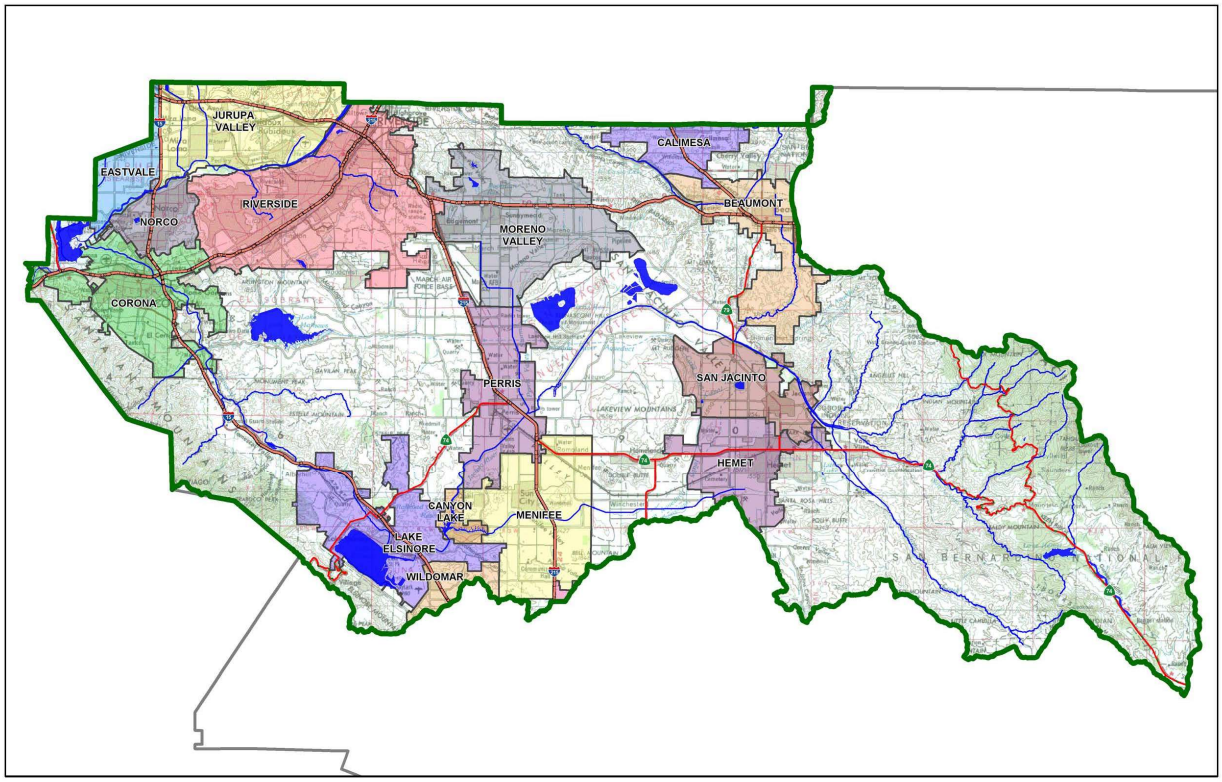
Project Specific Water Quality Management Plan

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

Project Title: Temescal Canyon Self-Storage

Development No: CUP240015

Design Review/Case No: TBD



Contact Information:

Prepared for: Preservation Partners; Attn.: William E. Szymczak; 21515 Hawthorne Blvd., Suite 150; Torrance, CA 90503; (310)294-7921; bill@preservationpartners.org

Prepared by: Omega Engineering Consultants, 4320 Viewridge Ave. Suite C, Patric de Boer, San Diego, CA 92123, (858) 840-6013; patric@omega-consultants.com

☒ **Preliminary**
☐ **Final**

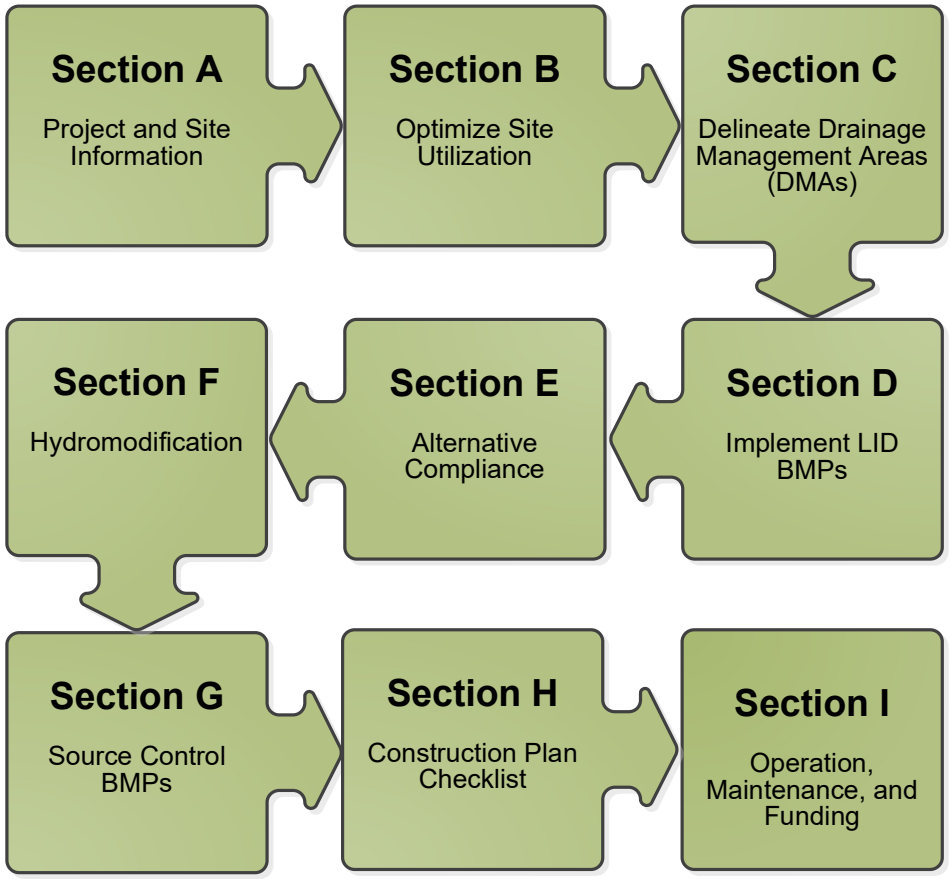
Original Date Prepared: 05/14/2024

Revision Date(s): 11/04/2024, 02/02/2025, 05/30/2025

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**
Template revised June 30, 2016

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 William E. Szymczak by Omega Engineering Consultants for the Temescal Canyon Self-Storage project.

This WQMP is intended to comply with the requirements of City of Corona for Ordinance No. TBD 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 City of Corona Water Quality Ordinance (Municipal Code Section).

"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: 6/2/2025
Owner's Printed Name: WILLIAM E. SZYMCZAK	Owner's Title/Position: MANAGER

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: 5/29/2025
Patric de Boer Preparer's Printed Name	Project Engineer Preparer's Title/Position

Preparer's Licensure:



Table of Contents

Section A: Project and Site Information 6

A.1 Maps and Site Plans 6
A.2 Identify Receiving Waters 7
A.3 Additional Permits/Approvals required for the Project: 7

Section B: Optimize Site Utilization (LID Principles) 8

Section C: Delineate Drainage Management Areas (DMAs) 10

Section D: Implement LID BMPs 12

D.1 Infiltration Applicability 12
D.2 Harvest and Use Assessment 13
D.3 Bioretention and Biotreatment Assessment 15
D.4 Feasibility Assessment Summaries 16
D.5 LID BMP Sizing 17

Section E: Alternative Compliance (LID Waiver Program) 18

E.1 Identify Pollutants of Concern 19
E.2 Stormwater Credits 20
E.3 Sizing Criteria 20
E.4 Treatment Control BMP Selection 21

Section F: Hydromodification 22

F.1 Hydrologic Conditions of Concern (HCOC) Analysis 22
F.2 HCOC Mitigation 23

Section G: Source Control BMPs 24

Section H: Construction Plan Checklist 27

Section I: Operation, Maintenance and Funding 28

List of Tables

Table A.1 Identification of Receiving Waters 7
Table A.2 Other Applicable Permits 7
Table C.1 DMA Classifications 10
Table C.2 Type 'A', Self-Treating Areas 10
Table C.3 Type 'B', Self-Retaining Areas 10
Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas 11
Table C.5 Type 'D', Areas Draining to BMPs 11
Table D.1 Infiltration Feasibility 12
Table D.2 LID Prioritization Summary Matrix 16
Table D.3 DCV Calculations for LID BMPs 17
Table E.1 Potential Pollutants by Land Use Type 19
Table E.2 Water Quality Credits 20
Table E.3 Treatment Control BMP Sizing 20
Table E.4 Treatment Control BMP Selection 21
Table F.1 Hydrologic Conditions of Concern Summary 22
Table G.1 Permanent and Operational Source Control Measures 24
Table H.1 Construction Plan Cross-reference 27

List of Appendices

Appendix 1: Maps and Site Plans 29
Appendix 2: Construction Plans 30
Appendix 3: Soils Information 31
Appendix 4: Historical Site Conditions 32
Appendix 5: LID Infeasibility 33
Appendix 6: BMP Design Details 34
Appendix 7: Hydromodification 35
Appendix 8: Source Control 36
Appendix 9: O&M 37
Appendix 10: Educational Materials ..... - 6 -

Section A: Project and Site Information

PROJECT INFORMATION		
Type of Project:	Commercial	
Planning Area:	TBD	
Community Name:	TBD	
Development Name:	CUP240015	
PROJECT LOCATION		
Latitude & Longitude (DMS): 33°48'11.39" N, 117°30'16.81" W		
Project Watershed and Sub-Watershed: Temescal Wash, Bedford Wash-Temescal Wash		
Gross Acres: 2.18 APN(s): 282-140-020-1 Map Book and Page No.: Insert text here		
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)	Commercial	
Proposed or Potential SIC Code(s)	4225	
Area of Impervious Project Footprint (SF)	68,068	
Total Area of proposed Impervious Surfaces within the Project Footprint (SF)/or Replacement	68,068	
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)	87,367	
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)	C	
What is the Water Quality Design Storm Depth for the project?	0.80"	

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
Temescal Wash	N/A	N/A	N/A
Temescal Canyon Lake	N/A	N/A	N/A
Prado Basin Management Zone	pH	RARE, REC1, REC2, WARM, WILD	Receiving water is approx. 11 miles from the project site.

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

Table A.2 Other Applicable Permits

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

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

Section B: Optimize Site Utilization (LID Principles)

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

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

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

Site Optimization

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

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

The existing drainage patterns will be preserved as best as possible. Currently, the site is occupied by a single commercial building with most of the site being asphalt paved. The existing site drains via surface flow to a couple of grated inlets that drain to the gutter on Temescal Canyon Road and ultimately to the public storm drain system. In the proposed conditions, the runoff from the site will drain to a fully lined biofiltration basin and a Modular Wetland Unit for treatment. After treatment, the site will drain to the public storm drain system on Temescal Canyon Rd., the same discharge point as the existing conditions.

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

There is no existing vegetation on-site to preserve.

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

The site has been assumed to have low infiltration capacity. We will elaborate once we obtain a Geotechnical Report.

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

Impervious area has been kept at a minimum based on the proposed site plan.

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

There is no runoff dispersion proposed for this project since the site is not proposing large and flat landscape areas to allow dispersion. All site impervious are will be routed to BMP's that will treat and release to the public storm drain system after 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)[1][2]	Area (Sq. Ft.)	DMA Type
DMA-1	Roof, Pavement and landscape	75,620	Type 'D'
DMA-2	Pavement and landscape	19,240	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)

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]

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

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]

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

DMA Name or ID	BMP Name or ID
DMA-1	BMP-1
DMA-2	BMP-2

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

Section D: Implement LID BMPs

D.1 Infiltration Applicability

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

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

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

Geotechnical Report

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

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

Infiltration Feasibility

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

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?	X	
If Yes, list affected DMAs: DMA-1 & 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:		X
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		
Describe here:		X

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: 0.62 acres

Type of Landscaping (Conservation Design or Active Turf): Conservative Design

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: 1.56 acres (Roof & Pavement)

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: 1.85

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: 2.89 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)
2.89 acres	0.62 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: 40 users

Project Type: Commercial

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: 1.56 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: 167

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: 261

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)
261 users	40 users

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.

N/A

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

Average Daily Demand: N/A

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: N/A

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: N/A

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: N/A

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)**
N/A	N/A

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

D.3 Bioretention and Biotreatment Assessment

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

Select one of the following:

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

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

D.4 Feasibility Assessment Summaries

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

Table D.2 LID Prioritization Summary Matrix

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

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.

Per the Geotechnical investigation performed by LGC Geotechnical on 06/21/2024, it was found that the average infiltration rate with a minimum factor of safety of 3.0 is 0.28 in/hr. Per the Riverside County – LID BMP Design Handbook, LID Bioretention and LID Biotreatment can be used if the calculated infiltration rate of the site is less than 0.3” per hour or less. There are no restrictions in using either type of BMP for treatment of the site.

We have chosen to use a Biotreatment BMP to treat DMA-1 as we don’t have enough landscape area to construct a typical Bioretention BMP. This BMP will be sized by calculating the Design Flow Rate of the tributary area to the BMP.

We have chosen to use a Bioretention BMP to treat DMA-2 since we have enough landscape area south of the building. It is feasible to drain the southerly portion of the site via surface flow to the bioretention BMP and have enough drop to connect to the public storm drain system on Temescal Canyon Road. This BMP will be sized by calculating the Design Capture Volume of the tributary area to the BMP.

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 Q_{BMP} Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperviousness Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
DMA-1	*75,620*	*Mixed Surface Types*	*0.82*	*0.62*	*46900*	*Design Storm Depth (in)*	*Design Flow Rate,* **Q_{BMP}** *(cfs)*	*Proposed Flow (cfs)*
	A_T = 75,620				Σ= 46900	[E]=0.20	DMA-1: Q_{BMP} = 0.185 cfs	DMA-1: Q_{BMP} = 0.231 cfs

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

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.4 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperviousness Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
DMA-2	*19,240*	*Mixed Surface Types*	*0.74*	*0.54*	*10312.5*	*Design Storm Depth (in)*	*Design Capture Volume,* **V_{BMP}** *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T = 19,240				Σ= 10312.5	[E]=0.80	DMA-2: V_{BMP} = 688 cf	DMA-2: V_{BMP} = 896 cf

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

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

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

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

- *Or* -

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

E.1 Identify Pollutants of Concern

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

Table E.1 Potential Pollutants by Land Use Type

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

P = Potential

N = Not Potential

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

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

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

Table E.2 Water Quality Credits

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

[1]Cannot Exceed 50%

[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

E.3 Sizing Criteria

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

Table E.3 Treatment Control BMP Sizing

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

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

[E] is for Flow-Based Treatment Control BMPs [E] = .2, for Volume-Based Control Treatment BMPs, [E] obtained from Exhibit A in the WQMP Guidance Document

[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12

[H] is from the Total Credit Percentage as Calculated from Table E.2 above

[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

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

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

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

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
BMP-1	TSS, Total Phosphorus, Ortho Phosphorus, Nitrogen, Dissolved Zinc, Total Zinc, Total Copper, Motor Oil	85%, 64%, 67%, 45%, 66%, 38%, 69%, 50%, 95%

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

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

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

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

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

If Yes, HCOC criteria do not apply.

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

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

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

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

Table F.1 Hydrologic Conditions of Concern Summary

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

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

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

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

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

N/A

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.

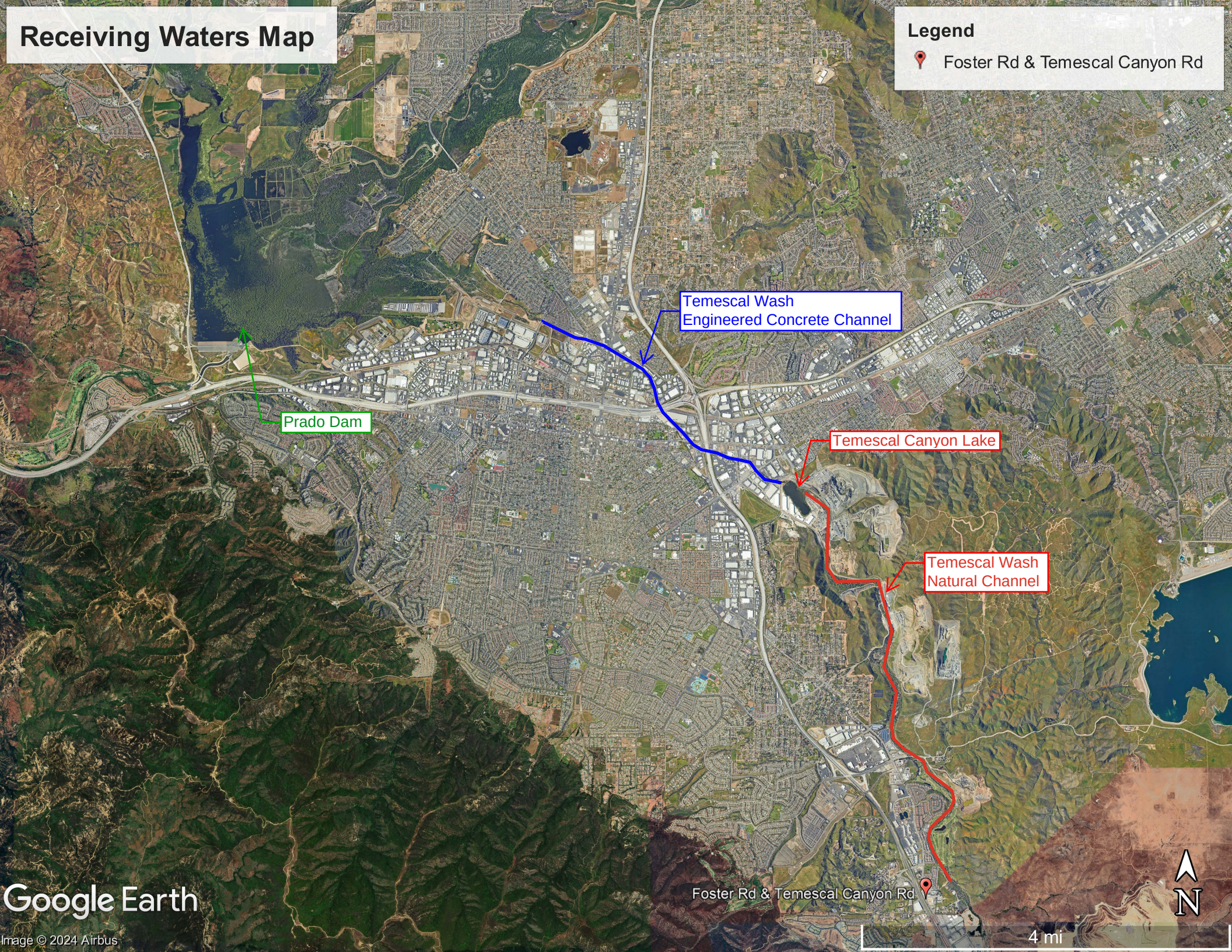
Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

The post-developed 2-year, 24-hour peak flow is less than the pre-developed peak flow. See below for the summary calculations.

$Q_{2\text{-year, 24-hour}}$ pre-developed peak flow: 6.57 cfs

$Q_{2\text{-year, 24-hour}}$ post-developed peak flow: 6.02 cfs

The post-developed peak flow is only 92% of the pre-developed peak flow. This shows that the proposed site will not discharge flow rate greater than 110% of the pre-development 2-year peak flowrate.


Receiving Waters Map
Legend
Foster Rd & Temescal Canyon Rd
Temescal Wash
Engineered Concrete Channel
Prado Dam
Temescal Canyon Lake
Temescal Wash
Natural Channel
Foster Rd & Temescal Canyon Rd
N
4 mi
Google Earth
Image © 2024 Airbus

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.
Interior floor drains	Interior floor drains will be plumbed to sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow.

Need for future indoor & structural pest control	Building design features shall discourage entry of pests	Provide Integrated Pest Management information to owners, lessees, and operators.
Landscape/ Outdoor Pesticide Use	The final landscape plans will accomplish all of the following:. Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides
Refuse areas	Trash enclosures provided and shown on the plans	Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post “no hazardous materials” signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, “Waste Handling and Disposal” in the CASQA Stormwater Handbooks
Fire sprinkler test water	Fire sprinkler test water shall drain directly to the sanitary sewer.	See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Miscellaneous drain or wash water or other sources. - Boiler drain lines	Boiler drain lines shall drain to sanitary sewer system and may not discharge to the storm drain system.	

-Condensate drain lines -Rooftop Equipment -Roofing, gutters and trim	Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	
Plazas, sidewalks, and parking lots		Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer.

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	Modular Wetland Systems	TBD	33.803819, -117.504697
BMP-2	Fully lined biofiltration	TBD	33.8027, -117.504367

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

Section I: Operation, Maintenance and Funding

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

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

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

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

Maintenance Mechanism: Owner to be responsible of on-site BMP's.

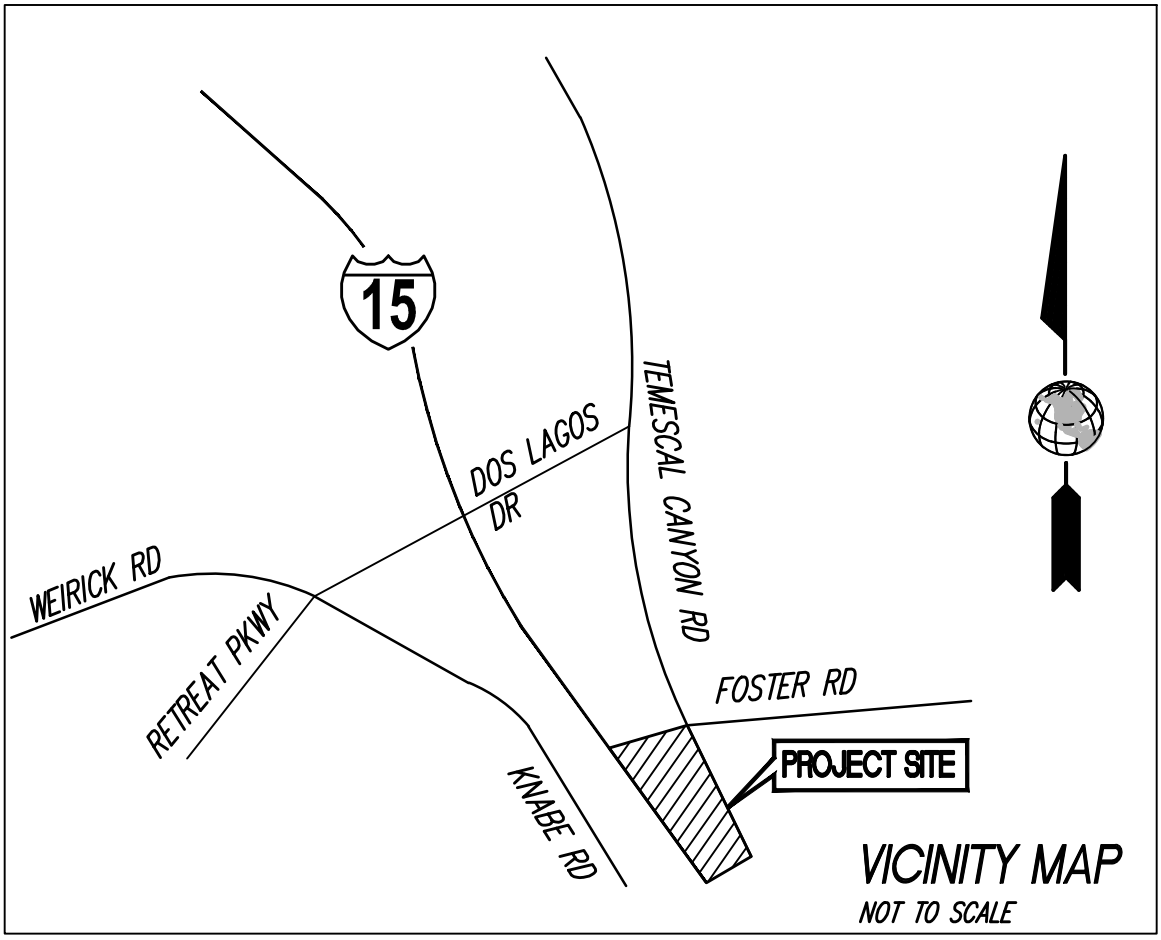
Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☐ Y ☒ N

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

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map



VICINITY MAP

NOT TO SCALE

R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

0.85 MiraLoma
0.61 RiversideNorth
0.54 RiversideSouth
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.90 HurkeyCreek
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Approx. Site Location
Storm Depth = 0.80"

Santa Ana River Watershed
Santa Margarita Watershed

JURUPA VALLEY | EASTVALE | NORCO | CORONA | RIVERSIDE | MORENO VALLEY | CALIMESA | BEAUMONT | SAN JACINTO | PERRIS | CANYON LAKE | LAKE ELSINORE | WILDOMAR | MENIFEE | HEMET | MURRIETA | TEMECULA

06	05	04	03	02	01
07	08	09	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

N

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

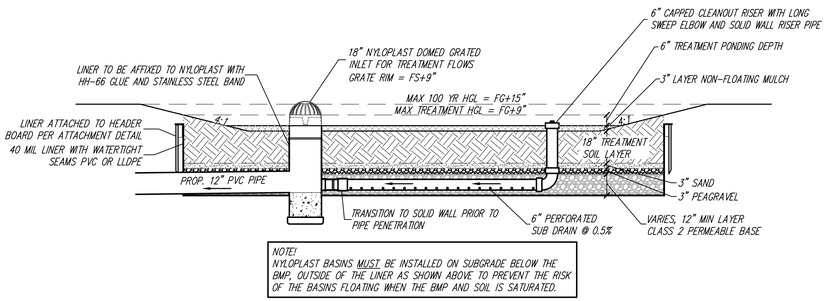
July 2011

IN THE UNINCORPORATED PORTION OF COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

CONDITIONAL USE PERMIT CUP240015

TEMESCAL CANYON SS

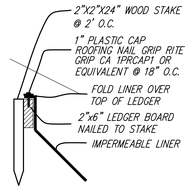
PORTION OF LOT 12 OF SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST



NOTE!
NYLOPLAST BASINS MUST BE INSTALLED ON SUBGRADE BELOW THE BMP, OUTSIDE OF THE LINER AS SHOWN ABOVE TO PREVENT THE RISK OF THE BASINS FLOATING WHEN THE BMP AND SOIL IS SATURATED.

BMP-2, BIORETENTION BMP, SECTION A-A — A

NOT TO SCALE

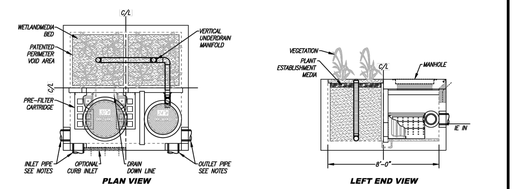


IMPERMEABLE LINER ATTACHMENT DETAIL — B

NOT TO SCALE

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			(CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



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 MANUFACTURER'S 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.
3. 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.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.

PROPRIETARY AND CONFIDENTIAL:
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, AND ANY SUPPLEMENTAL INFORMATION, MAY NOT BE DISCLOSED OR ENTRUSTED TO ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

BMP-1, MODULAR WETLAND SYSTEMS MWS-L-8-8-V — C

NOT TO SCALE

GRAPHICAL SCALE: 1" = 40'
0 20 40 80 120

DMA MAP

C-5

LEGEND:

- DMA BOUNDARY
- DRAINAGE ARROWS
- DRAINAGE MANAGEMENT AREA — DMA-#
- STRUCTURAL BEST MANAGEMENT PRACTICE — BMP-#
- POINT OF COMPLIANCE — POC-#
- IMPERVIOUS AREA
- ROOF AREA
- LANDSCAPED AREAS

DRAINAGE BASIN DATA

DMA-#	DMA TYPE	AREA (SF)	85TH % STORM DEPTH	IMPERVIOUS AREA (SF)	EFFECTIVE IMPERVIOUS FRACTION	DMA RUNOFF FACTOR	DCV (CF)	REQ'D Q_{BMP} (CFS)
DMA-1	TYPE 'D' DRAINS TO BMP-1	75,620	0.80	55,903	0.82	0.62	-	0.185
DMA-2	TYPE 'D' DRAINS TO BMP-2	19,240	0.80	12,165	0.74	0.54	688	-

BMP DATA TABLE

BMP-#	TREATING	BMP TYPE	REQ'D FOOTPRINT (SF)	PROP FOOTPRINT (SF)	REQ'D V_{BMP} (CF)	PROP V_{BMP} (CF)	REQ'D Q_{BMP} (CF)	PROP Q_{BMP} (CF)	BMP LOCATION
BMP-1	DMA-1	BIOTREATMENT	-	64	-	-	0.185	0.231	33.803781, -117.504808
BMP-2	DMA-2	BIORETENTION	510	550	688	921	-	-	33.802514, -117.504.375

NOTES

1. UNDERLYING NRCS HYDROLOGIC SOIL GROUP FOR SITE IS TYPE C
2. GROUNDWATER DEPTH IS HAS NOT YET BEEN DETERMINED
3. NO EXISTING NATURAL HYDROLOGIC FEATURES
4. NO CRITICAL COARSE SEDIMENT YIELD AREAS ON SITE
5. ALL APPLICABLE SOURCE CONTROL BMPS SHALL BE CONDUCTED

BIORETENTION INSPECTION SCHEDULE NOTES

CONTRACTOR MUST CONTACT ENGINEER FOR INSPECTION OF BMPS AT THE FOLLOWING STAGES OF CONSTRUCTION:

- PRIOR TO START OF CONSTRUCTION OF BIORETENTION AREA
- PRIOR TO CONSTRUCTION OF OUTLET STRUCTURE
- AFTER GRADING OF THE BASIN AREA FOR CERTIFICATION
- AFTER PLACEMENT OF IMPERMEABLE LINER (W/EXTRA LENGTH FOR EMBEDMENT)
- AFTER PLACEMENT OF SUB-DRAIN
- AFTER PLACEMENT OF GRAVEL DRAINAGE LAYER
- AFTER IRRIGATION AND LANDSCAPING ACTIVITIES

*SURVEY STAKED SHALL BE AVAILABLE FOR EACH AND EVERY INSPECTION

CONSTRUCTION BMP NOTES

ALL ROCK AND SAND TO BE PLACED IN POST-CONSTRUCTION BMP'S SHALL BE CLEAN-WASHED ROCK TO THE SATISFACTION OF THE GRADING INSPECTOR.

IMMEDIATELY BELOW THE SOIL MEDIA (BSM) INCLUDE A SECTION OF 3" SAND, THEN 3" PEAGRAVEL. ALL SUBDRAINS SHALL BE SCH. 40 WITH A MINIMUM SLOPE OF 0.5%

MAINTENANCE ACCESS NOTE

MAINTENANCE FOR PROPOSED BMP'S CAN BE ACCESSED WITHIN THE DRIVE AISLE. HEAVY MACHINERY IS NOT ALLOWED TO ENCROACH LIMITS OF BIORETENTION BMP (BMP-2).

SOURCE CONTROL BMP NOTES

ALL APPLICABLE SOURCE CONTROL BMPS SHALL BE UTILIZED

A. PROPOSED REFUSE AREA WILL REMAIN COVERED AND PROTECTED FROM WIND DISPERSAL. SIGNS SHALL BE PLACED WITH WORDS "DO NOT DUMP HAZARDOUS MATERIALS OR LIQUIDS HERE" OR SIMILAR. OWNER SHALL BE RESPONSIBLE TO KEEP THE AREA CLEAN OF LITTER AND SPILLS.

B. OWNER TO BE RESPONSIBLE FOR SWEEPING PLAZAS, SIDEWALKS, AND PARKING LOTS. THIS IS TO BE DONE REGULARLY AND AS NEEDED TO PREVENT ACCUMULATION OF LITTER AND DEBRIS.

C. FIRE SPRINKLER TEST WATER SHALL BE DRAINED TO THE BIORETENTION BASIN.

D. CONDENSATE DRAIN LINES INCLUDING AIR CONDITIONING SHALL BE ROUTED TO LANDSCAPE.

E. ROOFING, GUTTERS, AND TRIM SHALL NOT BE MADE OF COPPER OR OTHER UNPROTECTED METALS THAT MAY LEACH INTO RUNOFF MUST BE AVOIDED.

SOURCE CONTROL BMPs

STORM DRAIN STENCILING (1)

PRESERVATION PARTNERS

TEMESCAL CANYON SS

RIVERSIDE COUNTY, CA

OMEGA ENGINEERING CONSULTANTS
4320 VIEWRIDGE AVE. SUITE C
SAN DIEGO, CA 92123
PH:(858) 634-8620 FAX:(858)-634-8627

REGISTERED PROFESSIONAL ENGINEER
SEAN M. SAVAGE
No.75677
CIVIL
STATE OF CALIFORNIA

JORDAN ARCHITECTS
131 CALLE IGLESIA, SUITE 100
SAN CLEMENTE, CA 92672
949.388.8090

THIS DRAWING AND ITS CONTENTS ARE INSTRUMENTS OF SERVICE AND ARE THE COPYRIGHTED PROPERTY OF JORDAN ARCHITECTS, INC. THE USE IS EXPRESSLY INTENDED FOR THE PROJECT NOTED ABOVE AND MAY NOT BE REUSED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF JORDAN ARCHITECTS, INC. "COPYRIGHT" YEAR OF FIRST PUBLICATION 2022 JORDAN ARCHITECTS, INC.

JOB NUMBER: 23-408

DATE: 02/28/2025

Appendix 2: Construction Plans

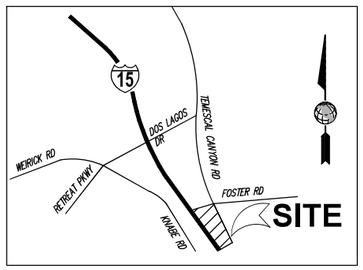
Grading and Drainage Plans

IN THE UNINCORPORATED PORTION OF COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

CONDITIONAL USE PERMIT CUP240015

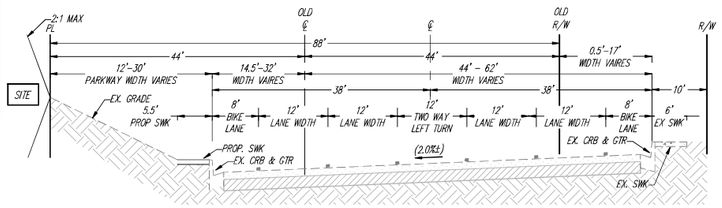
TEMESCAL CANYON SS

PORTION OF LOT 12 OF SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST



VICINITY MAP:

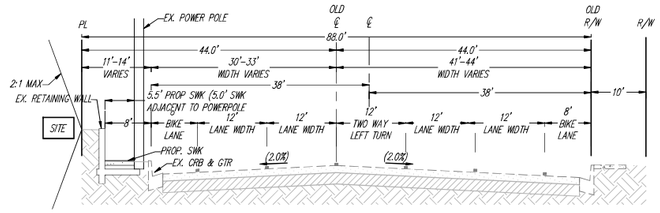
NOT TO SCALE



TYPICAL SECTION TEMESCAL CANYON RD

BETWEEN STA 155+18.49 & STA 152+62.79

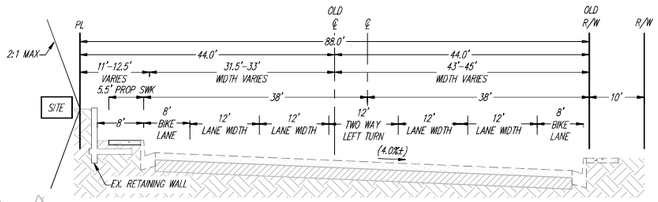
NOT TO SCALE



TYPICAL SECTION TEMESCAL CANYON RD

BETWEEN STA 152+62.79 & STA 151+42.79

NOT TO SCALE



TYPICAL SECTION TEMESCAL CANYON RD

BETWEEN STA STA 151+42.79 & 148+77.27

NOT TO SCALE

GRAPHICAL SCALE: 1" = 30'

0 15 30 60 90

OWNER:

PRESERVATION PARTNERS/ WILLIAM E. SZYMCZAK
21515 HAWTHORNE BLVD, SUITE 150
TORRANCE, CA. 90503

APPLICANT:

PRESERVATION PARTNERS/ WILLIAM E. SZYMCZAK
21515 HAWTHORNE BLVD, SUITE 150
TORRANCE, CA. 90503

REPRESENTATIVE:

OMEGA ENGINEERING CONSULTANTS, INC.
4320 VIEWRIDGE AVE. SUITE C
SAN DIEGO, CA 92108
(619) 488-6293

ADDRESS / APN:

ADDRESS: 21765 TEMESCAL CANYON RD, CORONA, CA 92883
APN: 282-140-020

BOUNDARY AREA:

2.24 GROSS ACRES
2.24 NET ACRES

CONCEPTUAL EARTHWORK:

1,435	CY	CUT
1,751	CY	UNDERCUTS (SLAB, PVMT, FTG UTIL, ETC)
3,054	CY	FILL
1,982	CY	ADJUSTMENTS (DEMO, SUBSIDENCE, SHRINK)
9,500	CY	OVEREXCAVATION / RECOMPACTION
1,850	CY	IMPORT

FEMA FLOOD ZONE:

FLOOD ZONE X

GENERAL DESCRIPTION:

1.	EXISTING GENERAL LAND USE:	CR
2.	PROPOSED GENERAL LAND USE:	CR
3.	GENERAL PLAN:	N/A
4.	EXISTING ZONING:	C-P-S, CZ
5.	PROPOSED ZONING:	C-P-S CZ
6.	PROPOSED LAND USE: WAREHOUSE / STORAGE UNITS	

BUILDINGS AREA:

1ST FLOOR -	35,215 SF
2ND FLOOR -	33,990 SF
3RD FLOOR -	33,990 SF
TOTAL -	103,195 SF

PARKING:

REGULAR :	4
ADA:	2
LOADING:	6
TOTAL:	12

SOURCE OF TOPOGRAPHY

OMEGA LAND SURVEYING, INC.
DATED FEBRUARY 24, 2024

EXISTING LEGEND:

ITEM	SYMBOL
PROPERTY LINE	
OLD CENTERLINE	℄
CENTERLINE	℄
RIGHT-OF-WAY	R/W
EX CONTOUR	589
EX EASEMENT	

PROPOSED LEGEND:

ITEM	SYMBOL
PROPOSED CURB	
PROPOSED RIBBON GUTTER	
PROP BROW DITCH	
PROP SD BIO AREA	
PROP FIRE HYDRANT	
PROP BUILDING FOOTPRINT	

LEGAL DESCRIPTION:

ALL THAT CERTAIN REAL PROPERTY SITUATED IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:
THAT PORTION OF GOVERNMENT LOT 12 OF SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST, SAN BERNARDINO BASE AND MERIDIAN, IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, ACCORDING TO UNITED STATES GOVERNMENT SURVEY THEREOF, LYING EASTERLY OF THE EASTERLY LINE OF LAND AS CONVEYED TO THE STATE OF CALIFORNIA BY DEED RECORDED NOVEMBER 17, 1964 AS INSTRUMENT NO. 138440 OF OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA, AND LYING WESTERLY OF THE WESTERLY LINE OF LAND AS CONVEYED TO THE COUNTY OF RIVERSIDE BY DEED RECORDED FEBRUARY 25, 1985 AS INSTRUMENT NO. 37907 OF OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA.

UTILITY PURVEYORS:

WATER: CITY OF CORONA
400 S. VICENTIA AVE.
CORONA, CA 92882
(951) 736-2234

SEWER: TEMESCAL VALLEY WATER DISTRICT
22646 TEMESCAL CANYON RD,
TEMESCAL VALLEY, CA 92883
(951) 277-1414

GAS: SOCAL GAS
1981 W. LUGONIA AVENUE
REDLANDS, CA. 92374
909-335-7854

ELECTRIC: SOCAL EDISON
P.O. BOX 287
REDLANDS, CA. 92373
909-875-6420

PHONE: VERIZON
1980 ORANGE TREE LAND
REDLANDS, CA. 92373
800-756-7777

CABLE: ADELPHIA
P.O. BOX 3003
REDLANDS, CA. 92373

PRESERVATION PARTNERS

TEMESCAL CANYON SS

RIVERSIDE COUNTY, CA

SITEMAP

C-1

OMEGA ENGINEERING CONSULTANTS
4320 VIEWRIDGE AVE. SUITE C
SAN DIEGO, CA 92123
PH:(858) 634-8620 FAX:(858)-634-8627

REGISTERED PROFESSIONAL ENGINEER SEAN M. SAVAGE No.75677 CIVIL STATE OF CALIFORNIA

JORDAN ARCHITECTS
131 CALLE IGLESIA, SUITE 100
SAN CLEMENTE, CA 92672
949.388.8090

THIS DRAWING AND ITS CONTENTS ARE INSTRUMENTS OF SERVICE AND ARE THE COPYRIGHTED PROPERTY OF JORDAN ARCHITECTS, INC. THE USE IS EXPRESSLY INTENDED FOR THE PROJECT NOTED ABOVE AND MAY NOT BE REUSED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF JORDAN ARCHITECTS, INC. "COPYRIGHT" YEAR OF FIRST PUBLICATION 2022 JORDAN ARCHITECTS, INC.

