Appendix I

Storm Water Quality Management Plan

Preliminary
Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)

Paseo Montril VTM

Permit Application Number 658273

Drawing No. TBD, IO No. 240076662

☐ **Check if electing for offsite alternative compliance**

Engineer of Work:

Wayne W. Chang, PE 46548, Exp. 6/30/2021
Provide Wet Signature and Stamp Above Line

Prepared For:

Pardee Homes

13400 Sabre Springs Parkway, Suite 200

San Diego, CA 92128

(858) 794-2500

Prepared By:

Chang Consultants

P.O. Box 9496

Rancho Santa Fe, CA 92067

(858) 692-0760

Date:

April 27, 2021

Approved by: City of San Diego Date

FOR REVIEW ONLY

The City of SAN DIEGO

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Project Name: Paseo Montril VTM

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- Attachment 3: Structural BMP Maintenance Plan
    - Maintenance Agreement (Form DS-3247) (when applicable)
- Attachment 4: Copy of Plan Sheets Showing Permanent Storm Water BMPs
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- Attachment 6: Project's Geotechnical and Groundwater Investigation Report

Acronyms

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

Certification Page

Project Name: Paseo Montril VTM
Permit Application

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

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 Storm Water Standards. 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 source control and site design 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.

Will sign and stamp upon approval

Engineer of Work's Signature

46548 — PE#

6/30/2021 — Expiration Date

Wayne W. Chang

Print Name

Chang Consultants

Company

April 27, 2021

Date

Engineer's Stamp

Project Name: Paseo Montril VTM

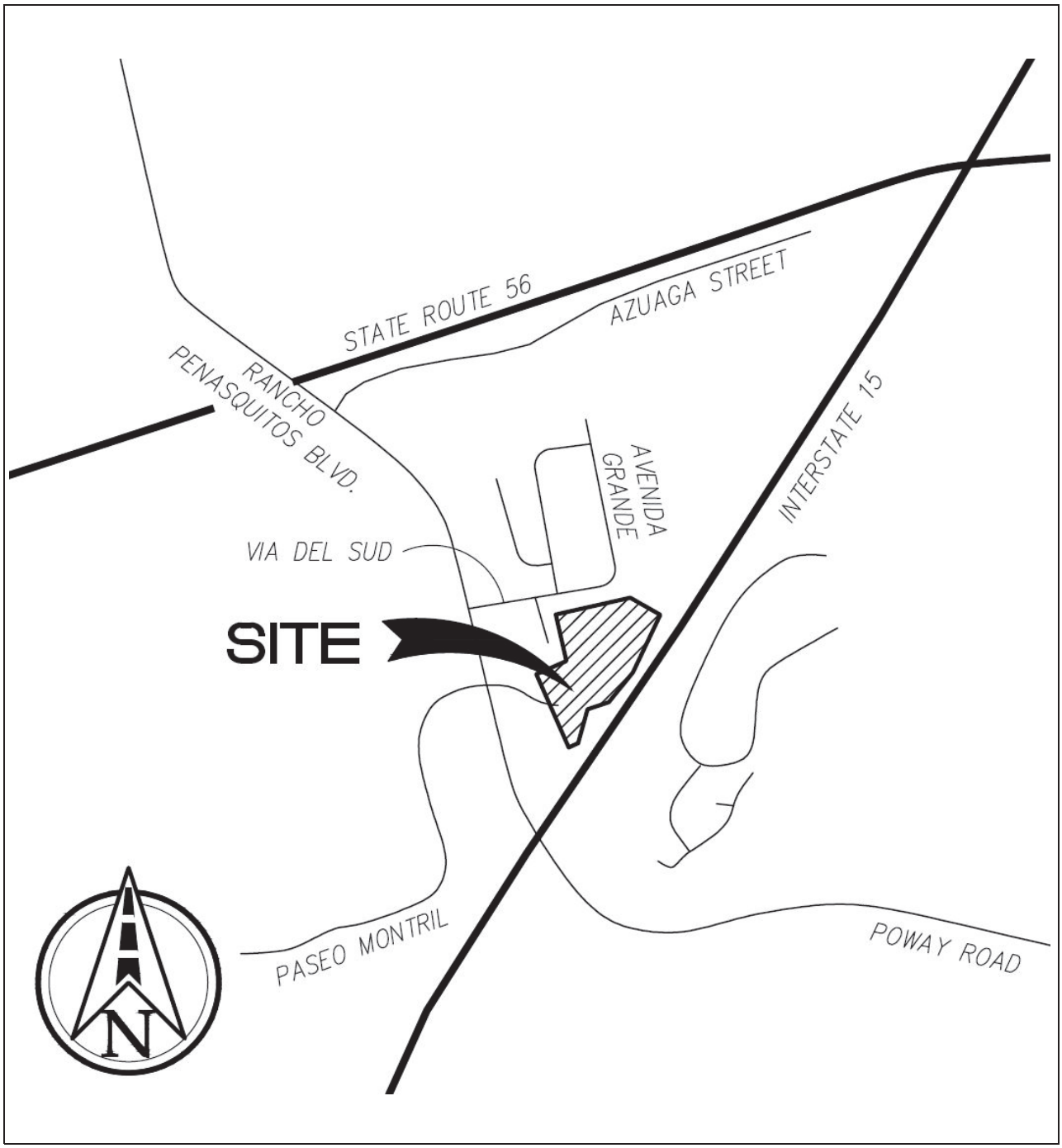
Submittal Record

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 last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck comments.

Submittal Number	Date	Project Status	Changes
1	9/25/2020	☑ Preliminary Design/Planning/CEQA ☐ Final Design	**Initial Submittal**
2	11/20/2020	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Second Submittal
3	2/16/2021	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Third Submittal
4	4/27/2021	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Fourth Submittal

Project Vicinity Map

Project Name: Paseo Montril
Permit Application 658273



Project Name: Paseo Montril VTM

City of San Diego Form DS-560 Storm Water Requirements Applicability Checklist

Attach DS-560 form.

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City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM
DS-560
November 2018

Project Address: East end of Paseo Montril, San Diego, CA 92129	Project Number: 658273

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1] , which is administered by the State Regional Water Quality Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ☒ Yes; SWPPP required, skip questions 2-4 ☐ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and/or contact with storm water?

   ☐ Yes; WPCP required, skip questions 3-4 ☐ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

   ☐ Yes; WPCP required, skip question 4 ☐ No; next question

4. Does the project only include the following Permit types listed below?

   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes; no document required

Check one of the boxes below, and continue to PART B:

☒ If you checked "Yes" for question 1, **a SWPPP is REQUIRED. Continue to PART B**

☐ If you checked "No" for question 1, and checked "Yes" for question 2 or 3, **a WPCP is REQUIRED.** If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

☐ If you checked "No" for all questions 1-3, and checked "Yes" for question 4 PART B **does not apply and no document is required. Continue to Section 2.**

1. More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

PART B: Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ☐ **ASBS**

a. Projects located in the ASBS watershed.

2. ☐ **High Priority**

a. Projects that qualify as Risk Level 2 or Risk Level 3 per the Construction General Permit (CGP) and not located in the ASBS watershed.

b. Projects that qualify as LUP Type 2 or LUP Type 3 per the CGP and not located in the ASBS watershed.

3. ☒ **Medium Priority**

a. Projects that are not located in an ASBS watershed or designated as a High priority site.

b. Projects that qualify as Risk Level 1 or LUP Type 1 per the CGP and not located in an ASBS watershed.

c. WPCP projects (>5,000sf of ground disturbance) located within the Los Penasquitos watershed management area.

4. ☐ **Low Priority**

a. Projects not subject to a Medium or High site priority designation and are not located in an ASBS watershed.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	☐ Yes	☒ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	☐ Yes	☒ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	☐ Yes	☒ No

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

1. **Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:**
   - **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
   - **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
   - **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

   ☐ Yes; PDP exempt requirements apply ☒ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

   ☐ Yes; PDP exempt requirements apply ☒ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1.	**New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land.	☒ Yes ☐ No
2.	**Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces 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
3.	**New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface.	☐ Yes ☒ No
4.	**New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater.	☒ Yes ☐ No
5.	**New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).**	☒ Yes ☐ No
6.	**New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).	☒ Yes ☐ No

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges 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). ☐ Yes ☒ No

8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ☐ Yes ☒ No

9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ☐ Yes ☒ No

10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ☐ Yes ☒ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**. ☐
2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ☐
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ☒

Wayne W. Chang (Agent)	Principal
Name of Owner or Agent *(Please Print)*	Title
	04/27/2021
Signature	Date

Project Name: Paseo Montril VTM

Applicability of Permanent, Post-Construction Storm Water BMP Requirements	Form I-1

Project Identification

Project Name: Paseo Montril VTM	
Permit Application Number: 658273	Date: April 27, 2021

Determination of Requirements

The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements.

Answer each step below, starting with **Step 1** and progressing through each step until reaching "Stop". Refer to the manual sections and/or separate forms referenced in each step below.

Step	Answer	Progression
Step 1: Is the project a "development project"? See Section 1.3 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to **Step 2**.
	☐ No	**Stop**. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.

Discussion / justification if the project is not a "development project" (e.g., the project includes *only* interior remodels within an existing building):

N/A

Step 2: Is the project a Standard Project, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, Storm Water Requirements Applicability Checklist.	☐ Standard Project	**Stop.** Standard Project requirements apply
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to **Step 3**.
	☐ PDP Exempt	**Stop.** Standard Project requirements apply. Provide discussion and list any additional requirements below.

Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:

N/A

Project Name: Paseo Montril VTM

Form I-1 Page 2 of 2		
Step	**Answer**	**Progression**
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to **Step 4**.
	☑ No	BMP Design Manual PDP requirements apply. Go to **Step 4**.
Discussion / justification of prior lawful approval, and identify requirements (not required if prior lawful approval does not apply): N/A		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to **Step 5**.
	☐ No	**Stop**. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do not apply: N/A		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the manual (Part 1 of Storm Water Standards) 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**.
Discussion / justification if protection of critical coarse sediment yield areas does not apply: N/A		

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody.
Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

N/A. Project is not exempt.

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Project Name: Paseo Montril VTM

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Paseo Montril VTM
Project Address	East end of Paseo Montril San Diego, CA 92129
Assessor's Parcel Number(s) (APN(s))	315-020-55
Permit Application Number	658273
Project Watershed	Select One: ☐ San Dieguito River ☑ Penasquitos ☐ Mission Bay ☐ San Diego River ☐ San Diego Bay ☐ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Rancho Santa Fe Hydrologic Subarea (905.11)
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	12.78 Acres (556,697 Square Feet)
Area to be disturbed by the project (Project Footprint)	3.26 Acres (142,134 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	1.87 Acres (81,586 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	1.39 Acres (60,548 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition	> 100 %

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):

- ☐ Existing development
- ☐ Previously graded but not built out
- ☐ Agricultural or other non-impervious use
- ☑ Vacant, undeveloped/natural

Description / Additional Information:

The site contains an undeveloped natural hillside that is moderately to steeply sloping.

Existing Land Cover Includes (select all that apply):

- ☑ Vegetative Cover
- ☐ Non-Vegetated Pervious Areas
- ☐ Impervious Areas

Description / Additional Information:

The existing land cover contains an earthen surface supporting naturally occuring vegetation (grasses and brush).

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:

- ☐ Groundwater Depth < 5 feet
- ☐ 5 feet < Groundwater Depth < 10 feet
- ☐ 10 feet < Groundwater Depth < 20 feet
- ☑ Groundwater Depth > 20 feet

Existing Natural Hydrologic Features (select all that apply):

- ☑ Watercourses
- ☐ Seeps
- ☐ Springs
- ☐ Wetlands
- ☐ None

Description / Additional Information:

The site is on a natural hillside. There is a hillside ravine located within the site that conveys storm runoff, but it is northeast of the project footprint, so is not impacted by development.

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Description of Existing Site Topography and Drainage

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. If runoff from offsite is conveyed through the site? If yes, quantification of 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 storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels;
4. Identify all discharge locations from the existing project along with a summary of the 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.

Descriptions/Additional Information

1. The existing site has not been disturbed, so the existing drainage conveyance is natural. The existing drainage within the project footprint occurs as sheet flow in a southerly to southeasterly direction over the moderate to steeply sloping natural hillside.

2. There is an existing residential development north of the site, but its storm runoff is directed away from the site. A small portion of the hillside area containing the site extends off-site to the north. The off-site tributary runoff will be directed around the site.

3. There are no existing drainage improvements within the project footprint. The development is proposed on an undeveloped natural hillside. The natural hillside slopes downwards in a southerly to southeasterly direction towards Interstate 15. Existing Caltrans drainage facilities capture and convey the hillside runoff away from the site along Interstate 15.

4. The drainage report in Attachment 5 shows that the overall drainage area within the project footprint covers 3.20 acres. Under existing conditions, the 100-year flow from this area will either be conveyed to Paseo Montril or one of two Caltrans inlets along Interstate 15.

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The project proposes multi-family residential development with 55 units in five buildings. The project will include access drives, parking, and landscaping. The project is disturbing approximately 24 percent of the site.

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

The primary impervious features will include the five multi-family residential buildings, access drives, parking, walkways, and hardscape.

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

The pervious features include proposed landscaping within the development area, as well as the adjacent natural hillsides that will remain undisturbed.

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

The existing site is a moderately to steeply sloping hillside, so grading will be required to accommodate the proposed development.

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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 and 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.

Description / Additional Information:

The project will include a private on-site drainage system (storm drain pipes, inlets, ditches, and drive aisles) to capture and convey the proposed condition runoff. The runoff will be directed to one of two Bio Clean Modular Wetlands System Linear BMPs for pollutant control each with a connected vault for flow control. Storm runoff from the BMPs will be directed in a proposed storm drain west along Paseo Montril. The proposed storm drain will connect to an existing storm drain at the intersection of Paseo Montril and Rancho Penasquitos Boulevard.

The overall drainage area encompassing the development area covers 3.20 acres. The development will mitigate its 100-year flow increase, as needed, with detention.

Form I-3B Page 6 of 11

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

- [x] Onsite storm drain inlets
- [ ] Interior floor drains and elevator shaft sump pumps
- [ ] Interior parking garages
- [x] Need for future indoor & structural pest control
- [x] Landscape/outdoor pesticide use
- [ ] Pools, spas, ponds, decorative fountains, and other water features
- [ ] Food service
- [x] Refuse areas
- [ ] Industrial processes
- [x] Outdoor storage of equipment or materials
- [ ] Vehicle and equipment cleaning
- [ ] Vehicle/equipment repair and maintenance
- [ ] Fuel dispensing areas
- [ ] Loading docks
- [x] Fire sprinkler test water
- [x] Miscellaneous drain or wash water
- [x] Plazas, sidewalks, and parking lots

Description/Additional Information:

The project will have a private on-site drainage system to convey flow to the pollutant and flow control BMPs. Pest control will be used for indoor and outdoor areas, as needed. Refuse storage will be in designated areas. Fire sprinklers will be installed in the residential buildings per code. The development will generate miscellaneous drain and wash water.

Project Name: Paseo Montril VTM

Form I-3B Page 7 of 11
Identification and Narrative of Receiving Water
Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable) Under pre-project conditions, storm runoff from the site either flows onto Paseo Montril or enters an existing Caltrans drainage system located south to southeast from the site. The drainage system continues along Interstate 15 and ultimately outlets into Los Penasquitos Creek approximately 0.5 miles south of the site. The Paseo Montril runoff also enters Los Penasquitos Creek. Los Penasquitos Creek continues approximately 9 miles west to Los Penasquitos Lagoon and the Pacific Ocean. Under post-project conditions, the runoff will be directed in a storm drain or on the street to an existing storm drain at the intersection of Paseo Montril and Rancho Penasquitos Blvd.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations The existing beneficial uses from the 2011 "Water Quality Control Plan for the San Diego Basin" (Penasquitos Hydrologic Unit 906.00, Poway Hydrologic Area 906.20) for inland surface waters include AGR, REC1, REC2, WARM, and WILD. The potential beneficial uses for inland surface waters include IND. The groundwater beneficial uses include MUN and AGR. The potential groundwater beneficial uses include IND.
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations There are no ASBS receiving waters downstream of the project.
Provide distance from project outfall location to impaired or sensitive receiving waters The storm drain that will convey the project's storm runoff away from the site discharges directly into Los Penasquitos Creek approximately 0.5 miles south of the site.
Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands There are no MHPA or enviromentally sensitive lands impacted by the project.

Project Name: Paseo Montril VTM

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

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 (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
Los Penasquitos Creek	Enterococcus, fecal coliform,	Per 2010 303(d), TMDLs are
	selenium, total dissolved solids,	required, but not completed.
	total nitrogen as N, and toxicity.	Highest priority WQ conditions
Los Penasquitos Lagoon	Sedimentation/siltation	are hydromodificaiton, siltation/
		sedimentation, freshwater discharges,
		and indicator bacteria.

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 anticipated from the project site based on all proposed use(s) of the site (see Appendix B.6):

Pollutant	Not Applicable to the Project Site	Anticipated 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	☐	☑	☐

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6)?

☑ 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):

N/A

Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.

Critical Coarse Sediment Yield Areas*
*This Section only required if hydromodification management requirements apply

Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint?

☐ Yes

☑ No

Discussion / Additional Information:

The site is not identified as containing critical coarse sediment yield areas on the San Diego County Regional Watershed Management Area Analysis (WMAA).

Form I-3B Page 10 of 11

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.

The majority of the storm runoff from the development area enters one of two Modular Wetlands System Linear for pollutant control and connected vaults for flow control. The BMP flows are conveyed away from the site west along Paseo Montril in a proposed storm drain to an existing public storm drain at the intersection of Paseo Montril and Rancho Penasquitos Boulevard. The storm drain outlets to Los Penasquitos Creek approximately 0.5 miles south of the site. The outlet into Los Penasquitos Creek is the POC for the site and is labeled POC 1.

Some of the proposed slopes along the project perimeter will be self-mitigating.

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

☑ No, the low flow threshold is $0.1Q_2$ (default low flow threshold)

☐ Yes, the result is the low flow threshold is $0.1Q_2$

☐ Yes, the result is the low flow threshold is $0.3Q_2$

☐ Yes, the result is the low flow threshold is $0.5Q_2$

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

N/A

Discussion / Additional Information: (optional)

N/A

Form I-3B Page 11 of 11

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.

N/A

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.

N/A

Project Name: Paseo Montril VTM

Source Control BMP Checklist for PDPs	Form I-4B

Source Control BMPs

All development projects must implement source control BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) 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 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?		
4.2.1 Prevention of Illicit Discharges into the MS4	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented: N/A			
4.2.2 Storm Drain Stenciling or Signage	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.2 not implemented: N/A			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.3 not implemented: N/A			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.4 not implemented: N/A			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.5 not implemented: N/A			

Project Name: Paseo Montril VTM

Form I-4B Page 2 of 2			
Source Control Requirement	**Applied?**		
4.2.6 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/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
SC-6A: Large Trash Generating Facilities	☐ Yes	☐ No	☑ N/A
SC-6B: Animal Facilities	☐ Yes	☐ No	☑ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes	☐ No	☑ N/A
SC-6D: Automotive Facilities	☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			
N/A			

Project Name: Paseo Montril VTM

Site Design BMP Checklist for PDPs	Form I-5B

Site Design BMPs

All development projects must implement site design BMPs where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) 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 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.

A site map with implemented site design BMPs must be included at the end of this checklist.

Site Design Requirement	Applied?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.1 not implemented: N/A.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☑ Yes	☐ No	☐ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☑ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.2 not implemented: A Modular Wetlands System Linear will treat the project runoff, so street trees are not used and are not applicable. Trees will be used for landscaping, but water quality credit is not taken for the trees, i.e., they will not be "street trees." The majority of the site (approximately 76%) will remain in its natural, undisturbed state.			

Project Name: Paseo Montril VTM

Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented: N/A			
4.3.4 Minimize Soil Compaction	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented: N/A			
4.3.5 Impervious Area Dispersion	☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented: N/A			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☑ Yes	☐ No	☐ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☑ Yes	☐ No	☐ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☑ Yes	☐ No	☐ N/A

Project Name: Paseo Montril VTM

Form I-5B Page 3 of 4				
Site Design Requirement		Applied?		
4.3.6 Runoff Collection		☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.6 not implemented: A Modular Wetland System Linear and vault will provide pollutant and flow control, respectively, so green roofs and permeable pavement are not proposed or required.				
6a-1	Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6a-2	Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
6b-1	Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
6b-2	Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species		☑ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented: N/A				
4.3.8 Harvest and Use Precipitation		☐ Yes	☐ No	☑ N/A
Discussion / justification if 4.3.8 not implemented: Harvest and use is considered to be infeasible per Form I-7 from the City "Storm Water Standards, Part 1: BMP Design Manual - Appendices." The harvest and use assessment is included in Attachment 1c.				
8-1	Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☑ N/A
8-2	Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☑ N/A

Project Name: Paseo Montril VTM

Form I-5B Page 4 of 4
Insert Site Map with all site design BMPs identified:
See Attachment 1a and 4 for plan sheets showing BMPs.

Project Name: Paseo Montril VTM

Summary of PDP Structural BMPs	Form I-6

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). 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 City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 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 must meet pollutant control requirements. The City of San Diego's October 2018 "Storm Water Standards" outline steps in selecting structural BMPs. Harvest and use is considered first. Per Attachment 1c, harvest and use is not feasible for the project.

Infiltration is considered next and is infeasible based on a determination by the project's geotechnical engineer, Geocon, Inc. The bedrock soils have low infiltration rates, and infiltration is not feasible due to the fill and retaining walls.

Biofiltration is the third BMP in the hierarchy. The project adopts this BMP with two Modular Wetlands System Linear and connected vaults. The MWS Linear (along with dispersion) shall be in accordance with current pollutant control requirements per the 2018 "Storm Water Standards." The vaults will be sized per the BMP Sizing Spreadsheet. Storm runoff from these BMPs will be conveyed to an existing public storm drain at the intersection of Paseo Montril and Rancho Penasquitos Boulevard.

(Continue on page 2 as necessary.)

Project Name: Paseo Montril VTM

Form I-6 Page 2 of 2

(Continued from page 1)

Project Name: Paseo Montril VTM

Form I-6 Page 1 of 2 (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP A - Modular Wetlands System Linear	
Construction Plan Sheet No. 5 and 6	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) ☐ 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 form DS-563	TBD during final engineering
Who will be the final owner of this BMP?	Homeowner's Association
Who will maintain this BMP into perpetuity?	Homeowner's Association
What is the funding mechanism for maintenance?	Developer initially, then HOA.

Form I-6 Page 2 of 2 (Copy as many as needed)
Structural BMP ID No. BMP A - Modular Wetlands System Linear
Construction Plan Sheet No. 5 and 6
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Modular Wetlands System Linear, BMP A, will provide pollutant control for the northerly project runoff. Dispersion will be provided within the site in conjunction with the MWS Linear.

Project Name: Paseo Montril

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP B - Vault	
Construction Plan Sheet No. 5 and 6	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) ☐ 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 form DS-563	TBD during final engineering
Who will be the final owner of this BMP?	Homeowner's Association
Who will maintain this BMP into perpetuity?	Homeowner's Association
What is the funding mechanism for maintenance?	Developer initially, then HOA after development

Project Name: Paseo Montril

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. BMP B - Vault
Construction Plan Sheet No. 5 and 6
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): The BMP B vault will provide flow control for the northerly project runoff.

Project Name: Paseo Montril

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP C - Modular Wetlands System Linear	
Construction Plan Sheet No. 5 and 6	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) ☐ 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 form DS-563	TBD during final engineering
Who will be the final owner of this BMP?	Homeowner's Association
Who will maintain this BMP into perpetuity?	Homeowner's Association
What is the funding mechanism for maintenance?	Developer initially, then HOA after development

Project Name: Paseo Montril

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. BMP C - Modular Wetlands System Linear
Construction Plan Sheet No. 5 and 6
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): Modular Wetlands System Linear, BMP C, will provide pollutant control for the southerly project runoff. Dispersion will be provided within the site in conjunction with the MWS Linear.

Project Name: Paseo Montril

Form I-6 Page of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. BMP D - Vault	
Construction Plan Sheet No. 5 and 6	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) ☐ 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 form DS-563	TBD during final engineering
Who will be the final owner of this BMP?	Homeowner's Association
Who will maintain this BMP into perpetuity?	Homeowner's Association
What is the funding mechanism for maintenance?	Developer initially, then HOA after development

Project Name: Paseo Montril

Form I-6 Page of (Copy as many as needed)
Structural BMP ID No. BMP D - Vault
Construction Plan Sheet No. 5 and 6
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs): The BMP D vault will provide flow control for the southerly project runoff.

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name: Paseo Montril VTM

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ 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	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition: • No Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A (optional) ○ Form I-8B (optional) • Partial Infiltration Condition: ○ Infiltration Feasibility Condition Letter (***Note: must be stamped and signed by licensed geotechnical engineer***) ○ Form I-8A ○ Form I-8B • Full Infiltration Condition: ○ Form I-8A ○ Form I-8B ○ Worksheet C.4-3 ○ Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	☑ 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 and site design credit calculations	☑ Included

Project Name: Paseo Montril VTM

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

The DMA Exhibit must identify:

- [x] Underlying hydrologic soil group
- [x] Approximate depth to groundwater
- [x] Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- [x] Critical coarse sediment yield areas to be protected
- [x] Existing topography and impervious areas
- [x] Existing and proposed site drainage network and connections to drainage offsite
- [x] Proposed grading
- [x] Proposed impervious features
- [x] Proposed design features and surface treatments used to minimize imperviousness
- [x] 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)
- [x] Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- [x] Structural BMPs (identify location, type of BMP, size/detail, and include cross-section)

1" = 50'

0 50

DMA 1
1.95 AC

DMA 2
0.58 AC

PASEO MONTRIL

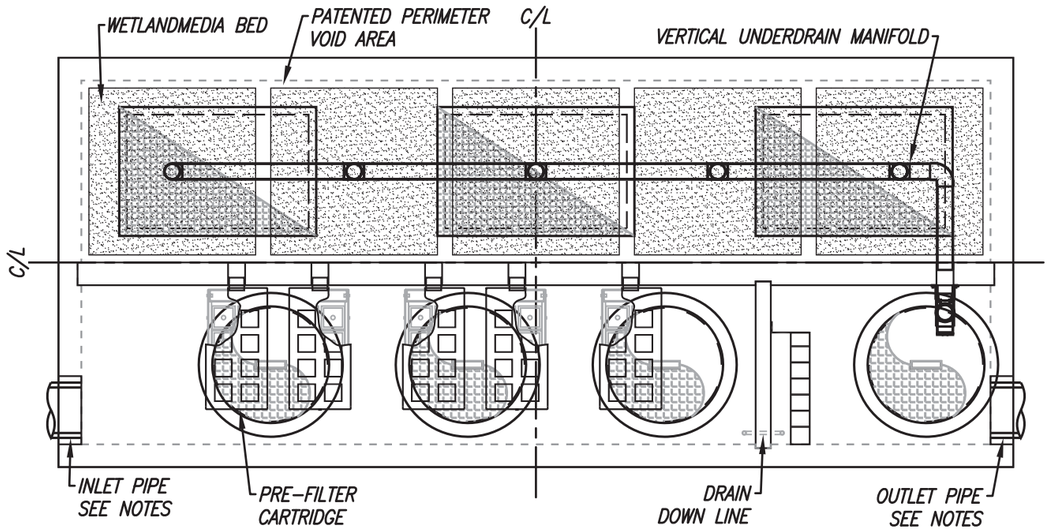
LEGEND:

- TOTAL DISTURBED AREA (3.26 AC)
- DRAINAGE BASIN
- PROPOSED DRAINAGE FACILITY
- PROPOSED VAULT
- PROPOSED MWS-L-8-20 (DMA 1) & MWS-L-4-13 (DMA 2)
- 1.95 AC DRAINAGE BASIN AREA
- PROPOSED ROOFS
- PROPOSED PAVEMENT
- PROPOSED LANDSCAPING
- PROPOSED SELF-MITIGATING AREA

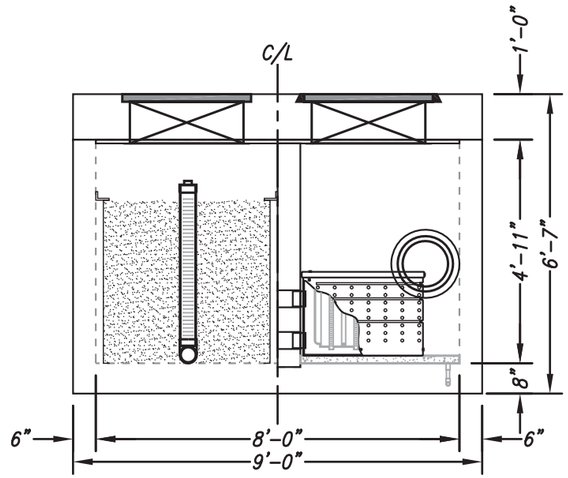
NOTES:
THE UNDERLYING HYDROLOGIC SOIL GROUP IS D. GROUNDWATER IS EXPECTED TO BE AT LEAST 20' DEEP. THERE ARE NO EXISTING ON-SITE CCSYAs OR IMPERVIOUS AREAS. POC 1 IS AT THE OUTLET OF THE PUBLIC STORM DRAIN TO LOS PENASQUITOS CREEK.

ATTACHMENT 1A AND 2A
DMA AND HYDROMODIFICATION MANAGEMENT EXHIBIT

SITE SPECIFIC DATA			
PROJECT NUMBER		----	
PROJECT NAME		----	
PROJECT LOCATION		----	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE	----	N/K	12"
OUTLET PIPE	----	N/K	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	######	######	######
SURFACE LOAD	PEDESTRIAN	PEDESTRIAN	PEDESTRIAN
FRAME & COVER	3EA ø30"	3EA 30" X 48"	ø30"
WETLANDMEDIA VOLUME (CY)			8.93
ORIFICE SIZE (DIA. INCHES)			5 EA ø1.34"
NOTES:			



PLAN VIEW



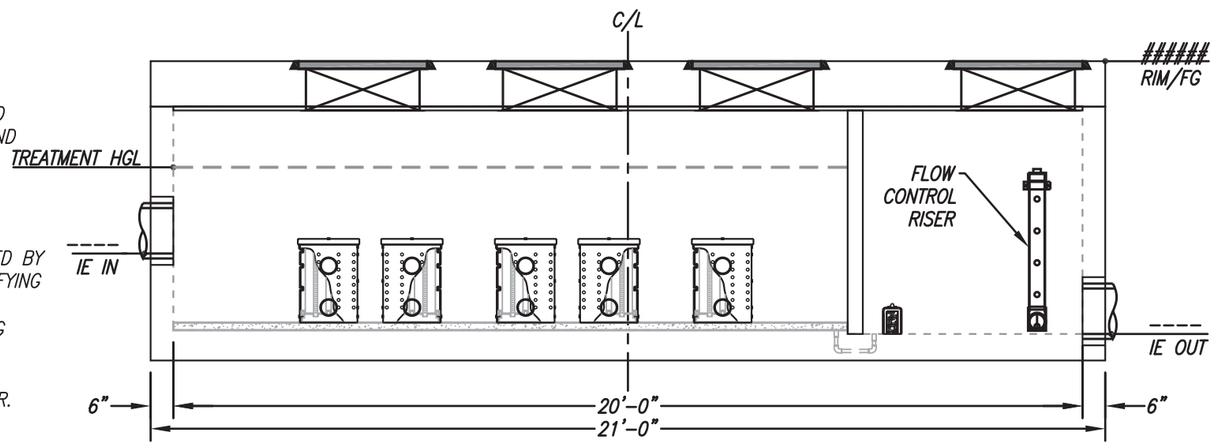
LEFT END VIEW

INSTALLATION NOTES

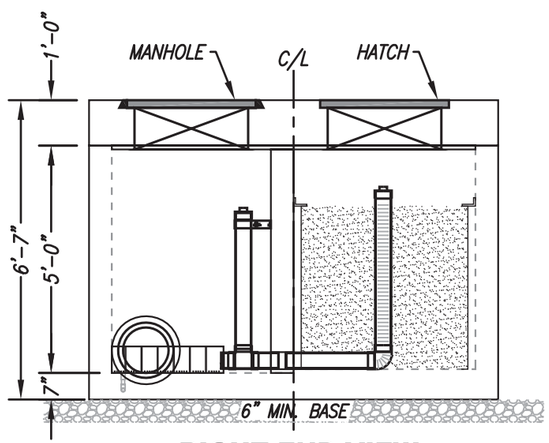
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER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

GENERAL NOTES

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



ELEVATION VIEW



RIGHT END VIEW

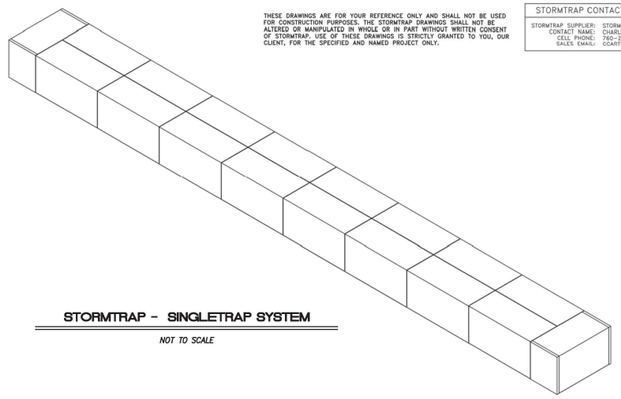
TREATMENT FLOW (CFS)	0.577
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-8-20-4'-11"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

11/16/20ASPOLAR

StormTrap®
MODULAR CONCRETE
STORMWATER MANAGEMENT

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



STORMTRAP - SINGLETRAP SYSTEM

NOT TO SCALE

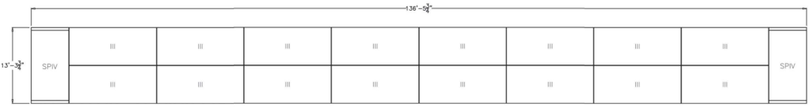
BILL OF MATERIALS			
QTY.	UNIT TYPE	DESCRIPTION	WEIGHT
0	I	7'-6" SINGLETRAP	0
0	II	7'-6" SINGLETRAP	0
16	III	7'-6" SINGLETRAP	20873
0	IV	7'-6" SINGLETRAP	23075
0	VII	7'-6" SINGLETRAP	0
2	SPIV	7'-6" SINGLETRAP	VARIES
0	T2 PANEL	6" THICK PANEL	0
4	T4 PANEL	6" THICK PANEL	3975
0	T7 PANEL	6" THICK PANEL	0
6	JOINTWRAP	150' PER ROLL	
40	JOINTTAPE	14.5' PER ROLL	

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.

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

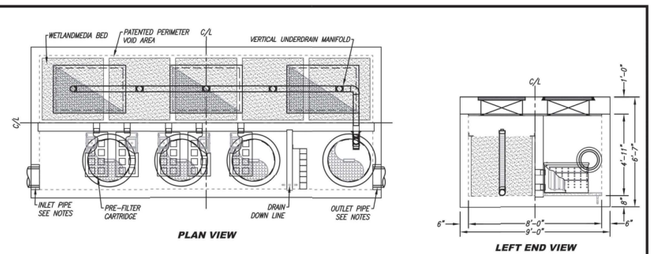
NOTES:
1. DIMENSIONING OF STORMTRAP SYSTEM SHOWN BELOW ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
2. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
3. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.
4. SP - INDICATES A MODULE WITH MODIFICATIONS.
5. P - INDICATES A MODULE WITH A PANEL ATTACHMENT.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



STORMTRAP - SINGLETRAP SYSTEM LAYOUT

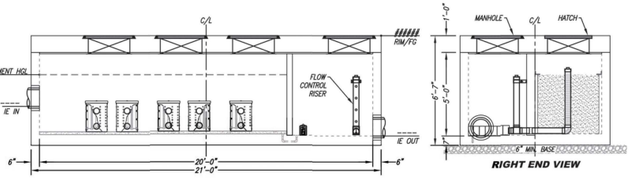
NOT TO SCALE

SITE SPECIFIC DATA			
PROJECT NUMBER		-----	
PROJECT NAME		-----	
PROJECT LOCATION		-----	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE	-----	N/K	12"
OUTLET PIPE	-----	N/K	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	//////	//////	//////
SURFACE LOAD	PEDESTRIAN	PEDESTRIAN	PEDESTRIAN
FRAME & COVER	3EA @30"	3EA 30" X 48"	@30"
WETLANDMEDIA VOLUME (CY)			8.93
ORIFICE SIZE (DIA. INCHES)			5 EA @1.34"
NOTES:			



PLAN VIEW

LEFT END VIEW



ELEVATION VIEW

RIGHT END VIEW

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

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

BIOCLEAN - MODULAR WETLANDS DETAIL

NOT TO SCALE

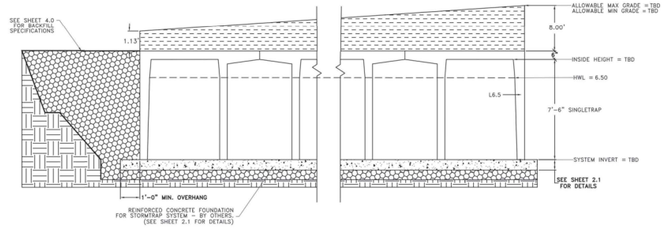
TREATMENT FLOW (CFS)	0.577
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MWS-L-8-20-4'-11"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

STRUCTURAL DESIGN LOADING CRITERIA	
LIVE LOADING:	AASHTO HS-20 HIGHWAY LOADING
GROUND WATER TABLE:	BELOW INVERT OF SYSTEM
SOIL BEARING PRESSURE:	3000PSF
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

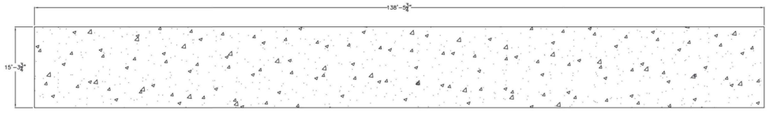
STORMTRAP SYSTEM INFORMATION	
WATER STORAGE PROV:	10256.36 CUBIC FEET @ 6.5' ELEV
UNIT HEADROOM:	7'-6" SINGLETRAP
UNIT QUANTITY:	18 TOTAL PIECES

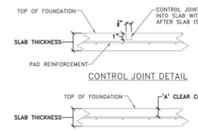
SITE SPECIFIC DESIGN CRITERIA
1. STORMTRAP UNITS SHALL BE MANUFACTURED AND INSTALLED ACCORDING TO SHOP DRAWINGS APPROVED BY THE INSTALLING CONTRACTOR AND ENGINEER OF RECORD. THE SHOP DRAWINGS SHALL INDICATE SIZE AND LOCATION OF ROOF OPENINGS AND INLET/ OUTLET PIPE TYPES, SIZES, INVERT ELEVATIONS AND SIZE OF OPENINGS.
2. COVER RANGE: MIN. 1.13' MAX. 8.00' 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.
5. SYSTEM DESIGN MAY ALLOW FOR INCIDENTAL LEAKAGE AND WILL NOT BE SUBJECT TO LEAKAGE TESTING.



STORMTRAP - 7'-6" SINGLETRAP DETAIL

NOT TO SCALE





CONCRETE FOUNDATION NOTES:
1. CONCRETE FOUNDATION TO BE SUPPLIED AND INSTALLED BY OTHERS.
2. CONCRETE STRENGTH @ 28 DAYS, 5%-8% ENTRAINED AIR, 4" MAX SLUMP.
3. SEE SHEET 2.1 FOR ADDITIONAL FOUNDATION DETAILS ON SHEET 1.0.
4. SOIL CONDITIONS TO BE VERIFIED ON SITE BY OTHERS.
5. REBAR: ASTM A615 GRADE 60, BLACK BAR.
6. DIMENSION OF FOUNDATION MUST HAVE 1'-0" OVERHANG BEYOND EXTERNAL FACE OF MODULE.
7. DIMENSION OF STORMTRAP SYSTEM ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
8. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
9. THE CONTROL JOINTS SHALL BE BETWEEN (IF REQUIRED BY ENGINEER OF RECORD) 16'-0" TO 24'-0" MAX APART.
10. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.

MAXIMUM SYSTEM COVER	SLAB THICKNESS	CONCRETE STRENGTH	REINFORCEMENT (BOTH DIRECTIONS)	'A' CLEAR COVER
6" - 12"	0'-8"	4000 PSI	#4 @ 18" O.C.	3.5"
>1'-0" - 2'-0"	0'-8"	4000 PSI	#4 @ 16" O.C.	3.5"
>2'-0" - 3'-0"	0'-8"	4000 PSI	#4 @ 12" O.C.	3.5"
>3'-0" - 4'-0"	0'-8"	4000 PSI	#4 @ 12" O.C.	3.5"
>4'-0" - 5'-0"	0'-8"	4000 PSI	#5 @ 18" O.C.	3.375"
>5'-0" - 6'-0"	0'-8"	4000 PSI	#5 @ 16" O.C.	3.375"
>6'-0" - 7'-0"	0'-8"	4000 PSI	#5 @ 16" O.C.	3.375"
>7'-0" - 8'-0"	0'-9"	4000 PSI	#5 @ 12" O.C.	3.875"
>8'-0" - 9'-0"	0'-10"	4000 PSI	#5 @ 12" O.C.	4.375"
>9'-0" - 10'-0"	0'-10"	4500 PSI	#5 @ 12" O.C.	4.375"

STORMTRAP - FOUNDATION DETAIL

NOT TO SCALE

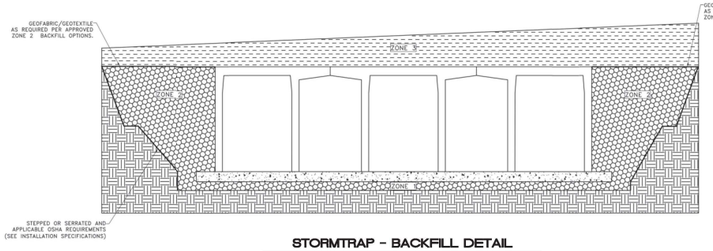
ZONE CHART		
ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	#3 (3") STONE AGGREGATE (SEE NOTE 4 FOR DESCRIPTION)
ZONE 2	BACKFILL	UNIFIED SOILS CLASSIFICATION (GW, GP, SW, SP) OR SEE BELOW FOR APPROVED BACKFILL OPTIONS
ZONE 3	FINAL COVER OVERTOP	MATERIALS NOT TO EXCEED 100 PCF

APPROVED ZONE 2 BACKFILL OPTIONS	
OPTION	REMARKS
1" 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 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.

FILL DEPTH	TRACK WIDTH	MAX VEHICLE WEIGHT (KIPS)	MAX GROUND PRESSURE
12"	12"	51.8	1890 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.

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 FROM THE ZONE 2 BACKFILL CHART IN THIS PAGE OR AN 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 IS RECOMMENDED FOR LEVELING PURPOSES ONLY (OPTIONAL).



STORMTRAP - BACKFILL DETAIL

NOT TO SCALE

BMP NOTE

DETAILS FOR STORMTRAP SINGLETRAP SYSTEM AND BIOCLEAN MODULAR WETLANDS SYSTEM ARE NOT FOR CONSTRUCTION AND PROVIDED FOR REFERENCE ONLY. FINAL DETAILS FOR CONSTRUCTION WILL BE PROVIDED DURING FINAL ENGINEERING.

NAME: CIVIL SENSE, INC.
ADDRESS: 13475 DANELON STREET, SUITE 150
POWAY, CA 92064
PHONE: 858-843-4253

PROJECT ADDRESS:
PASEO MONTRIL

PROJECT NAME:
PASEO MONTRIL VTM, SDP, PDP, CPA
REZONE, NDP AND EASEMENT VACATION

P.T.S. NUMBER: 658273
I.O. NUMBER: 240078662

SHEET TITLE:
STORM DRAIN BMP DETAILS

REVISION 12:	
REVISION 11:	
REVISION 10:	
REVISION 9:	
REVISION 8:	
REVISION 7:	
REVISION 6:	
REVISION 5:	
REVISION 4:	1/28/2021
REVISION 3:	1/8/2021
REVISION 2:	11/24/2020
REVISION 1:	9/28/2020
ORIGINAL DATE:	3/19/2020

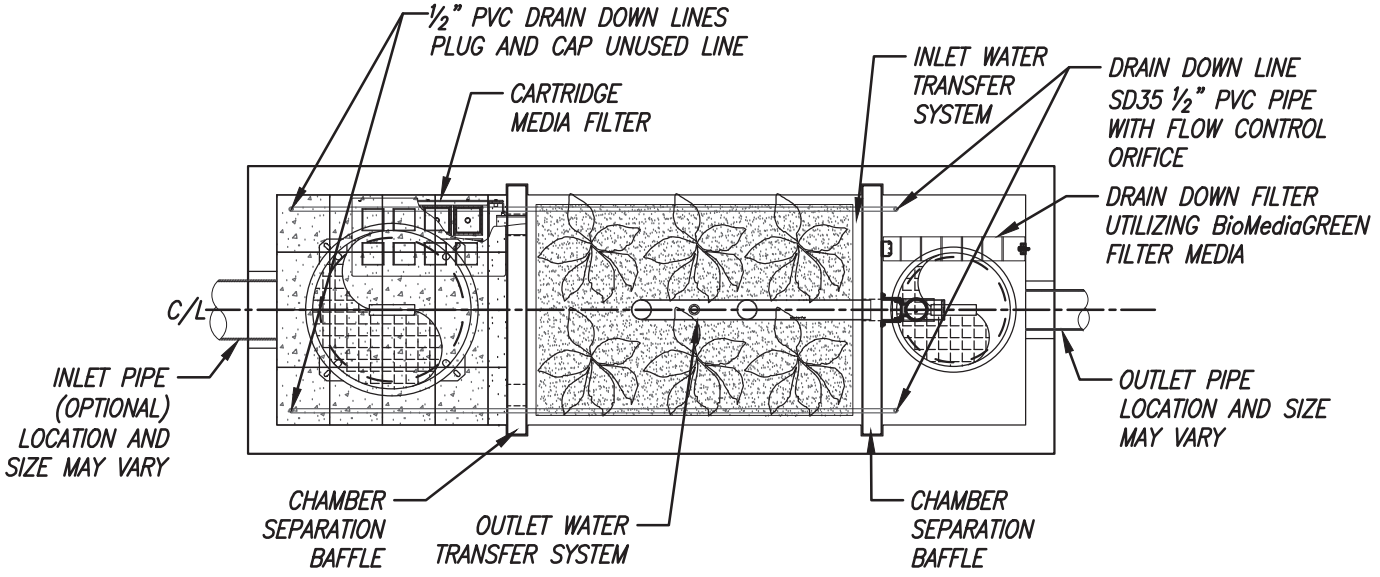
SHEET 6 OF 15

DEP #

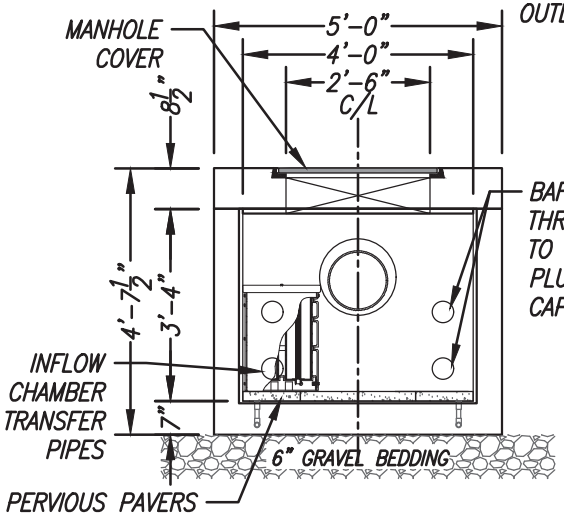
SITE SPECIFIC DATA*	
PROJECT NAME	PASEO MONTRIL
PROJECT LOCATION	SAN DIEGO, CA
STRUCTURE ID	MWS-4-13-V
PERFORMANCE DATA	
TREATMENT VOLUME (CF)	
TREATMENT HGL (FT)	
BYPASS FLOW RATE (CFS)	DEPENDANT ON PIPE SIZE

GENERAL NOTES

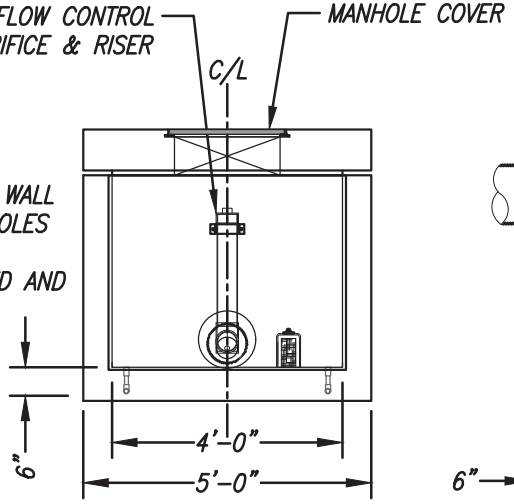
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.



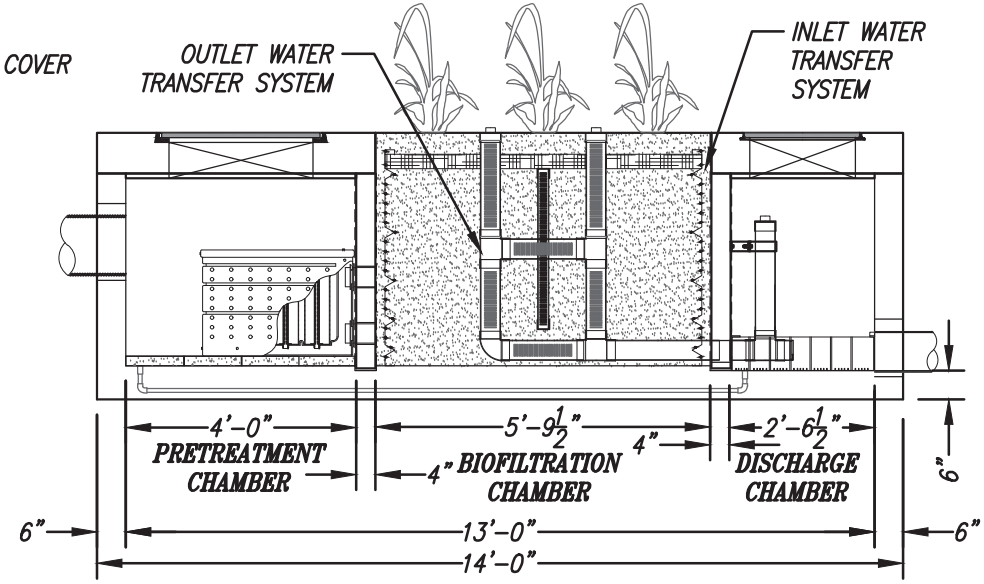
PLAN VIEW



LEFT END VIEW
PRETREATMENT CHAMBER



RIGHT END VIEW
DISCHARGE CHAMBER



ELEVATION VIEW

LEGEND

- WETLAND MEDIA
- PLANT/ROOT MOISTURE RETENTION LAYER

MODULAR WETLANDS

MWS-L-4-13
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

Project Name: Paseo Montril VTM

Attachment 1b

Tabular Summary of DMAs								Worksheet B-1	
DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
1	1.95	1.46	75.0	D	0.70	3,018	BMP A	MWS Linear	1
2	0.58	0.41	70.7	D	0.67	860	BMP C	MWS Linear	1
Self-Mit.	0.74	0	0	D	N/A	N/A	Self-Mitigating	Self-Mitigating	Self-Mit.

Summary of DMA Information (Must match project description and SWQMP Narrative)									
No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
2	2.53	1.87	74.0		0.69	3,878	2.53		1

Where: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

The DMA 1 impervious area consists of 29,386 sf (0.67 ac) of roofs and 34,221 sf (0.79 ac) of pavement. The DMA 1 pervious area consists of 21,157 sf (0.49 ac) of landscaping. The DMA 2 impervious area consists of 7,347 sf (0.17 ac) of roofs and 10,632 sf (0.24 ac) of pavement. The DMA 2 pervious area consists of 7,458 sf (0.17 ac) of landscaping.

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Attachment 1c

Harvest and Use Feasibility Checklist	Worksheet B.3-1 : 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.
[Provide a summary of calculations here]

The total DCV is 3,878 cf or 29,009 gallons. The 36 hour demand is compared to DCV to assess H&U. 0.25DCV is 7,252 gallons. Table B.3-1 demand is 9.3 gallons/resident/day (24 hours) or 14 gallons per 36 hours. For H&U to be feasible, the 36 hour demand must be greater than 7,252 gallons--the site must have 518 residents (7,252/14=518). The project proposed 55 dwelling units, so the number of residents will not be 518 and H&U is infeasible.

3. Calculate the DCV using worksheet B-2.1.
DCV = 3,878 (cubic feet)
[Provide a summary of calculations here]

The total DCV is included on Worksheet B-1 in Attachment 1b. The DCV is calculated on the next page from the 85th percentile, 24-hour storm depth of 0.61 inches; a pervious landscaping area of 28,615 sf; an impervious roof area of 36,733 sf; and pavement area of 44,853 sf.

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.

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.

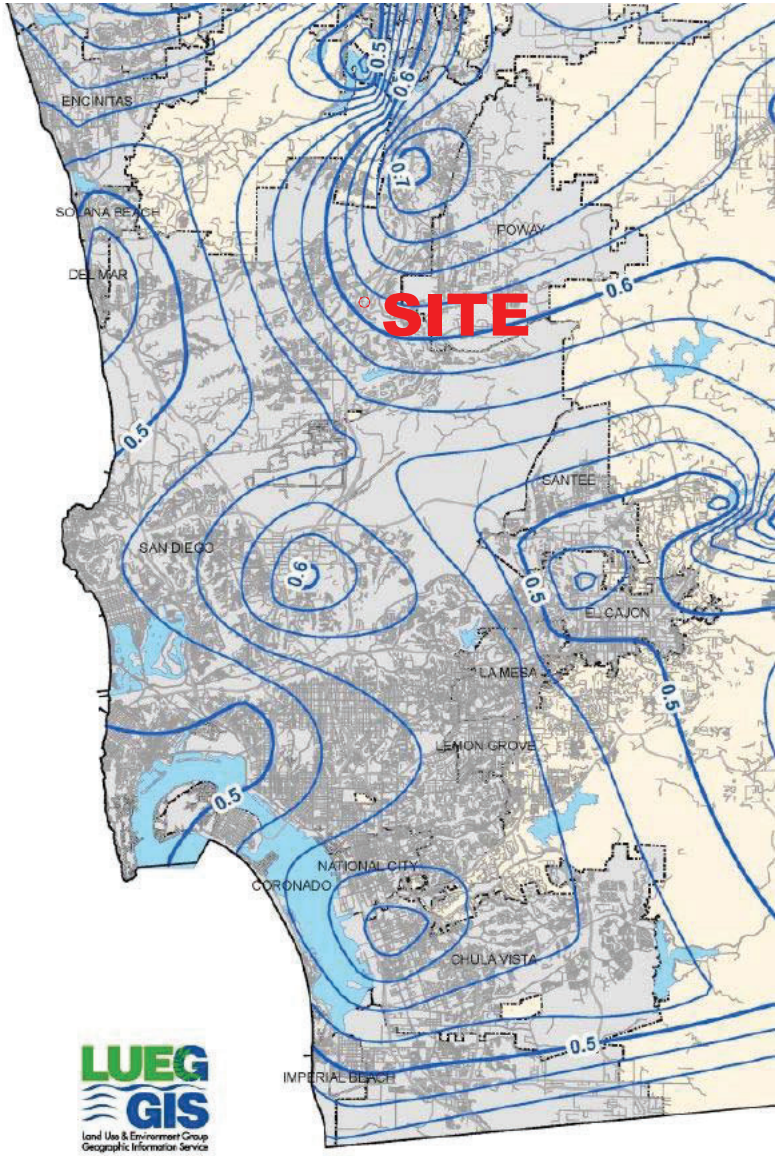
Worksheet B.2-1: DCV

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.61	inches
2	Area tributary to BMP (s)	A=	2.53	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.69	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volume installed for each tree, contributing area to each tree and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and the use of the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	3,878	cubic-feet

DMA 1 and 2 include 28,615 sf of landscaping and 81,586 sf of impervious surfaces (roofs and pavement), or 110,201 sf total.

The C value is calculated as [(28,615 x 0.1) + (81,586 x 0.9)] / 110,201 = 0.69.

San Diego County
85 th Percentile Isopluvials



Legend

- 85th PERCENTILE ISOPLUVIAL
- INCORPORATED CITY

NOTE:
The 85th percentile is a 24 hour rainfall total. It represetns a value such that 85% of the observed 24 hour rainfall totals will be less than that value.

N

0 1 2 4 6 8 Miles

LUEG GIS
Land Use & Environment Group
Geographic Information Service

05/14/2015
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Table B.3-1: Toilet and Urinal Water Usage per Resident or Employee

Land Use Type	Toilet User Unit of Normalization	Per Capita Use per Day		Visitor Factor[4]	Water Efficiency Factor	Total Use per Resident or Employee
		Toilet Flushing[1,2]	Urinals[3]			
Residential	Resident	18.5	NA	NA	0.5	9.3
Office	Employee (non-visitor)	9.0	2.27	1.1	0.5	7 (avg)
Retail	Employee (non-visitor)	9.0	2.11	1.4	0.5	
Schools	Employee (non-student)	6.7	3.5	6.4	0.5	33
Various Industrial Uses (excludes process water)	Employee (non-visitor)	9.0	2	1	0.5	5.5

[1]Based on American Waterworks Association Research Foundation, 1999. Residential End Uses of Water. Denver, CO: AWWARF
[2]Based on use of 3.45 gallons per flush and average number of per employee flushes per subsector, Table D-1 for MWD (Pacific Institute, 2003)
[3]Based on use of 1.6 gallons per flush, Table D-4 and average number of per employee flushes per subsector, Appendix D (Pacific Institute, 2003)
[4]Multiplied by the demand for toilet and urinal flushing for the project to account for visitors. Based on proportion of annual use allocated to visitors and others (includes students for schools; about 5 students per employee) for each subsector in Table D-1 and D-4 (Pacific Institute, 2003)
[5]Accounts for requirements to use ultra-low flush toilets in new development projects; assumed that requirements will reduce toilet and urinal flushing demand by half on average compared to literature estimates. Ultra low flush toilets are required in all new construction in California as of January 1, 1992. Ultra low flush toilets must use no more than 1.6 gallons per flush and Ultra low flush urinals must use no more than 1 gallon per flush. Note: If zero flush urinals are being used, adjust accordingly.

B.3.2.2 General Requirements for Irrigation Demand Calculations

The following guidelines should be followed for computing harvested water demand from landscape irrigation:

- If reclaimed water is planned for use for landscape irrigation, then the demand for harvested storm water should be reduced by the amount of reclaimed water that is available during the wet season.
- Irrigation rates should be based on the irrigation demand exerted by the types of landscaping that are proposed for the project, with consideration for water conservation requirements.
- Irrigation rates should be estimated to reflect the average wet season rates (defined as October through April) accounting for the effect of storm events in offsetting harvested water demand. In the absence of a detailed demand study, it should be assumed that irrigation demand is not present during days with greater than 0.1 inches of rain and the subsequent 3-day period. This irrigation shutdown period is consistent with standard practice in land application of wastewater and is applicable to storm water to prevent irrigation from resulting in dry weather runoff. Based on a statistical analysis of San Diego County rainfall patterns, approximately 30 percent of wet season days would not have a demand for irrigation.

Attachment 1d

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I- 8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Overall Site	
Criteria 1: Infiltration Rate Screening	
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☐ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☒ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☒ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☒ No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.

Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I- 8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Based on theUSDA Web Soil Survey, 75% of the site area has an infiltraiton rate of 0.06 in/hr or less. The other 25% of the site area is listed as having an estimated infiltration rate of 2 in/hr and is located along the eastern side of the site. However, based on field mapping, the area is underlain by hard metamorphic rock and is expected to have an infiltration rate of less than 0.5 in/hr. This area will recevie cuts to achieve proposed pad grade and fills in excess of 5 feet. In addition, in this area, retaining walls and building structures are planned. There is no reasonable area outside of the strucural improvements or compacted fill areas where an infiltraiton basin could be constructed due to the sloping hillside condition and sensitive habitat along the east side of the site.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A–1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☐ Yes	☐ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B–1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			
Part 1 Result – Full Infiltration Geotechnical Screening[12]		**Result**	
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.		☐ Full infiltration Condition ☒ Complete Part 2	

[12] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I- 8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Overall Site	

Criteria 3: Infiltration Rate Screening	
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ No; infiltration testing is conducted (refer to Table D.3–1), continue to Step 3B.
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☒ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☒ No: Skip to Part 2 Result.

Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate).

