Appendix F-2

Preliminary Water Quality Management Plan, Crescent Gardens Cemetery
March 13, 2024
prepared by Hunsaker & Associates

PRELIMINARY WATER QUALITY MANAGEMENT PLAN

"CRESCENT GARDENS CEMETERY"

TPM38623/CUP230002

Project Address:
Southwest of Grand Avenue and Adelfa Street
County of Riverside, CA

Prepared for:
MUSLIM MORTUARY & CEMETERY COMMITTEE
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Preparation/Revision Date:
November 10, 2022, November 20, 2023, March 13, 2024

W.O. 4427-1

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PRELIMINARY WATER QUALITY MANAGEMENT PLAN

"CRESCENT GARDENS CEMETERY"

COUNTY OF RIVERSIDE, CA

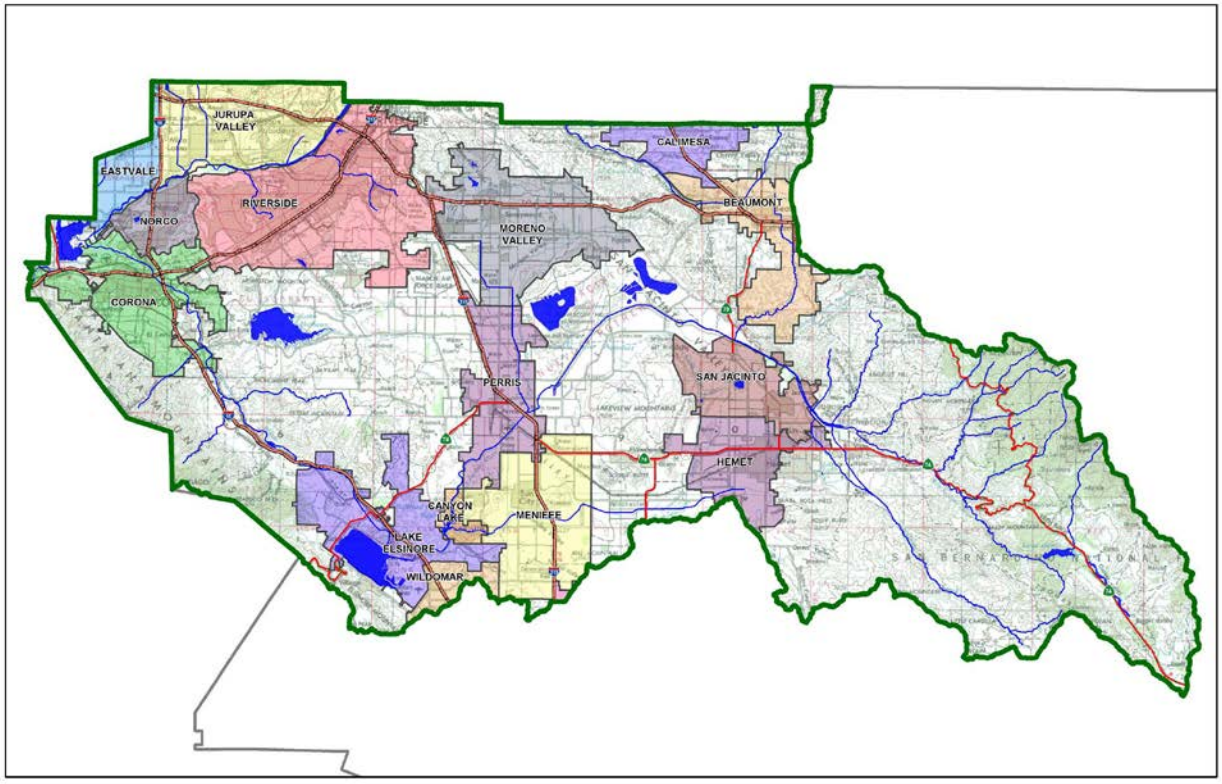
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Crescent Gardens Cemetery

Development No:

Design Review/Case No: TPM38623/CUP230002



☒ Preliminary
☐ Final

Original Date Prepared: November 10, 2022

Revision Date(s): November 20, 2023, March 13, 2023

Prepared for Compliance with

Regional Board Order No. R8-2010-0033
Template revised June 30, 2016

Contact Information:

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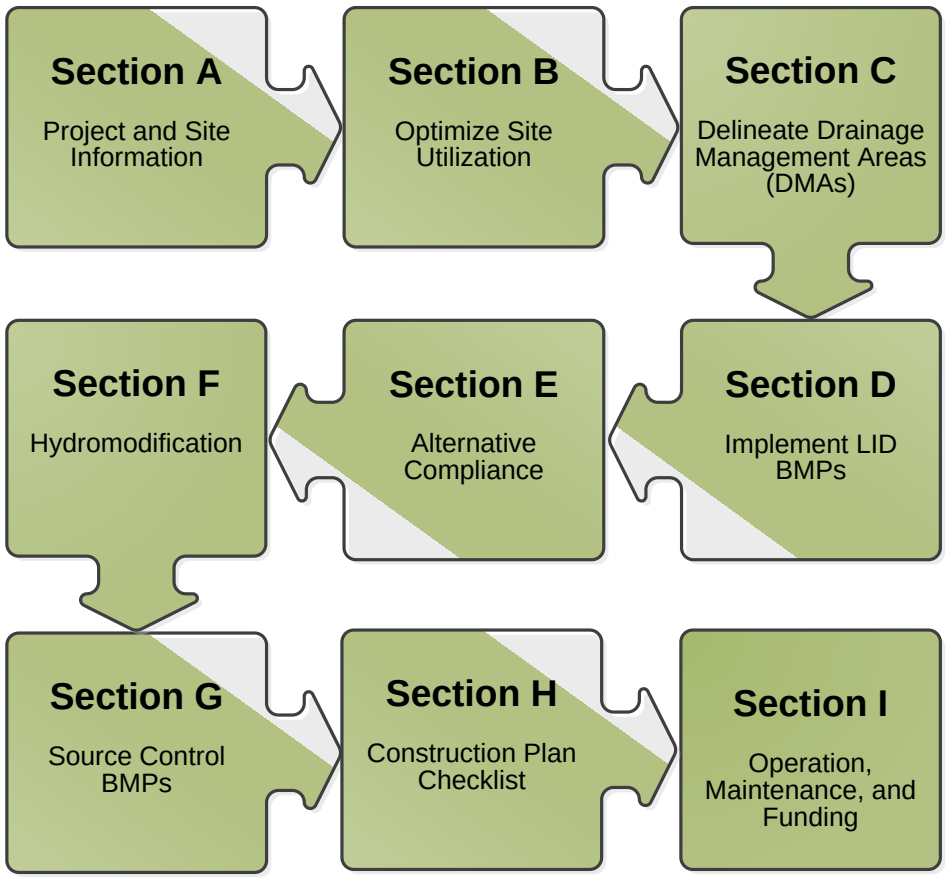
A Brief Introduction

This Project-Specific WQMP Template for the Santa Ana Region has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for MUSLIM MORTUARY & CEMETERY COMMITTEE by Hunsaker & Associates Irvine, Inc. for the Crescent Gardens Cemetery project.

This WQMP is intended to comply with the requirements of County of Riverside for the project which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under County of Riverside Water Quality Ordinance (Municipal Code Chapter 754.2)

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0033 and any subsequent amendments thereto."

Preparer's Signature	Date
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Cemetery
Planning Area:	
Community Name:	
Development Name:	Crescent Gardens Cemetery
PROJECT LOCATION	
Latitude & Longitude (DMS): 33.643714, -117.2353451	
Project Watershed and Sub-Watershed: Santa Ana	
Gross Acres: 85.5	
APN(s): 349-170-004, 349-170-005, 349-170-003, 349-170-006,, 349-170-013, 349-170-007, 349-170-008, 349-170-009, 349-170-010, 359-170-011, 349-170-012, 349-170-013, 349-170-035, 349-180-006, 349-180-002, 349-180-007, 349-180-008, 349-180-005, 349-180-004, 349-180-016, 349-180-017, 349-180-004, 349-180-020	
Map Book and Page No.:	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Cemetery
Proposed or Potential SIC Code(s)	
Area of Impervious Project Footprint (SF)	371,565
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	371,565
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☒ Y ☐ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the Project limits Footprint (SF)	0
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D) C and D	
What is the Water Quality Design Storm Depth for the project?	0.60

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling
- BMP Locations (Lat/Long)

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

The cemetery will be a phased development based on demand on roughly 85.5 gross acres.

Proposed Chapel: This area is located at the east side of Robert Street and Garfield Road as a focal point and main entrance to the cemetery area. The Chapel and Fraternal Hall area is designated for parking, place for worship, and gatherings. It includes shared parking between the Chapel and the reception hall uses with around 120 parking spaces, landscaped areas, and on-site residence for the manager of the chapel area. The chapel is anticipated to be around 3,500 sq. ft. and parking for each land use is planned to be shared on both sides of the main entry.

Proposed Cemetery: An approximate 34.5 acres of proposed cemetery burial grounds is on gradually graded slopes and level pad areas for individual burial plots. The acreage excludes roads, infrastructure, slopes and drainage/water quality basins, chapel, mortuary area, caretaker residence and natural open space for habitat. The cemetery is planned to be open every day from dawn to dusk. The cemetery has one caretaker that live on site to maintain it. The private roads are available for access to the general public. Gated entries are provided to secure after dusk. General public access will be available with limits.

Proposed Mortuary: The mortuary is located near the center of the cemetery. It is approximately 3,500 sq. ft. with around 58 parking spaces (1,700 sq. ft. for assembly area). The intent of the mortuary is to provide burial preparations and small family oriented gatherings as needed. It will provide offices for making funeral and burial arrangements, including religious services ancillary to the mortuary, with families.

Care Taker Residence. A caretaker residence, approximately 2,200 Sq. Ft. dwelling, as a possible modular design with its own septic tank, will be placed near the northwest corner of the project site fronting Robert Street and adjacent to the existing residential property north of Crescent Garden.

Main Entry: The project will have its main entry at Garfield Road and Robert Street. The cemetery entry will only be from this single point along west boundary. The entry will be gated and secured and controlled as necessary by on-site caretakers. A phased road development program is planned to incrementally develop the vehicle circulation system with a combination of paved and decomposed granite roads. This will provide access to cemetery members and resolve emergency vehicle access concerns.

As stated above, the cemetery expects limited use of the Cemetery once initial operations begin. Approximately 10 to 15 services per month, and impact on local streets is estimated to be minimal. Assuming an average of 20 visitors/funeral service, the expected total initial visitors may not exceed around 300 people per month. As the gravesites are used, the cemetery can expect additional weekend visitors, but the traffic demands are projected to be quite low for several years since the cemetery visitors will be spread over operating hours between dawn to dusk.

Drainage from the improved site will be collected in a series of surface drainage facilities and conveyed to detention basin facilities and/or to existing natural channels.

The proposed grading of the project site slightly alters the original drainage boundaries and drainage areas but does not alter the significantly alter the original points of discharge locations.

The proposed drainage systems will be designed to convey the 100-year peak flow generated on the project site and will be designed to mitigate any water quality and hydromodification impacts of the proposed development.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Lake Elsinore	DDT, Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCBs, Toxicity	REC1, REC2, WARM, WILD, COMM, RARE	N/A

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)*	☐ Y	☐ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, constraints might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. Opportunities might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Consideration of "highest and best use" of the discharge should also be considered. For example, Lake Elsinore is evaporating faster than runoff from natural precipitation can recharge it. Requiring infiltration of 85% of runoff events for projects tributary to Lake Elsinore would only exacerbate current water quality problems associated with Pollutant concentration due to lake water evaporation. In cases where rainfall events have low potential to recharge Lake Elsinore (i.e. no hydraulic connection between groundwater to Lake Elsinore, or other factors), requiring infiltration of Urban Runoff from projects is counterproductive to the overall watershed goals. Project proponents, in these cases, would be allowed to discharge Urban Runoff, provided they used equally effective filtration-based BMPs.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

Yes, runoff in the existing condition will be similar in the proposed condition.

Did you identify and protect existing vegetation? If so, how? If not, why?

The site is currently vacant with sparse vegetation.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

No, the project will not preserve natural infiltration characteristics. Due to the presence of shallow bedrock in the area, infiltration is not considered feasible for the development.

Did you identify and minimize impervious area? If so, how? If not, why?

Yes, landscaping areas will be incorporated in the project design. Streets will be designed to minimum width requirements per the County of Riverside.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes. The site is anticipated to be covered with mostly pervious areas, besides the surrounding roads, a few ancillary buildings and parking areas.

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DMA A	Mixed Surface Type	78,408	D
DMA B	Mixed Surface Type	95,832	D
DMA C	Concrete or Asphalt	13,068	D
DMA D	Concrete or Asphalt	17,424	D
DMA E	Landscape	69,696	A
DMA F	Landscape	78,408	A
DMA G	Mixed Surface Type	1,463,616	D
DMA H	Mixed Surface Type	339,768	D
DMA I	Mixed Surface Type	274,428	D

[1] *Reference Table 2-1 in the WQMP Guidance Document to populate this column*

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
DMA E	69,696	Landscape	
DMA F	78,408	Landscape	

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				Type 'C' DMAs that are draining to the Self-Retaining Area		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]
N/A						

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet)	Post-project surface type	Impervious fraction	Product		Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]	DMA name /ID	[D]	[C]/[D]
N/A							

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
DMA A	Bioretention Basin/Detention Basin
DMA B	Bioretention Basin/Detention Basin
DMA C	Proprietary Biofiltration System (Modular Wetland System) in DMA H
DMA D	Proprietary Biofiltration System (Modular Wetland System) in DMA H
DMA G	Bioretention Basin
DMA H	Proprietary Biofiltration System (Modular Wetland System)
DMA I	Bioretention/Detention Basin

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site; proceed to section D.3

If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		x
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		x
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		x
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?	x	
If Yes, list affected DMAs: A-I; measured in-situ infiltrations are 1.4 or less at tested locations		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		x
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?	x	
Describe here: The geotechnical report identifies the site is located with an area of shallow bedrock, as shallow as 3 inches before hitting refusal at 1.5 feet. Other exploratory borings showed a slim mantle of topsoil with underlying bedrock resulting in shallow refusals and poor infiltration rates		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

DMA A (1.8 acres) – Consists of a chapel and parking lot. Majority of runoff from this DMA will be conveyed to a Bioretention Basin/Detention Basin located at the northeast corner of the DMA A.

DMA B (2.2 acres) – Consists of a chapel, caretaker's residence and parking lot. Majority of runoff from this DMA will be conveyed to Bioretention Basin/Detention basin located in the eastern corner of the DMA B.

DMA C (0.3 acres) – Consists of the western portion of "A" Street. The low point of DMA C is located adjacent to the 100-year flood plain limit, therefore a BMP is not suitable for this location. DMA H has been oversized to mitigate flows for DMA C.

DMA D (0.4 acres) – Consists of the eastern portion of "A" Street. The low point of DMA D is located adjacent to the 100-year flood plain limit, therefore a BMP is not suitable for this location. DMA H has been oversized to mitigate flows for DMA D.

DMA E (1.6 acres) – Consists of a grave site and will be considered "Self-Treating" and will convey flows off site to natural area and will not comingle flows.

DMA F (1.8 acres) - Consists of a grave site and will be considered "Self-Treating" and will convey flows off site to natural area and will not comingle flows.

DMA G (33.6 acres) – Consists of grave sites, "B" Street, "D" Street and a portion of "A" Street and will convey flows to a proposed Bioretention Basin.

DMA H (7.8 acres) – Consists of grave sites, portion of "B" Street and "E" Street and will convey flows to a proposed Proprietary Biofiltration System (8'x20' Modular Wetland System). DMA H has been oversized to mitigate flows from DMA C and DMA D that are adjacent to the flood plain limits and the street area within the flood plain limits.

DMA I (6.3 acres) – Consists of grave sites and "C" Street and will convey flows to a proposed Bioretention Basin/Detention Basin.

D.2 Harvest and Use Assessment

Please check what applies*:*

☒ Reclaimed water will be used for the non-potable water demands for the project.

☐Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☐The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If none of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape:

Type of Landscaping (Conservation Design or Active Turf):

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces:

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor:

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area:

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users:

Project Type:

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces:

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-2 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor:

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users:

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	Projected number of toilet users (Step 1)

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand:

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces:

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-4 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-4:

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use:

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the projected average daily use (Step 1) to the minimum required non-potable use (Step 4).

Minimum required non-potable use (Step 4)	Projected average daily use (Step 1)

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment per Section 3.4.2 of the WQMP Guidance Document.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☐ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA A	☐	☐	☒	☐	☐
DMA B	☐	☐	☒	☐	☐
DMA C	☐	☐	☐	☐	☐
DMA D	☐	☐	☐	☐	☐

DMA G	☐	☐	☒	☐	☐
DMA H	☐	☐	☒	☐	☐
DMA I	☐	☐	☒	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

DMA A and DMA B, located at the northwest corner of the site proposes a Bioretention/Detention Basin. DMA G, located at the southeast corner of the site of the site proposes a Bioretention Basin. DMA H located at the north portion of the site proposes a Modular Wetland System. DMA I, located at the northeast corner of the site proposes a Bioretention/Detention Basin. DMA's C and D, located at northwest corner of the site, and the concrete crossing between DMA's do not propose LID BMP's. The crossing is located within the 100-year flood plain limits, and the low points for DMA C and DMA D are located right next to the flood plain limits, therefore placement of a BMP at these low points would not be suitable, adjacent to the 100 year flood plain limits. DMA H has been over-mitigated to accommodate DMA C, DMA D and the concrete crossing.

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First, calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second, design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*DMA A – Bioretention/Detention Basin*		
	[A]		[B]	[C]	[A] x [C]			
A	*78,408*	*Mixed Surface Type*	*0.8*	*0.60*	*46,989.6*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*

	78,408		46,989.6	0.6	2,349.5	***14,769***

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*DMA B – Bioretention Basin/Detention Basin*		
	[A]		[B]	[C]	[A] x [C]			
B	*95,832*	*Mixed Surface Type*	*0.8*	*0.60*	*57,431.7*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	95,832				57,431.7	0.60	2,871.6	***22,295***

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*DMA E – Bioretention Basin*		
	[A]		[B]	[C]	[A] x [C]			
G	*1,463,616*	*Mixed Surface Types*	*0.05*	*0.08*	*112,489.5*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*

	1,463,616				*112,489.5*	0.6	5,624.5	

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*DMA I – Bioretention Basin/Detention Basin*		
	[A]		[B]	[C]	[A] x [C]			
I	*274,428*	*Mixed Surface Types*	*0.19*	*0.16*	*45,222.2*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	274,428				*45,222.2*	0.6	2,261.1	***143,748.8***

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☐ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P[2]
☒ Commercial/Industrial Development	P[3]	P	P[1]	P[1]	P[5]	P[1]	P	P
☐ Automotive Repair Shops	N	P	N	N	P[4, 5]	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☐ Parking Lots (>5,000 ft^2)	P[6]	P	P[1]	P[1]	P[4]	P[1]	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☐	☒	☒	☐	☒	☒	☒

P = Potential

N = Not Potential

[1] A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

[2] A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

[3] A potential Pollutant is land use involving animal waste

[4] Specifically petroleum hydrocarbons

[5] Specifically solvents

[6] Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	
Total Credit Percentage[1]	

[1] *Cannot Exceed 50%*
[2] *Obtain corresponding data from Table 3-8 in the WQMP Guidance Document*

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]				
N/A						*Design Storm Depth (in)*	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	A_T = Σ[A]				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
N/A		

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.
[2] Cross Reference Table E.1 above to populate this column.
[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	Post-condition	% Difference
Time of Concentration	N/A	N/A	N/A
Volume (Cubic Feet)	N/A	N/A	N/A

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Susceptibility Maps.

Does the project qualify for this HCOC Exemption? ☒ Y ☐ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier: The project drains to an adequate sump, Lake Elsinore.

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources***: Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit***: Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative***: Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site storm drain inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Makers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	Inspect inlet markings on a bi-monthly basis. Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the

		CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
D2. Landscape/Outdoor Pesticide Use	Preserve, existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaping areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Inspect on a weekly basis. Maintain landscaping using minimum or no pesticides. See applicable operation BMPs in "What you show know for…..Landscaping and Gardening"
N. Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer.	Inspect on a monthly basis. See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www. Cabmphandbooks.com

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)	BMP Location (Lat/Long)

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: Owner, until formation of Property Owners' Association

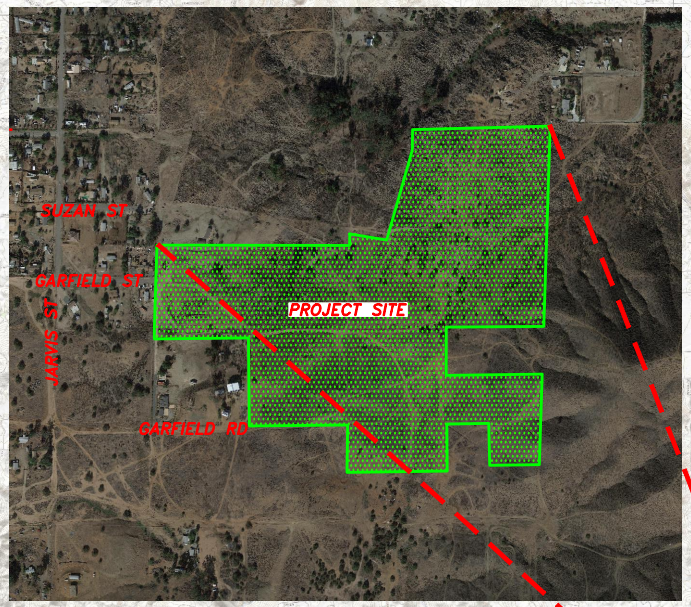
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☒ Y ☐ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map



PERRIS

SR-74

PROJECT SITE

MEADOWBROOK

I-15

CANYON LAKE

LAKE ELSINORE

PECHANGA PROPERTY

GARFIELD ROAD

AUBRY STREET

DRIVEWAY ACCESS

DRIVEWAY ACCESS

DRIVEWAY ACCESS

"A" STREET (PRIVATE)

"B" STREET (PRIVATE)

"C" STREET (PRIVATE)

"D" STREET (PRIVATE)

THEDA STREET (FUTURE)

DMA A 1.8

DMA B 2.2

DMA C 0.3

DMA D 0.4

DMA E 1.6

DMA F 1.8

DMA G 33.6

DMA H 7.8

DMA I 6.3

WATER QUALITY DETENTION BASIN BOTTOM=1390.0 BOTTOM AREA=11313 SF

WATER QUALITY DETENTION BASIN BOTTOM=1390.0 BOTTOM AREA=4600 SF

WATER QUALITY DETENTION BASIN BOTTOM=1384.0 BOTTOM AREA=4600 SF

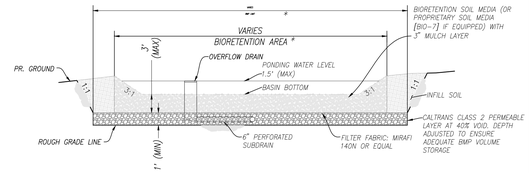
100' FUTURE R/W WIDTH ST

105' FUTURE R/W WIDTH ST

100' FUTURE R/W WIDTH ST

LEGEND

- PROPERTY LIMITS
- NAP — NOT A PART
- DRAINAGE MANAGEMENT AREA (DMA) LIMITS
- DMA / ACRE — DMA DESIGNATION AND ACREAGE
- SURFACE FLOW (ONSITE)
- SURFACE FLOW (OFFSITE)
- PROJECT STORM DRAIN SYSTEM (PRIVATE)
- PROJECT CATCH BASIN WITH BMP S1 CATCH BASIN STENCILING
- TRASH ENCLOSURE
- PROPRIETARY BIOFILTRATION (PRIVATE)
- BIORETENTION BASIN (PRIVATE)
- PROPOSED LANDSCAPE SLOPES 1:1 TO 4:1
- PROPOSED LANDSCAPE AREA
- NATURAL OPEN SPACE AREA
- PROPOSED BIORETENTION BASIN/DETENTION BASIN
- PROJECT BUILDING/STRUCTURE
- PROJECT PAVEMENT AREAS WITH BMP N15 STREET SWEEPING
- CONCRETE
- PROPOSED GRAVE SITE
- SELF TREATING AREAS
- PROPOSED AGGREGATE BASE



BIORETENTION WITH UNDERDRAIN
N.T.S.

TYPICAL SECTION DETAIL

NOTES:
1. ALL ROCK OR SAND TO BE PLACED IN POST-CONSTRUCTION BMPS SHALL BE CLEAN-WASHED ROCK TO THE SATISFACTION OF THE GRADING INSPECTOR.
2. IMMEDIATELY BELOW THE SOIL MEDIA (BSM) INCLUDE A SECTION OF 3" SAND, THEN 3" PEA GRAVEL. ALL SUBDRAINS SHALL BE SCH.40 WITH A MINIMUM SLOPE OF 0.5%.

FEET
0 50 100 200
0 1/2 1 2
INCHES

REVISION	
DATE	DESCRIPTION

PREPARED FOR:
Muslim Mortuary & Cemetery Committee
13121 Brookhurst Street, Suite C
Garden Grove, CA 92843

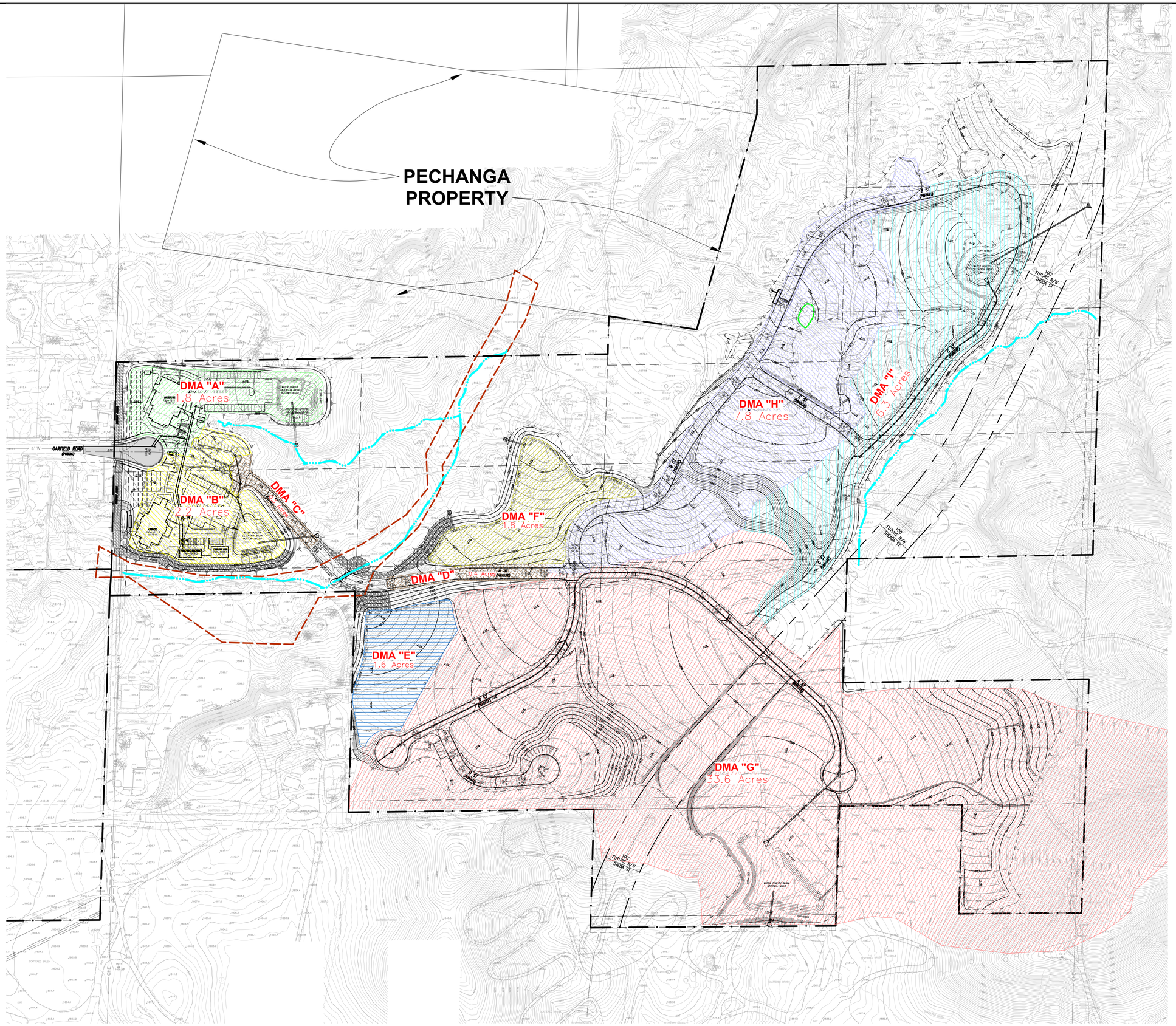
PREPARED BY:
HUNSAKER & ASSOCIATES IRVINE INC
PLANNING ▪ ENGINEERING ▪ SURVEYING
Three Hughes ▪ Irvine, CA 92618 ▪ PH: (949) 583-1010 ▪ FX: (949) 583-0759

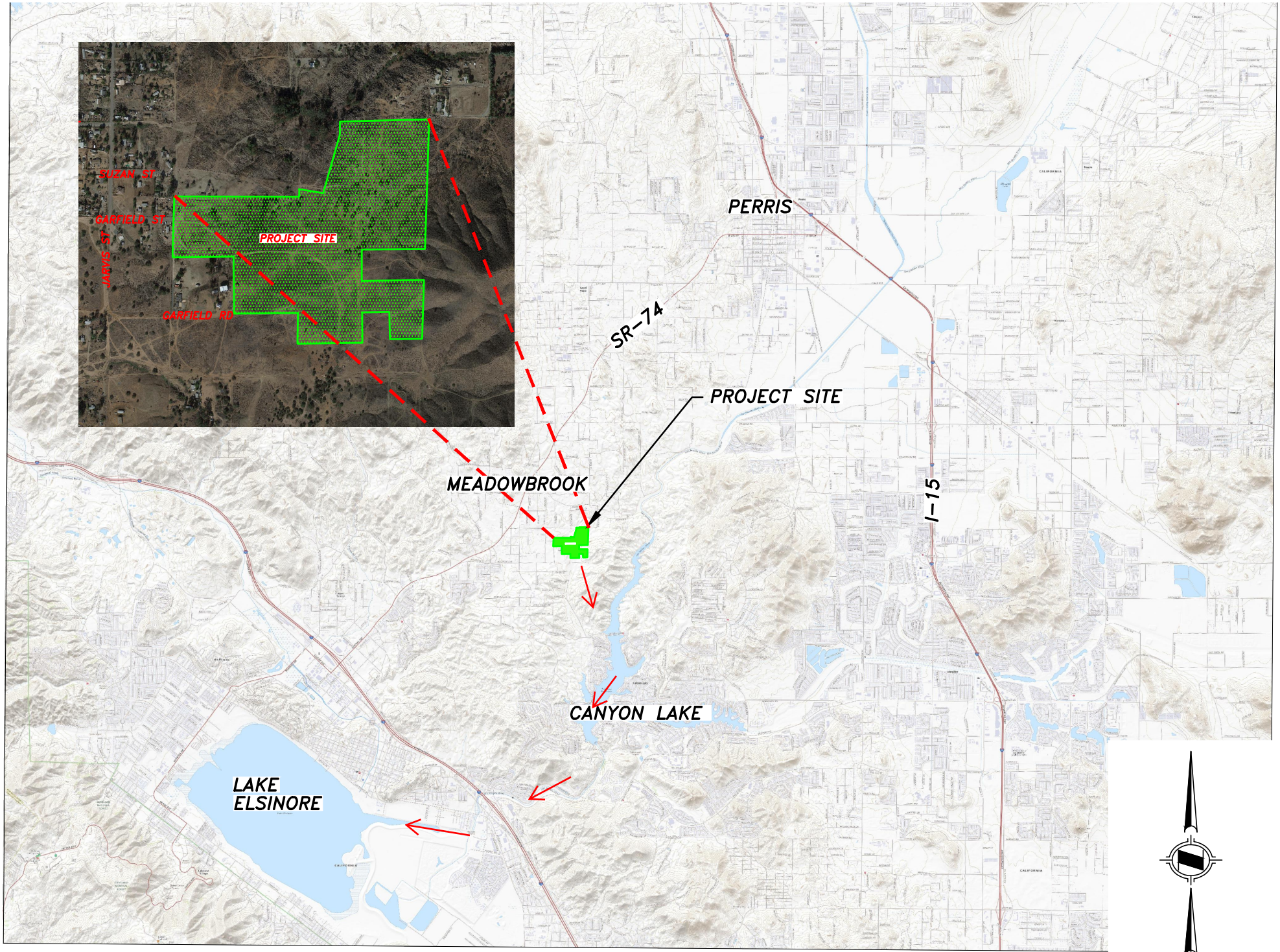
CRESCENT GARDENS, COUNTY OF RIVERSIDE

CRESCENT GARDENS CEMETERY PRELIMINARY WQMP EXHIBIT

DESIGNED BY: ____
DRAFTED BY: PM
CHECKED BY: MR
DATE: 03/06/2024
SHEET 1 OF 1
W.O. 4427-2

DATE: Mar. 06, 2024 09:35:18 AM FILE: F:\1167\Planning\SY_WQ\Exhibits\Crescent Gardens Cemetery PWQMP.dwg


PECHANGA
PROPERTY
DMA "A"
.8 Acres
DMA "B"
2.2 Acres
DMA "C"
1.4 Acres
DMA "D"
.4 Acres
DMA "E"
1.6 Acres
DMA "F"
1.8 Acres
DMA "G"
33.6 Acres
DMA "H"
7.8 Acres
DMA "I"
6.3 Acres
GARFIELD ROAD
(PUBLIC)
100' FUTURE R/W
THERA ST
105' FUTURE R/W
THERA ST
WATER QUALITY
SEDIMENT TRAP
WATER QUALITY
BIOSWALE
WATER QUALITY
BIOSWALE
WATER QUALITY BIOSWALE
WATER QUALITY BIOSWALE
WATER QUALITY



RECEIVING WATERS MAP

Appendix 2: Construction Plans

Grading and Drainage Plans

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL EXPLORATION AND INFILTRATION TESTING, PROPOSED CRESCENT GARDENS CEMETERY EAST OF THE INTERSECTION OF GARFIELD STREET AND ROBERTS STREET ASSESSOR'S PARCEL NUMBERS (APN'S) 349-170-003 THROUGH -013, -035, 349-180-002, -004 THROUGH -008, -016, -017, -020, AND 349-190-006 PERRIS AREA OF UNINCORPORATED RIVERSIDE COUNTY, CALIFORNIA

Prepared For

MUSLIM MORTUARY & CEMETERY COMMITTEE
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Project Number 038.0000019894

March 11, 2024

March 11, 2024

Project No. 038.00000019894

Muslim Mortuary & Cemetery Committee
13121 Brookhurst Street, Suite C
Garden Grove, California 92848

Attention: Hamid Haque, President

Subject: Geotechnical Exploration and Infiltration Testing
Proposed Crescent Gardens Cemetery
East of the Intersection of Garfield Street and Roberts Street
Assessor's Parcel Numbers (APN's) 349-170-003 through -013, -035, 349-180-002, -004 through -008, -016, -017, -020, and 349-190-006
Perris Area of Unincorporated Riverside County, California

In accordance with your request, Leighton Consulting, Inc. (Leighton) has prepared this geotechnical exploration report for the Crescent Gardens Cemetery development to be located within the combined 84.4-acre site of Assessor's Parcel Numbers (APNs) 349-170-003 though -013, -035, 349-180-002, -004 through -008, -016, -017, -020, 349-190-006, in the Perris area of unincorporated Riverside County, California. The purpose of this exploration has been to evaluate the general geotechnical conditions of the site with respect to the proposed development and to provide geotechnical recommendations for design and construction of the project.

Based on our geotechnical exploration, construction of the proposed Crescent Gardens Cemetery development is feasible from a geotechnical standpoint. The most significant geotechnical issues with respect to the project are those related to the potential for strong seismic shaking, compressible soils, and shallow, resistant bedrock. Good

planning and design of the project can limit the impact of these constraints. This report presents our findings, conclusions, and geotechnical recommendations for this project.

We appreciate this opportunity to be of service. If you have any questions regarding this report or if we can be of further service, please call us at your convenience at (866) LEIGHTON, directly at the phone extensions or e-mail addresses listed below.

Respectfully submitted,

LEIGHTON CONSULTING, INC.



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1.0 INTRODUCTION

1.1 Site Location and Description

This 84.4-acre project site is made up of Assessor's Parcel Numbers (APN's) 349-170-003 through -013, -035, 349-180-002, -004, through -008, -016, -017, -020, and 349-190-006 in the Perris area of unincorporated Riverside County, California. This project site is located east of the intersection of Garfield Street and Roberts Street. The site is bounded by residential homes to the west and the southwest, to the north by Pechanga Tribe property, and to the south and east by undeveloped and vacant land.

Currently, the site is undeveloped with scattered outcrops of bedrock within and surrounding the site. Based on our review of historic aerial imagery, the site has been historically vacant and undeveloped since the earliest available aerial imagery of the site dated 1967 (NETR, 2024). Based on review of available topographic maps and the elevation model from Google Earth, elevations within the project site range from approximately 1,550 feet above mean sea level (msl) to the north to approximately 1,669 feet msl to the southeast. The site generally drains toward the north and west from the base of the hillsides separating the site from the San Jacinto River. We also understand based on the *Grading Study September 18, 2023 vs. Exist. Topo* prepared by Hunsaker and Associates, Inc., annotated by you to indicate the scope of our exploration, that several surface artifacts associated with past usage of the site from the Pechanga Band of Indians have been mapped by others within the site.

1.2 Proposed Development

Based on the provided *Cresent Gardens – Conceptual Site Plan Exhibit* prepared by Hunsaker and Associates dated September 29, 2023. The project will consist of the construction of four new structures ranging in footprint size from approximately 1,340 to 8,983 square feet located near the entry of the proposed cemetery, which will be near the intersection of Garfield Street and Roberts Street. These proposed structures will consist of a chapel, a mortuary, a caretakers residence, and an equipment shed. Plans also call for grading of the site to accommodate large relatively flat pads for future cemetery plots, interior private roads, parking lots, and several water quality detention basins. Based on the annotated *Grading Study*, we understand that design cuts will be as deep as

approximately 20 feet from the current surface, and design fills will be on the order of approximately 15 feet thick. The deeper design cuts are planned in the southern portion of the site and the thicker design fills are planned in the central portion of the site.

1.3 Previous Work

Based on the project documents provided by you, we understand that two previous geotechnical investigations (EEI, 2006 and Soil Exploration Company Inc., 2021) and one environmental site assessment (EEI, 2005) were conducted for this project and site. These past investigations and site evaluations are summarized below:

EEI (2005), *Phase I Environmental Site Assessment*

EEI previously prepared a *Phase I Environmental Site Assessment* in 2005 (EEI, 2005) for portions of the site that were previously planned for a residential development referred to as "Dowling Estates/Meadow Brook." As part of their assessment, EEI conducted a site reconnaissance and office studies to gather available background information of the site to identify potential recognized environmental concerns. Based on their assessment, EEI did not find any Recognized Environmental Conditions within the property. That study did, however, identify numerous discarded tires and miscellaneous debris throughout the site, and EEI recommended that this debris be properly evaluated by an environmental consultant and discarded, especially within natural drainages within the site.

EEI (2006), *Geotechnical Feasibility Study*

EEI previously prepared a *Geotechnical Feasibility Study* (EEI, 2006) for portions of the site that were previously planned for a residential development referred to as "Dowling Estates/Meadow Brook." EEI's *Geotechnical Feasibility Study* focused on evaluating regional and site-specific information regarding potential geotechnical constraints associated with development of the 130-acre study area, which contained the currently proposed cemetery development. EEI's study included drilling of six (6) exploratory hollow-stem auger borings and 31 test pits. Their borings were advanced to depths ranging from 5 to 22 feet below the ground surface (bgs) and their test pits were excavated throughout the site to depths ranging from 1.5 feet to 6 feet bgs. EEI's feasibility study did not identify

any significant geotechnical issues that would preclude the project at that time from being developed. Bedrock was identified as shallow as ½ foot in hillside areas and between 3 to 10 feet bgs within the lower elevations on that site. Groundwater was encountered within one boring B-2 within a natural drainage area as shallow as 13 feet bgs.

Soil Exploration Company (2021),

RGS Engineering Geology (RGS) previously prepared a *Limited Geologic Feasibility Report* on behalf of the Soil Exploration Company (SEC) in 2021 for the proposed Cresent Cardens Cemetery (SEC, 2021). That limited geologic feasibility study focused on evaluating the existing soils and geologic conditions at the site relative to the proposed development. SEC's report provided findings regarding the rippability and percolation characteristics of the onsite earth materials. The study involved the excavation of fourteen (14) test pits to maximum depths of 10 feet below ground surface (bgs) and conducting infiltration testing throughout the site. RGS concluded that the development proposed at that time was feasible from an engineering standpoint provided their findings, conclusions, and recommendations were considered during design and construction. The proposed development was found to be underlain by shallow granitic and metamorphic bedrock with excavation characteristics identified as "moderate" within the granitic bedrock and "poor" within the metamorphic bedrock. RGS indicated that excavation 6 feet deep or greater was achievable with a rubber tire backhoe in areas with "poor" excavation characteristics. Moderate to poor percolation and infiltrations rates were observed onsite with moderately decomposed bedrock yielding moderate rates. Geologic Hazards were identified to be considered low except for the potential of high seismicity, as is the case for most of southern California.

1.4 Purpose of Investigation

The purpose of this study has been to evaluate the geotechnical conditions with respect to the project and to provide geotechnical recommendations for design and construction of the proposed development.

Our geotechnical exploration included excavating, logging, and sampling a total of fourteen (14) test pits, infiltration testing, laboratory testing, review of previous geotechnical exploration for this project, and geotechnical analysis to evaluate

existing geotechnical conditions and to develop the conclusions and recommendations contained in this report.

1.5 Scope of Investigation

The scope of our study has included the following tasks:

- Background Review: We reviewed available, relevant geotechnical geologic maps and reports and aerial photographs available from our in-house library, available online, or those provided by you.

- Utility Coordination: We contacted DigAlert (811) at least 48 hours prior to excavation of test pits to locate major utilities, underground services, and easements. We coordinated our work with you and a site representative from the Pechanga Tribe of Indians.

- Field Exploration: Our field exploration included excavating, logging, and sampling of eight (8) standard test pits (TP-1 through TP-8) at the proposed structure locations, select roadway paths, and other areas throughout the site. The test pits were excavated to depths of approximately 10 feet below ground surface (bgs). Earth materials encountered in the test pits were logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D2488). Each test pit was digitally photographed for inclusion in our report. Samples were retained in plastic bags and brought to our in-house geotechnical laboratory.

  Infiltration tests were conducted within six (6) additional test pits (IT-1 through IT-6) to evaluate general infiltration characteristics of subsurface soils at the depths and locations tested. Infiltration tests were conducted in general accordance with the Riverside County Standards. Infiltration tests were generally conducted at the bottom of infiltration test pit excavations with depths ranging from approximately 2 feet to 3.5 feet bgs.

  Our test pit logs are included in Appendix A, *Exploration Logs*. Approximate test pit locations are shown on Figure 2, *Exploration Location Map*.

  Five (5) P-wave seismic refraction survey profiles were conducted along lines SR-1 through SR-5 by a subcontracted geophysical firm, utilizing Geometrics

Geode 24-channel signal enhancement seismographs, 10 Hz vertical geophones, seismic cables with 10-foot spaced connectors, piezo hammer switches, and a 20-lb sledgehammer with an aluminum strike plate. Each seismic line consisted of 24 geophones spaced 10 feet apart for a line length of 230 feet. The purpose of these seismic refraction survey was to estimate density and ribbapility characteristics of the bedrock underlying this project. Approximate seismic refraction line locations are illustrated on Figure 2, *Exploration Location map*. A summary of seismic refraction survey results for this project is presented in Appendix D.

- Geotechnical Laboratory Testing: Geotechnical laboratory tests were conducted on selected bulk soil samples and relatively undisturbed samples obtained during our field investigation. This laboratory testing program was designed to evaluate engineering characteristics of site soils. Laboratory tests conducted during this investigation include:

  - Grain size distribution
  - Expansion Index
  - Maximum Dry Density and Optimum Moisture Content
  - Resistivity, sulfate content, chloride content and pH
  - R-Value Testing

  The laboratory tests results are presented in Appendix B, *Laboratory Test Results*.

- Engineering Analysis: Data obtained from our background review, along with data from our field exploration and geotechnical laboratory testing was evaluated and analyzed to develop geotechnical conclusions and provide recommendations presented in this report.

- Report Preparation: Results of our geotechnical exploration have been summarized in this report, presenting our findings, conclusions and geotechnical recommendations for design and construction of the proposed development.

2 .0 FINDINGS

2.1 Regional Geologic Conditions

The site is located within the Peninsular Ranges Geomorphic Province on the southern portion of the Perris Block. The Perris Block is bounded by the Elsinore fault zone to the west, San Jacinto fault zone to the east, the Sierra Madre fault zone to the north, and the San Felipe fault zone to the south and is a relatively unfaulted mass of Mesozoic plutonic rocks of the southern California Batholith and metasedimentary bedrock. The project site is located approximately 4.8 miles to the northeast of the Elsinore fault zone and approximately 15.5 miles to the southwest of the San Jacinto fault zone.

The site has been regionally mapped to be underlain by Cretaceous-age tonalite (granitic) and Triassic-age phyllite (metamorphic) bedrock with mantle of Pleistocene-age old axial channel deposits (alluvium) within the drainage in the southern portion of the project site (Morton & Miller, 2006). The old alluvial deposits have been described to consist of sands, silts, and gravel eroded from the surrounding mountains. Regional geologic conditions are illustrated on Figure 3, *Regional Geology Map*.

2.2 Subsurface Soil Conditions

Based upon our review of pertinent geotechnical literature and our subsurface exploration, the site is generally underlain by a thin mantle of topsoil was uncovered consisting of loose to medium dense sands with clays and silts, silty sands, and clayey sands. Granitic bedrock encountered underlying the topsoil in the northwestern portion of the site and generally consisted of white to gray, with zones of orange to orangish brown, reddish brown and brown, intensely weathered to decomposed tonalite (Kgt). Phyllite (Trmp) bedrock encountered underlying the topsoil in the southeastern portion of the site and generally consisted of gray, with fracture surfaces of orange to orangish brown, moderately to intensely weathered. Granitic and metamorphic bedrock in our test pits were considered to be slightly weathered where excavation refusal by a backhoe was met. We encountered excavation refusal at depths ranging from 1½ to 7½ feet bgs in our test pits, with shallower bedrock generally being encountered towards the eastern end of the site within the rolling hillsides and deeper bedrock being encountered towards the west.

Seismic refraction tomography from this study measured velocities that indicated fresh bedrock (identified as non-rippable with conventional earthmoving equipment) to be as shallow as approximately 20 feet bgs, and as deep as 65 feet bgs within the central portion of the property.

More detailed descriptions of the subsurface material encountered during our current investigation and past evaluations conducted by others are presented on the test pit logs in Appendix A.

2.2.1 Compressible and Collapsible Soil

Soil compressibility refers to a soil's potential for settlement when subjected to increased loads as from a fill surcharge. Based on this study, the upper portion of the thin mantle of topsoils and alluvial soils are considered moderately compressible. Removal and recompaction of compressible topsoil and alluvial soils beneath the proposed improvements are recommended to reduce the potential for adverse total and differential settlement of the proposed improvements.

Collapse potential refers to the potential settlement of a soil under existing stresses upon being wetted. Based on Leighton's recommendation to remove potentially compressible residual soils onsite and replace with compacted fill to design grades and the presence of shallow bedrock, the hydro-collapse potential is considered negligible.

2.2.2 Expansive Soils

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and shrink when dried. Foundations constructed on these soils are subjected to large uplifting forces caused by the swelling. Without proper measures taken, heaving and cracking of building foundations and slabs-on-grade could result.

Based on our laboratory test results from our current exploration and past evaluations at the site (Leighton, 2024 and EEI, 2006), onsite near-surface soils are expected to have a very low expansion potential.

2.2.3 Sulfate Content

Water-soluble sulfates in soil can react adversely with concrete. However, concrete in contact with soil containing sulfate concentrations of less than 0.1 percent by weight is considered to have negligible sulfate exposure based on American Concrete Institute (ACI) provisions, adopted by the 2022 CBC (CBC, 2022, Chapter 19, and ACI, 2019).

A near-surface soil sample was tested for soluble sulfate content for this study. That test result and those performed for a previous study (EEI, 2006) indicated sulfate contents of less than 0.1 percent by weight, indicating negligible sulfate content (Exposure Class S0). Recommendations for concrete in contact with the soil are provided in Section 3.11.

2.2.4 Resistivity, Chloride and pH

Soil corrosivity to ferrous metals can be estimated by the soil's electrical resistivity, chloride content and pH. In general, soil having a minimum resistivity less than 1,000 ohm-cm is considered severely corrosive. Soil with a chloride content of 500 parts-per-million (ppm) or more is considered corrosive to ferrous metals.

As a screening for potentially corrosive soil, a representative soil sample was tested during our investigation to determine minimum resistivity, chloride content, and pH. This test and those performed for a previous study (EEI, 2006) indicated a minimum resistivity of 2,850 ohm-cm, a chloride content as much as 30 ppm, and pH as acidic as 6.8. Based on these results, the onsite soil is considered moderately corrosive to ferrous metals.

2.3 Groundwater

Groundwater was not encountered in any of our test pits excavated to a maximum total depth of 7.5 feet bgs during our investigation. Groundwater data from nearby State Well Number 05S03W32L001S located approximately 3.8 miles southeast from the site located within regionally mapped alluvial soils was reviewed to include readings from April 25, 1995 through October 10, 2023.

These data indicated the shallowest groundwater was on the order of approximately 1403 feet above msl, which corelated to a depth of approximately 147 feet bgs from the lowest elevation of the site (CDWR, 2024). However, the site is underlain by shallow granitic and metamorphic bedrock, which are not considered a water-bearing earth unit.

During EEI's 2006 evaluation of the site (EEI, 2006) groundwater also was not encountered within any of their borings or test pits, with the exception of hollow stem-auger boring (B-2), which was located towards the southern end of the site within the natural drainage area. This logged groundwater was found at a depth of 13 feet bgs within that boring as was described as being perched on top of bedrock. Other areas may experience perched groundwater on top of bedrock, depending on precipitation.

2.5 Faulting and Seismicity

In general, the primary seismic hazards for sites in the region include surface rupture along active faults and strong ground shaking. The potential for fault rupture and seismic shaking are discussed below.

2.5.1 Surface Faulting

The State of California and Riverside County have mapped the site to be outside of any state designated fault zones (CGS, 2021 and Riverside County, 2020). Based on these maps and our research, no active faults are known to have been mapped on or trending toward the site. The closest mapped active or potentially active faults are presented in the following table.

Fault Name	Approximate Distance from Site
Elsinore fault	4.6 miles to the southwest
San Jacinto Fault	14.8 miles to the northeast

Based on our understanding of the current geologic framework, the potential for future surface rupture of active faults onsite is considered very low.

2.5.2 Seismic Design Parameters

The site will experience strong ground shaking after the proposed project is developed resulting from an earthquake occurring along one or more of the major active or potentially active faults in southern California. Accordingly, the project should be designed in accordance with all applicable current codes and standards utilizing the appropriate seismic design parameters to reduce seismic risk as defined by California Geological Survey (CGS) Chapter 2 of Special Publication 117a (CGS, 2008). Through compliance with these regulatory requirements and the utilization of appropriate seismic design parameters selected by the design professionals, potential effects relating to seismic shaking can be reduced.

The following parameters should be considered for design under the 2022 CBC:

2022 CBC Parameters (CBC or ASCE 7-16 reference)	Value 2022 CBC
Site Latitude and Longitude (degrees): 33.7169, -117.2814	
Site Class Definition (1613.2.2, ASCE 7-16 Ch 20)	B
Mapped Spectral Response Acceleration at 0.2s Period (1613.2.1), S_s	1.570 g
Mapped Spectral Response Acceleration at 1s Period (1613.2.1), S_1	0.584 g
Short Period Site Coefficient at 0.2s Period (T1613.2.3(1)), F_a	0.900 g
Long Period Site Coefficient at 1s Period (T1613.2.3(2)), F_v	0.800 g
Adjusted Spectral Response Acceleration at 0.2s Period (1613.2.3), S_{MS}	1.413 g
Adjusted Spectral Response Acceleration at 1s Period (1613.2.3), S_{M1}	0.467 g
Design Spectral Response Acceleration at 0.2s Period (1613.2.4), S_{DS}	0.942 g
Design Spectral Response Acceleration at 1s Period (1613.2.4), S_{D1}	0.312 g
Mapped *MCE*$_G$ peak ground acceleration (11.8.3.2, Fig 22-9 to 13), ***PGA***	0.667 g
Site Coefficient for Mapped *MCE*$_G$ *PGA* (11.8.3.2), F_{PGA}	0.900
Site-Modified Peak Ground Acceleration (1803.5.12; 11.8.3.2), PGA_M	0.600 g

Hazard deaggregation was estimated using the USGS Interactive Deaggregations utility. The results of this analysis indicate that the predominant modal earthquake has a magnitude of approximately 6.5

(M_W) at a distance on the order of 11.6 kilometers for the Maximum Considered Earthquake (2% probability of exceedance in 50 years), and corresponding peak ground acceleration of 0.55 g.

2.6 Secondary Seismic Hazards

In general, secondary seismic hazards for sites in the region could include soil liquefaction, earthquake-induced settlement, lateral displacement, landsliding, and earthquake-induced flooding. The potential for secondary seismic hazards at the site is discussed below.

2.6.1 Liquefaction Potential

Liquefaction is the loss of soil strength or stiffness due to a buildup of pore-water pressure during severe ground shaking. Liquefaction is associated primarily with loose (low density), saturated, fine-to-medium grained, cohesionless soils. As the shaking action of an earthquake progresses, the soil grains are rearranged and the soil densifies within a short period of time. Rapid densification of the soil results in a buildup of pore-water pressure. When the pore-water pressure approaches the total overburden pressure, the soil reduces greatly in strength and temporarily behaves similarly to a fluid. Effects of liquefaction can include sand boils, settlement, and bearing capacity failures below structural foundations.

The State of California has not evaluated the site for liquefaction hazards. However, Riverside County has mapped the bottom of the natural drainage in the southern portion of the site to be within a low zone of liquefaction susceptibility. Groundwater was not encountered during any of our test pits conducted to a maximum depth of about 7.5 feet below ground surface. Previous geotechnical exploration (EEI, 2006) included borings that extended to a maximum depth of 22 feet bgs indicated perched groundwater in one boring (B-2) at a depth of 13 feet bgs in bedrock.

Based on the hazard delineation by Riverside County, the presence of shallow bedrock, and the absence of shallow groundwater within the overall site, the potential for liquefaction to occur at the site is considered to be less than significant.

2.6.2 Lateral Spreading

Liquefaction may also cause lateral spreading. For lateral spreading to occur, the liquefiable zone must be continuous, unconstrained laterally, and free to move along gently sloping ground toward an unconfined area. Due to the shallow bedrock present at the site and the absence of liquefaction hazards, the potential for lateral spreading to occur at the site is considered low.

2.6.3 Seismically Induced Settlement

During a strong seismic event, seismically induced settlement can occur within loose to moderately dense, dry or saturated granular soil. Settlement caused by ground shaking is often nonuniformly distributed, which can result in differential settlement. Based on the presence of shallow bedrock encountered during our investigation, significant seismically induced settlement is unlikely to occur onsite.

2.6.4 Seismically Induced Landslides

The site has not been evaluated for seismically induced landslide potential by the State of California. No mapped limits of historic landslides have been mapped by the California Geological Survey on their Landslide Inventory Interactive website. Natural rolling hillsides towards the southeast portion of the development have gradients that are generally 2:1 (horizontal:vertical) or flatter and are composed of very dense shallow bedrock. These slopes are not expected to pose seismically induced landslides hazards.

2.6.5 Flooding

The Federal Emergency Management Agency (FEMA, 2008) has mapped a narrow drainage in the northwest portion of the site to be within a 100-year flood zone. The reminder of the site has been mapped to be outside of any other flood zones (see Figure 6, Flood Hazard Zone Map). Assuming adequate drainage is incorporated into the design and grade

changes, as currently proposed, increase the existing elevation for the proposed improvements adjacent to the identified flood zone area, the potential for flooding to occur at the site is considered very low.

2.6.6 Seismically Induced Flooding

Earthquake-induced flooding can be caused by failure of dams or other water-retaining structures as a result of an earthquake. The site is not located within a dam breach inundation zone as delineated by the Department of Safety of Dams (DSOD, 2021) see Figure 7, *Dam Breach Inundation Map*). Considering that the site is located outside State delineated dam inundation zones, the potential for inundation at the site from earthquake-induced dam failure is less than significant.

2.6.7 Seiches and Tsunamis

A tsunami, or seismically generated sea wave, is generally created by a large, distant earthquake occurring near a deep ocean trough. A seiche is an earthquake-induced wave in a confined body of water, such as a lake or reservoir. Damage from tsunamis is confined to coastal areas that are 20 feet or less above sea level. Since the project is not located near the coast and is separated by significant hillsides to the nearest confined body bodies of water, the risk of inundation from a tsunami or seiche has no impact.

2.6.8 Slope Stability and Landslides

The site is situated at the base of the adjacent rolling hillsides. No historic landslides have been mapped near the site by the State of California. Additionally, no evidence of previous landslides was found during our investigation. Therefore, slope stability and landslides are not expected to be a hazard at the site. Based on our review the provided *Geotechnical Evaluation Summary Exhibit* prepared by Hunsaker and Associates, we understand that existing rolling hillsides and proposed graded slopes are to be at configurations of 2:1 (H:V) or flatter within very dense bedrock formations.

2.6.9 Regional Subsidence

The site has been mapped outside of any areas of subsidence due to groundwater pumping, peat loss, or oil extraction as delineated by the United States Geological Survey (USGS). Due to the shallow bedrock present at the site, the chance for subsidence to occur at the site is considered nil.

2.7 Infiltration Testing

Infiltration testing was conducted within five of the six excavated test pits onsite (IT-1, IT-2, and IT-4 through IT-6) to estimate the infiltration characteristics of the onsite soils at the depths and locations tested and requested by the design team. The infiltration testing was generally conducted at a bottom test zone depth of approximately 2 feet to 3.5 feet bgs

The test consisted of excavating a test pit to the depth of the test area, and excavating a smaller infiltration test cube, generally a 1ft x 1ft x 1ft (L:W:H) at the bottom of the test pit. A layer of ¾ inch rock was placed in the excavated infiltration test pit bottom to support a temporary 6-inch-diameter perforated well casing pipe. In addition, ¾ inch rock was poured around the outside of the well casing within the test zone to prevent the test area from caving/collapsing or eroding when water is added. Water is added into the infiltration test pit to an initial water height, as water within the pit infiltrates into the soil, measurements are taken of the height of the water column within the pit at equally timed intervals (known as a falling head test). The infiltration rate as measured during intervals of the test is defined as the flow rate of water infiltrated, divided by the surface area of the infiltration interface.

Results of the infiltration testing are summarized below and are provided in Appendix A. Infiltration Recommendations are presented in section 3.10.

Infiltration Test Rates

Exploration ID	Soil Type	Approx. Test Zone (ft), bgs	Approximate Percent Fines	Unfactored Infiltration Rate (in/hr)	Proposed Application
IT-1	Weathered Bedrock	3-3.5	13	1.4	Infiltration Basin
IT-2	Weathered Bedrock	2-2.5	34	0.5	Infiltration Basin
IT-3	Unable to Test Due to Very Shallow Hard Bedrock				Infiltration Basin
IT-4	Weathered Bedrock	3-3.5	6	10	Infiltration Basin
IT-5	Weathered Bedrock	2.7-3	31	0.5	Leach Field
IT-6	Weathered Bedrock	2-2.5	25	1.7	Leach Field

3.0 CONCLUSIONS AND RECOMMENDATIONS

Based on our study, construction of the proposed development is generally feasible from a geotechnical standpoint, except for the construction of infiltration systems (see Section 3.10). No severe geologic or soil related issues were identified that would preclude development of the site for the proposed improvements. The most significant geotechnical issues at the site are those related to the potential for strong seismic shaking, potentially compressible near-surface soils, and rippability of shallow bedrock. Good planning and design of the project can limit the impact of these constraints. Remedial recommendations for these and other geotechnical issues are provided in the following sections.

3.1 General Earthwork and Grading

All grading should be performed in accordance with the General Earthwork and Grading Specifications presented in Appendix E, unless specifically revised or amended below or by future recommendations based on final development plans.

3.1.1 Site Preparation

Prior to construction, the site should be cleared of debris, which should be disposed of offsite. Any underground obstructions should be removed. Resulting cavities should be properly backfilled and compacted. Efforts should be made to locate existing utility lines. Those lines should be removed or rerouted if they interfere with the proposed construction, and the resulting cavities should be properly backfilled and compacted.

3.1.2 Overexcavation and Recompaction

To reduce the potential for adverse total and differential settlement of the proposed structures, the underlying subgrade soil should be prepared in such a manner that a uniform response to the applied loads is achieved.

We recommend that the onsite soils and highly weathered bedrock be overexcavated in areas of proposed structures (including retaining walls retaining more than 3 feet) a minimum depth of 3 feet below the existing ground surface or 2 feet below the bottom of the proposed footings, whichever is deeper. Where possible, overexcavation bottoms should

extend horizontally a minimum of 5 feet from the outside edges of the footings (including columns connected to the buildings), or a distance equal to the depth of overexcavation below the footings, whichever is farther. During overexcavation, the soil and bedrock conditions should be observed by Leighton to further evaluate these recommendations based on actual field conditions encountered. A firm removal bottom should be established across each building footprint to provide uniform foundation support for the proposed structures. Leighton should observe and test the removal bottom prior to placing fill. Deeper overexcavation and recompaction may be recommended locally to remove any loose soil at the overexcavation bottom or if the gradient of the bottom surface would yield a relatively large fill thickness differential beneath a proposed structure.

Areas outside these overexcavation limits planned for asphalt or concrete pavement, flatwork, and site walls, and areas to receive fill should be overexcavated to a minimum depth of 24 inches below the existing ground surface or 12 inches below the proposed subgrade, whichever is deeper.

After completion of the overexcavation, and prior to fill placement, the exposed surfaces should be scarified to a minimum depth of 6 inches, moisture conditioned to or slightly above optimum moisture content, and recompacted to a minimum 90 percent relative compaction, relative to the ASTM D1557 laboratory maximum density.

These recommendations should be reviewed once grading plans for the development are available.

3.1.3 Fill Placement and Compaction

Onsite soil to be used for compacted structural fill should also be free of organic material debris and oversized material (greater than 12 inches in largest dimension). Generation of oversized rock is expected during grading of this project, and handling of oversized material is explained in Section 3.1.7 of this report. Any soil to be placed as fill, whether onsite or imported material should be reviewed and possibly tested by Leighton.

All fill soil should be placed in thin, loose lifts, moisture conditioned, as necessary to near optimum moisture content, and compacted to a minimum 90 percent relative compaction. Relative compaction should be determined in accordance with ASTM Test Method D1557. Aggregate base for pavement should be compacted to a minimum of 95 percent relative compaction.

3.1.4 Import Fill Soil

Import soil to be placed as fill should be geotechnically accepted by Leighton. Preferably at least 3 working days prior to proposed import to the site, the contractor should provide Leighton pertinent information of the proposed import soil, such as location of the soil, whether stockpiled or native in place, and pertinent geotechnical reports if available. We recommend that a Leighton representative visit the proposed import site to observe the soil conditions and obtain representative soil samples. Potential issues may include soil that is more expansive than onsite soil, soil that is too wet, soil that is too rocky or too dissimilar to onsite soils, oversize material, organics, debris, etc.

3.1.5 Shrinkage and Subsidence

We assume that the bedrock onsite will not shrink but estimate it could bulk (roughly 5 percent) when placed as compacted fill. The alluvial soils onsite are expected to shrink on the order of 10 ± 5 percent when placed as compacted fill.

These values can vary significantly depending on the level of fill compaction, variations in the dry density of the existing soil, and other factors that influence the amount of volume change. The preliminary estimates of shrinkage presented here are, by necessity, based on very limited data as compared to the thousands of cubic yards of earth to be moved. Adjustments to earthwork volume should be anticipated during grading of the site, and areas should be established where grades can be adjusted to accommodate variations in earthwork shrinkage or swelling.

3.1.6 Rippability

Resistant tonalite bedrock underlies the site and excavations into this unit will be made with difficulty. Five areas were identified and requested for further evaluation of feasibility by Hunsaker and Associates within the provided *Geotechnical Evaluation Summary Exhibit* as these identified areas were proposed to have the deeper cuts in order to accommodate the grading design of the large pads onsite. Cuts ranging in depth from 0.5 to 20 feet in depth were identified within these select areas, with the majority of 20 foot cuts generally being located towards the southeast of the site. The conducted Seismic Refraction Surveys were conducted on the requested areas mentioned above with proposed cuts up to 20 feet in depth. Based on the Seismic Refraction Survey conducted during our investigation, bedrock was generally considered rippable using a Caterpillar D8R, D9R, and D10R heavy rippers at depths of 0 to 20 feet bgs with other areas being considered rippable up to a depth of 65 feet. The Seismic Refraction Survey identified a portion of the southwestern corner of the site (Line 2) to contain a zone at a depth of 15 to 20 feet bgs that is anticipated to contain bedrock that is considered marginally rippable, , heavy ripping and blasting should be expected. In addition, unweathered boulders or zones may be present within otherwise rippable material.

The amount of excavation into resistant bedrock can be minimized with a grading plan that minimizes deep cuts into bedrock based on review of the provided seismic refraction survey attached in Appendix D.

Design of proposed utilities should consider the rippability aspect within the onsite bedrock. The proposed utilities should be overexcavated during the grading phase, as heavy rippers are readily available during this time and excavations into bedrock with conventional pipeline equipment might pose difficulty.

3.1.7 Oversized Material

In addition to the difficulty of excavating resistant bedrock during grading, excavation into unweathered bedrock during grading will likely generate oversized material. In general, any rock or rock fragments greater than 12

inches in largest dimension are considered oversized. Oversized material excavated during grading will require special handling and/or special placement in fills.

The primary geotechnical consideration of oversized materials is the potential for settlement of the compacted fill and negative impacts on overlying improvements associated with improperly placed oversized materials. Settlement can occur when there are significant voids or loose soil around or between rocks, occurring for instance, when water eventually works its way into these areas. Nesting oversize material can cause these voids, as can inadequate quantities of water applied during fill placement, or inadequate compaction methods / equipment.

With the presence of shallow dense bedrock onsite, the generation of oversized material during grading is anticipated and should be anticipated by the grading contractor. The amount of oversized expected to be generated during grading will depend on the methods and equipment used by the grading contractor. Oversize rock should be placed in deeper fills (deeper than 5 feet below finish grade) or removed from structural fill areas. All rocks larger than 24 inches in dimension should be placed in windrows, surrounded by sandy soils, and placed with copious amounts of water. The rock windrows should be placed such that individual rocks are not nested and sandy soil can be worked completely around the rocks. It is imperative that the contractor use copious amounts of water.

Excavations for proposed utilities can be very difficult in the presence of large (greater than 24 inches) rocks. To facilitate utility construction (but not a geotechnical requirement), removing rocks larger than 24 inches in the upper 5 feet below the rough graded surface or 1 foot below the deepest utility may be considered.

3.2 Shallow Foundation Recommendations

Overexcavation and recompaction of the footing subgrade should be performed as detailed in Section 3.1. The following recommendations are based on the onsite soil conditions and soils with a very low expansion potential. The structural engineer should design the footing reinforcement in accordance with current

California Building Code (CBC) requirements. Local agencies, the structural engineer or the CBC may have requirements that are more stringent.

Overexcavation and recompaction of the footing subgrade soil should be performed as detailed in Section 3.1.2.

3.2.1 Minimum Embedment and Width

Based on our preliminary investigation, footings should have a minimum embedment per code requirements, with a minimum width of 24 and 12 inches for isolated and continuous footings, respectively.

3.2.2 Allowable Bearing

An allowable bearing pressure of 2,000 pounds-per-square-foot (psf) may be used, based on an assumed embedment depth of 18 inches and minimum width described above. This allowable bearing value may be increased by 250 psf per foot increase in depth or width to a maximum allowable bearing pressure of 4,000 psf. If higher bearing pressures are required, this should be reviewed on a case-by-case basis and may include additional overexcavation and/or soil reinforcement. These allowable bearing pressures are for total dead load and sustained live loads. Footing reinforcement should be designed by the structural engineer.

3.2.3 Lateral Load Resistance

Soil resistance available to withstand lateral loads on a shallow foundation is a function of the frictional resistance along the base of the footing and the passive resistance that may develop as the face of the structure tends to move into the soil. The frictional resistance between the base of the foundation and the subgrade soil may be computed using a coefficient of friction of 0.3. The passive resistance may be computed using an allowable equivalent fluid pressure of 240 pounds per cubic foot (pcf), assuming there is constant contact between the footing and undisturbed soil. The coefficient of friction and passive resistance may be combined without further reduction.

3.2.4 Increase in Bearing and Friction - Short Duration Loads

The allowable bearing pressure and coefficient of friction values may be increased by one-third when considering loads of short duration, such as those imposed by wind and seismic forces.

3.3 Recommendations for Slabs-On-Grade

Concrete slabs-on-grade should be designed by the structural engineer in accordance with the current CBC for soil with a very low expansion potential. Where conventional light floor loading conditions exist, the following minimum recommendations should be used. More stringent requirements may be required by local agencies, the structural engineer, the architect, or the CBC. Laboratory testing should be conducted at finish grade to evaluate the expansion index of near-surface subgrade soils. In addition, slabs-on-grade should have the following minimum recommended components:

- Subgrade Moisture Conditioning: The subgrade soil should be moisture conditioned to at least 2 percentage points above optimum moisture content to a minimum depth of 12 inches prior to placing the moisture vapor retarder, steel or concrete.

- Moisture Retarder: A minimum of 10-mil moisture retarder should be placed below slabs where moisture-sensitive floor coverings or equipment is planned. The structural engineer should specify pertinent concrete design parameters and moisture migration prevention measures, such as whether a sand blotter layer should be placed over the vapor retarder. The moisture barrier may be placed directly on subgrade provided gravel or other protruding objects that could puncture the moisture retarder are removed from the subgrade prior to placement. A heavier vapor retarder (such as 15 mil Stego Wrap) placed directly on prepared subgrade may also be used. Moisture retarders can reduce, but not eliminate moisture vapor rise from the underlying soils up through the slab. Moisture retarders should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Institute, ASTM International, and California Building Code requirements and guidelines.

- Concrete and Structural Design Thickness: Slabs-on-grade should be designed by the structural engineer but should be at least 4 inches thick (this is referring to the actual minimum thickness, not the nominal thickness). Reinforcing steel should be designed by the structural engineer, but as a minimum (for conventionally reinforced slabs) should be No. 3 rebar placed at 18 inches on center, each direction, mid-depth in the slab.

  Minor cracking of the concrete as it cures, due to drying and shrinkage, is normal and should be expected. However, cracking is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. Low slump concrete can reduce the potential for shrinkage cracking. Additionally, our experience indicates that reinforcement in slabs and foundations can generally reduce the potential for concrete cracking. The structural engineer should consider these components in slab design and specifications.

  Moisture retarders can reduce, but not eliminate moisture vapor rise from the underlying soils up through the slab. Floor covering manufacturers should be consulted for specific recommendations.

  Leighton does not practice in the field of moisture vapor transmission evaluation since this is not specifically a geotechnical issue. Therefore, we recommend that a qualified person, such as the flooring subcontractor and/or structural engineer, be consulted with to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. That person should provide recommendations for mitigation of potential adverse impact of moisture vapor transmission on various components of the structures as deemed appropriate.

3.4 Seismic Design Parameters

Seismic parameters presented in this report should be considered during project design. In order to reduce the effects of ground shaking produced by regional seismic events, seismic design should be performed in accordance with the current CBC. The CBC seismic design parameters listed in Section 2.5.2 of this

report should be considered for the seismic analysis of the subject site.

3.5 Retaining Walls

We recommend that retaining walls be backfilled with very low expansive soil and constructed with a backdrain in accordance with the recommendations provided on Figure 8 (rear of text). Using expansive soil as retaining wall backfill will result in higher lateral earth pressures exerted on the wall. Based on these recommendations, the following parameters may be used for the design of conventional retaining walls:

Static Equivalent Fluid Weight for Sand Backfill (pcf)		
Condition	Level Backfill	2:1 Sloping Backfill
Active	40	65
At-Rest	60	87
Passive (allowable)	240 (Maximum of 4,000 psf)	120 (2:1 Sloping Front)

The above values do not contain an appreciable factor of safety except the passive pressure, so the structural engineer should apply the applicable factors of safety and/or load factors during design, as specified by the California Building Code.

Cantilever walls that are designed to yield at least 0.001H, where H is equal to the wall height, may be designed using the active condition. Rigid walls and walls braced at the top should be designed using the at-rest condition.

Passive pressure is used to compute soil resistance to lateral structural movement. In addition, for sliding resistance, a frictional resistance coefficient of 0.30 may be used at the concrete and soil interface. The lateral passive resistance should be taken into account only if it is ensured that the soil providing passive resistance, embedded against the foundation elements, will remain intact with time.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure or traffic loading, should be considered in the design of the retaining wall. Loads applied within a 1:1

projection from the surcharging structure on the stem of the wall should be considered in the design. A third of uniform vertical surcharge-loads should be applied at the surface as a horizontal pressure on cantilever (active) retaining walls, while half of uniform vertical surcharge-loads should be applied as a horizontal pressure on braced (at-rest) retaining walls. To account for automobile parking surcharge, we suggest that a uniform horizontal pressure of 100 psf (for restrained walls) or 70 psf (for cantilever walls) be added for design, where autos are parked within a horizontal distance behind the retaining wall less than the height of the retaining wall stem.

For walls with a retained height over 6 feet, or where otherwise required by Code or deemed appropriate by the structural engineer, we recommend that the wall designs be checked seismically using an additive seismic Equivalent Fluid Pressure (EFP) of 19 pcf for level backfill and an EFP of 32 pcf for a 2:1 (H:V) sloping backfill, which is added to the active EFP. Such walls that are to be designed in the static case assuming the at-rest condition should be checked seismically using this additive seismic EFP added to the active condition (i.e., the additive seismic EFP is not added to the at-rest EFP value shown in Table 2 above). The additive seismic EFP should be applied with a standard EFP pressure distribution (i.e., it is not an inverted triangle).

Conventional retaining wall footings should have a minimum width of 24 inches and a minimum embedment of 12 inches below the lowest adjacent grade. An allowable bearing pressure of 2,000 psf may be used for retaining wall footing design, based on the minimum footing width and depth. This bearing value may be increased by 250 psf per foot increase in width or depth to a maximum allowable bearing pressure of 3,000 psf.

Plans indicating retaining wall locations and heights were not available during this study. Once plans are available they should be reviewed by Leighton to ensure the recommendations provided above remain applicable.

3.6 Pavement Design

Based on the design procedures outlined in the 2017 Caltrans Highway Design Manual, and using an assumed design R-value of 18, flexible pavement sections may consist of the following for the Traffic Indices indicated. Final pavement

design should be based on the Traffic Index determined by the project civil engineer and R-value testing provided near the end of grading.

Asphalt Pavement Section Thickness, Type I Subgrade Soil			
Traffic Index	Asphaltic Concrete (AC) Thickness (inches)	Class 2 Aggregate Base Thickness (inches)	Total Pavement Section Thickness (inches)
5 or less	3	7.5	10.5
6	4.0	9.0	13.0
7	5.0	10.5	15.5

All pavement construction should be performed in accordance with the Standard Specifications for Public Works Construction or Caltrans Specifications. Field observations and periodic testing, as needed during placement of the base course materials, should be undertaken to ensure that the requirements of the standard specifications are fulfilled.