JOB NUMBER: 23-408

DATE: 05/30/2025

IN THE UNINCORPORATED PORTION OF COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

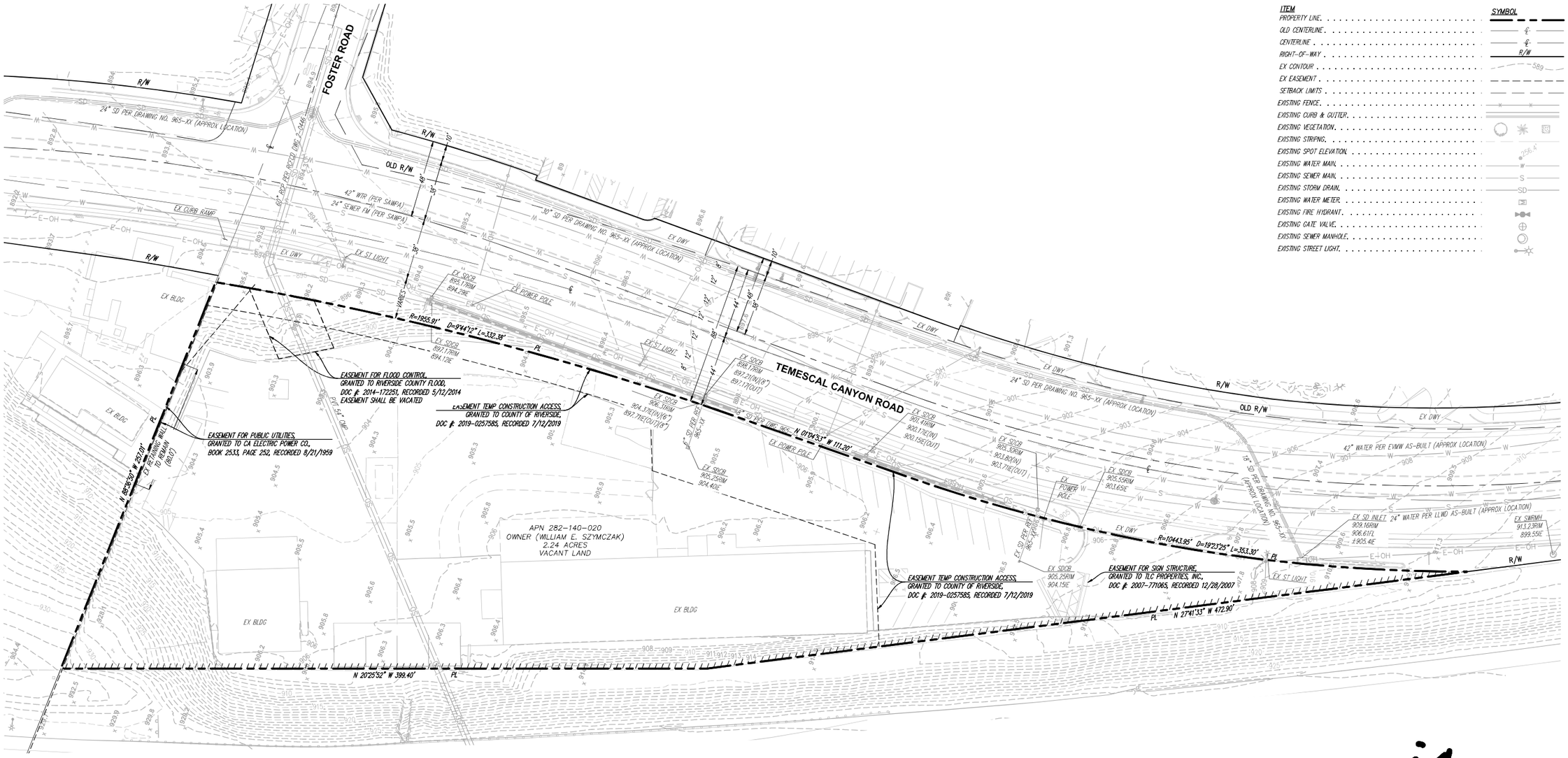
CONDITIONAL USE PERMIT CUP240015

TEMESCAL CANYON SS

PORTION OF LOT 12 OF SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST

EXISTING LEGEND:

ITEM	SYMBOL
PROPERTY LINE	
OLD CENTERLINE	℄
CENTERLINE	℄
RIGHT-OF-WAY	R/W
EX CONTOUR	589
EX EASEMENT	
SETBACK LIMITS	
EXISTING FENCE	-x-x-
EXISTING CURB & GUTTER	
EXISTING VEGETATION	
EXISTING STRIPING	
EXISTING SPOT ELEVATION	956.4
EXISTING WATER MAIN	W
EXISTING SEWER MAIN	S
EXISTING STORM DRAIN	SD
EXISTING WATER METER	
EXISTING FIRE HYDRANT	
EXISTING GATE VALVE	
EXISTING SEWER MANHOLE	
EXISTING STREET LIGHT	



PRESERVATION PARTNERS

TEMESCAL CANYON SS

RIVERSIDE COUNTY, CA

GRAPHICAL SCALE: 1" = 30'

0 15 30 60 90

CONSTRAINTS

C-2

OMEGA ENGINEERING CONSULTANTS
4320 VIEWRIDGE AVE. SUITE C
SAN DIEGO, CA 92123
PH:(858) 634-8620 FAX:(858)-634-8627

REGISTERED PROFESSIONAL ENGINEER
SEAN M. SAVAGE
No.75677
CIVIL
STATE OF CALIFORNIA

JORDAN ARCHITECTS
131 CALLE IGLESIA, SUITE 100
SAN CLEMENTE, CA 92672
949.388.8090

THIS DRAWING AND ITS CONTENTS ARE INSTRUMENTS OF SERVICE AND ARE THE COPYRIGHTED PROPERTY OF JORDAN ARCHITECTS, INC. THE USE IS EXPRESSLY INTENDED FOR THE PROJECT NOTED ABOVE AND MAY NOT BE REUSED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF JORDAN ARCHITECTS, INC. "COPYRIGHT" YEAR OF FIRST PUBLICATION 2022 JORDAN ARCHITECTS, INC.

JOB NUMBER: 23-408

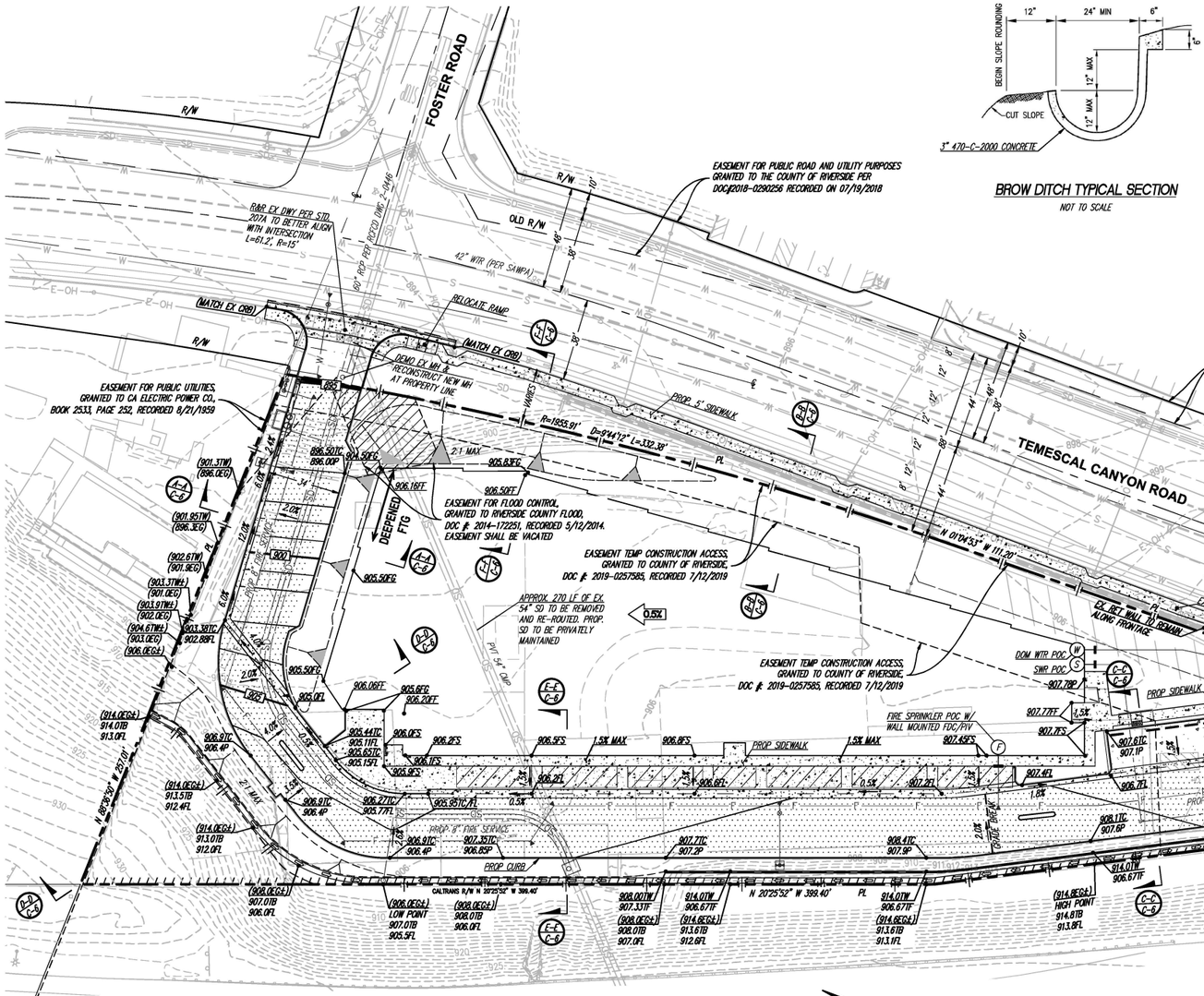
DATE: 11/12/2024

IN THE UNINCORPORATED PORTION OF COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

CONDITIONAL USE PERMIT CUP240015

TEMESCAL CANYON SS

PORTION OF LOT 12 OF SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST



BROW DITCH TYPICAL SECTION

NOT TO SCALE

EXISTING LEGEND:

ITEM	SYMBOL
PROPERTY LINE	
OLD CENTERLINE	
CENTERLINE	
RIGHT-OF-WAY	R/W
EX CONTOUR	589
EX EASEMENT	
SETBACK LIMITS	
EXISTING FENCE	
EXISTING CURB & GUTTER	
EXISTING VEGETATION	
EXISTING STRIPING	
EXISTING SPOT ELEVATION	1256.4'
EXISTING WATER MAIN	W
EXISTING SEWER MAIN	S
EXISTING STORM DRAIN	SD
EXISTING WATER METER	
EXISTING FIRE HYDRANT	
EXISTING GATE VALVE	
EXISTING SEWER MANHOLE	
EXISTING STREET LIGHT	

PROPOSED LEGEND:

ITEM	SYMBOL
PROPOSED CONTOUR	38
PROPOSED PROPERTY LINE	
PROPOSED GRADE BREAK	
PROPOSED DAYLIGHT	
PROPOSED FINISH FLOOR ELEVATION	FF=820.00
PROPOSED TOP OF CURB ELEVATION	374.00TC
PROPOSED PAVEMENT ELEVATION	374.00P
PROPOSED FLOWLINE ELEVATION	374.00FL
PROPOSED FINISHED GRADE ELEVATION	374.00FG
PROPOSED GRADIANT	1.75%
PROPOSED CURB	
PROPOSED CURB & GUTTER	
PROPOSED PCC PAVEMENT	
PROPOSED AC PAVEMENT (DRIVE)	
PROPOSED AC PAVEMENT (PARKING)	
PROPOSED DRIVEWAY	
PROPOSED CMU WALL	
PROPOSED BUILDING FOOTPRINT	
PROPOSED RIP RAP	
PROPOSED BROW DITCH	
PROPOSED RIBBON GUTTER	
PROPOSED DOMESTIC WATER POINT OF CONNECTION	W
PROPOSED FIRE POINT OF CONNECTION	FS
PROPOSED IRRIGATION POINT OF CONNECTION	IR
PROPOSED SEWER POINT OF CONNECTION	S
PROPOSED FIRE HYDRANT	
PROPOSED BACKFLOW	
PROPOSED PARKING CURB	
PROPOSED CURB RAMP	
PROPOSED TREE	
PROPOSED MODULAR WETLAND	
PROPOSED STORM DRAIN STRUCTURES	

PRESERVATION PARTNERS

TEMESCAL CANYON SS

RIVERSIDE COUNTY, CA

GRAPHICAL SCALE: 1" = 30'

0 15 30 60 90

CONCEPTUAL GRADING PLAN

C-3

OMEGA ENGINEERING CONSULTANTS
4320 VIEWRIDGE AVE. SUITE C
SAN DIEGO, CA 92123
PH:(858) 634-8620 FAX:(858)-634-8627

REGISTERED PROFESSIONAL ENGINEER SAM W. SAVAGE No.75677 CIVIL STATE OF CALIFORNIA

JORDAN ARCHITECTS
131 CALLE IGLESIA, SUITE 100
SAN CLEMENTE, CA 92672
949.388.8090

THIS DRAWING AND ITS CONTENTS ARE INSTRUMENTS OF SERVICE AND ARE THE COPYRIGHTED PROPERTY OF JORDAN ARCHITECTS, INC. THE USE IS EXPRESSLY INTENDED FOR THE PROJECT NOTED ABOVE AND MAY NOT BE REUSED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF JORDAN ARCHITECTS, INC. "COPYRIGHT" YEAR OF FIRST PUBLICATION 2022 JORDAN ARCHITECTS, INC.

JOB NUMBER: 23-408

DATE: 05/15/2025

IN THE UNINCORPORATED PORTION OF COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

CONDITIONAL USE PERMIT CUP240015

TEMESCAL CANYON SS

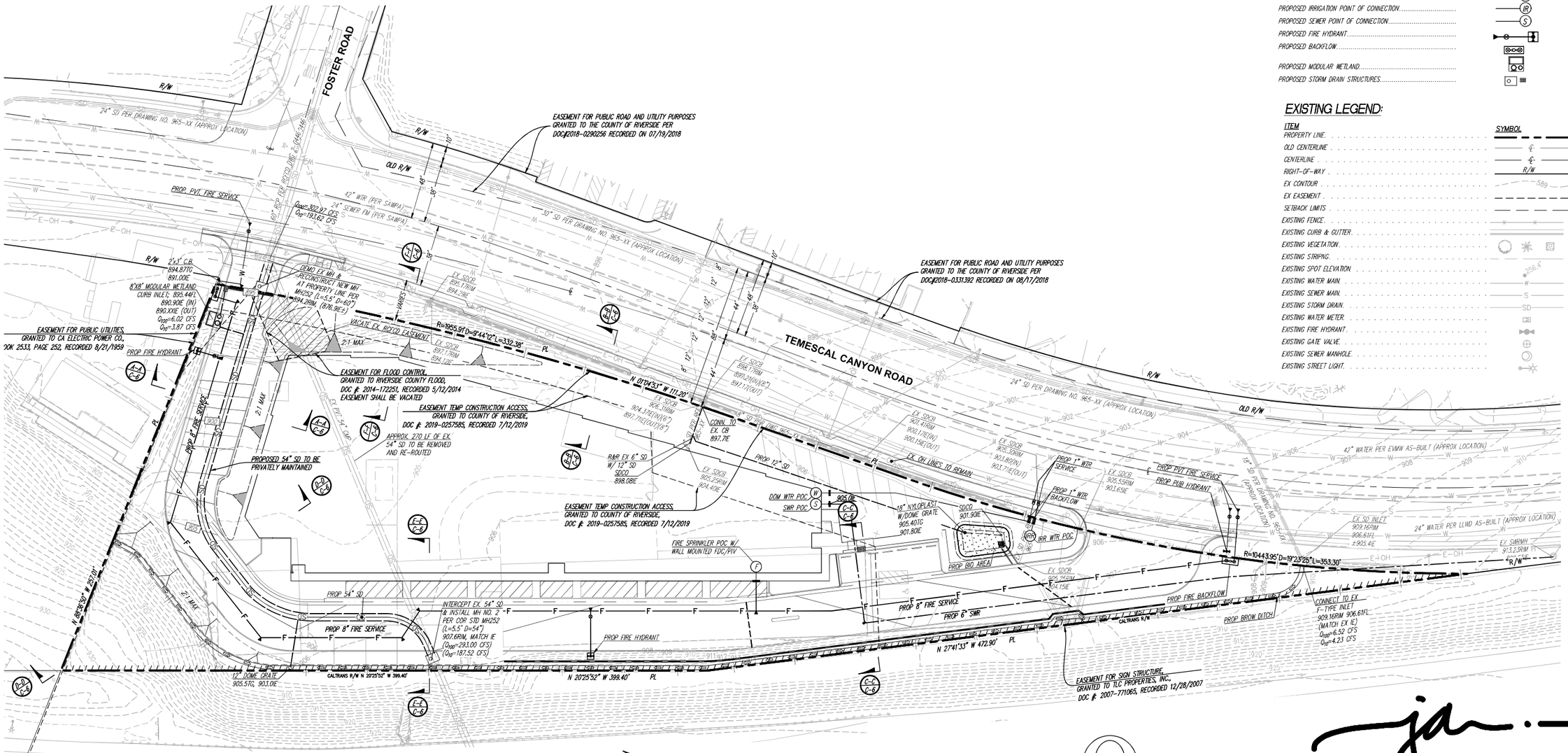
PORTION OF LOT 12 OF SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST

PROPOSED LEGEND:

ITEM	SYMBOL
PROPOSED CONTOUR	38
PROPOSED PROPERTY LINE	
PROPOSED GRADE BREAK	
PROPOSED DAYLIGHT	
PROPOSED RIP RAP	
PROPOSED BROW DITCH	
PROPOSED RIBBON GUTTER	
PROPOSED DOMESTIC WATER POINT OF CONNECTION	W
PROPOSED FIRE POINT OF CONNECTION	FS
PROPOSED IRRIGATION POINT OF CONNECTION	IR
PROPOSED SEWER POINT OF CONNECTION	S
PROPOSED FIRE HYDRANT	
PROPOSED BACKFLOW	
PROPOSED MODULAR WETLAND	
PROPOSED STORM DRAIN STRUCTURES	

EXISTING LEGEND:

ITEM	SYMBOL
PROPERTY LINE	
OLD CENTERLINE	℄
CENTERLINE	℄
RIGHT-OF-WAY	R/W
EX CONTOUR	589
EX EASEMENT	
SETBACK LIMITS	
EXISTING FENCE	
EXISTING CURB & GUTTER	
EXISTING VEGETATION	
EXISTING STRIPING	
EXISTING SPOT ELEVATION	2568.4
EXISTING WATER MAIN	W
EXISTING SEWER MAIN	S
EXISTING STORM DRAIN	SD
EXISTING WATER METER	
EXISTING FIRE HYDRANT	
EXISTING GATE VALVE	
EXISTING SEWER MANHOLE	
EXISTING STREET LIGHT	



PRESERVATION PARTNERS

TEMESCAL CANYON SS

RIVERSIDE COUNTY, CA

GRAPHICAL SCALE: 1" = 30'

0 15 30 60 90

UTILITY PLAN

C-4

OMEGA
ENGINEERING CONSULTANTS
4320 VIEWRIDGE AVE. SUITE C
SAN DIEGO, CA 92123
PH:(858) 634-8620 FAX:(858)-634-8627

REGISTERED PROFESSIONAL ENGINEER SEAN W. SAVAGE No.75677 CIVIL STATE OF CALIFORNIA

JORDAN ARCHITECTS
131 CALLE IGLESIA, SUITE 100
SAN CLEMENTE, CA 92672
949.388.8090

THIS DRAWING AND ITS CONTENTS ARE INSTRUMENTS OF SERVICE AND ARE THE COPYRIGHTED PROPERTY OF JORDAN ARCHITECTS, INC. THE USE IS EXPRESSLY INTENDED FOR THE PROJECT NOTED ABOVE AND MAY NOT BE REUSED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF JORDAN ARCHITECTS, INC. "COPYRIGHT" YEAR OF FIRST PUBLICATION 2022 JORDAN ARCHITECTS, INC.

JOB NUMBER: 23-408

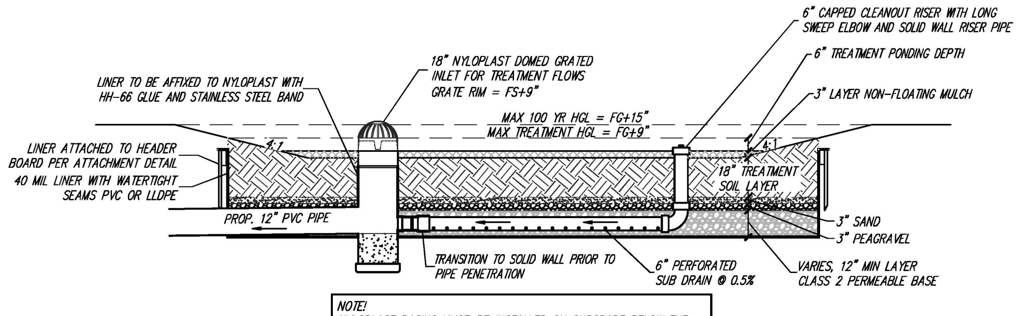
DATE: 05/15/2025

IN THE UNINCORPORATED PORTION OF COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

CONDITIONAL USE PERMIT CUP240015

TEMESCAL CANYON SS

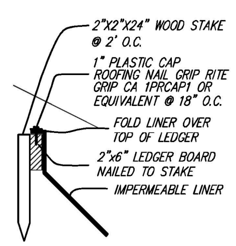
PORTION OF LOT 12 OF SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST



NOTE!
NYLOPLAST BASINS MUST BE INSTALLED ON SUBGRADE BELOW THE BMP, OUTSIDE OF THE LINER AS SHOWN ABOVE TO PREVENT THE RISK OF THE BASINS FLOATING WHEN THE BMP AND SOIL IS SATURATED.

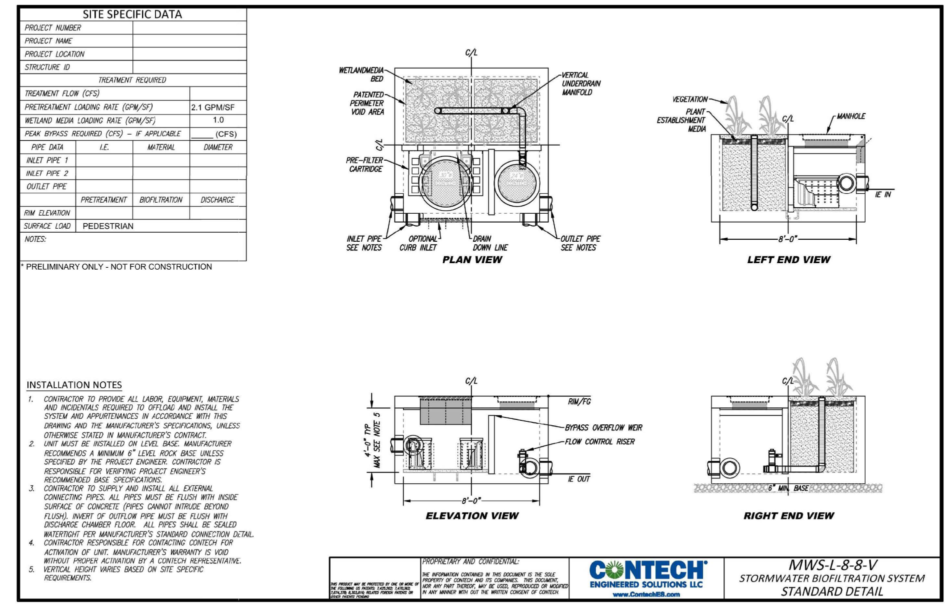
BMP-2, BIORETENTION BMP, SECTION A-A A

NOT TO SCALE



IMPERMEABLE LINER ATTACHMENT DETAIL B

NOT TO SCALE



BMP-1, MODULAR WETLAND SYSTEMS MWS-L-8-8-V C

NOT TO SCALE

LEGEND:

- DMA BOUNDARY
- DRAINAGE ARROWS
- DRAINAGE MANAGEMENT AREA — DMA-#
- STRUCTURAL BEST MANAGEMENT PRACTICE — BMP-#
- POINT OF COMPLIANCE — POC-#
- IMPERVIOUS AREA
- ROOF AREA
- LANDSCAPED AREAS

DRAINAGE BASIN DATA

DMA-#	DMA TYPE	AREA (SF)	85TH % STORM DEPTH	IMPERVIOUS AREA (SF)	EFFECTIVE IMPERVIOUS FRACTION	DMA RUNOFF FACTOR	DCV (CF)	REQ'D Q_{BMP} (CFS)
DMA-1	TYPE 'D' DRAINS TO BMP-1	75,620	0.80	55,903	0.82	0.62	–	0.185
DMA-2	TYPE 'D' DRAINS TO BMP-2	19,240	0.80	12,165	0.74	0.54	688	–

BMP DATA TABLE

BMP-#	TREATING	BMP TYPE	REQ'D FOOTPRINT (SF)	PROP FOOTPRINT (SF)	REQ'D V_{BMP} (CF)	PROP V_{BMP} (CF)	REQ'D Q_{BMP} (CF)	PROP Q_{BMP} (CF)	BMP LOCATION
BMP-1	DMA-1	BIOTREATMENT	–	64	–	–	0.185	0.231	33.803781, -117.504808
BMP-2	DMA-2	BIORETENTION	510	550	688	921	–	–	33.802514, -117.504375

NOTES

1. UNDERLYING NRCS HYDROLOGIC SOIL GROUP FOR SITE IS TYPE C
2. GROUNDWATER DEPTH IS HAS NOT YET BEEN DETERMINED
3. NO EXISTING NATURAL HYDROLOGIC FEATURES
4. NO CRITICAL COARSE SEDIMENT YIELD AREAS ON SITE
5. ALL APPLICABLE SOURCE CONTROL BMPS SHALL BE CONDUCTED

BIORETENTION INSPECTION SCHEDULE NOTES

CONTRACTOR MUST CONTACT ENGINEER FOR INSPECTION OF BMPS AT THE FOLLOWING STAGES OF CONSTRUCTION:

- PRIOR TO START OF CONSTRUCTION OF BIORETENTION AREA
- PRIOR TO CONSTRUCTION OF OUTLET STRUCTURE
- AFTER GRADING OF THE BASIN AREA FOR CERTIFICATION
- AFTER PLACEMENT OF IMPERMEABLE LINER (W/EXTRA LENGTH FOR EMBEDMENT)
- AFTER PLACEMENT OF SUB-DRAIN
- AFTER PLACEMENT OF GRAVEL DRAINAGE LAYER
- AFTER IRRIGATION AND LANDSCAPING ACTIVITIES

*SURVEY STAKED SHALL BE AVAILABLE FOR EACH AND EVERY INSPECTION

CONSTRUCTION BMP NOTES

ALL ROCK AND SAND TO BE PLACED IN POST-CONSTRUCTION BMP'S SHALL BE CLEAN-WASHED ROCK TO THE SATISFACTION OF THE GRADING INSPECTOR.

IMMEDIATELY BELOW THE SOIL MEDIA (BSM) INCLUDE A SECTION OF 3" SAND, THEN 3" PEAGRAVEL. ALL SUBDRAINS SHALL BE SCH. 40 WITH A MINIMUM SLOPE OF 0.5%

MAINTENANCE ACCESS NOTE

MAINTENANCE FOR PROPOSED BMP'S CAN BE ACCESSED WITHIN THE DRIVE AISLE. HEAVY MACHINERY IS NOT ALLOWED TO ENCROACH LIMITS OF BIORETENTION BMP (BMP-2).

SOURCE CONTROL BMP NOTES

ALL APPLICABLE SOURCE CONTROL BMPS SHALL BE UTILIZED

A. PROPOSED REFUSE AREA WILL REMAIN COVERED AND PROTECTED FROM WIND DISPERSAL. SIGNS SHALL BE PLACED WITH WORDS "DO NOT DUMP HAZARDOUS MATERIALS OR LIQUIDS HERE" OR SIMILAR. OWNER SHALL BE RESPONSIBLE TO KEEP THE AREA CLEAN OF LITTER AND SPILLS.

B. OWNER TO BE RESPONSIBLE FOR SWEEPING PLAZAS, SIDEWALKS, AND PARKING LOTS. THIS IS TO BE DONE REGULARLY AND AS NEEDED TO PREVENT ACCUMULATION OF LITTER AND DEBRIS.

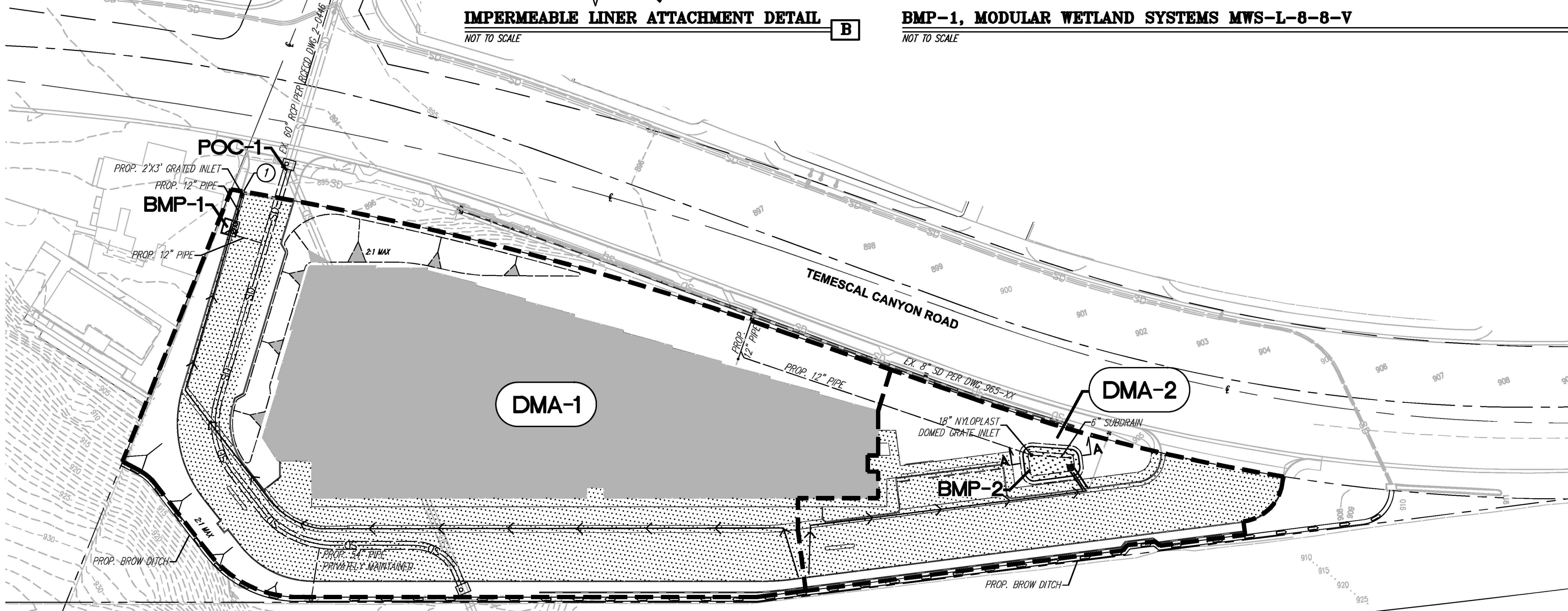
C. FIRE SPRINKLER TEST WATER SHALL BE DRAINED TO THE BIORETENTION BASIN.

D. CONDENSATE DRAIN LINES INCLUDING AIR CONDITIONING SHALL BE ROUTED TO LANDSCAPE.

E. ROOFING, GUTTERS, AND TRIM SHALL NOT BE MADE OF COPPER OR OTHER UNPROTECTED METALS THAT MAY LEACH INTO RUNOFF MUST BE AVOIDED.

SOURCE CONTROL BMPs

STORM DRAIN STENCILING (1)



GRAPHICAL SCALE: 1" = 40'

0 20 40 80 120

PRESERVATION PARTNERS
TEMESCAL CANYON SS
RIVERSIDE COUNTY, CA

DMA MAP

C-5

OMEGA ENGINEERING CONSULTANTS
4320 VIEWRIDGE AVE. SUITE C
SAN DIEGO, CA 92123
PH:(858) 634-8620 FAX:(858)-634-8627

REGISTERED PROFESSIONAL ENGINEER SEAN M. SAVAGE No.75677 CIVIL STATE OF CALIFORNIA

THIS DRAWING AND ITS CONTENTS ARE INSTRUMENTS OF SERVICE AND ARE THE COPYRIGHTED PROPERTY OF JORDAN ARCHITECTS, INC. THE USE IS EXPRESSLY INTENDED FOR THE PROJECT NOTED ABOVE AND MAY NOT BE REUSED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF JORDAN ARCHITECTS, INC. "COPYRIGHT" YEAR OF FIRST PUBLICATION 2022 JORDAN ARCHITECTS, INC.

JOB NUMBER: 23-408

DATE: 02/28/2025

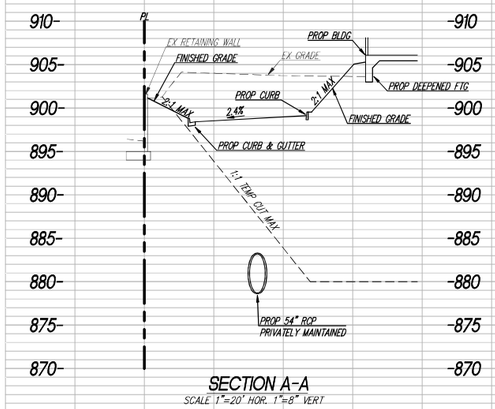
JORDAN ARCHITECTS
131 CALLE IGLESIA, SUITE 100
SAN CLEMENTE, CA 92672
949.388.8090

IN THE UNINCORPORATED PORTION OF COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

CONDITIONAL USE PERMIT CUP240015

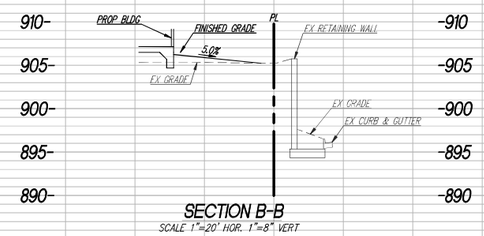
TEMESCAL CANYON SS

PORTION OF LOT 12 OF SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST



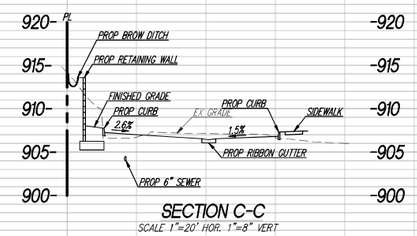
SECTION A-A

SCALE 1"=20' HOR. 1"=8' VERT.



SECTION B-B

SCALE 1"=20' HOR. 1"=8' VERT.



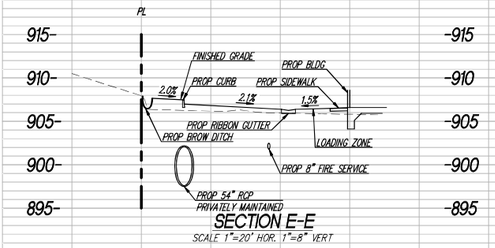
SECTION C-C

SCALE 1"=20' HOR. 1"=8' VERT.



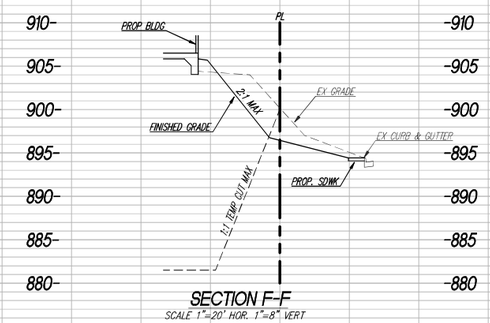
SECTION D-D

SCALE 1"=20' HOR. 1"=8' VERT.



SECTION E-E

SCALE 1"=20' HOR. 1"=8' VERT.



SECTION F-F

SCALE 1"=20' HOR. 1"=8' VERT.

PRESERVATION PARTNERS

TEMESCAL CANYON SS

RIVERSIDE COUNTY, CA

SECTIONS

C-6

ΩMEGA
ENGINEERING CONSULTANTS
4320 VIEWRIDGE AVE. SUITE C
SAN DIEGO, CA 92123
PH:(858) 634-8620 FAX:(858)-634-8627

REGISTERED PROFESSIONAL ENGINEER
SEAN W. SAVAGE
No.75677
CIVIL
STATE OF CALIFORNIA

THIS DRAWING AND ITS CONTENTS ARE INSTRUMENTS OF SERVICE AND ARE THE COPYRIGHTED PROPERTY OF JORDAN ARCHITECTS, INC. THE USE IS EXPRESSLY INTENDED FOR THE PROJECT NOTED ABOVE AND MAY NOT BE REUSED OR REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF JORDAN ARCHITECTS, INC. "COPYRIGHT" YEAR OF FIRST PUBLICATION 2022 JORDAN ARCHITECTS, INC.

JOB NUMBER: 23-408

DATE: 02/27/2025

JORDAN
ARCHITECTS
131 CALLE IGLESIA, SUITE 100
SAN CLEMENTE, CA 92672
949.388.8090

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

June 21, 2024 Project No. 24070-01

Mr. William Szymczak
Preservation Partners Management Group
21515 Hawthorne Blvd, Suite 150
Torrance, CA 90503

Subject: ***Preliminary Geotechnical Evaluation, Proposed Self Storage Development, 21765 Temescal Canyon Road, Corona Area, County of Riverside, California***

In accordance with your request, LGC Geotechnical, Inc. has performed a preliminary geotechnical evaluation for the proposed self-storage development to be located at 21765 Temescal Canyon Road in the Corona area of the County of Riverside, California. The purpose of our study was to evaluate the existing onsite geotechnical conditions and to provide preliminary geotechnical recommendations relative to the proposed development.

Should you have any questions regarding this report, please do not hesitate to contact our office. We appreciate this opportunity to be of service.

Respectfully,

LGC Geotechnical, Inc.

REGISTERED PROFESSIONAL ENGINEER
RYAN L. DOUGLAS
No. 3147
GEOTECHNICAL
STATE OF CALIFORNIA

Ryan Douglas, GE 3147
Project Engineer

CERTIFIED ENGINEERING GEOLOGIST
KEVIN BONIFACE COLSON
No. 2210
STATE OF CALIFORNIA

Kevin B. Colson, CEG 2210
Vice President

John Navarette
Staff Engineer

JMN/RLD/KBC/amm

Distribution: (1) Addressee (electronic copy)

TABLE OF CONTENTS

Section ***Page***

1.0 INTRODUCTION 1
1.1 Project Description 1
1.2 Subsurface Exploration 1
1.3 Field Percolation Testing 2
1.4 Laboratory Testing 3

2.0 GEOTECHNICAL CONDITIONS 4
2.1 Regional Geology 4
2.2 Site-Specific Geology 4
2.3 Geologic Structure 5
2.4 Groundwater 5
2.5 Landslides 5
2.6 Faulting 5
2.6.1 Lurching and Shallow Ground Rupture 6
2.6.2 Liquefaction and Dynamic Settlement 6
2.6.3 Lateral Spreading 7
2.7 Seismic Design Parameters 7
2.8 Rippability 8
2.9 Oversized Material 8
2.10 Expansive Soil Characteristics 9

3.0 FINDINGS AND CONCLUSIONS 10

4.0 RECOMMENDATIONS 11
4.1 Site Earthwork 11
4.1.1 Site Preparation 11
4.1.2 Removal Depths and Limits 12
4.1.3 Temporary Excavations 13
4.1.4 Removal Bottoms and Subgrade Preparation 14
4.1.5 Material for Fill 14
4.1.6 Fill Placement and Compaction 15
4.1.7 Trench and Retaining Wall Backfill and Compaction 16
4.1.8 Shrinkage and Subsidence 16
4.2 Preliminary Foundation Design Parameters 17
4.2.1 Slab Design and Construction 17
4.2.2 Shallow Foundation Maintenance 18
4.3 Soil Bearing and Lateral Resistance 18
4.4 Lateral Earth Pressures for Retaining Walls 19
4.5 Preliminary Pavement Sections 21
4.6 Soil Corrosivity 22
4.7 Nonstructural Concrete Flatwork 22
4.8 Surface Drainage and Landscaping 23
4.8.1 Precise Grading 23

4.8.2 Landscaping....23
4.9 Subsurface Water Infiltration....24
4.10 Pre-Construction Documentation and Construction Monitoring....25
4.11 Geotechnical Plan Review....26
4.12 Geotechnical Observation and Testing During Construction....26

5.0 LIMITATIONS....27

LIST OF TABLES, ILLUSTRATIONS, & APPENDICES

Tables

Table 1 – Summary of Field Infiltration Testing (Page 2)
Table 2 – Seismic Design Parameters (Page 7)
Table 3 – Lateral Earth Pressures – Onsite or Imported Select Sandy Backfill (Page 20)
Table 4 – Preliminary Asphalt Concrete Pavement Section Options (Page 21)
Table 5 – Nonstructural Concrete Flatwork for Very Low Expansion Potential (Page 23)

Figures

Figure 1 – Site Location Map (Rear of Text)
Figure 2 – Retaining Wall Backfill Detail (Rear of Text)

Sheets

Sheet 1– Boring Geotechnical Map (Rear of Text)

Appendices

Appendix A – References
Appendix B – Field Exploration Logs and Field Infiltration Data
Appendix C – Laboratory Test Results
Appendix D – Infiltration Data
Appendix E – General Earthwork and Grading Specifications

1.0 INTRODUCTION

LGC Geotechnical has performed a geotechnical evaluation for the proposed self-storage development to be located at 21765 Temescal Canyon Road in the Corona area of the County of Riverside, California (Figure 1). This report summarizes our findings, conclusions, and preliminary geotechnical recommendations relative to the proposed development.

1.1 Project Description

The approximately 2.3-acre, triangular-shaped site is bound by Temescal Canyon Road to the east, I-15 freeway to the west, a currently occupied property to the north. The site sits on a pre-developed pad that is currently used as a storage yard by a traffic control company. Based on aerial photographic review, the site appeared to be undeveloped as far back as 1948. By 1994 the site had already been developed and has remained relatively unchanged since (Historic Aerials, 2024).

We understand that the proposed development is to include grading and construction for a three-story self-storage building and associated parking, drive aisles, open space and improvements (Jordan, 2024). Preliminary building (dead plus live) loads were not provided at the time of this report. However, we have estimated the maximum column and wall structural (dead plus live) loads to be 100 kips and 5 kips per lineal foot, respectively. A preliminary grading plan was available and indicated that design (not including remedial grading) cuts and fills are relatively minor and are expected to be on the order of 2 to 3 feet.

The recommendations given in this report are based on the layout and estimated structural loads and grading information as indicated above. LGC Geotechnical should be provided with any updated project information, plans and/or any structural loads when they become available, in order to either confirm or modify the recommendations provided herein.

1.2 Subsurface Exploration

In June of 2024, LGC Geotechnical performed a subsurface geotechnical evaluation of the subject site consisting of the excavation of five hollow-stem auger borings in order to evaluate onsite geotechnical conditions.

Five borings (HS-1 through HS-3, I-1 and I-2) were excavated using a truck-mounted drill rig equipped with 8-inch-diameter hollow-stem augers with depths ranging from approximately 4.5 to 38.5 feet below existing grade. An LGC Geotechnical representative observed the drilling operations, logged the borings, and collected soil samples for laboratory testing. Driven soil samples were collected by means of the Standard Penetration Test (SPT) and Modified California Drive (MCD) sampler. The SPT sampler (1.4-inch ID) and MCD sampler (2.4-inch ID, 3.0-inch OD) were driven using a 140-pound hammer falling 30 inches to advance the sampler a total depth of 18 inches or until refusal. The raw blow counts for each 6-inch increment of penetration were recorded on the boring logs. Bulk samples were also collected and logged for laboratory testing at select depths. In select borings, after removal of the augers the depth of the boring due to caving

was measured and is noted on the boring logs. The borings were backfilled with cuttings. Please note that some settlement of the backfill may occur over time and the excavations should be topped off as needed. The approximate locations of our subsurface explorations are provided on the Boring Location Map (Sheet 1). The boring logs are provided in Appendix B.

At the completion of the excavation of Borings I-1 and I-2, an infiltration well was constructed within each boring for testing as outlined in the "Field Percolation Testing" section below. At the completion of infiltration testing, the installed pipe was removed, and the resulting void backfilled with native soils. Please note that some settlement of the backfill may occur over time and the excavations should be topped off as needed.

1.3 Field Percolation Testing

Estimation of infiltration rates was performed in general accordance with guidelines set forth by the County of Riverside (2011). In general, 3-inch diameter perforated PVC pipes were placed in each borehole to be tested and the annulus was backfilled with gravel, including placement of about 2 inches of gravel at the bottom of the borehole. The infiltration wells were pre-soaked prior to testing. Based on the County of Riverside methodology, the calculated (observed) infiltration rates are provided in Table 1. The observed infiltration rates are considered representative of the site soils where tested. These observed infiltration rates do not include any factor of safety. Observed infiltration rates have been normalized to correct the 3-Dimensional flow that occurs within the field test to 1-Dimensional flow out of the bottom of the boring. The approximate infiltration test locations are shown on the Boring Location Map (Sheet 1) and the infiltration test data is summarized in Table 1. Infiltration test results are provided in Appendix D.

TABLE 1

Summary of Infiltration Testing

Infiltration Test Location	Infiltration Test Depth Below Existing Grade (ft)	Observed Infiltration Rate* (Inch/Hr.)
I-1	5	1.4
I-2	4.5	0.3

*Normalized to One-Dimensional Flow, does not include any Factor of Safety.

The tested infiltration rates provided in this report are considered a general representation of the infiltration rates at the location of the infiltration boring. Please note, the testing of infiltration rates is highly dependent upon the materials encountered at the point of testing (i.e., location and depth of testing). Varying subsurface conditions may exist outside of the test locations which could alter the calculated infiltration rates indicated above. Please refer to Section 4.9 for preliminary subsurface water infiltration recommendations.

1.4 Laboratory Testing

Representative bulk and driven samples were obtained for laboratory testing during our field evaluation. Laboratory testing included in-situ moisture content and dry density, sieve analysis, expansion index, direct shear, Atterberg limit, consolidation/collapse potential, laboratory compaction, R-Value and corrosion characteristics (soluble sulfate, chloride, pH and minimum resistivity). A summary of the laboratory test results is presented below with complete results provided in Appendix C.