Based on theUSDA Web Soil Survey, 75% of the site area has an infiltraiton rate of 0.06 in/hr or less. The other 25% of the site area is listed as having an estimated infiltration rate of 2 in/hr and is located along the eastern side of the site. However, based on field mapping, the area is underlain by hard metamorphic rock and is expected to have an infiltration rate of less than 0.05 in/hr. This area will recevie cuts to achieve proposed pad grade and fills in excess of 5 feet. In addition, in this area, retaining walls and building structures are planned. There is no reasonable area outside of the strucural improvements or compacted fill areas where an infiltraiton basin could be constructed due to the sloping hillside condition and sensitive habitat along the east side of the site.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A–1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B–1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

[13] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Attachment 1e

POLLUTANT CONTROL BMP DESIGN

Pollutant control BMPs were selected to treat the project's pollutants of concern identified on Form I-3B. Two Bio Clean Modular Wetland System Linear BMPs (see the DMA Exhibit in Attachment 1a) are proposed for the site. One is at the southerly portion of the project and will collect the majority of the project runoff. The second is near the site entrance and will collect runoff from the southerly portion of the project. MWS Linear BMPs have a high pollutant removal efficiency for the project's pollutants of concern. MWS Linear are TAPE-certified and have been approved by the City of San Diego on similar multi-family residential projects. Furthermore, infiltration and partial infiltration are not feasible according to Geocon, Inc. (see Attachment 1d and 6).

MWS Linear BMPs can use flow-based sizing. The *BMP Design Manual* outlines the flow-based sizing procedure. Worksheet B.6-1 is used to determine the design flows. This worksheet was used for the two MWS Linear BMPs. The impervious and pervious areas tributary to each MWS Linear are shown and tabulated in Attachment 1a and 1b. Worksheet B.6-1 for each BMP is attached. The attached MWS Linear sizing table from the Bio Clean brochure shows that the flow from the larger DMA 1 exceeds the maximum capacity of the MWS Linear units. However, communication with Bio Clean revealed that a single unit can be used if the tributary runoff first enters a vault for flow control so that the flow into the unit is reduced. BioClean provided the attached sizing analyses for the MWS assuming the storm runoff enters the vault first. Their analyses show that a single MWS-L-8-20 unit provides the required pollutant control. For the MWS Linear that treats DMA 2, the Bio Clean brochure shows that an MWS-L-4-13 unit will treat the runoff.

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MWS for DMA 1

Worksheet B.6-1: Flow-Thru Design Flows

Flow-thru Design Flows		Worksheet B.6-1		
1	DCV	DCV	3,018	cubic-feet
2	DCV retained	$DCV_{retained}$	0	cubic-feet
3	DCV biofiltered	$DCV_{biofiltered}$	0	cubic-feet
4	DCV requiring flow-thru (Line 1 – Line 2 – 0.67*Line 3)	$DCV_{flow-thru}$	3,018	cubic-feet
5	Adjustment factor (Line 4 / Line 1)	AF=	use 1.5	unitless
6	Design rainfall intensity	i=	0.20	in/hr.
7	Area tributary to BMP (s)	A=	1.95	acres
8	Area-weighted runoff factor (estimate using Appendix B.2)	C=	0.70	unitless
9	Calculate Flow Rate = AF x (C x i x A)	Q=	0.409	cfs

1. Adjustment factor shall be estimated considering only retention and biofiltration BMPs located upstream of flow-thru BMPs. That is, if the flow-thru BMP is upstream of the project's retention and biofiltration BMPs then the flow-thru BMP shall be sized using an adjustment factor of 1.
2. Volume based (e.g., dry extended detention basin) flow-thru treatment control BMPs shall be sized to the volume in Line 4 and flow based (e.g., vegetated swales) shall be sized to flow rate in Line 9. Sand filter and media filter can be designed either by volume in Line 4 or flow rate in Line 9.
3. Proprietary BMPs, if used, shall provide certified treatment capacity equal to or greater than the calculated flow rate in Line 9; certified treatment capacity per unit shall be consistent with third party certifications.

The MWS Linear that treats runoff from DMA 1 will be provided after the vault instead of before the vault, so a single unit can be used. Bio Clean provided the single MWS Linear sizing on the next page.

MWS for DMA 2

Worksheet B.6-1: Flow-Thru Design Flows

Flow-thru Design Flows		Worksheet B.6-1		
1	DCV	DCV	860	cubic-feet
2	DCV retained	$DCV_{retained}$	0	cubic-feet
3	DCV biofiltered	$DCV_{biofiltered}$	0	cubic-feet
4	DCV requiring flow-thru (Line 1 – Line 2 – 0.67*Line 3)	$DCV_{flow-thru}$	860	cubic-feet
5	Adjustment factor (Line 4 / Line 1)	AF=	use 1.5	unitless
6	Design rainfall intensity	i=	0.20	in/hr.
7	Area tributary to BMP (s)	A=	0.58	acres
8	Area-weighted runoff factor (estimate using Appendix B.2)	C=	0.67	unitless
9	Calculate Flow Rate = AF x (C x i x A)	Q=	0.117	cfs

1. Adjustment factor shall be estimated considering only retention and biofiltration BMPs located upstream of flow-thru BMPs. That is, if the flow-thru BMP is upstream of the project's retention and biofiltration BMPs then the flow-thru BMP shall be sized using an adjustment factor of 1.
2. Volume based (e.g., dry extended detention basin) flow-thru treatment control BMPs shall be sized to the volume in Line 4 and flow based (e.g., vegetated swales) shall be sized to flow rate in Line 9. Sand filter and media filter can be designed either by volume in Line 4 or flow rate in Line 9.
3. Proprietary BMPs, if used, shall provide certified treatment capacity equal to or greater than the calculated flow rate in Line 9; certified treatment capacity per unit shall be consistent with third party certifications.

Q=0.117 cfs can be treated by an MWS-L-4-13.

Bio Clean

A Forterra Company

Date: 11/16/20

Subject: 11985 – Paseo Montril, San Diego, Ca

To Whom It May Concern,

The MWS Linear will be sized in accordance with the TAPE GULD approval for the Modular Wetland System. The system is sized at a loading rate of (less than or equal to) 1.0 gpm/sq ft, where the pre-filter cartridges are sized at a loading rate of less than 2.1 gpm/sq ft. Design, sizing, and loading have been reviewed and approved by a Modular Wetland Representative and is ready for final approval. Shown below are the calculations for this Project:

MWS-L-8-20-V-UG

- Required Treatment Flow Rate = 0.577 cfs
- MWS-Linear-8-20 Treatment Capacity Provided = 0.577 cfs or 258.96 gpm at 3.4' HGL
- Pre-filter Cartridge = 5 full size cartridges
- Surface Area per Cartridge = 25.6 sq ft
- Loading rate (Pre-Filter Cartridge) = 2.0 gpm/sq ft
- MWS Wetland Surface Area = 251.6 sf
- Loading Rate (Wetland Media) = 1.0 gpm/sf

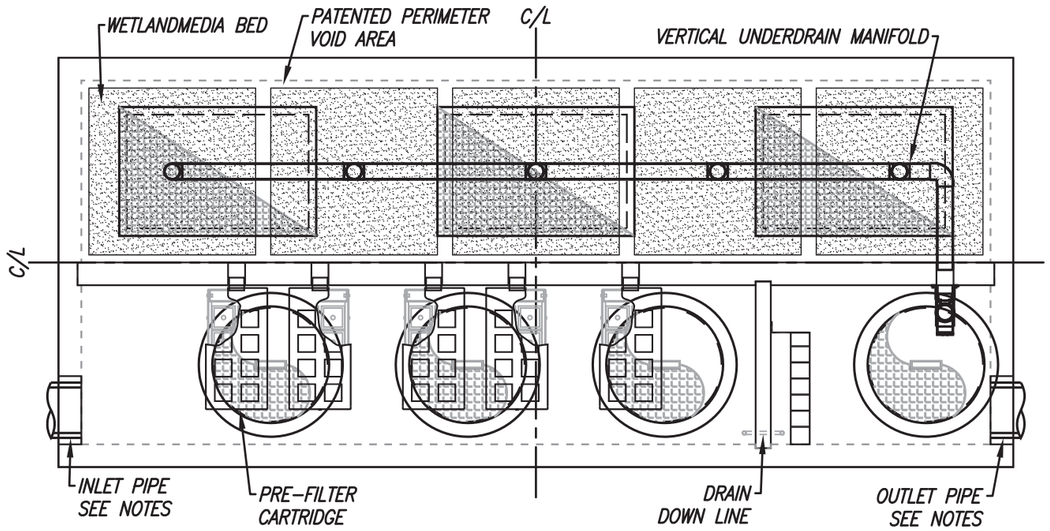
If you have any questions, please feel free to contact us at your convenience.

Sincerely,

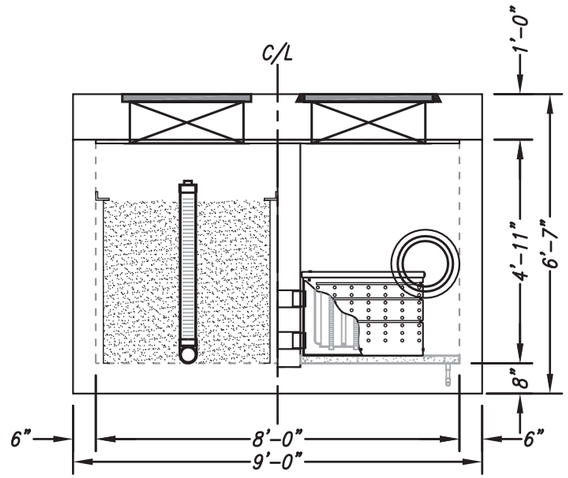
Anthony J. Spolar, E.I.T.

5796 Armada Dr. Suite 250, Carlsbad, Ca 92008
(469) 458-7973 • Fax (760) 433-3176
www.biocleanenvironmental com

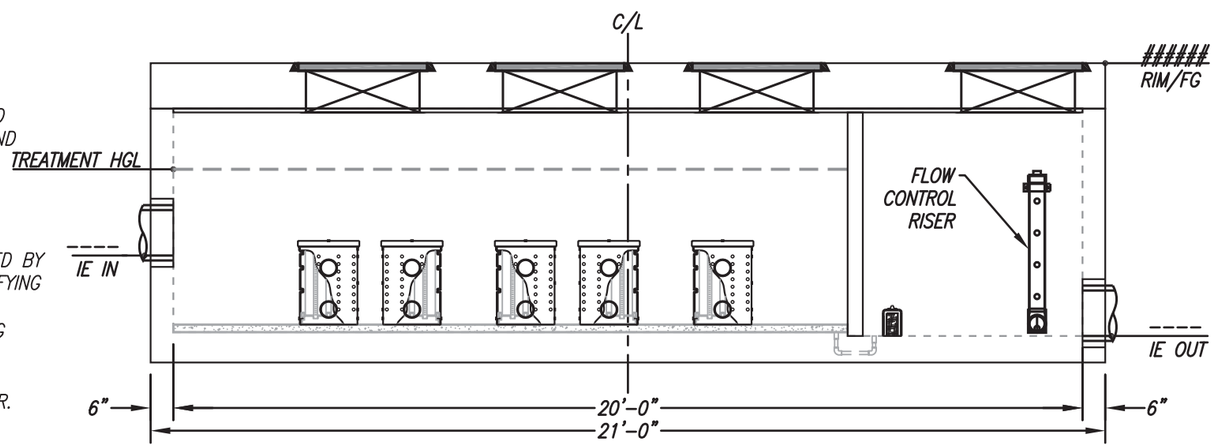
SITE SPECIFIC DATA			
PROJECT NUMBER		----	
PROJECT NAME		----	
PROJECT LOCATION		----	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE	----	N/K	12"
OUTLET PIPE	----	N/K	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	######	######	######
SURFACE LOAD	PEDESTRIAN	PEDESTRIAN	PEDESTRIAN
FRAME & COVER	3EA ø30"	3EA 30" X 48"	ø30"
WETLANDMEDIA VOLUME (CY)			8.93
ORIFICE SIZE (DIA. INCHES)			5 EA ø1.34"
NOTES:			



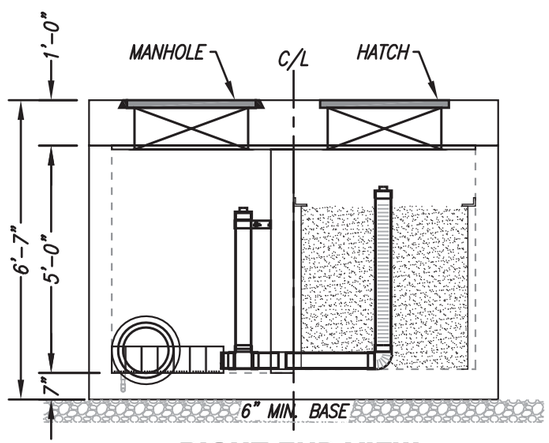
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

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

GENERAL NOTES

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

TREATMENT FLOW (CFS)	0.577
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

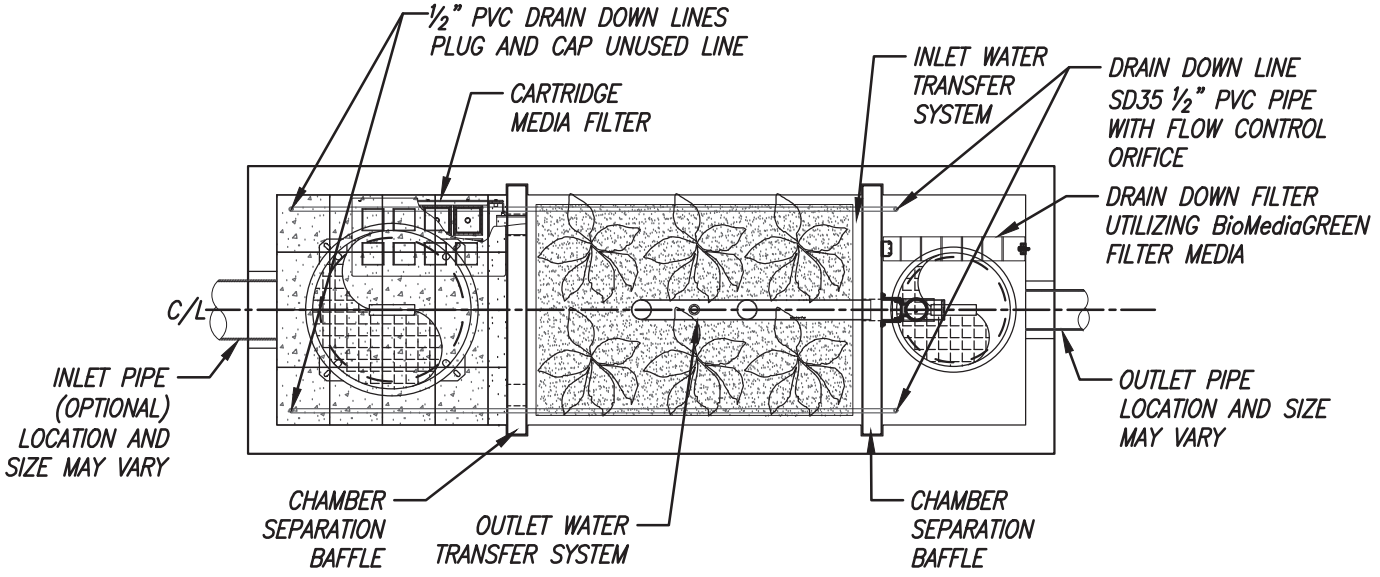
MWS-L-8-20-4'-11"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

11/16/20ASPOLAR

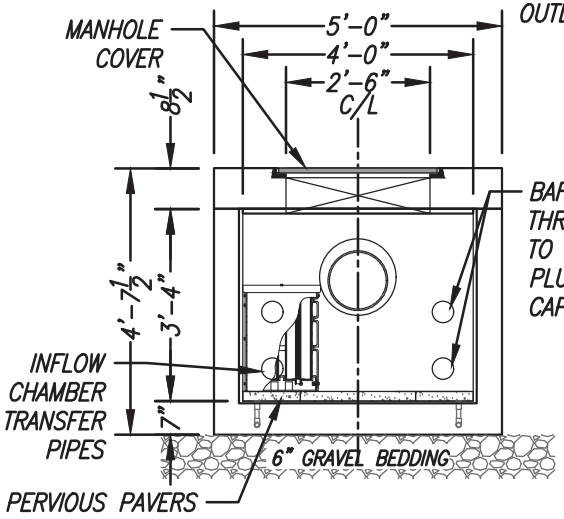
SITE SPECIFIC DATA*	
PROJECT NAME	PASEO MONTRIL
PROJECT LOCATION	SAN DIEGO, CA
STRUCTURE ID	MWS-4-13-V
PERFORMANCE DATA	
TREATMENT VOLUME (CF)	
TREATMENT HGL (FT)	
BYPASS FLOW RATE (CFS)	DEPENDANT ON PIPE SIZE

GENERAL NOTES

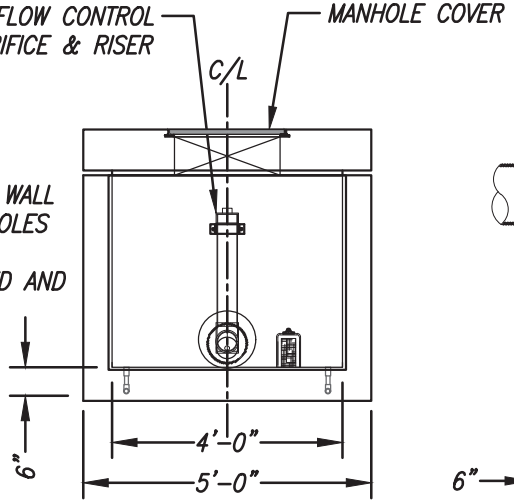
1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT MANUFACTURER.



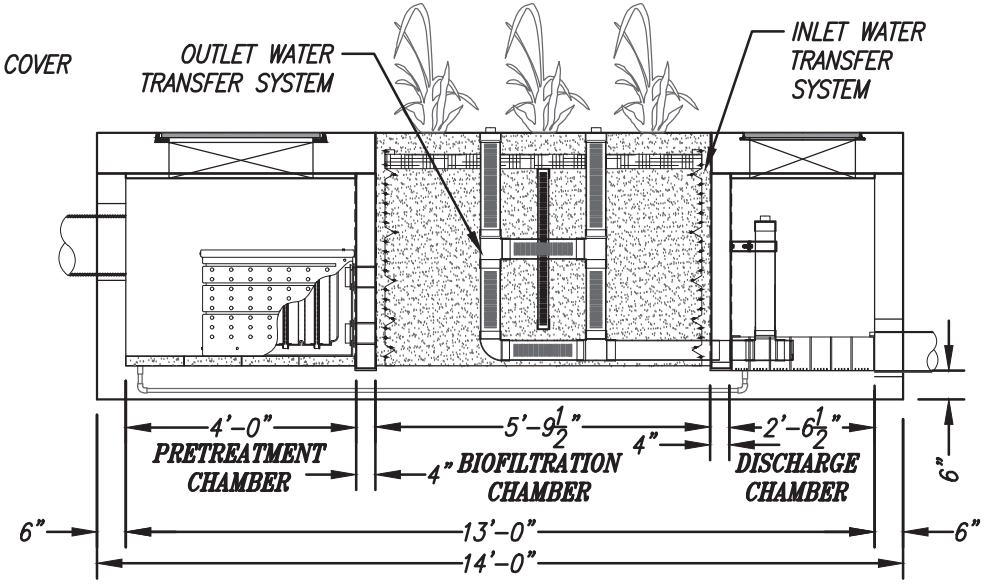
PLAN VIEW



LEFT END VIEW
PRETREATMENT CHAMBER



RIGHT END VIEW
DISCHARGE CHAMBER



ELEVATION VIEW

LEGEND

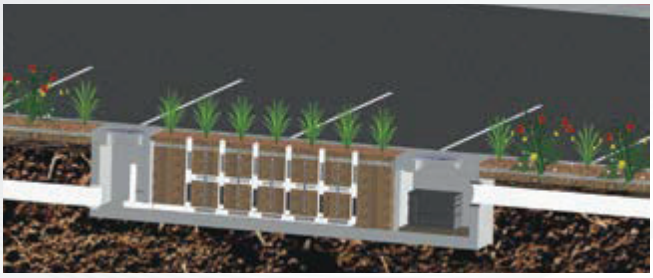
- WETLAND MEDIA
- PLANT/ROOT MOISTURE RETENTION LAYER

MODULAR WETLANDS

MWS-L-4-13
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

Flow Based Sizing

The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

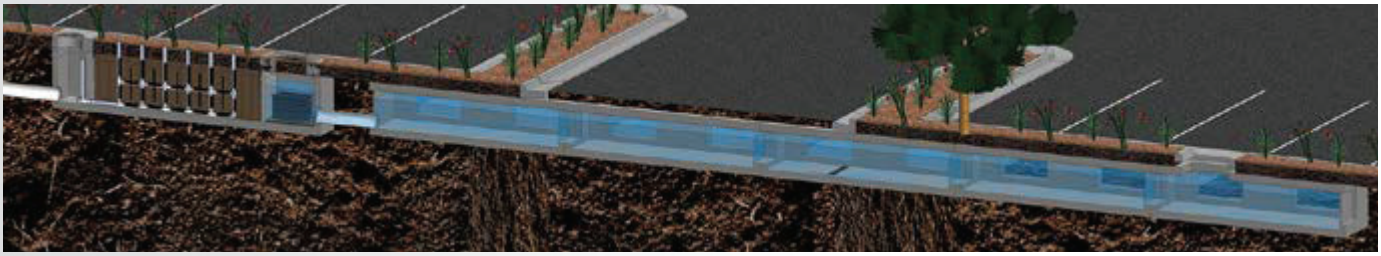


Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

For the MWS Linears at BMP A and C

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Compact (high rate) biofiltration BMPs have a media filtration rate greater than 5 in/hr. and a media surface area smaller than 3% of contributing area times adjusted runoff factor. Compact biofiltration BMPs are typically proprietary BMPs that may qualify as biofiltration.

A compact biofiltration BMP may satisfy the pollutant control requirements for a DMA onsite in some cases. This depends on the characteristics of the DMA **and** the performance certification/data of the BMP. If the pollutant control requirements for a DMA are met onsite, then the DMA is not required to participate in an offsite storm water alternative compliance program to meet its pollutant control obligations.

An applicant using a compact biofiltration BMP to meet the pollutant control requirements onsite must complete Section 1 of this form and include it in the PDP SWQMP. A separate form must be completed for each DMA. In instances where the City Engineer does not agree with the applicant's determination, Section 2 of this form will be completed by the City and returned to the applicant.

Section 1: Biofiltration Criteria Checklist (Appendix F)

Refer to Part 1 of the Storm Water Standards to complete this section. When separate forms/worksheets are referenced below, the applicant must also complete these separate forms/worksheets (as applicable) and include in the PDP SWQMP. The criteria numbers below correspond to the criteria numbers in Appendix F.

Criteria	Answer	Progression
Criteria 1 and 3: What is the infiltration condition of the DMA? Refer to Section 5.4.2 and Appendix C of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance. Applicant must complete and include the following in the PDP SWQMP submittal to support the feasibility determination: • Infiltration Feasibility Condition Letter; or • Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B. Applicant must complete and include all applicable sizing worksheets in the SWQMP submittal	○ Full Infiltration Condition	**Stop**. Compact biofiltration BMP is not allowed.
	○ Partial Infiltration Condition	Compact biofiltration BMP is only allowed, if the target volume retention is met onsite (Refer to Table B.5-1 in Appendix B.5). Use Worksheet B.5-2 in Appendix B.5 to estimate the target volume retention (Note: retention in this context means reduction). If the required volume reduction is achieved **proceed to Criteria 2**. If the required volume reduction is not achieved, compact biofiltration BMP is not allowed. **Stop**.
	◉ No Infiltration Condition	Compact biofiltration BMP is allowed if volume retention criteria in Table B.5-1 in Appendix B.5 for the no infiltration condition is met. Compliance with this criterion must be documented in the PDP SWQMP. If the criteria in Table B.5-1 is met **proceed to Criteria 2**. Attached after this form. If the criteria in Table B.5-1 is not met, compact biofiltration BMP is not allowed. **Stop**.

Compact (high rate) Biofiltration BMP Checklist	Form I-10

Provide basis for Criteria 1 and 3:

Feasibility Analysis:

Summarize findings and include either infiltration feasibility condition letter or Worksheet C.4-1: Form I-8A and Worksheet C.4-2: Form I-8B in the PDP SWQMP submittal.

If Partial Infiltration Condition:

Provide documentation that target volume retention is met (include Worksheet B.5-2 in the PDP SWQMP submittal). Worksheet B.5-7 in Appendix B.5 can be used to estimate volume retention benefits from landscape areas.

If No Infiltration Condition:

Provide documentation that the volume retention performance standard is met (include Worksheet B.5-2 in the PDP SWQMP submittal) in the PDP SWQMP submittal. Worksheet B.5-6 in Appendix B.5 can be used to document that the performance standard is met.

Criteria	Answer	Progression
Criteria 2: Is the compact biofiltration BMP sized to meet the performance standard from the MS4 Permit? Refer to Appendix B.5 and Appendix F.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Meets Flow based Criteria	Use guidance from **Appendix F.2.2** to size the compact biofiltration BMP to meet the flow based criteria. Include the calculations in the PDP SWQMP. Use parameters for sizing consistent with manufacturer guidelines and conditions of its third party certifications (i.e. a BMP certified at a loading rate of 1 gpm/sq. ft. cannot be designed using a loading rate of 1.5 gpm/sq. ft.) **Proceed to Criteria 4.**
	○ Meets Volume based Criteria	Provide documentation that the compact biofiltration BMP has a total static (i.e. non-routed) storage volume, including pore-spaces and pre-filter detention volume (Refer to Appendix B.5 for a schematic) of at least 0.75 times the portion of the DCV not reliably retained onsite. **Proceed to Criteria 4.**
	○ Does not Meet either criteria	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 2:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., loading rate, etc., as applicable).

Flow-based sizing calculations are provided at the beginning of Attachment 1e for the two MWS Linear BMPs. BioClean will provide sizing for BMP A since this MWS will be installed after a vault. The MWS for BMP C will be sized using the sizing table.

Criteria	Answer	Progression
Criteria 4: Does the compact biofiltration BMP meet the pollutant treatment performance standard for the projects most significant pollutants of concern? Refer to Appendix B.6 and Appendix F.1 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes, meets the TAPE certification.	Provide documentation that the compact BMP has an appropriate TAPE certification for the projects most significant pollutants of concern. **Proceed to Criteria 5.**
	○ Yes, through other third-party documentation	Acceptance of third-party documentation is at the discretion of the City Engineer. The City engineer will consider, (a) the data submitted; (b) representativeness of the data submitted; and (c) consistency of the BMP performance claims with pollutant control objectives in Table F.1-2 and Table F.1-1 while making this determination. If a compact biofiltration BMP is not accepted, a written explanation/ reason will be provided in Section 2. **Proceed to Criteria 5.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 4:

Provide documentation that identifies the projects most significant pollutants of concern and TAPE certification or other third party documentation that shows that the compact biofiltration BMP meets the pollutant treatment performance standard for the projects most significant pollutants of concern.

TAPE certification is attached after this form.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 5: Is the compact biofiltration BMP designed to promote appropriate biological activity to support and maintain treatment process? Refer to Appendix F of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	◉ Yes	Provide documentation that the compact biofiltration BMP support appropriate biological activity. Refer to Appendix F for guidance. **Proceed to Criteria 6.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 5:

Provide documentation that appropriate biological activity is supported by the compact biofiltration BMP to maintain treatment process.

The MWS Linear brochure is attached after this form and shows biofiltration.

Criteria	Answer	Progression
Criteria 6: Is the compact biofiltration BMP designed with a hydraulic loading rate to prevent erosion, scour and channeling within the BMP?	◉ Yes	Provide documentation that the compact biofiltration BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification. **Proceed to Criteria 7.**
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 6:

Provide documentation that the BMP meets the numeric criteria and is designed consistent with the manufacturer guidelines and conditions of its third-party certification (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).

Flow-based sizing calculations are provided at the beginning of Attachment 1e. MWS Linear units are designed to withstand erosion, scour, and channeling if sized for the design flow rate. The units are concrete, which will withstand hydraulic forces.

Compact (high rate) Biofiltration BMP Checklist		Form I-10
Criteria	**Answer**	**Progression**
Criteria 7: Is the compact biofiltration BMP maintenance plan consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies)?	◉ Yes, and the compact BMP is privately owned, operated and not in the public right of way.	Submit a maintenance agreement that will also include a statement that the BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification. **Stop**. The compact biofiltration BMP meets the required criteria.
	○ Yes, and the BMP is either owned or operated by the City or in the public right of way.	Approval is at the discretion of the City Engineer. The city engineer will consider maintenance requirements, cost of maintenance activities, relevant previous local experience with operation and maintenance of the BMP type, ability to continue to operate the system in event that the vending company is no longer operating as a business or other relevant factors while making the determination. **Stop**. Consult the City Engineer for a determination.
	○ No	**Stop**. Compact biofiltration BMP is not allowed.

Provide basis for Criteria 7:

Include copy of manufacturer guidelines and conditions of third-party certification in the maintenance agreement. PDP SWQMP must include a statement that the compact BMP will be maintained in accordance with manufacturer guidelines and conditions of third-party certification.

The two MWS Linear BMPs will be private.

Compact (high rate) Biofiltration BMP Checklist	Form I-10
Section 2: Verification (For City Use Only)	
Is the proposed compact BMP accepted by the City Engineer for onsite pollutant control compliance for the DMA?	◉ Yes ○ No, See explanation below
Explanation/reason if the compact BMP is not accepted by the City for onsite pollutant control compliance:	

Table B-5.1

Infiltration Feasibility Condition	Performance Standard
No Infiltration Condition (Based on Infiltration Feasibility Condition Letter and/or Worksheet C.4-1: Form I-8A and/or Worksheet C.4-2: Form I-8B) [There is no hierarchy in selecting the type of biofiltration BMP as long as the performance standard for the selected biofiltration BMP is met]	**Standard Biofiltration BMPs:** BMPs must meet the criteria in Appendix B.5.1.2 **Non-Standard Biofiltration BMPs:** Pollutant Removal: BMP must be sized using Worksheet B.5-1 and Worksheet B.5-4; **AND** Volume Retention: DMA must meet the target volume retention calculated using Worksheet B.5-2 (based on Figure B.5-2). Compliance with volume retention requirements can be documented by: • DMA has a combined BMP footprint and landscaped area (that meet the criteria in SD-B and SD-F factsheet) of 3% of contributing area times adjusted runoff factor or greater. The landscaped area must have an impervious area to pervious area ratio greater than 1.5:1. This can be documented using Worksheet B.5-6. [OR] • Applicant has an option to use other site design BMPs that will meet the target volume retention calculated using Worksheet B.5-2. This can be documented using Worksheet B.5-6 and/or Worksheet B.5-7. **Compact Biofiltration BMPs:** Pollutant Removal: BMP must meet the criteria in Appendix F. Form I-10 must be completed and submitted with the PDP SWQMP; **AND** Volume Retention: DMA must meet the target volume retention calculated using Worksheet B.5-2 (based on Figure B.5-2). Compliance with volume retention requirements can be documented by: • DMA has a combined BMP footprint and landscaped area (that meet the criteria in SD-B and SD-F factsheet) of 3% of contributing area times adjusted runoff factor or greater. The landscaped area must have an impervious area to pervious area ratio greater than 1.5:1. This can be documented using Worksheet B.5-6. [OR] • Applicant has an option to use other site design BMPs that will meet the target volume retention calculated using Worksheet B.5-2. This can be documented using Worksheet B.5-6 and/or Worksheet B.5-7.

Worksheet B.5-2 and B.5-6 are attached.

The City of SAN DIEGO	Project Name	Paseo Montril	
	BMP ID	BMP A MWS Linear	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	84,764	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.700320891	
3	85th percentile 24-hour rainfall depth	0.61	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	3018	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = $0.0000013 \times \text{Line } 8^3 - 0.000057 \times \text{Line } 8^2 + 0.0086 \times \text{Line } 8 - 0.014$ When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	69	cu. ft.

The City of SAN DIEGO	Project Name	Paseo Montril
	BMP ID	BMP A MWS Linear

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP		84,764	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)		0.7	
3	Effective impervious area draining to the BMP [Line 1 x Line 2]		59335	sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]		1780	sq. ft.
5	Biofiltration BMP Footprint		2253.428571	sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		1780				
7	Impervious area draining to the landscape area (sq. ft.)		2670				
8	Impervious to Pervious Area ratio [Line 7/Line 6]		1.50	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		1780	0	0	0	0
10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]				1780		sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]				4033.428571		sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	2.27	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	69	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-87.63	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

The City of SAN DIEGO	Project Name	Paseo Montril	
	BMP ID	BMP C MWS Linear	
Sizing Method for Volume Retention Criteria		**Worksheet B.5-2**	
1	Area draining to the BMP	25,437	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.665444038	
3	85th percentile 24-hour rainfall depth	0.61	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	860	cu. ft.
Volume Retention Requirement			
5	Measured infiltration rate in the DMA Note: When mapped hydrologic soil groups are used enter 0.10 for NRCS Type D soils and for NRCS Type C soils enter 0.30 When in no infiltration condition and the actual measured infiltration rate is unknown enter 0.0 if there are geotechnical and/or groundwater hazards identified in Appendix C or enter 0.05	0	in/hr.
6	Factor of safety	2	
7	Reliable infiltration rate, for biofiltration BMP sizing [Line 5 / Line 6]	0	in/hr.
8	Average annual volume reduction target (Figure B.5-2) When Line 7 > 0.01 in/hr. = Minimum (40, 166.9 x Line 7 +6.62) When Line 7 ≤ 0.01 in/hr. = 3.5%	3.5	%
9	Fraction of DCV to be retained (Figure B.5-3) When Line 8 > 8% = 0.0000013 x Line 8^3 - 0.000057 x Line 8^2 + 0.0086 x Line 8 - 0.014 When Line 8 ≤ 8% = 0.023	0.023	
10	Target volume retention [Line 9 x Line 4]	20	cu. ft.

The City of SAN DIEGO	Project Name	Paseo Montril
	BMP ID	BMP A MWS Linear

Volume Retention for No Infiltration Condition			Worksheet B.5-6	
1	Area draining to the biofiltration BMP	25,437		sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.67		
3	Effective impervious area draining to the BMP [Line 1 x Line 2]	17043		sq. ft.
4	Required area for Evapotranspiration [Line 3 x 0.03]	511		sq. ft.
5	Biofiltration BMP Footprint	14.85714286		sq. ft.

Landscape Area (must be identified on DS-3247)

		Identification	1	2	3	4	5
6	Landscape area that meet the requirements in SD-B and SD-F Fact Sheet (sq. ft.)		511				
7	Impervious area draining to the landscape area (sq. ft.)		766.5				
8	Impervious to Pervious Area ratio [Line 7/Line 6]		1.50	0.00	0.00	0.00	0.00
9	Effective Credit Area If (Line 8 >1.5, Line 6, Line 7/1.5]		511	0	0	0	0

10	Sum of Landscape area [sum of Line 9 Id's 1 to 5]	511	sq. ft.
11	Provided footprint for evapotranspiration [Line 5 + Line 10]	525.8571429	sq. ft.

Volume Retention Performance Standard

12	Is Line 11 ≥ Line 4?	Volume Retention Performance Standard is Met	
13	Fraction of the performance standard met through the BMP footprint and/or landscaping [Line 11/Line 4]	1.03	
14	Target Volume Retention [Line 10 from Worksheet B.5.2]	20	cu. ft.
15	Volume retention required from other site design BMPs [(1-Line 13) x Line 14]	-0.6	cu. ft.

Site Design BMP

	Identification	Site Design Type	Credit	
16	1			cu. ft.
	2			cu. ft.
	3			cu. ft.
	4			cu. ft.
	5			cu. ft.
	Sum of volume retention benefits from other site design BMPs (e.g. trees; rain barrels etc.). [sum of Line 16 Credits for Id's 1 to 5] Provide documentation of how the site design credit is calculated in the PDP SWQMP.		0	cu. ft.
17	Is Line 16 ≥ Line 15?	Volume Retention Performance Standard is Met		

WASHINGTON STATE DEPARTMENT OF ECOLOGY

TAPE Certification

July 2017

GENERAL USE LEVEL DESIGNATION FOR BASIC, ENHANCED, AND PHOSPHORUS TREATMENT

For the

MWS-Linear Modular Wetland

Ecology's Decision:

Based on Modular Wetland Systems, Inc. application submissions, including the Technical Evaluation Report, dated April 1, 2014, Ecology hereby issues the following use level designation:

1. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Basic treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

2. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Phosphorus treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

3. General use level designation (GULD) for the MWS-Linear Modular Wetland Stormwater Treatment System for Enhanced treatment

   - Sized at a hydraulic loading rate of 1 gallon per minute (gpm) per square foot (sq ft) of wetland cell surface area. For moderate pollutant loading rates (low to medium density residential basins), size the Prefilters at 3.0 gpm/sq ft of cartridge surface area. For high loading rates (commercial and industrial basins), size the Prefilters at 2.1 gpm/sq ft of cartridge surface area.

4. Ecology approves the MWS - Linear Modular Wetland Stormwater Treatment System units for Basic, Phosphorus, and Enhanced treatment at the hydraulic loading rate listed above. Designers shall calculate the water quality design flow rates using the following procedures:

    - Western Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using the latest version of the Western Washington Hydrology Model or other Ecology-approved continuous runoff model.
    - Eastern Washington: For treatment installed upstream of detention or retention, the water quality design flow rate is the peak 15-minute flow rate as calculated using one of the three methods described in Chapter 2.2.5 of the Stormwater Management Manual for Eastern Washington (SWMMEW) or local manual.
    - Entire State: For treatment installed downstream of detention, the water quality design flow rate is the full 2-year release rate of the detention facility.

5. These use level designations have no expiration date but may be revoked or amended by Ecology, and are subject to the conditions specified below.

Ecology's Conditions of Use:

Applicants shall comply with the following conditions:

1. Design, assemble, install, operate, and maintain the MWS – Linear Modular Wetland Stormwater Treatment System units, in accordance with Modular Wetland Systems, Inc. applicable manuals and documents and the Ecology Decision.
2. Each site plan must undergo Modular Wetland Systems, Inc. review and approval before site installation. This ensures that site grading and slope are appropriate for use of a MWS – Linear Modular Wetland Stormwater Treatment System unit.
3. MWS – Linear Modular Wetland Stormwater Treatment System media shall conform to the specifications submitted to, and approved by, Ecology.
4. The applicant tested the MWS – Linear Modular Wetland Stormwater Treatment System with an external bypass weir. This weir limited the depth of water flowing through the media, and therefore the active treatment area, to below the root zone of the plants. This GULD applies to MWS – Linear Modular Wetland Stormwater Treatment Systems whether plants are included in the final product or not.
5. Maintenance: The required maintenance interval for stormwater treatment devices is often dependent upon the degree of pollutant loading from a particular drainage basin. Therefore, Ecology does not endorse or recommend a "one size fits all" maintenance cycle for a particular model/size of manufactured filter treatment device.

    - Typically, Modular Wetland Systems, Inc. designs MWS - Linear Modular Wetland systems for a target prefilter media life of 6 to 12 months.
    - Indications of the need for maintenance include effluent flow decreasing to below the design flow rate or decrease in treatment below required levels.
    - Owners/operators must inspect MWS - Linear Modular Wetland systems for a minimum of twelve months from the start of post-construction operation to determine site-specific

maintenance schedules and requirements. You must conduct inspections monthly during the wet season, and every other month during the dry season. (According to the SWMMWW, the wet season in western Washington is October 1 to April 30. According to SWMMEW, the wet season in eastern Washington is October 1 to June 30). After the first year of operation, owners/operators must conduct inspections based on the findings during the first year of inspections.

- Conduct inspections by qualified personnel, follow manufacturer's guidelines, and use methods capable of determining either a decrease in treated effluent flowrate and/or a decrease in pollutant removal ability.
- When inspections are performed, the following findings typically serve as maintenance triggers:
    - Standing water remains in the vault between rain events, or
    - Bypass occurs during storms smaller than the design storm.
    - If excessive floatables (trash and debris) are present (but no standing water or excessive sedimentation), perform a minor maintenance consisting of gross solids removal, not prefilter media replacement.
    - Additional data collection will be used to create a correlation between pretreatment chamber sediment depth and pre-filter clogging (see *Issues to be Addressed by the Company* section below)

6. Discharges from the MWS - Linear Modular Wetland Stormwater Treatment System units shall not cause or contribute to water quality standards violations in receiving waters.

Applicant:	Modular Wetland Systems, Inc.
Applicant's Address:	*PO. Box 869* *Oceanside, CA 92054*

Application Documents:

- *Original Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., January 2011
- *Quality Assurance Project Plan*: Modular Wetland system – Linear Treatment System performance Monitoring Project, draft, January 2011.
- *Revised Application for Conditional Use Level Designation*, Modular Wetland System, Linear Stormwater Filtration System Modular Wetland Systems, Inc., May 2011
- *Memorandum: Modular Wetland System-Linear GULD Application Supplementary Data, April 2014*
- *Technical Evaluation Report: Modular Wetland System Stormwater Treatment System Performance Monitoring, April 2014.*

Applicant's Use Level Request:

General use level designation as a Basic, Enhanced, and Phosphorus treatment device in accordance with Ecology's Guidance for Evaluating Emerging Stormwater Treatment Technologies Technology Assessment Protocol – Ecology (TAPE) January 2011 Revision.

Applicant's Performance Claims:

- The MWS – Linear Modular wetland is capable of removing a minimum of 80-percent of TSS from stormwater with influent concentrations between 100 and 200 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 50-percent of Total Phosphorus from stormwater with influent concentrations between 0.1 and 0.5 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 30-percent of dissolved Copper from stormwater with influent concentrations between 0.005 and 0.020 mg/l.
- The MWS – Linear Modular wetland is capable of removing a minimum of 60-percent of dissolved Zinc from stormwater with influent concentrations between 0.02 and 0.30 mg/l.

Ecology Recommendations:

- Modular Wetland Systems, Inc. has shown Ecology, through laboratory and field-testing, that the MWS - Linear Modular Wetland Stormwater Treatment System filter system is capable of attaining Ecology's Basic, Total phosphorus, and Enhanced treatment goals.

Findings of Fact:

<u>Laboratory Testing</u>

The MWS-Linear Modular wetland has the:

- Capability to remove 99 percent of total suspended solids (using Sil-Co-Sil 106) in a quarter-scale model with influent concentrations of 270 mg/L.
- Capability to remove 91 percent of total suspended solids (using Sil-Co-Sil 106) in laboratory conditions with influent concentrations of 84.6 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 93 percent of dissolved Copper in a quarter-scale model with influent concentrations of 0.757 mg/L.
- Capability to remove 79 percent of dissolved Copper in laboratory conditions with influent concentrations of 0.567 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 80.5-percent of dissolved Zinc in a quarter-scale model with influent concentrations of 0.95 mg/L at a flow rate of 3.0 gpm per square foot of media.
- Capability to remove 78-percent of dissolved Zinc in laboratory conditions with influent concentrations of 0.75 mg/L at a flow rate of 3.0 gpm per square foot of media.

Field Testing

- Modular Wetland Systems, Inc. conducted monitoring of an MWS-Linear (Model # MWS-L-4-13) from April 2012 through May 2013, at a transportation maintenance facility in Portland, Oregon. The manufacturer collected flow-weighted composite samples of the system's influent and effluent during 28 separate storm events. The system treated approximately 75 percent of the runoff from 53.5 inches of rainfall during the monitoring period. The applicant sized the system at 1 gpm/sq ft. (wetland media) and 3gpm/sq ft. (prefilter).
- Influent TSS concentrations for qualifying sampled storm events ranged from 20 to 339 mg/L. Average TSS removal for influent concentrations greater than 100 mg/L (n=7) averaged 85 percent. For influent concentrations in the range of 20-100 mg/L (n=18), the upper 95 percent confidence interval about the mean effluent concentration was 12.8 mg/L.
- Total phosphorus removal for 17 events with influent TP concentrations in the range of 0.1 to 0.5 mg/L averaged 65 percent. A bootstrap estimate of the lower 95 percent confidence limit (LCL95) of the mean total phosphorus reduction was 58 percent.
- The lower 95 percent confidence limit of the mean percent removal was 60.5 percent for dissolved zinc for influent concentrations in the range of 0.02 to 0.3 mg/L (n=11). The lower 95 percent confidence limit of the mean percent removal was 32.5 percent for dissolved copper for influent concentrations in the range of 0.005 to 0.02 mg/L (n=14) at flow rates up to 28 gpm (design flow rate 41 gpm). Laboratory test data augmented the data set, showing dissolved copper removal at the design flow rate of 41 gpm (93 percent reduction in influent dissolved copper of 0.757 mg/L).

Issues to be addressed by the Company:

1. Modular Wetland Systems, Inc. should collect maintenance and inspection data for the first year on all installations in the Northwest in order to assess standard maintenance requirements for various land uses in the region. Modular Wetland Systems, Inc. should use these data to establish required maintenance cycles.
2. Modular Wetland Systems, Inc. should collect pre-treatment chamber sediment depth data for the first year of operation for all installations in the Northwest. Modular Wetland Systems, Inc. will use these data to create a correlation between sediment depth and pre-filter clogging.

Technology Description:
Download at http://www.modularwetlands.com/

Contact Information:

Applicant: Zach Kent
BioClean A Forterra Company.
398 Vi9a El Centro
Oceanside, CA 92058
zach.kent@forterrabp.com

MODULAR WETLANDS™

*Advanced **Stormwater** Biofiltration*

MWS **Linear**

Contents

The Urban Impact

For hundreds of years natural wetlands surrounding our shores have played an integral role as nature's stormwater treatment system. But as our cities grow and develop, these natural wetlands have perished under countless roads, rooftops, and parking lots.

Plant A Wetland

Without natural wetlands our cities are deprived of water purification, flood control, and land stability. Modular Wetlands and the MWS Linear re-establish nature's presence and rejuvenate water ways in urban areas.

MWS **Linear**

The Modular Wetland System Linear represents a pioneering breakthrough in stormwater technology as the only biofiltration system to utilize patented horizontal flow, allowing for a smaller footprint and higher treatment capacity. While most biofilters use little or no pre-treatment, the MWS Linear incorporates an advanced pre-treatment chamber that includes separation and pre-filter cartridges. In this chamber sediment and hydrocarbons are removed from runoff before it enters the biofiltration chamber, in turn reducing maintenance costs and improving performance.

Applications

The MWS Linear has been successfully used on numerous new construction and retrofit projects. The system's superior versatility makes it beneficial for a wide range of stormwater and waste water applications - treating rooftops, streetscapes, parking lots, and industrial sites.

Industrial

Many states enforce strict regulations for discharges from industrial sites. The MWS Linear has helped various sites meet difficult EPA mandated effluent limits for dissolved metals and other pollutants.

Residential

Low to high density developments can benefit from the versatile design of the MWS Linear. The system can be used in both decentralized LID design and cost-effective end-of-the-line configurations.

Streets

Street applications can be challenging due to limited space. The MWS Linear is very adaptable, and offers the smallest footprint to work around the constraints of existing utilities on retrofit projects.

Parking Lots

Parking lots are designed to maximize space and the MWS Linear's 4 ft. standard planter width allows for easy integration into parking lot islands and other landscape medians.

Commercial

Compared to bioretention systems, the MWS Linear can treat far more area in less space - meeting treatment and volume control requirements.

Mixed Use

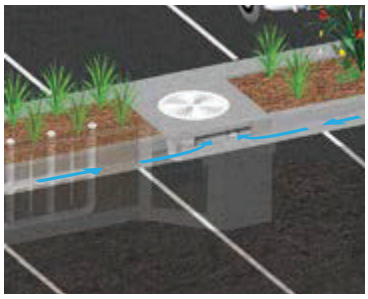
The MWS Linear can be installed as a raised planter to treat runoff from rooftops or patios, making it perfect for sustainable "live-work" spaces.

More applications are available on our website: www.ModularWetlands.com/Applications

- Agriculture
- Reuse
- Low Impact Development
- Waste Water

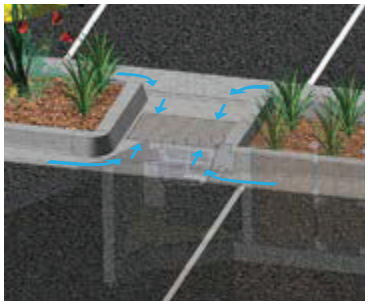
Configurations

The MWS Linear is the preferred biofiltration system of Civil Engineers across the country due to its versatile design. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your stormdrain design.



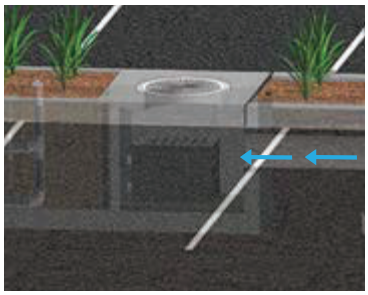
Curb Type

The *Curb Type* configuration accepts sheet flow through a curb opening and is commonly used along road ways and parking lots. It can be used in sump or flow by conditions. Length of curb opening varies based on model and size.



Grate Type

The *Grate Type* configuration offers the same features and benefits as the *Curb Type* but with a grated/drop inlet above the systems pre-treatment chamber. It has the added benefit of allowing for pedestrian access over the inlet. ADA compliant grates are available to assure easy and safe access. The *Grate Type* can also be used in scenarios where runoff needs to be intercepted on both sides of landscape islands.



Vault Type

The system's patented horizontal flow biofilter is able to accept inflow pipes directly into the pre-treatment chamber, meaning the MWS Linear can be used in end-of-the-line installations. This greatly improves feasibility over typical decentralized designs that are required with other biofiltration/bioretention systems. Another benefit of the "pipe in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements.

Downspout Type

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

Advantages & Operation

The MWS Linear is the most efficient and versatile biofiltration system on the market, and the only system with horizontal flow which improves performance, reduces footprint, and minimizes maintenance. Figure-1 and Figure-2 illustrate the invaluable benefits of horizontal flow and the multiple treatment stages.

Featured Advantages

- Horizontal Flow Biofiltration
- Greater Filter Surface Area
- Pre-Treatment Chamber
- Patented Perimeter Void Area
- Flow Control
- No Depressed Planter Area

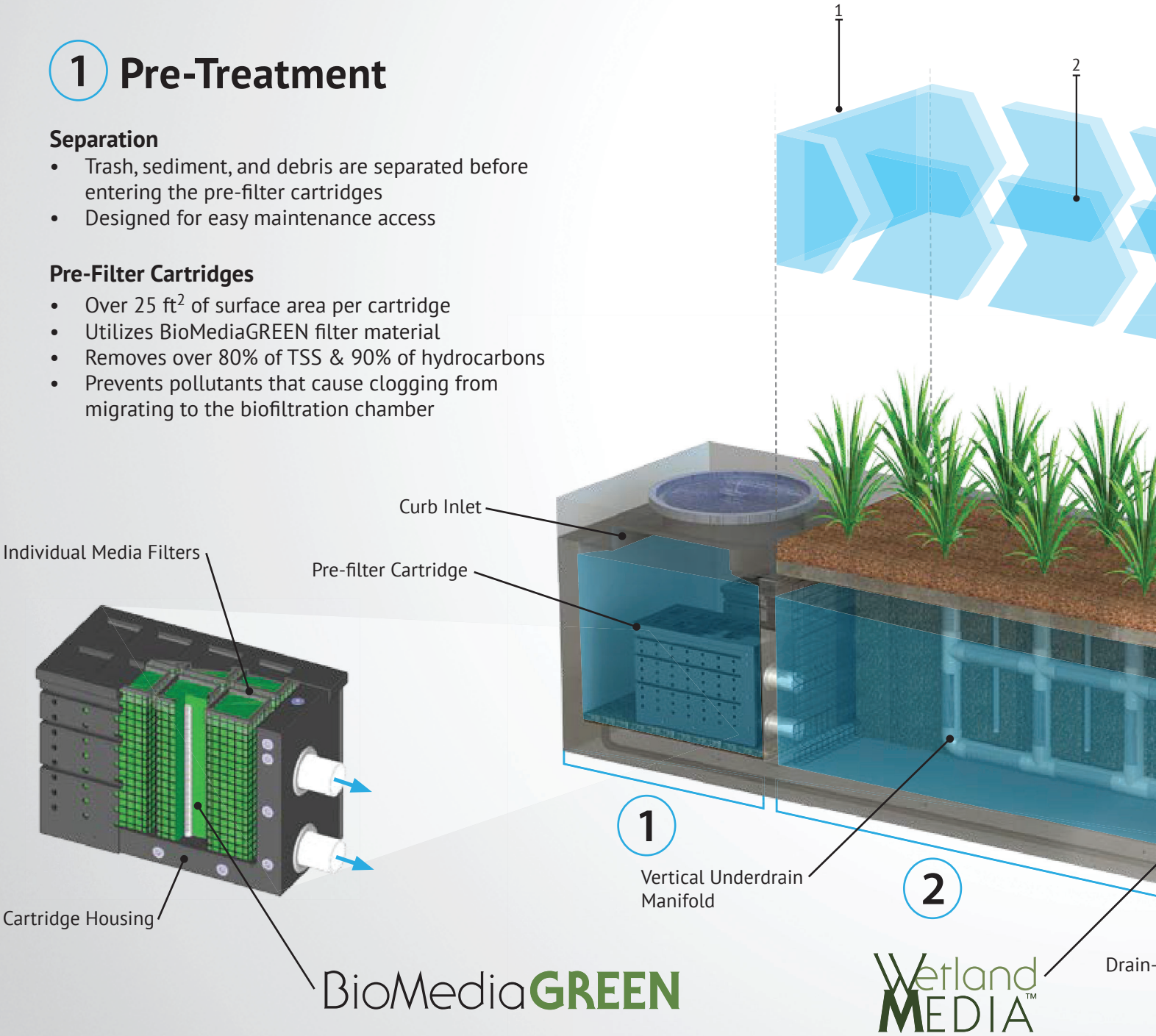
1 Pre-Treatment

Separation

- Trash, sediment, and debris are separated before entering the pre-filter cartridges
- Designed for easy maintenance access

Pre-Filter Cartridges

- Over 25 ft^2 of surface area per cartridge
- Utilizes BioMediaGREEN filter material
- Removes over 80% of TSS & 90% of hydrocarbons
- Prevents pollutants that cause clogging from migrating to the biofiltration chamber



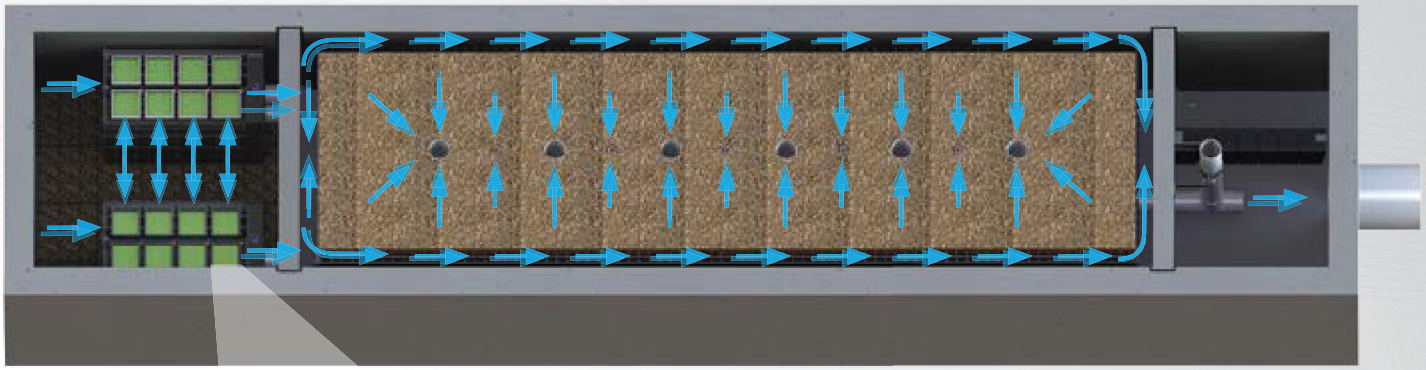
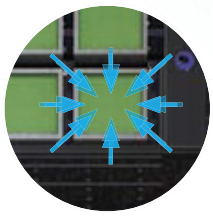


Fig. 2 - Top View

2x to 3x More Surface Area Than Traditional Downward Flow Bioretention Systems.



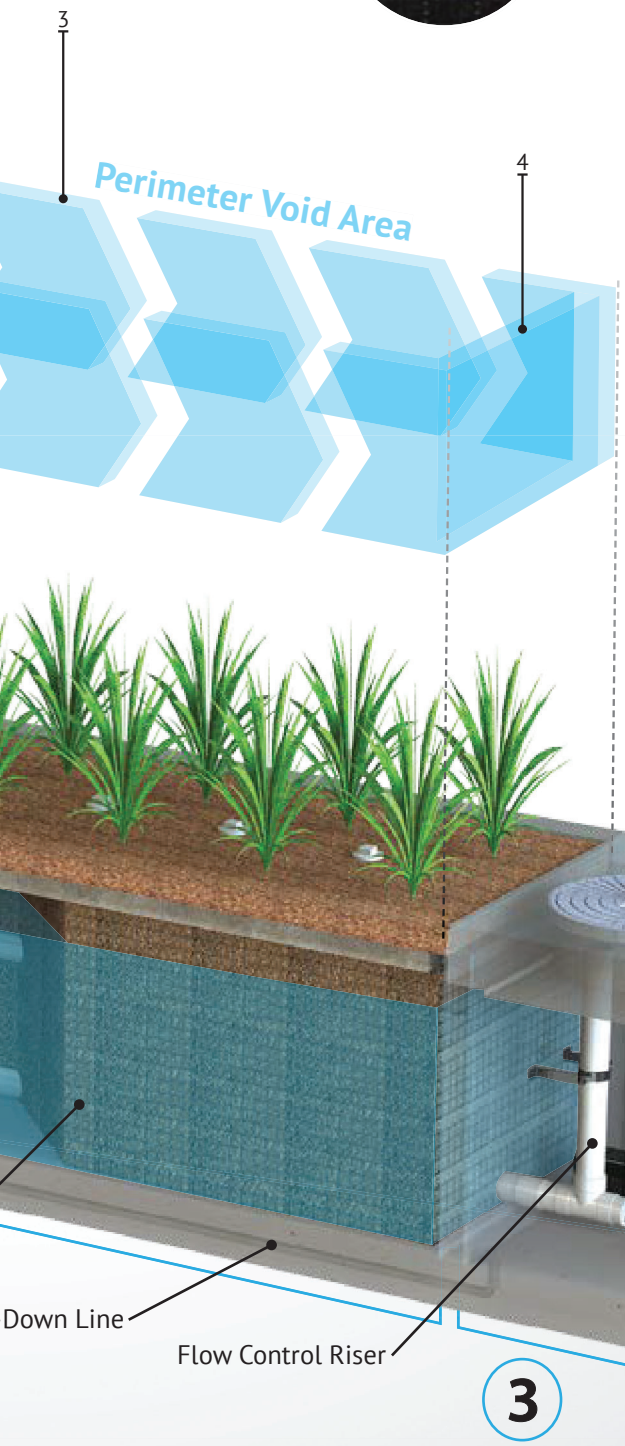


Fig. 1

2 Biofiltration

Horizontal Flow

- Less clogging than downward flow biofilters
- Water flow is subsurface
- Improves biological filtration

Patented Perimeter Void Area

- Vertically extends void area between the walls and the WetlandMEDIA on all four sides.
- Maximizes surface area of the media for higher treatment capacity

WetlandMEDIA

- Contains no organics and removes phosphorus
- Greater surface area and 48% void space
- Maximum evapotranspiration
- High ion exchange capacity and light weight

3 Discharge

Flow Control

- Orifice plate controls flow of water through WetlandMEDIA to a level lower than the media's capacity.
- Extends the life of the media and improves performance

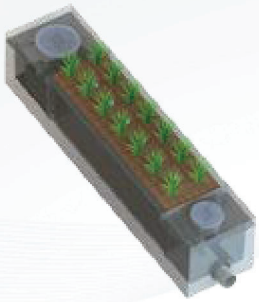
Drain-Down Filter

- The Drain-Down is an optional feature that completely drains the pre-treatment chamber
- Water that drains from the pre-treatment chamber between storm events will be treated

Orientations

Side-By-Side

The *Side-By-Side* orientation places the pre-treatment and discharge chamber adjacent to one another with the biofiltration chamber running parallel on either side. This minimizes the system length, providing a highly compact footprint. It has been proven useful in situations such as streets with directly adjacent sidewalks, as half of the system can be placed under that sidewalk. This orientation also offers internal bypass options as discussed below.



End-To-End

The *End-To-End* orientation places the pre-treatment and discharge chambers on opposite ends of the biofiltration chamber therefore minimizing the width of the system to 5 ft (outside dimension). This orientation is perfect for linear projects and street retrofits where existing utilities and sidewalks limit the amount of space available for installation. One limitation of this orientation is bypass must be external.

Bypass

Internal Bypass Weir (Side-by-Side Only)

The *Side-By-Side* orientation places the pre-treatment and discharge chambers adjacent to one another allowing for integration of internal bypass. The wall between these chambers can act as a bypass weir when flows exceed the system's treatment capacity, thus allowing bypass from the pre-treatment chamber directly to the discharge chamber.

