyzed the potential construction-related vibration impacts from development of the Red Hill Avenue Specific Plan that found that since the City Code limits the hours when construction activities would occur, construction-related vibration impacts would not expose the nearby residents to substantial vibration levels when people would normally sleep and found a less than significant construction-related vibration impact to the nearby homes.

The DPEIR provides a vibration threshold of 75 VdB for frequent events and 85 VdB for infrequent events and defines a frequent event as occurring more than 70 times per day. Since the project applicant has stated that no pile driving or other vibration intensive equipment will be utilized during construction of the proposed project, the most intensive piece of equipment that will likely be utilized during construction is a small bulldozer (i.e., D1, D2, or D3 dozers). From Table C above a small bulldozer creates a vibration level of 58 VdB at 25 feet. Based on typical propagation rates, the vibration level at the nearest multi-family home (5 feet away) would be 72 VdB. The vibration level at the nearest home would be below both the frequent event vibration threshold of 75 VdB and infrequent event vibration threshold of 85 VdB. Construction-related vibration impacts would be less than significant.

Operations-Related Vibration Impacts

The proposed project would consist of the development of a multi-family residential community. The on-going operation of the proposed project would not include the operation of any known vibration sources other than typical onsite vehicle operations for a residential development. Therefore, a less than significant vibration impact is anticipated from operation of the proposed project.

Level of Significance

Less than significant impact.

7.4 Aircraft Noise

The proposed project may expose people residing in the project area to excessive noise levels from aircraft. The nearest airport is John Wayne Airport that is located as near as 4.5 mile southwest of the project site. The project site is located outside of the 60 dBA CNEL noise contours of this Airport. Therefore, the proposed homes would not be exposed to excessive aircraft noise. Impacts would be less than significant.

Level of Significance

Less than significant impact.

8.0 REFERENCES

California Department of Transportation (Caltrans), *Technical Noise Supplement to the Traffic Noise Analytics Protocol*, September 2013.

California Department of Transportation, *Transportation- and Construction Vibration Guidance Manual*, April 2020.

City of Tustin, *Mitigation Monitoring and Reporting Program Red Hill Avenue Specific Plan Environmental Impact Report,* October 2018.

City of Tustin, *Red Hill Avenue Specific Plan*, adopted November 6, 2018.

Federal Transit Administration, *Transit Noise and Vibration Impact Assessment Manual,* September 2018.

Kimley Horn, *Red Hill Avenue Specific Plan Draft Program Environmental Impact Report,* February 2018.

U.S. Department of Transportation, *FHWA Roadway Construction Noise Model User's Guide,* January, 2006.

U.S. Department of Transportation, *Highway Traffic Noise: Analysis and Abatement Guidance,* December, 2011.

Vista Environmental, *City of Tustin – Compass at Red Hill Residential Project Construction-Related Diesel Particulate Matter (DPM) Emissions Health Risk Assessment (HRA) Technical Memorandum*, October 24, 2024.

Vista Environmental, *City of Tustin – Compass at Red Hill Residential Project Noise Impacts to Proposed Townhomes Technical Memorandum,* August 10, 2024

APPENDIX A

Field Noise Measurements Photo Index


Noise Measurement Site 1 - looking north


Noise Measurement Site 1 - looking northeast


Noise Measurement Site 1 - looking east


Noise Measurement Site 1 - looking southeast


Noise Measurement Site 1 - looking south


Noise Measurement Site 1 - looking southwest


Noise Measurement Site 1 - looking west


Noise Measurement Site 1 - looking northwest


Noise Measurement Site 2 - looking north


Noise Measurement Site 2 - looking northeast


Noise Measurement Site 2 - looking east


Noise Measurement Site 2 - looking southeast


Noise Measurement Site 2 - looking south


Noise Measurement Site 2 - looking southwest


Noise Measurement Site 2 - looking west


Noise Measurement Site 2 - looking northwest


Noise Measurement Site 3 - looking northeast


Noise Measurement Site 3 - looking east


Noise Measurement Site 3 - looking southeast


Noise Measurement Site 3 - looking south


Noise Measurement Site 3 - looking southwest


Noise Measurement Site 3 - looking west


Noise Measurement Site 3 - looking northwest


Noise Measurement Site 3 - looking north

APPENDIX B

Field Noise Measurements Printouts

Site 1 - On Northeast Side of Project Site (San Juan Ave)

July 24, 2024 4:15:13 PM Leq Daytime = 59.0
Sampling Time = 1 sec Freq Weighting=A Leq Evening = 60.8
Record Num = 86402 Leq Nighttime = 56.3
Leq = 58.5 Ldn(24hr)= 63.3 CNEL = 63.9
Min = 45.9 Min Leq hr at 6:15 AM 52.2
Max = 92.9 Max Leq hr at 10:43 AM 62.9

Site 1 - On Northeast Side of Project Site (San Juan Ave)

SPL	Time	Leq (1 hour Avg.)	Ldn	CNEL
55.5	16:15:13		55.5	55.5
63.0	16:15:14		63.0	63.0
68.4	16:15:15		68.4	68.4
63.3	16:15:16		63.3	63.3
58.8	16:15:17		58.8	58.8
61.8	16:15:18		61.8	61.8
59.8	16:15:19		59.8	59.8
57.6	16:15:20		57.6	57.6
75.5	16:15:21		75.5	75.5
62.7	16:15:22		62.7	62.7
57.3	16:15:23		57.3	57.3
55.6	16:15:24		55.6	55.6
58.6	16:15:25		58.6	58.6
69.8	16:15:26		69.8	69.8
64.7	16:15:27		64.7	64.7
67.5	16:15:28		67.5	67.5
66.0	16:15:29		66.0	66.0
66.9	16:15:30		66.9	66.9
54.9	16:15:31		54.9	54.9
56.9	16:15:32		56.9	56.9
63.1	16:15:33		63.1	63.1
55.3	16:15:34		55.3	55.3
55.1	16:15:35		55.1	55.1
56.5	16:15:36		56.5	56.5
57.2	16:15:37		57.2	57.2
56.4	16:15:38		56.4	56.4
57.3	16:15:39		57.3	57.3
56.4	16:15:40		56.4	56.4
58.0	16:15:41		58.0	58.0
56.5	16:15:42		56.5	56.5
77.4	16:15:43		77.4	77.4
57.7	16:15:44		57.7	57.7
56.1	16:15:45		56.1	56.1
56.8	16:15:46		56.8	56.8
56.7	16:15:47		56.7	56.7
57.4	16:15:48		57.4	57.4
62.0	16:15:49		62.0	62.0
62.8	16:15:50		62.8	62.8
64.1	16:15:51		64.1	64.1
65.1	16:15:52		65.1	65.1
65.2	16:15:53		65.2	65.2
65.6	16:15:54		65.6	65.6
65.1	16:15:55		65.1	65.1
61.6	16:15:56		61.6	61.6
63.1	16:15:57		63.1	63.1
65.4	16:15:58		65.4	65.4
65.4	16:15:59		65.4	65.4
65.1	16:16:00		65.1	65.1
61.6	16:16:01		61.6	61.6
63.4	16:16:02		63.4	63.4
61.8	16:16:03		61.8	61.8
67.2	16:16:04		67.2	67.2
70.6	16:16:05		70.6	70.6
74.3	16:16:06		74.3	74.3
74.7	16:16:07		74.7	74.7
74.5	16:16:08		74.5	74.5
64.7	16:16:09		64.7	64.7
62.9	16:16:10		62.9	62.9
64.3	16:16:11		64.3	64.3
60.3	16:16:12		60.3	60.3
64.4	16:16:13		64.4	64.4
66.4	16:16:14		66.4	66.4
64.7	16:16:15		64.7	64.7
60.0	16:16:16		60.0	60.0
59.6	16:16:17		59.6	59.6
68.5	16:16:18		68.5	68.5
59.9	16:16:19		59.9	59.9
67.5	16:16:20		67.5	67.5
67.4	16:16:21		67.4	67.4
66.7	16:16:22		66.7	66.7
70.9	16:16:23		70.9	70.9
61.9	16:16:24		61.9	61.9
66.1	16:16:25		66.1	66.1
58.1	16:16:26		58.1	58.1
64.0	16:16:27		64.0	64.0
61.2	16:16:28		61.2	61.2
59.8	16:16:29		59.8	59.8
59.7	16:16:30		59.7	59.7
59.0	16:16:31		59.0	59.0
58.6	16:16:32		58.6	58.6
59.9	16:16:33		59.9	59.9
61.0	16:16:34		61.0	61.0
67.9	16:16:35		67.9	67.9
69.7	16:16:36		69.7	69.7
77.4	16:16:37		77.4	77.4
70.7	16:16:38		70.7	70.7
69.9	16:16:39		69.9	69.9
65.8	16:16:40		65.8	65.8
58.5	16:16:41		58.5	58.5
61.9	16:16:42		61.9	61.9
61.0	16:16:43		61.0	61.0
62.2	16:16:44		62.2	62.2
65.1	16:16:45		65.1	65.1
61.0	16:16:46		61.0	61.0
61.3	16:16:47		61.3	61.3
59.0	16:16:48		59.0	59.0
57.1	16:16:49		57.1	57.1
56.0	16:16:50		56.0	56.0
70.8	16:16:51		70.8	70.8
54.5	16:16:52		54.5	54.5
56.3	16:16:53		56.3	56.3
55.2	16:16:54		55.2	55.2
55.2	16:16:55		55.2	55.2
59.7	16:16:56		59.7	59.7
59.8	16:16:57		59.8	59.8
58.1	16:16:58		58.1	58.1
58.8	16:16:59		58.8	58.8
55.6	16:17:00		55.6	55.6
54.3	16:17:01		54.3	54.3
55.5	16:17:02		55.5	55.5
56.3	16:17:03		56.3	56.3
54.9	16:17:04		54.9	54.9
55.5	16:17:05		55.5	55.5
56.0	16:17:06		56.0	56.0
56.4	16:17:07		56.4	56.4
57.2	16:17:08		57.2	57.2
56.7	16:17:09		56.7	56.7
59.3	16:17:10		59.3	59.3
59.1	16:17:11		59.1	59.1
57.4	16:17:12		57.4	57.4
57.6	16:17:13		57.6	57.6
54.9	16:17:14		54.9	54.9
53.1	16:17:15		53.1	53.1
53.8	16:17:16		53.8	53.8
54.8	16:17:17		54.8	54.8
53.5	16:17:18		53.5	53.5
54.1	16:17:19		54.1	54.1
55.1	16:17:20		55.1	55.1
54.5	16:17:21		54.5	54.5
53.2	16:17:22		53.2	53.2
55.4	16:17:23		55.4	55.4
53.6	16:17:24		53.6	53.6
53.7	16:17:25		53.7	53.7
52.8	16:17:26		52.8	52.8
52.0	16:17:27		52.0	52.0
52.1	16:17:28		52.1	52.1
51.5	16:17:29		51.5	51.5
50.6	16:17:30		50.6	50.6
50.2	16:17:31		50.2	50.2
57.9	16:17:32		57.9	57.9
51.0	16:17:33		51.0	51.0
52.2	16:17:34		52.2	52.2
52.5	16:17:35		52.5	52.5
54.1	16:17:36		54.1	54.1
56.0	16:17:37		56.0	56.0
60.2	16:17:38		60.2	60.2
60.1	16:17:39		60.1	60.1
61.4	16:17:40		61.4	61.4
57.7	16:17:41		57.7	57.7
57.5	16:17:42		57.5	57.5
54.1	16:17:43		54.1	54.1
54.6	16:17:44		54.6	54.6
57.8	16:17:45		57.8	57.8
57.6	16:17:46		57.6	57.6
56.1	16:17:47		56.1	56.1
57.4	16:17:48		57.4	57.4
57.6	16:17:49		57.6	57.6
57.6	16:17:50		57.6	57.6
56.3	16:17:51		56.3	56.3
56.7	16:17:52		56.7	56.7
57.0	16:17:53		57.0	57.0
56.8	16:17:54		56.8	56.8
58.7	16:17:55		58.7	58.7
60.8	16:17:56		60.8	60.8

Site 2 - On Southeast Side of Project Site (Red Hill Ave)

July 24, 2024 4:20:27 PM Leq Daytime = 67.1
ampling Time = 1 se Freq Weighting=A Leq Evening = 65.3
Record Num = 86402 Leq Nighttime = 64.1
Leq = 65.5 Ldn(24hr)= 69.2 CNEL = 69.6
Min = 43.1 Min Leq hr at 6:13 AM 54.4
Max = 95.0 Max Leq hr at 10:37 AM 68.1

Site 2 - On Southeast Side of Project Site (Red Hill Ave)

SPL	Time	Leq (1 hour Avg.)	Ldn	CNEL
67.1	16:20:27		67.1	67.1
65.2	16:20:28		65.2	65.2
60.6	16:20:29		60.6	60.6
60.8	16:20:30		60.8	60.8
64.3	16:20:31		64.3	64.3
53.8	16:20:32		53.8	53.8
75.4	16:20:33		75.4	75.4
68.8	16:20:34		68.8	68.8
58.9	16:20:35		58.9	58.9
58.3	16:20:36		58.3	58.3
57.1	16:20:37		57.1	57.1
55.1	16:20:38		55.1	55.1
56.8	16:20:39		56.8	56.8
57.7	16:20:40		57.7	57.7
62.9	16:20:41		62.9	62.9
64.3	16:20:42		64.3	64.3
61.3	16:20:43		61.3	61.3
59.1	16:20:44		59.1	59.1
57.8	16:20:45		57.8	57.8
62.5	16:20:46		62.5	62.5
60.2	16:20:47		60.2	60.2
62.5	16:20:48		62.5	62.5
64.0	16:20:49		64.0	64.0
64.3	16:20:50		64.3	64.3
65.6	16:20:51		65.6	65.6
68.0	16:20:52		68.0	68.0
70.9	16:20:53		70.9	70.9
70.0	16:20:54		70.0	70.0
76.5	16:20:55		76.5	76.5
71.4	16:20:56		71.4	71.4
72.6	16:20:57		72.6	72.6
68.5	16:20:58		68.5	68.5
69.5	16:20:59		69.5	69.5
69.7	16:21:00		69.7	69.7
69.9	16:21:01		69.9	69.9
70.8	16:21:02		70.8	70.8
73.1	16:21:03		73.1	73.1
71.4	16:21:04		71.4	71.4
69.9	16:21:05		69.9	69.9
69.9	16:21:06		69.9	69.9
70.3	16:21:07		70.3	70.3
69.8	16:21:08		69.8	69.8
70.4	16:21:09		70.4	70.4
66.2	16:21:10		66.2	66.2
70.7	16:21:11		70.7	70.7
69.0	16:21:12		69.0	69.0
69.8	16:21:13		69.8	69.8
69.5	16:21:14		69.5	69.5
67.9	16:21:15		67.9	67.9
68.6	16:21:16		68.6	68.6
67.5	16:21:17		67.5	67.5
63.2	16:21:18		63.2	63.2
61.5	16:21:19		61.5	61.5
64.6	16:21:20		64.6	64.6
66.0	16:21:21		66.0	66.0
59.7	16:21:22		59.7	59.7
62.9	16:21:23		62.9	62.9
66.4	16:21:24		66.4	66.4
66.0	16:21:25		66.0	66.0
60.2	16:21:26		60.2	60.2
55.6	16:21:27		55.6	55.6
67.9	16:21:28		67.9	67.9
65.0	16:21:29		65.0	65.0
62.8	16:21:30		62.8	62.8
61.8	16:21:31		61.8	61.8
61.8	16:21:32		61.8	61.8
58.1	16:21:33		58.1	58.1
54.3	16:21:34		54.3	54.3
63.2	16:21:35		63.2	63.2
63.6	16:21:36		63.6	63.6
69.0	16:21:37		69.0	69.0
54.7	16:21:38		54.7	54.7
57.5	16:21:39		57.5	57.5
59.9	16:21:40		59.9	59.9
60.7	16:21:41		60.7	60.7
64.8	16:21:42		64.8	64.8
66.7	16:21:43		66.7	66.7
66.8	16:21:44		66.8	66.8
62.2	16:21:45		62.2	62.2
59.0	16:21:46		59.0	59.0
57.1	16:21:47		57.1	57.1
54.4	16:21:48		54.4	54.4
53.2	16:21:49		53.2	53.2
52.9	16:21:50		52.9	52.9
54.5	16:21:51		54.5	54.5
57.9	16:21:52		57.9	57.9
58.0	16:21:53		58.0	58.0
59.6	16:21:54		59.6	59.6
59.6	16:21:55		59.6	59.6
57.6	16:21:56		57.6	57.6
53.9	16:21:57		53.9	53.9
53.2	16:21:58		53.2	53.2
53.0	16:21:59		53.0	53.0
53.3	16:22:00		53.3	53.3
52.5	16:22:01		52.5	52.5
52.1	16:22:02		52.1	52.1
51.5	16:22:03		51.5	51.5
51.7	16:22:04		51.7	51.7
52.0	16:22:05		52.0	52.0
52.3	16:22:06		52.3	52.3
51.7	16:22:07		51.7	51.7
51.6	16:22:08		51.6	51.6
51.4	16:22:09		51.4	51.4
51.5	16:22:10		51.5	51.5
55.7	16:22:11		55.7	55.7
52.0	16:22:12		52.0	52.0
51.8	16:22:13		51.8	51.8
51.9	16:22:14		51.9	51.9
51.0	16:22:15		51.0	51.0
50.9	16:22:16		50.9	50.9
50.4	16:22:17		50.4	50.4
51.0	16:22:18		51.0	51.0
50.9	16:22:19		50.9	50.9
53.0	16:22:20		53.0	53.0
57.9	16:22:21		57.9	57.9
62.2	16:22:22		62.2	62.2
64.8	16:22:23		64.8	64.8
65.3	16:22:24		65.3	65.3
62.9	16:22:25		62.9	62.9
58.5	16:22:26		58.5	58.5
58.3	16:22:27		58.3	58.3
62.6	16:22:28		62.6	62.6
64.8	16:22:29		64.8	64.8
68.1	16:22:30		68.1	68.1
69.7	16:22:31		69.7	69.7
69.3	16:22:32		69.3	69.3
68.4	16:22:33		68.4	68.4
68.2	16:22:34		68.2	68.2
69.6	16:22:35		69.6	69.6
68.2	16:22:36		68.2	68.2
68.7	16:22:37		68.7	68.7
70.0	16:22:38		70.0	70.0
68.7	16:22:39		68.7	68.7
67.6	16:22:40		67.6	67.6
69.9	16:22:41		69.9	69.9
69.0	16:22:42		69.0	69.0
70.7	16:22:43		70.7	70.7
72.1	16:22:44		72.1	72.1
71.8	16:22:45		71.8	71.8
70.2	16:22:46		70.2	70.2
71.7	16:22:47		71.7	71.7
71.1	16:22:48		71.1	71.1
69.4	16:22:49		69.4	69.4
70.7	16:22:50		70.7	70.7
71.1	16:22:51		71.1	71.1
72.7	16:22:52		72.7	72.7
72.3	16:22:53		72.3	72.3
70.2	16:22:54		70.2	70.2
68.1	16:22:55		68.1	68.1
67.2	16:22:56		67.2	67.2
65.4	16:22:57		65.4	65.4
65.5	16:22:58		65.5	65.5
66.2	16:22:59		66.2	66.2
67.4	16:23:00		67.4	67.4
66.8	16:23:01		66.8	66.8
66.2	16:23:02		66.2	66.2
64.4	16:23:03		64.4	64.4
61.8	16:23:04		61.8	61.8
59.5	16:23:05		59.5	59.5
59.8	16:23:06		59.8	59.8
64.9	16:23:07		64.9	64.9
66.8	16:23:08		66.8	66.8
66.1	16:23:09		66.1	66.1
66.6	16:23:10		66.6	66.6

