The City of San Diego

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

Multi-Family Residential Apartments
Project Number 512890
Title 1398 Lieta Street SDP

ENGINEER OF WORK:

David V. Caron, R.C.E. No. 70066
Provide Wet Signature and Stamp Above Line

PREPARED FOR:
Almeria Investment LP
PO Box 232628
Encinitas, CA 92024
Insert Telephone Number

PREPARED BY:

Civil Landworks

Civil Landworks Corp
110 Copperwood Way, Suite P
Oceanside, CA 92058
760-908-8745

DATE:
March 8, 2017

Approved by: City of San Diego Date

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

TABLE OF CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

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

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

CERTIFICATION PAGE

Project Name: Multi-Family Residential Apartments
Permit Application Number: Insert Permit Application Number

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.

Engineer of Work's Signature, PE Number & Expiration Date

David Caron
Print Name

Civil Landworks Corp.
Company

Date

Engineer's Stamp

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

Project Name: Multi-Family Residential Apartments - 1398 Lieta Street SDP

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	1/30/17	◉ Preliminary Design/Planning/CEQA ○ Final Design	Initial Submittal
2	4/3/17	◉ Preliminary Design/Planning/CEQA ○ Final Design	2nd Submittal
3	Enter a date.	○ Preliminary Design/Planning/CEQA ◉ Final Design	Click here to enter text.
4	Enter a date.	○ Preliminary Design/Planning/CEQA ◉ Final Design	Click here to enter text.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

PROJECT VICINITY MAP

Project Name: Multi-Family Residential Apartments
Permit Application Number: Insert Application Number.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

THE CITY OF SAN DIEGO	City of San Diego **Development Services** 1222 First Ave., MD-302 San Diego, CA 92101 (619) 446-5000	**Storm Water Requirements Applicability Checklist**	FORM **DS-560** February 2016

Project Address: 1398 Lieta Street	Project Number *(for the City Use Only)*:

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 administrated by the State Water Resources 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 that results in ground disturbance and contact with storm water runoff?

   ☐ 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 questions 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 one of the following activities and associated curb/ sidewalk repair: water services, sewer lateral, storm drain lateral, or dry 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, curb and gutter replacement, and retaining wall encroachments.

   ☐ Yes; no document required

Check one of the boxes to the right, 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 processes 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 question 1-3, and checked "Yes" for question 4
PART B **does not apply and no document is required. Continue to Section 2.**

More information on the City's construction BMP requirements as well as CGP requirements can be found at:
www.sandiego.gov/stormwater/regulations/swguide/constructing.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 Stat e 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. A map of the ASBS watershed can he found here *<placeholder for ASBS map link>*

2. ☐ High Priority

a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.

b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ☐ Medium Priority

a. Projects 1 acre or more but not subject to an ASBS or high priority designation.

b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ☒ Low Priority

a. Projects not subject to ASBS, high or medium priority designation.

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; PDP not exempt. PDP requirements apply.

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 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 that creates 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 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 STORM WATER REQUIREMENTS**.	☐
2. The project is a **STANDARD 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 hydromodification management.	☐

Name of Owner or Agent *(Please Print)*: David Caron	Title: Principal Engineer
Signature:	Date:

Applicability of Permanent, Post-Construction Storm Water BMP Requirements (Storm Water Intake Form for all Development Permit Applications)	**Form I-1**

Project Identification	
Project Name: Multi-Family Residential Apartments	
Permit Application Number: Insert Application Number.	Date: 1/6/17

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 Part 1 of Storm Water Standards 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 BMP Design 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):		
Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) in its entirety for guidance, AND complete 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:		

Form I-1 Page 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 BMP Design 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):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the BMP Design 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: The project discharge onto Morena Blvd, where stormwater will be collected via curb inlet and pipe to an exempt body of water, Mission Bay.		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the BMP Design 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: Proposed project site is not located within the critical coarse sediment yield areas provided by the San Diego County. See map in Attachment 2 for additional information.		

Project Name: Multi-Family Residential Apartments - 1398 Lieta Street SDP

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Multi-Family Residential Apartments
Project Address	1398 Lieta Street
Assessor's Parcel Number(s) (APN(s))	430-680-09
Permit Application Number	
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 paces (9XX.XX)	Miramar Hydrologic Sub-area, 906.40
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	0.617 Acres ([SQFT] Square Feet)
Area to be disturbed by the project (Project Footprint)	[AC] Acres (24,946 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	[AC] Acres (20,637 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	[AC] Acres (6,219 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.	325 %

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:
Existing Land Cover Includes (select all that apply): ☒ Vegetative Cover ☐ Non-Vegetated Pervious Areas ☒ Impervious Areas Description / Additional Information:
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐ NRCS Type A ☐ NRCS Type B ☐ NRCS Type C ☒ NRCS Type D
Approximate Depth to Groundwater (GW): ○ GW Depth < 5 feet ○ 5 feet < GW Depth < 10 feet ○ 10 feet < GW Depth < 20 feet ◉ GW Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☐ Watercourses ☐ Seeps ☐ Springs ☐ Wetlands ☒ None Description / Additional Information:

Form I-3B Page 3 of 11

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.

Description / Additional Information:

The existing site sheet flows northwesterly. The site consist of a single family residence at the southeast corner, vegetation and dirt patches. A small area offsite runoff is conveyed through the proposed property. The entire site sheet flows to the north corner of the property where it continues down the slopes onto Morena Blvd. Stormwater then travel south until captured via curb inlet then discharges onto Mission Bay. No storm drains system, detention facilities or treatment facilities were found on the existing site.

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The proposed development consist of construction of two multifamily residential structure with attached garages and driveways. Incidential underground utilities, retaining walls, hardscape, and site landscaping are also proposed with the project.

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

The proposed impervious features of the project includes the multifamily residential building, driveway, and walkways.

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

The proposed pervious features of the project includes landscape areas and a biofiltration basin.

Does the project include grading and changes to site topography?

- ◉ Yes
- ○ No

Description / Additional Information:

The project will include grading to provide a flat pad for the residential units. However, the outfall of the draiange pattern will be similar to the existing condition..

Form I-3B Page 5 of 11

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 proposed development will be graded to sheet flow toward a grate inlet via gutter and ribbon gutter. The capture runoff will then be piped to a biofiltration basin for treatment and detention prior to discharge onto Morena Blvd. All downspouts are placed so that stormwater will be discharge onto landscaping or the gutter the ribbon gutter. All site runoff will end up in the biofiltration basin prior to discharging offsite.

See drainage study for additional information on peak flows and drainage areas.

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):

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

Description / Additional Information:

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) Stormwater runoff from the proposed development will be captured and treated prior to discharging to Morena Blvd. Stormwater will then travel south down Morena Blvd until collected via curb inlet and pipe to the Mission Bay.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations. Municipal and Domestic Supply, Agricultural Supply, Industrial Service Supply, Navigation, Contact Water Recreation, Non-Contact Water Recreation, Commercial and Sport Fishing, Biological Habitats of Special Significant, Warm Freshwater Habitat, Cold Freshwater Habitat, Estuarine Habitat, Wildlife Habitat, Rare, Threatened , or Endangered, Marine Habitat, Migratic of Aquatic Organisms, Acquaculture, Shellfish Harvesting, Spawning, Reprod. And/or Early Development.
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations. Misison Bay support diverse native fauna and flora.
Provide distance from project outfall location to impaired or sensitive receiving waters. Approximately 1,150 feet from receiving waters
Sumarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands The project is located approximately 1,150 feet from Mission Bay, which support the diverse native fauna and flora. The stormwater onsite will be treated by a biofiltration basin prior to discharge offsite.

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	Pollutant(s)/Stressor(s)	TMDLs/ WQIP Highest Priority Pollutant
Mission Bay	Eutrophic, Lead	Hydromodification
Mission Bay Shoreline	Fecal Coliform, Total Coliform	Siltation/Sedimentation
Misison Bay Shoreline	Enterococcus	Freshwater Discharges
Rose Creek	Selenium, Toxicity	Indicator Bacteria
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

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 BMP Design Manual (Part 1 of Storm Water Standards) 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 of the BMP Design Manual)?

- ☐ Yes, hydromodification management flow control structural BMPs required.
- ☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- ☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- ☉ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

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

The project is exempt from hydromodification since the discharge runoff will be conveyed through a public curb and gutter conveyance system, prior to being pipe toward the an area identified as appropriate for an exemption by the WMAA.

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

Discussion / Additional Information:

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.

N/A

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

- ◉ No, the low flow threshold is 0.1Q2 (default low flow threshold)
- ○ Yes, the result is the low flow threshold is 0.1Q2
- ○ Yes, the result is the low flow threshold is 0.3Q2
- ○ Yes, the result is the low flow threshold is 0.5Q2

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

Discussion / Additional Information: (optional)

Form I-3B Page 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.

The site has a gradual slope from south to north. With the site soil classified as type "D", which has very slow infiltration rate when thoroughly wet. In addition, water perch below surface nearby a steep slope poses provides instability for the structure above.

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.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

Project Name: Multi-Family Residential Apartments - 1398 Lieta Street SDP

Source Control BMP Checklist for All Development Projects	Form I-4

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the 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?		
SC-1 Prevention of Illicit Discharges into the MS4	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☒ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-3 not implemented: No outdoor materials storage areas are proposed with this development.			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-4 not implemented: No materials stored in outdoor work areas are proposed with this development.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-5 not implemented: No outdoor trash storage areas are proposed with this development.			

Form I-4 Page 2 of 2			
Source Control Requirement	Applied?		
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☒ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	☒ N/A
Interior parking garages	☒ Yes	☐ No	☐ N/A
Need for future indoor & structural pest control	☐ Yes	☐ No	☒ N/A
Landscape/Outdoor Pesticide Use	☐ Yes	☐ No	☒ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☒ N/A
Food service	☐ Yes	☐ No	☒ N/A
Refuse areas	☐ Yes	☐ No	☒ N/A
Industrial processes	☐ Yes	☐ No	☒ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☒ N/A
Vehicle/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-related Uses	☐ Yes	☐ No	☒ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Site Design BMP Checklist for All Development Projects	Form I-5

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the 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?		
SD-1 Maintain Natural Draiange Pathways and Hydrologic Features	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-1 not implemented:			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☒ Yes	☐ No	☐ N/A
1-2 Are street trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☒ N/A
1-3 Implemented street trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☒ N/A
1-4 Is street tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☒ N/A
SD-2 Have natural areas, soils and vegetation been conserved?	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-2 not implemented:			

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

Form I-5 Page 3 of 4			
Site Design Requirement	Applied?		
SD-6 Runoff Collection	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-6 not implemented:			
6a-1 Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☒ No	☐ N/A
6a-2 Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E?	☐ Yes	☒ No	☐ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☒ No	☐ N/A
6b-2 Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E?	☐ Yes	☒ No	☐ N/A
SD-7 Landscaping with Native or Drought Tolerant Species	☒ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented:			
SD-8 Harvesting and Using Precipitation	☐ Yes	☒ No	☐ N/A
Discussion / justification if SD-8 not implemented: Per Worksheet B.3-1, Harvesting and Using Precipitation is not feasible for the proposed development. See Worksheet B.3-1 in Attachment 1 for additional information..			
8-1 Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☒ No	☐ N/A
8-2 Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E?	☐ Yes	☒ No	☐ N/A

Form I-5 Page 4 of 4

Insert Site Map with all site design BMPs identified:

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.

Harvest and use BMPs were considered, however, per Worksheet B.3-1, harvest and use BMP is infeasible for the proposed project.

See Worksheet B.3-1 in Attachment 1 for additional information.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of X

(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)

(Continued from page 1)

The following are factors when considering retention or infiltration BMPs. According to the USGS web survey, the proposed development is sitting on soil describe as Type "D", which has very slow infiltration rates when thoroughly wet.

Biofiltration facility was chosen for this project. Biofiltration basin has "high" effectiveness against coarse sediment, trash, and pollutants that tend to associate with fine particles during treatmenet. It also has a "medium" effectiveness against pollutnats that tend to be dissolved following treatment. The biofiltration basin will be used for treatment and detention. A flow control structure will be placed in the biofiltration basin to mitigate flows peak flows. While smaller storm events will be detained for treatment, larger storm event will bypass treatment and discharge offsite. Infiltration report indicates a design infiltration rate of 0.4 in/hr could be use on the site, therefore, the BMP treatment structure will have a unlined bottom to allow for infiltration.

See drainage report for information on flow paths and flow rates.

The BMPs were sized to 1.5 times the DVC not reliably retained onsite

Biofiltration BMPs have been designed to have an appropriate hydraulic loading rate to maximize storm water retention and pollutant removal, as well as to prevent erosion, scour, and channeling within the BMP.

See Attachment 1e for the checklist for specific design parameters, see below for a summary:

Media selected for the biofiltration BMP meets minimum quality and material specifications per Appendix F.4. Filtration rates are outlet controlled (e.g., via an underdrain and orifice/weir) instead of controlled by the infiltration rate of the media. Bioretention basin fact sheet to be utilitized for construction.

Specifically flow enter the basin into rip rap energy dissipators. The basins unclude underdrains and overflow for excessive flows

Form I-6 Page 3 of X (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No. IMP-1	
Construction Plan Sheet No. Click or tap here to enter text.	
Type of structural BMP: ☐ Retention by harvest and use (HU-1) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) ☒ Biofiltration (BF-1) ☐ 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 ☐ 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	Click or tap here to enter text.
Who will be the final owner of this BMP?	Property Owner
Who will maintain this BMP into perpetuity?	Property Owner
What is the funding mechanism for maintenance?	No funding needed

Form I-6 Page 4 of X (Copy as many as needed)
Structural BMP ID No. Click or tap here to enter text.
Construction Plan Sheet No. Click or tap here to enter text.
Discussion (as needed): Click or tap here to enter text.

THE CITY OF SAN DIEGO City of San Diego **Development Services** 1222 First Ave., MD-302 San Diego, CA 92101 (619) 446-5000	**Permenant BMP Construction** **Self Certification Form**	FORM DS-563 January 2016

Date Prepared: Click here to enter text.	Project No.: Click here to enter text.
Project Applicant: Click here to enter text.	Phone: Click here to enter text.
Project Address: 1398 Lieta Street, San Diego, CA	
Project Engineer: David Caron	Phone: 760-908-8745

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and structural BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 of the San Diego Regional Water Quality Control Board.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: _____

Date of Signature: _ Insert Date_

Printed Name: _David Caron_

Title: _Principal Engineer_

Phone No. _760-908-8745_

Engineer's Stamp

DS-563 (12-15)

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

Project Name: Multi-Family Residential Apartments - 1398 Lieta Street SDP

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	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	◉ Included ○ Not included because the entire project will use harvest and use BMPs
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☒ Included

Project Name: Multi-Family Residential Apartments - 1398 Lieta Street SDP

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

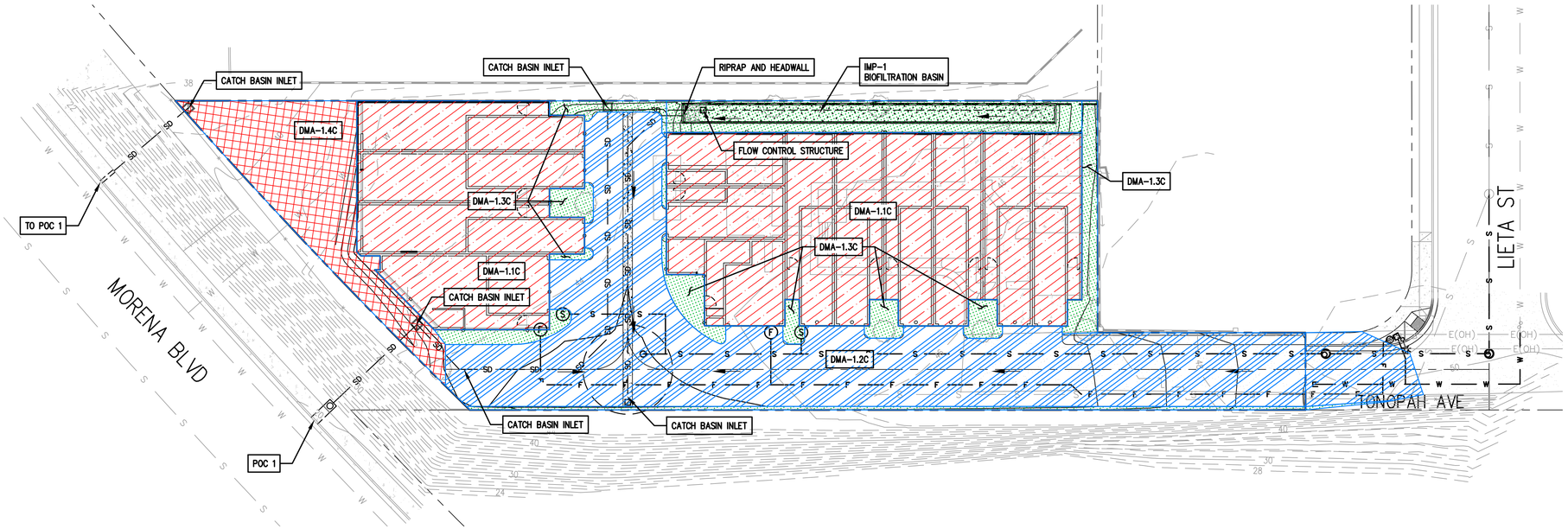
The DMA Exhibit must identify:

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

Attachment 1a

DMA Exhibit

DMA EXHIBIT



LEGEND

ITEM	SYMBOL
SUBDIVISION BOUNDARY	
BIOFILTRATION FACILITY	IMP-X
PAVEMENT AREA	DMA-X
BUILDING AREA	
LANDSCAPE AREA	
SELF-TREATING AREA	

DMA AREA SUMMARY

EX

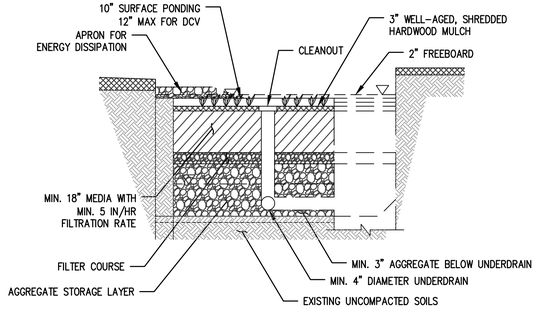
DMA ID	Type	Total Area SF	Total Area Acres
EX	Pervious	20,504	0.471
EX	Impervious	6,352	0.146
OFFSITE	Impervious	735	0.017
TOTAL		27,591	0.633

PR

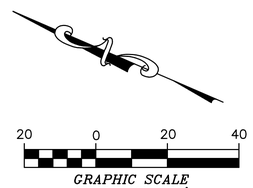
DMA ID	Type	Total Area SF	Total Area Acres
DMA-1.1	Roof	12,634	0.290
DMA-1.2	Pavement	8,541	0.196
DMA-1.3	Landscape	4,023	0.092
DMA-1.4	Self-Treating	2,393	0.055
TOTAL		27,591	0.633

NOTE

1. NO GROUNDWATER WAS ENCOUNTER WITHIN 8 FEET OF BORING TEST PIT.
2. SITE SOIL CLASSIFICATION TYPE "D".
3. THE PROJECT SITE IS NOT LOCATED ON OR DOWNSTREAM OF A POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREA PER WMAA MAP.



BIOFILTRATION BMP
N.T.S.



GRAPHIC SCALE
SCALE: 1" = 20'

Civil Landworks
110 COPPERWOOD WAY, SUITE P, OCEANSIDE, CA 92058
PH: 760-908-8745 • info@civillandworks.com

DMA EXHIBIT

SHEET 1 OF 1

LIETA STREET MULTI-FAMILY RESIDENCE
SAN DIEGO, CALIFORNIA

CLW JOB NO. 1192D
SCALE: 1"=20'
DATE: 1/9/17
REVISIONS: 1

3/31/17

Attachment 1b

Tabular Summary of DMAs

Included on DMA Exhibit in Attachment 1a

DMA SUMMARY

EX

DMA ID	Type	Total Area SF	Total Area Acres
EX	Pervious	20,504	0.471
EX	Impervious	6,352	0.146
OFFSITE	Impervious	735	0.017
TOTAL		27,591	0.633

PR

DMA ID	Type	Total Area SF	Total Area Acres
DMA-1.1	Roof	12,634	0.290
DMA-1.2	Pavement	8,541	0.196
DMA-1.3	Landscape	4,023	0.092
DMA-1.4	Self-Treating	2,393	0.055
TOTAL		27,591	0.633

Attachment 1c

Form I-7, Harvest and Use Feasibility Screening Checklist

Worksheet B.3-1. Harvest and Use Feasibility Screening

Harvest and Use Feasibility Screening	Worksheet B.3-1
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: N/A	
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] No, see attachments this section	
3. Calculate the DCV using worksheet B-2.1. [Provide a results here] No, see attachments this section	

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.

Automated Worksheet B.3-1: Project-Scale BMP Feasibility Analysis (V1.2)

Category	#	Description	Value	Units
Capture & Use Inputs	0	Design Capture Volume for Entire Project Site	884	cubic-feet
	1	Proposed Development Type	Residential	unitless
	2	Number of Residents or Employees at Proposed Development	26	#
	3	Total Planted Area within Development	5,638	sq-ft
	4	Water Use Category for Proposed Planted Areas	Low	unitless
Infiltration Inputs	5	Is Average Site Design Infiltration Rate ≤0.500 Inches per Hour?	Yes	yes/no
	6	Is Average Site Design Infiltration Rate ≤0.010 Inches per Hour?	No	yes/no
	7	Is Infiltration of the Full DCV Anticipated to Produce Negative Impacts?	Yes	yes/no
	8	Is Infiltration of Any Volume Anticipated to Produce Negative Impacts?	No	yes/no
Calculations	9	36-Hour Toilet Use Per Resident or Employee	1.86	cubic-feet
	10	Subtotal: Anticipated 36 Hour Toilet Use	48	cubic-feet
	11	Anticipated 1 Acre Landscape Use Over 36 Hours	52.14	cubic-feet
	12	Subtotal: Anticipated Landscape Use Over 36 Hours	7	cubic-feet
	13	Total Anticipated Use Over 36 Hours	55	cubic-feet
	14	Total Anticipated Use / Design Capture Volume	0.06	cubic-feet
	15	Are Full Capture and Use Techniques Feasible for this Project?	No	unitless
	16	Is Full Retention Feasible for this Project?	No	yes/no
	17	Is Partial Retention Feasible for this Project?	Yes	yes/no
Result	18	Feasibility Category	4	1, 2, 3, 4, 5

Worksheet B.3-1 General Notes:

A. Applicants may use this worksheet to determine the types of structural BMPs that are acceptable for implementation at their project site (as required in Section 5 of the BMPDM). User input should be provided for yellow shaded cells, values for all other cells will be automatically generated. Projects demonstrating feasibility or potential feasibility via this worksheet are encouraged to incorporate capture and use features in their project.

B. Negative impacts associated with retention may include geotechnical, groundwater, water balance, or other issues identified by a geotechnical engineer and substantiated through completion of Form I-8.

C. Feasibility Category 1: Applicant must implement capture & use, retention, and/or infiltration elements for the entire DCV.

D. Feasibility Category 2: Applicant must implement capture & use elements for the entire DCV.

E. Feasibility Category 3: Applicant must implement retention and/or infiltration elements for all DMAs with Design Infiltration Rates greater than 0.50 in/hr.

F. Feasibility Category 4: Applicant must implement standard unlined biofiltration BMPs sized at ≥3% of the effective impervious tributary area for all DMAs with Design Infiltration Rates of 0.011 to 0.50 in/hr. Applicants may be permitted to implement lined BMPs, reduced size BMPs, and/or specialized biofiltration BMPs provided additional criteria identified in "Supplemental Retention Criteria for Non-Standard Biofiltration BMPs" are satisfied.

G. Feasibility Category 5: Applicant must implement standard lined biofiltration BMPs sized at ≥3% of the effective impervious tributary area for all DMAs with Design Infiltration Rates of 0.010 in/hr or less. Applicants may also be permitted to implement reduced size and/or specialized biofiltration BMPs provided additional criteria identified in "Supplemental Retention Criteria for Non-Standard Biofiltration BMPs" are satisfied.

H. PDPs participating in an offsite alternative compliance program are not held to the feasibility categories presented herein.

Attachment 1d

Form I-8, Categorization of Infiltration Feasibility Condition

CHRISTIAN WHEELER
ENGINEERING

January 27, 2017

Almeria Investments, L.P.
P.O. Box 232628
Encinitas, California 92023
Attention: Mr. Michael Fulton, General Partner

Proposal 2150433.02R

Subject: **Report of Geotechnical Infiltration Feasibility Study**
Proposed Residential Development, 1389 Lieta Street, San Diego, California

References:
1) Christian Wheeler Engineering, Report CWE2150433.01, dated February 16, 2015
2) Civil Landworks, Preliminary Grading Plan for Lieta Street, dated September 12, 2016

Ladies and Gentlemen:

In accordance with your request and our proposal dated December 2, 2016, we have prepared this report to present the results of our storm water infiltration evaluation at the subject site. In general, the purpose of our investigation was to provide design infiltration rates based on percolation rates measured in the field. We understand that the existing structures and improvements at the site will be demolished and the property will be redeveloped into a 13-unit residential development consisting of two separate three-story buildings. Based on our discussions with the project's civil engineer, as well as our review of the referenced plans, we understand that a biofiltration BMP is proposed along the east side of the northerly property line.

FINDINGS

SITE DESCRIPTION

The subject site is a trapezoidal-shaped parcel of land located at the western terminus of Lieta Street in the Bay Park area of San Diego, California. The property is about 0.6 acres in area and is identified as Assessor's Parcel Number 430-680-09. Topographically, the majority of the site is relatively level with an elevation of about 45 feet. Relatively steep, descending slopes of up to about 20 to 25 feet in height bound the site to the south and west. The site is bound to the north by a combination 4-foot-tall retaining wall and ±2-foot-high slope. The wall retains the subject site. Existing improvements on-site are limited to a single-story, single family residence, multiple storage sheds, and on-grade concrete slabs within the eastern portion of the site.

FIELD INVESTIGATION

The subsurface exploration associated with this study consisted of two 7-inch-diameter auger borings and a six-inch-diameter hand auger boring. The borings were drilled within 50 feet of the proposed infiltration BMP in order to supplement our previous borings. The approximate locations of our recent and previous borings are shown on Plate No. 1 of this report. Logs of the explorations are presented in Appendix A of this report. Five percolation test borings were also drilled within the area expected to support the infiltration system. The borings were logged in detail with emphasis on describing the soil profile. Low permeability and relatively impermeable materials were identified in the borings. No evidence of soil contamination was detected within the samples obtained. The approximate locations of the percolation borings are also shown on Plate No. 1.

GEOLOGIC SETTING AND SOIL DESCRIPTION

Based on the results of our subsurface explorations and review of pertinent, readily available geologic literature, we have determined that the proposed BMP area is underlain by undifferentiated artificial fill/topsoil and Quaternary-age old paralic deposits. As observed within our borings, the artificial fill/topsoil was approximately 2 feet thick and consisted of dark brown, moist, loose, silty sand (SM). The old paralic deposits consisted of silty sand (SM), clayey sand (SC), sandy clay (CL), poorly-graded sand (SP), and poorly-graded sand with silt (SP-SM).

GROUNDWATER

Seepage was encountered within our percolation test boring HA-1/PT-4 at depth of approximately 8 feet below existing site grades. The encountered seepage water is not known to have any beneficial usage. It is our opinion that the seasonal high groundwater level at the site is approximately 40 feet below grade.

INFILTRATION RATE DETERMINATION

FIELD MEASUREMENT

Percolation testing was performed in five borings that were drilled within 50 feet of in the planned infiltration area. The approximate locations of the percolation borings are shown on Plate No. 1. Initially we performed three percolation tests (PT-1 through PT-3) at the proposed bottom of basin depth (5 feet below existing grade) on January 6, 2017. The percolation test rates at 5 feet were very low. Additional percolation test borings (PT-4 and PT-5) were drilled on January 5, 2017 in order to identify and test the more permeable sands at depth. These borings were drilled to a depth of approximately 10 feet below

existing grade. Perforated pipe was set in the percolation test holes and surrounded by ¾ inch gravel to prevent caving. After pipe installation, the test holes were presoaked.

The field percolation rates were determined the following day by using the falling head test method. It can be noted that the water placed within the percolation borings on the previous day had completely drained during the overnight presoak within test borings PT-1 and PT-5 while water still remained in borings PT-2, PT-3 and PT-4. After pipe installation, the test holes were presoaked and the "Sandy Soil Criteria Test" was performed over two-25 minute periods of time. The testing resulted in water dropping more than 6 inches during each 25 minute period in test boring PT-5. The initial water level was established by refilling the test holes to near the top of the proposed BMP. Percolation rates within PT-5 were monitored and recorded every 10 minutes over a period of 5 hours until the infiltration rates stabilized. Percolation rates within PT1, PT-2, PT-3, and PT-4 were monitored and recorded every 30 minutes over a period of 6 hours until the infiltration rates stabilized. Measurements were taken using a water level meter (Solinst, Model 101) with an accuracy measured to 0.005 foot increments (0.06 inch increments). The measured field percolation rates are presented in Table I. To account for the use of gravel around the perimeter of the perforated pipe, an adjustment factor was used in the calculation of the percolation rate in Table 1.

TABLE I: FIELD PERCOLATION AND INFILTRATION RATES

Test No.	Location	Depth of Testing	Field Percolation Rate	Field Infiltration Rate
PT-1	Northerly PL	5 feet	2.64 inches per hour	0.03 inches per hour
PT-2	Northerly PL	5 feet	0.24 inches per hour	0.00 inches per hour
PT-3	Northerly PL	5 feet	0.24 inches per hour	0.00 inches per hour
PT-4	Northerly PL	10 feet	2.16 inches per hour	0.03 inches per hour
PT-5	Northerly PL	10.58 feet	46.8 inches per hour	1.59 inches per hour

Infiltration and percolation are two related but different processes describing the movement of moisture through soil. Infiltration is the downward entry of water into the soil or rock surface and percolation is the flow of water through soil and porous or fractured rock. The direct measurement yielded by a percolation test tends to overestimate the infiltration rate, except perhaps in cases where a BMP is similarly dimensioned to the borehole. As such, adjustments of the measured percolation rates were converted into infiltration rates using the Porchet Method. The spreadsheet used for the conversion is included in Appendix A of this report.

The average infiltration rate for the soils below the proposed infiltration BMP were approximately 0.01 inches per hour at a depth of 5 feet and 0.81 inches per hour at depths of 7 to 10 feet below existing grade.