- Dry density of the samples collected ranged from approximately 103.7 pounds per cubic foot (pcf) to 125 pcf, with an average of 115.8 pcf. Field moisture contents ranged from 2.1 percent to approximately 10 percent, with an average of approximately 5 percent.
- Four fines content/gradation tests were performed and indicated fines content (passing No. 200 sieve) ranging from approximately 19 to 37 percent. According to the Unified Soils Classification System (USCS) the tested samples are classified as "coarse-grained" soil.
- One Expansion Index (EI) test indicated an EI value of 8, corresponding to "Very Low" expansion potential.
- One direct shear test performed. Results are provided in Appendix C.
- Two Atterberg Limit (liquid limit and plastic limit) tests were performed. Results indicated Plasticity Index values ranging from 12 to 21.
- One consolidation test was performed on a select sample. The deformation versus vertical stress plot is provided in Appendix C.
- A laboratory compaction test resulted in a maximum dry density of 135.0 pcf at optimum moisture content of 7.5 percent.
- An R-Value test was performed, results indicated a value of 76.
- Corrosion testing indicated soluble sulfate contents of less than approximately 0.02 percent or less, a chloride content of 240 parts per million (ppm), pH of 7.8, and a minimum resistivity of 3,060 ohm-centimeters.

Laboratory test results obtained from our field evaluation are provided in Appendix C. The moisture and dry density results are presented on the boring logs in Appendix B.

2.0 GEOTECHNICAL CONDITIONS

2.1 Regional Geology

The subject site is located along the northeastern flank of the Santa Ana Mountains, just north of the Elsinore-Temecula basin, within the Peninsular Ranges Geomorphic Province. In this area, the Santa Ana Mountains are composed of a core of metamorphic rocks of the Bedford Canyon Formation with lesser amounts of volcanic rock. Erosion has led to a series of sub-parallel canyons travelling out of the mountains. The material eroded from the mountains has formed a series of coalescing older alluvial fans, also referred to as older alluvial deposits. Subsequently these older fan deposits have been eroded by a series of younger drainage courses. The Elsinore Fault Zone located at the base of the eastern flank of the Santa Ana Mountains is considered a major active fault zone and is regionally part of the San Andreas Fault system. The San Andreas Fault system distributes right-lateral movement across the North American and Pacific Plates.

2.2 Site-Specific Geology

Based on our review of regional geologic maps for the area of the site (USGS, 2002), the project area is mapped as being underlain by Quaternary old and very old alluvial fan deposits. These materials are underlain by bedrock material of the Vaqueros and Sespe Formations (undifferentiated) at depth.

Based on the findings of our study, the site is underlain by undocumented artificial fill overlying alluvial fan deposits. For the purposes of this report “very old” and “old” alluvial fan deposits are undifferentiated. These materials are underlain by bedrock material of the Vaqueros and Sespe Formations (undifferentiated) at depth.

The alluvial fan deposits generally consist of interbedded layers of sand and gravel with varying amounts of silt, cobbles, and minor amounts of clay. Apparent density of these materials generally ranged from medium dense to very dense and increased with depth. Moisture contents are generally well below optimum.

Based on our review of historical aerial photographs, the northern portion of the site is comprised of an infilled valley, which was filled between 1980 and 1985. On the order of approximately 25 feet of fill was encountered in Boring HS-1. The fill was generally comprised of sand, silt and clay with gravel and cobble. Thin areas artificial fill (less than approximately 2 to 3 feet) associated with original development of the site also are likely present in the southern portion of the site. For the purposes of this study, these thinner areas of fill are not differentiated from the alluvial fan deposits. As of this writing, no documentation of the placement of this fill was available for our review. The fill is therefore considered undocumented and assumed not to be an engineered fill.

In general, the Vaqueros and Sespe Formation bedrock consists of interbedded marine and non-marine sandstone with varying amounts of siltstone and conglomerate. Bedrock underlies the alluvial fan deposits at depth. It is not anticipated to be encountered during site grading.

It should be noted that borings are only representative of the location and time where/when they are performed and varying subsurface conditions may exist outside of the performed location. In addition, subsurface conditions can change over time. The soil descriptions provided above should not be construed to mean that the subsurface profile is uniform, and that soil is homogeneous within the project area. For details on the stratigraphy at the exploration locations, refer to Appendix B.

2.3 Geologic Structure

Geologic structure was not identified in the subject site geotechnical evaluation. The alluvial materials encountered are generally massive, but may include low angle bedding, dipping in an easterly direction. Locally, bedding within the Vaqueros and Sespe Formation bedrock typically dips to the east and southeast.

2.4 Groundwater

Groundwater was not encountered during our subsurface evaluation to the maximum explored depth of approximately 38.5 feet below existing ground surface. Groundwater levels recorded nearby the subject site by the California Department of Water Resources were measured at depths greater than 50 feet below the ground surface (CDWR, 2016).

Seasonal fluctuations of groundwater elevations should be expected over time. In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present within the near-surface deposits due to local seepage or during rainy seasons. Local perched groundwater conditions or surface seepage may develop once site development is completed and landscape irrigation commences.

2.5 Landslides

Our research and field observations do not indicate the presence of landslides on the site or in the immediate vicinity. Review of regional geologic maps of the area do not indicate the presence of known or suspected landslides in the vicinity of the site.

2.6 Faulting

Prompted by damaging earthquakes in Northern and Southern California, State legislation and policies concerning the classification and land-use criteria associated with faults have been developed. The Alquist-Priolo Earthquake Fault Zoning Act was implemented in 1972 to prevent the construction of urban developments across the trace of active faults. California Geologic Survey Special Publication 42 was created to provide guidance for following and implementing the law requirements. Special Publication 42 was most recently revised in 2018 (CGS, 2018). According to the State Geologist, an "active" fault is defined as one which has had surface displacement within Holocene time (roughly the last 11,700 years). Regulatory Earthquake Fault Zones have been delineated to encompass traces of known, Holocene-active faults to address hazards associated with surface fault rupture within California. Where developments for human

occupation are proposed within these zones, the state requires detailed fault evaluations be performed so that engineering-geologists can identify the locations of active faults and recommend setbacks from locations of possible surface fault rupture.

The subject site is not located within a State of California Fault Rupture Hazard Zone (CGS, 2018). There are no known active or potentially active faults mapped on the site. The possibility of damage due to ground rupture, as a result of faulting, is considered very low since active faults are not known to cross the site.

Secondary effects of seismic shaking resulting from large earthquakes on the major faults in the Southern California region, which may affect the site, include ground lurching and shallow ground rupture, soil liquefaction, and dynamic settlement. These secondary effects of seismic shaking are a possibility throughout the Southern California region and are dependent on the distance between the site and causative fault and the onsite geology. A discussion of these secondary effects is provided in the following sections.

2.6.1 Lurching and Shallow Ground Rupture

Soil lurching refers to the rolling motion on the ground surface by the passage of seismic surface waves. Effects of this nature are not likely to be significant where the thickness of soft sediments do not vary appreciably under structures. Ground rupture due to active faulting is not likely to occur onsite due to the absence of known active fault traces. Ground cracking due to shaking from distant seismic events is not considered a significant hazard, although it is a possibility at any site.

2.6.2 Liquefaction and Dynamic Settlement

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions coexist: 1) shallow groundwater; 2) low density non-cohesive (granular) soils; and 3) high-intensity ground motion. Studies indicate that saturated, loose near-surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. In general, cohesive soils are not considered susceptible to liquefaction, depending on their plasticity and moisture content (Bray & Sancio, 2006). Effects of liquefaction on level ground include settlement, sand boils, and bearing capacity failures below structures. Dynamic settlement of dry loose sands can occur as the sand particles tend to settle and densify as a result of a seismic event.

According to the County of Riverside General Plan, the lower elevation areas around the site are considered to have a “very low” liquefaction susceptibility (County of Riverside, 2019b). Based on the lack of a shallow groundwater table and the anticipated as-graded conditions consisting of compacted fill overlying dense alluvial soils, there is very low potential for liquefaction and liquefaction-induced settlement during the maximum considered earthquake.

2.6.3 Lateral Spreading

Lateral spreading is a type of liquefaction-induced ground failure associated with the lateral displacement of surficial blocks of sediment resulting from liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluid mass, gravity plus the earthquake inertial forces may cause the mass to move down-slope towards a free face (such as a river channel or an embankment). Lateral spreading may cause large horizontal displacements and such movement typically damages pipelines, utilities, bridges, and structures.

Due to the very low potential for liquefaction, the potential for lateral spreading is also considered very low.

2.7 Seismic Design Parameters

The site seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the 2022 California Building Code (CBC) and applicable portions of ASCE 7-16 which has been adopted by the CBC. Please note that the following seismic parameters are only applicable for code-based acceleration response spectra and are not applicable for where site-specific ground motion procedures are required by ASCE 7-16. Representative site coordinates of latitude 33.802787 degrees north and longitude -117.504549 degrees west were utilized in our analyses. The maximum considered earthquake (MCE) spectral response accelerations (S_{MS} and S_{M1}) and adjusted design spectral response acceleration parameters (S_{DS} and S_{D1}) for Site Class C are provided in Table 2 below. The structural designer should contact the geotechnical consultant if structural conditions (e.g., number of stories, seismically isolated structures, etc.) require site-specific ground motions.

A deaggregation of the PGA based on a 2,475-year average return period (MCE) indicates that an earthquake magnitude of 6.59 at a distance of approximately 2.71 km from the site would contribute the most to this ground motion (USGS, 2014).

Section 1803.5.12 of the 2022 CBC (per Section 11.8.3 of ASCE 7) states that the maximum considered earthquake geometric mean (MCE_G) Peak Ground Acceleration (PGA) should be used for liquefaction potential. The PGA_M for the site is equal to 1.166g (SEAOC, 2024).

TABLE 2

Seismic Design Parameters

Selected Parameters from 2022 CBC, Section 1613 - Earthquake Loads	Seismic Design Values	Notes/Exceptions
Distance to applicable faults classifies the site as a "Near-Fault" site.		Section 11.4.1 of ASCE 7
Site Class	C	Chapter 20 of ASCE 7
Ss (Risk-Targeted Spectral Acceleration for Short Periods)	2.305g	From SEAOC, 2024
S_1 (Risk-Targeted Spectral Accelerations for 1-Second Periods)	0.918g	From SEAOC, 2024
F_a (per Table 1613.2.3(1))	1.200	For Simplified Design Procedure of Section 12.14 of ASCE 7, F_a shall be taken as 1.4 (Section 12.14.8.1)
F_v (per Table 1613.2.3(2))	1.400	-
S_{MS} for Site Class C [Note: $S_{MS} = F_a S_S$]	2.766g	-
S_{M1} for Site Class C [Note: $S_{M1} = F_v S_1$]	1.285g	-
S_{DS} for Site Class C [Note: $S_{DS} = (^2/_3) S_{MS}$]	1.844g	-
S_{D1} for Site Class C [Note: $S_{D1} = (^2/_3) S_{M1}$]	0.857g	-
C_{RS} (Mapped Risk Coefficient at 0.2 sec)	0.902	ASCE 7 Chapter 22
C_{R1}(Mapped Risk Coefficient at 1 sec)	0.894	ASCE 7 Chapter 22

2.8 Rippability

In general, excavation for foundations and underground improvements should be achievable with the appropriate heavy earthwork equipment in good working order.

2.9 Oversized Material

Generation of a surplus of oversized material (material greater than 8 inches in maximum dimension) is generally not anticipated during site grading. However, some oversized material may be encountered, which may result in excavation difficulty for narrow excavations. Recommendations are provided for appropriate handling of oversized materials in Appendix D.

2.10 Expansive Soil Characteristics

Laboratory test results indicate that site soils should be anticipated to have "Very Low" expansion potential. Final expansion potential of site soils should be determined at the completion of grading.

3.0 FINDINGS AND CONCLUSIONS

Based on the results of our geotechnical evaluation, it is our opinion that the proposed site development is feasible from a geotechnical standpoint, provided the following conclusions and recommendations are incorporated into the site design, grading, and construction.

The following is a summary of the primary geotechnical factors which may affect future development of the site.

- The site is comprised of undocumented artificial fill overlying Quaternary undifferentiated old and very old alluvial fan deposits. The Tertiary Vaqueros and Sespe Formations (undifferentiated) underly the alluvium at depth. In general, our borings indicate that the site contains primarily dense silty and clayey sands with varying amounts of gravel and cobble to the maximum explored depth of approximately 38 feet below existing grade. The undocumented fill and near-surface weathered native materials are not suitable for the planned improvements in their present condition (refer to Section 4.1). Moisture contents are generally well below optimum.
- From a geotechnical perspective, the existing onsite soils are suitable material for use as general fill, provided that they are relatively free from rocks (larger than 8 inches in maximum dimension), construction debris, and significant organic material.
- The materials encountered in our evaluation were comprised primarily of sands with lower fines contents (i.e., silts) and very low moisture content. These soils are considered susceptible to sloughing when exposed in steep-sided excavations (generally steeper than 1:1 inclination). Refer to the boring logs in Appendix B.
- Groundwater was not encountered to the maximum explored depth of approximately 38.5 feet below existing ground surface. Groundwater levels recorded nearby the subject site by the California Department of Water Resources were measured at depths greater than 50 feet below the ground surface.
- In general, the site will consist of compacted fill over dense to very dense soils. Due to the absence of groundwater the potential for liquefaction and dynamic settlement is considered very low.
- The proposed development will likely be subjected to strong seismic ground shaking during its design life from one of the regional faults. The subject site is not located within an Alquist-Priolo Earthquake Fault Zone and no faults were identified on the site during our site evaluation.
- Soils exposed at the proposed foundation level are anticipated to have a “Very Low” expansion potential (EI not exceeding 20). This shall be confirmed at the completion of site earthwork.
- Excavation for foundations and underground improvements should be achievable with the appropriate heavy earthwork equipment in good working order.
- From a geotechnical point of view, provided the geotechnical recommendations and parameters provided herein are appropriately incorporated into the design and construction of the project, the proposed site grading and construction are not anticipated to impact the adjacent properties and improvements.

4.0 RECOMMENDATIONS

The following recommendations are to be considered preliminary and should be confirmed upon completion of grading and earthwork operations. In addition, they should be considered minimal from a geotechnical viewpoint, as there may be more restrictive requirements from the architect, structural engineer, building codes, governing agencies, or the owner.

It should be noted that the following geotechnical recommendations are intended to provide sufficient information to develop the site in general accordance with the 2022 CBC requirements. With regard to the possible occurrence of potentially catastrophic geotechnical hazards such as fault rupture, earthquake-induced landslides, liquefaction, etc. the following geotechnical recommendations should provide adequate protection for the proposed development to the extent required to reduce seismic risk to an "acceptable level." The "acceptable level" of risk is defined by the California Code of Regulations as "that level that provides reasonable protection of the public safety, though it does not necessarily ensure continued structural integrity and functionality of the project" [Section 3721(a)]. Therefore, repair and remedial work of the proposed improvement may be required after a significant seismic event. With regards to the potential for less significant geologic hazards to the proposed development, the recommendations contained herein are intended as a reasonable protection against the potential damaging effects of geotechnical phenomena such as expansive soils, fill settlement, groundwater seepage, etc. It should be understood, however, that our recommendations are intended to maintain the structural integrity of the proposed development and structures given the site geotechnical conditions but cannot preclude the potential for some cosmetic distress or nuisance issues to develop as a result of the site geotechnical conditions.

The geotechnical recommendations contained herein must be confirmed to be suitable or modified based on the actual as-graded conditions.

4.1 Site Earthwork

We anticipate that earthwork at the site will consist of required earthwork removals, precise grading and construction of the proposed new improvements, including the industrial structures, subsurface utilities, and vehicular/truck pavement areas.

We recommend that earthwork onsite be performed in accordance with the following recommendations, future grading plan review report(s), the 2022 CBC/County of Riverside requirements, and the General Earthwork and Grading Specifications for Rough Grading included in Appendix E. In case of conflict, the following recommendations shall supersede those included in Appendix E. The following recommendations may be revised within future grading plan review reports or based on the actual conditions encountered during site grading.

4.1.1 Site Preparation

Prior to grading of areas to receive structural fill, engineered structures or improvements should be demolished and the area should be cleared of existing vegetation (shrubs, trees, grass, etc.), surface obstructions, concrete, asphalt, existing debris, and potentially compressible or otherwise unsuitable material. Debris should be removed and properly

disposed of off-site. Holes resulting from the removal of buried obstructions, which extend below proposed removal bottoms, should be replaced with suitable compacted fill material. Any abandoned utility lines associated backfill should be completely removed and replaced with properly compacted fill.

If cesspools or septic systems are encountered, they should be removed in their entirety. The resulting excavation should be backfilled with properly compacted fill soils. As an alternative, cesspools can be backfilled with lean sand-cement slurry. Any encountered wells should be properly abandoned in accordance with regulatory requirements. At the conclusion of the clearing operations, a representative of LGC Geotechnical should observe and accept the site prior to further grading.

4.1.2 Removal Depths and Limits

In order to provide a relatively uniform bearing condition for the planned building structures, upper loose/compressible soils are to be temporarily removed and recompacted as properly compacted fills. Existing undocumented artificial fill encountered within the influence of the proposed structural improvements should be removed to suitable, competent native materials prior to placement of artificial fill to design grades.

For preliminary planning purposes, the depth of required removals and recompaction may be estimated as indicated below and depicted on our Geotechnical Map. Removal of undocumented fill is anticipated to reach depths of on the order of 25 feet below existing grade in the northern portion of the site (see Geotechnical Map). Outside of this area, the undocumented fill and otherwise unsuitable materials are anticipated to be thinner and can be addressed by the remedial recommendations below, based on the improvements and structures proposed. Updated recommendations may be required based on additional fieldwork, changes to building layouts and actual structural loads.

Buildings: Soils shall be temporarily removed and recompacted to a minimum depth of 5 feet below existing grade or 3 feet below the bottom of foundations, whichever is deeper. Additionally, existing undocumented fill and unsuitable topsoil encountered within the building footprints should be removed and recompacted for use as compacted fill. Where space is available, the envelope for removal and recompaction should extend laterally a minimum distance equal to the depth of removal and recompaction below finish grade or 5 feet beyond the edges of the proposed building improvements, whichever is larger. To reduce the potential for differential settlement across the transition between the deep undocumented fill removal in the northern portion of the building footprint and the anticipated shallower removal to the south, we recommend "softening" of the transition. The area of shallower removals should be over excavated a minimum of 5 feet vertically and to at least one half the maximum fill thickness beneath the building footprint, not to exceed 15 feet vertically and extending at least 5 horizontal feet outside of the proposed building footprint. The bottom of the over excavation should be graded to flow towards deeper fill areas. Steeply inclined removal bottoms should be softened below building footprints to 3:1 (horizontal to vertical) inclinations or flatter. The over excavated material should then be replaced by compacted fill material to design grade.

The actual depth and lateral extents of over-excavation should be determined by the geotechnical consultant, based on subsurface conditions encountered during grading.

Minor Site Structures: For minor site structures such as free-standing walls, retaining walls, etc., removal and recompaction should extend at least 3 feet below existing grade or 2 feet below the base of foundations, whichever is deeper. Where space is available, the envelope for removal and recompaction should extend laterally a minimum distance of 3 feet beyond the edges of the proposed minor site structure improvements.

Pavement and Hardscape: Within pavement and hardscape areas, removal and recompaction should extend to a depth of at least 2 feet below the existing grade or 1 foot below finished subgrade (i.e., below planned aggregate base/asphalt concrete or PCC pavement), whichever is deeper. In general, the envelope for removal and recompaction should extend laterally a minimum distance of 2 feet beyond the edges of the proposed pavement and hardscape improvements.

Local conditions may be encountered during excavation that could require additional over-excavation beyond the above-noted minimum in order to obtain an acceptable subgrade. The actual depths and lateral extents of grading will be determined by the geotechnical consultant, based on subsurface conditions encountered during grading. Removal areas and areas to be over-excavated should be accurately staked in the field by the Project Surveyor.

4.1.3 Temporary Excavations

Temporary excavations should be performed in accordance with project plans, specifications, and applicable Occupational Safety and Health Administration (OSHA) requirements. Excavations should be laid back or shored in accordance with OSHA requirements before personnel or equipment are allowed to enter. Based on our field investigation, the majority of site soils are anticipated to be OSHA Type "B" soils (refer to the attached boring logs). Close coordination with the geotechnical consultant should be maintained to facilitate construction while providing safe excavations. Excavation safety is the sole responsibility of the contractor.

Sandy soils are present and should be considered susceptible to sloughing. Raveling of the sandy soils should be anticipated for temporary excavations/slopes. Flatter slope inclinations should be considered if raveling cannot be tolerated. The exposed slope surface may be kept surficially moist (but not saturated) during construction to reduce (not eliminate) potential sloughing.

The potential for impacting the existing improvements and adjacent properties may be reduced by performing excavations using narrow "A-B-C" slot cuts. This should be further evaluated based on the proposed grading plan. Protection of existing improvements during grading is the responsibility of the contractor.

Vehicular traffic, stockpiles, and equipment storage should be set back from the perimeter of excavations a minimum distance equivalent to a 1:1 projection from the bottom of the excavation or 5 feet, whichever is greater. Once an excavation has been initiated, it

should be backfilled as soon as practical. Prolonged exposure of temporary excavations may result in some localized instability. Excavations should be planned so that they are not initiated without sufficient time to shore/fill them prior to weekends, holidays, or forecasted rain.

It should be noted that any excavation that extends below a 1:1 (horizontal to vertical) projection of an existing foundation will remove existing support of the structure foundation. If requested, temporary shoring parameters can be provided.

4.1.4 Removal Bottoms and Subgrade Preparation

In general, removal bottom areas and any areas to receive compacted fill should be scarified to a minimum depth of 6 inches, brought to a near-optimum moisture condition, and re-compacted per project recommendations. Significant moisture conditioning should be anticipated for removal bottoms.

Removal bottoms and areas to receive fill should be observed and accepted by the geotechnical consultant prior to fill placement.

4.1.5 Material for Fill

From a geotechnical perspective, the onsite soils are generally considered suitable for use as general compacted fill, provided they are screened of organic materials, construction debris and any oversized material (8 inches in greatest dimension).

From a geotechnical viewpoint, import soils for general fill (i.e., non-retaining wall backfill) should consist of clean, granular soils of Very Low expansion potential (expansion index of 20 or less based on ASTM D4829). Import for retaining wall backfill should meet the criteria outlined in the paragraph below. Source samples should be provided to the geotechnical consultant for laboratory testing a minimum of three working days prior to any planned importation.

Retaining wall backfill should consist of sandy soils with a maximum of 35 percent fines (passing the No. 200 sieve) per American Society for Testing and Materials (ASTM) Test Method D1140 (or ASTM D6913/D422) and a Very Low expansion potential (EI of 20 or less per ASTM D4829). Soils should also be screened of organic materials, construction debris, and any material greater than 3 inches in maximum dimension. Some of the on-site soils may not be suitable for retaining wall backfill due to their fines content (i.e., silt and clay content) and expansion potential; therefore, import and/or select grading and stockpiling of select sandy materials should be anticipated by the contractor. Samples of retaining wall backfill should be sampled prior to construction to confirm the findings of the investigation.

Aggregate base (crushed aggregate base or crushed miscellaneous base) should conform to the requirements of Section 200-2 of the Standard Specifications for Public Works Construction ("Greenbook") for untreated base materials (except processed miscellaneous base), the County of Riverside or Caltrans Class 2 aggregate base.

The placement of demolition materials in compacted fill is acceptable from a geotechnical viewpoint provided the demolition material is broken up into pieces not larger than typically used for aggregate base (approximately 1 to 3 inches in maximum dimension) and well blended into fill soils with essentially no resulting voids. Demolition material placed in fills must be free of construction debris (wood, organics, etc.) and reinforcing steel. If asphalt concrete fragments will be incorporated into the demolition materials, approval from an environmental viewpoint may be required and is not the purview of the geotechnical consultant. From our previous experience, we recommend that asphalt concrete fragments be limited to fill areas within planned street areas (i.e., not within building pad areas).

4.1.6 Fill Placement and Compaction

Material to be placed as fill should be brought to near-optimum moisture content (generally within optimum and 2 percent above optimum moisture content) and recompacted to at least 90 percent relative compaction (per ASTM D1557). Moisture conditioning of site soils will be required in order to achieve adequate compaction. Drying and/or mixing the very moist soils may be required prior to reusing the materials in compacted fills. Generally, soils are present that will require additional moisture in order to achieve the recommended compaction criteria.

The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in compacted thickness. Each lift should be thoroughly compacted and accepted prior to subsequent lifts. Generally, placement and compaction of fill should be performed in accordance with local grading ordinances and with observation and testing by LGC Geotechnical. Oversized material as previously defined should be removed from site fills, if encountered.

During backfill of excavations, the fill should be properly benched into firm and competent soils of temporary backcut slopes as it is placed in lifts.

Aggregate base material should be compacted to a minimum of 95 percent relative compaction at or slightly above optimum moisture content per ASTM D1557. Subgrade below aggregate base should be compacted to a minimum of 90 percent relative compaction, per ASTM D1557 at near-optimum moisture content (generally within optimum and 2 percent above optimum moisture content), unless otherwise noted in the pavement recommendations sections.

If gap-graded ¾-inch rock is used for backfill (around storm drain storage chambers, retaining wall backfill, etc.) it will require compaction. Rock shall be placed in thin lifts (typically not exceeding 6 inches) and mechanically compacted with observation by geotechnical consultant. Backfill rock shall meet the requirements of ASTM D2321. Gap-graded rock is recommended to be wrapped in filter fabric (Mirafi 140N or approved alternative) or at the very minimum to be vertically separated from the trench backfill with filter fabric to prevent the migration of fines into the rock backfill.

4.1.7 Trench and Retaining Wall Backfill and Compaction

Bedding material used within the pipe zone should conform to the requirements of the current Greenbook and the pipe manufacturer. Where applicable, sand having a sand equivalent (SE) of 20 or greater (per Caltrans Test Method [CTM] 217) may be used to bed and shade the pipes within the bedding zone. Sand backfill should be densified by jetting or flooding and then tamped to ensure adequate compaction. Bedding sand should be from a natural source, manufactured sand from recycled material is not suitable for jetting. The onsite soils may generally be considered suitable as trench backfill (zone defined as 12 inches above the pipe to subgrade), provided the soils are screened of rocks greater than 6 inches in maximum dimension, construction debris and organic material. Trench backfill should be compacted in uniform lifts (as outlined above in Section "Material for Fill") by mechanical means to project recommendations (as outlined above in Section "Placement and Compaction of Fills. If gap-graded rock is used for trench backfill, refer to the above Section.

Retaining wall backfill should consist of sandy soils as outlined in preceding Section 4.1.5. The limits of select sandy backfill should extend at minimum ½ the height of the retaining wall or the width of the heel (if applicable), whichever is greater, refer to Figure 2 (rear of text). Retaining wall backfill soils should be compacted in relatively uniform thin lifts to at least 90 percent relative compaction (per ASTM D1557). Jetting or flooding of retaining wall backfill materials should not be permitted.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, typically sand-cement slurry may be substituted for compacted backfill. The slurry should contain about one sack of cement per cubic yard. When set, such a mix typically has the consistency of compacted soil. Sand cement slurry placed near the surface within landscape areas should be evaluated for potential impacts on planned improvements.

A representative from LGC Geotechnical should observe, probe, and test the backfill to verify compliance with the project recommendations.

4.1.8 Shrinkage and Subsidence

Allowance in the earthwork volumes budget should be made for an estimated 5 to 15 percent reduction in volume of the upper approximate 5 to 25 feet of site soils. It should be stressed that these values are only estimates and that an actual shrinkage factor would be extremely difficult to predetermine. Subsidence due to earthwork equipment is expected to be on the order of 0.1-foot. These values are estimates only and exclude losses due to removal of any vegetation or debris. The effective shrinkage of onsite soils will depend primarily on the type of compaction equipment and method of compaction used onsite by the contractor.

4.2 Preliminary Foundation Design Parameters

The following foundation recommendations are preliminary and must be confirmed by LGC Geotechnical at the completion of project plans (i.e., foundation, grading, etc.) as well as completion of earthwork. Please note that foundation recommendations are based on estimated structural loads. Increase of structural loads may require revision of the provided foundation recommendations and parameters and/or revised remedial recommendations.

Based on preliminary laboratory testing, site soils are anticipated to be of Very Low expansion potential (EI of 20 or less per ASTM D4829). However, this must be verified based on as-graded conditions. Recommended soil bearing and estimated static settlement are provided in Section 4.3.

4.2.1 Slab Design and Construction

Slabs are to be supported on compacted fill soils properly prepared in accordance with the recommendations provided in this report. Actual slab reinforcement and thickness should be determined by the structural engineer based on the imposed loading.

The foundation designer may use a modulus of vertical subgrade reaction (k) of 150 pounds per cubic inch (pounds per square inch per inch of deflection). This value is for a 1-foot by 1-foot square loaded area and should be adjusted by the structural designer for the area of the proposed footing using the following formula:

$k = 150 \times [(B+1)/2B]^2$
k = modulus of vertical subgrade reaction, pounds per cubic inch (pci)
B = foundation width (feet)

It is recommended that subgrade soils below slabs be moisture conditioned in order to maintain the recommended moisture content up to the time of concrete placement. The recommended moisture content of the slab subgrade soils should be between optimum moisture content and approximately 2 percent above optimum moisture content to a minimum depth of 12 inches. The moisture content of the slab subgrade should be verified by the geotechnical consultant within 1 to 2 days prior to concrete placement. In addition, this moisture content should be maintained around the immediate perimeter of the slab during construction and up to occupancy of the building structures.

The following recommendations are for informational purposes only, as they are unrelated to the geotechnical performance of the foundation. The following recommendations may be superseded by the foundation engineer and/or owner. Some post-construction moisture migration should be expected below the foundation. In general, interior floor slabs with moisture sensitive floor coverings should be underlain by a minimum 10 mil thick polyolefin material vapor retarder, which has a water vapor transmission rate (permeance) of less than 0.03 perms. The need for sand and/or the sand thickness (above and/or below the vapor retarder) should be specified by the structural engineer, architect or concrete contactor. The selection and thickness of sand is not a geotechnical engineering issue and is therefore outside our purview.

4.2.2 Shallow Foundation Maintenance

The geotechnical parameters provided herein assume that if the areas adjacent to the foundation are planted and irrigated, these areas will be designed with proper drainage and adequately maintained so that ponding, which causes significant moisture changes below the foundation, does not occur. Our recommendations do not account for excessive irrigation and/or incorrect landscape design. Plants should only be provided with sufficient irrigation for life and not overwatered to saturate subgrade soils. Sunken planters placed adjacent to the foundation should either be designed with an efficient drainage system or liners to prevent moisture infiltration below the foundation. Some lifting of the perimeter foundation beam should be expected even with properly constructed planters.

In addition to the factors mentioned above, future owners/property management personnel should be made aware of the potential negative influences of trees and/or other large vegetation. Roots that extend near the vicinity of foundations can cause distress to foundations. Future owners (and the owner's landscape architect) should not plant trees/large shrubs closer to the foundations than a distance equal to half the mature height of the tree or 20 feet, whichever is more conservative unless specifically provided with root barriers to prevent root growth below the building foundation.

It is the owner's responsibility to perform periodic maintenance during hot and dry periods to ensure that adequate watering has been provided to keep soil from separating or pulling back from the foundation. Future owners and property management personnel should be informed and educated regarding the importance of maintaining a constant level of soil-moisture. The owners should be made aware of the potential negative consequences of both excessive watering, as well as allowing potentially expansive soils to become too dry. Expansive soils can undergo shrinkage during drying, and swelling during the rainy winter season, or when irrigation is resumed. This can result in distress to building structures and hardscape improvements. These recommendations should be provided to future owners and property management personnel.

4.3 Soil Bearing and Lateral Resistance

Provided our earthwork recommendations are implemented, an allowable soil bearing pressure of 2,000 pounds per square foot (psf) may be used for the design of footings having a minimum width of 18 inches and minimum embedment of 12 inches below lowest adjacent ground surface. This value may be increased by 400 psf for each additional foot of embedment and by 200 psf for each additional foot of foundation width to a maximum value of 3,500 psf. These allowable bearing pressures are applicable for level (ground slope equal to or flatter than 5 horizontal feet to 1-foot vertical) conditions only. Bearing values indicated are for total dead loads and frequently applied live loads and may be increased by ⅓ for short duration loading (i.e., wind or seismic loads). The increase of bearing capacity is based on a reduced factor of safety (seismic factor of safety equal to three-fourths of the static factor of safety) for short duration loading.

Soil settlement is a function of footing dimensions and applied soil bearing pressure. In utilizing the above-mentioned allowable bearing capacity, assumed structural loads, and

provided our earthwork recommendations are implemented, foundation settlement due to structural loads is anticipated to be on the order of 1-inch or less. Differential settlement should be anticipated between nearby columns or walls where a large differential loading condition exists. Settlement estimates should be evaluated by LGC Geotechnical when foundation plans are available.

Resistance to lateral loads can be provided by friction acting at the base of foundations and by passive earth pressure. For concrete/soil frictional resistance, an allowable coefficient of friction of 0.35 (based on a factor of safety of 1.5) may be assumed with dead-load forces. An allowable passive lateral earth pressure of 250 pcf to a maximum of 2,500 psf may be used for lateral resistance for properly compacted fill and suitable native soils. This allowable passive pressure may be increased to 340 pcf to a maximum of 3,400 for short-duration seismic loading. For isolated pole footings (for items such as a deck, trellis, etc.) generally spaced a minimum of 3 pile diameters on-center, an allowable passive pressure of 500 pcf may be used for passive resistance. The provided passive pressure is based on an arching factor of 2 (e.g., 250 pcf x 2) and should be limited to a maximum of 10 times the value provided above (e.g., 500 pcf to a maximum of 5,000 psf). This value may be increased by one-third for short-duration seismic loading. These provided passive pressures are applicable for level (ground slope equal to or flatter than 5H:1V) conditions only. Frictional resistance and passive pressure may be used in combination without reduction. We recommend that the upper foot of passive resistance be neglected if finished grade will not be covered with concrete or asphalt concrete. The provided allowable passive pressure is based on a static and seismic factor of safety of 1.5 and 1.1, respectively.

4.4 Lateral Earth Pressures for Retaining Walls

Retaining walls of any significant height are not anticipated. The following may be used for design any minor site retaining walls. Lateral earth pressures are provided as equivalent fluid unit weights, in pound per square foot (psf) per foot of depth or pcf. These values do not contain an appreciable factor of safety, so the retaining wall designer should apply the applicable factors of safety and/or load factors during design.

The following lateral earth pressures are presented on Table 3 on the following page for approved select granular soils with a maximum of 35 percent fines (passing the No. 200 sieve per ASTM D-421/422) and Very Low expansion potential (EI of 20 or less per ASTM D4829). The wall designer should clearly indicate on the retaining wall plans the required sandy soil backfill criteria.

TABLE 3

Lateral Earth Pressures – Onsite or Imported Select Sandy Backfill

Conditions	Equivalent Fluid Unit Weight (pcf)	
	Level Backfill	2:1 Backfill Sloping Upwards
	Sandy Backfill	Sandy Backfill
Active	35	55
At-Rest	55	70

If the wall can yield enough to mobilize the full shear strength of the soil, it can be designed for "active" pressure. If the wall cannot yield under the applied load, the earth pressure will be higher. This would include 90-degree corners of retaining walls. Such walls should be designed for "at-rest." The equivalent fluid pressure values assume free-draining conditions. Retaining wall structures should be provided with appropriate drainage and appropriately waterproofed. Refer to Figure 2. Please note that waterproofing and outlet systems are not the purview of the geotechnical consultant. If conditions other than those assumed above are anticipated, the equivalent fluid pressure values should be provided on an individual-case basis by the geotechnical consultant.

Surcharge loading effects from any adjacent structures should be evaluated by the basement/retaining wall designer. The amount of surcharge loading on a proposed retaining wall structure is primarily a function of the distance, magnitude and lateral extents of the surcharge loading and should be evaluated on a case-by-case basis. In general, structural loads within a 1:1 (horizontal to vertical) upward projection from the bottom of the proposed retaining wall footing will surcharge the proposed retaining wall. In addition to the recommended lateral earth pressure, retaining walls adjacent to streets should be designed to resist vehicular traffic if applicable. Uniform surcharges may be estimated using the applicable coefficient of lateral earth pressure using a rectangular distribution. A factor of 0.5 and 0.46 may be used for at-rest and active conditions, respectively for a level backfill. The vertical traffic surcharge may be determined by the structural designer. The structural designer should contact the geotechnical consultant for any required geotechnical input in estimating any applicable surcharge loads.

If required, the retaining wall designer may use a seismic lateral earth pressure increment of 20 pcf for level backfill conditions up to a maximum retained height of 10 feet. This increment should be applied in addition to the provided static lateral earth pressure using a "normal" triangular distribution with the resultant acting at H/3 in relation to the base of the retaining structure (where H is the retained height). For the restrained, at-rest condition, the seismic increment may be added to the applicable active lateral earth pressure (in lieu of the at-rest lateral earth pressure) when analyzing short duration seismic loading. Per Section 1803.5.12 of the 2022 CBC, the seismic lateral earth pressure is applicable to structures assigned to Seismic Design Category D through F for retaining wall structures supporting more than 6 feet of backfill height. This seismic lateral earth pressure is estimated using the procedure outlined by the

Structural Engineers Association of California (Lew, et al, 2010).

Soil bearing and lateral resistance (friction coefficient and passive resistance) are provided in Section 4.3. Earthwork considerations (temporary backcuts, backfill, compaction, etc.) for retaining walls are provided in Section 4.1 (Site Earthwork) and the subsequent earthwork related sub-sections.

4.5 Preliminary Pavement Sections

The following provisional minimum asphalt concrete (AC) pavement sections are provided in Table 4 for Traffic Indices (TI) of 6 and 7 based on a preliminary design R-Value of 50. These recommendations must be confirmed with R-value testing of representative near-surface soils at the completion of grading and after underground utilities have been installed and backfilled. Determination of the Traffic Index (TI) is not the purview of the geotechnical consultant. Final pavement sections should be confirmed by the project civil/transportation engineer based upon the final design Traffic Index. If requested, LGC Geotechnical will provide sections for alternate TI values.

TABLE 4

Preliminary Asphalt Concrete Pavement Section Options

Assumed Traffic Index	≤ 6	7
R -Value Subgrade	50	50
AC Thickness	4.0 inches	4.0 inches
Aggregate Base Thickness	4.0 inches	6.0 inches

The provided preliminary Portland Cement concrete pavement section is based on the guidelines of the American Concrete Institute (ACI 330R-08). For the final design section, we recommend a traffic study be performed as LGC Geotechnical does not perform traffic engineering. Traffic study should include the design vehicle (number of axles and load per axle) and estimated number of daily repetitions/trips. Based on an assumed Average Daily Truck Traffic (ADTT) of 25, we recommend a preliminary section of a minimum of 5.5 inches of concrete over 4 inches of compacted aggregate base over compacted subgrade. The concrete should have a minimum compressive strength of 4,000 psi and a minimum flexural strength of 550 psi at the time the pavement is subjected to traffic. Steel reinforcement is not required (ACI, 2013). This pavement section assumes that edge restraints like a curb and gutter will be provided. To reduce the potential (but not eliminate) for cracking, paving should provide control joints at regular intervals not exceeding 10 feet in each direction. Decreasing the spacing of these joints will further reduce, but not eliminate the potential for unsightly cracking. Preliminary pavement section is based on a 20-year design. Truck loading is defined as one 16-kip axle and two 32-kip tandem axles (80 kips). Alternate section(s) may be provided based on anticipated specific traffic loadings and repetitions provided by others. LGC Geotechnical does not perform traffic engineering and determination of traffic loading is not the purview of the geotechnical consultant.

The thicknesses shown are for minimum thicknesses. Increasing the thickness of any or all of the above layers will reduce the likelihood of the pavement experiencing distress during its service life. The above recommendations are based on the assumption that proper maintenance and irrigation of the areas adjacent to the roadway will occur through the design life of the pavement. Failure to maintain a proper maintenance and/or irrigation program may jeopardize the integrity of the pavement.

Earthwork recommendations regarding aggregate base and subgrade are provided in the previous section "Site Earthwork" and the related sub-sections of this report.

4.6 Soil Corrosivity

Although not corrosion engineers (LGC Geotechnical is not a corrosion consultant), several governing agencies in Southern California require the geotechnical consultant to determine the corrosion potential of soils to buried concrete and metal facilities. We therefore present the results of our testing with regard to corrosion for the use of the client and other consultants, as they determine necessary.

Corrosion testing indicated soluble sulfate contents less than approximately 0.02 percent, a chloride content of 240 ppm, pH of 7.8, and a minimum resistivity of 3,060 ohm-centimeters. Based on Caltrans Corrosion Guidelines (2021), soils are considered corrosive if the pH is 5.5 or less, or the chloride concentration is 500 ppm or greater, or the sulfate concentration is 1,500 ppm (0.15 percent) or greater.

Based on laboratory sulfate test results, the near-surface soils have an exposure class of "S0" per ACI 318-14, Table 19.3.1.1 with respect to sulfates. This must be verified based on as-graded conditions.

Laboratory testing may need to be performed at the completion of grading by the project corrosion engineer to further evaluate the as-graded soil corrosivity characteristics. Accordingly, revision of the corrosion potential may be needed, should future test results differ substantially from the conditions reported herein. The client and/or other members of the development team should consider this during the design and planning phase of the project and formulate an appropriate course of action.

4.7 Nonstructural Concrete Flatwork

Nonstructural concrete (such as flatwork, sidewalks, etc.) has a potential for cracking due to changes in soil volume related to soil-moisture fluctuations. To reduce the potential for excessive cracking and lifting, concrete should be designed in accordance with the minimum guidelines outlined in Table 5 on the following page. These guidelines will reduce the potential for irregular cracking and promote cracking along control joints but will not eliminate all cracking or lifting. Thickening the concrete and/or adding additional reinforcement will further reduce cosmetic distress.

TABLE 5

Nonstructural Concrete Flatwork for Very Low Expansion Potential

	Flatwork	City Sidewalk Curb and Gutters
Minimum Thickness (in.)	4 (full)	City/Agency Standard
Presoaking	Wet down prior to placing	City/Agency Standard
Reinforcement	No. 3 at 24 inches on centers	City/Agency Standard
Crack Control Joints	Saw cut or deep open tool joint to a minimum of 1/3 the concrete thickness	City/Agency Standard
Maximum Joint Spacing	6 feet	City/Agency Standard
Aggregate Base Thickness (in.)	—	City/Agency Standard

4.8 Surface Drainage and Landscaping

4.8.1 Precise Grading

From a geotechnical perspective, we recommend that compacted finished grade soils adjacent to proposed structures be sloped away from the proposed structures and towards an approved drainage device or unobstructed swale. Drainage swales, wherever feasible, should not be constructed within 5 feet of buildings. Where lot and building geometry necessitates that drainage swales be routed closer than 5 feet to structural foundations, we recommend the use of area drains together with drainage swales. Drainage swales used in conjunction with area drains should be designed by the project civil engineer so that a properly constructed and maintained system will prevent ponding within 5 feet of the foundation. Code compliance of grades is not the purview of the geotechnical consultant.

Planters with open bottoms adjacent to buildings should be avoided. Planters should not be designed adjacent to buildings unless provisions for drainage, such as catch basins, liners, and/or area drains, are made. Overwatering must be avoided.

4.8.2 Landscaping

Planters adjacent to a building or structure should be avoided wherever possible or be properly designed (e.g., lined with a membrane), to reduce the penetration of water into

the adjacent footing subgrades and thereby reduce moisture-related damage to the foundation. Planting areas at grade should be provided with appropriate positive drainage. Wherever possible, exposed soil areas should be above adjacent paved grades to facilitate drainage. Planters should not be depressed below adjacent paved grades unless provisions for drainage, such as multiple depressed area drains, are constructed. Adequate drainage gradients, devices, and curbing should be provided to prevent runoff from adjacent pavement or walks into the planting areas. Irrigation methods should promote uniformity of moisture in planters and beneath adjacent concrete flatwork. Overwatering and underwatering of landscape areas must be avoided. Irrigation levels should be kept to the absolute minimum level necessary to maintain healthy plant life.