In areas where rigid concrete pavement is planned with auto and light truck access, we recommend 5.5 inches of Portland Cement Concrete (PCC) over 4 inches of aggregate base placed on prepared subgrade soil. For heavy truck access, we recommend a minimum of 7.0 inches of PCC over 6 inches of aggregate base. The PCC should have a 28-day compressive strength of 4,000 psi. Reinforcement should be specified by the structural engineer. The PCC pavement sections should be provided with crack-control joints spaced no more than 15 and 12.5 feet on center each way for 7 and 5.5-inch thick concrete, respectively. If sawcuts are used, they should have a minimum depth of ¼ of the slab thickness and made within 24 hours of concrete placement. We recommend that sections be as nearly square as possible.

PCC sidewalks should be at least 4 inches thick over prepared subgrade soil, with construction joints no more than 8 feet on center each way, with sections as nearly square as possible. Use of reinforcing will help reduce severity of cracking.

For concrete trash aprons, ADA stalls and ADA cross-walks, we recommend a minimum 5 inches of concrete over prepared subgrade soil.

All pavement construction should be performed in accordance with the Standard Specifications for Public Works Construction. Field observations and periodic testing, as needed during placement of the base course materials, should be undertaken to ensure that the requirements of the standard specifications are fulfilled. Prior to placement of aggregate base, the subgrade soil should be processed to a minimum depth of 6 inches, moisture-conditioned, as necessary, and recompacted to a minimum of 95 percent relative compaction. Aggregate base should be moisture conditioned, as necessary, and compacted to a minimum of 95 percent relative compaction.

If the pavement is to be constructed prior to construction of the structures, we recommend that the full depth of the pavement section be placed in order to support heavy construction traffic.

3.7 Temporary Excavations

All temporary excavations, including utility trenches, retaining wall excavations and other excavations should be performed in accordance with project plans, specifications and all OSHA requirements.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the slope, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structures.

Cantilever shoring should be designed based on an active equivalent fluid pressure of 40 pcf. If excavations are braced at the top and at specific design intervals, the active pressure may then be approximated by a rectangular soil pressure distribution with the pressure per foot of width equal to 25H, where H is equal to the depth of the excavation being shored.

During construction, the soil conditions should be regularly evaluated to verify that conditions are as anticipated. The contractor should be responsible for

providing the "competent person" required by OSHA, standards to evaluate soil conditions. Close coordination between the competent person and the geotechnical engineer should be maintained to facilitate construction while providing safe excavations.

3.8 Trench Backfill

Utility trenches should be backfilled with compacted fill in accordance with Sections 306-1.2 and 306-1.3 of the *Standard Specifications for Public Works Construction,* (SSPWC, "Greenbook"), 2018 Edition. Utility trenches may be backfilled with onsite material, provided it is free of rubble, debris, organic and oversized material up to 3 inches in largest dimension. Prior to backfilling trenches, pipes should be bedded in and covered with either:

(1) **Granular Bedding:** Uniform, free-draining (minimum permeability of 2 in/hr) sand material with a Sand Equivalent (SE) greater than or equal to 30, passing the No. 4 U.S. Standard Sieve (or as specified by the pipe manufacturer). Open-graded material (such as crushed rock) should not be used (unless surrounded by Mirafi 140N filter fabric), as surrounding soil can erode into such material, potentially causing voids at the surface and under structures.

(2) **CLSM:** Controlled Low Strength Material (CLSM) conforming to Section 201-6 of the SPWC. CLSM bedding should be placed to 1-foot (0.3 m) over the top of the conduit, and vibrated.

Pipe bedding should extend at least 4 inches below the pipeline invert and at least 12 inches over the top of the pipeline. The bedding and shading sand should be densified in place by mechanical means in accordance with the Greenbook (current edition).

Trench backfill over the pipe bedding zone may consist of native and clean fill soils. All backfill should be placed in thin lifts (appropriate for the type of compaction equipment), moisture conditioned at least 2 percent above optimum, and mechanically compacted to at least 90 percent relative compaction, relative to the ASTM D 1557 laboratory (Proctor) maximum density.

3.9 Surface Drainage

Inadequate control of runoff water and/or poorly controlled irrigation can lead to settlement of foundations, flatwork, walls, and other improvements. Maintaining adequate surface drainage, proper disposal of runoff water, and control of irrigation should help reduce the potential for future soil moisture problems.

Positive surface drainage should be designed to be directed away from foundations and toward approved drainage devices, such as gutters, paved drainage swales, or watertight area drains and collector pipes.

Surface drainage should be provided to prevent ponding of water adjacent to the structures. In general, the area around the buildings should slope away from the building. We recommend that unpaved landscaped areas adjacent to the buildings be avoided. Roof runoff should be carried to suitable drainage outlets by watertight drain pipes or over paved surfaces.

3.10 Infiltration Recommendations

Based on our onsite observations, laboratory testing, and infiltration test results summarized in Section 2.6 and presented in Appendix A, reliance of infiltration into onsite native soils for basins or leach fields is not recommended. Due to the presence of shallow bedrock in this area, as shallow as 3 inches in IT-3 before hitting refusal at 1.5 feet, and considering separation requirements by the County of Riverside for Low Impact Development Best Management Practices, infiltration is not feasible for this project. Although infiltration testing in TP-4, located in an area with a larger layer of weathered bedrock, showed favorable results, the thin mantle and underlying impermeable bedrock will create a confining layer within the area. It is likely that water infiltrated at depths of approximately 3 feet bgs through prolonged infiltration will tend to migrate laterally rather than vertically and produce lower infiltration values. Actual infiltration rates would be anticipated to decrease as the adjacent soils saturate.

The County of Riverside requires a minimum 5-foot vertical separation from bedrock or impermeable material for infiltration BMP devices. Compacted fill should also not be relied upon for infiltration due to inconsistent rates during compaction efforts and different relative density rates. Due to the presence of shallow bedrock in this area and considering separation requirements by the

County of Riverside for Low Impact Development Best Management Practices, infiltration of storm water at the site is generally considered not feasible for this project.

3.11 Sulfate Attack and Corrosion Protection

Based on the results of laboratory testing, concrete structures in contact with the onsite soil will have negligible exposure to water-soluble sulfates in the soil (Exposure Class S0). There is no cement type restriction for Exposure Class S0 per ACI 318. Concrete should be designed in accordance with ACI 318-14, Section 19.3 (ACI, 2014), adopted by the 2022 CBC (Section 1904.2).

The onsite soil is considered to be moderately corrosive to ferrous metals. It is recommended that any buried pipe be made of non-ferrous material, or that any ferrous pipe be protected by dielectric tape, polyethylene sleeves and/or other methods, with recommendations from a corrosion engineer. Corrosion information presented in this report should be provided to your underground utility subcontractors. Additional testing and evaluation by a corrosion engineer may be warranted if metallic utilities are planned.

3.12 Additional Geotechnical Services

The geotechnical recommendations presented in this report are based on subsurface conditions as interpreted from limited subsurface explorations and limited laboratory testing. Our geotechnical recommendations provided in this report are based on information available at the time the report was prepared and may change as plans are developed. Additional geotechnical investigation and analysis may be required based on final improvement plans. Leighton should review the site and grading plans when available and comment further on the geotechnical aspects of the project. Geotechnical observation and testing should be conducted during excavation and all phases of grading operations. Our conclusions and preliminary recommendations should be reviewed and verified by Leighton Consulting, Inc. during construction and revised accordingly if geotechnical conditions encountered vary from our preliminary findings and interpretations.

Geotechnical observation and testing should be provided:

- After completion of site clearing.
- During overexcavation of compressible soil.
- During compaction of all fill materials.
- After excavation of all footings and prior to placement of concrete.
- During utility trench backfilling and compaction.
- During pavement subgrade and base preparation.
- When any unusual conditions are encountered.

4.0 LIMITATIONS

This report was necessarily based in part upon data obtained from a limited number of observances, site visits, soil samples, tests, analyses, histories of occurrences, spaced subsurface explorations and limited information on historical events and observations. Such information is necessarily incomplete. The nature of many sites is such that differing characteristics can be experienced within small distances and under various climatic conditions. Changes in subsurface conditions can and do occur over time. This investigation was performed with the understanding that the subject site is proposed for residential development. The client is referred to Appendix F regarding important information provided by the Geo-Professional Business Association (GBA) on geotechnical engineering studies and reports and their applicability.

This report was prepared for Muslim Mortuary & Cemetery Committee based on their needs, directions, and requirements at the time of our investigation. This report is not authorized for use by and is not to be relied upon by any party except Muslim Mortuary & Cemetery Committee and its successors and assignees as owner of the property, with whom Leighton Consulting, Inc. has contracted for the work. Use of or reliance on this report by any other party is at that party's risk. Unauthorized use of or reliance on this report constitutes an agreement to defend and indemnify Leighton Consulting, Inc. from and against any liability which may arise as a result of such use or reliance, regardless of any fault, negligence, or strict liability of Leighton Consulting, Inc.

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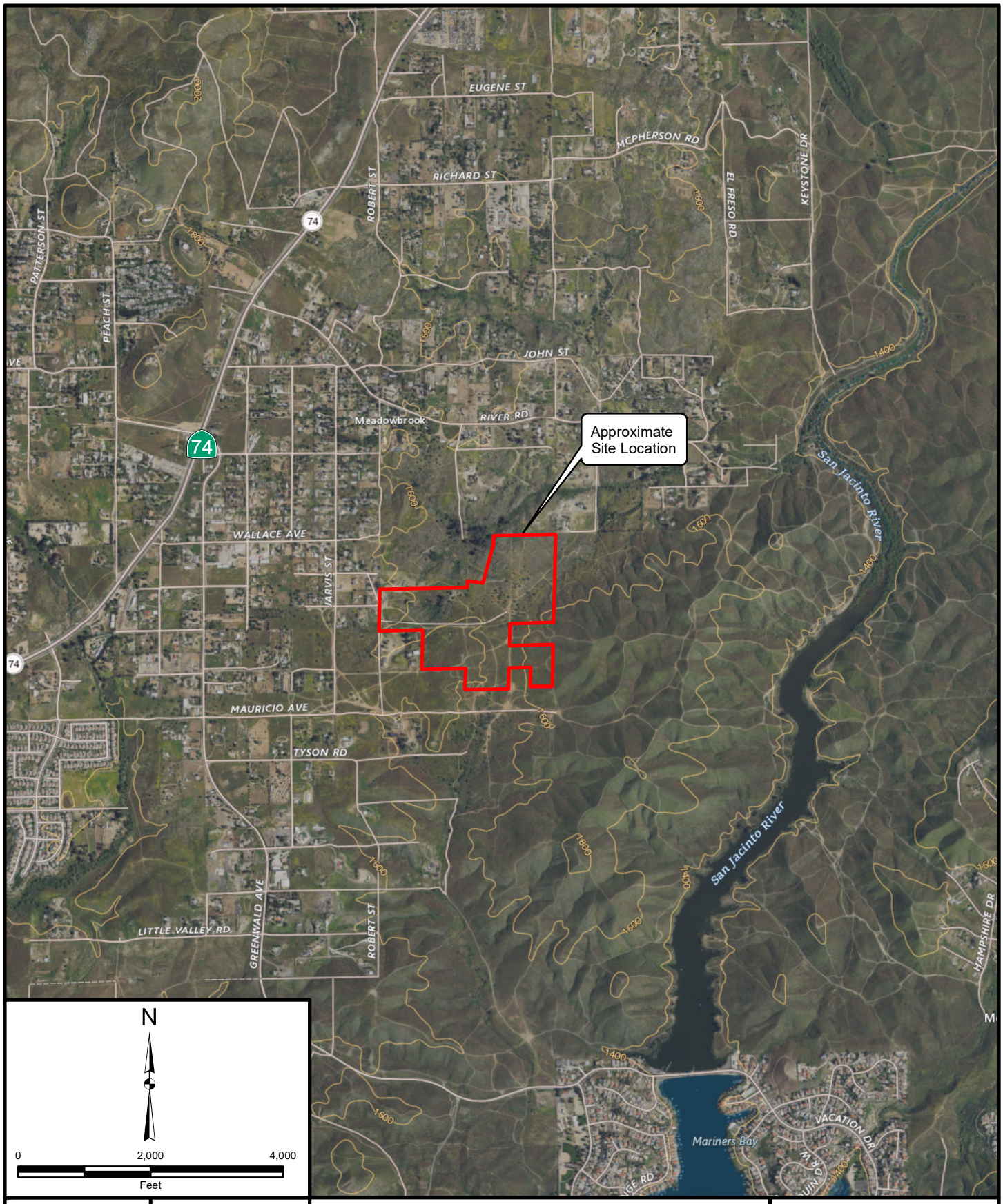


Project: 19894.038	Eng/Geol: SGO/JDH
Scale: 1 " = 2,000 '	Date: February 2024

Reference: USGS The National Map: Orthoimagery and US Topo. Data refreshed

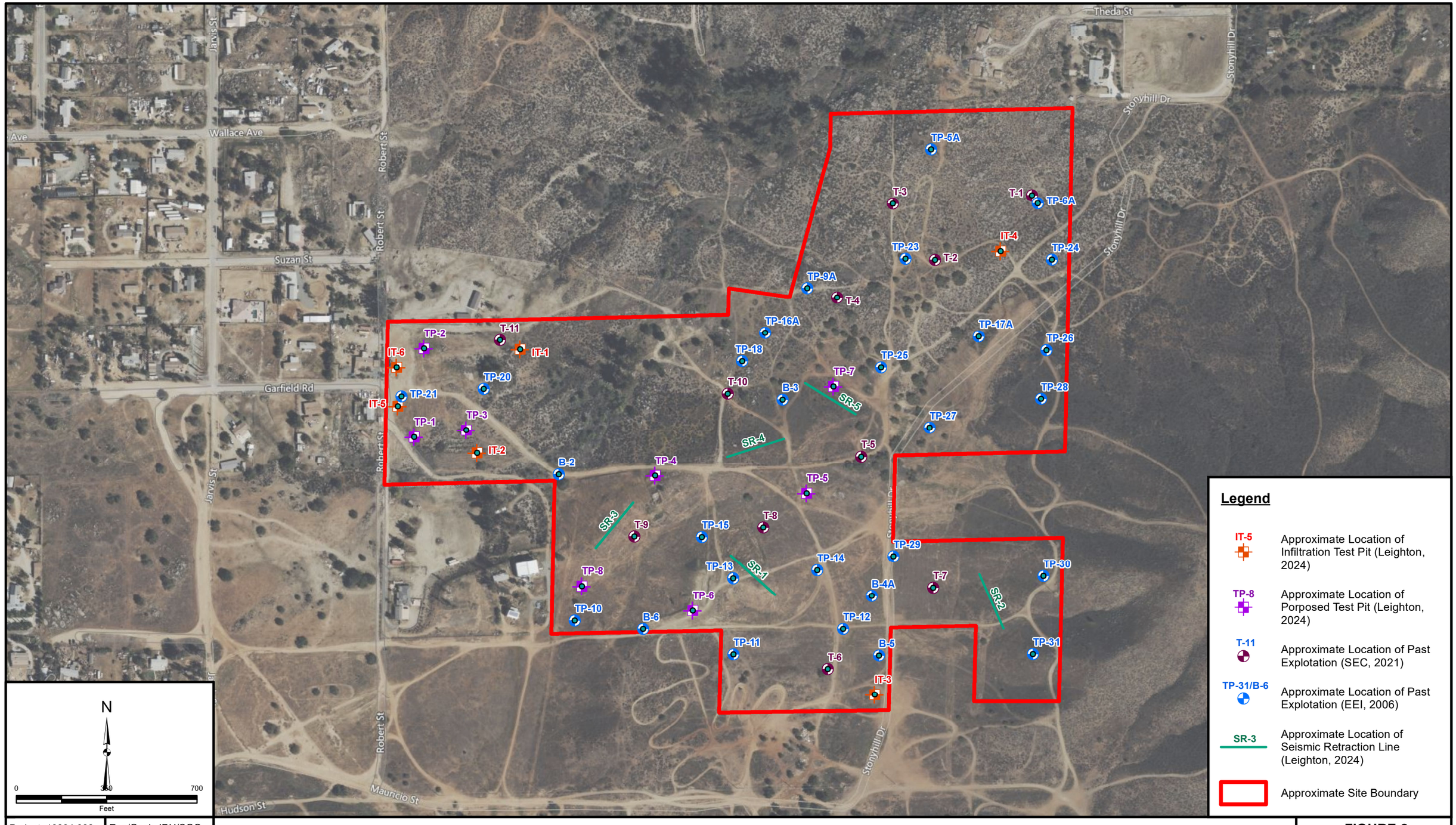
SITE LOCATION MAP

Proposed Crescent Gardens Cemetery
APNs 349-170-003 through -013, -035,
349-180-002, -004 through -008, -016, -017,
-020, 349-190-006, Perris Area,
Unincorporated Riverside County, California

FIGURE 1

Leighton

Map Saved as J:\Drafting\19894\Maps\19894_F01_SLM_2024-02-12.mxd on 2/15/2024 7:08:37 AM Author: KVM (kmanchikanti)



Legend

- IT-5 — Approximate Location of Infiltration Test Pit (Leighton, 2024)
- TP-8 — Approximate Location of Porposed Test Pit (Leighton, 2024)
- T-11 — Approximate Location of Past Explotation (SEC, 2021)
- TP-31/B-6 — Approximate Location of Past Explotation (EEI, 2006)
- SR-3 — Approximate Location of Seismic Retraction Line (Leighton, 2024)
- Approximate Site Boundary

Project: 19894.038	Eng/Geol: JDH/SGO
Scale: 1 " = 350 '	Date: February 2024

Reference: © 2024 Microsoft Corporation © 2024 Maxar ©CNES (2024) Distribution Airbus DS © 2024 TomTom, Rexford Industrial Realty, Conceptual Sie Plan

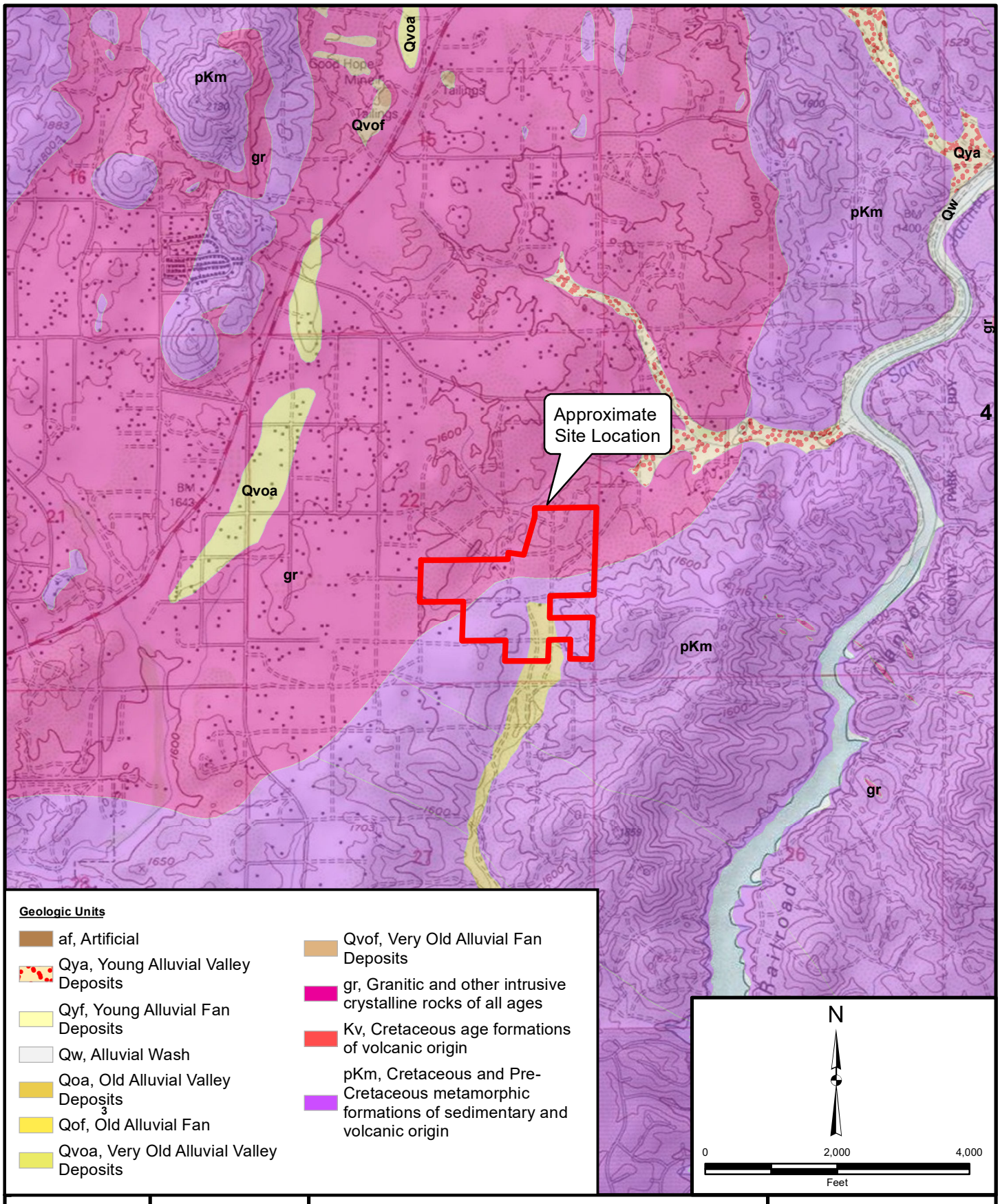
EXPLORATION LOCATION MAP

Proposed Crescent Gardens Cemetary
APNs 349-170-003 through -013, -035, 349-180-002, -004 through -008, -016, -017, -020, 349-190-006
Perris Area, Unincorporated Riverside County, California

FIGURE 2

Leighton

Map Saved as J:\Drafting\19894\Maps\19894_F02_GM_2024-02-23.mxd on 2/29/2024 10:55:09 AM Author: KVM (kmanchikanti)



Geologic Units

- af, Artificial
- Qya, Young Alluvial Valley Deposits
- Qyf, Young Alluvial Fan Deposits
- Qw, Alluvial Wash
- Qoa, Old Alluvial Valley Deposits
- Qof, Old Alluvial Fan
- Qvoa, Very Old Alluvial Valley Deposits
- Qvof, Very Old Alluvial Fan Deposits
- gr, Granitic and other intrusive crystalline rocks of all ages
- Kv, Cretaceous age formations of volcanic origin
- pKm, Cretaceous and Pre-Cretaceous metamorphic formations of sedimentary and volcanic origin

Project: 19894.038	Eng/Geol: JDH/SGO
Scale: 1 " = 2,000 '	Date: February 2024

Reference: Geologic map of the San Bernardino & Santa Ana 30'x60' Quadrangles, California. Morton & Miller, 2006

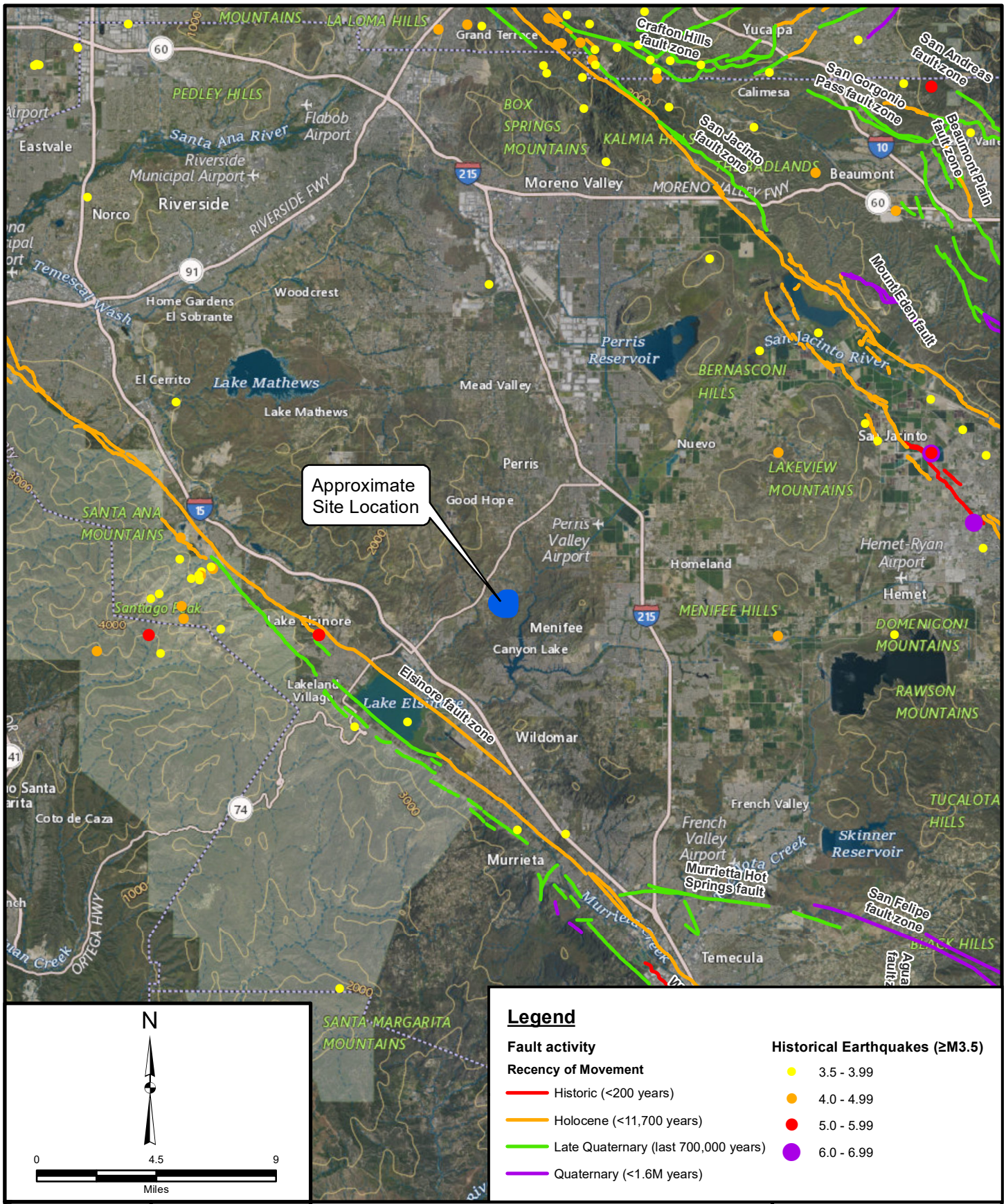
REGIONAL GEOLOGY MAP

Proposed Crescent Gardens Cemetary
APNs 349-170-003 through -013, -035,
349-180-002, -004 through -008, -016, -017,
-020, 349-190-006, Perris Area,
Unincorporated Riverside County, California

FIGURE 2

Leighton

Map Saved as J:\Drafting\19894\Maps\19894_F03_RGM_2024-02-12.mxd on 2/15/2024 7:15:13 AM Author: KVM (kmanchikanti)



Project: 19894.038	Eng/Geol: JDH/SGO
Scale: 1 " = 5 miles	Date: February 2024

Basemap Reference: USGS The National Map: Orthoimagery and US Topo. Data refreshed August, 2023.
Seismicity Data Reference: maps.conservation.ca.gov

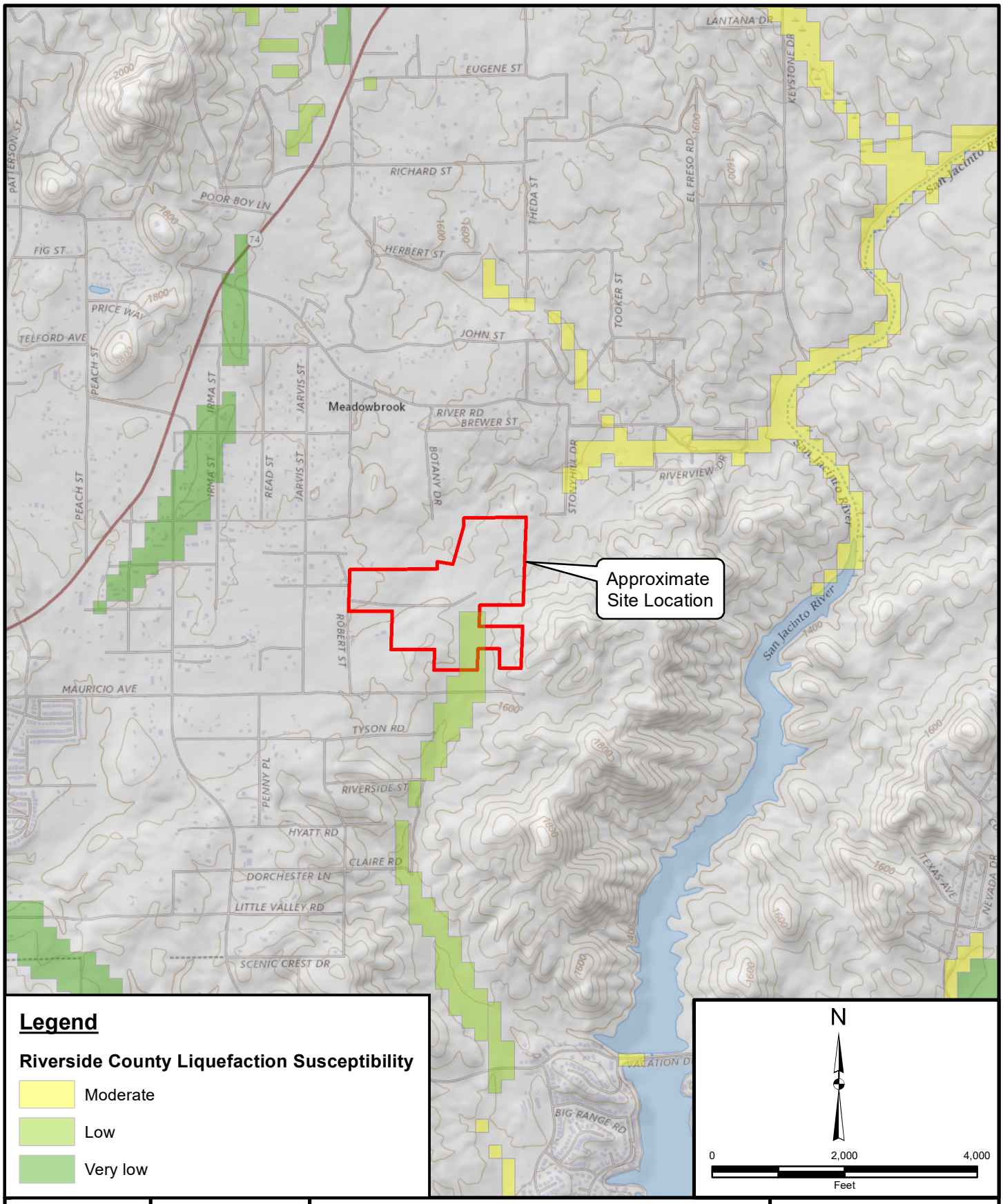
REGIONAL FAULT AND HISTORIC SEISMICITIY MAP

Proposed Crescent Gardens Cemetary
APNs 349-170-003 through -013, -035,
349-180-002, -004 through -008, -016, -017,
-020, 349-190-006, Perris Area,
Unincorporated Riverside County, California

FIGURE 4

Leighton

Map Saved as J:\Drafting\19894\Maps\19894_F04_RFHSM_2024-02-12.mxd on 2/15/2024 7:19:55 AM Author: KVM (kmanchikanti)



Project: 19894.038	Eng/Geol: JDH/SGO
Scale: 1 " = 2,000 '	Date: February 2024

Service Layer Credits: USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road

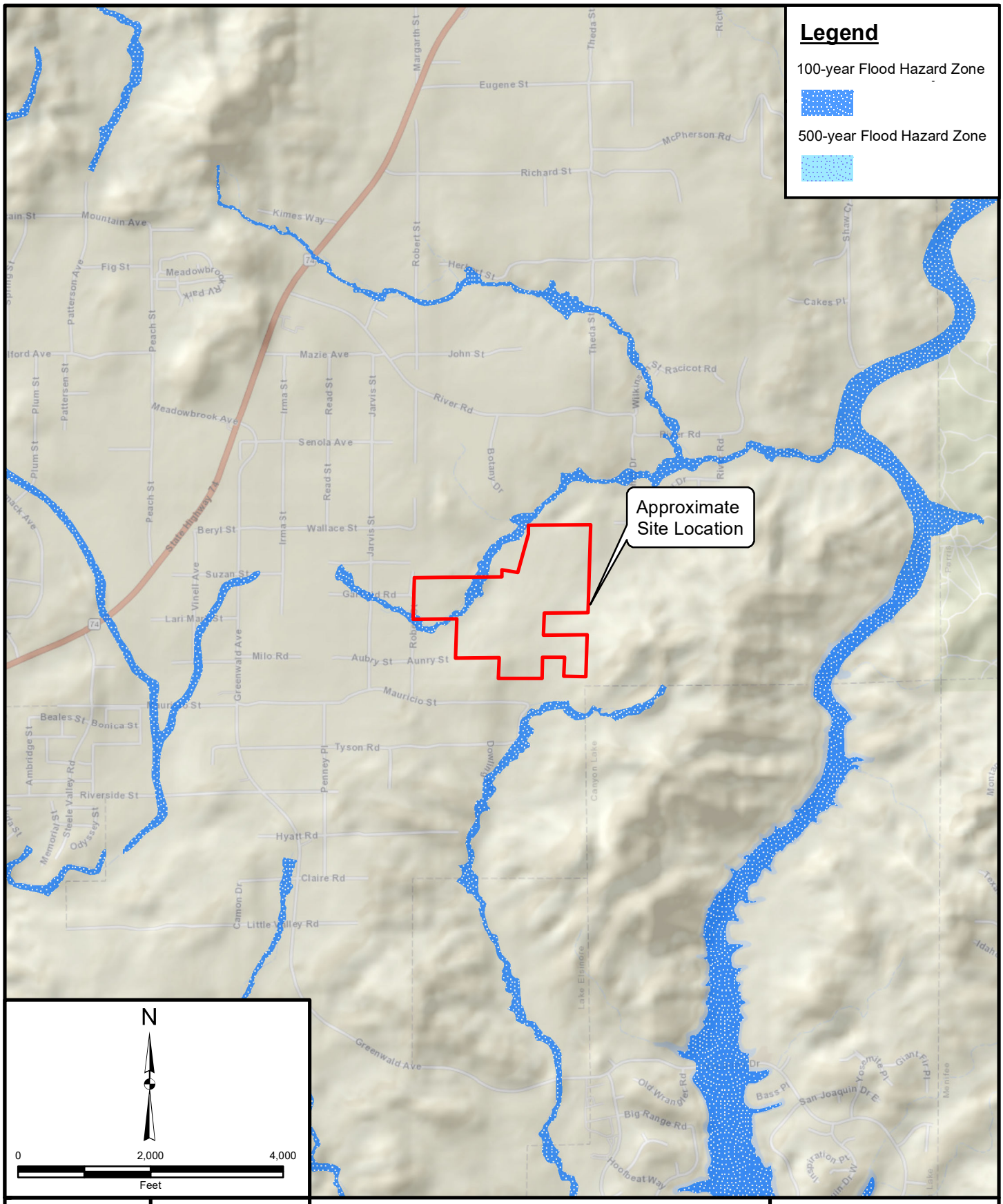
SEISMIC HAZARD MAP

Proposed Crescent Gardens Cemetary
APNs 349-170-003 through -013, -035,
349-180-002, -004 through -008, -016, -017,
-020, 349-190-006, Perris Area,
Unincorporated Riverside County, California

FIGURE 5

Leighton

Map Saved as J:\Drafting\19894\Maps\19894_F05_SHM_2024-02-12.mxd on 2/15/2024 7:14:40 AM Author: KVM (kmanchikanti)



Project: 19894.038	Eng/Geol: JDH/SGO
Scale: 1 " = 2,000 '	Date: February 2024

Reference: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community
FEMA (http://www.fema.gov/index.shtm), DWR (http://www.dwr.ca.gov)

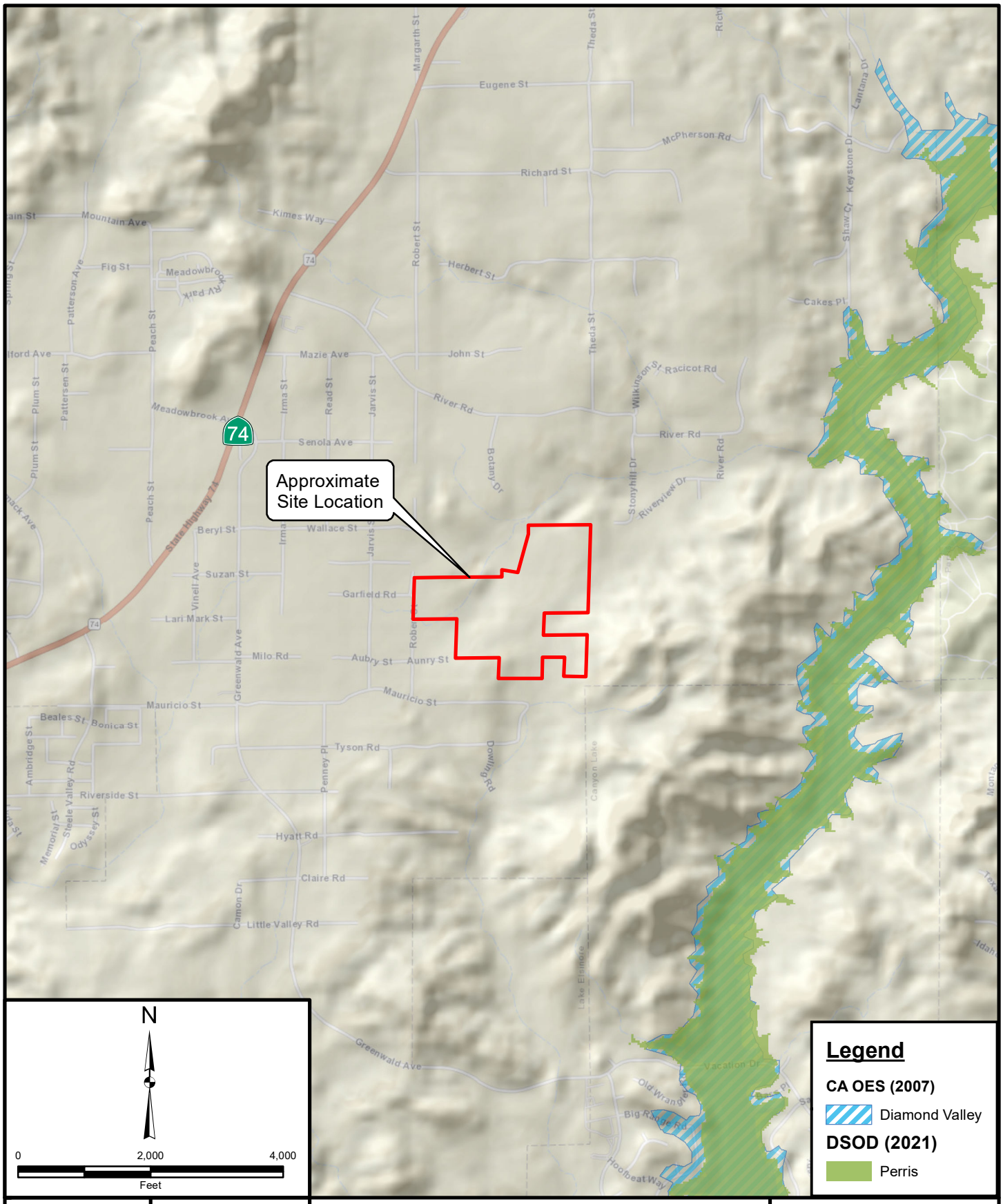
FLOOD HAZARD ZONE MAP

Proposed Crescent Gardens Cemetary
APNs 349-170-003 through -013, -035,
349-180-002, -004 through -008, -016, -017,
-020, 349-190-006, Perris Area,
Unincorporated Riverside County, California

FIGURE 6

Leighton

Map Saved as J:\Drafting\19894\Maps\19894_F06_FHM_2024-02-21.mxd on 2/21/2024 10:57:12 AM Author: KVM (kmanchikanti)



Project: 19894.038	Eng/Geol: JDH/SGO
Scale: 1 " = 2,000 '	Date: February 2024

Basemap Reference: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China
Reference: Office of Emergency Services (2007),
Dept of Safety of Dams (2021)
National Inventory of Dams, Army Corps of Engrs (2021)

DAM INUNDATION MAP

Proposed Crescent Gardens Cemetary
APNs 349-170-003 through -013, -035,
349-180-002, -004 through -008, -016, -017,
-020, 349-190-006, Perris Area,
Unincorporated Riverside County, California

FIGURE 7

Leighton

Map Saved as J:\Drafting\19894\Maps\19894_F07_DIM_2024-02-21.mxd on 2/21/2024 11:01:12 AM Author: KVM (kmanchikanti)

APPENDIX A
EXPLORATION LOGS

TEST PIT TP-1

City of Rancho Cucamonga Memorial Park

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1609'

Location: **See Figure 2 - Exploration Location Map**

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	1.3	SP-SC	POORLY-GRADED SAND with CLAY, brown, moist, mostly fine sand, some medium to coarse sand, medium plasticity, slightly micaceous, rootlets	Topsoil				
1.3	3.0	IGNEOUS	IGNEOUS ROCK (granitic), orange brown, coarse-grained, intensely weathered to decomposed, dry to slightly moist, fine to coarse sand sized mineral grains, trace clay	Kgt				
3.0	7.5	IGNEOUS	IGNEOUS ROCK (granitic), white and black to gray, coarse-grained, intensely weathered, dry, fine to coarse sand sized mineral grains, friable, few fines, relatively dense, more intact with depth	Kgt				

Total Depth = 7.5 feet bgs (REFUSAL)
No groundwater encountered when excavating
Test pit backfilled with spoils and wheel-rolled at surface



TEST PIT TP-2

Muslim Mortuary Crescent Gardens Canyon

Project No. 038.0000019894

Logged By: BTM

Date Excavated: 1/22/2024

Sampled By: BTM

Elevation: 1608'

Location: **See Figure 2 - Exploration Location Map**

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	0.5	SW-SM	WELL-GRADED SAND with SILT, brown, moist, mostly fine sand, some medium to coarse sand, low to medium plasticity	Topsoil				
0.5	1.0	IGNEOUS	IGNEOUS ROCK (granitic), orange, coarse-grained, decomposed, moist, fine to coarse sand sized mineral grains, extensive clay development	Kgt				
1.0	3.0	IGNEOUS	IGNEOUS ROCK, orange brown, coarse-grained, intensely weathered, slightly moist, fine to coarse sand sized grains, few fines, minor clay development	Kgt				
3.0	7.0	IGNEOUS	IGNEOUS ROCK, orange brown, coarse-grained, intensely to moderately weathered, 6% fines (lab)	Kgt				

Total Depth = 7 feet bgs (REFUSAL)
No groundwater encountered when excavating
Test pit backfilled with spoils and wheel-rolled at surface



TEST PIT TP-3

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1605'

Location: **See Figure 2 - Exploration Location Map**

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	0.8	SC	CLAYEY SAND, dark brown, moist, loose, fine to coarse sand, low plasticity, rootlets, slightly micaceous	Topsoil				
0.8	1.5	IGNEOUS	IGNEOUS ROCK (granitic), dark orange brown, decomposed, slightly moist, fine to coarse sand sized mineral grains, slightly micaceous, few rootlets, friable	Kgt				
1.5	7.0	IGNEOUS	IGNEOUS ROCK (granitic), gray, intesely to moderately weathered, dry to slightly moist, fine to coarse sand sized grains, few fines, heavily micaceous, becomes more dense with depth	Kgt				

Total Depth = 7 feet bgs (REFUSAL)
No groundwater encountered when excavating
Test pit back-filled with spoils and wheel-rolled at surface



TEST PIT TP-4

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1612'

Location: **See Figure 2 - Exploration Location Map**

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	1.33	SC	CLAYEY SAND, dark brown, moist to wet, loose, mostly fine sand, few medium to coarse sand, low plasticity, trace rootlets	Topsoil				
1.33	2.75	SCg	CLAYEY SAND with GRAVEL, red to reddish brown, dry to slighlty moist, dense, mostly fine sand, some medium to coarse sand, low plasticity, fine to coarse subangular granitic gravel	Qoa				
2.75	5.0	IGNEOUS	IGNEOUS ROCK (Granitic), orange brown, coarse-grained, intensely weathered, friable, fine to coarse sand sized grains, few fines, nonplastic	Kgt				

Total Depth = 5 feet bgs (REFUSAL)
No groundwater encountered when excavating
Test pit back-filled with spoils and wheel rolled at surface



TEST PIT TP-5

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1598'

Location: **See Figure 2 - Exploration Location Map**

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	0.9	SC	SANDY CLAY, reddish brown, moist, loose, mostly fine sand, few medium to coarse sand, low to medium plasticity	Topsoil				
0.9	1.75	IGNEOUS	IGNEOUS ROCK (Granitic), orange brown, coarse-grained, decomposed, fine to coarse sand sized mineral grains, some clay development, heavily oxidized, slightly micaceous, 35% fines (lab)	Kgt				
1.75	4.0	IGNEOUS	IGNEOUS ROCK (Granitic), white and orange, intensely weathered, friable, dry to slightly moist, fine to coarse sand sized mineral grains, significant fines, heavily oxidized; less oxidized and less clay development with depth	Kgt				

Total Depth = 5 feet bgs
No groundwater encountered when excavating
Test pit back-filled with spoils and wheel-rolled at surface



TEST PIT TP-6

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1642'

Location: **See Figure 2 - Exploration Location Map**

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	0.75	SM	SILTY SAND with GRAVEL, brown, slightly moist to moist, fine sand, low plastiity, slightly micaceous, rootlets, 17% fines (lab)	Topsoil				
0.75	4.0	IGNEOUS	METAMORPHIC ROCK (Phyllite), gray, moderately weathered, hard, highly fractured, heavily oxidized on fracture surfaces	Trmp				

Total Depth = 4 feet bgs (REFUSAL)
No groundwater encountered when excavating
Test pit back-filled with spoils and wheel-rolled at surface



TEST PIT TP-7

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1582'

Location: (see Figure 2, *Geotechnical Map*)

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	0.4	SC	CLAYEY SAND, brown, moist, fine to medium sand, some coarse sand, low plasticity, rootlets	Topsoil				
0.4	2.0	IGNEOUS	IGNEOUS ROCK (Granitic), red to reddish brown, coarse-grained, decomposed, fine to coarse sand sized mineral grains, loose, low plasticity	Kgt				
2.0	3.5	IGNEOUS	IGNEOUS ROCK (Granitic), ornage and gray, decomposed to intensely weathered, fine to coarse sand sized grains, few fines, friable, more dense than above	Kgt				
3.5	5.0	IGNEOUS	IGNEOUS ROCK (Granitic), gray with orange, intensely weathered, fine to coarse sand sized mineral grains, trace to few fines, nonplastic, micaceous, oxidized	Kgt				

Total Depth = 5 feet bgs
No groundwater encountered when excavating
Test pit back-filled with spoils and wheel-rolled at surface



TEST PIT TP-8

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1622'

Location: (see Figure 2, *Geotechnical Map*)

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	0.5	SM	SILTY SAND with gravel, reddish brown, slighlty moist, mostly fine sand, few medium to coarse sand, few fine subangular gravel, low plasticity	Topsoil				
0.5	3.0	IGNEOUS	METAMORPHIC ROCK (Phyllite), gray, moderately weathered, hard, highly fractured, heavily oxidized on fracture surfaces (reddish color)	Trmp				

Total Depth = 3 feet bgs(REFUSAL)
No groundwater encountered when excavating
Test pit back-filled with spoils and wheel-rolled at surface



TEST PIT IT-1

Muslim Mortuary Crescent Gardens Canyon
Logged By: BTM
Sampled By: BTM
Location: (see Figure 2, *Geotechnical Map*)

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1602'

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet) Top	Depth (feet) Bottom	USCS Symbol	Soil Description	Geologic Unit	Engineering Properties: Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	0.5	SC	SANDY CLAY, dark brown, moist, fine sand, medium plasticity	Topsoil				
0.5	1.0	IGNEOUS	IGNEOUS ROCK (Granitic), white and orange, decomposed, slightly moist, fine to coarse sand sized mineral grains, micaceous	Kgt				
1.0	3.0	IGNEOUS	IGNEOUS ROCK (Granitic), white to gray with slight orange oxidation, intensely weathered, dry, fine to coarse sand sized mineral grains, low plasticity, micaceous, 13% fines (lab)	Kgt				

Total Depth = 3 feet bgs
No groundwater encountered when excavating
Infiltration testing performed from approximately 3 to 3.5 feet bgs
Test pit backfilled with spoils and wheel-rolled at surface



TEST PIT IT-2

Muslim Mortuary Crescent Gardens Canyon
Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/25/2024
Elevation: 1600'

Location: (see Figure 2, *Geotechnical Map*)

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	1.1	SMc	SILTY SAND with CLAY, dark brown, moist, fine to medium sand, low plasticity, slight cohesion, rootlets	Topsoil				
1.1	2.0	SC	CLAYEY SAND, light to medium brown, dense, mostly fine sand, few medium to coarse sand, low plasticity, slightly micaceous, 34% fines (lab)	Qoa				
2.0	2.5	IGNEOUS	IGNEOUS ROCK (granitic), intensely weathered at bottom of test pit, dry fine to coarse sand sized mineral grains, low plasticity, micaceous	Kgt				

Total Depth = 2 feet bgs
No groundwater encountered when excavating
Infiltration testing performed from approximately 2 to 2.5 feet bgs
Test pit backfilled with spoils and wheel-rolled at surface



TEST PIT IT-3

Muslim Mortuary Crescent Gardens Canyon
Logged By: BTM
Sampled By: BTM
Location: (see Figure 2, *Geotechnical Map*)

Project No. 038.0000019894
Date Excavated: 1/25/2024
Elevation: 1587'

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet) Top	Depth (feet) Bottom	USCS Symbol	Soil Description	Geologic Unit	Engineering Properties: Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	0.25	SMc	SILTY SAND with CLAY, reddish brown, moist, very fine sand, low plasticity, rootlets	Topsoil				
0.25	1.5	IGNEOUS	METAMORPHIC ROCK (Phyllite), gray with red weathering, very hard, moderately to slightly weathered, moderately to highly fractured, extensive oxidation on fracture surfaces, micaeous, slight sheen *Stepout test pit attempted approximately 15 feet south of orignal test pit. Refusal encountered at similar depth. (Infiltration testing not feasible)	Trmp				

Total Depth = 1.5 feet (practical refusal)
No groundwater encountered when excavating
Infiltration testing not feasible at this location
Test pit backfilled with spoils and wheel-rolled at surface



TEST PIT IT-4

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/25/2024
Elevation: 1559'

Location: (see Figure 2, *Geotechnical Map*)

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	1.0	SM	SILTY SAND, medium brown, moist, mostly fine sand, few medium to coarse sand, slightly micaceous, low plasticity	Topsoil				
1.0	3.0	IGNEOUS	IGNEOUS ROCK (Granitic), speckled black and white to gray, decomposed, disintegration of mineral grains, loose to medium dense, slightly moist, fine to coarse sand sized mineral grains, few silt, micaceous, friable, 6% fines (lab)	Kgt				

Total Depth = 3 feet bgs
No groundwater encountered when excavating
Infiltration testing performed from approximately 3 to 3.5 feet bgs
Test pit backfilled with spoils and wheel-rolled at surface



TEST PIT IT-5

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1611'

Location: (see Figure 2, *Geotechnical Map*)

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	1.3	SC	CLAYEY SAND, reddish brown, moist, mostly fine sand, some medium to coarse sand, low to medium plasticity, slightly micaceous	Afu/ Topsoil				
1.3	2.0	IGNEOUS	IGNEOUS ROCK (Granitic), orange brown, intensely weatered to decomposed, dry to slightly moist, fine to coarse sand sized mineral grains, low plasticity, micaceous, 31% fines (lab)	Kgt				

Total Depth = 2 feet bgs
No groundwater encountered when excavating
Infiltration testing performed from approximately 2 to 2.75 feet bgs
Test pit backfilled with spoils and wheel-rolled at surface



TEST PIT IT-6

Muslim Mortuary Crescent Gardens Canyon

Logged By: BTM
Sampled By: BTM

Project No. 038.0000019894
Date Excavated: 1/22/2024
Elevation: 1615'

Location: (see Figure 2, *Geotechnical Map*)

This soil description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. This soil description (below) is a simplification of actual conditions encountered. Transitions between soil type may be gradual.

Depth (feet)		USCS Symbol	Soil Description	Geologic Unit	Engineering Properties			
Top	Bottom				Depth (feet)	Moisture (%)	Dry Density (pcf)	Relative Compaction (%)*
0.0	1.3	SC	SANDY CLAY to CLAYEY SAND, reddish brown, moist, mostly fine sand, some medium to coarse sand, low to medium plasticity, slightly micaceous	Afu/ Topsoil				
1.3	3.0	IGNEOUS	IGNEOUS ROCK (Granitic), orange brown, intensely weathered to decomposed, dry to slightly moist, fine to coarse sand sized mineral grains, micaceous, 25% fines (lab)	Kgt				

Total Depth = 3 feet bgs
No groundwater encountered when excavating
Infiltration testing performed from approximately 2 to 2.75 feet bgs
Test pit backfilled with spoils and wheel-rolled at surface



Results of Falling Head Infiltration Test

Project: 19894

Exploration #/Location: IT-1

Depth Test Pit, bgs (ft): 3

Tested by: AA

USCS Soil Type in test zone: Weathered Bedrock

Weather (start to finish): Cloudy

Water Source/pH: Tap Water

Equivalent boring diameter: 13.541 in. 6.770275 in. Well Radius

Depth to GW or aquitard, bgs: 100 ft

Well Prep: Bottom of test pit at approximately 3 feet below the ground surface with 4 inch depth infiltration pit, Set 6 inch diameter perforated pipe with 3/4" gravel around anulus

	ft	in.	Total (in.)
Depth to bottom of well measured from top of auger (or ground surface)	0. ft	4. in.	4
Casing stickup measured above top of auger (or ground surface) (+ is up	0. ft	8. in.	8
Depth to top of sand from top of casing	0. ft	0. in.	

Initial estimated Depth to Water Surface (in.): -7

Average depth of water in well, "h" (in.): 3

approx. h/r: 0.4

Tu (Fig. 8) (ft): 100.6

Tu>3h?: yes, OK

Open Pit Dimensions

Length 12 in

Width 12 in

Depth of well bottom below top of casing (in): 12

Cross-sectional area for flow calcs based on Δh

Well pack sand porosity	0.5
Casing outer diameter, in.	6.5
Casing inner diameter, in.	6
Cross-sectional area, in.^2	83.7

Use of Barrels:	No
Use of Flow Meter:	No
Test Type:	Falling Head

Field Data | **Calculations**

Date	Time	Data from Flow Meter		Depth to WL in Boring (measured from top of casing)		Water Temp (deg F)	Refilled?	Δt (min)	Total Elapsed Time (min)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3)			Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
		Reading (gallons)	Interval Pulse Count				(or Comments)							from supply	from Δh	Total						
Start Date	Start time:			ft	in.																	
1/22/24	14:20	Gallons																				
1/22/24	14:25				9				5	1.0	3.0											
1/22/24	14:27				9.375			2	7	1.4	2.6	-0.375	3	0	31	31	16	941	264	0.9	4.11	3.29
1/22/24	14:30				9.75			3	10	1.8	2.3	-0.375	2	0	31	31	10	628	248	0.9	3.24	2.34
1/22/24	14:33				10.375			3	13	2.4	1.6	-0.625	2	0	52	52	17	1046	226	0.9	8.26	4.26
1/22/24	14:35				10.5			2	15	2.5	1.5	-0.125	2	0	10	10	5	314	210	0.9	2.35	1.37
							Refilled															
1/22/24	14:36				8.25				16	0.3	3.8											
1/22/24	14:38				8.5			2	18	0.5	3.5	-0.25	4	0	21	21	10	628	298	0.9	1.97	1.94
1/22/24	14:40				8.75			2	20	0.8	3.3	-0.25	3	0	21	21	10	628	288	0.9	2.13	2.01
1/22/24	14:43				9.125			3	23	1.1	2.9	-0.375	3	0	31	31	10	628	274	0.9	2.48	2.11
1/22/24	14:46				9.25			3	26	1.3	2.8	-0.125	3	0	10	10	3	209	264	0.9	0.83	0.73
1/22/24	14:49				9.75			3	29	1.8	2.3	-0.5	3	0	42	42	14	837	250	0.9	4.43	3.08
1/22/24	14:52				9.825			3	32	1.8	2.2	-0.075	2	0	6	6	2	126	238	0.9	0.63	0.49
1/22/24	14:55				10.125			3	35	2.1	1.9	-0.3	2	0	25	25	8	502	230	0.9	3.11	2.01
1/22/24	14:58				10.5			3	38	2.5	1.5	-0.375	2	0	31	31	10	628	216	0.9	5.07	2.68
							Refilled															
1/22/24	14:59				7.875				39	-0.1	4.1											
1/22/24	15:02				8.25			3	42	0.3	3.8	-0.375	4	0	31	31	10	628	311	0.9	1.86	1.86
1/22/24	15:05				8.5			3	45	0.5	3.5	-0.25	4	0	21	21	7	418	298	0.9	1.31	1.29
1/22/24	15:10				9.125			5	50	1.1	2.9	-0.625	3	0	52	52	10	628	280	0.9	2.58	2.07
1/22/24	15:15				9.5			5	55	1.5	2.5	-0.375	3	0	31	31	6	377	258	0.9	1.73	1.34
1/22/24	15:20				9.75			5	60	1.8	2.3	-0.25	2	0	21	21	4	251	245	0.9	1.26	0.94
1/22/24	15:25				10.125			5	65	2.1	1.9	-0.375	2	0	31	31	6	377	232	0.9	2.38	1.50
							Refilled															
1/22/24	15:29				8.5				69	0.5	3.5											
1/22/24	15:32				8.875			3	72	0.9	3.1	-0.375	3	0	31	31	10	628	285	0.9	2.26	2.03
1/22/24	15:38				9.25			6	78	1.3	2.8	-0.375	3	0	31	31	5	314	269	0.9	1.30	1.08
1/22/24	15:42				9.5			4	82	1.5	2.5	-0.25	3	0	21	21	5	314	256	0.9	1.41	1.13
1/22/24	15:46				9.75			4	86	1.8	2.3	-0.25	2	0	21	21	5	314	245	0.9	1.58	1.18
1/22/24	15:49				10			3	89	2.0	2.0	-0.25	2	0	21	21	7	418	234	0.9	2.39	1.65
																				Minimum Rate:		0.49
														Raw Rate for design, prior to application of adjustment factors:								**1.46**

Results of Falling Head Infiltration Test

Project: 19894

Exploration #/Location: IT-2

Depth Test Pit, bgs (ft): 2

Tested by: AA

USCS Soil Type in test zone: Weathered Bedrock

Weather (start to finish): Cloudy

Water Source/pH: Tap Water

Equivalent boring diameter: 19.182 in. 9.591223 in. Well Radius

Depth to GW or aquitard, bgs: 100 ft

Well Prep: Bottom of test pit at approximately 2 feet below the ground surface with 6 inch depth infiltration pit, Set 6 inch diameter perforated pipe with 3/4" gravel around anulus

Initial estimated Depth to Water Surface (in.): -4

Average depth of water in well, "h" (in.): 3

approx. h/r: 0.4

Tu (Fig. 8) (ft): 100.4

Tu>3h?: yes, OK

Open Pit Dimensions

Length 17 in

Width 17 in

Cross-sectional area for flow calcs based on Δh

Well pack sand porosity 0.5

Casing outer diameter, in. 6.5

Casing inner diameter, in. 6

Cross-sectional area, in.^2 156.2

Use of Barrels: No

Use of Flow Meter: No

Test Type: Falling Head

	ft	in.	Total (in.)
Depth to bottom of well measured from top of auger (or ground surface)	0. ft	5.5 in.	5.5
Casing stickup measured above top of auger (or ground surface) (+ is up	0. ft	6.5 in.	6.5
Depth to top of sand from top of casing	0. ft	0. in.	

Depth of well bottom below top of casing (in): 12

Field Data / **Calculations**

Date	Time	Data from Flow Meter: Reading (gallons)	Data from Flow Meter: Interval Pulse Count	Depth to WL in Boring (measured from top of casing)	Water Temp (deg F)	Refilled? (or Comments)	Δt (min)	Total Elapsed Time (min)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3): from supply	Vol Change (in.^3): from Δh	Vol Change (in.^3): Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:	Gallons		ft / in.																	
1/25/2024	12:00																				
1/25/24	12:08			6.875				8	0.4	5.1											
1/25/24	12:10			7.25			2	10	0.8	4.8	-0.375	5	0	59	59	29	1757	587	0.9	2.88	2.76
1/25/24	12:12			7.5			2	12	1.0	4.5	-0.25	5	0	39	39	20	1171	568	0.9	2.01	1.90
1/25/24	12:15			7.75			3	15	1.3	4.3	-0.25	4	0	39	39	13	781	553	0.9	1.42	1.30
1/25/24	12:20			8			5	20	1.5	4.0	-0.25	4	0	39	39	8	469	538	0.9	0.91	0.80
1/25/24	12:25			8.375			5	25	1.9	3.6	-0.375	4	0	59	59	12	703	519	0.9	1.54	1.25
1/25/24	12:30			8.5			5	30	2.0	3.5	-0.125	4	0	20	20	4	234	504	0.9	0.52	0.43
1/25/24	12:40			8.75			10	40	2.3	3.3	-0.25	3	0	39	39	4	234	492	0.9	0.57	0.44
1/25/24	12:50			9.125			10	50	2.6	2.9	-0.375	3	0	59	59	6	351	474	0.9	0.99	0.68
1/25/24	13:00			9.25			10	60	2.8	2.8	-0.125	3	0	20	20	2	117	458	0.9	0.33	0.24
1/25/24	13:10			9.375			10	70	2.9	2.6	-0.125	3	0	20	20	2	117	451	0.9	0.35	0.24
1/25/24	13:20			9.675			10	80	3.2	2.3	-0.3	2	0	47	47	5	281	438	0.9	0.98	0.59
1/25/24	13:30			9.875			10	90	3.4	2.1	-0.2	2	0	31	31	3	187	423	0.9	0.70	0.41
1/25/24	13:40			10			10	100	3.5	2.0	-0.125	2	0	20	20	2	117	413	0.9	0.46	0.26
					Poor Rates Concluded Test																
																		Minimum Rate:			0.24
																		Raw Rate for design, prior to application of adjustment factors:			**0.50**

Results of Falling Head Infiltration Test

Project: 19894

Exploration #/Location: IT-4

Depth Test Pit, bgs (ft): 3

Tested by: AA

USCS Soil Type in test zone: SP-SM

Weather (start to finish): Rain

Water Source/pH: Tap Water

Equivalent boring diameter: 16.116 in. — 8.058239 in. Well Radius

Depth to GW or aquitard, bgs: 100 ft

Well Prep: Bottom of test pit at approximately 3 feet below the ground surface with 7 inch depth infiltration pit, Set 6 inch diameter perforated pipe with 3/4" gravel around anulus

	ft	in.	Total (in.)
Depth to bottom of well measured from top of auger (or ground surface)	0. ft	7. in.	7
Casing stickup measured above top of auger (or ground surface) (+ is up	0. ft	5. in.	5
Depth to top of sand from top of casing	0. ft	0. in.	

Initial estimated Depth to Water Surface (in.): -2

Average depth of water in well, "h" (in.): 4

approx. h/r: 0.5

Tu (Fig. 8) (ft): 100.2

Tu>3h?: yes, OK

Open Pit Dimensions

Length 12 in

Width 17 in

Depth of well bottom below top of casing (in): 12

Cross-sectional area for flow calcs based on Δh

Well pack sand porosity	0.5
Casing outer diameter, in.	6.5
Casing inner diameter, in.	6
Cross-sectional area, in.^2	113.7

Use of Barrels:	No
Use of Flow Meter:	No
Test Type:	Falling Head

Field Data | **Calculations**

Date	Time	Data from Flow Meter		Depth to WL in Boring (measured from top of casing)		Water Temp (deg F)	Refilled?	Δt (min)	Total Elapsed Time (min)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3)			Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
		Reading (gallons)	Interval Pulse Count				(or Comments)							from supply	from Δh	Total						
Start Date	Start time:																					
1/25/2024	13:50	Gallons		ft	in.																	
1/25/24	13:56				6				6	1.0	6.0											
1/25/24	13:58				6.375			2	8	1.4	5.6	-0.375	6	0	43	43	21	1279	498	0.9	2.06	2.37
1/25/24	14:00				9.875			2	10	4.9	2.1	-3.5	4	0	398	398	199	11937	400	0.9	91.57	27.50
1/25/24	14:02				11.25			2	12	6.3	0.8	-1.375	1	0	156	156	78	4689	277	0.9	108.81	15.62
							Refilled															
1/25/24	14:03				4.75				13	-0.3	7.3											
1/25/24	14:05				7			2	15	2.0	5.0	-2.25	6	0	256	256	128	7674	514	0.9	16.41	13.76
1/25/24	14:07				8.5			2	17	3.5	3.5	-1.5	4	0	171	171	85	5116	419	0.9	15.81	11.25
1/25/24	14:09				9.75			2	19	4.8	2.3	-1.25	3	0	142	142	71	4263	350	0.9	21.81	11.24
1/25/24	14:11				11.125			2	21	6.1	0.9	-1.375	2	0	156	156	78	4689	283	0.9	86.85	15.27
							Refilled															
1/25/24	14:13				4.5				23	-0.5	7.5											
1/25/24	14:15				5.75			2	25	0.8	6.3	-1.25	7	0	142	142	71	4263	552	0.9	6.49	7.12
1/25/24	14:18				8			3	28	3.0	4.0	-2.25	5	0	256	256	85	5116	463	0.9	14.47	10.18
1/25/24	14:21				10			3	31	5.0	2.0	-2	3	0	227	227	76	4547	356	0.9	30.70	11.78
1/25/24	14:23				11.25			2	33	6.3	0.8	-1.25	1	0	142	142	71	4263	274	0.9	94.64	14.36
							Refilled															
1/25/24	14:26				4.375				36	-0.6	7.6											
1/25/24	14:29				6.5			3	39	1.5	5.5	-2.125	7	0	242	242	81	4832	536	0.9	9.10	8.31
1/25/24	14:32				8.675			3	42	3.7	3.3	-2.175	4	0	247	247	82	4945	427	0.9	17.55	10.67
1/25/24	14:35				10.375			3	45	5.4	1.6	-1.7	2	0	193	193	64	3865	329	0.9	32.73	10.82
1/25/24	14:37				11.5			2	47	6.5	0.5	-1.125	1	0	128	128	64	3837	258	0.9	148.23	13.72
							Refilled															
1/25/24	14:41				4.675				51	-0.3	7.3											
1/25/24	14:44				7			3	54	2.0	5.0	-2.325	6	0	264	264	88	5286	516	0.9	11.37	9.44
1/25/24	14:47				9			3	57	4.0	3.0	-2	4	0	227	227	76	4547	407	0.9	18.05	10.31
1/25/24	14:50				10.75			3	60	5.8	1.3	-1.75	2	0	199	199	66	3979	312	0.9	48.98	11.77
							Refilled															
1/25/24	14:53				4.75				63	-0.3	7.3											
1/25/24	14:56				6.75			3	66	1.8	5.3	-2	6	0	227	227	76	4547	520	0.9	8.98	8.05
1/25/24	14:59				8.675			3	69	3.7	3.3	-1.925	4	0	219	219	73	4377	421	0.9	15.12	9.58
1/25/24	15:02				10.375			3	72	5.4	1.6	-1.7	2	0	193	193	64	3865	329	0.9	32.73	10.82
1/25/24	15:04				11.375			2	74	6.4	0.6	-1	1	0	114	114	57	3410	261	0.9	89.27	12.05
							Refilled															
1/25/24	15:05				5				75	0.0	7.0											
1/25/24	15:08				7.125			3	78	2.1	4.9	-2.125	6	0	242	242	81	4832	505	0.9	10.56	8.83
1/25/24	15:11				8.875			3	81	3.9	3.1	-1.75	4	0	199	199	66	3979	407	0.9	14.55	9.02
1/25/24	15:14				10.75			3	84	5.8	1.3	-1.875	2	0	213	213	71	4263	315	0.9	54.01	12.49
							Refilled															
1/25/24	15:20				4.875				90	-0.1	7.1											
1/25/24	15:23				7.875			3	93	2.9	4.1	-3	6	0	341	341	114	6821	489	0.9	19.79	12.86
1/25/24	15:26				9.25			3	96	4.3	2.8	-1.375	3	0	156	156	52	3126	378	0.9	12.75	7.62
																			Minimum Rate:			2.37
														Raw Rate for design, prior to application of adjustment factors:								**10.40**

Results of Falling Head Infiltration Test

Project:	19894	Initial estimated Depth to Water Surface (in.):	-5
Exploration #/Location:	IT-5	Average depth of water in well, "h" (in.):	4
Depth Test Pit, bgs (ft):	2.75	approx. h/r:	0.5
Tested by:	AA	Tu (Fig. 8) (ft):	100.4
USCS Soil Type in test zone:	Weathered Bedrock Recovered as Clayey Sand	Tu>3h?:	yes, OK
Weather (start to finish):	Rain		
Water Source/pH:	Tap Water	Open Pit Dimensions	
Equivalent boring diameter:	13.541 in.	6.770275 in. Well Radius	Length 12 in
Depth to GW or aquitard, bgs:	100 ft		Width 12 in

Well Prep: Bottom of test pit at approximately 2.75 feet below the ground surface with 5.5 inch depth infiltration pit, Set 6 inch diameter perforated pipe with 3/4" gravel around anulus

	ft	in.	Total (in.)
Depth to bottom of well measured from top of auger (or ground surface)	0. ft	5.5 in.	5.5
Casing stickup measured above top of auger (or ground surface) (+ is up	0. ft	6.5 in.	6.5
Depth to top of sand from top of casing	0. ft	0. in.	

Depth of well bottom below top of casing (in): 12

Cross-sectional area for flow calcs based on Δh

Well pack sand porosity	0.5
Casing outer diameter, in.	6.5
Casing inner diameter, in.	6
Cross-sectional area, in.^2	83.7

Use of Barrels:	No
Use of Flow Meter:	No
Test Type:	Falling Head

Field Data / **Calculations**

Date	Time	Data from Flow Meter		Depth to WL in Boring (measured from top of casing)		Water Temp (deg F)	Refilled?	Δt (min)	Total Elapsed Time (min)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3)			Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:	Reading (gallons)	Interval Pulse Count	ft	in.		(or Comments)							from supply	from Δh	Total						
1/22/24	9:00	Gallons																				
1/22/24	9:26				7.25				26	0.8	4.8											
1/22/24	9:28				7.5			2	28	1.0	4.5	-0.25	5	0	21	21	10	628	341	0.9	1.50	1.70
1/22/24	9:30				7.75			2	30	1.3	4.3	-0.25	4	0	21	21	10	628	330	0.9	1.60	1.75
1/22/24	9:32				8.25			2	32	1.8	3.8	-0.5	4	0	42	42	21	1255	314	0.9	3.77	3.68
1/22/24	9:34				8.25			2	34	1.8	3.8	0	4	0	0	0	0	0	304	0.9	0.00	0.00
1/22/24	9:38				8.5			4	38	2.0	3.5	-0.25	4	0	21	21	5	314	298	0.9	0.98	0.97
1/22/24	9:42				8.75			4	42	2.3	3.3	-0.25	3	0	21	21	5	314	288	0.9	1.07	1.01
1/22/24	9:46				9			4	46	2.5	3.0	-0.25	3	0	21	21	5	314	277	0.9	1.16	1.04
1/22/24	9:50				9.125			4	50	2.6	2.9	-0.125	3	0	10	10	3	157	269	0.9	0.60	0.54
1/22/24	9:55				9.5			5	55	3.0	2.5	-0.375	3	0	31	31	6	377	258	0.9	1.73	1.34
1/22/24	10:00				9.5			5	60	3.0	2.5	0	3	0	0	0	0	0	250	0.9	0.00	0.00
1/22/24	10:10				9.75			10	70	3.3	2.3	-0.25	2	0	21	21	2	126	245	0.9	0.63	0.47
1/22/24	10:20				9.875			10	80	3.4	2.1	-0.125	2	0	10	10	1	63	237	0.9	0.33	0.24
1/22/24	10:33				10.5			13	93	4.0	1.5	-0.625	2	0	52	52	4	241	221	0.9	2.09	1.01
							Refilled															
1/22/24	11:01				6.25				121	-0.3	5.8											
1/22/24	11:06				6.75			5	126	0.3	5.3	-0.5	6	0	42	42	8	502	378	0.9	1.04	1.22
1/22/24	11:11				6.875			5	131	0.4	5.1	-0.125	5	0	10	10	2	126	365	0.9	0.26	0.32
1/22/24	11:16				7.125			5	136	0.6	4.9	-0.25	5	0	21	21	4	251	357	0.9	0.55	0.65
1/22/24	11:30				7.75			14	150	1.3	4.3	-0.625	5	0	52	52	4	224	338	0.9	0.59	0.61
1/22/24	11:45				8.375			15	165	1.9	3.6	-0.625	4	0	52	52	3	209	311	0.9	0.66	0.62
1/22/24	11:53				8.5			8	173	2.0	3.5	-0.125	4	0	10	10	1	78	296	0.9	0.24	0.24
1/22/24	12:07				8.875			14	187	2.4	3.1	-0.375	3	0	31	31	2	134	285	0.9	0.49	0.44
							Poor Infiltration Concluded Test															
																			Minimum Rate:			0.00
																			Raw Rate for design, prior to application of adjustment factors:			**0.53**

Results of Falling Head Infiltration Test

Project: 19894

Exploration #/Location: IT-6

Depth Test Pit, bgs (ft): 2

Tested by: AA

USCS Soil Type in test zone: Weathered Bedrock

Weather (start to finish): Rain

Water Source/pH: Tap Water

Equivalent boring diameter: 13.541 in. 6.770275 in. Well Radius

Depth to GW or aquitard, bgs: 100 ft

Well Prep: Bottom of test pit at approximately 2 feet below the ground surface with 5 inch depth infiltration pit, Set 6 inch diameter perforated pipe with 3/4" gravel around anulus

Initial estimated Depth to Water Surface (in.): -5

Average depth of water in well, "h" (in.): 3

approx. h/r: 0.4

Tu (Fig. 8) (ft): 100.4

Tu>3h?: yes, OK

Open Pit Dimensions

Length 12 in

Width 12 in

Cross-sectional area for flow calcs based on Δh

Well pack sand porosity 0.5

Casing outer diameter, in. 6.5

Casing inner diameter, in. 6

Cross-sectional area, in.^2 83.7

Use of Barrels: No

Use of Flow Meter: No

Test Type: Falling Head

	ft	in.	Total (in.)
Depth to bottom of well measured from top of auger (or ground surface)	0. ft	5. in.	5
Casing stickup measured above top of auger (or ground surface) (+ is up	0. ft	7. in.	7
Depth to top of sand from top of casing	0. ft	0. in.	