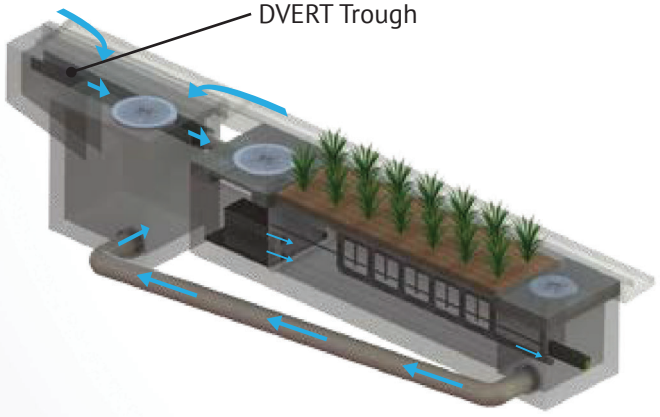
External Diversion Weir Structure

This traditional offline diversion method can be used with the MWS Linear in scenarios where runoff is being piped to the system. These simple and effective structures are generally configured with two outflow pipes. The first is a smaller pipe on the upstream side of the diversion weir - to divert low flows over to the MWS Linear for treatment. The second is the main pipe that receives water once the system has exceeded treatment capacity and water flows over the weir.

Flow By Design

This method is one in which the system is placed just upstream of a standard curb or grate inlet to intercept the first flush. Higher flows simply pass by the MWS Linear and into the standard inlet downstream.

DVERT Low Flow Diversion



This simple yet innovative diversion trough can be installed in existing or new curb and grate inlets to divert the first flush to the MWS Linear via pipe. It works similar to a rain gutter and is installed just below the opening into the inlet. It captures the low flows and channels them over to a connecting pipe exiting out the wall of the inlet and leading to the MWS Linear. The DVERT is perfect for retrofit and green street applications that allows the MWS Linear to be installed anywhere space is available.

Performance

The MWS Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, hydrocarbons and bacteria. Since 2007 the MWS Linear has been field tested on numerous sites across the country. With it's advanced pre-treatment chamber and innovative horizontal flow biofilter, the system is able to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes. With the same biological processes found in natural wetlands, the MWS Linear harnesses natures ability to process, transform, and remove even the most harmful pollutants.

Approvals

The MWS Linear has successfully met years of challenging technical reviews and testing from some of the most prestigious and demanding agencies in the nation, and perhaps the world.

Washington State TAPE Approved

The MWS Linear is approved for General Use Level Designation (GULD) for Basic, Enhanced, and Phosphorus treatment at 1 gpm/ft^2 loading rate. The highest performing BMP on the market for all main pollutant categories.

TSS	Total Phosphorus	Ortho Phosphorus	Nitrogen	Dissolved Zinc	Dissolved Copper	Total Zinc	Total Copper	Motor Oil
85%	64%	67%	45%	66%	38%	69%	50%	95%

DEQ Assignment

The Virginia Department of Environmental Quality assigned the MWS Linear, the highest phosphorus removal rating for manufactured treatment devices to meet the new Virginia Stormwater Management Program (VSMP) Technical Criteria.

Maryland Department Of The Environment Approved

Granted ESD (Environmental Site Design) status for new construction, redevelopment and retrofitting when designed in accordance with the Design Manual.

MASTEP Evaluation

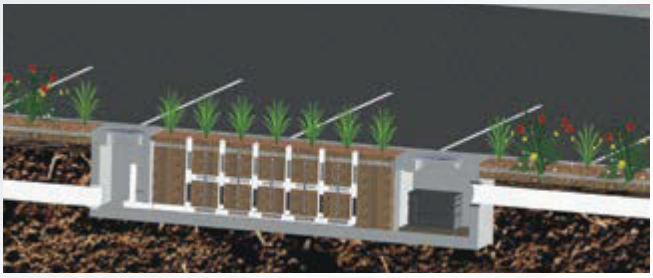
The University of Massachusetts at Amherst – Water Resources Research Center, issued a technical evaluation report noting removal rates up to 84% TSS, 70% Total Phosphorus, 68.5% Total Zinc, and more.

Rhode Island DEM Approved

Approved as an authorized BMP and noted to achieve the following minimum removal efficiencies: 85% TSS, 60% Pathogens, 30% Total Phosphorus, and 30% Total Nitrogen.

Flow Based Sizing

The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

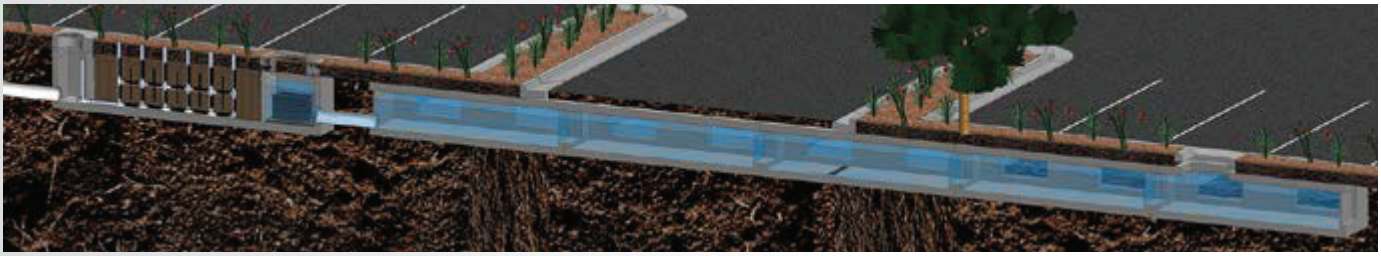


Treatment Flow Sizing Table

Model #	Dimensions	WetlandMedia Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4' x 4'	23 ft^2	0.052
MWS-L-4-6	4' x 6'	32 ft^2	0.073
MWS-L-4-8	4' x 8'	50 ft^2	0.115
MWS-L-4-13	4' x 13'	63 ft^2	0.144
MWS-L-4-15	4' x 15'	76 ft^2	0.175
MWS-L-4-17	4' x 17'	90 ft^2	0.206
MWS-L-4-19	4' x 19'	103 ft^2	0.237
MWS-L-4-21	4' x 21'	117 ft^2	0.268
MWS-L-8-8	8' x 8'	100 ft^2	0.230
MWS-L-8-12	8' x 12'	151 ft^2	0.346
MWS-L-8-16	8' x 16'	201 ft^2	0.462

Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.



Treatment Volume Sizing Table

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-13	3131	6261
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345
MWS-L-4-21	5853	11706
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145

Installation

The MWS Linear is simple, easy to install, and has a space efficient design that offers lower excavation and installation costs compared to traditional tree-box type systems. The structure of the system resembles pre-cast catch basin or utility vaults and is installed in a similar fashion.

The system is delivered fully assembled for quick installation. Generally, the structure can be unloaded and set in place in 15 minutes. Our experienced team of field technicians are available to supervise installations and provide technical support.

Maintenance

Reduce your maintenance costs, man hours, and materials with the MWS Linear. Unlike other biofiltration systems that provide no pre-treatment, the MWS Linear is a self-contained treatment train which incorporates simple and effective pre-treatment.

Maintenance requirements for the biofilter itself are almost completely eliminated, as the pre-treatment chamber removes and isolates trash, sediments, and hydrocarbons. What's left is the simple maintenance of an easily accessible pre-treatment chamber that can be cleaned by hand or with a standard vac truck. Only periodic replacement of low-cost media in the pre-filter cartridges is required for long term operation and there is absolutely no need to replace expensive biofiltration media.

Plant Selection

Abundant plants, trees, and grasses bring value and an aesthetic benefit to any urban setting, but those in the MWS Linear do even more - they increase pollutant removal. What's not seen, but very important, is that below grade the stormwater runoff/flow is being subjected to nature's secret weapon: a dynamic physical, chemical, and biological process working to break down and remove non-point source pollutants. The flow rate is controlled in the MWS Linear, giving the plants more "contact time" so that pollutants are more successfully decomposed, volatilized and incorporated into the biomass of The MWS Linear's micro/macro flora and fauna.

A wide range of plants are suitable for use in the MWS Linear, but selections vary by location and climate. View suitable plants by selecting the list relative to your project location's hardy zone.

Please visit **www.ModularWetlands.com/Plants** for more information and various plant lists.

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.

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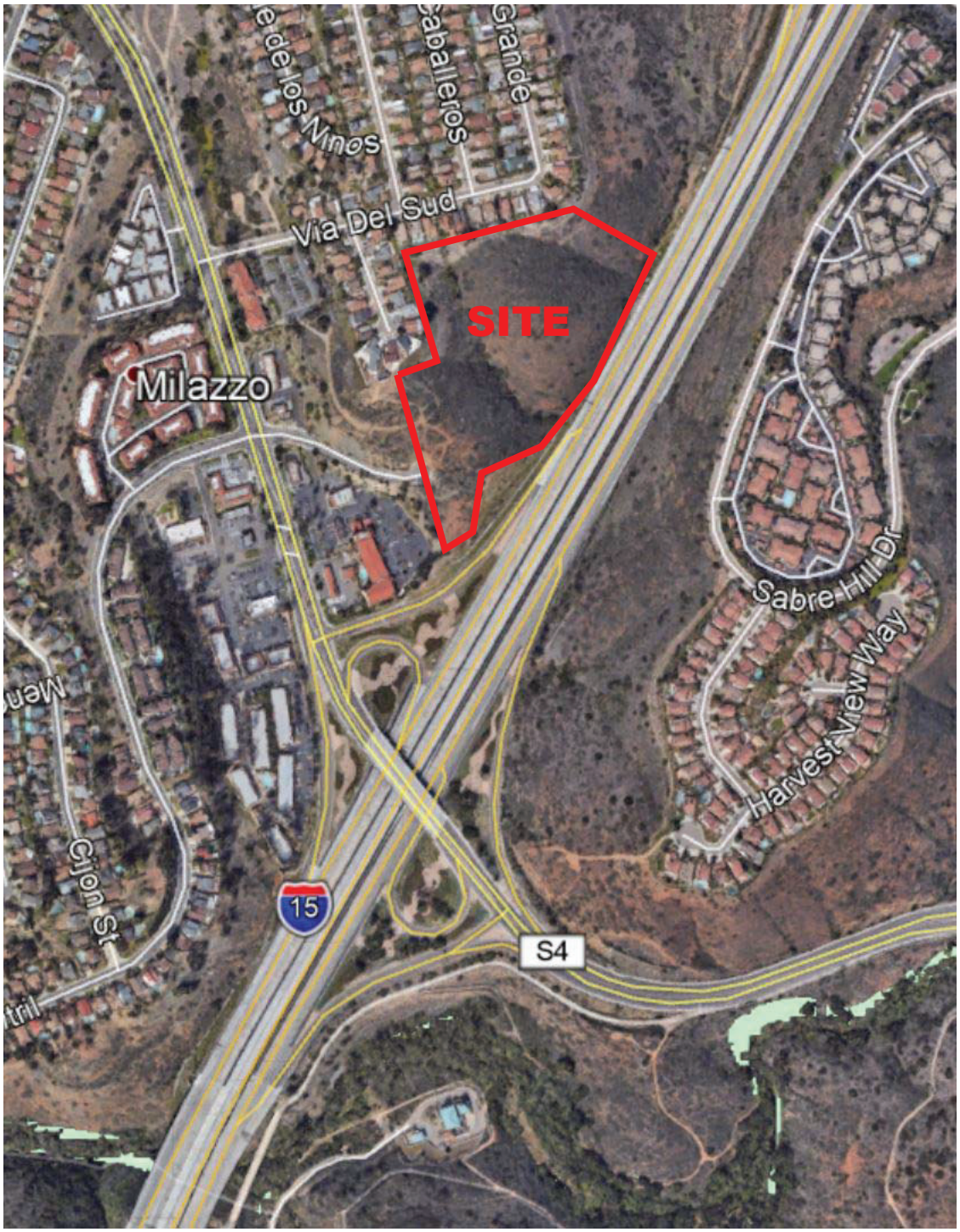
Project Name: Paseo Montril VTM

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☑ Included See Hydromodification Management Exhibit Checklist.
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 and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☑ Included ☐ Submitted as separate stand-alone document

Attachment 2a is combined with Attachment 1a.



Attachment 2b. CCSYA in light green (none exist in development footprint)

BMP Sizing Spreadsheet V3.0

Project Name:	Paseo Montril
Project Applicant:	Pardee Homes
Jurisdiction:	City of San Diego
Parcel (APN):	315-020-55
Hydrologic Unit:	Penasquitos
Rain Gauge:	Oceanside
Total Project Area (sf):	109,659
Channel Susceptibility:	High

BMP Sizing Spreadsheet V3.0			
Project Name:	Paseo Montril	Hydrologic Unit:	Penasquitos
Project Applicant:	Pardee Homes	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	109,659
Parcel (APN):	315-020-55	Low Flow Threshold:	0.1Q2
BMP Name:	BMP B Vault	BMP Type:	Cistern
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	NA

Areas Draining to BMP						HMP Sizing Factors	Minimum BMP Size
DMA Name	Area (sf)	Pre Project Soil Type	Pre-Project Slope	Post Project Surface Type	Area Weighted Runoff Factor (Table G.2-1)[1]	Volume	Volume (CF)
Roofs	29,386	D	Steep	Roofs	1.0	0.12	3526
Pavement	34,221	D	Steep	Concrete	1.0	0.12	4107
Landscaping	21,157	D	Steep	Landscape	0.1	0.12	254
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
BMP Tributary Area	84,764					Minimum BMP Size	7887
						Proposed BMP Size*	7887

* Assumes standard configuration

Standard Cistern Depth (Overflow Elevation)	3.5	ft
Provided Cistern Depth (Overflow Elevation)	3.5	ft
Minimum Required Cistern Footprint)	2253	CF

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manı

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This BMP Sizing Spreadsheet has been updated in conformance with the San Diego Region Model BMP Design Manual, April 2018. For questions or concerns please contact the jurisdiction in which your project is located.

BMP Sizing Spreadsheet V3.0			
Project Name:	Paseo Montril	Hydrologic Unit:	Penasquitos
Project Applicant:	Pardee Homes	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	109,659
Parcel (APN):	315-020-55	Low Flow Threshold:	0.1Q2
BMP Name	BMP B Vault	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition		Unit Runoff Ratio (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Slope				
Roofs	Oceanside	D	Steep	0.576	0.675	0.039	**0.57**
Pavement	Oceanside	D	Steep	0.576	0.786	0.045	**0.67**
Landscaping	Oceanside	D	Steep	0.576	0.486	0.028	**0.41**

3.50	**0.112**	**1.65**	**1.45**
Max Orifice Head (feet)	**Max Tot. Allowable Orifice Flow (cfs)**	**Max Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

Provide Hand Calc.	**0.112**	**1.65**	**1.450**
Average outflow during surface drawdown (cfs)	Max Orifice Outflow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	Provide Hand Calculation

BMP Sizing Spreadsheet V3.0			
Project Name:	Paseo Montril	Hydrologic Unit:	Penasquitos
Project Applicant:	Pardee Homes	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	109,659
Parcel (APN):	315-020-55	Low Flow Threshold:	0.1Q2
BMP Name:	BMP D Vault	BMP Type:	Cistern
BMP Native Soil Type:	D	BMP Infiltration Rate (in/hr):	NA

Areas Draining to BMP						HMP Sizing Factors	Minimum BMP Size
DMA Name	Area (sf)	Pre Project Soil Type	Pre-Project Slope	Post Project Surface Type	Area Weighted Runoff Factor (Table G.2-1)[1]	Volume	Volume (CF)
Roofs	7,347	D	Steep	Roofs	1.0	0.12	882
Pavement	10,632	D	Steep	Concrete	1.0	0.12	1276
Landscaping	7,458	D	Steep	Landscape	0.1	0.12	89
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
						0	0
BMP Tributary Area	25,437					Minimum BMP Size	2247
						Proposed BMP Size*	2247

* Assumes standard configuration

Standard Cistern Depth (Overflow Elevation)	3.5	ft
Provided Cistern Depth (Overflow Elevation)	3.5	ft
Minimum Required Cistern Footprint)	642	CF

Notes:

1. Runoff factors which are used for hydromodification management flow control (Table G.2-1) are different from the runoff factors used for pollutant control BMP sizing (Table B.1-1). Table references are taken from the San Diego Region Model BMP Design Manı

Describe the BMP's in sufficient detail in your PDP SWQMP to demonstrate the area, volume, and other criteria can be met within the constraints of the site.

BMP's must be adapted and applied to the conditions specific to the development project such as unstable slopes or the lack of available head.
Designated Staff have final review and approval authority over the project design.

This BMP Sizing Spreadsheet has been updated in conformance with the San Diego Region Model BMP Design Manual, April 2018. For questions or concerns please contact the jurisdiction in which your project is located.

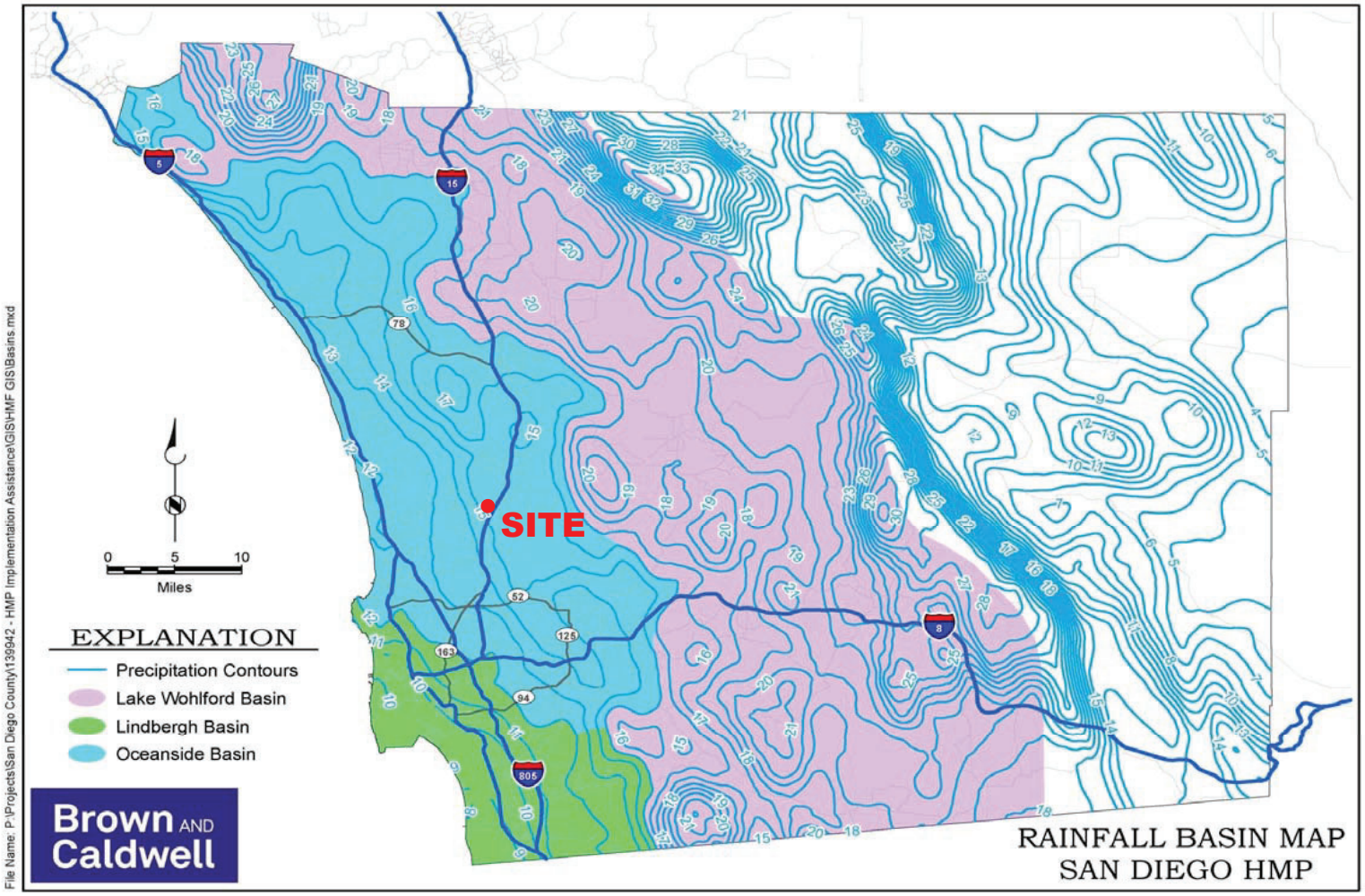
BMP Sizing Spreadsheet V3.0			
Project Name:	Paseo Montril	Hydrologic Unit:	Penasquitos
Project Applicant:	Pardee Homes	Rain Gauge:	Oceanside
Jurisdiction:	City of San Diego	Total Project Area:	109,659
Parcel (APN):	315-020-55	Low Flow Threshold:	0.1Q2
BMP Name	BMP D Vault	BMP Type:	Cistern

DMA Name	Rain Gauge	Pre-developed Condition		Unit Runoff Ratio (cfs/ac)	DMA Area (ac)	Orifice Flow - $\%Q_2$ (cfs)	Orifice Area (in^2)
		Soil Type	Slope				
Roofs	Oceanside	D	Steep	0.576	0.169	0.010	**0.14**
Pavement	Oceanside	D	Steep	0.576	0.244	0.014	**0.21**
Landscaping	Oceanside	D	Steep	0.576	0.171	0.010	**0.15**

3.50	**0.034**	**0.50**	**0.79**
Max Orifice Head (feet)	**Max Tot. Allowable Orifice Flow (cfs)**	**Max Tot. Allowable Orifice Area (in^2)**	**Max Orifice Diameter (in)**

Provide Hand Calc.	**0.033**	**0.49**	**0.790**
Average outflow during surface drawdown (cfs)	Max Orifice Outflow (cfs)	Actual Orifice Area (in^2)	Selected Orifice Diameter (in)

Drawdown (Hrs)	Provide Hand Calculation


SITE
0 5 10
Miles
EXPLANATION
Precipitation Contours
Lake Wohlford Basin
Lindbergh Basin
Oceanside Basin
Brown AND Caldwell
RAINFALL BASIN MAP
SAN DIEGO HMP
File Name: P:\Projects\San Diego County\139942 - HMP Implementation Assistance\GIS\HMF GIS\Basins.mxd

0.1Q2	A	Moderate	Oceanside	0.14
0.1Q2	A	Steep	Oceanside	0.135
0.1Q2	B	Flat	Oceanside	0.085
0.1Q2	B	Moderate	Oceanside	0.085
0.1Q2	B	Steep	Oceanside	0.085
0.1Q2	C	Flat	Oceanside	0.075
0.1Q2	C	Moderate	Oceanside	0.075
0.1Q2	C	Steep	Oceanside	0.075
0.1Q2	D	Flat	Oceanside	0.07
0.1Q2	D	Moderate	Oceanside	0.07
0.1Q2	D	Steep	Oceanside	0.07
0.1Q2	A	Flat	Lake Wohlford	0.285
0.1Q2	A	Moderate	Lake Wohlford	0.275
0.1Q2	A	Steep	Lake Wohlford	0.27
0.1Q2	B	Flat	Lake Wohlford	0.15
0.1Q2	B	Moderate	Lake Wohlford	0.145
0.1Q2	B	Steep	Lake Wohlford	0.145
0.1Q2	C	Flat	Lake Wohlford	0.07
0.1Q2	C	Moderate	Lake Wohlford	0.07
0.1Q2	C	Steep	Lake Wohlford	0.07
0.1Q2	D	Flat	Lake Wohlford	0.06
0.1Q2	D	Moderate	Lake Wohlford	0.06
0.1Q2	D	Steep	Lake Wohlford	0.06

Table G.2-6: Sizing Factors for Hydromodification Flow Control Cistern Facilities Designed Using Sizing Factor Method

Lower Flow Threshold	Soil Group	Slope	Rain Gauge	V
0.1Q2	A	Flat	Lindbergh	0.54
0.1Q2	A	Moderate	Lindbergh	0.51
0.1Q2	A	Steep	Lindbergh	0.49
0.1Q2	B	Flat	Lindbergh	0.19
0.1Q2	B	Moderate	Lindbergh	0.18
0.1Q2	B	Steep	Lindbergh	0.18

0.1Q2	C	Flat	Lindbergh	0.11
0.1Q2	C	Moderate	Lindbergh	0.11
0.1Q2	C	Steep	Lindbergh	0.11
0.1Q2	D	Flat	Lindbergh	0.09
0.1Q2	D	Moderate	Lindbergh	0.09
0.1Q2	D	Steep	Lindbergh	0.09
0.1Q2	A	Flat	Oceanside	0.26
0.1Q2	A	Moderate	Oceanside	0.25
0.1Q2	A	Steep	Oceanside	0.25
0.1Q2	B	Flat	Oceanside	0.16
0.1Q2	B	Moderate	Oceanside	0.16
0.1Q2	B	Steep	Oceanside	0.16
0.1Q2	C	Flat	Oceanside	0.14
0.1Q2	C	Moderate	Oceanside	0.14
0.1Q2	C	Steep	Oceanside	0.14
0.1Q2	D	Flat	Oceanside	0.12
0.1Q2	D	Moderate	Oceanside	0.12
0.1Q2	D	Steep	Oceanside	0.12
0.1Q2	A	Flat	Lake Wohlford	0.53
0.1Q2	A	Moderate	Lake Wohlford	0.49
0.1Q2	A	Steep	Lake Wohlford	0.49
0.1Q2	B	Flat	Lake Wohlford	0.28
0.1Q2	B	Moderate	Lake Wohlford	0.28
0.1Q2	B	Steep	Lake Wohlford	0.28
0.1Q2	C	Flat	Lake Wohlford	0.14
0.1Q2	C	Moderate	Lake Wohlford	0.14
0.1Q2	C	Steep	Lake Wohlford	0.14
0.1Q2	D	Flat	Lake Wohlford	0.12
0.1Q2	D	Moderate	Lake Wohlford	0.12
0.1Q2	D	Steep	Lake Wohlford	0.12

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: Paseo Montril VTM

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☐ Included ☑ Not applicable

Project Name: Paseo Montril VTM

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

Attachment 3: For private entity operation and maintenance, Attachment 3 must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- ☐ Vicinity map
- ☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- ☐ BMP and HMP location and dimensions
- ☐ BMP and HMP specifications/cross section/model
- ☐ Maintenance recommendations and frequency
- ☐ LID features such as (permeable paver and LS location, dim, SF).

This SWQMP is for entitlements (tentative map). Attachment 3 will be provided during final engineering.

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

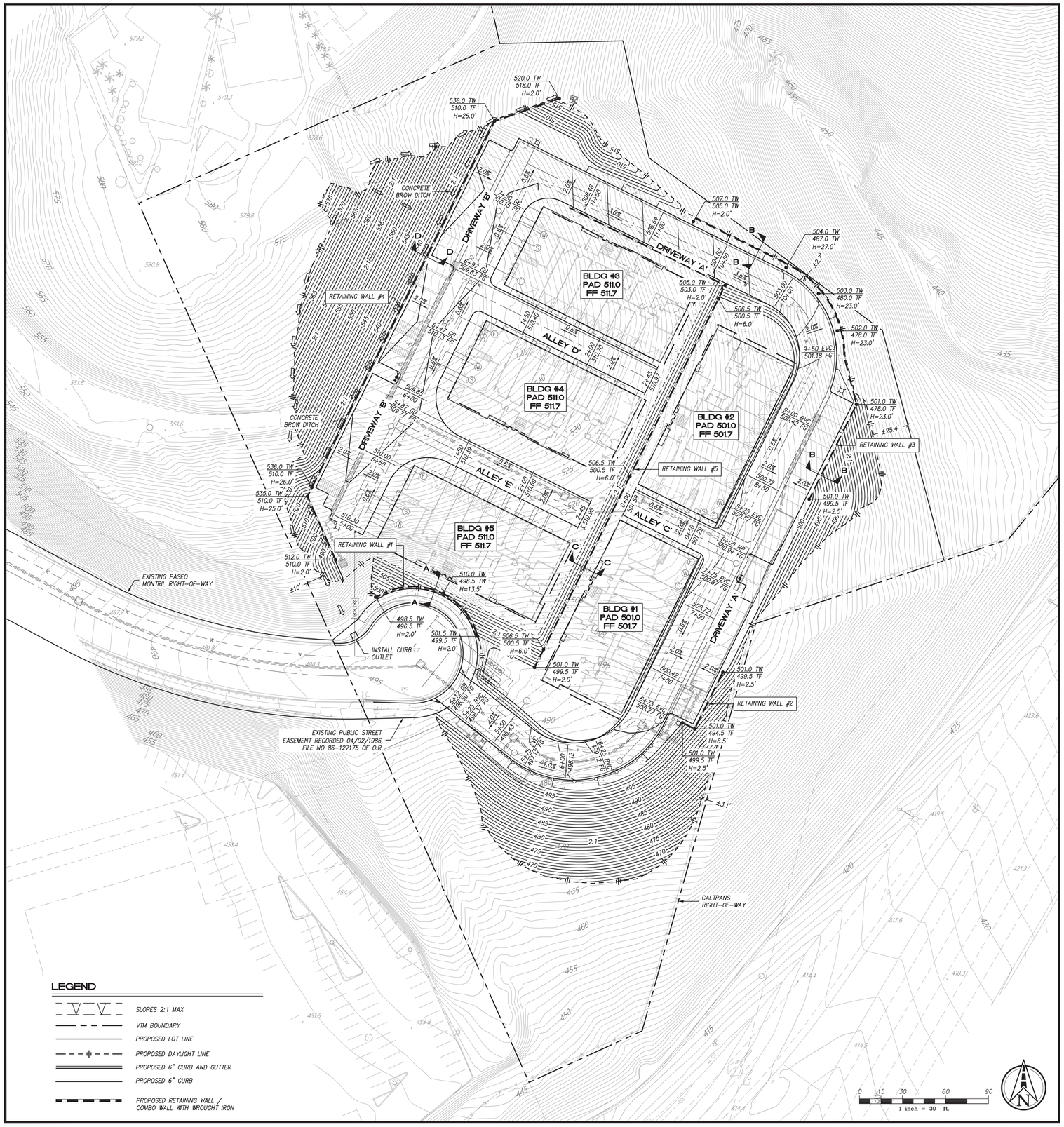
This is the cover sheet for Attachment 4.

Project Name: Paseo Montril VTM

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

The plans must identify:

- [x] Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- [x] The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
- [x] 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
- [x] How to access the structural BMP(s) to inspect and perform maintenance
- [x] 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)
- [x] 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. Broucher photocopies are not allowed.

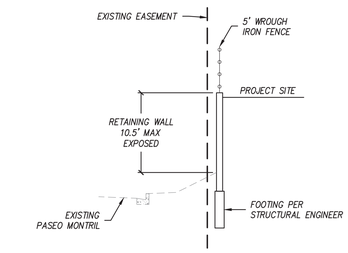


LEGEND

- SLOPES 2:1 MAX
- VTM BOUNDARY
- PROPOSED LOT LINE
- PROPOSED DAYLIGHT LINE
- PROPOSED 6" CURB AND GUTTER
- PROPOSED 6" CURB
- PROPOSED RETAINING WALL / COMBO WALL WITH WROUGHT IRON

GRADING NOTES / BMP NOTES

1. BMP MAINTENANCE – PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE, SATISFACTORY TO THE CITY ENGINEER.
2. CONSTRUCTION BMP – PRIOR TO ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION1 (GRADING REGULATIONS) OR SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.
3. THE PROPOSED PROJECT WILL COMPLY WITH ALL THE REQUIREMENTS OF THE CURRENT CITY OF SAN DIEGO STORM WATER STANDARDS MANUAL BEFORE A GRADING OR BUILDING PERMIT IS ISSUED. IT IS THE RESPONSIBILITY OF THE OWNER/DESIGNER/APPLICANT TO ENSURE THAT THE CURRENT STORM WATER PERMANENT BMP DESIGN STANDARDS ARE INCORPORATED INTO THE PROJECT.



SECTION A-A

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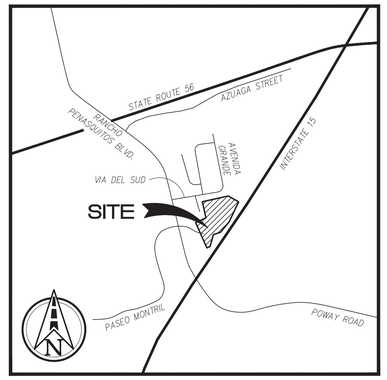
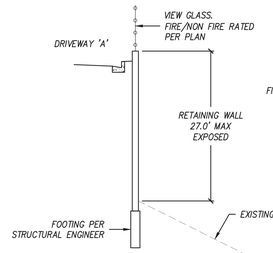


VICINITY MAP

NOT TO SCALE



SECTION B-B

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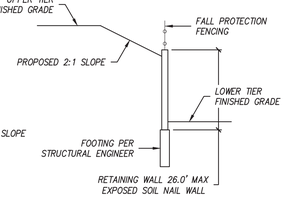

SECTION C-C

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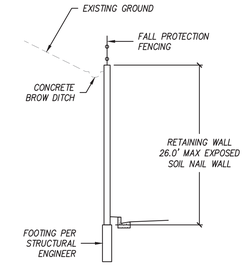

SECTION D-D

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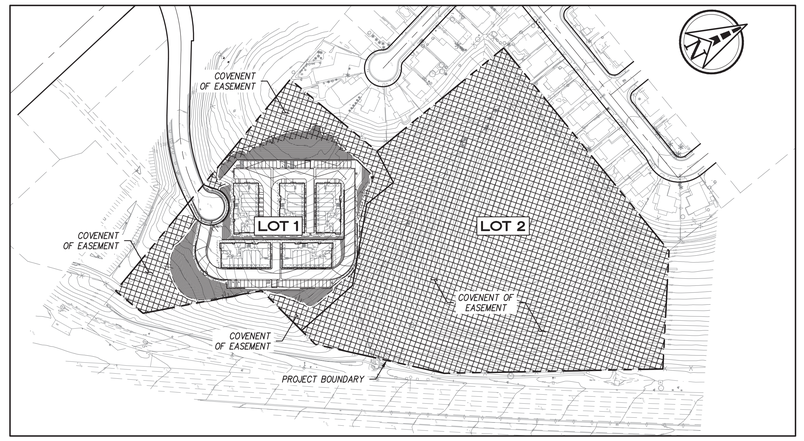


COVENENT OF EASEMENT DETAIL

SCALE: 1" = 150'

PREPARED BY:

CIVIL SENSE INC
13475 Danielson Street, Suite 150 | Poway, CA 92064
Office: 858-842-4353

HENRY H. PENG
R.C.E. 63686

DATE

NAME: CIVIL SENSE, INC.
ADDRESS: 13475 DANIELON STREET, SUITE 150
POWAY, CA 92064
PHONE: 858-843-4253

PROJECT ADDRESS:
PASEO MONTRIL

PROJECT NAME:
PASEO MONTRIL VTM, SDP, PDP, CPA
REZONE, NDP AND EASEMENT VACATION

P.T.S. NUMBER: 658273
I.O. NUMBER: 240076662

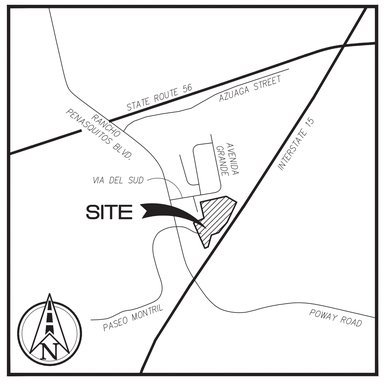
SHEET TITLE:
GRADING PLAN

REVISION 12:	
REVISION 11:	
REVISION 10:	
REVISION 9:	
REVISION 8:	
REVISION 7:	
REVISION 6:	
REVISION 5:	2/19/2021
REVISION 4:	1/28/2021
REVISION 3:	1/8/2021
REVISION 2:	11/24/2020
REVISION 1:	9/28/2020

ORIGINAL DATE: 3/19/2020

SHEET 4 OF 15

DEP #



VICINITY MAP

NOT TO SCALE

MINIMUM TREE SEPARATION DISTANCE

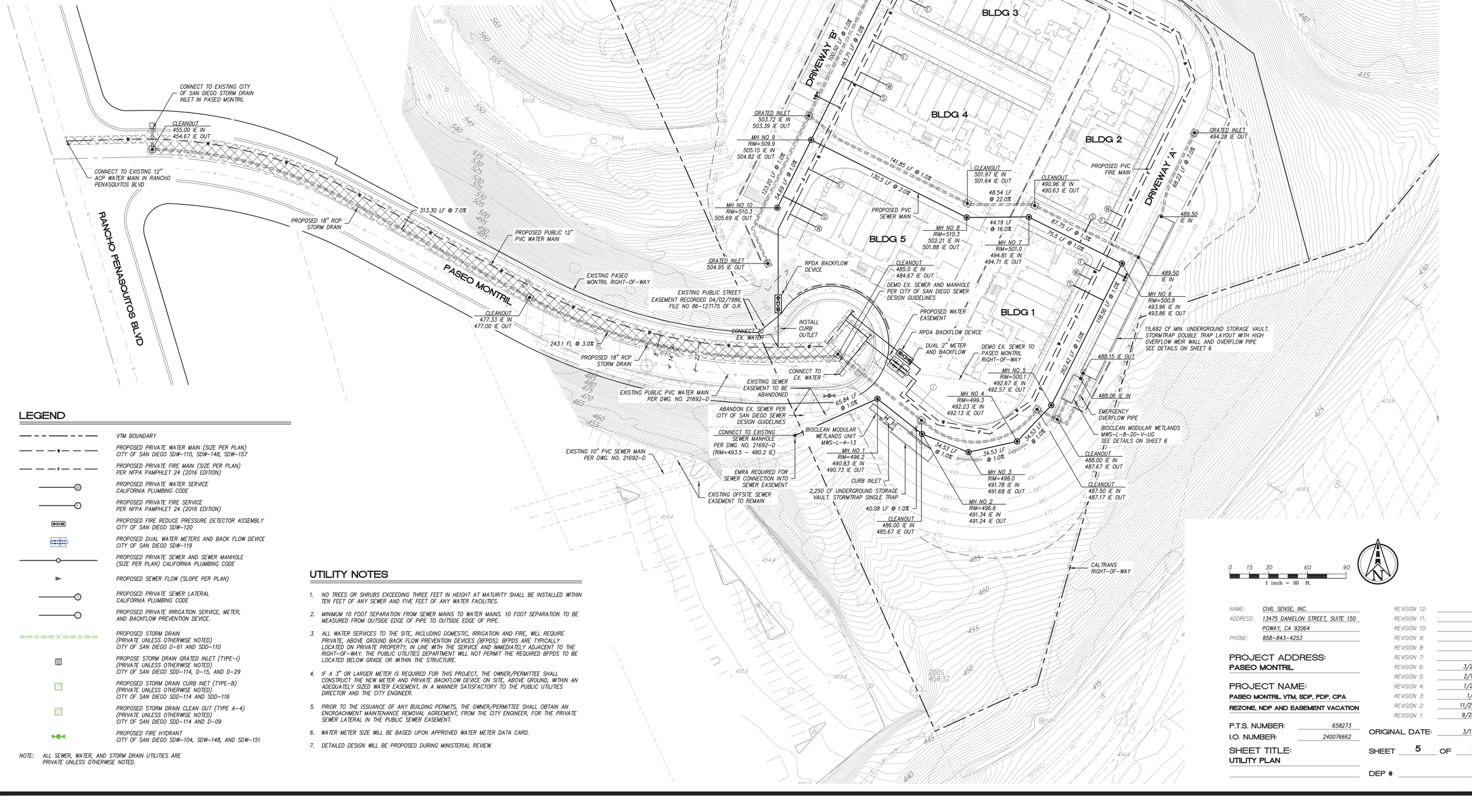
IMPROVEMENT	MIN. DISTANCE TO STREET TREE
TRAFFIC SIGNAL, STOP SIGN	20 FEET
UNDERGROUND UTILITY LINES (EXCEPT SEWER)	5 FEET
SEWER LINES	10 FEET
ABOVE GROUND UTILITY STRUCTURES (TRANSFORMERS, HYDRANTS, UTILITY POLES, ETC)	10 FEET
DRIVEWAYS	10 FEET *
INTERSECTIONS (INTERSECTING CURB LINES OF TWO STREETS)	25 FEET

* 5 FEET ON RESIDENTIAL LOCAL STREETS WITH A DESIGN SPEED OF 25MPH OR SLOWER

UTILITY TABLE

UTILITY	OVERHEAD/UNDERGROUND
GAS	UNDERGROUND
ELECTRIC	UNDERGROUND
TELEPHONE (AT&T)	UNDERGROUND
CABLE TELEVISION (SPECTRUM)	UNDERGROUND
SEWER	UNDERGROUND
STORM DRAIN	UNDERGROUND
FIRE	UNDERGROUND
WATER	UNDERGROUND

NOTE: THE SUBDIVIDER SHALL ENSURE THAT ALL ONSITE UTILITIES SERVING THE SUBDIVISION SHALL BE UNDERGROUNDED WITH ALL OF THE APPROPRIATE PERMITS.



LEGEND

- VTM BOUNDARY
- PROPOSED PRIVATE WATER MAIN (SIZE PER PLAN) CITY OF SAN DIEGO SDW-110, SDW-148, SDW-157
- PROPOSED PRIVATE FIRE MAIN (SIZE PER PLAN) PER NFPA PAMPHLET 24 (2016 EDITION)
- PROPOSED PRIVATE WATER SERVICE CALIFORNIA PLUMBING CODE
- PROPOSED PRIVATE FIRE SERVICE PER NFPA PAMPHLET 24 (2016 EDITION)
- PROPOSED FIRE REDUCE PRESSURE DETECTOR ASSEMBLY CITY OF SAN DIEGO SDW-120
- PROPOSED DUAL WATER METERS AND BACK FLOW DEVICE CITY OF SAN DIEGO SDW-119
- PROPOSED PRIVATE SEWER AND SEWER MANHOLE (SIZE PER PLAN) CALIFORNIA PLUMBING CODE
- PROPOSED SEWER FLOW (SLOPE PER PLAN)
- PROPOSED PRIVATE SEWER LATERAL CALIFORNIA PLUMBING CODE
- PROPOSED PRIVATE IRRIGATION SERVICE, METER, AND BACKFLOW PREVENTION DEVICE.
- PROPOSED STORM DRAIN (PRIVATE UNLESS OTHERWISE NOTED) CITY OF SAN DIEGO D-61 AND SDD-110
- PROPOSE STORM DRAIN GRATED INLET (TYPE-I) (PRIVATE UNLESS OTHERWISE NOTED) CITY OF SAN DIEGO SDD-114, D-15, AND D-29
- PROPOSED STORM DRAIN CURB INET (TYPE-B) (PRIVATE UNLESS OTHERWISE NOTED) CITY OF SAN DIEGO SDD-114 AND SDD-116
- PROPOSED STORM DRAIN CLEAN OUT (TYPE A-4) (PRIVATE UNLESS OTHERWISE NOTED) CITY OF SAN DIEGO SDD-114 AND D-09
- PROPOSED FIRE HYDRANT CITY OF SAN DIEGO SDW-104, SDW-148, AND SDW-151

NOTE: ALL SEWER, WATER, AND STORM DRAIN UTILITIES ARE PRIVATE UNLESS OTHERWISE NOTED.

UTILITY NOTES

1. NO TREES OR SHRUBS EXCEEDING THREE FEET IN HEIGHT AT MATURITY SHALL BE INSTALLED WITHIN TEN FEET OF ANY SEWER AND FIVE FEET OF ANY WATER FACILITIES.
2. MINIMUM 10 FOOT SEPARATION FROM SEWER MAINS TO WATER MAINS. 10 FOOT SEPARATION TO BE MEASURED FROM OUTSIDE EDGE OF PIPE TO OUTSIDE EDGE OF PIPE.
3. ALL WATER SERVICES TO THE SITE, INCLUDING DOMESTIC, IRRIGATION AND FIRE, WILL REQUIRE PRIVATE, ABOVE GROUND BACK FLOW PREVENTION DEVICES (BFPDS). BFPDS ARE TYPICALLY LOCATED ON PRIVATE PROPERTY, IN LINE WITH THE SERVICE AND IMMEDIATELY ADJACENT TO THE RIGHT-OF-WAY. THE PUBLIC UTILITIES DEPARTMENT WILL NOT PERMIT THE REQUIRED BFPDS TO BE LOCATED BELOW GRADE OR WITHIN THE STRUCTURE.
4. IF A 3" OR LARGER METER IS REQUIRED FOR THIS PROJECT, THE OWNER/PERMITTEE SHALL CONSTRUCT THE NEW METER AND PRIVATE BACKFLOW DEVICE ON SITE, ABOVE GROUND, WITHIN AN ADEQUATELY SIZED WATER EASEMENT, IN A MANNER SATISFACTORY TO THE PUBLIC UTILITIES DIRECTOR AND THE CITY ENGINEER.
5. PRIOR TO THE ISSUANCE OF ANY BUILDING PERMITS, THE OWNER/PERMITTEE SHALL OBTAIN AN ENCROACHMENT MAINTENANCE REMOVAL AGREEMENT, FROM THE CITY ENGINEER, FOR THE PRIVATE SEWER LATERAL IN THE PUBLIC SEWER EASEMENT.
6. WATER METER SIZE WILL BE BASED UPON APPROVED WATER METER DATA CARD.
7. DETAILED DESIGN WILL BE PROPOSED DURING MINISTERIAL REVIEW.

NAME: CIVIL SENSE, INC.
ADDRESS: 13475 DANIELON STREET, SUITE 150
POWAY, CA 92064
PHONE: 858-843-4253

PROJECT ADDRESS:
PASEO MONTRIL

PROJECT NAME:
PASEO MONTRIL VTM, SDP, PDP, CPA
REZONE, NDP AND EASEMENT VACATION

P.T.S. NUMBER: 658273
I.O. NUMBER: 240076662

SHEET TITLE:
UTILITY PLAN

REVISION 12:	
REVISION 11:	
REVISION 10:	
REVISION 9:	
REVISION 8:	
REVISION 7:	
REVISION 6:	3/24/2021
REVISION 5:	2/19/2021
REVISION 4:	1/28/2021
REVISION 3:	1/8/2021
REVISION 2:	11/24/2020
REVISION 1:	9/28/2020
ORIGINAL DATE:	3/19/2020

SHEET 5 OF 15

DEP #

BILL OF MATERIALS			
QTY.	UNIT TYPE	DESCRIPTION	WEIGHT
0	I	7'–6" SINGLETRAP	0
0	II	7'–6" SINGLETRAP	0
16	III	7'–6" SINGLETRAP	20873
0	IV	7'–6" SINGLETRAP	23075
0	VII	7'–6" SINGLETRAP	0
2	SPIV	7'–6" SINGLETRAP	VARIES
0	T2 PANEL	6" THICK PANEL	0
4	T4 PANEL	6" THICK PANEL	3975
0	T7 PANEL	6" THICK PANEL	0
6	JOINTWRAP	150' PER ROLL	
40	JOINTTAPE	14.5' PER ROLL	

LOADING DISCLAIMER:

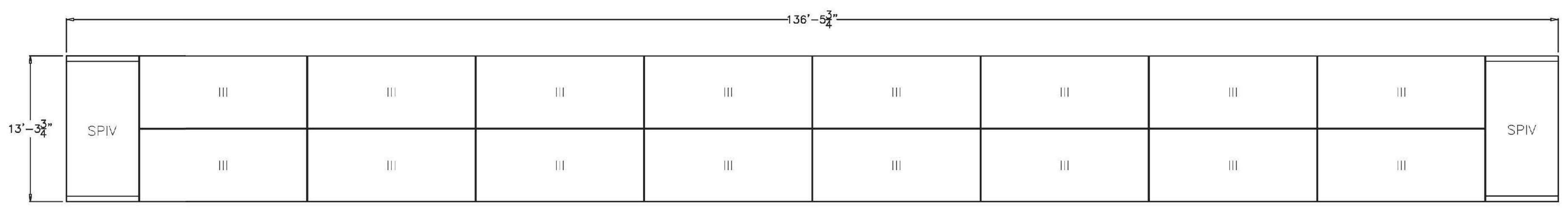
STORMTRAP IS NOT DESIGNED TO ACCEPT ANY ADDITIONAL LOADINGS FROM NEARBY STRUCTURES NEXT TO OR OVER THE TOP OF STORMTRAP. IF ADDITIONAL LOADING CONSIDERATIONS ARE REQUIRED FOR STRUCTURAL DESIGN OF STORMTRAP, PLEASE CONTACT STORMTRAP IMMEDIATELY.

NOTE:
DETAILS ARE FOR REFERENCE ONLY PROJECT SPECIFIC DETAILS TO BE PROVIDED AT FINAL ENGINEERING.

N

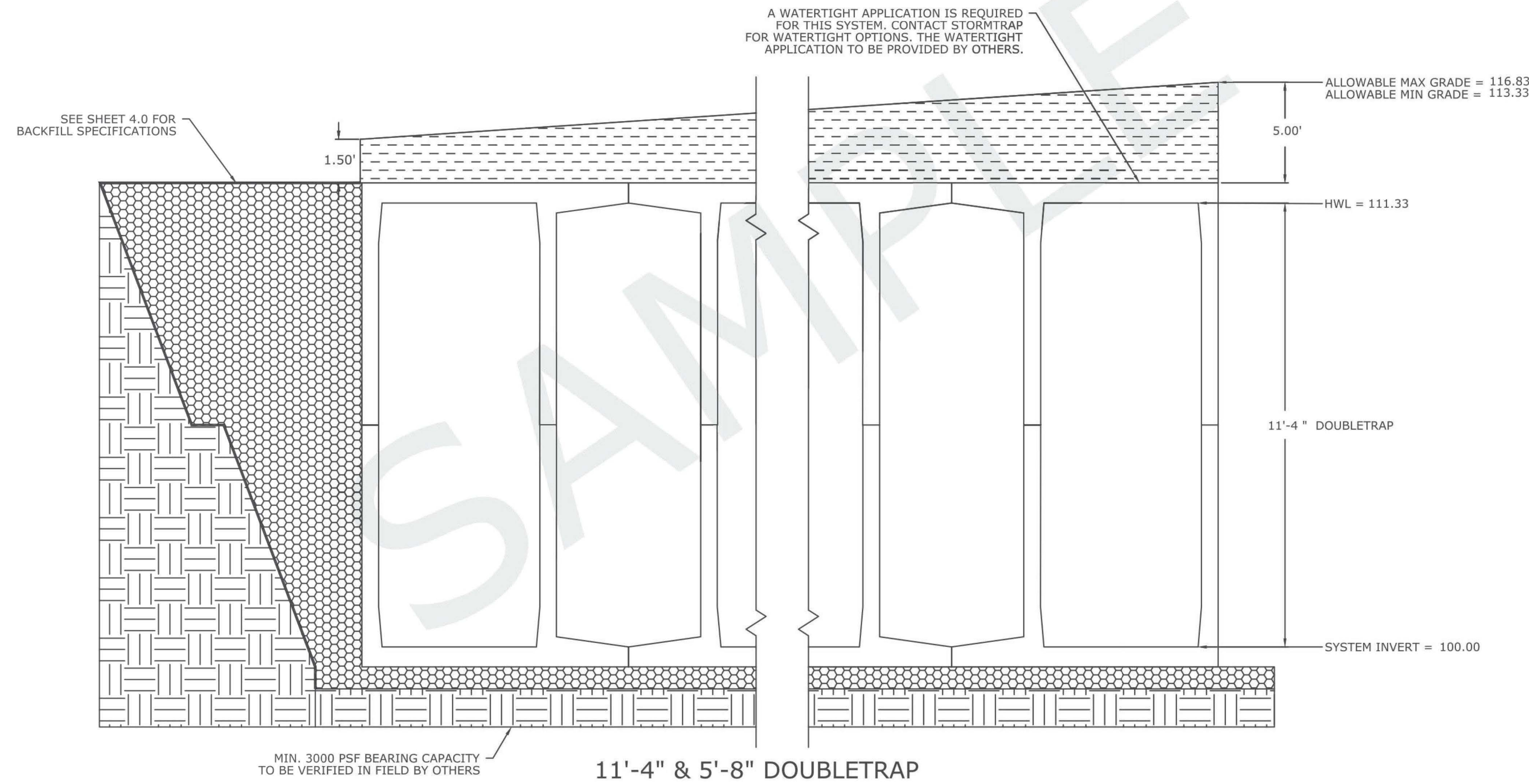
DESIGN CRITERIA
ALLOWABLE MAX GRADE = TBD
ALLOWABLE MIN GRADE = TBD
INSIDE HEIGHT ELEVATION = TBD
SYSTEM INVERT = TBD

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.



STORMTRAP – SYSTEM LAYOUT

NOT TO SCALE



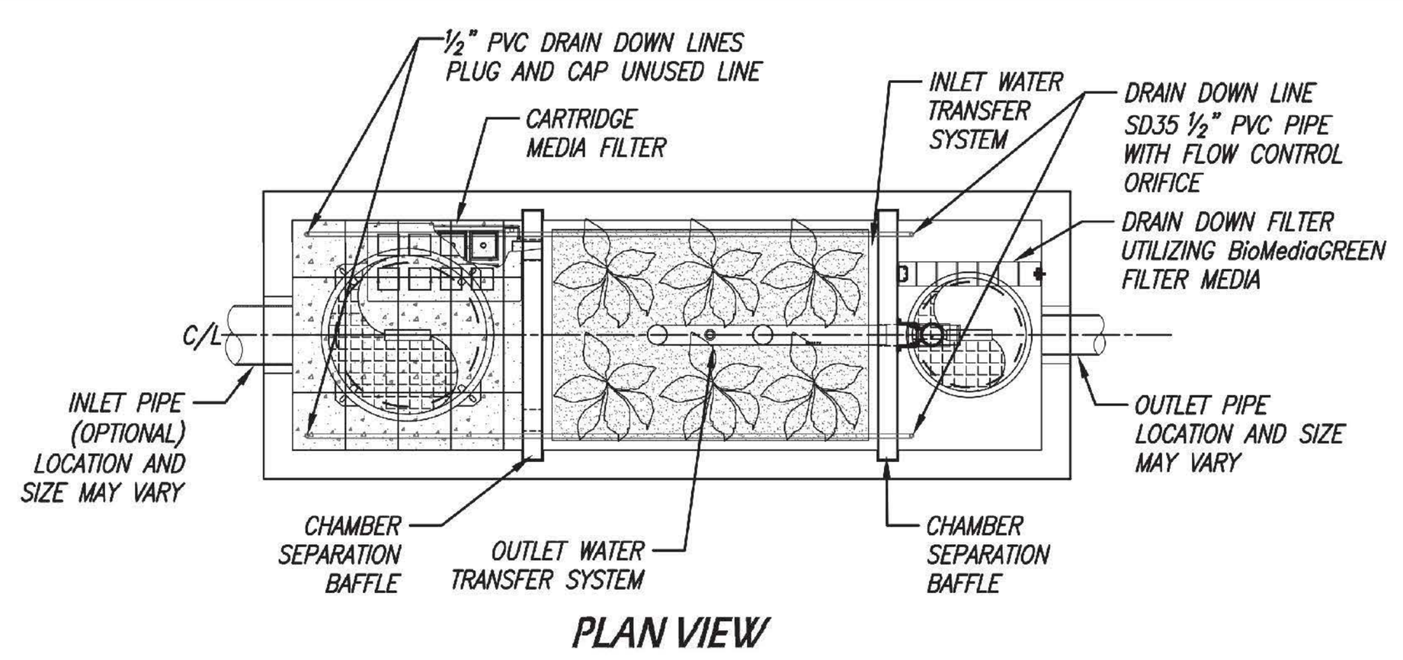
11'-4" & 5'-8" DOUBLETRAP

STORMTRAP – DOUBLETRAP DETAIL

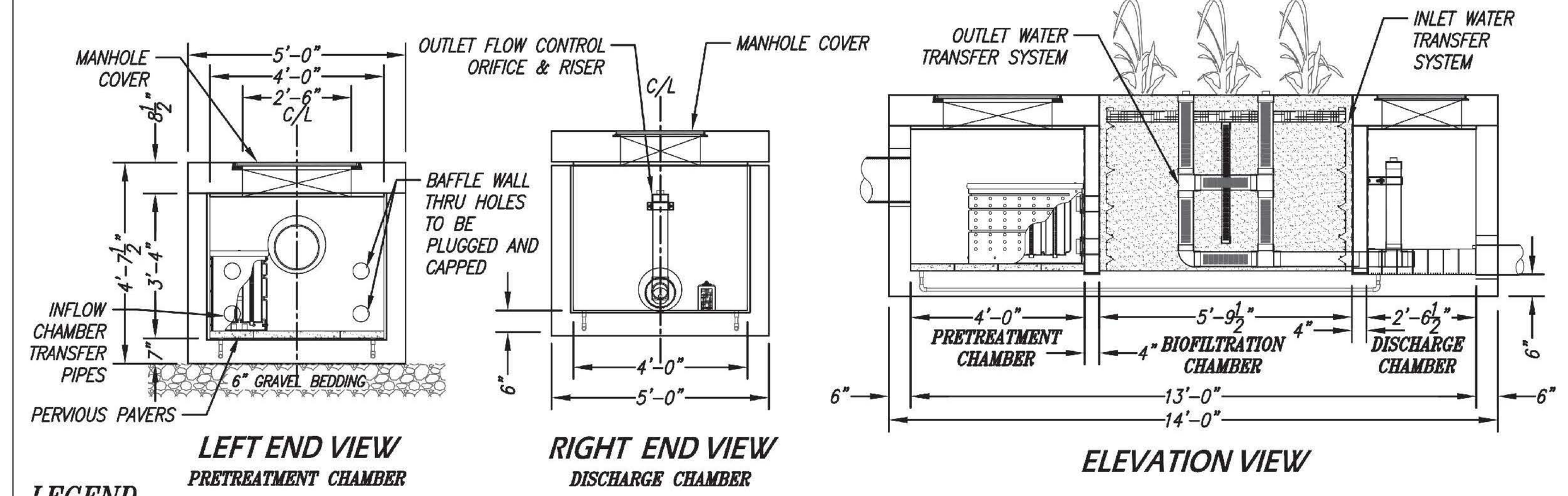
NOT TO SCALE

SITE SPECIFIC DATA*	
PROJECT NAME	PASEO MONTRIL
PROJECT LOCATION	SAN DIEGO, CA
STRUCTURE ID	MWS–4–13–V
PERFORMANCE DATA	
TREATMENT VOLUME (CF)	
TREATMENT HGL (FT)	
BYPASS FLOW RATE (CFS)	DEPENDANT ON PIPE SIZE

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



PLAN VIEW



LEFT END VIEW
PRETREATMENT CHAMBER

RIGHT END VIEW
DISCHARGE CHAMBER

ELEVATION VIEW

LEGEND

WETLAND MEDIA

PLANT/ROOT MOISTURE RETENTION LAYER

MODULAR WETLANDS

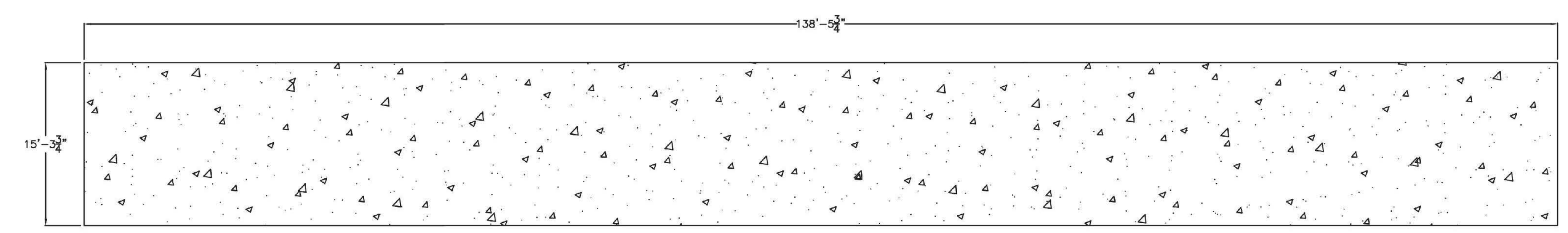
MWS-L-4-13
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

BIOCLEAN – MODULAR WETLANDS DETAIL

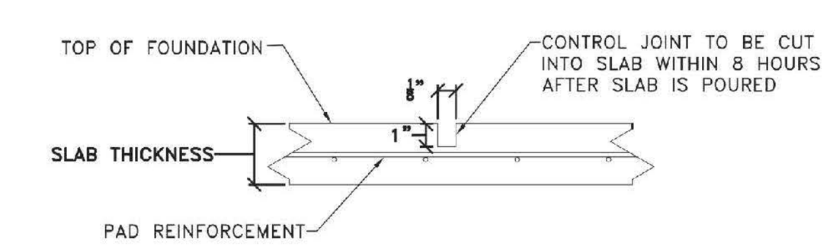
NOT TO SCALE

BMP NOTE

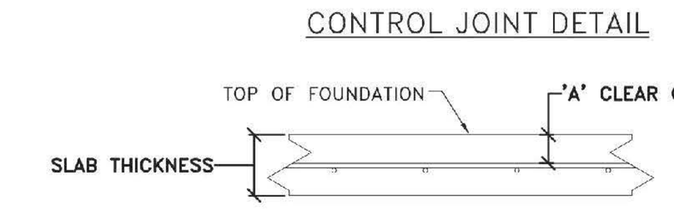
DETAILS FOR STORMTRAP SINGLETRAP SYSTEM AND BIOCLEAN MODULAR WETLANDS SYSTEM ARE NOT FOR CONSTRUCTION AND PROVIDED FOR REFERENCE ONLY. FINAL DETAILS FOR CONSTRUCTION WILL BE PROVIDED DURING FINAL ENGINEERING.