Area drain inlets should be maintained and kept clear of debris in order to properly function. Owners and property management personnel should also be made aware that excessive irrigation of neighboring properties can cause seepage and moisture conditions. Owners and property management personnel should be furnished with these recommendations communicating the importance of maintaining positive drainage away from structures, towards streets, when they design their improvements.

The impact of heavy irrigation or inadequate runoff gradients can create perched water conditions. This may result in seepage or shallow groundwater conditions where previously none existed. Maintaining adequate surface drainage and controlled irrigation will significantly reduce the potential for nuisance-type moisture problems. To reduce differential earth movements such as heaving and shrinkage due to the change in moisture content of foundation soils, which may cause distress to a structure and associated improvements, moisture content of the soils surrounding the structure should be kept as relatively constant as possible.

4.9 Subsurface Water Infiltration

Recent regulatory changes have occurred that mandate that storm water be infiltrated below grade rather than collected in a conventional storm drain system. Typically, a combination of methods are implemented to reduce surface water runoff and increase infiltration including; permeable pavements/pavers for roadways and walkways, directing surface water runoff to grass-lined swales, retention areas, and/or drywells, etc.

It should be noted that collecting and concentrating surface water for the purpose of intentional infiltration below grade, conflicts with the geotechnical engineering objective of directing surface water away from slopes, structures and other improvements. The geotechnical stability and integrity of a site is reliant upon appropriately handling surface water. In general, the vast majority of geotechnical distress issues are directly related to improper drainage. In general, distress in the form of movement of improvements could occur as a result of soil saturation and loss of soil support, expansion, internal soil erosion, collapse and/or settlement.

The results of our filed infiltration testing indicated the observed 1-D infiltration rate for I-1 and I-2 (not including required factors of safety for design) ranged from approximately 0.3 to 1.4 inches per hour. The design infiltration rate is thereby equal to the Observed Infiltration Rate divided by the design factor of safety. The design factor of safety must be a minimum of 3.0 but may be increased at the discretion of the design engineer (Riverside County, 2011). Per

the Riverside County infiltration guidelines (2011), infiltration of stormwater is not required when the factored infiltration rate (measured infiltration rate with safety factors applied) is less than 0.3 inches per hour in the vicinity of the BMPs. Results of infiltration testing are provided in Appendix D.

The following should be considered for design of any required infiltration system:

- Water discharge from any infiltration systems should not occur within the zone of influence of foundation footings (column and load bearing wall locations). From a geotechnical perspective we recommend a minimum infiltration system setback of 15 feet from the structural improvements.
- An adequate setback distance between any infiltration facility and adjacent property lines should be maintained.
- We recommend the design of any infiltration system include at least one redundancy or overflow system. It may be prudent to provide an overflow system directly connected to the storm drain system in order to prevent failure of the infiltration system, either as a result of lower than anticipated infiltration and/or very high flow volumes.
- The infiltration values provided are based on clean water and this requires the removal of trash, debris, soil particles, etc., and on-going maintenance. Over time, siltation and plugging may reduce the infiltration rate and subsequent effectiveness of the infiltration system. It should be noted that methods to prevent this shall be the responsibility of the infiltration designer and are not the purview of the geotechnical consultant. If adequate measures cannot be incorporated into the design and maintenance of the system, then the infiltration rates may need to be further reduced. These and other factors should be considered in selecting a design infiltration rate.
- Any designed infiltration system will require routine periodic maintenance.
- Contamination and environmental suitability of the site for infiltration was not evaluated by us and should be evaluated by others (environmental consultant). We only addressed the geotechnical issues associated with stormwater infiltration.

LGC Geotechnical should be provided with details for any planned required infiltration system early in the design process for geotechnical input.

4.10 Pre-Construction Documentation and Construction Monitoring

It is recommended that a program of documentation and monitoring be devised and put into practice before the onset of any groundwork. LGC Geotechnical can perform these services at your request. This should include, but not necessarily be limited to, detailed documentation of the existing improvements, buildings, and utilities around the area of proposed excavation, with particular attention to any distress that is already present prior to the start of work. At the completion of construction, we recommend that the adjacent properties be re-documented to confirm their condition after potentially damaging activities are completed. In the event of future claims, any post-construction damage may be attributed to other causes.

4.11 Geotechnical Plan Review

Project plans (e.g., grading, foundation, retaining wall, etc.) and any other improvement plans, and final project drawings should be reviewed by this office prior to construction to verify that our geotechnical recommendations, provided herein, have been appropriately incorporated. Additional or modified geotechnical recommendations may be required based on the proposed design.

4.12 Geotechnical Observation and Testing During Construction

The recommendations provided in this report are based on limited subsurface observations and geotechnical analysis. The interpolated subsurface conditions should be checked in the field during construction by a representative of LGC Geotechnical. Geotechnical observation and testing are required per Section 1705 of the 2022 CBC.

Geotechnical observation and/or testing should be performed by LGC Geotechnical at the following stages:

- During grading (removal bottoms, fill placement, etc.);
- During utility trench backfill and compaction;
- During retaining wall subdrain placement and backfill and compaction (if applicable);
- Preparation of subgrade and placement of aggregate base;
- After building and wall footing excavation and prior to placing reinforcement and/or concrete; and
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

5.0 LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report. The samples taken and submitted for laboratory testing, the observations made, and the in-situ field testing performed are believed representative of the entire project; however, soil and geologic conditions revealed by excavation may be different than our preliminary findings. If this occurs, the changed conditions must be evaluated by the project soils engineer and geologist and design(s) adjusted as required or alternate design(s) recommended.

This report is issued with the understanding that it is the responsibility of the owner, or of his/her representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and/or project engineer and incorporated into the plans, and the necessary steps are taken to see that the contractor and/or subcontractor properly implements the recommendations in the field. The contractor and/or subcontractor should notify the owner if they consider any of the recommendations presented herein to be unsafe.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can and do occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. Therefore, the findings, conclusions, and recommendations presented in this report can be relied upon only if LGC Geotechnical has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site.

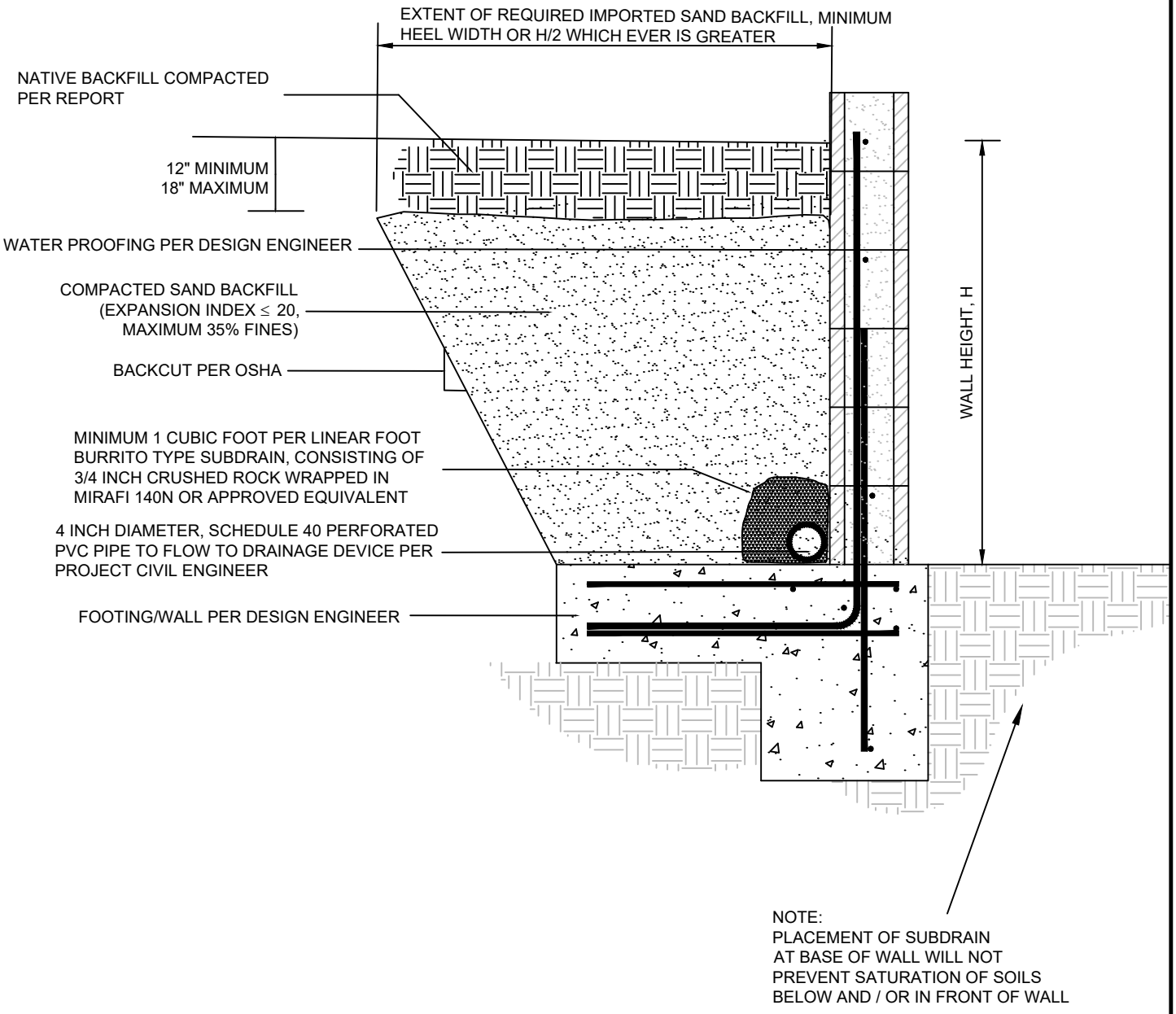
In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and modification, and should not be relied upon after a period of 3 years.



LGC Geotechnical, Inc.

FIGURE 1
Site Location Map

PROJECT NAME	Preservation Partners - Temescal Canyon
PROJECT NO.	24070-01
ENG. / GEOL.	RLD / KBC
SCALE	Not to Scale
DATE	June 2024



LGC Geotechnical, Inc.

FIGURE 2
Retaining Wall Backfill Detail

PROJECT NAME	*Preservation Partners - Temescal Canyon Road*
PROJECT NO.	*24070-01*
ENG. / GEOL.	*RLD / KBC*
SCALE	*Not to Scale*
DATE	*June 2024*

Appendix A
References

APPENDIX A

References

American Concrete Institute, 2013, Guide for the Design and Construction of Concrete Parking Lots (ACI 330R-08), fifteenth printing, November 2013.

_____, 2019, American Concrete Institute (ACI), 2019, Building Code Requirements for Structural Concrete (ACI 318-19) and Commentary (ACI 318R-19), June 2019.

American Society of Civil Engineers (ASCE), 2017, Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-16, 2017.

_____, 2018, Standard 7-16, Minimum Design Loads for Buildings and Associated Criteria for Buildings and Other Structures, Supplement 1, effective: December 12, 2018.

American Society for Testing and Materials (ASTM), Volume 04.08 Soil and Rock (I):D420 – D5876.

Bray, J.D., and Sancio, R. B., 2006, Assessment of Liquefaction Susceptibility of Fine-Grained Soils, *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, pp. 1165-1177, dated September 2006.

California Building Standards Commission, 2022, California Building Code, California Code of Regulations Title 24, Volumes 1 and 2, dated July 2022.

California Geological Survey (CGS), (Previously California Division of Mines and Geology [CDMG]), 2018, Earthquake Fault Zones, Special Publication 42, Revised 2018.

_____, 2008, California Geological Society Special Publication 117A: Guidelines for Evaluating and Mitigating Seismic Hazards in California.

Caltrans, 2021, Corrosion Guidelines, Version 3.2, dated May 2021.

Historic Aerials, 2024, historicareials.com/views, retrieved June 12, 2024.

Jordan Architects, 2024, Temescal Canyon SS, Riverside County, CA, Preliminary Site Plan, Scheme B, Job Number 23-408, dated April 17, 2024.

Lew, et al, 2010, Seismic Earth Pressures on Deep Basements, Structural Engineers Association of California (SEAOC) Convention Proceedings.

Riverside County (County), 2011, Low Impact Development BMP Design Handbook, Appendix A, Infiltration Testing, dated September 2011.

_____, 2019a, County of Riverside General Plan; Safety Element; Figure S-2 Earthquake Fault Study Zones, dated August 6, 2019

_____, 2019b, Geographic Information Services, Liquefaction Zones, Riverside County California, Riverside County, California, Available at: http://purl.stanford.edu/Liquefaction.shp

_____, 2023, Map My County, https://gis1.countyofriverside.us/Html5Viewer/?viewer=MMC_Public

Structural Engineers Association of California (SEAOC), 2024, Seismic Design Maps, Retrieved June 14, 2024, from https://seismicmaps.org/

United States Geological Survey (USGS), 2002, Geologic Map of the Corona South 7.5' Quadrangle, Riverside and Orange Couties, California, Version 1.0, C.H. Gray, Jr., Douglas M. Morton, and F.H. Weber, Jr., Preliminary Geologic Map of the Van Nuys 7.5' Quadrangle, Southern California, Compiled by R.F. Yerkes, Open File Report 02-21, dated 2002.

United States Geological Survey (USGS), 2014, Unified Hazard Tool, Dynamic: Conterminous U.S. 2014 (update) (v4.2.0), Retrieved June 14, 2024, from: https://earthquake.usgs.gov/hazards/interactive/

Appendix B
Field Exploration Logs and Field Infiltration Data

Geotechnical Boring Log Borehole HS-1

Date: 5/14/2024 | **Drilling Company:** Choice Drilling

Project Name: Temescal Canyon Rd | **Type of Rig:** CME 75

Project Number: 24070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~905' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By JMN
Sampled By JMN
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1				7.3	SC	**@ 0' - 25' - Artificial Fill - Undocumented (afu)** @ 0' - 2" Asphalt Concrete / 1" Aggregate Base; Clayey SAND with Gravel: brown, moist	MD DS EI CR
			R-1	16 27 43	125.0	8.3		@ 3' - Clayey SAND with Gravel: reddish brown, moist, very dense	
900	5		R-2	18 19 29	119.1	10.0		@ 5' - Clayey SAND with Gravel: reddish brown, moist, dense	AL CN
			R-3	12 16 18	103.7	5.6	SM	@ 7.5' - Silty SAND: brown, slightly moist, medium dense	
895	10		R-4	24 27 35	118.9	6.0		@ 10' - Silty SAND: brown, slightly moist, dense	-#200
890	15		R-5	31 34 42	113.5	3.1	SP/SC	@ 15' - SAND with Clay to Clayey SAND with Gravel: light brown, dry, very dense	
885	20		SPT-1	10 11 13		6.4	SC	@ 20' - Clayey SAND: brown, slightly moist, dense	-#200
880	25		R-6	27 32 43	122.2	4.3	SP-SC	**@ 25' - T.D. - Quaternary Old Fan Deposits (Qof)** @ 25' - SAND with Clay: brown, slightly moist, very dense	
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 5/13/2024

Geotechnical Boring Log Borehole HS-1

Date: 5/14/2024 | **Drilling Company:** Choice Drilling

Project Name: Temescal Canyon Rd | **Type of Rig:** CME 75

Project Number: 24070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~905' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By JMN
Sampled By JMN
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		SPT-1	20 22 50/4"		4.5	SM	@ 30' - Silty SAND: brown, slightly moist, very dense	
875	35		R-7	50/5"		3.2	GC	@ 35' - Clayey GRAVEL with Sand: brown, dry, very dense Auger Refusal at 38.5	
870	40							Total Depth = 38.5' Groundwater Not Encountered Caving: Hole Measured Approximately 37.5' after Removal of Auger Backfilled with Cuttings and Capped with AC Cold Patch on 5/14/2024	
865	45								
860	50								
855	55								
	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-2

Date: 5/14/2024 | **Drilling Company:** Choice Drilling

Project Name: Temescal Canyon Rd | **Type of Rig:** CME 75

Project Number: 24070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~905' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By JMN
Sampled By JMN
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1				5.1	SC	**@ 0' - 2.5' - Artificial Fill - Undocumented (afu)** @ 0' - 2" Asphalt Concrete / 1" Aggregate Base; Clayey SAND: brown, slightly moist	AL RV
			R-1	50/5"	109.4	4.5	GC	**@ 2.5' to T.D. - Quaternary Old Fan Deposits (Qof)** @ 2.5' - Clayey GRAVEL with Sand: brown, slightly moist, very dense	
900	5		R-2	50/5"	108.5	6.5	SC	@ 5' - Clayey SAND with Gravel: brown, slightly moist, very dense	
			R-3	44 50/5"	115.6	5.2		@ 7.5' - Clayey SAND with Gravel: brown, slightly moist, very dense	
895	10		R-4	50/4"	116.5	5.1		@ 10' - Clayey SAND with Gravel: brown, slightly moist, very dense Auger Refusal at 14.8'	
890	15							Total Depth = 14.8' Groundwater Not Encountered Caving: Hole Measured Approximately 12.5' after Removal of Auger Backfilled with Cuttings and Capped with AC Cold Patch on 5/14/2024	
885	20								
880	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 5/13/2024

Geotechnical Boring Log Borehole HS-3

Date: 5/14/2024 | **Drilling Company:** Choice Drilling

Project Name: Temescal Canyon Rd | **Type of Rig:** CME 75

Project Number: 24070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~905' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By JMN
Sampled By JMN
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1				3.3	SC	**@ 0' - 2.5' - Artificial Fill - Undocumented (afu)** @ 0' - Gravel Base; Clayey SAND with Gravel: brown, dry	
			R-1	7 50/4"	120.9	2.1	SM	**@ 2.5'- T.D. - Quaternary Old Fan Deposits (Qof)** @ 2.5' - Silty SAND with Gravel: grayish brown, dry, very moist	
900	5		R-2	50/5"	114.3	2.4		@ 5' - Silty SAND with Gravel: brown, dry, very dense	
			R-3	42 50/3"	118.5	5.0	CL GC	@ 7.5' - Sandy CLAY with Gravel to Clayey GRAVEL: brown, slightly moist, hard/very dense	
895	10		R-4	50/4"				@ 10' - No Recovery	
890	15		R-5	50/5"		2.7	SM	@ 15' - Silty SAND: grayish brown, dry, very dense Auger Refusal at 16'	
885	20							Total Depth = 16' Groundwater Not Encountered Caving: Hole Measured Approximately 13' after Removal of Auger Backfilled with Cuttings and Capped with AC Cold Patch on 5/14/2024	
880	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 5/13/2024

Geotechnical Boring Log Borehole I-1

Date: 5/14/2024 | **Drilling Company:** Choice Drilling

Project Name: Temescal Canyon Rd | **Type of Rig:** CME 75

Project Number: 24070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~906 MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By JMN
Sampled By JMN
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
905	0		SPT-1	26 50/5"		4.8	SC	@ 0' - 2.5" Asphalt Concrete / 1" Aggregate Base @ 2.5' - Clayey SAND with Gravel: brown, slightly moist, very dense	-#200
900	5							Total Depth = 5' 3" Perforated Pipe with Filter Sock Installed Surrounded by Gravel, and Presoaked on 5/14/2024 Backfilled with Cuttings on 5/15/2024	
895	10								
890	15								
885	20								
880	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 5/13/2024

Geotechnical Boring Log Borehole I-2

Date: 5/14/2024 | **Drilling Company:** Choice Drilling

Project Name: Temescal Canyon Rd | **Type of Rig:** CME 75

Project Number: 24070-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~906 MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By JMN
Sampled By JMN
Checked By RLD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
905	0		SPT-1	21 50/5"		6.5	SC	@ 0' - 2" Asphalt Concrete and 1" Aggregate Base @ 2.5' - Clayey SAND with Gravel: grayish brown, slightly moist, very dense	-#200
900	5							Total Depth = 4.5' 3" Perforated Pipe with Filter Sock Installed Surrounded by Gravel, and Presoaked on 5/14/2024 Backfilled with Cuttings on 5/15/2024	
895	10								
890	15								
885	20								
880	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 5/13/2024

Appendix C
Laboratory Test Results

APPENDIX C

Laboratory Testing Procedures and Test Results

The laboratory testing program was formulated towards providing data relating to the relevant engineering properties of the soils with respect to residential construction. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of the test type and a table summarizing the test results.

Moisture and Density Determination Tests: Moisture content (ASTM D2216) and dry density determinations (ASTM D2937) were performed on relatively undisturbed samples obtained from the test borings. The results of these tests are presented in the boring logs. Where applicable, only moisture content was determined from undisturbed or disturbed samples.

Expansion Index: The expansion potential of selected samples was evaluated by the Expansion Index Test, Standard ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch-thick by 4-inch-diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below.

Sample Location	Expansion Index	Expansion Potential*
HS-1 @ 1-5 ft	8	Very Low

* ASTM D4829

Grain Size Distribution/Fines Content: Representative samples were dried, weighed and soaked in water until individual soil particles were separated (per ASTM D421) and then washed on a No. 200 sieve (ASTM D1140). Where applicable, the portion retained on the No. 200 sieve and dried and then sieved on a U.S. Standard brass sieve set in accordance with ASTM D6913 (sieve).

Sample Location	Description	% Passing # 200 Sieve
HS-1 @ 10ft	Silty SAND	37
HS-1 @ 20ft	Clayey SAND	32
I-1 @ 2.5 ft	Clayey SAND with Gravel	19
I-2 @ 2.5 ft	Clayey SAND with Gravel	23

Laboratory Testing Procedures and Test Results

Direct Shear: Direct shear tests were performed on selected remolded samples, which were soaked for a minimum of 24 hours under a surcharge equal to the applied normal force during testing. After transfer of the sample to the shear box, and reloading the sample, pore pressures set up in the sample due to the transfer were allowed to dissipate for a period of approximately 1 hour prior to application of shearing force. The samples were tested under various normal loads, a motor-driven, strain-controlled, direct-shear testing apparatus at a strain rate of less than 0.05 inch per minute (for sandy soil). The results of these tests are attached in this appendix.

Atterberg Limits: The liquid and plastic limits ("Atterberg Limits") were determined per ASTM D4318 for engineering classification of fine-grained material and presented in the table below. The USCS soil classification indicated in the table below is based on the portion of sample passing the No. 40 sieve and may not necessarily be representative of the entire sample. The plot is provided in this Appendix.

Sample Location	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	USCS Soil Classification
HS-1 @ 5 feet	35	14	21	CL
HS-2 @ 1-5 feet	25	13	12	CL

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
HS-1 @ 1-5 ft	Brown Clayey SAND with Gravel	135.0	7.5

R-Value: The resistance R-value was determined by the ASTM D2844 for base, subbase, and basement soils. The samples were prepared and exudation pressure and R-value were determined. The graphically determined R-values at exudation pressure of 300 psi are reported in this appendix. These results were used for pavement design purposes. The results of these tests are presented in the following table.

Consolidation: Consolidation test was performed on selected, relatively undisturbed ring samples (Modified ASTM Test Method D2435). Samples (2.42 inches in diameter and 1 inch in height) were placed in a consolidometer and increasing loads were applied. The samples were allowed to consolidate under "double drainage" and total deformation for each loading step was recorded. The percent consolidation for each load step was recorded as the ratio of the amount of vertical compression to the original sample height. The consolidation pressure curve is presented in this appendix.

Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods (CTM 417). The soluble sulfate content is used to determine the appropriate cement type and maximum water-cement ratios. The test results are presented in the table below.

Sample Location	Sulfate Content (ppm)	Sulfate Exposure Class *
HS-1 @ 1-5 ft	128	S0

*Based on ACI 318R-14, Table 19.3.1.1

Chloride Content: Chloride content was tested in accordance with Caltrans Test Method (CTM) 422. The results are presented below.

Sample Location	Chloride Content, ppm
HS-1 @ 1-5 ft	240

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with CTM 643 and standard geochemical methods. The results are presented in the table below.

Sample Location	pH	Minimum Resistivity (ohms-cm)
HS-1 @ 1-5 ft	7.80	3,060

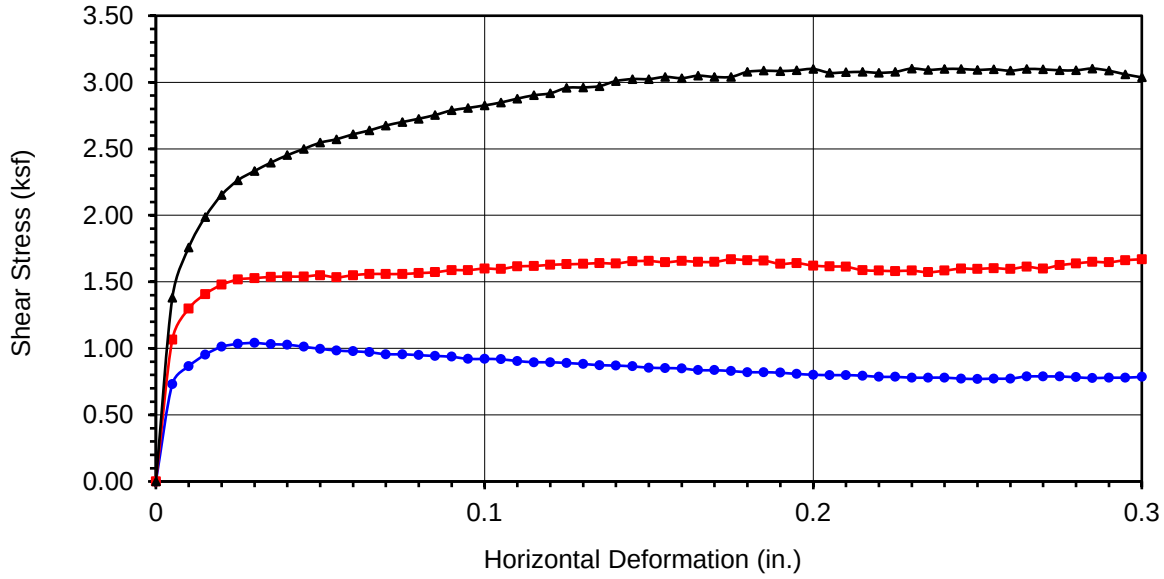
DIRECT SHEAR TEST

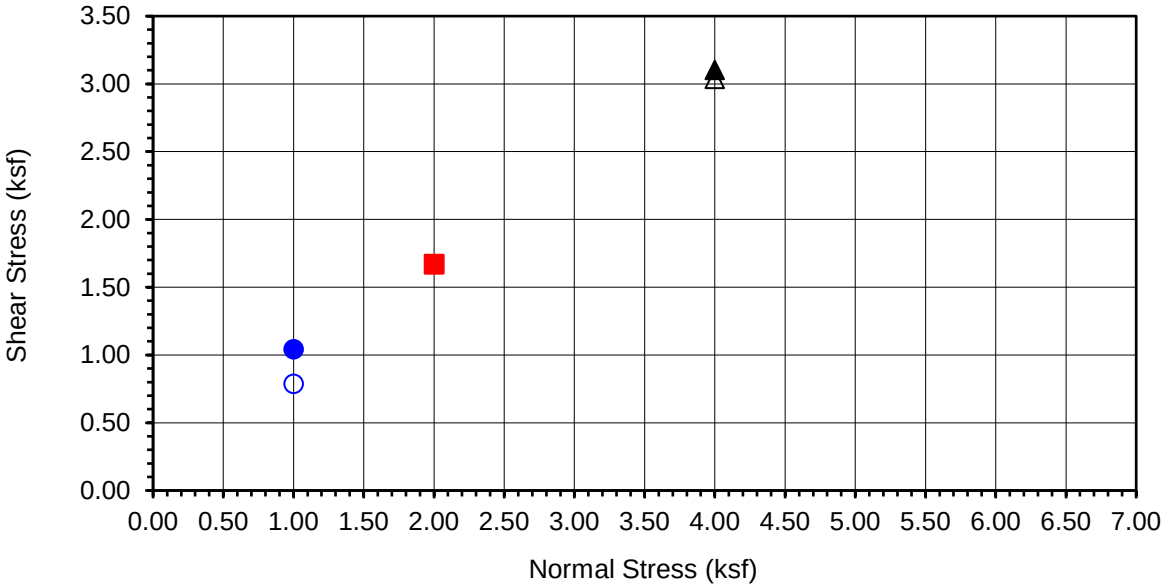
Consolidated Drained - ASTM D 3080

Project Name:	Preservation - Temescal Canyon Rd	Tested By:	GB/JD	Date:	05/30/24
Project No.:	24070-01	Checked By:	J. Ward	Date:	06/09/24
Boring No.:	HS-1	Sample Type:	90% Remold		
Sample No.:	B-1	Depth (ft.):	1-5		

Soil Identification: Brown clayey sand with gravel (SC)g

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	202.25	200.46	204.78
Weight of Ring(gm):	44.36	42.46	45.18
Before Shearing			
Weight of Wet Sample+Cont.(gm):	173.48	173.48	173.48
Weight of Dry Sample+Cont.(gm):	165.52	165.52	165.52
Weight of Container(gm):	56.75	56.75	56.75
Vertical Rdg.(in): Initial	0.0000	0.2523	0.2574
Vertical Rdg.(in): Final	-0.0063	0.2678	0.2755
After Shearing			
Weight of Wet Sample+Cont.(gm):	236.54	223.29	215.82
Weight of Dry Sample+Cont.(gm):	217.61	205.04	197.99
Weight of Container(gm):	71.78	58.92	51.19
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**HS-1**
Sample No.	**B-1**
Depth (ft)	**1-5**
Sample Type: 90% Remold	
Soil Identification: Brown clayey sand with gravel (SC)g	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.041	■ 1.669	▲ 3.103
Shear Stress @ End of Test (ksf)	○ 0.786	□ 1.669	△ 3.037
Deformation Rate (in./min.)	0.0033	0.0033	0.0033
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.32	7.32	7.32
Dry Density (pcf)	122.4	122.4	123.7
Saturation (%)	52.3	52.5	54.5
Soil Height Before Shearing (in.)	0.9937	0.9845	0.9819
Final Moisture Content (%)	13.0	12.5	12.1

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 24070-01

Preservation - Temescal Canyon Rd

05-24

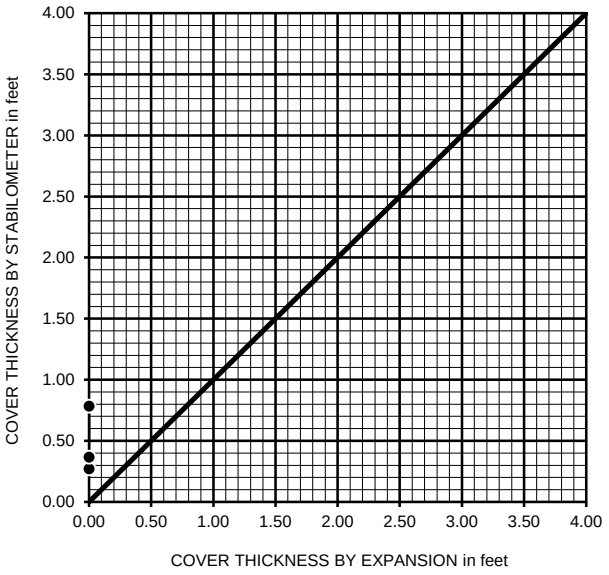
R-VALUE TEST RESULTS
DOT CA Test 301

PROJECT NAME:	Preservation - Temescal Canyon Rd	PROJECT NUMBER:	24070-01
BORING NUMBER:	HS-2	DEPTH (FT.):	1-5
SAMPLE NUMBER:	B-1	TECHNICIAN:	O. Figueroa
SAMPLE DESCRIPTION:	Brown silty sand with gravel (SM)g	DATE COMPLETED:	5/22/2024

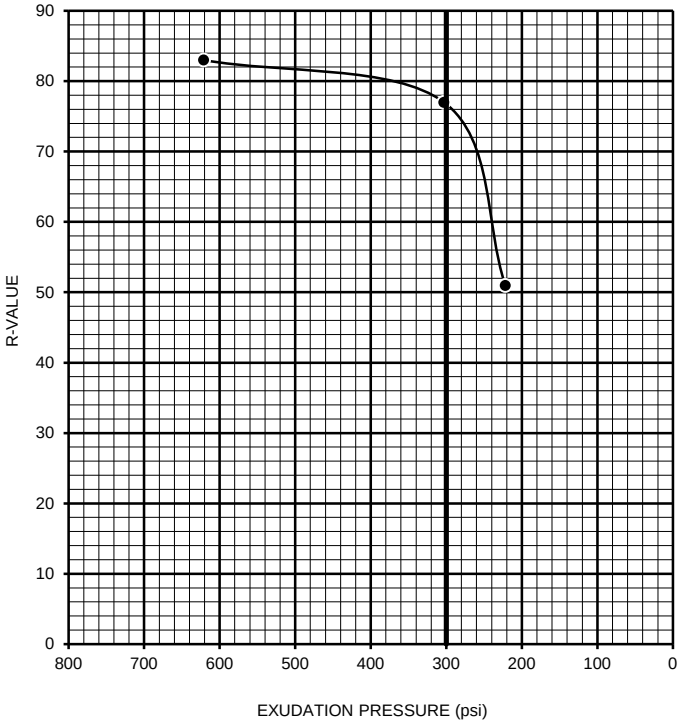
TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	7.6	8.1	8.7
HEIGHT OF SAMPLE, Inches	2.41	2.47	2.51
DRY DENSITY, pcf	132.6	133.1	134.7
COMPACTOR PRESSURE, psi	160	140	90
EXUDATION PRESSURE, psi	621	303	222
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	16	21	50
TURNS DISPLACEMENT	4.35	4.90	5.35
R-VALUE UNCORRECTED	84	77	51
R-VALUE CORRECTED	83	77	51

DESIGN CALCULATION DATA	a	b	c
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.27	0.37	0.78
EXPANSION PRESSURE THICKNESS, ft.	0.00	0.00	0.00

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	N/A
R-VALUE BY EXUDATION:	76
EQUILIBRIUM R-VALUE:	76

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

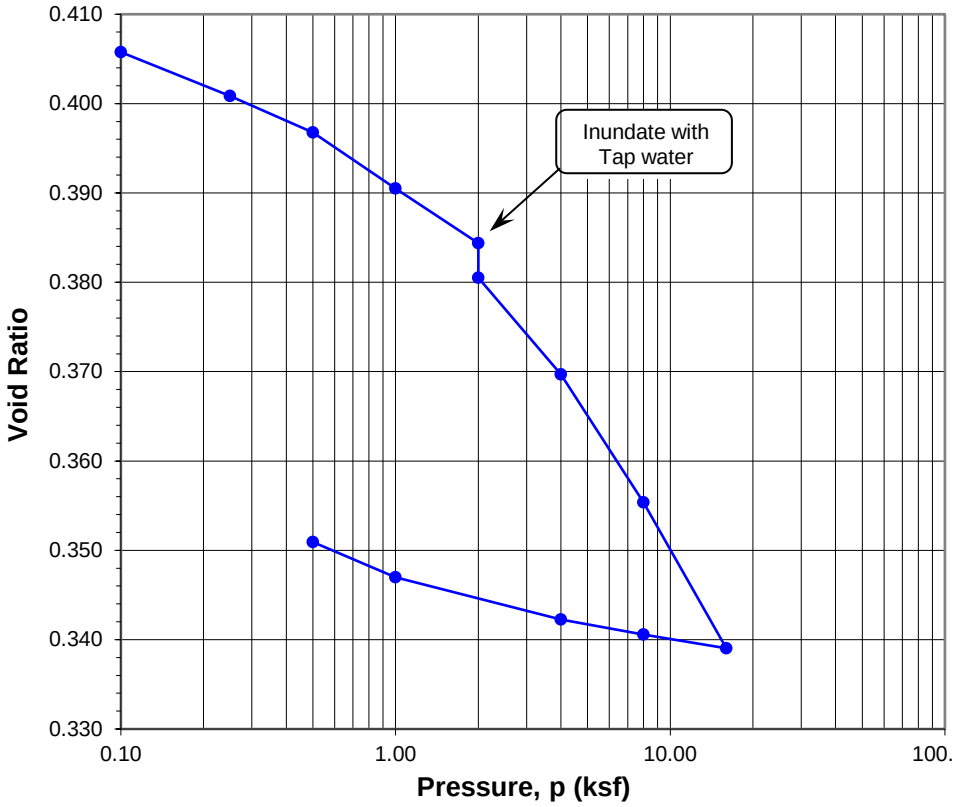
ASTM D 2435

Project Name:	Preservation - Temescal Canyon Rd	Tested By:	GB/JD
Project No.:	24070-01	Checked By:	J. Ward
Boring No.:	HS-1	Depth (ft.):	5.0
Sample No.:	R-2	Sample Type:	Ring
Soil Identification:	Strong brown clayey sand (SC)		

Date: 05/20/24

Date: 06/13/24

Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	203.51
Weight of Ring (g):	44.96
Height after consol. (in.):	0.9607
Before Test	
Wt. of Wet Sample+Cont. (g):	186.07
Wt. of Dry Sample+Cont. (g):	174.42
Weight of Container (g):	57.93
Initial Moisture Content (%)	10.0
Initial Dry Density (pcf)	119.9
Initial Saturation (%):	66
Initial Vertical Reading (in.)	0.1173
After Test	
Wt. of Wet Sample+Cont. (g):	259.60
Wt. of Dry Sample+Cont. (g):	241.94
Weight of Container (g):	54.31
Final Moisture Content (%)	12.38
Final Dry Density (pcf):	123.5
Final Saturation (%):	92
Final Vertical Reading (in.)	0.1616
Specific Gravity (assumed):	2.70
Water Density (pcf):	62.43

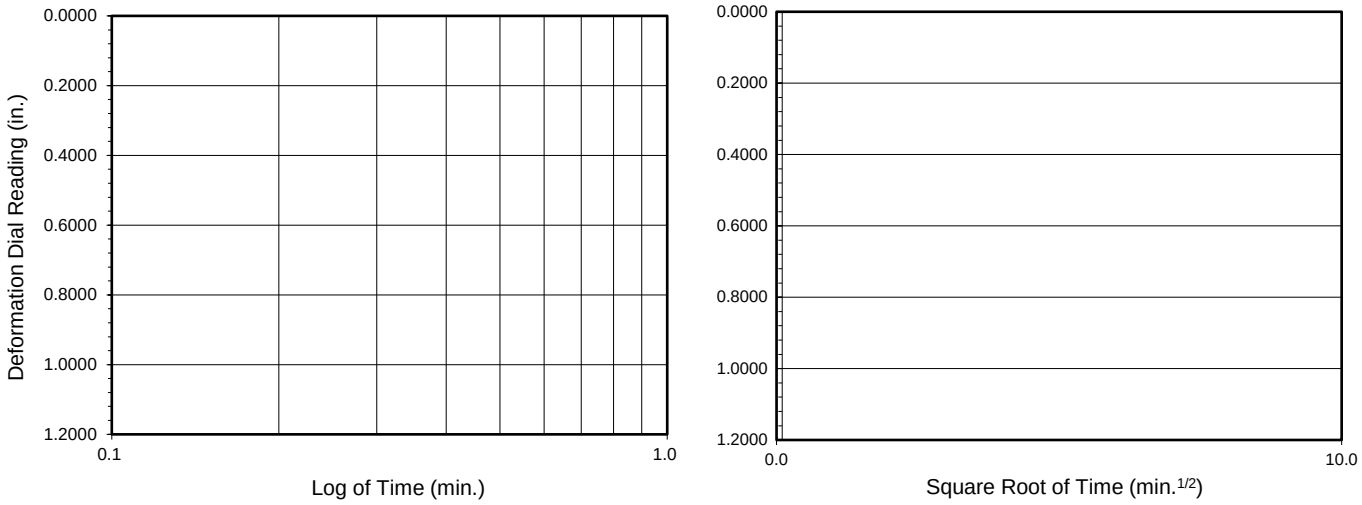


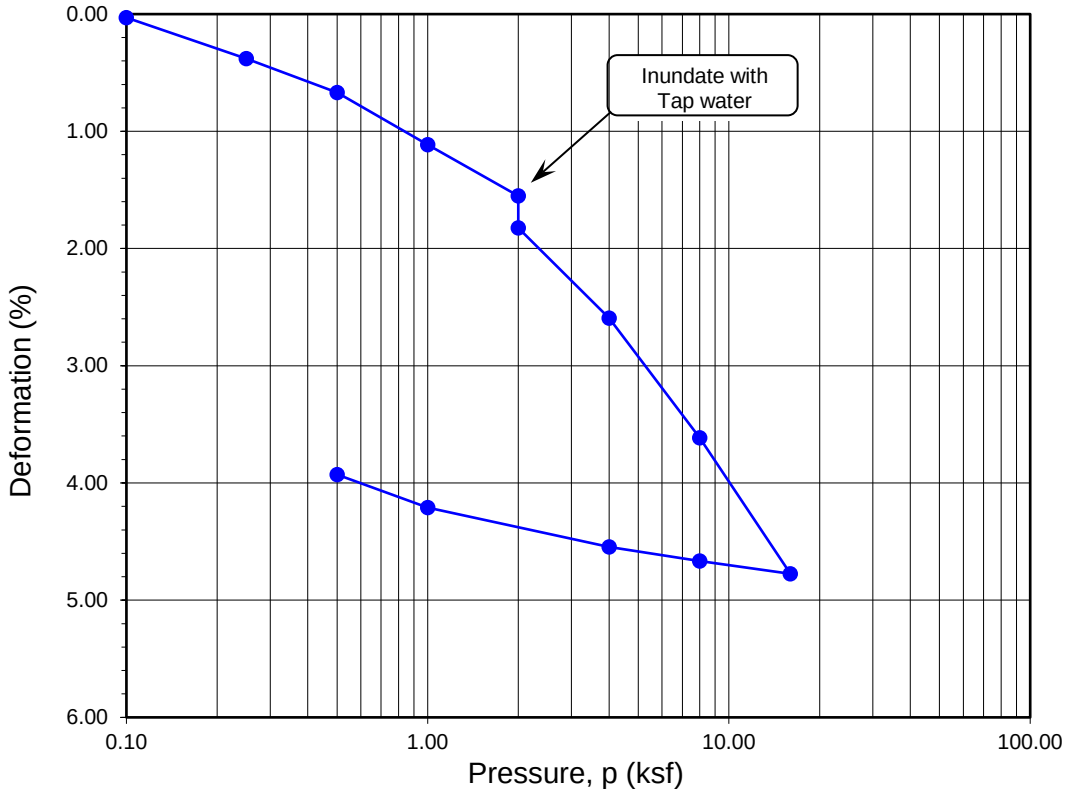
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.1176	0.9997	0.00	0.03	0.406	0.03
0.25	0.1217	0.9956	0.06	0.44	0.401	0.38
0.50	0.1253	0.9920	0.13	0.80	0.397	0.67
1.00	0.1309	0.9865	0.24	1.36	0.391	1.12
2.00	0.1366	0.9807	0.38	1.93	0.384	1.55
2.00	0.1394	0.9780	0.38	2.21	0.381	1.83
4.00	0.1488	0.9686	0.55	3.15	0.370	2.60
8.00	0.1609	0.9565	0.74	4.36	0.355	3.62
16.00	0.1748	0.9426	0.97	5.75	0.339	4.78
8.00	0.1725	0.9449	0.85	5.52	0.341	4.67
4.00	0.1702	0.9472	0.74	5.28	0.342	4.54
1.00	0.1650	0.9523	0.56	4.77	0.347	4.21
0.50	0.1616	0.9557	0.50	4.43	0.351	3.93

Time Readings

Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-1	**R-2**	**5**	**10.0**	**12.4**	**119.9**	**123.5**	**0.406**	**0.351**	**66**	**92**

Soil Identification: Strong brown clayey sand (SC)

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 24070-01

Preservation - Temescal Canyon Rd

06-24

Appendix D
Infiltration Data

Infiltration Test Data Sheet

LGC Geotechnical, Inc
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Preservation - Temescal Canyon
Project Number: 24070-01
Date: 5/15/2024
Boring Number: I-1

Test hole dimensions (if circular)	
Boring Depth (feet)*:	5
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	7:25	7:50	25.0	1.74	2.62	0.88	Yes
2	7:51	8:16	25.0	1.78	2.57	0.79	Yes

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, t (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, D (feet)	Tested Infiltration Rate(in/hr)
1	8:19	8:29	10.0	1.66	2.07	0.41	1.5
2	8:31	8:41	10.0	1.64	2.01	0.37	1.3
3	8:44	8:54	10.0	1.64	2.00	0.36	1.3
4	8:55	9:05	10.0	1.54	1.95	0.41	1.4
5	9:06	9:16	10.0	1.58	1.97	0.39	1.4
6	9:18	9:28	10.0	1.54	1.95	0.41	1.4
						Tested Infiltration Rate (No Factor of Safety)	**1.4**

Sketch:

Notes:

Based on Guidelines from: Riverside County 09/2012
Spreadsheet Revised on: 10/30/2019

LGC Geotechnical, Inc.

