CITY OF SAN MARCOS

PRIORITY DEVELOPMENT PROJECT (PDP)
STORM WATER QUALITY MANAGEMENT PLAN (SWQMP)

FOR
PICO PLACE

236-244 PICO AVENUE
CITY OF SAN MARCOS, CALIFORNIA 92069

ASSESSOR'S PARCEL NUMBER(S):
220-140-05-00 & 220-140-16-00

ENGINEER OF WORK:

Dr. Luis Parra – R.C.E. 66377

PREPARED FOR:

PICO INVESTMENTS 7, LLC.
29250 PASEO SEDANO
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(951) 801-0888

PDP SWQMP PREPARED BY:

REC CONSULTANTS
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(619) 323-9200

DATE OF SWQMP:
NOVEMBER 6, 2022
Revised APRIL 14, 2023

PLANS PREPARED BY:
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12731 LEWIS ST #203
GARDEN GROVE, CALIFORNIA 92840
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ACRONYMS

APN	Assessor's Parcel Number
BMP	Best Management Practice
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWQMP	Storm Water Quality Management Plan

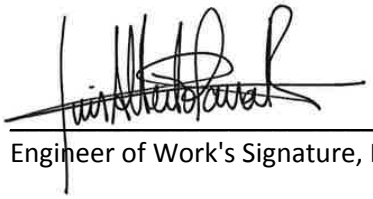
PDP SWQMP PREPARER'S CERTIFICATION PAGE

Project Name: Pico Place
Permit Application Number: GPA22-0005

PREPARER'S CERTIFICATION

I hereby declare that I am the Engineer in Responsible Charge of design of storm water best management practices (BMPs) for this project, and that I have exercised responsible charge over the design of the BMPs as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the PDP requirements of the County of San Diego BMP Design Manual, which is a design manual for compliance with local City of San Marcos and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

I have read and understand that the [City Engineer] has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the BMP Design Manual. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the [City Engineer] is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.



RCE 66377 Exp 6-30-24
Engineer of Work's Signature, PE Number & Expiration Date

Dr. Luis A. Parra

REC-Consultants

4/14/23
Date

Engineer's Seal:

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PDP SWQMP PROJECT OWNER'S CERTIFICATION PAGE

Project Name: Pico Place
Permit Application Number: GPA22-0005

PROJECT OWNER'S CERTIFICATION

This PDP SWQMP has been prepared for Pico Investments 7, LLC by REC Consultants, Inc. The PDP SWQMP is intended to comply with the PDP requirements of the County of San Diego BMP Design Manual, which is a design manual for compliance with the 2013 Municipal Storm Water Permit and regional MS4 Permit (California Regional Water Quality Control Board San Diego Region Order No. R9-2015-0100) requirements for storm water management.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan. Once the undersigned transfers its interests in the property, its successor-in-interest shall bear the aforementioned responsibility to implement the best management practices (BMPs) described within this plan, including ensuring on-going operation and maintenance of structural BMPs. A signed copy of this document shall be available on the subject property into perpetuity.

_____
Project Owner's Signature

_____
Print Name

_____
Company

_____
Date

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SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In column 4 summarize the changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments behind this page.

Submittal Number	Date	Project Status	Summary of Changes
1	November 6, 2022	☒Preliminary Design / Planning/ CEQA ☐ Final Design	Initial Submittal
2	February 21, 2023	☒Preliminary Design / Planning/ CEQA ☐ Final Design	2nd submittal
3	April 14, 2023	☒Preliminary Design / Planning/ CEQA ☐ Final Design	3rd submittal
4		☐Preliminary Design / Planning/ CEQA ☐ Final Design	
5		☐Preliminary Design / Planning/ CEQA ☐ Final Design	

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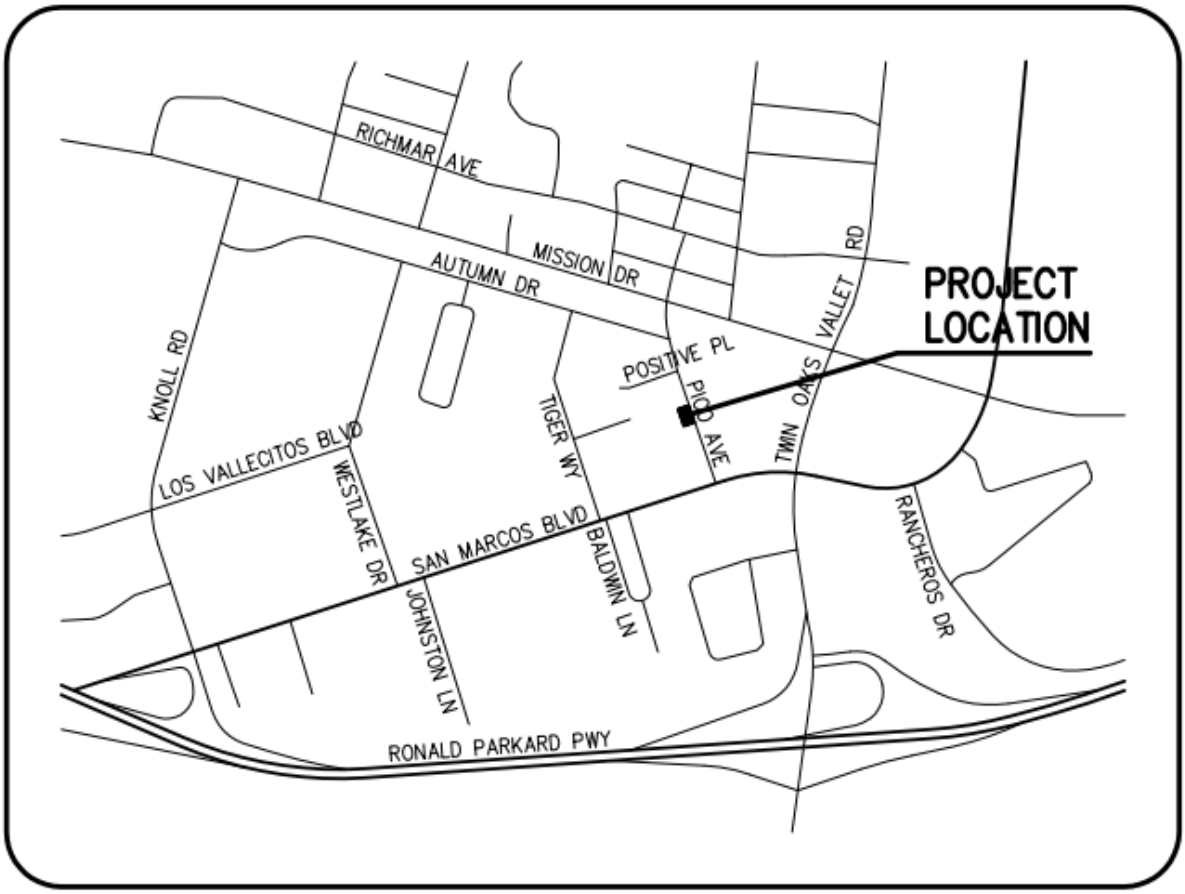
PROJECT VICINITY MAP

Project Name: Pico Place
Permit Application Number: GPA22-0005



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Applicability of Storm Water Best Management Practices (BMP) Requirements

(Storm Water Intake Form for all Development Permit Applications)
For detailed information please visit:
http://www.san-marcos.net/departments/development-services/stormwater/development-planning

Form I-1
[March 15, 2016]

Project Identification

Project Name: Pico Place

Description: Multi-family residential development

Permit Application Number (if applicable): GPA22-0005 | Date: November 6, 2022

Project Address: 236-244 Pico Avenue, San Marcos, CA 92069

Determination of Requirements

This form is required as part of the City's application process. The purpose of this form is to identify potential land development planning storm water requirements that apply to development projects.

Development projects are defined as construction, rehabilitation, redevelopment, or reconstruction of any public or private projects. In addition, the identification of a development project, as it relates to storm water regulations, would truly apply to development and redevelopment activities that have the potential to contact storm water and contribute a source of pollutants, or reduce the natural absorption and infiltration abilities of the land.

To access the BMP Design Manual, Storm Water Quality Management Plan (SWQMP) templates, and other pertinent information related to this program please refer to:
http://www.san-marcos.net/departments/development-services/stormwater/development-planning

Please answer each of the following steps below, starting with Step 1 and progressing through each step until reaching "Stop".

Step	Answer	Progression
Step 1: Based on the above, Is the project a "development project" (See definition above)? See Section 1.3 of the BMP Design Manual for further guidance if necessary.	☒ Yes	Go to Step 2.
	No	Permanent BMP requirements do not apply. No SWQMP will be required. Provide brief discussion below. **STOP.**
Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):		
Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? **To answer this item, complete Form I-2, Project Type Determination. See Section 1.4 of the BMP Design Manual *in its entirety* for guidance.** **In addition to Section 1.4, please refer to the City's SWQMP Submittal Requirements form.**	Standard Project	Only Standard Project requirements apply, including Standard Project SWQMP. **STOP.**
	☒PDP	Standard and PDP requirements apply, including PDP SWQMP. **Go to Step 3 on the following page.**
	Exception to PDP definitions	Standard Project requirements apply, and any additional requirements specific to the type of project. Provide discussion and list any additional requirements below. Prepare Standard Project SWQMP. **STOP.**
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Form I-1 Page 2, Form Date: March 15, 2016		
Step 3 (PDPs only). Please answer the list of questions in this section to determine if hydromodification requirements reply to the proposed PDP. Does the project:		
Step 3a. Discharge storm water runoff directly to the Pacific Ocean?	☐ Yes	**STOP**. Hydromodification requirements do not apply.
	☒ No	Continue to Step 3b.
Step 3b. Discharge storm water runoff directly to an enclosed embayment, not within protected areas?	☐ Yes	**STOP**. Hydromodification requirements do not apply.
	☒ No	Continue to Step 3c.
Step 3c. Discharge storm water runoff directly to a water storage reservoir or lake, below spillway or normal operating level?	☐ Yes	**STOP**. Hydromodification requirements do not apply.
	☒ No	Continue to Step 3d.
Step 3d. Discharge storm water runoff directly to an area identified in WMAA?	☐ Yes	**STOP**. Hydromodification requirements do not apply.
	☒ No	Hydromodification requirements apply to the project. Go to Step 4.
Discussion / justification if hydromodification control requirements do not apply:		

Step 4 (PDPs subject to hydromodification control requirements only). Does protection of critical coarse sediment yield areas apply based on review of WMAA Potential Critical Coarse Sediment Yield Area Map? See Section 6.2 of the BMP Design Manual for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	☒ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop. *Project site is not located in, or adjacent to Critical coarse sediment yield areas.

Project Type Determination Checklist			Form I-2 [March 15, 2016]
Project Information			
Project Name/Description: Pico Place			
Permit Application Number (if applicable): GPA22-0005			Date: November 6, 2022
Project Address: 236-244 Pico Avenue, San Marcos, CA 92069			
Project Type Determination: Standard Project or Priority Development Project (PDP)			
The project is (select one): ☒ New Development ☐ Redevelopment			
The total proposed newly created or replaced impervious area is: 21,975 ft^2 (0.504 acres)			
Is the project in any of the following categories, (a) through (f)?			
Yes ☒	No ☐	(a)	New development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☐	No ☒	(b)	Redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site on an existing site of 10,000 square feet or more of impervious surfaces). This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.
Yes ☒	No ☐	(c)	New and redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface (collectively over the entire project site), and support one or more of the following uses: (i) Restaurants. This category is defined as a facility that sells prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (Standard Industrial Classification (SIC) code 5812). (ii) Hillside development projects. This category includes development on any natural slope that is twenty-five percent or greater. (iii) Parking lots. This category is defined as a land area or facility for the temporary parking or storage of motor vehicles used personally, for business, or for commerce. (iv) Streets, roads, highways, freeways, and driveways. This category is defined as any paved impervious surface used for the transportation of automobiles, trucks, motorcycles, and other vehicles.

Form I-2 Page 2, Form Date: March 15, 2016			
Yes ☐	No ☒	(d)	New or redevelopment projects that create and/or replace 2,500 square feet or more of impervious surface (collectively over the entire project site), and discharging directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). *Note: ESAs are areas that include but are not limited to all Clean Water Act Section 303(d) impaired water bodies; areas designated as Areas of Special Biological Significance by the State Water Board and San Diego Water Board; State Water Quality Protected Areas; water bodies designated with the RARE beneficial use by the State Water Board and San Diego Water Board; and any other equivalent environmentally sensitive areas which have been identified by the Copermittees. See BMP Design Manual Section 1.4.2 for additional guidance.*
Yes ☐	No ☒	(e)	New development projects, or redevelopment projects that create and/or replace 5,000 square feet or more of impervious surface, that support one or more of the following uses: (i) Automotive repair shops. This category is defined as a facility that is categorized in any one of the following SIC codes: 5013, 5014, 5541, 7532-7534, or 7536-7539. (ii) Retail gasoline outlets (RGOs). This category includes RGOs that meet the following criteria: (a) 5,000 square feet or more or (b) a projected Average Daily Traffic (ADT) of 100 or more vehicles per day.
Yes ☐	No ☒	(f)	New or redevelopment projects that result in the disturbance of one or more acres of land and are expected to generate pollutants post construction. *Note: See BMP Design Manual Section 1.4.2 for additional guidance.*

Does the project meet the definition of one or more of the Priority Development Project categories (a) through (f) listed above?

☐ No – the project is <u>not</u> a Priority Development Project (Standard Project).

☒ Yes – the project is a Priority Development Project (PDP).

The following is for redevelopment PDPs only:

The area of existing (pre-project) impervious area at the project site is: _____ ft^2 (A)

The total proposed newly created or replaced impervious area is _____ ft^2 (B)

Percent impervious surface created or replaced (B/A)*100: _____%

The percent impervious surface created or replaced is (select one based on the above calculation):

☐ less than or equal to fifty percent (50%) – only new impervious areas are considered PDP

OR

☐ greater than fifty percent (50%) – the entire project site is a PDP

Site Information Checklist For PDPs	Form I-3B (PDPs) [March 15, 2016]
Project Summary Information	
Project Name	Pico Place
Project Address	236-244 Pico Avenue, San Marcos, CA 92069
Assessor's Parcel Number(s) (APN(s))	220-140-05-00, 220-140-16-00
Permit Application Number	GPA22-0005
Project Hydrologic Unit	Select One: ☐ Santa Margarita 902 ☐ San Luis Rey 903 ☒ Carlsbad 904 ☐ San Dieguito 905 ☐ Penasquitos 906 ☐ San Diego 907 ☐ Pueblo San Diego 908 ☐ Sweetwater 909 ☐ Otay 910 ☐ Tijuana 911
Project Watershed(Complete Hydrologic Unit, Area, and Subarea Name with Numeric Identifier)	Carlsbad Hydrologic Unit (904) San Marcos Hydrologic Area (904.5) Richland Hydraulic Sub-Area (904.52)
Parcel Area (total area of Assessor's Parcel(s) associated with the project)	0.675 Acres (29,403 Square Feet)
Area to be Disturbed by the Project (Project Area)	0.675 Acres (29,403 Square Feet)
Project Proposed Impervious Area (subset of Project Area)	0.504 Acres (21,975 Square Feet)
Project Proposed Pervious Area (subset of Project Area)	0.17 Acres (7,407 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Parcel Area.	

Description of Existing Site Condition

Current Status of the Site (select all that apply):
☒ Existing development
☒ Previously graded but not built out
☐ Demolition completed without new construction
☐ Agricultural or other non-impervious use
☐ Vacant, undeveloped/natural

Description / Additional Information:
The existing project site comprises of a developed single-family residence and an adjoining graded, undeveloped lot.

Existing Land Cover Includes (select all that apply):
☐ Vegetative Cover
☒ Non-Vegetated Pervious Areas
☒ Impervious Areas

Description / Additional Information:

The existing site incorporates a single residential structure, garage and paved driveway.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):
☐ NRCS Type A
☐ NRCS Type B
☒ NRCS Type C
☐ NRCS Type D

Approximate Depth to Groundwater (GW):
☐ GW Depth < 5 feet
☐ 5 feet < GW Depth < 10 feet
☐ 10 feet < GW Depth < 20 feet
☒ GW Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):
☐ Watercourses
☐ Seeps
☐ Springs
☐ Wetlands
☒ None

Description / Additional Information:

The existing site has no natural existing hydrological features.

Description of Existing Site Drainage Patterns

How is storm water runoff conveyed from the site? At a minimum, this description should answer:
(1) whether existing drainage conveyance is natural or urban;
(2) Is runoff from offsite conveyed through the site? if yes, quantify all offsite drainage areas, design flows, and locations where offsite flows enter the project site, and summarize how such flows are conveyed through the site;
(3)Provide details regarding existing project site drainage conveyance network, including any existing storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels; and
(4) Identify all discharge locations from the existing project site along with a summary of conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Describe existing site drainage patterns:

In existing conditions, the Pico Place project site is a developed residential lot featuring a single residential structure including several paved surface areas with an adjoining undeveloped lot to the north that is sparsely vegetated.

Runoff from the existing site flows overland to two (2) points of discharge; POC-1, an existing RCP storm drain located at the eastern boundary of the project site within Pico Avenue and POC-2, the westerly boundary of the site. The project site ultimately drains to the San Marcos Creek located to the south of the project site. The following table shows the existing condition flows discharging from the project site (and adjacent run-on from a neighboring site to the west of the project site).

SUMMARY OF EXISTING ONSITE CONDITION FLOWS

Discharge Location	Drainage Area (Ac)	100-Year Peak Flow (cfs)
Pico Avenue Storm Drain (POC-1)	0.234	1.57
Western Property Boundary (POC-2)	0.44	0.67

Please refer to the "TM Drainage Study for Pico Place" by REC Consultants dated April 2023 for further details and calculations.

Description of Proposed Site Development

Project Description / Proposed Land Use and/or Activities:

The proposed project consists of a multi-family development including landscaped open space, sidewalks and an access drive.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

Proposed impervious surfaces include: buildings, roadways, parking lots, and sidewalks.

List/describe proposed pervious features of the project (e.g., landscape areas):

Proposed pervious features include: landscape areas.

Does the project include grading and changes to site topography?

☒ Yes

☐ No

Description / Additional Information:

Proposed grading activities are such that project runoff will be conveyed both overland and through a storm drain network to one (1) proposed BMP. Runoff will reach the project's point of discharge (POC-1) as in existing conditions.

Description of Proposed Site Drainage Patterns

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☒ Yes

☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural or constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre- and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Describe proposed site drainage patterns::

The Pico Place project proposes the construction of multi- family residences, inclusive of a servicing drive and associated landscaping. Runoff from the project is drained to one (1) receiving multiple purpose water quality/HMP/Q100 detention vault. Detained flows are drained from the BMP facility and discharged to the existing storm drain system within the adjacent Pico Avenue.

Peak developed flows from the project site are conveyed to one (1) onsite detention facility prior to discharging to the existing storm drain system. The vault system is approximately 9-feet deep with a width of 9-feet and length of 54-feet. Due to the limited grade on the project site and utility constraints, the vault is to be located several feet below the existing storm drain invert in Pico Avenue such that the vault can only be drained via the use of pumps. Due to HMP criteria, two (2) separate pumps will be employed on the project site, a low flow pump outlet will be located at 3.0 feet from the bottom of the basin invert while the peak Q100 flow pump will be located at 7.25 feet from the basin invert. In an extreme event, flows will outlet via the surface private drive to Pico Avenue without risk of flooding the residential structures and also providing single vehicular lane access.

SUMMARY OF ONSITE PEAK FLOWS

Discharge Location	Area (ac)			100 Year Peak Flow (cfs)		
	Existing	Developed	Difference	Existing	Developed	Difference
POC-1	0.234	0.674	+0.44	1.57	1.50	-0.07
POC-2	0.44	0.0	-0.44	0.67	0.00	-0.67

As shown in the above table, the proposed Pico Place project site will result in a decrease of peak flows discharged from the project site by approximately 0.07cfs at POC-1 while fully removing flows tributary to the western boundary location POC-2.

Please refer to the “TM Drainage Study for Pico Place” by REC Consultants dated April 2023 for further details and calculations.

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

☒ On-site storm drain inlets
☒ Interior floor drains and elevator shaft sump pumps
☒ Interior parking garages
☐ Need for future indoor & structural pest control
☒ Landscape/Outdoor Pesticide Use
☐ Pools, spas, ponds, decorative fountains, and other water features
☐ Food service
☒ Refuse areas
☐ Industrial processes
☐ Outdoor storage of equipment or materials
☐ Vehicle and Equipment Cleaning
☐ Vehicle/Equipment Repair and Maintenance
☐ Fuel Dispensing Areas
☐ Loading Docks
☐ Fire Sprinkler Test Water
☐ Miscellaneous Drain or Wash Water
☒ Plazas, sidewalks, and parking lots

Description / Additional Information:

<u>On site Storm Drains</u>

Onsite storm drain inlets will be stenciled with prohibitive language in accordance with County Requirements. Inlet markings will be maintained and periodically repainted or replaces when necessary. Storm water pollution prevention information will be provided to new site owners, lessees, or operators. The following will be included in in lease agreements “Tenants 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.”

<u>Landscape/Outdoor Pesticide Use</u>

Any pesticides (indoor or outdoor) shall be applied in accordance with the manufacturer instructions and not within 72 hours of an actual or predicted rain event. Landscaping will be maintained using minimum or no pesticides. Provide information to new owners, lessees, and operators.

<u>Refuse Area</u>

Garbage bins will remain covered when not in use. No hazardous materials will be placed inside the bins.

Description / Additional Information Continuation:

Plazas, sidewalks, and parking lots

Runoff from plazas, sidewalks and parking lots will be collected by the onsite storm drain system and conveyed to the proposed infiltration BMP to address water quality and hydromodification prior to offsite discharge. Plazas, sidewalks, and parking lots will be swept regularly to prevent the accumulation of litter and debris.

The following features are not part of the subject development:

Outdoor material/equipment storage, food service and vehicle/equipment cleaning, repair and/or maintenance.

Identification and Narrative of Receiving Water and Pollutants of Concern

Describe flow path of storm water from the project site discharge location(s), through urban storm conveyance systems as applicable, to receiving creeks, rivers, and lagoons as applicable, and ultimate discharge to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable):

Project runoff will be conveyed via proposed urban storm conveyance network to the adjacent San Marcos Creek, located to the south of the project site. The San Marcos Creek ultimately discharges into San Marcos Lake.

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs / WQIP Highest Priority Pollutant
San Marcos Creek	DDE, Phosphorous, Sediment Toxicity, Selenium, TDS, Turbidity	Nutrients
San Marcos Lake	Ammonia as Nitrogen, Nutrients, Phosphorous	Nutrients

Identification of Project Site Pollutants*

***Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)**

Identify pollutants expected from the project site based on all proposed use(s) of the site (see BMP Design Manual Appendix B.6):

Pollutant	Not Applicable to the Project Site	Expected from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	☐	☐	☐
Nutrients	☐	☐	☐
Heavy Metals	☐	☐	☐
Organic Compounds	☐	☐	☐
Trash & Debris	☐	☐	☐
Oxygen Demanding Substances	☐	☐	☐
Oil & Grease	☐	☐	☐
Bacteria & Viruses	☐	☐	☐
Pesticides	☐	☐	☐

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

☒ Yes, hydromodification management flow control structural BMPs required.

☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

Please refer to the HMP Technical Memo for Pico Place by REC Consultants, November 2022.

Critical Coarse Sediment Yield Areas*

***This Section only required if hydromodification management requirements apply**

Based on the maps provided within the WMAA, do potential critical coarse sediment yield areas exist within the project drainage boundaries?

☐ Yes

☒ No, No critical coarse sediment yield areas to be protected based on WMAA maps

If yes, have any of the optional analyses presented in Section 6.2 of the BMP Design Manual been performed?

☐ 6.2.1 Verification of Geomorphic Landscape Units (GLUs) Onsite

☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment

☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite

☐ No optional analyses performed, the project will avoid critical coarse sediment yield areas identified based on WMAA maps

If optional analyses were performed, what is the final result?

☐ No critical coarse sediment yield areas to be protected based on verification of GLUs onsite

☐ Critical coarse sediment yield areas exist but additional analysis has determined that protection is not required. Documentation attached in Attachment 2.b of the SWQMP.

☐ Critical coarse sediment yield areas exist and require protection. The project will implement management measures described in Sections 6.2.4 and 6.2.5 as applicable, and the areas are identified on the SWQMP Exhibit.

Discussion / Additional Information:

Flow Control for Post-Project Runoff*

***This Section only required if hydromodification management requirements apply**

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

POC-1 is an existing RCP pipe located at the south-east boundary of the project site adjacent to the project site within Pico Avenue. Please refer to the site specific HMP memo prepared for the project site for further information.

Has a geomorphic assessment been performed for the receiving channel(s)?

☒ No, the low flow threshold is 0.1Q2 (default low flow threshold)

☐ Yes, the result is the low flow threshold is 0.1Q2

☐ Yes, the result is the low flow threshold is 0.3Q2

☐ Yes, the result is the low flow threshold is 0.5Q2

If a geomorphic assessment has been performed, provide title, date, and preparer:

Discussion / Additional Information: (optional)

Form I-3B Page 10 of 10, Form Date: March 15, 2016
Other Site Requirements and Constraints
When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.
Optional Additional Information or Continuation of Previous Sections As Needed
This space provided for additional information or continuation of information from previous sections as needed.

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Source Control BMP Checklist for All Development Projects (Standard Projects and Priority Development Projects)	Form I-4 [March 15, 2016]

Project Identification

Project Name: Pico Place

Permit Application Number: GPA22-0005

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the Model BMP Design Manual for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the Model BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented: No outdoor materials storage areas are proposed.			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented: No outdoor work areas proposed.			

Form I-4 Page 2 of 2, Form Date: March 15, 2016			
Source Control Requirement	**Applied?**		
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-5 not implemented:			
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
☒ On-site storm drain inlets	☒ Yes	☐ No	☐ N/A
☐ Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	☒ N/A
☒ Interior parking garages	☒ Yes	☐ No	☐ N/A
☐ Need for future indoor & structural pest control	☐ Yes	☐ No	☒ N/A
☒ Landscape/Outdoor Pesticide Use	☒ Yes	☐ No	☐ N/A
☐ Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☒ N/A
☐ Food service	☐ Yes	☐ No	☒ N/A
☒ Refuse areas	☒ Yes	☐ No	☐ N/A
☐ Industrial processes	☐ Yes	☐ No	☒ N/A
☐ Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
☐ Vehicle and Equipment Cleaning	☐ Yes	☐ No	☒ N/A
☐ Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☒ N/A
☐ Fuel Dispensing Areas	☐ Yes	☐ No	☒ N/A
☐ Loading Docks	☐ Yes	☐ No	☒ N/A
☐ Fire Sprinkler Test Water	☐ Yes	☐ No	☒ N/A
☐ Miscellaneous Drain or Wash Water	☐ Yes	☐ No	☒ N/A
☒ Plazas, sidewalks, and parking lots	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Site Design BMP Checklist for All Development Projects (Standard Projects and Priority Development Projects)	Form I-5 [March 15, 2016]

Project Identification

Project Name: Pico Place

Permit Application Number: GPA22-0005

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the Model BMP Design Manual for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the Model BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-1 not implemented: No existing hydrologic features exist on the project site.			
SD-2 Conserve Natural Areas, Soils, and Vegetation	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-2 not implemented:			
SD-3 Minimize Impervious Area	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented:			
SD-5 Impervious Area Dispersion	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-5 not implemented:			

Form I-5 Page 2 of 2, Form Date: March 15, 2016			
Site Design Requirement	**Applied?**		
SD-6 Runoff Collection	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-6 not implemented: Other BMPS are employed on the project site. An infiltration BMP is proposed in addition to the site design BMPs already included on the site. Also Harvest and use deemed infeasible per Worksheet 3-1 (Attachment 1)			
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	☐ Yes	☐ No	☒ N/A
Discussion / justification if SD-8 not implemented: Harvest and use deemed infeasible per Worksheet 3-1 (Attachment 1)			

Summary of PDP Structural BMPs	Form I-6 (PDPs) [March 15, 2016]
Project Identification	
Project Name: Pico Place	
Permit Application Number: GPA22-0005	
PDP Structural BMPs	
All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s). PDP structural BMPs must be verified by the local jurisdiction at the completion of construction. This may include requiring the project owner or project owner's representative and engineer of record to certify construction of the structural BMPs (see Section 1.12 of the BMP Design Manual). PDP structural BMPs must be maintained into perpetuity, and the local jurisdiction must confirm the maintenance (see Section 7 of the BMP Design Manual). Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).	

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

The project site was delineated by DMA per Section 3.3.3. There was a total of one (1) DMA delineated. The DCV of this DMA was calculated per Appendix B.1.

Runoff from the developed project site drains via an onsite storm drain to an underground storage vault. Prior to discharging to the vault system, runoff is intercepted by an upstream hydro-dynamic separator unit to screen larger particles & trash and debris that could potentially impact the underground vault's outlet structure or reduce the infiltration ability of the underlying soil. The detention vault is approximately 9' x 54' x 9' in dimension and due to site elevation constraints, all flows will drain from the underground BMP via two (2) pumps. The lower 3.0' of the detention vault has been allocated for the DCV which will fully infiltrate into the underlying soils (onsite geotechnical investigation measured an infiltration rate of 3 in/hr which has been factored to a design infiltration rate of 1.37 in/hr). As such, 100% of the DCV will be infiltrated into the underlying soil.

The vaults feature a 24-inch opening per vault section that allow runoff volume to drain to an underlying base of gravel located beneath the concrete structure such that the contact infiltration area with the soil is the total footprint area of the vault.

Per Worksheet B.3-1, it was determined that the implementation of Harvest and Use BMPs is infeasible.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of X, Form Date: March 15, 2016
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1)

Form I-6 Page 3 of X (Copy as many as needed) Form Date: March 15, 2016	
Structural BMP Summary Information **(Copy this page as needed to provide information for each individual proposed structural BMP)**	
Structural BMP ID No. BMP-1	
Construction Plan Sheet No.	
☐ Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☒ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☐ Biofiltration (BF-1) ☐ Biofiltration with Nutrient Sensitive Media Design (BF-2) ☐ Proprietary Biofiltration (BF-3) meeting all requirements of Appendix F ☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide BMP type/description in discussion section below) ☒ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below) ☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in discussion section below) ☒ Detention pond or vault for hydromodification management ☒ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only ☒ Combined pollutant control and hydromodification control ☐ Pre-treatment/forebay for another structural BMP ☒ Other (describe in discussion section below)	
Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification forms if required by the [City Engineer] (See Section 1.12 of the BMP Design Manual)	Dr. Luis A. Parra 2442 Second Avenue REC Consultants, Inc. (619) 232-9200
Who will be the final owner of this BMP?	Pico Investments 7, LLC.
Who will maintain this BMP into perpetuity?	Property Owner (Pico Investments 7, LLC.)
What is the funding mechanism for maintenance?	HOA

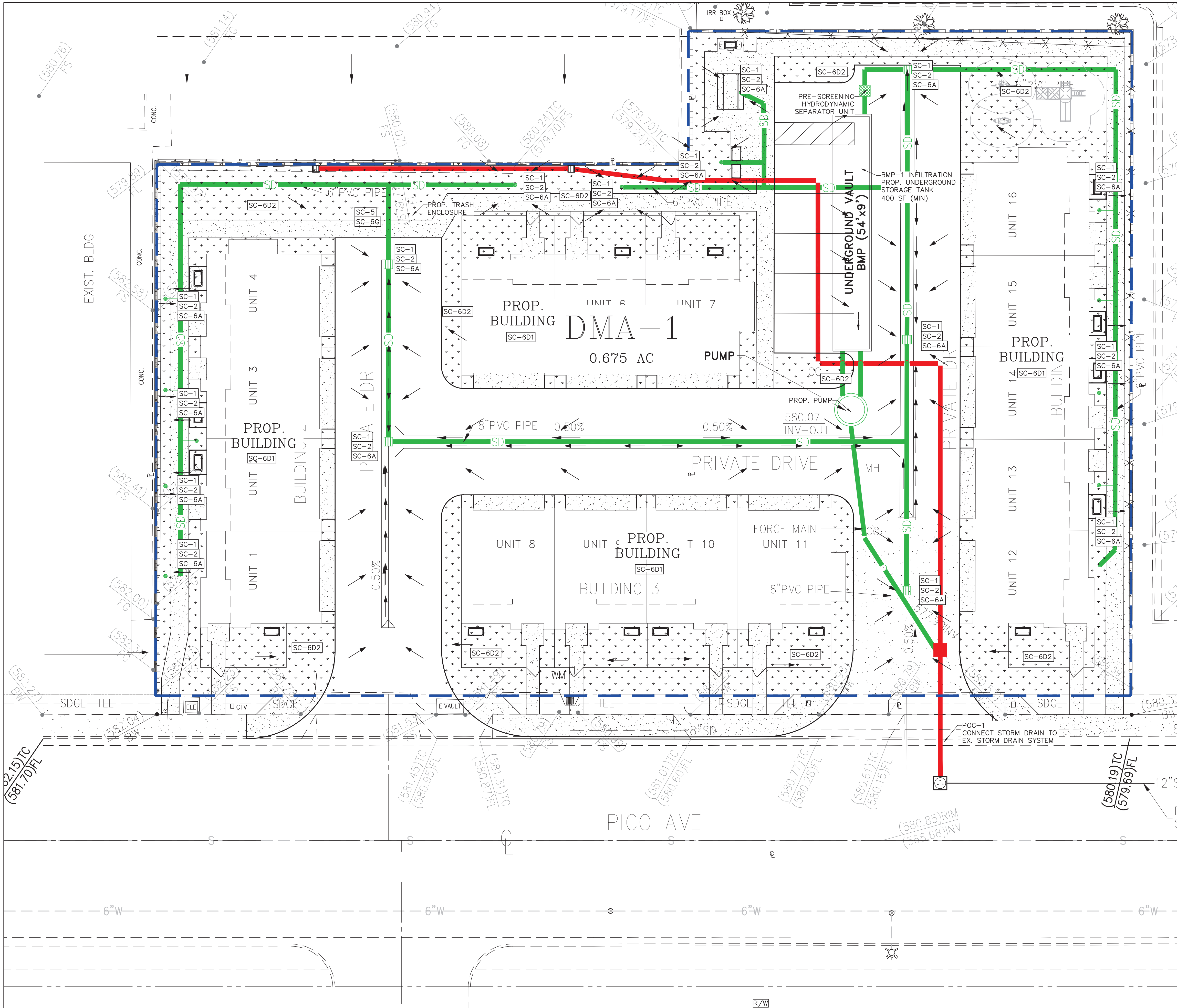
Form I-6 Page 4 of X (Copy as many as needed) , Form Date: March 15, 2016
Structural BMP ID No.
Construction Plan Sheet No.
Discussion (as needed): The proposed underground infiltration BMP vault is a multiple purpose treatment facility – water quality (DCV), HMP and peak flow Q100 flow mitigation is provided by the vault system. Upstream of the vault is a pre-treatment hydrodynamic separator unit to provide trash & debris screening prior to draining to the infiltration BMP. The pre-treatment hydrodynamic separator has no water quality benefit per the current BMP design manual standard and is only present to capture trash/debris/sediment to pre-screen for the infiltration BMP.

ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist on the back of this Attachment cover sheet.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☒ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☒ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☒ Included ☐ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines	☒ Included



LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	
RIGHT-OF-WAY LINE	
DMA BOUNDARY	
SURFACE FLOW	
ONSITE STORM DRAIN	
BYPASS STORM DRAIN	
PERVIOUS AREA	
IMPERVIOUS AREA	
PROP. CATCH BASIN	
PROP. AREA DRAIN	

DMA TYPE: DRAINS TO BMP
HYDROLOGIC SOIL GROUP: C
DEPTH TO GROUNDWATER: > 20 FT
NATURAL HYDROLOGIC FEATURES: NONE
CRITICAL COARSE SEDIMENT YIELD AREAS: NONE
IMPERVIOUS DMA AREA: 21,975 SF
(NOTE: PERVIOUS AREAS TO HAVE AMENDED SOILS)
PERVIOUS DMA AREA: 7,407 SF

SOURCE CONTROL BMPS

SC-1	PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
SC-2	STORM DRAIN STENCILING OR SIGNAGE
SC-5	PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
SC-6A	ON-SITE STORM DRAIN INLETS
SC-6D1	NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
SC-6D2	LANDSCAPE/OUTDOOR PESTICIDE USE
SC-6G	REFUSE AREAS

10 5 0 10 20 30
SCALE: 1" = 10'

REVISIONS

NO.	DESCRIPTION	DATE	APP'D

R·E·C Consultants, Inc.
Civil Engineering · Environmental
Land Surveying
2970 Fifth Avenue, Unit 340
San Diego, CA 92103
(619)232-9200 (619)232-9210 Fax

DATE: 10/10/2022
SCALE: 1" = 10'
DRAWN: E.R.F.
CHECKED: D.E.