CONCRETE FOUNDATION NOTES:
1. CONCRETE FOUNDATION TO BE SUPPLIED AND INSTALLED BY OTHERS.
2. CONCRETE STRENGTH @ 28 DAYS, 5%–8% ENTRAINED AIR, 4" MAX SLUMP.
3. NET ALLOWABLE SOIL PRESSURE AS INDICATED ON SHEET 1.0.
4. SOIL CONDITIONS TO BE VERIFIED ON SITE BY OTHERS.
5. REBAR: ASTM A615 GRADE 60, BLACK BAR.
6. DIMENSION OF FOUNDATION MUST HAVE 1'–0" OVERHANG BEYOND EXTERNAL FACE OF MODULE.
7. DIMENSION OF STORMTRAP SYSTEM ALLOW FOR A 3/4" GAP BETWEEN EACH MODULE.
8. ALL DIMENSIONS TO BE VERIFIED IN THE FIELD BY OTHERS.
9. THE CONTROL JOINTS SHALL BE BETWEEN (IF REQUIRED BY ENGINEER OF RECORD) 16'–0" TO 24'–0" MAX APART.
10. SEE SHEET 3.0 FOR INSTALLATION SPECIFICATIONS.



CONTROL JOINT DETAIL

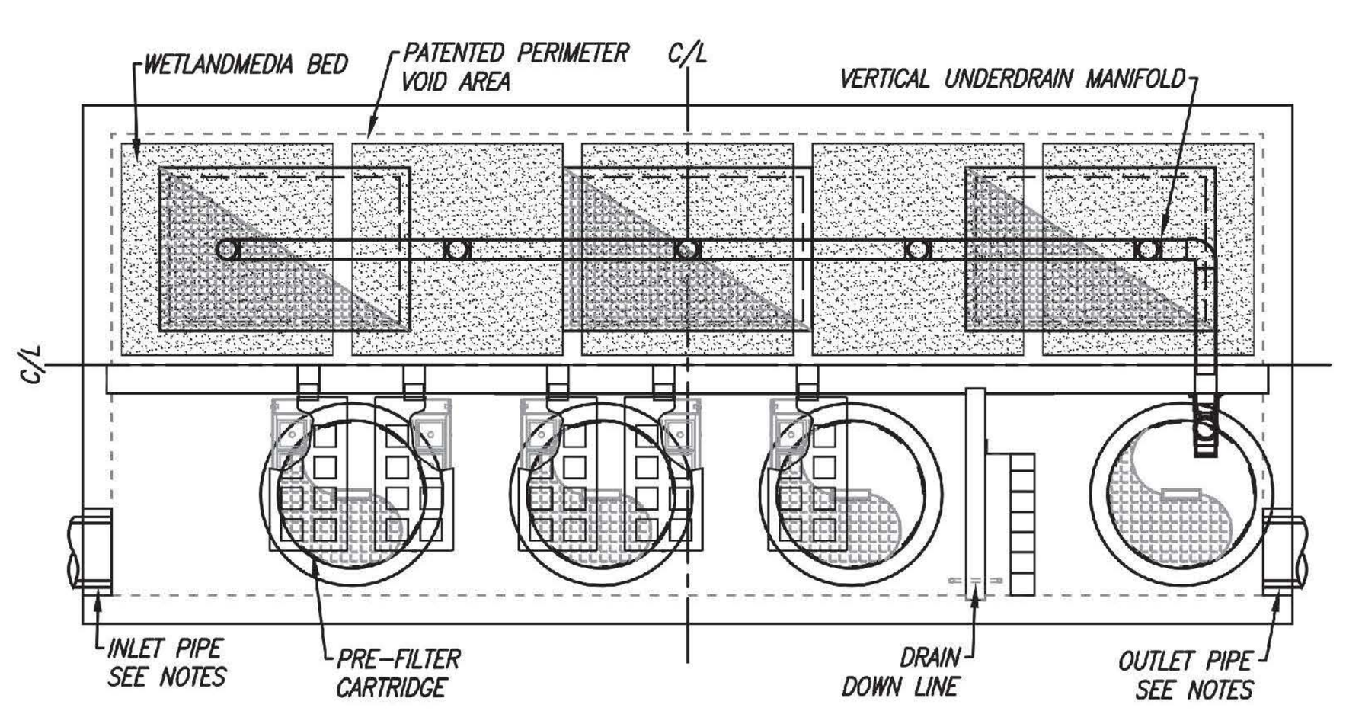


MAXIMUM SYSTEM COVER	SLAB THICKNESS	CONCRETE STRENGTH	REINFORCEMENT (BOTH DIRECTIONS)	'A' CLEAR COVER
6" – 12"	0'–8"	4000 PSI	#4 @ 18" O.C.	3.5"
>1'–0" – 2'–0"	0'–8"	4000 PSI	#4 @ 16" O.C.	3.5"
>2'–0" – 3'–0"	0'–8"	4000 PSI	#4 @ 12" O.C.	3.5"
>3'–0" – 4'–0"	0'–8"	4000 PSI	#4 @ 12" O.C.	3.5"
>4'–0" – 5'–0"	0'–8"	4000 PSI	#5 @ 18" O.C.	3.375"
>5'–0" – 6'–0"	0'–8"	4000 PSI	#5 @ 16" O.C.	3.375"
>6'–0" – 7'–0"	0'–8"	4000 PSI	#5 @ 16" O.C.	3.375"
>7'–0" – 8'–0"	0'–9"	4000 PSI	#5 @ 12" O.C.	3.875"
>8'–0" – 9'–0"	0'–10"	4000 PSI	#5 @ 12" O.C.	4.375"
>9'–0" – 10'–0"	0'–10"	4500 PSI	#5 @ 12" O.C.	4.375"

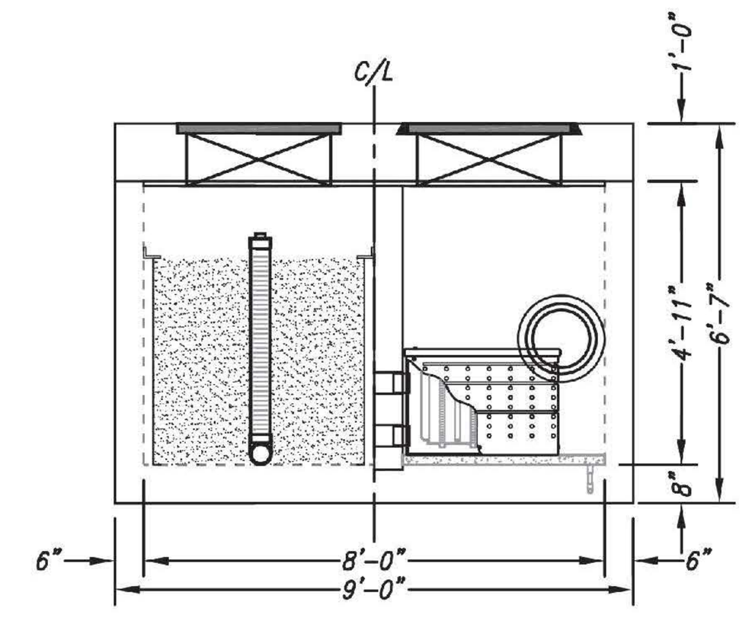
STORMTRAP – FOUNDATION DETAIL

NOT TO SCALE

SITE SPECIFIC DATA			
PROJECT NUMBER	----		
PROJECT NAME	----		
PROJECT LOCATION	----		
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE	----	N/K	12"
OUTLET PIPE	----	N/K	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	######	######	######
SURFACE LOAD	PEDESTRIAN	PEDESTRIAN	PEDESTRIAN
FRAME & COVER	3EA ø30"	3EA 30" X 48"	ø30"
WETLANDMEDIA VOLUME (CY)			8.93
ORIFICE SIZE (DIA. INCHES)			5 EA ø1.34"
NOTES:			



PLAN VIEW

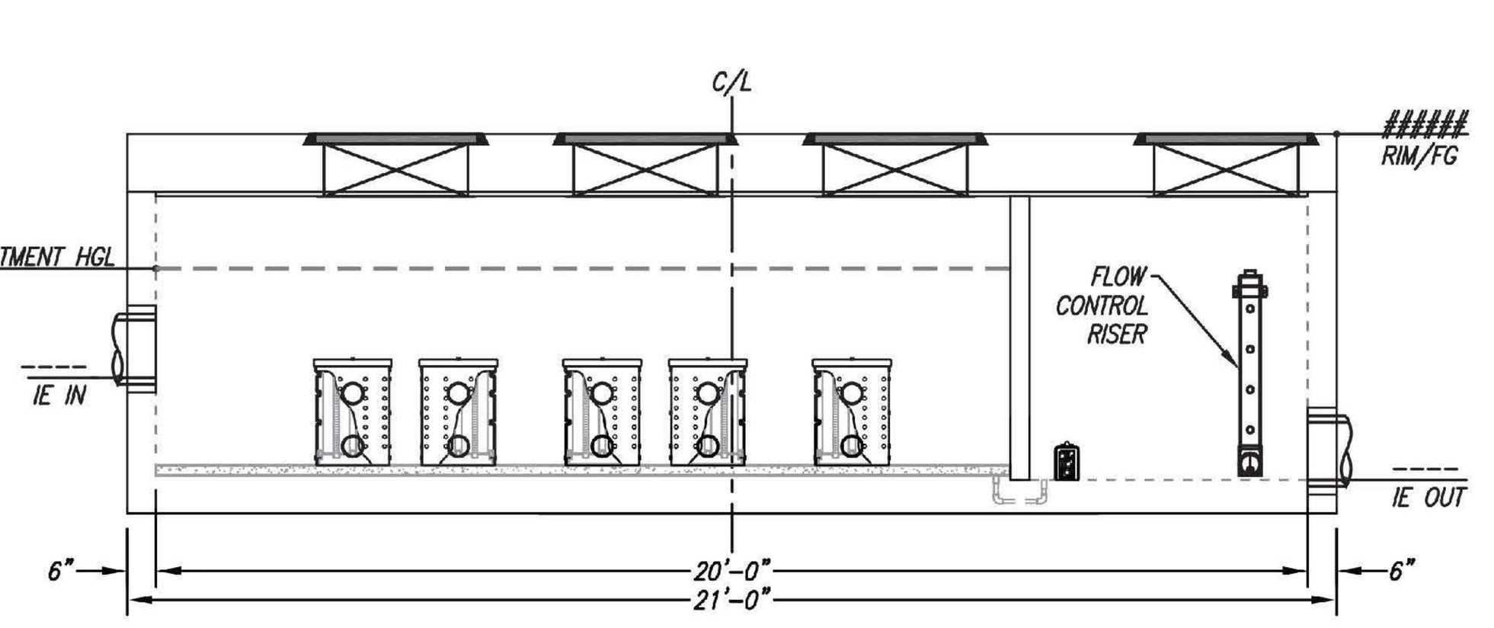


LEFT END VIEW

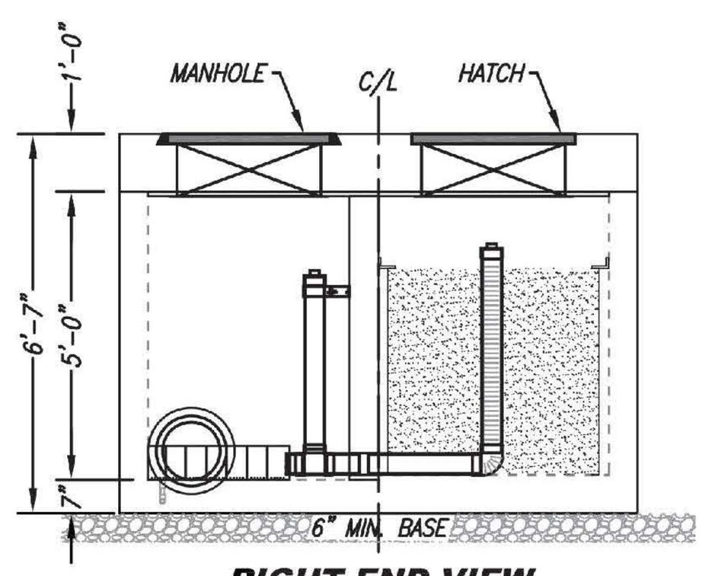
INSTALLATION NOTES
1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED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

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

11/16/20ASPOLAR



ELEVATION VIEW



RIGHT END VIEW

BIOCLEAN – MODULAR WETLANDS DETAIL

NOT TO SCALE

TREATMENT FLOW (CFS)	0.577
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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

PROPRIETARY AND CONFIDENTIAL:
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Bio Clean
A Forterra Company

MWS-L-8-20-4'-11"-V-UG
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

ZONE CHART		
ZONES	ZONE DESCRIPTIONS	REMARKS
ZONE 1	FOUNDATION AGGREGATE	#5 (3/4") 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

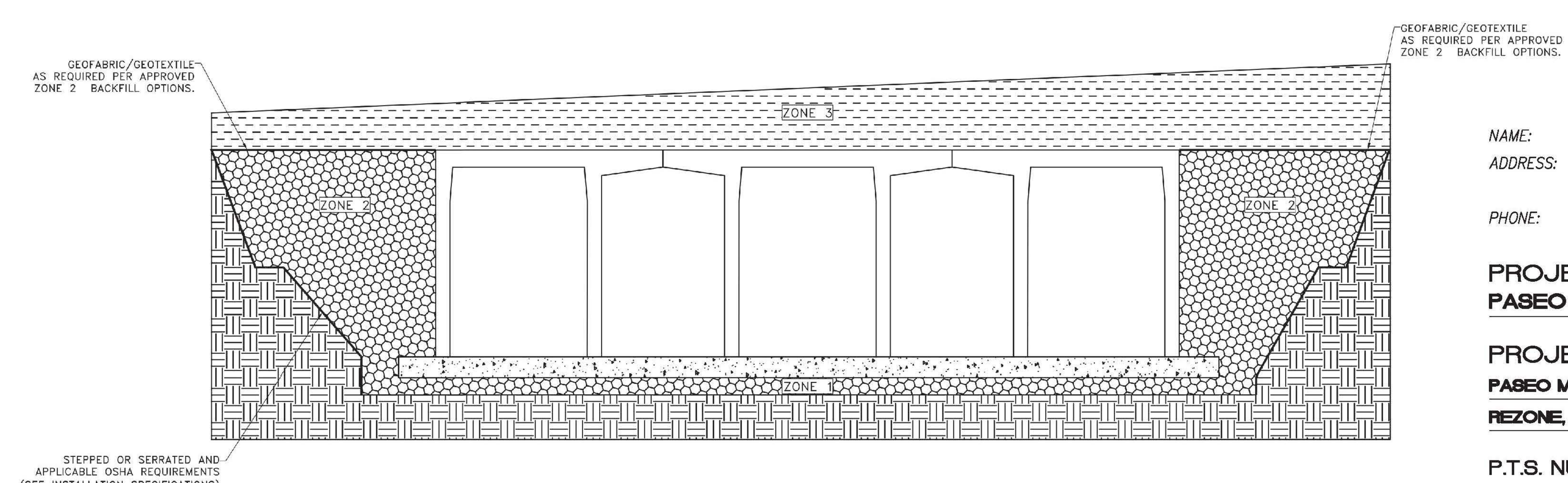
FILL DEPTH	TRACK WIDTH	MAX VEHICLE WEIGHT (KIPS)	MAX GROUND PRESSURE
12"	12"	51.8	1690 psf
	18"	56.1	1219 psf
	24"	68.1	1111 psf
	30"	76.7	1000 psf
	36"	85.0	924 psf

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

APPROVED ZONE 2 BACKFILL OPTIONS	
OPTION	REMARKS
3/4" 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

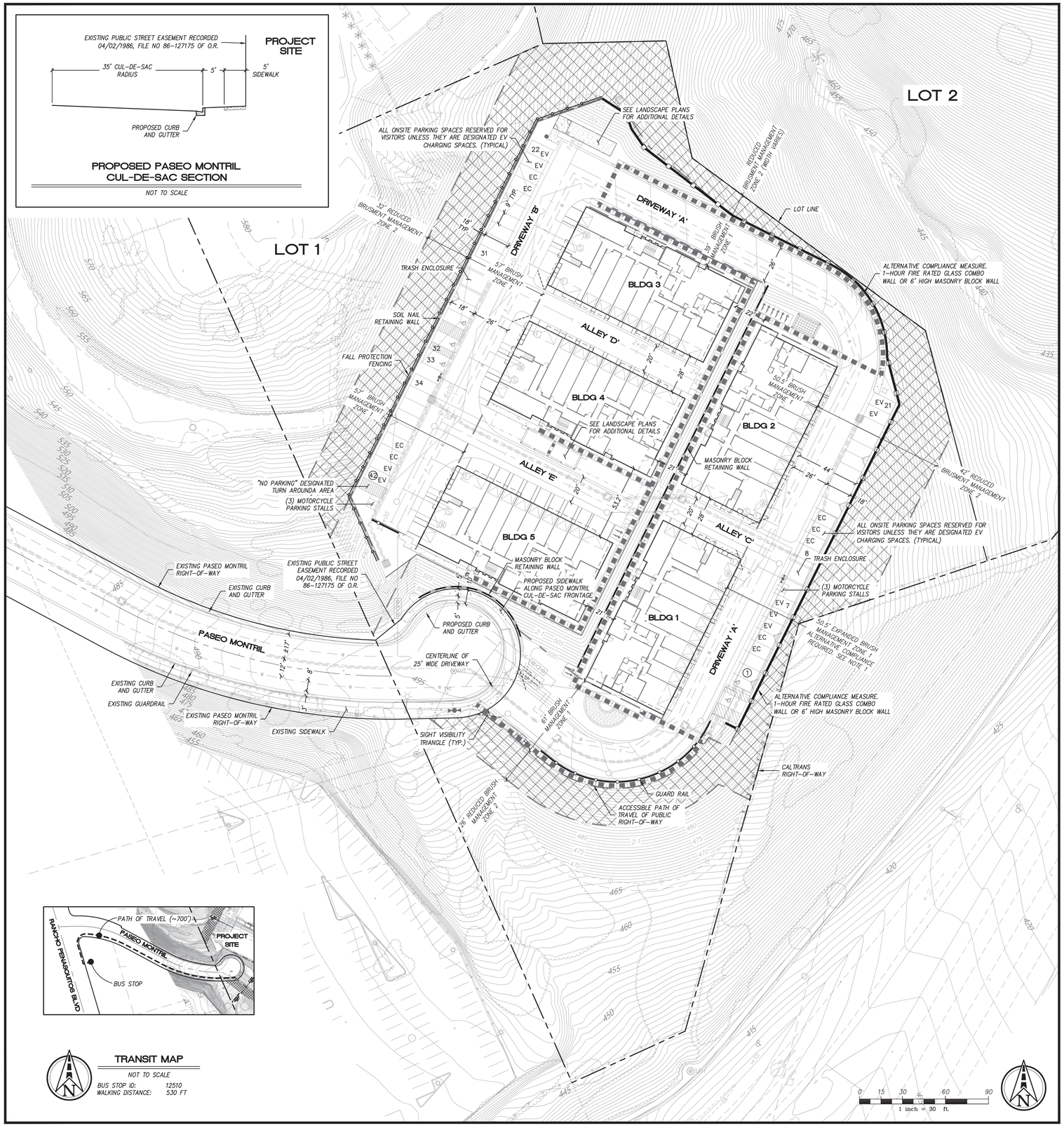
1. THE FILL PLACED AROUND THE STORMTRAP MODULES MUST DEPOSITED ON BOTH SIDES AT THE SAME TIME AND TO APPROXIMATELY THE SAME ELEVATION. AT NO TIME SHALL THE FILL BEHIND ONE SIDE WALL BE MORE THAN 2'–0" HIGHER THAN THE FILL ON THE OPPOSITE SIDE. BACKFILL SHALL EITHER BE COMPACTED AND/OR VIBRATED TO ENSURE 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 IS RECOMMENDED FOR LEVELING PURPOSES ONLY (OPTIONAL).



STORMTRAP – BACKFILL DETAIL

NOT TO SCALE

NAME:	CIVIL SENSE, INC.	REVISION 12:	
ADDRESS:	13475 DANIELON STREET, SUITE 150	REVISION 11:	
	POWAY, CA 92064	REVISION 10:	
PHONE:	858–843–4253	REVISION 9:	
		REVISION 8:	
PROJECT ADDRESS:	PASEO MONTRIL	REVISION 7:	
		REVISION 6:	3/24/2021
PROJECT NAME:	PASEO MONTRIL VTM, SDP, PDP, CPA	REVISION 5:	2/19/2021
	REZONE, NDP AND EASEMENT VACATION	REVISION 4:	1/28/2021
		REVISION 3:	1/8/2021
		REVISION 2:	11/24/2020
		REVISION 1:	9/28/2020
P.T.S. NUMBER:	658273	ORIGINAL DATE:	3/19/2020
I.O. NUMBER:	240076662		
SHEET TITLE:	STORM DRAIN BMP DETAILS	SHEET	6 OF 15
		DEP #	



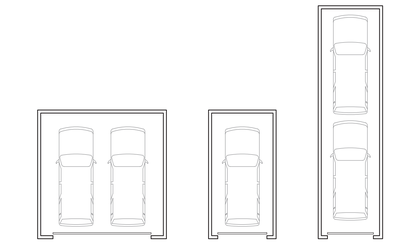
TRANSIT MAP

NOT TO SCALE

BUS STOP ID: 12510
WALKING DISTANCE: 530 FT

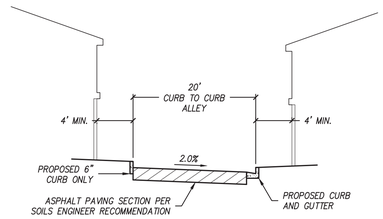
TYPICAL GARAGE SPACE DETAIL

1. CITY OF SAN DIEGO STANDARDS, ALL TWO-CAR GARAGES SHALL HAVE A MINIMUM DIMENSION OF 20 FEET X 20 FEET, WHILE ONE-CAR GARAGE SHALL HAVE A MINIMUM DIMENSION OF 10 FEET X 20 FEET, AS SHOWN BELOW.
2. CITY OF SAN DIEGO STANDARDS, ALL TWO-CAR TANDEM GARAGES SHALL HAVE A MINIMUM DIMENSION OF 9.5 FEET X 37 FEET, AS SHOWN BELOW.



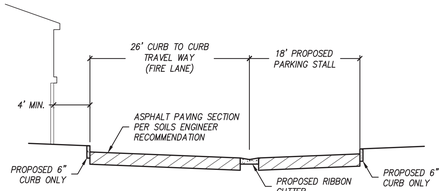
2-CAR GARAGE MIN. 20'x20' | 1-CAR GARAGE MIN. 10'x20' | 2-CAR TANDEM GARAGE MIN. 9.5'x37'

NOTE: BICYCLE PARKING PROVIDED WITHIN GARAGES.



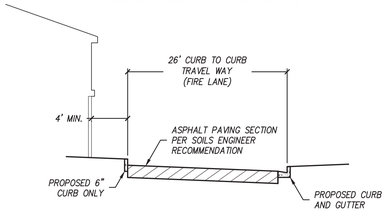
TYPICAL SECTION ALLEY 'C', 'D', AND 'E'

NOT TO SCALE
NOTE: NO PARKING PERMITTED ON EITHER SIDE OF THE DRIVEWAY.



TYPICAL SECTION PRIVATE DRIVEWAY 'A' AND 'B' (PARKING ONE SIDE)

NOT TO SCALE
NOTE: LOOKING UP STATION.
SECTION MIRRORED FOR PRIVATE DRIVEWAY 'B'



TYPICAL SECTION PRIVATE DRIVEWAY 'A' AND 'B' (NO PARKING)

NOT TO SCALE
NOTE: LOOKING UP STATION.
SECTION MIRRORED FOR PRIVATE DRIVEWAY 'B'

GENERAL NOTES

1. ALTERNATIVE COMPLIANCE MEASURES FOR BUILDINGS 1, 2, AND 3 ARE REQUIRED DUE TO THE REDUCED BRUSH MANAGEMENT ZONE 2. ALTERNATIVE COMPLIANCE MEASURE PROPOSED FOR THESE BUILDINGS SHALL BE COMBO MASONRY BLOCK/1-HR FIRE RATED WALL OR 6 FOOT HIGH MASONRY BLOCK WALL. TO BE DETERMINED AT MINISTERIAL REVIEW.
2. ALL SEWER, WATER AND STORM DRAIN UTILITIES ARE PRIVATE UNLESS OTHERWSE NOTED. SEE SHEET 5 FOR MORE INFORMATION.
3. VISIBILITY AREA – NO OBSTRUCTION INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3 FEET IN HEIGHT. PLANT MATERIAL, OTHER THAN TREES, LOCATED WITHIN VISIBILITY AREAS OR THE ADJACENT PUBLIC RIGHT-OF-WAY SHALL NOT EXCEED 24 INCHES IN HEIGHT, MEASURED FROM THE LOWEST GRADE ABUTTING THE PLANT MATERIAL TO THE TOP OF THE PLANT MATERIAL.

LEGEND

	SLOPES 2:1 MAX
	VTM BOUNDARY
	PROPOSED LOT LINE
	PROPOSED DAYLIGHT LINE
	PROPOSED 6" CURB AND GUTTER
	PROPOSED 6" CURB
	PROPOSED SIDEWALK
	PROPOSED STORM DRAIN
	PROPOSED SD CATCH BASIN INLET
	PRPOSED SD CLEANOUT
W	PROPOSED POTABLE WATER (PRIVATE)
F	PROPOSED FIRE MAIN (PRIVATE)
	PROPOSED SEWER MAIN (PRIVATE)
	PROPOSED WATER SERVICE
	PROPOSED FIRE SERVICE
	PROPOSED SEWER SERVICE
	PROPOSED IRRIGATION SERVICE
	PROPOSED WATER METER AND BACKFLOW
	PROPOSED FIRE BACKFLOW
	PROPOSED FIRE HYDRANT
	PROPOSED STREET LIGHT
	PROPOSED COMBO WALL W/FIRE RATED GLASS
	PROPOSED WROUGHT IRON FENCE
	PROPOSED FALL PROTECTION FENCE
	PROPOSED RETAINING WALL/COMBO WALL
	PROPOSED GUARDRAIL
	BRUSH MANAGEMENT ZONES
	ADA PATH OF TRAVEL
8' TYP. 3' TYP. 9' TYP.	MOTORCYCLE PARKING STALL (6 TOTAL)
18' TYP. 9' TYP.	PARKING STALL (44 NON-ADA STALLS)
9' TYP. 9' TYP. 18' TYP.	PARKING ADA STALL AND LOADING AREA (5 ADA STALLS)
10' TYP. 10' TYP. VISIBILITY TRIANGLE	VISIBILITY TRIANGLE. NO OBSTRUCTION INCLUDING LANDSCAPING OR SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 24 INCHES IN HEIGHT.
EV	ELECTRIC VEHICLE CHARGING SPACE
EC	ELECTRIC VEHICLE CHARGING CAPABLE SPACE (FOR FUTURE CONNECTION)

PREPARED BY:

CIVIL SENSE INC
13475 Danielson Street, Suite 150 | Poway, CA 92064
Office: 858-842-4353

HENRY H. PENG
R.C.E. 63686

DATE

REGISTERED PROFESSIONAL ENGINEER HENRY H. PENG No. 63686 Exp. 09-30-22 CIVIL STATE OF CALIFORNIA

NAME: CIVIL SENSE, INC.
ADDRESS: 13475 DANIELON STREET, SUITE 150
POWAY, CA 92064
PHONE: 858-843-4253

PROJECT ADDRESS:
PASEO MONTRIL

PROJECT NAME:
PASEO MONTRIL VTM, SDP, PDP, CPA
REZONE, NDP AND EASEMENT VACATION

P.T.S. NUMBER: 658273
I.O. NUMBER: 240076662

SHEET TITLE:
SITE PLAN

REVISION 12:	
REVISION 11:	
REVISION 10:	
REVISION 9:	
REVISION 8:	
REVISION 7:	
REVISION 6:	
REVISION 5:	2/19/2021
REVISION 4:	1/28/2021
REVISION 3:	1/8/2021
REVISION 2:	11/24/2020
REVISION 1:	9/28/2020

ORIGINAL DATE: 3/19/2020

SHEET 7 OF 15

DEP #

Attachment 5
Drainage Report

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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DRAINAGE REPORT

FOR

PASEO MONTRIL

(PTS No. 658273, I.O. No. 240076662)

April 27, 2021

Wayne W. Chang, MS, PE 46548

ChangConsultants

Civil Engineering ◦ Hydrology ◦ Hydraulics ◦ Sedimentation

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Rancho Santa Fe, CA 92067
(858) 692-0760
wayne@changconsultants.com

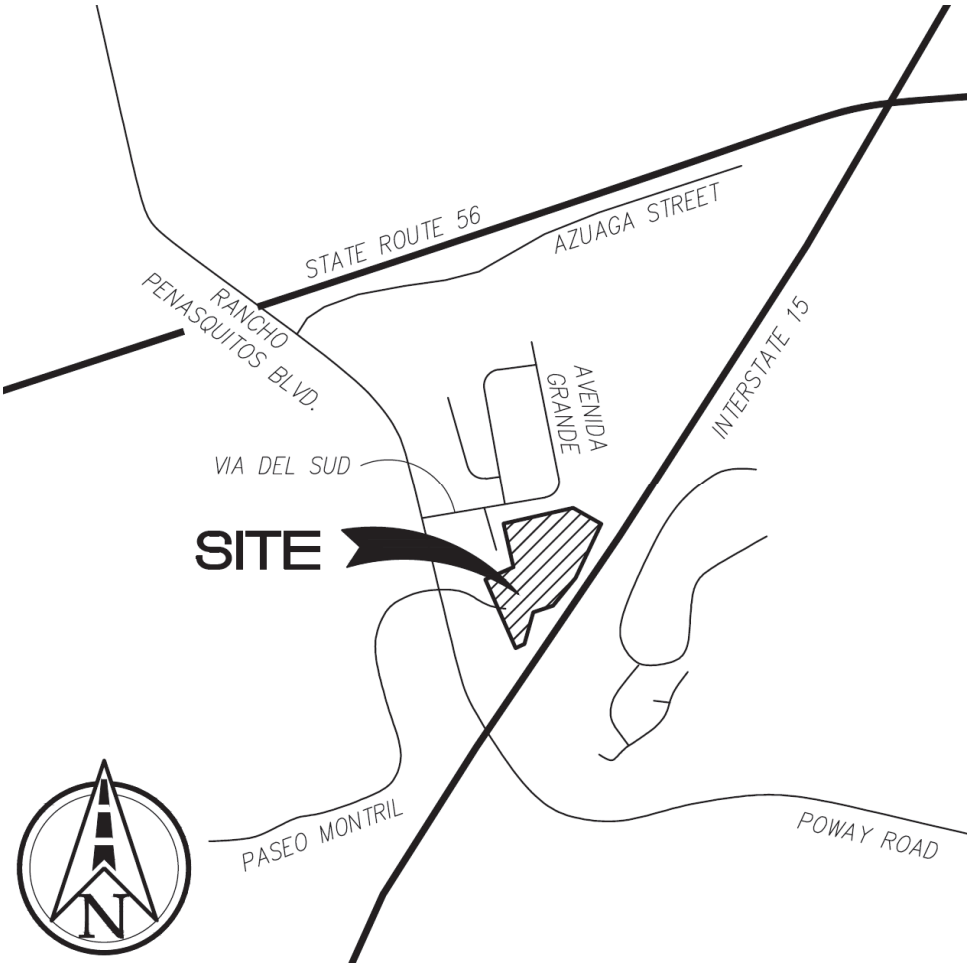
FOR REVIEW ONLY

-TABLE OF CONTENTS -

APPENDIX

INTRODUCTION

Pardee Homes is proposing to develop the 12.78 acre Paseo Montril site located at the east end of Paseo Montril in the city of San Diego (see the Vicinity Map). Civil Sense, Inc. has prepared the tentative map for project entitlements. The project proposes multi-family residential development containing 55 units in five buildings. The project will also include access drives, parking, and landscaping and is disturbing approximately 24 percent of the site.



Vicinity Map

Under existing, pre-project conditions, the site has not been disturbed. The existing drainage within the project footprint occurs as sheet flow in a southerly to southeasterly direction over the moderate to steeply sloping natural hillside. The storm runoff flows to three locations. A portion of the runoff flows onto Paseo Montril and is conveyed easterly away from the site along the existing street. The remainder of the runoff surface flows to a Caltrans storm drain system near the bottom of the hillside on the west side of Interstate 15. The runoff enters the Caltrans storm drain system at one of two locations, north and south. The Caltrans storm drain system conveys the runoff southerly away from the site along Interstate 15. The entire site runoff ultimately enters Los Penasquitos Creek, which is approximately 0.5 miles south of the site.

The project will include a private on-site drainage system (storm drain pipes, inlets, ditches, and drive aisles) to capture and convey the proposed condition runoff. Storm runoff within the majority of the development footprint will be directed to one of two Bio Clean Modular Wetlands System Linear BMPs for pollutant control. Each MWS Linear will be connected to an adjacent vault for flow control. The treated storm runoff will be conveyed by a proposed storm drain west along Paseo Montril to an existing storm drain system at the intersection of Paseo Montril and Rancho Penasquitos Boulevard. The project runoff will not enter the Caltrans inlets.

This preliminary drainage report has been prepared in support of Civil Sense, Inc.'s tentative map.

HYDROLOGIC RESULTS

The overall study area covers 3.20 acres so the City of San Diego's January 2017, *Drainage Design Manual's* (Manual) rational method procedure was the basis for the existing and proposed condition hydrologic analyses. The *Manual* states that "the underground storm drain system shall be based upon a 50-year frequency storm," and "the combination of storm drain system capacity and overflow will be able to carry the 100-year frequency storm. . . ." Since the site is so small, there will be minimal differences between the 50- and 100-year flow rates, so 100-year analyses are being performed. The CivilDesign Rational Method Hydrology Program is based on the City criteria and was used for the analyses. The rational method input parameters are summarized below and the supporting data is included in Appendix A:

- Intensity-Duration-Frequency: The City's 100-year Intensity-Duration-Frequency curve from the *Drainage Design Manual* was used.

- Drainage area: The existing condition drainage area was delineated from the project's topographic mapping.

  Under proposed conditions, storm runoff is conveyed by private drainage facilities to BMPs (two Modular Wetlands System Linear and associated vaults). The overall proposed condition drainage basin has been subdivided into subbasins to reflect the flow patterns. The overall existing and proposed condition drainage areas were set equal to allow a comparison of results.

- Hydrologic soil groups: The soil group within the site is entirely 'D' according to the City criteria.

- Runoff coefficients: Under existing conditions, the site is an undeveloped, natural hillside, so the rural land use category was assigned. For proposed conditions, the development footprint was modeled with the multi-units land use category, while the undisturbed area and landscaped slope to the northwest was modeled with the rural land use category.

The existing and proposed condition rational method results are included in Appendix A and summarized in Table 1. Table 1 shows that the project will increase the flow onto Paseo Montril and will not direct runoff to the Caltrans north or south inlets.

Location	Existing Conditions			Proposed Conditions		
	Node No.	Area, acres	Q_{100}, cfs	Node No.	Area, acres	Q_{100}, cfs
Paseo Montril	22	0.65	1.0	54	3.20	6.1
Caltrans South Inlet	12	1.07	1.5	N/A	0	0
Caltrans North Inlet	32	1.48	2.2	N/A	0	0

Table 1. Comparison of 100-Year Rational Method Results

A preliminary detention analysis was performed to estimate the storage volume needed to attenuate the 100-year flow towards Paseo Montril from 6.1 to 1.0 cubic feet per second (cfs). The proposed condition peak flow was converted to a hydrograph using the County's rational method hydrograph procedure. The hydrograph was entered into HEC-1 for the detention analysis. The HEC-1 results are included in Appendix A and show that at least 0.36 acre-feet (15,682 cubic feet) of storage is needed. The project will provide the required on-site storage in the two vaults in order to avoid increasing the 100-year flow onto Paseo Montril.

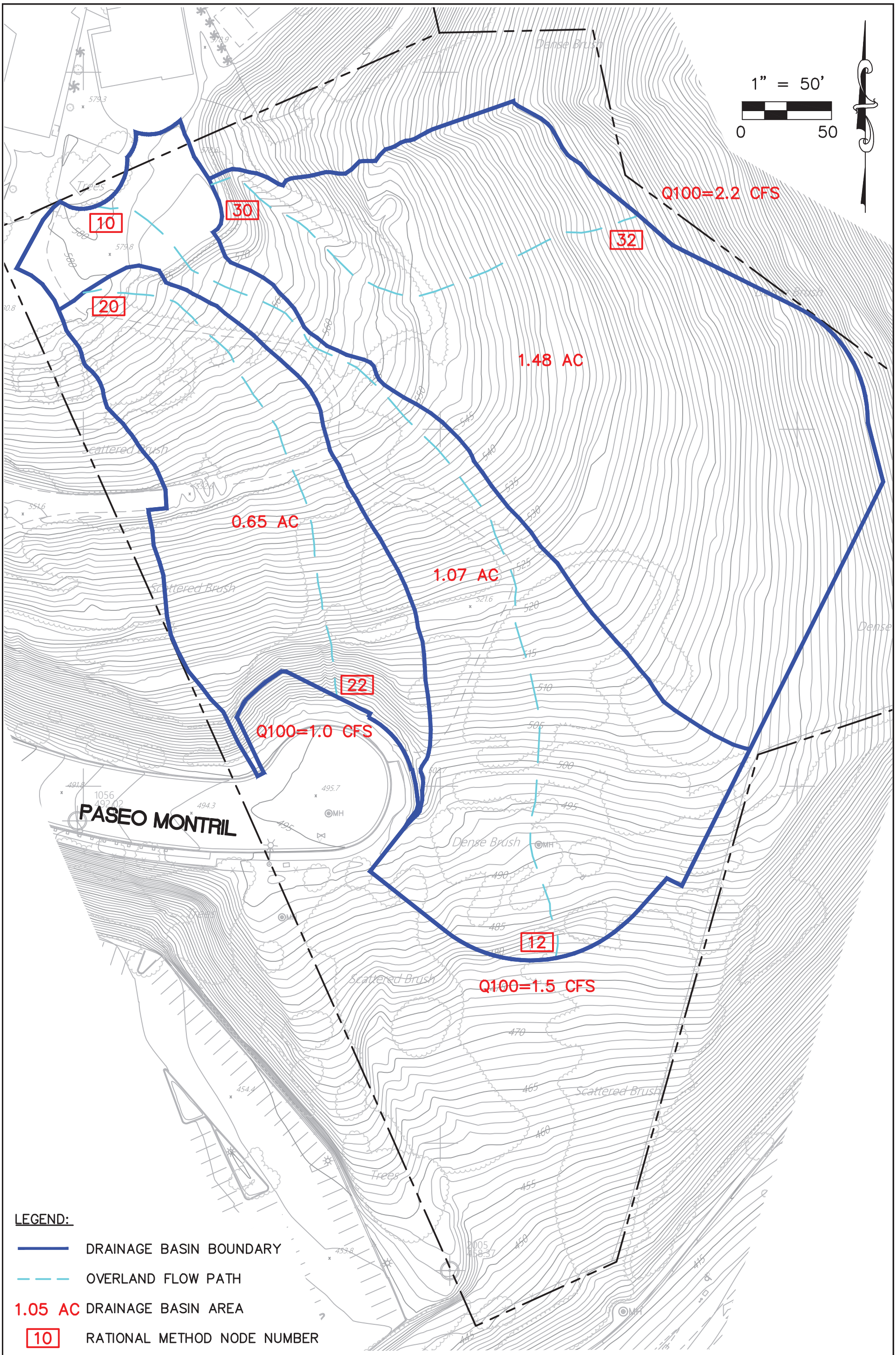
CONCLUSION

The analyses in this preliminary drainage report show that the project will increase the 100-year flow onto Paseo Montril. The increase will be mitigated by on-site storage. This will avoid burdening the existing downstream storm drain facilities. Storm runoff within the project footprint will no longer be conveyed to the Caltrans inlets, so there will not be an impact to these Caltrans facilities.

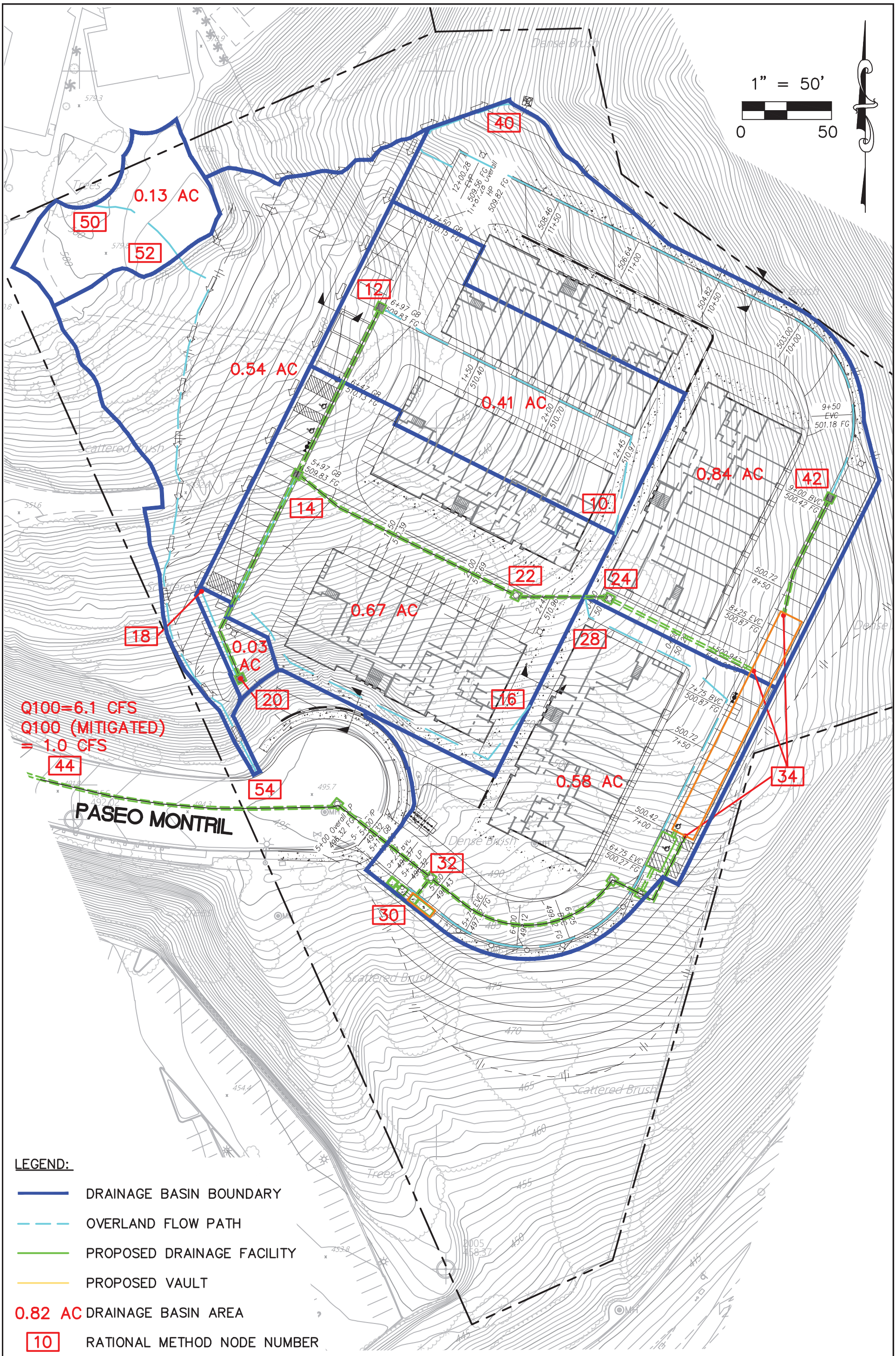
There are no waters of the US at or in the immediate vicinity of the site. Therefore, neither a Federal Clean Water Act Section 401 (Regional Water Quality Control Board) nor 404 permit (US Army Corps of Engineers) are required.

APPENDIX A

HYDROLOGIC RESULTS



EXISTING CONDITION
RATIONAL METHOD WORK MAP



PROPOSED CONDITION
RATIONAL METHOD WORK MAP

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

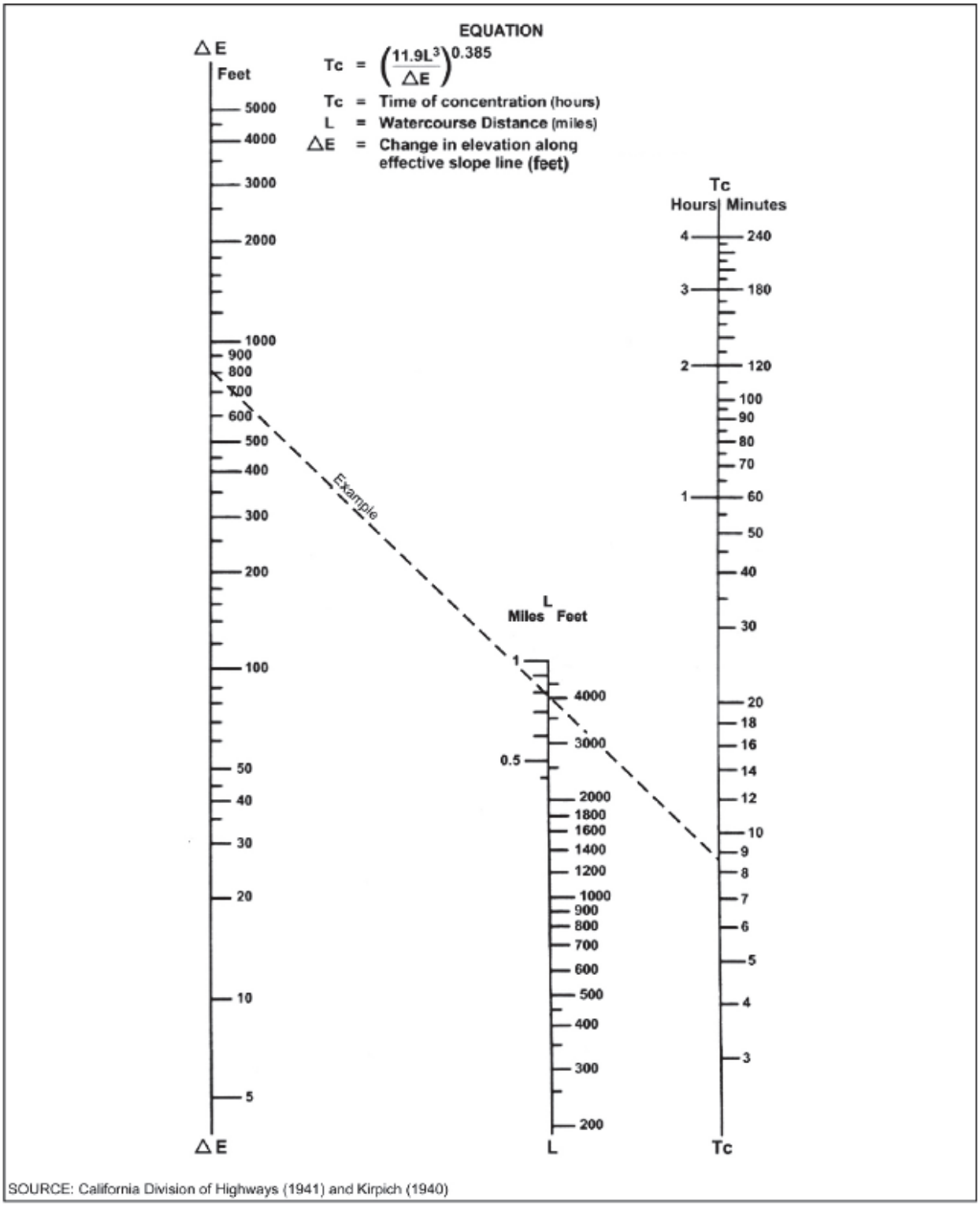


Figure A-2. Nomograph for Determination of T_c for Natural Watersheds

Note: Add ten minutes to the computed time of concentration from Figure A-2.

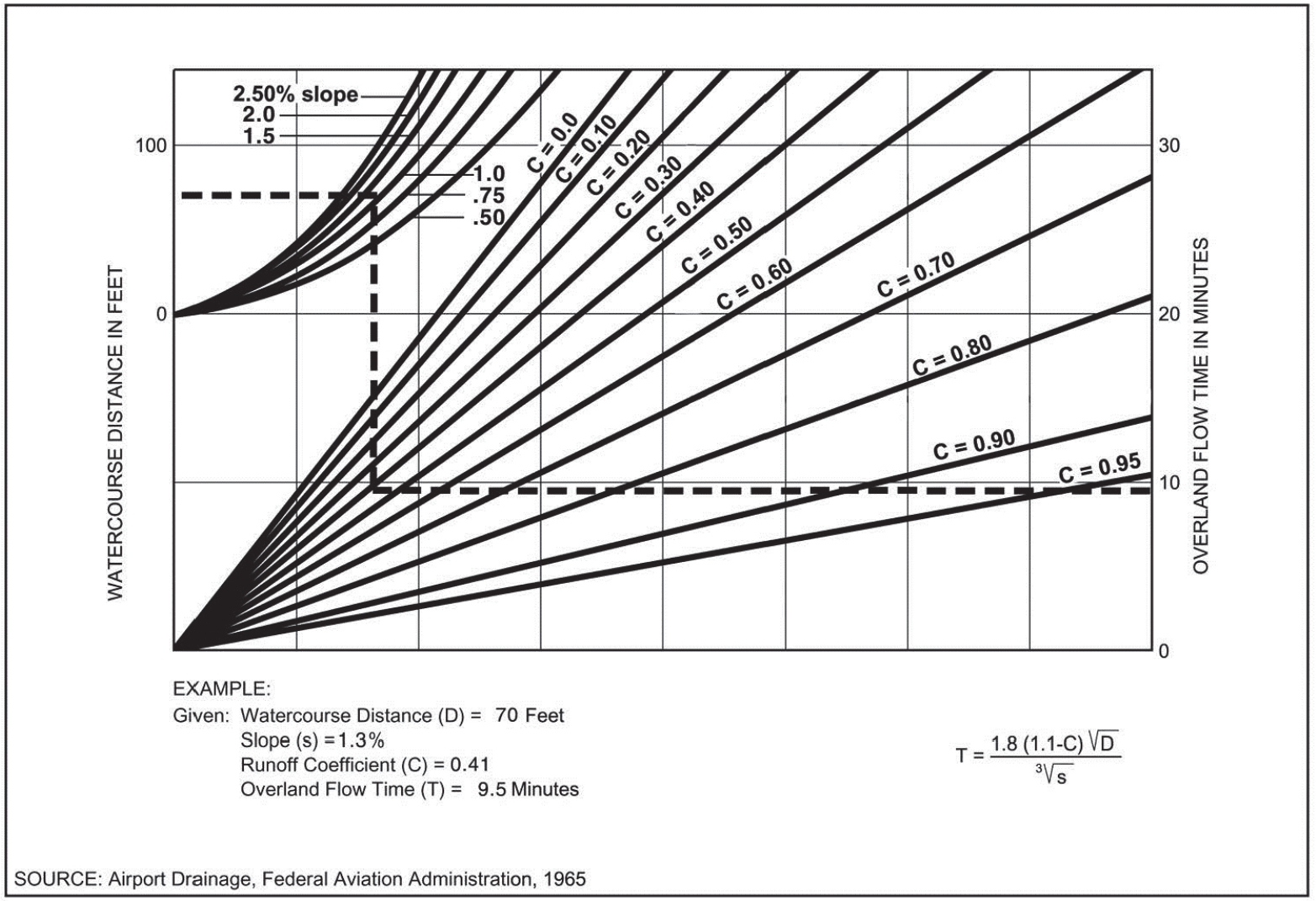


Figure A-4. Rational Formula – Overland Time of Flow Nomograph

Note: Use formula for watercourse distances in excess of 100 feet.

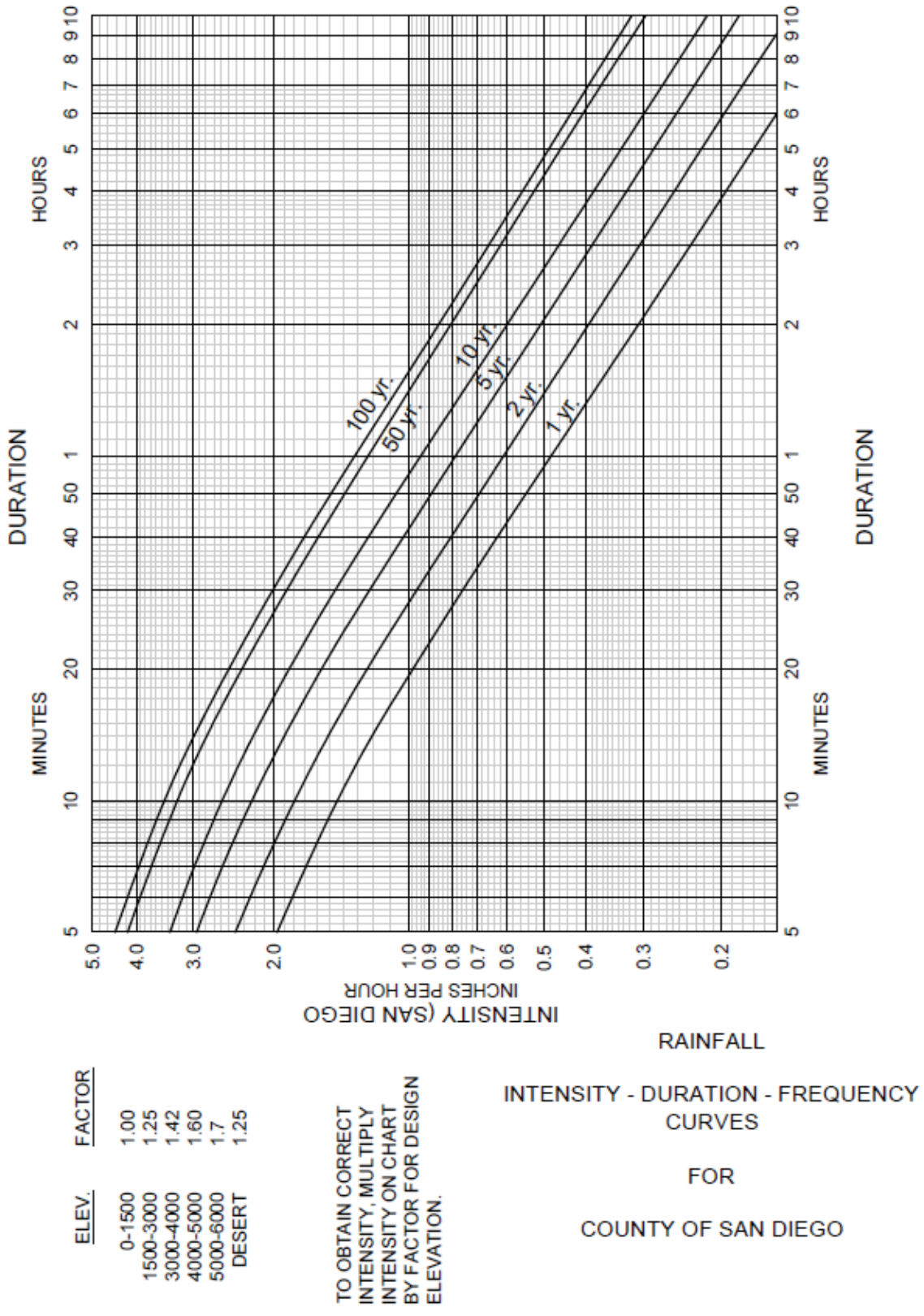


Figure A-1. Intensity-Duration-Frequency Design Chart

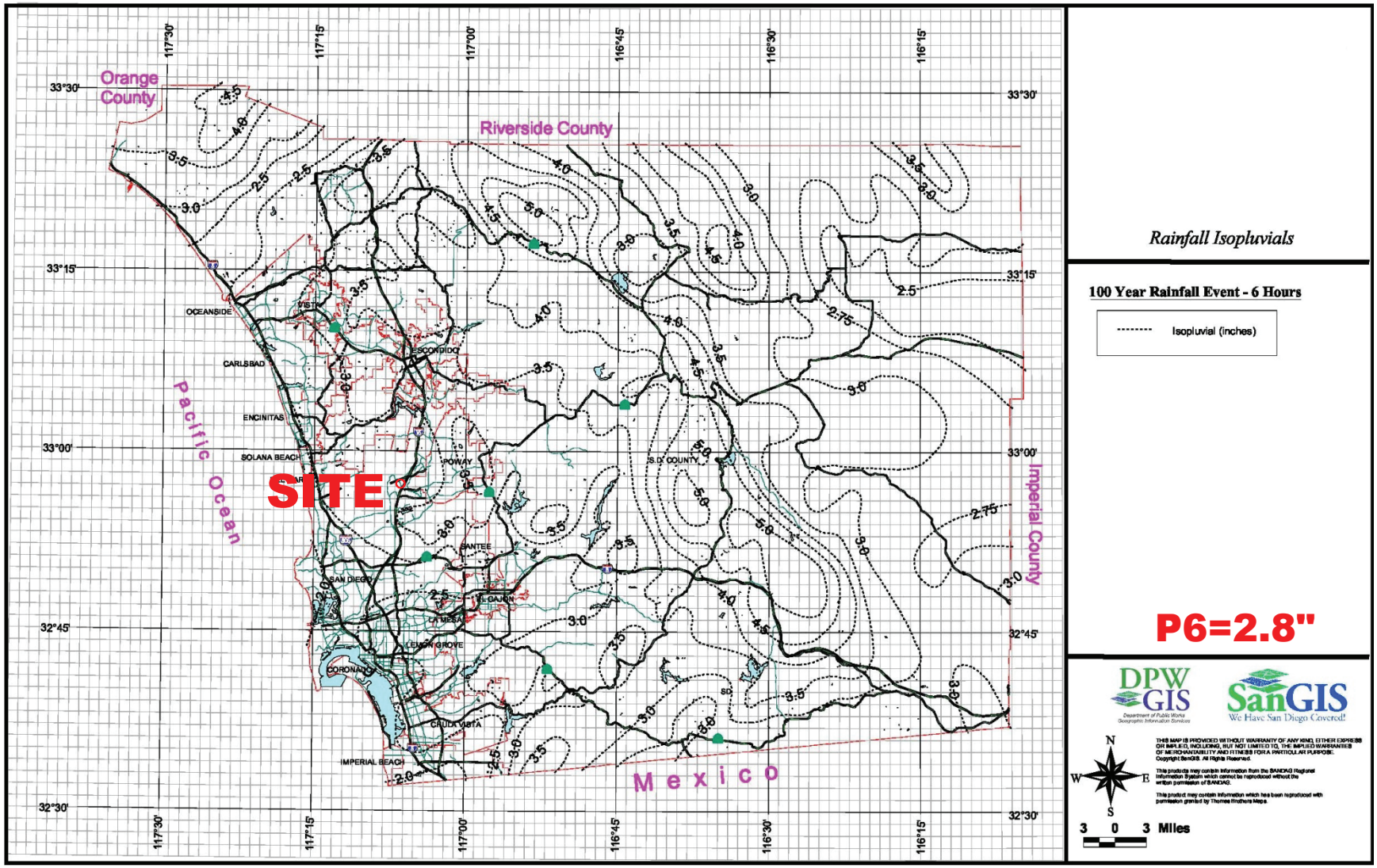


Figure B-2. 100-Year 6-Hour Isopluvials.