Infiltration Test Data Sheet

LGC Geotechnical, Inc
131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Preservation - Temescal Canyon
Project Number: 24070-01
Date: 5/15/2024
Boring Number: I-2

Test hole dimensions (if circular)	
Boring Depth (feet)*:	4.5
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	7:28	7:53	25.0	2.69	2.82	0.13	No
2	7:54	8:19	25.0	2.65	2.79	0.14	No

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, t (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, D (feet)	Tested Infiltration Rate(in/hr)
1	8:21	8:51	30.0	2.59	2.75	0.16	0.3
2	8:52	9:22	30.0	2.59	2.74	0.15	0.3
3	9:24	9:54	30.0	2.59	2.75	0.16	0.3
4	9:55	10:25	30.0	2.59	2.74	0.15	0.3
5	10:26	10:56	30.0	2.58	2.73	0.15	0.3
6	10:56	11:26	30.0	2.56	2.71	0.15	0.3
7	11:27	11:57	30.0	2.57	2.72	0.15	0.3
8	11:58	12:28	30.0	2.58	2.73	0.15	0.3
9	12:30	13:00	30.0	2.55	2.7	0.15	0.3
10	13:01	13:31	30.0	2.59	2.74	0.15	0.3
11	13:33	14:03	30.0	2.59	2.74	0.15	0.3
12	14:05	14:35	30.0	2.59	2.74	0.15	0.3
						Tested Infiltration Rate (No Factor of Safety)	**0.3**

Sketch:

Notes:

Based on Guidelines from: Riverside County 09/2012
Spreadsheet Revised on: 10/30/2019

Appendix E
General Earthwork and Grading Specifications

General Earthwork and Grading Specifications for Rough Grading

1.0 General

1.1 Intent

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record

Prior to commencement of work, the owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to confirm that the attained level of compaction is being accomplished as specified. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the project plans and specifications. The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of “equipment” of work and the estimated quantities of daily earthwork

contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the
Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified. It is the contractor's sole responsibility to provide proper fill compaction.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed. The contractor is responsible for all hazardous waste relating to his work. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Client should acquire the services of a qualified environmental assessor.

2.2 Processing

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be over-excavated as specified in the following section. Scarification shall continue until soils are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Over-excavation

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of the geotechnical consultant. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.5 Compaction Testing

Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than
5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over

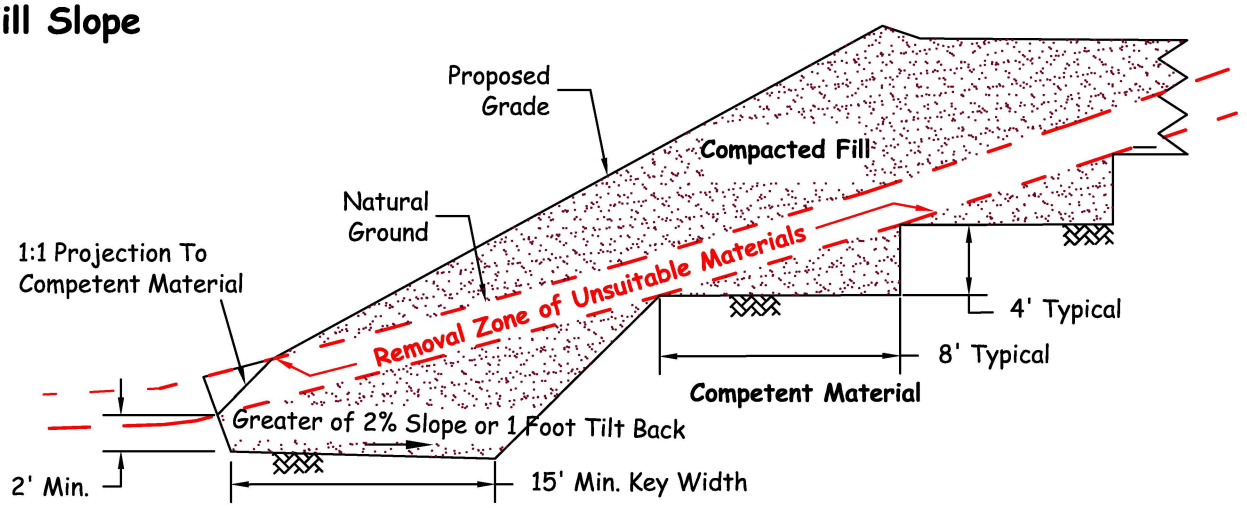
the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

7.3 The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

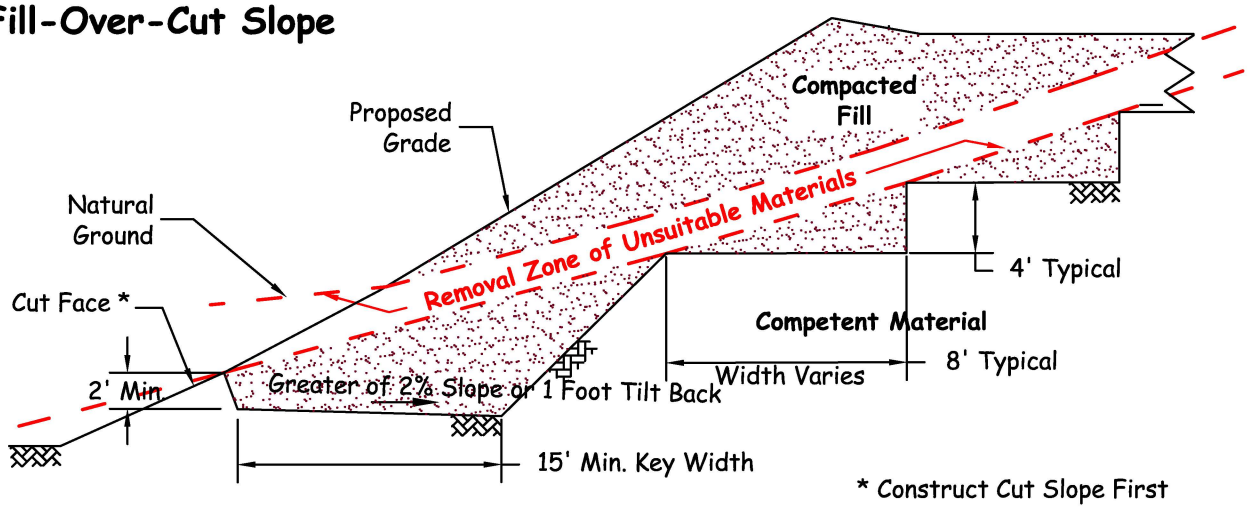
7.4 The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

Fill Slope

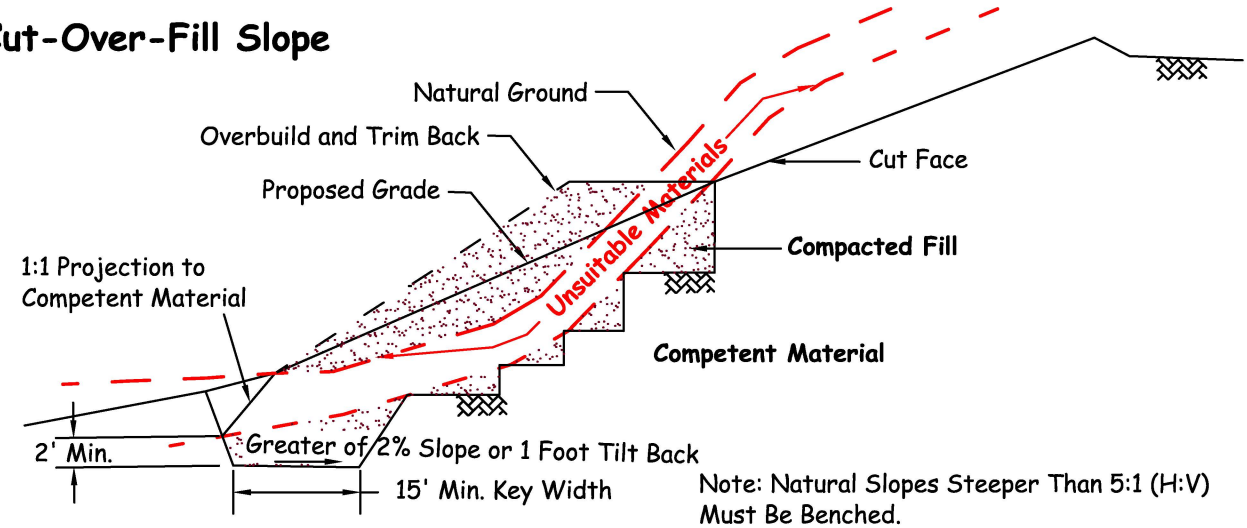


Fill-Over-Cut Slope



* Construct Cut Slope First

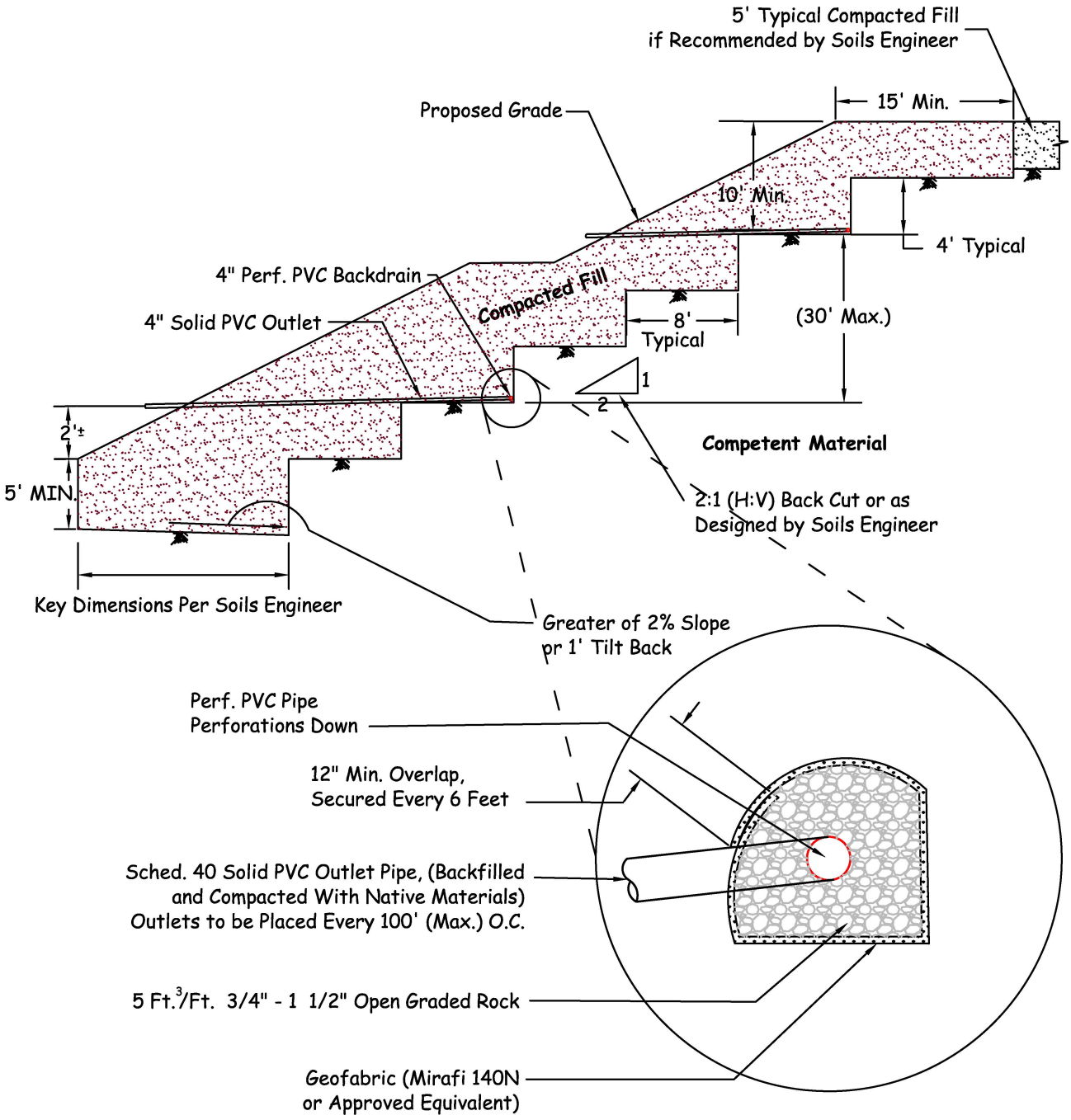
Cut-Over-Fill Slope



Note: Natural Slopes Steeper Than 5:1 (H:V) Must Be Benched.

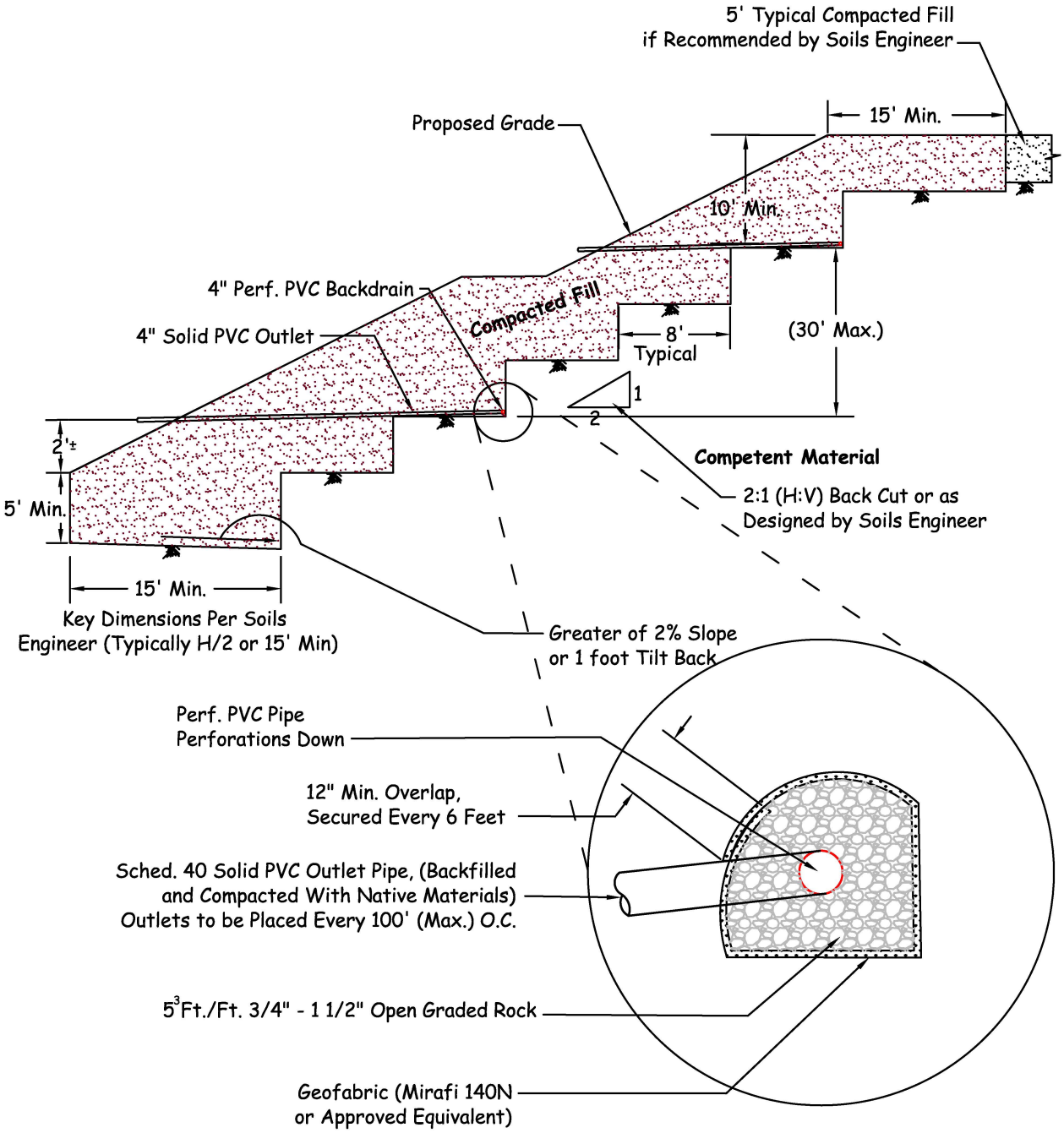
LGC Geotechnical, Inc.

KEYING AND BENCHING



LGC Geotechnical, Inc.

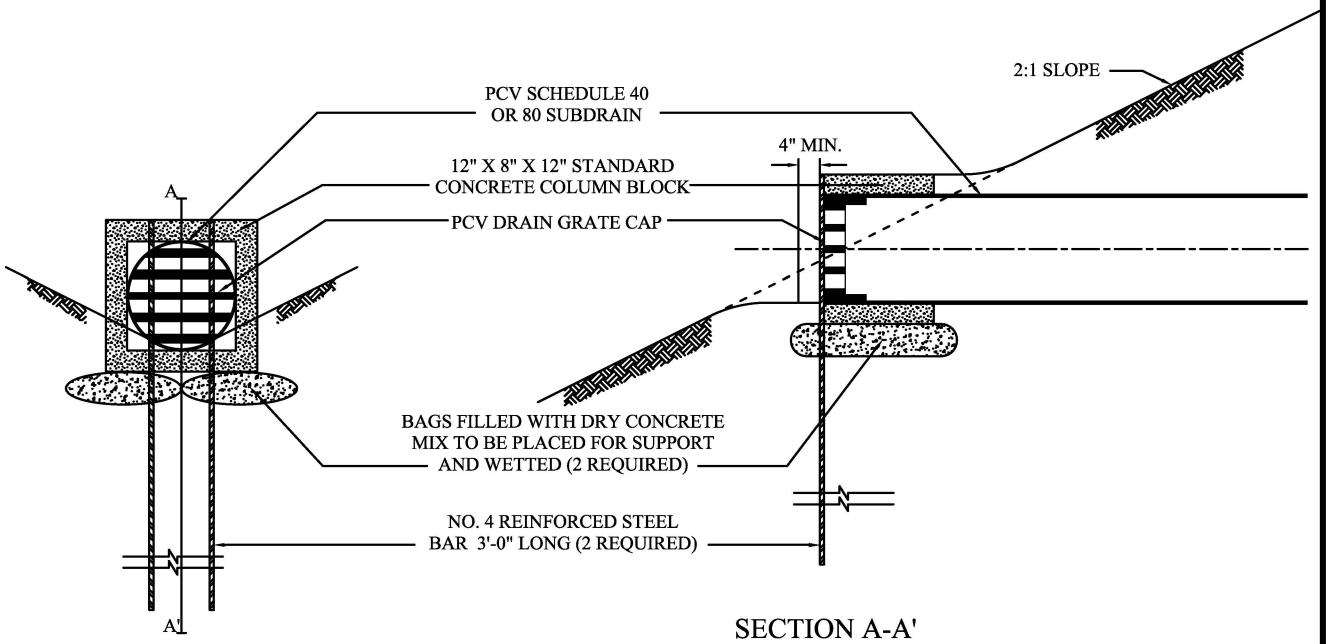
TYPICAL BUTTRESS DETAIL



LGC Geotechnical, Inc.

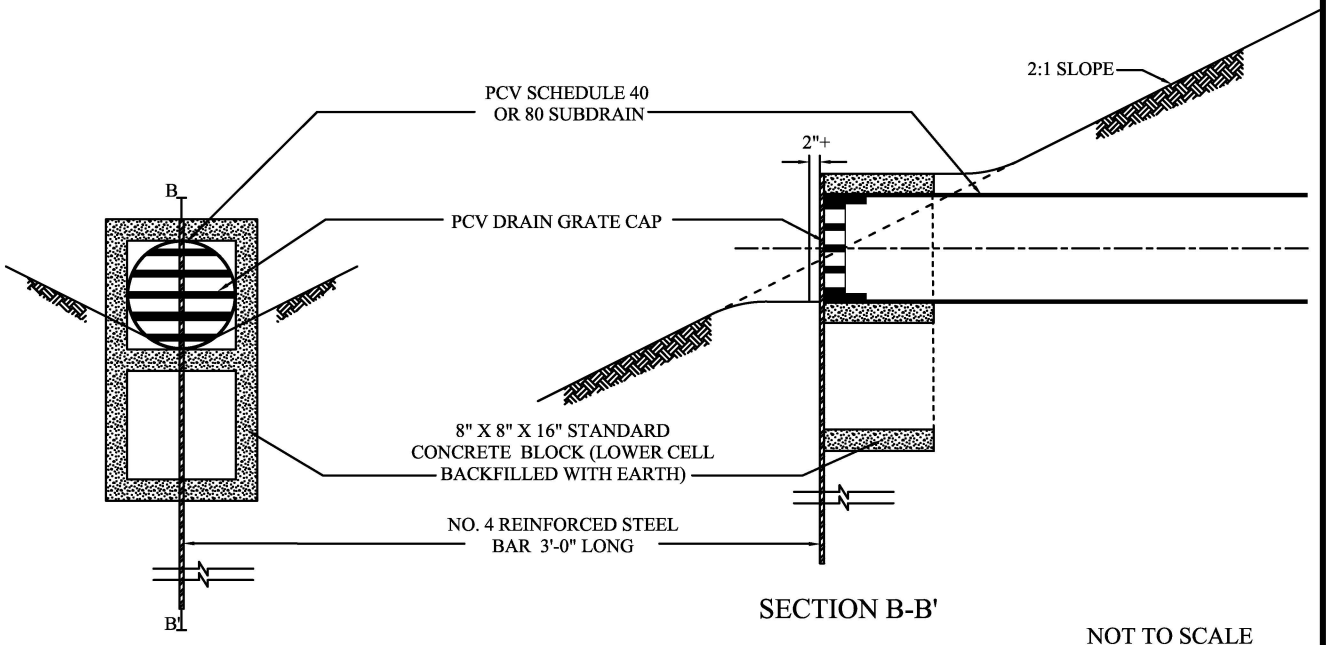
TYPICAL STABILIZATION FILL DETAIL

SUBDRAIN OUTLET MARKER -6" & 8" PIPE



SECTION A-A'

SUBDRAIN OUTLET MARKER -4" PIPE



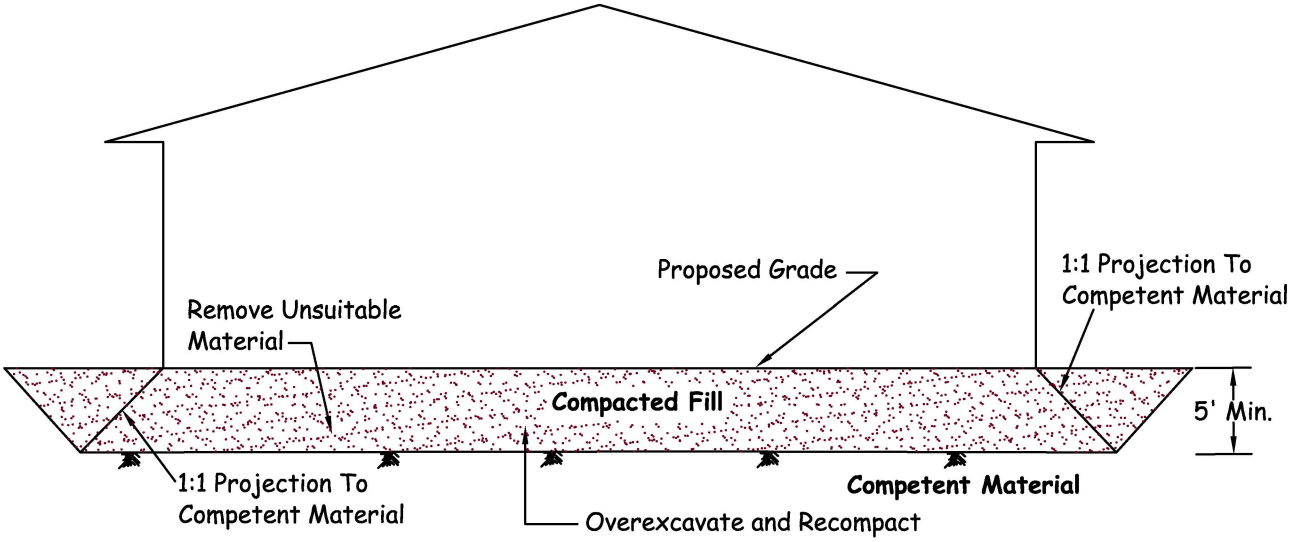
SECTION B-B'

NOT TO SCALE

LGC Geotechnical, Inc.

SUBDRAIN OUTLET MARKER DETAIL

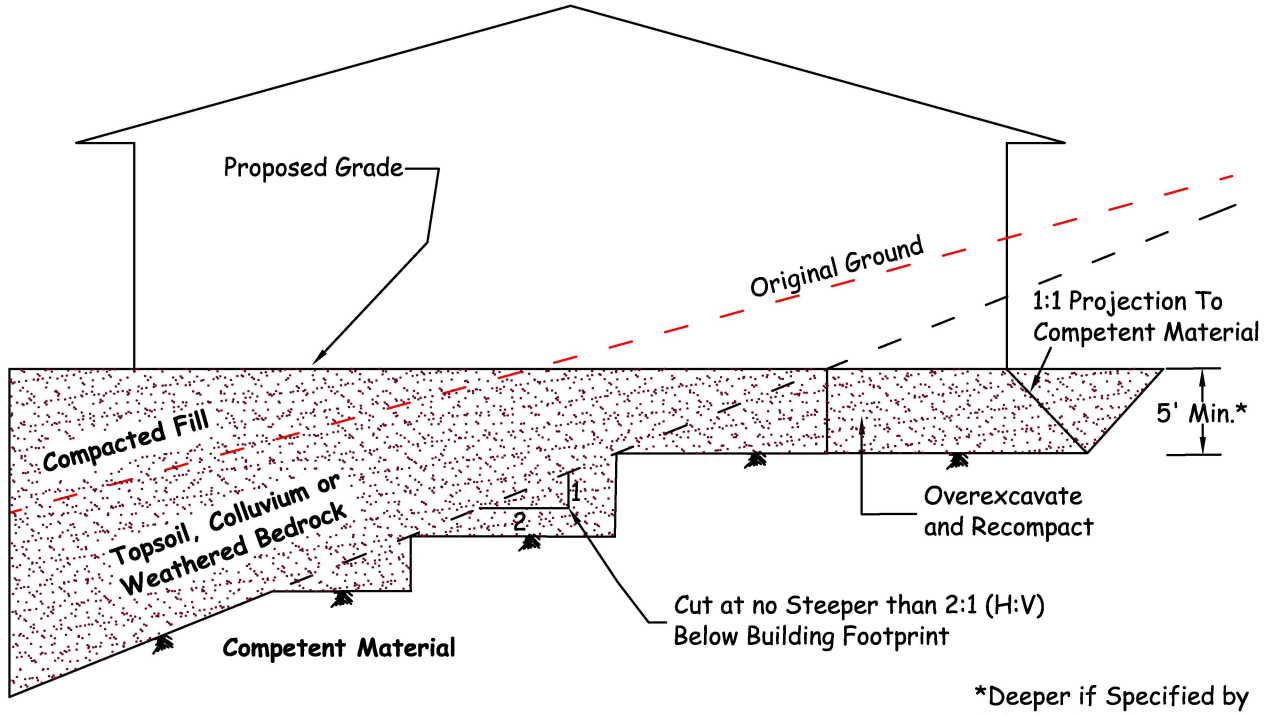
Cut Lot
(Exposing Unsuitable Soils at Design Grade)



Note 1: Removal Bottom Should be Graded With Minimum 2% Fall Towards Street or Other Suitable Area (as Determined by Soils Engineer) to Avoid Ponding Below Building

Note 2: Where Design Cut Lots are Excavated Entirely Into Competent Material, Overexcavation May Still be Required for Hard-Rock Conditions or for Materials With Variable Expansion Characteristics.

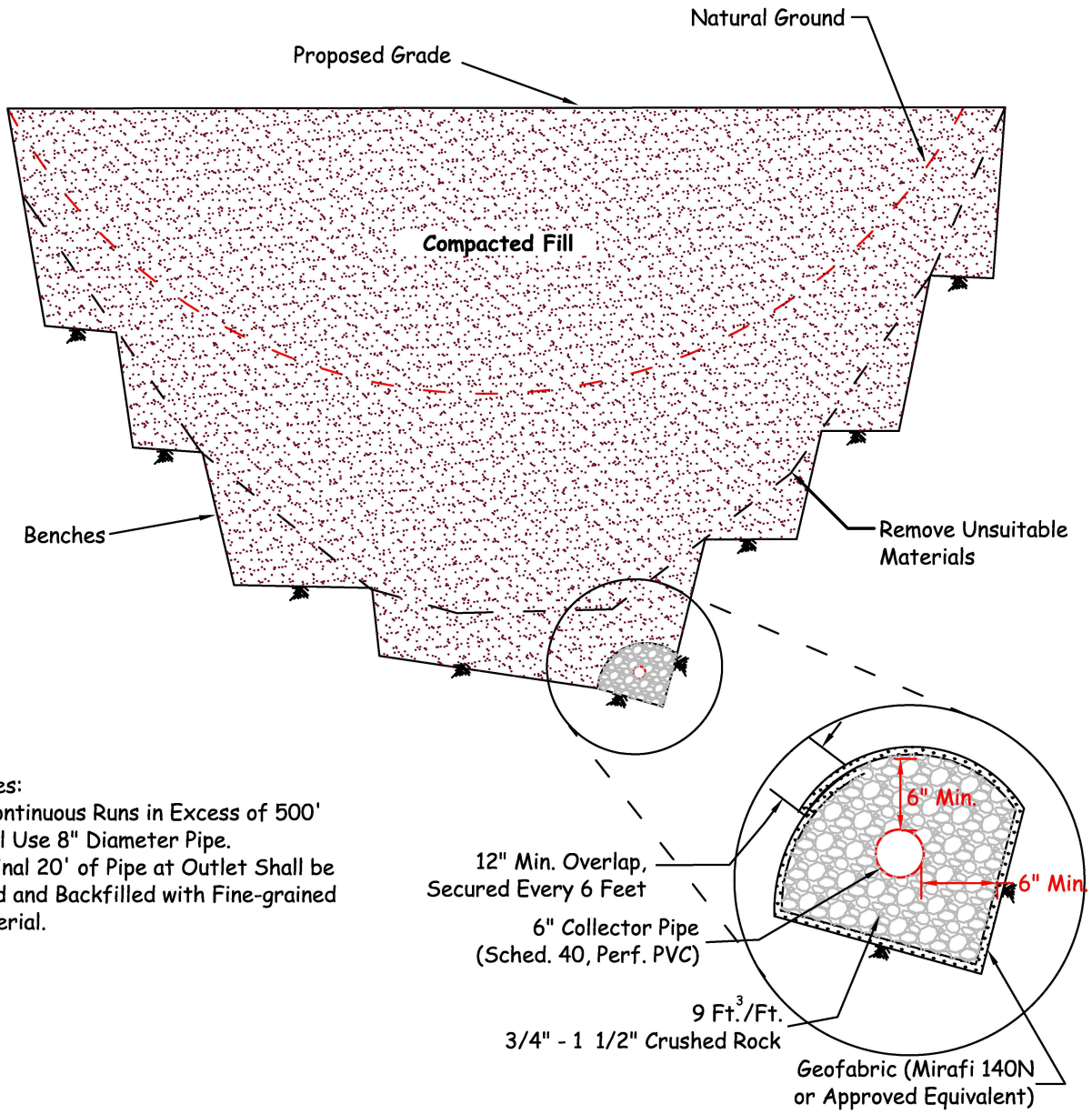
Cut/Fill Transition Lot



*Deeper if Specified by Soils Engineer

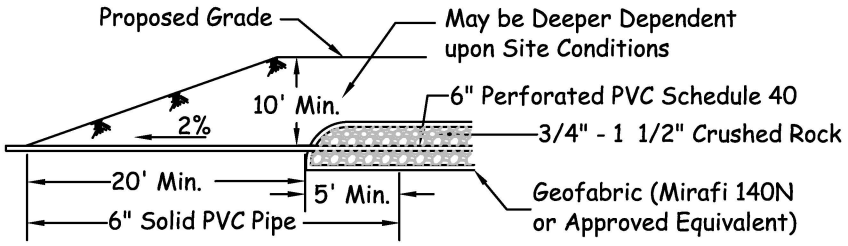
LGC Geotechnical, Inc.

CUT AND TRANSITION LOT OVEREXCAVATION DETAIL



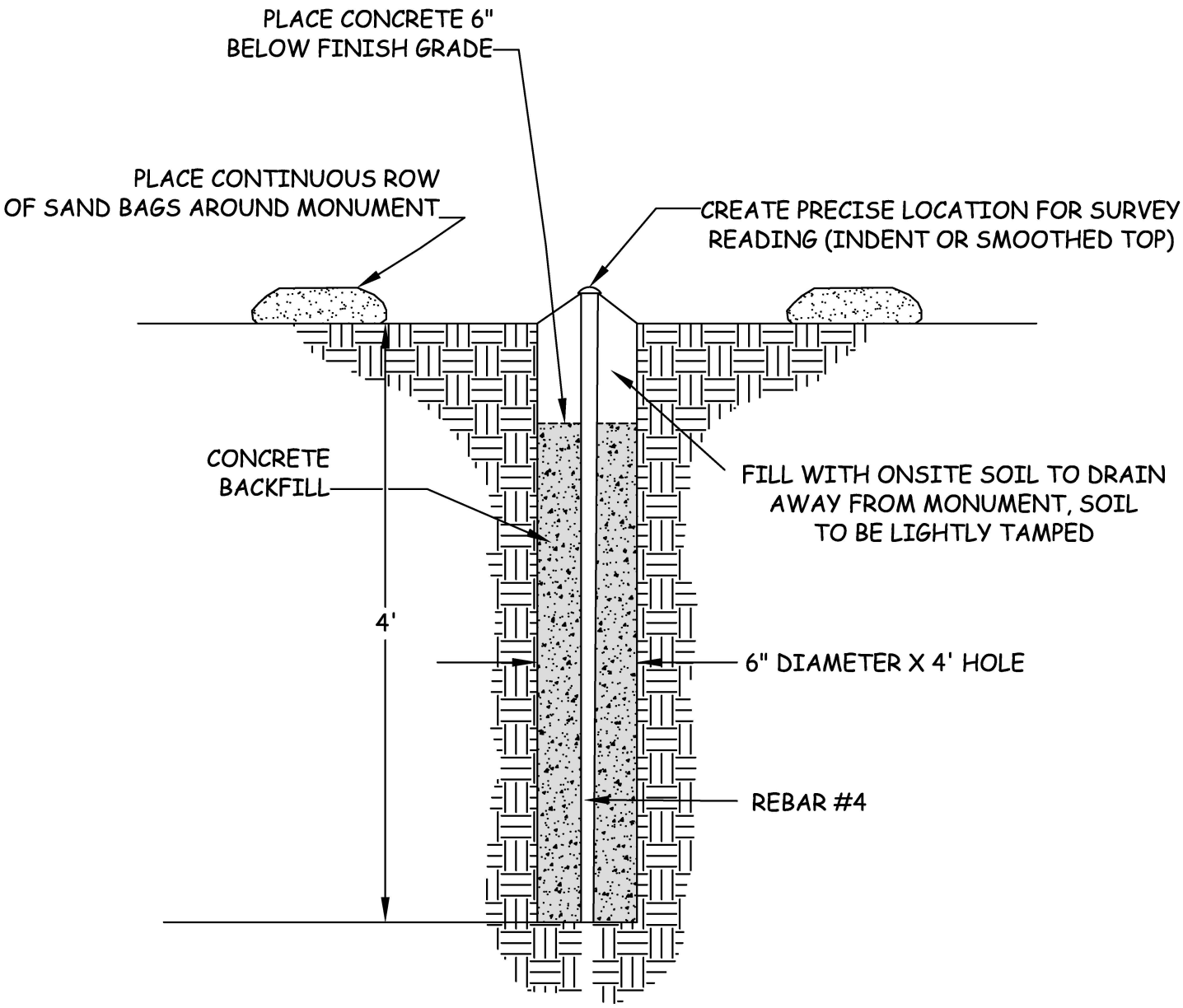
Notes:
1) Continuous Runs in Excess of 500' Shall Use 8" Diameter Pipe.
2) Final 20' of Pipe at Outlet Shall be Solid and Backfilled with Fine-grained Material.

Proposed Outlet Detail



LGC Geotechnical, Inc.

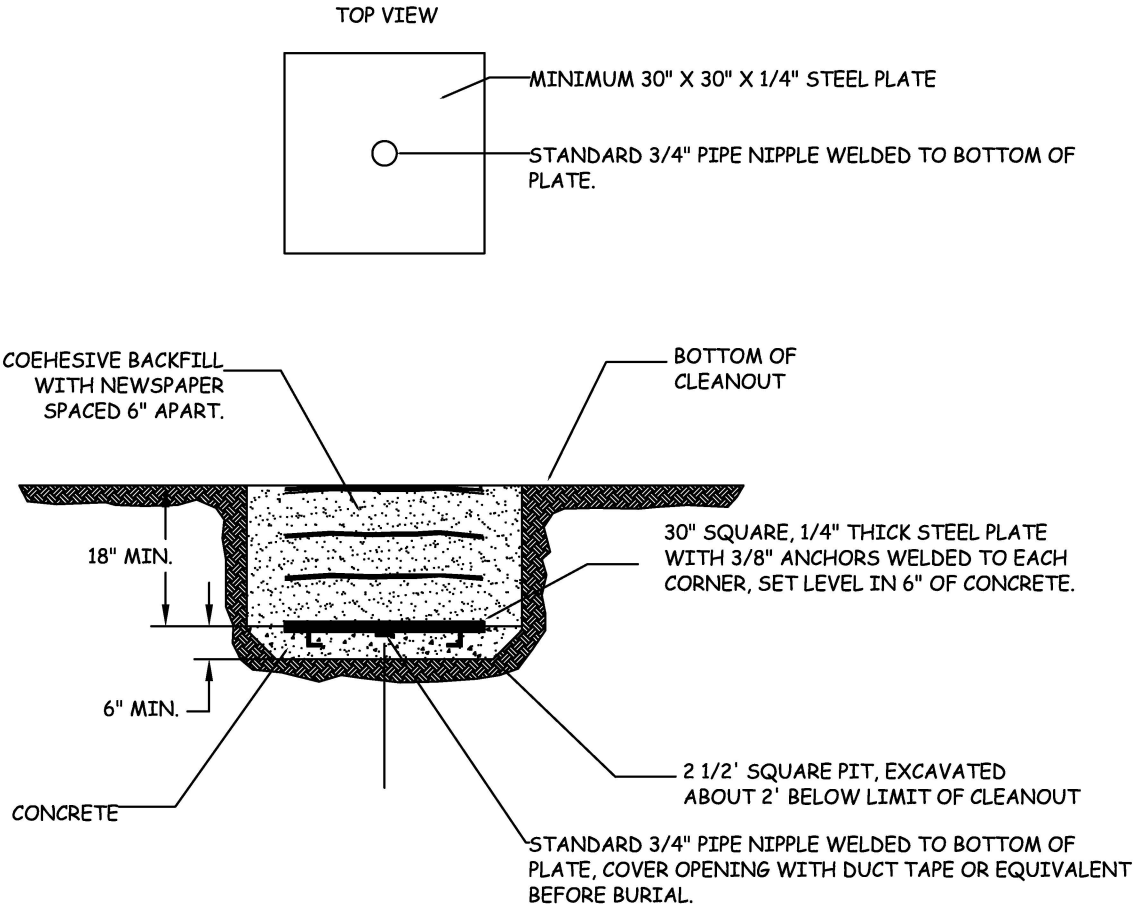
CANYON SUBDRAINS



NO CONSTRUCTION EQUIPMENT WITHIN 25 FEET
OF ANY INSTALLED SETTLEMENT MONUMENTS

LGC Geotechnical, Inc.

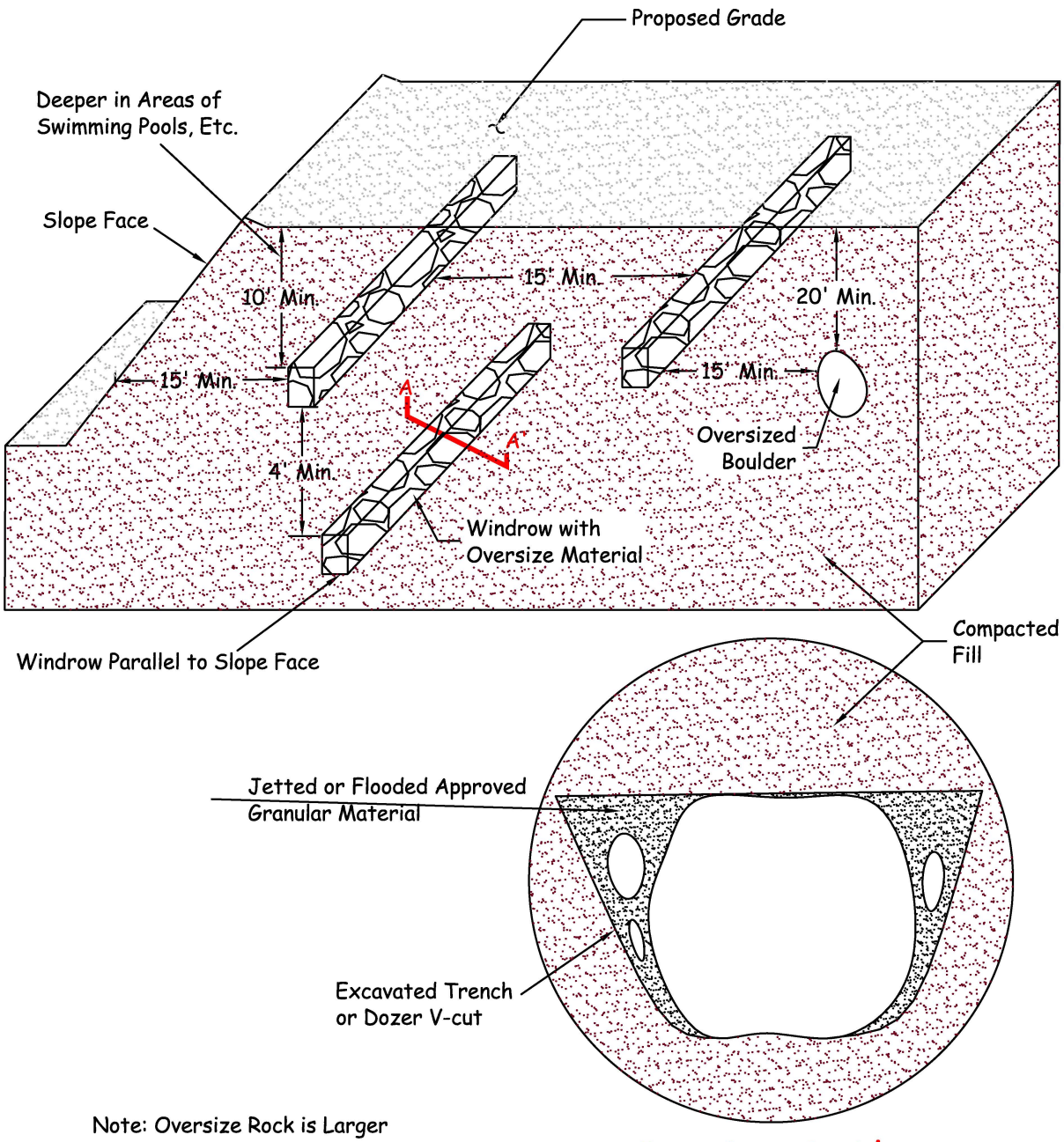
TYPICAL SURFACE SETTLEMENT MONUMENT



1. SURVEY FOR HORIZONTAL AND VERTICAL LOCATION TO NEAREST .01 INCH PRIOR TO BACKFILL USING KNOW LOCATIONS THAT WILL REMAIN INTACT DURING THE DURATION OF THE MONITORING PROGRAM. KNOW POINTS EXPLICITELY NOT ALLOWED ARE THOSE LOCATED ON FILL OR THAT WILL BE DESTROYED DURING GRADING.
2. IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE DURING GRADING, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE GEOTECHNICAL ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER.
3. DRILL TO RECOVER AND ATTACH RISER PIPE.

