Appendix F

Preliminary Project Specific Water Quality Management Plan

SDH & Associates

February 25, 2022

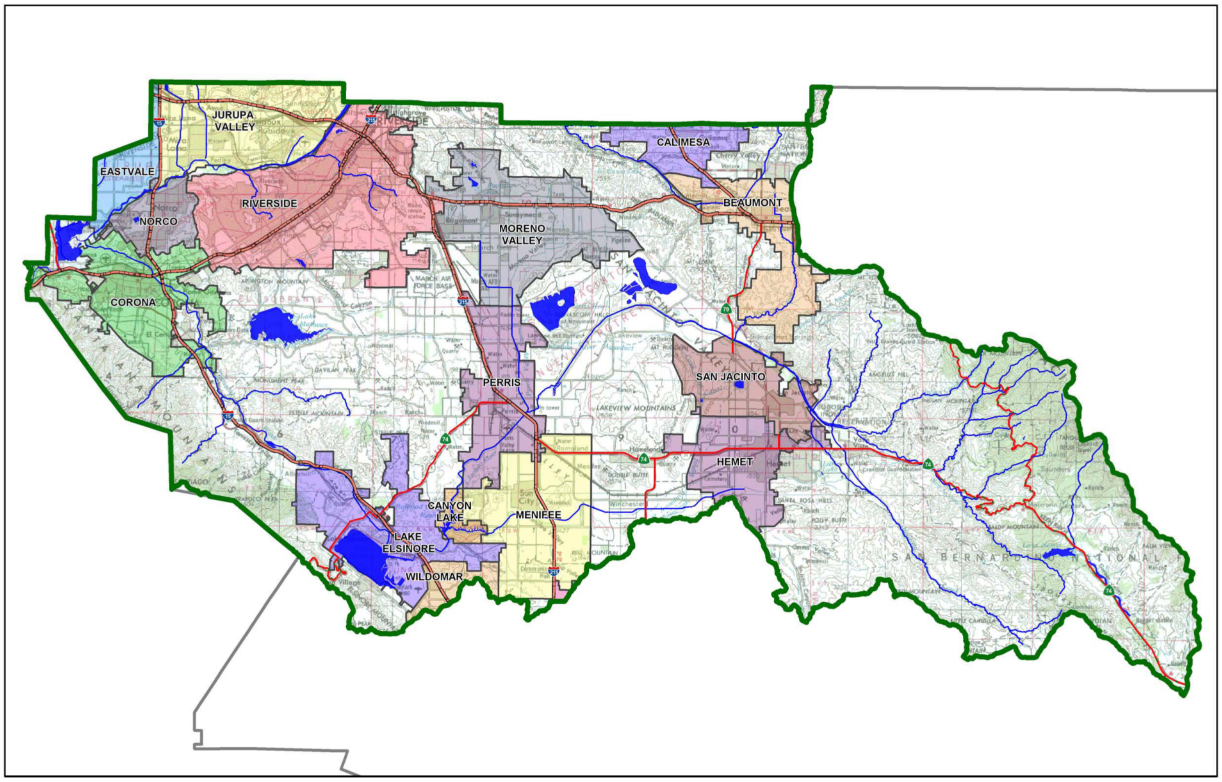
Project Specific Water Quality Management Plan

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

Project Title: Lake Creek-Wilson

Development No: TBD

Design Review/Case No: TBD



☒ **Preliminary**
☐ **Final**

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Revision Date(s): N/A

Prepared for Compliance with
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Template revised June 30, 2016

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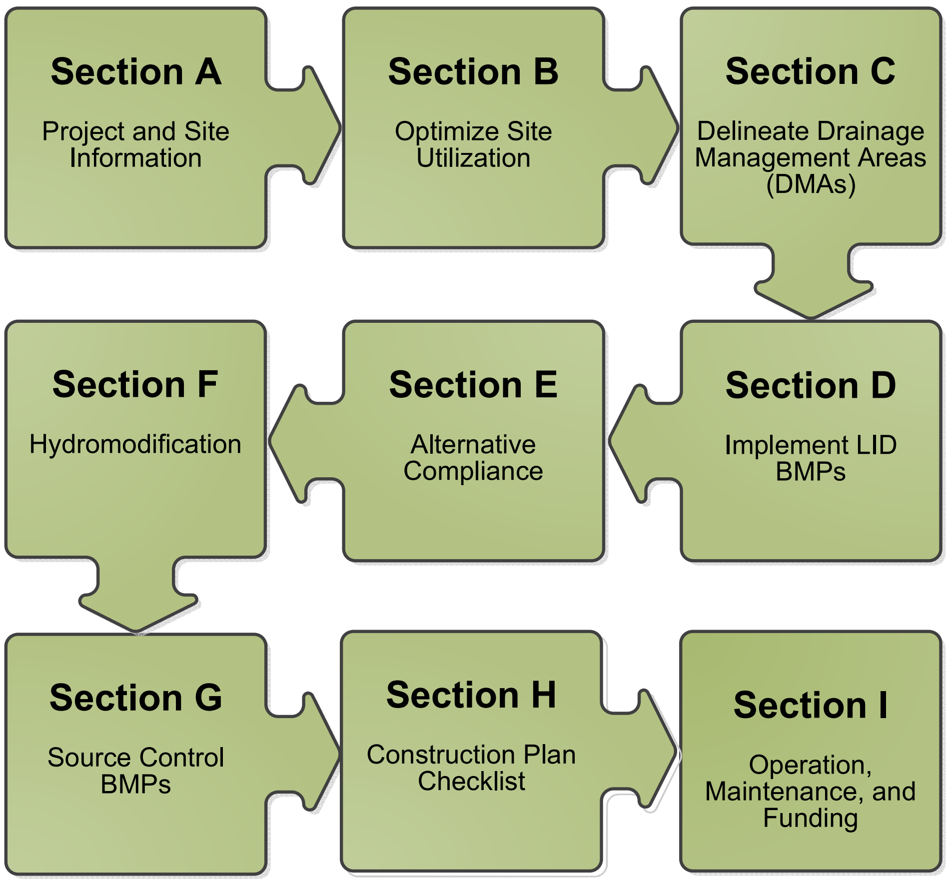
A Brief Introduction

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 Lake Creek Industrial, LLC for the Lake Creek-Wilson project (City Case No. TBD) located in the City of Perris, California. The APNs are 300-210-025 and 300-210-017.

This WQMP is intended to comply with the requirements of City of Perris for Water Quality Ordinance 1194 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 the City of Perris Water Quality Ordinance 1194.

"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
Nobu Murakami	Water Resources Engineer
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure:

Table of Contents

List of Tables

List of Appendices

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Light Industrial
Planning Area:	Perris Valley Commerce Center (PVCC) Specific Plan Area
Community Name:	Perris Valley
Development Name:	Lake Creek-Harley Knox
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°49'30.69"N, 117°12'50.64"W	
Project Watershed and Sub-Watershed: Santa Ana (Watershed) Perris Reservoir (Sub Watershed)	
Gross Acres: ~4.8 acres (parcel)	
APN(s): 300-210-025 and 300-210-017	
Map Book and Page No.: Parcels 3 and 4 shown on Map 12169 on File in Book 63, Page 26 of Parcel Maps	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Light Industrial
Proposed or Potential SIC Code(s)	1541
Area of Impervious Project Footprint (SF)	182,322 SF
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	182,322 SF
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:	N/A
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)	See Appendix 3 – NRCS Soil Types B, D, & A/D
What is the Water Quality Design Storm Depth for the project?	0.63 inch

Lake Creek Industrial, LLC is proposing to develop an industrial tilt-up warehouse building and associated parking as part of this project, which is located on west side of Wilson Avenue and approximately 820 feet from the intersection of Wilson Avenue and Placentia Avenue in the City of Perris (within Riverside County), California. A vicinity map is provided in Appendix 1 of this report for reference purpose. Applicable Assessor Parcel Numbers (APNs) are 300-210-025 and 300-210-017. The site is approximately 4.8 acres (parcel gross area) with approximately 4.7 acres of drainage management area. The proposed warehouse building footprint is approximately 80,800 square feet and there will be a total of ~82 parking spaces to be provided. The proposed impervious and pervious footprints within the drainage management area are approximately 182,322 square feet and 23,873 square feet, respectively. The project also includes a minor improvement for the easterly frontage Wilson Avenue.

In the existing condition, the site consists of open, undeveloped space, draining generally from west to east towards Wilson Avenue. There is an offsite run-on to the site from the westerly undeveloped land with an approximate area of 4.6 acres. At a later stage, the drainage delineation may be further refined with additional topographic information; however, based on our preliminary evaluation, this should be close. Runoff from

Wilson Avenue is conveyed in a southeasterly direction and eventually discharge into the existing MDP Perris Valley Storm Drain (PVSD) Channel, which ultimately discharges into Canyon Lake and then Lake Elsinore.

In the post-project condition, the drainage characteristics will be maintained similar as compared to the pre-project condition. Runoff from the site will be captured via proposed catch basins and conveyed via proposed storm drain pipes towards a proposed biotreatment LID BMP and a proprietary Modular Wetland System (MWS) for treatment purpose prior to discharging into a proposed catch basin on west side of Wilson Avenue. It is understood that a separate offsite development will construct a segment of the MDP Line H along Placentia Avenue (between Murrieta Avenue and Wilson Avenue) and a lateral storm drain pipe along Wilson Avenue from the intersection of Wilson/Placentia up to this project location. The aforementioned catch basin will connect into this storm drain line. In an effort to maintain the existing drainage characteristics, the westerly offsite area will be picked up and bypassed around the project via proposed on-site perimeter v-ditches and outlet to Wilson Avenue.

Additionally, a bioretention LID BMP was explored in the easterly landscape area of the site. However, by the time the facility accounts for the 4:1 side slopes based on the County of Riverside LID Manual, it would require more than the provided landscape areas to meet the minimum footprint. Therefore, a biotreatment LID BMP was utilized where possible to the extent practicable and a proprietary Modular Wetland System (MWS) is proposed to address the remainder of the project.

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.

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
Perris Valley Storm Drain	N/A	N/A	San Jacinto River Rach 3 (downstream).
San Jacinto River Reach 3 – Canyon Lake to Nuevo Road (HU#802.11)	None	MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE	This river reach has existing or potential RARE beneficial use.
Canyon Lake (HU#802.11, 802.12)	Nutrients, Pathogens **TMDL Completed** - Nutrients	MUN, AGR, GWR, REC1, REC2, COMM, WARM, WILD	San Jacinto River Reaches 1 (downstream).
San Jacinto River Rach 1 (HU#802.32, 802.31)	None	MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE	This river reach has existing or potential RARE beneficial use.
Lake Elsinore (HU#802.31)	Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCBs, Toxicity **TMDL Completed** – Nutrients, Organic Enrichment/Low Dissolved Oxygen	MUN, REC1, REC2, COMM, WARM, WILD, RARE	The lake has existing or potential RARE beneficial use.

Note: Based on the direction from the City, the 2012 impairment listing is referenced.

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 (dependent on tenant)	☒ Y	☐ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)* City of Perris – Grading Permit & Building Permit	☒ 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?

The existing site drains in an easterly direction towards Wilson Avenue and the drainage pattern will be maintained in the post-project condition.

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

The site has little or no existing vegetation as it has been graded and consistently cleared over many years.

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

Where applicable, runoff from the proposed hardscape area will be directed towards landscape area in an effort to promote incidental infiltration and preserve the infiltration capacity. Additionally, roof runoff through downspouts will be directed to proposed landscape areas where feasible to help slow

down the storm water runoff. The project-specific geotechnical engineer conducted infiltration testing at two locations and recommends a field infiltration rate of 1.0 in/hr, which is less than an infiltration threshold of 1.6 in/hr. Therefore, infiltration BMPs were not recommended for the site.

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

Impervious areas are only used where necessary and have been minimized to the extent practicable. Parking spaces are minimized close to the required amount and the landscaped areas have been maximized to the extent practicable.

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

Runoff from impervious surfaces is directed to the pervious areas where possible prior to being directed to the proposed structural BMP for water quality treatment.

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)[12]	Area (Sq. Ft.)	DMA Type
DMA 1-1	Ornamental Landscaping	7,240	Type D
DMA 1-2	Concrete or Asphalt	18,461	Type D
DMA 2-1	Ornamental Landscaping	5,681	Type D
DMA 2-2	Concrete or Asphalt	83,038	Type D
DMA 2-3	Roofs	80,823	Type D

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*
[2]*If multi-surface provide back-up*

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
DMA 1-1	7,240	Landscaping	Drip
DMA 2-1	5,681	Landscaping	Drip
DMA MISC. (Self-Treating Area)	10,952	Landscaping	N/A

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	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]
N/A							

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

DMA Name or ID	BMP Name or ID
DMA 1-1	BMP 1-Biotreatment (Vegetated Swale)
DMA 1-2	BMP 1-Biotreatment (Vegetated Swale)
DMA 2-1	BMP 2-Modular Wetland System (MWS-8-24-6'-0"-V-UG)
DMA 2-2	BMP 2-Modular Wetland System (MWS-8-24-6'-0"-V-UG)
DMA 2-3	BMP 2-Modular Wetland System (MWS-8-24-6'-0"-V-UG)

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?		✓
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		✓
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?		✓
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?	✓	
If Yes, list affected DMAs: DMA 1 and DMA 2		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		✓
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		✓
Describe here: Clayey materials observed approximately 5' below existing grade and below and 25' setback would be needed from structures and retaining walls for infiltration facilities.		

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.

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: Insert Area (Acres)

Type of Landscaping (Conservation Design or Active Turf): List Landscaping 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 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: Insert Area (Acres)

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: 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: Insert Area (Acres)

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)**
Insert Area (Acres)	Insert Area (Acres)

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: Number of daily Toilet Users

Project Type: Enter 'Residential', 'Commercial', 'Industrial' or 'Schools'

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: Insert Area (Acres)

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: 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: Required 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)**
Insert Area (Acres)	Insert Area (Acres)

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.

Insert narrative description here.

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: Projected Average Daily Use (gpd)

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: Insert Area (Acres)

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: Enter Value

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: Minimum use required (gpd)

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)**
Minimum use required (gpd)	Projected Average Daily Use (gpd)

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.

Note: A biotreatment LID BMP is proposed to treat a portion of the project to the extent practicable. However, the remaining portion of the project will be treated via a proprietary Modular Wetland System (MWS).

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 1-1	☐	☐	☐	☒	☐
DMA 1-2	☐	☐	☐	☒	☐
DMA 2-1	☐	☐	☐	☐	☒
DMA 2-2	☐	☐	☐	☐	☒
DMA 2-3	☐	☐	☐	☐	☒

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.

Note: As indicated above, a biotreatment LID BMP is provided for an easterly portion of the site and provide LID BMP to the extent possible. The remaining portion of the site would be directed to a proposed proprietary Modular Wetland System (MWS) prior to the outlet location.

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**	***BMP 1/Biotreatment LID BMP (Vegetated Swale)***		
	[A]		[B]	[C]	[A] x [C]	*Design Storm Depth (in)*	*Design Capture Volume, **V_{BMP}** (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA 1-1	*7,240*	*Ornamental Landscaping*	*0.1*	*0.11*	*799.7*			
DMA 1-2	*18,461*	*Concrete or Asphalt*	*1.0*	*0.89*	*16467.2*			
	A_T = Σ[A] = 25,701				Σ= [D] = 17266.9	[E] = 0.63	$[F] = \frac{[D]x[E]}{12}$ = 906.5	[G] = N/A - See additional calculation in Appendix 6 for BMP 1

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document.

[E] is obtained from Section 2.3.1 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. Additional supporting calculation is included in Appendix 6.

Table D.4 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	***BMP 2/Modular Wetland System (MWS-8-24-6'-0"-V-UG)***		
	[A]		[B]	[C]	[A] x [C]			
DMA 2-1	*5,681*	*Ornamental Landscaping*	*0.1*	*0.11*	*627.5*	*Design Storm Depth (in)*	*Design Capture Volume,* **V_{BMP}** *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA 2-2	*83,038*	*Concrete or Asphalt*	*1.0*	*0.89*	*74069.9*			
DMA 2-3	*80,823*	*Roofs*	*1.0*	*0.89*	*72094.1*			
	A_T = Σ[A] = 169,542				Σ= [D] = 146791.5	[E] = 0.63	[F] = $\frac{[D]x[E]}{12}$ = 7706.6	[G] = N/A – See Section E.3 for flow-based calculation.

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document.

[E] is obtained from Section 2.3.1 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. Additional supporting calculation is included in Appendix 6.

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.

Note: DMA 1 (an easterly portion of the project) will be treated via proposed biotreatment LID BMP; however, the remaining portion of the project (DMA 2) will be treated via a proposed proprietary Modular Wetland Systems (MWS), which is to be located in the easterly parking area.

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**	***BMP 2/Modular Wetland System (MWS-8-24-6'-0"-V-UG)***			
	[A]		[B]	[C]	[A] x [C]				
						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)*
DMA 2-1	*5,681*	*Ornamental Landscaping*	*0.1*	*0.11*	*627.5*				
DMA 2-2	*83,038*	*Concrete or Asphalt*	*1.0*	*0.892*	*74069.9*				
DMA 2-3	*80,823*	*Roofs*	*1.0*	*0.892*	*72094.1*				
	$A_T = \Sigma[A]$ 169,542				Σ= [D] 146791.5	[E] 0.20	$[F] = \frac{[D]\times[E]}{[G]}$ 0.67	[F] X (1-[H]) N/A	[I] 0.67

[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. The proposed Modular Wetland System was sized using flow-based approach.

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]
Modular Wetland System (BMP 2)	Metals, Nutrients, Pesticides, Toxic Organic Compounds, Sediments, Trash & Debris, and Oil & Grease	Metal (Medium), Nutrients/Pesticides (Medium), Toxic Organic Compounds (Medium), Sediments (High), Trash & Debris (High), Oil & Grease (High)

[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	INSERT VALUE	INSERT VALUE	INSERT VALUE
Volume (Cubic Feet)	INSERT VALUE	INSERT VALUE	INSERT VALUE

[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:

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.

Note: The project is within the Riverside County WAP HCOC Exemption area approved on April 20, 2017. Therefore, the project should be exempt from the HCOC requirements.

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
On-site storm drain 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. 3See 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 drain.”
Interior floor drains	Interior floor drains shall be plumbed to sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow.
Need for future indoor & structural pest control	Building design features including sealants barriers and fully closing windows and doors have been included to discourage entry of pests.	Integrated Pest Management (IPM) information to be provided to owners, lessees, and operators.
Landscape/outdoor pesticide use	Final Landscape Plans will accomplish 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. Prevent erosion of slopes by planting fast-growing, dense ground covering plants. Plant native vegetation to reduce the amount of water, fertilizers, and pesticides applied to the landscape. Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro-spray systems. Periodically inspect and fix leaks and misdirected sprinklers. Do not rake or blow leaves, clippings, or pruning waste into the street, gutter, or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city’s program. Integrated Pest Management (IPM) information to be provided to owners, lessees, and operators.
Refuse areas	Site design features dumpster enclosures. Signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.	Periodic inspections for leaky, overfilled, uncovered, or other problematic conditions will occur. Corrective action will be made upon detection, as circumstances permit. Dumping of liquid or hazardous wastes will be prohibited. Spill control materials will be available on-site. All wastes to properly stored and disposed of in accordance with all applicable Local, State and Federal regulations
Industrial Processes	All process activities to be performed indoors. No processes to drain to exterior or to storm drain system.	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/
Loading Docks	Maintain in a clean and orderly fashion. 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	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

	install door skirts (cowling) at each bay that enclose the end of the trailer.	
Fire Sprinkler Test Water	Provide a means to drain fire sprinkler test water to the sanitary sewer.	See the note in the Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Miscellaneous Drain or Wash Water or 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. Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary. Any drainage sumps on-site shall feature a sediment sump to reduce pumped water. Roofing, gutters, and trim made out of unprotected metals that may leach into runoff shall be avoided.	Inspect periodically to verify that equipment is not leaking or discharging to the storm drain system.
Plazas, Sidewalks, and Parking Lots	Maintain in a clean and orderly fashion.	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 wash water containing any cleaning agent or degreaser and discharge to the sanitary sewer, not to a storm drain.

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)
BMP 1	BMP 1 / Biotreatment LID BMP (Vegetated Swale)	BMP Site Plan	33°49'30.68"N / 117°12'47.47"W
BMP 2	BMP 2 / Modular Wetland System (MWS-8-24-6'-0"-V-UG)	BMP Site Plan	33°49'30.59"N / 117°12'47.68"W

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: See Appendix 9

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

☐ Y ☒ N

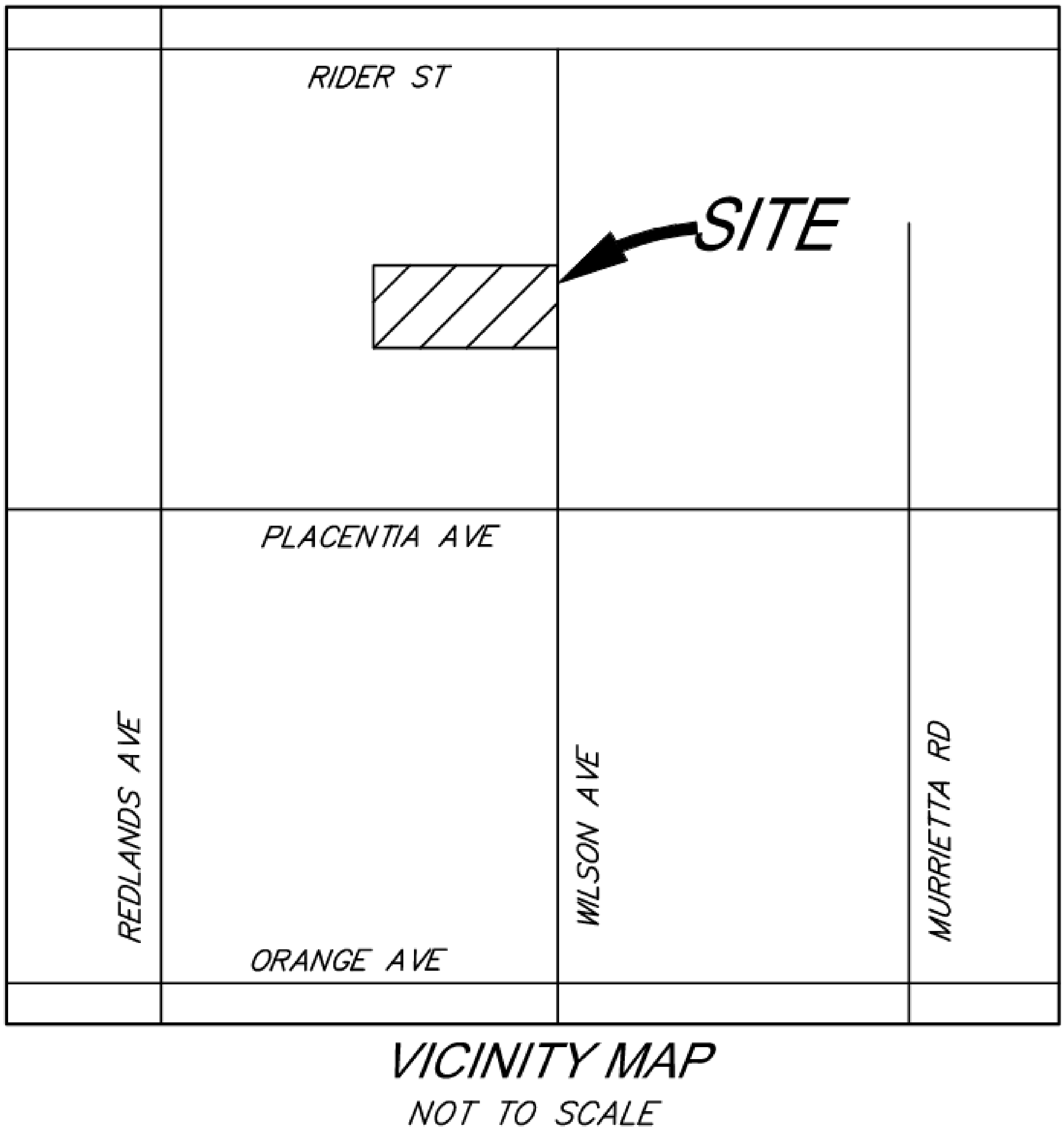
Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

<u>Note: To be completed at the time of the FWQMP.</u>

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

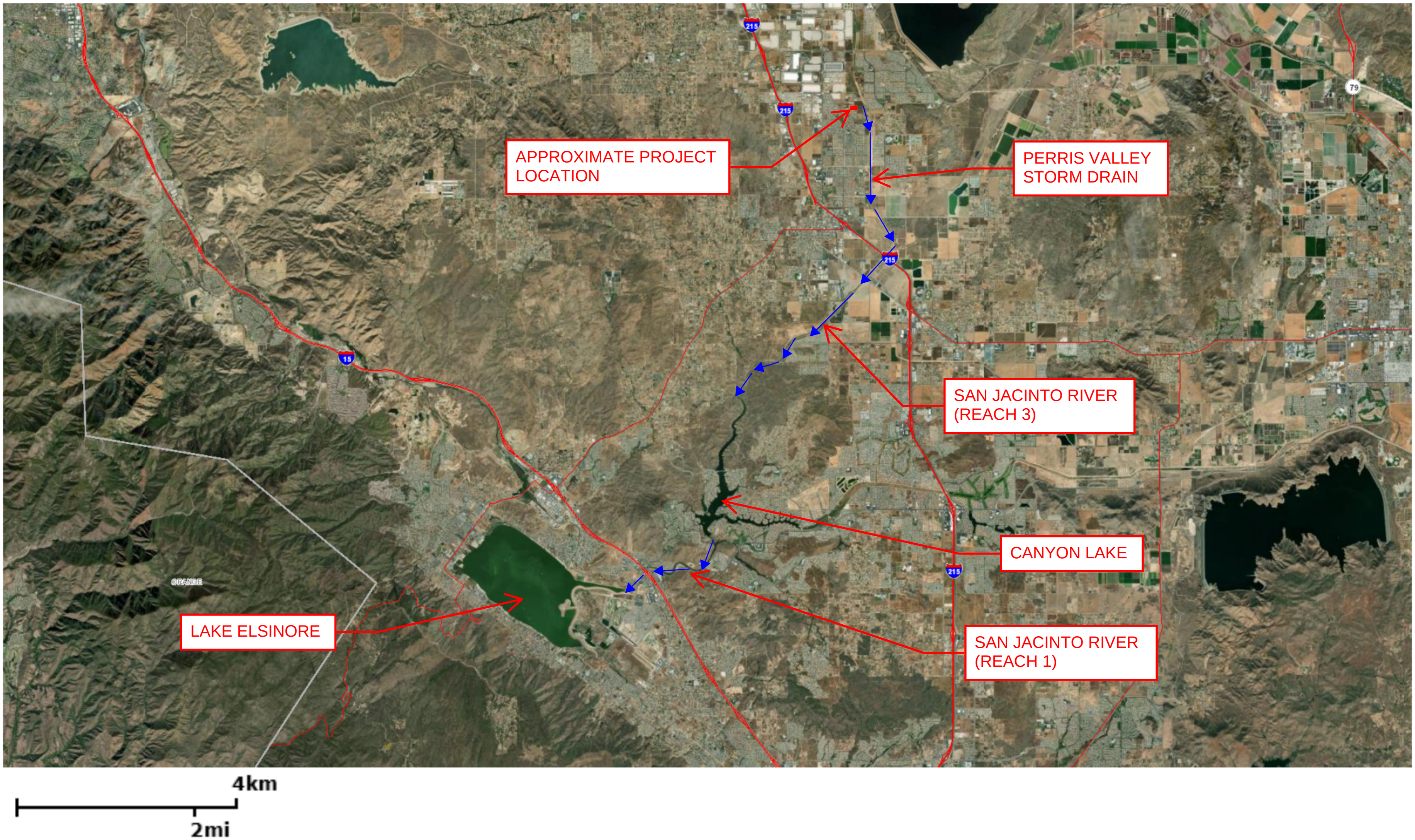
Vicinity Map



The project is located along Wilson Avenue (between Placentia Avenue and Rider Street) in the City of Perris, CA.