Depth of well bottom below top of casing (in): 12

Field Data / **Calculations**

Date	Time	Data from Flow Meter: Reading (gallons)	Data from Flow Meter: Interval Pulse Count	Depth to WL in Boring (measured from top of casing) ft	Depth to WL in Boring (measured from top of casing) in.	Water Temp (deg F)	Refilled? (or Comments)	Δt (min)	Total Elapsed Time (min)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3): from supply	Vol Change (in.^3): from Δh	Vol Change (in.^3): Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	Average Infiltration Surface Area, (in^2)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date	Start time:	Gallons		ft	in.																	
1/22/24	8:30																					
1/22/24	8:48			10					18	3.0	2.0											
1/22/24	8:49			10				1	19	3.0	2.0	0	2	0	0	0	0	0	229	0.9	0.00	0.00
1/22/24	8:50			10.375				1	20	3.4	1.6	-0.375	2	0	31	31	31	1883	221	0.9	13.92	7.85
1/22/24	8:52			10.75				2	22	3.8	1.3	-0.375	1	0	31	31	16	941	205	0.9	9.35	4.23
							Refilled															
1/22/24	11:21			7.5					171	0.5	4.5											
1/22/24	11:22			8.5				1	172	1.5	3.5	-1	4	0	84	84	84	5021	314	0.9	17.30	14.73
1/22/24	11:24			9.25				2	174	2.3	2.8	-0.75	3	0	63	63	31	1883	277	0.9	8.29	6.27
1/22/24	11:25			9.5				1	175	2.5	2.5	-0.25	3	0	21	21	21	1255	256	0.9	5.64	4.53
1/22/24	11:26			9.875				1	176	2.9	2.1	-0.375	2	0	31	31	31	1883	242	0.9	10.35	7.16
1/22/24	11:28			10				2	178	3.0	2.0	-0.125	2	0	10	10	5	314	232	0.9	1.74	1.25
							Refilled															
1/22/24	11:33			7.5					183	0.5	4.5											
1/22/24	11:35			8				2	185	1.0	4.0	-0.5	4	0	42	42	21	1255	325	0.9	3.51	3.56
1/22/24	11:37			8				2	187	1.0	4.0	0	4	0	0	0	0	0	314	0.9	0.00	0.00
1/22/24	11:40			9.125				3	190	2.1	2.9	-1.125	3	0	94	94	31	1883	290	0.9	8.32	5.98
1/22/24	11:43			9.375				3	193	2.4	2.6	-0.25	3	0	21	21	7	418	261	0.9	1.79	1.48
1/22/24	11:45			9.875				2	195	2.9	2.1	-0.5	2	0	42	42	21	1255	245	0.9	7.08	4.72
1/22/24	11:50			10.25				5	200	3.3	1.8	-0.375	2	0	31	31	6	377	226	0.9	2.56	1.53
							Refilled															
1/22/24	11:56			7.5					206	0.5	4.5											
1/22/24	11:58			8				2	208	1.0	4.0	-0.5	4	0	42	42	21	1255	325	0.9	3.51	3.56
1/22/24	12:00			8.125				2	210	1.1	3.9	-0.125	4	0	10	10	5	314	311	0.9	0.87	0.93
1/22/24	12:05			8.875				5	215	1.9	3.1	-0.75	4	0	63	63	13	753	293	0.9	2.86	2.37
1/22/24	12:10			9.5				5	220	2.5	2.5	-0.625	3	0	52	52	10	628	264	0.9	3.02	2.19
1/22/24	12:15			9.875				5	225	2.9	2.1	-0.375	2	0	31	31	6	377	242	0.9	2.07	1.43
1/22/24	12:20			10.5				5	230	3.5	1.5	-0.625	2	0	52	52	10	628	221	0.9	5.45	2.62
							Refilled															
1/22/24	12:54			7.5					264	0.5	4.5											
1/22/24	12:56			7.75				2	266	0.8	4.3	-0.25	4	0	21	21	10	628	330	0.9	1.60	1.75
1/22/24	13:00			8.125				4	270	1.1	3.9	-0.375	4	0	31	31	8	471	317	0.9	1.34	1.37
1/22/24	13:06			9				6	276	2.0	3.0	-0.875	3	0	73	73	12	732	290	0.9	2.97	2.33
1/22/24	13:10			9.25				4	280	2.3	2.8	-0.25	3	0	21	21	5	314	266	0.9	1.27	1.09
1/22/24	13:15			9.75				5	285	2.8	2.3	-0.5	3	0	42	42	8	502	250	0.9	2.66	1.85
1/22/24	13:22			10.375				7	292	3.4	1.6	-0.625	2	0	52	52	7	448	226	0.9	3.54	1.83
							Refilled															
1/22/24	13:45			7.25					315	0.3	4.8											
1/22/24	13:47			7.5				2	317	0.5	4.5	-0.25	5	0	21	21	10	628	341	0.9	1.50	1.70
1/22/24	13:50			7.75				3	320	0.8	4.3	-0.25	4	0	21	21	7	418	330	0.9	1.06	1.17
1/22/24	13:57			8.5				7	327	1.5	3.5	-0.75	4	0	63	63	9	538	309	0.9	1.80	1.61
1/22/24	14:02			8.875				5	332	1.9	3.1	-0.375	3	0	31	31	6	377	285	0.9	1.36	1.22
1/22/24	14:10			9.875				8	340	2.9	2.1	-1	3	0	84	84	10	628	256	0.9	3.91	2.26
1/22/24	14:13			10				3	343	3.0	2.0	-0.125	2	0	10	10	3	209	232	0.9	1.16	0.83

EEI 2006 LOGS

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BOREHOLE LOG

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Number: B-2

Client: Shopoff Group

Sheet: 1 of 1

Location: Meadowbrook Subdivision
Lake Elsinore/Perris, Riverside County, California

Date Started: 4/11/06

Project Number: P051109-1

EEI Representative: E.L.

Drill Rig/Sampling Method:
CalPac Drilling, HSA, 140 lb Auto-hammer with 30" drop,
California Modified Sampler

Borehole Diameter: 8"

SAMPLE LOG					BOREHOLE LOG			
Bulk	Undisturbed	Blows Per 6 Inches	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	SM		**0' - +/- 4' - <u>ALLUVIUM</u>** – Silty-**SAND**, dark brown, moist, loose, porous, common organics.
					1			
					2			
	MOD	2/1	114.0	5.9	3			**3'** – Silty-**SAND**, dark brown, moist, loose, porous, common organics.
					4			
	MOD	9/24	132.0	5.9	5			**5'** – Weathered **<u>BEDROCK</u> (Kgr)** – Decomposed granitic **ROCK (DG)**, gray and black, moist, dense, micaceous, easy excavating creates medium to coarse grain sand.
					6			
					7			
					8			
					9			
	MOD	23/40	137.8	5.2	10	Kgr		**10'** – Decomposed granitic **ROCK (DG)**, black and gray, slightly moist, dense, highly mafic, micaceous.
					11			
					12			**+/- 13'** – Groundwater Encountered
					13			
					14			
	MOD	50 for 5"	125.2	10.8	15			**15'** – Decomposed granitic **ROCK (DG)**, black and white, coarse-grained, moist, dense, highly mafic, massive.
					16			
					17			
					18			
					19			
					20			
					21			
					22			
					23			
					24			
					25			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
					34			
					35			
					36			
					37			

Total Depth of 15½'
Groundwater Encountered +/- 13' (Stabilized to 9')
Hole Backfilled with Native Soils
MOD = California Modified Sampler
NA = Not Available

BOREHOLE LOG

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Number: B-3

Client: Shopoff Group

Sheet: 1 of 1

Location: Meadowbrook Subdivision
Lake Elsinore/Perris, Riverside County, California

Date Started: 4/11/06

Project Number: P051109-1

EEI Representative: E.L.

Drill Rig/Sampling Method:
CalPac Drilling, HSA, 140 lb Auto-hammer with 30" drop,
California Modified Sampler

Borehole Diameter: 8"

SAMPLE LOG					BOREHOLE LOG			
Bulk	Undisturbed	Blows Per 6 Inches	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0 1 2	SM		**0'-1'** - **TOPSOIL** – Silty-**SAND**, brown, moist, loose.
	MOD	20/32	119.6	7.5	3 4			**2'** – **BEDROCK (Kgr)** **3'** – Weathered **BEDROCK** – Decomposed granitic **ROCK (DG)**, orange and brown, dry, dense, mafic, friable, excavates to sand.
	MOD	21/44	119.1	3.2	5 6 7 8 9			**5'** – Weathered granitic **ROCK**, orange and brown, dry, dense, mafic, friable, massive, easy excavating.
	MOD	20/45	94.5	4.3	10 11 12 13 14	Kgr		**10'** – Weathered granitic **ROCK (DG)**, brownish-gray, dry, dense, mafic, massive.
	MOD	30/50 for 4"	115.0	2.8	15 16 17 18 19			**15'** – Weathered granitic **ROCK (DG)**, gray, dry, dense, mafic, moderately easy drilling.
					20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37			Total Depth of 20' No Groundwater Encountered Hole Backfilled with Native Soils MOD = California Modified Sampler NA = Not Available

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BOREHOLE LOG

Number: B-4A

Client: Shopoff Group

Sheet: 1 of 1

Location: Meadowbrook Subdivision
Lake Elsinore/Perris, Riverside County, California

Date Started: 4/11/06

Project Number: P051109-1

EEI Representative: E.L.

Drill Rig/Sampling Method:
CalPac Drilling, HSA, 140 lb Auto-hammer with 30" drop,
California Modified Sampler

Borehole Diameter: 8"

SAMPLE LOG						BOREHOLE LOG		
Bulk	Undisturbed	Blows Per 6 Inches	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0	SM		**0'- +/-2' - TOPSOIL** – Clayey-**SAND**, brown, moist, pliable.
					1			
					2			**2'-10' – ALLUVIUM (Qal)**
	MOD	22/50 for 4"	115.4	12.5	3			**3'** – Silty-**SAND**, brown and orange, with small gravel, slightly moist, medium dense, porous.
					4			
	MOD	12/21	123.0	10.3	5			**5'** – Silty-**SAND**, gray-brown, with small to coarse gravel, slightly moist to moist, hard, brittle, porous.
					6			
					7			
					8			
					9			
	MOD	16/50 for 5"	118.2	12.5	10	Kgr/Jm		**+/-10'- 12' - BEDROCK**
					11			
					12			**10'** – Weathered metamorphic rock, excavates to sandy-gravel and gravelly-sand light brownish-gray, slightly moist, hard, brittle.
					13			
					14			**10½' – BEDROCK (Jm)**, gray and brown, gravel, dry, dense, weathered metamorphic rock, excavates to sandy-silt.
					15			
					16			
					17			
					18			
					19			
					20			Practical Refusal at 12'
					21			No Groundwater Encountered
					22			Hole Backfilled with Native Soils
					23			MOD = California Modified Sampler
					24			NA = Not Available
					25			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
					34			
					35			
					36			
					37			

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BOREHOLE LOG

Number: B-5

Client: Shopoff Group

Sheet: 1 of 1

Location: Meadowbrook Subdivision
Lake Elsinore/Perris, Riverside County, California

Date Started: 4/11/06

Project Number: P051109-1

EEI Representative: E.L.

Drill Rig/Sampling Method:
CalPac Drilling, HSA, 140 lb Auto-hammer with 30" drop,
California Modified Sampler

Borehole Diameter: 8"

SAMPLE LOG						BOREHOLE LOG		
Bulk	Undisturbed	Blows Per 6 Inches	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0			**0'- +/-2' - <u>TOPSOIL</u>** – Silty-**SAND**, orange-brown, occasional gravel, dry, loose.
					1			
					2	SM		
					3			**2'-5' – <u>BEDROCK</u> (Jm)**
	MOD	50 for 5"	NA	NA	NR	Jm		**3'** – Weathered metamorphic **<u>BEDROCK</u> (Jm)**, gray and brown, gravel, dry, dense, platy cleavage, excavates to sandy gravel (no recovery).
					4			
					5			**5'** – Practical Refusal. Bedrock excavates to gravelly sand, dry.
					6			
					7			
					8			
					9			
					10			
					11			
					12			
					13			
					14			
					15			
					16			
					17			
					18			
					19			
					20			
					21			
					22			
					23			
					24			
					25			
					26			
					27			
					28			
					29			
					30			
					31			
					32			
					33			
					34			
					35			
					36			
					37			

Practical Refusal at 5'
No Groundwater Encountered
Hole Backfilled with Native Soils
NR = No Recovery
MOD = California Modified Sampler
NA = Not Available

BOREHOLE LOG

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Number: B-6

Client: Shopoff Group

Sheet: 1 of 1

Location: Meadowbrook Subdivision
Lake Elsinore/Perris, Riverside County, California

Date Started: 4/11/06

Project Number: P051109-1

EEI Representative: E.L.

Drill Rig/Sampling Method: CalPac Drilling, HSA, 140 lb Auto-hammer with 30" drop, California Modified Sampler

Borehole Diameter: 8"

SAMPLE LOG						BOREHOLE LOG		
Bulk	Undisturbed	Blows Per 6 Inches	Dry Unit Wt. (pcf)	Moisture (%)	Depth In Feet	USCS Symbol	Graphic Log	Geologic Description (Soil Type, Color, Grain, Minor Soil Component, Moisture, Density, Odor, Etc.)
					0			**0'-22'** – Weathered **BEDROCK (Jm)**
					1			
					2			
	MOD	30/50 for 4"	131.6	2.3	3			**3'** – Weathered **BEDROCK (Jm)**, gray with orange-brown, dry, dense, fractured, weathered metamorphic rock, oxidized, moderately difficult drilling creates gravelly sand.
					4			
	MOD	35/50 for 2"	NA	3.7	5	PR		**5'** – Weathered metamorphic **ROCK (Jm)**, gray with orange-brown, dry, dense, fractured, oxidized (poor recovery).
					6			
					7			
					8			Stopped sampling, but drilled to find practical refusal on ridge.
					9	Jm		
					10			
					11			**5'-22'** – Difficult drilling, generates sandy-gravel and gravelly sand, with minor clay, dry, dense.
					12			
					13			
					14			
					15			
					16			
					17			
					18			
					19			
					20			
					21			
					22			
					23			Practical Refusal at 22'
					24			No Groundwater Encountered
					25			Hole Backfilled with Native Soils
					26			PR = Poor Recovery
					27			MOD = California Modified Sampler
					28			NA = Not Available
					29			
					30			
					31			
					32			
					33			
					34			
					35			
					36			
					37			

TP-5A

0' - ½' **Topsoil**- brown, silty-**SAND** (SM), loose, porous, slightly organic, moist

½' - 1' **Highly Weathered Bedrock (Kgr)** - orange brown, highly decomposed GRANITIC rock (D.G.), hard, friable, porous, excavates to clayey-**SAND** (SC), slightly moist.

1' - 5' **Weathered Bedrock (Kgr)** - orange brown and gray and black, decomposed GRANITE rock(D.G.) medium dense, massive, moderately friable, mafic, micaceous, slightly moist.

T.D. @ 5'
Test Pit Backfilled
N 33° 43.228'
W 117° 16.626

TP-6A

0' - ½' **Highly Weathered Bedrock (Kgr)**- orange brown, highly decomposed GRANITE rock (D.G.), hard, friable, porous, excavates to clayey-**SAND** (SC), slightly moist.

½' - 5½' **Weathered Bedrock (Kgr)**- orange brown and gray and black, decomposed GRANITIC rock(D.G.) medium dense, massive, moderately friable, mafic, micaceous, slightly moist.

T.D. @ 5½'
Test Pit Backfilled
N 33° 43.228'
W 117° 16.626

TP-7

0' - 1' **Topsoil** - brown silty sand(SM), loose, porous, brittle to friable, common rootlets, slightly moist.

1' - 3' **Colluvium** - brown to gray with depth, clayey- **SAND** (SC), hard, brittle, porous, blocks, relict rootlets, slightly moist, relict granitic structure 0' to 3'.

3' - 4' **Weathered Bedrock (Kgr)** - orange-black-olive gray, decomposed GRANITIC rock (D.G.), dense, massive, highly mafic, slightly friable, excavates to gravely SAND (SW), slightly moist.

T.D. @ 4'
Test Pit Backfilled
N 33° 42.897'
W117° 17.105'

TP-8

0' - 1½' **Topsoil**- brown, silty-**SAND** and sandy-**SILT** (ML/SM), loose, brittle, blocky, porous, occasional rootlets and roots, moist.

1½' - 3' **Weathered Bedrock (Kgr)** - gray and brown, decomposed GRANITIC rock (D.G.), dense, slightly friable, moisture, excavated to medium to coarse grain **SAND** with gravel (SP), mafic, occasional hard rock fragments floating in D.G. mass, slightly moist.

T.D. @ 3'
Test Pit Backfilled
N 33° 42.901'
W 117° 17.058'

TP-9A

0' - ½' **Topsoil** - orange brown, silty-**SAND** (SM), loose, porous, slightly moist.

½' - 3½' **Weathered Bedrock (Kgr)** - light brown and light gray, decomposed GRANITIC rock (D.G.), medium dense, moderately friable, massive, mafic, slightly moist, excavates to coarse grain **SAND** (SP).

T.D. @ 3½'
Test Pit Backfilled
N 33° 43.136'
W 17° 16.706'

TP-10

0' - 1½' **Topsoil** - red brown, silty-**SAND** (SM), loose, porous, friable, organic, moist.

1½' - 3' **Slopewash** - orange brown, silty-**SAND** with gravel (SM), loose to slightly dense, porous, occasional rootlets, angular rock fragments up to + 6" - in one dimension, slightly moist.

3' - 4' **Weathered Bedrock (Jm)** - gray and orange brown, weathered METAMORPHIC rock, medium dense to dense, difficult to excavate, blocky cleavage, excavated to rock fragments ranging from ½" to 4" in one dimension, oxidized, slightly moist.

T.D. @ 4'
Test Pit Backfilled
N 33° 42.916'
W 117° 16.902'

TP-11

0' - ½' **Topsoil** - orange brown, silty-**SAND** (SM), loose, porous, friable, organic, with occasional rootlets, occasional gravel, slightly moist.

½' - 3' **Weathered Bedrock (Jm)** - brown and gray, weathered METAMORPHIC rock, dense, brittle, blocky cleavage, difficult to excavate, angular rock fragments up to 8" in one dimension, oxidized fractured surface, dry.

Practical Refusal @ 3½'
Test Pit Backfilled
N 33° 42.901'
W 117° 16.780'

TP-12

0' - ½' **Topsoil** - orange brown, silty-**SAND** (SM), loose, porous, friable, organic, with occasional rootlets, occasional gravel, slightly moist.

½' - 3' **Slopewash** - silty-**SAND** and sandy-**SILT** (SM/ML), loose, porous, occasional rootlets and rock fragments, slightly moist.

3' - 4' **Weathered Bedrock (Jm)**- orange brown and gray, weathered METAMORPHIC rock, dense, fragmented, oxidized, difficult excavating creates angular rock fragments up to 4" in one dimension, dry, highly decomposed from 3' - 3½' with minor clayey-**GRAVEL** (GW).

Practical Refusal @ 4'
Test Pit Backfilled
N 33° 42.913'
W 117° 16.733'

TP-13

0' - ½' **Topsoil** - orange brown, silty-**SAND** (SM), loose, porous, friable, organic, with occasional rootlets, occasional gravel, slightly moist.

½' - 3½' **Weathered Bedrock(Jm)**- brown and gray, weathered METAMORPHIC rock, dense, brittle, blocky cleavage, difficult to excavate, angular rock fragments up to 8" in one dimension, oxidized fractured surface, dry.

T.D. @ 3½'
Test Pit Backfilled
N 33° 42.946'
W 117° 16.787'

TP-14

0' - 1½' **Topsoil**- brown, sandy-**SILT** (ML), loose, porous, organic, moist.

1½' - 3' **Weathered Bedrock (Jm)** - gray and orange brown on fracture surface, weathered METAMORPHIC rock, dense, hard and blocky, excavates to angular rock fragments up to 4" in one dimension, dry.

T.D. @ 3'
Test Pit Backfilled
N 33° 42.904'
W 117° 16.704'

TP-15

0' - ½' **Topsoil**- orange brown, silty-**SAND** (SM), loose, porous, organic, moist.

½' - 1' **Colluvium**- orange brown, clayey-**SAND** (SC) with gravel, brittle, hard, porous, organic, moist.

1' - 2½' **Weathered Bedrock (Kgr)** - orangish brown and gray, weathered GRANITE and METAMORPHIC rock, dense, excavates to sandy (D.G.) gravel (SW),metamorphic, friable, dry.

Practical Refusal @ 2½'
Test Pit Backfilled
N 33° 42.998'
W 117° 16.794'

TP-16A

0' - ½' **Topsoil-** orange brown, silty- **SAND** (SM), loose, porous, slightly moist.

½' -3½' **Weathered Bedrock (Kgr)** - light brown and light gray, decomposed, GRANITE rock, medium dense, moderately friable, massive, mafic, slightly moist, excavated to coarse grain sand.

T.D. @ 4'
Test Pit Backfilled
N 33° 43.12'
W 117° 16.730'

TP-17A

0' - ½' **Topsoil** - brown silty-**SAND** (SM), loose, porous, occasional roots, occasional animal burrows, moist.

½' - 5' **Weathered Bedrock (Kgr)** - orange brown and gray, weathered bedrock (D.G.), medium dense, friable, massive, easy excavating creates medium to coarse grained **SAND** (SP), occasional relief fractures, colored white, slightly moist.

T.D. @ 5'
Test Pit Backfilled
N 33° 43.107'
W 117° 16.586'

TP-18

0' - ½' **Topsoil** - brown silty-**SAND** (SM), loose, porous, moist.

1½' - 4' **Colluvium**- orange brown, silty-**SAND** and clayey-**SAND** (SM/SC), porous, brittle, blocky, occasional rock fragments, slightly moist.

4' - 4½' **Weathered Bedrock (Kgr)** - orange brown, decomposed GRANITIC rock (D.G.), medium dense, sightly friable, massive, mafic, oxidized, slightly moist

T.D. @ 4½'
Test Pit Backfilled
N 33° 43. 101'
W 117° 16.768'

TP-19

0' - 5' **Alluvium**- dark gray, and brown, silty-**SAND** (SM), loose, porous, occasional roots, moist, minor sloughing.

5' - 5½' **Weathered Bedrock (kgr)** - gray and white, decomposed GRANITIC rock (D.G.), medium dense, friable, mafic, excavates to clayey-**SAND** (SC), moist.

T.D. @ 5½'
Test Pit Backfilled
N 33° 43.123'
W117° 16.838'

TP-20

0' - ½' **Topsoil** - dark brown, sandy-**SILT** and silty-**SAND** (SM/ML) with minor clay, loose, porous, occasional rootlets, very moist.

½' - 3' **Weathered Bedrock (Kgr)** - orange brown and gray black, decomposed GRANITIC rock (D.G.), dense, friable massive, mafic, excavates to coarse grain **SAND** (SP), slightly moist to dry with depth.

T.D. @ 3'
Test Pit backfill
N 33° 43.007'
W 117° 16.972'

TP-21

0' - ½' **Topsoil** - dark brown, sandy-**SILT** (ML) and silty-**SAND** (SM) with minor clay, loose, porous, occasional rootlets, very moist.

½' - 1' **Colluvium** - dark brown, sandy-**CLAY** (CL), brittle, porous, blocky, common root hairs, moist.

1' - 2½' **Highly Weathered Bedrock (Kgr)** - orange brown, highly decomposed GRANITIC rock (D.G.), excavated to sandy-**CLAY** and clayey-**SAND** (CL/SC), massive, slightly moist.

2½' - 4' **Weathered Bedrock**- gray, change to brown decomposed GRANITIC rock (D.G.), medium dense to dense, massive, slightly friable, mafic, excavated to coarse grain **SAND** (SP), dry.

T.D. @ 4'
Test Pit Backfilled
N 33° 43. 057'
W 117° 17.024'

TP-22

0' - ½' **Topsoil** - orange brown, silty-**SAND** (SM), loose, porous, moist.

½' - 4' **Weathered Bedrock (Kgr)** - gray and black & white & orange, decomposed GRANITE rock (D.G.), very friable, massive, excavates to coarse-grain **SAND** (SP), moist.

T.D. @ 4'
Test Pit Backfilled
N 33° 43.231'
W 117° 17.045'

TP-23

0' - ½' **Topsoil** - brown, silty-**SAND** (SM), loose, porous, moist.

½' - 3½' **Weathered Bedrock (Kgr)** - orange brown and gray, decomposed GRANITIC rock (D.G.), medium dense, friable massive, oxidized, slightly moist.

3½' - 6½' Dark grey & white & brown, decomposed GRANITIC rock (D.G.), medium dense, friable, massive, mafic, excavates to medium to coarse grain **SAND** (SP), slightly moist.

T.D. @ 6'
Test Pit Backfilled
N 33° 43.181'
W117° 16.646'

TP-24

0' - ½' **Topsoil** - brown, silty-**SAND** (SM), loose, porous, slightly organic, moist.

½' - 5' **Weathered Bedrock (Kgr)** - orange brown and gray and black, decomposed GRANITE rock (D.G.), medium dense, massive, moderately friable, mafic, easy excavating creates medium to coarse grain **SAND** (SP), micaceous, slightly moist.

T.D. @ 5'
Test Pit Backfilled
N33° 43.153'
W117° 16. 586'

TP-25

0' - 1' **Topsoil** - red brown, silty-**SAND** (SM), loose, porous, organic, friable, moist.

1' - 6' **Weathered Bedrock (Kgr)** - orange brown and gray brown, decomposed GRANITIC rock (D.G.), friable, massive, medium dense, occasional relict fractures are white & crumbly, oxidized, medium to coarse grain **SAND** (SP) mafic, dry.

T.D. @ 6'
Test Pit Backfilled
N 33° 43. 087'
W 117° 16.500'

TP-26

0' - ½' **Topsoil** - brown, silty-**SAND** (SM), loose, porous, occasional roots, occasional animal burrows, moist.

½' - 4' **Weathered Bedrock (Kgr)** - orange brown and gray, decomposed GRANITE rock (D.G.), dense, slightly friable, micaceous, mafic, moderately difficult excavating creates **SAND** (SP), slightly moist.

T.D. @ 4'
Test Pit Backfilled
N 33° 43. 104'
W 117° 16.527'

TP-27

0' - 1' **Topsoil** - red brown, silty-SAND (SM), loose, porous, organic, friable. moist.

1' - 5' **Weathered Bedrock (Kgr)** - orange brown & gray brown, weathered GRANITIC rock (D.G.), friable massive, medium dense, micaceous, mafic, dry.

T.D. @ 5'
Test Pit Backfilled
N 33° 43. 047'
W 117° 16.634'

TP-28

0' - 1½' **Weathered Bedrock (Jm)** - brown, orange and gray, weathered METAMORPHIC rock, dense, fractured, oxidized, difficult excavating creates sandy-**GRAVEL** (GW) with angular fragments up to 6" in one direction, slightly moist.

Practical Refusal @ 1½'
Test Pit Backfilled
N 33° 43.045'
W 117° 16.535'

TP-29

0' - 1' **Topsoil** - brown, silty-**SAND** (SM), loose, porous, organic, moist.

1' - 2' **Slopewash** - medium brown, sandy-**CLAY** (CL), brittle, porous, blocky cleavage, slightly moist, well cemented, poorly sorted.

2' - 4' **Weathered Bedrock (Kgr)**- gray brown, weathered metamorphic rock, medium dense to dense, moderately difficult excavating creates sandy gravel (GP), with fragments up to 5" in one direction, dry.

T.D. @ 4'
Test Pit Backfilled
N 33° 42. 968'
W 117° 16. 656'

TP-30

0' - 2' **Weathered Bedrock (Jm)** - brown, orange and gray, weathered METAMORPHIC rock, dense, fractured, oxidized, difficult excavating creates sandy-**GRAVEL** (GW), angular fragments up to + 6" in one direction, slightly moist.

T.D. @ 2'
Test Pit Backfilled
N 33° 42.971'
W 117° 16. 539'

TP-31

0' - ½' **Topsoil** - orange brown, silty-**SAND** (SM), loose, porous, organic, moist.

½' - 4½' **Slopewash** - orange brown, silty-**SAND** (SM) with angular gravel, loose to slightly dense, porous, occasional rootlets, moist.

4½' - 5½' **Weathered Bedrock (Jm)** - orange brown & gray, weathered METAMORPHIC rock, dense, fractured, oxidized, difficult excavating creates sandy-GRAVEL (GW), angular fragments up to 6" in one dimension, slightly moist to dry.

Practical Refusal @ 5½'
Test Pit Backfilled
N 33° 42.872'
W 117° 16. 534'

SOIL EXPLORATION COMPANY 2021 LOGS

Leighton
a verdantas company

EXPLORATORY TRENCH LOG

PROJECT NAME Cemetery ELEVATION _____ TRENCH NO. T-1

PROJECT No. 1789-01 EQUIPMENT Case 580 w/ 24-inch bucket

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY CK DATE 12-17-20** **SAMPLED BY CK**
5							**BEDROCK- Decomposed Granite (Kgr)** Dark grey, medium to coarse grained, dense, Damp, generally massive structure, few fractures Excavates into coarse sand that is friable and Non-cohesive, trench walls are stable, Practical refusal at 10 ft.
10							Trench Backfilled No Groundwater Practical Refusal @ 10 ft.
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1566’	TRENCH NO.	T-2
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY** CK **DATE** 12-17-20 **SAMPLED BY** CK
							TOPSOIL – Silty Clayey Sand Medium grey-brown, fine to medium grained, Loose, dry, porous, easily crumbles in hand, Rootlets & organic material to 3%-5%.
5							**BEDROCK- Granite (Kgr)** Very hard (fresh), non-excavatable generally massive structure Practical refusal at 3 ft.
10							Trench Backfilled No Groundwater Practical Refusal @ 3 ft.
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1566 ft	TRENCH NO.	T-3
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY** CK **DATE** 12-17-20 **SAMPLED BY** CK
							BEDROCK- Decomposed Granite (Kgr)
							Light grey to tan brown, coarse grained, dense,
							Dry, massive structure, few fractures
							Excavates into coarse sand that is friable and
5							Non-cohesive, Practical refusal at 5 ft.
							Trench Backfilled
							No Groundwater
							No Caving
							Practical Refusal @ 5 ft
10							
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Cemetery	ELEVATION		TRENCH NO.	T-4
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

GEOTECHNICAL DESCRIPTION

LOGGED BY CK **DATE** 12-17-20
SAMPLED BY CK

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	
0							
5							**BEDROCK- Decomposed Granite (Kgr)** Light grey to tan brown, coarse grained, dense, Dry, massive structure, few fractures Excavates into coarse sand that is friable and Non-cohesive, vertical fractures @ 24" spacing With calcium carbonate infill
10							Practical Refusal @ 10 ft. No Groundwater No Caving Trench Backfilled
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1593’	TRENCH NO.	T-5
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY** CK **DATE** 12-17-20 **SAMPLED BY** CK
							TOPSOIL – Silty Clayey Sand Medium grey-brown, fine to medium grained, Loose, dry, porous, easily crumbles in hand, Rootlets & organic material to 3%-5%, 18” thick
5							**BEDROCK- Quartzite & Phyllite Metamorphics** Very hard, well fractured, minor foliation, Fine to medium grained, very difficult to excavate Practical refusal at 3.5 ft.
10							Trench Backfilled No Groundwater No Caving Practical Refusal @ 3.5 ft.
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1582’	TRENCH NO.	T-6
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY** CK **DATE** 12-17-20 **SAMPLED BY** CK
							BEDROCK- Quartzite & Phyllite Metamorphics Very hard, well fractured, minor foliation, Fine to medium grained, very difficult to excavate Practical refusal at 1.5 ft.
5							Trench Backfilled No Groundwater No Caving Practical Refusal @ 1.5 ft.
10							
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1599’	TRENCH NO.	T-7
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY** CK **DATE** 12-17-20 **SAMPLED BY** CK
							BEDROCK- Quartzite & Phyllite Metamorphics Very hard, well fractured, minor foliation, Fine to medium grained, very difficult to excavate Practical refusal at 1.5 ft.
5							Trench Backfilled No Groundwater No Caving Practical Refusal @ 1.5 ft.
10							
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1598’	TRENCH NO.	T-8
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY** CK **DATE** 12-17-20 **SAMPLED BY** CK
							TOPSOIL – Silty Clayey Sand Medium grey-brown, fine to medium grained, Loose, dry, porous, easily crumbles in hand, Rootlets & organic material to 3%-5%, 18” thick
5							**BEDROCK- Quartzite & Phyllite Metamorphics** Very hard, difficult to excavate Excavates as medium to coarse sand with gravel Both decomposed granite & metamorphics Visible, Practical refusal at 7 ft.
10							Trench Backfilled No Groundwater No Caving Practical Refusal @ 7 ft.
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1611’	TRENCH NO.	T-9
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY** CK **DATE** 12-17-20 **SAMPLED BY** CK
							BEDROCK- Quartzite & Phyllite Metamorphics Very hard, well fractured, minor foliation, Fine to medium grained, very difficult to excavate Practical refusal at 2 ft.
5							Trench Backfilled No Groundwater No Caving Practical Refusal @ 2 ft.
10							
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1587’	TRENCH NO.	T-10
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

GEOTECHNICAL DESCRIPTION

LOGGED BY CK **DATE** 12-17-20
SAMPLED BY CK

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	
0							
							TOPSOIL – Silty Clayey Sand (18”) Medium grey-brown, fine to medium grained, Loose, dry, porous, easily crumbles in hand, Rootlets & organic material present.
5							**BEDROCK- Granite (Kgr)** Dark grey, medium to coarse grained, dense Damp, massive structure, few fractures Excavates as coarse sand that is friable, And Non-cohesive, Practical refusal at 10 ft.
10							Trench Backfilled No Groundwater Practical Refusal @ 10 ft. No Caving
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
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(90) - RELATIVE COMPACTION

RGS Engineering Geology

EXPLORATORY TRENCH LOG

PROJECT NAME	Crescent Gardens	ELEVATION	1601 ft	TRENCH NO.	T-11
PROJECT No.	1789-01	EQUIPMENT	Case 580 w/ 24-inch bucket		

DEPTH (FEET)	TYPE OF TEST*	SAMPLE DEPTH	DRY DENSITY (PCF)	MOISTURE CONTENT %	(USCS) SOIL CLASSIFICATION	EARTH MATERIAL	GEOTECHNICAL DESCRIPTION
0							**LOGGED BY** CK **DATE** 12-17-20 **SAMPLED BY** CK
							TOPSOIL – Silty Clayey Sand (18") Medium grey-brown, fine to medium grained, Loose, dry, porous,
5							**BEDROCK- Granite (Kgr)** Dark grey, medium to coarse grained, dense Damp, massive structure, few fractures Very hard at 5 ft
10							Trench Backfilled No Groundwater Practical Refusal @ 6 ft. No Caving
15							

GRAPHIC LOG Trend: Scale: 1" = 5'

*TEST SYMBOLS

B - BULK SAMPLE
R - RING SAMPLE
SC - SANDCONE
MD - MAXIMUM DENSITY
GS - GRAIN SIZE
SE - SAND EQUIVALENT
NG - NUCLEAR GAUGE
(90) - RELATIVE COMPACTION

RGS Engineering Geology

APPENDIX B
LABORATORY TEST RESULTS

MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Muslim Mortuary Crescent Gardens Canyon	Tested By:	PM/NP	Date:	01/31/24
Project No.:	038.0000019894	Checked By:	A. Santos	Date:	02/08/24
Boring No.:	TP-2	Depth (ft.):	0-1		
Sample No.:	B-1				
Soil Identification:	Dark brown well-graded sand with silt (SW-SM)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03320 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3906	3976	3950			
Weight of Mold (g)	1808	1808	1808			
Net Weight of Soil (g)	2098	2168	2142			
Wet Weight of Soil + Cont. (g)	970.8	953.8	904.9			
Dry Weight of Soil + Cont. (g)	909.4	875.6	814.6			
Weight of Container (g)	75.4	89.2	72.4			
Moisture Content (%)	7.36	9.94	12.17			
Wet Density (pcf)	139.3	144.0	142.2			
Dry Density (pcf)	129.8	130.9	126.8			

Maximum Dry Density (pcf) **131.3** **Optimum Moisture Content (%)** **9.1**

PROCEDURE USED

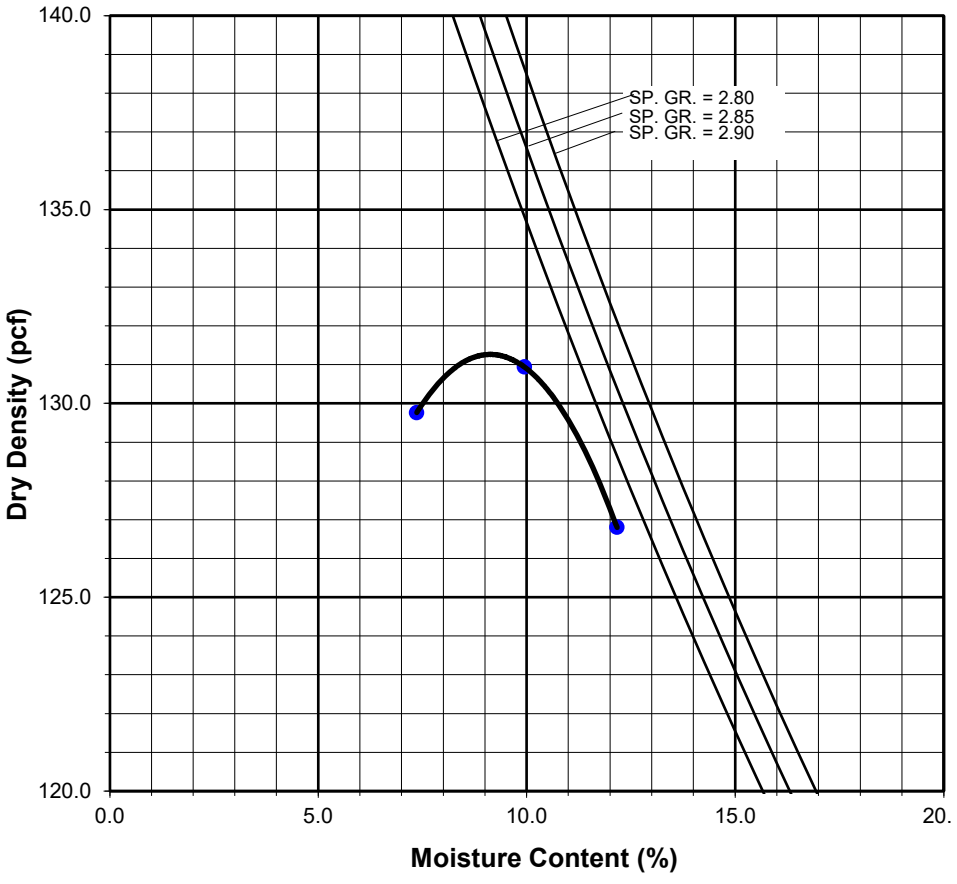
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Muslim Mortuary Crescent Gardens Canyon	Tested By:	PM/NP	Date:	02/01/24
Project No.:	038.0000019894	Checked By:	A. Santos	Date:	02/08/24
Boring No.:	TP-5	Depth (ft.):	0-1		
Sample No.:	B-1				
Soil Identification:	Strong brown clayey sand (SC)				

Preparation Method: [X] Moist [ ] Dry

[X] Mechanical Ram [ ] Manual Ram

Mold Volume (ft³) 0.03320 *Ram Weight = 10 lb.; Drop = 18 in.*

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3805	3894	3880			
Weight of Mold (g)	1808	1808	1808			
Net Weight of Soil (g)	1997	2086	2072			
Wet Weight of Soil + Cont. (g)	893.1	883.0	974.2			
Dry Weight of Soil + Cont. (g)	844.8	818.5	882.6			
Weight of Container (g)	75.3	72.4	88.5			
Moisture Content (%)	6.28	8.64	11.54			
Wet Density (pcf)	132.6	138.5	137.6			
Dry Density (pcf)	124.8	127.5	123.4			

Maximum Dry Density (pcf) **127.5** **Optimum Moisture Content (%)** **8.6**

PROCEDURE USED

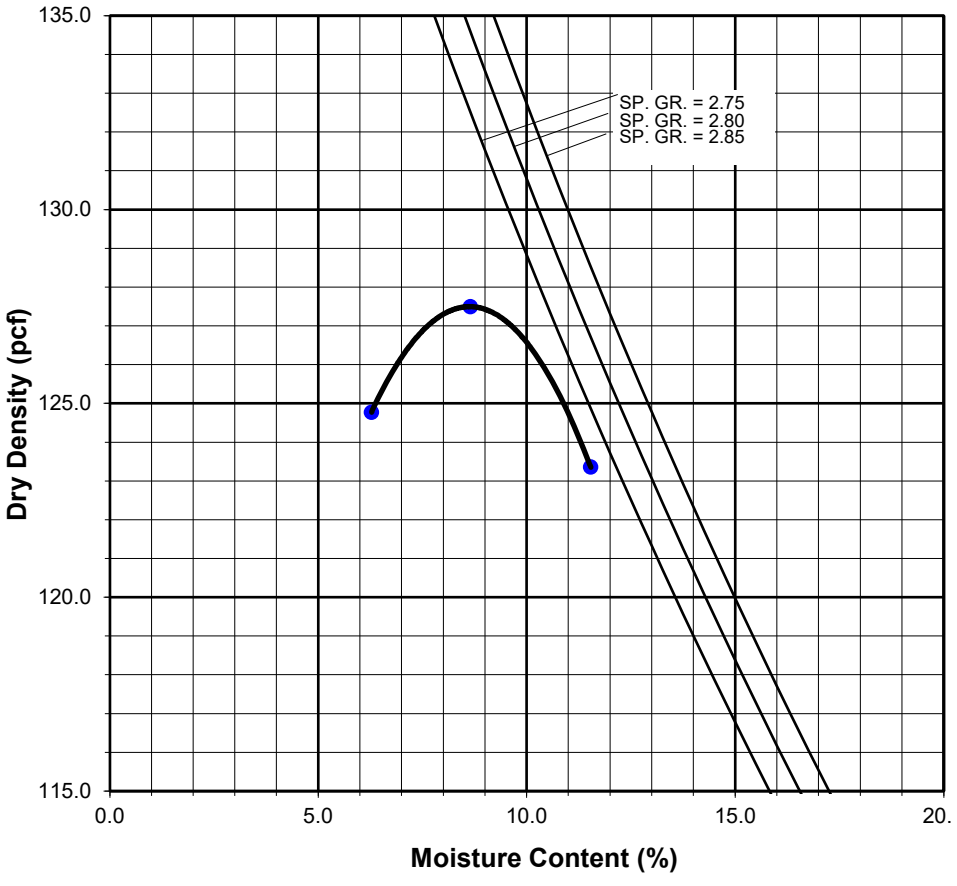
[X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

[ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

[ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



MODIFIED PROCTOR COMPACTION TEST

ASTM D 1557

Project Name:	Muslim Mortuary Crescent Gardens Canyon	Tested By:	PM/NP	Date:	02/02/24
Project No.:	038.0000019894	Input By:	A. Santos	Date:	02/08/24
Boring No.:	TP-6	Depth (ft.):	0-1		
Sample No.:	B-1				
Soil Identification:	Dark yellowish brown silty sand with gravel (SM)g				

Note: Corrected dry density calculation assumes specific gravity of 2.70 and moisture content of 1.0% for oversize particles

Preparation Method:	X	Moist
		Dry
Compaction Method	X	Mechanical Ram
		Manual Ram

Scalp Fraction (%)	
#3/4	
#3/8	26.7
#4	

Rammer Weight (lb.) = 10.0

Height of Drop (in.) = 18.0

Mold Volume (ft³) 0.03320

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3804	3899	3906			
Weight of Mold (g)	1808	1808	1808			
Net Weight of Soil (g)	1996	2091	2098			
Wet Weight of Soil + Cont. (g)	815.1	968.8	872.0			
Dry Weight of Soil + Cont. (g)	781.4	908.3	798.5			
Weight of Container (g)	88.7	88.9	74.6			
Moisture Content (%)	4.87	7.38	10.15			
Wet Density (pcf)	132.5	138.8	139.3			
Dry Density (pcf)	126.4	129.3	126.5			

Maximum Dry Density (pcf) 129.3

Corrected Dry Density (pcf) 137.9

Optimum Moisture Content (%) 7.6

Corrected Moisture Content (%) 5.8

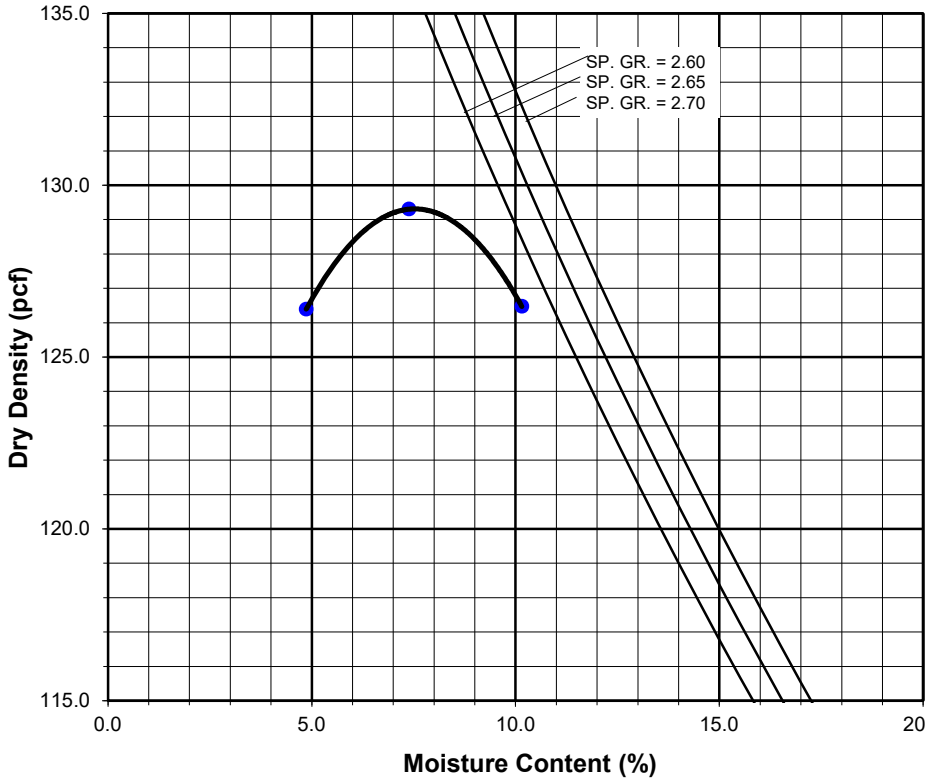
☐ **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

☒ **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

☐ **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:
GR:SA:FI

Atterberg Limits:
LL,PL,PI



Boring No.	IT-1							
Sample No.	B-1							
Depth (ft.)	1-3							
Sample Type	Bulk							
Soil Identification	Olive gray silty sand (SM)							
No Moisture Correction; ASTM D 1140 modified to include splitting the sample on the #4 sieve								
Total Sample Dry Weight Determination								
Dry Weight of Soil + Container (g)	2717.30							
Weight of Container (g)	277.13							
Dry Weight of Soil (g)	2440.17							
Sample Dry Weight Determination, Retained on Sieve #4								
Dry Weight of Sample + Cont. (g)	248.83							
Weight of Container (g)	75.53							
Weight of Dry Sample (g)	173.30							
Sample Dry Weight Determination, Passing Sieve #4								
Dry Weight of Sample + Cont. (g)	479.08							
Weight of Container (g)	110.88							
Weight of Dry Sample (g)	368.20							
After Wash								
Method (A or B)	A							
Dry Weight of Sample + Cont. (g)	427.98							
Weight of Container (g)	110.88							
Weight of Dry Sample (g)	317.10							
% Passing No. 4 Sieve	92.9							
% Retained No. 4 Sieve	7.1							
% Passing No. 200 Sieve	**12.9**							

Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: Muslim Mortuary Crescent Gardens Canyon
Project No.: 038.0000019894

Tested By: G. Bathala Date: 02/01/24

Boring No.	IT-2	IT-4	IT-5	IT-6				
Sample No.	B-1	B-1	B-1	B-1				
Depth (ft.)	1-3	2	3	0-2				
Sample Type	Bulk	Bulk	Bulk	Bulk				
Soil Identification	Dark brown clayey sand (SC)	Gray well-graded sand with silt (SW-SM)	Brown clayey sand (SC)	Yellowish brown clayey sand (SC)				
Moisture Correction								
Wet Weight of Soil + Container (g)	0.00	0.00	0.00	0.00				
Dry Weight of Soil + Container (g)	0.00	0.00	0.00	0.00				
Weight of Container (g)	1.00	1.00	1.00	1.00				
Moisture Content (%)	0.00	0.00	0.00	0.00				
Sample Dry Weight Determination								
Weight of Sample + Container (g)	474.27	481.30	427.78	460.68				
Weight of Container (g)	107.37	108.40	109.37	110.67				
Weight of Dry Sample (g)	366.90	372.90	318.41	350.01				
Container No.:								
After Wash								
Method (A or B)	A	A	A	A				
Dry Weight of Sample + Cont. (g)	351.16	457.32	328.73	372.76				
Weight of Container (g)	107.37	108.40	109.37	110.67				
Dry Weight of Sample (g)	243.79	348.92	219.36	262.09				
% Passing No. 200 Sieve	**33.6**	**6.4**	**31.1**	**25.1**				
% Retained No. 200 Sieve	66.4	93.6	68.9	74.9				

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PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name: Muslim Mortuary Crescent Gardens Canyon

Project No.: 038.0000019894

Tested By: G. Bathala Date: 02/01/24

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D6913

Project Name: Muslim Mortuary Crescent Gardens Canyon
Project No.: 038.0000019894
Boring No.: TP-2
Sample No.: B-1
Soil Identification: Dark brown well-graded sand with silt (SW-SM)

Tested By: KJ/GB Date: 02/01/24
Checked By: A. Santos Date: 02/05/24
Depth (feet): 4-5

Calculation of Dry Weights	Whole Sample	Sample Passing #4	Moisture Contents	Whole Sample	Sample passing #4
Container No.:	1F	R-2	Wt. of Air-Dry Soil + Cont.(g)	0.0	0.0
Wt. Air-Dried Soil + Cont.(g)	2463.7	616.1	Wt. of Dry Soil + Cont. (g)	0.0	0.0
Wt. of Container (g)	223.0	107.2	Wt. of Container No._____(g)	1.0	1.0
Dry Wt. of Soil (g)	2240.7	508.9	Moisture Content (%)	0.0	0.0

Passing #4 Material After Wet Sieve		
	Container No.	R-2
	Wt. of Dry Soil + Container (g)	587.7
	Wt. of Container (g)	107.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	480.5

U. S. Sieve Size		Cumulative Weight of Dry Soil Retained (g)		Percent Passing (%)
	(mm.)	Whole Sample	Sample Passing #4	
3"	75.0			
1 1/2"	37.5			
1"	25.0			
3/4"	19.0			
1/2"	12.5	0.0		100.0
3/8"	9.5	1.3		99.9
#4	4.75	12.1		99.5
#8	2.36		127.0	74.7
#16	1.18		272.0	46.3
#30	0.600		362.0	28.7
#50	0.300		421.8	17.0
#100	0.150		457.6	10.0
#200	0.075		478.5	5.9
PAN				

GRAVEL: **1 %**
SAND: **93 %**
FINES: **6 %**
GROUP SYMBOL: **SW-SM**

Cu = D60/D10 = 10.63
Cc = $(D30)^2/(D60*D10)$ = 1.46

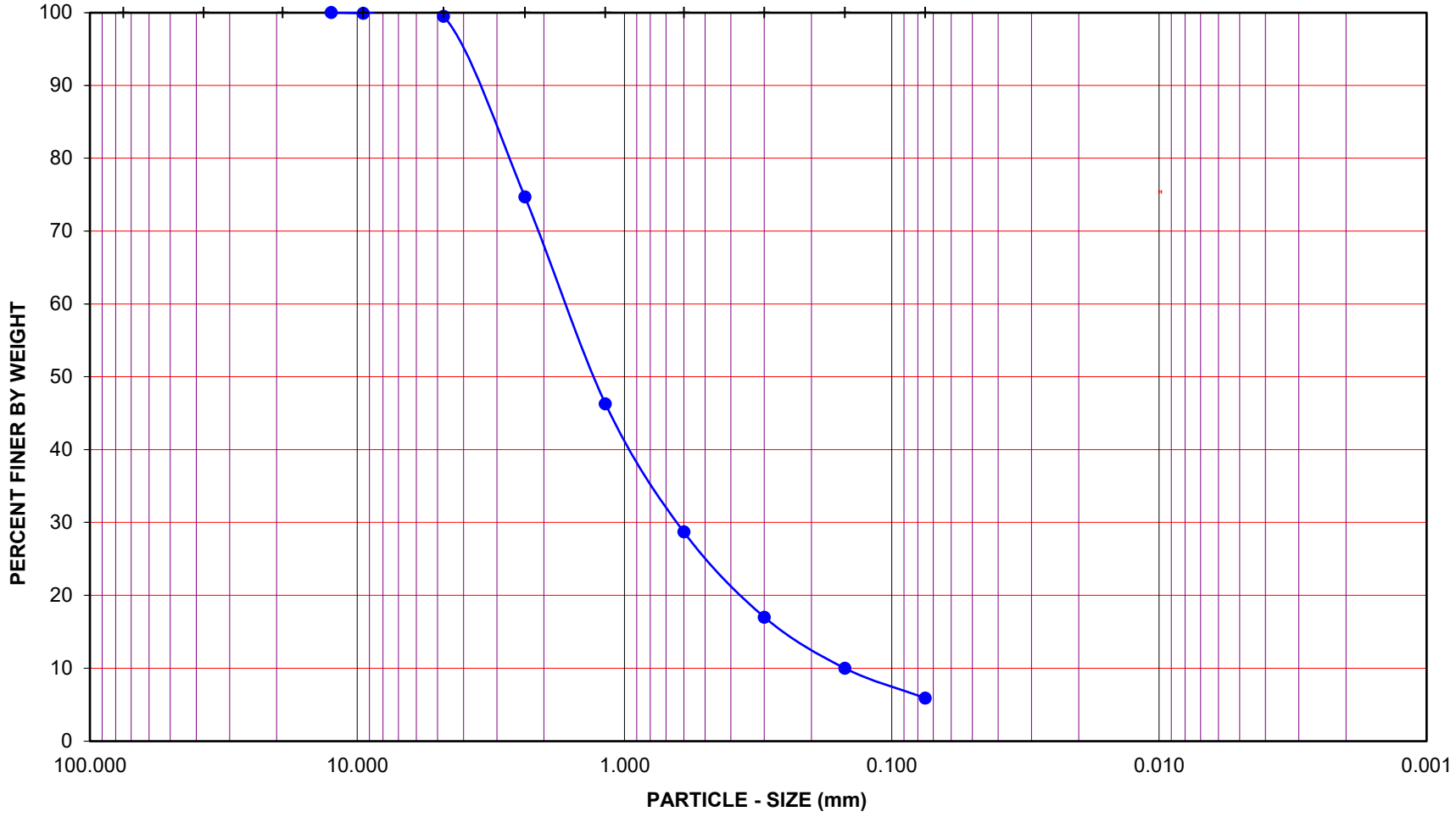
Remarks:

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING: 3.0" 1 1/2" 3/4" 3/8"

U.S. STANDARD SIEVE NUMBER: #4 #8 #16 #30 #50 #100 #200

HYDROMETER



Project Name: Muslim Mortuary Crescent Gardens Canyon

Project No.: 038.0000019894

Boring No.: TP-2 Sample No.: B-1

Depth (feet): 4-5 Soil Type : SW-SM

Soil Identification: Dark brown well-graded sand with silt (SW-SM)

GR:SA:FI : (%) 1 : 93 : 6

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PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Feb-24

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D6913

Project Name: Muslim Mortuary Crescent Gardens Canyon
Project No.: 038.0000019894
Boring No.: TP-5
Sample No.: B-1
Soil Identification: Strong brown clayey sand (SC)

Tested By: KJ/GB Date: 02/01/24
Checked By: A. Santos Date: 02/08/24
Depth (feet): 0-1

Calculation of Dry Weights	Whole Sample	Sample Passing #4	Moisture Contents	Whole Sample	Sample passing #4
Container No.:	ES-4	D-81	Wt. of Air-Dry Soil + Cont.(g)	0.0	0.0
Wt. Air-Dried Soil + Cont.(g)	2244.3	611.6	Wt. of Dry Soil + Cont. (g)	0.0	0.0
Wt. of Container (g)	228.9	108.0	Wt. of Container No._____(g)	1.0	1.0
Dry Wt. of Soil (g)	2015.4	503.6	Moisture Content (%)	0.0	0.0

Passing #4 Material After Wet Sieve		
	Container No.	D-81
	Wt. of Dry Soil + Container (g)	435.9
	Wt. of Container (g)	108.0
	Dry Wt. of Soil Retained on # 200 Sieve (g)	327.9

U. S. Sieve Size		Cumulative Weight of Dry Soil Retained (g)		Percent Passing (%)
	(mm.)	Whole Sample	Sample Passing #4	
3"	75.0			
1 1/2"	37.5			
1"	25.0	0.0		100.0
3/4"	19.0	14.1		99.3
1/2"	12.5	22.8		98.9
3/8"	9.5	26.1		98.7
#4	4.75	43.7		97.8
#8	2.36		36.1	90.8
#16	1.18		101.8	78.0
#30	0.600		165.7	65.6
#50	0.300		227.5	53.6
#100	0.150		280.4	43.3
#200	0.075		323.5	35.0
PAN				

GRAVEL: **2 %**
SAND: **63 %**
FINES: **35 %**
GROUP SYMBOL: **SC**

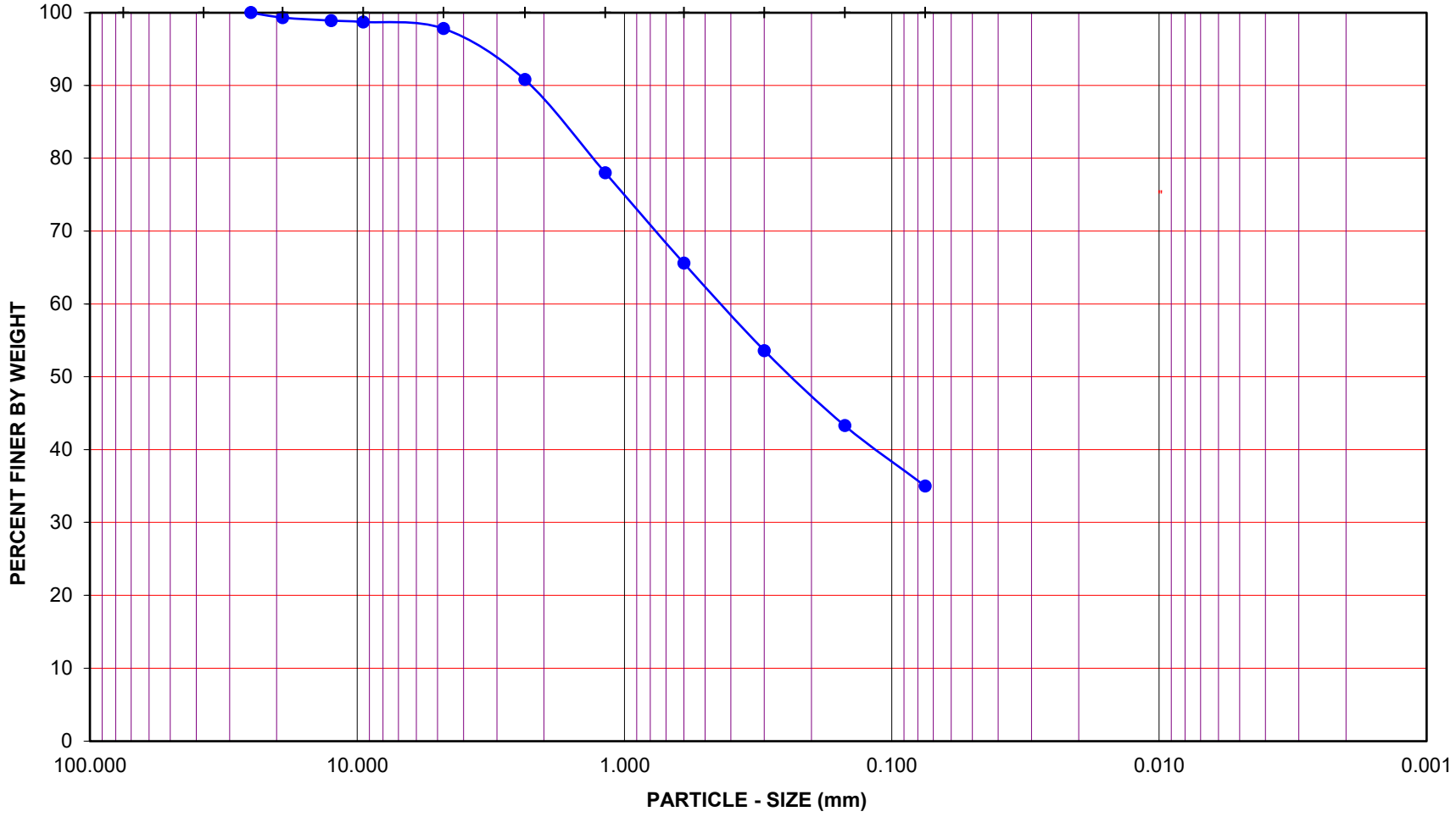
Cu = D60/D10 = 10.63
Cc = $(D30)^2/(D60*D10)$ = 1.46

Remarks:

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING — U.S. STANDARD SIEVE NUMBER — HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Muslim Mortuary Crescent Gardens Canyon

Project No.: 038.0000019894

Boring No.: TP-5 Sample No.: B-1

Depth (feet): 0-1 Soil Type : SC

Soil Identification: Strong brown clayey sand (SC)

GR:SA:FI : (%) 2 : 63 : 35

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PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Feb-24

PARTICLE-SIZE DISTRIBUTION (GRADATION) of SOILS USING SIEVE ANALYSIS

ASTM D6913

Project Name: Muslim Mortuary Crescent Gardens Canyon
Tested By: KJ/GB Date: 02/01/24
Project No.: 038.0000019894
Checked By: A. Santos Date: 02/08/24
Boring No.: TP-6
Depth (feet): 0-1
Sample No.: B-1
Soil Identification: Dark yellowish brown silty sand with gravel (SM)g, noted asphalt & organics

Calculation of Dry Weights	Whole Sample	Sample Passing #4	Moisture Contents	Whole Sample	Sample passing #4
Container No.:	AAA	57	Wt. of Air-Dry Soil + Cont.(g)	0.0	0.0
Wt. Air-Dried Soil + Cont.(g)	5043.6	627.2	Wt. of Dry Soil + Cont. (g)	0.0	0.0
Wt. of Container (g)	461.1	107.2	Wt. of Container No._____(g)	1.0	1.0
Dry Wt. of Soil (g)	4582.5	520.0	Moisture Content (%)	0.0	0.0

Passing #4 Material After Wet Sieve		
	Container No.	57
	Wt. of Dry Soil + Container (g)	505.2
	Wt. of Container (g)	107.2
	Dry Wt. of Soil Retained on # 200 Sieve (g)	398.0

U. S. Sieve Size		Cumulative Weight of Dry Soil Retained (g)		Percent Passing (%)
	(mm.)	Whole Sample	Sample Passing #4	
3"	75.0			
1 1/2"	37.5	0.0		100.0
1"	25.0	470.5		89.7
3/4"	19.0	691.3		84.9
1/2"	12.5	1007.1		78.0
3/8"	9.5	1221.4		73.3
#4	4.75	1656.8		63.8
#8	2.36		66.8	55.6
#16	1.18		125.9	48.4
#30	0.600		181.1	41.6
#50	0.300		244.7	33.8
#100	0.150		314.1	25.3
#200	0.075		382.6	16.9
PAN				

GRAVEL: **36 %**
SAND: **47 %**
FINES: **17 %**
GROUP SYMBOL: **(SM)g**

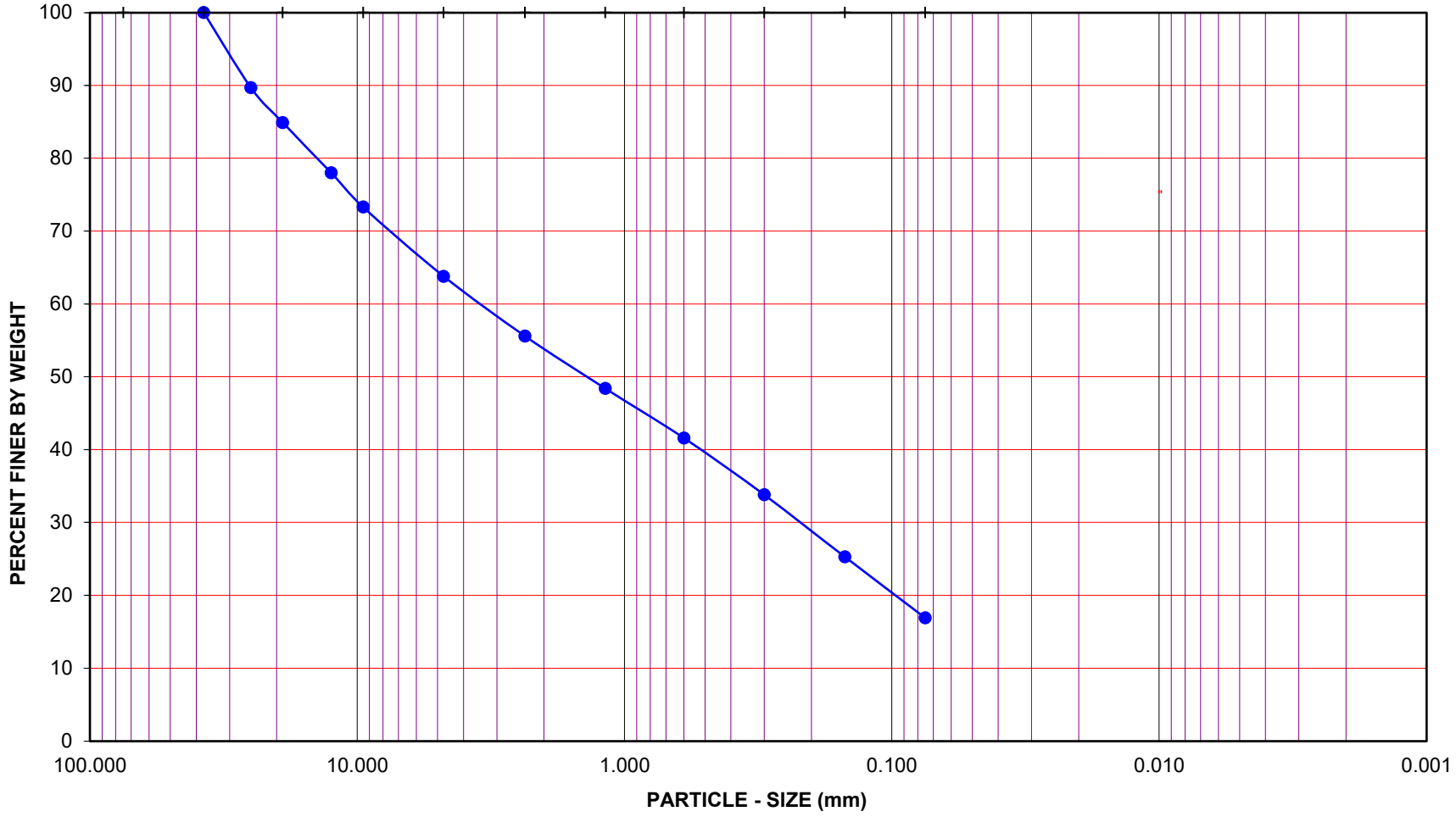
Cu = D60/D10 = 10.63
Cc = $(D30)^2/(D60*D10)$ = 1.46

Remarks:

GRAVEL		SAND			FINES	
COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING | U.S. STANDARD SIEVE NUMBER | HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Muslim Mortuary Crescent Gardens Canyon

Project No.: 038.0000019894

Boring No.: TP-6 Sample No.: B-1

Depth (feet): 0-1 Soil Type : (SM)g

Soil Identification: Dark yellowish brown silty sand with gravel (SM)g, noted asphalt & organics

GR:SA:FI : (%) 36 : 47 : 17

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PARTICLE - SIZE DISTRIBUTION ASTM D 6913

Feb-24

Sieve TP-6, B-1 @ 0-1

EXPANSION INDEX of SOILS
ASTM D 4829

Project Name:	Muslim Mortuary Crescent Gardens Canyon	Tested By:	J. Domingo	Date:	02/02/24
Project No.:	038.0000019894	Checked By:	A. Santos	Date:	02/08/24
Boring No.:	TP-1	Depth (ft.):	1-2		
Sample No.:	B-1				
Soil Identification:	Yellowish brown poorly-graded sand with clay (SP-SC)				

Dry Wt. of Soil + Cont. (g)	1000.00
Wt. of Container No. (g)	0.00
Dry Wt. of Soil (g)	1000.00
Weight Soil Retained on #4 Sieve	0.00
Percent Passing # 4	100.00

MOLDED SPECIMEN	Before Test	After Test
Specimen Diameter (in.)	4.01	4.01
Specimen Height (in.)	1.0000	1.0005
Wt. Comp. Soil + Mold (g)	613.50	433.44
Wt. of Mold (g)	208.10	0.00
Specific Gravity (Assumed)	2.70	2.70
Container No.	O	O
Wet Wt. of Soil + Cont. (g)	808.60	641.54
Dry Wt. of Soil + Cont. (g)	738.50	578.31
Wt. of Container (g)	0.00	208.10
Moisture Content (%)	9.49	17.08
Wet Density (pcf)	122.3	130.7
Dry Density (pcf)	111.7	111.6
Void Ratio	0.509	0.510
Total Porosity	0.338	0.338
Pore Volume (cc)	69.9	70.0
Degree of Saturation (%) [S_{meas}]	**50.3**	90.4

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
02/02/24	14:00	1.0	0	0.5385
02/02/24	14:10	1.0	10	0.5370
Add Distilled Water to the Specimen				
02/02/24	15:00	1.0	50	0.5375
02/03/24	7:22	1.0	1032	0.5390
02/03/24	11:53	1.0	1303	0.5390

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**2**

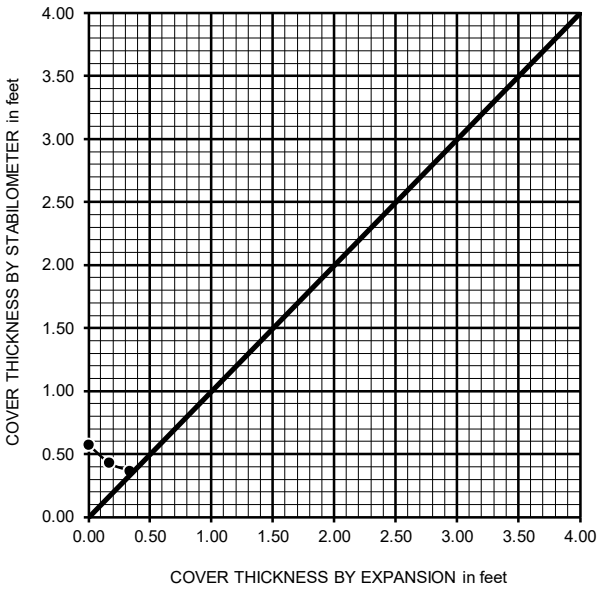
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Muslim Mortuary Crescent Gardens Canyon	PROJECT NUMBER:	038.0000019894
BORING NUMBER:	TP-1	DEPTH (FT.):	1-2
SAMPLE NUMBER:	B-1	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Yellowish brown poorly-graded sand w/ clay (SP-SC)	DATE COMPLETED:	1/31/2024

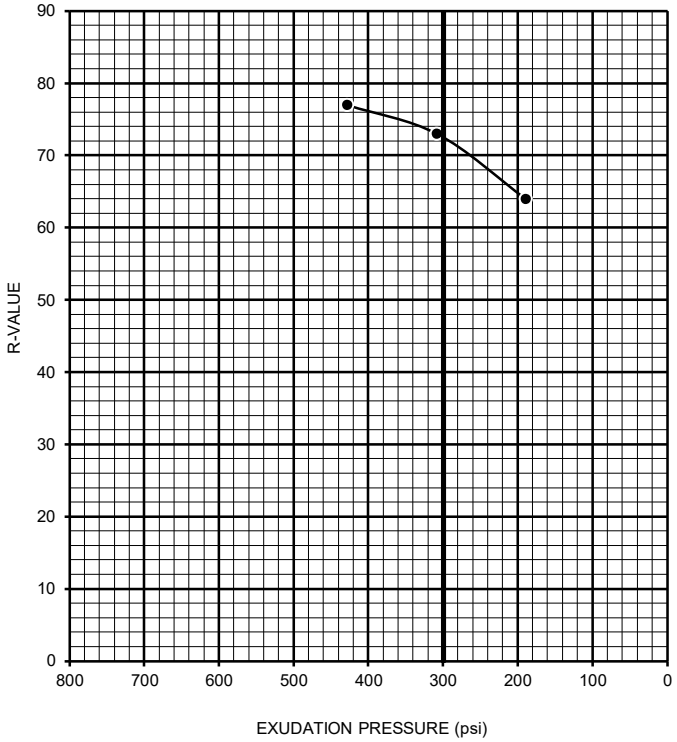
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	12.5	13.4	14.5
HEIGHT OF SAMPLE, Inches	2.49	2.52	2.54
DRY DENSITY, pcf	119.8	119.9	118.8
COMPACTOR PRESSURE, psi	275	220	150
EXUDATION PRESSURE, psi	428	308	189
EXPANSION, Inches x 10exp-4	10	5	0
STABILITY Ph 2,000 lbs (160 psi)	21	25	35
TURNS DISPLACEMENT	4.88	4.98	5.10
R-VALUE UNCORRECTED	77	73	64
R-VALUE CORRECTED	77	73	64

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.37	0.43	0.58
EXPANSION PRESSURE THICKNESS, ft.	0.33	0.17	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	75
R-VALUE BY EXUDATION:	72
EQUILIBRIUM R-VALUE:	72

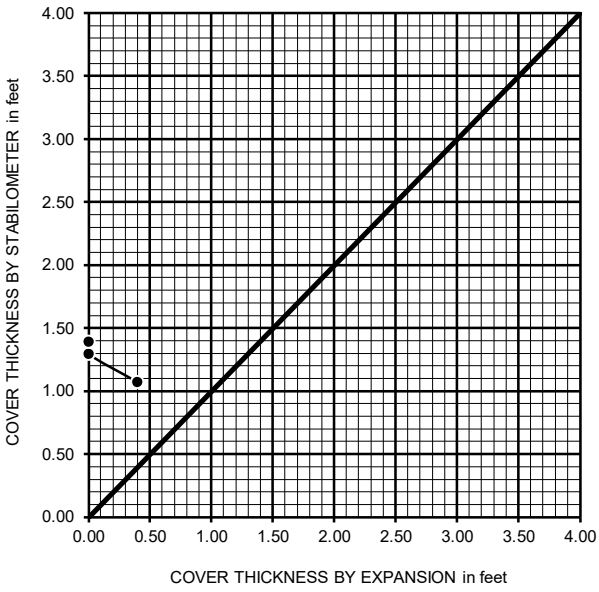
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Muslim Mortuary Crescent Gardens Canyon	PROJECT NUMBER:	038.0000019894
BORING NUMBER:	TP-5	DEPTH (FT.):	0-1
SAMPLE NUMBER:	B-1	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Strong brown clayey sand (SC)	DATE COMPLETED:	2/1/2024

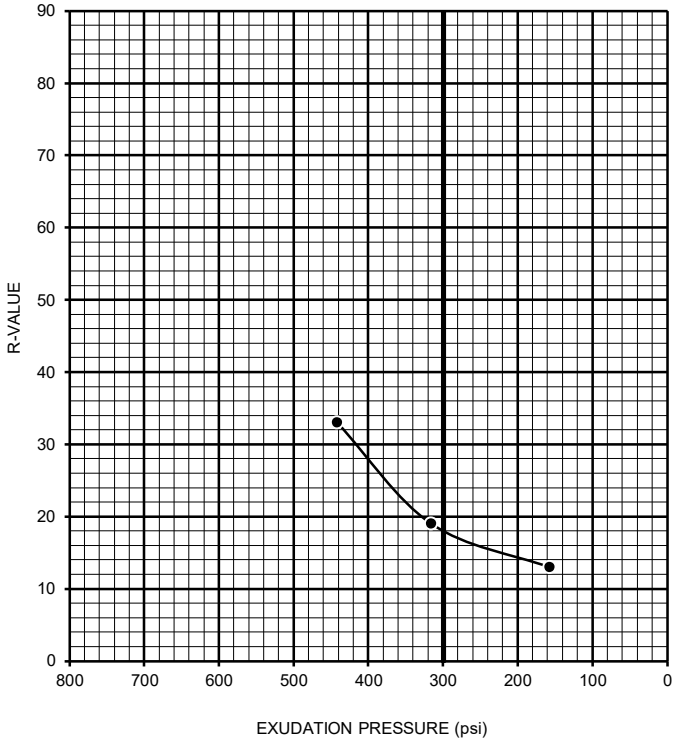
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	11.7	12.7	14.0
HEIGHT OF SAMPLE, Inches	2.46	2.53	2.48
DRY DENSITY, pcf	126.3	123.4	122.0
COMPACTOR PRESSURE, psi	100	60	50
EXUDATION PRESSURE, psi	442	316	158
EXPANSION, Inches x 10exp-4	12	0	0
STABILITY Ph 2,000 lbs (160 psi)	88	114	127
TURNS DISPLACEMENT	4.15	4.30	4.50
R-VALUE UNCORRECTED	33	19	13
R-VALUE CORRECTED	33	19	13