LGC Geotechnical, Inc.

TYPICAL SETTLEMENT PLATE AND RISER

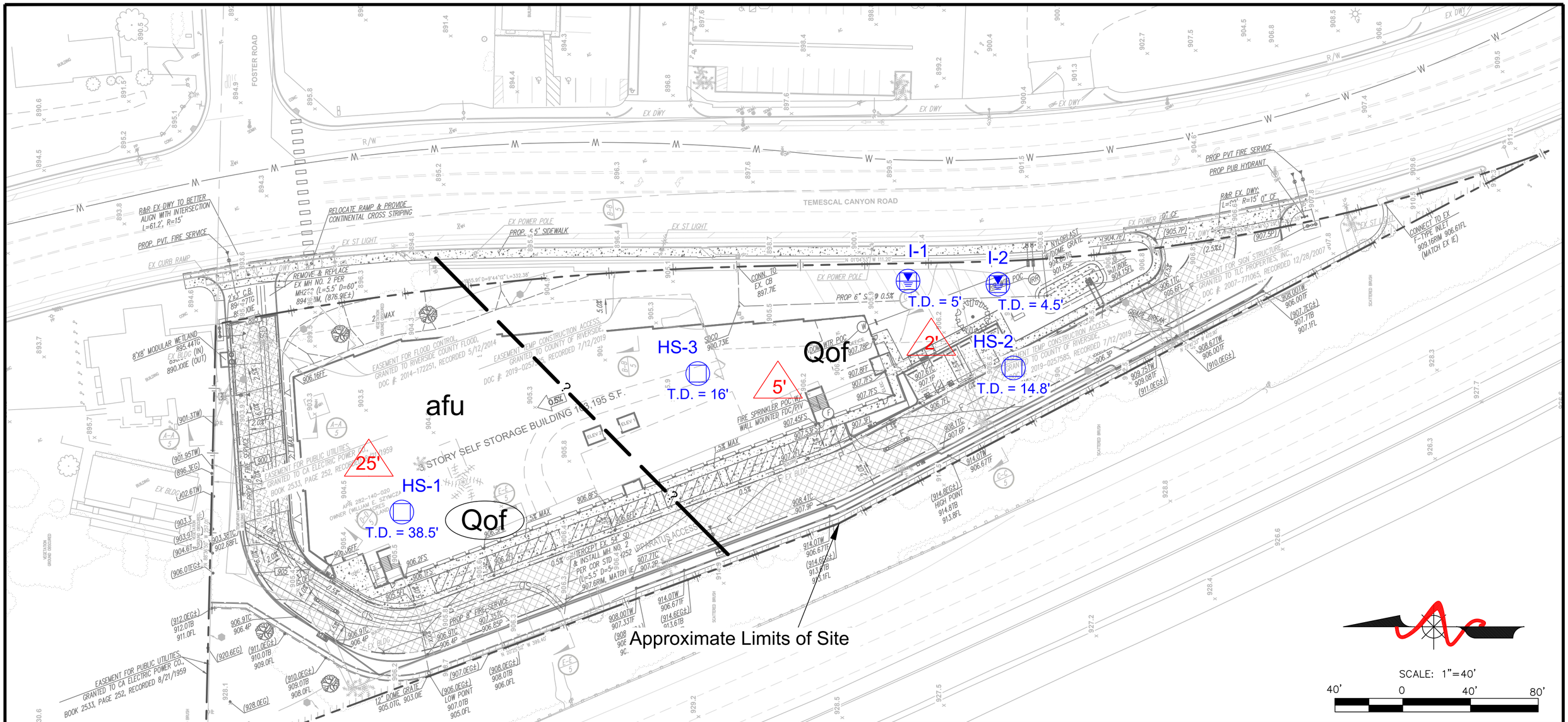


Note: Oversize Rock is Larger than 8" in Maximum Dimension.

Section A-A'

LGC Geotechnical, Inc.

OVERSIZE ROCK DISPOSAL DETAIL



LEGEND

afu — Artificial Fill - Undocumented

Qof — Quaternary Very Old and Old Fan Deposits (Undifferentiated)

25' — Anticipated Depth of Remedial Grading (in feet)

Approximate Location of Geologic Contact; Dotted Where Buried, Queried Where Uncertain

HS-3 / T.D. = 16' — Approximate Location of Hollow Stem Auger Boring by LGC Geotechnical, With Total Depth in Feet

I-2 / T.D. = 4.5' — Approximate Location of Hollow Stem Auger Infiltration Boring by LGC Geotechnical, With Total Depth in Feet

LGC Geotechnical, Inc.
131 Calle Iglesia, Ste. 200
San Clemente, CA 92672
TEL (949) 369-6141 FAX (949) 369-6142

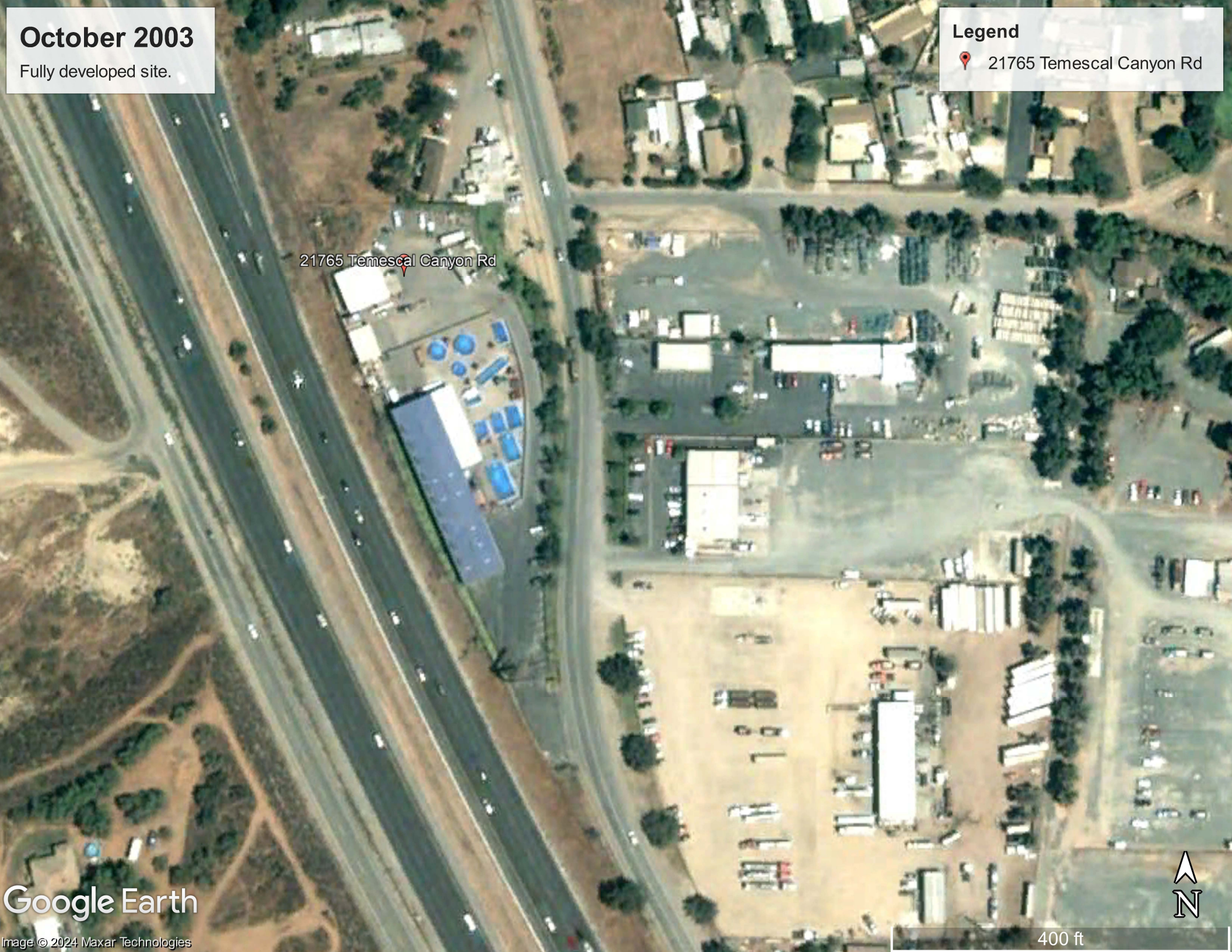
Geotechnical Location Map

PROJECT NAME	Preservation Partners - Temescal Canyon Road
PROJECT NO.	24070-01
ENG. / GEOL.	RLD / KBC
SCALE	1" = 40'
DATE	June 2024

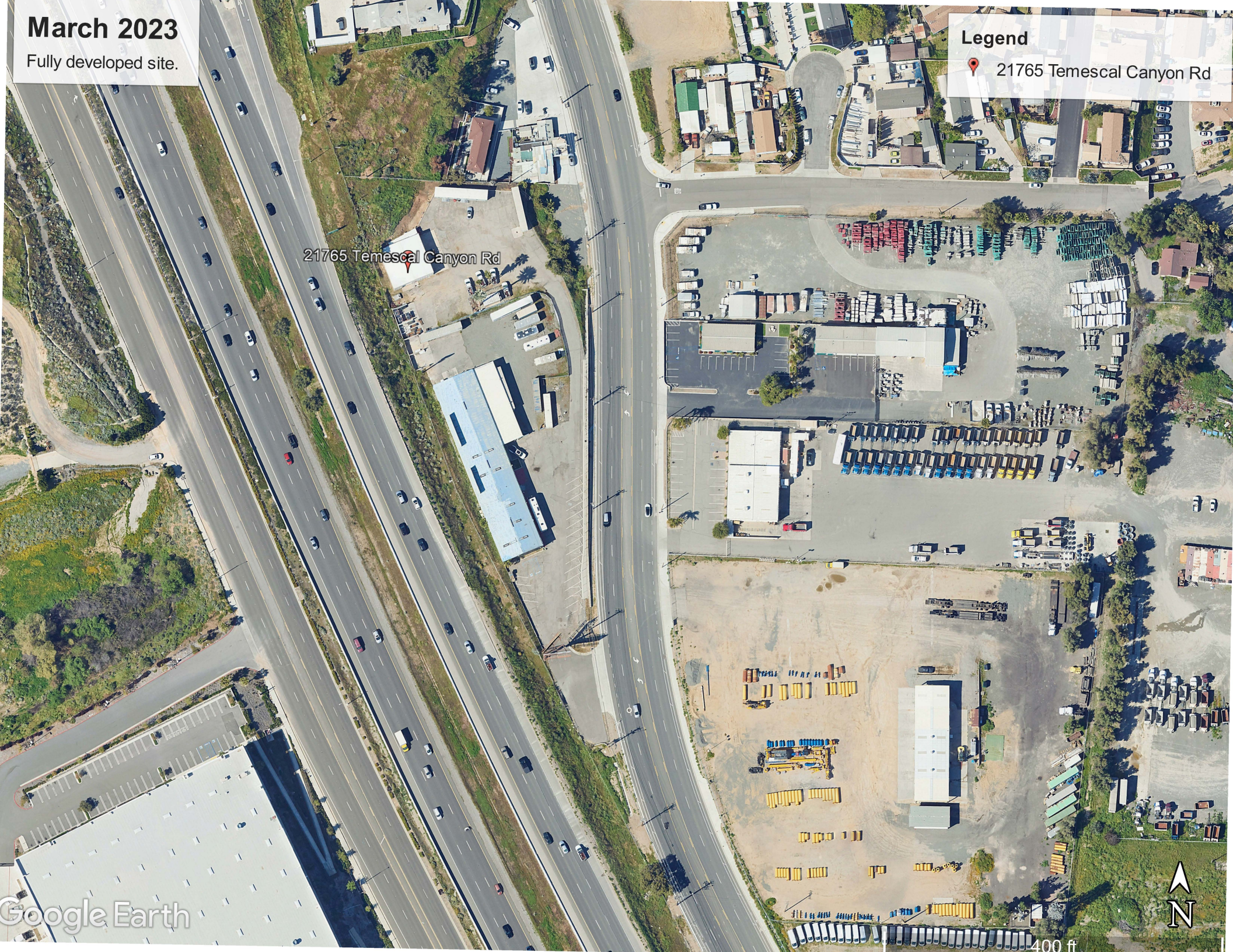
SHEET 1 of 1

Appendix 4: Historical Site Conditions

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


October 2003
Fully developed site.
Legend
21765 Temescal Canyon Rd
21765 Temescal Canyon Rd
Google Earth
Image © 2024 Maxar Technologies
N
400 ft


November 2013
Fully developed site.
Legend
21765 Temescal Canyon Rd
21765 Temescal Canyon Rd
Google Earth
400 ft
N


March 2023
Fully developed site.
Legend
21765 Temescal Canyon Rd
21765 Temescal Canyon Rd
Google Earth
400 ft
N

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed

V_{BMP} and Q_{BMP} worksheets

These worksheets are to be used to determine the required

Design Capture Volume (V_{BMP})
or the
Design Flow Rate (Q_{BMP})

for BMPs in the Santa Ana Watershed

To verify which watershed your project is located within, visit

www.rcflood.org/npdes

and use the 'Locate my Watershed' tool

If your project is not located in the Santa Ana Watershed,

Do not use these worksheets! Instead visit

www.rcflood.org/npdes/developers.aspx

To access worksheets applicable to your watershed

Use the tabs across the bottom
to access the worksheets for the Santa Ana Watershed

Santa Ana Watershed - BMP Design Volume, V_{BMP}

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	Omega Engineering Consultants	Date	11/4/2024
Designed by	Patric de Boer	Case No	TBD
Company Project Number/Name	0794 / Temescal Canyon Self-Storage		

BMP Identification

BMP NAME / ID: 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} = 0.80 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	*19,240*	*Mixed Surface Types*	*0.74*	*0.54*	*10312.5*			
	19240	***Total***			**10312.5**	**0.80**	***687.5***	***921***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

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: Omega Engineering Consultants
Date: 11/4/2024
Designed by: Patric de Boer
Case No: TBD
Company Project Number/Name: 0794 / Temescal Canyon Self-Storage

BMP Identification

BMP NAME / ID: 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*	*75,620*	*Mixed Surface Types*	*0.82*	*0.62*	*46900*			
		75620	*Total*			46900	0.20	*0.2*	*0.231*

Notes:

Effective Impervious Fraction

Developed Cover Types	Effective Impervious Fraction
Roofs	1.00
Concrete or Asphalt	1.00
Grouted or Gapless Paving Blocks	1.00
Compacted Soil (e.g. unpaved parking)	0.40
Decomposed Granite	0.40
Permeable Paving Blocks w/ Sand Filled Gap	0.25
Class 2 Base	0.30
Gravel or Class 2 Permeable Base	0.10
Pervious Concrete / Porous Asphalt	0.10
Open and Porous Pavers	0.10
Turf block	0.10
Ornamental Landscaping	0.10
Natural (A Soil)	0.03
Natural (B Soil)	0.15
Natural (C Soil)	0.30
Natural (D Soil)	0.40
Mixed Surface Types	

Use this table to determine the effective impervious fraction for the V_{BMP} and Q_{BMP} calculation sheets

Bioretention Facility - Design Procedure	BMP ID: BMP-2	Legend:	Required Entries / Calculated Cells

Company Name:	Omega Engineering Consultants	Date:	2/10/2025
Designed by:	Patric de Boer	County/City Case No.:	Riverside

Design Volume

Enter the area tributary to this feature	A_T=	0.44	acres
Enter V_{BMP} determined from Section 2.1 of this Handbook	V_{BMP}=	688	ft^3

Type of Bioretention Facility Design

(●) Side slopes required (parallel to parking spaces or adjacent to walkways)

( ) No side slopes required (perpendicular to parking space or Planter Boxes)

Bioretention Facility Surface Area

Depth of Soil Filter Media Layer	d_S =	1.5	ft
Top Width of Bioretention Facility, excluding curb	w_T =	18.0	ft
Total Effective Depth, d_E $d_E = (0.3) \times d_S + (0.4) \times 1 - (0.7/w_T) + 0.5$	d_E =	1.31	ft
Minimum Surface Area, A_m $A_M\ (ft^2) = \frac{V_{BMP}\ (ft^3)}{d_E\ (ft)}$	A_M =	525	ft^2
Proposed Surface Area	A=	550	ft^2

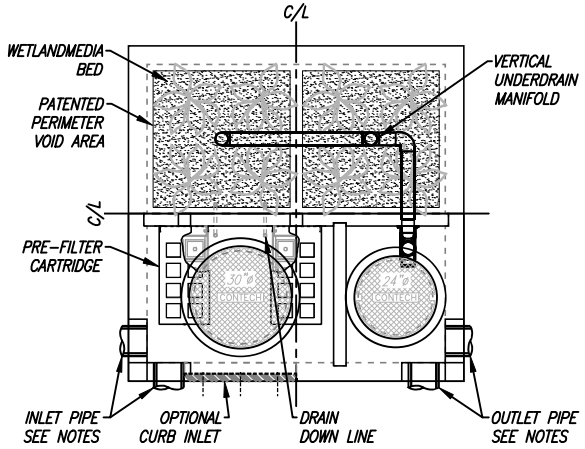
Bioretention Facility Properties

Side Slopes in Bioretention Facility	z =	4	:1
Diameter of Underdrain		6	inches
Longitudinal Slope of Site (3% maximum)		0	%
6" Check Dam Spacing		0	feet
Describe Vegetation:			

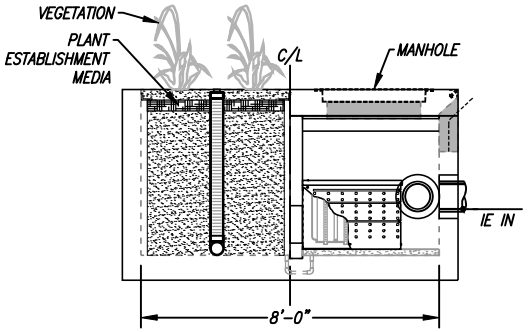
Notes:

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			_____ (CFS)
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



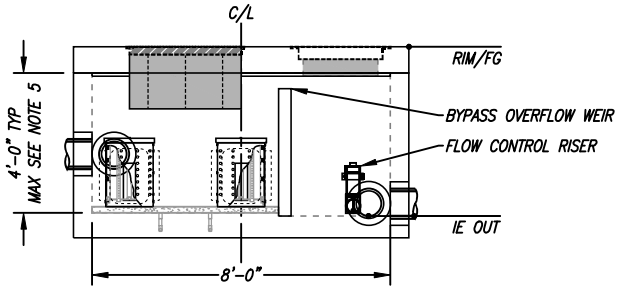
PLAN VIEW



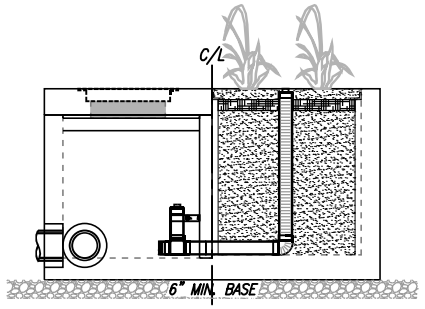
LEFT END VIEW

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 MANUFACTURER'S 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.
3. 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.
4. CONTRACTOR RESPONSIBLE FOR CONTACTING CONTECH FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A CONTECH REPRESENTATIVE.
5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.



ELEVATION VIEW



RIGHT END VIEW

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:

THE INFORMATION CONTAINED IN THIS DOCUMENT IS THE SOLE PROPERTY OF CONTECH AND ITS COMPANIES. THIS DOCUMENT, NOR ANY PART THEREOF, MAY BE USED, REPRODUCED OR MODIFIED IN ANY MANNER WITH OUT THE WRITTEN CONSENT OF CONTECH.

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

8/14/2020 SCOTT.SERTICH

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

LEGEND

BASIN NUMBER ..... E-#.#

AREA LIMITS .....

DRAINAGE FLOW PATH .....

BUILDING AREA .....

PAVEMENT AREA .....

PERVIOUS AREA .....

DRAINAGE BASIN DATA

BASIN #	AREA (AC)	IMP. %	SOIL TYPE	C_{100}	I_{100} (IN/HR)	Q_{100} (CFS)
E-1.1	2.40	76	C	0.87	4.07	8.51
E-1.2	1.95	85	C	0.89	4.58	7.94
E-1.3	0.79	56	C	0.88	4.78	3.31

FOSTER ROAD

DISCHARGE POINT # 1
Q_{100}= 18.38 CFS

TEMESCAL CANYON ROAD

E-1.1

E-1.2

E-1.3

INTERSTATE 15

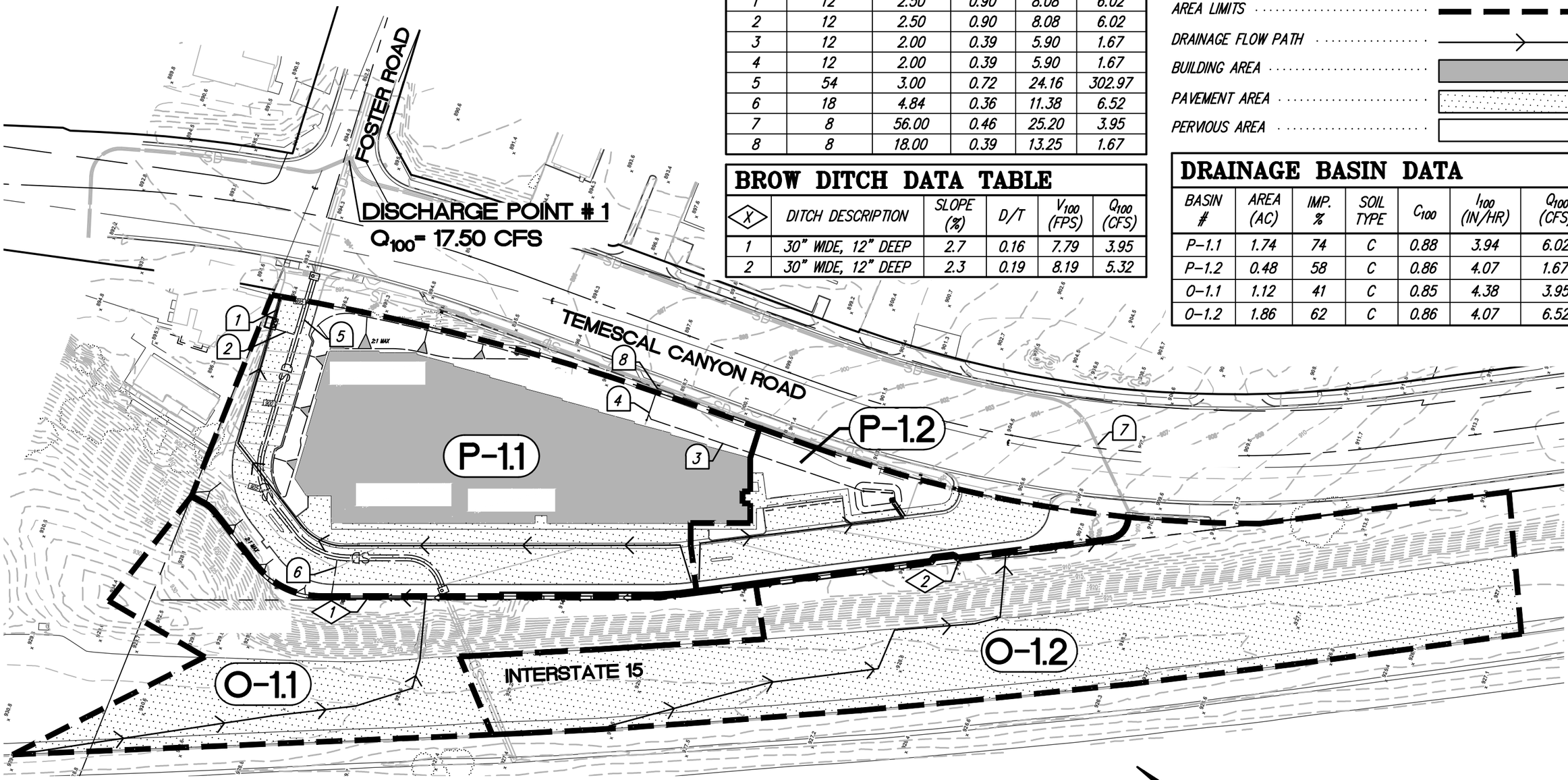
TEMESCAL CANYON SELF-STORAGE EXISTING HYDROLOGY EXHIBIT

GRAPHICAL SCALE: 1" = 80'

0 40 80 160

OMEGA

EX. HYDROLOGY EXHIBIT



PIPE DATA

(X) PIPE #	DIAMETER (INCHES)	SLOPE (%)	DEPTH /DIA	V_{100} (FPS)	Q_{100} (CFS)
1	12	2.50	0.90	8.08	6.02
2	12	2.50	0.90	8.08	6.02
3	12	2.00	0.39	5.90	1.67
4	12	2.00	0.39	5.90	1.67
5	54	3.00	0.72	24.16	302.97
6	18	4.84	0.36	11.38	6.52
7	8	56.00	0.46	25.20	3.95
8	8	18.00	0.39	13.25	1.67

BROW DITCH DATA TABLE

◇X◇	DITCH DESCRIPTION	SLOPE (%)	D/T	V_{100} (FPS)	Q_{100} (CFS)
1	30" WIDE, 12" DEEP	2.7	0.16	7.79	3.95
2	30" WIDE, 12" DEEP	2.3	0.19	8.19	5.32

LEGEND

- BASIN NUMBER ..... P-#.#
- AREA LIMITS .....
- DRAINAGE FLOW PATH .....
- BUILDING AREA .....
- PAVEMENT AREA .....
- PERVIOUS AREA .....

DRAINAGE BASIN DATA

BASIN #	AREA (AC)	IMP. %	SOIL TYPE	C_{100}	I_{100} (IN/HR)	Q_{100} (CFS)
P-1.1	1.74	74	C	0.88	3.94	6.02
P-1.2	0.48	58	C	0.86	4.07	1.67
O-1.1	1.12	41	C	0.85	4.38	3.95
O-1.2	1.86	62	C	0.86	4.07	6.52

TEMESCAL CANYON SELF-STORAGE PROPOSED HYDROLOGY EXHIBIT

GRAPHICAL SCALE: 1" = 80'

0 40 80 160

ΩMEGA

PROP. HYDROLOGY EXHIBIT

Temescal Canyon Self-Storage

2-YEAR STORM RATIONAL METHOD STUDY

Drainage Area	Soil & Development	A Acres	I_2 in/hr.	C_2	Q cfs	∑Q	T	Slope	Section	V fps	L ft.	T min	∑T	Remarks
E-1.1	Type C Soil	2.40	1.50	0.84	3.03	3.03	7.0					7.0		
E-1.2	Type C Soil	1.95	1.70	0.88	2.91	2.91	5.5					5.5		
			1.50			5.60	7.0							
E-1.3	Type C Soil	0.79	1.75	0.82	1.13	1.13	5.0					5.0		
			Discharge Point # 1			6.57						7.0		
P-1.1	Type C Soil	1.74	1.45	0.84	2.11	2.11	7.5					7.5		
O-1.1	Type C Soil	1.06	1.67	0.76	1.35	1.35	6.0					6.0		
			1.45			3.28	7.5							
P-1.2	Type C Soil	0.48	1.50	0.79	0.57	0.57	7.0					7.0		
O-1.2	Type C Soil	1.86	1.50	0.81	2.26	2.26	7.0					7.0		
			1.50			2.83	7.0							
			Discharge Point # 1			6.02						7.5		

C Value per Plate D-5.3

Intensity selected from Plate D-4.7

Calculated By: Rogelio Ruiz Date:

Checked By: Patric de Boer Date:

Junction Equation: $T_1 < T_2 < T_3$

$$Q_{T1} = Q_1 + \frac{T_1}{T_2} Q_2 + \frac{T_1}{T_3} Q_3$$

$$Q_{T2} = Q_2 + \frac{I_2}{I_1} Q_1 + \frac{T_2}{T_3} Q_3$$

$$Q_{T3} = Q_3 + \frac{I_3}{I_1} Q_1 + \frac{I_3}{I_2} Q_2$$

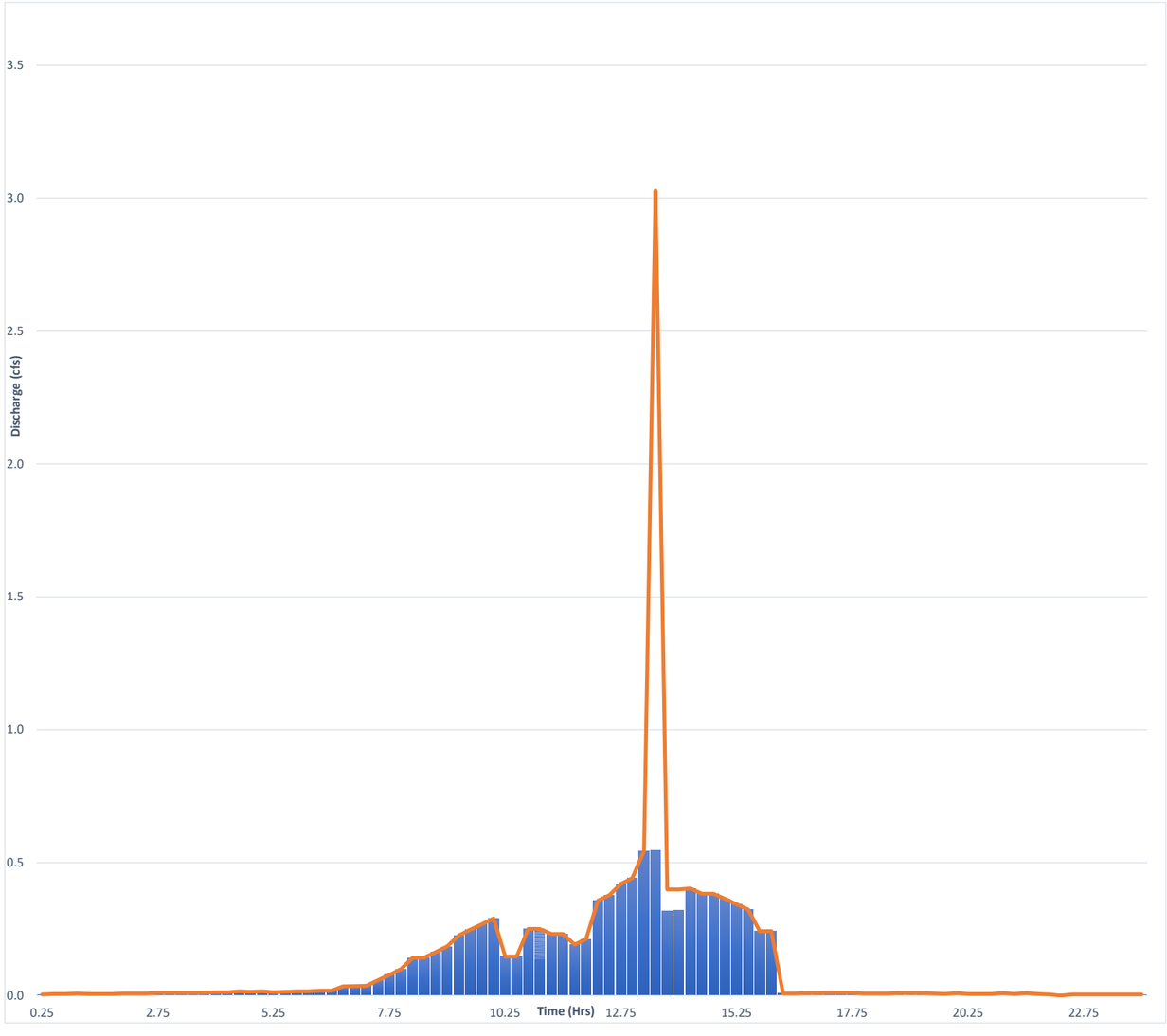
HCOC is mitigated per section F.2 of the WQMP. The post-developed peak flow is only 92% of the pre-developed peak flow. This shows that the proposed site will not discharge flow rate greater than 110% of the pre-development 2-year peak flowrate.

See attached 2-year hydrographs for the pre and post developed conditions.

PRE-DEVELOPED BASIN E-1.1 - SHORTCUT SYNTHETIC UNIT HYDROGRAPH 2-YR, 24 HR

Area (ac)	2.40	Impervious Percent	76%	F	0.06
Lag Time (mins)	4.5			C	0.0003
Unit Time (mins)	15	Storm Depth	2.14	Fm	0.04
Storm Frequency	2 yr	Rational Peak flow	3.03		
Storm Duration	24 hr	Unit Hydrograph Peak Flow	0.55		
Pervious Loss Rate	0.3	Adjustment factor	5.55		

Time Period	Pattern Percent	Storm Rain from plate E-5.9 (in/hr)	Loss Rate		Effective Rain	Flood Hydrograph	Adjusted Flood Hydrograph	Time (Hours)
			Max	Low				
1	0.2	0.02	0.079	0.015	0.00	0.00	0.00	0.25
2	0.3	0.03	0.078	0.023	0.00	0.01	0.01	0.5
3	0.3	0.03	0.078	0.023	0.00	0.01	0.01	0.75
4	0.4	0.03	0.077	0.031	0.00	0.01	0.01	1
5	0.3	0.03	0.077	0.023	0.00	0.01	0.01	1.25
6	0.3	0.03	0.077	0.023	0.00	0.01	0.01	1.5
7	0.3	0.03	0.077	0.023	0.00	0.01	0.01	1.75
8	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2
9	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2.25
10	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2.5
11	0.5	0.04	0.075	0.039	0.00	0.01	0.01	2.75
12	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3
13	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3.25
14	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3.5
15	0.5	0.04	0.074	0.039	0.00	0.01	0.01	3.75
16	0.6	0.05	0.074	0.046	0.01	0.01	0.01	4
17	0.6	0.05	0.074	0.046	0.01	0.01	0.01	4.25
18	0.8	0.07	0.073	0.062	0.01	0.02	0.02	4.5
19	0.7	0.06	0.073	0.054	0.01	0.01	0.01	4.75
20	0.8	0.068	0.073	0.062	0.01	0.02	0.02	5
21	0.6	0.05	0.073	0.046	0.01	0.01	0.01	5.25
22	0.7	0.06	0.072	0.054	0.01	0.01	0.01	5.5
23	0.8	0.07	0.072	0.062	0.01	0.02	0.02	5.75
24	0.8	0.07	0.072	0.062	0.01	0.02	0.02	6
25	0.9	0.08	0.072	0.069	0.01	0.02	0.02	6.25
26	0.9	0.08	0.071	0.069	0.01	0.02	0.02	6.5
27	1	0.09	0.071	-	0.01	0.04	0.04	6.75
28	1	0.09	0.071	-	0.01	0.04	0.04	7
29	1	0.09	0.070	-	0.02	0.04	0.04	7.25
30	1.1	0.09	0.070	-	0.02	0.06	0.06	7.5
31	1.2	0.10	0.070	-	0.03	0.08	0.08	7.75
32	1.3	0.11	0.070	-	0.04	0.10	0.10	8
33	1.5	0.13	0.069	-	0.06	0.14	0.14	8.25
34	1.5	0.13	0.069	-	0.06	0.14	0.14	8.5
35	1.6	0.14	0.069	-	0.07	0.16	0.16	8.75
36	1.7	0.15	0.069	-	0.08	0.18	0.18	9
37	1.9	0.16	0.068	-	0.09	0.23	0.23	9.25
38	2	0.17	0.068	-	0.10	0.25	0.25	9.5
39	2.1	0.18	0.068	-	0.11	0.27	0.27	9.75
40	2.2	0.19	0.068	-	0.12	0.29	0.29	10
41	1.5	0.13	0.067	-	0.06	0.15	0.15	10.25
42	1.5	0.13	0.067	-	0.06	0.15	0.15	10.5
43	2	0.17	0.067	-	0.10	0.25	0.25	10.75
44	2	0.17	0.067	-	0.10	0.25	0.25	11
45	1.9	0.16	0.066	-	0.10	0.23	0.23	11.25
46	1.9	0.16	0.066	-	0.10	0.23	0.23	11.5
47	1.7	0.15	0.066	-	0.08	0.19	0.19	11.75



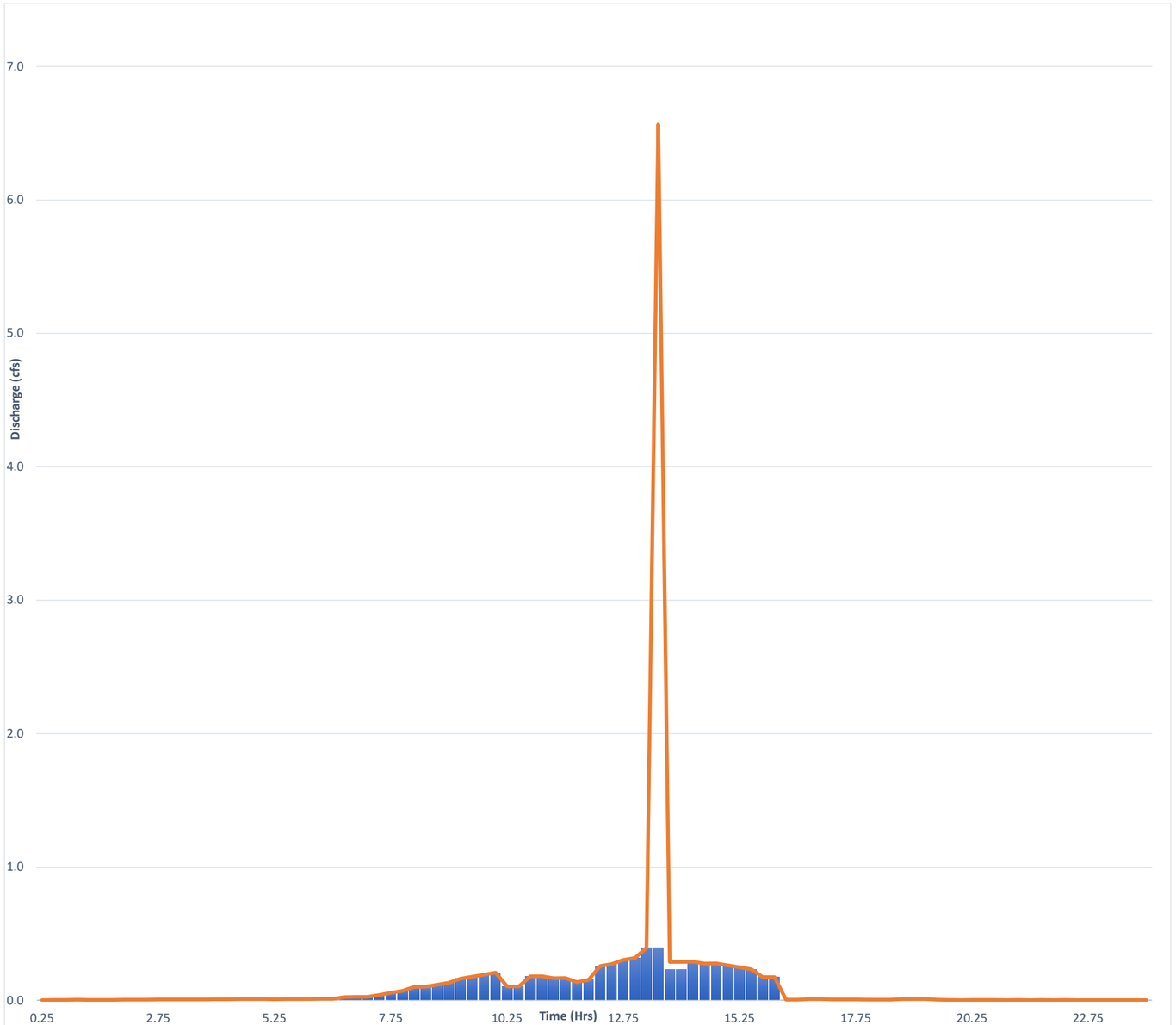
48	1.8	0.15	0.066	-	0.09	0.21	0.21	12
49	2.5	0.21	0.065	-	0.15	0.36	0.36	12.25
50	2.6	0.22	0.065	-	0.16	0.38	0.38	12.5
51	2.8	0.24	0.065	-	0.17	0.42	0.42	12.75
52	2.9	0.25	0.065	-	0.18	0.44	0.44	13
53	3.4	0.29	0.064	-	0.23	0.54	0.54	13.25
54	3.4	0.29	0.064	-	0.23	0.55	3.03	13.5
55	2.3	0.20	0.064	-	0.13	0.32	0.40	13.75
56	2.3	0.20	0.064	-	0.13	0.32	0.40	14
57	2.7	0.23	0.063	-	0.17	0.40	0.40	14.25
58	2.6	0.22	0.063	-	0.16	0.38	0.38	14.5
59	2.6	0.22	0.063	-	0.16	0.38	0.38	14.75
60	2.5	0.21	0.063	-	0.15	0.36	0.36	15
61	2.4	0.21	0.062	-	0.14	0.34	0.34	15.25
62	2.3	0.20	0.062	-	0.13	0.32	0.32	15.5
63	1.9	0.16	0.062	-	0.10	0.24	0.24	15.75
64	1.9	0.16	0.062	-	0.10	0.24	0.24	16
65	0.4	0.034	0.061	0.031	0.00	0.01	0.01	16.25
66	0.4	0.034	0.061	0.031	0.00	0.01	0.01	16.5
67	0.3	0.026	0.061	0.023	0.00	0.01	0.01	16.75
68	0.3	0.026	0.061	0.023	0.00	0.01	0.01	17
69	0.5	0.043	0.061	0.039	0.00	0.01	0.01	17.25
70	0.5	0.043	0.060	0.039	0.00	0.01	0.01	17.5
71	0.5	0.043	0.060	0.039	0.00	0.01	0.01	17.75
72	0.4	0.034	0.060	0.031	0.00	0.01	0.01	18
73	0.4	0.034	0.060	0.031	0.00	0.01	0.01	18.25
74	0.4	0.034	0.059	0.031	0.00	0.01	0.01	18.5
75	0.3	0.026	0.059	0.023	0.00	0.01	0.01	18.75
76	0.2	0.017	0.059	0.015	0.00	0.00	0.01	19
77	0.3	0.026	0.059	0.023	0.00	0.01	0.01	19.25
78	0.4	0.034	0.059	0.031	0.00	0.01	0.01	19.5
79	0.3	0.026	0.058	0.023	0.00	0.01	0.01	19.75
80	0.2	0.017	0.058	0.015	0.00	0.00	0.01	20
81	0.3	0.026	0.058	0.023	0.00	0.01	0.01	20.25
82	0.3	0.026	0.058	0.023	0.00	0.01	0.01	20.5
83	0.3	0.026	0.057	0.023	0.00	0.01	0.01	20.75
84	0.2	0.017	0.057	0.015	0.00	0.00	0.01	21
85	0.3	0.026	0.057	0.023	0.00	0.01	0.01	21.25
86	0.2	0.017	0.057	0.015	0.00	0.00	0.01	21.5
87	0.3	0.026	0.057	0.023	0.00	0.01	0.01	21.75
88	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22
89	0.3	0.026	0.056	0.023	0.00	0.01	0.00	22.25
90	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22.5
91	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22.75
92	0.2	0.017	0.056	0.015	0.00	0.00	0.00	23
93	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.25
94	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.5
95	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.75
96	0.2	0.017	0.055	0.015	0.00	0.00	0.00	24

Note: The values on the highighted cells have been adjusted to smoothen the hydrograph.