FACTOR OF SAFETY

The City of San Diego Storm Water Standards BMP Design Manual states that "a maximum factor of safety of 2.0 is recommended for infiltration feasibility screening such that an artificially high factor of safety (FOS) cannot be used to inappropriately rule out infiltration, unless justified. If the site passes the feasibility analysis at a FOS of 2.0, then infiltration must be investigated, but a higher FOS may be selected at the discretion of the design engineer. Using a FOS of 2.0, an infiltration rate of 0.005 inches per hour and 0.40 inches per hour can be used in the feasibility analysis for the soils below the proposed biofiltration BMP at depths of 5 feet and 7 to 10 feet below grades, respectively.

GEOTECHNICAL CRITERIA FOR INFILTRATION BMPs

GENERAL

Based on the current Storm Water Standards, BMP Design Manual, certain geotechnical criteria need to be addressed when assessing the feasibility and desirability of the use of infiltration BMPs for a project site. Those criteria, Per Section C.2 of the manual, are addressed below.

C2.1 SOIL AND GEOLOGIC CONDITIONS

Site soil and geologic conditions influence the rate at which water can physically enter the soils. Based on the conditions observed in our exploratory borings, the existing soils in the BMP area consist of silty sand (SM), clayey sand (SC), poorly graded sand (SP), sandy clay (CL), and silty sand-poorly graded sand (SM/SP). Seepage was encountered within our exploratory boring HA-1/PT-4 at depth of approximately 8 feet below existing site grades.

C2.2 SETTLEMENT AND VOLUME CHANGE

Settlement and volume change can occur when water is introduced below grade. Based upon the soil conditions observed in our borings, the site is underlain old paralic deposits that are capped by a thin vener of undifferentiated artificial fill/topsoil. The artificial fill/topsoil is subject to a higher potential for hydro-collapse upon wetting while the potential for hydro-collapse within the underlying older paralic deposits is considered to be relatively low to moderately severe.

C2.3 SLOPE STABILITY

Infiltration of water has the potential to increase the risk of failure to nearby slopes. As such, setbacks from slopes have been recommended herein as well as incorporating impermeable liners or cut-off walls.

C2.4 UTILITY CONSIDERATIONS

Utilities are either public or private infrastructure components that include underground pipelines, vaults, and wires/conduit, and above ground wiring and associated structures. Infiltration of water can pose a risk to subsurface utilities, or geotechnical hazards can occur within the utility trenches when water is introduced. Care should be taken when planning proposed utility trench and BMP siting. Mitigation will be provided to reduce the potential for water flow into offsite utility trenches.

C2.5 GROUNDWATER MOUNDING

Groundwater mounding occurs when infiltrated water creates a rise in the groundwater table beneath the facility. Groundwater mounding can affect nearby subterranean structures and utilities. Based on the anticipated depth to groundwater, the potential for groundwater mounding is low.

C2.6 RETAINING WALL AND FOUNDATIONS

Infiltration of water can result in potential increases in lateral pressures and potential reduction in soil strength. Retaining walls and foundations can be negatively impacted by these changes in soil conditions. This should be taken into account when designing the storm water BMPs, retaining walls and foundations for the site. The proposed biofiltration BMP is to be located adjacent to the neighboring slope and retaining wall along the northern property line. Recommendations are provided herein to mitigate for this hazard.

CONCLUSIONS AND RECOMMENDATIONS

Based on a review of our field study and our experience with similar projects, we anticipate that, as long as the recommendations contained herein are followed, infiltration of storm water utilizing the proposed onsite storm water infiltration BMP will not result in soil piping, daylight water seepage, or slope instability for the property or project sites down-gradient of the site.

The soils at approximately 5 feet below grade in the area of the planned storm water BMP consist of silty sands (SM), clayey sands (SC) and sandy clays (CL). Field infiltration rates measured within these soils were very low with an average of 0.01 inches per hour. Highly expansive (Expansion Index = 122) sandy clays (CL) were also encountered within the northeast portion of the site at a depth of 2½ feet to 6½ feet. We recommended that infiltrations occur below these relatively impermeable soils. It is recommended that infiltration occur within the within the sands encountered at a depth of approximately 7 to 10 feet below existing grades.

For the soils tested, after applying a factor of safety of 2.0, a design infiltration rate of 0.40 inches per hour can be used for the sandy soils at depths of 7 to 10 feet below existing grade in the area of the proposed biofiltration BMP. Based on the presence of highly to slight permeable soils, it is our opinion that it is feasible to partially infiltrate storm water at the site. The seasonal high groundwater in the area of the basin is estimated to be at approximately 40 feet below existing and proposed site grades.

For the proposed biofiltration BMP, we recommend that a minimum setback of 50 feet from steep slopes (>25%) or a distance of 1.5H from fill slopes where H is the height of the fill slope. Where the biofiltration BMP is located within 10 feet of a structure, retaining wall or settlement sensitive improvement we recommended that a cut-off wall or impermeable liner be constructed around the perimeter of the BMP. The cut-off wall or impermeable liner should extend a minimum of 5 feet below proposed grade, at least 2 feet below the lowest adjacent existing or proposed footing, and at least 2 feet below the bottom of the BMP, whichever is greater.

It should be recognized that routine inspection and maintenance of the BMP basins are necessary to prevent clogging and failure. A maintenance plan should be specified for each BMP by the designer and followed by the owner during the entire lifetime of the BMP device.

"Worksheet C.4-1: Categorization of Infiltration Feasibility Criteria" has been completed and signed for the subject project, and is included in Appendix B of this report.

It should be noted that it is not our intent to review the civil engineering plans, notes, details, or calculations, when prepared, to verify that the engineer has complied with any particular storm water design standards. It is the responsibility of the designer to properly prepare the storm water plan based on the municipal requirements considering the planned site development and infiltration rates.

Detrimentally expansive soils removed from the area of the proposed BMP basin should not be used as structural fill or backfill at the site.

LIMITATIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on our limited percolation testing, an evaluation of the subsurface soil conditions encountered at our subsurface exploration locations and the assumption that the infiltration rates and soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance

of the BMPs may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the soils engineer so that he may make modifications if necessary. In addition, this office should be advised of any changes in the project scope, proposed site grading or storm water BMP design so that it may be determined if the recommendations contained herein are appropriate. This should be verified in writing or modified by a written addendum.

If you should have any questions regarding this report, please do not hesitate to contact this office. This opportunity to be of professional service is sincerely appreciated.

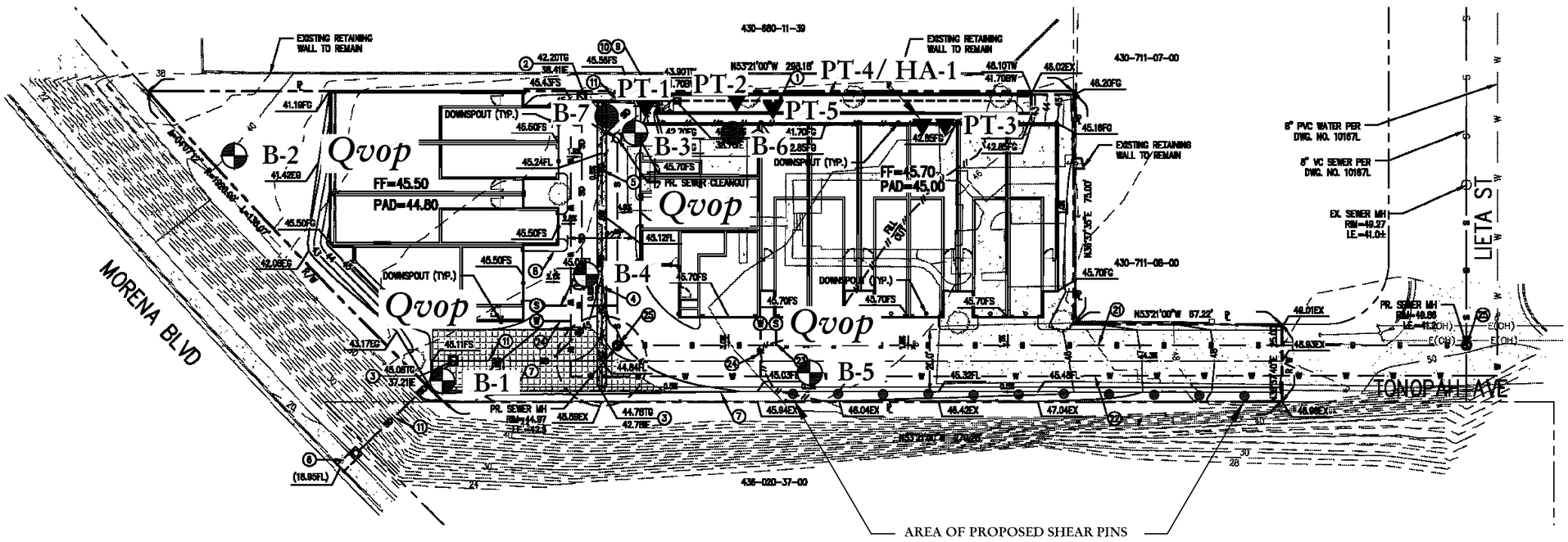
Respectfully submitted,
CHRISTIAN WHEELER ENGINEERING

Daniel J. Flowers, PG #9399

Daniel B. Adler, RCE #36037

David R. Russell, CEG 2215

DBA:drr:djf
ec: michael@almeriainvestments.com
tc@crudorealestate.com



LEGEND:

- PROPERTY LINE
- RIGHT OF WAY
- CENTERLINE
- EXISTING CONTOUR (MAJOR)
- EXISTING CONTOUR (MINOR)
- PROPOSED CONTOUR (MAJOR)
- PROPOSED CONTOUR (MINOR)
- CUT / FILL SLOPE
- DAYLIGHT LINE
- DIRECTION OF DRAINAGE
- CURB AND GUTTER
- PR. STORM DRAIN LINE
- PR. STORM INLET
- MASONRY RETAINING WALL
- PR. SEWER LINE
- PR. WATER LINE
- PR. SEWER MANHOLE
- PR. CURB OUTLET
- PR. SEWER CLEANOUT

CONSTRUCTION NOTES:

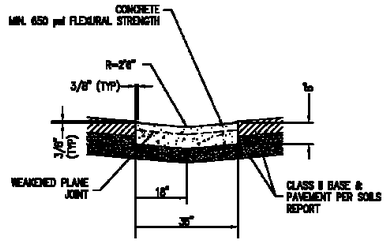
1. CONSTRUCT BIOFILTRATION BASIN PER DETAIL HEREON
2. CONSTRUCT STORM CONTROL VAULT
3. CONSTRUCT 24" X 24" GRATE INLET
4. CONSTRUCT 3' WIDE RIBBON GUTTER PER DETAIL HEREON
5. CONSTRUCT 9" HDPE STORM DRAIN
6. CONSTRUCT CURB OUTLET PER SDRSD D-25
7. CONSTRUCT CURB AND GUTTER PER SDRSD G-2
8. CONSTRUCT CURB ONLY PER SDRSD G-1
9. CONSTRUCT RIPRAP PER SDRSD D-40 NO. 2 BACKING T=1.1'
10. CONSTRUCT HEADWALL PER SDRSD D-30
11. CONSTRUCT 12" HDPE STORM DRAIN
12. CONSTRUCT RETAINING WALL PER SDRSD C-1

UTILITY NOTES:

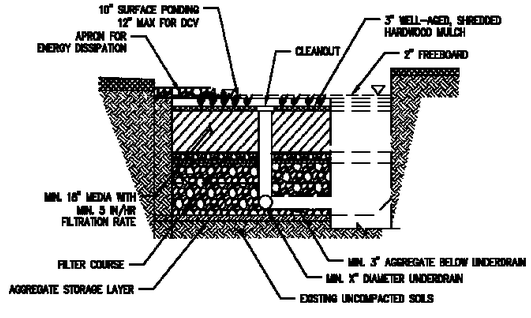
21. CONSTRUCT 8" SEWER MAIN
22. CONSTRUCT 8" WATER MAIN
23. CONSTRUCT 6" SEWER LATERAL PER SDRSD SS-01
24. CONSTRUCT 2" WATER LATERAL PER SDRSD WS-02
25. CONSTRUCT SEWER MANHOLE PER SDRSD SM-01
26. CONSTRUCT SEWER CLEANOUT PER SDRSD SC-01

CWE LEGEND

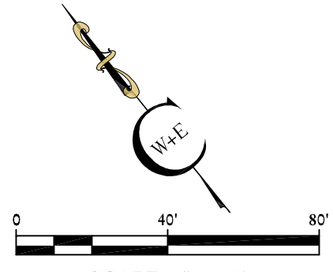
B-5	APPROXIMATE BORING LOCATION (CWE 2150433.01)
B-7	APPROXIMATE BORING LOCATION (CWE 2150433.02)
PT-5	PERCOLATION TEST LOCATION
PT-4/HA-1	PERCOLATION TEST AND HAND AUGER LOCATION
Qop	OLD PARALIC DEPOSITS



RIBBON GUTTER
NO SCALE



BIOFILTRATION BMP
N.T.S.



SCALE: 1" = 40'

Civil Landworks
110 COPPERWOOD WAY, SUITE P, OCEANSIDE, CA 92058
PH: 760-908-8745 • info@civillandworks.com

SITE PLAN AND GEOTECHNICAL MAP

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JANUARY 2017	JOB NO.:	2150433.02
BY:	SD	PLATE NO.:	1

CHRISTIAN WHEELER ENGINEERING

Appendix A

Boring Logs

LOG OF TEST BORING B-1

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	44.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	43.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil**							
			SM	**Old Paralic Deposits (Qop):** Orangish-brown, damp to moist, dense, fine- to medium-grained, SILTY SAND.	77	Cal					SA SO4
5			SM	Light yellowish-brown, damp to moist, medium dense, fine-grained, SILTY SAND.	33	Cal		7.4	109.4		77
10			SP	Light yellowish-brown to orangish-brown, damp, medium dense, fine- to medium-grained, POORLY GRADED SAND.	34	Cal		2.8	99.1		77
			SM	Orangish-brown, moist, medium dense to dense, fine- to medium-grained, SILTY SAND.							
15					53	Cal		8.6	112.0		
			SP	Light brown, damp to moist, medium dense, fine- to coarse-grained, POORLY GRADED SAND.							
20					36	Cal		2.6	97.8		
				Boring terminated at 20 feet. No groundwater or seepage encountered.							
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JANUARY 2017	JOB NO.:	2150433.02
BY:	SRD	FIGURE NO.:	A-1

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-2

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	42.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	42.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0	SM	**Topsoil:** Orangish-brown, dry, loose, fine- to medium-grained, SILTY SAND; abundant animal burrows.							
	SM	Orangish-brown, damp, medium dense.	36	Cal		2.8	102.3		
5			44	Cal		4.8	112.4		CP
	SM	Orangish-brown, damp to moist, medium dense, fine-grained, SILTY SAND.							
10			28	Cal		6.6	106.7		
	SM-SP	Light brown, damp, medium dense, fine- to medium-grained, SILTY SAND-POORLY GRADED SAND.							
15			60	Cal		6.5	106.7		DS
	SM	Orangish-brown, moist, dense, fine- to coarse-grained, SILTY SAND; trace gravels up to 1".							
20			50/5"	Cal					
		Boring terminated at 20 feet. No groundwater or seepage encountered.							
25									
30									

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JANUARY 2017	JOB NO.:	2150433.02
BY:	SRD	FIGURE NO.:	A-2

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-3

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	43.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	43.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE
0	SM	**Artificial Fill (Qaf):** Dark brown, damp, loose, fine- to medium-grained, SILTY SAND.		
	SM			
	SM	**Topsoil:** Orangish-brown, damp, loose, fine- to medium-grained, SILTY SAND.	26	Cal
		Old Paralic Deposits (Qop): Orangish-brown, damp to moist, medium dense, fine- to medium-grained, SILTY SAND.		
5			73	Cal
			32	Cal
10		Boring terminated at 10 feet. No groundwater or seepage encountered.		
15				
20				
25				
30				

BULK | MOISTURE CONTENT (%) | DRY DENSITY (pcf) | RELATIVE COMPACTION (%) | LABORATORY TESTS

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁹⁹ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JANUARY 2017	JOB NO.:	2150433.02
BY:	SRD	FIGURE NO.:	A-3

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-4

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	44.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	44.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil:** Brown, damp, loose, fine- to medium-grained, SILTY SAND; porous.							
			SM	**Old Paralic Deposits (Qop):** Grayish-brown, damp, dense to very dense, fine- to medium-grained, SILTY SAND.	50/5"	Cal		3.7	110.1		
5					28	Cal					
			SM-SP	Light orangish-brown, damp to moist, medium dense, fine- to coarse-grained, SILTY SAND-POORLY GRADED SAND.							
				Boring terminated at 6½ feet. No groundwater or seepage encountered.							
10											
15											
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JANUARY 2017	JOB NO.:	2150433.02
BY:	SRD	FIGURE NO.:	A-4

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-5

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	45.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	42.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0	SM	Old Paralic Deposits (Qop): Orangish-brown, damp, medium dense, fine-grained, SILTY SAND.							
			38	Cal		7.3	107.6		
5									
	SM-SP	Light orangish-brown, damp, medium dense, fine- to coarse-grained, SILTY SAND-POORLY GRADED SAND.	22	Cal		4.1	95.5		DS
10									
			38	Cal		4.0	101.5		SA
15	SM	Orangish-brown, damp to moist, medium dense to dense, fine- to coarse-grained, SILTY SAND; slight gravels.							
			57	Cal		6.6	105.0		
20		Boring terminated at 20 feet. No groundwater or seepage encountered.							
25									
30									

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JANUARY 2017	JOB NO.:	2150433.02
BY:	SRD	FIGURE NO.:	A-5

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-6

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	7 inch Solid Flight
Existing Elevation:	43.5 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	43.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE
0	SM	**Topsoil:** Dark brown, moist, very loose, very fine- to medium-grained, SILTY SAND with animal burrows.		
	SM	**Old Paralic Deposits (Qop):** Orangish-brown, damp, medium dense, very fine- to medium-grained, SILTY SAND.		
5	SC	Orangish-brown to light gray, moist, medium dense, very fine- to medium-grained, CLAYEY SAND, mottled.	14	SPT
	SM	Orangish-brown to light gray, moist, medium dense, very fine- to medium-grained, SILTY SAND with clay.	15	SPT
	SP	Orangish-brown, damp to moist, medium dense, fine- to coarse-grained, POORLY GRADED SAND, friable.	20	SPT
10		Trace gravels at contact.	26	SPT
	SP	Orangish-brown to reddish-brown, damp to moist, dense, very fine- to medium-grained, SILTY SAND, slightly cemented.	34	SPT
15	SM-SP	Orangish-brown, damp, medium dense, fine- to coarse-grained, SILTY SAND - POORLY GRADED SAND.	27	SPT
			18	SPT
		Boring terminated at 17.5 feet. No groundwater or seepage encountered.		
20				
25				
30				

BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JANUARY 2017	JOB NO.:	2150433.02
BY:	SRD	FIGURE NO.:	A-6

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-7

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	7 inch Solid Flight
Existing Elevation:	43.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	43.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil:** Dark brown, moist, very loose, very fine- to medium-grained, SILTY SAND with animal burrows.							
			SM	**Old Paralic Deposits (Qop):** Orangish-brown, damp, medium dense, very fine- to medium-grained, SILTY SAND.							
5			SM	Orangish-brown to light grayish-brown, moist, medium dense, SILTY SAND with clay.	15	SPT					
			SP	Orangish-brown, damp to moist, medium dense, fine- to coarse-grained, POORLY GRADED SAND, friable.	17	SPT					
10				Gravels at 11 to 12 feet.	21	SPT					
			SM	Orangish-brown to reddish-brown, damp to moist, dense, very fine- to medium-grained, SILTY SAND, slightly cemented.	32	SPT					
15			SM-SP	Orangish-brown, damp, medium dense to dense, fine- to coarse-grained, SILTY SAND - POORLY GRADED SAND.	33	SPT					
					30	SPT					
				Boring terminated at 16.5 feet. No groundwater or seepage encountered.							
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JANUARY 2017	JOB NO.:	2150433.02
BY:	SRD	FIGURE NO.:	A-7

CHRISTIAN WHEELER ENGINEERING

Appendix B

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

Categorization of Infiltration Feasibility Condition		Worksheet C.4-1	
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X
An infiltration rate assessment has been performed for the soils beneath the area of the proposed biofiltration basin as presented in the Report of Geotechnical Infiltration Feasibility Study (CWE 2150433.02). The measured percolation rates were converted to infiltration rates using the Porchet Method. The City of San Diego Storm Water Standards BMP Design Manual states that "a maximum factor of safety (FOS) of 2.0 is recommended for infiltration feasibility screening such that an artificially high factor of safety cannot be used to inappropriately rule out infiltration, unless justified." Using a FOS of 2.0, the average infiltration rate for the soils at a depth of 7 to 10 feet below the proposed biofiltration BMP was 0.40 inches per hour.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
An infiltration rate assessment has been performed for the subject site. Based on the underlying soil conditions and our recommendations presented in our report, we anticipate that infiltration greater than 0.5 inches per hour can be allowed without increasing risk of geologic hazards that cannot be mitigated to an acceptable level. C.2.1 A site specific geotechnical investigation was performed. C.2.2 The underlying old paralic deposits are expected to have a low to moderately severe potential for hydro collapse and consolidation. The clayey portions within the northeast portion of the site have a high potential for heave. This can be mitigated by select grading and incorporating impermeable liners or cut-off walls. C.2.3 Setbacks have been recommended to mitigate possible slope stability issues. C.2.4 A vertical liner will be used to prevent lateral migration into nearby utility trenches. C.2.5 Groundwater mounding is not expected to be a concern. C.2.6 Where the biofiltration BMP is located within 10 feet of a structure, retaining wall or settlement sensitive improvement we recommended that a cut-off wall or impermeable liner be constructed around the perimeter of the BMP. The cut-off wall or impermeable liner should extend a minimum of 5 feet below proposed grade, at least 2 feet below the lowest adjacent footing and at least 2 feet below the bottom of the BMP, whichever is greater. The basins should also have an impermeable surface on the sides to prevent lateral water flow.			

Worksheet C.4-1 Page 2 of			
Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Based on our review of items presented in Appendix C.3, we anticipate that infiltration greater than 0.5 inches per hour can be allowed without increasing risk of groundwater contamination that cannot be mitigated to an acceptable level. C.3.1 The subgrade soil appears to be suitable for onsite infiltration. We have no knowledge of groundwater or soil contamination onsite or down-gradient from the site. C.3.2 The seasonal high groundwater table is estimated to be greater than 40 feet below existing grade at the proposed BMP. The encountered seepage water is not known to have any beneficial usages. C.3.3 No existing wellheads are known within the vicinity of the subject site. C.3.4 The site was not previously used for industrial use. C.3.5 We recommend that infiltration activities be coordinated with the applicable groundwater management agency. C.3.6 There does not appear to be a high risk of causing potential water balance issues.			
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: There does not appear to be a high risk of causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters by allowing infiltration greater than 0.5 inches per hour.			
Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		Partial

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

Worksheet C.4-1 Page 3 of			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
An infiltration rate assessment has been performed for the soils beneath the area of the proposed biofiltration BMP as presented in the Report of Geotechnical Infiltration Feasibility Study (CWE 2150433.02). The measured percolation rates were converted to infiltration rates using the Porchet Method. The City of San Diego Storm Water Standards BMP Design Manual states that "a maximum factor of safety (FOS) of 2.0 is recommended for infiltration feasibility screening such that an artificially high factor of safety cannot be used to inappropriately rule out infiltration, unless justified." Using a FOS of 2.0, an infiltration rate of 0.40 inches per hour can be used for the soils at a depth of 7 to 10 feet below the proposed biofiltration basin along the northerly property line.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
An infiltration rate assessment has been performed for the subject site. Based on the underlying soil conditions and our recommendations presented in our report, we anticipate that infiltration in any appreciable quantity can be allowed without increasing risk of geologic hazards that cannot be mitigated to an acceptable level. C.2.2 The underlying old paralic deposits are expected to have a low to moderately severe potential for hydro collapse and consolidation. The clayey portions within the northeast portion of the site have a high potential for heave. This can be mitigated by select grading and incorporating impermeable liners or cut-off walls. C.2.3 Setbacks have been recommended to mitigate possible slope stability issues. C.2.4 A vertical liner will be used to prevent lateral migration into nearby utility trenches. C.2.5 Groundwater mounding is not expected to be a concern. C.2.6 Where the biofiltration BMP is located within 10 feet of a structure, retaining wall or settlement sensitive improvement we recommended that a cut-off wall or impermeable liner be constructed around the perimeter of the BMP. The cut-off wall or impermeable liner should extend a minimum of 5 feet below proposed grade, at least 2 feet below the lowest adjacent existing or proposed footing and at least 2 feet below the bottom of the BMP, whichever is greater. The basins should also have an impermeable surface on the sides to prevent lateral water flow.BMP, whichever is greater.			

Worksheet C.4-1 Page 4 of			
Criteria	Screening Question	Yes	No
7	Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	

Provide basis:
An infiltration rate assessment has been performed for the subject site. Based on the underlying soil conditions and our recommendations presented in our report, we anticipate that an infiltration rate of 0.40 inches per hour can be allowed without increasing risk of groundwater contamination that cannot be mitigated to an acceptable level.

C.3.1 The subgrade soil appears to be suitable for onsite infiltration. We have no knowledge of groundwater or soil contamination onsite or down-gradient from the site.
C.3.2 The seasonal high groundwater table is estimated to be at greater than 40 feet below existing grade.
C.3.3 No existing wellheads are known within the vicinity of the subject site.
C.3.4 We have no knowledge of a previous industrial use.

8	Can infiltration be allowed without violating downstream water rights? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	

We did not perform a study regarding water rights. However, these rights are not typical in the San Diego area.

Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration. If any answer from row 5-8 is no, then infiltration of any volume is considered to be infeasible within the drainage area. The feasibility screening category is No Infiltration.	Partial Infiltration

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

Troy S. Wilson, CEG 2551

Appendix C

Porchet Method- Percolation to Infiltration Conversion Spreadsheet

Percolation to Infiltration Rate Conversion (Porchet Method)

Proposed Residential Development, 1389 Lieta Street, San Diego, CA

CWE 2150433.02

Perc Test #	Gravel Adjustment Factor	Effective Radius (inches) r	Depth of Hole Below Existing Grade (inches)	Time Interval (min.) Δt	Height of pipe above surface (feet)	Initial Water Depth without correction (feet)	Final Water Depth without correction (feet)	Initial Water Height with correction (inches) H_o	Final Water Height with correction (inches) H_f	Change in head (inches) ΔH	Average Head Height (inches) H_{avg}	Tested Infiltration Rate (inch/hour) I_t
1	0.56	3.5	60	30	0.00	3.48	3.59	18.24	16.92	1.32	17.58	0.13
2	0.56	3.5	60	30	0.00	1.98	1.99	36.24	36.12	0.12	36.18	0.01
3	0.64	3	60	30	0.00	2.27	2.28	32.76	32.64	0.12	32.70	0.01
4	0.51	3	120	30	2.00	7.39	7.48	55.32	54.24	1.08	54.78	0.03
5	0.51	3	127	30	1.25	11.08	11.68	9.04	1.84	7.20	5.44	1.59

"Initial and final water depth without correction" are measurements taken from top of pipe if pipe is sticking out of ground (most cases)

"Initial and final water height with correction" factors in the height of pipe above surface, and provides measurement of water above bottom of pipe

If measurements are taken from grade "Height of pipe above surface" = 0

Gravel Adjustment Factor:

4-inch Diameter Pipe: 1.00 - No Gravel Used (No Caving)
0.51 - 3/4 inch gravel with 8 inch diameter hole
0.56 - 3/4 inch gravel with 7 inch diameter hole
0.64 - 3/4 inch gravel with 6 inch diameter hole

3-inch Diameter Pipe: 1.00 - No Gravel Used (No Caving)
0.44 - 3/4 inch gravel with 8 inch diameter hole
0.47 - 3/4 inch gravel with 7 inch diameter hole
0.51 - 3/4 inch gravel with 6 inch diameter hole

Porchet Method - Tested Percolation Rate Conversion to Tested Infiltration Rate

$$I_t = \frac{\Delta H \, 60 \, r}{\Delta t \, (r + 2H_{avg})}$$

I_t = tested infiltration rate, inches per hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
r = effective radius of test hole
H_{avg} = average head over the time interval, inches

Attachment 1e

Pollutant Control BMP Design

Worksheets / Calculations

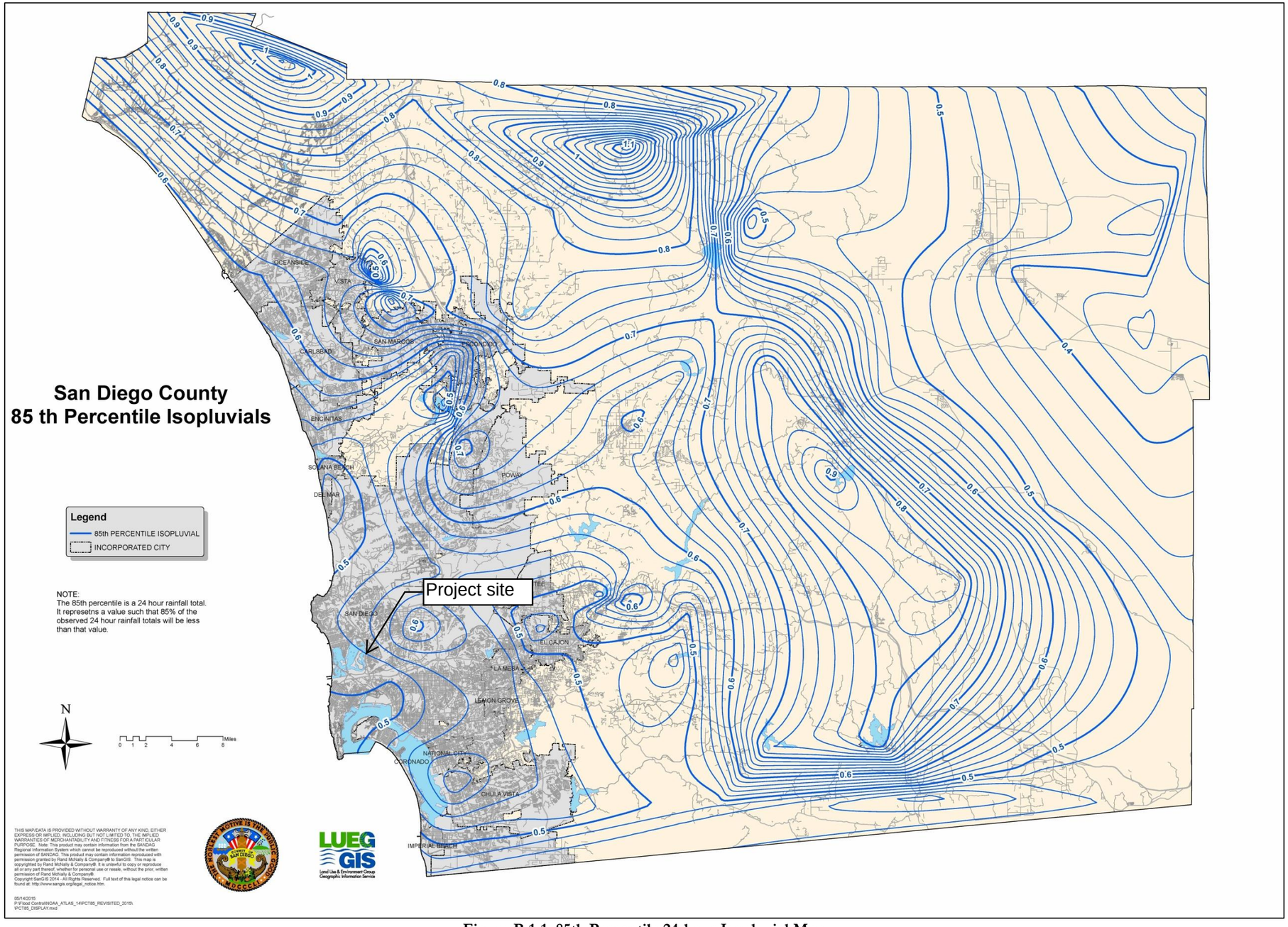


Figure B.1-1: 85th Percentile 24-hour Isopluvial Map

DMA SUMMARY

EX

DMA ID	Type	Total Area SF	Total Area Acres	Runoff Factor	C*A	C Factor
EX	Pervious	20,504	0.471	0.3	6151.2	
EX	Impervious	6,352	0.146	0.9	5716.8	
OFFSITE	Impervious	735	0.017	0.9	661.5	
TOTAL		27,591	0.633		12,530	0.45