SCREEN CAPTURE - RIVERSIDE COUNTY STORMWATER & WATER CONSERVATION TRACKING TOOL

RECEIVING WATER MAP - SUPPORTING MATERIALS

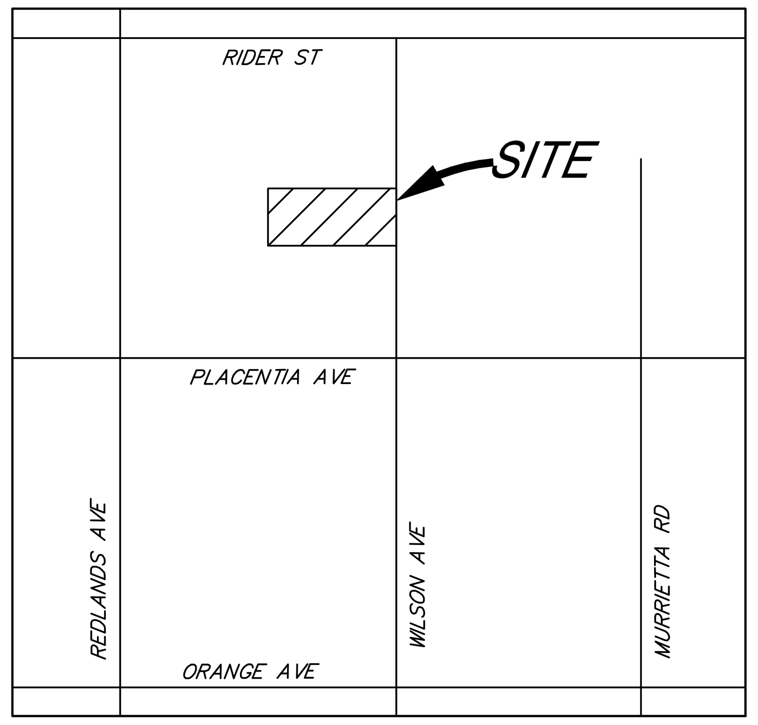


Riverside County
SWCTT

Stormwater Map

Site Address: rivco.permitrack.com

POST-CONSTRUCTION BMP SITE PLAN
LAKE CREEK-WILSON



VICINITY MAP
NOT TO SCALE

GENERAL NOTES

1. THE EXISTING SITE CONSISTS OF OPEN, UNDEVELOPED SPACE, DRAINING GENERALLY FROM WEST TO EAST TOWARDS WILSON AVENUE. THERE IS AN OFFSITE RUN-ON TO THE SITE FROM WESTERLY UNDEVELOPED LAND. RUNOFF FROM THE PROJECT RUNOFF FROM WILSON AVENUE IS CONVEYED IN A SOUTHEASTERLY DIRECTION AND EVENTUALLY DISCHARE INTO THE EXISTING MASTER DRAINAGE PLAN (MDP) PERRIS VALLEY STORM DRAIN CHANNEL, WHICH ULTIMATELY DISCHAGES INTO CANYON LAKE AND THEN LAKE ELSINORE.
2. THE POST-PROJECT DRAINAGE CHARACTERISTICS WILL BE MAINTAINED SIMILAR AS COMPARED TO THE PRE-PROJECT CONDITION. RUNOFF FROM THE SITE WILL BE CAPTURED VIA PROPOSED CATCH BASINS AND CONVEYED VIA PROPOSED STORM DRAIN PIPES TOWARDS A PROPOSED BIOTREATMENT LID BMP AND A PROPRIETARY MODULAR WETLAND SYSTEM (MWS) FOR TREATMENT PURPOSE PRIOR TO OUTLET INTO A PROPOSED CATCH BASIN IN WEST SIDE OF WILSON AVENUE. IT IS UNDERSTOOD THAT AN OFFSITE DEVELOPMENT WILL CONSTRUCT A SEGMENT OF THE MDP LINE H ALONG PLACENTIA AVENUE (BETWEEN MURRIETA AVENUE AND WILSON AVENUE) AND A LATERAL STORM DRAIN PIPE ALONG WILSON AVENUE FROM THE INTERSECTION OF WILSON/PLACENTIA UP TO THIS PROJECT LOCATION. THE AFOREMENTIONED CATCH BASIN WILL CONNECT INTO THIS STORM DRAIN LINE. THE WESTERLY OFFSITE AREA WILL BE BYPASSED AROUND THE PROJECT VIA A STORM DRAIN DITCH AND OUTLET TO WILSON AVENUE.
3. THE PROJECT-SPECIFIC GEOTECHNICAL ENGINEER CONDUCTED INFILTRATION TESTING AND RECOMMENDS A FIELD INFILTRATION RATE OF ~1.0 IN/HR, WHICH IS LESS THAN THE INFILTRATION THRESHOLD OF 1.6 IN/HR; THEREFORE, INFILTRATION WAS DEEMED INFEASIBLE FOR THIS PROJECT. A BIOTREATMENT LID BMP IS PROPOSED TO TREAT A PORTION OF THE PROJECT AND A PROPRIETARY MODULAR WETLAND SYSTEM (ALONG WITH A LOW-FLOW MECHANICAL PUMP) IS PROPOSED TO TREAT THE REMAINING PORTION OF THE PROJECT.
4. THE PROJECT IS SITUATED WITHIN THE ZONE X BASED ON THE FEMA FLOOD INSURANCE RATE MAP NUMBER 06065C1430H, EFFECTIVE AUGUST 18, 2014. THEREFORE, FEMA SUBMITTALS/PROCESSING SHOULD NOT BE NEEDED FOR THIS PROJECT.
5. PRELIMINARY DETAILS FOR TRASH ENCLOSURE WITH COVER, STENCIL, AND/OR ROOF DRAIN OUTLET LOCATIONS ARE PROVIDED ON THIS EXHIBIT OR BMP DETAIL SHEET; HOWEVER, THOSE DETAILS COULD BE REFINED FURTHER AT THE TIME OF FINAL WQMP.

PERMANENT SOURCE CONTROL BMPs

(1) MARK ALL INLETS WITH THE WORDS "ONLY RAIN DOWN THE STORM DRAIN" OR SIMILAR
(2) ENCLOSED REFUSE AREA WITH SIGNS POSTED NEARBY STATING "DO NOT DUMP HAZARDOUS MATERIALS HERE" OR SIMILAR
- LANDSCAPING DESIGNED 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.

OPERATIONAL SOURCE CONTROL BMPs

- MAINTAIN LANDCAPING USING MINIMUM OR NO PESTICIDES
- PREVENT EROSION OF SLOPES BY PLANTING FAST-GROWING, DENSE GROUND COVERING PLANTS
- PLANT NATIVE VEGETATION TO REDUCE THE AMOUNT OF WATER, FERTILIZERS, AND PESTICIDES APPLIED TO THE LANDSCAPE
- DO NOT OVERWATER
- USE IRRIGATION PRACTICES SUCH AS DRIP IRRIGATION, SOAKER HOSES OR MICRO-SPRAY SYSTEMS
- PERIODICALLY INSPECT AND FIX LEAKS AND MISDIRECTED SPRINKLERS.
- DO NOT RAKE OR BLOW LEAVES, CLIPPINGS, OR PRUNING WASTE INTO THE STREET, GUTTER OR STORM DRAIN
- DISPOSE OF GREEN WASTE BY COMPOSTING, HAULING IT TO A PERMITTED LANDFILL, OR RECYCLING IT THROUGH YOUR CITY'S PROGRAM
- PROVIDE IPM INFORMATION TO NEW OWNERS, LESSEES AND OPERATORS
- PERIODIC INSPECTIONS FOR LEAKY, OVERFILLED, UNCOVERED, OR OTHER PROBLEMATIC CONDITIONS WILL OCCUR
- CORRECTIVE ACTION WILL BE MADE UPON DETECTION, AS CIRCUMSTANCES PERMIT
- DUMPING OF LIQUID OR HAZARDOUS WASTES WILL BE PROHIBITED
- SPILL CONTROL MATERIALS WILL BE AVAILABLE ON-SITE
- MOVE LOADED AND UNLOADED ITEMS INDOORS AS SOON AS POSSIBLE
- 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 THE STORM DRAIN)

LID OPPORTUNITIES

1. PRESERVE EXISTING PERVIOUS AREA WHERE POSSIBLE.
2. LANDSCAPED AREAS DESIGNED TO BE SELF-RETAINING WHERE FEASIBLE.

DMA LEGEND & AREAS

DMA 1 DRAINING TO PERMANENT STRUCTURAL BMP

- DMA 1-1 (ORNAMENTAL LANDSCAPING) – 7,240 S.F.
- DMA 1-2 (CONCRETE OR ASPHALT) – 18,461 S.F.

TOTAL AREA = 25,701 S.F.

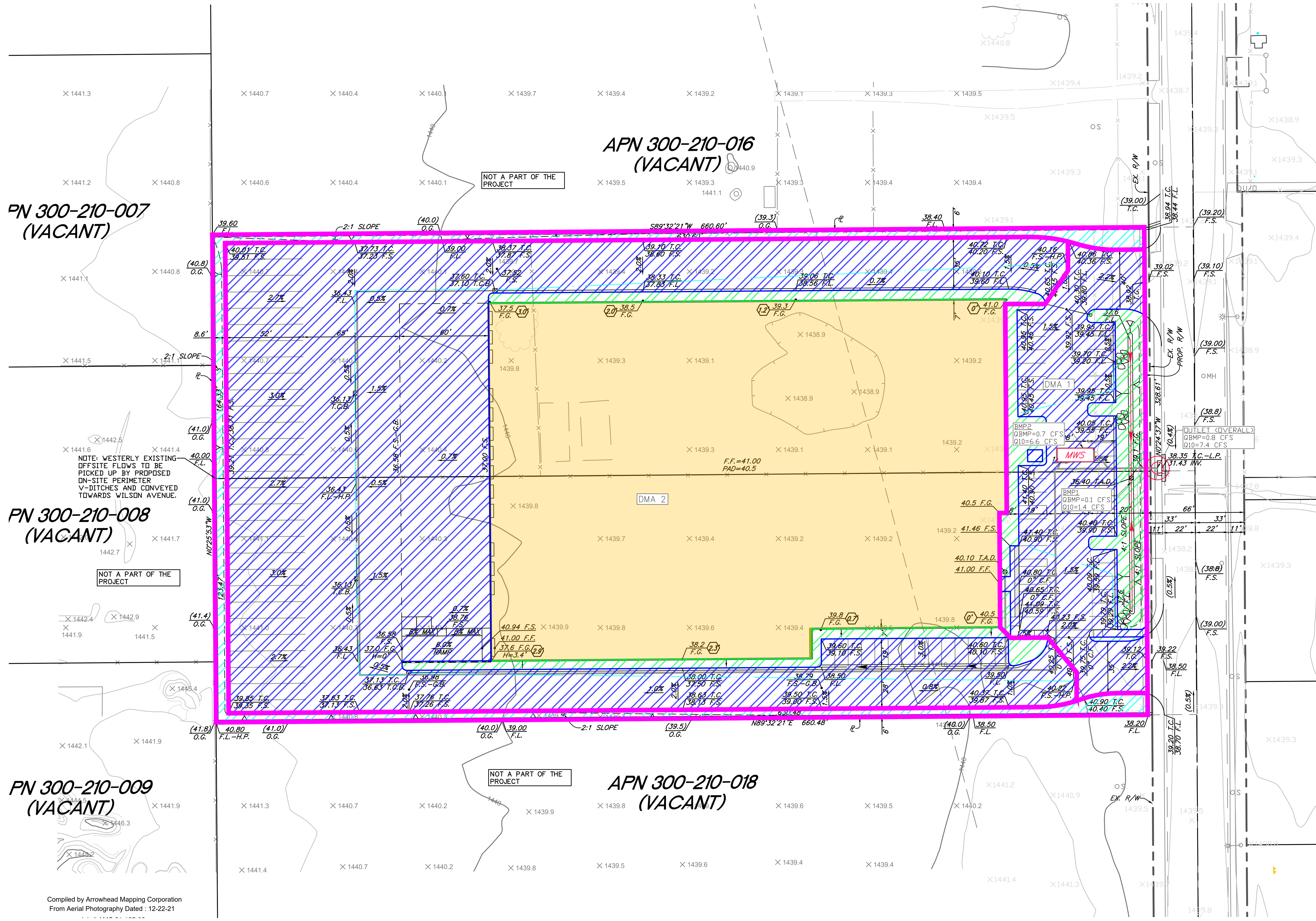
DMA 2 DRAINING TO PERMANENT STRUCTURAL BMP

- DMA 2-1 (ORNAMENTAL LANDSCAPING) – 5,681 S.F.
- DMA 2-2 (CONCRETE OR ASPHALT) – 83,038 S.F.
- DMA 2-3 (ROOFS) – 80,823 S.F.

TOTAL AREA = 169,542 S.F.

MISC. DMAs

- DMA MISC. – SELF-TREATING AREA (STA) – 10,952 S.F.

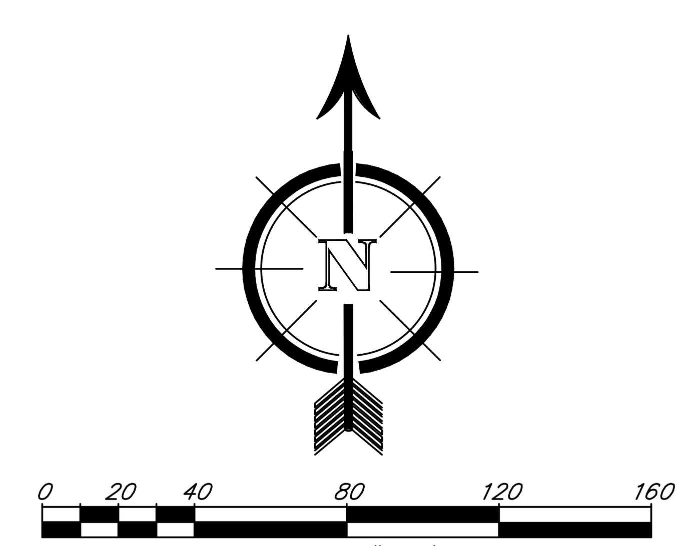


LEGEND

- DRAINAGE MANAGEMENT AREA
- TRACT BOUNDARY
- CENTERLINE
- CURB AND GUTTER
- 1280 EXISTING CONTOUR LINE
- SLOPE
- ROOF DRAIN LOCATION (TBD)
- DISCHARGE LOCATION
- PROPOSED STORM DRAIN
- GENERAL SURFACE FLOW PATH

PERMANENT STRUCTURAL BMP

- BMP 1: BIOTREATMENT LID BMP – PROPOSED VEGETATED SWALE
- MWS BMP 2: MODULAR WETLAND SYSTEM (MWS) – PROPOSED MWS-L-8-24-6'-0"-V-UG

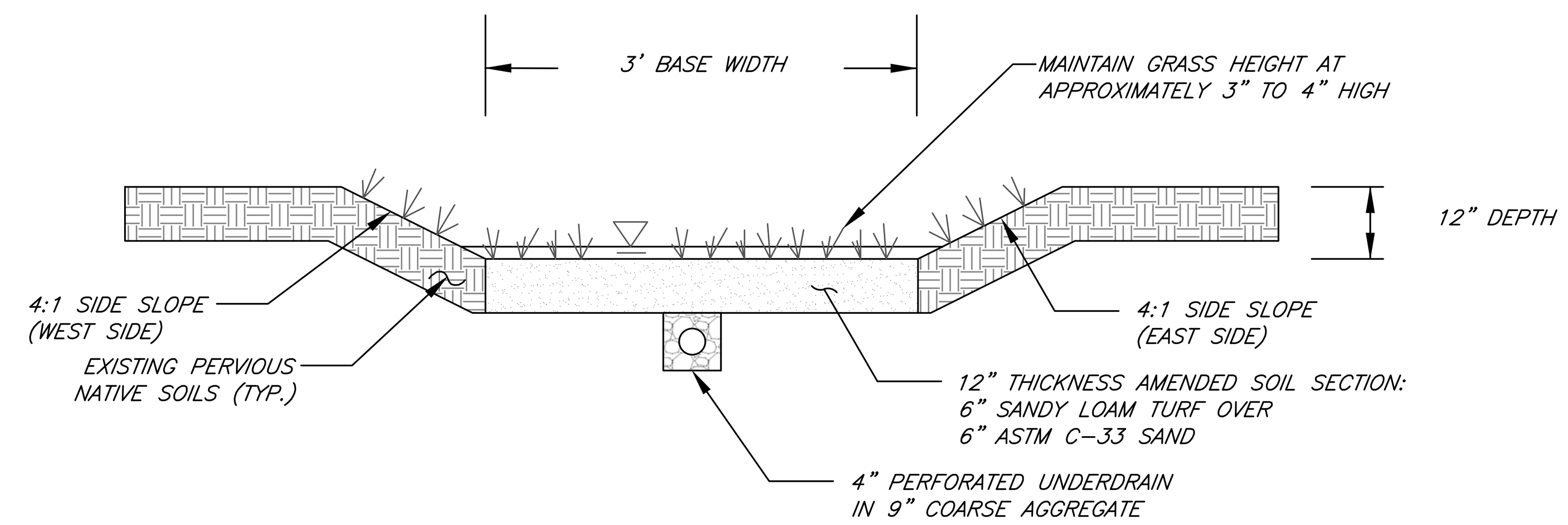


DATE: FEBRUARY 2022

CITY OF PERRIS	
POST-CONSTRUCTION BMP SITE PLAN DMA PLAN LAKE CREEK-WILSON (CITY CASE NO. TBD)	1 OF 2 SHEETS

NOT FOR CONSTRUCTION - THIS POST-CONSTRUCTION BMP SITE PLAN IS FOR WQMP REVIEW PURPOSE

POST-CONSTRUCTION BMP SECTION DETAIL
LAKE CREEK-WILSON

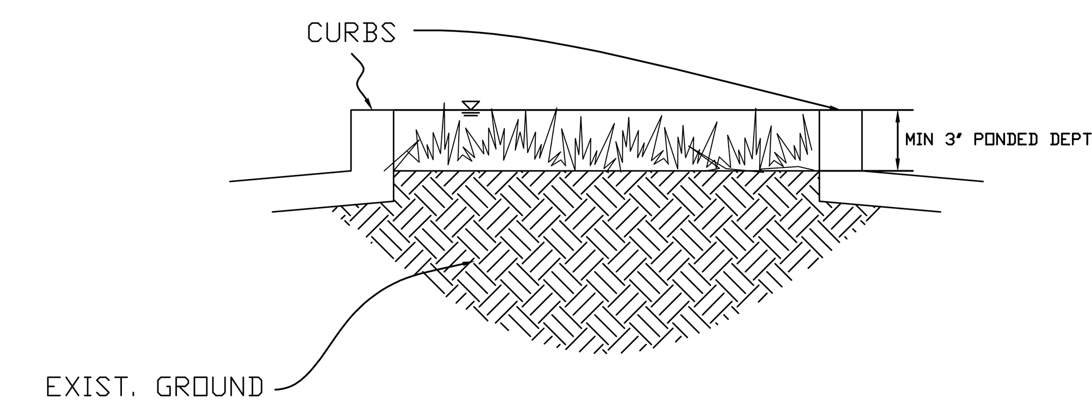


BMP 1 - BIOTREATMENT LID BMP (VEGETATED SWALE) - TYPICAL SECTION

NOT TO SCALE

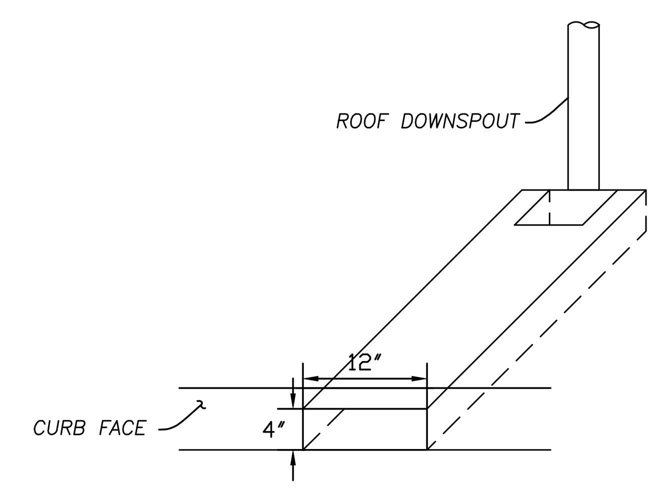
INLET PLACARD DETAIL (TYP.)

NOT TO SCALE



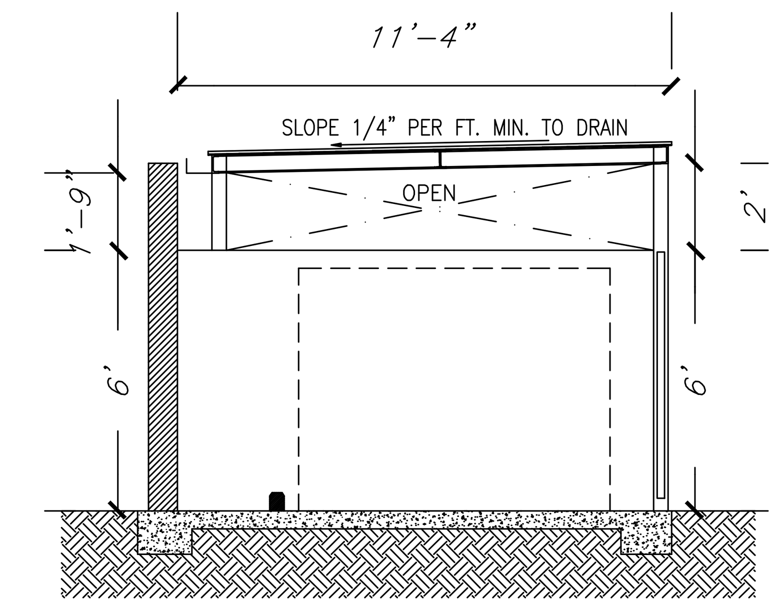
LANDSCAPED ISLAND DETAIL (TYP.)

NOT TO SCALE



ROOF DRAIN CURB OUTLET STRUCTURE DETAIL (TYP.)

NOT TO SCALE



TRASH ENCLOSURE STRUCTURE DETAIL (TYP.)

NOT TO SCALE

SITE SPECIFIC DATA			
PROJECT NUMBER		14963	
PROJECT NAME		LAKE CREEK – WILSON	
PROJECT LOCATION		PERRIS, CA	
STRUCTURE ID		BMP 2	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.67	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	31.40	HDPE	8"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	28.00	HDPE	8"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	40.40	40.40	40.40
SURFACE LOAD	H–20 DIRECT	H–20 DIRECT	H–20 DIRECT
FRAME & COVER	ø30"	3EA ø36"	ø30"
WETLANDMEDIA VOLUME (CY)			11.41
ORIFICE SIZE (DIA. INCHES)			ø2.64 EA

NOTES: PRELIMINARY NOT FOR CONSTRUCTION. INDUSTRIAL MEDIA REQUIRED. 8" WALL THICKNESS REQUIRED.

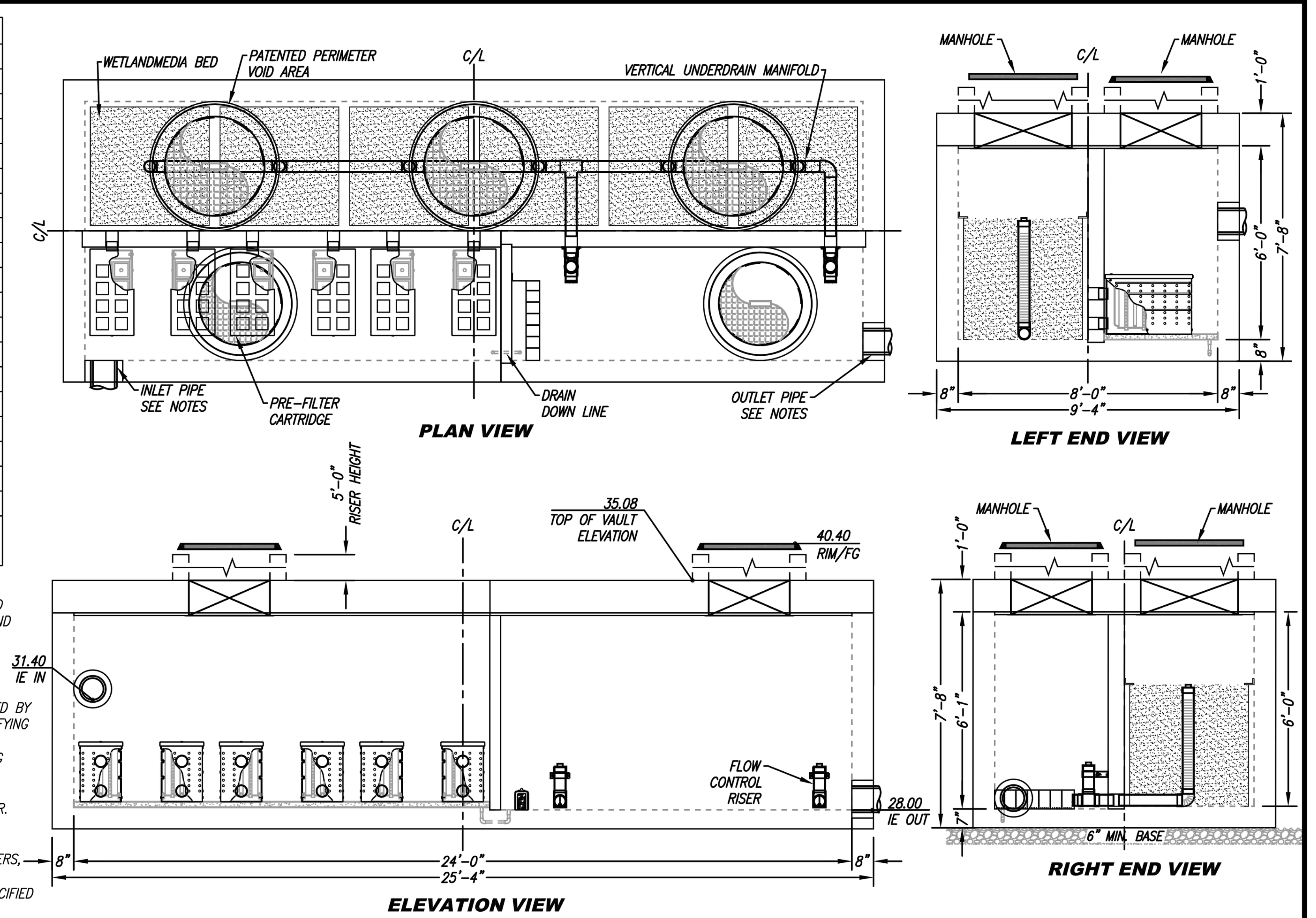
INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

2/23/22BREVE



TREATMENT FLOW (CFS)	0.67
OPERATING HEAD (FT)	3.3
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

PROPRIETARY AND CONFIDENTIAL:

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Bio Clean
A Forterra Company

MWS-L-8-24-6'-0"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

BMP 2 - PROPRIETARY MODULAR WETLAND SYSTEM (MWS)

NOT TO SCALE

GENERAL NOTES

1. THE PROPOSED LANDSCAPING/PLANTING (PLANT PALETTE) FOR THE PROPOSED BIOTREATMENT LID BMP (VEGETATED SWALE) IS TO BE PROVIDED SEPARATELY BY THE PROJECT LANDSCAPE ARCHITECT.
2. THE PROPOSED MODULAR WETLAND SYSTEM (MWS) (DETAILED SHOWN ON THIS SHEET) WILL BE PROVIDED USING THE FLOW-BASED APPROACH TO TREAT THE REMAINING AREA OF THE PROJECT (DMA 2).
3. IMMEDIATELY DOWNSTREAM OF THE PROPOSED MWS INCLUDES A LOW-FLOW MECHANICAL PUMP TO DIRECT THE TREATED LOW-FLOW BACK TO THE MAINLINE STORM DRAIN PIPE. OVERFLOW WILL CONTINUE TO BYPASS VIA GRAVITY THROUGH THE MAINLINE. A TYPICAL DETAIL FOR THE LOW-FLOW MECHANICAL PUMP WILL BE PROVIDED AT THE TIME OF FINAL WQMP.

DATE: FEBRUARY 2022

CITY OF PERRIS	
POST-CONSTRUCTION BMP SITE PLAN BMP DETAILS	2 OF
LAKE CREEK-WILSON (CITY CASE NO. TBD)	2 SHEETS

NOT FOR CONSTRUCTION – THIS POST-CONSTRUCTION BMP SITE PLAN IS FOR WQMP REVIEW PURPOSE

Appendix 2: Construction Plans

Grading and Drainage Plans

Note: Preliminary site plans are provided.

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

GEOTECHNICAL INVESTIGATION
PROPOSED WAREHOUSE

Wilson Avenue, North of Placentia Avenue
Perris, California
for
Lake Creek Industrial, LLC

SOUTHERN
CALIFORNIA
GEOTECHNICAL
A California Corporation

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

February 21, 2022

Lake Creek Industrial, LLC
1320 Brittany Cross Road
Santa Ana, California 92705

Attention: Mr. Jake Swan
Director

Project No.: **22G102-1**

Subject: **Geotechnical Investigation**
Proposed Warehouse
Wilson Avenue, North of Placentia Avenue
Perris, California

Gentlemen:

In accordance with your request, we have conducted a geotechnical investigation at the subject site. We are pleased to present this report summarizing the conclusions and recommendations developed from our investigation.

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Erick J. Aldrich, GE 2565
Geotechnical Engineer

Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

22885 Savi Ranch Parkway ▾ Suite E ▾ Yorba Linda ▾ California ▾ 92887
voice: (714) 685-1115 ▾ fax: (714) 685-1118 ▾ www.socalgeo.com

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

Presented below is a brief summary of the conclusions and recommendations of this investigation. Since this summary is not all inclusive, it should be read in complete context with the entire report.

Geotechnical Design Considerations

- Alluvium near-surface soils that were likely disturbed by agricultural operations were encountered at each boring location, extending from the ground surface to depths of 2½ to 5± feet. Soil classified as alluvium was encountered beneath these disturbed alluvial soils, extending to the total depth explored, which were drilled to a depth of up to 50± feet.
- The disturbed soils and near-surface alluvial soils possess varying strengths. These soils, in their present condition, are not considered suitable for support of the foundation loads of the new structure. Additionally, the results of laboratory testing indicate that the near-surface soils within the upper 7± feet possess a moderate potential for collapse when exposed to moisture infiltration as well as settlement when exposed to load increases in the range of those that will be exerted by the new foundations.
- Remedial grading will be necessary to remove the disturbed soils in their entirety, the upper portion of the near-surface native alluvial soils that are prone to settlement, and any soils disturbed during the demolition process, and replace these materials as compacted structural fill soils.
- The liquefaction analysis has identified potentially liquefiable soils at Boring No. B-3. Based on the settlement analysis, a total dynamic (liquefaction induced) settlement of approximately 3 inches could be expected at Boring No. B-3 with an estimated differential settlement of approximately 1.5 inches across an assumed distance of 100 feet.

Site Preparation Recommendations

- Demolition should include irrigation lines, underground utilities and any other subsurface improvements or objects that will not remain in place with the new development. Debris resultant from demolition should be disposed of off-site.
- Initial site preparation should include stripping of any surficial vegetation. The surficial vegetation, trees, and any organic soils should be properly disposed of off-site.
- Remedial grading is recommended to be performed within the proposed building area in order to remove the disturbed soils in their entirety, the upper portion of the near-surface native alluvial soils, and soils that may be disturbed during the demolition process. The soils within the proposed building area should be overexcavated to a depth of 6 feet below existing grade and to a depth of at least 4 feet below proposed building pad subgrade elevations, whichever is greater.
- Within the influence zones of new foundations, the overexcavation should extend to a depth of at least 3 feet below proposed foundation bearing grade. The overexcavation should extend at least 5 feet beyond the building perimeter, or to the extent equal to the depth of new fill below the foundation bearing grade, whichever is greater.
- Following completion of the overexcavation, the exposed soils should be scarified to a depth of at least 12 inches and moisture treated to 2 to 4 percent above optimum moisture content. The subgrade soils should then be recompacted to at least 90 percent of the ASTM

D-1557 maximum dry density. The previously excavated soils may then be replaced as compacted structural fill.

- The new pavement and flatwork subgrade soils are recommended to be scarified to a depth of 12± inches, thoroughly moisture conditioned and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Foundation Design Recommendations

- Conventional shallow foundations, supported in newly placed compacted fill.
- 2,500 lbs/ft^2 maximum allowable soil bearing pressure.
- Reinforcement consisting of at least four (4) No. 5 rebars (2 top and 2 bottom) in strip footings. Additional reinforcement may be necessary for structural considerations.