Effective Rain=	1.06	inches
Flood Volume=	0.212	Acre-Feet
	9233	cf

Area (ac)	1.74	Impervious Percent	74%	F	0.06
Lag Time (mins)	4.5			C	0.0003
Unit Time (mins)	15	Storm Depth	2.14	Fm	0.04
Storm Frequency	2 yr	Rational Peak flow	6.57		
Storm Duration	24 hr	Unit Hydrograph Peak Flow	0.39		
Pervious Loss Rate	0.3	Adjustment factor	16.66		

Time Period	Pattern Percent	Storm Rain from plate E-5.9 (in/hr)	Loss Rate		Effective Rain	Flood Hydrograph	Adjusted Flood Hydrograph	Time (Hours)
			Max	Low				
1	0.2	0.02	0.079	0.015	0.00	0.00	0.00	0.25
2	0.3	0.03	0.078	0.023	0.00	0.00	0.00	0.5
3	0.3	0.03	0.078	0.023	0.00	0.00	0.00	0.75
4	0.4	0.03	0.077	0.031	0.00	0.01	0.01	1
5	0.3	0.03	0.077	0.023	0.00	0.00	0.00	1.25
6	0.3	0.03	0.077	0.023	0.00	0.00	0.00	1.5
7	0.3	0.03	0.077	0.023	0.00	0.00	0.00	1.75
8	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2
9	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2.25
10	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2.5
11	0.5	0.04	0.075	0.039	0.00	0.01	0.01	2.75
12	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3
13	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3.25
14	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3.5
15	0.5	0.04	0.074	0.039	0.00	0.01	0.01	3.75
16	0.6	0.05	0.074	0.046	0.01	0.01	0.01	4
17	0.6	0.05	0.074	0.046	0.01	0.01	0.01	4.25
18	0.8	0.07	0.073	0.062	0.01	0.01	0.01	4.5
19	0.7	0.06	0.073	0.054	0.01	0.01	0.01	4.75
20	0.8	0.068	0.073	0.062	0.01	0.01	0.01	5
21	0.6	0.05	0.073	0.046	0.01	0.01	0.01	5.25
22	0.7	0.06	0.072	0.054	0.01	0.01	0.01	5.5
23	0.8	0.07	0.072	0.062	0.01	0.01	0.01	5.75
24	0.8	0.07	0.072	0.062	0.01	0.01	0.01	6
25	0.9	0.08	0.072	0.069	0.01	0.01	0.01	6.25
26	0.9	0.08	0.071	0.069	0.01	0.01	0.01	6.5
27	1	0.09	0.071	-	0.01	0.03	0.03	6.75
28	1	0.09	0.071	-	0.01	0.03	0.03	7
29	1	0.09	0.070	-	0.02	0.03	0.03	7.25
30	1.1	0.09	0.070	-	0.02	0.04	0.04	7.5
31	1.2	0.10	0.070	-	0.03	0.06	0.06	7.75
32	1.3	0.11	0.070	-	0.04	0.07	0.07	8
33	1.5	0.13	0.069	-	0.06	0.10	0.10	8.25
34	1.5	0.13	0.069	-	0.06	0.10	0.10	8.5
35	1.6	0.14	0.069	-	0.07	0.12	0.12	8.75
36	1.7	0.15	0.069	-	0.08	0.13	0.13	9
37	1.9	0.16	0.068	-	0.09	0.16	0.16	9.25
38	2	0.17	0.068	-	0.10	0.18	0.18	9.5
39	2.1	0.18	0.068	-	0.11	0.19	0.19	9.75
40	2.2	0.19	0.068	-	0.12	0.21	0.21	10
41	1.5	0.13	0.067	-	0.06	0.11	0.11	10.25
42	1.5	0.13	0.067	-	0.06	0.11	0.11	10.5
43	2	0.17	0.067	-	0.10	0.18	0.18	10.75
44	2	0.17	0.067	-	0.10	0.18	0.18	11



45	1.9	0.16	0.066	-	0.10	0.17	0.17	11.25
46	1.9	0.16	0.066	-	0.10	0.17	0.17	11.5
47	1.7	0.15	0.066	-	0.08	0.14	0.14	11.75
48	1.8	0.15	0.066	-	0.09	0.15	0.15	12
49	2.5	0.21	0.065	-	0.15	0.26	0.26	12.25
50	2.6	0.22	0.065	-	0.16	0.27	0.27	12.5
51	2.8	0.24	0.065	-	0.17	0.30	0.30	12.75
52	2.9	0.25	0.065	-	0.18	0.32	0.32	13
53	3.4	0.29	0.064	-	0.23	0.39	0.39	13.25
54	3.4	0.29	0.064	-	0.23	0.39	6.57	13.5
55	2.3	0.20	0.064	-	0.13	0.23	0.29	13.75
56	2.3	0.20	0.064	-	0.13	0.23	0.29	14
57	2.7	0.23	0.063	-	0.17	0.29	0.29	14.25
58	2.6	0.22	0.063	-	0.16	0.28	0.28	14.5
59	2.6	0.22	0.063	-	0.16	0.28	0.28	14.75
60	2.5	0.21	0.063	-	0.15	0.26	0.26	15
61	2.4	0.21	0.062	-	0.14	0.25	0.25	15.25
62	2.3	0.20	0.062	-	0.13	0.23	0.23	15.5
63	1.9	0.16	0.062	-	0.10	0.17	0.17	15.75
64	1.9	0.16	0.062	-	0.10	0.18	0.18	16
65	0.4	0.034	0.061	0.031	0.00	0.01	0.01	16.25
66	0.4	0.034	0.061	0.031	0.00	0.01	0.01	16.5
67	0.3	0.026	0.061	0.023	0.00	0.00	0.01	16.75
68	0.3	0.026	0.061	0.023	0.00	0.00	0.01	17
69	0.5	0.043	0.061	0.039	0.00	0.01	0.01	17.25
70	0.5	0.043	0.060	0.039	0.00	0.01	0.01	17.5
71	0.5	0.043	0.060	0.039	0.00	0.01	0.01	17.75
72	0.4	0.034	0.060	0.031	0.00	0.01	0.01	18
73	0.4	0.034	0.060	0.031	0.00	0.01	0.01	18.25
74	0.4	0.034	0.059	0.031	0.00	0.01	0.01	18.5
75	0.3	0.026	0.059	0.023	0.00	0.00	0.01	18.75
76	0.2	0.017	0.059	0.015	0.00	0.00	0.01	19
77	0.3	0.026	0.059	0.023	0.00	0.00	0.01	19.25
78	0.4	0.034	0.059	0.031	0.00	0.01	0.01	19.5
79	0.3	0.026	0.058	0.023	0.00	0.00	0.00	19.75
80	0.2	0.017	0.058	0.015	0.00	0.00	0.00	20
81	0.3	0.026	0.058	0.023	0.00	0.00	0.00	20.25
82	0.3	0.026	0.058	0.023	0.00	0.00	0.00	20.5
83	0.3	0.026	0.057	0.023	0.00	0.00	0.00	20.75
84	0.2	0.017	0.057	0.015	0.00	0.00	0.00	21
85	0.3	0.026	0.057	0.023	0.00	0.00	0.00	21.25
86	0.2	0.017	0.057	0.015	0.00	0.00	0.00	21.5
87	0.3	0.026	0.057	0.023	0.00	0.00	0.00	21.75
88	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22
89	0.3	0.026	0.056	0.023	0.00	0.00	0.00	22.25
90	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22.5
91	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22.75
92	0.2	0.017	0.056	0.015	0.00	0.00	0.00	23
93	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.25
94	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.5
95	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.75
96	0.2	0.017	0.055	0.015	0.00	0.00	0.00	24

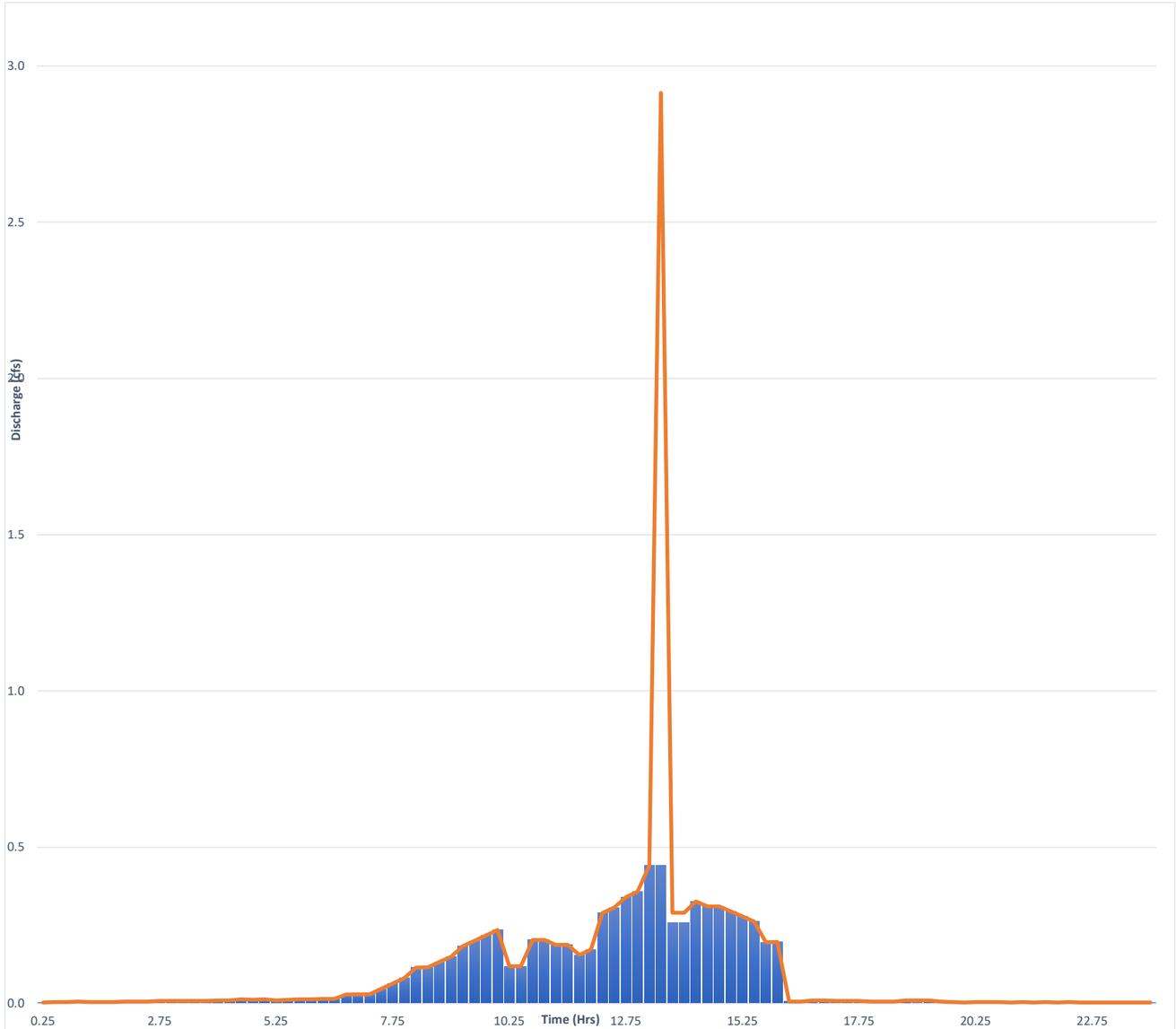
Note: The values on the highighted cells have been adjusted to smoothen the hydrograph.

Effective Rain=	1.06	inches
Flood Volume=	0.153	Acre-Feet
	6670	cf

PRE-DEVELOPED BASIN E-1.2 - SHORTCUT SYNTHETIC UNIT HYDROGRAPH 2-YR, 24 HR

Area (ac)	1.95	Impervious Percent	85%	F	0.06
Lag Time (mins)	4.5			C	0.0003
Unit Time (mins)	15	Storm Depth	2.14	Fm	0.04
Storm Frequency	2 yr	Rational Peak flow	2.91		
Storm Duration	24 hr	Unit Hydrograph Peak Flow	0.44		
Pervious Loss Rate	0.3	Adjustment factor	6.59		

Time Period	Pattern Percent	Storm Rain from plate E-5.9 (in/hr)	Loss Rate		Effective Rain	Flood Hydrograph	Adjusted Flood Hydrograph	Time (Hours)
			Max	Low				
1	0.2	0.02	0.079	0.015	0.00	0.00	0.00	0.25
2	0.3	0.03	0.078	0.023	0.00	0.01	0.01	0.5
3	0.3	0.03	0.078	0.023	0.00	0.01	0.01	0.75
4	0.4	0.03	0.077	0.031	0.00	0.01	0.01	1
5	0.3	0.03	0.077	0.023	0.00	0.01	0.01	1.25
6	0.3	0.03	0.077	0.023	0.00	0.01	0.01	1.5
7	0.3	0.03	0.077	0.023	0.00	0.01	0.01	1.75
8	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2
9	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2.25
10	0.4	0.03	0.076	0.031	0.00	0.01	0.01	2.5
11	0.5	0.04	0.075	0.039	0.00	0.01	0.01	2.75
12	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3
13	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3.25
14	0.5	0.04	0.075	0.039	0.00	0.01	0.01	3.5
15	0.5	0.04	0.074	0.039	0.00	0.01	0.01	3.75
16	0.6	0.05	0.074	0.046	0.01	0.01	0.01	4
17	0.6	0.05	0.074	0.046	0.01	0.01	0.01	4.25
18	0.8	0.07	0.073	0.062	0.01	0.01	0.01	4.5
19	0.7	0.06	0.073	0.054	0.01	0.01	0.01	4.75
20	0.8	0.068	0.073	0.062	0.01	0.01	0.01	5
21	0.6	0.05	0.073	0.046	0.01	0.01	0.01	5.25
22	0.7	0.06	0.072	0.054	0.01	0.01	0.01	5.5
23	0.8	0.07	0.072	0.062	0.01	0.01	0.01	5.75
24	0.8	0.07	0.072	0.062	0.01	0.01	0.01	6
25	0.9	0.08	0.072	0.069	0.01	0.02	0.02	6.25
26	0.9	0.08	0.071	0.069	0.01	0.02	0.02	6.5
27	1	0.09	0.071	-	0.01	0.03	0.03	6.75
28	1	0.09	0.071	-	0.01	0.03	0.03	7
29	1	0.09	0.070	-	0.02	0.03	0.03	7.25
30	1.1	0.09	0.070	-	0.02	0.05	0.05	7.5
31	1.2	0.10	0.070	-	0.03	0.06	0.06	7.75
32	1.3	0.11	0.070	-	0.04	0.08	0.08	8
33	1.5	0.13	0.069	-	0.06	0.11	0.11	8.25
34	1.5	0.13	0.069	-	0.06	0.12	0.12	8.5
35	1.6	0.14	0.069	-	0.07	0.13	0.13	8.75
36	1.7	0.15	0.069	-	0.08	0.15	0.15	9
37	1.9	0.16	0.068	-	0.09	0.18	0.18	9.25
38	2	0.17	0.068	-	0.10	0.20	0.20	9.5
39	2.1	0.18	0.068	-	0.11	0.22	0.22	9.75
40	2.2	0.19	0.068	-	0.12	0.24	0.24	10
41	1.5	0.13	0.067	-	0.06	0.12	0.12	10.25
42	1.5	0.13	0.067	-	0.06	0.12	0.12	10.5
43	2	0.17	0.067	-	0.10	0.20	0.20	10.75



44	2	0.17	0.067	-	0.10	0.20	0.20	11
45	1.9	0.16	0.066	-	0.10	0.19	0.19	11.25
46	1.9	0.16	0.066	-	0.10	0.19	0.19	11.5
47	1.7	0.15	0.066	-	0.08	0.16	0.16	11.75
48	1.8	0.15	0.066	-	0.09	0.17	0.17	12
49	2.5	0.21	0.065	-	0.15	0.29	0.29	12.25
50	2.6	0.22	0.065	-	0.16	0.31	0.31	12.5
51	2.8	0.24	0.065	-	0.17	0.34	0.34	12.75
52	2.9	0.25	0.065	-	0.18	0.36	0.36	13
53	3.4	0.29	0.064	-	0.23	0.44	0.44	13.25
54	3.4	0.29	0.064	-	0.23	0.44	2.91	13.5
55	2.3	0.20	0.064	-	0.13	0.26	0.29	13.75
56	2.3	0.20	0.064	-	0.13	0.26	0.29	14
57	2.7	0.23	0.063	-	0.17	0.33	0.33	14.25
58	2.6	0.22	0.063	-	0.16	0.31	0.31	14.5
59	2.6	0.22	0.063	-	0.16	0.31	0.31	14.75
60	2.5	0.21	0.063	-	0.15	0.29	0.29	15
61	2.4	0.21	0.062	-	0.14	0.28	0.28	15.25
62	2.3	0.20	0.062	-	0.13	0.26	0.26	15.5
63	1.9	0.16	0.062	-	0.10	0.20	0.20	15.75
64	1.9	0.16	0.062	-	0.10	0.20	0.20	16
65	0.4	0.034	0.061	0.031	0.00	0.01	0.01	16.25
66	0.4	0.034	0.061	0.031	0.00	0.01	0.01	16.5
67	0.3	0.026	0.061	0.023	0.00	0.01	0.01	16.75
68	0.3	0.026	0.061	0.023	0.00	0.01	0.01	17
69	0.5	0.043	0.061	0.039	0.00	0.01	0.01	17.25
70	0.5	0.043	0.060	0.039	0.00	0.01	0.01	17.5
71	0.5	0.043	0.060	0.039	0.00	0.01	0.01	17.75
72	0.4	0.034	0.060	0.031	0.00	0.01	0.01	18
73	0.4	0.034	0.060	0.031	0.00	0.01	0.01	18.25
74	0.4	0.034	0.059	0.031	0.00	0.01	0.01	18.5
75	0.3	0.026	0.059	0.023	0.00	0.01	0.01	18.75
76	0.2	0.017	0.059	0.015	0.00	0.00	0.01	19
77	0.3	0.026	0.059	0.023	0.00	0.01	0.01	19.25
78	0.4	0.034	0.059	0.031	0.00	0.01	0.01	19.5
79	0.3	0.026	0.058	0.023	0.00	0.01	0.01	19.75
80	0.2	0.017	0.058	0.015	0.00	0.00	0.00	20
81	0.3	0.026	0.058	0.023	0.00	0.01	0.01	20.25
82	0.3	0.026	0.058	0.023	0.00	0.01	0.01	20.5
83	0.3	0.026	0.057	0.023	0.00	0.01	0.01	20.75
84	0.2	0.017	0.057	0.015	0.00	0.00	0.00	21
85	0.3	0.026	0.057	0.023	0.00	0.01	0.01	21.25
86	0.2	0.017	0.057	0.015	0.00	0.00	0.00	21.5
87	0.3	0.026	0.057	0.023	0.00	0.01	0.01	21.75
88	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22
89	0.3	0.026	0.056	0.023	0.00	0.01	0.01	22.25
90	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22.5
91	0.2	0.017	0.056	0.015	0.00	0.00	0.00	22.75
92	0.2	0.017	0.056	0.015	0.00	0.00	0.00	23
93	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.25
94	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.5
95	0.2	0.017	0.055	0.015	0.00	0.00	0.00	23.75
96	0.2	0.017	0.055	0.015	0.00	0.00	0.00	24

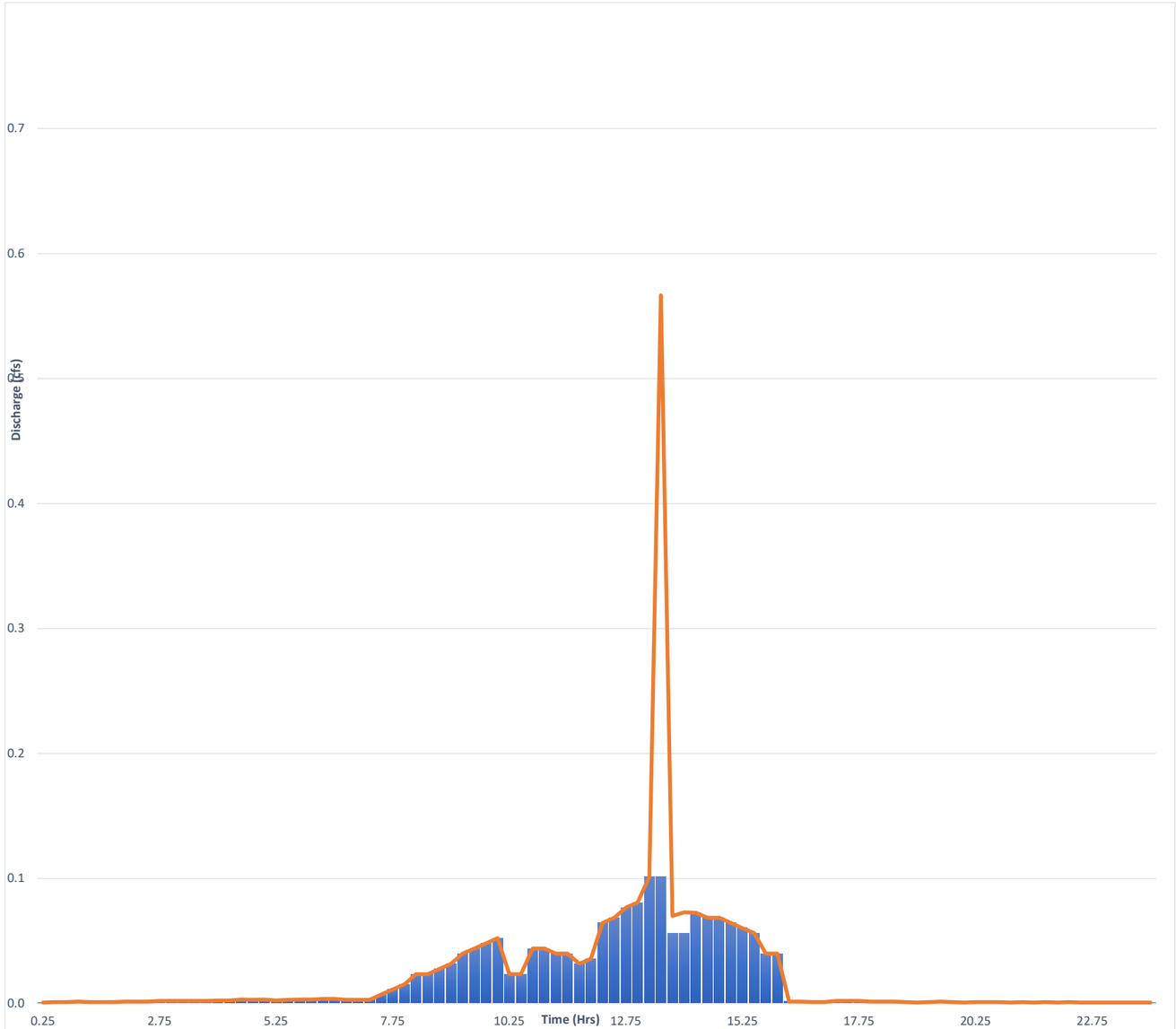
Note: The values on the highighted cells have been adjusted to smoothen the hydrograph.

Effective Rain=	1.06	inches
Flood Volume=	0.172	Acre-Feet
	7484	cf

POST-DEVELOPED BASIN P-1.2 - SHORTCUT SYNTHETIC UNIT HYDROGRAPH 2-YR, 24 HR

Area (ac)	0.48	Impervious Percent	58%	F	0.06
Lag Time (mins)	4.5			C	0.0003
Unit Time (mins)	15	Storm Depth	2.14	Fm	0.04
Storm Frequency	2 yr	Rational Peak flow	0.57		
Storm Duration	24 hr	Unit Hydrograph Peak Flow	0.10		
Pervious Loss Rate	0.3	Adjustment factor	5.592		

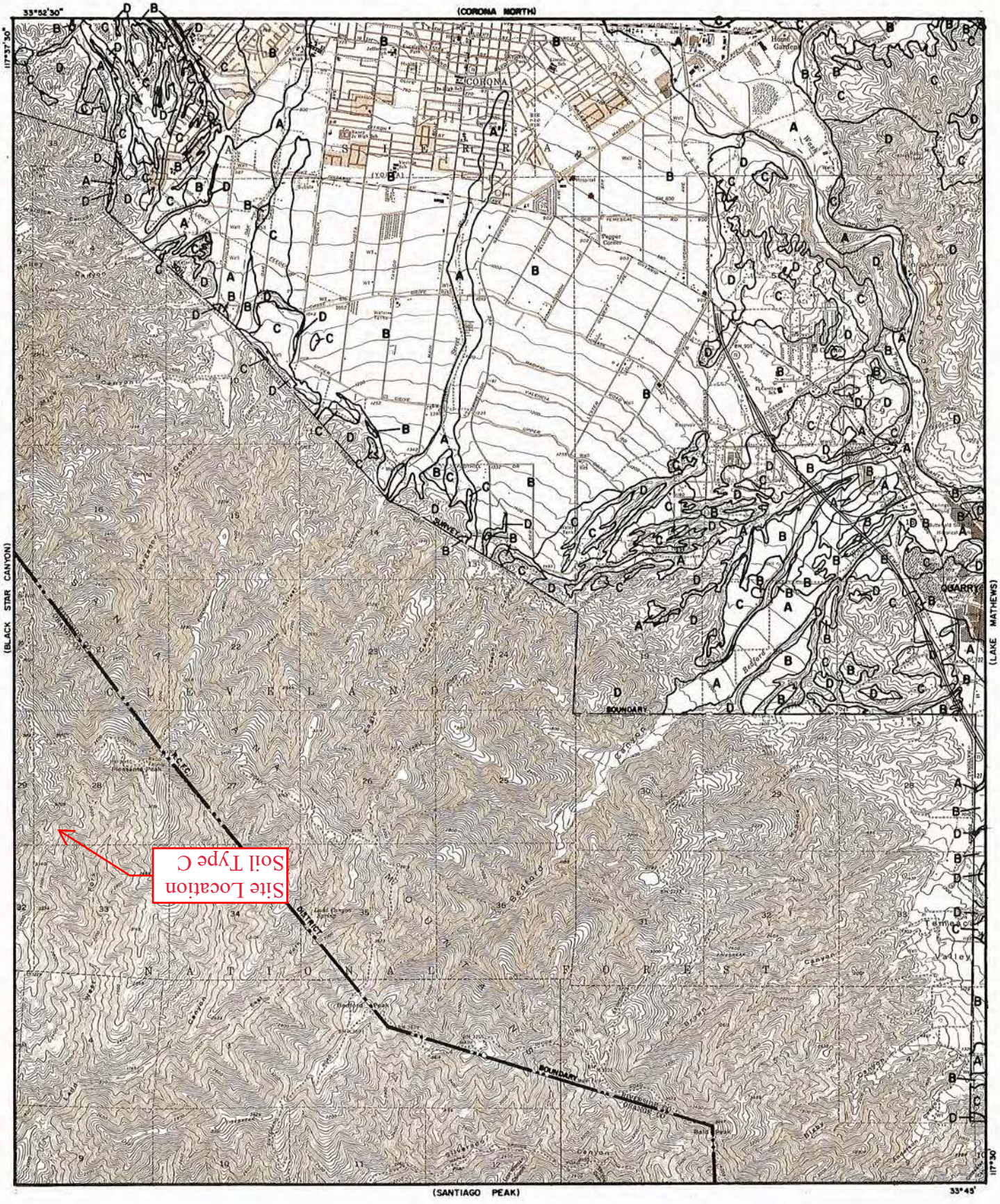
Time Period	Pattern Percent	Storm Rain from plate E-5.9 (in/hr)	Loss Rate		Effective Rain	Flood Hydrograph	Adjusted Flood Hydrograph	Time (Hours)
			Max	Low				
1	0.2	0.02	0.079	0.015	0.00	0.00	0.00	0.25
2	0.3	0.03	0.079	0.023	0.00	0.00	0.00	0.5
3	0.3	0.03	0.079	0.023	0.00	0.00	0.00	0.75
4	0.4	0.03	0.079	0.031	0.00	0.00	0.00	1
5	0.3	0.03	0.079	0.023	0.00	0.00	0.00	1.25
6	0.3	0.03	0.079	0.023	0.00	0.00	0.00	1.5
7	0.3	0.03	0.079	0.023	0.00	0.00	0.00	1.75
8	0.4	0.03	0.079	0.031	0.00	0.00	0.00	2
9	0.4	0.03	0.079	0.031	0.00	0.00	0.00	2.25
10	0.4	0.03	0.079	0.031	0.00	0.00	0.00	2.5
11	0.5	0.04	0.079	0.039	0.00	0.00	0.00	2.75
12	0.5	0.04	0.079	0.039	0.00	0.00	0.00	3
13	0.5	0.04	0.079	0.039	0.00	0.00	0.00	3.25
14	0.5	0.04	0.079	0.039	0.00	0.00	0.00	3.5
15	0.5	0.04	0.079	0.039	0.00	0.00	0.00	3.75
16	0.6	0.05	0.079	0.046	0.01	0.00	0.00	4
17	0.6	0.05	0.079	0.046	0.01	0.00	0.00	4.25
18	0.8	0.07	0.079	0.062	0.01	0.00	0.00	4.5
19	0.7	0.06	0.079	0.054	0.01	0.00	0.00	4.75
20	0.8	0.068	0.079	0.062	0.01	0.00	0.00	5
21	0.6	0.05	0.079	0.046	0.01	0.00	0.00	5.25
22	0.7	0.06	0.079	0.054	0.01	0.00	0.00	5.5
23	0.8	0.07	0.079	0.062	0.01	0.00	0.00	5.75
24	0.8	0.07	0.079	0.062	0.01	0.00	0.00	6
25	0.9	0.08	0.079	0.069	0.01	0.00	0.00	6.25
26	0.9	0.08	0.079	0.069	0.01	0.00	0.00	6.5
27	1	0.09	0.079	0.077	0.01	0.00	0.00	6.75
28	1	0.09	0.079	-	0.01	0.00	0.00	7
29	1	0.09	0.079	-	0.01	0.00	0.00	7.25
30	1.1	0.09	0.079	-	0.02	0.01	0.01	7.5
31	1.2	0.10	0.079	-	0.02	0.01	0.01	7.75
32	1.3	0.11	0.079	-	0.03	0.02	0.02	8
33	1.5	0.13	0.079	-	0.05	0.02	0.02	8.25
34	1.5	0.13	0.079	-	0.05	0.02	0.02	8.5
35	1.6	0.14	0.079	-	0.06	0.03	0.03	8.75
36	1.7	0.15	0.079	-	0.07	0.03	0.03	9
37	1.9	0.16	0.079	-	0.08	0.04	0.04	9.25
38	2	0.17	0.079	-	0.09	0.04	0.04	9.5
39	2.1	0.18	0.079	-	0.10	0.05	0.05	9.75
40	2.2	0.19	0.079	-	0.11	0.05	0.05	10
41	1.5	0.13	0.079	-	0.05	0.02	0.02	10.25
42	1.5	0.13	0.079	-	0.05	0.02	0.02	10.5
43	2	0.17	0.079	-	0.09	0.04	0.04	10.75



44	2	0.17	0.079	-	0.09	0.04	0.04	11
45	1.9	0.16	0.079	-	0.08	0.04	0.04	11.25
46	1.9	0.16	0.079	-	0.08	0.04	0.04	11.5
47	1.7	0.15	0.079	-	0.07	0.03	0.03	11.75
48	1.8	0.15	0.079	-	0.07	0.04	0.04	12
49	2.5	0.21	0.079	-	0.13	0.06	0.06	12.25
50	2.6	0.22	0.079	-	0.14	0.07	0.07	12.5
51	2.8	0.24	0.079	-	0.16	0.08	0.08	12.75
52	2.9	0.25	0.079	-	0.17	0.08	0.08	13
53	3.4	0.29	0.079	-	0.21	0.10	0.10	13.25
54	3.4	0.29	0.079	-	0.21	0.10	0.57	13.5
55	2.3	0.20	0.079	-	0.12	0.06	0.07	13.75
56	2.3	0.20	0.079	-	0.12	0.06	0.07	14
57	2.7	0.23	0.079	-	0.15	0.07	0.07	14.25
58	2.6	0.22	0.079	-	0.14	0.07	0.07	14.5
59	2.6	0.22	0.079	-	0.14	0.07	0.07	14.75
60	2.5	0.21	0.079	-	0.13	0.06	0.06	15
61	2.4	0.21	0.079	-	0.13	0.06	0.06	15.25
62	2.3	0.20	0.079	-	0.12	0.06	0.06	15.5
63	1.9	0.16	0.079	-	0.08	0.04	0.04	15.75
64	1.9	0.16	0.079	-	0.08	0.04	0.04	16
65	0.4	0.034	0.079	0.031	0.00	0.00	0.00	16.25
66	0.4	0.034	0.079	0.031	0.00	0.00	0.00	16.5
67	0.3	0.026	0.079	0.023	0.00	0.00	0.00	16.75
68	0.3	0.026	0.079	0.023	0.00	0.00	0.00	17
69	0.5	0.043	0.079	0.039	0.00	0.00	0.00	17.25
70	0.5	0.043	0.079	0.039	0.00	0.00	0.00	17.5
71	0.5	0.043	0.079	0.039	0.00	0.00	0.00	17.75
72	0.4	0.034	0.079	0.031	0.00	0.00	0.00	18
73	0.4	0.034	0.079	0.031	0.00	0.00	0.00	18.25
74	0.4	0.034	0.079	0.031	0.00	0.00	0.00	18.5
75	0.3	0.026	0.079	0.023	0.00	0.00	0.00	18.75
76	0.2	0.017	0.079	0.015	0.00	0.00	0.00	19
77	0.3	0.026	0.079	0.023	0.00	0.00	0.00	19.25
78	0.4	0.034	0.079	0.031	0.00	0.00	0.00	19.5
79	0.3	0.026	0.079	0.023	0.00	0.00	0.00	19.75
80	0.2	0.017	0.079	0.015	0.00	0.00	0.00	20
81	0.3	0.026	0.079	0.023	0.00	0.00	0.00	20.25
82	0.3	0.026	0.079	0.023	0.00	0.00	0.00	20.5
83	0.3	0.026	0.079	0.023	0.00	0.00	0.00	20.75
84	0.2	0.017	0.079	0.015	0.00	0.00	0.00	21
85	0.3	0.026	0.079	0.023	0.00	0.00	0.00	21.25
86	0.2	0.017	0.079	0.015	0.00	0.00	0.00	21.5
87	0.3	0.026	0.079	0.023	0.00	0.00	0.00	21.75
88	0.2	0.017	0.079	0.015	0.00	0.00	0.00	22
89	0.3	0.026	0.079	0.023	0.00	0.00	0.00	22.25
90	0.2	0.017	0.079	0.015	0.00	0.00	0.00	22.5
91	0.2	0.017	0.079	0.015	0.00	0.00	0.00	22.75
92	0.2	0.017	0.079	0.015	0.00	0.00	0.00	23
93	0.2	0.017	0.079	0.015	0.00	0.00	0.00	23.25
94	0.2	0.017	0.079	0.015	0.00	0.00	0.00	23.5
95	0.2	0.017	0.079	0.015	0.00	0.00	0.00	23.75
96	0.2	0.017	0.079	0.015	0.00	0.00	0.00	24

Note: The values on the highighted cells have been adjusted to smoothen the hydrograph.

Effective Rain=	0.94	inches
Flood Volume=	0.037	Acre-Feet
	1624	cf



LEGEND

— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

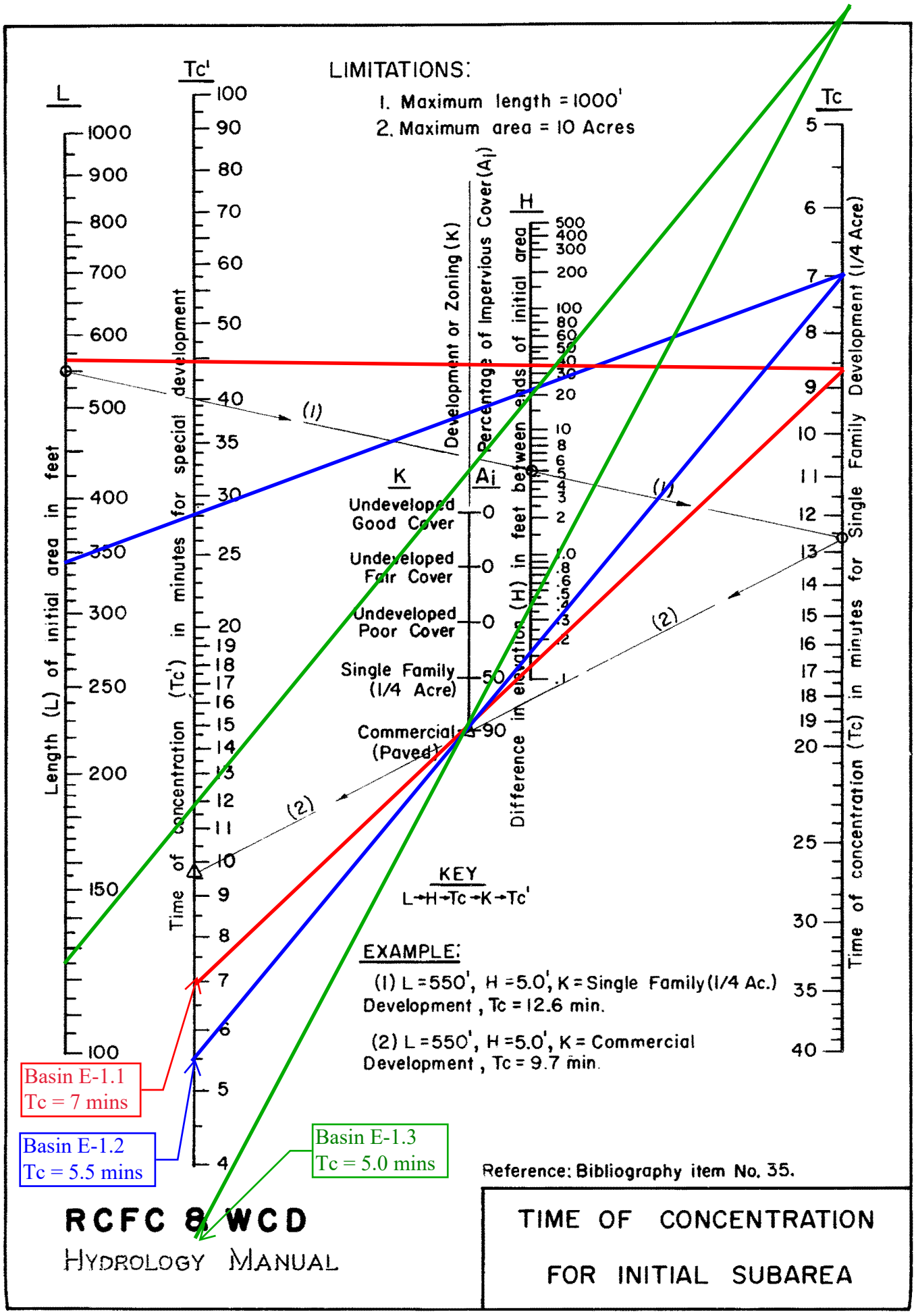
RCFC&WCD

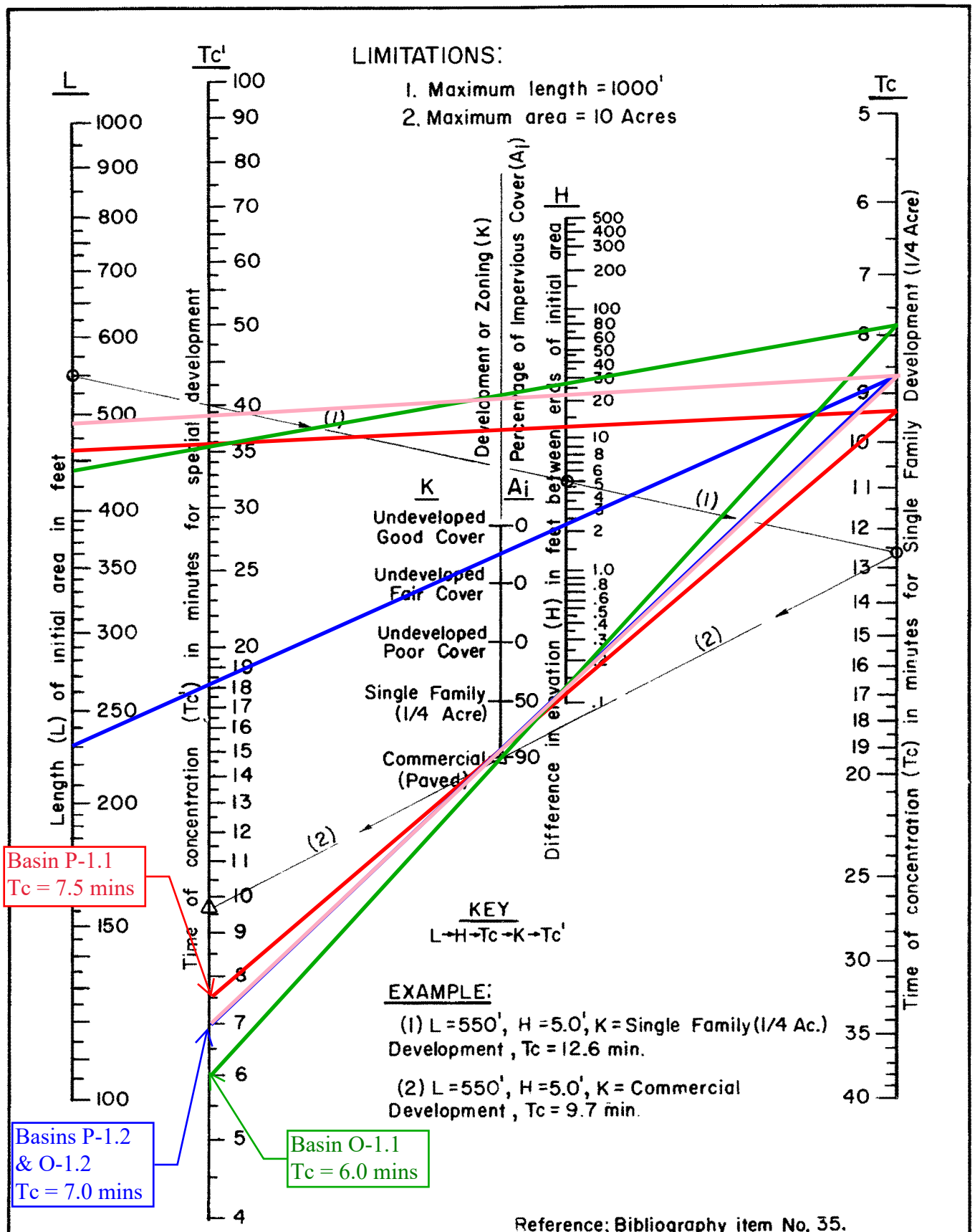
HYDROLOGY MANUAL

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR CORONA-SOUTH

PLATE C-1.27


LIMITATIONS:
1. Maximum length = 1000'
2. Maximum area = 10 Acres
L
Length (L) of initial area in feet
Tc'
Time of concentration (Tc') in minutes for special development
K
Development or Zoning (K)
Undeveloped Good Cover
Undeveloped Fair Cover
Undeveloped Poor Cover
Single Family (1/4 Acre)
Commercial (Paved)
Ai
Percentage of Impervious Cover (Ai)
H
Difference in elevation (H) in feet between ends of initial area
Tc
Time of concentration (Tc) in minutes for Single Family Development (1/4 Acre)
(1)
(2)
KEY
L→H→Tc→K→Tc'
EXAMPLE:
(1) L = 550', H = 5.0', K = Single Family (1/4 Ac.) Development, Tc = 12.6 min.
(2) L = 550', H = 5.0', K = Commercial Development, Tc = 9.7 min.
Basin E-1.1
Tc = 7 mins
Basin E-1.2
Tc = 5.5 mins
Basin E-1.3
Tc = 5.0 mins
Reference: Bibliography item No. 35.
RCFC & WCD
HYDROLOGY MANUAL
TIME OF CONCENTRATION
FOR INITIAL SUBAREA
Existing Conditions
PLATE D-3



Reference: Bibliography item No. 35.