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	1.07	1.30	1.39
EXPANSION PRESSURE THICKNESS, ft.	0.40	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	38
R-VALUE BY EXUDATION:	18
EQUILIBRIUM R-VALUE:	18

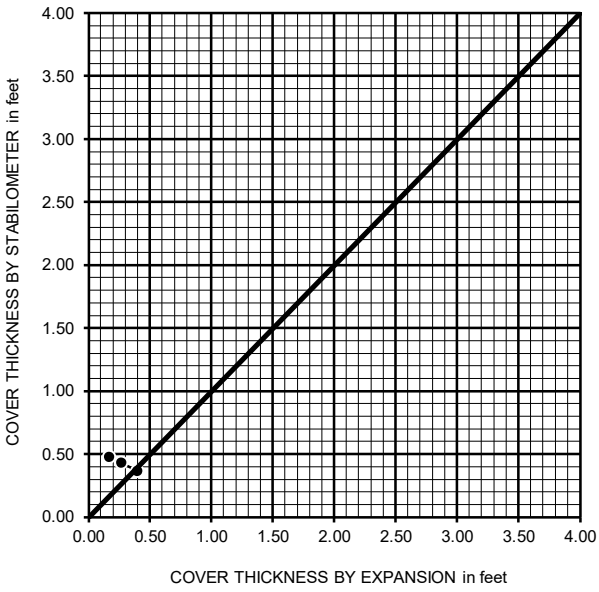
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Muslim Mortuary Crescent Gardens Canyon	PROJECT NUMBER:	038.0000019894
BORING NUMBER:	TP-6	DEPTH (FT.):	0-1
SAMPLE NUMBER:	B-1	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Dark yellowish brown silty sand with gravel (SM)g	DATE COMPLETED:	2/1/2024

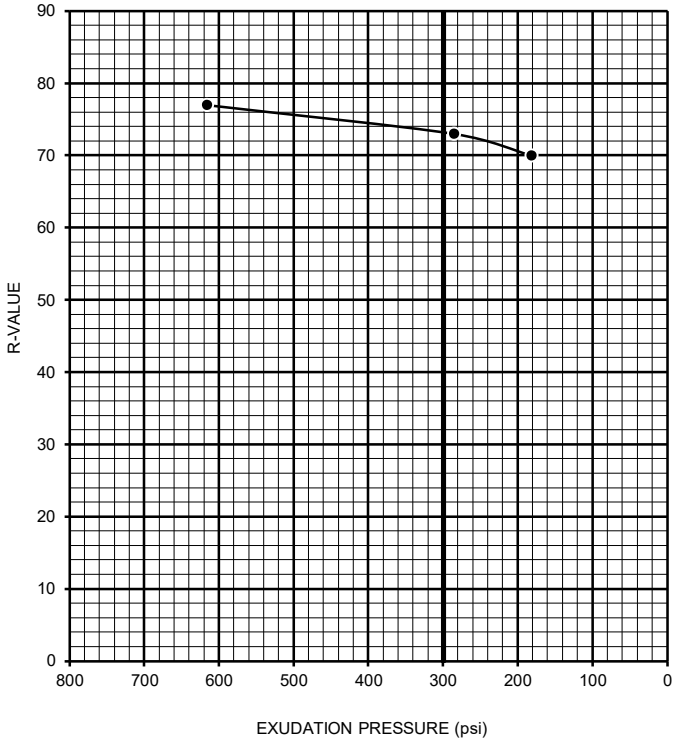
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	9.4	9.8	10.2
HEIGHT OF SAMPLE, Inches	2.54	2.52	2.55
DRY DENSITY, pcf	126.7	125.5	124.5
COMPACTOR PRESSURE, psi	275	225	200
EXUDATION PRESSURE, psi	616	285	181
EXPANSION, Inches x 10exp-4	12	8	5
STABILITY Ph 2,000 lbs (160 psi)	20	24	26
TURNS DISPLACEMENT	5.13	5.28	5.45
R-VALUE UNCORRECTED	77	73	70
R-VALUE CORRECTED	77	73	70

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.37	0.43	0.48
EXPANSION PRESSURE THICKNESS, ft.	0.40	0.27	0.17

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	78
R-VALUE BY EXUDATION:	73
EQUILIBRIUM R-VALUE:	73

TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name: Muslim Mortuary Crescent Gardens Canyon Tested By : K. Jumig Date: 02/01/24

Project No. : 038.0000019894 Checked By: A. Santos Date: 02/08/24

Boring No.	TP-1			
Sample No.	B-1			
Sample Depth (ft)	1-2			
Soil Identification:	Yellowish brown (SP-SC)			
Wet Weight of Soil + Container (g)	0.00			
Dry Weight of Soil + Container (g)	0.00			
Weight of Container (g)	1.00			
Moisture Content (%)	0.00			
Weight of Soaked Soil (g)	100.67			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	404			
Crucible No.	K			
Furnace Temperature (°C)	860			
Time In / Time Out	8:50/9:35			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	11.2860			
Wt. of Crucible (g)	11.2846			
Wt. of Residue (g) (A)	0.0014			
PPM of Sulfate (A) x 41150	57.61			
PPM of Sulfate, Dry Weight Basis	**58**			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	30			
ml of AgNO3 Soln. Used in Titration (C)	0.5			
PPM of Chloride (C -0.2) * 100 * 30 / B	30			
PPM of Chloride, Dry Wt. Basis	**30**			

pH TEST, DOT California Test 643

pH Value	**7.67**			
Temperature °C	20.7			

SOIL RESISTIVITY TEST

DOT CA TEST 643

Project Name:	Muslim Mortuary Crescent Gardens Canyon		Tested By :	K. Jumig	Date: 02/05/24
Project No. :	038.0000019894		Checked By:	A. Santos	Date: 02/08/24
Boring No.:	TP-1		Depth (ft.) :	1-2	
Sample No. :	B-1				

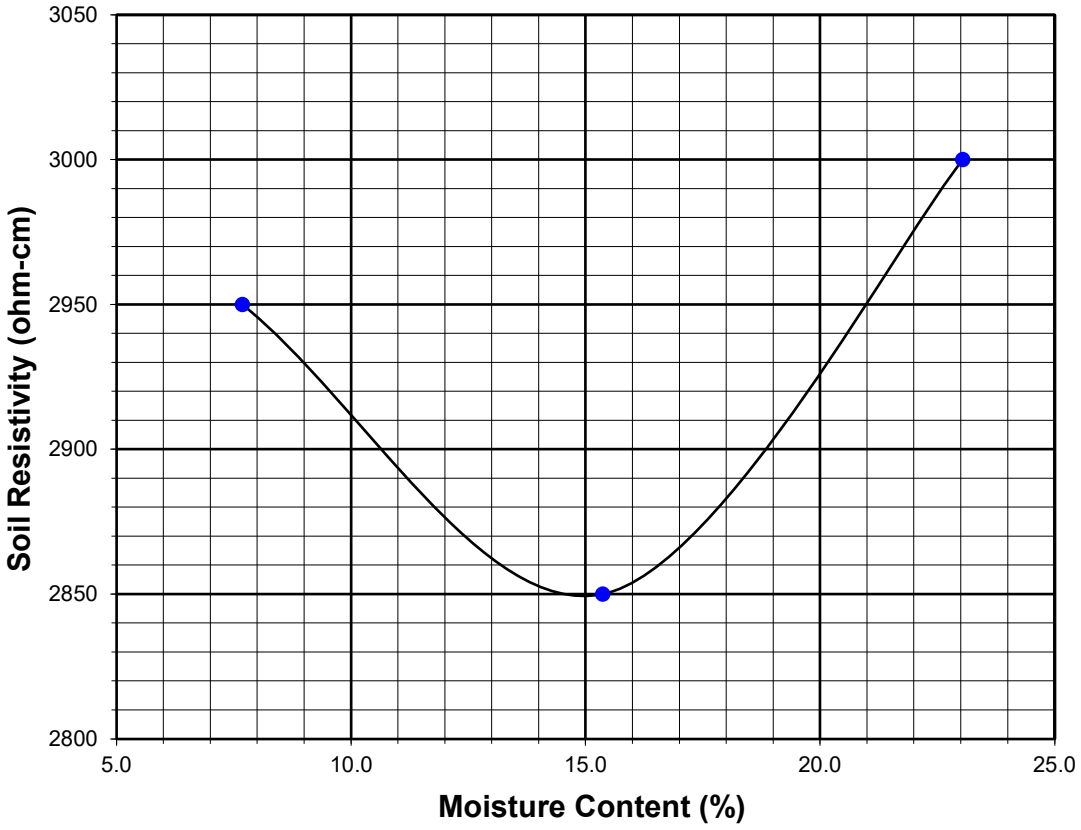
Soil Identification:* Yellowish brown (SP-SC)

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	10	7.68	2950	2950
2	20	15.36	2850	2850
3	30	23.04	3000	3000
4				
5				

Moisture Content (%) (MCi)	0.00
Wet Wt. of Soil + Cont. (g)	0.00
Dry Wt. of Soil + Cont. (g)	0.00
Wt. of Container (g)	1.00
Container No.	
Initial Soil Wt. (g) (Wt)	130.19
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH	
				pH	Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
2850	**15.0**	**58**	**30**	**7.67**	**20.7**



EEI 2006 LABORATORY

Leighton
a verdantas company

CONSOLIDATION-SWELL TEST ASTM D 2435

Job Data
Job No.: P051109-1
Client: Lowe's HIW
Project Name: Shopoff Group, Meadowbrook
Date: 4/28/06
Sample Data
Sample: B2 10-11'
Sample Type: In-place California Modified
Remarks:
Soil Description: Decomposed Granite

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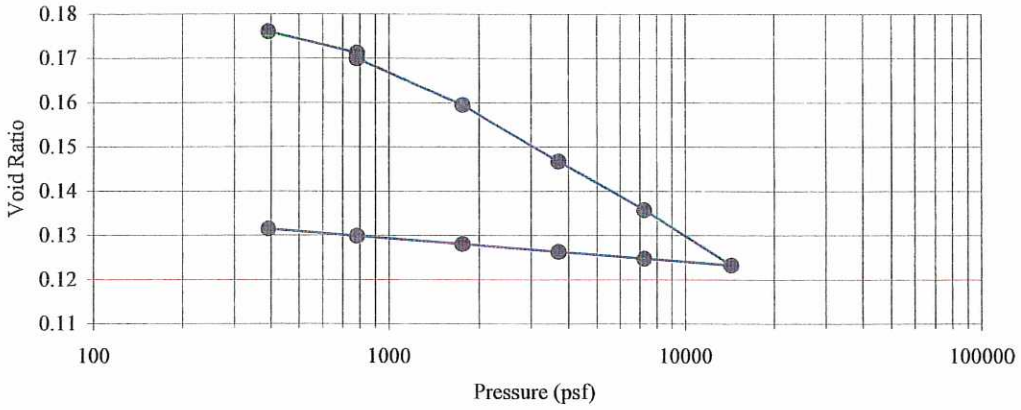

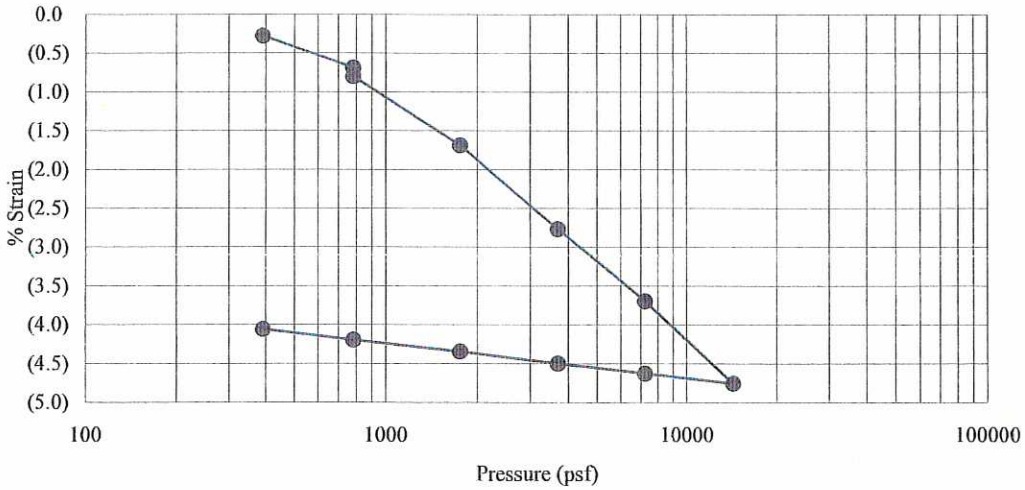

Swell Pressure:	786	psf
Percent Swell:	-0.1%	
Comp. Index (Cc):	0.042	
Consol. Index (Cr):	0.005	

Specimen Diameter:	2.42	in.
Specimen Height:	1.00	in.
Overburden Pressure (Po):	1275	psf
Preconsol. Pressure (Pp):	n/a	psf

	Initial	Final
Moisture Content:	5.2%	8.4%
Void Ratio:	0.176	0.131
Saturation:	n/a	180%
Dry Density (pcf):	142.9	150.0

CONSOLIDATION-SWELL TEST ASTM D 2435

Job Data
Job No.: P051109-1
Client: Lowe's HIW
Project Name: Shopoff Group, Meadowbrook
Date: 4/28/06
Sample Data
Sample: B4A 5-6'
Sample Type: In-place California Modified
Remarks:
Soil Description: Clayey Sand

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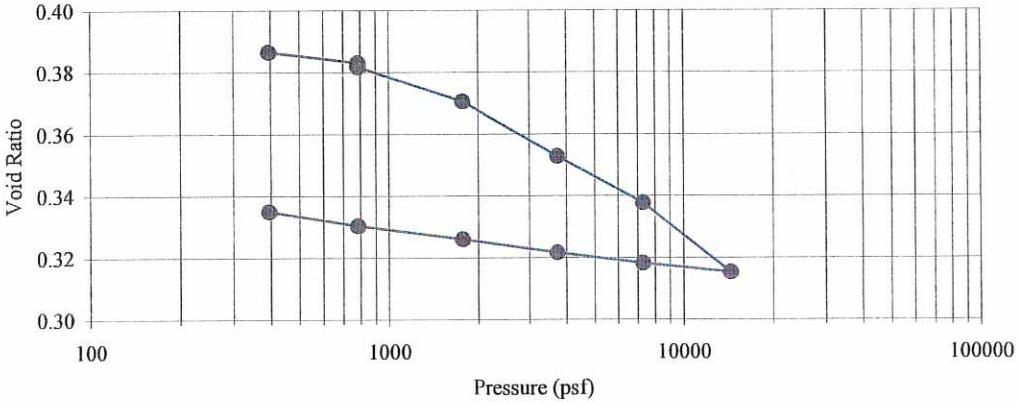

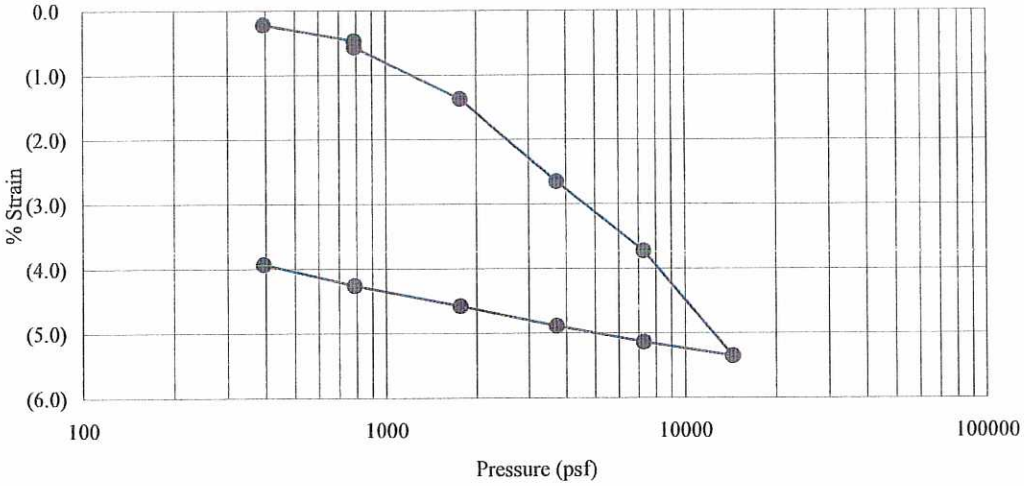

Swell Pressure:	786	psf
Percent Swell:	-0.1%	
Comp. Index (Cc):	0.076	
Consol. Index (Cr):	0.013	

Specimen Diameter:	2.42	in.
Specimen Height:	1.00	in.
Overburden Pressure (Po):	575	psf
Preconsol. Pressure (Pp):	n/a	psf

	Initial	Final
Moisture Content:	10.3%	15.0%
Void Ratio:	0.387	0.335
Saturation:	n/a	125%
Dry Density (pcf):	121.2	127.5

DIRECT SHEAR TEST ASTM D 3080

Job Data	
Job No.:	P051109-1
Client:	Shopoff Group, Meadowbrook
Date:	4/19/06
Sample Data	
Sample:	B1 5-6'
Sample Type:	Natural
Remarks:	Sample Innundated Prior to Testing
Soil Description:	DG

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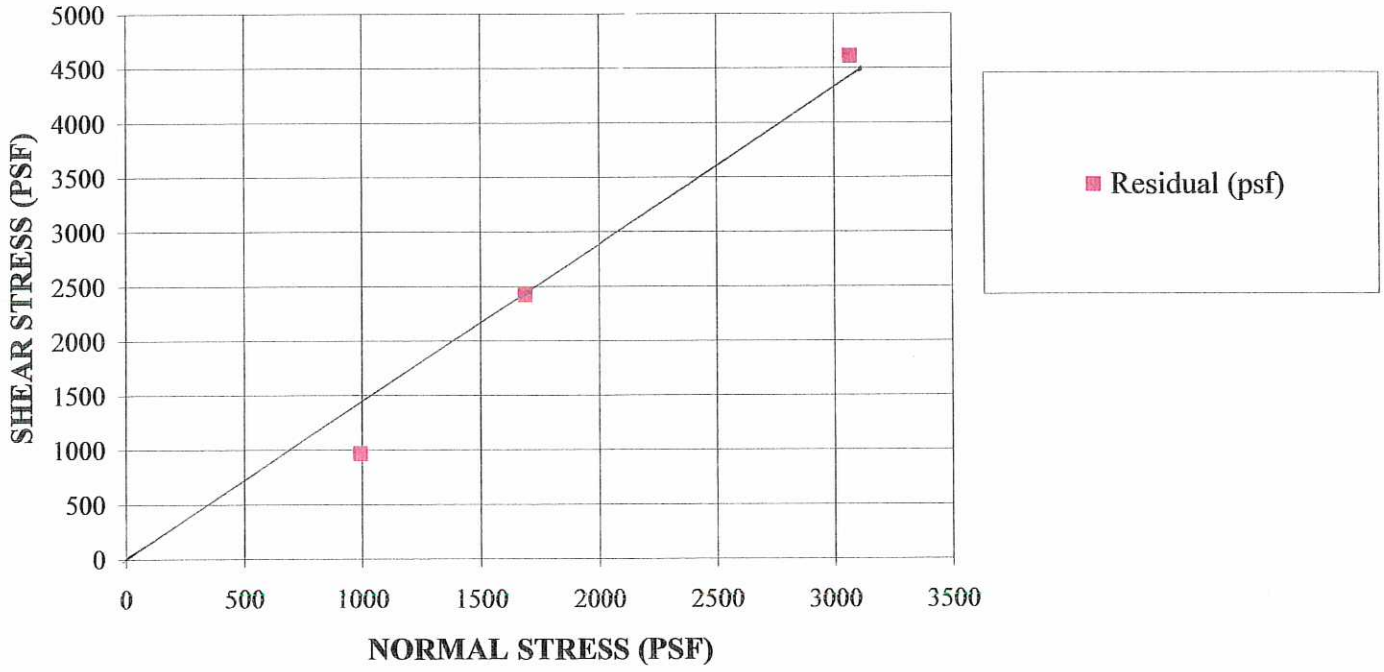
SHEAR TEST DIAGRAM



	Test Results Phi		Cohesion	
Residual (psf)	60	degrees	0	psf

Average Initial Moisture	3.9%
Average Dry Density	109.0 pcf
Average Final Moisture	10.8%

DIRECT SHEAR TEST ASTM D 3080

Job Data	
Job No.:	P051109-1
Client:	Shopoff Group, Meadowbrook
Date:	4/19/06
Sample Data	
Sample:	B2 5-6'
Sample Type:	Natural
Remarks:	Sample Innundated Prior to Testing
Soil Description:	SW-SM

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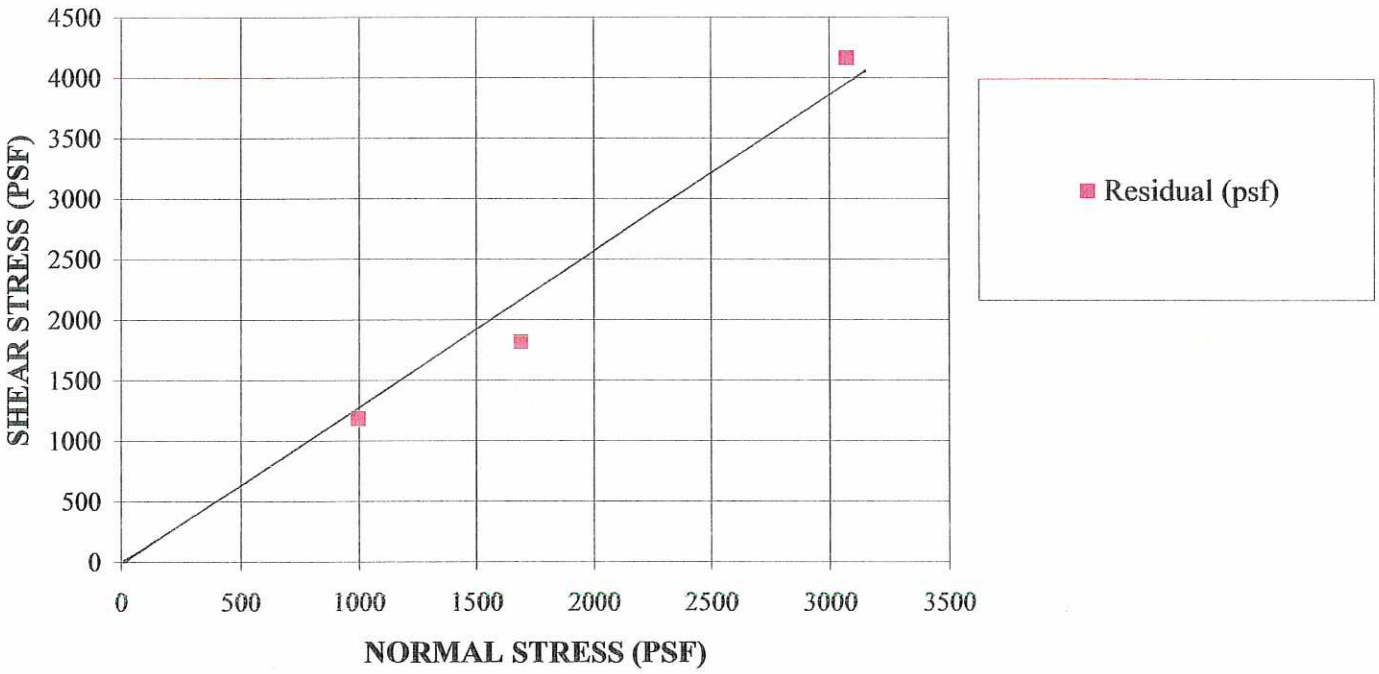
SHEAR TEST DIAGRAM



	Test Results Phi		Cohesion	
Residual (psf)	56	degrees	0	psf

Average Initial Moisture	5.9%
Average Dry Density	106.3 pcf
Average Final Moisture	12.3%

DIRECT SHEAR TEST ASTM D 3080

Job Data	
Job No.:	P051109-1
Client:	Shopoff Group, Meadowbrook
Date:	4/19/06
Sample Data	
Sample:	B3 5-6'
Sample Type:	Natural
Remarks:	Sample Innundated Prior to Testing
Soil Description:	DG

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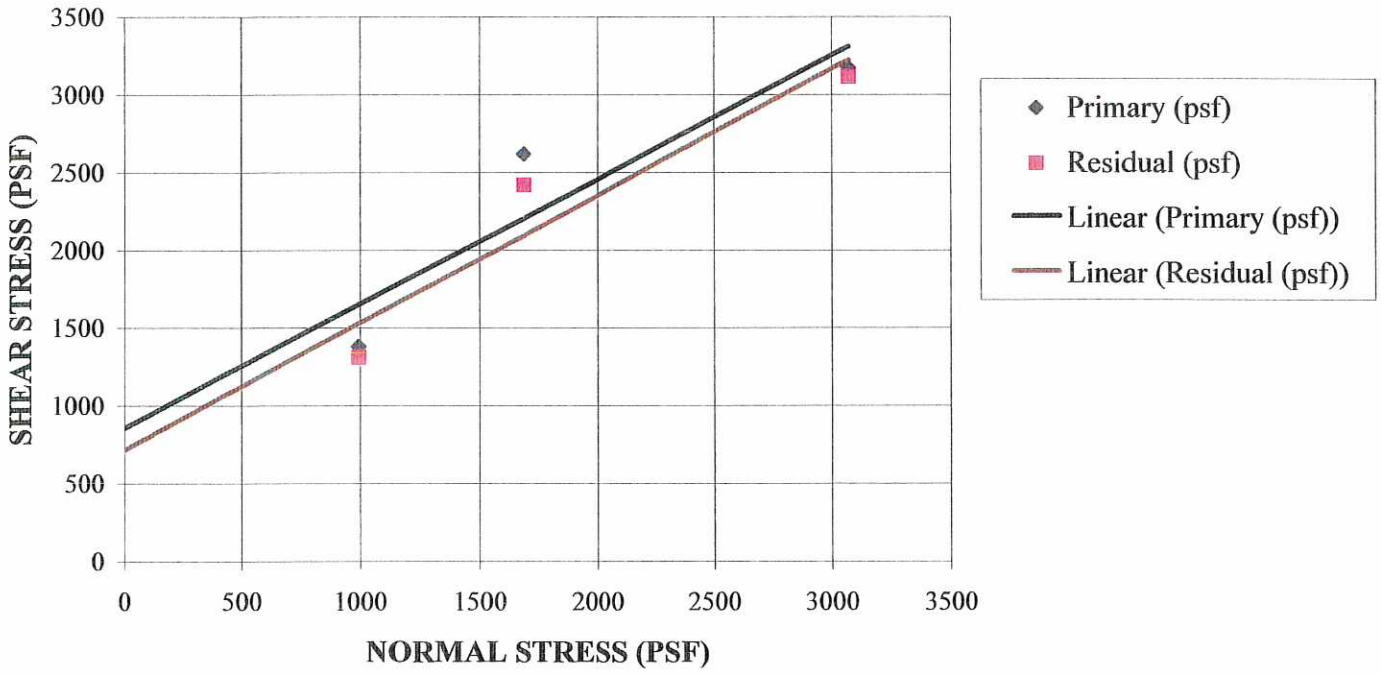
SHEAR TEST DIAGRAM



Test Results

	Phi		Cohesion	
Primary (psf)	39	degrees	860	psf
Residual (psf)	39	degrees	716	psf

Average Initial Moisture	3.2%
Average Dry Density	105.1 pcf
Average Final Moisture	12.6%

DIRECT SHEAR TEST ASTM D 3080

Job Data	
Job No.:	P051109-1
Client:	Shopoff Group - Meadowbrook
Date:	4/14/06
Sample Data	
Sample:	TP-22 2-4'
Sample Type:	Remolding to 92% of Max. Proctor
Remarks:	Sample Innundated Prior to Testing
Soil Description:	SW-SM, Well Graded Sand with Silt

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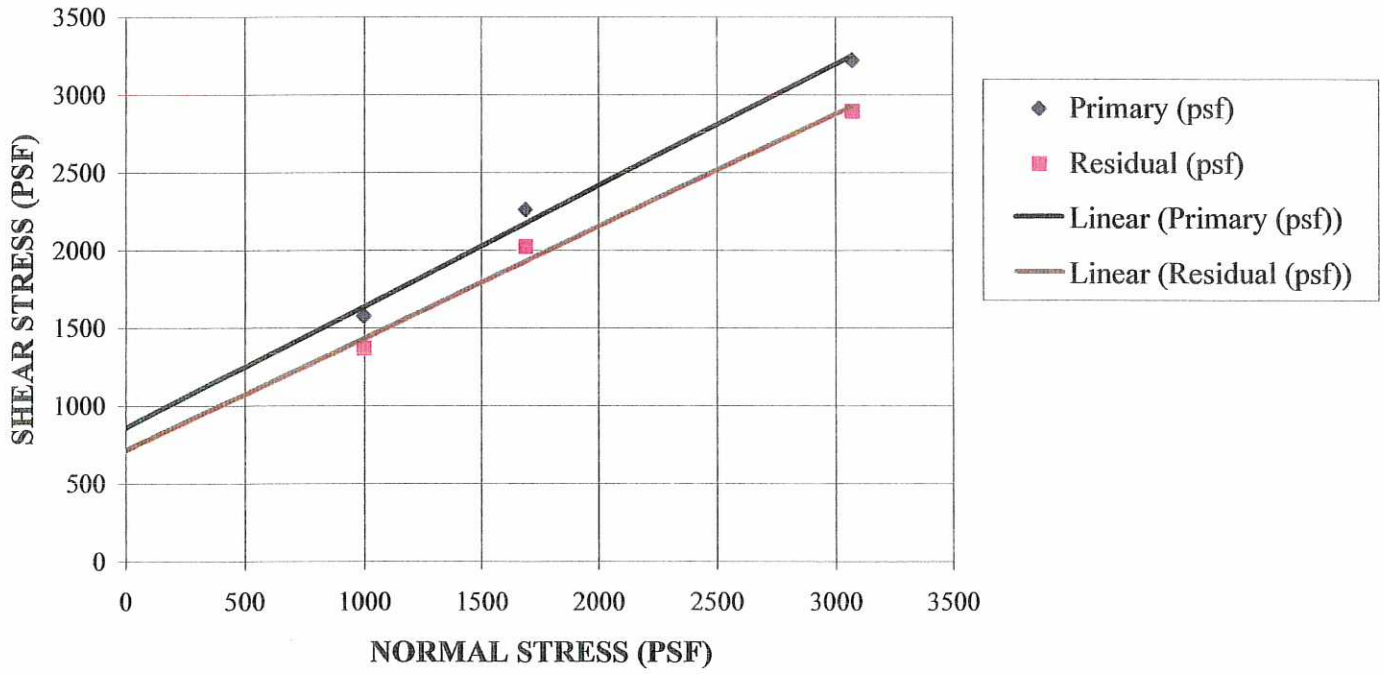
SHEAR TEST DIAGRAM



Test Results

	Phi		Cohesion	
Primary (psf)	38	degrees	861	psf
Residual (psf)	36	degrees	715	psf

Average Initial Moisture	8.5%
Average Dry Density	120.4 pcf
Average Final Moisture	10.8%

DIRECT SHEAR TEST ASTM D 3080

Job Data	
Job No.:	P051109-1
Client:	Shopoff Group - Meadowbrook
Date:	4/18/06
Sample Data	
Sample:	TP-31 0-4'
Sample Type:	Remolding to 92% of Max. Proctor
Remarks:	Sample Innundated Prior to Testing
Soil Description:	SC-SM, Silty, Clayey Sand with Gravel

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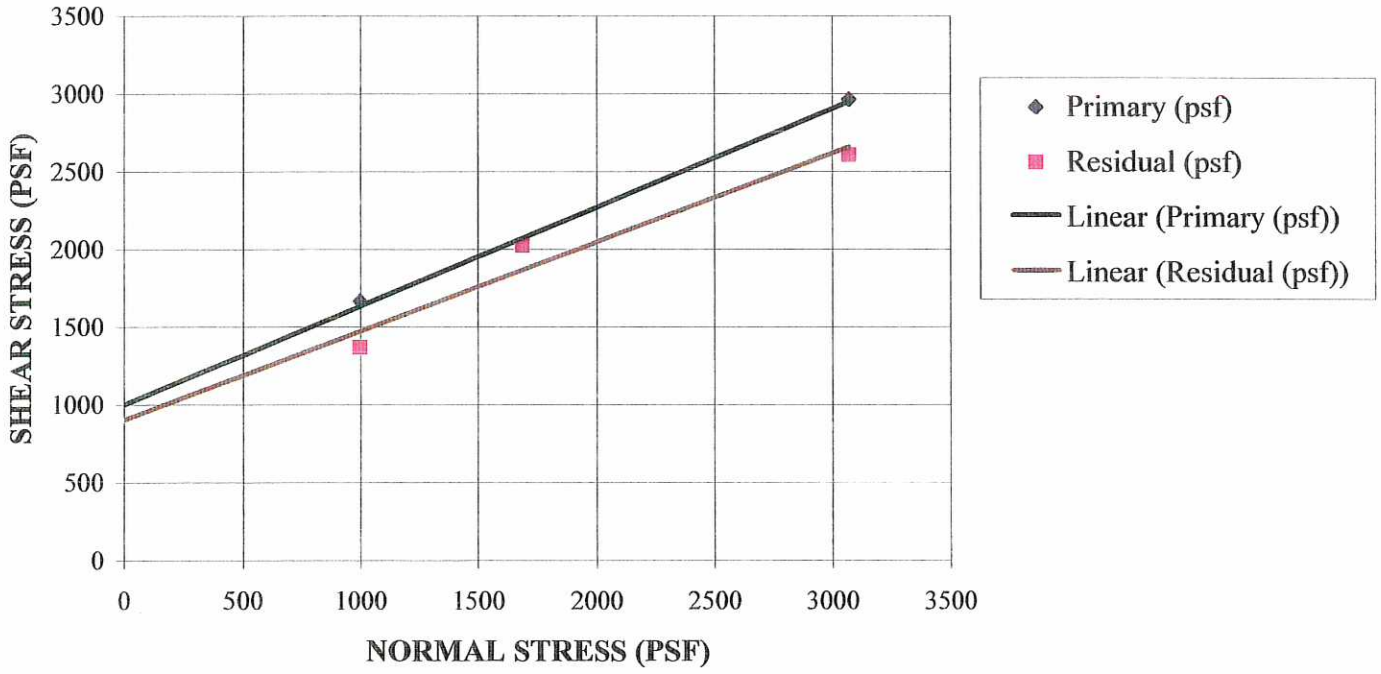
SHEAR TEST DIAGRAM



Test Results

	Phi		Cohesion	
Primary (psf)	32	degrees	1005	psf
Residual (psf)	30	degrees	904	psf

Average Initial Moisture	9.0%
Average Dry Density	126.6 pcf
Average Final Moisture	13.2%

EXPANSION INDEX TEST

ASTM METHOD D 4829

Sample : TP-3 0-4'

Moisture Content of Initial Sample		% Saturation of Re-molded Sample		Moisture Content of Final Sample	
Tare No. -		Wt. of Soil and Ring (g) -	624.5	Wt. of Soil and Ring (g) -	657
Wet Weight and Tare (g) -	200.0	Ring Weight (g) -	207.3	Ring Weight (g) -	207.3
Dry Weight and Tare (g) -	185.3	Wet Weight of Soil (g) -	417.2	Wet Weight of Soil (g) -	449.7
Tare Weight (g) -	0.0	Dry Weight of Soil (g) -	386.5	Dry Weight of Soil (g) -	386.5
Water Loss (g) -	14.7	Volume of Ring (ft^3) -	0.0073	Weight of Water (g) -	63.2
Dry Weight (g) -	185.3	Dry Density (pcf) -	116.7	*Final Moisture (%)*	*16.3*
Initial Moisture (%) -	*7.9*	*Initital Saturation (%) -*	*48.3*	*Final Saturation (%) -*	*99.5*

	Expansion Test - UBC (144 PSF)			
	Date	Time	Reading	
Add Weight	4/13/2006	16:18	0.340	
Add Water 10 Minutes		16:28	0.345	Initial Reading
		16:54	0.349	
	4/14/2006	9:19	0.349	
		14:02	0.349	Final Reading

EImeasured	=	4
EI_{50}	=	3

Expansion Index, EI_{50}	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4-13-06

Boring Number: TP-3

Location: 0-4'

Soil Description: Silty, Clayey Sand, SC-SM

Tested by: AW

EXPANSION INDEX TEST

ASTM METHOD D 4829

Sample : TP-31 0-4'

Moisture Content of Initial Sample		% Saturation of Re-molded Sample		Moisture Content of Final Sample	
Tare No. -		Wt. of Soil and Ring (g) -	635	Wt. of Soil and Ring (g) -	652
Wet Weight and Tare (g) -	200.0	Ring Weight (g) -	207.3	Ring Weight (g) -	207.3
Dry Weight and Tare (g) -	184.4	Wet Weight of Soil (g) -	427.7	Wet Weight of Soil (g) -	444.7
Tare Weight (g) -	0.0	Dry Weight of Soil (g) -	394.3	Dry Weight of Soil (g) -	394.3
Water Loss (g) -	15.6	Volume of Ring (ft^3) -	0.0073	Weight of Water (g) -	50.4
Dry Weight (g) -	184.4	Dry Density (pcf) -	119.1	*Final Moisture (%)*	*12.8*
Initial Moisture (%) -	*8.5*	*Initital Saturation (%) -*	*55.1*	*Final Saturation (%) -*	*83.1*

Expansion Test - UBC (144 PSF)				
	Date	Time	Reading	
Add Weight	4/14/2006	14:40	0.377	
Add Water 10 Minutes		14:50	0.377	Initial Reading
		15:55	0.380	
	4/15/2006	12:00	0.380	
		17:30	0.381	Final Reading

EImeasured	=	4
EI_{50}	=	**6**

Expansion Index, EI_{50}	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4-13-06

Boring Number: TP-31

Location: 0-4'

Soil Description: Silty, Clayey Sand with Gravel, SC-SM

Tested by: AW

Table 1 - Laboratory Tests on Soil Samples

E.E.I.
Shopoff Group
Your #P051109-1, MJS&A #06-0589LAB
7-Apr-06

Sample ID			TP-3 @ 0'-4' Bulk	TP-22 @ 2'-4' DG	TP-31 @ 0'-4' QSW
Resistivity		**Units**			
as-received		ohm-cm	160,000	500,000	370,000
saturated		ohm-cm	5,400	33,000	4,700
pH			6.8	7.2	6.8
Electrical Conductivity		mS/cm	0.07	0.02	0.10
Chemical Analyses					
Cations					
calcium	Ca^{2+}	mg/kg	56	20	88
magnesium	Mg^{2+}	mg/kg	70	7	61
sodium	Na^{1+}	mg/kg	ND	ND	ND
Anions					
carbonate	CO_3^{2-}	mg/kg	ND	ND	ND
bicarbonate	HCO_3^{1-}	mg/kg	153	31	265
chloride	Cl^{1-}	mg/kg	ND	ND	15
sulfate	SO_4^{2-}	mg/kg	39	27	32
Other Tests					
ammonium	NH_4^{1+}	mg/kg	na	na	na
nitrate	NO_3^{1-}	mg/kg	na	na	na
sulfide	S^{2-}	qual	na	na	na
Redox		mV	na	na	na

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract.
mg/kg = milligrams per kilogram (parts per million) of dry soil.
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

R - VALUE DATA SHEET

P.N. P051109-1
Meadow Brook

PROJECT NUMBER 33240 BORING NUMBER: TP-3 @ 0'-4'

SAMPLE DESCRIPTION: Brown Silty Sand

Item	SPECIMEN		
	a	b	c
Mold Number	10	11	12
Water added, grams	55	75	40
Initial Test Water, %	10.8	12.5	9.4
Compact Gage Pressure,psi	105	50	350
Exudation Pressure, psi	277	164	543
Height Sample, Inches	2.63	2.62	2.53
Gross Weight Mold, grams	3346	3287	3326
Tare Weight Mold, grams	2123	2101	2117
Sample Wet Weight, grams	1223	1186	1209
Expansion, Inches x 10exp-4	0	0	6
Stability 2,000 lbs (160psi)	28 / 64	36 / 84	19 / 39
Turns Displacement	4.82	5.33	4.23
R-Value Uncorrected	44	30	65
R-Value Corrected	48	33	65
Dry Density, pcf	127.2	121.9	132.3
DESIGN CALCULATION DATA			
Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.53	0.69	0.36
G. E. by Expansion	0.00	0.00	0.20

Equilibrium R-Value **50** by EXUDATION

Examined & Checked: 4 /12/ 06

Gf = 1.25

REMARKS:

Steven R. Marvin, RCE 30659

The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

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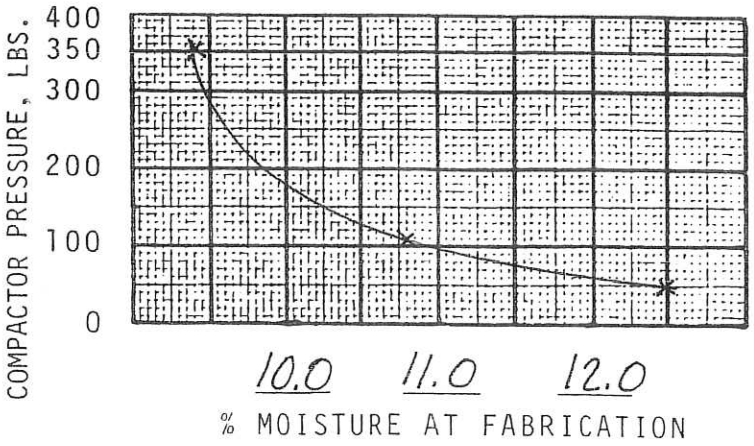
R-VALUE GRAPHICAL PRESENTATION

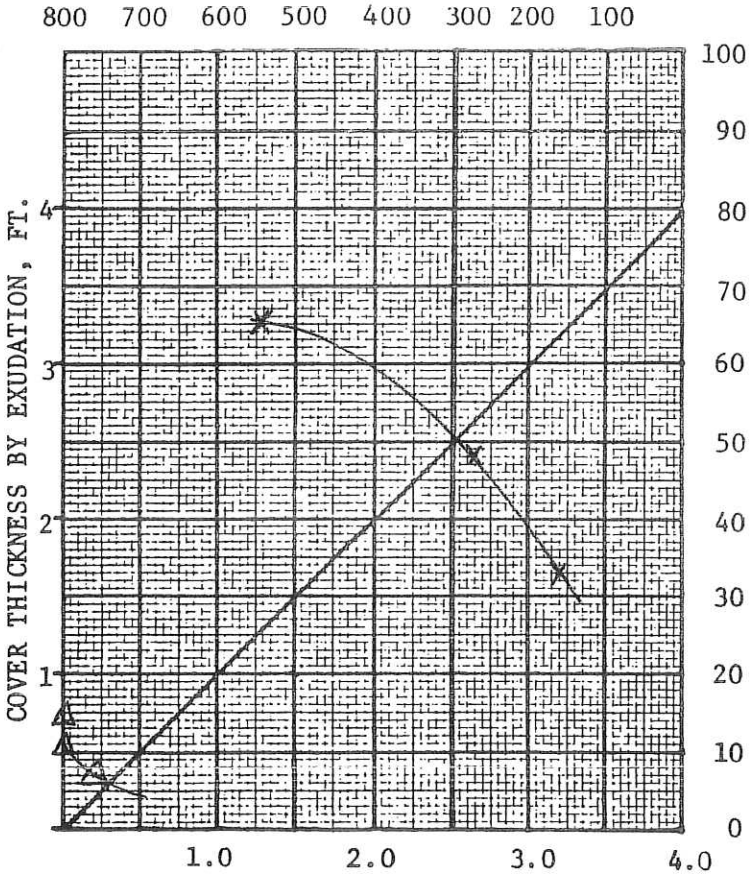
PROJECT NO. 33240
P.N. P051109-1 TP-3@0-4'
BORING NO. Meadowbrook
DATE 4/12/06

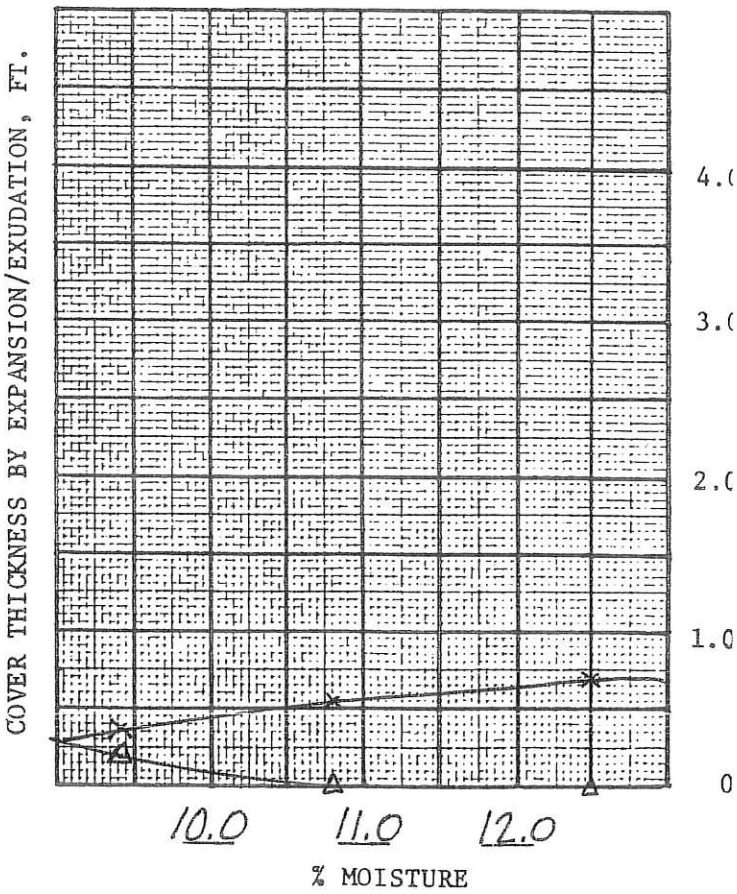
TRAFFIC INDEX Assumed 4.0

R-VALUE BY EXUDATION 50

R-VALUE BY EXPANSION —







R-VALUE vs. EXUD. PRES.

T by EXUDATION

EXUD. T vs. EXPAN. T

T by EXPANSION

REMARKS Gf = 1.25

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PROFESSIONAL PAVEMENT ENGINEERING

R - VALUE DATA SHEET

P.N. P051109-1
Meadow Brook

PROJECT NUMBER 33240 BORING NUMBER: TP-22 @ 2'-4'

SAMPLE DESCRIPTION: Brown Medium to Coarse Sand

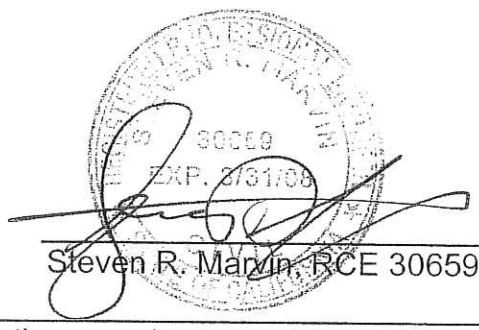
Item	SPECIMEN		
	a	b	c
Mold Number	7	8	9
Water added, grams	80	95	71
Initial Test Water, %	10.0	11.3	9.2
Compact Gage Pressure,psi	350	350	350
Exudation Pressure, psi	302	176	493
Height Sample, Inches	2.53	2.61	2.53
Gross Weight Mold, grams	3297	3328	3275
Tare Weight Mold, grams	2125	2116	2113
Sample Wet Weight, grams	1172	1212	1162
Expansion, Inches x 10exp-4	0	0	6
Stability 2,000 lbs (160psi)	15 / 29	17 / 34	11 / 20
Turns Displacement	5.36	5.41	5.31
R-Value Uncorrected	68	63	77
R-Value Corrected	68	66	77
Dry Density, pcf	127.6	126.5	127.4
DESIGN CALCULATION DATA			
Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.33	0.35	0.24
G. E. by Expansion	0.00	0.00	0.20

Equilibrium R-Value 68 by EXUDATION

Examined & Checked: 4 /12/ 06

Gf = 1.25

REMARKS:



The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

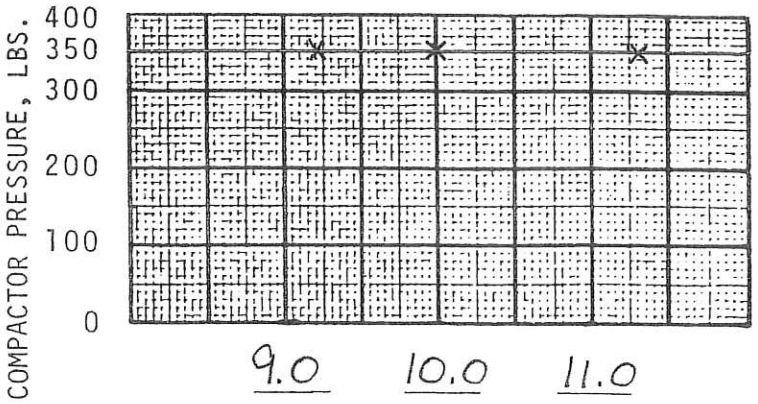
R-VALUE GRAPHICAL PRESENTATION

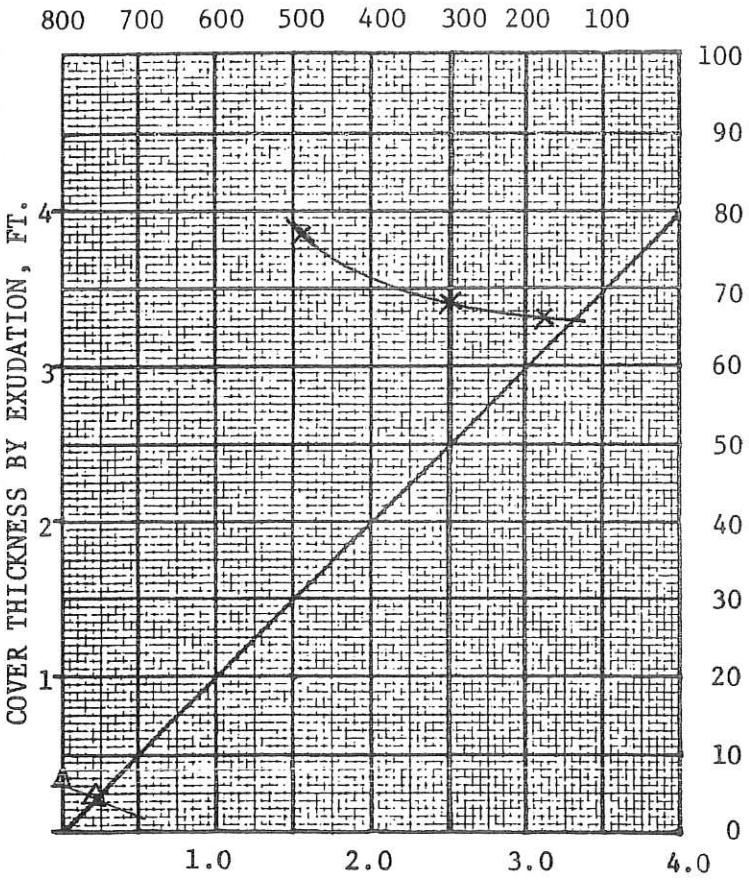
PROJECT NO. 33240
P.N. P051109-1 TP-22@2-4'
BORING NO. MeadowBrook
DATE 4/12/06

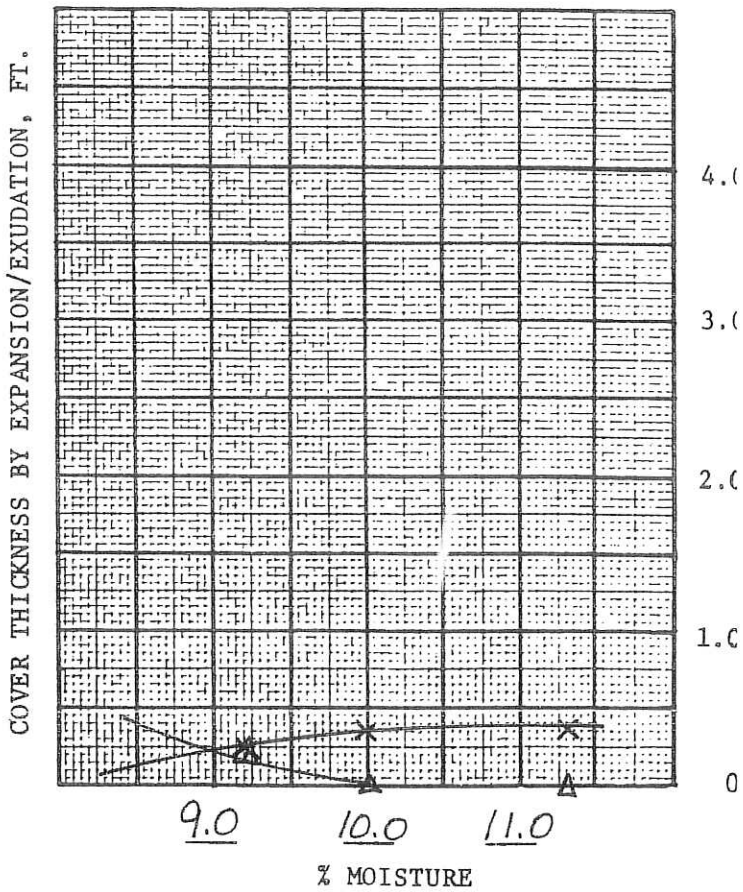
TRAFFIC INDEX Assumed 4.0

R-VALUE BY EXUDATION 68

R-VALUE BY EXPANSION —







R-VALUE vs. EXUD. PRES.
T by EXUDATION
EXUD. T vs. EXPAN. T
T by EXPANSION

REMARKS Gf=1.25

LaBelle • Marvin
PROFESSIONAL PAVEMENT ENGINEERING

R - VALUE DATA SHEET

P.N. P051109-1
Meadow Brook

PROJECT NUMBER 33240 BORING NUMBER: TP-31 @ 2'-4'

SAMPLE DESCRIPTION: Brown Silty Sand

Item	SPECIMEN		
	a	b	c
Mold Number	4	5	6
Water added, grams	50	64	45
Initial Test Water, %	9.9	11.2	9.5
Compact Gage Pressure,psi	220	90	350
Exudation Pressure, psi	357	241	475
Height Sample, Inches	2.60	2.64	2.60
Gross Weight Mold, grams	3324	3322	3346
Tare Weight Mold, grams	2120	2117	2122
Sample Wet Weight, grams	1204	1205	1224
Expansion, Inches x 10exp-4	16	5	19
Stability 2,000 lbs (160psi)	27 / 53	33 / 71	26 / 49
Turns Displacement	5.13	5.73	4.82
R-Value Uncorrected	50	35	54
R-Value Corrected	53	38	57
Dry Density, pcf	127.6	124.4	130.3
DESIGN CALCULATION DATA			
Traffic Index Assumed:	4.0	4.0	4.0
G.E. by Stability	0.48	0.63	0.44
G. E. by Expansion	0.53	0.17	0.63

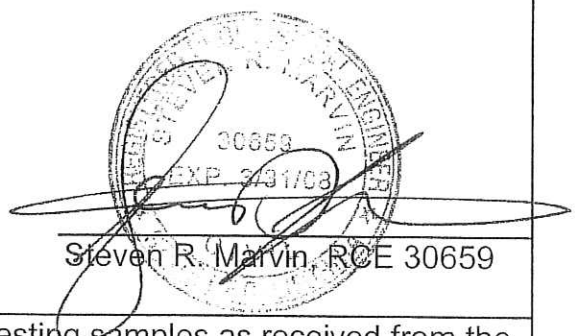
Equilibrium R-Value 46 by EXUDATION

Examined & Checked: 4 /12/ 06

Gf = 1.25

2.3% Ret. On 3/4" sieve.

REMARKS:



Steven R. Marvin, RCE 30659

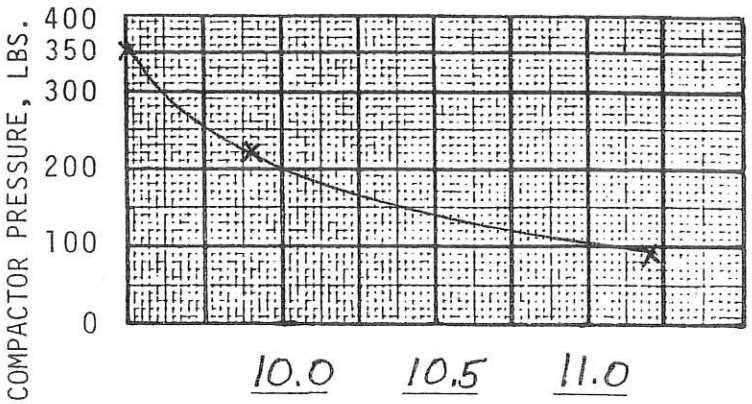
The data above is based upon processing and testing samples as received from the field. Test procedures in accordance with latest revisions to Department of Transportation, State of California, Materials & Research Test Method No. 301.

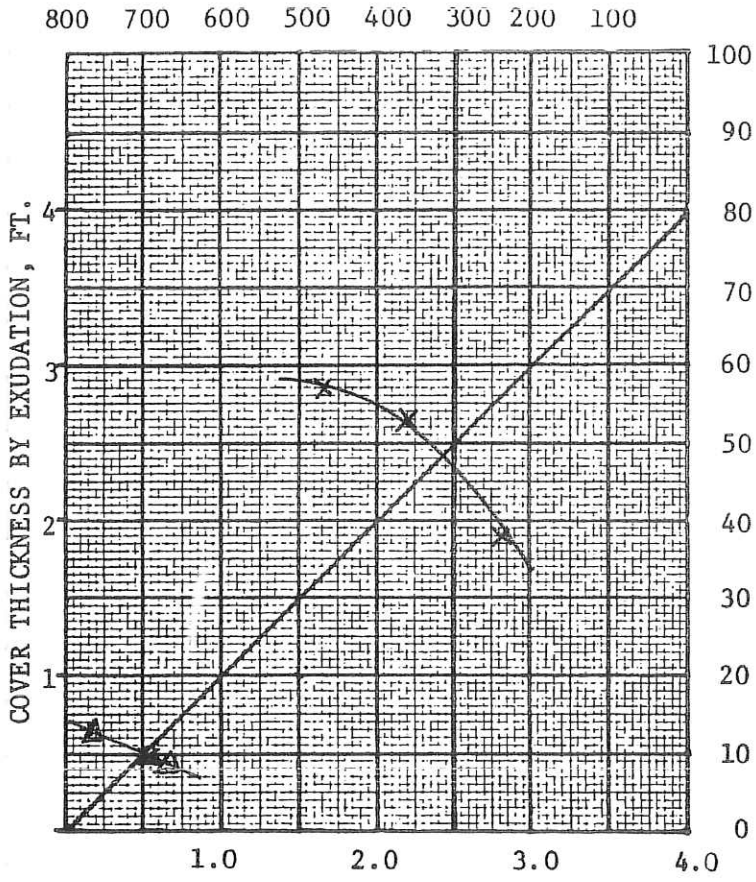
LaBelle • Marvin

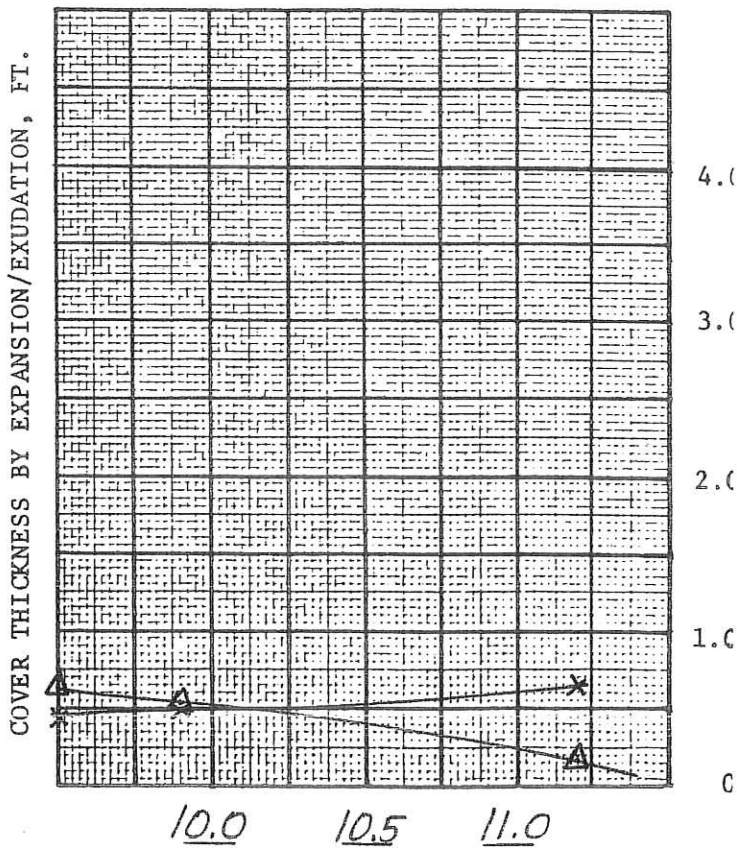
R-VALUE GRAPHICAL PRESENTATION

PROJECT NO. 33240
P.N. P051109-1 TP-31@2'-4'
BORING NO. Meadow Brook
DATE 4/12/06

TRAFFIC INDEX Assumed 4.0
R-VALUE BY EXUDATION 46
R-VALUE BY EXPANSION —







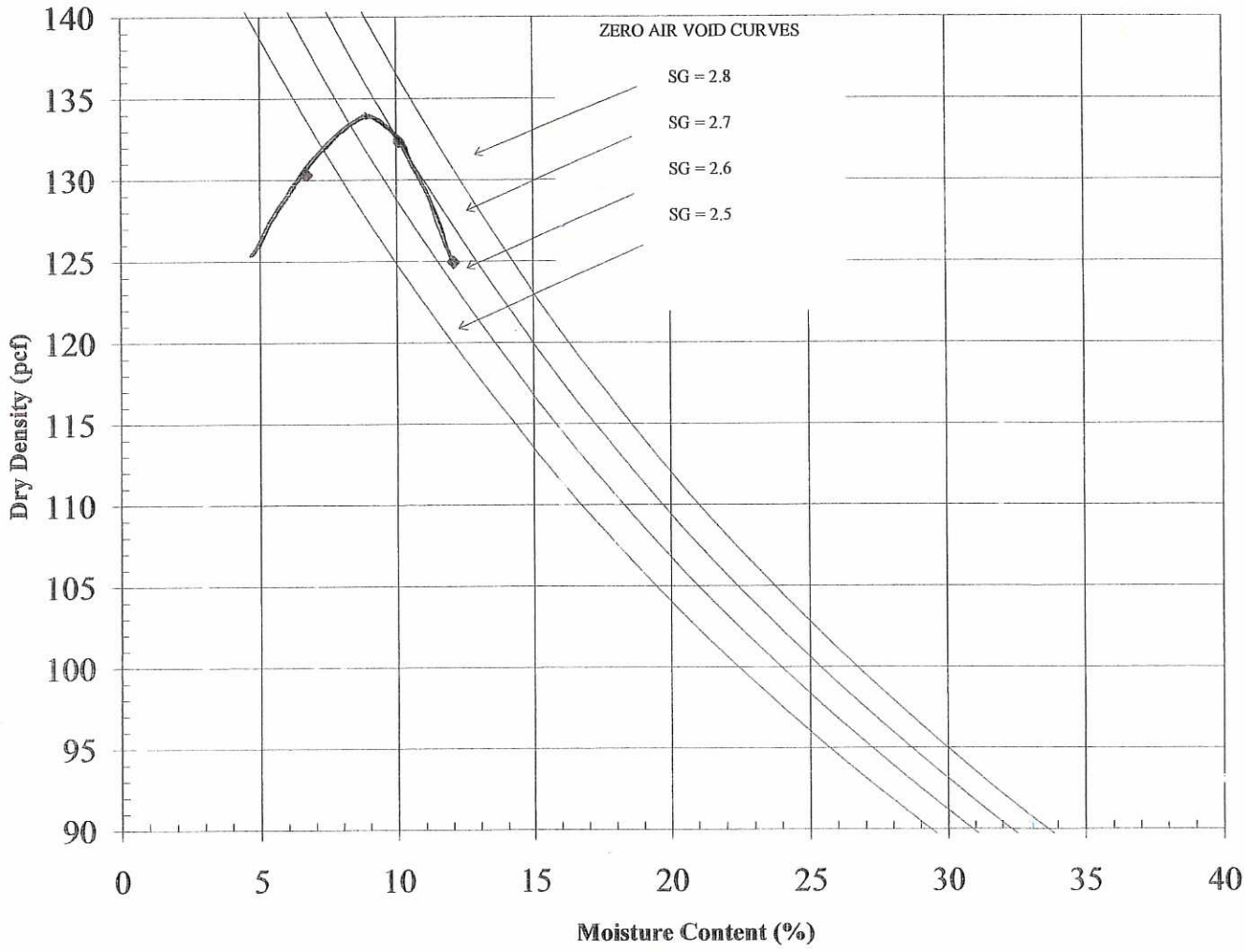
R-VALUE vs. EXUD. PRES.
T by EXUDATION
EXUD. T vs. EXPAN. T
T by EXPANSION

REMARKS Gf=1.25

LaBelle • Marvin
PROFESSIONAL PAVEMENT ENGINEERING

LABORATORY COMPACTION ASTM D 1557

Sample	1	2	3	
Mold and wet soil (lbs.)	13.882	14.104	13.918	
Mold (lbs.)	9.250	9.250	9.250	
Wet Soil (lbs.)	4.632	4.854	4.668	
Wet Density (pcf)	139.10	145.77	140.05	
Moisture (%)	6.7	10.1	12.1	
Dry Density (pcf)	130.3	132.4	125.0	



Maximum density 134 pcf @ 9.0% moisture

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadow Brook

Procedure: Method A

Job Number: P051109-1

Date: 4/04/06

Boring Number: TP-3

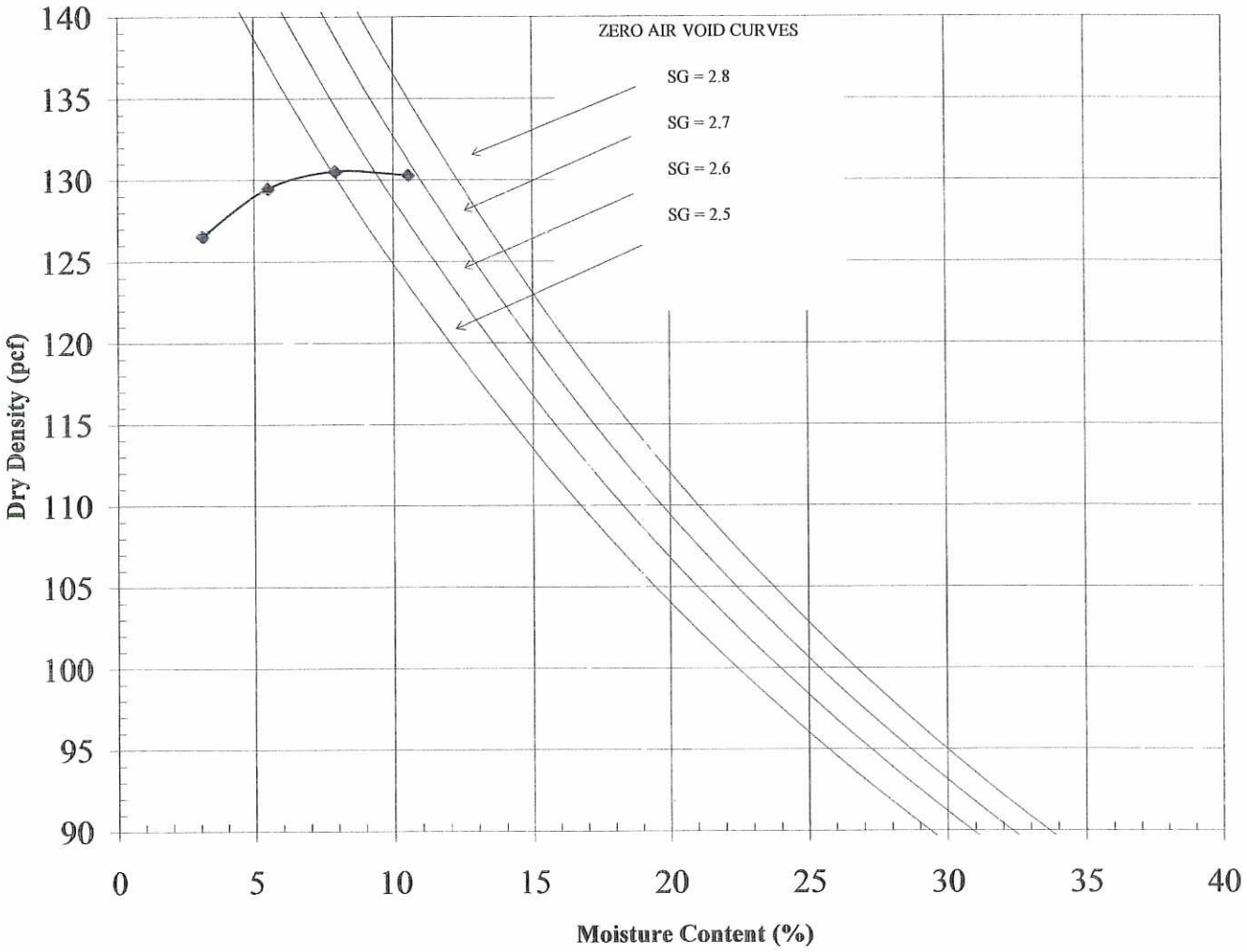
Location: 0-4 Feet

Soil Description: Silty, Clayey Sand, SC-SM

Tested by: AW

LABORATORY COMPACTION ASTM D 1557

Sample	1	2	3	4
Mold and wet soil (lbs.)	13.594	13.798	13.946	14.050
Mold (lbs.)	9.250	9.250	9.250	9.250
Wet Soil (lbs.)	4.344	4.548	4.696	4.800
Wet Density (pcf)	130.45	136.58	140.89	144.01
Moisture (%)	3.1	5.5	7.9	10.5
Dry Density (pcf)	126.6	129.5	130.6	130.3



Maximum density 131 pcf @ 9% moisture

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadow Brook

Procedure: Method A

Job Number: P051109-1

Date: 4/04/06

Boring Number: TP-22

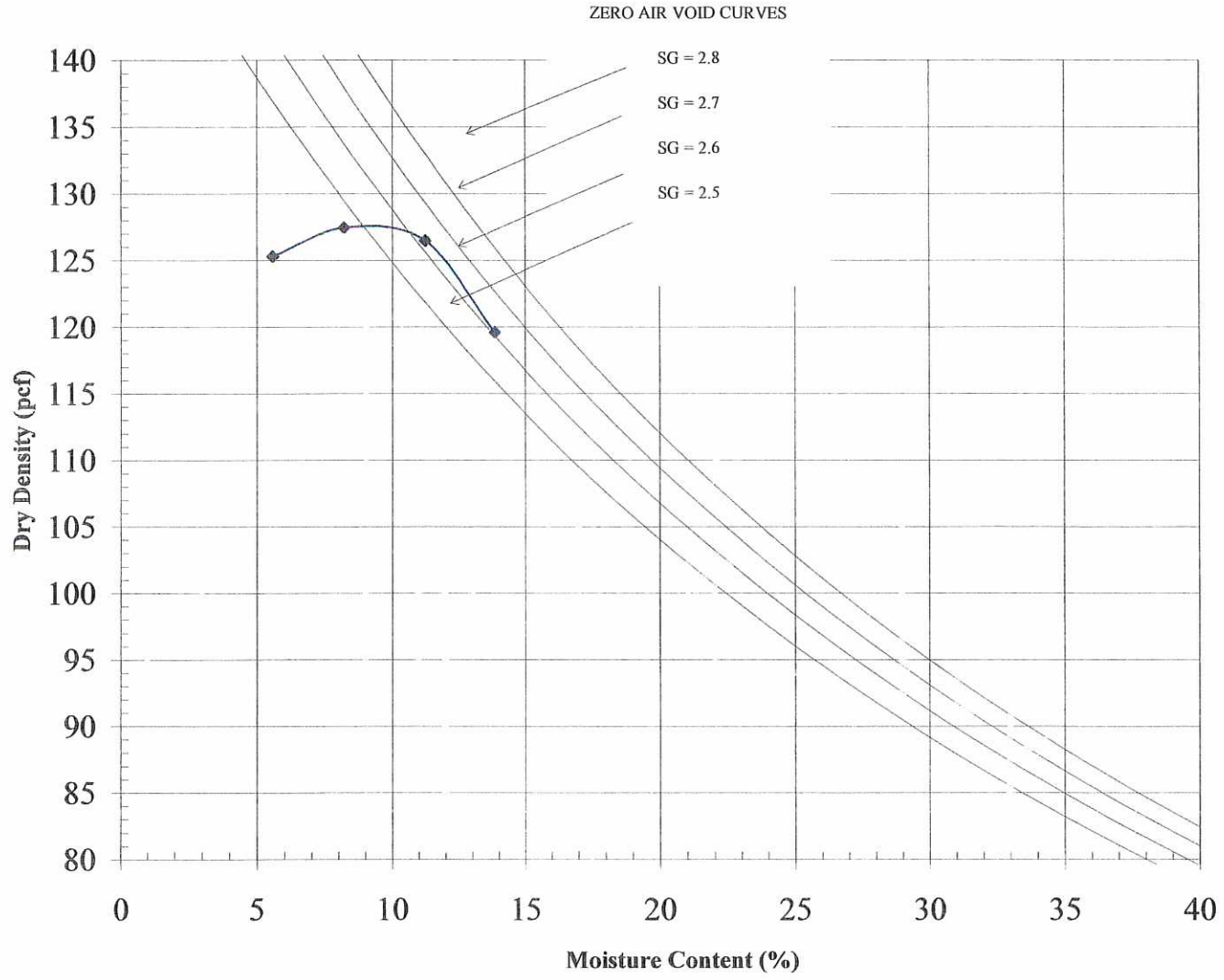
Location: 2-4 Feet

Soil Description: Well Graded Sand with Silt, SW-SM

Tested by: AW

LABORATORY COMPACTION ASTM D 1557

Sample	1	2	3	4
Mold and wet soil (lbs.)	16.078	16.500	16.708	16.368
Mold (lbs.)	6.154	6.154	6.154	6.154
Wet Soil (lbs.)	9.924	10.346	10.554	10.214
Wet Density (pcf)	132.32	137.95	140.72	136.19
Moisture (%)	5.6	8.2	11.2	13.9
Dry Density (pcf)	125.3	127.5	126.5	119.6



Maximum density 138 pcf @ 9% moisture

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Lowe's HIW, Inc.