Building Floor Slab Design Recommendations

- Conventional Slab-on-Grade: minimum 6 inches thick.
- Modulus of Subgrade Reaction: k = 150 psi/in^3.
- Floor slab thickness and reinforcement should be evaluated and designed by the structural engineer based on the design loading conditions, potential slab uses and anticipated geotechnical soil conditions that will be present after grading.

Pavements

ASPHALT PAVEMENTS (R = 30)					
Materials	**Thickness (inches)**				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	6	8	10	11	13
Compacted Subgrade	12	12	12	12	12

PORTLAND CEMENT CONCRETE PAVEMENTS (R = 30)				
Materials	**Thickness (inches)**			
	Autos and Light Truck Traffic (TI = 5.0 to 6.0)	Truck Traffic		
		(TI =7.0)	(TI =8.0)	(TI =9.0)
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

2.0 SCOPE OF SERVICES

The scope of services performed for this project was in accordance with our Proposal No. 21P515, dated December 21, 2021. The scope of services included a visual site reconnaissance, subsurface exploration, field and laboratory testing, and geotechnical engineering analyses to provide criteria for preparing the design of the building foundations, building floor slab, and parking lot pavements, along with site preparation recommendations and construction considerations for the proposed development. Based on the location of this site, this investigation also included a site-specific liquefaction evaluation. The evaluation of the environmental aspects of this site was beyond the scope of services for this geotechnical investigation.

3.0 SITE AND PROJECT DESCRIPTION

3.1 Site Conditions

The subject site is located on the west side of Wilson Avenue, 620± feet north of the intersection of Placentia Avenue and Wilson Avenue in Perris, California. The site is bounded to the north by a single-family residence, to the west and south by vacant lots, and to the east by Wilson Avenue.

The subject site consists of two rectangular-shaped parcels which total 4.93± acres in size. The site is currently vacant and undeveloped. The ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth. There are two rectangular concrete slabs near the center of the two lots, and localized areas of minor scattered debris and trash.

Detailed topographic information was not available at the time of this report. However, based on topographic information obtained from the USGS topo map, the site is at approximately 1460± feet mean sea level (msl). The overall site is relatively flat with a slight slope to the west at an estimated gradient of less than 1± percent.

3.2 Proposed Development

Based on a preliminary site plan (A1-1PA) provided to SCG prepared by RGA, the site will be developed with one (1) warehouse. The building will be 85,322± ft² in size and will be located in the east-central area of the site. The building will be constructed with dock-high doors along a portion of the west building wall. The building is anticipated to be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and concrete flatwork with limited areas of landscape planters throughout.

Detailed structural information has not been provided. It is assumed that the new building will be a single-story structure of tilt-up concrete construction, typically supported on conventional shallow foundations with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Grading plans for the proposed development were not available at the time of this report. The proposed development is not expected to include significant amounts of below-grade construction such as basements or crawl spaces.

4.0 SUBSURFACE EXPLORATION

4.1 Scope of Exploration/Sampling Methods

The subsurface exploration conducted for this project consisted of four (4) borings advanced to depths of 20 to 50± feet below the existing site grades. The borings were logged during drilling by a member of our staff.

The borings were advanced with hollow-stem augers, by a limited access track-mounted drilling rig. Representative bulk and relatively undisturbed soil samples were taken during drilling. Relatively undisturbed soil samples were taken with a split barrel "California Sampler," containing a series of one inch long, 2.416± inch diameter brass rings. This sampling method is described in ASTM Test Method D-3550. In-situ samples were also taken using a 1.4± inch inside diameter split spoon sampler, in general accordance with ASTM D-1586. Both of these samplers are driven into the ground with successive blows of a 140-pound weight falling 30 inches. The blow counts obtained during driving are recorded for further analysis. Bulk soil samples and soil obtained in the 1.4 inch split spoon sampler were placed in plastic bags to retain their original moisture content. The relatively undisturbed ring samples were placed in molded plastic sleeves that were then sealed and transported to our laboratory for further testing.

The approximate locations of the borings are indicated on the Boring Location Plan, included as Plate 2 in Appendix A of this report. The Boring Logs, which illustrate the conditions encountered at the boring locations, as well as the results of some of the laboratory testing, are included in Appendix B.

4.2 Geotechnical Conditions

Alluvium

Native alluvial soils were encountered at the ground surface of all boring locations, extending to at least the maximum depth explored of 50± feet. The near surface alluvium was observed to be disturbed by previous activities at the site, which may have included agricultural activities. These disturbed alluvium soils were observed to be in approximately the upper 2½ to 5± feet, and generally consisted of medium dense to dense sandy silt and silty to clayey fine sand.

The undisturbed alluvial soils generally consist of medium dense to dense silty to clayey fine sand and fine sandy silt with trace to little clay, medium sand and course sand. Some of the alluvium samples contained calcareous nodules and veining.

Groundwater

Groundwater was encountered in Boring No. B-1 at a depth of approximately 39 feet. As part of our research, we reviewed readily available groundwater data in order to determine regional groundwater depths. Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well on record is located approximately 4,340 feet northeast of the site. Water level readings within this monitoring well indicate a groundwater level of 25± feet below the ground surface in November 2019.

5.0 LABORATORY TESTING

The soil samples recovered from the subsurface exploration were returned to our laboratory for further testing to evaluate select physical and engineering properties of the soils. The tests are briefly discussed below. It should be noted that the test results are specific to the actual samples tested, and variations could be expected at other locations and depths.

Classification

Recovered soil samples were visually classified during drilling using the Unified Soil Classification System (USCS), in general accordance with ASTM D-2488. Field identifications were then supplemented with additional visual classifications and/or by laboratory testing. The USCS classifications are shown on the Boring Logs and are periodically referenced throughout this report.

Density and Moisture Content

The density has been evaluated for selected relatively undisturbed ring samples. These densities were evaluated in general accordance with the method presented in ASTM D-2937. The results are recorded as dry unit weight in pounds per cubic foot. The moisture contents are evaluated in accordance with ASTM D-2216, and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Consolidation

Selected soil samples have been tested to evaluate their consolidation potential, in general accordance with ASTM D-2435. The testing apparatus is designed to accept either natural or remolded samples in a one-inch high ring, approximately 2.416 inches in diameter. Each sample is then loaded incrementally in a geometric progression and the resulting deflection is recorded at selected time intervals. Porous stones are in contact with the top and bottom of the sample to permit the addition or release of pore water. The samples are typically inundated with water at an intermediate load to determine their potential for collapse or heave. The results of the consolidation testing are plotted on Plates C-1 through C-2 in Appendix C of this report.

Maximum Dry Density and Optimum Moisture Content

One representative bulk sample has been tested for its maximum dry density and optimum moisture content. The results have been obtained using the Modified Proctor procedure, per ASTM D-1557, and are presented on Plate C-3 in Appendix C of this report. These tests are generally used to compare the in-situ densities of undisturbed field samples, and for later compaction testing during grading. Additional testing of other soil types or soil mixes are typically necessary at a later date during site earthwork and compaction operations.

Expansion Index

The expansion potential of the on-site soils was evaluated in general accordance with ASTM D-4829. The testing apparatus is designed to accept a 4-inch diameter, 1-in high, remolded sample. The sample is initially remolded to 50± 1 percent saturation and then loaded with a surcharge equivalent to 144 pounds per square foot. The sample is then inundated with water, and allowed to swell against the surcharge. The resultant swell or consolidation is recorded after a 24-hour period. The results of the EI testing are as follows:

Sample Identification	Expansion Index	Expansive Potential
B-3 @ 0 to 5 feet	36	Low

Soluble Sulfates

A representative sample of the near-surface soils has been submitted to a subcontracted analytical laboratory for evaluation of soluble sulfate content. Soluble sulfates are naturally present in soils, and if the concentration is high enough, can result in degradation of concrete which comes into contact with these soils. The results of the soluble sulfate testing are presented below, and are discussed further in a subsequent section of this report.

Sample Identification	Soluble Sulfates (%)	Severity
B-3 @ 0 to 5 feet	0.0084	Not Applicable (S0)

Corrosivity Testing

A representative bulk sample of the near-surface soils was submitted to a subcontracted corrosion engineering laboratory to determine if the near-surface soils possess corrosive characteristics with respect to common construction materials. The corrosivity testing included an evaluation of the electrical resistivity, pH, and chloride concentrations of the soils, as well as other tests. The results of some of these tests are presented below.

Sample Identification	Saturated Resistivity (ohm-cm)	pH	Chlorides (mg/kg)	Nitrates (mg/kg)
B-3 @ 0 to 5 feet	2,160	7.3	11	64

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our review, field exploration, laboratory testing and geotechnical analyses, the proposed development is considered feasible from a geotechnical standpoint. The recommendations contained in this report should be taken into the design, construction, and grading considerations.

The recommendations are contingent upon grading and foundation construction activities being monitored by the geotechnical engineer of record. The recommendations are provided with the assumption that an adequate program of client consultation, construction monitoring, and testing will be performed during the final design and construction phases to verify compliance with these recommendations. Maintaining Southern California Geotechnical, Inc., (SCG) as the geotechnical consultant from the beginning to the end of the project will provide continuity of services. The geotechnical engineering firm providing testing and observation services shall assume the responsibility of Geotechnical Engineer of Record.

The Grading Guide Specifications, included as Appendix D, should be considered part of this report, and should be incorporated into the project specifications. The contractor and/or owner of the development should bring to the attention of the geotechnical engineer any conditions that differ from those stated in this report, or which may be detrimental for the development.

6.1 Seismic Design Considerations

The subject site is located in an area which is subject to strong ground motions due to earthquakes. The performance of a site specific seismic hazards analysis was beyond the scope of this investigation. However, numerous faults capable of producing significant ground motions are located near the subject site. Due to economic considerations, it is not generally considered reasonable to design a structure that is not susceptible to earthquake damage. Therefore, significant damage to structures may be unavoidable during large earthquakes. The proposed structures should, however, be designed to resist structural collapse and thereby provide reasonable protection from serious injury, catastrophic property damage and loss of life.

Faulting and Seismicity

Research of available maps indicates that the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. In addition, no evidence of faulting was observed during our subsurface exploration or site reconnaissance. Therefore, the possibility of significant fault rupture on the site is considered to be low.

Seismic Design Parameters

The 2019 California Building Code (CBC) provides procedures for earthquake resistant structural design that include considerations for on-site soil conditions, occupancy, and the configuration of the structure including the structural system and height. The seismic design parameters presented below are based on the soil profile and the proximity of known faults with respect to the subject site.

Based on standards in place at the time of this report, the proposed development is expected to be designed in accordance with the requirements of the 2019 edition of the California Building Code (CBC), which was adopted on January 1, 2020.

The 2019 CBC Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool, a web-based software application available at the website www.seismicmaps.org. This software application calculates seismic design parameters in accordance with several building code reference documents, including ASCE 7-16, upon which the 2019 CBC is based. The application utilizes a database of risk-targeted maximum considered earthquake (MCE_R) site accelerations at 0.01-degree intervals for each of the code documents. The tables below were created using data obtained from the application. The output generated from this program is included as Plate E-1 in Appendix E of this report.

The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than 0.2. However, Section 11.4.8 of ASCE 7-16 also indicates an exception to the requirement for a site-specific ground motion hazard analysis for certain structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) indicates that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." **Based on our understanding of the proposed development, the seismic design parameters presented below were calculated assuming that the exception in Section 11.4.8 applies to the proposed structure at this site. However, the structural engineer should verify that this exception is applicable to the proposed structure.** Based on the exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

2019 CBC SEISMIC DESIGN PARAMETERS

Parameter		Value
Mapped Spectral Acceleration at 0.2 sec Period	S_S	1.500
Mapped Spectral Acceleration at 1.0 sec Period	S_1	0.571
Site Class	---	D
Site Modified Spectral Acceleration at 0.2 sec Period	S_{MS}	1.500
Site Modified Spectral Acceleration at 1.0 sec Period	S_{M1}	0.987
Design Spectral Acceleration at 0.2 sec Period	S_{DS}	1.000
Design Spectral Acceleration at 1.0 sec Period	S_{D1}	0.658

It should be noted that the site coefficient F_v and the parameters S_{M1} and S_{D1} were not included in the SEAOC/OSHPD Seismic Design Maps Tool output for the 2019 CBC. We calculated these parameters-based on Table 1613.2.3(2) in Section 16.4.4 of the 2019 CBC using the value of S_1 obtained from the Seismic Design Maps Tool, assuming that a site-specific ground motion hazards analysis is not required for the proposed building at this site.

Liquefaction

Liquefaction is the loss of strength in generally cohesionless, saturated soils when the pore-water pressure induced in the soil by a seismic event becomes equal to or exceeds the overburden pressure. The primary factors which influence the potential for liquefaction include groundwater table elevation, soil type and plasticity characteristics, relative density of the soil, initial confining pressure, and intensity and duration of ground shaking. The depth within which the occurrence of liquefaction may impact surface improvements is generally identified as the upper 50 feet below the existing ground surface. Liquefaction potential is greater in saturated, loose, poorly graded fine sands with a mean (d_{50}) grain size in the range of 0.075 to 0.2 mm (Seed and Idriss, 1971). Non-sensitive clayey (cohesive) soils which possess a plasticity index of at least 18 (Bray and Sancio, 2006) are generally not considered to be susceptible to liquefaction, nor are those soils which are above the historic static groundwater table.

The Riverside County GIS website indicates that the subject site is located within a zone of moderate liquefaction susceptibility. Therefore, the scope of this investigation included a detailed liquefaction evaluation in order to determine the site-specific liquefaction potential.

The liquefaction analysis was conducted in general accordance with the requirements of Special Publication 117A (CDMG, 2008), and currently accepted practice (SCEC, 1997). The liquefaction potential of the subject site was evaluated using the empirical method developed by Boulanger and Idriss (Boulanger and Idriss, 2008). This method predicts the earthquake-induced liquefaction potential of the site based on a given design earthquake magnitude and peak ground acceleration at the subject site. This procedure essentially compares the cyclic resistance ratio (CRR) [the cyclic stress ratio required to induce liquefaction for a cohesionless soil stratum at a given depth] with the earthquake-induced cyclic stress ratio (CSR) at that depth from a specified design earthquake (defined by a peak ground surface acceleration and an associated earthquake moment magnitude). CRR is determined as a function of the corrected SPT N-value $(N_1)_{60\text{-}cs}$, adjusted for fines content. The factor of safety against liquefaction is defined as CRR/CSR. Based on Special Publication 117A, a factor of safety of at least 1.3 is required in order to demonstrate that a given soil stratum is non-liquefiable. Additionally, in accordance with Special Publication 117A, clayey soils which do not meet the criteria for liquefiable soils defined by Bray and Sancio (2006), loose soils with a plasticity index (PI) less than 12 and moisture content greater than 85% of the liquid limit, are considered to be insusceptible to liquefaction. Non-sensitive soils with a PI greater than 18 are also considered non-liquefiable.

As part of the liquefaction evaluation, Boring No. B-1 and B-3 were extended to a depth of 50± feet. Boring No. B-1 encountered groundwater at a depth of approximately 39 feet, and Boring No. B-3 did not encounter groundwater. Based on the research discussed in Section 4.2 of this report, a historic high groundwater depth of 25 feet was used for this liquefaction evaluation.

The liquefaction analysis procedure is tabulated on the spreadsheet forms included in Appendix F of this report. The liquefaction analysis was performed for Boring Nos. B-1 and B-3. The liquefaction potential of the site was analyzed utilizing a PGA_M of 0.55g for a magnitude 7 seismic event.

If liquefiable soils are identified, the potential settlements that could occur as a result of liquefaction are evaluated using the equation for volumetric strain due to post-cyclic reconsolidation (Yoshimine et. al, 2006). This procedure uses an empirical relationship between the induced cyclic shear strain and the corrected N-value to evaluate the expected volumetric strain of saturated sands subjected to earthquake shaking. This analysis is also documented on the spreadsheets included in Appendix F.

Conclusions and Recommendations

The liquefaction analysis has identified potentially liquefiable soils at Boring No. B-3. The liquefiable materials are present in two layers between depths of 25½ and 36½± feet. No liquefiable soils were encountered at Boring No. B-1. Soils which are located above the historic high groundwater table, or possess factors of safety in excess of 1.3, are considered non-liquefiable. Settlement analyses were conducted for each of the potentially liquefiable strata.

Based on the settlement analysis (also tabulated on the spreadsheets in Appendix F) a total dynamic (liquefaction induced) settlement of 3.11± inches could be expected at Boring No. B-3. The associated differential settlement is estimated to be on the order of 1.5± inches. The estimated differential settlement could be assumed to occur across a distance of 100 feet, indicating a maximum angular distortion of less than 0.002± inches per inch.

Based on our understanding of the proposed development, it is considered feasible to support the proposed structures on shallow foundations. Such a foundation system can be designed to resist the effects of the anticipated differential settlements, to the extent that the structures would not catastrophically fail. Designing the proposed structures to remain completely undamaged during a seismic event that could occur once every 2475 years (the code-specified return period used in the liquefaction analysis) is not considered to be economically feasible. Based on this understanding, the use of a shallow foundation system is considered to be the most economical means of supporting the proposed structures.

In order to support the proposed structures on shallow foundations (such as spread footings) the structural engineer should verify that the structures would not catastrophically fail due to the predicted dynamic differential settlements. Any utility connections to the structures should be designed to withstand the estimated differential settlements. It should also be noted that minor to moderate repairs, including re-leveling, restoration of utility connections, repair of damaged drywall and stucco, etc., would likely be required after occurrence of the liquefaction-induced settlements.

The use of a shallow foundation system, as described in this report, is typical for buildings of this type, where they are underlain the extent of liquefiable soils encountered at this site. The post-liquefaction damage that could occur within the building proposed for this site will also be typical of similar buildings in the vicinity of this project. However, if the owner determines that this level of potential damage is not acceptable, other geotechnical and structural options are available, including the use of ground improvement or mat foundations.

6.2 Geotechnical Design Considerations

General

The subsurface conditions encountered at the boring locations generally consist of variable strength native alluvium. Near-surface alluvial soils that were likely disturbed by agricultural operations were encountered at each boring location, extending from the ground surface to depths of 2½ to 5± feet. Soil classified as alluvium was encountered beneath these disturbed alluvial soils.

The results of laboratory testing indicate that the near surface alluvium (within the upper 7± feet) possesses a potential for moderate collapse when exposed to moisture infiltration as well as consolidation when exposed to load increases in the range of those that will be exerted by the new foundations. Based on these conditions, remedial grading will be necessary within the proposed building area to provide a subgrade suitable for support of the new foundations and floor slab.

Settlement

The recommended remedial grading will remove the potentially compressible/collapsible near-surface native alluvium, and replace these materials as compacted structural fill. The native soils that will remain in place below the recommended depth of overexcavation will not be subject to significant load increases from the foundations of the new structure. Provided that the recommended remedial grading is completed, the post-construction static settlements of the proposed structure are expected to be within tolerable limits.

Soluble Sulfates

The results of soluble sulfate testing on a selected sample of the on-site soils contain a soluble sulfate concentration that is considered to be not applicable, in accordance with American Concrete Institute (ACI) guidelines. Therefore, specialized concrete mix designs are not considered to be necessary, with regard to sulfate protection purposes. It is, however, recommended that additional soluble sulfate testing be conducted at the completion of rough grading to verify the soluble sulfate concentrations of the soils which are present at pad grade within the building areas.

Expansion

Laboratory testing performed on a representative sample of the near surface soils indicates that these materials possess a low expansion potential (EI = 36). Based on the presence of expansive soils at this site, care should be given to proper moisture conditioning of building pad subgrade soils to a moisture content of 2 to 4 percent above the ASTM D-1557 optimum during site grading. In addition to adequately moisture conditioning the subgrade soils and fill soils during grading, special care must be taken to maintaining moisture content of these soils at 2 to 4 percent above the optimum moisture content prior to foundation and slab construction. This will require the contractor to frequently moisture condition these soils throughout the grading and construction process, unless grading and the construction period occurs during a period of relatively wet weather.

Corrosion Potential

The results of laboratory testing indicate that the tested sample of the on-site soils possesses a saturated resistivity of 2,160 ohm-cm, and a pH value of 7.3. These test results have been evaluated in accordance with guidelines published by the Ductile Iron Pipe Research Association (DIPRA). The DIPRA guidelines consist of a point system by which characteristics of the soils are used to quantify the corrosivity characteristics of the site. Sulfides, and redox potential are factors that are also used in the evaluation procedure. We have evaluated the corrosivity characteristics of the on-site soils using resistivity, pH, and moisture content. Based on these factors, and utilizing the DIPRA procedure, the on-site soils are considered to be mildly corrosive to ductile iron pipe. Therefore, polyethylene encasement or some other appropriate method of protection may be required for iron pipes.

A low concentration of chlorides (11 mg/kg) was detected in the sample submitted for corrosivity testing. In general, soils possessing chloride concentrations in excess of 350 to 500 parts per million (ppm) are considered to be corrosive with respect to steel reinforcement within reinforced concrete. Based on the lack of any significant chlorides in the tested sample, the site is considered to have a C1 chloride exposure in accordance with the American Concrete Institute (ACI) Publication 318 Building Code Requirements for Structural Concrete and Commentary. Therefore, a specialized concrete mix design for reinforced concrete for protection against chloride exposure is not considered warranted.

Nitrates present in soil can be corrosive to copper tubing at concentrations greater than 50 mg/kg. The tested sample possesses a nitrate concentration of 64 mg/kg. **Based on this test result, the on-site soils are considered to be corrosive to copper pipe.**

It should be noted that SCG does not practice in the field of corrosion engineering. Therefore, the client may wish to contact a corrosion engineer to provide a more thorough evaluation.

Shrinkage/Subsidence

Removal and recompaction of the near-surface native fill soils is estimated to result in an average shrinkage of 5 to 15 percent. It should be noted that the potential shrinkage estimate is based on dry density testing performed on small-diameter samples taken at the boring locations. If a more accurate and precise shrinkage estimate is desired, SCG can perform a shrinkage study involving several excavated test-pits where in-place densities are determined using in-situ testing methods instead of laboratory density testing on small-diameter samples. Please contact SCG for details and a cost estimate regarding a shrinkage study, if desired.

Minor ground subsidence is expected to occur in the soils below the zone of removal, due to settlement and machinery working. The subsidence is estimated to be 0.10 feet.

These estimates are based on previous experience and the subsurface conditions encountered at the boring locations. The actual amount of subsidence is expected to be variable and will be dependent on the type of machinery used, repetitions of use, and dynamic effects, all of which are difficult to assess precisely.

Grading and Foundation Plan Review

It is recommended that we be provided with copies of the grading and foundation plans, when they become available, for review with regard to the conclusions, recommendations, and assumptions contained within this report.

6.3 Site Grading Recommendations

The grading recommendations presented below are based on the subsurface conditions encountered at the boring locations and our understanding of the proposed development. We recommend that grading activities be completed in accordance with the Grading Guide Specifications included as Appendix D of this report, unless superseded by site-specific recommendations presented below.

Site Stripping

Initial site preparation should include removal of the surficial vegetation and organic soils. Based on conditions encountered at the time of the subsurface exploration, minor to moderate stripping of the native grass and weed growth is expected to be necessary. These materials should be disposed of offsite. The actual extent of site stripping should be evaluated in the field by the geotechnical engineer, based on the organic content and stability of the encountered materials.

Treatment of Existing Soils: Building Pad

Remedial grading should be performed within the proposed building pad area in order to remove the existing potentially compressible/collapsible native alluvium. It is recommended that the overexcavation extend to a depth of at least 6 feet below existing grade and to a depth of at least 4 feet below proposed grade, whichever is greater. Within the influence zones of the new foundations, the overexcavation should extend to a depth of at least 3 feet below proposed foundation bearing grade.

The overexcavation areas should extend at least 5 feet beyond the building perimeter, and to an extent equal to the depth of fill below the new foundations. If the proposed structure incorporates exterior columns (such as for a canopy or overhang) the area of overexcavation should also encompass these areas.

Following completion of the overexcavation, the subgrade soils within the overexcavation areas should be evaluated by the geotechnical engineer to verify their suitability to serve as the structural fill subgrade, as well as to support the foundation loads of the new structure. This evaluation should include proof rolling and probing to identify soft, loose or otherwise unsuitable soils that need to be removed. Some localized areas of deeper excavation may be required if undocumented fill materials or loose, porous, overly moist, or low density native soils are encountered at the base of the overexcavation.

After a suitable overexcavation subgrade has been achieved, the exposed soils should be scarified to a depth of at least 12 inches and moisture conditioned or air dried to achieve a moisture content of 2 to 4 percent above optimum moisture content. The subgrade soils should then be recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. The building pad areas may then be raised to grade with previously excavated soils or imported, structural fill. Structural fill soils present within the proposed building area should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density.

Treatment of Existing Soils: Retaining Walls and Site Walls

The existing soils within the areas of proposed retaining walls and non-retaining site walls should be overexcavated to a depth of 3 feet below foundation bearing grade and replaced as compacted structural fill as discussed above for the proposed building pad. Undocumented fill soils within these foundation areas should be removed in their entirety. The overexcavation areas should extend at least 5 feet beyond the foundation perimeters, and to an extent equal to the depth of fill below the new foundations. Please note that erection pads used to construct the walls are considered to be part of the foundation system. The overexcavation subgrade soils should be evaluated by the geotechnical engineer prior to scarifying, moisture conditioning, and recompacting the upper 12 inches of exposed subgrade soils. The previously excavated soils may then be replaced as compacted structural fill.

Treatment of Existing Soils: Parking Areas

Based on economic considerations, overexcavation of the surficial alluvial soils in the new parking areas is not considered warranted, with the exception of areas where lower strength or unstable soils are identified by the geotechnical engineer during grading.

Subgrade preparation in the new parking areas should initially consist of removal of soils disturbed during stripping operations. The geotechnical engineer should then evaluate the subgrade to identify areas of additional unsuitable soils. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 2 to 4 percent above optimum, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength alluvial soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength or density, unsuitable soils.

The grading recommendations presented above for the proposed parking and drive areas assume that the owner and/or developer can tolerate minor amounts of settlement within the proposed parking areas. The grading recommendations presented above do not completely mitigate the extent of existing collapsible and compressible alluvium in the parking areas. As such, settlement and associated pavement distress could occur. Typically, repair of such distressed areas involves significantly lower costs than completely mitigating these soils at the time of construction. If the owner cannot tolerate the risk of such settlements, the parking and drive areas should be overexcavated to a depth of 2 feet below proposed pavement subgrade elevation, with the resulting soils replaced as compacted structural fill.

Treatment of Existing Soils: Flatwork Areas

Subgrade preparation in the new flatwork areas should initially consist of removal of soils disturbed during stripping and demolition operations. The geotechnical engineer should then evaluate the subgrade to identify areas of additional unsuitable soils. The subgrade soils should then be scarified to a depth of 12± inches, moisture conditioned to 2 to 4 percent above optimum, and recompacted to at least 90 percent of the ASTM D-1557 maximum dry density. Based on the presence of variable strength alluvial soils throughout the site, it is expected that some isolated areas of additional overexcavation may be required to remove zones of lower strength, unsuitable soils.

Fill Placement

- Fill soils should be placed in thin (6± inches), near-horizontal lifts, moisture conditioned to 2 to 4 percent above the optimum moisture content, and compacted.
- On-site soils may be used for fill provided they are cleaned of any debris to the satisfaction of the geotechnical engineer. Grading and fill placement activities should be completed in general accordance with the requirements of the CBC and the grading code of the City of Perris.
- Fill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. Fill soils should be well mixed to provide a uniform moisture content and consistency.
- Compaction tests should be performed periodically by the geotechnical engineer as random verification of compaction and moisture content. These tests are intended to aid the contractor. Since the tests are taken at discrete locations and depths, they may not be indicative of the entire fill and therefore should not relieve the contractor of his responsibility to meet the job specifications.

Imported Structural Fill

Imported structural fill should consist of very low expansive (EI < 20), well graded soils possessing at least 10 percent fines (that portion of the sample passing the No. 200 sieve). Additional specifications for structural fill are presented in the Grading Guide Specifications, included as Appendix D.

Utility Trench Backfill

In general, utility trench backfill soils should be compacted to at least 90 percent of the ASTM D-1557 maximum dry density. As an alternative, a clean sand (minimum Sand Equivalent of 30) may be placed within trenches and compacted in place (jetting or flooding is not recommended). Compacted trench backfill should conform to the requirements of the local grading code, and more restrictive requirements may be indicated by the City of Perris. Utility trench backfills should be observed by the geotechnical engineer. The trench backfill soils should be compaction tested where possible; probed and visually evaluated elsewhere.

Utility trenches which parallel a footing, and extending below a 1h:1v plane projected from the outside edge of the footing should be backfilled with structural fill soils, compacted to at least 90 percent of the ASTM D-1557 standard. Pea gravel backfill should not be used for these trenches.

6.4 Construction Considerations

Excavation Considerations

The near surface soils generally consist of moderate strength silty to clayey fine sands and fine sandy silts with varying minor clay content. These materials may be subject to minor caving within shallow excavations. Where caving occurs within shallow excavations, flattened excavation slopes may be sufficient to provide excavation stability. On a preliminary basis, the inclination of temporary slopes should not exceed 2h:1v for sands and 1.5h:1v for clay or silt, or the Cal-OSHA excavation guidelines for the type of soil encountered. Deeper excavations may require some form of external stabilization such as shoring or bracing or flattened/stepped excavations. Maintaining adequate moisture content within the near-surface soils will improve excavation stability. Excavation activities on this site should be conducted in accordance with Cal-OSHA regulations.

Moisture Sensitive Subgrade Soils

Most of the near surface soils possess appreciable silt and clay content and may become unstable if exposed to significant moisture infiltration or disturbance by construction traffic. In addition, based on their granular content, some of the on-site soils will also be susceptible to erosion. The site should, therefore, be graded to prevent ponding of surface water and to prevent water from running into excavations.

Groundwater

The static groundwater table is considered to exist at a depth in excess of 25± feet below existing grade. Therefore, groundwater is not expected to impact the proposed grading or foundation construction activities.

6.5 Foundation Design and Construction

Based on the preceding grading recommendations, it is assumed that the new building pad will be underlain by newly placed structural fill soils extending to depths of at least 3 feet below foundation bearing grade. Based on this subsurface profile, the proposed structure may be supported on conventional shallow foundations.