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 02/16/21

Paseo Montril
Tentative Map
Existing Conditions
100-Year Flow Rate

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity) = 1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

++
Process from Point/Station 10.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr) + 10 min.
Initial subarea flow distance = 545.000(Ft.)
Highest elevation = 580.300(Ft.)
Lowest elevation = 477.400(Ft.)
Elevation difference = 102.900(Ft.)
TC=[(11.9*0.1032^3)/(102.90)]^.385= 1.90 + 10 min. = 11.90 min.
Rainfall intensity (I) = 3.168(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450

```
Subarea runoff =      1.525(CFS)
Total initial stream area =        1.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr) + 10 min.
Initial subarea flow distance  =  300.000(Ft.)
Highest elevation =  580.200(Ft.)
Lowest elevation =  499.800(Ft.)
Elevation difference =   80.400(Ft.)
TC=[(11.9*0.0568^3)/( 80.40)]^.385=  1.05 + 10 min. =    11.05 min.
Rainfall intensity (I) =      3.255(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.952(CFS)
Total initial stream area =        0.650(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       32.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr) + 10 min.
Initial subarea flow distance  =  272.000(Ft.)
Highest elevation =  578.200(Ft.)
Lowest elevation =  510.500(Ft.)
Elevation difference =   67.700(Ft.)
TC=[(11.9*0.0515^3)/( 67.70)]^.385=  1.00 + 10 min. =    11.00 min.
Rainfall intensity (I) =      3.260(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      2.171(CFS)
Total initial stream area =        1.480(Ac.)
End of computations, total study area =          3.200 (Ac.)
```

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4

Rational method hydrology program based on
San Diego County Flood Control Division 1985 hydrology manual
Rational Hydrology Study Date: 02/16/21

Paseo Montril
Tentative Map
Proposed Conditions
100-Year Flow Rate

********* Hydrology Study Control Information **********

Program License Serial Number 4028

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity) = 1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method

++
Process from Point/Station 10.000 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type]
Initial subarea flow distance = 211.000(Ft.)
Highest elevation = 511.600(Ft.)
Lowest elevation = 509.830(Ft.)
Elevation difference = 1.770(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 11.09 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*(211.000^.5)/(0.839^(1/3)]= 11.09
Rainfall intensity (I) = 3.250(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700

```
Subarea runoff =      0.933(CFS)
Total initial stream area =        0.410(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   504.660(Ft.)
Downstream point/station elevation =   503.720(Ft.)
Pipe length  =    93.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.933(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.933(CFS)
Normal flow depth in pipe =    4.83(In.)
Flow top width inside pipe =    8.98(In.)
Critical Depth =    5.31(In.)
Pipe flow velocity =      3.86(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =    11.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.410(Ac.)
Runoff from this stream =      0.933(CFS)
Time of concentration =   11.49 min.
Rainfall intensity =     3.208(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Initial subarea flow distance  =  284.000(Ft.)
Highest elevation =  511.600(Ft.)
Lowest elevation =  509.830(Ft.)
Elevation difference =    1.770(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    14.20 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*( 284.000^.5)/( 0.623^(1/3)]=  14.20
```

```
Rainfall intensity (I) =      2.966(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      1.391(CFS)
Total initial stream area =        0.670(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.670(Ac.)
Runoff from this stream =      1.391(CFS)
Time of concentration =   14.20 min.
Rainfall intensity =     2.966(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       18.000 to Point/Station       20.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Initial subarea flow distance  =   51.000(Ft.)
Highest elevation =  511.200(Ft.)
Lowest elevation =  510.700(Ft.)
Elevation difference =    0.500(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     5.18 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*(  51.000^.5)/( 0.980^(1/3)]=   5.18
Rainfall intensity (I) =      4.328(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      0.091(CFS)
Total initial stream area =        0.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   505.000(Ft.)
Downstream point/station elevation =   503.720(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.091(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.091(CFS)
```

```
Normal flow depth in pipe =    1.65(In.)
Flow top width inside pipe =    5.35(In.)
Critical Depth =    1.78(In.)
Pipe flow velocity =      2.09(Ft/s)
Travel time through pipe =    1.03 min.
Time of concentration (TC) =     6.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.030(Ac.)
Runoff from this stream =      0.091(CFS)
Time of concentration =    6.21 min.
Rainfall intensity =     4.026(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)


1        0.933     11.49            3.208
2        1.391     14.20            2.966
3        0.091      6.21            4.026
Qmax(1) =
         1.000 *    1.000 *     0.933) +
         1.000 *    0.809 *     1.391) +
         0.797 *    1.000 *     0.091) + =       2.131
Qmax(2) =
         0.925 *    1.000 *     0.933) +
         1.000 *    1.000 *     1.391) +
         0.737 *    1.000 *     0.091) + =       2.320
Qmax(3) =
         1.000 *    0.540 *     0.933) +
         1.000 *    0.437 *     1.391) +
         1.000 *    1.000 *     0.091) + =       1.203

Total of 3 main streams to confluence:
Flow rates before confluence point:
       0.933       1.391       0.091
Maximum flow rates at confluence using above data:
        2.131        2.320        1.203
Area of streams before confluence:
        0.410        0.670        0.030


Results of confluence:
Total flow rate =      2.320(CFS)
Time of concentration =    14.205 min.
```

```
Effective stream area after confluence  =      1.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   503.490(Ft.)
Downstream point/station elevation =   502.070(Ft.)
Pipe length  =   136.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.320(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.320(CFS)
Normal flow depth in pipe =    6.96(In.)
Flow top width inside pipe =   11.85(In.)
Critical Depth =    7.83(In.)
Pipe flow velocity =      4.91(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =    14.67 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   501.740(Ft.)
Downstream point/station elevation =   490.960(Ft.)
Pipe length  =    49.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.320(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     2.320(CFS)
Normal flow depth in pipe =    4.38(In.)
Flow top width inside pipe =    5.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.13(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   490.630(Ft.)
Downstream point/station elevation =   489.760(Ft.)
Pipe length  =    87.30(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.320(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.320(CFS)
Normal flow depth in pipe =    7.07(In.)
Flow top width inside pipe =   11.81(In.)
Critical Depth =    7.83(In.)
```

```
Pipe flow velocity =      4.83(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =    15.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       34.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.110(Ac.)
Runoff from this stream =      2.320(CFS)
Time of concentration =   15.02 min.
Rainfall intensity =     2.903(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       42.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Initial subarea flow distance  =  414.000(Ft.)
Highest elevation =  518.600(Ft.)
Lowest elevation =  500.400(Ft.)
Elevation difference =   18.200(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.94 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*( 414.000^.5)/( 4.396^(1/3)]=   8.94
Rainfall intensity (I) =      3.514(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      2.066(CFS)
Total initial stream area =        0.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   494.820(Ft.)
Downstream point/station elevation =   489.500(Ft.)
Pipe length  =    68.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.066(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.066(CFS)
Normal flow depth in pipe =    4.21(In.)
```

```
Flow top width inside pipe =    8.98(In.)
Critical Depth =    7.81(In.)
Pipe flow velocity =     10.18(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     9.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       34.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.840(Ac.)
Runoff from this stream =      2.066(CFS)
Time of concentration =    9.05 min.
Rainfall intensity =     3.498(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        2.320     15.02            2.903
2        2.066      9.05            3.498
Qmax(1) =
        1.000 *    1.000 *     2.320) +
        0.830 *    1.000 *     2.066) + =       4.035
Qmax(2) =
        1.000 *    0.603 *     2.320) +
        1.000 *    1.000 *     2.066) + =       3.465

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.320       2.066
Maximum flow rates at confluence using above data:
        4.035        3.465
Area of streams before confluence:
        1.110        0.840


Results of confluence:
Total flow rate =      4.035(CFS)
Time of concentration =    15.022 min.
Effective stream area after confluence  =      1.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   495.420(Ft.)
```

```
Downstream point/station elevation =   491.300(Ft.)
Pipe length  =   182.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.035(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.035(CFS)
Normal flow depth in pipe =    7.77(In.)
Flow top width inside pipe =   11.47(In.)
Critical Depth =   10.21(In.)
Pipe flow velocity =      7.49(Ft/s)
Travel time through pipe =    0.40 min.
Time of concentration (TC) =    15.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.950(Ac.)
Runoff from this stream =      4.035(CFS)
Time of concentration =   15.43 min.
Rainfall intensity =     2.874(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       30.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[MULTI - UNITS area type                    ]
Initial subarea flow distance  =  368.000(Ft.)
Highest elevation =  502.200(Ft.)
Lowest elevation =  496.320(Ft.)
Elevation difference =    5.880(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =    11.81 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7000)*( 368.000^.5)/( 1.598^(1/3)]=  11.81
Rainfall intensity (I) =      3.176(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.700
Subarea runoff =      1.290(CFS)
Total initial stream area =        0.580(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =   492.500(Ft.)
Downstream point/station elevation =   491.890(Ft.)
Pipe length  =    11.33(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.290(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.290(CFS)
Normal flow depth in pipe =    4.86(In.)
Flow top width inside pipe =    4.70(In.)
Critical depth could not be calculated.
Pipe flow velocity =      7.56(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    11.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       32.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.580(Ac.)
Runoff from this stream =      1.290(CFS)
Time of concentration =   11.84 min.
Rainfall intensity =     3.174(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)


1        4.035     15.43            2.874
2        1.290     11.84            3.174
Qmax(1) =
        1.000 *    1.000 *     4.035) +
        0.905 *    1.000 *     1.290) + =       5.203
Qmax(2) =
        1.000 *    0.767 *     4.035) +
        1.000 *    1.000 *     1.290) + =       4.387

Total of 2 main streams to confluence:
Flow rates before confluence point:
       4.035       1.290
Maximum flow rates at confluence using above data:
        5.203        4.387
Area of streams before confluence:
        1.950        0.580


Results of confluence:
Total flow rate =      5.203(CFS)
Time of concentration =    15.427 min.
```

```
Effective stream area after confluence  =      2.530(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       44.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =   489.610(Ft.)
Downstream point/station elevation =   486.000(Ft.)
Pipe length  =   232.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.203(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.203(CFS)
Normal flow depth in pipe =    8.77(In.)
Flow top width inside pipe =   14.78(In.)
Critical Depth =   11.10(In.)
Pipe flow velocity =      6.98(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =    15.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       44.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.530(Ac.)
Runoff from this stream =      5.203(CFS)
Time of concentration =   15.98 min.
Rainfall intensity =     2.834(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       50.000 to Point/Station       52.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Time of concentration computed by the
natural watersheds nomograph (App X-A)
TC = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr) + 10 min.
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  580.300(Ft.)
Lowest elevation =  577.000(Ft.)
Elevation difference =    3.300(Ft.)
TC=[(11.9*0.0114^3)/(  3.30)]^.385=  0.56 + 10 min. =    10.56 min.
Rainfall intensity (I) =      3.308(In/Hr) for a   100.0 year storm
```

```
Effective runoff coefficient used for area (Q=KCIA) is C = 0.450
Subarea runoff =      0.194(CFS)
Total initial stream area =        0.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       52.000 to Point/Station       54.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   577.000(Ft.)
Downstream point elevation =   494.300(Ft.)
Channel length thru subarea  =   320.000(Ft.)
Channel base width    =    0.500(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      0.596(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      0.596(CFS)
Depth of flow =   0.098(Ft.), Average velocity =   8.760(Ft/s)
Channel flow top width =    0.891(Ft.)
Flow Velocity =    8.76(Ft/s)
Travel time  =    0.61 min.
Time of concentration =   11.17 min.
Critical depth =      0.254(Ft.)
 Adding area flow to channel
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
[RURAL(greater than 0.5 Ac, 0.2 ha) area type]
Rainfall intensity =      3.242(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.450
Subarea runoff =      0.788(CFS) for    0.540(Ac.)
Total runoff =      0.981(CFS)   Total area =        0.67(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       54.000 to Point/Station       44.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.670(Ac.)
Runoff from this stream =      0.981(CFS)
Time of concentration =   11.17 min.
Rainfall intensity =     3.242(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)
```

```
1         5.203     15.98             2.834
2         0.981     11.17             3.242
Qmax(1) =
         1.000 *    1.000 *     5.203) +
         0.874 *    1.000 *     0.981) + =       6.061
Qmax(2) =
         1.000 *    0.699 *     5.203) +
         1.000 *    1.000 *     0.981) + =       4.617

Total of 2 main streams to confluence:
Flow rates before confluence point:
       5.203       0.981
Maximum flow rates at confluence using above data:
         6.061        4.617
Area of streams before confluence:
         2.530        0.670


Results of confluence:
Total flow rate =      6.061(CFS)
Time of concentration =    15.981 min.
Effective stream area after confluence  =      3.200(Ac.)
End of computations, total study area =           3.200 (Ac.)
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   16FEB21  TIME  13:21:51   *
*                                       *
*****************************************
```


```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*         609 SECOND STREET         *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```


```
X     X  XXXXXXX   XXXXX          X
X     X  X       X     X        XX
X     X  X       X              X
XXXXXXX  XXXX    X        XXXXX  X
X     X  X       X              X
X     X  X       X     X        X
X     X  XXXXXXX   XXXXX        XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```
         LINE          ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

                       *DIAGRAM
*** FREE ***
             1         ID   PASEO MONTRIL
             2         ID   PRELIMINARY DETENTION ANALYSIS FOR TENTATIVE MAP
             3         ID   100-YEAR STORM EVENT
             4         IT       2 01JAN90    1200     200

             5         KK    SITE
             6         KM   RATIONAL METHOD HYDROGRAPH PROGRAM
             7         KM   100-YEAR, 6-HOUR RAINFALL IS 2.8 INCHES
             8         KM   RATIONAL METHOD RUNOFF COEFFICIENT IS 0.67
             9         KM   RATIONAL METHOD TIME OF CONCENTRATION IS 15.98 MINUTES
            10         BA  0.0050
            11         IN      16 01JAN90    1152
            12         QI       0     0.4     0.4     0.4     0.4     0.4     0.5     0.5     0.5     0.6
            13         QI     0.7     0.7     0.9       1     1.5     3.4     6.1     1.2     0.8     0.6
            14         QI     0.5     0.5     0.4     0.4       0       0       0       0       0       0
            15         QI       0       0       0       0       0

            16         KK  DETAIN
            17         RS       1    STOR      -1
            18         SV       0    0.36
            19         SQ       0     1.0
            20         SE     100     101
            21         ZZ
```

```
              SCHEMATIC DIAGRAM OF STREAM NETWORK
INPUT
 LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

  NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    5        SITE
               V
               V
   16      DETAIN

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
```

```
*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*              JUN  1998                *
*           VERSION 4.1                 *
*                                       *
*  RUN DATE   16FEB21  TIME  13:21:51   *
*                                       *
*****************************************
```

```
*************************************
*                                   *
*    U.S. ARMY CORPS OF ENGINEERS   *
*    HYDROLOGIC ENGINEERING CENTER  *
*          609 SECOND STREET        *
*       DAVIS, CALIFORNIA 95616     *
*           (916) 756-1104          *
*                                   *
*************************************
```

PASEO MONTRIL
PRELIMINARY DETENTION ANALYSIS FOR TENTATIVE MAP
100-YEAR STORM EVENT

```
    IT          HYDROGRAPH TIME DATA
                      NMIN           2  MINUTES IN COMPUTATION INTERVAL
                     IDATE      1JAN90  STARTING DATE
                     ITIME        1200  STARTING TIME
                        NQ         200  NUMBER OF HYDROGRAPH ORDINATES
                     NDDATE      1JAN90  ENDING DATE
                     NDTIME        1838  ENDING TIME
                     ICENT          19  CENTURY MARK

                  COMPUTATION INTERVAL     .03 HOURS
                      TOTAL TIME BASE    6.63 HOURS

         ENGLISH UNITS
              DRAINAGE AREA         SQUARE MILES
              PRECIPITATION DEPTH   INCHES
              LENGTH, ELEVATION     FEET
              FLOW                  CUBIC FEET PER SECOND
              STORAGE VOLUME        ACRE-FEET
              SURFACE AREA          ACRES
              TEMPERATURE           DEGREES FAHRENHEIT
```

*** ***

```
           **************
           *            *
  5 KK     *      SITE  *
           *            *
           **************
```

RATIONAL METHOD HYDROGRAPH PROGRAM
100-YEAR, 6-HOUR RAINFALL IS 2.8 INCHES
RATIONAL METHOD RUNOFF COEFFICIENT IS 0.67
RATIONAL METHOD TIME OF CONCENTRATION IS 15.98 MINUTES

```
  11 IN          TIME DATA FOR INPUT TIME SERIES
                      JXMIN          16  TIME INTERVAL IN MINUTES
                     JXDATE      1JAN90  STARTING DATE
                     JXTIME        1152  STARTING TIME

              SUBBASIN RUNOFF DATA

  10 BA          SUBBASIN CHARACTERISTICS
                      TAREA         .00  SUBBASIN AREA
```

***

****

HYDROGRAPH AT STATION SITE

****

DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW	DA MON HRMN	ORD	FLOW
1 JAN 1200	1	0.	1 JAN 1340	51	1.	1 JAN 1520	101	1.	1 JAN 1700	151	1.
1 JAN 1202	2	0.	1 JAN 1342	52	1.	1 JAN 1522	102	1.	1 JAN 1702	152	1.
1 JAN 1204	3	0.	1 JAN 1344	53	1.	1 JAN 1524	103	1.	1 JAN 1704	153	1.
1 JAN 1206	4	0.	1 JAN 1346	54	1.	1 JAN 1526	104	1.	1 JAN 1706	154	1.
1 JAN 1208	5	0.	1 JAN 1348	55	1.	1 JAN 1528	105	1.	1 JAN 1708	155	1.
1 JAN 1210	6	0.	1 JAN 1350	56	1.	1 JAN 1530	106	1.	1 JAN 1710	156	1.
1 JAN 1212	7	0.	1 JAN 1352	57	1.	1 JAN 1532	107	1.	1 JAN 1712	157	1.
1 JAN 1214	8	0.	1 JAN 1354	58	1.	1 JAN 1534	108	1.	1 JAN 1714	158	1.
1 JAN 1216	9	0.	1 JAN 1356	59	1.	1 JAN 1536	109	2.	1 JAN 1716	159	1.
1 JAN 1218	10	0.	1 JAN 1358	60	1.	1 JAN 1538	110	2.	1 JAN 1718	160	1.
1 JAN 1220	11	0.	1 JAN 1400	61	1.	1 JAN 1540	111	2.	1 JAN 1720	161	1.
1 JAN 1222	12	0.	1 JAN 1402	62	1.	1 JAN 1542	112	2.	1 JAN 1722	162	1.
1 JAN 1224	13	0.	1 JAN 1404	63	1.	1 JAN 1544	113	2.	1 JAN 1724	163	1.
1 JAN 1226	14	0.	1 JAN 1406	64	1.	1 JAN 1546	114	3.	1 JAN 1726	164	1.
1 JAN 1228	15	0.	1 JAN 1408	65	1.	1 JAN 1548	115	3.	1 JAN 1728	165	1.
1 JAN 1230	16	0.	1 JAN 1410	66	1.	1 JAN 1550	116	3.	1 JAN 1730	166	0.
1 JAN 1232	17	0.	1 JAN 1412	67	1.	1 JAN 1552	117	3.	1 JAN 1732	167	0.
1 JAN 1234	18	0.	1 JAN 1414	68	1.	1 JAN 1554	118	4.	1 JAN 1734	168	0.
1 JAN 1236	19	0.	1 JAN 1416	69	1.	1 JAN 1556	119	4.	1 JAN 1736	169	0.
1 JAN 1238	20	0.	1 JAN 1418	70	1.	1 JAN 1558	120	4.	1 JAN 1738	170	0.
1 JAN 1240	21	0.	1 JAN 1420	71	1.	1 JAN 1600	121	5.	1 JAN 1740	171	0.
1 JAN 1242	22	0.	1 JAN 1422	72	1.	1 JAN 1602	122	5.	1 JAN 1742	172	0.
1 JAN 1244	23	0.	1 JAN 1424	73	1.	1 JAN 1604	123	5.	1 JAN 1744	173	0.
1 JAN 1246	24	0.	1 JAN 1426	74	1.	1 JAN 1606	124	6.	1 JAN 1746	174	0.
1 JAN 1248	25	0.	1 JAN 1428	75	1.	1 JAN 1608	125	6.	1 JAN 1748	175	0.
1 JAN 1250	26	0.	1 JAN 1430	76	1.	1 JAN 1610	126	5.	1 JAN 1750	176	0.
1 JAN 1252	27	0.	1 JAN 1432	77	1.	1 JAN 1612	127	5.	1 JAN 1752	177	0.
1 JAN 1254	28	0.	1 JAN 1434	78	1.	1 JAN 1614	128	4.	1 JAN 1754	178	0.
1 JAN 1256	29	0.	1 JAN 1436	79	1.	1 JAN 1616	129	4.	1 JAN 1756	179	0.
1 JAN 1258	30	0.	1 JAN 1438	80	1.	1 JAN 1618	130	3.	1 JAN 1758	180	0.
1 JAN 1300	31	0.	1 JAN 1440	81	1.	1 JAN 1620	131	2.	1 JAN 1800	181	0.
1 JAN 1302	32	0.	1 JAN 1442	82	1.	1 JAN 1622	132	2.	1 JAN 1802	182	0.
1 JAN 1304	33	0.	1 JAN 1444	83	1.	1 JAN 1624	133	1.	1 JAN 1804	183	0.
1 JAN 1306	34	0.	1 JAN 1446	84	1.	1 JAN 1626	134	1.	1 JAN 1806	184	0.
1 JAN 1308	35	0.	1 JAN 1448	85	1.	1 JAN 1628	135	1.	1 JAN 1808	185	0.
1 JAN 1310	36	0.	1 JAN 1450	86	1.	1 JAN 1630	136	1.	1 JAN 1810	186	0.
1 JAN 1312	37	0.	1 JAN 1452	87	1.	1 JAN 1632	137	1.	1 JAN 1812	187	0.
1 JAN 1314	38	0.	1 JAN 1454	88	1.	1 JAN 1634	138	1.	1 JAN 1814	188	0.
1 JAN 1316	39	0.	1 JAN 1456	89	1.	1 JAN 1636	139	1.	1 JAN 1816	189	0.
1 JAN 1318	40	0.	1 JAN 1458	90	1.	1 JAN 1638	140	1.	1 JAN 1818	190	0.
1 JAN 1320	41	0.	1 JAN 1500	91	1.	1 JAN 1640	141	1.	1 JAN 1820	191	0.
1 JAN 1322	42	0.	1 JAN 1502	92	1.	1 JAN 1642	142	1.	1 JAN 1822	192	0.
1 JAN 1324	43	0.	1 JAN 1504	93	1.	1 JAN 1644	143	1.	1 JAN 1824	193	0.
1 JAN 1326	44	0.	1 JAN 1506	94	1.	1 JAN 1646	144	1.	1 JAN 1826	194	0.
1 JAN 1328	45	1.	1 JAN 1508	95	1.	1 JAN 1648	145	1.	1 JAN 1828	195	0.
1 JAN 1330	46	1.	1 JAN 1510	96	1.	1 JAN 1650	146	1.	1 JAN 1830	196	0.
1 JAN 1332	47	1.	1 JAN 1512	97	1.	1 JAN 1652	147	1.	1 JAN 1832	197	0.
1 JAN 1334	48	1.	1 JAN 1514	98	1.	1 JAN 1654	148	1.	1 JAN 1834	198	0.
1 JAN 1336	49	1.	1 JAN 1516	99	1.	1 JAN 1656	149	1.	1 JAN 1836	199	0.
1 JAN 1338	50	1.	1 JAN 1518	100	1.	1 JAN 1658	150	1.	1 JAN 1838	200	0.

****

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	6.63-HR
+ (CFS)	(HR)				
	(CFS)				
+ 6.	4.13	1.	1.	1.	1.
	(INCHES)	1.866	1.880	1.880	1.880
	(AC-FT)	0.	1.	1.	1.

CUMULATIVE AREA = .00 SQ MI

*** ***

```
          **************
          *            *
 16 KK    *    DETAIN  *
          *            *
          **************

             HYDROGRAPH ROUTING DATA

 17 RS          STORAGE ROUTING
                     NSTPS          1  NUMBER OF SUBREACHES
                      ITYP       STOR  TYPE OF INITIAL CONDITION
                     RSVRIC      -1.00  INITIAL CONDITION
                          X        .00 WORKING R AND D COEFFICIENT

 18 SV            STORAGE          .0        .4

 19 SQ          DISCHARGE          0.        1.

 20 SE          ELEVATION      100.00    101.00

                                                    ***
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HYDROGRAPH AT STATION DETAIN

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DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE	DA MON HRMN	ORD	OUTFLOW	STORAGE	STAGE
1 JAN 1200	1	0.	.1	100.2	1 JAN 1414	68	0.	.1	100.3	1 JAN 1628	135	1.	.4	101.0
1 JAN 1202	2	0.	.1	100.2	1 JAN 1416	69	0.	.1	100.3	1 JAN 1630	136	1.	.4	101.0
1 JAN 1204	3	0.	.1	100.2	1 JAN 1418	70	0.	.1	100.3	1 JAN 1632	137	1.	.4	101.0
1 JAN 1206	4	0.	.1	100.2	1 JAN 1420	71	0.	.1	100.3	1 JAN 1634	138	1.	.4	101.0
1 JAN 1208	5	0.	.1	100.2	1 JAN 1422	72	0.	.1	100.3	1 JAN 1636	139	1.	.4	101.0
1 JAN 1210	6	0.	.1	100.2	1 JAN 1424	73	0.	.1	100.3	1 JAN 1638	140	1.	.4	101.0
1 JAN 1212	7	0.	.1	100.2	1 JAN 1426	74	0.	.1	100.3	1 JAN 1640	141	1.	.4	101.0
1 JAN 1214	8	0.	.1	100.2	1 JAN 1428	75	0.	.1	100.3	1 JAN 1642	142	1.	.4	101.0
1 JAN 1216	9	0.	.1	100.2	1 JAN 1430	76	0.	.1	100.3	1 JAN 1644	143	1.	.4	101.0
1 JAN 1218	10	0.	.1	100.2	1 JAN 1432	77	0.	.1	100.3	1 JAN 1646	144	1.	.4	101.0
1 JAN 1220	11	0.	.1	100.2	1 JAN 1434	78	0.	.1	100.3	1 JAN 1648	145	1.	.4	101.0
1 JAN 1222	12	0.	.1	100.2	1 JAN 1436	79	0.	.1	100.3	1 JAN 1650	146	1.	.4	101.0
1 JAN 1224	13	0.	.1	100.2	1 JAN 1438	80	0.	.1	100.3	1 JAN 1652	147	1.	.4	101.0
1 JAN 1226	14	0.	.1	100.2	1 JAN 1440	81	0.	.1	100.3	1 JAN 1654	148	1.	.4	101.0
1 JAN 1228	15	0.	.1	100.2	1 JAN 1442	82	0.	.1	100.3	1 JAN 1656	149	1.	.4	101.0
1 JAN 1230	16	0.	.1	100.2	1 JAN 1444	83	0.	.1	100.3	1 JAN 1658	150	1.	.3	101.0
1 JAN 1232	17	0.	.1	100.2	1 JAN 1446	84	0.	.1	100.3	1 JAN 1700	151	1.	.3	101.0
1 JAN 1234	18	0.	.1	100.2	1 JAN 1448	85	0.	.1	100.3	1 JAN 1702	152	1.	.3	101.0
1 JAN 1236	19	0.	.1	100.2	1 JAN 1450	86	0.	.1	100.3	1 JAN 1704	153	1.	.3	101.0
1 JAN 1238	20	0.	.1	100.2	1 JAN 1452	87	0.	.1	100.4	1 JAN 1706	154	1.	.3	101.0
1 JAN 1240	21	0.	.1	100.2	1 JAN 1454	88	0.	.1	100.4	1 JAN 1708	155	1.	.3	101.0
1 JAN 1242	22	0.	.1	100.2	1 JAN 1456	89	0.	.1	100.4	1 JAN 1710	156	1.	.3	101.0
1 JAN 1244	23	0.	.1	100.2	1 JAN 1458	90	0.	.1	100.4	1 JAN 1712	157	1.	.3	100.9
1 JAN 1246	24	0.	.1	100.2	1 JAN 1500	91	0.	.1	100.4	1 JAN 1714	158	1.	.3	100.9
1 JAN 1248	25	0.	.1	100.2	1 JAN 1502	92	0.	.1	100.4	1 JAN 1716	159	1.	.3	100.9
1 JAN 1250	26	0.	.1	100.2	1 JAN 1504	93	0.	.1	100.4	1 JAN 1718	160	1.	.3	100.9
1 JAN 1252	27	0.	.1	100.2	1 JAN 1506	94	0.	.1	100.4	1 JAN 1720	161	1.	.3	100.9
1 JAN 1254	28	0.	.1	100.2	1 JAN 1508	95	0.	.1	100.4	1 JAN 1722	162	1.	.3	100.9
1 JAN 1256	29	0.	.1	100.2	1 JAN 1510	96	0.	.1	100.4	1 JAN 1724	163	1.	.3	100.9
1 JAN 1258	30	0.	.1	100.2	1 JAN 1512	97	0.	.1	100.4	1 JAN 1726	164	1.	.3	100.9
1 JAN 1300	31	0.	.1	100.2	1 JAN 1514	98	0.	.1	100.4	1 JAN 1728	165	1.	.3	100.9
1 JAN 1302	32	0.	.1	100.2	1 JAN 1516	99	0.	.1	100.4	1 JAN 1730	166	1.	.3	100.9
1 JAN 1304	33	0.	.1	100.2	1 JAN 1518	100	0.	.1	100.4	1 JAN 1732	167	1.	.3	100.9
1 JAN 1306	34	0.	.1	100.2	1 JAN 1520	101	0.	.1	100.4	1 JAN 1734	168	1.	.3	100.9
1 JAN 1308	35	0.	.1	100.2	1 JAN 1522	102	0.	.1	100.4	1 JAN 1736	169	1.	.3	100.9
1 JAN 1310	36	0.	.1	100.2	1 JAN 1524	103	0.	.1	100.4	1 JAN 1738	170	1.	.3	100.9
1 JAN 1312	37	0.	.1	100.2	1 JAN 1526	104	0.	.2	100.4	1 JAN 1740	171	1.	.3	100.9
1 JAN 1314	38	0.	.1	100.2	1 JAN 1528	105	0.	.2	100.4	1 JAN 1742	172	1.	.3	100.9
1 JAN 1316	39	0.	.1	100.2	1 JAN 1530	106	0.	.2	100.4	1 JAN 1744	173	1.	.3	100.9
1 JAN 1318	40	0.	.1	100.2	1 JAN 1532	107	0.	.2	100.4	1 JAN 1746	174	1.	.3	100.9

1	JAN	1320	41	0.	.1	100.3	*	1	JAN	1534	108	0.	.2	100.4	*	1	JAN	1748	175	1.	.3	100.9
1	JAN	1322	42	0.	.1	100.3	*	1	JAN	1536	109	0.	.2	100.5	*	1	JAN	1750	176	1.	.3	100.9
1	JAN	1324	43	0.	.1	100.3	*	1	JAN	1538	110	0.	.2	100.5	*	1	JAN	1752	177	1.	.3	100.9
1	JAN	1326	44	0.	.1	100.3	*	1	JAN	1540	111	0.	.2	100.5	*	1	JAN	1754	178	1.	.3	100.9
1	JAN	1328	45	0.	.1	100.3	*	1	JAN	1542	112	0.	.2	100.5	*	1	JAN	1756	179	1.	.3	100.9
1	JAN	1330	46	0.	.1	100.3	*	1	JAN	1544	113	1.	.2	100.5	*	1	JAN	1758	180	1.	.3	100.9
1	JAN	1332	47	0.	.1	100.3	*	1	JAN	1546	114	1.	.2	100.5	*	1	JAN	1800	181	1.	.3	100.9
1	JAN	1334	48	0.	.1	100.3	*	1	JAN	1548	115	1.	.2	100.5	*	1	JAN	1802	182	1.	.3	100.9
1	JAN	1336	49	0.	.1	100.3	*	1	JAN	1550	116	1.	.2	100.6	*	1	JAN	1804	183	1.	.3	100.9
1	JAN	1338	50	0.	.1	100.3	*	1	JAN	1552	117	1.	.2	100.6	*	1	JAN	1806	184	1.	.3	100.9
1	JAN	1340	51	0.	.1	100.3	*	1	JAN	1554	118	1.	.2	100.6	*	1	JAN	1808	185	1.	.3	100.8
1	JAN	1342	52	0.	.1	100.3	*	1	JAN	1556	119	1.	.2	100.6	*	1	JAN	1810	186	1.	.3	100.8
1	JAN	1344	53	0.	.1	100.3	*	1	JAN	1558	120	1.	.2	100.7	*	1	JAN	1812	187	1.	.3	100.8
1	JAN	1346	54	0.	.1	100.3	*	1	JAN	1600	121	1.	.2	100.7	*	1	JAN	1814	188	1.	.3	100.8
1	JAN	1348	55	0.	.1	100.3	*	1	JAN	1602	122	1.	.3	100.7	*	1	JAN	1816	189	1.	.3	100.8
1	JAN	1350	56	0.	.1	100.3	*	1	JAN	1604	123	1.	.3	100.7	*	1	JAN	1818	190	1.	.3	100.8
1	JAN	1352	57	0.	.1	100.3	*	1	JAN	1606	124	1.	.3	100.8	*	1	JAN	1820	191	1.	.3	100.8
1	JAN	1354	58	0.	.1	100.3	*	1	JAN	1608	125	1.	.3	100.8	*	1	JAN	1822	192	1.	.3	100.8
1	JAN	1356	59	0.	.1	100.3	*	1	JAN	1610	126	1.	.3	100.9	*	1	JAN	1824	193	1.	.3	100.8
1	JAN	1358	60	0.	.1	100.3	*	1	JAN	1612	127	1.	.3	100.9	*	1	JAN	1826	194	1.	.3	100.8
1	JAN	1400	61	0.	.1	100.3	*	1	JAN	1614	128	1.	.3	100.9	*	1	JAN	1828	195	1.	.3	100.8
1	JAN	1402	62	0.	.1	100.3	*	1	JAN	1616	129	1.	.3	100.9	*	1	JAN	1830	196	1.	.3	100.8
1	JAN	1404	63	0.	.1	100.3	*	1	JAN	1618	130	1.	.3	101.0	*	1	JAN	1832	197	1.	.3	100.8
1	JAN	1406	64	0.	.1	100.3	*	1	JAN	1620	131	1.	.4	101.0	*	1	JAN	1834	198	1.	.3	100.8
1	JAN	1408	65	0.	.1	100.3	*	1	JAN	1622	132	1.	.4	101.0	*	1	JAN	1836	199	1.	.3	100.8
1	JAN	1410	66	0.	.1	100.3	*	1	JAN	1624	133	1.	.4	101.0	*	1	JAN	1838	200	1.	.3	100.8
1	JAN	1412	67	0.	.1	100.3	*	1	JAN	1626	134	1.	.4	101.0	*							
							*								*							

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PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	6.63-HR
+ (CFS)	(HR)					
		(CFS)				
+ 1.	4.47		1.	1.	1.	1.
		(INCHES)	1.085	1.127	1.127	1.127
		(AC-FT)	0.	0.	0.	0.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
		6-HR	24-HR	72-HR	6.63-HR
+ (AC-FT)	(HR)				
0.	4.50	0.	0.	0.	0.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
		6-HR	24-HR	72-HR	6.63-HR
+ (FEET)	(HR)				
100.99	4.53	100.58	100.55	100.55	100.55

CUMULATIVE AREA = .00 SQ MI

RUNOFF SUMMARY
FLOW IN CUBIC FEET PER SECOND
TIME IN HOURS, AREA IN SQUARE MILES

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	SITE	6.	4.13	1.	1.	1.	.00		
+	ROUTED TO	DETAIN	1.	4.47	1.	1.	1.	.00		
+									100.99	4.53

*** NORMAL END OF HEC-1 ***

Attachment 6
Geotechnical and Groundwater Investigation Report

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

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INFILTRATION FEASIBILITY CONDITION LETTER

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

PARDEE HOMES
SAN DIEGO, CALIFORNIA

NOVEMBER 23, 2020
PROJECT NO. G2209-42-01

Project No. G2209-42-01
November 23, 2020

Pardee Homes
13400 Sabre Springs Parkway, Suite 200
San Diego, California 92128

Attention: Ms. April Tornillo

Subject: INFILTRATION FEASIBILITY CONDITION LETTER
PASEO MONTRIL
SAN DIEGO, CALIFORNIA

References:
1. *Update No. 2 to Geotechnical Investigation Report, Paseo Montril, San Diego, California,* prepared by Geocon Incorporated, dated September 28, 2020 (Project No. G2209-42-01);
2. *Update Geotechnical Report, Paseo Montril, San Diego, California, prepared by Geocon Incorporated*, dated March 2, 2020 (Project No. G2209-42-01).
3. *Geotechnical Investigation, Paseo Montril, San Diego, California,* prepared by Geocon Incorporated, dated January 5, 2017 (Project No. G2209-42-01).
4. *Grading Plan, Paseo Montril VTM, P.T.S. Number 658273, City of San Diego*, prepared by Civil Sense, Inc., September 28, 2020.
5. *DMA and Hydromodification Exhibit,* prepared by Chang Consultants, undated.

Dear Ms. Tornillo:

At your request, we have prepared this report regarding storm water management for the subject project. Previous recommendations specific to storm water management, as well as a summary of expected soil conditions, are provided in Reference 1. Based on References 4 and 5, an underground detention system on the east side of the site is being proposed for storm water management. Due to the presence of very hard metamorphic rock, expansive soils, existing hill side and cut slopes, and undocumented fills, we are recommending the site be classified as a "No Infiltration" condition.

SITE AND PROJECT DESCRIPTION

The project is located east of the terminus of Paseo Montril and west of Interstate 15 in San Diego, California. The property to be graded is approximately 4.5 acres and consists of an ungraded natural hillside covered by coastal sage scrub and non-native grass. Site elevations across the area to be

graded range from approximately 567 feet above mean sea level (MSL) at the north end of the property to approximately 465 feet MSL at the south end. Residential homes lie north of the site. A commercial center exists west of the property. Natural hill sides are present on east side of the property. A graded cut slope and Interstate 15 lie south of the property.

Based on the referenced plan, the site will be graded to construct 5 multi-story multi-family apartment buildings. Retaining walls and slopes are planned along the perimeter of the property and in the interior of the property. A retaining wall with a height up to approximately 25 feet is planned on the north side of the site. A 1.5:1 (horizontal to vertical) cut slope with a height of approximately 30 feet will be constructed in the native bedrock above the wall. Retaining walls up to 20 feet high are planned around the perimeter of the property and a wall up to 10 feet is planned on the interior of the property between the upper and lower building pads. Fill slopes with an inclination of 2:1 and heights up to approximately 30 feet will also be constructed on the property.

Below is the specific information requested from Section C.1.1 of the City's Storm Water Standards.

- **The Phase of the Project In which the geotechnical engineer first analyzed the site for infiltration feasibility:**

  The site was originally analyzed for infiltration feasibility in 2017 (Reference 3). This was performed during preliminary design.

- **Results of previous geotechnical analyses conducted in the project area, if any.**

  Geocon Incorporated performed a geotechnical investigation in 2016 (see Reference 3).

- **The development status of the site prior to the project application.**

  The site is undeveloped and consists of native hillside slopes. There has been some undocumented fill placed in the southwest portion of the site that was likely associated with construction of the adjacent commercial center.

- **The history of design discussion for the project footprint, resulting the final design determination.**

  From Civil Sense Inc.: *Pardee Homes has been evaluating the highest and best use of the property so that it complements surrounding land uses in the area, adheres to the goals of the Rancho Peñasquitos Community Plan, and creates much-needed housing in the City of San Diego located in close proximity to retail, schools, jobs and transit. Concept plans developed thus far for the proposed Project consist of 55 multi-family dwelling units on 3.1 developable acres and 12 acres of open space, preserving more than 79 percent of the project site. Sensitive site design with respect to steep slopes and surrounding natural environment was evaluated. The proposed site design complies with steep hillsides regulations by maintaining development to be within 25 percent of the premises. The proposed site design consolidates and clusters the proposed development around the cul-de-sac into the southern portion of the site in order to avoid impacts to a natural drainage course that bisects the northern and*

southern portions of the site. The site encourages stepped development and proposes an access road around the development in order to terrace buildings into two tiers. The upper tier is approximately 10 feet higher than the lower tier. Additionally, the site was designed to avoid visual impacts to the community above and preserve view opportunities.

- **Full/partial infiltration BMP standard setbacks to underground utilities, structures, retaining walls, fill slopes, and natural slopes applicable to the DMA that prevent full/partial infiltration.**

  The entire property is located on a natural hillside slope. The typical set back from slopes is 50 feet. There is no place on the property where infiltration BMPs could be set back 50 feet from the slope.

  Undocumented fill is present at the southwest corner of the property and extends to depths in excess of 17 feet. Infiltration near the undocumented fill is not recommended.

  Fill slopes and retaining walls will be constructed along the perimeter of the property. Infiltrating near the fill slopes and retaining walls is not recommended.

- **Physical impairments (i.e., fire road egress, public safety considerations, etc.) that prevent full/partial infiltration.**

  There are no fire road egress or public safety considerations that prevent full/partial infiltration.

- **Consideration of site design alternative to achieve partial/full infiltration within the DMA.**

  The site was evaluated for infiltration, however, there is no place on the site where infiltration is considered feasible. The project site sits on a natural hillside slope underlain by metamorphic bedrock which will require blasting to excavate. Infiltration into the bedrock is not feasible. Additionally, the sloping ground surface inhibits infiltration as setbacks from the slope cannot be achieved. There is undocumented fill located on the southern side of the site. Infiltration into the undocumented fill is also not feasible as it could cause settlement and distress to improvements.

  Grading will result in cuts into the native formational hard bedrock within the northern approximately two thirds of the site and compacted fills on the southern one-third. In our opinion there is no location on the project site where infiltration is feasible.

- **The extent site design BMPs requirements were included in the overall design.**

  From Change Consultants: *Site design BMPs included in the overall design include preserving natural drainage pathways as well as conserving natural areas, soils, and vegetation beyond the project footprint. In addition, impervious areas are being minimized, soil compaction will only be performed where needed, dispersion is being implemented, and native or drought tolerant species will be used for landscaping*.

- **Conclusion or recommendation from the geotechnical engineer regarding the DMA's infiltration condition.**

  There are no areas on the existing property where infiltration could occur to the presence of the hill slide slopes. Additionally, the site is underlain by very hard metamorphic rock and expansive soils

that inhibit infiltration. Undocumented fill in excess of 17 feet deep is present in the southwest portion of the property. At the completion of planned grading the southern approximately one-third of the site will be underlain by compacted fill and fill slopes that are up to 30 feet tall. The northern two-thirds of the site will be cut to grade and will expose very hard rock. Retaining walls will also exist along the perimeter of the graded areas.

Considering the hill side slopes it is our opinion that full and partial infiltration is infeasible due to the potential for lateral water migration.

Infiltration into the undocumented fill and proposed structural fills that will exists after grading, will cause soil movement and subsequent distress. Infiltration behind retaining walls is also not recommended due to the potential to cause wall movement and distress.

- **An Exhibit for all applicable DMA's that clearly labels:**
  - **Proposed development areas and development type.**
  - **All applicable features and setbacks that prevent partial or full infiltration, including underground utilities, structures, retaining walls, fill slopes, natural slopes, and existing fill materials greater than 5 feet.**
  - **Potential locations for structural BMPs.**
  - **Areas where full/partial infiltration BMPs cannot be proposed.**

  Figure 1 is the geologic map using the grading plan as a base map. Cross sections are provided on Figures 2 and 3. The hard metamorphic rock is labeled as Mzu. The figures shows the development area, the natural hillside slope, and proposed buildings, retaining walls, and improvements. Figure 2 is the DMA exhibit. As the entire property is underlain by hillside slope and metamorphic rock, there are no potential locations where infiltration BMPs could be constructed at an appropriate setback from the slope and in soils that are suitable for infiltration.

If you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

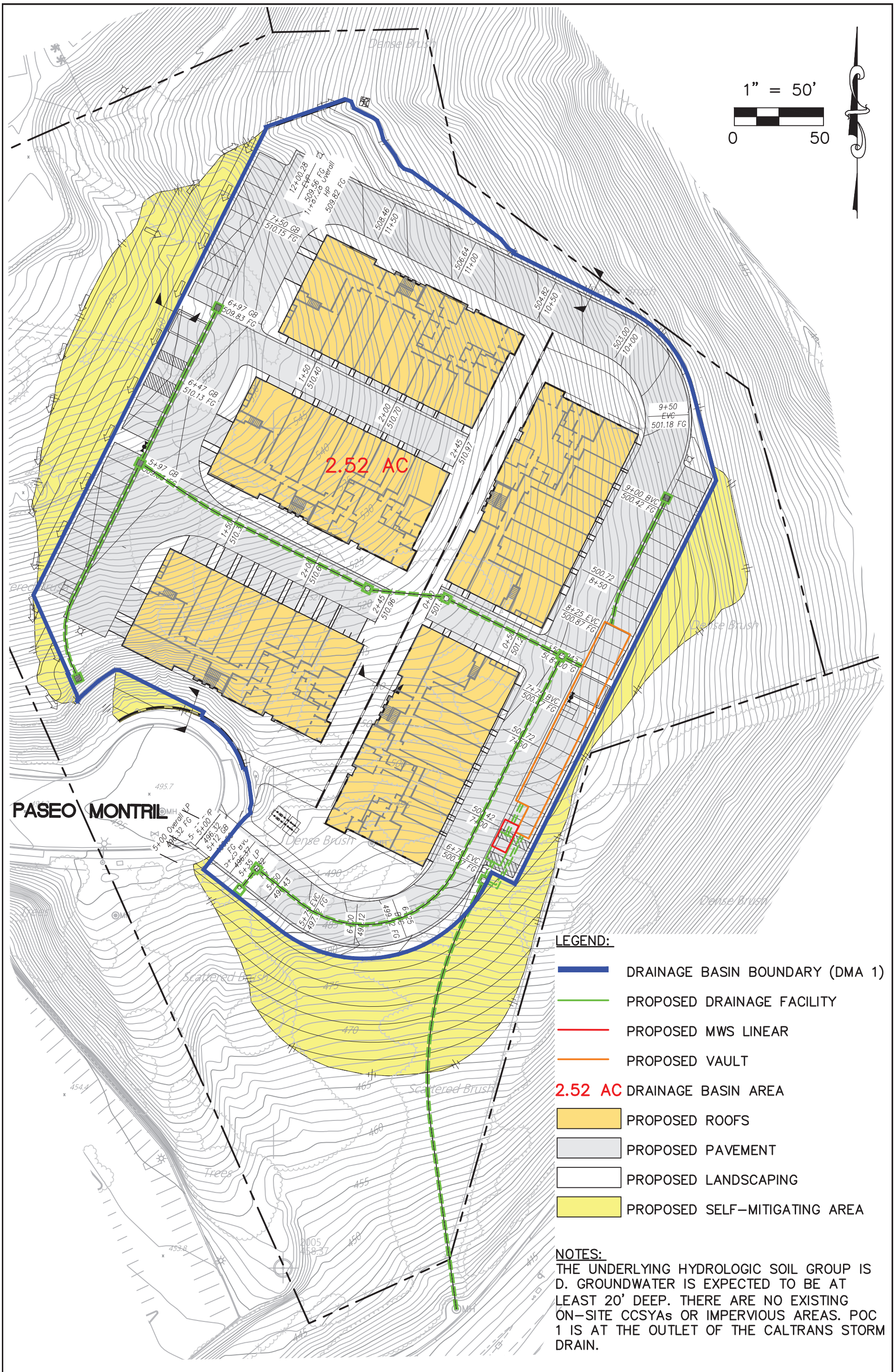
GEOCON INCORPORATED

Rodney C. Mikesell
GE 2533

REGISTERED PROFESSIONAL ENGINEER
RODNEY C. MIKESELL
No.2533
GEOTECHNICAL
STATE OF CALIFORNIA

RCM:dmc

(e-mail) Addressee



NOTES:
THE UNDERLYING HYDROLOGIC SOIL GROUP IS D. GROUNDWATER IS EXPECTED TO BE AT LEAST 20' DEEP. THERE ARE NO EXISTING ON-SITE CCSYAs OR IMPERVIOUS AREAS. POC 1 IS AT THE OUTLET OF THE CALTRANS STORM DRAIN.

ATTACHMENT 1A AND 2A
DMA AND HYDROMODIFICATION MANAGEMENT EXHIBIT

GRAPHIC SCALE

0' 20' 40' 60' 80' 120' 160'

SCALE 1"=40' (on 36x24)

GEOCON LEGEND

- Qpf .....PREVIOUSLY PLACED FILL
- Qal .....ALLUVIUM
- Qudf .....UNDOCUMENTED FILL
- Mzu .....METAMORPHIC ROCK
- ~? .....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)
- T-4 .....APPROX. LOCATION OF TRENCH
- AT-6 .....APPROX. LOCATION OF AIR TRACK BORING
- (+17) .....APPROX. DEPTH TO BEDROCK
- [15] .....APPROX. DEPTH OF RIPPABLE MATERIAL BASED ON PENETRATION RATE OF 20 SPF
- A A' .....APPROX. LOCATION OF GEOLOGIC CROSS SECTION

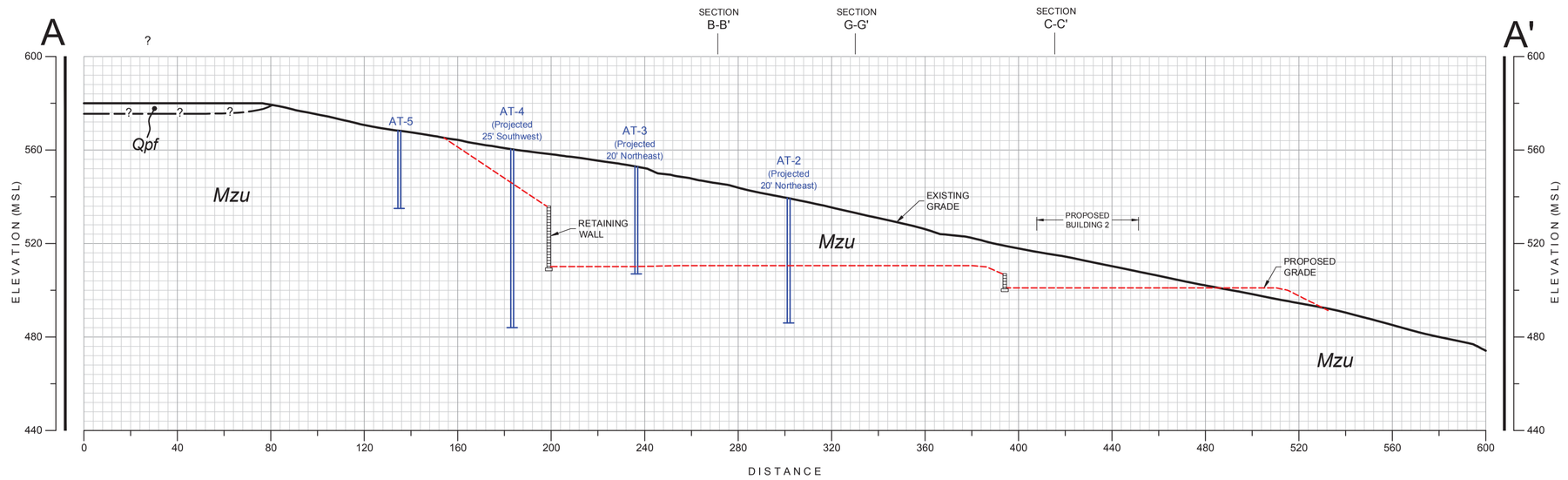
GEOLOGIC MAP

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

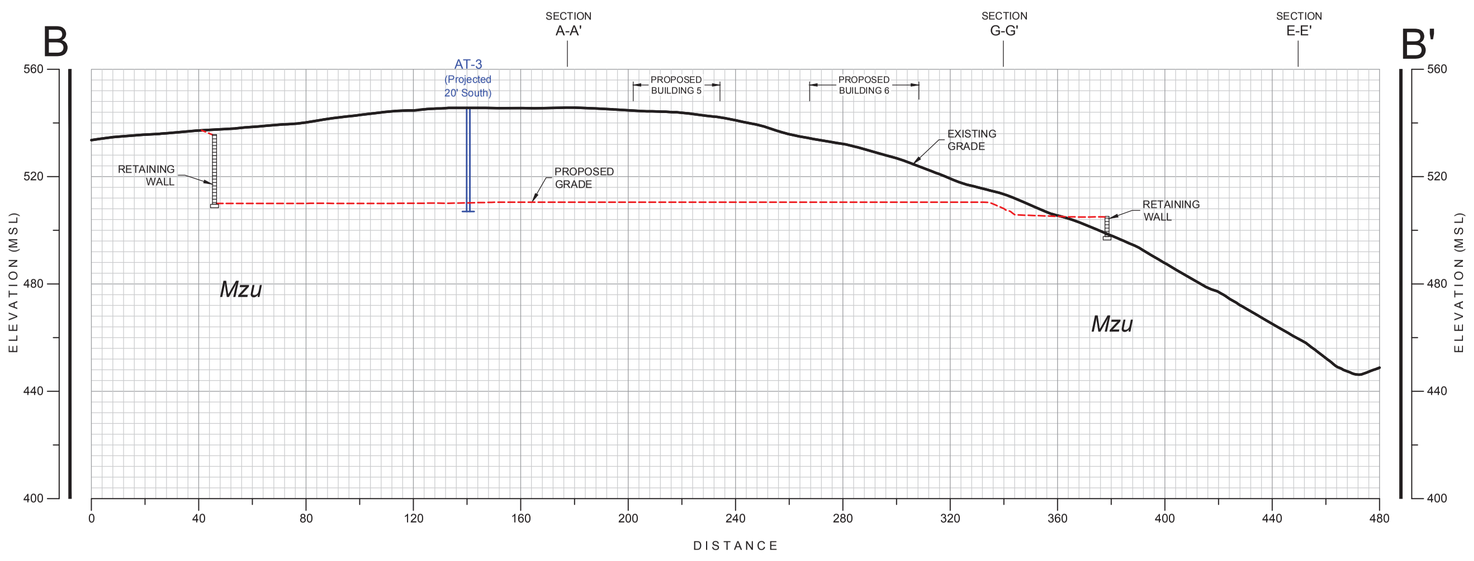
SCALE	1" = 40'	DATE	11 - 23 - 2020
PROJECT NO.	G2209 - 42 - 01	FIGURE	1
SHEET	1 OF 1		

Plotted:11/20/2020 3:52PM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\SHEETS\G2209-42-01 Geo Map 20.dwg



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)



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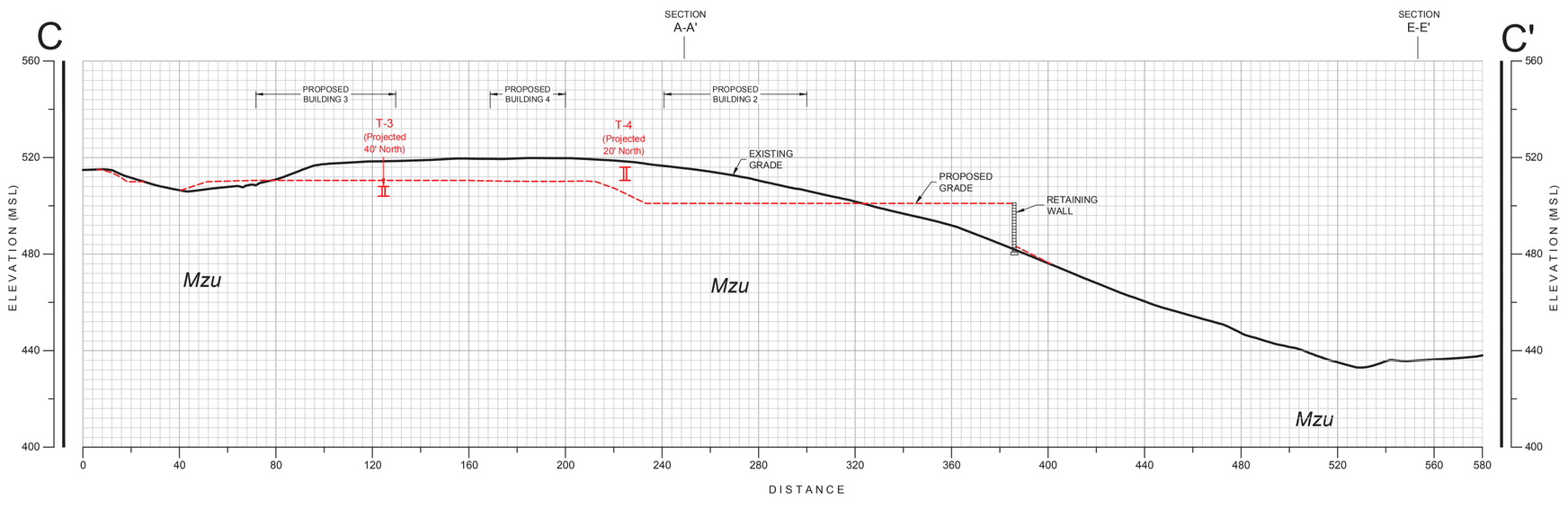

GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

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- AT-6 .....APPROX. LOCATION OF AIR TRACK BORING
- ?..... APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

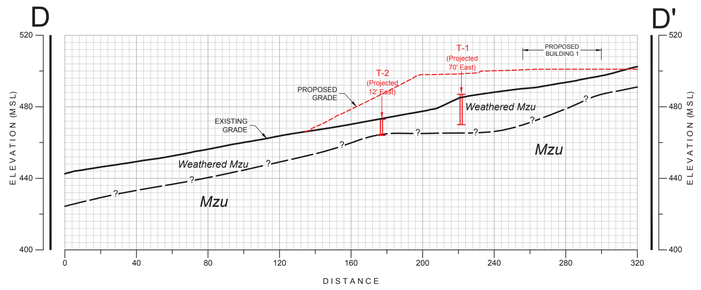
GEOLOGIC CROSS SECTIONS

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

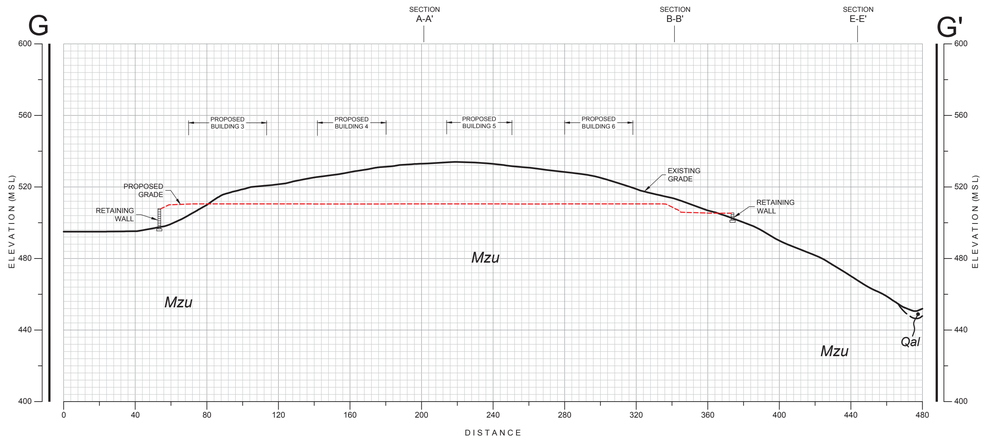
SCALE	1" = 40'	DATE	11 - 23 - 2020
PROJECT NO.	G2209 - 42 - 01	FIGURE	2
SHEET	1 OF 2		

Plotted:11/20/2020 3:52PM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\SHEETS\G2209-42-01 XSections 20.dwg



GEOLOGIC CROSS-SECTION D-D'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION G-G'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

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GEOLOGIC CROSS SECTIONS

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 40'	DATE 09 - 28 - 2020
PROJECT NO. G2209 - 42 - 01	FIGURE 3
SHEET 2 OF 2	

Plotted:11/20/2020 3:52PM | By:JONATHAN WILKINS | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\SHEETS\G2209-42-01 XSections 20.dwg

UPDATE GEOTECHNICAL REPORT

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

PARDEE HOMES
SAN DIEGO, CALIFORNIA

MARCH 2, 2020
PROJECT NO. G2209-42-01

Project No. G2209-42-01
March 2, 2020

Pardee Homes
13400 Sabre Springs Parkway, Suite 200
San Diego, California 92128

Attention: Ms. April Tornillo

Subject: UPDATE GEOTECHNICAL REPORT
PASEO MONTRIL
SAN DIEGO, CALIFORNIA

Reference:
1. *Geotechnical Investigation, Paseo Montril, San Diego, California,* prepared by Geocon Incorporated, dated January 5, 2017 (Project No. G2209-42-01).
2. *Paseo Montril Vesting Tentative Map, City of San Diego*, prepared by Civil Sense, Inc., undated.

Dear Ms. Tornillo:

In accordance with your request, we prepared this update to the referenced geotechnical investigation. The building locations and proposed improvements to the site have been modified subsequent to issuing Reference 1. This update provides a revised geologic map utilizing a CAD file of reference 2 as the base map to plot boring and trench locations and geologic contacts. We are also providing updated seismic design parameters in conformance with the 2019 California Building Code (CBC).

Based on the referenced tentative map, the site will be graded to construct 6 multi-story multi-family apartment buildings. Retaining walls and slopes are planned along the perimeter of the property and in the interior of the property. Retaining walls with heights of 10 feet or less are planned. A 1.5:1 (horizontal to vertical) cut slope with a height of approximately 60 feet will be constructed in the native bedrock on the northeast side of the property. Fill slopes with an inclination of 2:1 and heights up to approximately 30 feet will be constructed on the property. An updated Geologic Map is provided on Figure 1. Updated cross-sections are provided on Figures 2 and 3.

RECOMMENDATIONS

The recommendations of the referenced geotechnical investigation that are not specifically updated in this letter remain applicable to the design and construction of the project.

1.0 Seismic Design Criteria – 2019 California Building Code

1.1 Table 1.1 summarizes site-specific design criteria obtained from the 2019 California Building Code (CBC; Based on the 2018 International Building Code [IBC] and ASCE 7-16), Chapter 16 Structural Design, Section 1613 Earthquake Loads. We used the computer program *Seismic Design Maps*, provided by the Structural Engineers Association (SEA) to calculate the seismic design parameters. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.2.2 of the 2019 CBC and Table 20.3-1 of ASCE 7-16. The values presented herein are for the risk-targeted maximum considered earthquake (MCE_R) for Site Classes B and C. Site Class B should be used for building pads underlain by compacted fill that is 10 feet or less overlying metamorphic rock. Site Class C should be used for building pads underlain by compacted fill between 10 feet and 35 feet thick overlying metamorphic rock.