SHEET TITLE: DMA/BMP PLAN - PROPOSED

PROJECT: PICO PLACE
236-244 SAN MARCOS PICO AVENUE
SAN MARCOS, CA 92069

SHEET 1 OF 1 SHEETS

SAVE DATE: 4/14/2023 ~ PLOT DATE: 4/14/2023 ~ FILE NAME: C:\Users\david\Desktop\Pico Village\Drawings\Exhibits\DMA Map_REV.dwg

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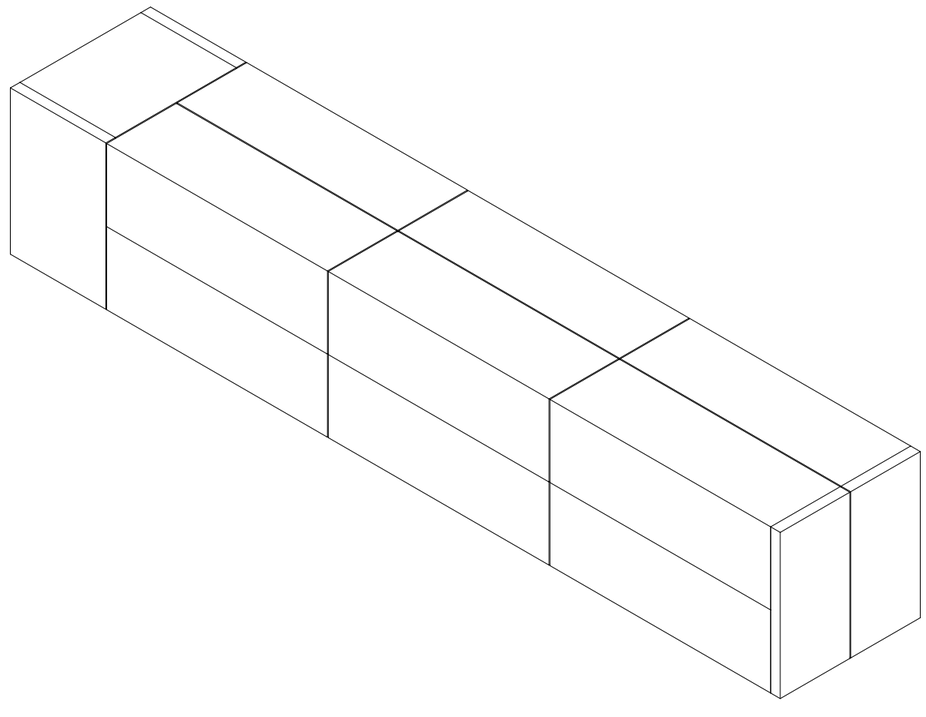
STORMWATER MANAGEMENT

SHEET INDEX	
PAGE	DESCRIPTION
0.0	COVER SHEET
1.0	DOUBLETRAP DESIGN CRITERIA
2.0	DOUBLETRAP SYSTEM LAYOUT
3.0	DOUBLETRAP INSTALLATION SPECIFICATIONS
3.1	DOUBLETRAP INSTALLATION SPECIFICATIONS
4.0	DOUBLETRAP BACKFILL SPECIFICATIONS
5.0	RECOMMENDED PIPE / ACCESS OPENING SPECIFICATIONS
6.0	DOUBLETRAP MODULE TYPES



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SAN MARCOS, CA

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ROMEOVILLE, IL 60446
P:815-941-4549 / F:331-318-5347

STORMTRAP CONTACT INFORMATION

STORMTRAP SUPPLIER: STORMTRAP
CONTACT NAME: CHARLIE CARTER
CELL PHONE: 760-212-5628
SALES EMAIL: CCARTER@STORMTRAP.COM

ENGINEER INFORMATION:

REC CONSULTANTS, INC.
27349 JEFFERSON AVE.
#112
TEMECULA, CA 92590
951-693-2400

PROJECT INFORMATION:

PICO PLACE

SAN MARCOS, CA

CURRENT ISSUE DATE:

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NTS

SHEET TITLE:

COVER SHEET

SHEET NUMBER:

0.0

STRUCTURAL DESIGN LOADING CRITERIA

LIVE LOADING: **AASHTO HS–20 HIGHWAY LOADING**

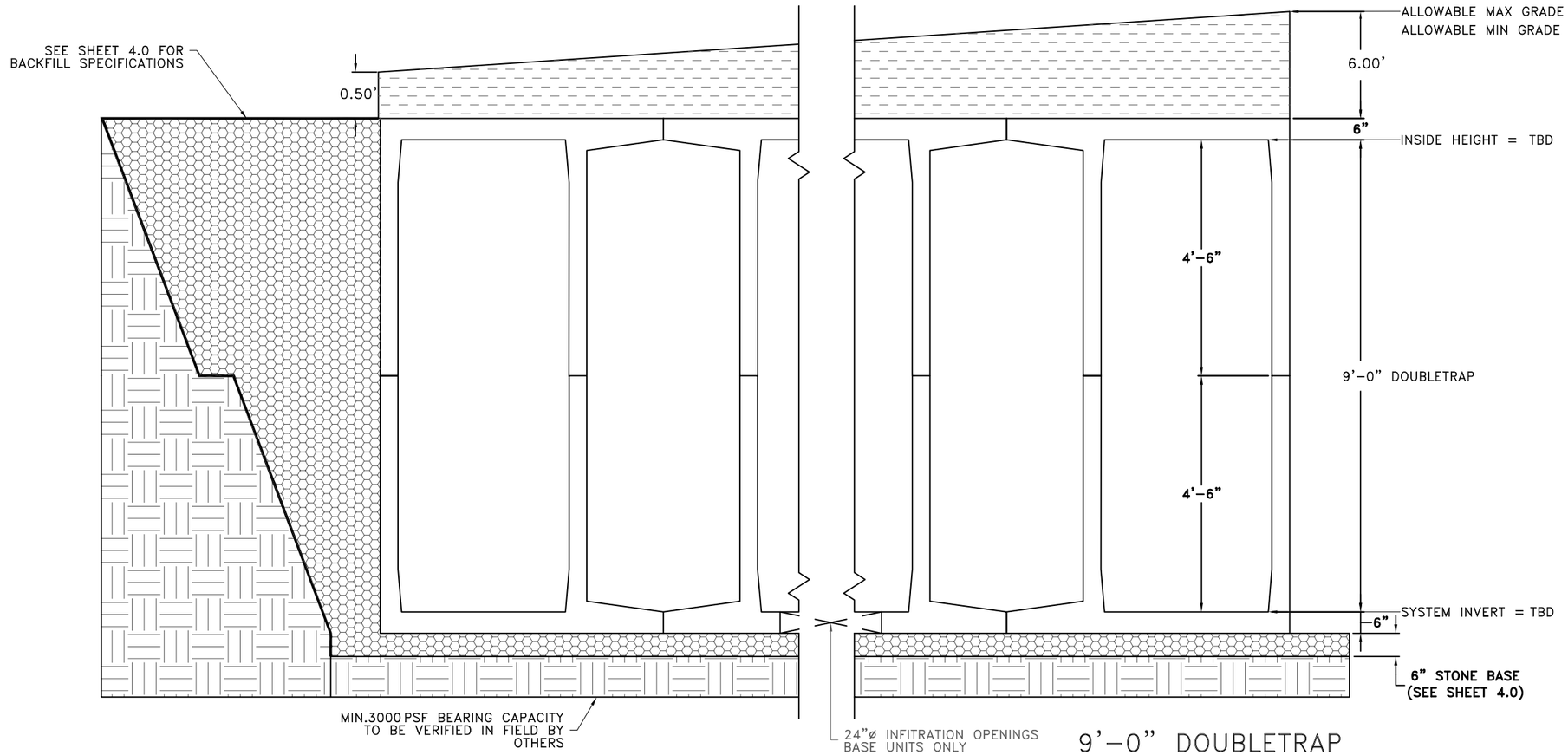
GROUND WATER TABLE: BELOW INVERT OF SYSTEM
SOIL BEARING PRESSURE: 3000 PSF
SOIL DENSITY: 120 PCF
EQUIVALENT UNSATURATED LATERAL ACTIVE EARTH PRESSURE: 35 PSF / FT.
EQUIVALENT SATURATED LATERAL ACTIVE EARTH PRESSURE: 80 PSF/FT. (IF WATER TABLE PRESENT)
APPLICABLE CODES: ASTM C857
ACI–318
BACKFILL TYPE: SEE SHEET 4.0 FOR BACKFILL OPTIONS

STORMTRAP SYSTEM INFORMATION

WATER STORAGE PROV: 3,886.65 CUBIC FEET
UNIT HEADROOM: 9'–0" DOUBLETRAP

SITE SPECIFIC DESIGN CRITERIA

1. STORMTRAP UNITS SHALL BE MANUFACTURED AND INSTALLED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER OF RECORD. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF OPENINGS AND INLET/OUTLET PIPE TYPES, SIZES, INVERT ELEVATIONS AND SIZE OF OPENINGS.
2. COVER RANGE: MIN. 0.50' MAX. 6.00' CONSULT STORMTRAP FOR ADDITIONAL COVER OPTIONS.
3. ALL DIMENSIONS AND SOIL CONDITIONS, INCLUDING BUT NOT LIMITED TO GROUNDWATER AND SOIL BEARING CAPACITY ARE REQUIRED TO BE VERIFIED IN THE FIELD BY OTHERS PRIOR TO STORMTRAP INSTALLATION.
4. FOR STRUCTURAL CALCULATIONS THE GROUND WATER TABLE IS ASSUMED TO BE BELOW INVERT OF SYSTEM IF WATER TABLE IS DIFFERENT THAN ASSUMED, CONTACT STORMTRAP.



9'–0" DOUBLETRAP

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SCALE:

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SHEET TITLE:

DOUBLETRAP DESIGN CRITERIA

SHEET NUMBER:

1.0

BILL OF MATERIALS

QTY.	UNIT TYPE	DESCRIPTION	TOP WEIGHT	BASE WEIGHT
0	I	9'-0" DOUBLETRAP	0	0
0	II	9'-0" DOUBLETRAP	0	0
0	III	9'-0" DOUBLETRAP	0	0
0	IV	9'-0" DOUBLETRAP	0	0
6	VII-3/VII-3NF	9'-0" DOUBLETRAP	12547	12446
1	SPIV/SPIVNF	9'-0" DOUBLETRAP	VARIES	VARIES
0	T2 PANEL	8" THICK PANEL	0	
2	T4 PANEL	8" THICK PANEL	6625	
2	T7 PANEL	8" THICK PANEL	4834	
2	JOINT WRAP	150' PER ROLL		
16	JOINT TAPE	14.5' PER ROLL		
TOTAL PIECES = 14				
TOTAL PANELS = 4				
HEAVIEST PICK WEIGHT = 12,547				

LOADING DISCLAIMER:

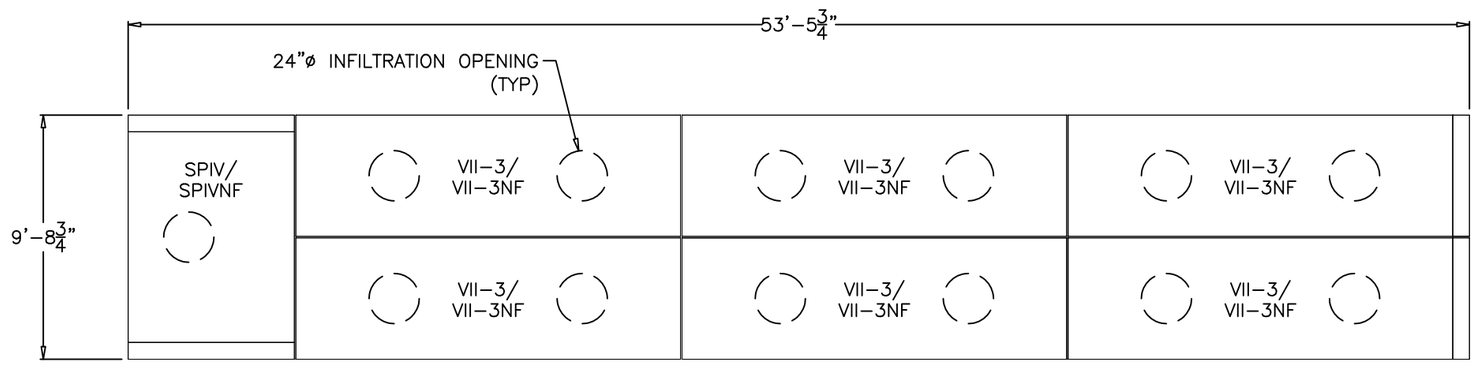
STORMTRAP IS NOT DESIGNED TO ACCEPT ANY ADDITIONAL LOADINGS FROM NEARBY STRUCTURES NEXT TO OR OVER THE TOP OF STORMTRAP. IF ADDITIONAL LOADING CONSIDERATIONS ARE REQUIRED FOR STRUCTURAL DESIGN OF STORMTRAP, PLEASE CONTACT STORMTRAP IMMEDIATELY.

TREE LOADING DISCLAIMER:

THE STORMTRAP SYSTEM HAS NOT BEEN DESIGNED TO SUPPORT THE ADDITIONAL WEIGHT OF ANY TREES. FURTHERMORE, THE ROOTS OF THE TREES MUST BE CONTAINED TO PREVENT FUTURE DAMAGE TO THE STORMTRAP SYSTEM. STORMTRAP ACCEPTS NO LIABILITY FOR DAMAGES CAUSED BY TREES OR OTHER VEGETATION PLACE AROUND OR ON TOP OF THE SYSTEM.

DESIGN CRITERIA
ALLOWABLE MAX GRADE = TBD
ALLOWABLE MIN GRADE =TBD
INSIDE HEIGHT ELEVATION =TBD
SYSTEM INVERT = TBD

NOTES:
1. DIMENSIONING OF STORMTRAP SYSTEM SHOWN BELOW ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
2. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
3. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.
4. SP – INDICATES A MODULE WITH MODIFICATIONS.
5. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
6. CONTRACTORS RESPONSIBILITY TO ENSURE CONSISTENCY/ACCURACY TO FINAL ENGINEER OF RECORD PLAN SET.



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SCALE:

NTS

SHEET TITLE:

DOUBLETRAP SYSTEM LAYOUT

SHEET NUMBER:

2.0

STORMTRAP INSTALLATION SPECIFICATIONS

1. STORMTRAP SHALL BE INSTALLED IN ACCORDANCE WITH ASTM C891, STANDARD FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES, THE FOLLOWING ADDITIONS AND/OR EXCEPTIONS SHALL APPLY:

2. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT PROPER/ADEQUATE EQUIPMENT IS USED TO SET/INSTALL THE MODULES.

3. STORMTRAP MODULES CAN BE PLACED ON A LEVEL, 6" FOUNDATION OF ¾" AGGREGATE EXTENDING 2'-0" PAST THE OUTSIDE OF THE SYSTEM (SEE DETAIL 1) AND SHALL BE PLACED ON PROPERLY COMPACTED SOILS (SEE SHEET 1.0 FOR SOIL BEARING CAPACITY REQUIREMENTS), AND IN ACCORDANCE WITH ASTM C891 STANDARD PRACTICE FOR INSTALLATION OF UNDERGROUND PRECAST UTILITY STRUCTURES.

4. THE STORMTRAP MODULES SHALL BE PLACED SUCH THAT THE MAXIMUM SPACE BETWEEN ADJACENT MODULES DOES NOT EXCEED ¾" (SEE DETAIL 2). IF THE SPACE EXCEEDS ¾", THE MODULES SHALL BE RESET WITH APPROPRIATE ADJUSTMENT MADE TO LINE AND GRADE TO BRING THE SPACE INTO SPECIFICATION.

5. STORMTRAP MODULES ARE NOT WATERTIGHT. IF A WATERTIGHT SOLUTION IS REQUIRED, CONTACT STORMTRAP FOR RECOMMENDATIONS. THE WATERTIGHT APPLICATION IS TO BE PROVIDED AND IMPLEMENTED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THE SELECTED WATERTIGHT SOLUTION PERFORMS AS SPECIFIED BY THE MANUFACTURER.

6. THE PERIMETER HORIZONTAL JOINT BETWEEN THE TOP AND BASE LEG CONNECTION OF THE STORMTRAP MODULES SHALL BE SEALED WITH PREFORMED MASTIC JOINT TAPE ACCORDING TO ASTM C891, 8.8 AND 8.12. (SEE DETAIL 3). THE MASTIC JOINT TAPE DOES NOT PROVIDE A WATERTIGHT SEAL.

7. ALL EXTERIOR ROOF AND EXTERIOR VERTICAL WALL JOINTS BETWEEN ADJACENT STORMTRAP MODULES SHALL BE SEALED WITH 8" WIDE PRE-FORMED, COLD-APPLIED, SELF-ADHERING ELASTOMERIC RESIN, BONDED TO A WOVEN , HIGHLY PUNCTURE RESISTANT POLYMER WRAP, CONFORMING TO ASTM C891 AND SHALL BE INTEGRATED WITH PRIMER SEALANT AS APPROVED BY STORMTRAP (SEE DETAILS 2, 4, & 5). THE JOINT WRAP DOES NOT PROVIDE A WATERTIGHT SEAL. THE SOLE PURPOSE OF THE JOINT WRAP IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM. THE ADHESIVE EXTERIOR JOINT WRAP SHALL BE INSTALLED ACCORDING TO THE FOLLOWING INSTALLATION INSTRUCTIONS:

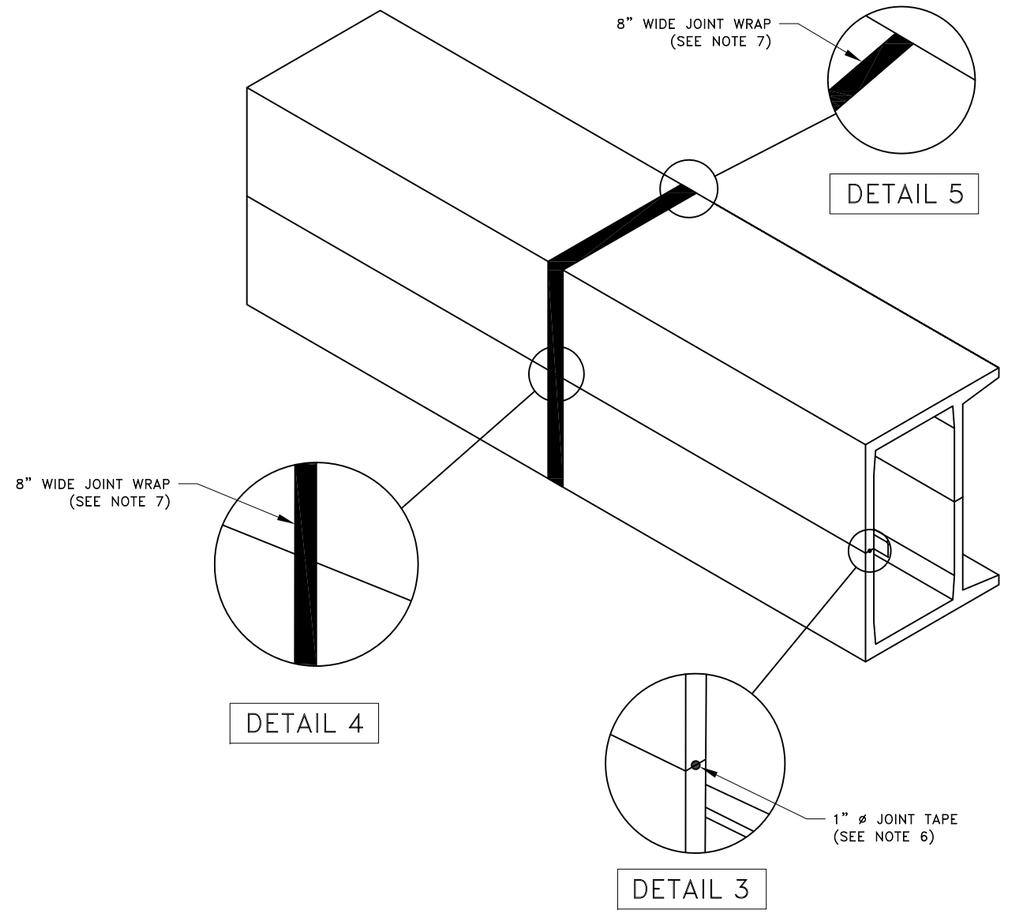
   7.1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE JOINT WRAP IS TO BE APPLIED.

   7.2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.

8. IF THE CONTRACTOR NEEDS TO CANCEL ANY SHIPMENTS, THEY MUST DO SO 48 HOURS PRIOR TO THEIR SCHEDULED ARRIVAL AT THE JOB SITE. IF CANCELED AFTER THAT TIME, PLEASE CONTACT THE PROJECT MANAGER.

9. IF THE STORMTRAP MODULE(S) IS DAMAGED IN ANY WAY PRIOR, DURING, OR AFTER INSTALL, STORMTRAP MUST BE CONTACTED IMMEDIATELY TO ASSESS THE DAMAGE AND TO DETERMINE WHETHER OR NOT THE MODULE(S) WILL NEED TO BE REPLACED. IF ANY MODULE ARRIVES AT THE JOBSITE DAMAGED DO NOT UNLOAD IT; CONTACT STORMTRAP IMMEDIATELY. ANY DAMAGE NOT REPORTED BEFORE THE TRUCK IS UNLOADED WILL BE THE CONTRACTOR'S RESPONSIBILITY.

10. STORMTRAP MODULES CANNOT BE ALTERED IN ANY WAY AFTER MANUFACTURING WITHOUT WRITTEN CONSENT FROM STORMTRAP.



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SCALE:

NTS

SHEET TITLE:

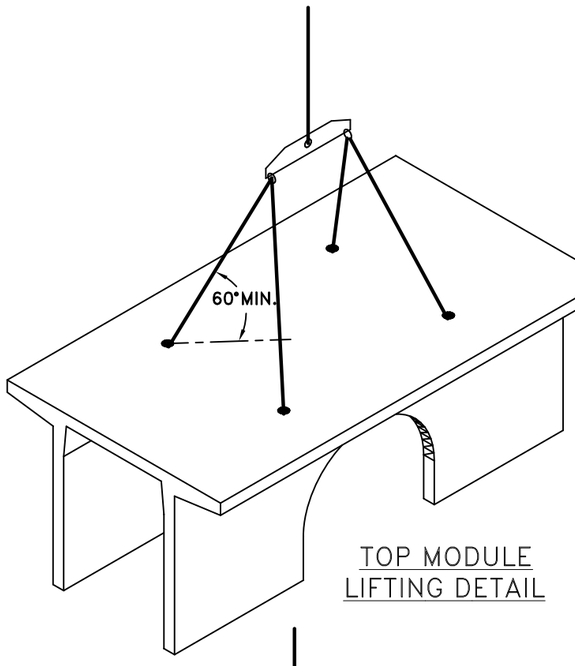
DOUBLETRAP
INSTALLATION
SPECIFICATIONS

SHEET NUMBER:

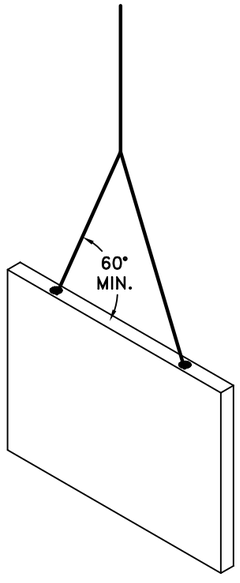
3.0

STORMTRAP MODULE LIFTING INSTALLATION NOTES

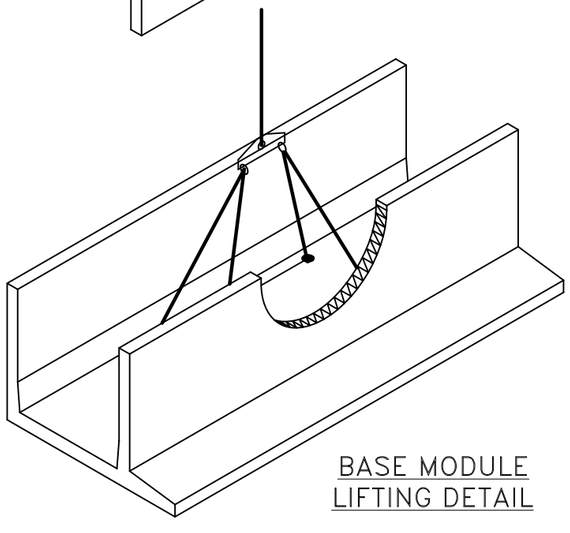
1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL (4) CHAINS/CABLES ARE SECURED PROPERLY TO THE LIFTING ANCHORS AND IN EQUAL TENSION WHEN LIFTING THE STORMTRAP MODULE (SEE RECOMMENDATIONS 2 & 3).
2. MINIMUM 7'-0" CHAIN/CABLE LENGTH TO BE USED TO LIFT STORMTRAP MODULES (SUPPLIED BY CONTRACTOR).
3. CONTRACTOR TO ENSURE MINIMUM LIFTING ANGLE IS 60° FROM TOP SURFACE OF STORMTRAP MODULE. SEE DETAIL.
4. IT IS UNDERSTOOD AND AGREED THAT AT ALL TIMES DURING WHICH HOISTING AND RIGGING EQUIPMENT IS BEING SUPPLIED TO THE PURCHASER, OPERATOR OF SUCH EQUIPMENT SHALL BE IN CHARGE OF HIS ENTIRE EQUIPMENT AND SHALL AT ALL TIMES BE THE JUDGE OF THE SAFETY AND PROPERTY OF ANY SUGGESTION TO HIM FROM THE SELLER, ITS AGENTS OR EMPLOYEES. PURCHASER AGREES TO SAVE, INDEMNIFY AND HOLD HARMLESS SELLER FROM ALL LOSS, CLAIMS, DEMANDS OR CAUSES OF ACTION, WHICH MAY ARISE FROM THE EXISTENCE OR OPERATION OF SAID EQUIPMENT.



TOP MODULE
LIFTING DETAIL



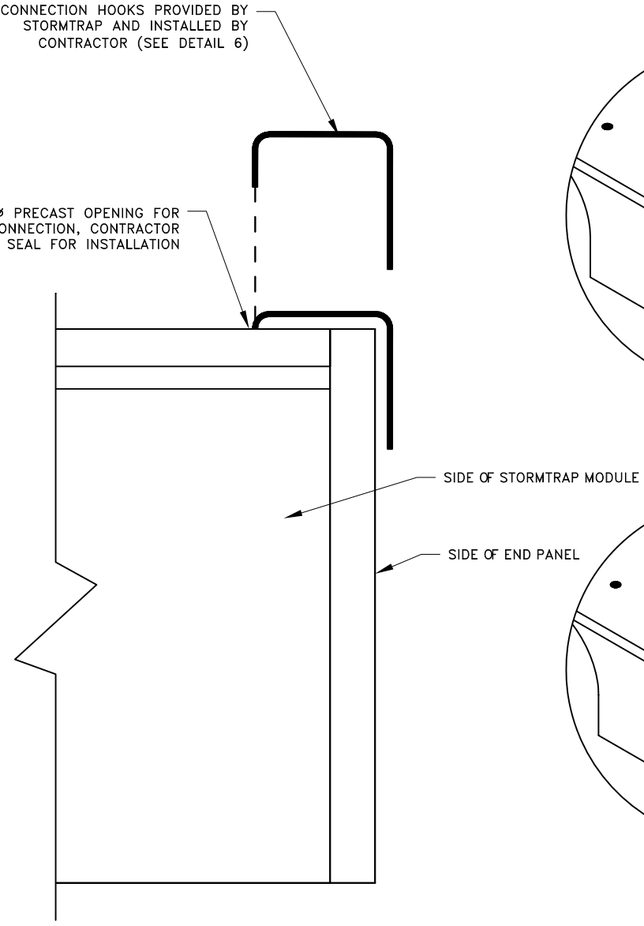
END PANEL
LIFTING DETAIL



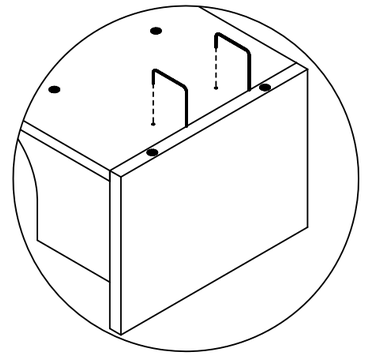
BASE MODULE
LIFTING DETAIL

END PANEL ERECTION/INSTALLATION NOTES

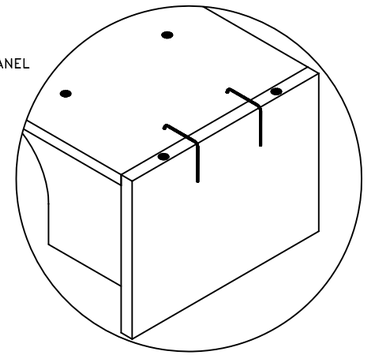
1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS).
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE (SEE PANEL CONNECTION ELEVATION VIEW).
4. ONCE CONNECTION HOOK IS ATTACHED, LIFTING CLUTCHES MAY BE REMOVED.
5. JOINT WRAP SHALL BE PLACED AROUND PERIMETER JOINT PANEL (SEE SHEET 3.0).



PANEL CONNECTION
ELEVATION VIEW



STEP 1



STEP 2

DETAIL 6

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SPECIFICATIONS

SHEET NUMBER:

3.1

ZONE CHART

ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	#5 (¾") STONE AGGREGATE (SEE NOTE 4 FOR DESCRIPTION)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) OR SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 120 PCF

FILL DEPTH	TRACK WIDTH	MAX VEHICLE WEIGHT (KIPS)	MAX GROUND PRESSURE
12"	12"	51.8	1690 psf
	18"	56.1	1219 psf
	24"	68.1	1111 psf
	30"	76.7	1000 psf
	36"	85.0	924 psf

NOTE:
TRACK LENGTH NOT TO EXCEED 15'-4".
ONLY TWO TRACKS PER VEHICLE.

APPROVED ZONE 2 BACKFILL OPTIONS

OPTION	REMARKS
¾" STONE AGGREGATE	THE STONE AGGREGATE SHALL CONSIST OF CLEAN AND FREE DRAINING ANGULAR MATERIAL. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 1" SIEVE WITH 0% TO 5% PASSING THE #8 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL (ASTM SIZE #57) AS DETERMINED BY THE GEOTECHNICAL ENGINEER.
SAND	IMPORTED PURE SAND IS PERMITTED TO BE USED AS BACKFILL IF IT IS CLEAN AND FREE DRAINING. THE SAND USED FOR BACKFILLING SHALL HAVE LESS THAN 40% PASSING #40 SIEVE AND LESS THAN 5% PASSING #200 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE SAND BACKFILL.
CRUSHED CONCRETE AGGREGATE	CLEAN, FREE DRAINING CRUSHED CONCRETE AGGREGATE MATERIAL CAN BE USED AS BACKFILL FOR STORMTRAP'S MODULES. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 1" SIEVE WITH 0% TO 5% PASSING THE #8 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL.
ROAD PACK	STONE AGGREGATE 100% PASSING THE 1-1/2" SIEVE WITH LESS THAN 12% PASSING THE #200 SIEVE (ASTM SIZE #467). GEOFABRIC AS PER GEOTECHNICAL ENGINEER RECOMMENDATION.

STORMTRAP ZONE INSTALLATION SPECIFICATIONS/PROCEDURES

1. THE FILL PLACED AROUND THE STORMTRAP MODULES MUST DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 2'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL EITHER BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL AGGREGATE/STONE MATERIAL IS WELL SEATED AND PROPERLY INTER LOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MUST BE FREE-DRAINING MATERIAL. SEE ZONE 2 BACKFILL CHART ON THIS PAGE FOR APPROVED BACKFILL OPTIONS. IF NATIVE EARTH IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED (PROVIDED BY OTHERS).

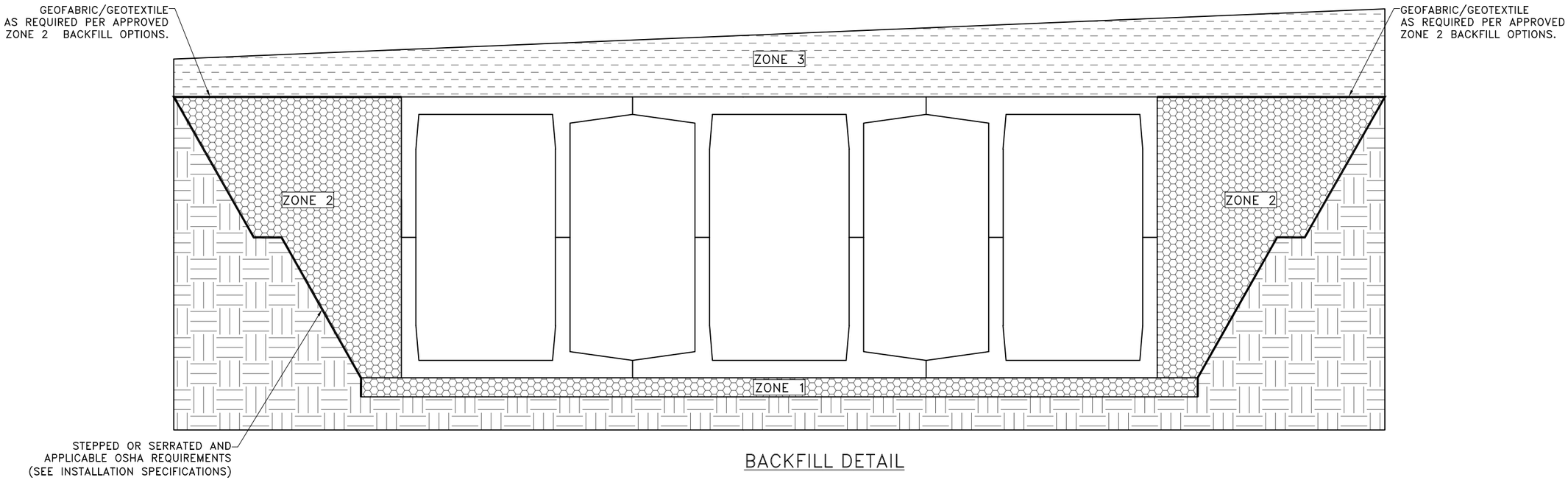
2. DURING PLACEMENT OF MATERIAL OVERTOP THE SYSTEM, AT NO TIME SHALL MACHINERY BE USED OVERTOP THAT EXCEEDS THE DESIGN LIMITATIONS OF THE SYSTEM. WHEN PLACEMENT OF MATERIAL OVERTOP, MATERIAL SHALL BE PLACED SUCH THAT THE DIRECTION OF PLACEMENT IS PARALLEL WITH THE OVERALL LONGITUDINAL DIRECTION OF THE SYSTEM WHENEVER POSSIBLE.

3. THE FILL PLACED OVERTOP THE SYSTEM SHALL BE PLACED AT A MINIMUM OF 6" LIFTS. AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN HS-20 LOADING CRITERIA TRAVEL OVERTOP THE SYSTEM WITHOUT THE MINIMUM DESIGN COVERAGE. IF TRAVEL IS NECESSARY OVERTOP THE SYSTEM PRIOR TO ACHIEVING THE MINIMUM DESIGN COVER, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS TO NOT EXCEED THE DESIGN CAPACITY OF THE SYSTEM. IN SOME CASES, IN ORDER TO ACHIEVE REQUIRED COMPACTION, HAND COMPACTION MAY BE NECESSARY IN ORDER NOT TO EXCEED THE ALLOTTED DESIGN LOADING. SEE CHART FOR TRACKED VEHICLE WIDTH AND ALLOWABLE MAXIMUM PRESSURE PER TRACK.

4. STONE AGGREGATE FOUNDATION IN ZONE 1 MAY BE REQUIRED FOR THE FOLLOWING:

   A.) INFILTRATION - IF INFILTRATION IS REQUIRED, A FREE DRAINING MATERIAL SHALL BE USED AT A DEPTH DETERMINED BY THE EOR. FREE DRAINING AGGREGATE IS DEFINED AS 80% AGGREGATE RETAINED ON ½" SIEVE, MAJORITY OF AGGREGATE SIZE BETWEEN ½" AND 1", AND ONLY 5% OF MATERIAL PASSING #3/8" SIEVE.

   B.) LEVELING - STORMTRAP RECOMMENDS STONE SUBBASE FOR LEVELING PURPOSES ONLY (OPTIONAL).



BACKFILL DETAIL

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SHEET TITLE:

DOUBLETRAP BACKFILL SPECIFICATIONS

SHEET NUMBER:

4.0

RECOMMENDED ACCESS OPENING SPECIFICATION

1. A TYPICAL ACCESS OPENING FOR THE STORMTRAP SYSTEM ARE 2'–0" IN DIAMETER. ACCESS OPENINGS LARGER THAN 3'–0" IN DIAMETER NEED TO BE APPROVED BY STORMTRAP. ALL OPENINGS MUST RETAIN AT LEAST 1'–0" OF CLEARANCE FROM THE END OF THE STORMTRAP MODULE UNLESS NOTED OTHERWISE. ALL ACCESS OPENINGS TO BE LOCATED ON INSIDE LEG UNLESS OTHERWISE SPECIFIED.
2. PLASTIC COATED STEEL STEPS PRODUCED BY M.A. INDUSTRIES PART #PS3–PFC OR APPROVED EQUAL (SEE STEP DETAIL) ARE PROVIDED INSIDE ANY MODULE WHERE DEEMED NECESSARY. THE HIGHEST STEP IN THE MODULE IS TO BE PLACED A DISTANCE OF 1'–0" FROM THE INSIDE EDGE OF THE STORMTRAP MODULES. ALL ENSUING STEPS SHALL BE PLACED AT A DISTANCE BETWEEN 10" MIN AND 14" MAX BETWEEN THEM. STEPS MAY BE MOVED OR ALTERED TO AVOID OPENINGS OR OTHER IRREGULARITIES IN THE MODULE.
3. STORMTRAP LIFTING INSERTS MAY BE RELOCATED TO AVOID INTERFERENCE WITH ACCESS OPENINGS OR THE CENTER OF GRAVITY OF THE MODULE AS NEEDED.
4. STORMTRAP ACCESS OPENINGS MAY BE RELOCATED TO AVOID INTERFERENCE WITH INLET AND/OR OUTLET PIPE OPENINGS SO PLACEMENT OF STEPS IS ATTAINABLE.
5. ACCESS OPENINGS SHOULD BE LOCATED IN ORDER TO MEET THE APPROPRIATE MUNICIPAL REQUIREMENTS. STORMTRAP RECOMMENDS AT LEAST TWO ACCESS OPENINGS PER SYSTEM FOR ACCESS AND INSPECTION.
6. USE PRECAST ADJUSTING RINGS AS NEEDED TO MEET GRADE. STORMTRAP RECOMMENDS FOR COVER OVER 2' TO USE PRECAST BARREL OR CONE SECTIONS. (PROVIDED BY OTHERS)

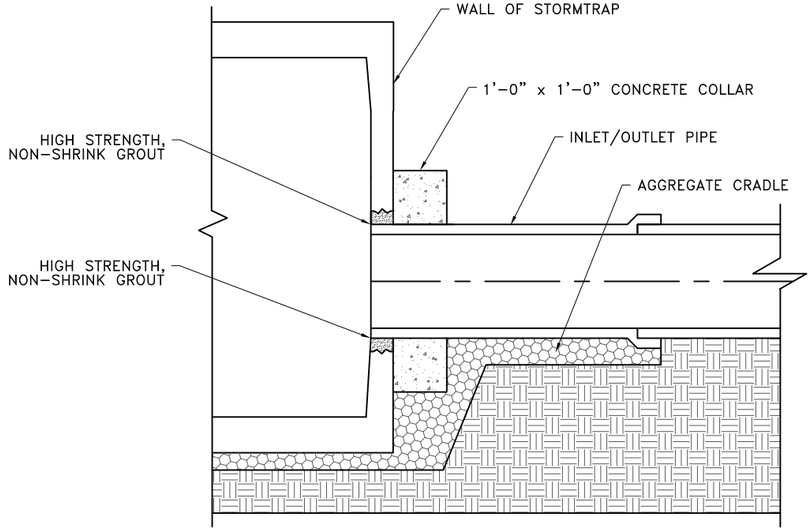
RECOMMENDED PIPE OPENING SPECIFICATION

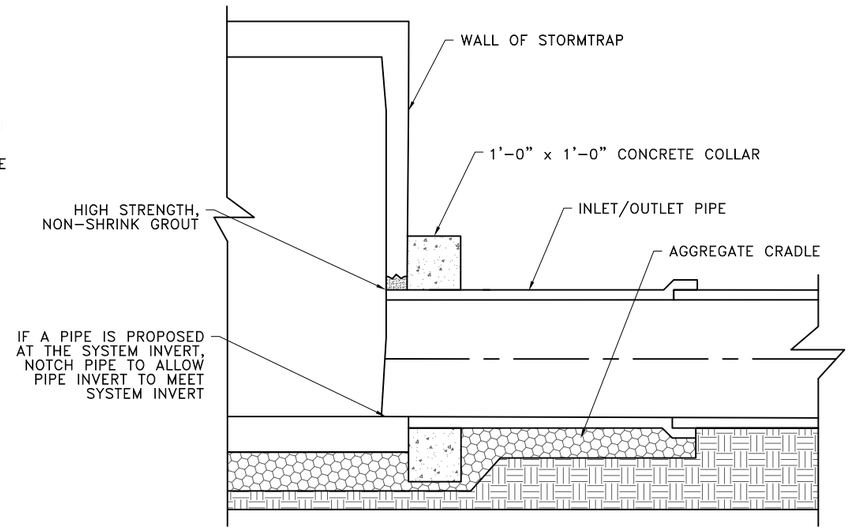
1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'–0".
2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.
3. CONNECTING PIPES SHALL BE INSTALLED WITH A 1'–0" CONCRETE COLLAR, AND AN AGGREGATE CRADLE FOR AT LEAST ONE PIPE LENGTH (SEE PIPE CONNECTION DETAIL). A STRUCTURAL GRADE CONCRETE OR HIGH STRENGTH, NON–SHRINK GROUT WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI SHALL BE USED.
4. THE ANNULAR SPACE BETWEEN THE PIPE AND THE HOLE SHALL BE FILLED WITH HIGH STRENGTH NON–SHRINK GROUT.