Site 3 - On Southwest Side of Project Site (Carwash)

July 24, 2024 4:25:03 PM Leq Daytime = 61.9
ampling Time = 1 se Freq Weighting=A Leq Evening = 61.0
Record Num = 86402 Leq Nighttime = 58.0
Leq = 60.1 Ldn(24hr)= 62.3 CNEL = 63.1
Min = 41.9 Min Leq hr at 6:03 AM 47.0
Max = 92.3 Max Leq hr at 11:46 AM 65.6

Site 3 - On Southwest Side of Project Site (Carwash)

SPL	Time	Leq (1 hour Avg.)	Ldn	CNEL
58.3	16:25:03		58.3	58.3
58.6	16:25:04		58.6	58.6
58.9	16:25:05		58.9	58.9
60.4	16:25:06		60.4	60.4
63.6	16:25:07		63.6	63.6
59.0	16:25:08		59.0	59.0
59.9	16:25:09		59.9	59.9
72.4	16:25:10		72.4	72.4
74.2	16:25:11		74.2	74.2
75.7	16:25:12		75.7	75.7
69.0	16:25:13		69.0	69.0
59.6	16:25:14		59.6	59.6
60.5	16:25:15		60.5	60.5
60.2	16:25:16		60.2	60.2
59.8	16:25:17		59.8	59.8
60.6	16:25:18		60.6	60.6
59.0	16:25:19		59.0	59.0
59.5	16:25:20		59.5	59.5
61.3	16:25:21		61.3	61.3
65.6	16:25:22		65.6	65.6
63.5	16:25:23		63.5	63.5
71.0	16:25:24		71.0	71.0
64.0	16:25:25		64.0	64.0
69.4	16:25:26		69.4	69.4
63.5	16:25:27		63.5	63.5
62.6	16:25:28		62.6	62.6
62.5	16:25:29		62.5	62.5
62.7	16:25:30		62.7	62.7
64.1	16:25:31		64.1	64.1
64.0	16:25:32		64.0	64.0
64.3	16:25:33		64.3	64.3
64.8	16:25:34		64.8	64.8
66.0	16:25:35		66.0	66.0
65.0	16:25:36		65.0	65.0
64.6	16:25:37		64.6	64.6
63.3	16:25:38		63.3	63.3
65.5	16:25:39		65.5	65.5
64.0	16:25:40		64.0	64.0
63.7	16:25:41		63.7	63.7
63.1	16:25:42		63.1	63.1
61.3	16:25:43		61.3	61.3
60.5	16:25:44		60.5	60.5
62.4	16:25:45		62.4	62.4
58.5	16:25:46		58.5	58.5
61.9	16:25:47		61.9	61.9
59.1	16:25:48		59.1	59.1
60.1	16:25:49		60.1	60.1
66.1	16:25:50		66.1	66.1
63.3	16:25:51		63.3	63.3
64.8	16:25:52		64.8	64.8
63.1	16:25:53		63.1	63.1
62.7	16:25:54		62.7	62.7
60.2	16:25:55		60.2	60.2
60.2	16:25:56		60.2	60.2
60.7	16:25:57		60.7	60.7
60.6	16:25:58		60.6	60.6
60.7	16:25:59		60.7	60.7
61.1	16:26:00		61.1	61.1
61.8	16:26:01		61.8	61.8
61.9	16:26:02		61.9	61.9
60.7	16:26:03		60.7	60.7
63.2	16:26:04		63.2	63.2
62.9	16:26:05		62.9	62.9
63.5	16:26:06		63.5	63.5
68.7	16:26:07		68.7	68.7
65.3	16:26:08		65.3	65.3
61.1	16:26:09		61.1	61.1
60.9	16:26:10		60.9	60.9
61.8	16:26:11		61.8	61.8
62.6	16:26:12		62.6	62.6
61.9	16:26:13		61.9	61.9
61.4	16:26:14		61.4	61.4
63.0	16:26:15		63.0	63.0
62.2	16:26:16		62.2	62.2
62.3	16:26:17		62.3	62.3
60.9	16:26:18		60.9	60.9
65.0	16:26:19		65.0	65.0
61.3	16:26:20		61.3	61.3
61.1	16:26:21		61.1	61.1
60.0	16:26:22		60.0	60.0
59.9	16:26:23		59.9	59.9
61.3	16:26:24		61.3	61.3
60.6	16:26:25		60.6	60.6
60.6	16:26:26		60.6	60.6
60.6	16:26:27		60.6	60.6
60.7	16:26:28		60.7	60.7
60.9	16:26:29		60.9	60.9
60.5	16:26:30		60.5	60.5
60.8	16:26:31		60.8	60.8
61.1	16:26:32		61.1	61.1
60.4	16:26:33		60.4	60.4
61.2	16:26:34		61.2	61.2
61.2	16:26:35		61.2	61.2
62.2	16:26:36		62.2	62.2
60.9	16:26:37		60.9	60.9
60.8	16:26:38		60.8	60.8
60.7	16:26:39		60.7	60.7
61.0	16:26:40		61.0	61.0
60.0	16:26:41		60.0	60.0
60.2	16:26:42		60.2	60.2
60.5	16:26:43		60.5	60.5
60.4	16:26:44		60.4	60.4
60.2	16:26:45		60.2	60.2
61.0	16:26:46		61.0	61.0
60.3	16:26:47		60.3	60.3
60.7	16:26:48		60.7	60.7
61.2	16:26:49		61.2	61.2
61.4	16:26:50		61.4	61.4
61.1	16:26:51		61.1	61.1
61.0	16:26:52		61.0	61.0
60.7	16:26:53		60.7	60.7
60.1	16:26:54		60.1	60.1
60.3	16:26:55		60.3	60.3
61.2	16:26:56		61.2	61.2
60.8	16:26:57		60.8	60.8
60.8	16:26:58		60.8	60.8
60.7	16:26:59		60.7	60.7
60.7	16:27:00		60.7	60.7
61.0	16:27:01		61.0	61.0
61.3	16:27:02		61.3	61.3
61.5	16:27:03		61.5	61.5
61.5	16:27:04		61.5	61.5
61.6	16:27:05		61.6	61.6
61.6	16:27:06		61.6	61.6
60.8	16:27:07		60.8	60.8
60.8	16:27:08		60.8	60.8
61.1	16:27:09		61.1	61.1
61.4	16:27:10		61.4	61.4
60.7	16:27:11		60.7	60.7
61.1	16:27:12		61.1	61.1
61.0	16:27:13		61.0	61.0
61.1	16:27:14		61.1	61.1
60.9	16:27:15		60.9	60.9
60.8	16:27:16		60.8	60.8
60.3	16:27:17		60.3	60.3
59.1	16:27:18		59.1	59.1
58.1	16:27:19		58.1	58.1
60.3	16:27:20		60.3	60.3
60.1	16:27:21		60.1	60.1
60.4	16:27:22		60.4	60.4
60.9	16:27:23		60.9	60.9
61.7	16:27:24		61.7	61.7
61.9	16:27:25		61.9	61.9
62.1	16:27:26		62.1	62.1
62.3	16:27:27		62.3	62.3
61.9	16:27:28		61.9	61.9
62.4	16:27:29		62.4	62.4
61.9	16:27:30		61.9	61.9
61.7	16:27:31		61.7	61.7
61.9	16:27:32		61.9	61.9
61.6	16:27:33		61.6	61.6
61.5	16:27:34		61.5	61.5
61.4	16:27:35		61.4	61.4
61.7	16:27:36		61.7	61.7
62.0	16:27:37		62.0	62.0
62.2	16:27:38		62.2	62.2
63.0	16:27:39		63.0	63.0
61.9	16:27:40		61.9	61.9
62.0	16:27:41		62.0	62.0
61.8	16:27:42		61.8	61.8
61.8	16:27:43		61.8	61.8
61.6	16:27:44		61.6	61.6
61.3	16:27:45		61.3	61.3
62.1	16:27:46		62.1	62.1

APPENDIX C

RCNM Model Construction Noise Calculation Printouts

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Site Preparation

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
MFH to North	Residential	59	60.8	56.3

			Equipment			
Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	50	5
Dozer	No	40		81.7	100	5
Dozer	No	40		81.7	150	5
Backhoe	No	40		77.6	200	5
Front End Loader	No	40		79.1	250	5
Tractor	No	40	84		300	5
Tractor	No	40	84		350	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Dozer		76.7	72.7	N/A	N/A	N/A	N/A
Dozer		70.6	66.7	N/A	N/A	N/A	N/A
Dozer		67.1	63.1	N/A	N/A	N/A	N/A
Backhoe		60.5	56.5	N/A	N/A	N/A	N/A
Front End Loader		60.1	56.2	N/A	N/A	N/A	N/A
Tractor		63.4	59.5	N/A	N/A	N/A	N/A
Tractor		62.1	58.1	N/A	N/A	N/A	N/A
	Total	**77**	**74**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Site Preparation

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
SFH to Northeast	Residential	59.0	61	56.3

			Equipment			
Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	85	0
Dozer	No	40		81.7	135	0
Dozer	No	40		81.7	185	0
Backhoe	No	40		77.6	235	0
Front End Loader	No	40		79.1	285	0
Tractor	No	40	84		335	0
Tractor	No	40	84		385	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Dozer		77.1	73.1	N/A	N/A	N/A	N/A
Dozer		73.0	69.1	N/A	N/A	N/A	N/A
Dozer		70.3	66.3	N/A	N/A	N/A	N/A
Backhoe		64.1	60.1	N/A	N/A	N/A	N/A
Front End Loader		64.0	60.0	N/A	N/A	N/A	N/A
Tractor		67.5	63.5	N/A	N/A	N/A	N/A
Tractor		66.3	62.3	N/A	N/A	N/A	N/A
	Total	**77**	**76**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Site Preparation

---- Receptor #3 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
MFH to West	Residential	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	80	5
Dozer	No	40		81.7	130	5
Dozer	No	40		81.7	180	5
Backhoe	No	40		77.6	230	5
Front End Loader	No	40		79.1	280	5
Tractor	No	40	84		330	5
Tractor	No	40	84		380	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Dozer		72.6	68.6	N/A	N/A	N/A	N/A
Dozer		68.4	64.4	N/A	N/A	N/A	N/A
Dozer		65.5	61.6	N/A	N/A	N/A	N/A
Backhoe		59.3	55.3	N/A	N/A	N/A	N/A
Front End Loader		59.1	55.2	N/A	N/A	N/A	N/A
Tractor		62.6	58.6	N/A	N/A	N/A	N/A
Tractor		61.4	57.4	N/A	N/A	N/A	N/A
	Total	**73**	**71**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Site Preparation

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
THS Classroom to West	Commercial	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Dozer	No	40		81.7	950	0
Dozer	No	40		81.7	1000	0
Dozer	No	40		81.7	1050	0
Backhoe	No	40		77.6	1100	0
Front End Loader	No	40		79.1	1150	0
Tractor	No	40	84		1200	0
Tractor	No	40	84		1250	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Dozer		56.1	52.1	N/A	N/A	N/A	N/A
Dozer		55.6	51.7	N/A	N/A	N/A	N/A
Dozer		55.2	51.2	N/A	N/A	N/A	N/A
Backhoe		50.7	46.7	N/A	N/A	N/A	N/A
Front End Loader		51.9	47.9	N/A	N/A	N/A	N/A
Tractor		56.4	52.4	N/A	N/A	N/A	N/A
Tractor		56.0	52.1	N/A	N/A	N/A	N/A
	Total	**56**	**60**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Grading

---- Receptor #1 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
MFH to North	Residential	59	60.8	56.3

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		50	5
Excavator	No	40		80.7	100	5
Dozer	No	40		81.7	150	5
Backhoe	No	40		77.6	200	5
Front End Loader	No	40		79.1	250	5
Tractor	No	40	84		300	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Grader		80.0	76.0	N/A	N/A	N/A	N/A
Excavator		69.7	65.7	N/A	N/A	N/A	N/A
Dozer		67.1	63.1	N/A	N/A	N/A	N/A
Backhoe		60.5	56.5	N/A	N/A	N/A	N/A
Front End Loader		60.1	56.2	N/A	N/A	N/A	N/A
Tractor		63.4	59.5	N/A	N/A	N/A	N/A
	Total	**80**	**77**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date:	11/1/2024
Case Description:	Compass at Red Hill - Grading

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
SFH to Northeast	Residential	59.0	60.8	56.3

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		85	0
Excavator	No	40		80.7	135	0
Dozer	No	40		81.7	185	0
Backhoe	No	40		77.6	235	0
Front End Loader	No	40		79.1	285	0
Tractor	No	40	84		335	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Grader		80.4	76.4	N/A	N/A	N/A	N/A
Excavator		72.1	68.1	N/A	N/A	N/A	N/A
Dozer		70.3	66.3	N/A	N/A	N/A	N/A
Backhoe		64.1	60.1	N/A	N/A	N/A	N/A
Front End Loader		64.0	60.0	N/A	N/A	N/A	N/A
Tractor		67.5	63.5	N/A	N/A	N/A	N/A
	Total	**80**	**78**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Grading

---- Receptor #3 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
MFH to West	Residential	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		80	5
Excavator	No	40		80.7	130	5
Dozer	No	40		81.7	180	5
Backhoe	No	40		77.6	230	5
Front End Loader	No	40		79.1	280	5
Tractor	No	40	84		330	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Grader		75.9	71.9	N/A	N/A	N/A	N/A
Excavator		67.4	63.4	N/A	N/A	N/A	N/A
Dozer		65.5	61.6	N/A	N/A	N/A	N/A
Backhoe		59.3	55.3	N/A	N/A	N/A	N/A
Front End Loader		59.1	55.2	N/A	N/A	N/A	N/A
Tractor		62.6	58.6	N/A	N/A	N/A	N/A
	Total	**76**	**73**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Grading

---- Receptor #4 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
THS Classroom to West	Commercial	61.9	61.0	58.0

			Equipment			
Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Grader	No	40	85		950	0
Excavator	No	40		80.7	1000	0
Dozer	No	40		81.7	1050	0
Backhoe	No	40		77.6	1100	0
Front End Loader	No	40		79.1	1150	0
Tractor	No	40	84		1200	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Grader		59.4	55.4	N/A	N/A	N/A	N/A
Excavator		54.7	50.7	N/A	N/A	N/A	N/A
Dozer		55.2	51.2	N/A	N/A	N/A	N/A
Backhoe		50.7	46.7	N/A	N/A	N/A	N/A
Front End Loader		51.9	47.9	N/A	N/A	N/A	N/A
Tractor		56.4	52.4	N/A	N/A	N/A	N/A
	Total	**59**	**60**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Building Construction