TABLE 1.1
2019 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2019 CBC Reference
Site Class	B	C	Section 1613.2.2
Fill Thickness, T (feet)	0<T≤10	10<T≤35	--
MCE_R Ground Motion Spectral Response Acceleration – Class B (short), S_S	0.818g	0.818g	Figure 1613.2.1(1)
MCE_R Ground Motion Spectral Response Acceleration – Class B (1 sec), S_1	0.301g	0.301g	Figure 1613.2.1(2)
Site Coefficient, F_A	0.900	1.200	Table 1613.2.3(1)
Site Coefficient, F_V	0.800	1.500	Table 1613.2.3(2)
Site Class Modified MCE_R Spectral Response Acceleration (short), S_{MS}	0.737g	0.982g	Section 1613.2.3 (Eqn 16-36)
Site Class Modified MCE_R Spectral Response Acceleration – (1 sec), S_{M1}	0.241g	0.452g	Section 1613.2.3 (Eqn 16-37)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.491g	0.655g	Section 1613.2.4 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.161g	0.301g	Section 1613.2.4 (Eqn 16-39)

1.2 The project structural engineer and architect should evaluate the appropriate Risk Category and Seismic Design Category for the planned structures. The values presented herein assume a Risk Category of II and resulting in a Seismic Design Category D.

1.3 Table 1.2 presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-16.

TABLE 1.2
ASCE 7-16 PEAK GROUND ACCELERATION

Parameter	Value		ASCE 7-16 Reference
Site Class	B	C	Section 1613.2.2 (2019 CBC)
Mapped MCE_G Peak Ground Acceleration, PGA	0.351g	0.351g	Figure 22-7
Site Coefficient, F_{PGA}	0.900	1.200	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.316g	0.422g	Section 11.8.3 (Eqn 11.8-1)

1.4 Conformance to the criteria in Tables 1.1 and 1.2 for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

2.0 Seismic Load on Retaining Walls

2.1 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 18.3.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 15H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.422g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

3.0 Site Drainage and Moisture Protection

3.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2019 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

3.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

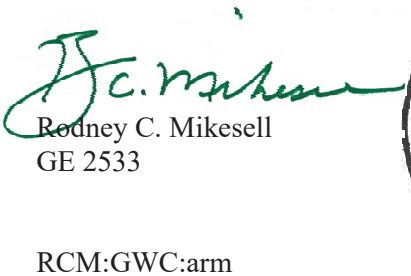
3.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

3.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. We recommend that subdrains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes be used. In addition, where landscaping is planned adjacent to the pavement, we recommend construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material.

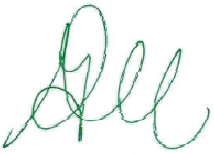
Should you have any questions regarding this letter, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

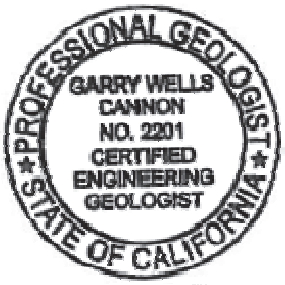
GEOCON INCORPORATED



Rodney C. Mikesell
GE 2533



Garry W. Cannon
CEG 2201
RCE 56468



RCM:GWC:arm

(e-mail) Addressee
(e-mail) Civil Sense, Inc.
Attention: Ms. Maykia Vang

GRAPHIC SCALE

0' 20' 40' 60' 80' 120' 160'

SCALE 1"=40' (on 36x24)

GEOCON LEGEND

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- Qal ..... ALLUVIUM
- Qudf ..... UNDOCUMENTED FILL
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- (+17) ..... APPROX. DEPTH TO BEDROCK
- [15] ..... APPROX. DEPTH OF RIPPABLE MATERIAL BASED ON PENETRATION RATE OF 20 SPF
- ..... APPROX. LOCATION OF GEOLOGIC CROSS SECTION

GEOLOGIC MAP

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 40'
DATE	03 - 02 - 2020
PROJECT NO.	G2209 - 42 - 01
FIGURE	1
SHEET	1 OF 1

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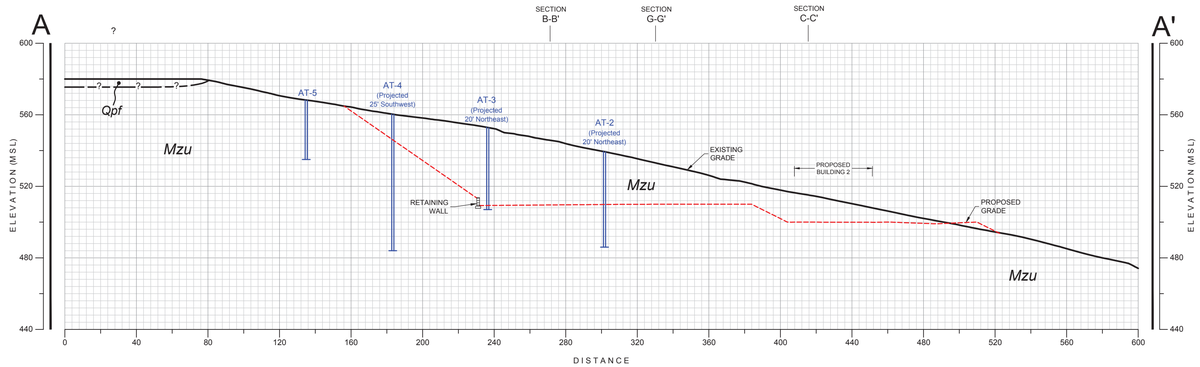
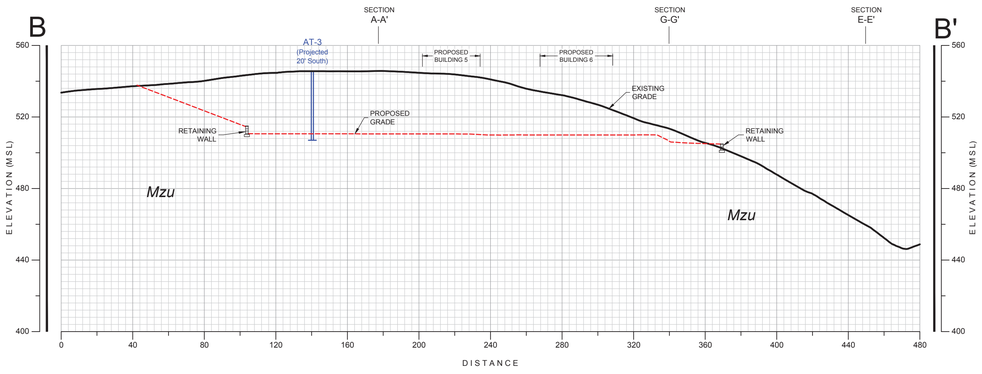


GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)



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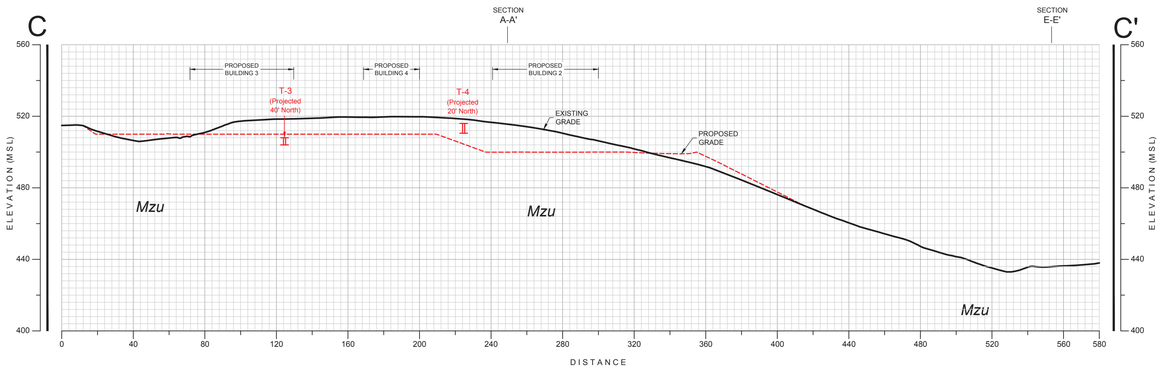

GEOLOGIC CROSS-SECTION C-C'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

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- .....APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS SECTIONS

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE	1" = 40'	DATE	03 - 02 - 2020
PROJECT NO.	G2209 - 42 - 01	FIGURE	2
SHEET	1 OF 2		

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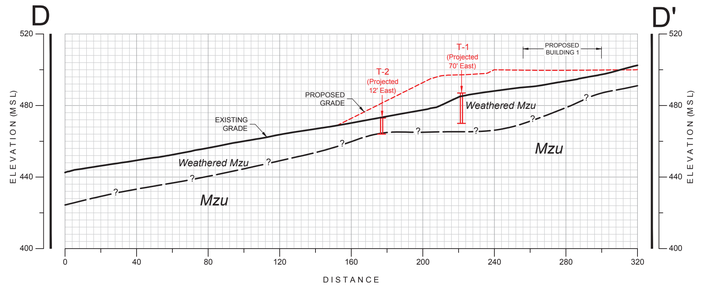
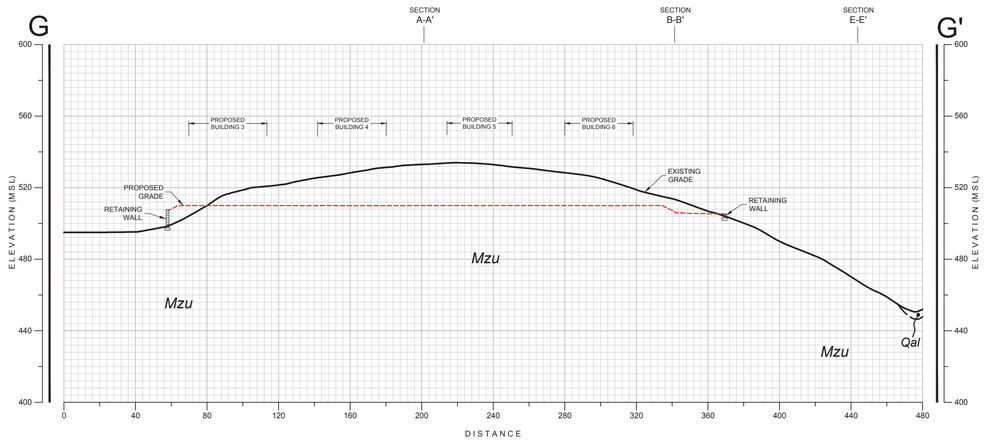


GEOLOGIC CROSS-SECTION D-D'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION G-G'

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GEOCON LEGEND

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GEOLOGIC CROSS SECTIONS

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

SCALE 1" = 40'	DATE 03 - 02 - 2020
PROJECT NO. G2209 - 42 - 01	FIGURE 3
SHEET 2 OF 2	

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GEOCON
INCORPORATED

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

GEOTECHNICAL INVESTIGATION

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

PREPARED FOR

PARDEE HOMES
SAN DIEGO, CALIFORNIA

JANUARY 5, 2017
PROJECT NO. G2209-42-01

GEOCON
INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS

Project No. G2209-42-01
January 5, 2017

Pardee Homes
13400 Sabre Springs Parkway, Suite 200
San Diego, California 92128

Attention: Mr. Allen Kashani

Subject: GEOTECHNICAL INVESTIGATION
PASEO MONTRIL
SAN DIEGO, CALIFORNIA

Dear Mr. Kashani:

In accordance with your request, we have performed a geotechnical investigation for the subject project. The accompanying report presents the findings of our study with our conclusions and recommendations pertaining to geotechnical aspects of developing the property as proposed. Based on the results of our investigation, it is our opinion that the site can be developed as proposed provided the recommendations of this report are followed.

Should you have any questions regarding this update investigation, or if we may be of further service, please contact the undersigned at your convenience.

Very truly yours,

GEOCON INCORPORATED

Rodney C. Mikesell
GE 2533

Garry W. Cannon
CEG 2201
RCE 56468

REGISTERED PROFESSIONAL ENGINEER
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PROFESSIONAL GEOLOGIST
GARRY WELLS CANNON
NO. 2201
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER
GARRY WELLS CANNON
No. C 056468
CIVIL
STATE OF CALIFORNIA

(e-mail) Addressee
(3/del) Civil Sense, Inc.
Attention: Mr. Inh Ling

6960 Flanders Drive ■ San Diego, California 92121-2974 ■ Telephone 858.558.6900 ■ Fax 858.558.6159

TABLE OF CONTENTS

TABLE OF CONTENTS (Concluded)

GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of our geotechnical investigation for the proposed Paseo Montril project located in San Diego, California (see Vicinity Map, Figure 1). The purpose of the investigation is to provide an evaluation of subsurface soil and geologic conditions at the site and, based on the conditions encountered, provide recommendations pertaining to the geotechnical aspects of developing the property. The area of planned development, as presently proposed, is presented on the Geologic Map, Figure 2.

The scope of our investigation included geologic mapping; subsurface exploration; laboratory testing; engineering analyses; and the preparation of this report. As a part of our investigation, we have reviewed published geologic maps and geologic reports related to the property and surrounding site area. A summary of the background information reviewed for this study is presented in the *List of References*.

The field investigation included geologic mapping, excavating four test pits, and drilling six, air-percussion borings. A discussion of the field investigation and logs of the trenches and borings are presented in Appendix A. The approximate locations of the exploratory trenches and borings are presented on the Geologic Map (Figure 2). We performed laboratory tests on soil samples obtained from the exploratory excavations to evaluate pertinent physical and chemical properties for engineering analysis. The results of the laboratory testing are presented in Appendix B.

Civil Sense, Inc. provided the topographic information and the site plan used during the field investigation and preparation of the Geologic Map. References to elevations presented in this report are based on the referenced topographic information. Geocon does not practice in the field of land surveying and is not responsible for the accuracy of such topographic information.

2. SITE AND PROJECT DESCRIPTION

The project is located east of the terminus of Paseo Montril and west of Interstate 15 in San Diego, California (see Vicinity Map, Figure 1). The property to be graded is approximately 4.5 acres and consists of a natural hillside covered by coastal sage scrub and non-native grass. Site elevations across the area to be graded range from approximately 580 feet above mean sea level (MSL) at the northwest corner to approximately 440 feet MSL at the southwest corner. Residential homes lie north of the site. A commercial center exists west of the property.

We understand that the property will be graded to construct 10 multi-family apartment buildings and a recreation center. A paved access road with parking stalls is planned along the perimeter of the site.

Grading will result in cuts up to 60 feet within the central and northern portions of the site, and fills up to 30 feet in the southwest corner and along the eastern edge. Retaining walls with heights ranging from less than 5 feet to 30 feet are planned along the site perimeter. The walls in the cut area will likely be soil nail walls or concrete walls. Walls in the fill areas will likely be concrete masonry unit (CMU), concrete, or mechanically stabilized earth (MSE) walls. A 1:5:1 (horizontal to vertical) cut slope will be made above the retaining wall at the north end of the property. Fill slopes with an inclination of 2:1 are planned at the southwest corner and east side of the site. We understand underground storage vaults are planned for storm water management.

The locations and descriptions provided herein are based on a site reconnaissance, review of the site plan, and project information provided by Civil Sense, Inc.

3. GEOLOGIC SETTING

The site is located in the Peninsular Ranges geomorphic province of Southern California. The Peninsular Ranges extend from Imperial Valley to the Pacific Ocean and from the Transverse Ranges into Baja California. The Peninsular Ranges are generally composed of Cretaceous age granitic rock intruded into older metamorphic rock. The Peninsular Ranges are dissected by the Elsinore Fault Zone that is associated with and sub-parallel to the San Andreas Fault Zone.

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation, geologic mapping, and published geologic maps, the site is underlain by surficial deposits consisting of undocumented fill, topsoil and weathered Mesozoic age metamorphic rock. The estimated lateral extent of the geologic units within the project boundary is shown on the Geologic Map and Cross Sections (see Figures 2 and 3) descriptions of the soil and geologic conditions are shown on the trench logs located in Appendix A and described herein.

4.1 Undocumented Fill (Qudf)

Undocumented fill was encountered in Trench T-1 and mapped along the western edge of the property. The undocumented fill was found to be approximately 4 feet thick near Trench T-1. We expect the undocumented fill could be up to 10 feet thick in the southwest corner. The undocumented fill is potentially compressible and should be removed and replaced as compacted fill.

4.2 Topsoil (Unmapped)

Topsoils blanket the majority of the site and vary in thickness from approximately 1 to 3 feet. The topsoils are characterized as stiff, dry to moist, sandy clay. Topsoil deposits are considered unsuitable in their present condition and will require removal and compaction in areas planned to receive

structural fill and/or settlement-sensitive structures. The topsoil exhibits a high expansion potential and should be placed in deeper fill areas.

4.3 Weathered Metamorphic Rock(Unmapped)

Deeply weathered metamorphic rock was encountered within the southwestern portion of the property. The weathered soils were found to depths of 8 feet and greater than 17 feet below the ground surface in trenches T-1 and T-2. The soils were found to be predominately lean to fat clay. Laboratory expansion index tests indicate the weathered soils are highly expansive. The weathered soils should be removed and replaced as compacted fill. The actual depth of required removals will be determined during grading, however, for budgetary purposes, complete removal and recompaction should be planned. The weathered soils are also sufficiently clayey and expansive that use of the soils is not recommended within the outer 15 feet of fill slopes, upper 5 feet of finish grade, or as backfill for retaining walls.

4.4 Undifferentiated Metamorphic Rock (Mzu)

Mesozoic-age Undifferentiated Metamorphic Rock is the underlying bedrock unit and is exposed at grade on the northern hillside and underlies the undocumented fill, topsoil, and the weathered metamorphic rock. This unit varies greatly in degree of weathering from highly weathered rippable materials to fresh, hard, non-rippable rock. Metamorphic rock is suitable for support of settlement sensitive structures and improvements.

To evaluate excavation and rippability characteristics, 6 air- percussion borings were performed in the northern cut area. The locations of air-percussion borings are shown on Figure 2. A discussion of rock rippability is provided below. Excavations into the metamorphic rock will require specialized rock breaking techniques and blasting to effectively excavate. It should be anticipated that excavations within this unit will generate boulders and oversize materials (rocks greater than 12 inches in dimension) that will require special handling and placement within structural fills.

5. RIPPABILITY AND ROCK CONSIDERATIONS

To aid in evaluating the rippability characteristics of the rock in proposed cut areas, 6 air-percussion borings were performed using an Ingersoll Rand ECM 370 equipped with a 4-inch bit. Drill penetration rates were used to evaluate rock rippability and to estimate the depth at which difficult excavation will occur. Rock rippability is a function of natural weathering processes that can vary vertically and horizontally over short distances depending on jointing, fracturing, and/or mineralogic discontinuities within the bedrock.

A frequently used guideline to compare rock rippability to drill penetration rate is that a penetration rate of approximately 0 to 20 seconds per foot (spf) generally indicates rippable material, 20 to 30 spf indicates marginally to non-rippable material, and greater than 30 spf indicates non-rippable rock. These general guidelines are typically based on drill rates using a rotary percussion drill rig similar to an Ingersoll Rand ECM 360 with a 3½-inch drill bit. The penetration rates (recorded in seconds per foot) for each air-track boring are presented in Appendix A.

The estimated thickness of rippable material for each air-track boring using 20 spf as the boundary between rippable and marginal to non-rippable rock is presented on the *Geologic Map*. The estimate is derived from a literal interpretation of the penetration rate from each boring log, based on the first occurrence where the penetration rate reaches 20 spf. Perspective contractors should use their own judgment to identify the penetration rate boundary between productive and non-productive ripping, and rippable and non-rippable rock.

Based on the discussion above and review of the subsurface information, it is expected that the majority of excavations within the development will experience very difficult ripping and/or blasting as excavations are extended beyond the rippable weathered mantle. Based on an air-track penetration rate of 20 spf, the thickness of the rippable rock mantle varies between 1 to 15 feet thick. Blasting techniques can be expected to generate oversized rock (rocks greater than 12-inches in dimension), which will necessitate typical hard rock handling and placement procedures during grading operations.

Estimates of the anticipated volume of hard rock materials generated from proposed excavations should be evaluated based on the information from each boring and drill penetration rate criteria acceptable to the contractor. Perspective contractors should evaluate the air-track and seismic refraction data and use their own judgment to identify the boundary between productive and non-productive ripping, and rippable and non-rippable rock. Roadway/utility corridors and lot undercutting criteria should also be considered when calculating the volume of hard rock. Proposed cuts in hard rock areas can be expected to generate oversized fragments.

Earthwork construction should be carefully planned to efficiently utilize available rock placement areas. Oversize materials should be placed in accordance with rock placement procedures presented in Appendix D of this report and governing jurisdictions. Crushing of oversize materials may be necessary to satisfy the placement requirements of this report.

6. SOIL CAPPING AND WALL BACKFILL CONSIDERATIONS

Based on our field investigation, we expect topsoil and weathered metamorphic rock to be highly expansive and not suitable for use as capping or wall backfill. It is our opinion that soil cap and wall backfill will need to be imported to the site. Alternatively, rock crushing can be utilized to produce

sufficient soil cap and wall backfill materials. If MSE type retaining walls will be utilized, the crushed product should meet wall designer specifications. Typically, MSE wall designers do not allow the use of angular rock within the backfill soil due to the potential for damage to the reinforcing grid. We expect most crushed products will be suitable for use behind conventional CMU or concrete type retaining walls. All backfill behind retaining walls should have an expansion index (EI) of 50 or less.

Capping material should be at least five feet thick within building pads and 3 feet within paved roadways. The capping material should consist of soil fill with an approximate maximum particle dimension of 6 inches with a minimum of 40 percent soil passing the ¾-inch sieve and should have at least 20 percent of the soil passing the No. 4 screen. Soils with an expansion potential (EI) of greater than 50 are not suitable for capping and should be placed in the deeper fill areas or at least 5 feet below design grade across the site and 15 feet from face of slopes. The grading contractor should take necessary steps to manage the available soils to cap the project.

7. GROUNDWATER

We did not encounter groundwater during our field investigation. Groundwater is not expected to adversely impact proposed project development. However, the Metamorphic rock has permeability characteristics and fracture systems that are conducive to water migration (natural or artificially induced by irrigation) that may result in seepage where none previously occurred. Surface drainage as well as implementation of a landscape irrigation-monitoring program can reduce this potential.

8. GEOLOGIC HAZARDS

8.1 Geologic Hazard Category

Based on the City of San Diego 2008 Seismic Safety Study, the site is located in Hazard Category 53 which is *Level or sloping terrain, unfavorable geologic structure, low to moderate risk*. It is our opinion, provided the recommendations of this report are followed, that the site will have a low risk to geologic hazards at the completion of grading.

8.2 Ground Rupture

No evidence of faulting was observed during our investigation. The USGS Fold and Fault database (USGS, 2016) shows that there are no mapped Quaternary faults crossing or trending toward the property. The site is not located within a currently established Alquist-Priolo Earthquake Fault Zone. The risk associated with ground rupture hazard due to earthquake faulting is low.

8.3 Seismicity

We performed a deterministic seismic hazard analysis using Risk Engineering (2015). Seven known active faults are located within a search radius of 50 miles from the property. We used the 2008 USGS fault database that provides several models and combinations of fault data to evaluate the fault information. Based on this database, the Newport-Inglewood/Rose Canyon and Rose Canyon Fault Zones, located approximately 11 miles west of the site, are the nearest known active faults and are the dominant source of potential ground motion. Earthquakes that might occur on the Newport-Inglewood/Rose Canyon and Rose Canyon Fault Zones or other faults within the southern California and northern Baja California area are potential generators of significant ground motion at the site. The estimated maximum earthquake magnitude and peak ground acceleration for the Newport-Inglewood/Rose Canyon Fault are 7.5 and 0.24g, respectively. Table 8.3.1 lists the estimated maximum earthquake magnitude and peak ground acceleration for the most dominant faults in relation to the site location. We calculated peak ground acceleration (PGA) using Boore-Atkinson (2008) NGA USGS2008, Campbell-Bozorgnia (2008) NGA USGS 2008, and Chiou-Youngs (2008) NGA acceleration-attenuation relationships.

TABLE 8.3.1
DETERMINISTIC SPECTRA SITE PARAMETERS

Fault Name	Distance from Site (miles)	Maximum Earthquake Magnitude (Mw)	Peak Ground Acceleration		
			Boore-Atkinson 2008 (g)	Campbell-Bozorgnia 2008 (g)	Chiou-Youngs 2008 (g)
Newport-Inglewood/Rose Canyon	11	7.5	0.23	0.19	0.24
Rose Canyon	11	6.9	0.19	0.17	0.18
Coronado Bank	25	7.4	0.13	0.10	0.11
Palos Verdes/Coronado Bank	25	7.7	0.15	0.11	0.13
Elsinore	27	7.85	0.15	0.11	0.14
Earthquake Valley	34	6.8	0.08	0.06	0.05
San Jacinto	48	7.88	0.09	0.07	0.08

In the event of a major earthquake on the referenced faults or other significant faults in the southern California and northern Baja California area, the site could be subjected to moderate to severe ground shaking. With respect to this hazard, the site is considered comparable to others in the general vicinity.

We performed a probabilistic seismic hazard analysis for the site using Risk Engineering (2015). Geologic parameters not addressed in the deterministic analysis are included in this analysis. The

program operates under the assumption that the occurrence rate of earthquakes on each mapped Quaternary fault is proportional to the faults slip rate. The program accounts for earthquake magnitude as a function of fault rupture length, and site acceleration estimates are made using the earthquake magnitude and distance from the site to the rupture zone. The program also accounts for uncertainty in each of following: (1) earthquake magnitude, (2) rupture length for a given magnitude, (3) location of the rupture zone, (4) maximum possible magnitude of a given earthquake, and (5) acceleration at the site from a given earthquake along each fault. By calculating the expected accelerations from considered earthquake sources, the program calculates the total average annual expected number of occurrences of site acceleration greater than a specified value. We utilized acceleration-attenuation relationships suggested by Boore-Atkinson (2008), Campbell-Bozorgnia (2008) and Chiou-Youngs (2008) in the analysis. Table 8.3.2 presents the site-specific probabilistic seismic hazard parameters including acceleration-attenuation relationships and the probability of exceedence.

TABLE 8.3.2
PROBABILISTIC SEISMIC HAZARD PARAMETERS

Probability of Exceedence	Peak Ground Acceleration		
	Boore-Atkinson, 2008 (g)	Campbell-Bozorgnia, 2008 (g)	Chiou-Youngs, 2008 (g)
2% in a 50 Year Period	0.36	0.35	0.39
5% in a 50 Year Period	0.27	0.26	0.27
10% in a 50 Year Period	0.21	0.20	0.20

While listing peak accelerations is useful for comparison of potential effects of fault activity in a region, other considerations are important in seismic design, including frequency and duration of motion and the soil conditions underlying the site. Seismic design of the structures should be performed in accordance with the 2016 California Building Code (CBC) guidelines currently adopted by the County of San Diego.

8.4 Liquefaction

Due to the dense underlying bedrock soils and the lack of near surface groundwater, the risk associated with liquefaction is low.

8.5 Landslides

Our geologic reconnaissance and review of available geotechnical and geologic reports for the site vicinity indicate that landslides are not present at the property or at a location that could impact the site. The risk associated with landsliding hazard is low.

8.6 Tsunamis and Seiches

The site is approximately 9 miles from the Pacific Ocean at an approximate site elevation between 440 to 580 feet above MSL. The risk associated with inundation hazard due to tsunamis is very low.

The site is no located down stream of any large bodies or water or reservoirs. The risk associated with inundation hazard due to seiche is very low.

8.7 Flooding

Our review of FEMA (2012) shows that the site is not located within a FEMA designated 100-year Flood Zone. The risk associated with flooding is low.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 General

9.1.1 No soil or geologic conditions were encountered that, in the opinion of Geocon Incorporated, would preclude the development of the property as proposed, provided the recommendations of this report are followed.

9.1.2 The site is underlain by compressible surficial soil deposits consisting of undocumented fill, topsoil and weathered metamorphic rock. Surficial soils will require remedial grading in the form of removal and recompaction. The surficial soils are also highly expansive and will require placement in deeper fill areas, away from slope faces, and outside of retaining wall backfill zones.

9.1.3 Mesozoic-age metamorphic rock underlies the surficial soil deposits and is exposed at grade in the northwestern hillside area of the property. This geologic unit is suitable for support of planned improvements and compacted fills.

9.1.4 With the exception of possible strong seismic shaking, no significant geologic hazards were observed or are known to exist that could adversely affect the proposed project.

9.1.5 The presence of hard rock within proposed cut areas will require special consideration during site development. Based on our study, the majority of the proposed excavation will encounter heavy ripping conditions with conventional heavy-duty equipment and blasting to achieve finish grade. In addition, heavy ripping and blasting will generate oversize materials that will require special handling and fill placement procedures. Oversize materials should be placed in accordance with Appendix D of this report.

9.1.6 An earthwork analysis should be performed to determine if there is an adequate volume of fill area available to accommodate the anticipated volume of blasted/oversize materials. This study should consider the proposed grading, rippability information contained in this report, rock placement requirements and include proposed undercutting of pads and streets. Consideration should be given to stockpiling select materials to be utilized for capping.

9.1.7 Based on our field investigation, we expect topsoil and weathered metamorphic rock to be highly expansive and not suitable for use as capping or wall backfill. Due to the lack of available on-site suitable soil for soil cap and wall backfill, it is our opinion that select import fill will need to be imported to the site. Alternatively, rock crushing can be utilized to produce soil cap and wall backfill materials. Specifications for soil cap and wall backfill is provided in the Grading and Retaining Wall sections of this report.

9.1.8 Cut slopes should be observed during grading by an engineering geologist to verify that the soil and geologic conditions do not differ significantly from those anticipated. Scaling of loose rock fragments from proposed cut slopes may also be necessary.

9.2 Soil and Excavation Characteristics

9.2.1 Excavation of the surficial deposits (undocumented fill, topsoil, and weathered metamorphic rock should generally require moderate to heavy effort using conventional heavy-duty grading equipment.

9.2.2 Excavating within the rock materials will generally vary in difficulty with the depth of excavation depending. Blasting will likely be required for depths below approximately 10 feet in rock cut areas. Depending on the blasting pattern and overburden thickness, the generation of oversize rock could impact project development. Oversize rock should be placed in accordance with *Recommended Grading Specifications* (Appendix D). Oversize rock may require breakage to acceptable sizes or exportation from the property. Placement of oversize rock within the area of proposed underground utilities should not be permitted.

9.2.3 The soil encountered in the field investigation is considered to be expansive (expansion index greater than 20 as defined by 2016 California Building Code (CBC) Section 1803.5.3. Table 9.2 presents soil classifications based on the expansion index.

TABLE 9.2
EXPANSION CLASSIFICATION BASED ON EXPANSION INDEX

Expansion Index (EI)	ASTM D 4829 Expansion Classification	2016 CBC Expansion Classification
0 – 20	Very Low	Non-Expansive
21 – 50	Low	Expansive
51 – 90	Medium	
91 – 130	High	
Greater Than 130	Very High	

9.2.4 On-site topsoil and weathered metamorphic rock consist predominately of fine grained clays. These materials have a high expansion potential. These soils are not expected to be suitable for capping or use as wall backfill and will require placement within deeper fill areas and away from slope faces.

9.3 Corrosion

9.3.1 We performed laboratory tests on samples of the site materials to evaluate the percentage of water-soluble sulfate content. Appendix B presents results of the laboratory water-soluble sulfate content tests. The test results indicate the on-site materials at the locations tested possess "S0" sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-14 Chapter 19. Table 9.3 presents a summary of concrete requirements set forth by 2016 CBC Section 1904 and ACI 318. The presence of water-soluble sulfates is not a visually discernible characteristic; therefore, other soil samples from the site could yield different concentrations. Additionally, over time landscaping activities (i.e., addition of fertilizers and other soil nutrients) may affect the concentration.

TABLE 9.3
REQUIREMENTS FOR CONCRETE EXPOSED TO SULFATE-CONTAINING SOLUTIONS

Exposure Class	Water-Soluble Sulfate (SO_4) Percent by Weight	Cement Type (ASTM C 150)	Maximum Water to Cement Ratio by Weight[1]	Minimum Compressive Strength (psi)
S0	$SO_4<0.10$	No Type Restriction	n/a	2,500
S1	$0.10\leq SO_4<0.20$	II	0.50	4,000
S2	$0.20\leq SO_4\leq 2.00$	V	0.45	4,500
S3	$SO_4>2.00$	V+Pozzolan or Slag	0.45	4,500

[1] Maximum water to cement ratio limits do not apply to lightweight concrete

9.3.2 Geocon Incorporated does not practice in the field of corrosion engineering; therefore, further evaluation by a corrosion engineer may be needed to incorporate the necessary precautions to avoid premature corrosion of underground pipes and buried metal in direct contact with the soils.

9.4 Slopes

9.4.1 Slope stability analyses were performed utilizing assumed shear strength parameters for low expansive compacted fill assuming imported soils. These analyses indicate that the proposed 2:1 fill slopes, constructed of soils that have a friction angle of at least 30 degrees and cohesion of 100 pounds per square foot (psf), should have calculated factor of safety of at least 1.5 under static conditions for both deep-seated failure and shallow sloughing conditions to proposed maximum project fill slope height of 50 feet. Slope stability calculations and graphical printouts for both deep-seated and surficial slope stability are presented on Figures 4 and 5.

9.4.2 Cut slopes in rock materials do not lend themselves to conventional slope stability analyses. However, Figure 6 summarizes a slope stability analysis assuming soil shear strength parameters for the rock and modeling assumed soil nails for the retaining wall. The strength parameters used are considered conservative for Metamorphic Rock. Based on our analysis and experience with similar rock conditions, 1.5:1 cut slopes to the planned heights of up to 80 feet (including the vertical wall) should possess a factor of safety of at least 1.5 with respect to global stability, if free of adversely oriented joints or fractures.

9.4.3 All cut slope excavations should be observed during grading by an engineering geologist to check that soil and geologic conditions do not differ significantly from those anticipated. In the event that adverse conditions are observed during grading such as intersecting faults planes or clay filled joints/fractures dipping out of slope, stabilization recommendations can be provided. Possible mitigation techniques such as tie-back anchors/rock bolts, rock blankets, geogrid reinforced embankments, or reducing the slope inclination may be utilized to improve the local stability of the slope. We anticipate that these remedial alternatives could be implemented within the development limits. We have observed and evaluated similar 1.5:1 (horizontal:vertical) slopes in metamorphic rock on other projects which did not require mitigation.

9.4.4 The outer 15 feet of fill slopes, measure horizontal to the slope face, should be composed of properly compacted granular "soil" fill (expansion index of 50 or less) to reduce the potential for surface sloughing.

9.4.5 Fill slopes should be compacted by backrolling with a loaded sheepsfoot roller at vertical intervals not to exceed 4 feet and should be track-walked at the completion of each slope such that the fill soils are uniformly compacted to at least 90 percent relative compaction to the face of the finished sloped. Alternatively, the fill slope may be over-built at least 3 feet and cut back to yield a properly compacted slope face.

9.4.6 All slopes should be landscaped with drought-tolerant vegetation, having variable root depths and requiring minimal landscape irrigation. In addition, all slopes should be drained and properly maintained to reduce erosion.

9.5 Subdrains

9.5.1 If rock fill is utilized on the project, subdrains may be required along the perimeter of the rock fill and at toe of slopes (see Figure 8). The need for subdrains can be determined by Geocon during grading based on the type of material that will be utilized for fill. Subdrains are also required for retaining walls.

9.6 Grading

9.6.1 All grading should be performed in accordance with the attached *Recommended Grading Specifications* (Appendix D). Where the recommendations of this section conflict with Appendix D, the recommendations of this section take precedence. All earthwork should be observed and all fills tested for proper compaction by Geocon Incorporated.

9.6.2 Prior to commencing grading, a preconstruction conference should be held at the site with the owner or developer, grading contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling and/or the grading plans can be discussed at that time.

9.6.3 Site preparation should begin with the removal of all deleterious material and vegetation. The depth of removal should be such that material exposed in cut areas or soils to be used as fill are relatively free of organic matter. Material generated during stripping and/or site demolition should be exported from the site.

9.6.4 All compressible soil deposits, including undocumented fill, topsoil, and weathered metamorphic rock within areas where structural improvements and/or structural fill are planned, should be removed to expose firm competent Metamorphic Rock and properly compacted prior to placing additional fill and/or structural loads. Deeper than normal benching and/or stripping operations for sloping ground surfaces will be required where the thickness of potentially compressible surficial deposits exceeds 3 feet. The actual extent of unsuitable soil removals will be determined in the field during grading by the geotechnical engineer and/or engineering geologist.

9.6.5. Removals at the toe of proposed fill slopes should extend horizontally beyond the edge of improvements a distance equal to the depth of removal. A typical detail of remedial grading beyond proposed grading is presented in Figure 7.

9.6.6 After removal of unsuitable materials is performed, the site should then be brought to final subgrade elevations with structural fill compacted in layers. In general, soils native to the site are suitable for re-use as fill if free from vegetation, debris and other deleterious material. Layers of fill should be no thicker than will allow for adequate bonding and compaction. All fill, including backfill and scarified ground surfaces, should be compacted to at least 90 percent of maximum dry density at or above optimum moisture content, as determined in accordance with ASTM Test Procedure D1557. Fill materials below optimum moisture content will require additional moisture conditioning prior to placing additional fill.

9.6.7 Grading operations should be scheduled to permit the placement of oversize material and expansive soils in deeper fill areas and to cap building pads with granular materials having a “very low” to “low” expansive potential (EI of 50 or less).

9.6.8 Where practical, the upper 5 feet of all building pads (cut or fill) should be comprised of soil with a “very low” to “low” expansion potential. Highly expansive fill soils should be placed in the deeper fill areas. Cobbles, rock fragments, and concretions greater than 6 inches in maximum dimension should not be placed within 3 feet of finish grade in building pad areas.

9.6.9 Cut pads exposing rock and cut/fill transition building pads should be undercut at least 5 feet and replaced with properly compacted “very low” to “low” expansive soil. The base of the undercuts should be sloped towards the front of the lots.

9.6.10 Undercutting of street areas and utilities should be performed in cut areas or areas where utilities will extend through the fill into the Metamorphic Rock to facilitate excavation of underground utilities in areas of hard rock. If subsurface improvements or landscape zones are planned outside these areas, consideration should be given to undercutting these areas as well.

9.6.11 Oversize material (defined as material greater than 12 inches in nominal dimension) will be generated during ripping and blasting of Metamorphic rock. Placement of oversize material within fills should be conducted in accordance with the recommendations in Appendix D and the oversize rock disposal detail (Figure 8). Grading operations on the site should be scheduled such that oversize materials are placed in deeper fills and at least 10 feet below finish pad grade and 2 feet below the deepest utilities.

9.6.12 Capping material should be at least five feet thick. The capping material should consist of soil fill with an approximate maximum particle dimension of 6 inches with a minimum of 40 percent soil passing the ¾-inch sieve and should have at least 20 percent of the soil passing the No. 4 screen. Soils with an expansion potential (EI) greater than 50 are not suitable for capping and should be placed in the deeper fill areas or at least 5 feet below design grade and 15 feet from face of slopes. The grading contractor should take necessary steps to manage the available soils to cap the project.

9.6.13 Based on our field investigation, we do not expect the on-site surficial soils will be suitable for capping and use as wall backfill. Import fill will be required. As an alternative, or in conjunction with importing soil, rock crushing can be considered to produce sufficient soil cap and wall backfill materials. If MSE type retaining walls will be utilized, the crushed

product should meet wall designer specifications. Typically, MSE wall designers do not allow the use of angular rock within the backfill soil due to the potential for damage to the reinforcing grid. We expect most crushed products will be suitable for use behind conventional CMU or concrete type retaining walls. All backfill behind retaining walls should have an expansion index (EI) of 50 or less.

9.6.14 It is recommended that excavations be observed during grading by a representative of Geocon Incorporated to verify that soil and geologic conditions do not differ significantly from those anticipated.

9.6.15 It is the responsibility of the contractor to ensure that all excavations and trenches are properly shored and maintained in accordance with applicable OSHA rules and regulations in order to maintain safety and maintain the stability of adjacent existing improvements.

9.6.16 Imported materials should consist of "very low" to "low" expansive (Expansion Index of 50 or less) soils. Prior to importing the material, samples from proposed borrow areas should be obtained and subjected to laboratory testing to determine whether the material conforms to the recommended criteria. At least 5 working days should be allowed for laboratory testing of the soil prior to its importation. Import materials should be free of oversize rock and construction debris.

9.7 Settlement Monitoring

9.7.1 Settlement monuments are not required.

9.8 Earthwork Grading Factors

9.8.1 Estimates of embankment shrink-swell factors are based on comparing laboratory compaction tests with the density of the material in its natural state and experience with similar soil and rock types. It should be emphasized that variations in natural soil density, as well as in compacted fill, render shrinkage value estimates very approximate. As an example, the contractor can compact fills to any relative compaction of 90 percent or higher of the laboratory maximum dry density. Thus, the contractor has at least a 10 percent range of control over the fill volume. Based on the work performed to date and considering the above discussion, the following earthwork factors may be used as a basis for estimating how much the on-site soils may shrink or swell when removed from their natural state and placed in compacted fills.

TABLE 9.8
ESTIMATED BULK AND SHRINK VALUES

Soils Unit	Shrink-Swell Factors
Undocumented Fill and Topsoil	5 to 10 Percent Shrink
Weathered Metamorphic Rock	0 to 5 percent Shrink
Metamorphic Rock	20 to 25 percent bulk

9.9 Seismic Design Criteria

9.9.1 We used the computer program *U.S. Seismic Design Maps*, provided by the USGS. Table 9.9.1 summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The short spectral response uses a period of 0.2 seconds. The values presented in Table 9.9.1 are for the risk-targeted maximum considered earthquake (MCE_R). Site Class C should be used for building pads underlain by compacted fills less 15 feet thick or less. Site Class D should be used for building pads underlain by compacted fill in excess of 15 feet. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10.

TABLE 9.9.1
2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value		2016 CBC Reference
Site Class	C	D	Section 1613.3.2
Fill Thickness, T (feet)	T≤15	T>15	--
Spectral Response – Class B (short), S_S	0.097 g	0.097 g	Figure 1613.3.1(1)
Spectral Response – Class B (1 sec), S_1	0.355 g	0.355 g	Figure 1613.3.1(2)
Site Coefficient, F_a	1.037	1.137	Table 1613.3.3(1)
Site Coefficient, F_v	1.445	1.690	Table 1613.3.3(2)
Maximum Considered Earthquake Spectral Response Acceleration (short), S_{MS}	0.941 g	1.031 g	Section 1613.3.3 (Eqn 16-37)
Maximum Considered Earthquake Spectral Response Acceleration – (1 sec), S_{M1}	0.513 g	0.600 g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S_{DS}	0.627 g	0.688 g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S_{D1}	0.342 g	0.400 g	Section 1613.3.4 (Eqn 16-40)

9.9.2 Table 9.9.2 presents additional seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10 for the mapped maximum considered geometric mean (MCE_G).

TABLE 9.9.2
2016 CBC SITE ACCELERATION PARAMETERS

Parameter	Value		ASCE 7-10 Reference
Site Class	C	D	--
Mapped MCE_G Peak Ground Acceleration, PGA	0.342 g	0.342 g	Figure 22-7
Site Coefficient, F_{PGA}	1.058	1.158	Table 11.8-1
Site Class Modified MCE_G Peak Ground Acceleration, PGA_M	0.362 g	0.396 g	Section 11.8.3 (Eqn 11.8-1)

9.9.3 Conformance to the criteria for seismic design does not constitute any guarantee or assurance that significant structural damage or ground failure will not occur in the event of a maximum level earthquake. The primary goal of seismic design is to protect life and not to avoid all damage, since such design may be economically prohibitive.

9.10 Foundation and Concrete Slab-On-Grade Recommendations

9.10.1 The foundation recommendations herein are for proposed one- to three-story residential structures. The foundation recommendations have been separated into three categories based on either the maximum and differential fill thickness or Expansion Index. The foundation category criteria are presented in Table 9.10.1.

TABLE 9.10.1
FOUNDATION CATEGORY CRITERIA

Foundation Category	Maximum Fill Thickness, T (feet)	Differential Fill Thickness, D (feet)	Expansion Index (EI)
I	T<20	--	EI≤50
II	20≤T<50	10≤D<20	50<EI≤90
III	T≥50	D≥20	90<EI≤130

9.10.2 We will provide final foundation categories for each building after finish pad grades have been achieved and we perform laboratory testing of the subgrade soil.

9.10.3 Table 9.10.2 presents minimum foundation and interior concrete slab design criteria for conventional foundation systems.

TABLE 9.10.2
CONVENTIONAL FOUNDATION RECOMMENDATIONS BY CATEGORY

Foundation Category	Minimum Footing Embedment Depth (inches)	Continuous Footing Reinforcement	Interior Slab Reinforcement
I	12	Two No. 4 bars, one top and one bottom	6 x 6 - 10/10 welded wire mesh at slab mid-point
II	18	Four No. 4 bars, two top and two bottom	No. 3 bars at 24 inches on center, both directions
III	24	Four No. 5 bars, two top and two bottom	No. 3 bars at 18 inches on center, both directions

9.10.4 The embedment depths presented in Table 9.10.2 should be measured from the lowest adjacent pad grade for both interior and exterior footings. The conventional foundations should have a minimum width of 12 inches and 24 inches for continuous and isolated footings, respectively. A typical foundation dimension detail is provided on Figure 9.

9.10.5 The concrete slab-on-grade should be a minimum of 4 inches thick for Foundation Categories I and II and 5 inches thick for Foundation Category III.

9.10.6 A vapor retarder should underlie slabs that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials. The vapor retarder design should be consistent with the guidelines presented in the American Concrete Institute's (ACI) *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (ACI 302.2R-06). The project architect or developer should specify the vapor retarder to be used based on the type of floor covering that will be installed and if the structure will possess a humidity- controlled environment.

9.10.7 The project foundation engineer, architect, and/or developer should determine the slab bedding sand thickness. We should be contacted to provide recommendations if the bedding sand is thicker than 6 inches.

9.10.8 The foundation design engineer should provide appropriate concrete mix design criteria and curing measures to assure proper curing of the slab by reducing the potential for rapid moisture loss and subsequent cracking and/or slab curl. We suggest that the foundation design engineer present the concrete mix design and proper curing methods on the

foundation plans. It is critical that the foundation contractor understands and follows the recommendations presented on the foundation plans.

9.10.9 As an alternative to the conventional foundation recommendations, consideration should be given to the use of post-tensioned concrete slab and foundation systems for the support of the proposed structures. The post-tensioned systems should be designed by a structural engineer experienced in post-tensioned slab design and design criteria of the Post-Tensioning Institute (PTI) DC 10.5-12 *Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive Soils* or *WRI/CRSI Design of Slab-on-Ground Foundations*, as required by the 2016 California Building Code (CBC Section 1808.6.2). Although this procedure was developed for expansive soil conditions, it can also be used to reduce the potential for foundation distress due to differential fill settlement. The post-tensioned design should incorporate the geotechnical parameters presented in Table 9.10.3 for the particular Foundation Category designated. The parameters presented in Table 9.10.3 are based on the guidelines presented in the PTI DC 10.5 design manual.

TABLE 9.10.3
POST-TENSIONED FOUNDATION SYSTEM DESIGN PARAMETERS

Post-Tensioning Institute (PTI), Third Edition Design Parameters	Foundation Category		
	I	II	III
Thornthwaite Index	-20	-20	-20
Equilibrium Suction	3.9	3.9	3.9
Edge Lift Moisture Variation Distance, e_M (feet)	5.3	5.1	4.9
Edge Lift, y_M (Inches)	0.61	1.10	1.58
Center Lift Moisture Variation Distance, e_M (feet)	9.0	9.0	9.0
Center Lift, y_M (inches)	0.30	0.47	0.66

9.10.10 The foundations for the post-tensioned slabs should be embedded in accordance with the recommendations of the structural engineer. If a post-tensioned mat foundation system is planned, the slab should possess a thickened edge with a minimum width of 12 inches and extend below the clean sand or crushed rock layer.

9.10.11 If the structural engineer proposes a post-tensioned foundation design method other than PTI DC 10.5:

- The deflection criteria presented in Table 9.10.3 are still applicable.

- Interior stiffener beams should be used for Foundation Categories II and III.
- The width of the perimeter foundations should be at least 12 inches.
- The perimeter footing embedment depths should be at least 12 inches, 18 inches and 24 inches for foundation categories I, II, and III, respectively. The embedment depths should be measured from the lowest adjacent pad grade.

9.10.12 Our experience indicates post-tensioned slabs may be susceptible to excessive edge lift, regardless of the underlying soil conditions. Placing reinforcing steel at the bottom of the perimeter footings and the interior stiffener beams may mitigate this potential. The structural engineer should design the foundation system to reduce the potential of edge lift occurring for the proposed structures.

9.10.13 During the construction of the post-tension foundation system, the concrete should be placed monolithically. Under no circumstances should cold joints form between the footings/grade beams and the slab during the construction of the post-tension foundation system unless designed by the structural engineer.

9.10.14 Category I, II, or III foundations may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf) (dead plus live load). This bearing pressure may be increased by one-third for transient loads due to wind or seismic forces. The estimated maximum total and differential settlement for the planned structures due to foundation loads is 1-inch and ½ inch, respectively.

9.10.15 Isolated footings outside of the slab area, if present, should have the minimum embedment depth and width recommended for conventional foundations for a particular Foundation Category. The use of isolated footings, which are located beyond the perimeter of the building and support structural elements connected to the building, are not recommended for Category III. Where this condition cannot be avoided, the isolated footings should be connected to the building foundation system with grade beams. In addition, consideration should be given to connecting patio slabs, which exceed 5 feet in width, to the building foundation to reduce the potential for future separation to occur.

9.10.16 Interior stiffening beams should be incorporated into the design of the foundation system in accordance with the PTI design procedures.

9.10.17 Special subgrade presaturation is not deemed necessary prior to placing concrete; however, the exposed foundation and slab subgrade soil should be moisture conditioned, as necessary, to maintain a moist condition as would be expected in any such concrete placement.

9.10.18 Where buildings or other improvements are planned near the top of a slope 3:1 (horizontal:vertical) or steeper, special foundation and/or design considerations are recommended due to the tendency for lateral soil movement to occur.

- For fill slopes less than 20 feet high or cut slopes regardless of height, footings should be deepened such that the bottom outside edge of the footing is at least 7 feet horizontally from the face of the slope.

- When located next to a descending 3:1 (horizontal:vertical) fill slope or steeper, the foundations should be extended to a depth where the minimum horizontal distance is equal to H/3 (where H equals the vertical distance from the top of the fill slope to the base of the fill soil) with a minimum of 7 feet but need not exceed 40 feet. The horizontal distance is measured from the outer, deepest edge of the footing to the face of the slope. A post-tensioned slab and foundation system or mat foundation system can be used to reduce the potential for distress in the structures associated with strain softening and lateral fill extension. Specific design parameters or recommendations for either of these alternatives can be provided once the building location and fill slope geometry have been determined.

- If swimming pools are planned, Geocon Incorporated should be contacted for a review of specific site conditions.

- Swimming pools located within 7 feet of the top of cut or fill slopes are not recommended. Where such a condition cannot be avoided, the portion of the swimming pool wall within 7 feet of the slope face be designed assuming that the adjacent soil provides no lateral support. This recommendation applies to fill slopes up to 30 feet in height, and cut slopes regardless of height. For swimming pools located near the top of fill slopes greater than 30 feet in height, additional recommendations may be required and Geocon Incorporated should be contacted for a review of specific site conditions.

- Although other improvements, which are relatively rigid or brittle, such as concrete flatwork or masonry walls, may experience some distress if located near the top of a slope, it is generally not economical to mitigate this potential. It may be possible, however, to incorporate design measures which would permit some lateral soil movement without causing extensive distress. Geocon Incorporated should be consulted for specific recommendations.

9.10.19 The recommendations of this report are intended to reduce the potential for cracking of slabs and foundations due to expansive soil (if present), differential settlement of fill soil with varying thicknesses. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade placed on such conditions may still exhibit some cracking due to soil movement and/or shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

9.10.20 Concrete slabs should be provided with adequate crack-control joints, construction joints and/or expansion joints to reduce unsightly shrinkage cracking. The design of joints should consider criteria of the American Concrete Institute (ACI) when establishing crack-control spacing. Additional steel reinforcing, concrete admixtures and/or closer crack control joint spacing should be considered where concrete-exposed finished floors are planned.

9.10.21 Geocon Incorporated should be consulted to provide additional design parameters as required by the structural engineer.

9.11 Excavation Slopes, Shoring, and Tiebacks

9.11.1 A retaining wall will be constructed along the north side of the site. We expect the wall will incorporate soil nails or solider pile and tie-backs, or other similar type wall construction. Deflection of the wall system should be limited so as to not impact adjacent structures and improvements.

9.11.2 The recommendations herein are provided for stable excavations and are submitted to the shoring and structural engineers to design a wall system. The contractor should construct the wall system as designed by the project shoring engineer. The stability of the excavation is dependent on the design and construction of the shoring system. Therefore, Geocon Incorporated cannot be responsible for site safety and the stability of the proposed excavations. It is the responsibility of the contractor to provide a safe excavation during the construction of the proposed project.

9.11.3 Temporary slopes should be made in conformance with OSHA requirements. Metamorphic Rock can be considered Type A soil (Type B soil if groundwater seepage is encountered) in accordance with OSHA requirements. Weathered metamorphic rock and compacted fill can be considered Type B soil (Type C if seepage is encountered). In general, special shoring requirements will not be necessary if temporary excavations will be less than 4 feet high. Temporary excavation depths greater than 4 feet, however, should be laid back at an appropriate inclination. These excavations should not become saturated or allowed to dry. Surcharge loads should not be permitted within a distance equal to the depth of the excavation from the top of the excavation. The top of the excavation should be a minimum of 15 feet from the edge of existing improvements. Excavations steeper than those recommended or closer than 15 feet from an existing surface improvement should be shored in accordance with applicable OSHA codes and regulations.

9.11.4 The design of shoring is governed by soil and groundwater conditions, and by the depth and width of the excavated area. Continuous support of the excavation face can be

provided by a system of soldier piles and wood lagging. Excavations exceeding 15 feet may require tieback anchors to provide additional wall restraint.

9.11.5 The excavation will be made in hard metamorphic rock. As such, drilling for soldier piles, tie-back anchors, or soil nails will encounter very difficult drilling conditions.

9.11.6 Permanent walls with a level backfill should be designed using a lateral pressure envelope acting on the back of the shoring and applying a pressure equal to 23H, 15H, or 19H, for a triangular, rectangular, or trapezoidal distribution, respectively, where H is the height of the shoring, in feet (resulting pressure in pounds per square foot) as shown in Figure 10. These values are based on an estimated maximum wall height of 30 feet. For a 1.5:1 slope behind the wall, a pressure equal to 35H, 23H, or 28H, for a triangular, rectangular, or trapezoidal distribution, respectively, should be used as shown on Figure 11. Triangular distribution should be used for cantilevered shoring and the trapezoidal and rectangular distribution should be used for multi-braced systems such as tieback anchors and rakers. The project shoring engineer should determine the applicable soil distribution for the design of the wall system. Additional lateral earth pressure due to the surcharging effects of adjacent structures or traffic loads should be considered, where appropriate, in the design of the wall.

9.11.7 Passive soil pressure resistance for embedded portions of soldier piles into native bedrock can be based upon an equivalent passive soil fluid weight of 400+400D, where D is the depth of embedment in feet (resulting in pounds per square foot) from the base of the excavation limits, as shown in Figure 12. The passive resistance can be assumed to act over a width of three pile diameters. The soldier piles should be embedded a minimum of 0.5 times the maximum height of the excavation (this depth is to include footing excavations) if tieback anchors are not employed. The project shoring engineer should determine the actual embedment depth.

9.11.8 Drilled shafts for the soldier piles should be observed by Geocon Incorporated prior to the placement of concrete reinforcement to check that the exposed soil conditions are similar to those expected and that footing excavations have been extended to the appropriate bearing strata, and design depths. If unexpected soil conditions are encountered, foundation modifications may be required.

9.11.9 Lateral movement of shoring is associated with vertical ground settlement outside of the excavation. Therefore, it is essential that the soldier pile and tieback system allow very limited amounts of lateral displacement. Earth pressures acting on a lagging wall can cause movement of the shoring toward the excavation and result in ground subsidence outside of

the excavation. Consequently, horizontal movements of the shoring wall should be accurately monitored and recorded during excavation and anchor construction.

9.11.10 Survey points should be established at the top of the pile on at least 20 percent of the soldier piles. An additional point located at an intermediate point between the top of the pile and the base of the excavation should be monitored on at least 20 percent of the piles if tieback anchors will be used. These points should be monitored on a weekly basis during excavation work and on a monthly basis until the completion of the wall.

9.11.11 The wall should be designed to limit horizontal soldier pile movement so as to not impact surrounding properties and improvements. The amount of horizontal deflection can be assumed to be essentially zero along the Active Zone and Effective Zone boundary. The magnitude of movement for intermediate depths and distances from the wall can be linearly interpolated. The project civil and/or wall engineer should determine the allowable amount of horizontal movement associated with the wall system that could affect existing utilities and structures, if present. In addition, the project civil and/or wall engineer should evaluate the existing utilities and improvements and provide a conclusion regarding the ability of the utilities and improvements to withstand the expected lateral and vertical movement associated with the planned excavation.

9.11.12 Tieback anchors employed in shoring should be designed such that anchors fully penetrate the Active Zone behind the wall. The Active Zone can be considered the wedge of soil from the face of the wall to a plane extending upward from the base of the excavation at a 25-degree angle from vertical, as shown on Figure 13. Normally, tieback anchors are contractor-designed and installed, and there are numerous anchor construction methods available. Non-shrinkage grout should be used for the construction of the tieback anchors.

9.11.13 A wall drain system should be incorporated into the design. A typical wall drain detail is provided on Figure 14. Corrosion protection should be provided for the tiebacks.

9.11.14 Experience has shown that the use of pressure grouting during formation of the bonded portion of the anchor will increase the soil-grout bond stress. A pressure grouting tube should be installed during the construction of the tieback. Post grouting should be performed if adequate capacity cannot be obtained by other construction methods.

9.11.15 Anchor capacity is a function of construction method, depth of anchor, batter, diameter of the bonded section, and the length of the bonded section. Anchor capacity should be evaluated using the strength parameters shown in Table 9.11.

TABLE 9.11
SOIL STRENGTH PARAMETERS FOR WALL

Description	Cohesion	Friction Angle
Metamorphic Rock	0 psf	45 degrees

9.11.16 Grout should only be placed in the tieback anchor's bonded section prior to testing. Tieback anchors should be proof-tested to at least 130 percent of the anchor's design working load. Following a successful proof test, the tieback anchors should be locked off at 80 percent of the allowable working load. Tieback anchor test failure criteria should be established in project plans and specifications. The tieback anchor test failure criteria should be based upon a maximum allowable displacement at 130 percent of the anchor's working load (anchor creep) and a maximum residual displacement within the anchor following stressing. Tieback anchor stressing should only be conducted after sufficient hydration has occurred within the grout. Tieback anchors that fail to meet project specified test criteria should be replaced or additional anchors should be constructed.

9.11.17 Lagging should keep pace with excavation and tieback anchor construction. The excavation should not be advanced deeper than three feet below the bottom of lagging at any time. These unlagged gaps of up to three feet should only be allowed to stand for short periods of time in order to decrease the probability of soil instability and should never be unsupported overnight. Backfilling should be conducted when necessary between the back of lagging and excavation sidewalls to reduce sloughing in this zone and all voids should be filled by the end of each day. Further, the excavation should not be advanced further than four feet below a row of tiebacks prior to those tiebacks being proof tested and locked off.

9.11.18 If tieback anchors are employed, an accurate survey of existing utilities and other underground structures adjacent to the shoring wall should be conducted. The survey should include both locations and depths of existing utilities. Locations of anchors should be adjusted as necessary during the design and construction process to accommodate the existing and proposed utilities.

9.11.19 The condition of existing buildings, streets, sidewalks, and other structures/improvements around the perimeter of the planned excavation should be documented prior to the start of shoring and excavation work. Special attention should be given to documenting existing cracks or other indications of differential settlement within these adjacent structures, pavements and other improvements. Underground utilities sensitive to settlement should be videotaped prior to construction to check the integrity of pipes. In addition, monitoring

points should be established indicating location and elevation around the excavation and on existing buildings. These points should be monitored on a weekly basis during excavation work and on a monthly basis thereafter. Inclinometers should be installed and monitored behind any shoring sections that will be excavated deeper than 30 feet below the existing ground surface.

9.12 Soil Nail Wall

9.12.1 Soil nail walls consist of installing closely spaced steel bars (nails) into a slope or excavation in a top-down construction sequence. Following installation of a horizontal row of nails, drains, waterproofing and wall-reinforcing steel are placed and shotcrete applied to create a final wall.

9.12.2 The excavation for the wall will be made in hard metamorphic rock. As such, drilling for soil nails will encounter very difficult drilling conditions.