Project Name: Meadow Brook

Procedure: Method C

Job Number: P051109-1

Date: 4/12/06

Boring Number: TP-31

Location: 0-4' Feet

Soil Description: Silty Clayey Sand with Gravel, SC-SM

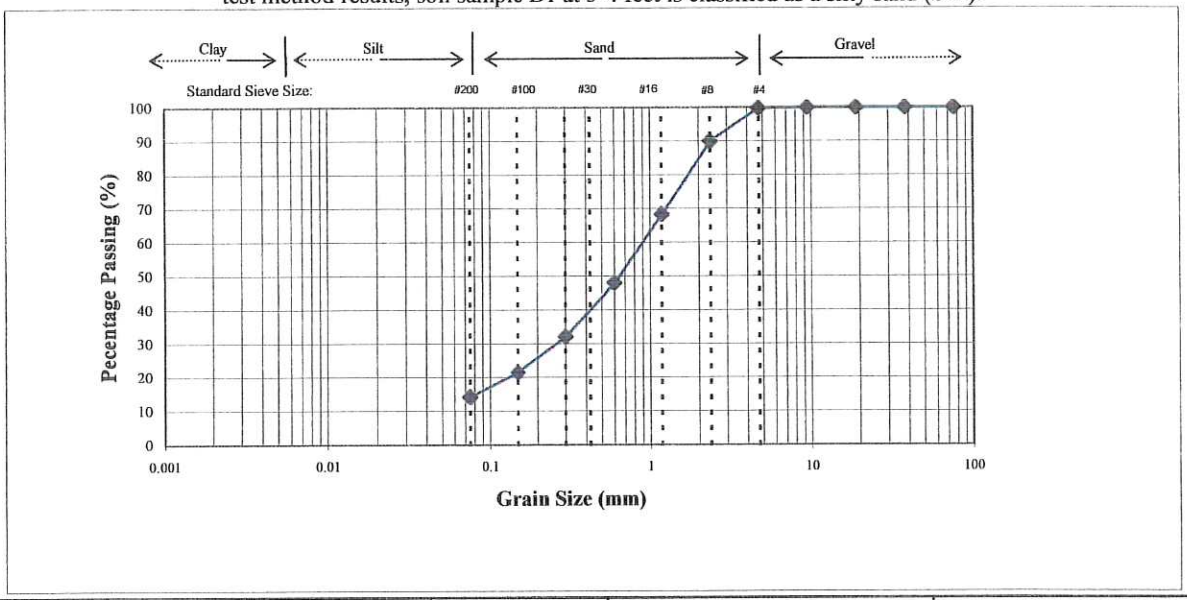
Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	B1 3-4'
Total Weight (g)	340.2
Dry Weight (g)	327.3
Wet Sieve Weight (g)	285.6
Initial Moisture (%)	3.9

D10 (mm)	NA
D30 (mm)	0.25
D60 (mm)	0.90
Cu	NA
Cc	NA

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B1 at 3-4 feet is classified as a silty sand (SM).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2	0.0	0.0	100.0
1.5"	38.1	0.0	0.0	100.0
3/4"	19.05	0.0	0.0	100.0
3/8"	9.53	0.0	0.0	100.0
#4	4.75	0.6	0.2	99.8
#8	2.36	32.5	9.9	90.1
#16	1.18	103.3	31.6	68.4
#30	0.6	169.8	51.9	48.1
#50	0.3	221.9	67.8	32.2
#100	0.15	256.7	78.4	21.6
#200	0.075	280.8	85.8	14.2

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4/20/06

Boring Number: B1

Location: 3-4 Feet

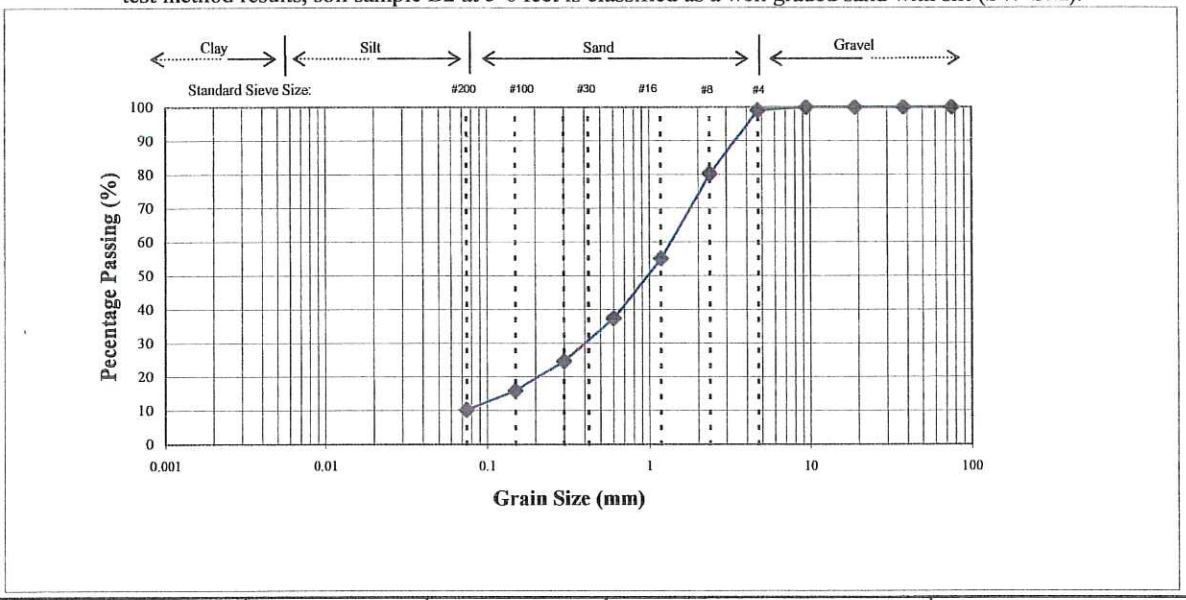
Soil Description: Silty Sand, SM

Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	B2 5-6'		D10 (mm)	0.08
Total Weight (g)	225.0		D30 (mm)	0.40
Dry Weight (g)	212.4		D60 (mm)	1.50
Wet Sieve Weight (g)	193.5		Cu	20.00
Initial Moisture (%)	5.9		Cc	1.42

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B2 at 5-6 feet is classified as a well graded sand with silt (**SW-SM**).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2	0.0	0.0	100.0
1.5"	38.1	0.0	0.0	100.0
3/4"	19.05	0.0	0.0	100.0
3/8"	9.53	0.0	0.0	100.0
#4	4.75	2.0	0.9	99.1
#8	2.36	41.7	19.6	80.4
#16	1.18	95.3	44.9	55.1
#30	0.6	132.9	62.6	37.4
#50	0.3	159.9	75.3	24.7
#100	0.15	178.6	84.1	15.9
#200	0.075	190.7	89.8	10.2

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4/20/06

Boring Number: B2

Location: 5-6 Feet

Soil Description: Well Graded Sand with Silt, SW-SM

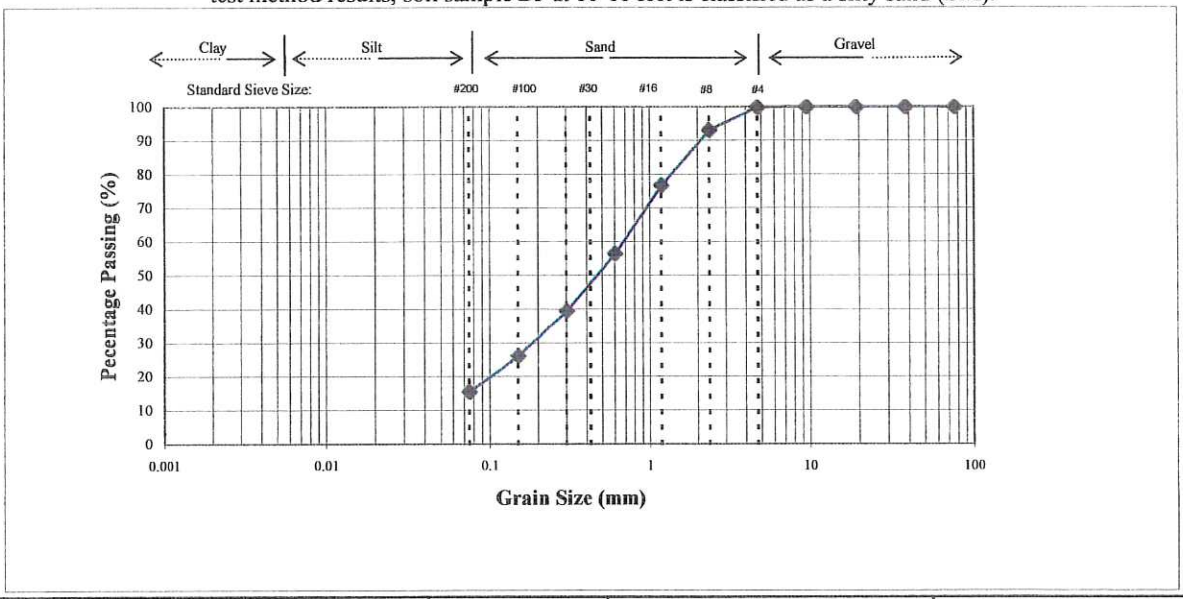
Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	**B3 10-11'**
Total Weight (g)	**283.9**
Dry Weight (g)	**272.2**
Wet Sieve Weight (g)	**238.0**
Initial Moisture (%)	4.3

D_{10} (mm)	**NA**
D_{30} (mm)	**0.20**
D_{60} (mm)	**0.70**
C_u	NA
C_c	NA

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B3 at 10-11 feet is classified as a silty sand (SM).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2	0.0	0.0	100.0
1.5"	38.1	0.0	0.0	100.0
3/4"	19.05	0.0	0.0	100.0
3/8"	9.53	0.0	0.0	100.0
#4	4.75	0.3	0.1	99.9
#8	2.36	18.6	6.8	93.2
#16	1.18	63.0	23.1	76.9
#30	0.6	118.3	43.5	56.5
#50	0.3	164.4	60.4	39.6
#100	0.15	200.9	73.8	26.2
#200	0.075	229.9	84.5	15.5

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4/20/06

Boring Number: B3

Location: 10-11 Feet

Soil Description: Silty Sand, SM

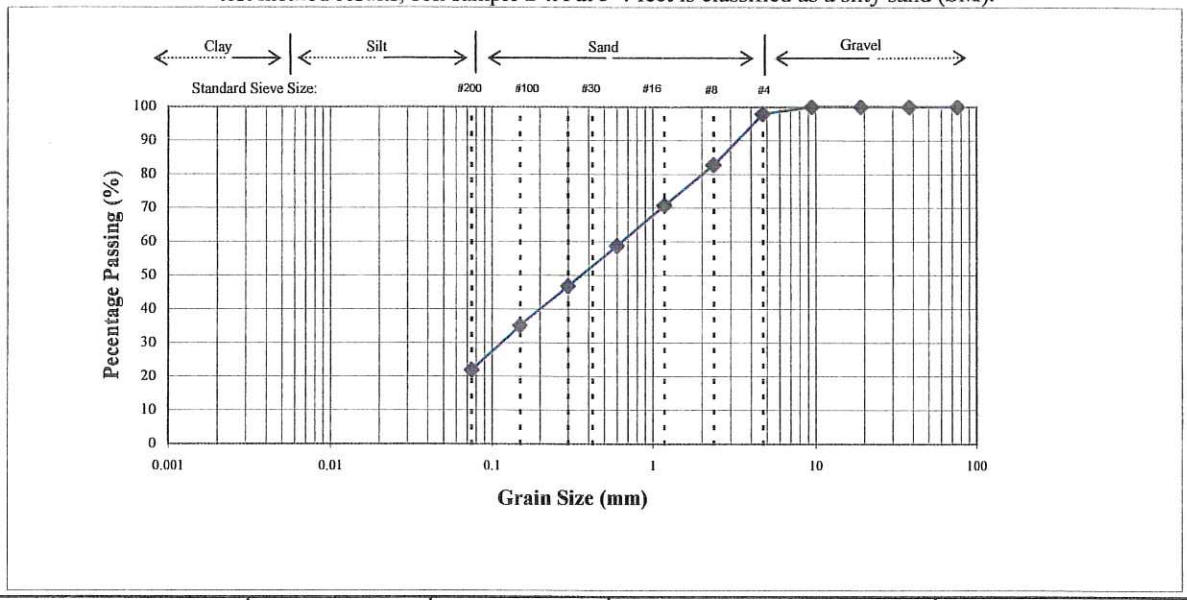
Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	B4A 3-4'
Total Weight (g)	186.3
Dry Weight (g)	165.6
Wet Sieve Weight (g)	129.2
Initial Moisture (%)	12.5

D10 (mm)	NA
D30 (mm)	0.10
D60 (mm)	0.60
Cu	NA
Cc	NA

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample B4A at 3-4 feet is classified as a silty sand (**SM**).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2	0.0	0.0	100.0
1.5"	38.1	0.0	0.0	100.0
3/4"	19.05	0.0	0.0	100.0
3/8"	9.53	0.0	0.0	100.0
#4	4.75	3.4	2.1	97.9
#8	2.36	28.5	17.2	82.8
#16	1.18	48.3	29.2	70.8
#30	0.6	68.3	41.2	58.8
#50	0.3	88.0	53.1	46.9
#100	0.15	107.4	64.9	35.1
#200	0.075	129.2	78.0	22.0

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4/20/06

Boring Number: B4A

Location: 3-4 Feet

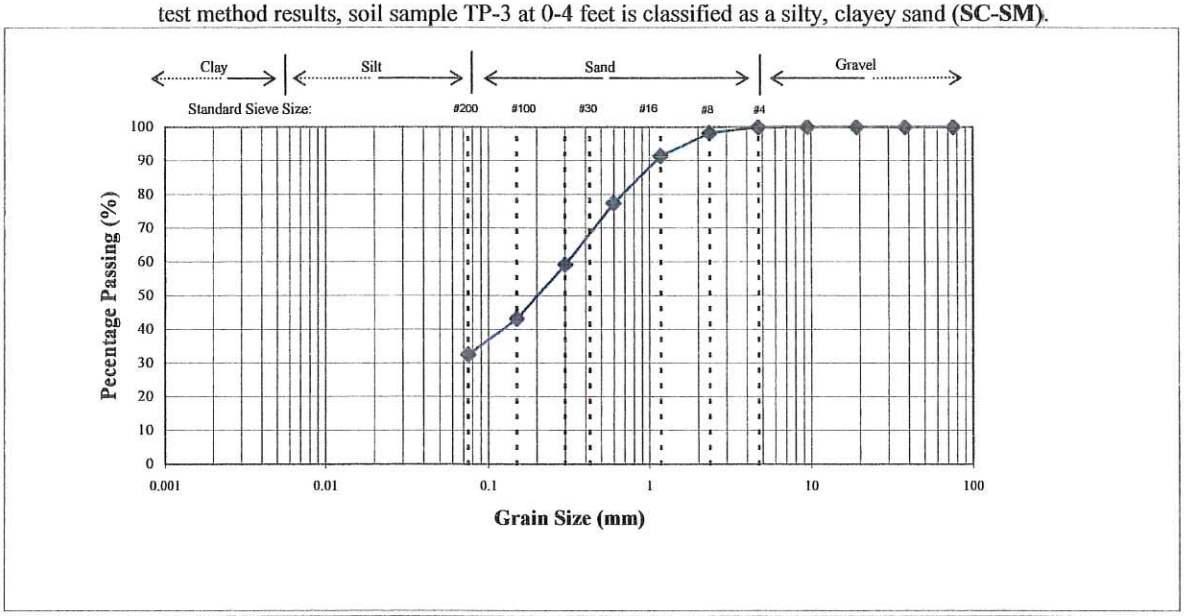
Soil Description: Silty Sand, SM

Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	TP-3		D10 (mm)	NA
Total Weight (g)	220.3		D30 (mm)	NA
Dry Weight (g)	205.8		D60 (mm)	0.30
Wet Sieve Weight (g)	146.4		Cu	NA
Initial Moisture (%)	7.0		Cc	NA

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample TP-3 at 0-4 feet is classified as a silty, clayey sand **(SC-SM)**.



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2	0.0	0.0	100.0
1.5"	38.1	0.0	0.0	100.0
3/4"	19.05	0.0	0.0	100.0
3/8"	9.53	0.0	0.0	100.0
#4	4.75	0.2	0.1	99.9
#8	2.36	3.8	1.8	98.2
#16	1.18	17.6	8.6	91.4
#30	0.6	46.4	22.5	77.5
#50	0.3	83.9	40.8	59.2
#100	0.15	116.9	56.8	43.2
#200	0.075	138.9	67.5	32.5

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4/13/06

Boring Number: TP-3

Location: 0-4 Feet

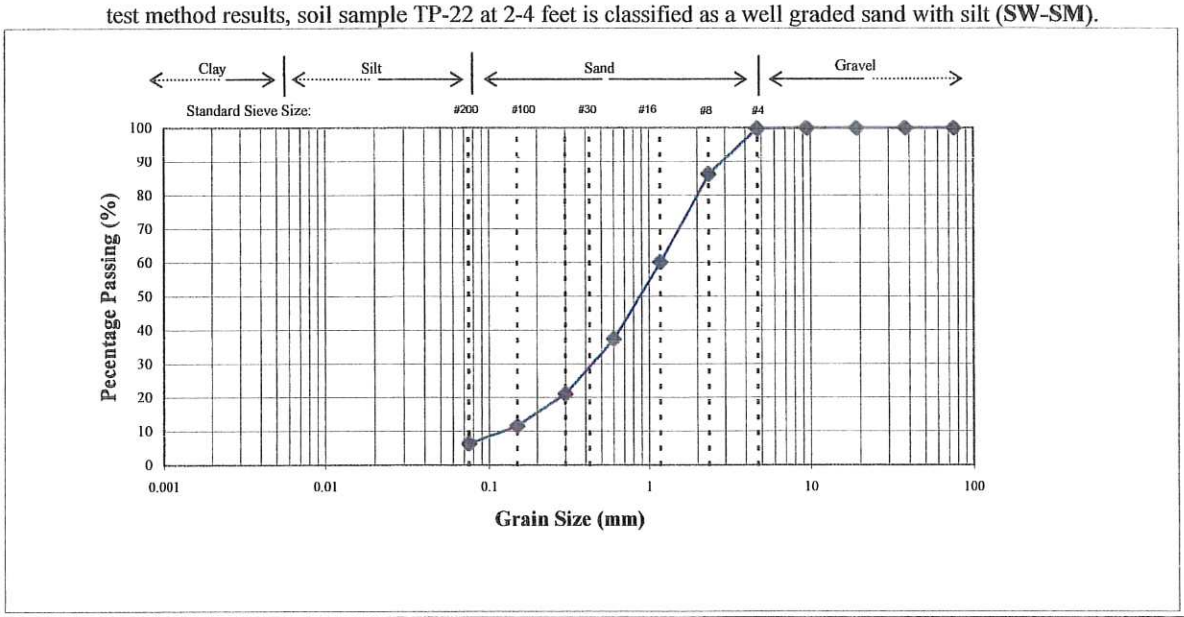
Soil Description: Silty, Clayey Sand SC-SM

Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	TP-22		D10 (mm)	0.10
Total Weight (g)	289.8		D30 (mm)	0.40
Dry Weight (g)	280.1		D60 (mm)	1.25
Wet Sieve Weight (g)	265.6		Cu	12.50
Initial Moisture (%)	3.5		Cc	1.28

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample TP-22 at 2-4 feet is classified as a well graded sand with silt (**SW-SM**).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
3"	76.2	0.0	0.0	100.0
1.5"	38.1	0.0	0.0	100.0
3/4"	19.05	0.0	0.0	100.0
3/8"	9.53	0.0	0.0	100.0
#4	4.75	0.5	0.2	99.8
#8	2.36	38.3	13.7	86.3
#16	1.18	111.3	39.7	60.3
#30	0.6	175.0	62.5	37.5
#50	0.3	220.8	78.8	21.2
#100	0.15	247.6	88.4	11.6
#200	0.075	262.2	93.6	6.4

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4/13/06

Boring Number: TP-22

Location: 2-4 Feet

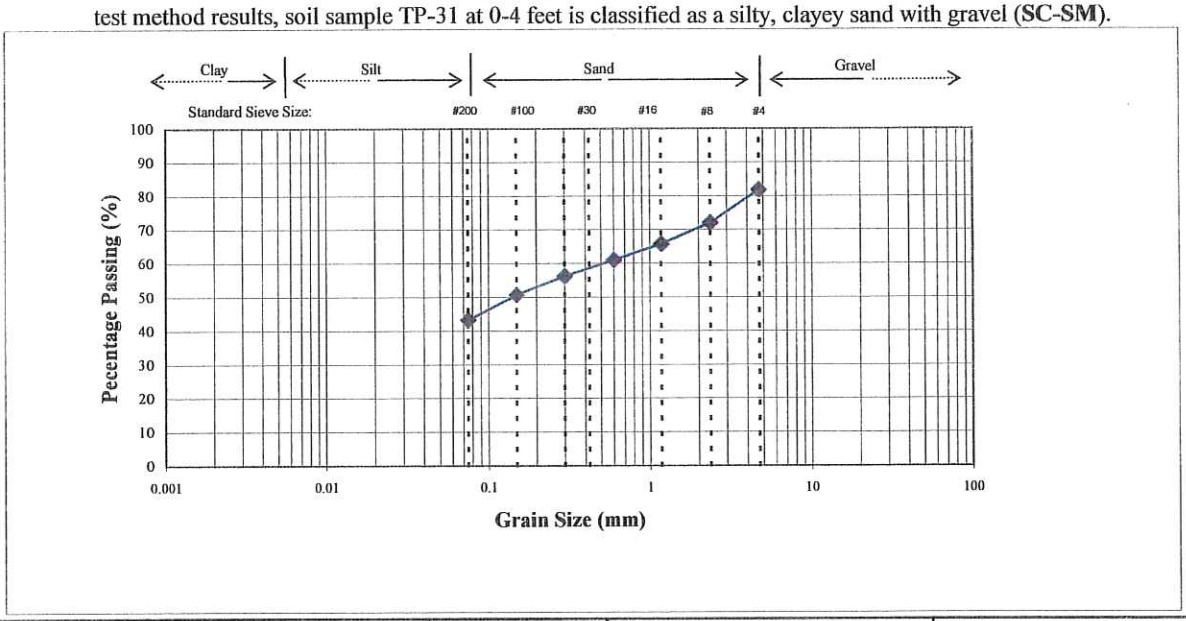
Soil Description: Well Graded Sand with Silt, SW-SM

Tested by: AW

PARTICLE-SIZE ANALYSIS OF SOILS
ASTM METHOD D 422 (SIEVE ANALYSIS)

Sample :	TP-31 0-4'		D10 (mm)	NA
Total Weight (g)	205.5		D30 (mm)	NA
Dry Weight (g)	194.3		D60 (mm)	0.50
Wet Sieve Weight (g)	119.7		Cu	NA
Initial Moisture (%)	5.8		Cc	NA

According to ASTM D 2487 Unified Soil Classification System (USCS) and ASTM D 422 (Standard Test Method for Particle-Size Analysis) test method results, soil sample TP-31 at 0-4 feet is classified as a silty, clayey sand with gravel (SC-SM).



Sieve Size (in)	Sieve Size (mm)	Cumulative Weight of dry soil (gm)	Percent Retained (%)	Percent Passing (%)
#4	4.75	35.2	18.1	81.9
#8	2.36	54.1	27.8	72.2
#16	1.18	66.3	34.1	65.9
#30	0.6	75.7	39.0	61.0
#50	0.3	84.9	43.7	56.3
#100	0.15	95.7	49.3	50.7
#200	0.075	110.1	56.7	43.3

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5845 Avenida Encinas, Ste. 128 Carlsbad, CA 92008

Client: Shopoff Group

Project Name: Meadowbrook

Job Number: P051109-1

Date: 4/13/06

Boring Number: TP-31

Location: 0-4 Feet

Soil Description: Silty, Clayey Sand with Gravel SC-SM

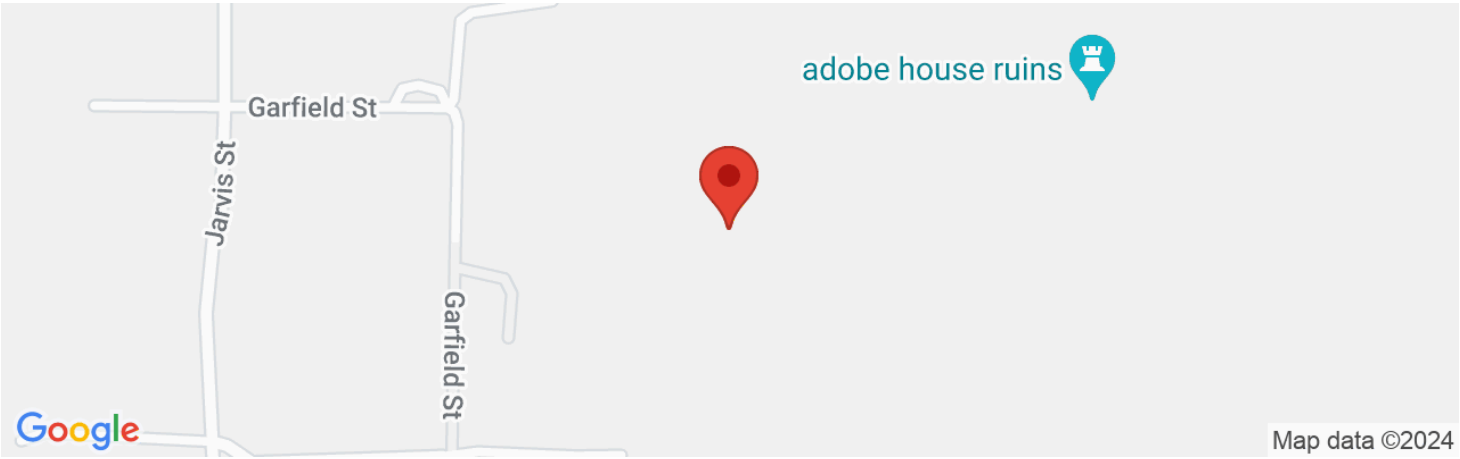
Tested by: AW

APPENDIX C
SEISMIC ANALYSIS

Leighton
a verdantas company

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: 33.7169, -117.2814



Date	2/23/2024, 4:59:50 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	B - Rock

Type	Value	Description
S_S	1.57	MCE_R ground motion. (for 0.2 second period)
S_1	0.584	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.413	Site-modified spectral acceleration value
S_{M1}	0.467	Site-modified spectral acceleration value
S_{DS}	0.942	Numeric seismic design value at 0.2 second SA
S_{D1}	0.312	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	0.9	Site amplification factor at 0.2 second
F_v	0.8	Site amplification factor at 1.0 second
PGA	0.667	MCE_G peak ground acceleration
F_{PGA}	0.9	Site amplification factor at PGA
PGA_M	0.6	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.614	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.746	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.57	Factored deterministic acceleration value. (0.2 second)
S1RT	0.584	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.64	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.607	Factored deterministic acceleration value. (1.0 second)
PGAd	0.667	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.674	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.925	Mapped value of the risk coefficient at short periods
C_{R1}	0.913	Mapped value of the risk coefficient at a period of 1 s
C_V	0.9	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 (update) (4.2.0)

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.7169

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

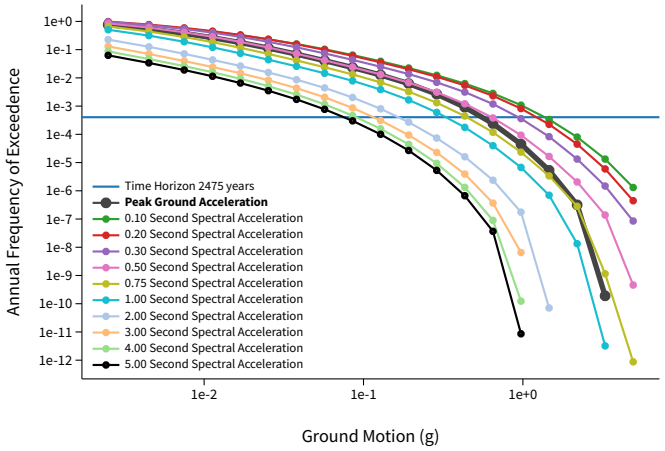
-117.2814

Site Class

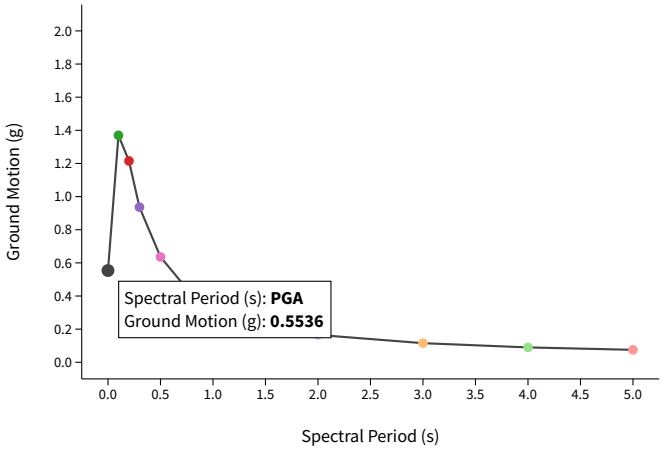
1150 m/s (Site class B)

Hazard Curve

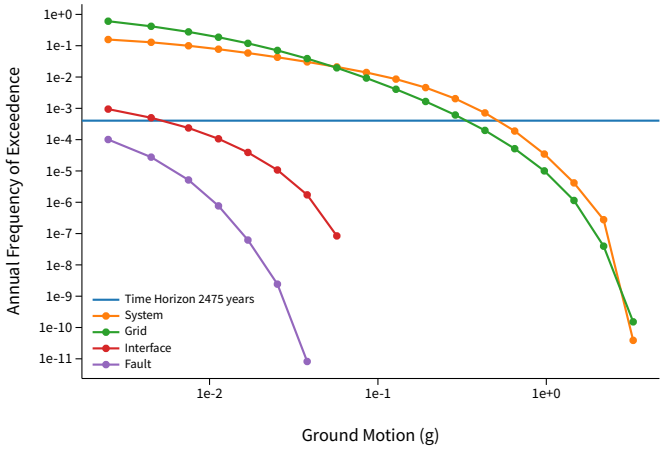
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for Peak Ground Acceleration

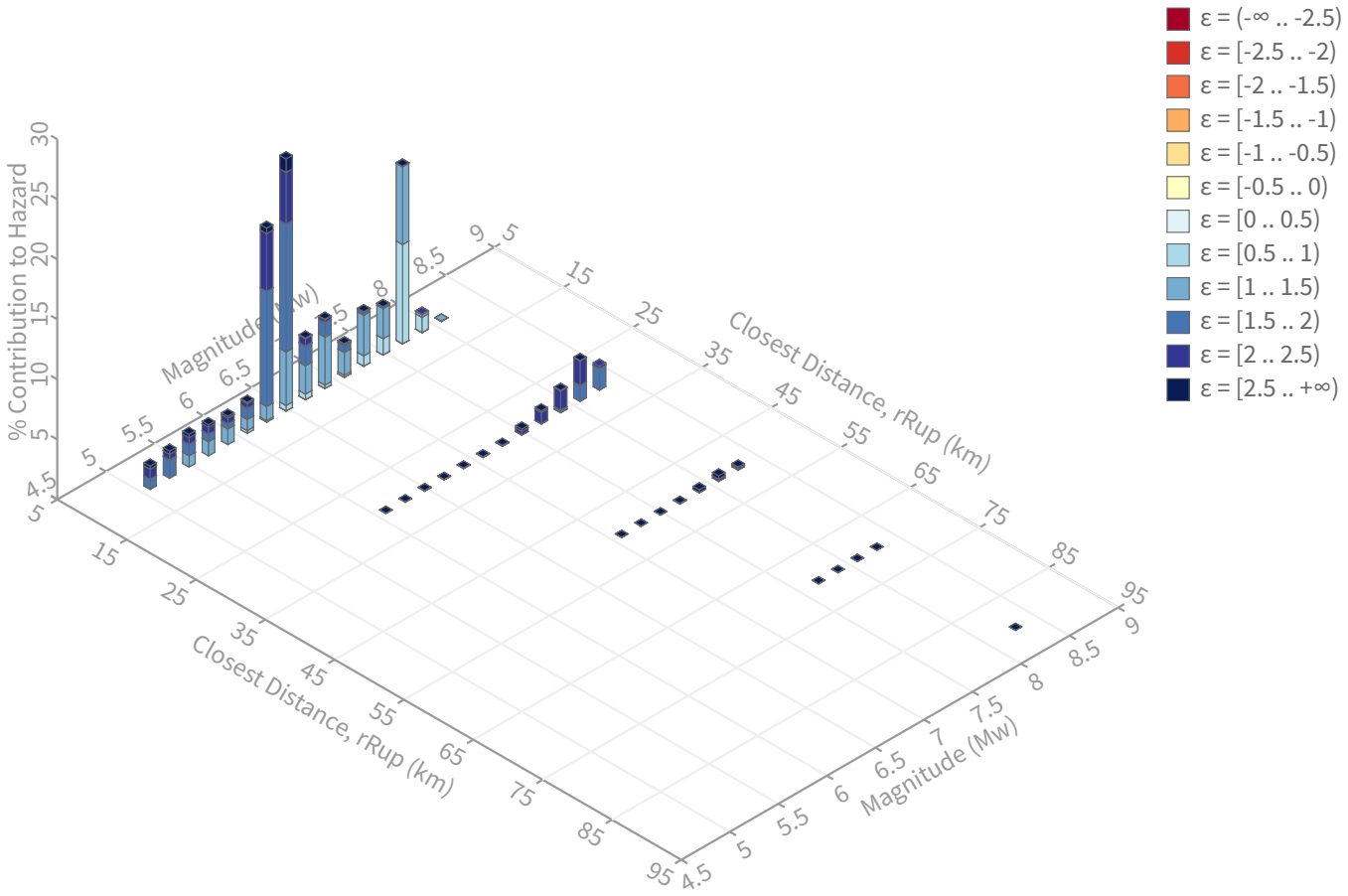


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.55363796 g

Recovered targets

Return period: 2817.0191 yrs
Exceedance rate: 0.00035498517 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.06 %

Mean (over all sources)

m: 6.81
r: 11.44 km
ε_0: 1.59 σ

Mode (largest m-r bin)

m: 6.5
r: 11.57 km
ε_0: 1.83 σ
Contribution: 20.99 %

Mode (largest m-r-ε_0 bin)

m: 6.5
r: 11.82 km
ε_0: 1.84 σ
Contribution: 10.66 %

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							39.79
Elsinore (Stepovers Combined) [0]		8.51	7.42	1.11	117.342°W	33.661°N	221.96	16.34
Elsinore (Glen Ivy) rev [3]		9.25	6.41	1.67	117.373°W	33.685°N	247.39	10.80
Elsinore (Glen Ivy) rev [2]		13.62	6.51	2.08	117.428°W	33.721°N	271.89	6.77
San Jacinto (Stepovers Combined) [0]		27.07	8.04	2.05	117.058°W	33.875°N	49.58	4.08
UC33brAvg_FM31	System							39.12
Elsinore (Stepovers Combined) [0]		8.51	7.39	1.12	117.342°W	33.661°N	221.96	16.14
Elsinore (Glen Ivy) rev [3]		9.25	6.41	1.67	117.373°W	33.685°N	247.39	10.51
Elsinore (Glen Ivy) rev [2]		13.62	6.48	2.10	117.428°W	33.721°N	271.89	6.58
San Jacinto (Stepovers Combined) [0]		27.07	8.04	2.05	117.058°W	33.875°N	49.58	4.11
UC33brAvg_FM31 (opt)	Grid							10.55
PointSourceFinite: -117.281, 33.739		5.75	5.56	1.52	117.281°W	33.739°N	0.00	2.25
PointSourceFinite: -117.281, 33.739		5.75	5.56	1.52	117.281°W	33.739°N	0.00	2.25
PointSourceFinite: -117.281, 33.784		7.95	6.04	1.60	117.281°W	33.784°N	0.00	1.03
PointSourceFinite: -117.281, 33.784		7.95	6.04	1.60	117.281°W	33.784°N	0.00	1.03
UC33brAvg_FM32 (opt)	Grid							10.54
PointSourceFinite: -117.281, 33.739		5.75	5.56	1.52	117.281°W	33.739°N	0.00	2.25
PointSourceFinite: -117.281, 33.739		5.75	5.56	1.52	117.281°W	33.739°N	0.00	2.25
PointSourceFinite: -117.281, 33.784		7.95	6.04	1.60	117.281°W	33.784°N	0.00	1.02
PointSourceFinite: -117.281, 33.784		7.95	6.04	1.60	117.281°W	33.784°N	0.00	1.02

APPENDIX D
SEISMIC REFRACTION SURVEY

Leighton
a verdantas company

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geophysical services

REPORT

SEISMIC REFRACTION SURVEY

Proposed Cresent Cemetery Project
Riverside County, California

GEO*Vision* Project No. 24019

Prepared for

Leighton Group, Inc.
10532 Acacia Street
Rancho Cucamonga, California 91730
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Prepared by

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Report 24019-01 Rev 0

February 2, 2024

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2 METHODOLOGY **3**
3 EQUIPMENT AND FIELD PROCEDURES **5**
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1 INTRODUCTION

A P-wave seismic refraction survey was conducted near Garfield Road and Robert Street in Perris, California on January 19th, 2024. The purpose of this investigation was to determine the rippability of the Jurassic sedimentary (Lines 1-2) and Mesozoic granitic rock (Lines 3-5) at the site. P-wave seismic data was acquired along five profiles, designated as Lines 1, 2, 3, 4 and 5 (Figure 1).

Depending on the degree of weathering, jointing, etc., granitic rock may broadly be characterized as rippable using a Caterpillar D8R, D9R, and D10R ripper at P-wave velocities less than 5,800, 6,800, and 7,200 ft/s, respectively (Caterpillar, 2018). Granitic rock is expected to be marginally rippable by a D8R, D9R, and D10R between a P-wave velocity of 5,800 and 8,000 ft/s, 6,800 and 8,000 ft/s, and 7,200 and 8,500 ft/s, respectively, and non-rippable at higher velocities (Caterpillar, 2018). A metasedimentary interface can be characterized as rippable using a Caterpillar D8R, D9R, and D10R ripper at P-wave velocities 6,300, 7,200, and 8,000 ft/s respectively (Caterpillar, 2018). As well as marginally rippable D8R, D9R, and D10R between a P-wave velocity of 6,300 and 8,400 ft/s, 7,200 and 9,200 ft/s, and 8,000 and 9,900 ft/s, respectively, and non-rippable at higher velocities. (Caterpillar, 2018).

The following sections include a discussion of equipment and field procedures, methodology, data processing, and results of the geophysical survey.



Seismic Refraction Line

Notes:
Coordinate System: NAD 1983 StatePlane California VI FIPS 0406 Feet
Base map source: Nearmap (9-2023)

GEOVision geophysical services

Date:	1/26/2024
GV Project:	24019
Developed by:	C Xiong
Drawn by:	T Rodriguez
Approved by:	A Martin
File Name:	GV_24019

FIGURE 1
SITE MAP

PROPOSED CRESENT CEMETERY PROJECT
RIVERSIDE COUNTY, CALIFORNIA

PREPARED FOR
LEIGHTON GROUP, INC.

2 METHODOLOGY

Detailed discussions of the seismic refraction method can be found in Telford et al. (1990), Dobrin and Savit (1988), and Redpath (1973).

When conducting a seismic survey, acoustic energy is input to the subsurface by an energy source such as a sledgehammer impacting a metallic plate, weight drop, vibratory source, or explosive charge. The acoustic waves propagate into the subsurface at a velocity dependent upon the elastic properties of the material through which they travel. When the waves reach an interface where the density or velocity changes significantly, a portion of the energy is reflected to the surface and the remainder is transmitted into the lower layer. Where the velocity of the lower layer is higher than that of the upper layer, a portion of the energy is also critically refracted along the interface. Critically refracted waves travel along the interface at the velocity of the lower layer and continually refract energy back to the surface. Receivers (geophones) laid out in linear array on the surface record the incoming refracted and reflected waves. The seismic refraction method involves analysis of the travel times of the first energy to arrive at the geophones. These seismic first arrivals are from either the direct wave (at geophones close to the source) or critically refracted waves (at geophones further from the source).

Analysis of seismic refraction data depends upon the complexity of the subsurface velocity structure. If the subsurface target is planar then the slope intercept method (Telford et al., 1990) can be used to model multiple horizontal or dipping planar layers. A minimum of one end shot is required to model horizontal layers and reverse end shots are required to model dipping planar layers. If the subsurface target is undulating (i.e. bedrock valley) then layer based analysis routines such as the generalized reciprocal method (Palmer, 1980 and 1981, Lankston and Lankston, 1986 and Lankston, 1990); reciprocal method (Hawkins, 1961) also referred to as the ABC method; Hales' method (Hales, 1958); delay time method (Wyrobek, 1956 and Gardner, 1967); time-term inversion (Scheidegger and Willmore, 1959); plus-minus method (Hagedoorn, 1959); and wavefront method (Rockwell, 1967) are preferred to model subsurface velocity structure. These methods generally require a minimum of 5 shot points per spread (end shots, off end shots and a center shot). If subsurface velocity structure is complex and cannot be adequately modeled using layer-based modeling techniques (e.g., complex weathering profile in bedrock, numerous lateral velocity variations), then Monte Carlo or tomographic inversion techniques (Zhang and Toksoz, 1998; Schuster and Quintus-Bosz, 1993) are required to model the seismic refraction data. These techniques require a high shot density; typically, every 3 to 6 stations/geophones.

Errors in seismic refraction models not associated with errors in first arrival data can be caused by blind zones, hidden layers, and lateral velocity variability. A blind zone is a geologic layer with a lower seismic velocity than the overlying layer and, therefore, does not give rise to a seismic refraction. This type of layer, therefore, cannot be recognized or modeled and depths to underlying layers would be overestimated. The presence of blind zones will cause errors in depth averaged seismic velocity or slowness.

A hidden layer is a layer with a velocity increase, but of sufficiently small thickness relative to the velocities of overlying and underlying layers, that refracted arrivals do not arrive at the geophones before those from the deeper, higher velocity layer. Because the seismic refraction method generally only involves the interpretation of first arrivals, a hidden layer cannot be

recognized or modeled and depths to underlying layers would be underestimated. However, it can be demonstrated that the presence of hidden layers does not cause significant errors in depth averaged seismic velocity or slowness, such as the average velocity of the upper 100 ft. A subsurface velocity structure that increases as a function of depth rather than as discrete layers, will also cause depths to subsurface refractors to be underestimated, in a manner very similar to that of the hidden layer problem.

Lateral velocity variability within a layer that is not characterized by the modeling scheme utilized for analysis will also result in depth errors to underlying layers. Additionally, at sites with steeply dipping or highly irregular bedrock surfaces, out-of-plane refractions (refractions from structures to the side of the line rather than from beneath the line) may severely complicate modeling. Tomographic inversion techniques can often resolve the complex velocity structures associated with hidden layers, velocity gradients and lateral velocity variations. However, in the event of an abrupt increase in velocity at a geologic horizon, the velocity model generated using tomographic inversion routines will smooth the horizon with velocity being underestimated at the interface and possibly overestimated at depth.

3 EQUIPMENT AND FIELD PROCEDURES

Seismic refraction equipment used during this investigation consisted of a Geometrics Geode 24-channel signal enhancement seismographs, 10 Hz vertical geophones, seismic cables with 10-foot spaced connectors, piezo hammer switches, and a 20-lb sledgehammer with an aluminum strike plate.

The locations of the seismic refraction profiles were established by Leighton Group Inc. Each seismic line consisted of 24 geophones spaced 10 feet apart for a line length of 230 feet. All geophone and shot point locations along each line were measured using a 300-foot tape measure. Elevations along each seismic refraction line were surveyed using a Trimble R10 GPS system with CenterPoint RTX real-time differential corrections.

Source locations included end shots at each end geophone, multiple off-end shot locations with a maximum offset of 100 ft, and interior shot locations at nominal 30 ft intervals for a total of 15 source locations per line. The 20-lb sledgehammer was used as the energy source for all source locations. A hammer switch mounted on the hammer was used to trigger the seismograph upon impact with the aluminum plate. The final seismic record at each shot point was the result of stacking 7 to 14 shots to increase the signal to noise ratio. All seismic records were stored on a laptop computer. Data acquisition parameters, file names, and other observations were recorded on a field log, which is retained in project files.

4 DATA REDUCTION AND MODELING

The first step in data processing consisted of picking the arrival time of the first energy (first arrival) received at each geophone for each shot point. The first arrivals on each seismic record are either a direct arrival from a compressional (P) wave traveling in the uppermost layer or a refracted arrival from a subsurface interface where there is a velocity increase. First-arrival times were selected using the manual picking routines in the SeisImager™ software suite (Geometrics, Inc.). These first-arrival times were saved in an ASCII file containing shot location, geophone locations, and associated first-arrival time. Errors in the first-arrival times were variable with error generally increasing with distance from the shot point. Elevations for each geophone location were calculated from the GPS data.

Seismic refraction data were then modeled using the tomographic analysis technique available in the SeisImager™ Plotrefa software package. Refraction tomography techniques are often able to resolve complex velocity structure (e.g., velocity gradients) that can be observed in bedrock weathering profiles. Layer-based modeling techniques such as the GRM are more applicable to characterize geologic structure that exhibits layering (e.g., low velocity sediments over high velocity rock). It should be noted, however, that tomographic modeling techniques will generate a velocity model with a gradual increase in velocity with depth even though an abrupt velocity increase may be present.

Tomographic analysis was conducted as outlined in the following steps. A smooth velocity gradient initial model was developed covering the expected velocity range in weathered rock at the site. The initial model had 18 layers with the top of the bottom layer at a depth related to the effective depth of investigation of the model. Velocity ranges were also set to values outside of the starting model minimum and maximum. The velocity models were extended to permit the use of off-end shot points during the inversion, as applicable. A minimum of 10 iterations of non-linear raypath inversion were then implemented to model the seismic data. The starting model parameters were then adjusted, as necessary, and the modeling process repeated until an acceptable fit between observed and calculated first arrival data was achieved.

The final tomographic velocity models for the seismic line were exported as ASCII files and imported into the Golden Software Surfer® mapping system where the velocity model was gridded, contoured, and annotated for presentation.

5 DISCUSSION OF RESULTS

The P-wave seismic refraction models for Lines 1 to 5 are presented as Figures 2, 3, 4, 5, and 6, respectively. A color scheme with blue-cyan, green-orange, and red-magenta representing low, intermediate, and high P-wave velocities, respectively, and velocity contours at 1,000 ft/s intervals are used to display the seismic velocity model. The depth of investigation is about 65 feet for Line 1 and 3, about 55 feet for Line 2, 60 feet for Line 4, and around 90 feet for Line 5.

Tomographic inversion techniques will typically model a gradual increase in seismic velocity with depth even if an abrupt velocity contact is present. Velocity gradients are, however, common in weathered rock geologic environments, such as the project site.

For discussion purposes, we assume that a Caterpillar D8R Ripper, or equivalent, will be used on site. Using higher performing rippers, such as the Caterpillar D9R Ripper, can increase the depth of rippable and marginally rippable zones. It may be more cost-effective to blast marginally rippable rock. Granitic rock with P-wave velocity of less than about 5,800 ft/s is considered rippable by a D8R Ripper. Granitic rock with P-wave velocity between about 5,800 and 8,000 ft/s is considered marginally rippable by a D8R. Granitic rock with P-wave velocity greater than 8,000 ft/s is considered non-rippable by a D8R. Metasedimentary rock with P-wave velocity between about 6,300 and 8,400 ft/s is considered marginally rippable by a D8R. Metasedimentary rock with P-wave velocity greater than 8,400 ft/s is considered non-rippable by a D8R.

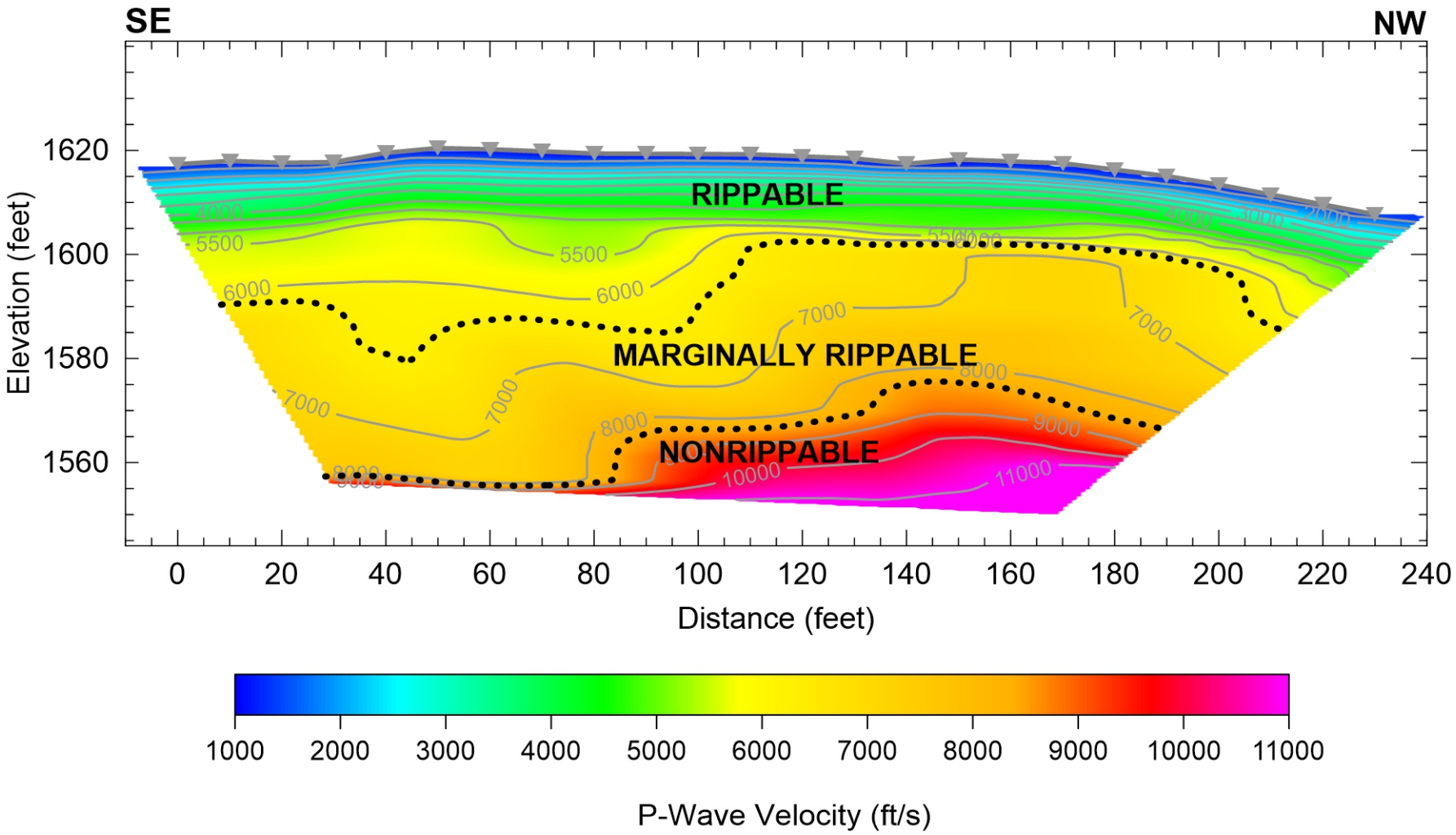
Line 1 (Figure 2) shows P-wave velocity increasing with depth from about 1,000 to 1,500 ft/s at the surface to over 11,000 ft/s at a depth of about 55 to 65 feet. The rock is expected to be rippable to a depth of between 15 and 40 ft and marginally rippable to a depth of about 40 to 65 ft. The metasedimentary rock is considered non-rippable at greater depths.

Beneath Line 2 (Figure 3), P-wave velocity increases with depth from about 1,000 to 2,000 ft/s at the surface to over 11,000 ft/s at a depth between about 30 and 40 ft. The rock is expected to be rippable to a depth of about 9 to 20 ft and marginally rippable to a depth of about 15 to 45 ft. The metasedimentary rock is considered non-rippable below a depth of 15 to 45 ft.

P-wave velocity increases with depth beneath Line 3 (Figure 4) from about 1,000 to 2,000 ft/s at the surface to over 11,000 ft/s at a depth between about 55 and 65 ft. The rock is expected to be rippable to a depth of about 20 to 35 ft and marginally rippable to a depth of about 40 to 50 ft.

Line 4 (Figure 5) shows P-wave velocity increasing with depth from about 1,000 to 2,000 ft/s at the surface to over 11,000 ft/s at a depth of about 60 ft. The rock is expected to be rippable to a depth of about 15 to 25 feet and marginally rippable to a depth of 35 to 50 feet. The granitic rock is expected to be non-rippable below a depth of 35 to 50 feet.

Line 5 (Figure 6) is modeled to a depth of about 90 ft with P-wave velocity increasing with depth from about 1,000 to 2,500 ft/s at the surface to over 11,000 at a depth of about 60 to 70 ft. The granitic rock is expected to be rippable to a depth of about 50 to 55 ft, marginally rippable to a depth of about 55 to 60 ft, and non-rippable at greater depths.



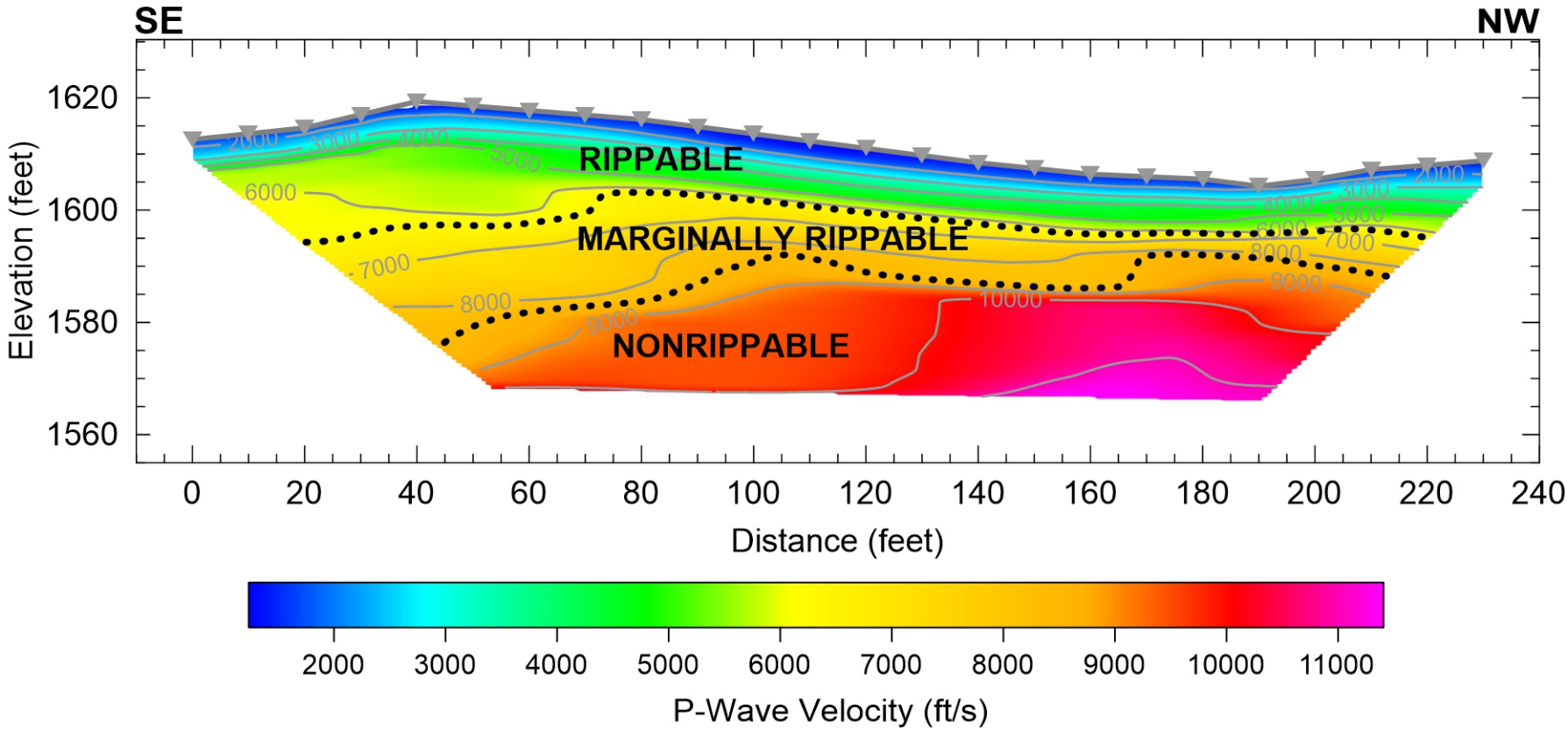
GEOVision geophysical services

Project No: 24019
Date: JAN 26, 2024
Drawn By: C. GARCIA
Approved By:
R:\GVProjects\2024\24008 ENGEO\Report\Figure 2.cdr

FIGURE 2
LINE 1 P-WAVE SEISMIC REFRACTION MODEL

CRESENT CEMETERY
RIVERSIDE COUNTY, CALIFORNIA

PREPARED FOR
LEIGHTON GROUP, INC.



GEOVision geophysical services

Project No: 24019	FIGURE 3 LINE 2 P-WAVE SEISMIC REFRACTION MODEL
Date: JAN 25, 2024	CRESENT CEMETERY RIVERSIDE COUNTY, CALIFORNIA
Drawn By: C. GARCIA	PREPARED FOR LEIGHTON GROUP, INC.
Approved By:	

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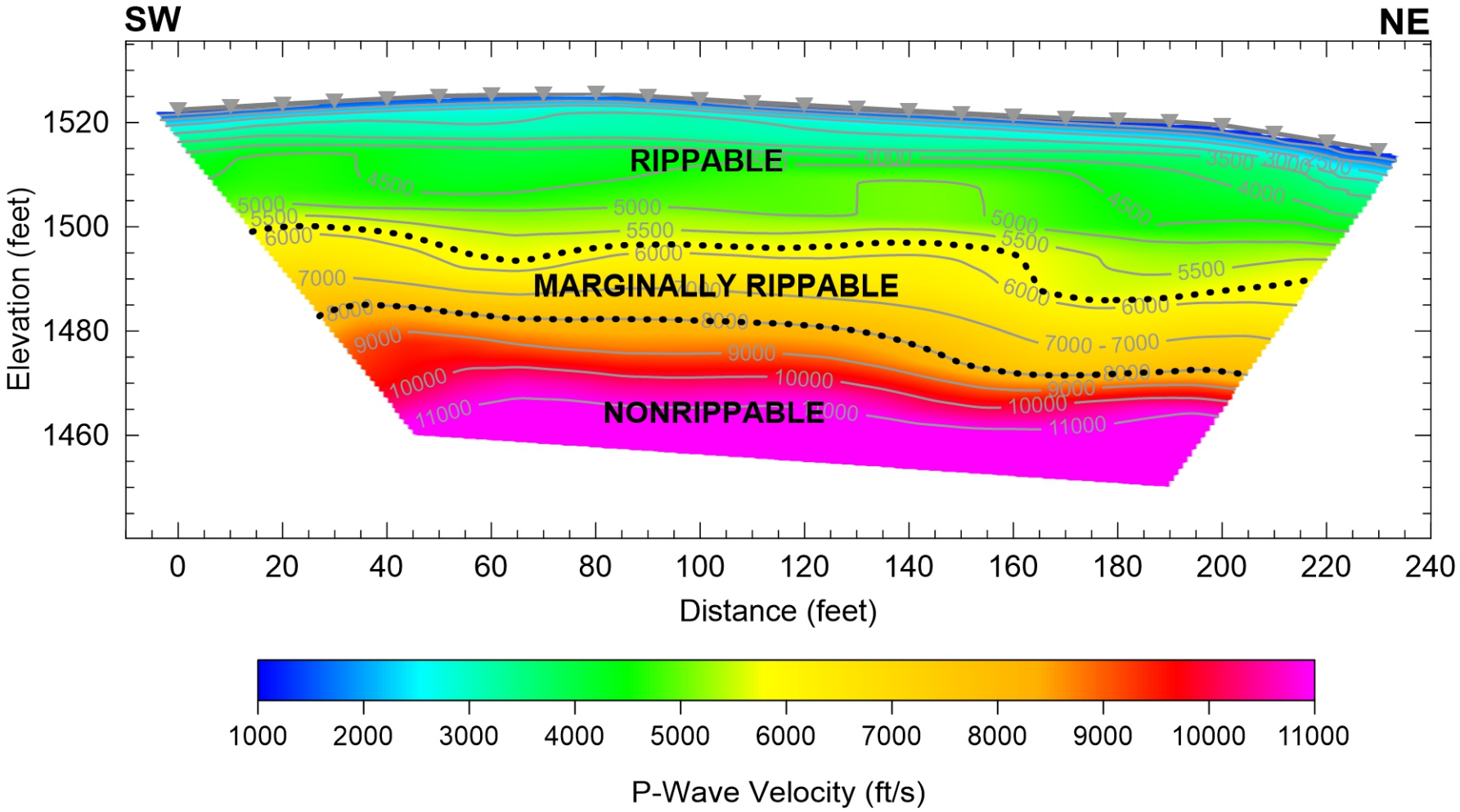
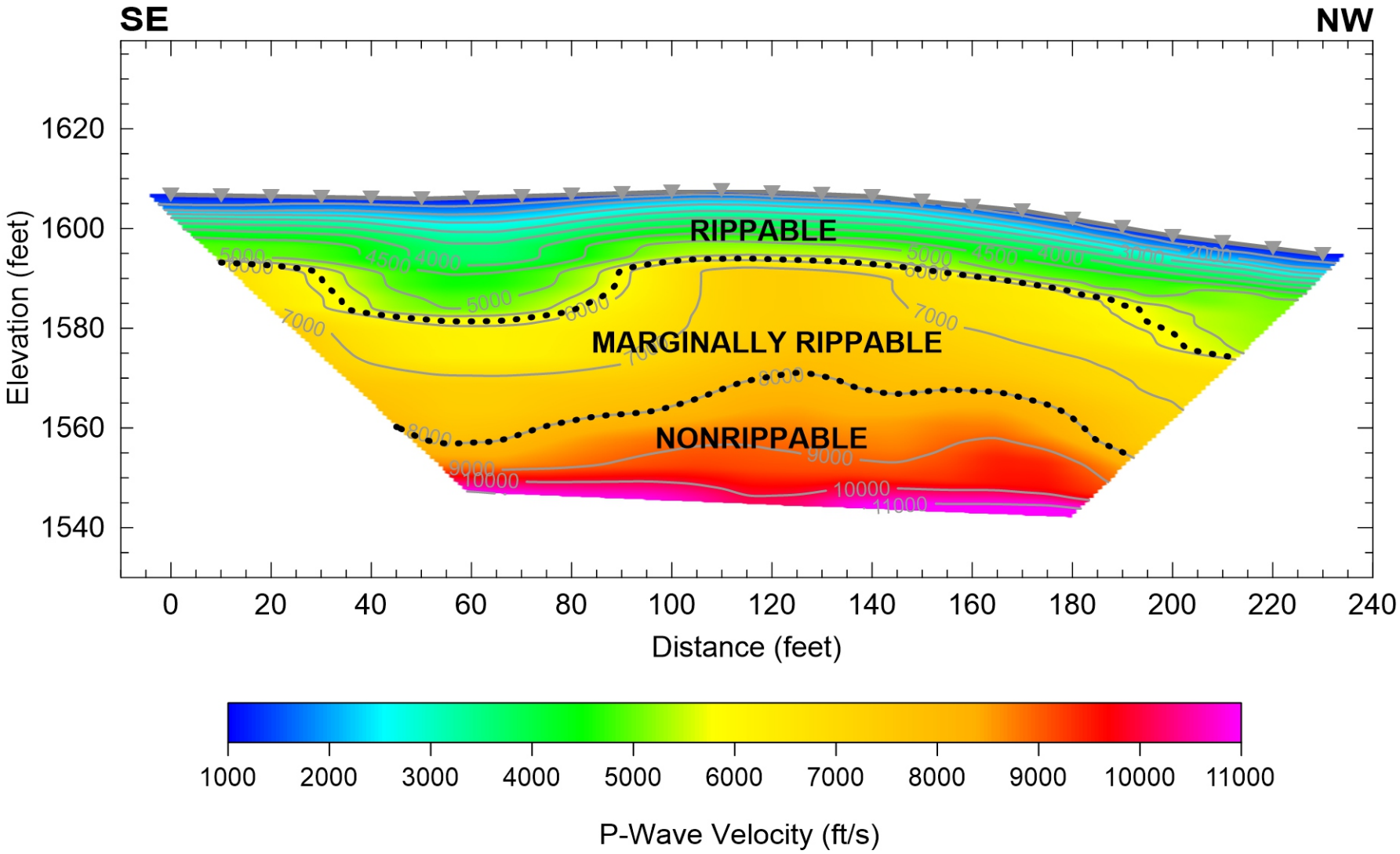


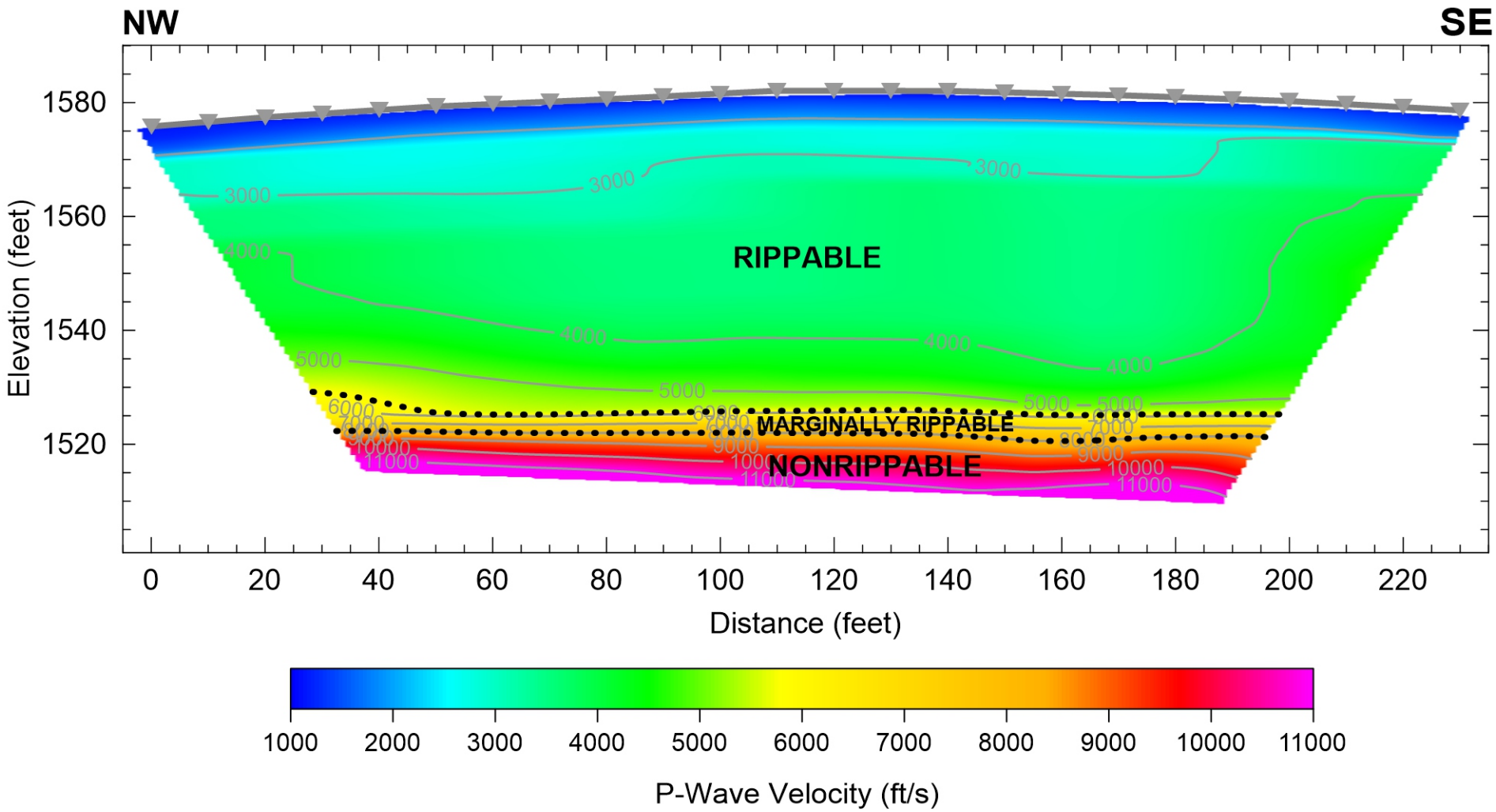
GEOVision geophysical services	FIGURE 4 LINE 3 P-WAVE SEISMIC REFRACTION MODEL
Project No: 24019 Date: JAN 25, 2024 Drawn By: E TRIPLETT Approved By:	CRESENT CEMETARY RIVERSIDE COUNTY, CALIFORNIA
R:\GVProjects\2024\24008 ENGEO\Report\Figure 2.cdr	PREPARED FOR LEIGHTON GROUP, INC.



GEOVision geophysical services

Project No: 24019	FIGURE 5 LINE 4 P-WAVE SEISMIC REFRACTION MODEL
Date: JAN 25, 2024	CRESENT CEMETARY RIVERSIDE COUNTY, CALIFORNIA
Drawn By: E TRIPLETT	PREPARED FOR LEIGHTON GROUP, INC.
Approved By:	

R:\GVProjects\2024\24008 ENGEO\Report\Figure 2.cdr



GEOVision geophysical services	FIGURE 6 LINE 5 P-WAVE SEISMIC REFRACTION MODEL
Project No: 24019 Date: JAN 26, 2024 Drawn By: C. GARCIA Approved By:	CRESENT CEMETERY RIVERSIDE COUNTY, CALIFORNIA
R:\GVProjects\2024\24008 ENGEO\Report\Figure 2.cdr	PREPARED FOR LEIGHTON GROUP, INC.

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7 CERTIFICATION

All geophysical data, analysis, interpretations, conclusions, and recommendations in this document have been prepared under the supervision of and reviewed by a **GEO***Vision* California Professional Geophysicist.

Prepared by,

2/2/2024

Eric Triplett — Date
Staff Geophysicist
GEO*Vision* Geophysical Services

Reviewed and approved by



2/2/2024

Antony J. Martin — Date
California Professional Geophysicist, P. Gp. 989
GEO*Vision* Geophysical Services

* This geophysical investigation was conducted under the supervision of a California Professional Geophysicist using industry standard methods and equipment. A high degree of professionalism was maintained during all aspects of the project from the field investigation and data acquisition, through data processing, interpretation, and reporting. All original field data files, field notes, observations, and other pertinent information are maintained in the project files and are available for the client to review for a period of at least one year.

  A professional geophysicist's certification of interpreted geophysical conditions comprises a declaration of his/her professional judgment. It does not constitute a warranty or guarantee, expressed or implied, nor does it relieve any other party of its responsibility to abide by contract documents, applicable codes, standards, regulations, or ordinances

APPENDIX E
GENERAL EARTHWORK AND GRADING SPECIFICATIONS

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LEIGHTON CONSULTING, INC.

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

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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 more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record: Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants 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 the 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 the 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 key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor 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 the plans and 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 contemplated 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 rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the 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, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be 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.

2.3 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 evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. 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 the fill.

2.5 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.

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 8 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 such 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 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. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate 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 the American Society of Testing and Materials (ASTM Test Method D1557-91).

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 D1557-91). 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 with uniformity.

4.4 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 D1557-91.

4.5 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).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. 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.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that 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.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the 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 by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. 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 Safety: The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill: All 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 of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

The 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.

7.3 Lift Thickness: 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.

7.4 Observation and Testing: The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

APPENDIX F

GEO-PROFESSIONAL BUSINESS ASSOCIATION (GBA)

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, clients can benefit from a lowered exposure to the subsurface problems that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed below, contact your GBA-member geotechnical engineer. Active involvement in the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Geotechnical-Engineering Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. *Those who rely on a geotechnical-engineering report prepared for a different client can be seriously misled*. No one except authorized client representatives should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one – not even you – should apply this report for any purpose or project except the one originally contemplated.*

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read it *in its entirety*. Do not rely on an executive summary. Do not read selected elements only. *Read this report in full.*

You Need to Inform Your Geotechnical Engineer about Change

Your geotechnical engineer considered unique, project-specific factors when designing the study behind this report and developing the confirmation-dependent recommendations the report conveys. A few typical factors include:

- the client's goals, objectives, budget, schedule, and risk-management preferences;
- the general nature of the structure involved, its size, configuration, and performance criteria;
- the structure's location and orientation on the site; and
- other planned or existing site improvements, such as retaining walls, access roads, parking lots, and underground utilities.

Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

This Report May Not Be Reliable

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, that it could be unwise to rely on a geotechnical-engineering report whose reliability may have been affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If your geotechnical engineer has not indicated an "apply-by" date on the report, ask what it should be*, and, in general, *if you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying it. A minor amount of additional testing or analysis – if any is required at all – could prevent major problems.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface through various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing were performed*. The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgment to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team from project start to project finish, so the individual can provide informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, *they are not final*, because the geotechnical engineer who developed them relied heavily on judgment and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* revealed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a full-time member of the design team, to:

- confer with other design-team members,
- help develop specifications,
- review pertinent elements of other design professionals' plans and specifications, and
- be on hand quickly whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction observation.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for informational purposes only*. To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report, but they may rely on the factual data relative to the specific times, locations, and depths/elevations referenced. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely*. Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures*. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. As a general rule, *do not rely on an environmental report prepared for a different client, site, or project, or that is more than six months old.*

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, none of the engineer's services were designed, conducted, or intended to prevent uncontrolled migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration.*** Confront the risk of moisture infiltration by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

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Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	Hunsaker & Associates Irvine, Inc.	Date	11/15/2023
Designed by		Case No	
Company Project Number/Name	Crescent Gardens Cemetery		

BMP Identification

BMP NAME / ID: DMA A

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
A	*78408*	*Mixed Surface Types*	*0.8*	*0.60*	*46989.6*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Hunsaker & Associates Irvine, Inc. | Date: 11/15/2023

Designed by: | Case No:

Company Project Number/Name: Crescent Gardens Cemetery

BMP Identification

BMP NAME / ID: DMA B

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
B	*95832*	*Mixed Surface Types*	*0.8*	*0.60*	*57431.7*			
	95832		***Total***		**57431.7**	**0.60**	***2871.6***	***22295***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Hunsaker & Associates Irvine, Inc. | Date: 11/15/2023

Designed by: | Case No:

Company Project Number/Name: Crescent Gardens Cemetery

BMP Identification

BMP NAME / ID: DMA G

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
G	*1463616*	*Mixed Surface Types*	*0.05*	*0.08*	*112489.5*			

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Hunsaker & Associates Irvine, Inc. | Date: 11/15/2023

Designed by: | Case No:

Company Project Number/Name: Crescent Gardens Cemetery

BMP Identification

BMP NAME / ID: DMA I

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
I	*274428*	*Mixed Surface Types*	*0.19*	*0.16*	*45222.2*			

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries	
	DMA A		Calculated Cells	

Company Name: Hunsaker & Associates Date: 11/15/2023

Designed by: County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T= 1.8 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 2,350 ft^3

Type of Bioretention Facility Design

- (●) Side slopes required (parallel to parking spaces or adjacent to walkways)
- ( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 3.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 80.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.79 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 1,312 ft^2

Proposed Surface Area — A= 4,806 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 3 %

6" Check Dam Spacing — 10 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID DMA I	Legend:	Required Entries / Calculated Cells

Company Name: Hunsaker & Associates Date: 11/15/2023

Designed by: County/City Case No.:

Design Volume

Enter the area tributary to this feature — A_T= 6.3 acres

Enter V_{BMP} determined from Section 2.1 of this Handbook — V_{BMP}= 2,261 ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer — d_S = 3.0 ft

Top Width of Bioretention Facility, excluding curb — w_T = 80.0 ft

Total Effective Depth, d_E

$d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$ — d_E = 1.79 ft

Minimum Surface Area, A_m

$$A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$$

A_M = 1,263 ft^2

Proposed Surface Area — A= 18,590 ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility — z = 4 :1

Diameter of Underdrain — 6 inches

Longitudinal Slope of Site (3% maximum) — 3 %

6" Check Dam Spacing — 10 feet

Describe Vegetation:

Notes:

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries	
	DMA B		Calculated Cells	

Company Name: Hunsaker & Associates Date: 11/15/2023

Designed by: County/City Case No.:

Design Volume

Enter the area tributary to this feature	A_T=	2.2	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	2,872	ft^3

Type of Bioretention Facility Design

- (●) Side slopes required (parallel to parking spaces or adjacent to walkways)
- ( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	80.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.79	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	1,604	ft^2
Proposed Surface Area	A=	6,068	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		3	%
6" Check Dam Spacing		10	feet
Describe Vegetation:			

Notes:

Bioretention Facility - Design Procedure	BMP ID	Legend:	Required Entries	
	DMA G		Calculated Cells	

Company Name: Hunsaker & Associates Date: 11/15/2023

Designed by: County/City Case No.:

Design Volume

Enter the area tributary to this feature	A_T=	33.6	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	5,625	ft^3

Type of Bioretention Facility Design

- (●) Side slopes required (parallel to parking spaces or adjacent to walkways)
- ( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	3.0	ft
Top Width of Bioretention Facility, excluding curb	w_T =	80.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.79	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	3,140	ft^2
Proposed Surface Area	A=	18,590	ft^2

Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		3	%
6" Check Dam Spacing		10	feet
Describe Vegetation:			

Notes:

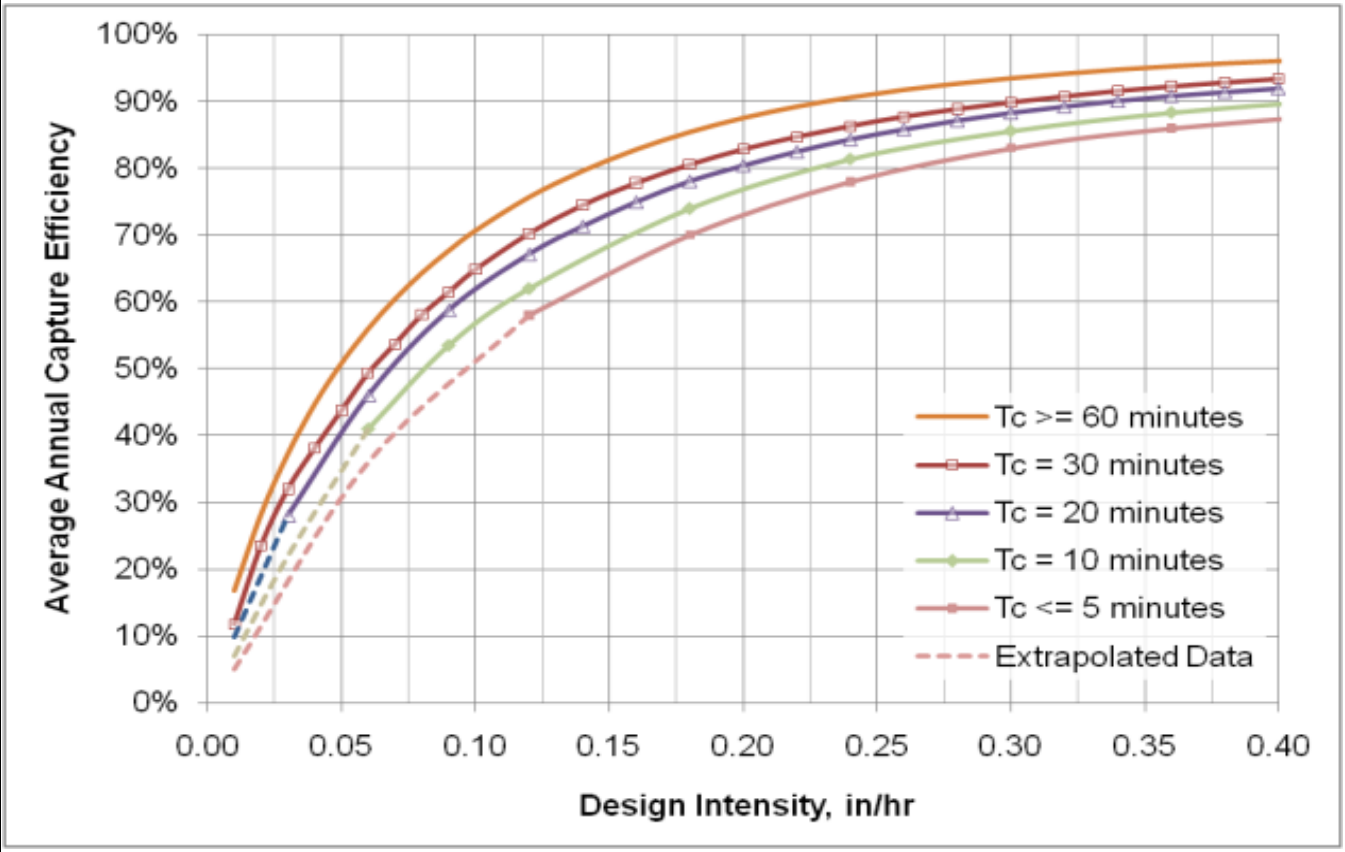
Worksheet D: Capture Efficiency Method for Flow-Based BMPs				
Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 *(Worksheet A)*	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.3	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.0	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.9	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.07	cfs
Supporting Calculations				
Describe system: DMA H has been oversized to mitigate flows for DMA C. A MWS, 8'x20' is proposed in DMA H.				
Provide time of concentration assumptions:				

Worksheet D: Capture Efficiency Method for Flow-Based BMPs				
Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 *(Worksheet A)*	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.4	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.0	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.9	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.09	cfs
Supporting Calculations				
Describe system: DMA H has been oversized to mitigate flows for DMA D. A MWS, 8'x20' is provided in DMA H.				
Provide time of concentration assumptions:				

Worksheet D: Capture Efficiency Method for Flow-Based BMPs				
Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter the time of concentration, T_c (min) (See Appendix IV.2)	T_c=	5	
2	Using Figure III.4, determine the design intensity at which the estimated time of concentration (T_c) achieves 80% capture efficiency, I_1	I_1=	0.26	in/hr
3	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
4	Enter capture efficiency corresponding to d_{HSC}, Y_2 *(Worksheet A)*	Y_2=	0	%
5	Using Figure III.4, determine the design intensity at which the time of concentration (T_c) achieves the upstream capture efficiency(Y_2), I_2	I_2=	0	
6	Determine the design intensity that must be provided by BMP, $I_{design} = I_1 - I_2$	I_{design}=	0.26	
Step 2: Calculate the design flowrate				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	0.1	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	1.0	
3	Calculate runoff coefficient, $C = (0.75 \times imp) + 0.15$	C=	0.9	
4	Calculate design flowrate, $Q_{design} = (C \times i_{design} \times A)$	Q_{design}=	0.02	cfs
Supporting Calculations				
Describe system: DMA H has been oversized to mitigate flows for the concrete crossing between DMA C and DMA D.				
Provide time of concentration assumptions:				

Worksheet D: Capture Efficiency Method for Flow-Based BMPs

Graphical Operations



Provide supporting graphical operations. See Example III.7.

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: Hunsaker & Associates Irvine, Inc. | Date: 2/26/2024

Designed by: | Case No:

Company Project Number/Name: Crescent Gardens

BMP Identification

BMP NAME / ID: DMA H - Proprietary Biofiltration (MWS or County approved equal)

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*H*	*339768*	*Mixed Surface Types*	*0.25*	*0.20*	*67327.2*			
		339768		***Total***		**67327.2**	**0.20**	***0.3***	***0.48***

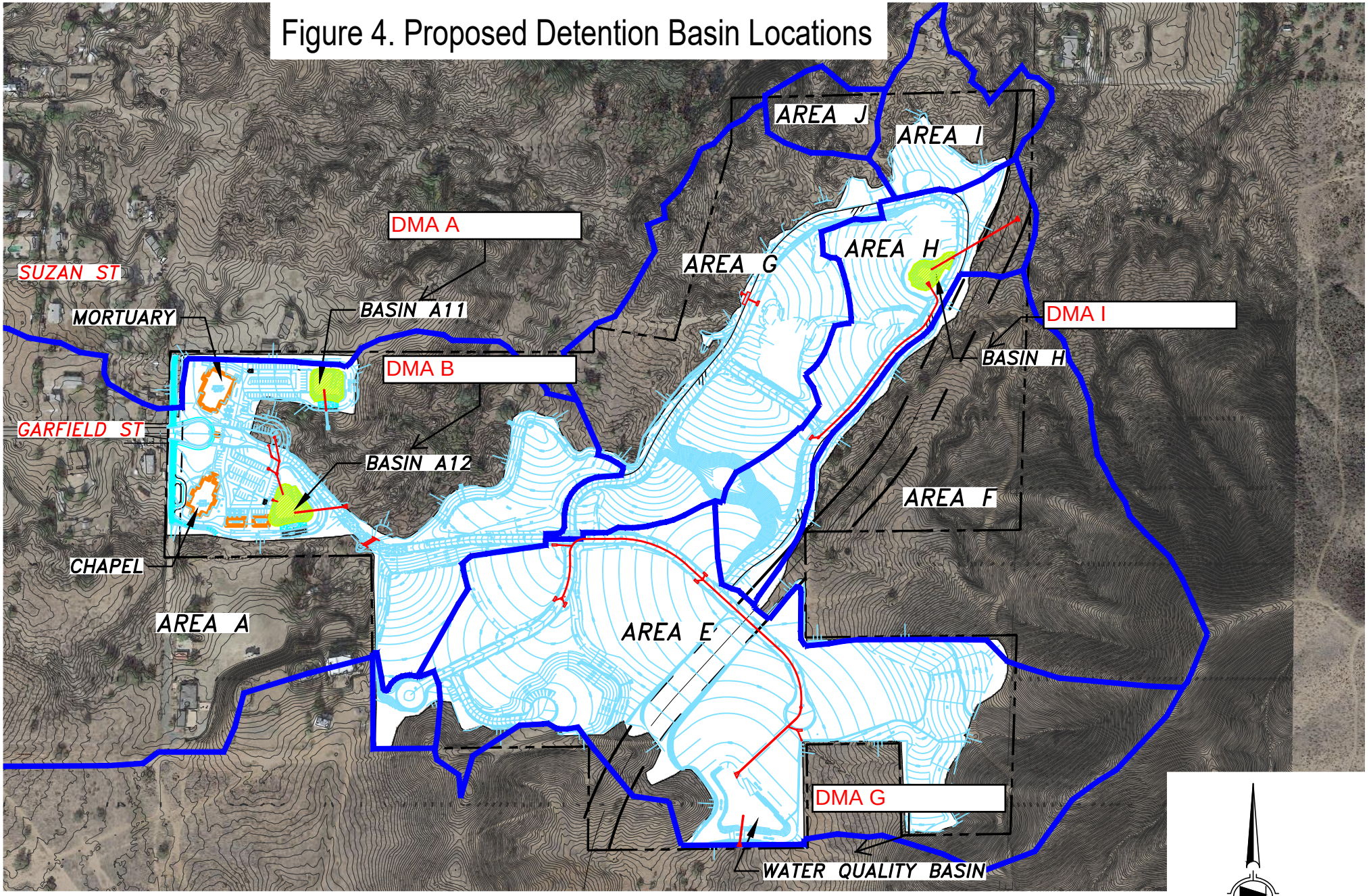
Notes:

MWS-L-8-20 has capacity of 0.577 cfs. A MWS or County of Riverside approved equal will be proposed. DMA H has been oversized to mitagate for DMA C (0.07 cfs), DMA D (0.09 cfs) and the crossing (0.02 cfs) between DMA C and DMA D. DMA C, D and the crossing cfs is 0.18. The total proposed cfs is 0.48.

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Figure 4. Proposed Detention Basin Locations



LEGEND

- MAJOR DRAINAGE AREA BOUNDARY
- MINOR DRAINAGE AREA BOUNDARY
- PROPERTY BOUNDARY
- PROPOSED STORM DRAIN
- DETENTION BASIN

Basin A11 Stage /Storage

Elev	Diff (Ft)	Stage (Ft)	Area (SF)	Average Area (SF)	Incrimental Volume (CF)	Total Volume (CF)	Total Volume (Ac-ft)	
1603.00	0	0	6067.9	0.0	0.0	0	0	
1604.00	1.00	1.00	7142.8	6605.4	6605.4	6605.35	0.152	
1605.00	1.00	2.00	8274.2	7708.5	7708.5	14313.85	0.329	
1606.00	1.00	3.00	9462.2	8868.2	8868.2	23182.05	0.532	Storage @ 2.9' = 22,295 CF
1606.90	0.90	3.90	10517.0	9989.6	8990.6	32172.69	0.739	1' Freeboard

Basin E Stage /Storage

Elev	Diff (Ft)	Stage (Ft)	Area (SF)	Average Area (SF)	Incrimental Volume (CF)	Total Volume (CF)	Total Volume (Ac-ft)	
1580.00	0	0	18590.5	0.0	0.0	0	0	
1581.00	1.00	1.00	20698.0	19644.3	19644.3	19644.25	0.451	
1582.00	1.00	2.00	22862.1	21780.1	21780.1	41424.30	0.951	
1583.00	1.00	3.00	25083.7	23972.9	23972.9	65397.20	1.501	Storage @ 3.0' = 65,397 CF
1584.00	1.00	4.00	27359.8	26221.8	26221.8	91618.95	2.103	1' Freeboard

Basin H Stage /Storage

Elev	Diff (Ft)	Stage (Ft)	Area (SF)	Average Area (SF)	Incrimental Volume (CF)	Total Volume (CF)	Total Volume (Ac-ft)	
1551.00	0	0	1625.0	0.0	0.0	0	0	
1552.00	1.00	1.00	2482.0	2053.5	2053.5	2053.50	0.047	
1553.00	1.00	2.00	3383.0	2932.5	2932.5	4986.00	0.114	
1554.00	1.00	3.00	4389.0	3886.0	3886.0	8872.00	0.204	
1555.00	1.00	4.00	6696.0	5542.5	5542.5	14414.50	0.331	Storage @ 4' = 0.33 AC-FT
1556.00	1.00	5.00	8727.0	7711.5	7711.5	22126.00	0.508	1' Freeboard

Sizing of the proposed retention basins to RCFC&WCD's requirements is based on the results of a Unit Hydrograph analysis comparing the peak flow and runoff volume from existing and proposed condition drainage areas tributary to each basin based on the 10-year, 24-hr storm event.

The Unit Hydrograph Calculations for the Project Site were performed using the methods outlined in Section E of the Hydrology Manual.

Precipitation values used in the development of the unit hydrographs for the proposed and existing condition for the project site were obtained from NOAA Atlas 14, Volume 6, Version 2. Copies of the precipitation values is available in Section 6 – References.

Lag time, area average mean soil loss rate (F), minimum soil loss rate (Fm) and low loss rate (F*) where developed using procedures shown on Plate E-1.1 of the Hydrology manual and calculated within the Civil Design Software program.

The parameters as mentioned above were entered into the Civil Design Software program and following tables summarizes the results:

Table 4. Unit Hydrographs Analysis Results for Area A and Area H (10-year, 24 hr Storm)

Drainage Area Name	Incorporated Detention Basins	Condition	Tributary Area (ac)	Peak Flow (cfs)	Runoff Volume (Ac-ft)
A	A11 & A12	Existing	119.92	33.0	11.5
		Proposed	120.22	33.2	12.2
Minimum Volume of Basins Required in Drainage Area A					***0.7***
H	H	Existing	4.46	1.7	0.6
		Proposed	8.53	2.7	0.9
Minimum Volume of Basin Required in Drainage Area H					**0.3**

Supporting Unit Hydrograph calculations can be found in Section 4 – Existing Condition & Proposed Condition Hydrology Unit Hydrograph Analysis.

To meet RCFC&WCD's mitigation requirements, proposed basins must provide a minimum volume as shown in Table 4 above. The following table summarizes the actual sizes of basin provided on the Project Site:

Table 5. Proposed Detention Basin Volumes Provided

Drainage Area Name	Detention Basins	Storage Volume Provided (Ac-ft)	Minium Volume of Basins Required (Ac-ft)
A	A11	0.33	
	A12	0.47	
Net Volume Provided		***0.8***	0.7
H	H	0.33	0.3

Basin sizing calculations can be found in Section 4 – Existing Condition & Proposed Condition Hydrology Unit Hydrograph Analysis.

H. FLOOD DELINATION OF EXISTING DRAINGE SWALE

The existing swale running though the project site in Drainage Area A and the proposed roadway/culvert crossing were analyzed to determine the extent of the floorplan and the performance of the proposed road/culvert crossing using HEC-RAS software. Cross sections of the existing swale were developed and imported into the HEC-RAS Model. A 8' (W) x 2' (H) box culvert and the roadway embankment was added to the model. Peak flows of 200 cfs (100-year Storm) and 111 cfs (10-year Storm) as determined from node 110.5 of the Rational Analysis were used to run the HEC-RAS Model.

The results of the HEC-RAS model indicate that during the 100-year storm 134 cfs will pass below the proposed roadway within the 8' (W) x 2' (H) box culvert. The remaining flow of 66 cfs will pass over the proposed roadway at a maximum depth of 8", an average velocity of 2.1 fps, and a spread of 95'. The results of the model also indicated that entire 10-year peak flow (111 cfs) will pass below the roadway within the proposed culvert with no flow crossing the roadway.

The results of this HEC-RAS analysis can be found in Section 5 – HEC-RAS Analysis.

I. CONCLUSION

The proposed drainage improvements along with the three detention basin will provide adequate on-site flood protection and mitigate off-site impacts in conformance with RCFC&WCD's criteria.

U n i t H y d r o g r a p h A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 10/19/23 File: crea2uh242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6406

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

CRESCENT GARDENS
Existing Condition
Area A
10/16/23

Drainage Area = 119.92(Ac.) = 0.187 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 119.92(Ac.) = 0.187 Sq. Mi.
Length along longest watercourse = 5504.00(Ft.)
Length along longest watercourse measured to centroid = 2594.00(Ft.)
Length along longest watercourse = 1.042 Mi.
Length along longest watercourse measured to centroid = 0.491 Mi.
Difference in elevation = 131.80(Ft.)
Slope along watercourse = 126.4360 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.223 Hr.
Lag time = 13.36 Min.
25% of lag time = 3.34 Min.
40% of lag time = 5.34 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
119.92	2.21	265.02

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
119.92	5.82	697.93

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.210(In)
Area Averaged 100-Year Rainfall = 5.820(In)

Point rain (area averaged) = 2.210(In)
Areal adjustment factor = 99.98 %
Adjusted average point rain = 2.209(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
119.920	78.10	0.118

Total Area Entered = 119.92(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
78.1	60.7	0.462	0.118	0.413	1.000	0.413
					Sum (F) =	0.413

Area averaged mean soil loss (F) (In/Hr) = 0.413
Minimum soil loss rate ((In/Hr)) = 0.207
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.806

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	37.435	3.948	4.772
2	0.167	74.870	15.900	19.217
3	0.250	112.305	25.143	30.387
4	0.333	149.740	18.667	22.560
5	0.417	187.175	9.371	11.326
6	0.500	224.610	5.615	6.787
7	0.583	262.045	4.164	5.032
8	0.667	299.480	3.270	3.952
9	0.750	336.914	2.513	3.037
10	0.833	374.349	2.119	2.561
11	0.917	411.784	1.661	2.008
12	1.000	449.219	1.303	1.575
13	1.083	486.654	1.162	1.404
14	1.167	524.089	1.061	1.282
15	1.250	561.524	0.836	1.010
16	1.333	598.959	0.710	0.858
17	1.417	636.394	0.603	0.729
18	1.500	673.829	0.494	0.597
19	1.583	711.264	0.384	0.464
20	1.667	748.699	0.374	0.452
21	1.750	786.134	0.374	0.452
22	1.833	823.569	0.326	0.394
			Sum = 100.000	Sum= 120.857

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.018	(0.732)	0.014	0.003
2	0.17	0.07	0.018	(0.730)	0.014	0.003
3	0.25	0.07	0.018	(0.727)	0.014	0.003
4	0.33	0.10	0.027	(0.724)	0.021	0.005
5	0.42	0.10	0.027	(0.721)	0.021	0.005
6	0.50	0.10	0.027	(0.718)	0.021	0.005
7	0.58	0.10	0.027	(0.715)	0.021	0.005
8	0.67	0.10	0.027	(0.713)	0.021	0.005
9	0.75	0.10	0.027	(0.710)	0.021	0.005
10	0.83	0.13	0.035	(0.707)	0.028	0.007
11	0.92	0.13	0.035	(0.704)	0.028	0.007
12	1.00	0.13	0.035	(0.702)	0.028	0.007
13	1.08	0.10	0.027	(0.699)	0.021	0.005
14	1.17	0.10	0.027	(0.696)	0.021	0.005
15	1.25	0.10	0.027	(0.693)	0.021	0.005
16	1.33	0.10	0.027	(0.690)	0.021	0.005
17	1.42	0.10	0.027	(0.688)	0.021	0.005
18	1.50	0.10	0.027	(0.685)	0.021	0.005
19	1.58	0.10	0.027	(0.682)	0.021	0.005
20	1.67	0.10	0.027	(0.680)	0.021	0.005
21	1.75	0.10	0.027	(0.677)	0.021	0.005
22	1.83	0.13	0.035	(0.674)	0.028	0.007
23	1.92	0.13	0.035	(0.671)	0.028	0.007
24	2.00	0.13	0.035	(0.669)	0.028	0.007
25	2.08	0.13	0.035	(0.666)	0.028	0.007
26	2.17	0.13	0.035	(0.663)	0.028	0.007
27	2.25	0.13	0.035	(0.661)	0.028	0.007
28	2.33	0.13	0.035	(0.658)	0.028	0.007
29	2.42	0.13	0.035	(0.655)	0.028	0.007
30	2.50	0.13	0.035	(0.652)	0.028	0.007
31	2.58	0.17	0.044	(0.650)	0.036	0.009
32	2.67	0.17	0.044	(0.647)	0.036	0.009
33	2.75	0.17	0.044	(0.644)	0.036	0.009
34	2.83	0.17	0.044	(0.642)	0.036	0.009
35	2.92	0.17	0.044	(0.639)	0.036	0.009
36	3.00	0.17	0.044	(0.637)	0.036	0.009
37	3.08	0.17	0.044	(0.634)	0.036	0.009
38	3.17	0.17	0.044	(0.631)	0.036	0.009
39	3.25	0.17	0.044	(0.629)	0.036	0.009
40	3.33	0.17	0.044	(0.626)	0.036	0.009
41	3.42	0.17	0.044	(0.623)	0.036	0.009
42	3.50	0.17	0.044	(0.621)	0.036	0.009
43	3.58	0.17	0.044	(0.618)	0.036	0.009
44	3.67	0.17	0.044	(0.616)	0.036	0.009
45	3.75	0.17	0.044	(0.613)	0.036	0.009
46	3.83	0.20	0.053	(0.610)	0.043	0.010
47	3.92	0.20	0.053	(0.608)	0.043	0.010
48	4.00	0.20	0.053	(0.605)	0.043	0.010
49	4.08	0.20	0.053	(0.603)	0.043	0.010
50	4.17	0.20	0.053	(0.600)	0.043	0.010
51	4.25	0.20	0.053	(0.598)	0.043	0.010
52	4.33	0.23	0.062	(0.595)	0.050	0.012
53	4.42	0.23	0.062	(0.593)	0.050	0.012
54	4.50	0.23	0.062	(0.590)	0.050	0.012
55	4.58	0.23	0.062	(0.587)	0.050	0.012
56	4.67	0.23	0.062	(0.585)	0.050	0.012
57	4.75	0.23	0.062	(0.582)	0.050	0.012
58	4.83	0.27	0.071	(0.580)	0.057	0.014
59	4.92	0.27	0.071	(0.577)	0.057	0.014
60	5.00	0.27	0.071	(0.575)	0.057	0.014
61	5.08	0.20	0.053	(0.572)	0.043	0.010
62	5.17	0.20	0.053	(0.570)	0.043	0.010
63	5.25	0.20	0.053	(0.567)	0.043	0.010
64	5.33	0.23	0.062	(0.565)	0.050	0.012
65	5.42	0.23	0.062	(0.562)	0.050	0.012
66	5.50	0.23	0.062	(0.560)	0.050	0.012
67	5.58	0.27	0.071	(0.558)	0.057	0.014
68	5.67	0.27	0.071	(0.555)	0.057	0.014
69	5.75	0.27	0.071	(0.553)	0.057	0.014
70	5.83	0.27	0.071	(0.550)	0.057	0.014
71	5.92	0.27	0.071	(0.548)	0.057	0.014
72	6.00	0.27	0.071	(0.545)	0.057	0.014
73	6.08	0.30	0.080	(0.543)	0.064	0.015
74	6.17	0.30	0.080	(0.540)	0.064	0.015
75	6.25	0.30	0.080	(0.538)	0.064	0.015
76	6.33	0.30	0.080	(0.536)	0.064	0.015
77	6.42	0.30	0.080	(0.533)	0.064	0.015
78	6.50	0.30	0.080	(0.531)	0.064	0.015
79	6.58	0.33	0.088	(0.529)	0.071	0.017
80	6.67	0.33	0.088	(0.526)	0.071	0.017
81	6.75	0.33	0.088	(0.524)	0.071	0.017
82	6.83	0.33	0.088	(0.521)	0.071	0.017
83	6.92	0.33	0.088	(0.519)	0.071	0.017
84	7.00	0.33	0.088	(0.517)	0.071	0.017
85	7.08	0.33	0.088	(0.514)	0.071	0.017
86	7.17	0.33	0.088	(0.512)	0.071	0.017
87	7.25	0.33	0.088	(0.510)	0.071	0.017
88	7.33	0.37	0.097	(0.507)	0.078	0.019
89	7.42	0.37	0.097	(0.505)	0.078	0.019
90	7.50	0.37	0.097	(0.503)	0.078	0.019
91	7.58	0.40	0.106	(0.500)	0.085	0.021
92	7.67	0.40	0.106	(0.498)	0.085	0.021
93	7.75	0.40	0.106	(0.496)	0.085	0.021
94	7.83	0.43	0.115	(0.493)	0.093	0.022
95	7.92	0.43	0.115	(0.491)	0.093	0.022
96	8.00	0.43	0.115	(0.489)	0.093	0.022
97	8.08	0.50	0.133	(0.487)	0.107	0.026
98	8.17	0.50	0.133	(0.484)	0.107	0.026
99	8.25	0.50	0.133	(0.482)	0.107	0.026
100	8.33	0.50	0.133	(0.480)	0.107	0.026
101	8.42	0.50	0.133	(0.478)	0.107	0.026
102	8.50	0.50	0.133	(0.475)	0.107	0.026
103	8.58	0.53	0.141	(0.473)	0.114	0.027
104	8.67	0.53	0.141	(0.471)	0.114	0.027
105	8.75	0.53	0.141	(0.469)	0.114	0.027
106	8.83	0.57	0.150	(0.467)	0.121	0.029
107	8.92	0.57	0.150	(0.464)	0.121	0.029
108	9.00	0.57	0.150	(0.462)	0.121	0.029
109	9.08	0.63	0.168	(0.460)	0.135	0.033
110	9.17	0.63	0.168	(0.458)	0.135	0.033
111	9.25	0.63	0.168	(0.456)	0.135	0.033
112	9.33	0.67	0.177	(0.453)	0.142	0.034
113	9.42	0.67	0.177	(0.451)	0.142	0.034
114	9.50	0.67	0.177	(0.449)	0.142	0.034
115	9.58	0.70	0.186	(0.447)	0.150	0.036
116	9.67	0.70	0.186	(0.445)	0.150	0.036
117	9.75	0.70	0.186	(0.443)	0.150	0.036

118	9.83	0.73	0.194	(0.441)	0.157	0.038
119	9.92	0.73	0.194	(0.438)	0.157	0.038
120	10.00	0.73	0.194	(0.436)	0.157	0.038
121	10.08	0.50	0.133	(0.434)	0.107	0.026
122	10.17	0.50	0.133	(0.432)	0.107	0.026
123	10.25	0.50	0.133	(0.430)	0.107	0.026
124	10.33	0.50	0.133	(0.428)	0.107	0.026
125	10.42	0.50	0.133	(0.426)	0.107	0.026
126	10.50	0.50	0.133	(0.424)	0.107	0.026
127	10.58	0.67	0.177	(0.422)	0.142	0.034
128	10.67	0.67	0.177	(0.420)	0.142	0.034
129	10.75	0.67	0.177	(0.418)	0.142	0.034
130	10.83	0.67	0.177	(0.415)	0.142	0.034
131	10.92	0.67	0.177	(0.413)	0.142	0.034
132	11.00	0.67	0.177	(0.411)	0.142	0.034
133	11.08	0.63	0.168	(0.409)	0.135	0.033
134	11.17	0.63	0.168	(0.407)	0.135	0.033
135	11.25	0.63	0.168	(0.405)	0.135	0.033
136	11.33	0.63	0.168	(0.403)	0.135	0.033
137	11.42	0.63	0.168	(0.401)	0.135	0.033
138	11.50	0.63	0.168	(0.399)	0.135	0.033
139	11.58	0.57	0.150	(0.397)	0.121	0.029
140	11.67	0.57	0.150	(0.395)	0.121	0.029
141	11.75	0.57	0.150	(0.393)	0.121	0.029
142	11.83	0.60	0.159	(0.391)	0.128	0.031
143	11.92	0.60	0.159	(0.390)	0.128	0.031
144	12.00	0.60	0.159	(0.388)	0.128	0.031
145	12.08	0.83	0.221	(0.386)	0.178	0.043
146	12.17	0.83	0.221	(0.384)	0.178	0.043
147	12.25	0.83	0.221	(0.382)	0.178	0.043
148	12.33	0.87	0.230	(0.380)	0.185	0.045
149	12.42	0.87	0.230	(0.378)	0.185	0.045
150	12.50	0.87	0.230	(0.376)	0.185	0.045
151	12.58	0.93	0.247	(0.374)	0.199	0.048
152	12.67	0.93	0.247	(0.372)	0.199	0.048
153	12.75	0.93	0.247	(0.370)	0.199	0.048
154	12.83	0.97	0.256	(0.369)	0.206	0.050
155	12.92	0.97	0.256	(0.367)	0.206	0.050
156	13.00	0.97	0.256	(0.365)	0.206	0.050
157	13.08	1.13	0.300	(0.363)	0.242	0.058
158	13.17	1.13	0.300	(0.361)	0.242	0.058
159	13.25	1.13	0.300	(0.359)	0.242	0.058
160	13.33	1.13	0.300	(0.357)	0.242	0.058
161	13.42	1.13	0.300	(0.356)	0.242	0.058
162	13.50	1.13	0.300	(0.354)	0.242	0.058
163	13.58	0.77	0.203	(0.352)	0.164	0.040
164	13.67	0.77	0.203	(0.350)	0.164	0.040
165	13.75	0.77	0.203	(0.348)	0.164	0.040
166	13.83	0.77	0.203	(0.347)	0.164	0.040
167	13.92	0.77	0.203	(0.345)	0.164	0.040
168	14.00	0.77	0.203	(0.343)	0.164	0.040
169	14.08	0.90	0.239	(0.341)	0.192	0.046
170	14.17	0.90	0.239	(0.340)	0.192	0.046
171	14.25	0.90	0.239	(0.338)	0.192	0.046
172	14.33	0.87	0.230	(0.336)	0.185	0.045
173	14.42	0.87	0.230	(0.334)	0.185	0.045
174	14.50	0.87	0.230	(0.333)	0.185	0.045
175	14.58	0.87	0.230	(0.331)	0.185	0.045
176	14.67	0.87	0.230	(0.329)	0.185	0.045
177	14.75	0.87	0.230	(0.328)	0.185	0.045
178	14.83	0.83	0.221	(0.326)	0.178	0.043
179	14.92	0.83	0.221	(0.324)	0.178	0.043
180	15.00	0.83	0.221	(0.323)	0.178	0.043
181	15.08	0.80	0.212	(0.321)	0.171	0.041
182	15.17	0.80	0.212	(0.319)	0.171	0.041
183	15.25	0.80	0.212	(0.318)	0.171	0.041
184	15.33	0.77	0.203	(0.316)	0.164	0.040
185	15.42	0.77	0.203	(0.314)	0.164	0.040
186	15.50	0.77	0.203	(0.313)	0.164	0.040
187	15.58	0.63	0.168	(0.311)	0.135	0.033
188	15.67	0.63	0.168	(0.310)	0.135	0.033
189	15.75	0.63	0.168	(0.308)	0.135	0.033
190	15.83	0.63	0.168	(0.307)	0.135	0.033
191	15.92	0.63	0.168	(0.305)	0.135	0.033
192	16.00	0.63	0.168	(0.303)	0.135	0.033
193	16.08	0.13	0.035	(0.302)	0.028	0.007
194	16.17	0.13	0.035	(0.300)	0.028	0.007
195	16.25	0.13	0.035	(0.299)	0.028	0.007
196	16.33	0.13	0.035	(0.297)	0.028	0.007
197	16.42	0.13	0.035	(0.296)	0.028	0.007
198	16.50	0.13	0.035	(0.294)	0.028	0.007
199	16.58	0.10	0.027	(0.293)	0.021	0.005
200	16.67	0.10	0.027	(0.291)	0.021	0.005
201	16.75	0.10	0.027	(0.290)	0.021	0.005
202	16.83	0.10	0.027	(0.288)	0.021	0.005
203	16.92	0.10	0.027	(0.287)	0.021	0.005
204	17.00	0.10	0.027	(0.285)	0.021	0.005
205	17.08	0.17	0.044	(0.284)	0.036	0.009
206	17.17	0.17	0.044	(0.283)	0.036	0.009
207	17.25	0.17	0.044	(0.281)	0.036	0.009
208	17.33	0.17	0.044	(0.280)	0.036	0.009
209	17.42	0.17	0.044	(0.278)	0.036	0.009
210	17.50	0.17	0.044	(0.277)	0.036	0.009
211	17.58	0.17	0.044	(0.275)	0.036	0.009
212	17.67	0.17	0.044	(0.274)	0.036	0.009
213	17.75	0.17	0.044	(0.273)	0.036	0.009
214	17.83	0.13	0.035	(0.271)	0.028	0.007
215	17.92	0.13	0.035	(0.270)	0.028	0.007
216	18.00	0.13	0.035	(0.269)	0.028	0.007
217	18.08	0.13	0.035	(0.267)	0.028	0.007
218	18.17	0.13	0.035	(0.266)	0.028	0.007
219	18.25	0.13	0.035	(0.265)	0.028	0.007
220	18.33	0.13	0.035	(0.263)	0.028	0.007
221	18.42	0.13	0.035	(0.262)	0.028	0.007
222	18.50	0.13	0.035	(0.261)	0.028	0.007
223	18.58	0.10	0.027	(0.260)	0.021	0.005
224	18.67	0.10	0.027	(0.258)	0.021	0.005
225	18.75	0.10	0.027	(0.257)	0.021	0.005
226	18.83	0.07	0.018	(0.256)	0.014	0.003
227	18.92	0.07	0.018	(0.255)	0.014	0.003
228	19.00	0.07	0.018	(0.254)	0.014	0.003
229	19.08	0.10	0.027	(0.252)	0.021	0.005
230	19.17	0.10	0.027	(0.251)	0.021	0.005
231	19.25	0.10	0.027	(0.250)	0.021	0.005
232	19.33	0.13	0.035	(0.249)	0.028	0.007
233	19.42	0.13	0.035	(0.248)	0.028	0.007
234	19.50	0.13	0.035	(0.247)	0.028	0.007
235	19.58	0.10	0.027	(0.245)	0.021	0.005
236	19.67	0.10	0.027	(0.244)	0.021	0.005
237	19.75	0.10	0.027	(0.243)	0.021	0.005

238	19.83	0.07	0.018	(0.242)	0.014	0.003
239	19.92	0.07	0.018	(0.241)	0.014	0.003
240	20.00	0.07	0.018	(0.240)	0.014	0.003
241	20.08	0.10	0.027	(0.239)	0.021	0.005
242	20.17	0.10	0.027	(0.238)	0.021	0.005
243	20.25	0.10	0.027	(0.237)	0.021	0.005
244	20.33	0.10	0.027	(0.236)	0.021	0.005
245	20.42	0.10	0.027	(0.235)	0.021	0.005
246	20.50	0.10	0.027	(0.234)	0.021	0.005
247	20.58	0.10	0.027	(0.233)	0.021	0.005
248	20.67	0.10	0.027	(0.232)	0.021	0.005
249	20.75	0.10	0.027	(0.231)	0.021	0.005
250	20.83	0.07	0.018	(0.230)	0.014	0.003
251	20.92	0.07	0.018	(0.229)	0.014	0.003
252	21.00	0.07	0.018	(0.228)	0.014	0.003
253	21.08	0.10	0.027	(0.227)	0.021	0.005
254	21.17	0.10	0.027	(0.226)	0.021	0.005
255	21.25	0.10	0.027	(0.225)	0.021	0.005
256	21.33	0.07	0.018	(0.224)	0.014	0.003
257	21.42	0.07	0.018	(0.224)	0.014	0.003
258	21.50	0.07	0.018	(0.223)	0.014	0.003
259	21.58	0.10	0.027	(0.222)	0.021	0.005
260	21.67	0.10	0.027	(0.221)	0.021	0.005
261	21.75	0.10	0.027	(0.220)	0.021	0.005
262	21.83	0.07	0.018	(0.220)	0.014	0.003
263	21.92	0.07	0.018	(0.219)	0.014	0.003
264	22.00	0.07	0.018	(0.218)	0.014	0.003
265	22.08	0.10	0.027	(0.217)	0.021	0.005
266	22.17	0.10	0.027	(0.217)	0.021	0.005
267	22.25	0.10	0.027	(0.216)	0.021	0.005
268	22.33	0.07	0.018	(0.215)	0.014	0.003
269	22.42	0.07	0.018	(0.215)	0.014	0.003
270	22.50	0.07	0.018	(0.214)	0.014	0.003
271	22.58	0.07	0.018	(0.213)	0.014	0.003
272	22.67	0.07	0.018	(0.213)	0.014	0.003
273	22.75	0.07	0.018	(0.212)	0.014	0.003
274	22.83	0.07	0.018	(0.212)	0.014	0.003
275	22.92	0.07	0.018	(0.211)	0.014	0.003
276	23.00	0.07	0.018	(0.211)	0.014	0.003
277	23.08	0.07	0.018	(0.210)	0.014	0.003
278	23.17	0.07	0.018	(0.210)	0.014	0.003
279	23.25	0.07	0.018	(0.209)	0.014	0.003
280	23.33	0.07	0.018	(0.209)	0.014	0.003
281	23.42	0.07	0.018	(0.208)	0.014	0.003
282	23.50	0.07	0.018	(0.208)	0.014	0.003
283	23.58	0.07	0.018	(0.208)	0.014	0.003
284	23.67	0.07	0.018	(0.207)	0.014	0.003
285	23.75	0.07	0.018	(0.207)	0.014	0.003
286	23.83	0.07	0.018	(0.207)	0.014	0.003
287	23.92	0.07	0.018	(0.207)	0.014	0.003
288	24.00	0.07	0.018	(0.207)	0.014	0.003

(Loss Rate Not Used)

Sum = 100.0 Sum = 5.2

Flood volume = Effective rainfall 0.43(In)
times area 119.9(Ac.)/[(In)/(Ft.)] = 4.3(Ac.Ft)
Total soil loss = 1.78(In)
Total soil loss = 17.788(Ac.Ft)
Total rainfall = 2.21(In)
Flood volume = 186975.6 Cubic Feet
Total soil loss = 774833.2 Cubic Feet

Peak flow rate of this hydrograph = 6.763(CFS)

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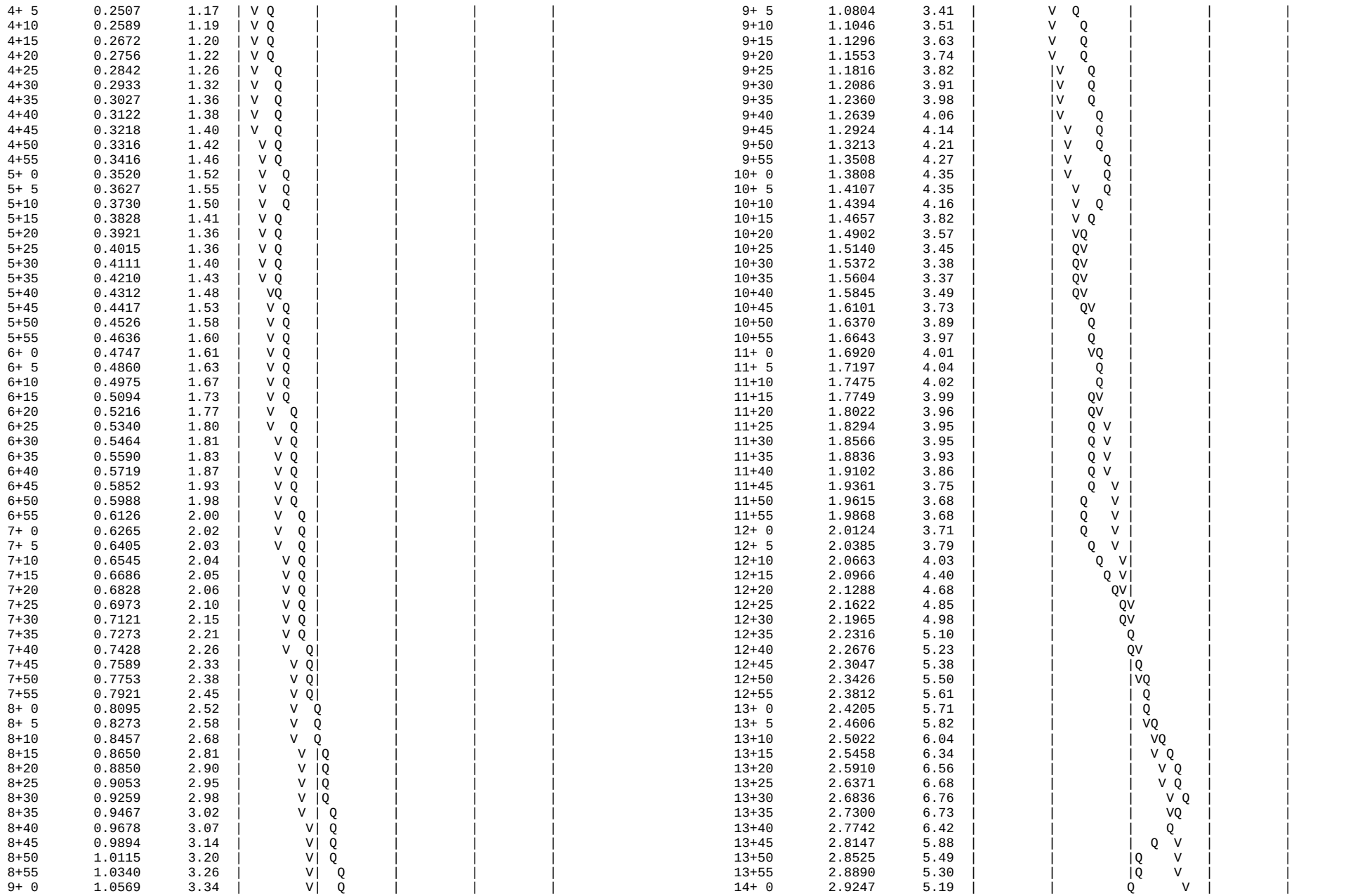
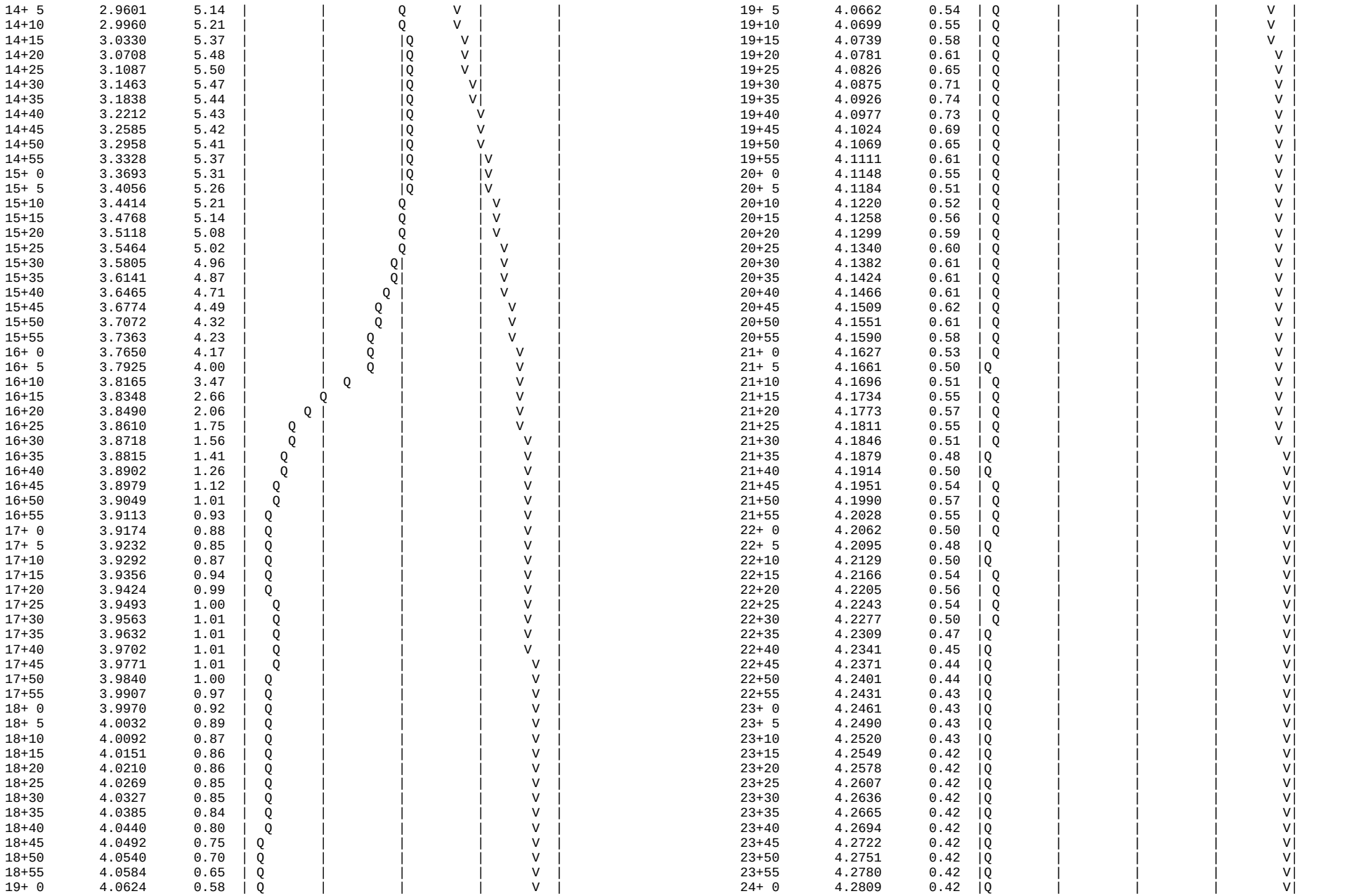
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001	0.02	Q	|	|	|	|
0+10	0.0007	0.08	Q	|	|	|	|
0+15	0.0020	0.19	Q	|	|	|	|
0+20	0.0038	0.27	VQ	|	|	|	|
0+25	0.0062	0.34	VQ	|	|	|	|
0+30	0.0091	0.42	VQ	|	|	|	|
0+35	0.0124	0.48	VQ	|	|	|	|
0+40	0.0159	0.51	V Q	|	|	|	|
0+45	0.0196	0.53	V Q	|	|	|	|
0+50	0.0234	0.56	V Q	|	|	|	|
0+55	0.0276	0.60	V Q	|	|	|	|
1+ 0	0.0322	0.67	V Q	|	|	|	|
1+ 5	0.0370	0.71	V Q	|	|	|	|
1+10	0.0418	0.70	V Q	|	|	|	|
1+15	0.0464	0.67	V Q	|	|	|	|
1+20	0.0509	0.64	V Q	|	|	|	|
1+25	0.0552	0.63	V Q	|	|	|	|
1+30	0.0596	0.63	V Q	|	|	|	|
1+35	0.0639	0.63	V Q	|	|	|	|
1+40	0.0682	0.63	V Q	|	|	|	|
1+45	0.0726	0.63	V Q	|	|	|	|
1+50	0.0770	0.64	V Q	|	|	|	|
1+55	0.0816	0.67	V Q	|	|	|	|
2+ 0	0.0866	0.72	V Q	|	|	|	|
2+ 5	0.0918	0.76	V Q	|	|	|	|
2+10	0.0972	0.78	V Q	|	|	|	|
2+15	0.1026	0.79	V Q	|	|	|	|
2+20	0.1081	0.80	|V Q	|	|	|	|
2+25	0.1136	0.80	|V Q	|	|	|	|
2+30	0.1192	0.81	|V Q	|	|	|	|
2+35	0.1249	0.82	|V Q	|	|	|	|
2+40	0.1308	0.86	|V Q	|	|	|	|
2+45	0.1371	0.91	|V Q	|	|	|	|
2+50	0.1436	0.95	|V Q	|	|	|	|
2+55	0.1503	0.97	|V Q	|	|	|	|
3+ 0	0.1571	0.99	|V Q	|	|	|	|
3+ 5	0.1640	1.00	|V Q	|	|	|	|
3+10	0.1709	1.01	|V Q	|	|	|	|
3+15	0.1779	1.01	|V Q	|	|	|	|
3+20	0.1849	1.02	|V Q	|	|	|	|
3+25	0.1920	1.02	|V Q	|	|	|	|
3+30	0.1990	1.02	|V Q	|	|	|	|
3+35	0.2061	1.03	|V Q	|	|	|	|
3+40	0.2132	1.03	|V Q	|	|	|	|
3+45	0.2203	1.03	| V Q	|	|	|	|
3+50	0.2275	1.04	| V Q	|	|	|	|
3+55	0.2349	1.08	| V Q	|	|	|	|
4+ 0	0.2427	1.13	| V Q	|	|	|	|





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  24+ 5       4.2836      0.40  |Q        |         |         |        V|
  24+10       4.2859      0.33  |Q        |         |         |        V|
  24+15       4.2875      0.23  Q         |         |         |        V|
  24+20       4.2885      0.15  Q         |         |         |        V|
  24+25       4.2893      0.11  Q         |         |         |        V|
  24+30       4.2899      0.09  Q         |         |         |        V|
  24+35       4.2904      0.07  Q         |         |         |        V|
  24+40       4.2908      0.06  Q         |         |         |        V|
  24+45       4.2911      0.05  Q         |         |         |        V|
  24+50       4.2914      0.04  Q         |         |         |        V|
  24+55       4.2916      0.03  Q         |         |         |        V|
  25+ 0       4.2918      0.03  Q         |         |         |        V|
  25+ 5       4.2919      0.02  Q         |         |         |        V|
  25+10       4.2920      0.02  Q         |         |         |        V|
  25+15       4.2921      0.01  Q         |         |         |        V|
  25+20       4.2922      0.01  Q         |         |         |        V|
  25+25       4.2923      0.01  Q         |         |         |        V|
  25+30       4.2923      0.01  Q         |         |         |        V|
  25+35       4.2923      0.00  Q         |         |         |        V|
  25+40       4.2924      0.00  Q         |         |         |        V|
  25+45       4.2924      0.00  Q         |         |         |         V
-------------------------------------------------------------------------
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/19/23 File: creh2uh242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6406

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

CRESCENT GARDENS
EXISTING CONDITION
AREA H
10/16/23

Drainage Area = 4.46(Ac.) = 0.007 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 4.46(Ac.) = 0.007 Sq. Mi.
Length along longest watercourse = 680.60(Ft.)
Length along longest watercourse measured to centroid = 342.00(Ft.)
Length along longest watercourse = 0.129 Mi.
Length along longest watercourse measured to centroid = 0.065 Mi.
Difference in elevation = 71.00(Ft.)
Slope along watercourse = 550.8081 Ft./Mi.
Average Manning's 'N' = 0.040
Lag time = 0.047 Hr.
Lag time = 2.82 Min.
25% of lag time = 0.70 Min.
40% of lag time = 1.13 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
4.46	2.21	9.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
4.46	5.82	25.96

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.210(In)
Area Averaged 100-Year Rainfall = 5.820(In)

Point rain (area averaged) = 2.210(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.210(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
4.460	89.00	0.000

Total Area Entered = 4.46(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
89.0	76.4	0.286	0.000	0.286	1.000	0.286
					Sum (F) =	0.286

Area averaged mean soil loss (F) (In/Hr) = 0.286
Minimum soil loss rate ((In/Hr)) = 0.143
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	177.464	39.219	1.763
2	0.167	354.928	44.970	2.021
3	0.250	532.392	9.778	0.439
4	0.333	709.856	4.034	0.181
5	0.417	887.320	2.000	0.090
		Sum = 100.000	Sum=	4.495

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.018	(0.508)	0.016	0.002
2	0.17	0.07	0.018	(0.506)	0.016	0.002
3	0.25	0.07	0.018	(0.504)	0.016	0.002
4	0.33	0.10	0.027	(0.502)	0.024	0.003
5	0.42	0.10	0.027	(0.500)	0.024	0.003
6	0.50	0.10	0.027	(0.498)	0.024	0.003
7	0.58	0.10	0.027	(0.496)	0.024	0.003
8	0.67	0.10	0.027	(0.494)	0.024	0.003
9	0.75	0.10	0.027	(0.492)	0.024	0.003
10	0.83	0.13	0.035	(0.490)	0.032	0.004
11	0.92	0.13	0.035	(0.488)	0.032	0.004
12	1.00	0.13	0.035	(0.486)	0.032	0.004
13	1.08	0.10	0.027	(0.485)	0.024	0.003
14	1.17	0.10	0.027	(0.483)	0.024	0.003

15	1.25	0.10	0.027	(0.481)	0.024	0.003
16	1.33	0.10	0.027	(0.479)	0.024	0.003
17	1.42	0.10	0.027	(0.477)	0.024	0.003
18	1.50	0.10	0.027	(0.475)	0.024	0.003
19	1.58	0.10	0.027	(0.473)	0.024	0.003
20	1.67	0.10	0.027	(0.471)	0.024	0.003
21	1.75	0.10	0.027	(0.469)	0.024	0.003
22	1.83	0.13	0.035	(0.467)	0.032	0.004
23	1.92	0.13	0.035	(0.466)	0.032	0.004
24	2.00	0.13	0.035	(0.464)	0.032	0.004
25	2.08	0.13	0.035	(0.462)	0.032	0.004
26	2.17	0.13	0.035	(0.460)	0.032	0.004
27	2.25	0.13	0.035	(0.458)	0.032	0.004
28	2.33	0.13	0.035	(0.456)	0.032	0.004
29	2.42	0.13	0.035	(0.454)	0.032	0.004
30	2.50	0.13	0.035	(0.452)	0.032	0.004
31	2.58	0.17	0.044	(0.451)	0.040	0.004
32	2.67	0.17	0.044	(0.449)	0.040	0.004
33	2.75	0.17	0.044	(0.447)	0.040	0.004
34	2.83	0.17	0.044	(0.445)	0.040	0.004
35	2.92	0.17	0.044	(0.443)	0.040	0.004
36	3.00	0.17	0.044	(0.441)	0.040	0.004
37	3.08	0.17	0.044	(0.440)	0.040	0.004
38	3.17	0.17	0.044	(0.438)	0.040	0.004
39	3.25	0.17	0.044	(0.436)	0.040	0.004
40	3.33	0.17	0.044	(0.434)	0.040	0.004
41	3.42	0.17	0.044	(0.432)	0.040	0.004
42	3.50	0.17	0.044	(0.430)	0.040	0.004
43	3.58	0.17	0.044	(0.429)	0.040	0.004
44	3.67	0.17	0.044	(0.427)	0.040	0.004
45	3.75	0.17	0.044	(0.425)	0.040	0.004
46	3.83	0.20	0.053	(0.423)	0.048	0.005
47	3.92	0.20	0.053	(0.422)	0.048	0.005
48	4.00	0.20	0.053	(0.420)	0.048	0.005
49	4.08	0.20	0.053	(0.418)	0.048	0.005
50	4.17	0.20	0.053	(0.416)	0.048	0.005
51	4.25	0.20	0.053	(0.414)	0.048	0.005
52	4.33	0.23	0.062	(0.413)	0.056	0.006
53	4.42	0.23	0.062	(0.411)	0.056	0.006
54	4.50	0.23	0.062	(0.409)	0.056	0.006
55	4.58	0.23	0.062	(0.407)	0.056	0.006
56	4.67	0.23	0.062	(0.406)	0.056	0.006
57	4.75	0.23	0.062	(0.404)	0.056	0.006
58	4.83	0.27	0.071	(0.402)	0.064	0.007
59	4.92	0.27	0.071	(0.400)	0.064	0.007
60	5.00	0.27	0.071	(0.399)	0.064	0.007
61	5.08	0.20	0.053	(0.397)	0.048	0.005
62	5.17	0.20	0.053	(0.395)	0.048	0.005
63	5.25	0.20	0.053	(0.393)	0.048	0.005
64	5.33	0.23	0.062	(0.392)	0.056	0.006
65	5.42	0.23	0.062	(0.390)	0.056	0.006
66	5.50	0.23	0.062	(0.388)	0.056	0.006
67	5.58	0.27	0.071	(0.387)	0.064	0.007
68	5.67	0.27	0.071	(0.385)	0.064	0.007
69	5.75	0.27	0.071	(0.383)	0.064	0.007
70	5.83	0.27	0.071	(0.382)	0.064	0.007
71	5.92	0.27	0.071	(0.380)	0.064	0.007
72	6.00	0.27	0.071	(0.378)	0.064	0.007
73	6.08	0.30	0.080	(0.376)	0.072	0.008
74	6.17	0.30	0.080	(0.375)	0.072	0.008
75	6.25	0.30	0.080	(0.373)	0.072	0.008
76	6.33	0.30	0.080	(0.371)	0.072	0.008
77	6.42	0.30	0.080	(0.370)	0.072	0.008
78	6.50	0.30	0.080	(0.368)	0.072	0.008
79	6.58	0.33	0.088	(0.366)	0.080	0.009
80	6.67	0.33	0.088	(0.365)	0.080	0.009
81	6.75	0.33	0.088	(0.363)	0.080	0.009
82	6.83	0.33	0.088	(0.362)	0.080	0.009
83	6.92	0.33	0.088	(0.360)	0.080	0.009
84	7.00	0.33	0.088	(0.358)	0.080	0.009
85	7.08	0.33	0.088	(0.357)	0.080	0.009
86	7.17	0.33	0.088	(0.355)	0.080	0.009
87	7.25	0.33	0.088	(0.353)	0.080	0.009
88	7.33	0.37	0.097	(0.352)	0.088	0.010
89	7.42	0.37	0.097	(0.350)	0.088	0.010
90	7.50	0.37	0.097	(0.349)	0.088	0.010
91	7.58	0.40	0.106	(0.347)	0.095	0.011
92	7.67	0.40	0.106	(0.345)	0.095	0.011
93	7.75	0.40	0.106	(0.344)	0.095	0.011
94	7.83	0.43	0.115	(0.342)	0.103	0.011
95	7.92	0.43	0.115	(0.341)	0.103	0.011
96	8.00	0.43	0.115	(0.339)	0.103	0.011
97	8.08	0.50	0.133	(0.337)	0.119	0.013
98	8.17	0.50	0.133	(0.336)	0.119	0.013
99	8.25	0.50	0.133	(0.334)	0.119	0.013
100	8.33	0.50	0.133	(0.333)	0.119	0.013
101	8.42	0.50	0.133	(0.331)	0.119	0.013
102	8.50	0.50	0.133	(0.330)	0.119	0.013
103	8.58	0.53	0.141	(0.328)	0.127	0.014
104	8.67	0.53	0.141	(0.327)	0.127	0.014
105	8.75	0.53	0.141	(0.325)	0.127	0.014
106	8.83	0.57	0.150	(0.323)	0.135	0.015
107	8.92	0.57	0.150	(0.322)	0.135	0.015
108	9.00	0.57	0.150	(0.320)	0.135	0.015
109	9.08	0.63	0.168	(0.319)	0.151	0.017
110	9.17	0.63	0.168	(0.317)	0.151	0.017
111	9.25	0.63	0.168	(0.316)	0.151	0.017
112	9.33	0.67	0.177	(0.314)	0.159	0.018
113	9.42	0.67	0.177	(0.313)	0.159	0.018
114	9.50	0.67	0.177	(0.311)	0.159	0.018
115	9.58	0.70	0.186	(0.310)	0.167	0.019
116	9.67	0.70	0.186	(0.308)	0.167	0.019
117	9.75	0.70	0.186	(0.307)	0.167	0.019
118	9.83	0.73	0.194	(0.305)	0.175	0.019
119	9.92	0.73	0.194	(0.304)	0.175	0.019
120	10.00	0.73	0.194	(0.303)	0.175	0.019
121	10.08	0.50	0.133	(0.301)	0.119	0.013
122	10.17	0.50	0.133	(0.300)	0.119	0.013
123	10.25	0.50	0.133	(0.298)	0.119	0.013
124	10.33	0.50	0.133	(0.297)	0.119	0.013
125	10.42	0.50	0.133	(0.295)	0.119	0.013
126	10.50	0.50	0.133	(0.294)	0.119	0.013
127	10.58	0.67	0.177	(0.292)	0.159	0.018
128	10.67	0.67	0.177	(0.291)	0.159	0.018
129	10.75	0.67	0.177	(0.290)	0.159	0.018
130	10.83	0.67	0.177	(0.288)	0.159	0.018
131	10.92	0.67	0.177	(0.287)	0.159	0.018
132	11.00	0.67	0.177	(0.285)	0.159	0.018
133	11.08	0.63	0.168	(0.284)	0.151	0.017
134	11.17	0.63	0.168	(0.282)	0.151	0.017

135	11.25	0.63	0.168	(0.281)	0.151	0.017
136	11.33	0.63	0.168	(0.280)	0.151	0.017
137	11.42	0.63	0.168	(0.278)	0.151	0.017
138	11.50	0.63	0.168	(0.277)	0.151	0.017
139	11.58	0.57	0.150	(0.276)	0.135	0.015
140	11.67	0.57	0.150	(0.274)	0.135	0.015
141	11.75	0.57	0.150	(0.273)	0.135	0.015
142	11.83	0.60	0.159	(0.271)	0.143	0.016
143	11.92	0.60	0.159	(0.270)	0.143	0.016
144	12.00	0.60	0.159	(0.269)	0.143	0.016
145	12.08	0.83	0.221	(0.267)	0.199	0.022
146	12.17	0.83	0.221	(0.266)	0.199	0.022
147	12.25	0.83	0.221	(0.265)	0.199	0.022
148	12.33	0.87	0.230	(0.263)	0.207	0.023
149	12.42	0.87	0.230	(0.262)	0.207	0.023
150	12.50	0.87	0.230	(0.261)	0.207	0.023
151	12.58	0.93	0.248	(0.259)	0.223	0.025
152	12.67	0.93	0.248	(0.258)	0.223	0.025
153	12.75	0.93	0.248	(0.257)	0.223	0.025
154	12.83	0.97	0.256	(0.256)	0.231	0.026
155	12.92	0.97	0.256	(0.254)	0.231	0.026
156	13.00	0.97	0.256	(0.253)	0.231	0.026
157	13.08	1.13	0.301	0.252	(0.271)	0.049
158	13.17	1.13	0.301	0.250	(0.271)	0.050
159	13.25	1.13	0.301	0.249	(0.271)	0.051
160	13.33	1.13	0.301	0.248	(0.271)	0.053
161	13.42	1.13	0.301	0.247	(0.271)	0.054
162	13.50	1.13	0.301	0.245	(0.271)	0.055
163	13.58	0.77	0.203	(0.244)	0.183	0.020
164	13.67	0.77	0.203	(0.243)	0.183	0.020
165	13.75	0.77	0.203	(0.242)	0.183	0.020
166	13.83	0.77	0.203	(0.240)	0.183	0.020
167	13.92	0.77	0.203	(0.239)	0.183	0.020
168	14.00	0.77	0.203	(0.238)	0.183	0.020
169	14.08	0.90	0.239	(0.237)	0.215	0.024
170	14.17	0.90	0.239	(0.236)	0.215	0.024
171	14.25	0.90	0.239	(0.234)	0.215	0.024
172	14.33	0.87	0.230	(0.233)	0.207	0.023
173	14.42	0.87	0.230	(0.232)	0.207	0.023
174	14.50	0.87	0.230	(0.231)	0.207	0.023
175	14.58	0.87	0.230	(0.230)	0.207	0.023
176	14.67	0.87	0.230	(0.228)	0.207	0.023
177	14.75	0.87	0.230	(0.227)	0.207	0.023
178	14.83	0.83	0.221	(0.226)	0.199	0.022
179	14.92	0.83	0.221	(0.225)	0.199	0.022
180	15.00	0.83	0.221	(0.224)	0.199	0.022
181	15.08	0.80	0.212	(0.223)	0.191	0.021
182	15.17	0.80	0.212	(0.221)	0.191	0.021
183	15.25	0.80	0.212	(0.220)	0.191	0.021
184	15.33	0.77	0.203	(0.219)	0.183	0.020
185	15.42	0.77	0.203	(0.218)	0.183	0.020
186	15.50	0.77	0.203	(0.217)	0.183	0.020
187	15.58	0.63	0.168	(0.216)	0.151	0.017
188	15.67	0.63	0.168	(0.215)	0.151	0.017
189	15.75	0.63	0.168	(0.214)	0.151	0.017
190	15.83	0.63	0.168	(0.213)	0.151	0.017
191	15.92	0.63	0.168	(0.211)	0.151	0.017
192	16.00	0.63	0.168	(0.210)	0.151	0.017
193	16.08	0.13	0.035	(0.209)	0.032	0.004
194	16.17	0.13	0.035	(0.208)	0.032	0.004
195	16.25	0.13	0.035	(0.207)	0.032	0.004
196	16.33	0.13	0.035	(0.206)	0.032	0.004
197	16.42	0.13	0.035	(0.205)	0.032	0.004
198	16.50	0.13	0.035	(0.204)	0.032	0.004
199	16.58	0.10	0.027	(0.203)	0.024	0.003
200	16.67	0.10	0.027	(0.202)	0.024	0.003
201	16.75	0.10	0.027	(0.201)	0.024	0.003
202	16.83	0.10	0.027	(0.200)	0.024	0.003
203	16.92	0.10	0.027	(0.199)	0.024	0.003
204	17.00	0.10	0.027	(0.198)	0.024	0.003
205	17.08	0.17	0.044	(0.197)	0.040	0.004
206	17.17	0.17	0.044	(0.196)	0.040	0.004
207	17.25	0.17	0.044	(0.195)	0.040	0.004
208	17.33	0.17	0.044	(0.194)	0.040	0.004
209	17.42	0.17	0.044	(0.193)	0.040	0.004
210	17.50	0.17	0.044	(0.192)	0.040	0.004
211	17.58	0.17	0.044	(0.191)	0.040	0.004
212	17.67	0.17	0.044	(0.190)	0.040	0.004
213	17.75	0.17	0.044	(0.189)	0.040	0.004
214	17.83	0.13	0.035	(0.188)	0.032	0.004
215	17.92	0.13	0.035	(0.187)	0.032	0.004
216	18.00	0.13	0.035	(0.186)	0.032	0.004
217	18.08	0.13	0.035	(0.185)	0.032	0.004
218	18.17	0.13	0.035	(0.185)	0.032	0.004
219	18.25	0.13	0.035	(0.184)	0.032	0.004
220	18.33	0.13	0.035	(0.183)	0.032	0.004
221	18.42	0.13	0.035	(0.182)	0.032	0.004
222	18.50	0.13	0.035	(0.181)	0.032	0.004
223	18.58	0.10	0.027	(0.180)	0.024	0.003
224	18.67	0.10	0.027	(0.179)	0.024	0.003
225	18.75	0.10	0.027	(0.178)	0.024	0.003
226	18.83	0.07	0.018	(0.177)	0.016	0.002
227	18.92	0.07	0.018	(0.177)	0.016	0.002
228	19.00	0.07	0.018	(0.176)	0.016	0.002
229	19.08	0.10	0.027	(0.175)	0.024	0.003
230	19.17	0.10	0.027	(0.174)	0.024	0.003
231	19.25	0.10	0.027	(0.173)	0.024	0.003
232	19.33	0.13	0.035	(0.173)	0.032	0.004
233	19.42	0.13	0.035	(0.172)	0.032	0.004
234	19.50	0.13	0.035	(0.171)	0.032	0.004
235	19.58	0.10	0.027	(0.170)	0.024	0.003
236	19.67	0.10	0.027	(0.169)	0.024	0.003
237	19.75	0.10	0.027	(0.169)	0.024	0.003
238	19.83	0.07	0.018	(0.168)	0.016	0.002
239	19.92	0.07	0.018	(0.167)	0.016	0.002
240	20.00	0.07	0.018	(0.166)	0.016	0.002
241	20.08	0.10	0.027	(0.166)	0.024	0.003
242	20.17	0.10	0.027	(0.165)	0.024	0.003
243	20.25	0.10	0.027	(0.164)	0.024	0.003
244	20.33	0.10	0.027	(0.163)	0.024	0.003
245	20.42	0.10	0.027	(0.163)	0.024	0.003
246	20.50	0.10	0.027	(0.162)	0.024	0.003
247	20.58	0.10	0.027	(0.161)	0.024	0.003
248	20.67	0.10	0.027	(0.161)	0.024	0.003
249	20.75	0.10	0.027	(0.160)	0.024	0.003
250	20.83	0.07	0.018	(0.159)	0.016	0.002
251	20.92	0.07	0.018	(0.159)	0.016	0.002
252	21.00	0.07	0.018	(0.158)	0.016	0.002
253	21.08	0.10	0.027	(0.157)	0.024	0.003
254	21.17	0.10	0.027	(0.157)	0.024	0.003

255	21.25	0.10	0.027	(0.156)	0.024	0.003
256	21.33	0.07	0.018	(0.156)	0.016	0.002
257	21.42	0.07	0.018	(0.155)	0.016	0.002
258	21.50	0.07	0.018	(0.155)	0.016	0.002
259	21.58	0.10	0.027	(0.154)	0.024	0.003
260	21.67	0.10	0.027	(0.153)	0.024	0.003
261	21.75	0.10	0.027	(0.153)	0.024	0.003
262	21.83	0.07	0.018	(0.152)	0.016	0.002
263	21.92	0.07	0.018	(0.152)	0.016	0.002
264	22.00	0.07	0.018	(0.151)	0.016	0.002
265	22.08	0.10	0.027	(0.151)	0.024	0.003
266	22.17	0.10	0.027	(0.150)	0.024	0.003
267	22.25	0.10	0.027	(0.150)	0.024	0.003
268	22.33	0.07	0.018	(0.149)	0.016	0.002
269	22.42	0.07	0.018	(0.149)	0.016	0.002
270	22.50	0.07	0.018	(0.148)	0.016	0.002
271	22.58	0.07	0.018	(0.148)	0.016	0.002
272	22.67	0.07	0.018	(0.148)	0.016	0.002
273	22.75	0.07	0.018	(0.147)	0.016	0.002
274	22.83	0.07	0.018	(0.147)	0.016	0.002
275	22.92	0.07	0.018	(0.146)	0.016	0.002
276	23.00	0.07	0.018	(0.146)	0.016	0.002
277	23.08	0.07	0.018	(0.146)	0.016	0.002
278	23.17	0.07	0.018	(0.145)	0.016	0.002
279	23.25	0.07	0.018	(0.145)	0.016	0.002
280	23.33	0.07	0.018	(0.145)	0.016	0.002
281	23.42	0.07	0.018	(0.145)	0.016	0.002
282	23.50	0.07	0.018	(0.144)	0.016	0.002
283	23.58	0.07	0.018	(0.144)	0.016	0.002
284	23.67	0.07	0.018	(0.144)	0.016	0.002
285	23.75	0.07	0.018	(0.144)	0.016	0.002
286	23.83	0.07	0.018	(0.143)	0.016	0.002
287	23.92	0.07	0.018	(0.143)	0.016	0.002
288	24.00	0.07	0.018	(0.143)	0.016	0.002

(Loss Rate Not Used)

Sum = 100.0 Sum = 2.8

Flood volume = Effective rainfall 0.23(In)
times area 4.5(Ac.)/[(In)/(Ft.)] = 0.1(Ac.Ft)
Total soil loss = 1.98(In)
Total soil loss = 0.735(Ac.Ft)
Total rainfall = 2.21(In)
Flood volume = 3755.8 Cubic Feet
Total soil loss = 32023.4 Cubic Feet

Peak flow rate of this hydrograph = 0.243(CFS)

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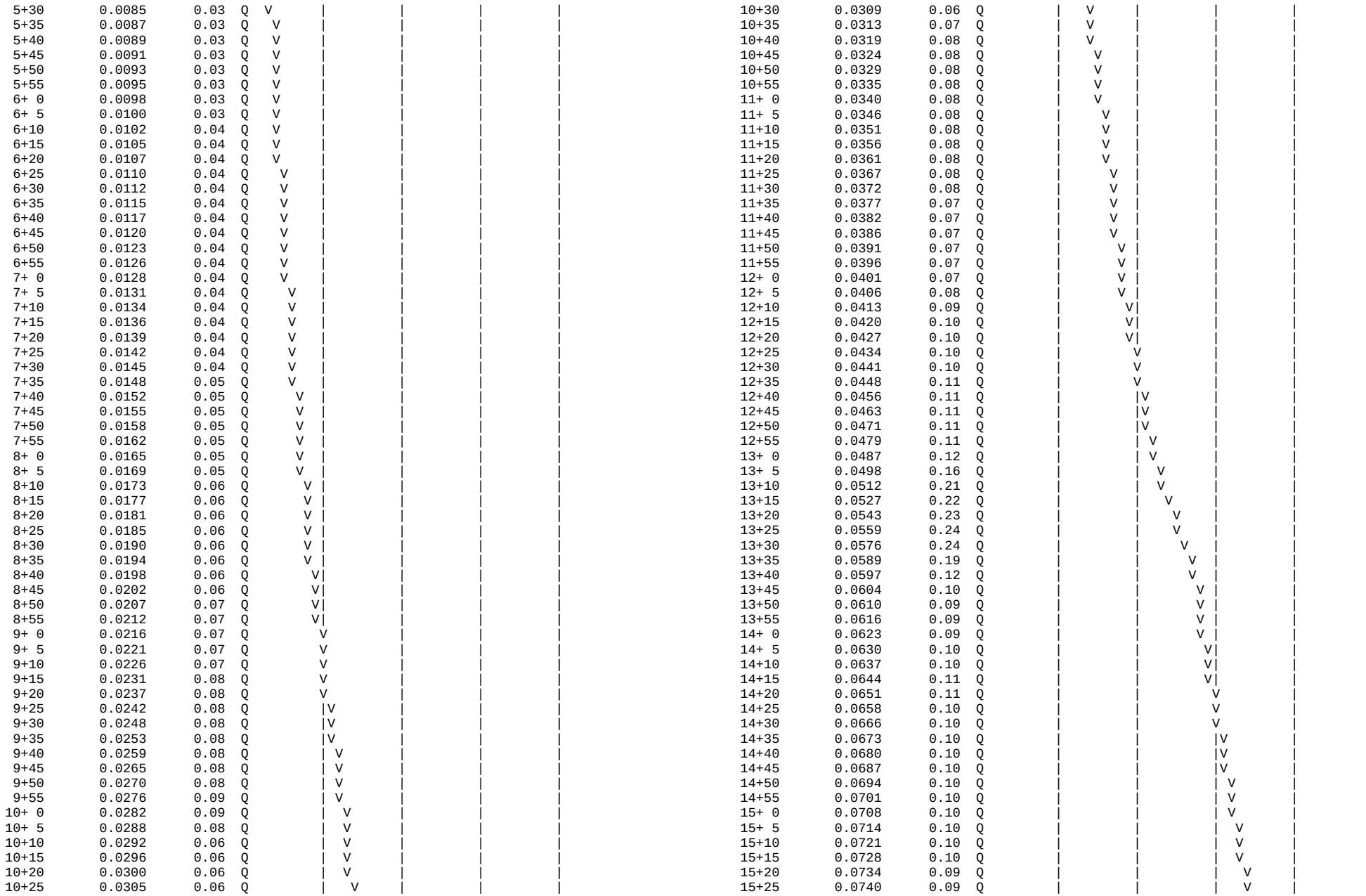
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0001	0.01	Q	|	|	|	|
0+15	0.0001	0.01	Q	|	|	|	|
0+20	0.0002	0.01	Q	|	|	|	|
0+25	0.0003	0.01	Q	|	|	|	|
0+30	0.0003	0.01	Q	|	|	|	|
0+35	0.0004	0.01	Q	|	|	|	|
0+40	0.0005	0.01	Q	|	|	|	|
0+45	0.0006	0.01	Q	|	|	|	|
0+50	0.0007	0.01	Q	|	|	|	|
0+55	0.0008	0.02	Q	|	|	|	|
1+ 0	0.0009	0.02	Q	|	|	|	|
1+ 5	0.0010	0.01	Q	|	|	|	|
1+10	0.0011	0.01	Q	|	|	|	|
1+15	0.0012	0.01	Q	|	|	|	|
1+20	0.0012	0.01	Q	|	|	|	|
1+25	0.0013	0.01	Q	|	|	|	|
1+30	0.0014	0.01	Q	|	|	|	|
1+35	0.0015	0.01	Q	|	|	|	|
1+40	0.0016	0.01	Q	|	|	|	|
1+45	0.0017	0.01	Q	|	|	|	|
1+50	0.0017	0.01	Q	|	|	|	|
1+55	0.0019	0.02	Q	|	|	|	|
2+ 0	0.0020	0.02	Q	|	|	|	|
2+ 5	0.0021	0.02	Q	|	|	|	|
2+10	0.0022	0.02	QV	|	|	|	|
2+15	0.0023	0.02	QV	|	|	|	|
2+20	0.0024	0.02	QV	|	|	|	|
2+25	0.0025	0.02	QV	|	|	|	|
2+30	0.0026	0.02	QV	|	|	|	|
2+35	0.0027	0.02	QV	|	|	|	|
2+40	0.0029	0.02	QV	|	|	|	|
2+45	0.0030	0.02	QV	|	|	|	|
2+50	0.0031	0.02	QV	|	|	|	|
2+55	0.0033	0.02	QV	|	|	|	|
3+ 0	0.0034	0.02	QV	|	|	|	|
3+ 5	0.0036	0.02	QV	|	|	|	|
3+10	0.0037	0.02	QV	|	|	|	|
3+15	0.0038	0.02	QV	|	|	|	|
3+20	0.0040	0.02	QV	|	|	|	|
3+25	0.0041	0.02	QV	|	|	|	|
3+30	0.0042	0.02	QV	|	|	|	|
3+35	0.0044	0.02	Q V	|	|	|	|
3+40	0.0045	0.02	Q V	|	|	|	|
3+45	0.0046	0.02	Q V	|	|	|	|
3+50	0.0048	0.02	Q V	|	|	|	|
3+55	0.0050	0.02	Q V	|	|	|	|
4+ 0	0.0051	0.02	Q V	|	|	|	|
4+ 5	0.0053	0.02	Q V	|	|	|	|
4+10	0.0054	0.02	Q V	|	|	|	|
4+15	0.0056	0.02	Q V	|	|	|	|
4+20	0.0058	0.03	Q V	|	|	|	|
4+25	0.0060	0.03	Q V	|	|	|	|
4+30	0.0062	0.03	Q V	|	|	|	|
4+35	0.0064	0.03	Q V	|	|	|	|
4+40	0.0065	0.03	Q V	|	|	|	|
4+45	0.0067	0.03	Q V	|	|	|	|
4+50	0.0069	0.03	Q V	|	|	|	|
4+55	0.0072	0.03	Q V	|	|	|	|
5+ 0	0.0074	0.03	Q V	|	|	|	|
5+ 5	0.0076	0.03	Q V	|	|	|	|
5+10	0.0077	0.03	Q V	|	|	|	|
5+15	0.0079	0.02	Q V	|	|	|	|
5+20	0.0081	0.03	Q V	|	|	|	|
5+25	0.0083	0.03	Q V	|	|	|	|