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
MFH to North	Residential	59	60.8	56.3

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Gradall	No	40		83.4	50	5
Gradall	No	40		83.4	100	5
Gradall	No	40		83.4	150	5
Crane	No	16		80.6	200	5
Generator	No	50		80.6	250	5
Backhoe	No	40		77.6	300	5
Front End Loader	No	40		79.1	350	5
Tractor	No	40	84		400	5
Welder / Torch	No	40		74	450	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Gradall		78.4	74.4	N/A	N/A	N/A	N/A
Gradall		72.4	68.4	N/A	N/A	N/A	N/A
Gradall		68.9	64.9	N/A	N/A	N/A	N/A
Crane		63.5	55.6	N/A	N/A	N/A	N/A
Generator		61.7	58.6	N/A	N/A	N/A	N/A
Backhoe		57.0	53.0	N/A	N/A	N/A	N/A
Front End Loader		57.2	53.2	N/A	N/A	N/A	N/A
Tractor		60.9	57.0	N/A	N/A	N/A	N/A
Welder / Torch		49.9	45.9	N/A	N/A	N/A	N/A
	Total	**78**	**76**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Building Construction

---- Receptor #2 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
SFH to Northeast	Residential	59.0	60.8	56.3

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Gradall	No	40		83.4	85	0
Gradall	No	40		83.4	135	0
Gradall	No	40		83.4	185	0
Crane	No	16		81	235	0
Generator	No	50		81	285	0
Backhoe	No	40		78	335	0
Front End Loader	No	40		79.1	385	0
Tractor	No	40	84		435	0
Welder / Torch	No	40		74	485	0

Results

Equipment		Calculated (dBA) ***Lmax**	**Leq**	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq
Gradall		78.8	74.8	N/A	N/A	N/A	N/A
Gradall		74.8	70.8	N/A	N/A	N/A	N/A
Gradall		72.0	68.1	N/A	N/A	N/A	N/A
Crane		67.1	59.1	N/A	N/A	N/A	N/A
Generator		65.5	62.5	N/A	N/A	N/A	N/A
Backhoe		61.0	57.1	N/A	N/A	N/A	N/A
Front End Loader		61.4	57.4	N/A	N/A	N/A	N/A
Tractor		65.2	61.2	N/A	N/A	N/A	N/A
Welder / Torch		54.3	50.3	N/A	N/A	N/A	N/A
	Total	**79**	**77**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Building Construction

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
MFH to West	Residential	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Gradall	No	40		83.4	80	5
Gradall	No	40		83.4	130	5
Gradall	No	40		83.4	180	5
Crane	No	16		80.6	230	5
Generator	No	50		80.6	280	5
Backhoe	No	40		77.6	330	5
Front End Loader	No	40		79.1	380	5
Tractor	No	40	84		430	5
Welder / Torch	No	40		74	480	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Gradall		74.3	70.3	N/A	N/A	N/A	N/A
Gradall		70.1	66.1	N/A	N/A	N/A	N/A
Gradall		67.3	63.3	N/A	N/A	N/A	N/A
Crane		62.3	54.3	N/A	N/A	N/A	N/A
Generator		60.7	57.7	N/A	N/A	N/A	N/A
Backhoe		56.2	52.2	N/A	N/A	N/A	N/A
Front End Loader		56.5	52.5	N/A	N/A	N/A	N/A
Tractor		60.3	56.3	N/A	N/A	N/A	N/A
Welder / Torch		49.4	45.4	N/A	N/A	N/A	N/A
	Total	**74**	**73**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Building Construction

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
THS Classroom to West	Commercial	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Gradall	No	40		83.4	950	0
Gradall	No	40		83.4	1000	0
Gradall	No	40		83.4	1050	0
Crane	No	16		80.6	1100	0
Generator	No	50		80.6	1150	0
Backhoe	No	40		77.6	1200	0
Front End Loader	No	40		79.1	1250	0
Tractor	No	40	84		1300	0
Welder / Torch	No	40		74	1350	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Gradall		57.8	53.8	N/A	N/A	N/A	N/A
Gradall		57.4	53.4	N/A	N/A	N/A	N/A
Gradall		57.0	53.0	N/A	N/A	N/A	N/A
Crane		53.7	45.7	N/A	N/A	N/A	N/A
Generator		53.4	50.4	N/A	N/A	N/A	N/A
Backhoe		50.0	46.0	N/A	N/A	N/A	N/A
Front End Loader		51.2	47.2	N/A	N/A	N/A	N/A
Tractor		55.7	51.7	N/A	N/A	N/A	N/A
Welder / Torch		45.4	41.4	N/A	N/A	N/A	N/A
	Total	**58**	**60**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Paving

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
MFH to North	Residential	59.0	60.8	56.3

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		50	5
Roller	No	20		80	100	5
Roller	No	20		80	150	5
Concrete Mixer Truck	No	40		78.8	200	5
Concrete Mixer Truck	No	40		78.8	250	5
Paver	No	50		77.2	300	5
Paver	No	50		77.2	350	5
Paver	No	50		77.2	400	5

Results

	Calculated (dBA)		Noise Limits (dBA)			
			Day		Evening	
Equipment	***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Tractor	79.0	75.0	N/A	N/A	N/A	N/A
Roller	69.0	62.0	N/A	N/A	N/A	N/A
Roller	65.5	58.5	N/A	N/A	N/A	N/A
Concrete Mixer Truck	61.8	57.8	N/A	N/A	N/A	N/A
Concrete Mixer Truck	59.8	55.8	N/A	N/A	N/A	N/A
Paver	56.7	53.6	N/A	N/A	N/A	N/A
Paver	55.3	52.3	N/A	N/A	N/A	N/A
Paver	54.2	51.1	N/A	N/A	N/A	N/A
Total	**79**	**76**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Paving

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
SFH to Northeast	Residential	59.0	61	56.3

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		85	0
Roller	No	20		80	135	0
Roller	No	20		80	185	0
Concrete Mixer Truck	No	40		78.8	235	0
Concrete Mixer Truck	No	40		78.8	285	0
Paver	No	50		77.2	335	0
Paver	No	50		77.2	385	0
Paver	No	50		77.2	435	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Tractor		79.4	75.4	N/A	N/A	N/A	N/A
Roller		71.4	64.4	N/A	N/A	N/A	N/A
Roller		68.6	61.6	N/A	N/A	N/A	N/A
Concrete Mixer Truck		65.4	61.4	N/A	N/A	N/A	N/A
Concrete Mixer Truck		63.7	59.7	N/A	N/A	N/A	N/A
Paver		60.7	57.7	N/A	N/A	N/A	N/A
Paver		59.5	56.5	N/A	N/A	N/A	N/A
Paver		58.4	55.4	N/A	N/A	N/A	N/A
	Total	**79**	**76**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Paving

---- Receptor #3 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
MFH to West	Residential	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		80	5
Roller	No	20		80	130	5
Roller	No	20		80	180	5
Concrete Mixer Truck	No	40		78.8	230	5
Concrete Mixer Truck	No	40		78.8	280	5
Paver	No	50		77.2	330	5
Paver	No	50		77.2	380	5
Paver	No	50		77.2	430	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Tractor		75	71	N/A	N/A	N/A	N/A
Roller		67	60	N/A	N/A	N/A	N/A
Roller		64	57	N/A	N/A	N/A	N/A
Concrete Mixer Truck		61	57	N/A	N/A	N/A	N/A
Concrete Mixer Truck		59	55	N/A	N/A	N/A	N/A
Paver		56	53	N/A	N/A	N/A	N/A
Paver		55	52	N/A	N/A	N/A	N/A
Paver		59	56	N/A	N/A	N/A	N/A
	Total	**75**	**72**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Paving

---- Receptor #4 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
THS Classroom to West	Commercial	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Tractor	No	40	84		950	0
Roller	No	20		80	1000	0
Roller	No	20		80	1050	0
Concrete Mixer Truck	No	40		78.8	1100	0
Concrete Mixer Truck	No	40		78.8	1150	0
Paver	No	50		77.2	1200	0
Paver	No	50		77.2	1250	0
Paver	No	50		77.2	1300	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Tractor		58.4	54.4	N/A	N/A	N/A	N/A
Roller		54.0	47.0	N/A	N/A	N/A	N/A
Roller		53.6	46.6	N/A	N/A	N/A	N/A
Concrete Mixer Truck		52.0	48.0	N/A	N/A	N/A	N/A
Concrete Mixer Truck		51.6	47.6	N/A	N/A	N/A	N/A
Paver		49.6	46.6	N/A	N/A	N/A	N/A
Paver		49.3	46.3	N/A	N/A	N/A	N/A
Paver		48.9	45.9	N/A	N/A	N/A	N/A
	Total	**58**	**58**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Painting

---- Receptor #1 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
MFH to North	Residential	59.0	60.8	56.3

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	50	5

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Compressor (air)		72.7	68.7	N/A	N/A	N/A	N/A
	Total	**73**	**69**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #2 ----

		Baselines (dBA)		
Description	Land Use	Daytime	Evening	Night
SFH to Northeast	Residential	59.0	60.8	56.3

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	85	0

Results

		Calculated (dBA)		Noise Limits (dBA)			
				Day		Evening	
Equipment		***Lmax**	**Leq**	Lmax	Leq	Lmax	Leq
Compressor (air)		73.1	69.1	N/A	N/A	N/A	N/A
	Total	**73**	**69**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

Roadway Construction Noise Model (RCNM),Version 1.1

Report date: 11/1/2024
Case Description: Compass at Red Hill - Painting

---- Receptor #3 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
MFH to West	Residential	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	80	5

Results

Equipment		Calculated (dBA) ***Lmax**	**Leq**	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq
Compressor (air)		68.6	64.6	N/A	N/A	N/A	N/A
	Total	**69**	**65**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

---- Receptor #4 ----

Description	Land Use	Baselines (dBA) Daytime	Evening	Night
THS Classroom to West	Commercial	61.9	61.0	58.0

Description	Impact Device	Usage(%)	Equipment Spec Lmax (dBA)	Actual Lmax (dBA)	Receptor Distance (feet)	Estimated Shielding (dBA)
Compressor (air)	No	40		77.7	950	0

Results

Equipment		Calculated (dBA) ***Lmax**	**Leq**	Noise Limits (dBA) Day Lmax	Leq	Evening Lmax	Leq
Compressor (air)		52.1	48.1	N/A	N/A	N/A	N/A
	Total	**52**	**48**	N/A	N/A	N/A	N/A

*Calculated Lmax is the Loudest value.

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April 11, 2025

Johanna Crooker, AICP
Director of Forward Planning – Entitlements, Southern California
Meritage Homes
5 Peters Canyon Road
Irvine, CA 92606
O: 949.299.3847
E: Johanna.Crooker@mlcholdings.net

LLG Reference: 2.24.4816.1

Subject: **Revised Traffic Assessment for the Compass at Red Hill Project**
Tustin, California

Dear Ms. Crooker,

Linscott, Law & Greenspan, Engineers (LLG) is pleased to submit this revised Traffic Assessment for the proposed Compass at Red Hill Project (hereinafter referred to as "Project"). The Project site is located south of San Juan Street and west of Red Hill Avenue at 13751 and 13841 Red Hill Avenue in the City of Tustin, California. This analysis has been updated to address applicable traffic and parking comments included in a City comment package received on April 10, 2025.

The Project site is included within the Traffic Analysis Zone (TAZ) 1 of the *Red Hill Avenue Specific Plan*, which was previously analyzed as part of the *Traffic Impact Study for the Red Hill Avenue Specific Plan, prepared by Kimley-Horn and Associates, Inc., dated January 2018.* Further, the subject property is currently vacant but is entitled for development of a mixed-use project that includes a 137-unit residential apartment development and 7,000 square-feet of general retail/commercial floor area.

The Project, as now proposed, includes the development of a 73-unit residential townhome/condominium community. As such, this letter summarizes the trip generation forecast potential of the proposed Project in comparison to what is currently allowed for Traffic Analysis Zone (TAZ) 1 of the *Red Hill Avenue Specific Plan*, for which the Project site is located, and current entitlements as approved by the City of Tustin City Council in August 2021.

David S. Shender, PE
John A. Boarman, PE
Richard E. Barretto, PE
Keil D. Maberry, PE
KC Yellapu, PE
Dave Roseman, PE
Shankar Ramakrishnan, PE

An LG2WB Company Founded 1966

The *Trip Generation Assessment for Tustin Red Hill Mixed-Use Project, date July 1, 2021,* and the *Revised Queuing Assessment for Tustin Red Hill Mixed-Use Project, dated May 11, 2021,* both of which were prepared by LLG served as a reference for this analysis.

PROJECT LOCATION

The Project site, which is located in TAZ 1 of the proposed *Red Hill Avenue Specific Plan,* adjacent to the existing residential and commercial uses and Tustin High School, is comprised of two parcels of land with a total acreage of 3.38 acres that is located south of San Juan Street and west of Red Hill Avenue at 13751 and 13841 Red Hill Avenue in the City of Tustin, California. ***Figure 1*** located at the rear of this letter report, presents a Vicinity Map, which illustrates the general location of the project and the surrounding street system. ***Figure 2*** presents the existing site aerial.

PROJECT DESCRIPTION

Proposed Project

As noted earlier, the proposed Project falls within the northern portion of TAZ 1, south of San Juan Street and west of Red Hill Avenue. The proposed Compass at Red Hill project will include the development of up to 73 residential townhomes/ condominiums consisting of three-story townhomes with a mix 8 two-bedroom units, 33 three-bedrooms units and 32 four-bedroom units.

Parking for the Project would be provided via 146 garage spaces and 18 off-street parking spaces internal to the project site for a total of 164 spaces. In addition, as a part of Project frontage improvement, up to 13 on-street parking spaces will be constructed that would be open to the general public; these spaces are not considered a part of the Project's parking supply.

On-site facilities/amenities for residents include a recreation area, tot lot and open space. As now envisioned, access to the Project will be provided via a full access driveway on Red Hill Avenue. ***Table 1*** summarizes the proposed Project development totals for the site. ***Figure 3*** presents the site plan for the proposed Project prepared by Kevin L. Crook, Architect Inc.

Current Entitlements

The current entitlements (herein after referred to as Entitled Project) for the subject property include the construction of a 137-unit residential apartment development consisting of 16 studio units, 62 one-bedroom units, 49 two-bedroom units and 10 Live/Work units. Further, of the Project's proposed total unit count of 137, six (6) units are designated as affordable units, consistent with the City's "Workforce Housing Ordinance". The commercial component of the Entitled Project consists of 7,000 SF of general retail/commercial space. ***Table 2*** summarizes the Entitled Project development totals for the site.

Red Hill Avenue Specific Plan

TAZ 1 within the Specific Plan identifies a proposed mix of up to 160 residential units and up to 30,000 SF of retail/commercial floor area. Direct comparison between the allowed development potential for TAZ 1 to the proposed Project would result in the Project being 87 DU below the residential allotment for TAZ 1 and with no proposed commercial uses, the Project is expected to be 30,000 SF below allotment for TAZ 1. Hence, the Project is well within the development envelope allocated for the TAZ 1. Further yet, the proposed Project would result in 64 DU fewer units and 7,000 SF less retail/commercial floor area when compared to the Entitled Development.

PROJECT TRAFFIC GENERATION FORECAST

Table 3 summarizes the trip generation rates used in forecasting the vehicular trips generated by the Entitled Development and proposed Project and also presents the forecast peak hour and daily traffic volumes.

The trip generation potential of the Entitled Development and proposed Project were estimated using current trip rates for ITE Land Use 220: Multifamily Housing Low Rise and ITE Land Use 822: Strip Retail Plaza (< 40k SF) Center contained in the 11th Edition of *Trip Generation,* published by the Institute of Transportation Engineers (ITE), [Washington, D.C., 2021].

Further review of the middle portion of *Table 3, Row A* indicates that the Entitled Development is forecast to generate 1,304 daily trips, with 72 trips (23 inbound, 49 outbound) produced in the AM peak hour and 116 trips (67 inbound, 49 outbound) produced in the PM peak hour on a "typical" weekday.

As shown in the lower portion of *Table 3, Row B,* the proposed Project is forecast to generate 492 daily trips, with 29 trips (7 inbound, 22 outbound) produced in the AM peak hour and 37 trips (23 inbound, 14 outbound) produced in the PM peak hour on a “typical” weekday.

A comparison of the trips generated by the proposed Project to that of the Entitled Land Use shows that the proposed Project would generate less traffic than the entitled mix of uses, with 812 fewer daily trips, 43 fewer AM peak hour trips and 79 fewer PM peak hour trips.

CONCLUSIONS

Given the results of the trip generation forecast comparison, we conclude that the proposed Project trips are expected to be less than the Allowable Development Land Uses’ trip generation for TAZ 1 as evaluated in the *Traffic Impact Study for the Red Hill Avenue Specific Plan*. In addition, the Project would generate less traffic than the currently Entitled Development project.