RECOMMENDED PIPE INSTALLATION INSTRUCTIONS

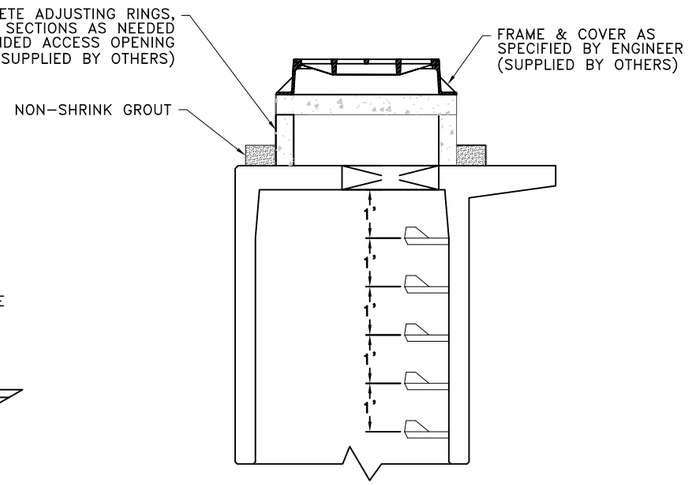
1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

NOTE: ALL ANCILLARY PRODUCTS/SPECIFICATIONS RECOMMENDED AND SHOWN ON THIS SHEET ARE RECOMMENDATIONS ONLY AND SUBJECT TO CHANGE PER THE INSTALLING CONTRACTOR AND/OR PER LOCAL MUNICIPAL CODE/REQUIREMENTS.

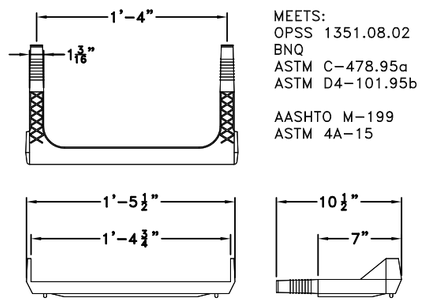




PIPE CONNECTION DETAIL



RISER / STAIR DETAIL



MEETS:
OPSS 1351.08.02
BNQ
ASTM C–478.95a
ASTM D4–101.95b

AASHTO M–199
ASTM 4A–15

STEP DETAIL

*** NOTICE *** 03–25–2022

DUE TO CURRENT INCONSISTENCIES IN THE 16" STEP SUPPLY, STORMTRAP MAY SUBSTITUTE THE 16" STEP WITH THE CLOSEST ALTERNATIVE LENGTH STEP UNTIL THE SUPPLY CHAIN ISSUE IS RESOLVED.

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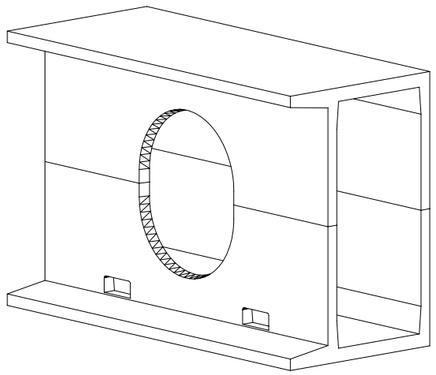
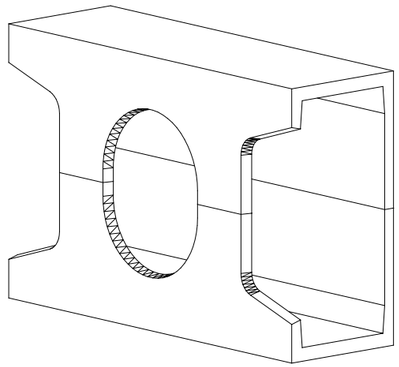
RECOMMENDED PIPE / ACCESS OPENING SPECIFICATIONS

SHEET NUMBER:

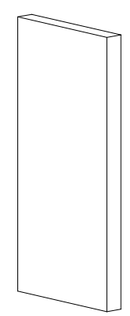
5.0



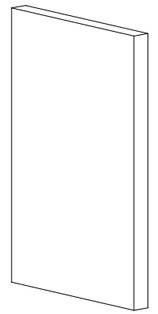
TYPE IV/IVNF



TYPE VII-3/VII-3NF



TYPE VII
END PANEL



TYPE IV
END PANEL

NOTES:
1. OPENING LOCATIONS AND SHAPES MAY VARY.
2. SP – INDICATES A MODULE WITH MODIFICATIONS.
3. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
4. POCKET WINDOW OPENINGS ARE OPTIONAL.

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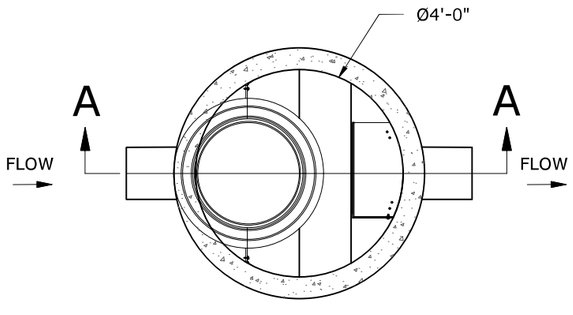
DOUBLETRAP
MODULE TYPES

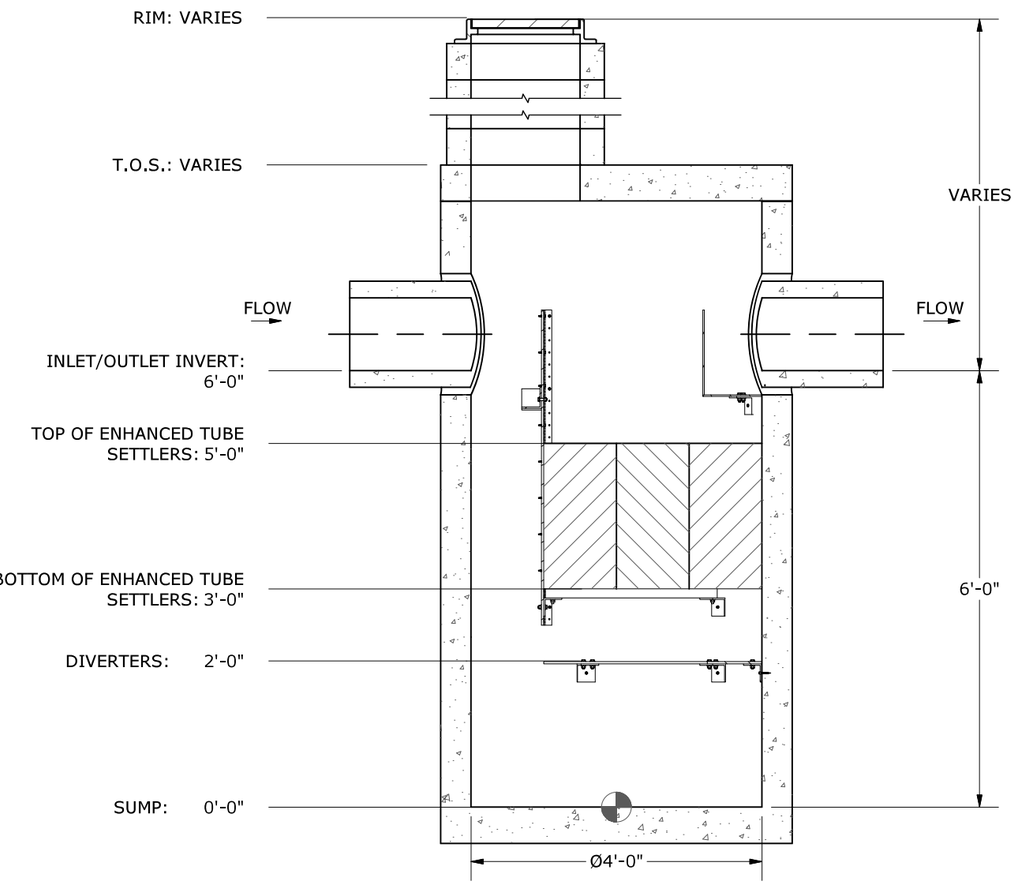
SHEET NUMBER:

6.0

SITE SPECIFIC DATA			
STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
SEDIMENT STORAGE CAPACITY (CF)			14.6
RIM ELEVATION			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			
OUTLET PIPE			



PLAN VIEW
N.T.S.



SECTION A-A
N.T.S.

DESIGN NOTES:

1. DESIGN LOADING:
   a. LOAD RATING = AASHTO HS-20
   b. MINUMUM COVER = 0.50', MAXIMUM COVER = 10.00'. CONTACT STORMTRAP FOR ADDITIONAL COVER OPTIONS.
   c. WATER TABLE AT OR BELOW OUTLET PIPE INVERT ELEVATION.
   d. NO LATERAL SURCHARGE FROM ADJACENT STRUCTURES SUCH AS VEGETATION, BUILDINGS, WALLS, OR FOUNDATIONS.
2. ENGINEER OF RECORD TO CONFIRM THE DESIGN LOADINGS MEET PROJECT REQUIREMENTS. CONTACT STORMTRAP FOR ALTERNATIVE DESIGN LOAD OPTIONS.

GENERAL NOTES:

1. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS, WEIGHTS, AND ACCESSORIES, PLEASE CONTACT YOUR STORMTRAP REPRESENTATIVE.
2. CONCRETE COMPONENTS SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM C478.
3. CONTRACTOR TO INSTALL THE STRUCTURE IN ACCORDANCE WITH ASTM C1821.
4. CONTRACTOR TO PROVIDE ALL LABOR AND EQUIPMENT REQUIRED TO OFFLOAD AND INSTALL UNIT.
5. CONTRACTOR TO PROVIDE AND INSTALL ALL PIPES, FRAMES, COVERS, HATCHES, AND RISERS UNLESS SPECIFIED OTHERWISE.
6. CONTRACTOR TO ADD JOINT SEALANT (PROVIDED BY STORMTRAP) BETWEEN ALL STRUCTURE SECTIONS.

DRAWINGS ARE FOR REFERENCE ONLY AND SHALL
NOT BE USED FOR CONSTRUCTION PURPOSES.

StormSettler™

StormTrap

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STORMSETTLER 4 STANDARD DETAIL

DRAWN BY:	DATE:	SCALE:	
KMW	9/6/22	NTS	SHEET 1 OF 1

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Use this checklist to ensure the required information has been included on the DMA Exhibit:

The DMA Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography and impervious areas
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed demolition
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
☒ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
☒ Structural BMPs (identify location, type of BMP, and size/detail)

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Harvest and Use Feasibility Checklist	Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☒ Toilet and urinal flushing
☒ Landscape irrigation
☐ Other:_____

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.

Toilet and urinal flushing demand: $\left(\frac{9.3gal}{person-day}\right)\left(\frac{1ft^3}{7.48gal}\right)\left[(16\ Units)\left(\frac{4\ person}{buidling}\right)\right](1.5day) = 119ft^3$

Irrigation demand: $\left(\frac{1470gal}{acre-1.5day}\right)\left(\frac{1ft^3}{7.48gal}\right)(1.5day)(0.17\ acre) = 50ft^3$

Total: 169 cubic-feet

3. Calculate the DCV using worksheet B-2.1.

1,148 cubic-feet

3a. Is the 36-hour demand greater than or equal to the DCV?	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36-hour demand less than 0.25DCV?
☐ Yes / ☒ No ⇨	☐ Yes / ☒ No ⇨	☒ Yes
⇩	⇩	⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible. 169 < 1,148(0.25) 169 < 287

Is harvest and use feasible based on further evaluation?

☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☒ No, select alternate BMPs.

Note: All rainwater harvest and use must comply with the California Plumbing Code (Sections 1702.9.3, 1702.9.4, etc.).

Categorization of Infiltration Feasibility Condition

Form I-8

Part 1 - Full Infiltration Feasibility Screening Criteria
Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Note that it is not necessary to investigate each and every criterion in the worksheet if infiltration is precluded. Instead a letter of justification from a geotechnical professional familiar with the local conditions substantiating any geotechnical issues will be required.

Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☒	☐

Provide basis:

Onsite percolation tests indicate soils have a measured infiltration rate of 3 in/hr at test boring location P-1 which is within the vicinity of the proposed infiltration BMP.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Please refer to the DMA Exhibit and BMP calculations included under SWQMP Attachment 1. Additional soils data is included in the *Geotechnical Investigation Proposed Multi-Family Residential Development 236 and 244 Pico Avenue* prepared by Global Geo-Engineering, Inc. (08/31/22).

2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☒	☐

Provide basis:

Yes – as such an infiltration BMP is being used on the project site.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Per the attached Geotechnical Study, proposed Infiltration will not impact soil stability or utilities in project area.

Form I-8 Page 2 of 4

Criteria	Screening Question	Yes	No
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐

Provide basis:

Yes – as such an infiltration BMP is being used on the project site.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

No nearby groundwater wells were found to be listed during review of California department of water resources website and per Fig. C3, Appendix 3 of BMP Manual historic Ground water is more than 15 feet below ground.

4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☒	☐

Provide basis:

Yes – as such an infiltration BMP is being used on the project site.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Proposed infiltration will not impact seasonality of ephemeral streams or increased discharge of contaminated ground water to surface water.

Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	☒ Yes ☐ No

Form I-8 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☐	☐

Provide basis:

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☐	☐

Provide basis:

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Form I-8 Page 4 of 4			
Criteria	Screening Question	**Yes**	**No**
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☐	☐
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
8	**Can infiltration be allowed without violating downstream water rights**? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☐	☐
Provide basis: Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	☐ Yes ☐ No	

GLOBAL GEO-ENGINEERING, INC.

August 31, 2022
Project 9421-04

DMS Consultants, Inc.
12377 Lewis Street, Suite 203
Garden Grove, California 92840

Attention: Mr. Surender Dewan, P. E.
President

Subject: Geotechnical Investigation
Proposed Multi-Family Residential Development
236 and 244 Pico Avenue
San Marcos, California

References: *See Appendix A*

Dear Mr. Dewan:

1. INTRODUCTION

a) In accordance with your request, we have conducted a geotechnical investigation for the proposed residential development located in San Marcos, California.

b) We understand that the proposed development will consist of the construction of four 3-story, multi-family residential structures, each unit approximately 1,170-squarefoot, with related parking/driveway areas on a 0.67-acre parcel of land. In addition, an infiltration system is planned to be installed for potential stormwater runoff.

c) Grading and structural plans are not available at present. We are assuming that the existing grades will remain unchanged. We anticipate the loads from the proposed structures will not exceed 3 kip/ft for the continuous footings and 50 kips for the column footings.

2. SCOPE

The scope of services we provided were as follows:

a) Preliminary planning and evaluations, and review of geotechnical reports related to the project site and nearby surrounding area *(See References – Appendix A)*;

3 Corporate Park, Suite 270, Irvine, California 92606
Office (949) 221-0900 Fax (949) 221-0091
Email: global@globalgeo.net

b) Excavation of three (3) borings utilizing a hollow stem auger drill rig to a maximum depth of 40 feet below ground surface. One of the borings was drilled to a depth of 5 feet below ground surface for the purpose of percolation testing;

c) Sampling and logging of subsurface materials encountered in the borings;

d) Field percolation testing to determine the infiltrations rate;

e) Laboratory testing of samples representative of those obtained in the field, in order to evaluate relevant engineering properties;

f) Engineering and geologic analyses of the field and laboratory data;

g) Preparation of a report presenting our findings, conclusions and recommendations.

3. FIELD EXPLORATION AND LABORATORY TESTING

The field exploration program is given in *Appendix B*, which includes the Logs of Borings. The results of the laboratory testing are included in *Appendix C.*

4. SITE DESCRIPTION

4.1 Location

a) The project site is located along the southwest side of Pico Avenue, approximately 280 feet northwest of San Marcos Boulevard, in the city of San Marcos, California.

b) The approximate site location is shown on the *Location Map, Figure 1.*

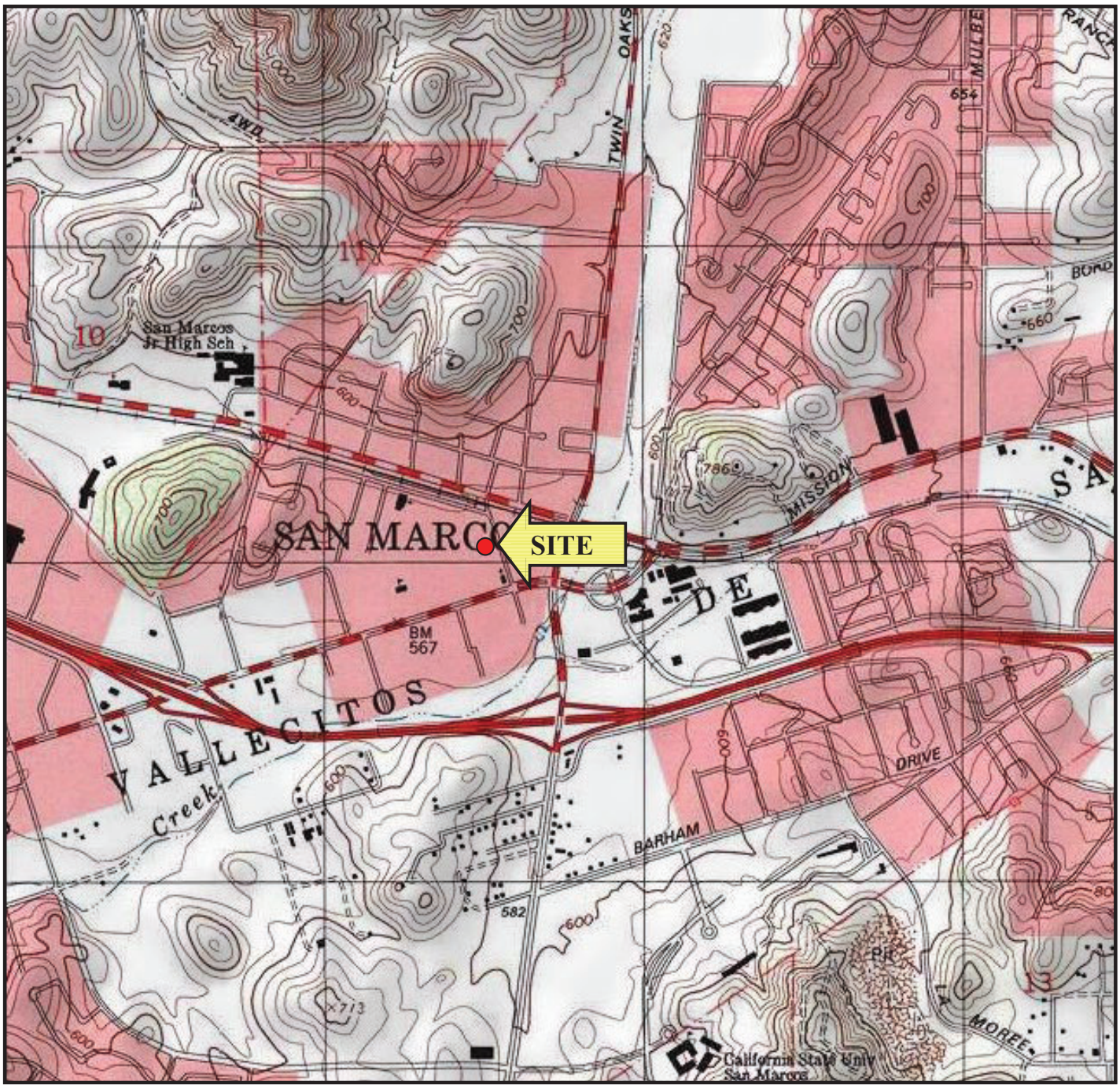
4.2 Existing Surface Conditions

a) The subject property is currently vacant and void of any building structures.

b) The ground surface throughout the project site is relatively level. The natural topography of the site area descends to the south at an approximate gradient of one percent.

c) Surface drainage consists of sheet flow runoff of incident rainfall water derived primarily within the property boundaries and adjacent properties.

LOCATION MAP



BASE MAP: USGS 7.5-Minute Topographic Map,
San Marcos Quadrangle, 1999

2000 0 2000 4000

SCALE FEET

NORTH

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA

244 Pico Avenue
San Marcos, California

Date: August 2022

Project No.: 9421-04

Figure No: 1

4.3 Geology

4.3.1 Regional Geologic Setting

The subject property is located within the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges consist of a series of mountain ranges separated by longitudinal valleys. The ranges trend northwest-southeast and are sub parallel to faults branching from the San Andreas Fault. The Peninsular Ranges extend from the southern side of the Santa Monica and San Gabriel Mountains into Baja California, Mexico (CDMG, 1997).

4.3.2 Local Geologic Setting

In general, the project site area is underlain by Recent- to Older-aged alluvial deposits which overlie granitic bedrock.

4.4 Subsurface Conditions

a) The subsurface conditions, as encountered in our explorations, are described in the following sections.

b) More detailed descriptions of the subsurface conditions are presented in our *Logs of Borings,* which are enclosed as *Figures B-2* through *B-4* in Appendix B. The locations of the borings are shown on our *Boring Location Plan, Figure B-5.*

4.4.1 Alluvium

a) Alluvial deposits were encountered in all of our borings excavated on-site.

b) The alluvium was found to generally consist of interlayers of Silty SAND, SAND and Sandy to Clayey SILT.

c) The Silty SAND and SAND sediments were generally found to be fine to coarse grained, slightly moist to very moist and medium dense.

d) The Sandy to Clayey SILT deposits were observed to be slightly moist to moist and stiff.

4.4.2 Bedrock

a) Bedrock, classified as Tonalite, was encountered at a depth of 37 feet below ground surface in Boring B-1.

b) The bedrock encountered in our boring was noted to be fine textured and hard.

4.4.3 Groundwater

a) Groundwater was encountered in our deeper boring (Boring B-1) at a depth of 24 feet below ground surface. The static water level was measured at a depth of 23.5 feet below ground surface approximately 30 minutes after termination of drilling.

b) No nearby groundwater wells were found to be listed during our review of the *California Department of Water Resources* internet website.

5. SEISMICITY

5.1 General

a) The property is located in the general proximity of several active and potentially active faults, which are typical for sites in the Southern California region. Earthquakes occurring on active faults within a 70-mile radius are capable of generating ground shaking of engineering significance to the proposed construction.

b) In Southern California, most of the seismic damage to manmade structures results from ground shaking and, to a lesser degree, from liquefaction and ground rupture caused by earthquakes along active fault zones. In general, the greater the magnitude of the earthquake, greater is the potential damage.

5.2 Ground Surface Rupture

a) The closest known active fault is the Elsinore Fault, located at a distance of about 16.3 miles northeast of the project site. Other nearby active or potentially active faults include the Rose Canyon Fault and the San Jacinto Fault located at distances of about 20.8 miles and 40.8 miles, respectively, from the subject property.

b) Due to the distance of the closest active fault to the site, ground rupture is not considered a significant hazard at the site.

5.3 Ground Shaking

a) We utilized the California Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps internet program to calculate the peak ground acceleration (PGA) at the project site location. Using the ASCE 7-16 standard and Site Class D, the PGA at the subject property resulted to be 0.47g.

b) *Figure 2* shows the geographical relationships among the site locations, nearby faults and the epicenters of significant occurrences. The project site is not located within any State of California delineated Earthquake Fault Zone; however, during historic times, a number of major earthquakes have occurred along the active faults in Southern California. From the seismic history of the region and proximity, the Elsinore Fault and Rose Canyon Fault have the greatest potential for causing earthquake damage related to ground shaking at this site.

5.4 Liquefaction

The subject site is underlain by dense soil layers overlying a Tonalite bedrock. The potential for the liquefaction is considered to be low.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

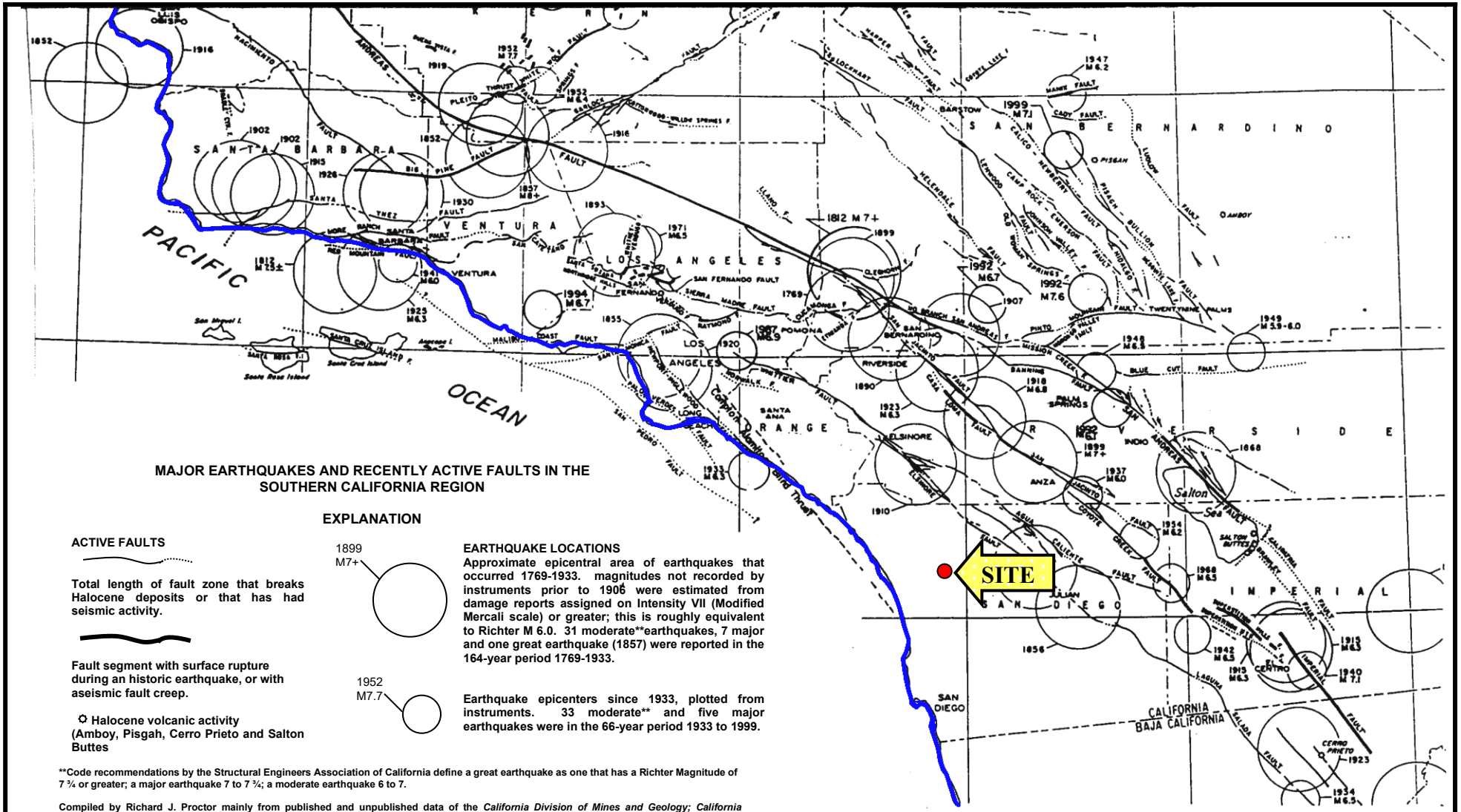
a) It is our opinion that the site will be suitable for the proposed development, from a geotechnical aspect, assuming that our recommendations are implemented.

b) We are of the opinion that the proposed structures can be supported on shallow spread footings founded in the existing competent soils.

c) We consider that the anticipated grading will not adversely affect, nor be adversely affected by adjoining property, with due precautions being taken.

d) The final grading plans and foundation plans/design loads should be reviewed by the Geotechnical Engineer.

e) The design recommendations in the report should be reviewed during the construction phase.



MAJOR EARTHQUAKES AND RECENTLY ACTIVE FAULTS IN THE SOUTHERN CALIFORNIA REGION

EXPLANATION

ACTIVE FAULTS

Total length of fault zone that breaks Holocene deposits or that has had seismic activity.

Fault segment with surface rupture during an historic earthquake, or with aseismic fault creep.

Halocene volcanic activity (Amboy, Pisgah, Cerro Prieto and Salton Buttes

1899 M7+

1952 M7.7

EARTHQUAKE LOCATIONS

Approximate epicentral area of earthquakes that occurred 1769-1933. magnitudes not recorded by instruments prior to 1906 were estimated from damage reports assigned on Intensity VII (Modified Mercali scale) or greater; this is roughly equivalent to Richter M 6.0. 31 moderate**earthquakes, 7 major and one great earthquake (1857) were reported in the 164-year period 1769-1933.

Earthquake epicenters since 1933, plotted from instruments. 33 moderate** and five major earthquakes were in the 66-year period 1933 to 1999.

**Code recommendations by the Structural Engineers Association of California define a great earthquake as one that has a Richter Magnitude of 7 ¾ or greater; a major earthquake 7 to 7 ¾; a moderate earthquake 6 to 7.

Compiled by Richard J. Proctor mainly from published and unpublished data of the *California Division of Mines and Geology; California Department of Water Resources Bulletin 116-2* (1964); selections from bulletins of the *Geological* and *Seismological Societies of America*; from C.F. Richter, *Elementary Seismology* (1958); and the *National Atlas*, p. 66, and from Working Group on California Earthquake Probabilities- SSA Bulletin V 85.

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING
IRVINE, CALIFORNIA

244 Pico Avenue
San Marcos, California

Date: August 2022

Project No: 9421-04

Figure No: 2

6.2 Grading

6.2.1 Processing of On-Site Soils

a) To provide uniform support conditions, the subgrade soils should be overexcavated to a depth of one foot below the foundation bottom and three feet below the slab-on-grade, subject to review during construction. The overexcavation should laterally extend for a distance of 5 feet.

b) There should be at least one foot of reworked soils or compacted fill below the pavements.

c) Wherever structural fills are to be placed, the upper 6 to 8 inches of the subgrade should, after stripping or overexcavation, first be scarified, reworked and wetted down thoroughly.

d) Any loosening of reworked or native material, consequent to the passage of construction traffic, weathering, etc., should be made good prior to further construction.

e) The depths of overexcavation should be reviewed by the Geotechnical Engineer during the actual construction. Any surface or subsurface obstructions, or questionable material encountered during grading should be brought immediately to the attention of the Geotechnical Engineer for proper exposure, removal or processing as directed. No underground obstructions or facilities should remain in any structural areas. Depressions and/or cavities created as a result of the removal of obstructions should be backfilled properly with suitable material, and compacted.

6.2.2 Material Selection

After the site has been stripped of any debris, vegetation and organic soils, excavated on-site soils are considered satisfactory for reuse in the construction of on-site fills, with the following provisions:

a) Significant water will be required to be added to the existing soils;

b) The organic content does not exceed 3 percent by volume;

c) Large size rocks greater than 8 inches in diameter should not be incorporated in compacted fill;

d) Rocks greater than 4 inches in diameter should not be incorporated in compacted fill to within one foot of the underside of the footings and slabs.

6.2.3 Compaction Requirements

a) Reworking/compaction shall include moisture-conditioning as needed to bring the soils to slightly above the optimum moisture content. All reworked soils and structural fills should be densified to achieve at least 90 percent relative compaction with reference to laboratory compaction standard. The optimum moisture content and maximum dry density should be determined in the laboratory in accordance with ASTM Test Designation D1557.

b) Fill should be compacted in lifts not exceeding 8 inches (loose).

6.2.4 Excavating Conditions

a) Excavation of on-site materials may be accomplished with standard earthmoving or trenching equipment. No hard rock was encountered which will require blasting.

b) Ground water was encountered at a depth of 24 feet below ground surface in our deeper boring. Dewatering is not anticipated in excavations shallower than 24 feet below ground surface.

6.2.5 Shrinkage

For preliminary earthwork calculation, an average shrinkage factor of approximately 5 percent is recommended for the soils (this does not include handling losses).

6.2.6 Expansion Potential

a) Based upon our visual observations, the expansion potential for the on-site soils is considered to be *medium*. The recommendations provided in the following sections will reduce the effects of the expansive subgrade soils.

b) Any imported material, or doubtful material exposed during grading, should be evaluated for its expansive properties.

c) In any event, the subgrade soils should be tested for their expansion potential or during the final stages of grading.

6.2.7 Sulphate Content

a) The sulphate contents of representative samples of the soil are less than 0.1%. The sulphate exposure is considered to be *negligible*. Type II Portland cement is recommended for the construction.

a) The fill materials should be tested for their sulphate content during the final stage of rough grading.

6.2.8 Utility Trenching

a) The walls of temporary construction trenches in fill should stand nearly vertical, with only minor sloughing, provided the total depth does not exceed 3 feet (approximately). Shoring of excavation walls or flattening of slopes may be required, if greater depths are necessary.

b) Trenches should be located so as not to impair the bearing capacity or to cause settlement under foundations. As a guide, trenches should be clear of a 45-degree plane, extending outward and downward from the edge of foundations. Shoring should comply with Cal-OSHA regulations.

c) Existing soils may be utilized for trenching backfill, provided they are free of organic materials.

d) All work associated with trench shoring must conform to the state and federal safety codes.

6.2.9 Surface Drainage Provisions

Positive surface gradients should be provided adjacent to the buildings to direct surface water run-off away from structural foundations and to suitable discharge facilities.

6.2.10 Grading Control

All grading and earthwork should be performed under the observation of a Geotechnical Engineer in order to achieve proper subgrade preparation, selection of satisfactory materials, placement and compaction of all structural fill. Sufficient notification prior to stripping and earthwork construction is essential to make certain that the work will be adequately observed and tested.

6.3 Slab-on-Grade

a) Concrete floor slabs may be founded on the reworked existing soils or compacted fill.

b) The slab should be underlain by four inches of granular material. A plastic vapor barrier is recommended to be placed at the mid-height of the base layer.

c) It is recommended that #4 bars on 12-inch center, both ways, or equivalent be provided as minimum reinforcement in slabs-on-grade. Joints should be provided and slabs supporting no vehicular traffic should be at least 5 inches thick.

d) The FFL should be at least 6 inches above highest adjacent grade.

e) The subgrade soils should be kept moist prior to the concrete pour.

6.4 Spread Foundations

The proposed structures can be founded on shallow spread footings. The criteria presented as follows should be adopted:

6.4.1 Dimensions/Embedment Depths

Number of Stories (floors supported)	**Minimum Width (ft.)**	**Minimum Footing Thickness (in.)**	**Minimum Embedment Below Lowest Finished Surface (ft.)**	
3	1.5	6	Perimeter	2.5
			Interior	2.5
Square Column Footings To 50 kip	2	-		2.5

6.4.2 Allowable Bearing Capacity

Embedment Depth (ft.)	**Allowable Bearing Capacity (lb/ft^2)**
1.0	2,000

(Notes:

- The allowable bearing capacity may be increased by 800 lb/ft^2 for each additional foot increase in the depth or by 200 lb/ft^2 he width to a maximum value of 4,000 lb/ft^2;

- These values may be increased by one-third in the case of short-duration loads, such as induced by wind or seismic forces;
- At least 2x#4 bars should be provided in wall footings, one on top and one at the bottom;
- In the event that footings are founded in structural fills consisting of imported materials, the allowable bearing capacities will depend on the type of these materials, and should be re-evaluated;
- Bearing capacities should be re-evaluated when loads have been obtained and footings sized during the preliminary design;
- Planter areas should not be sited adjacent to walls;
- Footing excavations should be observed by the Geotechnical Engineer;
- Footing excavations should be kept moist prior to the concrete pour;
- It should be insured that the embedment depths do not become reduced or adversely affected by erosion, softening, planting, digging, etc.)

6.4.3 Settlements

Total and differential settlements under spread footings are expected to be within tolerable limits and are not expected to exceed 1 and ¾ inches in a horizontal distance of 40 feet, respectively.

6.5 Lateral Pressures

a) The following lateral pressures are recommended for the design of retaining structures.

		Pressure (lb/ft^2/ft depth)	
Lateral Force	**Soil Profile**	**Unrestrained Wall**	**Rigidly Supported Wall**
Active Pressure	Level	36	-
At-Rest Pressure	Level	-	65
Passive Resistance (ignore upper 1.5 ft.)	Level	300	-

b) Friction coefficient: 0.35 (includes a Factor of Safety of 1.5). While combining friction with passive resistance, reduce passive by 1/3.

c) These values apply to the existing soil, and to compacted backfill generated from in-situ material. Imported material should be evaluated separately. It is recommended that where feasible, imported granular backfill be utilized, for a width equal to approximately one-quarter the wall height, and not less than 1.5 feet.

d) Backfill should be placed under engineering control.

e) Subdrains comprised of 4-inch perforated SDR-35 or equivalent PVC pipe covered in a minimum of one cubic foot per linear foot of filter rock and wrapped in Mirafi 140N filter fabric should be provided behind retaining walls.

6.6 Seismic Coefficients and Liquefaction Potential

a) For seismic analysis of the proposed project in accordance with the seismic provisions of ASCE 7-16, we recommend the following:

ITEM	VALUE
Site Latitude (Decimal-degrees)	33.14197
Site Longitude (Decimal-degrees)	-117.16598
Site Class	D
Risk Category	II
Mapped Spectral Response Acceleration-Short Period (0.2 Sec) - S_S	0.897
Mapped Spectral Response Acceleration-1 Second Period – S_1	0.33
Short Period Site Coefficient-F_a	1.141
Long Period Site Coefficient F_v	1.90
Adjusted Spectral Response Acceleration @ 0.2 Sec. Period (Sms)	1.024
Adjusted Spectral Response Acceleration @ 1Sec.Period (S_{m1})	0.627
Design Spectral Response Acceleration @ 0.2 Sec. Period (S_{Ds})	0.682
Design Spectral Response Acceleration @ 1-Sec. Period (S_{D1})	0.418

b) Ground water was encountered at a depth of 24 feet below ground surface, however, the subject site is underlain by dense soil layers. The potential for liquefaction is considered to be low.

6.7 Pavement Design

6.7.1 Asphalt Pavement Section

a) Based on Traffic Indices (T.I) and on the anticipated "R" – Value of 42 of the subgrade, the following tentative structural pavement sections are recommended.

Location	T.I.	Asphaltic Concrete (inches)	Aggregate Base (inches)
Parking and Driveways	Up to 5.0	3	4
Driveway (light truck traffic)	6.0	3	6

b) The subgrade soils should be tested for R-Value at the conclusion of rough grading and the pavement sections should be finalized then.

6.7.2 Subgrade Preparation

Subgrade soils within the upper 12 inches of finished grade shall be moisture-conditioned where necessary, shall be compacted to at least 90 percent relative compaction per ASTM D1557, and shall be free of any loose or soft areas.

6.7.3 Base Preparation

Unless otherwise specified, the base shall consist of Class II ¾-inch aggregate base or approved Crushed Miscellaneous Base. The base shall be compacted to a minimum of 95 percent relative compaction in accordance with the procedures described in ASTM Test Method D1557.

6.7.4 Concrete Pavement

If proposed, the concrete pavement should be at least 5 inches thick, reinforced with #4 bars on 12 inches center bothways, underlain by 4 inches thick base as recommended above. Thicker concrete section will be required for traffic greater than T.I. of 6.0.