Foundation Design Parameters

New square and rectangular footings may be designed as follows:

- Maximum, net allowable soil bearing pressure: 2,500 lbs/ft^2.
- Minimum wall/column footing width: 14 inches/24 inches.
- Minimum longitudinal steel reinforcement within strip footings: Four (4) No. 5 rebars (2 top and 2 bottom).

- Minimum foundation embedment: 12 inches into suitable structural fill soils, and at least 18 inches below the lowest adjacent exterior grade. Interior column footings may be placed immediately beneath the floor slab.

- It is recommended that the perimeter building foundations be continuous across exterior doorways. Flatwork adjacent to the exterior doors should be doweled into the perimeter foundations in a manner determined by the structural engineer.

The allowable bearing pressures presented above may be increased by 1/3 when considering short duration wind or seismic loads. The minimum steel reinforcement recommended above is based on standard geotechnical practice. Additional rigidity may be necessary for structural considerations. The actual design of the foundations should be determined by the structural engineer.

Foundation Construction

The foundation subgrade soils should be evaluated at the time of overexcavation, as discussed in Section 6.3 of this report. It is further recommended that the foundation subgrade soils be evaluated by the geotechnical engineer immediately prior to steel or concrete placement. Soils suitable for direct foundation support should consist of newly placed structural fill compacted at least 90 percent of the ASTM D-1557 maximum dry density. Unsuitable materials should be removed to a depth of suitable bearing compacted structural fill, with the resulting excavations backfilled with compacted fill soils. As an alternative, lean concrete slurry (500 to 1,500 psi) may be used to backfill such isolated overexcavations.

The foundation subgrade soils should also be properly moisture conditioned to 2 to 4 percent above the Modified Proctor optimum, to a depth of at least 12 inches below bearing grade. Since it is typically not feasible to increase the moisture content of the floor slab and foundation subgrade soils once rough grading has been completed, care should be taken to maintain the moisture content of the building pad subgrade soils throughout the construction process.

Estimated Foundation Settlements

Post-construction total and differential static settlements of shallow foundations designed and constructed in accordance with the previously presented recommendations are estimated to be less than 1.0 and 0.5 inches, respectively. Differential movements are expected to occur over a 30-foot span, thereby resulting in an angular distortion of less than 0.002 inches per inch.

Lateral Load Resistance

Lateral load resistance will be developed by a combination of friction acting at the base of foundations and slab and the passive earth pressure developed by footings below grade. The following friction and passive pressure may be used to resist lateral forces:

- Passive Earth Pressure: 300 lbs/ft^3
- Friction Coefficient: 0.30

These are allowable values, and include a factor of safety. When combining friction and passive resistance, the passive pressure component should be reduced by one-third. These values assume that footings will be poured directly against compacted structural fill soils. The maximum allowable passive pressure is 2,500 lbs/ft^2.

6.6 Floor Slab Design and Construction

Subgrades which will support the new floor slab should be prepared in accordance with the recommendations contained in the ***Site Grading Recommendations*** section of this report. Based on the anticipated grading which will occur at this site, the floor of the proposed structure may be constructed as a conventional slab-on-grade supported on newly placed structural fill, extending to a depth of at least 4 feet below finished pad grade. Based on geotechnical considerations, the floor slab may be designed as follows:

- Minimum slab thickness: 6 inches.
- Modulus of Subgrade Reaction: 150 lbs/in^3.
- Minimum slab reinforcement: Floor slab thickness and reinforcement should be evaluated and designed by the structural engineer based on the design loading conditions, potential slab uses and anticipated geotechnical soil conditions that will be present after grading.
- Slab underlayment: If moisture sensitive floor coverings will be used then minimum slab underlayment should consist of a moisture vapor barrier constructed below the entire slab area where such moisture sensitive floor coverings are expected. The moisture vapor barrier should meet or exceed the Class A rating as defined by ASTM E 1745-97 and have a permeance rating less than 0.01 perms as described in ASTM E 96-95 and ASTM E 154-88. A polyolefin material such as Stego® Wrap Vapor Barrier or equivalent will meet these specifications. The moisture vapor barrier should be properly constructed in accordance with applicable manufacturer specifications. Given that a rock free subgrade is anticipated and that a capillary break is not required, sand below the barrier is not required. The need for sand and/or the amount of sand above the moisture vapor barrier should be specified by the structural engineer or concrete contractor. The selection of sand above the barrier is not a geotechnical engineering design consideration and hence outside our purview. Where moisture sensitive floor coverings are not anticipated and potential moisture transmission through the slab is acceptable, the vapor barrier may be eliminated.
- Moisture conditions the floor slab subgrade soils to 2 to 4 percent above the Modified Proctor optimum moisture content, to a depth of 12 inches. The moisture content of the floor slab subgrade soils should be verified by the geotechnical engineer within 24 hours prior to concrete placement.
- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.

6.7 Exterior Flatwork Design and Construction

Subgrades which will support new exterior slabs-on-grade for sidewalks, patios, and other concrete flatwork, should be prepared in accordance with the recommendations contained in the ***Grading Recommendations*** section of this report. Based on geotechnical considerations, exterior slabs on grade may be designed as follows:

- Minimum slab thickness: 4½ inches.
- Minimum slab reinforcement: No. 3 bars at 18 inches on center, in both directions.
- The flatwork at building entry areas should be structurally connected to the perimeter foundation that is recommended to span across the door opening. This recommendation is designed to reduce the potential for differential movement at this joint.
- Moisture condition the slab subgrade soils to at least 2 to 4 percent of optimum moisture content, to a depth of at least 12 inches. Adequate moisture conditioning should be verified by the geotechnical engineer 24 hours prior to concrete placement.
- Proper concrete curing techniques should be utilized to reduce the potential for slab curling or the formation of excessive shrinkage cracks.
- Control joints should be provided at a maximum spacing of 8 feet on center in two directions for slabs and at 6 feet on center for sidewalks. Control joints are intended to direct cracking. Minor cracking of exterior concrete slabs on grade should be expected.

Expansion or felt joints should be used at the interface of exterior slabs on grade and any fixed structures to allow relative movement.

6.8 Retaining Wall Design and Construction

Although not indicated on the site plan, some small (less than 6 feet in height) retaining walls may be required to facilitate the new site grades and in the loading dock areas. The parameters recommended for use in the design of these walls are presented below.

Retaining Wall Design Parameters

Based on the soil conditions encountered at the boring locations, the following parameters may be used in the design of new retaining walls for this site. The following parameters assume that on-site soils will be utilized for retaining wall backfill. The near surface soils generally consist of clayey sands, silty sand and sandy silt with varying clay content. Based on their composition, the on-site soils have been assigned a design friction angle of 30 degrees.

If desired, SCG could provide design parameters for an alternative select backfill material behind the retaining walls. The use of select backfill material could result in lower lateral earth pressures. In order to use the design parameters for an imported select fill, this material must be placed within the entire active failure wedge. This wedge is defined as extending from the heel of the retaining wall upwards at an angle of approximately 60° from horizontal. If select backfill material behind the retaining wall is desired, SCG should be contacted for supplementary recommendations.

RETAINING WALL DESIGN PARAMETERS

Design Parameter		Soil Type: On-site Clayey Sand, Silty Sands and Sandy Silts
Internal Friction Angle (ϕ)		30°
Unit Weight		135 lbs/ft³
Equivalent Fluid Pressure:	Active Condition (level backfill)	45 lbs/ft³
	Active Condition (2h:1v backfill)	73 lbs/ft³
	At-Rest Condition (level backfill)	68 lbs/ft³

The walls should be designed using a soil-footing coefficient of friction of 0.30 and an equivalent passive pressure of 300 lbs/ft³. The structural engineer should incorporate appropriate factors of safety in the design of the retaining walls.

The active earth pressure may be used for the design of retaining walls that do not directly support structures or support soils that in turn support structures and which will be allowed to deflect. The at-rest earth pressure should be used for walls that will not be allowed to deflect such as those which will support foundation bearing soils, or which will support foundation loads directly.

Where the soils on the toe side of the retaining wall are not covered by a "hard" surface such as a structure or pavement, the upper 1 foot of soil should be neglected when calculating passive resistance due to the potential for the material to become disturbed or degraded during the life of the structure.

Seismic Lateral Earth Pressures

In accordance with the 2019 CBC, retaining walls more than 6 feet in height must be designed for seismic lateral earth pressures. If walls 6 feet or more are required for this site, the geotechnical engineer should be contacted for supplementary seismic lateral earth pressure recommendations.

Retaining Wall Foundation Design

The retaining wall foundations should be supported within newly placed compacted structural fill, extending to a depth of at least 3 feet below proposed foundation bearing grade. Foundations to support new retaining walls should be designed in accordance with the general Foundation Design Parameters presented in a previous section of this report.

Backfill Material

On-site soils may be used to backfill the retaining walls pending field review and approval by the geotechnical engineer. Backfill material placed within 3 feet of the back wall face should have a particle size no greater than 3 inches and should not consist of clay soil. The retaining wall backfill materials should be generally well graded.

It is recommended that a minimum 1 foot thick layer of free-draining granular material (less than 5 percent passing the No. 200 sieve) be placed against the face of the retaining walls. This material should extend from the top of the retaining wall footing to within 1 foot of the ground surface on the back side of the retaining wall. This material should be approved by the geotechnical engineer. In lieu of the 1 foot thick layer of free-draining material, a properly installed prefabricated drainage composite such as the MiraDRAIN 6000XL (or approved equivalent), which is specifically designed for use behind retaining walls, may be used. If the layer of free-draining material is not covered by an impermeable surface, such as a structure or pavement, a 12-inch thick layer of a low permeability soil should be placed over the backfill to reduce surface water migration to the underlying soils. The layer of free draining granular material should be separated from the backfill soils by a suitable geotextile, approved by the geotechnical engineer.

Retaining wall backfill should be placed and compacted under engineering controlled conditions in the necessary layer thicknesses to obtain an in-place density between 90 and 93 percent of the maximum dry density as evaluated by the Modified Proctor test (ASTM D1557). Care should be taken to avoid over-compaction of the soils behind the retaining walls, and the use of heavy compaction equipment should be avoided.

Subsurface Drainage

As previously indicated, the retaining wall design parameters are based upon drained backfill conditions. Consequently, some form of permanent drainage system will be necessary in conjunction with the appropriate backfill material. Subsurface drainage may consist of either:

- A weep hole drainage system typically consisting of a series of 2-inch diameter holes in the wall situated slightly above the ground surface elevation on the exposed side of the wall and at an approximate 10-foot on-center spacing. Alternatively, 4-inch diameter holes at an approximate 20-foot on-center spacing can be used for this type of drainage system. In addition, the weep holes should include a 2 cubic foot pocket of open graded gravel, surrounded by an approved geotextile fabric, at each weep hole location.

- A 4-inch diameter perforated pipe surrounded by 2 cubic feet of gravel per linear foot of drain placed behind the wall, above the retaining wall footing. The gravel layer should be wrapped in a suitable geotextile fabric to reduce the potential for migration of fines. The footing drain should be extended to daylight or tied into a storm drainage system. The actual design of this type of system should be designed by the civil engineer to provide a drainage system that possesses adequate capacity and slope for its intended use.

6.9 Pavement Design Parameters

Site preparation in the pavement area should be completed as previously recommended in the ***Site Grading Recommendations*** section of this report. The subsequent pavement recommendations assume proper drainage and construction monitoring, and are based on either PCA or CALTRANS design parameters for a twenty (20) year design period. However, these designs also assume a routine pavement maintenance program is implemented to obtain the anticipated 20-year pavement service life.

Pavement Subgrades

It is anticipated that the new pavements will be primarily supported on a layer of compacted structural fill, consisting of scarified, thoroughly moisture conditioned and recompacted existing soils. The near surface soils generally consist of sandy clay, silty sands and sandy silts with varying clay content. These soils are generally considered to possess fair pavement support characteristics with an estimated R-value of 30. R-value testing was outside the scope of services. The subsequent pavement design is therefore based upon an assumed R-value of 30.

Fill material imported to the site should have support characteristics equal to or greater than that of the on-site soils and be placed and compacted under engineering controlled conditions. It is recommended that R-value testing be performed after completion of rough grading to confirm that the estimated design value used is appropriate. Depending upon the results of the R-value testing, it may be feasible to use thinner pavement sections in some areas of the site.

Asphaltic Concrete

Presented below are the recommended thicknesses for new flexible pavement structures consisting of asphaltic concrete over a granular base. The pavement designs are based on the traffic indices (TI's) indicated. The client and/or civil engineer should verify that these TI's are representative of the anticipated traffic volumes. If the client and/or civil engineer determine that the expected traffic volume will exceed the applicable traffic index, we should be contacted for supplementary recommendations. The design traffic indices equate to the following approximate daily traffic volumes over a 20-year design life, assuming six operational traffic days per week.

Traffic Index	No. of Heavy Trucks per Day
4.0	0
5.0	1
6.0	3
7.0	11
8.0	35
9.0	93

For the purpose of the traffic volumes indicated above, a truck is defined as a 5-axle tractor trailer unit with one 8-kip axle and two 32-kip tandem axles. The traffic indices above allow for 1,000 automobiles per day.

ASPHALT PAVEMENTS (R = 30)					
Materials	Thickness (inches)				
	Auto Parking and Auto Drive Lanes (TI = 4.0 to 5.0)	Truck Traffic			
		TI = 6.0	TI = 7.0	TI = 8.0	TI = 9.0
Asphalt Concrete	3	3½	4	5	5½
Aggregate Base	6	8	10	11	13
Compacted Subgrade	12	12	12	12	12

The aggregate base course should be compacted to at least 95 percent of the ASTM D-1557 maximum dry density. The asphaltic concrete should be compacted to at least 95 percent of the Marshall maximum density, as evaluated by ASTM D-2726. The aggregate base course may consist of crushed aggregate base (CAB) or crushed miscellaneous base (CMB), which is a recycled gravel, asphalt and concrete material. The gradation, R-Value, Sand Equivalent, and Percentage Wear of the CAB or CMB should comply with appropriate specifications contained in the current edition of the "Greenbook" Standard Specifications for Public Works Construction or local agency requirements.

Portland Cement Concrete

The preparation of the subgrade soils within concrete pavement areas should be performed as previously described for proposed asphalt pavement areas. The minimum recommended thicknesses for the Portland Cement Concrete pavement sections are as follows:

PORTLAND CEMENT CONCRETE PAVEMENTS (R = 30)				
Materials	Thickness (inches)			
	Autos and Light Truck Traffic (TI = 5.0 to 6.0)	Truck Traffic		
		TI = 7.0	TI = 8.0	TI = 9.0
PCC	5	5½	6½	8
Compacted Subgrade (95% minimum compaction)	12	12	12	12

The concrete should have a 28-day compressive strength of at least 3,000 psi. Recommendations for reinforcement within the PCC pavements should be deferred to the project structural engineer. The maximum joint spacing within the PCC pavements is recommended to be equal to or less than 30 times the pavement thickness, or as specified by the project structural engineer.

7.0 GENERAL COMMENTS

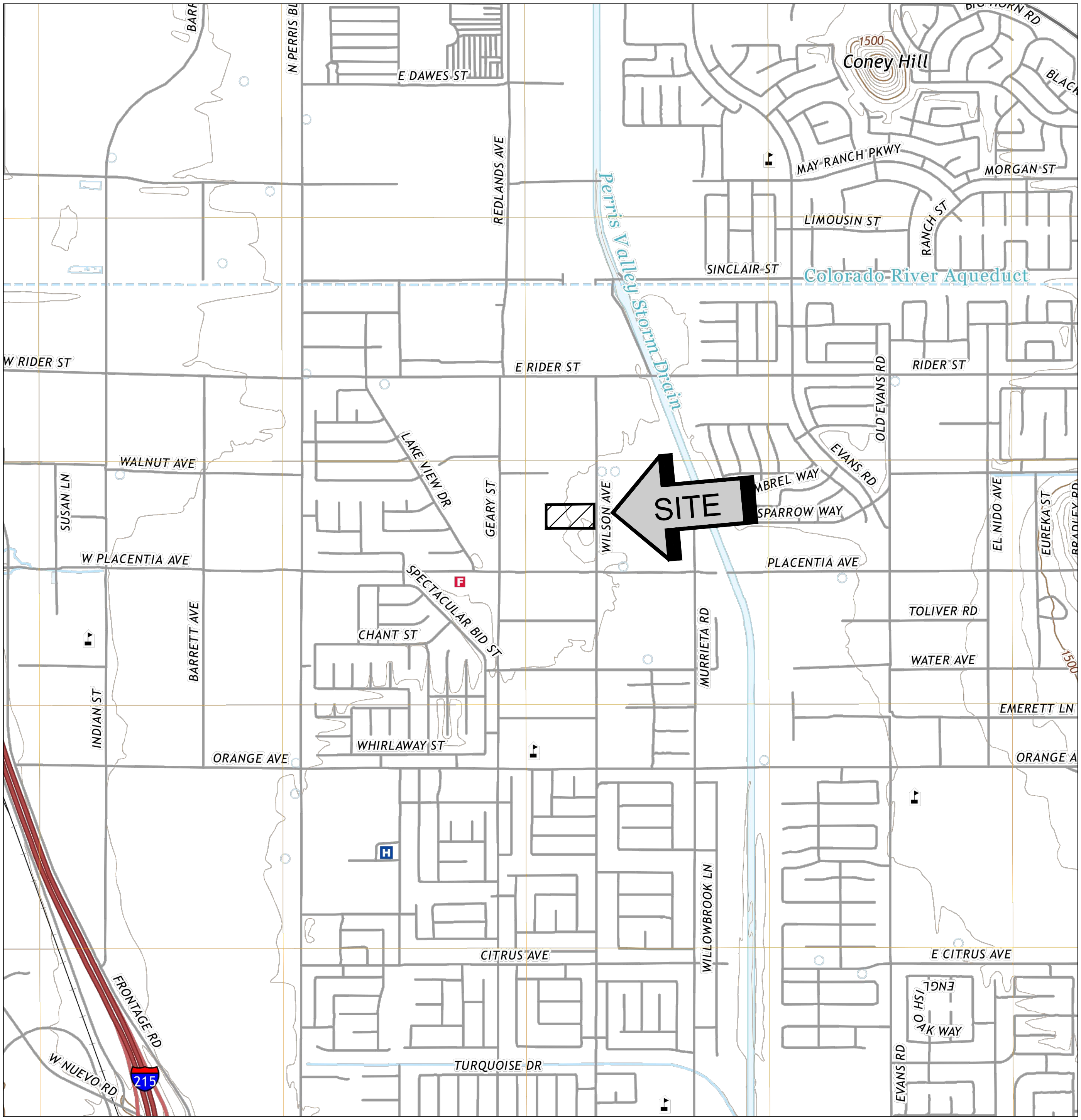
This report has been prepared as an instrument of service for use by the client, in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, civil engineer, and/or structural engineer. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The client(s)' reliance upon this report is subject to the Engineering Services Agreement, incorporated into our proposal for this project.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and sample depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted.

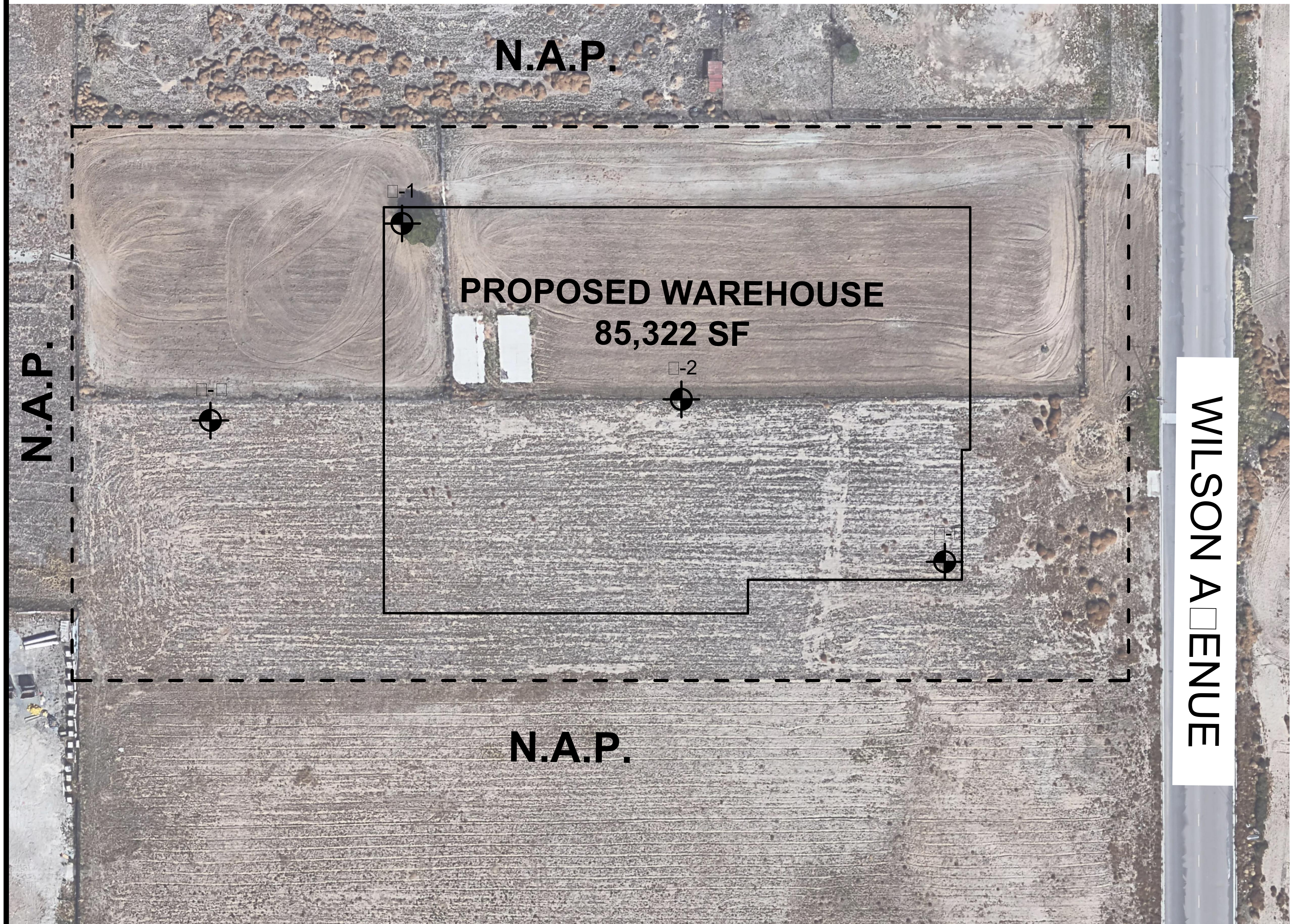
The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

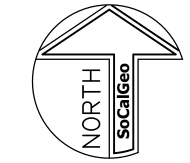
APPENDIX A



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 201□.

SITE LOCATION MAP	
PROPOSED WAREHOUSE	
PERRIS, CALIFORNIA	
SCALE: 1" = 2000'	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: MD CHKD: RGT	
SCG PROJECT 22G102-1	
PLATE 1	





GEOTECHNICAL LEGEND

APPRO□IMATE □ORING LOCATION

PROPOSED WAREHOUSE OUTLINE

PROPERT□ LINE

NOTE: CONCEPTUAL SITE PLAN PREPARED □□ RGA ARCHITECTS.
AERIAL PHOTOGRAPH O□TAINED FROM GOOGLE EARTH.

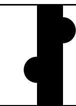
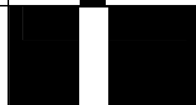
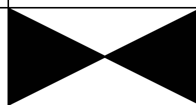
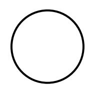
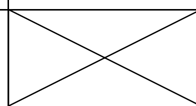
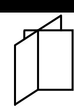
BORING LOCATION PLAN
PROPOSED WAREHOUSE
PERRIS, CALIFORNIA

SCALE: 1" □ □0□
DRAWN: MD
CHKD: EA
SCG PROJECT 22G102-1
PLATE 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX B

BORING LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH: Distance in feet below the ground surface.

SAMPLE: Sample Type as depicted above.

BLOW COUNT: Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3” indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.

POCKET PEN.: Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.

GRAPHIC LOG: Graphic Soil Symbol as depicted on the following page.

DRY DENSITY: Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.

MOISTURE CONTENT: Moisture content of a soil sample, expressed as a percentage of the dry weight.

LIQUID LIMIT: The moisture content above which a soil behaves as a liquid.

PLASTIC LIMIT: The moisture content above which a soil behaves as a plastic.

PASSING #200 SIEVE: The percentage of the sample finer than the #200 standard sieve.

UNCONFINED SHEAR: The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 22G102-1
PROJECT: Proposed Warehouse
LOCATION: Perris, California

DRILLING DATE: 1/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Caleb Brackett

WATER DEPTH: 39 feet
CAVE DEPTH: N/A
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					DISTURBED ALLUVIUM: Gray Brown, fine to medium Sandy Silt, medium dense-damp							
	X	24				101	10					
					ALLUVIUM: Brown Silty fine Sand, trace medium Sand, trace Calcareous nodules, medium dense to dense-damp							
	X	42				110	6					
5	X	53				99	5					
					Light Brown fine Sandy Silt, trace to little Clay, trace Calcareous nodules, dense-damp							
	X	56				116	12					
					Light Gray Brown Clayey Silt, trace to little fine Sand, hard-damp							
	X	50/6"	4.5			115	9					
10												
					Light Brown Clayey fine Sand, trace Silt, medium dense-moist							
	X	19					16					
15												
					Brown fine Sandy Silt, trace Clay, dense-damp to moist							
	X	36					14					
20												
					Brown Clayey fine Sand, trace to little Silt, dense-damp							
	X	35					13					
25												
					Brown Silty fine Sand to fine Sandy Silt, trace Clay, Calcareous nodules, dense-moist							
	X	39					16					

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-1

JOB NO.: 22G102-1	DRILLING DATE: 1/21/22	WATER DEPTH: 39 feet
PROJECT: Proposed Warehouse	DRILLING METHOD: Hollow Stem Auger	CAVE DEPTH: N/A
LOCATION: Perris, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (Continued)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					Brown Silty fine Sand to fine Sandy Silt, trace Clay, Calcareous nodules, dense-moist							
					Brown Silty fine Sand to Clayey fine Sand, medium dense-damp							
	X	27					14			47		
35												
					Brown Clayey fine to medium Sand, trace Calcareous veining, medium dense-moist							
	X	27			▽		15			35		
40												
	X	23			@ 43½-50 feet, wet		15			28		
45												
					Red Brown fine to coarse Sand, little Clay, dense-wet							
	X	46					12					
50												
					Boring Terminated at 50'							

BORING NO. B-2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G102-1
PROJECT: Proposed Warehouse
LOCATION: Perris, California

DRILLING DATE: 1/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Caleb Brackett

WATER DEPTH: Dry
CAVE DEPTH: 13 feet
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					DISTURBED ALLUVIUM: Gray Brown fine Sandy Silt, trace Clay, medium dense-damp							
	X	36					11					
	X	17					8					
5					ALLUVIUM: Light Brown fine Sandy Silt, trace to little Clay, medium dense-moist							
	X	40					17					
	X	22					27					
					@ 9 feet, Calareous veining, very moist							
10					Reddish Brown fine Sandy Silt, trace Clay, medium dense-moist							
	X	31					17					
15												
					Red Brown fine Sandy Silt, little Clay, medium dense-damp to moist							
	X	33					15					
20					Boring Terminated at 20'							

TBL 22G102-1.GPJ SOCALGEO.GDT 2/21/22

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 22G102-1
PROJECT: Proposed Warehouse
LOCATION: Perris, California

DRILLING DATE: 1/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Caleb Brackett

WATER DEPTH: Dry
CAVE DEPTH: 17 feet
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: --- MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
		35			DISTURBED ALLUVIUM: Brown Clayey fine Sand, trace to little Silt, trace medium Sand, trace fine Root Fibers, medium dense-damp	108	12					EI = 36 @ 0-5'
		54			ALLUVIUM: Gray Brown Silt, trace Clay, trace to little fine Sand, dense-moist	80	16					
5		47			Brown fine to medium Silty Sand, trace Clay, dense-dry	117	3					
		31			Gray Brown Clayey Silt, trace to little fine Sand, very stiff to hard-damp	96	9					
10		38	4.5			98	10					
		20			Brown Silty fine to medium Sand, trace to little Clay, medium dense-damp		9					
15												
		50/6"			Brown Silty fine Sand, trace Clay, medium dense to very dense-damp to moist		15					
20												
		24					12			44		
25												
		10	2.5		Brown Silty Clay, little to some fine Sand, Calcareous veining, medium stiff-moist		20	23	22	57		

TBL 22G102-1.GPJ SOCALGEO.GDT 2/21/22

TEST BORING LOG

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-3

JOB NO.: 22G102-1
PROJECT: Proposed Warehouse
LOCATION: Perris, California

DRILLING DATE: 1/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Caleb Brackett

WATER DEPTH: Dry
CAVE DEPTH: 17 feet
READING TAKEN: At Completion

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION (Continued)	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					Brown Clayey fine Sand, trace to little Silt, medium stiff-moist							
	X	13					17	21	17	45		
35												
					Red Brown Silty fine to medium Sand, trace Clay, medium dense-damp to moist							
	X	20					14			25		
40												
	X	21	3.0		Brown fine Sandy Clay to Sandy Silt, medium dense-moist to very moist		18			54		
45												
					Brown Silty fine Sand, dense-moist to very moist							
	X	32					15					
50												
					Boring Terminated at 50'							

TBL 22G102-1.GPJ SOCALGEO.GDT 2/21/22

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

BORING NO. B-4

JOB NO.: 22G102-1
PROJECT: Proposed Warehouse
LOCATION: Perris, California

DRILLING DATE: 1/21/22
DRILLING METHOD: Hollow Stem Auger
LOGGED BY: Caleb Brackett