As such, the proposed Project will not create any new traffic impacts beyond those already previously identified in prior traffic studies. Further, the improvements identified for Red Hill Avenue along project frontage, inclusive of recommended median improvements and left-turn storage at the proposed signal on Red Hill Avenue at the Project Driveway, as documented in the *Revised Queuing Assessment for Tustin Red Hill Mixed-Use Project, date May 11, 2021,* remain valid.

Lastly, given the proposed Project is forecast to generate less than 50 or more peak hour trips, the Project would be exempt from the preparation of a full traffic impact study[1] based on the requirements published in the *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024)*.

* * * * * * * * * *

---

[1] See *Exhibit A City of Tustin Transportation Impact Analysis Flor Chart for Land Use Projects* of the City’s VMT Analysis Guidelines.

We appreciate the opportunity to prepare this investigation for the proposed Compass at Red Hill Project. Should you have any questions or need additional assistance, please do not hesitate to call Shane Green or me at (949) 825-6175.

Sincerely,

Linscott, Law & Greenspan, Engineers

REGISTERED PROFESSIONAL ENGINEER
RICHARD E. BARRETTO
No. 2006
Exp. 6/30/25
TRAFFIC
STATE OF CALIFORNIA

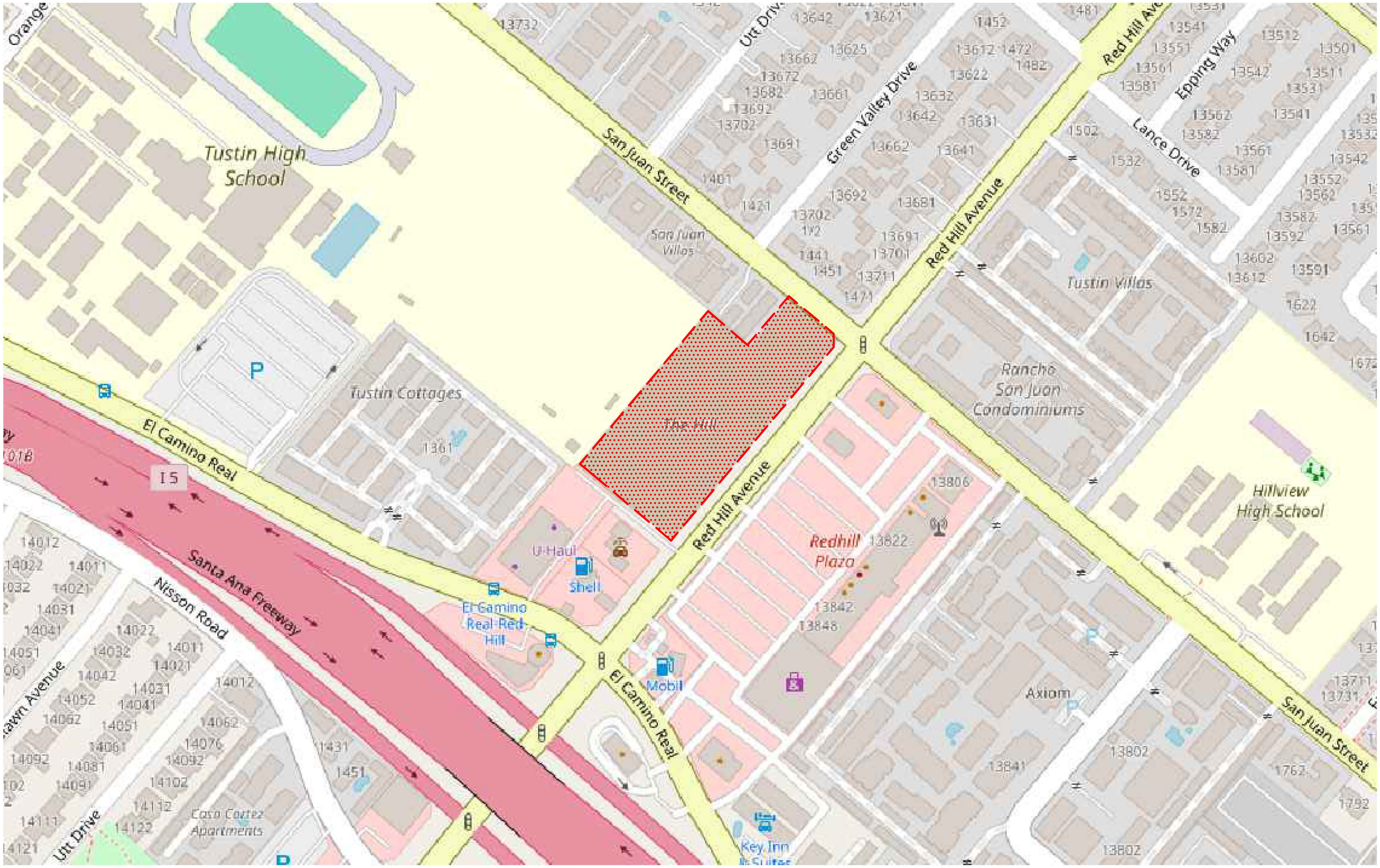
Richard E. Barretto, P.E.
Principal

Cc. Shane S. Green, P.E., Senior Transportation Engineer

Attachments

Figure 1: Vicinity Map
Figure 2: Existing Aerial Photograph
Figure 3: Proposed Site Plan

Table 1: Proposed Project Development Summary
Table 2: Entitled Development Summary
Table 3: Project Traffic Generation Forecast



SOURCE: OPEN STREETS

KEY

🟥 = PROJECT SITE

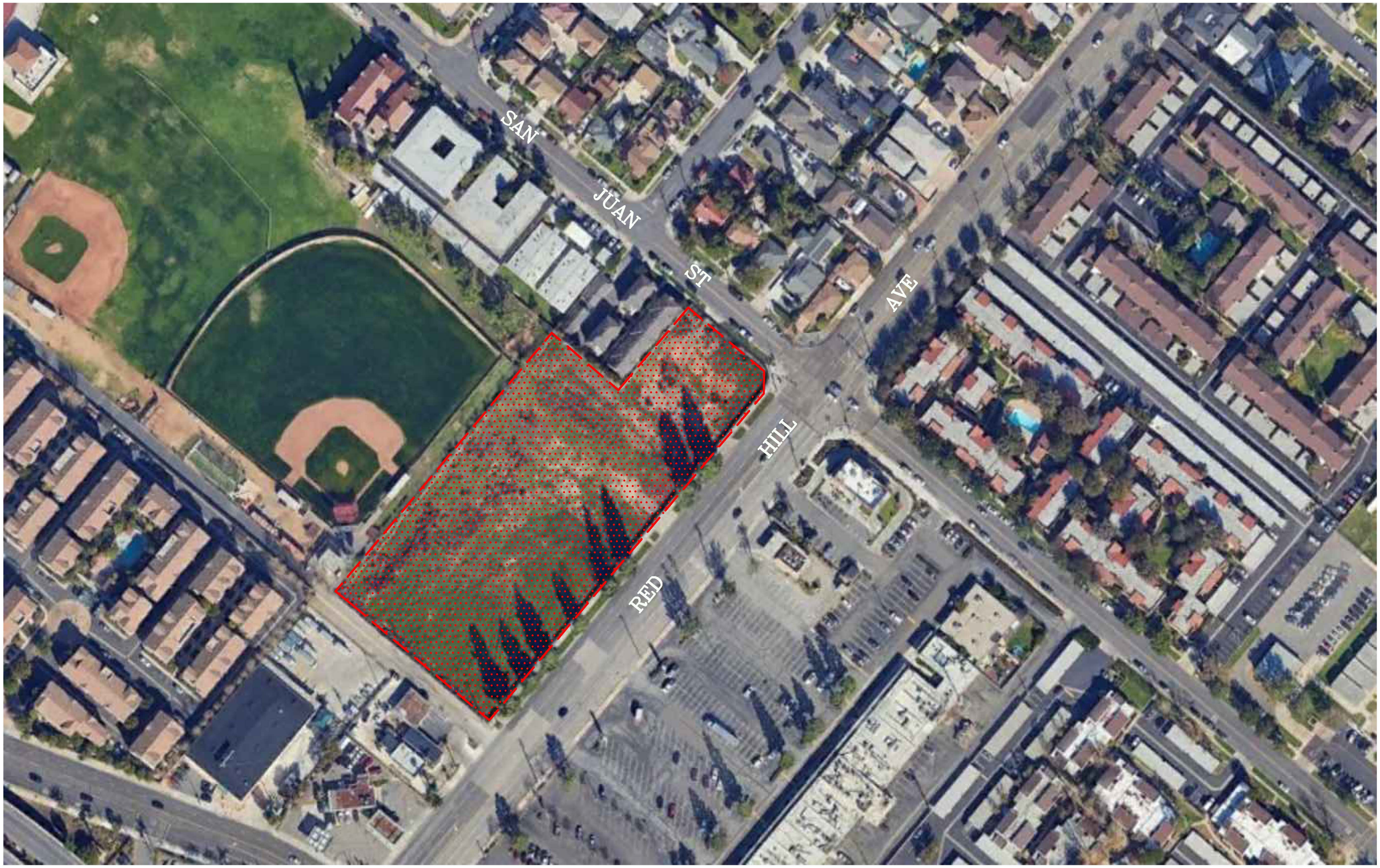
NO SCALE

FIGURE 1

VICINITY MAP

COMPASS AT RED HILL, TUSTIN

n:\4800\2244816 – compass at red hill, tustin\dwg\4816 f-1.dwg LDP 14:03:39 11-06-2024 talavera-solache



n:\4800\2244883 – irvine walmart expansion, irvine\dwg\4883 f-2.dwg LDP 13:47:39 10-09-2024 saavedra

SOURCE: GOOGLE

KEY

▨ = PROJECT SITE

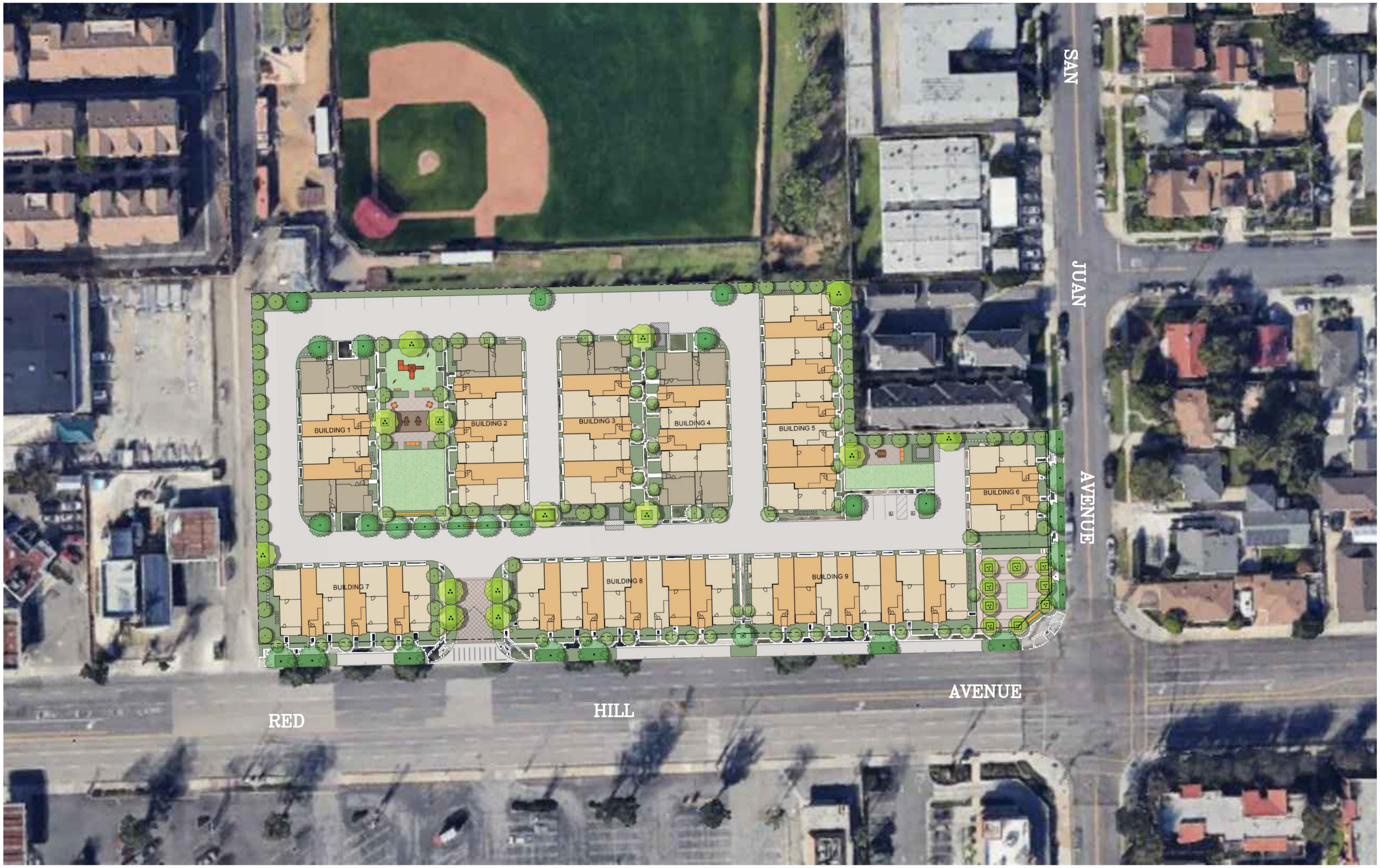
N

NO SCALE

FIGURE 2

EXISTING AERIAL PHOTOGRAPH

COMPASS AT RED HILL, TUSTIN



n:\4800\2244816 – compass at red hill, tustin\dwg\4816 f-3.dwg LDP 15:36:20 02-27-2025 saavedra

SOURCE: MERITAGE HOMES

N NO SCALE

FIGURE 3

PROPOSED SITE PLAN

COMPASS AT RED HILL, TUSTIN

TABLE 1
PROPOSED PROJECT DEVELOPMENT SUMMARY[2]
COMPASS AT RED HILL, TUSTIN

Land Use / Project Description	**Project Development Totals**
Townhome / Condominium Development	
Residential Allocation (Size)	
☐ 2-Bedroom, 2.5 Bath Units (1210 SF)	8 Units
☐ 3-Bedroom, 3 Bath Units (1497 SF)	33 Units
☐ 4-Bedroom, 4 Bath Units (1791 SF)	32 Units
Total Residential Units:	***73 Units***
Off-Street Parking Supply	
☐ 2-car Garages per Unit	146 spaces
☐ Off-Street Parking (internal parking; non-assigned)	18 spaces
Total Parking Supply:	***164 spaces***
On-Street Parking	
☐ ***Parallel Parking on Red Hill Avenue Project Frontage***	***13 spaces***

---

[2] Source: Conceptual Site Plan, prepared by Kevin L. Crook Architect, Inc.

TABLE 2
ENTITLED DEVELOPMENT SUMMARY[3]
COMPASS AT RED HILL, TUSTIN

Land Use / Project Description	**Project Development Totals**
Mixed-Use Development	
Apartment Allocation (Size)	
☐ Studio Units (515 SF)	16 Units
☐ One (1) Bedroom Units (679 SF-707 SF)	62 Units
☐ Two (2) Bedroom Units (941 SF-1460 SF)	49 Units
☐ Live/work Units (560 SF - 1351 SF)	10 Units
Total Residential Units:	***137 Units***
Apartment-Related Building Amenities (see Architectural Plan Sheet G1.1 for details on “open space matrix” and other non-structured/retail plaza open space)	
☐ Bike Shop	100 SF
☐ Entry Promenade	2,439 SF
☐ Co-Working Space	761 SF
☐ Fitness	1,048 SF
☐ Club	1,556 SF
☐ Mail Lounge	364
☐ Courtyards	7,026 SF
☐ Roof Deck Building B	1,444 SF
☐ Bistro / Gaming Garden / Dog Run	5,530 SF
Total Apartment Amenities/Common Area:	***20,268 SF***
Retail/Commercial Uses	
☐ General Retail Shops	7,000 SF
☐ Leasing Office	999 SF
Total Retail/Commercial:	***7,999 SF***

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[3] Source: Architects Orange, Red Hill Mixed Use – Sheet A1.2 Site Plan; (Total on-site supply of 227 spaces).