6.8 Corrosion Potential

a) Soil Corrosion potential for metal and concrete was estimated by performing water-soluble sulfate, chloride, pH, and electrical resistivity tests during this investigation.

b) Electrical resistivity is a measure of soil resistance to the flow of corrosion currents. Corrosion currents are generally high in low resistivity soils. The electrical resistivity of a soil decreases primarily with an increase in its chemical and moisture contents.

c) A commonly accepted correlation between electrical resistivity and corrosivity for buried ferrous metals is presented below:

Electrical Resistivity, Ohm-cm	**Corrosion Potential**
Less than 1,000	Severe
1,000-2,000	Corrosive
2,000-10,000	Moderate
Greater than 10,000	Mild

d) Results of electrical resistivity test indicate a value of 3,339 ohm-cm for the near-surface soils. Based on this data, it is our opinion that, in general, on-site near-surface soils are considered *moderately corrosive* in nature. This potential should be considered in design of underground metal pipes.

6.9 Percolation Study

a) The soils in the upper 5 feet were Clayey Silty SAND underlain by Silty SAND/Sandy SILT. We recommend the basin to be at least 6 feet deep.

b) As more granular soils are anticipated at that depth, we estimate the following infiltration rate. During the grading operation, a percolation test should be conducted to verify the infiltration rate.

Boring No.	**Percolation Rate (inch/hour)**
P-1	3.0

c) These rates are calculated using a factor of safety of 1.0. Appropriate factor of safety should be utilized while designing the basin.

7. LIMITATIONS

a) Soils and bedrock over an area show variations in geological structure, type, strength and other properties from what can be observed, sampled and tested from specimens extracted from necessarily limited exploratory borings. Therefore, there are natural limitations inherent in making geologic and soil engineering studies and analyses. Our findings, interpretations, analyses and recommendations are based on observation, laboratory data and our professional experience; and the projections we make are professional judgments conforming to the usual standards of the profession. No other warranty is herein expressed or implied.

b) In the event that during construction, conditions are exposed which are significantly different from those described in this report, they should be brought to the attention of the Geotechnical Engineer.

The opportunity to be of service is sincerely appreciated. If you have any questions or if we can be of further assistance, please call.

Very truly yours,

GLOBAL GEO-ENGINEERING, INC.

Mohan B. Upasani
Principal Geotechnical Engineer
RGE 2301
(Exp. March 31, 2023)

Kevin B. Young
Principal Engineering Geologist
CEG 2253
(Exp. October 31, 2023)

MBU/KBY: fdg

Enclosures:

Location Map	- Figure 1
Seismicity Map	- Figure 2
References	- Appendix A
Field Exploration	- Appendix B
Unified Soils Classification System	Figure B-1
Logs of Borings	Figures B-2 through B-3
Boring Location Plan	Figure B-4
Laboratory Testing	- Appendix C

APPENDIX A

References

1. California Geological Survey, *Earthquake Fault Zones of Required Investigation,* (Internet).

2. California Division of Mines and Geology, 1996, *Geologic Maps of the Northwestern Part of San Diego County, California,* CDMG Open File Report 96-02.

3. California Office of Statewide Health Planning and Development, Seismic Design Maps Web Tool, ASCE 7-16 Standard (Internet).

4. United States Geological Survey, 1948, San Marcos Quadrangle, 7.5-Minute Topographic Series.

5. United States Geological Survey, 1968, San Marcos Quadrangle, 7.5-Minute Topographic Series.

6. United States Geological Survey, 1968 photorevised 1983, San Marcos Quadrangle, 7.5-Minute Topographic Series.

APPENDIX B

Field Exploration

a) The site was explored on May 17, 2022, utilizing a B-61 Mobile hollow stem drill rig to excavate three borings to a maximum depth of 40 feet below the existing ground surface. One of the borings were subsequently backfilled. Three-inch diameter perforated pipe with gravel rock encasement was installed in Boring P-1 for the purpose of percolation testing

b) The soils encountered in the excavations were logged and sampled by our Engineering Geologist. The soils were classified in accordance with the Unified Soil Classification System described in *Figure B-1*. The Logs of Borings are presented in *Figures B-2 through B-4*. The approximate locations of the borings are shown on the *Boring Location Plan, Plate 1*. The logs, as presented, are based on the field logs, modified as required from the results of the laboratory tests. Driven ring and bulk samples were obtained from the excavations for laboratory inspection and testing. The depths at which the samples were obtained are indicated on the logs.

c) The number of blows of the driving weight during sampling was recorded, together with the depth of penetration, the driving weight and the height of fall. The blows required per foot of penetration for given samples was then calculated and shown on the logs.

d) Groundwater was encountered at a depth of 24 feet below ground surface in Boring B-1.

e) Caving occurred in all of the borings to the depths noted on the logs.

UNIFIED SOILS CLASSIFICATION (ASTM D-2487)

PRIMARY DIVISION			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of materials is larger than #200 sieve size	GRAVELS More than half of coarse fraction is larger than #4 sieve	Clean Gravels (<5% fines)	GW	Well graded gravels, gravel-sand mixture, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		Gravel with Fines	GM	Silty gravels, gravel-sand-silt mixture. Non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures. Plastic fines
	SANDS More than half of coarse fraction is smaller than #4 sieve	Clean Sands (<5% fines)	SW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		Sands with Fines	SM	Silty sands, sand-silt mixtures. Non-Plastic fines.
			SC	Clayey sands, sand-clay mixtures. Plastic fines.
FINE GRAINED SOILS More than half of material is smaller than #200 sieve size	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts, with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
	Highly Organic Soils		PT	Peat and other highly organic soils.

CLASSIFICATION BASED ON FIELD TESTS

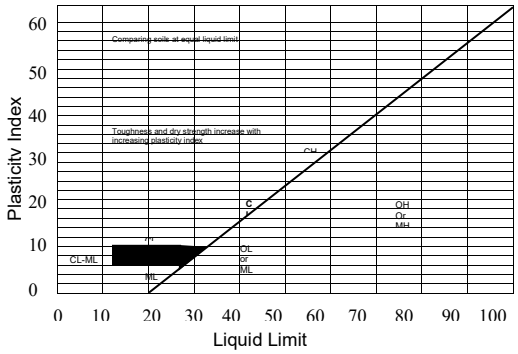
PENETRATION RESISTANCE (PR)	
Sands and Gravels	
Relative Density	Blows/foot
Very loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Clays and Silts		
Consistency	Blows/foot*	Strength**
Very Soft	0-2	0-½
Soft	2-4	¼-½
Firm	4-8	½-1
Stiff	8-15	1-2
Very Stiff	15-30	2-4
Hard	Over 30	Over 4

*Numbers of blows of 140 lb hammer falling 30 inches to drive a 2-inch O.D. (1 3/8 in. I.D.) Split Barrel sampler (ASTM-1568 Standard Penetration Test)

**Unconfined Compressive strength in tons/sq. ft. Read from pocket penetrometer

CLASSIFICATION CRITERIA BASED ON LAB TESTS



Plasticity chart for laboratory Classification of Fine-grained soils

GW and SW – $C_u = D_{60}/D_{10}$ greater than 4 for GW and 6 for SW; $C_c = (D_{30})^2/D_{10} \times D_{60}$ between 1 and 3

GP and SP – Clean gravel or sand not meeting requirement for GW and SW

GM and SM – Atterberg limit below "A" line or P.I. less than 4

GC and SC – Atterberg limit above "A" line P.I. greater than 7

CLASSIFICATION OF EARTH MATERIAL IS BASED ON FIELD INSPECTION AND SHOULD NOT BE CONSTRUED TO IMPLY LABORATORY ANALYSIS UNLESS SO STATED.

Fines (Silty or Clay)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobbles	Boulders
Sieve Sizes 200	40	10	4	¾"	3"	10"	

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING, IRVINE, CALIFORNIA

244 Pico Avenue
San Marcos, California

Date: August 2022

Project No.: 9421-04

Figure No.: B-1

Global Geo-Engineering, Inc.
Irvine, California

Geologists and Geotechnical Engineers

244 Pico Avenue
San Marcos, California

Project 9421-04

LOG OF BORING B-1

Date : May 17, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type
- Ring
- Bulk
- Standard Penetration Testing

Water Levels
- Groundwater Encountered
- Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compactior	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
		7.6	116.7	55			SM		Clayey Silty SAND: fine to medium grained, light reddish brown, slightly moist, medium dense
5		6.8	112.6	29			SM/ML		Silty SAND: fine grained, yellow brown, slightly moist, medium dense with SILT interbeds
10		12.9	116.2	100					
		15.0	115.5	39			ML		Clayey SILT: light reddish to reddish brown, slightly moist to moist, stiff
15									
		19.3	109.6	38					@19' moist
20									
		15.0	115.4	23		▼	SP		SAND: medium to coarse grained, reddish brown, very moist to wet, medium dense, water encountered
25									

Figure B-2.1

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Irvine, California
Geologists and Geotechnical Engineers

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San Marcos, California

Project 9421-04

LOG OF BORING B-1

Date : May 17, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
25							SP		
30	☒	19.5	106.0	18			SP/ML		@29' fine to medium grained with SILT interbeds
35	☒	17.2	104.9	12					@34' medium grained, olive brown ALLUVIUM
40	☒	9.1	129.3	100			GR		TONALITE: fine textured, hard BASEMENT ROCK
45									Bottom of Boring at 40 feet:
50									

Notes:
1. Caving to 23 feet after augers were removed
2. Water encountered at 24', Static water level measured at 23.5'
3. Boring backfilled

Figure B-2.2

Global Geo-Engineering, Inc.
Irvine, California
Geologists and Geotechnical Engineers

244 Pico Avenue
San Marcos, California

Project 9421-04

LOG OF BORING B-2

Date : May 17, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0							CL/ML		Sandy Silty CLAY: reddish brown, slightly moist, medium stiff with Clayey SILT interbeds
	☒	13.5	113.8	20					
							ML		Sandy SILT: yellow to light reddish brown, slightly moist, stiff
5	☒	11.0	107.2	45					
	☒	11.2	112.5	35			ML/SM		@9' with Silty SAND interbeds
10									
							ML		Clayey SILT: olive gray to light reddish brown, slightly moist, stiff
	☒	14.0	114.2	48					
15									
	☒	12.0	113.4	20			SM		Clayey Silty SAND: fine to medium grained, light reddish brown, moist, medium dense ALLUVIUM
20									Bottom of Boring at 20 feet:
25									

Notes:
1. Caving to 15.5 feet after augers were removed
2. No groundwater or seepage encountered
3. Boring backfilled

Figure B-3

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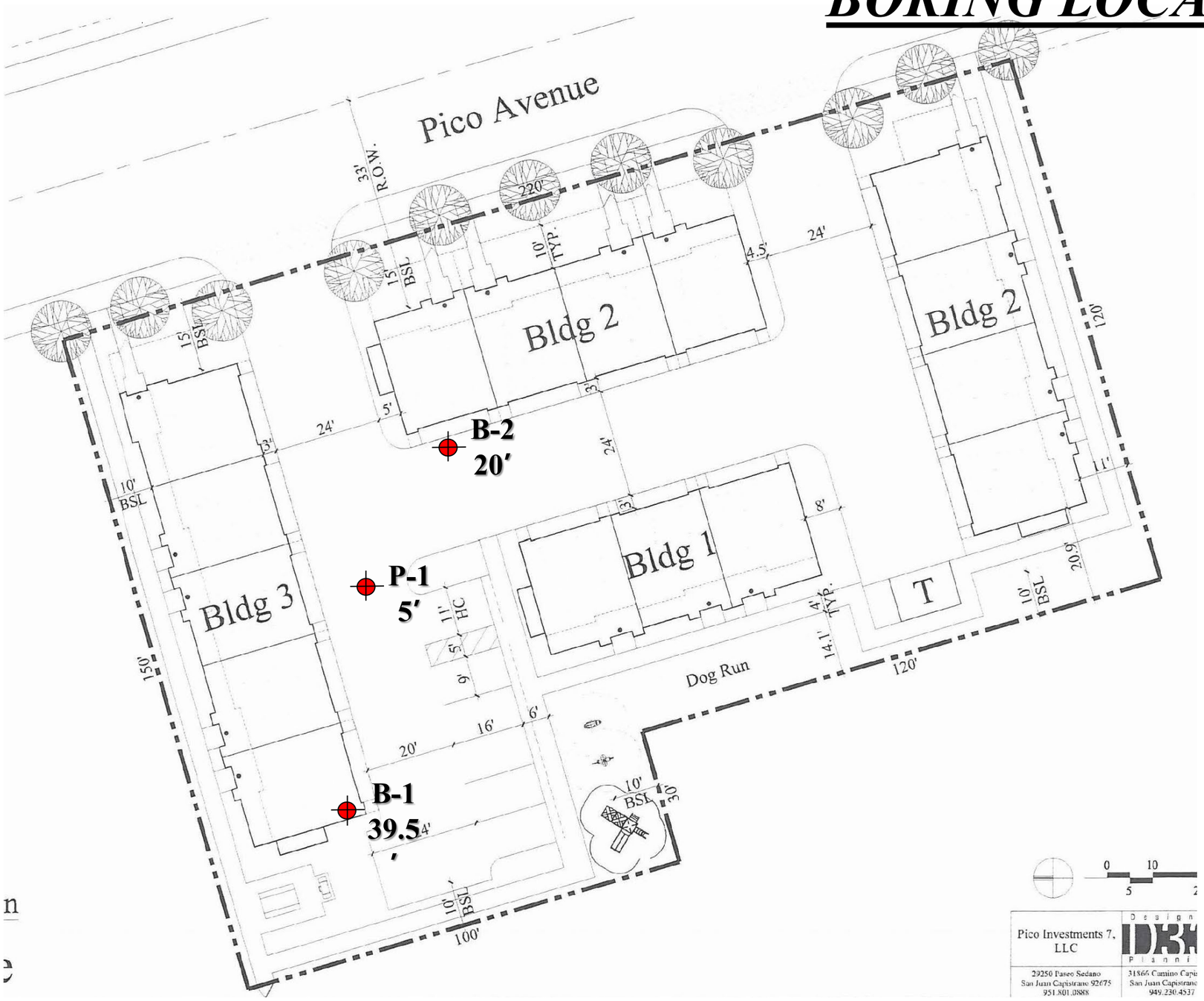
BORING LOCATION PLAN



Not to Scale

KEY

B-2 20′ Approximate Location of Boring, Showing Total Depth

P-1 5′ Approximate Location of Percolation Boring, Showing Total Depth

N

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GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA

244 Pico Avenue
San Marcos, California

Date: January 2023

Project No.: 9421-04

Figure No: B-5

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APPENDIX C

Laboratory Testing Program

The laboratory-testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested as described below.

a) Moisture and Density

Moisture-density information usually provides a gross indication of soil consistency. Local variations at the time of the investigation can be delineated, and a correlation obtained between soils found on this site and nearby sites. The dry unit weights and field moisture contents were determined for selected samples. The results are shown on the Logs of Borings.

b) Compaction

A representative soil sample was tested in the laboratory to determine the maximum dry density and optimum moisture content, using the ASTM D1557 compaction test method. This test procedure requires 25 blows of a 10-pound hammer falling a height of 18 inches on each of five layers, in a 1/30 cubic foot cylinder. The results of the test are presented below.

Boring No.	Sample Depth (ft.)	Soil Description	Optimum Moisture Content (%)	Maximum Dry Density (lb/ft^3)
B-1	1-3	Clayey Silty SAND	9.9	127.3

c) Direct Shear

Direct shear tests were made on remolded samples, using a direct shear machine at a constant rate of strain. Variable normal or confining loads are applied vertically and the soil shear strengths are obtained at these loads. The angle of internal friction and the cohesion are then evaluated. The samples were tested at saturated moisture contents. The results are shown below in terms of the Coulomb shear strength parameters.

Boring No.	Sample Depth (ft)	Soil Description	Coulomb Cohesion (lb/ft^2)	Angle of Internal Friction (°)	Peak/Residual
B-1	1-3	Clayey Silty SAND	250 250	29 29	Peak Ultimate

d) Sulfate Content

A representative soil sample was analyzed for its sulphate content. The results are given below:

Boring No.	Sample Depth (ft.)	Soil Description	Sulphate Content (%)
B-1	1-3	Clayey Silty SAND	0.0026

e) Chloride Content

A representative soil sample was analyzed for chloride content in accordance with California Test Method CA422. The result is given below:

Boring No.	Sample Depth (ft)	Soil Description	Chloride Content (%)
B-1	1-3	Clayey Silty SAND	0.0023

f) Resistivity and pH

A representative soil sample was analyzed in accordance with California Test Methods CA532 and CA643 to determine the minimum resistivity and pH. The result is provided below:

Boring No.	Sample Depth (ft)	Soil Description	pH	Minimum Resistivity (Ohm-cm)
B-1	1-3	Clayey Silty SAND	8.1	3,339

g) Expansion Potential

Surface soils were collected in the field and tested in the laboratory in accordance with the ASTM Test Designation D4829. The degree of expansion potential is determined from soil volume changes occurring during saturation of the specimen. The results of the tests are presented below:

Boring No.	Sample Depth (ft)	Soil Description	Expansion Index	Expansion Potential
B-2	2	Sandy Silty CLAY	70	Medium

Worksheet D.5-1: Factor of Safety and Design Infiltration Rate Worksheet

Factor of Safety and Design Infiltration Rate Worksheet			Worksheet D.5-1		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.5
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.5
B	Design	Level of pretreatment/ expected sediment loads	0.5	1	0.5
		Redundancy/resiliency	0.25	2	0.5
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1.25
Combined Safety Factor, $S_{total} = S_A \times S_B$					1.5 x 1.25 = 2.19
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					3.0 in/hr
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$					3/2.19 = 1.37 in/hr
Supporting Data					
Briefly describe infiltration test and provide reference to test forms:					

Automated Worksheet B.1: Calculation of Design Capture Volume (V2.0)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
Standard Drainage Basin Inputs	1	Drainage Basin ID or Name	DMA-1										unitless
	2	85th Percentile 24-hr Storm Depth	0.67										inches
	3	Impervious Surfaces Not Directed to Dispersion Area (C=0.90)	21,975										sq-ft
	4	Semi-Pervious Surfaces Not Serving as Dispersion Area (C=0.30)											sq-ft
	5	Engineered Pervious Surfaces Not Serving as Dispersion Area (C=0.10)	7,407										sq-ft
	6	Natural Type A Soil Not Serving as Dispersion Area (C=0.10)											sq-ft
	7	Natural Type B Soil Not Serving as Dispersion Area (C=0.14)											sq-ft
	8	Natural Type C Soil Not Serving as Dispersion Area (C=0.23)											sq-ft
	9	Natural Type D Soil Not Serving as Dispersion Area (C=0.30)											sq-ft
Dispersion Area, Tree Well & Rain Barrel Inputs (Optional)	10	Does Tributary Incorporate Dispersion, Tree Wells, and/or Rain Barrels?	No	No	No	No	No	No	No	No	No	No	yes/no
	11	Impervious Surfaces **Directed to Dispersion Area** per SD-B (Ci=0.90)											sq-ft
	12	Semi-Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	13	Engineered Pervious Surfaces **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	14	Natural Type A Soil **Serving as Dispersion Area** per SD-B (Ci=0.10)											sq-ft
	15	Natural Type B Soil **Serving as Dispersion Area** per SD-B (Ci=0.14)											sq-ft
	16	Natural Type C Soil **Serving as Dispersion Area** per SD-B (Ci=0.23)											sq-ft
	17	Natural Type D Soil **Serving as Dispersion Area** per SD-B (Ci=0.30)											sq-ft
	18	Number of Tree Wells Proposed per SD-A											#
	19	Average Mature Tree Canopy Diameter											ft
	20	Number of Rain Barrels Proposed per SD-E											#
	21	Average Rain Barrel Size											gal
Initial Runoff Factor Calculation	22	Total Tributary Area	29,382	0	0	0	0	0	0	0	0	0	sq-ft
	23	Initial Runoff Factor for Standard Drainage Areas	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	24	Initial Runoff Factor for Dispersed & Dispersion Areas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	25	Initial Weighted Runoff Factor	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	26	Initial Design Capture Volume	1,148	0	0	0	0	0	0	0	0	0	cubic-feet
Dispersion Area Adjustments	27	Total Impervious Area Dispersed to Pervious Surface	0	0	0	0	0	0	0	0	0	0	sq-ft
	28	Total Pervious Dispersion Area	0	0	0	0	0	0	0	0	0	0	sq-ft
	29	Ratio of Dispersed Impervious Area to Pervious Dispersion Area	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	ratio
	30	Adjustment Factor for Dispersed & Dispersion Areas	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	ratio
	31	Runoff Factor After Dispersion Techniques	0.70	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	unitless
	32	Design Capture Volume After Dispersion Techniques	1,148	0	0	0	0	0	0	0	0	0	cubic-feet
Tree & Barrel Adjustments	33	Total Tree Well Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Total Rain Barrel Volume Reduction	0	0	0	0	0	0	0	0	0	0	cubic-feet
Results	35	Final Adjusted Runoff Factor	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	36	Final Effective Tributary Area	20,567	0	0	0	0	0	0	0	0	0	sq-ft
	37	Initial Design Capture Volume Retained by Site Design Elements	0	0	0	0	0	0	0	0	0	0	cubic-feet
	38	Final Design Capture Volume Tributary to BMP	1,148	0	0	0	0	0	0	0	0	0	cubic-feet

No Warning Messages

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B.4.1 Simple Method

Stepwise Instructions:

1. Compute DCV using Worksheet B.4-1
2. Estimate design infiltration rate using Worksheet D.5-1
3. Design BMP(s) to ensure that the DCV is fully retained (i.e., no surface discharge during the design event) and the stored effective depth draws down in no longer than 36 hours.

Worksheet B.4-1: Simple Sizing Method for Infiltration BMPs

Simple Sizing Method for Infiltration BMPs		Worksheet B.4-1		
1	DCV (Worksheet B-2.1)	DCV=	**1,148**	cubic-feet
2	Estimated design infiltration rate (Worksheet D.5-1)	K_{design}=	**1.37**	in/hr
3	Available BMP surface area	A_{BMP}=	**400**	sq-ft
4	Average effective depth in the BMP footprint (DCV/A_{BMP})	D_{avg}=	**3.0**	feet
5	Drawdown time, T (D_{avg} *12/K_{design})	T=	**26.3**	hours
6	Provide alternative calculation of drawdown time, if needed.			

Notes:

- Drawdown time must be less than 36 hours. This criterion was set to achieve average annual capture of 80% to account for back to back storms (See rationale in Section B.4.3). In order to use a different drawdown time, BMPs should be sized using the percent capture method (Section B.4.2).
- The average effective depth calculation should account for any aggregate/media in the BMP. For example, 4 feet of stone at a porosity of 0.4 would equate to 1.6 feet of effective depth.
- This method may overestimate drawdown time for BMPs that drain through both the bottom and walls of the system. BMP specific calculations of drawdown time may be provided that account for BMP-specific geometry.

Stage-Storage-Discharge Summary Table

Depth (ft)	Area (ft2)	Volume (ft3)	Ac-Ft	Q-out (cfs)	
0	400	0	0	0	
1	400	400	0.009183	0	
2	400	800	0.018365	0	
3	400	1200	0.027548	0	DCV Contained
3.2	400	1280	0.029385	0.015	
4	400	1600	0.036731	0.015	
5	400	2000	0.045914	0.015	
6	400	2400	0.055096	0.015	
7	400	2800	0.064279	0.015	
7.25	400	2900	0.066575	1.5015	
8	400	3200	0.073462	1.5015	
9	400	3600	0.082645	1.5015	

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

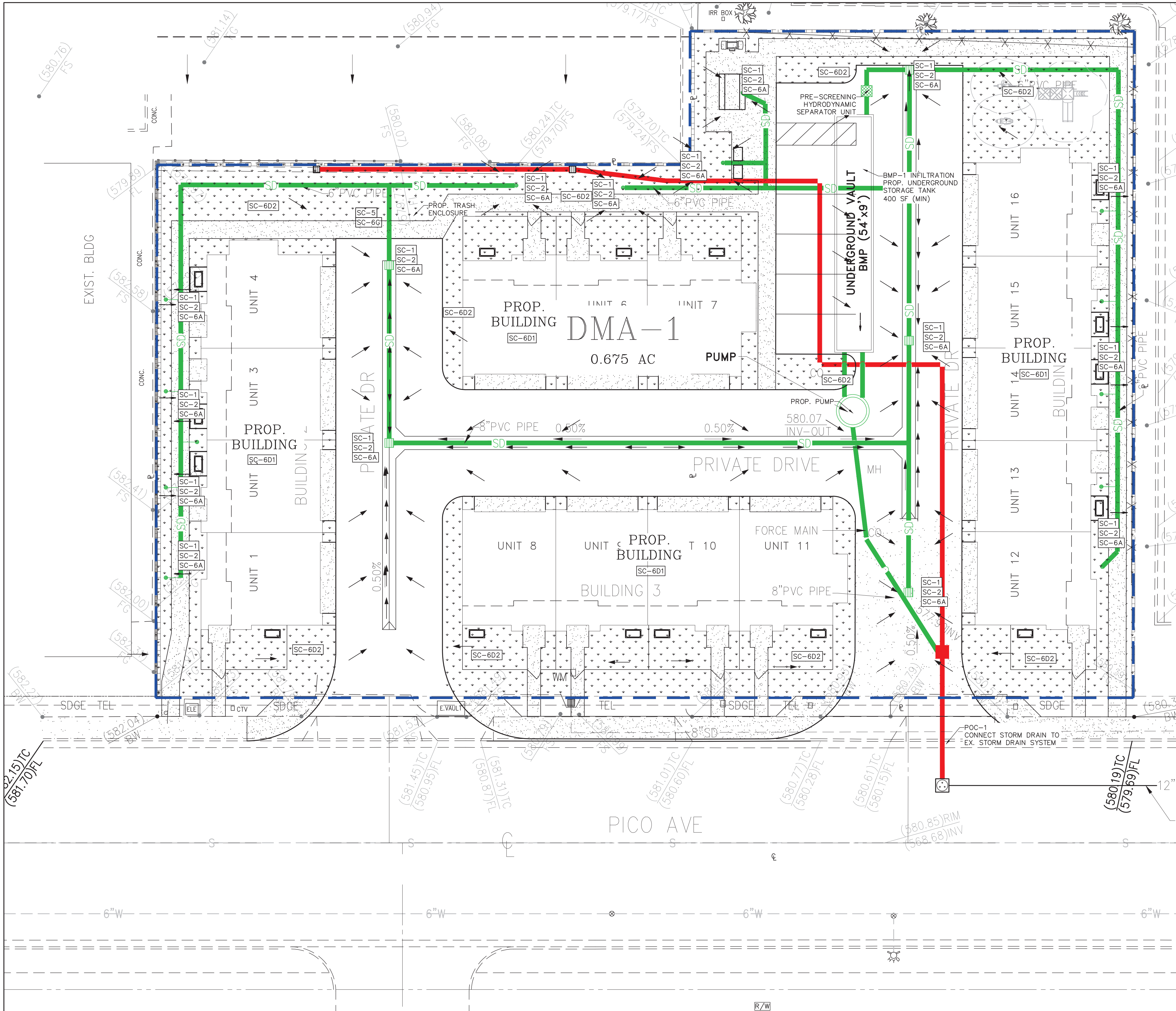
Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 2a	Hydromodification Management Exhibit (Required)	☒ Included See Hydromodification Management Exhibit Checklist on the back of this Attachment cover sheet.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☒ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☒ Not performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design, including Structural BMP Drawdown Calculations and Overflow Design Summary (Required) See Chapter 6 and Appendix G of the BMP Design Manual	☒ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☒ Not required because BMPs will drain in less than 96 hours

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☒ Underlying hydrologic soil group
☒ Approximate depth to groundwater
☒ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☒ Critical coarse sediment yield areas to be protected
☒ Existing topography
☒ Existing and proposed site drainage network and connections to drainage offsite
☒ Proposed grading
☒ Proposed impervious features
☒ Proposed design features and surface treatments used to minimize imperviousness
☒ Point(s) of Compliance (POC) for Hydromodification Management
☒ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☒ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)



LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	
RIGHT-OF-WAY LINE	
DMA BOUNDARY	
SURFACE FLOW	
ONSITE STORM DRAIN	
BYPASS STORM DRAIN	
PERVIOUS AREA	
IMPERVIOUS AREA	
PROP. CATCH BASIN	
PROP. AREA DRAIN	

DMA TYPE: DRAINS TO BMP
HYDROLOGIC SOIL GROUP: C
DEPTH TO GROUNDWATER: > 20 FT
NATURAL HYDROLOGIC FEATURES: NONE
CRITICAL COARSE SEDIMENT YIELD AREAS: NONE
IMPERVIOUS DMA AREA: 21,975 SF
(NOTE: PERVIOUS AREAS TO HAVE AMENDED SOILS)
PERVIOUS DMA AREA: 7,407 SF

SOURCE CONTROL BMPS

SC-1	PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
SC-2	STORM DRAIN STENCILING OR SIGNAGE
SC-5	PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
SC-6A	ON-SITE STORM DRAIN INLETS
SC-6D1	NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
SC-6D2	LANDSCAPE/OUTDOOR PESTICIDE USE
SC-6G	REFUSE AREAS

SCALE: 1" = 10'

REVISIONS
NO. | DESCRIPTION | DATE | APP'D

REC Consultants, Inc.
Civil Engineering • Environmental Land Surveying
2970 Fifth Avenue, Unit 340
San Diego, CA 92103
(619)232-9200 (619)232-9210 Fax

DATE: 10/10/2022
SCALE: 1" = 10'
DRAWN: E.R.F.
CHECKED: D.E.

SHEET TITLE: DMA/BMP PLAN - PROPOSED

PROJECT: PICO PLACE
236-244 SAN MARCOS PICO AVENUE
SAN MARCOS, CA 92069

SHEET 1 OF 1 SHEETS

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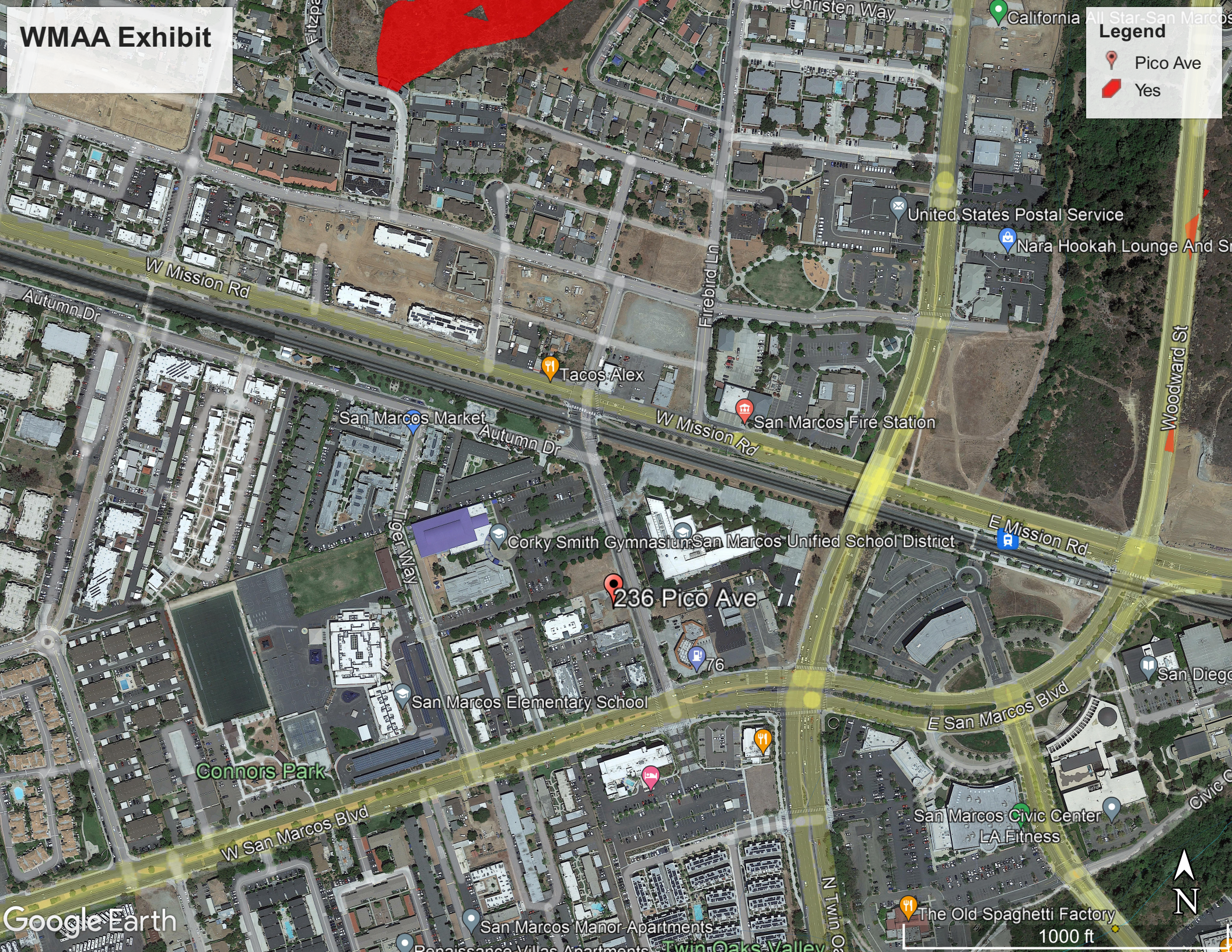
WMAA Exhibit
Legend
Pico Ave
Yes
Christen Way
California All Star-San Marcos
United States Postal Service
Nara Hookah Lounge And Sm
Firebird Ln
W Mission Rd
Autumn Dr
Tacos Alex
San Marcos Market
San Marcos Fire Station
Woodward St
Tiger Way
Corky Smith Gymnasium
San Marcos Unified School District
E Mission Rd
236 Pico Ave
76
San Marcos Elementary School
E San Marcos Blvd
Connors Park
W San Marcos Blvd
San Marcos Civic Center
LA Fitness
The Old Spaghetti Factory
San Marcos Manor Apartments
Renaissance Villas Apartments
Twin Oaks Valley
N Twin Oaks
N
1000 ft
Google Earth

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TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

Pico Place

Prepared For:

DMS Consultants, Inc.

Prepared by:

Luis Parra, PhD, CPSWQ, ToR, D.WRE.
R.C.E. 66377

November 3, 2022

REC Consultants
2442 Second Avenue
San Diego, CA 92101
Telephone: (619) 232-9200

TECHNICAL MEMORANDUM

TO: DMS Consultants, Inc.

FROM: Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE, CFM.
David Edwards, MS, PE, CFM.

DATE: November 3, 2022, Revised February 27, 2023

RE: Summary of SWMM Modeling for Hydromodification Compliance for Pico Place, San Marcos, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed residential development project site in the City of San Marcos using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post-developed conditions at the site in order to determine if the proposed LID facilities have sufficient volume to meet Order R9-2013-001 requirements of the California Regional Water Quality Control Board San Diego Region (SDRWQCB), as explained in the Final Hydromodification Management Plan (HMP), dated March 2011, prepared for the County of San Diego by Brown and Caldwell.

SWMM MODEL DEVELOPMENT

The Pico Place project comprises of a multi0family development inclusive of a private drive accessway and vegetated landscaped areas. Two (2) SWMM models were prepared for this study: the first for the pre-development and the second for the post-developed conditions. The project site drains to one (1) overall Point of Compliance (POC-1), located at the existing storm drain system to the eastern boundary of the project site within the adjacent Pico Avenue.

Per Section G.1.2 in Appendix G of the 2016 City of San Marcos' BMP Design Manual, the EPA SWMM model was used to perform the continuous hydrologic simulation. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP facility is sufficient to meet the current HMP requirements.

The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Poway gauge from the Project Clean Water website was used for this study, since it is the most representative of the project site precipitation due to elevation and proximity to the project site. Please see gauge location and project location map on Attachment 5.

The Escondido gage is not recommended for continuous simulation because (a) 22% of the intensities higher than 0.4 in/hr have data problems, and (b) the highest intensities measured in this station do not belong to the location of the gage (were copied from Wolford, at an elevation 850 ft higher than Escondido). Similarly, Wohlford data was not used mainly because the difference in elevation. At this point, we decided that the closest gage, with no significant data problems at similar elevation than the project elevation, was the most appropriate, therefore we used Poway precipitation.

Per the California Irrigation Management Information System "Reference Evaporation Zones" (CIMIS ETo Zone Map), the project site is located within the Zone 6 Evapotranspiration Area. Thus evapotranspiration values for the site were modeled using Zone 9 average monthly values from Table G.1-1 from the City of San Marcos' 2016 BMP Design Manual. The site was modeled with type C hydrologic soil per the site-specific geotechnical report undertaken for the project site (please refer to Attachment 8 of this memo).

Soils have been assumed to be compacted in the existing condition to represent the current developed condition of the site. In the post developed conditions, the soils have been modeled as fully compacted. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of the parameters is explained in detail.

HMP MODELING

PRE DEVELOPED CONDITIONS

The current property consists on a developed residential site that drains via overland flow to a receiving storm drain system (POC-1) located within Pico Avenue to the east of the project site. Flows split to the east and west of the site however both outlets are then drained to the same receiving system within Pico Avenue. Table 1 below illustrates the pre-developed area to be developed and impervious percentage accordingly.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip[(1)]
POC-1	DMA-1C	0.675	0%
TOTAL	**--**	**0.675**	0%

Notes: (1) – Per the 2013 RWQCB permit, existing condition impervious surfaces are not to be accounted for in existing conditions analysis.

DEVELOPED CONDITIONS

Runoff from the developed project site is drained to one (1) onsite receiving LID Infiltration BMP. Once flows are routed via the proposed LID BMPs, developed onsite flows are then conveyed to the aforementioned POC. Table 2 below summarizes the DMAs for the developed site.

TABLE 2 – SUMMARY OF DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
POC-1	DMA-1C	0.675	74.79%
TOTAL	--	**0.675**	--

Developed flows from the project site are conveyed to one (1) onsite detention facility prior to discharging to the existing storm drain system. The vault system is approximately 9-feet deep with a width of 8-feet and length of 50-feet. Due to the limited grade on the project site and utility constraints, the vault is to be located several feet below the existing storm drain invert in Pico Avenue such that the

vault can only be drained via the use of pumps. Due to HMP criteria, two (2) separate pumps will be employed on the project site, a low flow pump outlet will be located at 3.0 feet from the bottom of the basin invert while the peak Q100 flow pump will be located at 7.25 feet from the basin invert. In an extreme event, flows will outlet via the surface private drive to Pico Avenue without risk of flooding the residential structures and also providing single vehicular lane access.

Due to the high rate of measured infiltration onsite experienced during the geotechnical investigation, the base of the vault will be unlined such that flows can infiltrate into the underlying base. The filtration basin has been modeled directly as basins within SWMM can have infiltration associated with the base footprint accordingly.

Water Quality BMP Sizing &Drawdown Calculations

It is assumed all storm water quality requirements for the project will be met by the LID BMPs detailed in the SWQMP and other BMPs included within the site design. However, detailed water quality requirements are not discussed within this technical memo. For further information in regards to storm water quality requirements for the project (including sizing and drawdown) please refer to the site-specific Storm Water Quality Management Plan (SWQMP).

BMP MODELING FOR HMP PURPOSES

Modeling of HMP BMPs

One (1) LID BMP basin is proposed for hydromodification conformance for the project site. Tables 4 and 5 illustrates the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project. It should be noted that pumps are the only possible outlet structure such that an elevation and flow will be identified for the system.