9.12.3 A wall drain system should be incorporated into the design. A typical wall drain detail for a soil nail wall is provided on Figure 15. Corrosion protection should be provided for the nails.

9.12.4 Geocon Incorporated should provide observation services during nail installation, grout and shotcrete strength testing, and nail testing.

9.12.5 Design and testing of soil nails should be conducted in conformance with FHWA guidelines presented in the *Manual for Design and Construction Monitoring of Soil Nail Walls, FHWA-SA-96-069.* In addition to verification and proof testing, we recommended ultimate strength tests be performed to verify ultimate bond strength assumptions.

9.12.6 All verification test nails should sacrificial and not incorporated into the wall.

9.12.7 The soil strength parameters listed in Table 9.12 can be used in design of the soil nails.

TABLE 9.12
SOIL STRENGTH PARAMETERS FOR SOIL NAIL WALLS

Description	Cohesion (psf)	Friction Angle (degrees)	Ultimate Bond Stress (psi)
Metamorphic Rock	0	45 degrees	40 psi

9.13 Conventional Retaining Walls

9.13.1 Retaining walls that are allowed to rotate more than 0.001H (where H equals the height of the retaining portion of the wall) at the top of the wall and having a level backfill surface should be designed for an active soil pressure equivalent to the pressure exerted by a fluid density of 35 pcf. Where the backfill will be inclined at 2:1 (horizontal:vertical), an active soil pressure of 50 pcf is recommended. Expansive soils should not be used as backfill material behind retaining walls. All soil placed for retaining wall backfill should have an Expansion Index less than 50.

9.13.2 Soil contemplated for use as retaining wall backfill, including import materials, should be identified in the field prior to backfill. At that time Geocon Incorporated should obtain samples for laboratory testing to evaluate its suitability. Modified lateral earth pressures may be necessary if the backfill soil does not meet the required expansion index or shear strength. City or regional standard wall designs, if used, are based on a specific active lateral earth pressure and/or soil friction angle. In this regard, on-site soil to be used as backfill may or may not meet the values for standard wall designs. Geocon Incorporated should be consulted to assess the suitability of the on-site soil for use as wall backfill if standard wall designs will be used.

9.13.3 Where walls are restrained from movement at the top, an additional uniform pressure of 7H psf should be added to the active soil pressure where the wall possesses a height of 8 feet or less and 12H where the wall is greater than 8 feet. For retaining walls subject to vehicular loads within a horizontal distance equal to two-thirds the wall height, a surcharge equivalent to 2 feet of fill soil should be added.

9.13.4 Retaining walls should be provided with a drainage system adequate to prevent the buildup of hydrostatic forces and should be waterproofed as required by the project architect. The use of drainage openings through the base of the wall (weep holes) is not recommended where the seepage could be a nuisance or otherwise adversely affect the property adjacent to the base of the wall. The above recommendations assume a properly compacted granular (EI of less than 50) backfill material with no hydrostatic forces or imposed surcharge load. Figure 16 presents a typical retaining wall drainage detail. If conditions different than those described are anticipated, or if specific drainage details are desired, Geocon Incorporated should be contacted for additional recommendations.

9.13.5 The structural engineer should determine the seismic design category for the project in accordance with Section 1613 of the CBC. If the project possesses a seismic design category of D, E, or F, retaining walls that support more than 6 feet of backfill should be designed with seismic lateral pressure in accordance with Section 18.3.5.12 of the 2016 CBC. The seismic load is dependent on the retained height where H is the height of the wall, in feet, and the calculated loads result in pounds per square foot (psf) exerted at the base of the wall and zero at the top of the wall. A seismic load of 19H should be used for design. We used the peak ground acceleration adjusted for Site Class effects, PGA_M, of 0.396g calculated from ASCE 7-10 Section 11.8.3 and applied a pseudo-static coefficient of 0.33.

9.13.6 The recommendations assume a properly compacted granular backfill soil with no hydrostatic forces or imposed surcharge load. If the retaining walls are subject to surcharge loading within a horizontal distance equal to or less than the height of the wall, or if conditions different than those described are expected, Geocon Incorporated should be contacted for additional recommendations.

9.13.7 Footings near the top of slopes or within slopes should be extended in depth such that the outer bottom edge of the footing is at least 7 feet horizontally from the face of the finish slope.

9.13.8 In general, shallow conventional wall footings founded in properly compacted fill and having a minimum depth and width of one foot may be designed for an allowable soil bearing pressure of 2,000 psf, provided the soil within 3 feet below the base of the wall has an Expansion Index of 50 or less. The recommended allowable soil bearing pressures may be increased by 300 psf and 500 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing pressure of 4,000 psf.

9.14 Lateral Loading

9.14.1 For resistance to lateral loads, a passive earth pressure equivalent to a fluid density of 300 pcf is recommended for footings or shear keys poured neat against properly compacted granular fill soils or undisturbed formation materials. The passive pressure assumes a horizontal surface extending away from the base of the wall at least five feet or three times the surface generating the passive pressure, whichever is greater. The upper 12 inches of material not protected by floor slabs or pavement should not be included in the design for lateral resistance. Where walls are planned adjacent to and/or on descending slopes, a passive pressure of 150 pcf should be used in design.

9.14.2 If friction is to be used to resist lateral loads, an allowable coefficient of friction between soil and concrete of 0.35 should be used for design.

9.14.3 The passive and frictional resistant loads can be combined for design purposes. The lateral passive pressures may be increased by one-third when considering transient loads due to wind or seismic forces.

9.15 MSE Retaining Wall Recommendations

9.15.1 We recommend the following geotechnical parameters be used for design of the MSE retaining walls.

TABLE 9.15
GEOTECHNICAL DESIGN PARAMETERS

Parameter	Reinforced Zone	Retained Zone	Foundation Zone
Angle of Internal Friction	30 degrees	30 degrees	30 degrees
Cohesion	100 psf	100 psf	100 psf
Moist Unit Weight	130 pcf	130 pcf	130 pcf

9.15.2 The shear strength values provided in Table 9.15 for the reinforced zone assume that granular materials will be used as backfill. Because importing or crushing of on-site materials will be required to generate wall backfill materials, we recommend proposed wall backfill soils be tested prior to importing and during grading to check that the soils meet the values listed on Table 9.11 and those used in the design of the MSE wall.

9.15.3 If crushing of on-site soils will be performed to generate backfill for MSE type walls, the crushed product should meet wall designer specifications. Typically, MSE wall designers do not allow the use of angular rock within the backfill soil due to the potential for damage to the reinforcing grid. All wall backfill should have an expansion index (EI) of 50 or less.

9.15.4 Once proposed backfill materials are imported or crushed product is made, sufficient samples should be collected and subjected to laboratory testing to assess the soils suitability for use as wall backfill. Results should be provided to the designer to re-evaluate stability of the walls. Dependent upon test results, the designer may require modifications to the original wall design (e.g., longer geogrid embedment lengths).

9.15.5 Backfill materials within the reinforced zone should be compacted to a dry density of at least 90 percent of the laboratory maximum dry density near to or slightly above optimum moisture content in accordance with ASTM D 1557. This is applicable to the entire embedment length of the geogrid reinforcement. Typically, wall designers specify that heavy compaction equipment be excluded from within 3 feet of the face of the wall;

however, smaller equipment (e.g., walk-behind, self-driven compactors or hand whackers) should be used to compact the materials without causing deformation of the wall. If the designer specifies no compactive effort for this zone, the materials are essentially not properly compacted and the geogrid within the uncompacted zone should not be relied upon for reinforcement and overall embedment lengths should be increased to account for the difference.

9.15.6 The wall should be provided with drainage system sufficient enough to prevent excessive seepage through the wall and water at the base of the wall to prevent hydrostatic pressures behind the wall.

9.15.7 Geosynthetic reinforcement must elongate to develop full tensile resistance. This elongation generally results in movement at the top of the wall. The amount of movement is dependent upon the height of the wall (e.g., higher walls rotate more), construction, and the type of geosynthetic used. In addition, over time reinforced-earth retaining walls have been known to exhibit creep and can undergo additional movement. Given this condition, the owner should be aware that structures and pavement placed within the reinforced and retained zones of the wall may undergo movement and should be designed to accommodate this movement.

9.16 Storm Water Management

9.16.1 If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff into the subsurface occurs, downstream improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

9.16.2 Storm water management recommendations are provided in Appendix C.

9.17 Site Drainage and Moisture Protection

9.17.1 Adequate site drainage is critical to reduce the potential for differential soil movement, erosion and subsurface seepage. Under no circumstances should water be allowed to pond adjacent to footings. The site should be graded and maintained such that surface drainage is

directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, surface drainage should be directed away from the top of slopes into swales or other controlled drainage devices. Roof and pavement drainage should be directed into conduits that carry runoff away from the proposed structure.

9.17.2 In the case of basement walls or building walls retaining landscaping areas, a water-proofing system should be used on the wall and joints, and a Miradrain drainage panel (or similar) should be placed over the waterproofing. The project architect or civil engineer should provide detailed specifications on the plans for all waterproofing and drainage.

9.17.3 Underground utilities should be leak free. Utility and irrigation lines should be checked periodically for leaks, and detected leaks should be repaired promptly. Detrimental soil movement could occur if water is allowed to infiltrate the soil for prolonged periods of time.

9.17.4 Landscaping planters adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Area drains to collect excess irrigation water and transmit it to drainage structures or impervious above-grade planter boxes can be used. In addition, where landscaping is planned adjacent to the pavement, construction of a cutoff wall along the edge of the pavement that extends at least 6 inches below the bottom of the base material should be considered.

9.18 Slope Maintenance

9.18.1 Slopes that are steeper than 3:1 (horizontal:vertical) may, under conditions that are both difficult to prevent and predict, be susceptible to near-surface (surficial) slope instability. The instability is typically limited to the outer 3 feet of a portion of the slope and usually does not directly impact the improvements on the pad areas above or below the slope. The occurrence of surficial instability is more prevalent on fill slopes and is generally preceded by a period of heavy rainfall, excessive irrigation, or the migration of subsurface seepage. The disturbance and/or loosening of the surficial soils, as might result from root growth, soil expansion, or excavation for irrigation lines and slope planting, may also be a significant contributing factor to surficial instability. It is therefore recommended that, to the maximum extent practical: (a) disturbed/loosened surficial soils be either removed or properly recompacted, (b) irrigation systems be periodically inspected and maintained to eliminate leaks and excessive irrigation, and (c) surface drains on and adjacent to slopes be periodically maintained to preclude ponding or erosion. Although the incorporation of the above recommendations should reduce the potential for surficial slope instability, it will not eliminate the possibility and, therefore, it may be necessary to rebuild or repair a portion of the project's slopes in the future.

9.19 Grading and Foundation Plan Review

9.19.1 The geotechnical engineer and engineering geologist should review the grading and foundation plans prior to final submittal to check their compliance with the recommendations of this report and to determine the need for additional comments, recommendations and/or analysis.

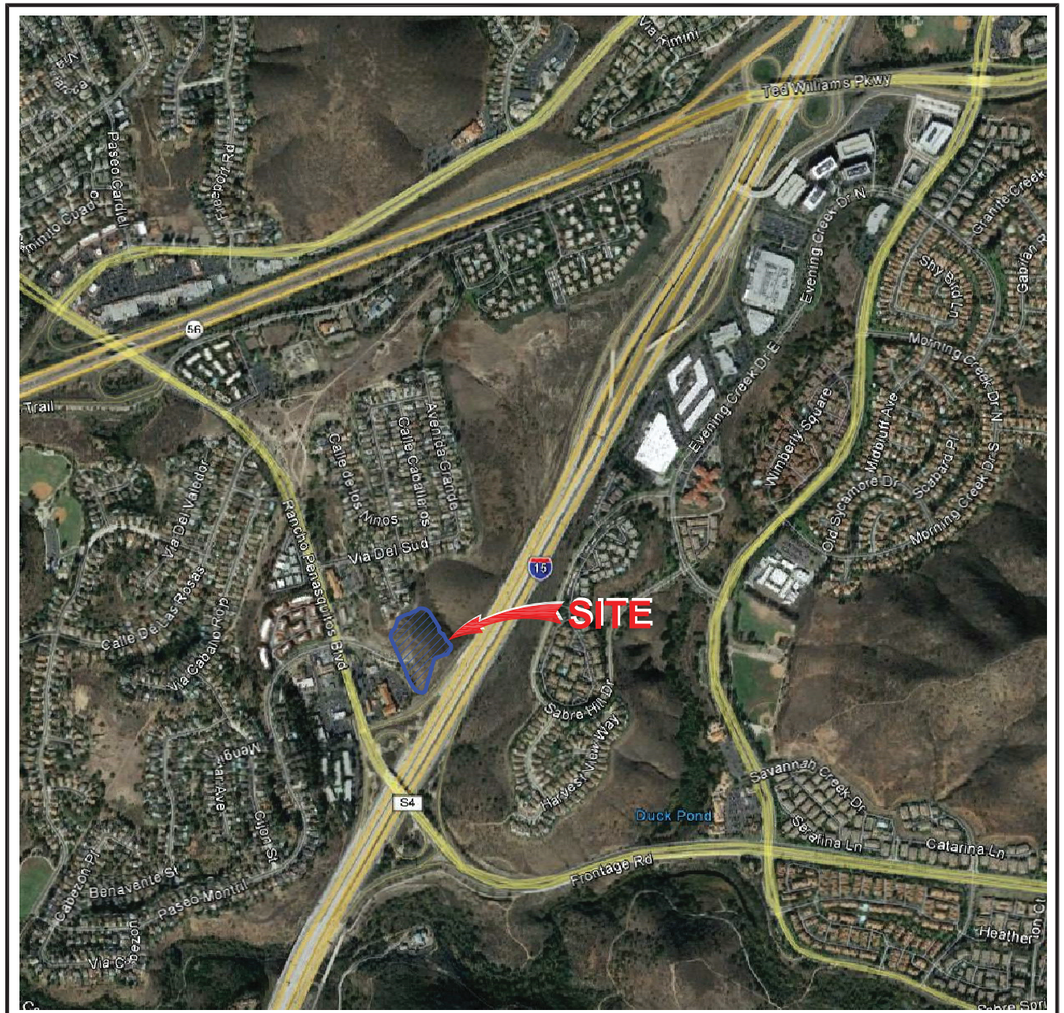
LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

2. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon Incorporated should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon Incorporated.

3. This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

4. The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.



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N

NO SCALE

VICINITY MAP

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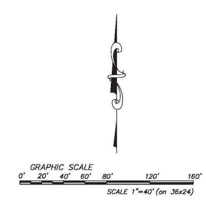
RM / AML		DSK/GTYPD

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 1

Plotted:01/04/2018 3:40PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\G2209-42-01 Vic Map.dwg



GEOCON LEGEND

Qudf ........UNDOCUMENTED FILL

Mzu ....METAMORPHIC ROCK

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

T-4 ....APPROX. LOCATION OF TRENCH

AT-6 ....APPROX. LOCATION OF AIR TRACK BORING

(+17) ....APPROX. DEPTH TO BEDROCK

[15] ....APPROX. DEPTH OF RIPPABLE MATERIAL BASED ON PENETRATION RATE OF 20 SPF

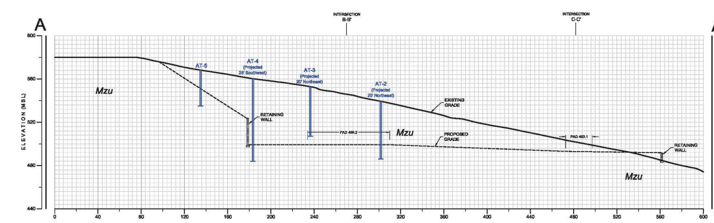
D D' ....APPROX. LOCATION OF GEOLOGIC CROSS SECTION

GEOLOGIC MAP

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

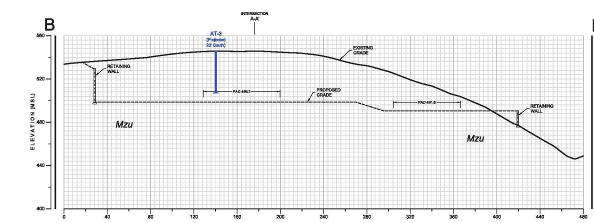
GEOCON INCORPORATED GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS 6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974 PHONE 858 558-6900 - FAX 858 558-6159	SCALE 1" = 40'	DATE 01 - 05 - 2018
	PROJECT NO. G2209 - 42 - 01	FIGURE 2
	SHEET 1 OF 1	

Plotted:01/04/2018 4:01PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\SHEETS\G2209-42-01 Geo Map.dwg



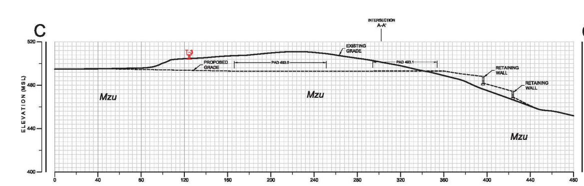
GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)



GEOLOGIC CROSS-SECTION A-A'

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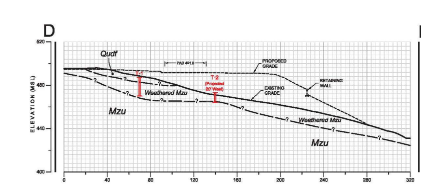

GEOLOGIC CROSS-SECTION A-A'

SCALE: 1" = 40' (Vert. = Horiz.)

GEOCON LEGEND

Qudf ........UNDOCUMENTED FILL

Mzu ....METAMORPHIC ROCK

T-4 ....APPROX. LOCATION OF TRENCH

AT-6 ....APPROX. LOCATION OF AIR TRACK BORING

........APPROX. LOCATION OF GEOLOGIC CONTACT (Queried Where Uncertain)

GEOLOGIC CROSS SECTION

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

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	PROJECT NO. G2209 - 42 - 01	FIGURE 3
	SHEET 1 OF 1	

Plotted:01/05/2018 9:00AM | By:RUBEN AGUILAR | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\SHEETS\G2209-42-01 XSections.dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	50 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)	
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	30 degrees
APPARENT COHESION	C	=	200 pounds per square foot

NO SEEPAGE FORCES

ANALYSIS :

$\gamma_{c\phi}$	=	$\frac{\gamma_t H \tan\phi}{C}$	EQUATION (3-3), REFERENCE 1
FS	=	$\frac{NcfC}{\gamma_t H}$	EQUATION (3-2), REFERENCE 1
$\gamma_{c\phi}$	=	18.8	CALCULATED USING EQ. (3-3)
Ncf	=	50	DETERMINED USING FIGURE 10, REFERENCE 2
FS	=	1.54	FACTOR OF SAFETY CALCULATED USING EQ. (3-2)

REFERENCES :

1.....Janbu, N., Stability Analysis of Slopes with Dimensionless Parameters, Harvard Soil Mechanics, Series No. 46, 1954

2.....Janbu, N., Discussion of J.M. Bell, Dimensionless Parameters for Homogeneous Earth Slopes, Journal of Soil Mechanics and Foundation Design, No. SM6, November 1967.

SLOPE STABILITY ANALYSIS

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RM / AML		DSK/GTYPD	DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 4

Plotted:01/04/2018 3:35PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Slope Stability Analyses (SSA).dwg

ASSUMED CONDITIONS :

SLOPE HEIGHT	H	=	Infinite
DEPTH OF SATURATION	Z	=	3 feet
SLOPE INCLINATION	2 : 1	(Horizontal : Vertical)	
SLOPE ANGLE	i	=	26.6 degrees
UNIT WEIGHT OF WATER	γ_w	=	62.4 pounds per cubic foot
TOTAL UNIT WEIGHT OF SOIL	γ_t	=	130 pounds per cubic foot
ANGLE OF INTERNAL FRICTION	ϕ	=	30 degrees
APPARENT COHESION	C	=	200 pounds per square foot

SLOPE SATURATED TO VERTICAL DEPTH Z BELOW SLOPE FACE

SEEPAGE FORCES PARALLEL TO SLOPE FACE

ANALYSIS :

$$FS = \frac{C + (\gamma_t - \gamma_w)\ Z\ cos^2\ i\ tan\ \phi}{\gamma_t\ Z\ sin\ i\ cos\ i} = 1.9$$

REFERENCES :

1.....Haefeli, R. *The Stability of Slopes Acted Upon by Parallel Seepage*, Proc. Second International Conference, SMFE, Rotterdam, 1948, 1, 57-62

2.....Skempton, A. W., and F.A. Delory, *Stability of Natural Slopes in London Clay*, Proc. Fourth International Conference, SMFE, London, 1957, 2, 378-81

SURFICIAL SLOPE STABILITY ANALYSIS

GEOCON INCORPORATED

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RM / AML		DSK/GTYPD	DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 5

Plotted:01/04/2018 3:34PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Slope Stability Analyses-Surficial (SSSA).dwg

Paseo Montril
Project No. G2209-42-01
Section A-A'
Name: Section A-A'.gsz
Date: 1/4/2018
Mzu: Unit Weight: 135 pcf: Cohesion: 500 psf: Phi: 45 °

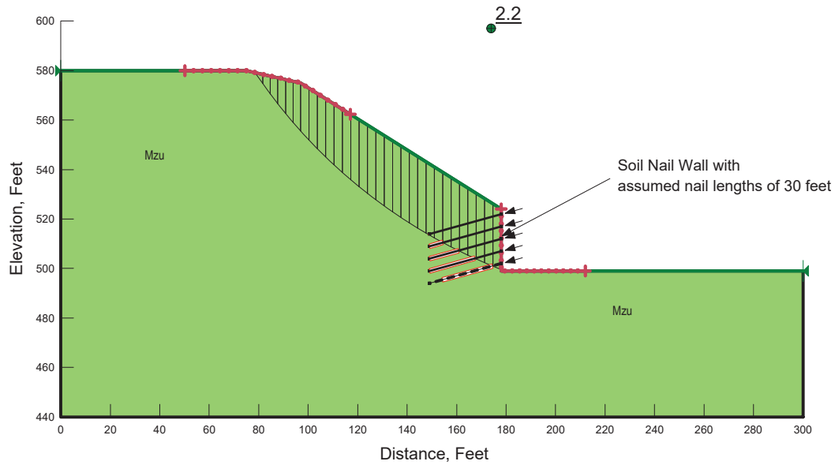
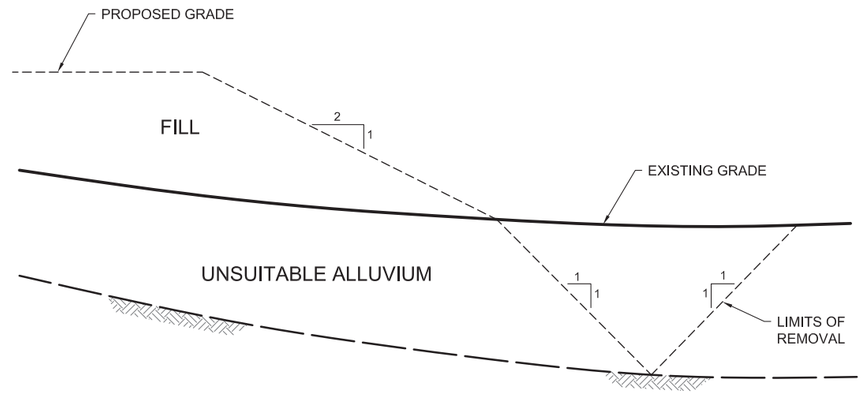


Figure 6



LEFT-IN-PLACE
FORMATIONAL MATERIAL

NOT TO SCALE

NOTE:

SLOPE OF BACKCUT MAY BE STEEPENED WITH THE APPROVAL OF THE SOILS ENGINEER WHERE BOUNDARY CONSTRAINTS LIMIT EXTENT OF REMOVALS

NO SCALE

CONSTRUCTION DETAIL FOR LATERAL EXTENT OF REMOVAL

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PASEO MONTRIL
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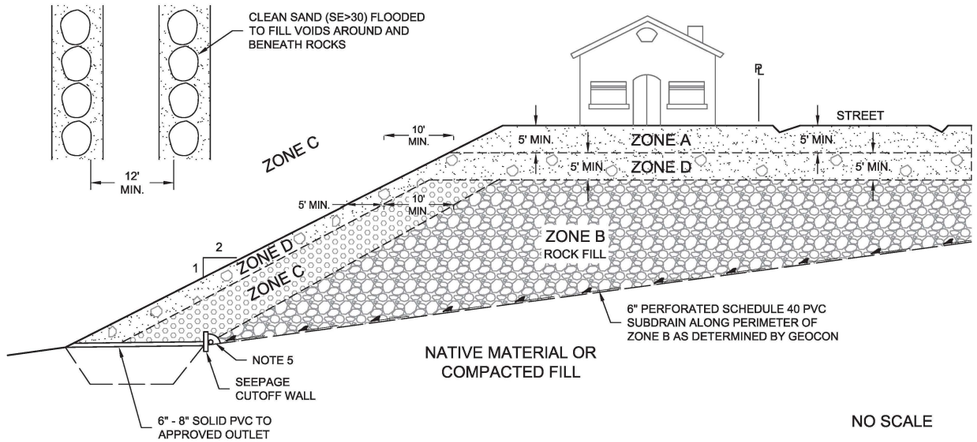
DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 7

Plotted:01/04/2018 3:33PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Lateral Extent of Removal.dwg

ZONE B

WINDROWS DETAIL
(PLAN VIEW)



LEGEND

ZONE A: COMPACTED SOIL FILL. NO ROCK FRAGMENTS OVER 6 INCHES IN DIMENSION.

ZONE B: BLASTED ROCK FILL GENERALLY CONSISTING OF 2 FOOT MINUS MATERIAL WITH OCCASIONAL INDIVIDUAL ROCK UP TO 4 FEET MAXIMUM DIMENSION. IN PARKWAY/STREETS, ZONE B SHOULD TERMINATE AT LEAST 2 FEET BELOW LOWEST UTILITY. ALTERNATE: ROCKS 2 TO 4 FEET IN MAXIMUM DIMENSION CAN BE PLACED IN WINDROWS IN COMPACTED SOIL FILL POSSESSING A SAND EQUIVALENT OF AT LEAST 30.

ZONE C: ROCKS UP TO 2 FEET IN MAXIMUM DIMENSION IN A MATRIX OF COMPACTED SOIL FILL WITHIN SLOPE AREAS ONLY.

ZONE D: ROCKS UP TO 1 FOOT IN MAXIMUM DIMENSION IN A MATRIX OF COMPACTED SOIL FILL.

NOTES

1. COMPACTED SOIL FILL IN UPPER 8 FEET SHALL CONTAIN AT LEAST 40 PERCENT SOIL PASSING THE 3/4 - INCH SIEVE (BY WEIGHT) AND IN THE UPPER 3 FEET OF PAD GRADE AT LEAST 20% SOIL PASSING THE NO. 4 SIEVE (BY WEIGHT) AND COMPACTED IN ACCORDANCE WITH SPECIFICATIONS FOR STRUCTURAL FILL.
2. CONTINUOUS OBSERVATION REQUIRED BY GEOCON DURING ROCK PLACEMENT.
3. ROCK FILL (LESS THAN 40 PERCENT SOIL SIZES) MAY BE PERMITTED IN DESIGNATED AREAS UPON THE RECOMMENDATION OF THE GEOTECHNICAL ENGINEER.
4. DEPTH OF ZONE D SHOULD EXTEND AT LEAST 2 FEET BELOW DEEPEST UTILITY WITHIN ROADWAYS.
5. 6" PERFORATED SCHEDULE 40 PVC SUBDRAIN ALONG THE TOE AND PORTIONS OF THE PERIMETER OF ZONE B.
6. BASE OF ZONE B SHOULD SLOPE A MINIMUM OF 2 PERCENT.

OVERSIZE ROCK DISPOSAL DETAIL

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PASEO MONTRIL
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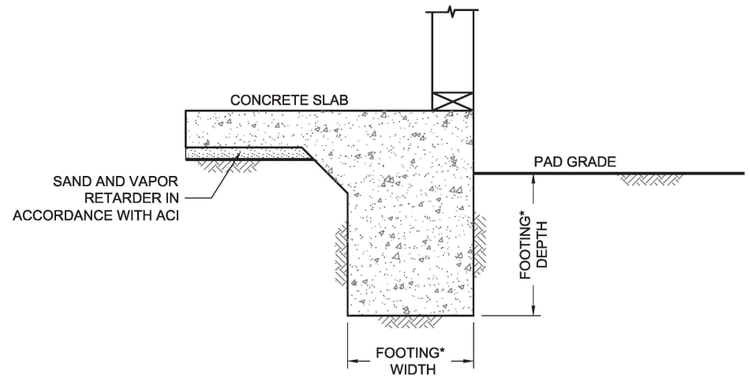
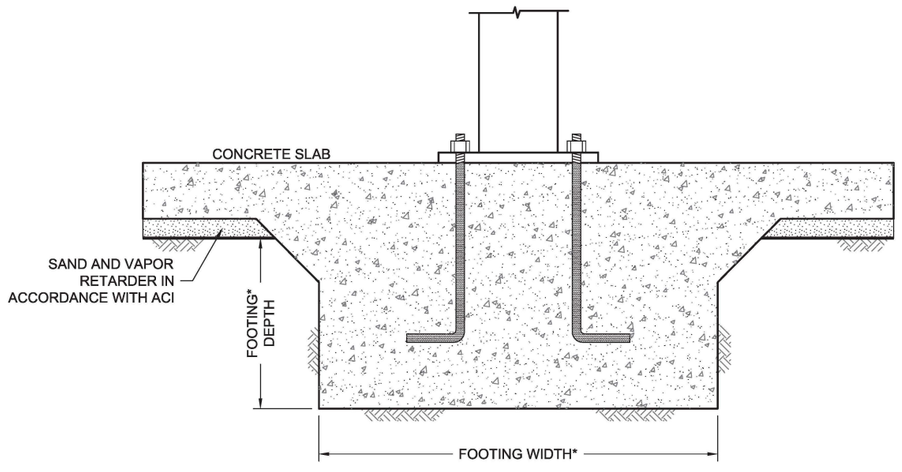
DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 8

Plotted:01/04/2018 3:33PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Oversize Rock Disposal.dwg





*....SEE REPORT FOR FOUNDATION WIDTH AND DEPTH RECOMMENDATION

NO SCALE

WALL / COLUMN FOOTING DIMENSION DETAIL

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RM / AML		DSK/GTYPD

PASEO MONTRIL
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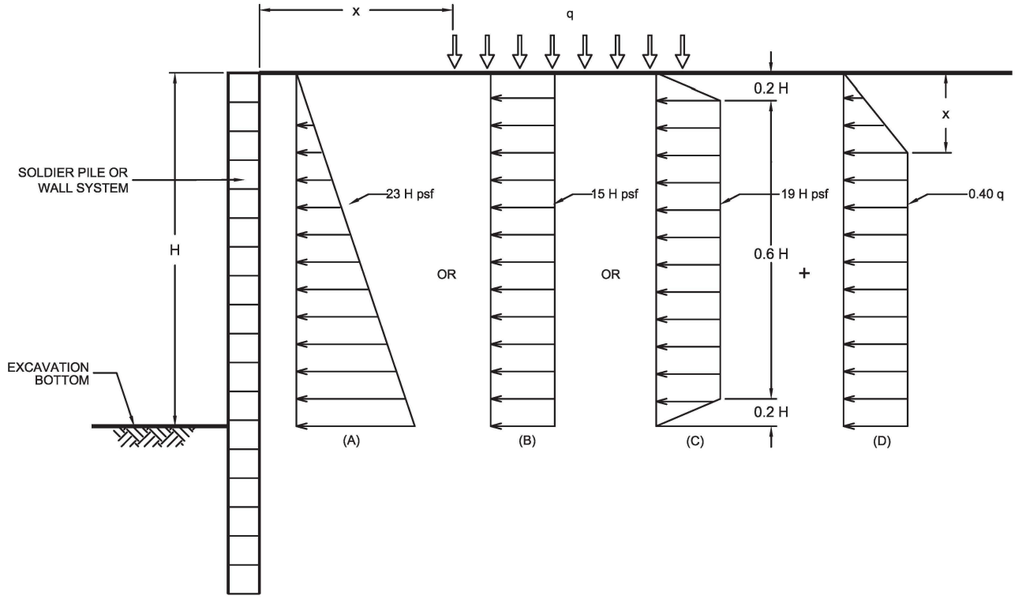
DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 9

Plotted:01/04/2018 3:32PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Wall-Column Footing Dimension Detail (COLFOOT2).dwg



(A).....TRIANGULAR DISTRIBUTION - CANTILEVERED SHORING

(B).....RECTANGULAR DISTRIBUTION - MULTI-BRACED SHORING

(C).....TRAPEZOIDAL DISTRIBUTION - MULTI BRACED SHORING

(D).....SURCHARGE DISTRIBUTION

NO SCALE

LATERAL ACTIVE PRESSURES FOR VERTICAL EXCAVATIONS

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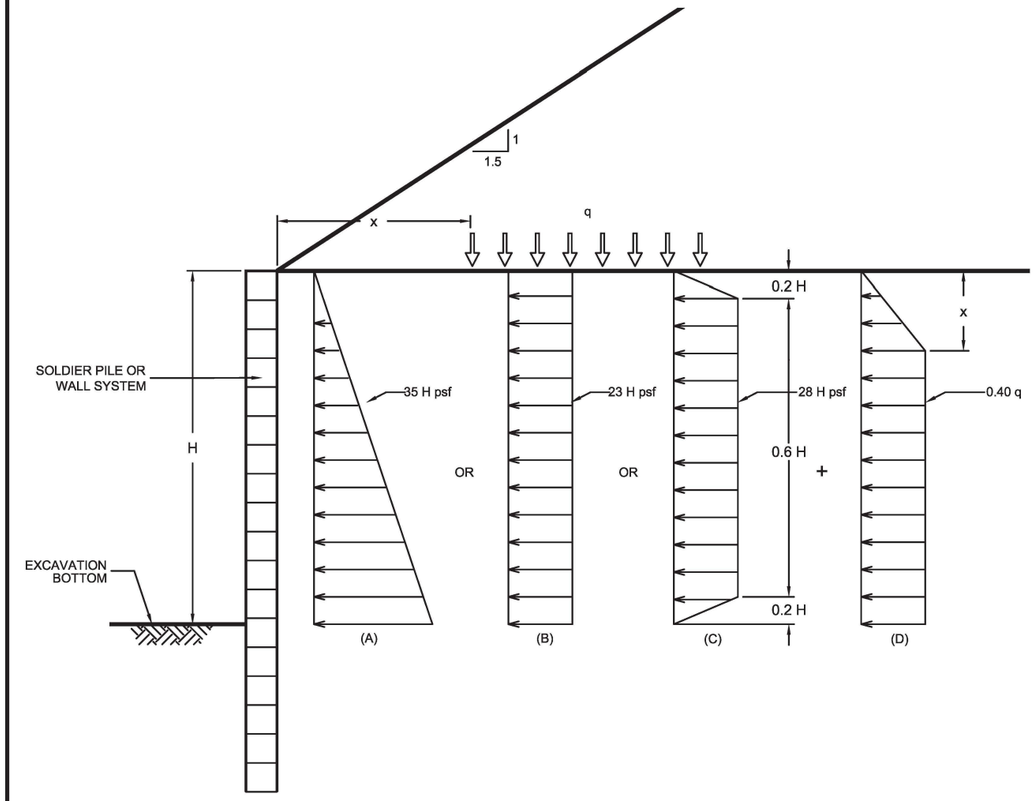
RM / AML		DSK/GTYPD

DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 10

Plotted:01/04/2018 3:32PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\LAPFVE6.dwg



(A).....TRIANGULAR DISTRIBUTION - CANTILEVERED SHORING

(B).....RECTANGULAR DISTRIBUTION - MULTI-BRACED SHORING

(C).....TRAPEZOIDAL DISTRIBUTION - MULTI BRACED SHORING

(D).....SURCHARGE DISTRIBUTION

NO SCALE

LATERAL ACTIVE PRESSURES FOR VERTICAL EXCAVATIONS

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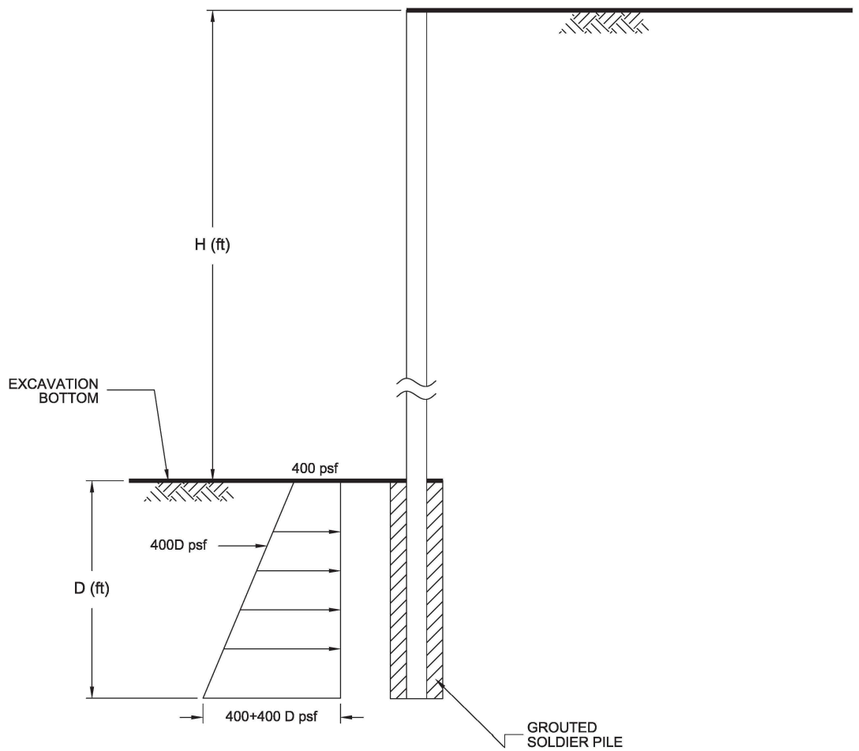
DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 11

Plotted:01/04/2018 3:31PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\LAPFVE5.dwg



NO SCALE

RECOMMENDED GROUTED SOLDIER PILE PRESSURE DISTRIBUTION

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GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
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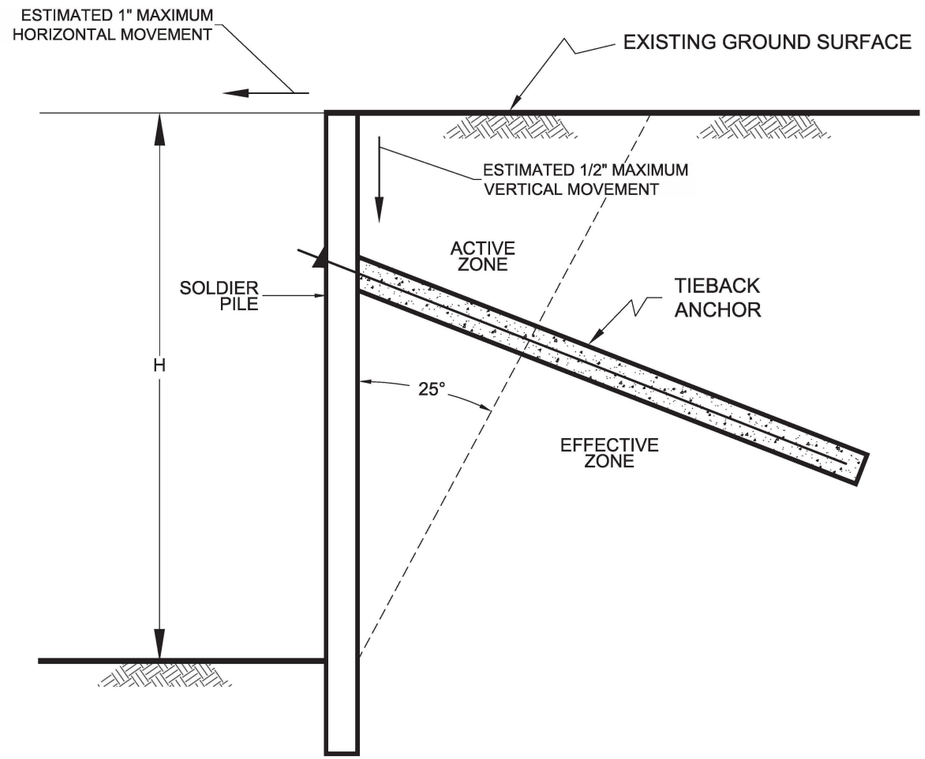
RM / AML		DSK/GTYPD	DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 12

Plotted:01/04/2018 3:31PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Grouted Soldier Pile Passive Pressure (RGSPPD6).dwg



NOTE: NO ESTIMATED MOVEMENT AT EFFECTIVE ZONE

NO SCALE

RECOMMENDED EFFECTIVE ZONE FOR TIEBACK ANCHORS

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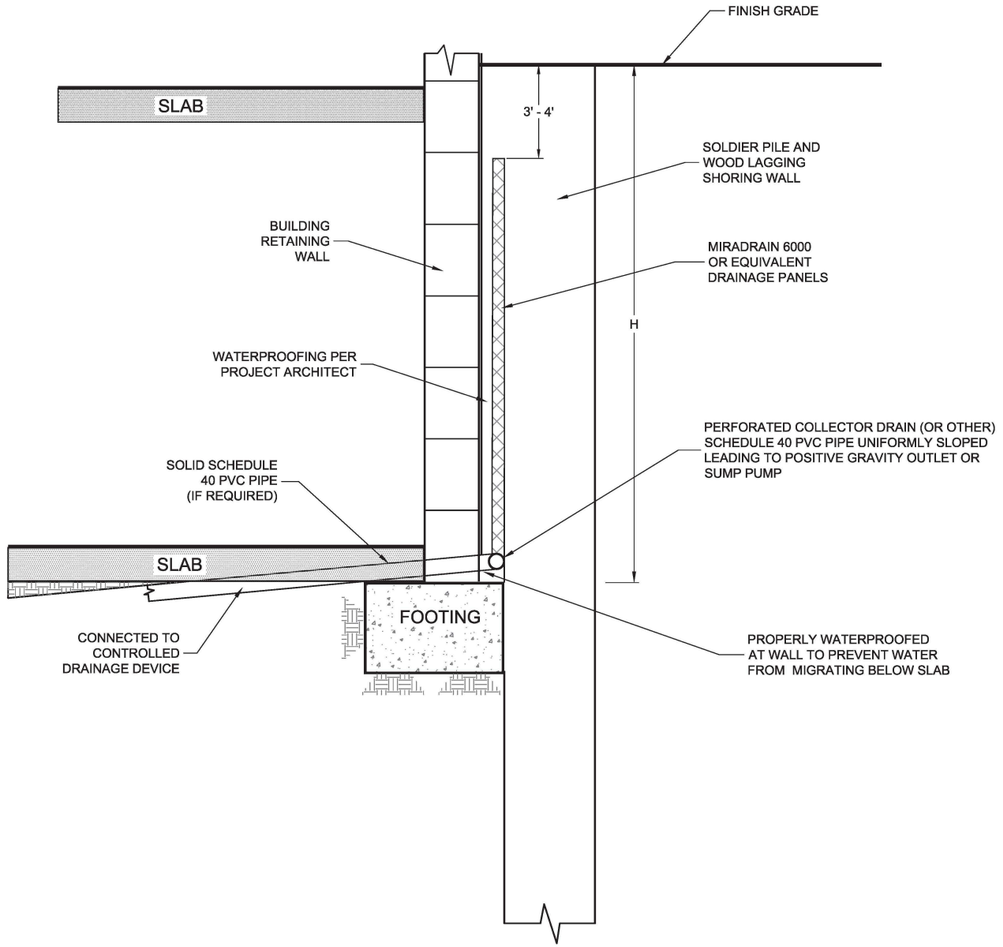
RM / AML		DSK/GTYPD	DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 13

Plotted:01/04/2018 3:30PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Effective Zone For Tieback Anchors (REZTA6).dwg



SOLDIER PILE WALL DRAINAGE DETAIL

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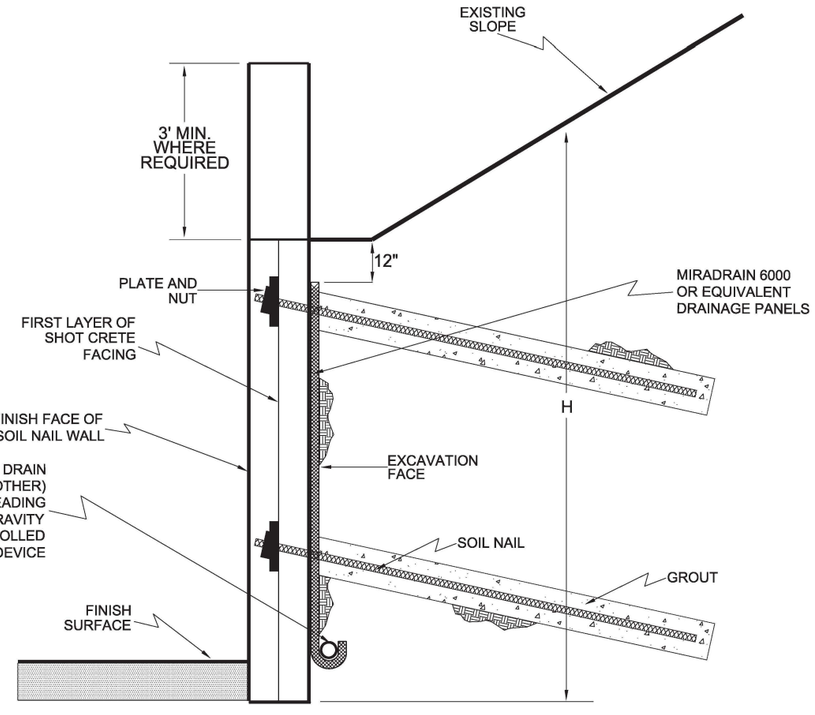
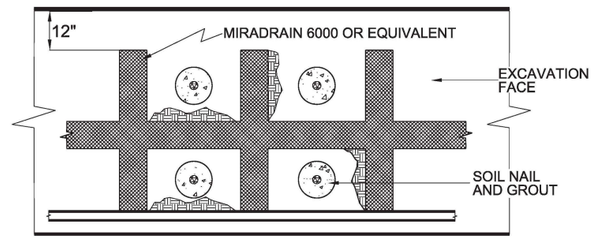
RM / AML		DSK/GTYPD	DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 14

Plotted:01/04/2018 3:30PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Soldier Pile Wall Drainage Detail (SPWDD3).dwg



NO SCALE



DRAINAGE PANELS PER SOIL NAIL WALL ENGINEER

NO SCALE

SOIL NAIL WALL DRAINAGE DETAIL

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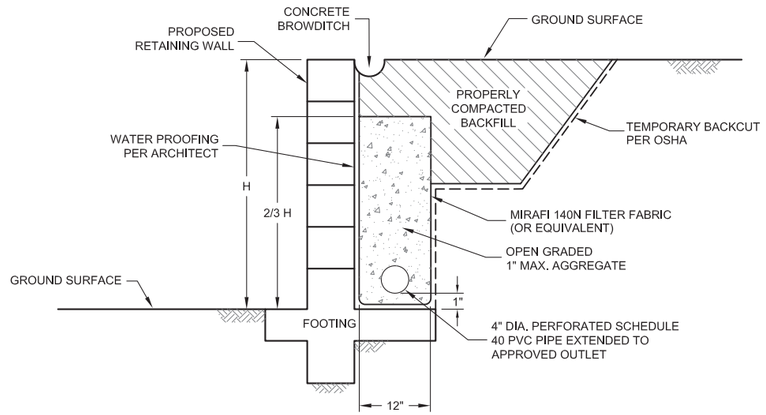
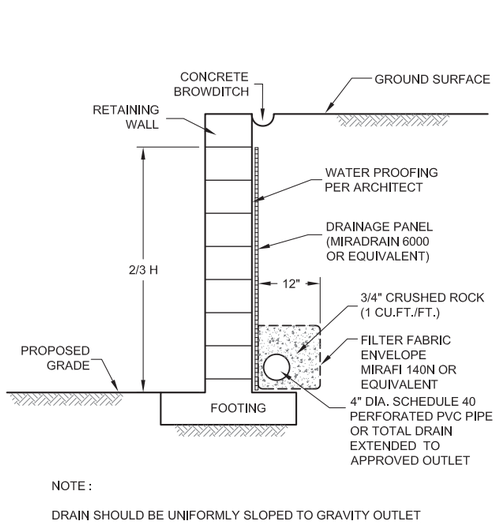
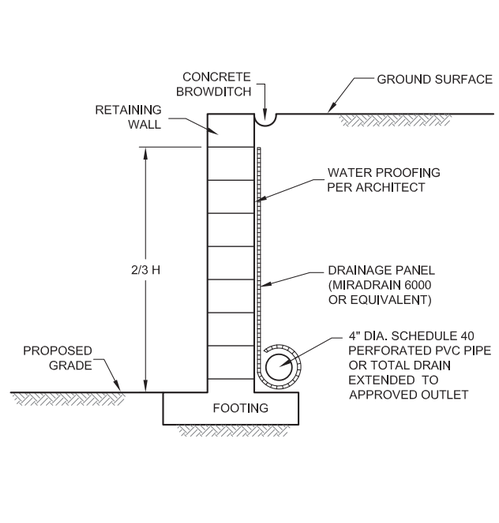
PASEO MONTRIL
SAN DIEGO, CALIFORNIA

RM / AML		DSK/GTYPD	DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 15

Plotted:01/04/2018 3:29PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Soil Nail Wall Drainage Detail (SNWDD).dwg







NOTE :

DRAIN SHOULD BE UNIFORMLY SLOPED TO GRAVITY OUTLET
OR TO A SUMP WHERE WATER CAN BE REMOVED BY PUMPING

NO SCALE

TYPICAL RETAINING WALL DRAIN DETAIL

GEOCON INCORPORATED
GEOTECHNICAL ■ ENVIRONMENTAL ■ MATERIALS
6960 FLANDERS DRIVE - SAN DIEGO, CALIFORNIA 92121 - 2974
PHONE 858 558-6900 - FAX 858 558-6159

RM / AML		DSK/GTYPD

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

DATE 01 - 05 - 2018	PROJECT NO. G2209 - 42 - 01	FIG. 16

Plotted:01/04/2018 3:29PM | By:ALVIN LADRILLONO | File Location:Y:\PROJECTS\G2209-42-01 (Paseo Montril)\DETAILS\Typical Retaining Wall Drainage Detail (RWDD7A).dwg

APPENDIX A

FIELD INVESTIGATION

Fieldwork for our investigation was performed on November 15, 2017 and included a site reconnaissance and subsurface exploration. The subsurface exploration consisted of four backhoe test pits and six air-track percussion borings. The exploratory trenches were excavated using a John Deere 410G rubber tire backhoe with a 2-foot-wide bucket and extended to depths between 4 feet and 17 feet. The air-percussion borings were performed using an Ingersoll Rand ECM 370 equipped with a 4-inch bit. The borings extended to depths between 24 feet and 76 feet.

The approximate locations of trenches and borings are shown on the Geologic Map, Figure 2 (Map Pocket). The trenches and borings were located in the field based on visual reference points. Therefore, actual locations may deviate slightly.

The soil encountered in the borings were visually examined, classified, and logged in general accordance with American Society for Testing and Materials (ASTM) practice for Description and Identification of Soils (Visual-Manual Procedure D 2488). The logs depict the soil and geologic conditions observed and the depth at which samples were obtained. Logs of the trenches are presented on Figures A-1 through A-4. The logs depict the soil and geologic conditions encountered. Logs of the air-track borings are presented on Figures A-5 through A-10.

PROJECT NO. G2209-42-01

TRENCH T 1

ELEV. (MSL.) **487'** DATE COMPLETED **11-15-2017**

EQUIPMENT _____ BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				SM/GW	**UNDOCUMENTED FILL (Qudf)** Loose, dry, brown, Clayey, fine to medium SAND and GRAVEL			
4				CH	**TOPSOIL (WEATHERED Mzu)** Stiff, moist, red brown, fine, FAT CLAY			
10	T1-1							
12					Dark olive - more Sand and Gravel (angular Mzu)			
14	T1-2							
16					TRENCH TERMINATED AT 17 FEET No groundwater encountered			

G2209-42-01.GPJ

Figure A-1,
Log of Trench T 1, Page 1 of 1

SAMPLE SYMBOLS: ... SAMPLING UNSUCCESSFUL; ... STANDARD PENETRATION TEST; ... DRIVE SAMPLE (UNDISTURBED); ... DISTURBED OR BAG SAMPLE; ... CHUNK SAMPLE; ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

PROJECT NO. G2209-42-01

TRENCH T 2

ELEV. (MSL.) **473'** DATE COMPLETED **11-15-2017**

EQUIPMENT _____ BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TOPSOIL (WEATHERED Mzu)** Stiff, moist, red brown, fine, FAT CLAY			
2								
4								
6								
8					**METAMORPHIC ROCK (Mzu)** Moderate to slightly weathered, dark gray, intensely fractured, META-SEDIMENTARY ROCK			
					TRENCH TERMINATED AT 9 FEET No groundwater encountered			

G2209-42-01.GPJ

Figure A-2,
Log of Trench T 2, Page 1 of 1

SAMPLE SYMBOLS: ... SAMPLING UNSUCCESSFUL; ... STANDARD PENETRATION TEST; ... DRIVE SAMPLE (UNDISTURBED); ... DISTURBED OR BAG SAMPLE; ... CHUNK SAMPLE; ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

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PROJECT NO. G2209-42-01

TRENCH T 3

ELEV. (MSL.) **508'** DATE COMPLETED **11-15-2017**

EQUIPMENT _____ BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0				CH	**TOPSOIL** Stiff, moist, dark red brown, fine, FAT CLAY			
2					**METAMORPHIC ROCK (Mzu)** Moderate to slightly weathered, dark gray, intensely fracture, META-SEDIMENTARY ROCK			
4					TRENCH TERMINATED AT 4 FEET No groundwater encountered			

G2209-42-01.GPJ

Figure A-3,
Log of Trench T 3, Page 1 of 1

SAMPLE SYMBOLS: ... SAMPLING UNSUCCESSFUL; ... STANDARD PENETRATION TEST; ... DRIVE SAMPLE (UNDISTURBED); ... DISTURBED OR BAG SAMPLE; ... CHUNK SAMPLE; ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2209-42-01

TRENCH T 4

ELEV. (MSL.) **516'** DATE COMPLETED **11-15-2017**

EQUIPMENT _____ BY: **G. CANNON**

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	MATERIAL DESCRIPTION	PENETRATION RESISTANCE (BLOWS/FT.)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
0								
				CH	**TOPSOIL** Soft, dry, red brown, fine, FAT CLAY			
2					**METAMORPHIC ROCK (Mzu)** Moderate to slightly weathered dark gray, intensely fractured, META-SEDIMENTARY ROCK			
	T4-1							
4								
					TRENCH TERMINATED AT 5 FEET No groundwater encountered			

Figure A-4,
Log of Trench T 4, Page 1 of 1

G2209-42-01.GPJ

SAMPLE SYMBOLS

... SAMPLING UNSUCCESSFUL
... STANDARD PENETRATION TEST
... DRIVE SAMPLE (UNDISTURBED)
... DISTURBED OR BAG SAMPLE
... CHUNK SAMPLE
... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

GEOCON

PROJECT NO. G2209-42-01

PASEO MONTRIL

AIR TRACK BORING AT-1
Elevation - 521 Feet (MSL)
Date 11-16-2017 - Equipment: ECM-370

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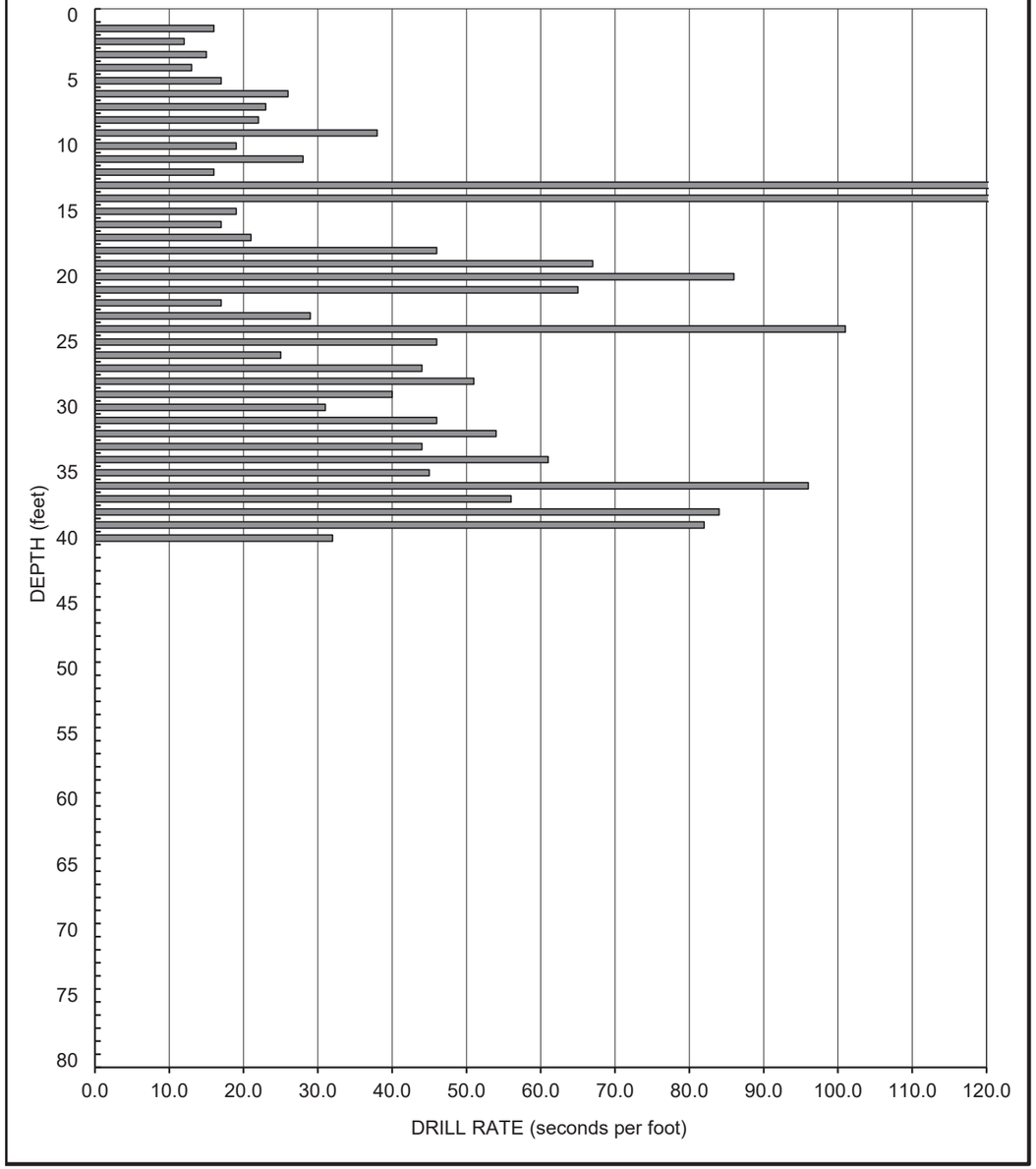


AT001.xls

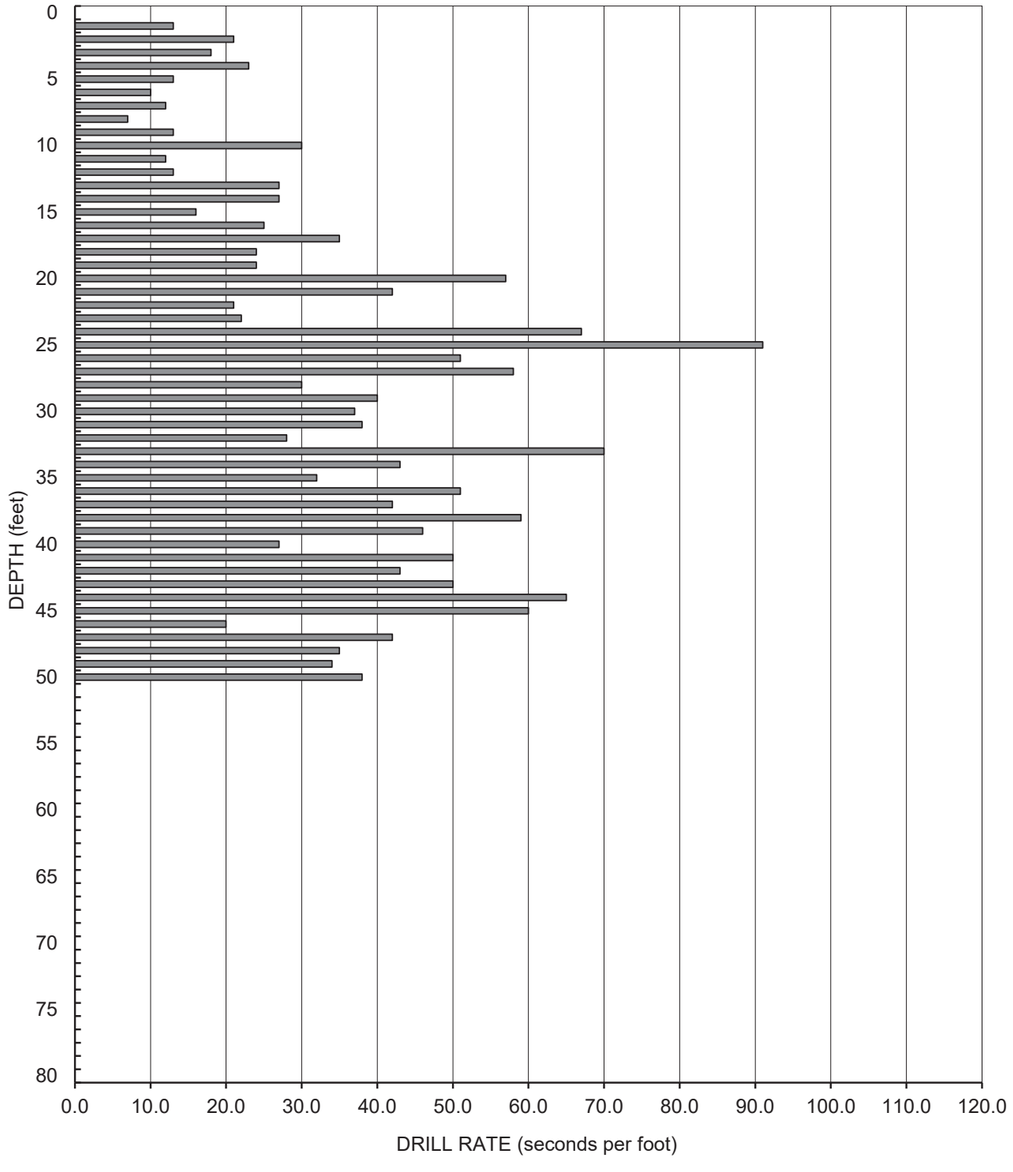
FIGURE A-5

PROJECT NO. G2209-42-01

PASEO MONTRIL

AIR TRACK BORING AT-2
Elevation - 537 Feet (MSL)
Date 11-16-2017 - Equipment: ECM-370