PR

DMA ID	Type	Total Area SF	Total Area Acres	Runoff Factor	C*A	C Factor
DMA-1.1	Roof	12,634	0.290	0.9	11370.6	
DMA-1.2	Pavement	8,541	0.196	0.9	7686.9	
DMA-1.3	Landscape	4,023	0.092	0.3	1206.9	
DMA-1.4	Self-Treating	2,393	0.055	0.3	717.9	
TOTAL		27,591	0.633	**C=**	20,982	0.76

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods

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=	0.52	inches
2	Area tributary to BMP (s)	A=	0.633	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.76	unitless
4	Trees Credit Volume	TCV=	0	cubic-feet
5	Rain barrels Credit Volume	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	909	cubic-feet

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1 (Page 1 of 2)	
1	Remaining DCV after implementing retention BMPs	909	cubic-feet
Partial Retention			
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.4	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	14.4	inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	3.6	inches
7	Assumed surface area of the biofiltration BMP	660	sq-ft
8	Media retained pore storage	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	891	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	249	cubic-feet
BMP Parameters			
11	Surface Ponding [6 inch minimum, 12 inch maximum]	10	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	12	inches
14	Freely drained pore storage	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5	in/hr.
Baseline Calculations			
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	30	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	73.6	inches
19	Total Depth Treated [Line 17 + Line 18]	103.6	inches

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (continued)

Simple Sizing Method for Biofiltration BMPs		Worksheet B.5-1 (Page 2 of 2)	
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	373.5	cubic- feet
21	Required Footprint [Line 20/ Line 19] x 12	43	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	186.75	cubic- feet
23	Required Footprint [Line 22/ Line 18] x 12	30	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	27,591	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.76	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	629	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	629	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	0.980	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	X Yes ☐ No	

Note:

1. Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)
2. The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.
3. The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.
4. If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discr

1	**Biofiltration BMPs shall be allowed to be used only as described in the BMP selection process based on a documented feasibility analysis.** Intent: This manual defines a specific prioritization of pollutant treatment BMPs, where BMPs that retain water (retained includes evapotranspired, infiltrated, and/or harvested and used) must be used before considering BMPs that have a biofiltered discharge to the MS4 or surface waters. Use of a biofiltration BMP in a manner in conflict with this prioritization (i.e., without a feasibility analysis justifying its use) is not permitted, regardless of the adequacy of the sizing and design of the system.	
☐	The project applicant has demonstrated that it is not technically feasible to retain the full DCV onsite.	Document feasibility analysis and findings in SWQMP per Appendix C.
2	**Biofiltration BMPs must be sized using acceptable sizing methods.** Intent: The MS4 Permit and this manual defines specific sizing methods that must be used to size biofiltration BMPs. Sizing of biofiltration BMPs is a fundamental factor in the amount of storm water that can be treated and also influences volume and pollutant retention processes.	
☒	The project applicant has demonstrated that biofiltration BMPs are sized to meet one of the biofiltration sizing options available (Appendix B.5).	Submit sizing worksheets (Appendix B.5) or other equivalent documentation with the SWQMP.
3	**Biofiltration BMPs must be sited and designed to achieve maximum feasible infiltration and evapotranspiration.** Intent: Various decisions about BMP placement and design influence how much water is retained via infiltration and evapotranspiration. The MS4 Permit requires that biofiltration BMPs achieve maximum feasible retention (evapotranspiration and infiltration) of storm water volume.	
☒	The biofiltration BMP is sited to allow for maximum infiltration of runoff volume based on the feasibility factors considered in site planning efforts. It is also designed to maximize evapotranspiration through the use of amended media and plants (biofiltration designs without amended media and plants may be permissible; see Item 5).	Document site planning and feasibility analyses in SWQMP per Section 5.4.
☒	For biofiltration BMPs categorized as "Partial Infiltration Condition," the infiltration storage depth in the biofiltration design has been selected to drain in 36 hours (+/-25%) or an alternative value shown to maximize infiltration on the site.	Included documentation of estimated infiltration rate per Appendix D; provide calculations using Appendix B.4 and B.5 to show that the infiltration storage depth meets this criterion. Note, depths that are too shallow or too deep may not be acceptable.

	For biofiltration BMP locations categorized as "Partial Infiltration Condition," the infiltration storage is over the entire bottom of the biofiltration BMP footprint.	Document on plans that the infiltration storage covers the entire bottom of the BMP (i.e., not just underdrain trenches); or an equivalent footprint elsewhere on the site.
	For biofiltration BMP locations categorized as "Partial Infiltration Condition," the sizing factor used for the infiltration storage area is not less than the minimum biofiltration BMP sizing factors calculated using Worksheet B.5.1.	Provide a table that compares the minimum sizing factor per Worksheet B.5.1 to the provided sizing factor. Note: The infiltration storage area could be a separate storage feature located downstream of the biofiltration BMP, not necessarily within the same footprint.
	An impermeable liner or other hydraulic restriction layer is only used when needed to avoid geotechnical and/or subsurface contamination issues in locations identified as "No Infiltration Condition." NO LINER IS USED	If using an impermeable liner or hydraulic restriction layer, provide documentation of feasibility findings per Appendix C that recommend the use of this feature.
	The use of "compact" biofiltration BMP design[8] is permitted only in conditions identified as "No Infiltration Condition" and where site-specific documentation demonstrates that the use of larger footprint biofiltration BMPs would be infeasible.	Provide documentation of feasibility findings that recommend no infiltration is feasible. Provide site-specific information to demonstrate that a larger footprint biofiltration BMP would not be feasible.
4	**Biofiltration BMPs must be designed with a hydraulic loading rate to maximize pollutant retention, preserve pollutant control processes, and minimize potential for pollutant washout.** Intent: Various decisions about biofiltration BMP design influence the degree to which pollutants are retained. The MS4 Permit requires that biofiltration BMPs achieve maximum feasible retention of storm water pollutants.	

[8]Compact biofiltration BMPs are defined as features with infiltration storage footprint less than the minimum sizing factors required to achieve 40% volume retention. Note that if a biofiltration BMP is accompanied by an infiltrating area downstream that has a footprint equal to at least the minimum sizing factors calculated using Worksheet B.5.1 assuming a partial infiltration condition, then it is not considered to be a compact biofiltration BMP for the purpose of Item 4 of the checklist. For potential configurations with a higher rate biofiltration BMP upstream of an larger footprint infiltration area, the BMP would still need to comply with Item 5 of this checklist for pollutant treatment effectiveness.

☒	Media selected for the biofiltration BMP meets minimum quality and material specifications per Appendix F.4 or County LID Manual, including the maximum allowable design filtration rate and minimum thickness of media. OR	Provide documentation that media meets the specifications in Appendix F.4 or County LID Manual.
☐	Alternatively, for proprietary designs and custom media mixes not meeting the media specifications contained in Appendix F.4 or County LID Manual, field scale testing data are provided to demonstrate that proposed media meets the pollutant treatment performance criteria in Section F.1 below.	Provide documentation of performance information as described in Section F.1.
☒	To the extent practicable, filtration rates are outlet controlled (e.g., via an underdrain and orifice/weir) instead of controlled by the infiltration rate of the media.	Include outlet control in designs or provide documentation of why outlet control is not practicable.
☒	The water surface drains to at least 12 inches below the media surface within 24 hours from the end of storm event flow to preserve plant health and promote healthy soil structure.	Include calculations to demonstrate that drawdown rate is adequate. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the City Engineer if certified by a landscape architect or agronomist.
☒	If nutrients are a pollutant of concern, design of the biofiltration BMP follows nutrient-sensitive design criteria.	Follow specifications for nutrient sensitive design in Fact Sheet BF-2. Or provide alternative documentation that nutrient treatment is addressed and potential for nutrient release is minimized.
☒	Media gradation calculations demonstrate that migration of media between layers will be prevented and permeability will be preserved.	Follow specification for choking layer in Fact Sheet PR-1 or BF-1. Or include calculations to demonstrate that choking layer is appropriately specified.

5 Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.

Intent: Biological processes are an important element of biofiltration performance and longevity.

☐	Plants have been selected to be tolerant of project climate, design ponding depths and the treatment media composition.	Provide documentation justifying plant selection. Refer to the plant list in Appendix E.20.
☐	Plants have been selected to minimize irrigation requirements.	Provide documentation describing irrigation requirements for establishment and long term operation.
☐	Plant location and growth will not impede expected long-term media filtration rates and will enhance long term infiltration rates to the extent possible.	Provide documentation justifying plant selection. Refer to the plant list in Appendix E.20.
☐	If plants are not part of the biofiltration design, other biological processes are supported as needed to sustain treatment processes (e.g., biofilm in a subsurface flow wetland).	For biofiltration designs without plants, describe the biological processes that will support effective treatment and how they will be sustained. Refer to Appendix F.3
6	**Biofiltration BMPs must be designed with a hydraulic loading rate to prevent erosion, scour, and channeling within the BMP.** Intent: Erosion, scour, and/or channeling can disrupt treatment processes and reduce biofiltration effectiveness.	
☐	Scour protection has been provided for both sheet flow and pipe inflows to the BMP, where needed.	Provide documentation of scour protection as described in Fact Sheets PR-1 or BF-1 or approved equivalent.
☐	Where scour protection has not been provided, flows into and within the BMP are kept to non-erosive velocities.	Provide documentation of design checks for erosive velocities as described in Fact Sheets PR-1 or BF-1 or approved equivalent.
☐	For proprietary BMPs, the BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification[9] (i.e., maximum tributary area, maximum inflow velocities, etc., as applicable).	Provide copy of manufacturer recommendations and conditions of third-party certification.

[9]Certifications or verifications issued by the Washington Technology Acceptance Protocol-Ecology program and the New Jersey Corporation for Advanced Technology programs are typically accompanied by a set of guidelines regarding appropriate design and maintenance conditions that would be consistent with the certification/verification

7	**Biofiltration BMP must include operations and maintenance design features and planning considerations for continued effectiveness of pollutant and flow control functions.** Intent: Biofiltration BMPs require regular maintenance in order provide ongoing function as intended. Additionally, it is not possible to foresee and avoid potential issues as part of design; therefore plans must be in place to correct issues if they arise.	
☒	The biofiltration BMP O&M plan describes specific inspection activities, regular/periodic maintenance activities and specific corrective actions relating to scour, erosion, channeling, media clogging, vegetation health, and inflow and outflow structures. N/A FOR DISCRETIONARY	Include O&M plan with project submittal as described in Chapter 7.
☒	Adequate site area and features have been provided for BMP inspection and maintenance access.	Illustrate maintenance access routes, setbacks, maintenance features as needed on project water quality plans.
☐	For proprietary biofiltration BMPs, the BMP maintenance plan is consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies). N/A FROM DISCRETIONARY	Provide copy of manufacturer recommendations and conditions of third-party certification.

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.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

Project Name: Multi-Family Residential Apartments - 1398 Lieta Street SDP

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 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	○ Included ◉ Not required because BMPs will drain in less than 96 hours

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

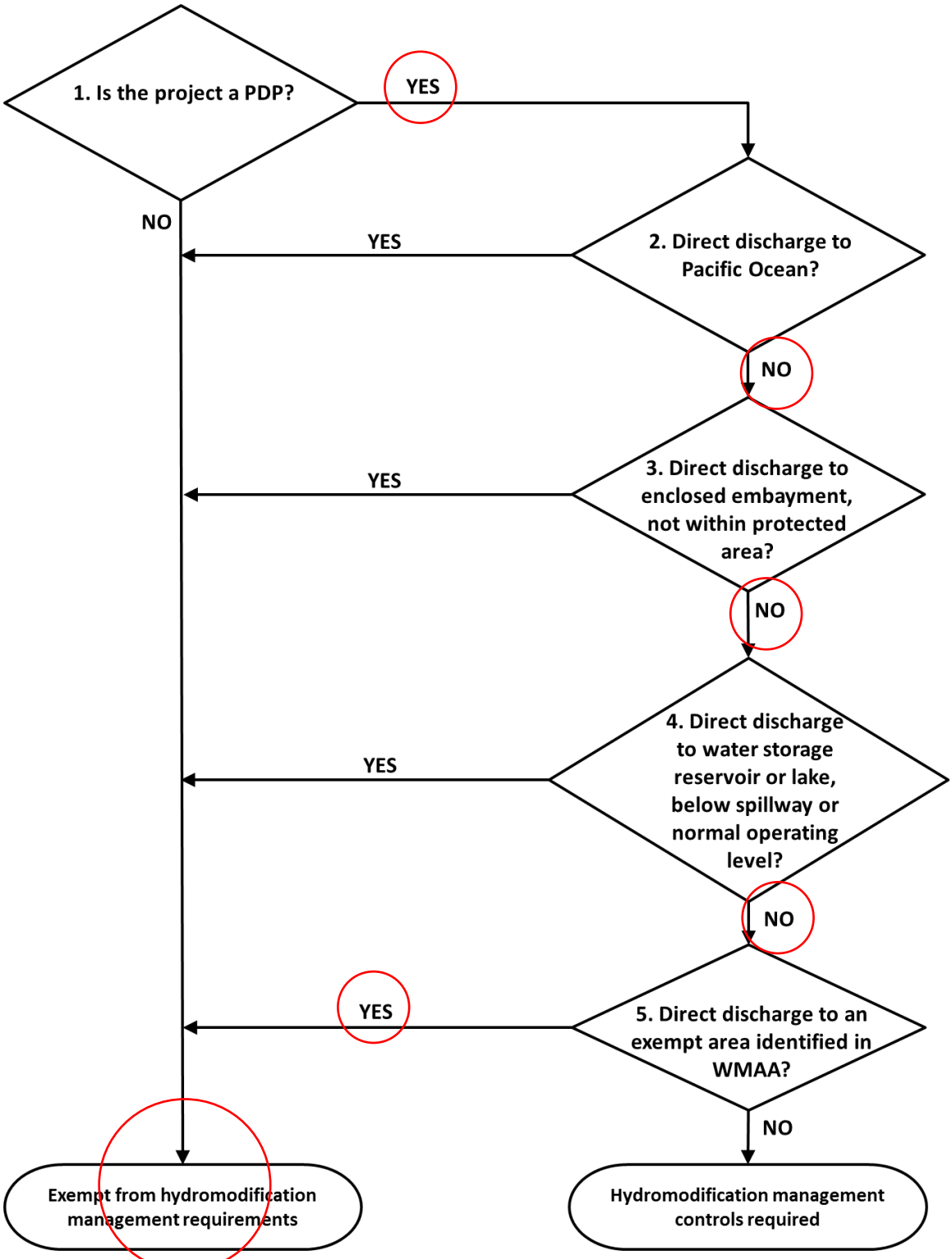
The Hydromodification Management Exhibit must identify:

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

Attachment 2a

Hydromodification Management Exhibit

N/A



*Direct discharge refers to an uninterrupted hardened conveyance system; Note to be used in conjunction with Node Descriptions.

Figure 1-2. Applicability of Hydromodification Management BMP Requirements

Parcel Information Report

THE CITY OF SAN DIEGO
Development Services Department
1222 First Avenue, San Diego, CA 92101-4154

8/4/2016 07:13:55

Report Number 101

North

241 feet

Scale Is Approximate

Map Layers Included In Report

Description	Visible	Transparent	Has Intersecting Features
Roads	✓		Yes
Freeways	✓		No
Parcels	✓	✓	Yes
Storm Drain Conveyance	✓		No
Storm Drain Structures	✓		No
Orthophotos (1999)	✓		No

Intersecting Features

Roads

Road Name
TONOPAH AV

Parcels

APN	Recordation	Owner Information	Valuation		Other
430-680-0900	Record: 461153 Date:8/31/2015	ALMERIA INVESTMENTS LP	Land:	$800,000	Units: 1
	Legal:	P O BOX 232628	Imp:	$25,000	Taxable: ✓
Address(es)	LOT 255 LOT 5 0.62 AC M/L IN	ENCINITAS CA 92023	Total:	$825,000	Own Occ:
1398 LIETA ST					

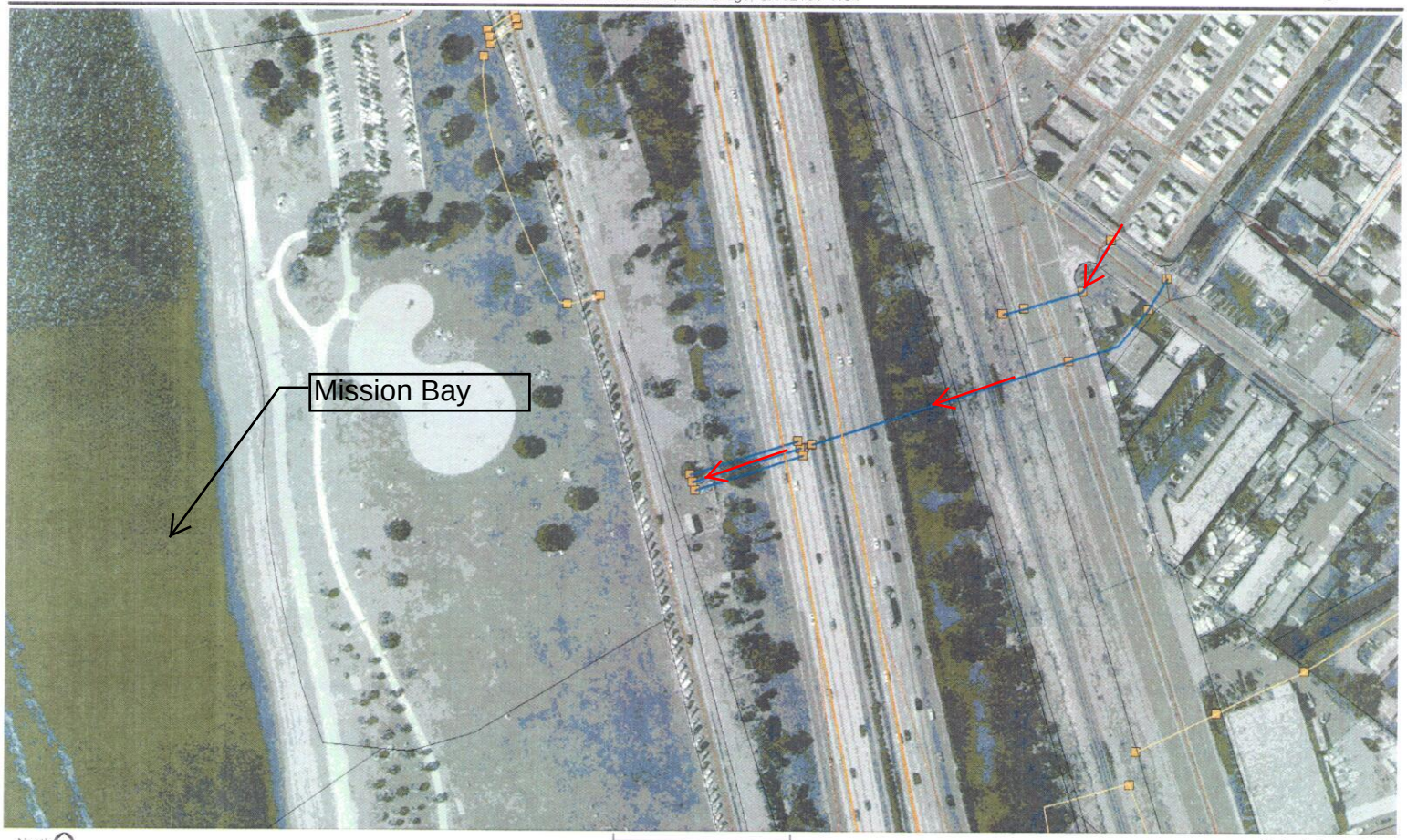
DSDCUSTOMER

Parcel Information Report

8/4/2016 07:14:49

Report Number 101

THE CITY OF SAN DIEGO
Development Services Department
1222 First Avenue, San Diego, CA 92101-4154



Scale Is Approximate

Map Layers Included In Report

Description	Visible	Transparent	Has Intersecting Features
Roads	✓		Yes
Freeways	✓		No
Parcels	✓	✓	Yes
Storm Drain Conveyance	✓		No
Storm Drain Structures	✓		No
Orthophotos (1999)	✓		No

Intersecting Features

Roads

Road Name
TONOPAH AV

Parcels

APN	Recordation	Owner Information		Valuation		Other	
430-680-0900	Record: 461153 Date:8/31/2015	ALMERIA INVESTMENTS LP		Land:	$800,000	Units:	1
	Legal:	P O BOX 232628		Imp:	$25,000	Taxable:	✓
Address(es)	LOT 255 LOT 5 0.62 AC M/L IN	ENCINITAS	CA 92023	Total:	$825,000	Own Occ:	
1398 LIETA ST							

DSDCUSTOMER

Attachment 2b

Management of Critical Coarse Sediment Yield Areas

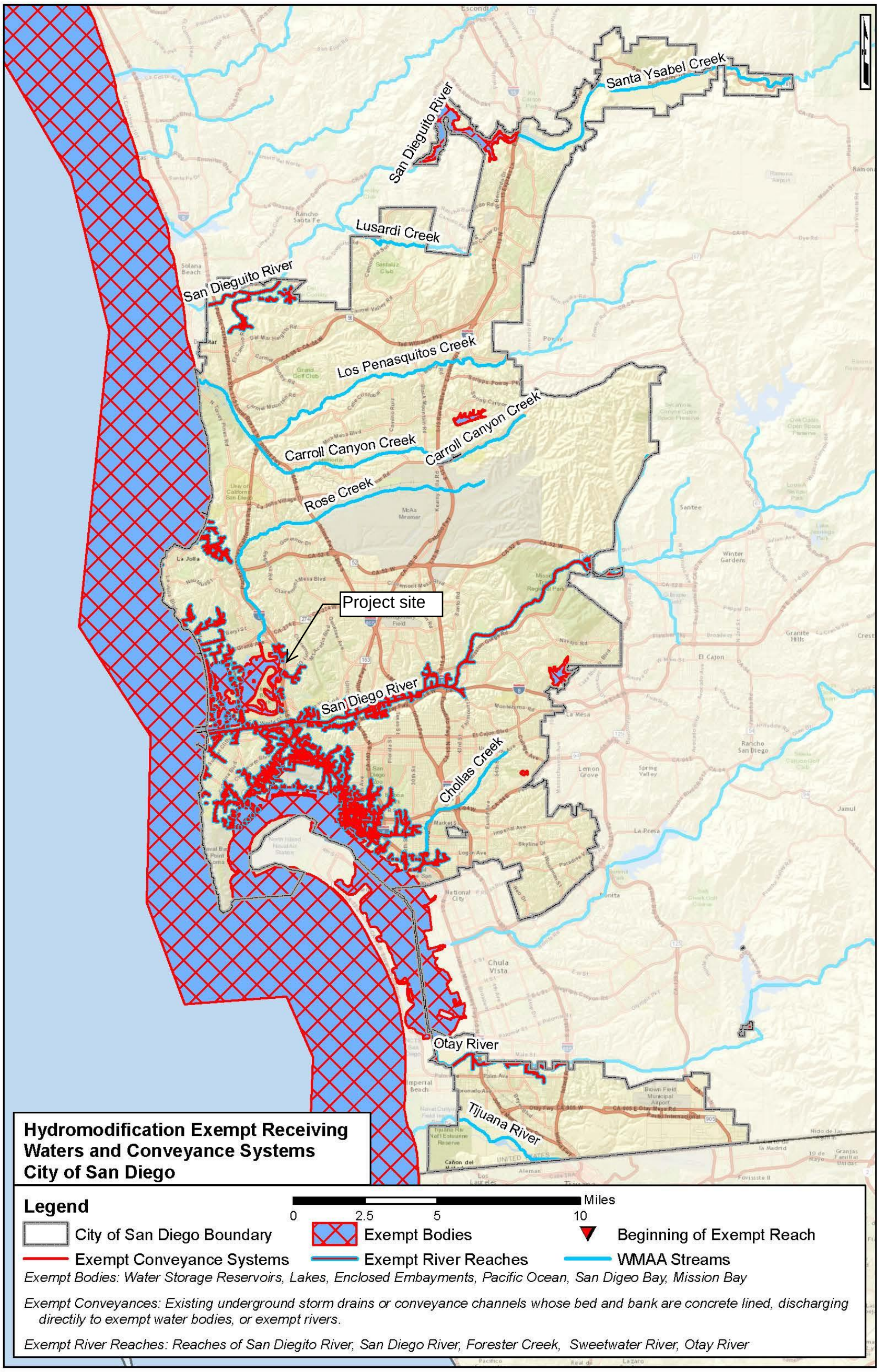


Figure H-G.2-2 Hydromodification Exempt Areas

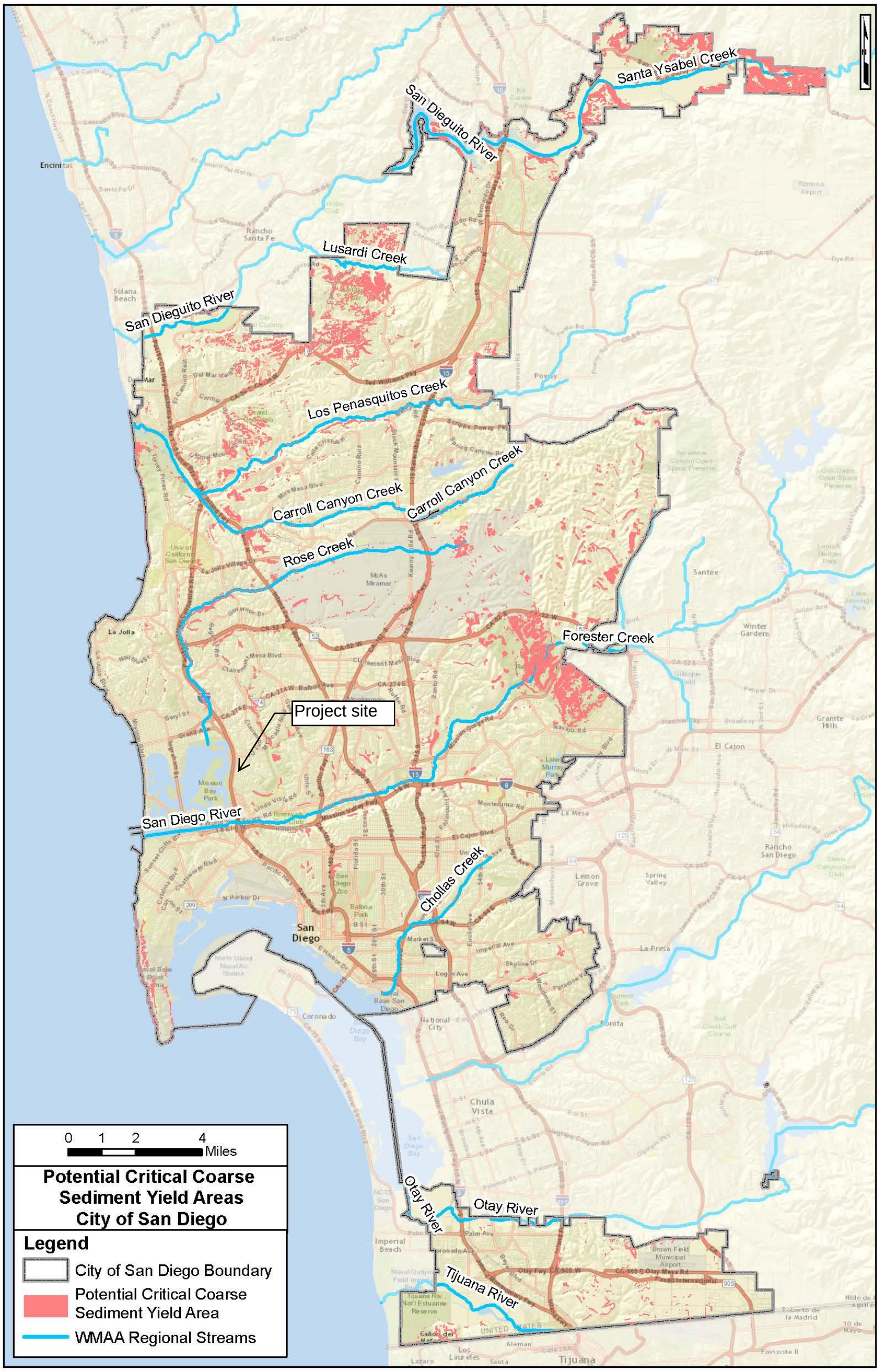


Figure H-G.2-1 Potential Critical Coarse Sediment Yield Areas

Attachment 2c

Geomorphic Assessment of Receiving Channels

N/A

Attachment 2d

Flow Control Facility Design and Structural BMP Drawdown Calculations

Automated Worksheet B.5-1: Sizing Lined or Unlined Biofiltration BMPs (V1.2)

Category	#	Description	*i*	*ii*	*iii*	*iv*	*v*	*vi*	*vii*	*viii*	*ix*	*x*	Units
BMP Inputs	0	Drainage Basin ID or Name	1	-	-	-	-	-	-	-	-	-	sq-ft
	1	Design Infiltration Rate Recommended by Geotechnical Engineer	0.400	-	-	-	-	-	-	-	-	-	in/hr
	2	Effective Tributary Area	20,411	-	-	-	-	-	-	-	-	-	sq-ft
	3	Minimum Biofiltration Footprint Sizing Factor	0.030	-	-	-	-	-	-	-	-	-	ratio
	4	Design Capture Volume Tributary to BMP	884	-	-	-	-	-	-	-	-	-	cubic-feet
	5	Is Biofiltration Basin Impermeably Lined or Unlined?	Unlined										unitless
	6	Provided Biofiltration BMP Surface Area	660										sq-ft
	7	Provided Surface Ponding Depth	12										inches
	8	Provided Soil Media Thickness	18										inches
	9	Provided Depth of Gravel Above Underdrain Invert	11										inches
	10	Diameter of Underdrain or Hydromod Orifice (Select Smallest)	4.00										inches
	11	Provided Depth of Gravel Below the Underdrain	3										inches
Retention Calculations	12	Volume Infiltrated Over 6 Hour Storm	132	0	0	0	0	0	0	0	0	0	cubic-feet
	13	Soil Media Pore Space Available for Retention	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	unitless
	14	Gravel Pore Space Available for Retention	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	unitless
	15	Effective Retention Depth	2.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	16	Calculated Retention Storage Drawdown (Including 6 Hr Storm)	9	0	0	0	0	0	0	0	0	0	hours
	17	Volume Retained by BMP	248	0	0	0	0	0	0	0	0	0	cubic-feet
	18	Fraction of DCV Retained	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	19	Portion of Retention Performance Standard Satisfied	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	20	Fraction of DCV Retained (normalized to 36-hr drawdown)	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	21	Design Capture Volume Remaining for Biofiltration	362	0	0	0	0	0	0	0	0	0	cubic-feet
Biofiltration Calculations	22	Max Hydromod Flow Rate through Underdrain	0.7575	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	CFS
	23	Max Soil Filtration Rate Allowed by Underdrain Orifice	49.58	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	in/hr
	24	Soil Media Filtration Rate per Specifications	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	25	Soil Media Filtration Rate to be used for Sizing	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	in/hr
	26	Depth Biofiltered Over 6 Hour Storm	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	inches
	27	Soil Media Pore Space Available for Biofiltration	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	unitless
	28	Effective Depth of Biofiltration Storage	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inches
	29	Drawdown Time for Surface Ponding	2	0	0	0	0	0	0	0	0	0	hours
	30	Drawdown Time for Effective Biofiltration Depth	4	0	0	0	0	0	0	0	0	0	hours
	31	Total Depth Biofiltered	50.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	inches
	32	Option 1 - Biofilter 1.50 DCV: Target Volume	543	0	0	0	0	0	0	0	0	0	cubic-feet
	33	Option 1 - Provided Biofiltration Volume	543	0	0	0	0	0	0	0	0	0	cubic-feet
	34	Option 2 - Store 0.75 DCV: Target Volume	272	0	0	0	0	0	0	0	0	0	cubic-feet
	35	Option 2 - Provided Storage Volume	272	0	0	0	0	0	0	0	0	0	cubic-feet
	36	Portion of Biofiltration Performance Standard Satisfied	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
Result	37	Do Site Design Elements and BMPs Satisfy Annual Retention Requirements?	Yes	-	-	-	-	-	-	-	-	-	yes/no
	38	Overall Portion of Performance Standard Satisfied	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ratio
	39	This BMP Overflows to the Following Drainage Basin	-	-	-	-	-	-	-	-	-	-	unitless
	40	**Deficit of Effectively Treated Stormwater**	0	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**	cubic-feet

Worksheet B.5-1 General Notes:

A. Applicants may use this worksheet to size Lined or Unlined Biofiltration BMPs (BF-1, PR-1) for up to 10 basins. User input must be provided for yellow shaded cells, values for blue cells are automatically populated based on user inputs from previous worksheets, values for all other cells will be automatically generated, errors/notifications will be highlighted in red/orange and summarized below. BMPs fully satisfying the pollutant control performance standards will have a deficit treated volume of zero and be highlighted in green.