TABLE 4 – SUMMARY OF BIOFILTRATION / PARTIAL INFILTRATION BMP

BMP	DIMENSIONS				
	Tributary Area (ft^2)	Vault Width (ft)	Vault Length (ft)	Vault Depth (ft)	Total Vault Volume (ft^3)
Vault	30,596	8	50	9	3,600

TABLE 5 – SUMMARY OF OUTLET PUMP DETAILS

BMP	Low Flow Pump		Peak Flow Pump	
	Flow Rate (cfs)	Elevation[(1)] (ft)	Flow Rate (cfs)	Elevation[(1)] (ft)
Vault	0.0185	3.0	1.5	7.25

Notes:
(1): Basin ground surface elevation assumed to be 0.00 ft elevation..

FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at the POCs by exporting the hourly runoff time series results from SWMM to a spreadsheet.

Q_2 and Q_{10} were determined with a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model includes a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at the POC is illustrated in Figure 1 in both normal and logarithmic scale.

As can be seen in Figure 1, the FDC for the proposed condition with the HMP BMPs is within 110% of the curve for the existing condition in both peak flows and durations. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold for the POC. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the peak flow table in Attachment 1.

Discussion of the Manning's coefficient (Pervious Areas) for Pre and Post-Development Conditions

Typically, the Manning's coefficient is selected as n = 0.10 for pervious areas and n = 0.012 for impervious areas. However, due to the impact that n has in the continuous simulation a more accurate value of the Manning's coefficient has been chosen for pervious areas. Taken into consideration the study prepared by TRWE (Reference [6]) a value of n = 0.05 has been selected (see Table 1 of Reference [6] included in Attachment 7). An average n value between average grass plus pasture (0.04) and dense grass (0.06) has been selected per the reference cited, for light rain (<0.8 in/hr) as more than 99% of the rainfall has been measured with this intensity.

SUMMARY

This study has demonstrated that the proposed HMP BMP provided for the Pico Place site is sufficient to meet the current HMP criteria if the cross-section areas and volumes recommended within this technical memorandum, and the respective orifice and outlet structure are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type C Soil is representative of the existing condition site. This is based on the site-specific geotechnical investigation undertaken for the project site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural "x" scale) and Flow Duration Table.
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Elevations vs. Discharge Curves to be used in SWMM
5. Pre & Post Development Maps, Project plan and section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Documentation
9. Summary files from the SWMM Model

REFERENCES

[1] – *"Review and Analysis of San Diego County Hydromodification Management Plan (HMP): Assumptions, Criteria, Methods, & Modeling Tools – Prepared for the Cities of San Marcos, Oceanside & Vista",* May 2012, TRW Engineering.

[2] – *"Final Hydromodification Management Plan (HMP) prepared for the County of San Diego",* March 2011, Brown and Caldwell.

[3] - Order R9-2013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – "*Handbook of Hydrology*", David R. Maidment, Editor in Chief. 1992, McGraw Hill.

[5] – "*City of San Marcos BMP Design Manual*", February 2016.

[6] – *"Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region"*, TRWE, 2016.

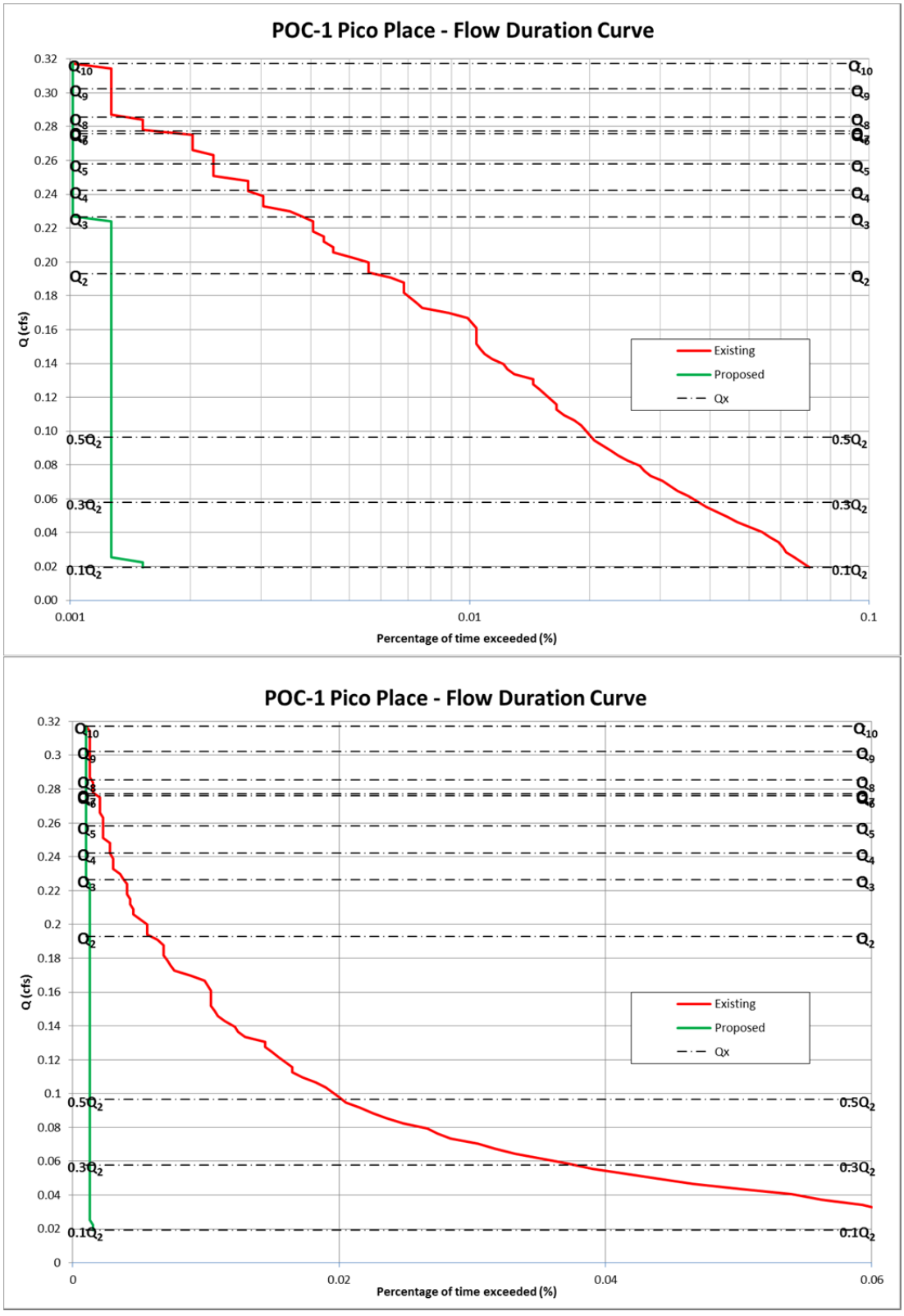


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

ATTACHMENT 1.

Q_2 to Q_{10} Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	0.193	0.019	0.174
3-year	0.227	0.019	0.208
4-year	0.242	0.019	0.223
5-year	0.258	0.019	0.239
6-year	0.276	0.019	0.257
7-year	0.277	0.019	0.258
8-year	0.285	0.019	0.266
9-year	0.302	0.022	0.281
10-year	0.317	0.037	0.280

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

1) Flow duration curve shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

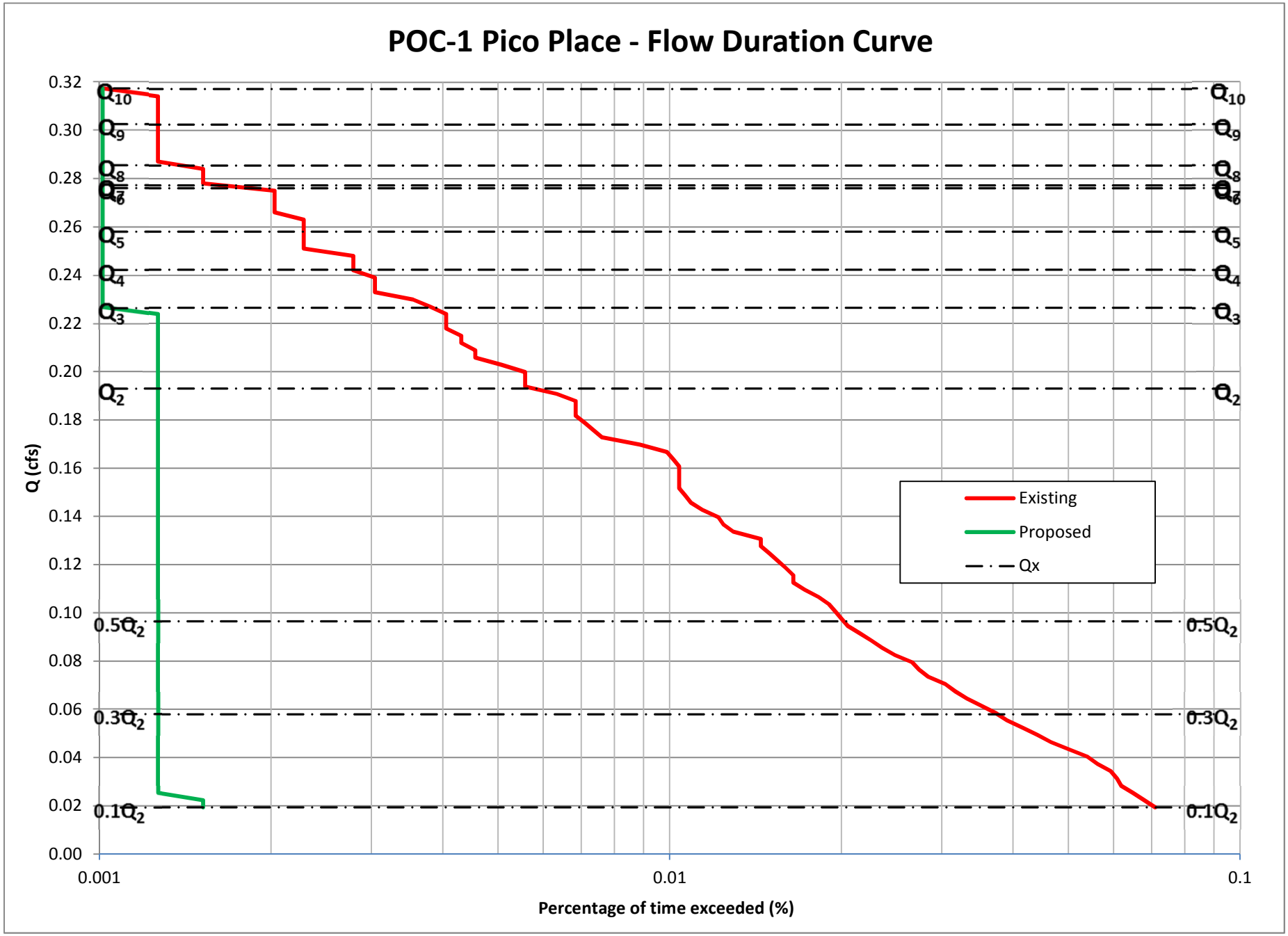
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 - Q_{10}$ is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

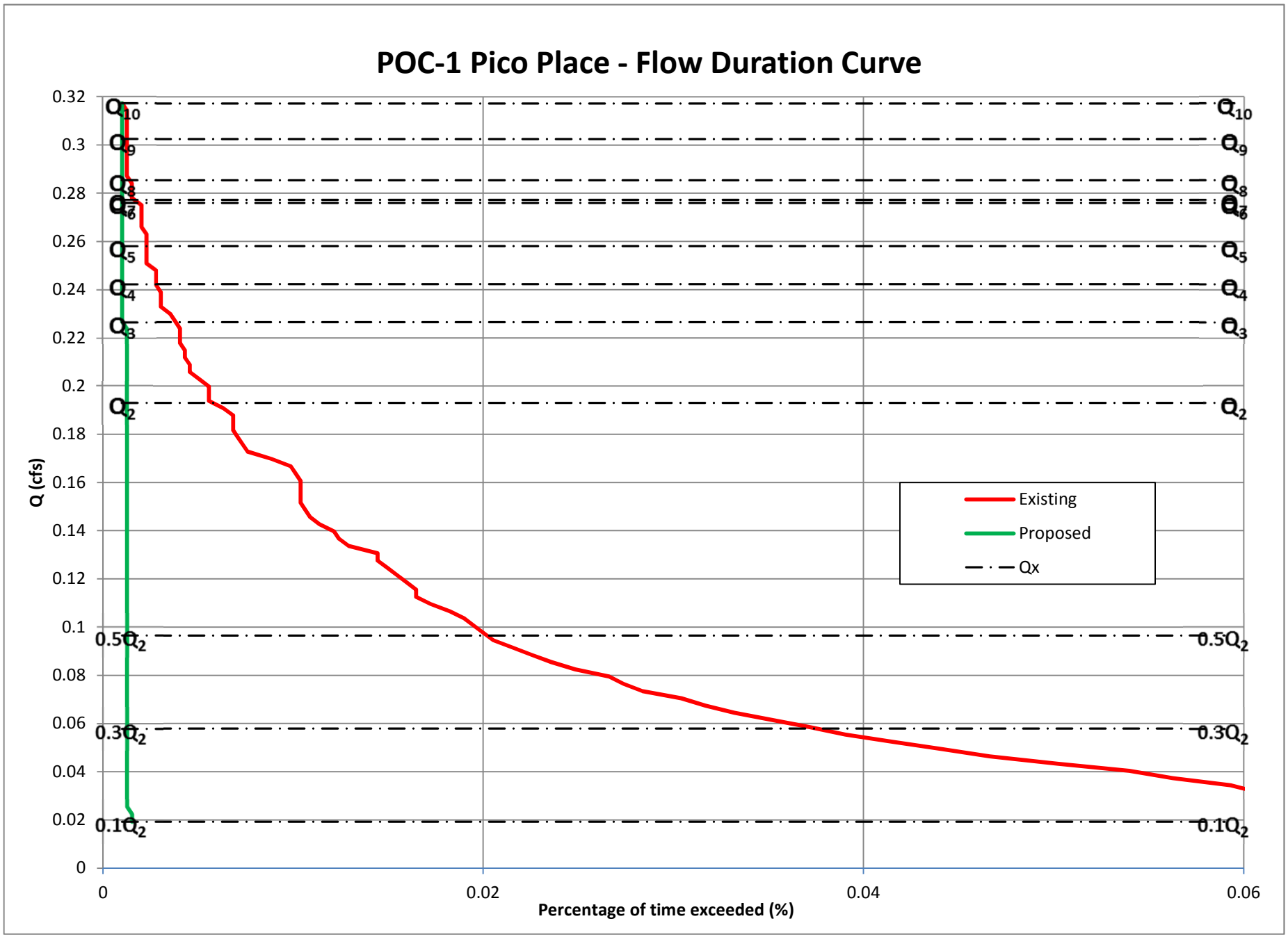
Consequently, the design passes the hydromodification test.

It is important to note that the flow duration curve can be expressed in the "x" axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same, and compliance can be observed regardless of the variable selected. However, in order to satisfy the City of San Marcos HMP example, % of time exceeded is the variable of choice in the flow duration curve. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented just to prove the difference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by REC, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8 and Q_9) in order to demonstrate compliance at any range $Q_x - Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). REC performed the analysis using the Cunnane Plotting position Method (the preferred method in the HMP permit) from the "n" largest independent peak flows obtained from the continuous time series.

The largest "n" peak flows are attached in this appendix, as well as the values of Q_i with a return period "i", from i=2 to 10. The Q_i values are also added into the flow-duration plot.


POC-1 Pico Place - Flow Duration Curve
Q (cfs)
0.32
0.30
0.28
0.26
0.24
0.22
0.20
0.18
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
Q_{10}
Q_9
Q_8
Q_7
Q_6
Q_5
Q_4
Q_3
Q_2
$0.5Q_2$
$0.3Q_2$
$0.1Q_2$
0.001
0.01
0.1
Percentage of time exceeded (%)
Existing
Proposed
Qx


POC-1 Pico Place - Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
0.32
0.3
0.28
0.26
0.24
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
0.02
0.04
0.06
Q_{10}
Q_9
Q_8
Q_7
Q_6
Q_5
Q_4
Q_3
Q_2
$0.5Q_2$
$0.3Q_2$
$0.1Q_2$
Existing
Proposed
Qx

Flow Duration Curve Data for Pico Place POC 1 - San Marcos, CA

Q2 =	0.193	cfs	Fraction	10 %
Q10 =	0.32	cfs		
Step =	0.0030	cfs		
Count =	394487	hours		
	45.00	years		

	Existing Condition			Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.019	280	7.10E-02	6	1.52E-03	2%	Pass
2	0.022	268	6.79E-02	6	1.52E-03	2%	Pass
3	0.025	256	6.49E-02	5	1.27E-03	2%	Pass
4	0.028	244	6.19E-02	5	1.27E-03	2%	Pass
5	0.031	240	6.08E-02	5	1.27E-03	2%	Pass
6	0.034	234	5.93E-02	5	1.27E-03	2%	Pass
7	0.037	222	5.63E-02	5	1.27E-03	2%	Pass
8	0.040	213	5.40E-02	5	1.27E-03	2%	Pass
9	0.043	198	5.02E-02	5	1.27E-03	3%	Pass
10	0.046	184	4.66E-02	5	1.27E-03	3%	Pass
11	0.049	174	4.41E-02	5	1.27E-03	3%	Pass
12	0.052	164	4.16E-02	5	1.27E-03	3%	Pass
13	0.055	154	3.90E-02	5	1.27E-03	3%	Pass
14	0.058	147	3.73E-02	5	1.27E-03	3%	Pass
15	0.061	139	3.52E-02	5	1.27E-03	4%	Pass
16	0.064	131	3.32E-02	5	1.27E-03	4%	Pass
17	0.067	125	3.17E-02	5	1.27E-03	4%	Pass
18	0.070	120	3.04E-02	5	1.27E-03	4%	Pass
19	0.073	112	2.84E-02	5	1.27E-03	4%	Pass
20	0.076	108	2.74E-02	5	1.27E-03	5%	Pass
21	0.079	105	2.66E-02	5	1.27E-03	5%	Pass
22	0.082	98	2.48E-02	5	1.27E-03	5%	Pass
23	0.085	93	2.36E-02	5	1.27E-03	5%	Pass
24	0.089	89	2.26E-02	5	1.27E-03	6%	Pass
25	0.092	85	2.15E-02	5	1.27E-03	6%	Pass
26	0.095	81	2.05E-02	5	1.27E-03	6%	Pass
27	0.098	79	2.00E-02	5	1.27E-03	6%	Pass
28	0.101	77	1.95E-02	5	1.27E-03	6%	Pass
29	0.104	75	1.90E-02	5	1.27E-03	7%	Pass
30	0.107	72	1.83E-02	5	1.27E-03	7%	Pass
31	0.110	68	1.72E-02	5	1.27E-03	7%	Pass
32	0.113	65	1.65E-02	5	1.27E-03	8%	Pass
33	0.116	65	1.65E-02	5	1.27E-03	8%	Pass
34	0.119	63	1.60E-02	5	1.27E-03	8%	Pass
35	0.122	61	1.55E-02	5	1.27E-03	8%	Pass
36	0.125	59	1.50E-02	5	1.27E-03	8%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	0.128	57	1.44E-02	5	1.27E-03	9%	Pass
38	0.131	57	1.44E-02	5	1.27E-03	9%	Pass
39	0.134	51	1.29E-02	5	1.27E-03	10%	Pass
40	0.137	49	1.24E-02	5	1.27E-03	10%	Pass
41	0.140	48	1.22E-02	5	1.27E-03	10%	Pass
42	0.143	45	1.14E-02	5	1.27E-03	11%	Pass
43	0.146	43	1.09E-02	5	1.27E-03	12%	Pass
44	0.149	42	1.06E-02	5	1.27E-03	12%	Pass
45	0.152	41	1.04E-02	5	1.27E-03	12%	Pass
46	0.155	41	1.04E-02	5	1.27E-03	12%	Pass
47	0.158	41	1.04E-02	5	1.27E-03	12%	Pass
48	0.161	41	1.04E-02	5	1.27E-03	12%	Pass
49	0.164	40	1.01E-02	5	1.27E-03	13%	Pass
50	0.167	39	9.89E-03	5	1.27E-03	13%	Pass
51	0.170	35	8.87E-03	5	1.27E-03	14%	Pass
52	0.173	30	7.60E-03	5	1.27E-03	17%	Pass
53	0.176	29	7.35E-03	5	1.27E-03	17%	Pass
54	0.179	28	7.10E-03	5	1.27E-03	18%	Pass
55	0.182	27	6.84E-03	5	1.27E-03	19%	Pass
56	0.185	27	6.84E-03	5	1.27E-03	19%	Pass
57	0.188	27	6.84E-03	5	1.27E-03	19%	Pass
58	0.191	25	6.34E-03	5	1.27E-03	20%	Pass
59	0.194	22	5.58E-03	5	1.27E-03	23%	Pass
60	0.197	22	5.58E-03	5	1.27E-03	23%	Pass
61	0.200	22	5.58E-03	5	1.27E-03	23%	Pass
62	0.203	20	5.07E-03	5	1.27E-03	25%	Pass
63	0.206	18	4.56E-03	5	1.27E-03	28%	Pass
64	0.209	18	4.56E-03	5	1.27E-03	28%	Pass
65	0.212	17	4.31E-03	5	1.27E-03	29%	Pass
66	0.215	17	4.31E-03	5	1.27E-03	29%	Pass
67	0.218	16	4.06E-03	5	1.27E-03	31%	Pass
68	0.221	16	4.06E-03	5	1.27E-03	31%	Pass
69	0.224	16	4.06E-03	5	1.27E-03	31%	Pass
70	0.227	15	3.80E-03	4	1.01E-03	27%	Pass
71	0.230	14	3.55E-03	4	1.01E-03	29%	Pass
72	0.233	12	3.04E-03	4	1.01E-03	33%	Pass
73	0.236	12	3.04E-03	4	1.01E-03	33%	Pass
74	0.239	12	3.04E-03	4	1.01E-03	33%	Pass
75	0.242	11	2.79E-03	4	1.01E-03	36%	Pass
76	0.245	11	2.79E-03	4	1.01E-03	36%	Pass
77	0.248	11	2.79E-03	4	1.01E-03	36%	Pass
78	0.251	9	2.28E-03	4	1.01E-03	44%	Pass
79	0.254	9	2.28E-03	4	1.01E-03	44%	Pass
80	0.257	9	2.28E-03	4	1.01E-03	44%	Pass
81	0.260	9	2.28E-03	4	1.01E-03	44%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	0.263	9	2.28E-03	4	1.01E-03	44%	Pass
83	0.266	8	2.03E-03	4	1.01E-03	50%	Pass
84	0.269	8	2.03E-03	4	1.01E-03	50%	Pass
85	0.272	8	2.03E-03	4	1.01E-03	50%	Pass
86	0.275	8	2.03E-03	4	1.01E-03	50%	Pass
87	0.278	6	1.52E-03	4	1.01E-03	67%	Pass
88	0.281	6	1.52E-03	4	1.01E-03	67%	Pass
89	0.284	6	1.52E-03	4	1.01E-03	67%	Pass
90	0.287	5	1.27E-03	4	1.01E-03	80%	Pass
91	0.290	5	1.27E-03	4	1.01E-03	80%	Pass
92	0.293	5	1.27E-03	4	1.01E-03	80%	Pass
93	0.296	5	1.27E-03	4	1.01E-03	80%	Pass
94	0.299	5	1.27E-03	4	1.01E-03	80%	Pass
95	0.302	5	1.27E-03	4	1.01E-03	80%	Pass
96	0.305	5	1.27E-03	4	1.01E-03	80%	Pass
97	0.308	5	1.27E-03	4	1.01E-03	80%	Pass
98	0.311	5	1.27E-03	4	1.01E-03	80%	Pass
99	0.314	5	1.27E-03	4	1.01E-03	80%	Pass
100	0.317	4	1.01E-03	4	1.01E-03	100%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	0.317	0.037	0.280
9	0.302	0.022	0.281
8	0.285	0.019	0.266
7	0.277	0.019	0.258
6	0.276	0.019	0.257
5	0.258	0.019	0.239
4	0.242	0.019	0.223
3	0.227	0.019	0.208
2	0.193	0.019	0.174

ATTACHMENT 3

List of the "n" Largest Peaks: Pre & Post-Developed Conditions

Basic Probabilistic Equation:

R = 1/P R: Return period (years).

P: Probability of a flow to be equaled or exceeded any given year (dimensionless).

Cunnane Equation:

$$P = \frac{i-0.4}{n+0.2}$$

Weibull Equation:

$$P = \frac{i}{n+1}$$

i: Position of the peak whose probability is desired (sorted from large to small)

n: number of years analyzed.

Explanation of Variables for the Tables in this Attachment

Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.

Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.

Date: Date of the occurrence of the peak at the outlet from the continuous simulation

Note: all peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt = 0, and the peak is the largest value in 25 hours (12 hours before, the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

List of Peak events and Determination of P2 and P10 (Pre-Development)
Pico Place POC 1 - San Marcos

T (Year)	Cunnane (cfs)	Weibull (cfs)	Peaks (cfs)	Date	Posit	Period of Return (Years)	
10	**0.38**	**0.39**				Weibull	Cunnane
9	**0.36**	**0.38**	0.155	12/6/1966	45	1.02	1.01
8	**0.34**	**0.35**	0.157	2/15/1992	44	1.05	1.04
7	**0.34**	**0.34**	0.157	2/8/1993	43	1.07	1.06
6	**0.34**	**0.34**	0.158	4/14/2003	42	1.10	1.09
5	**0.31**	**0.31**	0.163	4/1/1982	41	1.12	1.11
4	**0.29**	**0.29**	0.163	1/9/1998	40	1.15	1.14
3	**0.27**	**0.27**	0.174	12/5/1966	39	1.18	1.17
2	**0.23**	**0.23**	0.179	11/29/1982	38	1.21	1.20
			0.182	2/21/2005	37	1.24	1.23
			0.191	2/21/2000	36	1.28	1.27
			0.198	3/8/1974	35	1.31	1.31
			0.198	1/18/1993	34	1.35	1.35
			0.199	2/17/1998	33	1.39	1.39
			0.2	1/4/1995	32	1.44	1.43
			0.201	2/6/1976	31	1.48	1.48
			0.201	9/10/1976	30	1.53	1.53
			0.201	2/16/1980	29	1.59	1.58
			0.204	4/21/1988	28	1.64	1.64
			0.205	11/16/1972	27	1.70	1.70
			0.209	11/23/1965	26	1.77	1.77
			0.224	2/27/2001	25	1.84	1.84
			0.224	2/12/2003	24	1.92	1.92
			0.225	3/17/1963	23	2.00	2.00
			0.24	1/29/1980	22	2.09	2.09
			0.24	4/18/1995	21	2.19	2.19
			0.246	1/6/1979	20	2.30	2.31
			0.253	3/1/1983	19	2.42	2.43
			0.257	1/9/2005	18	2.56	2.57
			0.26	2/8/1983	17	2.71	2.72
			0.266	11/30/1982	16	2.88	2.90
			0.273	1/7/1974	15	3.07	3.10
			0.282	2/28/1970	14	3.29	3.32
			0.284	11/12/1976	13	3.54	3.59
			0.294	12/18/1978	12	3.83	3.90
			0.294	12/29/1978	11	4.18	4.26
			0.302	2/14/1998	10	4.60	4.71
			0.315	11/5/1987	9	5.11	5.26
			0.339	2/3/1998	8	5.75	5.95
			0.339	2/8/1998	7	6.57	6.85
			0.341	12/29/2004	6	7.67	8.07
			0.382	3/17/1982	5	9.20	9.83
			0.392	1/10/1978	4	11.50	12.56
			0.413	1/25/1995	3	15.33	17.38
			0.423	3/24/1983	2	23.00	28.25
			0.472	2/21/1980	1	46.00	75.33

Note:
Cunnane is the preferred method by the HMP permit.

List of Peak events and Determination of P2 and P10 (Post-Development)
Pico Place POC 1 - San Marcos

T (Year)	Cunnane (cfs)	Weibull (cfs)	Peaks (cfs)	Date	Posit	Period of Return (Years)	
10	**0.04**	**0.09**				Weibull	Cunnane
9	**0.02**	**0.02**	0.019	2/9/1963	45	1.02	1.01
8	**0.02**	**0.02**	0.019	2/9/1963	44	1.05	1.04
7	**0.02**	**0.02**	0.019	2/9/1963	43	1.07	1.06
6	**0.02**	**0.02**	0.019	2/9/1963	42	1.10	1.09
5	**0.02**	**0.02**	0.019	2/10/1963	41	1.12	1.11
4	**0.02**	**0.02**	0.019	2/10/1963	40	1.15	1.14
3	**0.02**	**0.02**	0.019	2/10/1963	39	1.18	1.17
2	**0.02**	**0.02**	0.019	2/10/1963	38	1.21	1.20
			0.019	2/10/1963	37	1.24	1.23
			0.019	2/10/1963	36	1.28	1.27
			0.019	2/10/1963	35	1.31	1.31
			0.019	2/10/1963	34	1.35	1.35
			0.019	2/11/1963	33	1.39	1.39
			0.019	2/11/1963	32	1.44	1.43
			0.019	2/11/1963	31	1.48	1.48
			0.019	2/11/1963	30	1.53	1.53
			0.019	2/11/1963	29	1.59	1.58
			0.019	2/11/1963	28	1.64	1.64
			0.019	2/11/1963	27	1.70	1.70
			0.019	3/17/1963	26	1.77	1.77
			0.019	3/17/1963	25	1.84	1.84
			0.019	3/17/1963	24	1.92	1.92
			0.019	3/17/1963	23	2.00	2.00
			0.019	11/21/1963	22	2.09	2.09
			0.019	11/21/1963	21	2.19	2.19
			0.019	11/16/1965	20	2.30	2.31
			0.019	11/16/1965	19	2.42	2.43
			0.019	11/16/1965	18	2.56	2.57
			0.019	11/16/1965	17	2.71	2.72
			0.019	11/17/1965	16	2.88	2.90
			0.019	11/17/1965	15	3.07	3.10
			0.019	11/22/1965	14	3.29	3.32
			0.019	11/22/1965	13	3.54	3.59
			0.019	11/22/1965	12	3.83	3.90
			0.019	11/22/1965	11	4.18	4.26
			0.019	11/22/1965	10	4.60	4.71
			0.019	11/22/1965	9	5.11	5.26
			0.019	11/23/1965	8	5.75	5.95
			0.019	11/23/1965	7	6.57	6.85
			0.019	11/23/1965	6	7.67	8.07
			0.024	1/29/1980	5	9.20	9.83
			0.226	1/29/1980	4	11.50	12.56
			0.89	2/21/1980	3	15.33	17.38
			1.34	12/5/1966	2	23.00	28.25
			1.5	1/4/1995	1	46.00	75.33

Note:
Cunnane is the preferred method by the HMP permit.

ATTACHMENT 4

AREA VS ELEVATION

The storage provided by the detention vault is entered into the Storage Module within SWMM – please refer to Attachment 7 for further information. It should be noted that all facilities are walled; as such the stage-area relationship is a constant. A stage-storage calculation is provided on the following page for verification.

DISCHARGE VS ELEVATION

Due to elevation constraints on the project site, the outlets from the vault are pumps – as such a constant flow out from the vault is experienced when the volume within the basin exceeds the invert elevation of the pump outlet invert.

DISCHARGE EQUATIONS

1) Weir:

$$Q_W = C_W \cdot L \cdot H^{3/2} \quad (1)$$

2) Slot:

As an orifice: $$Q_s = B_s \cdot h_s \cdot c_g \cdot \sqrt{2g\left(H - \frac{h_s}{2}\right)} \quad (2.a)$$

As a weir: $$Q_s = C_W \cdot B_s \cdot H^{3/2} \quad (2.b)$$

For H > h_s slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

3) Vertical Orifices

As an orifice: $$Q_o = 0.25 \cdot \pi D^2 \cdot c_g \cdot \sqrt{2g\left(H - \frac{D}{2}\right)} \quad (3.a)$$

As a weir: Critical depth and geometric family of circular sector must be solved to determined Q as a function of H:

$$\frac{Q_O^2}{g} = \frac{A_{cr}^3}{T_{cr}}; \quad H = y_{cr} + \frac{A_{cr}}{2 \cdot T_{cr}}; \; T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}\,; \quad A_{cr} = \frac{D^2}{8}[\alpha_{cr} - sin(\alpha_{cr})]\,;$$

$$y_{cr} = \frac{D}{2}[1 - sin(0.5 \cdot \alpha_{cr})] \quad \text{(3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)}$$

There is a value of H (approximately H = 110% D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type o discharge.

The following are the variables used above:

Q_W, Q_s, Q_O = Discharge of weir, slot or orifice (cfs)

C_W, c_g : Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s : Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

A_{cr}, T_{cr}, y_{cr}, α_{cr}: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Stage-Storage-Discharge Summary Table

Depth (ft)	Area (ft2)	Volume (ft3)	Ac-Ft	Q-out (cfs)	
0	400	0	0	0	
1	400	400	0.009183	0	
2	400	800	0.018365	0	
3	400	1200	0.027548	0	DCV Contained
3.2	400	1280	0.029385	0.015	
4	400	1600	0.036731	0.015	
5	400	2000	0.045914	0.015	
6	400	2400	0.055096	0.015	
7	400	2800	0.064279	0.015	
7.25	400	2900	0.066575	1.5015	
8	400	3200	0.073462	1.5015	
9	400	3600	0.082645	1.5015	

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention

Section Sketches

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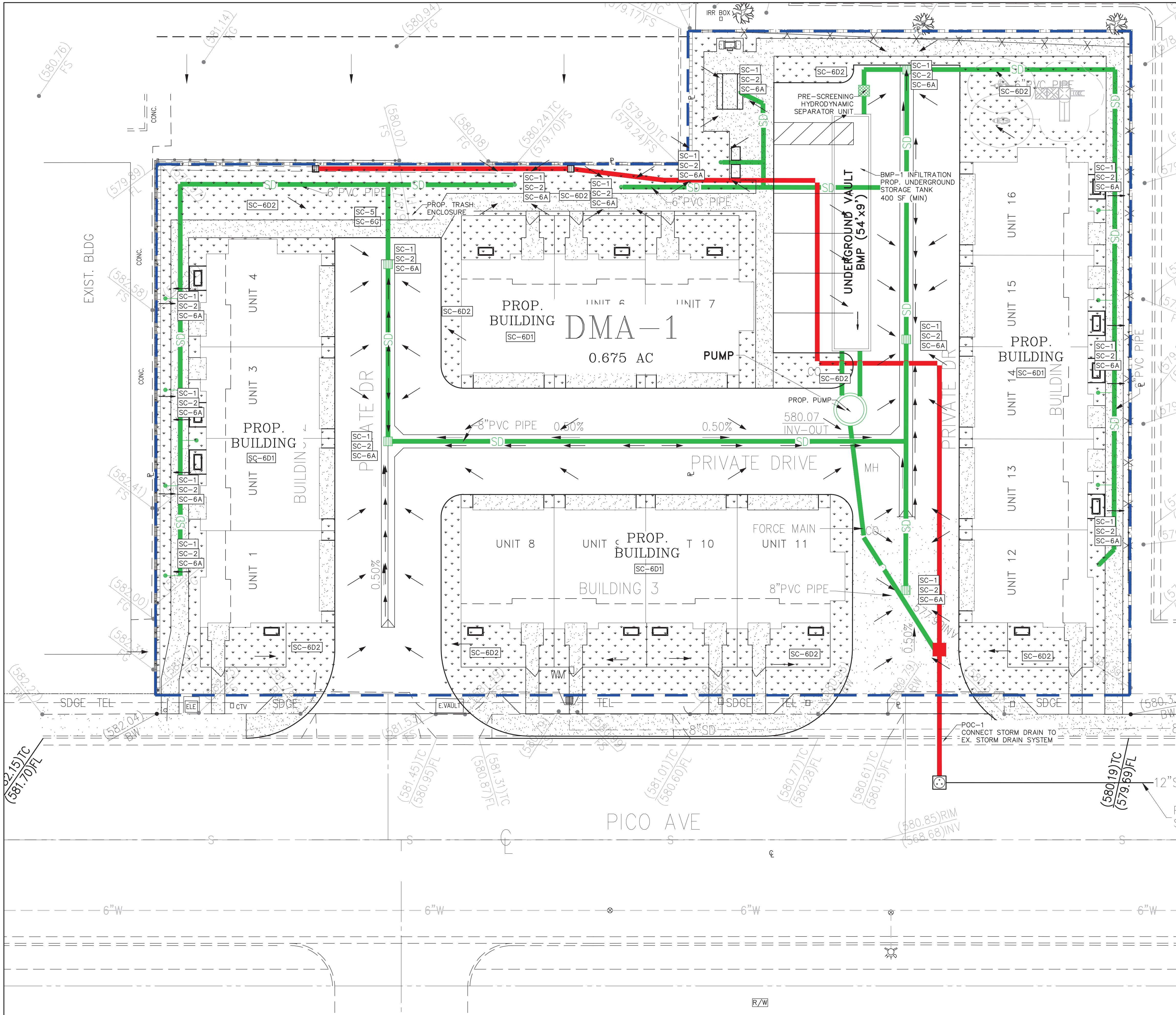

LEGEND

DESCRIPTION	SYMBOL
PROPERTY LINE	
RIGHT-OF-WAY LINE	
DMA BOUNDARY	
SURFACE FLOW	
ONSITE STORM DRAIN	
BYPASS STORM DRAIN	
PERVIOUS AREA	
IMPERVIOUS AREA	
PROP. CATCH BASIN	
PROP. AREA DRAIN	

DMA TYPE: DRAINS TO BMP
HYDROLOGIC SOIL GROUP: C
DEPTH TO GROUNDWATER: > 20 FT
NATURAL HYDROLOGIC FEATURES: NONE
CRITICAL COARSE SEDIMENT YIELD AREAS: NONE
IMPERVIOUS DMA AREA: 21,975 SF
(NOTE: PERVIOUS AREAS TO HAVE AMENDED SOILS)
PERVIOUS DMA AREA: 7,407 SF

SOURCE CONTROL BMPS

SC-1	PREVENTION OF ILLICIT DISCHARGES INTO THE MS4
SC-2	STORM DRAIN STENCILING OR SIGNAGE
SC-5	PROTECT TRASH STORAGE AREAS FROM RAINFALL, RUN-ON, RUNOFF, AND WIND DISPERSAL
SC-6A	ON-SITE STORM DRAIN INLETS
SC-6D1	NEED FOR FUTURE INDOOR & STRUCTURAL PEST CONTROL
SC-6D2	LANDSCAPE/OUTDOOR PESTICIDE USE
SC-6G	REFUSE AREAS

10 5 0 10 20 30
SCALE: 1" = 10'

REVISIONS
NO. | DESCRIPTION | DATE | APP'D

R·E·C Consultants, Inc.
Civil Engineering·Environmental
Land Surveying
2970 Fifth Avenue, Unit 340
San Diego, CA 92103
(619)232-9200 (619)232-9210 Fax

DATE: 10/10/2022
SCALE: 1" = 10'
DRAWN: E.R.F.
CHECKED: D.E.