RCFC & WCD

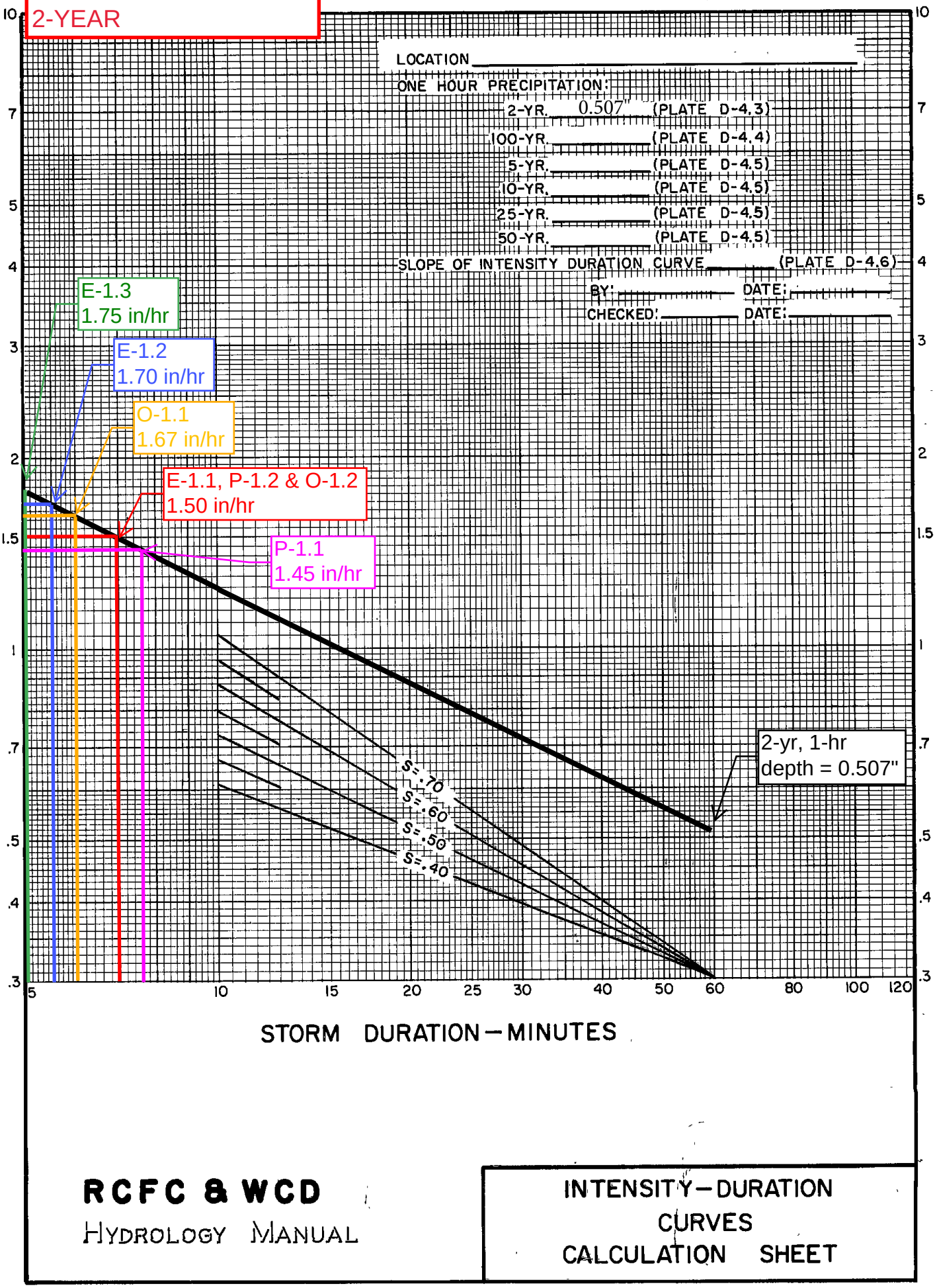
HYDROLOGY MANUAL

TIME OF CONCENTRATION FOR INITIAL SUBAREA

Proposed Conditions

PLATE D-3

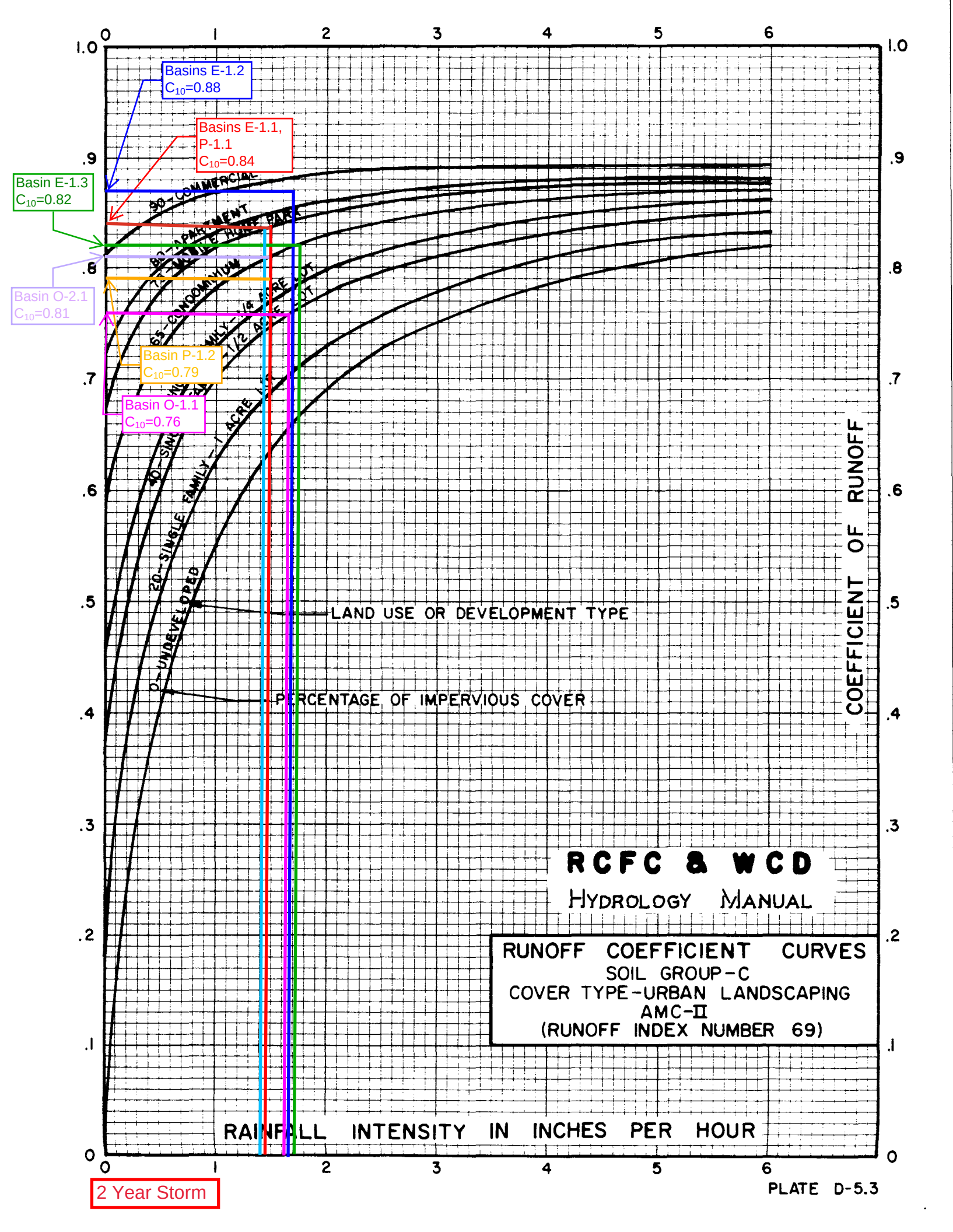
EXISTING CONDITIONS
2-YEAR



RCFC & WCD
HYDROLOGY MANUAL

INTENSITY — DURATION
CURVES
CALCULATION SHEET

PLATE D-4.7


Basins E-1.2
C_{10}=0.88
Basins E-1.1,
P-1.1
C_{10}=0.84
Basin E-1.3
C_{10}=0.82
Basin O-2.1
C_{10}=0.81
Basin P-1.2
C_{10}=0.79
Basin O-1.1
C_{10}=0.76
90-COMMERCIAL
65-CONDOMINIUM
20-SINGLE FAMILY-1 ACRE LOT
D-UNDEVELOPED
LAND USE OR DEVELOPMENT TYPE
PERCENTAGE OF IMPERVIOUS COVER
COEFFICIENT OF RUNOFF
RAINFALL INTENSITY IN INCHES PER HOUR
RCFC & WCD
HYDROLOGY MANUAL
RUNOFF COEFFICIENT CURVES
SOIL GROUP-C
COVER TYPE-URBAN LANDSCAPING
AMC-II
(RUNOFF INDEX NUMBER 69)
2 Year Storm
PLATE D-5.3

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	**… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE**		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
☑ **A.** On-site storm drain inlets	☑ Locations of inlets.	☑ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	☑ Maintain and periodically repaint or replace inlet markings. ☑ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ☑ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ☑ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
☐ **B.** Interior floor drains and elevator shaft sump pumps		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ **C.** Interior parking garages		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☑ **D1.** Need for future indoor & structural pest control		❑ Note building design features that discourage entry of pests.	❑ Provide Integrated Pest Management information to owners, lessees, and operators.
☑ **D2.** Landscape/ Outdoor Pesticide Use	❑ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ☑ Show self-retaining landscape areas, if any. ❑ Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)	State that final landscape plans will accomplish all of the following. ❑ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ☑ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ❑ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. ☑ Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	☑ Maintain landscaping using minimum or no pesticides. ☑ See applicable operational BMPs in **"What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☑ Provide IPM information to new owners, lessees and operators.

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **E.** Pools, spas, ponds, decorative fountains, and other water features.	❑ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)	If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	❑ See applicable operational BMPs in "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
❑ **F.** Food service	❑ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ❑ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	❑ Describe the location and features of the designated cleaning area. ❑ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	❑ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ Provide this brochure to new site owners, lessees, and operators.
☑ **G.** Refuse areas	☑ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☑ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ☑ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	❑ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☑ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☑ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
❑ **H.** Industrial processes.	❑ Show process area.	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
❑ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ❑ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ❑ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank www.cchealth.org/groups/hazmat/	❑ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
❑ **J.** Vehicle and Equipment Cleaning	❑ Show on drawings as appropriate: **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑**Car dealerships and similar may rinse cars with water only.**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **K.** Vehicle/Equipment Repair and Maintenance	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ❑ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ❑ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	❑ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ❑ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ❑ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the Stormwater Control Plan, note that all of the following restrictions apply to use the site: ❑ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ❑ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ❑ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **L.** Fuel Dispensing Areas	❑ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ❑ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		❑ The property owner shall dry sweep the fueling area routinely. ❑ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[6] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ **M.** Loading Docks	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ❑ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ❑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		❑ Move loaded and unloaded items indoors as soon as possible. ❑ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☑ **N.** Fire Sprinkler Test Water		☑ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☑ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ☑ Boiler drain lines ☑ Condensate drain lines ❑ Rooftop equipment ❑ Drainage sumps ☑ Roofing, gutters, and trim. ❑ Other sources		☑ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☑ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ❑ Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ❑ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☑ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. Include controls for other sources as specified by local reviewer.	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	2 **Permanent Controls—Show on WQMP Drawings**	3 **Permanent Controls—List in WQMP Table and Narrative**	4 **Operational BMPs—Include in WQMP Table and Narrative**
☑ **P.** Plazas, sidewalks, and parking lots.			☑ Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Appendix 9: O&M

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

WILL BE PROVIDED IN MINISTERIAL REVIEW

Appendix 10: Educational Materials

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

CONTECH®
ENGINEERED SOLUTIONS

Modular Wetlands® Linear Stormwater Biofiltration



The experts you need to solve your stormwater challenges



Contech is the leader in stormwater solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

Your Contech Team



STORMWATER CONSULTANT

It's my job to recommend the best solution to meet permitting requirements.



STORMWATER DESIGN ENGINEER

I work with consultants to design the best approved solution to meet your project's needs.



REGULATORY MANAGER

I understand the local stormwater regulations and what solutions will be approved.



SALES ENGINEER

I make sure our solutions meet the needs of the contractor during construction.

Contech is your partner in stormwater management solutions



Restoring Nature's Presence in Urban Areas – Modular Wetlands® Linear

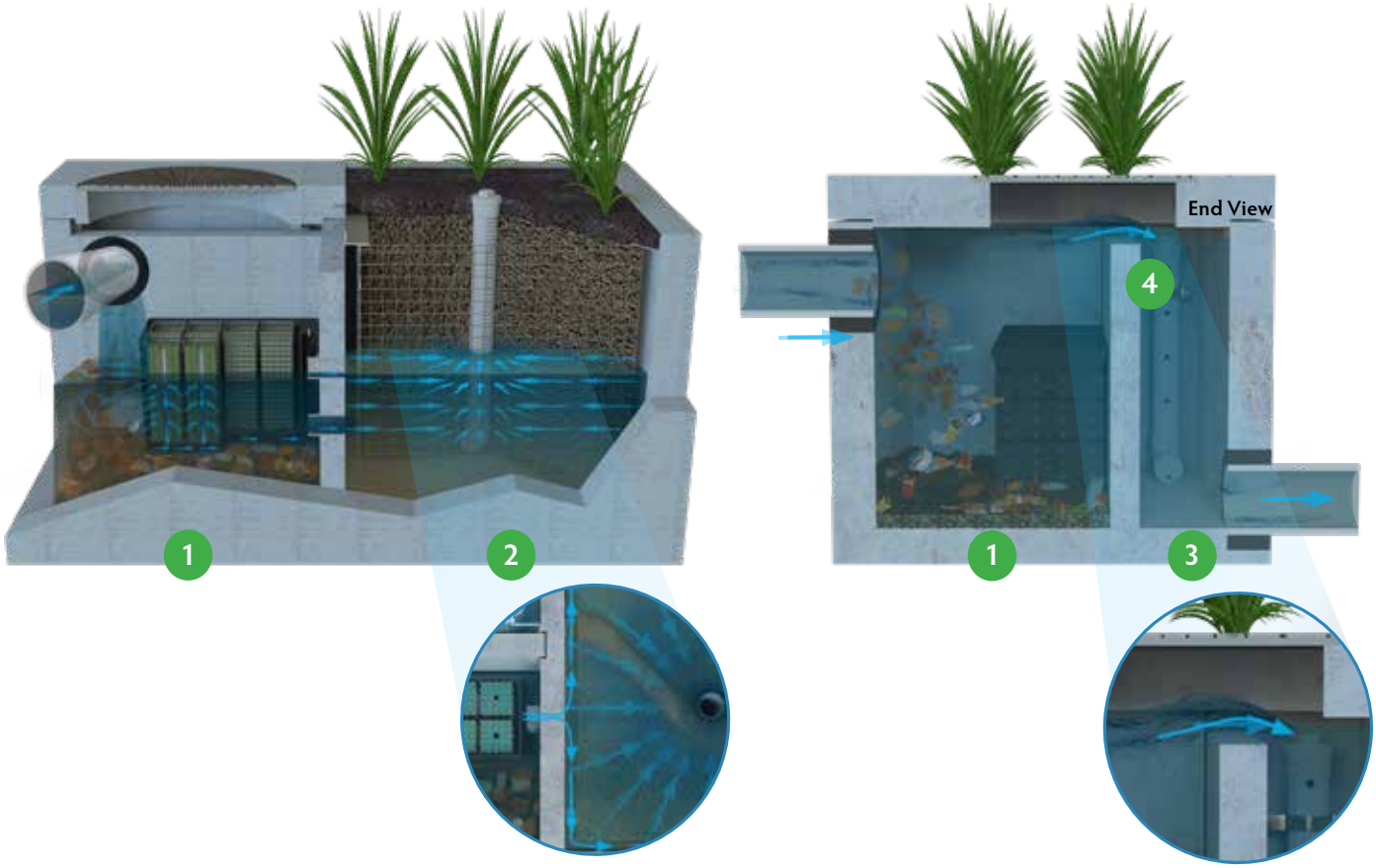
As cities grow, there is less space for natural solutions to treat stormwater. Contech understands this and is committed to providing compact, Low Impact Development (LID) solutions like the Modular Wetlands Linear to protect our nation's waterways.

The Modular Wetlands® Linear is the only biofiltration system to utilize patented horizontal flow, allowing for a small footprint, high treatment capacity, and design versatility. It is also the only biofiltration system that can be routinely installed downstream of storage for additional volume control and treatment.

With numerous regulatory approvals, the system's aesthetic appeal and superior pollutant removal make it the ideal solution for a wide range of stormwater applications, including urban development projects, commercial parking lots, residential streets, mixed-use developments, streetscapes, and more.

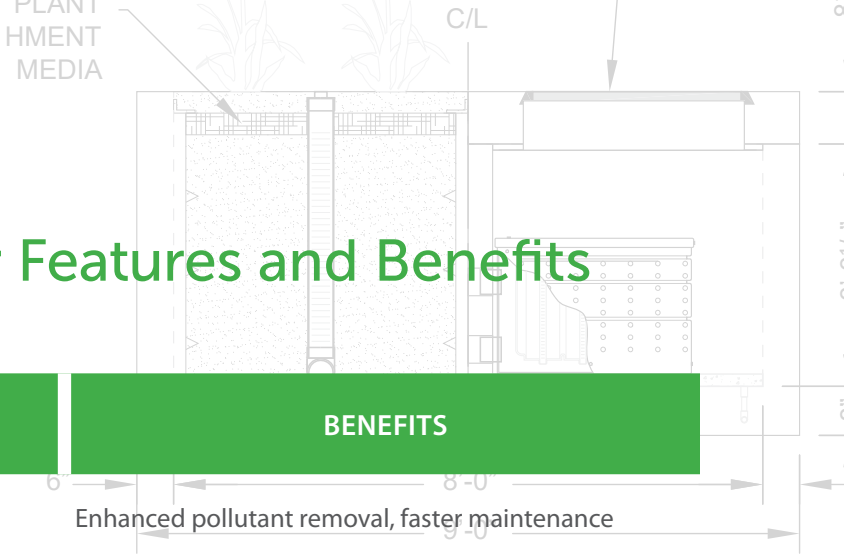
MODULAR WETLANDS®

How the Modular Wetlands® Linear Works



1. **PRETREATMENT** | Stormwater enters the pretreatment chamber where total suspended solids settle, and trash and debris are contained within the chamber. Stormwater then travels through the pretreatment filter boxes that provide additional treatment.
2. **BIOFILTRATION** | As water enters the biofiltration chamber, it fills the void space in the chamber's perimeter. Horizontal forces push the water inward through the biofiltration media, where nutrients and metals are captured. The water then enters the drain pipe to be discharged.
3. **DISCHARGE** | The specially designed vertical drain pipe and orifice control plate control the flow of water through the media to a level lower than the media's capacity, ensuring media effectiveness. The water then enters the horizontal drain pipe to be discharged.
4. **BYPASS** | During peak flows, an internal weir in the side-by-side configuration allows high flows to bypass treatment, eliminating flooding and the need for a separate bypass structure. Bypass is not provided in the end-to end configuration.

Using horizontal flow to improve performance



Modular Wetlands® Linear Features and Benefits

FEATURE	BENEFITS
Pretreatment chamber	Enhanced pollutant removal, faster maintenance
Horizontal flow biofiltration	Greater filter surface area
Performance verified by both the WA DOE and NJ DEP	Superior pollutant capture with confidence
Built-in high flow bypass	Eliminates flooding and the need for a separate bypass structure
Available in multiple configurations and sizes	Flexibility to meet site-specific needs

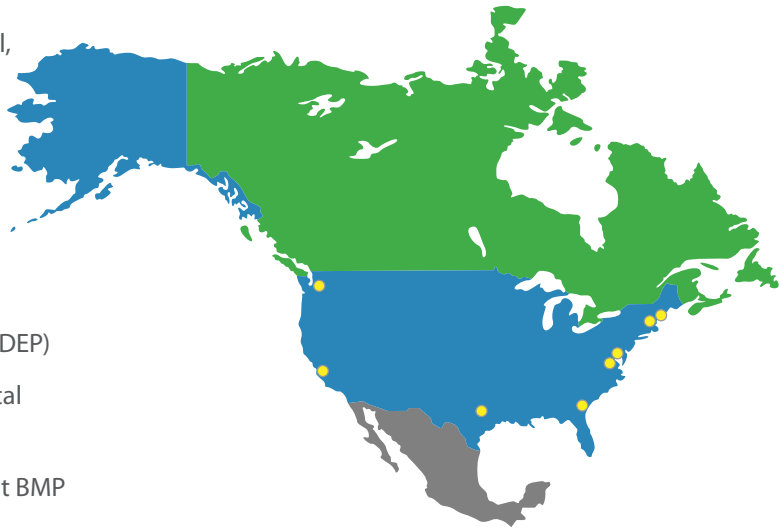


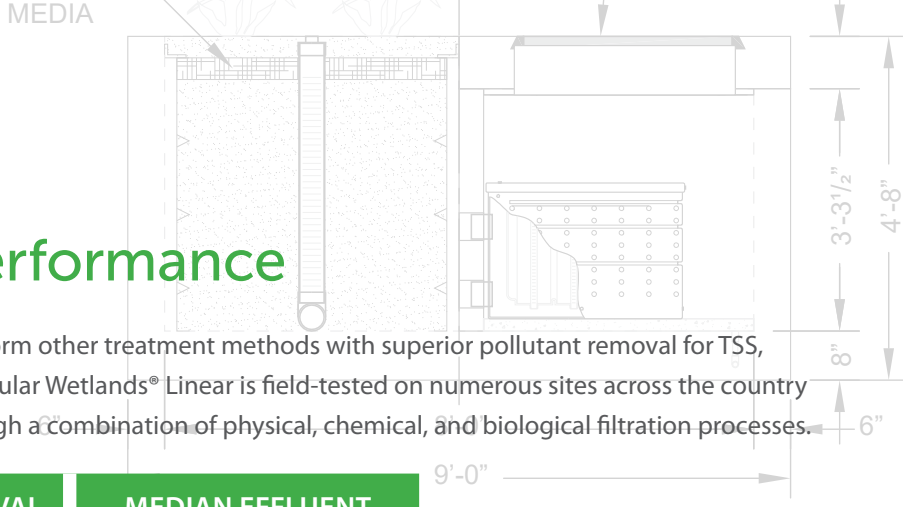
The Modular Wetlands system offers many different configurations.

Select Modular Wetlands® Linear Approvals

Modular Wetlands Linear is approved through numerous local, state and federal programs, including but not limited to:

- Washington State Department of Ecology TAPE
- California Water Resources Control Board, Full Capture Certification
- Virginia Department of Environmental Quality (VA DEQ)
- New Jersey Department of Environmental Protection (NJDEP)
- Maryland Department of the Environment - Environmental Site Design (ESD)
- Rhode Island Department of Environmental Management BMP
- Texas Commission on Environmental Quality (TCEQ)
- Atlanta Regional Commission Certification





Modular Wetlands® Performance

The Modular Wetlands® Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, and hydrocarbons. The Modular Wetlands® Linear is field-tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes.

POLLUTANT OF CONCERN	MEDIAN REMOVAL EFFICIENCY	MEDIAN EFFLUENT CONCENTRATION (MG/L)
Total Suspended Solids (TSS)	89%	12
Total Phosphorus - TAPE (TP)	61%	0.041
Nitrogen (TN)	23%	1
Total Copper (TCu)	50%	0.006
Total Dissolved Copper	37%	0.006
Total Zinc (TZn)	66%	0.019
Dissolved Zinc	60%	0.0148
Motor Oil	79%	0.8

Sources:
TAPE Field Study - 2012
TAPE Field Study - 2013

Note: Some jurisdictions recognize higher removal rates. Contact your Contech Stormwater Consultant for performance expectations.

Modular Wetlands® Linear Maintenance

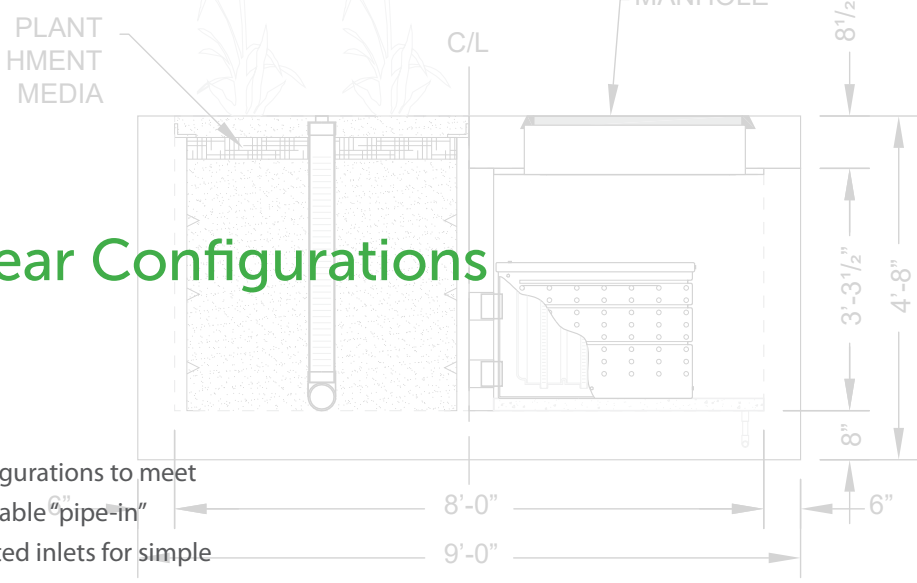
The Modular Wetlands® Linear is a self-contained treatment train. Maintenance requirements for the unit consist of five simple steps that can be completed using a vacuum truck. The system can also be cleaned by hand.

- Remove trash from the screening device
- Remove sediment from the separation chamber
- Periodically replace the pretreatment cartridge filter media
- Replace the drain down filter media
- Trim vegetation



Most Modular Wetland Linear systems can be cleaned in about thirty minutes.

Multiple configurations allow for easy site integration



Modular Wetlands® Linear Configurations

Multiple system configurations integrate with site hydraulic design and layout ...

The Modular Wetlands Linear is offered in multiple configurations to meet site specific needs. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.



Curb Inlet

The Curb Inlet configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions.



Vault

The Vault configuration can be used in end-of-the-line installations. Another benefit of the "pipe-in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements, or for traffic-rated designs (no plants).



Downspout

The Downspout configuration is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

A partner you can rely on



STORMWATER SOLUTIONS

PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

TAKE THE NEXT STEP

For more information: www.ContechES.com

NOTHING IN THIS CATALOG SHOULD BE CONSTRUED AS A WARRANTY. APPLICATIONS SUGGESTED HEREIN ARE DESCRIBED ONLY TO HELP READERS MAKE THEIR OWN EVALUATIONS AND DECISIONS, AND ARE NEITHER GUARANTEES NOR WARRANTIES OF SUITABILITY FOR ANY APPLICATION. CONTECH MAKES NO WARRANTY WHATSOEVER, EXPRESS OR IMPLIED, RELATED TO THE APPLICATIONS, MATERIALS, COATINGS, OR PRODUCTS DISCUSSED HEREIN. ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND ALL IMPLIED WARRANTIES OF FITNESS FOR ANY PARTICULAR PURPOSE ARE DISCLAIMED BY CONTECH. SEE CONTECH'S CONDITIONS OF SALE (AVAILABLE AT WWW.CONTECHES.COM/COS) FOR MORE INFORMATION.

CONTECH® ENGINEERED SOLUTIONS

Get social with us:

800-338-1122 | www.ContechES.com

© 2022 Contech Engineered Solutions LLC, a QUIKRETE Company

All Rights Reserved. Printed in the USA.

3.5 Bioretention Facility

Type of BMP	LID – Bioretention
Treatment Mechanisms	Infiltration, Evapotranspiration, Evaporation, Biofiltration
Maximum Drainage Area	This BMP is intended to be integrated into a project's landscaped area in a distributed manner. Typically, contributing drainage areas to Bioretention Facilities range from less than 1 acre to a maximum of around 10 acres.
Other Names	Rain Garden, Bioretention Cell, Bioretention Basin, Biofiltration Basin, Landscaped Filter Basin, Porous Landscape Detention

Description

Bioretention Facilities are shallow, vegetated basins underlain by an engineered soil media. Healthy plant and biological activity in the root zone maintain and renew the macro-pore space in the soil and maximize plant uptake of pollutants and runoff. This keeps the Best Management Practice (BMP) from becoming clogged and allows more of the soil column to function as both a sponge (retaining water) and a highly effective and self-maintaining biofilter. In most cases, the bottom of a Bioretention Facility is unlined, which also provides an opportunity for infiltration to the extent the underlying onsite soil can accommodate. When the infiltration rate of the underlying soil is exceeded, fully biotreated flows are discharged via underdrains. Bioretention Facilities therefore will inherently achieve the maximum feasible level of infiltration and evapotranspiration and achieve the minimum feasible (but highly biotreated) discharge to the storm drain system.

Siting Considerations

These facilities work best when they are designed in a relatively level area. Unlike other BMPs, Bioretention Facilities can be used in smaller landscaped spaces on the site, such as:

- ✓ Parking islands
- ✓ Medians
- ✓ Site entrances

Landscaped areas on the site (such as may otherwise be required through minimum landscaping ordinances), can often be designed as Bioretention Facilities. This can be accomplished by:

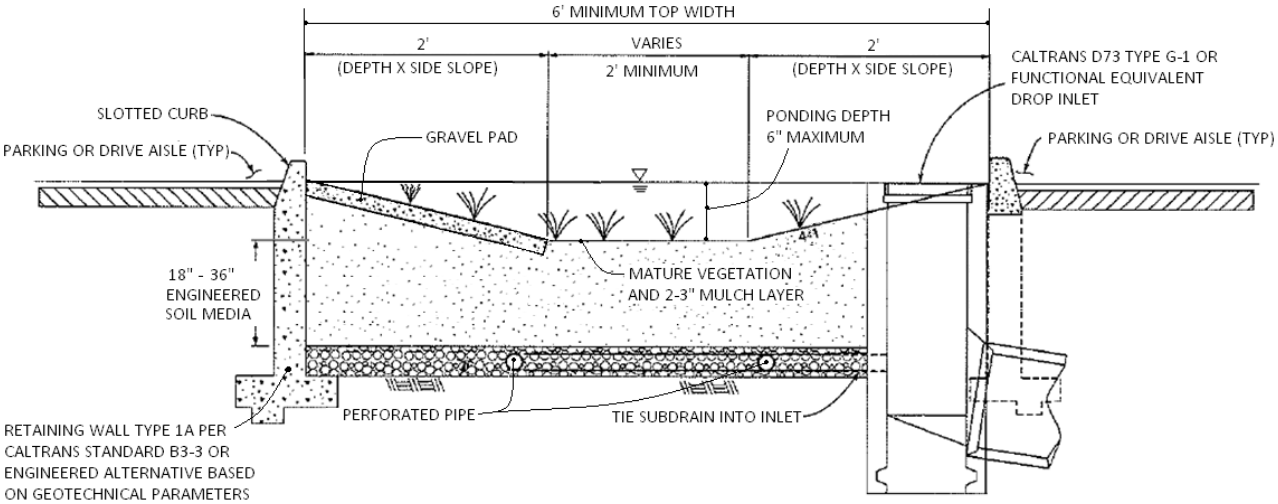
- *Depressing* landscaped areas below adjacent impervious surfaces, rather than elevating those areas
- Grading the site to direct runoff from those impervious surfaces *into* the Bioretention Facility, rather than away from the landscaping
- Sizing and designing the depressed landscaped area as a Bioretention Facility as described in this Fact Sheet

Bioretention Facilities should however not be used downstream of areas where large amounts of sediment can clog the system. Placing a Bioretention Facility at the toe of a steep slope should also be avoided due to the potential for clogging the engineered soil media with erosion from the slope, as well as the potential for damaging the vegetation.

Design and Sizing Criteria

The recommended cross section necessary for a Bioretention Facility includes:

- Vegetated area
- 18' minimum depth of engineered soil media
- 12' minimum gravel layer depth with 6' perforated pipes (added flow control features such as orifice plates may be required to mitigate for HCOC conditions)



While the 18-inch minimum engineered soil media depth can be used in some cases, it is recommended to use 24 inches or a preferred 36 inches to provide an adequate root zone for the chosen plant palate. Such a design also provides for improved removal effectiveness for nutrients. The recommended ponding depth inside of a Bioretention Facility is 6 inches; measured from the flat bottom surface to the top of the water surface as shown in Figure 1.

Because this BMP is filled with an engineered soil media, pore space in the soil and gravel layer is assumed to provide storage volume. However, several considerations must be noted:

- Surcharge storage above the soil surface (6 inches) is important to assure that design flows do not bypass the BMP when runoff exceeds the soil's absorption rate.
- In cases where the Bioretention Facility contains engineered soil media deeper than 36 inches, the pore space within the engineered soil media can only be counted to the 36-inch depth.
- A maximum of 30 percent pore space can be used for the soil media whereas a maximum of 40 percent pore space can be use for the gravel layer.

Figure 1: Standard Layout for a Bioretention Facility

Engineered Soil Media Requirements

The engineered soil media shall be comprised of 85 percent mineral component and 15 percent organic component, by volume, drum mixed prior to placement. The mineral component shall be a Class A sandy loam topsoil that meets the range specified in Table 1 below. The organic component shall be nitrogen stabilized compost[1], such that nitrogen does not leach from the media.

Table 1: Mineral Component Range Requirements

Percent Range	Component
70-80	Sand
15-20	Silt
5-10	Clay

The trip ticket, or certificate of compliance, shall be made available to the inspector to prove the engineered mix meets this specification.

Vegetation Requirements

Vegetative cover is important to minimize erosion and ensure that treatment occurs in the Bioretention Facility. The area should be designed for at least 70 percent mature coverage throughout the Bioretention Facility. To prevent the BMP from being used as walkways, Bioretention Facilities shall be planted with a combination of small trees, densely planted shrubs, and natural grasses. Grasses shall be native or ornamental; preferably ones that do not need to be mowed. The application of fertilizers and pesticides should be minimal. To maintain oxygen levels for the vegetation and promote biodegradation, it is important that vegetation not be completely submerged for any extended period of time. Therefore, a maximum of 6 inches of ponded water shall be used in the design to ensure that plants within the Bioretention Facility remain healthy.

A 2 to 3-inch layer of standard shredded aged hardwood mulch shall be placed as the top layer inside the Bioretention Facility. The 6-inch ponding depth shown in Figure 1 above shall be measured from the top surface of the 2 to 3-inch mulch layer.

Curb Cuts

To allow water to flow into the Bioretention Facility, 1-foot-wide (minimum) curb cuts should be placed approximately every 10 feet around the perimeter of the Bioretention Facility. Figure 2 shows a curb cut in a Bioretention Facility. Curb cut flow lines must be at or above the V_{BMP} water surface level.

[1] For more information on compost, visit the US Composting Council website at: http://compostingcouncil.org/



Figure 2: Curb Cut located in a Bioretention Facility

To reduce erosion, a gravel pad shall be placed at each inlet point to the Bioretention Facility. The gravel should be 1- to 1.5-inch diameter in size. The gravel should overlap the curb cut opening a minimum of 6 inches. The gravel pad inside the Bioretention Facility should be flush with the finished surface at the curb cut and extend to the bottom of the slope.

In addition, place an apron of stone or concrete, a foot square or larger, inside each inlet to prevent vegetation from growing up and blocking the inlet. See Figure 3.

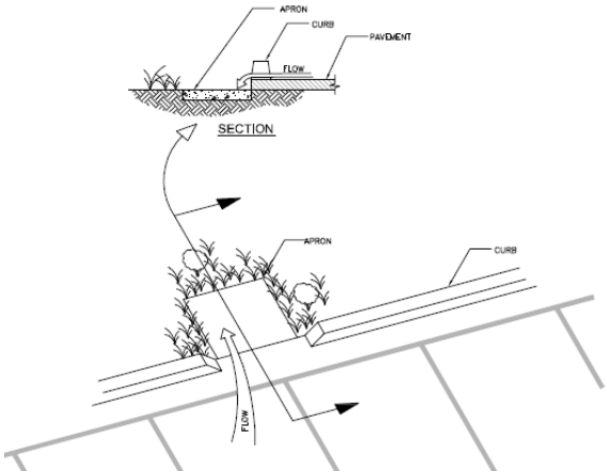


Figure 3: Apron located in a Bioretention Facility

Terracing the Landscaped Filter Basin

It is recommended that Bioretention Facilities be level. In the event the facility site slopes and lacks proper design, water would fill the lowest point of the BMP and then discharge from the basin without being treated. To ensure that the water will be held within the Bioretention Facility on sloped sites, the BMP must be terraced with nonporous check dams to provide the required storage and treatment capacity.

The terraced version of this BMP shall be used on non-flat sites with no more than a 3 percent slope. The surcharge depth cannot exceed 0.5 feet, and side slopes shall not exceed 4:1. Table 2 below shows the spacing of the check dams, and slopes shall be rounded up (i.e., 2.5 percent slope shall use 10' spacing for check dams).

Table 2: Check Dam Spacing

6" Check Dam Spacing	
Slope	**Spacing**
1%	*25'*
2%	*15'*
3%	*10'*

Roof Runoff

Roof downspouts may be directed towards Bioretention Facilities. However, the downspouts must discharge onto a concrete splash block to protect the Bioretention Facility from erosion.

Retaining Walls

It is recommended that Retaining Wall Type 1A, per Caltrans Standard B3-3 or equivalent, be constructed around the entire perimeter of the Bioretention Facility. This practice will protect the sides of the Bioretention Facility from collapsing during construction and maintenance or from high service loads adjacent to the BMP. Where such service loads would not exist adjacent to the BMP, an engineered alternative may be used if signed by a licensed civil engineer.

Side Slope Requirements

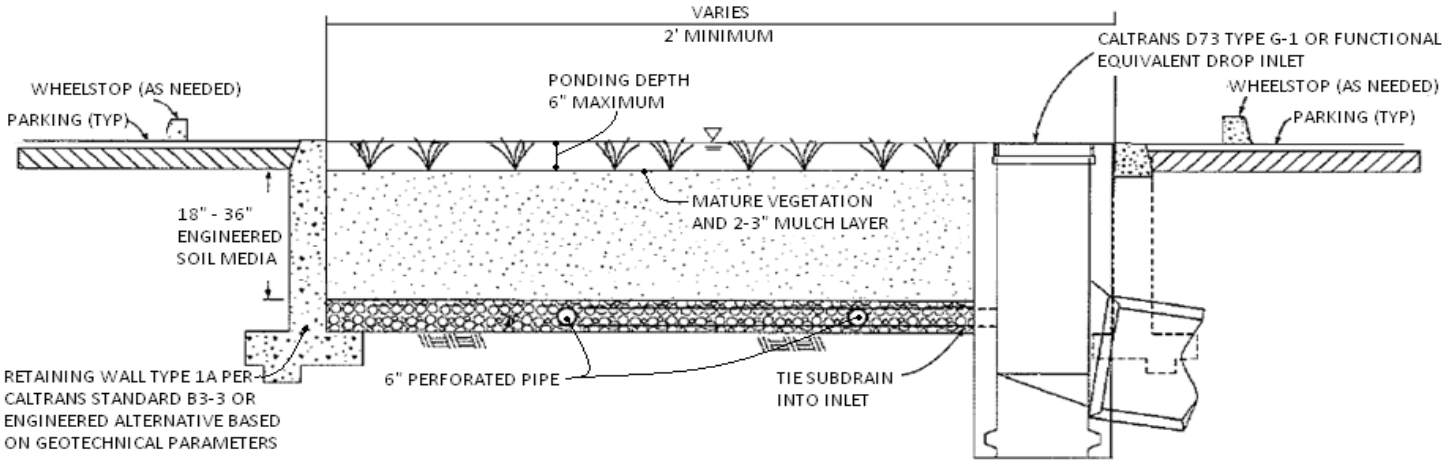
Bioretention Facilities Requiring Side Slopes

The design should assure that the Bioretention Facility does not present a tripping hazard. Bioretention Facilities proposed near pedestrian areas, such as areas parallel to parking spaces or along a walkway, must have a gentle slope to the bottom of the facility. Side slopes inside of a Bioretention Facility shall be 4:1. A typical cross section for the Bioretention Facility is shown in Figure 1.

Bioretention Facilities Not Requiring Side Slopes

Where cars park perpendicular to the Bioretention Facility, side slopes are not required. A 6-inch maximum drop may be used, and the Bioretention Facility must be planted with trees and shrubs to prevent pedestrian access. In this case, a curb is not placed around the Bioretention Facility,

but wheel stops shall be used to prevent vehicles from entering the Bioretention Facility, as shown in Figure 4.



Planter Boxes

Bioretention Facilities can also be placed above ground as planter boxes. Planter boxes must have a minimum width of 2 feet, a maximum surcharge depth of 6 inches, and no side slopes are necessary. Planter boxes must be constructed so as to ensure that the top surface of the engineered soil media will remain level. This option may be constructed of concrete, brick, stone or other stable materials that will not warp or bend. Chemically treated wood or galvanized steel, which has the ability to contaminate stormwater, should not be used. Planter boxes must be lined with an impermeable liner on all sides, including the bottom. Due to the impermeable liner, the inside bottom of the planter box shall be designed and constructed with a cross fall, directing treated flows within the subdrain layer toward the point where subdrain exits the planter box, and subdrains shall be oriented with drain holes oriented down. These provisions will help avoid excessive stagnant water within the gravel underdrain layer. Similar to the in-ground Bioretention Facility versions, this BMP benefits from healthy plants and biological activity in the root zone. Planter boxes should be planted with appropriately selected vegetation.



Figure 5: Planter Box
Source: LA Team Effort

Overflow

An overflow route is needed in the Bioretention Facility design to bypass stored runoff from storm events larger than V_{BMP} or in the event of facility or subdrain clogging. Overflow systems must connect to an acceptable discharge point, such as a downstream conveyance system as shown in Figure 1 and Figure 4. The inlet to the overflow structure shall be elevated inside the Bioretention Facility to be flush with the ponding surface for the design capture volume (V_{BMP}) as shown in Figure 4. This will allow the design capture volume to be fully treated by the Bioretention Facility, and for larger events to safely be conveyed to downstream systems. The overflow inlet shall **not** be located in the entrance of a Bioretention Facility, as shown in Figure 6.

Underdrain Gravel and Pipes

An underdrain gravel layer and pipes shall be provided in accordance with Appendix B – Underdrains.



Figure 6: Incorrect Placement of an Overflow Inlet.

Inspection and Maintenance Schedule

The Bioretention Facility area shall be inspected for erosion, dead vegetation, soggy soils, or standing water. The use of fertilizers and pesticides on the plants inside the Bioretention Facility should be minimized.

Schedule	Activity
Ongoing	• Keep adjacent landscape areas maintained. Remove clippings from landscape maintenance activities. • Remove trash and debris • Replace damaged grass and/or plants • Replace surface mulch layer as needed to maintain a 2-3 inch soil cover.
After storm events	• Inspect areas for ponding
Annually	• Inspect/clean inlets and outlets