TABLE 3
PROJECT TRAFFIC GENERATION FORECAST[4]
COMPASS AT RED HILL, TUSTIN

ITE Land Use Code / Project Description	**Daily 2-Way**	**AM Peak Hour**			**PM Peak Hour**		
		Enter	**Exit**	**Total**	**Enter**	**Exit**	**Total**
Generation Factors:							
▪ 221: Multifamily Housing (Low-Rise) Not Close to Rail Transit (TE/DU)	6.74	24%	76%	0.40	63%	37%	0.51
▪ 822: Strip Retail Plaza Less Than 40K SF (TE/TSF)	54.45	60%	40%	2.36	50%	50%	6.59
Generation Forecast – Entitled Project:							
▪ Apartment (137 DU)	923	13	42	55	44	26	70
▪ General Retail (7,000 SF)[5]	381	10	7	17	23	23	46
Entitled Project Total Trip Generation Forecast [A]	***1,304***	***23***	***49***	***72***	***67***	***49***	***116***
Generation Forecast – Proposed Project:							
▪ Condominium / Townhouse (73 DU)	492	7	22	29	23	14	37
Proposed Project Trip Generation Forecast [B]	***492***	***7***	***22***	***29***	***23***	***14***	***37***
Net Project Trip Generation Forecast (Proposed Project - Entitled Development) [C] = [B] – [A]	***-812***	***-16***	***-27***	***-43***	***-44***	***-35***	***-79***

Notes:

- TE/DU = Trip end per dwelling unit
- TE/TSF = Trip end per 1,000 square-feet of development

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[4] Source: *Trip Generation*, *11th Edition,* Institute of Transportation Engineers (ITE), Washington, D.C. (2021). It noted that the trip rates utilized in the *Traffic Impact Study for the Red Hill Avenue Specific Plan.* Were based on information from the *9th Edition of Trip Generation*.

[5] Please note, since approximately 4,834 SF of leasing area, club house and fitness is designated as apartment amenities (for resident use only), this floor area was excluded from the retail/commercial component of the Entitled Project.

CITY OF TUSTIN
VMT SCREENING FORM FOR LAND USE PROJECTS

This form acknowledges the City of Tustin requirements for the evaluation of vehicle miles traveled (VMT) under CEQA.
The analysis provided in this form should follow the City of Tustin approved VMT Guidelines, dated February 13, 2024.

I. Project Description

Case Number: DESIGN REVIEW (DR) 2024-001 4SUBDIVISION (SUB) 2024-0005, DEVELOPMENT AGREEMENT (DA) 2024-0004

Project Name: COMPASS AT RED HILL, A73-UNIT RESIDENTIAL TOWNHOME PROJECT WITHIN THE RED HILL AVENUE SPECIFIC PLAN (RHASP)

Project Location: THE PROJECT SITE IS LOCATED AT 13751 AND 13841 RED HILL AVENUE

Project Description: 73-UNIT RESIDENTIAL DEVELOPMENT TO BE DEVELOPED IN PLACE OF A PREVIOUSLY ENTITLED MIXED-USE PROJECT THAT INCLUDED 137-UNIT APARTMENT PROJECT WITH 7,000 SF OF GENERAL RETAIL/COMMERCIAL FLOOR AREA

Current GP Land Use:	RED HILL SPECIFIC PLAN	**Proposed GP Land Use:**	RED HILL SPECIFIC PLAN
Current Zoning:	RED HILL SPECIFIC PLAN	**Proposed Zoning:**	RED HILL SPECIFIC PLAN

Does the Poject require a General Plan Amendment and/or Zone Change?	**YES**		**NO**	**X**

II. VMT Screening Criteria

A. Is the Project 100% affordable housing?	**YES**		**NO**	**X**	Attachments:	
B. Is the Project within 1/2 mile of qualifying transit?	**YES**		**NO**	**X**	Attachments:	
C. Is the Project a local serving land use?	**YES**		**NO**	**X**	Attachments:	
D. Is the Project in a low VMT area?	**YES**	X	**NO**		Attachments:	
E. Are the Project's Net Daily Trips less than 500 ADT?	**YES**	X	**NO**		Attachments:	

Low VMT Area Evaluation:

City of Tustin VMT Thresholds		
Citywide Average Home-Based VMT[1] =	15.0	VMT/Capita
Citywide Average Employment VMT[1] =	25.1	VMT/Employee

[1] OCTAM 5.0 v.6.22.23 base year (2016) statistics.

Project Traffic Analysis Zone (TAZ)	**VMT Rate for Project TAZ[1]**		**Type of Project**	
1115	**14.1**	VMT/Capita	Residential:	X
	24.4	VMT/Employee	Non-Residential:	

Trip Generation Evaluation:

Source of Trip Generation: See attached VMT Screening Assessment and 11th Edition of Trip Generation, ITE
* Use trip rates from the latest edition of the ITE Trip Generation Manual or as approved by City Staff.

Project Trip Generation: 492 **Average Daily Trips (ADT)**

Internal Trip Credit:	YES		NO	X	% Trip Credit:	
Pass-By Trip Credit:	YES		NO	X	% Trip Credit:	
Affordable Housing Credit:	YES		NO	X	% Trip Credit:	
Existing Land Use Trip Credit:	YES	X	NO		Trip Credit:	**1,304 [1]**

Net Project Trip Generation: **-812** **Average Daily Trips (ADT)** Attachments: **Yes**

Does project trip generation warrant an LOS evaluation outside of CEQA?	**YES**		**NO**	**X**

[1] Represents trip generation associated with the Entitled Mixed-Use Development Project

III. VMT Analysis Summary

A. Is additional VMT modeling required to evaluate impacts?	**YES**		**NO**	X

Projects that do not satisfy at least one (1) of the VMT screening criteria AND generate 2,400 or more net daily trips AND require a zone change/general plan amendment may require additional VMT modeling using OCTAM. Project that generates less than 2,400 daily trips may use the base TAZ rate for VMT analysis and mitigation purposes.

B. City of Tustin VMT Threshold of Significance:	**N/A**
C. Unmitigated Project VMT Rate:	**N/A**

D. Does Unmitigated Project VMT Rate Exceed VMT Threshold?	**YES**		**NO**	
E. Is mitigation required?	**YES**		**NO**	

F. Percentage Reduction Required to Achieve the Citywide Average VMT:	

G. Mitigation Measures:

Source:		
	VMT Reduction Mitigation Measure:	**Estimated VMT Reduction (%)**
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
	Total VMT Reduction (%)	

All mitigation measures are subject to become Conditions of Approval of the project. Provide attachments showing all VMT reduction calculations.

H. Mitigated Project TAZ VMT Rate:	N/A
I. Significance Finding: (Less than significant, less than significant with mitigation, potential significant, etc.)	N/A

Prepared By		**Developer/Applicant**	
Company:	Linscott, Law & Greenspan, Engineers	**Company:**	Meritage Homes
Contact:	Richard Barretto	**Contact:**	Johanna Crooker
Address:	2 Executive Circle, Suite 250, Irvine, CA	**Address:**	5 Peters Canyon Road
Phone:	(949) 825-6175	**Phone:**	949.299.3847
Email:	barretto@llgengineers.com	**Email:**	johanna.crooker@mlcholdings.net
Date:	04/11/2025	**Date:**	04/11/2025

Approved by:

Tustin Public Works Engineering	**Date**	**Tustin Community Development Planning**	**Date**

Development review and processing fees should be submitted with, or prior to the submittal of this Form.
The Public Works and/or Planning Division staff will not process the Form prior to fees being paid to the City.

LLG

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Pasadena
Irvine
San Diego

TECHNICAL MEMORANDUM

To: Johanna Crooker, AICP
Director of Forward Planning – Entitlements
Southern California, Meritage Homes

Date: April 11, 2025

From: Richard E. Barretto, P.E., Principal
Linscott, Law and Greenspan, Engineers

RBarretto

LLG Ref: 2.24.4816.1

CC: Shane S. Green, P.E., Senior Transportation Engineer

Subject: ***Revised Vehicle Miles Traveled (VMT) Screening Assessment for the Compass at Red Hill Project***
Tustin, CA

As requested, Linscott, Law & Greenspan, Engineers (LLG) is pleased to submit this revised Vehicle Miles Traveled (VMT) Screening Assessment Memorandum for the Compass at Red Hill Project (hereinafter referred to as Project) in the City of Tustin, California. This Screening Memorandum presents the VMT screening criteria, assessment methodology, and conclusion. The approach and methodology outlined in this Screening Memorandum is consistent with the *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024)*, which provides additional detail on the language and analysis procedures described in this Screening Memorandum. This assessment has been updated to address applicable VMT comments included in a City comment package received on April 10, 2025.

The following sections of this Technical Memorandum summarize the Project description, present City of Tustin's VMT screening criteria, assessment methodology, and conclusion.

PROJECT DESCRIPTION

The Project site is located south of San Juan Street and west of Red Hill Avenue at 13751 and 13841 Red Hill Avenue in the City of Tustin, California. ***Figure 1***, located at the rear of this memorandum, presents a Vicinity Map, which illustrates the general location of the project and the surrounding street system. ***Figure 2*** presents the existing site aerial.

The Project site is included within the Traffic Analysis Zone (TAZ) 1 of the *Red Hill Avenue Specific Plan*, which was previously analyzed as part of the *Traffic Impact Study for the Red Hill Avenue Specific Plan, prepared by Kimley-Horn and Associates, Inc., dated January 2018.* Further, the subject property is currently vacant, but it entitled to the development of a mixed-use project that included a 137-unit residential apartment development and 7,000 square-feet of general retail/commercial space.

The Project, as now proposed, includes the development of a 73-unit residential townhome/condominium community consisting of three-story townhomes with a mix

8 two-bedroom units, 33 three-bedrooms units and 32 four-bedroom units. Parking for the Project would be provided via 146 garage spaces and 18 off-street parking spaces internal to the project site for a total supply of 165 parking spaces. In addition, as a part of Project frontage improvement, up to 13 on-street parking spaces will be constructed that would be open to the general public; these spaces are not considered a part of the Project's parking supply. On-site facilities/amenities for residents include a recreation area, tot lot and open space. As now envisioned, access to the Project will be provided via a full access driveway on Red Hill Avenue. ***Table 1*** summarizes the proposed Project development totals for the site. ***Figure 3*** presents the site plan for the proposed Project prepared by Kevin L. Crook, Architect Inc.

PROJECT SCREENING CRITERIA

Project screening is used to determine if a project will be required to conduct a detailed VMT analysis. The following section discusses the various screening methods outlined in the *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024)*, and outlines whether the Project will screen-out, either in its entirety or partially, based on individual land uses.

The *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024)*[1] states that five types of screening that can be applied to screen projects from project-level assessment. These screening steps are summarized below:

Step 1: Affordable Housing Screening

The *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024)* states:

> *"If a project consists of 100% affordable housing, then the presumption can be made that it will have a less than significant impact on VMT. According to sources provided by OPR, affordable housing projects typically generate lower VMT than market-rate housing and a project consisting of a high percentage of affordable housing may be a basis for the city to find a less than significant impact on VMT. Furthermore, a project which includes any affordable residential units may factor in the effect of the affordability on VMT into the assessment of VMT generated by those units."*

Based on the above, the proposed Project will not screen out under the Affordable Housing Screening criteria since the Project site is not 100% affordable housing.

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[1] See *Section 2.0 VMT Screening for Land Use Projects* of the City's VMT Analysis Guidelines.

Step 2: Transit Priority Area (TPA) Screening

The second screening methodology is for projects in Transit Priority Areas (TPA). The *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024) states*:

> *"CEQA Guideline Section 15064.3, subdivision (b)(1), states that lead agencies generally should presume that certain projects (including residential, retail, and office projects, as well as projects that are a mix of these uses) proposed within one half (½) mile of an existing major transit stop or an existing stop along a high quality transit corridor will have a less than significant impact on VMT.*
>
> *For purposes of the Tustin VMT Guidelines, qualifying transit means a major transit stop or high-quality transit corridor, defined as follows:*
>
> - ***Major transit stop*** *means a site containing an existing rail transit station, a ferry terminal served by either a bus or rail transit service, or the intersection of two or more major bus routes with a frequency of service interval of 15 minutes or less during the morning and afternoon peak commute periods. (Pub. Resources Code, § 21064.3).*
> - ***High-quality transit corridor*** *means a corridor with fixed route bus service with service intervals no longer than 15 minutes during peak commute hours. (Pub. Resources Code, § 21155).*
>
> *The latest OCTA Bus and Metrolink Rail transit schedules should be utilized during the VMT screening process to determine whether a bus stop or corridor meets the criteria for qualifying transit.*
>
> *Per CEQA Section 21155(b), a project shall be considered to be within one-half mile of a major transit stop if all parcels within the project have no more than 25 percent of their area farther than one-half mile from the stop and if not more than 10 percent of the residential units or 100 units, whichever is less, in the project are farther than one-half mile from the stop or corridor. The analysis should also consider any substantial physical barriers that may impede pedestrian access between the transit stop and project site."*

As presented in ***Figure 4***[2] the Project is not located within a Transit Priority Area (TPA). As such, the proposed Project will not screen out under the TPA Screening criteria since the Project site is located within Tustin's TPA area.

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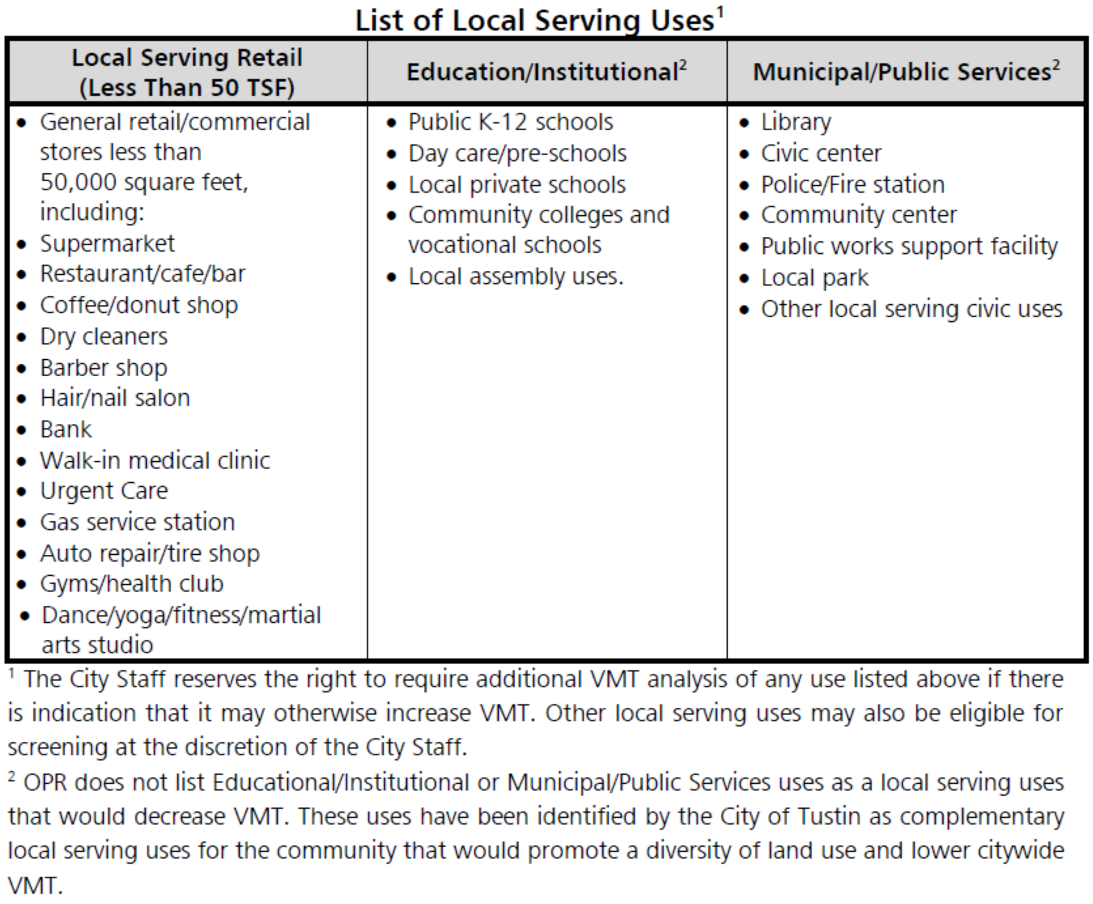
[2] See *Exhibit B City of Tustin Transit Priority Area from the City's VMT Analysis Guidelines.*

Step 3: Local Serving Project Screening

The third screening methodology is for local serving projects. The *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024) states:*

> *"Local serving land uses provide goods and services to the local community. Local serving land uses offer more opportunities for residents and employees to shop, dine and obtain services closer to home and work.*
>
> *Local serving uses can also include community resources that may otherwise be located outside of the local area. By improving destination proximity, local serving uses lead to shortened trip lengths and reduced VMT. Therefore, local serving uses may be presumed to have a less than significant impact on VMT. Projects that serve a wider regional area and population, such as regional shopping and entertainment centers would not qualify as a local serving use."*

Screenshot 1 *below contains the List of Locas Serving Uses based on the City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024).*



List of Local Serving Uses[1]

Local Serving Retail (Less Than 50 TSF)	Education/Institutional[2]	Municipal/Public Services[2]
• General retail/commercial stores less than 50,000 square feet, including: • Supermarket • Restaurant/cafe/bar • Coffee/donut shop • Dry cleaners • Barber shop • Hair/nail salon • Bank • Walk-in medical clinic • Urgent Care • Gas service station • Auto repair/tire shop • Gyms/health club • Dance/yoga/fitness/martial arts studio	• Public K-12 schools • Day care/pre-schools • Local private schools • Community colleges and vocational schools • Local assembly uses.	• Library • Civic center • Police/Fire station • Community center • Public works support facility • Local park • Other local serving civic uses

[1] The City Staff reserves the right to require additional VMT analysis of any use listed above if there is indication that it may otherwise increase VMT. Other local serving uses may also be eligible for screening at the discretion of the City Staff.