15+30	0.0747	0.09	Q	|	|	|	V |
15+35	0.0753	0.09	Q	|	|	|	V |
15+40	0.0758	0.08	Q	|	|	|	V |
15+45	0.0763	0.08	Q	|	|	|	V |
15+50	0.0769	0.08	Q	|	|	|	V |
15+55	0.0774	0.08	Q	|	|	|	V |
16+ 0	0.0779	0.08	Q	|	|	|	V |
16+ 5	0.0783	0.05	Q	|	|	|	V |
16+10	0.0784	0.03	Q	|	|	|	V |
16+15	0.0786	0.02	Q	|	|	|	V |
16+20	0.0787	0.02	Q	|	|	|	V |
16+25	0.0788	0.02	Q	|	|	|	V |
16+30	0.0789	0.02	Q	|	|	|	V |
16+35	0.0790	0.01	Q	|	|	|	V |
16+40	0.0791	0.01	Q	|	|	|	V |
16+45	0.0792	0.01	Q	|	|	|	V |
16+50	0.0793	0.01	Q	|	|	|	V |
16+55	0.0793	0.01	Q	|	|	|	V |
17+ 0	0.0794	0.01	Q	|	|	|	V |
17+ 5	0.0795	0.02	Q	|	|	|	V |
17+10	0.0796	0.02	Q	|	|	|	V |
17+15	0.0798	0.02	Q	|	|	|	V |
17+20	0.0799	0.02	Q	|	|	|	V |
17+25	0.0801	0.02	Q	|	|	|	V |
17+30	0.0802	0.02	Q	|	|	|	V |
17+35	0.0803	0.02	Q	|	|	|	V |
17+40	0.0805	0.02	Q	|	|	|	V |
17+45	0.0806	0.02	Q	|	|	|	V |
17+50	0.0807	0.02	Q	|	|	|	V |
17+55	0.0808	0.02	Q	|	|	|	V |
18+ 0	0.0810	0.02	Q	|	|	|	V |
18+ 5	0.0811	0.02	Q	|	|	|	V |
18+10	0.0812	0.02	Q	|	|	|	V |
18+15	0.0813	0.02	Q	|	|	|	V |
18+20	0.0814	0.02	Q	|	|	|	V |
18+25	0.0815	0.02	Q	|	|	|	V |
18+30	0.0816	0.02	Q	|	|	|	V |
18+35	0.0817	0.01	Q	|	|	|	V |
18+40	0.0818	0.01	Q	|	|	|	V |
18+45	0.0819	0.01	Q	|	|	|	V |
18+50	0.0820	0.01	Q	|	|	|	V |
18+55	0.0820	0.01	Q	|	|	|	V |
19+ 0	0.0821	0.01	Q	|	|	|	V |
19+ 5	0.0821	0.01	Q	|	|	|	V |
19+10	0.0822	0.01	Q	|	|	|	V |
19+15	0.0823	0.01	Q	|	|	|	V |
19+20	0.0824	0.01	Q	|	|	|	V |
19+25	0.0825	0.02	Q	|	|	|	V |
19+30	0.0826	0.02	Q	|	|	|	V |
19+35	0.0827	0.01	Q	|	|	|	V |
19+40	0.0828	0.01	Q	|	|	|	V |
19+45	0.0829	0.01	Q	|	|	|	V |
19+50	0.0829	0.01	Q	|	|	|	V |
19+55	0.0830	0.01	Q	|	|	|	V |
20+ 0	0.0831	0.01	Q	|	|	|	V |
20+ 5	0.0831	0.01	Q	|	|	|	V |
20+10	0.0832	0.01	Q	|	|	|	V |
20+15	0.0833	0.01	Q	|	|	|	V |
20+20	0.0834	0.01	Q	|	|	|	V |
20+25	0.0834	0.01	Q	|	|	|	V |
20+30	0.0835	0.01	Q	|	|	|	V |
20+35	0.0836	0.01	Q	|	|	|	V |
20+40	0.0837	0.01	Q	|	|	|	V |
20+45	0.0838	0.01	Q	|	|	|	V |
20+50	0.0838	0.01	Q	|	|	|	V |
20+55	0.0839	0.01	Q	|	|	|	V |
21+ 0	0.0840	0.01	Q	|	|	|	V |
21+ 5	0.0840	0.01	Q	|	|	|	V |
21+10	0.0841	0.01	Q	|	|	|	V |
21+15	0.0842	0.01	Q	|	|	|	V |
21+20	0.0843	0.01	Q	|	|	|	V |
21+25	0.0843	0.01	Q	|	|	|	V |
21+30	0.0844	0.01	Q	|	|	|	V |
21+35	0.0844	0.01	Q	|	|	|	V |
21+40	0.0845	0.01	Q	|	|	|	V |
21+45	0.0846	0.01	Q	|	|	|	V |
21+50	0.0847	0.01	Q	|	|	|	V |
21+55	0.0847	0.01	Q	|	|	|	V |
22+ 0	0.0848	0.01	Q	|	|	|	V |
22+ 5	0.0848	0.01	Q	|	|	|	V |
22+10	0.0849	0.01	Q	|	|	|	V |
22+15	0.0850	0.01	Q	|	|	|	V |
22+20	0.0851	0.01	Q	|	|	|	V |
22+25	0.0851	0.01	Q	|	|	|	V |
22+30	0.0852	0.01	Q	|	|	|	V |
22+35	0.0852	0.01	Q	|	|	|	V |
22+40	0.0853	0.01	Q	|	|	|	V |
22+45	0.0854	0.01	Q	|	|	|	V |
22+50	0.0854	0.01	Q	|	|	|	V |
22+55	0.0855	0.01	Q	|	|	|	V |
23+ 0	0.0855	0.01	Q	|	|	|	V |
23+ 5	0.0856	0.01	Q	|	|	|	V |
23+10	0.0856	0.01	Q	|	|	|	V |
23+15	0.0857	0.01	Q	|	|	|	V |
23+20	0.0857	0.01	Q	|	|	|	V |
23+25	0.0858	0.01	Q	|	|	|	V |
23+30	0.0858	0.01	Q	|	|	|	V |
23+35	0.0859	0.01	Q	|	|	|	V |
23+40	0.0860	0.01	Q	|	|	|	V |
23+45	0.0860	0.01	Q	|	|	|	V |
23+50	0.0861	0.01	Q	|	|	|	V |
23+55	0.0861	0.01	Q	|	|	|	V |
24+ 0	0.0862	0.01	Q	|	|	|	V |
24+ 5	0.0862	0.00	Q	|	|	|	V |
24+10	0.0862	0.00	Q	|	|	|	V |
24+15	0.0862	0.00	Q	|	|	|	V |
24+20	0.0862	0.00	Q	|	|	|	V

U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/19/23 File: crpa2uh242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6406

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

CRESCENT GARDENS
Proposed Condition
Area A
10/16/23

Drainage Area = 120.22(Ac.) = 0.188 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 120.22(Ac.) = 0.188 Sq. Mi.
Length along longest watercourse = 5504.00(Ft.)
Length along longest watercourse measured to centroid = 2594.00(Ft.)
Length along longest watercourse = 1.042 Mi.
Length along longest watercourse measured to centroid = 0.491 Mi.
Difference in elevation = 131.80(Ft.)
Slope along watercourse = 126.4360 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.223 Hr.
Lag time = 13.36 Min.
25% of lag time = 3.34 Min.
40% of lag time = 5.34 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
120.22	2.21	265.69

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
120.22	5.82	699.68

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.210(In)
Area Averaged 100-Year Rainfall = 5.820(In)

Point rain (area averaged) = 2.210(In)
Areal adjustment factor = 99.98 %
Adjusted average point rain = 2.209(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
120.220	77.40	0.155

Total Area Entered = 120.22(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
77.4	59.9	0.471	0.155	0.405	1.000	0.405
					Sum (F) =	0.405

Area averaged mean soil loss (F) (In/Hr) = 0.405
Minimum soil loss rate ((In/Hr)) = 0.203
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.776

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	37.435	3.948	4.784
2	0.167	74.870	15.900	19.265
3	0.250	112.305	25.143	30.463
4	0.333	149.740	18.667	22.617
5	0.417	187.175	9.371	11.354
6	0.500	224.610	5.615	6.804
7	0.583	262.045	4.164	5.045
8	0.667	299.480	3.270	3.961
9	0.750	336.914	2.513	3.044
10	0.833	374.349	2.119	2.568
11	0.917	411.784	1.661	2.013
12	1.000	449.219	1.303	1.579
13	1.083	486.654	1.162	1.408
14	1.167	524.089	1.061	1.286
15	1.250	561.524	0.836	1.012
16	1.333	598.959	0.710	0.860
17	1.417	636.394	0.603	0.731
18	1.500	673.829	0.494	0.598
19	1.583	711.264	0.384	0.466
20	1.667	748.699	0.374	0.454
21	1.750	786.134	0.374	0.454
22	1.833	823.569	0.326	0.395
			Sum = 100.000	Sum= 121.159

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	0.07	0.018	(0.719)		0.014	0.004
2	0.17	0.07	0.018	(0.716)		0.014	0.004
3	0.25	0.07	0.018	(0.713)		0.014	0.004
4	0.33	0.10	0.027	(0.710)		0.021	0.006
5	0.42	0.10	0.027	(0.708)		0.021	0.006
6	0.50	0.10	0.027	(0.705)		0.021	0.006
7	0.58	0.10	0.027	(0.702)		0.021	0.006
8	0.67	0.10	0.027	(0.699)		0.021	0.006
9	0.75	0.10	0.027	(0.697)		0.021	0.006
10	0.83	0.13	0.035	(0.694)		0.027	0.008
11	0.92	0.13	0.035	(0.691)		0.027	0.008
12	1.00	0.13	0.035	(0.689)		0.027	0.008
13	1.08	0.10	0.027	(0.686)		0.021	0.006
14	1.17	0.10	0.027	(0.683)		0.021	0.006
15	1.25	0.10	0.027	(0.680)		0.021	0.006
16	1.33	0.10	0.027	(0.678)		0.021	0.006
17	1.42	0.10	0.027	(0.675)		0.021	0.006
18	1.50	0.10	0.027	(0.672)		0.021	0.006
19	1.58	0.10	0.027	(0.670)		0.021	0.006
20	1.67	0.10	0.027	(0.667)		0.021	0.006
21	1.75	0.10	0.027	(0.664)		0.021	0.006
22	1.83	0.13	0.035	(0.662)		0.027	0.008
23	1.92	0.13	0.035	(0.659)		0.027	0.008
24	2.00	0.13	0.035	(0.656)		0.027	0.008
25	2.08	0.13	0.035	(0.654)		0.027	0.008
26	2.17	0.13	0.035	(0.651)		0.027	0.008
27	2.25	0.13	0.035	(0.648)		0.027	0.008
28	2.33	0.13	0.035	(0.646)		0.027	0.008
29	2.42	0.13	0.035	(0.643)		0.027	0.008
30	2.50	0.13	0.035	(0.640)		0.027	0.008
31	2.58	0.17	0.044	(0.638)		0.034	0.010
32	2.67	0.17	0.044	(0.635)		0.034	0.010
33	2.75	0.17	0.044	(0.633)		0.034	0.010
34	2.83	0.17	0.044	(0.630)		0.034	0.010
35	2.92	0.17	0.044	(0.627)		0.034	0.010
36	3.00	0.17	0.044	(0.625)		0.034	0.010
37	3.08	0.17	0.044	(0.622)		0.034	0.010
38	3.17	0.17	0.044	(0.620)		0.034	0.010
39	3.25	0.17	0.044	(0.617)		0.034	0.010
40	3.33	0.17	0.044	(0.614)		0.034	0.010
41	3.42	0.17	0.044	(0.612)		0.034	0.010
42	3.50	0.17	0.044	(0.609)		0.034	0.010
43	3.58	0.17	0.044	(0.607)		0.034	0.010
44	3.67	0.17	0.044	(0.604)		0.034	0.010
45	3.75	0.17	0.044	(0.602)		0.034	0.010
46	3.83	0.20	0.053	(0.599)		0.041	0.012
47	3.92	0.20	0.053	(0.597)		0.041	0.012
48	4.00	0.20	0.053	(0.594)		0.041	0.012
49	4.08	0.20	0.053	(0.592)		0.041	0.012
50	4.17	0.20	0.053	(0.589)		0.041	0.012
51	4.25	0.20	0.053	(0.587)		0.041	0.012
52	4.33	0.23	0.062	(0.584)		0.048	0.014
53	4.42	0.23	0.062	(0.582)		0.048	0.014
54	4.50	0.23	0.062	(0.579)		0.048	0.014
55	4.58	0.23	0.062	(0.577)		0.048	0.014
56	4.67	0.23	0.062	(0.574)		0.048	0.014
57	4.75	0.23	0.062	(0.572)		0.048	0.014
58	4.83	0.27	0.071	(0.569)		0.055	0.016
59	4.92	0.27	0.071	(0.567)		0.055	0.016
60	5.00	0.27	0.071	(0.564)		0.055	0.016
61	5.08	0.20	0.053	(0.562)		0.041	0.012
62	5.17	0.20	0.053	(0.559)		0.041	0.012
63	5.25	0.20	0.053	(0.557)		0.041	0.012
64	5.33	0.23	0.062	(0.554)		0.048	0.014
65	5.42	0.23	0.062	(0.552)		0.048	0.014
66	5.50	0.23	0.062	(0.550)		0.048	0.014
67	5.58	0.27	0.071	(0.547)		0.055	0.016
68	5.67	0.27	0.071	(0.545)		0.055	0.016
69	5.75	0.27	0.071	(0.542)		0.055	0.016
70	5.83	0.27	0.071	(0.540)		0.055	0.016
71	5.92	0.27	0.071	(0.538)		0.055	0.016
72	6.00	0.27	0.071	(0.535)		0.055	0.016
73	6.08	0.30	0.080	(0.533)		0.062	0.018
74	6.17	0.30	0.080	(0.530)		0.062	0.018
75	6.25	0.30	0.080	(0.528)		0.062	0.018
76	6.33	0.30	0.080	(0.526)		0.062	0.018
77	6.42	0.30	0.080	(0.523)		0.062	0.018
78	6.50	0.30	0.080	(0.521)		0.062	0.018
79	6.58	0.33	0.088	(0.519)		0.069	0.020
80	6.67	0.33	0.088	(0.516)		0.069	0.020
81	6.75	0.33	0.088	(0.514)		0.069	0.020
82	6.83	0.33	0.088	(0.512)		0.069	0.020
83	6.92	0.33	0.088	(0.509)		0.069	0.020
84	7.00	0.33	0.088	(0.507)		0.069	0.020
85	7.08	0.33	0.088	(0.505)		0.069	0.020
86	7.17	0.33	0.088	(0.503)		0.069	0.020
87	7.25	0.33	0.088	(0.500)		0.069	0.020
88	7.33	0.37	0.097	(0.498)		0.075	0.022
89	7.42	0.37	0.097	(0.496)		0.075	0.022
90	7.50	0.37	0.097	(0.493)		0.075	0.022
91	7.58	0.40	0.106	(0.491)		0.082	0.024
92	7.67	0.40	0.106	(0.489)		0.082	0.024
93	7.75	0.40	0.106	(0.487)		0.082	0.024
94	7.83	0.43	0.115	(0.484)		0.089	0.026
95	7.92	0.43	0.115	(0.482)		0.089	0.026
96	8.00	0.43	0.115	(0.480)		0.089	0.026
97	8.08	0.50	0.133	(0.478)		0.103	0.030
98	8.17	0.50	0.133	(0.475)		0.103	0.030
99	8.25	0.50	0.133	(0.473)		0.103	0.030
100	8.33	0.50	0.133	(0.471)		0.103	0.030
101	8.42	0.50	0.133	(0.469)		0.103	0.030
102	8.50	0.50	0.133	(0.467)		0.103	0.030
103	8.58	0.53	0.141	(0.464)		0.110	0.032
104	8.67	0.53	0.141	(0.462)		0.110	0.032
105	8.75	0.53	0.141	(0.460)		0.110	0.032
106	8.83	0.57	0.150	(0.458)		0.117	0.034
107	8.92	0.57	0.150	(0.456)		0.117	0.034
108	9.00	0.57	0.150	(0.454)		0.117	0.034
109	9.08	0.63	0.168	(0.451)		0.130	0.038
110	9.17	0.63	0.168	(0.449)		0.130	0.038
111	9.25	0.63	0.168	(0.447)		0.130	0.038
112	9.33	0.67	0.177	(0.445)		0.137	0.040
113	9.42	0.67	0.177	(0.443)		0.137	0.040
114	9.50	0.67	0.177	(0.441)		0.137	0.040
115	9.58	0.70	0.186	(0.439)		0.144	0.042
116	9.67	0.70	0.186	(0.437)		0.144	0.042
117	9.75	0.70	0.186	(0.434)		0.144	0.042

118	9.83	0.73	0.194	(0.432)	0.151	0.044
119	9.92	0.73	0.194	(0.430)	0.151	0.044
120	10.00	0.73	0.194	(0.428)	0.151	0.044
121	10.08	0.50	0.133	(0.426)	0.103	0.030
122	10.17	0.50	0.133	(0.424)	0.103	0.030
123	10.25	0.50	0.133	(0.422)	0.103	0.030
124	10.33	0.50	0.133	(0.420)	0.103	0.030
125	10.42	0.50	0.133	(0.418)	0.103	0.030
126	10.50	0.50	0.133	(0.416)	0.103	0.030
127	10.58	0.67	0.177	(0.414)	0.137	0.040
128	10.67	0.67	0.177	(0.412)	0.137	0.040
129	10.75	0.67	0.177	(0.410)	0.137	0.040
130	10.83	0.67	0.177	(0.408)	0.137	0.040
131	10.92	0.67	0.177	(0.406)	0.137	0.040
132	11.00	0.67	0.177	(0.404)	0.137	0.040
133	11.08	0.63	0.168	(0.402)	0.130	0.038
134	11.17	0.63	0.168	(0.400)	0.130	0.038
135	11.25	0.63	0.168	(0.398)	0.130	0.038
136	11.33	0.63	0.168	(0.396)	0.130	0.038
137	11.42	0.63	0.168	(0.394)	0.130	0.038
138	11.50	0.63	0.168	(0.392)	0.130	0.038
139	11.58	0.57	0.150	(0.390)	0.117	0.034
140	11.67	0.57	0.150	(0.388)	0.117	0.034
141	11.75	0.57	0.150	(0.386)	0.117	0.034
142	11.83	0.60	0.159	(0.384)	0.123	0.036
143	11.92	0.60	0.159	(0.382)	0.123	0.036
144	12.00	0.60	0.159	(0.380)	0.123	0.036
145	12.08	0.83	0.221	(0.379)	0.171	0.049
146	12.17	0.83	0.221	(0.377)	0.171	0.049
147	12.25	0.83	0.221	(0.375)	0.171	0.049
148	12.33	0.87	0.230	(0.373)	0.178	0.051
149	12.42	0.87	0.230	(0.371)	0.178	0.051
150	12.50	0.87	0.230	(0.369)	0.178	0.051
151	12.58	0.93	0.247	(0.367)	0.192	0.055
152	12.67	0.93	0.247	(0.365)	0.192	0.055
153	12.75	0.93	0.247	(0.364)	0.192	0.055
154	12.83	0.97	0.256	(0.362)	0.199	0.057
155	12.92	0.97	0.256	(0.360)	0.199	0.057
156	13.00	0.97	0.256	(0.358)	0.199	0.057
157	13.08	1.13	0.300	(0.356)	0.233	0.067
158	13.17	1.13	0.300	(0.354)	0.233	0.067
159	13.25	1.13	0.300	(0.353)	0.233	0.067
160	13.33	1.13	0.300	(0.351)	0.233	0.067
161	13.42	1.13	0.300	(0.349)	0.233	0.067
162	13.50	1.13	0.300	(0.347)	0.233	0.067
163	13.58	0.77	0.203	(0.346)	0.158	0.046
164	13.67	0.77	0.203	(0.344)	0.158	0.046
165	13.75	0.77	0.203	(0.342)	0.158	0.046
166	13.83	0.77	0.203	(0.340)	0.158	0.046
167	13.92	0.77	0.203	(0.339)	0.158	0.046
168	14.00	0.77	0.203	(0.337)	0.158	0.046
169	14.08	0.90	0.239	(0.335)	0.185	0.053
170	14.17	0.90	0.239	(0.333)	0.185	0.053
171	14.25	0.90	0.239	(0.332)	0.185	0.053
172	14.33	0.87	0.230	(0.330)	0.178	0.051
173	14.42	0.87	0.230	(0.328)	0.178	0.051
174	14.50	0.87	0.230	(0.327)	0.178	0.051
175	14.58	0.87	0.230	(0.325)	0.178	0.051
176	14.67	0.87	0.230	(0.323)	0.178	0.051
177	14.75	0.87	0.230	(0.322)	0.178	0.051
178	14.83	0.83	0.221	(0.320)	0.171	0.049
179	14.92	0.83	0.221	(0.318)	0.171	0.049
180	15.00	0.83	0.221	(0.317)	0.171	0.049
181	15.08	0.80	0.212	(0.315)	0.165	0.048
182	15.17	0.80	0.212	(0.313)	0.165	0.048
183	15.25	0.80	0.212	(0.312)	0.165	0.048
184	15.33	0.77	0.203	(0.310)	0.158	0.046
185	15.42	0.77	0.203	(0.309)	0.158	0.046
186	15.50	0.77	0.203	(0.307)	0.158	0.046
187	15.58	0.63	0.168	(0.306)	0.130	0.038
188	15.67	0.63	0.168	(0.304)	0.130	0.038
189	15.75	0.63	0.168	(0.302)	0.130	0.038
190	15.83	0.63	0.168	(0.301)	0.130	0.038
191	15.92	0.63	0.168	(0.299)	0.130	0.038
192	16.00	0.63	0.168	(0.298)	0.130	0.038
193	16.08	0.13	0.035	(0.296)	0.027	0.008
194	16.17	0.13	0.035	(0.295)	0.027	0.008
195	16.25	0.13	0.035	(0.293)	0.027	0.008
196	16.33	0.13	0.035	(0.292)	0.027	0.008
197	16.42	0.13	0.035	(0.290)	0.027	0.008
198	16.50	0.13	0.035	(0.289)	0.027	0.008
199	16.58	0.10	0.027	(0.287)	0.021	0.006
200	16.67	0.10	0.027	(0.286)	0.021	0.006
201	16.75	0.10	0.027	(0.284)	0.021	0.006
202	16.83	0.10	0.027	(0.283)	0.021	0.006
203	16.92	0.10	0.027	(0.282)	0.021	0.006
204	17.00	0.10	0.027	(0.280)	0.021	0.006
205	17.08	0.17	0.044	(0.279)	0.034	0.010
206	17.17	0.17	0.044	(0.277)	0.034	0.010
207	17.25	0.17	0.044	(0.276)	0.034	0.010
208	17.33	0.17	0.044	(0.274)	0.034	0.010
209	17.42	0.17	0.044	(0.273)	0.034	0.010
210	17.50	0.17	0.044	(0.272)	0.034	0.010
211	17.58	0.17	0.044	(0.270)	0.034	0.010
212	17.67	0.17	0.044	(0.269)	0.034	0.010
213	17.75	0.17	0.044	(0.268)	0.034	0.010
214	17.83	0.13	0.035	(0.266)	0.027	0.008
215	17.92	0.13	0.035	(0.265)	0.027	0.008
216	18.00	0.13	0.035	(0.264)	0.027	0.008
217	18.08	0.13	0.035	(0.262)	0.027	0.008
218	18.17	0.13	0.035	(0.261)	0.027	0.008
219	18.25	0.13	0.035	(0.260)	0.027	0.008
220	18.33	0.13	0.035	(0.259)	0.027	0.008
221	18.42	0.13	0.035	(0.257)	0.027	0.008
222	18.50	0.13	0.035	(0.256)	0.027	0.008
223	18.58	0.10	0.027	(0.255)	0.021	0.006
224	18.67	0.10	0.027	(0.254)	0.021	0.006
225	18.75	0.10	0.027	(0.252)	0.021	0.006
226	18.83	0.07	0.018	(0.251)	0.014	0.004
227	18.92	0.07	0.018	(0.250)	0.014	0.004
228	19.00	0.07	0.018	(0.249)	0.014	0.004
229	19.08	0.10	0.027	(0.248)	0.021	0.006
230	19.17	0.10	0.027	(0.246)	0.021	0.006
231	19.25	0.10	0.027	(0.245)	0.021	0.006
232	19.33	0.13	0.035	(0.244)	0.027	0.008
233	19.42	0.13	0.035	(0.243)	0.027	0.008
234	19.50	0.13	0.035	(0.242)	0.027	0.008
235	19.58	0.10	0.027	(0.241)	0.021	0.006
236	19.67	0.10	0.027	(0.240)	0.021	0.006
237	19.75	0.10	0.027	(0.239)	0.021	0.006

238	19.83	0.07	0.018	(0.238)	0.014	0.004
239	19.92	0.07	0.018	(0.237)	0.014	0.004
240	20.00	0.07	0.018	(0.235)	0.014	0.004
241	20.08	0.10	0.027	(0.234)	0.021	0.006
242	20.17	0.10	0.027	(0.233)	0.021	0.006
243	20.25	0.10	0.027	(0.232)	0.021	0.006
244	20.33	0.10	0.027	(0.231)	0.021	0.006
245	20.42	0.10	0.027	(0.230)	0.021	0.006
246	20.50	0.10	0.027	(0.229)	0.021	0.006
247	20.58	0.10	0.027	(0.228)	0.021	0.006
248	20.67	0.10	0.027	(0.227)	0.021	0.006
249	20.75	0.10	0.027	(0.227)	0.021	0.006
250	20.83	0.07	0.018	(0.226)	0.014	0.004
251	20.92	0.07	0.018	(0.225)	0.014	0.004
252	21.00	0.07	0.018	(0.224)	0.014	0.004
253	21.08	0.10	0.027	(0.223)	0.021	0.006
254	21.17	0.10	0.027	(0.222)	0.021	0.006
255	21.25	0.10	0.027	(0.221)	0.021	0.006
256	21.33	0.07	0.018	(0.220)	0.014	0.004
257	21.42	0.07	0.018	(0.220)	0.014	0.004
258	21.50	0.07	0.018	(0.219)	0.014	0.004
259	21.58	0.10	0.027	(0.218)	0.021	0.006
260	21.67	0.10	0.027	(0.217)	0.021	0.006
261	21.75	0.10	0.027	(0.216)	0.021	0.006
262	21.83	0.07	0.018	(0.216)	0.014	0.004
263	21.92	0.07	0.018	(0.215)	0.014	0.004
264	22.00	0.07	0.018	(0.214)	0.014	0.004
265	22.08	0.10	0.027	(0.213)	0.021	0.006
266	22.17	0.10	0.027	(0.213)	0.021	0.006
267	22.25	0.10	0.027	(0.212)	0.021	0.006
268	22.33	0.07	0.018	(0.211)	0.014	0.004
269	22.42	0.07	0.018	(0.211)	0.014	0.004
270	22.50	0.07	0.018	(0.210)	0.014	0.004
271	22.58	0.07	0.018	(0.209)	0.014	0.004
272	22.67	0.07	0.018	(0.209)	0.014	0.004
273	22.75	0.07	0.018	(0.208)	0.014	0.004
274	22.83	0.07	0.018	(0.208)	0.014	0.004
275	22.92	0.07	0.018	(0.207)	0.014	0.004
276	23.00	0.07	0.018	(0.207)	0.014	0.004
277	23.08	0.07	0.018	(0.206)	0.014	0.004
278	23.17	0.07	0.018	(0.206)	0.014	0.004
279	23.25	0.07	0.018	(0.205)	0.014	0.004
280	23.33	0.07	0.018	(0.205)	0.014	0.004
281	23.42	0.07	0.018	(0.205)	0.014	0.004
282	23.50	0.07	0.018	(0.204)	0.014	0.004
283	23.58	0.07	0.018	(0.204)	0.014	0.004
284	23.67	0.07	0.018	(0.204)	0.014	0.004
285	23.75	0.07	0.018	(0.203)	0.014	0.004
286	23.83	0.07	0.018	(0.203)	0.014	0.004
287	23.92	0.07	0.018	(0.203)	0.014	0.004
288	24.00	0.07	0.018	(0.203)	0.014	0.004

(Loss Rate Not Used)

Sum = 100.0 Sum = 5.9

Flood volume = Effective rainfall 0.49(In)
times area 120.2(Ac.)/[(In)/(Ft.)] = 5.0(Ac.Ft)
Total soil loss = 1.71(In)
Total soil loss = 17.177(Ac.Ft)
Total rainfall = 2.21(In)
Flood volume = 215984.0 Cubic Feet
Total soil loss = 748230.4 Cubic Feet

Peak flow rate of this hydrograph = 7.812(CFS)

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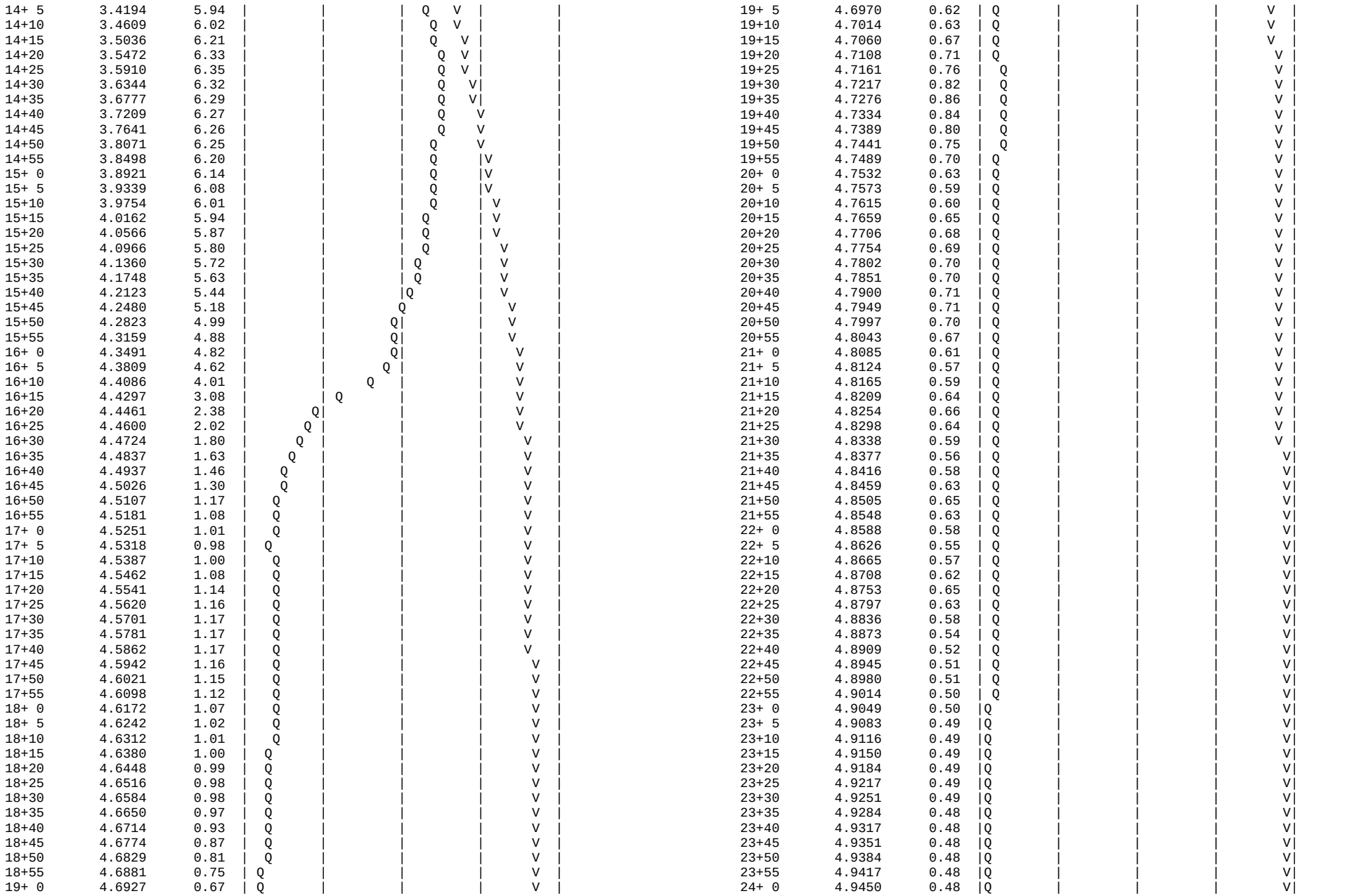
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001	0.02	Q	|	|	|	|
0+10	0.0008	0.10	Q	|	|	|	|
0+15	0.0023	0.22	Q	|	|	|	|
0+20	0.0044	0.32	VQ	|	|	|	|
0+25	0.0072	0.40	VQ	|	|	|	|
0+30	0.0105	0.49	VQ	|	|	|	|
0+35	0.0143	0.55	V Q	|	|	|	|
0+40	0.0184	0.59	V Q	|	|	|	|
0+45	0.0226	0.61	V Q	|	|	|	|
0+50	0.0270	0.64	V Q	|	|	|	|
0+55	0.0318	0.70	V Q	|	|	|	|
1+ 0	0.0371	0.77	V Q	|	|	|	|
1+ 5	0.0428	0.82	V Q	|	|	|	|
1+10	0.0483	0.81	V Q	|	|	|	|
1+15	0.0536	0.77	V Q	|	|	|	|
1+20	0.0587	0.74	V Q	|	|	|	|
1+25	0.0638	0.73	V Q	|	|	|	|
1+30	0.0688	0.73	V Q	|	|	|	|
1+35	0.0738	0.73	V Q	|	|	|	|
1+40	0.0788	0.73	V Q	|	|	|	|
1+45	0.0838	0.73	V Q	|	|	|	|
1+50	0.0889	0.74	V Q	|	|	|	|
1+55	0.0942	0.77	V Q	|	|	|	|
2+ 0	0.1000	0.83	V Q	|	|	|	|
2+ 5	0.1060	0.88	V Q	|	|	|	|
2+10	0.1122	0.90	V Q	|	|	|	|
2+15	0.1185	0.91	V Q	|	|	|	|
2+20	0.1249	0.92	|V Q	|	|	|	|
2+25	0.1313	0.93	|V Q	|	|	|	|
2+30	0.1377	0.94	|V Q	|	|	|	|
2+35	0.1443	0.95	|V Q	|	|	|	|
2+40	0.1511	0.99	|V Q	|	|	|	|
2+45	0.1583	1.05	|V Q	|	|	|	|
2+50	0.1659	1.10	|V Q	|	|	|	|
2+55	0.1737	1.13	|V Q	|	|	|	|
3+ 0	0.1815	1.14	|V Q	|	|	|	|
3+ 5	0.1895	1.15	|V Q	|	|	|	|
3+10	0.1975	1.16	|V Q	|	|	|	|
3+15	0.2055	1.17	|V Q	|	|	|	|
3+20	0.2136	1.18	|V Q	|	|	|	|
3+25	0.2217	1.18	|V Q	|	|	|	|
3+30	0.2299	1.18	|V Q	|	|	|	|
3+35	0.2381	1.19	|V Q	|	|	|	|
3+40	0.2463	1.19	|V Q	|	|	|	|
3+45	0.2545	1.19	| V Q	|	|	|	|
3+50	0.2628	1.20	| V Q	|	|	|	|
3+55	0.2713	1.24	| V Q	|	|	|	|
4+ 0	0.2803	1.30	| V Q	|	|	|	|

4+ 5	0.2896	1.35	V Q				
4+10	0.2991	1.37	V Q				
4+15	0.3086	1.39	V Q				
4+20	0.3183	1.41	V Q				
4+25	0.3283	1.45	V Q				
4+30	0.3388	1.52	V Q				
4+35	0.3496	1.57	V Q				
4+40	0.3606	1.60	V Q				
4+45	0.3717	1.61	V Q				
4+50	0.3830	1.64	V Q				
4+55	0.3946	1.68	V Q				
5+ 0	0.4067	1.75	V Q				
5+ 5	0.4190	1.79	V Q				
5+10	0.4309	1.74	V Q				
5+15	0.4422	1.63	V Q				
5+20	0.4530	1.57	V Q				
5+25	0.4638	1.57	V Q				
5+30	0.4749	1.61	V Q				
5+35	0.4863	1.66	V Q				
5+40	0.4981	1.71	V Q				
5+45	0.5103	1.77	V Q				
5+50	0.5228	1.82	V Q				
5+55	0.5355	1.85	V Q				
6+ 0	0.5484	1.86	V Q				
6+ 5	0.5614	1.88	V Q				
6+10	0.5747	1.93	V Q				
6+15	0.5884	2.00	V Q				
6+20	0.6025	2.05	V Q				
6+25	0.6168	2.07	V Q				
6+30	0.6312	2.09	V Q				
6+35	0.6458	2.11	V Q				
6+40	0.6607	2.16	V Q				
6+45	0.6760	2.23	V Q				
6+50	0.6917	2.28	V Q				
6+55	0.7077	2.31	V Q				
7+ 0	0.7237	2.33	V Q				
7+ 5	0.7398	2.34	V Q				
7+10	0.7561	2.35	V Q				
7+15	0.7723	2.36	V Q				
7+20	0.7887	2.38	V Q				
7+25	0.8054	2.42	V Q				
7+30	0.8226	2.49	V Q				
7+35	0.8401	2.55	V Q				
7+40	0.8581	2.61	V Q				
7+45	0.8766	2.69	V Q				
7+50	0.8956	2.75	V Q				
7+55	0.9150	2.82	V Q				
8+ 0	0.9350	2.91	V Q				
8+ 5	0.9556	2.99	V Q				
8+10	0.9769	3.10	V Q				
8+15	0.9993	3.24	V Q				
8+20	1.0223	3.35	V Q				
8+25	1.0458	3.41	V Q				
8+30	1.0695	3.45	V Q				
8+35	1.0935	3.49	V Q				
8+40	1.1180	3.55	V Q				
8+45	1.1430	3.63	V Q				
8+50	1.1684	3.70	V Q				
8+55	1.1944	3.77	V Q				
9+ 0	1.2209	3.85	V Q				
9+ 5	1.2480	3.94	V Q				
9+10	1.2759	4.05	V Q				
9+15	1.3048	4.20	V Q				
9+20	1.3346	4.32	V Q				
9+25	1.3650	4.42	V Q				
9+30	1.3961	4.51	V Q				
9+35	1.4277	4.60	V Q				
9+40	1.4600	4.68	V Q				
9+45	1.4929	4.78	V Q				
9+50	1.5263	4.86	V Q				
9+55	1.5604	4.94	V Q				
10+ 0	1.5950	5.03	V Q				
10+ 5	1.6296	5.03	V Q				
10+10	1.6627	4.80	V Q				
10+15	1.6931	4.41	V Q				
10+20	1.7214	4.12	V Q				
10+25	1.7489	3.98	VQ				
10+30	1.7757	3.90	VQ				
10+35	1.8025	3.89	VQ				
10+40	1.8303	4.04	V Q				
10+45	1.8599	4.30	V Q				
10+50	1.8909	4.50	V Q				
10+55	1.9225	4.59	V Q				
11+ 0	1.9545	4.64	V Q				
11+ 5	1.9866	4.66	V Q				
11+10	2.0186	4.65	V Q				
11+15	2.0503	4.61	V Q				
11+20	2.0818	4.58	V Q				
11+25	2.1132	4.56	VQ				
11+30	2.1446	4.56	VQ				
11+35	2.1759	4.54	VQ				
11+40	2.2066	4.46	Q				
11+45	2.2365	4.34	QV				
11+50	2.2658	4.26	QV				
11+55	2.2951	4.25	QV				
12+ 0	2.3246	4.29	QV				
12+ 5	2.3548	4.38	QV				
12+10	2.3868	4.66	QV				
12+15	2.4218	5.08	VQ				
12+20	2.4591	5.41	VQ				
12+25	2.4977	5.60	V Q				
12+30	2.5373	5.76	V Q				
12+35	2.5778	5.89	V Q				
12+40	2.6194	6.04	V Q				
12+45	2.6622	6.21	V Q				
12+50	2.7060	6.36	V Q				
12+55	2.7506	6.48	V Q				
13+ 0	2.7960	6.59	V Q				
13+ 5	2.8423	6.73	V Q				
13+10	2.8904	6.98	V Q				
13+15	2.9408	7.32	V Q				
13+20	2.9930	7.58	V Q				
13+25	3.0462	7.72	V Q				
13+30	3.1000	7.81	V Q				
13+35	3.1536	7.78	V Q				
13+40	3.2046	7.41	V Q				
13+45	3.2514	6.79	VQ				
13+50	3.2951	6.34	QV				
13+55	3.3372	6.12	Q V				
14+ 0	3.3785	5.99	Q V				



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  24+ 5       4.9482      0.46  |Q        |         |         |        V|
  24+10       4.9508      0.38  |Q        |         |         |        V|
  24+15       4.9527      0.26  |Q        |         |         |        V|
  24+20       4.9539      0.17  Q         |         |         |        V|
  24+25       4.9548      0.13  Q         |         |         |        V|
  24+30       4.9555      0.10  Q         |         |         |        V|
  24+35       4.9560      0.08  Q         |         |         |        V|
  24+40       4.9565      0.07  Q         |         |         |        V|
  24+45       4.9569      0.05  Q         |         |         |        V|
  24+50       4.9572      0.04  Q         |         |         |        V|
  24+55       4.9574      0.04  Q         |         |         |        V|
  25+ 0       4.9576      0.03  Q         |         |         |        V|
  25+ 5       4.9578      0.02  Q         |         |         |        V|
  25+10       4.9579      0.02  Q         |         |         |        V|
  25+15       4.9580      0.02  Q         |         |         |        V|
  25+20       4.9581      0.01  Q         |         |         |        V|
  25+25       4.9582      0.01  Q         |         |         |        V|
  25+30       4.9582      0.01  Q         |         |         |        V|
  25+35       4.9583      0.01  Q         |         |         |        V|
  25+40       4.9583      0.00  Q         |         |         |        V|
  25+45       4.9583      0.00  Q         |         |         |        V|
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/19/23 File: crph2uh242.out

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Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6406

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

CRESCENT GARDENS
Proposed Conditions
AREA H
10/16/23

Drainage Area = 8.53(Ac.) = 0.013 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 8.53(Ac.) = 0.013 Sq. Mi.
Length along longest watercourse = 2153.90(Ft.)
Length along longest watercourse measured to centroid = 668.00(Ft.)
Length along longest watercourse = 0.408 Mi.
Length along longest watercourse measured to centroid = 0.127 Mi.
Difference in elevation = 59.50(Ft.)
Slope along watercourse = 145.8564 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.060 Hr.
Lag time = 3.62 Min.
25% of lag time = 0.91 Min.
40% of lag time = 1.45 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.53	2.21	18.85

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.53	5.82	49.64

STORM EVENT (YEAR) = 2.00
Area Averaged 2-Year Rainfall = 2.210(In)
Area Averaged 100-Year Rainfall = 5.820(In)

Point rain (area averaged) = 2.210(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.210(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
1.430	89.00	0.000
5.570	75.00	0.000
1.530	98.00	0.900

Total Area Entered = 8.53(Ac.)

RI AMC2	RI AMC-1	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
89.0	76.4	0.286	0.000	0.286	0.168	0.048
75.0	57.0	0.501	0.000	0.501	0.653	0.327
98.0	94.8	0.068	0.900	0.013	0.179	0.002
					Sum (F) =	0.377

Area averaged mean soil loss (F) (In/Hr) = 0.377
Minimum soil loss rate ((In/Hr)) = 0.189
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.760

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	138.002	30.158	2.593
2	0.167	276.003	47.834	4.112
3	0.250	414.005	11.937	1.026
4	0.333	552.007	5.273	0.453
5	0.417	690.008	2.835	0.244
6	0.500	828.010	1.962	0.169
		Sum = 100.000	Sum=	8.597

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.018	(0.669)	0.013	0.004
2	0.17	0.07	0.018	(0.666)	0.013	0.004
3	0.25	0.07	0.018	(0.664)	0.013	0.004
4	0.33	0.10	0.027	(0.661)	0.020	0.006
5	0.42	0.10	0.027	(0.658)	0.020	0.006
6	0.50	0.10	0.027	(0.656)	0.020	0.006
7	0.58	0.10	0.027	(0.653)	0.020	0.006
8	0.67	0.10	0.027	(0.651)	0.020	0.006
9	0.75	0.10	0.027	(0.648)	0.020	0.006

10	0.83	0.13	0.035	(0.646)	0.027	0.008
11	0.92	0.13	0.035	(0.643)	0.027	0.008
12	1.00	0.13	0.035	(0.641)	0.027	0.008
13	1.08	0.10	0.027	(0.638)	0.020	0.006
14	1.17	0.10	0.027	(0.635)	0.020	0.006
15	1.25	0.10	0.027	(0.633)	0.020	0.006
16	1.33	0.10	0.027	(0.630)	0.020	0.006
17	1.42	0.10	0.027	(0.628)	0.020	0.006
18	1.50	0.10	0.027	(0.625)	0.020	0.006
19	1.58	0.10	0.027	(0.623)	0.020	0.006
20	1.67	0.10	0.027	(0.620)	0.020	0.006
21	1.75	0.10	0.027	(0.618)	0.020	0.006
22	1.83	0.13	0.035	(0.615)	0.027	0.008
23	1.92	0.13	0.035	(0.613)	0.027	0.008
24	2.00	0.13	0.035	(0.610)	0.027	0.008
25	2.08	0.13	0.035	(0.608)	0.027	0.008
26	2.17	0.13	0.035	(0.606)	0.027	0.008
27	2.25	0.13	0.035	(0.603)	0.027	0.008
28	2.33	0.13	0.035	(0.601)	0.027	0.008
29	2.42	0.13	0.035	(0.598)	0.027	0.008
30	2.50	0.13	0.035	(0.596)	0.027	0.008
31	2.58	0.17	0.044	(0.593)	0.034	0.011
32	2.67	0.17	0.044	(0.591)	0.034	0.011
33	2.75	0.17	0.044	(0.588)	0.034	0.011
34	2.83	0.17	0.044	(0.586)	0.034	0.011
35	2.92	0.17	0.044	(0.584)	0.034	0.011
36	3.00	0.17	0.044	(0.581)	0.034	0.011
37	3.08	0.17	0.044	(0.579)	0.034	0.011
38	3.17	0.17	0.044	(0.576)	0.034	0.011
39	3.25	0.17	0.044	(0.574)	0.034	0.011
40	3.33	0.17	0.044	(0.572)	0.034	0.011
41	3.42	0.17	0.044	(0.569)	0.034	0.011
42	3.50	0.17	0.044	(0.567)	0.034	0.011
43	3.58	0.17	0.044	(0.564)	0.034	0.011
44	3.67	0.17	0.044	(0.562)	0.034	0.011
45	3.75	0.17	0.044	(0.560)	0.034	0.011
46	3.83	0.20	0.053	(0.557)	0.040	0.013
47	3.92	0.20	0.053	(0.555)	0.040	0.013
48	4.00	0.20	0.053	(0.553)	0.040	0.013
49	4.08	0.20	0.053	(0.550)	0.040	0.013
50	4.17	0.20	0.053	(0.548)	0.040	0.013
51	4.25	0.20	0.053	(0.546)	0.040	0.013
52	4.33	0.23	0.062	(0.543)	0.047	0.015
53	4.42	0.23	0.062	(0.541)	0.047	0.015
54	4.50	0.23	0.062	(0.539)	0.047	0.015
55	4.58	0.23	0.062	(0.536)	0.047	0.015
56	4.67	0.23	0.062	(0.534)	0.047	0.015
57	4.75	0.23	0.062	(0.532)	0.047	0.015
58	4.83	0.27	0.071	(0.529)	0.054	0.017
59	4.92	0.27	0.071	(0.527)	0.054	0.017
60	5.00	0.27	0.071	(0.525)	0.054	0.017
61	5.08	0.20	0.053	(0.523)	0.040	0.013
62	5.17	0.20	0.053	(0.520)	0.040	0.013
63	5.25	0.20	0.053	(0.518)	0.040	0.013
64	5.33	0.23	0.062	(0.516)	0.047	0.015
65	5.42	0.23	0.062	(0.514)	0.047	0.015
66	5.50	0.23	0.062	(0.511)	0.047	0.015
67	5.58	0.27	0.071	(0.509)	0.054	0.017
68	5.67	0.27	0.071	(0.507)	0.054	0.017
69	5.75	0.27	0.071	(0.505)	0.054	0.017
70	5.83	0.27	0.071	(0.502)	0.054	0.017
71	5.92	0.27	0.071	(0.500)	0.054	0.017
72	6.00	0.27	0.071	(0.498)	0.054	0.017
73	6.08	0.30	0.080	(0.496)	0.060	0.019
74	6.17	0.30	0.080	(0.494)	0.060	0.019
75	6.25	0.30	0.080	(0.491)	0.060	0.019
76	6.33	0.30	0.080	(0.489)	0.060	0.019
77	6.42	0.30	0.080	(0.487)	0.060	0.019
78	6.50	0.30	0.080	(0.485)	0.060	0.019
79	6.58	0.33	0.088	(0.483)	0.067	0.021
80	6.67	0.33	0.088	(0.480)	0.067	0.021
81	6.75	0.33	0.088	(0.478)	0.067	0.021
82	6.83	0.33	0.088	(0.476)	0.067	0.021
83	6.92	0.33	0.088	(0.474)	0.067	0.021
84	7.00	0.33	0.088	(0.472)	0.067	0.021
85	7.08	0.33	0.088	(0.470)	0.067	0.021
86	7.17	0.33	0.088	(0.467)	0.067	0.021
87	7.25	0.33	0.088	(0.465)	0.067	0.021
88	7.33	0.37	0.097	(0.463)	0.074	0.023
89	7.42	0.37	0.097	(0.461)	0.074	0.023
90	7.50	0.37	0.097	(0.459)	0.074	0.023
91	7.58	0.40	0.106	(0.457)	0.081	0.025
92	7.67	0.40	0.106	(0.455)	0.081	0.025
93	7.75	0.40	0.106	(0.453)	0.081	0.025
94	7.83	0.43	0.115	(0.451)	0.087	0.028
95	7.92	0.43	0.115	(0.448)	0.087	0.028
96	8.00	0.43	0.115	(0.446)	0.087	0.028
97	8.08	0.50	0.133	(0.444)	0.101	0.032
98	8.17	0.50	0.133	(0.442)	0.101	0.032
99	8.25	0.50	0.133	(0.440)	0.101	0.032
100	8.33	0.50	0.133	(0.438)	0.101	0.032
101	8.42	0.50	0.133	(0.436)	0.101	0.032
102	8.50	0.50	0.133	(0.434)	0.101	0.032
103	8.58	0.53	0.141	(0.432)	0.107	0.034
104	8.67	0.53	0.141	(0.430)	0.107	0.034
105	8.75	0.53	0.141	(0.428)	0.107	0.034
106	8.83	0.57	0.150	(0.426)	0.114	0.036
107	8.92	0.57	0.150	(0.424)	0.114	0.036
108	9.00	0.57	0.150	(0.422)	0.114	0.036
109	9.08	0.63	0.168	(0.420)	0.128	0.040
110	9.17	0.63	0.168	(0.418)	0.128	0.040
111	9.25	0.63	0.168	(0.416)	0.128	0.040
112	9.33	0.67	0.177	(0.414)	0.134	0.042
113	9.42	0.67	0.177	(0.412)	0.134	0.042
114	9.50	0.67	0.177	(0.410)	0.134	0.042
115	9.58	0.70	0.186	(0.408)	0.141	0.045
116	9.67	0.70	0.186	(0.406)	0.141	0.045
117	9.75	0.70	0.186	(0.404)	0.141	0.045
118	9.83	0.73	0.194	(0.402)	0.148	0.047
119	9.92	0.73	0.194	(0.400)	0.148	0.047
120	10.00	0.73	0.194	(0.398)	0.148	0.047
121	10.08	0.50	0.133	(0.396)	0.101	0.032
122	10.17	0.50	0.133	(0.394)	0.101	0.032
123	10.25	0.50	0.133	(0.393)	0.101	0.032
124	10.33	0.50	0.133	(0.391)	0.101	0.032
125	10.42	0.50	0.133	(0.389)	0.101	0.032
126	10.50	0.50	0.133	(0.387)	0.101	0.032
127	10.58	0.67	0.177	(0.385)	0.134	0.042
128	10.67	0.67	0.177	(0.383)	0.134	0.042
129	10.75	0.67	0.177	(0.381)	0.134	0.042

130	10.83	0.67	0.177	(0.379)	0.134	0.042
131	10.92	0.67	0.177	(0.378)	0.134	0.042
132	11.00	0.67	0.177	(0.376)	0.134	0.042
133	11.08	0.63	0.168	(0.374)	0.128	0.040
134	11.17	0.63	0.168	(0.372)	0.128	0.040
135	11.25	0.63	0.168	(0.370)	0.128	0.040
136	11.33	0.63	0.168	(0.368)	0.128	0.040
137	11.42	0.63	0.168	(0.366)	0.128	0.040
138	11.50	0.63	0.168	(0.365)	0.128	0.040
139	11.58	0.57	0.150	(0.363)	0.114	0.036
140	11.67	0.57	0.150	(0.361)	0.114	0.036
141	11.75	0.57	0.150	(0.359)	0.114	0.036
142	11.83	0.60	0.159	(0.357)	0.121	0.038
143	11.92	0.60	0.159	(0.356)	0.121	0.038
144	12.00	0.60	0.159	(0.354)	0.121	0.038
145	12.08	0.83	0.221	(0.352)	0.168	0.053
146	12.17	0.83	0.221	(0.350)	0.168	0.053
147	12.25	0.83	0.221	(0.349)	0.168	0.053
148	12.33	0.87	0.230	(0.347)	0.175	0.055
149	12.42	0.87	0.230	(0.345)	0.175	0.055
150	12.50	0.87	0.230	(0.343)	0.175	0.055
151	12.58	0.93	0.248	(0.342)	0.188	0.059
152	12.67	0.93	0.248	(0.340)	0.188	0.059
153	12.75	0.93	0.248	(0.338)	0.188	0.059
154	12.83	0.97	0.256	(0.337)	0.195	0.062
155	12.92	0.97	0.256	(0.335)	0.195	0.062
156	13.00	0.97	0.256	(0.333)	0.195	0.062
157	13.08	1.13	0.301	(0.331)	0.228	0.072
158	13.17	1.13	0.301	(0.330)	0.228	0.072
159	13.25	1.13	0.301	(0.328)	0.228	0.072
160	13.33	1.13	0.301	(0.326)	0.228	0.072
161	13.42	1.13	0.301	(0.325)	0.228	0.072
162	13.50	1.13	0.301	(0.323)	0.228	0.072
163	13.58	0.77	0.203	(0.321)	0.155	0.049
164	13.67	0.77	0.203	(0.320)	0.155	0.049
165	13.75	0.77	0.203	(0.318)	0.155	0.049
166	13.83	0.77	0.203	(0.317)	0.155	0.049
167	13.92	0.77	0.203	(0.315)	0.155	0.049
168	14.00	0.77	0.203	(0.313)	0.155	0.049
169	14.08	0.90	0.239	(0.312)	0.181	0.057
170	14.17	0.90	0.239	(0.310)	0.181	0.057
171	14.25	0.90	0.239	(0.309)	0.181	0.057
172	14.33	0.87	0.230	(0.307)	0.175	0.055
173	14.42	0.87	0.230	(0.305)	0.175	0.055
174	14.50	0.87	0.230	(0.304)	0.175	0.055
175	14.58	0.87	0.230	(0.302)	0.175	0.055
176	14.67	0.87	0.230	(0.301)	0.175	0.055
177	14.75	0.87	0.230	(0.299)	0.175	0.055
178	14.83	0.83	0.221	(0.298)	0.168	0.053
179	14.92	0.83	0.221	(0.296)	0.168	0.053
180	15.00	0.83	0.221	(0.295)	0.168	0.053
181	15.08	0.80	0.212	(0.293)	0.161	0.051
182	15.17	0.80	0.212	(0.292)	0.161	0.051
183	15.25	0.80	0.212	(0.290)	0.161	0.051
184	15.33	0.77	0.203	(0.289)	0.155	0.049
185	15.42	0.77	0.203	(0.287)	0.155	0.049
186	15.50	0.77	0.203	(0.286)	0.155	0.049
187	15.58	0.63	0.168	(0.284)	0.128	0.040
188	15.67	0.63	0.168	(0.283)	0.128	0.040
189	15.75	0.63	0.168	(0.281)	0.128	0.040
190	15.83	0.63	0.168	(0.280)	0.128	0.040
191	15.92	0.63	0.168	(0.278)	0.128	0.040
192	16.00	0.63	0.168	(0.277)	0.128	0.040
193	16.08	0.13	0.035	(0.276)	0.027	0.008
194	16.17	0.13	0.035	(0.274)	0.027	0.008
195	16.25	0.13	0.035	(0.273)	0.027	0.008
196	16.33	0.13	0.035	(0.271)	0.027	0.008
197	16.42	0.13	0.035	(0.270)	0.027	0.008
198	16.50	0.13	0.035	(0.269)	0.027	0.008
199	16.58	0.10	0.027	(0.267)	0.020	0.006
200	16.67	0.10	0.027	(0.266)	0.020	0.006
201	16.75	0.10	0.027	(0.265)	0.020	0.006
202	16.83	0.10	0.027	(0.263)	0.020	0.006
203	16.92	0.10	0.027	(0.262)	0.020	0.006
204	17.00	0.10	0.027	(0.261)	0.020	0.006
205	17.08	0.17	0.044	(0.259)	0.034	0.011
206	17.17	0.17	0.044	(0.258)	0.034	0.011
207	17.25	0.17	0.044	(0.257)	0.034	0.011
208	17.33	0.17	0.044	(0.255)	0.034	0.011
209	17.42	0.17	0.044	(0.254)	0.034	0.011
210	17.50	0.17	0.044	(0.253)	0.034	0.011
211	17.58	0.17	0.044	(0.252)	0.034	0.011
212	17.67	0.17	0.044	(0.250)	0.034	0.011
213	17.75	0.17	0.044	(0.249)	0.034	0.011
214	17.83	0.13	0.035	(0.248)	0.027	0.008
215	17.92	0.13	0.035	(0.247)	0.027	0.008
216	18.00	0.13	0.035	(0.245)	0.027	0.008
217	18.08	0.13	0.035	(0.244)	0.027	0.008
218	18.17	0.13	0.035	(0.243)	0.027	0.008
219	18.25	0.13	0.035	(0.242)	0.027	0.008
220	18.33	0.13	0.035	(0.241)	0.027	0.008
221	18.42	0.13	0.035	(0.239)	0.027	0.008
222	18.50	0.13	0.035	(0.238)	0.027	0.008
223	18.58	0.10	0.027	(0.237)	0.020	0.006
224	18.67	0.10	0.027	(0.236)	0.020	0.006
225	18.75	0.10	0.027	(0.235)	0.020	0.006
226	18.83	0.07	0.018	(0.234)	0.013	0.004
227	18.92	0.07	0.018	(0.233)	0.013	0.004
228	19.00	0.07	0.018	(0.231)	0.013	0.004
229	19.08	0.10	0.027	(0.230)	0.020	0.006
230	19.17	0.10	0.027	(0.229)	0.020	0.006
231	19.25	0.10	0.027	(0.228)	0.020	0.006
232	19.33	0.13	0.035	(0.227)	0.027	0.008
233	19.42	0.13	0.035	(0.226)	0.027	0.008
234	19.50	0.13	0.035	(0.225)	0.027	0.008
235	19.58	0.10	0.027	(0.224)	0.020	0.006
236	19.67	0.10	0.027	(0.223)	0.020	0.006
237	19.75	0.10	0.027	(0.222)	0.020	0.006
238	19.83	0.07	0.018	(0.221)	0.013	0.004
239	19.92	0.07	0.018	(0.220)	0.013	0.004
240	20.00	0.07	0.018	(0.219)	0.013	0.004
241	20.08	0.10	0.027	(0.218)	0.020	0.006
242	20.17	0.10	0.027	(0.217)	0.020	0.006
243	20.25	0.10	0.027	(0.216)	0.020	0.006
244	20.33	0.10	0.027	(0.215)	0.020	0.006
245	20.42	0.10	0.027	(0.214)	0.020	0.006
246	20.50	0.10	0.027	(0.213)	0.020	0.006
247	20.58	0.10	0.027	(0.213)	0.020	0.006
248	20.67	0.10	0.027	(0.212)	0.020	0.006
249	20.75	0.10	0.027	(0.211)	0.020	0.006

250	20.83	0.07	0.018	(0.210)	0.013	0.004
251	20.92	0.07	0.018	(0.209)	0.013	0.004
252	21.00	0.07	0.018	(0.208)	0.013	0.004
253	21.08	0.10	0.027	(0.207)	0.020	0.006
254	21.17	0.10	0.027	(0.207)	0.020	0.006
255	21.25	0.10	0.027	(0.206)	0.020	0.006
256	21.33	0.07	0.018	(0.205)	0.013	0.004
257	21.42	0.07	0.018	(0.204)	0.013	0.004
258	21.50	0.07	0.018	(0.203)	0.013	0.004
259	21.58	0.10	0.027	(0.203)	0.020	0.006
260	21.67	0.10	0.027	(0.202)	0.020	0.006
261	21.75	0.10	0.027	(0.201)	0.020	0.006
262	21.83	0.07	0.018	(0.201)	0.013	0.004
263	21.92	0.07	0.018	(0.200)	0.013	0.004
264	22.00	0.07	0.018	(0.199)	0.013	0.004
265	22.08	0.10	0.027	(0.199)	0.020	0.006
266	22.17	0.10	0.027	(0.198)	0.020	0.006
267	22.25	0.10	0.027	(0.197)	0.020	0.006
268	22.33	0.07	0.018	(0.197)	0.013	0.004
269	22.42	0.07	0.018	(0.196)	0.013	0.004
270	22.50	0.07	0.018	(0.195)	0.013	0.004
271	22.58	0.07	0.018	(0.195)	0.013	0.004
272	22.67	0.07	0.018	(0.194)	0.013	0.004
273	22.75	0.07	0.018	(0.194)	0.013	0.004
274	22.83	0.07	0.018	(0.193)	0.013	0.004
275	22.92	0.07	0.018	(0.193)	0.013	0.004
276	23.00	0.07	0.018	(0.192)	0.013	0.004
277	23.08	0.07	0.018	(0.192)	0.013	0.004
278	23.17	0.07	0.018	(0.191)	0.013	0.004
279	23.25	0.07	0.018	(0.191)	0.013	0.004
280	23.33	0.07	0.018	(0.191)	0.013	0.004
281	23.42	0.07	0.018	(0.190)	0.013	0.004
282	23.50	0.07	0.018	(0.190)	0.013	0.004
283	23.58	0.07	0.018	(0.190)	0.013	0.004
284	23.67	0.07	0.018	(0.189)	0.013	0.004
285	23.75	0.07	0.018	(0.189)	0.013	0.004
286	23.83	0.07	0.018	(0.189)	0.013	0.004
287	23.92	0.07	0.018	(0.189)	0.013	0.004
288	24.00	0.07	0.018	(0.189)	0.013	0.004

(Loss Rate Not Used)

Sum = 100.0 Sum = 6.4

Flood volume = Effective rainfall 0.53(In)
times area 8.5(Ac.)/[(In)/(Ft.)] = 0.4(Ac.Ft)
Total soil loss = 1.68(In)
Total soil loss = 1.194(Ac.Ft)
Total rainfall = 2.21(In)
Flood volume = 16423.0 Cubic Feet
Total soil loss = 52006.1 Cubic Feet

Peak flow rate of this hydrograph = 0.620(CFS)

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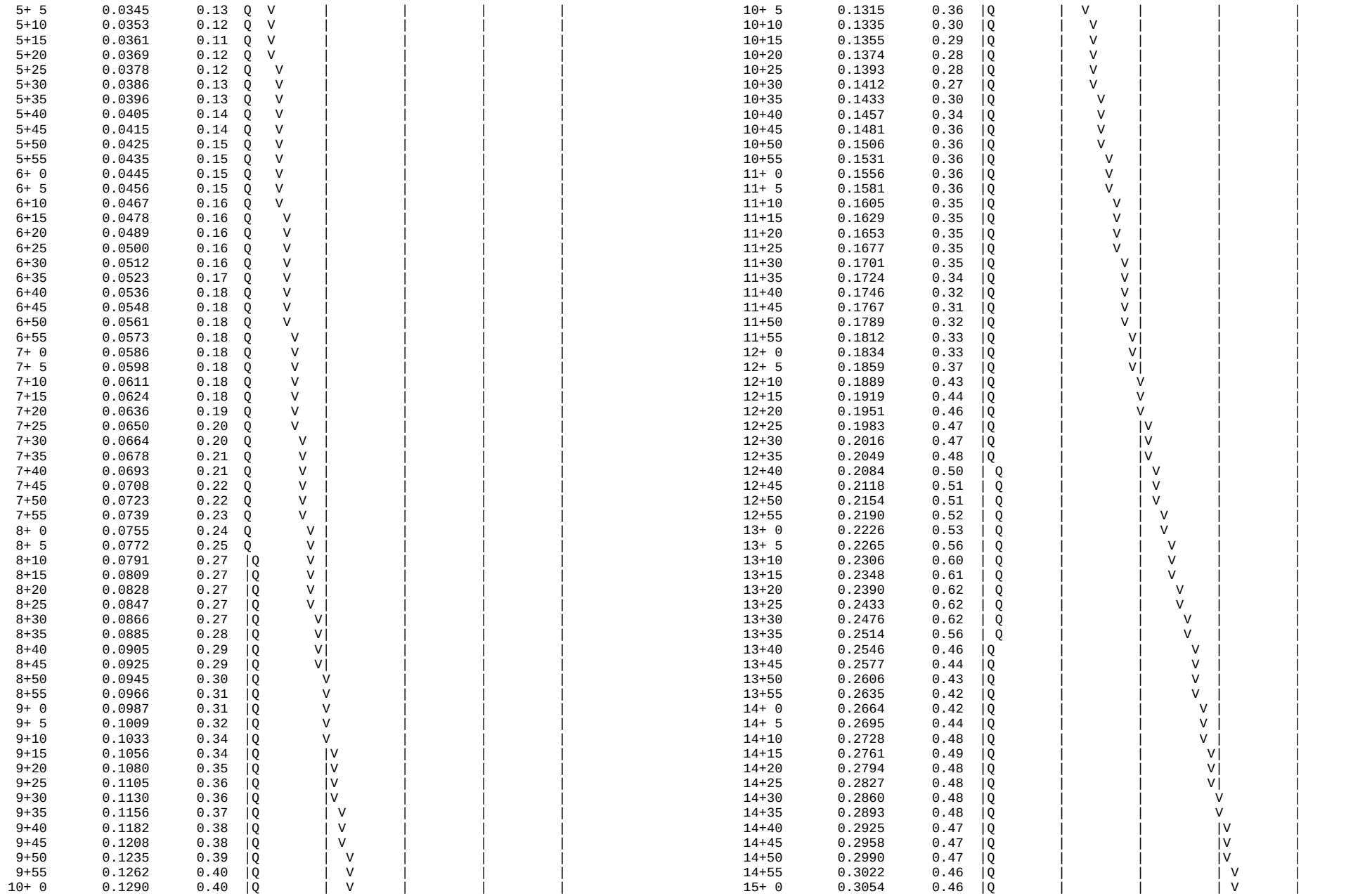
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0001	0.01	Q				
0+10	0.0003	0.03	Q				
0+15	0.0005	0.03	Q				
0+20	0.0008	0.04	Q				
0+25	0.0011	0.05	Q				
0+30	0.0015	0.05	Q				
0+35	0.0019	0.05	Q				
0+40	0.0022	0.05	Q				
0+45	0.0026	0.05	Q				
0+50	0.0030	0.06	Q				
0+55	0.0035	0.07	Q				
1+ 0	0.0040	0.07	Q				
1+ 5	0.0044	0.07	Q				
1+10	0.0048	0.06	Q				
1+15	0.0052	0.06	Q				
1+20	0.0056	0.06	Q				
1+25	0.0060	0.06	Q				
1+30	0.0064	0.05	Q				
1+35	0.0068	0.05	Q				
1+40	0.0071	0.05	Q				
1+45	0.0075	0.05	Q				
1+50	0.0079	0.06	Q				
1+55	0.0084	0.07	Q				
2+ 0	0.0089	0.07	Q				
2+ 5	0.0094	0.07	Q				
2+10	0.0099	0.07	QV				
2+15	0.0104	0.07	QV				
2+20	0.0109	0.07	QV				
2+25	0.0114	0.07	QV				
2+30	0.0119	0.07	QV				
2+35	0.0124	0.08	QV				
2+40	0.0130	0.09	QV				
2+45	0.0137	0.09	QV				
2+50	0.0143	0.09	QV				
2+55	0.0149	0.09	QV				
3+ 0	0.0155	0.09	QV				
3+ 5	0.0162	0.09	QV				
3+10	0.0168	0.09	QV				
3+15	0.0174	0.09	QV				
3+20	0.0180	0.09	QV				
3+25	0.0187	0.09	QV				
3+30	0.0193	0.09	Q V				
3+35	0.0199	0.09	Q V				
3+40	0.0206	0.09	Q V				
3+45	0.0212	0.09	Q V				
3+50	0.0219	0.10	Q V				
3+55	0.0226	0.11	Q V				
4+ 0	0.0233	0.11	Q V				
4+ 5	0.0241	0.11	Q V				
4+10	0.0248	0.11	Q V				
4+15	0.0256	0.11	Q V				
4+20	0.0264	0.11	Q V				
4+25	0.0272	0.12	Q V				
4+30	0.0281	0.13	Q V				
4+35	0.0290	0.13	Q V				
4+40	0.0298	0.13	Q V				
4+45	0.0307	0.13	Q V				
4+50	0.0316	0.13	Q V				
4+55	0.0326	0.14	Q V				
5+ 0	0.0336	0.14	Q V				



15+ 5	0.3085	0.45	Q			V	
15+10	0.3115	0.44	Q			V	
15+15	0.3145	0.44	Q			V	
15+20	0.3175	0.43	Q			V	
15+25	0.3204	0.42	Q			V	
15+30	0.3233	0.42	Q			V	
15+35	0.3261	0.40	Q			V	
15+40	0.3286	0.36	Q			V	
15+45	0.3310	0.35	Q			V	
15+50	0.3334	0.35	Q			V	
15+55	0.3358	0.35	Q			V	
16+ 0	0.3382	0.35	Q			V	
16+ 5	0.3401	0.26	Q			V	
16+10	0.3410	0.13	Q			V	
16+15	0.3417	0.10	Q			V	
16+20	0.3423	0.09	Q			V	
16+25	0.3428	0.08	Q			V	
16+30	0.3433	0.07	Q			V	
16+35	0.3438	0.07	Q			V	
16+40	0.3442	0.06	Q			V	
16+45	0.3446	0.06	Q			V	
16+50	0.3449	0.06	Q			V	
16+55	0.3453	0.06	Q			V	
17+ 0	0.3457	0.05	Q			V	
17+ 5	0.3461	0.07	Q			V	
17+10	0.3467	0.08	Q			V	
17+15	0.3473	0.09	Q			V	
17+20	0.3479	0.09	Q			V	
17+25	0.3486	0.09	Q			V	
17+30	0.3492	0.09	Q			V	
17+35	0.3498	0.09	Q			V	
17+40	0.3504	0.09	Q			V	
17+45	0.3511	0.09	Q			V	
17+50	0.3517	0.09	Q			V	
17+55	0.3522	0.08	Q			V	
18+ 0	0.3527	0.07	Q			V	
18+ 5	0.3532	0.07	Q			V	
18+10	0.3537	0.07	Q			V	
18+15	0.3542	0.07	Q			V	
18+20	0.3547	0.07	Q			V	
18+25	0.3552	0.07	Q			V	
18+30	0.3557	0.07	Q			V	
18+35	0.3562	0.07	Q			V	
18+40	0.3566	0.06	Q			V	
18+45	0.3570	0.06	Q			V	
18+50	0.3573	0.05	Q			V	
18+55	0.3576	0.04	Q			V	
19+ 0	0.3579	0.04	Q			V	
19+ 5	0.3582	0.04	Q			V	
19+10	0.3585	0.05	Q			V	
19+15	0.3589	0.05	Q			V	
19+20	0.3593	0.06	Q			V	
19+25	0.3598	0.07	Q			V	
19+30	0.3603	0.07	Q			V	
19+35	0.3607	0.07	Q			V	
19+40	0.3611	0.06	Q			V	
19+45	0.3615	0.06	Q			V	
19+50	0.3619	0.05	Q			V	
19+55	0.3621	0.04	Q			V	
20+ 0	0.3624	0.04	Q			V	
20+ 5	0.3627	0.04	Q				V
20+10	0.3631	0.05	Q				V
20+15	0.3634	0.05	Q				V
20+20	0.3638	0.05	Q				V
20+25	0.3642	0.05	Q				V
20+30	0.3645	0.05	Q				V
20+35	0.3649	0.05	Q				V
20+40	0.3653	0.05	Q				V
20+45	0.3657	0.05	Q				V
20+50	0.3660	0.05	Q				V
20+55	0.3663	0.04	Q				V
21+ 0	0.3666	0.04	Q				V
21+ 5	0.3669	0.04	Q				V
21+10	0.3672	0.05	Q				V
21+15	0.3676	0.05	Q				V
21+20	0.3679	0.05	Q				V
21+25	0.3682	0.04	Q				V
21+30	0.3684	0.04	Q				V
21+35	0.3687	0.04	Q				V
21+40	0.3691	0.05	Q				V
21+45	0.3695	0.05	Q				V
21+50	0.3698	0.05	Q				V
21+55	0.3701	0.04	Q				V
22+ 0	0.3703	0.04	Q				V
22+ 5	0.3706	0.04	Q				V
22+10	0.3710	0.05	Q				V
22+15	0.3713	0.05	Q				V
22+20	0.3717	0.05	Q				V
22+25	0.3719	0.04	Q				V
22+30	0.3722	0.04	Q				V
22+35	0.3725	0.04	Q				V
22+40	0.3727	0.04	Q				V
22+45	0.3730	0.04	Q				V
22+50	0.3732	0.04	Q				V
22+55	0.3735	0.04	Q				V
23+ 0	0.3737	0.04	Q				V
23+ 5	0.3740	0.04	Q				V
23+10	0.3742	0.04	Q				V
23+15	0.3745	0.04	Q				V
23+20	0.3747	0.04	Q				V
23+25	0.3750	0.04	Q				V
23+30	0.3752	0.04	Q				V
23+35	0.3755	0.04	Q				V
23+40	0.3757	0.04	Q				V
23+45	0.3760	0.04	Q				V
23+50	0.3762	0.04	Q				V
23+55	0.3765	0.04	Q				V
24+ 0	0.3767	0.04	Q				V
24+ 5	0.3769	0.03	Q				V
24+10	0.3770	0.01	Q				V
24+15	0.3770	0.00	Q				V
24+20	0.3770	0.00	Q				V
24+25	0.3770	0.00	Q				V

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ A. **On-site storm drain inlets**	☒ **Locations of inlets.**	☒ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☒ **Maintain and periodically repaint or replace inlet markings.** ☒ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☒ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☒ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☐ B. **Interior floor drains and elevator shaft sump pumps**		☐ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**
☐ C. **Interior parking garages**		☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ D1. **Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☐ **Show self-retaining landscape areas, if any.** ☐ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☐ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☐ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☒ **Consider using pest-resistant plants, especially adjacent to hardscape.** **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ☒ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☒ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ E. **Pools, spas, ponds, decorative fountains, and other water features.**	☐ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	☒ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☐ F. **Food service**	☐ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ☐ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	☐ **Describe the location and features of the designated cleaning area.** ☐ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	☐ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
☐ G. **Refuse areas**	☐ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ☐ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ☐ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	☐ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ☐ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	☐ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑**Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ K. **Vehicle/Equipment Repair and Maintenance**	☐ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ☐ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ☐ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	☐ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ☐ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ☐ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ☐ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ☐ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ☒ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ M. **Loading Docks**	❑ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		❑ **Move loaded and unloaded items indoors as soon as possible.** ❑ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ N. **Fire Sprinkler Test Water**		☐ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	☒ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ☐ **Boiler drain lines** ☐ **Condensate drain lines** ☐ **Rooftop equipment** ☐ **Drainage sumps** ☒ **Roofing, gutters, and trim.** ☐ **Other sources**		☐ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ☐ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ☐ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ☐ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ☒ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ P. **Plazas, sidewalks, and parking lots.**			❑ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Operation and Maintenance Responsibility Plan

The owner of the property, Muslim Mortuary & Cemetery Committee shall be responsible for funding, inspecting, and maintaining all improvements onsite.