WATER DEPTH: Dry
CAVE DEPTH: 13 feet
READING TAKEN: At Completion

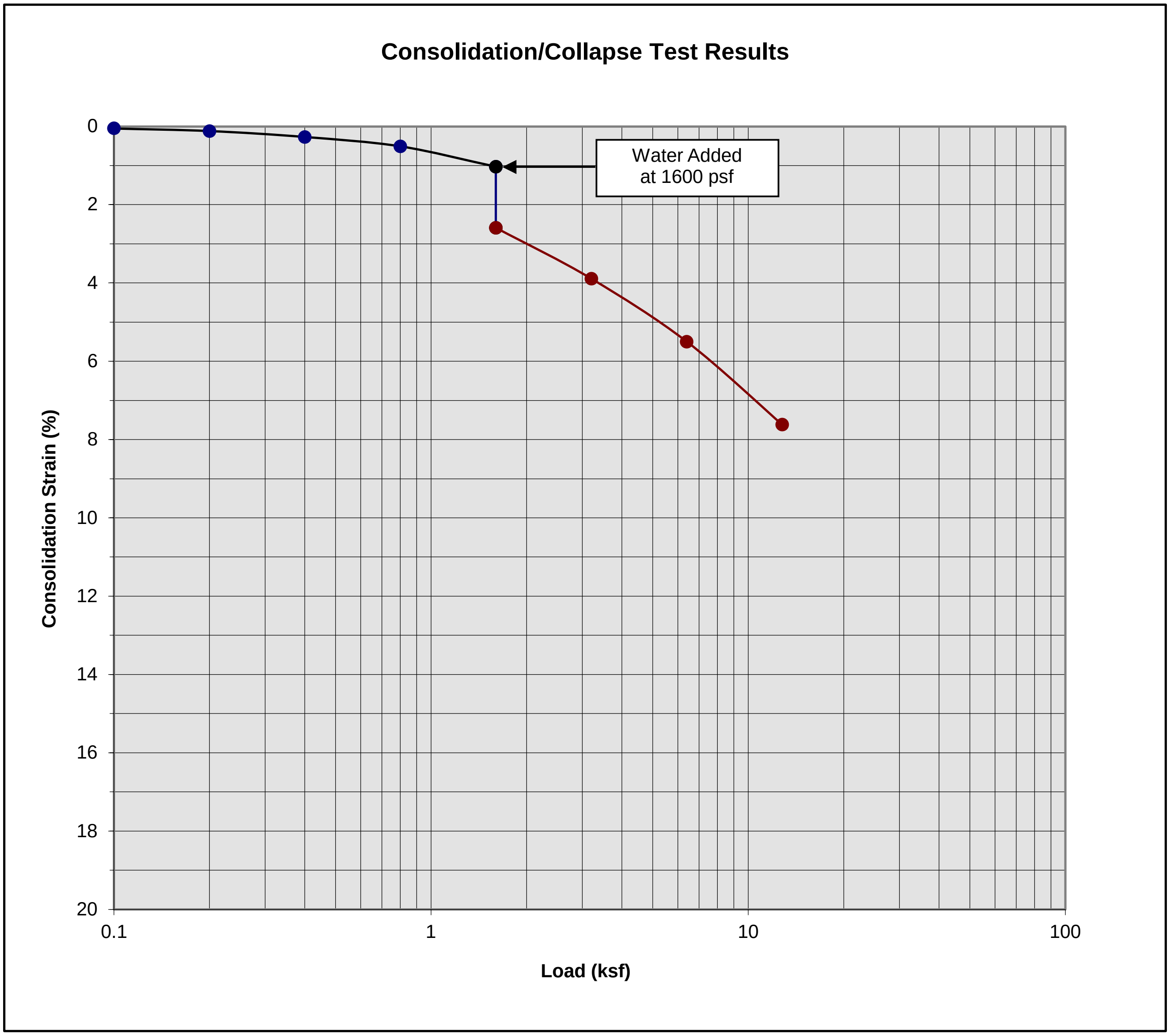
SURFACE ELEVATION: --- MSL

DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					DISTURBED ALLUVIUM: Brown Silty fine Sand, trace Clay, trace medium Sand, trace fine Root Fibers, dense-damp							
	X	31					6					
					ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, dense-damp							
	X	36					6					
5					Light Brown fine Sandy Silt, trace Clay, dense-damp to moist							
	X	31					15					
					Light Brown fine Sandy Silt, trace Clay, Calcareous nodules, medium dense-very moist							
	X	24					26					
10					Brown fine Sandy Silt, trace Clay, Calcareous nodules, medium dense-damp							
	X	21					12					
15												
	X	26					11					
20												
					Boring Terminated at 20'							

TBL 22G102-1.GPJ SOCALGEO.GDT 2/21/22

TEST BORING LOG

APPENDIX C

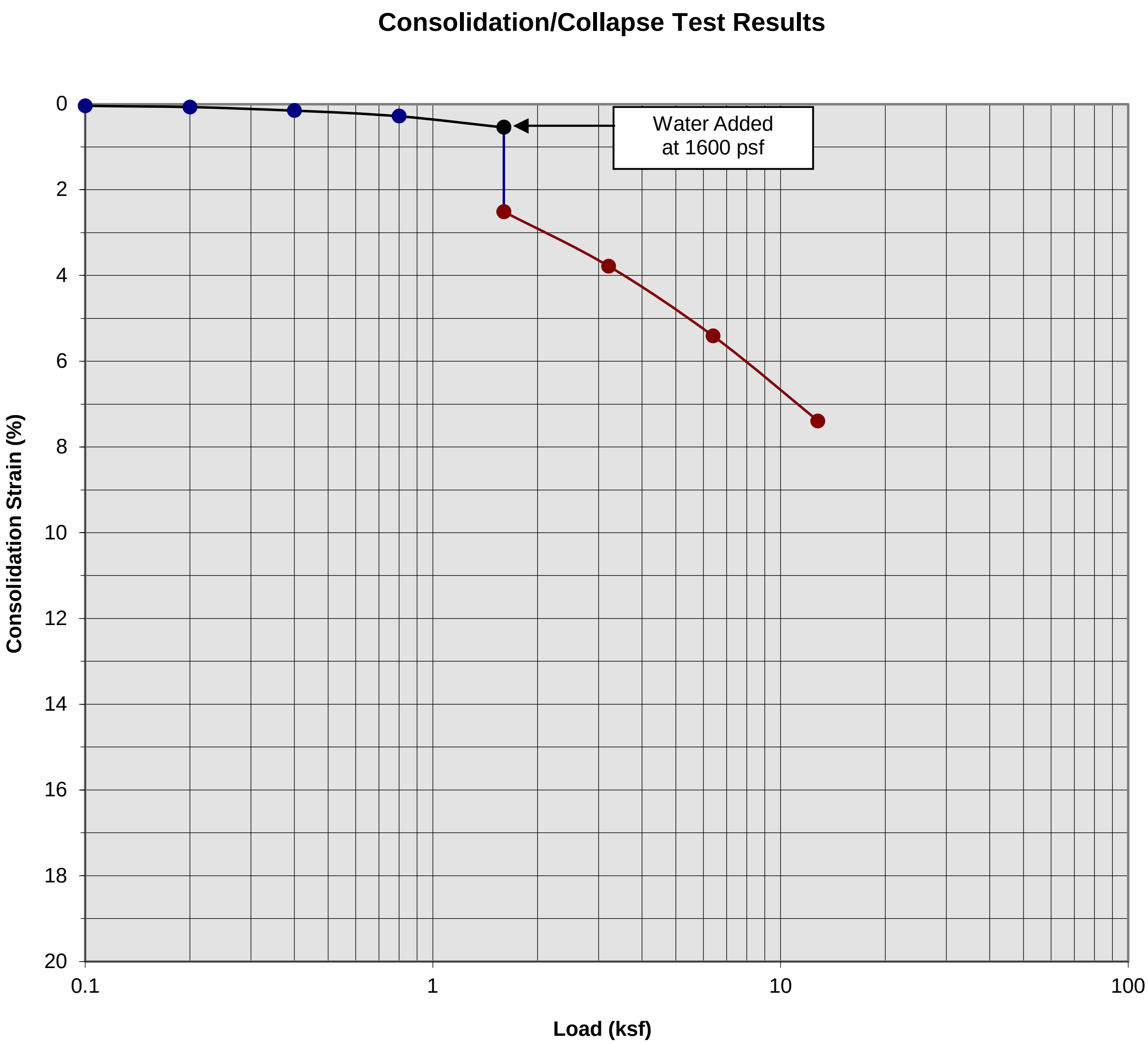


Classification: Gray Brown Silt, trace Clay, trace to little fine Sand

Boring Number:	B-3	Initial Moisture Content (%)	15
Sample Number:	---	Final Moisture Content (%)	36
Depth (ft)	3 to 4	Initial Dry Density (pcf)	84.8
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	91.1
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.56

Proposed Warehouse
Perris, California
Project No. 22G102
PLATE C- 1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

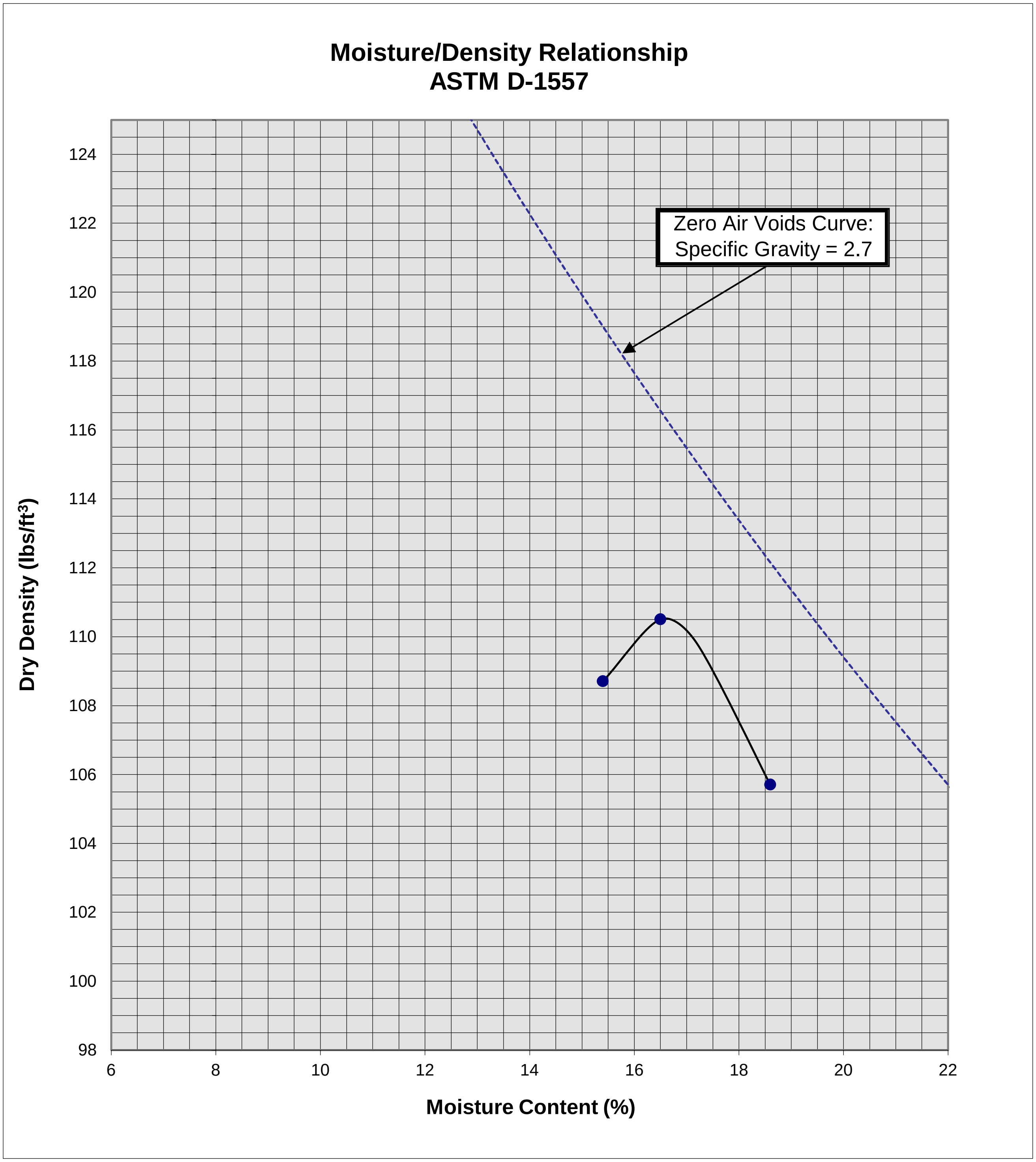


Classification: Brown fine to medium Silty Sand, trace Clay

Boring Number:	B-3	Initial Moisture Content (%)	4
Sample Number:	---	Final Moisture Content (%)	13
Depth (ft)	5 to 6	Initial Dry Density (pcf)	117.3
Specimen Diameter (in)	2.4	Final Dry Density (pcf)	125.9
Specimen Thickness (in)	1.0	Percent Collapse (%)	1.97

Proposed Warehouse
Perris, California
Project No. 22G102
PLATE C- 2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation



Soil ID Number	B-3 @ 0-5'
Optimum Moisture (%)	16.5
Maximum Dry Density (pcf)	110.5
Soil Classification	Brown Clayey fine Sand, trace to little Silt, trace medium Sand

Proposed Warehouse
Perris, California
Project No. 22G102-1
PLATE C-3

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

APPENDIX D

GRADING GUIDE SPECIFICATIONS

These grading guide specifications are intended to provide typical procedures for grading operations. They are intended to supplement the recommendations contained in the geotechnical investigation report for this project. Should the recommendations in the geotechnical investigation report conflict with the grading guide specifications, the more site specific recommendations in the geotechnical investigation report will govern.

General

- The Earthwork Contractor is responsible for the satisfactory completion of all earthwork in accordance with the plans and geotechnical reports, and in accordance with city, county, and applicable building codes.

- The Geotechnical Engineer is the representative of the Owner/Builder for the purpose of implementing the report recommendations and guidelines. These duties are not intended to relieve the Earthwork Contractor of any responsibility to perform in a workman-like manner, nor is the Geotechnical Engineer to direct the grading equipment or personnel employed by the Contractor.

- The Earthwork Contractor is required to notify the Geotechnical Engineer of the anticipated work and schedule so that testing and inspections can be provided. If necessary, work may be stopped and redone if personnel have not been scheduled in advance.

- The Earthwork Contractor is required to have suitable and sufficient equipment on the job-site to process, moisture condition, mix and compact the amount of fill being placed to the approved compaction. In addition, suitable support equipment should be available to conform with recommendations and guidelines in this report.

- Canyon cleanouts, overexcavation areas, processed ground to receive fill, key excavations, subdrains and benches should be observed by the Geotechnical Engineer prior to placement of any fill. It is the Earthwork Contractor's responsibility to notify the Geotechnical Engineer of areas that are ready for inspection.

- Excavation, filling, and subgrade preparation should be performed in a manner and sequence that will provide drainage at all times and proper control of erosion. Precipitation, springs, and seepage water encountered shall be pumped or drained to provide a suitable working surface. The Geotechnical Engineer must be informed of springs or water seepage encountered during grading or foundation construction for possible revision to the recommended construction procedures and/or installation of subdrains.

Site Preparation

- The Earthwork Contractor is responsible for all clearing, grubbing, stripping and site preparation for the project in accordance with the recommendations of the Geotechnical Engineer.

- If any materials or areas are encountered by the Earthwork Contractor which are suspected of having toxic or environmentally sensitive contamination, the Geotechnical Engineer and Owner/Builder should be notified immediately.

- Major vegetation should be stripped and disposed of off-site. This includes trees, brush, heavy grasses and any materials considered unsuitable by the Geotechnical Engineer.

- Underground structures such as basements, cesspools or septic disposal systems, mining shafts, tunnels, wells and pipelines should be removed under the inspection of the Geotechnical Engineer and recommendations provided by the Geotechnical Engineer and/or city, county or state agencies. If such structures are known or found, the Geotechnical Engineer should be notified as soon as possible so that recommendations can be formulated.

- Any topsoil, slopewash, colluvium, alluvium and rock materials which are considered unsuitable by the Geotechnical Engineer should be removed prior to fill placement.

- Remaining voids created during site clearing caused by removal of trees, foundations basements, irrigation facilities, etc., should be excavated and filled with compacted fill.

- Subsequent to clearing and removals, areas to receive fill should be scarified to a depth of 10 to 12 inches, moisture conditioned and compacted

- The moisture condition of the processed ground should be at or slightly above the optimum moisture content as determined by the Geotechnical Engineer. Depending upon field conditions, this may require air drying or watering together with mixing and/or discing.

Compacted Fills

- Soil materials imported to or excavated on the property may be utilized in the fill, provided each material has been determined to be suitable in the opinion of the Geotechnical Engineer. Unless otherwise approved by the Geotechnical Engineer, all fill materials shall be free of deleterious, organic, or frozen matter, shall contain no chemicals that may result in the material being classified as "contaminated," and shall be very low to non-expansive with a maximum expansion index (EI) of 50. The top 12 inches of the compacted fill should have a maximum particle size of 3 inches, and all underlying compacted fill material a maximum 6-inch particle size, except as noted below.

- All soils should be evaluated and tested by the Geotechnical Engineer. Materials with high expansion potential, low strength, poor gradation or containing organic materials may require removal from the site or selective placement and/or mixing to the satisfaction of the Geotechnical Engineer.

- Rock fragments or rocks less than 6 inches in their largest dimensions, or as otherwise determined by the Geotechnical Engineer, may be used in compacted fill, provided the distribution and placement is satisfactory in the opinion of the Geotechnical Engineer.

- Rock fragments or rocks greater than 12 inches should be taken off-site or placed in accordance with recommendations and in areas designated as suitable by the Geotechnical Engineer. These materials should be placed in accordance with Plate D-8 of these Grading Guide Specifications and in accordance with the following recommendations:

  - Rocks 12 inches or more in diameter should be placed in rows at least 15 feet apart, 15 feet from the edge of the fill, and 10 feet or more below subgrade. Spaces should be left between each rock fragment to provide for placement and compaction of soil around the fragments.

  - Fill materials consisting of soil meeting the minimum moisture content requirements and free of oversize material should be placed between and over the rows of rock or concrete. Ample water and compactive effort should be applied to the fill materials as they are placed in order that all of the voids between each of the fragments are filled and compacted to the specified density.

  - Subsequent rows of rocks should be placed such that they are not directly above a row placed in the previous lift of fill. A minimum 5-foot offset between rows is recommended.

  - To facilitate future trenching, oversized material should not be placed within the range of foundation excavations, future utilities or other underground construction unless specifically approved by the soil engineer and the developer/owner representative.

- Fill materials approved by the Geotechnical Engineer should be placed in areas previously prepared to receive fill and in evenly placed, near horizontal layers at about 6 to 8 inches in loose thickness, or as otherwise determined by the Geotechnical Engineer for the project.

- Each layer should be moisture conditioned to optimum moisture content, or slightly above, as directed by the Geotechnical Engineer. After proper mixing and/or drying, to evenly distribute the moisture, the layers should be compacted to at least 90 percent of the maximum dry density in compliance with ASTM D-1557-78 unless otherwise indicated.

- Density and moisture content testing should be performed by the Geotechnical Engineer at random intervals and locations as determined by the Geotechnical Engineer. These tests are intended as an aid to the Earthwork Contractor, so he can evaluate his workmanship, equipment effectiveness and site conditions. The Earthwork Contractor is responsible for compaction as required by the Geotechnical Report(s) and governmental agencies.

- Fill areas unused for a period of time may require moisture conditioning, processing and recompaction prior to the start of additional filling. The Earthwork Contractor should notify the Geotechnical Engineer of his intent so that an evaluation can be made.

- Fill placed on ground sloping at a 5-to-1 inclination (horizontal-to-vertical) or steeper should be benched into bedrock or other suitable materials, as directed by the Geotechnical Engineer. Typical details of benching are illustrated on Plates D-2, D-4, and D-5.

- Cut/fill transition lots should have the cut portion overexcavated to a depth of at least 3 feet and rebuilt with fill (see Plate D-1), as determined by the Geotechnical Engineer.

- All cut lots should be inspected by the Geotechnical Engineer for fracturing and other bedrock conditions. If necessary, the pads should be overexcavated to a depth of 3 feet and rebuilt with a uniform, more cohesive soil type to impede moisture penetration.

- Cut portions of pad areas above buttresses or stabilizations should be overexcavated to a depth of 3 feet and rebuilt with uniform, more cohesive compacted fill to impede moisture penetration.

- Non-structural fill adjacent to structural fill should typically be placed in unison to provide lateral support. Backfill along walls must be placed and compacted with care to ensure that excessive unbalanced lateral pressures do not develop. The type of fill material placed adjacent to below grade walls must be properly tested and approved by the Geotechnical Engineer with consideration of the lateral earth pressure used in the design.

Foundations

- The foundation influence zone is defined as extending one foot horizontally from the outside edge of a footing, and proceeding downward at a ½ horizontal to 1 vertical (0.5:1) inclination.
- Where overexcavation beneath a footing subgrade is necessary, it should be conducted so as to encompass the entire foundation influence zone, as described above.
- Compacted fill adjacent to exterior footings should extend at least 12 inches above foundation bearing grade. Compacted fill within the interior of structures should extend to the floor subgrade elevation.

Fill Slopes

- The placement and compaction of fill described above applies to all fill slopes. Slope compaction should be accomplished by overfilling the slope, adequately compacting the fill in even layers, including the overfilled zone and cutting the slope back to expose the compacted core
- Slope compaction may also be achieved by backrolling the slope adequately every 2 to 4 vertical feet during the filling process as well as requiring the earth moving and compaction equipment to work close to the top of the slope. Upon completion of slope construction, the slope face should be compacted with a sheepsfoot connected to a sideboom and then grid rolled. This method of slope compaction should only be used if approved by the Geotechnical Engineer.
- Sandy soils lacking in adequate cohesion may be unstable for a finished slope condition and therefore should not be placed within 15 horizontal feet of the slope face.
- All fill slopes should be keyed into bedrock or other suitable material. Fill keys should be at least 15 feet wide and inclined at 2 percent into the slope. For slopes higher than 30 feet, the fill key width should be equal to one-half the height of the slope (see Plate D-5).
- All fill keys should be cleared of loose slough material prior to geotechnical inspection and should be approved by the Geotechnical Engineer and governmental agencies prior to filling.
- The cut portion of fill over cut slopes should be made first and inspected by the Geotechnical Engineer for possible stabilization requirements. The fill portion should be adequately keyed through all surficial soils and into bedrock or suitable material. Soils should be removed from the transition zone between the cut and fill portions (see Plate D-2).

Cut Slopes

- All cut slopes should be inspected by the Geotechnical Engineer to determine the need for stabilization. The Earthwork Contractor should notify the Geotechnical Engineer when slope cutting is in progress at intervals of 10 vertical feet. Failure to notify may result in a delay in recommendations.
- Cut slopes exposing loose, cohesionless sands should be reported to the Geotechnical Engineer for possible stabilization recommendations.
- All stabilization excavations should be cleared of loose slough material prior to geotechnical inspection. Stakes should be provided by the Civil Engineer to verify the location and dimensions of the key. A typical stabilization fill detail is shown on Plate D-5.

- Stabilization key excavations should be provided with subdrains. Typical subdrain details are shown on Plates D-6.

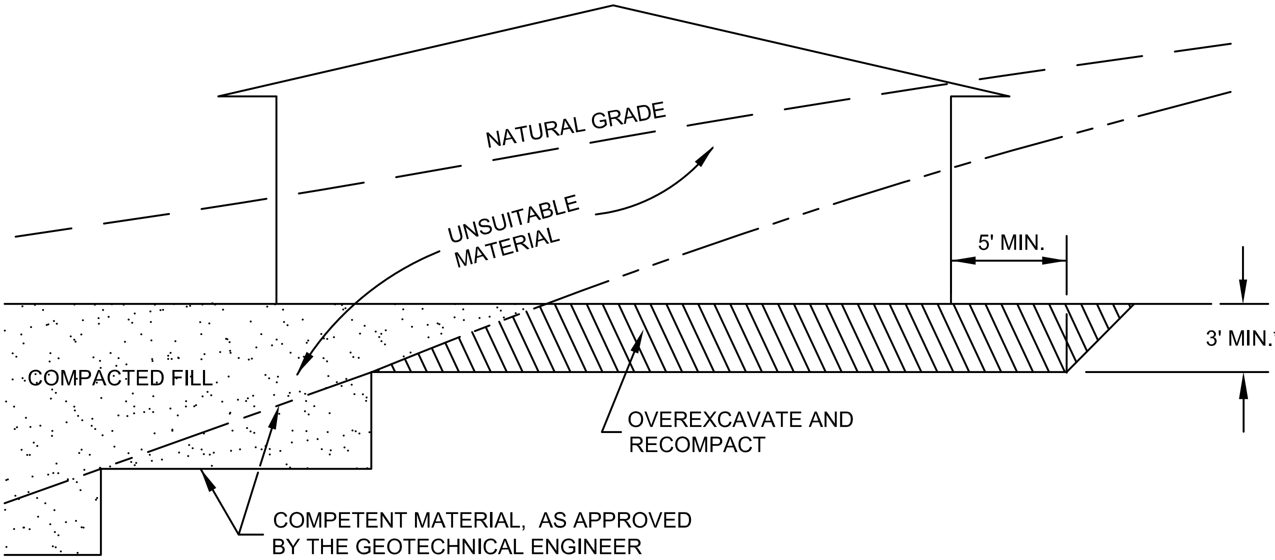
Subdrains

- Subdrains may be required in canyons and swales where fill placement is proposed. Typical subdrain details for canyons are shown on Plate D-3. Subdrains should be installed after approval of removals and before filling, as determined by the Soils Engineer.

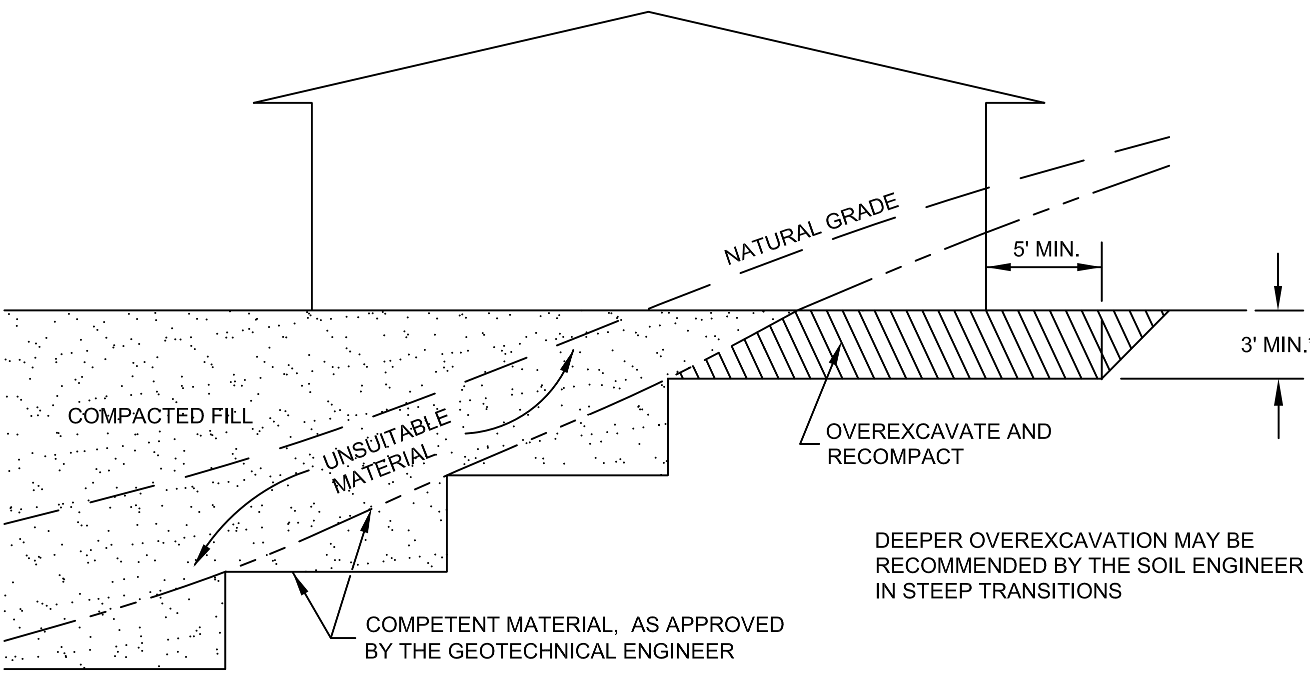
- Plastic pipe may be used for subdrains provided it is Schedule 40 or SDR 35 or equivalent. Pipe should be protected against breakage, typically by placement in a square-cut (backhoe) trench or as recommended by the manufacturer.

- Filter material for subdrains should conform to CALTRANS Specification 68-1.025 or as approved by the Geotechnical Engineer for the specific site conditions. Clean ¾-inch crushed rock may be used provided it is wrapped in an acceptable filter cloth and approved by the Geotechnical Engineer. Pipe diameters should be 6 inches for runs up to 500 feet and 8 inches for the downstream continuations of longer runs. Four-inch diameter pipe may be used in buttress and stabilization fills.