[2] OPR does not list Educational/Institutional or Municipal/Public Services uses as a local serving uses that would decrease VMT. These uses have been identified by the City of Tustin as complementary local serving uses for the community that would promote a diversity of land use and lower citywide VMT.

Based on above table, the proposed Project will not screen out under the Local Serving Project Screening criteria since the Project is a residential land use.

Step 4: Low VMT Area Screening

The fourth screening methodology is to assess if the Project is located in a Low VMT Area. The *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024) states:*

> *"Projects that locate in areas with low VMT, and that incorporate similar features (i.e., density, mix of uses, transit accessibility), will tend to exhibit similarly low VMT. If a project is located in a Traffic Analysis Zone (TAZ) with VMT per capita or VMT per employee that is less than or equal to the citywide average, then the project is considered to be located in a low VMT area, and can be presumed to have a less than significant impact on VMT.*
>
> *The latest version of the OCTAM should be used to determine whether a project is located in a low VMT area.*
>
> *Residential projects shall utilize and compare the VMT/capita rate of the TAZ in which the project is located to the citywide average VMT/capita rate. Non-residential projects shall utilize and compare the VMT/employee rate to the citywide average VMT/employee rate. For mixed-use projects in which the residential component is considered the primary use, and the non- residential component is less than 50,000 square feet of local serving retail, the analysis shall be run as a residential project and the VMT/capita rate should be used. If a mixed-use project consists of non-local serving uses, a separate screening assessment should be prepared for both the residential and non-residential components of the project."*

Based on the above, the proposed Project, which is located within TAZ 1115, will screen out since it is located in a low VMT area as presented in ***Figure 5***[3] .

Step 5: Project Net Daily Trips Screening

The fifth screening methodology is for the Project's net daily trips. The *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024) states:*

> *"Most small projects that generate less than 500 net average daily traffic (ADT) would not cause a substantial increase in the total citywide or regional VMT and may therefore be presumed to have a less than significant impact on VMT. Appendix B provides additional discussion, evidence, and analysis regarding the application of the 500 ADT screening criteria and how it has*

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[3] See *Exhibit D Low VMT Area – VMT per Capita from the City's VMT Analysis Guidelines.*

> *been established within the context of CEQA. The ADT screening threshold is consistent with the County of Orange, and other agencies in the region, which have adopted higher ADT screening thresholds than initially recommended by OPR, and the threshold is based on the unique characteristics of the community. The OPR Technical Advisory recommends setting the small project trip threshold to 110 daily trips. However, as shown in evidence provided in Appendix B, projects that generate less than 500 ADT in the City of Tustin would not cause substantial increases in the overall VMT for the City and would not result in a significant GHG impact, thus it may be presumed to have a less than significant impact on VMT.*
>
> *The latest edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual is the preferred source for calculating trip generation in the City of Tustin. The use of other sources of trip generation must be approved by the City Staff. The screening criteria trip limit is based on net trip generation after considering pass-by, internal capture, affordable housing, and/or existing land use trips."*

Table 2 summarizes the trip generation rates used in forecasting the vehicular trips generated for the entitled development and proposed Project and also presents the forecast peak hour and daily traffic volumes.

The trip generation potential of the Entitled Development and proposed Project were estimated using ITE Land Use 220: Multifamily Housing Low Rise and ITE Land Use 822: Strip Retail Plaza (< 40k SF) Center rates contained in the 11th Edition of *Trip Generation,* published by the Institute of Transportation Engineers (ITE), [Washington, D.C., 2021].

For the purposes of CEQA VMT compliance it is appropriate to compare the proposed Project trips to the trip budget associated with the Entitled Development. As such, a comparison of the trips generated by the proposed Project to that of the Entitled Development shows that the proposed Project would generate less traffic than the entitled mix of uses, with 812 fewer daily trips (See *Row C of Table 2*).

In addition, with a focus on the proposed Project, the proposed 73-unit residential community is forecast to generate 492 daily trips, which is lower than the threshold of 500 daily trips (See *Row B of Table 2*).

Based on the above, the proposed Project will screen out since it generates less than 500 net daily trips.

CONCLUSIONS

Consistent with the *City of Tustin Vehicles Miles Traveled (VMT) Analysis Guidelines, dated March 2024 (adopted in May 2024)*, and based on the VMT screening methodology, the Project meets the screening criteria since it is located in a low VMT area and generates less than 500 daily trips.

Therefore, in accordance with the *City of Tustin Vehicle Miles Traveled (VMT) Analysis Guidelines (dated March 2024)*, the proposed Project is exempt from the preparation of any further VMT analysis and may be presumed to have a less than significant CEQA-related transportation impact. As such, no further VMT analysis is necessary or required.

* * * * * * * * * *

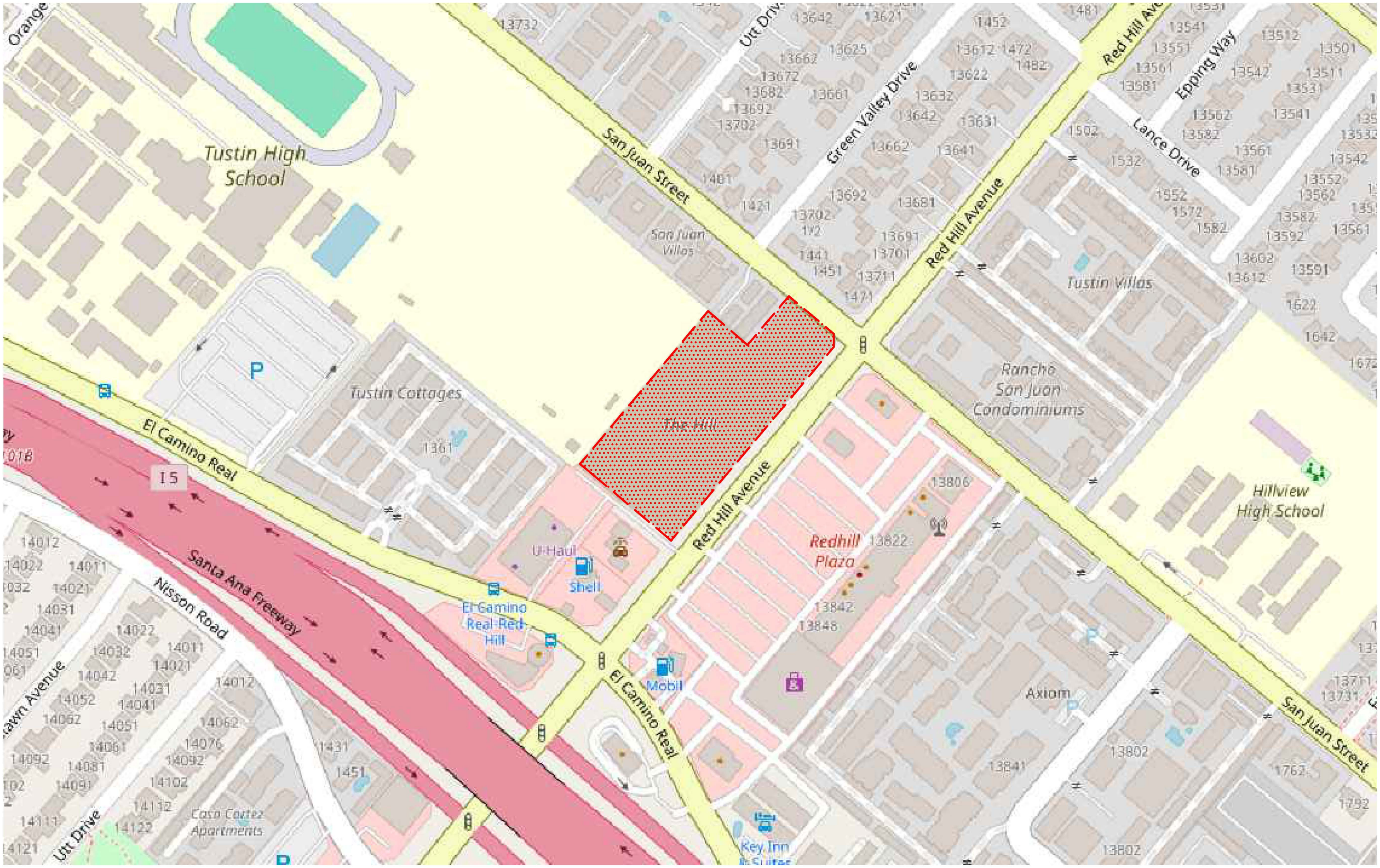
We appreciate the opportunity to provide this Technical Memorandum. Should you have any questions regarding the memorandum, please contact us at (949) 825-6175.

Attachments

Figure 1: Vicinity Map
Figure 2: Existing Aerial Photograph
Figure 3: Proposed Site Plan
Figure 4: Tustin Transit Priority Areas
Figure 5: Tustin Low VMT Area – VMT per Capita

Table 1: Proposed Project Development Summary
Table 2: Project Traffic Generation Forecast

REGISTERED PROFESSIONAL ENGINEER
RICHARD E. BARRETTO
No. 2006
Exp. 6/30/25
TRAFFIC
STATE OF CALIFORNIA



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SOURCE: OPEN STREETS

KEY

▨ = PROJECT SITE

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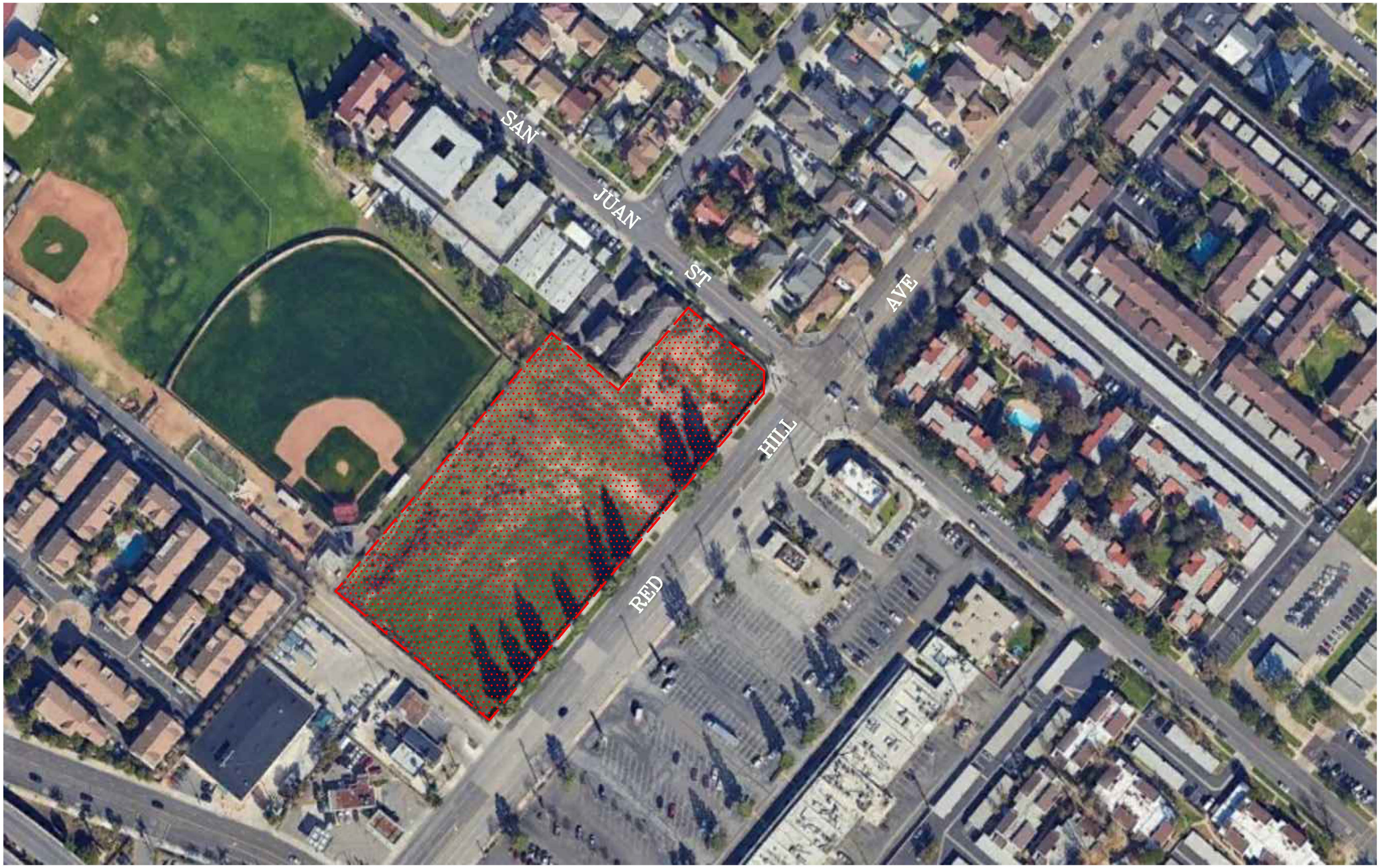
NO SCALE

FIGURE 1

VICINITY MAP

COMPASS AT RED HILL, TUSTIN



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SOURCE: GOOGLE

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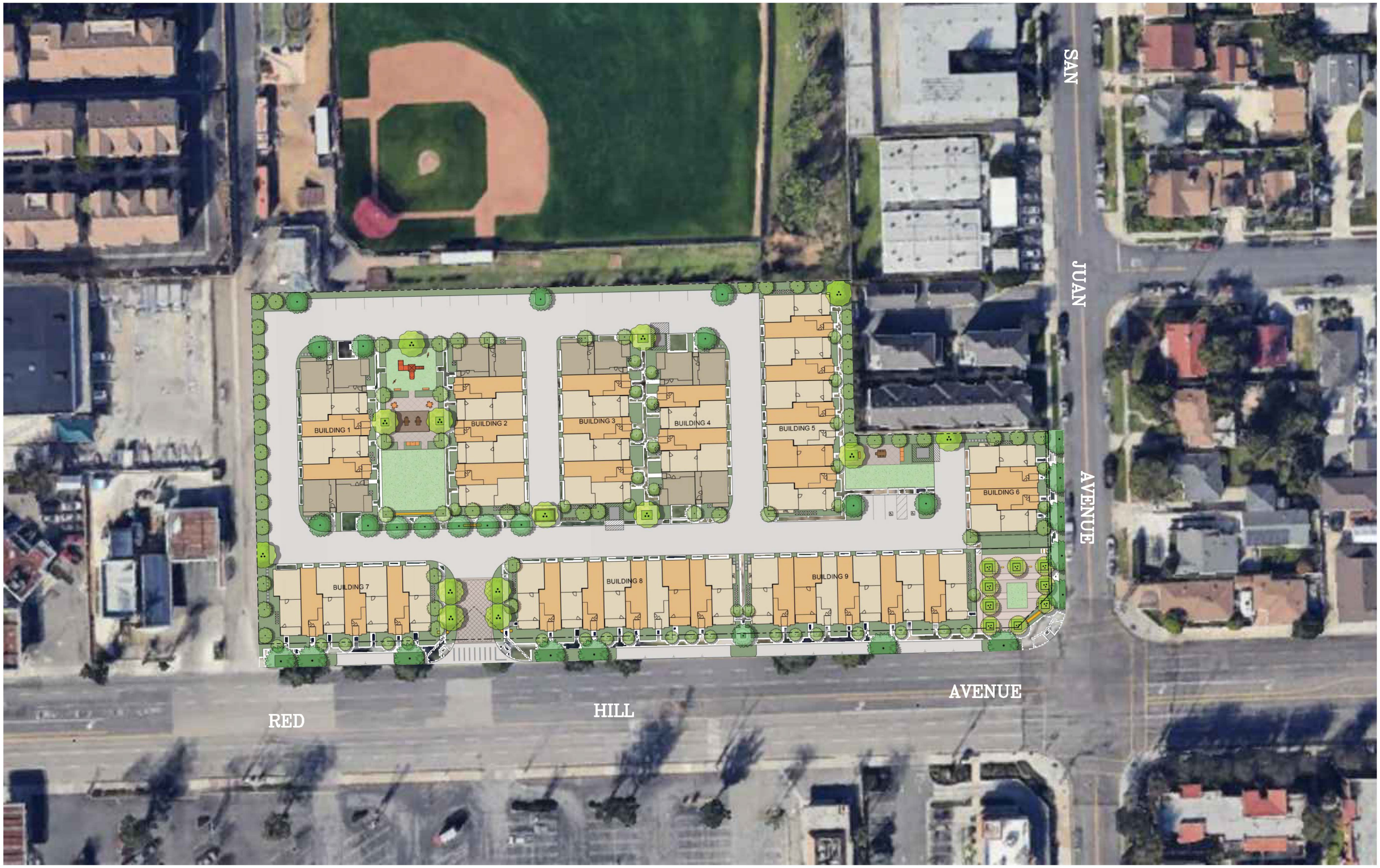
FIGURE 2