Attachment 2e

Vector Control Plan

N/A

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

E.13. BF-1 Biofiltration

Location: 43rd Street and Logan Avenue, San Diego, California

MS4 Permit Category
Biofiltration
Manual Category
Biofiltration
Applicable Performance Standard
Pollutant Control Flow Control
Primary Benefits
Treatment Volume Reduction (Incidental) Peak Flow Attenuation (Optional)

Description

Biofiltration (Bioretention with underdrain) facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to discharge via underdrain or overflow to the downstream conveyance system. Bioretention with underdrain facilities are commonly incorporated into the site within parking lot landscaping, along roadsides, and in open spaces. Because these types of facilities have limited or no infiltration, they are typically designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system. Treatment is achieved through filtration, sedimentation, sorption, biochemical processes and plant uptake.

Typical bioretention with underdrain components include:

- Inflow distribution mechanisms (e.g, perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side slope and basin bottom vegetation selected based on expected climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer (aka choking layer) consisting of aggregate to prevent the migration of fines into uncompacted native soils or the aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Impermeable liner or uncompacted native soils at the bottom of the facility
- Overflow structure

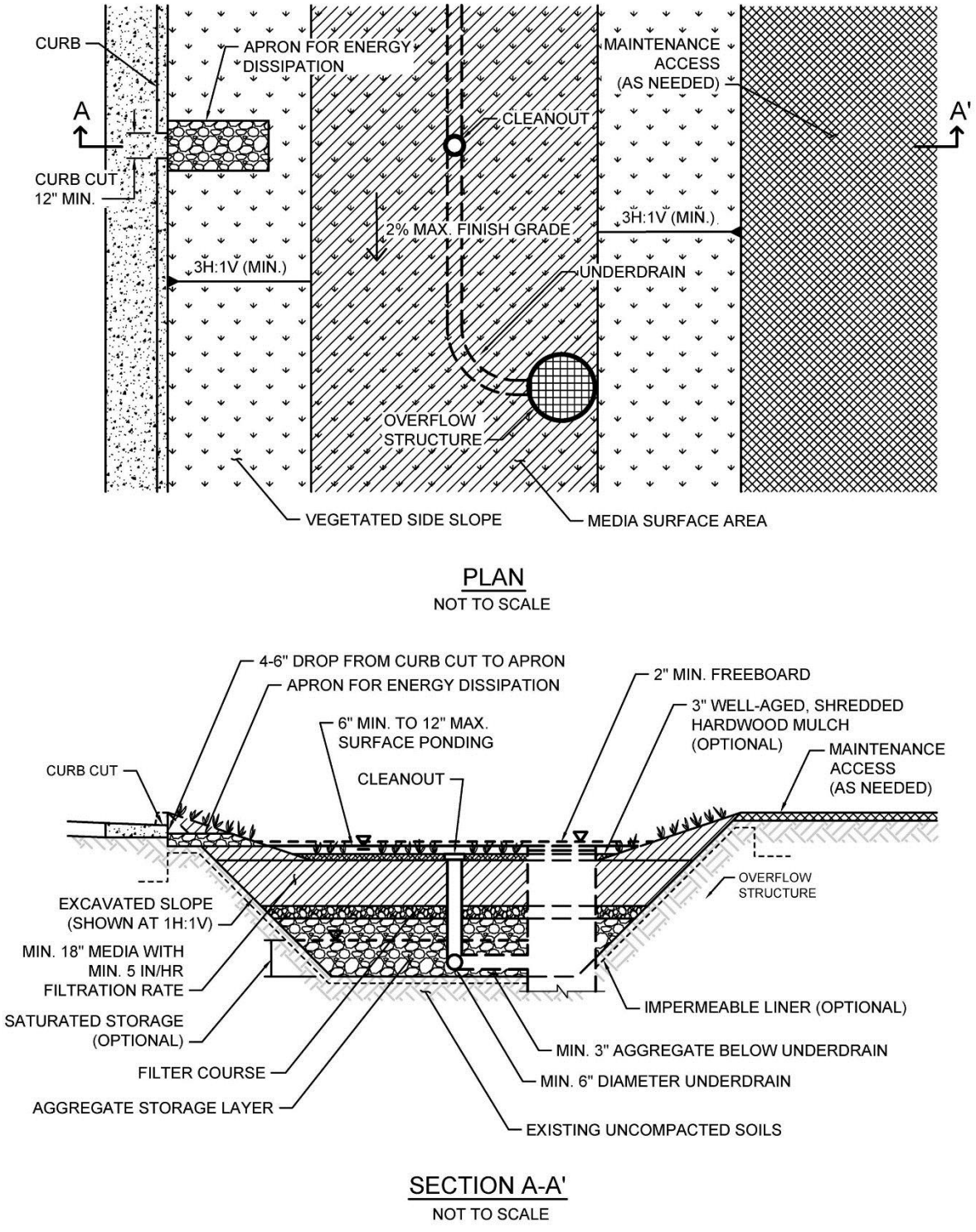


Figure E.13-E.13-1: Typical plan and Section view of a Biofiltration BMP

Design Adaptations for Project Goals

Biofiltration Treatment BMP for storm water pollutant control. The system is lined or un-lined to provide incidental infiltration, and an underdrain is provided at the bottom to carry away filtered runoff. This configuration is considered to provide biofiltration treatment via flow through the media layer. Storage provided above the underdrain within surface ponding, media, and aggregate storage is considered included in the biofiltration treatment volume. Saturated storage within the aggregate storage layer can be added to this design by raising the underdrain above the bottom of the aggregate storage layer or via an internal weir structure designed to maintain a specific water level elevation.

Integrated storm water flow control and pollutant control configuration. The system can be designed to provide flow rate and duration control by primarily providing increased surface ponding and/or having a deeper aggregate storage layer above the underdrain. This will allow for significant detention storage, which can be controlled via inclusion of an outlet structure at the downstream end of the underdrain.

Design Criteria and Considerations

Bioretention with underdrain must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of the City Engineer if it is determined to be appropriate:

	Siting and Design	Intent/Rationale
□	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
□	An impermeable liner or other hydraulic restriction layer is included if site constraints indicate that infiltration or lateral flows should not be allowed.	Lining prevents storm water from impacting groundwater and/or sensitive environmental or geotechnical features. Incidental infiltration, when allowable, can aid in pollutant removal and groundwater recharge.
□	Contributing tributary area shall be ≤ 5 acres (≤ 1 acre preferred).	Bigger BMPs require additional design features for proper performance. Contributing tributary area greater than 5 acres may be allowed at the discretion of the City Engineer if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to minimizing short circuiting of flows in the BMP and 2) incorporate additional design features requested by the City Engineer for proper performance of the regional BMP.
□	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.
Surface Ponding		

	Siting and Design	Intent/Rationale
□	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hour for plant health. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the City Engineer if certified by a landscape architect or agronomist.
□	Surface ponding depth is ≥ 6 and ≤ 12 inches.	Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of the City Engineer if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence and/or flatter side slopes) and 3) potential for elevated clogging risk is considered.
□	A minimum of 2 inches of freeboard is provided.	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
□	Side slopes are stabilized with vegetation and are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Vegetation		
□	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.20.	Plants suited to the climate and ponding depth are more likely to survive.
□	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch (Mandatory)		
□	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		

	Siting and Design	Intent/Rationale
□	Media maintains a minimum filtration rate of 5 in/hr over lifetime of facility. Additional Criteria for media hydraulic conductivity described in the bioretention soil media model specification (Appendix F.4)	A filtration rate of at least 5 inches per hour allows soil to drain between events. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.
□	Media is a minimum 18 inches deep, meeting the following media specifications: Model biorention soil media specification provided in Appendix F.4 or County of San Diego Low Impact Development Handbook: Appendix G - Bioretention Soil Specification (June 2014, unless superseded by more recent edition). Alternatively, for proprietary designs and custom media mixes not meeting the media specifications, the media meets the pollutant treatment performance criteria in Section F.1.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications shall be followed. For non-standard or proprietary designs, compliance with Appendix F.1 ensures that adequate treatment performance will be provided.
□	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Use Worksheet B.5-1 Line 26 to estimate the minimum surface area required per this criteria.
□	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
Filter Course Layer		
□	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade and can result in poor water quality performance for turbidity and suspended solids. Filter fabric is more likely to clog.

	Siting and Design	Intent/Rationale
□	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility and impede infiltration.
□	To reduce clogging potential, a two-layer filter course (aka choking stone system) is used consisting of one 3" layer of clean and washed ASTM 33 Fine Aggregate Sand overlying a 3" layer of ASTM No 8 Stone (Appendix F.5).	This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.
Aggregate Storage Layer		
□	ASTM #57 open graded stone is used for the storage layer and a two layer filter course (detailed above) is used above this layer	This layer provides additional storage capacity. ASTM #8 stone provides an acceptable choking/bridging interface with the particles in ASTM #57 stone.
□	The depth of aggregate provided (12-inch typical) and storage layer configuration is adequate for providing conveyance for underdrain flows to the outlet structure.	Proper storage layer configuration and underdrain placement will minimize facility drawdown time.
Inflow, Underdrain, and Outflow Structures		
□	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
□	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
□	Curb cut inlets are at least 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
□	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
□	Minimum underdrain diameter is 8 inches.	Smaller diameter underdrains are prone to clogging.
□	Underdrains should be affixed with an upturned elbow to an elevation at least 9 to 12 inches above the invert of the underdrain.	An upturned elbow reduces velocity in the underdrain pipe and can help reduce mobilization of sediments from the underdrain and media bed.

	Siting and Design	Intent/Rationale
□	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
□	An underdrain cleanout with a minimum 8-inch diameter and lockable cap is placed every 50 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance.
□	Overflow is safely conveyed to a downstream storm drain system or discharge point Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only

To design bioretention with underdrain for storm water pollutant control only (no flow control required), the following steps should be taken:

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary areas.
3. Use the sizing worksheet presented in Appendix B.5 to size biofiltration BMPs.

Conceptual Design and Sizing Approach when Storm Water Flow Control is Applicable

Control of flow rates and/or durations will typically require significant surface ponding and/or aggregate storage volumes, and therefore the following steps should be taken prior to determination of storm water pollutant control design. Pre-development and allowable post-project flow rates and durations should be determined as discussed in Chapter 6 of the manual.

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Iteratively determine the facility footprint area, surface ponding and/or aggregate storage layer depth required to provide detention storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention storage by altering outlet structure orifice size(s) and/or water control levels. Multi-level orifices can be used within an outlet structure to control the full range of flows.
3. If bioretention with underdrain cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with significant storage volume such as an underground vault can be used to provide remaining controls.
4. After bioretention with underdrain has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

Project Name: Multi-Family Residential Apartments - 1398 Lieta Street SDP

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☐ Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Maintenance Agreement (Form DS-3247) (when applicable)	◘ Included ◘ Not Applicable

Project Name: Multi-Family Residential Apartments - 1398 Lieta Street SDP

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

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:
  - ☐ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual
- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

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

Attachment 3b: For private entity operation and maintenance, Attachment 3b 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).

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s):Click or tap here to enter text..

2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's WQTR and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s)Click or tap here to enter text..

3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibits(s):Click or tap here to enter text.

(Owner Signature)

Click or tap here to enter text.

(Print Name and Title)

Click or tap here to enter text.

(Company/Organization Name)

Click or tap to enter a date.

(Date)

THE CITY OF SAN DIEGO

APPROVED:

(City Control engineer Signature

(Print Name)

(Date)

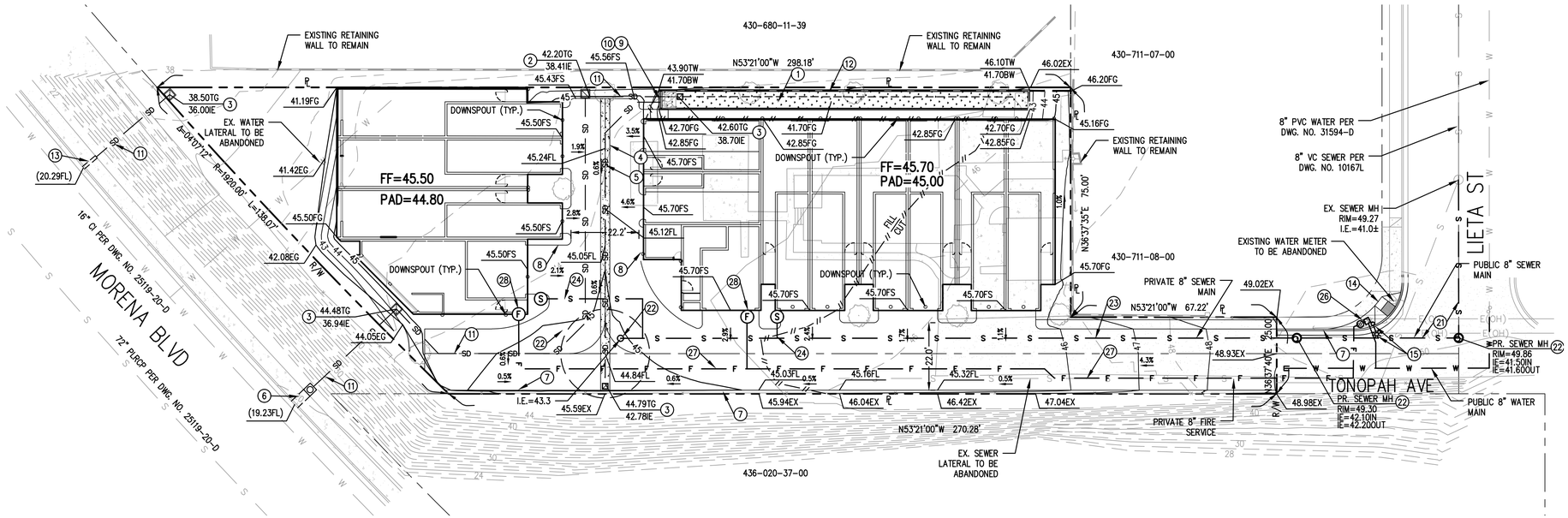
NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDMENTS PER CIVIL CODE SEC. 1180 ET.SEQ

ATTACHMENT 4
COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

PRELIMINARY GRADING PLAN FOR LIETA STREET
NOT FOR CONSTRUCTION



LEGEND:

- PROPERTY LINE
- RIGHT OF WAY
- CENTERLINE
- EXISTING CONTOUR (MAJOR) 490
- EXISTING CONTOUR (MINOR)
- PROPOSED CONTOUR (MAJOR) 490
- PROPOSED CONTOUR (MINOR)
- CUT / FILL SLOPE
- DAYLIGHT LINE (CUT / FILL)
- DIRECTION OF DRAINAGE
- CURB AND GUTTER
- PR. STORM DRAIN LINE SD
- PR. STORM INLET
- MASONRY RETAINING WALL
- PR. SEWER LINE S
- PR. WATER LINE W
- PR. SEWER MANHOLE
- PR. CURB OUTLET
- PR. SEWER CLEANOUT

CONSTRUCTION NOTES:

1. CONSTRUCT BIOFILTRATION BASIN PER DETAIL HEREON
2. CONSTRUCT STORM CONTROL VAULT
3. CONSTRUCT 24" X 24" GRATE INLET
4. CONSTRUCT 3' WIDE RIBBON GUTTER PER DETAIL HEREON
5. CONSTRUCT 9" HDPE STORM DRAIN
6. CONSTRUCT CURB OUTLET PER SDRSD D-25
7. CONSTRUCT CURB AND GUTTER PER SDG-151
8. CONSTRUCT CURB ONLY PER SDG-150
9. CONSTRUCT RIPRAP PER SDD-104, NO. 2 BACKING T=1.1'
10. CONSTRUCT HEADWALL PER SDRSD D-30
11. CONSTRUCT 12" HDPE STORM DRAIN
12. CONSTRUCT RETAINING WALL PER SDRSD C-1
13. CONSTRUCT SIDEWALK UNDERDRAIN PER SDRSD D-27
14. CONSTRUCT CURB RAMPS PER SDG-133, TYPE A

UTILITY NOTES:

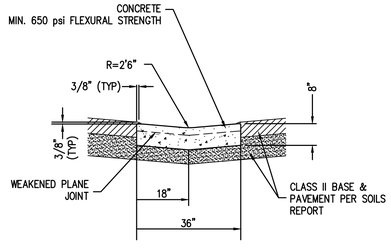
21. CONSTRUCT PUBLIC 8" SEWER MAIN
22. CONSTRUCT SEWER MANHOLE PER SDRSD SM-01
23. CONSTRUCT PRIVATE 8" SEWER MAIN
24. CONSTRUCT PRIVATE 6" SEWER LATERAL PER SDS-105
25. CONSTRUCT SEWER CLEANOUT PER SDRSD SC-01
26. CONSTRUCT FIRE BACKFLOW PREVENTER PER SDW-105
27. CONSTRUCT PRIVATE 6" PVC C900 FIRE LINE
28. FIRE SERVICE POC

STORM WATER NOTE

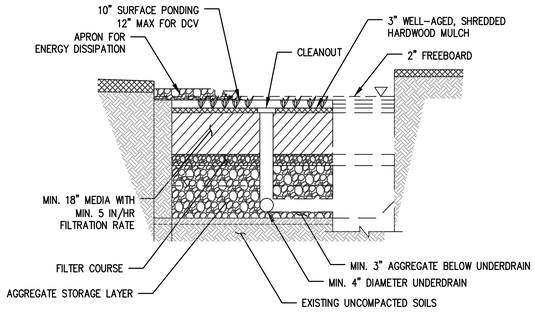
1. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITEE SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE, SATISFACTORY TO THE CITY ENGINEER.
2. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITTEE SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.
3. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT THE OWNER/PERMITTEE SHALL SUBMIT A WATER POLLUTION CONTROL PLAN (WPCP). THE WPCP SHALL BE PREPARED IN ACCORDANCE WITH THE GUIDELINES IN PART 2 CONSTRUCTION BMP STANDARDS CHAPTER 4 OF THE CITY'S STORM WATER STANDARDS
4. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE APPLICANT SHALL SUBMIT A TECHNICAL REPORT THAT WILL BE SUBJECT TO FINAL REVIEW AND APPROVAL BY THE CITY ENGINEER, BASED ON THE STORM WATER STANDARDS IN EFFECT AT THE TIME OF THE CONSTRUCTION PERMIT ISSUANCE.

NOTE

1. THE OWNER/PERMITTEE SHALL OBTAIN AN ENCROACHMENT MAINTENANCE REMOVAL AGREEMENT, FROM THE CITY ENGINEER, FOR THE PORTION OF THE PROPOSED PRIVATE STORM DRAIN SYSTEM LOCATED WHERE THE OWNER/PERMITTEE IS NOT THE OWNER OF THE PROPERTY FRONTING THE ENCROACHMENT.
2. THIS PROJECT WILL NOT DISCHARGE ANY INCREASE IN STORM WATER RUN-OFF ONTO THE EXISTING RIGHT-OF-WAY SLOPE AREAS.
3. 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.
4. ALL ONSITE WATER AND SEWER FACILITIES WILL BE PRIVATE AND SHALL BE DESIGNED TO MEET THE REQUIREMENTS OF THE CALIFORNIA UNIFORM PLUMBING CODE AND SHALL BE REVIEWED AS PART OF THE BUILDING PERMIT PLAN CHECK.
5. THIS PROJECT WILL NOT DISCHARGE ANY INCREASE IN STORM WATER RUN-OFF ONTO THE EXISTING RIGHT-OF-WAY SLOPE AREAS.



RIBBON GUTTER
NO SCALE



BIOFILTRATION BMP
N.T.S.

OWNER

ALMERIA INVESTMENTS LP
1398 LIETA STREET
SAN DIEGO, CA 92110

ASSESSOR'S PARCEL NOS.

430-680-09

EARTHWORK DATA

CUT = 220 C.Y. FILL = 890 C.Y.
IMPORT = 670 C.Y.

TOTAL LOT AREA = 26,855 S.F.
TOTAL DISTURBED AREA = 25,102 S.F.

THESE QUANTITIES DO NOT INCLUDE ANY LOSSES DUE TO SHRINKAGE, SUBSIDENCE, OVEREXCAVATION, OR ANY SPECIAL REQUIREMENTS THAT MAY BE SPECIFIED IN THE PRELIMINARY SOILS REPORT. THESE QUANTITIES ARE FOR PERMIT PURPOSES ONLY. ALL CONTRACTORS BIDDING ON THIS PROJECT SHOULD MAKE THEIR OWN DETERMINATION OF EARTHWORK QUANTITIES PRIOR TO SUBMITTING A BID.

TOPOGRAPHY

TOPOGRAPHIC SURVEY IS BASED UPON A FIELD SURVEY AND REPRESENTS THE TOPOGRAPHIC FEATURE OF THIS SITE. CONTRACTOR TO VERIFY EXACT LOCATION OF UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION.
BENCHMARK: A BRASS PLUG LOCATED IN THE TOP OF CURB, OVER A CONCRETE STORM DRAIN INLET AT THE SOUTHEAST CORNER OF MORENA BOULEVARD AND ASHER STREET.
ELEVATION = 21.883' MSL (NGVD '29)

ENGINEER

CIVIL LANDWORKS CORP.
110 COPPERWOOD WAY, SUITE P
OCEANSIDE, CA 92058
760-908-8745

DAVID V. CARON 3-3-17

REGISTERED PROFESSIONAL ENGINEER
DAVID V. CARON
No.C070066
EXP.09/30/18
CIVIL
STATE OF CALIFORNIA

Civil Landworks
110 COPPERWOOD WAY, SUITE P, OCEANSIDE, CA 92058
PH: 760-908-8745 • info@civillandworks.com

20 0 20 40
GRAPHIC SCALE
SCALE: 1"= 20'

3/29/17

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

The plans must identify:

☐ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
☐ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
☐ Details and specifications for construction of structural BMP(s)
☐ Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
☐ How to access the structural BMP(s) to inspect and perform maintenance
☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
☐ Recommended equipment to perform maintenance
☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
☐ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
☐ All BMPs must be fully dimensioned on the plans
☐ When propritery BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Broucher photocopies are not allowed.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

ATTACHMENT 5
DRAINAGE REPORT

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

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

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.

THIS PAGE INTENTIONALLY LEFT BLANK FOR DOUBLE-SIDED PRINTING

REPORT OF PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED RESIENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

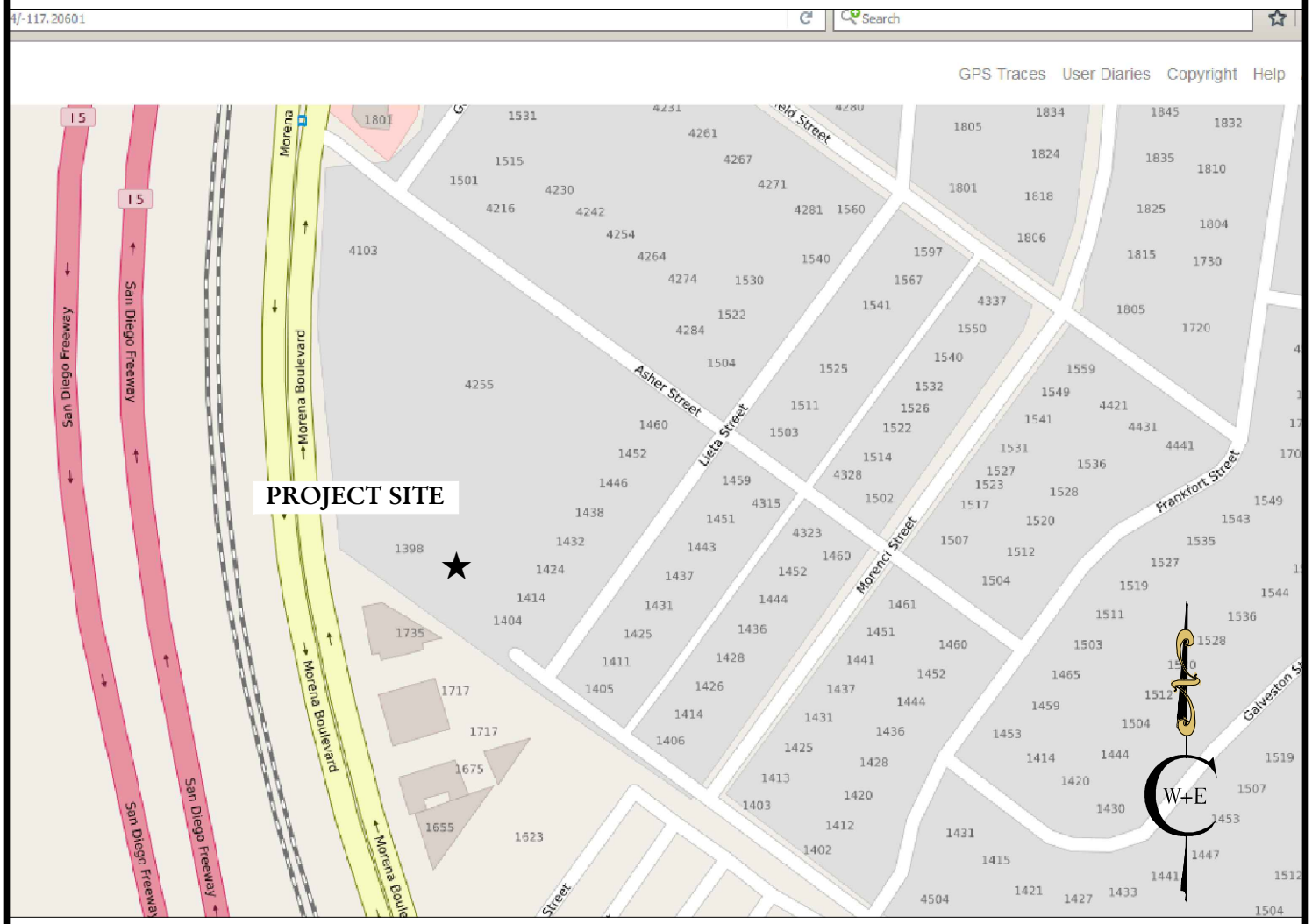
PREPARED FOR

ALMERIA INVESTMENTS, LP
P O BOX 232628
ENCINITAS, CALIFORNIA 92023

PREPARED BY

CHRISTIAN WHEELER ENGINEERING
3980 HOME AVENUE
SAN DIEGO, CALIFORNIA 92105

SITE VICINITY



PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SRD	FIGURE NO.:	1

CHRISTIAN WHEELER
ENGINEERING

July 31, 2016

Almeria Investments, L.P. CWE 2150433.01
P.O. Box 232628
Encinitas, California 92023
Attention: Mr. Michael Fulton, General Partner

Subject: Report of Preliminary Geotechnical Investigation
Proposed Residnetial Development, 1389 Lieta Street, San Diego, California

Ladies and Gentlemen

In accordance with your request and our proposal dated July 28, 2015, we have completed a preliminary geotechnical investigation for a proposed mixed-use development to be constructed at the subject property. We are presenting herewith a report of our findings and recommendations.