CUT LOT



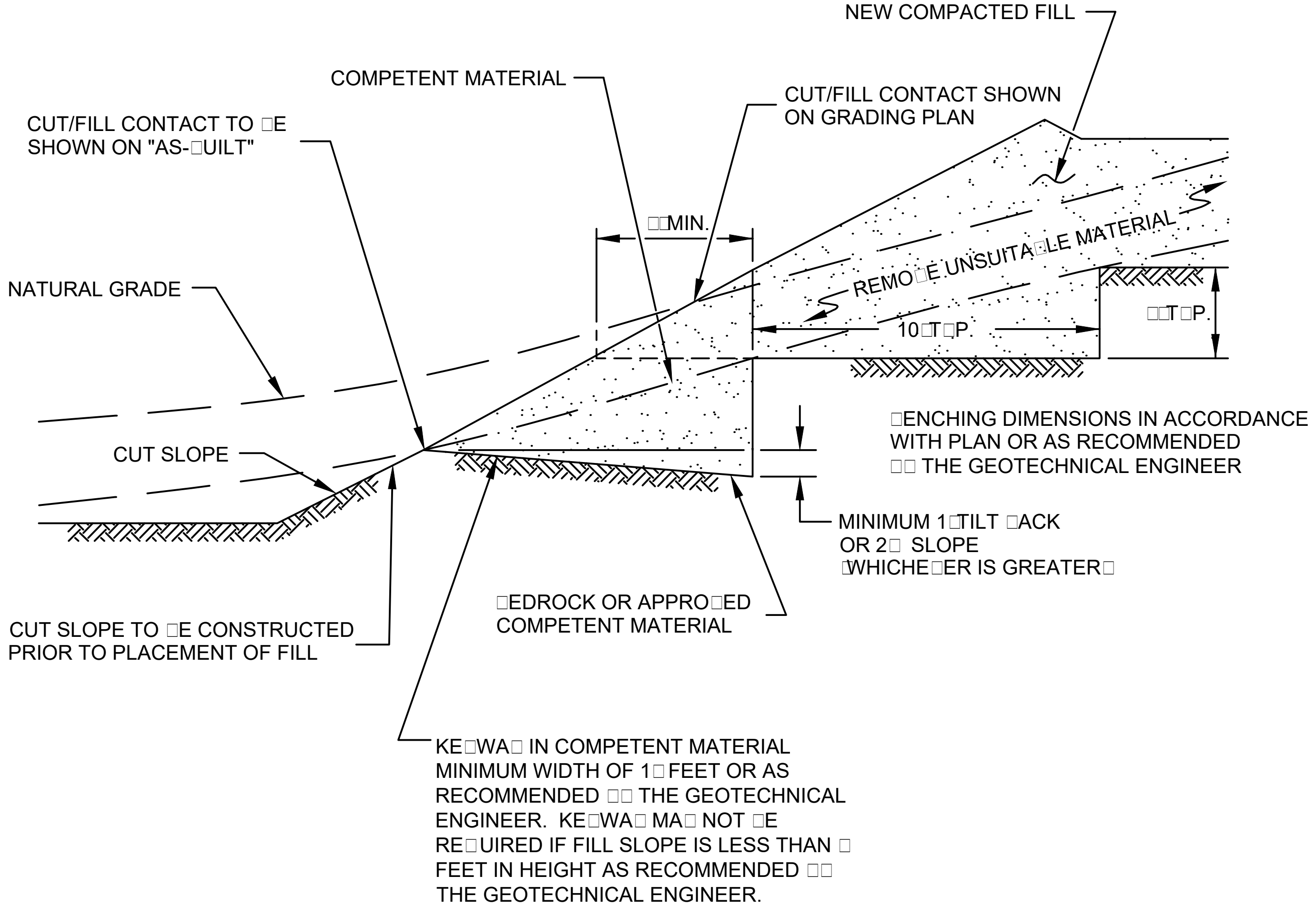
CUT/FILL LOT (TRANSITION)



DEEPER OVEREXCAVATION MAY BE RECOMMENDED BY THE SOIL ENGINEER IN STEEP TRANSITIONS

*SEE TEXT OF REPORT FOR SPECIFIC RECOMMENDATION. ACTUAL DEPTH OF OVEREXCAVATION MAY BE GREATER.

TRANSITION LOT DETAIL	
GRADING GUIDE SPECIFICATIONS	
NOT TO SCALE	SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: JAS CHKD: GKM	
PLATE D-1	



FILL ABOVE CUT SLOPE DETAIL

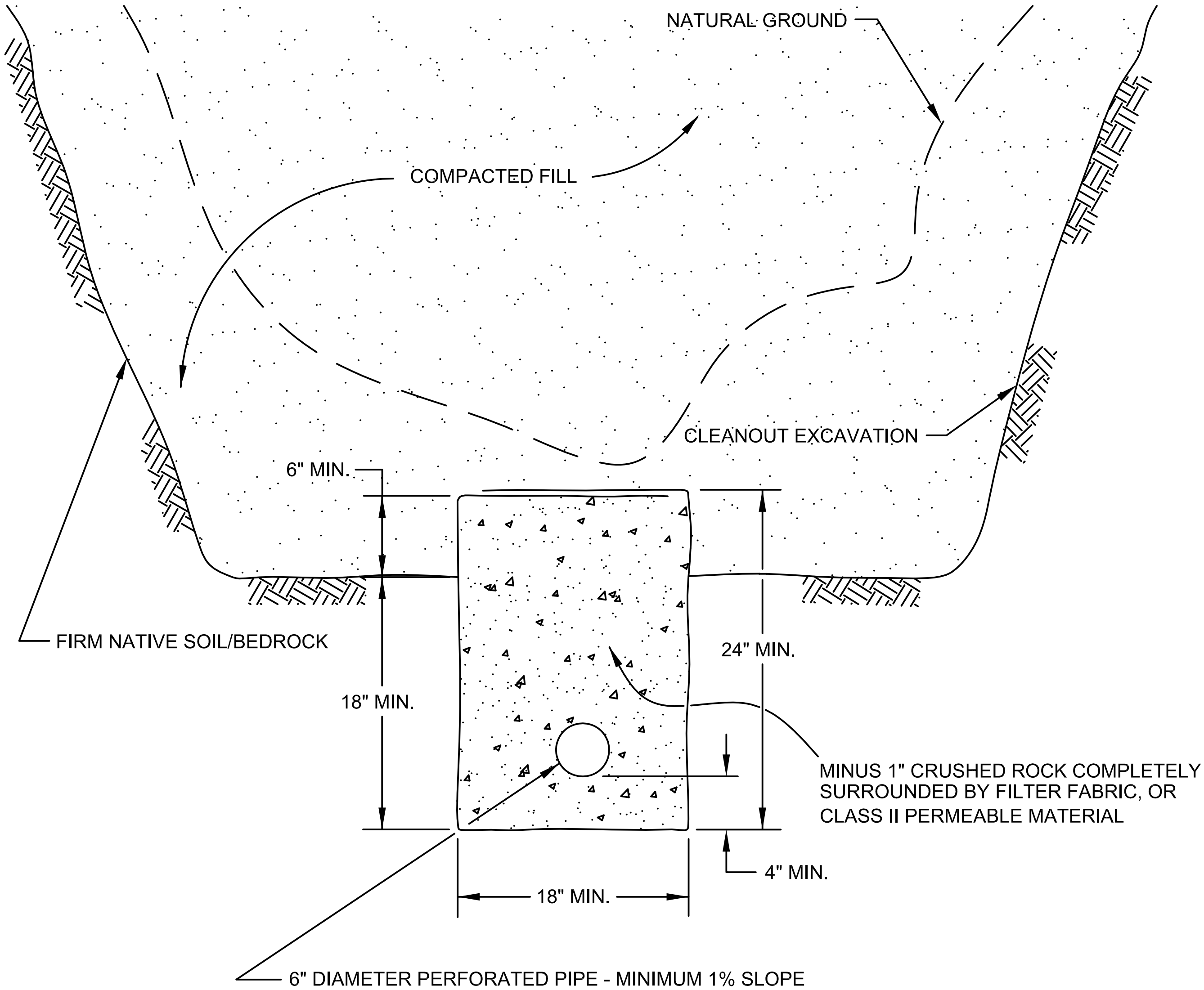
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-2

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



PIPE MATERIAL	DEPTH OF FILL OVER SUBDRAIN
ADS (CORRUGATED POLETHYLENE)	8
TRANSITE UNDERDRAIN	20
PVC OR ABS: SDR 35	35
SDR 21	100

SCHEMATIC ONLY
NOT TO SCALE

CANYON SUBDRAIN DETAIL

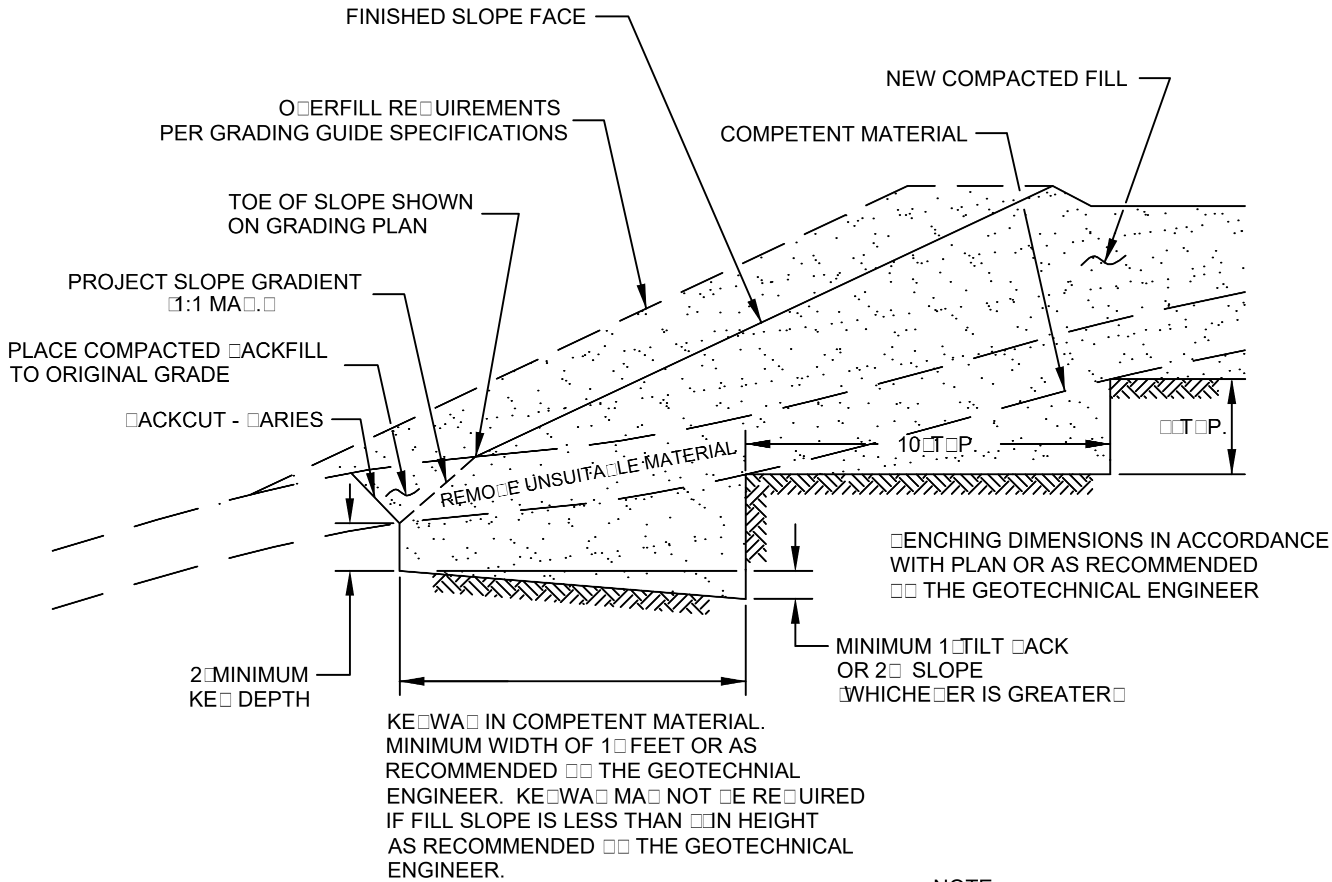
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-3

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



NOTE:
□ENCHING SHALL □E RE□UIRED WHEN NATURAL SLOPES ARE E□UAL TO OR STEEPER THAN □:1 OR WHEN RECOMMENDED □□ THE GEOTECHNICAL ENGINEER.

FILL ABOVE NATURAL SLOPE DETAIL

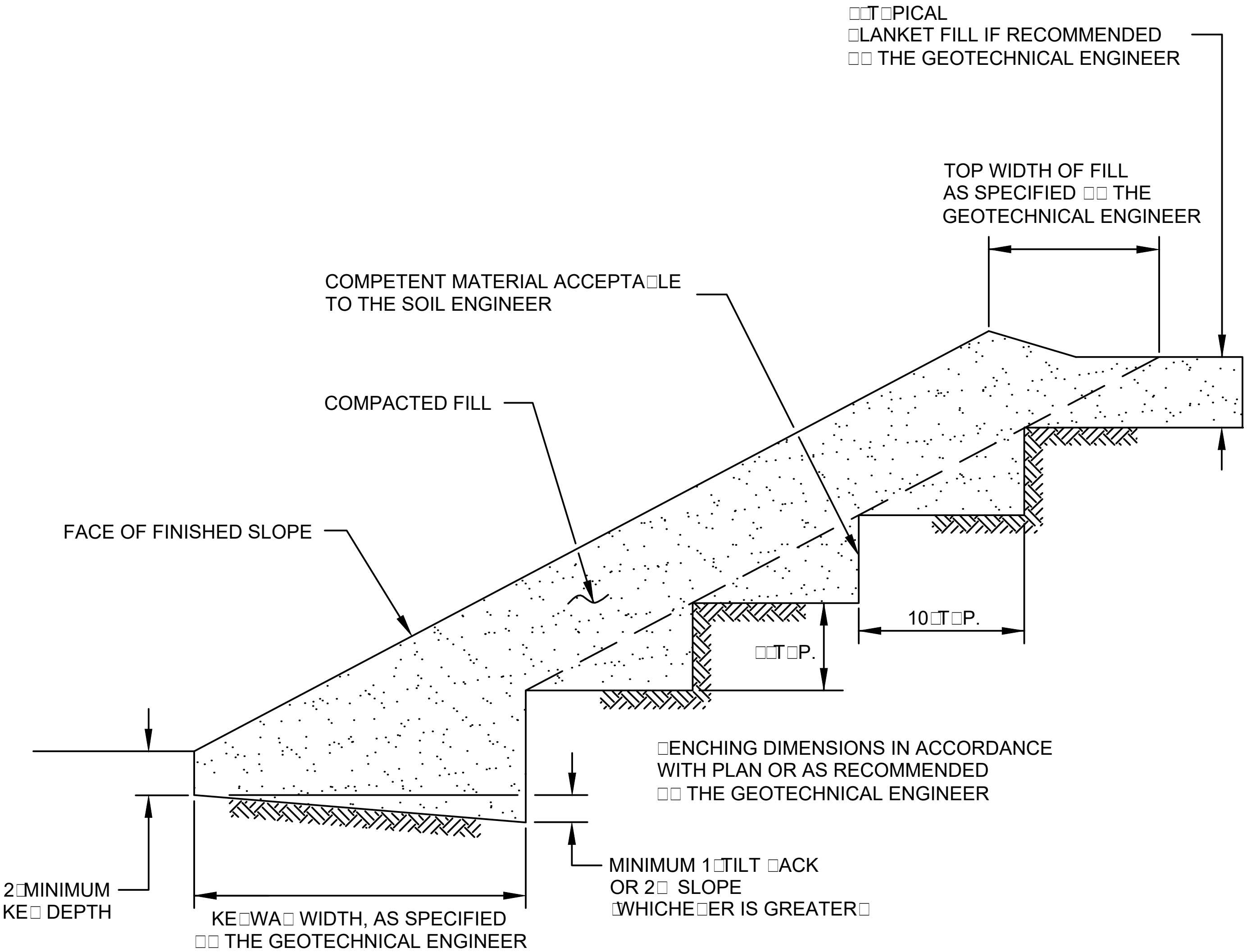
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-4

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



STABILIZATION FILL DETAIL

GRADING GUIDE SPECIFICATIONS

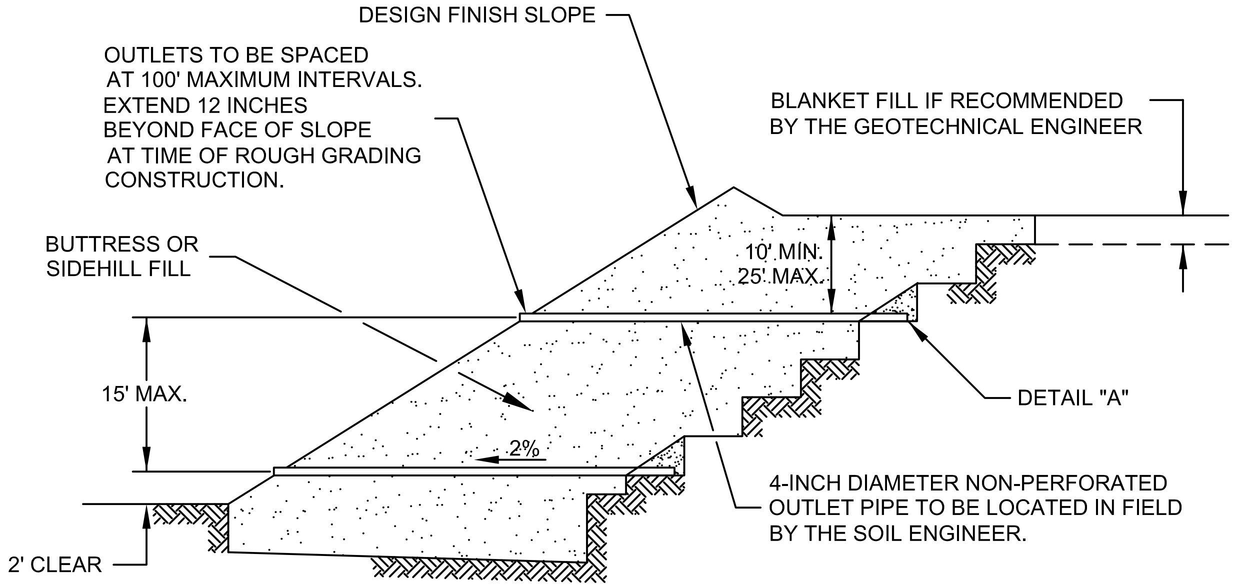
NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-5

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



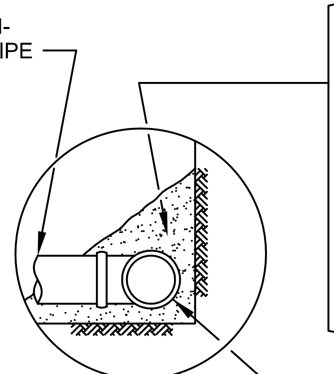
"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50



DETAIL "A"

NOTES:
1. TRENCH FOR OUTLET PIPES TO BE BACKFILLED WITH ON-SITE SOIL.

SLOPE FILL SUBDRAINS

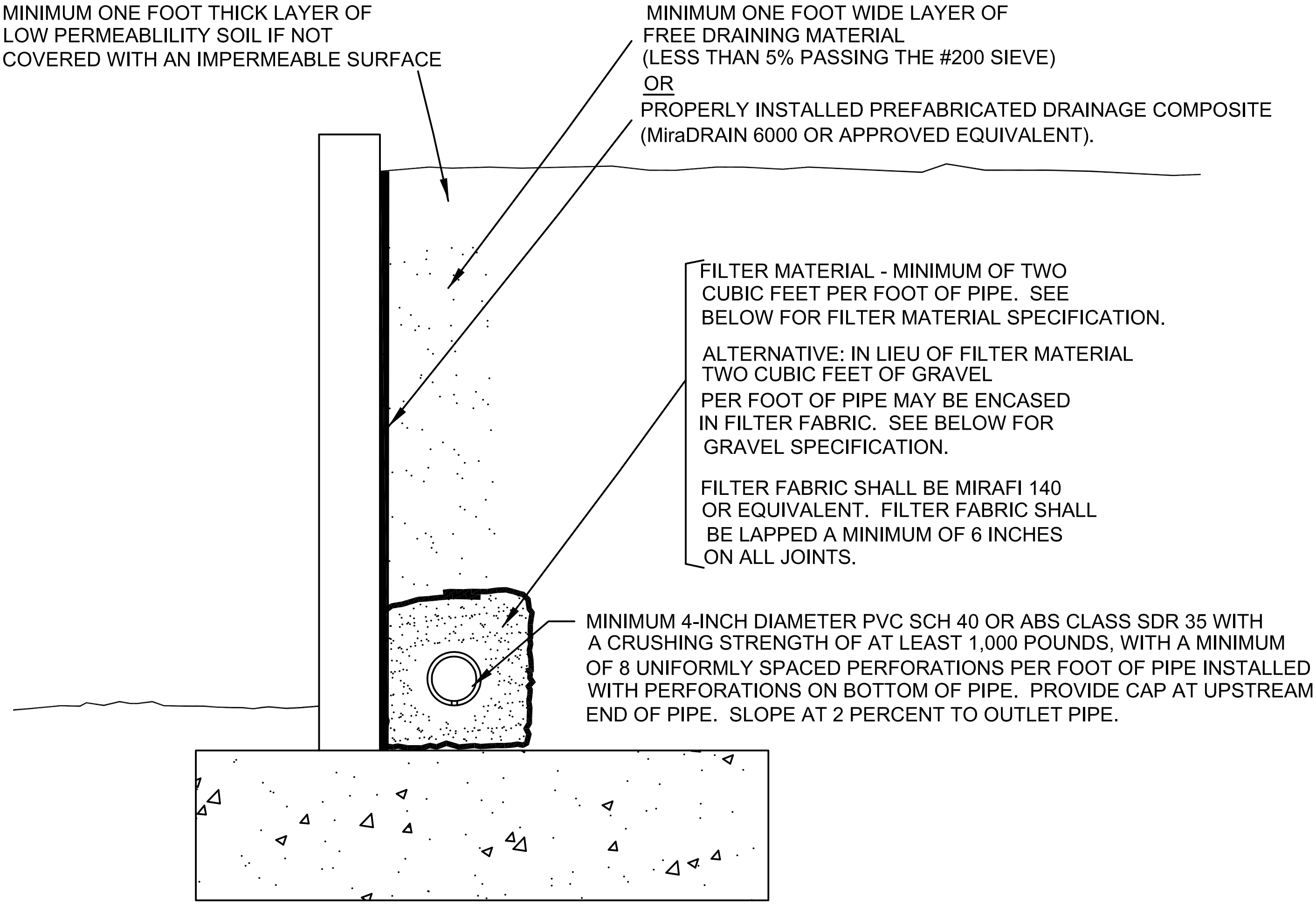
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: JAS
CHKD: GKM

PLATE D-6

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL



"FILTER MATERIAL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT: (CONFORMS TO EMA STD. PLAN 323)

SIEVE SIZE	PERCENTAGE PASSING
1"	100
3/4"	90-100
3/8"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

"GRAVEL" TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUIVALENT:

SIEVE SIZE	MAXIMUM PERCENTAGE PASSING
1 1/2"	100
NO. 4	50
NO. 200	8

SAND EQUIVALENT = MINIMUM OF 50

RETAINING WALL BACKDRAINS

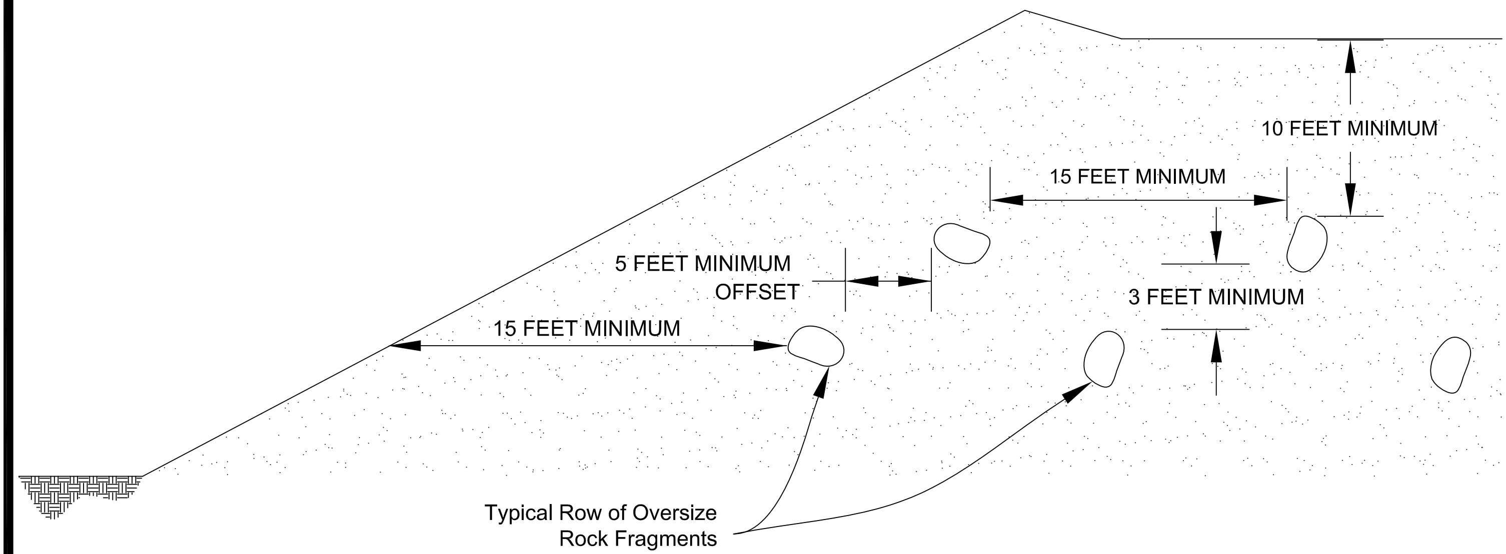
GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

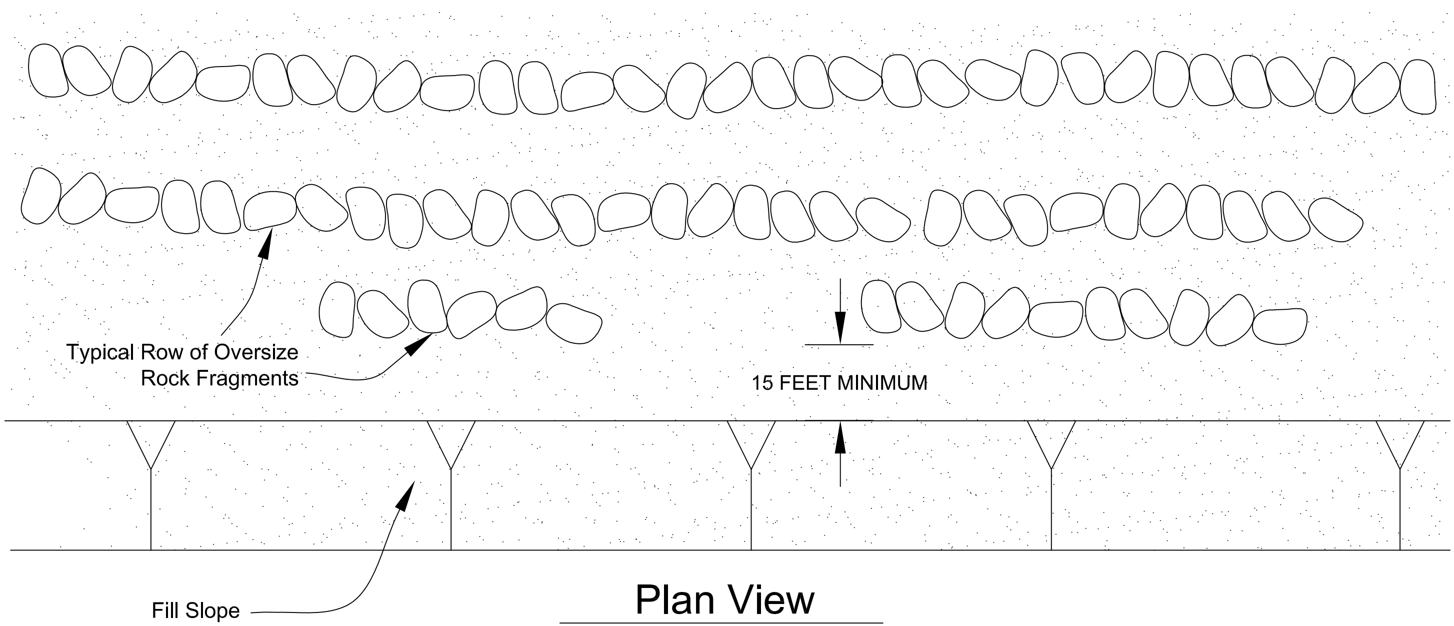
DRAWN: JAS
CHKD: GKM

PLATE D-7

SoCalGeo
SOUTHERN CALIFORNIA GEOTECHNICAL



Section View



Plan View

PLACEMENT OF OVERSIZED MATERIAL

GRADING GUIDE SPECIFICATIONS

NOT TO SCALE

DRAWN: PM
CHKD: GKM

PLATE D-8

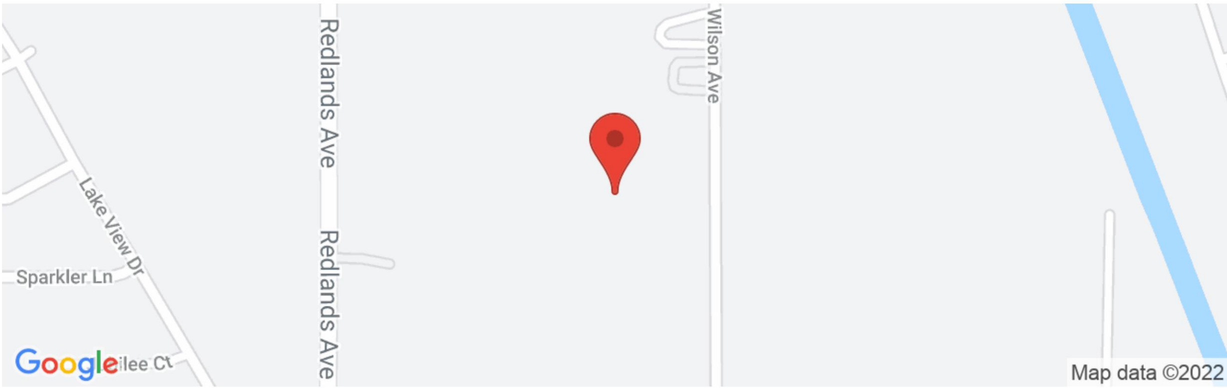
SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX E

22G102

Latitude, Longitude: 33.825217, -117.214126



Date	2/10/2022, 11:35:58 AM
Design Code Reference Document	ASCE7-16
Risk Category	III
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.5	MCE_R ground motion. (for 0.2 second period)
S_1	0.571	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.5	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.55	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.524	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.634	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.571	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.626	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.933	Mapped value of the risk coefficient at short periods
C_{R1}	0.912	Mapped value of the risk coefficient at a period of 1 s

SOURCE: SEAOC/OSHPD Seismic Design Maps Tool
<https://seismicmaps.org/>

SEISMIC DESIGN PARAMETERS - 2019 CBC

PROPOSED WAREHOUSE

PERRIS, CALIFORNIA

DRAWN: MD
CHKD: EA

SCG PROJECT
22G102-1

PLATE E-1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL

APPENDIX F

LIQUEFACTION EVALUATION

Project Name	Lake Creek - Proposed Warehouse	MCE$_G$ Design Acceleration	0.550 (g)
Project Location	Perris, CA	Design Magnitude	7
Project Number	22G102-1	Historic High Depth to Groundwater	25 (ft)
Engineer	E. Aldrich	Depth to Groundwater at Time of Drilling	39 (ft)
		Borehole Diameter	6 (in)
Boring No.	B-1		