SHEET TITLE: DMA/BMP PLAN - PROPOSED
PROJECT: PICO PLACE
236-244 SAN MARCOS PICO AVENUE
SAN MARCOS, CA 92069

SHEET 1 OF 1 SHEETS

SAVE DATE: 4/14/2023 ~ PLOT DATE: 4/14/2023 ~ FILE NAME: C:\Users\david\Desktop\Pico Village\Drawings\Exhibits\DMA Map_REV.dwg

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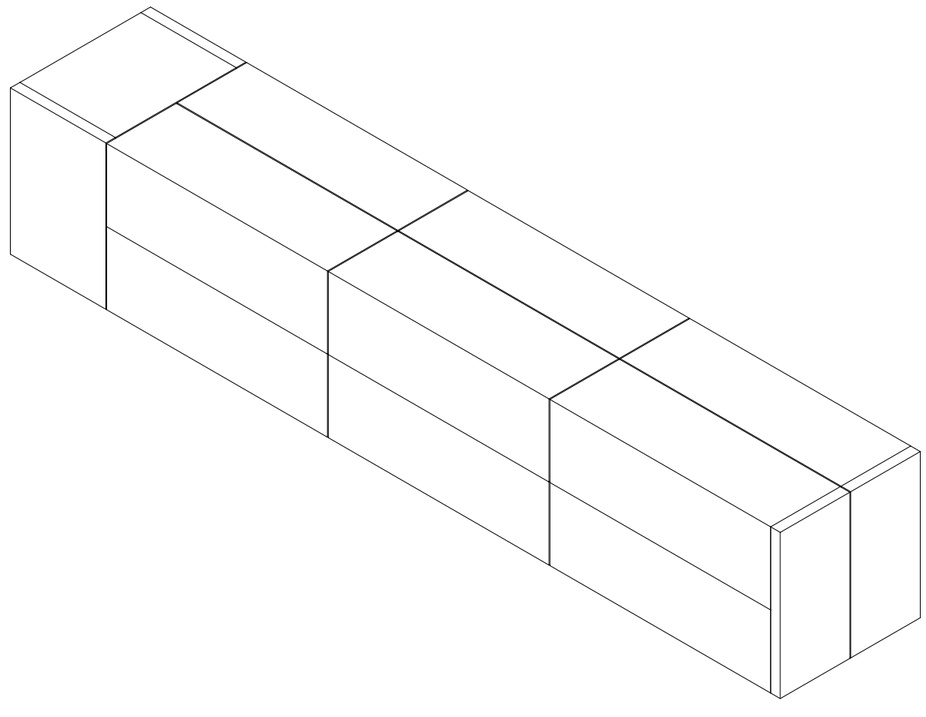
MODULAR CONCRETE
STORMWATER MANAGEMENT

SHEET INDEX	
PAGE	DESCRIPTION
0.0	COVER SHEET
1.0	DOUBLETRAP DESIGN CRITERIA
2.0	DOUBLETRAP SYSTEM LAYOUT
3.0	DOUBLETRAP INSTALLATION SPECIFICATIONS
3.1	DOUBLETRAP INSTALLATION SPECIFICATIONS
4.0	DOUBLETRAP BACKFILL SPECIFICATIONS
5.0	RECOMMENDED PIPE / ACCESS OPENING SPECIFICATIONS
6.0	DOUBLETRAP MODULE TYPES



PICO PLACE
SAN MARCOS, CA

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CONTACT NAME: CHARLIE CARTER
CELL PHONE: 760-212-5628
SALES EMAIL: CCARTER@STORMTRAP.COM

ENGINEER INFORMATION:

REC CONSULTANTS, INC.
27349 JEFFERSON AVE.
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951-693-2400

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COVER SHEET

SHEET NUMBER:

0.0

STRUCTURAL DESIGN LOADING CRITERIA

LIVE LOADING: **AASHTO HS–20 HIGHWAY LOADING**

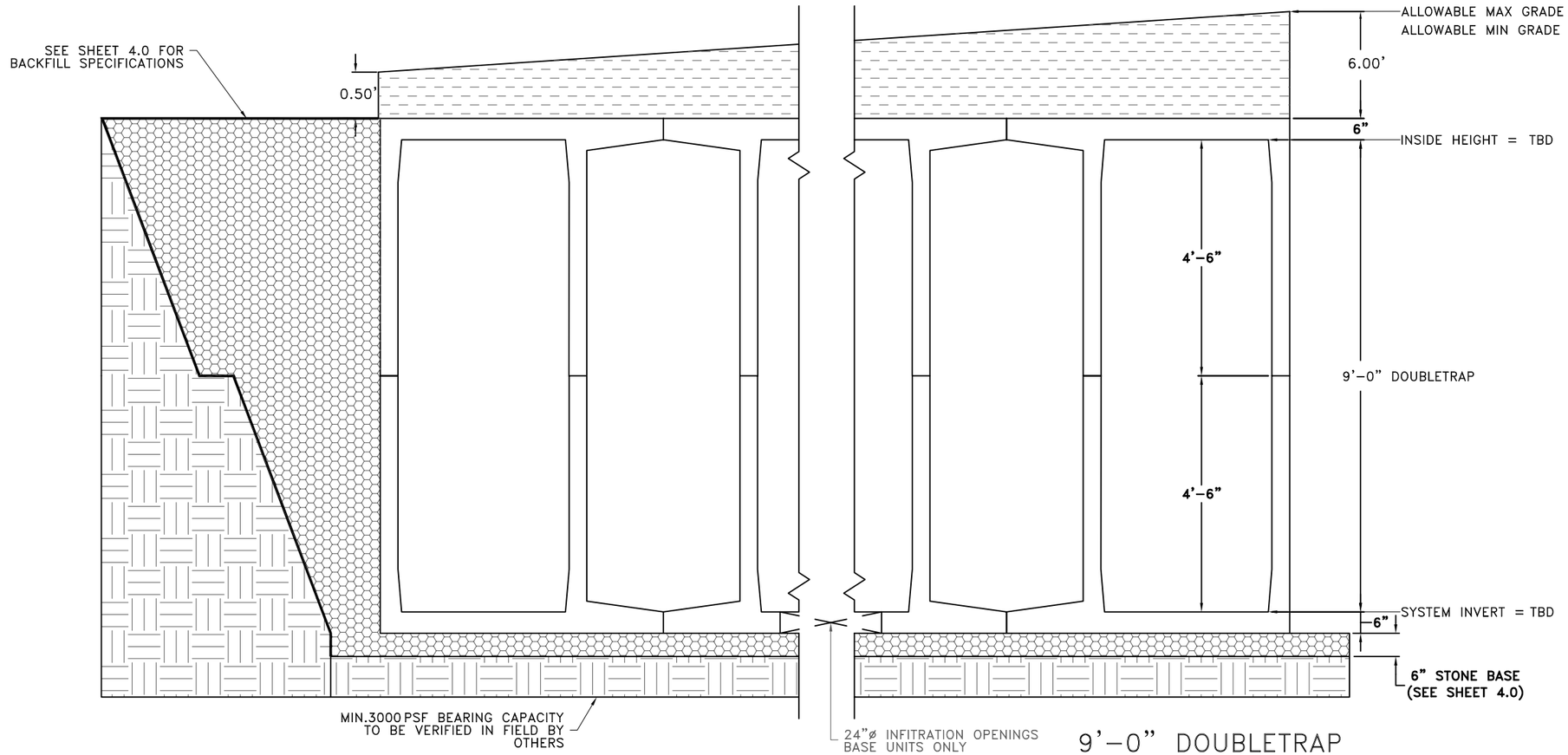
GROUND WATER TABLE: BELOW INVERT OF SYSTEM
SOIL BEARING PRESSURE: 3000 PSF
SOIL DENSITY: 120 PCF
EQUIVALENT UNSATURATED LATERAL ACTIVE EARTH PRESSURE: 35 PSF / FT.
EQUIVALENT SATURATED LATERAL ACTIVE EARTH PRESSURE: 80 PSF/FT. (IF WATER TABLE PRESENT)
APPLICABLE CODES: ASTM C857
ACI–318
BACKFILL TYPE: SEE SHEET 4.0 FOR BACKFILL OPTIONS

STORMTRAP SYSTEM INFORMATION

WATER STORAGE PROV: 3,886.65 CUBIC FEET
UNIT HEADROOM: 9'–0" DOUBLETRAP

SITE SPECIFIC DESIGN CRITERIA

1. STORMTRAP UNITS SHALL BE MANUFACTURED AND INSTALLED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER OF RECORD. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF OPENINGS AND INLET/OUTLET PIPE TYPES, SIZES, INVERT ELEVATIONS AND SIZE OF OPENINGS.
2. COVER RANGE: MIN. 0.50' MAX. 6.00' CONSULT STORMTRAP FOR ADDITIONAL COVER OPTIONS.
3. ALL DIMENSIONS AND SOIL CONDITIONS, INCLUDING BUT NOT LIMITED TO GROUNDWATER AND SOIL BEARING CAPACITY ARE REQUIRED TO BE VERIFIED IN THE FIELD BY OTHERS PRIOR TO STORMTRAP INSTALLATION.
4. FOR STRUCTURAL CALCULATIONS THE GROUND WATER TABLE IS ASSUMED TO BE BELOW INVERT OF SYSTEM IF WATER TABLE IS DIFFERENT THAN ASSUMED, CONTACT STORMTRAP.



9'–0" DOUBLETRAP

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1	2/23/2023	PRELIMINARY	EB

SCALE:

NTS

SHEET TITLE:

DOUBLETRAP DESIGN CRITERIA

SHEET NUMBER:

1.0

BILL OF MATERIALS

QTY.	UNIT TYPE	DESCRIPTION	TOP WEIGHT	BASE WEIGHT
0	I	9'-0" DOUBLETRAP	0	0
0	II	9'-0" DOUBLETRAP	0	0
0	III	9'-0" DOUBLETRAP	0	0
0	IV	9'-0" DOUBLETRAP	0	0
6	VII-3/VII-3NF	9'-0" DOUBLETRAP	12547	12446
1	SPIV/SPIVNF	9'-0" DOUBLETRAP	VARIES	VARIES
0	T2 PANEL	8" THICK PANEL	0	
2	T4 PANEL	8" THICK PANEL	6625	
2	T7 PANEL	8" THICK PANEL	4834	
2	JOINT WRAP	150' PER ROLL		
16	JOINT TAPE	14.5' PER ROLL		
TOTAL PIECES = 14				
TOTAL PANELS = 4				
HEAVIEST PICK WEIGHT = 12,547				

LOADING DISCLAIMER:

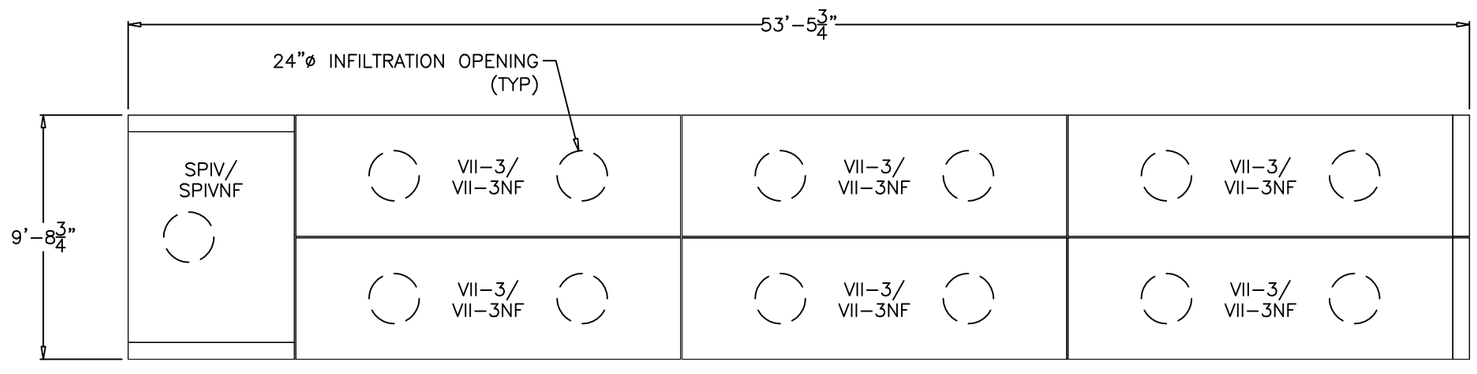
STORMTRAP IS NOT DESIGNED TO ACCEPT ANY ADDITIONAL LOADINGS FROM NEARBY STRUCTURES NEXT TO OR OVER THE TOP OF STORMTRAP. IF ADDITIONAL LOADING CONSIDERATIONS ARE REQUIRED FOR STRUCTURAL DESIGN OF STORMTRAP, PLEASE CONTACT STORMTRAP IMMEDIATELY.

TREE LOADING DISCLAIMER:

THE STORMTRAP SYSTEM HAS NOT BEEN DESIGNED TO SUPPORT THE ADDITIONAL WEIGHT OF ANY TREES. FURTHERMORE, THE ROOTS OF THE TREES MUST BE CONTAINED TO PREVENT FUTURE DAMAGE TO THE STORMTRAP SYSTEM. STORMTRAP ACCEPTS NO LIABILITY FOR DAMAGES CAUSED BY TREES OR OTHER VEGETATION PLACE AROUND OR ON TOP OF THE SYSTEM.

DESIGN CRITERIA
ALLOWABLE MAX GRADE = TBD
ALLOWABLE MIN GRADE =TBD
INSIDE HEIGHT ELEVATION =TBD
SYSTEM INVERT = TBD

NOTES:
1. DIMENSIONING OF STORMTRAP SYSTEM SHOWN BELOW ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
2. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
3. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.
4. SP – INDICATES A MODULE WITH MODIFICATIONS.
5. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
6. CONTRACTORS RESPONSIBILITY TO ENSURE CONSISTENCY/ACCURACY TO FINAL ENGINEER OF RECORD PLAN SET.



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1	2/23/2023	PRELIMINARY	EB

SCALE:

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SHEET TITLE:

DOUBLETRAP SYSTEM LAYOUT

SHEET NUMBER:

2.0

STORMTRAP INSTALLATION SPECIFICATIONS

1. STORMTRAP SHALL BE INSTALLED IN ACCORDANCE WITH ASTM C891, STANDARD FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES, THE FOLLOWING ADDITIONS AND/OR EXCEPTIONS SHALL APPLY:

2. IT IS THE RESPONSIBILITY OF THE INSTALLING CONTRACTOR TO ENSURE THAT PROPER/ADEQUATE EQUIPMENT IS USED TO SET/INSTALL THE MODULES.

3. STORMTRAP MODULES CAN BE PLACED ON A LEVEL, 6" FOUNDATION OF ¾" AGGREGATE EXTENDING 2'-0" PAST THE OUTSIDE OF THE SYSTEM (SEE DETAIL 1) AND SHALL BE PLACED ON PROPERLY COMPACTED SOILS (SEE SHEET 1.0 FOR SOIL BEARING CAPACITY REQUIREMENTS), AND IN ACCORDANCE WITH ASTM C891 STANDARD PRACTICE FOR INSTALLATION OF UNDERGROUND PRECAST UTILITY STRUCTURES.

4. THE STORMTRAP MODULES SHALL BE PLACED SUCH THAT THE MAXIMUM SPACE BETWEEN ADJACENT MODULES DOES NOT EXCEED ¾" (SEE DETAIL 2). IF THE SPACE EXCEEDS ¾", THE MODULES SHALL BE RESET WITH APPROPRIATE ADJUSTMENT MADE TO LINE AND GRADE TO BRING THE SPACE INTO SPECIFICATION.

5. STORMTRAP MODULES ARE NOT WATERTIGHT. IF A WATERTIGHT SOLUTION IS REQUIRED, CONTACT STORMTRAP FOR RECOMMENDATIONS. THE WATERTIGHT APPLICATION IS TO BE PROVIDED AND IMPLEMENTED BY THE CONTRACTOR. THE CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THE SELECTED WATERTIGHT SOLUTION PERFORMS AS SPECIFIED BY THE MANUFACTURER.

6. THE PERIMETER HORIZONTAL JOINT BETWEEN THE TOP AND BASE LEG CONNECTION OF THE STORMTRAP MODULES SHALL BE SEALED WITH PREFORMED MASTIC JOINT TAPE ACCORDING TO ASTM C891, 8.8 AND 8.12. (SEE DETAIL 3). THE MASTIC JOINT TAPE DOES NOT PROVIDE A WATERTIGHT SEAL.

7. ALL EXTERIOR ROOF AND EXTERIOR VERTICAL WALL JOINTS BETWEEN ADJACENT STORMTRAP MODULES SHALL BE SEALED WITH 8" WIDE PRE-FORMED, COLD-APPLIED, SELF-ADHERING ELASTOMERIC RESIN, BONDED TO A WOVEN , HIGHLY PUNCTURE RESISTANT POLYMER WRAP, CONFORMING TO ASTM C891 AND SHALL BE INTEGRATED WITH PRIMER SEALANT AS APPROVED BY STORMTRAP (SEE DETAILS 2, 4, & 5). THE JOINT WRAP DOES NOT PROVIDE A WATERTIGHT SEAL. THE SOLE PURPOSE OF THE JOINT WRAP IS TO PROVIDE A SILT AND SOIL TIGHT SYSTEM. THE ADHESIVE EXTERIOR JOINT WRAP SHALL BE INSTALLED ACCORDING TO THE FOLLOWING INSTALLATION INSTRUCTIONS:

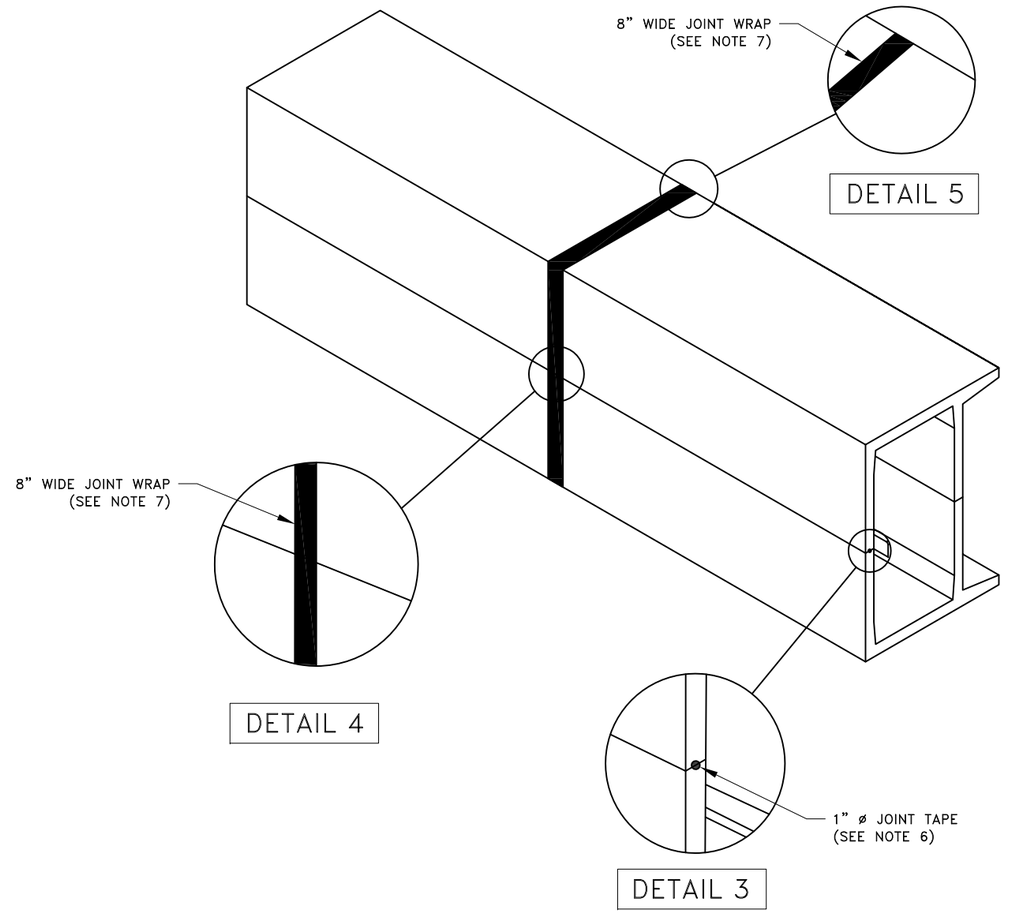
   7.1. USE A BRUSH OR WET CLOTH TO THOROUGHLY CLEAN THE OUTSIDE SURFACE AT THE POINT WHERE JOINT WRAP IS TO BE APPLIED.

   7.2. A RELEASE PAPER PROTECTS THE ADHESIVE SIDE OF THE JOINT WRAP. PLACE THE ADHESIVE TAPE (ADHESIVE SIDE DOWN) AROUND THE STRUCTURE, REMOVING THE RELEASE PAPER AS YOU GO. PRESS THE JOINT WRAP FIRMLY AGAINST THE STORMTRAP MODULE SURFACE WHEN APPLYING.

8. IF THE CONTRACTOR NEEDS TO CANCEL ANY SHIPMENTS, THEY MUST DO SO 48 HOURS PRIOR TO THEIR SCHEDULED ARRIVAL AT THE JOB SITE. IF CANCELED AFTER THAT TIME, PLEASE CONTACT THE PROJECT MANAGER.

9. IF THE STORMTRAP MODULE(S) IS DAMAGED IN ANY WAY PRIOR, DURING, OR AFTER INSTALL, STORMTRAP MUST BE CONTACTED IMMEDIATELY TO ASSESS THE DAMAGE AND TO DETERMINE WHETHER OR NOT THE MODULE(S) WILL NEED TO BE REPLACED. IF ANY MODULE ARRIVES AT THE JOBSITE DAMAGED DO NOT UNLOAD IT; CONTACT STORMTRAP IMMEDIATELY. ANY DAMAGE NOT REPORTED BEFORE THE TRUCK IS UNLOADED WILL BE THE CONTRACTOR'S RESPONSIBILITY.

10. STORMTRAP MODULES CANNOT BE ALTERED IN ANY WAY AFTER MANUFACTURING WITHOUT WRITTEN CONSENT FROM STORMTRAP.



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SCALE:

NTS

SHEET TITLE:

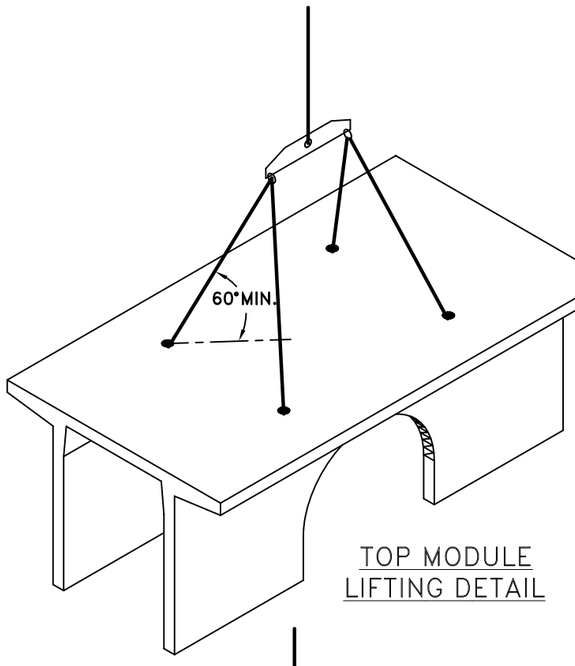
DOUBLETRAP
INSTALLATION
SPECIFICATIONS

SHEET NUMBER:

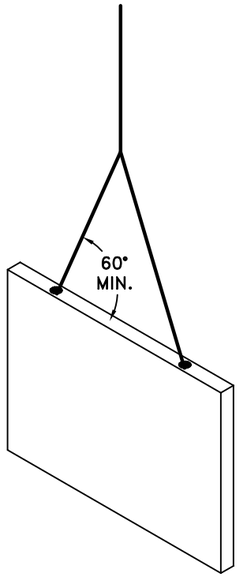
3.0

STORMTRAP MODULE LIFTING INSTALLATION NOTES

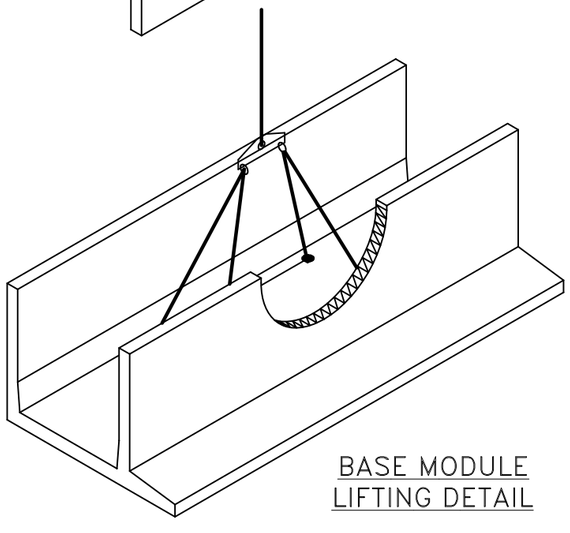
1. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT ALL (4) CHAINS/CABLES ARE SECURED PROPERLY TO THE LIFTING ANCHORS AND IN EQUAL TENSION WHEN LIFTING THE STORMTRAP MODULE (SEE RECOMMENDATIONS 2 & 3).
2. MINIMUM 7'-0" CHAIN/CABLE LENGTH TO BE USED TO LIFT STORMTRAP MODULES (SUPPLIED BY CONTRACTOR).
3. CONTRACTOR TO ENSURE MINIMUM LIFTING ANGLE IS 60° FROM TOP SURFACE OF STORMTRAP MODULE. SEE DETAIL.
4. IT IS UNDERSTOOD AND AGREED THAT AT ALL TIMES DURING WHICH HOISTING AND RIGGING EQUIPMENT IS BEING SUPPLIED TO THE PURCHASER, OPERATOR OF SUCH EQUIPMENT SHALL BE IN CHARGE OF HIS ENTIRE EQUIPMENT AND SHALL AT ALL TIMES BE THE JUDGE OF THE SAFETY AND PROPERTY OF ANY SUGGESTION TO HIM FROM THE SELLER, ITS AGENTS OR EMPLOYEES. PURCHASER AGREES TO SAVE, INDEMNIFY AND HOLD HARMLESS SELLER FROM ALL LOSS, CLAIMS, DEMANDS OR CAUSES OF ACTION, WHICH MAY ARISE FROM THE EXISTENCE OR OPERATION OF SAID EQUIPMENT.



TOP MODULE
LIFTING DETAIL



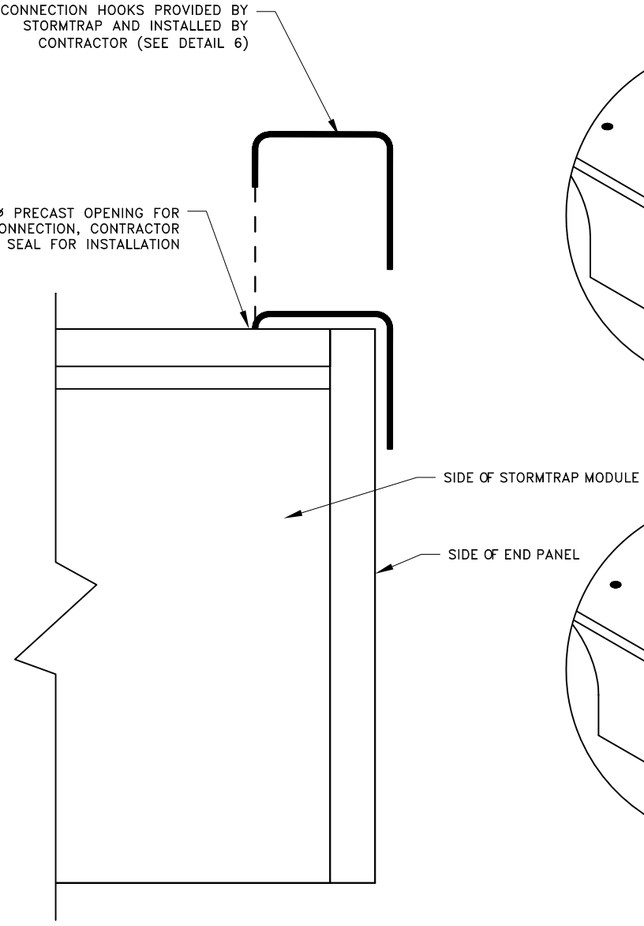
END PANEL
LIFTING DETAIL



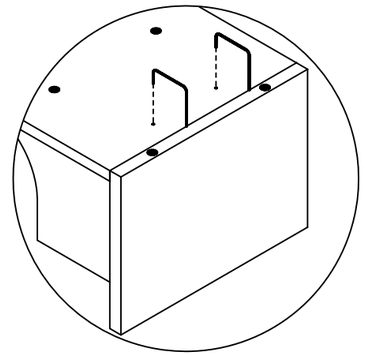
BASE MODULE
LIFTING DETAIL

END PANEL ERECTION/INSTALLATION NOTES

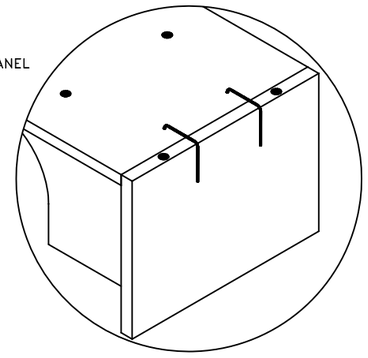
1. END PANELS WILL BE SUPPLIED TO CLOSE OFF OPEN ENDS OF ROWS.
2. PANELS SHALL BE INSTALLED IN A TILT UP FASHION DIRECTLY ADJACENT TO OPEN END OF MODULE (REFER TO SHEET 2.0 FOR END PANEL LOCATIONS).
3. CONNECTION HOOKS WILL BE SUPPLIED WITH END PANELS TO SECURELY CONNECT PANEL TO ADJACENT STORMTRAP MODULE (SEE PANEL CONNECTION ELEVATION VIEW).
4. ONCE CONNECTION HOOK IS ATTACHED, LIFTING CLUTCHES MAY BE REMOVED.
5. JOINT WRAP SHALL BE PLACED AROUND PERIMETER JOINT PANEL (SEE SHEET 3.0).



PANEL CONNECTION
ELEVATION VIEW



STEP 1



STEP 2

DETAIL 6

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SPECIFICATIONS

SHEET NUMBER:

3.1

ZONE CHART

ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	#5 (¾") STONE AGGREGATE (SEE NOTE 4 FOR DESCRIPTION)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) OR SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 120 PCF

FILL DEPTH	TRACK WIDTH	MAX VEHICLE WEIGHT (KIPS)	MAX GROUND PRESSURE
12"	12"	51.8	1690 psf
	18"	56.1	1219 psf
	24"	68.1	1111 psf
	30"	76.7	1000 psf
	36"	85.0	924 psf

NOTE:
TRACK LENGTH NOT TO EXCEED 15'-4".
ONLY TWO TRACKS PER VEHICLE.

APPROVED ZONE 2 BACKFILL OPTIONS

OPTION	REMARKS
¾" STONE AGGREGATE	THE STONE AGGREGATE SHALL CONSIST OF CLEAN AND FREE DRAINING ANGULAR MATERIAL. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 1" SIEVE WITH 0% TO 5% PASSING THE #8 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL (ASTM SIZE #57) AS DETERMINED BY THE GEOTECHNICAL ENGINEER.
SAND	IMPORTED PURE SAND IS PERMITTED TO BE USED AS BACKFILL IF IT IS CLEAN AND FREE DRAINING. THE SAND USED FOR BACKFILLING SHALL HAVE LESS THAN 40% PASSING #40 SIEVE AND LESS THAN 5% PASSING #200 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE SAND BACKFILL.
CRUSHED CONCRETE AGGREGATE	CLEAN, FREE DRAINING CRUSHED CONCRETE AGGREGATE MATERIAL CAN BE USED AS BACKFILL FOR STORMTRAP'S MODULES. THE SIZE OF THIS MATERIAL SHALL HAVE 100% PASSING THE 1" SIEVE WITH 0% TO 5% PASSING THE #8 SIEVE. THIS MATERIAL SHALL BE SEPARATED FROM NATIVE MATERIAL USING GEOFABRIC AROUND THE PERIMETER OF THE BACKFILL.
ROAD PACK	STONE AGGREGATE 100% PASSING THE 1-1/2" SIEVE WITH LESS THAN 12% PASSING THE #200 SIEVE (ASTM SIZE #467). GEOFABRIC AS PER GEOTECHNICAL ENGINEER RECOMMENDATION.

STORMTRAP ZONE INSTALLATION SPECIFICATIONS/PROCEDURES

1. THE FILL PLACED AROUND THE STORMTRAP MODULES MUST DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 2'-0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL EITHER BE COMPACTED AND/OR VIBRATED TO ENSURE THAT BACKFILL AGGREGATE/STONE MATERIAL IS WELL SEATED AND PROPERLY INTER LOCKED. CARE SHALL BE TAKEN TO PREVENT ANY WEDGING ACTION AGAINST THE STRUCTURE, AND ALL SLOPES WITHIN THE AREA TO BE BACKFILLED MUST BE STEPPED OR SERRATED TO PREVENT WEDGING ACTION. CARE SHALL ALSO BE TAKEN AS NOT TO DISRUPT THE JOINT WRAP FROM THE JOINT DURING THE BACKFILL PROCESS. BACKFILL MUST BE FREE-DRAINING MATERIAL. SEE ZONE 2 BACKFILL CHART ON THIS PAGE FOR APPROVED BACKFILL OPTIONS. IF NATIVE EARTH IS SUSCEPTIBLE TO MIGRATION, CONFIRM WITH GEOTECHNICAL ENGINEER AND PROVIDE PROTECTION AS REQUIRED (PROVIDED BY OTHERS).

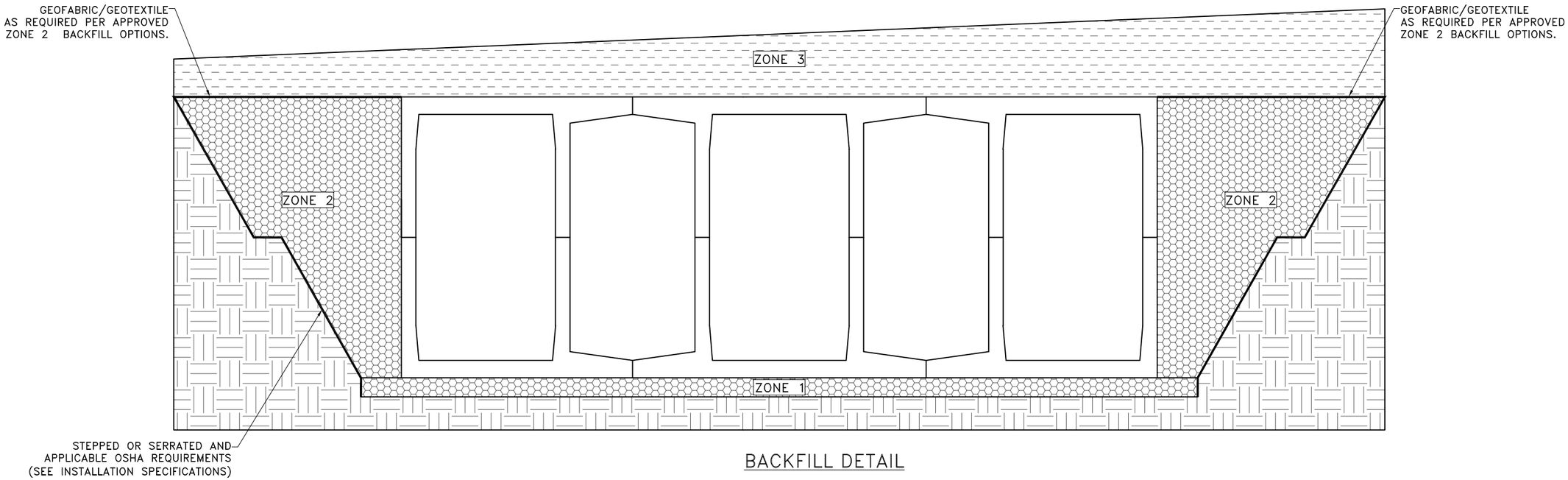
2. DURING PLACEMENT OF MATERIAL OVERTOP THE SYSTEM, AT NO TIME SHALL MACHINERY BE USED OVERTOP THAT EXCEEDS THE DESIGN LIMITATIONS OF THE SYSTEM. WHEN PLACEMENT OF MATERIAL OVERTOP, MATERIAL SHALL BE PLACED SUCH THAT THE DIRECTION OF PLACEMENT IS PARALLEL WITH THE OVERALL LONGITUDINAL DIRECTION OF THE SYSTEM WHENEVER POSSIBLE.

3. THE FILL PLACED OVERTOP THE SYSTEM SHALL BE PLACED AT A MINIMUM OF 6" LIFTS. AT NO TIME SHALL MACHINERY OR VEHICLES GREATER THAN THE DESIGN HS-20 LOADING CRITERIA TRAVEL OVERTOP THE SYSTEM WITHOUT THE MINIMUM DESIGN COVERAGE. IF TRAVEL IS NECESSARY OVERTOP THE SYSTEM PRIOR TO ACHIEVING THE MINIMUM DESIGN COVER, IT MAY BE NECESSARY TO REDUCE THE ULTIMATE LOAD/BURDEN OF THE OPERATING MACHINERY SO AS TO NOT EXCEED THE DESIGN CAPACITY OF THE SYSTEM. IN SOME CASES, IN ORDER TO ACHIEVE REQUIRED COMPACTION, HAND COMPACTION MAY BE NECESSARY IN ORDER NOT TO EXCEED THE ALLOTTED DESIGN LOADING. SEE CHART FOR TRACKED VEHICLE WIDTH AND ALLOWABLE MAXIMUM PRESSURE PER TRACK.

4. STONE AGGREGATE FOUNDATION IN ZONE 1 MAY BE REQUIRED FOR THE FOLLOWING:

   A.) INFILTRATION - IF INFILTRATION IS REQUIRED, A FREE DRAINING MATERIAL SHALL BE USED AT A DEPTH DETERMINED BY THE EOR. FREE DRAINING AGGREGATE IS DEFINED AS 80% AGGREGATE RETAINED ON ½" SIEVE, MAJORITY OF AGGREGATE SIZE BETWEEN ½" AND 1", AND ONLY 5% OF MATERIAL PASSING #3/8" SIEVE.

   B.) LEVELING - STORMTRAP RECOMMENDS STONE SUBBASE FOR LEVELING PURPOSES ONLY (OPTIONAL).