It is our opinion and judgment that no geotechnical conditions exist at or in the vicinity of the subject property that would preclude the construction of the subject project as presently proposed.

If you have any questions after reviewing this report, please do not hesitate to contact our office. This opportunity to be of professional service is sincerely appreciated.

Respectfully submitted,
CHRISTIAN WHEELER ENGINEERING

Daniel B. Adler, RCE #36037 David R. Russell, CEG #2215

DBA:drr
cc: michael@almeriainvestments.com
tc@crudorealestate.com

PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

INTRODUCTION AND PROJECT DESCRIPTION

This report presents the results of a preliminary geotechnical investigation performed for a proposed residential development to be constructed at 1389 Lieta Street, San Diego, California. The following Figure No. 1 presents a vicinity map showing the location of the property.

We understand that it is proposed to develop the site to support a 13-unit residential development consisting of two separate three-story buildings. The structures will consist of on-grade parking and storage levels with two stories of residential space above. The structures are anticipated to be of wood-frame construction with on-grade, concrete floor slabs. The proposed improvements are expected to be supported by conventional shallow foundations. Site retaining walls of up to about 5 feet in height are expected and grading is expected to be limited to cuts and fills of up to about 5 feet from existing grades.

To assist in the preparation of this report, we were provided with a preliminary grading plan prepared by Civil Landworks, dated July 19, 2016. A copy of the map was used as a base map for our Site Plan and Geologic Map, and is included herein as Plate No. 1. That map was also used to prepare geologic cross sections of the site, included herein as Plates No. 2, 3, 4 and 5.

This report has been prepared for the exclusive use of Almeria Investments, LP, and its design consultants, for specific application to the project described herein. Should the project be modified, the conclusions and recommendations presented in this report should be reviewed by Christian Wheeler Engineering for conformance with our recommendations and to determine whether any

additional subsurface investigation, laboratory testing and/or recommendations are necessary. Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with generally accepted engineering principles and practices. This warranty is in lieu of all other warranties, expressed or implied.

SCOPE OF SERVICES

Our preliminary geotechnical investigation consisted of surface reconnaissance, subsurface exploration, obtaining representative soil samples, laboratory testing, analysis of the field and laboratory data, and review of relevant geologic literature. Our scope of service did not include assessment of hazardous substance contamination, recommendations to prevent floor slab moisture intrusion or the formation of mold within the structures, evaluation or design of storm water infiltration facilities, or any other services not specifically described in the scope of services presented below.

More specifically, the intent of our proposed investigation was to:

- Drill five exploratory borings with a truck mounted drill rig to explore the existing soil conditions.
- Backfill the boring holes using a grout or a grout/bentonite mix as required by the County of San Diego Department of Environmental Health.
- Evaluate, by laboratory tests and our past experience with similar soil types, the engineering properties of the various soil strata that may influence the proposed construction, including bearing capacities, expansive characteristics and settlement potential.
- Describe the general geology at the site, including possible geologic hazards that could have an effect on the proposed construction, and provide the seismic design parameters as required by the 2013 edition of the California Building Code.
- Quantitatively address the gross and surficial stabilities of the proposed site configuration.
- Address potential construction difficulties that may be encountered due to soil conditions, groundwater or geologic hazards, and provide geotechnical recommendations to deal with these difficulties.
- Provide site preparation and grading recommendations for the anticipated work.
- Provide foundation recommendations for the type of construction anticipated and develop soil engineering design criteria for the recommended foundation designs.

- Provide recommendations for temporary cut slopes and shoring design.
- Provide design parameters for unrestrained retaining walls.
- Provide a preliminary geotechnical report presenting the results of our investigation, including a plot plan showing the location of our subsurface explorations, excavation logs, laboratory test results, and our conclusions and recommendations for the proposed project. The report will be provided as an electronic document in Portable Document Format (PDF).

Although a test for the presence of soluble sulfates within the soils that may be in contact with reinforced concrete was performed as part of the scope of our services, it should be understood Christian Wheeler Engineering does not practice corrosion engineering. If a corrosivity analysis is considered necessary, we recommend that the client retain an engineering firm that specializes in this field to consult with them on this matter. The results of our sulfate testing should only be used as a guideline to determine if additional testing and analysis is necessary.

FINDINGS

SITE DESCRIPTION

The subject site is an irregular-shaped parcel of land located at the western terminus of Lieta Street in the Bay Park area of San Diego, California. The property is about 0.6 acres in area and is identified as Assessor's Parcel Number 430-680-09. Topographically, the majority of the site is relatively level with an elevation of about 45 feet. Relatively steep, descending slopes of up to about 20 to 25 feet in height bound the site to the south and west. Existing improvements on-site are limited to a single-story, single family residence, multiple storage sheds, and on-grade concrete slabs within the eastern portion of the site.

GENERAL GEOLOGY AND SUBSURFACE CONDITIONS

GEOLOGIC SETTING AND SOIL DESCRIPTION: The subject site is located in the Coastal Plains Physiographic Province of San Diego County. Based upon the findings of our subsurface explorations and review of readily available, pertinent geologic and geotechnical literature, it was determined that the project area is underlain by undifferentiated artificial fil/topsoil and Quaternary-age

sedimentary old paralic deposits. These materials are described below. A Site Plan and Geotechnical Map depicting site geology as well geologic cross sections are presented in Plate Nos. 1 through 5.

ARTIFICIAL FILL/TOPSOIL: The majority of the site was found to be underlain by a thin layer of undifferentiated fill/topsoil extending to a maximum depth of about 2 feet from existing site grade. As encountered in the borings, these materials generally consisted of brown, dark brown, and orangish-brown, dry to moist, loose, silty sand (SM). The artificial fill/topsoil was judged to have a low expansion potential (EI between 21 and 50).

OLD PARALIC DEPOSITS (Qop): Quaternary-age old paralic deposits were encountered underlying the surficial soils. As encountered in our explorations, the old paralic generally consisted of light brown, orangish-brown, and light grayish-brown, damp to moist, medium dense to very dense, silty sand (SM), well graded sand with silt (SW-SM), and poorly graded sand (SP). The old paralic deposits were judged to have a very low to low expansion potential (EI <50).

GEOLOGIC STRUCTURE: Based on our review of the referenced geologic maps and our experience in the vicinity of the subject site, the bedding of the old paralic deposits that underlie the site is considered to be generally massive with faint bedding that dips gently ($<4°$) to the southwest.

GROUNDWATER: No groundwater was encountered in the borings, which extended to a maximum depth of 20 feet below existing site grades. However, it should be recognized that minor groundwater seepage problems might occur after construction and landscaping are completed. These are usually minor phenomena and are often the result of an alteration in drainage patterns and/or an increase in irrigation water. Based on the anticipated construction and the permeability of the on-site soils, it is our opinion that any seepage problems that may occur will be minor in extent. It is further our opinion that these problems can be most effectively corrected on an individual basis if and when they occur.

TECTONIC SETTING: Much of Southern California, including the San Diego County area, is characterized by a series of Quaternary-age fault zones that consist of several individual, en echelon faults that generally strike in a northerly to northwesterly direction. Some of these fault zones (and

the individual faults within the zone) are classified as "active" according to the criteria of the California Division of Mines and Geology. Active fault zones are those that have shown conclusive evidence of faulting during the Holocene Epoch (the most recent 11,000 years). The Division of Mines and Geology used the term "potentially active" on Earthquake Fault Zone maps until 1988 to refer to all Quaternary-age (last 1.6 million years) faults for the purpose of evaluation for possible zonation in accordance with the Alquist-Priolo Earthquake Fault Zoning Act and identified all Quaternary-age faults as "potentially active" except for certain faults that were presumed to be inactive based on direct geologic evidence of inactivity during all of Holocene time or longer. Some faults considered to be "potentially active" would be considered to be "active" but lack specific criteria used by the State Geologist, such as *sufficiently active* and *well-defined*. Faults older than Quaternary-age are not specifically defined in Special Publication 42, Fault Rupture Hazard Zones in California, published by the California Division of Mines and Geology. However, it is generally accepted that faults showing no movement during the Quaternary period may be considered to be "inactive". The City of San Diego guidelines indicate that since the beginning of the Pleistocene Epoch marks the boundary between "potentially active" and "inactive" faults, unfaulted Pleistocene-age deposits are accepted as evidence that a fault may be considered to be "inactive".

A review of available geologic maps indicates that the nearest active fault zone is the Rose Canyon Fault Zone, located approximately 600 feet to the east. Other active fault zones in the region that could possibly affect the site include the Coronado Bank, San Diego Trough, and San Clemente Fault Zones to the southwest, the Newport-Inglewood and Palos Verdes Fault Zones to the northwest, and the Elsinore, Earthquake Valley, San Jacinto, and San Andreas Fault Zones to the northeast.

GEOLOGIC HAZARDS

GENERAL: The site is located in an area where the risks due to significant geologic hazards are relatively low. No geologic hazards of sufficient magnitude to preclude use of the site for residential purposes are known to exist. In our professional opinion and to the best of our knowledge, the site is suitable for the proposed improvements.

CITY OF SAN DIEGO SEISMIC SAFETY STUDY: As part of our services, we have reviewed the City of San Diego Seismic Safety Study. This study is the result of a comprehensive investigation of

the City that rates areas according to geological risk potential (nominal, low, moderate, and high) and identifies potential geotechnical hazards and/or describes geomorphic conditions.

According to the San Diego Seismic Safety Map No. 20, the site is located within Geologic Hazard Category 53. Hazard Category 53 is assigned to areas of level to sloping terrain with unfavorable geologic structure, where the potential risks are classified as "low to moderate." A description of the anticipated geologic structure within the vicinity of the site is presented above in the "Geologic Structure" section of this report.

SLOPE STABILITY: As part of our study we reviewed the publication, "Landslide Hazards in the Southern Part of the San Diego Metropolitan Area" by Tan, 1995. This reference is a comprehensive study that classifies San Diego County into areas of relative landslide susceptibility. According to this publication, the site is located in within Relative Landslide Susceptibility Area 2. Area 2 is considered to be "marginally susceptible" to slope failures; Area 2 includes gentle to moderately sloping terrain, where slope failure and landsliding occurrences are rare.

Based on the proximity of the above described 20- to 25-foot-high slopes in close proximity to the southern and western boundaries of the site, we have performed a series of quantitative slope stability analyses to address the stability of the proposed site topography. These analyses are discussed in the following section of this report.

GROSS STABILITY ANALYSES

GEOLOGIC CONSIDERATIONS: The site was found to be underlain by Quaternary-age old paralic deposits that are overlain by a thin veneer of surficial soils consisting of man-placed fill and topsoil. These materials are described in the "Geologic Setting and Soil Description" section of this report. The old paralic deposit that underlie the site are generally massive. Based on this, the proposed topographies along geologic cross sections A-A', B-B', C-C', and D-D' (see Plate Nos. 2-5 of this report), were analyzed for circular-type failures mechanisms.

STRENGTH PARAMETERS: The strength parameters and unit weights for the old paralic deposits that underlie the site and crop out along the adjacent sloping areas were modeled in our analyses based

on the results of direct shear testing and moisture density testing of relatively undisturbed samples and our previous experience with similar soil types in the vicinity of the subject site. It should be noted that, based on the results of our testing and experience with similar soils, the shear strengths of the materials modeled in our analyses are, in our professional opinion and judgment, appropriately conservative. In consideration of the generally massive nature of the old paralic deposits beneath the site and the level of conservatism applied in modeling the shear strengths of such materials, the use of anisotropic soil strength parameters to model localized tectonic fractures or shear zones or across and along bedding strengths of said materials was not considered necessary. The following strength parameters were used in our analysis of the global stability of the existing slope.

Soil Type	Unit Weight, g	Phi, f	Cohesion, c
Old Paralic Deposits (Qop)	120 pcf	32°	200 psf

METHOD OF GROSS STABILITY ANALYSIS: The analyses of the global stability of the prosed site topography and adjacent sloping areas was performed using Version 2 of the GSTABL7© computer program developed by Garry H. Gregory, PE. The program analyzes circular, block, specified, and randomly shaped failure surfaces using the Modified Bishop, Janbu, or Spencer's Methods. The STEDwin© computer program, developed by Harald W. Van Aller, P. E., was used in conjunction with this program for data entry and graphics display. Our analyses modeled block- and circular-type failure mechanisms. Each individual analysis was programmed to run at least 2,000 random failure surfaces. The most critical failure surfaces were then accumulated for each failure type and sorted by value of the factor-of-safety. After the specified number of failure surfaces were successfully generated and analyzed, the ten most critical surfaces were plotted so that the pattern could be studied.

Following the completion of our analysis described above along geologic cross section D-D', we performed a subsequent analysis to model the installation of a row of shear pins along the eastern portion of the site's southern boundary, which is above an existing 0.6:1 (H:V) slope of up to about 18 feet in height.

SHEAR PIN LOAD REQUIREMENTS: In order to determine the load required to "stabilize" the existing off-site slope modelled in our analyses along geologic cross section D-D', shear pin loads were

input into our slope stability analysis (see Appendix E) until a factor-of-safety of at least 1.5 was obtained. Using this methodology, it was determined that the row of shear pins would need to resist a load of 5,000 pounds per linear foot of slope (plf) along the top of the adjacent (off-site) ±18-foot-high cut slope demonstrating an approximate inclination of 06.1:1 (H:V). The location of the proposed row of shear pins is shown on the Plate Number 1 of this report.

RESULTS OF GROSS STABILITY ANALYSIS: Computer printouts of our quantitative, gross stability analyses are included in Appendix E of this report. The results of our stability analyses indicate that the minimum factors-of-safety against gross, slope failures affecting the site and proposed improvements will be 1.5 or greater, provided slope the slope stabilization procedures recommended herein are implemented. A factor-of-safety of 1.5 is the minimum that is generally considered to be stable.

LIQUEFACTION: The earth materials underlying the site are not considered subject to liquefaction due to such factors as soil density, grain-size distribution, and the absence of an unconfined, free groundwater table within the undifferentiated artificial fill/alluvium.

FLOODING: As delineated on the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency, the site is not located within either the 100-year flood zone or the 500-year flood zone.

TSUNAMIS: Tsunamis are great sea waves produced by submarine earthquakes or volcanic eruptions. The site is not within the projected tsunami inundation area presented on the La Jolla Quadrangle of the Tsunami Inundation Map for Emergency Planning (CEMA, 2009). Furthermore, due to the site's setback from the ocean and elevation, it is not considered directly susceptible from damage from tsunamis.

SEICHES: Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays or reservoirs. Due to the site's location, it is considered to have a negligible risk potential for seiches.

CONCLUSIONS AND DISCUSSION

In general, it is our professional opinion and judgment that the subject property is suitable for the construction of the subject project and associated improvements provided the recommendations presented herein are implemented. The main geotechnical conditions encountered affecting the proposed project include potentially compressible fill soils and topsoils, soils collapsible upon saturation, and existing steep slopes at property lines. These conditions are discussed hereinafter.

As encountered in our subsurface explorations, the site is underlain by a relatively thin layer of potentially compressible artificial soils/topsoil extending to a maximum depth of about 2 feet below existing grade. These deposits are considered unsuitable, in their present condition, for the support of settlement sensitive improvements. In addition, the old paralic deposits were found to be moderately potentially collapsible upon saturation. It is recommended that these conditions be mitigated by the removal of the artificial fill/topsoil and the partial removal of the old paralic deposits. The soils removed may be replaced as compacted fill.

Relatively steep slopes exist adjacent to the southern and western property lines. The soils are primarily comprised of sandy old paralic deposits with a high erosion potential. For the most part, our calculations indicate that the slopes to have an acceptable theoretical gross stability factor of safety ($FS > 1.5$). The portion of the slope represented by section D-D' has, in its current condition, a gross stability calculated factor-of-safety of 1.2. In order to increase the factor of safety to at least 1.5, it is recommended that a row of shear pins be constructed in the general location shown in Plate No. 1. It is further our opinion that it will be prudent to locate the proposed structures no closer than 20 feet from the top of existing slopes. If the structures are located closer than 20 feet from the top of existing slopes, their foundations should be deepened to achieve this setback.

The site is located in an area that is relatively free of geologic hazards that will have a significant effect on the proposed construction. The most likely geologic hazard that could affect the site is ground shaking due to seismic activity along one of the regional active faults. However, construction in accordance with the requirements of the most recent edition of the California Building Code and the local governmental agencies should provide a level of life-safety suitable for the type of development proposed.

RECOMMENDATIONS

GRADING AND EARTHWORK

GENERAL: All grading should conform to the guidelines presented in the current edition of the California Building Code, the minimum requirements of the City of San Diego, and the recommended Grading Specifications and Special Provisions attached hereto, except where specifically superseded in the text of this report.

PREGRADE MEETING: It is recommended that a pregrade meeting including the grading contractor, the client, and a representative from Christian Wheeler Engineering be performed, to discuss the recommendations of this report and address any issues that may affect grading operations.

CLEARING AND GRUBBING: Site preparation should begin with the removal of existing structures and associated improvements slated for demolition. The resulting debris, any existing vegetation, and other deleterious materials in areas to receive proposed improvements or new fill soils should be removed from the site.

SITE PREPARATION: It is recommended that existing artificial fill/topsoil underlying proposed structures, associated improvements, and new fills should be removed in its entirety. In addition, old paralic deposits within 4 feet from finish or existing grade, whichever is deeper, should be removed. Deeper removals may be necessary in areas of the site not investigated or due to unforeseen conditions. Lateral removals limits should extend at least 5 feet from the perimeter of the structures, any settlement sensitive improvements, and new fills or equal to removal depth, whichever is more. No removals are recommended beyond property lines. All excavated areas should be approved by the geotechnical engineer or his representative prior to replacing any of the excavated soils. The excavated materials can be replaced as properly compacted fill in accordance with the recommendations presented in the “Compaction and Method of Filling” section of this report.

PROCESSING OF FILL AREAS: Prior to placing any new fill soils or constructing any new improvements in areas that have been cleaned out to receive fill, the exposed soils should be scarified

to a depth of 12 inches, moisture-conditioned, and compacted to at least 90 percent relative compaction.

COMPACTION AND METHOD OF FILLING: In general, all structural fill placed at the site should be compacted to a relative compaction of at least 90 percent of its maximum laboratory dry density as determined by ASTM Laboratory Test D1557. Fills should be placed at or slightly above optimum moisture content, in lifts six to eight inches thick, with each lift compacted by mechanical means. Fills should consist of approved earth material, free of trash or debris, roots, vegetation, or other materials determined to be unsuitable by the Geotechnical Consultant. Fill material should be free of rocks or lumps of soil in excess of 6 inches in maximum dimension.

Utility trench backfill within 5 feet of the proposed structures and beneath all concrete flatwork or pavements should be compacted to a minimum of 90 percent of its maximum dry density.

SURFACE DRAINAGE: The drainage around the proposed improvements should be designed to collect and direct surface water away from proposed improvements and the top of slopes toward appropriate drainage facilities. Rain gutters with downspouts that discharge runoff away from the structure into controlled drainage devices are recommended.

The ground around the proposed improvements should be graded so that surface water flows rapidly away from the improvements without ponding. In general, we suggest that the ground adjacent to structures be sloped away at a minimum gradient of 2 percent. In densely vegetated areas where runoff can be impaired we suggest a minimum gradient of 5 percent for the first 5 feet from the structure. It is essential that new and existing drainage patterns be coordinated to produce proper drainage. Pervious hardscape surfaces adjacent to structures should be similarly graded.

Drainage patterns provided at the time of construction should be maintained throughout the life of the proposed improvements. Site irrigation should be limited to the minimum necessary to sustain landscape growth. Over watering should be avoided. Should excessive irrigation, impaired drainage, or unusually high rainfall occur, zones of wet or saturated soil may develop.

TEMPORARY CONSTRUCTION SLOPES: Temporary cut slopes up to about 10 feet in height may be necessary for the construction of the proposed underground utilities. Temporary slopes should be constructed at a continuous 1:1 (horizontal to vertical) inclination or flatter. However, any unshored temporary excavations exposing cohesionless sands should be constructed at a continuous 2:1 (horizontal to vertical) inclination. All temporary slopes should be observed by the engineering geologist during grading to ascertain that no unforeseen adverse conditions exist. No surcharge loads such as adjacent building foundations, soil or equipment stockpiles, vehicles, etc. should be allowed within a distance from the top of temporary slopes equal to half the slope height.

It should be noted that the contractor is solely responsible for designing and constructing stable, temporary excavations and may need to shore, slope, or bench the sides of trench excavations as required to maintain the stability of the excavation sides. The contractor's "competent person", as defined in the OSHA Construction Standards for Excavations, 29 CFR, Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety process. Temporary cut slopes should be constructed in accordance with the recommendations presented in this section. In no other case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

SHEAR PINS

GENERAL: As indicated by the results of our slope stability analyses presented in Appendix E of this report, we have determined that a single row of shear pins, installed along and adjacent to the steep (±0.6:1 (H:V)) off-site slope along the east side of the site's southern boundary will increase the minimum factor-of-safety against gross slope failures to 1.7, provided the shear pins are designed to resist a force of 5,000 pounds for each linear foot of slope between the shear pins.

LATERAL LOADS ON SHEAR PINS: The shear pins should be designed to resist forces of 5 kips for each linear foot of slope between the shear pins. This load may be assumed to act at depth equal to the elevation of the toe of the adjacent slope.

MINIMUM SHEAR PIN DIMENSIONS: As a minimum, the shear pins should be embedded at least 20 feet below proposed site grades. However, the depth may be greater to satisfy the required

lateral capacities of the proposed shear pins. Shear pins should have a minimum diameter of 24 inches. The project structural engineer should design all shear pin locations, dimensions, and pier reinforcing using the recommendations and design parameters herein. However, the shear pins should be spaced no farther than three pier diameters.

SHEAR PIN REINFORCING: Piers should be reinforced in accordance with the recommendations of the project structural engineer. The reinforcing cages should extend the full depth of the shear pins.

SHEAR PIN LATERAL CAPACITY: The passive pressure for the competent formational materials below the elevation of the toe of the adjacent slope may be considered to be 400 pounds per square foot per foot of depth, up to a maximum value of 4,000 psf. This value may be assumed to act on an area equal to twice the pier diameter.

SHEAR PIN EXCAVATION OBSERVATION: All pier excavations should be observed by the Geotechnical Consultant prior to placing the reinforcing steel cage to determine if the soil and geologic conditions are similar to the conditions anticipated in the preparation of this report. It should be recognized that downhole logging of some of the shear pin excavations by an engineering geologist may be necessary.

FOUNDATIONS

GENERAL: Based on our findings and engineering judgment, the proposed structures may be supported by conventional shallow continuous and isolated spread footings. Deepened conventional foundations or drilled cast-in-place concrete piers may be needed to support portions of the structures if the recommended structural setback of 20 feet is unfeasible. The following recommendations are considered the minimum based on the anticipated soil conditions after site preparation as recommended in this report is performed, and are not intended to be lieu of structural considerations. All foundations should be designed by a qualified professional.

SHALLOW FOUNDATIONS

GENERAL: Spread footings supporting the proposed structures should be embedded at 24 inches below lowest adjacent finish pad grade. For light miscellaneous exterior improvements, the minimum embedment may be reduced to 12 inches. Continuous and isolated footings should have a minimum width of 12 inches and 24 inches, respectively. Retaining wall footings should be at least 18 inches deep and 24 inches wide.

BEARING CAPACITY: Spread footings supporting the proposed structures with a minimum embedment depth of 24 inches and minimum width of 12 inches may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot (psf). This value may be increased by 600 psf for each additional foot of embedment depth and 400 psf for each additional foot of width, up to a maximum of 4,000 psf. The bearing values may also be increased by one-third for combinations of temporary loads such as those due to wind or seismic loads.

FOOTING REINFORCING: Reinforcement requirements for foundations should be provided by a structural designer. However, based on the expected soil conditions, we recommend that the minimum reinforcing for continuous footings consist of at least 2 No. 5 bars positioned near the bottom of the footing and 2 No. 5 bars positioned near the top of the footing.

LATERAL LOAD RESISTANCE: Lateral loads against foundations may be resisted by friction between the bottom of the footing and the supporting soil, and by the passive pressure against the footing. The coefficient of friction between concrete and soil may be considered to be 0.30 for the underground portion of the structure. The passive resistance may be considered to be equal to an equivalent fluid weight of 300 pounds per cubic foot (pcf). These values are based on the assumption that the footings are poured tight against undisturbed soil. If a combination of the passive pressure and friction is used, the friction value should be reduced by one-third.

CAST-IN-PLACE CONCRETE PIERS

MINIMUM PIER DIMENSIONS: Cast-in-place concrete pier foundations should have a minimum diameter of 24 inches. The piers should extend to a minimum depth of 10 feet below finish grade. At this depth, a bearing capacity of 5,000 pounds per square foot (psf) may be assumed for said piers. This bearing pressure may be increased by 800 psf for each additional foot of depth, and 600 psf for each additional foot of width, up to a maximum bearing pressure of 15,000 psf. This value may be increased by one-third when considering wind and/or seismic loads.

PIER REINFORCING: The reinforcing steel for the piers should be specified by the project structural engineer. As a minimum, we recommend that the pier reinforcing extend the full depth of the pier excavation.

LATERAL BEARING CAPACITY: The allowable lateral bearing resistance to lateral loads may be assumed to be 400 pounds per square foot per foot of depth up to a maximum of 4,000 pounds per square foot. This value may be assumed to start at a depth such that a minimum horizontal distance of 10 feet exists between the face of the slope and the pier, and may be assumed to act on an area equal to twice the pier diameter.

EXCAVATION CHARACTERISTICS: It is anticipated that the proposed piers may be drilled utilizing conventional drilling equipment in good working condition. Caving conditions may occur due to the cohesionless nature of some of the old paralic deposits.

PIER EXCAVATION OBSERVATION AND CLEANING: All pier excavations should be observed by Christian Wheeler Engineering during drilling to determine whether the minimum pier depth recommended has been achieved and that the foundation soils are as anticipated in the preparation of this report. Prior to placing the steel reinforcing cages, all loose or disturbed soils at the bottom of the pier excavations should be removed. The cleanout of the pier excavations should be approved by the geotechnical engineer.

SETTLEMENT CHARACTERISTICS: The anticipated total and differential footing static settlement is expected to be less than about 1 inch and 1 inch in 40 feet, respectively, provided the recommendations presented in this report are followed. It should be recognized that minor cracks normally occur in concrete slabs and foundations due to concrete shrinkage during curing or redistribution of stresses, therefore some cracks should be anticipated. Such cracks are not necessarily an indication of excessive vertical movements.

EXPANSIVE CHARACTERISTICS: The anticipated foundation soils underlying the proposed structure and associated improvements are expected to have a very low expansion potential (EI < 20). The recommendations presented in this report reflect this condition.

FOUNDATION PLAN REVIEW: The final foundation plan and accompanying details and notes should be submitted to this office for review. The intent of our review will be to verify that the plans used for construction reflect the minimum dimensioning and reinforcing criteria presented in this section and that no additional criteria are required due to changes in the foundation type or layout. It is not our intent to review structural plans, notes, details, or calculations to verify that the design engineer has correctly applied the geotechnical design values. It is the responsibility of the design engineer to properly design/specify the foundations and other structural elements based on the requirements of the structure and considering the information presented in this report.

FOUNDATION EXCAVATION OBSERVATION: All foundation excavations should be observed by the Geotechnical Consultant prior to constructing forms or placing reinforcing steel to determine if the foundation recommendations presented herein are complied with. All footing excavations should be excavated neat, level and square. All loose or unsuitable material should be removed prior to the placement of concrete.

SOLUBLE SULFATES: The water soluble sulfate content of selected soil samples from the site was determined in accordance with California Test Method 417. The results of these tests indicate a soluble sulfate content of 0.005 percent. Soils with a soluble sulfate content of less than 0.1 percent are considered to be negligible.

SEISMIC DESIGN FACTORS

The seismic design factors applicable to the subject site are provided below. The seismic design factors were determined in accordance with the 2013 California Building Code. The site coefficients and adjusted maximum considered earthquake spectral response acceleration parameters are presented in the following Table I.

TABLE I: SEISMIC DESIGN FACTORS

Site Coordinates: Latitude Longitude	32.778° -117.207°
Site Class	D
Site Coefficient F_a	1.0
Site Coefficient F_v	1.508
Spectral Response Acceleration at Short Periods S_s	1.272 g
Spectral Response Acceleration at 1 Second Period S_1	0.492 g
$S_{MS} = F_a S_s$	1.272 g
$S_{M1} = F_v S_1$	0.742 g
$S_{DS} = 2/3 * S_{MS}$	0848 g
$S_{D1} = 2/3 * S_{M1}$	0.494 g

Probable ground shaking levels at the site could range from slight to moderate, depending on such factors as the magnitude of the seismic event and the distance to the epicenter. It is likely that the site will experience the effects of at least one moderate to large earthquake during the life of the proposed improvements.

ON-GRADE SLABS

GENERAL: It is our understanding that the floor system of the proposed structures will consist of a concrete slab. The following recommendations are considered the minimum slab requirements based on the soil conditions and are not intended in lieu of structural considerations.

CONVENTIONAL CONCRETE SLABS: The minimum slab thickness should be 5 inches (actual) and the slab should be reinforced with at least No. 4 bars spaced at 18 inches on center each way. Slab reinforcement should be supported on chairs such that the reinforcing bars are positioned at mid-

height in the floor slab. The slab reinforcement should extend down into the perimeter footings at least 12 inches.

UNDER-SLAB VAPOR RETARDERS: Steps should be taken to minimize the transmission of moisture vapor from the subsoil through the interior slabs where it can potentially damage the interior floor coverings. Local industry standards typically include the placement of a vapor retarder, such as plastic, in a layer of coarse sand placed directly beneath the concrete slab. In this case 2 inches of sand above and below the plastic are suggested. The vapor retarder should be at least 15-mil Stegowrap® or similar material with sealed seams and should extend at least 12 inches down the sides of the interior and perimeter footings. The sand should have a sand equivalent of at least 30, and contain less than 10% passing the Number 100 sieve and less than 5% passing the Number 200 sieve. The membrane should be placed in accordance with the recommendation and consideration of ACI 302, "Guide for Concrete Floor and Slab Construction" and ASTM E1643, "Standards Practice for Installation of Water Vapor Retarder Used in Contact with Earth or Granular Fill Under Concrete Slabs." It is the flooring contractor's responsibility to place floor coverings in accordance with the flooring manufacturer specifications.