Maintenance and inspection activities for the identified BMPs will be performed as indicated on the enclosed BMP Maintenance Responsibility/Frequency Matrix. The owner shall be responsible for all maintenance and inspection responsibilities for all improvements located within the limits of the project.

Until such time as the property is sold and a successor assumes all O&M responsibilities.

See the attached County of Riverside Recorded BMP & WQMP Transfer, Access & Maintenance Agreement.

BMP	RESPONSIBILITY	BMP START DATE	FREQUENCY
Education for Property Owners	Owner	Upon completion of project.	Information to be provided to owners. Owner to insure that all staff/employees and contractors be given a copy of the latest environmental awareness education materials provided by the County of Riverside to inform them of the impacts of dumping oil, paints, solvents or other potentially harmful chemicals into the storm drain; the proper use and management of fertilizers, pesticides and herbicides in landscaping and gardening practices; the impacts of littering and improper watering.
Activity Restrictions	Owner	Upon completion of project.	Continuous, language shall be included to identify surface water quality protection required of the tenants. Surface water quality activities shall also be conducted in conformance with the Water Quality Management Plan.
Irrigation System and Landscape Maintenance	Owner	Upon completion of project.	Monthly during regular maintenance, manage landscaping in accordance with the County of Riverside Water Conservation Ordinance and with the State of California Department of Pesticides management guidelines for use of fertilizers and pesticides. Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted 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 and day or night time temperatures.
Street Sweeping	Owner	Upon completion of project.	All project streets and exposed parking and travel areas shall be swept on a weekly basis to minimize the potential for offsite transport of pollutants.

BMP	RESPONSIBILITY	BMP START DATE	FREQUENCY
Drainage Facility Inspection and Maintenance	Owner	Upon completion of project.	Post construction, all drainage improvements located within the project site shall be private improvements, to be maintained by the owner. Drainage facility inspection and maintenance activities will be done on a regular basis (quarterly), and prior to the storm season, no later than October 1st of each year.
Storm Drain System Signage	Owner	Upon completion of project.	Yearly. Storm drain stencils or signage prohibiting dumping and discharge of materials ("No Dumping – Drains to River") shall be provided adjacent to each of the project's proposed inlets. The stencils shall be inspected and restenciled as needed to maintain legibility.
Bioretention Basin	Owner	Upon completion of project.	Inspect for standing water or saturated conditions that lasts for more than 72 hours. Inspect for vegetation health, presence of burrows, and trash, debris, obstructions and signs of erosion. Replace plantings, remove trash and repair as needed. Trim vegetation to prevent establishment of woody and other non-desired vegetation Remove accumulated sediment when sediment level exceeds 10% of basin volume.

BMP	RESPONSIBILITY	BMP START DATE	FREQUENCY
Modular Wetland System	Owner	Upon completion of project	Inspect unit for accumulated debris and sediment and plant health 1st Year Operation – Monthly during rainy season, bi-monthly during dry season. After 1st Year – Every 6 – 12 months based on inspection findings. Trim vegetation (See Hardy Zone 9 plantings per manufacturer's recommendation in Section 6.3a)Monthly with landscaping activities. Remove trash from screening device and separation chamber Remove sediment from pre-chamber, replace pre-filter cartridge media and drain down filter media.Perform maintenance per inspection findings. Replace wetland media 20 years, or as needed based on inspection results.

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Operation and Maintenance Responsibility Plan

The owner of the property, Muslim Mortuary & Cemetery Committee shall be responsible for funding, inspecting, and maintaining all improvements onsite.

Maintenance and inspection activities for the identified BMPs will be performed as indicated on the enclosed BMP Maintenance Responsibility/Frequency Matrix. The owner shall be responsible for all maintenance and inspection responsibilities for all improvements located within the limits of the project.

Until such time as the property is sold and a successor assumes all O&M responsibilities.

See the attached County of Riverside Recorded BMP & WQMP Transfer, Access & Maintenance Agreement.

BMP	RESPONSIBILITY	BMP START DATE	FREQUENCY
Education for Property Owners	Owner	Upon completion of project.	Information to be provided to owners. Owner to insure that all staff/employees and contractors be given a copy of the latest environmental awareness education materials provided by the County of Riverside to inform them of the impacts of dumping oil, paints, solvents or other potentially harmful chemicals into the storm drain; the proper use and management of fertilizers, pesticides and herbicides in landscaping and gardening practices; the impacts of littering and improper watering.
Activity Restrictions	Owner	Upon completion of project.	Continuous, language shall be included to identify surface water quality protection required of the tenants. Surface water quality activities shall also be conducted in conformance with the Water Quality Management Plan.
Irrigation System and Landscape Maintenance	Owner	Upon completion of project.	Monthly during regular maintenance, manage landscaping in accordance with the County of Riverside Water Conservation Ordinance and with the State of California Department of Pesticides management guidelines for use of fertilizers and pesticides. Verify that runoff minimizing landscape design continues to function by checking that water sensors are functioning properly, that irrigation heads are adjusted 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 and day or night time temperatures.
Street Sweeping	Owner	Upon completion of project.	All project streets and exposed parking and travel areas shall be swept on a weekly basis to minimize the potential for offsite transport of pollutants.

BMP	RESPONSIBILITY	BMP START DATE	FREQUENCY
Drainage Facility Inspection and Maintenance	Owner	Upon completion of project.	Post construction, all drainage improvements located within the project site shall be private improvements, to be maintained by the owner. Drainage facility inspection and maintenance activities will be done on a regular basis (quarterly), and prior to the storm season, no later than October 1st of each year.
Storm Drain System Signage	Owner	Upon completion of project.	Yearly. Storm drain stencils or signage prohibiting dumping and discharge of materials ("No Dumping – Drains to River") shall be provided adjacent to each of the project's proposed inlets. The stencils shall be inspected and restenciled as needed to maintain legibility.
Bioretention Basin	Owner	Upon completion of project.	Inspect for standing water or saturated conditions that lasts for more than 72 hours. Inspect for vegetation health, presence of burrows, and trash, debris, obstructions and signs of erosion. Replace plantings, remove trash and repair as needed. Trim vegetation to prevent establishment of woody and other non-desired vegetation Remove accumulated sediment when sediment level exceeds 10% of basin volume.

BMP	RESPONSIBILITY	BMP START DATE	FREQUENCY
Modular Wetland System	Owner	Upon completion of project	Inspect unit for accumulated debris and sediment and plant health 1st Year Operation – Monthly during rainy season, bi-monthly during dry season. After 1st Year – Every 6 – 12 months based on inspection findings. Trim vegetation (See Hardy Zone 9 plantings per manufacturer's recommendation in Section 6.3a)Monthly with landscaping activities. Remove trash from screening device and separation chamber Remove sediment from pre-chamber, replace pre-filter cartridge media and drain down filter media.Perform maintenance per inspection findings. Replace wetland media 20 years, or as needed based on inspection results.

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

CONTECH®
ENGINEERED SOLUTIONS

Modular Wetlands® Linear Stormwater Biofiltration



The experts you need to solve your stormwater challenges



Contech is the leader in stormwater solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

Your Contech Team



STORMWATER CONSULTANT

It's my job to recommend the best solution to meet permitting requirements.



STORMWATER DESIGN ENGINEER

I work with consultants to design the best approved solution to meet your project's needs.



REGULATORY MANAGER

I understand the local stormwater regulations and what solutions will be approved.



SALES ENGINEER

I make sure our solutions meet the needs of the contractor during construction.

Contech is your partner in stormwater management solutions



Restoring Nature's Presence in Urban Areas – Modular Wetlands® Linear

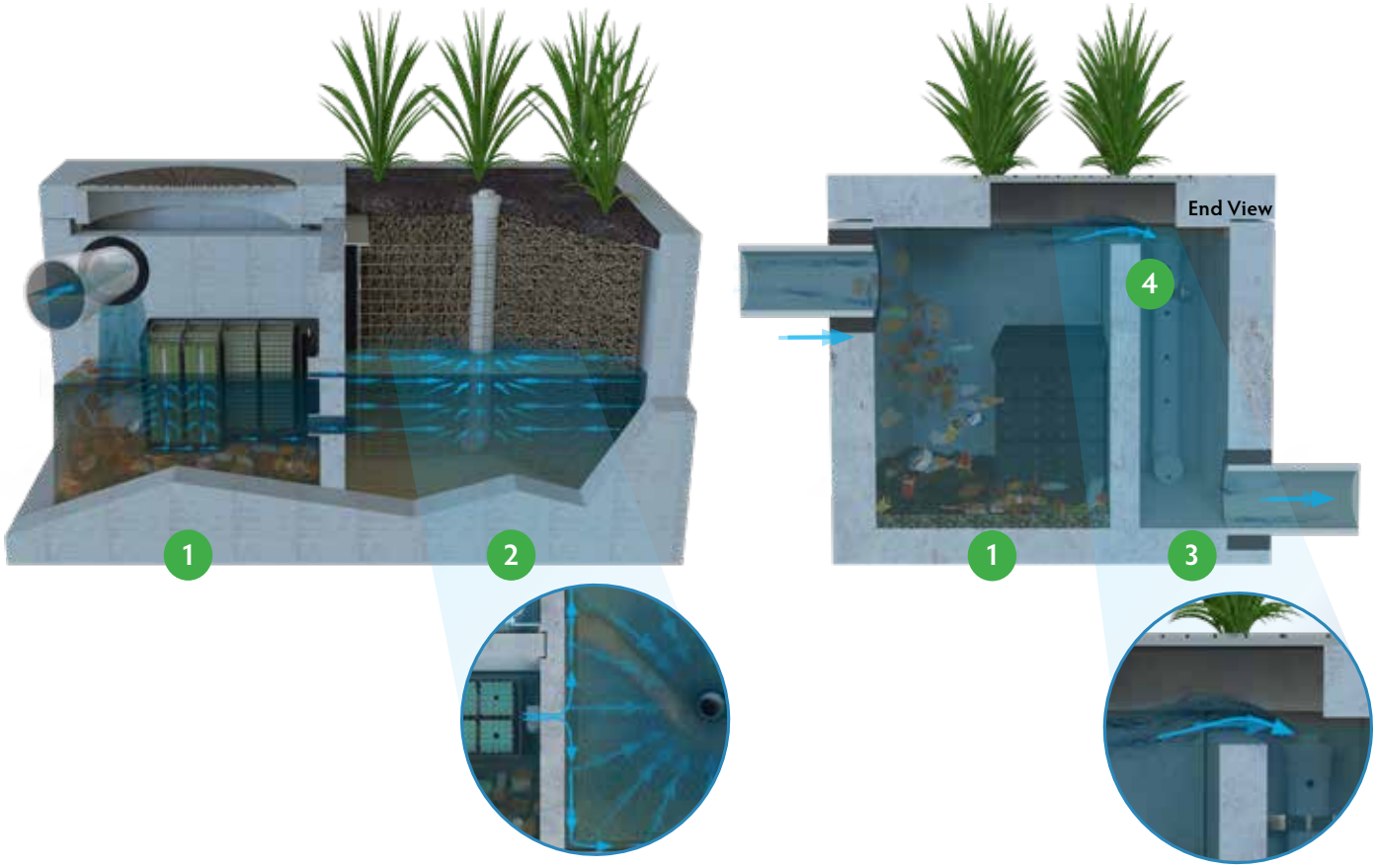
As cities grow, there is less space for natural solutions to treat stormwater. Contech understands this and is committed to providing compact, Low Impact Development (LID) solutions like the Modular Wetlands Linear to protect our nation's waterways.

The Modular Wetlands® Linear is the only biofiltration system to utilize patented horizontal flow, allowing for a small footprint, high treatment capacity, and design versatility. It is also the only biofiltration system that can be routinely installed downstream of storage for additional volume control and treatment.

With numerous regulatory approvals, the system's aesthetic appeal and superior pollutant removal make it the ideal solution for a wide range of stormwater applications, including urban development projects, commercial parking lots, residential streets, mixed-use developments, streetscapes, and more.

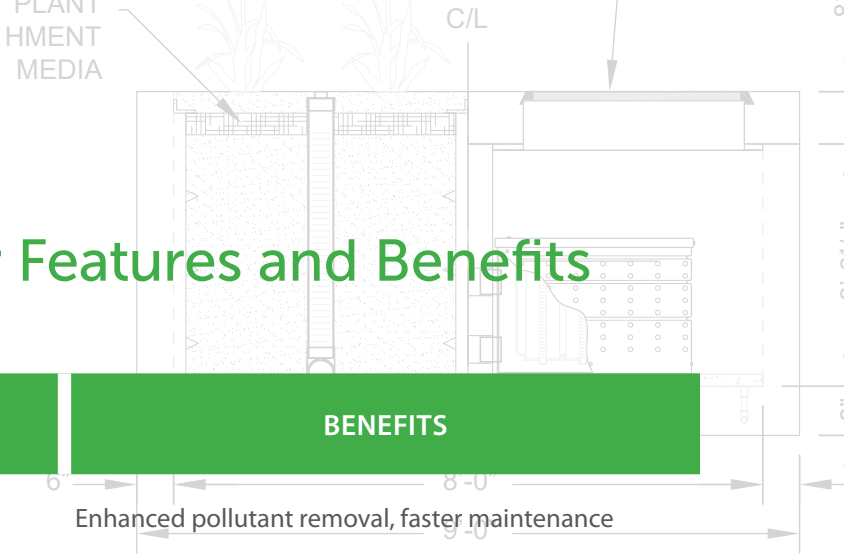
MODULAR WETLANDS®

How the Modular Wetlands® Linear Works



1. **PRETREATMENT** | Stormwater enters the pretreatment chamber where total suspended solids settle, and trash and debris are contained within the chamber. Stormwater then travels through the pretreatment filter boxes that provide additional treatment.
2. **BIOFILTRATION** | As water enters the biofiltration chamber, it fills the void space in the chamber's perimeter. Horizontal forces push the water inward through the biofiltration media, where nutrients and metals are captured. The water then enters the drain pipe to be discharged.
3. **DISCHARGE** | The specially designed vertical drain pipe and orifice control plate control the flow of water through the media to a level lower than the media's capacity, ensuring media effectiveness. The water then enters the horizontal drain pipe to be discharged.
4. **BYPASS** | During peak flows, an internal weir in the side-by-side configuration allows high flows to bypass treatment, eliminating flooding and the need for a separate bypass structure. Bypass is not provided in the end-to end configuration.

Using horizontal flow to improve performance



Modular Wetlands® Linear Features and Benefits

FEATURE	BENEFITS
Pretreatment chamber	Enhanced pollutant removal, faster maintenance
Horizontal flow biofiltration	Greater filter surface area
Performance verified by both the WA DOE and NJ DEP	Superior pollutant capture with confidence
Built-in high flow bypass	Eliminates flooding and the need for a separate bypass structure
Available in multiple configurations and sizes	Flexibility to meet site-specific needs

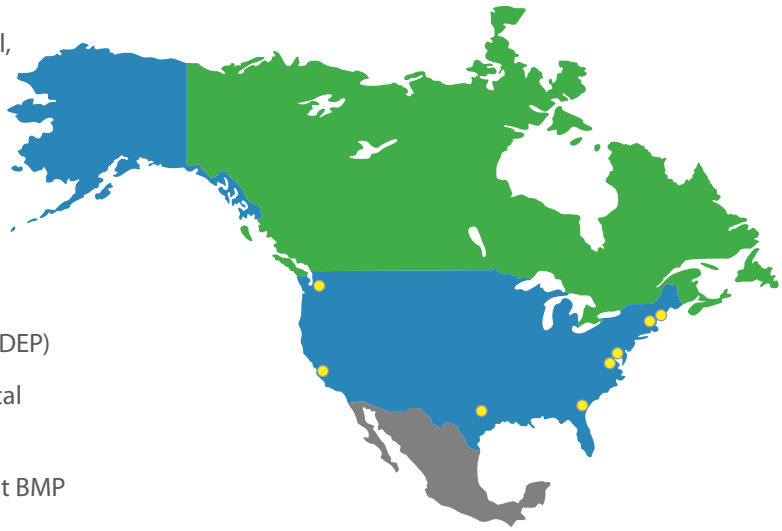


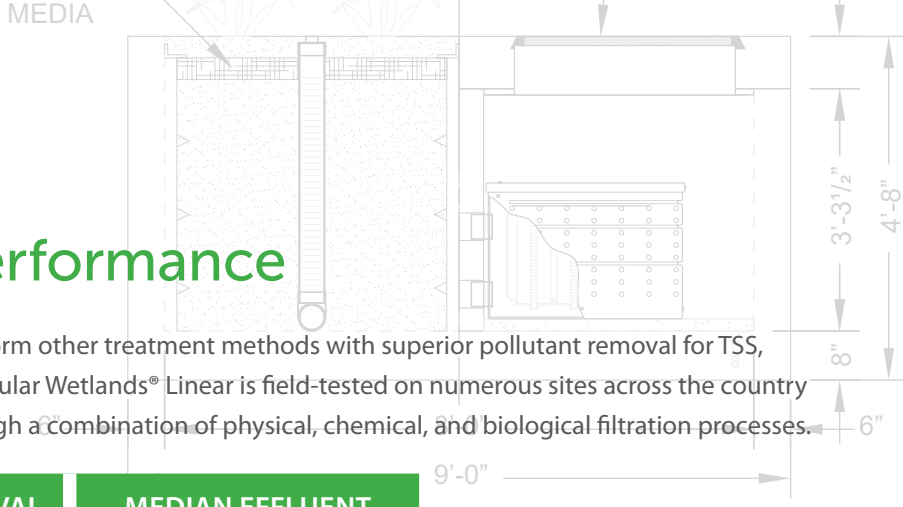
The Modular Wetlands system offers many different configurations.

Select Modular Wetlands® Linear Approvals

Modular Wetlands Linear is approved through numerous local, state and federal programs, including but not limited to:

- Washington State Department of Ecology TAPE
- California Water Resources Control Board, Full Capture Certification
- Virginia Department of Environmental Quality (VA DEQ)
- New Jersey Department of Environmental Protection (NJDEP)
- Maryland Department of the Environment - Environmental Site Design (ESD)
- Rhode Island Department of Environmental Management BMP
- Texas Commission on Environmental Quality (TCEQ)
- Atlanta Regional Commission Certification





Modular Wetlands® Performance

The Modular Wetlands® Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, and hydrocarbons. The Modular Wetlands® Linear is field-tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes.

POLLUTANT OF CONCERN	MEDIAN REMOVAL EFFICIENCY	MEDIAN EFFLUENT CONCENTRATION (MG/L)
Total Suspended Solids (TSS)	89%	12
Total Phosphorus - TAPE (TP)	61%	0.041
Nitrogen (TN)	23%	1
Total Copper (TCu)	50%	0.006
Total Dissolved Copper	37%	0.006
Total Zinc (TZn)	66%	0.019
Dissolved Zinc	60%	0.0148
Motor Oil	79%	0.8

Sources:
TAPE Field Study - 2012
TAPE Field Study - 2013

Note: Some jurisdictions recognize higher removal rates. Contact your Contech Stormwater Consultant for performance expectations.

Modular Wetlands® Linear Maintenance

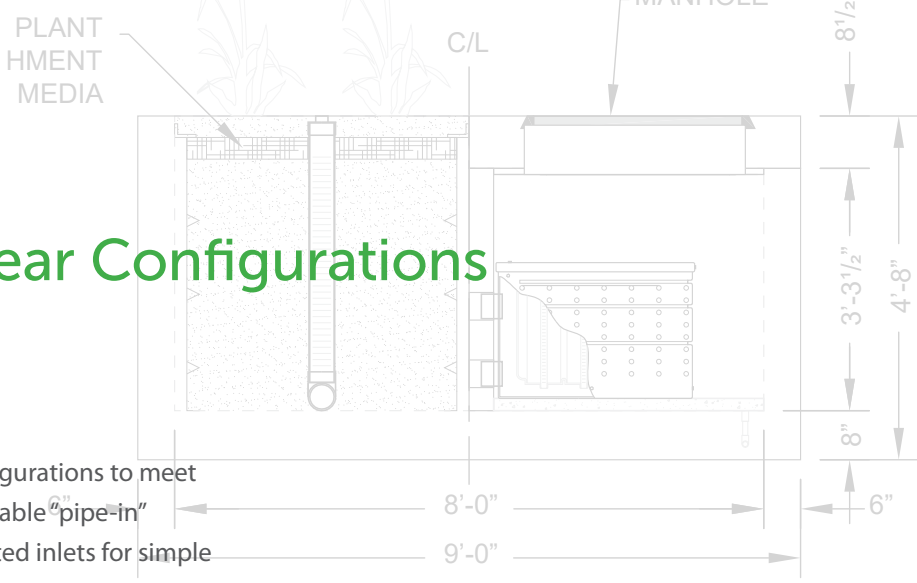
The Modular Wetlands® Linear is a self-contained treatment train. Maintenance requirements for the unit consist of five simple steps that can be completed using a vacuum truck. The system can also be cleaned by hand.

- Remove trash from the screening device
- Remove sediment from the separation chamber
- Periodically replace the pretreatment cartridge filter media
- Replace the drain down filter media
- Trim vegetation



Most Modular Wetland Linear systems can be cleaned in about thirty minutes.

Multiple configurations allow for easy site integration



Modular Wetlands® Linear Configurations

Multiple system configurations integrate with site hydraulic design and layout ...

The Modular Wetlands Linear is offered in multiple configurations to meet site specific needs. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.



Curb Inlet

The Curb Inlet configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions.



Vault

The Vault configuration can be used in end-of-the-line installations. Another benefit of the "pipe-in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements, or for traffic-rated designs (no plants).



Downspout

The Downspout configuration is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

A partner you can rely on



STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

TAKE THE NEXT STEP

For more information: www.ContechES.com

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CONTECH® ENGINEERED SOLUTIONS

Get social with us:

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Engineered Soil Media Requirements

The engineered soil media shall be comprised of 85 percent mineral component and 15 percent organic component, by volume, drum mixed prior to placement. The mineral component shall be a Class A sandy loam topsoil that meets the range specified in Table 1 below. The organic component shall be nitrogen stabilized compost[1], such that nitrogen does not leach from the media.

Table 1: Mineral Component Range Requirements

Percent Range	Component
70-80	Sand
15-20	Silt
5-10	Clay

The trip ticket, or certificate of compliance, shall be made available to the inspector to prove the engineered mix meets this specification.

Vegetation Requirements

Vegetative cover is important to minimize erosion and ensure that treatment occurs in the Bioretention Facility. The area should be designed for at least 70 percent mature coverage throughout the Bioretention Facility. To prevent the BMP from being used as walkways, Bioretention Facilities shall be planted with a combination of small trees, densely planted shrubs, and natural grasses. Grasses shall be native or ornamental; preferably ones that do not need to be mowed. The application of fertilizers and pesticides should be minimal. To maintain oxygen levels for the vegetation and promote biodegradation, it is important that vegetation not be completely submerged for any extended period of time. Therefore, a maximum of 6 inches of ponded water shall be used in the design to ensure that plants within the Bioretention Facility remain healthy.

A 2 to 3-inch layer of standard shredded aged hardwood mulch shall be placed as the top layer inside the Bioretention Facility. The 6-inch ponding depth shown in Figure 1 above shall be measured from the top surface of the 2 to 3-inch mulch layer.

Curb Cuts

To allow water to flow into the Bioretention Facility, 1-foot-wide (minimum) curb cuts should be placed approximately every 10 feet around the perimeter of the Bioretention Facility. Figure 2 shows a curb cut in a Bioretention Facility. Curb cut flow lines must be at or above the V_{BMP} water surface level.

[1] For more information on compost, visit the US Composting Council website at: http://compostingcouncil.org/

Adopt a pet from your local animal shelter or adoption centers at pet stores. A variety of animals, from purebred tomixe d breed are waiting for loving arms and good homes. Consider volunteering at your local animal shelters. Volunteers, donations, food, newspapers, old towels and linens are needed to help the animals.



RIVERSIDE COUNTY
ANIMAL SHELTER LOCATIONS:

BLYTHE
16450 West Hobson Way
Blythe, CA 92225
760-921-7857

HEMET
800 South Sanderson
Hemet, CA 92545
909 925-8025

INDIO
45-355 Van Buren
Indio, CA 92201
760-347-2319

RIVERSIDE
5950 Wilderness Avenue
Riverside, CA 92504
909-358-7387

FOR ALL OTHER AREAS
CALL 1-888-636-7387

Riverside County gratefully acknowledges the City of Los Angeles Stormwater Program for the design concept of this brochure.

What's the Scoop?



TIPS FOR A HEALTHY PET AND A HEALTHIER ENVIRONMENT

CREATE A HEALTHY ENVIRONMENT in and around your home by following these simple pet practices. Your pet, family and neighbors will appreciate their clean comfortable surroundings.

HOUSEHOLD PETS

We all love our pets, but pet waste is a subject everyone likes to avoid. Pet waste left on trails, sidewalks, streets, and grassy areas is immediately flushed into the nearest waterway when it rains. Even if you can't see water near you, the rain or waste water WASHES all that PET WASTE and BACTERIA INTO THE STORMDRAIN, where it travels to your neighborhood creek or lake untreated. These animal droppings also contain nutrients that can promote the growth of algae, if they enter our streams and lakes. The risk of STORMWATER CONTAMINATION INCREASES, if pet wastes is allowed to accumulate in animal pen areas or left on sidewalks, streets, or driveways where runoff can carry them to storm sewers.

Some of the DISEASES THAT CAN SPREAD from pet waste are:
Campylobacteriosis — a bacterial infection that causes diarrhea in humans.
Salmonellosis — the most common bacterial infection transmitted to humans from animals.
Toxocarisis — roundworms transmitted from animals to humans.

Flies and other pest insects can also increase when pet waste is disposed of improperly, becoming a nuisance and adding yet another vector for disease transmission.

WHAT CAN YOU DO?

- SCOOP up pet waste and flush it down the toilet.
- NEVER DUMP pet waste into a storm drain or catch basin.
- USE the complimentary BAGS or mutt mitts offered in dispensers at local parks.
- CARRY EXTRA BAGS when walking your dog and make them available to other pet owners who are without.
- TEACH CHILDREN how to properly clean up after a pet.
- TELL FRIENDS AND NEIGHBORS about the ill effects of animal waste on the environment. Encourage them to clean up after pets.

Did You Know . . .
that Californians illegally dump about 80 million gallons of motor oil each year?

Many communities have "Scoop the Poop" laws that govern pet waste cleanup. Some of these laws specifically require anyone who walks an animal off of their property to carry a bag, shovel, or scooper. Any waste left by the animal must be cleaned up immediately. CALL YOUR LOCAL CODE ENFORCEMENT OFFICER to find out more about pet waste regulations.

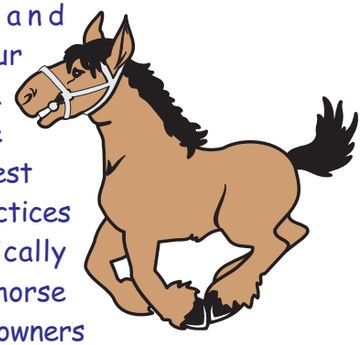


Pets are only one of the many fixtures of suburban America that add to water pollution. Lawn fertilizers, rinse water from driveways and motor oil commonly end up in streams and lakes. **CALL 1-800-506-2555 FOR HOUSEHOLD HAZARDOUS WASTE COLLECTION LOCATION AND DATES.** Maintain your automobile to avoid leaks. Dispose of used vehicle fluids properly. Your pets can be poisoned if they ingest gas, oil or antifreeze that drips onto the pavement or is stored in open containers.

NEVER HOSE VEHICLE FLUIDS into the street or gutter. USE ABSORBENT MATERIALS such as cat litter to clean-up spills. SWEEP UP used absorbent materials and place in the trash.

HORSES AND LIVESTOCK

Fortunate enough to own a horse or livestock? You, too, can play a part in protecting and cleaning up our water resources. The following are a few simple Best Management Practices (BMPs) specifically designed for horse owners and landowners with horses.



- STORE your manure properly. Do not store unprotected piles of manure in places where runoff may enter streams, or flood waters may wash the manure away. Place a cover or tarp over the pile to keep rainwater out.
- CHECK with your local conservation district to design manure storage facilities to protect water quality. These structures usually consist of a concrete pad to protect ground water and a short wall on one or two sides to make manure handling easier.
- TRY composting – A vegetative cover placed around buildings or on steeper slopes can help minimize erosion and absorb nutrients while improving the appearance of your property. In addition, avoid costlier erosion controls, vegetative covers will provide animals with better traction during wet or icy conditions.



- KEEP animals out of steams – Designed stream crossings provide a safe, easy way for horses and livestock to ford streams. Fencing encourages the use of the crossing instead of the streambed to navigate streams. This will allow vegetation to stabilize stream banks and reduce sediment pollution.
- MOW pastures to proper height, six inches is typically recommended.
- Material STORAGE SAFETY TIPS – Many of the chemicals found in barns require careful handling and proper disposal. When using these chemicals, be certain to follow these common sense guidelines:
  - Buy only what you need.
  - Treat spills of hoof oils like fuel spill. Use kitty litter to soak up the oil and dispose in a tightly sealed plastic bag.
  - Store pesticides in a locked, dry, well-ventilated area.
  - Protect stored fertilizer and pesticides from rain and surface water.

Call 1-800-506-2555 to locate your local conservation district to find out what to do with your current backyard manure pile, how to re-establish a healthy pasture, what to do about weeds, and what grasses grow best in your soils.

Thank you for doing your part to protect your watershed, the environment, and the equestrian way of life in your community!



After the Storm

A Citizen's Guide to Understanding Stormwater

EPA 833-B-03-002

January 2003

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www.epa.gov/npdes/stormwater
www.epa.gov/nps

What is stormwater runoff?



Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.



Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

Why is stormwater runoff a problem?

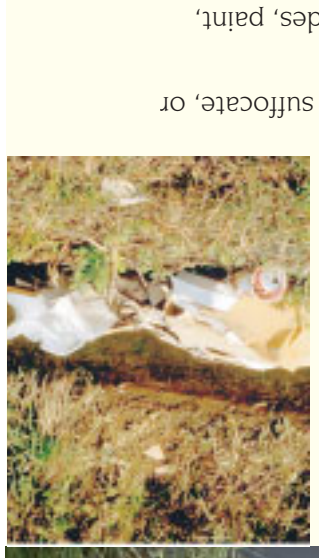


The effects of pollution

Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.
- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.







Stormwater Pollution Solutions



Residential

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care



Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Septic systems



Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

Auto care



Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Pet waste



Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.



Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.



Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.



Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.



Commercial

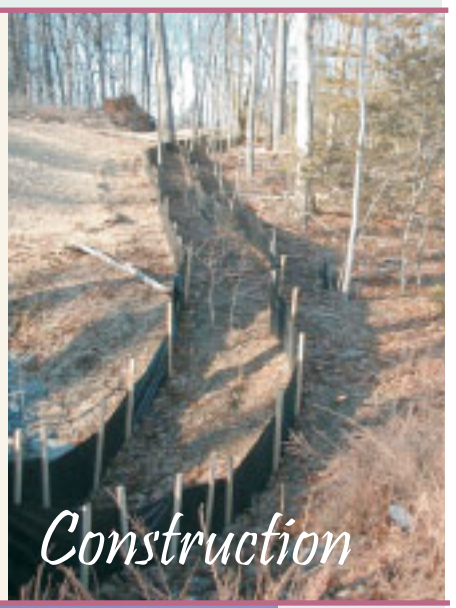
Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Construction

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.





Agriculture

Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.



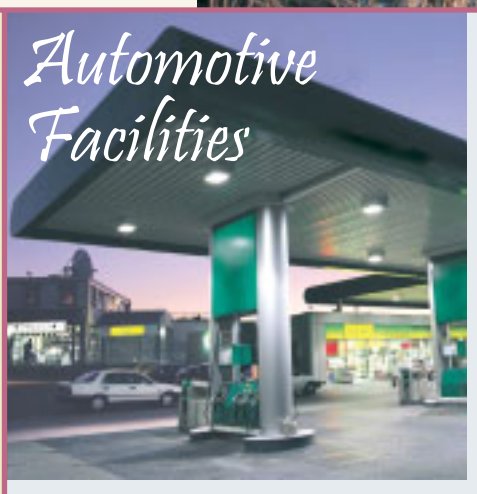
- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.



Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.



Automotive Facilities

Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

AUTO MAINTENANCE



Oil and grease from cars, asbestos worn from brake linings, zinc from tires, and toxics from spilled fluids often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

Cleanin' Work Sites...



Avoid hosing down your garage floor and driveway; instead, sweep regularly. Also, use non-toxic cleaning products. A water and baking soda mixture works great on removing corrosion from battery terminals and cleaning chrome; mix the soda with a mild, biodegradable dishwashing soap to clean wheels and tires. Additionally, a mixture of white vinegar or lemon juice with water can be used to clean windows.

Spills...

Avoid accidental spills by using a drip pan and funnel when draining or pouring fluids. Be ready for unexpected spills by preparing and using spill containment and cleanup kits. Kits should include safety equipment and cleanup materials such as kitty litter, sawdust or cornmeal. Furthermore, prevent leaks from stored vehicles by draining gas, hydraulic oil, and transmission, brake & radiator fluid. To report serious spills, call 1-800-33-TOXIC.

Recycling...

The law requires people to recycle motor oil and lead acid batteries. REMEMBER: Never dump them down storm drains. Other items which can be recycled include oil filters, antifreeze, cleaning solutions, hydraulic & transmission fluids, metal scraps, water-based paints, and used tires. For recycling information, call 386-8401.

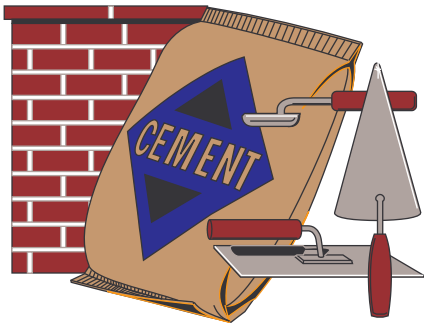
Washin' Vehicles...

Take vehicles to a washing facility to prevent oil & grease, suspended solids and other toxics from washing into our storm drains. Otherwise, use bermed wash areas to prevent contact with stormwater. Discharge wash water to sewer only after contacting local sewer authority to find out if pretreatment is required. At home, vehicles should be washed on the lawn, which can absorb unwanted runoff.



For more information, call your city's stormwater representative

FRESH CONCRETE & MORTAR APPLICATION



Cement, cement wash, gravel, asphalt, solvents, and motor oil from fresh concrete and mortar activities often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

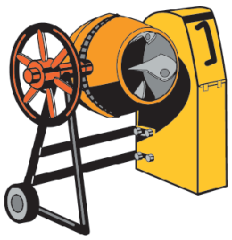
General Business Practices...

Schedule excavation and grading work during dry weather, and in case it rains, prevent materials from contacting stormwater by storing them under cover. Also, secure open bags of cement to keep wind-blown cement powder away from streets, gutters and storm drains.



During Construction...

Prevent mortar and cement from entering the storm drains by placing erosion controls (i.e., berms or temporary vegetation) down-slope to capture runoff. When breaking up paving, be sure to pick up all pieces and recycle them at a crushing company; small amounts of excess dry concrete, grout and mortar can be disposed of in the trash. Setup small mixers on tarps or heavy drop cloths to allow for easy cleanup of debris. REMEMBER: Never bury waste material -- recycle or dispose of it as hazardous waste. Call 386-8401 for recycling and disposal information.

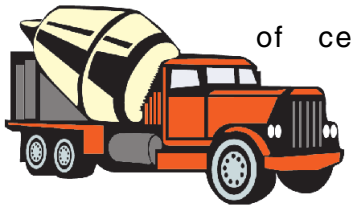


Handling Materials & Wastes...

Minimize wastes when ordering materials by ordering only the amounts needed to complete the job. Whenever possible, use recycled or recyclable materials. Recycle broken asphalt, concrete, wood, and cleared vegetation. Unrecyclable materials must be taken to an appropriate landfill or disposed of as hazardous waste. For recycling and disposal information, call 386-8401.

Cleaning up...

When cleaning up after driveway or sidewalk construction, wash concrete dust onto designated dirt areas, not down the driveway or into the street or storm drain. Also, wash out concrete mixers and equipment only in specified wash-out areas, where the water flows into containment ponds. Cement washwater can be recycled by pumping it back into cement mixers for reuse. REMEMBER: Never dispose of cement washout into driveways, streets, gutters, storm drains or drainage ditches.



For more information, call your city's stormwater representative

For Information:

For more information on the General Industrial Storm Water Permit contact:

State Water Resources Control Board (SWRCB)
(916) 657-1146 or www.swrcb.ca.gov/ or, at your Regional Water Quality Control Board (RWQCB).

Santa Ana Region (8)
California Tower
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
(909) 782-4130

San Diego Region (9)
9771 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124
(619) 467-2952

Colorado River Basin Region (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491

SPILL RESPONSE AGENCY:
HAZ-MAT: (909) 358-5055
HAZARDOUS WASTE DISPOSAL: (909) 358-5055
RECYCLING INFORMATION: 1-800-366-SAVE
TO REPORT ILLEGAL DUMPING OR A CLOGGED STORM DRAIN: 1-800-506-2555

To order additional brochures or to obtain information on other pollution prevention activities, call:
(909) 955-1111.

StormWater
CleanWater
PROTECTION PROGRAM

Riverside County gratefully acknowledges the State Water Quality Control Board and the American Public Works Association, Storm Water Quality Task Force for the information provided in this brochure.

DID YOU KNOW . . .

YOUR FACILITY MAY NEED A STORM WATER PERMIT?



Many industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit

FIND OUT IF YOUR FACILITY MUST OBTAIN A PERMIT

StormWater Pollution . . . What you should know

Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to help prevent flooding by carrying excess rainwater away from streets. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.



In recent years, awareness of the need to protect water quality has increased. As a result, federal, state, and local programs have been established to reduce polluted stormwater discharges to our waterways. The emphasis of these programs is to prevent stormwater pollution since it's much easier, and less costly, than cleaning up "after the fact."

National Pollutant Discharge Elimination System (NPDES)

In 1987, the Federal Clean Water Act was amended to establish a framework for regulating industrial stormwater discharges under the NPDES permit program. In California, NPDES permits are issued by the State Water Resources Control Board (SWRCB) and the nine (9) Regional Water Quality Control Boards (RWQCB). In general, certain industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit if the type of facilities or operations falls into one of the several categories described in this brochure.

How Do I Know If I Need A Permit?

Following are ***general descriptions*** of the industry categories types that are regulated by the Industrial Activities Storm Water General Permit. Contact your local Region Water Quality Control Board to determine if your facility/operation requires coverage under the Permit.

➜ Facilities such as cement manufacturing; feedlots; fertilizer manufacturing; petroleum refining; phosphate manufacturing; steam electric power generation; coal mining; mineral mining and processing; ore mining and dressing; and asphalt emulsion;

➜ Facilities classified as lumber and wood products (except wood kitchen cabinets); pulp, paper, and paperboard mills; chemical producers (except some pharmaceutical and biological products); petroleum and coal products; leather production and products; stone, clay and glass products; primary metal industries; fabricated structural metal; ship and boat building and repairing;

➜ Active or inactive mining operations and oil and gas exploration, production, processing, or treatment operations;

➜ Hazardous waste treatment, storage, or disposal facilities;

➜ Landfills, land application sites and open dumps that receive or have received any industrial waste; unless there is a new overlying land use such as a golf course, park, etc., and there is no discharge associated with the landfill;

➜ Facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards;

➜ Steam electric power generating facilities, facilities that generate steam for electric power by combustion;

➜ Transportation facilities that have vehicle maintenance shops, fueling facilities, equipment cleaning operations, or airport deicing operations. This includes school bus maintenance facilities operated by a school district;

➜ Sewage treatment facilities;

➜ Facilities that have areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water.

How do I obtain coverage under the Industrial Activities Storm Water General Permit?

Obtain a permit application package from your local Regional Water Quality Control Board listed on the back of this brochure or the State Water Resources Control Board (SWRCB). Submit a completed Notice of Intent (NOI) form, site map and the appropriate fee ($250 or $500) to the SWRCB. Facilities must submit an NOI thirty (30) days prior to beginning operation. Once you submit the NOI, the State Board will send you a letter acknowledging receipt of your NOI and will assign your facility a waste discharge identification number (WDID No.). You will also receive an annual fee billing. These billings should roughly coincide with the date the State Board processed your original NOI submittal.

What are the requirements of the Industrial Activities Storm Water General Permit?

The basic requirements of the Permit are:

1. The facility must eliminate any non-stormwater discharges or obtain a separate permit for such discharges.

2. The facility must develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must identify sources of pollutants that may be exposed to stormwater. Once the sources of pollutants have been identified, the facility operator must develop and implement Best Management Practices (BMPs) to minimize or prevent polluted runoff.

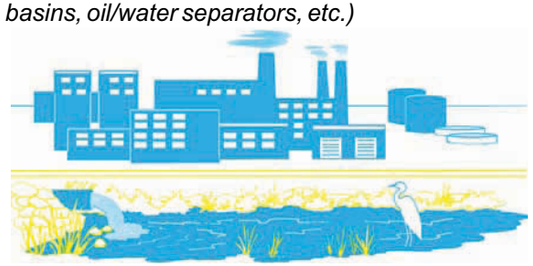
   Guidance in preparing a SWPPP is available from a document prepared by the California Storm Water Quality Task Force called the California Storm Water Best Management Practice Handbook.

3. The facility must develop and implement a Monitoring Program that includes conducting visual observations and collecting samples of the facility's storm water discharges associated with industrial activity. The General Permit requires that the analysis be conducted by a laboratory that is certified by the State of California.

4. The facility must submit to the Regional Board, every July 1, an annual report that includes the results of its monitoring program.

A Non-Storm Water Discharge is... *any discharge to a storm drain system that is not composed entirely of storm water. The following non-storm water discharges are authorized by the General Permit: fire hydrant flushing; potable water sources, including potable water related to the operation, maintenance, or testing of potable water systems; drinking fountain water; atmospheric condensates including refrigeration, air conditioning, and compressor condensate; irrigation drainage; landscape watering; springs; non-contaminated ground water; foundation or footing drainage; and sea water infiltration where the sea waters are discharged back into the sea water source.*

A BMP is . . . *a technique, process, activity, or structure used to reduce the pollutant content of a storm water discharge. BMPs may include simple, non-structural methods such as good housekeeping, staff training and preventive maintenance. Additionally, BMPs may include structural modifications such as the installation of berms, canopies or treatment control (e.g. setting basins, oil/water separators, etc.)*



WARNING*: There are significant penalties for non-compliance: a minimum fine of $5,000 for failing to obtain permit coverage, and, up to $10,000 per day, per violation plus $10 per gallon of discharge in excess of 1,000 gallons.*

Adopt a pet from your local animal shelter or adoption centers at pet stores. A variety of animals, from purebred tomixe d breed are waiting for loving arms and good homes. Consider volunteering at your local animal shelters. Volunteers, donations, food, newspapers, old towels and linens are needed to help the animals.



RIVERSIDE COUNTY
ANIMAL SHELTER LOCATIONS:

BLYTHE
16450 West Hobson Way
Blythe, CA 92225
760-921-7857

HEMET
800 South Sanderson
Hemet, CA 92545
909 925-8025

INDIO
45-355 Van Buren
Indio, CA 92201
760-347-2319

RIVERSIDE
5950 Wilderness Avenue
Riverside, CA 92504
909-358-7387

FOR ALL OTHER AREAS
CALL 1-888-636-7387

Riverside County gratefully acknowledges the City of Los Angeles Stormwater Program for the design concept of this brochure.

What's the Scoop?



TIPS FOR A HEALTHY PET AND A HEALTHIER ENVIRONMENT

CREATE A HEALTHY ENVIRONMENT in and around your home by following these simple pet practices. Your pet, family and neighbors will appreciate their clean comfortable surroundings.

HOUSEHOLD PETS

We all love our pets, but pet waste is a subject everyone likes to avoid. Pet waste left on trails, sidewalks, streets, and grassy areas is immediately flushed into the nearest waterway when it rains. Even if you can't see water near you, the rain or waste water WASHES all that PET WASTE and BACTERIA INTO THE STORMDRAIN, where it travels to your neighborhood creek or lake untreated. These animal droppings also contain nutrients that can promote the growth of algae, if they enter our streams and lakes. The risk of STORMWATER CONTAMINATION INCREASES, if pet wastes is allowed to accumulate in animal pen areas or left on sidewalks, streets, or driveways where runoff can carry them to storm sewers.

Some of the DISEASES THAT CAN SPREAD from pet waste are:
Campylobacteriosis — a bacterial infection that causes diarrhea in humans.
Salmonellosis — the most common bacterial infection transmitted to humans from animals.
Toxocarisis — roundworms transmitted from animals to humans.

Flies and other pest insects can also increase when pet waste is disposed of improperly, becoming a nuisance and adding yet another vector for disease transmission.

WHAT CAN YOU DO?

- SCOOP up pet waste and flush it down the toilet.
- NEVER DUMP pet waste into a storm drain or catch basin.
- USE the complimentary BAGS or mutt mitts offered in dispensers at local parks.
- CARRY EXTRA BAGS when walking your dog and make them available to other pet owners who are without.
- TEACH CHILDREN how to properly clean up after a pet.
- TELL FRIENDS AND NEIGHBORS about the ill effects of animal waste on the environment. Encourage them to clean up after pets.

Did You Know . . .
that Californians illegally dump about 80 million gallons of motor oil each year?

Many communities have "Scoop the Poop" laws that govern pet waste cleanup. Some of these laws specifically require anyone who walks an animal off of their property to carry a bag, shovel, or scooper. Any waste left by the animal must be cleaned up immediately. CALL YOUR LOCAL CODE ENFORCEMENT OFFICER to find out more about pet waste regulations.

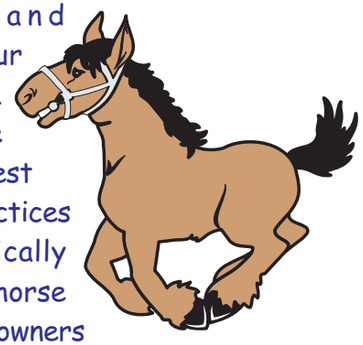


Pets are only one of the many fixtures of suburban America that add to water pollution. Lawn fertilizers, rinse water from driveways and motor oil commonly end up in streams and lakes. **CALL 1-800-506-2555 FOR HOUSEHOLD HAZARDOUS WASTE COLLECTION LOCATION AND DATES.** Maintain your automobile to avoid leaks. Dispose of used vehicle fluids properly. Your pets can be poisoned if they ingest gas, oil or antifreeze that drips onto the pavement or is stored in open containers.

NEVER HOSE VEHICLE FLUIDS into the street or gutter. USE ABSORBENT MATERIALS such as cat litter to clean-up spills. SWEEP UP used absorbent materials and place in the trash.

HORSES AND LIVESTOCK

Fortunate enough to own a horse or livestock? You, too, can play a part in protecting and cleaning up our water resources. The following are a few simple Best Management Practices (BMPs) specifically designed for horse owners and landowners with horses.



- STORE your manure properly. Do not store unprotected piles of manure in places where runoff may enter streams, or flood waters may wash the manure away. Place a cover or tarp over the pile to keep rainwater out.
- CHECK with your local conservation district to design manure storage facilities to protect water quality. These structures usually consist of a concrete pad to protect ground water and a short wall on one or two sides to make manure handling easier.
- TRY composting – A vegetative cover placed around buildings or on steeper slopes can help minimize erosion and absorb nutrients while improving the appearance of your property. In addition, avoid costlier erosion controls, vegetative covers will provide animals with better traction during wet or icy conditions.



- KEEP animals out of steams – Designed stream crossings provide a safe, easy way for horses and livestock to ford streams. Fencing encourages the use of the crossing instead of the streambed to navigate streams. This will allow vegetation to stabilize stream banks and reduce sediment pollution.
- MOW pastures to proper height, six inches is typically recommended.
- Material STORAGE SAFETY TIPS – Many of the chemicals found in barns require careful handling and proper disposal. When using these chemicals, be certain to follow these common sense guidelines:
  - Buy only what you need.
  - Treat spills of hoof oils like fuel spill. Use kitty litter to soak up the oil and dispose in a tightly sealed plastic bag.
  - Store pesticides in a locked, dry, well-ventilated area.
  - Protect stored fertilizer and pesticides from rain and surface water.

Call 1-800-506-2555 to locate your local conservation district to find out what to do with your current backyard manure pile, how to re-establish a healthy pasture, what to do about weeds, and what grasses grow best in your soils.

Thank you for doing your part to protect your watershed, the environment, and the equestrian way of life in your community!



Helpful telephone numbers and links:

Riverside County Water Agencies

City of Banning	(951) 922-3130
City of Beaumont/Cherry Valley	(951) 845-9581
City of Blythe	(760) 922-6161
City of Coachella	(760) 398-3502
City of Corona	(951) 736-2263
City of Hemet	(951) 765-3710
City of Norco	(951) 270 5607
City of Riverside Public Works	(951) 351-6140
City of San Jacinto	(951) 654-4041
Coachella Valley Water District	(760) 398-2651
Desert Water Agency (Palm Springs)	(760) 323-4971
Eastern Municipal Water District	(951) 928-3777
Elsinore Valley Municipal Water District	(951) 674 3146
Elsinore Water District	(951) 674-2168
Farm Mutual Water Company	(951) 244-4198
Idyllwild Water District	(951) 659-2143
Indio Water Authority	(760) 391-4129
Jurupa Community Services District	(951) 685-7434
Lee Lake Water	(951) 658-3241
Mission Springs Water	(760) 329-6448
Rancho California Water District	(951) 296-6900
Ripley, CSA #62	(760) 922-4951
Riverside Co. Service Area #51	(760) 227-3203
Rubidoux Community Services District	(951) 684-7580
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(951) 789-5000
Yucaipa Valley Water District	(909) 797-5117

REPORT ILLEGAL STORM DRAIN DISPOSAL

1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers



Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

Do you know where street flows actually go?

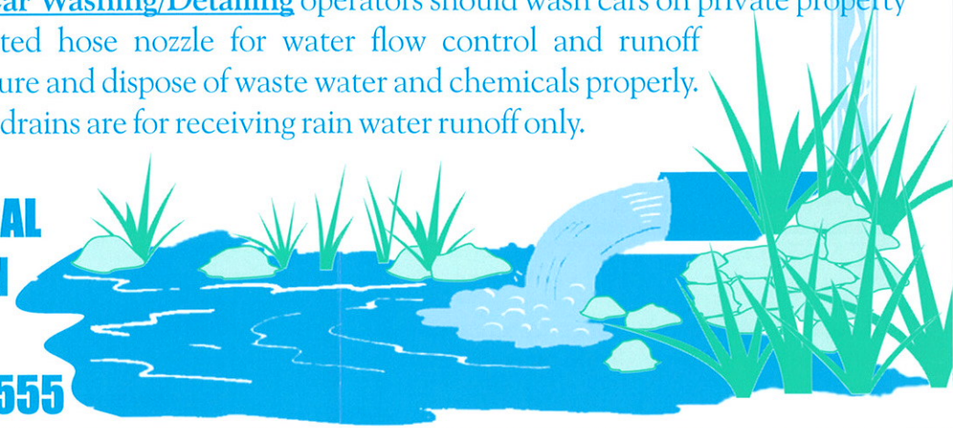
Storm drains are NOT connected to sanitary sewer systems and treatment plants!



The primary purpose of storm drains is to carry rain water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. ***Each of us*** can do our part to keep storm water clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of ***small amounts*** of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing wash water to the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.



Report illegal storm drain disposal,
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them for being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.



When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlet by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

For Information:

Local Sewering Agencies in Riverside County:

City of Beaumont	(909) 769-8520
Belair Homeowners Association	(909) 277-1414
City of Banning	(909) 922-3130
City of Blythe	(760) 922-6161
City of Coachella	(760) 391-5008
Coachella Valley Water District	(760) 398-2651
City of Corona	(909) 736-2259
Desert Center, CSA #51	(760) 227-3203
Eastern Municipal Water District	(909) 928-3777
Elsinore Valley MWD	(909) 674-3146
Farm Mutual Water Company	(909) 244-4198
Idyllwild Water District	(909) 659-2143
Jurupa Community Services Dist.	(909) 685-7434
Lake Hemet MWD	(909) 658-3241
Lee Lake Water District	(909) 277-1414
March Air Force Base	(909) 656-7000
Mission Springs Water District	(760) 329-6448
City of Palm Springs	(760) 323-8242
Rancho Caballero	(909) 780-9272
Rancho California Water Dist.	(909) 676-4101
Ripley, CSA #62	(760) 922-4909
Rubidoux Community Services Dist.	(909) 684-7580
City of Riverside	(909) 782-5341
Silent Valley Club, Inc	(909) 849-4501
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(909) 780-4170

Spill Response Agency:
Haz-Mat: (909) 358-5055
Hazardous Waste Disposal: (909) 358-5055
To Report Illegal Dumping or a Clogged Storm Drain: 1-800-506-2555

StormWater CleanWater
PROTECTION PROGRAM

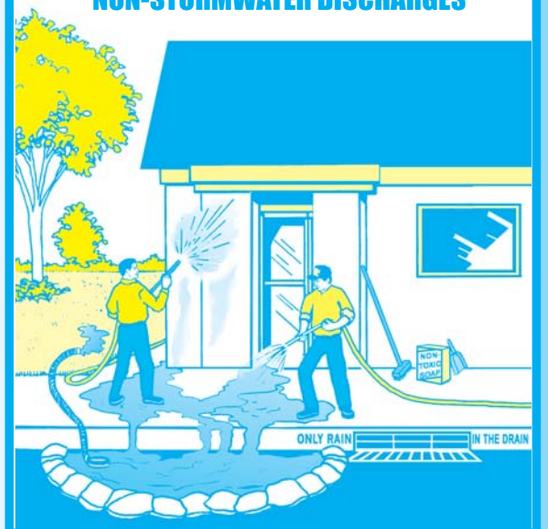
Riverside County gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure.

StormWater Pollution

What you should know for...

OUTDOOR CLEANING ACTIVITIES

NON-STORMWATER DISCHARGES



GUIDELINES for disposal of washwater from:

- Sidewalk, plaza or parking lot cleaning
- Vehicle washing or detailing
- Building exterior cleaning
- Waterproofing
- Equipment cleaning or degreasing

Do you know . . . where the water should go?



Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to prevent flooding by carrying excess rainwater away from streets. . . it's not designed to be a waste disposal system. Since the storm drain system does not provide for water treatment, it often serves the unintended function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

Non-stormwater discharges such as washwater generated from outdoor cleaning projects often transport harmful pollutants into storm drains and our local waterways. Polluted runoff contaminates local waterways and poses a threat to groundwater resources.

Soaps, degreasers, automotive fluids, litter, and a host of other materials washed off buildings, sidewalks, plazas, parking areas, vehicles, and equipment can all pollute our waterways.

The Cities and County of Riverside StormWater/CleanWater Protection Program

Since preventing pollution is much easier, and less costly than cleaning up "after the fact," the Cities and County of Riverside StormWater/CleanWater Protection Program informs residents and businesses of pollution prevention activities such as those described in this pamphlet.

The Cities and County of Riverside have adopted ordinances for stormwater management and discharge control. In accordance with state and federal law, these local stormwater ordinances **prohibit** the discharge of wastes into the storm drain system or local surface waters. This includes non-stormwater discharges containing oil, grease, detergents, degreasers, trash, or other waste materials.



PLEASE NOTE: The discharge of pollutants into the street, gutters, storm drain system, or waterways - without a Regional Water Quality Control Board permit or waiver - is ***strictly prohibited*** by local ordinances and state and federal law.

Help Protect Our Waterways!

Use These Guidelines For Outdoor Cleaning Activities and Washwater Disposal

DO . . . Dispose of **small amounts** of **washwater from cleaning building exteriors, sidewalks, or plazas** onto landscaped or unpaved surfaces provided you have the owner's permission and the discharge will not cause flooding or nuisance problems, or flow into a storm drain.

DO NOT . . . Discharge **large amounts** of these types of washwater onto landscaped areas or soil where water may run to a street or storm drain. Wastewater from exterior cleaning may be pumped to a sewer line with specific permission from the local sewering agency.

DO . . . Check with your local sewering agency's policies and requirements concerning waste water disposal. **Water from many outdoor cleaning activities** may be acceptable for disposal to the sewer system. See the list on the back of this flyer for phone numbers of the sewering agencies in your area.

DO NOT . . . Pour **hazardous wastes** or toxic materials into the storm drain or sewer system . . . properly dispose of it instead. When in doubt, contact the local sewering agency! The agency will tell you what types of liquid wastes can be accepted.

DO . . . Understand that **water (without soap) used to remove dust from clean vehicles** may be discharged to a street or storm drain. **Washwater from sidewalk, plaza, and building surface cleaning** may go into a street or storm drain if ALL of the following conditions are met:

1) The surface being washed is free of residual oil stains, debris and similar pollutants by using dry cleanup methods (sweeping, and cleaning any oil or chemical spills with rags or other absorbent materials before using water).
2) Washing is done with water only - no soap or other cleaning materials.
3) You have not used the water to remove paint from surfaces during cleaning.

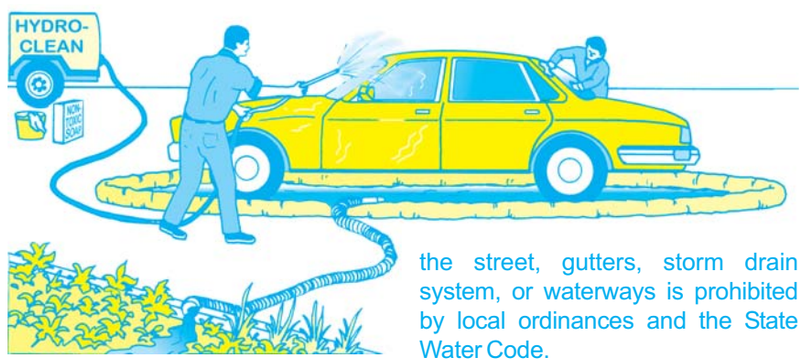
DO NOT . . . Dispose of water containing **soap or any other type of cleaning agent** into a storm drain or water body. This is a direct violation of state and/or local regulations. Because **wastewater from cleaning parking areas or roadways** normally contains metallic brake pad dust, oil and other automotive fluids, it should never be discharged to a street, gutter, or storm drain.

DO . . . Understand that **mobile auto detailers** should divert washwater to landscaped or dirt areas. Note: Be aware that soapy washwater may adversely affect landscaping; consult with the property owner. Residual washwater may remain on paved surfaces to evaporate; sweep up any remaining residue. If there is sufficient water volume to reach the storm drain, collect the runoff and obtain permission to pump it into the sanitary sewer. Follow local sewering agency's requirements for disposal.

DO NOT . . . Dispose of left over cleaning agents into the gutter, storm drain or sanitary sewer.

Regarding Cleaning Agents:

If you must use soap, use biodegradable/phosphate free cleaners. Avoid use of petroleum based cleaning products. Although the use of nontoxic cleaning products is strongly encouraged, ***do*** understand that these products can still degrade water quality and, therefore, the discharge of these products into



the street, gutters, storm drain system, or waterways is prohibited by local ordinances and the State Water Code.

Note: When cleaning surfaces with a high pressure washer or steam cleaning methods, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning, as compared to the use of a low pressure hose, can remove additional materials that can contaminate local waterways.

Other Tips to Help Protect Our Water . . .

Screening Wash Water

A thorough dry cleanup before washing (without soap) surfaces such as building exteriors and decks without loose paint, sidewalks, or plaza areas, *should be sufficient to protect storm drains.* **However**, if any debris (solids) could enter storm drains or remain in the gutter or street after cleaning, washwater should first pass through a "20 mesh" or finer screen to catch the solid material, which should then be disposed of in the trash.

Drain Inlet Protection/ Containing & Collecting Wash Water

- Sand bags can be used to create a barrier around storm drain inlets.
- Plugs or rubber mats can be used to temporarily seal storm drain openings.
- You can also use vacuum booms, containment pads, or temporary berms to keep wash water away from the street, gutter, or storm drain.

Equipment and Supplies

Special materials such as absorbents, storm drain plugs and seals, small sump pumps, and vacuum booms are available from many vendors. For more information check catalogs such as New Pig (800-468-4647), Lab Safety Supply (800-356-0783), C&H (800-558-9966), and W.W. Grainger (800-994-9174); or call the Cleaning Equipment Trade Association (800-441-0111) or the Power Washers of North America (800-393-PWNA).



PAINTING

Paints, solvents, adhesives, and toxic chemicals from painting operations often make their way into the San Bernardino County storm drain system and DO NOT GET TREATED before reaching the Santa Ana River. These wastes pollute our drinking water, and make our waters unhealthy and unsafe for people and wildlife.

Follow these practices to help prevent stormwater pollution...

General Business Practices...

Keep all paint products and wastes away from the street, gutter, and storm drains. Reuse paint thinner by setting used thinner aside in a closed, labeled jar to settle out paint particles, and then pouring off the clear liquid for future use. Wrap dried paint residue in newspaper and dispose of it in the trash.

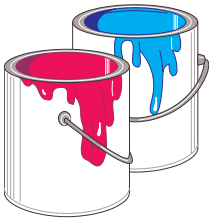
Water-Based Paints...

Purchase water-based paints whenever possible. Look for products labeled “latex” or “clean up with water.”

Recycle or Reuse Paints...

Recycle/reuse leftover paint by using it for touch-ups, or by giving it to someone who can use it, such as a theatre group, school, city or other community organization. If you’re unable to give it away, contact 386-8401 for information on hazardous waste pick-up.

Paint Cleanup...



Avoid cleaning brushes and rinsing paint containers in a street, gutter, or storm drain. For water-based paints, “brush out” as much paint as possible and and rinse in the sink. For oil-based paints, “brush out” as much paint as possible, clean with thinner, and then filter and reuse thinner or solvent.

Paint Removal...

Chemical paint stripping residue, chips & dust from marine paints, and paints containing lead or tributyl tin are hazardous wastes. For disposal information, call 386-8401. Also, when stripping or cleaning building exteriors with high-pressure water, block storm drains and divert the washwater onto a designated dirt area. Check with your local wastewater treatment authority to find out if you can collect building cleaning water and discharge it to the sewer.



For more information, call your city’s stormwater representative

Helpful telephone numbers and links:

Riverside County Water Agencies:

City of Banning	(951) 922-3130
City of Beaumont	(951) 769-8520
City of Blythe	(760) 922-6161
City of Coachella	(760) 398-3502
Coachella Valley Water District	(760) 398-2651
City of Corona	(951) 736-2259
Desert Center, CSA #51	(760) 227-3203
Eastern Municipal Water District	(951) 928-3777
Elsinore Valley MWD	(951) 674-3146
Farm Mutual Water Company	(951) 244-4198
City of Hemet	(951) 765-3712
Idyllwild Water District	(951) 659-2143
Jurupa Community Services District	(951) 360-8795
Lake Hemet MWD	(951) 658-3241
Lee Lake Water District	(951) 277-1414
March Air Force Base	(951) 656-7000
Mission Springs Water District	(760) 329-6448
City of Palm Springs	(760) 323-8253
Rancho Caballero	(951) 780-9272
Rancho California Water District	(951) 296-6900
Ripley, CSA #62	(760) 922-4951
City of Riverside	(951) 351-6170
Rubidoux Community Services District	(951) 684-7580
Silent Valley Club, Inc	(951) 849-4501
Valley Sanitary District	(760) 347-2356
Western Municipal Water District	(951) 789-5000
Yucaipa Valley Water District	(909) 797-5117

CALL 1-800-506-2555 to:

- Report clogged storm drains or illegal storm drain disposal from residential, industrial, construction and commercial sites into public streets, storm drains and/or water bodies.
- Find out about our various storm drain pollution prevention materials.
- Locate the dates and times of Household Hazardous Waste (HHW) Collection Event.
- Request adult, neighborhood, or classroom presentations.
- Locate other County environmental services.
- Receive grasscycling information and composting workshop information.

Or visit our (Riverside County Flood Control District website at:
www.floodcontrol.co.riverside.ca.us

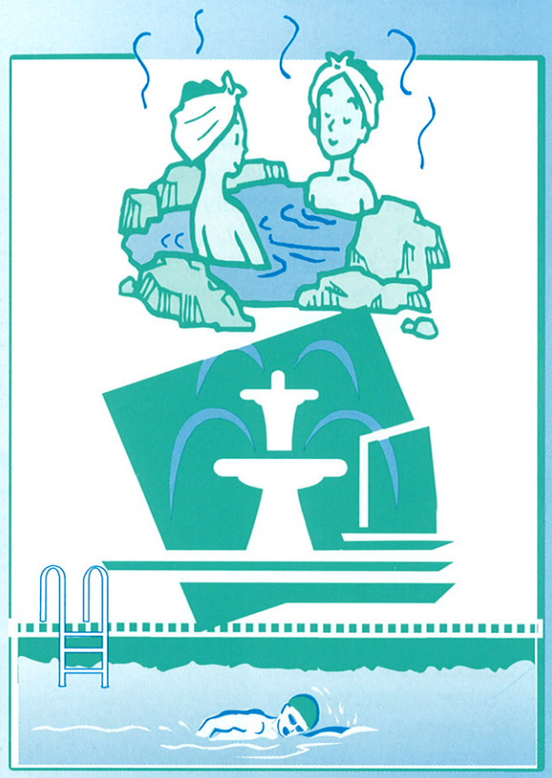
Other links to additional storm drain pollution information:

- County of Riverside Environmental Health:
  www.rivcoeh.org
- California State Water Resource Conservation Board:
  www.swrcb.ca.gov/stormwtr/links.html
- California Water Quality Task Force:
  www.cabmphandbooks.com/
- United State Environmental Protection Agency (EPA):
  www.epa.gov/opptintr/p2home/programs/busprc.htm
  (compliance assistance information)

Riverside County Only Rain in the Storm Drain Pollution Protection Program gratefully acknowledges the Bay Area Stormwater Management Agencies Association and the Cleaning Equipment Trade Association for information provided in this brochure.

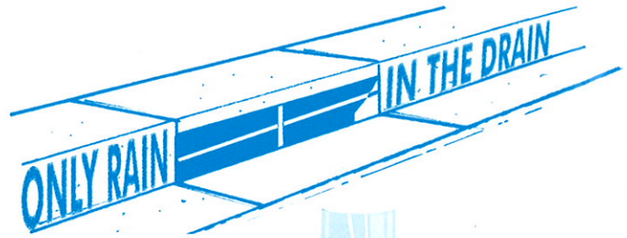
StormWater Pollution

What you should know for...



Swimming Pool, Jacuzzi and Fountain Maintenance

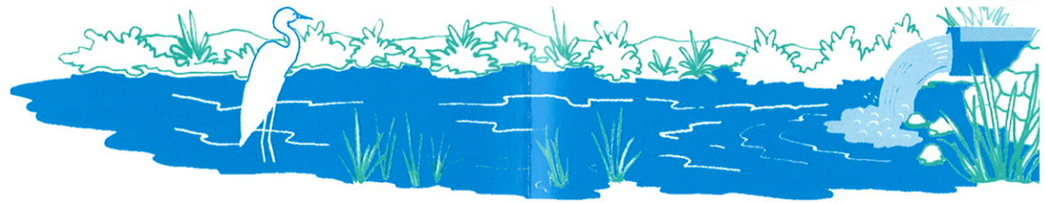
Do you know . . . where the water actually goes?



Storm Drains are not connected to sanitary sewer systems and treatment plants!

The primary purpose of storm drains is to carry rain water away from developed areas to prevent flooding. Untreated storm water and the pollutants it carries flow directly into rivers, lakes, and streams. Wastewater from residential swimming pools, jacuzzis, fishponds, and fountains often contain chemicals used for sanitizing or cleansing purposes. Toxic chemicals (such as chlorine or copper-based algaecides) can damage the environment when wastewater is allowed to flow into our local rivers, lakes, and streams by way of the storm drain system. Each of us can do our part to help clean our water, and that adds up to a pollution solution.

The Cities and County of Riverside have adopted ordinances for storm drain pollution management to maintain discharge control and prevent illegal storm drain discharge. In accordance with state and federal law, these local storm water ordinances prohibit the discharge of pollutants into the storm drain system or local surface waters. The Only Rain in the Storm Drain Pollution Program informs residents and businesses of storm drain pollution prevention activities such as those described in this brochure.



PLEASE NOTE: The discharge of pollutants into the street, gutters, storm drain system, or waterways – without a Regional Water Quality Control board permit or waiver – is strictly prohibited by local ordinances and state and federal law.

Do Your Part to Protect Our Waterways!

Use These Guidelines For Proper Draining of Your Swimming Pool, Jacuzzi and Fountain Water

Discharge Regulations



Requirements for pool draining may differ from city to city. Check with your water agency to see if disposal to the sanitary sewer line is allowed for pool discharges (see reverse side for Riverside County water purveyors).

If sewer discharge is allowed, a hose can be run from your swimming pool pump to the washing machine drain or a sink or bathtub. If sewer discharge is not allowed, or if your house is served by a septic tank, review the options presented below.

Discharge Options

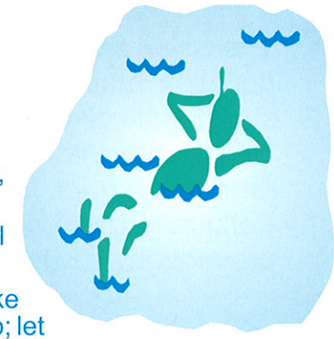
If your local sewer agency will not accept pool water into their system, or if you are on a septic tank system, follow these guidelines:

1. Reduce or eliminate solids (e.g., debris, leaves or dirt) in the pool water.
2. Allow the chemicals in the pool water to dissipate. This could take up to seven (7) days depending on the time of year. Create a co-op; let your neighbor share your pool while theirs is being prepared for draining, then use their pool while yours is being drained. Chlorinated water should not be discharged into the storm drain or surface waters. This includes large pools such as community swimming pools or spas.
3. When the pool water is free of all chemicals (verify by a home pool water test kit) drain pool water to landscaped areas, lawns, yards, or any areas that will absorb the water.
4. You may have to drain the pool water over a period of a few days to allow the landscape areas to absorb most of the water.
5. Control the flow of the draining pool water to prevent soil erosion. Do not allow sediment to enter the street, gutter or storm drain.
6. Avoid discharging pool water into the street and storm drain system. Water runoff that enters the street can pick up motor oil, pet waste, trash and other pollutants, eventually carrying them into the storm drain system and local surface waters.

Refinishing Pool Surfaces

If you are resurfacing your pool, or resurfacing the pool patio area, be sure to hose down mixers, tools and trailers in a dirt area where rinse water won't flow into the street, gutter or storm drain. Local storm water ordinances strictly prohibit the discharge of pollutants into the storm drain system.

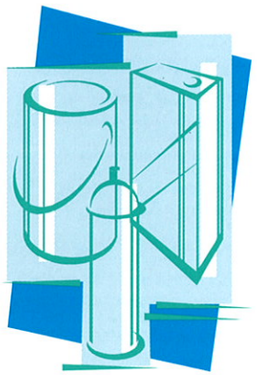
Residues from acid washing and similar activities require special handling. Never discharge low or high pH wastewater into the street, gutter or storm drain.



Cleaning Filters

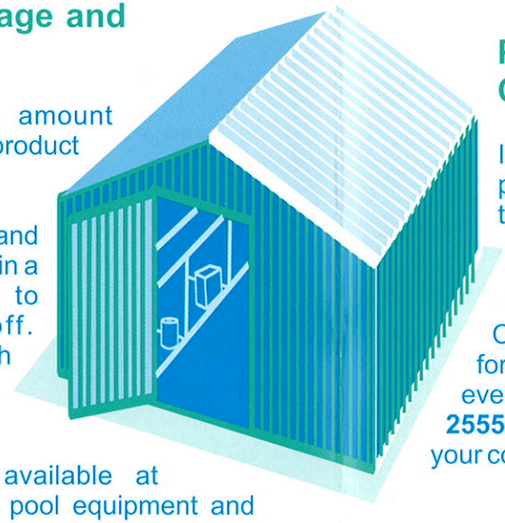
Discharge of pool filter rinse water and backflush to a stream, ditch, or storm drain is prohibited. Backflush from pool filters must be discharged to the sanitary sewer, on-site septic tank and drainfield system (if properly designed and adequately sized), or a seepage pit. Alternatively, pool filter rinse water and backwash may be diverted to dirt or landscaped areas. Filter media and other solids should be picked up and disposed of in the trash.

Algaecides



Avoid using copper-based algaecides unless absolutely necessary. Control algae with chlorine, organic polymers or other alternatives to copper-based pool chemicals. Copper is a heavy metal that can be toxic to aquatic life.

Chemical Storage and Handling



- Use only the amount indicated on product labels.
- Store chlorine and other chemicals in a covered area to prevent runoff. Keep out of reach of children and pets.
- Chlorine kits, available at retail swimming pool equipment and supply stores, should be used to monitor the chlorine and pH levels.
- Chlorine and other pool chemicals should never be allowed to flow into the gutter or the storm drain system.

Proper Disposal of Pool Chemicals

If you need to dispose of unwanted pool chemicals, first try giving them to a neighbor with a pool. If that doesn't work, bring unwanted pool chemicals to a Household Hazardous Waste (HHW) Collection Event. There's no cost for bringing HHW items to collection events - it's FREE! Call **1-800-506-2555** for a schedule of HHW events in your community.

NEVER put unused chemicals into the trash, onto the ground or down a storm drain.