Sample Depth (ft)	Depth to Top of Layer (ft)	Depth to Bottom of Layer (ft)	Depth to Midpoint (ft)	Uncorrected SPT N-Value	Unit Weight of Soil (pcf)	Fines Content (%)	Energy Correction	C_B	C_S	C_N	Rod Length Correction	$(N_1)_{60}$	$(N_1)_{60CS}$	Overburden Stress (σ_o) (psf)	Eff. Overburden Stress (Hist. Water) (σ_o') (psf)	Eff. Overburden Stress (Curr. Water) (σ_o') (psf)	Stress Reduction Coefficient (r_d)	MSF	Ks	Cyclic Resistance Ratio (M=7.5)	Cyclic Resistance Ratio (M=7)	Cyclic Stress Ratio Induced by Design Earthquake	Factor of Safety	Comments
							(1)	(2)	(3)	(4)	(5)	(6)	(7)				(8)	(9)	(10)	(11)	(12)	(13)		
19.5	0	22	11	36	120	0	1.3	1.05	1.3	1.08	0.95	65.5	65.5	1320	1320	1320	0.97	1.21	1.1	2.00	2.00	N/A	N/A	Above Water Table
24.5	22	26.5	24.3	35	120	0	1.3	1.05	1.3	0.93	0.95	55.1	55.1	2910	2910	2910	0.91	1.21	0.9	2.00	2.00	0.32	6.16	Nonliquefiable
29.5	26.5	32	29.3	39	120	0	1.3	1.05	1.3	0.91	0.95	59.7	59.7	3510	3245	3510	0.88	1.21	0.87	2.00	2.00	0.34	5.86	Nonliquefiable
34.5	32	37	34.5	27	120	47	1.3	1.05	1.3	0.84	1	40.1	45.7	4140	3547	4140	0.85	1.21	0.85	2.00	2.00	0.36	5.61	Nonliquefiable
39.5	37	42	39.5	27	120	35	1.3	1.05	1.3	0.80	1	38.5	44.0	4740	3835	4709	0.83	1.21	0.82	2.00	1.99	0.36	5.46	Nonliquefiable
44.5	42	47	44.5	23	120	28	1.3	1.05	1.3	0.76	1	31.0	36.2	5340	4123	4997	0.80	1.21	0.81	1.45	1.42	0.37	3.86	Nonliquefiable
49.5	47	50	48.5	46	120	0	1.3	1.05	1.3	0.89	1	72.6	72.6	5820	4354	5227	0.78	1.21	0.78	2.00	1.90	0.37	5.13	Nonliquefiable

Notes:

(1) Energy Correction for N_{90} of automatic hammer to standard N_{60}
(2) Borehole Diameter Correction (Skempton, 1986)
(3) Correction for split-spoon sampler with room for liners, but liners are absent, (Seed et al., 1984, 2001)
(4) Overburden Correction, Caluclated by Eq. 39 (Boulanger and Idriss, 2008)
(5) Rod Length Correction for Samples <10 m in depth
(6) N-value corrected for energy, borehole diameter, sampler with absent liners, rod length, and overburden
(7) N-value corrected for fines content per Eqs. 75 and 76 (Boulanger and Idriss, 2008)
(8) Stress Reduction Coefficient calculated by Eq. 22 (Boulanger and Idriss, 2008)
(9) Magnitude Scaling Factor calculated by Eqns. A.8 & A.10 (Boulanger and Idriss, 2014)
(10) Overburden Correction Factor calcuated by Eq. 54 (Boulanger and Idriss, 2008)
(11) Calcuated by Eq. 70 (Boulanger and Idriss, 2008)
(12) Calcuated by Eq. 72 (Boulanger and Idriss, 2008)
(13) Calcuated by Eq. 25 (Boulanger and Idriss, 2008)

LIQUEFACTION INDUCED SETTLEMENTS

Project Name	Lake Creek - Proposed Warehouse
Project Location	Perris, CA
Project Number	22G102-1
Engineer	E. Aldrich

Boring No. B-1

Sample Depth (ft)	Depth to Top of Layer (ft)	Depth to Bottom of Layer (ft)	Depth to Midpoint (ft)	$(N_1)_{60}$	DN for fines content	$(N_1)_{60\text{-}CS}$	Liquefaction Factor of Safety	Limiting Shear Strain γ_{min}	Parameter Fα	Maximum Shear Strain γ_{max}	Height of Layer		Vertical Reconsolidation Strain ε_v		Total Deformation of Layer (in)	Comments
				(1)	(2)	(3)	(4)	(5)	(6)	(7)			(8)			
19.5	0	22	11	65.5	0.0	65.5	N/A	0.00	-2.90	0.00	22.00		0.000		0.00	Above Water Table
24.5	22	26.5	24.3	55.1	0.0	55.1	6.16	0.00	-2.01	0.00	4.50		0.000		0.00	Nonliquefiable
29.5	26.5	32	29.3	59.7	0.0	59.7	5.86	0.00	-2.40	0.00	5.50		0.000		0.00	Nonliquefiable
34.5	32	37	34.5	40.1	5.6	45.7	5.61	0.00	-1.25	0.00	5.00		0.000		0.00	Nonliquefiable
39.5	37	42	39.5	38.5	5.5	44.0	5.46	0.00	-1.11	0.00	5.00		0.000		0.00	Nonliquefiable
44.5	42	47	44.5	31.0	5.3	36.2	3.86	0.02	-0.52	0.00	5.00		0.000		0.00	Nonliquefiable
49.5	47	50	48.5	72.6	0.0	72.6	5.13	0.00	-3.53	0.00	3.00		0.000		0.00	Nonliquefiable
											Total Deformation (in)				0.00	

Notes:

(1) $(N_1)_{60}$ calculated previously for the individual layer

(2) Correction for fines content per Equation 76 (Boulanger and Idriss, 2008)

(3) Corrected $(N_1)_{60}$ for fines content

(4) Factor of Safety against Liquefaction, calculated previously for the individual layer

(5) Calcuated by Eq. 86 (Boulanger and Idriss, 2008)

(6) Calcuated by Eq. 89 (Boulanger and Idriss, 2008)

(7) Calcuated by Eqs. 90, 91, and 92 (Boulanger and Idriss, 2008)

(8) Volumetric Strain Induced in a Liquefiable Layer, Calcuated by Eq. 96 (Boulanger and Idriss, 2008)
(Strain N/A if Factor of Safety against Liquefaction > 1.3)

LIQUEFACTION EVALUATION

Project Name	Lake Creek - Proposed Warehouse	MCE_G Design Acceleration	0.550 (g)
Project Location	Perris, CA	Design Magnitude	7
Project Number	22G102-1	Historic High Depth to Groundwater	25 (ft)
Engineer	E. Aldrich	Depth to Groundwater at Time of Drilling	39 (ft)
		Borehole Diameter	6 (in)
Boring No.	B-3		

Sample Depth (ft)	Depth to Top of Layer (ft)	Depth to Bottom of Layer (ft)	Depth to Midpoint (ft)	Uncorrected SPT N-Value	Unit Weight of Soil (pcf)	Fines Content (%)	Energy Correction	C_B	C_S	C_N	Rod Length Correction	$(N_1)_{60}$	$(N_1)_{60CS}$	Overburden Stress (σ_o) (psf)	Eff. Overburden Stress (Hist. Water) (σ_o') (psf)	Eff. Overburden Stress (Curr. Water) (σ_o') (psf)	Stress Reduction Coefficient (r_d)	MSF	Ks	Cyclic Resistance Ratio (M=7.5)	Cyclic Resistance Ratio (M=7)	Cyclic Stress Ratio Induced by Design Earthquake	Factor of Safety	Comments
							(1)	(2)	(3)	(4)	(5)	(6)	(7)				(8)	(9)	(10)	(11)	(12)	(13)		
19.5	0	22	11	50	120	0	1.3	1.05	1.3	1.03	0.95	87.0	87.0	1320	1320	1320	0.97	1.21	1.1	2.00	2.00	N/A	N/A	Above Water Table
24.5	22	25.5	23.8	24	120	44	1.3	1.05	1.3	0.92	0.95	37.2	42.8	2850	2850	2850	0.91	1.21	0.91	2.00	2.00	0.33	6.14	Nonliquefiable
29.5	25.5	30	27.8	10	120	57	1.3	1.05	1.117	0.81	0.95	11.7	17.3	3330	3158	3330	0.89	1.07	0.95	0.18	0.18	0.34	0.54	**Liquefiable**
34.5	30	36.5	33.3	13	120	45	1.3	1.05	1.156	0.76	1	15.6	21.2	3990	3475	3990	0.86	1.10	0.93	0.22	0.23	0.35	0.64	**Liquefiable**
39.5	36.5	42	39.3	20	120	25	1.3	1.05	1.259	0.75	1	25.9	30.9	4710	3821	4694	0.83	1.19	0.87	0.55	0.57	0.36	1.56	Nonliquefiable
44.5	42	47	44.5	21	120	54	1.3	1.05	1.271	0.74	1	27.1	32.7	5340	4123	4997	0.80	1.21	0.84	0.72	0.73	0.37	1.99	Nonliquefiable
49.5	47	50	48.5	32	120	0	1.3	1.05	1.3	0.78	1	44.4	44.4	5820	4354	5227	0.78	1.21	0.78	2.00	1.90	0.37	5.13	Nonliquefiable

Notes:

(1) Energy Correction for N_{90} of automatic hammer to standard N_{60}
(2) Borehole Diameter Correction (Skempton, 1986)
(3) Correction for split-spoon sampler with room for liners, but liners are absent, (Seed et al., 1984, 2001)
(4) Overburden Correction, Caluclated by Eq. 39 (Boulanger and Idriss, 2008)
(5) Rod Length Correction for Samples <10 m in depth
(6) N-value corrected for energy, borehole diameter, sampler with absent liners, rod length, and overburden
(7) N-value corrected for fines content per Eqs. 75 and 76 (Boulanger and Idriss, 2008)
(8) Stress Reduction Coefficient calculated by Eq. 22 (Boulanger and Idriss, 2008)
(9) Magnitude Scaling Factor calculated by Eqns. A.8 & A.10 (Boulanger and Idriss, 2014)
(10) Overburden Correction Factor calcuated by Eq. 54 (Boulanger and Idriss, 2008)
(11) Calcuated by Eq. 70 (Boulanger and Idriss, 2008)
(12) Calcuated by Eq. 72 (Boulanger and Idriss, 2008)
(13) Calcuated by Eq. 25 (Boulanger and Idriss, 2008)

LIQUEFACTION INDUCED SETTLEMENTS

Project Name	Lake Creek - Proposed Warehouse
Project Location	Perris, CA
Project Number	22G102-1
Engineer	E. Aldrich

Boring No. B-3

Sample Depth (ft)	Depth to Top of Layer (ft)	Depth to Bottom of Layer (ft)	Depth to Midpoint (ft)	$(N_1)_{60}$	DN for fines content	$(N_1)_{60\text{-}CS}$	Liquefaction Factor of Safety	Limiting Shear Strain γ_{min}	Parameter Fα	Maximum Shear Strain γ_{max}	Height of Layer		Vertical Reconsolidation Strain ε_v		Total Deformation of Layer (in)	Comments
				(1)	(2)	(3)	(4)	(5)	(6)	(7)			(8)			
19.5	0	22	11	87.0	0.0	87.0	N/A	0.00	-4.84	0.00	22.00		0.000		0.00	Above Water Table
24.5	22	25.5	23.8	37.2	5.6	42.8	6.14	0.00	-1.02	0.00	3.50		0.000		0.00	Nonliquefiable
29.5	25.5	30	27.8	11.7	5.6	17.3	0.54	0.21	0.65	0.21	4.50		0.026		1.39	Liquefiable
34.5	30	36.5	33.3	15.6	5.6	21.2	0.64	0.14	0.45	0.14	6.50		0.022		1.71	Liquefiable
39.5	36.5	42	39.3	25.9	5.1	30.9	1.56	0.04	-0.15	0.01	5.50		0.002		0.00	Nonliquefiable
44.5	42	47	44.5	27.1	5.6	32.7	1.99	0.03	-0.27	0.00	5.00		0.000		0.00	Nonliquefiable
49.5	47	50	48.5	44.4	0.0	44.4	5.13	0.00	-1.14	0.00	3.00		0.000		0.00	Nonliquefiable
											Total Deformation (in)				3.11	

Notes:

(1) $(N_1)_{60}$ calculated previously for the individual layer
(2) Correction for fines content per Equation 76 (Boulanger and Idriss, 2008)
(3) Corrected $(N_1)_{60}$ for fines content
(4) Factor of Safety against Liquefaction, calculated previously for the individual layer
(5) Calcuated by Eq. 86 (Boulanger and Idriss, 2008)
(6) Calcuated by Eq. 89 (Boulanger and Idriss, 2008)
(7) Calcuated by Eqs. 90, 91, and 92 (Boulanger and Idriss, 2008)
(8) Volumetric Strain Induced in a Liquefiable Layer, Calcuated by Eq. 96 (Boulanger and Idriss, 2008)
(Strain N/A if Factor of Safety against Liquefaction > 1.3)

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

March 1, 2022

Lake Creek Industrial, LLC
1320 Brittany Cross Road
Santa Ana, California 92705

Attention: Mr. Jake Swan
Director

Project No.: **22G102-2**

Subject: **Results of Infiltration Testing**
Proposed Warehouse
Wilson Avenue, North of Placentia Avenue
Perris, California

Reference: Geotechnical Investigation, Proposed Warehouse, Wilson Avenue, North of Placentia Avenue, Perris, California, prepared for Lake Creek Industrial, LLC, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G102-1, dated February 21, 2022.

Mr. Swan:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 21P515, dated December 21, 2021. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Site and Project Description

The subject site is located on the west side of Wilson Avenue, 620± feet north of the intersection of Placentia Avenue and Wilson Avenue in Perris, California. The site is bounded to the north by a single-family residence, to the west and south by vacant lots, and to the east by Wilson Avenue. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1.

The subject site consists of two rectangular-shaped parcels which total 4.93± acres in size. The site is currently vacant and undeveloped. The ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth. There are two rectangular concrete slabs near the center of the two lots, and localized areas of minor scattered debris and trash.

Detailed topographic information was not available at the time of this report. However, based on topographic information obtained from the USGS topo map, the site is at approximately 1460± feet mean sea level (msl). The overall site is relatively flat with a slight slope to the west at an estimated gradient of less than 1± percent.

Proposed Development

Based on a preliminary site plan (A1-1PA) provided to SCG prepared by RGA, the site will be developed with one (1) warehouse. The building will be 85,322± ft² in size and will be located in the east-central area of the site. The building will be constructed with dock-high doors along a portion of the west building wall. The building is anticipated to be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and concrete flatwork with limited areas of landscape planters throughout.

The proposed development will include on-site storm water infiltration. Based on conversations with the project civil engineer, we understand that the infiltration system will consist a below-grade chamber system located in the western area of the site. The bottom of the infiltration system will be 10± feet below the existing site grades.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site, which is referenced above. As part of this study, four (4) borings were advanced to depths of 20 to 50± feet below existing site grades.

Native alluvial soils were encountered at the ground surface at all of the boring locations. The near surface alluvium was observed to be disturbed by previous activities at the site, which may have included agricultural activities. These disturbed alluvium soils were observed to be in approximately the upper 2½ to 5± feet, and generally consisted of medium dense to dense sandy silt and silty to clayey fine sand. The undisturbed alluvial soils generally consist of medium dense to dense silty to clayey fine sand and fine sandy silt with trace to little clay, medium sand and coarse sand. Some of the alluvium samples contained calcareous nodules and veining.

Groundwater

Groundwater was encountered in Boring No. B-1 at a depth of approximately 39 feet. As part of our research, we reviewed readily available groundwater data in order to determine regional groundwater depths. Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well on record is located approximately 4,340 feet northeast of the site. Water level readings within this monitoring well indicate a groundwater level of 25± feet below the ground surface in November 2019.

Subsurface Exploration

Scope of Exploration

The subsurface exploration for the infiltration testing consisted of two (2) backhoe-excavated trenches, extending to a depth 10± feet below existing site grades. The trenches were logged during excavation by a member of our staff. The approximate locations of the infiltration trenches (identified as I-1 and I-2) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface at both of the infiltration test locations extending to depths of 1½ to 2± feet. The fill soils consist of silty fine sands with trace amounts of clay. Native alluvial soils were encountered beneath the fill soils at both of the infiltration test locations extending to at least a depth of 10± feet, the maximum depth explored. The alluvium consists of very dense fine to medium sandy silt to silty fine to medium sands. The Trench Logs, which illustrate the conditions encountered at the infiltration test locations, are presented in this report.

Infiltration Testing

We understand that the results of the testing will be used to prepare a preliminary design for the storm water infiltration system that will be used at the subject site. As previously mentioned, the infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at both of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at the trench locations, the volumetric measurements were made at 15-minute increments. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Infiltration Rate (inches/hour)
I-1	10	Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace coarse Sand	1.1
I-2	10	Brown fine to medium Sandy Silty to Silty fine to medium Sand, trace coarse Sand	1.0

Design Recommendations

Two (2) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range between 1.0 and 1.1 inches per hour. The major factors affecting the lack of infiltration at these locations is the presence of very dense alluvium and higher fines content. **Therefore, we recommend an infiltration rate of 1.0 inches per hour be used in the design of the stormwater infiltration system.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration system to identify the soil classification at the base of the infiltration basin. It should be confirmed that the soils at the base of the proposed infiltration system corresponds with those presented in this report to ensure that the performance of the system will be consistent with the rates reported herein.

The design of storm water disposal systems should be performed by the project civil engineer, in accordance with the City of Perris and/or County of Riverside guidelines. It is recommended any such systems be designed and constructed to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the flow rates through the system. It should be noted that the recommended infiltration rates are based on infiltration testing at two (2) discrete locations and that the overall infiltration rates of the proposed infiltration systems could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

Chamber Maintenance

The proposed project may include below-grade infiltration chambers. Water flowing into these chambers will carry some level of sediment. This layer has the potential to significantly reduce the infiltration rate of the basin subgrade soils. Therefore, a formal chamber maintenance program should be established to ensure that these silt and clay deposits are removed from the chamber on a regular basis.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining**

walls. Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

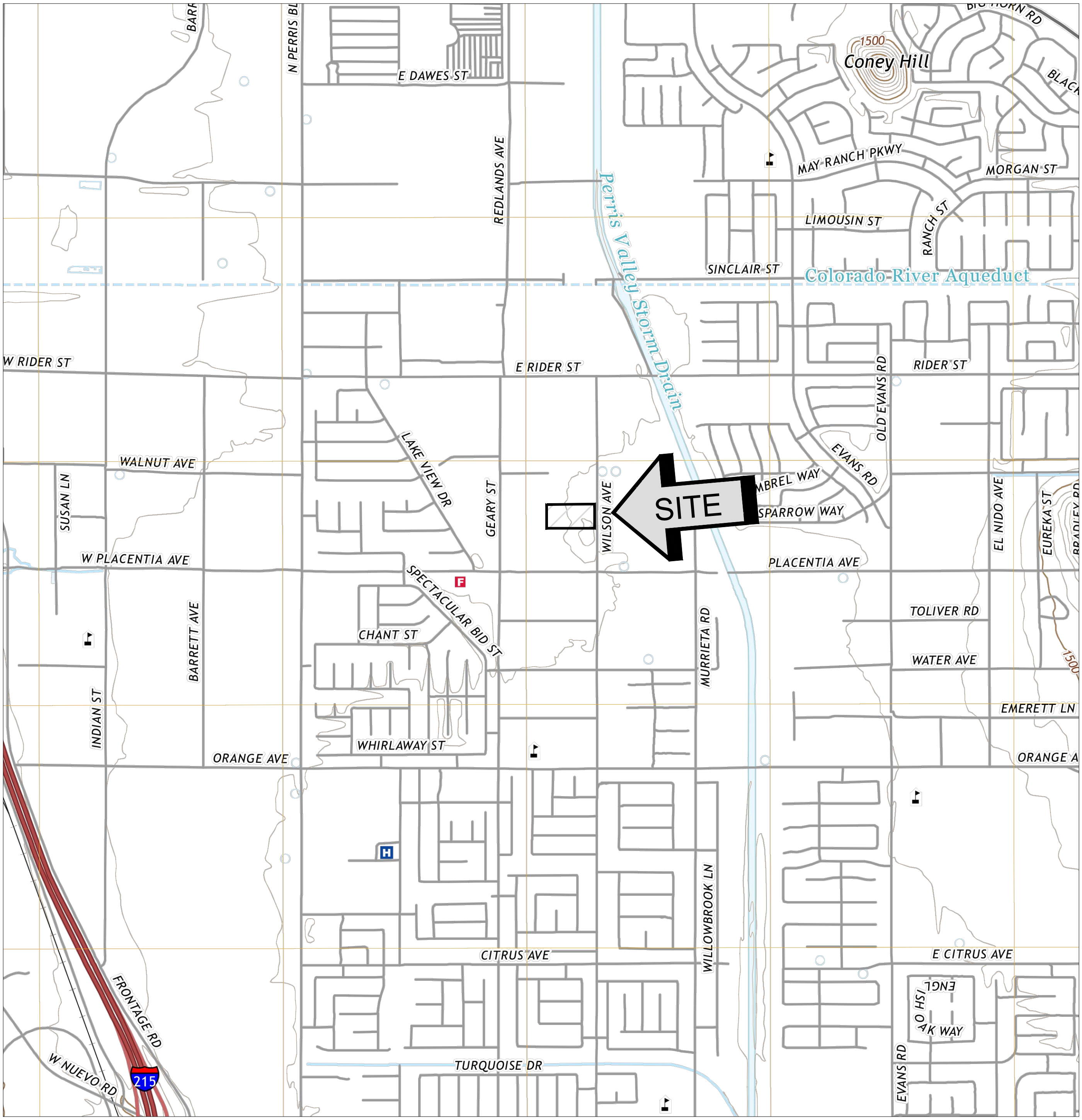
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Daryl Kas, CEG 2467
Senior Geologist

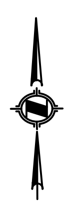
Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1: Site Location Map
Plate 2: Infiltration Test Location Plan
Trench Log Legend and Logs (4 pages)
Infiltration Test Results Spreadsheets (2 pages)
Grainsize Distribution Graphs (2 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2018.



SITE LOCATION MAP

PROPOSED WAREHOUSE

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
DRAWN: MD CHKD: RGT	
SCG PROJECT 22G102-2	
PLATE 1	

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION LOCATION
- APPROXIMATE BORING LOCATION (SCG PROJECT NO. 22G102-1)
- PROPOSED INFILTRATION SYSTEM

NOTE: CONCEPTUAL SITE PLAN PREPARED BY RGA ARCHITECTS. AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH.

INFILTRATION TEST LOCATION PLAN

PROPOSED WAREHOUSE

PERRIS, CALIFORNIA

SCALE: 1" = 60'

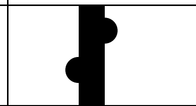
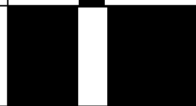
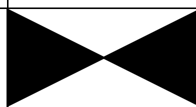
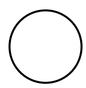
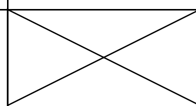
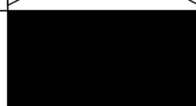
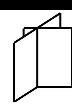
DRAWN: MD
CHKD: EA

SCG PROJECT 22G102-2

PLATE 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL

TRENCH LOG LEGEND

SAMPLE TYPE	GRAPHICAL SYMBOL	SAMPLE DESCRIPTION
AUGER		SAMPLE COLLECTED FROM AUGER CUTTINGS, NO FIELD MEASUREMENT OF SOIL STRENGTH. (DISTURBED)
CORE		ROCK CORE SAMPLE: TYPICALLY TAKEN WITH A DIAMOND-TIPPED CORE BARREL. TYPICALLY USED ONLY IN HIGHLY CONSOLIDATED BEDROCK.
GRAB		SOIL SAMPLE TAKEN WITH NO SPECIALIZED EQUIPMENT, SUCH AS FROM A STOCKPILE OR THE GROUND SURFACE. (DISTURBED)
CS		CALIFORNIA SAMPLER: 2-1/2 INCH I.D. SPLIT BARREL SAMPLER, LINED WITH 1-INCH HIGH BRASS RINGS. DRIVEN WITH SPT HAMMER. (RELATIVELY UNDISTURBED)
NSR		NO RECOVERY: THE SAMPLING ATTEMPT DID NOT RESULT IN RECOVERY OF ANY SIGNIFICANT SOIL OR ROCK MATERIAL.
SPT		STANDARD PENETRATION TEST: SAMPLER IS A 1.4 INCH INSIDE DIAMETER SPLIT BARREL, DRIVEN 18 INCHES WITH THE SPT HAMMER. (DISTURBED)
SH		SHELBY TUBE: TAKEN WITH A THIN WALL SAMPLE TUBE, PUSHED INTO THE SOIL AND THEN EXTRACTED. (UNDISTURBED)
VANE		VANE SHEAR TEST: SOIL STRENGTH OBTAINED USING A 4 BLADED SHEAR DEVICE. TYPICALLY USED IN SOFT CLAYS-NO SAMPLE RECOVERED.

COLUMN DESCRIPTIONS

DEPTH:	Distance in feet below the ground surface.
SAMPLE:	Sample Type as depicted above.
BLOW COUNT:	Number of blows required to advance the sampler 12 inches using a 140 lb hammer with a 30-inch drop. 50/3" indicates penetration refusal (>50 blows) at 3 inches. WH indicates that the weight of the hammer was sufficient to push the sampler 6 inches or more.
POCKET PEN.:	Approximate shear strength of a cohesive soil sample as measured by pocket penetrometer.
GRAPHIC LOG:	Graphic Soil Symbol as depicted on the following page.
DRY DENSITY:	Dry density of an undisturbed or relatively undisturbed sample in lbs/ft^3.
MOISTURE CONTENT:	Moisture content of a soil sample, expressed as a percentage of the dry weight.
LIQUID LIMIT:	The moisture content above which a soil behaves as a liquid.
PLASTIC LIMIT:	The moisture content above which a soil behaves as a plastic.
PASSING #200 SIEVE:	The percentage of the sample finer than the #200 standard sieve.
UNCONFINED SHEAR:	The shear strength of a cohesive soil sample, as measured in the unconfined state.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

TRENCH NO. I-1

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G102-2
PROJECT: Proposed Warehouse
LOCATION: Perris, California

EXCAVATION DATE: 1/26/22
EXCAVATION METHOD: Backhoe
LOGGED BY: Caleb Brackett

WATER DEPTH: Dry
CAVE DEPTH: ---
READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Brown fine Sandy Silt, trace Clay, trace fine root fibers, loose-damp							
					ALLUVIUM: Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace coarse Sand, trace calcareous veining, very dense-very moist							
5												
10	(bulk sample)						18			48		
					Trench Terminated at 10'							

TBL 22G102-2.GPJ SOCALGEO.GDT 3/2/22

TEST TRENCH LOG **PLATE B-1**

TRENCH NO. I-2

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

JOB NO.: 22G102-2	EXCAVATION DATE: 1/26/22	WATER DEPTH: Dry
PROJECT: Proposed Warehouse	EXCAVATION METHOD: Backhoe	CAVE DEPTH: ---
LOCATION: Perris, California	LOGGED BY: Caleb Brackett	READING TAKEN: At Completion

FIELD RESULTS						LABORATORY RESULTS						
DEPTH (FEET)	SAMPLE	BLOW COUNT	POCKET PEN. (TSF)	GRAPHIC LOG	DESCRIPTION SURFACE ELEVATION: MSL	DRY DENSITY (PCF)	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PASSING #200 SIEVE (%)	ORGANIC CONTENT (%)	COMMENTS
					FILL: Brown Silty fine Sand, trace to little Clay, trace fine root fibers, porous, loose-damp							
					ALLUVIUM: Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace coarse Sand, trace calcareous veining, very dense-moist							
5												
	(bag sample)						10			54		
10												
					Trench Terminated at 10'							

TBL 22G102-2.GPJ SOCALGEO.GDT 3/2/22

TEST TRENCH LOG

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Perris, California
Project Number	22G102-2
Engineer	Caleb Brackett

Infiltration Test No	I-1

Constants	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	9:00 AM	15	0	800	0	4000	4.39	7.31	1.73	2.88
	Final	9:15 AM	**15**	800		4000					
2	Initial	9:15 AM	15	0	700	0	3600	3.84	6.58	1.51	2.59
	Final	9:30 AM	**30**	700		3600					
3	Initial	9:30 AM	15	0	650	0	3400	3.56	6.21	1.40	2.45
	Final	9:45 AM	**45**	650		3400					
4	Initial	9:45 AM	15	0	550	0	3300	3.02	6.03	1.19	2.37
	Final	10:00 AM	**60**	550		3300					
5	Initial	10:00 AM	15	0	550	0	3100	3.02	5.66	1.19	2.23
	Final	10:15 AM	**75**	550		3100					
6	Initial	10:15 AM	15	0	500	0	3000	2.74	5.48	1.08	2.16
	Final	10:30 AM	**90**	500		3000					

INFILTRATION CALCULATIONS

Project Name	Proposed Warehouse
Project Location	Perris, California
Project Number	22G102-2
Engineer	Caleb Brackett