EXTERIOR CONCRETE FLATWORK: Exterior concrete slabs-on-grade should have a minimum thickness of 4 inches and be reinforced with at least No. 3 bars placed at 18 inches on center each way (ocew). Exterior concrete slabs adjacent to the structure should be doweled to perimeter footings as recommended by the structural engineer. Driveway slabs should have a minimum thickness of 5 inches and be reinforced with at least No. 4 bars placed at 12 inches ocew. Driveway slabs should be provided with a thickened edge a least 18 inches deep and 6 inches wide. All slabs should be provided with weakened plane joints in accordance with the American Concrete Institute (ACI) guidelines. Special attention should be paid to the method of concrete curing to reduce the potential for excessive shrinkage cracking. It should be recognized that minor cracks occur normally in concrete slabs due to shrinkage. Some shrinkage cracks should be expected and are not necessarily an indication of excessive movement or structural distress.

EARTH RETAINING WALLS

FOUNDATIONS: Foundations for any proposed retaining walls should be constructed in accordance with the foundation recommendations presented previously in this report.

PASSIVE PRESSURE: The passive pressure for the anticipated foundation soils may be considered to be 300 pounds per square foot per foot of depth. The coefficient of friction for concrete to soil may be assumed to be 0.30 for the resistance to lateral movement. This pressure may be increased by one-third for seismic loading. When combining frictional and passive resistance, the friction should be reduced by one-third. The upper one foot of soil should be neglected in passive pressure calculations where the footing is abutted by landscaping.

ACTIVE PRESSURE: The active soil pressure for the design of unrestrained and restrained earth retaining structures with level backfill may be assumed to be equivalent to the pressure of a fluid weighing 39 and 60 pounds per cubic foot, respectively. This pressure does not consider any surcharges. If any are anticipated, this office should be contacted for the necessary increase in soil pressure. These values assume a drained backfill condition.

Seismic lateral earth pressures may be assumed to equal an inverted triangle starting at the bottom of the wall with the maximum pressure equal to 11H pounds per square foot (where H = wall height in feet) occurring at the top of the wall.

WATERPROOFING AND WALL DRAINAGE SYSTEMS: Due to the anticipated high moisture content of the underground garage foundation soils special waterproofing measures should be implemented. Waterproofing recommendations should be provided by a project's waterproofing consultant. The project architect should provide (or coordinate) waterproofing details for the retaining walls. The design values presented above are based on a drained backfill condition and do not consider hydrostatic pressures. Unless hydrostatic pressures are incorporated into the design, the retaining wall designer should provide a detail for a wall drainage system. Typical retaining wall drain system details are presented as Plate No. 6 of this report for informational purposes. Additionally, outlets points for the retaining wall drain system should be coordinated with the project civil engineer. It is assumed that sump pumps will be necessary to discharge retaining wall subdrains.

BACKFILL: All backfill soils should be compacted to at least 90 percent relative compaction. Expansive or clayey soils should not be used for backfill material. The wall should not be backfilled until the masonry has reached an adequate strength.

LIMITATIONS

REVIEW, OBSERVATION AND TESTING

The recommendations presented in this report are contingent upon our review of final plans and specifications. Such plans and specifications should be made available to the geotechnical engineer and engineering geologist so that they may review and verify their compliance with this report and with the California Building Code.

It is recommended that Christian Wheeler Engineering be retained to provide continuous soil engineering services during the earthwork operations. This is to verify compliance with the design concepts, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

UNIFORMITY OF CONDITIONS

The recommendations and opinions expressed in this report reflect our best estimate of the project requirements based on an evaluation of the subsurface soil conditions encountered at the subsurface exploration locations and on the assumption that the soil conditions do not deviate appreciably from those encountered. It should be recognized that the performance of the foundations and/or cut and fill slopes may be influenced by undisclosed or unforeseen variations in the soil conditions that may occur in the intermediate and unexplored areas. Any unusual conditions not covered in this report that may be encountered during site development should be brought to the attention of the geotechnical engineer so that he may make modifications if necessary.

CHANGE IN SCOPE

This office should be advised of any changes in the project scope or proposed site grading so that we may determine if the recommendations contained herein are appropriate. This should be verified in writing or modified by a written addendum.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Government Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations.

PROFESSIONAL STANDARD

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the locations where our borings, surveys, and explorations are made, and that our data, interpretations, and recommendations be based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for the interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

CLIENT'S RESPONSIBILITY

It is the responsibility of the Client, or its representatives, to ensure that the information and recommendations contained herein are brought to the attention of the structural engineer and

architect for the project and incorporated into the project's plans and specifications. It is further their responsibility to take the necessary measures to insure that the contractor and his subcontractors carry out such recommendations during construction.

FIELD EXPLORATIONS

Five subsurface explorations were made on December 18, 2015 at the locations indicated on the Site Plan and Geotechnical Map included herewith as Plate No. 1. These explorations consisted of small diameter borings utilizing a truck mounted drill rig (Deidrich D50). The fieldwork was conducted under the observation and direction of our engineering geology personnel.

The explorations were carefully logged when made. The logs are presented on Appendix A. The soils are described in accordance with the Unified Soils Classification. In addition, a verbal textural description, the wet color, the apparent moisture, and the density or consistency is provided. The density of granular soils is given as very loose, loose, medium dense, dense or very dense. The consistency of silts or clays is given as either very soft, soft, medium stiff, stiff, very stiff, or hard.

Relatively undisturbed drive samples were collected using a modified California sampler. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin, brass rings with inside diameters of approximately 2.4 inches. The sample barrel was driven into the ground with the weight of a 140-pound hammer falling 30 inches in general accordance with ASTM D 3550-84. The driving weight is permitted to fall freely. The number of blows per foot of driving, or as indicated, are presented on the boring logs as an index to the relative resistance of the sampled materials. The samples were removed from the sample barrel in the brass rings, and sealed. Bulk samples of the earth materials encountered were also collected. Samples were transported to our laboratory for testing.

LABORATORY TESTING

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. A brief description of the tests performed and the subsequent results are presented in Appendix B.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

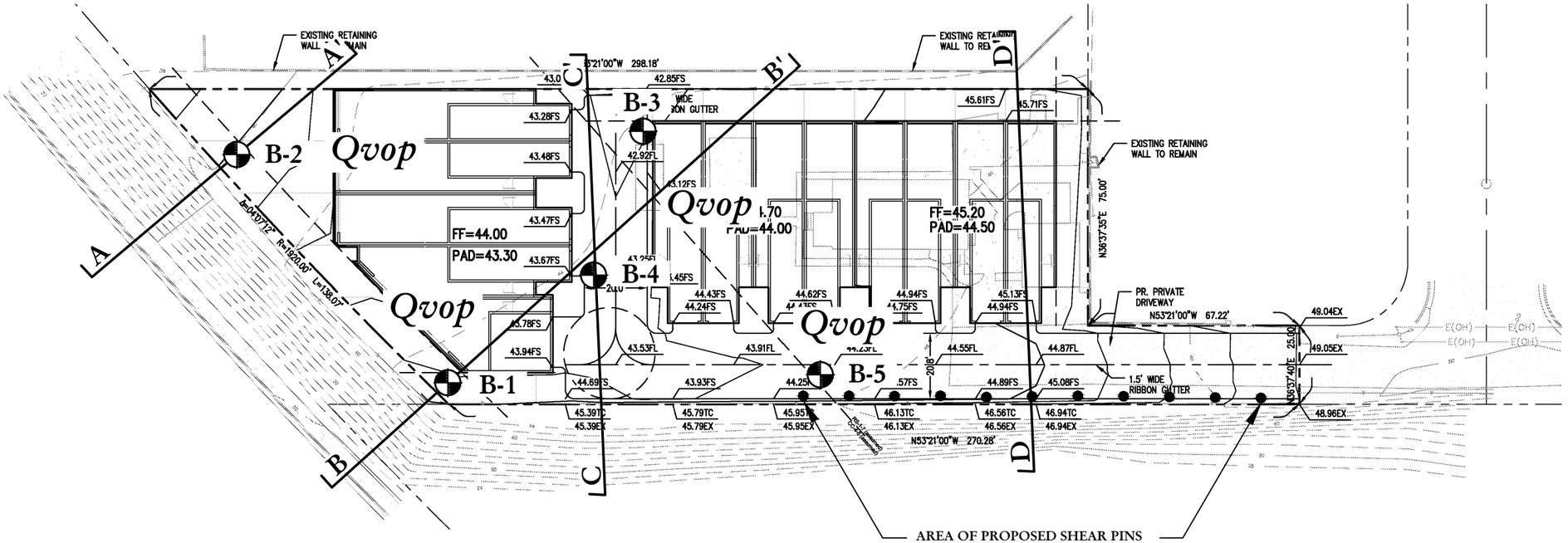
ATTACHMENTS

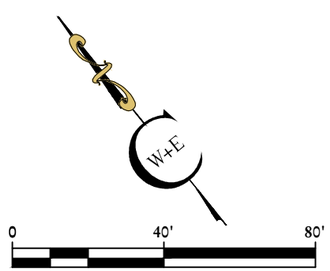
TABLES

FIGURES

PLATES

APPENDICES





SCALE: 1" = 40'

CWE LEGEND

B-5	APPROXIMATE BORING LOCATION
C C'	GEOLOGIC CROSS SECTION
Qvop	VERY OLD PARALIC DEPOSITS

ENGINEER

CIVIL LANDWORKS CORP.
110 COPPERWOOD WAY, SUITE P
OCEANSIDE, CA 92058
760-908-8745

DAVID V. CARON 7-19-16

REGISTERED PROFESSIONAL ENGINEER
DAVID V. CARON
No.C070066
EXP.09/30/16
CIVIL
STATE OF CALIFORNIA

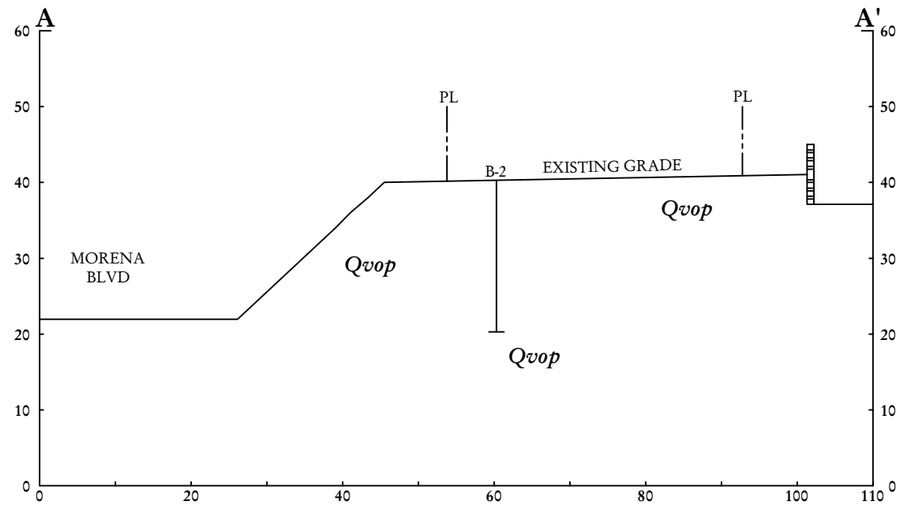
Civil Landworks
110 COPPERWOOD WAY, SUITE P, OCEANSIDE, CA 92058
PH: 760-908-8745 • info@civillandworks.com

SITE PLAN AND GEOTECHNICAL MAP

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	DRR/JDB	PLATE NO.:	1

CHRISTIAN WHEELER ENGINEERING



CWE LEGEND

Qvop	VERY OLD PARALIC DEPOSITS

0 20' 40'

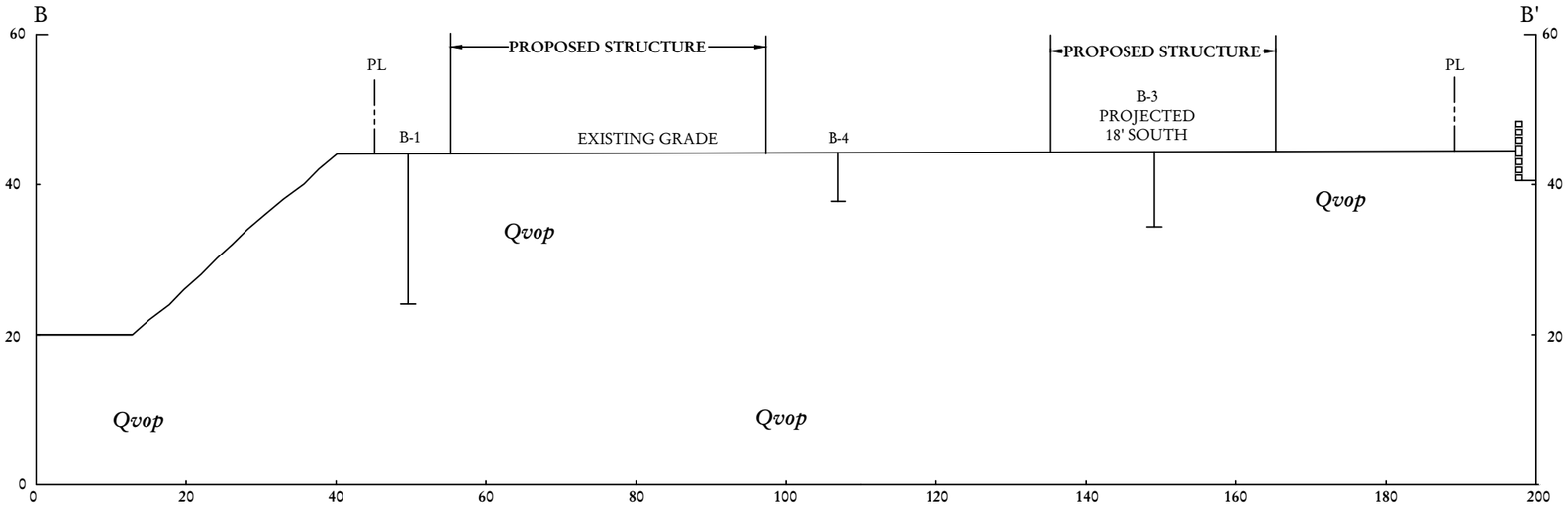
SCALE: 1" = 20'

GEOLOGIC CROSS SECTION A-A'

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SD	PLATE NO.:	2

CHRISTIAN WHEELER
ENGINEERING



CWE LEGEND

Qvop	VERY OLD PARALIC DEPOSITS

0 20' 40'

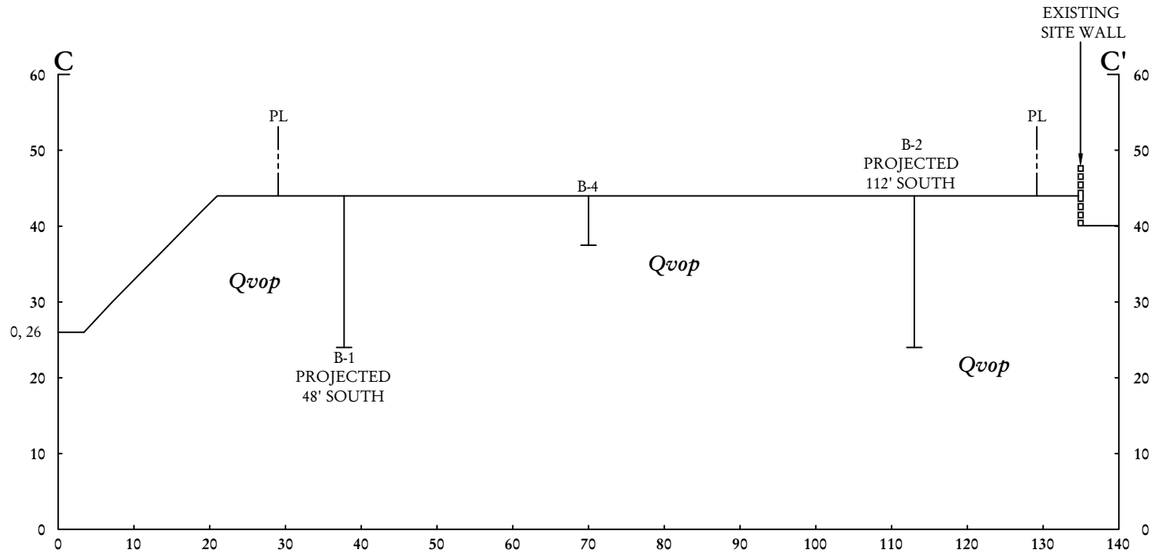
SCALE: 1" = 20'

GEOLOGIC CROSS SECTION B-B'

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SD	PLATE NO.:	3

CHRISTIAN WHEELER
ENGINEERING



CWE LEGEND

Qvop	VERY OLD PARALIC DEPOSITS

0 20' 40'

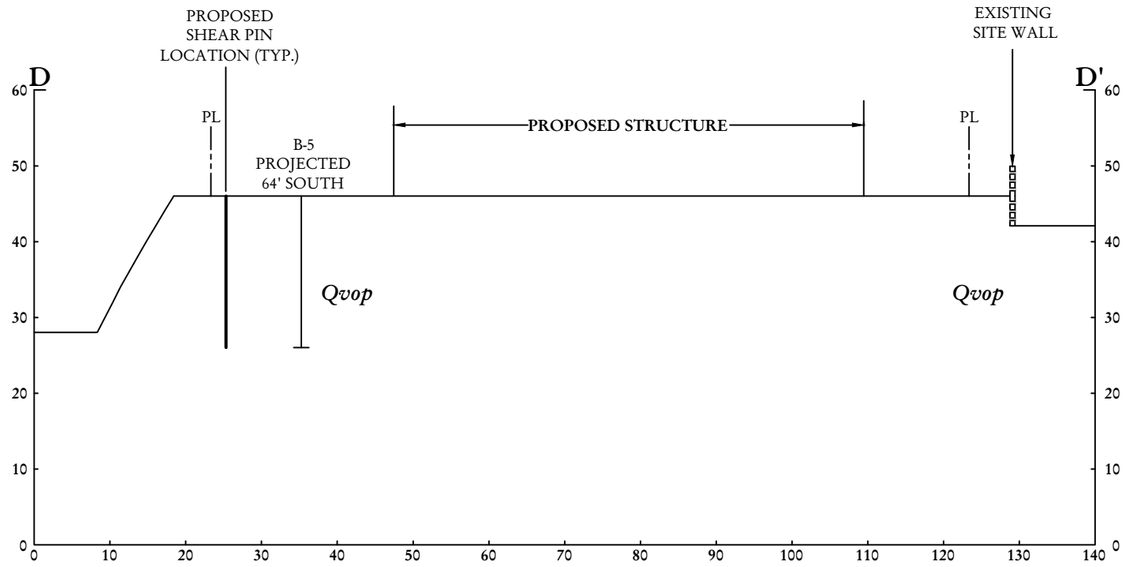
SCALE: 1" = 20'

GEOLOGIC CROSS SECTION C-C'

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SD	PLATE NO.:	4

CHRISTIAN WHEELER
ENGINEERING



CWE LEGEND

Qvop	VERY OLD PARALIC DEPOSITS

0 20' 40'

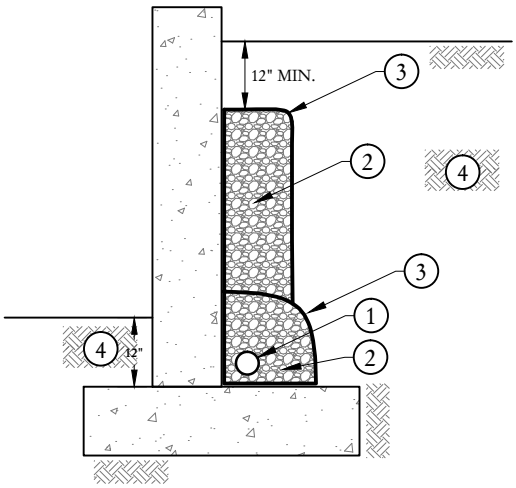
SCALE: 1" = 20'

GEOLOGIC CROSS SECTION D-D'

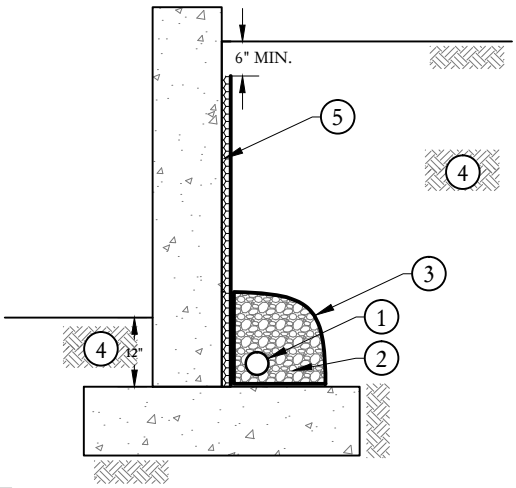
PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SD	PLATE NO.:	5

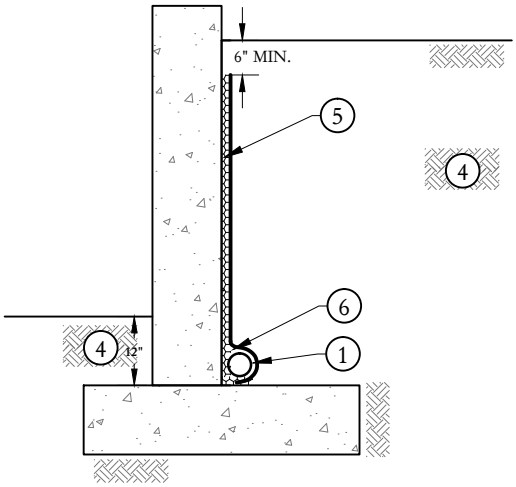
CHRISTIAN WHEELER
ENGINEERING



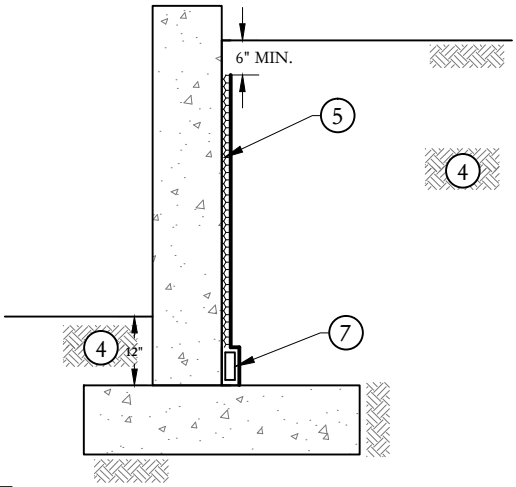
1 DETAIL



2 DETAIL



3 DETAIL



4 DETAIL

NOTES AND DETAILS

GENERAL NOTES:

1) THE NEED FOR WATERPROOFING SHOULD BE EVALUATED BY OTHERS.
2) WATERPROOFING TO BE DESIGNED BY OTHERS (CWE CAN PROVIDE A DESIGN IF REQUESTED).
3) EXTEND DRAIN TO SUITABLE DISCHARGE POINT PER CIVIL ENGINEER.
4) DO NOT CONNECT SURFACE DRAINS TO SUBDRAIN SYSTEM.

DETAILS:

1. 4-INCH PERFORATED PVC PIPE ON TOP OF FOOTING, HOLES POSITIONED DOWNWARD (SDR 35, SCHEDULE 40, OR EQUIVALENT).
2. ¾ INCH OPEN-GRADED CRUSHED AGGREGATE.
3. GEOFARBRIC WRAPPED COMPLETELY AROUND ROCK.
4. PROPERLY COMPACTED BACKFILL SOIL.
5. WALL DRAINAGE PANELS (MIRADRAIN OR EQUIVALENT) PLACED PER MANUFACTURER'S REC'S.
6. UNDERLAY SUBDRAIN WITH AND CUT FABRIC BACK FROM DRAINAGE PANELS AND WRAP FABRIC AROUND PIPE.
7. COLLECTION DRAIN (TOTAL DRAIN OR EQUIVALENT) LOCATED AT BASE OF WALL DRAINAGE PANEL PER MANUFACTURER'S RECOMMENDATIONS.

CANTILEVER RETAINING WALL DRAINAGE SYSTEMS

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SRD	PLATE NO.:	6

CHRISTIAN WHEELER
ENGINEERING

Appendix A

Subsurface Explorations

LOG OF TEST BORING B-1

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	44.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	43.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0	SM	**Topsoil**							
	SM	**Old Paralic Deposits (Qop):** Orangish-brown, damp to moist, dense, fine- to medium-grained, SILTY SAND.	77	Cal					SA SO4
5	SM	Light yellowish-brown, damp to moist, medium dense, fine-grained, SILTY SAND.	33	Cal		7.4	109.4		77
10	SP	Light yellowish-brown to orangish-brown, damp, medium dense, fine- to medium-grained, POORLY GRADED SAND.	34	Cal		2.8	99.1		77
15	SM	Orangish-brown, moist, medium dense to dense, fine- to medium-grained, SILTY SAND.	53	Cal		8.6	112.0		
20	SP	Light brown, damp to moist, medium dense, fine- to coarse-grained, POORLY GRADED SAND.	36	Cal		2.6	97.8		
		Boring terminated at 20 feet. No groundwater or seepage encountered.							
25									
30									

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SRD	FIGURE NO.:	A-1

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-2

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	42.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	42.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0	SM	**Topsoil:** Orangish-brown, dry, loose, fine- to medium-grained, SILTY SAND; abundant animal burrows.							
	SM	Orangish-brown, damp, medium dense.	36	Cal		2.8	102.3		
5			44	Cal		4.8	112.4		CP
	SM	Orangish-brown, damp to moist, medium dense, fine-grained, SILTY SAND.							
10	SM-SP	Light brown, damp, medium dense, fine- to medium-grained, SILTY SAND-POORLY GRADED SAND.	28	Cal		6.6	106.7		
15	SM	Orangish-brown, moist, dense, fine- to coarse-grained, SILTY SAND; trace gravels up to 1".	60	Cal		6.5	106.7		DS
20			50/5"	Cal					
		Boring terminated at 20 feet. No groundwater or seepage encountered.							
25									
30									

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SRD	FIGURE NO.:	A-2

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-3

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	43.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	43.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE
0	SM	**Artificial Fill (Qaf):** Dark brown, damp, loose, fine- to medium-grained, SILTY SAND.		
	SM			
	SM	**Topsoil:** Orangish-brown, damp, loose, fine- to medium-grained, SILTY SAND.	26	Cal
		Old Paralic Deposits (Qop): Orangish-brown, damp to moist, medium dense, fine- to medium-grained, SILTY SAND.		
5			73	Cal
			32	Cal
10		Boring terminated at 10 feet. No groundwater or seepage encountered.		
15				
20				
25				
30				

BULK | MOISTURE CONTENT (%) | DRY DENSITY (pcf) | RELATIVE COMPACTION (%) | LABORATORY TESTS

Notes:

Symbol Legend

- Groundwater Level During Drilling
- Groundwater Level After Drilling
- Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SRD	FIGURE NO.:	A-3

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-4

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	44.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	44.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0			SM	**Topsoil:** Brown, damp, loose, fine- to medium-grained, SILTY SAND; porous.							
			SM	**Old Paralic Deposits (Qop):** Grayish-brown, damp, dense to very dense, fine- to medium-grained, SILTY SAND.	50/5"	Cal		3.7	110.1		
5					28	Cal					
			SM-SP	Light orangish-brown, damp to moist, medium dense, fine- to coarse-grained, SILTY SAND-POORLY GRADED SAND.							
				Boring terminated at 6½ feet. No groundwater or seepage encountered.							
10											
15											
20											
25											
30											

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SRD	FIGURE NO.:	A-4

CHRISTIAN WHEELER ENGINEERING

LOG OF TEST BORING B-5

Date Logged:	12/18/15	Equipment:	Dietrich
Logged By:	DRR	Auger Type:	6 inch Solid Flight
Existing Elevation:	45.0 feet	Drive Type:	140lbs/30 inches
Proposed Elevation:	42.0 feet	Depth to Water:	N/A

Sample Type and Laboratory Test Legend

Cal	Modified California Sampler	CK	Chunk Density
SPT	Standard Penetration Test	DR	Density Ring
ST	Shelby Tube		
MD	Max Density	DS	Direct Shear
SO4	Soluble Sulfates	Con	Consolidation
SA	Sieve Analysis	EI	Expansion Index
HA	Hydrometer	R-Val	Resistance Value
SE	Sand Equivalent	Chl	Soluble Chlorides
PI	Plasticity Index	Res	pH & Resistivity
CP	Collapse Potential		

DEPTH (ft)	USCS SYMBOL	SUMMARY OF SUBSURFACE CONDITIONS (based on Unified Soil Classification System)	PENETRATION (blows per foot)	SAMPLE TYPE	BULK	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	RELATIVE COMPACTION (%)	LABORATORY TESTS
0	SM	Old Paralic Deposits (Qop): Orangish-brown, damp, medium dense, fine-grained, SILTY SAND.							
			38	Cal		7.3	107.6		
5									
	SM-SP	Light orangish-brown, damp, medium dense, fine- to coarse-grained, SILTY SAND-POORLY GRADED SAND.	22	Cal		4.1	95.5		DS
10									
			38	Cal		4.0	101.5		SA
15									
	SM	Orangish-brown, damp to moist, medium dense to dense, fine- to coarse-grained, SILTY SAND; slight gravels.							
			57	Cal		6.6	105.0		
20		Boring terminated at 20 feet. No groundwater or seepage encountered.							
25									
30									

Notes:

Symbol Legend

- ▽ Groundwater Level During Drilling
- ▼ Groundwater Level After Drilling
- ⁘ Apparent Seepage
- * No Sample Recovery
- ** Non-Representative Blow Count (rocks present)

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

DATE:	JULY 2016	JOB NO.:	2150433.01
BY:	SRD	FIGURE NO.:	A-5

CHRISTIAN WHEELER ENGINEERING

Appendix B

Laboratory Test Results

Laboratory tests were performed in accordance with the generally accepted American Society for Testing and Materials (ASTM) test methods or suggested procedures. Brief descriptions of the tests performed are presented below:

a) **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System and are presented on the exploration logs in Appendix A.

b) **MOISTURE-DENSITY: MOISTURE-DENSITY:** In-place moisture contents and dry densities were determined for selected soil samples in accordance with ATM D 2937. The results are summarized in the boring logs presented in Appendix A.

c) **DIRECT SHEAR:** Direct shear tests were performed on selected samples of the on-site soils in accordance with ASTM D 3080.

d) **GRAIN SIZE DISTRIBUTION:** The grain size distributions of selected samples were determined in accordance with ASTM C136 and/or ASTM D 422.

e) **COLLAPSE POTENTIAL TEST:** Collapse potential tests were performed on selected undisturbed soil samples in accordance with ASTM D 5333.

f) **SOLUBLE SULFATE CONTENT:** The soluble sulfate content was determined for representative samples in accordance with California Test Methods 417.