BACKFILL DETAIL

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DOUBLETRAP BACKFILL SPECIFICATIONS

SHEET NUMBER:

4.0

RECOMMENDED ACCESS OPENING SPECIFICATION

1. A TYPICAL ACCESS OPENING FOR THE STORMTRAP SYSTEM ARE 2'–0" IN DIAMETER. ACCESS OPENINGS LARGER THAN 3'–0" IN DIAMETER NEED TO BE APPROVED BY STORMTRAP. ALL OPENINGS MUST RETAIN AT LEAST 1'–0" OF CLEARANCE FROM THE END OF THE STORMTRAP MODULE UNLESS NOTED OTHERWISE. ALL ACCESS OPENINGS TO BE LOCATED ON INSIDE LEG UNLESS OTHERWISE SPECIFIED.
2. PLASTIC COATED STEEL STEPS PRODUCED BY M.A. INDUSTRIES PART #PS3–PFC OR APPROVED EQUAL (SEE STEP DETAIL) ARE PROVIDED INSIDE ANY MODULE WHERE DEEMED NECESSARY. THE HIGHEST STEP IN THE MODULE IS TO BE PLACED A DISTANCE OF 1'–0" FROM THE INSIDE EDGE OF THE STORMTRAP MODULES. ALL ENSUING STEPS SHALL BE PLACED AT A DISTANCE BETWEEN 10" MIN AND 14" MAX BETWEEN THEM. STEPS MAY BE MOVED OR ALTERED TO AVOID OPENINGS OR OTHER IRREGULARITIES IN THE MODULE.
3. STORMTRAP LIFTING INSERTS MAY BE RELOCATED TO AVOID INTERFERENCE WITH ACCESS OPENINGS OR THE CENTER OF GRAVITY OF THE MODULE AS NEEDED.
4. STORMTRAP ACCESS OPENINGS MAY BE RELOCATED TO AVOID INTERFERENCE WITH INLET AND/OR OUTLET PIPE OPENINGS SO PLACEMENT OF STEPS IS ATTAINABLE.
5. ACCESS OPENINGS SHOULD BE LOCATED IN ORDER TO MEET THE APPROPRIATE MUNICIPAL REQUIREMENTS. STORMTRAP RECOMMENDS AT LEAST TWO ACCESS OPENINGS PER SYSTEM FOR ACCESS AND INSPECTION.
6. USE PRECAST ADJUSTING RINGS AS NEEDED TO MEET GRADE. STORMTRAP RECOMMENDS FOR COVER OVER 2' TO USE PRECAST BARREL OR CONE SECTIONS. (PROVIDED BY OTHERS)

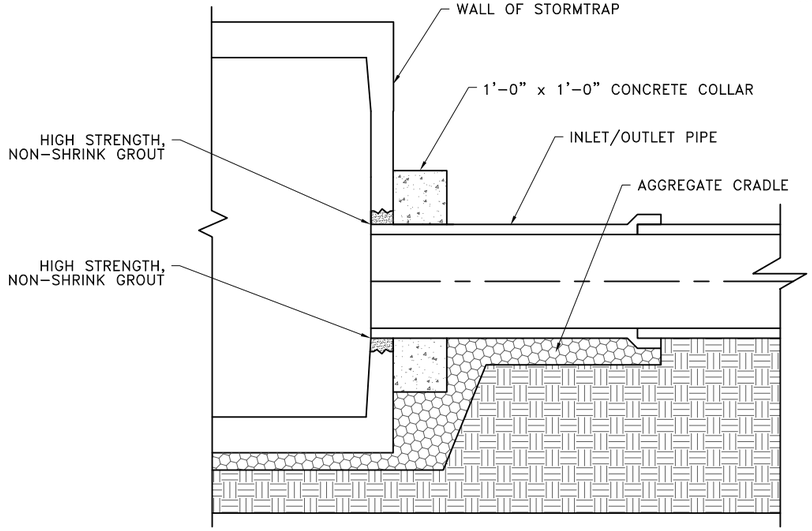
RECOMMENDED PIPE OPENING SPECIFICATION

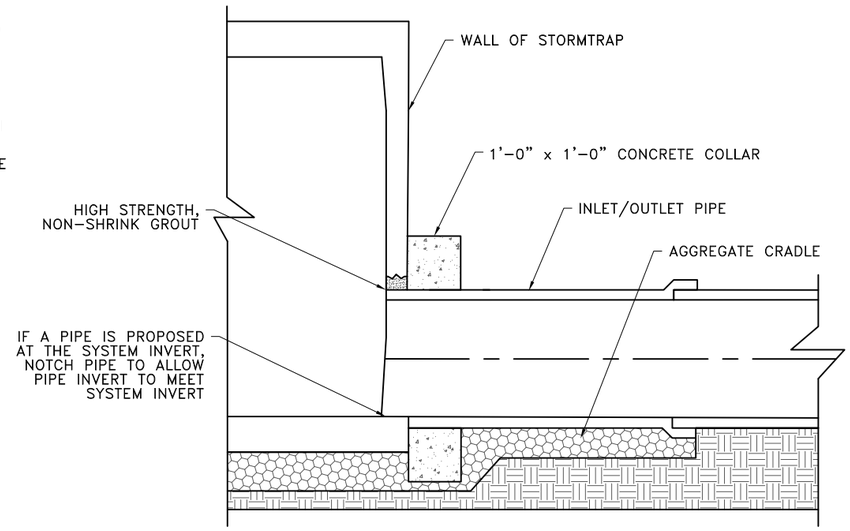
1. MINIMUM EDGE DISTANCE FOR AN OPENING ON THE OUTSIDE WALL SHALL BE NO LESS THAN 1'–0".
2. MAXIMUM OPENING SIZE TO BE DETERMINED BY THE MODULE HEIGHT. PREFERRED OPENING SIZE ø 36" OR LESS. ANY OPENING NEEDED THAT DOES NOT FIT THIS CRITERIA SHALL BE BROUGHT TO THE ATTENTION OF STORMTRAP FOR REVIEW.
3. CONNECTING PIPES SHALL BE INSTALLED WITH A 1'–0" CONCRETE COLLAR, AND AN AGGREGATE CRADLE FOR AT LEAST ONE PIPE LENGTH (SEE PIPE CONNECTION DETAIL). A STRUCTURAL GRADE CONCRETE OR HIGH STRENGTH, NON–SHRINK GROUT WITH A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 3000 PSI SHALL BE USED.
4. THE ANNULAR SPACE BETWEEN THE PIPE AND THE HOLE SHALL BE FILLED WITH HIGH STRENGTH NON–SHRINK GROUT.

RECOMMENDED PIPE INSTALLATION INSTRUCTIONS

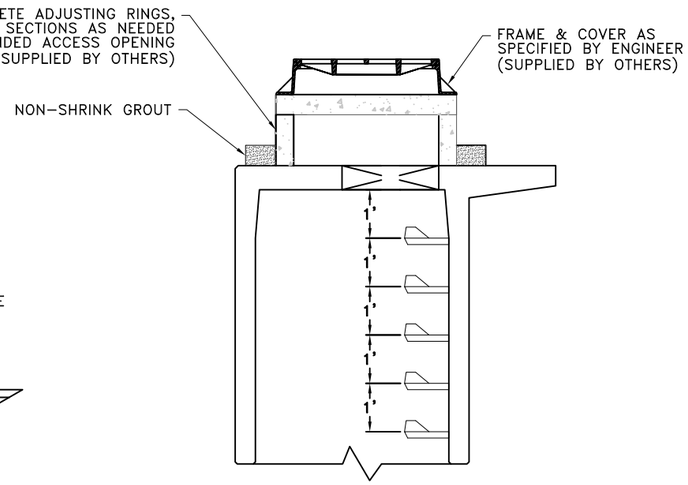
1. CLEAN AND LIGHTLY LUBRICATE ALL OF THE PIPE TO BE INSERTED INTO STORMTRAP.
2. IF PIPE IS CUT, CARE SHOULD BE TAKEN TO ALLOW NO SHARP EDGES. BEVEL AND LUBRICATE LEAD END OF PIPE.
3. ALIGN CENTER OF PIPE TO CORRECT ELEVATION AND INSERT INTO OPENING.

NOTE: ALL ANCILLARY PRODUCTS/SPECIFICATIONS RECOMMENDED AND SHOWN ON THIS SHEET ARE RECOMMENDATIONS ONLY AND SUBJECT TO CHANGE PER THE INSTALLING CONTRACTOR AND/OR PER LOCAL MUNICIPAL CODE/REQUIREMENTS.

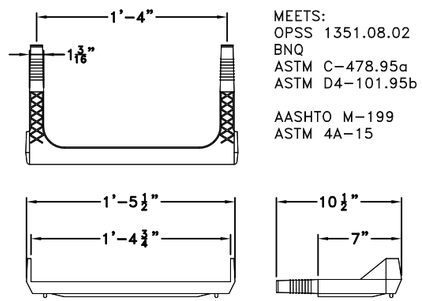




PIPE CONNECTION DETAIL



RISER / STAIR DETAIL



MEETS:
OPSS 1351.08.02
BNQ
ASTM C–478.95a
ASTM D4–101.95b

AASHTO M–199
ASTM 4A–15

STEP DETAIL

*** NOTICE *** 03–25–2022

DUE TO CURRENT INCONSISTENCIES IN THE 16" STEP SUPPLY, STORMTRAP MAY SUBSTITUTE THE 16" STEP WITH THE CLOSEST ALTERNATIVE LENGTH STEP UNTIL THE SUPPLY CHAIN ISSUE IS RESOLVED.

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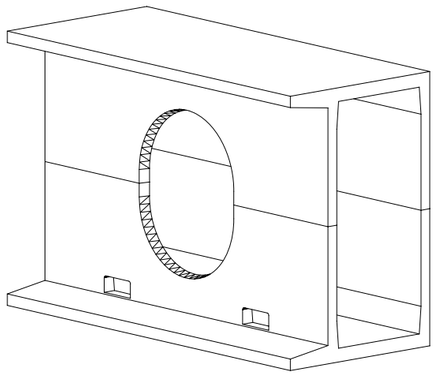
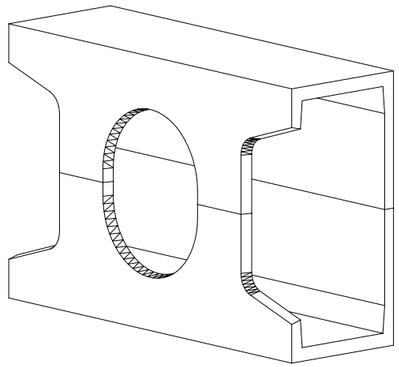
RECOMMENDED PIPE / ACCESS OPENING SPECIFICATIONS

SHEET NUMBER:

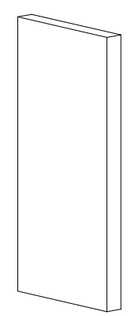
5.0



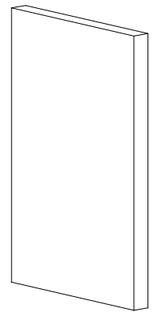
TYPE IV/IVNF



TYPE VII-3/VII-3NF



TYPE VII
END PANEL



TYPE IV
END PANEL

NOTES:
1. OPENING LOCATIONS AND SHAPES MAY VARY.
2. SP – INDICATES A MODULE WITH MODIFICATIONS.
3. P – INDICATES A MODULE WITH A PANEL ATTACHMENT.
4. POCKET WINDOW OPENINGS ARE OPTIONAL.

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DOUBLETRAP
MODULE TYPES

SHEET NUMBER:

6.0

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ATTACHMENT 6

SWMM Input Data in Input Format (Existing & Proposed Models)

PRE_DEV

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[TITLE]

[OPTIONS]
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INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
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START_TIME           00:00:00
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REPORT_START_TIME    00:00:00
END_DATE             10/05/2007
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.07   0.1    0.13   0.17   0.19   0.22   0.24   0.22   0.19   0.13   0.09   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
Poway            INTENSITY 1:00   1.0    TIMESERIES Poway

[SUBCATCHMENTS]
;;                                             Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet         Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- -------------- -------- -------- -------- -------- -------- --------
DMA-1-C          Poway            POC-1          0.675    0        114      1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1-C          0.012      0.05       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-1-C          6          0.075      0.32

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Poway            FILE "PowayRain.prn"

[REPORT]
INPUT      NO
```

```
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -2332.031 5700.000 3253.906 12300.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -1889.283          9043.612

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1-C          -2819.679          11253.304

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Poway            3324.814           11388.987
```

POST_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           10/05/1962
START_TIME           00:00:00
REPORT_START_DATE    10/05/1962
REPORT_START_TIME    00:00:00
END_DATE             10/05/2007
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.07   0.1    0.13   0.17   0.19   0.22   0.24   0.22   0.19   0.13   0.09   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
Poway            INTENSITY 1:00   1.0    TIMESERIES Poway

[SUBCATCHMENTS]
;;                                          Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet     Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------- -------- -------- -------- -------- -------- --------
DMA-1-C          Poway            1          0.675    74.79    114      1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1-C          0.012      0.05       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-1-C          6          0.075      0.32

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                    Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                   Area     Frac.    Infiltration
Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- ----------
------
1                0        9        0        TABULAR    Vault                    400      0        6        1.37
0.32
```