EXISTING AERIAL PHOTOGRAPH

COMPASS AT RED HILL, TUSTIN



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SOURCE: MERITAGE HOMES

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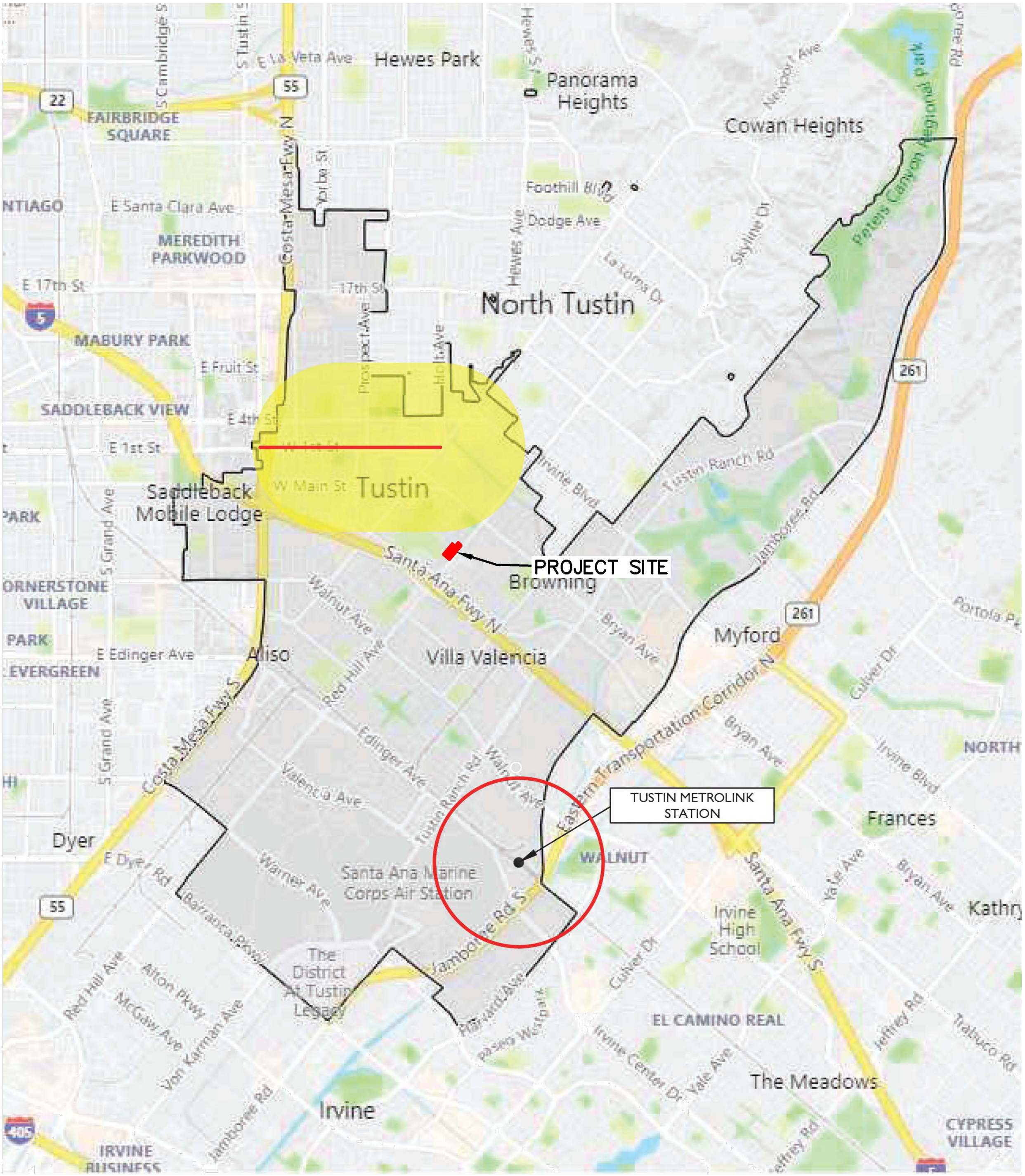
FIGURE 3

PROPOSED SITE PLAN

COMPASS AT RED HILL, TUSTIN



Legend:

○ = Transit Priority Area (1/2 Mile Radius)

● = High Quality Transit Corridor (1/2 Mile Radius)

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SOURCE: CITY OF TUSTIN VMT GUIDELINES

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▨ = PROJECT SITE

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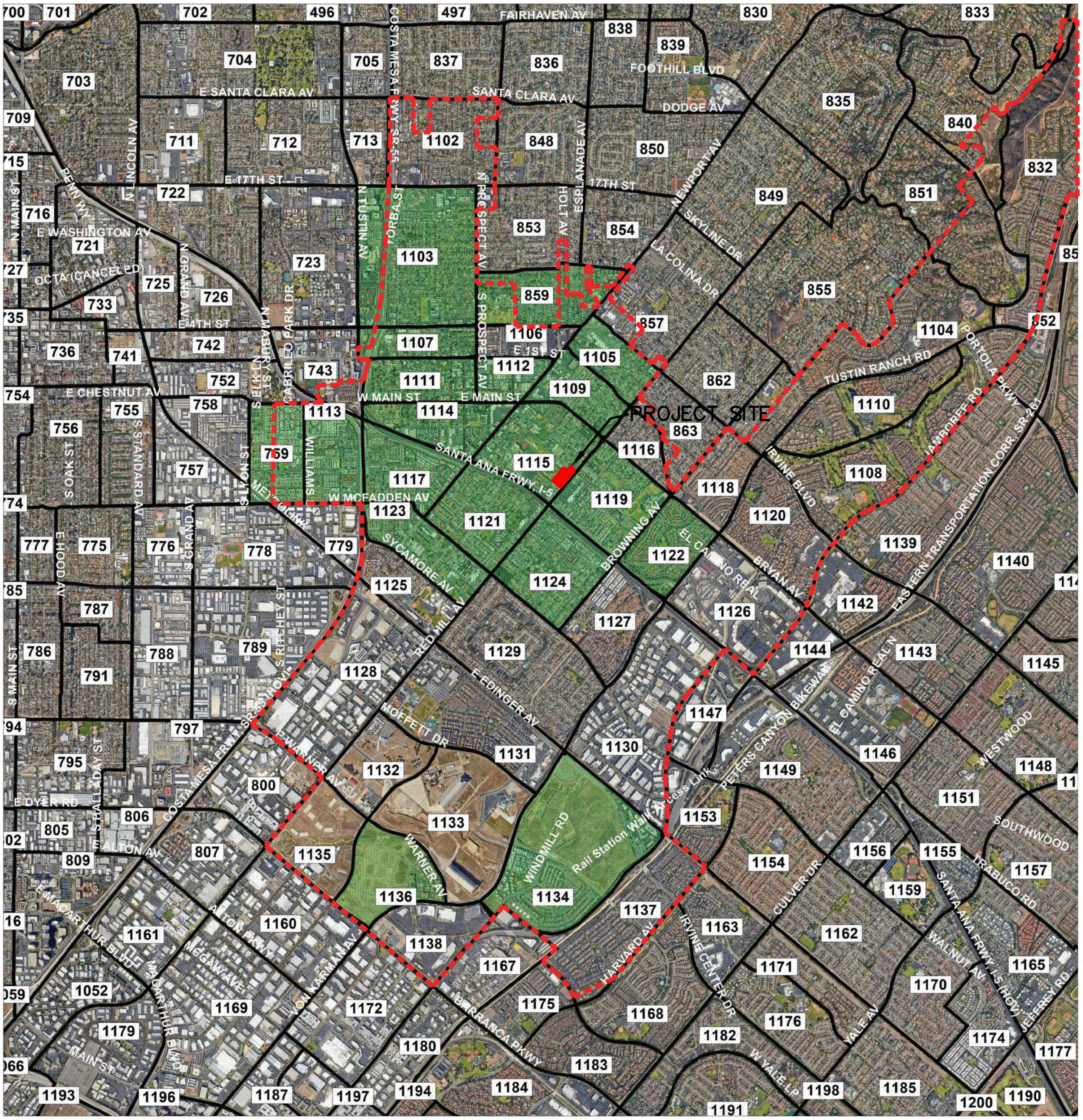
FIGURE 4

TUSTIN TRANSIT PRIORITY AREA

COMPASS AT RED HILL, TUSTIN



Legend:

🟩 = VMT/capita less than or equal to City of Tustin 2016 citywide average VMT/capita

⬚ = City of Tustin Boundary

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SOURCE: CITY OF TUSTIN VMT GUIDELINES

KEY

🟥 = PROJECT SITE

N NO SCALE

FIGURE 5

TUSTIN LOW VMT AREA–VMT PER CAPITA

COMPASS AT RED HILL, TUSTIN

TABLE 1

PROPOSED PROJECT DEVELOPMENT SUMMARY[4]

COMPASS AT RED HILL, TUSTIN

Land Use / Project Description	**Project Development Totals**
Townhome / Condominium Development	
Residential Allocation (Size)	
☐ 2-Bedroom, 2.5 Bath Units (1210 SF)	8 Units
☐ 3-Bedroom, 3 Bath Units (1497 SF)	33 Units
☐ 4-Bedroom, 4 Bath Units (1791 SF)	32 Units
Total Residential Units:	***73 Units***
Off-Street Parking Supply	
☐ 2-car Garages per Unit	146 spaces
☐ Open Parking (internal parking; non-assigned)	18 spaces
Total Parking Supply :	***164 spaces***
On-Street Parking	
☐ ***Parallel Parking on Red Hill Avenue Project Frontage***	***13 spaces***

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[4] Source: Conceptual Site Plan, prepared by Kevin L. Crook Architect, Inc.

TABLE 2
PROJECT TRAFFIC GENERATION FORECAST[5]
COMPASS AT RED HILL, TUSTIN

ITE Land Use Code / Project Description	Daily 2-Way	AM Peak Hour			PM Peak Hour		
		Enter	**Exit**	**Total**	**Enter**	**Exit**	**Total**
Generation Factors:							
▪ 221: Multifamily Housing (Low-Rise) Not Close to Rail Transit (TE/DU)	6.74	24%	76%	0.40	63%	37%	0.51
▪ 822: Strip Retail Plaza Less Than 40K SF (TE/TSF)	54.45	60%	40%	2.36	50%	50%	6.59
Generation Forecast – Entitled Project:							
▪ Apartment (137 DU)	923	13	42	55	44	26	70
▪ General Retail (7,000 SF)[6]	381	10	7	17	23	23	46
Entitled Project Total Trip Generation Forecast [A]	***1,304***	***23***	***49***	***72***	***67***	***49***	***116***
Generation Forecast – Proposed Project:							
▪ Condominium / Townhouse (73 DU)	492	7	22	29	23	14	37
Proposed Project Trip Generation Forecast [B]	***492***	***7***	***22***	***29***	***23***	***14***	***37***
Net Project Trip Generation Forecast (Proposed Project - Entitled Development) [C] = [B] – [A]	***-812***	***-16***	***-27***	***-43***	***-44***	***-35***	***-79***

Notes:

- TE/DU = Trip end per dwelling unit
- TE/TSF = Trip end per 1,000 square-feet of development

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[5] Source: *Trip Generation*, *11th Edition,* Institute of Transportation Engineers (ITE), Washington, D.C. (2021). It noted that the trip rates utilized in the *Traffic Impact Study for the Red Hill Avenue Specific Plan.* Were based on information from the *9th Edition of Trip Generation*.

[6] Please note, since approximately 4,834 SF of leasing area, club house and fitness is designated as apartment amenities (for resident use only), this floor area was excluded from the retail/commercial component of the Entitled Project.

Mitigation Monitoring and Reporting Program

Introduction

Development within the Red Hill Avenue Specific Plan (RHASP) area is subject to mitigation measures identified in the RHASP Final EIR, the development regulations in the RHASP, and the City's Municipal Code. Mitigation Measures from the RHASP Final EIR are included herein and will be incorporated into the Compass at Red Hill Residential Project (Project) located at 13751 & 13841 Red Hill Avenue (APNs 500-141-09 and 500-141-10), on the west corner of San Juan Street and Red Hill Avenue, as applicable.

A Mitigation Monitoring and Reporting Program (MMRP) is required to ensure that adopted mitigation measures are successfully implemented for the Project. The City of Tustin is the Lead Agency for the Project and is responsible for implementation of the MMRP. This report describes the parties that will be responsible for monitoring implementation of the individual mitigation measures in the MMRP.

Mitigation Monitoring and Reporting Program

The MMRP for the Project will be active through all phases of the Project, including design, construction, and operation. The attached table identifies the mitigation program required to be implemented by the City for the Compass at Red Hill Residential Project. The table identifies the Plan, Program, Policies (PPPs); Project Design Features (PDFs); and mitigation measures required by the City to mitigate or avoid significant adverse impacts associated with the implementation of the Project, the timing of implementation, and the responsible party or parties for monitoring compliance.

The MMRP also includes a column that will be used by the compliance monitor (individual responsible for monitoring compliance) to document when implementation of the measure is completed. As individual Plan, Program, Policies; Project Design Features (PDFs); and mitigation measures are completed, the compliance monitor will sign and date the MMRP, indicating that the required actions have been completed.

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TABLE 1: MITIGATION MONITORING AND REPORTING PROGRAM THE RED HILL MIXED USE PROJECT

Plan, Program, Policy / Project Design Feature / RHASP Final EIR Mitigation Measure	**Notes**	**Timing**	**Responsible for Ensuring Compliance / Verification**	**Date Completed and Initials**
AIR QUALITY				
PPP AQ-1: SCAQMD Rule 403. The following measures shall be incorporated into construction plans and specifications as implementation of SCAQMD Rule 403: • All clearing, grading, earth-moving, or excavation activities shall cease when winds exceed 25 mph per SCAQMD guidelines in order to limit fugitive dust emissions. • The contractor shall ensure that all disturbed unpaved roads and disturbed areas within the Project are watered at least three (3) times daily during dry weather. Watering, with complete coverage of disturbed areas, shall occur at least three times a day, preferably in the mid-morning, afternoon, and after work is done for the day. • The contractor shall ensure that traffic speeds on unpaved roads and Project site areas are reduced to 15 miles per hour or less.		Note in Construction Plans and Specifications. Prior to Demolition and Grading Permits.	City of Tustin Building Division	
PPP AQ-2: SCAQMD Rule 1113. The following measure shall be incorporated into construction plans and specifications as implementation of SCAQMD Rule 1113. The Project shall only use "Low-Volatile Organic Compounds (VOC)" paints (no more than 50 gram/liter of VOC) consistent with SCAQMD Rule 1113.		Note in Construction Plans and Specifications. Prior to Demolition and Grading Permits.	City of Tustin Building Division	
PPP AQ-3: SCAQMD Rule 445. The following measure shall be incorporated into construction plans and specifications as implementation of SCAQMD Rule 445. Wood burning stoves and fireplaces shall not be included or used in the new development.		Note in Construction Plans, Specifications, and Permits. Prior to Demolition and Grading Permits.	City of Tustin Building Division	
MM 4.2-1: Electric Vehicle (EV) Charging Stations. Prior to the issuance of building permits, the City's Building Official shall confirm that project plans and specifications designate that vehicle parking spaces developed within the Specific Plan area shall be EV ready to encourage EV use and appropriately size electrical panels to accommodate future expanded EV use.		Note in Construction Plans, Specifications, and Permits. Prior to Building Permits.	City of Tustin Building Division	

Plan, Program, Policy / Project Design Feature / RHASP Final EIR Mitigation Measure	Notes	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
MM 4.2-2: Vanpool/Rideshare Programs. Prior to the issuance of occupancy permits, the City's Building Official shall confirm that future commercial uses within the Specific Plan area include Codes, Covenants, and Restrictions (CC&Rs) that provide for a voluntary vanpool/shuttle and employee ridesharing programs for which all employees shall be eligible to participate. The voluntary ride sharing program could be achieved through a multi-faceted approach, such as designating a certain percentage of parking spaces for ride-sharing vehicles, designating adequate passenger loading and unloading and waiting areas for ridesharing vehicles, and/or providing a web site or message board for coordinating rides. This measure is not applicable to residential uses.		Note in Construction Plans, Specifications, and Permits. Prior to Occupancy Permits.	City of Tustin Building Division	
MM 4.2-3: Operational Emissions Reductions. Prior to the issuance of building permits, the City's Planning Official shall confirm that project plans and specifications consider and mitigate the impacts on regional air quality and GHG emissions when reviewing proposals for new development. Impacts shall be evaluated in accordance with SCAQMD recommended methodologies and procedures. Recommended mitigation measure may include, but are not limited to, the following: • Install heat transfer modules in all furnaces; • Install solar panels for water heating systems for residential and other facilities; • Incorporate renewable energy sources in the project design (e.g., solar photovoltaic panels). • Include passive solar cooling/heating design elements in building designs; • Include design elements that maximize use of natural lighting in new development; • Include provisions to install energy efficient appliances and lighting in new development. • Install higher efficacy public street and exterior lighting. • Increase project density. • Incorporate design measures that promote bicycle, pedestrian, and public transportation use. • Provide preferential parking spaces for alternatively-fueled vehicles. • Incorporate measures that reduce water use and waste generation. • Provide informational materials on low ROG/VOC consumer products, cleaners, paints, and other products, as well as the importance of recycling and purchasing recycled material. Informational materials shall be provided to residential and commercial occupants through CC&R requirements		Note in Construction Plans, Specifications, and Permits. Prior to Building Permits.	City of Tustin Building Division	