GEOCON INCORPORATED



AT002.xls

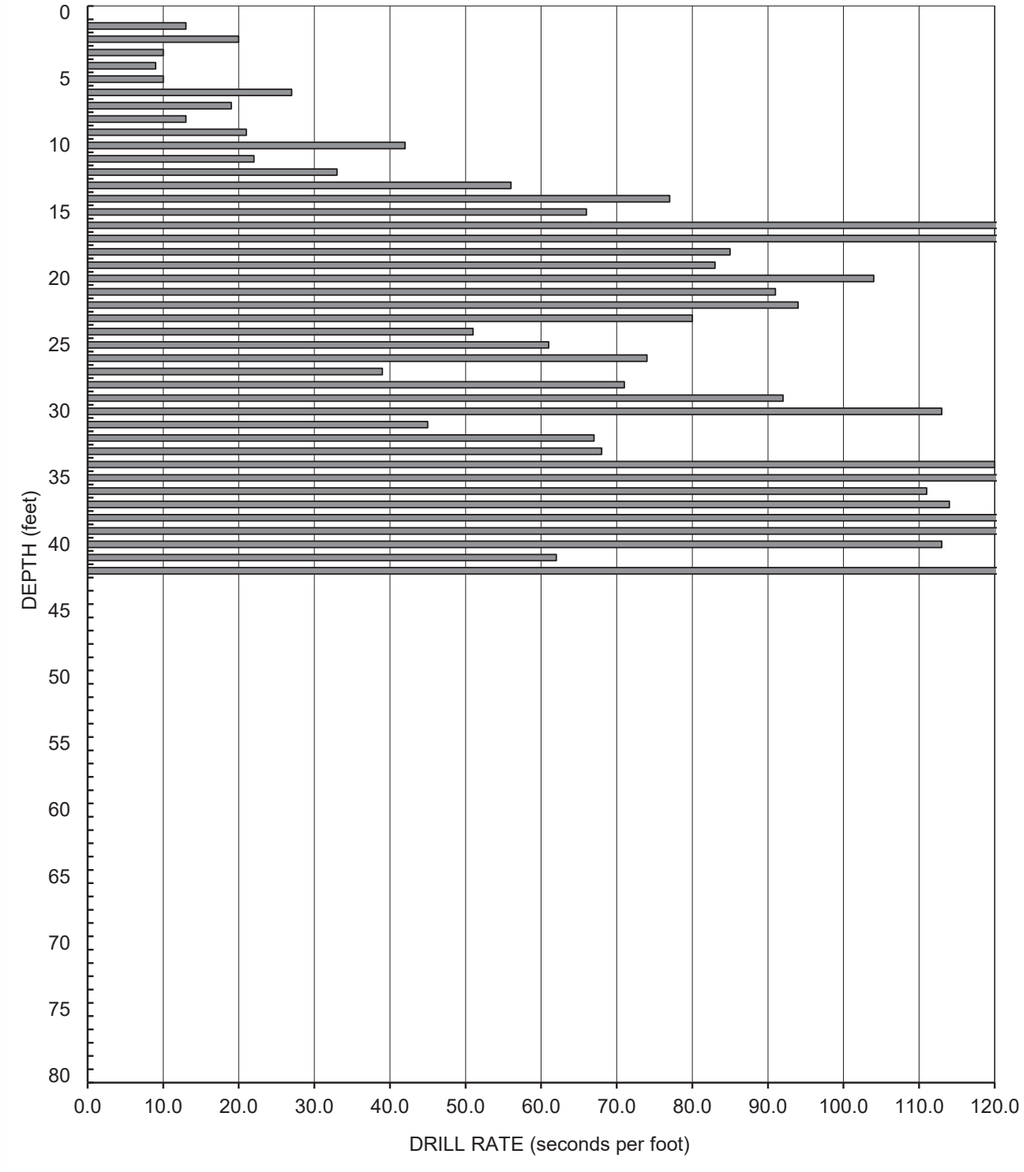
FIGURE A-6

PROJECT NO. G2209-42-01

PASEO MONTRIL

AIR TRACK BORING AT-3
Elevation - 550 Feet (MSL)
Date 11-16-2017 - Equipment: ECM-370

GEOCON INCORPORATED



AT003.xls

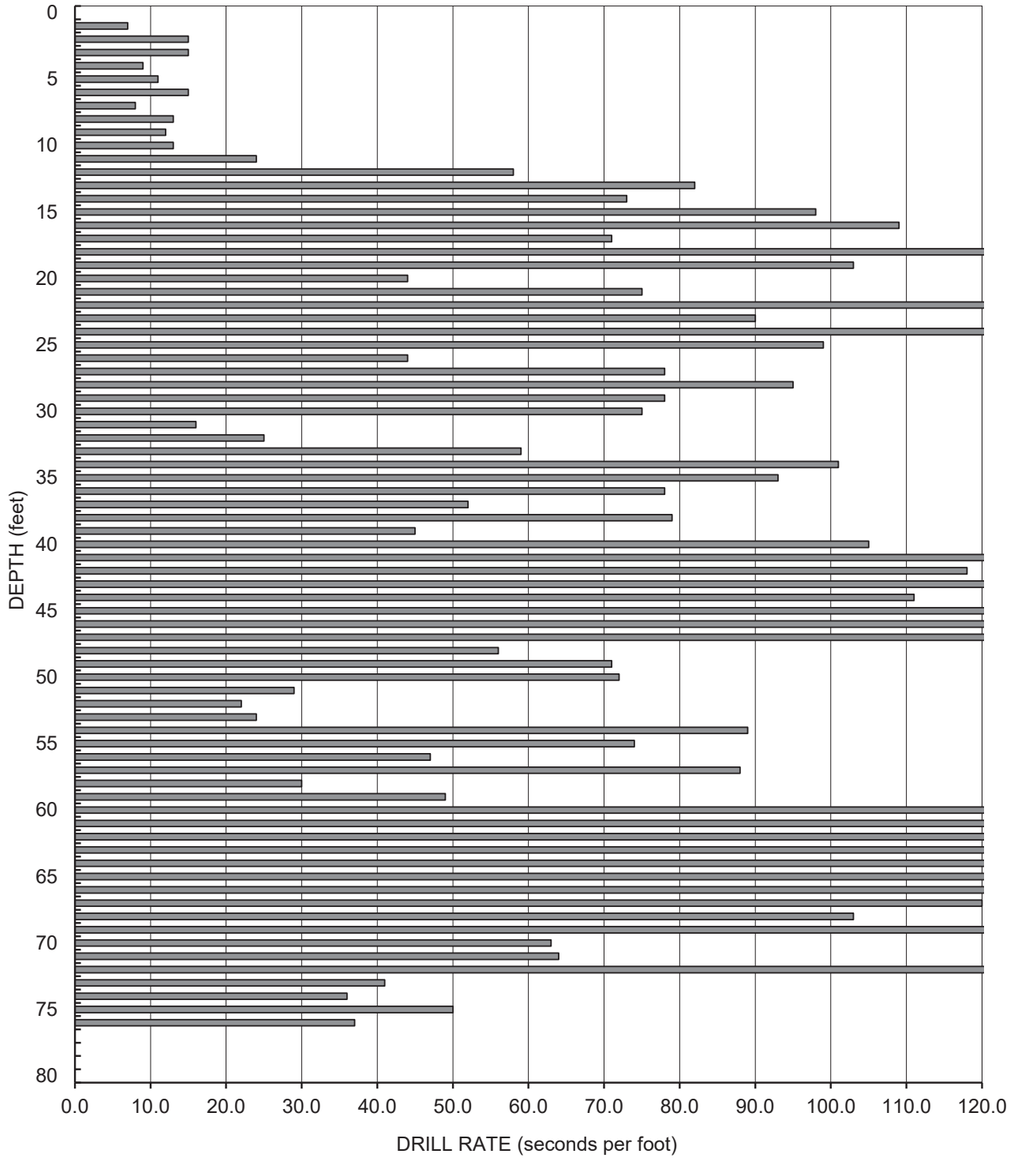
FIGURE A-7

PROJECT NO. G2209-42-01

PASEO MONTRIL

AIR TRACK BORING AT-4
Elevation - 560.5 Feet (MSL)
Date 11-15-2017 - Equipment: ECM-370

GEOCON INCORPORATED



AT004.xls

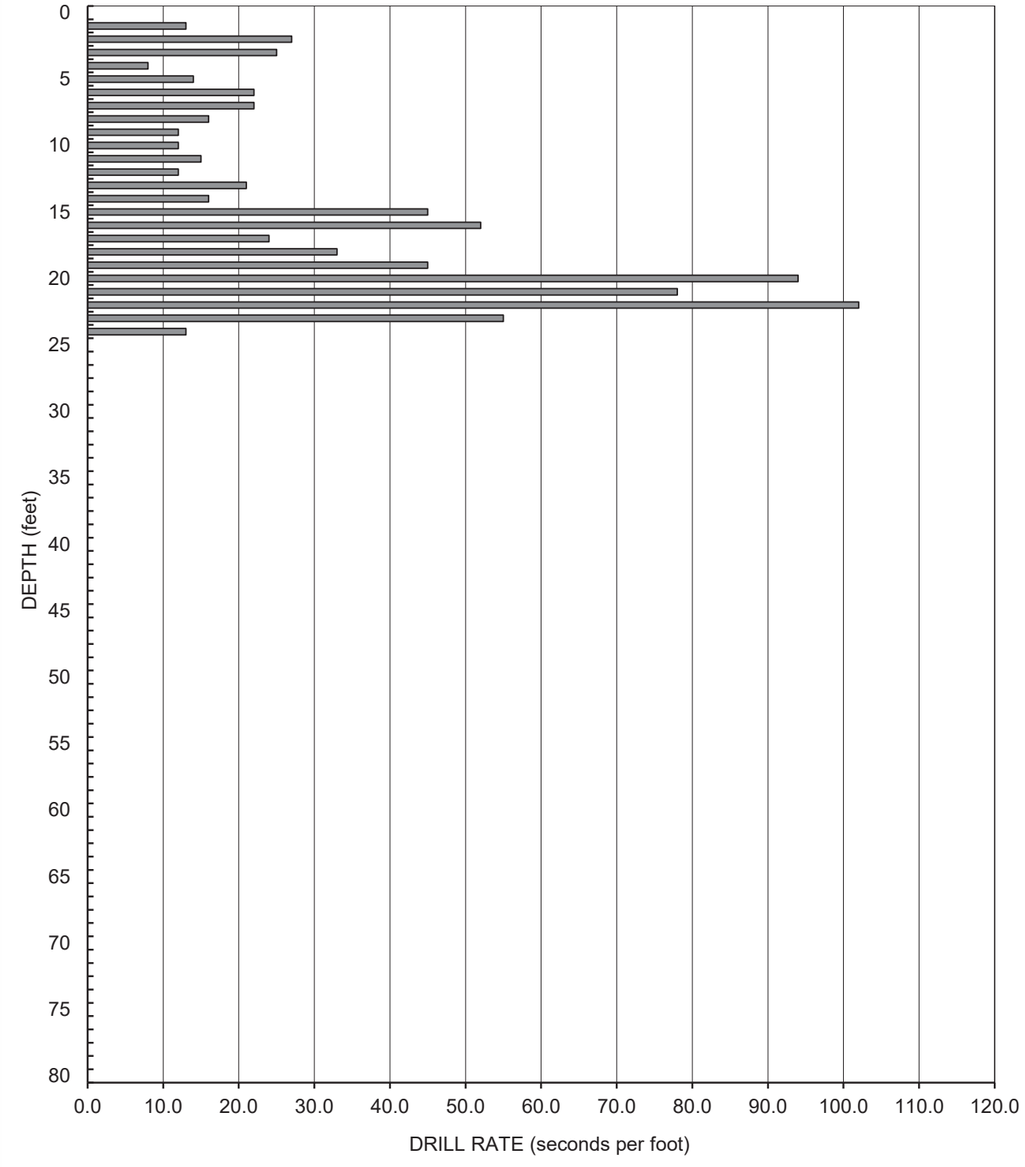
FIGURE A-8

PROJECT NO. G2209-42-01

PASEO MONTRIL

AIR TRACK BORING AT-5
Elevation - 560 Feet (MSL)
Date 11-15-2017 - Equipment: ECM-370

GEOCON INCORPORATED



AT005.xls

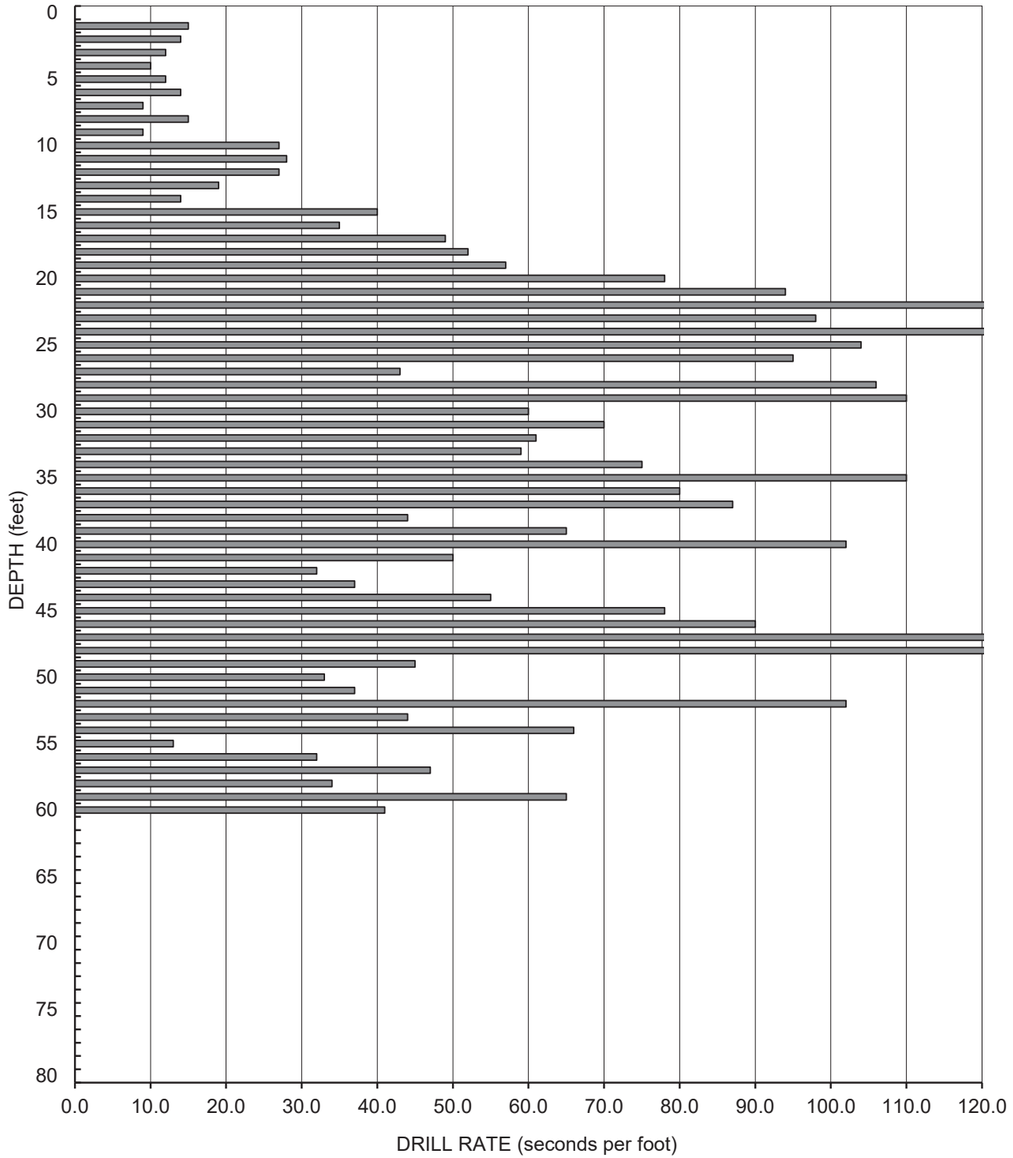
FIGURE A-9

PROJECT NO. G2209-42-01

PASEO MONTRIL

AIR TRACK BORING AT-6
Elevation - 549.5 Feet (MSL)
Date 11-15-2017 - Equipment: ECM-370

GEOCON INCORPORATED



AT006.xls

FIGURE A-10

APPENDIX B

APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the American Society for Testing and Materials (ASTM) or other suggested procedures. Selected soil samples were tested for their maximum dry density and optimum moisture content, expansion characteristics, gradation, Atterberg limits, and water-soluble sulfate content. The results of our laboratory tests are summarized on the following tables and graphs.

TABLE B-I
SUMMARY OF LABORATORY MAXIMUM DRY DENSITY AND OPTIMUM MOISTURE CONTENT TEST RESULTS

Sample No.	Description	Maximum Dry Density (pcf)	Optimum Moisture Content (% dry wt.)
T1-1	Dark brown CLAY with trace gravel and little sand	112.7	17.7
T1-2	Gray brown CLAY with trace gravel and sand	113.3	16.2

TABLE B-II
SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	Expansion Classification
	Before Test	After Test			
T1-1	14.7	34.9	93.7	107	High
T1-2	13.6	31.2	95.8	115	High

TABLE B-III
SUMMARY OF LABORATORY WATER-SOLUBLE SULFATE TEST RESULTS

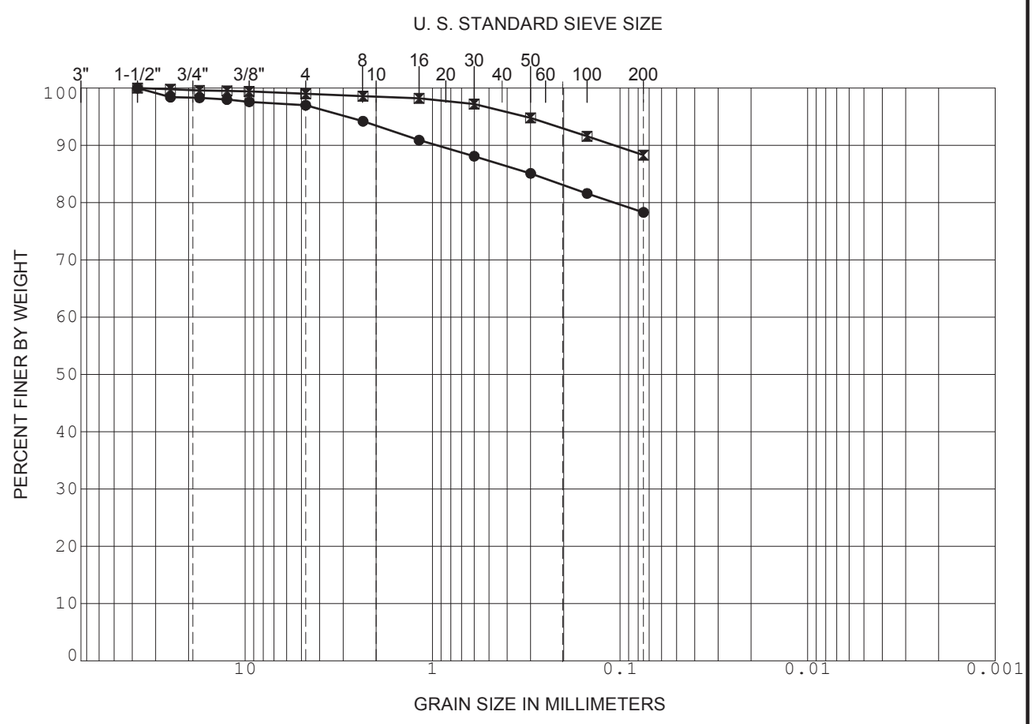
Sample No.	Water-Soluble Sulfate Content (%)	Exposure
T1-1	0.034	Not Applicable
T1-2	0.038	Not Applicable

TABLE B-IV
SUMMARY OF LABORATORY ATTERBERG LIMITS TEST RESULTS
ASTM D 4318

Sample No.	Description	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	Unified Soil Classification (Group Symbol)
T1-1	Dark brown Fat CLAY	65	20	45	CH
T1-2	Gray Brown Fat CLAY	50	27	23	CH

PROJECT NO. G2209-42-01

GRAVEL		SAND			SILT OR CLAY
COARSE	FINE	COARSE	MEDIUM	FINE	



	SAMPLE	DEPTH (ft)	CLASSIFICATION	NAT WC	LL	PL	PI
●	T1-1	11.0	(CH) FAT CLAY with Sand		65	20	45
■	T1-2	15.0	(CH) FAT CLAY		50	27	23
▲							

GRADATION CURVE

PASEO MONTRIL

SAN DIEGO, CALIFORNIA

G2209-42-01.GPJ

Figure B-1

GEOCON

APPENDIX C

APPENDIX C

STORM WATER MANAGEMENT

If storm water management devices are not properly designed and constructed, there is a risk for distress to improvements and properties located hydrologically down gradient or adjacent to these devices. Factors such as the amount of water being detained, its residence time, and soil permeability have an important effect on seepage transmission and the potential adverse impacts that may occur if the storm water management features are not properly designed and constructed. We have not performed a hydrogeological study at the site. If infiltration of storm water runoff into the subsurface occurs, downstream improvements may be subjected to seeps, springs, slope instability, raised groundwater, movement of foundations and slabs, or other undesirable impacts as a result of water infiltration.

Hydrologic Soil Group

The United States Department of Agriculture (USDA), Natural Resources Conservation Services, provides general information regarding soil conditions for areas within the United States. The USDA website also provides the Hydrologic Soil Group. Table C-1 presents the descriptions of the hydrologic soil groups. If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

TABLE C-1
HYDROLOGIC SOIL GROUP DEFINITIONS

Soil Group	Soil Group Definition
A	Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.
B	Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.
C	Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.
D	Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high-water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The subject property is underlain by soil and geologic units consisting of undocumented fill, alluvium, terrace deposits, and granitic rock. The property falls within Hydraulic Soil Groups B, C, and D, which range from moderate infiltration characteristics to very slow infiltration. The majority

of the site falls within Hydrologic Soil Group C. Table C-2 presents the information from the USDA website for the property.

TABLE C-2
USDA WEB SOIL SURVEY – HYDROLOGIC SOIL GROUP

Map Unit Name	Map Unit Symbol	Approximate Percentage of Property	Hydrologic Soil Group	Estimated Infiltration Rate (in/hr)
Diablo-Olivenhain complex, 9 to 30 percent slopes	DoE	7	D	0.06
Friant rocky fine sandy loam, 9 to 30 percent slopes	FxE	25	D	2
Olivenhain cobbly loam, 9 to 30 percent slopes	OhE	68	D	0.06

Summary of Existing and Future Graded Soil Conditions

Because the property is in an ungraded condition, the existing soil conditions do not reflect the soil conditions that will be present at the completion of grading. Currently, the site is underlain by undocumented fill, topsoil, weathered Metamorphic rock and Metamorphic Rock. Grading will result in cuts up to approximately 50 feet in northern portion of the property and fills along the eastern, southern and southwest portions of the property. At the completion of grading, the site will be underlain by compacted fill overlying Metamorphic Rock. Compacted fill depths are expected to range from 5 feet (bedrock undercut areas) to 30 feet in fill areas.

Infiltration Testing

Infiltration testing has not been performed as proposed grading will result in cuts and fills across the entire site and in-situ tests performed now will not reflect actual conditions at the completion of grading. Estimated infiltration rates from the USDA Web Soil Survey for each of the mapped soil units is shown on Table C-2.

STORM WATER MANAGEMENT CONCLUSIONS

Soil Types

At the completion of grading the site will be underlain by compacted fill and Metamorphic Rock. Compacted fill depths will range from approximately 5 feet in building pad undercut areas to 30 feet in fill areas. Infiltration into compacted fill is considered unfeasible due to the potential for settlement of structural improvements and lateral seepage migration into the retaining wall backfill along the perimeter of the project. Infiltration into the Metamorphic Rock is also considered

infeasible due to its dense/hard nature and the potential to cause lateral water migration to structural improvements and slopes.

Infiltration Rates

Based on the USDA Web Soil Survey, we recommend an unfactored infiltration rate of 0.06 in/hr. The 2 in/hr indicated on the soil survey website for FxE is located in the hillside and drainage on the east side of the project. Grading along the eastern side of the property will result in compacted fill and walls up to 14 feet high.

Existing and Proposed Structures

There are no existing structures present on the property. However, at the completion of grading, residential multi-family structures and infrastructure be constructed across the property.

Groundwater

Groundwater was not encountered in our exploratory excavations. Groundwater is estimated to be at depths greater than 50 feet below proposed finish grades.

Soil or Groundwater Contamination

We are unaware of contaminated soil or groundwater on the property. Therefore, infiltration associated with this risk is considered feasible.

Slopes

New fill slopes are planned at the southwest and southeast corners of the site. A cut slope will be constructed along the northwest side of the property. An existing cut slopes that extends down to Interstate 15 exists on the south side of the site. Infiltration near slopes is not recommended due to the potential for lateral water migration.

Storm Water Management Devices

If basins are utilized, a liner with subdrains is recommended. The liner should be impermeable (e.g. High-density polyethylene, HDPE, with a thickness of about 30 mil or equivalent Polyvinyl Chloride**,** PVC). The subdrain should be perforated, be at least 4 inches in diameter and consist of Schedule 40 PVC pipe and surrounded in gravel. The subdrain should be connected to a proper outlet. If storage vaults are utilized, the vaults should be water-tight.

Storm Water Standard Worksheets

The SWS requests the geotechnical engineer complete the *Categorization of Infiltration Feasibility Condition* (Worksheet C.4-1 or I-8) worksheet information to help evaluate the potential for infiltration on the property. Worksheets C.4-1 have been attached.

The regional storm water standards also have a worksheet (Worksheet D.5-1 or Form I-9) that helps the project civil engineer estimate the factor of safety based on several factors. Table C-3 describes the suitability assessment input parameters related to the geotechnical engineering aspects for the factor of safety determination.

TABLE C-3
SUITABILITY ASSESSMENT RELATED CONSIDERATIONS FOR INFILTRATION FACILITY SAFETY FACTORS

Consideration	High Concern – 3 Points	Medium Concern – 2 Points	Low Concern – 1 Point
Assessment Methods	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates. Use of well permeameter or borehole methods without accompanying continuous boring log. Relatively sparse testing with direct infiltration methods	Use of well permeameter or borehole methods with accompanying continuous boring log. Direct measurement of infiltration area with localized infiltration measurement methods (e.g., infiltrometer). Moderate spatial resolution	Direct measurement with localized (i.e. small-scale) infiltration testing methods at relatively high resolution or use of extensive test pit infiltration measurement methods.
Predominant Soil Texture	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site Soil Variability	Highly variable soils indicated from site assessment or unknown variability	Soil boring/test pits indicate moderately homogenous soils	Soil boring/test pits indicate relatively homogenous soils
Depth to Groundwater/ Impervious Layer	<5 feet below facility bottom	5-15 feet below facility bottom	>15 feet below facility bottom

Table C-4 presents the estimated factor values for the evaluation of the factor of safety. The factor of safety is determined using the information contained in Table C-4 and the results of our geotechnical investigation. Table C-4 only presents the suitability assessment safety factor (Part A) of the worksheet. The project civil engineer should evaluate the safety factor for design (Part B of Worksheet D.5-1) and use the combined safety factor for the design infiltration rate.

TABLE C-4
FACTOR OF SAFETY WORKSHEET D.5-1 DESIGN VALUES – PART A[1]

Suitability Assessment Factor Category	Assigned Weight (w)	Factor Value (v)	Product (p = w x v)
Assessment Methods	0.25	3	0.75
Predominant Soil Texture	0.25	3	0.75
Site Soil Variability	0.25	1	0.25
Depth to Groundwater/Impervious Layer	0.25	1	0.25
Suitability Assessment Safety Factor, $S_A = \Sigma p$			2

1 The project civil engineer should complete Part B of Worksheet D.5-1 or Form I-9 to determine the overall factor of safety.

CONCLUSIONS AND RECOMMENDATIONS

It is our opinion that infiltration is infeasible due to expected low infiltration rates in the bedrock soils, as well as the presence of fill and retaining walls that will be constructed on the property. Our evaluation included the soil and geologic conditions, settlement and volume change of the underlying soil, slope stability, utility considerations, groundwater mounding, retaining walls, foundations, and existing groundwater elevations.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		**Project Phase:**
Overall Site		
Criteria 1: Infiltration Rate Screening		
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☐ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☒ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).	
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☒ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.	
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☒ No; full infiltration is not required. Answer "No" to Criteria 1 Result.	
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☐ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.	

Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☐ No; conduct appropriate number of tests.	
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☐ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.	
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☐ No; answer "No" to Criteria 1 Result.	
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☒ No; full infiltration is not required. Skip to Part 1 Result.	

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

Based on theUSDA Web Soil Survey, 75% of the site area has an infiltraiton rate of 0.06 in/hr or less. The other 25% of the site area is listed as having an estimated infiltration rate of 2 in/hr and is located along the eastern side of the site. However, based on field mapping, the area is underlain by hard metamorphic rock and is expected to have an infiltration rate of less than 0.5 in/hr. This area will recevie cuts to achieve proposed pad grade and fills in excess of 5 feet. In addition, in this area, retaining walls and building structures are planned. There is no reasonable area outside of the strucural improvements or compacted fill areas where an infiltraiton basin could be constructed due to the sloping hillside condition and sensitive habitat along the east side of the site.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A–1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☐ Yes	☐ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B–1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐ Yes	☐ No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 1 Result – Full Infiltration Geotechnical Screening [12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐ Full infiltration Condition ☒ Complete Part 2

[12] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		**Project Phase:**
Overall Site		
Criteria 3: Infiltration Rate Screening		
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☒ No; infiltration testing is conducted (refer to Table D.3–1), continue to Step 3B.	
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☒ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.	
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☒ No: Skip to Part 2 Result.	
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). Based on theUSDA Web Soil Survey, 75% of the site area has an infiltraiton rate of 0.06 in/hr or less. The other 25% of the site area is listed as having an estimated infiltration rate of 2 in/hr and is located along the eastern side of the site. However, based on field mapping, the area is underlain by hard metamorphic rock and is expected to have an infiltration rate of less than 0.05 in/hr. This area will recevie cuts to achieve proposed pad grade and fills in excess of 5 feet. In addition, in this area, retaining walls and building structures are planned. There is no reasonable area outside of the strucural improvements or compacted fill areas where an infiltraiton basin could be constructed due to the sloping hillside condition and sensitive habitat along the east side of the site.		

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions			Worksheet C.4-1: Form I- 8A[10]
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A–1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐ Yes	☐ No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐ Yes	☐ No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐ Yes	☐ No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B–1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐ Yes	☐ No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐ Yes	☐ No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐ Yes	☐ No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐ Yes	☐ No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐ Yes	☐ No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐ Yes	☐ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I- 8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☒ No Infiltration Condition

[13] To be completed using gathered site information and best professional judgement considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by City Engineer to substantiate findings.

APPENDIX D

APPENDIX D

RECOMMENDED GRADING SPECIFICATIONS

FOR

PASEO MONTRIL
SAN DIEGO, CALIFORNIA

PROJECT NO. G2209-42-01

RECOMMENDED GRADING SPECIFICATIONS

1. GENERAL

1.1 These Recommended Grading Specifications shall be used in conjunction with the Geotechnical Report for the project prepared by Geocon. The recommendations contained in the text of the Geotechnical Report are a part of the earthwork and grading specifications and shall supersede the provisions contained hereinafter in the case of conflict.

1.2 Prior to the commencement of grading, a geotechnical consultant (Consultant) shall be employed for the purpose of observing earthwork procedures and testing the fills for substantial conformance with the recommendations of the Geotechnical Report and these specifications. The Consultant should provide adequate testing and observation services so that they may assess whether, in their opinion, the work was performed in substantial conformance with these specifications. It shall be the responsibility of the Contractor to assist the Consultant and keep them apprised of work schedules and changes so that personnel may be scheduled accordingly.

1.3 It shall be the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the work in accordance with applicable grading codes or agency ordinances, these specifications and the approved grading plans. If, in the opinion of the Consultant, unsatisfactory conditions such as questionable soil materials, poor moisture condition, inadequate compaction, and/or adverse weather result in a quality of work not in conformance with these specifications, the Consultant will be empowered to reject the work and recommend to the Owner that grading be stopped until the unacceptable conditions are corrected.

2. DEFINITIONS

2.1 **Owner** shall refer to the owner of the property or the entity on whose behalf the grading work is being performed and who has contracted with the Contractor to have grading performed.

2.2 **Contractor** shall refer to the Contractor performing the site grading work.

2.3 **Civil Engineer** or **Engineer of Work** shall refer to the California licensed Civil Engineer or consulting firm responsible for preparation of the grading plans, surveying and verifying as-graded topography.

2.4 **Consultant** shall refer to the soil engineering and engineering geology consulting firm retained to provide geotechnical services for the project.

2.5 **Soil Engineer** shall refer to a California licensed Civil Engineer retained by the Owner, who is experienced in the practice of geotechnical engineering. The Soil Engineer shall be responsible for having qualified representatives on-site to observe and test the Contractor's work for conformance with these specifications.

2.6 **Engineering Geologist** shall refer to a California licensed Engineering Geologist retained by the Owner to provide geologic observations and recommendations during the site grading.

2.7 **Geotechnical Report** shall refer to a soil report (including all addenda) which may include a geologic reconnaissance or geologic investigation that was prepared specifically for the development of the project for which these Recommended Grading Specifications are intended to apply.

3. MATERIALS

3.1 Materials for compacted fill shall consist of any soil excavated from the cut areas or imported to the site that, in the opinion of the Consultant, is suitable for use in construction of fills. In general, fill materials can be classified as *soil* fills, *soil-rock* fills or *rock* fills, as defined below.

3.1.1 **Soil fills** are defined as fills containing no rocks or hard lumps greater than 12 inches in maximum dimension and containing at least 40 percent by weight of material smaller than ¾ inch in size.

3.1.2 **Soil-rock fills** are defined as fills containing no rocks or hard lumps larger than 4 feet in maximum dimension and containing a sufficient matrix of soil fill to allow for proper compaction of soil fill around the rock fragments or hard lumps as specified in Paragraph 6.2. **Oversize rock** is defined as material greater than 12 inches.

3.1.3 **Rock fills** are defined as fills containing no rocks or hard lumps larger than 3 feet in maximum dimension and containing little or no fines. Fines are defined as material smaller than ¾ inch in maximum dimension. The quantity of fines shall be less than approximately 20 percent of the rock fill quantity.

3.2 Material of a perishable, spongy, or otherwise unsuitable nature as determined by the Consultant shall not be used in fills.

3.3 Materials used for fill, either imported or on-site, shall not contain hazardous materials as defined by the California Code of Regulations, Title 22, Division 4, Chapter 30, Articles 9

and 10; 40CFR; and any other applicable local, state or federal laws. The Consultant shall not be responsible for the identification or analysis of the potential presence of hazardous materials. However, if observations, odors or soil discoloration cause Consultant to suspect the presence of hazardous materials, the Consultant may request from the Owner the termination of grading operations within the affected area. Prior to resuming grading operations, the Owner shall provide a written report to the Consultant indicating that the suspected materials are not hazardous as defined by applicable laws and regulations.

3.4 The outer 15 feet of *soil-rock* fill slopes, measured horizontally, should be composed of properly compacted *soil* fill materials approved by the Consultant. *Rock* fill may extend to the slope face, provided that the slope is not steeper than 2:1 (horizontal:vertical) and a soil layer no thicker than 12 inches is track-walked onto the face for landscaping purposes. This procedure may be utilized provided it is acceptable to the governing agency, Owner and Consultant.

3.5 Samples of soil materials to be used for fill should be tested in the laboratory by the Consultant to determine the maximum density, optimum moisture content, and, where appropriate, shear strength, expansion, and gradation characteristics of the soil.

3.6 During grading, soil or groundwater conditions other than those identified in the Geotechnical Report may be encountered by the Contractor. The Consultant shall be notified immediately to evaluate the significance of the unanticipated condition

4. CLEARING AND PREPARING AREAS TO BE FILLED

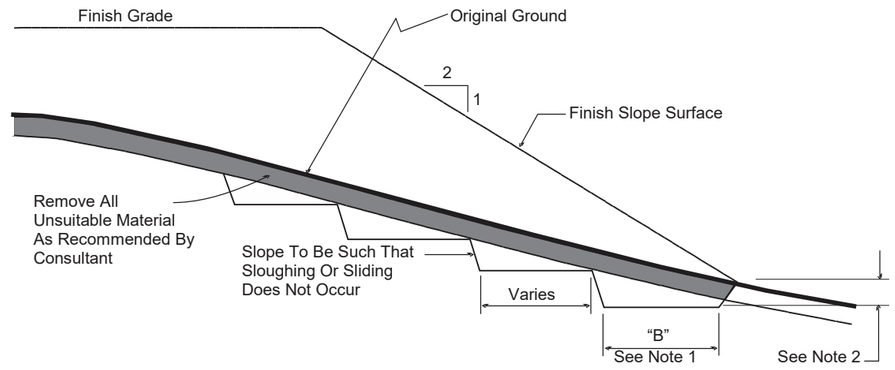
4.1 Areas to be excavated and filled shall be cleared and grubbed. Clearing shall consist of complete removal above the ground surface of trees, stumps, brush, vegetation, man-made structures, and similar debris. Grubbing shall consist of removal of stumps, roots, buried logs and other unsuitable material and shall be performed in areas to be graded. Roots and other projections exceeding 1½ inches in diameter shall be removed to a depth of 3 feet below the surface of the ground. Borrow areas shall be grubbed to the extent necessary to provide suitable fill materials.

4.2 Asphalt pavement material removed during clearing operations should be properly disposed at an approved off-site facility or in an acceptable area of the project evaluated by Geocon and the property owner. Concrete fragments that are free of reinforcing steel may be placed in fills, provided they are placed in accordance with Section 6.2 or 6.3 of this document.

4.3 After clearing and grubbing of organic matter and other unsuitable material, loose or porous soils shall be removed to the depth recommended in the Geotechnical Report. The depth of removal and compaction should be observed and approved by a representative of the Consultant. The exposed surface shall then be plowed or scarified to a minimum depth of 6 inches and until the surface is free from uneven features that would tend to prevent uniform compaction by the equipment to be used.

4.4 Where the slope ratio of the original ground is steeper than 5:1 (horizontal:vertical), or where recommended by the Consultant, the original ground should be benched in accordance with the following illustration.

TYPICAL BENCHING DETAIL



No Scale

DETAIL NOTES:
(1) Key width "B" should be a minimum of 10 feet, or sufficiently wide to permit complete coverage with the compaction equipment used. The base of the key should be graded horizontal, or inclined slightly into the natural slope.

(2) The outside of the key should be below the topsoil or unsuitable surficial material and at least 2 feet into dense formational material. Where hard rock is exposed in the bottom of the key, the depth and configuration of the key may be modified as approved by the Consultant.

4.5 After areas to receive fill have been cleared and scarified, the surface should be moisture conditioned to achieve the proper moisture content, and compacted as recommended in Section 6 of these specifications.

5. COMPACTION EQUIPMENT

5.1 Compaction of *soil* or *soil-rock* fill shall be accomplished by sheepsfoot or segmented-steel wheeled rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Equipment shall be of such a design that it will be capable of compacting the *soil* or *soil-rock* fill to the specified relative compaction at the specified moisture content.

5.2 Compaction of *rock* fills shall be performed in accordance with Section 6.3.

6. PLACING, SPREADING AND COMPACTION OF FILL MATERIAL

6.1 *Soil* fill, as defined in Paragraph 3.1.1, shall be placed by the Contractor in accordance with the following recommendations:

6.1.1 *Soil* fill shall be placed by the Contractor in layers that, when compacted, should generally not exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during spreading to obtain uniformity of material and moisture in each layer. The entire fill shall be constructed as a unit in nearly level lifts. Rock materials greater than 12 inches in maximum dimension shall be placed in accordance with Section 6.2 or 6.3 of these specifications.

6.1.2 In general, the *soil* fill shall be compacted at a moisture content at or above the optimum moisture content as determined by ASTM D 1557.

6.1.3 When the moisture content of *soil* fill is below that specified by the Consultant, water shall be added by the Contractor until the moisture content is in the range specified.

6.1.4 When the moisture content of the *soil* fill is above the range specified by the Consultant or too wet to achieve proper compaction, the *soil* fill shall be aerated by the Contractor by blading/mixing, or other satisfactory methods until the moisture content is within the range specified.

6.1.5 After each layer has been placed, mixed, and spread evenly, it shall be thoroughly compacted by the Contractor to a relative compaction of at least 90 percent. Relative compaction is defined as the ratio (expressed in percent) of the in-place dry density of the compacted fill to the maximum laboratory dry density as determined in accordance with ASTM D 1557. Compaction shall be continuous over the entire area, and compaction equipment shall make sufficient passes so that the specified minimum relative compaction has been achieved throughout the entire fill.

6.1.6 Where practical, soils having an Expansion Index greater than 50 should be placed at least 3 feet below finish pad grade and should be compacted at a moisture content generally 2 to 4 percent greater than the optimum moisture content for the material.

6.1.7 Properly compacted *soil* fill shall extend to the design surface of fill slopes. To achieve proper compaction, it is recommended that fill slopes be over-built by at least 3 feet and then cut to the design grade. This procedure is considered preferable to track-walking of slopes, as described in the following paragraph.

6.1.8 As an alternative to over-building of slopes, slope faces may be back-rolled with a heavy-duty loaded sheepsfoot or vibratory roller at maximum 4-foot fill height intervals. Upon completion, slopes should then be track-walked with a D-8 dozer or similar equipment, such that a dozer track covers all slope surfaces at least twice.

6.2 *Soil-rock* fill, as defined in Paragraph 3.1.2, shall be placed by the Contractor in accordance with the following recommendations:

6.2.1 Rocks larger than 12 inches but less than 4 feet in maximum dimension may be incorporated into the compacted *soil* fill, but shall be limited to the area measured 15 feet minimum horizontally from the slope face and 5 feet below finish grade or 3 feet below the deepest utility, whichever is deeper.

6.2.2 Rocks or rock fragments up to 4 feet in maximum dimension may either be individually placed or placed in windrows. Under certain conditions, rocks or rock fragments up to 10 feet in maximum dimension may be placed using similar methods. The acceptability of placing rock materials greater than 4 feet in maximum dimension shall be evaluated during grading as specific cases arise and shall be approved by the Consultant prior to placement.

6.2.3 For individual placement, sufficient space shall be provided between rocks to allow for passage of compaction equipment.

6.2.4 For windrow placement, the rocks should be placed in trenches excavated in properly compacted *soil* fill. Trenches should be approximately 5 feet wide and 4 feet deep in maximum dimension. The voids around and beneath rocks should be filled with approved granular soil having a Sand Equivalent of 30 or greater and should be compacted by flooding. Windrows may also be placed utilizing an "open-face" method in lieu of the trench procedure, however, this method should first be approved by the Consultant.

6.2.5 Windrows should generally be parallel to each other and may be placed either parallel to or perpendicular to the face of the slope depending on the site geometry. The minimum horizontal spacing for windrows shall be 12 feet center-to-center with a 5-foot stagger or offset from lower courses to next overlying course. The minimum vertical spacing between windrow courses shall be 2 feet from the top of a lower windrow to the bottom of the next higher windrow.

6.2.6 Rock placement, fill placement and flooding of approved granular soil in the windrows should be continuously observed by the Consultant.

6.3 *Rock* fills, as defined in Section 3.1.3, shall be placed by the Contractor in accordance with the following recommendations:

6.3.1 The base of the *rock* fill shall be placed on a sloping surface (minimum slope of 2 percent). The surface shall slope toward suitable subdrainage outlet facilities. The *rock* fills shall be provided with subdrains during construction so that a hydrostatic pressure buildup does not develop. The subdrains shall be permanently connected to controlled drainage facilities to control post-construction infiltration of water.

6.3.2 *Rock* fills shall be placed in lifts not exceeding 3 feet. Placement shall be by rock trucks traversing previously placed lifts and dumping at the edge of the currently placed lift. Spreading of the *rock* fill shall be by dozer to facilitate *seating* of the rock. The *rock* fill shall be watered heavily during placement. Watering shall consist of water trucks traversing in front of the current rock lift face and spraying water continuously during rock placement. Compaction equipment with compactive energy comparable to or greater than that of a 20-ton steel vibratory roller or other compaction equipment providing suitable energy to achieve the required compaction or deflection as recommended in Paragraph 6.3.3 shall be utilized. The number of passes to be made should be determined as described in Paragraph 6.3.3. Once a *rock* fill lift has been covered with *soil* fill, no additional *rock* fill lifts will be permitted over the *soil* fill.

6.3.3 Plate bearing tests, in accordance with ASTM D 1196, may be performed in both the compacted *soil* fill and in the *rock* fill to aid in determining the required minimum number of passes of the compaction equipment. If performed, a minimum of three plate bearing tests should be performed in the properly compacted *soil* fill (minimum relative compaction of 90 percent). Plate bearing tests shall then be performed on areas of *rock* fill having two passes, four passes and six passes of the compaction equipment, respectively. The number of passes required for the *rock* fill shall be determined by comparing the results of the plate bearing tests for the *soil* fill and the *rock* fill and by evaluating the deflection variation with number of passes. The required number of passes of the compaction equipment will be performed as necessary until the plate bearing deflections are equal to or less than that determined for the properly compacted *soil* fill. In no case will the required number of passes be less than two.

6.3.4 A representative of the Consultant should be present during *rock* fill operations to observe that the minimum number of "passes" have been obtained, that water is being properly applied and that specified procedures are being followed. The actual number of plate bearing tests will be determined by the Consultant during grading.

6.3.5 Test pits shall be excavated by the Contractor so that the Consultant can state that, in their opinion, sufficient water is present and that voids between large rocks are properly filled with smaller rock material. In-place density testing will not be required in the *rock* fills.

6.3.6 To reduce the potential for "piping" of fines into the *rock* fill from overlying *soil* fill material, a 2-foot layer of graded filter material shall be placed above the uppermost lift of *rock* fill. The need to place graded filter material below the *rock* should be determined by the Consultant prior to commencing grading. The gradation of the graded filter material will be determined at the time the *rock* fill is being excavated. Materials typical of the *rock* fill should be submitted to the Consultant in a timely manner, to allow design of the graded filter prior to the commencement of *rock* fill placement.

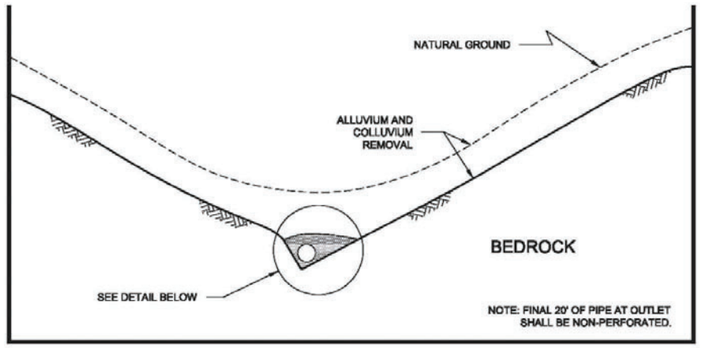
6.3.7 *Rock* fill placement should be continuously observed during placement by the Consultant.

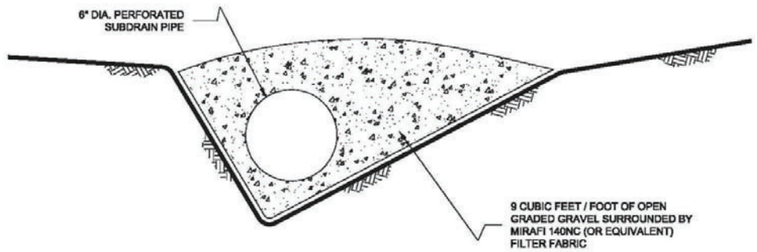
7. SUBDRAINS

7.1 The geologic units on the site may have permeability characteristics and/or fracture systems that could be susceptible under certain conditions to seepage. The use of canyon subdrains may be necessary to mitigate the potential for adverse impacts associated with seepage conditions. Canyon subdrains with lengths in excess of 500 feet or extensions of existing offsite subdrains should use 8-inch-diameter pipes. Canyon subdrains less than 500 feet in length should use 6-inch-diameter pipes.

GI rev. 07/2015

TYPICAL CANYON DRAIN DETAIL





NOTES:

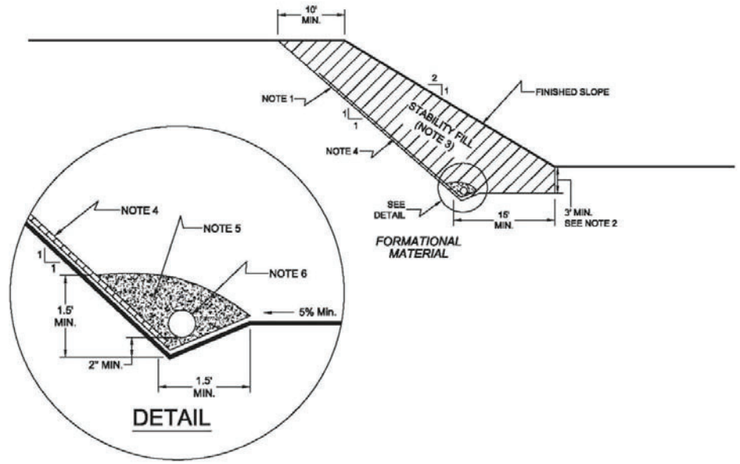
1.....8-INCH DIAMETER, SCHEDULE 80 PVC PERFORATED PIPE FOR FILLS IN EXCESS OF 100-FEET IN DEPTH OR A PIPE LENGTH OF LONGER THAN 500 FEET.

2.....6-INCH DIAMETER, SCHEDULE 40 PVC PERFORATED PIPE FOR FILLS LESS THAN 100-FEET IN DEPTH OR A PIPE LENGTH SHORTER THAN 500 FEET.

NO SCALE

7.2 Slope drains within stability fill keyways should use 4-inch-diameter (or lager) pipes.

TYPICAL STABILITY FILL DETAIL



NOTES:

1.....EXCAVATE BACKCUT AT 1:1 INCLINATION (UNLESS OTHERWISE NOTED).

2.....BASE OF STABILITY FILL TO BE 3 FEET INTO FORMATIONAL MATERIAL, SLOPING A MINIMUM 5% INTO SLOPE.

3.....STABILITY FILL TO BE COMPOSED OF PROPERLY COMPACTED GRANULAR SOIL.

4.....CHIMNEY DRAINS TO BE APPROVED PREFABRICATED CHIMNEY DRAIN PANELS (MIRADRAIN G200N OR EQUIVALENT) SPACED APPROXIMATELY 20 FEET CENTER TO CENTER AND 4 FEET WIDE. CLOSER SPACING MAY BE REQUIRED IF SEEPAGE IS ENCOUNTERED.

5.....FILTER MATERIAL TO BE 3/4-INCH, OPEN-GRADED CRUSHED ROCK ENCLOSED IN APPROVED FILTER FABRIC (MIRAFI 140NC).

6.....COLLECTOR PIPE TO BE 4-INCH MINIMUM DIAMETER, PERFORATED, THICK-WALLED PVC SCHEDULE 40 OR EQUIVALENT, AND SLOPED TO DRAIN AT 1 PERCENT MINIMUM TO APPROVED OUTLET.

NO SCALE

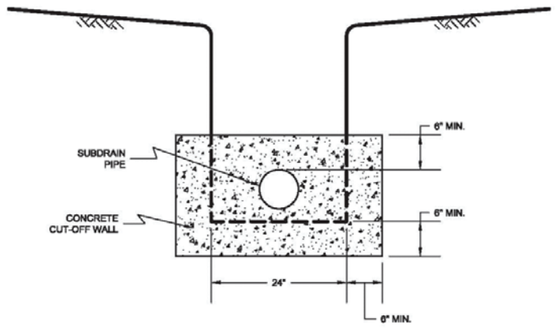
7.3 The actual subdrain locations will be evaluated in the field during the remedial grading operations. Additional drains may be necessary depending on the conditions observed and the requirements of the local regulatory agencies. Appropriate subdrain outlets should be evaluated prior to finalizing 40-scale grading plans.

7.4 *Rock* fill or *soil-rock* fill areas may require subdrains along their down-slope perimeters to mitigate the potential for buildup of water from construction or landscape irrigation. The subdrains should be at least 6-inch-diameter pipes encapsulated in gravel and filter fabric. *Rock* fill drains should be constructed using the same requirements as canyon subdrains.

7.5 Prior to outletting, the final 20-foot segment of a subdrain that will not be extended during future development should consist of non-perforated drainpipe. At the non-perforated/ perforated interface, a seepage cutoff wall should be constructed on the downslope side of the pipe.

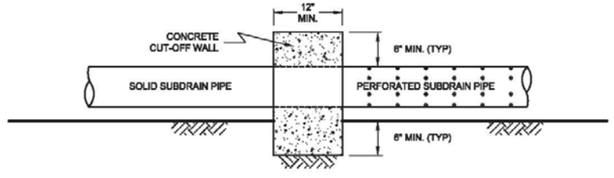
TYPICAL CUT OFF WALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW

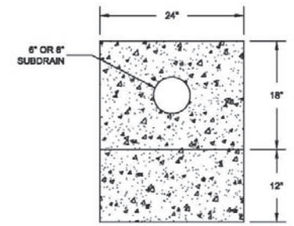


NO SCALE

7.6 Subdrains that discharge into a natural drainage course or open space area should be provided with a permanent headwall structure.

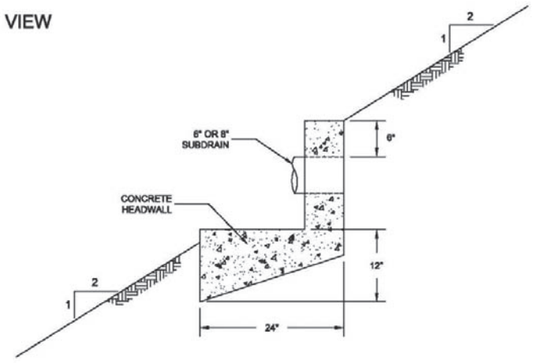
TYPICAL HEADWALL DETAIL

FRONT VIEW



NO SCALE

SIDE VIEW



NOTE: HEADWALL SHOULD OUTLET AT TOE OF FILL SLOPE OR INTO CONTROLLED SURFACE DRAINAGE

NO SCALE

7.7 The final grading plans should show the location of the proposed subdrains. After completion of remedial excavations and subdrain installation, the project civil engineer should survey the drain locations and prepare an “as-built” map showing the drain locations. The final outlet and connection locations should be determined during grading operations. Subdrains that will be extended on adjacent projects after grading can be placed on formational material and a vertical riser should be placed at the end of the subdrain. The grading contractor should consider videoing the subdrains shortly after burial to check proper installation and functionality. The contractor is responsible for the performance of the drains.

8. OBSERVATION AND TESTING

8.1 The Consultant shall be the Owner's representative to observe and perform tests during clearing, grubbing, filling, and compaction operations. In general, no more than 2 feet in vertical elevation of *soil* or *soil-rock* fill should be placed without at least one field density test being performed within that interval. In addition, a minimum of one field density test should be performed for every 2,000 cubic yards of *soil* or *soil-rock* fill placed and compacted.

8.2 The Consultant should perform a sufficient distribution of field density tests of the compacted *soil* or *soil-rock* fill to provide a basis for expressing an opinion whether the fill material is compacted as specified. Density tests shall be performed in the compacted materials below any disturbed surface. When these tests indicate that the density of any layer of fill or portion thereof is below that specified, the particular layer or areas represented by the test shall be reworked until the specified density has been achieved.

8.3 During placement of *rock* fill, the Consultant should observe that the minimum number of passes have been obtained per the criteria discussed in Section 6.3.3. The Consultant should request the excavation of observation pits and may perform plate bearing tests on the placed *rock* fills. The observation pits will be excavated to provide a basis for expressing an opinion as to whether the *rock* fill is properly seated and sufficient moisture has been applied to the material. When observations indicate that a layer of *rock* fill or any portion thereof is below that specified, the affected layer or area shall be reworked until the *rock* fill has been adequately seated and sufficient moisture applied.

8.4 A settlement monitoring program designed by the Consultant may be conducted in areas of *rock* fill placement. The specific design of the monitoring program shall be as recommended in the Conclusions and Recommendations section of the project Geotechnical Report or in the final report of testing and observation services performed during grading.

8.5 We should observe the placement of subdrains, to check that the drainage devices have been placed and constructed in substantial conformance with project specifications.

8.6 Testing procedures shall conform to the following Standards as appropriate:

8.6.1 Soil and Soil-Rock Fills:

8.6.1.1 Field Density Test, ASTM D 1556, *Density of Soil In-Place By the Sand-Cone Method.*

8.6.1.2 Field Density Test, Nuclear Method, ASTM D 6938, *Density of Soil and Soil-Aggregate In-Place by Nuclear Methods (Shallow Depth).*

8.6.1.3 Laboratory Compaction Test, ASTM D 1557, *Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Pound Hammer and 18-Inch Drop.*

8.6.1.4. Expansion Index Test, ASTM D 4829, *Expansion Index Test.*

9. PROTECTION OF WORK

9.1 During construction, the Contractor shall properly grade all excavated surfaces to provide positive drainage and prevent ponding of water. Drainage of surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site. The Contractor shall take remedial measures to prevent erosion of freshly graded areas until such time as permanent drainage and erosion control features have been installed. Areas subjected to erosion or sedimentation shall be properly prepared in accordance with the Specifications prior to placing additional fill or structures.

9.2 After completion of grading as observed and tested by the Consultant, no further excavation or filling shall be conducted except in conjunction with the services of the Consultant.

10. CERTIFICATIONS AND FINAL REPORTS

10.1 Upon completion of the work, Contractor shall furnish Owner a certification by the Civil Engineer stating that the lots and/or building pads are graded to within 0.1 foot vertically of elevations shown on the grading plan and that all tops and toes of slopes are within 0.5 foot horizontally of the positions shown on the grading plans. After installation of a section of subdrain, the project Civil Engineer should survey its location and prepare an *as-built* plan of the subdrain location. The project Civil Engineer should verify the proper outlet for the subdrains and the Contractor should ensure that the drain system is free of obstructions.

10.2 The Owner is responsible for furnishing a final as-graded soil and geologic report satisfactory to the appropriate governing or accepting agencies. The as-graded report should be prepared and signed by a California licensed Civil Engineer experienced in geotechnical engineering and by a California Certified Engineering Geologist, indicating that the geotechnical aspects of the grading were performed in substantial conformance with the Specifications or approved changes to the Specifications.

LIST OF REFERENCES

Risk Engineering (2015), *EZ-FRISK (version 7.62)*, software package used to perform site-specific earthquake hazard analyses, accessed January 4, 2018;

FEMA (2012), *Flood Insurance Rate Map (FIRM) Map Number 06073C1353G, effective May 16, 2012*, http://www.fema.gov, accessed January 4, 2018;

Kennedy, M. P., and S. S. Tan, (2005), *Geologic Map of the San Diego 30' x 60' Quadrangle, California*, Californian Geological Survey, Regional Map Series, 1:100,000 Scale, Map No. 3;

USGS (2014), *U.S. Seismic Design Maps Web Application (version 3.1.0)*, http://earthquake.usgs.gov/designmaps/us/application.php. Accessed January 3, 2018;

USGS (2016), *Quaternary Fault and Fold Database of the United States*, http://earthquakes,usgs.gov/hazards/qfaults, accessed January 4, 2018.