POST_DEV

```
[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet          Qcoeff/                     Flap
;;Name           Node             Node             Height     Type            QTable           Qexpon     Gate
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- ----
1                1                POC-1            0          TABULAR/DEPTH   Out                         NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
Out              Rating     0          0
Out                         0.49       0
Out                         0.5        0
Out                         1          0
Out                         2          0
Out                         2.99       0.0001
Out                         3.0        0.0185
Out                         3.2        0.0185
Out                         4          0.0185
Out                         5          0.0185
Out                         6          0.0185
Out                         7          0.0185
Out                         7.24       0.0185
Out                         7.25       1.50
Out                         8          1.51
Out                         9          1.52

Vault            Storage    0          400
Vault                       9          400

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Poway            FILE "PowayRain.prn"

[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -2332.031 5700.000 3253.906 12300.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -1889.283          9043.612
1                -2383.226          10232.685

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1-C          -2819.679          11253.304

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Poway            22.077             10601.554
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, outfalls, storage units, weir as a discharge, and outfalls (point of compliance), are also shown.

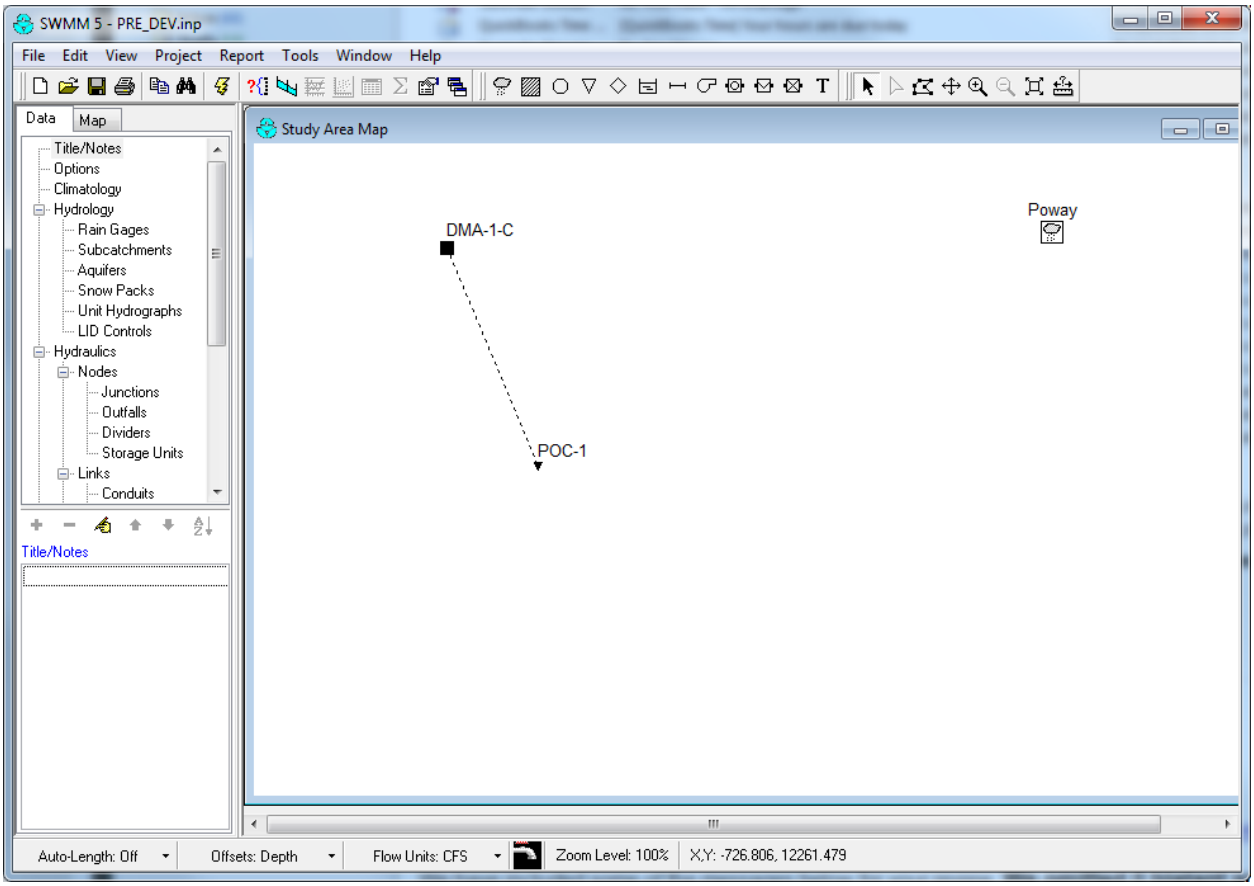
Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from Appendix G of the 2016 City of San Marcos BMP Design Manual.

Soil characteristics of the existing soils were determined from the NRCS Web Soil Survey and site specific geotechnical report (located in Attachment 8 of this report).

A Technical document prepared by Tory R Walker Engineering for the Cities of San Marcos, Oceanside and Vista (Reference [1]) can also be consulted for additional information regarding typical values for SWMM parameters.

Manning's roughness coefficients have been based upon the findings of the "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*" date 2016 by TRW Engineering (Reference [6]).

PRE-DEVELOPED CONDITION



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	-1889.283
Y-Coordinate	9043.612
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage Poway

Property	Value
Name	Poway
X-Coordinate	22.077
Y-Coordinate	10601.554
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Poway
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage

Subcatchment DMA-1-C

Property	Value
Name	DMA-1-C
X-Coordinate	-2819.679
Y-Coordinate	11253.304
Description	
Tag	
Rain Gage	Poway
Outlet	POC-1
Area	0.675
Width	114
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

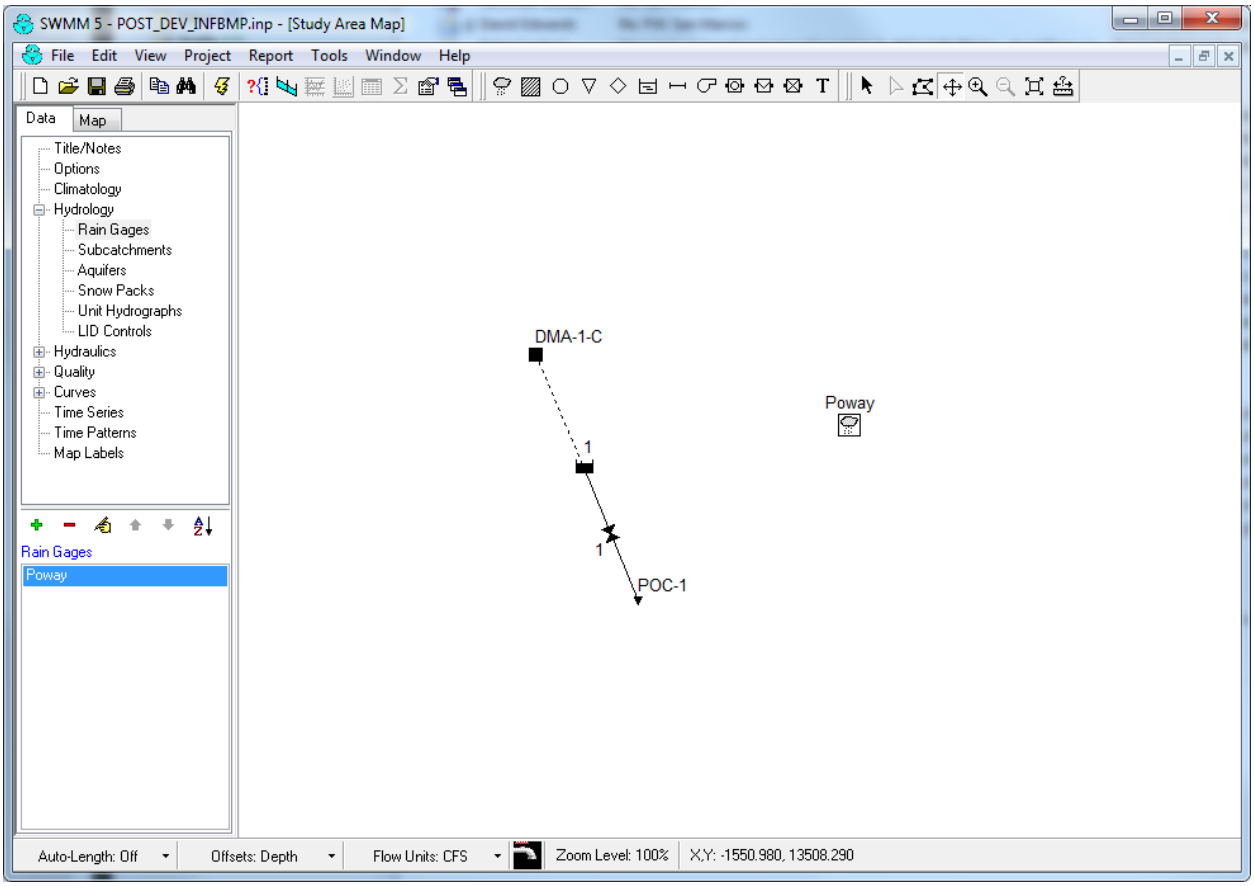
Mannings N for pervious area

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

POST-DEVELOPED CONDITION



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	-1889.283
Y-Coordinate	9043.612
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage Poway

Property	Value
Name	Poway
X-Coordinate	22.077
Y-Coordinate	10601.554
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Poway
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage

Subcatchment DMA-1-C

Property	Value
Name	DMA-1-C
X-Coordinate	-2819.679
Y-Coordinate	11253.304
Description	
Tag	
Rain Gage	Poway
Outlet	1
Area	0.675
Width	114
% Slope	1
% Imperv	74.79
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

Detention Basin

Storage Unit 1

Property	Value
Name	1
X-Coordinate	-2383.226
Y-Coordinate	10232.685
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	9
Initial Depth	0
Ponded Area	400
Evap. Factor	0
Infiltration	YES
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	Vault

User-assigned name of storage unit

Outlet 1

Property	Value
Name	1
Inlet Node	1
Outlet Node	POC-1
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/DEPTH
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	Out

User-assigned name of outlet

Storage Curve Editor

Curve Name: Vault

Description:

	Depth (ft)	Area (ft2)
1	0	400
2	9	400
3		
4		
5		
6		
7		
8		
9		

View... Load... Save... OK Cancel Help

Rating Curve Editor

Curve Name: Out

Description:

	Head (ft)	Outflow (CFS)
1	0	0
2	0.49	0
3	0.5	0
4	1	0
5	2	0
6	2.99	0.0001
7	3.0	0.0185
8	3.2	0.0185
9	4	0.0185

View... Load... Save... OK Cancel Help

EXPLANATION OF SELECTED VARIABLES

Sub Catchment Areas:

Please refer to the attached diagrams that indicate the DMA and detention BMPs (BMP) sub areas modeled within the project site at both the pre and post developed conditions draining to the POC.

Parameters for the pre- and post-developed models include soil type C as determined from the NRCS websoil survey review (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for these soils types, according to Appendix G of the 2016 City of San Marcos BMP Design Manual.

For surface runoff infiltration values, REC selected infiltration values per Appendix G of the 2016 City of San Marcos BMP Design Manual corresponding to hydrologic soil type.

Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant than the precise routing in a system where the time of concentration is much smaller than 1 hour.

Overland Flow Manning's Coefficient per TRWE (Reference [6])

appeal of a de facto value, we anticipate that jurisdictions will not be inclined to approve land surfaces other than short prairie grass. Therefore, in order to provide SWMM users with a wider range of land surfaces suitable for local application and to provide Copermittees with confidence in the design parameters, we recommend using the values published by Yen and Chow in Table 3-5 of the EPA SWMM Reference Manual Volume I – Hydrology.

SWMM-Endorsed Values Will Improve Model Quality

In January 2016, the EPA released the SWMM Reference Manual Volume I – Hydrology (SWMM Hydrology Reference Manual). The SWMM Hydrology Reference Manual complements the SWMM 5 User's Manual and SWMM 5 Applications Manual by providing an in-depth description of the program's hydrologic components (EPA 2016). Table 3-5 of the SWMM Hydrology Reference Manual expounds upon SWMM 5 User's Manual Table A.6 by providing Manning's *n* values for additional overland flow surfaces[3]. The values are provided in Table 1:

Table 1: Manning's *n* Values for Overland Flow (EPA, 2016; Yen 2001; Yen and Chow, 1983).

Overland Surface	Light Rain (< 0.8 in/hr)	Moderate Rain (0.8-1.2 in/hr)	Heavy Rain (> 1.2 in/hr)
Smooth asphalt pavement	0.010	0.012	0.015
Smooth impervious surface	0.011	0.013	0.015
Tar and sand pavement	0.012	0.014	0.016
Concrete pavement	0.014	0.017	0.020
Rough impervious surface	0.015	0.019	0.023
Smooth bare packed soil	0.017	0.021	0.025
Moderate bare packed soil	0.025	0.030	0.035
Rough bare packed soil	0.032	0.038	0.045
Gravel soil	0.025	0.032	0.045
Mowed poor grass	0.030	0.038	0.045
Average grass, closely clipped sod	0.040	0.050	0.060
Pasture	0.040	0.055	0.070
Timberland	0.060	0.090	0.120
Dense grass	0.060	0.090	0.120
Shrubs and bushes	0.080	0.120	0.180
Land Use			
Business	0.014	0.022	0.035
Semibusiness	0.022	0.035	0.050
Industrial	0.020	0.035	0.050
Dense residential	0.025	0.040	0.060
Suburban residential	0.030	0.055	0.080
Parks and lawns	0.040	0.075	0.120

For purposes of local hydromodification management BMP design, these Manning's *n* values are an improvement upon the values presented by Engman (1986) in SWMM 5 User's Manual Table A.6. Values from SWMM 5 User's Manual Table A.6, while completely suitable for the intended application to certain agricultural land covers, comes with the disclaimer that the provided Manning's *n* values are valid for shallow-depth overland flow that match the conditions in the experimental plots (Engman,

[3] Further discussion is provided on page 6 under "Discussion of Differences Between Manning's *n* Values"

ATTACHMENT 8

Geotechnical Documentation

GLOBAL GEO-ENGINEERING, INC.

August 31, 2022
Project 9421-04

DMS Consultants, Inc.
12377 Lewis Street, Suite 203
Garden Grove, California 92840

Attention: Mr. Surender Dewan, P. E.
President

Subject: Geotechnical Investigation
Proposed Multi-Family Residential Development
236 and 244 Pico Avenue
San Marcos, California

References: *See Appendix A*

Dear Mr. Dewan:

1. INTRODUCTION

a) In accordance with your request, we have conducted a geotechnical investigation for the proposed residential development located in San Marcos, California.

b) We understand that the proposed development will consist of the construction of four 3-story, multi-family residential structures, each unit approximately 1,170-squarefoot, with related parking/driveway areas on a 0.67-acre parcel of land. In addition, an infiltration system is planned to be installed for potential stormwater runoff.

c) Grading and structural plans are not available at present. We are assuming that the existing grades will remain unchanged. We anticipate the loads from the proposed structures will not exceed 3 kip/ft for the continuous footings and 50 kips for the column footings.

2. SCOPE

The scope of services we provided were as follows:

a) Preliminary planning and evaluations, and review of geotechnical reports related to the project site and nearby surrounding area *(See References – Appendix A)*;

3 Corporate Park, Suite 270, Irvine, California 92606
Office (949) 221-0900 Fax (949) 221-0091
Email: global@globalgeo.net

b) Excavation of three (3) borings utilizing a hollow stem auger drill rig to a maximum depth of 40 feet below ground surface. One of the borings was drilled to a depth of 5 feet below ground surface for the purpose of percolation testing;

c) Sampling and logging of subsurface materials encountered in the borings;

d) Field percolation testing to determine the infiltrations rate;

e) Laboratory testing of samples representative of those obtained in the field, in order to evaluate relevant engineering properties;

f) Engineering and geologic analyses of the field and laboratory data;

g) Preparation of a report presenting our findings, conclusions and recommendations.

3. FIELD EXPLORATION AND LABORATORY TESTING

The field exploration program is given in *Appendix B*, which includes the Logs of Borings. The results of the laboratory testing are included in *Appendix C.*

4. SITE DESCRIPTION

4.1 Location

a) The project site is located along the southwest side of Pico Avenue, approximately 280 feet northwest of San Marcos Boulevard, in the city of San Marcos, California.

b) The approximate site location is shown on the *Location Map, Figure 1.*

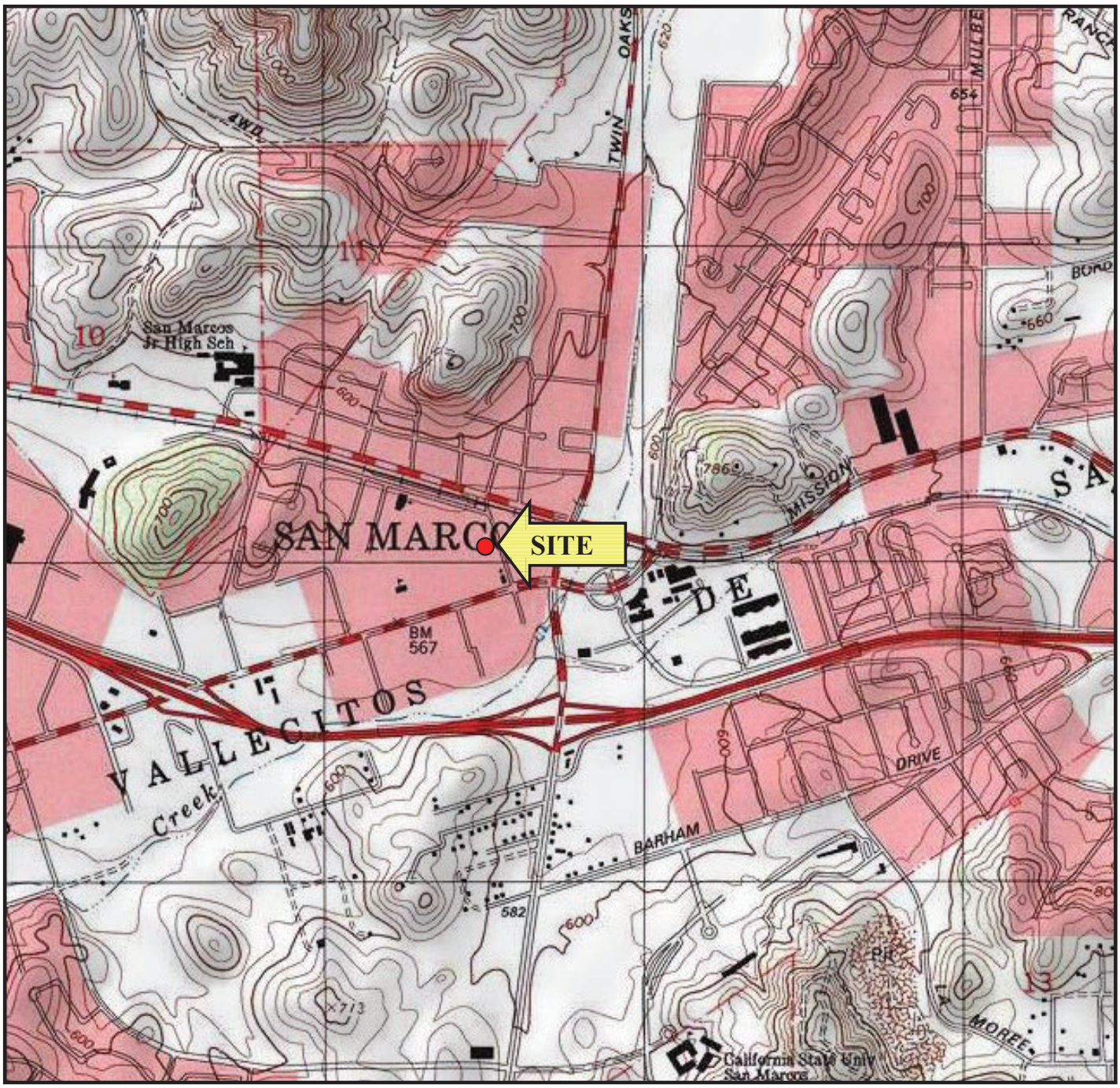
4.2 Existing Surface Conditions

a) The subject property is currently vacant and void of any building structures.

b) The ground surface throughout the project site is relatively level. The natural topography of the site area descends to the south at an approximate gradient of one percent.

c) Surface drainage consists of sheet flow runoff of incident rainfall water derived primarily within the property boundaries and adjacent properties.

LOCATION MAP



BASE MAP: USGS 7.5-Minute Topographic Map,
San Marcos Quadrangle, 1999

2000 0 2000 4000

SCALE FEET

NORTH

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA

244 Pico Avenue
San Marcos, California

Date: August 2022

Project No.: 9421-04

Figure No: 1

4.3 Geology

4.3.1 Regional Geologic Setting

The subject property is located within the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges consist of a series of mountain ranges separated by longitudinal valleys. The ranges trend northwest-southeast and are sub parallel to faults branching from the San Andreas Fault. The Peninsular Ranges extend from the southern side of the Santa Monica and San Gabriel Mountains into Baja California, Mexico (CDMG, 1997).

4.3.2 Local Geologic Setting

In general, the project site area is underlain by Recent- to Older-aged alluvial deposits which overlie granitic bedrock.

4.4 Subsurface Conditions

a) The subsurface conditions, as encountered in our explorations, are described in the following sections.

b) More detailed descriptions of the subsurface conditions are presented in our *Logs of Borings,* which are enclosed as *Figures B-2* through *B-4* in Appendix B. The locations of the borings are shown on our *Boring Location Plan, Figure B-5.*

4.4.1 Alluvium

a) Alluvial deposits were encountered in all of our borings excavated on-site.

b) The alluvium was found to generally consist of interlayers of Silty SAND, SAND and Sandy to Clayey SILT.

c) The Silty SAND and SAND sediments were generally found to be fine to coarse grained, slightly moist to very moist and medium dense.

d) The Sandy to Clayey SILT deposits were observed to be slightly moist to moist and stiff.

4.4.2 Bedrock

a) Bedrock, classified as Tonalite, was encountered at a depth of 37 feet below ground surface in Boring B-1.

b) The bedrock encountered in our boring was noted to be fine textured and hard.

4.4.3 Groundwater

a) Groundwater was encountered in our deeper boring (Boring B-1) at a depth of 24 feet below ground surface. The static water level was measured at a depth of 23.5 feet below ground surface approximately 30 minutes after termination of drilling.

b) No nearby groundwater wells were found to be listed during our review of the *California Department of Water Resources* internet website.

5. SEISMICITY

5.1 General

a) The property is located in the general proximity of several active and potentially active faults, which are typical for sites in the Southern California region. Earthquakes occurring on active faults within a 70-mile radius are capable of generating ground shaking of engineering significance to the proposed construction.

b) In Southern California, most of the seismic damage to manmade structures results from ground shaking and, to a lesser degree, from liquefaction and ground rupture caused by earthquakes along active fault zones. In general, the greater the magnitude of the earthquake, greater is the potential damage.

5.2 Ground Surface Rupture

a) The closest known active fault is the Elsinore Fault, located at a distance of about 16.3 miles northeast of the project site. Other nearby active or potentially active faults include the Rose Canyon Fault and the San Jacinto Fault located at distances of about 20.8 miles and 40.8 miles, respectively, from the subject property.

b) Due to the distance of the closest active fault to the site, ground rupture is not considered a significant hazard at the site.

5.3 Ground Shaking

a) We utilized the California Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps internet program to calculate the peak ground acceleration (PGA) at the project site location. Using the ASCE 7-16 standard and Site Class D, the PGA at the subject property resulted to be 0.47g.

b) *Figure 2* shows the geographical relationships among the site locations, nearby faults and the epicenters of significant occurrences. The project site is not located within any State of California delineated Earthquake Fault Zone; however, during historic times, a number of major earthquakes have occurred along the active faults in Southern California. From the seismic history of the region and proximity, the Elsinore Fault and Rose Canyon Fault have the greatest potential for causing earthquake damage related to ground shaking at this site.

5.4 Liquefaction

The subject site is underlain by dense soil layers overlying a Tonalite bedrock. The potential for the liquefaction is considered to be low.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

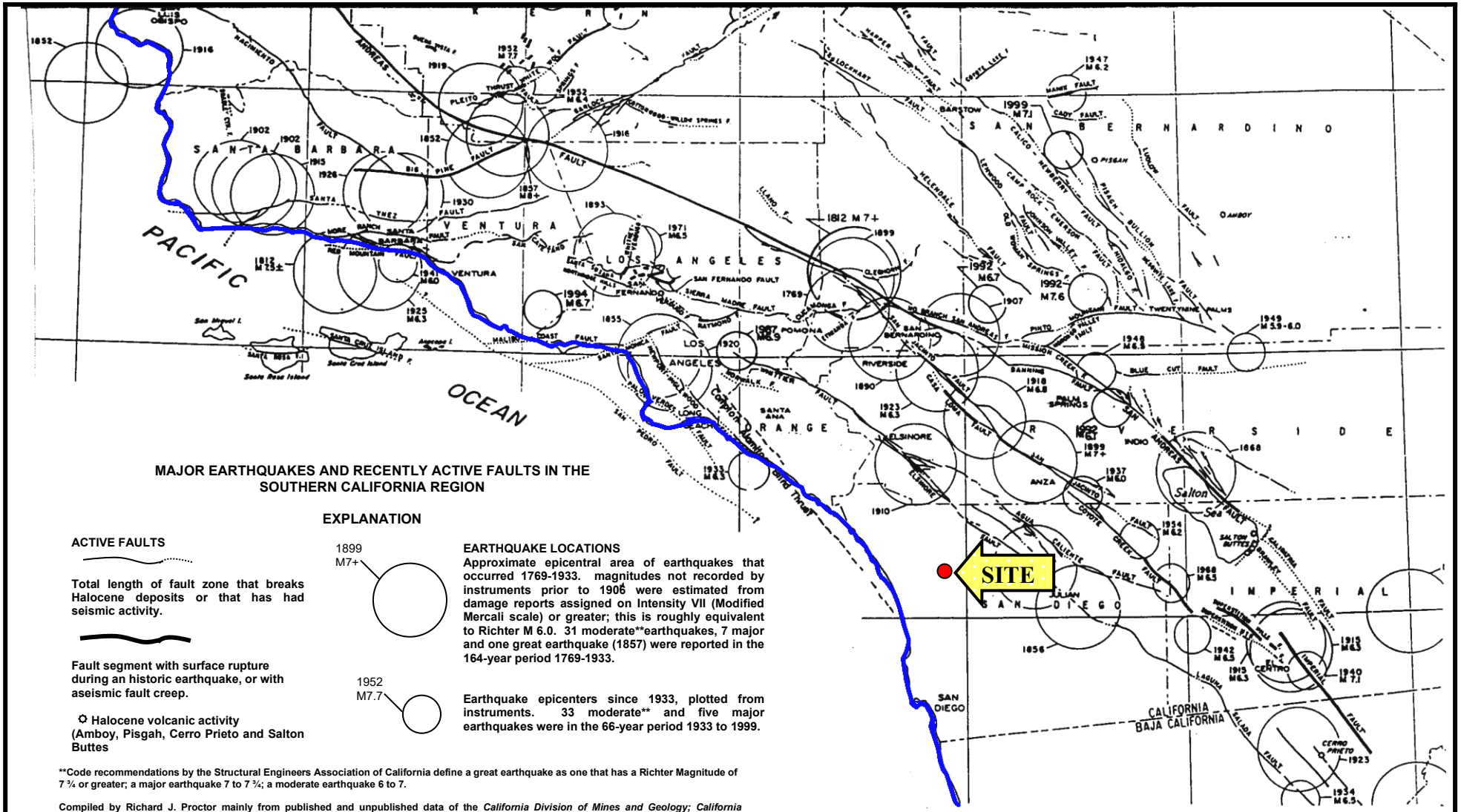
a) It is our opinion that the site will be suitable for the proposed development, from a geotechnical aspect, assuming that our recommendations are implemented.

b) We are of the opinion that the proposed structures can be supported on shallow spread footings founded in the existing competent soils.

c) We consider that the anticipated grading will not adversely affect, nor be adversely affected by adjoining property, with due precautions being taken.

d) The final grading plans and foundation plans/design loads should be reviewed by the Geotechnical Engineer.

e) The design recommendations in the report should be reviewed during the construction phase.



MAJOR EARTHQUAKES AND RECENTLY ACTIVE FAULTS IN THE SOUTHERN CALIFORNIA REGION

EXPLANATION

ACTIVE FAULTS

Total length of fault zone that breaks Holocene deposits or that has had seismic activity.

Fault segment with surface rupture during an historic earthquake, or with aseismic fault creep.

Halocene volcanic activity (Amboy, Pisgah, Cerro Prieto and Salton Buttes

1899 M7+

1952 M7.7

EARTHQUAKE LOCATIONS

Approximate epicentral area of earthquakes that occurred 1769-1933. magnitudes not recorded by instruments prior to 1906 were estimated from damage reports assigned on Intensity VII (Modified Mercali scale) or greater; this is roughly equivalent to Richter M 6.0. 31 moderate**earthquakes, 7 major and one great earthquake (1857) were reported in the 164-year period 1769-1933.

Earthquake epicenters since 1933, plotted from instruments. 33 moderate** and five major earthquakes were in the 66-year period 1933 to 1999.

**Code recommendations by the Structural Engineers Association of California define a great earthquake as one that has a Richter Magnitude of 7 ¾ or greater; a major earthquake 7 to 7 ¾; a moderate earthquake 6 to 7.

Compiled by Richard J. Proctor mainly from published and unpublished data of the *California Division of Mines and Geology; California Department of Water Resources Bulletin 116-2* (1964); selections from bulletins of the *Geological* and *Seismological Societies of America*; from C.F. Richter, *Elementary Seismology* (1958); and the *National Atlas*, p. 66, and from Working Group on California Earthquake Probabilities- SSA Bulletin V 85.

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Date: August 2022

Project No: 9421-04

Figure No: 2

6.2 Grading

6.2.1 Processing of On-Site Soils

a) To provide uniform support conditions, the subgrade soils should be overexcavated to a depth of one foot below the foundation bottom and three feet below the slab-on-grade, subject to review during construction. The overexcavation should laterally extend for a distance of 5 feet.

b) There should be at least one foot of reworked soils or compacted fill below the pavements.

c) Wherever structural fills are to be placed, the upper 6 to 8 inches of the subgrade should, after stripping or overexcavation, first be scarified, reworked and wetted down thoroughly.

d) Any loosening of reworked or native material, consequent to the passage of construction traffic, weathering, etc., should be made good prior to further construction.

e) The depths of overexcavation should be reviewed by the Geotechnical Engineer during the actual construction. Any surface or subsurface obstructions, or questionable material encountered during grading should be brought immediately to the attention of the Geotechnical Engineer for proper exposure, removal or processing as directed. No underground obstructions or facilities should remain in any structural areas. Depressions and/or cavities created as a result of the removal of obstructions should be backfilled properly with suitable material, and compacted.

6.2.2 Material Selection

After the site has been stripped of any debris, vegetation and organic soils, excavated on-site soils are considered satisfactory for reuse in the construction of on-site fills, with the following provisions:

a) Significant water will be required to be added to the existing soils;

b) The organic content does not exceed 3 percent by volume;

c) Large size rocks greater than 8 inches in diameter should not be incorporated in compacted fill;

d) Rocks greater than 4 inches in diameter should not be incorporated in compacted fill to within one foot of the underside of the footings and slabs.

6.2.3 Compaction Requirements

a) Reworking/compaction shall include moisture-conditioning as needed to bring the soils to slightly above the optimum moisture content. All reworked soils and structural fills should be densified to achieve at least 90 percent relative compaction with reference to laboratory compaction standard. The optimum moisture content and maximum dry density should be determined in the laboratory in accordance with ASTM Test Designation D1557.

b) Fill should be compacted in lifts not exceeding 8 inches (loose).

6.2.4 Excavating Conditions

a) Excavation of on-site materials may be accomplished with standard earthmoving or trenching equipment. No hard rock was encountered which will require blasting.

b) Ground water was encountered at a depth of 24 feet below ground surface in our deeper boring. Dewatering is not anticipated in excavations shallower than 24 feet below ground surface.

6.2.5 Shrinkage

For preliminary earthwork calculation, an average shrinkage factor of approximately 5 percent is recommended for the soils (this does not include handling losses).

6.2.6 Expansion Potential

a) Based upon our visual observations, the expansion potential for the on-site soils is considered to be *medium*. The recommendations provided in the following sections will reduce the effects of the expansive subgrade soils.

b) Any imported material, or doubtful material exposed during grading, should be evaluated for its expansive properties.

c) In any event, the subgrade soils should be tested for their expansion potential or during the final stages of grading.

6.2.7 Sulphate Content

a) The sulphate contents of representative samples of the soil are less than 0.1%. The sulphate exposure is considered to be *negligible*. Type II Portland cement is recommended for the construction.

a) The fill materials should be tested for their sulphate content during the final stage of rough grading.

6.2.8 Utility Trenching

a) The walls of temporary construction trenches in fill should stand nearly vertical, with only minor sloughing, provided the total depth does not exceed 3 feet (approximately). Shoring of excavation walls or flattening of slopes may be required, if greater depths are necessary.

b) Trenches should be located so as not to impair the bearing capacity or to cause settlement under foundations. As a guide, trenches should be clear of a 45-degree plane, extending outward and downward from the edge of foundations. Shoring should comply with Cal-OSHA regulations.

c) Existing soils may be utilized for trenching backfill, provided they are free of organic materials.

d) All work associated with trench shoring must conform to the state and federal safety codes.

6.2.9 Surface Drainage Provisions

Positive surface gradients should be provided adjacent to the buildings to direct surface water run-off away from structural foundations and to suitable discharge facilities.

6.2.10 Grading Control

All grading and earthwork should be performed under the observation of a Geotechnical Engineer in order to achieve proper subgrade preparation, selection of satisfactory materials, placement and compaction of all structural fill. Sufficient notification prior to stripping and earthwork construction is essential to make certain that the work will be adequately observed and tested.

6.3 Slab-on-Grade

a) Concrete floor slabs may be founded on the reworked existing soils or compacted fill.

b) The slab should be underlain by four inches of granular material. A plastic vapor barrier is recommended to be placed at the mid-height of the base layer.

c) It is recommended that #4 bars on 12-inch center, both ways, or equivalent be provided as minimum reinforcement in slabs-on-grade. Joints should be provided and slabs supporting no vehicular traffic should be at least 5 inches thick.

d) The FFL should be at least 6 inches above highest adjacent grade.

e) The subgrade soils should be kept moist prior to the concrete pour.

6.4 Spread Foundations

The proposed structures can be founded on shallow spread footings. The criteria presented as follows should be adopted:

6.4.1 Dimensions/Embedment Depths

Number of Stories (floors supported)	**Minimum Width (ft.)**	**Minimum Footing Thickness (in.)**	**Minimum Embedment Below Lowest Finished Surface (ft.)**	
3	1.5	6	Perimeter	2.5
			Interior	2.5
Square Column Footings To 50 kip	2	-		2.5

6.4.2 Allowable Bearing Capacity

Embedment Depth (ft.)	**Allowable Bearing Capacity (lb/ft^2)**
1.0	2,000

(Notes:

- The allowable bearing capacity may be increased by 800 lb/ft^2 for each additional foot increase in the depth or by 200 lb/ft^2 he width to a maximum value of 4,000 lb/ft^2;

- These values may be increased by one-third in the case of short-duration loads, such as induced by wind or seismic forces;
- At least 2x#4 bars should be provided in wall footings, one on top and one at the bottom;
- In the event that footings are founded in structural fills consisting of imported materials, the allowable bearing capacities will depend on the type of these materials, and should be re-evaluated;
- Bearing capacities should be re-evaluated when loads have been obtained and footings sized during the preliminary design;
- Planter areas should not be sited adjacent to walls;
- Footing excavations should be observed by the Geotechnical Engineer;
- Footing excavations should be kept moist prior to the concrete pour;
- It should be insured that the embedment depths do not become reduced or adversely affected by erosion, softening, planting, digging, etc.)

6.4.3 Settlements

Total and differential settlements under spread footings are expected to be within tolerable limits and are not expected to exceed 1 and ¾ inches in a horizontal distance of 40 feet, respectively.

6.5 Lateral Pressures

a) The following lateral pressures are recommended for the design of retaining structures.

		Pressure (lb/ft^2/ft depth)	
Lateral Force	**Soil Profile**	**Unrestrained Wall**	**Rigidly Supported Wall**
Active Pressure	Level	36	-
At-Rest Pressure	Level	-	65
Passive Resistance (ignore upper 1.5 ft.)	Level	300	-

b) Friction coefficient: 0.35 (includes a Factor of Safety of 1.5). While combining friction with passive resistance, reduce passive by 1/3.

c) These values apply to the existing soil, and to compacted backfill generated from in-situ material. Imported material should be evaluated separately. It is recommended that where feasible, imported granular backfill be utilized, for a width equal to approximately one-quarter the wall height, and not less than 1.5 feet.

d) Backfill should be placed under engineering control.

e) Subdrains comprised of 4-inch perforated SDR-35 or equivalent PVC pipe covered in a minimum of one cubic foot per linear foot of filter rock and wrapped in Mirafi 140N filter fabric should be provided behind retaining walls.

6.6 Seismic Coefficients and Liquefaction Potential

a) For seismic analysis of the proposed project in accordance with the seismic provisions of ASCE 7-16, we recommend the following:

ITEM	VALUE
Site Latitude (Decimal-degrees)	33.14197
Site Longitude (Decimal-degrees)	-117.16598
Site Class	D
Risk Category	II
Mapped Spectral Response Acceleration-Short Period (0.2 Sec) - S_S	0.897
Mapped Spectral Response Acceleration-1 Second Period – S_1	0.33
Short Period Site Coefficient-F_a	1.141
Long Period Site Coefficient F_v	1.90
Adjusted Spectral Response Acceleration @ 0.2 Sec. Period (Sms)	1.024
Adjusted Spectral Response Acceleration @ 1Sec.Period (S_{m1})	0.627
Design Spectral Response Acceleration @ 0.2 Sec. Period (S_{Ds})	0.682
Design Spectral Response Acceleration @ 1-Sec. Period (S_{D1})	0.418

b) Ground water was encountered at a depth of 24 feet below ground surface, however, the subject site is underlain by dense soil layers. The potential for liquefaction is considered to be low.

6.7 Pavement Design

6.7.1 Asphalt Pavement Section

a) Based on Traffic Indices (T.I) and on the anticipated "R" – Value of 42 of the subgrade, the following tentative structural pavement sections are recommended.

Location	T.I.	Asphaltic Concrete (inches)	Aggregate Base (inches)
Parking and Driveways	Up to 5.0	3	4
Driveway (light truck traffic)	6.0	3	6

b) The subgrade soils should be tested for R-Value at the conclusion of rough grading and the pavement sections should be finalized then.

6.7.2 Subgrade Preparation

Subgrade soils within the upper 12 inches of finished grade shall be moisture-conditioned where necessary, shall be compacted to at least 90 percent relative compaction per ASTM D1557, and shall be free of any loose or soft areas.

6.7.3 Base Preparation

Unless otherwise specified, the base shall consist of Class II ¾-inch aggregate base or approved Crushed Miscellaneous Base. The base shall be compacted to a minimum of 95 percent relative compaction in accordance with the procedures described in ASTM Test Method D1557.

6.7.4 Concrete Pavement

If proposed, the concrete pavement should be at least 5 inches thick, reinforced with #4 bars on 12 inches center bothways, underlain by 4 inches thick base as recommended above. Thicker concrete section will be required for traffic greater than T.I. of 6.0.

6.8 Corrosion Potential

a) Soil Corrosion potential for metal and concrete was estimated by performing water-soluble sulfate, chloride, pH, and electrical resistivity tests during this investigation.

b) Electrical resistivity is a measure of soil resistance to the flow of corrosion currents. Corrosion currents are generally high in low resistivity soils. The electrical resistivity of a soil decreases primarily with an increase in its chemical and moisture contents.

c) A commonly accepted correlation between electrical resistivity and corrosivity for buried ferrous metals is presented below:

Electrical Resistivity, Ohm-cm	**Corrosion Potential**
Less than 1,000	Severe
1,000-2,000	Corrosive
2,000-10,000	Moderate
Greater than 10,000	Mild

d) Results of electrical resistivity test indicate a value of 3,339 ohm-cm for the near-surface soils. Based on this data, it is our opinion that, in general, on-site near-surface soils are considered *moderately corrosive* in nature. This potential should be considered in design of underground metal pipes.

6.9 Percolation Study

a) The soils in the upper 5 feet were Clayey Silty SAND underlain by Silty SAND/Sandy SILT. We recommend the basin to be at least 6 feet deep.

b) As more granular soils are anticipated at that depth, we estimate the following infiltration rate. During the grading operation, a percolation test should be conducted to verify the infiltration rate.

Boring No.	**Percolation Rate (inch/hour)**
P-1	3.0

c) These rates are calculated using a factor of safety of 1.0. Appropriate factor of safety should be utilized while designing the basin.

7. LIMITATIONS

a) Soils and bedrock over an area show variations in geological structure, type, strength and other properties from what can be observed, sampled and tested from specimens extracted from necessarily limited exploratory borings. Therefore, there are natural limitations inherent in making geologic and soil engineering studies and analyses. Our findings, interpretations, analyses and recommendations are based on observation, laboratory data and our professional experience; and the projections we make are professional judgments conforming to the usual standards of the profession. No other warranty is herein expressed or implied.

b) In the event that during construction, conditions are exposed which are significantly different from those described in this report, they should be brought to the attention of the Geotechnical Engineer.

The opportunity to be of service is sincerely appreciated. If you have any questions or if we can be of further assistance, please call.

Very truly yours,

GLOBAL GEO-ENGINEERING, INC.

Mohan B. Upasani
Principal Geotechnical Engineer
RGE 2301
(Exp. March 31, 2023)

Kevin B. Young
Principal Engineering Geologist
CEG 2253
(Exp. October 31, 2023)

MBU/KBY: fdg

Enclosures:

Location Map	- Figure 1
Seismicity Map	- Figure 2
References	- Appendix A
Field Exploration	- Appendix B
Unified Soils Classification System	Figure B-1
Logs of Borings	Figures B-2 through B-3
Boring Location Plan	Figure B-4
Laboratory Testing	- Appendix C

APPENDIX A

References

1. California Geological Survey, *Earthquake Fault Zones of Required Investigation,* (Internet).

2. California Division of Mines and Geology, 1996, *Geologic Maps of the Northwestern Part of San Diego County, California,* CDMG Open File Report 96-02.

3. California Office of Statewide Health Planning and Development, Seismic Design Maps Web Tool, ASCE 7-16 Standard (Internet).

4. United States Geological Survey, 1948, San Marcos Quadrangle, 7.5-Minute Topographic Series.

5. United States Geological Survey, 1968, San Marcos Quadrangle, 7.5-Minute Topographic Series.

6. United States Geological Survey, 1968 photorevised 1983, San Marcos Quadrangle, 7.5-Minute Topographic Series.

APPENDIX B

Field Exploration

a) The site was explored on May 17, 2022, utilizing a B-61 Mobile hollow stem drill rig to excavate three borings to a maximum depth of 40 feet below the existing ground surface. One of the borings were subsequently backfilled. Three-inch diameter perforated pipe with gravel rock encasement was installed in Boring P-1 for the purpose of percolation testing

b) The soils encountered in the excavations were logged and sampled by our Engineering Geologist. The soils were classified in accordance with the Unified Soil Classification System described in *Figure B-1*. The Logs of Borings are presented in *Figures B-2 through B-4*. The approximate locations of the borings are shown on the *Boring Location Plan, Plate 1*. The logs, as presented, are based on the field logs, modified as required from the results of the laboratory tests. Driven ring and bulk samples were obtained from the excavations for laboratory inspection and testing. The depths at which the samples were obtained are indicated on the logs.

c) The number of blows of the driving weight during sampling was recorded, together with the depth of penetration, the driving weight and the height of fall. The blows required per foot of penetration for given samples was then calculated and shown on the logs.

d) Groundwater was encountered at a depth of 24 feet below ground surface in Boring B-1.

e) Caving occurred in all of the borings to the depths noted on the logs.

UNIFIED SOILS CLASSIFICATION (ASTM D-2487)

PRIMARY DIVISION			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of materials is larger than #200 sieve size	GRAVELS More than half of coarse fraction is larger than #4 sieve	Clean Gravels (<5% fines)	GW	Well graded gravels, gravel-sand mixture, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		Gravel with Fines	GM	Silty gravels, gravel-sand-silt mixture. Non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures. Plastic fines
	SANDS More than half of coarse fraction is smaller than #4 sieve	Clean Sands (<5% fines)	SW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		Sands with Fines	SM	Silty sands, sand-silt mixtures. Non-Plastic fines.
			SC	Clayey sands, sand-clay mixtures. Plastic fines.
FINE GRAINED SOILS More than half of material is smaller than #200 sieve size	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts, with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
	Highly Organic Soils		PT	Peat and other highly organic soils.

CLASSIFICATION BASED ON FIELD TESTS

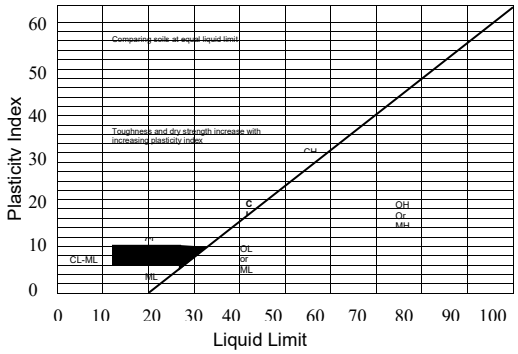
PENETRATION RESISTANCE (PR)	
Sands and Gravels	
Relative Density	Blows/foot
Very loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Clays and Silts		
Consistency	Blows/foot*	Strength**
Very Soft	0-2	0-½
Soft	2-4	¼-½
Firm	4-8	½-1
Stiff	8-15	1-2
Very Stiff	15-30	2-4
Hard	Over 30	Over 4

*Numbers of blows of 140 lb hammer falling 30 inches to drive a 2-inch O.D. (1 3/8 in. I.D.) Split Barrel sampler (ASTM-1568 Standard Penetration Test)

**Unconfined Compressive strength in tons/sq. ft. Read from pocket penetrometer

CLASSIFICATION CRITERIA BASED ON LAB TESTS



Plasticity chart for laboratory Classification of Fine-grained soils

GW and SW – $C_u = D_{60}/D_{10}$ greater than 4 for GW and 6 for SW; $C_c = (D_{30})^2/D_{10} \times D_{60}$ between 1 and 3

GP and SP – Clean gravel or sand not meeting requirement for GW and SW

GM and SM – Atterberg limit below "A" line or P.I. less than 4

GC and SC – Atterberg limit above "A" line P.I. greater than 7

CLASSIFICATION OF EARTH MATERIAL IS BASED ON FIELD INSPECTION AND SHOULD NOT BE CONSTRUED TO IMPLY LABORATORY ANALYSIS UNLESS SO STATED.

Fines (Silty or Clay)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobbles	Boulders
Sieve Sizes 200	40	10	4	¾"	3"	10"	

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Figure No.: B-1

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Project 9421-04

LOG OF BORING B-1

Date : May 17, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type
- Ring
- Bulk
- Standard Penetration Testing

Water Levels
- Groundwater Encountered
- Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compactior	Water Level	USCS	GRAPHIC	DESCRIPTION
0									
		7.6	116.7	55			SM		Clayey Silty SAND: fine to medium grained, light reddish brown, slightly moist, medium dense
5		6.8	112.6	29			SM/ML		Silty SAND: fine grained, yellow brown, slightly moist, medium dense with SILT interbeds
10		12.9	116.2	100					
		15.0	115.5	39			ML		Clayey SILT: light reddish to reddish brown, slightly moist to moist, stiff
15									
		19.3	109.6	38					@19' moist
20									
		15.0	115.4	23		▼	SP		SAND: medium to coarse grained, reddish brown, very moist to wet, medium dense, water encountered
25									

Figure B-2.1

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LOG OF BORING B-1

Date : May 17, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
25							SP		
30	☒	19.5	106.0	18			SP/ML		@29' fine to medium grained with SILT interbeds
35	☒	17.2	104.9	12					@34' medium grained, olive brown ALLUVIUM
40	☒	9.1	129.3	100			GR		TONALITE: fine textured, hard BASEMENT ROCK
45									Bottom of Boring at 40 feet:
50									

Notes:
1. Caving to 23 feet after augers were removed
2. Water encountered at 24', Static water level measured at 23.5'
3. Boring backfilled

Figure B-2.2

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Project 9421-04

LOG OF BORING B-2

Date : May 17, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: Groundwater Encountered; Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0							CL/ML		Sandy Silty CLAY: reddish brown, slightly moist, medium stiff with Clayey SILT interbeds
	☒	13.5	113.8	20					
							ML		Sandy SILT: yellow to light reddish brown, slightly moist, stiff
5	☒	11.0	107.2	45					
	☒	11.2	112.5	35			ML/SM		@9' with Silty SAND interbeds
10									
							ML		Clayey SILT: olive gray to light reddish brown, slightly moist, stiff
	☒	14.0	114.2	48					
15									
	☒	12.0	113.4	20			SM		Clayey Silty SAND: fine to medium grained, light reddish brown, moist, medium dense ALLUVIUM
20									Bottom of Boring at 20 feet:
25									

Notes:
1. Caving to 15.5 feet after augers were removed
2. No groundwater or seepage encountered
3. Boring backfilled

Figure B-3

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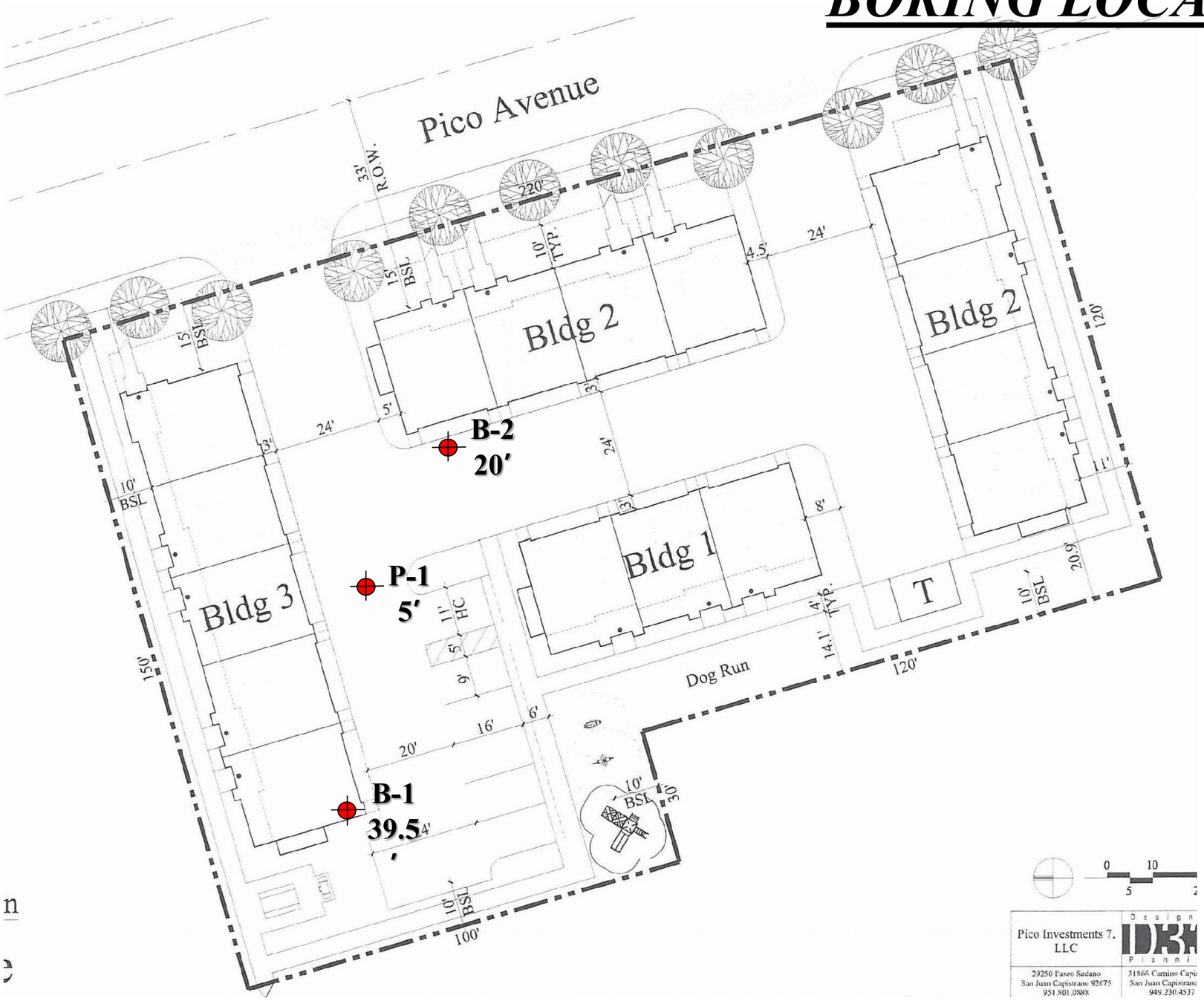
BORING LOCATION PLAN



Not to Scale

KEY

B-2 20′ Approximate Location of Boring, Showing Total Depth

P-1 5′ Approximate Location of Percolation Boring, Showing Total Depth

N

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Figure No: B-5

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APPENDIX C

Laboratory Testing Program

The laboratory-testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested as described below.

a) Moisture and Density

Moisture-density information usually provides a gross indication of soil consistency. Local variations at the time of the investigation can be delineated, and a correlation obtained between soils found on this site and nearby sites. The dry unit weights and field moisture contents were determined for selected samples. The results are shown on the Logs of Borings.

b) Compaction

A representative soil sample was tested in the laboratory to determine the maximum dry density and optimum moisture content, using the ASTM D1557 compaction test method. This test procedure requires 25 blows of a 10-pound hammer falling a height of 18 inches on each of five layers, in a 1/30 cubic foot cylinder. The results of the test are presented below.

Boring No.	Sample Depth (ft.)	Soil Description	Optimum Moisture Content (%)	Maximum Dry Density (lb/ft^3)
B-1	1-3	Clayey Silty SAND	9.9	127.3

c) Direct Shear

Direct shear tests were made on remolded samples, using a direct shear machine at a constant rate of strain. Variable normal or confining loads are applied vertically and the soil shear strengths are obtained at these loads. The angle of internal friction and the cohesion are then evaluated. The samples were tested at saturated moisture contents. The results are shown below in terms of the Coulomb shear strength parameters.

Boring No.	Sample Depth (ft)	Soil Description	Coulomb Cohesion (lb/ft^2)	Angle of Internal Friction (°)	Peak/Residual
B-1	1-3	Clayey Silty SAND	250 250	29 29	Peak Ultimate

d) Sulfate Content

A representative soil sample was analyzed for its sulphate content. The results are given below:

Boring No.	Sample Depth (ft.)	Soil Description	Sulphate Content (%)
B-1	1-3	Clayey Silty SAND	0.0026

e) Chloride Content

A representative soil sample was analyzed for chloride content in accordance with California Test Method CA422. The result is given below:

Boring No.	Sample Depth (ft)	Soil Description	Chloride Content (%)
B-1	1-3	Clayey Silty SAND	0.0023

f) Resistivity and pH

A representative soil sample was analyzed in accordance with California Test Methods CA532 and CA643 to determine the minimum resistivity and pH. The result is provided below:

Boring No.	Sample Depth (ft)	Soil Description	pH	Minimum Resistivity (Ohm-cm)
B-1	1-3	Clayey Silty SAND	8.1	3,339

g) Expansion Potential

Surface soils were collected in the field and tested in the laboratory in accordance with the ASTM Test Designation D4829. The degree of expansion potential is determined from soil volume changes occurring during saturation of the specimen. The results of the tests are presented below:

Boring No.	Sample Depth (ft)	Soil Description	Expansion Index	Expansion Potential
B-2	2	Sandy Silty CLAY	70	Medium

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ATTACHMENT 9

Summary Files from the SWMM Model

PRE_DEV

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CFS
Process Models:
  Rainfall/Runoff ..... YES
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... NO
  Water Quality ..... NO
Infiltration Method ..... GREEN_AMPT
Starting Date OCT-05-1962 00:00:00
Ending Date OCT-05-2007 23:00:00
Antecedent Dry Days 0.0
Report Time Step 01:00:00
Wet Time Step 00:15:00
Dry Time Step 04:00:00

Runoff Quantity Continuity	Volume acre-feet	Depth inches
Total Precipitation	30.777	547.150
Evaporation Loss	0.477	8.477
Infiltration Loss	28.588	508.225
Surface Runoff	1.944	34.554
Final Surface Storage	0.000	0.000
Continuity Error (%)	-0.750	

Flow Routing Continuity	Volume acre-feet	Volume 10^6 gal
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.944	0.633
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.944	0.633
Internal Outflow	0.000	0.000
Storage Losses	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1-C	547.15	0.00	8.48	508.22	34.55	0.63	0.47	0.063

Analysis begun on: Sat Nov 05 10:52:00 2022
Analysis ended on: Sat Nov 05 10:52:24 2022
Total elapsed time: 00:00:24

POST_DEV

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------

***********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
***********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ OCT-05-1962 00:00:00
Ending Date .............. OCT-05-2007 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


*************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
*************************     ---------       -------
Total Precipitation ......        30.777       547.150
Evaporation Loss .........         4.429        78.736
Infiltration Loss ........         7.152       127.142
Surface Runoff ...........        19.497       346.620
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -0.977


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        19.497         6.354
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         2.259         0.736
Internal Outflow .........         0.000         0.000
Storage Losses ...........        17.348         5.653
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....        -0.561


*******************************
Highest Flow Instability Indexes
*******************************
All links are stable.


************************
Routing Time Step Summary
************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
```

Maximum Time Step : 60.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1-C	547.15	0.00	78.74	127.14	346.62	6.35	0.53	0.634

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00
1	STORAGE	0.05	7.28	7.28	6325 04:38

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
POC-1	OUTFALL	0.00	1.50	6325 04:38	0.000	0.736
1	STORAGE	0.53	0.53	6348 00:00	6.353	6.353

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
1	STORAGE	394487.02	7.278	1.722

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

	Average Volume	Avg Pcnt	E&I Pcnt	Maximum Volume	Max Pcnt	Time of Max Occurrence	Maximum Outflow

Storage Unit	1000 ft3	Full	Loss	1000 ft3	Full	days hr:min	CFS
1	0.018	1	89	2.925	81	6325 04:38	1.50

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
POC-1	0.33	0.02	1.50	0.736
System	0.33	0.02	1.50	0.736

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
1	DUMMY	1.50	6325 04:38			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Feb 27 14:51:05 2023
Analysis ended on: Mon Feb 27 14:51:37 2023
Total elapsed time: 00:00:32

ATTACHMENT 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

Indicate which Items are Included behind this cover sheet:

Attachment Sequence	**Contents**	**Checklist**
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☒ Included See Structural BMP Maintenance Information Checklist on the back of this Attachment cover sheet.
Attachment 3b	Draft Maintenance Agreement (when applicable)	☐ Included ☒ Not Applicable

Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

☒ **Preliminary Design / Planning / CEQA level submittal:**

Attachment 3a must identify:

☒ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual

Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

☐ **Final Design level submittal:**

Attachment 3a must identify:

- ☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
- ☐ How to access the structural BMP(s) to inspect and perform maintenance
- ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☐ Recommended equipment to perform maintenance
- ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b shall include a draft maintenance agreement in the local jurisdiction's standard format (PDP applicant to contact the [City Engineer] to obtain the current maintenance agreement forms).

downstream storm drain system or discharge point.

3. If an infiltration basin cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with appropriate storage volume such as an underground vault can be used to provide additional control.
4. After the infiltration basin has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

Maintenance Overview

Normal Expected Maintenance. Infiltration basins require routine maintenance to: remove accumulated materials such as sediment, trash or debris from the forebay and the basin; maintain vegetation health if the BMP includes vegetation; and maintain integrity of side slopes, inlets, energy dissipators, and outlets. A summary table of standard inspection and maintenance indicators is provided within this Fact Sheet.

Non-Standard Maintenance or BMP Failure. If any of the following scenarios are observed, the BMP is not performing as intended to protect downstream waterways from pollution and/or erosion. Corrective maintenance, increased inspection and maintenance, BMP replacement, or a different BMP type will be required.

- The BMP is not drained between storm events. Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface or subsurface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from clogging of the underlying native soils, or clogging of covers applied at the basin surface such as topsoil, mulch, or rock layer. The specific cause of the drainage issue must be determined and corrected. For surface-level basins (i.e., not underground infiltration galleries), surface cover materials can be removed and replaced, and/or native soils can be scarified or tilled to help reestablish infiltration. If it is determined that the underlying native soils have been compacted or do not have the infiltration capacity expected, or if the infiltration surface area is not accessible (e.g., an underground infiltration gallery) the County reviewer shall be contacted prior to any additional repairs or reconstruction.

- Sediment, trash, or debris accumulation has filled the forebay or other pretreatment device within one month, or if no forebay or other pretreatment device is present, has filled greater than 25% of the surface ponding volume within one maintenance cycle. This means the load from the tributary drainage area is too high, reducing BMP function or clogging the BMP. This would require adding a forebay or other pretreatment measures within the tributary area draining to the BMP to intercept the materials if no pretreatment component is present, or increased maintenance frequency for an existing forebay or other pretreatment device. Pretreatment components, especially for sediment, will extend the life of the infiltration basin.

- Erosion due to concentrated storm water runoff flow that is not readily corrected by adding

erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the County reviewer shall be contacted prior to any additional repairs or reconstruction.

Other Special Considerations. If the infiltration basin is vegetated: Vegetated structural BMPs that are constructed in the vicinity of, or connected to, an existing jurisdictional water or wetland could inadvertently result in creation of expanded waters or wetlands. As such, vegetated structural BMPs have the potential to come under the jurisdiction of the United States Army Corps of Engineers, SDRWQCB, California Department of Fish and Wildlife, or the United States Fish and Wildlife Service. This could result in the need for specific resource agency permits and costly mitigation to perform maintenance of the structural BMP. Along with proper placement of a structural BMP, routine maintenance is key to preventing this scenario

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Summary of Standard Inspection and Maintenance

The property owner is responsible to ensure inspection, operation and maintenance of permanent BMPs on their property unless responsibility has been formally transferred to an agency, community facilities district, homeowners association, property owners association, or other special district.

Maintenance frequencies listed in this table are average/typical frequencies. Actual maintenance needs are site-specific, and maintenance may be required more frequently. Maintenance must be performed whenever needed, based on maintenance indicators presented in this table. The BMP owner is responsible for conducting regular inspections to see when maintenance is needed based on the maintenance indicators. During the first year of operation of a structural BMP, inspection is recommended at least once prior to August 31 and then monthly from September through May. Inspection during a storm event is also recommended. After the initial period of frequent inspections, the minimum inspection and maintenance frequency can be determined based on the results of the first year inspections.

Threshold/Indicator	Maintenance Action	Inspection and Maintenance Frequency
Accumulation of sediment, litter, or debris in forebay and/or basin	Remove and properly dispose of accumulated materials, (without damage to vegetation when applicable).	• Inspect monthly. If the forebay is 25% full* or more in one month, increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. • Remove any accumulated materials found within the infiltration area at each inspection. • When the BMP includes a forebay, materials must be removed from the forebay when the forebay is 25% full*, or if accumulation within the forebay blocks flow to the infiltration area.
Obstructed inlet or outlet structure	Clear blockage.	• Inspect monthly and after every 0.5-inch or larger storm event. • Remove any accumulated materials found at each inspection.

Threshold/Indicator	Maintenance Action	Inspection and Maintenance Frequency
Poor vegetation establishment (when the BMP includes vegetated surface by design)	Re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintain when needed.
Dead or diseased vegetation (when the BMP includes vegetated surface by design)	Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans.	• Inspect monthly. • Maintain when needed.
Overgrown vegetation (when the BMP includes vegetated surface by design)	Mow or trim as appropriate.	• Inspect monthly. • Maintain when needed.
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.	• Inspect monthly. • Maintain when needed.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the County reviewer shall be contacted prior to any additional repairs or reconstruction.	• Inspect after every 0.5-inch or larger storm event. If erosion due to storm water flow has been observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintain when needed. If the issue is not corrected by restoring the BMP to the original plan and grade, the County reviewer shall be contacted prior to any additional repairs or reconstruction.

Threshold/Indicator	Maintenance Action	Inspection and Maintenance Frequency
Standing water in infiltration basin without subsurface infiltration gallery for longer than 24-96 hours following a storm event	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, or removing/replacing clogged or compacted surface treatments and/or scarifying or tilling native soils. Always remove deposited sediments before scarification, and use a hand-guided rotary tiller. If it is determined that the underlying native soils have been compacted or do not have the infiltration capacity expected, the County reviewer shall be contacted prior to any additional repairs or reconstruction.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintain when needed.
Standing water in subsurface infiltration gallery for longer than 24-96 hours following a storm event	This condition requires investigation of why infiltration is not occurring. If feasible, corrective action shall be taken to restore infiltration (e.g., flush fine sediment or remove and replace clogged soils). BMP may require retrofit if infiltration cannot be restored. The County reviewer shall be contacted prior to any repairs or reconstruction.	• Inspect monthly and after every 0.5-inch or larger storm event. If standing water is observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintain when needed.

Threshold/Indicator	Maintenance Action	Inspection and Maintenance Frequency
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology	If mosquitos/larvae are observed: first, immediately remove any standing water by dispersing to nearby landscaping; second, make corrective measures as applicable to restore BMP drainage to prevent standing water. For subsurface infiltration galleries, ensure access covers are tight fitting, with gaps or holes no greater than 1/16 inch, and/or install barriers such as inserts or screens that prevent mosquito access to the subsurface storage. If mosquitos persist following corrective measures to remove standing water, or if the BMP design does not meet the 96-hour drawdown criteria because the underlying native soils have been compacted or do not have the infiltration capacity expected, the County reviewer shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.	• Inspect monthly and after every 0.5-inch or larger storm event. If mosquitos are observed, increase inspection frequency to after every 0.1-inch or larger storm event. • Maintain when needed
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.	• Inspect annually. • Maintain when needed.

"25% full" is defined as ¼ of the depth from the design bottom elevation to the crest of the outflow structure (e.g., if the height to the outflow opening is 12 inches from the bottom elevation, then the materials must be removed when there is 3 inches of accumulation – this should be marked on the outflow structure).

ATTACHMENT 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

☒ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
☒ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☒ Details and specifications for construction of structural BMP(s)
☒ Signage indicating the location and boundary of structural BMP(s) as required by the [City Engineer]
☒ How to access the structural BMP(s) to inspect and perform maintenance
☒ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☒ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☒ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☒ Recommended equipment to perform maintenance
☒ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☒ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☒ All BMPs must be fully dimensioned on the plans
☒ When proprietary BMPs are used, site-specific cross section with outflow, inflow, and model number shall be provided. Photocopies of general brochures are not acceptable.