Plan, Program, Policy / Project Design Feature / RHASP Final EIR Mitigation Measure	Notes	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
• Incorporate measures and design features that promote ride sharing and consistency with the commute-reduction requirements of SCAQMD Rule 2202 (On-Road Motor Vehicle Mitigation Options).				
BIOLOGICAL RESOURCES				
PPP BIO-1: The Project shall comply with the Migratory Bird Treaty Act (MBTA) (United States Code Title 33, Section 703 et seq.; see also Code of Federal Regulations Title 50, Part 10) and Section 3503 of the California Fish and Game Code.		Note in Construction Plans and Specifications. Prior to Demolition and Grading Permits.	City of Tustin Planning Division	
CULTURAL RESOURCES				
PPP CUL-1: Should human remains be discovered during Project construction, the Project would be required to comply with State Health and Safety Code Section 7050.5, which states that no further disturbance may occur in the vicinity of the body until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. The County Coroner must be notified of the find immediately. If the remains are determined to be prehistoric, the Coroner will notify the Native American Heritage Commission, which will determine the identity of and notify a Most Likely Descendant (MLD). With the permission of the landowner or his/her authorized representative, the MLD may inspect the site of the discovery. The MLD must complete the inspection within 48 hours of notification by the NAHC.		Note in Construction Plans and Specifications. Prior to Demolition and Grading Permits.	City of Tustin Building Division	
MM 4.3-1: The CEQA Guidelines (14 CCR §15126.4[b][3]) direct public agencies, wherever feasible, to avoid damaging historical resources of an archaeological nature, preferably by preserving the resource(s) in place. Preservation in place options suggested by the CEQA Guidelines include (1) planning construction to avoid an archaeological site; (2) incorporating the site into open space; (3) capping the site with a chemically stable soil; and/or (4) deeding the site into a permanent conservation easement. Prior to issuance of a grading permit for grading of 2 feet or more in depth below the natural or existing grade, the applicant/developer shall provide written evidence to the City Planning Division that a qualified archaeologist has been retained by the applicant/developer to respond on an as-needed basis to address unanticipated archaeological discoveries and any archaeological requirements (e.g., conditions of	Mitigation Measure 4.3-1 has been updated to be consistent with City standard measures for archeological and tribal cultural resources. Mitigation regarding tribal cultural resources has been broken up and renumbered to MM TCR-1, MM-TCR-2, and	Note in Construction Plans and Specifications. Written evidence to the City Planning Division that a qualified archaeologist has been retained Prior to Demolition and Grading Permits.	City of Tustin Building Division City Planning Division	

Plan, Program, Policy / Project Design Feature / RHASP Final EIR Mitigation Measure	Notes	Timing	Responsible for Ensuring Compliance / Verification	Date Completed and Initials
approval) that are applicable to the Project. The applicant/developer is encouraged to conduct a field meeting prior to the start of construction activity with all construction supervisors to train staff to identify potential archaeological resources. In the event that archaeological materials ~~are~~ encountered during ground-disturbing activities, work in the immediate vicinity of the resource shall cease until a qualified archaeologist has assessed the discovery and appropriate treatment pursuant to CEQA Guidelines Section 15064.5 is determined. If discovered archaeological resources are found to be significant, the archaeologist shall determine, in consultation with the City, appropriate avoidance measures or other appropriate mitigation. Per CEQA Guidelines Section 15126.4(b)(3), preservation in place shall be the preferred means to avoid impacts to archaeological resources qualifying as historical resources. Consistent with CEQA Guidelines Section 15126.4(b)(3)(C), if it is demonstrated that confirmed resources cannot be avoided, the qualified archaeologist shall develop additional treatment measures, such as data recovery, reburial/relocation, deposit at a local museum that accepts such resources, or other appropriate measures. If an archaeological site does not qualify as a historical resource but meets the criteria for a unique archaeological resource as defined in Section 21083.2, then the site shall be treated in accordance with the provisions of Section 21083.2.	MM TCR-3, as listed in Section 5.18, *Tribal Cultural Resources*. These measures reflect the latest standard City language and are equivalent in intent and implementation. The revisions to the mitigation would be consistent with the Certified EIR and are consistent with CEQA Guidelines Section 15162(a).			
GEOLOGY AND SOILS				
MM 4.3-2: Prior to issuance of any grading or building permits for any development projects under the Red Hill Avenue Specific Plan, the applicant shall provide a letter to the City of Tustin Community Development Department, or designee, from a paleontologist selected from the roll of qualified paleontologists maintained by the County of Orange, stating that the applicant has retained this individual, and that the paleontologist shall provide on-call services in the event resources are discovered. The paleontologist shall be present at the pre-grading conference to establish procedures for paleontological resource surveillance. If paleontological resources are discovered during any development project within the Red Hill Avenue Specific Plan area, ground-disturbing activity within 50 feet of the area of the discovery shall cease. If the find is determined by paleontologists to require further treatment, the area of discovery will be protected from disturbance while qualified paleontologists and		Note in Construction Plans and Specifications. Prior to Grading Permits.	City of Tustin Building Division	

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appropriate officials, in consultation with a recognized museum repository (e.g., National History Museum of Los Angeles County), determine an appropriate treatment plan				
HAZARDS AND HAZARDOUS MATERIALS				
MM 4.6-1: Prior to issuance of grading permits, a human health risk evaluation shall be prepared by a qualified environmental professional in consultation with Orange County Health Care Agency, Environmental Health Division (OCHCA-EH) for any individual site application proposed on a site with a current or former hazardous materially regulated facility to determine if there is a contamination risk to the proposed land use. Remedial activities, if necessary, may be required, in consultation with OCHCA-EH.		Prior to issuance of Grading and Building Permits	Community Development Department – Building Division	
HYDROLOGY AND WATER QUALITY				
MM 4.7-1: Prior to the issuance of any grading or building permits for any development projects under the Red Hill Avenue Specific Plan, the project applicant shall prepare and submit to the Department of Public Works a hydrology and hydraulics analysis demonstrating that the existing condition flow rates are not exceeded by the proposed project flow rates.		In Construction Plans and Specifications. Prior to Grading Permits.	City of Tustin Building Division	
MM 4.7-2: Prior to the issuance of any grading or building permits for any development projects under the Red Hill Avenue Specific Plan that do not have a direct connection to the City's existing storm drain system, shall provide to the Department of Public Works hydraulic analyses of the downstream storm drain system that demonstrate no significant impacts to the City storm drain infrastructure.		In Construction Plans and Specifications. Prior to Grading Permits.	City of Tustin Building Division	
NOISE				
MM 4.9-1: Construction Noise. Prior to the approval of grading plans, the City of Tustin Building Division shall ensure that all plans include Best Management Practices to minimize construction noise. Construction noise Best Management Practices may include the following: • Construction contractors shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers, consistent with manufacturers' standards, and all stationary construction equipment shall be placed so that emitted noise is directed away from the noise sensitive use near the construction activity	Applies to construction with noise levels over 85 dBA (such as during Project grading) adjacent to existing multi-family residences to the north of the Project site.	In Construction Plans and Specifications. Prior to Demolition, Grading, and Building Permits.	City of Tustin Building Division	

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• The construction contractor shall locate equipment staging in areas that will create the greatest distance between construction-related noise sources and noise-sensitive receivers nearest to the construction activities. • The construction contractor shall limit haul truck deliveries to the same hours specified for construction equipment by Tustin City Code Article 4, Chapter 6, Section 4617. The contractor shall design delivery routes to minimize the exposure of sensitive land uses to delivery truck noise • Construction activity within 50 feet of occupied noise sensitive uses shall reduce construction noise levels exceeding 85 dBA Leq at nearby sensitive land uses by one or more of the following methods to reduce noise to below 85 dBA Leq: ○ Install temporary construction noise barriers within the line of site of occupied sensitive uses for the duration of construction activities that could generate noise exceeding 85 dBA Leq. The noise control barrier(s) must provide a solid face from top to bottom and shall ▪ Provide a minimum transmission loss of 20 dBA and be constructed with an acoustical blanket (e.g. vinyl acoustic curtains or quilted blankets) attached to the construction site perimeter fence or equivalent temporary fence posts; ▪ Be maintained and any damage promptly repaired. Gaps, holes, or weakness in the barrier or openings between the barrier and the ground shall be promptly repaired; and ▪ Be removed and the site appropriately restored upon the conclusion of the construction activity. ○ Install sound dampening mats or blankets to the engine compartments of mobile equipment (e.g., graders, dozers, heavy trucks). The dampening materials must be capable of a 5-dBA minimum noise reduction, must be installed prior to the use of heavy mobile construction equipment, and must remain installed for the duration of the equipment use.				
MM 4.9-2: Construction Vibration. The following measures shall be implemented by applicants for development within the Red Hill Avenue Specific Plan area to reduce construction vibration at nearby receptors: • Avoid impact pile-driving where possible • In areas where project construction is anticipated to include pile drivers or in close proximity to schools or historical structures, conduct site-specific vibration		In Construction Plans and Specifications. Prior to Demolition, Grading, and Building Permits.	City of Tustin Building Division	

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studies to determine the area of impact and to present appropriate vibration reduction technique that may include the following: ○ Develop a vibration monitoring and construction contingency plan to identify structures where monitoring should be conducted, set up a vibration monitoring schedule, define structure specific vibration limits, and address the need to conduct photo, elevation, and crack surveys to document before and after construction conditions. ○ Identify construction contingencies for when vibration levels approach the standards ○ At a minimum, conduct vibration monitoring during pile-driving activities. Monitoring results may indicate the need for more or less intensive measurements. ○ When vibration levels approach standards, suspend construction and implement contingencies to either lower vibration levels or secure the affected structures. ○ Conduct a post-survey on any structures where either monitoring has indicated high levels or complaints of damage has been made. Make appropriate repairs or compensation where damage has occurred as a result of vibration.				
PUBLIC SERVICES				
PPP PS-1: Pursuant to Section 65995 of the California Government Code, prior to the issuance of building permits for any development projects under the Red Hill Avenue Specific Plan, the applicant shall pay developer fees to the Tustin Unified School District; payment of the adopted fees would provide full and complete mitigation of school impacts.		Note in Construction Plans and Specifications. Prior to Building Permits.	City of Tustin Planning Division	
PPP PS-2: New development under the Red Hill Avenue Specific Plan shall be subject to the same General Obligation bond tax rate as already applied to other properties within the Tustin Unified School District for Measure G (approved in 2008) based upon assessed value of the residential and commercial uses.		Note in Construction Plans and Specifications. Prior to Building Permits.	City of Tustin Planning Division	

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RECREATION				
MM 4.12-1: For residential projects not subject to City of Tustin Subdivision Code (Article 9, Chapter 3, Section 9331 of the Tustin City Code), prior to the issuance of building permits, applicants shall dedicate parkland or pay a park fee, on a per unit basis, reflecting the value of land required for park purposes. The amount of land which would otherwise be required for dedication shall be computed by multiplying the number of proposed dwelling units by 0.003 acre per person and 2.24 persons per dwelling unit. The parkland in-lieu fee shall be computed by multiplying the amount of land required for dedication by $2,500,000 per acre.		Note in Construction Plans and Specifications. Prior to Building Permits.	City of Tustin Planning Division	
TRANSPORTATION				
MM 4.13-1: Red Hill Avenue at Interstate 5 Southbound Ramps: Re-stripe the eastbound approach (the off-ramp) to convert from a shared left-through lane and one dedicated right-turn lane to one dedicated left-turn lane and a shared left-through-right lane. This improvement would provide additional capacity for the heavy eastbound left-turn volume. With this improvement, the intersection would operate at Level of Service D or better during both peak hours. The California Department of Transportation' (Caltrans) approval and cooperation would be required to implement this improvement.		Prior to issuance of Grading and Building Permits		
TRIBAL CULTURAL RESOURCES				
MM TCR-1: Prior to the issuance of demolition or grading permits for any projects that would disturb previously undisturbed soils (native soils) or soils that have native fill, the project applicant/developer shall retain a Native American Monitor, with first preference given to the Gabrieleño Band of Mission Indians – Kizh Nation, who responded to the City's request for consultation on November 14, 2023 (first preference Tribe, Tribe). The applicant/developer shall allow 45 days from the initial contact with the first preference tribe to enter into a contract for monitoring services. If the applicant/developer is unable to contact the Kizh Nation after three documented attempts or is unable to secure an agreement, the applicant shall report to the lead agency, and the lead agency will contact the Kizh Nation to validate that the parties were unable to enter into an agreement. The applicant/developer shall have made three documented attempts to directly contact the Kizh Nation to enter into a tribal monitoring agreement. If the applicant/developer can demonstrate they were unable to secure an agreement with the first preference tribe, as validated and documented by	Mitigation Measure TCR-1 has been added to be consistent with City standard measures for archeological and tribal cultural resources. The addition of mitigation would be consistent with the Certified EIR and is consistent with CEQA Gudelines Section 15162(a).	Prior to Demolition and Grading Permits.	City of Tustin Building Division City Planning Division	

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the Community Development Department in writing, or if the contracted tribe fails to fulfill its obligation under the contract terms, then the applicant/developer may retain an alternative qualified tribal monitor from a culturally affiliated tribe if approved by the City. The monitor shall be retained prior to the issuance of a demolition permit or grading permit, and the commencement of any development related “ground-disturbing activity” for the subject project at all project locations (i.e., both on-site and any off-site locations that are included in the project description/definition and/or required in connection with the project, such as public improvement work). “Ground-disturbing activity” shall include, but is not limited to, demolition, pavement removal, auguring, grubbing, boring, grading, excavation, drilling, and trenching for the purposes of reconstruction and new development. "Ground-disturbing activity" shall not include minor maintenance activities such as potholing, tree removal, and parking lot maintenance. This mitigation measure does not apply to projects that would only disturb soils made up of artificial fill, as verified by a soils or geotechnical report. A copy of the executed monitoring agreement shall be submitted to the lead agency prior to the commencement of any ground-disturbing activity, or the issuance of any permit necessary to commence a ground-disturbing activity. The monitor will complete daily monitoring logs that will provide descriptions of the relevant ground-disturbing activities, the type of construction activities performed, locations of ground-disturbing activities, soil types, cultural-related materials, and any other facts, conditions, materials, or discoveries of significance to the Kizh Nation. Monitor logs will identify and describe any discovered TCRs, including but not limited to, Native American cultural and historical artifacts, remains, places of significance, etc., (collectively, tribal cultural resources, or “TCR”), as well as any discovered Native American (ancestral) human remains and burial goods. Copies of monitor logs will be provided to the project applicant/lead agency upon written request to the consulting tribe. If a monitor is selected from a tribe other than the Kizh Nation, the Kizh Nation shall be contacted if any discoveries are found. On-site tribal monitoring shall conclude upon the latter of the following (1) written confirmation to the consulting tribe from a designated point of contact for the project applicant/lead agency that all ground-disturbing activities and phases that may involve				

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ground-disturbing activities and that have the potential to impact local TCRs on the project site or in connection with the project are complete.				
MM TCR-2: Upon discovery of any TCRs, all construction activities in the immediate vicinity of the discovery shall cease (i.e., not less than the surrounding 50 feet) and shall not resume until the discovered TCR has been fully assessed by the tribal monitor and consulting archaeologist. If the consulting tribe is other than the Gabrieleño Band of Mission Indians – Kizh Nation, the Kizh Nation shall be contacted and the consulting tribe will recover and retain all discovered TCRs in the form and/or manner the Kizh Nation deems appropriate, in the Kizh Nation sole discretion, and for any purpose the Kizh Nation deems appropriate, including for educational, cultural and/or historic purposes.	Mitigation Measure TCR-2 has been added to be consistent with City standard measures for archeological and tribal cultural resources. The addition of mitigation would be consistent with the Certified EIR and is consistent with CEQA Gudelines Section 15162(a).	Prior to Demolition and Grading Permits.	City of Tustin Building Division City Planning Division	
MM TCR-3: Native American human remains are defined in PRC 5097.98 (d)(1) as an inhumation or cremation, and in any state of decomposition or skeletal completeness. Funerary objects, called associated grave goods in Public Resources Code Section 5097.98, are also to be treated according to this statute. If Native American human remains and/or grave goods are discovered or recognized on the project site, then Public Resource Code 5097.9 as well as Health and Safety Code Section 7050.5 shall be followed. Human remains and grave/burial goods shall be treated alike per California Public Resources Code section 5097.98(d)(1) and (2). Preservation in place (i.e., avoidance) is the preferred manner of treatment for discovered human remains and/or burial goods. Any discovery of human remains/burial goods shall be kept confidential to prevent further disturbance.	Mitigation Measure TCR-3 has been added to be consistent with City standard measures for archeological and tribal cultural resources. The addition of mitigation would be consistent with the Certified EIR and is consistent with CEQA Gudelines Section 15162(a).	Prior to Demolition and Grading Permits.	City of Tustin Building Division City Planning Division	