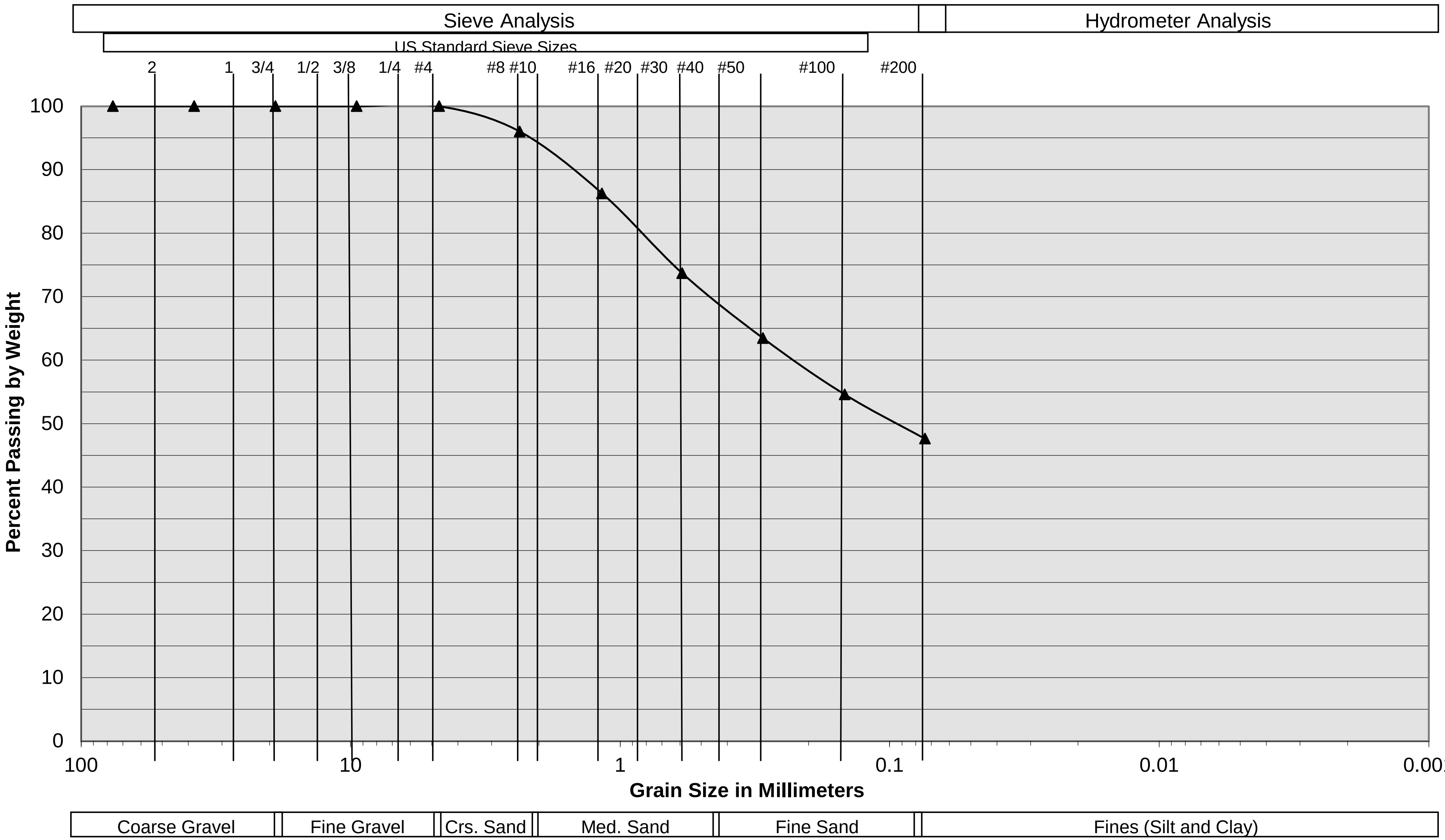
Infiltration Test No: I-2

Constants	Diameter (ft)	Area (ft^2)	Area (cm^2)
Inner	1	0.79	730
Anlr. Spac	2	2.36	2189

*Note: The infiltration rate was calculated based on current time interval

Test Interval		Time (hr)	Interval **Elapsed** (min)	Flow Readings: Inner Ring (ml)	Ring Flow (cm^3)	Annular Ring (ml)	Space Flow (cm^3)	Infiltration Rates: Inner Ring* (cm/hr)	Annular Space* (cm/hr)	Inner Ring* (in/hr)	Annular Space* (in/hr)
1	Initial	12:00 PM	15	0	700	0	4400	3.84	8.04	1.51	3.17
	Final	12:15 PM	**15**	700		4400					
2	Initial	12:15 PM	15	0	650	0	4200	3.56	7.68	1.40	3.02
	Final	12:30 PM	**30**	650		4200					
3	Initial	12:30 PM	15	0	600	0	4100	3.29	7.49	1.30	2.95
	Final	12:45 PM	**45**	600		4100					
4	Initial	12:45 PM	15	0	500	0	2600	2.74	4.75	1.08	1.87
	Final	1:00 PM	**60**	500		2600					
5	Initial	1:00 PM	15	0	450	0	2500	2.47	4.57	0.97	1.80
	Final	1:15 PM	**75**	450		2500					
6	Initial	1:15 PM	15	0	450	0	2400	2.47	4.39	0.97	1.73
	Final	1:30 PM	**90**	450		2400					

Grain Size Distribution

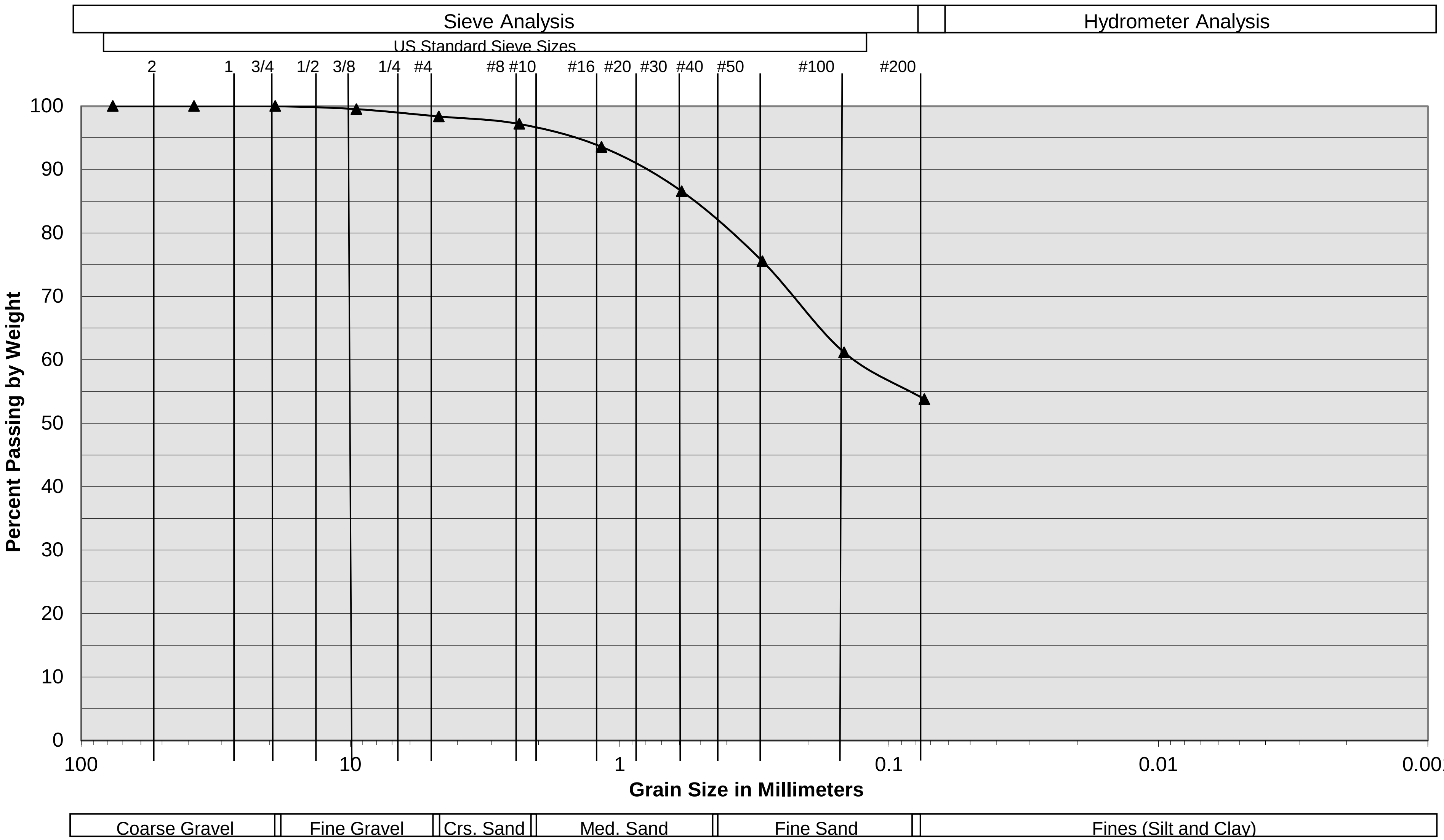


Sample Description	I-1 @ 10'
Soil Classification	Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace coarse Sand

Proposed Warehouse
Perris, California
Project No. 22G102-2
PLATE C- 1

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Grain Size Distribution



Sample Description	I-2 @ 10'
Soil Classification	Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace coarse Sand

Proposed Warehouse
Perris, California
Project No. 22G102-2
PLATE C- 2

SoCalGeo SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Not included.

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

N/A – Runoff from the project is directed to Canon Lake, which ultimately drains to Lake Elsinore. Based on the infiltration investigation from the geotechnical engineer, infiltration is not technically feasible for this project. A biotreatment LID BMP is proposed to treat a portion of the project to the extent practicable. However, the remaining portion of the project will be treated via a proprietary Modular Wetland System (MWS) prior to discharging at the project outlet.

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: SDH & Associates, Inc. — Date: 2/25/2022

Designed by: NM — Case No: TBD

Company Project Number/Name: 2130 / Lake Creek-Wilson

BMP Identification

BMP NAME / ID: Biotreatment (Vegetated Swale) / BMP 1

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}= 0.63 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)*
DMA 1-1	*7,240*	*Ornamental Landscaping*	*0.1*	*0.11*	*799.7*			
DMA 1-2	*18,461*	*Concrete or Asphalt*	*1*	*0.89*	*16467.2*			
	25701	*Total*			*17266.9*	**0.63**	*906.5*	*N/A*

Notes:

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	SDH & Associates, Inc.	Date	2/25/2022
Designed by	NM	Case No	TBD
Company Project Number/Name	2130 / Lake Creek-Wilson		

BMP Identification

BMP NAME / ID: Biotreatment (Vegetated Swale) / BMP 1

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	*DMA 1-1*	*7,240*	*Ornamental Landscaping*	*0.1*	*0.11*	*799.7*			
	DMA 1-2	*18,461*	*Concrete or Asphalt*	*1*	*0.892*	*16467.2*			
		25701	***Total***			**17266.9**	**0.20**	***0.1***	***0.1***

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: SDH & Associates, Inc. | Date: 2/25/2022

Designed by: NM | Case No: TBD

Company Project Number/Name: 2130 / Lake Creek-Wilson

BMP Identification

BMP NAME / ID: MWS / BMP 2

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}= 0.63 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)*
DMA 2-1	*5,681*	*Ornamental Landscaping*	*0.1*	*0.11*	*627.5*			
DMA 2-2	*83,038*	*Concrete or Asphalt*	*1*	*0.89*	*74069.9*			
DMA 2-2	*80,823*	*Roofs*	*1*	*0.89*	*72094.1*			
	169542	***Total***			**146791.5**	**0.63**	***7706.6***	***N/A***

Notes:

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: SDH & Associates, Inc. Date: 2/25/2022

Designed by: NM Case No: TBD

Company Project Number/Name: 2130 / Lake Creek-Wilson

BMP Identification

BMP NAME / ID: MWS / BMP 2

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	*DMA 2-1*	*5,681*	*Ornamental Landscaping*	*0.1*	*0.11*	*627.5*			
	DMA 2-2	*83,038*	*Concrete or Asphalt*	*1*	*0.892*	*74069.9*			
	DMA 2-2	*80,823*	*Roofs*	*1*	*0.892*	*72094.1*			
		169542	***Total***			**146791.5**	**0.20**	***0.7***	***0.7***

Notes:

BMP 1 - BIOTREATMENT LID BMP - VEGETATED SWALE
SUPPORTING HYDRAULIC CALCULATIONS
PER WATER QUALITY LOW-FLOW

LC-WILSON_VegetatedSwale_Low-flow

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.200	OK - SUGGESTED MANNING'S N FOR LOW-FLOW.
Channel Slope	0.010 ft/ft	
Left Side Slope	4.000 H:V	OK - FLATTER THAN 3:1.
Right Side Slope	4.000 H:V	
Bottom Width	3.00 ft	OK - MINIMUM 2 FEET BOTTOM WIDTH.
Discharge	0.10 cfs	APPROXIMATE WATER QUALITY LOW-FLOW.

Results

Normal Depth	1.8 in	OK - NO MORE THAN 3 TO 5" MAX.
Flow Area	0.5 ft²	
Wetted Perimeter	4.2 ft	
Hydraulic Radius	1.5 in	
Top Width	4.19 ft	
Critical Depth	0.4 in	
Critical Slope	1.866 ft/ft	
Velocity	0.19 ft/s	(see note below)
Velocity Head	0.00 ft	
Specific Energy	0.15 ft	
Froude Number	0.093	
Flow Type	Subcritical	

OK - LESS THAN 1.0 FPS MAX.

L (REQ'D) = (MINIMUM 5 MIN.) * (0.19 FT/S) * (60 SEC/MIN) = ~57' MINIMUM.

THE PROJECT PLANS TO PROVIDE A **MINIMUM OF ~90' IN LENGTH FOR THE PROPOSED VEGETATED SWALE IN EACH SIDE OF THE PROPOSED CATCH BASIN / ATRIUM GRATE (WITH 3' BOTTOM WIDTH; 1' DEPTH (MIN.), 4:1 SIDES; AND APPROXIMATELY 1% LONGITUDINAL SLOPE)**. THIS WILL PROVIDE MORE THAN A MINIMUM OF 5-MINUTE RESIDENCE (CONTACT) TIME. THEREFORE, OK.

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.8 in
Critical Depth	0.4 in
Channel Slope	0.010 ft/ft
Critical Slope	1.866 ft/ft

BMP 1 - BIOTREATMENT LID BMP - VEGETATED SWALE
SUPPORTING HYDRAULIC CALCULATIONS
CONVEYANCE CHECK FOR 10-YEAR FLOW

LC-WILSON_VegetatedSwale_Conveyance

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.060
Channel Slope	0.010 ft/ft
Left Side Slope	4.000 H:V
Right Side Slope	4.000 H:V
Bottom Width	3.00 ft
Discharge	1.40 cfs

APPROXIMATE 10-YEAR FLOW.

Results

Normal Depth	4.0 in
Flow Area	1.4 ft²
Wetted Perimeter	5.7 ft
Hydraulic Radius	3.0 in
Top Width	5.64 ft
Critical Depth	2.1 in
Critical Slope	0.101 ft/ft
Velocity	0.98 ft/s
Velocity Head	0.01 ft
Specific Energy	0.35 ft
Froude Number	0.344
Flow Type	Subcritical

OK - THE PROVIDED SWALE DEPTH IS MORE THAN 12".

GVF Input Data

Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data

Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	4.0 in
Critical Depth	2.1 in
Channel Slope	0.010 ft/ft
Critical Slope	0.101 ft/ft

SITE SPECIFIC DATA			
PROJECT NUMBER		14963	
PROJECT NAME		LAKE CREEK - WILSON	
PROJECT LOCATION		PERRIS, CA	
STRUCTURE ID		BMP 2	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.67	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			OFFLINE
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	31.40	HDPE	8"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	28.00	HDPE	8"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	40.40	40.40	40.40
SURFACE LOAD	H-20 DIRECT	H-20 DIRECT	H-20 DIRECT
FRAME & COVER	ø30"	3EA ø36"	ø30"
WETLANDMEDIA VOLUME (CY)			11.41
ORIFICE SIZE (DIA. INCHES)			ø2.64 EA

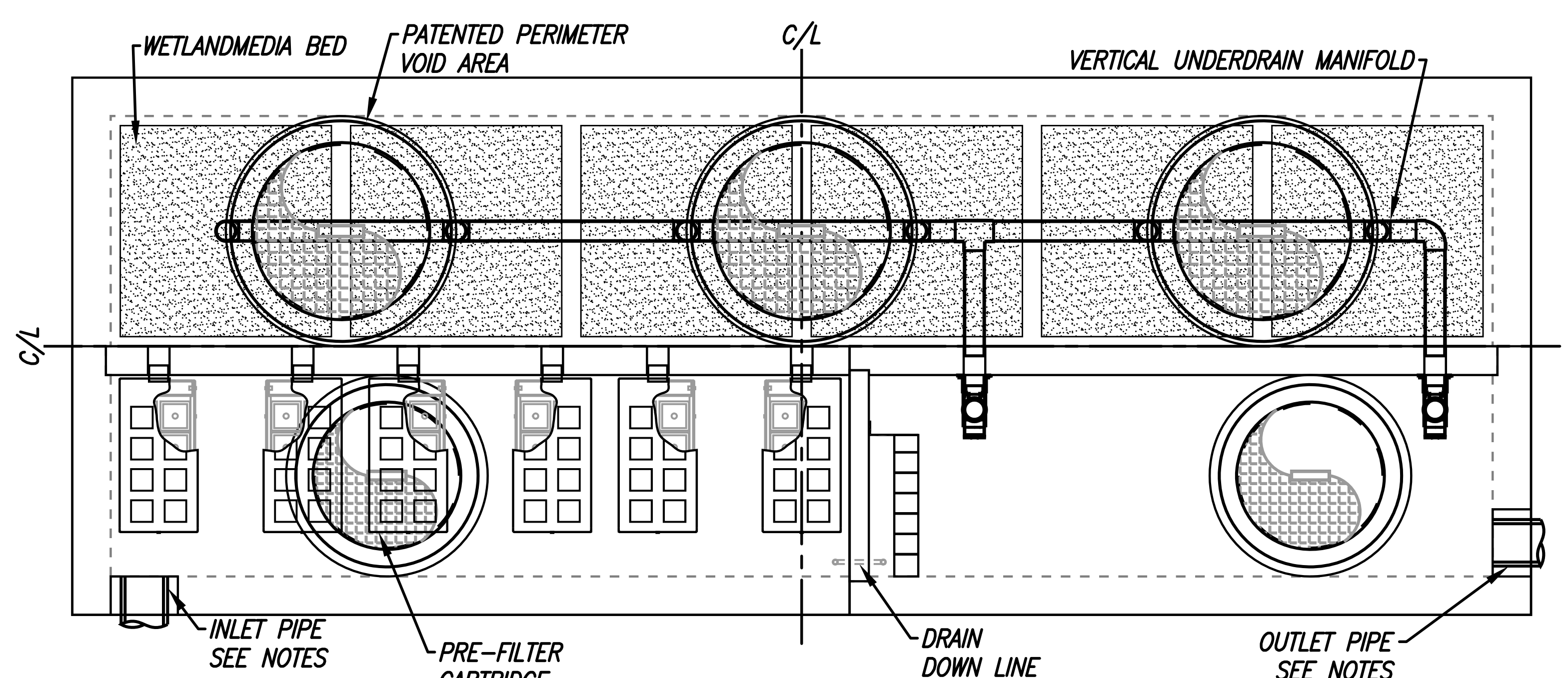
NOTES: PRELIMINARY NOT FOR CONSTRUCTION. INDUSTRIAL MEDIA REQUIRED. 8" WALL THICKNESS REQUIRED.

INSTALLATION NOTES

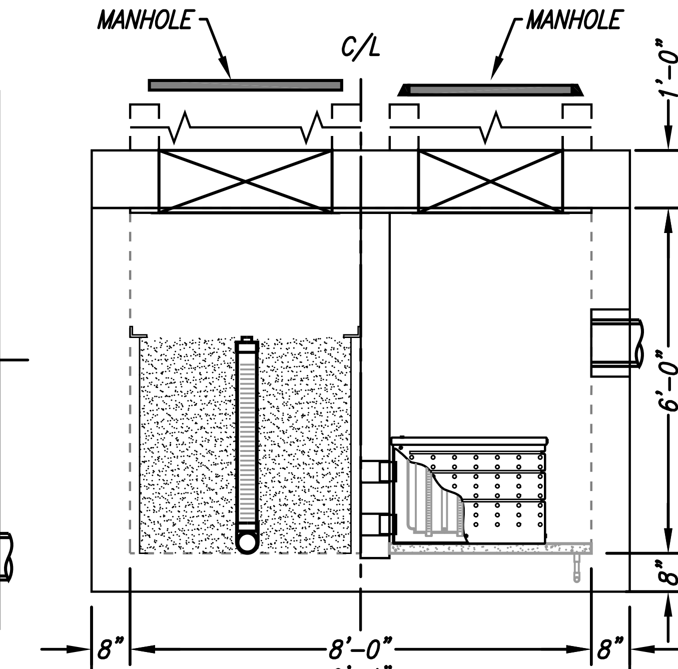
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

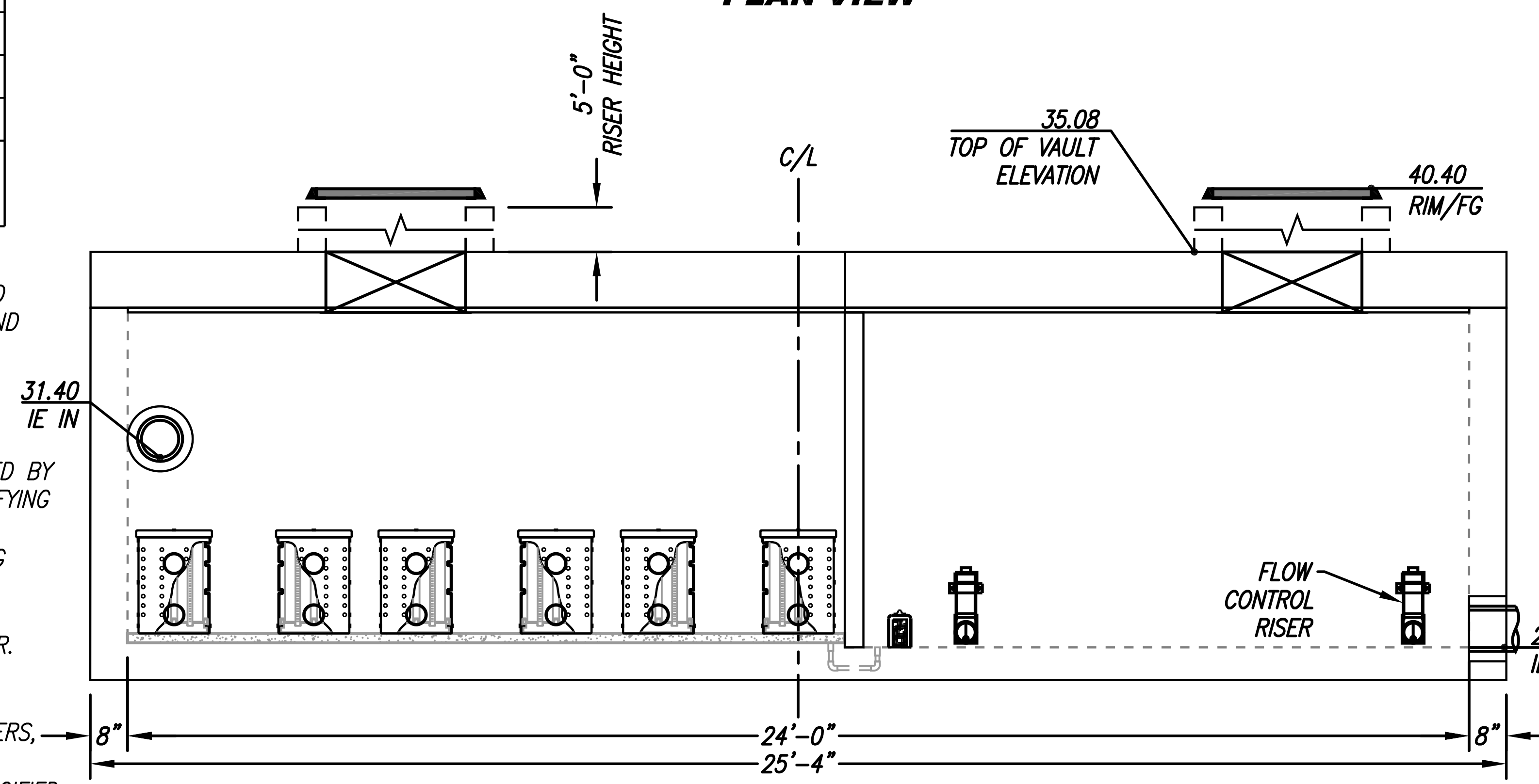
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.



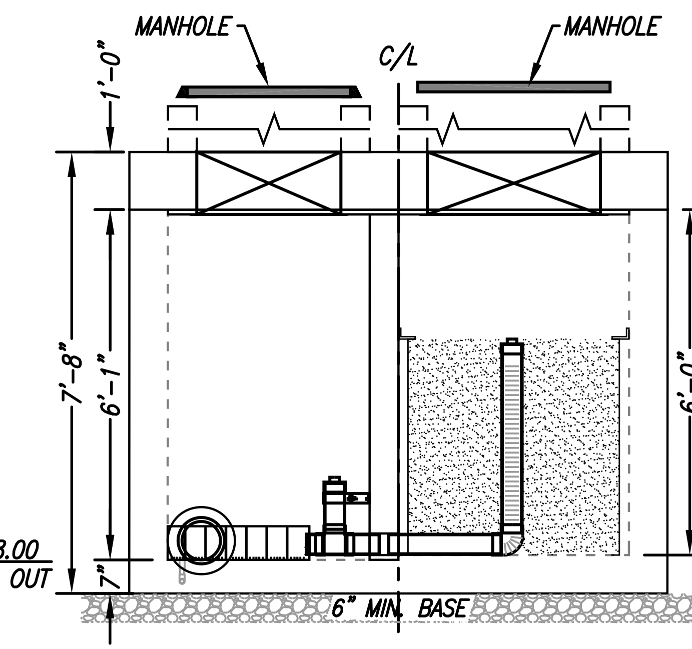
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

TREATMENT FLOW (CFS)	0.67
OPERATING HEAD (FT)	3.3
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

Bio Clean
A Forterra Company

MWS-L-8-24-6'-0"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

2/23/22BREVE

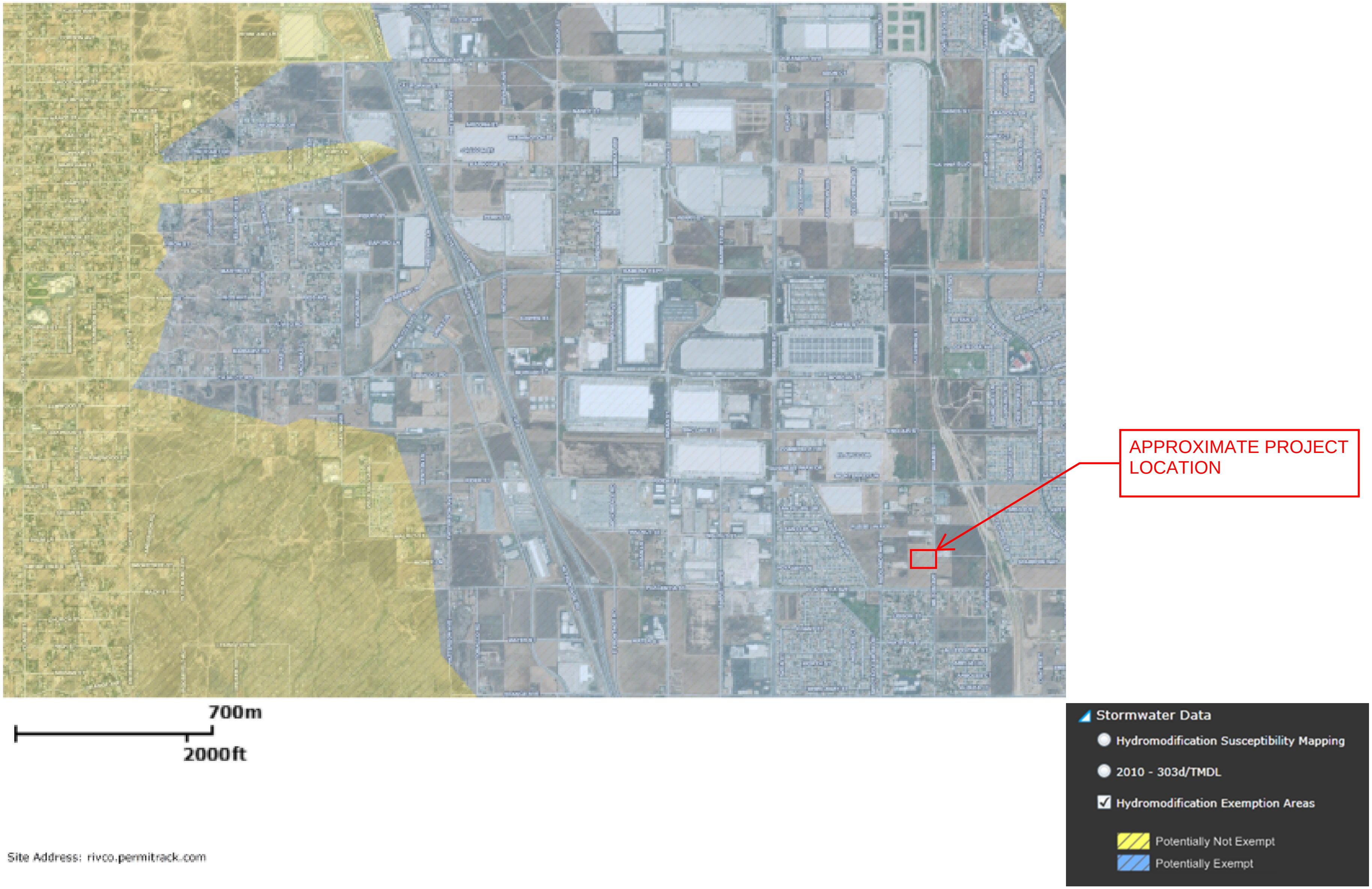
Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

Note: The project is within the Riverside County WAP HCOC Exemption area approved on April 20, 2017. Therefore, the project is exempt from the HCOC requirements.

SCREEN CAPTURE - RIVERSIDE COUTY STORM WATER & WATER CONSERVATION TRACKING TOOL

HCOC EXEMPTION AREAS



Site Address: rivco.permitrack.com

NOTE: THE PROJECT IS WITHIN THE RIVERSIDE COUNTY WAP HCOC EXEMPTION AREA APPROVED ON APRIL 20, 2017. THEREFORE, THE PROJECT SHOULD BE EXEMPT FROM THE HCOC REQUIREMENTS.

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Note: The Source Control checklist will be prepared during final engineering (construction document) stage at the time of the final WQMP.

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Note: The O&M Plan will be prepared during final engineering (construction document) stage at the time of the final WQMP.

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Note: The following reference materials are anticipated to be included in this Appendix during final engineering stage at the time of the final WQMP.

- **SC-10 – Non-Stormwater Discharges**
- **SC-11 – Spill Prevention, Control & Cleanup**
- **SC-30 – Outdoor Loading/Unloading**
- **SC-34 – Waste Handling and Disposal**
- **SC-41 – Building & Grounds Maintenance**
- **SC-43 – Parking/Storage Area Maintenance**
- **SC-60 – Housekeeping Practices**
- **SD-10 – Site Design and Landscape Planning**
- **SD-11 – Roof Runoff Controls**
- **SD-12 – Efficient Irrigation**
- **SD-13 – Storm Drain Signage**
- **SD-32 – Trash Storage Areas**