LABORATORY TEST RESULTS

PROPOSED MULTI-FAMILY DEVELOPEMENT

1389 LIETA STREET

SAN DIEGO, CALIFORNIA

DIRECT SHEAR (ASTM D3080)

Sample Location	**Boring B-1 @ 11½'**	**Boring B-2 @ 16½'**	**Boring B-5 @ 8½'**
Sample Type	Undisturbed	Undisturbed	Undisturbed
Friction Angle	33°	36°	35°
Cohesion	175 psf	200 psf	175 psf

GRAIN SIZE DISTRIBUTION (ASTM D422)

Sample Location	**Boring B-1 @ 1'-4'**	**Boring B-5 @ 14½'**
Sieve Size	*Percent Passing*	*Percent Passing*
⅜		100
#4		99
#8	100	99
#16	99	95
#30	93	73
#50	65	31
#100	41	17
#200	29	13

COLLAPSE POTENTIAL (ASTM D 5333)

Sample Location	**Boring B-1 @ 6½'**	**Boring B-2 @ 6½'**
Initial Moisture Content	7.4 %	4.8 %
Initial Density	109.4 pcf	112.4 pcf
Consolidation Before Water Added	2.9 %	4.3 %
Consolidation After Water Added	7.3%	6.7 %
Final Moisture	15.2 %	14.3 %

SOLUBLE SULFATES (CALIFORNIA TEST METHOD 417)

Sample Location	**Boring B-1 @ 1'-4'**
Soluble Sulfate	0.005 % (SO_4)

Appendix C

References

REFERENCES

Bryant, W. A. (compiler), 2005, Digital Database of Quaternary and Younger Faults from the Fault Activity Map of California, version 2.0: California Geological Survey Web Page, http://www.consrv.ca.gov/CGS/information/publications/QuaternaryFaults_ver2.htm

California Emergency Management Agency – California Geological Society – University of Southern California, 2009, Tsunami Inundation Map for Emergency Planning, La Jolla Quadrangle, scale 1:24,000, dated June 1, 2009.

City of San Diego, 2008, Seismic Safety Study, Sheet 20.

Federal Emergency Management Agency, 2012, San Diego County, California and Incorporated Areas Flood Insurance Rate Map, Map Number 06073C1614G.

Historic Aerials, NETR Online, historicaerials.com

Jennings, C.W. and Bryant, W. A., 2010, Fault Activity Map, California Geological Survey, Geologic Data Map No. 6, http://www.quake.ca.gov/gmaps/FAM/faultactivitymap.html

Kennedy, M.P. and Tan, S.S., 2008, Geologic Map of the San Diego 30' X 60' Quadrangle, California; California Department of Conservation and California Geological Survey.

Kern, P., 1989, Earthquakes and Faults in San Diego County, Pickle Press, 73 pp.

Tan, S.S., 1995, Landslide Hazards in the Southern Part of the San Diego Metropolitan Area, San Diego County, California, California Division of Mines and Geology Open-File Report 95-03.

U.S. Geological Survey, U.S. Seismic Design Maps Web Application, http://geohazards.usgs.gov/designmaps/us/application.php

U.S. Geological Survey, Quaternary Faults in Google Earth, http://earthquake.usgs.gov/hazards/qfaults/google.php

TOPOGRAPHIC MAPS

City of San Diego, 1953, Topographic Map Sheet 222-1701; Scale: 1 inch = 200 feet

City of San Diego, 1963, Topographic Map Sheet 222-1701; Scale: 1 inch = 200 feet

City of San Diego, 1979, Ortho-Topographic Map Sheet 222-1701; Scale: 1 inch = 200 feet

United States Geological Survey, 1903, La Jolla Quadrangle; Scale 1 inch = 2000 feet

United States Geological Survey, 1943, La Jolla Quadrangle; Scale 1 inch = 2000 feet

United States Geological Survey, 1953, La Jolla Quadrangle; Scale 1 inch = 2000 feet

United States Geological Survey, 1967, La Jolla Quadrangle; Scale 1 inch = 2000 feet

United States Geological Survey, 1975, La Jolla Quadrangle; Scale 1 inch = 2000 feet

Appendix D

Recommended Grading Specifications – General Provisions

RECOMMENDED GRADING SPECIFICATIONS - GENERAL PROVISIONS

PROPOSED RESIDENTIAL DEVELOPMENT
1389 LIETA STREET
SAN DIEGO, CALIFORNIA

GENERAL INTENT

The intent of these specifications is to establish procedures for clearing, compacting natural ground, preparing areas to be filled, and placing and compacting fill soils to the lines and grades shown on the accepted plans. The recommendations contained in the preliminary geotechnical investigation report and/or the attached Special Provisions are a part of the Recommended Grading Specifications and shall supersede the provisions contained hereinafter in the case of conflict. These specifications shall only be used in conjunction with the geotechnical report for which they are a part. No deviation from these specifications will be allowed, except where specified in the geotechnical report or in other written communication signed by the Geotechnical Engineer.

OBSERVATION AND TESTING

Christian Wheeler Engineering shall be retained as the Geotechnical Engineer to observe and test the earthwork in accordance with these specifications. It will be necessary that the Geotechnical Engineer or his representative provide adequate observation so that he may provide his opinion as to whether or not the work was accomplished as specified. It shall be the responsibility of the contractor to assist the Geotechnical Engineer and to keep him apprised of work schedules, changes and new information and data so that he may provide these opinions. In the event that any unusual conditions not covered by the special provisions or preliminary geotechnical report are encountered during the grading operations, the Geotechnical Engineer shall be contacted for further recommendations.

If, in the opinion of the Geotechnical Engineer, substandard conditions are encountered, such as questionable or unsuitable soil, unacceptable moisture content, inadequate compaction, adverse weather, etc., construction should be stopped until the conditions are remedied or corrected or he shall recommend rejection of this work.

Tests used to determine the degree of compaction should be performed in accordance with the following American Society for Testing and Materials test methods:

Maximum Density & Optimum Moisture Content - ASTM D1557
Density of Soil In-Place - ASTM D1556 or ASTM D6938

All densities shall be expressed in terms of Relative Compaction as determined by the foregoing ASTM testing procedures.

PREPARATION OF AREAS TO RECEIVE FILL

All vegetation, brush and debris derived from clearing operations shall be removed, and legally disposed of. All areas disturbed by site grading should be left in a neat and finished appearance, free from unsightly debris.

After clearing or benching the natural ground, the areas to be filled shall be scarified to a depth of 6 inches, brought to the proper moisture content, compacted and tested for the specified minimum degree of compaction. All loose soils in excess of 6 inches thick should be removed to firm natural ground which is defined as natural soil which possesses an in-situ density of at least 90 percent of its maximum dry density.

When the slope of the natural ground receiving fill exceeds 20 percent (5 horizontal units to 1 vertical unit), the original ground shall be stepped or benched. Benches shall be cut to a firm competent formational soil. The lower bench shall be at least 10 feet wide or 1-1/2 times the equipment width, whichever is greater, and shall be sloped back into the hillside at a gradient of not less than two (2) percent. All other benches should be at least 6 feet wide. The horizontal portion of each bench shall be compacted prior to receiving fill as specified herein for compacted natural ground. Ground slopes flatter than 20 percent shall be benched when considered necessary by the Geotechnical Engineer.

Any abandoned buried structures encountered during grading operations must be totally removed. All underground utilities to be abandoned beneath any proposed structure should be removed from within 10 feet of the structure and properly capped off. The resulting depressions from the above

described procedure should be backfilled with acceptable soil that is compacted to the requirements of the Geotechnical Engineer. This includes, but is not limited to, septic tanks, fuel tanks, sewer lines or leach lines, storm drains and water lines. Any buried structures or utilities not to be abandoned should be brought to the attention of the Geotechnical Engineer so that he may determine if any special recommendation will be necessary.

All water wells which will be abandoned should be backfilled and capped in accordance to the requirements set forth by the Geotechnical Engineer. The top of the cap should be at least 4 feet below finish grade or 3 feet below the bottom of footing whichever is greater. The type of cap will depend on the diameter of the well and should be determined by the Geotechnical Engineer and/or a qualified Structural Engineer.

FILL MATERIAL

Materials to be placed in the fill shall be approved by the Geotechnical Engineer and shall be free of vegetable matter and other deleterious substances. Granular soil shall contain sufficient fine material to fill the voids. The definition and disposition of oversized rocks and expansive or detrimental soils are covered in the geotechnical report or Special Provisions. Expansive soils, soils of poor gradation, or soils with low strength characteristics may be thoroughly mixed with other soils to provide satisfactory fill material, but only with the explicit consent of the Geotechnical Engineer. Any import material shall be approved by the Geotechnical Engineer before being brought to the site.

PLACING AND COMPACTION OF FILL

Approved fill material shall be placed in areas prepared to receive fill in layers not to exceed 6 inches in compacted thickness. Each layer shall have a uniform moisture content in the range that will allow the compaction effort to be efficiently applied to achieve the specified degree of compaction. Each layer shall be uniformly compacted to the specified minimum degree of compaction with equipment of adequate size to economically compact the layer. Compaction equipment should either be specifically designed for soil compaction or of proven reliability. The minimum degree of compaction to be achieved is specified in either the Special Provisions or the recommendations contained in the preliminary geotechnical investigation report.

When the structural fill material includes rocks, no rocks will be allowed to nest and all voids must be carefully filled with soil such that the minimum degree of compaction recommended in the Special Provisions is achieved. The maximum size and spacing of rock permitted in structural fills and in non-structural fills is discussed in the geotechnical report, when applicable.

Field observation and compaction tests to estimate the degree of compaction of the fill will be taken by the Geotechnical Engineer or his representative. The location and frequency of the tests shall be at the Geotechnical Engineer's discretion. When the compaction test indicates that a particular layer is at less than the required degree of compaction, the layer shall be reworked to the satisfaction of the Geotechnical Engineer and until the desired relative compaction has been obtained.

Fill slopes shall be compacted by means of sheepsfoot rollers or other suitable equipment. Compaction by sheepsfoot roller shall be at vertical intervals of not greater than four feet. In addition, fill slopes at a ratio of two horizontal to one vertical or flatter, should be trackrolled. Steeper fill slopes shall be over-built and cut-back to finish contours after the slope has been constructed. Slope compaction operations shall result in all fill material six or more inches inward from the finished face of the slope having a relative compaction of at least 90 percent of maximum dry density or the degree of compaction specified in the Special Provisions section of this specification. The compaction operation on the slopes shall be continued until the Geotechnical Engineer is of the opinion that the slopes will be surficially stable.

Density tests in the slopes will be made by the Geotechnical Engineer during construction of the slopes to determine if the required compaction is being achieved. Where failing tests occur or other field problems arise, the Contractor will be notified that day of such conditions by written communication from the Geotechnical Engineer or his representative in the form of a daily field report.

If the method of achieving the required slope compaction selected by the Contractor fails to produce the necessary results, the Contractor shall rework or rebuild such slopes until the required degree of compaction is obtained, at no cost to the Owner or Geotechnical Engineer.

CUT SLOPES

The Engineering Geologist shall inspect cut slopes excavated in rock or lithified formational material during the grading operations at intervals determined at his discretion. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be analyzed by the Engineering Geologist and Geotechnical Engineer to determine if mitigating measures are necessary.

Unless otherwise specified in the geotechnical report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of the controlling governmental agency.

ENGINEERING OBSERVATION

Field observation by the Geotechnical Engineer or his representative shall be made during the filling and compaction operations so that he can express his opinion regarding the conformance of the grading with acceptable standards of practice. Neither the presence of the Geotechnical Engineer or his representative or the observation and testing shall release the Grading Contractor from his duty to compact all fill material to the specified degree of compaction.

SEASON LIMITS

Fill shall not be placed during unfavorable weather conditions. When work is interrupted by heavy rain, filling operations shall not be resumed until the proper moisture content and density of the fill materials can be achieved. Damaged site conditions resulting from weather or acts of God shall be repaired before acceptance of work.

RECOMMENDED GRADING SPECIFICATIONS - SPECIAL PROVISIONS

RELATIVE COMPACTION: The minimum degree of compaction to be obtained in compacted natural ground, compacted fill, and compacted backfill shall be at least 90 percent. For street and

parking lot subgrade, the upper twelve inches should be compacted to at least 95 percent relative compaction.

EXPANSIVE SOILS: Detrimentally expansive soil is defined as clayey soil which has an expansion index of 50 or greater when tested in accordance with the American Society of Testing Materials (ASTM) Laboratory Test D4829-95.

OVERSIZED MATERIAL: Oversized fill material is generally defined herein as rocks or lumps of soil over six inches in diameter. Oversized materials should not be placed in fill unless recommendations of placement of such material is provided by the Geotechnical Engineer. At least 40 percent of the fill soils shall pass through a No. 4 U.S. Standard Sieve.

TRANSITION LOTS: Where transitions between cut and fill occur within the proposed building pad, the cut portion should be undercut a minimum of one foot below the base of the proposed footings and recompacted as structural backfill. In certain cases that would be addressed in the geotechnical report, special footing reinforcement or a combination of special footing reinforcement and undercutting may be required.

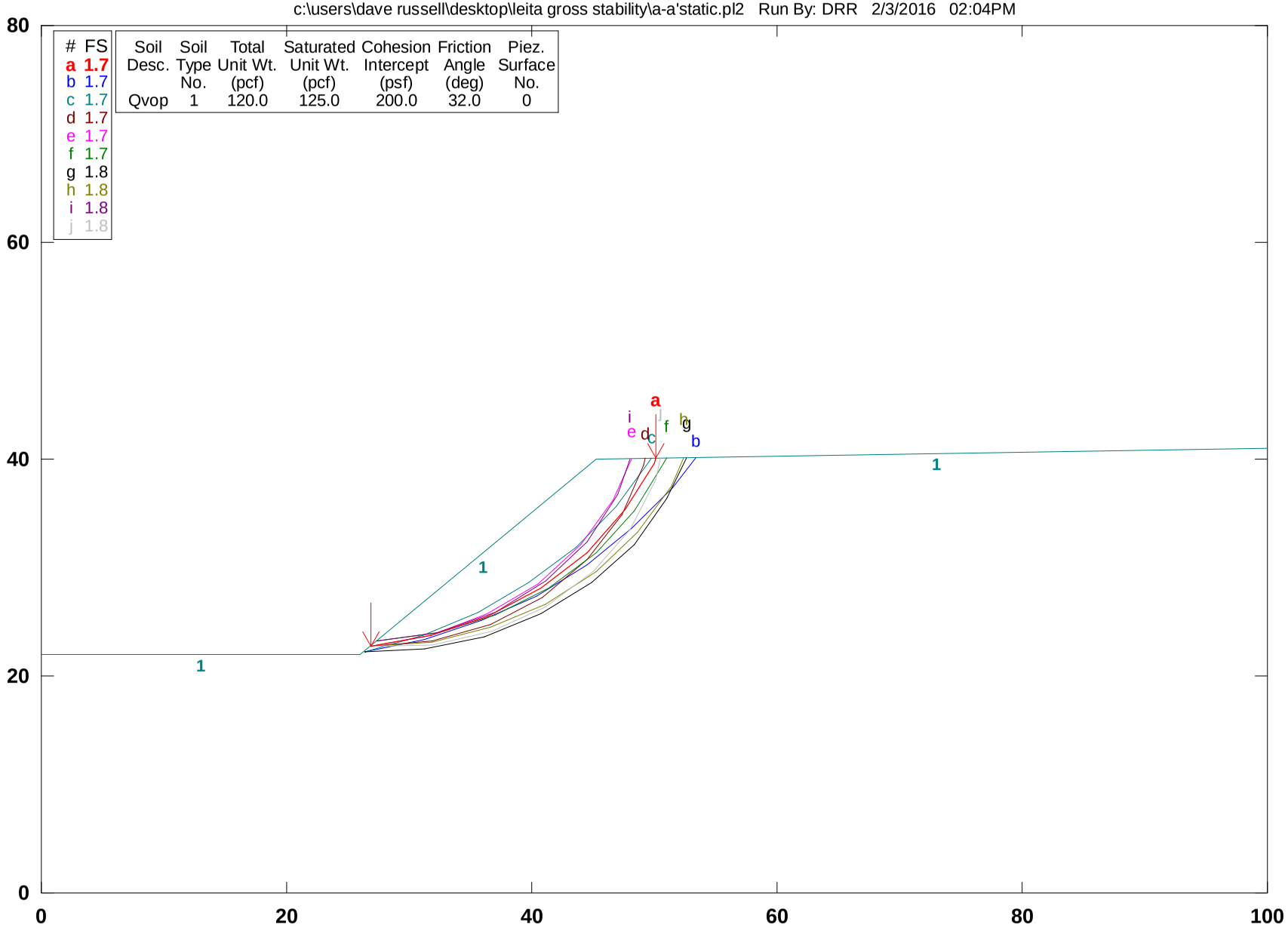
Appendix E

Global Stability Analyses

Cross Section A-A’

CWE 2150433 - Leita Street Mixed Use A-A' Static

c:\users\dave russell\desktop\leita gross stability\a-a'static.pl2 Run By: DRR 2/3/2016 02:04PM



GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 2/3/2016
Time of Run: 02:04PM
Run By: DRR
Input Data Filename: C:\Users\Dave Russell\Desktop\Leita Gross Stability\a-a'Static.in
Output Filename: C:\Users\Dave Russell\Desktop\Leita Gross Stability\a-a'Static.OUT
Unit System: English
Plotted Output Filename: C:\Users\Dave Russell\Desktop\LeGross Stability\a-a'Static.PLT

PROBLEM DESCRIPTION: CWE 2150433 - Leita Street Mixed Use
A-A' Static

BOUNDARY COORDINATES
3 Top Boundaries
3 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	22.00	26.00	22.00	1
2	26.00	22.00	45.30	40.00	1
3	45.30	40.00	100.00	41.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	200.0	32.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 20.00(ft)
and X = 30.00(ft)
Each Surface Terminates Between X = 47.00(ft)
and X = 90.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max = 7.224 FS Min = 1.720 FS Ave = 3.798
Standard Deviation = 1.214 Coefficient of Variation = 31.95 %
Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.84	22.79
2	31.75	23.75
3	36.41	25.56
4	40.69	28.14
5	44.46	31.43
6	47.61	35.31

7	50.03	39.69
8	50.17	40.09

Circle Center At X = 23.78 ; Y = 51.29 ; and Radius = 28.67

Factor of Safety

*** 1.720 ***

Individual data on the 8 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.9	1061.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	4.7	2730.0	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.3	3522.2	0.0	0.0	0.	0.	0.0	0.0	0.0
4	3.8	3472.4	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.8	771.3	0.0	0.0	0.	0.	0.0	0.0	0.0
6	2.3	1697.0	0.0	0.0	0.	0.	0.0	0.0	0.0
7	2.4	746.1	0.0	0.0	0.	0.	0.0	0.0	0.0
8	0.1	3.3	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.32	22.29
2	31.19	23.42
3	35.88	25.14
4	40.32	27.44
5	44.44	30.27
6	48.17	33.60
7	51.46	37.37
8	53.32	40.15

Circle Center At X = 19.96 ; Y = 61.27 ; and Radius = 39.49

Factor of Safety

*** 1.730 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.32	22.29
2	31.09	23.78
3	35.62	25.90
4	39.81	28.63
5	43.59	31.90
6	46.88	35.66
7	49.62	39.84
8	49.73	40.08

Circle Center At X = 18.01 ; Y = 57.54 ; and Radius = 36.20

Factor of Safety

*** 1.738 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.84	22.79
2	31.82	23.22
3	36.59	24.75
4	40.90	27.28
5	44.54	30.70
6	47.35	34.84
7	49.18	39.49
8	49.27	40.07

Circle Center At X = 27.41 ; Y = 45.24 ; and Radius = 22.46

Factor of Safety

*** 1.742 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.84	22.79
2	31.75	23.76
3	36.36	25.69
4	40.49	28.51
5	43.97	32.10
6	46.66	36.31
7	48.10	40.05

Circle Center At X = 24.49 ; Y = 47.52 ; and Radius = 24.85

Factor of Safety

*** 1.745 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.37	23.28
2	32.31	24.01
3	37.04	25.64
4	41.39	28.11
5	45.21	31.34
6	48.38	35.20
7	50.78	39.59
8	50.95	40.10

Circle Center At X = 25.90 ; Y = 50.28 ; and Radius = 27.04

Factor of Safety

*** 1.747 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.32	22.29
2	31.31	22.51
3	36.18	23.66
4	40.74	25.70
5	44.84	28.57
6	48.32	32.16
7	51.06	36.34
8	52.63	40.13

Circle Center At X = 27.73 ; Y = 48.54 ; and Radius = 26.28

Factor of Safety

*** 1.758 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.84	22.79
2	31.83	23.18
3	36.65	24.48
4	41.16	26.65
5	45.20	29.60
6	48.63	33.23
7	51.34	37.44
8	52.44	40.13

Circle Center At X = 27.26 ; Y = 49.72 ; and Radius = 26.94

Factor of Safety

*** 1.759 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	27.37	23.28
2	32.31	24.06
3	36.95	25.91
4	41.07	28.74
5	44.47	32.41
6	46.97	36.74
7	47.99	40.05

Circle Center At X = 26.35 ; Y = 45.75 ; and Radius = 22.50

Factor of Safety

*** 1.766 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	26.84	22.79
2	31.84	22.89
3	36.69	24.11
4	41.15	26.37
5	44.99	29.57
6	48.03	33.55
7	50.10	38.10
8	50.51	40.10

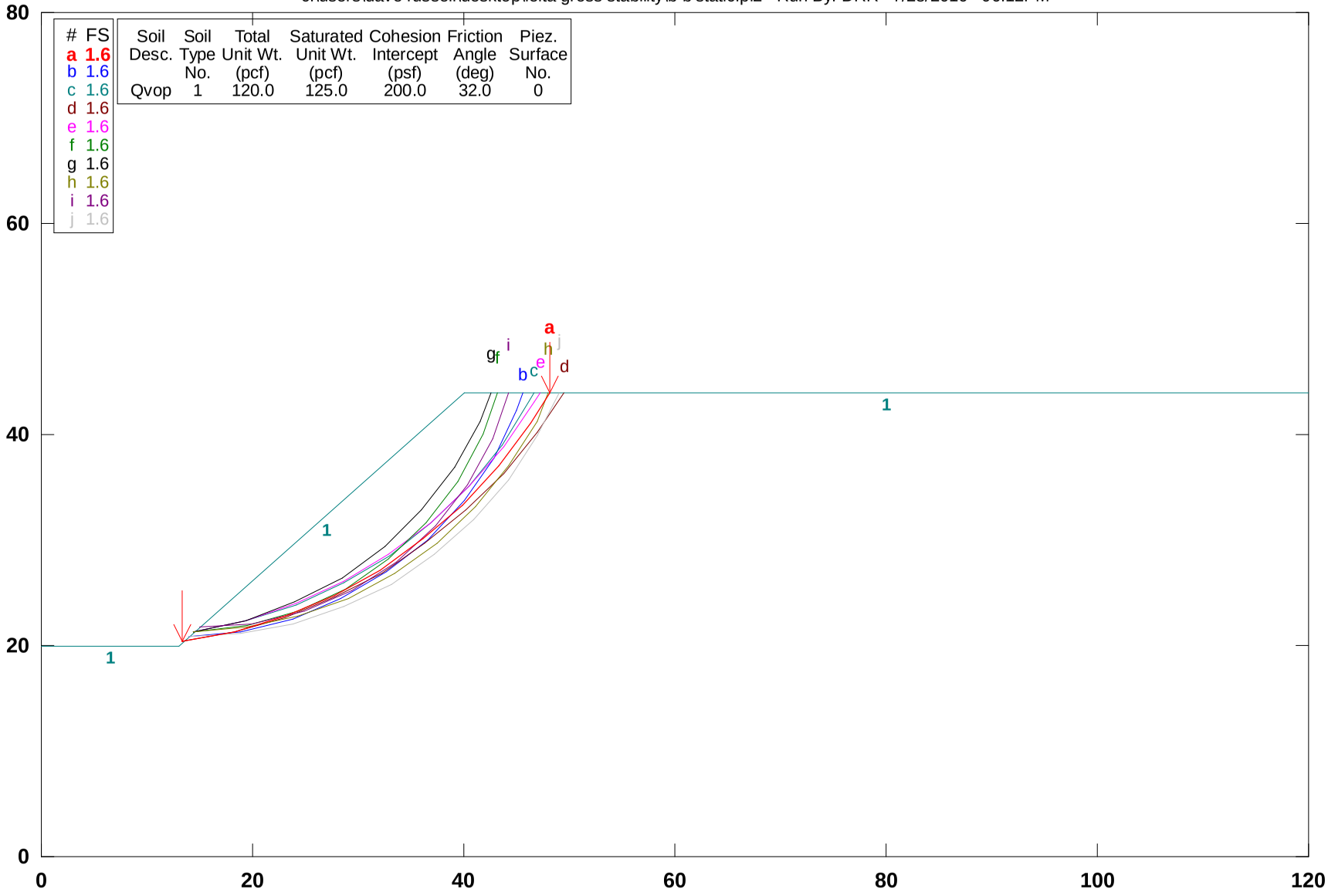
Circle Center At X = 28.93 ; Y = 44.77 ; and Radius = 22.08

Factor of Safety
***   1.773   ***
**** END OF GSTABL7 OUTPUT ****

Cross Section B-B’

CWE 2150433 - Leita Street Mixed Use B-B' Static

c:\users\dave russell\desktop\leita gross stability\b-b'static.pl2 Run By: DRR 7/28/2016 06:12PM



GSTABL7 v.2 FSmin=1.6

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 7/28/2016
Time of Run: 06:12PM
Run By: DRR
Input Data Filename: c:\Users\Dave Russell\Desktop\Leita Gross Stability\b-b'static.in
Output Filename: c:\Users\Dave Russell\Desktop\Leita Gross Stability\b-b'static.OUT
Unit System: English
Plotted Output Filename: c:\Users\Dave Russell\Desktop\LeGross Stability\b-b'static.PLT
PROBLEM DESCRIPTION: CWE 2150433 - Leita Street Mixed Use
B-B' Static

BOUNDARY COORDINATES
3 Top Boundaries
3 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	20.00	13.00	20.00	1
2	13.00	20.00	40.00	44.00	1
3	40.00	44.00	120.00	44.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	200.0	32.0	0.00	0.0	0

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 5.00(ft)
and X = 15.00(ft)
Each Surface Terminates Between X = 40.00(ft)
and X = 100.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max = 6.207 FS Min = 1.558 FS Ave = 3.548
Standard Deviation = 1.087 Coefficient of Variation = 30.63 %
Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	13.42	20.37
2	18.33	21.34
3	23.11	22.81
4	27.71	24.77
5	32.07	27.20
6	36.16	30.08

7	39.93	33.37
8	43.34	37.03
9	46.34	41.03
10	48.12	44.00

Circle Center At X = 6.77 ; Y = 67.43 ; and Radius = 47.52

Factor of Safety

*** 1.558 ***

Individual data on the 10 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.9	1000.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	4.8	2744.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.6	3994.3	0.0	0.0	0.	0.	0.0	0.0	0.0
4	4.4	4731.9	0.0	0.0	0.	0.	0.0	0.0	0.0
5	4.1	4973.5	0.0	0.0	0.	0.	0.0	0.0	0.0
6	3.8	4766.8	0.0	0.0	0.	0.	0.0	0.0	0.0
7	0.1	86.5	0.0	0.0	0.	0.	0.0	0.0	0.0
8	3.3	3508.7	0.0	0.0	0.	0.	0.0	0.0	0.0
9	3.0	1791.3	0.0	0.0	0.	0.	0.0	0.0	0.0
10	1.8	317.5	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	13.95	20.84
2	18.92	21.32
3	23.78	22.51
4	28.41	24.39
5	32.72	26.93
6	36.62	30.07
7	40.01	33.73
8	42.84	37.86
9	45.04	42.35
10	45.57	44.00

Circle Center At X = 13.26 ; Y = 54.96 ; and Radius = 34.12

Factor of Safety

*** 1.570 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.47	21.31
2	19.37	22.31
3	24.12	23.87
4	28.66	25.96
5	32.94	28.56
6	36.88	31.63
7	40.45	35.14
8	43.59	39.03
9	46.26	43.25
10	46.62	44.00

Circle Center At X = 8.27 ; Y = 64.22 ; and Radius = 43.35

Factor of Safety

*** 1.573 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	13.42	20.37
2	18.33	21.30
3	23.13	22.70
4	27.77	24.58
5	32.19	26.91
6	36.37	29.66
7	40.24	32.82
8	43.79	36.34
9	46.97	40.20
10	49.51	44.00

Circle Center At X = 6.63 ; Y = 70.12 ; and Radius = 50.21

Factor of Safety

*** 1.574 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.47	21.31
2	19.36	22.39
3	24.09	23.99
4	28.63	26.08
5	32.92	28.65
6	36.91	31.66
7	40.56	35.09
8	43.81	38.88
9	46.65	43.00
10	47.18	44.00

Circle Center At X = 6.95 ; Y = 67.07 ; and Radius = 46.38

Factor of Safety

*** 1.579 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.47	21.31
2	19.44	21.86
3	24.26	23.21
4	28.79	25.33
5	32.91	28.15
6	36.52	31.61
7	39.52	35.61
8	41.83	40.05
9	43.13	44.00

Circle Center At X = 13.60 ; Y = 51.93 ; and Radius = 30.64

Factor of Safety

*** 1.592 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.47	21.31
2	19.36	22.36
3	24.06	24.08
4	28.46	26.45
5	32.49	29.41
6	36.05	32.92
7	39.09	36.89
8	41.54	41.24
9	42.61	44.00

Circle Center At X = 9.54 ; Y = 56.36 ; and Radius = 35.40

Factor of Safety

*** 1.599 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	14.47	21.31
2	19.46	21.71
3	24.34	22.77
4	29.04	24.49
5	33.46	26.82
6	37.53	29.73
7	41.17	33.16
8	44.32	37.04
9	46.91	41.32
10	48.07	44.00

Circle Center At X = 14.09 ; Y = 58.10 ; and Radius = 36.79

Factor of Safety

*** 1.603 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	15.00	21.78
2	19.99	22.11
3	24.85	23.27
4	29.45	25.23
5	33.66	27.94

6	37.35	31.31
7	40.42	35.26
8	42.78	39.66
9	44.24	44.00

Circle Center At X = 15.55 ; Y = 51.44 ; and Radius = 29.67

Factor of Safety

*** 1.609 ***

Failure Surface Specified By 10 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	13.95	20.84
2	18.94	21.13
3	23.85	22.08
4	28.59	23.67
5	33.08	25.87
6	37.23	28.65
7	40.98	31.96
8	44.26	35.73
9	47.01	39.91
10	48.98	44.00

Circle Center At X = 14.30 ; Y = 58.39 ; and Radius = 37.55

Factor of Safety

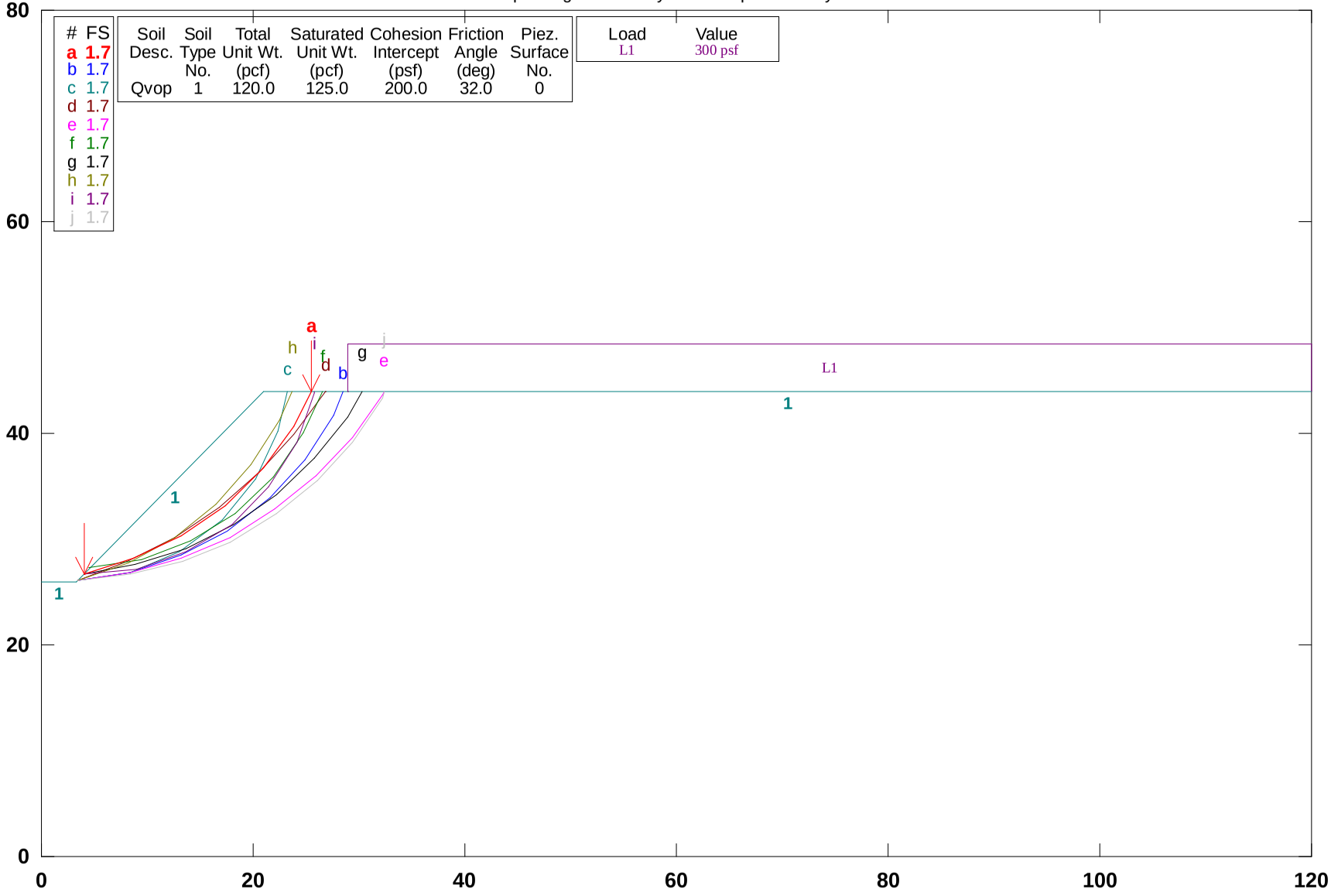
*** 1.610 ***

**** END OF GSTABL7 OUTPUT ****

Cross Section C-C’

CWE 2150433 - Leita Street Mixed Use C-C' Static

c:\users\dave russell\desktop\leita gross stability\c-c'static.pl2 Run By: DRR 7/28/2016 06:02PM



GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 7/28/2016
Time of Run: 06:02PM
Run By: DRR
Input Data Filename: c:\Users\Dave Russell\Desktop\Leita Gross Stability\c-c'static.in
Output Filename: c:\Users\Dave Russell\Desktop\Leita Gross Stability\c-c'static.OUT
Unit System: English
Plotted Output Filename: c:\Users\Dave Russell\Desktop\LeGross Stability\c-c'static.PLT

PROBLEM DESCRIPTION: CWE 2150433 - Leita Street Mixed Use
C-C' Static

BOUNDARY COORDINATES
3 Top Boundaries
3 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	26.00	3.30	26.00	1
2	3.30	26.00	21.00	44.00	1
3	21.00	44.00	120.00	44.00	1

Default Y-Origin = 0.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	200.0	32.0	0.00	0.0	0

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	29.00	120.00	300.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 0.30(ft)
and X = 10.30(ft)
Each Surface Terminates Between X = 23.00(ft)
and X = 70.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max = 8.057 FS Min = 1.653 FS Ave = 3.820
Standard Deviation = 1.372 Coefficient of Variation = 35.93 %
Failure Surface Specified By 7 Coordinate Points

Point	X-Surf	Y-Surf

No.	(ft)	(ft)
1	3.98	26.70
2	8.77	28.13
3	13.27	30.31
4	17.36	33.19
5	20.93	36.69
6	23.89	40.72
7	25.57	44.00

Circle Center At X = -2.48 ; Y = 57.00 ; and Radius = 30.99

Factor of Safety

*** 1.653 ***

Individual data on the 7 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.8	988.1	0.0	0.0	0.	0.	0.0	0.0	0.0
2	4.5	2499.8	0.0	0.0	0.	0.	0.0	0.0	0.0
3	4.1	3170.8	0.0	0.0	0.	0.	0.0	0.0	0.0
4	3.6	3072.0	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.1	60.8	0.0	0.0	0.	0.	0.0	0.0	0.0
6	2.9	1819.6	0.0	0.0	0.	0.	0.0	0.0	0.0
7	1.7	329.4	0.0	0.0	0.	0.	0.0	0.0	0.0

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.46	26.16
2	8.41	26.88
3	13.16	28.43
4	17.58	30.77
5	21.53	33.83
6	24.91	37.52
7	27.60	41.73
8	28.55	44.00

Circle Center At X = 1.87 ; Y = 54.97 ; and Radius = 28.85

Factor of Safety

*** 1.657 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.46	26.16
2	8.40	26.92
3	13.01	28.85
4	17.03	31.82
5	20.22	35.67
6	22.40	40.17
7	23.21	44.00

Circle Center At X = 2.79 ; Y = 46.87 ; and Radius = 20.72

Factor of Safety

*** 1.663 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.46	26.16
2	8.14	27.92
3	12.59	30.20
4	16.73	32.99
5	20.53	36.25
6	23.92	39.92
7	26.86	43.97
8	26.88	44.00

Circle Center At X = -9.21 ; Y = 67.10 ; and Radius = 42.85

Factor of Safety

*** 1.665 ***

Failure Surface Specified By 9 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.46	26.16
2	8.41	26.84
3	13.23	28.18

4	17.81	30.18
5	22.08	32.78
6	25.95	35.95
7	29.35	39.61
8	32.22	43.71
9	32.36	44.00

Circle Center At X = 1.04 ; Y = 62.46 ; and Radius = 36.38

Factor of Safety

*** 1.677 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	4.51	27.23
2	9.45	28.03
3	14.12	29.80
4	18.35	32.46
5	21.96	35.92
6	24.81	40.03
7	26.51	44.00

Circle Center At X = 3.03 ; Y = 52.07 ; and Radius = 24.88

Factor of Safety

*** 1.679 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.98	26.70
2	8.91	27.53
3	13.67	29.08
4	18.14	31.31
5	22.24	34.17
6	25.87	37.61
7	28.96	41.54
8	30.36	44.00

Circle Center At X = 0.94 ; Y = 60.08 ; and Radius = 33.52

Factor of Safety

*** 1.679 ***

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.46	26.16
2	8.18	27.80
3	12.57	30.20
4	16.50	33.29
5	19.86	36.99
6	22.56	41.20
7	23.76	44.00

Circle Center At X = -4.00 ; Y = 55.29 ; and Radius = 30.07

Factor of Safety

*** 1.679 ***

Failure Surface Specified By 8 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.98	26.70
2	8.96	27.15
3	13.71	28.73
4	17.96	31.35
5	21.51	34.88
6	24.15	39.12
7	25.75	43.86
8	25.76	44.00

Circle Center At X = 4.53 ; Y = 48.36 ; and Radius = 21.68

Factor of Safety

*** 1.683 ***

Failure Surface Specified By 9 Coordinate Points

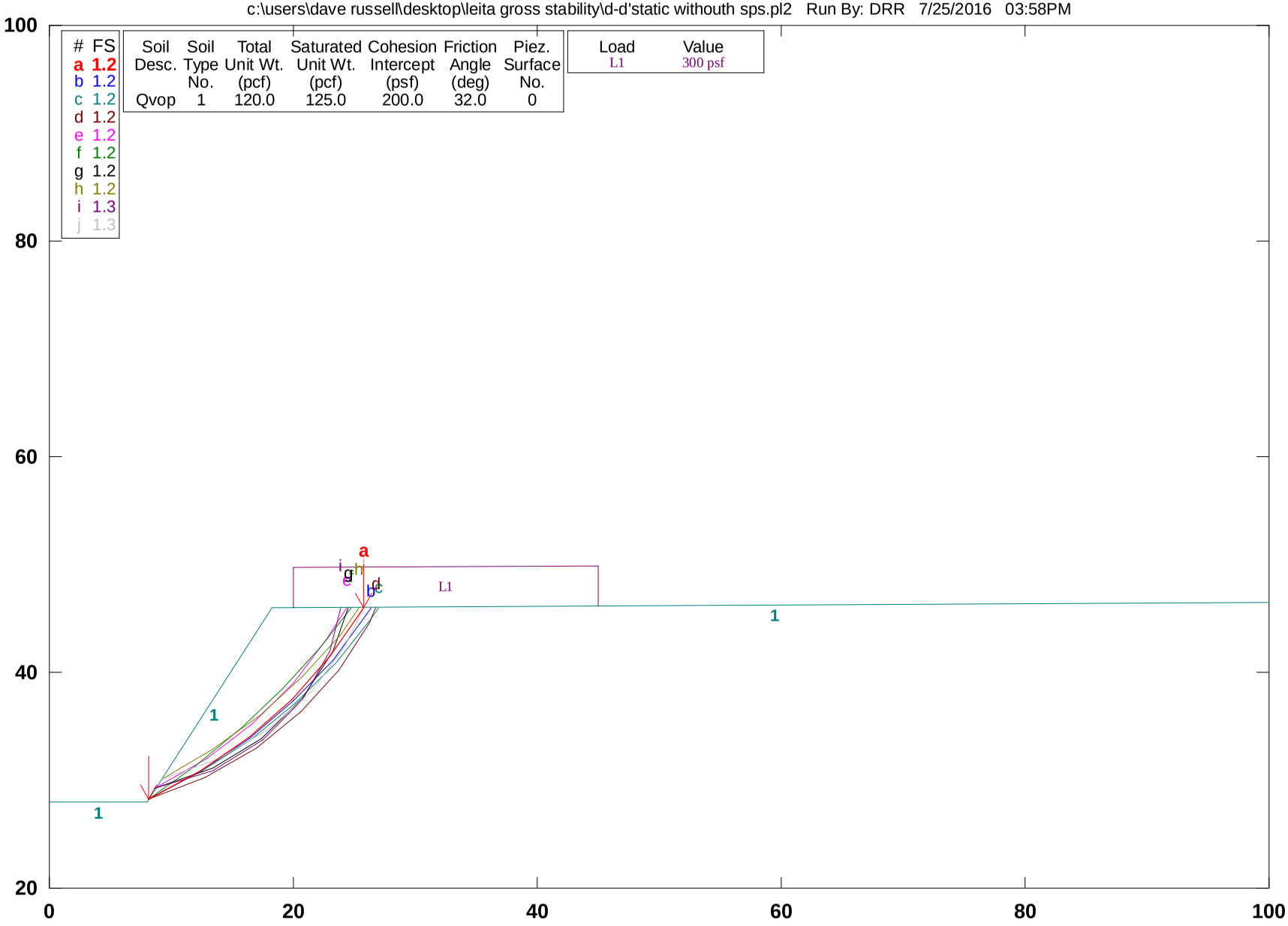
Point No.	X-Surf (ft)	Y-Surf (ft)
1	3.46	26.16
2	8.43	26.64
3	13.29	27.85
4	17.91	29.77

```
    5         22.19       32.34
    6         26.06       35.51
    7         29.41       39.22
    8         32.18       43.38
    9         32.47       44.00
Circle Center At X =     2.68 ; Y =    60.02 ; and Radius =    33.87
       Factor of Safety
      ***    1.695   ***
          **** END OF GSTABL7 OUTPUT ****
```

Cross Section D-D’

CWE 2150433 - Leita Street Mixed Use D-D' Static - No Shear Pins

c:\users\dave russell\desktop\leita gross stability\d-d'static withouth sps.pl2 Run By: DRR 7/25/2016 03:58PM



GSTABL7 v.2 FSmin=1.2

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 7/25/2016
Time of Run: 03:58PM
Run By: DRR
Input Data Filename: C:\Users\Dave Russell\Desktop\Leita Gross Stability\D-D'static withouth SPs.in
Output Filename: C:\Users\Dave Russell\Desktop\Leita Gross Stability\D-D'static withouth SPs.OUT
Unit System: English
Plotted Output Filename: C:\Users\Dave Russell\Desktop\LeGross Stability\D-D'static withouth SPs.PLT
PROBLEM DESCRIPTION: CWE 2150433 - Leita Street Mixed Use
D-D' Static - No Shear Pins

BOUNDARY COORDINATES
3 Top Boundaries
3 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	28.00	8.00	28.00	1
2	8.00	28.00	18.30	46.00	1
3	18.30	46.00	100.00	46.50	1

User Specified Y-Origin = 20.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	200.0	32.0	0.00	0.0	0

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	20.00	45.00	300.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

PIER/PILE LOAD(S)
1 Pier/Pile Load(s) Specified

Pier/Pile No.	X-Pos (ft)	Y-Pos (ft)	Load (lbs)	Spacing (ft)	Inclination (deg)	Length (ft)
1	19.00	46.00	5000.0	1.0	90.00	20.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles
Assuming A Uniform Distribution Of Load Horizontally Between
Individual Piers/Piles.

PIER/PILE LOAD DATA HAS BEEN SUPPRESSED
A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 5.00(ft)
and X = 15.00(ft)
Each Surface Terminates Between X = 21.00(ft)
and X = 50.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial

Failure Surfaces Evaluated. They Are
Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max = 16.567 FS Min = 1.181 FS Ave = 3.654
Standard Deviation = 2.217 Coefficient of Variation = 60.69 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.42	30.90
3	16.34	34.00
4	19.87	37.53
5	22.97	41.46
6	25.58	45.72
7	25.73	46.05

Circle Center At X = -12.02 ; Y = 65.86 ; and Radius = 42.66
Factor of Safety
*** 1.181 ***
Individual data on the 8 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.3	1232.3	0.0	0.0	0.	0.	0.0	0.0	0.0
2	3.9	3154.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	2.0	2190.1	0.0	0.0	0.	0.	0.0	0.0	0.0
4	1.6	1747.6	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.1	128.0	0.0	0.0	0.	0.	0.0	0.0	0.0
6	3.0	2294.4	0.0	0.0	0.	0.	0.0	0.0	890.4
7	2.6	767.1	0.0	0.0	0.	0.	0.0	0.0	784.3
8	0.1	2.9	0.0	0.0	0.	0.	0.0	0.0	44.8

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.44	30.86
3	16.41	33.90
4	20.02	37.35
5	23.23	41.19
6	26.00	45.35
7	26.36	46.05

Circle Center At X = -13.05 ; Y = 68.30 ; and Radius = 45.29
Factor of Safety
*** 1.186 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.46	30.82
3	16.49	33.79
4	20.18	37.16
5	23.50	40.90
6	26.42	44.96
7	27.04	46.05

Circle Center At X = -14.14 ; Y = 71.00 ; and Radius = 48.19
Factor of Safety
*** 1.195 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.75	30.26
3	16.95	32.96
4	20.66	36.31
5	23.78	40.23
6	26.21	44.59
7	26.73	46.05

Circle Center At X = -1.63 ; Y = 57.25 ; and Radius = 30.58

Factor of Safety
*** 1.204 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.68	29.20
2	12.84	31.98
3	16.61	35.26
4	19.96	38.98
5	22.81	43.08
6	24.37	46.04

Circle Center At X = -11.19 ; Y = 63.43 ; and Radius = 39.58
Factor of Safety
*** 1.213 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.06	31.41
3	15.71	34.82
4	19.11	38.49
5	22.22	42.40
6	24.69	46.04

Circle Center At X = -31.77 ; Y = 82.02 ; and Radius = 66.96
Factor of Safety
*** 1.227 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.68	29.20
2	13.32	31.07
3	17.43	33.92
4	20.80	37.61
5	23.27	41.96
6	24.49	46.04

Circle Center At X = 2.77 ; Y = 50.59 ; and Radius = 22.20
Factor of Safety
*** 1.234 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	9.21	30.12
2	13.38	32.88
3	17.24	36.06
4	20.74	39.63
5	23.84	43.55
6	25.43	46.04

Circle Center At X = -14.39 ; Y = 70.37 ; and Radius = 46.66
Factor of Safety
*** 1.248 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.68	29.20
2	13.38	30.92
3	17.50	33.75
4	20.78	37.53
5	23.01	42.00
6	23.88	46.03

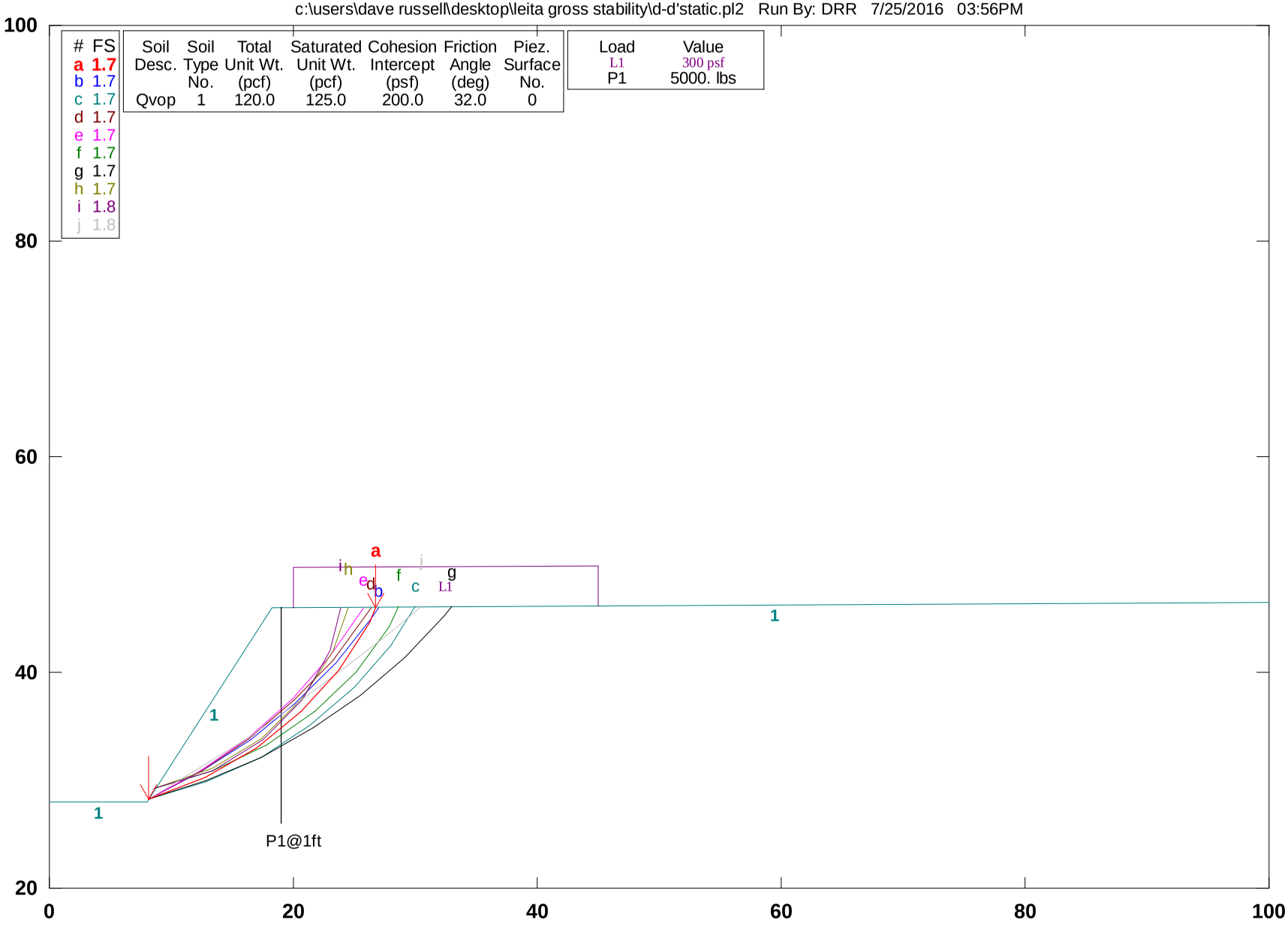
Circle Center At X = 4.33 ; Y = 48.40 ; and Radius = 19.69
Factor of Safety
*** 1.254 ***
Failure Surface Specified By 6 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	9.21	30.12
2	13.85	31.98
3	18.02	34.74
4	21.54	38.29
5	24.28	42.47

```
        6         25.70       46.05
    Circle Center At X =     2.52 ; Y =    53.54 ; and Radius =    24.37
           Factor of Safety
          ***    1.266   ***
              **** END OF GSTABL7 OUTPUT ****
```

CWE 2150433 - Leita Street Mixed Use D-D' Static

c:\users\dave russell\desktop\leita gross stability\d-d'static.pl2 Run By: DRR 7/25/2016 03:56PM



GSTABL7 v.2 FSmin=1.7

Safety Factors Are Calculated By The Modified Bishop Method

***** GSTABL7 *****

** GSTABL7 by Garry H. Gregory, P.E. **

** Original Version 1.0, January 1996; Current Version 2.003, June 2002 **

****

SLOPE STABILITY ANALYSIS SYSTEM

Modified Bishop, Simplified Janbu, or GLE Method of Slices.
(Includes Spencer & Morgenstern-Price Type Analysis)
Including Pier/Pile, Reinforcement, Soil Nail, Tieback,
Nonlinear Undrained Shear Strength, Curved Phi Envelope,
Anisotropic Soil, Fiber-Reinforced Soil, Boundary Loads, Water
Surfaces, Pseudo-Static & Newmark Earthquake, and Applied Forces.

****

Analysis Run Date: 7/25/2016
Time of Run: 03:56PM
Run By: DRR
Input Data Filename: C:\Users\Dave Russell\Desktop\Leita Gross Stability\D-D'static.in
Output Filename: C:\Users\Dave Russell\Desktop\Leita Gross Stability\D-D'static.OUT
Unit System: English
Plotted Output Filename: C:\Users\Dave Russell\Desktop\LeGross Stability\D-D'static.PLT

PROBLEM DESCRIPTION: CWE 2150433 - Leita Street Mixed Use
D-D' Static

BOUNDARY COORDINATES
3 Top Boundaries
3 Total Boundaries

Boundary No.	X-Left (ft)	Y-Left (ft)	X-Right (ft)	Y-Right (ft)	Soil Type Below Bnd
1	0.00	28.00	8.00	28.00	1
2	8.00	28.00	18.30	46.00	1
3	18.30	46.00	100.00	46.50	1

User Specified Y-Origin = 20.00(ft)
Default X-Plus Value = 0.00(ft)
Default Y-Plus Value = 0.00(ft)

ISOTROPIC SOIL PARAMETERS
1 Type(s) of Soil

Soil Type No.	Total Unit Wt. (pcf)	Saturated Unit Wt. (pcf)	Cohesion Intercept (psf)	Friction Angle (deg)	Pore Pressure Param.	Pressure Constant (psf)	Piez. Surface No.
1	120.0	125.0	200.0	32.0	0.00	0.0	0

BOUNDARY LOAD(S)
1 Load(s) Specified

Load No.	X-Left (ft)	X-Right (ft)	Intensity (psf)	Deflection (deg)
1	20.00	45.00	300.0	0.0

NOTE - Intensity Is Specified As A Uniformly Distributed
Force Acting On A Horizontally Projected Surface.

PIER/PILE LOAD(S)
1 Pier/Pile Load(s) Specified

Pier/Pile No.	X-Pos (ft)	Y-Pos (ft)	Load (lbs)	Spacing (ft)	Inclination (deg)	Length (ft)
1	19.00	46.00	5000.0	1.0	90.00	20.0

NOTE - An Equivalent Line Load Is Calculated For Each Row Of Piers/Piles
Assuming A Uniform Distribution Of Load Horizontally Between
Individual Piers/Piles.

A Critical Failure Surface Searching Method, Using A Random
Technique For Generating Circular Surfaces, Has Been Specified.
2000 Trial Surfaces Have Been Generated.
100 Surface(s) Initiate(s) From Each Of 20 Points Equally Spaced
Along The Ground Surface Between X = 5.00(ft)
and X = 15.00(ft)
Each Surface Terminates Between X = 21.00(ft)
and X = 50.00(ft)
Unless Further Limitations Were Imposed, The Minimum Elevation
At Which A Surface Extends Is Y = 0.00(ft)
5.00(ft) Line Segments Define Each Trial Failure Surface.
Following Are Displayed The Ten Most Critical Of The Trial
Failure Surfaces Evaluated. They Are

Ordered - Most Critical First.
* * Safety Factors Are Calculated By The Modified Bishop Method * *
Total Number of Trial Surfaces Evaluated = 2000
Statistical Data On All Valid FS Values:
FS Max = 18.253 FS Min = 1.658 FS Ave = 4.222
Standard Deviation = 2.379 Coefficient of Variation = 56.35 %
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.75	30.26
3	16.95	32.96
4	20.66	36.31
5	23.78	40.23
6	26.21	44.59
7	26.73	46.05

Circle Center At X = -1.63 ; Y = 57.25 ; and Radius = 30.58
Factor of Safety
*** 1.658 ***
Individual data on the 8 slices

Slice No.	Width (ft)	Weight (lbs)	Water Force Top (lbs)	Water Force Bot (lbs)	Tie Force Norm (lbs)	Tie Force Tan (lbs)	Earthquake Force Hor (lbs)	Earthquake Force Ver (lbs)	Surcharge Load (lbs)
1	4.6	1663.6	0.0	0.0	0.	0.	0.0	0.0	0.0
2	4.2	4221.4	0.0	0.0	0.	0.	0.0	0.0	0.0
3	1.3	1817.3	0.0	0.0	0.	0.	0.0	0.0	0.0
4	1.7	2256.1	0.0	0.0	0.	0.	0.0	0.0	0.0
5	0.7	796.3	0.0	0.0	0.	0.	0.0	0.0	199.1
6	3.1	2896.7	0.0	0.0	0.	0.	0.0	0.0	934.0
7	2.4	1060.5	0.0	0.0	0.	0.	0.0	0.0	730.2
8	0.5	45.7	0.0	0.0	0.	0.	0.0	0.0	157.0

Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.46	30.82
3	16.49	33.79
4	20.18	37.16
5	23.50	40.90
6	26.42	44.96
7	27.04	46.05

Circle Center At X = -14.14 ; Y = 71.00 ; and Radius = 48.19
Factor of Safety
*** 1.682 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.89	29.89
3	17.34	32.17
4	21.40	35.08
5	24.99	38.56
6	28.04	42.53
7	30.01	46.07

Circle Center At X = -0.39 ; Y = 61.20 ; and Radius = 34.01
Factor of Safety
*** 1.684 ***
Failure Surface Specified By 7 Coordinate Points

Point No.	X-Surf (ft)	Y-Surf (ft)
1	8.16	28.28
2	12.44	30.86
3	16.41	33.90
4	20.02	37.35
5	23.23	41.19
6	26.00	45.35
7	26.36	46.05

Circle Center At X = -13.05 ; Y = 68.30 ; and Radius = 45.29
Factor of Safety

```
      ***    1.690   ***
Failure Surface Specified By  7 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1          8.16       28.28
    2         12.42       30.90
    3         16.34       34.00
    4         19.87       37.53
    5         22.97       41.46
    6         25.58       45.72
    7         25.73       46.05
Circle Center At X =   -12.02 ; Y =    65.86 ; and Radius =    42.66
       Factor of Safety
      ***    1.701   ***
Failure Surface Specified By  7 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1          8.68       29.20
    2         13.40       30.85
    3         17.79       33.25
    4         21.72       36.34
    5         25.10       40.02
    6         27.84       44.21
    7         28.65       46.06
Circle Center At X =     0.95 ; Y =    58.79 ; and Radius =    30.59
       Factor of Safety
      ***    1.729   ***
Failure Surface Specified By  8 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1          8.16       28.28
    2         12.85       29.99
    3         17.35       32.18
    4         21.59       34.83
    5         25.53       37.91
    6         29.13       41.38
    7         32.35       45.20
    8         32.95       46.09
Circle Center At X =    -5.75 ; Y =    73.79 ; and Radius =    47.59
       Factor of Safety
      ***    1.729   ***
Failure Surface Specified By  6 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1          8.68       29.20
    2         13.32       31.07
    3         17.43       33.92
    4         20.80       37.61
    5         23.27       41.96
    6         24.49       46.04
Circle Center At X =     2.77 ; Y =    50.59 ; and Radius =    22.20
       Factor of Safety
      ***    1.745   ***
Failure Surface Specified By  6 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1          8.68       29.20
    2         13.38       30.92
    3         17.50       33.75
    4         20.78       37.53
    5         23.01       42.00
    6         23.88       46.03
Circle Center At X =     4.33 ; Y =    48.40 ; and Radius =    19.69
       Factor of Safety
      ***    1.767   ***
Failure Surface Specified By  7 Coordinate Points
  Point      X-Surf      Y-Surf
   No.        (ft)        (ft)
    1          8.16       28.28
    2         12.28       31.11
```

```
    3         16.32       34.06
    4         20.26       37.13
    5         24.12       40.31
    6         27.87       43.62
    7         30.51       46.07
Circle Center At X =   -84.35 ; Y =   167.50 ; and Radius =   167.16
       Factor of Safety
      ***    1.769   ***
          **** END OF GSTABL7 OUTPUT ****
```